Poudre School District Board of Education
2407 Laporte Avenue, Fort Collins, CO 80521 • 970-490-3607
Meeting Agenda

Business Meeting

The Board will convene in a Dinner Session at 5:30 p.m. in the Information Technology Center, 2413 Laporte Avenue, Fort Collins. Members of the public may attend this session in person. However, due to room size, public seating is limited and once capacity is reached, no one else will be allowed into the room. The session will not be live streamed.

At 6:30 p.m., the Board will meet in a regular business meeting in the boardroom at the Johannsen Support Services Center, located at 2407 Laporte Avenue, Fort Collins. Members of the public may attend this meeting in person. However, once room capacity has been reached, no one else will be allowed in the building. Members of the public can watch the meeting live via YouTube or Comcast/Xfinity channel 10.

PSD continues to be a mask-friendly district and supports those who choose to wear a mask or not. Protocols could change at any time between the posting of the meeting and the meeting itself. Members of the community are expected to follow current PSD COVID protocols when in PSD buildings.

Requests for reasonable accommodations made under the ADA will be considered upon request. Individuals must notify Liz Davis, Senior Executive Director of Student Services, by email at edavis@psdschools.org of the request for an accommodation no later than 5:00 p.m. the day prior to the meeting. Accommodations will not be made for anyone who did not properly submit a request by the stated deadline.

NOTICE: In case unforeseen circumstances requires the meeting locations to change or the meeting to be canceled, this information will be posted at: www.psdschools.org/yourdistrict/boardofeducation/board-meetings-agendas.

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Tuesday, January 9, 2024

Dinner Session
5:30 PM - Information Technology Center Training Room

This time is scheduled for the Board to receive information and to discuss issues introduced by Board members and the Superintendent. These matters may be scheduled in advance or raised at the meeting. No Board action on substantive matters is taken at the dinner session. As is the case at the regular business meeting, the Board may vote to go into executive session to discuss and/or receive information on particular matters as authorized by C.R.S., 24-6-402(4). The following topics have been scheduled in advance for this dinner meeting:

1. **District Information and Board Discussion Topics**
2. **Agenda Planning**

REGULAR BUSINESS MEETING

6:30 PM

Page

1. CALL TO ORDER

2. PLEDGE OF ALLEGIANCE

3. APPROVAL OF AGENDA

4. RECOGNITIONS AND REPORTS

5. ACTION ITEMS

5.1 Resolution in Support of Dr. Martin Luther King Jr. Day 5 - 7

MLK Resolution.pdf

6. SUPERINTENDENT REPORT

7. COMMUNITY COMMENT

8. BOARD TOPICS AND COMMITTEE REPORTS

9. CONSENT AGENDA

Board members will be asked if they wish to discuss any items listed on the Consent Agenda. If so, these items will be moved from the Consent Agenda and placed under Action Items . Items remaining on the Consent Agenda will be voted on together, pursuant to the following motion: "I move that the Board approve and adopt the recommended actions for the items remaining on the consent agenda."

9.1 Personnel Action BOE Agenda 1-9-2024 8 - 9

Personnel Action BOE Agenda 1-9-2024.pdf

9.2 Meeting Minutes for December 9, 2023 and December 12, 2023 10 - 19

12.12.23 Meeting Minutes - FINAL.pdf

12.9.23 Special Meeting Minutes - FINAL.pdf

9.3 Designation of Posting Location for Public Meetings 20

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9.4 Social Media Litigation Representation Agreement 21 - 41

Social Media Addiction Magazine Wagstaff.pdf

Social Media Representation Agreement (Wagstaff-Kirton).pdf

Social Media School District Litigation Introduction and FAQs.pdf

9.5 Dunn Elementary School HVAC Upgrades Phase II Construction 42 - 633

Contracts Checklist - Dunn Elementary HVAC.pdf

Recommendation of Award Saunder's IFB 24-121-001.pdf

Saunders North - Dunn Elementary HVAC - 2023-24- Final - VendorSigned (1).pdf

10. ACTION ITEMS

10.1 Annual Mill Levy Certification 634 - 640

Mill Levy Resolution 1-09-2024.pdf

Poudre R1 December Certification_2023.pdf

FY 23-24 Traditional Mill Levy Certification Form CDE.pdf

Change in Taxes 1-09-2024.pdf

Estimated Tax Impact 1-09-2024.pdf

10.2 Intergovernmental Agreement for a Southeast Community Center 641 - 662

IGA Southeast Community Center.pdf

11. INFORMATIONAL REPORTS / DISCUSSION ITEMS

11.1 9th and 10th Grade English Language Arts Adoption Overview 663 - 687

9_10 Literacy Update BOE 1-9-24.pdf

12. EXECUTIVE SESSION

12.1 SRO Contract Amendment

12.2 Legal Advice

12.3 Legal Advice

13. ADJOURNMENT

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Poudre School District
Board of Education Meeting Coversheet

Action Item

Agenda Item Title: Resolution in Support of Dr. Martin Luther King Jr. Day

Summary: January 15, 2024 is Dr. Martin Luther King Jr. Day. Dr. King became the leader of the American Civil Rights Movement through nonviolence and civil disobedience. Dr. King responded to arrest and violence with nonviolence and courage to end segregation and racial discrimination in America.

Dr. King is remembered for awakening the conscience of the United States and using his message of hope to bring people together to build the “Beloved Community”, a community of justice.

Recommendation: The Superintendent recommends approval of the resolution in support of Dr. Martin Luther King Jr. Day, January 15, 2024.

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Resolution
of the Poudre School District Board of Education

In Support of

Dr. Martin Luther King Jr. DAY
January 15, 2024

WHEREAS, the Reverend Dr. Martin Luther King Jr. was born on January 15, 1929 and was assassinated on April 4, 1968; and

WHEREAS, Dr. King was the leader of the American Civil Rights Movement from 1955 until his assassination in 1968; and

WHEREAS, Dr. King led the Montgomery, Alabama bus boycott for 381 days to protest the arrest of Rosa Parks and the segregation of the bus system, during which time Dr. King was arrested and his home was bombed; and

WHEREAS, while experiencing racism, arrests, and violence, Dr. King courageously and fervently advocated for a nonviolent resistance strategy and civil disobedience to end segregation and racial discrimination in America and in 1964, at age 35, became the youngest man to be awarded the Nobel Peace Prize in recognition of his efforts; and

WHEREAS, through his work and reliance on nonviolent protest, Dr. King was instrumental in the passage of the Civil Rights Act of 1964 and the Voting Rights Act of 1965; and

WHEREAS, for his work in alleviating racial inequality through nonviolent resistance, Dr. Martin Luther King Jr. Day was signed into law by President Ronald Regan in 1986; and

WHEREAS, Dr. King will be remembered for awakening the conscience and consciousness of the United States and using his message of hope to bring people together to build the “Beloved Community,” a community of justice; and

WHEREAS, the Black and other communities we have traditionally underserved face cultural and systemic barriers to an inclusive and equitable education. Poudre School District strives to close the equity and opportunity gaps for students and promises to commemorate the legacy of Dr. King by creating and upholding equitable, inclusive, and rigorous educational opportunities, experiences, and outcomes; and

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Resolution

of the Poudre School District Board of Education

WHEREAS, the theme for this year's celebration of Dr. King's life and legacy is: "It starts with us." Diversity, Equity, and Inclusion are fundamental values in Poudre School District, and we are committed to ensuring that students, families, and staff who have historically been underrepresented are valued, seen, heard, and empowered.

NOW, THEREFORE BE IT RESOLVED, the Poudre School District Board of Education does hereby proclaim January 15, 2024, as Dr. Martin Luther King Jr. Day in Poudre School District. We encourage students, staff, and the community to celebrate Reverend Dr. Martin Luther King Jr., and those who have followed in the Reverend's footsteps expanding social justice and civil rights in our community and throughout the United States of America.

Approved and adopted this 9th day of January, 2024.

POUDRE SCHOOL DISTRICT

ATTEST:

By:_____
President, Board of Education

_____
Secretary, Board of Education

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Poudre School District
Board of Education Meeting Coversheet

Consent Item

Agenda Item Title: Personnel Action

Policy Facts: EL 2.8-9 Communication and Support to the Board - Submit to the Board all matters regarding which Board action is required by law, along with the Superintendent's recommendations and required policy compliance assurances.

GP 3.2.3.5, the Board will "take all actions required by law."

Summary and/or Background: This Personnel Action is the final step for the Human Resources Department regarding personnel actions relating to licensed and administrative employment in the District.

Recommendation: The Superintendent recommends approval of the attached personnel actions.

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Human Resources - Personnel Action
1/9/2024

1. Administrative/Professional Staff

A. Administrative/Professional Employment/Reappointment

	Name	Effec Date	Assignment
1)	James Sarles	12/18/2023	Assistant Director, Facilities Department

2. Licensed Staff

A. Employment/Reappointment

	Name	Effec Date	Assignment
1)	Timothy Clang	01/08/2024	Teacher, Poudre High School
2)	Amber Gilmore	01/08/2024	Teacher, Timnath Middle/High School
3)	Teresa Hartline	01/08/2024	Counselor, Rice Elementary School
4)	Asher Johnson	01/08/2024	Teacher, Centennial High School
5)	Amiee Kellogg	01/09/2024	Behavior Intervention Coach, Student Services
6)	Pamela Kilness	01/08/2024	Counselor, Rocky Mountain High School
7)	Patricia Mogorit	01/08/2024	Counselor, Rocky Mountain High School
8)	Melissa Sereduke	01/08/2024	Teacher, Laurel Elementary School
9)	Nicholas Tomasini	01/08/2024	Teacher, Poudre High School
10)	Jessica Van Thorre	12/19/2023	Interventionist, Irish Elementary School

B. Leave of Absence

	Name	Effec Date	Assignment
1)	Andrea Bartholomew	01/08/2024	Teacher, Dunn Elementary School
2)	Haley Budd	01/08/2024	Interventionist, Putnam Elementary School
3)	Alexandra Devalk	10/25/2023	Teacher, Bauder Elementary School
4)	Kathleen Finkeldei	12/04/2023	Counselor, Rocky Mountain High School
5)	Alison Gonzalez	01/08/2024	Teacher, Lincoln Middle School
6)	Kasi Karnes	12/04/2023	Teacher, Putnam Elementary School
7)	Zac Larsen	12/20/2023	Teacher, Centennial High School
8)	Kiley Maitland	11/27/2023	Teacher, Traut Elementary School
9)	Patricia Newman	11/29/2023	Teacher, Lincoln Middle School
10)	Ashlyn Patton	10/15/2023	Instructional Coach, Irish Elementary School
11)	Kelly Samuel	12/06/2023	Teacher, Timnath Middle/High School

C. Resignation

	Name	Effec Date	Assignment
1)	Dennise Borunda	01/12/2024	Teacher, Harris Elementary School

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Poudre School District
Board of Education Meeting Coversheet

Consent Item

Agenda Item Title: Meeting Minutes for December 9, 2023 and December 12, 2023

Summary and/or Background: Meeting minutes are taken at Board meetings where action is taken and must be approved by the Board at a future meeting. Approval is usually given by consent of the Board.

Recommendation: The Board President recommends approval of the Board meeting minutes from December 9, 2023 and December 12, 2023.

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Minutes from Board of Education Business Meeting
December 12, 2023

DINNER SESSION - 5:30 PM Information Technology Center Training Room

PRESENT: President Kristen Draper; Directors Jim Brokish, Conor Duffy, Kevin Havelda, Carolyn Reed, and Scott Schoenbauer; Assistant Superintendents Julie Chaplain, Traci Gile and Insoon Olson; Chief Officers Jeff Connell, Lauren Hooten, Bud Hunt, Dave Montoya, Madeline Noblett, Dwayne Schmitz, and Erich WonSavage; General Counsel Autumn Aspen

ABSENT: Vice President Jessica Zamora
LATE: None

Dinner session began at 5:32 p.m.

1.0 District Information and Board Discussion Topics

- Superintendent Kingsley was absent due to illness.
- Chief of Staff Lauren Hooten provided an update on the Long Range Facilities Planning Steering Committee process.
- Marketing of the application process was discussed.
- Director Schoenbauer volunteered to present the meeting recognition.

2.0 Agenda Planning

- Board Committee assignments were planned.

Dinner session ended at 6:03 p.m.

REGULAR BUSINESS MEETING (BOARDROOM) – 6:30 PM

PRESENT: President Kristen Draper; Vice President Jessica Zamora; Directors Jim Brokish, Conor Duffy, Kevin Havelda, Carolyn Reed, and Scott Schoenbauer; Assistant Superintendents Julie Chaplain, Traci Gile and Insoon Olson; Chief Officers Jeff Connell, Lauren Hooten, Bud Hunt, Dave Montoya, Madeline Noblett, Dwayne Schmitz, and Erich WonSavage; General Counsel Autumn Aspen

ABSENT: None
LATE: None

1.0 CALL TO ORDER

President Draper called the regular business meeting to order at 6:30 p.m.

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2.0 PLEDGE OF ALLEGIANCE

President Draper led the Board of Education, staff, and community members in the Pledge of Allegiance.

3.0 APPROVAL OF AGENDA

There were no changes to the agenda.

4.0 RECOGNITIONS AND REPORTS

4.1 Fossil Ridge High School Marching Band

Fossil Ridge High School Principal Mark Barry introduced Director of Bands Aaron Herman and Associate Band Director Hannah Peterson, who spoke about the program and the recognition.

Director Schoenbauer congratulated the group on behalf of the Board of Education.

5.0 SUPERINTENDENT REPORT

Superintendent Kingsley was absent due to illness. Chief of Staff Lauren Hooten introduced a video titled *Understanding PSD* and informed listeners that a steering committee will be formed soon to discuss and inform long range planning.

6.0 COMMUNITY COMMENT

Anna Lebedda expressed dissatisfaction with a new dyslexia page added to the PSD website.

Dani Lawrence conveyed frustration with the Integrated Services department and asked for reform.

Joe Gawronski said PSD is missing out on student enrollment opportunities by watering down the offerings within the district.

Kenan Thomas spoke in support of PCA and the Journey Program and said any plan to consolidate the school is harmful.

7.0 CONSENT AGENDA

7.1 Personnel Action

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7.2 Meeting Minutes from October 9, 2023, November 14, 2023 and November 28, 2023
7.3 Quarterly Financials (June and September 2023)
7.4 Cherry Heights Lease
7.5 2023 Fiscal Year External Audit-Related Documents (Annual Comprehensive Financial Report (ACFR) and Single Audit
7.6 Fort Collins Montessori School Renewal Application
7.7 Liberty Common School Renewal Application
7.8 Empowering Action for School Improvement (EASI) Grant
7.9 Participation in the State Treasurer's Interest-free Loan Program
7.10 Resolution Designating Authorized Signatories to Sign Documents (Authorizing Resolution)
7.11 Playground Replacement Projects at CLP, Dunn, and O'Dea Elementary Schools

Director Havelda moved that the Board approve and adopt the recommended actions for the items on the Consent Agenda.

Director Brokish seconded the motion.

The voting was as follows:
Those voting AYE: Directors Jim Brokish, Kristen Draper, Conor Duffy, Kevin Havelda, Carolyn Reed, Scott Schoenbauer, and Jessica Zamora
Those voting NO: None
Motion passed: 7-0

8.0 ACTION ITEMS

8.1 Audit Committee Annual Report and Member Recommendation

Vice President Zamora moved that the Board acknowledge receipt of the Annual Report of the Audit Committee for 2023 and approve the renewal of two-year terms for Mark Hartman and Brian Stacy Gumley through 2026.

Director Reed seconded the motion.

- Audit Committee Member Brian Richmond was unable to present the report due to bad weather.
- Chief Financial Officer Dave Montoya spoke about the annual report and member recommendations.

The voting was as follows:
Those voting AYE: Directors Jim Brokish, Kristen Draper, Conor Duffy, Kevin Havelda, Carolyn Reed, Scott Schoenbauer, and Jessica Zamora
Those voting NO: None

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Motion passed: 7-0

8.2 Monitoring/Policy Review: EL 2.3, Financial Condition and Activities

Director Brokish moved that the Board determine that the Superintendent has reasonably interpreted Board of Education Policy EL 2.3 in his Internal Monitoring Report dated 12/12/23 and that the evidence presented supports the Superintendent's conclusions stated in the Internal Monitoring Report.

Vice President Zamora seconded the motion.

Board discussion included:

- Gratitude was expressed for difficult work performed by Chief Financial Officer Dave Montoya and staff on behalf of the district.

The voting was as follows:
Those voting AYE: Directors Jim Brokish, Kristen Draper, Conor Duffy, Kevin Havelda, Carolyn Reed, Scott Schoenbauer, and Jessica Zamora
Those voting NO: None
Motion passed: 7-0

9.0 BOARD TOPICS AND COMMITTEE REPORTS

- Appreciation was expressed for the hard work completed by the Audit Committee.
- Board members attended CASB last week in Colorado Springs; PSD student involvement was inspiring and appreciated.
- Congratulations to Poudre High School Principal Cathy Mackay and the CTE program students who were honored at the CASB convention.
- Student Advisory Council members attended CASB and brought great pride to Board members.

10.0 INFORMATIONAL REPORTS/DISCUSSION ITEMS

10.1 Retro Commissioning Study Progress Update

Chief Operations Officer Jeff Connel introduced McKinstry Project Director Lauren Bridgers who provided the update.

Board discussion included:

- Solar funds would be dedicated to six feasible sites.
- Clarification was requested regarding morning warm up/cool down.
- Anticipated timeline for work is the end of February/beginning of March.
- Gratitude was expressed to the McKinstry team for work performed.

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10.2 Annual Mill Levy Certification

Chief Financial Officer Dave Montoya provided information about the Annual Mill Levy Certification.

Board discussion included:

- Important for public to understand that an increase in property taxes does not translate to increased funds for the school district.
- Funds received by the district are determined by the number of students enrolled, times the state assigned *per pupil revenue* and has nothing to do with property taxes.
- $55,000 reduction is a one-year-only program; next steps are unknown.
- Gratitude was conveyed to staff for digging into finances and providing an informative update.

10.3 District Annual Budget Process, Priorities, and Update

Budget Director Brian Gustafson provided the update.

Board discussion included:

- $333 million dollar loss over the past 15 years due to the Budget Stabilization Factor is significant.
- Data request was made for number of students residing within District boundaries and not attending PSD schools.
- Explanation of employee self-funded benefits was provided.
- Important to aggressively market strengths of school district such as CTE program and robust extra-curricular offerings.

11.0 EXECUTIVE SESSION

11.1 Legal Advice
11.2 Negotiations
11.3 SE Innovation Center

Director Havelda moved that the Board enter executive session for the following purposes:

1) to receive legal advice about potential participation in a class action social media lawsuit as authorized by C.R.S. 24-6-402(4)(b), and

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2) to develop the strategy of the school district for negotiations relating to the 2024-2025 collective bargaining agreement or employment contracts, as authorized by C.R.S. 24-6-402(4)(e)(III) and

3) to determine positions relative to matters that may be subject to negotiations, develop strategy for negotiations and instruct negotiators relating to a possible intergovernmental agreement relating to the southeast community recreation center as authorized by C.R.S. 24-6-402(4)(e);

Individuals invited to join the Board in executive session are Superintendent Brian Kingsley, Chief Officers Lauren Hooten, Erich WonSavage, and Jeff Connell; and General Counsel Autumn Aspen.

Vice President Zamora seconded the motion.

The voting was as follows:
Those voting AYE: Directors Jim Brokish, Kristen Draper, Conor Duffy, Kevin Havelda, Carolyn Reed, Scott Schoenbauer, and Jessica Zamora
Those voting NO: None
Motion passed: 7-0

President Draper recused herself from Executive Session 11.3, SE Innovation Center.

Executive Session 11.1 began at 8:44 p.m.
Executive Session 11.1 ended at 9:10 p.m.

Those in attendance for 11.1 were: Board of Education, Chief of Staff Lauren Hooten, and General Counsel Autumn Aspen

Executive Session 11.2 began at 9:10 p.m.
Executive Session 11.2 ended at 9:44 p.m.

Those in attendance for 11.2 were: Board of Education, Chief Officers Lauren Hooten, Dave Montoya, and Erich WonSavage; General Counsel Autumn Aspen

Executive Session 11.3 began at 9:44 p.m.
Executive Session 11.3 ended at 10:01 p.m.

Those in attendance for 11.3 were: Board of Education (minus President Draper), Chief Officers Jeff Connell, Lauren Hooten, and Dave Montoya; General Counsel Autumn Aspen

12.0 ADJOURNMENT

The meeting was adjourned at 10:02 p.m.

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Respectfully submitted,

Jill Brunner
Secretary to the Board of Education

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Minutes from Board of Education Special Meeting
Broadmoor Hotel, Colorado Springs
December 9, 2023

SPECIAL MEETING (FARNY ROOM, BROADMOOR HOTEL) – 9:00 AM

PRESENT: President Kristen Draper; Vice President Jessica Zamora; Directors Jim Brokish, Conor Duffy, Kevin Havelda, Carolyn Reed, and Scott Schoenbauer; Superintendent Brian Kingsley

ABSENT: None
LATE: None

1.0 CALL TO ORDER

President Draper called the regular business meeting to order at 9:10 a.m.

2.0 DISCUSSION ITEMS

2.1 Board Norming

Board discussion included:

- Retreat provides an opportunity to progress as a cohesive team.
- Sharing thoughts and perspectives on difficult topics is important.
- "Team of Eight" concept is critical to success moving forward.
- Breakout teams discussed varying topics including commonality, influential people, overcoming life challenges, stress, and more.

Board recessed at 9:52 a.m.
Board reconvened at 9:57 a.m.

- Members discussed topics from a Brené Brown book and what it means to be brave, set boundaries and more.

Board recessed at 10.25 a.m.
Board reconvened at 10:31 a.m.

2.2 Board/Superintendent Communications

Board discussion included:

- Board members were encouraged to reach out to Executive Secretary Monica Eddy and Chief of Staff Lauren Hooten for support.
- Team of Eight philosophy was discussed; Board unison does not always mean having the same viewpoint.
- Friday Updates provide information about big items throughout the week.

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- Individual contact from the Superintendent to members will occur if something urgent needs to be discussed.
- Board leadership is available to members if questions about protocol exist.
- Board members who individually speak to the media represent themselves and not the Board as a whole.
- Cabinet is an extension of the Superintendent; Board members are welcome to reach out to Cabinet members and are asked to inform the Superintendent afterward.
- Board meeting packets are typically published by Thursday afternoon, but exceptions occur.
- Questions about the meeting packet should be sent to Executive Secretary Monica Eddy by Monday preceding a meeting if possible.
- Potential for re-structuring Community Comment will be discussed at a future meeting.
- Staff interaction was discussed.
- School visit procedures were explained.

2.3 District Priorities/Professional Development

- Cabinet members are participating in Professional Development; Board members were invited to join.
- National Association of School Board Advocacy Institute will be held January 27, 2024, in Washington, D.C.; interested members should sign up soon.

3.0 ADJOURNMENT

The meeting adjourned at 12:16 p.m.

Respectfully submitted,

Jill Brunner
Secretary to the Board of Education

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Poudre School District
Board of Education Meeting Coversheet

Consent Item

Agenda Item Title: Designation of Posting Location for Public Meetings

Policy Facts: Under Colorado law, any meetings at which the adoption of any proposed policy, position, resolution, rule, regulation, or formal action occurs or at which a majority or quorum of the body is in attendance, or is expected to be in attendance, shall be held only after full and timely notice to the public. In addition, a local public body shall be determined to have given full and timely notice if the notice of the meeting is posted in a designated public place within the boundaries of the local public body no less than twenty-four hours prior to the holding of the meeting. The public place or places for posting such notice shall be designated annually at the local public body's first regular meeting of each calendar year. Posting shall include specific agenda information where possible.

Recommendation: The Superintendent recommends the designated posting location for the Board of Education public meeting notices be located on the Poudre School District Board of Education web pages, currently located at http://www.psdschools.org/your-district/board-of-education/board-meetings-agendas.

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Poudre School District
Board of Education Meeting Coversheet

Consent Item

Agenda Item Title: Social Media Litigation Representation Agreement

Summary and/or Background: The law firms of Wagstaff & Cartmell, LLP; Beasley Allen Crow Methvin Portis & Miles, P.C.; Goza & Honnold, LLC; and Kirton McConkie PC currently represent other school districts across the country in asserting claims against certain social media companies for their role in the youth mental health crisis impacting schools. Many of the active cases against social media companies have been consolidated in a multi-district litigation in the U.S. District Court in Northern California. The above referenced counsel has asked the Poudre School District to join the social media litigation on a contingency fee basis, meaning that the District will pay no legal fees or expenses unless and until its lawyers recover compensation on the District's behalf.

Attached for the Board's review and consideration is the social media Representation Agreement, an introductory and frequently asked questions document on the social media lawsuit, and an article on the lawsuit from the law firm.

Recommendation: The Superintendent recommends the Board approve the District's participation in the multi-district litigation against certain social media companies, and authorize the Board President to sign the attorney-client engagement agreement and associated documents.

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SOCIAL MEDIA ADDICTION

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NATIONAL SOCIAL MEDIA LITIGATION TEAM

OUR YOUTH ARE FACING A MENTAL HEALTH CRISIS CAUSED BY SOCIAL MEDIA COMPANIES

Our nation's youth have become addicted to social media, resulting in a major mental health crisis.

WHO IS RESPONSIBLE?

Social media companies like Meta (Facebook and Instagram), Tik Tok, Snapchat and YouTube/Google.

Everything about these products—from inadequate age verification measures, insufficient parental controls, endless scrolling, constant notifications, and targeted algorithms—have been designed to addict teen and adolescent users.

These companies are fueled by their own greed and have put profits over the safety of our youth.

As a result, children across the country are suffering mental and physical harms.

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www.wagstaffcartmell.com | 816.701.1100 | jpkieffer@wcllp.com

NATIONAL SOCIAL MEDIA LITIGATION TEAM

This consortium was formed to work jointly on behalf of public entities in the investigation and prosecution of claims for damages arising out of negligence, public nuisance and other claims against social media companies like Meta (Facebook and Instagram), Tik Tok, Snapchat and YouTube/Google.

We are leaders in representing public entities in this type of litigation against major companies. Our law firms previously created the National JUUL Consortium, which collectively represented over 300 school districts and public entities that serve over 5 million students in litigation against the e-cigarette giant. We helped secure a substantial settlement agreement with JUUL that provides school districts across the country with meaningful compensation. We are now working with school districts and other government entities to hold social media companies accountable for the harms they've caused.

All the firms in our legal team are nationally recognized firms that have built a reputation on their ability and willingness to litigate complex disputes against some of the world's largest companies.

Large cases and powerful defendants are nothing new to us. We have fought and won cases against giants such as BP, Bayer, Volkswagen and Johnson & Johnson to name just a few.

We are committed to representing public entities, large and small, across the country. We will work to obtain just compensation for the mental health crisis and the costs imposed on them by irresponsible social media companies.

Members of our Consortium currently serve in key social media litigation leadership roles, including Co-Lead of the Judicial Council Coordination Proceedings (JCCP) in California state court, Plaintiffs' Steering Committee in the JCCP, and Plaintiffs' Leadership Committee in the Social Media Addition/ Personal Injury Product Liability multidistrict litigation (MDL) in federal court.

Together, our team will work with school districts across the nation as they seek to hold social media companies accountable for creating a youth mental health crisis caused by social media addiction.

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Wagstaff & Cartmell

beasley allen
LAW FIRM

gozahonnold
TRIAL LAWYERS

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IT'S TIME THESE SOCIAL MEDIA GIANTS ARE HELD ACCOUNTABLE FOR FAILING TO PROTECT OUR YOUNG, VULNERABLE AND AT-RISK CHILDREN

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WHAT IS THE PROBLEM?

Social media companies like Meta (Facebook and Instagram), Tik Tok, Snapchat and YouTube/Google knowingly put young users in harm's way to generate billions of dollars in profit.

They adopted targeted algorithms to collect adolescent users' data unethically; used addictive psychological tactics to increase adolescent and teen usage; and feature inefficient controls to help parents exercise their rights and duties to monitor and limit their children's use.

As a result, our children are becoming addicted to social media, resulting in mental and physical injuries like anxiety, depression, eating disorders, body dysmorphia, suicidal ideation, self-harm, and even death.

TARGETED ALGORITHMS

Meta, Snap, TikTok and YouTube/ Google are considered to be some of the largest information technology companies in the world.

Meta, for example, generated $69.7 billion from advertising in 2019, more than 98% of its total revenue for the year.[1] In other words, Meta makes billions of dollars marketing its adolescent user base—along with detailed data on their likes and interests—to advertisers to increase its profits.

These companies use advanced computer rules and processes to collect and analyze users' data. This information is used to assemble virtual files on their users, covering hundreds if not thousands of user-specific data segments. This allows advertisers to tailor advertising and designate advertising dollars to very specific categories of adolescent users.

Many of these data segments are collected by social media companies, scrutinizing each adolescent user's activity on and off the products. Youth users are not even aware of such behavioral surveillance, like navigation paths, watch time and hover time.

The larger a social media product's user database grows, the more time users spend on the database. The more detailed information the product can extract from its users, the more money it makes.

[1] https://www.cnn.com/2020/06/30/tech/facebook-ad-business-boycott/index.html

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DESIGNED TO BE ADDICTIVE

Today's adolescents are the first generation of consumers to have grown up primarily in the digital era. They have come of age alongside social media products and massive tech companies.

According to the Pew Research Center, 92% of U.S. teens are active on social media,[2] with Facebook, Instagram, Tik Tok, Snapchat and YouTube/Google dominating. The research found that nearly half the teens surveyed (46%) said they are online "almost constantly"[3] and 62% of 13- to 18-year-olds use social media daily.[4]

Products like Facebook, Instagram, Snapchat, TikTok, and YouTube use email, text alerts and push notifications to inform users when they receive "likes" or "mentions." When someone posts on social media and receives positive feedback, the brain releases dopamine, the body's "feel-good" hormone, rewarding the behavior.[5] These products also contain addictive algorithms that are meticulously designed to hook adolescent users into a cycle of habitual use.

A similar brain conditioning occurs with addictive drugs. Like alcohol or drugs, people can become addicted to social media.

FAILURE TO PROTECT

These social media companies use ineffective age verification measures, easily allowing children to access their products. Parents are essentially defenseless against the tactics of these companies. These products have features that prevent parents from monitoring and limiting children's use.

In April 2021, former Facebook employee Frances Haugen revealed that the company had detailed knowledge of its negative impact on young users' mental health. Facebook and Instagram hid information from the public, driving teens' interest in their products to increase their profit and refusing to take steps to prevent harm.

[2] https://www.aap.org/en/patient-care/mental-health-minute/social-media-and-adolescent-mental-health/
[3] https://www.pewresearch.org/internet/2022/08/10/teens-social-media-and-technology-2022/
[4] https://www.commonsensemedia.org/sites/default/files/research/report/8-18-census-integrated-report-final-web_0.pdf
[5] https://sitn.hms.harvard.edu/flash/2018/dopamine-smartphones-battle-time/

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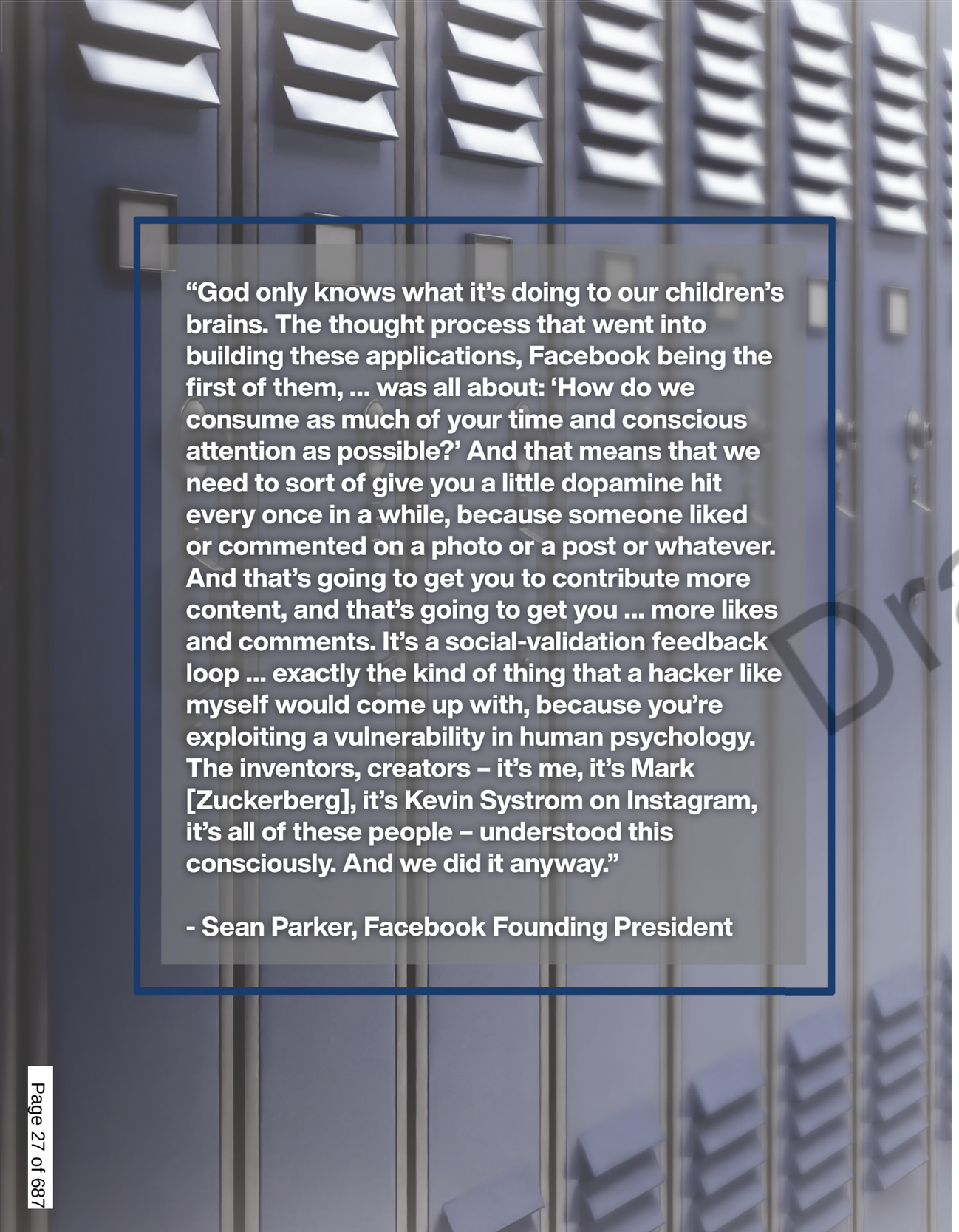

"God only knows what it's doing to our children's brains. The thought process that went into building these applications, Facebook being the first of them, ... was all about: 'How do we consume as much of your time and conscious attention as possible?' And that means that we need to sort of give you a little dopamine hit every once in a while, because someone liked or commented on a photo or a post or whatever. And that's going to get you to contribute more content, and that's going to get you ... more likes and comments. It's a social-validation feedback loop ... exactly the kind of thing that a hacker like myself would come up with, because you're exploiting a vulnerability in human psychology. The inventors, creators – it's me, it's Mark [Zuckerberg], it's Kevin Systrom on Instagram, it's all of these people – understood this consciously. And we did it anyway."

- Sean Parker, Facebook Founding President

THE LAWSUITS

Social media has invaded school districts across the nation and placed severe burdens on school administrators as they work to find ways to educate students on the dangers of social media addiction and keep it from disrupting the learning environment. Social media addiction and the resulting mental health crisis have forced schools to:

- Hire additional mental health professionals
- Develop lesson plans on social media harms
- Provide more training for educators, staff and the community
- Address property damage caused by mentally anguished students
- Increase disciplinary measures
- Address bullying, harassment and threats
- Confiscate electronic devices
- Notify parents and guardians of students' behavioral issues and attendance
- Investigate and respond to threats made over social media
- Update student handbooks and school policies

Many schools have diverted educational resources to crack down on the mental health crisis caused by social media addiction. School districts already have limited funds and should not have to allocate budget money for educational campaigns, prevention and treatment of social media harms. The mental heath issues students face include:

- Anxiety
- Depression
- Eating disorders (anorexia, bulimia, binge eating, etc.)
- Body dysmorphia (obsessive focus on a perceived flaw in appearance)
- ADD/ADHD
- Lack of focus, inability to concentrate
- Self-harm, thoughts of self-harm
- Suicide, attempted suicide, suicide ideation

The law affords school districts the opportunity to hold social media companies responsible for the damage they cause to our children.

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THE LAWSUITS

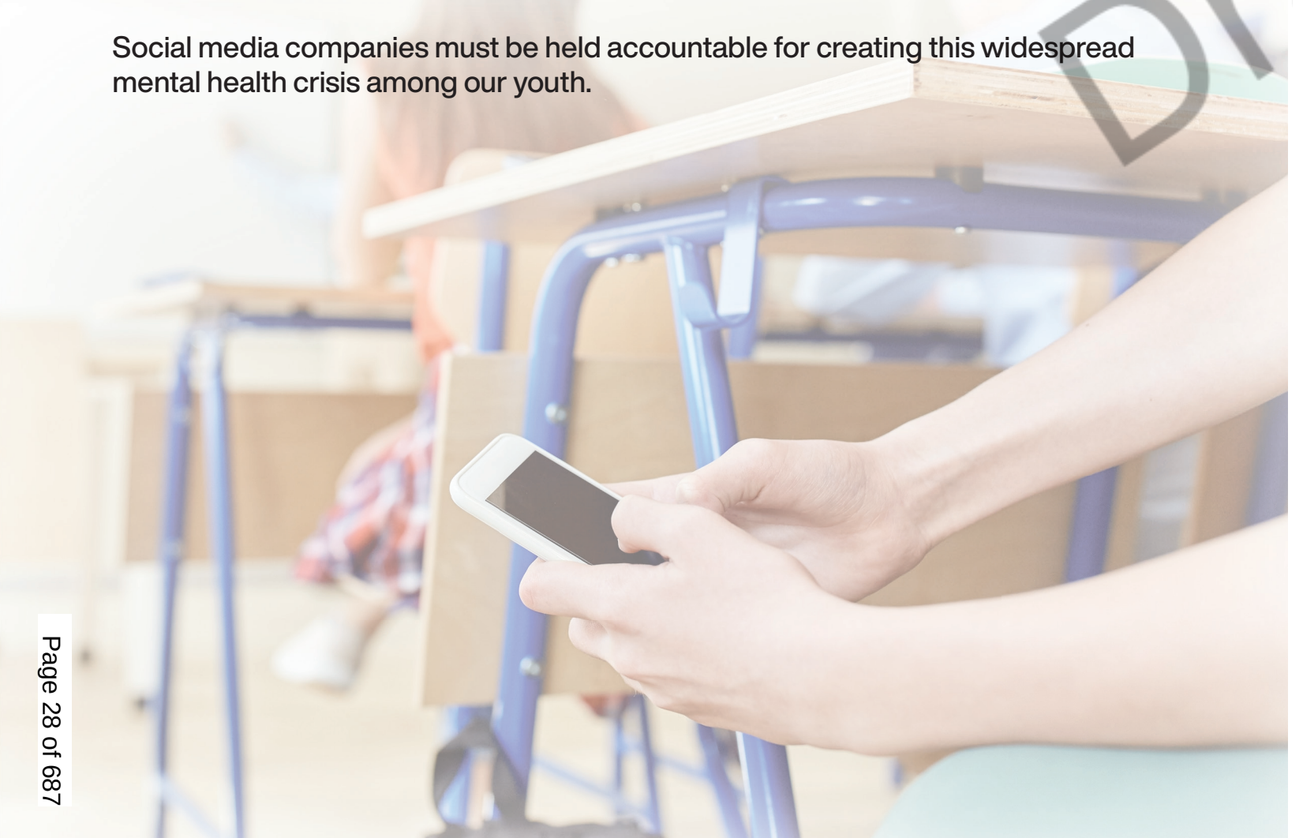
Social media companies can be held responsible for past and future expenses for school districts dealing with the effects of their students' social media addictions.

The lawsuits against social media companies request damages to provide relief from the districts' financial losses as a result of arranging outreach and education programs regarding social media harms and hiring additional mental health professions. The lawsuits also seek an abatement remedy to combat our youth's mental health crisis due to social media addiction.

School districts do not have to pay anything upfront. The law firms handling the cases will front the expenses in the litigation. The school districts would only be required to pay expenses if the law firms obtain a recovery on the school districts' behalf. If the action is not successful, no legal fees are owed.

Many districts across the nation are struggling to protect their students from the mental and physical injuries caused by social media addiction.

Social media companies must be held accountable for creating this widespread mental health crisis among our youth.



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OUR LEGAL TEAM

Wagstaff & Cartmell

Founded in 1997 when Tom Wagstaff and Tom Cartmell left a large Kansas City firm to form a boutique, the original vision of Wagstaff and Cartmell was to be a premier trial firm representing both plaintiffs and defendants in complex cases.

Now with 33 attorneys and over 40 supporting staff members, the firm's lawyers appear in cases nationwide, including in multidistrict litigation, class actions, and mass tort cases. The firm has lawyers licensed in California, Missouri, Kansas, Colorado, Utah, the District of Columbia, and numerous federal district and appellate courts, including the U.S. Supreme Court.

Wagstaff & Cartmell attorneys have frequently been appointed to senior leadership positions in national multidistrict litigation, state court consolidations, and class actions. In multidistrict litigation against social media companies, the firm represents dozens of adolescents in numerous states across the nation. Tom and Jon have been extensively involved in the social media litigation from the outset, including serving on the JCCP Plaintiffs' Steering Committee.

Tom Cartmell

Jon Kieffer

www.wagstaffcartmell.com | 816.701.1100 | jpkieffer@wcllp.com

OUR LEGAL TEAM

Founded in 1979, Beasley Allen Law Firm is a leader in complex plaintiff litigation nationwide. We work with attorneys and clients across the country and have offices located in Atlanta, Georgia, Dallas, Texas, Mobile, Alabama, and Montgomery, Alabama. Our award-winning attorneys live by our creed of "helping those who need it most."

Beasley Allen lawyers currently hold key leadership in the social media litigation, including being appointed as Co-Lead of the JCCP in California state court and on the Plaintiffs' Leadership Committee in the Social Media Addition/Personal Injury Product Liability MDL.

Joseph VanZandt served on the Plaintiffs' Steering Committee in the national JUUL MDL. He was recognized as a Business Insider "Rising Star of the Courtroom: 15 Great Litigators of the Future" in 2022 and a Law360 Rising Star in 2020. He was also selected to the Super Lawyers "Rising Stars" list in 2021 and 2022 and to the National Trial Lawyers Association's Top 40 Under 40 for Civil Plaintiffs in 2019.

Davis Vaughn was heavily involved in the national JUUL MDL, assisting the Trial, Law & Briefing, Bellwether, Expert, and Discovery Committees with all aspects of case workup, discovery, and trial preparation. He is a member of the Alabama State Bar and American Association for Justice. Davis was selected to the National Trial Lawyers Association's Top 40 Under 40 for Civil Plaintiffs in 2022.

Joseph VanZandt

Davis Vaughn

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gozahonnold TRIAL LAWYERS

Kirk is a Fellow in the American College of Trial Lawyers, a member of the American Board of Trial Advocates, and a Fellow in the International Academy of Trial Lawyers.

Brad has served in numerous leadership positions on a number of successful MDLs. Brad served on the Plaintiffs' Steering Committee of the JUUL MDL.

Kirk and Brad have been extensively involved in the social media litigation from the outset, including serving on the JCCP Plaintiffs' Steering Committee.

Kirk Goza

Bradley Honnold

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FOR MORE INFORMATION:

Wagstaff & Cartmell

816.701.1100

jpkieffer@wcllp.com
www.wagstaffcartmell.com

One of our dedicated lawyers will personally meet with you to review your case, for free.

ATTORNEY-CLIENT ENGAGEMENT AGREEMENT

The Attorney-Client Engagement Agreement ("Agreement") is entered into by and between _____ [District Name] ("Client" or "District") and Wagstaff & Cartmell, LLP and its co-counsel Beasley Allen Crow Methvin Portis & Miles, P.C., Goza & Honnold, LLC, and Kirton McConkie PC ("Attorneys" or "We"), and encompasses the following provisions:

1. CONDITIONS

This Agreement will not take effect, and Attorneys will have no obligation to provide legal services, until Client returns a signed copy of this Agreement.

2. SCOPE

Client hires Attorneys to provide legal services in connection with pursuing claims for damages associated with social media litigation, including against Facebook, Meta, Instagram, Snapchat, TikTok, YouTube, and Google, as well as other defendants Attorneys determine appropriate and in the best interests of Client ("Action").

3. DUTIES AND RESPONSIBILITIES OF PARTIES

All professional work performed under this Agreement shall be performed by Attorneys in accordance with existing professional standards. Attorneys shall exert their best efforts and use their best judgment in review and analysis and preparation of opinions and memoranda and representation in such proceedings. Client will cooperate with Attorneys and their representatives at all times and comply with all reasonable requests of Attorneys in the prosecution of this matter on a timely basis. Client agrees to be truthful at all times with Attorneys, to provide whatever information is necessary (in the Attorneys' estimation) in a timely and competent manner, and to provide immediate information as to any change in Client's status which may have any impact on the prosecution of the Action. At the end of this Agreement Client shall designate a "District Representative" as the authorized representative to be the primary individual to communicate with Attorneys regarding the subject matter of Attorneys' representation of Client under this Agreement.

4. LEGAL SERVICES SPECIFICALLY EXCLUDED

Unless otherwise agreed in writing by Client and Attorneys, Attorneys will *not* provide legal services with respect to (a) defending any legal proceeding or claim against the Client commenced by any person unless such proceeding or claim is filed against the Client in the Action or (b) proceedings before any federal or state administrative or governmental agency, department, or board. With Client's permission, however, Attorneys may elect to appear at such administrative proceedings to protect Client's rights. If Client wishes to retain Attorneys to provide any legal services not provided under this Agreement for additional compensation, a separate written agreement between Attorneys and Client will be required.

5. FEES

a. Client will pay Attorneys' fees ("Attorneys' Fees") of:

   i. For any monetary settlement or recovery, or any non-monetary recovery, that Attorneys obtain for Client, Attorneys shall be entitled to thirty-three percent (33%), including thirty-three percent (33%) of the value of any non-monetary settlement or recovery, provided that such fee will be paid only by money recovered from defendants. However, if money recovered from defendants is less than thirty-three percent (33%) of the value of any non-monetary settlement or recovery, Client is not responsible for paying Attorneys any money other than what has been recovered from

defendants.

ii. Client understands and acknowledges that Attorneys are co-counsel in this Action and are entitled to share in the Attorneys' Fees. Client understands that this Agreement will not increase the total amount of attorneys' fees owed to Attorneys by Client. Client understands and acknowledges that the Attorneys' Fees will be shared as follows:

1. Wagstaff & Cartmell, LLP	25%
2. Beasley Allen Crow Methvin Portis & Miles, P.C.	25%
3. Goza & Honnold, LLC	25%
4. Kirton McConkie PC	25%

b. For determining the Attorneys' Fees as outlined in paragraph 5(a), the date of recovery shall be the date that monies are paid or non-monetary value conveyed by defendants as a result of the Action, whether through settlement, judgment, or other means, rather than the date such monies are promised, agreed, or ordered to be paid.

c. Contingency fee rates are not set by law but have been negotiated. If no recovery is made, no fees will be charged.

d. The contingent fee is calculated as a percent of any settlement or recovery prior to the deduction of any expense or cost, i.e., the "Gross Recovery," unless prohibited by law or Court rule. If Client and Attorneys disagree as to the fair market value of any non-monetary property or services included in the Gross Recovery, Attorneys and Client agree that a binding appraisal will be conducted to determine this value.

e. The Gross Recovery shall include, without limitation, any monetary payments, or the fair market value of any non-monetary property and/or services to be transferred and/or rendered for the benefit of the District, agreed or ordered to be made by the adverse parties or their insurance carriers as a result of the Action, whether by settlement, arbitration award, court judgment (after all appeals exhausted), or otherwise. Any statutory attorneys' fee paid by defendants shall be included in calculating the Gross Recovery.

f. If, by judgment, there is *no* monetary recovery and District receives nonmonetary or "in kind" relief, Attorneys acknowledge that District is not obligated to pay Attorneys' Fees from public funds for the value of the in kind relief. In the event of in kind relief by judgment, Attorneys' sole source of recovery of contingent fees will come from a common fund or court ordered attorneys' fees.

g. District agrees the defendants shall pay all attorneys' fees in a settlement that includes only nonmonetary relief. Client understands that Attorneys have and will invest resources into prosecuting this action on behalf of the Client and Client agrees to make a good faith effort to include attorneys' fees for Attorneys as part of the terms of any settlement or resolution of the Action.

6. FEDERAL MDL AND STATE COORDINATION FEE ASSESSMENTS

a. In the event there is a Court ordered assessment or agreement for fees and costs required to be paid to any current or future Federal Multidistrict Litigation (MDL) or any State Court coordinated proceedings, which typically ranges from 6% to 9% of the gross proceeds, any such assessment will be paid from Client's share of any recovery proceeds as part of the costs and expenses advanced, unless otherwise ordered by the Court or prohibited by law or Court rules. At this time, Attorneys

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cannot determine what Court ordered assessment, if any, will be paid to an MDL or to a State Court coordinated proceeding.

b. District understands that additional Attorneys' Fees and/or litigation expense reimbursement(s) may be received by Attorneys from common benefit fund(s) or plaintiff's steering committee discretionary funds from an MDL or State Court coordinated proceeding, Attorneys' representation of other claimants in this litigation, or from other sources. District agrees and understands that the Attorneys' Fees set forth above in Section 5 shall be recoverable to Attorneys in addition to and not withstanding such other fees, and that Attorneys' Fees are calculated prior to the assessment of any Court ordered assessment, i.e., from the Gross Recovery.

7. SETTLEMENT

Client has the authority to accept or reject any final settlement amount after receiving the advice of Attorneys. District understands settlements are a "compromise" of its claim, and that Attorneys' Fees, as outlined in Section 5 above, apply to settlements. For example, if a settlement is reached, and includes future or structured payments, Attorneys' Fees shall include its contingent portion of those future or structured payments.

8. ASSOCIATE COUNSEL

a. District agrees that Attorneys may, in their discretion, employ associate counsel to assist in prosecuting District's claim, and District agrees to the participation of any lawyers that Attorneys may choose to involve in District's case. With the exceptions set forth below, payment of Attorneys' Fees to any such additional counsel will be the responsibility of Attorneys and will not increase the total Attorneys' Fees to be paid by District. Appropriate costs and expenses incurred by any such additional counsel on District's behalf, however, will be chargeable to District on the same terms (set out in this Agreement) as costs and expenses incurred on District's behalf by Attorneys.

b. In some instances, it may be necessary for Attorneys to retain special outside counsel to assist on matters other than prosecuting District's claim for damages. Examples of such instances include the following: a defendant may seek bankruptcy protection and District seeks bankruptcy counsel that affects District's claim; or a complex, group settlement may require an ethics opinion from outside counsel; or special action in probate court may be necessary. District understands that Attorneys do not specialize in these areas of the law and agrees that Attorneys may retain such special outside counsel to represent District when Attorneys deem such assistance to be reasonably necessary. District understands that the fees for such counsel will be deducted from District's share of the recovery.

9. REASONABLE FEE IF CONTINGENT FEE IS UNENFORCEABLE OR IF ATTORNEY IS DISCHARGED BEFORE ANY RECOVERY

In the event that the contingent fee portion of this agreement is determined to be unenforceable for any reason or the Attorneys are prevented from representing Client on a contingent fee basis, Client agrees to pay a reasonable fee for the services rendered. If the parties are unable to agree on a reasonable fee for the services rendered, Attorneys and Client agree that the fee will be determined by arbitration proceedings before a mutually agreed upon neutral affiliate with the Judicial Arbitration and Mediation Services (JAMS); in any event, Attorneys and Client agree that the fee determined by arbitration shall not exceed thirty percent (33%) of the Gross Recovery as defined herein.

10. NO GENERAL FUND PAYMENTS

Notwithstanding any other provision in this Agreement, in no event will the Client be required to pay legal fees out of any fund other than the monies recovered from defendants in this litigation. Under no

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circumstances shall Client's own funds be obligated to satisfy the Attorneys' Fees as a result of the Action or this Agreement.

11. COSTS AND EXPENSES

In addition to paying Attorneys' Fees, Client shall reimburse Attorneys for all "costs/expenses," which include but is not limited to the following: process servers' fees, fees fixed by law or assessed by courts or other agencies, court reporters' fees, messenger and other delivery fees, parking, investigation expenses, consultants' fees, expert witness fees, travel expenses, and other similar items incurred by Attorneys. The costs/expenses incurred that Attorneys advance will be owed in addition to Attorneys' Fees and Client will reimburse those costs/expenses after Attorneys' Fees have been deducted, unless prohibited by law or Court rule. If there is no recovery, Client will not be required to reimburse Attorneys for costs/expenses. In the event a recovery is less than incurred costs/expenses, Client will not be required to reimburse Attorneys for any costs/expenses above and beyond the recovery.

12. SHARED EXPENSES

Client understands that Attorneys may incur certain expenses that jointly benefit multiple clients, including, for example, expenses for travel, experts, and copying. Client agrees that Attorneys shall divide such expenses equally, or pro rata, among such clients, and deduct Client's portion of those expenses from Client's share of any recovery.

13. DISBURSEMENT OF PROCEEDS TO CLIENT

a. The proceeds of any settlement, judgment or recovery on District's behalf under the terms of this Agreement shall be disbursed to District as soon as reasonably practicable after receipt by Attorneys. At the time of disbursement of any proceeds recovered on District's behalf under the terms of this Agreement, District will be provided with a detailed disbursement sheet reflecting the method by which Attorneys' Fees have been calculated and the expenses of litigation which are due to Attorneys from such proceeds. Attorneys are authorized to retain out of any monies that may come into their hands by reason of its representation of District the fees, costs, expenses and disbursements to which they are entitled as determined in this Agreement.

b. It is possible that payment to the Client by the adverse parties to the Action or their insurance carrier(s) or any third-party may be deferred, as in the case of an annuity, a structured settlement, or periodic payments. The Attorneys' Fees will be paid out of the initial payment if there are sufficient funds to satisfy the Attorneys' Fees. If there are insufficient funds to pay the Attorneys' Fees in full from the initial payment, the balance owed to Attorneys will be paid from subsequent payments to Client before there is any distribution to Client.

14. LIEN

In the event any third-party attempts to lien any proceeds recovered in this Action, Client hereby grants, and agrees, to the extent permitted by law or Court rule, that Attorneys hold a first priority and superior lien on any and all proceeds recovered from defendants in the Action in the amount of the Attorneys' Fees and costs that the Attorneys are entitled to under this Agreement. This lien right is limited to only those monies recovered from defendants and in no way affects any other rights of Client in any way whatsoever.

15. DURATION

This Agreement shall cover the period from date of execution until the termination of the Action or termination of the legal services rendered hereunder, whichever is sooner. This Agreement may be terminated by District upon at least 10-days' notice, and in the event of such termination, neither party shall have any further rights against the other, except that in the event of a recovery by District against the

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defendant(s) subsequent to termination, Attorneys shall have rights in the nature of *quantum meruit* to recover fees, costs and expenses reasonably allocable to its work prior to termination. In the event of termination of this Agreement for any reason, Attorneys shall immediately return to District all materials and documents of every kind and nature, including but not limited to District documents and computer disks, relating to this Agreement and the Action. Attorneys may withdraw as District's attorneys at any time if they determine, in their sole discretion, that District's claim lacks merit or that it is not worthwhile to pursue District's claim further.

16. DISCLAIMER OF GUARANTEE

Nothing in this Agreement and nothing in Attorneys' statements to Client will be construed as a promise or guarantee about the outcome of Client's matter. Attorneys make no such promises or guarantees. Attorneys' comments about the outcome of Client's matter are expressions of opinion only.

17. MULTIPLE REPRESENTATIONS

District understands that Attorneys do or may represent many other individuals/entities with actual or potential claims in the Action. Attorneys' representation of multiple claimants at the same time may create certain actual or potential conflicts of interest in that the interests and objectives of each client individually on certain issues are, or may become, inconsistent with the interests and objectives of the other. As attorneys, Attorneys are governed by specific rules and regulations relating to Attorneys' professional responsibility in Attorneys' representation of clients, and especially where conflicts of interest may arise from Attorneys' representation of multiple clients against the same or similar defendants, Attorneys are required to advise Attorneys' clients of any actual or potential conflicts of interest and obtain their informed written consent to Attorneys' representation when actual, present, or potential conflicts of interest exist. By signing this Agreement, the District is acknowledging that they have been advised of the potential conflicts of interest which may be or are associated with Attorneys' representation of District and other multiple claimants and that District nevertheless wants Attorneys to represent District, and that District consents to Attorneys' representation of others in connection with the Action. Attorneys strongly advise District, however, that District remains completely free to seek other legal advice at any time even after District signs this Agreement.

18. AGGREGATE SETTLEMENT

Often times in cases where Attorneys represent multiple clients in similar litigation, the opposing parties or defendants attempt to settle or otherwise resolve Attorneys' cases in a group or groups, by making a single settlement offer to settle a number of cases simultaneously. There exists a potential conflict of interest whenever attorneys represent multiple clients in a settlement of this type because it necessitates choices concerning the allocation of limited settlement amounts among the multiple clients. However, if all clients consent, a group settlement can be accomplished and a single offer can be fairly distributed among the clients by assigning settlement amounts based upon the strengths and weaknesses of each case, the relative nature, severity and extent of injuries, and individual case evaluations. In the event of a group or aggregate settlement proposal, Attorneys may implement a settlement program, overseen by a referee or special master, who may be appointed by a court, designed to ensure consistency and fairness for all claimants, and which will assign various settlement values and amounts to each client's case depending upon the facts and circumstances of each individual case. District authorizes Attorneys to enter into and engage in group settlement discussions and agreements which may include District's individual claims. Although District authorizes Attorneys to engage in such group settlement discussions and agreements, District will still retain the right to approve, and Attorneys are required to obtain District's approval of, any settlement of District's case.

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19. ENTIRE AGREEMENT

It is expressly agreed that this Agreement represents the entire agreement of the parties, that all previous understandings are merged in this Agreement, and that no modification of this Agreement shall be valid unless written and executed by both parties.

20. SEVERANCE CLAUSE

It is expressly agreed that if any term or provision of this Agreement, or the application thereof to any person or circumstance, shall be held invalid or unenforceable to any extent, the remainder of this Agreement, or the application of such term or provision to persons or circumstances other than those to which it is held invalid or unenforceable, shall not be affected thereby; and every other term and provision of this Agreement shall be valid and shall be enforced to the fullest extent permitted by law.

21. COUNTERPARTS

This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, and all of which, taken together, shall constitute one and the same instrument. Facsimile or PDF versions of this Agreement shall have the same force and effect as signature of the original.

The above is approved and agreed upon by all parties.

[SIGNATURE PAGE FOLLOWS]

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ACKNOWLEDGMENT OF CLIENT

The undersigned agrees to the terms and provisions of this Attorney-Client Engagement Agreement.

Signature: _____

Print Name: _____

Print Title: _____

Print Date: _____

Print Name of School District: _____ (the "Client" or "District")

AUTHORIZED REPRESENTATIVE OF THE DISTRICT FOR THIS AGREEMENT

(the "District Representative")

Print Name: _____

Print Title: _____

Print Phone Number: _____

Print Email: _____

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ACKNOWLEDGMENT OF ATTORNEYS

The undersigned agrees to the terms and provisions of this Attorney-Client Engagement Agreement.

Dated: _____ _____

Tom Cartmell, Esq.
Wagstaff & Cartmell, LLP

Dated: _____ _____

Joseph VanZandt, Esq.
Beasley Allen Crow Methvin Portis & Miles, P.C.

Dated: _____ _____

Kirk Goza, Esq.
Goza & Honnold, LLC

Dated: _____ _____

Joel Wright, Esq.
Kirton McConkie PC

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Social Media School District Litigation:
Introduction and Frequently Asked Questions

Social media companies, like Facebook, Instagram, TikTok, Snapchat, and YouTube, have infiltrated our communities and become a fixture in the lives of our children. These social media products have become ubiquitous — we see children constantly using these products in our homes and in our schools. National surveys show that a significant percentage of high school and middle school students regularly use social media, often to the point of developing severe addiction to the products. Our investigation has revealed that social media companies engaged in deceptive practices by designing and promoting their products to attract and addict children. Everything about these products—from inadequate age verification measures, insufficient parental controls, endless scrolling, constant notifications, and targeted algorithms—have been designed to addict teen and adolescent users.

Due to the conduct of these social media companies, a new generation of children are suffering from addiction and other related mental health issues, which has uniquely impacted schools and forced them to incur a multitude of costs to address this problem. With schools now facing the challenge to remedy and abate the situation, Wagstaff Cartmell has teamed up with a national coalition of firms to represent school districts and public entities combatting the youth mental health crisis, caused by social media companies. The national law firm coalition includes:

- **Wagstaff & Cartmell** – Kansas City (www.wagstaffcartmell.com)
- **Beasley Allen** – Atlanta | Montgomery | Dallas | Mobile (www.beasleyallen.com)
- **Goza & Honnold** – Kansas City (www.gohonlaw.com)

Each of these firms are committed to protecting public health and have built reputations on their ability and willingness to litigate complex disputes, against some of the world's largest companies. Currently, members from each of these firms serve in key court-appointed leadership roles in the national litigation against JUUL, the e-cigarette manufacturer responsible for creating a youth vaping epidemic among school campuses. We were successful in our pursuit to hold JUUL accountable, as JUUL recently entered into a substantial settlement agreement to compensate school districts and help abate the problems caused by the e-cigarette epidemic.

Our firms similarly believe that social media companies should be held accountable for the mental health crisis impacting our nation's youth. We welcome the opportunity to discuss these important issues with your organization and its members, and hope that you will consider joining this effort on behalf of public education and the welfare of our children. Below, we have provided responses to some frequently asked questions. If you have additional questions or would like additional information, please contact Jon Kieffer or Austin Brane via email at jpkieffer@wcllp.com and abrane@wcllp.com or by phone at 816-701-1100.

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Frequently Asked Questions

How will filing a lawsuit against social media companies benefit your school district?

Suing social media companies gives school districts the opportunity to recover financial reimbursement for the expenses the districts have incurred because of the youth mental health crisis. Some schools have spent thousands of dollars, countless hours, and other precious resources to implement or adjust their methods of policing, discipline, and helping addicted students who constantly use social media products on school property. Even if your school district has not expended substantial funds to deal with this problem, investigating claims and potentially filing a lawsuit can help a school obtain future damages to fund necessary steps to deal with the social media-caused mental health crisis in your schools.

Beyond the opportunity for financial recovery, school district participation in this litigation is critical. Social media companies have targeted our children with addictive and harmful products that feature no warnings or instructions for safe usage. School districts have been especially impacted and are in a unique position to take a stand against this conduct. School districts joining this litigation will play a pivotal role in holding social media companies accountable and sending the message to these companies that profits should not be gained at the expense of children's health and safety. We believe social media companies should pay and provide schools with resources to fight this mental health crisis on the front lines.

What are the financial costs/risks for school districts participating in this litigation?

Wagstaff Cartmell works on a contingency fee basis, meaning school districts are not required to pay any legal fees or expenses unless, and until, Wagstaff Cartmell recovers compensation on behalf of the school district. Wagstaff Cartmell will front all expenses associated with pursuing a claim. If Wagstaff Cartmell recovers compensation on behalf of the school district, Wagstaff Cartmell will be reimbursed for expenses out of the amount of the recovery. If the case is not successful – meaning that the school district does not recover compensation for its claim – the school district will not owe Wagstaff Cartmell for any legal fees or expenses.

What legal claims do school districts have against social media companies?

Cases against social media companies involving school districts are based on a cause of action known as "public nuisance." Public nuisance claims allow both government and private entities to hold companies liable for unique damages incurred as a result of the companies' conduct. This cause of action has been successfully utilized by government and private entities to redress several similar public health epidemics, most notably the JUUL e-cigarette epidemic, current opioid crisis, and the original tobacco litigation in the 90s. Social media companies have caused a youth mental health crisis that has significantly impacted schools. Utilizing the public nuisance liability theory allows school districts to hold social media companies accountable for its conduct and the damage caused.

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Where will the litigation take place and how will it proceed?

Hundreds of personal injury lawsuits have been filed in federal courts against social media companies by individuals and school districts. Because several of the social media companies are headquartered in California, there is also an active California consolidated state court litigation called the "JCCP", which contains additional lawsuits against these companies. The federal court system has consolidated the cases in a Multi-District Litigation ("MDL") in front of Judge Yvonne Gonzalez Rogers in the Northern District of California (Oakland Division). Judge Gonzalez Rogers will manage discovery, pre-trial briefing, and other issues common to all cases. Judge Gonzalez Rogers may also try several test, or "bellwether," cases in the MDL. Once the MDL work is complete, each case will be sent back to a federal district court in the school district's state for individual trials, unless there is pre-trial settlement.

Wagstaff and Cartmell lawyer Tom Cartmell has been appointed to the Plaintiff Steering Committee in the JCCP. Tom Cartmell and Wagstaff Cartmell lawyer Jon Kieffer have been appointed to multiple committees, including discovery and expert witness committees. In this capacity, Wagstaff Cartmell and its lawyers are uniquely situated to help guide and prosecute school district lawsuits against these social media companies.

How much of the school district's time and resources will be required?

This is difficult to predict with certainty, but we anticipate minimal inconvenience and interruption. We understand that your school administrators are extremely busy, so we vow to do everything we can to make this process as efficient as possible. Because your district's case would be consolidated in the MDL for pre-trial coordination, most of the litigation efforts will focus on issues common to all litigants. There will be some case-specific discovery in the MDL, but that would be mostly in the form of written discovery and document production. Within 2-3 months of filing a case, a school district would complete a written "Plaintiff Fact Sheet" and would provide basic supporting documentation to gather basic information about the school's claim. We will work with school district administrators to obtain the necessary information and documents as efficiently and conveniently as possible.

If a school district's case is selected for trial, more in-depth discovery would occur in the form of depositions of key administrators. However, given the expected large number of cases filed in MDL, the number of cases selected for more in-depth discovery and trials is usually relatively small.

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Poudre School District
Board of Education Meeting Coversheet

Action Item

Agenda Item Title: Dunn Elementary School HVAC Upgrades Phase II Construction

Policy Facts: Under paragraph 10 of Policy EL 2.6, the Superintendent shall not make or authorize any District purchase, contract, or other financial obligation of $250,000 or more without prior Board approval.
Under Policy DJA, prior approval of the Board of Education is required for the purchase of goods and/or services, including construction contracts of $250,000 or more.

Under Policy DJB: “Purchases resulting from documented price quotes, competitive bidding or competitive proposals shall be awarded without favor or prejudice to the lowest responsive, responsible vendor based on the best interests of the district.

Summary and/or Background: In 2007, a detailed audit of PSD facilities was conducted by a third-party facility condition assessment firm. The approved items were correlated and carried forward for completion as part of the 2010 Building Fund Program. In 2016, Dunn Elementary School had A/C Cooling installed in the original 1940 floorplan as well as electrical service upgrades and varies other items. In the 2016 Bond, there was $1,785,000 approved in the Ongoing Facilities Improvements List for completing the remaining areas: Media Center, Front Office and 2006 Classroom Addition, converting the non- A/C Areas for a fully A/C building. Work is scheduled for Summer of 2024.

Recommendation: The Superintendent and Chief Operations Officer recommend the Board of Education approve expenditures in excess of $250,000, authorizing staff to execute a contract with the vendor to be selected to provide the construction services.

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Clear Form

Contracts Checklist

Date

12/20/2023

Section I	
Completed by Finance	**School or department submitting contract:** Operations
	Summary title of contract: Construction Agreement Between Poudre School District R-1 and Saunders North LLC
	Description: This is phase two (the construction phase) of a major renovation of the HVAC control system at Dunn Elementary School
	Scope: Renovation of the HVAC control system at Dunn Elementary School
	Comments: By approving this agreement, the Board of Education is approving estimated cumulative expenditures in excess of $250,000 for the 2023-24 school year.
Section II	
Completed by Budget Director	☐ General Fund ☑ Bond ☐ Grant ☐ PSA ☐ Other (explanation):
	Year one cost: $1,445,000.00 **Multi-year cost (if applicable):**
	Comments: Total cost is based off of the vendor's response to a formal solicitation for this project.
Section III	
Completed by Strategic Sourcing	Formal Solicitation ☑ Invitation for Bid (IFB) ☐ Request for Proposal (RFP) ☐ Request for Qualifications (RFQu) ☐ Exemption (explanation): ☐ Other (explanation):
	Comments: A formal solicitation was conducted in November/December of 2023 - IFB 24-121-001. Saunders North, LLC was the lowest bid and the awarded vendor
Section IV	
Completed by Contracts/Legal	**Term of agreement:** December 18, 2023 through August 1, 2024
	Duration: Approximately 7-8 months
	Relevant terms: District Standard Construction Agreement
	Renewal options: None
	Additional information for BOE: None
	Executed by: To be executed by the Chief Operations Officer and Chief Finance Officer
	Comments: None

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Poudre School District
Operations
Facility Services
2445 LaPorte Avenue
Fort Collins, CO 80521

MEMORANDUM

To: Kristin Thetford-Purchasing and Contract Manager

From: Brian Schlicting- Project Manager

Date: December 14, 2023

Subject: IFB #24-121-001-Dunn Elementary School HVAC – Intent to award

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Having reviewed the electronic bids for IFB # 24-121-001, Dunn Elementary School HVAC Phase II, Facilities, Construction Services recommends that an intent to award be sent to Saunders North LLC for the award of the IFB 24-121-001, as they are the lowest bidder for the Contract amount of $1,445,000.00.

If any additional information is need, please feel free to contact me. Thank you.

Brian Schlicting
Project Manager

Dunn Elementary School HVAC Upgrades -Phase 2 IFB #24-121-001			
Vendor	Bid Price		Acknowledged Addendum 1&2
US Engineering	$	1,657,438.00	Yes
WCC Construction	$	1,524,000.00	Yes
Saunders North, LLC	$	1,445,000.00	Yes

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CONSTRUCTION AGREEMENT

THIS CONSTRUCTION AGREEMENT ("Agreement") is made as of the 18th day of December 2023, between the POUDRE SCHOOL DISTRICT R-1, State of Colorado ("Owner") and Saunders North, LLC ("Contractor"), in connection with Dunn Elementary School HVAC Upgrades-Phase 2 IFB #24-121-001 at 501 S Washington, Fort Collins, Colorado 80521, complete with all work appurtenant there to ("Project").

In consideration of the compensation to be paid to the Contractor and of the mutual agreements herein contained, the parties agree as follows:

1.00 THE CONTRACT DOCUMENTS. The Contract Documents shall consist of this Construction Agreement, which Agreement also incorporates by this reference all of the instruments set forth in Article 1 of the General Contract Conditions as fully as if they were set forth in this Agreement in full and instruments described in Invitation to IFB #24-121-001 (Exhibit A).

2.00 SCOPE OF THE WORK. The Contractor will furnish all tools, equipment, machinery, supplies, superintendence, insurance, transportation, and other construction accessories, services, and facilities specified or required to be incorporated in and form a permanent part of the completed work. In addition, the Contractor shall provide and perform all necessary labor in a first-class and workmanlike manner and in accordance with the conditions and prices stated in the Bid Proposal and the requirements, stipulations, provisions, and conditions of the Contract Documents, as defined in the attached General Conditions. The Contractor shall further perform, execute, construct, and complete all things mentioned to be done by the Contractor and all work included in and covered by the Owner's official award of this contract to the Contractor, such award being based on the acceptance by the Owner of the Contractor's bid, or part thereof.

3.00 TIME OF COMMENCEMENT AND COMPLETION. The Contractor agrees to commence work under this Agreement in accordance with the applicable Proposal (Exhibit B) upon issuance of Notice to Proceed and to fully complete all work by no later than August 1, 2024.

4.00 TIME OF THE ESSENCE. All time limits stated in this Agreement and the Contract Documents are of the essence of the Agreement.

5.00 LIQUIDATED DAMAGES. The Contractor understands and agrees that the completion of the entire project within the time provided is an essential feature of this Agreement and that the Owner will sustain substantial damages, the amount of which is not possible to accurately determine at this time, if the work is not so completed. The Contractor, therefore, agrees to proceed with due diligence, taking all precautions and making all necessary arrangements to ensure the completion of the work within the prescribed time. The Contractor further agrees that their failure to finally and fully complete the work within the time allowed shall be considered as a breach of the Agreement and entitle the Owner to collect liquidated damages for the delay in completion of the sum of Eight Hundred and 00/100 Dollars ($800.00) for each calendar day that elapses between the date set forth in Section 3.00 of this Agreement, as extended in accordance with the General Conditions, and the date of final completion of the Project, as more fully defined in the General Conditions Article 45.00.

6.00 CONTRACT SUM. The Owner shall pay to the Contractor for performance of the work encompassed by this Agreement, and the Contractor will accept as full compensation therefor, the lump sum of One Million, Four-Hundred Forty-Five Thousand and Zero Cents ($1,445,000) ("Contract Sum"), subject to adjustment as provided by the Contract Documents, to be paid by progress payments in the manner provided for in the Contract Documents. The amount of money appropriated by the Owner for the project is equal to or in excess of the Contract Sum.

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7.00 ACCEPTANCE AND FINAL PAYMENT. Upon receipt of written notice that the work is ready for final inspection and acceptance, the Contractor, the Architect, and the Owner shall make such inspection, and when the work is found to be acceptable under the Agreement and the Agreement fully performed, including the satisfactory completion of all punch list items, the Architect shall promptly so certify to the Owner, over their own signature, stating that the work provided for in this Agreement has been completed in accordance with the Contract Documents and is accepted by them under the terms and conditions therefor, and that the entire balance found to be due the Contractor, and noted in said final certificate, is due and payable. Before issuance of the Owner's letter of acceptance, the Contractor shall submit evidence satisfactory to the Owner that all payrolls, material bills, and other indebtedness connected with the work has been or will promptly be paid. Final payment shall be made following the procedures set forth in the Contract Documents.

8.00 REPRESENTATIONS.

8.01 The Contractor shall not extend the credit or faith of the Owner to any other persons or organizations.

8.02 The Contractor represents that it understands the nature, location, and scope of the Work, the character of the equipment and facilities needed preliminary to and during the performance of the Work, and the general and local conditions and all other matters that can in any way affect the Work and is not relying on any representations or promises by the Owner except as set forth in this Agreement.

8.03 The Contractor shall cooperate with other contractors, if any, and employees of the Owner in performing the Work.

9.00 <u>WARRANTIES</u>

9.01 The Contractor warrants that the Work shall be conducted in a good and workmanlike manner and shall be suitable and fit for the purposes for which it is intended.

9.02 The Contractor warrants and represents that it has full authority under applicable law to execute and deliver this Agreement and to perform all of the obligations under this Agreement.

9.03 The Contractor represents that it shall perform the work in a safe and diligent manner and Contractor shall use its best skill and judgment pursuant to the standards of the profession for such Work in furthering the Owner's best interests.

9.04 The Contractor warrants all Work to be free from any defects in materials and workmanship for a period of two (2) years following final completion and acceptance by the Owner.

10.00 BINDING EFFECT AND ASSIGNMENT. This Agreement shall be binding on the parties as well as their successors, assigns and personal representatives. Notwithstanding the foregoing, the Contractor shall not assign any of their rights or obligations under this Agreement without the express written consent of the Owner. Upon any assignment even though consented to by the Owner, the Contractor shall remain liable for the performance of the work under this Agreement.

11.00 PARTIAL INVALIDITY. If any provisions of this Agreement are finally determined by a court of competent jurisdiction to be in violation of any statute or rule of law of the State of Colorado, then such provisions shall be deemed null and void to the extent that they may be violate of law, but without invalidating the remaining provisions hereof.

12.00 WAIVER. No waiver of any breach of any one of the agreements, terms, conditions, or covenants of this Agreement by the Owner shall be deemed or imply or constitute a waiver of any other agreement, term, condition, or covenant of this Agreement. The failure of the Owner to insist on strict

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performance of any agreement, term, condition, or covenant, herein set forth, shall not constitute or be construed as a waiver of the Owner's rights thereafter to enforce any other default; neither shall such failure to insist upon strict performance be deemed sufficient grounds to enable the Contractor to forego or subvert or otherwise disregard any other agreement, term, condition, or covenant of this Agreement.

13.00 ENTIRE AGREEMENT. This Agreement, together with the Contract Documents as defined in Article 1.00 herein, constitute the entire agreement of the parties hereto. No modification, change, or alteration of the within Agreement shall be of any legal force or effect unless in writing, signed by all the parties hereto.

14.00 COUNTERPARTS. This Agreement may be executed in several counterparts, and each such counterpart shall be deemed an original. For purposes of executing this Agreement, facsimile or scanned signatures shall be as valid as the original.

15.00 GOVERNING LAW. Venue for any and all legal actions regarding or arising out of the transaction covered herein shall be solely in the District Court in and for Larimer County, State of Colorado. This transaction shall be governed by the laws of the State of Colorado.

16.00 ATTORNEYS' FEES. In the event it becomes necessary for either party to enforce any provisions or breach of this Agreement by commencing litigation, the prevailing party in such action shall be entitled to collect, as part of any judgment entered, its reasonable expert witness and attorneys' fees and costs.

17.00 PREMISES ACCESS CERTIFICATION. Contractor certifies it shall not employ on Owner premises any persons convicted of any felony or misdemeanor crime of unlawful sexual behavior involving children.

18.00 INTENTIONALLY OMITTED

19.00 NOTICES. All notices, requests, demands, and other communications given or to be given under this Agreement shall be in writing and shall be deemed to have been duly given when served if served personally, or on the second day after mailing if mailed by first-class mail, registered or certified, postage prepaid, and properly addressed to the party to whom notice is to be given as set forth below.

If to Owner: Poudre School District R-1
Attn: Chief Operating Officer
2407 La Porte Avenue
Fort Collins, Colorado 80521-2297

With a copy to: Autumn Aspen, Esq.
General Counsel
Poudre School District R-1
2407 LaPorte Avenue
Fort Collins, Colorado 80521-2297

If to Contractor, then to the individual at the address set forth in the signature block below.

Either party may change its address for purposes of notice by giving written notice to the other party in accordance with this paragraph.

IN WITNESS WHEREOF, the parties have executed this Agreement on the day and year first above written and shall extend to and bind the parties, their successors, assigns, and personal representatives.

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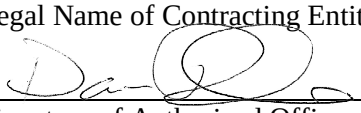
CONTRACTOR:	OWNER:
Saunders North LLC Legal Name of Contracting Entity	POUDRE SCHOOL DISTRICT R-1
 Signature of Authorized Officer	Director of Construction & Facilities
Dan Dirksen Printed Name of Signatory	Chief Financial Officer
1212 Riverside Ave Suite 130 Street Address	
Fort Collins, CO 80524 City, State, Zip Code	
46-5643583 FEIN	Legal Review

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Exhibit A
Copy of IFB 24-121-001

See attached .pdf named “IFB 24-121-001 – Dunn Elementary School HVAC Upgrades – Phase 2”

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POUDRE SCHOOL DISTRICT R-1

INVITATION FOR BID

DUNN ELEMENTARY SCHOOL HVAC UPGRADES-PHASE 2

IFB #24-121-001

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BID SCHEDULE

IFB Posted to BidNet	**November 15, 2023**
Optional Site Visit	**November 20, 2023 @ 2:00 MT**
Questions Due	**November 27, 2023 @ 2:00 p.m. MT**
IFB Closing Date	**December 13, 2023 @ 2:00 p.m. MT**

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11.0 BID FORM

EXHIBIT A- SAMPLE CONTRACT

EXHIBIT B- DRAWINGS AND PROJECT MANUAL

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INVITATION FOR BID
DUNN ELEMENTARY SCHOOL HVAC UPGRADES-PHASE 2
IFB #24-121-001

Poudre School District (the "District") is requesting bids from professional and qualified contractors ("Contractor") for a project consisting of, but not limited to, a major renovation of the HVAC and control system at Dunn Elementary as described in this Invitation for Bids ("IFB").

The District shall provide copies of this IFB to Contractors through the electronic solicitation platform www.bidnetdirect.com where registered Contractors are required to submit their electronic IFB response along with the first and last name, telephone number and e-mail address of the employee within their organization who will be designated as the District's primary contact with respect to this IFB and the Contractor's response thereto. The District may provide copies of this IFB to other Contractors upon request, who are also requested to provide the first and last name, telephone number and e-mail address of the employee within their organization who will be designated as the District's primary contact with respect to this IFB and their response thereto.

Questions regarding this IFB must be in writing and may ONLY be directed to the District via the BidNet platform any time after the issuance of this IFB through and including 2:00 p.m. MT on November 27, 2023. Questions received after the date/time and/or not submitted electronically through the BidNet platform may not be addressed.

During the solicitation process and until an award has been announced, communication regarding this IFB will only be permitted with the Procurement Agent named below. Communication with a district employee other than the Procurement Agent named below may disqualify your bid from consideration.

Each question submitted, as well as the District's response thereto, shall be provided in a questions and answers document/addendum via www.bidnetdirect.com

Note: Each question must be submitted individually. Multiple questions per entry will not be answered.

The District will only accept and consider electronically submitted bids from Contractors, which must be submitted and received in the www.bidnetdirect.com electronic solicitation portal on or before 2:00 p.m. MT on December 13, 2023, at which time the submission portal will close and no further submissions be allowed or considered.

It is the sole responsibility of the Contractor to see that the bids are submitted through the BidNet portal by the submission deadline.

Sales Prohibited/Conflict of Interest: No officer, employee, or member of the School Board, shall have a financial interest in the sale to the school district of any real or personal property, equipment, material, supplies or services where such officer or employee exercises directly or indirectly any

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decision-making authority concerning such sale or any supervisory authority over the services to be rendered. This rule also applies to subcontracts with the School District.
Soliciting or accepting any gift, gratuity favor, entertainment, kickback or any items of monetary value from any person who has or is seeking to do business with the District is prohibited.

Collusive or sham proposals: Any proposal deemed to be collusive or a sham proposal will be rejected and reported to authorities as such. Your authorized signature on this proposal assures that such proposal is genuine and is not a collusive or sham proposal.

The District reserves the right to reject any and all proposals and to waive any irregularities or informalities.

Sincerely,

Kristin Thetford
Purchasing and Contract Manager
kthetford@psdschools.org

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INVITATION FOR BID
DUNN ELEMENTARY SCHOOL HVAC UPGRADES-PHASE 2
IFB #24-121-001

1.0 BACKGROUND

Poudre School District is requesting lump sum bids for a project consisting of, but not limited to, a major renovation of the HVAC and control system at Dunn Elementary School.

Poudre School District is a high-performing district, covering more than 1,800 square miles in northern Colorado with diverse school settings. The District's instructional program is centered around District Ends, under the Policy Governance model, developed to support a comprehensive curriculum.

While more than 70% of the District's families choose to send their children to their neighborhood school, the district does support school choice and offers a wide spectrum of educational programs to fit any child's needs. Program options include International Baccalaureate, Core Knowledge, Bilingual/Dual Language Immersion, Hybrid/Online, Expeditionary Learning, Science, Technology, Engineering and Math (STEM) along with extra-curriculars and athletics. The District has two (2) LEED certified school buildings and over 30 Energy Star awards and supports operational sustainability in all areas of work.

Our Schools:

- 32 elementary schools
- 10 middle schools
- 6 comprehensive high schools
- 2 additional combined middle/high schools
- 6 option (100% choice) schools
- 3 alternative high schools
- 5 charter schools
- 1 online school

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2.0 GENERAL TERMS AND CONDITIONS

2.1 This is a solicitation for an offer and is not an offer to contract for goods or services.

2.2 These General Terms and Conditions apply to all offers made to the District by all prospective Contractors on behalf of District Solicitations including, but not limited to, Invitations for Bid (IFB), Requests for Documented Quotes (DQ), Requests for Qualifications (RFQ) and Requests for Proposals (RFP).

2.3 Contractor must provide all requested information. Failure to do so may result in rejection of the proposal at the option of the District.

2.4 The District is exempt from city, county, and state sales and use tax and federal excise taxes or federal transportation taxes. The District's state tax exempt number is 98-03335.

2.5 There is no expressed or implied obligation for the District to reimburse Contractors for any expenses incurred in preparing IFB in response to this solicitation.

2.6 The Contractor, by affixing his signature to this IFB, certifies that his IFB is made without previous understanding, agreement, or connection either with any persons, firms or corporations offering a IFB for the same items or with the District. The Contractor also certifies that his IFB is in all respects fair, without outside control, collusion, fraud, or otherwise illegal action.

2.7 Prior to and as a condition of the provision of any Services under this Agreement, Contractor shall require each person providing such Services to submit to fingerprinting and a background check administered by the District at the District's expense. Contractor shall ensure that no person to whom the District objects based on the results of said fingerprinting and background check provides any Services under this Agreement. If the District objects to any Contractor based on the results of the background check, the Contractor shall not be allowed to provide Services. All information provided and all information received by the District through the Contractor background check and/or other sources, shall be considered and maintained as confidential information under the Colorado Open Records Act and not subject to disclosure to third parties except as required by law.

2.7.1 The successful Contractor(s) must verify that they have done a background check on all of their employees working on school district property. The successful Contractor will be responsible to adhere to any Federal, State, and Local privacy and confidentiality requirements and other laws, regulations or policies governing employee background checks.

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2.8 In the event the District has reasonable grounds to believe that any individual assigned to perform work under this agreement has a criminal record, is a registered sex offender, is under the influence of alcohol or other substance, has exhibited violence or based upon other information the District deems reliable; the District may exclude such individual from any school building or grounds or impose reasonable conditions upon such individual's presence upon any school premises. In the judgment of the District, if the agreement cannot be performed as a result of such action, the agreement may be terminated.

2.9 Contractor agrees to provide the items covered in this solicitation in strict accordance with the District's specifications and at the price noted for each item.

2.10 Contractor shall not assign an agreement, as a result of this solicitation, or any of its rights, interests or obligations without the prior written consent of the District. The consent may be withheld for any reason or no reason as determined by the District in its sole discretion.

2.11 It is agreed that no otherwise qualified Contractor shall be excluded from participating in, be denied the benefits of, or be subject to discrimination, including harassment, under any provision of this Agreement on the basis of race; creed; color; national origin; age; sex; pregnancy; physical recovery from childbirth or a related condition; sexual orientation; marital status; veteran status; religion; genetic information; gender expression; gender identity; ancestry; or disability.

2.12 Venue for any and all legal action regarding or arising out of transactions covered herein shall be solely in the District Court in and for Larimer County, State of Colorado. The transactions covered herein shall be governed by the laws of the State of Colorado.

2.13 IFB shall contain a signature of an authorized representative in the space provided on the Bid Certification Form. Failure to properly sign IFB may result in bid being considered non-responsive.

2.14 In the case of conflicts between the IFB and any referenced bid documents, the more stringent requirements shall govern. In all cases, the Contractor is responsible for notifying the District of the conflict.

2.15 In the case of conflicts between the General Terms and Conditions and the Specific Conditions outlined in this Solicitation, the Special Conditions shall prevail.

2.16 The District shall issue written addenda if substantial changes, which impact the technical submission of IFB, are required. Copies of such addenda will be distributed via the BidNet system. In the event of conflict with the original agreement documents, addenda shall govern all other agreement documents to the extent

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specified. Subsequent addenda shall govern over prior addenda only to the extent specified.

2.17 All information and supplemental documentation required in conjunction with this IFB shall be furnished by the Contractor with its bid. If the Contractor fails to supply any required information or documents, its bid may be considered non-responsive and ineligible for award.

2.18 All changes in IFB Documents shall be through written addendum or Question and Answers results posted on BidNet.

2.19 The accuracy of the bid is the sole responsibility of the Contractor. No changes in the bid shall be allowed after the submission deadline, except when the Contractor can show clear and convincing evidence that an unintentional factual mistake was made, including the nature of the mistake and the price actually intended.

2.20 The apparent silence or omissions within this solicitation regarding a detailed description of the materials and services to be provided shall be interpreted to mean that only the best commercial practices are to prevail and that only materials and workmanship of first quality are to be used.

2.21 Contractor may offer a cash discount for prompt payment; however, such discounts shall not be considered in determining the lowest net cost for bid evaluation purposes.

2.22 Payment for the goods and/or services furnished by the Contractor shall not constitute acceptance thereof. The District shall have the right to inspect such goods and the products of such services, and to reject any or all of which are in the District's judgment defective or nonconforming.

2.23 The District may, at its sole and absolute discretion:

2.23.1 Reject any and all or parts of any or all bids submitted by prospective Contractors;

2.23.2 Re-advertise this solicitation;

2.23.3 Postpone or cancel the bid process for this solicitation;

2.23.4 Waive any irregularities or technicalities that are not qualified as a requirement for responsiveness in this IFB or in bids received in conjunction with this IFB; and/or

2.23.5 Determine the criteria and process whereby bids are evaluated and awarded.

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2.24 Contact with District personnel regarding this IFB, other than inquiries to the specific Procurement Agent identified in this document, may be grounds for elimination from the selection process.

2.25 Information and materials submitted in response to this IFB may be considered public records subject to disclosure under the Colorado Open Records Act ("CORA"), C.R.S. §§ 24-72-200.1 to -205.5. Information and materials that Contractor believes are confidential and not subject to disclosure under CORA must be submitted separately with a citation to the section of CORA and any other relevant law under which Contractor believes they are confidential. The District, not Contractor, shall determine whether information and materials so identified will be withheld as confidential, but will inform Contractor in advance of disclosure to give it an opportunity to take legal action to protect its interests vis-à-vis the party making the CORA request.

2.26 Contractors must note in the IFB response any intent to use subcontractors. The person providing services, address, phone number and three client references, along with the type of work to be performed must be included. Use of subcontractors may be considered as a factor in the District's evaluation process. If the Contractor fails to notify the District of its intent to use subcontractors in the proposal submittal, the proposal may be considered a void offer. If Contractor is issued an intent to award, a list of identified subcontractors will need to be provided to the District during the subsequent contracting process. Subcontractors will be allowed only by written permission of the District. The Contractor agrees that it is fully responsible to the District for the acts or omissions of its subcontractors, or any persons employed by them, in the same way as it is for the acts and omissions of persons directly employed by the Contractor. Nothing contained in the Contract or any subcontract shall create any contractual relation between any subcontractor and the District.

2.27 During the performance of this contract, the Contractor agrees to provide a "drug-free workplace." For the purposes of this section, a "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to the contractor. The Contractor's employees are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance during the performance of this Contract.

2.28 The District reserves the right to negotiate further, request additional information or enter into an agreement with one (1) or more Contractors. The District may make such inquiries and conduct such investigations as it deems necessary to determine the qualifications and ability of the Contractor(s) to provide the services orproducts called for under the solicitation and/or represented in the Contractor(s)'s response. Contractor(s) shall provide information in a timely manner to the District in connection with such inquiries and investigations.

2.29 Should the District determine in its sole discretion that only one (1) Contractor is fully qualified or that one (1) Contractor is clearly more highly qualified than the others under consideration, an Agreement may be negotiated and awarded to that Contractor.

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2.30 The successful Contractor(s) will be required to enter into a negotiated agreement with the District prior to the start of work.

2.31 The agreement language will control over any language contained within this IFB that conflicts with the signed and fully executed agreement.

2.32 Pricing will remain fixed and firm for the initial term and all extensions of the Agreement.

2.33 The Contractor shall provide the services as an independent contractor of the District and the persons performing such services shall not be considered employees of the District. As such, the Contractor shall have the right to determine how and by whom the services will be provided, subject to and consistent with the terms and conditions of this solicitation

2.33.1 The Contractor shall be exclusively responsible for: (a) all compensation, employment tax withholdings and payments, and all fringe benefits for its employees in full compliance with all applicable federal, state and local laws; (b) all insurance coverages and benefits for its employees in full compliance with all applicable federal, state and local laws, including but not limited to pension or retirement benefits, workers' compensation, unemployment compensation, and Social Security benefits; and (c) all payments to its contractors and subcontractors for goods and/or services directly or indirectly related to this solicitation.

2.33.2 Nothing in this solicitation or as a result of this solicitation shall be construed as creating a single enterprise, partnership, joint venture or employer-employee relationship between a future Contractor and the District. The future Contractor will not be considered a partner, agent or representative of the District and will not represent itself to be a partner, agent or representative of the District. The District is not a partner, agent or representative of any future Contractor and shall not represent itself to be a partner, agent or representative of the Contractor.

2.34 The District may make such reasonable investigations as deemed proper and necessary to determine the ability of the Contractor to perform the work and the Contractor shall furnish to the District all such information and data for this purpose as may be requested. The District further reserves the right to reject any proposal if the evidence submitted by, or investigations of, such Contractor fails to satisfy the District that such Contractor is properly qualified to carry out the obligations of the Agreement and to complete the work/furnish the item(s) contemplated therein.

2.35 Although this solicitation specifies the number of goods and/or scope of services intended to be purchased by the District, it is understood and agreed that the District may, during the term of the Agreement, adjust the quantity of goods and/or the scope

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of services at the Agreement price from the awarded Contractor. The option, if exercised, is the prerogative of the District and shall be honored by the Contractor as a condition of the Agreement award.

2.36 The Contractor shall be responsible to correct, at its expense, any problems, defects and/or deficiencies in service reported which do not meet the specifications set forth in the Scope of Work.

2.37 The awarded Contractor shall be held entirely responsible for any and all damage to District property, accidents or injuries to employees and the public by reason of work contracted under terms of this IFB. The Contractor shall be required to take safety precautions in an effort to protect persons and District property. Each Contractor, its employees, representatives and subcontractors agrees to abide by all applicable Federal, State and Local codes, laws, rules and regulations, including all OSHA requirements. The awarded Contractor shall also furnish all supplies, which conform to all applicable safety codes and regulations. Any fines levied by the above-mentioned authorities because of inadequacies to comply with these requirements shall be borne solely by the Contractor. Barricades shall be provided by the Contractor when work is performed in areas traversed by persons or when deemed necessary by the District's Project Manager.

2.38 Contractor warrants that all goods and/or services furnished as a result of this solicitation shall conform to District specifications and to industry standards and shall be free from defects in material and workmanship. Contractor warrants that all goods and/or services furnished as a result of this solicitation shall be merchantable and shall be safe and appropriate for the purpose for which goods and/or services of like kind are normally used. If Contractor knows or has reason to know the particular purpose for which the District intends to use the goods and/or services, Contractor warrants that such goods and/or services shall be fit for that particular purpose. Contractor warrants that all goods furnished as a result of this solicitation shall be new unless otherwise specified by the District, and that the title conveyed regarding such goods shall be good and its transfer rightful. Contractor agrees to promptly replace or correct defects in any goods or services not conforming to the foregoing opportunity to do so. In the event of Contractor's failure to promptly replace or correct defects in nonconforming goods and services or make such corrections and charge Contractor its costs incurred therefor.

2.38.1 All chemicals, equipment and materials proposed and/or used by Contractors in satisfaction of the terms of this solicitation shall conform to the standards required by the U.S. Department of Labor Occupational Safety and Health Administration (OSHA). Material safety data sheets (MSDS) shall be provided to the District upon request.

2.39 **Cooperative Purchasing Efforts**

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2.39.1 Poudre School District is a member of, or affiliated with, several regional professional procurement organizations within Colorado and Wyoming. These organizations are comprised of governmental purchasing agents, or agency representatives responsible for the purchasing function. These organizations include:

2.39.2 Colorado Educational Purchasing Council (CEPC) - A cooperative purchasing organization comprised of purchasing agents/buyers representing all Colorado public school districts.

2.39.3 Multiple Assembly of Procurement Officials (MAPO) - A cooperative purchasing organization comprised of procurement representatives from state, county, municipal, governments, special districts, or school districts along the front range of the Rocky Mountains in Colorado.

2.39.4 Rocky Mountain Governmental Purchasing Association (RMGPA) - A chapter member of the National Institute of Governmental Purchasing (NIGP), consisting of public procurement professionals and their representative agencies which include approximately 100 state, county, and municipal governments; school districts and higher education; and other special districts.

2.39.5 Members of these organizations, at their discretion, may request use of the agreements or awards that result from this solicitation. Each governmental entity which uses an agreement(s) resulting from this solicitation would establish its own agreement, issue its own orders, schedule deliveries, be invoiced individually, make its own payments, and issue its own exemption certificates as required by the Vendor. It is understood and agreed that the District is not a legally binding party to any contractual agreement made between another governmental entity and the Vendor as a result of this solicitation. The District shall not be liable for any costs or damages incurred by any other entity. Usage by any other entity shall have no negative impact on the District in the current term or in any future terms.

3.0 SPECIFIC CONDITIONS

3.1 The initial agreement between the District and the awarded Contractor(s) is planned to commence upon full execution of the agreement and shall continue through and including December 31, 2024, unless terminated earlier by the District as stated in section 3.1.1 below. Though the agreement will extend through December 31, 2024, it is understood and agreed upon that substantial completion of all identified work be finished by August 1, 2024.

3.1.1 Notwithstanding the planned term of an agreement and/or any extensions thereof as provided in sections 3.2 and 3.1.1 the District may terminate an

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agreement at any time in its sole discretion for any reason, with or without cause, upon written notice served on the Contractor no less than thirty (30) days prior to the date of termination. In the event of such early termination by the District, the Contractor shall be paid up to the date of termination for services performed under and in accordance with this agreement.

3.2 For services requiring Contractor's presence on District Property, the successful Contractor must provide proof of insurance that meets the insurance requirements stated in section 8.0 of this IFB document. Contractor must maintain required insurance during the term of the contract.

3.3 During the performance of this contract, the Contractor agrees to provide a "drug-free workplace." For the purposes of this section, a "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to the contractor. The Contractor's employees are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance during the performance of this Contract.

3.4 The District will provide access to the premises and related facilities for regular working hours or outside regular working hours and days as requested by the District.

3.5 The District will respond in a timely manner to requests by the Contractor in cases where there are ambiguities in the work to be performed or resources to be supplied by the District that are not available.

3.6 Performance Bond. A Performance and a Payment Bond shall be submitted by CONTRACTOR for all Contracts in excess of fifty thousand U.S. Dollars ($50,000.00) or if indicated in Article 6. When indicated in Article 6, a clean irrevocable letter of credit payable to the OWNER from a bank acceptable to the OWNER may be substituted for the bonds. Each bond shall be in the amount of the Contract sum and shall either be in the form supplied by OWNER or shall be in such other form as approved by OWNER. Each bond shall comply with the requirements of C.R.S. 38-26-105 and 106. Regardless of whether a bond or letter of credit is used by the CONTRACTOR and accepted by the OWNER, such bond or letter of credit shall not expire prior to two (2) years following final settlement.

4.0 CONTRACTOR'S RESPONSIBILITIES

4.1 Contractor shall furnish all labor, materials and equipment, necessary for satisfactory Contract performance. A sample contract is provided as Exhibit A.

4.2 Contractor is further responsible for all labor, materials and equipment necessary for satisfactory completion of the scope as identified in Exhibit B.

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4.3 Upon request, proof shall be available that the Contractor possesses adequate and sufficient equipment and resources to perform quality service and to commence work once the contract has been fully executed.

4.4 Contractor shall be responsible for all site cleanups, including trash and debris. District dumpsters are not to be used. The building(s) and property of the District shall be left in an as-found condition. The Contractor shall remove all unusable materials and debris from the District premises. At completion, the Contractor shall thoroughly clean up all areas where work has been involved.

4.5 The Contractor shall be responsible for disposing environmentally hazardous waste materials in a manner that is consistent with regulations stipulated by the United States Environmental Protection Agency ("EPA"), as well as, with any State or locally prescribed procedures. Any costs associated with disposal of above stated materials shall be at the expense of the Contractor.

4.6 All work shall be performed in full compliance with all applicable EPA, OSHA, DOT and State regulations.

4.7 Contractor shall be solely responsible for the safety of its work, materials, equipment, tools, etc. on the site and shall, if deemed necessary or expedient, employ, at its own expense, the services of a competent watchman. The District disclaims all responsibility for the safety of the work, materials, equipment tools, etc. or for any damage, which may be done to same due to theft, or any other cause until such time as the District formally accepts the completed work.

4.8 Contractor will be responsible for all necessary licenses and any necessary permits, excluding state, building, and fire permits, which the District will coordinate.

4.9 Project estimates, schedules, work activity, other trades not included in the agreement, inspections, and payment requests must be approved by the District Project Manager.

4.10 Contractor shall visit the project site prior to commencement of work to verify working area project scope and potential safety issues.

4.11 Contractor will be responsible for providing a clean and safe environment surrounding the work area at all times, including, if necessary, fencing of equipment, storage and work area.

4.12 Health Standards. The Contractor shall have and maintain a set of protocols and guidelines to meet evolving health and safety requirements and implement communicable diseases protocols, which shall follow guidance and orders from state and/or local public health officials and shall be no less strict than the District's protocols.

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4.12.1 Contractor shall ensure all individuals providing Services under this section 4.12.1 for the Contractor wear appropriate personal protective equipment as designated in this solicitation, at all times while on District property.

4.12.2 If the District is directed, or the District determines to limit or restrict access to any or all of its facilities or District Location due to a public health or safety concern, the District may, at its discretion, temporarily delay or stop Contractor's services, with or without prior notice.

5.0 SUBMISSION OF BID

5.1 By signature of the Bid Certification Form, contained within this IFB, and accepted submission through BidNet to this solicitation, the Vendor certifies that submission of this IFB is made without any previous understanding, agreement, or connection either with any persons, firms or corporations offering a IFB for the same items or with the District.

5.2 Bid responses shall contain a signature of an authorized representative in the space provided on the Bid Certification Form.

5.3 The Vendor through submission of the Bid Certification Form certifies that this solicitation is in all respects fair, without outside control, collusion, fraud, or otherwise illegal action.

5.4 It shall be the sole responsibility of the Vendor to ensure their Bid is submitted through BidNet by the submission deadline. Late responses will not be accepted.

6.0 EVALUATION AND AWARD

6.1 During the evaluation process, the District reserves the right, where it may serve the District's best interest, to request additional information, or clarifications from bidders, or to allow corrections of errors or omissions. Amendments or clarifications to submitted response not requested by the District will not be accepted, nor considered following the opening of the response.

6.2 Responses to this IFB will be independently evaluated.

6.3 This IFB may be awarded to one or more Contractor, meeting the specifications and deemed to be in the best interests of the District. Final evaluation may be based on, but not limited to, any or all of the following: price, adherence to specifications, previous experience with similar projects, reference checks and delivery timeline. Those that are clearly non-responsive to the stated requirements may be eliminated prior to this evaluation.

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6.4 Amendments or clarifications to the submitted Bids not requested by the District will not be accepted, nor considered following the opening of the Bid.

6.5 Submission of a bid is deemed as acceptance of all terms, conditions and specifications contained in the District's solicitation package initially provided to the Contractor.

6.6 Appeal of Award. Contractor may appeal the award by submitting, in writing, a request for re-consideration to the District's Strategic Sourcing department within seventy-two (72) hours after the receipt of the notice of award.

6.7 For the purposes of solicitation evaluation, bidders must indicate any variances to the specifications and terms and conditions, no matter how slight. If variations are not stated in the bidder's response, it shall be construed that the proposal fully complies with the specifications and terms and conditions. Notwithstanding the above, it is hereby agreed and understood that the District reserves the right to reject these variations if they individually or, as a whole, do not meet the standards established in the specifications.

6.8 Modification to this document, exhibits or addenda will be considered invalid will not accepted in any format by the District, and may be cause for disqualification. Proposed modifications may be submitted through BidNet with the submission of a Bid response. Proposed modifications are not considered as accepted unless formally accepted in writing by the procurement agent prior to the intent to award. Submission of a modification, and an intent to award from a solicitation shall not be considered in any way, an acceptance of any proposed modifications by the Vendor.

6.9 Award of contract shall be made to the responsive and responsible bidder meeting the specifications and as deemed to be in the best interests of the District. Interviews may be requested with one or more respondents. Final evaluation may be based on, but not limited to, any or all of the following: price, adherence to specifications, performance, previous experience with similar projects, references, product availability and delivery time. Those Bids that are clearly non-responsive to the stated requirements may be eliminated prior to this evaluation.

6.10 This solicitation, or submitted agreement from a Contractor, does not commit the District to award a contract or to pay any costs incurred in the preparation of a proposal or to procure a contract for the services. The District reserves the right to accept or reject any or all proposals received as a result of this request or to cancel in part or in its entirety this solicitation if it is deemed to be in the best interest of the District. The District reserves the right to accept any portion of the response , or the entire response as deemed in the best interest of the District.

7.0 WARRANTIES

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7.1 The Contractor warrants that all parts, material, components, equipment and other items used to perform the work shall be new and suitable for the purpose used and will be of good quality, free from faults and defects and all Work will be free of defects and in conformance with the Contract Documents. The Contractor also warrants that its workers will be sufficiently skilled to produce the highest quality of work, which is free from faults and defects. Work not so conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor further warrants that the construction processes and methods employed to perform the work shall be suitable for the results required.

7.2 The Contractor shall promptly repair, replace, or otherwise correct any of its workmanship and any parts, materials, components, equipment or other items in the work which contain faults or defects, whether such failures are observed by the District, Consultant, or Contractor before or after Final Completion. The Contractor shall bear all costs of correcting such work covered by the warranties.

7.3 The Contractor shall further warrant that all work shall be free of defects of material and workmanship for a period of two (2) years minimum and/or as required in the Bid Documents. The Contractor agrees it will, at its own expense, repair and replace all such defective work and all other work damaged thereby which become defective during the term of the Guarantee Warranty. Whenever guarantees or warranties are required by the specifications for a longer period than the two (2) year warranty, such period shall govern. The District shall have the full benefit of longer warranties provided by the Contractor/Manufacturer.

7.4 Upon discovery of any warranty defect, the District shall give written notice to the Contractor and state the time frame in which the repairs shall be made.

7.5 The Contractor, at its own expense, shall repair or replace any damages to equipment, facilities, or other personal or real property owned by the District which is damaged as a result of any such fault or defect, at no cost to the District.

7.6 Contractor warrants that all goods and/or services furnished as a result of this solicitation shall conform to District specifications and to industry standards and shall be free from defects in material and workmanship. Contractor warrants that all goods and/or services furnished as a result of this solicitation shall be merchantable and shall be safe and appropriate for the purpose for which goods and/or services of like kind are normally used. If Contractor knows or has reason to know the particular purpose for which the District intends to use the goods and/or services, Contractor warrants that such goods and/or services shall be fit for that particular purpose. Contractor warrants that all goods furnished as a result of this solicitation shall be new unless otherwise specified by the District, and that the title conveyed regarding such goods shall be good and its transfer rightful. Contractor agrees to promptly replace or correct defects in any goods or services not conforming to the foregoing opportunity to do so. In the event of Contractor's failure to promptly replace or

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correct defects in nonconforming goods and services or make such corrections and charge Contractor its costs incurred therefor.

8.0 INSURANCE

Contractor shall procure and maintain the required insurance specified below for the duration of the agreement, which insurance shall be written for not less than the amounts specified or greater if required by law. The District's receipt of a Certificate of Insurance from the Contractor with limits and or coverages that do not meet the requirements does not waive the requirements and the Contractor shall still be responsible for the limits and coverages stated in the agreement. Specified coverages and amounts may be provided by a combination of a primary policy plus an umbrella or following form excess policy. All insurance shall be with a carrier licensed in the state of Colorado and shall have a minimum A.M. Best rating of A-VII. Memorandums of Insurance will not be accepted.

Any insurance and/or self-insurance carried by the District is excess of the coverage extended to the District by Contractor. Contractor shall provide at least thirty (30) days' advance written notice to the District prior to cancellation, change of coverage, or non-renewal.

Commercial General Liability

Minimum Limits

a.	Each Occurrence Limit	$2,000,000
b.	General Aggregate	$3,000,000
c.	Products/Completed Operations Aggregate	$3,000,000
d.	Personal/Advertising Injury	$2,000,000
e.	Fire Damage (Any One Fire)	$50,000
f.	Medical Payments (Any One Person)	$5,000

g. The policy shall provide for Bodily Injury and Property Damage, Premises and Operations, Products/Completed Operations, Personal/Advertising Injury and liability assumed under an Insured Contract (including defense costs).
h. The policy shall be endorsed to include the following additional insured language: "Poudre School District R-1, its elected officials, employees, agents, and volunteers shall be named as an additional insured with respect to liability arising out of the activities performed by, or on behalf of the Contractor" and shall be insured to the full limits of liability purchased by the Contractor even if those limits of liability are in excess of those required by this Contract. Copy of policy endorsement must be attached to the Certificate of Insurance.
i. The policy shall cover the Contractor's completed operations and that coverage shall be kept in place for up to the statute of repose.

Commercial Automobile Liability Providing Coverage for Owned, Non-Owned, and Leased or Hired Vehicles (if vehicles will be utilized in performing the work)

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a. Bodily Injury & Property Damage
   Combined Single Limit Minimum $1,000,000
b. If Contractor operates vehicles in performing any services under this Contract, the policy shall be endorsed to include the following additional insured language: "Poudre School District R-1, its elected officials, employees, agents, and volunteers shall be named as an additional insured with respect to liability arising out of the activities performed by, or on behalf of the Contractor" and shall be insured to the full limits of liability purchased by the Contractor even if those limits of liability are in excess of those required by this Contract. Copy of policy endorsement must be attached to the Certificate of Insurance.

Workers' Compensation and Employers' Liability
If Contractor is exempt under the Colorado Workers' Compensation Act, this requirement will be waived if proof a current Workers' Compensation Coverage Rejection is on file with the Colorado Department of Labor and Employment, Division of Worker's Compensation and a copy is submitted to the District.

Minimum Limits

- State of Colorado — Statutory
- Employer's Liability — $100,000 Each Accident
  $500,000 Disease – Policy Limit
  $100,000 Disease – Each Employee
- Waiver of subrogation in favor of Poudre School District R-1.

8.1 **Indemnification.** Contractor shall indemnify and hold harmless the District and the District's Board members, employees, representatives and agents from and against any and all liability arising from any suit, action, grievance, charge or proceeding brought in connection with or related to Contractor's operations, provision of services and/or conduct of any of its employees, volunteers, agents or representatives. The indemnification and hold harmless obligation hereunder shall include all attorney fees, costs and expenses incurred by the District and/or the District's Board members, employees, representatives and/or agents in defense of said suits, actions, grievances, charges and/or proceedings. Nothing in this section or otherwise in this Agreement shall be construed in any way or applied in any manner as a compromise or waiver of the District's rights and protections under the Colorado Constitution or the Colorado Governmental Immunity Act.

8.2 Governmental Immunity. It is specifically understood and agreed that nothing contained in this Agreement shall be construed as an express or implied waiver by the District of any of the immunities, rights, benefits, protections, or other provisions of the Colorado Constitution or Governmental Immunity Act, C.R.S. §§ 24-10-101 *et seq*, as now or hereafter amended.

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9.0 REFERENCES

References are mandatory – List three (3) references for which your company has completed similar services for projects of similar scope. Colorado K-12 public school references are preferred, if available.

9.1 Company Name_____

Address _____

Contact Person _____

Telephone _____

Email _____

Describe type of work/service performed or items supplied _____

_____

9.2 Company Name_____

Address _____

Contact Person _____

Telephone _____

Email _____

Describe type of work/service performed or items supplied _____

_____

9.3 Company Name_____

Address _____

Contact Person _____

Telephone _____

Email _____

Describe type of work/service performed or items supplied _____

_____

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10.0 BID CERTIFICATION

DUNN ELEMENTARY SCHOOL HVAC UPGRADES-PHASE 2
IFB #24-121-001

The District will only accept and consider electronically submitted proposals from Contractors, which must be submitted and received in the www.bidnetdirect.com electronic solicitation portal on or before December 13, 2023, 2:00 p.m. MT.

The undersigned hereby affirms that:

- Contractor is a duly authorized agent of the company issuing this IFB and that all information provided in the Bid is true and accurate.
- Contractor has read the conditions and technical specifications, which were made available to the company in conjunction with this IFB, and fully understands and accepts these terms unless specific variations have been expressly listed in the Bid.
- Contractor will adhere to all terms and conditions and provide, at a minimum, all services as expressed in the IFB and/or the company's Bid responding to the IFB.
- Contractor meets or exceeds all of the required criteria as specified by this IFB, or if not, has submitted a Justification for Consideration addressing any failure to meet the criteria.
- Contractor's Bid is being offered independently of any other Contractor and in full compliance with the terms specified in the IFB.
- Contractor will accept any awards made to it, as a result of this IFB for a minimum of ninety (90) calendar days following the date and time of the IFB closing.

Company Name: _____

Signature of Agent: _____

Printed Name: _____

Title: _____

E-mail address: _____

Mailing address: _____

Phone Number: _____

Contact Person: _____
(If different from Agent – include e-mail address and phone number)

NOTE: Bids submitted without the signature of an authorized agent of the company may be considered non-responsive and ineligible for the award.

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11.0 BID FORM

DUNN ELEMENTARY SCHOOL HVAC UPGRADES-PHASE 2
IFB #24-121-001

Provide the information requested. Poudre School District reserves the right to reject any or all Bids or any parts thereof. This IFB may be awarded to one (1) Contractor. Contractor agrees to furnish all labor and materials to complete the execution of the scope described in the Bid Documents and any relating Q&A/addenda.

Base Bid Lump Sum – Dunn Elementary School HVAC Upgrades-Phase 2

_____Dollars($_____)

Confirm the Q&A Document/Addenda have been received. The modifications to the Bid Documents noted in all Addenda issued have been considered and all costs are included in the above cost(s). It is the responsibility of the Contractor to confirm all project Addenda have been received and included in the submitted Bid (and alter the list below).

Q&A/Addendum # _____ Dated _____ Signature _____

Q&A/Addendum # _____ Dated _____ Signature _____

Company Name: _____

Authorized Agent's Name: _____

Authorized Agent's Signature: _____

Email: _____

Phone: _____

Date: _____

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CONSTRUCTION AGREEMENT

THIS CONSTRUCTION AGREEMENT ("Agreement") is made as of the XXth day of Month 20xx, between the POUDRE SCHOOL DISTRICT R-1, State of Colorado ("Owner") and NAME ("Contractor"), in connection with Dunn Elementary School HVAC Upgrades-Phase 2 IFB #24-121-001 at 501 S Washington, Fort Collins, Colorado 80521, complete with all work appurtenant there to ("Project").

In consideration of the compensation to be paid to the Contractor and of the mutual agreements herein contained, the parties agree as follows:

1.00 THE CONTRACT DOCUMENTS. The Contract Documents shall consist of this Construction Agreement, which Agreement also incorporates by this reference all of the instruments set forth in Article 1 of the General Contract Conditions as fully as if they were set forth in this Agreement in full and instruments described in Invitation for Bid IFB #24-121-001 (Exhibit A).

2.00 SCOPE OF THE WORK. The Contractor will furnish all tools, equipment, machinery, supplies, superintendence, insurance, transportation, and other construction accessories, services, and facilities specified or required to be incorporated in and form a permanent part of the completed work. In addition, the Contractor shall provide and perform all necessary labor in a first-class and workmanlike manner and in accordance with the conditions and prices stated in the Bid Proposal and the requirements, stipulations, provisions, and conditions of the Contract Documents, as defined in the attached General Conditions. The Contractor shall further perform, execute, construct, and complete all things mentioned to be done by the Contractor and all work included in and covered by the Owner's official award of this contract to the Contractor, such award being based on the acceptance by the Owner of the Contractor's bid, or part thereof.

3.00 TIME OF COMMENCEMENT AND COMPLETION. The Contractor agrees to commence work under this Agreement in accordance with the applicable Proposal (Exhibit B) upon issuance of Notice to Proceed and to fully complete all work by no later than August 1, 2024.

4.00 TIME OF THE ESSENCE. All time limits stated in this Agreement and the Contract Documents are of the essence of the Agreement.

5.00 LIQUIDATED DAMAGES. The Contractor understands and agrees that the completion of the entire project within the time provided is an essential feature of this Agreement and that the Owner will sustain substantial damages, the amount of which is not possible to accurately determine at this time, if the work is not so completed. The Contractor, therefore, agrees to proceed with due diligence, taking all precautions and making all necessary arrangements to ensure the completion of the work within the prescribed time. The Contractor further agrees that their failure to finally and fully complete the work within the time allowed shall be considered as a breach of the Agreement and entitle the Owner to collect liquidated damages for the delay in completion of the sum of Eight Hundred and 00/100 Dollars ($800.00) for each calendar day that elapses between the date set forth in Section 3.00 of this Agreement, as extended in accordance with the General Conditions, and the date of final completion of the Project, as more fully defined in the General Conditions Article 45.00.

6.00 CONTRACT SUM. The Owner shall pay to the Contractor for performance of the work encompassed by this Agreement, and the Contractor will accept as full compensation therefor, the lump sum of SPELL OUT ($xxxxxxxx) ("Contract Sum"), subject to adjustment as provided by the Contract Documents, to be paid by progress payments in the manner provided for in the Contract Documents. The amount of money appropriated by the Owner for the project is equal to or in excess of the Contract Sum.

7.00 ACCEPTANCE AND FINAL PAYMENT. Upon receipt of written notice that the work is

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ready for final inspection and acceptance, the Contractor, the Architect, and the Owner shall make such inspection, and when the work is found to be acceptable under the Agreement and the Agreement fully performed, including the satisfactory completion of all punch list items, the Architect shall promptly so certify to the Owner, over their own signature, stating that the work provided for in this Agreement has been completed in accordance with the Contract Documents and is accepted by them under the terms and conditions therefor, and that the entire balance found to be due the Contractor, and noted in said final certificate, is due and payable. Before issuance of the Owner's letter of acceptance, the Contractor shall submit evidence satisfactory to the Owner that all payrolls, material bills, and other indebtedness connected with the work has been or will promptly be paid. Final payment shall be made following the procedures set forth in the Contract Documents.

8.00 REPRESENTATIONS.

8.01 The Contractor shall not extend the credit or faith of the Owner to any other persons or organizations.

8.02 The Contractor represents that it understands the nature, location, and scope of the Work, the character of the equipment and facilities needed preliminary to and during the performance of the Work, and the general and local conditions and all other matters that can in any way affect the Work and is not relying on any representations or promises by the Owner except as set forth in this Agreement.

8.03 The Contractor shall cooperate with other contractors, if any, and employees of the Owner in performing the Work.

9.00 <u>WARRANTIES</u>

9.01 The Contractor warrants that the Work shall be conducted in a good and workmanlike manner and shall be suitable and fit for the purposes for which it is intended.

9.02 The Contractor warrants and represents that it has full authority under applicable law to execute and deliver this Agreement and to perform all of the obligations under this Agreement.

9.03 The Contractor represents that it shall perform the work in a safe and diligent manner and Contractor shall use its best skill and judgment pursuant to the standards of the profession for such Work in furthering the Owner’s best interests.

9.04 The Contractor warrants all Work to be free from any defects in materials and workmanship for a period of two (2) years following final completion and acceptance by the Owner.

10.00 BINDING EFFECT AND ASSIGNMENT. This Agreement shall be binding on the parties as well as their successors, assigns and personal representatives. Notwithstanding the foregoing, the Contractor shall not assign any of their rights or obligations under this Agreement without the express written consent of the Owner. Upon any assignment even though consented to by the Owner, the Contractor shall remain liable for the performance of the work under this Agreement.

11.00 PARTIAL INVALIDITY. If any provisions of this Agreement are finally determined by a court of competent jurisdiction to be in violation of any statute or rule of law of the State of Colorado, then such provisions shall be deemed null and void to the extent that they may be violate of law, but without invalidating the remaining provisions hereof.

12.00 WAIVER. No waiver of any breach of any one of the agreements, terms, conditions, or covenants of this Agreement by the Owner shall be deemed or imply or constitute a waiver of any other agreement, term, condition, or covenant of this Agreement. The failure of the Owner to insist on strict performance of any agreement, term, condition, or covenant, herein set forth, shall not constitute or be

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construed as a waiver of the Owner's rights thereafter to enforce any other default; neither shall such failure to insist upon strict performance be deemed sufficient grounds to enable the Contractor to forego or subvert or otherwise disregard any other agreement, term, condition, or covenant of this Agreement.

13.00 ENTIRE AGREEMENT. This Agreement, together with the Contract Documents as defined in Article 1.00 herein, constitute the entire agreement of the parties hereto. No modification, change, or alteration of the within Agreement shall be of any legal force or effect unless in writing, signed by all the parties hereto.

14.00 COUNTERPARTS. This Agreement may be executed in several counterparts, and each such counterpart shall be deemed an original. For purposes of executing this Agreement, facsimile or scanned signatures shall be as valid as the original.

15.00 GOVERNING LAW. Venue for any and all legal actions regarding or arising out of the transaction covered herein shall be solely in the District Court in and for Larimer County, State of Colorado. This transaction shall be governed by the laws of the State of Colorado.

16.00 ATTORNEYS' FEES. In the event it becomes necessary for either party to enforce any provisions or breach of this Agreement by commencing litigation, the prevailing party in such action shall be entitled to collect, as part of any judgment entered, its reasonable expert witness and attorneys' fees and costs.

17.00 PREMISES ACCESS CERTIFICATION. Contractor certifies it shall not employ on Owner premises any persons convicted of any felony or misdemeanor crime of unlawful sexual behavior involving children.

18.00 INTENTIONALLY OMITTED

19.00 NOTICES. All notices, requests, demands, and other communications given or to be given under this Agreement shall be in writing and shall be deemed to have been duly given when served if served personally, or on the second day after mailing if mailed by first-class mail, registered or certified, postage prepaid, and properly addressed to the party to whom notice is to be given as set forth below.

If to Owner: Poudre School District R-1
Attn: Chief Operating Officer
2407 La Porte Avenue
Fort Collins, Colorado 80521-2297

With a copy to: Autumn Aspen, Esq.
General Counsel
Poudre School District R-1
2407 LaPorte Avenue
Fort Collins, Colorado 80521-2297

If to Contractor, then to the individual at the address set forth in the signature block below.

Either party may change its address for purposes of notice by giving written notice to the other party in accordance with this paragraph.

IN WITNESS WHEREOF, the parties have executed this Agreement on the day and year first above written and shall extend to and bind the parties, their successors, assigns, and personal representatives.

SAMPLE

CONTRACTOR:	OWNER:
	POUDRE SCHOOL DISTRICT R-1
Legal Name of Contracting Entity	
Signature of Authorized Officer	Director of Construction & Facilities
Printed Name of Signatory	Chief Financial Officer
Street Address	
City, State, Zip Code	
FEIN	Legal Review

SAMPLE

Exhibit A
Copy of IFB XXX

See attached .pdf named "xxxxx" (xxxx pages in file)

SAMPLE

Exhibit B
Bid Response

The next xx pages are the Bid Response and award Letter.

SAMPLE

Exhibit C
General Contract Conditions

See attached .pdf named “Contract - Exhibit C General Conditions” (58 or xx pages in file)

SAMPLE

GENERAL CONDITIONS OF THE CONSTRUCTION AGREEMENT

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GC 1.00 CONTRACT DOCUMENTS AND DEFINITIONS

All Work under the Construction Agreement shall be accomplished in accordance with the Contract Documents, which shall consist of the Request for Qualifications, Request for Proposals, Proposal(s), Notice of Award, Notice to Proceed, Performance Bond, Labor and Material Payment Bond, Construction Agreement, General Contract Conditions, Supplementary Conditions, Asbestos Management Plan Contractor Responsibility Form, Drawings and Specifications, tests and engineering data, approved Change Orders, Contractor's Requests for Payment, Architect's Certificates, and all addenda issued by theOwner or Architect prior to execution of the Construction Agreement and all modifications issued by theOwner or Architect after execution of the Construction Agreement.

With respect to the Contract Documents, the following definitions and understandings shall control:

1.01 *"Contract" or "Contract Documents"* shall include all of the items enumerated in GC-1.00 above.

1.02 *"Owner"* shall mean Poudre School District R-1, and shall include its duly authorized representatives.

1.03 *"Contractor"* shall mean the corporation, company, partnership, firm, entity, or individual named and designated as such in the Construction Agreement, and any persons or entities acting on its behalf.

1.04 *"Subcontractor"* shall mean any corporation, partnership, entity, or individual having a direct contract with the Contractor or another subcontractor for performing Work and/or furnishing laboror material on the Project covered by the Contract.

1.05 *"Architect"* shall mean the corporation, partnership, entity or individual named and designated as "architect" or "engineer" in the Construction Agreement, and any persons or entities actingon the Architect's behalf and within the scope of the particular duties properly entrusted to them in eachcase. In the event that there is no Architect on the Project, then "Architect" shall refer to Owner and its duly authorized representative.

1.06 *"Notice to Contractor"* shall be deemed to have been duly served if made in writing and delivered in person to the individual or to a member of the firm or to an officer of the corporation for which it is intended, or if sent by registered or certified mail, to Contractor's last known business address.

1.07 *"The Work"* shall mean the construction and services required by the Contract Documents for completion of the Project, and includes all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations, whether on or off the Project site, and all labor, materials equipment and services provided or to be provided by subcontractors,sub-subcontractors, or any other entity for whom the Contractor is responsible.

1.08 *"The Project"* is the total construction designed by the Architect of which the Work performed under the Contract Documents may be the whole or a part.

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1.09 *The "date of final completion" and "finally completed"* shall mean the date when construction is certified by the Architect to be finally completed in accordance with the Contract Documents, as modified by any Change Orders processed under the terms of GC-23.00 below and when the Owner has fully accepted the Project for the use for which it was intended. Such date will be set forth on a letter of acceptance issued by the Owner.

1.10 *"Drawings" or "plans"* shall mean all (a) drawings furnished by the Owner and/or Architect as a basis for the award of Contract and for construction of the Project; (b) supplementary drawings furnished by the Owner and/or Architect to clarify and to define in greater detail the intent of the Contract drawings and specifications; (c) drawings submitted by the successful Contractor as may be required after the Contract is awarded; (d) drawings furnished by the Owner and/or Architect to the Contractor during the progress of the Work; and (e) engineering data and drawings submitted by the Contractor during the progress of the Work, provided such drawings are acceptable to the Architect and Owner.

1.11 *"Specifications"* are the written technical information concerning materials, components, systems, equipment, and manner of installation as indicated on the drawings or plans and which state the quality, performance, and characteristics to be achieved by application of construction methods.

1.12 *"Change Order"* shall mean a written order to the Contractor signed by the Owner or its authorized agent issued after the execution of the Construction Agreement, authorizing a change in the Work and/or adjustment in the Guaranteed Maximum Price ("GMP") or the contract time schedule. Each adjustment in the GMP resulting from a Change Order shall clearly separate the amount attributable to the Cost of the Work and the Contractor's Fee.

1.13 *"day" or "days"* shall mean calendar days. In computing a period of days, when the ending date is not specified, the first day is excluded and the last day is included. If any deadline falls on a Saturday, Sunday, or federal or Colorado state holiday, such deadline will be extended to the next day that is not a Saturday, Sunday or federal or Colorado state holiday.

GC 2.00 REFERENCE STANDARDS

Reference to the standards of any technical society, organization, or association, or to codes of local or state authorities, shall mean the latest standard, code, specification, or tentative standard adopted and published as of the date of execution of the Construction Agreement, unless specifically stated otherwise.

GC 3.00 DRAWINGS AND SPECIFICATIONS

3.01 *Ownership of Drawings.* All drawings, specifications, and copies thereof furnished by the Architect are the property of the Architect and the Owner, whether or not the Work for which they are made is performed, and are not to be used on other Work except by written agreement with the Architect and the Owner.

3.02 *Figured Dimensions to Govern.* Dimensions and elevations shown on the drawings shall be accurately followed. No Work shown on the drawings, the dimensions of which are not indicated, shall

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be executed until necessary dimensions have been obtained from the Architect.

3.03 *Contractor to Check Drawings and Schedules.* The Contractor shall check and verify all dimensions, elevations, and quantities shown on the drawings and furnished to it by the Architect, and shall notify the Architect of any discrepancy between the drawings and the conditions on the ground, or any error or omission in drawings, or in the layout as given by stakes, points, or instructions that it may discover. Before ordering any material or doing any Work, the Contractor shall verify all measurements concerning the Project and shall be responsible for the correctness of same. No extra charge orcompensation shall be allowed on account of any difference between actual dimensions and the measurements indicated on the drawings. Any difference that may be found shall be submitted to the Architect for consideration and written determination before proceeding with the Work. The Contractor shall not be allowed to take advantage of any error or omission in the drawings or Contract Documents. Full written instructions shall be furnished by the Architect should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified.

3.04 *Detail Drawings and Instructions.* The Architect shall furnish with reasonable promptness additional instructions, by means of drawings or otherwise, necessary for the proper execution of the Work. All such drawings and instructions shall be consistent with the Contract Documents. The Work shall be executed in conformity with the Architect's drawings and instructions, andthe Contractor shall do no Work without proper drawings and instructions.

3.05 *Drawings and Specifications Available on the Site.* The Contractor shall maintain at the Project site for the Owner and the Architect a Project record set of drawings, including addenda, approved shop drawings, Change Orders, and other modifications, with all changes or deviations from the original drawings neatly marked thereon in a contrasting color. The Contractor shall also maintain a Project record set of specifications at the Project site, noting therein by appropriate section the names, models, and other distinguishing characteristics of the materials actually incorporated into the Work. This Project record set of drawings and specifications shall be updated daily as the Project progresses and shall be made available to the Owner and Architect for inspection at all times. Upon final completion of the Workand before final payment, three (3) copies and one (1) electronic of this Project record set of drawings and specifications shall be delivered to the Owner. One (1) copy of this Project record set of drawings andspecification shall be delivered to the Architect.

3.06 *Laws and Regulations.* The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations bearing on the conduct of the Work as drawn and specified. If the Contractor observes that the drawings and specifications are at variance therewith, it shall promptly notify the Architect in writing, and any necessary adjustments shall be made as provided in the Contract for changes in the Work. If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules, or regulations without giving the required notice to the Architect and receiving a writtendirective to proceed, it shall bear all costs arising therefrom and to correct and/or remedy same.

GC 4.00 ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend all suits or claims for infringement of patent rights and shall hold the Owner harmless from any and all liability or loss

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on account thereof. If the Contractor has information that the process or article specified involves the infringement of a patent, it shall be responsible for any and all liability or loss resulting therefrom unless it promptly furnishes such information to the Architect in writing.

GC 5.00 ITEMS COVERED BY CONTRACT PRICE

5.01 *Items Supplied by Owner.* Owner shall supply the following items for the Project:

a. Building Permit;

b. Initial Survey;

c. Materials Testing Including Soil Testing;

d. Third Party Inspections;

e. Commissioning; and

f. Test and Balance as Required for Commissioning.

5.02 *Items Supplied by Contractor.* Unless specifically stated otherwise, the Contractor shall accept the compensation stated in the Construction Agreement as full payment for furnishing all the materials, transportation, apparatus, temporary structures, equipment, services, fuel, energy, light, water, labor and tools, and all other things necessary for the complete and proper execution of the Work contemplated by or reasonably implied from the Contract Documents, within the time limits indicated therein. Such amount shall include any loss or damage resulting from the nature of the Work, from the elements or from any unforeseen difficulties that may be encountered; all risks of every description connected with the prosecution of the Work; all expenses incurred in consequence of any suspension or discontinuance of the Work; and all other amounts necessary for completing the Work pursuant to the Contract Documents within the time limits indicated therein.

GC 6.00 EXECUTION, CORRELATION, INTENT, AND INTERPRETATION OF CONTRACT DOCUMENTS

6.01 *Execution.* The Construction Agreement and other Contract Documents shall be signed in multiple copies as directed by the Owner. Within ten (10) days of Notice of Award, the Contractor shall submit to the Owner a minimum of five (5) fully executed original sets of the Construction Agreement; Performance Bond, and Labor and Material Payment Bond with original Power of Attorney; and certificates of required insurance coverage. The date of the Contract for purposes of these documents shall be the date of the Notice of Award letter. The Owner shall execute the Construction Agreement, assemble all copies, and distribute the Contract Documents. The Contractor shall not commence the Work until it receives the Notice to Proceed. All bonds and insurance certificates shall be submitted to the Owner prior to the award of the first subcontract.

6.02 *Correlation.* By executing the Construction Agreement, the Contractor represents that it has visited the Project site, familiarized itself with the local conditions under which the Work is to be

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performed, and correlated its observations with the requirements of the Contract Documents.

6.03 *Intent.* The intention of the Contract Documents is to include all labor and materials, tools, equipment, construction equipment, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work. Materials or Work described in words that, as applied, have a well-known technical or trade meaning shall be held to refer to such recognized meaning. The organization of the specifications into divisions, sections, and articles, as the case may be, and the arrangement of drawings shall not control the Contractor in dividing the Work among subcontractors or in establishing the extent of Work to be performed by any trade. It is intended that even though Work is not covered under any heading, division, section, article, branch, class, or trade of the specifications, it shall nevertheless be supplied if it is required elsewhere in the Contract Documents or is reasonably inferable therefrom as being necessary to produce the intended results. The specifications and drawings are intended to supplement but not necessarily duplicate each other. Any Work exhibited in the one and not in the other shall be executed as if it had been set forth in both, so that the Work will be constructed according to the complete design as determined by the Architect.

6.04 *Interpretation.* Should anything necessary for a clear understanding of the Work be omitted from the specifications and drawings, or should the requirements appear to be in conflict, the Contractor shall secure written interpretations or instructions from the Architect before proceeding with the Work affected thereby. The Contractor shall secure written interpretations or instructions by submitting the Owner's form Request for Interpretation to the Architect. Oral requests shall not be acknowledged by the Architect or Owner. Additional costs incurred by the Owner as a result of unnecessary requests made by the Contractor, as determined by the Owner, shall be the responsibility of the Contractor. It is understood and agreed that the Work shall be performed according to the true intent of the Contract Documents.

6.05 *Conflict in Interpretation.* In the case of discrepancy or in the event of a conflict between the different Contract Documents, the documents shall take precedence in the following order:

a. Change Orders;

b. Written Amendments to Construction Agreement (including, if applicable, the GMP);

c. Construction Agreement;

d. General Conditions;

e. Drawings and specifications; and

f. Bid Documents, including addenda.

Where two or more of the Contract Documents are complementary, the more detailed provision shall control over the more general provision.

GC 7.00 MATERIALS, LABOR, FACILITIES, AND STORAGE

SAMPLE

7.01 *Contractor's Responsibility.* Unless otherwise agreed in writing, the Contractor shall provide and pay for all materials, labor, tools, equipment, machinery, transportation, and other facilities necessary for the proper execution and completion of the Work. The Contractor shall provide and pay for all the temporary facilities required to supply all the power, light, water, and heat needed by it and its subcontractors for their Work and shall install and maintain all such facilities in such manner as to protect the public and workers and to conform with any applicable laws and regulations. If temporary heat and/or protection is required for the expeditious prosecution of the Work and before the permanent heating apparatus is available for use, the temporary heating apparatus shall be installed and operated in such a manner that the finish Work and/or construction will not be damaged thereby. Unless otherwise specified, the Contractor shall pay for all the power, light, and water used by it and its subcontractors, without regard to whether such items are metered by temporary or permanent meters. The cutoff date on permanent meters shall be either the agreed date of full occupancy by the Owner or the date of final acceptance of the Project, whichever shall be the earlier date. Upon completion of the Work, the Contractor shall remove all surplus materials, tools and such temporary facilities and structures, furnished by the contractor from the Project site. All debris and rubbish caused by the operations of the contractor shall be removed, and the area occupied during construction activities shall be restored to its original condition, within 48 hours of project completion, unless otherwise directed by the municipality or owner's representative.

7.02 *Materials.* Unless otherwise specified, all materials shall be new and both Workmanship and materials shall be of the highest quality. The Contractor shall furnish satisfactory evidence to the Owner as to the kind and quality of materials. Samples shall be furnished, when specified, and the Work shall be in accordance with those samples that have been approved.

7.03 *Toilet Facilities.* The Contractor shall provide and maintain, in a neat and sanitary condition, adequate temporary toilet facilities for the use of any and all employees engaged on the Work, in strict compliance with the requirements of all applicable codes, regulations, laws, and ordinances. In no event may present toilet facilities of any existing building at the site of the Work be used by employees of the Contractor or its subcontractors. Upon final completion of the Work, the Contractor shall remove all such temporary facilities from the site and disinfect the premises.

7.04 *Facilities and Storage.* The Contractor shall provide suitable temporary facilities and quarters for workers, as needed, and shall maintain on premises water-tight storage sheds or tool houses for storage of building materials and tools that could be damaged by weather. The Contractor shall allow space for the erection of sheds and provide similar facilities for storage by subcontractors of their materials and tools. Storage of materials shall be confined to the site. These facilities or quarters shall further provide for protection against theft and damage of building materials and tools. Upon final completion of the Work, the Contractor shall remove all such temporary facilities from the site.

7.05 *Office Space.* The Contractor shall provide adequate, weatherproofed, heated and well-lighted office space at the site of the Work, for use by the Architect and the Owner and their representatives, unless otherwise directed by the Owner in writing. The Contractor shall also provide telephone service at such office, which shall be available for use by the Architect, the Owner, and their representatives without charge, except for toll calls, unless otherwise directed by the Owner in writing.

7.06 *Quality and Location of Facilities.* All of the foregoing facilities shall be of a quality and

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placed in locations acceptable to the Architect and the Owner.

GC 8.00 PERFORMANCE AND PAYMENT BONDS

8.01 *Required Bonds.* The Contractor shall, within ten (10) days from the Notice of Award furnish bonds to the Owner in the full amount of the contract price, covering both the faithful performance of the Contract and the payment of all obligations for labor and materials arising thereunder, on such customary forms as the Owner may prescribe and with such sureties as it may approve. The amount of the bonds shall be increased, if necessary, to reflect approved changes in the Work that result in an increase in the total cost of the Work plus the Contractor's fees. Such bonds shall be duly executed by a qualified surety licensed to do business in the State of Colorado, conditioned upon the true and faithful performance of the Contract, and shall provide that if the Contractor or its subcontractors fail to duly pay for any labor, materials, or other supplies used or consumed by such Contractor or its subcontractors in the performance of the Work contracted to be done, the surety will pay the same in an amount not exceeding the sum specified in the bond, as adjusted by approved Change Orders, and together with interest as provided by law. The performance bond shall additionally guarantee that the Contractor shall remedy any omissions, correct any and all defects, and adjust and make operable all component parts of Work falling under the requirements of the Contract that may be called to the Contractor's attention within a period of twenty-four (24) months following the date of the letter of acceptance.

8.02 *Additional Bond Requirements.* The premium for all bonds shall be paid by the Contractor and included in the bid price in the bid proposal. The Owner will accept and approve bonds written by sureties legally authorized to write such bonds in the State of Colorado, provided such surety companies are rated in Best's Insurance Guide (latest edition), not lower than A- or have Best's Financial Rating of at least X. If, at any time a surety on such a bond becomes irresponsible or loses its right to do business in the State of Colorado, new bonds shall be provided by an alternate surety licensed to do business in the State and meeting the requirements of this Section 8.00.

GC 9.00 PERMITS AND COMPLIANCE WITH STATUTES, RULES, AND REGULATIONS

9.01 *Permits.* Any local permits, governmental fees, and licenses necessary for the proper execution and completion of the Work shall be secured and paid for by the Contractor. Owner will pay for and secure building permit from Colorado Division of Fire Prevention and Control. Easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner, unless otherwise specified in writing. The Owner is generally exempt from paying any fee for any building permit issued by any building departments or agencies located in Larimer County, and the Contractor shall see that no building permit fee is paid. The Owner shall negotiate and provide for all electrical, gas, water, and sewer mains for the Contractor's connections. The Contractor shall arrange with the utility company for actual connection, make necessary connections, and pay for all associated inspection fees and permits as required by any government agency. In addition, the Contractor shall furnish all material and items required to complete all connections. The Contractor shall call for all inspections on a timely basis by any agency having jurisdiction over the Work.

9.02 *Compliance with Statutes, Rules and Regulations.* The Contractor and all subcontractors

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shall comply with all applicable federal and state statutes, rules, regulations, and directives of the State Division of Fire Prevention and Control, and other governmental body having jurisdiction over the work to be performed. If any of the provisions of the Contract Documents are in conflict therewith, such portions shall be considered stricken and the applicable statute, ordinance, regulation, or ruling substituted therefor. All such cases of apparent conflict coming to the attention of any party shall immediately be called to the attention of the Owner. The Contractor shall strictly observe and comply with all federal and state laws pertaining to the employment and payment of labor.

GC 10.00 SURVEYS, BENCHMARKS, MONUMENTS, STAKES, AND MEASUREMENTS

10.01 *Surveys.* As provided by the Owner, the Contractor shall obtain from the Architect a copy of all surveys describing property lines, elevation benchmarks, physical characteristics, and utility locations.

10.02 *Benchmarks.* The Contractor shall properly stake out the Work and provide and rigidly set benchmarks and batter boards as necessary for the proper performance of the Work. The Contractor shall remain responsible for their maintenance and their accuracy. A permanent benchmark, approved as to location and type by the Architect, from which all grades are to be taken, shall be established near the site of the Work by the Contractor. From this benchmark the Contractor shall ascertain all grades and levels to Project buildings as needed. The Contract Documents shall include all necessary information to establish the benchmark.

10.03 *Preservation of Monuments and Stakes.* The Contractor shall carefully preserve all monuments, benchmarks, property markers, reference points, and stakes. In case of the destruction thereof, the Contractor shall be charged with the expense of replacement and shall be responsible for anymistake or loss of time that may be caused. Permanent monuments and/or benchmarks that must be removed or disturbed shall be protected until properly referenced for relocation. The Contractor shall furnish all materials, labor and assistance for the proper replacement of such monuments and benchmarks.

10.04 *Measurements.* Before ordering any material or performing any Work, the Contractor shall verify all measurements on the Project and shall be responsible for the accuracy of same. No extra charge or compensation shall be allowed because of any difference between actual dimensions and the measurements indicated in the drawings or specifications. Any discrepancies shall be submitted to the Architect and Owner for consideration before proceeding with the Work.

GC 11.00 CHANGED CONDITIONS

The Contractor shall promptly, and before such conditions are disturbed, notify the Owner and the Architect in writing of: (1) sub-surface or latent physical conditions at the Project site differing materially from those indicated in the Contract Documents, or (2) unknown physical conditions at the Project site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract Documents. The Owner and the Architect shall promptly investigate the conditions, and if the Owner finds that such conditions do so materially differ and cause an increase or decrease in the cost of or the time required for performance of the Work, an equitable adjustment shall be made and the Contract modified in writing accordingly. Any claim of the

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Contractor for adjustment hereunder shall not be allowed unless it has given notice as required.

GC 12.00 PROTECTION OF PERSONS, WORK AND PROPERTY

12.01 *Building Exits and Barricades.* During the course of construction, the Contractor shall keep all required building exits free and unimpeded. Such exits shall not be closed at any time for any reason while the building is occupied or at any time when the building is unoccupied, except after writtenapproval is given by the Owner and proper warning and directional signs are posted. Barricades shall be erected so that traffic is separated and protected from the construction.

12.02 *Precautions.* The Contractor shall take all necessary precautions to ensure the safety of all employees and other persons on the Project or who may be affected by the Contractor's Work thereon.The Contractor shall also take all necessary precautions to protect the Work and all temporary facilities, as well as materials, tools, and equipment incorporated therein or to be incorporated therein from damage or destruction, whether in storage on or off the Project site and whether in the custody or control of the Contractor or any of its subcontractors. The Contractor shall also take all necessary precautions toprotect all property at the Project site and adjacent thereto not designated for removal, relocation or replacement, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities.

12.03 *OSHA Compliance.* The Contractor shall comply with all applicable provisions of the Occupational Safety and Health Administration ("OSHA") and all laws, ordinances, rules, regulations, and orders of all governmental agencies or authorities having jurisdiction to protect the safety of employees and/or other persons who may be affected by the Work. The Contractor shall erect and maintain all necessary safeguards to protect workers on the Project site and the owners and users of adjacent property, and shall post danger signs and other warnings against hazards created by the Work including but not limited to protruding nails, hoists, well holes, elevator shafts, hatchways, scaffolding, window openings, stairways, excavations, and falling materials. The Contractor shall designate a responsible employee at the Project site as a safety officer to ensure the Contractor's compliance with this section. Said employee shall be the Contractor's superintendent unless otherwise designated in writing by theContractor to the Owner and the Architect.

12.04 *Contractor's Liability.* The Contractor shall be liable for all injury, damage or loss to any person or property caused in whole or in part by the Contractor, any of its subcontractors, or any person employed by or under the direction of the Contractor or any of its subcontractors. To the extent possible and unless otherwise directed by the Owner or Architect, the Contractor shall promptly repair, pay for or otherwise remedy any such injury, damage or loss and shall indemnify and hold harmless the Owner against any and all liability, claims, damages, losses and expenses arising therefrom. The terms of this section shall not apply in the case of injury, damage or loss proximately caused by the acts or omissions of the Owner and/or Architect and not attributable to any fault or negligence of the Contractor.

12.05 *Emergencies.* In the event of an emergency that threatens the safety or life of any personor threatens to damage or destroy the Project and/or any Work, materials, equipment or property thereon or to be used thereon, the Contractor shall act at its discretion to prevent such injury, death, damage or destruction. The Contractor shall immediately notify the Owner and Architect in writing of any such emergency and any action taken by the Contractor in response thereto. Any compensation due the

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Contractor for such emergency action shall be determined by agreement of the Contractor, Owner and Architect, and an appropriate Change Order shall be issued therefor.

GC 13.00 WORK ON EXISTING BUILDINGS

13.01 *Protection of Occupants.* In addition to all other requirements of the Contract Documents, if the Work involves an addition or alteration to an existing building, the Contractor shall erect and maintain during the progress of the Work suitable dustproof partitions to protect such building and the occupants thereof. If necessary, in the Owner's or Contractor's judgment or pursuant to manufacturer's directives or recommendations in order to protect occupants from noxious fumes, odors,or hazardous substances, the Contractor may be required to provide additional ventilation and/or work different or extended hours to avoid disruption to other activities within the existing building. Contractorshall protect and keep from harm all occupants of an existing building from construction activities, and shall include a safe pathway into and out of the school.

13.02 *Partitions and Scheduling.* If any portions of an existing building are to be remodeled or repaired, such portions shall be adequately partitioned off with dustproof partitions and well ventilated. All remodeling Work shall be scheduled and submitted to the Owner and Architect for approval. The various contractors shall schedule their Work jointly, in order that each may accomplish its Work within such existing building in an orderly fashion during regular school vacation periods where possible, or in such a manner as to permit full use of the building and without impairment of any existing facilities.

13.03 *Existing Systems.* Existing building systems, such as fire alarm, temperature controls and air distribution, security systems, public announcement systems, irrigation systems, and the like, shall be demonstrated and noted by Owner to the Contractor as operational prior to Contractor's commencing the Work and Contractor may participate in observation of such systems. Such systems are the responsibility of the Contractor to maintain in pre-construction condition.

GC 14.00 CONTRACTOR'S SUPERINTENDENCE AND SUPERVISION

14.01 *Superintendent.* During the progress of the Work, the Contractor shall ensure that a competent superintendent and any necessary assistants, all satisfactory to the Architect and the Owner, are on the Project site at all times while Work is in progress. The superintendent shall not be changed bythe Contractor except with the written consent of the Architect and the Owner, unless the superintendentceases to be in the Contractor's employ. The superintendent shall represent the Contractor on the Projectand all directions given to him/her shall be as binding as if given to the Contractor. The Architect and theOwner shall not be responsible for the acts or omissions of the superintendent or his/her assistants.

14.02 *Supervision.* The Contractor shall provide full-time, qualified, and efficient supervision of the Work, using competent skill and attention. The Contractor is responsible for determining and supervising all temporary and permanent erection and construction sequences, techniques, means, or methods. The Contractor shall direct, schedule, coordinate the Work to ensure that all parts fit together properly and in accordance with the Contract Documents. The Contractor shall carefully study and compare all Contract Documents and other instructions and shall at once report to the Architect and theOwner any error, inconsistency, or omission that Contractor may discover.

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14.03 *Additional Supervision Duties.* The Contractor shall see that the Work is carried out in accordance with the Contract Documents and in a thorough and first-class manner in every respect. The Contractor shall provide engineering, surveying, and coordination to accurately establish all lines, levels, and marks necessary to facilitate the operations of all parties involved in the Contractor's Work. The Contractor shall lay out the Work in a manner satisfactory to the Architect, making permanent records of all lines and levels required for excavation, grading, and foundations, and for all other parts of the Work. The Contractor shall be responsible for the commencement and the proper completion of the various stages and sequences of construction. The Contractor shall strictly adhere to the approved construction schedule.

GC 15.00 SUBSTITUTIONS

The Contractor shall be held to have used in its base proposal and to furnish under the Contract those items of equipment and/or materials that are specifically identified in the plans and specifications by a manufacturer's name, model, or catalog number. Items of equipment and/or materials of the Contractor's choice may be offered as alternates to the items named in the plans and specifications by submitting, with the proposal and on the form provided, identifying data on the articles proposed together with a statement of the amount of addition or deduction from the base bid if the bidder's alternate is accepted. Prior approval by the Architect is not required on items submitted as alternate bids. After execution of the Construction Agreement, substitution of equipment and/or materials of makes other than those specifically named in the Contract Documents may be approved by the Owner so long as the equipment or material proposed for substitution in the opinion of the Owner is just as suitable as the equipment and/or materials named in the plans and specifications so far as performance, construction, efficiency, and utility are concerned. A request for substitution shall ordinarily be required to be based upon one or more of the following grounds: the specified equipment or material is no longer available, a substitution will improve lead time, quality will be improved (documented detail required), or the Owner will incur substantial savings. All requests for substitution must be submitted in writing with supporting documentation by or through the Contractor to the Architect for initial review and recommendation before being submitted to the Owner for evaluation and final approval. In the absence of the Owner's written approval, no substitution of equipment or materials shall be allowed for any items specified in the Contract Documents. In case of a difference in price, occurring as a result of an approved substitution, the Owner shall receive all benefit of the difference in cost involved in the substitution. All approved substitutions shall be documented by the issuance of a formal Change Order as provided in these General Conditions.

GC 16.00 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

16.01 *Shop Drawings.* "Shop drawings" are drawings, diagrams, illustrations, schedules, performance charts, brochures, manufacturer's literature, and other data that are prepared by the Contractor or any subcontractor, manufacturer, supplier, or distributor, and that illustrate some portion of the Work. Shop drawings shall be submitted in both hard copy and electronic format.

16.02 *Samples.* "Samples" are physical examples furnished by the Contractor to the Owner and/or Architect to illustrate materials, finishes, equipment, or Workmanship, and to establish standards by which the Work will be judged.

16.03 *Product Data.* "Product data" are illustrations, standard schedules, performance charts,

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instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work. Product data shall be submitted in both hard copyand electronic format.

16.04 *Contractor's Obligations.* The Contractor shall review, approve, stamp an then submit to the Architect shop drawings, product data, samples, and similar submittals required by the Contract Documents with reasonable promptness and in such a sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Shop drawings, product data, samples, and similar submittal required by the Contract Documents shall properly identify specified items. At the time of submission, the Contractor shall inform the Architect in writing of any deviation in the shop drawings, product data, or samples from the requirements of the Contract Documents. Substitutions will be allowed only in accordance with the provisions of GC-15.00. The number of copies and format of submittal shall be as required by the Architect, but, at a minimum, shall include three (3) copies and one (1) electronic copy of the original shop drawings and product data for the Owner.

16.05 *Verification.* By approving and submitting shop drawings, product data, and samples, the Contractor thereby represents that it has determined and verified all field measurements, field construction criteria, dimensions, elevations, quantities, materials, catalog numbers, and similar data, as shown on the drawings and specifications furnished by the Architect, or will do so, and that it has checkedand coordinated each shop drawing, product data, and sample with the requirements of the Work and ofthe Contract Documents.

16.06 *Architect/Owner Review.* The Architect shall review and approve shop drawings, product data, and samples with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The Architect's approval of a separate item shall not indicate approval of any assembly in which the item functions. Upon the final completion of the Work, the Contractor shall furnish to the Architect two corrected copies of all shop or setting drawings showing the as-built condition of the Work. The Architect, after review, shall submit one of these copies to the Owner.

16.07 *Corrections.* The Contractor shall make any corrections required by the Architect and shall resubmit the required number of corrected copies of shop drawings or new samples until approvedby the Architect. The Contractor shall direct specific attention in a separate writing or on resubmitted shop drawings to revisions other than the corrections requested by the Architect on previous submissions.

16.08 *Contractor's Responsibility.* The Architect's approval of shop drawings, product data, or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval of the specific deviation. The Architect's approval shall also not relieve the Contractor from responsibility for errors or omissions in the shop drawings, product data, or samples.

16.09 *Architect Approval Required.* No portion of the Work requiring the submission of a shop drawing, product data, or sample shall be commenced until such submittal has been approved in writingby the Architect. All such portions of the Work shall be in accordance with approved shop drawings, product

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data, and samples. All material finishes and samples shall be approved at one time. The Contractor shall submit all items requiring approval of finishes, color, material, etc., with sufficient lead time to allow simultaneous consideration and preparation of complete finish color schedule. No approvals of single items shall be considered.

16.10 *Copies to Owner.* When shop drawings, product data, samples or similar submittals have been approved and stamped by both Contractor and Architect, Contractor shall immediately forward an electronic copy of each to the Owner.

GC 17.00 CASH ALLOWANCE

The Contractor shall include in the Contract Sum, if applicable, all allowances named in the Contract Documents and shall cause the work so covered to be done by such contractors and for such sums as the Owner may direct, the Contract Sum being adjusted in conformity therewith. The Contractor declares that the Contract Sum includes such sums for expenses and profit on account of cash allowances as Contractor deems proper. No demand for expenses or profit other than those included in the Contract Sum shall be allowed. The Contractor shall not be required to employ for any such work persons against whom he has filed a lien or has a reasonable objection due to previous legal claims.

GC 18.00 EXPEDITING MATERIALS

The Contractor shall, immediately after receipt of the Notice of Award and approval of its list of subcontractors and material suppliers, place orders for all equipment, materials, and supplies required for the Work. The Contractor shall, when requested, submit to the Architect evidence that such orders have been placed. The Contractor shall exercise due diligence in seeing that all equipment, materials, and supplies are delivered well in advance of the time they are needed on the Project and shall properly store and protect same at its expense and in accordance with these General Conditions, either at the Project site or elsewhere as approved by the Architect.

GC 19.00 BLASTING

No explosives of any nature except for those normally employed in powder actuated tools, .38 caliber or smaller, shall be employed or used on the Project site except with the express and specific prior written approval of the Architect and the Owner and any appropriate governmental authorities, in each instance. The Contractor shall notify the Architect of need for such approval three (3) days prior to the proposed use of such explosives.

GC 20.00 SOIL TEST REPORT

The Owner may arrange for a separate consultant to conduct field and laboratory soil investigations on the Project site and to prepare a report of its findings. Such a report, if prepared, shall be available for review by the Contractor in the Architect's office. Such data is offered solely for reference and is not to be considered a part of the Contract Documents. The data contained in any such document prepared for the Owner by a separate consultant is believed to be reliable; however, the Owner and Architect do not

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guarantee its accuracy or completeness. All applicable subcontractors shall be fully familiar with the contents of such reports, if prepared, and shall consider and evaluate them in the performance of their contracts and the Work.

GC 21.00 HAZARDOUS MATERIALS

21.01 *Responsibility and Reporting.* Unless otherwise provided in the Contract Documents, the Contractor shall have no responsibility for the presence, handling, removal or disposal of hazardous materials in any form at the Project site, including but not limited to asbestos, asbestos products, polychlorinated biphenyl (PCB), lead, or other hazardous materials. Prior to its commencement or continuation of any portion of the Work, the Contractor shall provide notice to the Owner of the presence, location, amount and condition of any known or suspected hazardous materials that are discovered at the Project site. Such notice shall be in writing and shall be submitted no more than twenty-four (24) hours after the presence of such materials becomes known or suspected.

21.02 *Contractor's Obligations.* In the event hazardous materials become known or suspected by the Contractor as described in GC-21.01 above, the Contractor shall not proceed with or continue the Work until it has received written authorization from the Owner. If the Contractor proceeds with the Work without said authorization, it assumes any and all responsibility and liability for contamination and cleanup at the Project site according to applicable federal and state laws, and for any death or personal injury, including but not limited to medical expenses that may be incurred by any individual as a result of exposure to hazardous materials on the Project site.

21.03 *Owner's Obligations.* In the event hazardous materials are identified or encountered during the course of the Project, the Owner at its expense shall take reasonable actions to properly and safely deal with such materials.

21.04 *Management Plan.* The Contractor acknowledges that it and its employees, agents and subcontractors have the responsibility of being fully informed of the Owner's Management Plan as it relates to buildings located at the Project site and shall consult with the Owner about how such plan addresses suspected or active asbestos-containing material areas within such buildings.

GC 22.00 DAMAGE TO UTILITIES

22.01 *Adequate Precautions.* The Contractor shall take adequate precautions to protect existing utilities on and off the Project site and avoid damage thereto. The Contractor shall repair or replace or have repaired or replaced at its expense any damage to streets, water, sewer, light, power, cable, or telephone lines or fiber network that are damaged by reason of the Contractor's Work.

22.02 *Location.* The location and extent of underground utilities, fiber network, cables and conduit indicated on the drawings are not guaranteed. This information is shown only for such use as bidders and contractors may choose to make of it. The Contractor shall check with all public utility companies for locations and shall comply with their regulations regarding such utilities in performing the Work.

22.03 *Protection from Damage.* The Contractor shall adequately protect active underground

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utilities from damage, and if damaged shall immediately effect all necessary repairs. Removal or relocation of active underground utilities shall be done only as indicated on the drawings. If such utilities are in use, they shall be maintained in continuous service. If not indicated on the drawings or not known to exist, the Contractor shall report discovery of such utilities to the Architect and shall not proceed further until directed to do so.

22.04 *Inactive or Abandoned Utilities.* Inactive or abandoned utilities, whether or not they are indicated on the drawings, shall be recorded as to location and depth and shall be removed for a distance of not less than three (3) feet from the outside line of all concrete Work unless otherwise required by regulations. Ends shall be capped or plugged. There shall be no adjustment of the Contract amount for Work due to inactive or abandoned utilities.

GC 23.00 CHANGES IN THE WORK

23.01 *Change Orders.* The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Project consisting of additions, deletions, or other revisions. Under such circumstances, the GMP, if applicable and established, and the Contract Time Schedule shall be adjusted accordingly. All such changes in the Work shall be authorized by Change Order. No Change Order or other form of order or directive by the Owner or Architect requiring additional compensable Work to be performed, which causes the aggregate amount payable under the Contract Documents to exceed the amount appropriated for the original agreement, shall be issued unless the Contractor is given written assurance by the Owner that lawful appropriations to cover the costs of the additional Work have been made. Any claim of the Contractor for adjustment under this section must be asserted in writing within ten (10) days from the date of the Contractor's receipt of the Change Order.

23.02 *Minor Changes.* The Architect shall have authority to order minor changes in the Work not involving an adjustment in the GMP or an extension of the Contract Time Schedule and not inconsistent with the intent of the Contract Documents. Such changes may be effected by field order or by other written order. Such changes shall be binding on the Owner and the Contractor. In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in this Article.

23.03 *Price Differential.* The cost or credit resulting from a change in the Work shall be determined in one or more of the following ways:

a. By estimate, with a detailed cost breakdown as set forth in GC-23.03(c) below, and acceptance in a lump sum, with a maximum combined markup to the Owner, for the Contractor and all affected subcontractors, not to exceed a total of fifteen percent (15%).

b. By unit prices named in the Contract or subsequently agreed upon.

c. If the parties are unable to agree on one of the above methods, then the amount shall be determined by force account under the following formula:

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i. The actual cost of all direct labor performed (including foremen employed continuously on the Work, but not the salary, or any part thereof, of the Contractor's superintendent) and the actual materials furnished for and used in such Work, less all available cash, trade, or other discounts.

ii. Rental for the use of such items of equipment as have an individual value in excess of One Thousand Dollars ($1,000); provided, however, that the amount of such rental charge and the length of time and probable cost of the use of such equipment shall have been authorized in writing by the Owner.

iii. All proportionate sums paid for royalties, permits, and inspection fees.

iv. All proportionate premiums for public liability insurance, workers' compensation, and other proper and necessary insurance, as well as all applicable payroll taxes.

v. Either a predetermined lump sum; fixed fee; or a fee of fifteen percent (15%), which fee shall be applied to the total of GC-23.03(c)(i), GC-23.03(c)(ii) and GC-23.03(c)(iii) only, and shall constitute full compensation to the Contractor and all its subcontractors for all costs and expenses, including all overhead and profit, which are not otherwise enumerated in this GC-23.03(c).

vi. The Contractor shall keep and present, in such manner as the Owner may direct, an accurate accounting of all the fees and costs described in this GC-23.03(c), together with all supporting vouchers and other documentation, all subject to audit by the Owner.

GC 24.00 CLAIMS FOR EXTRA COST

If the Contractor claims that any instructions by drawings or otherwise, after the date of the Construction Agreement, involve extra costs under this Contract that were not included in the original bid, or require an extension in the construction schedule, the Contractor shall give the Owner and the Architect written notice thereof no later than ten (10) days after the receipt of such instructions, and in any event before proceeding to execute the Work, except in an emergency endangering life or property, and the procedure shall then be as provided for changes in the Work. No such claim shall be valid unless so made. Any change in the Contract amount or construction schedule must be authorized by Change Order.

GC 25.00 DELAYS AND EXTENSIONS OF TIME

25.01 *Delays and Extensions of Time.* If the Contractor is delayed at any time in the progress of the Work by the negligence or other improper act of the Owner or the Architect, or by any employee of either, or by any separate contractor employed by the Owner, or by changes ordered in the Work, or by any other cause that the Owner determines may justify the delay, then the completion date shall be extended by Change Order for such reasonable time as the Owner may determine.

a. Extension of the Contract completion time will be considered for delays due to weather conditions only when such conditions have had a material, adverse impact upon the critical path of the construction schedule, are more severe and extended than those reflected by the ten (10) year average for the month as evidenced by climatological data, U.S. Department of Commerce, for the area where the

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Project is located, and only if a request for such an extension of time is received within seven (7) days of the first date of each delay. Extensions of time due to weather or other allowable reasons will be granted on the basis of 1.4 calendar days' credit for every working day lost with each separate extension figured to the nearest whole calendar day.

b. All Contractor requests for extension of time shall be subject to the Owner's approval and shall be made in writing to the Owner no more than seven (7) days after the occurrence causing the delay; otherwise they shall be deemed waived. Any request for extension of time for a change in the Work or for any occurrence allegedly causing a delay as provided for herein must be substantiated by demonstrating the effect of the change or occurrence on the critical path of the construction schedule.

c. If no schedule or agreement is made stating the dates upon which written interpretations or detail drawings shall be furnished, then no claim for delay shall be allowed on accountof failure to furnish such interpretations or detail drawings until fifteen (15) days after demand is made for them, and then only if such claim is reasonable.

d. Should the time for completion of the Contract be extended, the Owner reserves the right to occupy any part of the structure upon written notice to the Contractor from the Architect or the Owner, but only after the Architect has made a thorough inspection, accompanied by the Contractor's superintendent, to note any defects in workmanship or materials that are the responsibility of the Contractor. Such inspection shall not be deemed to modify any other Contract requirements or provisionsrelating to observations, inspections or acceptance of the Work. Any such partial occupancy shall not bedeemed a waiver of any provision for liquidated damages for delay in final completion.

e. When the whole or a portion of the Work is suspended for any reason, the Contractor shall properly cover over, secure, and protect all Work as may be susceptible to damage in the absence of such action.

25.02 *Article Not Exclusive.* This GC-25.00 does not exclude the recovery of damages by the Owner for delay under other provisions of the Contract Documents.

GC 26.00 ACCESS TO WORK

26.01 *Access.* The Architect, the Owner, and their representatives shall at all times have access to the Work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access so that the Architect may perform its functions under the Contract Documents.

26.02 *Inspection.* If the specifications, the Architect's instructions, laws, ordinances, or any public authority require any Work to be specially tested or approved, the Contractor shall give the Architect timely notice of its readiness for such testing or approval by the Architect or inspection by another authority, and if the inspection is by another authority, of the date fixed for such inspection. All required certificates of inspection shall be secured by the Contractor. If any Work is covered up without approval or consent of the Architect, it must, if required by the Architect, be uncovered for examination at the Contractor's expense.

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26.03 *Reinspection.* Reinspection of questioned Work may be ordered by the Owner, and if so ordered, the Work must be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, the Owner shall pay the cost of reinspection and replacement. If such Work is found not to be in accordance with the Contract Documents, the Contractor shall pay such cost.

26.04 *Testing.* Materials incorporated into the Project shall be subject to routine tests as required to ensure their compliance with the specifications. Such tests may include, but shall not necessarily be restricted to, the following: concrete (primary mix design, slump tests, cylinder compressions tests, and air entrainment tests); steel (tensile tests); welds (field inspection and x-ray examination); soils (sub-soil investigation, physical analysis, and compaction tests); asphalt pavement (physical analysis and compaction tests); and roofing samples cut from in-place built-up roof. Any other basic materials for which standard laboratory test procedures have been established may also be included if doubt as to their quality should arise. Any testing contemplated by this section shall be done at the discretion of the Owner, who shall bear all costs, unless otherwise provided in the Contract Documents. The Contractor shall be held responsible for providing samples of sufficient size for test purposes and for cooperating with the Owner or its representative in obtaining and preparing samples for tests. All tests shall be in accordance with standard test procedures and shall be performed by persons or firms selected by the Owner. Contractor shall schedule and coordinate all tests and inspections directly with the owner's testing and/or inspection agency. Contractor shall give the architect and owner 48 hours' notice of when and where tests and inspections are to be made so that the architect may be present for such procedures.

GC 27.00 CORRECTION OF WORK

27.01 *Correction of Work Before and After Completion.* The Architect or Owner has the authority to reject Work that is defective or otherwise does not conform to the Contract Documents. The Contractor, following written demand, shall promptly correct all Work rejected by the Architect or Owner as defective or as otherwise failing to conform to the Contract Documents, whether observed before or after the date of final completion and whether or not fabricated, installed, or completed. The Contractor shall bear all costs of correcting such rejected Work, including the cost of the Architect's and/or Owner's consultant's additional services necessitated thereby. If the Contractor proceeds to build in or cover the item that has been rejected, the Contractor shall be totally responsible for the cost of removal and replacement of said item and removal and replacement of all necessary Work surrounding or covering the item.

27.02 *Tests to Determine Conformance.* Whenever in the opinion of the Architect or the Owner tests are essential to assure the professional evaluation of the Work that is subject to being rejected or condemned, the necessary number of tests shall be performed by consultants designated by the Owner. The recommendation of such consultants shall be final and all parties to the Contract shall comply with the methods and extent of the corrections submitted in writing to the Owner and the Architect by such consultants. The cost of the tests shall become the Contractor's responsibility when corrections of any nature are recommended by the consultant to the investigated Work; otherwise, the Owner shall pay for all tests performed. Should such special testing, inspection, or approval be caused by the Contractor's failure to follow the requirements of the Contract Documents or required tests under GC-26.04 indicating conditions not in conformance with the Contract Documents, the costs of such additional testing, inspection, or approval shall be borne by the Contractor, regardless of the results.

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27.03 *Removal of Rejected Work.* The Contractor shall promptly remove from the Project site all Work rejected by the Architect or Owner as failing to conform to the Contract Documents, whether or not the Work is physically incorporated. Thereafter, the Contractor shall promptly replace and re-execute such Work in accordance with the Contract Documents and without expense to the Owner. The Contractor shall further bear the expense of making good all Work of other contractors and/or subcontractors destroyed or damaged by such removal or replacement, and shall bear the expense of making good all of its Work and the Work of its subcontractors found to be defective by such removal or replacement. If the Contractor does not remove such rejected Work within a reasonable time, fixed by written notice from the Owner through the Architect, the Owner may remove it and may store the material at the expense of the Contractor. If the Contractor does not pay the expenses of such removal and storage within ten (10) days' time thereafter, the Owner may, upon ten (10) days' written notice, sell such materials at auction or at private sale. In such case, the Owner shall account to the Contractor for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor, including compensation for additional Architect or consultant services. If the net proceeds of sale do not cover all costs that the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner. In addition, the Owner shall have any other remedies that may be available to it.

27.04 *Correction of Work After Final Payment.* Neither the final estimate or payment, nor any provision in the Contract Documents, shall relieve the Contractor of responsibility for faulty materials or workmanship and, unless otherwise specified, the Contractor shall remedy any defects due thereto and pay for any damage to other Work or property resulting therefrom, which appear within a period of two (2) years from the date of final completion and acceptance. This warranty shall be in addition to and not in lieu of all other remedies available to the Owner.

27.05 *Failure to Correct the Work.* If the Contractor fails to correct defective or nonconforming Work, the Owner may correct it and otherwise proceed against the Contractor for the cost thereof in accordance with the provisions of these General Conditions.

27.06 *Deductions for Uncorrected Work.* If the Owner deems it inexpedient to correct Work that has been damaged, is defective or has not been done in accordance with the Contract Documents, then an appropriate deduction from the price shall be made and reflected by a Change Order or, if the amount is determined after final payment, it shall be paid by the Contractor.

27.07 *Additional Obligations.* The obligations of the Contractor to correct the Work shall be in addition to, and not in lieu of, any other obligations imposed upon it by law, special guarantees,warranties, or other rights of the Owner.

GC 28.00 OWNER'S RIGHT TO CARRY OUT WORK

If the Contractor should neglect to prosecute the Work properly or fail to perform any requirement of the Contract Documents, the Owner, after three (3) working days' written notice to the Contractor, may, without prejudice to any other remedy it may have, make good such deficiencies, and may deduct the reasonable cost thereof from the payment then or thereafter due the Contractor. In the event such Work is

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performed by the Owner, the Owner's employees, or by persons other than the Contractor at the Owner's request, the Owner shall not be liable to the Contractor for inconvenience expense or subsequent cost of removal of such Work. The amount to be deducted as the cost of doing the Work shall include the cost of the Architect's additional services made necessary by such default. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

GC 29.00 OWNER'S RIGHT TO TERMINATE CONTRACT

29.01 *Termination for Cause.* If the Contractor should be adjudged bankrupt; or if it should make a general assignment for the benefit of its creditors without approval of the Owner; or if a receiver should be appointed on account of its insolvency; or if it should refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workers, competent supervision and superintendence of the Work, proper materials, or competent management of the Project; of if it should fail to make prompt payment to subcontractors or for material or labor; or disregard any laws, ordinances, or the instructions of the Architect or Owner; or otherwise be guilty of a material violation of any provision of the Contract Documents; then the Owner, when in its sole opinion sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor, and its surety, if any, seven (7) days' written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools, and appliances thereon and finish the Work by whatever method the Owner may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finally completed and accepted by the Owner. If the unpaid balance of the Contract amount exceeds the expense of completing the Work, including the cost of additional architectural, engineering, managerial, consultant, and administrative services, such excess shall be paid to the Contractor. If such expense exceeds such unpaid balance, the Contractor shall pay the difference to the Owner and the Owner shall be justified in withholding payment of any unpaid amounts. The expense incurred by the Owner, as herein provided, and the damages incurred through the Contractor's default, shall be determined by the Owner. The Contractor will not be reimbursed for any anticipated profit.

29.02 *Termination Without Cause.* Should conditions arise that in the Owner's opinion make it necessary or advisable to discontinue Work under the Contract Documents, the Owner may terminate the Contract in whole or in part without cause or fault by the Contractor by giving seven (7) days' written notice to the Contractor. The notice shall specify the date and extent to which the Contract is terminated. Upon any such termination, the Owner shall take possession of the Project site and all or any part of the materials and equipment delivered or en route to the site. In the event of termination without cause under this section, the Contractor shall be equitably paid for all Work properly completed, based upon the approved schedules of values. The Contractor will not be reimbursed for any anticipated profit.

GC 30.00 CONSTRUCTION SCHEDULE AND PROGRESS REPORTS

30.01 *Construction Schedule.* The Contractor shall submit, within ten (10) days after the date of the notice of award in a format acceptable to the Owner, an overall timetable of the construction schedule for the Project. This schedule shall start with the date of the notice of award, and the completion date shall be a date that will enable the Owner to accept the Work on the date specified in the Construction Agreement. The schedule shall portray fully a timetable representing the various elements in the schedule of values and shall provide for the expeditious and practicable execution of the Work. The time shown between the

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starting and completion dates of the various elements within the schedule shall represent one hundred percent (100%) completion of each element. Additional detailed schedules of separate elements of the Work such as commissioning, test and balance, and owner training, may be requested at the Owner's discretion. No request for payment shall be accepted by the Owner until this schedule has been submitted as required herein. This schedule shall be revised from time to time during the course of the Work when the actual progress, in the opinion of the Architect or the Owner, varies materially from that previously approved.

30.02 *Monthly Progress Reports.* The Contractor shall submit monthly progress reports with each request for payment. Basically, these reports shall reflect the Contractor's "Work in place" progress and shall be certified by the Contractor as to the date and contents of such "Work in place" progress report. If requested by the Owner, the monthly progress reports shall also include representative photographs of the actual Work in place. Such reports shall depict progress and percentage of completion, consistent with the values and amounts contained on the counterpart request for payment. The subcontractors shall be supplied copies of the Contractor's approved schedule. These subcontractors shall develop a similar schedule based on their respective Work. Failure to submit an approved schedule or monthly progress report shall be deemed cause to reject requests for payment.

30.03 *Scheduling.* The Contractor shall schedule all Work so as to reduce to a minimum any disruption in the use of the existing facilities and interruptions of utility service of any type. Where electrical or mechanical Work performed under this Contract will necessitate interruptions of service to existing facilities, the Contractor shall furnish and install temporary service to such facilities or perform such Work at such times when said existing utilities are not in normal use. The Contractor shall bear the cost of all overtime or inconvenience resulting therefrom. Any remodeling work which may interrupt normal building functions, especially periodic standardized testing, shall be scheduled and coordinated with the Owner at least one (1) week prior.

30.04 *Noise Ordinance Violation.* The Contractor shall at all times comply with the local noise ordinance requirements relating to the Work. To the extent there are any violations of any applicable noise ordinances imposed on the Owner as a direct or indirect result of the Contractor's Work, then the Contractor shall reimburse the Owner for any sums paid or due and payable by the Owner as a result of such violations. The Owner reserves the right to deduct any expenses incurred by the Owner as a result of any noise ordinance violations by the Contractor from any amount due to the Contractor under this Construction Agreement or, at its option, to collect such sum directly from the Contractor or its surety.

GC 31.00 SCHEDULE OF VALUES

Progress payments shall be made on the valuation of the Work done. Before beginning work and prior to the first Application for Payment, the Contractor shall the Contractor shall submit to the Architect and the Owner a complete, itemized schedule of the values of the various parts of the Work, aggregating the total sum of the Contract and separating material costs from other costs. Such schedule shall include as costs the material costs of all subcontractors under the Contractor and the costs of all materials to be taken from the Contractor's or subcontractors' own stocks of material. The schedule of values shall be supported by such evidence as to its correctness as the Architect and/or the Owner may direct. Each item on the schedule of values shall include its proper share of overhead and profit. The schedule of values shall be used for the estimates and progress payments provided for in these General Conditions. Along with such

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schedule of values, the Contractor shall submit a schedule of estimated monthly application amounts to be submitted over the course of the Project to assist the Owner in arranging payments.

GC 32.00 PAYMENT

32.01 *Certificates for Payment.* No request for payment shall be submitted to the Owner until and unless it has been certified by the Architect. No certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by the Owner shall constitute any acceptance of any Work not completed in accordance with the Contract Documents.

32.02 *Payments to Contractor.* Partial payments shall be made as the Work progresses within twenty-one (21) days after the close of the calendar month. Requests for payment, along with the appropriate supporting documentation shall be submitted to the Architect on a regularly established monthly schedule approved by the Owner. Supporting documentation is defined as: Job cost variance report; schedule of values; equipment rental information; updated schedules, including recovery schedule if behind, lien release, subcontractor pay applications and supplier invoices; contractor general conditions billed to correct line from payment matrix (GCs or fee). All materials stored off site require the following: certificate of insurance for stored materials, bill of sale, supplier invoices and photos. The Owner reserves the right to withhold payments at any time regardless of the Architect's recommendations or issuance of certificate for payment. The request for payment shall be based on the same items as are shown in the schedule of values itemizing the material used and Work performed for which payment is claimed. In preparing estimates, material delivered and properly stored on the site and preparatory Work done may be taken into consideration. The Contractor shall provide the Owner with a completed federal Form W-9 upon submission of the Contractor's first request for payment.

a. If payments are made on account of materials not incorporated in the Work, but delivered and suitably stored at the Project site or at some other location agreed upon in writing, such payments shall be conditioned upon submission by the Contractor of bills of sale or such other procedures that will establish the Owner's interest, including applicable insurance and transportation to the Project site.

b. Payments shall be made in the full value of the Work performed and material stored, less five percent (5%) of such value which shall be retained until completion and acceptance of all Work unless otherwise agreed by Owner, and less the aggregate of any previous payments.

c. Under any Contract exceeding One Hundred Fifty Thousand Dollars ($150,000) pursuant to which sums are withheld to assure satisfactory performance, the Contractor may withdraw the whole or any portion of such sums withheld if the Contractor deposits acceptable securities with the Owner in an amount at all times at least equal to the amount withdrawn. All such withdrawals shall be on the Owner's approved forms and shall require that the acceptable securities be endorsed in favor of the Owner, authorizing the Owner to negotiate the acceptable securities and to receive the payments due.

d. The Contractor warrants and guarantees that title to all Work, materials, and equipment covered by a request for payment, whether incorporated in the Project or not, shall pass to the Owner upon the receipt of such payment by the Contractor, free and clear of all liens, claims, security interests, or encumbrances; and that no Work, materials, or equipment covered by a request for payment

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shall have been acquired by the Contractor or by any other person performing the Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person. This provision shall not be construed as relieving the Contractor from the sole responsibility for all materials and Work upon which payments have been made or the restoration of any damaged Work, or as a waiver of the right of the Owner to require the fulfillment of all the terms of the Contract.

e. After the date of final completion of the Work, final settlement for the Project shall be advertised in accordance with Colorado law.

f. On the date of final settlement, as advertised, and after the Contractor has submitted a written notice to the Owner that no claims have been filed, final payment shall be made in full. Notwithstanding the foregoing, the Owner may withhold sufficient funds, if available, for unpaid claims as specified in GC-46.04.

32.03 *Payments Withheld.* The Owner may withhold payment or the Architect may decline to issue a certificate for payment in whole or in part, or the Architect may withhold or nullify the whole or any part of any certificate previously issued, because of subsequently discovered evidence or subsequent inspections, for such an amount or to such extent as may be necessary in the opinion of either the Owneror the Architect to protect the Owner from loss on account of:

a. defective Work not remedied;

b. claims filed or reasonable evidence indicating probable filing of claims;

c. failure of the Contractor to make payments properly to subcontractors or for material or labor;

d. a reasonable doubt that the Contract can be completed for the balance then unpaid;

e. damage to another contractor or to the property;

f. failure of the Contractor to perform any portion of the Work in a timely manner or in compliance with any approved schedules; or

g. failure of the Contractor to submit on a timely basis any documentation required by the Contract Documents, including without limitation monthly progress reports, schedule of values, or request for approval of subcontractors.

32.04 *Recordkeeping.* As further described in GC-56.00, the Contractor shall keep complete and accurate records, accounts and books with regard to all materials, equipment and labor involved in the performance of the Work in accordance with generally accepted accounting principles. The Owner and Architect shall have access to the Contractor's accounting records at all reasonable times, and the Contractor agrees to make any changes to its system of keeping these records as the Owner may reasonably request in writing. All such records shall be preserved and the Owner shall have access to them for six (6)

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years after final payment to the Contractor.

GC 33.00 INSURANCE

33.01 The Contractor, at its expense, shall procure and maintain in effect at all times throughout the duration of the Project, including the one- or two-year warranty period, as applicable, all insurance requirements and limits as set forth below. The Contractor shall continue to provide evidence of such coverage to the Owner on an annual basis during the aforementioned period including all of the terms of the insurance and indemnification requirements of this Construction Agreement. All insurance policies specified below shall include a provision preventing cancellation without thirty (30) days' prior notice by certified mail. Completed certificates of insurance shall be filed with the Owner within ten (10) days after the date of the Notice of Award. Such certificates shall specifically state the inclusion of the coverages and the provisions set forth herein and shall state whether the coverage is "claims made" or "per occurrence". If the coverage is written on a "claims made" basis, Contractor shall confirm that any retroactive date for the coverage precedes the effective date of the Construction Agreement and is in effect for a period of three (3) years from the date of final acceptance of the Work.

a. Workers' Compensation Insurance. The Contractor shall procure and maintain workers' compensation insurance at its own expense during the term of the Construction Agreement, including occupational disease provisions for all employees per statutory requirements. Such policy shall contain a waiver of subrogation in favor of the Owner. The Contractor shall also require each subcontractor to furnish workers' compensation insurance, including occupational disease provisions for all of the latter's employees, and to the extent not furnished, the Contractor accepts full liability and responsibility for subcontractor's employees. In cases where any class of employees engaged in hazardous work under this Construction Agreement at the site of the Project is not protected under the Workers' Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide, adequate and suitable insurance for the protection of employees not otherwise protected.

b. Commercial General Liability Insurance. The Contractor, at its own expense, shall procure and maintain commercial general liability insurance to protect the Contractor from all claims for bodily injury, including death and all claims for destruction of or damage to property (other than the Work itself), arising out of or in connection with any operations under this Construction Agreement, whether such operations be by the Contractor or by any subcontractor under it or anyone directly or indirectly employed by the Contractor or by a subcontractor. All such insurance shall be written with limits and coverages as specified below and shall be written on an occurrence form:

Project Amount	$0-10M	$10M-30M	$30M-50M	$50M-$100M
Insurance Required				
General Aggregate	$ 2,000,000	$ 5,000,000	$ 10,000,000	$ 25,000,000

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Products- Completed Operations Aggregate	$ 2,000,000	$ 5,000,000	$ 10,000,000	$ 25,000,000
Each Occurrence	$ 1,000,000	$ 1,000,000	$ 5,000,000	$ 10,000,000
Personal Injury	$ 1,000,000	$ 1,000,000	$ 5,000,000	$ 10,000,000
Fire Damage Limit for any one fire	$ 50,000	$ 50,000	$ 50,000	$ 50,000
Medical payments per person	$ 5,000	$ 5,000	$ 5,000	$ 5,000

[Coverage limits shall be a function of the project amount.]

The following coverages shall be included in the Commercial General Liability Insurance:

1. Designated Construction Projects General Aggregate Limit (ISO CG 2503-1997 edition orequivalent.

2. Owner, its subsidiary, parent, associated and/or affiliated entities, successors or assigns, its elected officials, trustees, employees, agents, and volunteers shall be named as Additional Insureds with respect to liability and defense of suits arising out of the activities performed by, or on behalf of the Contractors, including completed operations, and must include both ONGOING Operations and COMPLETED Operations per CG 2010 12/19 and CG 2037 12/19 or equivalent as permitted by law.

3. Additional Insured—Owners, Lessees or Contractors Endorsement, ISO Form 2038 or equivalent.

4. The policy shall be endorsed to be **primary and non-contributory** with any insurance maintained by Additional Insureds.

5. A waiver of subrogation in favor of all Additional Insured parties.

6. Personal/Advertising Injury Liability

7. Contractual Liability coverage to support Contractor's indemnification obligations

8. Explosion, collapse and underground (xcu)

9. Independent contractors

10. Products/Completed Operations

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11. Premises and Operations

The following exclusionary endorsements are prohibited in the Commercial General Liability Insurance policy:

1. Damage to Work performed by Subcontract/Vendor (CG 22-94 or similar)

2. Contractual Liability Coverage Exclusion modifying or deleting the definition of an"insured contract" from the unaltered SO CG 0001 1001 policy from (CG 2426 or similar)

The Contractor shall maintain general liability coverage including Products and Completed Operations insurance, and the Additional Insured with primary and non-contributory coverage as specified in this Contract for two (2) years after completion of the Project.

c. Comprehensive Automobile Liability Insurance. The Contractor shall maintain comprehensive automobile liability insurance, including coverage for liability arising out of any auto (including owned, hired, and non-owned autos), with a combined single limit of $1,000,000/person, $1,000,000/accident, and $1,000,000/property damage. Such insurance shall include a waiver of subrogation in favor of the Owner.

d. Umbrella Liability Insurance (for projects exceeding $10,000,000). The Contractor shall maintain umbrella/excess liability insurance on an occurrence basis in excess of the underlying insurance described in Subsections a through c above. Coverage shall follow the terms of the underlying insurance, included the additional insured and waiver of subrogation provisions. The amountsof insurance required above may be satisfied by the Contractor purchasing coverage for the limits specified or by any combination of underlying and umbrella limits, so long as the total amount of insurance is not less than the limits specified in each section previously mentioned.

Each occurrence	$5,000,000
Aggregate	$5,000,000

e. Builder's Risk Insurance. The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in Colorado, Builder's Risk insurance or equivalent policy form in the amount of the initial contract sum, plus the value of subsequent contract modifications, change orders, and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such Builder's Risk insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Owner has an insurable interest in the property, or the Date of Notice specified on the Notice of Acceptance, State Form SBP-6.27 or whichever is later. This insurance shall include interests of the Owner, the Contractor, subcontractors and subsubcontractors in the Project as named insureds. All associated deductibles shall be the responsibility of the Contractor. Such policy may have a deductible clause but not to exceed ten thousand dollars ($10,000.00). Builder's Risk insurance shall be on a special cause of loss form and shall include, without limitation, insurance against

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the perils of fire (with extended coverage), transit, increased cost of construction, architect's fees and expenses and all below and above ground structures, piping, foundations including underground water and sewer mains including the ground on which the structure rests, excavation, backfilling, filling and grading, and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (including water damage), windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss. Such Builder's Risk insurance shall include equipment breakdown coverage (aka boiler and machinery) which shall specifically cover insured equipment during installation and testing (including cold and hot testing) and such insurance must provide coverage from the time any covered property becomes the responsibility of the Contractor, and continue without interruption during construction, renovation, or installation, including any time during which the covered property is being transported to the construction installation site, or awaiting installation, whether on or off site. Contractor shall maintain Builders Risk coverage including partial use by Owner during construction. Contractor will take reasonable steps to obtain consent of the Builders Risk carrier to delete any provisions with regard to restrictions within any Occupancy Clause within the Builders Risk Policy. The Contractor shall waive all rights of subrogation as regards the Owner, its officials, officers, agents and employees, all while acting within the scope and course of their employment for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section or other property insurance applicable to the Work. The Contractor shall require all subcontractors at any tier to similarly waive all such rights of subrogation and shall expressly include such a waiver in all subcontracts. Upon request, the amount of such insurance shall be increased to include the cost of any additional work to be done on the Project, or materials or equipment to be incorporated in the Project, under other independent contracts let or to be let. In such event, the Contractor shall be reimbursed for this cost as his or her share of the insurance in the same ratio as the ratio of the insurance represented by such independent contracts let or to be let to the total insurance carried. The Owner shall have the power to adjust and settle any loss. Unless it is agreed otherwise, all monies received shall be applied first on rebuilding or repairing the destroyed or injured work.

f. Professional Liability Insurance. Contractor shall maintain professional liability insurance covering wrongful acts, errors and/or omissions, including design errors, if applicable for damage sustained by reason of or in the course of operations under this Contract resulting from professional services provided by the Contractor as part of this Contract. The policy coverages shall be amended to provide that coverage shall apply for three (3) years after project is complete. The policy is to be on a primary basis if other professional coverage is carried. Minimum coverage shall be in the amount of $1,000,000 per loss and $3,000,000 aggregate.

g. Contractor's Pollution Liability. Owner requires this coverage whenever work at issue under this Contract involves potential pollution risk to the environment or losses caused by pollution conditions (including asbestos) that may arise from the operations of the Contractor described in the Contractor's scope of services. Policy shall cover the Contractor's completed operations. Coverage shall apply to sudden and gradual pollution conditions resulting from the escape of release of smoke, vapors, fumes, acids, alkalis, toxic chemicals, liquids, or gases, natural gas, waste materials, or other irritants, contaminants, or pollutants (including asbestos). If the coverage is written on a claims-made basis, the

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Contractor warrants that any retroactive date applicable to coverage under the policy precedes the effective date of this Contract; and that continuous coverage will be maintained or an extended discovery period will be exercised for a period of three (3) years beginning from the time that work under this contract is completed. The policy shall be endorsed to include the following as Additional Insureds: "Owner, its subsidiary, parent, associated and/or affiliated entities, successors, or assigns, its elected officials, trustees, employees, agents, and volunteers named as an additional insured with respect to liability and defense of suits arising out of the activities performed by, or on behalf of the Contractor, including completed operations". The policy shall have the following minimum limits:

Per Loss	**$**	**1,000,000**
Aggregate	**$**	**1,000,000**

33.02 *Immunity* The parties understand and agree that the Owner does not waive or intend to waive any provision of the Contract, including the provisions of this Article; the monetary limitations of the Contract; or any of the rights, immunities, and protections provided by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101 *et seq.*, as from time to time amended, or otherwise available to the Owner.

33.03 *Additional Miscellaneous Insurance Provisions.* Certificates of insurance and/or insurance policies required under this Contract shall be subject to the following stipulations and additional requirements:

a. Any and all deductibles or self-insured retentions contained in any insurance policy shall be assumed by and at the sole risk of the Contractor;

b. If any of the said policies shall fail at any time to meet the requirements of the Contract Documents as to form or substance, or if a company issuing any such policy shall be or at any time cease to be approved by the Division of Insurance of the State of Colorado, or be or cease to be in compliance with any stricter requirements of the Contract Documents, the Contractor shall promptly obtain a new policy, submit the same to the Owner and State Building Programs for approval if requested, and submit a certificate of insurance as hereinbefore provided. Upon failure of the Contractor to furnish, deliver and maintain such insurance as provided herein, this Agreement, in the sole discretion of the State of Colorado, may be immediately declared suspended, discontinued, or terminated. Failure of the Contractor in obtaining and/or maintaining any required insurance shall not relieve the Contractor from any liability under the Agreement, nor shall the insurance requirements be construed to conflict with the obligations of the Contractor concerning indemnification;

c. All requisite insurance shall be obtained from financially responsible insurance companies, authorized to do business in the State of Colorado and acceptable to the Owner;

d. Receipt, review or acceptance by the Owner of any insurance policies or certificates of insurance required by this Agreement shall not be construed as a waiver or relieve the Contractor from its obligation to meet the insurance requirements contained in these General Conditions.

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GC 34.00 SEPARATE CONTRACTS

34.01 *Other Contracts.* The Owner reserves the right to enter into other contracts inconnection with the Work. The Contractor shall afford such other contractors reasonable opportunity forthe introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate its Work with theirs.

34.02 *Duty to Inspect and Report.* If any part of the Contractor's Work depends on proper execution or results upon the Work of any other contractor, the Contractor shall inspect and promptly report to the Owner through the Architect any defects in such Work that render it unsuitable for such proper execution and results. The Contractor's failure to so inspect and report shall constitute an acceptance of the other contractor's Work as fit and proper for the reception of the Contractor's Work, except as to defects that may subsequently develop in the other contractor's Work.

34.03 *Duty to Measure.* To ensure the proper execution of its subsequent Work, the Contractor shall measure Work already in place and shall immediately report to the Owner through the Architect any discrepancy between the executed Work and the Contract Documents.

GC 35.00 SUBCONTRACTORS

35.01 *Subcontractors and Suppliers.* Within ten (10) days of the mutual execution of the Contract, the Contractor shall include with on the forms provided, the names of its subcontractors and suppliers of labor and materials. The Contractor shall, before awarding any subcontracts, re-verify to the Owner and Architect in writing on the standard form "Request of Approval of Subcontractors" the names of subcontractors proposed for the Project. Any deviation from the original subcontractor and supplier list shall not be allowed unless justification is submitted in writing to the Owner by the Contractor that the subcontractor or supplier is deemed unfit or unable to perform the specified Work, is unwilling to enter into a subcontract, or is not in compliance with the Contract Documents. The Contractor shall not employ any subcontractors that the Owner or Architect may, within a reasonable time, object to as incompetent, unfit, or otherwise undesirable. Substitutions of subcontractors listed in the executed proposal form may not be made without written approval of the Owner.

a. If, before or after the execution of the Contract, a change of any subcontractor on such list is required by the Architect or by the Owner prior to the award of the relevant contract, the contract sum may be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued.

35.02 *Obligations.* The Owner shall, on request, furnish to a subcontractor, wherever practicable, evidence of the amounts certified on the subcontractor's account. The Contractor agrees that it is as fully responsible to the Owner for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

35.03 *Final Listing.* The Contractor, at the conclusion of the Work and before final payment is made, shall furnish to the Owner a listing of the names, contact persons, addresses, and telephone numbers of all subcontractors and material suppliers who furnished labor and materials on the Project, with

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identification of the services rendered and materials provided.

35.04 *No Contractual Relationship.* Nothing contained in the Contract Documents shall create any direct contractual relationship between any subcontractor and the Owner.

GC 36.00 RELATIONS OF CONTRACTOR AND SUBCONTRACTOR

36.01 *Written Agreement.* Unless specifically noted to the contrary in a subcontract approved in writing as adequate by the Owner, the Contractor agrees to bind each of its subcontractors by a written agreement and require in such agreements that every subcontractor be bound by the terms of the Construction Agreement, these General Conditions, any Supplementary Conditions, and the drawings and specifications as far as applicable to the subcontractor's Work.

36.02 *Subcontractors' Agreement.* Each subcontractor shall agree:

a. To be bound to the Contractor by the terms of the Construction Agreement, these General Conditions, the Supplementary Conditions, the drawings and specifications, and any other Contract Documents, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes toward the Owner.

b. To preserve and protect the rights of the Owner and the Architect under the Contract with respect to the Work to be performed under the subcontract so that the subcontracting thereof will not prejudice such rights.

c. To perform all Work in accordance with the requirements of the Contract Documents.

d. To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment as specified in the General Conditions.

e. To make all claims for extras, for extensions of time, and for damages for delays or otherwise, to the Contractor in the manner provided in the General Conditions of the Contract and the Supplementary Conditions for like claims by the Contractor upon the Owner, except that the time for making claims for extra cost is one week.

f. To purchase and maintain for the duration of the Project and completion of the Work and any warranty periods such insurance as required by Contractor in Article GC-47.00.

36.03 *Contractor's Agreement.* The Contractor agrees:

a. To be bound to the subcontractor by all the obligations that the Owner assumes to the Contractor under the Construction Agreement, these General Conditions, any Supplementary Conditions, the drawings and specifications, and by all the provisions thereof affording remedies and redress to the Contractor from the Owner.

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b. To pay the subcontractor not later than seven (7) days immediately following the payment of each certificate issued under the schedule of values described in these General Conditions, the amount allowed to the Contractor on account of the subcontractor's Work to the extent of the subcontractor's interest therein.

c. To pay the subcontractor, upon the payment certificates, if issued otherwise than as in GC 36.03(b) above, so that at all times the Contractor's total payments shall be as large in proportion to the value of the Work done by it as the total amount certified to the Contractor is to the value of the Work done by the subcontractor.

d. To pay the subcontractor to such extent as may be provided by the Contract Documents or the subcontract, if either of these provides for earlier or larger payments than the above.

e. To pay the subcontractor a just share of any insurance payment received by the Contractor, applicable to Work performed by such subcontractor.

36.04 *Verified Documentation.* The Owner may require the Contractor to submit verified documentation evidencing that full and timely payments have been made to its subcontractors and suppliers, and/or that legal justification exists for withholding payments. In addition, the Owner may contact the subcontractors and suppliers directly to obtain verification that payments have been made asrequired by law or the Contract Documents.

36.05 *No Obligation.* Nothing in this GC-36.00 shall create any obligation on the part of the Owner to pay or to see to the payment of any sums to any subcontractor, nor shall it form the basis for any action by the subcontractor against the Owner on any contractual theories.

36.06 *Meeting with Architect.* The Contractor shall arrange for the foreman of each subcontractor (mechanical, electrical, masonry, plastering, painting, etc.) on the job to meet with the Architect at the job prior to any Work being started by the subcontractor so that phases of the subcontractor's Work can be thoroughly discussed and the quality of materials and workmanship expected can be completely understood and agreed upon.

GC 37.00 CONTRACTORS' MUTUAL RESPONSIBILITY

The entire Project may be covered by more than one contract and in such case there will of necessity be a certain overlapping of obligations and responsibilities. Each contractor shall, therefore, take due notice of the Work called for in contracts other than its own. If the Contractor causes damage to the Work of another contractor, the Contractor agrees, upon notice of said damage, to settle with such other contractor by agreement, if it will so settle. If such other contractor sues the Owner on account of any damage alleged to have been caused by the Contractor, the Owner may notify the Contractor who shall, at the Owner's option, defend such proceedings at the Contractor's expense or reimburse the Owner for the expenses incurred in its defense, and if any judgment against the Owner results therefrom, the Contractor shall pay or satisfy the judgment and pay all costs and expenses thereby incurred by the Owner.

GC 38.00 CUTTING, PATCHING, AND EXCAVATING

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38.01 *Standards.* The Contractor shall do all cutting, fitting, and patching that may be required to make the several parts of the Work come together properly and receive or be received by Work of other contractors or subcontractors shown upon, or reasonably implied by, the drawings and specifications for the completed Project.

38.02 *Responsibility.* Any cost caused by defective or improperly timed Work shall be borne by the party responsible therefor. The Contractor shall not endanger any Work by cutting, excavating, or otherwise altering the Work and shall not cut or alter the Work of any subcontractor except with the consent of the Architect.

38.03 *Cutting and Sizing.* The Contractor and each subcontractor shall leave all chases, holes, or openings straight, true, and of proper size in its own Work, or cut the same in existing Work as may be necessary for the proper installation of its own or another contractor's or subcontractor's Work, consulting with the Architect regarding proper location and size of same. In case of a failure to leave or cut said chases, holes, or openings in the proper place, the Contractor or subcontractors shall cut them afterward at their own expense. No excessive cutting shall be permitted, nor shall any piers or other structural members be cut or modified in the field without the written consent of the Architect. After such Work has been installed, the Contractor and subcontractors shall carefully fit around, close up, repair, patch, and point up same as directed to the entire satisfaction of the Architect. Each section of this specification shall include all cutting, patching, and excavating for that trade division unless specifically stated to the contrary.

GC 39.00 EMPLOYEES

39.01 *Qualifications.* The Contractor and its subcontractors shall at all times enforce strict discipline and good order among their employees, and shall not employ any persons on the Project considered by the Architect or the Owner to be unfit or not skilled in the work assigned to them. The Contractor shall also keep its employees and those of its subcontractors from socializing on the Project site before and after working hours and from fraternizing at any time with staff, students, parents, and other persons who are at the school or the Project site.

39.02 *Drug- and Tobacco-Free Zone.* Poudre School District R-1 properties are drug-free zones and tobacco-free zones. In furtherance of this standard, the Contractor shall establish and maintain a safe and efficient work environment for all its employees, free from the effects of alcohol, controlled substances, and illegal drugs. The use of tobacco products on school grounds is prohibited. The manufacture, distribution, dispensing, possession, or use of alcohol, controlled substances, and illegal drugs is prohibited on or adjacent to the Project site and all of the Owner's other property at all times. Illegal drug use is the use of illegal drugs and the abuse of alcohol and other drugs, including anabolic steroids. Controlled substances are drugs specifically identified and regulated under state and/or federal law and include but are not limited to opiates, narcotics, cocaine, amphetamines and other stimulants, depressants, hallucinogenic substances, and marijuana. The Contractor shall strictly enforce this prohibition among its own employees and its subcontractors and their employees while they are on Owner's property. The Contractor and subcontractors shall require all of their employees to undergo drug and alcohol testing if an employee is involved in an accident on the Project site that may have been caused by human error that could be drug- or alcohol-related, or when a supervisor has reasonable suspicion or notice that an employee shows signs of possible intoxication, use, or being under the influence of drugs, alcohol, or controlled substances.

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Employees who violate these prohibitions shall be subject to disciplinary action by their employers up to and including termination, and may be denied access to the Project site. Violation of this provision shall also constitute sufficient grounds for termination of the Contract or any subcontract by the Owner and payment by Contractor of any damages or penalties to the Owner.

39.03 *Equal Employment.* During the performance of this Contract, the Contractor agrees not to discriminate against any employee or applicant for employment because of religion, race, creed, color, sex, sexual orientation, gender identity or gender expression, national origin, disability, age or other protected status. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their religion, race, creed, color, sex, sexual orientation, gender identity or gender expression, national origin, disability, age or other legally protected status. Such action shall include, but not be limited to, employment, promotion, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. The Contractor shall state, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, that all qualified applicants will receive consideration for employment without regard to religion, race, creed, color, sex, sexual orientation, gender identity or gender expression, national origin, disability, age or other legally protected status.

39.04 *Responsibility for Employees.* The Contractor shall be responsible to the Owner for the acts and omissions of all its agents and employees. The Contractor shall also be responsible for the acts and omissions of all its subcontractors and their agents and employees, and all other persons acting on behalf of the Contractor or subcontractors as set forth herein.

39.05 *Removal of Employee*. Removal of a specific person(s) from a project as a result of any condition mentioned above will not relieve the Contractor from timely performance of work completion and will not be considered grounds for a request for additional funds or time extension to complete the Project

GC 40.00 CLEANING UP

40.01 *Contractor's Responsibilities.* The Contractor shall at all times keep the Project site free from accumulations of waste material and rubbish caused by its employees or Work, and shall remove all rubbish as often as it deems necessary or as directed by the Owner or the Architect. Upon completion of the Work, the Contractor shall remove all its rubbish, tools, scaffolding, and surplus materials from and about the Project site, and shall wash all glazing and window frames inside and outside where work was performed removing all stains, paint, etc., from same. Care shall be taken not to scratch the glazing in this clean up.

40.02 *Standards.* All floors and wall coverings shall be left thoroughly clean and finished; all walls and ledges shall be dusted; all plumbing fixtures shall be cleaned; all hardware shall be free of all labels, paint, stains, dust, dirt, and the like; all marks, stains, fingerprints, oil, and dirt shall be removed from painted, decorated, or natural finish Work and the Project building(s) shall be ready for occupancy except for being further equipped by the Owner. In case of dispute, the Owner may perform such cleaningup

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as may be required and charge the cost to the Contractor.

GC 41.00 USE OF PREMISES

The Contractor shall confine its equipment, the storage of materials, and the operations of its workers to locations indicated by law, ordinances, permits, and the Contract Documents, and shall not unreasonably encumber the Project site with its materials. The Contractor shall not load or permit any part of a structure to be loaded with a weight that will endanger the safety of persons or property. During the performance of the Work, the Contractor and his subcontractors and their employees, agents or suppliers, will use such entrance or entrances to the construction site that may be designated from time to time by the Owner. Further, the Contractor and its subcontractors, their employees and agents, shall perform the Work at such times of the day and days of the week as may be designated by the Owner fromtime to time. The Contractor shall enforce all Owner instructions and other regulations regarding signs, advertisements, fires, and smoking and shall not allow the possession or consumption of alcohol or drugson the Project site by its or any subcontractor's workers.

GC 42.00 OCCUPANCY

The Contractor, upon the Owner's written request, shall allow the Owner to occupy portions of the Work and to place and install, subject to reasonable restrictions, as much equipment and furnishings during the progress of the Work as is possible without interfering with the progress of the Work. Such occupancy and the placing or installing of equipment and furnishings shall not in any way evidence the final completion of the Work or signify the Owner's acceptance of the Work, or any part of it. Equipment includes such things as kitchen equipment, etc. Furnishings include such things as lockers, benches, desks, etc. Prior to occupancy, when practicable, the Architect shall make a thorough inspection accompanied by the Contractor's superintendent to note any defects in workmanship or materials that are the responsibility of the Contractor. The provisions of this section shall not be in limitation of the Owner's rights set forth in GC-24 and GC-25.

GC 43.00 TEMPORARY OR TRIAL USAGE

43.01 *Not Evidence of Acceptance.* Temporary or trial usage by the Owner of any mechanical device, machinery, apparatus, equipment, or any Work or material supplied under the Contract before final completion and written acceptance by the Architect shall not be construed as evidence of the Architect's or Owner's acceptance of same or the commencement of any warranty period.

43.02 *Authorization.* The Owner has the privilege of such temporary or trial usage, for such reasonable time as the Owner and the Architect deem proper. The Contractor shall make no claim for damage or injury to or breaking of any parts of such Work that may be caused by weakness or inaccuracy of structural parts or by defective material or workmanship. If the Contractor so elects, it may, without cost to the Owner, make such trial usage. However, trials shall only be conducted with the Architect's prior approval and under the Architect's observation.

GC 44.00 TESTING OF BUILDING SYSTEMS

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44.01 *Testing Plan.* The Contractor shall submit a written plan prior to completion and acceptance, consistent with the Contract Documents and applicable codes, for the testing and training of owner's maintenance staff of all building systems. All testing shall be of the complete system, before covering, or of individually separable larger portions of the system and shall be performed in the presence of the appropriate consultant and representative of the Owner. A written report shall be filed in the Owner's office Facilities and Construction, recording each test, and signed by such consultant. All owner training shall be videotaped, a copy of which shall accompany the O&M manuals presented at the job completion.

44.02 *Contractor's Responsibility.* When heating, air conditioning, ventilation, exhaust, or items of electrical or other equipment are installed, it shall be the responsibility of the Contractor installing such equipment to operate it for a sufficient period of time as required by the Architect for proper testingof the equipment and instructing the Owner's operating personnel. All items of equipment, testing meters, testing instruments, and incidentals required for proper testing and for instructing the Owner's operating personnel shall be provided by the Contractor responsible for providing and installing the equipment.

GC 45.00 LIQUIDATED DAMAGES FOR DELAY IN COMPLETION

It is understood and agreed that completion of the entire Project within the time specified in the Construction Agreement is a matter of vital necessity to the Owner, that the Owner will suffer substantial damages if the entire Project is not completed within the specified time, and that it would not be possible to accurately determine the amount of such damages. In view of these facts, the Contractor agrees to pay the Owner liquidated damages in the sum set forth in the Construction Agreement for each calendar day, if any, which elapses between the date stated in the Construction Agreement, as extended by any extensions of time under the provisions of these General Conditions, and the date of final completion when the entire Project is finally accepted within the meaning of the acceptance and final payment provision of these General Conditions. If the Contractor fails to pay such liquidated damages promptly upon demand therefor, the surety on the Contractor's performance bond shall pay such damages. Also, the Owner may withhold all or any part of such liquidated damages from any payment due the Contractor. No changes in the Work shall extend the time for completion or the contract schedule unless set forth in a properly approved Change Order.

GC 46.00 ACCEPTANCE AND FINAL PAYMENT

46.01 *Final Inspection.* Within a reasonable time after final completion of the Work and before final acceptance thereof, a final inspection shall be made by the Architect, accompanied by the Owner, to determine whether the Work has been completed in accordance with the Contract Documents. A written report of inspection and detailed punch list, certified as to contents and date of inspection, shall be completed by the Owner and the Architect and delivered or mailed to the Contractor.

46.02 *Acceptance.* All prior requests for payment shall be subject to correction in the final request for payment. When all Work, including the punch list, has been certified by the Architect as finally and satisfactorily completed, and approved by the Owner's Board of Education, it shall be deemed accepted as of the date of the issuance of the Owner's letter of acceptance.

46.03 *Final Settlement.* Upon submission of the final request for payment, the time of final

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settlement for the Work shall be established and shall thereafter be advertised by two (2) publications of notice, the last of which shall appear at least ten (10) days prior to the time of final settlement. Final payment and settlement shall be made at the time of final settlement as advertised, or as soon thereafter as appropriate and practicable, in the judgment of the Owner. The Owner shall not authorize final payment until all items on the final punch list are complete, all operations and maintenance manuals accepted, all Owner training is complete, and all close out documents are filed with the Owner.

46.04 *Unpaid Claims.* Neither the final payment nor any part of any sums withheld shall become due until the Contractor delivers to the Owner verified documentation showing full payment for all labor, materials, supplies, and equipment expended upon or incorporated in the Work under the Contract. If any unpaid claim for such labor, materials, supplies, or equipment is filed with the Owner before payment in full of all sums due the Contractor on the final settlement date, the Owner shall withhold from the Contractor sufficient funds, if available, to provide for the payment of such claim, until the same is paid or withdrawn. Such payment or withdrawal shall be evidenced by filing with the Owner a receipt for payment in full or an order authorizing withdrawal signed by the claimant or its duly authorized agent or assignee. Such funds shall ordinarily not be withheld longer than ninety (90) days following the date fixed for final settlement with the Contractor, as set forth in the published notice of final settlement, unless an action at law has been commenced within that time to enforce such unpaid claim and a notice of lis pendens has been filed with the Owner. At the expiration of the ninety (90) day period, the Owner shall release to the Contractor all funds that are not the subject of such action at law. Notwithstanding the provisions in this section, in the event the Colorado statutory procedure as set forth herein is amended during the term of the Construction Agreement, such amended procedure shall be substituted accordingly.

46.05 *Unsatisfied Claims.* If any claim for such labor, materials, supplies, or equipment remains unsatisfied after all payments are made by the Owner to the Contractor, the Contractor shall refund to the Owner all sums which the latter may for any reason be compelled to pay to satisfy such claim, includingall costs and attorneys' fees incurred by the Owner as a result of the Contractor's default in such respect.

46.06 *No Waiver.* The making and acceptance of final payment shall not constitute a waiver of any claims by the Owner, including, among others, those arising from unpaid claims, from faulty Work that appears before or after final payment, or from any failure to comply with any requirements of the Contract Documents.

GC 47.00 WARRANTIES ON PORTIONS OF THE WORK

The Contractor shall, in case of Work performed or materials or equipment provided for which warranties are required by the Contract Documents, secure the required warranties and deliver copies thereof to the Architect and the Owner at the time that the Work is finally completed. There shall be provided one copy for the Architect and two (2) copies (one electronic and one printed) for the Owner, bound into the operations and maintenance manuals. All such warranties shall commence on the date set forth in the letter of acceptance and shall not in any way reduce the Contractor's responsibilities under the Contract. Notwithstanding the foregoing, the warranty period shall not begin with respect to any item that is not completed on the date set forth in the letter of acceptance until such item is finally completed. Whenever guarantees or warranties are required by the specifications for a longer period than two years, such longer period shall govern. Contractor shall make use of web-based program for reporting of warranty

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issues to the Contractor with weekly status reports given to the Architect and Owner.

GC 48.00 CONTRACTOR'S PROJECT GUARANTEE AFTER COMPLETION

48.01 *Warrant and Guarantee.* The Contractor expressly warrants and guarantees that the Project will be constructed in a first-class, workmanlike manner; that it will be safe, free from structural and workmanship defects and defects in materials; and that the improvements will be suitable and fit for occupancy and for the purpose for which they were intended. Contractor shall, as a condition of acceptance, provide a certification letter that no asbestos containing materials were used in the Project.

48.02 *Unconditional Agreement to Remedy.* Neither the Architect's approval of the final request for payment nor payment of any request for payment or of any sum previously withheld from the Contractor shall relieve the Contractor of responsibility for its warranty and guarantee hereunder or for faulty materials or workmanship or the faulty workmanship of its subcontractors, and, unless otherwise agreed, the Contractor unconditionally agrees to remedy any defects due thereto, and pay for any damages resulting therefrom, which shall appear within a period of two (2) years from the date set forth in the letter of acceptance of its Work.

48.03 *Inspections.* The Owner, the Architect, and the Contractor together shall make at least three (3) complete inspections of the Work after the Work has been accepted by the Architect and the Owner. One such inspection shall be made approximately six (6) months after the acceptance of the Work, another such inspection shall be made approximately twelve (12) months after the acceptance of the Work, and a third such inspection shall be made approximately twenty-three (23) months after the acceptance of the Work. The Architect shall make a written report of these inspections, certified as to contents and date of inspection, and forward these reports electronically to the Owner and the Contractor within seven (7) days after completion of each inspection. The Contractor shall immediately initiate such remedial Work as may be necessary to correct any deficiencies or defective Work shown by this report, and shall promptly complete all such remedial Work in a manner deemed satisfactory to the Owner.

48.04 *Owner's Remedies.* If the Contractor fails to promptly correct all deficiencies and defects shown by the report, the Owner may do so, after giving the Contractor ten (10) days' written notice of its intent to do so. The Owner shall be entitled to collect from the Contractor all costs and expenses incurred in correcting such deficiencies and defects, as well as all damages resulting from such deficiencies and defects. The guarantee and warranties of the Contractor provided for herein are in addition to and not in lieu of any other remedies available to the Owner.

GC 49.00 MISCELLANEOUS KEYS, SWITCHES, ETC.

Except as otherwise specifically required by the technical specifications, at the completion of the Project all loose keys for hose bibs, adjustment keys and wrenches for door closers and panic hardware, keys for electric switches, electrical panels, and all other equipment shall be identified, accounted for and turned over to the Architect for transmittal to the Owner.

GC 50.00 INDEMNIFICATION

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To the fullest extent permitted by law, the Contractor shall indemnify and hold the Owner and the Architect and their directors, agents and employees harmless from and against all liabilities, costs, and expense, including attorneys' fees, arising out of, involving, or in connection with any death, personal injury or property damage, including the Work itself and including the loss of use therefrom, caused in whole or in part by Contractor's acts or omissions or the acts or omissions of Contractor's subcontractors, agents, or employees. This specific indemnification by the Contractor is in addition to and not in lieu of other remedies which may be available to the Owner. This provision shall survive the termination of the Contract.

GC 51.00 LABOR DISPUTES

Notwithstanding any other provision contained elsewhere in the Contract Documents and superseding any contrary term expressed in the Contract Documents, the Contractor agrees that in the event of any picket or other form of labor dispute at the Project site, whether such dispute or picket is in connection with the Contractor, subcontractor, or any other person or entity on the Project site, the Contractor shall continue to perform the Work required under the Contract Documents without interruption or delay. In the event the Contractor fails to continue the performance of the Work without interruption or delay because of such picket or other form of labor dispute, the Owner may terminate the services of the Contractor after giving seventy-two (72) hours' written notice of its intent to do so. The terminated Contractor may then be replaced at the discretion of the Owner and all extra costs involved in doing so shall be payable by the terminated Contractor.

GC 52.00 LIMITATION OF ACTIONS

Any actions against the Contractor, its subcontractors, suppliers, or others providing materials or services for the Project, brought to recover damages for injury to person, damage to property (including loss or damage to property on the Project itself), or defects in materials caused by the design, manufacture, supplying, planning, supervision, inspection, construction, or observation of construction of the Project shall be brought within six (6) years after such claim for relief arises and the nature and extent are fully discovered. In no case shall such an action be brought more than ten (10) years after the date of final completion and acceptance of the Project; provided, however, that in any case where the cause of action arises during the tenth year, such action shall be brought within six (6) years after such cause of action arises and the nature and extent are fully discovered by the Owner.

GC 53.00 PREFERENCE FOR COLORADO LABOR, MATERIALS, AND RESIDENT BIDDERS

53.01 *Colorado Labor.* In compliance with Colorado Revised Statutes §§ 8-17-101 and 8-17-102, Colorado labor shall be employed to perform at least eighty percent (80%) of the Work. Owner, in Owner's sole discretion after consultation with the State of Colorado, shall have the right to waive the eighty percent requirement if, in the Owner's sole discretion, there is reasonable evidence to demonstrate insufficient Colorado labor to perform the Work and if compliance with this Section 53.01 would create an undue burden that would substantially prevent a project from proceeding to completion. Owner shall not impose contractual damages on Contractor for a delay in the Work due to the Owner's decision to exercise this right. The term "Colorado labor" means any person who is a resident of the state of Colorado, at the time of the public works project, without discrimination as to race, color, creed, sex, sexual orientation,

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national origin, ancestry, age, or religion except when sex or age is a bona fide occupational qualification. A resident of the state of Colorado is a person who can provide a valid Colorado driver's license, a valid Colorado state-issued photo identification, or documentation that he or she has resided in Colorado for the last thirty days.

53.02 *Resident Bidders.* In compliance with Colorado Revised Statutes § 24-103-908, preference shall be given to resident bidders against nonresident bidders from a state or foreign country equal to the preference given or required by the state or foreign country in which the nonresident bidder is a resident. The term "resident bidder" means a person, partnership, corporation, or joint venture that is (a) authorized to transact business in Colorado and maintains its principal place of business in Colorado; or (b) authorized to transact business in Colorado, maintains a place of business in Colorado, and has paid Colorado unemployment compensation taxes in at least six (6) of the eight (8) quarters immediately prior to bidding on a construction contract for the Project.

GC 54.00 SALES AND USE TAX

The Contractor shall coordinate with the Owner to ascertain whether a sales or use tax may be collectible on the purchase of building materials, supplies, and equipment used on the Project by the Contractor. Some cities and municipalities will charge a sales or use tax on building materials, supplies, and equipment "picked up" and/or used within that city or municipality by a Contractor. Whenever possible, the Contractor shall have building materials, supplies, and equipment for the Project delivered to the construction site by common carrier, conveyance by the seller, or by mail, to avoid city or municipal sales and use taxes for which refunds will not be made. The Owner is exempt from the payment of any state sales and use taxes for materials, supplies, and equipment used on the Project by the Contractor and subcontractors. For the purpose of exercising such exemption, the Contractor and all its subcontractors shall apply for and obtain a certificate of exemption for the Work from the Colorado Department of Revenue. Copies of such certificates shall be filed with the Owner before any materials are purchased or any Work commenced hereunder. No amounts paid to Contractor pursuant to the Construction Agreement shall include reimbursement for such taxes. The final bill submitted by the Contractor for final payment shall show the net cost of all materials purchased by the Contractor and all subcontractors. At the time of final completion, the Contractor and his subcontractors shall execute affidavits, in duplicate, showing the amount of local municipal sales or use taxes, if any, paid by the Contractor or subcontractors upon materials used on the project, which affidavits shall further state that all such materials have been "built in" to the project, and where books and records and other substantiating evidence of payment of said tax are located and where they may be examined by appropriate governmental authorities, if such examination is required. The Contractor and all subcontractors shall maintain sufficient records to verify the amount of sales and use taxes paid to any local governmental entity. Failure to keep such records, resulting in the inability of the Owner to claim a refund for sales and use taxes for such materials, if allowed, shall render the Contractor or subcontractor liable for the amounts of such tax refund as determined by the Architect's/Consultant's cost estimates of such materials.

GC 55.00 LIENS

It is hereby mutually understood by and between the parties hereto that no contractor, subcontractor, materialman, vendee, laborer, mechanic, or other person, can or will contract for or in any

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other manner have or acquire any lien upon the Project building or Works covered by this Contract, or the land upon which the same is situated.

GC 56.00 OWNER'S INSPECTION OF CONTRACTOR'S RECORDS

The Contractor's records and the records of any of the Contractor's affiliates, subsidiaries or parent companies shall be subject to inspection and audit in connection with the Contract. "Records" shall include, but not be limited to, accounting records (hard copy, as well as computer readable data), written policies and procedures, subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.), original estimates, estimating worksheets, correspondence, Change Order files (including documentation covering negotiated settlements), back charge logs and supporting documentation, general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends, and any other supporting evidence reasonably deemed necessary by the Owner to substantiate charges related to the Contract. All of the foregoing shall be open to inspection and subject to audit and/or reproduction by the Owner or its agent or authorized representative to the extent necessary to adequately permit evaluation and verification of the cost of the Work, the appropriateness of the adjustedguaranteed maximum, the quality of the Work installed, and/or any invoices, Change Orders, payments or claims submitted by the Contractor or any of its payees pursuant to the execution of the Contract.

GC 57.00 CERTIFICATION BY CONTRACTOR REGARDING PREMISES ACCESS

The Contractor certifies to Owner that Contractor will not knowingly employ on Poudre School District premises persons convicted of any felony or misdemeanor crime of unlawful sexual behavior involving children.

GC 58.00 CONTRACTOR SAFETY RESPONSIBILITIES

Poudre School District is dedicated to providing a safe and injury free environment for the students, faculty, District employees, occupants, vendors, visitors, and the general public associated with their properties. This is of the utmost importance to the Owner and shall be a priority of the Contractor and its Subcontractors in the execution of their obligations to the Contract. In addition, the Contractor and its subcontractors shall, at no additional cost to the Owner, comply with the following provisions:

58.01 *Contractor's Obligation to Provide Safety Compliance.* The Contactor will submit a copy of its Safety Program for review by the Owner's Safety Representative. Contractor has the sole responsibility for the adequacy and enforcement of its Safety Program. Contractor's Safety Program shall provide a basis for periodic compliance observation by Owner of Contractor's work areas. The Contractor shall submit to Owner written verification that all subcontractors engaged for services in the executions of the Contract are contractually obligated to comply with all provisions of Contractor's Safety Program. The Owner's Safety Representative is authorized to make written documentation of any safety and health hazards or violations brought to the attention of the Owner and shall request Contractor undertake expeditious corrective measures.

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58.02 *Contractor Safety Representative.* In order to form an integrated team to effectively provide safe services to the Owner, the Contractor shall provide the name and contact information of Contractor's designated Safety Representative. This individual will have the responsibility and authority to ensure the Contractor's implementation, compliance with, and enforcement of, the Contractor's Safety Program and all applicable federal, state and local safety and health standards, rules and regulations. Owner reserves the right to require the Contractor to replace its designated Safety Representative if Owner determines the individual is not qualified, is ineffective or is not fulfilling all applicable safety and health responsibilities. Contractor shall conduct bi-monthly Toolbox talks to supplement the OSHA training efforts of their company or organization, and to keep safety front and center in their workers' minds. These are designed to heighten employee awareness of workplace hazards and supplement, not replace, OSHA regulations. These shall be bi-lingual if necessary.

58.03 *Contractors Obligation to Report Accidents and Incidents to Owner.* Contractor shall notify Owner of all incidents or injuries occurring on Owner's property and/or related to the Project. This notification obligation includes any injury or loss to District students, faculty, administrative personnel, visitors, vendors, Contractor's or subcontractor's workers, the general public and/or premises or property. Contractor and its subcontractors shall notify the Owner immediately of the incident or injury and shall investigate, compile and provide to Owner all relevant information within 24 (twenty-four) hours after occurrence on District-provided forms, if applicable. Contractor shall develop corrective actions for incident and injury prevention and timely report same to the District. Contractor agrees to perform Post Accident/Incident drug and alcohol testing. The expense of testing shall be borne by the Contractor at no additional cost to the Owner. The results of said testing will be provided to the Owner as part of the incident/injury report.

58.04 *Owner's Observation of Safety, Health and Environmental Compliance.* Owner will have the right to observe the Project and Contractor's work area to monitor compliance with Contractor's own Safety Program. Owner's Safety Representative will make recommendations as to the practices observed and provide a written report with concerns and/or documenting compliance issues observed. At any time a condition of threat to life and limb is observed with respect to any individual, including students, staff, District employees, occupants, vendors, visitors, the general public and/or workers, or to District property, Owner has the authority to immediately issue a Stop Work Order. Any stop work ordered by the Owner for such a safety reason must be effective immediately upon issuance. All associated costs and corrective action shall be the responsibility of Contractor. Work schedules will not be extended to accommodate the period of any such Stop Work Order, including any time required to implement corrective work or abate unsafe conditions. Any request or notice regarding, or visit of, the Project by an OSHA Compliance Officer must be immediately reported to the Owner's Safety Representative. Contractor must advise the Compliance Officer that the Owner is not the general contractor. Contractor must promptly provide the Compliance Officer with any and all information requested.

58.05 *Contractor's Prohibited Articles and Actions on Owner's Property.* The Contractor and its Subcontractors shall comply with the following District prohibitions:

a. Firearms, explosives, fireworks, shall not be allowed on Owner's Property: Pursuant to the Gun-Free School Zones Act, (18 U.S.C. §§ 921(a) (25, 26), 922(q) (1), it is unlawful for anyone to knowingly possess firearms in school zones.

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b. Harassment Policy: Owner prohibits verbal and/or sexual harassment of students, faculty, personnel and general public on its property. Owner reserves the right to ban offenders of this policy from all District premises.

c. Sex Offenders: Pursuant to Colorado Revised Statute 16-22-110, Public's Right to Know of Registered Sex Offenders, Owner reserves the right to investigate the status of any Contractor and/or subcontractor personnel with respect to Colorado Sex Offender Registry.

Contractor is obligated to notify all workers, vendors and employees associated with their work on the Project of the above policies and prohibitions. Contractor must conduct a Site Specific Orientation for such persons, as more fully set forth in the District's Construction Safety Manual. Any worker, vendor or employee that is engaged in an illegal act, refuses to submit to a search of property or person; or refuses, delays, is uncooperative with, or alters a urine and/or blood analysis shall be immediately removed from District property and the Project and shall prohibited from re-entering District premises.

58.06 *Project Site Conditions.*

a. Housekeeping: Contractor shall maintain a level of organization and cleanliness of the Project site that is conducive to the safety, health and well-being of all persons.

b. Security: Contractor shall secure materials, equipment, tools and access to the Project site.

c. Indoor Air Quality: Contractor agrees to make every reasonable effort to control, reduce,or abate nuisance odors, dust or fumes from products, equipment or site work to ensurethat minimum air quality standards are achieved and maintained.

d. Storm Water and Waste Water: Contractor agrees to comply with all applicable Federal,State and local codes, laws and regulations concerning permits, controls and best practices for SWPPP controls and compliance. Contractor shall apply and pay for and adhere to Colorado Discharge Permit System.

58.07 *Site Specific Orientation and Safety Plans in Place.* Contractor agrees to provide to all Contractors and subcontractors Project workers a mandatory site-specific orientation ("Site Specific Orientation") that covers the following information and practices:

a. Information as to the requirements of the District's Construction Safety Manual;

b. Information as to the requirements of the Contractor's Safety Program and policies;

c. Information as to the requirements of the Owner's Contract and all Prohibited Articles and Actions;

d. Specific guidelines to follow in the event of an emergency;

e. Communication of expectations concerning safety, safe practices and site-specific

SAMPLE

logistics; and

f. Security mechanism(s) to ensure that only authorized personnel who have participated in a site-specific safety orientation are permitted to access the Project site Contractor shall issue an Owner-approved Hard Hat self-adhesive label with identifying number that evidences a person's participation in the Site-Specific Orientation. Only those persons with the approved Hard Hat label shall be authorized to access the Project premises. Contractor shall maintain a current and accurate record of each person's issued number by name, date of issuance, record of attendance at the Project site and, as applicable, date of deactivation. Owner shall provide the labels at no cost to the Contractor for the term of the Contract.

58.08 *Record Keeping.* Contractor agrees to produce, maintain, and store on the Project site, all safety-related reports and records. Such documentation shall be produced by Contractor to Owner upon request. All such records shall be made accessible to governmental authorities upon request.

GC 59.00 CONTRACTOR ASBESTOS MANAGEMENT AND LEAD PAINT RESPONSIBILITIES

Contractor shall adhere to all AHERA, EPA, and Colorado Department of Public Health and Environment regulations regarding asbestos treatment and management before and during any construction, renovation or maintenance project. To that end, Contractor shall review the asbestos management plan before the work begins. Any activity that could potentially disturb asbestos containing building materials must be brought to the attention of Owner's Environmental Services Department prior to the start of work, and if the scope of work changes during the course of the project. Owner's Environmental Services will identify all areas of concern and facilitate any necessary abatement in order to help make all projects successful. Contractor shall adhere to all federal and state regulations regarding the treatment and management of lead based paint before, during, and after any construction, renovation, or maintenance project. To that end, Contractor shall review the lead based paint (LBP) records before work begins, and complete additional testing for LBP as necessary. Any activity that potentially disturbs LBP must be brought to the attention of the Owner's Facilities and Construction Department prior to the start of work. All records of supplemental inspection and testing and any change in the scope of work will be provided to Owner.

GC 60.00 ARCHITECT'S STATUS AND INSPECTIONS

60.01 *Authority.* The Architect shall be the Owner's representative during construction and until the expiration of the warranty period. The Architect shall have authority to act on behalf of the Owner only to the extent expressly provided in the Contract Documents or otherwise in writing. The Architect, with written approval of the Owner, shall have authority to stop the Work whenever such stoppage may be reasonably necessary in its opinion to ensure the proper execution of the Contract.

60.02 *Decisions.* The Architect shall be, in the first instance, the interpreter of the conditions of the Contract and the judge of its performance, although the Owner shall retain the final authority in decisions regarding such matters. The Architect shall, within a reasonable time, make recommendations on all claims of the Contractor and on all other matters relating to the execution and progress of the Work.All such decisions shall be subject to review by the Owner. The Architect's decisions in matters relating to

SAMPLE

artistic effect, after consultation with the Owner, shall be final, if within the terms of the Contract Documents.

60.03 *Inspections.* The Contractor shall provide timely notice to the Architect when inspections are desirable or required by the terms of the Contract Documents or the Architect's Agreement with the Owner. Such notice shall be given in order to allow for the following reviews and inspections, among others:

a. Reviewing and approving shop drawings, samples and other submissions for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents.

b. Inspection of load-bearing surfaces or excavations before footings are poured.

c. Inspection of reinforcing steel after installation and before concrete is poured.

d. Inspection of structural and architectural concrete before, during, and after pouring.

e. Evaluation of all laboratory reports.

f. Inspection of structural steel after erection and prior to its being covered or enclosed.

g. Inspection of mechanical work following its installation and prior to its being covered or enclosed.

h. Inspecting of electrical work following its installation and prior to its being covered or enclosed.

i. Inspection of exposed surfaces for compliance with the Contract Documents.

GC 61.00 ORAL STATEMENTS

It is understood and agreed that the written terms and provisions of the Contract Documents shall supersede all oral statements of the Owner, Architect, Contractor and their representatives, and that oral statements shall not be effective or be construed as being a part of this Contract.

GC 62.00 PROJECT SIGN

Owner shall provide Project signs which Contractor shall install at Owner's direction at the Project site. Except as approved by Owner, no advertising or signage shall be permitted on the Project site.

GC 63.00 HISTORICAL DATA

SAMPLE

In addition to the warranties, guarantees, operating instructions, etc., elsewhere specified in the Contract Documents, at the conclusion of the Work and before final payment is made, the Contractor shall furnish a listing of the principal's names, addresses, and telephone numbers of all subcontractors and suppliers that furnished labor and/or materials on the Project, with identification of the services and materials rendered by each. There shall be provided one (1) copy for the Architect and three (3) copies and one (1) electronic copy for the Owner. All copies shall be delivered to the Architect for review and distribution.

GC 64.00 ASSIGNMENT

The Contractor shall not assign its interests herein in whole or in part without the written consentof the Owner; nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner.

GC 65.00 TIME OF THE ESSENCE

All time limits stated in the Contract Documents are of the essence of the Contract.

GC 66.00 DISPUTES

The Contract shall be governed by and construed in accordance with the laws of the State of Colorado. Venue for any dispute concerning the Contract or the Project shall be exclusively in the federal court located in Colorado or the state court located in Larimer County, Colorado.

GC 67.00 SURVIVAL

The provisions of the Contract relating to indemnification from Contractor to Owner shall survive any termination or expiration of the Contract. Additionally, any provisions of the Contract which require performance subsequent to the termination or expiration of the Contract shall also survive such termination or expiration.

SAMPLE

DUNN ELEMENTARY SCHOOL

HVAC UPGRADES | PHASE 2

501 SOUTH WASHINGTON AVENUE

FORT COLLINS | COLORADO | 80521

OWNER:

POUDRE SCHOOL DISTRICT
2445 LAPORTE AVENUE
FORT COLLINS | COLORADO | 80521
PHONE: 970|490|3594
EMAIL: bschlicting@psdschools.org

Brian Schlicting
Project Manager II

ARCHITECT:

DIGITAL ARCHITECTURAL MODELING | LLC
125 SOUTH HOWES STREET | SUITE 500
FORT COLLINS | COLORADO | 80521
PHONE: 970|234|8569
EMAIL: sean@damodeling.com

Sean Christian | NCARB
Architect

STRUCTURAL:

JVA | INC
213 LINDEN STREET|SUITE 200
FORT COLLINS | COLORADO | 80524
PHONE: 303|444|1951
EMAIL: scarpenter@jvajva.com

Steve Carpenter | PE
Structural Engineer

MECHANICAL:

IMEG CORP
7600 EAST ORCHARD ROAD | SUITE 250-S
GREENWOOD VILLAGE | COLORADO | 80111
PHONE: 303|796|6019
EMAIL: brian.r.eagleton@imegcorp.com

Brian Eagleton | P.E.
Senior Mechanical Engineer

ELECTRICAL:

IMEG CORP
7600 EAST ORCHARD ROAD | SUITE 250-S
GREENWOOD VILLAGE | COLORADO | 80111
PHONE: 303|796|6019
EMAIL: marshall.h.moore@imegcorp.com

Marshall Moore | PE | LC
Senior Electrical Engineer

FIRE:

TLH FIRE
6901 SOUTH PIERCE STREET
LITTLETON | COLORADO | 80128
PHONE: 303|517|9558
EMAIL: tami@holleyfpe.com

Tami Holley | PE
Fire Protection Engineer

DRAWING INDEX:

A0.0	TITLE SHEET, KEY PLAN, VICINITY MAP, PROJECT SUMMARY AND BASIC CODE INFORMATION
AD2.0	AREA 1 AND 2 - CEILING DEMOLITION PLAN
AD3.0	AREA 1 AND 2 - ROOF DEMOLITION PLAN
A1.0	AREA 1 - DEMOLITION AND NEW FLOOR PLANS, DETAILS AND STRUCTURAL PLANS
A2.0	AREA 1 AND 2 - NEW CEILING PLANS
A3.0	AREA 1 AND 2 - NEW ROOF PLANS
A4.0	ROOFING DETAILS
M0	MECHANICAL COVER SHEET
MD1.1	AREA 1 - MECHANICAL DEMOLITION PLAN
MD1.2	AREA 2 - MECHANICAL DEMOLITION PLAN
MD3.1	AREA 1 - MECHANICAL ROOF DEMOLITION PLAN
MD3.2	AREA 2 - MECHANICAL ROOF DEMOLITION PLAN
M1.1	AREA 1 - MECHANICAL NEW PLAN
M1.2	AREA 2 - MECHANICAL NEW PLAN
M2.1	AREA 1 - NEW PIPING PLAN
M2.2	AREA 2 - NEW PIPING PLAN
M3.1	AREA 1 - MECHANICAL NEW ROOF PLAN
M3.2	AREA 2 - MECHANICAL NEW ROOF PLAN
M4.0	MECHANICAL DETAILS, SCHEDULES AND CONTROLS
M4.1	MECHANICAL DETAILS, SCHEDULES AND CONTROLS
M4.2	MECHANICAL DETAILS, SCHEDULES AND CONTROLS
M4.3	MECHANICAL DETAILS, SCHEDULES AND CONTROLS
M4.4	MECHANICAL DETAILS, SCHEDULES AND CONTROLS
M5.0	MECHANICAL COM-CHECK
E0	ELECTRICAL COVER SHEET
ED1.1	AREA 1 - ELECTRICAL DEMOLITION PLAN
ED3.1	AREA 1 - ELECTRICAL ROOF DEMOLITION PLAN
ED3.2	AREA 2 - ELECTRICAL ROOF DEMOLITION PLAN
E1.1	AREA 1 - LIGHTING NEW PLAN
E1.2	AREA 2 - LIGHTING NEW PLAN
E2.1	AREA 1 - POWER AND SYSTEMS NEW PLAN
E2.2	AREA 2 - POWER AND SYSTEMS NEW PLAN
E3.1	AREA 1 - ELECTRICAL NEW ROOF PLAN
E3.2	AREA 2 - ELECTRICAL NEW ROOF PLAN
E4.1	ELECTRICAL DETAILS, SCHEDULES AND ONE-LINE
FA0.0	FIRE ALARM COVER PAGE
FAD2.0	FLOOR PLAN - DEMOLITION
FA2.0	FLOOR PLAN - FIRE ALARM
FA3.0	DESIGN CRITERIA AND RISER
FA4.0	GRAPHIC MAP
FA5.0	TECHNICAL GUIDELINES
FA5.1	TECHNICAL GUIDELINES

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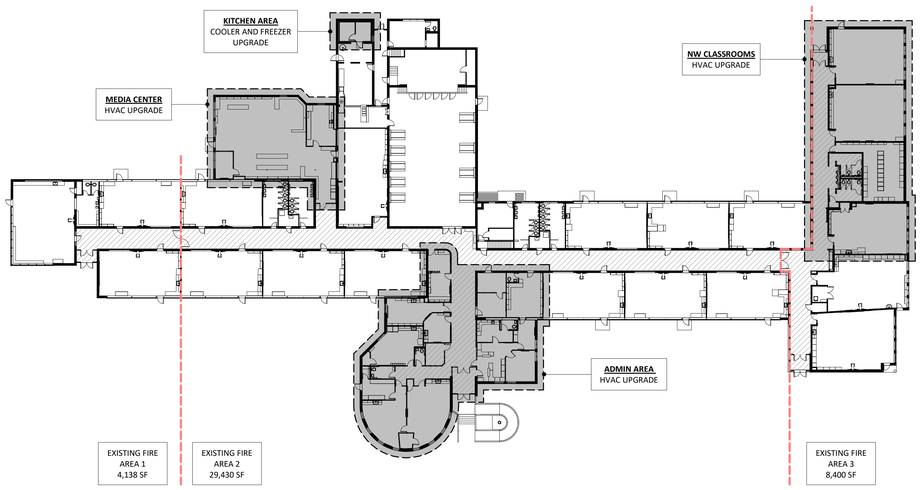

PROJECT SUMMARY:

PROJECT SCOPE OF WORK IS LIMITED TO HVAC UPGRADES AND FREEZER/COOLER UPGRADE ONLY PER ALTERATION LEVEL 2 - IEBC CHAPTER 6, 602.1 AS DESCRIBED BELOW:

- WORK IS LIMITED TO THE REMOVAL AND REPLACEMENT OF EXISTING HVAC EQUIPMENT
- FREEZER/COOLER UPGRADE SHALL BE THE REMOVAL OF EXISTING FREE STANDING UNITS TO NEW SELF ENCLOSED FREEZER/COOLER UNIT IN THE SAME LOCATION
- THERE SHALL BE NO CHANGE TO EXISTING EGRESS PATHS AND/OR LOCATIONS
- LIGHTING UPGRADES TO AREAS OF WORK ONLY

BASIC CODE INFORMATION:

CODES USED:	2021 IBC - INTERNATIONAL BUILDING CODE 2021 IEBC - INTERNATIONAL EXISTING BUILDING CODE 2021 IECC - INTERNATIONAL ENERGY CONSERVATION CODE 2021 IFC - INTERNATIONAL FIRE CODE 2021 IMC - INTERNATIONAL MECHANICAL CODE 2023 NEC - NATIONAL ENERGY CODE 2021 NFPA 70 2018 COLORADO PLUMBING CODE 2018 COLORADO FUEL GAS CODE 2017 ICC-A117.1 - ACCESSIBILITY CODE
BUILDING OWNER:	POUDRE SCHOOL DISTRICT
BUILDING OCCUPANCY:	E
BUILDING AREA:	41,970 SF
EXISTING CONSTRUCTION TYPE:	II-B - PER 2021 IBC TABLE 601
NUMBER OF STORIES:	1
BUILDING HEIGHT:	VARIES
FIRE RATED ASSEMBLIES:	EXISTING AREA SEPARATION TO REMAIN
FIRE SPRINKLERS:	EXISTING NON-SPRINKLER
FIRE ALARM:	EXISTING HORN AND STROBE NOTIFICATION
AREA OF WORK:	ADMIN, MEDIA AND NW CLASSROOMS - HVAC UPGRADES KITCHEN AREA - FREEZER/COOLER UPGRADE
ALTERATION LEVEL:	LEVEL 2 - PER 2021 IEBC CHAPTER 6, 603.1 AND CHAPTER 3, 301.3.2 AREA OF WORK COMPLIANCE METHOD: CHAPTER 7 AND 8 ALTERATIONS - LEVEL 1 AND 2

KEY PLAN, PROJECT SUMMARY AND BASIC CODE INFORMATION:

NOT TO SCALE

N

DIGITAL ARCHITECTURAL MODELING
970|234|8569 WWW.DAMODELING.COM

DUNN ELEMENTARY | HVAC UPGRADES | PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS | COLORADO | 80521
KEY PLAN, VICINITY MAP AND CODE INFORMATION

ISSUE FOR PERMIT AND BIDDING

PROJECT	012.23
DATE	11.13.23
DRAWN	DAM

NO.	DESCRIPTION	DATE

REVISIONS

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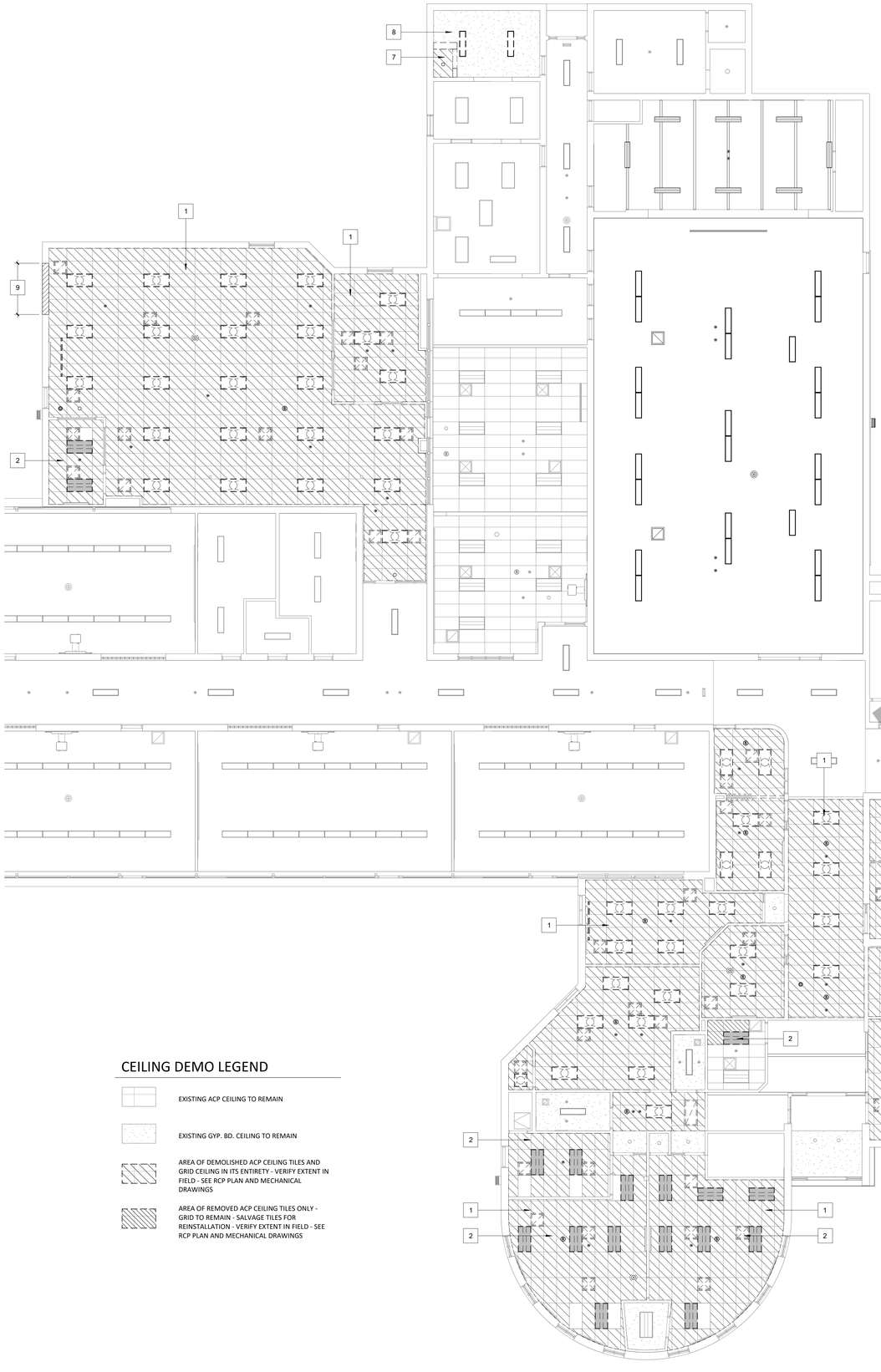
A0.0



CEILING DEMO LEGEND

- EXISTING ACP CEILING TO REMAIN
- EXISTING GYP. BD. CEILING TO REMAIN
- AREA OF DEMOLISHED ACP CEILING TILES AND GRID CEILING IN ITS ENTIRETY - VERIFY EXTENT IN FIELD - SEE RCP PLAN AND MECHANICAL DRAWINGS
- AREA OF REMOVED ACP CEILING TILES ONLY - GRID TO REMAIN - SALVAGE TILES FOR REINSTALLATION - VERIFY EXTENT IN FIELD - SEE RCP PLAN AND MECHANICAL DRAWINGS

1 AREA 1 - CEILING DEMOLITION PLAN
1/8" = 1'-0"

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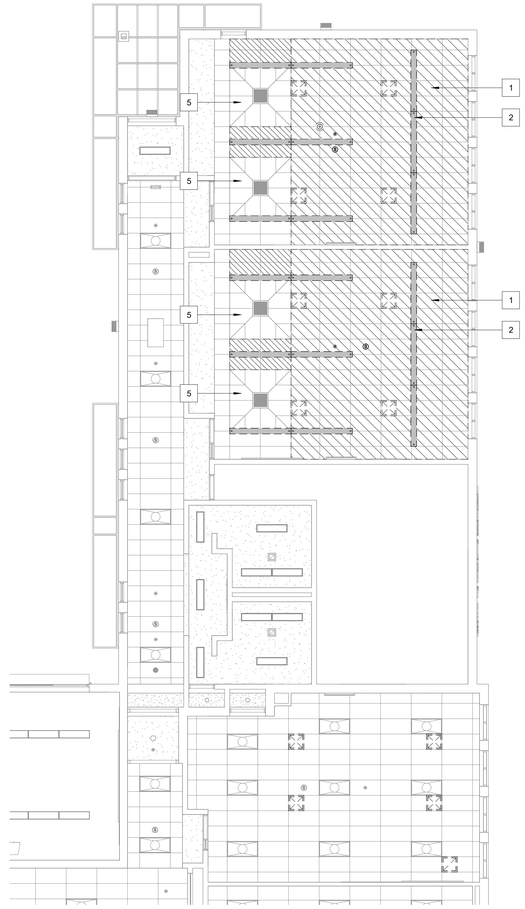
CEILING EQUIPMENT KEY AND RESPONSIBILITY MATRIX

ALL WORK RELATED TO ACTIVITY INDICATED IN THIS RESPONSIBILITY MATRIX IS THE RESPONSIBILITY OF THE CONTRACTOR AND SHOULD BE INCLUDED IN THE BASE BID UNLESS NOTED OTHERWISE. UNIT PRICING INCLUDES ONLY ADDITIONAL SCOPE THAT IS PREFORMED BEYOND ANTICIPATED SCOPE INDICATED IN THE DRAWINGS

EQUIPMENT ITEM	LOCATION IN ROOM	WORK SCOPE	RESPONSIBLE PARTY
TELEVISIONS	WALL MOUNTED-REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	REMOVE TELEVISIONS AFFECTED BY WORK SCOPE IN AREA. GENERAL CONTRACTOR TO REMOVE, STORE, PROTECT, AND REINSTALL IN ORIGINAL LOCATION. G.C. TO VERIFY OPERATION FOLLOWING REINSTALLATION.	GENERAL CONTRACTOR CONTRACT WITH INTERFACE
SMARTBOARDS AND SMARTBOARD PROJECTORS	SMART BOARDS: WALL MOUNTED-REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS. PROJECTORS: CEILING/WALL MOUNTED-REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	REMOVE SMART BOARDS AND SMART BOARD PROJECTORS AFFECTED BY WORK SCOPE IN AREA. GENERAL CONTRACTOR TO SUBCONTRACT WITH H&H FOR REMOVAL AND REINSTALLATION. GC IS RESPONSIBLE FOR STORAGE, CLEANING, AND VERIFY OPERATION FOLLOWING REINSTALLATION.	GENERAL CONTRACTOR CONTRACT WITH INTERFACE
WIRELESS ACCESS POINTS	CEILING MOUNTED - REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	OWNER WILL REMOVE AND REINSTALL. GC RESPONSIBLE TO MAINTAIN EXISTING CABLING IN WORKING CONDITION.	PSD
SECURITY CAMERAS	REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	OWNER WILL REMOVE AND REINSTALL. GC RESPONSIBLE TO MAINTAIN EXISTING CACC/TV CABLING IN WORKING CONDITION.	PSD
INTERCOM SPEAKERS	CEILINGS -REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	PRIOR TO ANY INTERCOM SYSTEM WORK, THE GENERAL CONTRACTOR AND APPROVED SUBCONTRACTOR WILL PERFORM A PRE-DEMOLITION TEST OF THE INTERCOM SYSTEM IN IT'S ENTIRETY AND DOCUMENT ALL DEFICIENCIES PRIOR TO BEGINNING ANY WORK ON THE SYSTEM. PROVIDE DOCUMENTATION OF THIS TEST TO THE OWNER. REMOVE INTERCOM SPEAKERS AFFECTED BY WORK SCOPE IN AREA. GENERAL CONTRACTOR TO SUBCONTRACT WITH QUALIFIED AND APPROVED SUBCONTRACTOR (BEACON COMMUNICATIONS OR EQUAL) FOR REMOVAL AND REINSTALLATION. GC AND APPROVED SUBCONTRACTOR IS RESPONSIBLE FOR STORAGE, CLEANING, AND REINSTALLATION OF ALL INTERCOM COMPONENTS. FOLLOWING REINSTALLATION, THE GENERAL CONTRACTOR AND APPROVED SUBCONTRACTOR WILL PERFORM A POST INSTALLATION TEST OF THE INTERCOM SYSTEM IN IT'S ENTIRETY AND DOCUMENT THAT THE INTERCOM SYSTEM IS WORKING IN IT'S ENTIRETY. PROVIDE DOCUMENTATION OF THIS TEST TO THE OWNER GC SHALL ALLOW 24-HOUR NOTICE FOR ALL PRE AND POST TESTING OF INTERCOM WORK TO ALLOW PSD IT MAINTENANCE ATTENDANCE	GENERAL CONTRACTOR CONTRACT WITH INTERFACE
LIGHTING FIXTURES	CEILING MOUNTED - REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	REMOVE LIGHTING FIXTURES AFFECTED BY WORK SCOPE IN AREA. GENERAL CONTRACTOR TO SUBCONTRACT WITH QUALIFIED AND APPROVED SUBCONTRACTOR FOR REMOVAL AND REINSTALLATION. GC IS RESPONSIBLE FOR STORAGE, CLEANING, AND VERIFY OPERATION FOLLOWING REINSTALLATION.	GENERAL CONTRACTOR AND APPROVED QUALIFIED SUBCONTRACTOR



2 AREA 2 - CEILING DEMOLITION PLAN
1/8" = 1'-0"

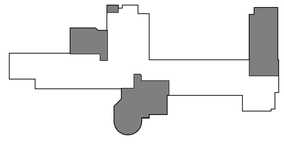
N

GENERAL NOTES:

A. CEILING REMOVAL AND REPLACEMENT IS SCHEDULED TO ACCOMMODATE THE REMOVAL OF EXISTING AND INSTALLATION OF NEW MECHANICAL SYSTEMS AS A PART OF THIS PROJECT - SEE MECHANICAL DRAWINGS
B. THE CONTRACTOR SHALL FULLY UNDERSTAND THE SCOPE OF THE MECHANICAL/ELECTRICAL WORK SCHEDULED FOR EACH AREA AND PERFORM MINIMAL DEMOLITION TO REMOVE EXISTING MECHANICAL SYSTEMS AND INSTALL NEW UNLESS NOTED OTHERWISE
C. CONTRACTOR SHALL FULLY COORDINATE WITH MECHANICAL/ELECTRICAL SUB-CONTRACTORS PRIOR TO PERFORMING WORK
D. SALVAGE ALL REMOVED CEILING TILES FOR REINSTALLATION IN SAME OR OTHER AREAS AFTER MEP WORK - RE-USE ONLY IF IN GOOD SHAPE - OTHERWISE PROVIDE NEW
E. REMOVE EXISTING LIGHTING FIXTURES AS REQUIRED IN AREAS OF CEILING DEMOLITION PER CEILING EQUIPMENT RESPONSIBILITY MATRIX

DEMOLITION NOTES:

1. REMOVE EXISTING CEILING AND CEILING GRID PER CEILING DEMO LEGEND - TYPICAL UNLESS NOTED OTHERWISE
2. REMOVE AND SALVAGE EXISTING NEWER LED LIGHTING FIXTURES FOR REINSTALLATION THIS AREA - SEE CEILING DEMO LEGEND
3. REMOVE EXISTING ROOF TOP MECHANICAL UNIT AND MECHANICAL CURB - SEE MECHANICAL DRAWINGS
4. REMOVE PORTION OF EXISTING ROOFING AS REQUIRED TO ACCOMMODATE STRUCTURAL REINFORCEMENT AND NEW ROOF TOP MECHANICAL UNIT AND CURB - DIMENSIONS SHOWN FOR BIDDING AND REFERENCE - COORDINATE EXACT EXTENT OF DEMOLITION IN FIELD WITH MECHANICAL DRAWINGS
5. COORDINATE DEMOLITION WITH EXISTING SLOPED ACP CEILING, GRID AND SOLA TUBE TO REMAIN
6. COORDINATE NEW ROOF PENETRATION LOCATION WITH NEW FREEZER/COOLER WORK BELOW - SEE NEW FLOOR AND ROOF PLANS
7. REMOVE EXISTING GYP. BD. CEILING IN ENTIRETY AT EXISTING CLOSET - SEE NEW FLOOR AND CEILING PLANS
8. REMOVE EXISTING LIGHTING FIXTURES THIS AREA FOR INSTALLATION OF NEW FREEZER/COOLER - SEE NEW FLOOR PLAN
9. REMOVE EXISTING EXTERIOR LOUVER - PREP OPENING FOR INSTALLATION OF INSULATED PANEL - SEE NEW CEILING PLAN AND DETAIL



KEY PLAN

NOT TO SCALE

DIGITAL ARCHITECTURAL MODELING
970.234.8569 WWW.DAMODELING.COM

DUNN ELEMENTARY | HVAC UPGRADES | PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS | COLORADO | 80521
AREA 1 AND 2 - CEILING DEMOLITION PLAN

ISSUE FOR PERMIT AND BIDDING

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DATE	11.13.23
DRAWN	DAM

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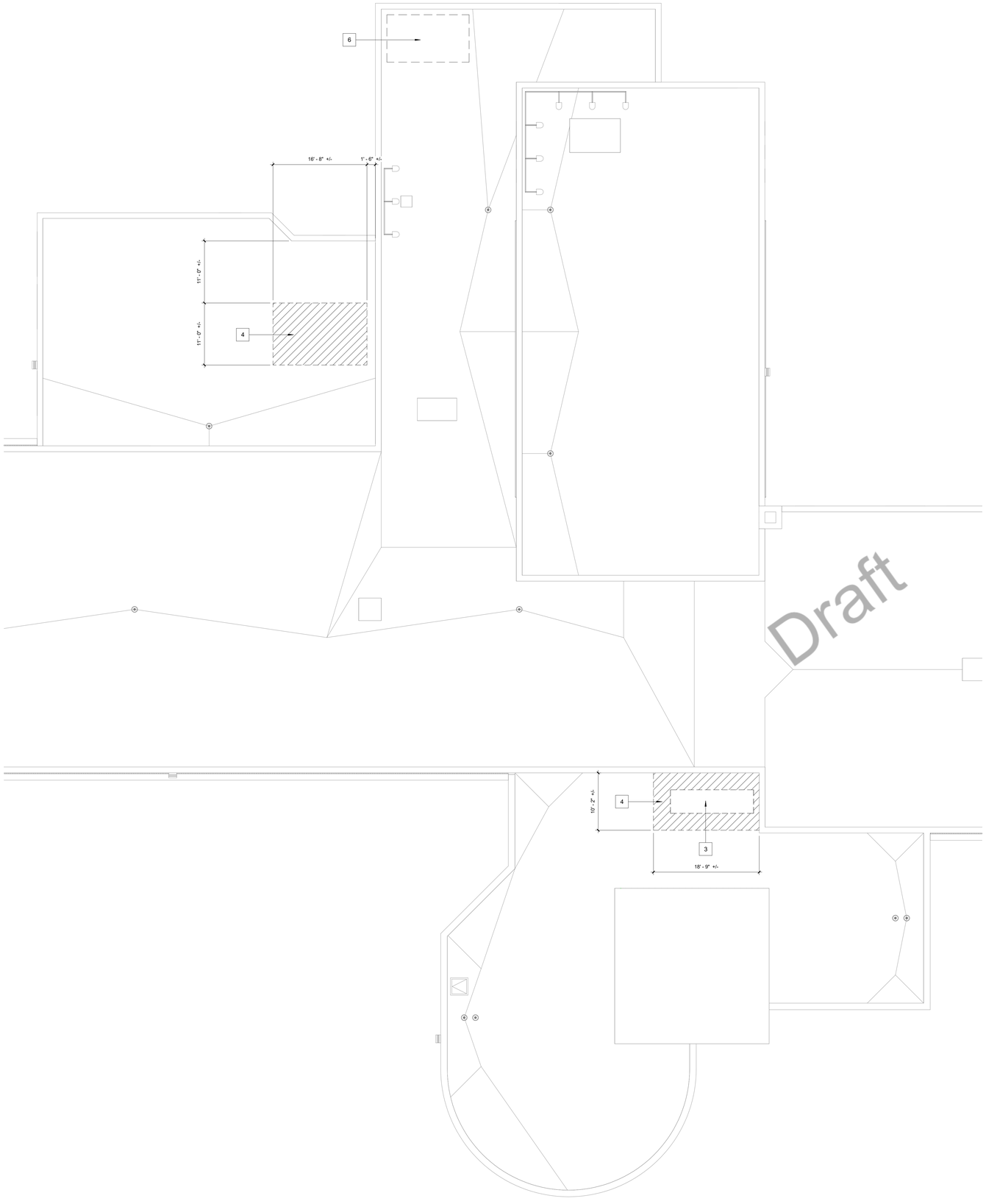
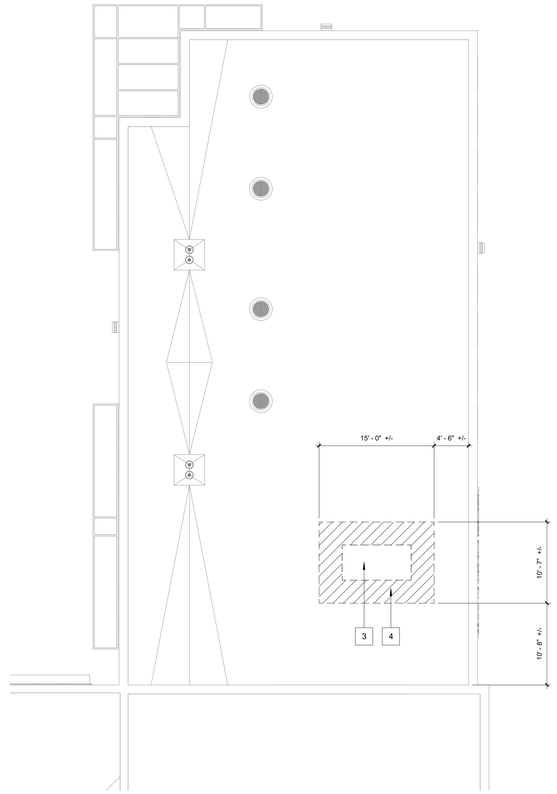


1 AREA 1 - ROOF DEMOLITION PLAN
1/8" = 1'-0"



2 AREA 2 - ROOF DEMOLITION PLAN
1/8" = 1'-0"

GENERAL NOTES:

A. CEILING REMOVAL AND REPLACEMENT IS SCHEDULED TO ACCOMMODATE THE REMOVAL OF EXISTING AND INSTALLATION OF NEW MECHANICAL SYSTEMS AS A PART OF THIS PROJECT - SEE MECHANICAL DRAWINGS
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C. CONTRACTOR SHALL FULLY COORDINATE WITH MECHANICAL/ELECTRICAL SUB-CONTRACTORS PRIOR TO PERFORMING WORK
D. SALVAGE ALL REMOVED CEILING TILES FOR REINSTALLATION IN SAME OR OTHER AREAS AFTER MEP WORK - RE-USE ONLY IF IN GOOD SHAPE - OTHERWISE PROVIDE NEW
E. REMOVE EXISTING LIGHTING FIXTURES AS REQUIRED IN AREAS OF CEILING DEMOLITION PER CEILING EQUIPMENT RESPONSIBILITY MATRIX

DEMOLITION NOTES:

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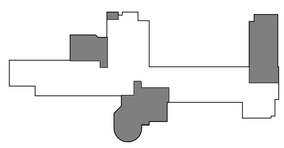

KEY PLAN

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DIGITAL ARCHITECTURAL MODELING
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DUNN ELEMENTARY | HVAC UPGRADES | PHASE 2

501 SOUTH WASHINGTON AVENUE
FORT COLLINS | COLORADO | 80521

AREA 1 AND 2 - ROOF DEMOLITION PLAN

ISSUE FOR PERMIT AND BIDDING

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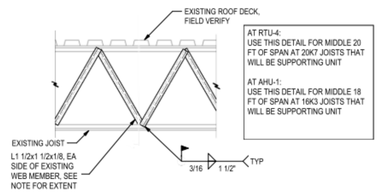
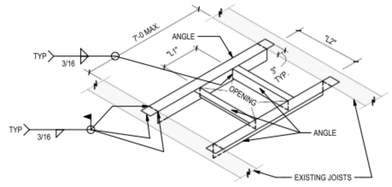


JOIST WEB REINFORCING DETAIL

Project Name: DUNN RTU REPLACEMENT		Scale: NO SCALE	Drawing Number:
JVA, Inc. 1319 Spruce Street Boulder, CO 80302 303.444.1951 www.jvajva.com Boulder • Fort Collins • Vilden Park Glenwood Springs • Denver	Drawing Reference: JOIST WEB REINFORCING DETAIL	Date: 11/13/23	S4
	Issue: CONSTRUCTION DOCUMENTS	JVA Job #: 22102	
		Designed By: SRW	

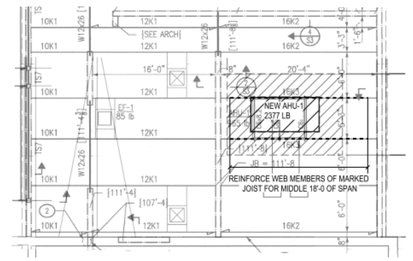


"L1" OR "L2 (USE LARGER VALUE)	ANGLE SIZES	REMARKS
UP TO 1'-0	NONE REQUIRED	
UP TO 3'-0	L3-1/2x3-1/2x1/4	
UP TO 5'-0	L5x3x1/4 (LLV)	
UP TO 7'-0	L6x4x5/16 (LLV)	

- USE ABOVE FRAMING AT ALL FLOOR & ROOF OPENINGS WHERE EITHER "L1" OR "L2" EXCEEDS 1'-0 , UNLESS NOTED OTHERWISE
- VERIFY WITH ARCHITECTURAL AND MECHANICAL DRAWINGS FOR SIZE AND LOCATION OF ALL OPENINGS

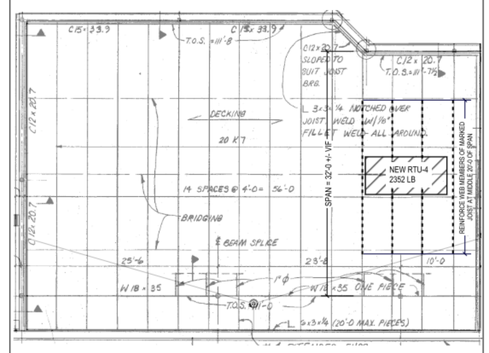
NEW OPENING AT EXIST METAL DECK

Project Name: DUNN RTU REPLACEMENT		Scale: NO SCALE	Drawing Number:
JVA, Inc. 1319 Spruce Street Boulder, CO 80302 303.444.1951 www.jvajva.com Boulder • Fort Collins • Vilden Park Glenwood Springs • Denver	Drawing Reference: NEW OPENING AT EXISTING METAL DECK	Date: 11/13/23	S3
	Issue: CONSTRUCTION DOCUMENTS	JVA Job #: 22102	
		Designed By: SRW	



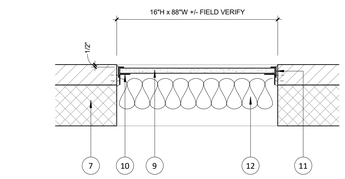
PARTIAL EXISTING ROOF FRAMING PLAN - CLASSROOMS
1/8"=1'-0

Project Name: DUNN RTU REPLACEMENT		Scale: 1/8"=1'-0	Drawing Number:
JVA, Inc. 1319 Spruce Street Boulder, CO 80302 303.444.1951 www.jvajva.com Boulder • Fort Collins • Vilden Park Glenwood Springs • Denver	Drawing Reference: MODIFIED JOISTS AT CLASSROOMS	Date: 11/13/23	S2
	Issue: CONSTRUCTION DOCUMENTS	JVA Job #: 22102	
		Designed By: SRW	

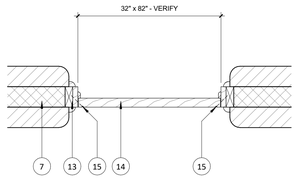


PARTIAL EXISTING ROOF FRAMING PLAN - MEDIA CENTER
1/8"=1'-0

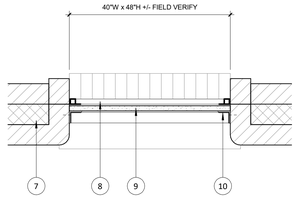
Project Name: DUNN RTU REPLACEMENT		Scale: 1/8"=1'-0	Drawing Number:
JVA, Inc. 1319 Spruce Street Boulder, CO 80302 303.444.1951 www.jvajva.com Boulder • Fort Collins • Vilden Park Glenwood Springs • Denver	Drawing Reference: MODIFIED JOISTS AT MEDIA CENTER	Date: 11/13/23	S1
	Issue: CONSTRUCTION DOCUMENTS	JVA Job #: 22102	
		Designed By: SRW	



5 LOUVER INFILL DETAIL
1" = 1'-0"



4 DOOR INFILL DETAIL
1" = 1'-0"

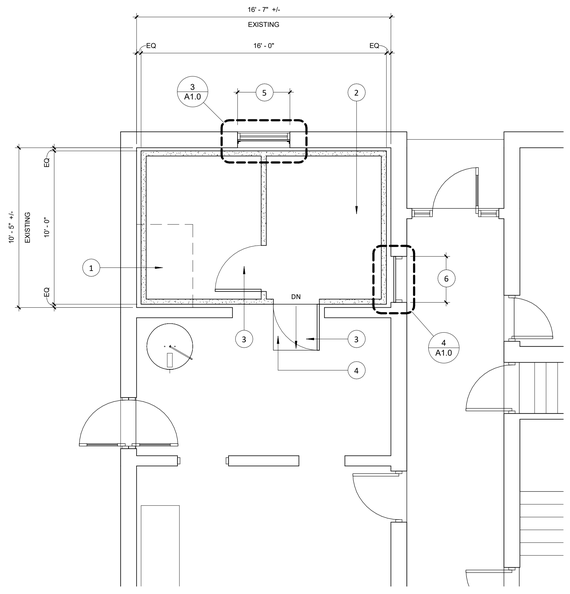


3 WINDOW INFILL DETAIL
1" = 1'-0"

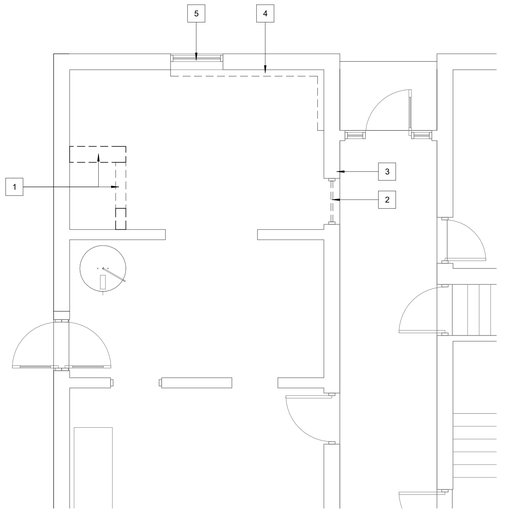
LAMINATED METAL INSULATED PANELS

1. LAMINATED METAL FACED PANELS AS MANUFACTURED BY MAPES INDUSTRIES, INC.
2. ACCEPTABLE ALTERNATES: PER REQUIREMENTS OF SECTION 01600, PANELS HAVING SIMILAR COMPOSITE CONSTRUCTION AND PROVIDING MANUFACTURER HAS A MINIMUM OF 25-YEARS PANEL LAMINATING EXPERIENCE AND COMPARABLE PUBLISHED WARRANTIES.
3. FINISH
   a. EXTERIOR: COLORLUME
   b. INTERIOR: KYNAR/HYLAR - AAMA 605.2-92 RESIN BASED - 70%
4. COLOR
   a. CLEAR ANODIZED ALUMINUM
5. PANEL FABRICATION
   a. SUBSTRATES
      - EXTERIOR: CLEAR ANODIZED ALUMINUM
      - INTERIOR: HIGH DENSITY 1/8" TEMPERED HARDBOARD
   b. CORES
      - 1.7-LB DENSITY ISOCYANURATE
   c. PANEL THICKNESS
      - 1 INCH

Draft



2 FLOOR PLAN - AREA 1 NEW
1/4" = 1'-0"



1 FLOOR PLAN - AREA 1 DEMO
1/4" = 1'-0"

GENERAL NOTES:

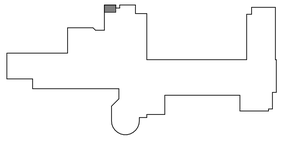
A. SCOPE OF WORK IN AREA 1 SHALL BE THE INSTALLATION OF NEW FREEZER/COOLER UNIT ONLY
B. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS AND SHALL INFORM ARCHITECT AND OWNER OF ANY MAJOR DISCREPANCIES
C. ALL MECHANICAL, ELECTRICAL AND PLUMBING WORK SHOWN FOR REFERENCE - SEE MEP DRAWINGS
D. DESIGN INTENT FOR SPACE SHALL BE CLEAN AND FLUSH FINISHES FOR CONCEALED SPACE

DEMOLITION NOTES:

1. REMOVE EXISTING MASONRY WALL - CLEAN FLOOR AND WALL FOR FLUSH CONCEALED FINISH
2. REMOVE EXISTING DOOR AND HARDWARE - EXISTING FRAME TO REMAIN
3. REMOVE ROOM NUMBER AND SIGNAGE FROM CORRIDOR WALL
4. REMOVE EXISTING FIN TUBE RADIATOR, SUPPLY AND RETURN LINES - CAP LINES AT FLOOR OR WALL PENETRATION LOCATION
5. CLEAN EXISTING WINDOW JAMB AND HARDWARE - PREP OPENING FOR INSTALLATION OF NEW INSULATED PANEL - SEE NEW PLAN

KEY NOTES:

1. PATCH AND FILL FLOOR AS REQUIRED FROM DEMOLITION FOR FLUSH LEVEL FINISH - PREP FLOOR PER MANUFACTURES REQUIREMENTS
2. NEW PREFABRICATED WALK-IN FREEZER/COOLER UNIT WITH RAISED INSULATED FLOOR - 10'-0"W x 16'-0"L x 8'-8"H - PROVIDE MINIMUM 1" AIR GAP WHERE UNIT ABUTS EXISTING WALLS - SEE SPECIFICATIONS
3. MANUFACTURE PROVIDED 36" UNIT DOORS - SEE SPECIFICATIONS
4. MANUFACTURE PROVIDED COOLER RAMP - SEE SPECIFICATIONS
5. CLOSE, LOCK AND SEAL EXISTING EXTERIOR WINDOW - PROVIDE NEW 40"W x 48"H INSULATED PANEL INFILL - INSTALL AT INTERIOR WITH 2" ALUMINUM ANGLES AT FULL PERIMETER - SEE DETAIL
6. PROVIDE NEW FLUSH WOOD DOOR PANEL TO MATCH EXISTING ADJACENT DOORS IN EXISTING DOOR FRAME - SEE DETAIL
7. EXISTING MASONRY WALL TO REMAIN - SHOWN FOR REFERENCE ONLY
8. EXISTING STEEL WINDOW AND GLAZING TO REMAIN - PERMANENTLY LOCK AND SEAL OPERABLE PORTION OF WINDOW - PREP FRAME AT INTERIOR AS NEEDED FOR INSTALLATION OF NEW INSULATED PANEL INFILL
9. PROVIDE 1" INSULATED PANEL INFILL - SEE ADJACENT METAL WINDOW PANEL - FIELD VERIFY SIZING - SET PANEL IN BEAD OF SEALANT AT FULL PERIMETER OF EXISTING STEEL WINDOW FRAME
10. 2" x 2" ALUMINUM ANGLE AT FULL PERIMETER OF PANEL INFILL - ATTACH ANGLE TO EXISTING MASONRY WALL - PROVIDE SEALANT AT FULL PERIMETER - TYPICAL
11. 1" x 2" ALUMINUM ANGLE AT FULL PERIMETER OF EXTERIOR PANEL INFILL - ATTACH ANGLE TO EXISTING MASONRY WALL - PROVIDE SEALANT AT FULL PERIMETER - TYPICAL
12. FILL LOUVER OPENING WITH BATT INSULATION AT ABOVE CEILING INTERIOR SPACE
13. EXISTING WOOD DOOR FRAME TO REMAIN - SHOWN FOR REFERENCE ONLY
14. INSTALL NEW 32" x 82" FLUSH WOOD DOOR PANEL IN EXISTING WOOD FRAME - VERIFY SIZE IN FIELD
15. ATTACH NEW WOOD DOOR PANEL TO EXISTING WOOD DOOR FRAME FROM INSIDE OF ROOM WITH 3" WOOD SCREWS AT SIDES AND TOP OF DOOR PANEL - DRILL AND COUNTERSINK HOLES



KEY PLAN

NOT TO SCALE

ISSUE FOR PERMIT AND BIDDING

DUNN ELEMENTARY | HVAC UPGRADES | PHASE 2

501 SOUTH WASHINGTON AVENUE
FORT COLLINS | COLORADO | 80521

AREA 1 - DEMOLITION AND NEW FLOOR PLANS, DETAILS AND STRUCTURAL PLANS

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PROJECT	012.23
DATE	11.13.23
DRAWN	DAM

NO.	DESCRIPTION	DATE

REVISIONS

SHEET

A1.0

CEILING EQUIPMENT KEY AND RESPONSIBILITY MATRIX

ALL WORK RELATED TO ACTIVITY INDICATED IN THIS RESPONSIBILITY MATRIX IS THE RESPONSIBILITY OF THE CONTRACTOR AND SHOULD BE INCLUDED IN THE BASE BID UNLESS NOTED OTHERWISE. UNIT PRICING INCLUDES ONLY ADDITIONAL SCOPE THAT IS PREFORMED BEYOND ANTICIPATED SCOPE INDICATED IN THE DRAWINGS

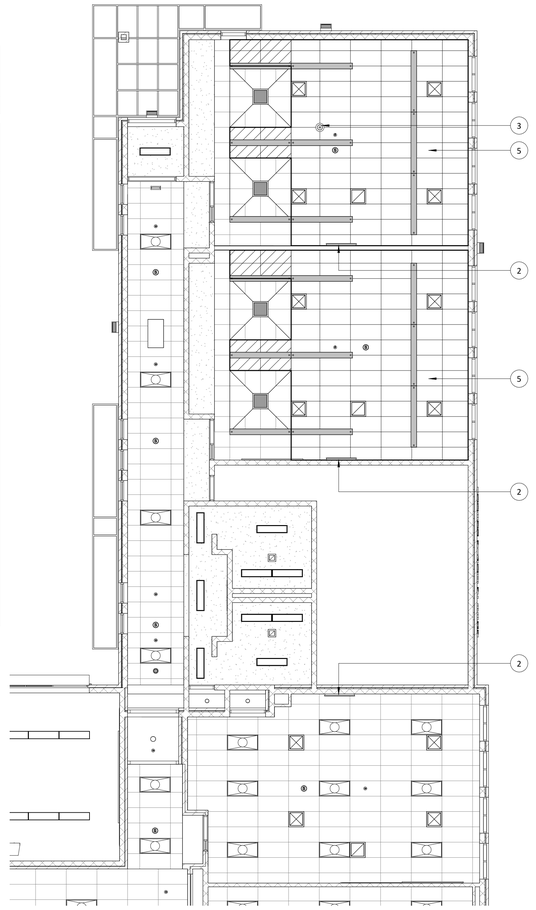
EQUIPMENT ITEM	LOCATION IN ROOM	WORK SCOPE	RESPONSIBLE PARTY
TELEVISIONS	WALL MOUNTED-REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	REMOVE TELEVISIONS AFFECTED BY WORK SCOPE IN AREA. GENERAL CONTRACTOR TO REMOVE, STORE, PROTECT, AND REINSTALL IN ORIGINAL LOCATION. G.C. TO VERIFY OPERATION FOLLOWING REINSTALLATION.	GENERAL CONTRACTOR CONTRACT WITH INTERFACE
SMARTBOARDS AND SMARTBOARD PROJECTORS	SMART BOARDS: WALL MOUNTED-REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS. PROJECTORS: CEILING/WALL MOUNTED-REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	REMOVE SMART BOARDS AND SMART BOARD PROJECTORS AFFECTED BY WORK SCOPE IN AREA. GENERAL CONTRACTOR TO SUBCONTRACT WITH H&H FOR REMOVAL AND REINSTALLATION. GC IS RESPONSIBLE FOR STORAGE, CLEANING, AND VERIFY OPERATION FOLLOWING REINSTALLATION.	GENERAL CONTRACTOR CONTRACT WITH INTERFACE
WIRELESS ACCESS POINTS	CEILING MOUNTED - REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	OWNER WILL REMOVE AND REINSTALL. GC RESPONSIBLE TO MAINTAIN EXISTING CABLING IN WORKING CONDITION.	PSD
SECURITY CAMERAS	REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	OWNER WILL REMOVE AND REINSTALL. GC RESPONSIBLE TO MAINTAIN EXISTING CACC/TV CABLING IN WORKING CONDITION.	PSD
INTERCOM SPEAKERS	CEILINGS -REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	PRIOR TO ANY INTERCOM SYSTEM WORK, THE GENERAL CONTRACTOR AND APPROVED SUBCONTRACTOR WILL PERFORM A PRE-DEMOLITION TEST OF THE INTERCOM SYSTEM IN IT'S ENTIRETY AND DOCUMENT ALL DEFICIENCIES PRIOR TO BEGINNING ANY WORK ON THE SYSTEM. PROVIDE DOCUMENTATION OF THIS TEST TO THE OWNER. REMOVE INTERCOM SPEAKERS AFFECTED BY WORK SCOPE IN AREA. GENERAL CONTRACTOR TO SUBCONTRACT WITH QUALIFIED AND APPROVED SUBCONTRACTOR (BEACON COMMUNICATIONS OR EQUAL) FOR REMOVAL AND REINSTALLATION. GC AND APPROVED SUBCONTRACTOR IS RESPONSIBLE FOR STORAGE, CLEANING, AND REINSTALLATION OF ALL INTERCOM COMPONENTS. FOLLOWING REINSTALLATION, THE GENERAL CONTRACTOR AND APPROVED SUBCONTRACTOR WILL PERFORM A POST INSTALLATION TEST OF THE INTERCOM SYSTEM IN IT'S ENTIRETY AND DOCUMENT THAT THE INTERCOM SYSTEM IS WORKING IN IT'S ENTIRETY. PROVIDE DOCUMENTATION OF THIS TEST TO THE OWNER GC SHALL ALLOW 24-HOUR NOTICE FOR ALL PRE AND POST TESTING OF INTERCOM WORK TO ALLOW PSD IT MAINTENANCE ATTENDANCE	GENERAL CONTRACTOR CONTRACT WITH INTERFACE
LIGHTING FIXTURES	CEILING MOUNTED - REFERENCE DRAWINGS FOR SPECIFIC LOCATIONS.	REMOVE LIGHTING FIXTURES AFFECTED BY WORK SCOPE IN AREA. GENERAL CONTRACTOR TO SUBCONTRACT WITH QUALIFIED AND APPROVED SUBCONTRACTOR FOR REMOVAL AND REINSTALLATION. GC IS RESPONSIBLE FOR STORAGE, CLEANING, AND VERIFY OPERATION FOLLOWING REINSTALLATION.	GENERAL CONTRACTOR AND APPROVED QUALIFIED SUBCONTRACTOR

CEILING LEGEND

- EXISTING ACP CEILING - SHOWN FOR REFERENCE
- EXISTING GYP. BD. CEILING - SHOWN FOR REFERENCE
- INSTALL NEW CEILING TILES IN NEW CEILING GRID, SEE RCP PLAN AND SPECS
- REINSTALL EXISTING CEILING TILES IN EXISTING CEILING GRID, SEE RCP PLAN
- NEW LED LIGHT FIXTURE IN EXISTING OR SIMILAR LOCATION - SEE CEILING PLAN AND ELECTRICAL DRAWINGS
- REINSTALL SALVAGED LED LIGHT FIXTURE IN EXISTING OR SIMILAR LOCATION - SEE CEILING PLAN AND ELECTRICAL DRAWINGS

1 AREA 1 - NEW CEILING PLAN
1/8" = 1'-0"

N



2 AREA 2 - NEW CEILING PLAN
1/8" = 1'-0"

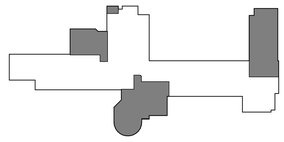
N

GENERAL NOTES:

A. CEILING REPLACEMENT SHALL ACCOMMODATE THE INSTALLATION OF NEW MECHANICAL SYSTEMS AND SHALL BE INSTALLED IN SIMILAR LOCATION AS EXISTING - SEE EXISTING CEILING PLANS AND MECHANICAL DRAWINGS
B. CONTRACTOR SHALL FULLY COORDINATE REINSTALLATION OF EXISTING CEILING MOUNTING EQUIPMENT AS SHOWN IN EXISTING CEILING PLANS - SEE EXISTING CEILING PLANS AND RESPONSIBILITY MATRIX

KEY NOTES:

1. APPROXIMATE LOCATION OF EXISTING WALL MOUNTED SMARTBOARD - SHOWN FOR REFERENCE - VERIFY IN FIELD - SEE CEILING RESPONSIBILITY MATRIX
2. APPROXIMATE LOCATION OF EXISTING WALL MOUNTED TELEVISION - SHOWN FOR REFERENCE - VERIFY IN FIELD - SEE CEILING RESPONSIBILITY MATRIX
3. REINSTALL EXISTING WIRELESS ACCESS POINT AT THIS APPROXIMATE LOCATION - VERIFY IN FIELD - SEE EXISTING CEILING PLANS AND CEILING RESPONSIBILITY MATRIX
4. REINSTALL EXISTING SECURITY CAMERA AT THIS APPROXIMATE LOCATION - VERIFY IN FIELD - SEE EXISTING CEILING PLANS AND CEILING RESPONSIBILITY MATRIX
5. REINSTALL SALVAGED LIGHTING FIXTURES TO SIMILAR LOCATIONS IN THIS AREA - SEE EXISTING CEILING PLANS AND CEILING RESPONSIBILITY MATRIX
6. INSTALL NEW 16"H x 88"W INSULATED PANEL INFILL AT LOCATION OF EXTERIOR LOUVER - COORDINATE EXACT SIZING IN FIELD - SEE DETAIL
7. PROVIDE VINYL FACED ACP CEILING TILES AT THIS LOCATION ONLY



KEY PLAN
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FORT COLLINS | COLORADO | 80521
AREA 1 AND 2 - NEW CEILING PLANS

ISSUE FOR PERMIT AND BIDDING

PROJECT	012.23
DATE	11.13.23
DRAWN	DAM

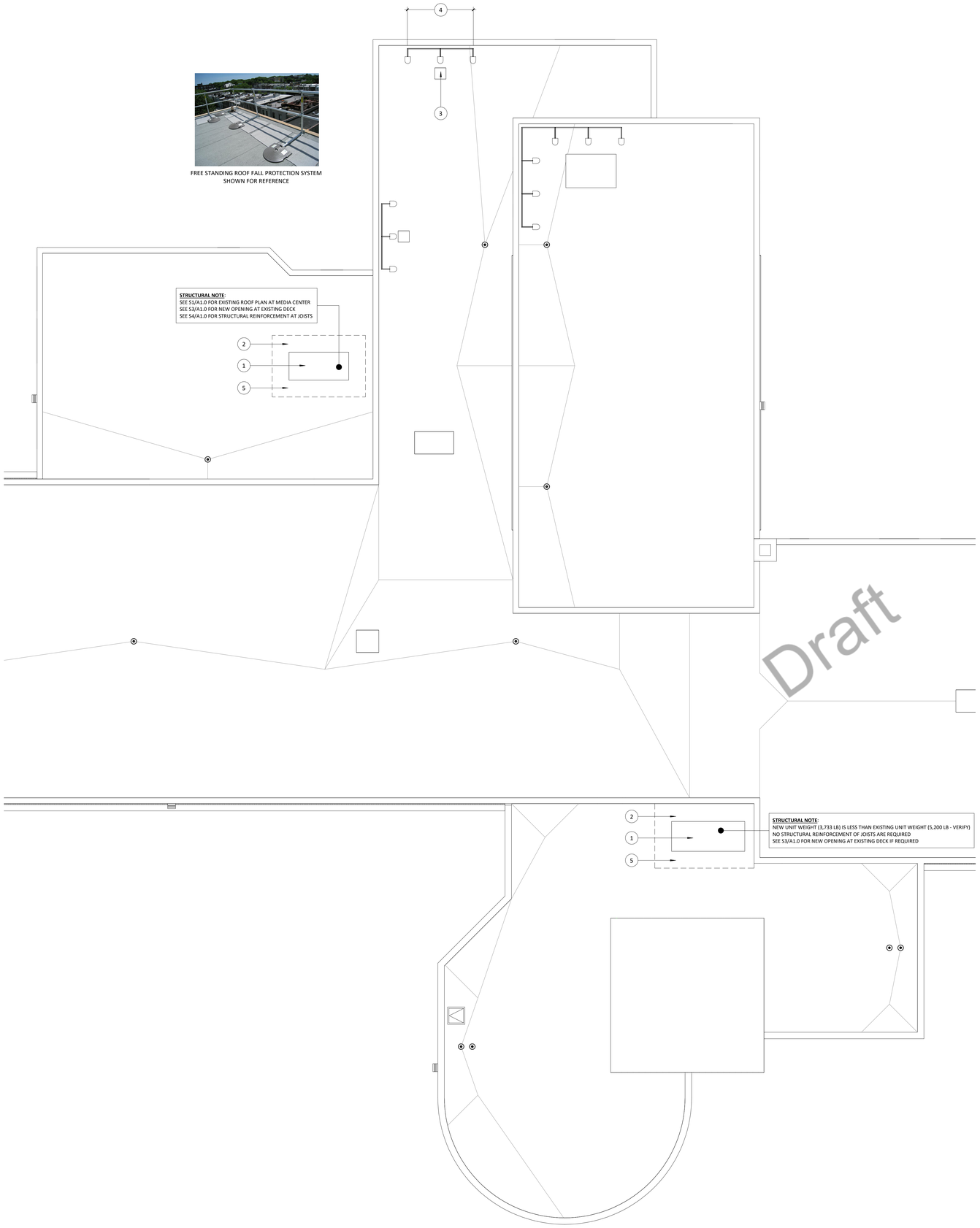
NO.	DESCRIPTION	DATE

REVISIONS

SHEET

A2.0

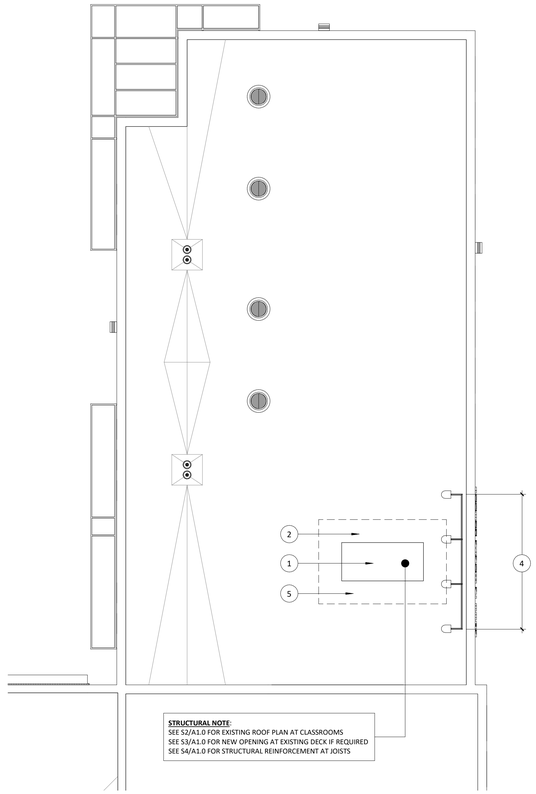
FREE STANDING ROOF FALL PROTECTION SYSTEM
SHOWN FOR REFERENCE



1 AREA 1 - NEW ROOF PLAN

1/8" = 1'-0"

N



2 AREA 2 - NEW ROOF PLAN

1/8" = 1'-0"

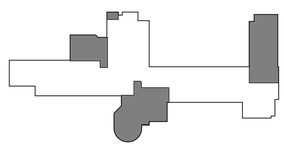
N

GENERAL NOTES:

A. EXISTING ROOFING JOHNS-MANVILLE ROLLED SHEET GOODS CURRENTLY UNDER WARRANTY - ROOFING REPAIRS SHALL BE COMPLETED BY PSD APPROVED VENDORS ONLY - SEE SPECIFICATIONS:
   - FRONT RANGE ROOFING
   - B&M ROOFING
   - COLORADO MOISTURE CONTROL
   - UNITED ROOFING MATERIALS
B. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS AND SHALL INFORM ARCHITECT AND OWNER OF ANY MAJOR DISCREPANCIES
C. ALL MECHANICAL, ELECTRICAL AND PLUMBING WORK SHOWN FOR REFERENCE - SEE MEP DRAWINGS

KEY NOTES:

1. APPROXIMATE LOCATION OF NEW ROOF TOP MECHANICAL UNIT - SEE MECHANICAL DRAWINGS
2. PATCH, REPAIR AND PROVIDE NEW ROOFING AS REQUIRED AFTER INSTALLATION OF NEW MECHANICAL ROOF CURB - COMPLETE WORK PER MANUFACTURES REQUIREMENTS - SEE PROVIDED MANUFACTURES ROOFING DETAILS
3. APPROXIMATE LOCATION OF NEW ROOF MOUNTED CONDENSING UNIT AND LINE SET - SHOWN FOR REFERENCE - COORDINATE EXACT LOCATION IN FIELD - SEE ROOFING DETAILS
4. PROVIDE NEW FREESTANDING ROOF FALL PROTECTION SYSTEM, INCLUDING PIPE RAILINGS, UPRIGHTS, BASES, COUNTERWEIGHTS AND FITTINGS - RAILING TO EXTEND 5' - 0" BEYOND MECHANICAL UNIT AT BOTH DIRECTIONS - VERIFY REQUIRED LENGTH IN FIELD WITH NEW MECHANICAL UNIT - SEE ADJACENT PHOTO AND SPECIFICATIONS
5. STRUCTURAL REINFORCEMENT BELOW - SEE STRUCTURAL DRAWINGS
6. EXISTING SBS MEMBRANE ROOFING - PROTECT DURING INSTALLATION OF NEW ROOF CURB AND LINE-SET
7. NEW CONDENSER INSULATED LINE-SET - COORDINATE EXACT LOCATION IN FIELD
8. 24 GAUGE G.S. PELICAN HOOD
9. TERMINATION BAR AND SEALANT OVER THE MEMBRANE FLASHING AND WATER BLOCK MASTIC
10. NEW MEMBRANE FLASHING 8" MIN UP SIDE OF NEW PELICAN HOOD CHASE - SEE MANUFACTURES DETAILS
11. NEW CORNER FLASHING TO SBS MEMBRANE ROOFING - SEE MANUFACTURES DETAILS



KEY PLAN

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AREA 1 AND 2 - NEW ROOF PLANS

PROJECT	012.23
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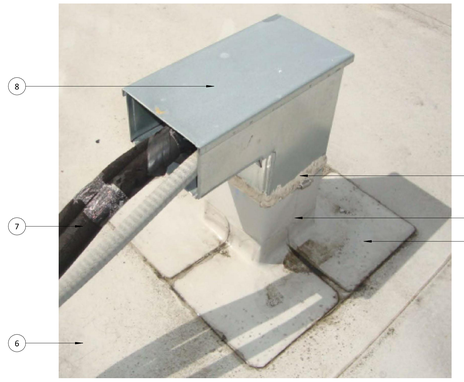

2 TYPICAL ROOF TOP LINSET DETAIL

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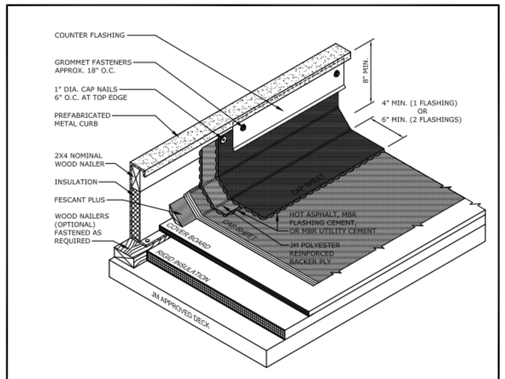
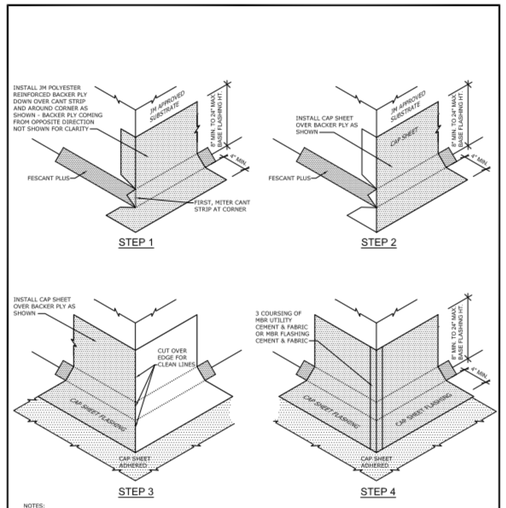


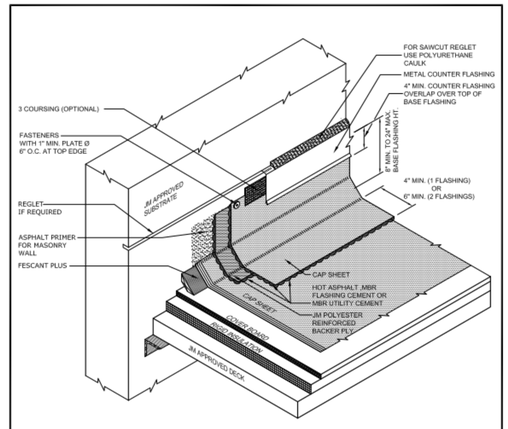
NOTES:
1. REFER TO JOHNS MANVILLE WEBSITE (www.jm.com) FOR MOST UP-TO-DATE INFORMATION.
2. JM POLYESTER REINFORCED BACKER PLY INCLUDES DYNABASE PR OR DYNALASTIC 180 S.
3. HEIGHT OF CURB TO BE ADJUSTED WITH NAILERS. IT IS PREFERRED TO RAISE ROOF HATCH WITH NAILERS TO EXTEND FLASHING HEIGHT.
4. THE VERTICAL WOOD CURB SHOULD BE FASTENED TO THE DECK ONLY.
5. CURB INSULATION MUST BE MECHANICALLY ATTACHED OR ADHERED SOLIDLY TO METAL CURB.
6. CURB MUST BE SET SO AS TO PROVIDE 8" MIN FLASHING HEIGHT.
7. METAL COUNTERFLASHING IS REQUIRED FOR ALL INSTALLATIONS.
8. ANY CARPENTRY, METAL WORK, OR MASONRY CONSTRUCTION SHOULD BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH LOCAL CODE REQUIREMENTS AND/OR PROJECT SPECIFICATIONS. THESE COMPONENTS SHOULD BE REVIEWED AND APPROVED BY A LICENSED DESIGN PROFESSIONAL.
9. VERTICAL JOINTS ARE TO BE OVERLAPPED 4" MINIMUM FOR ALL APPLICATIONS. 3 COURSING WITH MBR UTILITY CEMENT AND FABRIC OR JM MBR FLASHING CEMENT IS RECOMMENDED ON ALL VERTICAL FLASHING LAPS AND INSIDE/OUTSIDE CORNERS EXTENDING PAST LEADING EDGE OF CANT STRIP..
10. PLEASE SEE BITUMINOUS FLASHING SPECIFICATIONS FOR A FULL DESCRIPTION OF INSTALLATION INSTRUCTIONS AND REQUIREMENTS WHICH ARE CONSIDERED A PART OF THIS DETAIL.

DRAWING NO.		PREFABRICATED CURB		
BIT-8		MEMBRANE TYPE: BUR	Johns Manville is a manufacturer of commercial roofing products and offers this general conceptual information to you as a courtesy. This complimentary assistance is not to be used or relied upon by anyone as a substitute for professional engineering design and documentation required by building code, contract, or applicable law. By accepting these comments you agree they do not constitute any representations, endorsements of, or an assumption by Johns Manville of any duty or liability for either the adequacy of the design of the building or any other material not supplied by Johns Manville.	Johns Manville
CURB & CORNER		MAXIMUM GUARANTEE TERM		
SCALE: N.T.S	ISSUE DATE: 02-06-19			



NOTES:
1. REFER TO JOHNS MANVILLE WEBSITE (www.jm.com) FOR MOST UP-TO-DATE INFORMATION.
2. 3-COURSING WITH MBR UTILITY CEMENT & FABRIC OR MBR FLASHING CEMENT & FABRIC MUST BE USED ALONG EDGE OF BASE FLASHING AS DEPICTED IN STEP 4.
3. VERTICAL JOINTS ARE TO BE OVERLAPPED 4" MINIMUM FOR ALL APPLICATIONS. 3 COURSING WITH MBR UTILITY CEMENT AND FABRIC OR JM MBR FLASHING CEMENT IS RECOMMENDED ON ALL VERTICAL FLASHING LAPS AND INSIDE/OUTSIDE CORNERS EXTENDING PAST LEADING EDGE OF CANT STRIP.
4. PLEASE SEE BITUMINOUS FLASHING SPECIFICATIONS FOR A FULL DESCRIPTION OF INSTALLATION INSTRUCTIONS AND REQUIREMENTS WHICH ARE CONSIDERED A PART OF THIS DETAIL.
5. JM POLYESTER REINFORCED BACKER PLY INCLUDES DYNABASE PR OR DYNALASTIC 180 S.
6. MASONRY SUBSTRATES REQUIRE PRIMING WITH ASPHALT PRIMER PRIOR TO BACKER PLY INSTALLATION. WOOD SUBSTRATES REQUIRE A MECHANICALLY FASTENED BACKER PLY FASTENED 9" O.C. IN BOTH DIRECTIONS.

DRAWING NO.		BASE FLASHING AT OUTSIDE CORNER		
BIT-26		MEMBRANE TYPE: BUR	Johns Manville is a manufacturer of commercial roofing products and offers this general conceptual information to you as a courtesy for general educational purposes only. This complimentary assistance is not to be either used or relied upon by anyone as a substitute for professional engineering design and documentation required by building code, contract, or applicable law. By accepting these general conceptual information, you agree it does not constitute any representations, endorsements of, or an assumption by Johns Manville of any duty or liability for either the adequacy of the design of a building, any of its components or the sufficiency of any construction.	Johns Manville
CURB & CORNER		MAXIMUM GUARANTEE TERM		
SCALE: N.T.S	ISSUE DATE: 07-08-21			



NOTES:
1. REFER TO JOHNS MANVILLE WEBSITE (www.jm.com) FOR MOST UP-TO-DATE INFORMATION.
2. JM POLYESTER REINFORCED BACKER PLY INCLUDES DYNABASE PR OR DYNALASTIC 180 S.
3. MASONRY SUBSTRATES REQUIRE PRIMING WITH ASPHALT PRIMER PRIOR TO BACKER PLY INSTALLATION. WOOD SUBSTRATES REQUIRE A MECHANICALLY FASTENED BACKER PLY FASTENED 9" O.C. IN BOTH DIRECTIONS.
4. METAL COUNTER FLASHING IS RECOMMENDED FOR ALL INSTALLATIONS AND IS REQUIRED FOR ALL GUARANTEES 15 YEARS OR LONGER. A 3 CURSISING OF PERMAFLASH MAY BE USED TO SEAL THE TOP EDGE OF THE FLASHING ON 10 YEAR NDL'S IN LIEU OF METAL COUNTER FLASHING.
5. VERTICAL JOINTS ARE TO BE OVERLAPPED 4" MINIMUM FOR ALL APPLICATIONS. 3 COURSING WITH MBR UTILITY CEMENT AND FABRIC OR JM MBR FLASHING CEMENT IS RECOMMENDED ON ALL VERTICAL FLASHING LAPS AND INSIDE/OUTSIDE CORNERS EXTENDING PAST LEADING EDGE OF CANT STRIP.
6. ANY CARPENTRY, METAL WORK, OR MASONRY CONSTRUCTION SHOULD BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH LOCAL CODE REQUIREMENTS AND/OR PROJECT SPECIFICATIONS. THESE COMPONENTS SHOULD BE REVIEWED AND APPROVED BY A LICENSED DESIGN PROFESSIONAL.
7. PLEASE SEE BITUMINOUS FLASHING SPECIFICATIONS FOR A FULL DESCRIPTION OF INSTALLATION INSTRUCTIONS AND REQUIREMENTS WHICH ARE CONSIDERED A PART OF THIS DETAIL.

DRAWING NO.		BASE FLASHING FOR LOAD BEARING WALL W/ COUNTERFLASHING		
BIT-1 (LB)		MEMBRANE TYPE: BUR	Johns Manville is a manufacturer of commercial roofing products and offers this general conceptual information to you as a courtesy. This complimentary assistance is not to be used or relied upon for anyone as a substitute for professional engineering design and documentation required by building code, contract, or applicable law. By accepting these comments you agree they do not constitute any representations, endorsements of, or an assumption by Johns Manville of any liability for either the adequacy of the design of the building or any other material not supplied by Johns Manville.	Johns Manville
FLASHING WALL		MAXIMUM GUARANTEE TERM		
SCALE: N.T.S	ISSUE DATE: 02-06-19			

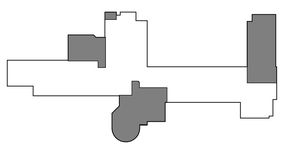
1 JOHNS MANVILLE MANUFACTURES DETAILS

GENERAL NOTES:

A. EXISTING ROOFING JOHNS-MANVILLE ROLLED SHEET GOODS CURRENTLY UNDER WARRANTY - ROOFING REPAIRS SHALL BE COMPLETED BY PSD APPROVED VENDORS ONLY - SEE SPECIFICATIONS:
   - FRONT RANGE ROOFING
   - B&M ROOFING
   - COLORADO MOISTURE CONTROL
   - UNITED ROOFING MATERIALS
B. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS AND SHALL INFORM ARCHITECT AND OWNER OF ANY MAJOR DISCREPANCIES
C. ALL MECHANICAL, ELECTRICAL AND PLUMBING WORK SHOWN FOR REFERENCE - SEE MEP DRAWINGS

KEY NOTES:

1. APPROXIMATE LOCATION OF NEW ROOF TOP MECHANICAL UNIT - SEE MECHANICAL DRAWINGS
2. PATCH, REPAIR AND PROVIDE NEW ROOFING AS REQUIRED AFTER INSTALLATION OF NEW MECHANICAL ROOF CURB - COMPLETE WORK PER MANUFACTURES REQUIREMENTS - SEE PROVIDED MANUFACTURES ROOFING DETAILS
3. APPROXIMATE LOCATION OF NEW ROOF MOUNTED CONDENSING UNIT AND LINE SET - SHOWN FOR REFERENCE - COORDINATE EXACT LOCATION IN FIELD - SEE ROOFING DETAILS
4. PROVIDE NEW FREESTANDING ROOF FALL PROTECTION SYSTEM, INCLUDING PIPE RAILINGS, UPRIGHTS, BASES, COUNTERWEIGHTS AND FITTINGS - RAILING TO EXTEND 5' - 0" BEYOND MECHANICAL UNIT AT BOTH DIRECTIONS - VERIFY REQUIRED LENGTH IN FIELD WITH NEW MECHANICAL UNIT - SEE ADJACENT PHOTO AND SPECIFICATIONS
5. STRUCTURAL REINFORCEMENT BELOW - SEE STRUCTURAL DRAWINGS
6. EXISTING SBS MEMBRANE ROOFING - PROTECT DURING INSTALLATION OF NEW ROOF CURB AND LINE-SET
7. NEW CONDENSER INSULATED LINE-SET - COORDINATE EXACT LOCATION IN FIELD
8. 24 GAUGE G.S. PELICAN HOOD
9. TERMINATION BAR AND SEALANT OVER THE MEMBRANE FLASHING AND WATER BLOCK MASTIC
10. NEW MEMBRANE FLASHING 8" MIN UP SIDE OF NEW PELICAN HOOD CHASE - SEE MANUFACTURES DETAILS
11. NEW CORNER FLASHING TO SBS MEMBRANE ROOFING - SEE MANUFACTURES DETAILS



KEY PLAN

NOT TO SCALE

DIGITAL ARCHITECTURAL MODELING
970.234.8569 WWW.DAMODELING.COM

DUNN ELEMENTARY | HVAC UPGRADES | PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS | COLORADO | 80521

ROOFING DETAILS

ISSUE FOR PERMIT AND BIDDING

PROJECT	012.23
DATE	11.13.23
DRAWN	DAM

NO.	DESCRIPTION	DATE

REVISIONS

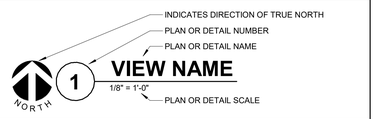
SHEET

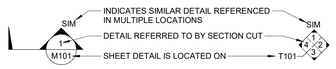
A4.0

VIEW KEY

NAME — LEVEL NAME
10'-0" — HEIGHT ABOVE PROJECT 0'-0"

1 — INDICATES NOTE USED TO DESCRIBE ADDITIONAL INFORMATION ABOUT WORK REQUIRED, SPECIFIC TO THE SHEET AND/OR DETAIL





LINE TYPE AND TAG KEY:

NEW WORK BY THIS CONTRACTOR (WIDE LINE)
- NEW
- EXISTING TO BE REMOVED (SHORT DASHED PATTERN)
- NEW UNDERFLOOR OR UNDERGROUND (LONG DASHED PATTERN)

EXISTING TO REMAIN OR WORK BY OTHERS (NARROW LINE)
- EXISTING
- EXISTING TO BE REMOVED BY OTHERS (SHORT DASHED PATTERN)
- EXISTING UNDERFLOOR OR UNDERGROUND (LONG DASHED PATTERN)

HALFTONING DOES NOT MODIFY SCOPE.

'TAG'-E	TAGS WITH DASH 'E' INDICATES THE REFERENCED OBJECT IS EXISTING
TAG-1	UNDERLINED TAG INDICATES OBJECT IS IN-SCOPE. IF NEW, ADDITIONAL INFORMATION IS AVAILABLE IN A SCHEDULE, MATERIAL LIST, OR SYMBOL LIST
	INDICATES AN EXISTING SYSTEM'S POINT OF CONNECTION/REMOVAL

MECHANICAL ABBREVIATION KEY

ABBR:	DESCRIPTION:
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
BFP	BACKFLOW PREVENTER
BT	BATHTUB
C	COMMON
CB	CATCH BASIN
CD-E	CEILING DIFFUSER - EXISTING
CFSD	CONTROL/FIRE/SMOKE DAMPER
CI	CAST IRON
CO	CLEANOUT
CS	CLINICAL SINK
DB	DIALYSIS BOX
DF	DRINKING FOUNTAIN
DI	DUCTILE IRON
DPG (0-2")	DIFFERENTIAL PRESSURE GAUGE (RANGE)
DPS	DIFFERENTIAL PRESSURE SWITCH
E	EXISTING
EA	EXHAUST/RELIEF AIR
ECFSD	EXISTING CONTROL FIRE SMOKE DAMPER
EE	EMERGENCY EYEWASH
EFD	EXISTING FIRE DAMPER
EFSD	EXISTING FIRE SMOKE DAMPER
EP	ELECTRICAL TO PNEUMATIC VALVE
ES	EMERGENCY SHOWER
ESD	EXISTING SMOKE DAMPER
ESE	EMERGENCY SHOWER/EYEWASH
EWC	ELECTRIC WATER COOLER
FCO	FLOOR CLEANOUT
FD	FIRE DAMPER
FM	FLOW METER
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FS	FLOOR SINK
FSD	FIRE/SMOKE DAMPER
GD	GARBAGE DISPOSER
GI	GREASE INTERCEPTOR
HB	HOSE BIBB
I.E.	INVERT ELEVATION (FOR REFERENCE ONLY)
LAV	LAVATORY
MA	MIXED AIR
MB	MOP BASIN
MH	MANHOLE
MV	MIXING VALVE
NC	NEW CONNECTION
N.C.	NORMALLY CLOSED
NIC	NOT IN CONTRACT
N.O.	NORMALLY OPEN
NT	NEUTRALIZATION TANK
OA	OUTSIDE AIR
OS	OIL SEPARATOR
PS	PRESSURE SWITCH
RA	RETURN AIR
RD	ROOF DRAIN
SA	SUPPLY AIR
SD	SMOKE DAMPER
SH	SHOWER
SK	SINK
SS	SERVICE SINK
TAB	TERMINAL AIR BOX
TD	TRANSFER DUCT
TP	TRAP PRIMER
TYP	TYPICAL
UB	UTILITY BOX
UC-1	DOOR UNDERCUT BY OTHERS (1" TYPICAL)
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
VTR	VENT THROUGH ROOF
WC	WATER CLOSET
WCO	WALL CLEANOUT
WF	WASH FOUNTAIN
WH	WATER HEATER
WMF	WASHING MACHINE FIXTURE
WM	WATER METER
WS	WATER SOFTENER
YCO	YARD CLEANOUT

MECHANICAL SYMBOL LIST

NOT ALL SYMBOLS MAY APPLY.

SYMBOL:	DESCRIPTION:
AV	ACID VENT
AW	ACID WASTE
CA	COMPRESSED AIR
CR	CONDENSER WATER RETURN
CS	CONDENSER WATER SUPPLY
CW	COLD WATER - POTABLE
CWR	CHILLED WATER RETURN
CWS	CHILLED WATER SUPPLY
D	DRAIN - PLUMBING
FP	FIRE PROTECTION
G	NATURAL GAS
GRV	GAS REGULATOR VENT
GRV	GAS VENT
GSAN	SANITARY DRAINAGE (GREASE SANITARY DRAINAGE)
GV	GREASE VENT
HCR	HEATING/CHILLED WATER RETURN
HCS	HEATING/CHILLED WATER SUPPLY
HG	REFRIGERANT HOT GAS
HPC	HIGH PRESSURE CONDENSATE
HW	HOT WATER - POTABLE
HWC	HOT WATER CIRCULATING - POTABLE
HW140	HOT WATER - POTABLE NUMBER INDICATES TEMP
HWC140	HOT WATER CIRC. - POTABLE NUMBER INDICATES TEMP
HWR	HEATING WATER RETURN
HWS	HEATING WATER SUPPLY
LIQ	REFRIGERANT LIQUID
LPC	LOW PRESSURE CONDENSATE
LPS	LOW PRESSURE STEAM
LWR	LOOP WATER RETURN
LWS	LOOP WATER SUPPLY
P	PROPANE GAS
PC	PUMPED CONDENSATE
PD	PUMPED DISCHARGE
RO	REVERSE OSMOSIS WATER
SAN	SANITARY DRAINAGE
ST(1,000)	STORM DRAINAGE (ROOF SQUARE FOOTAGE)
STS	STORM DRAINAGE (SECONDARY)
STW	SOFT TEMPERED WATER
SUC	REFRIGERANT SUCTION
SV	SAFETY RELIEF VENT
TW	TEMPERED WATER
V	VENT
W	SERVICE WATER - POTABLE
	PIPE CAP
	PIPE DOWN
	PIPE UP OR UP/DOWN
FD	PIPE SERVING FIXTURE ON FLOOR ABOVE (EXAMPLE: FD = FLOOR DRAIN)
	DIRECTION OF FLOW IN PIPE
	ROUTE TO DRAIN
RD-1 6"(1000)	ROOF DRAIN PROPERTIES SYMBOL SIZE (ROOF SQ. FT.)
	NEW CONNECTION
	DIELECTRIC CONNECTION
	UNION/FLANGE
	SHUTOFF VALVE NORMALLY OPEN
	SHUTOFF VALVE NORMALLY CLOSED
	THROTTLING VALVE
	BALANCING VALVE (NUMBER INDICATES GPM)
	AUTOMATIC BALANCING VALVE
	MIXING VALVE
	CONTROL VALVE (THREE-WAY)
	CONTROL VALVE (TWO-WAY)
	SOLENOID VALVE
	CHECK VALVE
	SAFETY/RELIEF VALVE
	PRESSURE REDUCING VALVE (LIQUID/GAS)
	PRESSURE REDUCING VALVE (STEAM)
	TRIPLE DUTY VALVE (ANGLE TYPE)
	TRIPLE DUTY VALVE (IN-LINE TYPE)
	PUMP
	VACUUM BREAKER
	"WYE" - STRAINER
	"WYE" - STRAINER W/SHUTOFF VALVE AND HOSE CONNECTION WITH CAP
	AUTOMATIC DRAIN VALVE
	AIR PRESSURE MAINTENANCE DEVICE
	AIR SUPERVISORY SWITCH
	ANGLE VALVE
	BUTTERFLY VALVE WITH MONITOR SWITCH
	INSPECTOR TEST AND DRAIN VALVE
	OS&Y GATE VALVE
	OS&Y GATE VALVE WITH MONITOR SWITCH
	CHECK VALVE
	SAFETY/RELIEF VALVE
	PRESSURE REDUCING VALVE (LIQUID/GAS)
	BASKET STRAINER
	FLEXIBLE CONNECTION
	PRESSURE/TEMPERATURE TEST PLUG
	REDUCER - REFERENCE SPECIFICATION FOR CONCENTRIC/ECCENTRIC AND FOT/FOB
	SUCTION DIFFUSER WITH SUPPORT FOOT
	AUTOMATIC AIR VENT
	MANUAL AIR VENT
	DRAIN VALVE WITH HOSE CONNECTION AND CAP
T-	STEAM TRAP (REFER TO SCHEDULE)
T-	F&T STEAM TRAP (REFER TO SCHEDULE)
T-	INVERTED BUCKET STEAM TRAP (REFER TO SCHEDULE)
	ALIGNMENT GUIDE
	PIPE ANCHOR

MECHANICAL SYMBOL LIST

NOT ALL SYMBOLS MAY APPLY.

SYMBOL:	DESCRIPTION:
	EXPANSION JOINT
M	METER
	VALVE BOX
MGO	MEDICAL GAS OUTLET (MGO)
	ALARM PANEL
	HEADWALL
A	SINGLE GAS OUTLET (AIR)
O	SINGLE GAS OUTLET (OXYGEN)
V	SINGLE GAS OUTLET (VACUUM)
	NITROGEN PRESSURE CONTROL CABINET
	PRESSURE TRANSDUCER WITH ALARM WIRING
NO HATCH	LIGHT HAZARD
	ORDINARY GROUP 1
	ORDINARY GROUP 2
	DEMOLITION
	EXTRA GROUP 1
	EXTRA GROUP 2
	SPRINKLER - WALL MOUNTED
	SPRINKLER
	SPRINKLER - CONCEALED
	SPRINKLER
	SPRINKLER
	SPRINKLER
A	SPRINKLER
A	SPRINKLER
	DIRECTION OF AIR FLOW
	FLEXIBLE DUCT
	MANUAL VOLUME DAMPER
R	RISE IN DIRECTION OF AIR FLOW
D	DROP IN DIRECTION OF AIR FLOW
	DUCT CAP
	DUCT DOWN
	DUCT UP
	SUPPLY/OUTSIDE AIR DUCT SECTION
	RETURN AIR DUCT SECTION
	EXHAUST/RELIEF AIR DUCT SECTION
	4-WAY DIFFUSER WITH BLANKOFF IN ONE DIRECTION
CD-1 6/115	AIR TERMINAL PROPERTIES SYMBOL NECK SIZE/CFM
###	TERMINAL AIR BOX (REFER TO SCHEDULE)
###	TERMINAL AIR BOX w/REHEAT COIL (REFER TO SCHEDULE)
	SERIES FAN POWERED TERMINAL AIR BOX w/REHEAT COIL (REFER TO SCHEDULE)
	PARALLEL FAN POWERED TERMINAL AIR BOX w/REHEAT COIL (REFER TO SCHEDULE)
H	HUMIDIFIER
	OPPOSED BLADE DAMPER (REFER TO SCHEDULE)
	PARALLEL BLADE DAMPER (REFER TO SCHEDULE)
XX-Y	AIRFLOW MEASUREMENT SYMBOL XX - AHU SYMBOL Y - SEQUENTIAL NUMBER
ACT	ACTUATOR
DS	DOOR SWITCH
DP	DIFFERENTIAL PRESSURE SWITCH
CS	CURRENT SWITCH
VS	VIBRATION SWITCH
FM	FLOW METER
	FAN
MTR	MOTOR
R	CONTACTOR
	NORMALL CLOSED CONTACT
	NORMALLY OPEN CONTACT
AI	ANALOG INPUT
AO	ANALOG OUTPUT
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT

PROJECT ALTITUDE:	**5,300 FT. ABOVE SEA LEVEL**

MECHANICAL DESIGN CONDITIONS:

DESIGN CONDITIONS: **BASED ON WEATHER DATA FOR: FORT COLLINS, COLORADO**

SUMMER:	95°F DRY BULB, 62°F WET BULB
WINTER:	-5°F DRY BULB

TYPICAL ROOM SETPOINTS:

SUMMER DESIGN:	75°F DRY BULB, NO HUMIDITY REQUIREMENT
WINTER DESIGN:	70°F DRY BULB, NO HUMIDITY REQUIREMENT
SUMMER SETBACK:	80°F DRY BULB, NO HUMIDITY REQUIREMENT
WINTER SETBACK:	65°F DRY BULB, NO HUMIDITY REQUIREMENT

REFER TO CONTROL DIAGRAMS FOR ROOM SPECIFICS.

MECHANICAL SYMBOL LIST

NOT ALL SYMBOLS MAY APPLY.

SYMBOL:	DESCRIPTION:
FM	FLOW METER
F	FLOW SWITCH
FS	FLOW SENSOR
FS	AIR FLOW SWITCH
FM	DUCT FLOW METER
P	PRESSURE SWITCH
	MONITOR SWITCH
P	PRESSURE SENSOR (FURNISHED WITH BALL VALVE)
P	PRESSURE GAUGE (FURNISHED WITH BALL VALVE)
	DIFFERENTIAL PRESSURE SENSOR
P	PRESSURE SENSOR (DUCT MOUNTED)
SP	STATIC SWITCH
T	THERMOSTAT
TM	THERMOSTAT/SENSOR WITH HEAVY DUTY ENCLOSURE
T	TEMPERATURE SENSOR (DUCT MOUNTED)
T	TEMPERATURE SENSOR WITH WELL
T	THERMOMETER WITH WELL (DIAL TYPE)
T	THERMOMETER WITH WELL (FILLED TYPE)
T	AVERAGING TEMPERATURE SENSOR
T	LOW LIMIT TEMPERATURE SWITCH
T	PROBE TEMPERATURE SENSOR
H	HUMIDISTAT SENSOR
H	HUMIDISTAT / SENSOR
H	HUMIDITY SENSOR (DUCT MOUNTED)
C	CARBON MONOXIDE SENSOR
CO_2	CARBON DIOXIDE SENSOR
C	CARBON MONOXIDE SENSOR (DUCT MOUNTED)
CO_2	CARBON DIOXIDE SENSOR (DUCT MOUNTED)
	FILTER
DSD	DUCT SMOKE DETECTOR
	HEATING/ COOLING COIL
	AIR BLENDER
	MANUAL MOTOR STARTER W/THERMAL OVERLOAD

APPLICABLE CODES

CONTRACTOR SHALL COMPLY WITH APPLICABLE CODES AND LOCAL AMENDMENTS INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

BUILDING CODE:	IBC 2021 EDITION
FIRE CODE:	IFC 2021 EDITION
PLUMBING CODE:	2021 COLORADO PLUMBING CODE
MECHANICAL CODE:	IMC 2021 EDITION
ELECTRICAL CODE:	NFPA 70 (NEC) 2023 EDITION
ENERGY CONSERVATION CODE:	IECC 2021
LOCAL BUILDING CODE:	CURRENT EDITION

GENERAL NOTES COLORADO:

1. ANY ROUGH-IN AND/OR FINAL PLUMBING INSPECTIONS SHALL BE PERFORMED BY THE STATE OF COLORADO DEPARTMENT OF REGULATORY AGENCIES (DORA).
2. BUILDING SHALL NOT BE CONSIDERED ACCEPTABLE FOR FINAL INSPECTIONS PRIOR TO CODE OFFICIAL RECEIVING A LETTER ACKNOWLEDGING THE BUILDER OWNER HAS RECEIVED AT LEAST A PRELIMINARY COMMISSIONING REPORT.

MECHANICAL GENERAL NOTES:

THESE NOTES APPLY TO ALL MECHANICAL SHEETS AND TRADES, INCLUDING BUT NOT LIMITED TO, FIRE PROTECTION, PLUMBING, MEDICAL GAS, VENTILATION, PIPING AND TEMPERATURE CONTROL.

1. DRAWINGS SHOWING LOCATIONS OF EQUIPMENT, DUCTWORK, PIPING, ETC. ARE DIAGRAMMATIC AND MAY NOT ALWAYS REFLECT EXACT INSTALLATION CONDITIONS. DRAWINGS SHOW THE GENERAL ARRANGEMENT OF DUCTWORK, PIPING, EQUIPMENT, ETC., AND MAY NOT INCLUDE ALL OFFSETS AND FITTINGS REQUIRED FOR OR COMPLETE INSTALLATION. THE DRAWINGS SHALL BE FOLLOWED AS CLOSELY AS ACTUAL BUILDING CONSTRUCTION AND THE WORK OF OTHERS WILL PERMIT.
2. DO NOT SCALE DRAWINGS. VERIFY ALL DIMENSIONS AND CLEARANCES FROM ARCHITECTURAL, STRUCTURAL, SUBMITTALS, AND OTHER APPROPRIATE DRAWINGS OR PHYSICALLY AT SITE. REVIEW ALL DRAWINGS, INCLUDING THOSE OF OTHER TRADES.
3. COORDINATE ALL WORK WITH ALL OTHER TRADES PRIOR TO INSTALLATION TO PROVIDE CLEARANCES REQUIRED FOR OPERATION, MAINTENANCE, CODE COMPLIANCE, AND TO VERIFY NON-INTERFERENCE WITH OTHER WORK. DO NOT FABRICATE PRIOR TO VERIFICATION OF NECESSARY CLEARANCES FOR ALL TRADES. BRING ANY INTERFERENCES OR CONFLICTS TO THE ATTENTION OF THE ARCHITECT/ENGINEER BEFORE PROCEEDING WITH FABRICATION OR EQUIPMENT ORDERS.
4. REVIEW SPACE REQUIREMENTS OF EQUIPMENT SPECIFIED OR SUBSTITUTED AND MAKE REASONABLE ACCOMMODATIONS IN LAYOUT AND POSITIONING TO PROVIDE PROPER ACCESS.
5. ANY CHANGES REQUIRED TO ELIMINATE CONFLICTS OR THAT RESULT FROM A FAILURE TO COORDINATE SHALL BE MADE BY THE CONTRACTOR WITHOUT ADDITIONAL COST OR EXPENSE TO OTHERS.
6. EACH CONTRACTOR IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH ELECTRICAL CHANGES REQUIRED FOR EQUIPMENT PROPOSED THAT DIFFERS FROM THE BASIS OF DESIGN.
7. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN, ELECTRICAL, TECHNOLOGY AUDIO/VISUAL, AND OTHER MECHANICAL PLANS FOR EXACT LOCATIONS OF ALL CEILING MOUNTED DEVICES, OTHER THAN SPRINKLERS.
8. EACH CONTRACTOR IS RESPONSIBLE FOR DAMAGE CAUSED BY THEIR ACTIONS TO WALLS, FLOORS, CEILINGS, AND ROOFS. THE CONTRACTOR WHOSE WORK CAUSES DAMAGE IS RESPONSIBLE FOR PATCHING TO MATCH ORIGINAL CONSTRUCTION, FIRE RATING, AND FINISH.
9. IN AREAS WITH DRYWALL CEILINGS COORDINATE LOCATIONS OF ACCESS PANELS WITH THE GC FOR ACCESS TO VALVES, DUCTWORK ACCESSORIES, DAMPERS, ETC. COORDINATE PANEL TYPE AND COLOR WITH ARCHITECT. NOTIFY THE GC OF THE REQUIRED ACCESS PANELS PRIOR TO BIDDING.
10. SEAL ALL FLOOR, WALL, AND ROOF PENETRATIONS AIRTIGHT WHERE CONDUITS, PIPING, AND DUCTS PENETRATE. PENETRATIONS THROUGH EXTERIOR WALLS AND ROOF SHALL BE SEALED AIRTIGHT WITH WATERPROOFING MATERIALS RECOMMENDED BY MANUFACTURER FOR OUTDOOR USE.
11. CAULK ALL PIPE AND DUCT PENETRATIONS OF FULL HEIGHT NON-FIRE RATED WALL, PARTITION, FLOOR, AND ROOF ASSEMBLIES. THIS IS ESSENTIAL TO PREVENT NOISE TRANSMISSION FROM ONE ROOM TO ANOTHER AND TO PROVIDE THE DESIRED NC LEVELS WITHIN ROOMS.
12. WHERE PIPES AND DUCTS ARE SHOWN TO PENETRATE FLOORS, PROVIDE SLEEVED OPENINGS WITH THE TOP EDGE RAISED ABOVE FLOOR SURFACE IN ACCORDANCE WITH ALL RELEVANT SPEC SECTIONS. SEAL SLEEVE PERIMETER TO BE WATERTIGHT.
13. EQUIPMENT SIZES AND SERVICE CLEARANCE REQUIREMENTS VARY AMONG DIFFERENT MANUFACTURERS. CONSULT APPROVED SHOP DRAWINGS FOR EQUIPMENT SIZES AND REQUIRED SERVICE CLEARANCES. COORDINATE WITH LAYOUT OF EQUIPMENT PADS, PIPING, DUCTWORK, ETC.
14. DO NOT BLOCK TUBE PULL OR EQUIPMENT SERVICE CLEARANCES.
15. MAINTAIN MINIMUM 3'-6" CLEARANCE IN FRONT OF ALL ELECTRICAL PANELS, MOTOR STARTERS, SWITCHES, AND DISCONNECTS.
16. PROVIDE CONCRETE EQUIPMENT PAD FOR ALL FLOOR MOUNTED EQUIPMENT. PAD SHALL EXTEND MINIMUM 6" BEYOND ALL SIDES OF EQUIPMENT.
17. DO NOT SUPPORT EQUIPMENT, PIPING, OR DUCTWORK FROM METAL DECKING OR OTHER NON-STRUCTURAL BUILDING ELEMENTS. ANCHORS EMBEDDED IN CONCRETE SHALL BE CRACKED CONCRETE APPROVED IN ACCORDANCE WITH SPECIFICATIONS.

PIPING GENERAL NOTES:

1. THE SIZE OF BRANCH PIPING TO TERMINAL HEATING DEVICES AND COILS SHALL BE 3/4" UNLESS NOTED OTHERWISE.
2. PIPE DRAIN LINES FROM EQUIPMENT TO NEAREST FLOOR DRAIN.
3. INSTALL ALL REFRIGERANT LIQUID AND SUCTION PIPING SIZED PER EQUIPMENT MANUFACTURER RECOMMENDATIONS.

VENTILATION GENERAL NOTES:

1. THE SIZE OF EACH BRANCH DUCT TO A TERMINAL AIR BOX (TAB) SHALL MATCH THE TAB'S INLET SIZE UNLESS THE BRANCH IS GREATER THAN 6 FEET IN LENGTH, IN WHICH CASE THE BRANCH SHALL BE INCREASED ONE DUCT SIZE, OR NOTED OTHERWISE.
2. ALIGN TEMPERATURE SENSORS WITH LIGHT SWITCHES AND WHEN IN CLOSE PROXIMITY TO EACH OTHER.
3. PROVIDE ACCESS DOORS AT ALL DUCT MOUNTED EQUIPMENT.
4. EXISTING AIR INLET AND OUTLET CFM SHOWN ON DRAWINGS ARE FROM EXISTING DRAWINGS, AND ARE FOR REFERENCE ONLY. CONTRACTOR SHALL USE PRE-BALANCE VALUES, AND NOT EXISTING CFM SHOWN ON DRAWINGS.
5. CONTRACTOR MAY REUSE PORTIONS OF EXISTING DUCT PROVIDED SIZES AND PRESSURE CLASSES ARE CORRECT, DUCT IS THOROUGHLY CLEANED AND FREE OF DEFECTS, AND ALL TRANSVERSE JOINTS, LONGITUDINAL SEAMS, AND DUCT WALL PENETRATIONS ARE SEALED AS SPECIFIED FOR NEW DUCTWORK.
6. CLEAN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK UPSTREAM OF ALL NEW CONNECTIONS PER SPECIFICATION SECTION 23 31 00.

TEMPERATURE CONTROL GENERAL NOTES:

1. REFER TO EQUIPMENT SCHEDULES TO CROSS REFERENCE WHICH CONTROL DIAGRAMS APPLY TO WHICH ITEMS OF EQUIPMENT. REFER TO TERMINAL AIR BOX (TAB) SCHEDULES FOR TEMP SENSOR REQUIREMENTS FOR EACH TAB.
2. EACH D.I., D.O., A.I. AND A.O. POINT SHOWN FOR ALL CONTROL DIAGRAMS SHALL BE DISCRETE FROM ALL OTHER POINTS EXCEPT AS SPECIFICALLY NOTED.
3. ALL WIRING, CONTROL COMPONENTS, DEVICES AND PROGRAMMING SHOWN ON THESE CONTROL DRAWINGS SHALL BE PROVIDED BY THE TCC UNLESS SPECIFICALLY NOTED OTHERWISE.

MECHANICAL RENOVATION NOTES:

1. EXISTING CONDITIONS ARE SHOWN BASED ON INFORMATION OBTAINED FROM FIELD SURVEYS, EXISTING BUILDING DOCUMENTS, AND STAFF. VERIFY EXISTING CONDITIONS AND REPORT ANY CONFLICTS BEFORE PROCEEDING.
2. NOT ALL EXISTING DUCTWORK AND PIPING IS SHOWN. VERIFY EXISTING CONDITIONS BEFORE STARTING WORK. NOTIFY ENGINEER OF ANY CONFLICTS WITH NEW WORK.
3. FIELD VERIFY THE AVAILABLE CLEARANCES FOR DUCTWORK AND PIPING BEFORE FABRICATION. RISES AND DROPS MAY BE NECESSARY BECAUSE OF EXISTING FIELD CONDITIONS.
4. EACH CONTRACTOR SHALL FIELD VERIFY ACCESSIBILITY TO THE AREA OF THEIR WORK AND SHALL NOTIFY THE CONSTRUCTION MANAGER PRIOR TO BIDDING IF OTHER UTILITIES ARE REQUIRED TO BE REMOVED OR RELOCATED TO ALLOW ACCESS TO THEIR AREA OF WORK.
5. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR CUTTING, REMOVAL AND PATCHING OF ROOFS, WALLS, AND FLOORS ASSOCIATED WITH WORK BY ALL CONTRACTORS. CONTRACTORS SHALL NOTIFY THE GC OF AFFECTED AREAS PRIOR TO BIDDING.
6. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR REMOVAL AND REPLACEMENT OF CEILINGS, CEILING TILES, AND CEILING GRIDS ASSOCIATED WITH AREAS OF WORK BY ALL CONTRACTORS. NOTIFY THE GENERAL CONTRACTOR OF AFFECTED AREAS PRIOR TO BIDDING.
7. WHERE EXISTING MECHANICAL SYSTEMS ARE LOCATED IN AREAS THAT CONFLICT WITH NEW EQUIPMENT, PIPING, OR DUCTWORK TO BE INSTALLED, EACH CONTRACTOR SHALL EITHER ARRANGE NEW EQUIPMENT, PIPING, OR DUCTWORK IN SUCH A FASHION THAT IT DOES NOT CONFLICT WITH EXISTING SYSTEMS, OR REWORK EXISTING MECHANICAL SYSTEMS TO ALLOW FOR INSTALLATION OF NEW EQUIPMENT, PIPING, OR DUCTWORK.
8. PROVIDE TEMPORARY CONNECTIONS TO MAINTAIN EXISTING SYSTEMS IN SERVICE DURING CONSTRUCTION. MAINTAIN ACCESS TO EXISTING MECHANICAL INSTALLATIONS THAT REMAIN ACTIVE.
9. OBTAIN PERMISSION FROM OWNER BEFORE SHUTTING DOWN ANY SYSTEM FOR ANY REASON. MAINTAIN SERVICE TO ALL COMPONENTS THAT ARE TO REMAIN UNTIL NEW SYSTEMS ARE INSTALLED.
10. MAINTAIN EXISTING SYSTEM IN SERVICE UNTIL NEW SYSTEM IS COMPLETE AND READY FOR TIE IN AND SWITCHOVER. DRAIN SYSTEM ONLY TO MAKE SWITCHOVERS AND CONNECTIONS. OBTAIN PERMISSION FROM OWNER BEFORE PARTIALLY OR COMPLETELY DRAINING SYSTEM. MAKE CHANGEOVER TO NEW SYSTEMS WITH MINIMUM OUTAGE.
11. DISCONNECT AND REMOVE MECHANICAL DEVICES AND EQUIPMENT SERVING EQUIPMENT THAT HAS BEEN REMOVED.

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MECHANICAL, PLUMBING AND FIRE PROTECTION COVER SHEET

ISSUE FOR PERMIT AND BIDDING

PROJECT	012.23
DATE	11.13.23
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NO.	DESCRIPTION	DATE

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KEYNOTES (X)

001 EXISTING FAN COIL, LOUVER, PIPING PACKAGE, AND ALL ASSOCIATED COMPONENTS TO BE REMOVED. SALVAGE EXISTING CONTROLS.

002 EXISTING HEATING COIL, ISOLATION VALVES, CONTROL VALES, BALANCING VALVES, STRAINERS, UNIONS, VENTS, PORTS, AND ALL ASSOCIATED COMPONENTS TO BE REMOVED. SALVAGE EXISTING CONTROLS.

003 EXISTING HEATING COIL TO BE RELOCATED. REFER TO NEW DRAWINGS FOR NEW LOCATION.

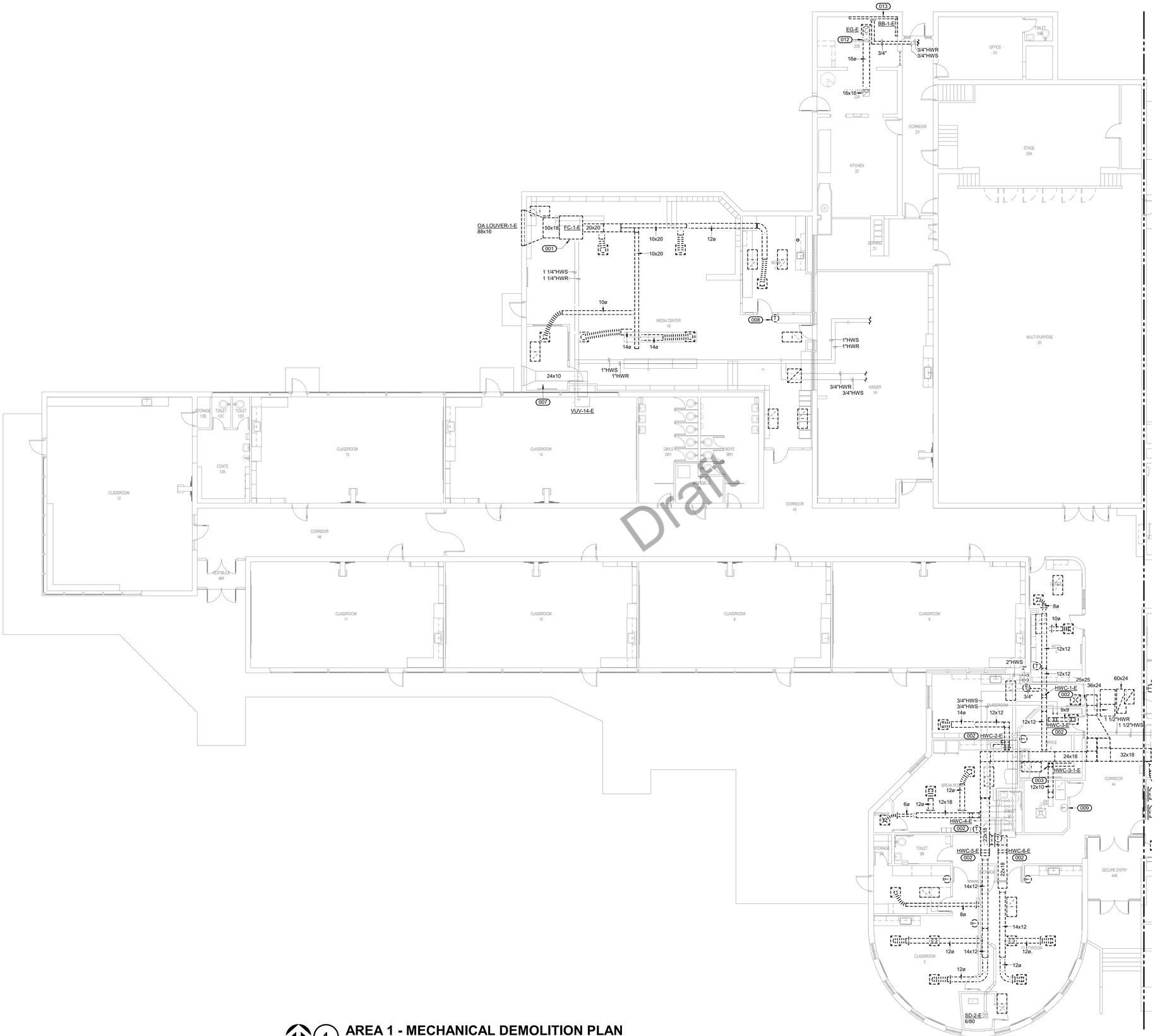
007 EXISTING LOUVER AND DUCTWORK FOR VUV-14-E TO REMAIN.

008 REMOVE EXISTING TEMPERATURE SENSOR. TYPICAL.

009 EXISTING TEMPERATURE SENSOR TO REMAIN.

012 REMOVE EXISTING EXHAUST GRILLE AND SECTION OF 16" ROUND EXHAUST DUCTWORK AND RELOCATE TO ROOM SOUTH. CONFIRM EXISTING T-SAT LOCATION AND RELOCATE TO ROOM SOUTH. REFER TO NEW DRAWINGS FOR MORE INFORMATION.

013 REMOVE EXISTING BASEBOARD HEATING. CAP AND SEAL PIPING IN CORRIDOR CEILING SPACE WITH ISOLATION VALVES.



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1 **AREA 1 - MECHANICAL DEMOLITION PLAN**
1/8" = 1'-0"

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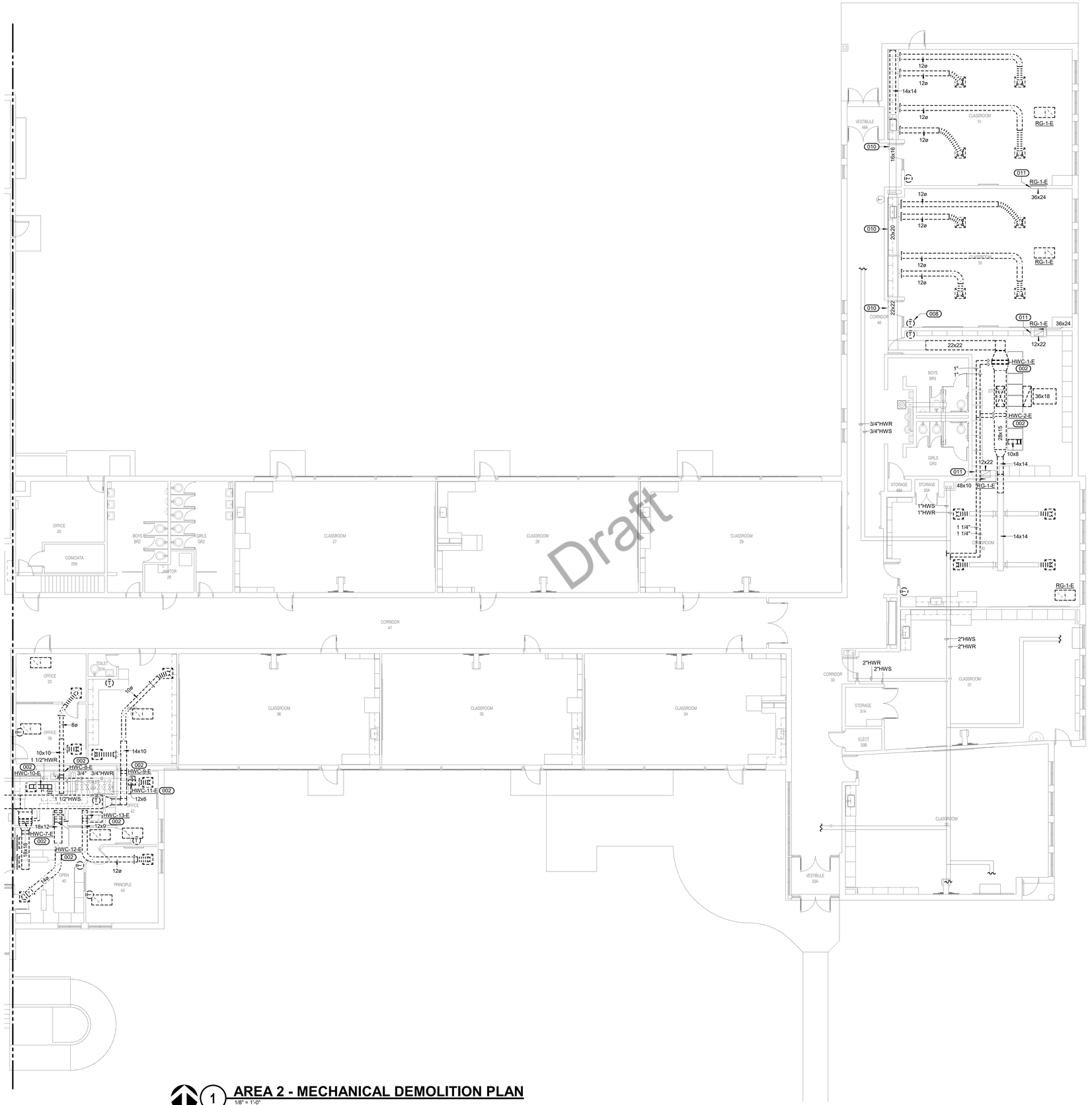

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KEYNOTES (X)

002	EXISTING HEATING COIL, ISOLATION VALVES, CONTROL VALES, BALANCING VALVES, STRAINERS, UNIONS, VENTS, PORTS, AND ALL ASSOCIATED COMPONENTS TO BE REMOVED. SALVAGE EXISTING CONTROLS.
008	REMOVE EXISTING TEMPERATURE SENSOR. TYPICAL.
010	EXISTING DUCTWORK IN SOFFIT TO REMAIN.
011	EXISTING RETURN GRILLES AND DUCT TO REMAIN.

1 **AREA 2 - MECHANICAL DEMOLITION PLAN**
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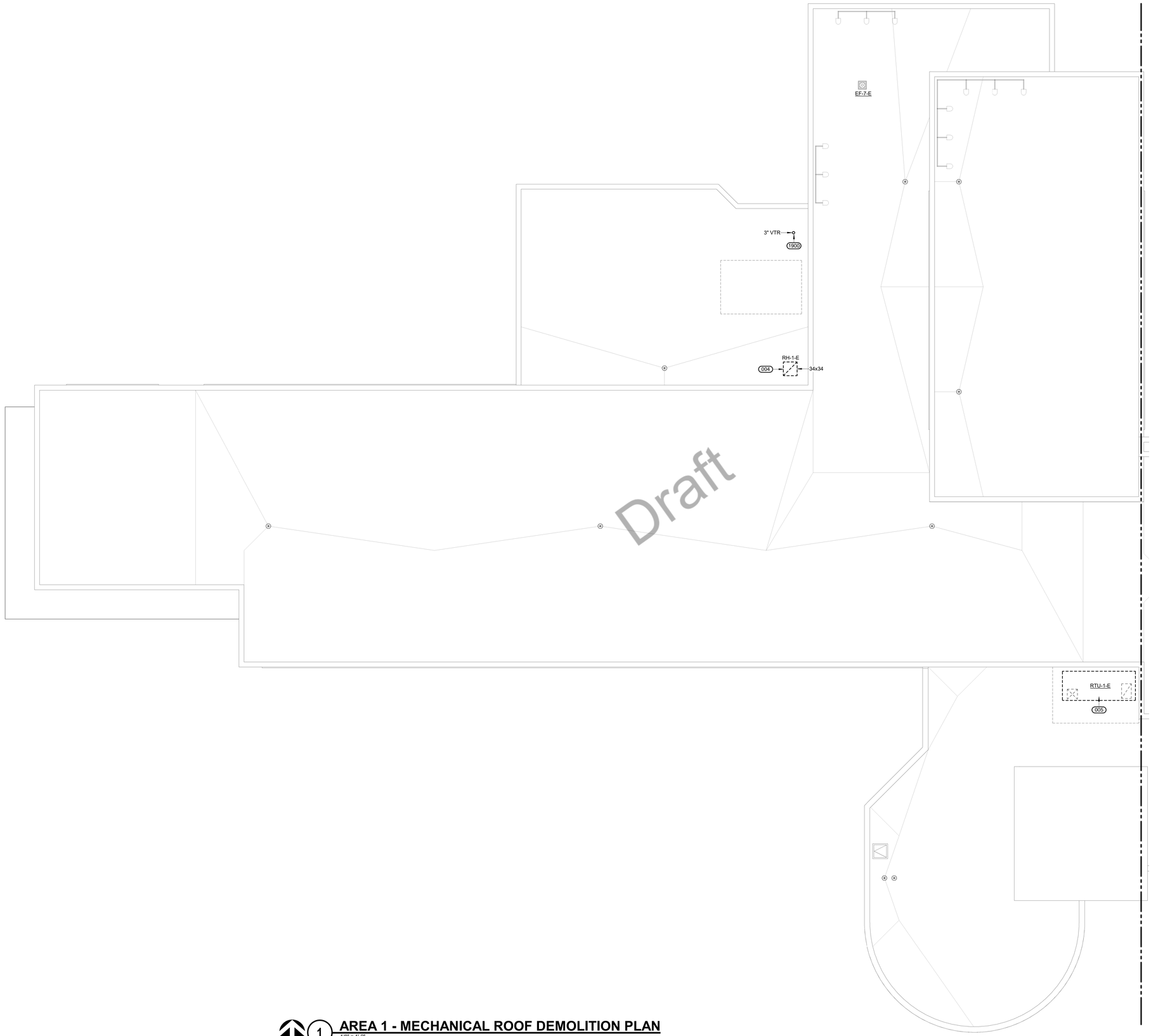
KEYNOTES (X)

004	ALL ASSOCIATED EXISTING RELIEF HOOD COMPONENTS TO BE REMOVED. PATCH ROOF TO MATCH EXISTING.
005	EXISTING ROOFTOP UNIT, CURB, PIPING PACKAGE, AND ALL ASSOCIATED COMPONENTS TO BE REMOVED. SALVAGE EXISTING CONTROLS.
1900	MOVE EXISTING 3" PLUMBING VENT. NEW VENT LOCATION TO BE 15' FROM THE UNIT INTAKE. PATCH ROOF TO MATCH EXISTING.



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NORTH 1 **AREA 1 - MECHANICAL ROOF DEMOLITION PLAN**
1/8" = 1'-0"

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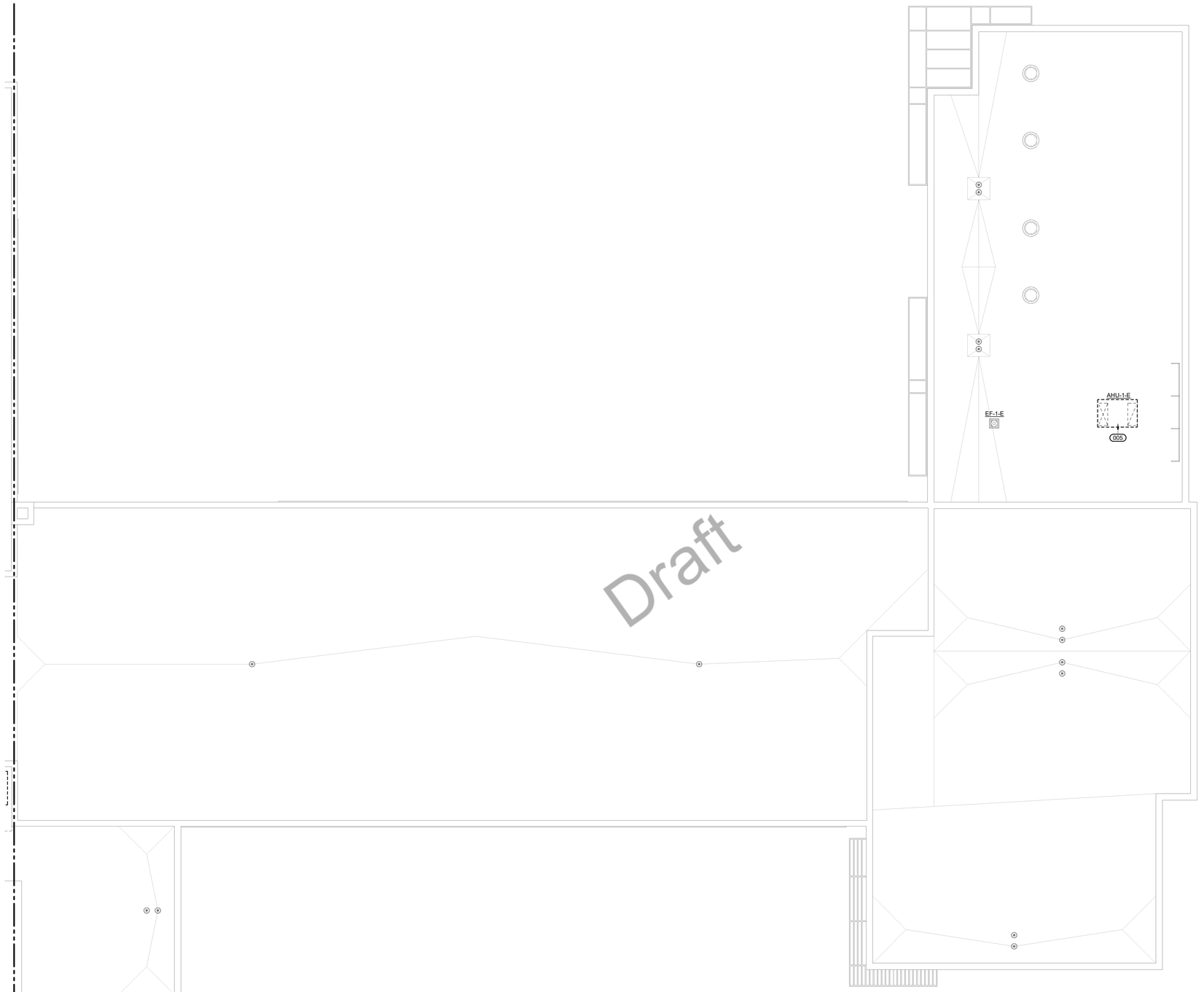
KEYNOTES (X)

005 EXISTING ROOFTOP UNIT, CURB, PIPING PACKAGE, AND ALL ASSOCIATED COMPONENTS TO BE REMOVED. SALVAGE EXISTING CONTROLS.



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1 AREA 2 - MECHANICAL ROOF DEMOLITION PLAN
1/8" = 1'-0"

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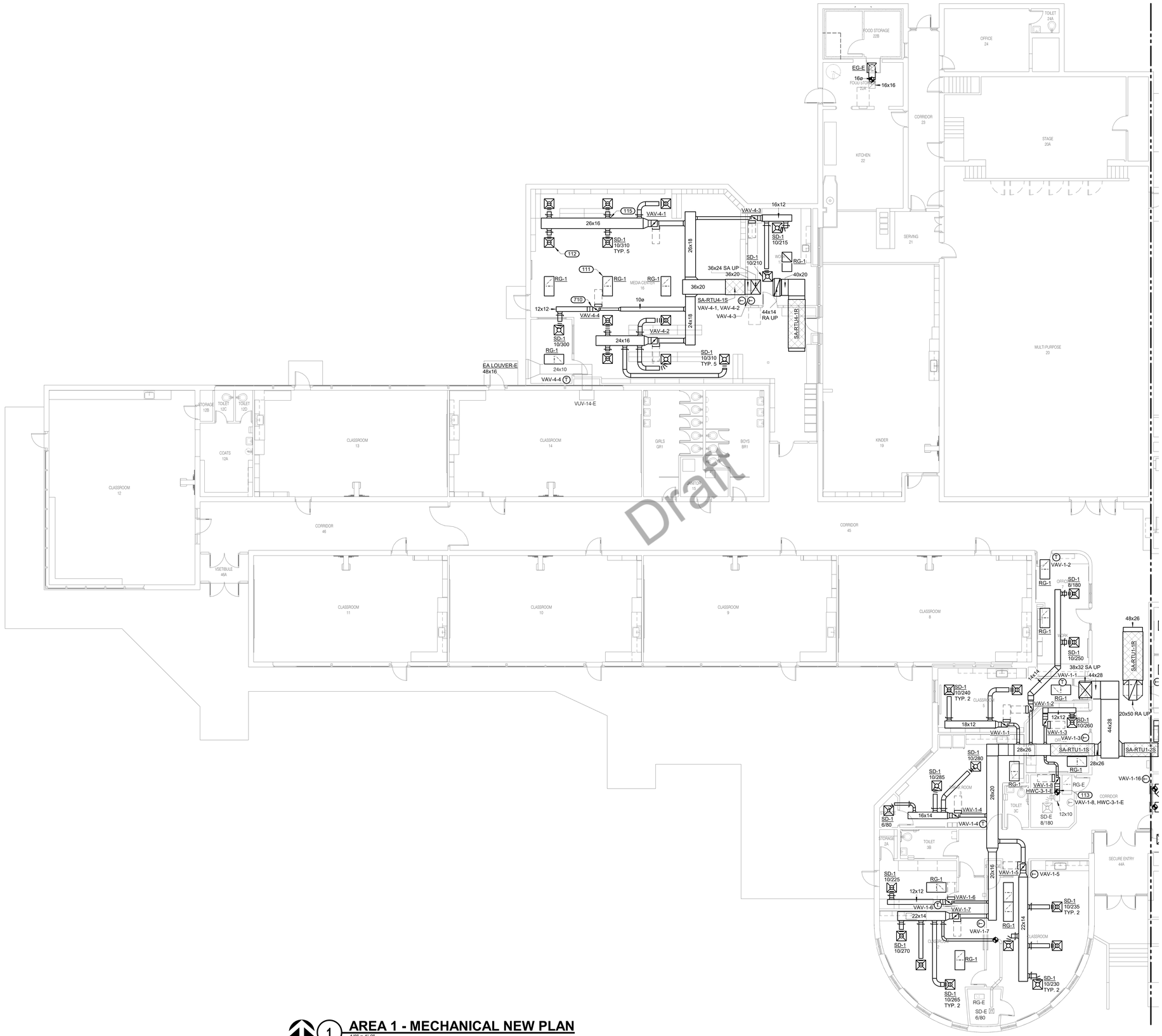
KEYNOTES (X)

111	REFER TO RETURN AIR GRILLE WITH SOUND BOOT DETAIL. TYPICAL.
112	REFER TO DIFFUSER CONNECTION DETAIL. TYPICAL.
113	RE-INSTALL EXISTING HEATING COIL AND RELOCATE/EXTEND EXISTING PIPING PACKAGE TO MEET NEW LOCATION.
115	REFER TO ROUND DUCT TAKE OFF DETAIL. TYPICAL.
710	VAV-#-#, VARIABLE VOLUME BOX. REFER TO SCHEDULE AND 3-WAY/2-WAY PIPING DETAILS FOR MORE INFORMATION. TYPICAL.



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1 AREA 1 - MECHANICAL NEW PLAN

1/8" = 1'-0"

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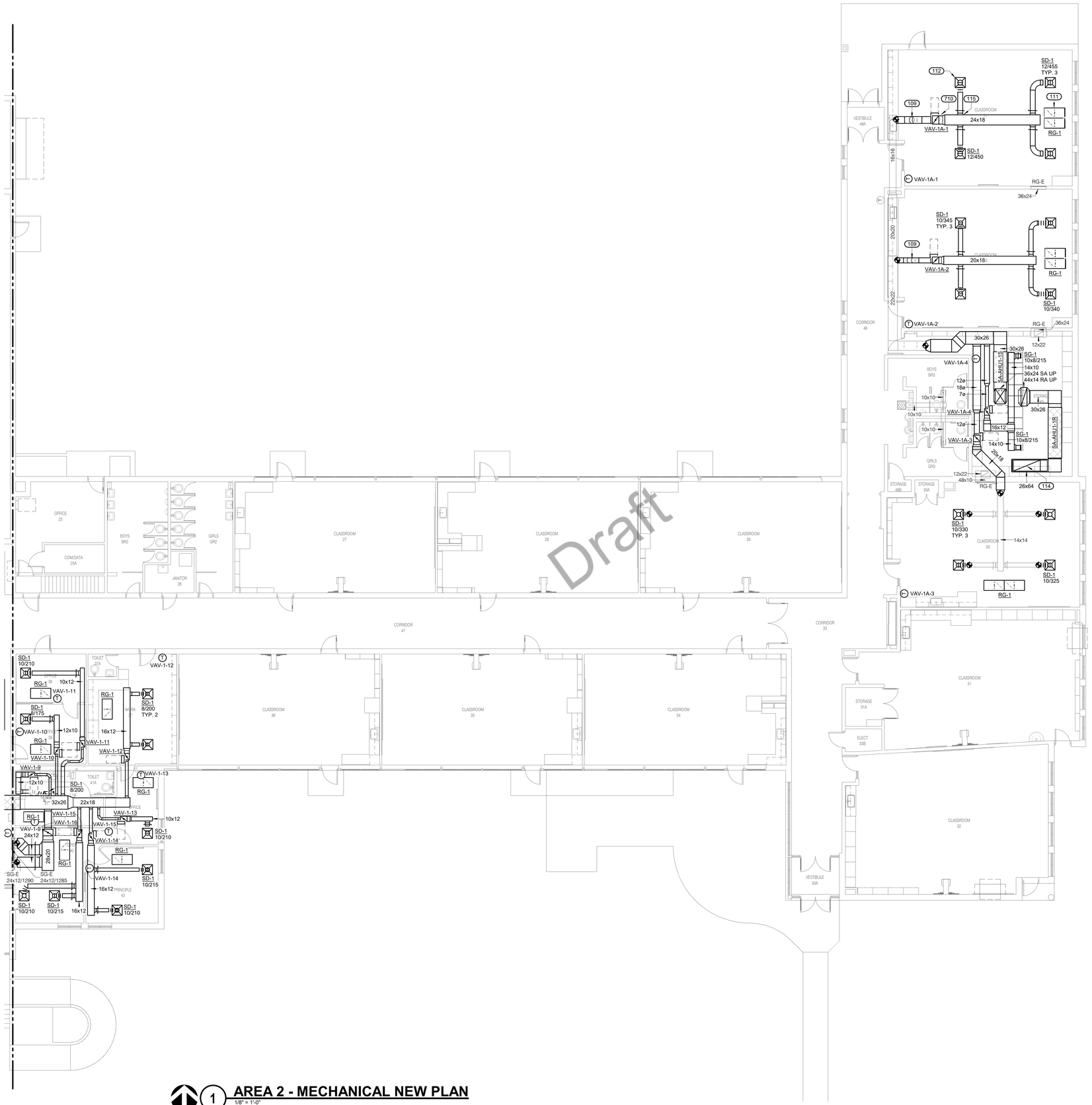

KEYNOTES (X)

109	OFFSET VAV INLET DUCTWORK OVER EXISTING STORM PIPING.
111	REFER TO RETURN AIR GRILLE WITH SOUND BOOT DETAIL. TYPICAL.
112	REFER TO DIFFUSER CONNECTION DETAIL. TYPICAL.
114	PROVIDE A 26x64 OPENING ON THE TOP OF THE RETURN DUCT AND CAP OPEN END.
115	REFER TO ROUND DUCT TAKE OFF DETAIL. TYPICAL.
710	VAV-#-#, VARIABLE VOLUME BOX. REFER TO SCHEDULE AND 3-WAY/2-WAY PIPING DETAILS FOR MORE INFORMATION. TYPICAL.

1 AREA 2 - MECHANICAL NEW PLAN
1/8" = 1'-0"

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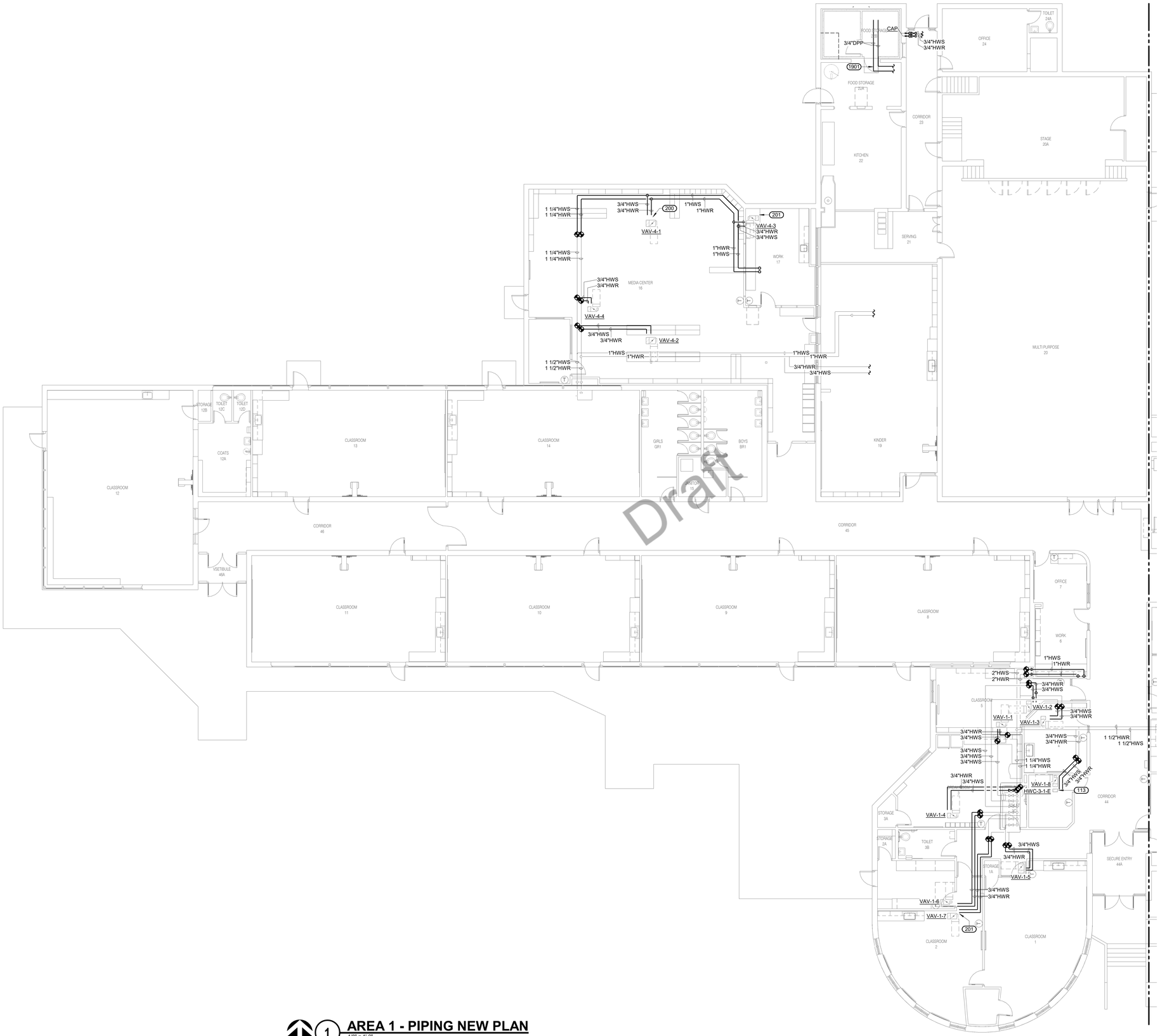
KEYNOTES (X)

113	RE-INSTALL EXISTING HEATING COIL AND RELOCATE/EXTEND EXISTING PIPING PACKAGE TO MEET NEW LOCATION.
200	PROVIDE EQUIPMENT PIPING CONNECTIONS PER 2-WAY COIL DETAIL. TYPICAL UNLESS OTHERWISE NOTED.
201	PROVIDE EQUIPMENT PIPING CONNECTIONS PER 3-WAY COIL DETAIL.
1901	PROVIDE 3/4" DRAIN PIPING TO FREEZER AND COOLER. ROUTE TO NEAREST FLOOR SINK IN KITCHEN. PROVIDE HEAT TRACE FOR PIPING WITHIN THE FREEZER. RAYCHEM BTV AT 5 W/LF WITH THERMOSTAT CONTROL OR APPROVED EQUAL.



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1 AREA 1 - PIPING NEW PLAN

1/8" = 1'-0"

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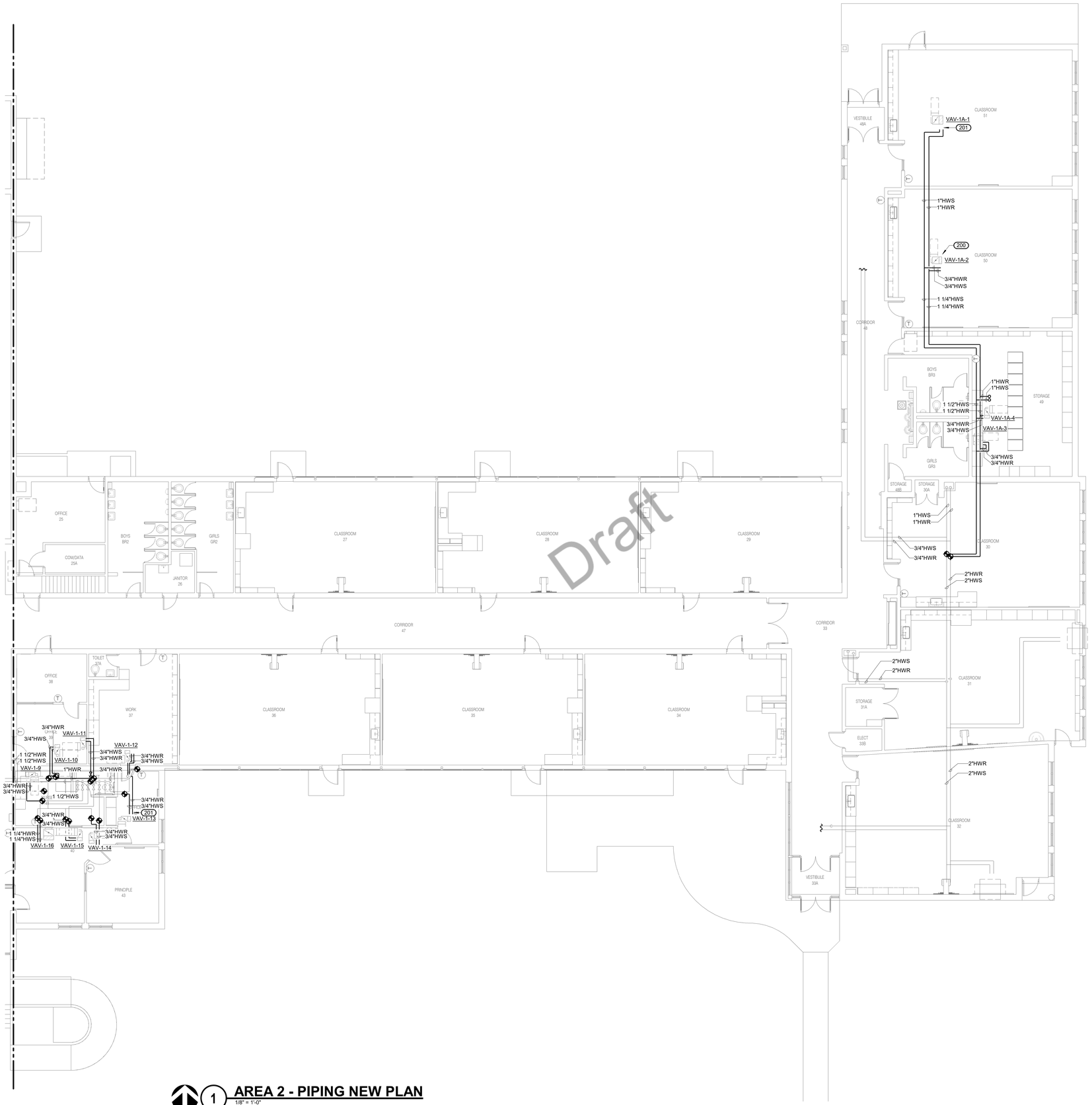
KEYNOTES (X)

200 PROVIDE EQUIPMENT PIPING CONNECTIONS PER 2-WAY COIL DETAIL. TYPICAL UNLESS OTHERWISE NOTED.

201 PROVIDE EQUIPMENT PIPING CONNECTIONS PER 3-WAY COIL DETAIL.



1 AREA 2 - PIPING NEW PLAN

1/8" = 1'-0"

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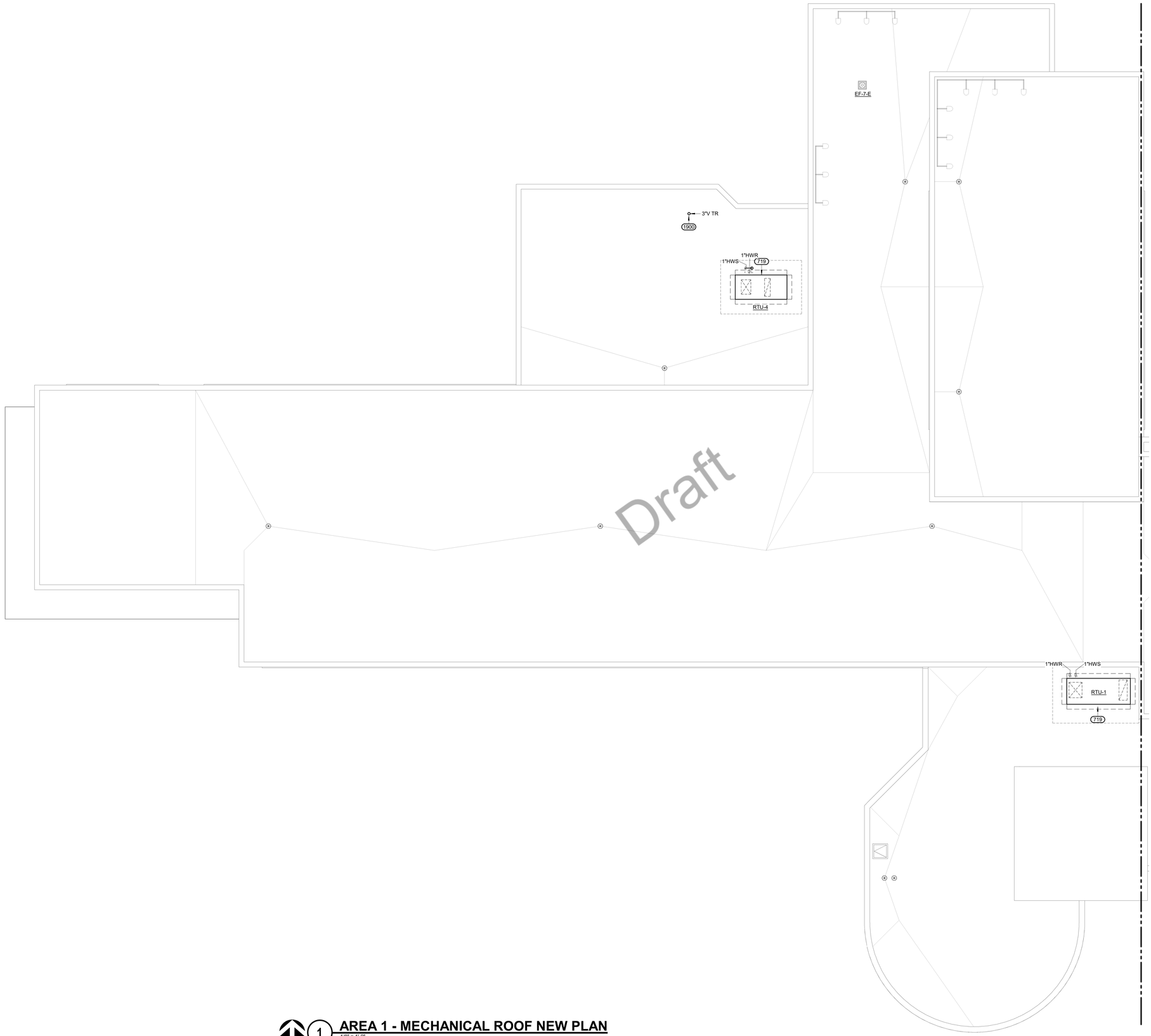
KEYNOTES (X)

719 RTU-#/AHU-#. NEW ROOF TOP UNIT. REFER TO SCHEDULE. PROVIDE WITH NEW 24" ROOF CURB THAT ADAPTS TO EXISTING OPENINGS FOR ALL LOCATIONS WHERE THE UNIT IS REPLACING AN EXISTING UNIT.

1900 MOVE EXISTING 3" PLUMBING VENT. NEW VENT LOCATION TO BE 15' FROM THE UNIT INTAKE. PATCH ROOF TO MATCH EXISTING.



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AREA 1 - MECHANICAL ROOF NEW PLAN

1/8" = 1'-0"

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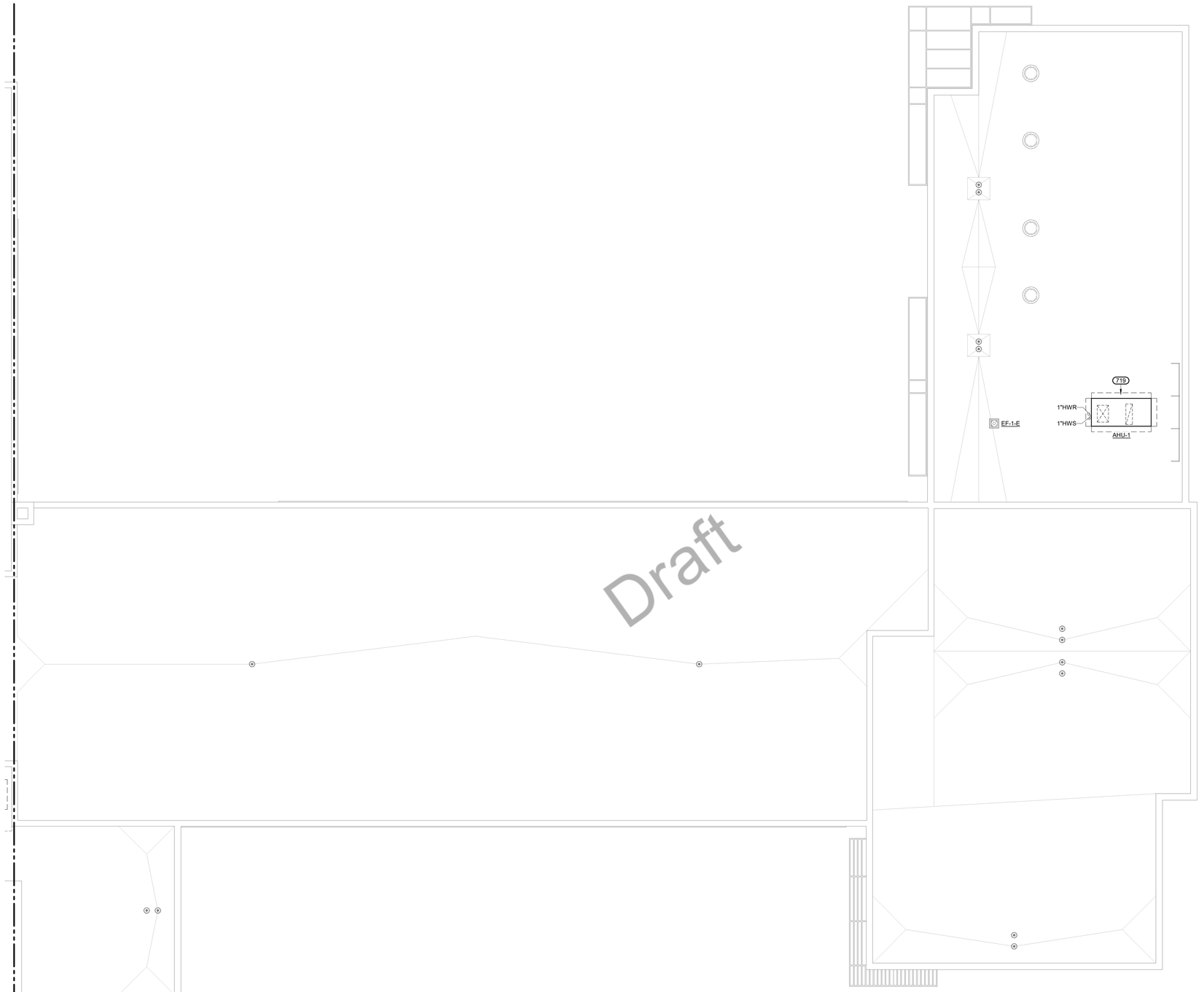

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REF. SCALE IN INCHES PROJECT #230005385.00

AIR HANDLING SCHEDULE

NOTES:
1.PROVIDE SHAFT GROUNDING AS REQUIRED IN THE MOTOR SPECIFICATION ----23 05 13.
2.PROVIDE UNIT WITH 24" ADAPT IN PLACE CURB TO MATCH EXISTING UNIT OPENINGS.
3. UNIT HEATING COIL IS SIZED FOR MORNING WARM UP.

					SUPPLY FAN (NOTE 1)						EXHAUST FAN (NOTE 1)						ELECTRICAL							HEATING COIL - 30% PG							
TAG NAME	AREA SERVED	COOLING CFM	HEATING CFM	OUTSIDE AIR CFM	NO. OF FANS	CFM TOTAL	EXT. S.P.	RPM (NOTE D)	BHP EACH(NOTE E)	MHP EACH (NOTE E)	NO. OF FANS	CFM TOTAL	EXT. S.P.	RPM (NOTE D)	BHP EACH(NOTE E)	MHP EACH (NOTE E)	NO. OF POWER CONNECTIONS	VOLTAGE	PHASES	DISCONNECT(S) BY (NOTE A)	DISCONNECT(S) TYPE (NOTE B)	CONTROLLER STARTER(S) BY (NOTE A)	CONTROLLER STARTER(S) TYPE (NOTE C)	SCCR	EAT °F	LAT °F	EWT °F	LWT °F	GPM	MBH	MAX. A.P.D. IN. W.C.	W.P.D. FEET HEAD
AHU-1	CLASSROOMS	4935	4,565	2000	1	4935	1.3	1915	4.1	5	1	4935	0.8	1704	2.3	3	1	460	3	EC	F	MFR	VFD	5000	59.0	77.0	180	160	6.0	83	0.2	1.0
RTU-1	ADMIN	8650	6,905	2000	1	8650	1.5	1863	9.9	10	1	8650	1.0	1945	7.7	10	1	460	3	EC	F	MFR	VFD	5000	68.0	80.0	180	160	8.7	95	0.3	1.0
RTU-4	MEDIA CENTER	3825	2,435	675	1	3825	1.3	2137	3.1	5	1	3825	0.8	1405	1.3	2	1	460	3	EC	F	MFR	VFD	5000	66.0	91.0	180	160	6.0	55	0.1	1.0

AIR HANDLING SCHEDULE - CONT.

	DX COOLING COIL							FILTER				MAX. DIMENSIONS			WEIGHT			
								PRE-FILTER	FINAL-FILTER	PRESSURE DROP								
TAG NAME	EAT DB °F	EAT WB °F	LAT DB °F	LAT WB °F	AMB TEMP. °F	TOTAL MBH	SENSIBLE MBH	TYPE	TYPE	DIRTY	CLEAN	LENGTH	WIDTH	HEIGHT	OPERATING	MANUFACTURER	MODEL	NOTES
AHU-1	77.0	58.0	52.0	52.0	95	135	109.0	MERV 8	MERV 13	0.4	0.3	128	60	51	2500	AAON	RN-011	1,2,3
RTU-1	76.0	59.0	51.0	51.0	95	215	190.0	MERV 8	MERV 13	0.4	0.3	157	60	60	4000	AAON	RN-018	1,2,3
RTU-4	76.0	59.0	51.0	49.0	95	99	84.0	MERV 8	MERV 13	0.4	0.3	128	60	51	2500	AAON	RN-009	1,3

HEAT RECOVERY WHEEL SCHEDULE

NOTES:
1.HEAT RECOVERY WHEEL IS INTERGRAL TO UNIT

				SUMMER CONDITIONS						WINTER CONDITIONS								ELECTRICAL				
				OA TEMP		RA TEMP		TEMPERED AIR TEMP		HEAT RECOVERED	OA TEMP		RA TEMP		TEMPERED AIR TEMP		HEAT RECOVERED	TOTAL EFFECTIVENESS	MAXIMUM AIR PRESSURE DROP (IN W.C.)	MOTOR (HP)	VOLTAGE	PHASES	STARTER TYPE (NOTE 1)	NOTES
TAG NAME	AREA SERVED	OA CFM	EA CFM	°F DB	°F WB	°F DB	°F WB	°F DB	°F WB	MBH	°F DB	°F WB	°F DB	°F WB	°F DB	°F WB	MBH							
AHU-1	CLASSROOMS	2000	2000	95.0	61.0	75.0	62.0	77.0	58.0	26	-10.0	-10.0	70.0	62.0	59.0	46.0	98	75	0.7	460	3	1	VFD	1
RTU-1	ADMIN	2000	2000	95.0	61.0	75.0	62.0	76.0	59.0	27	-10.0	-10.0	70.0	62.0	65.0	51.0	113	84	0.4	460	3	1	VFD	1
RTU-4	MEDIA CENTER	675	675	95.0	61.0	75.0	62.0	76.0	59.0	10	-10.0	-10.0	70.0	62.0	66.0	52.0	39	85	0.3	460	3	1	VFD	1

DUCT SILENCER SCHEDULE

NOTES:
1.PRESSURE DROP VALUES LISTED ARE PER ASTM E477-99 TEST PROCEDURE AND DO NOT INCLUDE SYSTEM EFFECTS.
2.SILENCER SHALL BE CONSTRUCTED TO KEEP THE BREAKOUT NOISE CONTRIBUTION TO THE AFFECTED ROOM BELOW 40 Dba. SILENCER SHALL BE FACTORY MANUFACTURED AND ALL EXPOSED SURFACES SHALL BE SHEETMETAL (EXCEPT FOR SPECIFIED EXTERNAL DUCT INSULATION FOR UNITS THAT DO REQUIRE DUAL-WALL CONSTRUCTION.)

					ACOUSTICAL PERFORMANCE AT +1000 FPM																DIMENSIONS (INCHES)						
					MINIMUM DYNAMIC INSERTION LOSS IN DB								MAXIMUM ALLOWABLE GENERATED NOISE IN DB RE 10^{-12} WATTS														
					OCTAVE BAND CENTER FREQUENCY								OCTAVE BAND CENTER FREQUENCY														
TAG NAME	AREA SERVED	CFM	VELOCITY	MAX. S.P. DROP IN. W.C. (NOTE 1)	63	125	250	500	1000	2000	4000	8000	63	125	250	500	1000	2000	4000	8000	LENGTH	WIDTH	HEIGHT	WEIGHT	MANUFACTURER	MODEL	NOTES
SA-AHU1-1R	CLASSROOMS	4935	911	0.21	21	34	42	55	52	33	22	16	42	20	23	37	42	40	39	30	120	30	26	325	PRICE	RMX120/XF	1, 2
SA-AHU1-1S	CLASSROOMS	4935	911	0.11	8	14	22	33	29	22	14	11	46	32	23	34	36	31	26	22	72	30	26	175	PRICE	RM72/9D	1, 2
SA-RTU1-1R	ADMIN	8650	998	0.29	22	35	49	55	55	42	26	19	50	27	30	42	47	47	47	39	120	48	26	525	PRICE	RMX120/9F	1, 2
SA-RTU1-1S	ADMIN	4030	797	0.10	12	19	33	48	41	29	19	14	42	27	17	30	33	28	21	17	108	28	26	250	PRICE	RM108/8D	1, 2
SA-RTU1-2S	ADMIN	4620	800	0.14	10	16	25	38	30	22	15	11	47	28	32	38	38	36	29	22	84	32	26	225	PRICE	RL84/UD	1, 2
SA-RTU4-1R	MEDIA CENTER	3825	689	0.24	21	34	42	55	52	33	22	16	42	20	23	37	41	41	40	31	120	40	20	275	PRICE	RM120/XF	1, 2
SA-RTU4-1S	MEDIA CENTER	3825	765	0.10	7	12	16	25	20	14	11	9	45	31	22	33	35	31	25	21	48	36	20	100	PRICE	RM48/WE	1, 2

SCHEDULE GENERAL NOTES:

A. DISCONNECT AND CONTROLLER STARTER FURNISHED AND INSTALLED BY:
MFR = MANUFACTURER
EC = ELECTRICAL CONTRACTOR
MC = FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED BY ELECTRICAL CONTRACTOR
MFR/EC = FURNISHED LOOSE BY MANUFACTURER INSTALLED BY ELECTRICAL CONTRACTOR
ATC = AUTOMATIC TEMPERATURE CONTROL CONTRACTOR

B. DISCONNECT TYPE:
CB = CIRCUIT BREAKER
F = FUSED
NF = NON-FUSED

C. CONTROLLER STARTER TYPE:
FV = FULL VOLTAGE
WYE = WYE-DELTA
SS = SOLID STATE (SOFT START)
MS = MANUAL STARTER
VFD = VARIABLE FREQUENCY DRIVE
VFD/B = VARIABLE FREQUENCY DRIVE WITH BYPASS
YD = WYE - DELTA

D. FAN RPM SHALL NOT EXCEED 110% OF SCHEDULED VALUE, WITH THE SCHEDULED WHEEL TYPE. SUBSTITUTION OF BI OR BIA FANS FOR FC IS ACCEPTABLE IF EFFICIENCY IS NOT LOWER.

E. NO EQUIPMENT SHALL BE SELECTED ABOVE 90% OF MOTOR NAME PLATE RATING.

F. MUST BE WITHIN +/- 10% OF SCHEDULED RPM.

G. CURB TYPE:
MFR = STANDARD CURB BY MANUFACTURER
GC = BY GENERAL CONTRACTOR
SAC = SOUND ATTENUATOR CURB

Draft

TERMINAL AIR BOX SCHEDULE - SINGLE DUCT

NOTES:
1.NEITHER RADIATED NOR DISCHARGE SOUND LEVELS SHALL EXCEED NC 35 AT 1.5" INLET STATIC PRESSURE WHEN TESTED PER AHRI STANDARD 885-2008 USING 5/8" 20-LB DENSITY MINERAL FIBER CEILING TILE.
2.TOTAL AIR PRESSURE DROP OF TAB AND REHEAT COIL SHALL NOT EXCEED 0.50" WC.
3.REFER TO CONTROL DRAWINGS FOR DESCRIPTION OF CONTROL TYPE.
4.SENSOR TYPES: 1 - SENSOR ONLY, 2 - SENSOR WITH ADJUSTMENT, 3 - SENSOR WITH OVERRIDE, 4 - SENSOR WITH ADJUSTMENT AND OVERRIDE.
5.HEATING COIL IS BASED ON HEATING AIR FLOW. WATER PRESSURE DROP OF REHEAT COILS SHALL NOT EXCEED 5'. PROVIDE REHEAT COILS SEPARATE FROM BOXES IF REQUIRED TO MEET WATER PRESSURE DROP REQUIREMENTS. WHEN LAT °F, EWT °F, AND GPM VALUES ARE BLANK, HEATING COIL IS NOT REQUIRED FOR TAB.
6.HEATING COIL SELECTION SHALL BE BASED ON A FIXED LEAVING AIR TEMPERATURE AND VARIABLE LWT. GPM SHALL REMAIN FIXED AT THE MAXIMUM AS SCHEDULED.

		CFM			HEATING COIL (NOTES 5, 6)								
TAG NAME	AREA SERVED	COOLING MAX.	HEATING MAX.	MIN.	EAT °F	LAT °F	EWT °F	MAX. GPM	MIN. INLET SIZE (IN.) DIA.	CONTROL TYPE (NOTE 3)	MANUFACTURER	MODEL (NOTES 1, 2)	NOTES
VAV-1-1	CLASSROOM 5	480	350	95	55.0	95.0	180	1.1	7"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-2	WORK ROOM 7 AND 6	430	120	95	55.0	95.0	180	1.0	7"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-3	OFFICE 4	260	100	65	55.0	95.0	180	0.5	6"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-4	BREAK ROOM 3	645	575	125	55.0	95.0	180	1.8	8"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-5	CLASSROOM 1	930	850	210	55.0	95.0	180	2.6	10"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-6	STAFF 2A	225	225	60	55.0	95.0	180	0.7	5"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-7	CLASSROOM 2	880	870	210	55.0	95.0	180	2.8	10"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-8	SMALL GROUP 4A	180	130	60	55.0	95.0	180	0.0	5"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-9	NURSE 41	200	65	60	55.0	95.0	180	0.5	5"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-10	OFFICE 39	175	100	60	55.0	95.0	180	0.5	5"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-11	OFFICE 38	210	60	60	55.0	95.0	180	0.5	5"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-12	WORK 37	400	300	95	55.0	95.0	180	0.9	7"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-13	WORK ROOM 42	210	210	60	55.0	95.0	180	0.6	5"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-14	PRINCIPLE 43	425	600	95	55.0	95.0	180	1.8	7"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-15	OPEN 40	425	350	95	55.0	95.0	180	1.1	7"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1-16	CORRIDOR 44	2575	2000	575	55.0	95.0	180	6.1	16"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1A-1	CLASSROOM 51	1815	1775	575	55.0	95.0	180	5.4	16"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1A-2	CLASSROOM 50	1375	1100	300	55.0	95.0	180	3.3	12"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1A-3	CLASSROOM 30	1315	1000	300	55.0	95.0	180	3.0	12"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-1A-4	STORAGE 49	430	690	95	55.0	95.0	180	2.1	7"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-4-1	MEDIA CENTER 16	1550	925	300	55.0	95.0	180	2.8	12"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-4-2	MEDIA CENTER 16	1550	925	300	55.0	95.0	180	2.8	12"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-4-3	WORK ROOM 17	425	330	95	55.0	95.0	180	1.0	7"	FMCS	PRICE	SDV	NOTES 1, 2
VAV-4-4	SMALL GROUP 16A	300	255	65	55.0	95.0	180	0.8	6"	FMCS	PRICE	SDV	NOTES 1, 2

AIR TERMINAL SCHEDULE

NOTES:
1.CONTRACTOR SHALL DETERMINE PROPER BORDER TYPE TO MATCH CEILING CONSTRUCTION.
2.REFER TO DRAWINGS FOR NECK SIZE. ALL BRANCH DUCTWORK TO AIR TERMINALS SHALL BE NECK SIZE UNLESS NOTED OTHERWISE.

TAG NAME	FACE SIZE (IN.) (NOTE 2)	TYPE	BORDER (NOTE 1)	MATERIAL	FINISH	VOLUME DAMPER REQUIRED	MANUFACTURER	MODEL	NOTES
RG-1	24x24	PERFORATED	LAY-IN	STEEL	WHITE	NO	PRICE	PDR	1, 2 (WITH BOOT. REFER TO DETAIL.)
SD-1	24x24	LOUVER FACE	LAY-IN	STEEL	WHITE	NO	PRICE	SMD	1, 2
SG-1	SEE DWG.	35 DEGREE DEFLECTION	SURFACE MOUNT	STEEL	WHITE	NO	PRICE	500	2

PIPE INSULATION SCHEDULE (HVAC)

GENERAL NOTES:
1. REFER TO THE SPECIFICATIONS FOR TYPE DESCRIPTIONS AND JACKETING REQUIREMENTS. VALUES LISTED BELOW ARE BASED ON ASHRAE / IECC REQUIREMENTS.
2. TYPE A INSULATION IS NOT ALLOWED IN NON-AIR CONDITIONED SPACES, SUCH AS MECHANICAL ROOMS, EXTERIOR, ATTICS, ETC.
3. TYPE B INSULATION GREATER THAN 1" THICK SHALL BE INSTALLED USING MULTIPLE LAYERS OF 3/4" OR 1" WITH STAGGERED SEAMS.
4. TYPE E IS NOT ALLOWED IN RETURN AIR PLENUMS, UNLESS LISTED AND LABELED AS 25/50 RATED PER ASTM E84/UL723
5. TYPE G 4" SHALL BE INSTALLED IN TWO (2) 2" LAYERS WITH STAGGERED SEAMS.
6. PROVIDE RIGID INSERT AT HANGERS, EITHER PRE-MANUFACTURED COUPLINGS (REFER TO PIPE HANGER AND SUPPORTS SPECIFICATIONS) OR TYPE C, D, OR E INSULATION. SEE SPEC. FOR MORE DETAILS....

PIPE SYSTEM	INSULATION TYPE	INSULATION THICKNESS PER NOMINAL PIPE OR TUBE SIZE					NOTES
		< 1"	1" TO < 1.5"	1.5" TO < 4"	4" TO < 8"	≥ 8"	
23 PIPING - HEATING							
HWR - HEATING WATER RETURN	A (GlsFbr), C (CelGla), E (Plyiso), F (Phenol)	1.5"	1.5"	2"	2"	2"	
HWS - HEATING WATER SUPPLY	A (GlsFbr), C (CelGla), E (Plyiso), F (Phenol)	1.5"	1.5"	2"	2"	2"	

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MECHANICAL DETAILS, SCHEDULES, AND CONTROLS

PROJECT	012.23
DATE	11.13.23
DRAWN	BRE

NO.	DESCRIPTION	DATE

REVISIONS

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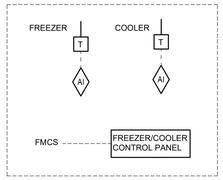
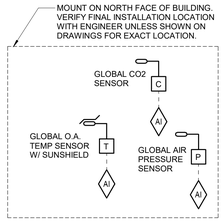


SEQUENCE OF OPERATION:
PROVIDE TEMPERATURE SENSORS FOR FREEZER AND COOLER TEMPERATURE MONITORING.

FMCS TO PROVIDE ALARM IF THE FREEZER OR COOLER RISES OR FALLS 10 DEG. F. (ADJ.) BELOW OR ABOVE SETPOINT.

FMCS TO CONFIRM IF DIRECT INTERGRATION TO FREEZER/COOLER CONTROL PANEL IS AN OPTION AND DIRECTLY INTERGRATE TO MONITOR THE TEMPERATURES AND OMIT THE SENSORS.

7 FREEZER AND COOLER MONITORING
NO SCALE

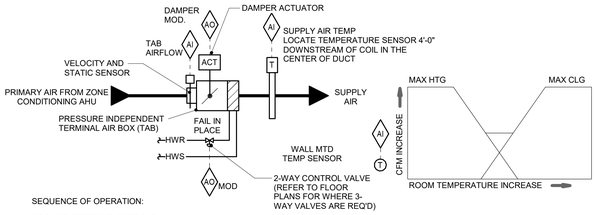


SEQUENCE OF OPERATION:
PROVIDE GLOBAL O.A. DRY-BULB TEMPERATURE, GLOBAL CARBON DIOXIDE, AND OUTSIDE AIR REFERENCE PRESSURE.

OUTSIDE AIR PRESSURE SHALL BE INSTALLED ON ALL FOUR SIDES OF THE BUILDING AND PIPED WITH EQUAL LENGTHS OF 1/4" TUBING TO A PIPE MANIFOLD. PIPING BY TCC. LOCATIONS TO BE DETERMINED PER MANUFACTURER'S RECOMMENDATIONS AND ENGINEER'S APPROVAL. TCC SHALL PRIME AND PAINT THE DEVICE ENCLOSURE.

GLOBAL SENSORS SHALL CONTINUOUSLY UPDATE FMCS FOR USE IN CONTROLLING MECHANICAL EQUIPMENT AS REQUIRED IN SEQUENCES OF OPERATION.

1 GLOBAL REFERENCE POINTS
NO SCALE



SEQUENCE OF OPERATION:

COOLING SETPOINT: 75 DEG. F.
UNOCCUPIED COOLING SETPOINT: 85 DEG. F.
HEATING SETPOINT: 70 DEG. F.
UNOCCUPIED HEATING SETPOINT: 65 DEG. F.

TEMPERATURE CONTROLS CONTRACTOR SHALL PROVIDE CONTROLS VALVES, DISCHARGE AIR TEMPERATURE SENSORS, WIRING AND PROGRAMMING TO ACCOMPLISH THE BELOW SEQUENCE FOR THE VAV CONTROLLERS FOR THE NEW VAV BOXES. IN ALL CASES, NEW VAV BOXES SHALL OPERATE IN CONJUNCTION WITH NEW SPACE TEMPERATURE SENSORS.

OCCUPIED CYCLE
WHEN DUCT PRESSURE IS SENSED, INDICATING THAT THE PRIMARY SYSTEM AIR IS OPERATING, THE PRIMARY AIR VOLUME DAMPER SHALL OPEN AND MODULATE THE PRIMARY AIR TO SATISFY THE OCCUPIED SPACE COOLING SETPOINT.

AS THE ROOM TEMPERATURE SENSOR SENSES A NEED FOR NO COOLING, THE CONTROL SYSTEM SHALL CLOSE THE PRIMARY AIR VOLUME DAMPER DOWN TO THE MINIMUM PRIMARY AIR POSITION.

ON SENSING A NEED FOR HEAT, THE HEATING WATER CONTROL VALVE SHALL BE MODULATED AS REQUIRED TO SATISFY THE SPACE HEATING SETPOINT. DISCHARGE AIR TEMPERATURE SHALL BE LIMITED TO 90 DEG. IF SPACE TEMPERATURE CANNOT BE MET WITH 90 DEG. F AIR, THE AIRFLOW RATE SHALL BE INCREASE UP TO THE SCHEDULED HEATING AIRFLOW RATE. IF THE SPACE TEMPERATURE STILL CANNOT BE MET, THE HEATING VALVE SHALL BE ALLOWED TO MODULATE TO FULL OPEN TO MEET THE SPACE TEMPERATURE SETPOINT. UPON A RISE ABOVE SPACE TEMPERATURE SETPOINT, THE OPPOSITE SEQUENCE SHALL OCCUR.

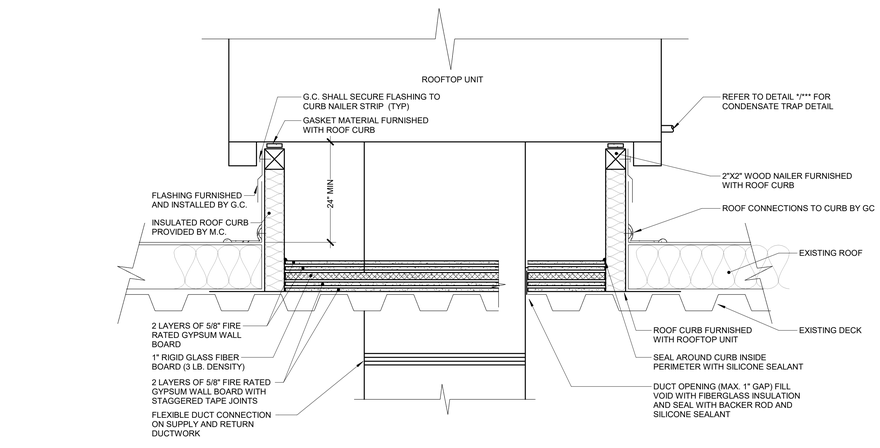
THE HEATING WATER VALVE SHALL BE LOCKED OUT WHEN THE ASSOCIATED ROOFTOP UNIT IS IN COOLING MODE.

UNOCCUPIED CYCLE
THE PRIMARY AIR VOLUME DAMPER SHALL POSITIVELY CLOSE. WHEN DUCT PRESSURE IS SENSED, INDICATING THAT THE PRIMARY SYSTEM AIR IS OPERATING, THE PRIMARY AIR VOLUME DAMPER SHALL OPEN TO THE HEATING CFM AIR POSITION. THE SPACE THERMOSTAT SHALL MODULATE THE HEATING WATER CONTROL VALVE TO MAINTAIN THE UNOCCUPIED SPACE HEATING SETPOINT.

2 SHUTOFF VAV CONTROL DRAWING AND SEQUENCE OF OPERATION
NO SCALE

GENERAL CONTROL NOTES:
1. REFER TO EQUIPMENT SCHEDULES TO CROSS REFERENCE WHICH CONTROL DIAGRAMS APPLY TO WHICH ITEMS OF EQUIPMENT. REFER TO TERMINAL AIR BOX (TAB) SCHEDULES FOR TEMP SENSOR REQUIREMENTS FOR EACH TAB.
2. EACH D.I., D.O., A.I. AND A.O. POINT SHOWN FOR ALL CONTROL DIAGRAMS SHALL BE DISCRETE FROM ALL OTHER POINTS EXCEPT AS SPECIFICALLY NOTED.
3. ALL WIRING, CONTROL COMPONENTS, DEVICES AND PROGRAMMING SHOWN ON THESE CONTROL DRAWINGS SHALL BE PROVIDED BY THE TCC UNLESS SPECIFICALLY NOTED OTHERWISE.
4. ALL ACTUATORS SHALL BE OF THE ELECTRICAL TYPE FOR THIS PROJECT UNLESS AN ACTUATOR IS SPECIFICALLY INDICATED ON THE DRAWINGS OR SPECIFICATIONS TO BE PNEUMATIC.
5. ALL MODULATING DAMPER AND VALVE ACTUATORS SHOWN WITH POSITION FEEDBACK SHALL HAVE THE VALVE POSITION DISPLAYED ON GRAPHICAL SCREEN ADJACENT TO THE DAMPER/VALVE COMMAND SIGNAL. DISPLAYED VALVE POSITION SHALL BE FROM THE FEEDBACK DEVICE/CIRCUIT (OUTPUT SIGNAL FROM THE FMCS TO THE ACTUATOR IS NOT ACCEPTABLE)
6. MODULATING SIGNALS SHALL BE DISPLAYED AS % OPEN (SIGNALS DISPLAYED AS % CLOSED ARE NOT ACCEPTABLE).
7. PRESSURE TRANSMITTERS WHOSE SIGNAL IS UTILIZED FOR MAINTAINING DUCT STATIC PRESSURE SHALL BE WIRED DIRECTLY TO THE CONTROLLER WHICH MODULATES FAN SPEED. SIGNAL SHALL BE COMPLETELY INDEPENDENT OF THE FMCS NETWORK.
8. PRESSURE TRANSMITTERS WHOSE SIGNAL IS UTILIZED FOR MAINTAINING DIFFERENTIAL PRESSURE OF ANY PUMPED WATER SYSTEM (E.G. HEATING HOT WATER, CHILLED WATER AND THE LIKE) SHALL BE WIRED DIRECTLY TO THE CONTROLLER WHICH MODULATES PUMP SPEED. SIGNAL SHALL BE COMPLETELY INDEPENDENT OF THE FMCS NETWORK.
9. ALL CONTROL COMPONENTS SUCH AS RELAYS, SWITCHES, DDC CONTROLLERS, ETC. SHALL BE MOUNTED IN STEEL ENCLOSURES WITH STEEL MOUNTING BACKPLATES PER SPECIFICATION 23 09 00.
10. EACH CONTROL PANEL SHALL HAVE A LAMINATED COPY OF THE APPLICABLE SEQUENCE OF OPERATION AND CONTROL DIAGRAM INDICATING THE POINTS, COMPONENTS AND OPERATION OF EQUIPMENT ASSOCIATED WITH EACH PANEL. REFER TO SECTION 23 09 00 FOR ADDITIONAL REQUIREMENTS.
11. TCC SHALL WIRE THE CONTROL SIGNAL FROM THE ASSOCIATED AIR HANDLING UNIT RTU CONTROL PANEL TO CONTROL THE OPERATION OF SMOKE DAMPERS IN ACCORDANCE WITH SEQUENCE OF OPERATION. TCC SHALL PROVIDE ALL WIRING, CONDUIT, TRANSFORMERS, FUSING AND ALL OTHER ELECTRICAL COMPONENTS REQUIRED FOR COMPLETE INSTALLATION.
12. TCC SHALL EXTEND CONTROL SIGNAL FROM ADDRESSABLE RELAY DEVICE SERVING EACH AIR HANDLING UNIT. REFER TO ELECTRICAL DRAWINGS FOR LOCATIONS. TCC SHALL EXTEND AND TERMINATE WIRING AS REQUIRED FOR EQUIPMENT SHUTDOWN.
13. TCC SHALL EXTEND 24 VOLT POWER FROM CONTROL POWER SHOWN ON FLOOR PLANS TO ALL TERMINAL AIR BOX CONTROLLERS JUNCTION BOX. TCC SHALL PROVIDE ALL WIRING, SUPPORTS, FUSING SPACE, TOGGLE SWITCHES, AND ALL OTHER ELECTRICAL COMPONENTS REQUIRED FOR COMPLETE INSTALLATION.
14. TCC SHALL PROVIDE CONDUIT RUNS AS REQUIRED FOR OUTDOOR EQUIPMENT AND FOR EQUIPMENT INSTALLED REMOTELY FROM THE MAIN BUILDING THAT IS BEING MONITORED OR CONTROLLED BY THE FMCS.
15. TCC SHALL PROVIDE THERMOSTATS FOR AUTOMATIC CONTROL OF EQUIPMENT AS REQUIRED BY THESE CONTROL DRAWINGS. THERMOSTAT CONTACT AMP RATING SHALL BE MINIMUM 125% OF THE MAX. CURRENT DRAW FOR THE EQUIPMENT BEING SERVED. WHERE THERMOSTATS CONTROL THE STARTING OF MOTORS (I.E. FANS), THERMOSTATS SHALL BE RATED FOR MOTOR STARTING APPLICATIONS.
16. ELEMENT LENGTHS FOR BOTH MIXED AIR TEMP SENSORS AND LOW LIMIT TEMP SWITCHES SHALL BE MINIMUM 1 LINEAR FOOT PER SQUARE FOOT OF COIL SURFACE AREA. PROVIDE MULTIPLE SENSORS AND SWITCHES AS NEEDED TO ACHIEVE REQUIRED ELEMENT LENGTHS. LOCATE RESET SWITCHES MAX. 6'-6" ABOVE ADJACENT STANDING SURFACE (I.E. ROOF, PLATFORM OR FLOOR) SO THE RESET SWITCH CAN BE CYCLED WITHOUT THE NEED FOR A LADDER.
17. TO PREVENT GENERATOR OVERLOADING, TCC SHALL PROGRAM A STAGGERED START TIME FOR ALL MECHANICAL EQUIPMENT THAT IS CONTROLLED BY FMCS TO INCLUDE, BUT NOT LIMITED TO, AIR HANDLERS, PUMPS, EXHAUST FANS, AND CHILLERS. THE FIRST EQUIPMENT SHALL START 2 MINUTES (ADJ.) FROM THE TIME THE FMCS RECEIVES THE SIGNAL THAT THE TRANSFER SWITCH CHANGED TO EMERGENCY POWER SOURCE WITH ALL EQUIPMENT BEING ENERGIZED WITHIN A 20 MINUTE (ADJ.) TIME SPAN. COORDINATE ORDER OF EQUIPMENT STAGING WITH OWNER'S REPRESENTATIVE.
18. CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND DO NOT SHOW ALL REQUIRED CONTROL DEVICES AND COMPONENTS. REFER TO FLOOR PLANS, FLOW DIAGRAMS AND DETAILS FOR ADDITIONAL CONTROL DEVICES, COMPONENTS AND REQUIREMENTS NOT SHOWN ON THESE CONTROL DRAWINGS.
19. TCC SHALL PROVIDE ALL CONTROL COMPONENTS AND ACCESSORIES AS REQUIRED FOR EQUIPMENT TO BE CONTROLLED AS DESCRIBED IN THE SEQUENCE OF OPERATION REGARDLESS OF WHETHER ALL CONTROL COMPONENTS OR POINTS ARE SHOWN IN THE ASSOCIATED CONTROL DIAGRAM.
20. ALL ALARMS SHALL NOT REQUIRE MANUAL RESET.

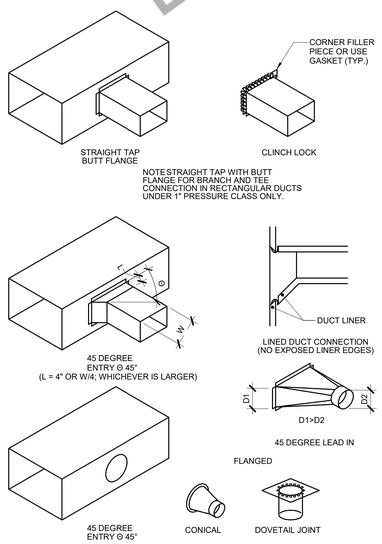
3 GENERAL CONTROL NOTES
NO SCALE



NOTES:

1. ALL ROOF FLASHING SHALL BE PER ROOF MANUFACTURER'S RECOMMENDATIONS.
2. ROOF CURB SHALL BE INSTALLED PER ROOF CURB MANUFACTURER'S RECOMMENDATIONS.
3. PROVIDE EXTENDED CURB AS REQUIRED TO MAINTAIN 12" CLEARANCE ABOVE INSULATION.

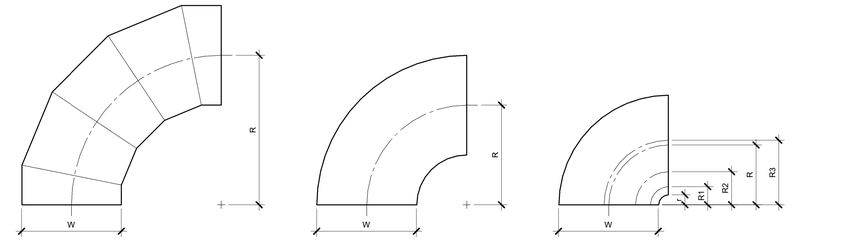
ROOF SUPPORT - ROOF TOP UNIT CURB
4
NO SCALE



NOTES:

1. DO NOT USE CONNECTIONS WITH SCOOPS.
2. FIT ALL CONNECTIONS TO AVOID VISIBLE OPENINGS AND SECURE THEM SUITABLY FOR THE PRESSURE CLASS.
3. ADDITIONAL MECHANICAL FASTENERS ARE REQUIRED FOR 4"W.G. AND OVER.
4. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

5 DUCT - BRANCH CONNECTIONS
NO SCALE



NOTES:

1. BEAD, CROSSBREAK, AND REINFORCE FLAT SURFACES AS IN STRAIGHT DUCT.
2. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
3. DEFAULT ELBOW SHALL BE TYPE "RE 1".
4. ELBOW TYPES SHALL BE INSTALLED AS SHOWN AND NOT BE SUBSTITUTED WITHOUT PERMISSION. EXCEPTION: RE1 OR RE3 MAY BE SUBSTITUTED FOR RE2.

6 DUCT - ELBOW CONSTRUCTION
NO SCALE

Draft

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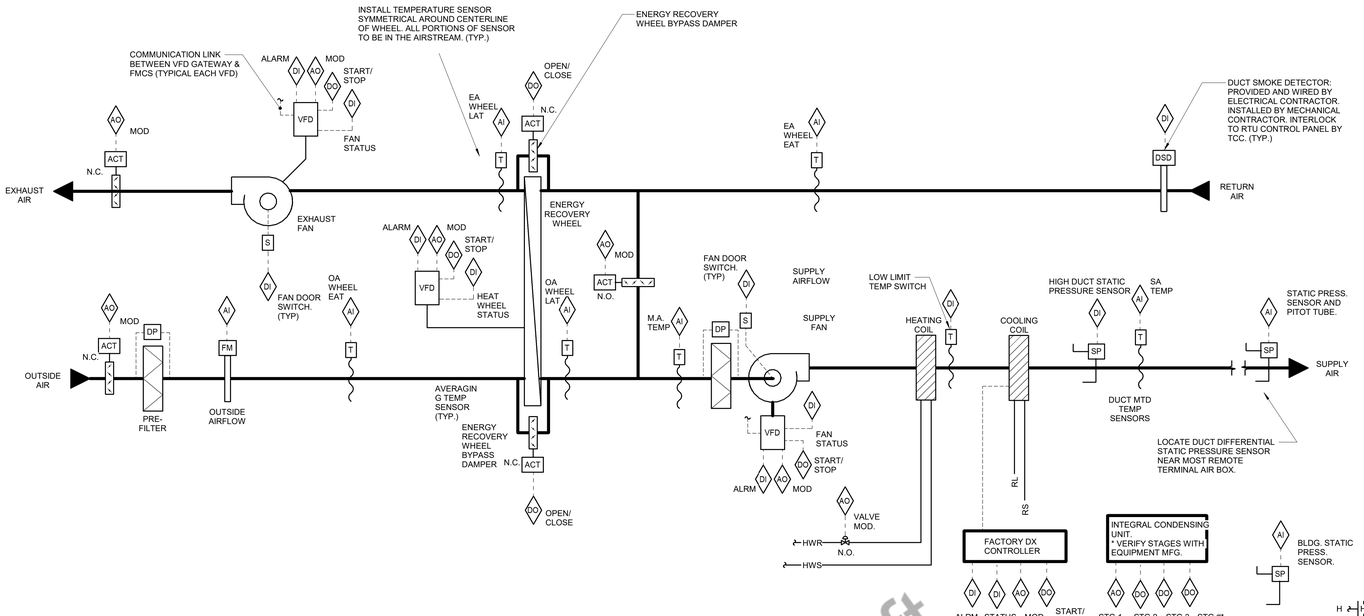


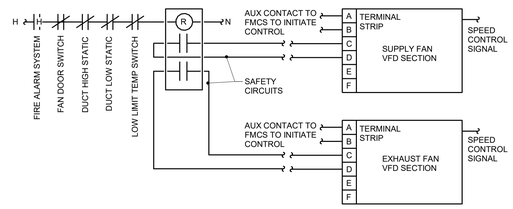
RTU REPORT GENERATION:
DDC FMCS SHALL MONITOR THE FOLLOWING POINTS ON 10 MINUTE (ADJ.) INTERVALS WITHIN A SINGLE TREND. THE TREND SHALL RUN FOR A 365-DAY (ADJ.) DURATION AT WHICH POINT THE NEWEST VALUES SHALL AUTOMATICALLY OVERWRITE THE OLDEST VALUES:

- DATE
- TIME
- GLOBAL OUTSIDE AIR TEMP [°F]
- SUPPLY AIR TEMP (SAT) [°F]
- SUPPLY AIR TEMP SETPOINT [°F]
- EXHAUST AIR TEMP (eAT) [°F]
- OUTSIDE AIRFLOW [CFM]
- MIXED AIR TEMP [°F]
- HEATING WATER VALVE POSITION [% OPEN]
- DX COOLING STATUS
- SUPPLY DUCT STATIC PRESSURE SETPOINT [INCHES W.G.]
- SUPPLY DUCT STATIC PRESSURE [INCHES W.G.]
- BLDG. STATIC PRESSURE [INCHES W.G.]
- BLDG. STATIC PRESSURE SETPOINT [INCHES W.G.]
- SUPPLY FAN VFD OUTPUT [% FULL SPEED]
- EXHAUST FAN VFD OUTPUT [% FULL SPEED]
- OUTSIDE AIR DAMPER POSITION [% OPEN]
- RETURN AIR DAMPER POSITION [% OPEN]
- EXHAUST AIR DAMPER POSITION [% OPEN]
- ENERGY RECOVERY WHEEL VFD OUTPUT [% FULL SPEED]
- ENERGY RECOVERY WHEEL OUTSIDE AIR LEAVING AIR TEMPERATURE [°F]
- ENERGY RECOVERY WHEEL EXHAUST AIR LEAVING AIR TEMPERATURE [°F]
- BYPASS DAMPER POSITION [OPEN/CLOSED]

THIS INFORMATION SHALL BE ACCESSIBLE TO VIEW IN GRAPHICAL FORM ON THE FMCS OPERATOR WORKSTATION.

ONCE PER MONTH, THE DDC FMCS SHALL RECORD THE LARGEST RTU AIRFLOW WHICH OCCURRED DURING THAT MONTH. THE DATE, TIME, OUTSIDE AIR TEMPERATURE (AND ALL OTHER VALUES LISTED ABOVE) THAT COINCIDED WITH THAT EVENT SHALL ALSO BE RECORDED. THIS INFORMATION SHALL BE STORED TO A MEMORY LOCATION ON THE FMCS OPERATOR WORKSTATION THAT IS MAINTAINED (NOT AUTOMATICALLY OVERWRITTEN).

AIR HANDLER REPORT GENERATION
TYPICAL FOR RTU-10a



SUPPLY & EXHAUST FAN VFD CONTROL

SEQUENCE OF OPERATION:

VAV AIR HANDLING UNIT W/ ENERGY RECOVERY WHEEL. HEATING WATER COIL AND DIRECT EXPANSION COOLING.
GENERAL SECTION:
OUTSIDE AIR, MIXED AIR, AND EXHAUST AIR DAMPERS ARE PROVIDED WITH THE UNIT.

CONTROLLERS FOR THE UNITS SHALL BE LOCATED IN THE TEMPERATURE CONTROL PANELS WITHIN THE BUILDING. REFER TO FLOOR PLANS FOR TEMPERATURE CONTROL PANEL LOCATIONS.

THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL CLOSE WHENEVER THE SUPPLY FAN STOPS UNDER ANY CONDITION. THE MIXED AIR DAMPER SHALL OPEN.

ALL CONTROL POINTS SHOWN SHALL REPORT TO THE FMCS.

PROVIDE ALARM AT FMCS IF THE DISCHARGE AIR TEMPERATURE FALLS BELOW 45 DEG F, OR ABOVE F 95 DEG F

ENERGY RECOVERY WHEEL DEFROST CONTROL:
UNIT TO BE CONTROLLED BASED ON MANUFACTURER'S STANDARD FROST CONTROL SEQUENCE AND CONTROLLER. BASIS OF DESIGN FROST CONTROL SEQUENCE: WHEN THE OA DB TEMPERATURE IS BELOW 14F (ADJ) AND THE RA DEW POINT IS GREATER THAN 27F (ADJ) THE HEAT WHEEL WILL REDUCE SPEED TO MINIMUM RPM. UNIT MANUFACUTRE WILL PROVIDE DEFROST SEQUENCE WITH A PACKAGED CONTROLLER. FMCS TO DISPLAY POINTS ON GRAPHICS.

LIFE SAFETY SECTION:
SHOULD THE SMOKE DETECTOR, FREEZE STAT, OR DOOR SWITCH ACTIVATE, THE DETECTOR, STAT, OR DOOR SWITCH SHALL STOP THE SUPPLY FAN AND EXHAUST FANS IN BOTH THE MANUAL OR AUTOMATIC MODE, INDEPENDENT OF THE CONTROL SYSTEM. AN ALARM SIGNAL SHALL BE INDICATED AT THE FMCS.

PROVIDE A HIGH LIMIT DUCT STATIC PRESSURE SENSOR IMMEDIATELY DOWNSTREAM OF THE SUPPLY AIR FAN. UPON TRIPPING (4 IN. W.C.), THE HIGH LIMIT DUCT STATIC PRESSURE CONTROLLER SHALL STOP THE SUPPLY FAN INDEPENDENT OF THE CONTROL SYSTEM.

UNIT START / STOP CONTROL:
THE FMCS TIME AND OPTIMUM START/STOP PROGRAM SHALL CONTROL THE SYSTEM IN THE FOLLOWING CONTROL CYCLES (INITIALLY START AT 6:30 A.M. AND INITIALLY STOP AT 4:30 P.M.) (ADJ).

WARM UP / COOL DOWN CYCLE:
AS CALCULATED BY THE FMCS OPTIMUM START PROGRAM, THE WARM UP / COOL DOWN CYCLE SHALL START AS LATE AS POSSIBLE TO BRING THE SPACE TO ITS PROGRAMMED SETPOINT BY THE PROGRAMMED OCCUPIED TIME.

WARM UP:
DURING THE WARM UP CYCLE, THE SUPPLY FAN SHALL BE ON, THE OUTSIDE AIR AND EXHAUST AIR DAMPER SHALL BE 100% CLOSED AND THE MIXED AIR DAMPER SHALL BE 100% OPEN. WHEN THE SPACE TEMPERATURE REACHES THE OCCUPIED SETPOINT, THE SYSTEM SHALL GO TO THE OCCUPIED CYCLE.

COOL DOWN,
THE COOL DOWN CYCLE SHALL BE THE SAME AS THE OCCUPIED CYCLE.

OCCUPIED CYCLE:
THE EXHAUST AIR DAMPER SHALL OPEN AND THE MIXED AIR AND OUTSIDE AIR DAMPER SHALL OPEN TO MINIMUM POSITION. THE SUPPLY FAN SHALL BE ENERGIZED. THE SUPPLY FAN SHALL BE SLOWLY RAMPED FROM ZERO TO MINIMUM SPEED AFTER THE SUPPLY FAN IS STARTED. THE AIR HANDLING UNIT SUPPLY FAN SPEED SHALL MODULATE TO MAINTAIN DUCT STATIC PRESSURE SETPOINT OF 0.75 IN WG (OR AS REQUIRED AS DETERMINED BY THE BALANCING CONTRACTOR). THE SUPPLY FAN SPEED SHALL NOT DROP BELOW 30% TO ASSURE ADEQUATE FAN MOTOR COOLING.

EXHAUST FAN SHALL BE INDEXED TO RUN WHENEVER THE SUPPLY FAN IS INDEXED TO RUN. PROVIDE NO MORE THAN A 50% OFFSET FROM THE SUPPLY FAN. THE EXHAUST FAN SHALL MODULATE TO MAINTAIN A BUILDING STATIC PRESSURE OF 0.05" WC.

VENTILATION AIR CONTROL:
WHENEVER THE AIR HANDLING UNIT IS IN OCCUPIED MODE, THE OUTSIDE AIR DAMPER SHALL MODULATE VIA THE OSA FLOW MEASURING STATION TO MAINTAIN THE MINIMUM OSA POSITION AS SCHEDULED.

THE DISCHARGE AIR TEMPERATURE SHALL BE MAINTAINED AT A MAXIMUM TEMPERATURE SETPOINT OF 55 DEG F. IN BOTH THE HEATING AND COOLING MODES BY:

1ST STAGE OF HEATING: MODULATING THE HEAT WHEEL. SLOWER SPEEDS FOR LESS HEAT. HIGHER SPEEDS FOR MORE HEAT.
2ND STAGE OF HE HEATING: WHEN THE 1ST STAGE OF HEATING CANNOT MAINTAIN THE SUPPLY AIR TEMPERATURE FOR TEN MINUTES (ADJ) THEN THE HEATING WATER CONTROL VALVE IN THE HEATING MODE SHALL OPEN AND MODULATE TO MAINTAIN THE SUPPLY AIR TEMPERATURE.
LESS HEATING SHALL BE OPPOSITE OF ABOVE.

1ST STAGE COOLING. MODULATING THE MIXED AIR DAMPER AND OUTSIDE AIR DAMPER FOR ECONOMIZER COOLING WITH THE HEAT WHEEL OFF. (SEE BELOW FOR ECONOMIZER COOLING)
2ND STAGE OF COOLING: WHEN THE 1ST STAGE OF COOLING CANNOT MAINTAIN THE SUPPLY AIR TEMPERATURE FOR TEN MINUTES (ADJ) THEN THE HEAT WHEEL SHALL START AND MODULATE. SLOWER SPEEDS FOR LESS COOLING. HIGHER SPEEDS FOR MORE COOLING.
3RD STAGE OF COOLING: WHEN THE 2ND STAGE OF COOLING CANNOT MAINTAIN THE SUPPLY AIR TEMPERATURE FOR TEN MINUTES (ADJ) THEN DX COOLING SHALL BE ENABLED TO MAINTAIN SUPPLY AIR TEMPERATURE.
LESS COOLING SHALL BE OPPOSITE OF ABOVE.

ECONOMIZER COOLING IS ENABLED WHENEVER THE OUTSIDE AIR DRY-BULB TEMPERATURE IS LESS THAN THE RETURN AIR DRY-BULB TEMPERATURE PLUS DEADBAND. WHEN THE OUTSIDE AIR DRY-BULB TEMPERATURE IS GREATER THAN THE RETURN AIR DRY-BULB TEMPERATURE, ECONOMIZER COOLING IS DISABLED AND THE OUTSIDE AIR DAMPER SHALL RETURN TO MINIMUM POSITION.

THE DISCHARGE AIR TEMPERATURE SHALL BE LIMITED TO A MINIMUM OF 55 DEG F, AND A MAXIMUM OF 95 DEG F.

SHOULD THE SUPPLY FAN OR EXHAUST FAN FAIL TO START OR FAIL DURING OPERATION FOR ANY REASON, AN ALARM SHALL BE INDICATED AT THE DDC CONTROL PANEL.

UNOCCUPIED CYCLE:
THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL BE CLOSED. THE MIXED AIR DAMPER SHALL BE OPEN. THE SUPPLY AND EXHAUST FANS SHALL BE OFF.

BASED ON SPACE SENSOR INPUT, THE SUPPLY FAN SHALL START WHEN SPACE TEMPERATURE DROPS BELOW 60 DEG F. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED. THE HEATING WATER VALVE SHALL OPEN IN THE HEATING MODE. WHEN THE SPACE TEMPERATURE REACHES 65 DEG F, THE SUPPLY FAN SHALL STOP, THE HEATING WATER VALVE SHALL CLOSE AND THE UNIT SHALL CYCLE OFF.

BASED ON SPACE SENSOR INPUT, THE SUPPLY FAN SHALL START WHEN SPACE TEMPERATURE RISES ABOVE 85 DEG F. (ADJ.). ECONOMIZER COOLING SHALL BE FIRST STAGE OF COOLING AND THE DX COOLING SHALL BE THE SECOND STAGE OF COOLING. WHEN THE SPACE TEMPERATURE REACHES 80 DEG F. (ADJ.), THE SUPPLY FAN SHALL STOP, THE OUTSIDE AIR DAMPER AND THE DX COOLING SHALL BE DISABLED, THE MIXED AIR DAMPER SHALL OPEN AND THE UNIT SHALL CYCLE OFF.

WHEN THE MIXED AIR TEMPERATURE DROPS BELOW 30 DEG.F. THE HEATING WATER VALVE SHALL MODULATE OPEN UNTIL THE MIXED AIR TEMPERATURE IS GREATER THAN 45 DEG. F. THE HEATING WATER VALVE SHALL THEN CLOSE.

Draft

1 VAV (AHU-1, RTU-1, RTU-4) ROOFTOP UNIT CONTROL DRAWING AND SEQ. OF OPERATION
NO SCALE

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DUCTWORK INSULATION (WRAP & LINER) SCHEDULE

SYSTEM	LOCATION	SERVICE NOTE 1	EXPOSED		CONCEALED		MINIMUM R-VALUE	SPECIFIC NOTES
			RECTANGULAR	ROUND / OVAL	RECTANGULAR	ROUND / OVAL		
SUPPLY AIR	INDOOR	MAIN	1-1/2" LINER	1-1/2" LINER	1-1/2" LINER	1-1/2" LINER	R-6	
		MAIN TO TERMINAL	1-1/2" LINER	---	1-1/2" LINER	2" WRAP	R-6	
		TERMINAL TO GRD	1-1/2" LINER	---	1-1/2" LINER	2" WRAP	R-6	
RETURN AIR	INDOOR	MAIN	1" LINER	1" LINER	1" LINER	1" LINER	R-4	
		BRANCH	1" LINER	---	1" LINER	1-1/2" WRAP	R-4	
OUTSIDE AIR - TEMPERED	INDOOR	MAIN	1" LINER	1" LINER	1" LINER	1" LINER	---	2
		BRANCH	1" LINER	---	1" LINER	1-1/2" WRAP	---	2
EXHAUST AIR	INDOOR	MAIN	---	---	---	---	---	2, 5
		BRANCH	---	---	---	---	---	2, 5
EXHAUST AIR - TYPE 1 KITCHEN EXHAUST	INDOOR	---	3" WRAP WITH 4-1/2" AT SEAMS	3" WRAP WITH 4-1/2" AT SEAMS	3" WRAP WITH 4-1/2" AT SEAMS	3" WRAP WITH 4-1/2" AT SEAMS	---	2, 4
OUTSIDE AIR - TEMPERED	OUTDOOR	MAIN	3" LINER	3" LINER	3" LINER	3" LINER	R-12	
		BRANCH	3" LINER	3" LINER	3" LINER	3" LINER	R-12	

GENERAL NOTES:

1) MINIMUM R-VALUE BASED ON 2021 IECC REQUIREMENTS.

2) DUCT SIZES SHOWN ARE INSIDE FREE AREA DIMENSIONS. LINER, WHERE USED, WILL NEED TO BE FACTORED INTO THE DUCT SIZE.

3) THE INSULATION THICKNESS GIVEN MEETS OR EXCEEDS THE REQUIRED R-VALUE FOR THE BASIS OF DESIGN (JOHNS MANVILLE). INSTALLED PRODUCT SHALL MEET OR EXCEED THE LISTED R-VALUE; INSULATION THICKNESS AND CORRESPONDING DUCT SIZE (FOR LINER) SHALL BE INCREASED FOR ALTERNATES THAT CANNOT MEET THIS THICKNESS TO PERFORMANCE CONDITION.

4) R-VALUES FOR WRAP SHALL BE SHOWN USING THEIR INSTALLED CONDITION RATING AS NOTED ON THE MANUFACTURER'S SPECIFICATION SHEET.

5) JACKET (PVC OR METAL) SHALL BE INSTALLED AS REQUIRED BY THE SPECIFICATIONS.

6) FLEXIBLE DUCT SHALL BE AS NOTED IN THE "AIR DUCT ACCESSORIES" SPECIFICATION.

7) DUCT WRAP IS ALLOWED TO BE BLANKET OR BOARD; CONTRACTOR OPTION.

8) MULTIPLE LAYERS OF WRAP OR LINER TO ACHIEVE TOTAL R-VALUE ARE ACCEPTABLE IF INSTALLED PER MANUFACTURER'S INSTRUCTIONS.

SPECIFIC NOTES:

1) FIELD CONSTRUCTED PLENUMS SHALL MATCH THE REQUIREMENTS OF MAIN DUCTS UNLESS SPECIFICALLY NOTED OTHERWISE.

2) INSULATION PROVIDED FOR ACOUSTICS OR OTHER PERFORMANCE CRITERIA, NO ENERGY CODE REQUIREMENT

3) WHERE EXHAUST TO THE ENERGY RECOVERY IS COMING FROM A MOIST ENVIRONMENT (LOCKER, SHOWER, DISHWASHER, LAUNDRY, ETC.) WRAP SHALL BE PROVIDED IN LIEU OF LINER BACK TO MAIN OR FOR 25'; WHICHEVER DISTANCE IS GREATER.

4) EXHAUST SYSTEMS SHALL BE PROVIDED WITH 1" WRAP INSULATION BETWEEN SYSTEM BACKDRAFT DAMPER AND PENETRATION OF BUILDING EXTERIOR OR ALL DUCT WITHIN 20' OF BUILDING EXTERIOR PENETRATION WHICHEVER IS LESS TO PREVENT CONDENSATION.

5) WRAP USED EXTERIOR TO THE BUILDING SHALL BE PROTECTED USING FIELD APPLIED METAL JACKETS.

DEFINITIONS:

EXPOSED DUCT: DUCT THAT IS EXPOSED TO VIEW IN OCCUPIED OR UNOCCUPIED SPACES THAT ARE CONDITIONED.

CONCEALED DUCT: DUCT THAT IS CONCEALED IN CHASES, SHAFTS, CEILING PLENUMS OR OTHER ASSEMBLY WITHIN THE INSULATED BUILDING ENVELOPE.

MAIN DUCT: DUCT FROM THE AIR HANDLING UNIT TO FINAL TERMINAL TAKEOFF.

MAIN TO TERMINAL DUCT: THIS IS A BRANCH DUCT; TYPICALLY THE DUCT FROM THE MAIN TAKEOFF TO THE TERMINAL (VAV BOX OR EQUIVALENT).

TERMINAL TO GRD DUCT: THIS IS A BRANCH DUCT DOWNSTREAM OF THE TERMINAL (VAV BOX, HEAT PUMP, FAN COIL OR EQUIVALENT).

OUTSIDE AIR TEMPERED: TEMPERED OUTSIDE AIR IS AIR THAT IS HEATED OR COOLED TO WITHIN 10 DEG F OF THE SPACE/SURROUNDING TEMPERATURE.

INDOOR: DUCT LOCATIONS WITHIN THE INSULATED BUILDING ENVELOPE.

OUTDOOR: DUCT LOCATIONS OUTSIDE OF THE INSULATED BUILDING ENVELOPE (ON GRADE, ROOF, EXTERIOR SOFFIT, EXTERIOR CHASE, ATTIC, CRAWLSPACE, ETC.).

IMC 2021 VENTILATION RATE PROCEDURE CALCULATIONS

UNIT	FLOOR	ROOM NUMBER	ROOM NAME	ZONE TYPE	AREA SQ FT	OCCUPANT OUTDOOR AIRFLOW RATE CFM/PER	AREA OUTDOOR AIRFLOW RATE CFM/SQ FT	OCCUPANT DENSITY PEOPLE PER 1000 SQ FT	OCCUPANT QUANTITY	OVER-VENTILATION PERCENTAGE	BREATHING ZONE OUTDOOR AIRFLOW RATE CFM	TABLE 6-2 ZONE AIR DISTRIBUTION EFFECTIVENESS (Ez)	TOTAL SUPPLY AIR TO ZONE AT CONDITION ANALYZED CFM - NOTE 1	ZONE VENTILATION EFFICIENCY (Evz)	SYSTEM VENTILATION EFFICIENCY NOTE 2 (Ev)	MINIMUM PERCENTAGE AIRFLOW AT UNIT	MINIMUM OUTSIDE AIRFLOW AT UNIT NOTE 3
AHU-1		51	Classroom	Classrooms (age 9 plus)	1050	10.0	0.12	35	35	0%	476	0.8	1775	1.01	0.76	-	-
		49	Storage	Storage rooms	690	0.0	0.12	0	0	0%	83	0.8	430	1.11	0.76	-	-
		50	Classroom	Classrooms (age 9 plus)	1050	10.0	0.12	35	35	0%	476	0.8	1100	0.81	0.76	-	-
		30	Classroom	Classrooms (age 9 plus)	991	10.0	0.12	35	35	0%	469	0.8	1000	0.76	0.76	-	-
AHU-1	TOTALS												4305	-	0.76	46%	1970

SPECIFIC NOTES:

1. TOTAL SUPPLY AIR AT CONDITION ANALYZED USES THE MAXIMUM AIRFLOW PROVIDED TO THE ZONE DURING THE HEATING OR COOLING MODE, WHICHEVER IS BEING ANALYZED.
2. AS DETERMINED USING THE ASHRAE 62.1-2019 "62 MZ Calc" SPREADSHEET. SYSTEM VENTILATION EFFICIENCY IS EQUAL TO THE LOWEST ZONE VENTILATION EFFICIENCY OF ALL ROOMS SERVED BY THE UNIT.
3. SEE UNIT EQUIPMENT SCHEDULE FOR ACTUAL OUTSIDE AIR SETPOINT FOR BALANCING; WHICH WILL MEET OR EXCEED THE MINIMUM REQUIREMENT NOTED HEREIN.
4. OCCUPANT QUANTITY MAY VARY FROM OCCUPANT DENSITY FROM IMC. IN THOSE CASES OCCUPANT QUANTITY IS ADJUSTED TO MEET DATA PROVIDED BY THE CLIENT. THIS IS ACCEPTABLE PER IMC 403.3 EXCEPTION. OCCUPANCY RATES GREATER THAN CODE NOTED WITH AN BOLD UNDERLINE. OCCUPANCY RATES LESS THAN CODE NOTED WITH AN BOLD DOUBLE UNDERLINE.

Unit Outside Airflow Balance Setpoint [cfm] 2000

Unit Meets ASHRAE 62.1 Requirements **Yes**

IMC 2021 VENTILATION RATE PROCEDURE CALCULATIONS

UNIT	FLOOR	ROOM NUMBER	ROOM NAME	ZONE TYPE	AREA SQ FT	OCCUPANT OUTDOOR AIRFLOW RATE CFM/PER	AREA OUTDOOR AIRFLOW RATE CFM/SQ FT	OCCUPANT DENSITY PEOPLE PER 1000 SQ FT	OCCUPANT QUANTITY	OVER-VENTILATION PERCENTAGE	BREATHING ZONE OUTDOOR AIRFLOW RATE CFM	TABLE 6-2 ZONE AIR DISTRIBUTION EFFECTIVENESS (Ez)	TOTAL SUPPLY AIR TO ZONE AT CONDITION ANALYZED CFM - NOTE 1	ZONE VENTILATION EFFICIENCY (Evz)	SYSTEM VENTILATION EFFICIENCY NOTE 2 (Ev)	MINIMUM PERCENTAGE AIRFLOW AT UNIT	MINIMUM OUTSIDE AIRFLOW AT UNIT NOTE 3
RTU-1		44	Corridor	Corridors	1878	0.0	0.06	0	0	0%	113	0.8	2000	1.12	0.68	-	-
		38	Office	Office space	138	5.0	0.06	5	3	0%	23	0.8	60	0.71	0.68	-	-
		6	Work Room	Office space	162	5.0	0.06	5	3	0%	25	0.8	60	0.68	0.68	-	-
		7	Work Room	Office space	134	5.0	0.06	5	2	0%	18	0.8	60	0.82	0.68	-	-
		3	Break Room	Break rooms	462	5.0	0.06	25	10	0%	78	0.8	575	1.02	0.68	-	-
		41	Nurse	Office space	155	5.0	0.06	5	3	0%	24	0.8	65	0.72	0.68	-	-
		40	Open	Lobbies	304	5.0	0.06	150	6	0%	48	0.8	350	1.02	0.68	-	-
		37	Work	Classrooms (age 9 plus)	440	10.0	0.12	35	8	0%	133	0.8	350	0.72	0.68	-	-
		5	Classroom	Classrooms (age 9 plus)	334	10.0	0.12	35	10	0%	140	0.8	350	0.69	0.68	-	-
		4A	Small Group	Classrooms (age 9 plus)	110	10.0	0.12	35	6	0%	73	0.8	180	0.68	0.68	-	-
		42	Work Room	Office space	158	5.0	0.06	5	3	0%	24	0.8	210	1.05	0.68	-	-
		39	Office	Office space	178	5.0	0.06	5	3	0%	26	0.8	100	0.87	0.68	-	-
		2B	DE-ESCL	Classrooms (age 9 plus)	65	10.0	0.12	35	1	0%	18	0.8	100	0.97	0.68	-	-
		43	Principle	Office space	258	5.0	0.06	5	4	0%	35	0.8	600	1.12	0.68	-	-
		2	Classroom	Classrooms (age 9 plus)	462	10.0	0.12	35	18	0%	235	0.8	770	0.81	0.68	-	-
		4	Office	Office space	185	5.0	0.06	5	3	0%	26	0.8	100	0.86	0.68	-	-
		2A	Staff	Office space	174	5.0	0.06	5	2	0%	20	0.8	225	1.08	0.68	-	-
		1	Classroom	Classrooms (age 9 plus)	640	10.0	0.12	35	20	0%	277	0.8	850	0.78	0.68	-	-
RTU-1	TOTALS												7005	-	0.68	28%	1979

SPECIFIC NOTES:

1. TOTAL SUPPLY AIR AT CONDITION ANALYZED USES THE MAXIMUM AIRFLOW PROVIDED TO THE ZONE DURING THE HEATING OR COOLING MODE, WHICHEVER IS BEING ANALYZED.
2. AS DETERMINED USING THE ASHRAE 62.1-2019 "62 MZ Calc" SPREADSHEET. SYSTEM VENTILATION EFFICIENCY IS EQUAL TO THE LOWEST ZONE VENTILATION EFFICIENCY OF ALL ROOMS SERVED BY THE UNIT.
3. SEE UNIT EQUIPMENT SCHEDULE FOR ACTUAL OUTSIDE AIR SETPOINT FOR BALANCING; WHICH WILL MEET OR EXCEED THE MINIMUM REQUIREMENT NOTED HEREIN.
4. OCCUPANT QUANTITY MAY VARY FROM OCCUPANT DENSITY FROM IMC. IN THOSE CASES OCCUPANT QUANTITY IS ADJUSTED TO MEET DATA PROVIDED BY THE CLIENT. THIS IS ACCEPTABLE PER IMC 403.3 EXCEPTION. OCCUPANCY RATES GREATER THAN CODE NOTED WITH AN BOLD UNDERLINE. OCCUPANCY RATES LESS THAN CODE NOTED WITH AN BOLD DOUBLE UNDERLINE.

Unit Outside Airflow Balance Setpoint [cfm] 2050

Unit Meets ASHRAE 62.1 Requirements **Yes**

IMC 2021 VENTILATION RATE PROCEDURE CALCULATIONS

UNIT	FLOOR	ROOM NUMBER	ROOM NAME	ZONE TYPE	AREA SQ FT	OCCUPANT OUTDOOR AIRFLOW RATE CFM/PER	AREA OUTDOOR AIRFLOW RATE CFM/SQ FT	OCCUPANT DENSITY PEOPLE PER 1000 SQ FT	OCCUPANT QUANTITY	OVER-VENTILATION PERCENTAGE	BREATHING ZONE OUTDOOR AIRFLOW RATE CFM	TABLE 6-2 ZONE AIR DISTRIBUTION EFFECTIVENESS (Ez)	TOTAL SUPPLY AIR TO ZONE AT CONDITION ANALYZED CFM - NOTE 1	ZONE VENTILATION EFFICIENCY (Evz)	SYSTEM VENTILATION EFFICIENCY NOTE 2 (Ev)	MINIMUM PERCENTAGE AIRFLOW AT UNIT	MINIMUM OUTSIDE AIRFLOW AT UNIT NOTE 3
RTU-4		16	Media Center	Libraries	2103	5.0	0.12	10	50	0%	502	0.8	1850	0.90	0.90	-	-
		16A	Small Group	Office space	128	5.0	0.06	5	6	0%	38	0.8	255	1.05	0.90	-	-
		17	Work Room	Office space	305	5.0	0.06	5	4	0%	38	0.8	330	1.09	0.90	-	-
RTU-4	TOTALS												2435	-	0.90	26%	644

SPECIFIC NOTES:

1. TOTAL SUPPLY AIR AT CONDITION ANALYZED USES THE MAXIMUM AIRFLOW PROVIDED TO THE ZONE DURING THE HEATING OR COOLING MODE, WHICHEVER IS BEING ANALYZED.
2. AS DETERMINED USING THE ASHRAE 62.1-2019 "62 MZ Calc" SPREADSHEET. SYSTEM VENTILATION EFFICIENCY IS EQUAL TO THE LOWEST ZONE VENTILATION EFFICIENCY OF ALL ROOMS SERVED BY THE UNIT.
3. SEE UNIT EQUIPMENT SCHEDULE FOR ACTUAL OUTSIDE AIR SETPOINT FOR BALANCING; WHICH WILL MEET OR EXCEED THE MINIMUM REQUIREMENT NOTED HEREIN.
4. OCCUPANT QUANTITY MAY VARY FROM OCCUPANT DENSITY FROM IMC. IN THOSE CASES OCCUPANT QUANTITY IS ADJUSTED TO MEET DATA PROVIDED BY THE CLIENT. THIS IS ACCEPTABLE PER IMC 403.3 EXCEPTION. OCCUPANCY RATES GREATER THAN CODE NOTED WITH AN BOLD UNDERLINE. OCCUPANCY RATES LESS THAN CODE NOTED WITH AN BOLD DOUBLE UNDERLINE.

Unit Outside Airflow Balance Setpoint [cfm] 675

Unit Meets ASHRAE 62.1 Requirements **Yes**

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ISSUE FOR PERMIT AND BIDDING

PROJECT 012.23
DATE 11.13.23
DRAWN BRE

NO.	DESCRIPTION	DATE

REVISIONS

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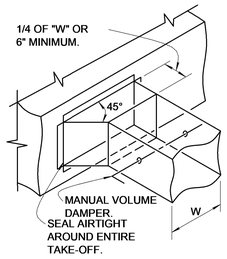
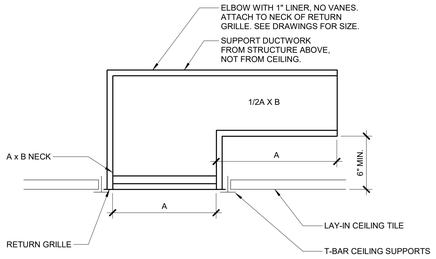


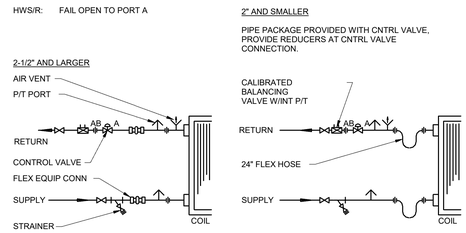
1 45° DUCT TAKE-OFF
NO SCALE



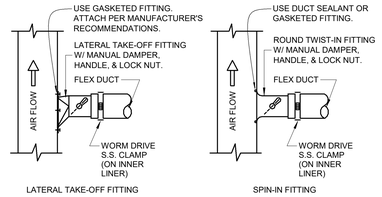
NOTES:

1. THIS DETAIL APPLIES TO ALL RETURN GRILLES.

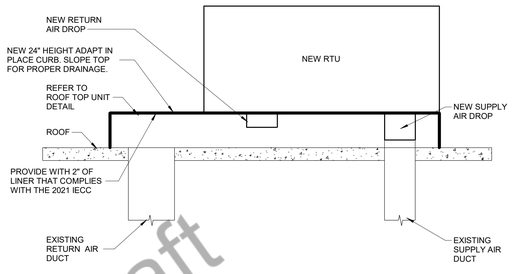
2 AIR TERMINAL - CEILING RETURN SOUND BOOT
NO SCALE



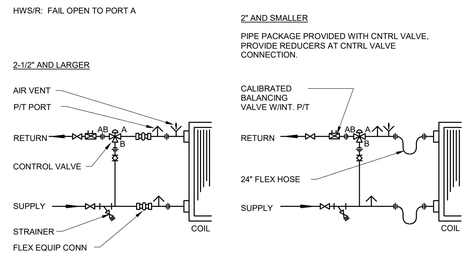
3 2-WAY COIL / EQUIPMENT ASSEMBLY DETAIL
NO SCALE



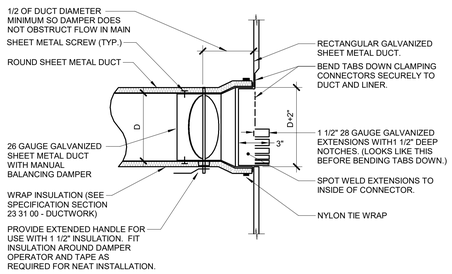
4 ROUND DUCT TAKE-OFF DETAIL
NO SCALE



5 NEW ADAPT IN PLACE ROOF CURB DETAIL
NO SCALE



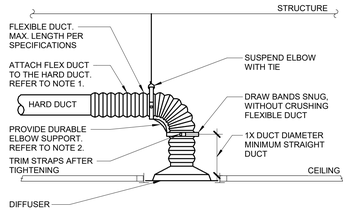
6 3-WAY COIL / EQUIPMENT ASSEMBLY
NO SCALE



NOTES:

1. THIS DETAIL APPLIES ONLY TO TAPS OFF LINED DUCTS.
2. TAP DOES NOT NEED TO BE CONICAL IF THE TAP IS NOT LOCATED BETWEEN FANS AND TERMINAL AIR BOXES, DUCT IS NOT OVER 2" PRESSURE CLASS, AND ROUND DUCT IS NOT OVER 12" DIAMETER.

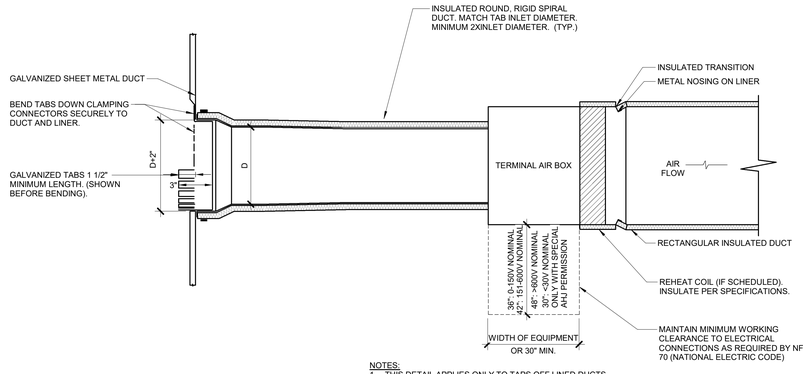
7 DUCT - HARD CONICAL TO LINED DUCT CONNECTION
NO SCALE



NOTES:

1. TO ATTACH FLEX DUCT TO THE HARD DUCT, TAPE THE INNER LINER TO THE HARD DUCT THEN ATTACH WITH TWO NYLON TIE WRAPS; ONE FOR THE INNER LINER AND ONE FOR THE OUTER SHELL. FOLD THE OUTER SHELL INSIDE ITSELF SO IT HAS NEAT EDGES PRIOR TO TIE WRAPPING.
2. DURABLE ELBOW SUPPORT ACCEPTABLE MANUFACTURER AND MODEL: HART AND COOLEY - SMARTFLOW, THERMAFLEX - FLEXFLOW, TITUS - FLEXRIGHT, OR APPROVED EQUAL.

8 DIFFUSER CONNECTION DETAIL (W/ RADIUS FORMING ELBOW)
NO SCALE



NOTES:

1. THIS DETAIL APPLIES ONLY TO TAPS OFF LINED DUCTS.
2. THIS DETAIL APPLIES TO TERMINAL AIR BOXES WITH ROUND INLETS AND RECTANGULAR OUTLETS.
3. DUCT LEADING TO TAB INLET MUST BE STRAIGHT FOR 1.5 DIAMETERS UPSTREAM.

9 TERMINAL AIR BOX - SINGLE DUCT - LINED
NO SCALE

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PROJECT	012.23
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PROJECT #23005385.00

COM*check* Software Version COMcheckWeb
Mechanical Compliance Certificate

Project Information

Energy Code:	2021 IECC
Project Title:	Dunn Elementary School
Location:	Fort Collins, Colorado
Climate Zone:	5b
Project Type:	Alteration

Construction Site:
501 South Washington Avenue, Fort Collins, CO, USA
Fort Collins, Colorado 80521

Owner/Agent:
Brian Schlicting
Poudre School District
2445 Laporte Avenue
Fort Collins, Colorado 80521
970-490-3594
bschlicting@psdschools.org

Designer/Contractor:
Brian Eagleton
IMEG
7600 E Orchard Rd Suite 250S
Greenwood Village, Colorado 80111
3037966019
brian.eagleton@imegcorp.com

Mechanical Systems List

Quantity **System Type & Description**

1 AHU-1 (Multiple-Zone):
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 73 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 135 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 10.80 EER, Required Efficiency = 10.80 EER
Proposed Part Load Efficiency = 14.00 IEER, Required Part Load Efficiency = 14.00 IEER
Fan System: FAN SYSTEM 1 -- Compliance (Brake HP and fan efficiency method) : Passes

Fans:
FAN 1 Supply, Multi-Zone VAV, 4935 CFM, 5.0 motor nameplate hp, 4.1 design brake hp (4.1 max. BHP), 0.95 fan energy index
FAN 2 Exhaust, Multi-Zone VAV, 4935 CFM, 3.0 motor nameplate hp, 2.3 design brake hp (2.3 max. BHP), 0.95 fan energy index
Pressure Drop Credits:
Particulate filtration credit: MERV 13 through 15, 1.0752 credit
Energy recover device, other than Coil Runaround Loop, 3.0105 credit
Sound attenuation section, 0.3584 credit

1 RTU-1 (Multiple-Zone):
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 94 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 214 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 10.80 EER, Required Efficiency = 10.80 EER
Proposed Part Load Efficiency = 14.00 IEER, Required Part Load Efficiency = 14.00 IEER
Fan System: FAN SYSTEM 2 -- Compliance (Brake HP and fan efficiency method) : Passes

Fans:
FAN 3 Supply, Multi-Zone VAV, 8650 CFM, 10.0 motor nameplate hp, 9.9 design brake hp (9.9 max. BHP), 0.95 fan energy index
FAN 4 Exhaust, Multi-Zone VAV, 8650 CFM, 10.0 motor nameplate hp, 7.7 design brake hp (7.7 max. BHP), 0.95 fan energy index
Pressure Drop Credits:
Particulate filtration credit: MERV 13 through 15, 1.8845 credit
Energy recover device, other than Coil Runaround Loop, 5.2767 credit
Sound attenuation section, 0.6282 credit

1 RTU-4 (Multiple-Zone):
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 54 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 99 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 11.00 EER, Required Efficiency = 11.00 EER
Proposed Part Load Efficiency = 14.60 IEER, Required Part Load Efficiency = 14.60 IEER

Quantity **System Type & Description**

Fan System: FAN SYSTEM 3 -- Compliance (Brake HP and fan efficiency method) : Passes

Fans:
FAN 6 Exhaust, Multi-Zone VAV, 3825 CFM, 2.0 motor nameplate hp, 1.3 design brake hp (1.3 max. BHP), 0.95 fan energy index
FAN 5 Supply, Multi-Zone VAV, 3825 CFM, 5.0 motor nameplate hp, 3.0 design brake hp (3.0 max. BHP), 0.95 fan energy index
Pressure Drop Credits:
Sound attenuation section, 0.2778 credit
Particulate filtration credit: MERV 13 through 15, 0.8333 credit
Energy recover device, other than Coil Runaround Loop, 2.3333 credit

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2021 IECC requirements in COMcheck Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Mark Ford - Mechanical Designer — Name - Title
Signature
11/13/2023 — Date

Draft

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MECHANICAL COMCHECK

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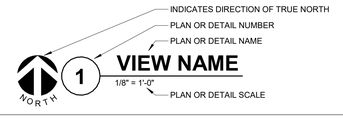
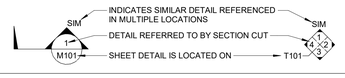
VIEW KEY

NAME — LEVEL NAME
10'-0" — HEIGHT ABOVE PROJECT 0'-0"

1 — INDICATES NOTE USED TO DESCRIBE ADDITIONAL INFORMATION ABOUT WORK REQUIRED, SPECIFIC TO THE SHEET AND/OR DETAIL





LINE TYPE AND TAG KEY:

NEW WORK BY THIS CONTRACTOR (WIDE LINE)
———— NEW
- - - - - - EXISTING TO BE REMOVED (SHORT DASHED PATTERN)
— — — NEW UNDERFLOOR OR UNDERGROUND (LONG DASHED PATTERN)

EXISTING TO REMAIN OR WORK BY OTHERS (NARROW LINE)
———— EXISTING
- - - - - - EXISTING TO BE REMOVED BY OTHERS (SHORT DASHED PATTERN)
— — — EXISTING UNDERFLOOR OR UNDERGROUND (LONG DASHED PATTERN)

HALFTONING DOES NOT MODIFY SCOPE.

'TAG'-E — TAGS WITH DASH 'E' INDICATES THE REFERENCED OBJECT IS EXISTING

TAG-1 — UNDERLINED TAG INDICATES OBJECT IS IN-SCOPE. IF NEW, ADDITIONAL INFORMATION IS AVAILABLE IN A SCHEDULE, MATERIAL LIST, OR SYMBOL LIST

INDICATES AN EXISTING SYSTEM'S POINT OF CONNECTION/REMOVAL

APPLICABLE CODES

CONTRACTOR SHALL COMPLY WITH APPLICABLE CODES AND LOCAL AMENDMENTS INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

BUILDING CODE:	IBC 2021 EDITION
FIRE CODE:	IFC 2021 EDITION
PLUMBING CODE:	2021 COLORADO PLUMBING CODE
MECHANICAL CODE:	IMC 2021 EDITION
ELECTRICAL CODE:	NFPA 70 (NEC) 2023 EDITION
ENERGY CONSERVATION CODE:	IECC 2021
LOCAL BUILDING CODE:	CURRENT EDITION

CONDUIT INSTALLATION SCHEDULE

THE FOLLOWING SCHEDULE SHALL BE ADHERED TO UNLESS THEY CONSTITUTE A VIOLATION OF APPLICABLE CODES OR ARE NOTED OTHERWISE ON THE DRAWINGS. THE INSTALLATION OF RMC CONDUIT WILL BE PERMITTED IN PLACE OF ALL CONDUIT SPECIFIED IN THIS SCHEDULE. REFER TO CONDUIT AND BOXES SPECIFICATION 26 05 33 FOR ADDITIONAL INFORMATION.

INSTALLATION TYPE	RMC	IMC	EMT	RTRC	PVC COATED RMC	PVC	PVC CONCRETE ENCASED	HDPE	ASR
FEEDERS: SWITCHBOARDS, DISTRIBUTION PANELS, PANELBOARDS, MOTOR CONTROL CENTERS, ETC.		X	X						
BRANCH CIRCUITS: LIGHTING, RECEPTACLES, CONTROLS, ETC.		X	X						
MECHANICAL EQUIPMENT FEEDERS: PUMPS, CHILLERS, AIR HANDLING UNITS, ETC.		X	X						
FLOOR MOUNTED EQUIPMENT FEEDERS: PUMPS, ETC. (INCLUDE NO MORE THAN 6 FEET OF LFMC TO PUMP)		X	X						
CONTROLS (LIGHTING, POWER, BUILDING AUTOMATION, ETC.)		X	X						
FINISHED SPACES / CONCEALED			X						
WET AND DAMP LOCATIONS: (CONDUIT, BOXES, FITTINGS, INSTALLED AND EQUIPPED TO PREVENT WATER ENTRY)	X			X					
CORROSIVE LOCATIONS				X	X				
ELEVATED CONCRETE SLABS (ABOVE GRADE)	X					X			
INTERIOR LOCATIONS: CONCEALED			X						
INTERIOR LOCATIONS: EXPOSED		X	X						
INTERIOR LOCATIONS: EXISTING WALLS AND EXPOSED INSTALLATION (FINISHED SPACES)			X						
DEFINITIONS:									
CONCRETE ENCASEMENT: CONDUIT WITH A MINIMUM OF 3" THICKNESS BETWEEN THE SURFACE OF THE CONCRETE AND THE NEAREST CONDUIT. CONCRETE TO BE DOWELED INTO THE FOUNDATION.									

ELECTRICAL SYMBOL LIST

SYMBOL:	TAG:	SPEC SECTION:	DESCRIPTION:
GB	GB	26 05 26	GROUND BUS
IBT	IBT	26 05 26	INTERSYSTEM BONDING TERMINATION
E / E	ECONN	26 05 33	ELECTRICAL CONNECTION
J / J	JB	26 05 33	JUNCTION BOX
	FB-# or PT-#	26 27 26	FLOOR BOX or POKE THROUGH
RI	RI-TECH	26 05 33	TECHNOLOGY OUTLET ROUGH-IN
RI	RI-TECH-C	26 05 33	TECHNOLOGY ROUGH-IN, CEILING
TV	RI-TV	26 05 33	TV ANTENNA OUTLET ROUGH-IN
	WM-#	26 05 35	MULTI OUTLET SYSTEM
	WW-#	26 05 35	ELECTRICAL WIREWAY w/ DEVICES SHOWN
DEM	DEM	26 09 13	ENERGY METER
DPM	DPM	26 09 13/ 26 24 13	DIGITAL POWER METER
	EPO	26 09 16 26 32 13	EMERGENCY STOP / POWER OFF (N.C. AND N.O. CONTACT)
PB	PB	26 09 16	MOMENTARY PUSHBUTTON OPERATOR
	PANEL '###'	26 24 16	PANELBOARD - RECESS MOUNT
	PANEL '###'	26 24 16	PANELBOARD - SURFACE MOUNT
	MX-#/MS-# /CB-#/CS-#	26 24 19	MANUAL SWITCH / STARTER / COMBINATION STARTER/ CIRCUIT BREAKER. REFER TO DISC/STA SCHEDULE
	ATF-#	26 22 00	AUTOMATIC TRANSFER SWITCH
	TR-#/DTR-#	26 22 00	TRANSFORMER. REFER TO TRANSFORMER SCHEDULE
	MPC-#	26 24 23	PACKAGED POWER CENTER
	CB-#	26 28 16	CIRCUIT BREAKER - SURFACE MOUNTED. REFER TO DISC/STA SCHEDULE
	CB-#	26 28 16	CIRCUIT BREAKER - FLUSH MOUNTED. REFER TO DISC/STA SCHEDULE
	DS-#/FDS-#/DSS-#	26 28 16	DISCONNECT. REFER TO DISC/STA SCHEDULE
GANN	GANN-#	26 32 13	GENERATOR ANNUNCIATOR PANEL
DB	DB	ARCH	DOOR BELL
HD	HD	ARCH	HAND DRYER
PP	PP	ARCH	PUSH PAD

ELECTRICAL SYMBOL LIST

SYMBOL:	TAG:	SPEC SECTION:	DESCRIPTION:
O	REC-DUP-O	26 27 26	DUPLEX RECEPTACLE CONTROLLED BY OCCUPANCY
O	REC-QUAD-O	26 27 26	QUAD RECEPTACLE CONTROLLED BY OCCUPANCY
	REC-DUP	26 27 26	DUPLEX RECEPTACLE, 125V
	REC-DUP-GFI	26 27 26	DUPLEX GFI RECEPTACLE, 125V
G	REC-DUP-GFI-R	26 27 26	GROUND FAULT DEVICE
W	REC-DUP-WP	26 27 26	DUPLEX GFI WEATHERPROOF RECEPTACLE 125V
X	REC-DUP-XP	26 27 26	DUPLEX RECEPTACLE, EXPLOSION PROOF, 125V
	REC-ISO	26 27 26	ISOLATED GROUND RECEPTACLE, 125V
S	REC-ISO-SUR	26 27 26	ISOLATED GROUND RECEPTACLE WITH SURGE SUPPRESSION, 125V
S	REC-ISO-SUR-QUAD	26 27 26	ISOLATED GROUND QUAD RECEPTACLE WITH SURGE SUPPRESSION, 125V
U	REC-USB	26 27 26	DUPLEX RECEPTACLE, USB CHARGING
	REC-ARC	26 27 26	ARC FAULT CIRCUIT INTERRUPTER RECEPT 125V
	REC-SIM-520R	26 27 26	SIMPLEX RECEPTACLE, 125V
	REC-TAMP	26 27 26	DUPLEX RECEPTACLE, TAMPER RESISTANT, 125V
	REC-TAMP-GFI	26 27 26	GFI DUPLEX RECEPTACLE, TAMPER RESISTANT, 125V
	REC-TAMP-QUAD	26 27 26	QUAD RECEPTACLE, TAMPER RESISTANT, 125V
	REC-QUAD	26 27 26	QUAD RECEPTACLE, 125V
	REC-QUAD-GFI	26 27 26	QUAD GFI RECEPTACLE, 125V
U	REC-QUAD-USB	26 27 26	QUAD RECEPTACLE, USB 125V
W	REC-QUAD-WP	26 27 26	QUAD GFI WEATHERPROOF RECEPTACLE, 125V
	REC-DUP-PED	26 05 33	RECEPTACLE - PEDESTAL STYLE
	REC-PED-QUAD	26 05 33	RECEPTACLE - PEDESTAL STYLE
#	REC-Z#	26 27 26	IEC PIN AND SLEEVE RECEPTACLE, 600V
	PP#	26 27 23	POWER POLE

ELECTRICAL SYMBOL LIST

SYMBOL:	TAG:	SPEC SECTION:	DESCRIPTION:
S	SW-1P	26 09 33	SWITCH - SINGLE POLE
S_T	SW-1P-ADJ	26 09 33	SWITCH - LOCAL TIMER - USER ADJUSTABLE
S_X	SW-1P-EX	26 09 33	SWITCH - EXPLOSION PROOF
S_K	SW-1P-K	26 09 33	SWITCH - SINGLE POLE - KEY LOCK
S_P	SW-1P-PL	26 09 33	SWITCH - PILOT LIGHT
S_W	SW-1P-WP	26 09 33	SWITCH - WEATHERPROOF
S_2	SW-2P	26 09 33	SWITCH - TWO POLE
S_{K2}	SW-2P-K	26 09 33	SWITCH - TWO POLE - KEY LOCK
S_3	SW-3W	26 09 33	SWITCH - THREE WAY
S_{K3}	SW-3W-K	26 09 33	SWITCH - THREE WAY - KEY LOCK
S_4	SW-4W	26 09 33	SWITCH - FOUR WAY
S_{K4}	SW-4W-K	26 09 33	SWITCH - FOUR WAY - KEY LOCK
D_D	SW-D-LED	26 09 33	DIMMER - LED
D_{D3}	SW-D3-LED	26 09 33	DIMMER - LED - 3-WAY
D_O	SW-OD	26 09 33	DIMMER - WALL DIMMER OCCUPANCY SENSOR
LS	SW-LS	26 09 33	DAYLIGHT LEVEL SENSOR
LS D	SW-LS-D	26 09 33	DAYLIGHT LEVEL SENSOR - 1 ZONE DIMMING
PC	SW-LS-PC	26 09 33	PHOTOCELL
OC D	SW-OC-D	26 09 33	OCCUPANCY SENSOR - DUAL TECHNOLOGY
OC D	SW-OC-D-W	26 09 33	OCCUPANCY SENSOR - DUAL TECHNOLOGY - WALL MOUNTED
OC HA	SW-OC-P-HA	26 09 33	OCCUPANCY SENSOR - HIGH BAY AISLE COVERAGE
OC HB	SW-OC-P-HB	26 09 33	OCCUPANCY SENSOR - HIGH BAY
S_O	SW-OC-P-O	26 09 33	SWITCH - OCCUPANCY SENSOR WALL SWITCH
S_{O2}	SW-OC-P-O2	26 09 33	SWITCH - OCCUPANCY SENSOR AND DUAL SWITCH
OC P	SW-OC-P-P	26 09 33	OCCUPANCY SENSOR - PASSIVE INFRARED 360 DEGREE COVERAGE
OC P	SW-OC-P-W	26 09 33	OCCUPANCY SENSOR - PASSIVE INFRARED - WALL MOUNTED
OC U	SW-OC-U	26 09 33	OCCUPANCY SENSOR - ULTRASONIC 360 DEGREE COVERAGE
OC U2	SW-OC-U2	26 09 33	OCCUPANCY SENSOR - ULTRASONIC 35'X30' HAND MOTION COVERAGE
OC A	SW-OC-U-A	26 09 33	OCCUPANCY SENSOR - ULTRASONIC TWO SIDED CORRIDOR COVERAGE
OC U	SW-OC-U-W	26 09 33	OCCUPANCY SENSOR - ULTRASONIC - WALL MOUNTED
SW	SW	26 09 33	WALL CONTROL STATION
TC	TC-#	26 09 33	TIME SWITCH
#B	SW-DCS	26 09 33	DIMMER CONTROL STATION
S_{LV}	SW-LV	26 09 33	LOW VOLTAGE SWITCH
	LCP-#	26 09 33	LIGHTING CONTROL PANEL

ELECTRICAL SYMBOL LIST

SYMBOL:	TAG:	SPEC SECTION:	DESCRIPTION:
	REFER TO LUMINAIRE SCHEDULE		LINEAR LUMINAIRES
			TROFFER
			WALL SCONCE LUMINAIRE
			DOWNLIGHT LUMINAIRE
			AIMABLE OR WALL WASH LUMINAIRE
			INDUSTRIAL LUMINAIRE
			WALL BRACKET LUMINAIRE
			POLE MOUNTED LUMINAIRE
			SINGLE FACE EXIT SIGN
			DOUBLE FACE EXIT SIGN
			WALL/CEILING EMERGENCY EXIT SIGN
			EMERGENCY UNIT

ELECTRICAL SYMBOL LIST

SYMBOL:	TAG:	SPEC SECTION:	DESCRIPTION:
COMMON AND SEQUENCE OF OPERATION SUBSCRIPTS			SUBSCRIPTS: TYPE / PROGRAMMING WG = WIRE GUARD IS REQUIRED W = WEATHERPROOF A = ATRIUM CA = CLEAN AGENT SYSTEM CR = COMPUTER ROOM E = ELEVATOR RECALL D = HVAC CONTROL
	FACP-#	28 31 00	FIRE ALARM CONTROL PANEL
	FAA-#	28 31 00	FIRE ALARM ANNUNCIATOR
S	FA-122	28 31 00	FIRE ALARM DUCT SMOKE DETECTOR # = EQUIP OR SYSTEM
S AS	ASSD-#	28 31 50	FIRE ALARM AIR SAMPLING SMOKE DETECTION
H # H #	FA-140	28 31 00	FIRE ALARM HEAT DETECTOR BLANK = COMBINATION RATE OF RISE / FIXED TEMP AT = ATTIC (LOCATED IN) F = FIXED TEMP RC = RATE COMPENSATED X - EXPLOSION PROOF
H	FA-141	28 31 00	HEAT DETECTOR - LINEAR WIRE TYPE

ELECTRICAL GENERAL NOTES:

1. "NL" INDICATES LUMINAIRE IS UNSWITCHED FOR NIGHT LIGHT.
2. SHADED LUMINAIRE OR DEVICE INDICATES LUMINAIRE OR DEVICE IS CONNECTED TO AN EMERGENCY CIRCUIT OR CONTAINS INTEGRAL EMERGENCY POWER SOURCE.
3. REFER TO SHEET E4.1 FOR LUMINAIRE SCHEDULE.
4. { Z###} INDICATES THE LIGHTING ZONES FOR THE SPACE. PROVIDE SEPARATE CONTROL OF EACH CONTROLLED ZONE. LUMINAIRES ASSOCIATED WITH THE SAME ZONE SHALL OPERATE TOGETHER WITHIN THE SAME PROGRAMMED SCENE.
5. { B#} PUSH BUTTON REFERS TO SCENE QUANTITY. CONTROL STATION SHALL BE CAPABLE OF [RAISE/LOWER AND] SWITCHING ON/OFF FOR MULTIPLE SCENES AS INDICATED ON SHEETS AND THE LIGHTING SEQUENCE OF OPERATIONS {L##}. COORDINATE QUANTITIES OF BUTTONS FOR CONTROL STATIONS WITH LIGHTING CONTROL MANUFACTURER. REFER TO SHEET E4.1.
6. { L##} DENOTES THE LIGHTING SEQUENCE OF OPERATIONS FOR THIS SPACE. REFER TO SHEET E4.1.
7. VACANCY/OCCUPANCY SENSOR LAYOUT: SENSORS ARE SHOWN ON THE PLANS FOR DESIGN INTENT AND MAY NOT REPRESENT EVERY DEVICE. PROVIDE MANUFACTURER SPECIFIC FLOOR PLAN LAYOUTS SHOWING LOCATION, ORIENTATION, AND COVERAGE AREA OF EACH CONTROL DEVICE, SENSOR, AND CONTROLLER/INTERFACE. AREAS REQUIRING MULTIPLE SENSOR DEVICES FOR APPROPRIATE COVERAGE, SUBMIT SPECIFIC MANUFACTURER-APPROVED SENSOR LAYOUT AS AN OVERLAY DIRECTLY ON THE PROJECT DRAWINGS, EITHER IN PRINT OR APPROVED ELECTRONIC FORM.

LUMINAIRE KEY:

LUMINAIRE — F1 = FIXTURE TAG
1 = CIRCUIT NUMBER
a = SWITCH DESIGNATION
NL = SUBSCRIPT (IF APPLICABLE)
Z = ZONE DESIGNATION

*IF LABEL IS ORIENTED HORIZONTALLY A SLASH WILL SEPARATE THIS INFORMATION. EX: F1 / 1 / a / NL

DEVICE KEY:

DEVICE — A = MOUNTING (IF APPLICABLE)
1 = CIRCUIT NUMBER

*IF LABEL IS ORIENTED HORIZONTALLY A SLASH WILL SEPARATE THIS INFORMATION. EX: A / 1

ELECTRICAL MOUNTING SUBSCRIPT KEY:

A — MOUNT AT +6" TO CENTERLINE ABOVE COUNTER OR BACKSPLASH
C — MOUNT AT CEILING
H — MOUNT ORIENTED HORIZONTALLY
EWC — ELECTRIC WATER COOLER

ELECTRICAL RENOVATION NOTES:

THESE NOTES APPLY TO ALL ELECTRICAL SHEETS AND TRADES, INCLUDING BUT NOT LIMITED TO, LIGHTING, POWER, AND SYSTEMS.

1. EXISTING CONDITIONS ARE SHOWN BASED ON INFORMATION OBTAINED FROM FIELD SURVEYS, EXISTING BUILDING DOCUMENTS, AND STAFF. VERIFY EXISTING CONDITIONS AND REPORT ANY CONFLICTS BEFORE PROCEEDING.
2. NOT ALL EXISTING EQUIPMENT, LUMINAIRES, AND CONDUIT ARE SHOWN. VERIFY EXISTING CONDITIONS AND REPORT ANY CONFLICTS WITH NEW WORK BEFORE STARTING WORK.
3. FIELD VERIFY THE AVAILABLE CLEARANCES FOR CABLE TRAY, BUSWAY AND CONDUITS BEFORE FABRICATION. RISES AND DROPS MAY BE NECESSARY BECAUSE OF EXISTING FIELD CONDITIONS.
4. EACH CONTRACTOR SHALL FIELD VERIFY ACCESSIBILITY TO THE AREA OF THEIR WORK AND SHALL NOTIFY THE CONSTRUCTION MANAGER, PRIOR TO BIDDING IF OTHER UTILITIES ARE REQUIRED TO BE REMOVED OR RELOCATED TO ALLOW ACCESS TO THEIR AREA OF WORK.
5. WHERE EXISTING ELECTRICAL SYSTEMS ARE LOCATED IN AREAS THAT CONFLICT WITH NEW EQUIPMENT, PIPING, OR DUCTWORK TO BE INSTALLED, EACH CONTRACTOR SHALL EITHER ARRANGE NEW EQUIPMENT, CONDUIT, OR DUCTWORK IN SUCH A FASHION THAT IT DOES NOT CONFLICT WITH EXISTING SYSTEMS, OR REWORK EXISTING ELECTRICAL SYSTEMS TO ALLOW FOR INSTALLATION OF NEW EQUIPMENT, PIPING, OR DUCTWORK.
6. CONTRACTOR IS RESPONSIBLE FOR RE-SUPPORTING OF EXISTING AND NEW LOW VOLTAGE CABLING IN AREAS WHERE THE CEILING IS BEING REMOVED PER LOCAL CODE.

ELECTRICAL INSTALLATION NOTES:

1. THE COMPLETE INSTALLATION SHALL BE IN ACCORDANCE WITH THE ADA STANDARDS FOR ACCESSIBLE DESIGN.
2. CIRCUIT NUMBERS ARE SHOWN FOR CIRCUIT IDENTIFICATION. CIRCUITING SHALL AGREE WITH NUMBERING ON THE PANEL PROVIDED. COMMON NEUTRALS MAY NOT BE USED FOR BRANCH CIRCUITS. BALANCE THE LOAD ON PANEL AS EVENLY AS POSSIBLE BETWEEN EACH PHASE.
3. EMERGENCY BRANCH WIRING FOR FEEDERS AND BRANCH CIRCUITS SHALL BE ROUTED IN SEPARATE RACEWAY, JUNCTION BOXES, PULL BOXES, AND CABINETS. WIRING FOR EACH BRANCH SHALL BE INDEPENDENT FROM OTHER BRANCHES, INCLUDING THE NORMAL BRANCH.
4. FLUSH MOUNT ALL LIGHTING CONTROL DEVICES AT +42" FROM FLOOR (CENTERLINE DIMENSION), EXCEPT WHERE OTHERWISE NOTED. DEVICES MAY BE SURFACE MOUNTED WHEN CONDUIT IS SPECIFIED EXPOSED.
5. ALL MATERIALS USED TO SEAL PENETRATIONS OF FIRE RATED WALLS AND FLOORS SHALL BE TESTED AND CERTIFIED AS A SYSTEM PER ASTM E814 STANDARDS FOR FIRE TESTS OF THROUGH-PENETRATION FIRESTOPS. REFER TO 26 05 03 FOR ADDITIONAL INFORMATION AND REQUIREMENTS SPECIFIC TO FIRESTOPPING.
6. CONTRACTOR SHALL COORDINATE THE LOCATION OF ALL CEILING MOUNTED DEVICES AND EQUIPMENT WITH LUMINAIRES, SPRINKLER, AND CEILING DIFFUSERS. CENTER ALL DEVICES IN CEILING TILE PATTERN. SMOKE DETECTORS AND OCCUPANCY/VACANCY SENSORS SHALL BE LOCATED NO CLOSER THAN 3 FEET TO AN AIR SUPPLY DIFFUSER OR RETURN GRILLE.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN WALLS. ALL OPENINGS SHALL BE REPAIRED TO MATCH EXISTING BY A QUALIFIED CONTRACTOR AT THE EXPENSE OF THIS CONTRACTOR. ALL CONDUITS THROUGH WALLS SHALL BE GROUTED OR SEALED INTO OPENINGS.
8. ALL WELDING SHALL BE ACCORDING TO AMERICAN WELDING SOCIETY STANDARDS. CONTRACTOR SHALL FURNISH TO THE ARCHITECT/ENGINEER CERTIFICATES QUALIFYING EACH WELDER, PRIOR TO START OF WORK. THE ARCHITECT/ENGINEER RESERVES THE RIGHT TO REQUIRE QUALIFYING DEMONSTRATION, AT THE CONTRACTOR'S EXPENSE, OF ANY WELDERS ASSIGNED TO THE JOB.
9. EACH CONTRACTOR IS RESPONSIBLE FOR DAMAGE CAUSED BY THEIR ACTIONS TO THE WALLS, FLOORS, CEILINGS, AND ROOFS. THE CONTRACTOR WHOSE WORK CAUSES DAMAGE IS RESPONSIBLE FOR PATCHING TO MATCH ORIGINAL CONSTRUCTION, FIRE RATING, AND FINISH.
10. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN, ELECTRICAL, TECHNOLOGY AUDIO/VISUAL, AND OTHER ELECTRICAL PLANS FOR EXACT LOCATIONS OF ALL CEILING MOUNTED DEVICES, OTHER THAN SPRINKLERS.
11. ELECTRICAL IDENTIFICATION. REFER TO SPECIFICATION SECTION 26 05 53 FOR COLOR/LABEL REQUIREMENTS FOR CONDUIT, BOX, CABLE/WIRE, AND EQUIPMENT.

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ELECTRICAL COVERSHEET

PROJECT	012.23
DATE	11.13.23
DRAWN	JMN

NO.	DESCRIPTION	DATE

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ELECTRICAL GENERAL NOTES:

1. EXISTING LOW VOLTAGE DEVICES INCLUDING FIRE ALARM, A/V, DATA, AND SECURITY IN CEILINGS BEING DEMOLISHED ARE TO BE PROTECTED DURING DEMOLITION. RE-INSTALL EXISTING DEVICES IN THE SAME LOCATION IN NEW CEILING.

KEYNOTES (X)

2002 APPROXIMATE LOCATION OF DUCT SMOKE DETECTOR TO BE REMOVED FROM DUCT AND PROTECTED DURING DEMOLITION.

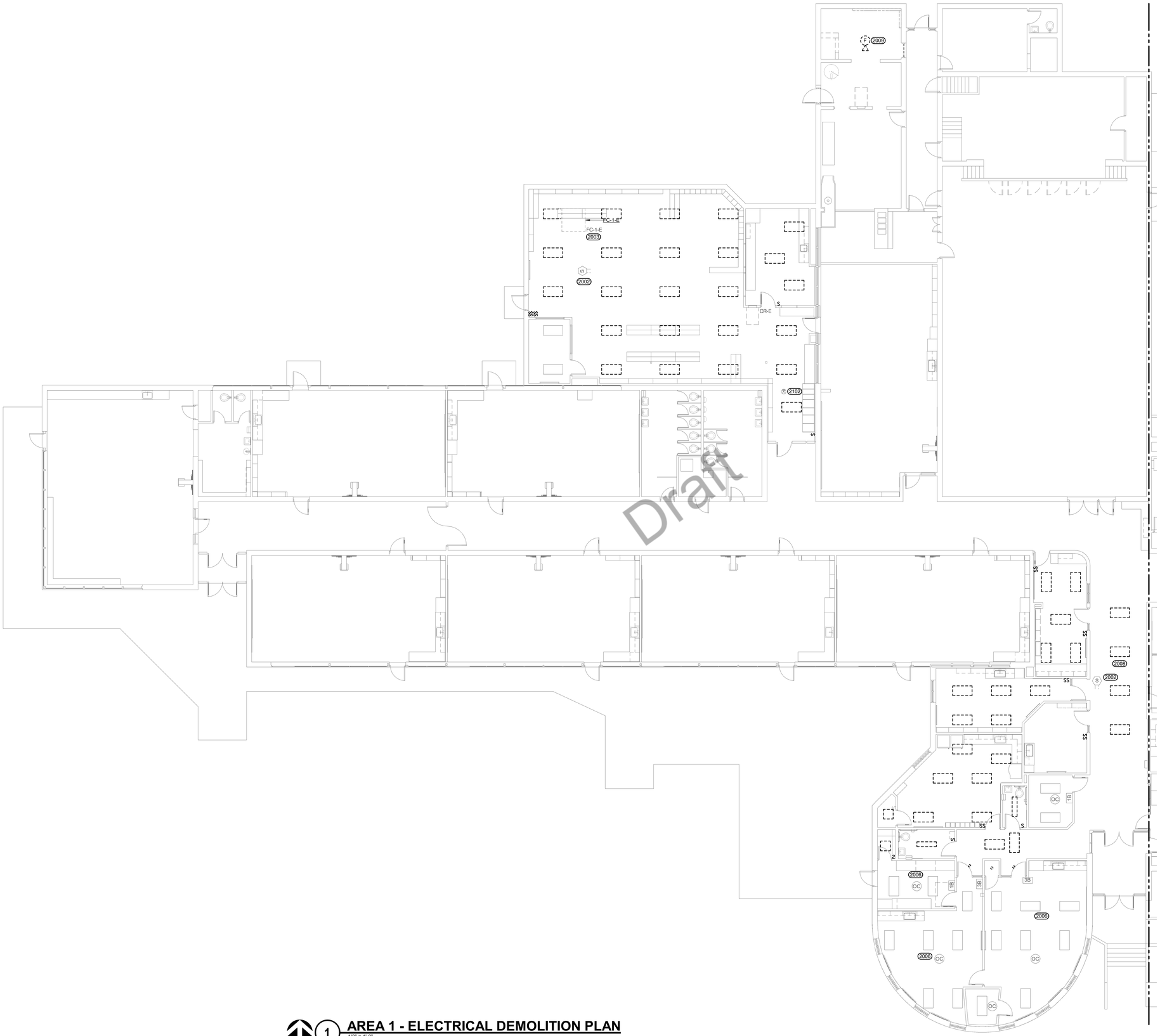
2003 EXISTING FAN COIL UNIT TO BE REMOVED. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO PANEL CR-E. MARK EXISTING BREAKER AS SPARE.

2006 EXISTING CEILING TO BE TAKEN DOWN. EXISTING LIGHTING TO BE PROTECTED DURING DEMOLITION AND PLACED IN THE SAME LOCATION IN THE NEW GRID.

2008 EXISTING LIGHTS TO BE REMOVED. SAVE AND PROTECT EXISTING CIRCUITS AND LIGHTING CONTROLS FOR RECONNECTION TO NEW LIGHTS.

2009 EXISTING FIRE ALARM DEVICE TO RELOCATED. REMOVE, SAVED AND PROTECTED DURING DEMOLITION, SAVE AND PROTECT EXISTING WIRING AND CIRCUIT FOR RECONNECTION TO DEVICE. REFER TO SHEET E2.1 FOR ADDITIONAL INFORMATION.

2102 EXISTING EXIT SIGN AND ASSOCIATED CIRCUIT TO BE SAVED AND PROTECTED DURING DEMOLITION, AND REINSTALLED DURING LIGHTING INSTALLATION.



1 AREA 1 - ELECTRICAL DEMOLITION PLAN
1/8" = 1'-0"

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AREA 1 - ELECTRICAL DEMOLITION PLAN

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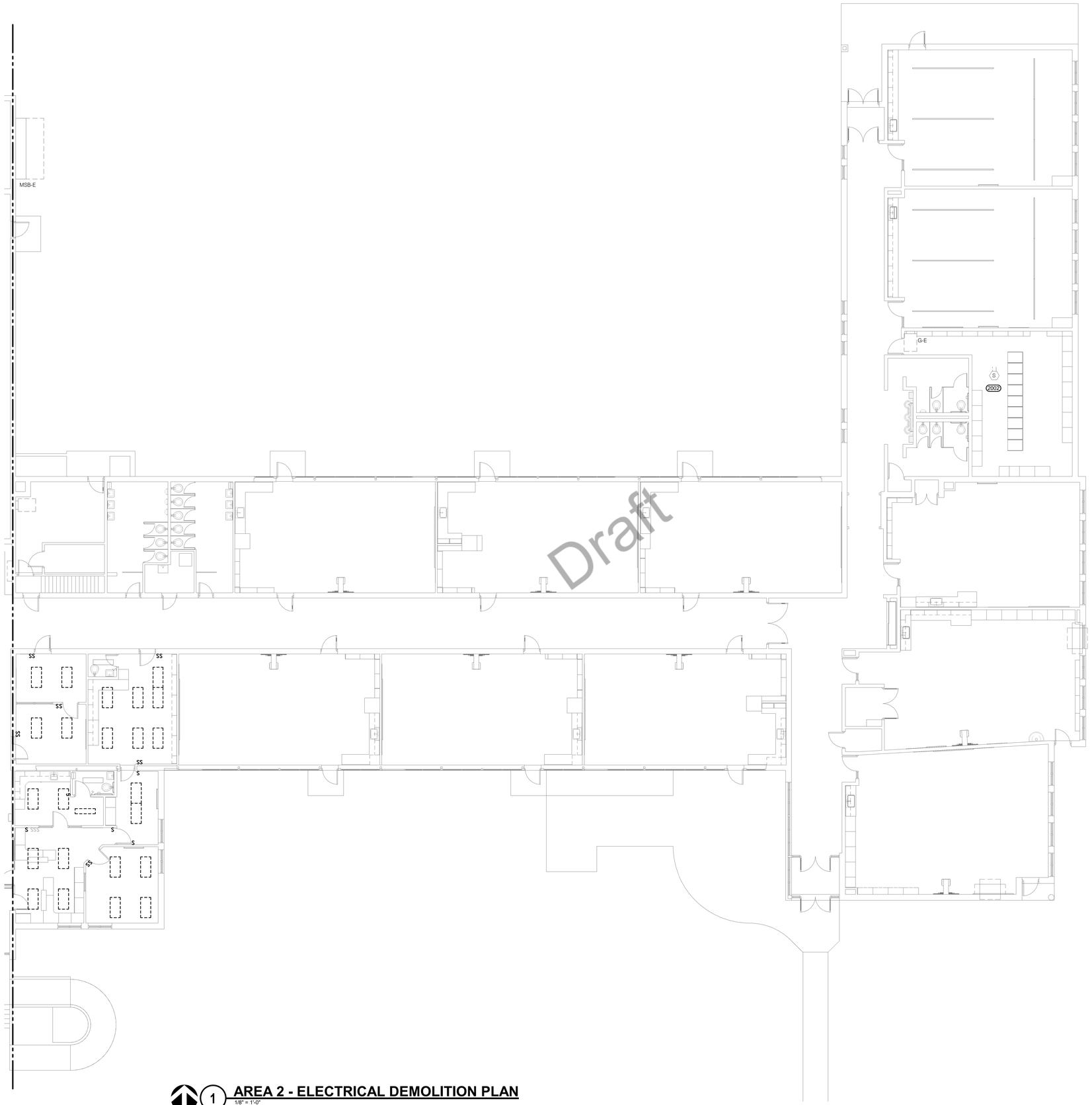

ELECTRICAL GENERAL NOTES:

1. EXISTING LOW VOLTAGE DEVICES INCLUDING FIRE ALARM, A/V, DATA, AND SECURITY IN CEILINGS BEING DEMOLISHED ARE TO BE PROTECTED DURING DEMOLITION. RE-INSTALL EXISTING DEVICES IN THE SAME LOCATION IN NEW CEILING.

KEYNOTES (X)

2002 APPROXIMATE LOCATION OF DUCT SMOKE DETECTOR TO BE REMOVED FROM DUCT AND PROTECTED DURING DEMOLITION.

NORTH 1 **AREA 2 - ELECTRICAL DEMOLITION PLAN**
1/8" = 1'-0"

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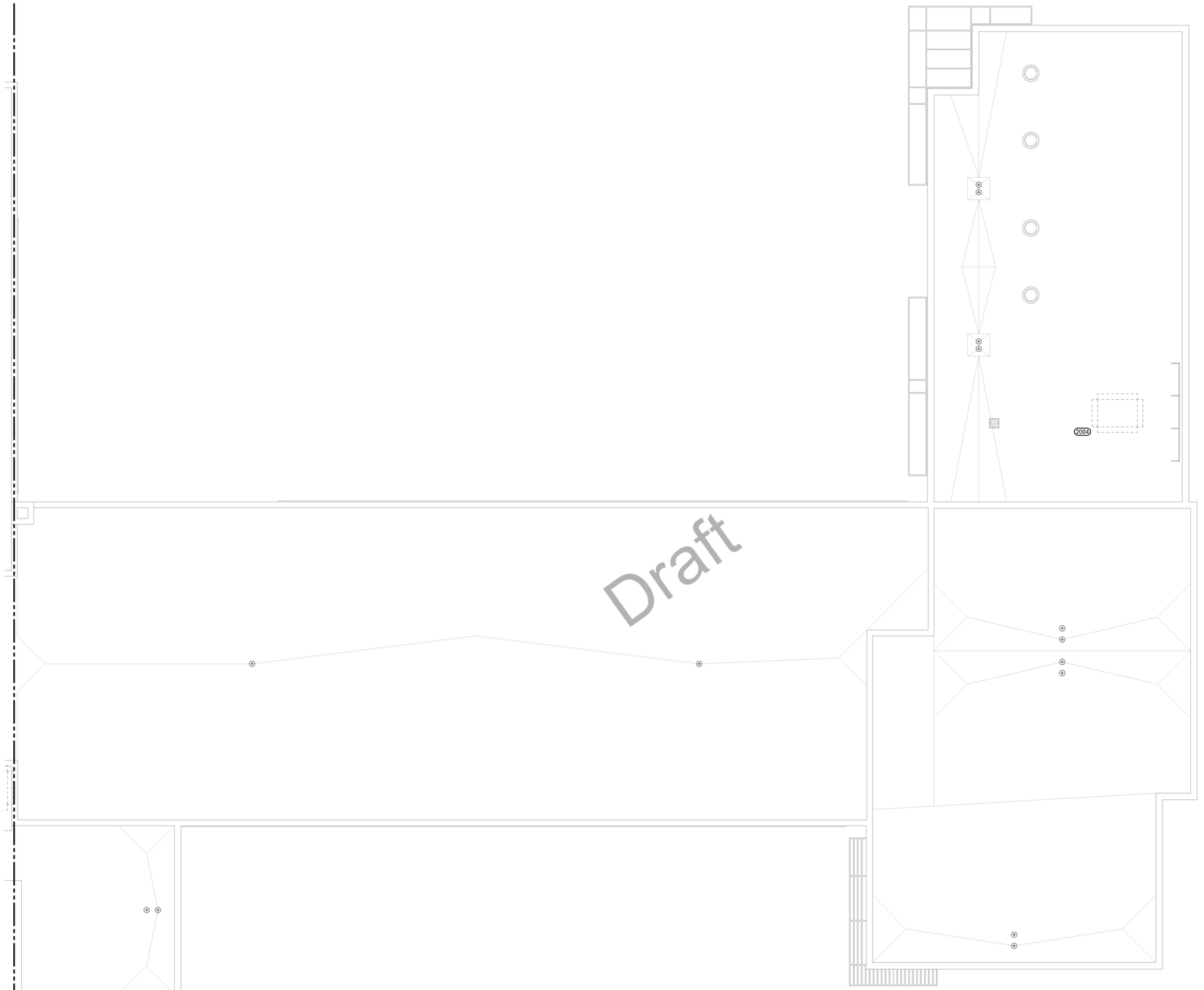
KEYNOTES (X)

2004 EXISTING AIR HANDLING UNIT TO BE REMOVED. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO PANEL G-E. MARK EXISTING BREAKER AS SPARE.



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AREA 2 - ELECTRICAL ROOF DEMOLITION PLAN

1/8" = 1'-0"

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AREA 2 - ELECTRICAL ROOF DEMOLITION PLAN

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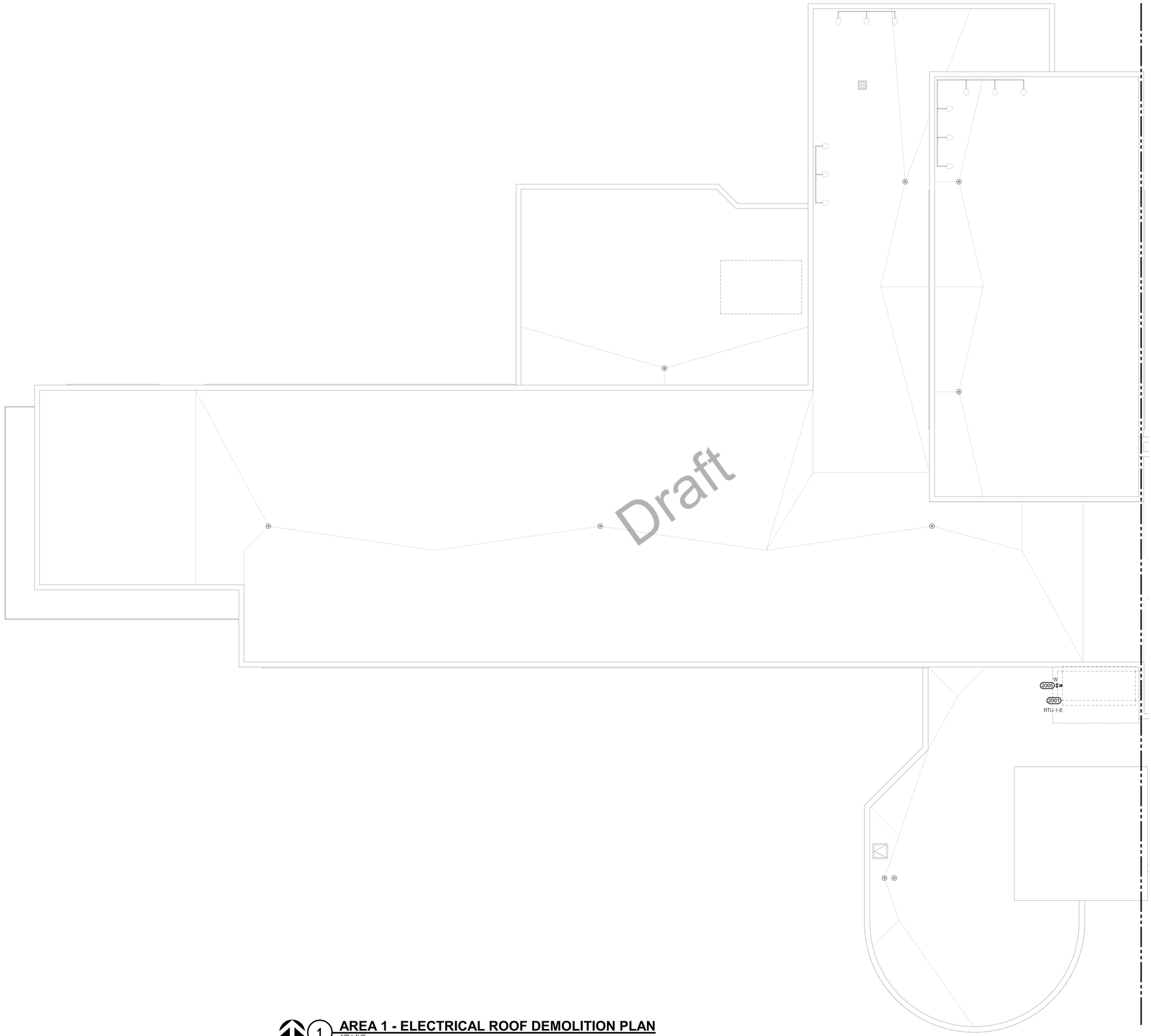
KEYNOTES (X)

2001 EXISTING HVAC EQUIPMENT TO BE REMOVED. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO SOURCE. MARK EXISTING BREAKER AS SPARE.

2005 EXISTING OUTLET TO BE REMOVED. CIRCUIT TO REMAIN.



1 AREA 1 - ELECTRICAL ROOF DEMOLITION PLAN
1/8" = 1'-0"

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AREA 1 - ELECTRICAL ROOF DEMOLITION PLAN

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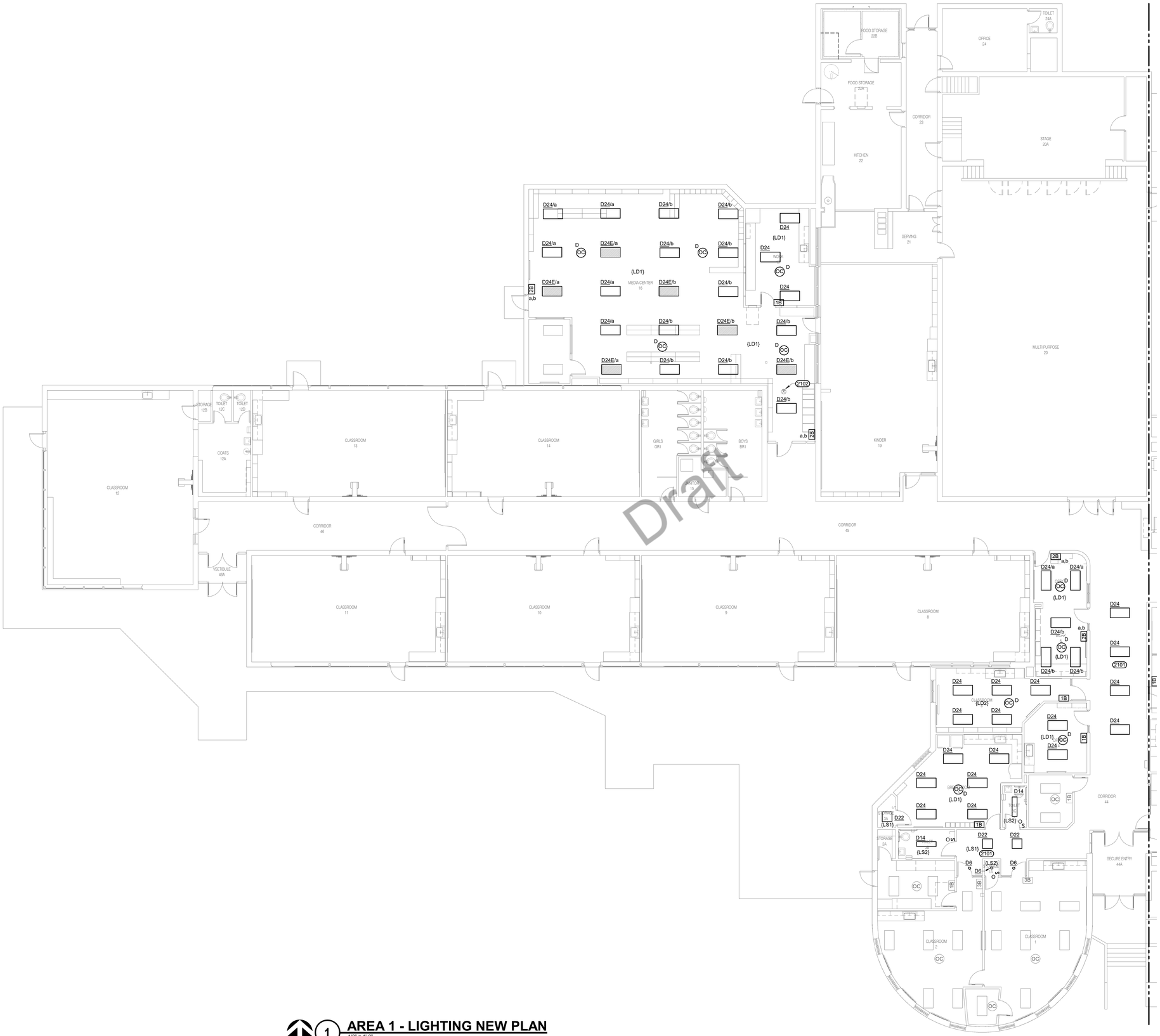

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ELECTRICAL GENERAL NOTES:

1. EXISTING LOW VOLTAGE DEVICES INCLUDING FIRE ALARM, A/V, DATA, AND SECURITY IN CEILINGS BEING DEMOLISHED ARE TO BE PROTECTED DURING DEMOLITION. RE-INSTALL EXISTING DEVICES IN THE SAME LOCATION IN NEW CEILING.

KEYNOTES (X)

2101 CORRIDOR LUMINAIRE SHALL BE TIED INTO EXISTING CORRIDOR LIGHTING CIRCUITS AND CONTROL SAVED DURING DEMOLITION.

2102 EXISTING EXIT SIGN AND ASSOCIATED CIRCUIT TO BE SAVED AND PROTECTED DURING DEMOLITION, AND REINSTALLED DURING LIGHTING INSTALLATION.

1 NORTH **AREA 1 - LIGHTING NEW PLAN**
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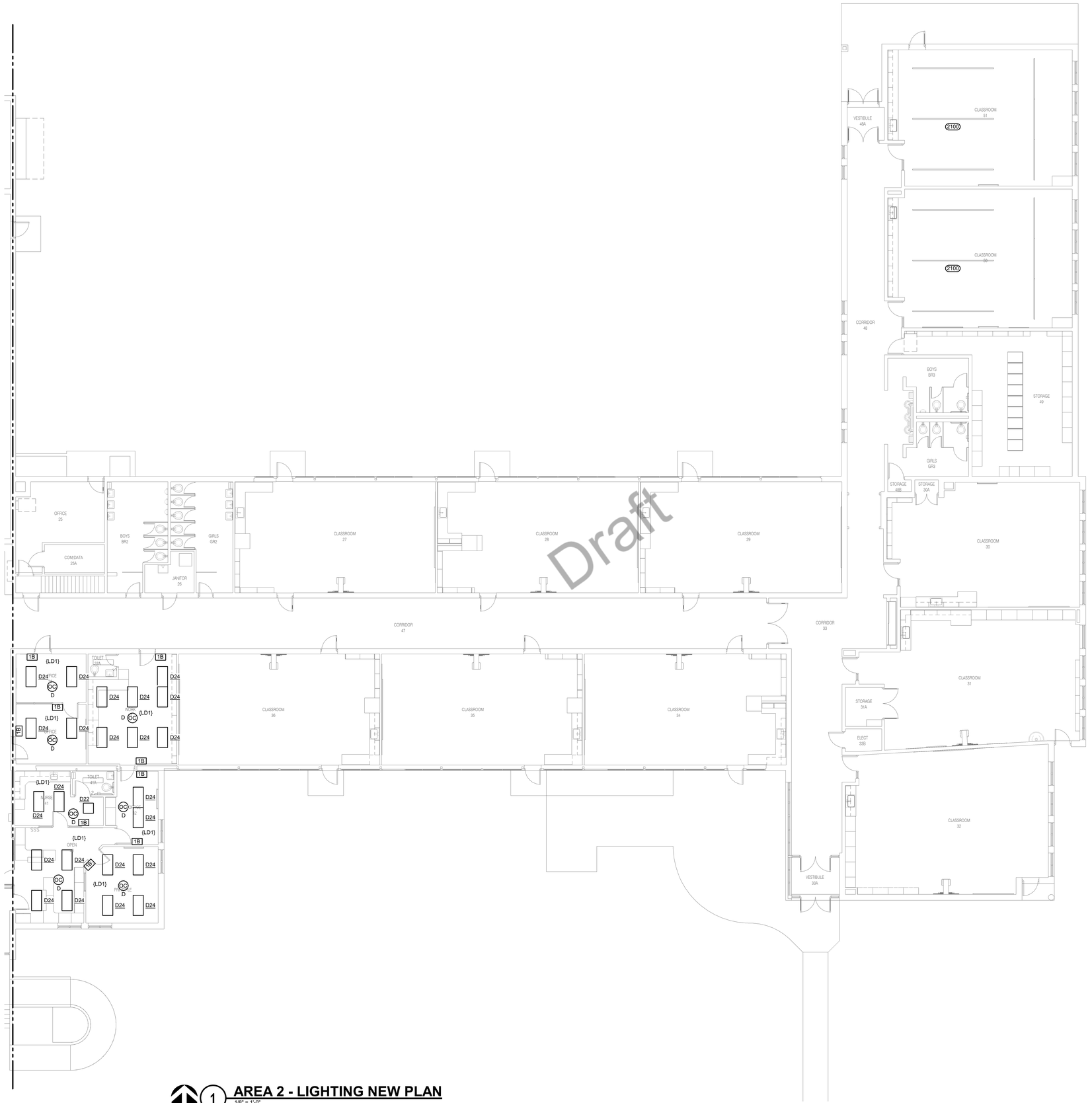

NORTH 1 **AREA 2 - LIGHTING NEW PLAN**

1/8" = 1'-0"

ELECTRICAL GENERAL NOTES:

1. EXISTING LOW VOLTAGE DEVICES INCLUDING FIRE ALARM, A/V, DATA, AND SECURITY IN CEILINGS BEING DEMOLISHED ARE TO BE PROTECTED DURING DEMOLITION. RE-INSTALL EXISTING DEVICES IN THE SAME LOCATION IN NEW CEILING.

KEYNOTES (X)

2100 COORDINATE WITH OTHER DISCIPLINES TO PROVIDE REMOVAL AND REINSTALLATION OF EXISTING PENDANT FIXTURES TO ALLOW INSTALLATION OF NEW DUCT.

DIGITAL ARCHITECTURAL MODELING
970.234.8569 WWW.DAMODELING.COM

DUNN ELEMENTARY | HVAC UPGRADES | PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS | COLORADO | 80521
AREA 2 - LIGHTING NEW PLAN

ISSUE FOR PERMIT AND BIDDING

PROJECT	012.23
DATE	11.13.23
DRAWN	JMN

NO.	DESCRIPTION	DATE

REVISIONS

SHEET

E1.2

IMEG
7600 E ORCHARD ROAD
SUITE 250-S
GREENWOOD VILLAGE, CO 80111
P: 303.796.6000
www.imegcorp.com

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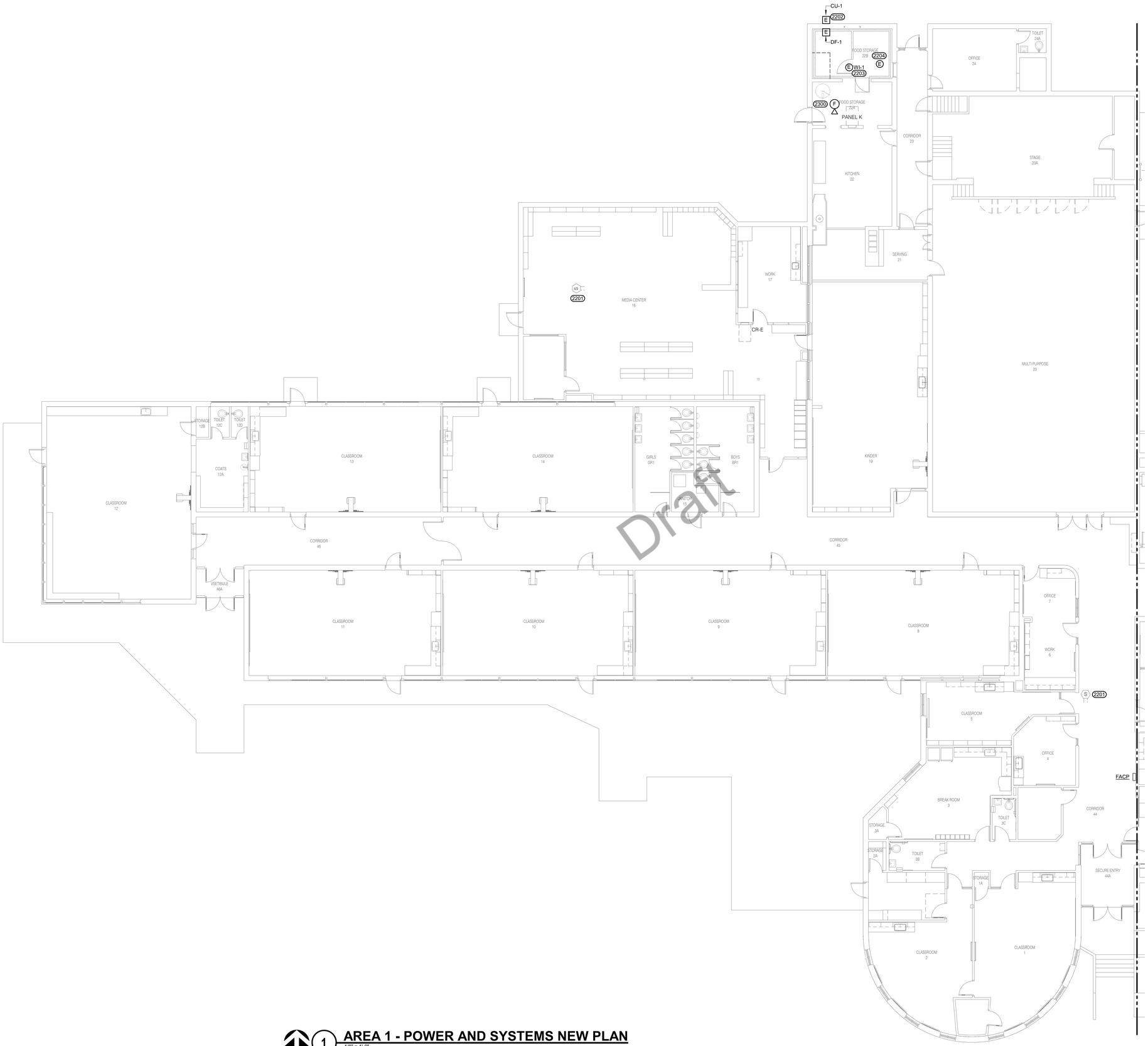
REF. SCALE IN INCHES PROJECT #23005385.00



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KEYNOTES (X)

2201 INSTALL EXISTING DUCT DETECTOR IN THE SAME LOCATION IN NEW DUCT.

2202 PROVIDE POWER TO WALK-IN FREEZER ELECTRICAL TIE IN FOR CONDENSING UNIT AND DEFROST FAN. COORDINATE EXACT LOCATION OF CONDENSING UNIT WITH EQUIPMENT PROVIDER / INSTALLER. PROVIDE A SERVICE RECEPTACLE NEARBY PER NEC REQUIREMENTS.

2203 PROVIDE (1) 20A, 120V CIRCUIT FROM PANEL "K" FOR WALK IN FREEZER DOOR CONNECTION. COORDINATE EXACT LOCATION OF ELECTRICAL CONNECTION WITH THE EQUIPMENT PROVIDER / INSTALLER.

2204 PROVIDE (1) 20A, 120V CIRCUIT FROM PANEL "K" FOR HEAT TRACE. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. REFER TO MECHANICAL PLANS FOR ADDITIONAL DETAILS.

2300 EXISTING FIRE ALARM DEVICE TO BE RELOCATED HERE. RECONNECT TO EXISTING WIRING AND CIRCUIT. EXTEND WIRING AND CIRCUIT IF NESSARRY TO MAKE FULLY OPERATIONAL.

1 AREA 1 - POWER AND SYSTEMS NEW PLAN

1/8" = 1'-0"

NORTH

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AREA 1 - POWER AND SYSTEMS NEW PLAN

PROJECT	012.23
DATE	11.13.23
DRAWN	JMN

NO.	DESCRIPTION	DATE

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E2.1

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REVISIONS			
NO.	DESCRIPTION	DATE	
		JMN	
		11.13.23	
		012.23	

PROJECT
DATE
DRAWN
SHEET

E2.2

ISSUE FOR PERMIT AND BIDDING

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IMEG SCALE IN INCHES
PROJECT #23003800.00

KEYNOTES

2201 INSTALL EXISTING DUCT DETECTOR IN THE SAME LOCATION IN NEW DUCT.

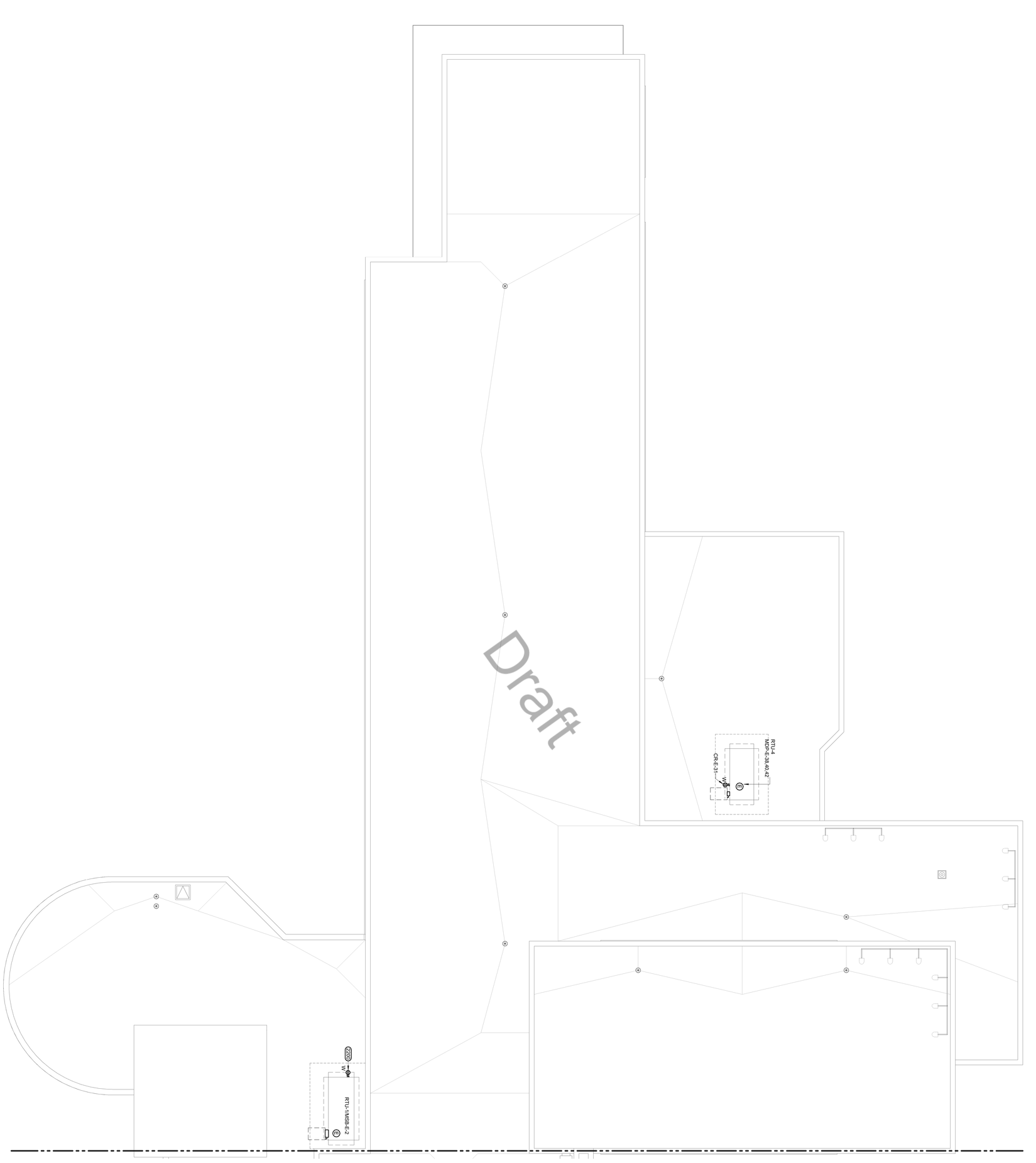
1 AREA 2 - POWER AND SYSTEMS NEW PLAN
1/8" = 1'-0"
NORTH

NORTH

1

1/8" = 1'-0"

AREA 1 - POWER ROOF PLAN



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PROJECT #20000080.00

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E3.1

REVISIONS

NO.	DESCRIPTION	DATE
		11.13.23

PROJECT
012.23

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AREA 1 - ELECTRICAL ROOF NEW PLAN

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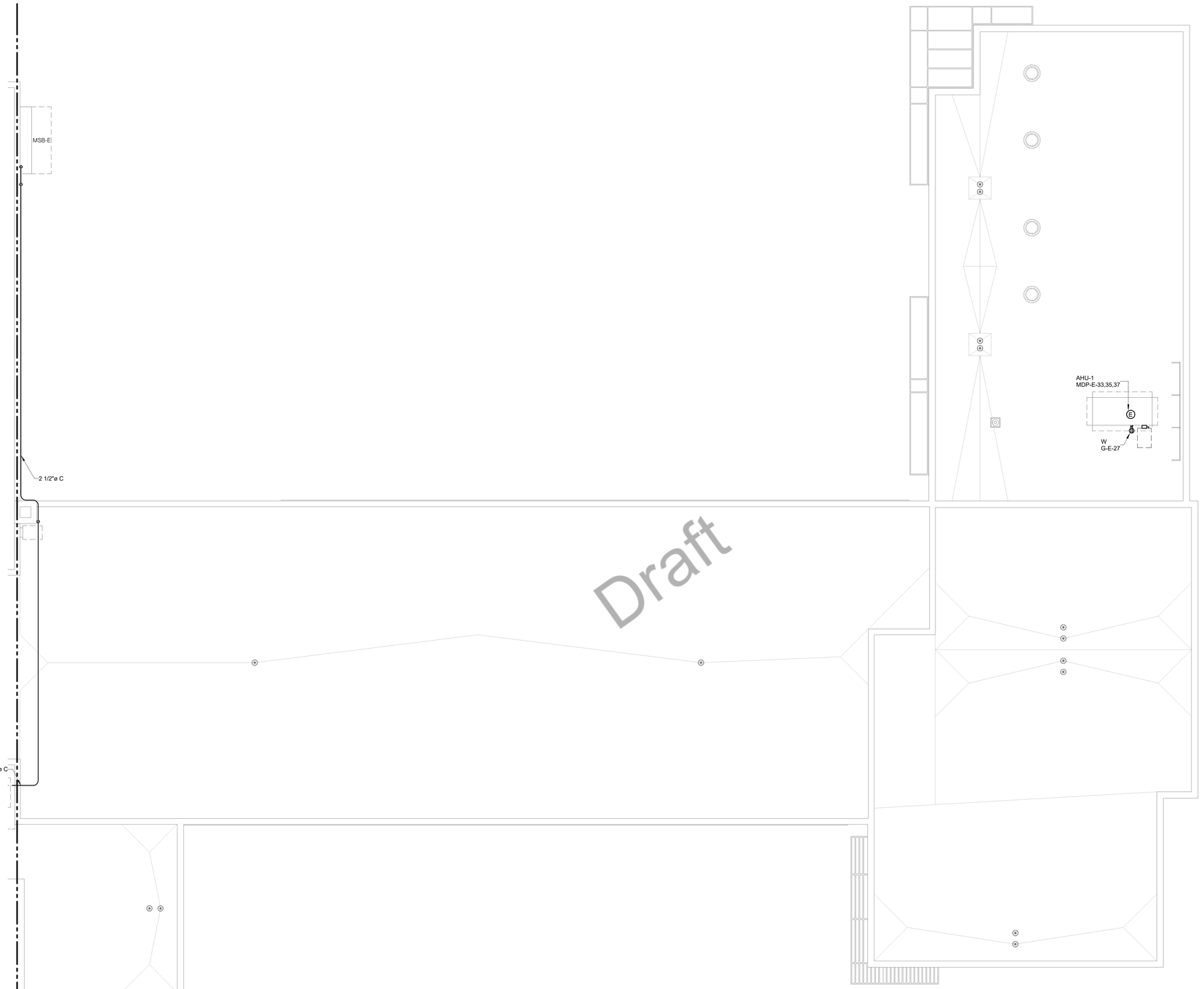

1 **AREA 2 - POWER ROOF PLAN**
1/8" = 1'-0"

NORTH

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AREA 2 - ELECTRICAL ROOF NEW PLAN

PROJECT	012.23
DATE	11.13.23
DRAWN	JMN

NO.	DESCRIPTION	DATE

REVISIONS

SHEET

E3.2

PANEL G-E

MOUNTING: SURFACE
ENCLOSURE: NEMA 1
FED FROM: 150 A/3P @ MSB-E
LOCATION: STORAGE 49

SINGLE TUB
SOLID NEUTRAL
GROUND BUS

MAIN: 225 A MLO
VOLTS: 120/208 Wye
PHASE: 3
WIRE: 4
SCCR: 10 kA
ISC UNKNOWN 0.00 kA

NOTES:

KEY	CKT NO.	LOAD DESCRIPTION	OCPD AMPS	P	WIRE SIZE H	N	G	VD %	A	B	C	VD %	WIRE SIZE G	N	H	P	OCPD AMPS	LOAD DESCRIPTION	CKT NO.	KEY
	1	EXISTING LOAD	20 A	1	10	10	10	2.6	0.9	0.9		2.52	10	10	10	1	20 A	EXISTING LOAD	2	
	3	EXISTING LOAD	20 A	1	10	10	10	2.56			0.9	0.9	2.47	10	10	10	1	20 A	EXISTING LOAD	4	
	5	EXISTING LOAD	20 A	1	10	10	10	2.52				0.9	0.9	2.44	10	10	10	1	20 A	EXISTING LOAD	6	
	7	EXISTING LOAD	20 A	1	10	10	10	2.48	0.9	0.9				2.4	10	10	10	1	20 A	EXISTING LOAD	8	
	9	EXISTING LOAD	20 A	1	10	10	10	2.44			0.9	0.9		2.36	10	10	10	1	20 A	EXISTING LOAD	10	
	11	EXISTING LOAD	20 A	1	10	10	10	2.39					0.9	0.9	2.31	10	10	10	1	20 A	EXISTING LOAD	12	
	13	EXISTING LOAD	20 A	1	10	10	10	2.36	0.9	0.9				2.27	10	10	10	1	20 A	EXISTING LOAD	14	
	15	EXISTING LOAD	20 A	1	10	10	10	2.32			0.9	0		--	--	--	--	2	30 A	SPARE	16	--
	17	EXISTING LOAD	20 A	1	10	10	10	2.28					0.9	0	--	--	--	--	--	--	18	--
	19	EXISTING LOAD	20 A	1	10	10	10	2.25	0.9	0.9				2.2	10	10	10	1	20 A	EXISTING LOAD	20	
	21	EXISTING LOAD	20 A	1	10	10	10	2.21			0.9	3.27		1.44	10	--	4	2	60 A	EXISTING LOAD	22	
	23	EXISTING LOAD	20 A	1	10	10	10	2.18					0.9	3.27	--	--	--	--	--	--	24	--
	25	EXISTING LOAD	20 A	1	10	10	10	2.13	0.9	3.27				1.41	10	--	4	2	60 A	EXISTING LOAD	26	
	27	**R- AHU-1 SERVICE ROOF**	20 A	1	12	12	12	0.35			0.18	3.27		--	--	--	--	--	--	--	28	--
--	29	SPARE	20 A	1	--	--	--						0	0	--	--	--	1	20 A	SPARE	30	--
--	31	SPARE	20 A	1	--	--	--		0	0				--	--	--	--	1	20 A	SPARE	32	--
--	33	SPARE	20 A	1	--	--	--				0	0		--	--	--	--	1	20 A	SPARE	34	--
--	35	SPARE	20 A	1	--	--	--						0	0	--	--	--	1	20 A	SPARE	36	--
--	37	SPARE	20 A	1	--	--	--		0	0				--	--	--	--	1	20 A	SPARE	38	--
--	39	SPARE	20 A	1	--	--	--				0	0		--	--	--	--	1	20 A	SPARE	40	--
--	41	SPARE	20 A	1	--	--	--						0	0	--	--	--	1	20 A	SPARE	42	--
							Total Load:		11.37 kVA		12.11 kVA			8.67 kVA								
							Total Amps:		98.17		104.39			72.21								

LOAD SUMMARY

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND
Lighting	4.5 kVA	100.00%	4.5 kVA
Power	27.462 kVA	100.00%	27.462 kVA
Receptacles	0.18 kVA	100.00%	0.18 kVA

TOTALS*	
TOTAL CONNECTED LOAD:	32.14 kVA
TOTAL ESTIMATED DEMAND LOAD:	32.142 kVA
TOTAL CONNECTED AMPS:	89.22 A
TOTAL ESTIMATED DEMAND AMPS:	89.2 A

*TOTAL DEMAND CALCS SUBTRACT ANY REDUNDANT LOAD AND THE SMALLER OF ANY NONCOINCIDENT HVAC LOADS. THIS CALC IS DONE AT EACH PANEL.

CIRCUIT KEY NOTES:

PANEL MDP-E

MOUNTING: SURFACE
ENCLOSURE: NEMA 1
FED FROM: 600 A/3P @ MSB-E
LOCATION: OFFICE 25

SINGLE TUB
SOLID NEUTRAL
GROUND BUS

MAIN: 600 A MLO
VOLTS: 120/208 Wye
PHASE: 3
WIRE: 4
SCCR: 22 kA
ISC UNKNOWN 0.00 kA

NOTES:

KEY	CKT NO.	LOAD DESCRIPTION	OCPD AMPS	P	WIRE SIZE H	N	G	VD %	A	B	C	VD %	WIRE SIZE G	N	H	P	OCPD AMPS	LOAD DESCRIPTION	CKT NO.	KEY
	1	EXISTING LOAD	25 A	2	6	--	6	2.53	3	3		2.59	6	--	6	2	20 A	EXISTING LOAD	2	
--	3	--	--	--	--	--	--	--			3	--	--	--	--	--	--	--	4	--
	5	EXISTING LOAD	175 A	2	2/0	--	6	0.6				3	3	2.55	6	--	6	2	20 A	EXISTING LOAD	6	
--	7	--	--	--	--	--	--	--	3	3				--	--	--	--	--	--	--	8	--
	9	EXISTING LOAD	60 A	2	4	--	10	1.59			3	3		2.5	6	--	6	2	20 A	EXISTING LOAD	10	
--	11	--	--	--	--	--	--	--					3	--	--	--	--	--	--	--	12	--
	13	EXISTING LOAD	175 A	2	2/0	--	6	0.58	3	3				2.46	6	--	6	2	20 A	EXISTING LOAD	14	
--	15	--	--	--	--	--	--	--			3	3		--	--	--	--	--	--	--	16	--
	17	EXISTING LOAD	175 A	2	2/0	--	6	0.57					3	1.58	10	--	4	2	60 A	EXISTING LOAD	18	
--	19	--	--	--	--	--	--	--	3	3				--	--	--	--	--	--	--	20	--
	21	EXISTING LOAD	35 A	3	8	--	10	1.81			2	3		1.55	10	--	4	2	60 A	EXISTING LOAD	22	
--	23	--	--	--	--	--	--	--					2	--	--	--	--	--	--	--	24	--
--	25	--	--	--	--	--	--	--	2	6				2.52	1	1	1	1	20 A	EXISTING LOAD	26	
	27	EXISTING LOAD	35 A	3	8	--	10	1.77			2	6		2.48	1	1	1	1	20 A	EXISTING LOAD	28	
--	29	--	--	--	--	--	--	--					2	6	2.43	1	1	1	20 A	EXISTING LOAD	30	
--	31	--	--	--	--	--	--	--	2	6				2.38	1	1	1	1	20 A	EXISTING LOAD	32	
1	33	**AHU-1**	**80 A**	**3**	3	--	8	2.07			4.65	6		2.33	1	1	1	1	20 A	EXISTING LOAD	34	
--	35	--	--	--	--	--	--	--					4.65	6	2.28	1	1	1	20 A	EXISTING LOAD	36	
--	37	--	--	--	--	--	--	--	4.65	4.23				1.33	8	--	4	3	**80 A**	**RTU-4**	**38**	**1**
--	39	SPARE	20 A	1	--	--	--				0	4.23		--	--	--	--	--	--	--	40	--
--	41	SPARE	20 A	1	--	--	--						0	4.23	--	--	--	--	--	--	42	--
							Total Load:		48.87 kVA		45.87 kVA			45.87 kVA								
							Total Amps:		407.29		382.29			382.29								

LOAD SUMMARY

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND
HVAC	74.624 kVA	100.00%	74.624 kVA
Power	66 kVA	100.00%	66 kVA

TOTALS*	
TOTAL CONNECTED LOAD:	140.62 kVA
TOTAL ESTIMATED DEMAND LOAD:	140.624 kVA
TOTAL CONNECTED AMPS:	390.33 A
TOTAL ESTIMATED DEMAND AMPS:	390.3 A

*TOTAL DEMAND CALCS SUBTRACT ANY REDUNDANT LOAD AND THE SMALLER OF ANY NONCOINCIDENT HVAC LOADS. THIS CALC IS DONE AT EACH PANEL.

CIRCUIT KEY NOTES: 1. REMOVE EXISTING BREAKERS AND IN PROVIDE NEW BREAKER AS INDICATED, MATCH EXISTING BREAKER MANUFACTURER AND AIC RATING.

PANEL CR-E

MOUNTING: RECESSED
ENCLOSURE: NEMA 1
FED FROM: 150 A/2P @ MSB-E
LOCATION: MEDIA CENTER 16

SINGLE TUB
SOLID NEUTRAL
GROUND BUS

MAIN: 225 A MCB
VOLTS: 120/208 Single
PHASE: 1
WIRE: 3
SCCR: 10 kA
ISC UNKNOWN 0.00 kA

NOTES:

KEY	CKT NO.	LOAD DESCRIPTION	OCPD AMPS	P	WIRE SIZE H	N	G	VD %	A	B	VD %	WIRE SIZE G	N	H	P	OCPD AMPS	LOAD DESCRIPTION	CKT NO.	KEY
	1	EXISTING LOAD	20 A	1	10	10	10	2.36	0.8	0.8	2.42	10	10	10	1	20 A	EXISTING LOAD	2	
	3	EXISTING LOAD	20 A	1	10	10	10	2.32			0.8	0.8	2.38	10	10	10	1	20 A	EXISTING LOAD	4	
	5	EXISTING LOAD	20 A	1	10	10	10	2.29	0.8	0.8			2.34	10	10	10	1	20 A	EXISTING LOAD	6	
	7	EXISTING LOAD	20 A	1	10	10	10	2.25			0.8	0.8	2.3	10	10	10	1	20 A	EXISTING LOAD	8	
	9	EXISTING LOAD	20 A	1	10	10	10	2.21	0.8	0.8			2.26	10	10	10	1	20 A	EXISTING LOAD	10	
	11	EXISTING LOAD	20 A	1	10	10	10	2.17			0.8	0.8	2.22	10	10	10	1	20 A	EXISTING LOAD	12	
	13	EXISTING LOAD	20 A	1	10	10	10	2.13	0.8	0.8			2.19	10	10	10	1	20 A	EXISTING LOAD	14	
	15	EXISTING LOAD	20 A	1	10	10	10	2.1			0.8	0.8	2.15	10	10	10	1	20 A	EXISTING LOAD	16	
	17	EXISTING LOAD	20 A	1	10	10	10	2.06	0.8	0.8			2.12	10	10	10	1	20 A	EXISTING LOAD	18	
	19	EXISTING LOAD	20 A	1	10	10	10	2.08			0.8	0.8	2.13	10	10	10	1	20 A	EXISTING LOAD	20	
	21	EXISTING LOAD	20 A	1	10	10	10	2.11	0.8	0.8			2.17	10	10	10	1	20 A	EXISTING LOAD	22	
	23	EXISTING LOAD	20 A	1	10	10	10	2.15			0.8	0.8	2.21	10	10	10	1	20 A	EXISTING LOAD	24	
	25	EXISTING LOAD	20 A	1	10	10	10	2.19	0.8	0.8			2.24	10	10	10	1	20 A	EXISTING LOAD	26	
	27	EXISTING LOAD	20 A	1	10	10	10	2.22			0.8	0.4	1.25	12	--	12	2	20 A	EXISTING LOAD	28	
	29	EXISTING LOAD	20 A	1	10	10	10	2.27	0.8	0.4			--	--	--	--	--	--	--	--	30	--
1	31	**R- RTU 4 SERVICE ROOF**	20 A	1	12	12	12	0.21			0.18	0		--	--	--	2	20 A	SPARE	32	--
--	33	SPACE	--	1	--	--	--		--	0			--	--	--	--	--	--	--	--	34	--
--	35	SPACE	--	1	--	--	--				--	--		--	--	--	1	--	SPACE		36	--
--	37	SPACE	--	1	--	--	--		--	--				--	--	--	1	--	SPACE		38	--
--	39	SPACE	--	1	--	--	--				--	--		--	--	--	1	--	SPACE		40	--
							Total Load:		12.40 kVA		10.98 kVA											
							Total Amps:		117.41		105.58											

LOAD SUMMARY

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND
Power	23.2 kVA	100.00%	23.2 kVA
Receptacles	0.18 kVA	100.00%	0.18 kVA

TOTALS*	
TOTAL CONNECTED LOAD:	23.38 kVA
TOTAL ESTIMATED DEMAND LOAD:	23.38 kVA
TOTAL CONNECTED AMPS:	112.40 A
TOTAL ESTIMATED DEMAND AMPS:	112.4 A

*TOTAL DEMAND CALCS SUBTRACT ANY REDUNDANT LOAD AND THE SMALLER OF ANY NONCOINCIDENT HVAC LOADS. THIS CALC IS DONE AT EACH PANEL.

CIRCUIT KEY NOTES: 1. FIELD VERIFY EXISTING BREAKER IS A SPARE, IF NOT PROVIDE NEW 20A,1P BREAKER IN EXISTING SPACE AT 36 AND CIRCUIT RTU-4 SERVICE RECEPTACE TO IT. NEW BREAKER TO MATCH EXISTING BREAKER MANUFACTURER AND AIC RATING.

LED LUMINAIRE SCHEDULE

(DESC) DOOR:
FA - FLAT ALUMINUM
FS - FLAT STEEL
RA - REGRESSED ALUMINUM
RS - REGRESSED STEEL
FINISH:
PAF - PAINT AFTER FABRICATION
CFSA - COLOR-FINISH SELECTION BY ARCHITECT

DISTRIBUTION:
II - ANSI/IES TYPE 2 DISTRIBUTION
III - ANSI/IES TYPE 3 DISTRIBUTION
IV - ANSI/IES TYPE 4 DISTRIBUTION
V - ANSI/IES TYPE 5 DISTRIBUTION

BEAMWIDTH:
NSP - VERY NARROW SPOT
SP - SPOT
MD - MEDIUM
WD - WIDE
VWD - VERY WIDE
WW - WALL WASH

(L/L) LENS/LOUVER:
A - .125" ACRYLIC
B - BAFFLE/LOUVER
C - CLEAR ALZAK
F - FROSTED ACRYLIC
G - TEMPERED GLASS
K - KSH12 .125" ACRYLIC
K19 - KSH19 .156" ACRYLIC
M - MATTE DIFFUSE CLEAR
N - NONE
P - POLYCARBONATE
R - HIGH IMPACT DR ACRYLIC
SS - SEMI-SPECULAR CLEAR
O - OTHER (SEE DESCRIPTION)
[DESIGN SPECIFIC BLANKS]

(MTG) MOUNTING:
CL - CEILING SURFACE
CV - COVE
FR - FLANGED RECESSED
P - PERIMETER
PL - POLE
RE - RECESSED
SSP - SUSPENDED
SU - SURFACE
UC - UNDER CABINET
WL - WALL
O - OTHER (SEE DESCRIPTION)

(WATT) PER: FIX - FIXTURE, FT - FOOT, LAMP

(TYPE) LED
LED - LIGHT EMITTING DIODE
TLED - TUBULAR LED LAMP
OLED - ORGANIC LED
DLED - DYNAMIC TUNABLE LED
RGB - COLOR CHANGING LED
RGBW - COLOR CHANGING + WHITE
RGBA - COLOR CHANGING + AMBER
RLED - RETROFIT LED
WLED - WARM DIM LED

(TYPE) DRIVER:
0-10V - 0-10V DIMMING
DALI - DIGITAL ADDRESSABLE
DMX - DIGITAL MULTIPLEX
EB - ELECTRONIC
ELV - ELECTRONIC LOW VOLTAGE
EM - EMERGENCY BATTERY
HL - HIGH/LOW (100%/50%) STEP DIM
LINE - LINE VOLTAGE DIMMING
ML - MULTI-LEVEL SWITCHING
MV - MULTI-VOLTAGE ELECTRONIC
REM - REMOTE
O - OTHER (SEE DESCRIPTION)

CATALOG NUMBER SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND CATALOG NUMBER ONLY. THE COMPLETE DESCRIPTION AND THE SPECIFICATION SHALL BE COORDINATED WITH THE CATALOG NUMBER TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE FIRST MANUFACTURER LISTED IS THE BASIS OF DESIGN.

VERIFY AND COORDINATE ALL CEILING TYPES WITH LUMINAIRE MOUNTING AND TRIM REQUIREMENTS PRIOR TO THE RELEASE OF THE LUMINAIRE ORDER.
CONFIRM ALL COLORS AND FINISHES OF ALL LUMINAIRE COMPONENTS WITH ARCHITECT AND INTERIOR DESIGNER PRIOR TO THE RELEASE OF THE LUMINAIRE ORDER.
UNLESS INDICATED ON LIGHTING PLANS OR BELOW, REFER TO ARCHITECTURAL AND INTERIOR DESIGN ELEVATIONS, SECTIONS AND DETAILS FOR ALL SUSPENDED AND WALL MOUNTED LUMINAIRE MOUNTING HEIGHTS.

REFER TO SPECIFICATION SECTIONS LED LIGHTING 26 51 19 AND EMERGENCY LIGHTING INVERTER 26 52 15 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
INTERIOR CORRELATED COLOR TEMPERATURE 3500K, COLOR RENDERING INDEX (CRI) AT OR ABOVE 85, UNLESS NOTED OTHERWISE.
EXTERIOR CORRELATED COLOR TEMPERATURE 3500K, COLOR RENDERING INDEX (CRI) AT OR ABOVE 85, UNLESS NOTED OTHERWISE.

ITEM	DESCRIPTION	L/L	MTG	DIMENSIONS L	W	H	DIA.	WATT ANSI WATTS	PER	LED TYPE	QTY	DELIVERED LUMENS (MIN)	DRIVER VOLTS	TYPE	MANUFACTURER AND MODEL
D6	OPEN RECESSED DOWNLIGHT, CLEAR SPECULAR, MEDIUM DISTRIBUTION	O	RE			9 1/2"	6"	20 W	FIX	LED	1	2065	120 V	0-10V	GOTHAM EVO GENERAL ILLUMINATION ROUND DOWNLIGHT
D14	1X4 VOLUMETRIC TROFFER, ALUMINUM BEZEL, STEEL BACKPLATE, SEAMLESS CORNERS, INTEGRAL GRID CLIPS, ACRYLIC LIGHT GUIDE, WHITE FROST LENS. NO DIODE IMAGE SHALL BE VISIBLE	F	RE	4'-0"	1'-0"	4 1/2"		32 W	FIX	LED	1	4011	120 V	0-10V	LITHONIA BLT 1x4
D22	2X2 VOLUMETRIC TROFFER, ALUMINUM BEZEL, STEEL BACKPLATE, SEAMLESS CORNERS, INTEGRAL GRID CLIPS, ACRYLIC LIGHT GUIDE, WHITE FROST LENS. NO DIODE IMAGE SHALL BE VISIBLE	F	RE	2'-0"	2'-0"	4 1/2"		31 W	FIX	LED	1	4000	120 V	0-10V	LITHONIA BLT 2x2
D24	2X4 VOLUMETRIC TROFFER, ALUMINUM BEZEL, STEEL BACKPLATE, SEAMLESS CORNERS, INTEGRAL GRID CLIPS, ACRYLIC LIGHT GUIDE, WHITE FROST LENS. NO DIODE IMAGE SHALL BE VISIBLE	F	RE	4'-0"	2'-0"	4 1/2"		38 W	FIX	LED	1	4961	120 V	0-10V	LITHONIA BLT 2x4
D24E	SAME AS D24 BUT WITH INTEGRAL BATTERY PACK WITH EMERGENCY OUTPUT OF ATLEAST 1400 LUMENS	F	RE	4'-0"	2'-0"	4 1/2"		38 W	FIX	LED	1	4961	120 V	0-10V	LITHONIA BLT 2x4

MECHANICAL CONNECTION SCHEDULE

ITEM	VOLTAGE	APPARENT LOAD	FLA	MOCP	OCPD	WIRE AND RACEWAY	DISCONNECT BY	DISCONNECT TYPE	COMMENTS	Panel
K										
WI-1	120 V, 1Ø	0.21 kVA	1.8 A	15 A	15 A	2#12 & 1#12 EGC IN 3/4" C.	MFR	-	EC TO PROVIDE CIRCUIT BREAKERS IN PANEL AND WIRING FROM PANEL TO WALK-IN FREEZER. OTHERS TO MAKE FINAL CONNECTION AND VERIFY EQUIPMENT IS OPERATIONAL.	K
MDP-E										
AHU-1	208 V, 3Ø	13.94 kVA	67 A	80 A	80 A	3#3 & 1#8 EGC IN 1" C.	EC	100AS/80AF	DISCONNECT SWITCH TO BE NEMA 3R. PROVIDE NEW BREAKER.	MDP-E
RTU-4	208 V, 3Ø	12.69 kVA	61 A	80 A	80 A	3#4 & 1#8 EGC IN 1" C.	EC	100AS/80AF	DISCONNECT SWITCH TO BE NEMA 3R. PROVIDE NEW BREAKER.	MDP-E
MSB-E										
CU-1	208 V, 1Ø	6.24 kVA	30 A	40 A	50 A	2#10 & 1#10 EGC IN 3/4" C.	MFR	-	EC TO PROVIDE CIRCUIT BREAKERS IN PANEL AND WIRING FROM PANEL TO WALK-IN FREEZER. OTHERS TO MAKE FINAL CONNECTION AND VERIFY EQUIPMENT IS OPERATIONAL.	MSB-E
DF-1	208 V, 1Ø	0.36 kVA	0.8 A	20 A	50 A	2#10 & 1#10 EGC IN 3/4" C.	MFR	-	EC TO PROVIDE CIRCUIT BREAKERS IN PANEL AND WIRING FROM PANEL TO WALK-IN FREEZER. OTHERS TO MAKE FINAL CONNECTION AND VERIFY EQUIPMENT IS OPERATIONAL.	MSB-E
RTU-1	208 V, 3Ø	58.68 kVA	134 A	150 A	150 A	3#2/0 & 1#6 EGC IN 1 1/2" C.	EC	200AS/150AF	DISCONNECT SWITCH TO BE NEMA 3R. PROVIDE NEW BREAKER.	MSB-E

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LIGHTING SEQUENCE OF OPERATION

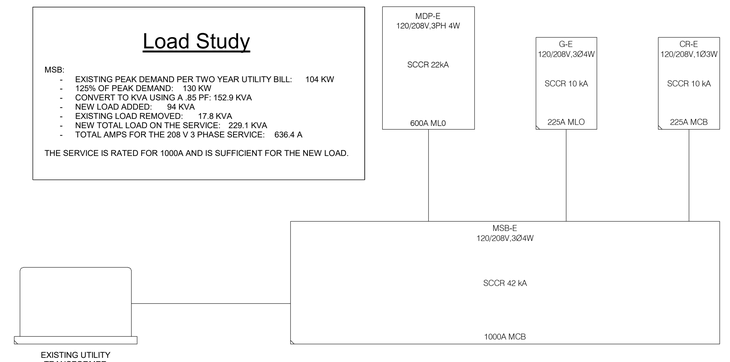
NOTES:
1. {L##} DENOTES THE LIGHTING SEQUENCE OF OPERATIONS FOR THIS SPACE.
2. {#B} PUSH BUTTON REFERS TO SCENE QUANTITY. CONTROL STATION SHALL BE CAPABLE OF [RAISE/LOWER AND] SWITCHING ON/OFF FOR MULTIPLE SCENES AS INDICATED ON SHEETS AND THE LIGHTING SEQUENCE OF OPERATIONS {L##}. COORDINATE QUANTITIES OF BUTTONS FOR CONTROL STATIONS WITH LIGHTING CONTROL MANUFACTURER.
3. [Z#] DENOTES LIGHTING CONTROL ZONE. PROVIDE SEPARATE CONTROL OF EACH CONTROLLED ZONE. LUMINAIRES ASSOCIATED WITH THE SAME ZONE SHALL OPERATE TOGETHER WITHIN THE SAME PROGRAMMED SCENE.
4. a = SWITCH DESIGNATION FOR LIGHTING CONTROL.
5. VERIFY AND COORDINATE ALL TIME CLOCK SETTINGS WITH OWNER PRIOR TO FINAL PROGRAMMING.
6. VERIFY AND COORDINATE ALL PUSH BUTTON WALL DEVICES AND QUANTITIES OF INDIVIDUAL BUTTONS WITH SCENES AND ZONES PER LOCATION.
7. VERIFY AND COORDINATE ALL PUSH BUTTON QUANTITIES AND SCENE NAMES WITH OWNER PRIOR TO SUBMITTING ENGRAVING TEMPLATE TO MANUFACTURER.

PLAN ID	LIGHTING SWITCHED
{LD1}	Sequence: Dimmed lights are controlled in this space. ON: The lights turned on using a wall control. ADJUST: The dimming luminaires are raised / lowered using a controller. OFF: The lights turn off using a wall controller. After the space has been vacant for 15 minutes, the lights will automatically turn off.
{LD2}	Sequence: Dimmed lights are controlled in this space. ON: The lights turned on using a wall control. ADJUST: The dimming luminaires are raised / lowered using a controller. The color tuning is raised / lowered using a controller. OFF: The lights turn off using a wall controller. After the space has been vacant for 15 minutes, the lights will automatically turn off.
{LS1}	Sequence: Lights are controlled in this space ON: The lights turned on using a wall control. OFF: The lights turn off using a wall controller.
{LS2}	Sequence: Lights are controlled in this space. ON: The lights turned on using a wall control. OFF: The lights turn off using a wall controller. After the space has been vacant for 15 minutes, the lights will automatically turn off.

Load Study

MSB:
- EXISTING PEAK DEMAND PER TWO YEAR UTILITY BILL: 104 KW
- 125% OF PEAK DEMAND: 130 KW
- CONVERT TO KVA USING A .85 PF: 152.9 KVA
- NEW LOAD ADDED: 94 KVA
- EXISTING LOAD REMOVED: 17.8 KVA
- NEW TOTAL LOAD ON THE SERVICE: 229.1 KVA
- TOTAL AMPS FOR THE 208 V 3 PHASE SERVICE: 636.4 A

THE SERVICE IS RATED FOR 1000A AND IS SUFFICIENT FOR THE NEW LOAD.



1 **MSB PARTIAL RISER DIAGRAM**
NO SCALE

IMEG
7600 E ORCHARD ROAD
SUITE 250-S
GREENWOOD VILLAGE, CO 80111
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0 1 2 3
REF. SCALE IN INCHES
PROJECT #23005385.00

DIGITAL ARCHITECTURAL MODELING
970.234.9569 WWW.DAMODELING.COM

DUNN ELEMENTARY | HVAC UPGRADES | PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS | COLORADO | 80521

ELECTRICAL DETAILS, SCHEDULES, AND ONE-LINE

ISSUE FOR PERMIT AND BIDDING

PROJECT 012.23
DATE 11.13.23
DRAWN JMN

NO.	DESCRIPTION	DATE

REVISIONS

SHEET
E4.1

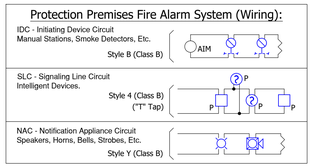
Poudre School District

DUNN ELEMENTARY SCHOOL

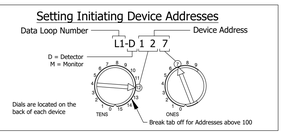
HVAC Upgrade Phase 2
501 South Washington Ave
Fort Collins, Colorado 80521

Fire Alarm System Drawings

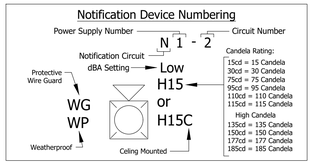
Protection Premises Fire Alarm System (Wiring):



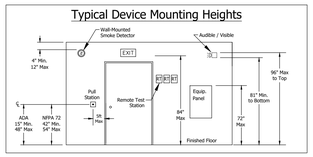
Setting Initiating Device Addresses



Notification Device Numbering



Typical Device Mounting Heights



Symbols Legend DEVICES SHOWN IN GREY ARE EXISTING TO REMAIN. DEVICES SHOWN IN RED ARE NEW.

Symbol	Qty.	Description	Mounting	Manufacturer	Part #
FACP	1	Intelligent Fire Alarm System Control Panel w/ DACT	SBB-C4 Enclosure at 72" to Top	Notifier	NFS-320SYS
CMAP	1	Custom Graphic Map (Picture Frame)	Surface Mount	FDS	18X24
P	32	Intelligent Photo Smoke Detector	4 Square Deep with 3" Round Ring	Notifier	FSP-851 with B210lp Base
I/F135°	2	Intelligent Heat Detector (135 Degree Fixed Temperature)	4 Square Deep with 3" Round Ring	Notifier	FST-851 with B210lp Base
I/R135°	9	Intelligent Heat Detector (135 Degree Fixed / Rate of Rise Temp)	4 Square Deep with 3" Round Ring	Notifier	FST-851R with B210lp Base
I/F190°	2	Intelligent Heat Detector (190 Degree Fixed High Temperature)	4 Square Deep with 3" Round Ring	Notifier	FST-851H with B210lp Base
P	9	Addressable Manual Pull Station	1 Gang at 48" to Center	Notifier	NBG-12LX
PC	1	Manual Pull Station - Protective Cover w/o Horn	Surface Mount	STI	STI-1230
P	2	Intelligent Duct Smoke Detector	Surface (Ref. Mfg Information)	Notifier	DNR / FSP-851R
RT	2	Duct Detector Remote Indicator with Keyed Test Switch	1 Gang at 7ft from Finished Floor (Refer to Flag Note 9 for more info)	Notifier	RTS-151KEY
AIM	3	Addressable Monitor Module	4 Square Deep	Notifier	FMM-1
AIM Z	1	Addressable Interface Monitor Module	4 Square Deep	Notifier	FZM-1
AOM R	5	Addressable Relay Module	4 Square Deep	Notifier	FRM-1
R	3	Remote Relay - Single Circuit	Surface	Notifier	R-10E
APS	3	Audible Power Supply, 8 Amp	Surface	Notifier	FCPS-24S8
H75	10	Horn with Multi Candela Sync Strobe at 75cd	1 Gang at 80" to Bottom	Notifier	P2R
H95	6	Horn with Multi Candela Sync Strobe at 95cd	1 Gang at 80" to Bottom	Notifier	P2R
15	6	Multi Candela Sync Strobe at 15cd	1 Gang at 80" to Bottom	Notifier	SR
30	4	Multi Candela Sync Strobe at 30cd	1 Gang at 80" to Bottom	Notifier	SR
H15C	5	Ceiling Horn with Multi Candela Sync Strobe at 15cd	4 Square Deep	Notifier	PC2R
H30C	7	Ceiling Horn with Multi Candela Sync Strobe at 30cd	4 Square Deep	Notifier	PC2R
H75C	9	Ceiling Horn with Multi Candela Sync Strobe at 75cd	4 Square Deep	Notifier	PC2R
H95C	3	Ceiling Horn with Multi Candela Sync Strobe at 95cd	4 Square Deep	Notifier	PC2R
15C	17	Ceiling Multi Candela Sync Strobe at 15cd	4 Square Deep	Notifier	SCR
30C	2	Ceiling Multi Candela Sync Strobe at 30cd	4 Square Deep	Notifier	SCR
75C	5	Ceiling Multi Candela Sync Strobe at 75cd	4 Square Deep	Notifier	SCR
95C	1	Ceiling Multi Candela Sync Strobe at 95cd	4 Square Deep	Notifier	SCR
110C	1	Ceiling Multi Candela Sync Strobe at 110cd	4 Square Deep	Notifier	SCR
15C	3	Ceiling Multi Candela Sync Strobe at 15cd (NEW)	4 Square Deep	Notifier	SCRL
DH	6	Magnetic Door Holder	Existing to be Reused (120VAC)		
SP	1	120 Volt 20 amp Surge Protection		E-Clips	E120H
WG	2	Ceiling Horn/Strobe Wire Guard	Surface Mount	STI	STI-9714
WG	2	Detector Wire Guard	Surface Mount	STI	STI-9602
C P	2	Conventional Photo Smoke Detector	4 Square Deep with 3" Round Ring	Notifier	2151 with B110LP Base
P C	2	Conventional Manual Pull Station	1 Gang at 48" to Center	Notifier	NBG-12L
TS	2	Surge Protector	Surface	TII	TII 326-2M
J	N/A	Fire Alarm Junction Box			Supplied by Others
FARC	1	Fire Alarm Records Cabinet	Surface Mount	Space Age	SSU-00672
EM	1	Emergency Power Panel			Supplied by Others
▲	2	Phone Line DACT (To Phone Lines)			Supplied by Others
P	1	Intelligent Duct Smoke Detector	Surface (Ref. Mfg Information)	Notifier	DNR / FSP-851R
RT	1	Duct Detector Remote Indicator with Keyed Test Switch	1 Gang at 7ft from Finished Floor (Refer to Flag Note 9 for more info)	Notifier	RTS-151KEY
AOM R	1	Addressable Relay Module	4 Square Deep	Notifier	FRM-1

Wire Legend

Symbol	Description	MFG.	Part Number	Color Coded Cable	Type of Circuit Application
A	1 pair 16 AWG Twisted / NON Shielded Fire Alarm Cable (FPLP)	West Penn	60991B	Brown + Black - Red Jacket w/ Brown Tracer	Conventional (IDC) Circuit Plenum
AW	1 pair 16 AWG Twisted / NON Shielded Fire Alarm Cable (Wet Location)	West Penn	AQ225	Brown + Black - Red Jacket w/ Brown Tracer	Conventional (IDC) Circuit Wet Location
C	1 pair 14 AWG Twisted / NON Shielded Fire Alarm Cable (FPLP)	West Penn	60993BT-BL	Blue + Black - Red Jacket w/ Blue Tracer	Audible (NAC) Circuit Plenum
CW	1 pair 14 AWG Twisted / NON Shielded Fire Alarm Cable (Wet Location)	West Penn	AQ226	Blue + Black - Red Jacket w/ Blue Tracer	Audible (NAC) Wet Location
D	1 pair 16 AWG Twisted / NON Shielded Fire Alarm Cable (FPLP)	West Penn	60991B-SLC	Red + Black - Red Jacket Pre-Printed "SLC"	Data (SLC) Circuit Plenum
J	2 14 AWG THHN (in EMT)			Green + Black - Red Jacket w/ Green Tracer	HVAC Interface
K	2 14 AWG THHN (in EMT)			White (N) / Black (H) tag for Ckt type @ J box	Damper Interface
L	2 16 AWG TFFN (in EMT)			Brown + Yellow - tag for Ckt type @ J box	Aux Equipment Interface
M	2 14 AWG THHN (in EMT)			Blue + Orange - tag for Ckt type @ J box	Door Holder Circuit
T	CAT 5 Network Cable				Telephone Circuit
U	1 pair 14 AWG Twisted / NON Shielded Fire Alarm Cable (FPLP)	West Penn	60993BT-BL	Blue + Black - Red Jacket w/ Blue Tracer	NAC Sync Circuit Plenum
W	2 pair 16 AWG Twisted / NON Shielded Fire Alarm Cable (FPLP)	West Penn	60164B	Red + Black - Red Jacket tag for Ckt type @ J box	Remote Test Station Circuit Plenum

Wire Manufacturer is for Reference Purpose Only, Consult NEC and Specifications for Wiring Methods.

WIRE LEGEND

VISUAL WIRING DEMOLITION	NEW VISUAL WIRING
1 PAIR 14 AWG TWISTED / UNSHIELDED (FPLP) RED + BLACK = RED JACKET W/BLUE TRACER AUDIBLE (NAC) CIRCUIT PLENUM	1 PAIR 14 AWG TWISTED / UNSHIELDED (FPLP) RED + BLACK = RED JACKET W/BLUE TRACER AUDIBLE (NAC) CIRCUIT PLENUM

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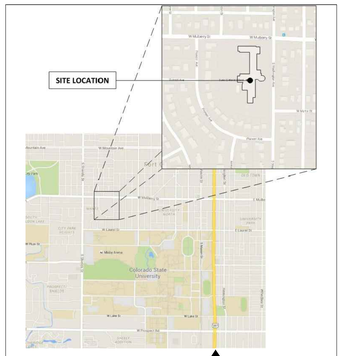
SCOPE OF WORK

DUNN ELEMENTARY SCHOOL IS AN EXISTING ONE STORY EDUCATIONAL FACILITY THAT IS UNDERGOING AN HVAC UPGRADE, LIMITED CEILING REPLACEMENT, AND KITCHEN COOLER REMODEL. GRAPHIC MAPS WILL BE UPDATED, PRINTED, AND INSTALLED BY THE SCHOOL DISTRICT.

1. CONTRACTOR SHALL PROTECT ALL SMOKE DETECTORS WITH PRESS AND SEAL DURING THE CONSTRUCTION PERIOD. WHERE CEILINGS ARE BEING REMOVED/REPLACED, CONTRACTOR SHALL PROTECT/SUPPORT FIRE ALARM DEVICES (SMOKE DETECTORS AND NOTIFICATION APPLIANCES) AND RELOCATE OUTSIDE THE AREA OF CONSTRUCTION PATHWAYS. CONTRACTOR SHALL PROTECT EXISTING SMOKE DETECTOR SENSORS DURING CONSTRUCTION AND CLEAN UP IN ACCORDANCE WITH NFPA 72 §17.7.1.11
   17.7.1.12* PROTECTION DURING CONSTRUCTION.
   17.7.1.12.2 WHERE DETECTORS ARE INSTALLED BUT NOT OPERATIONAL DURING CONSTRUCTION, THEY SHALL BE PROTECTED FROM CONSTRUCTION DEBRIS, DUST, DIRT, AND DAMAGE IN ACCORDANCE WITH THE MANUFACTURER'S COMMENDATIONS AND VERIFIED TO BE OPERATING IN ACCORDANCE WITH THE LISTED SENSITIVITY, OR THEY SHALL BE REPLACED PRIOR TO THE FINAL ACCEPTANCE TEST OF THE SYSTEM.
2. CONTRACTOR SHALL TAKE ABOVE CEILING PICTURES PRIOR TO CONSTRUCTION DOCUMENTING EXISTING CONDITIONS.
3. PROTECT EXISTING DUCT DETECTORS, TEST SWITCHES, ASSOCIATED FIRE ALARM MODULES, WIRING, AND CONDUIT AND REINSTALL IF NECESSARY.
4. REMOVE DUCT DETECTOR SENSORS L1D018 IN THE MAIN ENTRANCE AND L1D003 IN STORAGE 44 AND TEMPORARILY REMOVE DUCT DETECTORS FROM PROGRAMMING PRIOR TO THE START OF CONSTRUCTION AND SAFELY STORE AND PROTECT THE DEVICES FOR REINSTALLATION/PROGRAMMING/FUNCTION VERIFICATION UPON PROJECT COMPLETION.
5. CONTRACTOR SHALL WALK THE JOBSITE ON A REGULAR BASIS TO ENSURE ALL PROTECTION REMAINS IN PLACE.
6. CONTRACTOR SHALL REMOVE PRESS AND SEAL PROTECTION AFTER ALL CONSTRUCTION IS COMPLETE.
7. THE EXISTING STROBE IN BOOK 23 SHALL BE RELOCATED TO STORAGE 22A.
   - EXISTING WIRE SHOWN ON THE DEMOLITION PLANS (REFERENCE WIRE LEGEND) SHALL BE DEMOLISHED IN ITS ENTIRETY (BACK BOXES & SUPPORT, WIRE AND SUPPORT). NEW CABLE, BACK BOXES AND SUPPORT SHALL BE PROVIDED AND WIRE RAN IN COMPLIANCE WITH THE NEC AND PSD TECHNICAL GUIDELINES.
8. THE FIRE ALARM SYSTEM SHALL REMAIN ACTIVE AT ALL TIMES IN A MANNER THAT THE FIRE ALARM CONTROL PANEL SHOWS ALL SYSTEMS NORMAL DURING THE ENTIRE CONSTRUCTION PERIOD. (IF THE CONTRACTOR COMPROMISES A FIRE ALARM CIRCUIT/DEVICE RESULTING IN A TROUBLE CONDITION, THE CONTRACTOR SHALL NOTIFY TLH FIRE AND PSD IN WRITING WITHIN 4 HOURS OF THE OCCURRENCE OF THE TROUBLE CONDITION SO THAT A REMEDY PROCEDURE CAN BE IMMEDIATELY IMPLEMENTED.). THE CONTRACTOR SHALL HIRE AN APPROPRIATE VENDOR TO PRODUCE A HISTORY REPORT WHEN TROUBLES ARE DISCOVERED TO DETERMINE THE NATURE OF THE TROUBLE AND FUNCTIONAL TESTING WILL TAKE PLACE ONLY FOR DEVICES IMPACTED.
9. OPEN CABLING SHALL BE SUPPORTED AT A MINIMUM OF EVERY 4 TO 6 FEET TO BUILDING STRUCTURAL MEMBERS UTILIZING METAL BRIDLE RINGS. CABLING THAT IS SECURED TO OR CONTACTING SPRINKLER PIPING, HVAC DUCTWORK, ELECTRICAL CONDUIT OR OTHER NON-STRUCTURAL BUILDING MEMBER SHALL NOT BE ACCEPTABLE AND SHALL CAUSE THE CABLE TO BE RE-INSTALLED AND RE-SUPPORTED IN A PROPER MANNER.
10. FIRE ALARM GRAPHIC MAPS WILL BE PREPARED BY TLH FIRE AND DELIVERED DIRECTLY TO BRIAN ZIMMERMAN IN AUTOCAD FORMAT FOR PLOTTING AND FRAMING. POUDRE SCHOOL DISTRICT SHALL INSTALL THE NEW GRAPHIC MAP WHICH REFLECTS THE NEW INFORMATION.
11. PROVIDE AND INSTALL TWO (2) NEW 18 AH BATTERIES FOR FIRE ALARM CONTROL PANEL AND SIX (6) NEW 7 AH BATTERIES FOR THREE (3) REMOTE POWER SUPPLIES.
12. CONTRACTOR SHALL PRE-TEST 100% OF THE EXISTING FIRE ALARM SYSTEM PRIOR TO START OF CONSTRUCTION. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING PSD OF PRE-EXISTING DEFICIENCIES IN WRITING PRIOR TO STARTING CONSTRUCTION.

ADDITIONAL NOTES

1. PRELIMINARY:
   1.A. PRIOR TO THE START OF CONSTRUCTION, BUT AFTER THE LAST DAY OF SCHOOL, THE CONTRACTOR SHALL COORDINATE SITE VISIT DATE WITH TLH FIRE TO EVALUATE ABOVE CEILING CONDITIONS IN AREAS WHERE WORK WILL TAKE PLACE. THE CONTRACTOR SHALL ASSIST TLH FIRE WITH THE FIELD LOCATION OF ALL ABOVE CEILING FIRE ALARM DEVICES SHOWN ON THE GRAPHIC MAP AS WELL AS THE LOCATION OF EACH ABOVE-CEILING MODULE AS INDICATED ON THE PANEL PROGRAM. THE CONTRACTOR SHALL ALSO ASSIST WITH LOCATING DEVICES AND POWER SUPPLIES IN LOCKED ROOMS AND UTILITY SHUT OFF LOCATIONS.
   1.B. TLH FIRE AUDITS OF THE ABOVE CEILING FIRE ALARM SYSTEM SHOULD BE PERFORMED BEFORE CONSTRUCTION STARTS AND AFTER CONSTRUCTION IS COMPLETE. AN ELECTRICAL CONTRACTOR DOES NOT NEED TO BE INVOLVED WITH THE AUDITS. THE PURPOSE OF THE AUDITS WILL BE TO CONFIRM THAT THE FIRE ALARM SYSTEM HAS NOT BEEN COMPROMISED BY CONSTRUCTION DURING THE SUMMER. TLH FIRE "PRE-CONSTRUCTION AUDIT" SHOULD TAKE PLACE AS SOON AS CEILINGS ARE OPEN, BUT BEFORE CONSTRUCTION BEGINS. TLH FIRE "FINAL" AUDIT SHOULD NOT TAKE PLACE UNTIL ALL CONSTRUCTION IS COMPLETE AT THE END OF THE SUMMER.
   1.C. APPLICABLE PROCEDURES.
      a. THE CONTRACTOR SHALL PROVIDE EARPLUGS FOR ALL PERSONS ON SITE DURING FIRE ALARM SYSTEM NOTIFICATION APPLIANCE TESTING.
      b. THE SERVICE OF A NICET II, FACTORY-TRAINED ENGINEER OR TECHNICIAN AUTHORIZED BY THE MANUFACTURER OF THE FIRE ALARM EQUIPMENT SHALL BE PROVIDED TO TECHNICALLY SUPERVISE AND PARTICIPATE DURING ALL OF THE ADJUSTMENTS AND TESTS FOR THE SYSTEM. ALL TESTING SHALL BE IN ACCORDANCE WITH NFPA 72.
      c. THE FIRE ALARM VENDOR SHALL PROVIDE A PRINTOUT OR EMAIL SHOWING THAT EACH DEVICE HAS BEEN PRETESTED PRIOR TO TLH FIRE OBSERVATIONS. TLH FIRE PRE-TEST OBSERVATION FORMS SHALL ALSO BE COMPLETED, SIGNED BY BOTH THE INSTALLING CONTRACTOR AND NOTIFIER FACTORY TRAINED TECHNICIAN AND SUBMITTED TO TLH FIRE PRIOR TO TLH FIRE OBSERVATIONS. A TYPED RECORD OF COMPLETION SHALL ALSO BE PROVIDED.
2. DURING CONSTRUCTION:
   2.A. THE FIRE ALARM SYSTEM SHALL REMAIN ACTIVE AT ALL TIMES IN A MANNER THAT THE FIRE ALARM CONTROL PANEL SHOWS ALL SYSTEMS NORMAL DURING THE ENTIRE CONSTRUCTION PERIOD. IF THE CONTRACTOR COMPROMISES A FIRE ALARM CIRCUIT/DEVICE RESULTING IN A TROUBLE CONDITION, THE CONTRACTOR SHALL NOTIFY TLH FIRE AND PSD IN WRITING WITHIN 4 HOURS OF THE OCCURRENCE OF THE TROUBLE CONDITION SO THAT A REMEDY PROCEDURE (SUBMITTED BY THE CONTRACTOR AT THE START OF THE PROJECT) CAN BE IMMEDIATELY IMPLEMENTED. THE CONTRACTOR SHALL PRODUCE A HISTORY REPORT WHEN TROUBLES ARE DISCOVERED TO DETERMINE THE NATURE OF THE TROUBLE AND FUNCTIONAL TESTING WILL TAKE PLACE ONLY FOR DEVICES IMPACTED.
   2.B. FIRE ALARM SHOP DRAWING SUBMITTALS ARE REQUIRED FOR THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR FIRE ALARM PERMIT REQUIREMENTS AND ASSOCIATED FEES.
   2.C. CONTRACTOR SHALL PROTECT ALL SMOKE DETECTORS WITH PRESS AND SEAL DURING THE CONSTRUCTION PERIOD.
   2.D. CONTRACTOR SHALL WALK THE JOBSITE ON A REGULAR BASIS TO ENSURE ALL PROTECTION REMAINS IN PLACE.
   2.E. CONTRACTOR SHALL REMOVE PRESS AND SEAL PROTECTION AFTER ALL CONSTRUCTION IS COMPLETE.
3. INSTALLATION:
   3.A. HVAC UNIT SHALL BE CLEANED/TESTED AND BALANCED BEFORE DUCT DETECTORS ARE INSTALLED.
   3.B. DUCT DETECTORS SHALL BE INSTALLED BY MECHANICAL, CONNECTED BY ELECTRICAL, AND MANOMETER READINGS BY MECHANICAL CONTRACTOR.
   3.C. MECHANICAL CONTRACTOR SHALL PROVIDE NEW DUCT DETECTOR SENSORS IF SENSORS ARE INSTALLED PRIOR TO TEST AND BALANCE AND BUILDING FINAL CLEAN.
   3.D. DUCT DETECTORS (EXISTING AND NEW) SHALL BE PROGRAMMED TO INITIATE A SUPERVISORY CONDITION.
   3.E. WALL MOUNT KEYED SWITCH 8' AFF.
4. TESTING:
   4.A. PRE-TESTING SHALL TAKE PLACE BY THE ELECTRICAL AND MECHANICAL CONTRACTORS WITH TLH FIRE PRIOR TO LOCAL AHJ TEST.
   4.B. CONTRACTOR SHALL EMPLOY A FIRE ALARM VENDOR FOR PROGRAMMING AND TESTING OF FIRE ALARM CONTROL PANEL.
   4.C. CONTRACTOR SHALL FUNCTIONALLY TEST 100% OF PROGRAMMED DEVICES AND 10% OF EXISTING DEVICES IN ACCORDANCE WITH NFPA 72.
5. CLOSEOUT:
   5.A. FIRE ALARM GRAPHIC MAPS WILL BE PREPARED BY TLH FIRE AND DELIVERED DIRECTLY TO BRIAN ZIMMERMAN IN AUTOCAD FORMAT FOR PLOTTING AND FRAMING. POUDRE SCHOOL DISTRICT SHALL INSTALL THE NEW GRAPHIC MAP.



GOVERNING CODES

- 2021 INTERNATIONAL BUILDING CODE
- 2021 INTERNATIONAL MECHANICAL CODE
- 2023 NATIONAL ELECTRICAL CODE
- 2021 INTERNATIONAL FIRE CODE
- 2019 NFPA 72
- OCCUPANCY: E
- AREA: 41,970
- CONSTRUCTION TYPE = II-B
- NUMBER OF STORIES: 1 STORY
- FIRE PROTECTION: EXISTING NON-SPRINKLERED TO REMAIN
- FIRE ALARM: EXISTING HORN/STROBE

OWNER

POUDRE SCHOOL DISTRICT
2445 LAPORTE AVENUE
FORT COLLINS, COLORADO 80521
970-490-3017

ARCHITECT

DIGITAL ARCHITECTURAL MODELING
FORT COLLINS, COLORADO
970-234-8569

AUTHORITY HAVING JURISDICTION

POUDRE FIRE AUTHORITY
102 REMINGTON STREET
FORT COLLINS, COLORADO 80524
970-416-2891

FIRE ALARM CONSULTANT

TLH FIRE
6901 SOUTH PIERCE STREET SUITE 205
LITTLETON, COLORADO 80128
303-517-1775

GENERAL CONTRACTOR

INFORMATION NEEDED BEFORE SUBMITTING TO AHJ.

ELECTRICAL CONTRACTOR

INFORMATION NEEDED BEFORE SUBMITTING TO AHJ.

SHEET INDEX

FA0.0	FIRE ALARM COVER PAGE
FAD2.0	FLOOR PLAN - DEMOLITION
FA2.0	FLOOR PLAN - FIRE ALARM
FA3.0	DESIGN CRITERIA AND RISER
FA4.0	GRAPHIC MAP
FA5.0	TECHNICAL GUIDELINES
FA5.1	TECHNICAL GUIDELINES

DIGITAL ARCHITECTURAL MODELING
FORT COLLINS, COLORADO

TLH Fire

DUNN ELEMENTARY SCHOOL - HVAC UPGRADES PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS, COLORADO 80521
FIRE ALARM SYSTEM DRAWINGS

BID DOCUMENTS

PROJECT 012.23
DATE 11.13.23
DRAWN GPR

NO.	DESCRIPTION	DATE

REVISIONS

FIRE ALARM COVER PAGE

FA0.0

WIRE LEGEND	
VISUAL WIRING DEMOLITION	NEW VISUAL WIRING
1 PAIR 14 AWG TWISTED / UNSHIELDED (FPLP) RED + BLACK = RED JACKET W/BLUE TRACER AUDIBLE (NAC) CIRCUIT PLENUM	1 PAIR 14 AWG TWISTED / UNSHIELDED (FPLP) RED + BLACK = RED JACKET W/BLUE TRACER AUDIBLE (NAC) CIRCUIT PLENUM

DEMOLITION FLAG NOTES	
D1	CONTRACTOR SHALL PROTECT DEVICES IN CEILING REPLACEMENT AREA IN ACCORDANCE WITH NFPA 72 §17.7.1.12, RELOCATE CEILING MOUNTED DEVICES ABOVE GRID, NEATLY SECURE SUPPORTING HARDWARE, AND REINSTALL DEVICES IN NEW CEILING. PROVIDE ADDITIONAL SUPPORTS WHEN NECESSARY TO ACHIEVE COMPLIANCE WITH NEC AND TECHNICAL GUIDELINES. ENSURE CIRCUIT INTEGRITY IS MAINTAINED.
D2	PROTECT NOTIFICATION APPLIANCE DURING CONSTRUCTION. RELOCATE ABOVE GRID, NEATLY SECURE SUPPORTING HARDWARE, AND REINSTALL IN NEW CEILING. PROVIDE ADDITIONAL SUPPORTS WHEN NECESSARY TO ACHIEVE COMPLIANCE WITH NEC AND TECHNICAL GUIDELINES. ENSURE CIRCUIT INTEGRITY IS MAINTAINED.
D3	RELOCATE NOTIFICATION APPLIANCE TO NEW LOCATION SHOWN. PROVIDE NEW WIRE RUN BETWEEN UPSTREAM AND DOWNSTREAM NOTIFICATION APPLIANCES. SUPPORT EVERY 4-6 FEET WITH RED BRIDAL RINGS IN ACCORDANCE WITH TECHNICAL GUIDELINES.
D4	REMOVE DUCT DETECTOR SENSOR AND TEMPORARILY REMOVE DUCT DETECTOR FROM PROGRAMMING PRIOR TO THE START OF CONSTRUCTION AND SAFELY STORE AND PROTECT THE DEVICE FOR REINSTALLATION/PROGRAMMING/FUNCTION VERIFICATION UPON PROJECT COMPLETION.
NOT ALL NOTES ARE USED ON EACH PAGE	

1 DUNN ELEMENTARY SCHOOL - DEMOLITION PLAN CLASSROOMS

SCALE: 1/8" = 1'-0"

8' 4' 0 8'

SCALE: 1/8" = 1'-0"

2 DUNN ELEMENTARY SCHOOL - DEMOLITION PLAN KINDERGARTEN, MEDIA CENTER

SCALE: 1/8" = 1'-0"

8' 4' 0 8'

SCALE: 1/8" = 1'-0"

KEY PLAN

NOT TO SCALE

DIGITAL ARCHITECTURAL MODELING
DESIGN & CONSTRUCTION DOCUMENTS

TLH Fire

DUNN ELEMENTARY SCHOOL - HVAC UPGRADES PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS, COLORADO 80521
FIRE ALARM SYSTEM DRAWINGS

PROJECT	012.23
DATE	11.13.23
DRAWN	GPR

NO.	DESCRIPTION	DATE

REVISIONS

FLOOR PLAN - DEMOLITION

FAD2.0

BID DOCUMENTS

Drawings

WIRE LEGEND

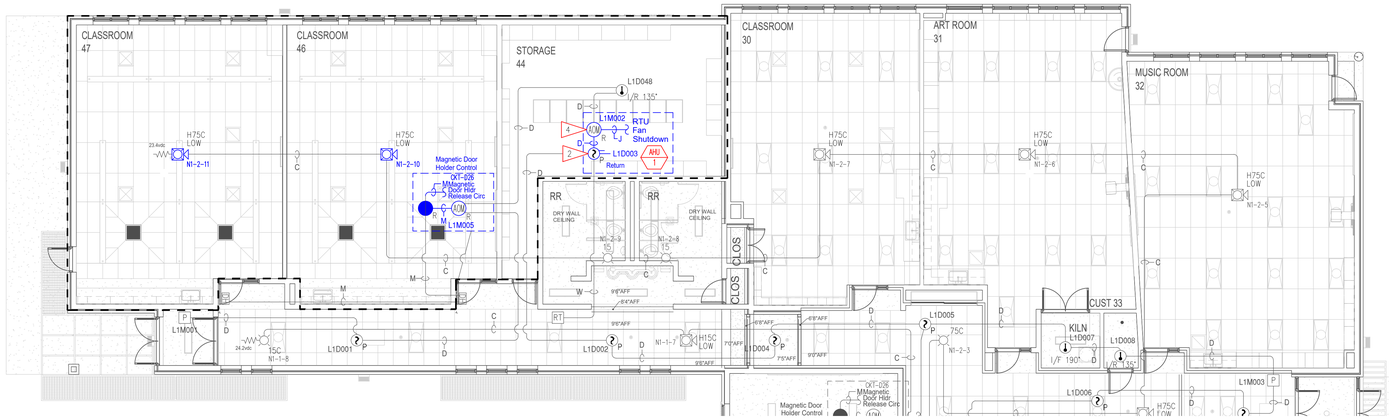
VISUAL WIRING DEMOLITION	NEW VISUAL WIRING
1 PAIR 14 AWG TWISTED / UNSHIELDED (FPLP) RED + BLACK = RED JACKET W/BLUE TRACER AUDIBLE (NAC) CIRCUIT PLENUM	1 PAIR 14 AWG TWISTED / UNSHIELDED (FPLP) RED + BLACK = RED JACKET W/BLUE TRACER AUDIBLE (NAC) CIRCUIT PLENUM

GENERAL NOTES

1. CONTRACTOR SHALL EXAMINE THE SITE AND CONSTRUCTION DOCUMENTS. CEILING CONFIGURATIONS MAY REQUIRE SURFACE MOUNTED DEVICES WHICH SHALL BE PROTECTED IN A MANNER SUCH THAT KNOCKOUTS ARE NOT EXPOSED. BACKBOXES SHALL BE PROVIDED BY FIRE ALARM SYSTEM VENDOR AND APPROVED BY ENGINEER OF RECORD PRIOR TO INSTALLATION.
2. CONTRACTOR SHALL ALIGN DEVICE INSTALLATION WITH LIGHTING FIXTURES OR SIMILAR IN A WORKMANSHIP-LIKE MANNER. COORDINATE WITH THE ARCHITECT OR ENGINEER OF RECORD.
3. SURFACE MOUNTED DEVICES REQUIRE A WIRE-MOULD BACKBOX OR A DEVICE SPECIFIC BACKBOX SKIRT.
4. APPLIANCES SHALL BE INSTALLED BELOW LIGHTING LEVEL.
5. EXPOSED OR NON-ACCESSIBLE WIRE SHALL BE INSTALLED IN CONDUIT.
6. CONDUIT SHALL BE PAINTED TO MATCH THE EXISTING SURFACE COLOR AS REQUESTED BY OWNER.

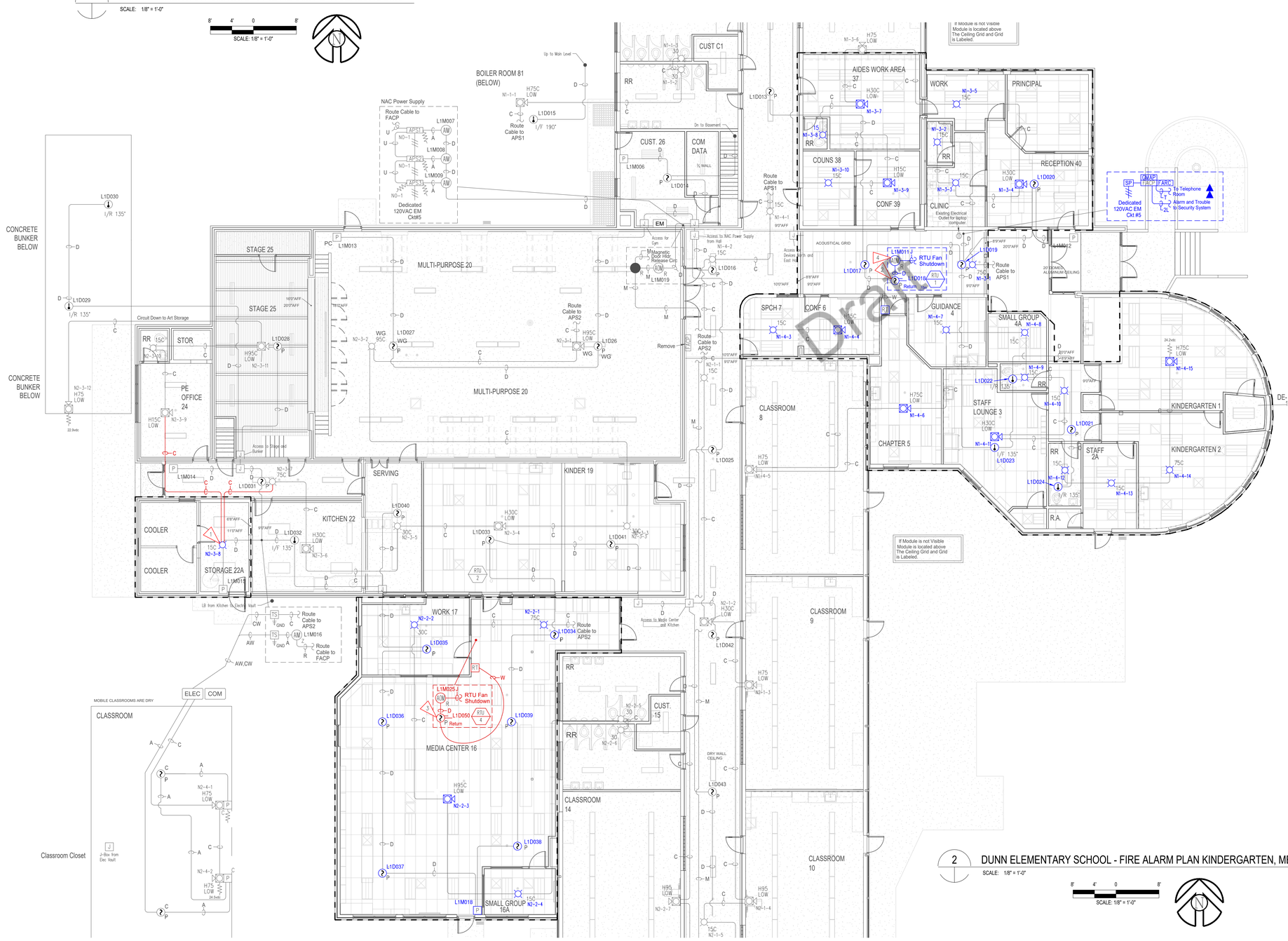
FLAG NOTES

1. RELOCATE EXISTING NOTIFICATION APPLIANCE TO NEW LOCATION.
2. REINSTALL EXISTING DUCT DETECTOR SENSOR UPON COMPLETION OF CONSTRUCTION. CONTRACTOR SHALL CONNECT EXISTING REMOTE TEST SWITCH AND TEST FUNCTIONALITY OF BOTH AHU SHUTDOWN AND REMOTE TEST SWITCH.
3. INSTALL NEW DUCT DETECTOR UPON COMPLETION OF CONSTRUCTION. CONTRACTOR SHALL FURNISH AND CONNECT REMOTE TEST SWITCH AND TEST FUNCTIONALITY OF BOTH AHU SHUTDOWN AND REMOTE TEST SWITCH.
4. TIE IN EXISTING SHUTDOWN RELAY WITH NEW HVAC UNIT.



1 DUNN ELEMENTARY SCHOOL - FIRE ALARM PLAN CLASSROOMS

SCALE: 1/8" = 1'-0"



2 DUNN ELEMENTARY SCHOOL - FIRE ALARM PLAN KINDERGARTEN, MEDIA CENTER

SCALE: 1/8" = 1'-0"

KEY PLAN

NOT TO SCALE

Draft

DIGITAL ARCHITECTURAL MODELING
DENVER | COLORADO SPRINGS

TLH Fire

DUNN ELEMENTARY SCHOOL - HVAC UPGRADES PHASE 2

501 SOUTH WASHINGTON AVENUE
FORT COLLINS, COLORADO 80521

FIRE ALARM SYSTEM DRAWINGS

BID DOCUMENTS

PROJECT	012.23
DATE	11.13.23
DRAWN	GPR

NO.	DESCRIPTION	DATE

REVISIONS

FLOOR PLAN - FIRE ALARM

FA2.0

POUDRE SCHOOL DISTRICT DESIGN STANDARDS

IN COMPLIANCE, STATE CODE REQUIREMENTS (INTERNATIONAL FIRE CODE 2021 AND NFPA 72 2019) AND EXCEEDING REQUIREMENTS IN VERY LIMITED CIRCUMSTANCES, THE FIRE ALARM SYSTEM DESIGN INCORPORATES THE FOLLOWING DESIGN CRITERIA FOR SCHOOLS NOT PROTECTED WITH AUTOMATIC SPRINKLERS. FOR SCHOOLS PROTECTED WITH AUTOMATIC SPRINKLERS, ONLY THE SECTIONS RELATED TO SMOKE DETECTORS (AS ANNOTATED), MANUAL PULL STATIONS, DUCT DETECTORS AND NOTIFICATION SHALL APPLY. HEAT DETECTORS SHALL NOT BE ADDED TO SCHOOLS PROTECTED WITH AUTOMATIC SPRINKLERS. THE CONTRACTOR SHALL PROVIDE EARPLUGS FOR ALL BUILDING OCCUPANTS DURING ALL FIRE ALARM SYSTEM NOTIFICATION APPLIANCE TESTING.

SMOKE DETECTION
1. SMOKE DETECTORS SHALL BE LOCATED THROUGHOUT ALL COMMON CORRIDORS. THESE SMOKE DETECTORS SHALL CONTROL MAGNETIC DOOR HOLD OPENS. DOOR HOLDERS SHALL RELEASE UPON GENERAL ALARM. (FULLY SPRINKLERED SCHOOLS SHALL ONLY HAVE SMOKE DETECTORS WITHIN 5 FEET OF MAGNETIC DOOR HOLDERS.)
2. A SMOKE DETECTOR SHALL BE LOCATED IN THE MAIN ELECTRICAL ROOM.
3. SMOKE DETECTORS SHALL BE LOCATED AT ALL FIRE ALARM REMOTE POWER SUPPLY PANELS AND FIRE ALARM CONTROL PANEL LOCATIONS UNLESS THE ENVIRONMENT IS UNSUITABLE FOR SMOKE DETECTORS IN WHICH CASE 135 DEGREE FIXED TEMPERATURE HEAT DETECTORS SHALL BE UTILIZED.
4. SMOKE DETECTORS SHALL BE LOCATED IN ALL COMPUTER CLASSROOMS.
5. SMOKE DETECTORS SHALL BE LOCATED IN THE LIBRARY/MEDIA CENTER
6. A SMOKE DETECTOR SHALL BE LOCATED IN EACH HOT ROOM.
7. A SMOKE DETECTOR SHALL BE LOCATED IN EACH MODULAR CLASSROOM AND SHALL BE NON-INTELLIGENT.
8. SMOKE DETECTORS SHALL BE LOCATED IN ELEVATOR LOBBIES, ELEVATOR MACHINE ROOM, AND THE TOP OF SHAFT FOR ELEVATOR CONTROL PURPOSES AS REQUIRED BY ANSI A 17.1.
9. SMOKE DETECTORS SHALL BE PROVIDED AS REQUIRED BY THE INTERNATIONAL MECHANICAL CODE FOR FIRE/SMOKE DAMPERS IF APPLICABLE TO THE SCHOOL.
10. PROVIDE WIRE GUARDS FOR ALL GYM AND CAFETERIA SMOKE DETECTORS. CONTRACTOR SHALL NOTCH WIRE GUARDS TO ALLOW FOR MAGNETIC TESTING. NOTE: MAGNET TESTING IS NOT A SUBSTITUTE FOR SMOKE CHAMBER ENTRY TESTING..

HEAT DETECTION
1. HEAT DETECTORS SHALL BE LOCATED IN ALL CODE REQUIRED AREAS, NOT SUITABLE FOR SMOKE DETECTION.
2. INTELLIGENT 135 DEGREE RATE OF RISE HEAT DETECTORS SHALL BE LOCATED IN ALL CHEMICAL STORAGE AREAS, SCIENCE PREP ROOMS AND SCIENCE CLASSROOMS.
3. INTELLIGENT 135 DEGREE RATE OF RISE HEAT DETECTORS SHALL BE LOCATED CAFETERIAS AND GYMS.
4. INTELLIGENT 135 DEGREE FIXED TEMP HEAT DETECTORS SHALL BE LOCATED IN KITCHENS AND HOME ECONOMICS CLASSROOMS, AND PRIMARY STAFF ROOM.
5. HEAT DETECTORS SHALL BE PROVIDED IN DISHWASH ROOMS WHERE EXISTING HEAT DETECTION IS IN PLACE AND SHALL BE 135° WEATHERPROOF RATE ANTICIPATION THERMOTECH MODEL.
6. HEAT DETECTORS SHALL BE LOCATED IN ALL BOILER ROOMS, CHILLER ROOMS, AND OTHER SIMILAR ROOMS. THESE DETECTORS SHALL BE INTELLIGENT/ANALOG TYPE DEVICE SET TO THE HIGHEST FIXED TEMPERATURE.
7. HEAT DETECTORS SHALL BE LOCATED IN THE ELEVATOR MACHINE ROOMS AND TOP OF SHAFT FOR ELEVATOR SHUNT TRIP PURPOSES ONLY AS REQUIRED BY STATE CODE. THESE DETECTORS SHALL BE INTELLIGENT/ANALOG TYPE DEVICE.
8. A HEAT DETECTOR SHALL BE LOCATED IN THE KILN ROOM. THE DETECTOR SHALL BE INTELLIGENT/ANALOG TYPE DEVICE SET TO THE HIGHEST FIXED TEMPERATURE.
9. INTELLIGENT 135 DEGREE RATE OF RISE HEAT DETECTORS SHALL BE LOCATED STORAGE ROOMS GREATER THAN 400 SQ FT OR IN STORAGE ROOMS WITH EXISTING HEAT DETECTORS.
10. PROVIDE WIRE GUARDS FOR ALL GYM HEAT DETECTORS. CONTRACTOR SHALL NOTCH WIRE GUARDS TO ALLOW ENTRY FOR MAGNET TESTING. NOTE: MAGNET TESTING IS NOT A SUBSTITUTE FOR HEAT SOURCE TESTING.

DUCT SMOKE DETECTION
1. DUCT SMOKE DETECTORS SHALL BE INTELLIGENT ANALOG/ADDRESSABLE TYPE, WHICH SHALL REPORT TO THE FIRE ALARM SYSTEM AS A "SUPERVISORY" TYPE DEVICE.
2. DUCT SMOKE DETECTORS SHALL BE LOCATED IN THE RETURN AIR DUCTWORK OF ALL HVAC UNITS GREATER THAN 2,000CFM.
3. DUCT SMOKE DETECTORS SHALL BE LOCATED IN THE SUPPLY AND RETURN DUCTWORK OF ALL HVAC UNITS GREATER THAN 15,000 CFM OR AS REQUIRED BY THE INTERNATIONAL MECHANICAL CODE.
4. WHERE SUPPLY SIDE DUCT DETECTORS ARE NO LONGER REQUIRED, CONTRACTOR SHALL REMOVE SUPPLY SIDE DUCT DETECTOR AND SAMPLING TUBE AND SEAL PENETRATIONS ON DUCTWORK WITH ALUMINUM DUCT TAPE.
5. REMOTE TEST STATIONS SHALL BE KEYED AND SHALL BE LOCATED NO HIGHER THAN 7 FEET ABOVE THE FINISHED FLOOR. IF THE CONTRACTOR OBTAINS PERMISSION TO MOUNT THE REMOTE TEST SWITCH HIGHER THAN 7 FEET ABOVE THE FINISHED FLOOR, THE TEST SWITCH SHALL BE MAGNET (NOT KEYED).

MANUAL PULL STATIONS
1. MANUAL STATIONS SHALL BE DUAL ACTION TYPE WITH A KEY (NOT ALLEN WRENCH).
2. MANUAL PULL STATIONS SHALL BE LOCATED AT EACH MAIN (DOUBLE DOORS) BUILDING EXIT, AND EXTERIOR EXITS OF THE GYM, CAFETERIA, AND LIBRARY/MEDIA CENTER.
3. MANUAL PULL STATIONS SHALL BE LOCATED AT EXTERIOR EXITS IN MIDDLE SCHOOL AND HIGH SCHOOL TECH CLASSROOMS.
4. MANUAL PULL STATIONS SHALL BE LOCATED AT EACH KITCHEN, BOILER AND MECHANICAL ROOMS WITH EXTERIOR BUILDING ACCESS.
5. MANUAL PULL STATIONS SHALL BE PROVIDED AT ALL PORTABLE MODULAR CLASSROOM EXITS AND SHALL BE NON-INTELLIGENT.
6. MANUAL STATIONS SHALL BE MOUNTED WITH THE OPERATING MECHANISM AT 48" ABOVE FINISHED FLOOR.
7. FOR EXISTING SCHOOLS PROTECTED WITH AUTOMATIC SPRINKLERS, THE NEW PULL STATIONS SHALL BE LOCATED TO MATCH EXISTING PULL STATION LOCATIONS.
8. PROTECT MANUAL PULL STATIONS IN GYM AND CAFETERIA WITH STI DAMAGE STOPPER.

AUDIBLE, VISUAL, AND AUDIBLE/VISUAL NOTIFICATION APPLIANCES
1. HORNS AND HORN/STROBES SHALL BE GENERALLY LOCATED TO PROVIDE A MINIMUM OF 15DB ABOVE AMBIENT SOUND LEVELS THROUGHOUT BUILDING AREAS.
2. ALL HORNS SHALL BE SET TO LOWEST DB SETTING AND THEN ADJUSTED UP AS REQUIRED.
3. HORN/STROBES SHALL BE LOCATED IN ALL MECHANICAL ROOMS AND OTHER HIGH-NOISE ENVIRONMENT AREAS.
4. STROBES SHALL BE LOCATED IN ALL COMMON 'PUBLIC AREA' SPACES, INCLUDING CORRIDORS, CLASSROOMS, RESTROOMS, OPEN OFFICE AREAS, LUNCH, CONFERENCE ROOMS, AND OTHER AREAS WHERE MORE THAN A TWO PERSON OCCUPANCY IS ANTICIPATED.
5. STROBES SHALL BE LOCATED IN COPY ROOMS, WORK ROOMS, STORAGE ROOMS GREATER THAN 400 SQUARE FEET, AND STORAGE ROOMS WHERE HIGH OCCUPANT NORMAL USAGE LEVELS ARE ANTICIPATED.
6. STROBES SHALL NOT BE INSTALLED IN SINGLE OCCUPANT OFFICES.
7. PROVIDE WIRE GUARDS FOR ALL GYM AND CAFETERIA HORNS AND STROBES.

REMOTE MONITORING, FIRE ALARM CONTROL PANEL, AND REMOTE POWER SUPPLY
1. TWO NEW PHONE LINES SHALL BE PROVIDED TO EACH FACP. THE FIRE ALARM SYSTEM SHALL REPORT POINT CONTACT ID TO THE MONITORING COMPANY. CROSS CONNECTS SHALL BE COMPLETED BY PSD.
2. AN ELECTRICAL OUTLET REQUIRED SHALL BE PROVIDED BY EACH FACP.
3. THE ELECTRICAL CONTRACTOR SHALL RUN EM POWER TO FACP AND RPS FROM THE FACILITY EM PANEL.

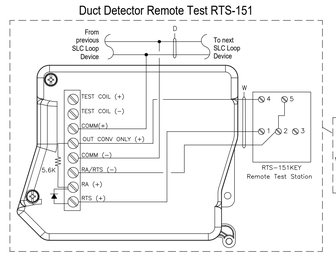
MODULAR CLASSROOMS
1. THE ELECTRICAL CONTRACTOR SHALL RUN 24VDC POWER TO EACH MODULAR CLASSROOM.
2. ALL MODULAR CLASSROOM DEVICES SHALL BE CONVENTIONAL (NON-INTELLIGENT). SMOKE DETECTORS AND PULL STATIONS MAY BE ON THE SAME ZONE.

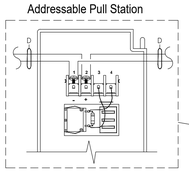
MAGNETIC DOOR HOLDERS
1. MAGNETIC DOOR HOLDERS SHALL BE 120VAC. EXISTING DOOR MAGS MAY BE REUSED IF THEY ARE FIELD VERIFIED TO BE 120VAC, OTHERWISE, THEY MUST BE REPLACED WITH NEW 120VAC DEVICES.

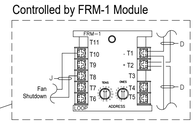
LABELS FOR DEVICES
1. ALL EQUIPMENT SHALL BE CLEARLY LABELED WITH THE DEVICE ADDRESS ON THE BASE OF THE DETECTOR OR MANUAL PULL STATION WITH TYPE LETTERED LABELS WITH A TEXT AT A FONT SIZE OF AT LEAST 18 POINT.
   a. SMOKE DETECTORS AND MANUAL PULL STATIONS SHALL BE LABELED WITH THE DEVICE ADDRESS ON THE BASE OF THE DETECTOR OR MANUAL PULL STATION.
   b. ALL NOTIFICATION APPLIANCES SHALL BE LABELED WITH THE NOTIFICATION APPLIANCE CIRCUIT DESIGNATION. THE 'END OF LINE" SHALL BE CLEARLY LABELED.
   c. MONITOR AND RELAY MODULES SHALL BE LABELED WITH THE DEVICE ADDRESS AND FUNCTION. (FOR EXAMPLE: LIM–23 WATERFLOW, LIM–50 MAG DOOR RELEASE, ETC.)
   d. DUCT DETECTORS SHALL BE LABELED WITH THE DEVICE ADDRESS ON THE BASE OF THE DETECTOR AND THE CEILING GRID SHALL BE LABELED AS DUCT DETECTOR, HVAC UNIT AND DEVICE ADDRESS.
2. ALL MODULES SHALL HAVE THE STATUS LEDs VISIBLE WITHOUT REQUIRING THE REMOVAL OF A CEILING TILE OR COVER PLATE.

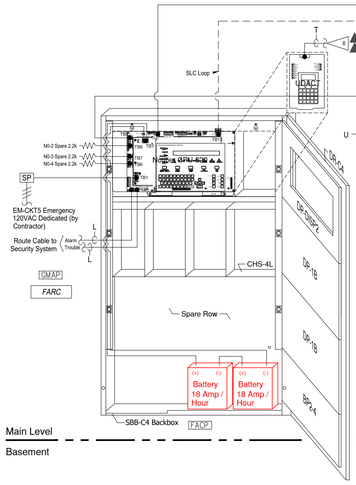
GRAPHIC MAP
1. GRAPHIC MAPS SHALL BE SECURELY MOUNTED NEXT TO THE FIRE ALARM CONTROL PANEL. A GRAPHIC MAP IS ALSO REQUIRED NEXT TO THE REMOTE ANNUNCIATOR (IF PROVIDED). GRAPHIC MAPS AND COLORS SHALL BE APPROVED BY PSD AND TLH PRIOR TO MOUNTING AND INSTALLATION.

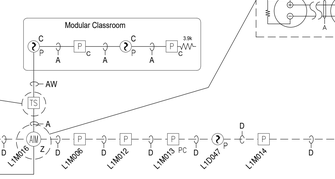
PROVIDE AND INSTALL NEW BATTERIES FOR FIRE ALARM CONTROL PANEL AND REMOTE POWER SUPPLIES

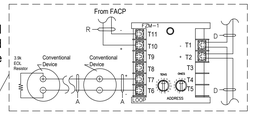


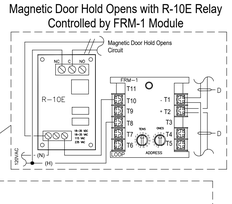


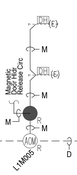


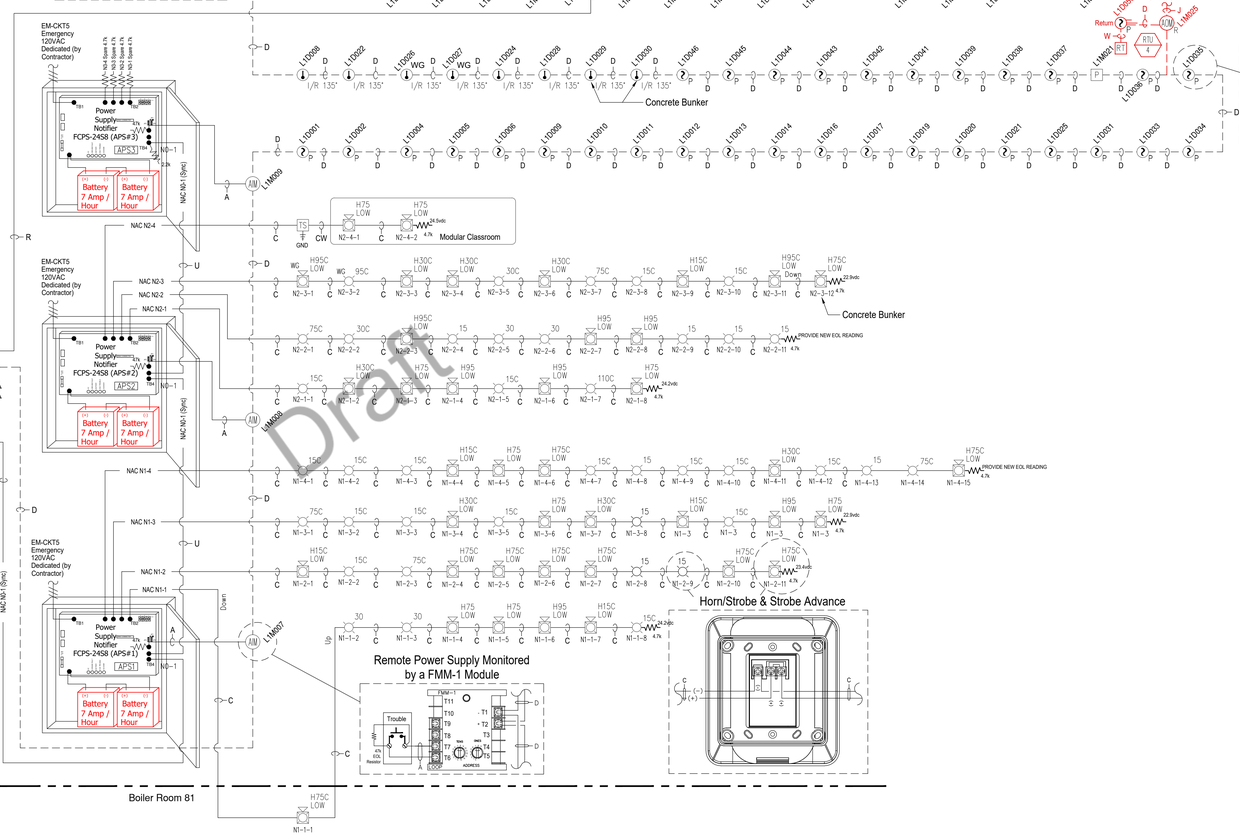












1 RISER DIAGRAM
SCALE: NTS

SLC Loop No.1						
D Address				M Address		
	Device	Label	Extended Label	Device	Label	Extended Label
L1D001	Smoke (Photo)	North Hall by Rm 46		L1M001	Pull Station	North Hall West Exit
L1D002	Smoke (Photo)	North Hall by RR's		L1M002	Relay	**AHU-1 Shutdown**
L1D003	Duct	**AHU-1 Return**	Storage 44	L1M003	Pull Station	North Hall East Exit
L1D004	Smoke (Photo)	North Hall by Rm 30		L1M004	Relay	Door Holder Control
L1D005	Smoke (Photo)	North Hall by Rm 30		L1M005		
L1D006	Smoke (Photo)	North Hall by Cust33		L1M006	Pull Station	Custodial Rm 26 Exit
L1D007	Heat (High)	Art Rm 31-Kiln Rm		L1M007	Monitor	APS1 Remote Power
L1D008	Heat (Rate of Rise)	North Hall Cust Clst		L1M008	Monitor	APS2 Remote Power
L1D009	Smoke (Photo)	North Hall by 32		L1M009	Monitor	APS3 Remote Power
L1D010	Smoke (Photo)	North Hall by 29		L1M010		
L1D011	Smoke (Photo)	North Hall by 28		L1M011	Relay	RTU-1 Shutdown
L1D012	Smoke (Photo)	North Hall by 27		L1M012	Pull Station	Main Entrance
L1D013	Smoke (Photo)	North Hall by 37		L1M013	Pull Station	Multi-Purpose Exit
L1D014	Smoke (Photo)	Custodial Rm26		L1M014	Pull Station	Kitchen Hall Exit
L1D015	Heat (High)	Basement Boiler Rm		L1M015	Pull Station	Kitchen Exit
L1D016	Smoke (Photo)	Hall by Multipurpose		L1M016	Monitor	Modular Classrooms Smoke & Pull
L1D017	Smoke (Photo)	Entry Hall by Rm 39		L1M017		
L1D018	Sup L(Duct P)	RTU-1 Return	Hall Entry	L1M018	Pull Station	Media Center
L1D019	Smoke (Photo)	Entry Hall by	Main Office	L1M019	Relay	Door Holder Control
L1D020	Smoke (Photo)	Reception Office	Rm 40	L1M020		
L1D021	Smoke (Photo)	Kindergarten Hall		L1M021	Pull Station	South Hall Exit
L1D022	Heat (Rate of Rise)	Staff Restroom	By Lounge	L1M022		
L1D023	Heat (Rate of Rise)	Staff Lounge Rm 3		L1M023		
L1D024	Heat (Rate of Rise)	Vistor Restroom	By Lounge	L1M024		
L1D025	Smoke (Photo)	South Hall by Rm 8		**L1M025**	**Relay**	**RTU-4 Shutdown**
L1D026	Heat (Rate of Rise)	Multi-Purpose Room		L1M026		
L1D027	Heat (Rate of Rise)	Multi-Purpose Room		L1M027		
L1D028	Heat (Rate of Rise)	Multi-Purpose Room	Stage	L1M028		
L1D029	Heat (Rate of Rise)	Basement Under Stage		L1M029		
L1D030	Heat (Rate of Rise)	Basement Under Stage	Under Stage	L1M030		
L1D031	Smoke (Photo)	Kitchen Hall		L1M031		
L1D032	Heat (Rate of Rise)	Kitchen		L1M032		
L1D033	Smoke (Photo)	Computer Lab Rm 18		L1M033		
L1D034	Smoke (Photo)	Media Center Entry		L1M034		
L1D035	Smoke (Photo)	Media Center Work	Rm17	L1M035		
L1D036	Smoke (Photo)	Media Center		L1M036		
L1D037	Smoke (Photo)	Media Center		L1M037		
L1D038	Smoke (Photo)	Media Center		L1M038		
L1D039	Smoke (Photo)	Media Center		L1M039		
L1D040				L1M040		
L1D041	Smoke (Photo)	Resource Rm19		L1M041		
L1D042	Smoke (Photo)	South Hall by Rm 9		L1M042		
L1D043	Smoke (Photo)	South Hall by Rm 10		L1M043		
L1D044	Smoke (Photo)	South Hall by Rm 14		L1M044		
L1D045	Smoke (Photo)	South Hall by Rm 11		L1M045		
L1D046	Smoke (Photo)	South Hall by Rm 12		L1M046		
L1D047	Smoke (Photo)	South Kindergarten	Rm 12	L1M047		
L1D048	Heat (Rate of Rise)	North Storage Rm 44		L1M048		
L1D049				L1M049		
L1D050	**Sup L(Duct P)**	**RTU 4 Return**	**Media Center**	L1M050		
Spare				Spare		
Thru				Thru		
L1D158				L1M158		
L1D159				L1M159		
L1D127	Max Number of Detectors to maintain spare loop capacity			**L1M127**	Max Number of Detectors to maintain spare loop capacity	

PSD - Dunn Elementary School New - Notifier NFS-320SYS (FACP) Main Entrance		Battery Back up Calculation				
Item	Qty	Part #	Description	Standby	Alarm	Total Standby	Total Alarm
1	1	CPU-320SYS	NFS-320SYS Fire Alarm Control Panel	0.250000	0.250000	0.250000	0.250000
2	1	KDM-R2	Keyboard Display Annunciator	0.100000	0.100000	0.100000	0.100000
3	1		# of NAC Circuits in Use (0,1,2,3, or 4)	0.035000	0.035000	0.035000	0.035000
5	1	UDACT	Digital Transmitter	0.040000	0.100000	0.040000	0.100000
6	32	FSP-851	Intelligent Photoelectric Smoke Detector	0.000300	0.006500	0.009600	0.208000
7	2	DNR / FSP-851R	Intelligent Photoelectric Duct Smoke Detector	0.000360	0.006500	0.000720	0.013000
8	2	RTS151KEY	Remote Test Station, w/ Key Reset Switch	0.000000	0.012000	0.000000	0.024000
9	2	FST-851	Intelligent Heat Detector (Fixed 135 Degree)	0.000300	0.006500	0.000600	0.013000
10	9	FST-851R	Intelligent Heat Detector (Rate of Rise / Fixed 135 Degree)	0.000300	0.006500	0.002700	0.058500
11	2	FST-851H	Intelligent Heat Detector (Fixed 190 Degree)	0.000300	0.006500	0.000600	0.013000
12	3	FMM-1	Addressable Monitor Module	0.000350	0.005000	0.001050	0.015000
13	1	FZM-1	Addressable Monitor Module for 2 wire Detectors	0.000300	0.005100	0.000300	0.005100
14	5	FRM-1	Addressable Relay Module	0.000255	0.006500	0.001275	0.032500
15	3	R-10E	Aux Relay	0.000000	0.023000	0.000000	0.069000
16	9	NBG-12LX	Addressable Manual Pull Station	0.000375	0.000375	0.003375	0.003375
17	3	FCPS-24S8	Audible Power Supply Activation	0.000000	0.021700	0.000000	0.065100
18	2	2451	Conventional Smoke Detector	0.000120	0.000120	0.000240	0.000240
19	2	NBG-12L	Conventional Manual Pull Station	0.000000	0.000000	0.000000	0.000000
			NEW DEVICES - HVAC UPGRADE				
20	1	DNR / FSP-851R	Intelligent Photoelectric Duct Smoke Detector	0.000360	0.006500	0.000360	0.006500
21	1	RTS151KEY	Remote Test Station, w/ Key Reset Switch	0.000000	0.012000	0.000000	0.012000
22	1	FRM-1	Addressable Relay Module	0.000255	0.006500	0.000255	0.006500
						0.446075	1.029815
			Standby Current Total Hours =	0.446075	X 24 (Hours)	=	10.705800
			Alarm Current Total Minutes =	1.029815	X 0.084 (5 Mins)	=	0.086504
			Total			=	10.792304
			20% Battery Depletion			=	2.158461
			Total AH Rated Batteries Needed			=	12.950765
			Total AH Rated Batteries Supplied *NEW*				18

DIGITAL ARCHITECTURAL MODELING
TLH Fire

DUNN ELEMENTARY SCHOOL - HVAC UPGRADES PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS, COLORADO 80521
FIRE ALARM SYSTEM DRAWINGS

BID DOCUMENTS

PROJECT	012.23
DATE	11.13.23
DRAWN	GPR

NO.	DESCRIPTION	DATE

REVISIONS

DESIGN CRITERIA AND RISER

FA3.0

Draft

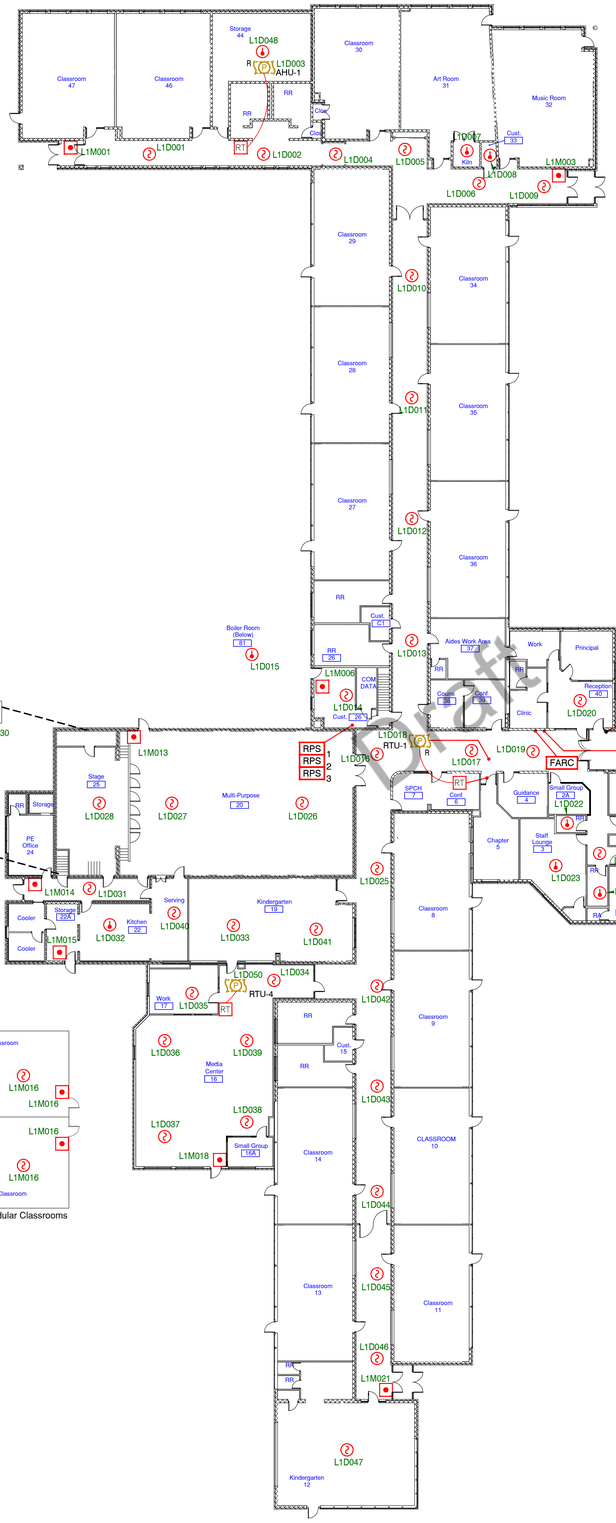
18”

24”

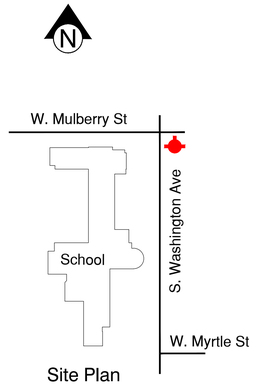
Poudre School District

DUNN ELEMENTARY SCHOOL

501 South Washington Avenue
Fort Collins,
Colorado 80521



Modular Classrooms



Site Plan

YOU ARE HERE

SYMBOL'S LEGEND:	
FACP	FIRE ALARM CONTROL PANEL
MAP	GRAPHIC MAP
RPS	REMOTE POWER SUPPLY
FARC	FIRE ALARM RECORD CABINET
	MANUAL PULL STATION
	SMOKE DETECTOR
	DUCT SMOKE DETECTOR
RT	REMOTE TEST STATION
	THERMAL (HEAT) DETECTOR
	FIRE HYDRANT

11/09/2023

DIGITAL ARCHITECTURAL MODELING
BIM | VDC | INTEGRATED PROJECT DELIVERY

TLH Fire

DUNN ELEMENTARY SCHOOL - HVAC UPGRADES PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS, COLORADO 80521
FIRE ALARM SYSTEM DRAWINGS

BID DOCUMENTS

PROJECT	012.23
DATE	11.13.23
DRAWN	GPR

NO.	DESCRIPTION	DATE

REVISIONS

GRAPHIC MAP

FA4.0

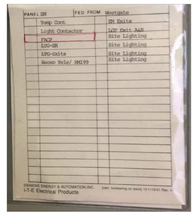
LABEL INSIDE OF FACP WITH ACCOUNT INFORMATION, BYPASS ZONES AND LOCATION OF FACP 120VAC CIRCUIT PANEL AND BREAKER NUMBER. USE KROY LETTERING MACHINE WITH ¼-INCH MINIMUM BLACK LETTERING ON WHITE BACKGROUND, UNLESS ALTERNATE LABELING IS APPROVED BY OWNER.

101. FACP LABELS
NOT TO SCALE

PROVIDE PANEL BREAKER LOCKS FOR ALL ELECTRICAL CIRCUITS FOR FIRE ALARM CONTROL EQUIPMENT PANELS. FIRE ALARM CIRCUIT BREAKER LOCKS SHALL BE COLOR CODED RED. BREAKER LOCKS SHALL BE ECLIPS ELOCK-FA OR APPROVED EQUIVALENT.

102. BREAKER LOCKS
NOT TO SCALE

PROVIDE TYPED ELECTRICAL PANEL BREAKER CIRCUIT LIST.

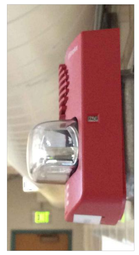


103. BREAKER CIRCUIT LIST
NOT TO SCALE

LABEL EACH NOTIFICATION APPLIANCE WITH NOTIFICATION APPLIANCE CIRCUIT NUMBER AND DEVICE NUMBER IN CIRCUIT (EX: RPS OR AMP 1:1-1, RPS OR AMP 1:1-2, ETC.). LABEL NOTIFICATION APPLIANCE CIRCUIT AND END OF LINE (EOL) DEVICE LOCATION ON THE NOTIFICATION APPLIANCE WHERE THE EOL IS LOCATED (EX: RPS OR AMP 1:1 EOL). PROVIDE SEPARATE LABEL FOR STROBE AND SPEAKER CIRCUITS. USE POWER SUPPLY AND AMPLIFIER DESIGNATIONS FOR NOTIFICATION LABELS. USE KROY LETTERING MACHINE WITH ⅛-INCH MINIMUM BLACK LETTERING ON CLEAR BACKGROUND, UNLESS ALTERNATE LABELING APPROVED BY THE DISTRICT.

104. NOTIFICATION APPLIANCE LABELS
NOT TO SCALE

SELECTABLE CANDELA DEVICES SHALL BE INSTALLED WITH SETTINGS AS INDICATED ON CONTRACT DOCUMENTS. SIMPLEX STROBE SETTINGS SHALL BE SET IN FACP PROGRAMMING.



105. SELECTABLE CANDELA
NOT TO SCALE

PROVIDE WIRE IDENTIFICATION LABELS (N1:1, ETC.) ON WIRES ENTERING PANELS AND J-BOXES.

106. NAC CIRCUIT LABELS
NOT TO SCALE

BATTERIES SHALL BE LABELED WITH MONTH/YEAR OF INSTALLATION AND MONTH/YEAR OF MANUFACTURE.

107. BATTERY LABELS
NOT TO SCALE

CONTRACTOR SHALL DEMOLISH EXISTING LABELS FOR DEMOLISHED DEVICES.

108. LABEL DEMOLITION
NOT TO SCALE

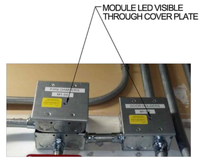
LABEL EACH CONCEALED DEVICE LOCATION WITH DEVICE TYPE, DEVICE ID ADDRESS AND CIRCUIT FUNCTION (I.E. L01-D102 RTU-10 DUCT DETECTOR) AT THE ADJACENT CEILING TILE GRID T-BAR. USE PLASTIC LAMINATE WITH ENGRAVED ⅛-INCH LETTERING. LAMINATE SHALL BE OF RED ON WHITE CORE CONSTRUCTION (WHITE LETTERING ON RED BACKGROUND). CONTRACTOR SHALL PROVIDE SAMPLE PLACARD FOR OWNER APPROVAL PRIOR TO INSTALLATION.

109. CONCEALED DEVICES
NOT TO SCALE

CONTRACTOR SHALL PROVIDE AND INSTALL DOOR FRAME PLACARDS TO MATCH FACILITY ASSESSMENT. ARCHITECT/ENGINEER SHALL DEFINE ROOMS THAT REQUIRE PLACARDS ON CONTRACT DOCUMENTS. THE DOOR FRAME PLACARDS SHALL REFLECT THE MAPPS ROOM DESIGNATION AND SHALL BE ENGRAVED PHENOLIC LABELS MATCHING THE COLOR OF EXISTING DOOR FRAME LABELS (UNLESS ALTERNATE COLOR APPROVED BY DISTRICT), APPROXIMATELY 2" TALL BY 5" WIDE AND ATTACHED TO THE CENTER OF THE DOOR FRAME (STICKY BACK). CONTRACTOR SHALL PROVIDE SAMPLE DOOR TAGS FOR OWNER APPROVAL PRIOR TO INSTALLATION.

110. FACILITY ASSESSMENT DOOR PLACARDS
NOT TO SCALE

LABEL EACH CONTROL MODULE OR MONITOR MODULE WITH DEVICE ID ADDRESS AND FUNCTION (I.E. L1-M1 AHU-1 SHUTDOWN, M1-5 CLOSE FIRE/SMOKE DAMPERS, ETC.). USE KROY LETTERING MACHINE WITH ¼-INCH MINIMUM BLACK LETTERING ON WHITE BACKGROUND, UNLESS ALTERNATE LABELING IS APPROVED BY OWNER. FIRE ALARM VENDOR SHALL PROVIDE COVER PLATES THAT PERMIT DEVICE CONTROL/MONITOR LED VISIBILITY.



111. MODULE LABELS
NOT TO SCALE

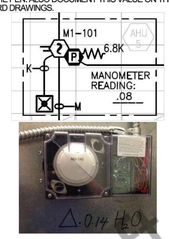
LABEL EACH INITIATING DEVICE WITH DEVICE ID ADDRESS (I.E. L01-D001 OR M01-001). SMOKE AND HEAT DETECTORS SHALL BE LABELED ON BASE. USE KROY LETTERING MACHINE WITH ¼-INCH MINIMUM BLACK LETTERING ON WHITE BACKGROUND, UNLESS ALTERNATE LABELING IS APPROVED BY OWNER. CARBON MONOXIDE DETECTORS - THE DETECTOR SHALL BE LABELED/SIGNED "CARBON MONOXIDE DETECTOR" AND IT SHALL BE LEGIBLE WITHOUT THE USE OF A LADDER OR OTHER MEANS.

112. INITIATING DEVICE LABELS
NOT TO SCALE

CONTRACTOR SHALL REUSE/REINSTALL EXISTING UL LISTED PULL STATION COVERS. EXISTING SOUNDER COVERS SHALL HAVE BATTERIES REMOVED PRIOR TO REINSTALLATION. NEW COVERS SHALL BE EQUIPPED WITH ALARMS (WITHOUT BATTERIES) AND SHALL BE PROVIDED IN GYMS AND CAFETERIAS.

113. PULL STATION COVERS
NOT TO SCALE

LABEL DUCT DETECTOR HOUSING WITH DEVICE ID ADDRESS (I.E. L01-D001 OR M01-001). USE KROY LETTERING MACHINE WITH ⅛-INCH MINIMUM BLACK LETTERING ON WHITE BACKGROUND, UNLESS ALTERNATE LABELING APPROVED BY OWNER. PROVIDE MAGNEHELIC DIFFERENTIAL PRESSURE DELTA WRITTEN ON THE DUCT ADJACENT TO THE DETECTOR HOUSING WITH A BLACK SHARPIE PEN. ALSO DOCUMENT THIS VALUE ON THE RECORD DRAWINGS.



114. DUCT DETECTOR LABELS
NOT TO SCALE

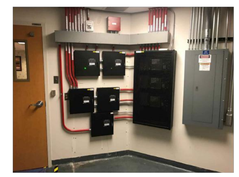
LABEL EACH REMOTE DUCT DETECTOR OR BEAM DETECTOR TEST STATION WITH ASSOCIATED DEVICE ID ADDRESS AND ASSOCIATED HVAC UNIT OR BEAM DETECTOR DESIGNATION (I.E. L01-D001 RTU-1, L01-D004 NORTH BEAM, ETC.). LABEL LOCATION OF THE DEVICE ASSOCIATED WITH THE TEST STATION. IF THE TEST STATION IS NOT IN THE DIRECT VICINITY OF THE ASSOCIATED DEVICE (I.E. L01-M001 RTU-1 CLASSROOM 201). USE KROY LETTERING MACHINE WITH ⅛-INCH MINIMUM BLACK LETTERING ON WHITE BACKGROUND, UNLESS ALTERNATE LABELING IS APPROVED BY OWNER. LOCATE TEST STATION IN NEAREST CORRIDOR LOCATION AT A MINIMUM OF 7FT ABOVE FINISHED FLOOR.

115. REMOTE TEST SWITCHES
NOT TO SCALE

WHEN PATCHING DUCTS, UTILIZE STEEL PLATES SECURED BY #8 X ½" INDENTED SLOTTED HEX WASHER HEAD TYPE A SHEET METAL SCREWS AND APPLY MASTIC WHICH IS LISTED AND LABELED "181A-M" IN ACCORDANCE WITH UL 181A. DO NOT USE TAPE.

116. DUCT DETECTOR SAMPLING TUBE PATCH METHOD
NOT TO SCALE

CONTRACTOR SHALL LABEL CONDUIT ASSOCIATED WITH FIRE ALARM CONTROL EQUIPMENT CABINETS WITH THE CIRCUITS PRESENT IN EACH CONDUIT. LABELS SHALL BE 1" WHITE TEXT ON RED BACKGROUND FOR SILVER CONDUIT OR 1" BLACK TEXT ON WHITE BACKGROUND FOR RED CONDUIT. LABEL EACH PANEL WITH PANEL ID AS REQUIRED BY THE NEC. USE PLASTIC LAMINATE WITH ENGRAVED ⅛-INCH LETTERING. LAMINATE SHALL BE OF RED ON WHITE CORE CONSTRUCTION (WHITE LETTERING ON RED BACKGROUND). CONTRACTOR SHALL PROVIDE SAMPLE PLACARD FOR OWNER APPROVAL PRIOR TO INSTALLATION. SEE EXAMPLE PICTURES.



117. CONDUIT LABELS & PANEL IDENTIFICATION
NOT TO SCALE

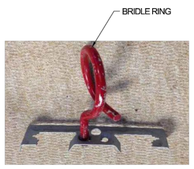
CONDUITS, JUNCTION BOXES AND DEVICE BACK BOXES SHALL HAVE APPROPRIATE PLENUM RATED PLASTIC EDGE PROTECTION WIRE INSULATING BUSHING WHERE OPEN CABLE ROUTING OCCURS. DO NOT USE ROMEX TYPE CONNECTORS.

118. GROMET & STRAIN RELIEF BUSHING
NOT TO SCALE

OPEN CABLING SHALL BE INSTALLED IN A NEAT AND WORKMANSHIP-LIKE MANNER. CONTRACTOR SHALL NOT USE ZIP TIES. RED PLENUM RATED VELCRO SHALL BE UTILIZED ONLY TO AVOID OBSTRUCTIONS AND TO SECURE THE SERVICE LOOP IN THE BRIDLE RING.

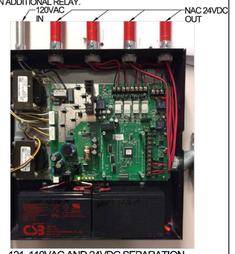
119. PLENUM RATED VELCRO WRAP
NOT TO SCALE

OPEN CABLING SHALL BE SUPPORTED AT A MINIMUM OF EVERY 4 TO 6 FEET TO BUILDING STRUCTURAL MEMBERS UTILIZING METAL BRIDLE RINGS. CABLING THAT IS SECURED TO SPRINKLER PIPING, HVAC DUCTWORK, ELECTRICAL CONDUIT OR OTHER NON-STRUCTURAL BUILDING MEMBER SHALL NOT BE ACCEPTABLE AND SHALL CAUSE THE CABLE TO BE RE-INSTALLED AND RE-SUPPORTED IN A PROPER MANNER.



120. BRIDLE RINGS
NOT TO SCALE

ROUTE CABLES SUCH THAT A MINIMUM SEPARATION OF 6" IS MAINTAINED BETWEEN CLASS 1 WIRE AND POWER-LIMITED FIRE ALARM CIRCUITS. PROVIDE SEPARATE RELAY (MR201C OR APPROVED EQUIVALENT) WHERE 120VAC IS REQUIRED TO RELEASE FIRE/SMOKE DAMPERS, MAGNETIC DOOR HOLDERS, OR SIMILAR. FOR NOTIFIER DEVICES, BARRIER CB500 MAY BE INSTALLED IN PLACE OF AN ADDITIONAL RELAY.



121. 110VAC AND 24VDC SEPARATION
NOT TO SCALE

APPROPRIATE FIRE CAULKING OR SEALANT SHALL BE UTILIZED WHERE OPEN CABLING PENETRATES FIRE SEPARATION BARRIERS OR BUILDING SEPARATION WALLS OCCUR. FIRE CAULK ALL CONDUIT ENDS WHERE CONDUIT SLEEVES PENETRATE FIRE BARRIER SEPARATIONS. AFTER CABLE HAS BEEN INSTALLED, COMPLY WITH UL THROUGH PENETRATION REQUIREMENTS. SEE DIVISION 7.

122. FIRE CAULKING
NOT TO SCALE

MOUNT OUTLET BOX FOR ELECTRIC DOOR HOLDER TO WITHSTAND 80 POUNDS PULLING FORCE. WHERE WALL CONSTRUCTION IS WOOD OR STEEL FRAME, UTILIZE CADDY TELESCOPIC BRACKET TSGB16/TSGB24 OR APPROVED EQUIVALENT OR 2X4 PLYWOOD SECURED TO ADJACENT SUPPORTS FOR NEW CONSTRUCTION.

123. MAGNETIC DOOR HOLDER SUPPORT
NOT TO SCALE

CONDUIT SHALL BE SECURELY FASTENED AND SUPPORTED ON EACH SIDE OF PENETRATION.

124. CONDUIT SUPPORT THROUGH PENETRATION
NOT TO SCALE

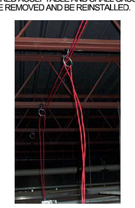
CONTRACTOR SHALL PROVIDE AND INSTALL SSB-TBAR SUPPORT BRACKETS WITH T-BAR DROP CEILING MOUNTING CLIPS (OR APPROVED EQUIVALENT). ADJUSTABLE CADDYS SHALL NOT BE PERMITTED. PROVIDE AND INSTALL ORBIT FIRE ALARM 4S (FA-UMAB1-3-½" DEEP BOXES.

125. BACKBOX AND BACKBOX SUPPORT
NOT TO SCALE

CABLE ROUTING SHALL BE PERPENDICULAR TO OR PARALLEL TO STRUCTURAL BUILDING MEMBERS, AND SHALL UTILIZE A METAL BRIDLE RING TYPE SUPPORT SYSTEM ATTACHED TO STRUCTURAL BUILDING MEMBERS ONLY. DIAGONAL ROUTING OF CABLE SHALL NOT BE CONSIDERED ACCEPTABLE AND SHALL CAUSE CABLE TO BE REMOVED AND REINSTALLED. OPEN CABLING SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. CONTRACTOR SHALL REMOVE ANY KINKS OR PINCHES IN CABLE.

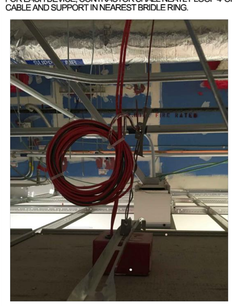
126. CABLE ROUTING
NOT TO SCALE

OPEN CABLING SHALL BE ROUTED AWAY FROM OTHER BUILDING CABLING AND EQUIPMENT, AND SHALL BE ROUTED TO AND FROM THE DEVICE IN A VERTICAL OR HORIZONTAL MANNER. MAINTAIN CABLING AT THE SAME LEVEL WHERE POSSIBLE. CABLING THAT IS NOT DROPPED VERTICALLY TO THE DEVICE OR ROUTED HORIZONTALLY STRAIGHT TO THE DEVICE SHALL NOT BE CONSIDERED ACCEPTABLE. CABLING THAT IS ROUTED THROUGH, OVER, UNDER OR AROUND OTHER EQUIPMENT, WHEN A STRAIGHT HORIZONTAL OR VERTICAL PATH IS AVAILABLE SHALL NOT BE CONSIDERED ACCEPTABLE AND SHALL CAUSE THE CABLE TO BE REMOVED AND BE REINSTALLED.



127. CABLE ROUTING
NOT TO SCALE

FOR EACH DEVICE, CONTRACTOR SHALL NEATLY LOOP 4' OF CABLE AND SUPPORT IN NEAREST BRIDLE RING.



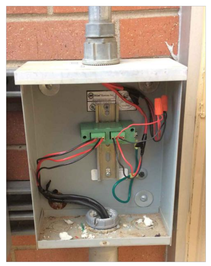
128. SERVICE LOOP
NOT TO SCALE

TYPE OF CIRCUIT APPLICATION	DESCRIPTION	COLOR CODED CABLE
CONVENTIONAL (CO) CIRCUIT PLENUM	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (FPLP)	RED + BLACK - RED JACKET W/ BROWN STRIPE
DATA (SLC) CIRCUIT PLENUM	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (FPLP)	RED + BLACK - RED JACKET FIRE PRINTED "SLC"
DATA (SLC) WET LOCATIONS	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (WET LOCATION)	RED + BLACK - BLACK JACKET TAG FOR OKT TYPE @ J BOX
VISUAL (NAC) CIRCUIT PLENUM	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (FPLP)	RED + BLACK - RED JACKET W/ GREEN STRIPE
VISUAL (NAC) WET LOCATION	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (WET LOCATION)	RED + BLACK - BLACK JACKET TAG FOR OKT TYPE @ J BOX
SPEAKER (NAC) CIRCUIT PLENUM	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (FPLP)	RED + BLACK - RED JACKET W/ BLUE STRIPE
SPEAKER (NAC) WET LOCATION	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (WET LOCATION)	RED + BLACK - BLACK JACKET TAG FOR OKT TYPE @ J BOX
AUX POWER CIRCUIT PLENUM	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (FPLP)	RED + BLACK - RED JACKET W/ PURPLE STRIPE
NAC SYNC CIRCUIT PLENUM	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (FPLP)	RED + BLACK - RED JACKET W/ YELLOW STRIPE
NETWORK CIRCUIT PLENUM	1 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (FPLP)	RED + BLACK - RED JACKET W/ YELLOW STRIPE
RELAY, MISCELLANEOUS CIRCUIT PLENUM		RED + BLACK - RED JACKET W/ YELLOW STRIPE
REMOTE TEST 5% TON CIRCUIT PLENUM	2 PAIR 16 AWG TWISTED / UNSHIELDED FIRE ALARM CABLE (FPLP)	RED + BLACK - RED JACKET W/ YELLOW STRIPE
TELEPHONE CIRCUIT	CAT 6 NETWORK CABLE	RED JACKET TAG FOR OKT TYPE @ J BOX

WIRING COLOR CODE SHALL BE CONSISTENT THROUGHOUT THE ENTIRE SYSTEM AND PERMANENTLY POSTED INSIDE THE FIRE ALARM CONTROL PANEL. COLOR CODING SHALL BE BY CONTINUOUS COLORED INSULATION. WIRE SHALL NOT BE PAINTED.
CONDUCTOR SIZING AND NUMBER SUBJECT TO EQUIPMENT MANUFACTURER RECOMMENDATIONS.

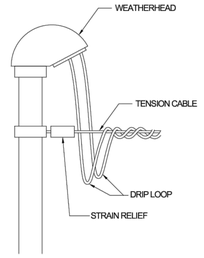
129. WIRE TYPE AND STRIPING
NOT TO SCALE

TERMINATIONS BETWEEN FPLP AND WET LOCATION CABLE SHALL BE ORIENTED IN A VERTICAL POSITION TO ALLEVIATE POSSIBILITY OF WATER RETENTION.



130. MODULAR CLASSROOM J-BOX
NOT TO SCALE

OVERHEAD CONDUIT ENTRIES TO MODULAR CLASSROOMS SHALL BE INSTALLED WITH A WEATHERHEAD, CABLE SUPPORT, DRIP LOOP AND STRAIN RELIEF. SURGE SUPPRESSORS SHALL BE PROVIDED TO PROTECT BOTH THE SCHOOL AND THE FIRST MODULAR CLASSROOM.



131. OVERHEAD CABLE TO MODULAR CLASSROOM
NOT TO SCALE

SHOP DRAWINGS SHALL INCLUDE FACP PROGRAMMING LIST WHICH INCLUDES DEVICE NUMBER, DEVICE LOCATION AND REFERENCES TO MAJOR BUILDING AREAS. WHERE NECESSARY TO DISTINGUISH THE LOCATIONS OF TWO OR MORE DETECTORS, COMPASS DIRECTIONS SHALL BE INCORPORATED IN THE DEVICE LOCATION DESCRIPTION IN PROGRAMMING. EXAMPLES INCLUDE:

L01-D001	SMOKE(PHOTO)	CLASSROOM 1 EAST
L01-D002	SMOKE(PHOTO)	CLASSROOM 1 WEST
L01-D003	SMOKE(PHOTO)	WEST CORRIDOR NORTH
L01-D004	SMOKE(PHOTO)	WEST CORRIDOR CENTER
L01-D005	SMOKE(PHOTO)	WEST CORRIDOR SOUTH
L01-D006	HEAT	IDF 200
L01-D007	SUP L(DUCT P)	AHU-1 RETURN
L01-D010	SMOKE(BEAM)	GYM 150 NORTH
L01-D011	SMOKE(BEAM)	GYM 150 SOUTH
L01-M001	PULL STATION	NORTH ENTRY 136
L01-M060	RELAY	RTU-2 SHUTDOWN

132. FACP PROGRAMMING LABELS
NOT TO SCALE

1. FA-001 FIRE ALARM SYSTEM LABELING & INSTALLATION
2. FA-002 FIRE ALARM SYSTEM DETAILS
3. FA-003 VESDA INSTALLATION DETAILS
4. FA-004 VESDA INSTALLATION DETAILS CONTINUED

133. SHEET INDEX
NOT TO SCALE

draft

DIGITAL ARCHITECTURAL MODELING
DAVID A. SMITH
TLH FIRE
6901 S. PIERCE STREET
SUITE 205
LITTLETON, CO 80128
TLH Fire

TECHNICAL GUIDELINES
DETAILS ARE GRAPHICAL DEPICTIONS OF DIV 28 SPECIFICATIONS

DUNN ELEMENTARY SCHOOL - HVAC UPGRADES PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS, COLORADO 80521
FIRE ALARM SYSTEM DRAWINGS

DATE: 08/16/2022
SCALE: NOT TO SCALE

PROJECT 012.23
DATE 11.13.23
DRAWN GPR

NO.	DESCRIPTION	DATE

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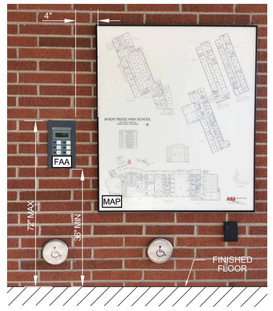
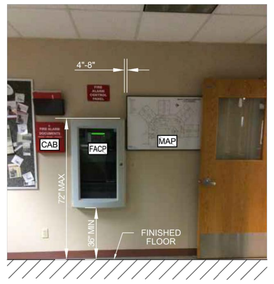
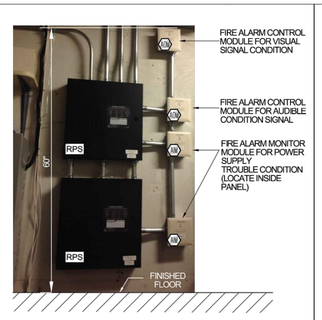
FA5.0



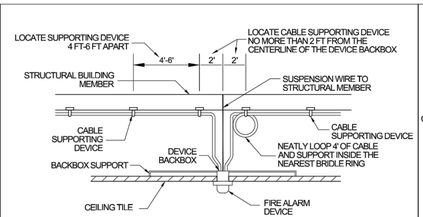
201. FIRE ALARM ANNUNCIATOR PANEL ELEVATION
NOT TO SCALE



202. FIRE ALARM CONTROL PANEL ELEVATION
NOT TO SCALE

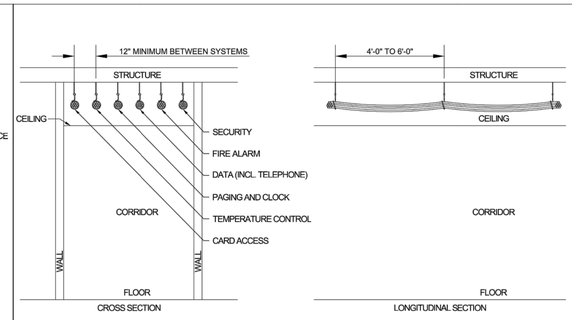


203. BOOSTER POWER SUPPLY PANEL ELEVATION
NOT TO SCALE

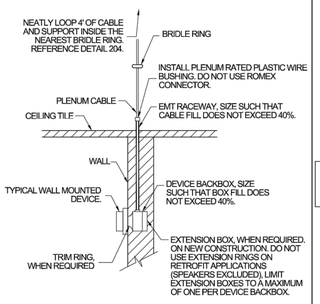


1. CABLE SUPPORTING DEVICES SHALL BE ATTACHED TO BUILDING STRUCTURAL WALLS OR MEMBERS.
2. MAINTAIN PLENUM CABLE ROUTING AT HIGHEST ELEVATION.
3. MAKE ALL DEVICE DROPS AS CLOSE TO VERTICAL AS POSSIBLE.
4. REFER TO OPEN (PLENUM) CABLE INSTALLATION REQUIREMENTS IN TECHNICAL GUIDELINES.

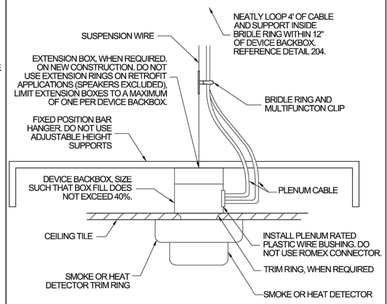
204. TYPICAL PLENUM CABLE WIRING INSTALLATION
NOT TO SCALE



205. BRIDLE RING SUPPORT AND SYSTEM SEPARATION
NOT TO SCALE

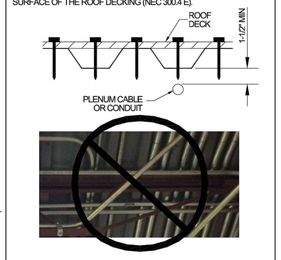


206. TYPICAL WALL MOUNT DEVICE INSTALLATION
NOT TO SCALE

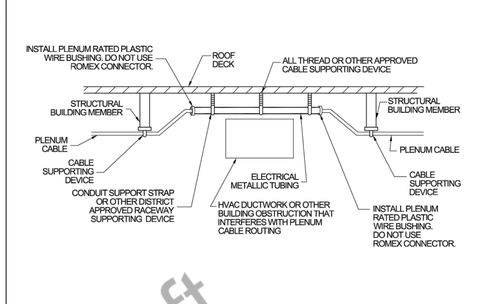


207. TYPICAL CEILING MOUNT DEVICE INSTALLATION
NOT TO SCALE

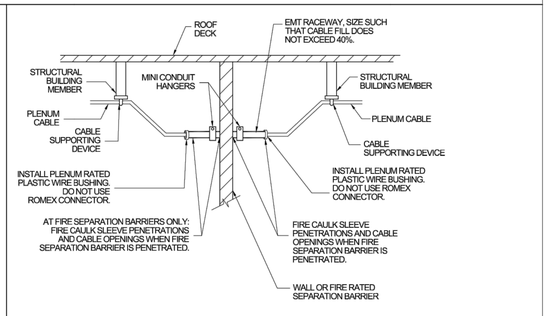
CABLE OR RACEWAY-TYPE WIRING METHOD, INSTALLED IN EXPOSED OR CONCEALED LOCATIONS UNDER METAL-CORRUGATED SHEET ROOF DECKING, SHALL BE INSTALLED AND SUPPORTED SO THE NEAREST OUTSIDE SURFACE OF THE CABLE OR RACEWAY IS NOT LESS THAN 1-1/2" FROM THE NEAREST SURFACE OF THE ROOF DECKING (NEC 300.4 E).



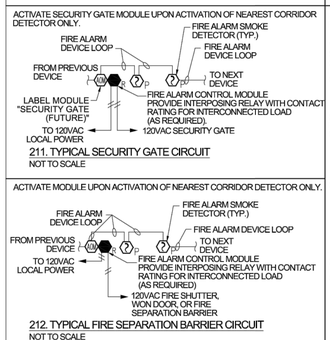
208. RACEWAYS INSTALLED UNDER ROOF DECKING
NOT TO SCALE



209. TYPICAL PLENUM CABLE WIRE INSTALLATION WITH OBSTRUCTION
NOT TO SCALE

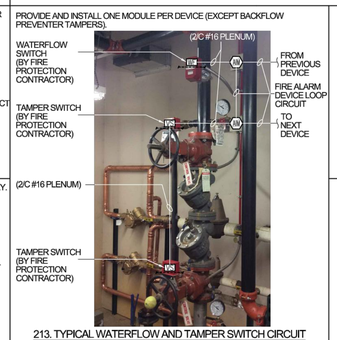


210. TYPICAL PLENUM CABLE INSTALLATION THROUGH PENETRATION
NOT TO SCALE

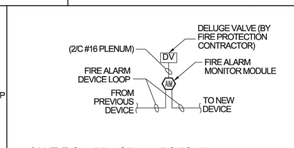


211. TYPICAL SECURITY GATE CIRCUIT
NOT TO SCALE

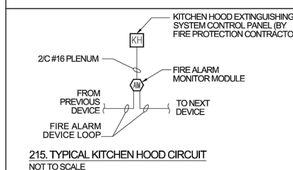
212. TYPICAL FIRE SEPARATION BARRIER CIRCUIT
NOT TO SCALE



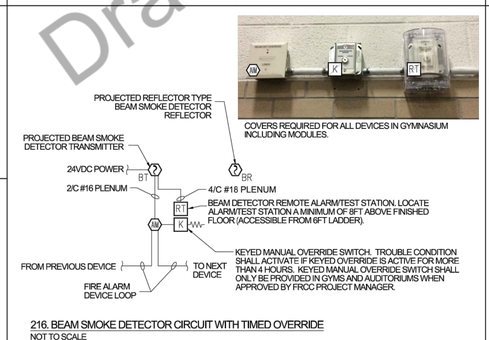
213. TYPICAL WATERFLOW AND TAMPER SWITCH CIRCUIT
NOT TO SCALE



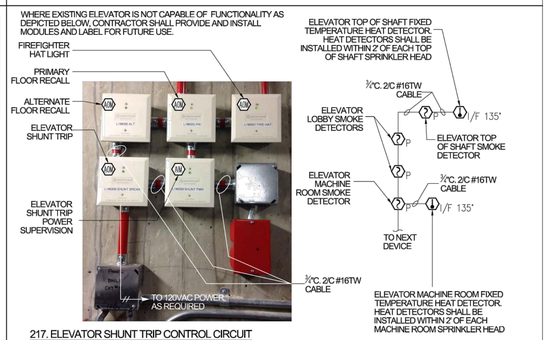
214. TYPICAL DELUGE VALVE CIRCUIT
NOT TO SCALE



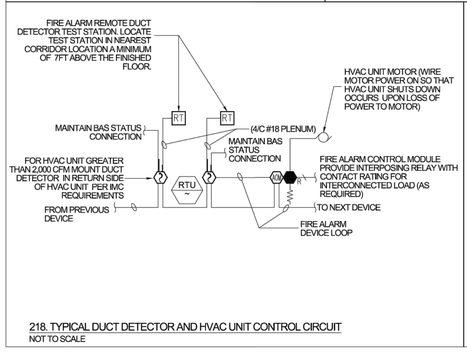
215. TYPICAL KITCHEN HOOD CIRCUIT
NOT TO SCALE



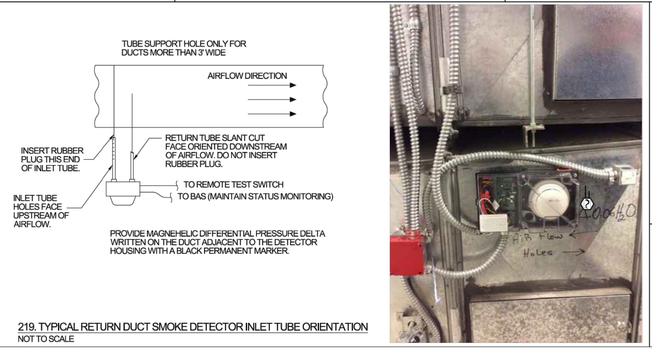
216. BEAM SMOKE DETECTOR CIRCUIT WITH TIMED OVERRIDE
NOT TO SCALE



217. ELEVATOR SHUNT TRIP CONTROL CIRCUIT
NOT TO SCALE



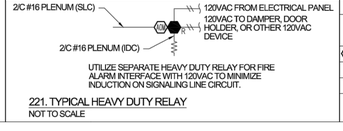
218. TYPICAL DUCT DETECTOR AND HVAC UNIT CONTROL CIRCUIT
NOT TO SCALE



219. TYPICAL RETURN DUCT SMOKE DETECTOR INLET TUBE ORIENTATION
NOT TO SCALE

INDEPENDENT PENETRATIONS SHALL BE DRILLED FOR EXTERIOR APPLIANCES. EXTERIOR CONDUIT IS NOT PERMITTED FOR OUTSIDE STROBES OR HORNSTROBES (RED STROBE ONLY REQUIRED FOR GOLDEN FIRE). LIQUID TIGHT FLEXIBLE METALLIC CONDUIT (FMC) AND RIGID/IMC CONDUIT TO LIQUID TIGHT FMC TRANSITION COUPLINGS SHALL BE UTILIZED FOR EXTERIOR WALL MOUNTED LOUD SPEAKERS. WEATHERPROOF ELECTRICAL BOXES SHALL BE MOUNTED SLIGHTLY ABOVE THE DRIP LOOP TO AVOID WATER ACCUMULATION IN THE BOX.

220. EXTERIOR APPLIANCES
NOT TO SCALE



221. TYPICAL HEAVY DUTY RELAY
NOT TO SCALE

DEVICE	DESCRIPTION	DEVICE	DESCRIPTION
FACP	FIRE ALARM CONTROL PANEL	WFSI	AUTOMATIC SPRINKLER WATER FLOW SWITCH
AMP	AMPLIFIER	TS	AUTOMATIC SPRINKLER TAMPER SWITCH
CAB	RECORD DRAWING CABINET	S30C 1W	SPEAKER/STROBE, CEILING, CANDELA INTENSITY, WATTS
FAA	FIRE ALARM ANNUNCIATOR		
RPS	REMOTE POWER SUPPLY	S15 1W	SPEAKER/STROBE, WALL , CANDELA INTENSITY, WATTS
DACT	DIGITAL ALARM COMMUNICATOR - POINT CONTACT ID		
MAP	GRAPHIC MAP	S 1W	SPEAKER, WATTS
F	MANUAL PULL STATION, DOUBLE ACTION, INTELLIGENT W/ KEY	H15 1W	HORN/STROBE, WALL, CANDELA INTENSITY
P	PHOTOELECTRIC SMOKE DETECTOR, INTELLIGENT	15C	STROBE, CEILING, CANDELA INTENSITY
I/F 190°	FIXED TEMP 190° HEAT DETECTOR, INTELLIGENT	15	STROBE, WALL, CANDELA INTENSITY
I/F 135°	FIXED TEMP 135° HEAT DETECTOR, INTELLIGENT	WP	WEATHERPROOF DEVICE
I/R 135°	RATE OF RISE 135° HEAT DETECTOR, INTELLIGENT	WG	WIRE GUARD
RT	REMOTE TEST STATION	FSD	FIRE/SMOKE DAMPER
K	KEYED OVERRIDE SWITCH	KH	KITCHEN ANSUL SYSTEM
P	PHOTOELECTRIC DUCT SMOKE DETECTOR, INTELLIGENT, HI-FLO OR LOW-FLO	MDH	MAGNETIC DOOR HOLDER - NEW
			FIRE DEPARTMENT CONNECTION
R	HEAVY DUTY RELAY		DATA (REFER TO DIVISION 270000)
OM	OUTPUT MODULE, INTELLIGENT		PHONE LINE DACT
IM	SINGLE INPUT MODULE, INTELLIGENT	X	TRANSIENT SUPPRESSION

222. NFPA 170 COMPLIANT SYMBOLS
NOT TO SCALE

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DIGITAL ARCHITECTURAL MODELING
DESIGN | BUILD | MAINTAIN

TLH FIRE
6901 S. PIERCE STREET
SUITE 205
LITTLETON, CO 80128

TECHNICAL GUIDELINES
DETAILS ARE GRAPHICAL DEPICTIONS OF DIV 28 SPECIFICATIONS

DUNN ELEMENTARY SCHOOL - HVAC UPGRADES PHASE 2
501 SOUTH WASHINGTON AVENUE
FORT COLLINS, COLORADO 80521
FIRE ALARM SYSTEM DRAWINGS

PROJECT 012.23
DATE 11.13.23
DRAWN GPR

NO.	DESCRIPTION	DATE

REVISIONS

DATE: 08/16/2022
SCALE: NOT TO SCALE

BID DOCUMENTS

TECHNICAL GUIDELINES
FA5.1

Poudre School District

Dunn Elementary School

HVAC Upgrades | Phase 2

Project Manual

January 13, 2023

Draft

POUDRE SCHOOL DISTRICT™

DIVISION 1-14

DIVISION 23

DIVISION 26

Owner:
Poudre School District
2407 LaPorte Avenue
Fort Collins |Colorado | 80521

Architect:
Digital Architectural Modeling | LLC
125 South Howes Street | Suite 500
Fort Collins | Colorado | 80521

Mechanical:
IMEG Corp
7600 East Orchard Road | Suite 250-S
Greenwood Village | Colorado | 80111

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SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.2 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed. Include the following information:
   1. Dates: Indicate when cutting and patching will be performed.
   2. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
   3. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

B. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

C. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

D. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety

E. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

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1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
4. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

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SECTION 024119 - SELECTIVE DEMOLITION AND REMOVALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removal of selected site and building elements.
   2. Salvage of existing items to be reused or recycled, as indicated on the drawings, and including but not limited to:
      a. ACP Ceiling Systems including Grid and Panels
      b. Ceiling-mounted electrical devices.

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1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

E. Demolish: Remove.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

C. Predemolition Photographs or Video: Submit before Work begins.

1.5 COORDINATION

A. Coordinate removals and new construction of architectural, structural, mechanical, plumbing and electrical systems prior to initiating construction. Establish a schedule for removals, noting duration between service interruptions and new systems being operational.

1.6 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Storage or sale of removed items or materials on-site is not permitted.

D. Building Services: Maintain all existing building systems and services, except those specifically identified for removal. Where required, protect building systems and services against damage during selective demolition operations.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and preconstruction video recordings.
   1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
   2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off indicated utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove plumbing, and HVAC systems, equipment, and components indicated to be removed.
      a. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      b. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

c. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
d. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. At the General Contractor's discretion, General Contractor to furnish professional engineering design services required for shoring and bracing design and implementation required during Selective Demolition activity.
2. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering

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and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area off-site designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

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SECTION 075216 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes modifications, repairs, and tie-ins to an existing roofing system, including the following:
   1. SBS-modified bituminous membrane roofing.
   2. Cover board.
   3. Roof insulation.
   4. Substrate board.

B. At completion of the Work, written manufacturer's certification shall be provided, documenting that the existing warranty remains valid and in force.

C. Work of this Section shall be performed by one of the Poudre School District-approved contractors below (NO EXCEPTIONS):

   1. Front Range Roofing
   2. B&M Roofing
   3. Colorado Moisture Control
   4. United Roofing Materials

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1.2 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 "Terminology Relating to Roofing and Waterproofing"; glossary of NRCA's "The NRCA Roofing and Waterproofing Manual"; and the Roof Consultants Institute "Glossary of Roofing Terms" for definition of terms related to roofing work in this Section.

B. Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another and with the existing roofing system under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Jobsite Safety: Execute all operations and provide a safe work environment in accordance to OSHA standards and regulations. This requirement applies to all contractor personnel, associated subcontractors, workers in other trades, and jobsite visitors.
   1. Follow all industry fire prevention guidelines for storage of materials, staging areas, roof access, and application means and methods.
   2. Any applicable local fire codes supersede industry guidelines.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
   1. Base flashings, cants, and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Crickets, saddles, and tapered edge strips, including slopes.
   4. Insulation fastening patterns.

C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to modify and install roofing system.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements.

E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Source Limitations: Obtain all components from single source roofing manufacturer.

C. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

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4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Require all trades listed in Preliminary Roofing Conference to be present.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.8 GUARANTEE

A. At completion of the Work, provide manufacturer's certification that the existing roofing warranty remains in force.

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PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Johns Manville Roofing Systems

2.2 SBS-MODIFIED ASPHALT-SHEET MATERIALS

A. Roofing Membrane Sheet: ASTM D 6162, Grade S, Type II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Product: DynaPly.

B. Roofing Membrane Cap Sheet: ASTM D 6162, Grade G, Type II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet; surface to match existing; suitable for application method specified. Product: DynaKap FR.

2.3 BASE FLASHING SHEET MATERIALS

A. Backer Sheet: ASTM D 6162, Grade S, Type II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Product: DynaPly.

B. Flashing Sheet: ASTM D 6164, Grade G, Type II, polyester-reinforced, SBS-modified asphalt sheet; granular surfaced; suitable for application method specified. Product: DynaWeld Cap 180 FR.

C. Liquid Applied Flashing: A liquid and fabric reinforced flashing system created with a stitchbonded polyester scrim and a two-component, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator. Product: PermaFlash System.

2.4 AUXILIARY ROOFING MEMBRANE MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

B. Roofing Asphalt: ASTM D 312, Type III.

C. Cold-Applied Adhesive: Roofing system manufacturer's asphalt-based, two-component, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with membrane applications. Product: MBR Bonding Adhesive.

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D. Cold-Applied Flashing Adhesive: Roofing system manufacturer's asphalt-based, two-component, asbestos-free, trowel-grade, cold-applied adhesive specially formulated for compatibility and use with flashing applications. Product: MBR Flashing Cement.

E. Mastic Sealant: As required by Johns Manville.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Product: All Purpose Fasteners and Plates.

G. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

H. Miscellaneous Accessories: Provide all miscellaneous accessories recommended by roofing system manufacturer.

2.5 COVER BOARD

A. Perlite Board: ASTM C 728; composed of expanded perlite, cellulosic fibers, binders and waterproofing agents with top surface seal-coated. Product: 3/4" DuraBoard

2.6 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Product: ENRGY 3.
   1. Provide insulation package with minimum thickness of 1 inch, or as indicated.
   2. Install no boards thicker than 1.5”. If insulation package required is thicker than 1.5”, install in multiple layers.

2.7 TAPERED INSULATION

A. Tapered Insulation: ASTM C 1289, provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated. Product: Tapered ENRGY 3.

2.8 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

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B. Provide factory preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

C. Cold Fluid-Applied Adhesive: Manufacturer's No VOC, two-component cold fluid-applied adhesive formulated to adhere roof insulation to substrate. Product: MBR Bonding Adhesive.

D. Insulation Cant Strips: ASTM C 728, perlite insulation board. Product: FesCant Plus.

E. Wood Nailer Strips: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry."

2.9 SUBSTRATE BOARD

A. Substrate Board: ASTM C 728, perlite board, 3/4 inch (19 mm) thick, seal coated. Product: Fesco Board.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening substrate panel to roof deck. Product: All Purpose Fasteners and Plates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the entire building roof, not only areas where work is indicated.
   1. Document conditions that require repair to maintain the existing warranty.
   2. Proposals for base bid shall be accompanied by a detailed list of warranty work required.

B. Examine work area substrates and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
   2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with asphalt primer at a rate recommended by roofing manufacturer and allow primer to dry.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of steel deck according to recommendations in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
   2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturer's written instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSULATION AND COVER BOARD INSTALLATION

A. Coordinate installing roof system components so insulation and cover board is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installing roof insulation and cover board.

C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees per manufacturer’s instruction.

D. Install tapered insulation under area of roofing to conform to slopes indicated.

E. Install boards with long joints in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with like material.
   1. Cut and fit boards within 1/4 inch (6 mm) of nailers, projections, and penetrations.

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F. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall thickness is 1.5 inches (38 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

G. Trim surface of boards where necessary at roof drains so completed surface is flush and does not restrict flow of water.

H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

I. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing system specification 2CID-CA according to roofing system manufacturer's written instructions, applicable recommendations of Johns Manville "Bituminous Roofing Binder", and requirements in this Section.

B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Where roof slope exceeds 1/2 inch per 12 inches, contact the membrane manufacturer for installation instructions regarding installation direction and backnailing

D. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

E. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
   1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
   2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
   3. Remove and discard temporary seals before beginning work on adjoining roofing.

F. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
   1. Adhere to substrate in cold-applied adhesive.
   2. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

   1. Repair tears and voids in laps and lapped seams not completely sealed.
   2. Apply roofing granules to cover exuded bead at laps while bead is hot.

C. Install roofing membrane sheets so side and end laps shed water.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.7 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
   1. Prime substrates with asphalt primer if required by roofing system manufacturer.
   2. Backer Sheet Application: Install backer sheet and adhere to substrate in cold-applied adhesive at rate required by roofing system manufacturer.
   3. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

D. Roof Drains: Flash drain using PermaFlash system. Clamp roofing membrane, flashing, and stripping into roof-drain clamping ring.
   1. Install stripping according to roofing system manufacturer's written instructions.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

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B. Final Roof Inspection:
   1. Final inspection of roofing system shall include the entire building SBS Membrane Roofing system, regardless of whether the area was indicated to be part of the Work or not.
   2. Notify Architect or Owner 48 hours in advance of date and time of inspection.
   3. Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of roofing system where test results or inspections indicate that they will not support continuation of the roofing warranty.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075216

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SECTION 07720 –ROOF EDGE PROTECTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

Basis of Design: KeeGuard® Roof Edge Protection System, including pipe railings, uprights, bases, counterweights, fittings and delivery to site.

RELATED SECTIONS

A. Section 07400 - Membrane Roofing: Coordination of roof edge protection installation.

1.3 SUBMITTALS

. A. Manufacturer's data sheets on each product to be used, including:

1.4 QUALITY ASSURANCE

A. Railings Structural Requirements:

1. Handrail, wall rail and guardrail assemblies and attachments shall withstand a minimum concentrated load of 200 pounds (90719 g) applied in any direction on the top rail.

2. Infill area of guardrail system capable of withstanding a horizontal concentrated load of 200 pounds (90719 g) applied to one square foot (8165 g/sm) at any point in the system. Load not to act concurrently with loads on top rail of system in determining stress on guardrail.

PART 2 PRODUCTS

A. Finish: Polyester factory applied spray coating.
B. Fasteners: Type 304 or 305 stainless steel or galvanized.

2.4 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.
B. Upright tops shall be plugged with weather and light resistant material.
C. Assemble components with joints tightly fitted and secured. Accurately form components to suit installation.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Fit exposed connections accurately together to form tight joints. For all connections with Kee Klamp fittings, each set screw is to be tightened to 29 foot pounds (39 Nm)of torque.

C. Perform cutting, and fitting required for installation of handrails. Set handrails and accurately in location, alignment, and elevation, measured from established lines and levels.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Latex joint sealants.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.4 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Building Systems; Sonolac.
b. Bostik, Inc.; Chem-Calk 600.
c. Pecora Corporation; AC-20+.
d. Tremco Incorporated; Tremflex 834.
2. Joint Locations:
e. Vertical joints on exposed surfaces of interior walls and partitions.
f. Perimeter joints between interior wall surfaces and frames of interior doors and windows.

2.3 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pecora Corporation; AIS-919.
b. USG Corporation; SHEETROCK Acoustical Sealant.

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2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Clean joint surfaces and prepare for sealant primer and sealant as recommended by manufacturer.

C. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

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SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.

1.3 ACTION SUBMITTALS

A. Samples for Initial Selection: For factory-finished doors.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
2. Warranty Period for Solid-Core Interior Doors: Life of installation.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide Marshfield Door Systems, Inc. “Variable Privacy Door” in (1) location indicated, and products meeting specifications by one of the following for all other Flush Wood Doors.:

1. Algoma Hardwoods, Inc.
2. Buell.
3. Mohawk.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Standards”**,** "Architectural Wood Flush Doors."
1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-1**,** made with binder containing no urea-formaldehyde.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

C. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
   a. Screw Withdrawal, Face: 700 lbf (3100 N).
   b. Screw Withdrawal, Edge: 400 lbf (1780 N).

2.3 VENEER-FACED DOORS AND MATCHING TRANSOMS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
1. Grade: Custom (Grade A faces).
2. Species: Red Oak
3. Cut: Plain sliced (flat sliced).
4. Assembly of Veneer Leaves on Door Faces: Center-balance match.
5. Core: Either glued wood stave or structural composite lumber.
6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

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2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish:
   1. Grade: Custom.
   2. Finish: AWI's "Architectural Woodwork Standards" System 5, conversion varnish.
   3. Staining: As selected by Architect from manufacturer's full range.
   4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors before hanging doors.
   1. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

3.3 ADJUSTING

A. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

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SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:
1. Section 079200 "Joint Sealants" for requirements for sealants provided and installed by this section.
2. Section 092900 "Gypsum Board" for interior gypsum board assemblies.
3. Section 095113 “Acoustical Panel Ceilings.”

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products by one of the following manufacturers:
1. Cemco, Inc.
2. Dale/Incor, Inc.
3. Dietrich Industries, Inc.

2.2 FRAMING SYSTEMS

A. Studs and Runners: ASTM C 645 and GA-216
1. Steel Studs and Runners: Galvanized sheet steel, C-Shaped, with knurled faces, and finished in accordance with ASTM A123 G60 coating class.
a. Studs Minimum Base-Metal Thickness: 25 gauge studs in field and 20 gauge studs around openings and at corners**.**
b. Runners: 25 gauge.
c. Depth: As indicated on Drawings.
1) Studs for wall furring shall be 2 ½ inches deep.
d. Provide long-leg runners for slip joint at structure.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

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3.3 INSTALLATION OF WALL FRAMING

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types, and not greater than 16 inches o.c.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install by aligning floor and ceiling tracks. Continue framing around ducts penetrating partitions above ceiling. Unless noted otherwise, provide 25 gauge studs in field and 20 gauge studs around openings and at corners.
   1. Install floor tracks in continuous bed of sealant.
   2. Align holes in studs to facilitate installation of conduit and piping.
   3. At intersections, place studs not more than 2 inches from abutting walls. Construct corners using a minimum of two 20 gauge studs in each partition.
   4. Each stud shall be one-piece full-length from the floor tack to the ceiling track.

5. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
6. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs, and attach to, underside of overhead structure.
7. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
8. Curved Partitions and Framing:
   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.
9. Provide cross studs as blocking for fixtures and equipment anchored to the wall, and for attachment of mechanical and electrical items located within the walls. Coordinate location and type of blocking with other trades.
10. Provide bridging in accordance with manufacturer recommendations.
11. At partitions that terminate above the ceiling, provide additional bracing from the top of the partition to the structure at 4 foot o.c. max.
12. Where stud walls are located on slab-on-grade, do not connect framing to exterior walls located on independent foundations.
13. Provide compressible filler behind studs at intersections with masonry walls.

E. Wall Furring:
   1. Install furring vertically, with spacing not to exceed 16 inches o.c., attached directly to concrete or masonry.
   2. Install furring as required for fire resistance rating indicated.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

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SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum board.

B. Related Requirements:
   1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

A. Size: 4 feet wide X maximum length available.

B. All gypsum board products and accessories shall be formaldehyde-free and asbestos-free.

C. Use post-industrial and post-consumer recycled gypsum board products with the highest level of recycled content readily available.

2.2 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Georgia-Pacific Gypsum LLC.
   2. National Gypsum Company.
   3. USG Corporation.

B. Standard Gypsum Wallboard, complying with ASTM C 1396/C 1396M
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.

C. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation and through-penetration (impact resistance) than standard, regular-type and Type X gypsum board.
   1. Core: 5/8 inch.
   2. Reference drawings for locations.

D. Moisture- and Mold-Resistant Gypsum Board, complying with ASTM C 1396/C 1396M, with moisture- and mold-resistant core and paper surfaces.
   1. For use in all wet areas.
   2. Core: 5/8 inch (15.9 mm).
   3. Long Edges: Tapered.

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4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized steel.
   2. Shapes:
      a. Cornerbead.
      b. L-Bead: L-shaped; exposed long flange receives joint compound.
      c. Specialty shapes, as required.
   3. Products:
      a. Dur-a-Bead products by USG Corporation, or equivalent by:
         1) Georgia Pacific
         2) National Gypsum

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M and GA 216

B. Joint Tape:
   1. Interior Gypsum Board: Paper.
   2. Products:
      a. Sheetrock joint tape by USG Corporation, or equivalent by:
         1) Georgia Pacific
         2) National Gypsum

C. Joint Compound for Interior Gypsum Board.
   1. Lime compound, All-Purpose joint and texturing compound, containing inert fillers and natural binders.
   2. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow-releasing compounds.
   3. Products:
      a. Sheetrock brand joint compound by USG corporation, or equivalent by:
         1) Georgia Pacific
         2) National Gypsum

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840 and GA-216.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

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C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels, and break framing behind control joints.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first. Provide fasteners spaced per 2003 International Building Code requirements.

I. Tolerances: Maximum acceptable variation from flat surface is 1/16 inch per foot and 1/8 inch in 10 feet.

J. Apply sealants where indicated, and only after gypsum board has bee primed.

3.2 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in locations, as indicated.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
   4. Seal holes and cut edges in moisture-resistant gypsum board with sealant.

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3.3 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at a maximum of 30 feet o.c. Also provide control joints at points of stress at openings and potential structural movement.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. L-Bead and specialty shapes: Where partition meets dissimilar materials, and where indicated.

D. Drywall accessories: Install column collars and duct wrap where indicated.

3.4 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 4: At panel surfaces that will receive additional finish material layers.
   a. Tape, fill and sand joints, edges and corners to produce smooth surface ready to receive finish.
   b. Feather coats onto adjoining surfaces so camber is 1/32 inch maximum.
   c. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.5 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

END OF SECTION 092900

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SECTION 095113 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Section includes acoustical tiles.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

D. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

2.3 ACOUSTICAL PANELS

A. Manufacturer: Basis of Design Products: Subject to compliance with requirements, provide the following products or an Approved Equal:
1. USG; Fine Fissured, 24 inches x 48 inches, white, square edge.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.

D. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches) o.c. on all cross tees.

2.5 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. USG Interiors, Inc.; Subsidiary of USG Corporation.

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B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
   1. Structural Classification: Intermediate-duty system.
   2. Face Design: Flat, flush.
   3. Cap Material: Steel cold-rolled sheet; painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
   2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

A. Products: Per Section 079200, Joint Sealants.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

END OF SECTION 095113

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SECTION 114000 – FOODSERVICE EQUIPMENT

1. SCOPE / OVERVIEW

The Contractor is to purchase the walk in and refrigeration system as a package and have it delivered to the job site. The package includes but is not limited to, walk in COOLER/FREEZER box sized per the drawings, internal supporting steel structure, condensers, evaporator coils, doors, lighting, temperature monitoring system, etc.

The contractor will be responsible for, but not limited to, assembling the walk in panels, hanging the refrigeration coils, setting the condensers / racks, running / charging the refrigeration lines, installation of condensate pump, to make the entire walk in COOLER/FREEZER system fully functional.

Reference Responsibility Matrix at the end of this Section.

2. WALK IN FREEZER BOX

A. WALK IN FREEZER PANELS
1. Exposed and unexposed panel surfaces to be 26 gauge stucco embossed aluminum.
2. The panels shall be an NSF approved cleanable surface, UL classified or verifiable equivalent.
3. The manufacture shall submit complete specifications referencing panel thickness, R value, K value and U value.
4. Each panel shall be filled with rigid “Foamed-in-place” urethane having a thermal conductivity (K factor) of 0.133 BTU/hr./ft squared per degrees Fahrenheit/inch and an overall coefficient of heat transfer (U factor) of not more than 0.03. “R” factor shall be 31 or greater for cooler walls and ceiling and 40 or greater for freezer walls and ceiling. Insulation shall have a 97% closed cell structure. Overall thickness shall be 4” minimum.
5. The panels shall be constructed as to be self supporting or perform adequately when supported by an appropriate steel ceiling support structure. They will include an integral cam locking mechanism and weather stripping to create an air tight seal at all joints.
6. Where the panels meet the floor surface an NSF cove / angle is required, in compliance with local health department regulations.
7. The manufacturer shall submit a sample of the walk in panel 12”x 12” square and floor contact screed / floor securing system, with their bid package.

B. FREEZER FLOOR CONSTRUCTION
1. Freezer sections to set on the existing concrete / slab on grade and leveled. If the bidder has any exception to the freezer floor section setting slab on grade, they are required to immediately bring those exceptions to the attention of the owner, prior to bidding.

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2. Freezer Structured Floor Panels: 4" thick insulated floor panels with integral ramp containing non-conductive fiberglass structural imbeds, with an additional ¾" Plywood adhered to the floor skin, and 3/16" Diamond Tread plate overlay to support a "rolling load" of 4,000 lbs. per square foot.

C. COOLER FLOOR CONSTRUCTION

1. Cooler Floor Panels: Floor panels shall be placed on a concrete and leveled.
2. Reinforced Cooler Floor: ½" Plywood or ½" OSB with 16 Ga. Stainless-Steel 3/16" Aluminum Diamond Tread. These panels are designed to support a "uniformly distributed load" of 2,500 lbs. per square foot.
3. The general contractor shall be responsible for all trim or sealant required / detailed by the manufacturer at the concrete floor / walk in panel contact point.

D. FREEZER DOORS

1. The manufacturer shall provide (1) Hinged Entrance Door with heated jambs at each location.
2. Hinged Entrance Door Dimensions:
   Widths: Reference Drawings for each location.
   Heights: 84"
3. See drawings for door swing directions at each location.
4. Deadbolt Handle Latch: Security latch with sliding deadbolt and inside safety release.
5. All doors shall have a 48" high aluminum diamond tread kick plate mounted to the interior and exterior of each door.
6. Doors will include heated jambs.
7. Each door shall include a contact activated, auto reversing function.
8. Each door shall include a strip curtain to contain as much cold air as possible during loading and unloading.
9. The contractor is responsible for installation, alignment, electrical connections, etc. to make the doors operational.

E. COOLER DOORS

1 The manufacturer shall provide (1) Hinged Entrance Door at each location.
2 Hinged Entrance Door Dimensions:
   Widths: Reference Drawings for each location.
   Heights: 84"
3 See drawings for door swing directions at each location.
4 Deadbolt Handle Latch: Security latch with sliding deadbolt and inside safety release.
5 All doors shall have a 48" high aluminum diamond tread kick plate mounted to the interior and exterior of each door.
6 Each door shall include a contact activated, auto reversing function.
7 Each door shall include a strip curtain to contain as much cold air as possible during loading and unloading.
8 The contractor is responsible for installation, alignment, electrical connections, etc. to make the doors operational.

F. LIGHTING

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1. The manufacturer shall provide lighting inside the walk in to a minimum of 40 foot candles in all areas. However additional lighting may be designated or required by code.
2. The lighting fixture shall be a type allowing for its continued operation in a sub-zero degree Fahrenheit environment in the freezer sections and +35 Fahrenheit environment in the cooler sections.
3. The contractor is responsible to install, hang, support, and connection of all lighting within the walk in. Owner will provide and install electrical power required for lighting.
4. The manufacturer is responsible to supply a lighting plan which will evenly distribute the appropriate amount of light through the walk in, based on the rack arrangement as shown.

3. REFRIGERATION

A. TEMPERATURE REQUIREMENTS
1. Freezer section is required to hold a temperature of (-) 10 degrees Fahrenheit.
2. Cooler Section is required to hold a temperature of (+) 35 degrees Fahrenheit.

B. LOCATION
1. The walk in freezer shall be located in a climate controlled building, with an ambient temperature of approximately (+) 80 Fahrenheit during summer months and approximately (+) 70 degrees Fahrenheit during winter months.
2. The walk in and refrigeration system should be designed to operate in an environment of (+) 60 degrees to (+) 90 degrees Fahrenheit.
3. The building and walk in will reside at approximately 5000 ft. above sea level.

C. EVAPORATOR COILS
1. The manufacturer shall provide the evaporator coils with the appropriate cold controls, defrost controls, freezer condensate drain line heat tape, etc. It is the responsibility of the contractor to install / hang each evaporator coil as per manufacturer's recommendation.
2. The manufacturer is to locate the evaporator coils for maximum efficiency.
3. The contractor shall provide all condensate line piping, p-traps, ejector pumps, lift pumps, etc, for collection and discharge of condensate, required for a fully functional drain system.
4. Owner will install condensate drain lines from ejector/lift pumps to Owner selected discharge location (See Section 6 – Walk-In Freezer Responsibility Matrix).

D. CONDENSING UNITS
1. The manufacturer shall provide an engineered refrigeration system capable of maintaining the temperatures called out in the TEMPERATURE REQUIREMENTS section.
2. The condensers will be located on the roof above the walk-in in an exterior location.

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3 The condensers should be properly equipped with suction accumulators, site glass, filters, vibration absorbers, etc.
4. The Contractor is responsible for installing new Mechanical Equipment curbs per the drawings, and for placing condensing units on the roof in locations indicated in the drawings.
5. The Contractor is responsible for, but not limited to mounting condensers, condenser rack installation, refrigeration line runs / insulation, refrigerant charging, connection and control wire runs to condensers and evap. coils, etc, to make the walk in refrigeration system fully functional. (See Section 6 – Walk-In Freezer Responsibility Matrix).
6. The Contractor will furnish and install electrical power to the condenser location. (See Section 6 – Walk-In Freezer Responsibility Matrix).
11. The contractor will terminate all electrical connections to the freezer, evaporator, condenser, lights, etc. and power up the installation for a fully functioning system

4. GENERAL:

A. ENVIRONMENTAL COMPLIANCE
1. The walk in panels, doors and refrigeration system will comply with all current government regulations regarding energy efficiency and environmental safe guards.

B. WARRANTY
1. The walk in box and panels shall carry a (10) ten year warranty and a (1) year warranty on all other components through the manufacturer.
2. Compressors shall carry a 5 year warranty through the manufacturer.
3. Refrigeration work: Through the refrigeration contractor.

5. SPECIFICATION NOTES
1. Different manufacturers have differing locations for electrical feeds for the coils, condensers, etc. for the Walk-In units. **The contractor will coordinate with Owner for these conditions in the final construction and installation phase.**

6. WALK-IN COOLER/FREEZER RESPONSIBILITY MATRIX:

O = Owner C = Contractor

ITEM	FURNISHED BY	INSTALLED BY
SITEWORK:		
Site Preparation	O	O
WALK-IN UNITS		
Walk-In Cooler Units and All Accessories per Specifications	C	C
Condensing Units per Specifications	C	C
Condensing Units Placement on Roof as indicated	C	C
Evaporator Coils per Specifications	C	C

Condensate Pumps per Specifications	C	C
Condensate Piping per Specifications	C	C
ARCHITECTURAL:		
All Architectural Work Scope as Indicated.	C	C
Misc. Roof Demo – Fans, Curbs, etc. as Indicated.	C	C
New Mechanical Equipment Curbs and installation as indicated.	C	C
MECHANICAL:		
Removal of Existing Misc. Mechanical items as indicated	C	C
ELECTRICAL:		
Existing Ceiling Mounted Electrical Items Removal	C	C
Ceiling Mounted Electrical Items Re-Installation as indicated	C	C
Misc. Electrical as indicated	C	C
Electrical Power to Walk-In Locations as indicated	C	C
Walk-In Connection (ALL) to Owner Furnished Power	C	C
Electrical Power to Roof Mounted Condensing Units	C	C
Condenser Connection to Owner Furnished Power	C	C
Electrical Power to Condensate Pumps	C	C
Condensate Pumps Connection to Owner Furnished Power	C	C
FIRE ALARM		
Remove/Reinstall Existing Ceiling Mounted Fire Alarm Devices	C	C
Remove/Reinstall Device Wiring as indicated.	C	C
Remove/Reinstall Pull Stations / Horn-Strobes as indicated.	C	C

END OF SPECIFICATION

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SECTION 23 05 00 - BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 23 Sections. Also refer to Division 1 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 SCOPE OF WORK

A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.

B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make his portion of the Mechanical Work a finished and working system.

C. Scope of Work:
   1. Heating Work shall include, but is not necessarily limited to:
      a. Furnish and install a complete heating water system including pumps, piping, insulation, air control equipment, specialties, and connections to heating coils.
      b. Furnish and install condensate drain piping from cooling related equipment such as air handlers, heat pumps, and cooling coil drain pans.
      c. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.
   2. Air Conditioning and Ventilating Work shall include, but is not necessarily limited to:
      a. Furnish and install package rooftop air handling units complete with curbs.
      b. Furnish and install complete supply air ductwork systems including all fittings, insulation, and outlets.
      c. Furnish and install complete return air ductwork systems including all fittings, insulation, and inlets.
      d. Furnish and install complete exhaust ductwork systems including all fittings, insulation, inlets, and fans.
      e. Furnish and install mechanical room ventilation systems including louvers, ductwork, insulation, and fans.
      f. Furnish and install all temperature control systems.
      g. Furnish and install all fire dampers.
      h. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.
   3. Temperature Control Work shall include, but is not necessarily limited to:
      a. Furnish and install a complete temperature control system as specified in Section 23 09 00.

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b. Temperature control system shall consist of a full Direct Digital Control (DDC) system including all accessories, sensors, and programming.
c. Furnish automatic control valves and dampers for installation by others.
d. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.

4. Testing, Adjusting, and Balancing Work shall include, but is not necessarily limited to:
   a. Furnish complete testing, adjusting, and balancing as specified in Section 23 05 93, including, but not limited to, air systems, hydronic systems, plumbing systems, and verification of control systems.

1.3 WORK SEQUENCE

A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours will be required.

B. Schedule overtime for the following work:

C. Itemize all work and list associated hours and pay scale for each item.

1.4 ALTERNATES

A. Refer to Division 01

1.5 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

A. Definitions:
   1. "Mechanical Contractors" refers to the following:
      a. Plumbing Contractor.
      b. Heating Contractor.
      c. Air Conditioning and Ventilating Contractor.
      d. Temperature Control Contractor.
      e. Fire Protection Contractor.
      f. Testing, Adjusting, and Balancing Contractor.
   2. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case the devices are usually single phase and are usually connected to the motor power wiring through a manual motor starter having "Manual-Off-Auto" provisions.
   3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
   4. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. Generally, where the motor power wiring exceeds 120 volts, a control transformer is used to give a control voltage of 120 volts.

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5. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring which directly powers or controls a motor used to drive equipment such as fans, pumps, etc.
    a. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt) in which case a control transformer shall be furnished as part of the temperature control wiring.
6. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
7. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. General:
1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete electrical power/controls wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
4. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements, California Code of Regulation Title 24, Article E725.
5. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:
    a. Light fixtures.
    b. Gravity flow piping, including condensate.
    c. Electrical busduct.
    d. Sheet metal.
    e. Electrical cable trays, including access space.
    f. Sprinkler piping and other piping.

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g. Electrical conduits and wireway.

C. Mechanical Contractor's Responsibility:
1. Assumes responsibility for internal wiring of all equipment provided by the Mechanical Contractor, for example:
a. Pumps.
b. Heat Pumps
c. Burners.
d. Air Conditioning Units.
e. Condensing Units.
f. Makeup Air Units.
g. Electric Humidifiers.
h. Gas Trains.
i. Package Air Handling Units.
j. Packaged Rooftop Units.
2. Assumes all responsibility for the Temperature Control wiring, when the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
3. Temperature Control Contractor's Responsibility:
a. Wiring of all devices needed to make the Temperature Control System functional.
b. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Subcontractor OR Contractor.
c. Coordinating equipment locations (such as relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.
4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

D. Electrical Contractor's Responsibility:
1. Provides all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor on the Mechanical Drawings or Specifications.
2. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Subcontractor Contractor when so noted on the Electrical Drawings.
3. Provides motor control and temperature control wiring, where so noted on the drawings.
4. Coordinate with the Mechanical Contractor for size of motors and/or other electrical devices involved with repair or replacement of existing equipment.
5. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain fans upon actuation of the Fire Alarm System as indicated and specified in Division 28.
6. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.6 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

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1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:
1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:
1. Conform to all requirements of the Town of Wellington State of Colorado Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all published standards of Poudre School District .
3. Conform to all State Codes.
4. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
5. If the Contractor notes, at the time of bidding, any parts of the drawings or specifications that do not comply with the codes or regulations, he shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, he shall submit with his proposal a separate price to make the system comply with the codes and regulations.
6. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
7. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
8. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:
1. Procure all applicable permits and licenses.
2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.

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7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriters' Laboratories, Inc. and approved by FM Global.

E. Utility Company Requirements:
1. Secure from the appropriate private or public utility company all applicable requirements.
2. Comply with all utility company requirements.
3. Make application for and pay for service connections, such as gas.
4. Make application for and pay for all meters and metering systems required by the utility company.

F. Examination of Drawings:
1. The drawings for the mechanical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.
   a. Any item listed as furnished shall also be installed, unless otherwise noted.
9. Any item listed as installed shall also be furnished, unless otherwise noted.

G. Field Measurements:
1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

H. Electronic Media/Files:
1. Construction drawings for this project have been prepared utilizing AutoCAD MEP Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.

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5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

1.7 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

Referenced Specification Section	Submittal Item
23 05 15	Variable Frequency Drives
23 05 16	Expansion Compensation
23 05 29	Hangers and Supports
23 05 48	Vibration Isolation Equipment
23 05 53	HVAC Identification
23 05 93	Testing, Adjusting, and Balancing
23 07 13	Duct Insulation
23 07 16	HVAC Equipment Insulation
23 07 19	HVAC Pipe Insulation
23 09 00	Controls
23 09 13	Instrumentation
23 21 00	Hydronic Piping Systems and Valves
23 23 00	Refrigeration Piping and Specialties
23 25 00	Chemical Treatment Systems
23 31 00	Ductwork
23 31 00	Ductwork Layout Drawings
23 31 00	Duct Specialties (such as Turning Vanes)
23 33 00	Duct Silencers
23 33 00	Fire Dampers
23 33 00	Smoke Dampers
23 33 00	Combination Fire Smoke Dampers
23 34 23	Power Ventilators
23 37 00	Grilles, Registers , and Diffusers
23 37 00	Louvers
23 74 11	Rooftop Air Conditioning Units

B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:
   a. Date

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b. Project title and number
c. Contractor's name and address
d. Division of work (e.g., plumbing, heating, ventilating, etc.)
e. Description of items submitted and relevant specification number
f. Notations of deviations from the contract documents
g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:
   a. Date
   b. Project title and number
   c. Architect/Engineer
   d. Contractor and subcontractors' names and addresses
   e. Supplier and manufacturer's names and addresses
   f. Division of work (e.g., plumbing, heating, ventilating, etc.)
   g. Description of item submitted (using project nomenclature) and relevant specification number
   h. Notations of deviations from the contract documents
   i. Other pertinent data
   j. Provide space for Contractor's review stamps
3. Composition:
   a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
   b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
   c. All sets shall contain an index of the items enclosed with a general topic description on the cover.
4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; electrical power criteria (e.g., voltage, phase, amps, horsepower, kW, etc.) wiring and control diagrams; Short Circuit Current Rating (SCCR); dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:
   a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
   b. Unstamped submittals will be rejected.
   c. The Contractor's review shall include, but not be limited to, verification of the following:
      1) Only approved manufacturers are used.
      2) Addenda items have been incorporated.
      3) Catalog numbers and options match those specified.
      4) Performance data matches that specified.
      5) Electrical characteristics and loads match those specified.
      6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
      7) Dimensions and service clearances are suitable for the intended location.

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8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:
   a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
   b. The Contractor shall clearly indicate the size, finish, material, etc.
   c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
   d. All marks and identifications on the submittals shall be unambiguous.
7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.

C. Electronic Submittal Procedures:
1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
   a. Submittal file name: 23 XX XX.description.YYYYMMDD
   b. Transmittal file name: 23 XX XX.description.YYYYMMDD

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5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files shall be transmitted via a pre-approved method.

1.9 SCHEDULE OF VALUES

D. The requirements herein are in addition to the provisions of Division 1.

E. Format:
1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

F. Preparation:
1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:
   a. Material: Delivered cost of product with taxes paid.
   b. Labor: Labor cost, excluding overhead and profit.

G. Update Schedule of Values when:
1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.8 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders with inadequate breakdown will be rejected.

B. Change order work shall not proceed until authorized.

1.9 EQUIPMENT SUPPLIERS' INSPECTION

A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:
1. Air Cooled Condensers
2. Base Mounted Pumps
3. Condensing Units
4. Fire Seal Systems

B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.

C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

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1.10 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.

B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate his/her work with other trades.

1.11 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.12 WARRANTY

A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.

B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.13 INSURANCE

A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

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1.14 CONTINGENCY

A. The Mechanical Contractors shall include in the Base Bid a contingency of one percent (1%) to be used only by change orders issued by the Architect/Engineer. The unused portion of the contingency shall be deducted from the Contract price before final payment is made.

1.15 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis for job design and establishes the quality required.

B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications, and fits in the allocated space.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.

D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on his part or on the part of other Contractors whose work is affected.

E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.

F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

1.16 PROJECT COMMISSIONING

A. The Contractor shall work with the Commissioning Agent (CxA) as described in Section 01 91 00 and 23 08 00, and provide all services as described in the Commissioning Plan.

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PART 2 - PRODUCTS

2.1 NOT APPLICABLE

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or his or her employee and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and his or her personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:
   1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found at the following website (https://call811.com/) or by calling 811.
   2. The Contractor shall do all excavating, filling, backfilling and compacting associated with his/her work.

B. Excavation:
   1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
   2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
   3. Trim bottom and sides of excavations to grades required for foundations.
   4. Protect excavations against frost and freezing.
   5. Take care in excavating not to damage surrounding structures, equipment, or buried pipe. Do not undermine footing or foundation.
   6. Perform all trenching in a manner to prevent cave-ins and risk to workers.
   7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.

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8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.

C. Dewatering:
1. Contractor shall furnish, install, operate, and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:
1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:
1. No rubbish or waste material is permitted for fill or backfill.
2. Provide all necessary sand and/or CA6 for backfilling.
3. Dispose of the excess excavated earth as directed.
4. Backfill materials shall be suitable for required compaction, clean and free of perishable materials and stones greater than 4 inches in diameter. Water shall not be permitted to rise in unbackfilled trenches. No material shall be used for backfilling that contains frozen earth, debris, or earth with a high void content.
5. Backfill all trenches and excavations immediately after installing pipes or removal of forms, unless other protection is provided.
6. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.
7. Lay all piping on a compacted bed of CA6 at least 3 inches deep. Backfill around pipes with CA6, 6 inch150 mm layers, and compact each layer.
8. Use sand or CA6 for backfill up to grade for all piping under slabs or paved areas. All other piping shall have sand or CA6 backfill to 6 inches150 mm above the top of the pipe.
9. Place all backfill above the sand/CA6 in uniform layers not exceeding 6 inches deep. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
10. Where the fill and backfill will ultimately be under a building, floor or paving, each layer of fill shall be compacted to 95% of the maximum density determined by AASHTO Designation T-99 or ASTM Designation D-698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T-99 or ASTM D-698 test.

F. Surface Restoration:
1. Where trenches are cut through graded, planted, or landscaped areas, the areas shall be restored to the original condition. Replace all planting removed or damaged to its original condition. A minimum of 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded.
2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition.

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3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:
   1. Placing fill over underground and underslab utilities.
   2. Covering exterior walls, interior partitions and chases.
   3. Installing hard or suspended ceilings and soffits.

B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

C. Above-Ceiling Final Observation
   1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:
      a. Pipe insulation is installed and fully sealed.
      b. Pipe and duct wall penetrations are sealed.
      c. Pipe identification and valve tags are installed.
      d. Main, branch and flexible ducts are installed.
      e. Diffusers, registers and grilles are installed and connected to ductwork.
      f. Terminal air box reheat coil piping or wiring is complete.
      g. Terminal air box control wiring is complete and all control boxes are closed.
   2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
   3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.4 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 1.

B. IDPH Final Occupancy Checklist for Request of Inspection:
   1. Each Contractor must submit all forms and certifications required by IDPH relating to their work at 85% completion of the project or when directed by the Owner/Architect/Engineer.

C. Final Jobsite Observation:
   1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
   2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
   3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.

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4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

D. Before final payment is authorized, this Contractor must submit the following:
1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up or reproducible drawings and specifications.
3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
4. Inspection by State Boiler Inspector.
5. Start-up reports on all equipment requiring a factory installation inspection or start-up.
6. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed; receipt by Architect/Engineer required prior to final payment approval.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:
1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:
1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
   a. O&M file name: O&M.div23.contractor.YYYYMMDD
   b. Transmittal file name: O&Mtransmittal.div23.contractor.YYYYMMDD
5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files shall be divided into files that are clearly labeled as "1 of 2", "2 of 2", etc.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.

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8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. D. Operation and Maintenance Instructions shall include:
1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Refer to Section 23 09 00 for additional requirements for Temperature Control submittals.
5. Copy of final approved test and balance reports.
6. Copies of all factory inspections and/or equipment startup reports.
7. Copies of warranties.
8. Schematic electrical power/controls wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
9. Dimensional drawings of equipment.
10. Capacities and utility consumption of equipment.
11. Detailed parts lists with lists of suppliers.
12. Operating procedures for each system.
13. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
14. Repair procedures for major components.
15. List of lubricants in all equipment and recommended frequency of lubrication.
16. Instruction books, cards, and manuals furnished with the equipment.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVES

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of all systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

D. The instructions shall include:
1. Explanation of all system flow diagrams.
2. Explanation of all air handling systems.
3. Temperature control system operation including calibration, adjustment and proper operating conditions of all sensors.
4. Maintenance of equipment.
5. Smoke control systems.

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6. Stairwell pressurization systems.
7. Start-up procedures for all major equipment.
8. Explanation of seasonal system changes.
9. Description of emergency system operation.

E. The Architect/Engineer shall be notified of the time and place instructions will be given to the Owner's representatives so he or his representative can attend if desired.

F. Minimum hours of instruction for each item shall be:
1. Heating Water System - ___4__ hours.
2. Chemical Treatment System - As defined in Section 23 25 00.
3. Air Handling System(s) - ___4__ hours.
4. Temperature Controls - As defined in Section 23 09 00.

G. The Contractor shall prepare a detailed, written training agenda and submit it to the Architect/Engineer a minimum of two or four weeks prior to the formal training for approval. The written agenda shall include specific training points within the items described above. For example: how to adjust setpoints, troubleshooting, proper start-up, proper shut-down, seasonal changes, draining, venting, changing filters, changing belts, etc. Failure to provide and follow an approved training agenda may result in additional training required at the expense of the Contractor.

H. Operating Instructions:
1. Contractor is responsible for all instructions to the Owner's representatives for the mechanical and control systems.
2. If the Contractor does not have staff that can adequately provide the required instructions he shall include in his bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 SYSTEM STARTING AND ADJUSTING

A. The mechanical systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final comfort adjustments as required.

B. Complete all manufacturer-recommended startup procedures and checklists to verify proper motor rotation, electrical power voltage is within equipment limitations, equipment controls maintain pressures and temperatures within acceptable ranges, all filters and protective guards are in-place, acceptable access is provided for maintenance and servicing, and equipment operation does not pose a danger to personnel or property.

C. Operate all HVAC systems continuously for at least one week prior to occupancy to bring construction materials to suitable moisture levels. Areas with mechanical cooling shall be maintained below 60% RH.

D. Contractor shall adjust the mechanical systems and controls at season changes during the one year warranty period, as required, to provide satisfactory operation and to prove performance of all systems in all seasons.

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E. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.

F. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

A. The following paragraph supplements Division 1 requirements:
   1. Contractor shall maintain at the job site a separate and complete set of mechanical drawings and specifications on which he shall clearly and permanently mark in complete detail all changes made to the mechanical systems.

B. Mark drawings to indicate revisions to piping and ductwork, size and location, both exterior and interior; including locations of coils, dampers, other control devices, filters, and other units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (e.g., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.

C. Refer to Section 23 09 00 for additional requirements for Temperature Control documents.

D. Before completion of the project, a set of reproducible mechanical drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.

E. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.

F. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

G. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.9 PAINTING

A. This Contractor shall paint the following items:

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B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.

C. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, he shall have the equipment and all its supports, hangers, etc., painted to match the room decor.

D. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.

E. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer his color preference and furnish this color.

F. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.

G. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.

H. Paint all outdoor exposed natural gas propane piping the color selected by Owner or Architect/Engineer.

I. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:
   1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
   2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic latex paint.
   3. Color of paint shall be by Architect

3.10 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.

B. Clean all drain pans and areas where moisture is present. Immediately report any mold, biological growth, or water damage.

C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.11 SPECIAL REQUIREMENTS

A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.

B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

D. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:
   1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
   2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.

3.12 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:
   1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:
      a. Minimizing the amount of dust generated.
      b. Reducing solvent fumes and VOC emissions.
      c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
      d. Protect stored on-site and installed absorptive materials from moisture damage.

END OF SECTION

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SECTION 23 05 13 - MOTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single Phase and Three Phase Electric Motors.

1.2 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. ANSI/IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.

E. ANSI/NEMA MG 1 - Motors and Generators.

F. ANSI/NFPA 70 - National Electrical Code.

G. Energy Independence and Security Act of 2007.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00. Include nominal efficiency and power factor for all premium efficiency motors. Efficiencies must meet or exceed the nominal energy efficiency levels presented below.

B. Submit shop drawings for all three phase motors.

C. Submit motor data with equipment when motor is installed by the manufacturer at the factory.

D. Submit shaft grounding device for all motors as required.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof coverings. For extended outdoor storage, follow manufacturer's recommendations for equipment and motor.

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1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data including assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of commercial and industrial motors and accessories, with a minimum of three years documented manufacturing experience.

PART 2 - PRODUCTS

2.1 MOTORS - GENERAL CONSTRUCTION AND REQUIREMENTS

A. Refer to the drawings for required electrical characteristics. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. Design motors for continuous operation in 40ºC environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

C. Explosion-Proof Motors: UL listed and labeled for the hazard classification shown on the drawing, with over-temperature protection.

D. Visible Nameplate: Indicating horsepower, voltage, phase, hertz, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, insulation class.

E. Electrical Connection: Boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.

F. Unless otherwise indicated, motors 3/4 HP and smaller shall be single phase, 60 hertz, open drip-proof or totally enclosed fan-cooled type.

G. Unless otherwise indicated, motors 1 HP and larger shall be three phase, 60 hertz, squirrel cage type, NEMA Design Code B (low current in-rush, normal starting torque), open drip-proof or totally enclosed fan-cooled type.

H. Each contractor shall set all motors furnished by him.

I. All motors shall have a minimum service factor of 1.15.

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J. All motors shall have ball or roller bearings with a minimum L-10 fatigue life of 150,000 hours in direct-coupled applications and 50,000 hours for belted applications. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG1-14.43.

K. Bearings shall be sealed type for 10 HP and smaller motors. Bearings shall be regreasable type for larger motors.

L. Aluminum end housings are not permitted on motors 15 HP or larger.

M. Provide all belted motors with a means of moving and securing the motor to tighten belts. Motors over 2 HP shall have screw type tension adjustment. Motors over 40 HP29 shall have dual screw adjusters. Slide bases shall conform to NEMA standards.

N. For all motors, devices to protect the motor against loss of phase (single phasing protection) shall be provided. Devices to meet this requirement shall be of the overload or as a separate device. Units shall have manual reset and adjustable limits. current sensing type, and may be provided either as an integral part of the thermal Provide an approved reduced voltage starter, such as a closed transition autotransformer type.

O. Ball bearings with lube lines extended to accessible location.

P. All motor wiring and windings shall be copper.

Q. Energy Efficiency:
1. Electric motors less than 1 hp and greater than/equal to 0.5 hp shall be specified as Electronically Commutated Motor (ECM) type.
2. Electric motors 1 hp and greater shall be of the premium efficiency type as defined by the Consortium for Energy Efficiency (CEE). Motors shall have a nominal nameplate efficiency that meets or exceeds the values in Table 1. Those motors that exceed the efficiency requirements listed in Table 1 by at least one numeric percent qualify as an "Enhanced" Premium efficient electric motor under the Xcel Energy Rebate program.

R. Single Phase Motors: Furnish for all applications 1/6 through 3/4 HP, single phase, capacitor start, capacitor run, drip-proof, thermally protected motors, for 120 volt 60 hertz current.

S. Three-Phase Motors: Furnish for all applications 1 HP and larger, 3-phase general purpose, drip-proof, squirrel cage induction motors, for 208V, 60Hz current.

T. Motors used with adjustable speed drives to be inverter duty and compatible with the drive.

U. Motors to be sized for an operating load factor between 60% and 75%.

V. For 208 volt three-phase power, 200 volt motors are to be used. 208-230 volt motors are not acceptable for 208 volt power.

W. V-Belt Drives:
1. i. Capacity of V-Belt Drives at rated RPM shall be not less than 150% of motor nameplate horsepower rating.

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2.2 PREMIUM EFFICIENCY MOTORS (INCLUDING MOST 3-PHASE GENERAL PURPOSE MOTORS)

A. All motors, unless exempted by EPAct legislation that became federal law on December 19, 2010, shall comply with the efficiencies listed in that standard, which are reprinted below. These match the 2010 NEMA premium efficiency ratings. All ratings listed are nominal full load efficiencies, verified in accordance with IEEE Standard 112, Test Method B. Average expected (not guaranteed minimum) power factors shall also be at least the following:

Full-Load Efficiencies %

HP kW	Open Drip-Proof			Totally Enclosed Fan Cooled		
	1200 rpm	1800 rpm	3600 rpm	1200 rpm	1800 rpm	3600 rpm
0.75	82.5	85.5	77.0	82.5	85.5	77.0
1.5 1.1	86.5	86.5	84.0	87.5	86.5	84.0
1.5	87.5	86.5	85.5	88.5	86.5	85.5
2.2	88.5	89.5	85.5	89.5	89.5	86.5
4.0	89.5	89.5	86.5	89.5	89.5	88.5
7.5 5.5	90.2	91.0	88.5	91.0	91.7	89.5
10.0 7.5	91.7	91.7	89.5	91.0	91.7	90.2
15.0 11.0	91.7	93.0	90.2	91.7	92.4	91.0
20.0 15.0	92.4	93.0	91.0	91.7	93.0	91.0
25.0 18.5	93.0	93.6	91.7	93.0	93.6	91.7
30.0 22.0	93.6	94.1	91.7	93.0	93.6	91.7
40.0 30.0	94.1	94.1	92.4	94.1	94.1	92.4
50.0 37.0	94.1	94.5	93.0	94.1	94.5	93.0

B. Motor nameplate shall be noted with the above ratings.

2.3 MOTORS ON VARIABLE FREQUENCY DRIVES

A. All motors driven by VFDs shall be premium efficiency type.

B. Motors shall be designed for use with VFDs in variable torque applications with 1.15 service factor. Motors shall not be equipped with auxiliary blowers.

C. Motors driven by VFDs shall have Class F or H insulation and be designated by the motor manufacturer to be suitable for inverter duty service in accordance with NEMA MG 1 Section IV, "Performance Standards Applying to All Machines," Part 31 "Definite-Purpose Inverter-Fed Polyphase Motors.

D. All 480-volt motors controlled by VFDs shall be equipped with an alternate discharge path, such as a shaft grounding ring or grounding brush, to divert adverse shaft currents from the motor bearings on the drive end of the motor shaft. Motor shafts 2" and larger require shaft grounding on the drive end and the non-drive end. This Contractor shall ensure (via field observation and measurement) that the shaft is effectively grounded upon startup.

1. Providing grounding rings internal to the motor housing is an acceptable solution, provided the motor is affixed with a label clearly indicating the presence of a grounding assembly. The grounding ring shall be listed for 40,000 hours of motor service and shall be accessible via the drive endplate.

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2.4 MOTORS FOR WET OR CORROSIVE DUTY

A. Where noted for wet and/or corrosive duty, motors shall be designed for severe duty with cast-iron frame, epoxy finish, stainless steel nameplate, polymer shaft seal, corrosion resistant fasteners and fan, moisture resistant windings, and non-wicking leads.

2.5 MOTORS FOR HAZARDOUS DUTY

A. Where noted for hazardous duty, motors shall be designed for the class, group, and T code listed for the application. Frame sizes 143T and larger shall have normally closed winding thermostats to keep surface temperatures below the nameplate T code under all conditions.

2.6 MOTOR DRIVEN EQUIPMENT

A. No equipment shall be selected or operate above 90% of its motor nameplate rating. Motor size may not be increased to compensate for equipment with efficiency lower than that specified.

B. If a larger motor than specified is required on equipment, the contractor supplying the equipment is responsible for all additional costs due to larger starters, wiring, etc.

2.7 SHEAVES

A. All sheaves shall conform to NEMA Standard MG1-14.42, which lists minimum diameters and maximum overhangs. Locate motors to minimize overhang.

B. When replacing sheaves, use sheaves of at least the originally supplied sizes.

C. Contractor responsible for motor shall also be responsible for replacement sheaves. Coordinate with testing and balancing of the equipment.

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PART 3 - EXECUTION

3.1 INSTALLATION

A. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

B. For flexible coupled drive motors, mount coupling to the shafts in accordance with the coupling manufacturer's recommendations. Align shafts to manufacturer's requirements or within 0.002 inch per inch diameter of coupling hub.

C. For belt drive motors, mount sheaves on the appropriate shafts per manufacturer's instructions. Use a straight edge to check alignment of the sheaves. Reposition sheaves as necessary so the straight edge contacts both sheave faces squarely. After sheaves are aligned, loosen the adjustable motor base so the belt(s) can be added, and tighten the base so the belt tension is in accordance with the drive manufacturer's recommendations. Frequently check belt tension and adjust if necessary during the first day of operation and again after 80 hours of operation.

END OF SECTION

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SECTION 23 05 15 - VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Variable frequency controllers.

1.2 RELATED REQUIREMENTS

A. Section 23 05 13 - Motors: for shaft grounding rings to be used for VFD driven equipment.

B. Section 26 28 13 - Fuses.

1.3 DESCRIPTION

A. This specification is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B or better induction motor.

B. The drive manufacturer shall supply the drive and all necessary options as herein specified. VFDs that are manufactured by a third party and "brand labeled" shall not be acceptable.

C. All VFDs installed on this project shall be from the same manufacturer.

1.4 DEFINITIONS

A. VFC: Variable Frequency motor Controller. Use interchangeably with VFD.

B. VFD: Variable Frequency motor Drive. Used interchangeably with VFC.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 23 02 00 Basic HVAC Requirements, for submittal procedures.

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

C. Shop Drawings: Indicate front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.

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1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: UL listed, classified, and labeled as suitable for the purpose intended.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.

1.8 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements

B. The VFD Product Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, labor, travel time and expenses.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB
2. Yaskawa Electric America, Inc.

2.2 DESCRIPTION

A. Variable Frequency Controllers: Enclosed controllers suitable for operating the indicated loads, in conformance with requirements of NEMA ICS 7. Select unspecified features and options in accordance with NEMA ICS 3.1.
1. Employ microprocessor-based inverter logic isolated from power circuits.
2. Employ pulse-width-modulated inverter system.
3. Design for ability to operate controller with motor disconnected from output.
4. Design to attempt five automatic restarts following fault condition before locking out and requiring manual restart.

B. Enclosures: NEMA 250, Type 1, suitable for equipment application in places regularly open to the public.

2.3 OPERATING REQUIREMENTS

A. Rated Input and Motor Nameplate Voltage shall be as required for the driven piece of equipment.

B. Displacement Power Factor: Between 1.0 and 0.95, lagging, over entire range of operating speed and load.

C. Operating Ambient: 0 degrees C to 40 degrees C.

D. The input current rating of the VFD shall be no more than 3% greater than the output current rating. VFD's with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.120.

E. Enclosure shall be UL rated and shall be UL listed as a plenum rated VFD.

F. Volts Per Hertz Adjustment: Plus or minus 10 percent.

G. Current Limit Adjustment: 60 to 110 percent of rated.

H. Acceleration Rate Adjustment: 0.5 to 30 seconds.

I. Deceleration Rate Adjustment: 1 to 30 seconds.

J. Input Signal: 4 to 20 mA DC.

2.4 COMPONENTS

A. Display: Provide integral digital display to indicate output voltage, output frequency, and output current.

B. Status Indicators: Separate indicators for overcurrent, overvoltage, ground fault, overtemperature, and input power ON.

C. Furnish HAND-OFF-AUTOMATIC selector switch and manual speed control.

D. Include undervoltage release, input phase loss, output device over temperature, loss of analog input, panel loss, external fault, motor thermal protection, stall, under load, motor phase loss and ground fault.

E. Include run permissive circuitry.

F. The VFD shall provide a programmable loss-of-load (broken belt / broken coupling).

G. The VFD shall have internal 5% impedance reactors to reduce the harmonics to the power line and to add protection from AC line transients, no exceptions.

H. Control Power Source: Integral control transformer.

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I. Door Interlocks: Furnish mechanical means to prevent opening of equipment with power connected, or to disconnect power if door is opened; include means for defeating interlock by qualified persons.

J. Safety Interlocks: Furnish terminals for remote contact to inhibit starting under both manual and automatic mode.

K. Control Interlocks: Furnish terminals for remote contact to allow starting in automatic mode.

L. Control Communication: The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus and BACnet MS/TP. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet.)

M. Disconnecting Means: Include integral fused disconnect switch on the line side of each controller.

N. Wiring Terminations: Match conductor materials and sizes indicated.

2.5 SOURCE QUALITY CONTROL

A. Shop inspect and perform standard productions tests for each controller.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surface is suitable for controller installation.

B. Do not install controller until building environment can be maintained within the service conditions required by the manufacturer.

C. Coordinate layout and installation of VFDs with other construction including conduit, piping, equipment, and adjacent surfaces.

3.2 INSTALLATION

A. Install in accordance with NEMA ICS 7.1 and manufacturer's instructions.

B. Wall-Mounting Controllers: Install VFDs on walls with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor unless otherwise indicated, and by bolting units to lightweight structural-steel channels bolted to wall ensuring air flow to the back of the VFD. For controllers not on walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."

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C. Roof-Mounting Controllers: Install VFD on roofs with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.
   1. Curbs and roof penetrations are specified in Division 07 Section "Roof Accessories."
   2. Structural-steel channels are specified in Division 26 Section "Hangers and Supports for Electrical Systems."

D. Tighten accessible connections and mechanical fasteners after placing controller.

E. Provide fuses in fusible switches; refer to Section 26 28 13 for product requirements.

F. Select and install overload heater elements in motor controllers to match installed motor characteristics.

G. Identify variable frequency controllers.

H. Install shaft grounding rings complying with Division 23 Section "Common Motors Requirements for HVAC Equipment" on all VFD driven motors.

I. Where the VFD is located remote from the driven piece of equipment a control interlock shall be routed from the VFD to any service disconnects located at the driven piece of equipment. Upon operation of disconnect the VFD shall be shut-down.

3.3 FIELD QUALITY CONTROL

A. Provide the service of the manufacturer's field representative to prepare and start controllers.

B. Perform field inspection and testing in accordance with Section 01 40 00.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.17.

3.4 ADJUSTING

A. Make final adjustments to installed controller to assure proper operation of load system. Obtain performance requirements from installer of driven loads.

3.5 CLOSEOUT ACTIVITIES

A. Engage a factory-authorized service representative to demonstrate operation of controllers in automatic and manual modes.

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3.6 MAINTENANCE

A. Provide service and maintenance of controllers for one year from Date of Substantial Completion.

END OF SECTION

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SECTION 23 05 29 - HVAC SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hangers, Supports, and Associated Anchors.

B. Equipment Bases and Supports.

C. Sleeves and Seals.

D. Flashing and Sealing of Equipment and Pipe Stacks.

E. Cutting of Openings.

F. Escutcheon Plates and Trim.

1.2 REFERENCES

A. ANSI/ASME B31.1 - Power Piping.

B. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

C. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

D. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

E. MSS SP-127 - Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00. Include plastic pipe manufacturers' support spacing requirements.

1.4 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
   1. Pipe Hangers and Supports:
      a. B-Line Systems Inc.
      b. Carpenter and Patterson, Inc.
      c. Fee & Mason Mfg. Co.; Div. Figgie International
      d. Grinnell Corp.
      e. PHD Manufacturing, Inc.
      f. Elcen Metal Products Company
      g. Michigan Hanger Company
      h. ITT Grinnell Corp.
      i. Unistrut Metal Framing Systems
      j. Hubbard Enterprises (Supports for domestic water piping)
      k. Specialty Products Co. (Supports for domestic water piping)
   2. Saddles and Shield:
      a. Grinnell Corp.
      b. Pipe Shields, Inc.
      c. Insulation Pipe Supports Manufacturing
      d. Insulated Saddle Shield Insert Product Inc.
      e. Michigan Hanger Company
      f. Future Market Industries, Inc.
      g. Component Products Co.
      h. Value Engineered Products, Inc.
   3. Roof Equipment Supports:
      a. Custom Curb, Inc.
      b. Pate Co.
      c. Thycurb Div.; Thybar Corp.

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2.2 PRODUCTS

A. General
   1. Provide pipe hangers, supports, anchors, and guides as specified herein, conforming to manufacturer's standardization society specification SP-69. Locate at changes in direction and at concentrated loads. Hanger design shall permit vertical adjustment and lateral movement to allow pipe expansion. Double nut hangers where piping is subject to water hammer, i.e. near flush valves and solenoid valves. All insulated pipe will have insulation inserts with shield at all hanger locations.
   2. Bear hot piping directly on insulation shields and cold piping on insulation, shielded as described under article for insulation. All insulated pipe will have insulation inserts with shield at all hanger locations.
   3. Provide pipe hangers of ample diameter for cold piping insulation and vapor barrier jacket.
   4. Use carbon steel adjustable hangers as follows:
      a. Steel / cast iron, 2-1/2" and larger. *PSD*, Grinnell Fig. 260, Fee and Mason Fig. 239, Elcen Fig. 12.

b. Steel, plastic and cast iron, 2" and smaller. *PSD*, Grinnell Fig. 69, Fee and Mason Fig. 400, Elcen Fig. 202.
c. Copper pipe 2" and smaller. *PSD*, Grinnell Fig. CT-69, Fee and Mason Fig. 389, Elcen Fig. 389.

5. Three or more pipes may be supported on trapeze hangers. Isolate copper pipe from bearing on the cross member with an electrically insulating material.
   a. Trapeze hangers shall be "Unistrut" or equal, double channel with drop rods. Where pipes are to be supported on trapeze hanger, provide "Unistrut" or equal speed clamps. Isolate copper pipe from cross member as specified above. Clamps may be placed over insulation.
   b. All insulated piping supported by a trapeze hanger to have 360 degree insulation inserts and clamped with Unistrut type pipe clamps.
6. Support horizontal steel piping per SP-69 or as follows, whichever is more stringent:

Pipe Size	Rode Diameter	Maximum Spacing
Up to 1-1/4"	3/8"	8 ft.
1-1/2" to 3-1/2"	1/2"	8 ft.
4" & 5"	5/8"	12 ft.
6"	3/4"	12 ft.

7. Support horizontal copper piping per SP-69 or as follows, whichever is more stringent:

Nom. Tubing Size	Rod Diameter	Maximum Spacing
Up to 1-1/2"	3/8"	6 ft.
2" to 2-1/2"	3/8"	8 ft.
3"	1/2"	9 ft.

8. Support horizontal hub and spigot pipe at every hub, 10 ft. max. spacing.
9. Support horizontal hubless cast iron pipe at every joint and at each horizontal branch connection. Sway brace to prevent shear.
10. Support plastic every 4 feet.
11. Support vertical piping as follows:
    a. Steel: Every other floor.
    b. Cast Iron and Copper: Every floor, 10 ft. max. intervals.
    c. Plastic: Every floor plus 5' spacing between floors.
12. In existing concrete frame structures, support pipe hangers from the sides only of beams or joists using austempered ramset fasteners or Phillips red head concrete anchors. Follow manufacturer's load recommendations.
13. In reinforced concrete structures, support pipe hangers and ducts from concrete inserts as follows:
    a. Loads to 400 pounds light weight concrete inserts, Grinnell Fig. 285, Elcen Fig. 86, Fee and Mason Fig. 186.
    b. Loads 400 to 1430 pounds: Universal concrete insert, Grinnell Fig. 282, Elcen Fig. 64, Fee and Mason Fig. 2570.
    c. Set inserts in concrete forms obtain approval of their locations in ample time to permit pouring of concrete as scheduled; provide reinforcing rods for pipe sizes over 3" and for duct sizes as directed. iv. In areas where concrete slab will form finished ceiling, take care to have inserts finish flush with concrete slab surface and to make neat appearance.
14. In steel framed structures, support pipe hangers from beam clamps, attachments and brackets bolted to steel joists or beams. Use steel washer plates for pipe supported from steel joists, Grinnell Fig. 60, Elcen Fig. 84, Fee and Mason Fig. 91. Hang near joist panel point, where possible. Bolting to steel deck is prohibited. Hang pipes over 5" diameter from more than 1 joist. Absolutely no piping shall be supported directly on the roof joists.
15. Hanging from one pipe to another is prohibited.

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16. Anchor pipe with steel collars or saddles fitted with lugs and bolts, Keflex BA or Adsco. Install anchor braces and turnbuckles as required for stability. Attachment in a manner injurious to the structure is prohibited.

B. Pipe Hangers & Supports
1. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58.
   a. Components shall have galvanized coatings where installed for piping and equipment that will not have field-applied finish.
   b. Pipe attachments shall have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
2. Adjustable Clevis Hanger: MSS Type 1.
   a. Steel Pipe, size 3/8" thru 12", Grinnell fig. 260.
   b. Copper Pipe, size 1/2" thru 4", Grinnell fig. CT-65.
   c. Cast Iron Pipe, size 4" thru 24", Grinnell fig. 590.
3. Adjustable Swivel Ring: MSS Type 10.
   a. Steel Pipe, size 1/2" thru 2", Grinnell fig. 69; size 2-1/2" thru 8", Grinnell figs. 69 or 70.
4. Copper Pipe, size 1/2" thru 4", Grinnell fig. CT-69.
5. Pipe Clamps: MSS Type 8.
   a. Steel Pipe, size 3/4" thru 20", Grinnell fig. 261.
   b. Copper Pipe, size 1/2" thru 4", Grinnell fig. CT-121.
6. U Bolts: MSS Type 24.
   a. Steel Pipe, size 1/2" thru 36", Grinnell fig. 137.
   b. Copper Pipe, size 1/2" thru 8", Grinnell fig. 137C.
7. Straps: MSS Type 26.
   a. i. Steel Pipe, size 1/2" thru 4", Grinnell fig. 262.
8. Pipe Stanchion Saddle: MSS Type 37.
   a. i. Steel Pipe, size 4" thru 12", Grinnell fig. 259.
9. Yoke & Roller Hanger: MSS Type 43
   a. i. 2-1/2" thru 20", Grinnell fig. 181.
10. Hanger Rods: Continuous threaded steel.
    a. Hangers:
       1) Hot Pipes:
          a) 1/2" through 1-1/2": Adjustable wrought steel ring.
          b) 2" through 5": Adjustable wrought steel clevis.
          c) 6" and Over: Adjustable steel yoke and cast iron roll. ii. Cold Pipes:
       2) 1/2" through 1-1/2": Adjustable wrought steel ring.
       3) 2" and Over: Adjustable wrought steel clevis.
       4) Multiple or Trapeze: Structural steel channel (with web vertical), with welded spacers and hanger rods. Provide cast iron roll and stand for hot pipe sizes six inches and over. Provide hanger rods one size larger than for largest pipe in trapeze. If the deflection at center of trapeze exceeds 1/360 of the distance between the end hangers, install an additional hanger at mid-span or use a larger channel. On trapeze type hangers, provide pipe clamps on all piping. Clamps on insulated piping shall be sized for the insulation O.D. to allow for pipe movement.
11. Wall Supports for Horizontal Pipe:
    a. 1/2" through 3-1/2": Steel offset hook. ii. 4" and Over: Welded steel bracket and wrought steel clamp. Provide adjustable steel yoke and cast iron roll for hot pipe 200oF and over and sizes six inches and over.

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12. Upper Attachments:
    a. For attaching hanger rods to structural steel I-beams:
        1) Provide adjustable beam clamp, Elcen No. 95 with No. 235 rod socket or equal. Attach to bottom flange of beam.
    b. For attaching hanger rods to bar joists:
        1) When bottom chord is constructed of structural steel angles, provide Elcen No. 84H square washer or equal with nut. Place hanger rod between backs of the two angles and support with the washer on top of the angles. Spot weld washer to angles.
        2) When bottom chord is constructed of round bars, provide Elcen No. 137 bar joint washer or equal.
        3) All hanger rods to be supported by bar joist or structural steel. Thread rod not to be secured from roof deck.

C. Floor, Wall, And Ceiling Plates
1. Plates shall be installed on all exposed pipe passing through walls, floors, or ceilings.
    a. Plates shall be as manufactured by Ritter Pattern and Casting Company, 120 Walker Street, New York, New York 10013, or approved equal, chrome plated steel plates with set screw and concealed hinge. Cut plates to fit flush at close-spaced piping locations.

D. Saddles And Thermal Shield Inserts
1. General: Provide saddles [thermal shield inserts] under all insulated piping hangers and thermal shield inserts on all piping through floors, wall and roof construction penetrations. Size saddles and shields for exact fit to mate with pipe insulation or a minimum of 1" thick for uninsulated pipe thermal shield inserts.
2. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
    a. Grinnell Figs 160-165.
3. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
    a. Grinnell Fig. 167.
4. 4. Thermal Shield Inserts: Provide 100-psi average compressive strength, waterproof, asbestos free calcium silicate, encased with a sheet metal enclosure. Insert and shield shall cover the entire circumference or the bottom half circumference of the pipe and shall be of length recommended by the manufacturer for pipe size and thickness of insulation or the thickness of the wall, roof or floor construction.

E. Miscellaneous Materials
1. Steel Plates, Shapes, and Bars: ASTM A 36.
2. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.

F. Roof Equipment Supports
1. General: Construct roof equipment supports using minimum 18-ga galvanized steel with fully mitered and welded corners, 3" cant, internal bulkhead reinforcing, integral base plates, pressure treated wood nailer, 18-ga galvanized steel counterflashing and rigid insulation.
2. Configuration: Compensate for slope in roof so top of support is dead level.

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PART 3 - EXECUTION

3.1 PREPARATION

A. Inspection
1. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION

A. Installation Of Building Attachments
1. Install building attachments on structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.

B. Installation Of Hangers And Supports
1. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69 and SP-89. Arrange for grouping of parallel runs of horizontal piping to be supported together on field fabricated, heavy-duty trapeze hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
2. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.
3. Support fire-water piping independently from other piping systems.
4. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
5. Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, to facilitate action of expansion joints, expansion loops, expansion bends and similar units and within 1'-0" of each horizontal elbow.
6. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
7. Pipe Slopes: Install hangers and supports to provide slopes, and so that maximum pipe deflections allowed by ANSI B31.9 Building Services Piping Code is not exceeded.
8. Insulated Piping: Comply with the following installation requirements.
    a. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
    b. On trapeze type hangers, provide pipe clamps on all piping. Clamps on insulated piping shall be sized for the insulation O.D. to allow for pipe movement.
    c. Saddles: Install Protection saddles MSS Type 39 where insulation without vapor barrier. Fill interior voids with segments of insulation that match adjoining pipe insulation. iv. Thermal Shield Inserts: Install thermal shield inserts MSS Type 40 on all insulated piping. Thermal shield inserts shall span an arc of 360 degrees and shall have dimensions in inches not less than the following:

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d. Insert material shall be at least as long as the protective shield.

NPS	LENGTH	THICKNESS
1/4 THROUGH 3-1/2	12	0.048
	12	0.060
5 & 6	18	0.060

9. Install hydronic piping (copper and steel) hangers with the following minimum rod sizes and maximum spacing:

SIZE (NPS)	SPAN IN FEET	ROD SIZE - INCHES
1	7	3/8
1-1/2	9	3/8
2	10	3/8
3	12	1/2
4	12	5/8

10. Support vertical runs at each floor.
11. Install steel natural gas piping with the following minimum rod size and maximum spacing:

SIZE (NPS)	SPAN IN FEET	ROD SIZE - INCHES
1/2	6	3/8
3/4 TO 1	8	3/8
1-1/4 or larger (horizontal)	10	1/2
Vertical, all sizes	every floor level	

12. Install horizontal water distribution piping with the following maximum spacing and minimum rod sizes:

PIPE SIZE INCHES	STEEL PIPE MAX. SPAN-FT.	COPPER TUBE MAX. SPAN-FT.	ROD DIA. INCHES
UP TO 1/2	6	6	3/8
3/4 & 1	8	6	3/8
1-1/4	10	6	3/8
1-1/2	10	6	3/8
2	10	10	3/8
2-1/2	10	10	1/2
3	10	10	1/2
4	10	10	5/8 (1/2 FOR COPPER)

13. Install sanitary drainage and vent systems with the following maximum spacing and minimum rod sizes:

PIPE MATERIAL	MAX HORIZONTAL SPACING IN FT.	MAX VEHICLE SPACING IN FT.
Cast-Iron Pipe	5	15
Copper Tubing - 1-1/4" and smaller	6	10
Copper Tubing - 1-1/2" and larger	10	10

14. Support horizontal cast iron pipe as follows:
    a. Hub & Spigot: All sizes - One hanger to each joint.
    b. No-Hub: All sizes

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1) With Clamp-All and Anaheim Series 4000 stainless steel couplings and MG cast iron couplings: one hanger to each joint.
2) With all other stainless steel band type couplings: one hanger to each side of joint.
3) Support all horizontal cast iron pipe within 18 inches of each joint and with 5 feet maximum spacing between hangers, except that pipe exceeding 5 feet in length shall be supported at intervals no greater than 10 feet.
4) Use hanger rods same size as for steel.
5) Support vertical cast iron pipe at each story height and at its base. Secure vertical hub and spigot pipe immediately below the hub. Support vertical nohub pipe so that the weight is carried from the pipe to the support and not from the joint to the support.

15. Provide copper or copper plated hangers and supports for copper piping or provide sheet lead packing between hanger or support and piping. All insulated piping to have insulation inserts.
16. Place a hanger within one foot of each horizontal elbow.
17. Use hangers which are vertically adjustable 1-1/2 inch minimum after piping is erected.
18. Support vertical steel and copper piping at every story height but at not more than 15 foot intervals for steel and 10 feet for copper.
19. Where several pipes can be installed in parallel and at same elevation, provide uni-strut trapeze hangers. Provide pipe clamps on all pipes supported on trapeze hangers, sized for the O.D. of the pipe insulation insert and shield, to allow for pipe movement.
20. Where practical, support riser piping independently of connected horizontal piping.
21. All insulated pipes shall have thermal shield insert [insulation protection saddles] at all support points. All piping shall have thermal shield inserts at each penetration thru wall, floor and roof.
22. Each pipe drop to equipment shall be adequately supported. All supporting lugs or guides shall be securely anchored to the building structure.
23. Install all couplings with torque wrench, torqued to inch pounds as specified by the manufacturer.
24. Securely anchor and support plumbing domestic water piping in chases or walls. Use factory manufactured clamps and brackets connected to fixture carriers, waste/vent piping or brackets connected to studs. Wires or straps will not be permitted.
    a. When copper supplies are connected to flush valves, support the tubing by the studs or by a fixture carrier, not by clamping to waste/vent piping. Prevent copper tubes from making contact with steel brackets using duct tape, fire retardant polyethylene inserts or other dielectric insulating material.
    b. Place supports every ten feet on vertical pipe and every five feet on horizontal pipe.
25. Hang all insulated pipe at the point of support in the following manner:
    a. Thermal Shield Insert: Provide thermal shield insert of the same thickness as adjoining insulation for insulated pipe. The entire 360 degrees shall be waterproof, asbestos free, calcium silicate.
        1) If the pipe hanger spacing exceeds ten (10) feet or if there are to be pipe rollers, utilize a double thick shield on bearing surface.
        2) On domestic cold water, chilled water and horizontal roof drain pipe the thermal shield insert shall extend 2 inches beyond the construction material and the sheet metal shield shall span an arc of 360 degrees. All hangers shall be properly sized to accommodate the thermal shield insert and no hanger shall penetrate or crush any of the insulating material.

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26. Install anchors and fasteners in accordance with manufacturer's recommendations and the following:
    a. In the event a self-drilling expansion shield or machine bolt expansion shield is considered to have been installed improperly, the Contractor shall make an acceptable replacement or demonstrate the stability of the anchor by performing an on-site test under which the anchor will be subjected to a load equal to twice the actual load.
    b. Powder-driven fasteners may be used only where they will be concealed after the construction is complete. Where an occasional fastener appears to be improperly installed, additional fastener(s) shall be driven nearby (not closer than 6 inches) in undisturbed concrete. Where it is considered that many fasteners are improperly installed, the Contractor shall test load any 50 successively driven fasteners. If 10 percent or more of these fasteners fail, the Contractor shall utilize other fastening means as approved and at no additional cost to the Owner.
    c. Hangers for piping and ducts shall be attached to cellular steel floor decks with steel plates and bolted rod conforming to the steel deck manufacturer's requirements. Where the individual hanger load exceeds the capacity of a single floor deck attachment, steel angles, beams or channels shall be provided to span the number of floor deck attachments required. iv. Welding may be used for securing hangers to steel structural members. Welded attachments shall be designed so that the fiber stress at any point of the weld or attachment will not exceed the fiber stress in the hanger rod.

C. SLEEVES AND SEALS
1. General:
    a. Encase all insulated pipes penetrating fire rated walls and floors in 360 degree metalshielded insulation inserts as manufactured by Pipe Shields, Inc. or equal. Extend insulation insert on all domestic cold water, chilled water and refrigerant lines 1" beyond sheet metal shield.
2. Pipes:
    a. Pipes
        1) Pipes penetrating fire rated concrete or masonry construction, whether insulated or not, shall be provided with sheet metal or pipe sleeves fitted into place at time of construction. In poured concrete, the sleeves shall be steel pipe with a full circle, continuously welded water stop plate to also act as a sleeve anchor. When installing Link-Seal (see paragraph f) the sleeve and Link-Seal shall be of matched sizes. Otherwise, sleeves shall be of such size to provide all around clearance of 1/4" to 1". Seal entire space between pipe and sleeve with fire stopping as specified in paragraph A.
        2) Sleeves in non-fire rated or non-bearing walls, floors or ceilings, new or existing construction, shall be steel pipe or galvanized sheet metal with lock-type longitudinal seam. Pack all open spaces on each end with mineral wood or other non-combustible material, positively fastened in place. Asbestos is not acceptable.
        3) Where a pipe of any description passes through a concrete floor, the sleeve shall extend at least 2" above the finished floor, except when using the ProSet Systems.
        4) At Contractor's option, where uninsulated pipes penetrate cast-in-place concrete floors, the "ProSet Systems", Atlanta, Georgia, sleeving may be employed.

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5) For pipes penetrating foundation walls, water-proofing membrane floors or other places where water leakage could be encountered, install Link-Seal wall sleeves by Thunderline Corporation in manner recommended by the manufacturer.

3. Seals:
   a. General:
      1) Seal all holes or voids where mechanical systems penetrate fire rated floors and walls with a fire stopping sealant having a fire rating equal to or greater than that of the construction being penetrated, but not less than 2 hours. The sealant shall meet the requirements of ASTM E-814, ASTM E-119 and UL-1479. It shall be installed with strict adherence to the manufacturer's instructions and according to the product's UL Laboratory listing. The use of asbestos in any form is not permitted. Types of Seals:
         a) Intumescent (3M Company CP25 Caulk and 303 Putty)
         b) Expanding Foam (Dow Corning 3-6548 Silicone RTV Foam)
         c) Refractory Putty (SOHIO Carborundum Fire Putty)
   b. Method of Use:
      1) Intumescent type: For insulated pipe, install insulation through the sleeve with a continuous vapor seal if required. Install intumescent seal in the annular space between the pipe insulation and the pipe sleeve. Refer to manufacturer's data sheets for maximum annular space allowable and thickness of material required to maintain the rating of the construction being penetrated in conformance with applicable UL Fire Stop Classification for the product.
      2) Expanding foam: For insulated pipe, terminate the insulation on both sides of the wall or floor being penetrated and fill the space between the construction and the bare pipe with the foam. For uninsulated pipe, continue pipe through the penetration and proceed as with insulated pipe.
      3) Refractory putty: For insulated pipe, provide a 360 degree metal-shielded calcium silicate insulation insert as specified in paragraph "A." Pack and seal the entire space between shield and sleeve with refractory putty. When sealing bare pipe, omit the metal-shielded insert.
   c. Escutcheons:
      1) In finished parts of the building, after painting is completed, install chromium plated escutcheons on all pipes passing through walls and floors.

D. METAL FABRICATION
1. Cut, drill, and fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors.
2. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
3. Field Welding: For procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, comply with those listed on project drawings and the following:
   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish welds at exposed connections so no roughness shows after finishing and contours at welded surfaces match adjacent contours.

E. ADJUSTING

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1. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve slope of pipe.
2. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.
    a. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous.
3. For galvanized surfaces clean welds bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

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SECTION 23 05 48 - HVAC VIBRATION ISOLATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Bases.

B. Vibration Isolation.

C. Flexible Connectors.

1.2 SUBMITTALS

A. Submit shop drawings per Section 23 05 00 and the Vibration Isolation Submittal Form at the end of this section.

B. Vibration isolation submittals may be included with equipment being isolated, but must comply with this section.

C. Base submittals shall include equipment served, construction, coatings, weights, and dimensions.

D. Isolator submittals shall include:
1. Equipment served
2. Type of Isolator
3. Load in Pounds/Kilogram per Isolator
4. Recommended Maximum Load for Isolator
5. Spring Constants of Isolators (for Spring Isolators)
6. Load vs. Deflection Curves (for Neoprene Isolators)
7. Specified Deflection
8. Deflection to Solid (at least 150% of calculated deflection)
9. Loaded (Operating) Deflection
10. Free Height
11. Loaded Height
12. Kx/Ky (horizontal to vertical stiffness ratio - for spring isolators)
13. Materials and Coatings
14. Spring Diameters

E. Make separate calculations for each isolator on equipment where the load is not equally distributed.

F. Flexible connector shop drawings shall include overall face-to-face length and all specified properties.

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PART 2 - PRODUCTS

2.1 BASIC CONSTRUCTION AND REQUIREMENT

A. Vibration isolation for this project is subject to seismic restraint requirements of Section 23 05 50.

B. Vibration isolators shall have either known undeflected heights or other markings so deflection under load can be verified.

C. All isolators shall operate in the linear portion of their load versus deflection curve. The linear portion of the deflection curve of all spring isolators shall extend 50% beyond the calculated operating deflection [e.g., 3" for 2" calculated deflection]. The point of 50% additional deflection shall not exceed the recommended load rating of the isolator.

D. The lateral to vertical stiffness ratio (Kx/Ky) of spring isolators shall be between 0.8 and 2.0.

E. All neoprene shall have UV resistance sufficient for 20 years of outdoor service.

F. All isolators shall be designed or treated for corrosion resistance. Steel bases shall be cleaned of welding slag and primed for interior use, and hot dip galvanized after fabrication for exterior use. All bolts and washers over 3/8" diameter located outdoors shall be hot dip galvanized per ASTM A153. All other bolts, nuts and washers shall be zinc electroplated. All ferrous portions of isolators, other than springs, for exterior use shall be hot dip galvanized after fabrication. Outdoor springs shall be neoprene dipped or hot dip galvanized. All damage to coatings shall be field repaired with two coats of zinc rich coating.

G. Equip all mountings used with structural steel bases with height-saving brackets. Bottoms of the brackets shall be 1-1/2" to 2-1/2" above the floor or housekeeping pad, unless shown otherwise on the drawings. Steel bases shall have at least four points of support.

H. Provide motor slide rails for belt-driven equipment per Section 23 05 13.

I. All isolators, except M1, shall have provision for leveling.

J. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
   1. Vibration Control Products:
   2. Mason Industries, Inc.
   3. Peabody Noise Control, Inc.

2.2 MOUNTINGS

A. Type M1:
   1. 0.75" thick waffled neoprene pad with minimum static deflection of 0.07" at calculated load and 0.11" at maximum load. For loads less than 15 pounds, the deflection at calculated load requirement is waived, but the isolator must have a maximum stiffness of the ratio of 45#/0.35".

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2. Units need not be bolted down unless called for or needed to prevent movement. If bolted down, prevent short circuiting with neoprene bushings and washers between bolts and isolators.
3. Acceptable Manufacturers: Mason "Super W"

B. Type M2:
1. Double deflection neoprene with minimum static deflection of 0.15" at calculated load and 0.35" at maximum rated load.
2. All metal shall be neoprene covered. Mounting shall have friction pads both top and bottom.
3. All units shall have bolt holes and be bolted down.
4. Use steel rails above the mountings to compensate for the overhang of equipment such as small vent sets and close coupled pumps.
5. Acceptable Manufacturers: Mason Industries "ND" or "DNR".

C. Type M3:
1. Free standing, laterally stable spring isolators without housings and complete with 1/4" neoprene friction pads.
2. Units shall have bolt holes but need not be bolted down unless called for or needed to prevent movement. If bolted down, prevent short circuiting with neoprene bushings and washers between bolts and isolators. Bolt holes shall not be within the springs.
3. All mountings shall have leveling bolts.
4. Acceptable Manufacturers: Mason "SLFH".

D. Type M4:
1. Use restrained spring mountings for equipment with operating weight different from the installed weight such as chillers and boilers, and equipment exposed to the wind such as cooling towers.
2. Spring isolators shall be free-standing with 1/4" neoprene acoustical friction pads.
3. All units shall have bolt holes and be bolted down. Prevent short circuiting with neoprene bushings and washers between bolts and isolators.
4. All mountings shall have leveling bolts.
5. Housings with vertical resilient limit stops shall prevent spring extension when weight is removed. Housings shall serve as blocking during erection and the installed and operating heights shall be the same.
6. Maintain a minimum clearance of 1/2" around restraining bolts and between the housings and the springs so as not to interfere with the spring action.
7. Limit stops shall be out of contact during normal operation.
8. Select isolators for equipment subjected to wind loads in conformance with ASCE 7-02.
9. Acceptable Manufacturers: Mason "SLRS".

2.3 THRUST RESTRAINTS

A. Type TR1:
1. Horizontal thrust restraints shall consist of spring elements in neoprene cups with grommets to prevent short circuiting hanger rods and nuts and washers for pre-compression.
2. Select springs for deflection of 0.75" to 1.50" at maximum calculated thrust. Springs shall be field adjusted for 1/2" movement. Spring constant may not exceed 50% of the vertical stiffness of the mounts (M3, etc.).

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3. Centrifugal fans shall incline slightly forward when off and discharge directly in line with the ductwork at maximum static pressure.
4. Fabricate structural supports as needed to attach thrust restraints.
5. If connected to a housing, check maximum thrust the housing can restrain and connections required.
6. Acceptable Manufacturers: Mason "WB".

2.4 HANGERS

A. Type H1:
1. Vibration hangers shall consist of a double-deflection neoprene element with a projecting bushing or oversized opening to prevent steel-to-steel contact.
2. Static deflection shall be at least 0.15" at calculated load and 0.35" at maximum rated load.
3. Provide hangers with end connections as required for hanging ductwork or piping.
4. Acceptable Manufacturers: Mason "HD" or "WHD".

B. Type H2:
1. Vibration hangers shall contain a steel spring in a neoprene cup with a grommet to prevent short circuiting the hanger rod.
2. The cup shall have a steel washer to distribute load on the neoprene and prevent its extrusion.
3. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30º arc before contacting the grommet and short circuiting the spring.
4. Provide end connections for hanging ductwork or piping.
5. Acceptable Manufacturers: Mason "30".

C. Type H3:
1. Vibration hangers shall have a steel spring in a neoprene cup with a grommet to prevent short circuiting of the hanger rod.
2. The cup shall have a steel washer to distribute load on the neoprene and prevent its extrusion.
3. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30º arc before contacting the grommet and short circuiting the spring.
4. Provide end connections for hanging ductwork or piping.
5. Hangers shall be capable of holding the load at a fixed elevation during installation. They shall have a secondary adjustment to transfer the load to the spring and maintain the same position.
6. Deflection shall be indicated by a pointer and scale.
7. Acceptable Manufacturer: Mason "PC30".

2.5 BASES

A. Type B1:
1. Rectangular structural steel bases.

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2. All perimeter members shall be beams or channels with minimum depth of 10% of the longest base dimension or 14" maximum if rigidity is acceptable to the equipment manufacturer.
3. Use height saving brackets, unless noted otherwise.
4. Acceptable Manufacturers: Mason "WF".

B. Type B2:
1. Steel members welded to height-saving brackets to cradle machines having legs or bases that do not require complete supplementary bases.
2. Members shall be sufficiently rigid to prevent strains in the equipment.
3. Acceptable Manufacturers: Mason "ICS".

C. Type B3:
1. Rectangular structural channel concrete forms for floating foundations.
2. Where applicable, bases shall be large enough to support suction elbows, discharge elbows, and suction diffusers.
3. Channel depth shall be at least 1/12 the longest dimension of the base but not less than 6"150 mm. Depth need not exceed 12" if rigidity is acceptable to equipment manufacturer.
4. Forms shall include 1/2" rebars welded on 6" centers running both ways in a layer 1-1/2" above the bottom, and drilled steel members with sleeves welded below the holes to receive the equipment anchor bolts.
5. Contractor shall pour 3,300 PSI concrete inside entire base. Concrete to be same thickness as sides of base. Trowel concrete smooth on top of base.
6. Use height saving brackets, unless noted otherwise.
7. Acceptable Manufacturers: Mason "K", Kinetics "CIB-H".

2.6 FLEXIBLE CONNECTORS (NOISE AND VIBRATION ELIMINATORS)

A. Type FC1:
1. Spherical flexible connectors with multiple plies of nylon tire cord fabric and either EPDM or molded and cured neoprene. Outdoor units shall be EPDM.
2. Steel aircraft cables or threaded steel rods shall be used to prevent excess elongation.
3. All straight through connections shall be made with twin-spheres properly pre-extended as recommended by the manufacturer.
4. Connectors up to 2" size may have threaded ends.
5. Connectors 2-1/2" and over shall have floating steel flanges recessed to lock raised face neoprene flanges.
6. All connectors shall be rated for a minimum working pressure of 150 psi at 200ºF.
7. Acceptable Manufacturer: Metraflex "Double Cable-Sphere".

B. Type FC2:
1. Stainless steel flexible connectors with corrugated stainless steel hose body and stainless steel braided casing.
2. Rated for minimum working pressures of 150 psi at 70ºF and 100 psi at 800ºF4.
3. Sizes 2" and under shall have steel threaded connections.
4. Sizes 2-1/2" and over shall have 150 lb.Class 150 steel flanges.
5. Suitable for 1/2" permanent misalignment.
6. Acceptable Manufacturers: Mason "BSS-GU".

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PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Provide vibration isolation as indicated on the drawings and as described herein.

C. Clean the surface below all mountings that are not bolted down and apply adhesive cement equal to Mason Type WG between mounting and floor. If movement occurs, bolt mountings down. Isolate bolts from baseplates with neoprene washers and bushings.

D. All static deflections listed in the drawings and specifications are the minimum acceptable actual deflection of the isolator under the weight of the installed equipment - not the maximum rated deflection of the isolator.

E. Support equipment to be mounted on structural steel frames with isolators under the frames or under brackets welded to the frames. Where frames are not needed, fasten isolators directly to the equipment.

F. Where a specific quantity of hangers is noted in these specifications, it shall mean hanger pairs for support points that require multiple hangers, such as rectangular ducts or pipes supported on a strut rack.

3.2 VIBRATION ISOLATION OF DUCTWORK

A. The first five hangers from vibration-isolated equipment shall have spring isolators with the same static deflection as the equipment. Use type H1 or H2 as required for the specified deflection. The next five hangers shall be type H1.

B. For base mounted pumps without resilient mountings, the first five hangers shall be Type H1.

C. Where piping is floor-supported, use M2 instead of H1 and M3 instead of H2.

D. Install flexible connectors in all piping connected to vibration producing equipment. This includes all fans, base-mounted pumps, compressors, etc. Absence of flexible connectors on piping diagrams does not imply that they are not required.

E. Use Type FC1 where pressures are lower than 150 psi, temperatures are below 220ºF, and the fluid handled is compatible with neoprene and EPDM.

F. Use Type FC2 for all other services. FC2 shall be installed parallel with equipment shafts.

G. Provide sufficient piping flexibility for vibrating refrigerant equipment, or furnish flexible connectors with appropriate temperature and pressure ratings.

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H. Vibration isolators shall not cause any change in position of piping that will result in stresses in connections or misalignment of shafts or bearings. Equipment and piping shall be maintained in a rigid position during installation. Do not transfer load to the isolators until the installation is complete and under full operational load. Hanger H3 and Mounting M4 may be used instead of other products for this purpose.

I. Support piping to prevent extension of flexible connectors.

3.3 VIBRATION ISOLATION OF DUCTWORK

A. The first three hangers on all fan systems with static pressure greater than 1.0" shall be Type H2 with 0.75" minimum static deflection. All other hangers supporting ductwork within 50' of and connected to vibration-isolated equipment shall be Type H1 with at least 0.20".

B. Provide flexible duct connections as described in Section 23 33 00 at all fan inlets and outlets and on the mechanical room side of all locations where ducts penetrate mechanical room walls.

3.4 VIBRATION ISOLATION SCHEDULE

EQUIPMENT DESIGNATION	BASE TYPE	ISOLATOR TYPE	STATIC DEFLECTION	FLEXIBLE CONNECTIONS
Inline Pump(s)	NA	M3 or H2 or H3	0.75" (Less than 3HP) or 1.5" (3 HP and above)	NA
RTU fans (Note 1)	B1 or B2 or B3	M3 and/or TR1	Refer to ASHRAE Table	Per Section 23 33 00
Packaged HVAC Unit (<10 HP) (Note 1) - AREA A AND HORIZONTAL HEAT PUMPS.	NA	M3 or H2 or H3	0.75"	Per Section 23 33 00
Packaged HVAC Unit (<10 HP) (Note 1) - ALL OTHER AREA HEAT PUMPS	NA	M1	0.07"	Per Section 23 33 00

Note 1: RTU and HVAC Unit internal fan isolation shall be determined by RTU manufacturer. Isolation selected shall be a minimum of 98% efficient at scheduled CFMl/s and static pressure.

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SECTION 23 05 53 - HVAC IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Identification of products installed under Division 23.

1.2 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

B. ASTM B-1, B-3, and B-8 for copper conductors.

C. ASTM D-1248 for Polyethylene Extrusion Materials, ICEA S-70-547 Weatherproof Resistant Polyethylene Conductors, ICEA S-61-402/NEMA WC5 Thermoplastic Insulated Wire & Cable, ICEA S-95-658/NEMA WC70 Non-Shielded 0 - 2kV Cables.

D. CGA Pamphlet C-9, Standard Color-Marking of Compressed Gas Cylinders for Medical Use.

E. NFPA-99 - Health Care Facilities.

F. UL 1581 Standard for Electrical Wires, Cables, and Flexible Cords.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00. Include list of items identified, wording, letter sizes, and color coding.

B. Include valve chart and schedule listing valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Westline

B. Brady

C. Seaton

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2.2 MATERIALS

A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

OD of Pipe or insulation	Marker Length	Size of Letters
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

1. Plastic tags may be used for outside diameters under 3/4".

B. Plastic Nameplates: Laminated three-layer phenolic with engraved black, 1/4" minimum letters on light contrasting background.

C. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.

D. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.

E. Plastic Pipe Markers: Semi-rigid plastic, preformed to fit around pipe or pipe covering; indicating flow direction and fluid conveyed.

F. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.

G. Stencil Painted Pipe Markers: Use industrial enamel spray paint per ANSI Standard A13.1. Indicate fluid conveyed and flow direction.

H. Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape 6" wide by 3.5 mils thick, manufactured for direct burial, with aluminum foil core for location by non-ferric metal detectors and bold lettering identifying buried item.

I. Tracer Wire:
1. Single copper conductors shall be solid or stranded annealed or hard uncoated copper per UL83 and ASTM requirements. Tracer tape or copper-coated steel wire is not acceptable.
2. Conductor shall be insulated with HMWPE as specified and applied in a concentric manner. The minimum at any point shall not be less than 90% of the specified average thickness in compliance with UL 83.
3. Tracer wire shall be continuously spark tested at 7500 Volts DC. Other electrical and mechanical tests shall be in accordance with UL 1581.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Degrease and clean surfaces to receive adhesive for identification materials.

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C. Piping Systems
1. General: Install pipe markers of the following type on each system and include arrows to show normal direction of flow.
2. The requirement of labeling the mechanical system components and the quality of the identification shall be emphasized in areas exposed to the student population, including, but not limited to, the stairways, the gymnasium, the cafeteria, the mechanical yard, the art room, the music room and roof areas visible from the second floor.
3. Plastic pipe markers. Install on pipe insulation segment where required for hot non-insulated pipes.
4. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
5. Near each valve and control device.
6. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
7. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
8. At access doors, manholes and similar access points which permit view of concealed piping.
9. Near major equipment items and other points of origination and termination.
10. Spaced intermediately at maximum spacing of 25' along each piping run, except reduce spacing to 15' in congested areas of piping and equipment.
11. On piping above removable acoustical ceilings.

D. Valves:
1. General: Provide valve tag on valves in each piping system. List each tagged valve in valve schedule for each piping system. List valve tag locations on redline drawing at location of valves.
   a. Building services main shut-off valves.
   b. Each individual system main shut-off valves. iii. Each individual system floor shut-off valves.
   c. Each individual system major branch shut-off valves.
2. Mount valve schedule frames and schedules in mechanical equipment rooms where directed by Owner.
3. Number all tags and show the service of the pipe.
4. Number all tags and show the service of the pipe.
5. Label all valves with tags indicating service and number. Tags 1-1/2" in diameter, brass, with 1/4" high black letters. Securely fasten with chain and hook. Match service abbreviations given on mechanical drawings. Show all valve tag numbers on red line drawings at valve locations. All valves located behind access panels or located above ceiling tiles are to be labeled
6. Identify all valves located above ceilings or behind access panels using Dymo embossing Tape punched with M-3 Dymomite hand embossing tool. Punch out 3/32" holes at each side of label and secure with Parker-Kalon self-taping screws in addition to adhesive.
7. For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with non-yellowing Plexi-glas.

E. Pipe Markers:
1. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color coded pipe markers, complying with ANSI A13.1.

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2. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125 deg. F. (52 deg. C.) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
3. Small Pipes: For external diameters less than 6" (including insulation if any), provide fullband pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
    a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
    b. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".
4. 4. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
    a. Steel spring or non-metallic fasteners.
    b. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 11/2" wide; full circle at both ends of pipe marker, tape lapped 3".
    c. Strapped-to-pipe (or insulation) application of semi- rigid type, with manufacturer's standard stainless steel bands.
5. Lettering: Comply with piping system nomenclature or to match existing building lettering nomenclature system and abbreviate only as necessary for each application length.
6. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

F. Equipment:
1. Identify all key equipment, thermostats, controls, relays, dampers, valves, etc., using Dymo embossing Tape punched with M-3 Dymomite hand embossing tool. Punch out 3/32" holes at each side of label and secure with Parker-Kalon self-taping screws in addition to adhesive.
    a. Embossing tape equipment identification specified shall apply to identification labeling of mechanical equipment above ceilings or ceiling access doors. Provide this type of labeling at the ceiling to locate equipment from the occupied space.
2. For mechanical equipment exposed to view throughout the building, located in mechanical rooms or on the roof, provide engraved plastic laminate identification, black with white core, minimum size 2" x 4", with 1" high lettering. Equipment labels shall be fastened with self-tabbing stainless steel screws. Provide contact-type permanent adhesive where screws should not penetrate the substrate.

G. Tracer Wire:
1. Tracer wire shall be installed on top of all non-metallic buried utilities.
2. Tracer wire shall be taped directly to plastic water or drain pipe.
3. Tracer wire shall not be fastened directly or indirectly to gas piping.
4. Tracer wire when attached shall be secured to the pipe a minimum of every 10 feet and at all changes of direction.
5. Tape shall be Polyken "930-35", Protecto-Wrap "310", or approved equal.
6. Tracer wire shall be continuous between boxes and shall be tested for continuity.
7. Splices in tracer wire shall be made with a water proof splice kit to prevent corrosion. Wire nuts shall not be used.
8. The tracer wire shall daylight to grade through a 2" PVC conduit, at the point of the utility entrance to building. PVC conduit shall be capped and labeled as future contact point to locate the utility.

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3.2 SCHEDULE

A. Pipes to be marked shall be labeled with the text as shown in the following table regardless of which method or material is used:

Pipe Service	Lettering Color	Background Color
HEATING WATER SUPPLY	White	Green
HEATING WATER RETURN	White	Green

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SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing, adjusting, and balancing of air systems.

B. Testing, adjusting, and balancing of condenser water systems.

C. Testing, adjusting, and balancing of plumbing systems.

D. Testing, adjusting, and balancing of energy recovery systems.

E. Measurement of final operating condition of HVAC systems.

1.2 QUALITY ASSURANCE

A. Agency shall be a company specializing in the adjusting and balancing of systems specified in this section with minimum three years' experience. Perform work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor, SMARTA Certified Air and Hydronic Balancer, or TABB Certified Supervisor.

B. Work shall be performed in accordance with the requirements of the references listed at the start of this section.

1.3 REFERENCES

A. AABC - National Standards for Total System Balance, 2002.

B. ADC - Test Code for Grilles, Registers, and Diffusers.

C. AMCA - Publication 203-90; Field Performance Measurement of Fan Systems.

D. ASHRAE - 2003 HVAC Applications Handbook; Chapter 37, Testing, Adjusting and Balancing.

E. ASHRAE/ANSI - Standard 111-1988; Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC&R Systems.

F. NEBB - Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems, Sixth Edition, 1998.

G. SMACNA - HVAC Systems; Testing, Adjusting and Balancing, Third Edition, 2002.

H. TABB - International Standards for Environmental Systems Balance.

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1.4 SUBMITTALS

A. Submit copies of report forms, balancing procedures, and the name and qualifications of testing and balancing agency for approval within 30 days after award of Contract.

B. Electronic Copies:
1. Submit a certified copy of test reports to the Architect/Engineer for approval. Electronic copies shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Copies that are not legible will be returned to the Contractor for resubmittal. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
2. Electronic file size shall be limited to a maximum of 10MB. Larger files shall be divided into files that are clearly labeled as "1 of 2", "2 of 2", etc.
3. All text shall be searchable.
4. Bookmarks shall be used. All bookmark titles shall be an active link to the index page and index tabs.

C. Paper Copies:
1. Submit four (4) certified copies of test reports to the Architect/Engineer for approval in soft cover, 3-hole binder manuals, with cover identification. Include index page and indexing tabs.

1.5 REPORT FORMS

A. Submit reports on AABC, SMACNA or NEBB forms. Use custom forms approved by the Architect/Engineer when needed to supply specified information.

B. Include in the final report a schematic drawing showing each system component, including balancing devices, for each system. Each drawing shall be included with the test reports required for that system. The schematic drawings shall identify all testing points and cross-reference these points to the report forms and procedures.

C. Refer to PART 4 for required reports.

1.6 WARRANTY/GUARANTEE

A. The TAB Contractor shall include an extended warranty of 90 days after owner receipt of a completed balancing report, during which time the Owner may request a recheck of terminals, or resetting of any outlet, coil, or device listed in the test report. This warranty shall provide a minimum of 24 manhours of onsite service time. If it is determined that the new test results are not within the design criteria, the balancer shall rebalance the system according to design criteria.

B. Warranty/Guarantee must meet one of the following programs: TABB International Quality Assurance Program, AABC National Project Performance Guarantee, NEBB's Conformance Certification.

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1.7 SCHEDULING

A. Coordinate schedule with other trades. Provide a minimum of seven days' notice to all trades and the Architect/Engineer prior to performing each test.

B. Project will be constructed in phases. Provide balancing report after each phase is complete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Griffith Engineering Service, Denver, Colorado.

B. Fort Collins/Midwest.

C. TAB Services of Denver, Colorado.

D. Lawrence H. Finn & Assoc., Greeley, Colorado.

E. JPG Engineering, Sedalia, Colorado.

F. Air-Right, Denver, Colorado.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All procedures must conform to a published standard listed in the References article of this section. All equipment shall be adjusted in accordance with the manufacturer's recommendations. Any system not listed in this specification but installed under the contract documents shall be balanced using a procedure from a published standard listed in the References article.

B. The Balancing Contractor shall incorporate all pertinent documented construction changes (e.g. submittals/shop drawings, change orders, RFIs, ASIs, etc.) and include in the balancing report.

C. Recorded data shall represent actual measured or observed conditions.

D. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing is complete, close probe holes and patch insulation with new materials as specified. Restore vapor barrier and finish as specified.

E. Permanently mark setting of valves, dampers, and other adjustment devices allowing for settings to be restored. Set and lock memory stops.

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F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, plugging test holes, and restoring thermostats to specified settings.

G. The Balancing Contractor shall measure terminal air box air flow, and the TCC shall adjust DDC readout to match. Refer to Section 23 09 00 for additional information.

H. Installations with systems consisting of multiple components shall be balanced with all system components operating.

3.2 EXAMINATION

A. Before beginning work, verify that systems are complete and operable. Ensure the following:
   1. General Equipment Requirements:
      a. Equipment is safe to operate and in normal condition.
      b. Equipment with moving parts is properly lubricated.
      c. Temperature control systems are complete and operable.
      d. Proper thermal overload protection is in place for electrical equipment.
      e. Direction of rotation of all fans and pumps is correct.
      f. Access doors are closed and end caps are in place.
   2. Duct System Requirements:
      a. All filters are clean and in place. If required, install temporary media.
      b. Duct systems are clean and free of debris.
      c. Fire/smoke and manual volume dampers are in place, functional and open.
      d. Air outlets are installed and connected.
      e. Duct system leakage has been minimized.
   3. Pipe System Requirements:
      a. Coil fins have been cleaned and combed.
      b. Hydronic systems have been cleaned, filled, and vented.
      c. Strainer screens are clean and in place.
      d. Shutoff, throttling and balancing valves are open.

B. Report any defects or deficiencies to Architect/Engineer.

C. Promptly report items that are abnormal or prevent proper balancing.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the Architect/Engineer for spot checks during testing.

B. Instruments shall be calibrated within six months of testing performed for project, or more recently if recommended by the instrument manufacturer.

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3.4 INSTALLATION TOLERANCES

A. ± 10% of scheduled values:
   1. Adjust air inlets and outlets to ± 10% of scheduled values.
   2. Adjust piping systems to ± 10% of design values.

B. ± 5% of scheduled values:
   1. Adjust fume exhaust systems to ± 5% of scheduled values.
   2. Adjust supply and exhaust air-handling systems for space pressurization to ± 5% of scheduled values, and to provide proper pressurization.

C. + 5% of scheduled values
   1. Adjust outdoor air intakes to within + 5% of scheduled values.
   2. Adjust exhaust air through energy recovery equipment to within +5% of scheduled values.

D. Adjust supply, return, and exhaust air-handling systems to +10% / -5% of scheduled values.

3.5 ADJUSTING

A. After adjustment, take measurements to verify balance has not been disrupted or that disruption has been rectified.

B. Once balancing of systems is complete, at least one damper or valve must be 100% open.

C. After testing, adjusting and balancing are complete, operate each system and randomly check measurements to verify system is operating as reported in the report. Document any discrepancies.

D. Contractor responsible for each motor shall also be responsible for replacement sheaves. Coordinate with contractor.

E. Contractor responsible for pump shall trim impeller to final duty point as instructed by this contractor on all pumps not driven by a VFD. Coordinate with contractor.

3.6 SUBMISSION OF REPORTS

A. Fill in test results on appropriate forms.

PART 4 - SYSTEMS TO BE TESTED, ADJUSTED AND BALANCED

4.1 GENERAL REQUIREMENTS

A. Title Page:
   1. Project name.
   2. Project location.
   3. Project Architect.
   4. Project Engineer (IMEG Corp.).

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5. Project General Contractor.
6. TAB Company name, address, phone number.
7. TAB Supervisor's name and certification number.
8. TAB Supervisor's signature and date.
9. Report date.

B. Report Index

C. General Information:
1. Test conditions.
2. Nomenclature used throughout report.
3. Notable system characteristics/discrepancies from design.
4. Test standards followed.
5. Any deficiencies noted.
6. Quality assurance statement.

D. Instrument List:
1. Instrument.
2. Manufacturer, model, and serial number.
3. Range.
4. Calibration date.

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4.2 AIR SYSTEMS

A. Duct Leakage Test:
1. Air system and fan.
2. Leakage class.
3. Test pressure.
4. Construction pressure.
5. Flow rate (cfm): specified and actual.
6. Leakage (refer to Section 23 31 00 in the specifications): specified and actual.
7. Statement that fire dampers, reheat coils and other accessories were included in the test.
8. Pass or Fail.
9. Test performed by.
10. Test witnessed by.

B. Air Moving Equipment:
1. General Requirements:
   a. Drawing symbol.
   b. Location.
   c. Manufacturer, model, arrangement, class, discharge.
   d. Fan RPM.
   e. Multiple RPM fan curve with operating point marked. (Obtain from equipment supplier).
   f. Final frequency of motor at maximum flow rate (on fans driven by VFD).
2. Flow Rate:
   a. Supply flow rate (cfm): specified and actual.
   b. Return flow rate (cfm): specified and actual.
   c. Outside flow rate (cfm): specified and actual.
   d. Exhaust flow rate (cfm): specified and actual.

3. Pressure Drop and Pressure:
    a. Filter pressure drop: specified and actual.
    b. Total static pressure: specified and actual. (Indicate if across fan or external to unit).
    c. Inlet pressure.
    d. Discharge pressure.

C. Fan Data:
1. Drawing symbol.
2. Location.
3. Manufacturer and model.
4. Flow rate (cfm): specified and actual.
5. Total static pressure: specified and actual. (Indicate measurement locations).
6. Inlet pressure.
7. Discharge pressure.
8. Fan RPM.

D. Electric Motors:
1. Drawing symbol of equipment served.
2. Manufacturer, Model, Frame.
3. Nameplate: HPkW, phase, service factor, RPM, operating amps, efficiency.
4. Measured: Amps in each phase.

E. Duct Traverse:
1. System zone/branch/location.
2. Duct size.
3. Free area.
4. Velocity: specified and actual.
5. Flow rate (cfm): specified and actual.
6. Duct static pressure.
7. Air temperature.
8. Air correction factor.

F. Air Flow Measuring Station:
1. Drawing symbol.
2. Service.
3. Location.
4. Manufacturer and model.
5. Size.
6. Flow rate (cfm): specified and actual.
7. Pressure drop: specified and actual.

G. Fume Hood:
1. Drawing symbol.
2. Location.
3. Manufacturer and Model.
4. Total flow rate (cfm): specified and actual.
5. Test velocities.
6. Hood opening dimensions.

H. Positive Air Flow Test:

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1. Occupied Supply Air (Max./Min.) Flow rate (cfm): specified and actual.
2. Occupied Return Air (Max./Min.) Flow rate (cfm): specified and actual.
3. Unoccupied Supply Air (Max./Min.) Flow rate (cfm): specified and actual.
4. Unoccupied Return Air (Min./Max.) Flow rate (cfm): specified and actual.

I. Fire, Smoke, and Fire/Smoke Dampers:
1. Damper ID #.
2. System identification.
3. Type.
4. Size.
5. UL assembly number.
6. Location of damper and access door.
7. Fusible link temperature rating.
8. Manufacturer and model.
9. Operation pass/fail/reset.

4.3 HEATING WATER SYSTEMS

A. Pump Data (Primary and Secondary Condenser Water Loop and Heating Water Pumps):
1. Existing drawing symbol or equipment TAG
2. Service.
3. Manufacturer, size, and model.
4. Impeller size: specified, actual, and final (if trimmed).
5. Flow Rate (gpm): specified and actual.
6. Pump Head: specified, operating and shutoff.
7. Suction Pressure: Operating and shutoff.
8. Discharge Pressure: Operating and shutoff.
9. Final frequency of motor at maximum flow rate (on pumps driven by VFD).

B. Electric Motors (Associated Heating Water Loop Pump Motors):
1. Drawing symbol of equipment served.
2. Manufacturer, Model, Frame.
3. Nameplate: HP, phase, service factor, RPM, operating amps, efficiency.
4. Measured: Amps in each phase.

C. Heating Water Coils:
1. General Requirements:
   a. Drawing symbol.
   b. Service.
   c. Location.
   d. Manufacturer and model.
   e. Size.
2. Flow Rate:
   a. Flow rate (cfm): specified and actual.
   b. Water flow rate: specified and actual.
3. Temperature:
   a. Entering air temperature: specified and actual.
   b. Leaving air temperature: specified and actual.
   c. Entering water temperature: specified and actual.
   d. Leaving water temperature: specified and actual.

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4. Pressure Drop and Pressure:
    a. Air pressure drop: specified and actual.
    b. Steam pressure after valve: specified and actual.
    c. Water pressure drop: specified and actual.
5. Energy:
    a. Air Btuh (cfm x temp rise x 1.09).
    b. Water Btuh (gpm x temp drop x 500). Repeat tests if not within 10% of air Btuh.

D. Hot Water Boiler:
1. General Requirements:
    a. Drawing symbol.
    b. Service.
    c. Location.
    d. Manufacturer, model, and identification number.
    e. Control setting: specified and actual.
2. Temperature:
    a. Entering water temperature: specified and actual.
    b. Leaving water temperature: specified and actual.
3. Flow Rate:
    a. Flow rate (gpm): specified and actual.
4. Pressure Drop and Pressure:
    a. Pressure Drop: specified and actual.
5. Energy:
    a. Rating (Btuh).
    b. Measured output (Btuh).

4.4 PLUMBING SYSTEMS

A. Pump Data:
1. Drawing symbol.
2. Service.
3. Manufacturer, size, and model.
4. Impeller size: specified, actual, and final (if trimmed).
5. Flow Rate (gpm): specified and actual.
6. Pump Head: specified, operating and shutoff.
7. Suction Pressure: operating and shutoff.
8. Discharge Pressure: operating and shutoff.

B. Electric Motors:
1. Drawing symbol of equipment served.
2. Manufacturer, model, frame.
3. Nameplate: HP, phase, service factor, RPM, operating amps, efficiency.
4. Measured: Amps for each phase.

C. Balancing Valve:
1. Drawing symbol.
2. Service.
3. Location.
4. Size.
5. Manufacturer and model.

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6. Flow rate (gpm): specified and actual.
7. Pressure drop: specified and actual.

D. Gas Fired Water Heater:
1. Drawing symbol.
2. Service.
3. Location.
4. Manufacturer and model.
5. Capacity (Btuh): specified, nameplate, and actual.
6. Entering water temperature: specified and actual.
7. Leaving water temperature: specified and actual.
8. Pressure Drop: specified and actual.
9. Control Setting: specified and actual.

4.5 ENERGY RECOVERY SYSTEMS

A. Air Systems - Air energy recovery devices shall be tested at ambient temperatures of less than 40°F or greater than 85°F.
1. Energy Recovery Wheel:
a. General Requirements:
1) Drawing Symbol.
2) Location.
3) Wheel RPM.
b. Primary Air:
1) Primary Entering Air Temperature.
2) Primary Leaving Air Temperature.
3) Primary Air Pressure Drop.
4) Primary Air Flow Rate (cfm).
c. Secondary Air:
1) Secondary Entering Air Temperature.
2) Secondary Leaving Air Temperature.
3) Secondary Air Pressure Drop.
4) Secondary Air Flow Rate (cfm).
2. Coils:
a. General Requirements:
1) Drawing Symbol.
2) Location.
3) Water Flow Rate (gpm).
b. Primary Coil:
1) Primary Coil Entering Air Temperature.
2) Primary Coil Leaving Air Temperature.
3) Primary Coil Water Pressure Drop.
4) Primary Coil Entering Water Temperature.
5) Primary Coil Leaving Water Temperature.
3. Air to Air Plate Exchanger:
a. General Requirements:
1) Drawing Symbol
2) Location.
b. Primary Air:
1) Primary Entering Air Temperature.

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2) Primary Leaving Air Temperature.
3) Primary Air Flow Rate (cfm).
4) Primary Air Pressure Drop.

c. Secondary Air:
1) Secondary Entering Air Temperature.
2) Secondary Leaving Air Temperature.
3) Secondary Air Flow Rate (cfm).
4) Secondary Air Pressure Drop.

END OF SECTION

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SECTION 23 07 13 - DUCTWORK INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Ductwork Insulation.

B. Insulation Jackets.

1.2 QUALITY ASSURANCE

A. Applicator: Company specializing in ductwork insulation application with five years minimum experience. When requested, installer shall submit manufacturer's certificate indicating qualifications.

B. Materials: UL listed in Category HNKT; flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723.

C. Adhesives: UL listed, meeting NFPA 90A/90B requirements.

1.3 REFERENCES

A. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

B. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

C. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

D. ASTM E84 - Surface Burning Characteristics of Building Materials.

E. ASTM E136 - Standard Test Method for the Behavior of Materials in a Vertical Tube Furnace at 750°C.

F. ASTM E814 - Fire Tests of Through Penetrations Firestops.

G. ASTM E2336-04 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems.

H. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

I. NFPA 96 - Standard for the Installation of Equipment for Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.

J. NFPA 255 - Surface Burning Characteristics of Building Materials.

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K. UL - XHEZ - Through Penetration Firestop Systems.

L. UL 263 - Full Scale External Fire Tests with Hose Stream.

M. UL 723 - Surface Burning Characteristics of Building Materials.

N. UL 1479 - Fire Tests of Through Penetrations Firestops.

1.4 SUBMITTALS

A. Submit shop drawings per Section 23 05 00. Include product description, list of materials and thickness for each service, and location.

B. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Type A: Flexible Fiberglass - Outside Wrap; ANSI/ASTM C553; commercial grade; 0.28 / 0.26 (Out-Of-Package/Installed-Compressed 25%) maximum 'K' value at 75°F; foil scrim Kraft facing, 1.0 lb./cu. ft. density. Submit both "Out of Package" and "Installed-Compressed 25%" K and R-values.

B. Type C: Flexible Fiberglass Liner; ANSI/ASTM C1071; 0.28 maximum 'K' value at 75°F; 1.5 lb/cu ft minimum density; coated air side for 4000 fpm air velocity.

C. Type D: Rigid Fiberglass Liner; 0.23 maximum 'K' value at 75°F; smooth coated mat facing laminated to the insulation, suitable for 5000 fpm air side velocity.

D. Type E: Double wall ductwork insulation; fiberglass; 0.27 maximum 'K' value at 75°F mean temperature; 1.5 lb/cu ft density.

E. Type F: Flexible High Temperature Wrap; ASTM E2336 rating as 2-hour separation with zero clearance to combustible materials over the full length. Material to be totally scrim encapsulated. Material to be a minimum 1-1/2" thick with a minimum core density of 6 pcf. Wrap system should offer zero clearance to combustibles per ASTM E2336 at all locations, comply with all applicable codes, and be approved by AHJ. If system is not rated for zero clearance per ASTM E2336 at all locations with single layer, a two-layer system shall be provided with zero clearance per ASTM E2336 at all locations. Material must be tested and listed for installation on grease ducts and installed per listed design. Refer to Section 23 33 00 for prefabricated, pre-insulated access doors required for grease duct systems.

F. Type G: Preformed rigid fiberglass acoustical liner. ANSI/ASTM C1071; 0.23 maximum 'K' value at 75°F mean temperature; Noise Reduction Coefficient (NRC) per ASTM C423 Type "A" mounting of 0.70 0.75 for 1" thickness, 0.90 for 1.5" thickness. Liner shall be factory coated with an anti-microbial agent to prevent fungus and bacteria growth per ASTM G-21 and G-22. Max flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723.

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2.2 JACKETS

A. Vapor Barrier Jackets: Kraft reinforced foil scrim vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 25 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

2.3 JACKET COVERINGS

A. Aluminum Jackets: ASTM B209; 0.016" thick; smooth or embossed stucco finish with Z edge seams and aluminum bands for outdoor use. Where colored jacket covers are called for, provide factory-applied hard film acrylic paint in color selected by Architect.

B. Stainless Steel Jackets: Type 304 316 stainless steel; 0.010" thick; smooth finish with Z edge seams and stainless steel bands for outdoor use.

C. Laminated 5 ply, flexible, self-adhering, protective jacketing, vapor barrier and weather proofing membrane having high performance acrylic adhesive capable of installation with no additional mechanical attachment. Owner/Architect shall select from manufacturer's standard finishes. For areas exposed to high traffic or rough service, where scheduled or where shown on the drawings, use 13 ply heavy duty protective jacketing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install materials in accordance with manufacturer's instructions, codes, and industry standards.

B. Install materials after ductwork has been tested.

C. Clean surfaces for adhesives.

D. Provide insulation with vapor barrier when air conveyed may be below ambient temperature.

E. Exterior Duct Wrap - Flexible, Type A:
1. Apply with edges tightly butted.
2. Cut slightly longer than perimeter of duct to insure full thickness at corners. Do not wrap excessively tight.
3. Seal joints with adhesive backed tape.
4. Apply so insulation conforms uniformly and firmly to duct.
5. Provide high-density insulation inserts at trapeze duct hangers and straps to prevent crushing of insulation. Maintain continuous vapor barrier through the hanger.
6. Seal all penetrations of the vapor barrier by strap hangers or slip cable hangers with adhesive backed tape.
7. Tape all joints with Royal Tapes #RT 350 (216-439-7229), Venture Tape 1525CW, or Compac Type FSK. No substitutions will be accepted without written permission from the Architect/Engineer.
8. Press tape tightly to the duct covering with a squeegee for a tight continuous seal. Fish mouths and loose tape edges are not acceptable.
9. Staples may be used, but must be covered with tape.

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10. Vapor barrier must be continuous.
11. Mechanically fasten on 12" centers at bottom of ducts over 24" wide and on all sides of vertical ducts.

F. Interior Insulation - Flexible Duct Liner, Type C:
   1. Observation of Duct Lining:
      a. After installation of ductwork, Architect/Engineer may select random observation points in each system.
         1) At each observation point, cut and remove an 18" x 18" section of ductwork and liner for verification of installation.
         2) Random observation points based on one opening per 75 lineal ft. of total duct run.
      b. When any of the observation points shows non-compliance, additional points will be designated by the Architect/Engineer, and observation repeated.
      c. If 20% of points observed do not comply, remove and replace all lined ducts and repeat tests. Where replacement is not required, correct all non-compliances.
      d. At end of observation, repair all duct lining and observation holes by installing standard, insulated, hinged access doors per Section 23 33 00.
      e. Paint or finish to match adjacent duct surfaces.
   2. Impale on spindle anchors welded or mechanically fastened to the duct. Adhesive or glue fastened anchors are not acceptable. Maximum anchor spacing per SMACNA Duct Construction Standards or manufacturer's recommendations, whichever is more restrictive. Locate pins less than 3" from corners and at intervals not over 6" around the perimeter at leading and trailing edges. Locate pins within 3" of transverse joints and at intervals not over 16" long the length of the duct. Pins must be long enough to prevent compressing the insulation.
   3. In addition to anchors, secure liner with UL listed adhesive covering over 90% of the duct surface.
   4. Install per the latest edition of the SMACNA Manual.
   5. Leading edges shall be covered as follows:
      a. For duct velocities below 3000 fpm, coat leading edges with adhesive. Neatly butt liner without gaps at transverse joints. Cut liner flush with end of the duct section for tight joints with no exposed duct. If adhesive is shop installed, field apply additional adhesive to the end of each duct section for complete adhesion of the liner. Protect edges from dirt and debris.
      b. For duct velocities above 3000 fpm, cover leading edges with metal nosing. Use nosing on upstream edges of each section of duct. If the duct can be installed in either direction, provide nosing on each end or clearly mark the duct to allow visual verification after installation. Verify duct velocities based on the scheduled air flow rates and determine where metal nosing is required.
   6. Overlap liner at longitudinal joints. Make longitudinal joints at corners of the duct unless the duct size does not allow this. Coat longitudinal joints with adhesive at velocities over 2500 fpm.
   7. Seal all damaged duct liner with adhesive and glass cloth. Do not damage duct liner surface coatings.
   8. Duct dimensions given are OUTSIDE dimensions.

G. Plenum Walls - Type D:
   1. Brush apply adhesive to the wall before installing insulation. Provide 100% coverage.
   2. Apply pins to the wall with adhesive. Locate pins 15" O.C. maximum and within 2" of all insulation edges.

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3. Secure insulation to pins with speed clips and cut all pins off close to the clips. Cover raw ends of pins with glass fabric set in adhesive.
4. Cover all joints with 3" wide strips of glass fabric set in adhesive.
5. Protect all door openings with sheet metal angles.

H. Double-Wall Ductwork Insulation - Type E:
1. Install insulation per manufacturer's recommendations.
2. Duct dimensions given are net inside dimensions of inner wall.

I. Exterior Fire Protection, Flexible Type - Type F:
1. Cut and secure duct wrap around ductwork, support angles, and hangers per manufacturer's recommendations.
2. Seal all joints as required to maintain enclosure rating.
3. Installation shall be rated for 2 hours, unless otherwise noted.
4. Provide manufacturer's recommended assembly to protect all access doors to maintain enclosure rating and to permit easy replacement of insulation.

J. Preformed Fiberglass Acoustical Liner, Rigid - Type G:
1. Cut and secure duct liner inside duct.
2. Install insulation pins or adhesives in locations as recommended by the manufacturer.
3. Seal all damaged duct liner and fill all gaps with manufacturer approved sealant. Do not damage duct liner surface coatings.
4. Where edges show evidence of delamination, the damaged areas shall be secured by manufacturer approved sealant.
5. Duct dimensions given are net inside dimensions. Increase sheet metal to allow for insulation thickness.

K. Continue insulation with vapor barrier through penetrations unless code prohibits.

L. Provide 2" wide, 24" high, 26 gauge, galvanized sheet metal corner protection angles for all externally insulated ductwork extending to a floor or curb.

3.2 SCHEDULE

A. Refer to schedule on drawings.

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SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping Insulation.

B. Insulation Jackets.

1.2 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with five years minimum experience.

B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723 (where required).

1.3 REFERENCES

A. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

B. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.

C. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

D. ANSI/ASTM C534 - Elastomeric Foam Insulation.

E. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

F. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.

G. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

H. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Insulation.

I. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.

J. ASTM C1729 - Standard Specification for Aluminum Jacketing for Insulation.

K. ASTM C1767 - Standard Specification for Stainless Steel Jacketing for Insulation.

L. ASTM E84 - Surface Burning Characteristics of Building Materials.

M. NFPA 255 - Surface Burning Characteristics of Building Materials.

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N. UL 723 - Surface Burning Characteristics of Building Materials.

O. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

1.4 SUBMITTALS

A. Submit shop drawings per Section 23 05 00. Include product description, list of materials and thickness for each service, and locations.

PART 2 - PRODUCTS

2.1 INSULATION

A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75ºF; non-combustible. All purpose, white Kraft jacket bonded to aluminum foil and reinforced with fiberglass yarn, 25/50 flame spread/smoke developed rating when tested in accordance with ASTM E84 (UL 723).

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2.2 VAPOR BARRIER JACKETS

A. Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

B. Polyvinylidene Chloride (PVDC or Saran) film and tape: Durable and highly moisture and moisture vapor resistant. Please refer to manufacturer's recommended installation guidelines.

2.3 JACKET COVERINGS

A. Aluminum Jackets: ASTM C1729; 0.016" thick (thicker where required by ASTM C1729); stucco embossed finish with Z edge seams and aluminum bands for outdoor use. t.

B. Stainless Steel Jackets: ASTM C1767. Type 304 316 stainless steel; 0.010" thick (thicker where required by ASTM C1729); smooth finish with Z edge seams and stainless steel bands for outdoor use.

C. Plastic Jackets and Fitting Covers: High impact, glossy white, 0.020" 0.030" thick, self-extinguishing plastic. Suitable for use indoors or outdoors with ultraviolet inhibitors. Suitable for -40ºF to 150ºF. 25/50 maximum flame spread/smoke developed.

2.4 REMOVABLE INSULATION JACKETS

A. Removable insulation jackets shall consist of outer covering, interstitial insulation material, and inner covering.

B. Inner and outer covering shall be constructed from a minimum 16.5 oz./yd2 PTFE fiberglass composite and suitable for insulating surface temperatures up to 550ºF.

C. Interstitial insulation blanket shall be minimum 1-1/2" thick and shall consist of either:
   1. Silica and glass-fiber insulation felts and blankets - minimum 6 lb./ft3 density.
   2. E-type glass-fiber felts and blankets - minimum 6 lb./ft3 density.

D. Construction: Inner and outer covering with interstitial insulation material shall be joined into a single assembly using a double sewn lock stitch with 4-6 stitches/inch. The thread used shall be able to withstand minimum 550ºF surface temperatures without degradation. The use of hog rings, staples, and wires for closure of assembly are not acceptable. The interstitial insulation shall be sewn as an integral part of the inner and outer coverings to prevent shifting of the insulation. Insulation pins are not an allowable method of preventing the insulation from shifting and shall not be used.

E. No raw cut jacket edges shall be exposed.

F. Jackets shall be fastened to equipment and piping components using hook and loop (Velcro) straps and minimum 1" slide buckles.

G. Jacket coverings shall have an inner covering edge with a continuous strip of hook & loop closure (Velcro) that is parallel to the seam and overlaps the outer covering by a minimum of 2 inches.

H. Acceptable Manufacturers: Firwin Corp, Lewco Specialty Products, ThermaXX Jackets LLC or approved equivalent.

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PART 3 - EXECUTION

3.1 PREPARATION

A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

3.2 INSTALLATION

A. General Installation Requirements:
   1. Install materials per manufacturer's instructions, building codes and industry standards.
   2. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.

3. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a 180 deg. cylindrical segment the same length as metal shields. Inserts shall be a cellular glass (for all temperature ranges) or molded hydrous calcium silicate (for pipe with operating temperatures above 70 deg. F, with a minimum compressive strength of 50 psi. Polyisocyanurate insulation with a minimum compressive strength of 24 psi is acceptable for pipe sizes 3" and below, minimum 60 psi for pipe sizes 4" and above, and operate below 300 deg. F. Factory fabricated inserts may be used. Rectangular blocks, plugs, or wood material are not acceptable. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor. Refer to Supports and Anchors specification section for additional information.
4. Neatly finish insulation at supports, protrusions, and interruptions.
5. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.
6. Shields shall be at least the following lengths and gauges:

Pipe Size	Shield Size
1/2" to 3"	12" long x 18 gauge
4"	12" long x 16 gauge
5" to 6"	18" long x 16 gauge
8" to 14"	24" long x 14 gauge
16" to 24"	24" long x 12 gauge

7. All piping and insulation that does not meet 25/50 that is in an air plenum shall have written approval from the Authority Having Jurisdiction and the local fire department for authorization and materials approval. If approval has been allowed, the non-rated material shall be wrapped with a product that has passed ASTM E84 and/or NFPA 255 testing with a rating of 25/50 or below.

B. Insulated Piping Operating Below 60°F:
1. Insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
2. On piping operating below 60ºF in locations that are not mechanically cooled (e.g., penthouses, mechanical rooms, tunnels, chases at exterior walls, etc.), Type B insulation shall be used.
3. All balance valves with fluid operating below 60°F shall be insulated with a removable plug wrapped with vapor barrier tape to allow reading and adjusting of the valve.

C. Insulated Piping Operating Between 60°F and 140°F:
1. Do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.

D. Insulated Piping Operating Above 140°F:
1. Insulate fittings, valves, flanges, float & thermostatic steam traps, and strainers. On gate valves, the insulation shall be extended to cover the entire valve bonnet, leaving only the portion of the stem that is above the bonnet and valve operator exposed.
2. All balance valves with fluid operating above 140°F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.

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3. The use of removable insulation jackets is acceptable for insulating large and non-cylindrical shaped piping components (e.g., check valves, pressure regulating valves, calibrated balance valves, gate valve bonnets, F&T traps, strainers, line sets, and the like).

E. Refrigerant Piping:
1. On refrigerant piping (25°F and above) and not required to meet the 25/50 flame/smoke, provide at each strut or clevis support an insulation coupling to support pipe and to accept insulation thickness of adjoining insulation, to prevent insulation from sagging and crushing. The coupling shall be suitable for planned temperatures, use with specified pipe material, and shall be a 360°, one-piece cylindrical segment. Use mechanical fasteners where coupling cannot be installed on pipe during installation. Contractor shall apply adhesive to ends of insulation entering insulation coupling to maintain vapor barrier.

F. Exposed Piping:
1. Locate and cover seams in least visible locations.
2. Where exposed insulated piping extends above the floor, provide a sheet metal guard around the insulation extending 12" above the floor. Guard shall be 0.016" cylindrical smooth or stucco aluminum and shall fit tightly to the insulation.

3.3 INSULATION

A. Type A Insulation:
1. All Service Jackets: Seal all longitudinal joints with self-seal laps using a single pressure sensitive adhesive system. Do not staple.
2. Insulation without self-seal lap may be used if installed with Benjamin Foster 85-20 or equivalent Chicago Mastic, 3M or Childers lap adhesive.
3. Apply insulation with laps on top of pipe.
4. Fittings, Valve Bodies and Flanges: All fittings 3" and smaller will be insulated with factory cut 20Mil PVC Cover with fiberglass inserts matching adjoining thickness. All fittings 4" and larger will be mitered from the same thickness and type of the adjoining insulation. The 20Mil PVC Cover will be sealed on systems requiring vapor barrier

3.4 JACKET COVER INSTALLATION

A. Metal Covering:
1. Provide vapor barrier as specified for insulation type. Cover with aluminum jacket covering with seams located on the bottom of horizontal piping. Include fittings, joints and valves.
2. Seal all interior and exterior butt joints with metal draw bands and sealant. Seal all exterior joints watertight.
3. Interior joints do not need to be sealed.
4. Use metal covering on the following pipes:
   a. All exterior piping.
   b. Engine exhaust piping (interior).
   c. Cover insulation with aluminum jacketing.
5. Use aluminum jacket covers on the following pipes:
   a. All exterior piping.

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B. Plastic Covering:
   1. Provide vapor barrier as specified for insulation type. Cover with plastic jacket covering. Position seams to shed water.
   2. Solvent weld all joints with manufacturer recommended cement.
   3. Overlap all laps and butt joints 1-1/2" minimum. Repair any loose ends that do not seal securely. Solvent weld all fitting covers in the same manner. Final installation shall be watertight.
   4. All joints in areas noted shall meet USDA standards for Totally Sealed Systems, including overlaps of 1" on circumferential and 1.5" to 2" on longitudinal seams.
   5. Use plastic insulation covering on all exposed pipes including, but not limited to:
      a. All exposed piping in areas noted on drawings.
      b. All exposed piping in locker rooms.
      c. All exposed piping below 8'-0"2500 mm above floor.
      d. All piping in mechanical rooms and/or tunnels that is subject to damage from normal operations. (Example: Piping that must be stepped over routinely.)
      e. All kitchen areas.

3.5 SCHEDULE

A. Refer to schedule on drawings.

END OF SECTION

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SECTION 23 09 00 - CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Complete System of Automatic Controls.

B. Control Devices, Components, Wiring and Material.

C. Instructions for Owners.

1.2 QUALITY ASSURANCE

A. The Controls Contractor shall be a fully owned subsidiary of the control manufacturer or factory authorized installer of the major control components and has been in continuous business for at least fifteen years working for PSD in the last three years..

B. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under this section.

1.3 REFERENCES

A. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.

B. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. ANSI/ASHRAE Standard 135-2001: BACnet® - A Data Communication Protocol for Building Automation and Control Networks, including all amendments.

D. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 volts Maximum).

E. ANSI/NFPA 70 - National Electrical Code.

F. ANSI/NFPA 90A - Installation of Air-Conditioning and Ventilation Systems.

G. ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality.

H. ASHRAE 85 - Automatic Control Terminology for Heating, Ventilating, Air Conditioning.

I. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

J. ANSI/ASTM B32 - Solder Metal.

K. ASTM B280 - Seamless Copper Tube for Air Conditioning & Refrigeration Field Service.

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L. ASTM D1693 - Environmental Stress - Cracking of Ethylene Plastics.

1.4 SUBMITTALS

A. Equipment Coordination:
1. The Controls Contractor shall obtain approved equipment submittals from other contractors to determine equipment wiring connections, to choose appropriate controllers, and to provide programming.
2. Control valve selections shall be based on flow rates shown in approved shop drawings.
3. Coordinate the control interface of all equipment with the equipment manufacturers prior to submittal submission.

B. Shop Drawings:
1. Submit shop drawings per Section 23 05 00. In addition, submit an electronic copy of the shop drawings in Adobe Acrobat (.pdf) format to the Owner for review.
2. Cross-reference all control components and point names in a single table located at the beginning of the submittal with the identical nomenclature used in this section.
3. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol.
4. System Architecture: Provide riser diagrams of wiring between central control unit and all control panels. This shall include specific protocols associated with each level within the architecture. Identify all interface equipment between CPU and control panels. The architecture shall include interface requirements with other systems including, but not limited to, security systems, lighting control, fire alarm, elevator status, and power monitoring system.
5. Diagrams shall include:
   a. Wiring diagrams and layouts for each control panel showing all termination numbers.
   b. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.
   c. Identification of all control components connected to emergency power.
   d. Schematic diagrams for all field sensors and controllers.
   e. A schematic diagram of each controlled system. The schematics shall have all control points labeled. The schematics shall graphically show the location of all control elements in the system.
   f. A schematic wiring diagram for each controlled system. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the control system schematic, label it with the same name. Label all terminals.
   g. A tabular instrumentation list for each controlled system. The table shall show element name, type of device, manufacturer, model number and product data sheet number.
   h. All installation details and any other details required to demonstrate that the system will function properly.
   i. All interface requirements with other systems.

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6. The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published. The number of nodes per channel shall be no more than 80% of the defined segment (logical or physical) limit in order to provide future system enhancement with minimal infrastructure modifications.
7. Sequences: Submit a complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system. The wording of the control sequences in the submittal shall match verbatim that included in the construction documents to ensure there are no sequence deviations from that intended by the Architect/Engineer. Clearly highlight any deviations from the specified sequences on the submittals.
8. Points List Schedule: Submit a complete points list of all points to be connected to the TCS and FMCS. The points list for each system controller shall include both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, the location of the I/O device, and reference drawings. Where a control point is the same as that shown on the control system schematic, label it with the same name. Points list shall specifically identify alarms, trends, event history, archive, totalization, graphic points, and all mapped points from other systems (security systems, lighting control, fire alarm, etc.). Provide points lists, point naming convention, and factory support information for systems provided and integrated into the FMCS.
9. Damper Schedule: Schedule shall include a separate line for each damper and a column for each of the damper attributes:
    a. Damper Identification Tag.
    b. Location.
    c. Damper Type.
    d. Damper Size.
    e. Duct Size.
    f. Arrangement.
    g. Blade Type.
    h. Velocity.
    i. Pressure Drop.
    j. Fail Position.
    k. Actuator Identification Tag.
    l. Actuator Type.
    m. Mounting.
10. Valve Schedule: Valve manufacturer shall size valves and create a valve schedule. Schedule shall include a separate line for each valve and a column for each of the valve attributes:
    a. Valve Identification Tag.
    b. Location.
    c. Valve Type.
    d. Valve Size.
    e. Pipe Size.
    f. Configuration.
    g. Flow Characteristics.
    h. Capacity.
    i. Valve CV.
    j. Design Pressure Drop.
    k. Pressure Drop at Design Flow.
    l. Fail Position.
    m. Close-off Pressure.

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n. Valve and Actuator Model Number and Type.

11. Airflow Measuring Station Schedule:
    a. The manufacturer's authorized representative shall prepare the airflow measuring station submittal, or review and approve in writing the submittal prepared by the TCC prior to submission to the Architect/Engineer and prior to installation. The representative shall review air handling equipment submittals and duct fabrication drawings to ensure that all AFMS locations meet the appropriate parameters to achieve proper installation and the specified accuracy. Comply with all manufacturer's installation requirements including straight up and downstream duct lengths. Install airflow straighteners if required by the manufacturer based on installation constraints. The Architect/Engineer shall be notified for approval of any deviations.
    b. Submit product data sheets for airflow measuring devices indicating minimum placement requirements, sensor density, sensor distribution, and installed accuracy to the host control system.
    c. Submit installation, operation, and maintenance documentation.
12. Product Data Sheets: Required for each component that includes: unique identification tag that is consistent throughout the submittal, manufacturer's description, technical data, performance curves, installation/maintenance instructions, and other relevant items. When manufacturer's literature applies to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements.
13. Graphic Display: Include a sample graphic of each system and component identified in the points list with a flowchart (site map) indicating how the graphics are to be linked to each other for system navigation.
14. Software: A list of operating system software, operator interface software, color graphic software, and third-party software.
15. Control System Demonstration and Acceptance: Provide a description of the proposed process, along with all reports and checklists to be used.
16. Clearly identify work by others in the submittal.
17. Quantities of items submitted may be reviewed but are the responsibility of the Contractor to verify.

C. Operation and Maintenance Manual:
    1. In addition to the requirements of Section 23 05 00, submit an electronic copy of the O&M manuals in PDF format.
    2. Provide three complete sets of manuals.
    3. Each O&M manual shall include:
        a. Table of contents with indexed tabs dividing information as outlined below.
        b. Definitions: List of all abbreviations and technical terms with definitions.
        c. Warranty Contacts: Names, addresses, and 24-hour telephone numbers of contractors installing equipment and controls and service representatives of each.
        d. Licenses, Guarantees, and Warranties: Provide documentation for all equipment and systems.
        e. System Components: Alphabetical list of all system components, with the name, address, and telephone number of the vendor.

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f. Operating Procedures: Include procedures for operating the control systems; logging on/off; enabling, assigning, and reporting alarms; generating reports; collection, displaying, and archiving of trended data; overriding computer control; event scheduling; backing up software and data files; and changing setpoints and other variables.
g. Programming: Description of the programming language (including syntax), statement descriptions (including algorithms and calculations used), point database creation and modification, program creation and modification, and use of the editor.
h. Engineering, Installation, and Maintenance: Explain how to design and install new points, panels, and other hardware; recommended preventive maintenance procedures for all system components, including a schedule of tasks (inspection, cleaning, calibration, etc.), time between tasks, and task descriptions; how to debug hardware problems; and how to repair or replace hardware. A list of recommended spare parts.
i. Original Software: Complete original issue CDs for all software provided, including operating systems, programming language, operator workstation software, and graphics software.
j. Software: One set of CDs containing an executable copy of all custom software created using the programming language, including the setpoints, tuning parameters, and object database.
k. Graphics: A glossary or icon symbol library detailing the function of each graphic icon and graphics creation and modification. One set of CDs containing files of all color graphic screens created for the project.

D. Training Manual:
1. Provide a course outline and training manuals for each training class.

E. Record Documents:
1. Submit record documentation per Section 23 05 00.
2. Provide a complete set of "as-built" drawings and application software on CDs. Provide drawings as AutoCAD™ or Visio™ compatible files. Provide two copies of the "as-built" drawings with revisions clearly indicated in addition to the documents on compact disk. All as-built drawings shall also be installed on the FMCS server in a dedicated directory. Provide all product data sheets in PDF format.
3. Submit two hard copies and one electronic copy of as-built versions of the shop drawings, including product data and record drawings with revisions clearly indicated. Provide floor plans showing actual locations of control components including panels, thermostats, sensors, and hardware.
4. Provide all completed testing and commissioning reports and checklists, along with all trend logs for each system identified in the points lists.
5. Submit printouts of all graphic screens with current values (temperatures, pressures, etc.) to the A/E verifying completion and proper operation of all points.

1.5 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

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B. Factory-Mounted Components: Where control devices specified in this section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

1.6 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Control Valves.

B. Flow Switches.

C. Temperature Sensor Sockets.

D. Gauge Taps.

E. Automatic Dampers.

F. Flow Meters.

1.7 AGENCY AND CODE APPROVALS

A. All products shall have the following agency approvals. Provide verification that the approvals exist for all submitted products with the submittal package.
1. UL-916; Energy Management Systems.
2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "Signal Equipment."
3. EMC Directive 89/336/EEC (European CE Mark).
4. FCC, Part 15, Subpart J, Class A Computing Devices.

1.8 ACRONYMS

A. Acronyms used in this specification are as follows:

B-AAC	BACnet Advanced Application Controller
B-ASC	BACnet Application Specific Controller
BTL	BACnet Testing Laboratories
DDC	Direct Digital Controls
FMCS	Facility Management and Control System
GUI	Graphic User Interface
IBC	Interoperable BACnet Controller
IDC	Interoperable Digital Controller
LAN	Local Area Network
NAC	Network Area Controller
ODBC	Open DataBase Connectivity
OOT	Object Oriented Technology
OPC	Open Connectivity via Open Standards
PICS	Product Interoperability Compliance Statement
PMI	Power Measurement Interface
POT	Portable Operator's Terminal
TCC	Temperature Control Contractor
TCS	Temperature Control System

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WAN	Wide Area Network
WBI	Web Browser Interface

1.9 SUMMARY

A. Extend existing FMCS for this project.

1.10 SYSTEM DESCRIPTION

A. The entire TCS shall be comprised of a network of interoperable, standalone digital controllers communicating via the following protocol to an NAC. Temperature Control System products shall be as specified below.

B. The FMCS shall include Network Area Controller or Controllers (NAC) within each facility. The NAC shall connect to the Owner's local or wide area network, depending on configuration. Provide access to the system, either locally in each building or remotely from a central site or sites, through standard Web browsers, via the Internet, and/or via local area network.

C. Provide materials and labor necessary to connect factory supplied control components.

D. Provide central and remote hardware, software, and interconnecting wire and conduit.

E. The FMCS shall include automated alarming software capable of calling e-mail compatible cellular telephones and pagers. The e-mail alarm paging system shall be able to segregate users, time schedules, and equipment and be capable of being programmed by the Owner.

F. For the dedicated configuration tool provided, it is preferable that it be launched from within the applicable Network Management Software. If not, include any software required for controller configuration as a leave-behind tool with enough license capability to support the installation.

G. For each operator workstation provided, furnish one legal copy of all software tools, configuration tools, management tools, and utilities used during system commissioning and installation. All tools shall be readily available in the market. Contractor shall convey to the Owner all software tools and their legal licenses at project closeout.

H. Plastic laminate labels on all panels and major field devices screwed or riveted to the panel faces, no adhesives. Do not attach labels to replaceable devices or room thermostats or sensors. The definition of major is left to the consultant.

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1.11 SOFTWARE LICENSE AGREEMENT

A. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job-specific configuration documentation, data files, configuration tools, and application-level software developed for the project. This shall include, but is not limited to, all custom, job-specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the NAC, FMCS Server(s), and any related LAN/WAN/intranet and/or Internet connected routers and devices. Provide the Owner with all required IDs and passwords for access to any component or software program. The Owner shall determine which organizations shall be named in the SI organization ID ("orgid") of all software licenses. Owner shall be free to direct the modification of the "orgid" in any software license, regardless of supplier.

1.12 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It is this Contractor's responsibility to check the Contract Documents for possible conflicts between the Work of this section and that of other crafts in equipment location; pipe, duct and conduit runs; electrical outlets and fixtures; air diffusers; and structural and architectural features.

1.13 WARRANTY

A. Refer to Section 23 05 00 for warranty requirements.

B. Within the warranty period, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this Contractor at no expense to the Owner.

C. Warranty requirements include furnishing and installing all FMCS software upgrades issued by the manufacturer during the one-year warranty period.

D. Update all software and back-ups during warranty period and all user documentation on the Owner's archived software disks.

1.14 WARRANTY ACCESS

A. The Owner shall grant to this Contractor reasonable access to the TCS and FMCS during the warranty period.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Distech by Long Building Technologies. BacNET over IP.

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2.2 SYSTEM ARCHITECTURE

A. General:
1. The Temperature Control System (TCS) and Facility Management Control System (FMCS) shall consist of a network of interoperable, standalone digital controllers, a computer system, graphic user interface software, printers, network devices, valves, dampers, sensors, and other devices as specified herein.
2. The installed system shall provide secure password access to all features, functions and data contained in the overall FMCS.

B. Open, Interoperable, Integrated Architectures:
1. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data are not acceptable.
2. The supplied system must be able to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs are not acceptable.
3. Hierarchical or "flat" topologies are required to have system response times as indicated below and to manage the flow and sharing of data without unduly burdening the customer's internal intranet network.
a. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
b. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

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2.3 NETWORKS

A. The Local Area Network (LAN) shall be a 100 megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP. Provide support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.

B. Local area network minimum physical and media access requirements:
1. Ethernet; IEEE Standard 802.3.
2. Cable; 100 Base-T, UTP-8 wire, Category 6.
3. Minimum throughput; 100 Mbps.

C. Communication conduits shall not be installed closer than six feet from 110VAC or higher transformers or run parallel within six feet1800 mm of electrical high-power cables. Route the cable as far from interference generating devices as possible. Where communication wire must cross 110VAC or higher wire, it must do so at right angles.

D. Ground all shields (earth ground) at one point only to eliminate ground loops. Provide all shield grounding at the controller location, with the shield at the sensor/device end of the applicable wire being left long and "safed" off in an appropriate manner.

E. There shall be no power wiring more than 30 VAC rms run in conduit with communications wiring. In cases where signal wiring is run in conduit with communication wiring, run all communication wiring and signal wiring using separate twisted pairs (24awg) in accordance with the manufacturer's wiring practices.

2.4 REMOTE NETWORK ACCESS

A. For Local Area Network installations, provide access to the LAN from a remote location via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

2.5 CENTRAL DDC CONTROLLER (NAC)

A. Connect direct to field data points or individual equipment controllers.

B. Electrically isolate and otherwise protected against voltage transients, sudden drops, spikes, and power surges unless this protection is provided to the DDC system from outside itself.

C. Removable circuit boards and plug-in terminal for ease of servicing.

D. Permit special global commands such as date, time of day, history, night setback, setpoint adjustments, or summer/winter setpoint changeover that will automatically apply to all subsidiary (individual equipment) controllers.

E. 24 hours of battery backup with a programmed alarm after expiration of the recommended battery life to prompt replacement.

F. If more than one panel is required to comprise the central DDC controller, seamlessly connect them such that they will be addressable as if only a single DDC controller were operating the system.

G. Power connections

H. NEMA 1 cabinet(s) assembled, furnished and installed by the Controls Contractor.

I. Software:
   1. Multi-tasking menu driven in plain English. If programming code is used, eg, C or Pascal, provide a translator or explanatory remarks in the code so that a user unfamiliar with programming codes can understand the program. An intelligent user shall be able to add, delete, or modify any control sequence, value, schedule or assignment without additional software or proficiency in a programming language.
   2. Include but do not limit functions to:
      a. Universal inputs and outputs
      b. Digital Inputs and outputs
      c. Momentary Digital Outputs.
      d. Accumulate Pulsed Inputs, eg, KW demand.
      e. Analog Inputs.

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f. Analog Outputs with clamping.
g. Time Functions:
    1) Weekly clock: 24 hours, 8 days.
        a) Yearly clock: 365 days for holiday schedule.
h. demand limiting.
i. Control Functions.
j. Analog to Digital Converter.
k. Math and Logic Functions:
    1) Add, Subtract, Multiply, Divide.
        a) Minimum, Maximum, Average.
        b) And, Or, Exclusive or.
        c) Not and, Nor, Exclusive nor.
        d) Square root.
        e) Absolute value.
        f) Sign value.
        g) Equal or not equal to.
        h) Exponentiation.
l. Accumulation Function:
    1) Run Time Totalization with automatic alarm and reset.
        a) Analog Integration with automatic alarm and reset.
m. Alarm Functions:
    1) Digital, Analog and Hi/Lo settings and dead band.
        a) Conditional Alarms with If/Then/Else logic.
        b) Alarm Inhibiting.
        c) Fluttering Alarm Suppression.
        d) Customized Alarm Messages of at least 70 Characters.
        e) Auto dial of any alarm condition to the dumb Epson printer/modem combination or up to 5 phone numbers.
        f) Provide dry contact closures for up to seven alarms that can be wired by the owner to the security panel. Install a 1" conduit with a nylon pull line from the point where alarms are gathered to the security panel. (i.e. District freeze alarms)

3. Produce the necessary reverse acting or direct acting PID signals as required by the control sequence of the equipment being controlled.
4. Include self-diagnostic procedures for checking the LED digital displays (if any) and verify the integrity of the CPU memory and database.
5. Provide sequences to accommodate power failure, operate under emergency power and restart after power has been restored.
6. Compare up to 100 analog readings to preset high and low limits, unique to each data point, and annunciate each time a value exceeds a limit.
7. Where applicable assign each alarm points a return-to-normal dead band.
8. Any analog value resulting from a mathematical calculation shall be assignable as an alarm.
9. An alarm point can be inhibited by another digital point if desired. The condition of the digital point when the inhibit condition occurs can be operator programmed for either an open contact or a closed contact.
10. Provide time delays for alarms that are easily changed by the user.
11. Allow the operator to design, test, then implement desired ("What if") control strategies on- line without harming controlled equipment. Once satisfied with a control strategy, the user can release the controls to automatic and monitor the performance of the system.
12. Reports:

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a. Name: Returns all points with their assigned English names.
b. Type: Returns all points with their types such as analog or digital.
c. Address: Returns a list of controller addresses.
d. Status: Returns all points with a specific status; e.g., all zones in heating, all zones in cooling, all zones unoccupied, or all zones in manual override control.
1) Value: Returns all points greater to, equal to or less than a specified value. For example lists all zones with a temperature greater than 76°F.
e. History: Displays the history of a value over a specified time at specified intervals.

13. Allow "wild cards" or similar procedures to group points and functions.
14. Diagnostics:
a. Capable of self-diagnosing without a query by an operator.
b. Alarm a power failure or a communication failure with any controller to the dumb Epson printer/modem via telephone. Repeat alarms at programmable intervals while the situation remains unattended and unacknowledged. Acknowledging and silencing alarms shall be a simple procedure from a remote PC or the central controller.
15. Password Security:
a. Level 1-Proprietary: All functions available. Retained by the manufacturer and given to the District.
b. Level 2--Super: All functions available. May read or change passwords including but no higher than itself. Give to the District's project manager or mechanical engineer in a sealed envelope and do not reveal during training and demonstration sessions.
c. Level 3-Working: All functions available (Read, write and invoke). May read or change passwords including but no higher than itself. May be revealed during training and demonstrations.
d. Levels 4, 5 & 6: Functions assignable by higher passwords.
e. Level 7: Read only does not allow invoke or write ability
16. To simplify error checking and reprogramming write software in logical groups or subroutines each serving one piece of equipment or an intuitive collection. Add nonfunctional remarks in the software to explain the function of each group and identify the equipment controlled. As much as possible reuse standard routines that have been proven effective by experience and duplicate them for identical equipment.

J. Installation
1. Graphics are to be separate per unit, no relativized graphics permitted on PSD systems
2. No subcontractors permitted for programming or graphic creation on PSD systems
3. Programming contractor has standard programs, unique to PSD standardization practices that are adjusted as needed to fit the current control sequence
4. Contractor uses an in house second person verification process to assure programs meet PSD standardization and can be readily edited and understood. This includes the points having alarms, trends, graphics are all configured correctly
5. Provide a printed and electronic copy of the final sequence of operations and a point assignment list to the PSD Building Automation Controls Department.
6. Present 16 training hours in the proprietary software in addition to controls training required elsewhere. The consultant shall confer with the District prior to issuing construction documents to determine the amount of training desired.

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2.6 INDIVIDUAL CONTROLLERS

A. All individual Equipment
1. Function independently on loss of communication with the central DDC controller.
2. Capable of program changes or displaying data while in communication with:
a. A portable computer plugged into the central DDC controller.
b. A remote computer via telephone modem through the central DDC controller.
3. Locally adjustable address, setpoints and sensor scaling.
4. Control by proportional, integral, derivative or combination.
5. Proportional heating and cooling with adjustable dead band.
6. Either 0 to 10 vdc or 4 to 20 mA proportional output (except VAV boxes).
7. Internal switches (or software) for each output to change from direct to reverse acting.

B. Major Equipment Controllers
1. Locally and centrally control each item of equipment such as an air handling unit by a controller mounted on or near that piece of equipment. Preferably boiler plants or the chiller/tower combination may be operated from one controller or directly from the central DDC controller.
2. Equipment requires separate controller/s NDIO to the Jace is not acceptable unless approved by PSD
3. If not in the specification, PSD shall be consulted about required points for the equipment not listed
4. Each individual equipment controller shall have the below listed data (as applicable) readable and command able at the individual equipment controller with the plug-in computer, at the central DDC controller or from a remote computer, as applicable. Design an EIA-232 communication bus or similar capability among major equipment controllers so that the foregoing is possible.
5. Percentage data readings must state percent open. NOTE: * = Read only
a. Current building KW demand *.
b. Administration area cooling unit on or off.
c. Each air-handling unit:
1) Supply fan on/off.
2) Exhaust fan on/off.
3) Outside air damper percent open.
4) Return air damper percent open.
5) Exhaust air damper percent open.
6) Heating coil valve percent open.
7) Cooling coil valve percent open.
8) Discharge air pressure using the same pressure sensor used to set the inlet vanes.
9) Inlet vane percent open.
10) Discharge air temperature.
11) Smoke detector alarm *.
12) Freeze stat alarm *.
13) Mixed air temperature.
14) Return air temperature.
d. Outside air temperature using the sensor which resets heating water temperature*.
e. Heating system:
1) Each boiler on or off.
2) Boiler pump on or off if applicable
3) Heating water pumps on or off.

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4) Heating pump VFD speed if applicable
5) Heating system differential pressure if applicable
6) Combustion air damper position
7) HWS DP setpoint and reading
8) Heating water supply temperature.
9) Heating water return temperature *.
10) Boiler room temperature
11) Alarm status *:
    a) No heating water flow.
    b) Flame failure
    c) Heating water temperature out of limits.
    d) PSD freeze alarm (below 100-degree HWS and below 30 degrees OAT)

f. Heat pumps
1) Supply fan on or off
2) Supply air temp sensor
3) Supply air temp active DAT
4) Mixed air temp
5) Iso valve status
6) Compressor start stop
7) Compressor status
8) Reversing valve status
9) Safety status form the heat pump
10) Space temperature
11) Cooling set point
12) Heating set point
13) ERV serving the heating pump supply air temperature

g. Energy recovery roof top unit
1) Supply fan on or off
2) Supply fan VFD speed
3) Exhaust fan on or off
4) Exhaust fan VFD speed
5) Evaporative cooling on or off if applicable
6) Evaporative leaving temperature
7) Exhaust air temperature before cooling section
8) Heat wheel on or off
9) Heat wheel leaving air temperature
10) Freeze stat status
11) Smoke detector status
12) Supply duct high limit status
13) Supply air temperature
14) Supply air temperature setpoint
15) Duct static pressure setpoint
16) Duct static pressure inches water column +/-.01
17) Supply air humidity percentage

h. Roof top unit with or without DX
1) Supply fan on/off.
2) Exhaust fan on/off.
3) Outside air damper percent open.
4) Return air damper percent open.
5) Exhaust air damper percent open.

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6) Heating coil valve percent open.
7) Cooling coil valve percent open.
8) Discharge air pressure using the same pressure sensor used to set the inlet vanes.
9) Discharge air temperature.
10) Smoke detector alarm *.
11) Freeze stat alarm *.
12) Mixed air temperature.
13) Return air temperature.
14) DX on or off if applicable
15) DX cooling capacity if applicable
16) Co2 return sensor if applicable
17) Duct static pressure inches water column adjustable +/-.01
18) Duct static setpoint
19) Supply fan VFD speed if applicable

i. Fan coils
1) Supply fan start or stop
2) Supply fan status
3) Supply air temperature
4) Supply air temperature active DAT
5) Lox limit or freeze stat status
6) Hot water valve position percent open
7) Mixed air temperature
8) Mixed air damper position percent open
9) Mixed air damper minimum position percent open
10) Return air temperature
11) Space temperature
12) Active cooling set point
13) Active heating set point

j. Exhaust fans
1) Fan start or stop
2) Fan status
3) Fans on wall switches will have no alarms unless fan is for kitchen hoods

k. VAV BOX CONTROLLERS (Stadium)
1) Pressure independent control.
2) Separate adjustable heating, cooling, and fan maximum and minimum volume setpoints, if applicable.
3) Modulate the heating control valve (two-position valves are not permitted).
4) Each VAV box locally and centrally controlled by a single controller mounted accessible and near the box.
5) Readable and adjustable at each VAV box controller, the central DDC controller or from a remote computer:
6) Room heating setpoint temperature, occupied/unoccupied.
7) Room cooling setpoint temperature, occupied/unoccupied.
8) Maximum cooling velocity or cfm.
9) Minimum cooling velocity or cfm.
10) Minimum heating velocity or cfm.
11) Box fan on-off trip point (as applicable).
12) Actual supply air velocity or cfm (read only).
13) Box fan status (read only, if applicable).
14) Actual room temperature (read only).

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15) Heating valve percent open.
16) Actual supply air temperature downstream of the heating coil (read only).
17) Active supply temperature setpoint with an override
18) Actual supply air temperature (RTU supply temperature) upstream of the VAV box (read for diagnostics only).

6. INDIVIDUAL EQUIPMENT CONTROLLER SOFTWARE
   a. Routinely report to the central DDC controller.
   b. Continuously poll data for changes at minimum intervals of 100ms.
   c. Continuously accumulate data pulses up to two per second.
   d. Digital outputs in four forms; pulsed, sustained, pulse width modulated and binary staged closures.
      1) Pulsed closures: 200 milliseconds.
      2) Keep sustained closures in the commanded state until receipt of a contrary command.
      3) Vary pulse width modulation from 100ms to 255 seconds.
   e. Permit up to 25 levels of staging, e.g., boiler modules.
7. Installation
   a. Locate each individual equipment controller near the equipment served (inside the building) and label its function.

2.7 DATA COLLECTION AND STORAGE (TRENDING REQUIREMENTS)

A. The NAC shall be able to collect data for any property of any object and store resident in the NAC that shall have, at a minimum, the following configurable properties:
   1. Designating the log as interval or deviation.
   2. For interval logs, configure the object for time of day, day of week and the sample collection interval.
   3. For deviation logs, configure the object for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
   4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full or rollover the data on a first-in, first-out basis.
   5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

B. Store all log data in a relational database in the NAC that is accessible from a server (if the system is so configured) or a standard Web browser.

C. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

D. All log data shall be available to the user in ALL the following data formats:
   1. HTML.
   2. XML.
   3. Plain text.
   4. Comma or tab separated values.

E. The NAC shall archive its log data either locally (to itself) or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties:
   1. Archive on time of day.

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2. Archive on user-defined number of data stores in the log (buffer size).
3. Archive when log has reached its user-defined capacity of data stores.
4. Provide ability to clear logs once archived.

2.8 AUDIT LOG

A. Provide and maintain an audit log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:
1. Time and date.
2. User ID.
3. Change or activity: i.e., change setpoint, add or delete objects, commands, etc.

2.9 DATABASE BACKUP AND STORAGE

A. The NAC shall automatically backup its database on a user-defined time interval.

B. Store copies of the current database and, at the most, the recently saved database in the NAC. The age of the most recently saved database shall depend on the user-defined database save interval.

C. Store the NAC database in XML format to allow viewing and editing. Other formats are acceptable as long as XML format is supported.

2.10 GRAPHIC USER INTERFACE SOFTWARE

A. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu pulldowns and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line) that displays the location and the selected object identification.

B. Point Organization: Organize points by equipment categories, location, or other means acceptable to Owner.

C. Real-Time Displays: The GUI shall support the following graphic features and functions:
1. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file. Use of proprietary graphic file formats is not acceptable. In addition to, or in lieu of, a graphic background, the GUI shall support the use of scanned pictures.
2. Graphic screens shall be able to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URLs, and links to other graphic screens.

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3. Graphics shall support layering, and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.
4. Modifying common application objects, such as schedules, calendars, and setpoints, shall be accomplished graphically.
    a. Schedule times shall be adjusted using a graphic slider without requiring any keyboard entry from the operator.
    b. Holidays shall be set by using a graphic calendar without requiring any keyboard entry from the operator.
5. Commands to start and stop binary objects shall be made by selecting the object and the appropriate command from a pop-up menu. No text entry shall be required.
6. Adjustments to analog objects, such as setpoints, shall be made by selecting the object and using a graphic slider to adjust the value. No text entry shall be required.

D. System Configuration: At a minimum, the GUI shall include the necessary software and components to enable the operator to perform the following tasks with proper password access:
1. Create, delete or modify control strategies.
2. Add/delete objects.
3. Tune control loops by adjusting control loop parameters.
4. Enable or disable control strategies.
5. Generate hard copy records or control strategies on a printer.
6. Select alarm points and define the alarm state.
7. Select points to be trended and initiate the recording of values automatically.
8. View any trend as a graph.

E. On-Line Help: Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available using hypertext. All system documentation and help files shall be in HTML format.

F. Security: Each operator shall be required to log on to that system with a user name and password to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall be able to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operator's access for viewing and/or changing each system application, full screen editor, and object. Each operator shall be automatically logged off the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. Store all system security data in an encrypted format.

G. System Diagnostics: The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. Annunciate the failure of any device to the operator.

H. Alarm Console:
1. The system shall have a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and to acknowledge the alarm.

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2. When the alarm console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator are not acceptable. The use of the alarm console can be enabled or disabled by the system administrator.

2.11 WEB BROWSER CLIENTS

A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™, Firefox™, or Chrome. Systems requiring additional software to enable a standard Web browser to reside on the client machine, or manufacturer-specific browsers, are not acceptable.

B. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphic User Interface. Systems that require different views or that require different means of interacting with objects, such as schedules or logs, are not permitted.

C. The Web browser client shall provide:
1. User log-on identification and password shall be required. If an unauthorized user attempts access, display a blank web page. Implement security using Java authentication and encryption techniques to prevent unauthorized access.
2. Graphic screens developed for the GUI shall be the same screens used for the Web browser client. The web browser interface shall support all animated graphic objects supported by the GUI.
3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
4. Store all graphic screens in the Network Area Controller (NAC) without requiring any graphics storage on the client machine.
5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
    a. Modify common application objects, such as schedules, calendars, and setpoints, graphically.
        1) Schedule times shall be adjustable using a graphic slider, without requiring any keyboard entry from the operator.
        2) Holidays shall be set using a graphic calendar, without requiring any keyboard entry from the operator.
    b. Commands to start and stop binary objects shall be made by right-clicking the selected object and selecting the appropriate command from a pop-up menu. No text entry shall be required.
    c. View logs and charts.
    d. View and acknowledge alarms.
    e. Setup and execute SQL queries on log and archive information

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7. The system shall be able to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just his/her defined home page. From the home page, links to other views or pages in the system shall be possible, if allowed by the system administrator.
8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on intranet sites by specifying the Uniform Resource Locator (URL) for the desired link.

2.12 SYSTEM PROGRAMMING

A. The GUI software shall perform system programming and graphic display engineering. Access to the GUI software shall be through password access as assigned by the system administrator.

B. Provide a library of control, application, and graphic objects to enable creation of all applications and user interface screens. Applications shall be created by selecting the control objects from the library, dragging or pasting them on the screen, and linking them together using a built-in graphic connection tool. Completed applications may be stored in the library for future use. GUI screens shall be created in the same fashion. Data for the user displays shall be obtained by graphically linking the user display objects to the application objects to provide "real-time" data updates. Any real-time data value or object property may be connected to display its current value on a user display. Provide all software tools or processes to create applications and user interface displays.

C. Programming Methods
1. Provide the capability to copy objects from the supplied libraries or from a user-defined library to the user's application. Link objects with a graphic linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; e.g., internal, external, hardware, etc.
2. Configuration of each object shall be done through the object's property sheet using fill-in-the-blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration is not acceptable.
3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
4. All programming shall be done in real time. Systems requiring the uploading, editing, and downloading of database objects are not allowed.
5. The system shall support object duplication in a customer's database. An application, once configured, can be copied and pasted for easy reuse and duplication. All links, other than to the hardware, shall be maintained during duplication.

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2.13 DDE DEVICE INTEGRATION

A. The NAC shall support the integration of device data via Dynamic Data Exchange (DDE) over the Ethernet network. The NAC shall act as a DDE client to another software application that functions as a DDE server.

B. Provide the required objects in the library included with the Graphic User Interface programming software to support the integration of these devices into the FMCS. Objects provided shall include, at a minimum:
1. DDE Generic AI Object.
2. DDE Generic AO Object.
3. DDE Generic BO Object.
4. DDE Generic BI Object.

2.14 OPC SYSTEM INTEGRATION

A. The Network Area Controller shall act as an OPC client and shall support the integration of device data from OPC servers. The connection to the OPC server shall be Ethernet IP. The OPC client shall support third-party OPC servers compatible with the Data Access 1.0 and 2.0 specifications.

B. Provide the required objects in the library included with the GUI programming software to support the integration of the OPC system data into the FMCS. Objects provided shall include:
1. Read/Write OPC AI Object.
2. Read/Write OPC AO Object.
3. Read/Write OPC BI Object.
4. Read/Write OPC BO Object.
5. Read/Write OPC Date/Time Input Object.
6. Read/Write OPC Date/Time Output Object.
7. Read/Write OPC String Input Object.
8. Read/Write OPC String Output Object.

C. The NAC shall perform all scheduling, alarming, logging and global supervisory control functions of the OPC system devices.

D. The FMCS supplier shall provide an OPC client communications driver. The vendor that provided the equipment using OPC shall provide documentation of the system's OPC server interface and shall provide free factory support during system commissioning.

2.15 SOFTWARE

A. IDC/IBCs shall operate totally standalone and independent of a central computer for all specified control applications.

B. Software shall include a complete operating system (OS), communications handler, point processing, energy management application packages as specified herein, standard control algorithms and specific control sequences (IDC/IBC) and an Owner/user custom control calculation package complete with interpreter.

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C. OS software shall be PROM resident, operate in real time, provide prioritized task scheduling, control time programs, monitor and manage communications, and scan inputs and outputs.

D. Each IDC/IBC panel shall include the following energy management routines:
1. Time of day scheduling.
2. Optimum start/stop.
3. Peak demand limiting.
4. Economizer control.
5. PID control.
6. Supply air reset.
7. Outdoor air reset.

E. Input/output point processing software shall include:
1. Update of all connected input and output points at least once per second.
2. Analog to digital conversion, scaling and offset, correction of sensor non-linearity, sensing no response or failed sensors, and conversion of values to 32-bit floating point format. Retain both the maximum and minimum values sensed for each analog input in memory. It shall be possible to input subsets of standard sensor ranges to the A/D converter and assign gains to match the full-scale 32-bit conversion to achieve high accuracy readout.
3. A reasonability check on all analog inputs against previous values and discarding of values falling outside preprogrammed reasonability limits.
4. Assignment of proper engineering units and status conditions to all inputs and outputs.
5. Analog input alarm comparison with the ability to assign two individual sets of high and low limits (warning and alarm) to an input or to assign a set of floating limits (alarm a reset schedule or FMCS control point) to the input. Assign each alarm a unique differential to prevent a point from oscillating in and out of alarm. Make alarm comparisons of each scan cycle.
6. Adjustment of timing from two seconds to two minutes in one-second increments to eliminate nuisance alarms on startup.

F. Command Control software shall manage the receipt of commands from the server and from control programs.
1. Provide command delay to prevent simultaneous energizing of loads. Delay must be programmable from 0 to 30 seconds.
2. Assign each command a command and residual priority to manage conflicts created by multiple programs having access to the same command point. Allow only outputs with a higher command priority to execute. Whenever a command is allowed to execute, its assigned residual priority shall replace the existing residual priority.
3. A "fixed mode" option (override) shall allow inputs to and outputs from control programs to set to a fixed state or value. When in the "fixed mode", assign inputs and outputs high residual command priority to prevent override by application programs.

G. Alarm lockout software shall prevent nuisance alarms. On initial start-up of mechanical equipment, assign a "timed lockout" period to analog points to allow them to reach a stable condition before activating alarm comparison logic. Lockout period shall be programmable for each point from 0 to 90 minutes in one-minute increments.

H. A "hard lockout" shall also be provided to positively lock out alarms when equipment is turned off or when a true alarm depends on the condition of an associated point. Hard lockout points and lockout initiators shall be operator programmable.

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I. Runtime shall be accumulated based on the status of a digital input point. It shall be possible to totalize either on time or off time up to 10,000 hours with one-minute resolution. Runtime counts shall reside in non-volatile memory and have DCP resident runtime limits assignable through the operator's terminal.

J. A transition counter shall count the number of times a device is cycled on or off. Counter shall be non-volatile and capable of counting 600,000 cycles. Limits shall be assignable to counts to provide maintenance alarm printouts.

K. Custom IDC/IBC programs shall meet the control strategies called for in the sequence of operation of these specifications. Each IDC/IBC shall have resident in its memory and available to the programs a full library of IDC/IBC algorithms, intrinsic control operators, arithmetic, logic, and relational operators. Provide the following features:
   1. Proportional Control, Proportional plus Integral (PI), Proportional plus Integral plus Derivative (PID), and Adaptive Control (self-learning). Use Adaptive Control where the controlled flow rate is variable (such as TAB units and variable flow pumping loops). The adaptive control algorithm shall monitor the loop response to output corrections and adjust the loop response characteristics in accordance with the time constant changes imposed by variable flow rates. The algorithm shall operate in a continuous self-learning manner and shall retain in memory a stored record of the system dynamics so that, on system shutdown and restart, the learning process starts from where it left off. Standard PID algorithms are not acceptable substitutes for variable flow applications since they will provide satisfactory control at only one flow rate and will require continued manual fine tuning.
   2. All IDC/IBC setpoints, gains and time constants associated with IDC/IBC programs shall be available to the operator for display and modification via the operator workstation.
   3. The execution interval of each IDC/IBC loop shall be adjustable from 2 to 120 seconds in one-second increments.
   4. IDC/IBC control programs shall assign initialization values to all outputs so controlled devices assume a failsafe position on start-up.

L. Provide time and event programming (TEP) capability to initiate a controlled sequence of events for execution at a specific time or upon the occurrence of an event. Minimum program features required are:
   1. Analog points commandable to a specific value.
   2. Digital points commandable to a specific state; e.g. on or off; fast, slow or off.
   3. Initiator to be a specific day and time or a specific event; e.g. an alarm.
   4. Manual initiation via operator's command.
   5. Commands must honor command delays (to prevent current surges), and assigned minimum ON and OFF times.
   6. Commands must honor command and residual priority structures allowing higher priority commands (like smoke control) to override lower priority commands (like time of day scheduling) and residual priority.
   7. Ability to chain TEPs.
   8. Ability to enable and disable TEPs individually.
   9. Ability to enable/disable TEP initiators.

M. Store Energy Management application programs and associated data files in non-volatile or 72-hour battery backed RAM memory. Individual programs shall be accessible from the operator workstation for enabling/disabling and program parameter modification and shall include:
   1. Time Programs:

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a. Provide an independent start and stop program time for each system identified in the points list.
b. It shall be possible to assign two independent start and stop times/days to any equipment connected to a controller.

2. Exception Day Scheduling:
a. Provide an Exception Day program for holiday and other planned exceptions to time programs. Exception schedules shall be DSC resident and operator programmable up to one year in advance.
b. The program shall allow definition of up to 32 exception time spans. Define each span by calendar start day and calendar stop day.

3. An IDC/IBC resident temporary scheduler shall allow operators to modify present time program control of equipment. Minimum feature set required is:
a. Ability to alter time schedules as much as six days in advance.
b. Ability to alter either start time, stop time or both for each day.
c. Temporary schedule shall be in effect for all days specified.
d. Automatically delete the temporary schedule and restore program to normal schedule after execution.
e. Ability to assign schedule changes as permanent as well as temporary.

N. The IDC/IBC shall have built-in, non-descriptive, self-test procedure for checking the indication lights, digital display, and memory. It shall display advisories for maintenance, performance, and/or software problems.

O. All electronics shall be:
1. Standard locally stocked modular boards.
2. Plug-in type.
3. Furnish all ROM programs unlocked.

2.16 CONTROL DAMPERS

A. Rectangular Control Dampers - Standard Construction:
1. Shall be licensed to bear the AMCA Certified Rating Seal.
2. Test leakage and pressure drop per AMCA 500.
3. Frame: Hat-shaped channel, minimum 12 gauge extruded aluminum, and minimum 4"100 mm deep. Caulk or weld seams to prevent leakage.
4. Blades: Minimum 12 gauge extruded aluminum airfoil design, minimum 6"150 mm wide, and overlapping blades and blade seals (overlapping blade seals only is unacceptable).
5. Shaft: Non-cylindrical, solid aluminum shaft with opening in blade to match profile of shaft. Shaft shall be securely fastened to the blade and of sufficient length to mount direct-coupled actuator. Damper manufacturer shall provide drive pin extensions and outboard bearing support brackets as required.
6. Bearings: Acetal (Delrin/Celcon) inner bearing fixed to an aluminum shaft, rotating within a polycarbonate outer bearing inserted in the frame. Provide thrust bearings for vertical damper applications.
7. Blade Seals: Extruded silicone gaskets secured in an integral slot within the blade.
8. Side Seals: Stainless steel compression type or extruded silicone gasket secured in an integral slot within the frame.

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9. Linkage: Shall be concealed in the frame, constructed of aluminum or corrosion-resistant zinc plated steel, and securely fastened to shaft. Blades linked for opposed operation, unless noted otherwise on the drawings. Blades shall close evenly. Use one direct-coupled actuator per damper section. Jack-shafting is not acceptable.
10. Size Limits: 48"1220 mm maximum horizontal blade length, 24 square foot2.2 m2 maximum area per damper. Total cross-sectional area of dampers in ducts shall be at least as large as the duct without the use of blank-off sections.
11. Maximum Leakage: Class 1A at 1" w.c.0.25 kPa pressure differential for a 24"600 mmx24"600 mm damper.
12. Maximum Pressure Drop for Opposed Blade Damper: 0.15"0.04 kPa for 8,000 cfm3775 L/s through a 24"600 mmx24"600 mm damper (2000 fpm10 m/s).
13. Maximum Pressure Drop for Parallel Blade Damper: 0.08"0.02 kPa for 8,000 cfm3775 L/s through a 24"600 mmx24"600 mm damper (2000 fpm10 m/s).

B. Thermally Insulated Control Damper:
1. Shall be licensed to bear the AMCA Certified Rating Seal.
2. Test leakage and pressure drop per AMCA 500.
3. Thermally Broken Frame: Extruded aluminum, minimum 4"100 mm deep, 0.080"2 mm minimum thickness, flanged to duct. Entire frame shall be thermally broken using polyurethane resin pockets, complete with thermal cuts.
4. Blades: Minimum 12 gauge extruded aluminum airfoil design, minimum 6"150 mm wide, internally insulated with expanded polyurethane foam and thermally broken, with overlapping blades and blade seals (overlapping blade seals only is unacceptable).
5. Shaft: Non-cylindrical, solid aluminum shaft with opening in blade to match profile of shaft. Shaft shall be securely fastened to the blade and of sufficient length to mount direct-coupled actuator. Damper manufacturer shall provide drive pin extensions and outboard bearing support brackets as required.
6. Bearings: Acetal (Delrin/Celcon) inner bearing fixed to an aluminum shaft, rotating within a polycarbonate outer bearing inserted in the frame. Provide thrust bearings for vertical damper applications.
7. Side Seals: Stainless steel compression type or extruded silicone gasket secured in an integral slot within the frame.
8. Linkage: Shall be concealed in the frame, constructed of aluminum or corrosion-resistant zinc plated steel, and securely fastened to shaft. Blades linked for opposed operation, unless noted otherwise on the drawings. Blades shall close evenly. Use one direct-coupled actuator per damper section. Jack-shafting is not acceptable.
9. Size Limits: 48"1220 mm maximum horizontal blade length, 24 square foot2.2 m2 maximum area per damper. Total cross-sectional area of dampers in ducts shall be at least as large as the duct without the use of blank-off sections.
10. Maximum Leakage: Class 1A at 1" w.c.0.25 kPa pressure differential for a 24"600 mmx24"600 mm damper.
11. Maximum Pressure Drop: 0.21"0.05 kPa for 8,000 cfm3775 L/s through a 24"600 mmx24"600 mm damper (2000 fpm10 m/s).

C. Round Galvanized Steel Control Dampers:
1. Test leakage and pressure drop per AMCA 500.
2. Frame: Minimum 20 gauge galvanized steel, 10"250 mm long.
3. Bearings: Provide thrust bearings for vertical damper applications.
4. Blades: Two-layer galvanized steel, equivalent 14 gauge thickness with neoprene or polyethylene foam seal enclosed in two-piece blade construction up to 24"600 mm, 10 gauge steel over 24"600 mm.

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5. Linkage: Stainless steel, minimum 1/2"12 mm diameter shaft through 24"600 mm, 3/4"20 mm shaft over 24"600 mm size. Stainless steel bearings. Shaft shall be securely keyed to blades and of sufficient length to mount direct-coupled actuator. Install damper with the shaft horizontal to the floor. Damper manufacturer shall provide drive pin extensions and outboard bearing support brackets as required.
6. Maximum Leakage: 8 cfm3.8 L/s maximum at 1" w.c.0.25 kPa pressure differential for a 24"600 mmx24"600 mm damper.
7. Maximum Pressure Drop: 0.10"0.02 kPa for 6,280 cfm2960 L/s through a 24"600 mm damper (2,000 fpm10 m/s).

D. Round Stainless Steel Control Dampers:
1. Test leakage and pressure drop per AMCA 500.
2. Frame: Hat-shaped channel, minimum 10 gauge Type 304 stainless steel (304L or 316L for welded duct). Caulk or weld seams to prevent leakage.
3. Bearings: Provide thrust bearings for vertical damper applications.
4. Blades: Minimum 12 gauge Type 304 stainless steel construction. No seals are required.
5. Linkage: Stainless steel, minimum 1/2"12 mm diameter shaft through 12"300 mm, 3/4"20 mm shaft through 24"600 mm, 1"25 mm shaft over 24"600 mm size. Stainless steel bearings. Shaft shall be securely keyed to blades and of sufficient length to mount direct-coupled actuator. Install damper with the shaft horizontal to the floor. Damper manufacturer shall provide drive pin extensions and outboard bearing support brackets as required.
6. Maximum Leakage: 26 cfm12 L/s maximum at 1" w.c.0.25 kPa pressure differential for a 24"600 mmx24"600 mm damper.
7. Maximum Pressure Drop: 0.15"0.04 kPa for 6,280 cfm2960 L/s through a 24"600 mm damper (2,000 fpm10 m/s).

2.17 DAMPER ACTUATORS

A. General:
1. Provide position indication or verification on the outside air, return air and exhaust air dampers of air handling units larger than 15,000 cfm. An example is an analog input to the DDC panel from an actuator with feedback
2. Provide at least one operator for each 16 square feet of damper, or for each length greater than 48".
3. Modulating electric actuators with adjustable end switches to prevent over stroking are acceptable in small dampers associated with unitary equipment like exhaust fans. Consult the District if exceptions are desired or in remodel projects where no instrument air compressor exists.
4. 4-20 mA, 24 vac or 0-10 vdc for electric. Do not use 24 vdc if the actuator position must be reported.
5. VAV box actuators: capable of permanent stall operation without damage. Adjustable stop pins for stroke limits. Drive gears of nickel steel, no plastic.

B. Damper Actuators - Electronic - Spring Return:
1. Damper actuators shall be UL listed, electronic direct coupled with spring return to normal position for modulating or two-position control as noted in the sequence of control. Actuator shall be 24 VAC with proportional control, electronic overload protection to prevent actuator damage due to over-rotation and "V" bolt clamp with matching "V" toothed cradle (single bolt or setscrew fasteners not acceptable).

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2. Following power interruption, spring return mechanism shall close the damper. Mechanical spring shall be rated for a minimum of 60,000 full cycles. Provide breathable membrane in actuator housing to compensate for pressure differential and allow for 95% non-condensing relative humidity in the airstream.
3. Mount actuators with motor outside of airstream whenever possible. Unit casings shall have housing with proper weather, corrosive, or explosion-proof construction as required by application.
4. Actuators shall be rated for 60,000 full cycles at rated torque with 2-year unconditional warranty. Size actuators per damper manufacturer's recommendations.
5. Provide end switches as required for the sequence of operation.
6. Provide analog feedback signal for positive position indication. Refer to FMCS points list.

2.18 HYDRONIC CONTROL VALVES

A. General:
1. Two-position valves shall be a minimum of line size with a maximum allowable pressure drop of 2 psi.
2. Size two-way and three-way modulating valves to provide a pressure drop at full flow of 1 to 4 psi, except boiler three-way and cooling tower bypass valves shall not have a pressure drop over 2 psi.
3. Two-way valves shall be 100% tight-closing. Three-way valves shall be 100% tight-closing in both extreme positions.
4. Modulating two-way valves shall have equal percentage flow characteristics.
5. Modulating three-way valves shall have linear flow characteristics.
6. Piping geometry correction factors for Cv ratings shall be used and stated for ball valves, butterfly valves, or non-characterized valves.
7. Flanged cast iron in sizes 2-1/2" and larger, otherwise bronze. Seat and inner valve material of hardened steel. Sizes 2" and smaller with soldered or threaded connections.
8. Spring return to the normal position in the absence of control power, that is, fail with the heating valves open and the cooling valves closed.
9. Modulating electric actuators with adjustable end switches to prevent over stroking are acceptable in sizes <1". Use electric actuators for larger sizes.

B. Two-position:
1. Ball 2" and under:
   a. Design Pressure: 400 psia
      1) Design Temperature: 212ºF
      2) Design Flow Differential Pressure Rating: 150 psi
   b. Bronze body, stainless steel stem, chrome plated brass or stainless steel full port ball, PTFE or RTFE seats and seals, screwed ends (solder ends are acceptable only if rated for soldering in line with 470ºF melting point of 95-5 solder).
2. Ball 3" to 6":
   a. Design Pressure: 200 psi1380 kPa
      1) Design Temperature: 212ºF100°C
      2) Design Flow Differential Pressure Rating: 35 psi241kPa
   b. Cast iron body, stainless steel stem, stainless steel full port ball, PTFE or RTFE seats and seals, flanged ends.
3. Butterfly 2-1/2" to 12":
   a. Design Pressure: 125 psi

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1) Design Temperature: -20ºF to 212ºF
2) Design Flow Differential Pressure Rating: 50 psi

b. Cast iron body, stainless steel stem with extended neck, aluminum-bronze or nickel-plated iron disc, EPDM seats and seals, fully lugged ends.

C. Modulating:

1. Globe 1/2" to 2":
   a. Design Pressure: 250 psi
      1) Design Temperature: 212ºF
      2) Design Flow Differential Pressure Rating: 35 psi
   b. Bronze body, trim and plug; stainless steel stem; stainless steel or bronze seat; EPDM or PTFE packing; threaded ends.
2. Globe 2-1/2" to 6":
   a. Design Pressure: 125 psi
      1) Design Temperature: 250ºF
      2) Design Flow Differential Pressure Rating: 25 psi
   b. Cast iron body, bronze or brass trim and plug; stainless steel stem; bronze seat; EPDM or PTFE packing; flanged ends.
3. Ball 2" and under:
   a. Design Pressure: 400 psi
      1) Design Temperature: 212ºF
      2) Design Flow Differential Pressure Rating: 35 psi
   b. Bronze or brass body, nickel plated brass or stainless steel stem, chrome plated brass or stainless steel ball, PTFE or RTFE seats and seals, screwed ends (solder ends are acceptable only if rated for soldering in line with 470ºF melting point of 95-5 solder).
4. Ball 3" to 6":
   a. Design Pressure: 200 psi
      1) Design Temperature: 212ºF
      2) Design Flow Differential Pressure Rating: 35 psi
   b. Cast iron body, stainless steel stem, stainless steel full port ball, PTFE or RTFE seats and seals, flanged ends.
5. Butterfly 2-1/2" to 12":
   a. Design Pressure: 125 psi
      1) Design Temperature: -20ºF to 212ºF
      2) Design Flow Differential Pressure Rating: 50 psi345 kPa
   b. Cast iron body, stainless steel stem with extended neck, aluminum-bronze or nickel-plated iron disc, EPDM seats and seals, fully lugged ends.

2.19 VALVE ACTUATORS

A. General:

1. Actuators shall be sized to operate the valve through its full range of motion and shall close against pump shutoff pressure without producing audible noise at any valve position.
2. Provide visual position indication.
3. Mount actuator directly on valve or provide linear motion assembly as required for valve type.

B. Valve Actuators - Electronic:

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1. Actuator shall be UL listed and provided with NEMA housing for applicable environment, electronic overload protection to prevent actuator damage due to over-rotation, and "V" bolt clamp with matching "V" toothed cradle (single bolt or setscrew fasteners not acceptable).
2. Actuators shall be rated for 60,000 full stroke cycles at rated torque. Stall motor not acceptable.
3. Tri-state/floating actuators shall have auto-zeroing function for realigning valve position.
4. Proportional actuator position shall be proportional to analog or pulse width modulating signal from electronic control system.
5. Spring return actuators shall have an internal spring return mechanism. Non-mechanical forms of fail-safe operation are not acceptable.
6. Provide analog feedback signal for positive position indication as required by control diagrams.

2.20 CONTROL INSTRUMENTATION

A. Temperature Measuring Devices:
   1. Electric Thermostats:
      a. Single Temperature - Line Voltage Electric: Integral manual ON/OFF/AUTO selector switch, minimum dead band of 5ºF3°C, concealed temperature adjustment, locking cover, rated for load, single or double pole as required.
      b. Single Temperature - Low Voltage Electric: Integral manual ON/OFF/AUTO selector switch, minimum dead band of 5ºF3°C, anticipator circuits, concealed temperature adjustment, locking cover, 24 V control transformer (if not included with unit under control), single or double pole as required.
   2. Low Limit Switch:
      a. Line voltage liquid-filled type responsive only to the lowest temperature sensed along any one-foot length of its element.
      b. Adjustable.
      c. Auto reset.

B. Temperature Sensors:
   1. Room Temperature Sensor:
      a. Sensor with Setpoint Adjustment and LCD display: Two-piece construction, ventilated plastic enclosure, white in color, thermistor sensing element or resistance temperature device (RTD), 45°F7°C to 90°F32°C operating range, ± 0.50°F0.25°C accuracy, with exposed single setpoint adjustment.
         1) Provide setpoint ajustment and LCD display for all occupied areas.
         2) Provide LCD display only with guards for gyms, exercise, athletic flex rooms, corridors, restrooms, locker rooms, commons, auditorium.
            a) Basis of Desing Allure EC-Smart-Vue-CM with intergral motion detector.
      b. 1K, 10K, 20K type 2 or 3 Thermistor or platinum RTD, Accuracy ±1°F. Do not use RTDs that require transmitters
   2. Duct Temperature Sensor:
      a. Minimum range 32°F to 110°F, accuracy ±1°F, repeatable 1.5% of range. Use averaging elements, not bulbs.
   3. Water Temperature Sensor:

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a. Insert in a pipe well and immerse in a substance designed to enhance heat transfer and rapid response. Minimum range 35°F to 220°F, 1% accuracy, repeatable within 1% of range.

4. Outdoor Air Temperature Sensor
   a. Approved manufacturers: Mamac 205 F, high resistance change versus temperature change, designed for outdoor mounting insulated from the building on north facing wall and out of the sun, minimum range -20 to +110°F, accuracy ±1°F, repeatable within 1/2°F.

C. Humidity Measuring Devices:
   1. Humidity Sensors: Fully electronic with no moving parts or parts requiring periodic service. Accuracy shall be ± 2% of reading.
   2. Humidistats:
      a. Room Humidistats: Wall-mounted, proportioning type, with adjustable 2% RH throttling range, operating range from 30% to 80% at temperatures up to 110ºF43°C, cover with concealed setpoint.
      b. Duct Humidistats: Proportioning insertion type, with adjustable 2% RH throttling range and operating range from 20% to 80% at temperatures up to 150ºF66°C.
      c. High Limit Duct Humidistat: 2-position insertion type, with differential maximum 2% RH.
   3. Acceptable manufacturer: MamacHU-224-2

D. Pressure Measuring Devices
   1. Differential Pressure Switches:
      a. Standard Pressure Switches:
         1) Diaphragm-activated gauge with 4-3/4"120 mm dial, cast aluminum case, sealed interior, designed to resist shock and vibration, and rated for 15 psig105 kPa gauge.
         2) Accuracy shall be ± 3% of full scale maximum throughout entire range at 70ºF.
         3) Provide mounting brackets, probes, and shutoff valves required for proper installation.
         4) The range and service shall be as required for application or as noted on the drawings.
         5) The range and services shall be as follows:
            a) a)
         6) Provide two (2) photo-transistor-activated circuits and two (2) DPDT relays for both high or low limit alarms or controls.
            a) Provide latching relays that require manual reset once activated.
            b) Acceptable Manufacturer: Dwyer Photohelic Series 3000.
      b. High Pressure Switches (Manual Reset):
         1) Differential pressure switch with single pole, double-throw snap switch and enclosure.
         2) Rated for pressure specified in sequence of control.
         3) Electrical rating shall be 15 amps at 120-480 volts.
         4) Setpoint adjustment shall be screw type located inside enclosure.
         5) Provide optional manual reset for overpressure protection with all tubing, brackets, and adapters.
         6) Repeatability: ± 3%.
   2. Pressure Transmitters/Transducer:
      a. Select device suitable for intended application; water or air, static or differential.

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b. Select for appropriate range, including negative if applicable.
c. 100% solid state device, temperature compensated, suitable for pressures of 200% rated range with averaging to stabilize output, accuracy of ± 1% full scale, and a 4-20 mA output.
d. Provide a NEMA 4 enclosure unless panel mounted.
e. Air service shall have a minimum of three field selectable ranges.
f. When used for room pressure control, the transducer shall be bidirectional with a range of ± 0.1" W.C25 Pa.
g. Provide pressure line outlet cover on both sides of the wall when used for room pressure control.
h. Furnish with integral LED's to indicate Zero Pressure, Pressure In Range, and Pressure Out Of Range as a diagnostic aid.
i. Differential Building Static pressure: vary output voltage linearly. Range: -0.1 to 0.1" W.C. with an accuracy of 2% of its range, repeatable to 0.5% of range.
j. Fully adjustable (not fixed)0-25psi fixed range.
k. Approved manufacturers: Differential Pressure Transducer-Dwyer 629-03-CH-P2-E5-S1 Submit others to District for approval.

E. Flow Measuring Devices:
1. Flow Switches:
a. Suitable for the intended application (water or air system).
b. Pressure differential type with SPDT contacts. Do not use paddle switches except where required to maintain a warranty or where other devices would not work reliably. If in doubt, check with the District. Use McDonnell-Miller FS4-3 or approved equal.
c. Use current switches to prove low head pump flow where appropriate.
2. Airflow Measuring Stations:
a. Duct Mounted Airflow Measuring Stations (AFMS) - Thermal Dispersion:
1) Provide airflow/temperature measurement devices where indicated on the plans.
2) Each AFMS shall consist of one or more sensor probes and a single, remotely mounted, microprocessor-based transmitter capable of independently processing up to 16 independently wired sensor assemblies.
a) Each sensor assembly shall contain two individually wired, hermetically sealed bead-in-glass thermistors.
b) Thermistors shall be mounted in the sensor assembly using a marine-grade, waterproof epoxy. Thermistor leads shall be protected and not exposed to the environment.
c) Devices using chip-in-glass or diode-case chip thermistors are not acceptable.
d) Devices using less than two thermistors in each sensor assembly are not acceptable.
e) Devices using platinum wire RTDs are not acceptable.
f) Devices having electronic circuitry mounted in or at the sensor probe are not acceptable.
g) Pitot tubes and arrays are not acceptable.
h) Vortex shedding devices are not acceptable.
3) All Sensor Probes:
a) Each sensor assembly shall independently determine the velocity and temperature at its measurement point.

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b) Each sensor assembly shall be calibrated at a minimum of 16 airflow rates and 3 temperatures to standards that are traceable to the National Institute of Standards and Technology (NIST).
c) Airflow measuring station assembly accuracy shall be +/-2% of Reading over the entire operating airflow range. Temperature accuracy shall be +/-0.15° F0.07°C between -20° F-29°C and 160° F71°C.
d) The operating humidity range for each sensor probe shall be 0-99% RH (non-condensing).
e) Each sensor probe shall have an integral, UL listed, plenum rated cable and terminal plug for connection to the remotely mounted transmitter. A single manufacturer shall provide both the airflow/temperature measuring probe(s) and transmitter for each measurement location.
f) The number of probes shall be as recommended by the manufacturer to achieve the specified accuracy.

4) Duct and Plenum Probes:
a) Probes shall be constructed of extruded, gold anodized, 6063 aluminum tube. All wires within the aluminum tube shall be Kynar coated.
b) Probe assembly mounting brackets shall be constructed of 304 stainless steel.
c) The operating airflow range shall be 0 to 5,000 FPM unless otherwise indicated on the plans.

5) Sensor Density:

Area (sq.ft. m2)	Total # of Sensors Required
< 2 0.2	4
2 0.2 to < 4 0.4	6
4 0.4 to < 8 0.75	8
8 0.75 to < 16 1.5	12
≥? 16 1.5	16

6) Transmitters:
a) The transmitter shall have an integral 16-character alphanumeric LCD display capable of simultaneously displaying individual airflow and temperature.
b) The transmitter shall be capable of field configuration and diagnostics using an on-board interface and LCD display.
c) The operating temperature range for the transmitter shall be -20° F29°C to 120° F71°C.
d) The transmitter shall be capable of communicating with other devices using one of the following interface options:
a) Linear analog output signals for airflow and temperature: Field selectable, fuse protected and isolated, 0-10VDC/4-20mA (4-wire)
b) RS-485: Field selectable BACnet-ARCNET, BACnet-MS/TP, Modbus-RTU or Johnson Controls N2-Bus. BACnet devices shall provide analog variables for airflow and temperature containing individual sensor airflow rate and temperature data.

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c) 10 Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP, Modbus-TCP and TCP/IP. Provide dynamic link libraries and VBA functions to interface Ethernet devices to Microsoft Excel for remote monitoring of airflow and temperature using a Windows 2000 or Windows XP based PC.
d) LonWorks Free Topology

F. Current Measuring Devices:
1. Current Switches for Constant Speed Motors:
a. Digital device rated for amperage load of motor or device with split core design, adjustable high and low trip points, 600 VAC rms isolation, induced power from the monitored load, LED indicator lamps for output status and sensor power. The device shall sense overloading, belt-loss, and power failure with a single signal.
2. Current Switches for Motors Controlled by VFD:
a. Digital device rated for amperage load of motor or device with split core design, factory programmed to detect motor undercurrent conditions on variable or constant volume loads, self-calibrating, positive status indication, LED indicator lamps, 600 VAC rms isolation, induced power from the monitored load with NO output. The current sensor shall store the motor current operating parameters in non-volatile memory and have a pushbutton reset to clear the memory if the operating parameters change or the sensor is moved to another load. The device shall sense overloading, belt-loss, and power failure with a single signal. The sensor shall be mounted on the load side of variable frequency drives.
3. Use adjustable CT switches on motors to provide fan status input points into the DDC panel.
4. Use adjustable CT on pump motors to provide pump status input points into the DDC

G. Occupancy Sensors:
1. Use auxiliary contacts on sensor provided and installed by the Electrical Contractor. Refer to electrical drawings for sensor location and specifications. Coordinate with Electrical Contractor.

H. Carbon Monoxide Sensors:
1. Solid-state gas sensor/transmitter, NEMA 1 NEMA 4X gasketed enclosure, normal operating temperature 0-120°F50°C, normal relative humidity operation 5-95%, ± 5% accuracy, and detection range of 0-200 ppm.
2. Provide 4-20 mA output from the sensor to the FMCS system.
3. Provide local alarm whenever carbon monoxide level exceeds 100 ppm.
4. Install in accordance with OSHA requirements.
5. Unit shall be factory calibrated and shall be re-calibrated after installation per manufacturer's recommendations.

I. Carbon Dioxide Sensors:
1. Return sensor acceptable manufacturer: Kele KCD-D
2. Room sensor acceptable manufacturer: Kele KCD-W

J. Indicators:
1. Interface each indicator with remote sensor/controller to display measured value.
2. Supply selector switches for multiple indicators that show which variable is being measured.
3. Accurate and repeatable to ±0.5% of the measured variable's maximum value.

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4. Electro mechanical device or panel mounted back screen display.
5. Indicators are not required for values that can be reported by the DDC system.

K. Miscellaneous Devices:
1. Control Relays:
   a. Form "C" contacts rated for the application with "push-to-test" contact transfer feature and an integral LED to indicate coil energization.
   b. Mount all relays and power supplies in a NEMA 1 NEMA 12 enclosure beside the FMCS panel or controlled device and clearly label their functions.
   c. Relays for isolation of point and HOA control acceptable manufacturer: RIBU1S
2. Thermostat and Sensor Enclosures:
   a. Clear plastic guard with lock. Wire guard with tamperproof screws. Fasten to wall separately from thermostat. Provide guards in all corridors, gymnasiums, locker rooms, toilet rooms, assembly halls and as noted on the drawings. Kele ATK04.
3. Twist Timers:
   a. Wall-mounted heavy duty, with rotary dial and face graduated in minutes or hours as noted. Unit shall fit behind standard "decorator" wall plate. Color of timer and face plate shall match remainder of project. Verify with Electrical Contractor. Provide wall plate and engraved plastic label indicating service.
   b. Switch shall be rated for 20 amps at 125 volts (10 amps at 277 volts) and fit standard 2-1/2"65 mm deep electrical box.
   c. Provide time cycle noted on the drawings or in the specifications; up to 12 hours.
   d. Acceptable Manufacturers: Paragon SWD Series, Tork A500 Series, Intermatic FD Series, or Marktime Series 93.
4. Wind dampening "weather head" on each atmospheric pressure sensing point; e.g., Dwyer A-306. Locate above wind eddies caused by the building structure and roof equipment.
5. Shielded cable on critical communication and sensor lines as recommended by the manufacturer or advised by the consultant.
6. Flow (paddle) Switches shall be used where required to prove flow through low head pumps. Provide isolation valves and unions on both sides of flow switches.

2.21 CONDUIT AND BOXES

A. Conduit and Boxes: Refer to Electrical Section 26 05 33 for materials , sizing, and other requirements

B. Conduit and Box Identification (Color and Labeling):
1. Refer to the Temperature Control Contractor notes located on the mechanical cover sheet for raceway and box color requirements.
2. Refer to Electrical Section 26 05 53 for raceway and box labeling requirements.

2.22 WIRE AND CABLE

A. Wire and Cable: Refer to Electrical Section 26 05 13 for wire and cable materials.
1. Wire and Cable Color: Refer to the Temperature Control Contractor notes located on the mechanical cover sheet for wire and cable color requirements.

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PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Verify that systems are ready to receive work. Beginning of installation means installer accepts existing conditions.

B. Install system and materials in accordance with manufacturer's instructions.

C. Drawings of the TCS and FMCS network are diagrammatic only. Any apparatus not shown but required to meet the intent of the project documents shall be furnished and installed without additional cost.

D. Install all operators, sensors, and control devices where accessible for service, adjustment, calibration, and repair. Do not install devices where blocked by piping or ductwork. Devices with manual reset or limit adjustments shall be installed below 6'-0" if practical to allow inspection without using a ladder.

E. Verify locations of wall-mounted devices (such as thermostats, temperature and humidity sensors, and other exposed sensors) with drawings and room details before installation. Coordinate mounting heights to be consistent with other wall-mounted devices. Maximum height above finished floor shall not exceed 48". Install all wall-mounted CO2 sensors between 3 feet and 6 feet above the floor.

F. Provide valves over 3/4" size with position indicators and pilot positioners where sequenced with other controls.

G. Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle iron supports. One cabinet may accommodate more than one system in same equipment room.

H. After completion of installation, test and adjust control equipment.

I. Check calibration of instruments. Recalibrate or replace.

J. Furnish and install conduit, wire, and cable per the National Electric Code, unless noted otherwise in this section.

K. All controls associated with the proper operation of air handling units, pumps, or other mechanical equipment served by emergency power shall be connected to the emergency power system. Control components shall be powered from the equipment branch optional standby branch of emergency power. In no instance shall panel be connected to the life safety or critical branch of the emergency power system. Panels may be connected to a common 20 amp, 120 volt circuit provided the total load on the circuit does not exceed 16 amps. Circuit conductors shall be sized per the table below. All power connections to the control panels shall be performed by a licensed electrician at the cost of this Contractor. Submit circuit information (total amperage on circuit, conductors length, and panel) for control panels to the Architect/Engineer for approval.

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L. All hardware, software, equipment, accessories, wiring (power and sensor), piping, relays, sensors, power supplies, transformers, and instrumentation required for a complete and operational FMCS system, but not shown on the electrical drawings, are the responsibility of the TCC.

M. Labels For Control Devices:
1. Provide labels indicating service of all control devices in panels and other locations.
2. Labels may be made with permanent marking pen in the control panels if clearly legible.
3. Use engraved labels for items outside panel such as outside air thermostats.
4. Labels are not required for room thermostats, damper actuators and other items where their function is obvious.

N. VFDs:
1. This project includes several variable frequency drives to control the flow of fans and/or pumps based on a control variable.
2. Verify output signal required, 4-20 mA or 0-10V dc, with the EC.
3. If VFD has a bypass feature, auxiliary contacts on the drive may not be used for motor status. A separate relay must be used to indicate motor rotation in either hand or auto positions.
4. If a separate current transmitter or switch is indicated for status, install this device between the VFD and the motor. In this case, the drive status may be connected to the auxiliary contacts in the VFD.
5. Some devices, such as low limits and fire alarm shutdown relays, must be hardwired to the fan motor. Make connections such that fan will shut down whether in hand or auto position if the unit has a bypass feature.

O. Airflow Stations:
1. The transmitter shall be installed at a location that is protected from weather, water, and vibration.
2. Mount transmitter where they can easily be read (36"900 mm to 66"1680 mm above floor). Do not fasten transmitters directly to ductwork or compromise duct insulation.
3. The manufacturer's authorized representative shall visit the project site during construction prior to station installations to confirm all submitted sizes, mounting requirements and locations. Size adjustments shall be made at no additional cost. The representative shall meet on site with the TCC to support and train them on proper installation procedures and calibration.
4. Install labels at each sensor and transmitter identifying its service.

P. Use adjustable CT switches on motors to provide fan status input points into the DDC panel.

Q. Use adjustable CT on pump motors to provide pump status input points into the DDC

R. The Controls Contractor is responsible for preassembling and installing panels and all hardware with his own employees, proving the system and training District people in its proper function and maintenance.

S. Wiring, conduit placement and the installing of actuators and related linkage may be subcontracted to a District approved installer but in this case the controls contractor shall label and connect all wiring terminations and be responsible for the subcontractor's work.

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T. Plenum rated cable inside of plenums. Wiring suspended neatly from the overhead structure. Do not support on top of ceiling tiles. Minimum wire size, 18 AWG stranded.

U. Number or color code wiring terminals and provide a cross reference to ease later checkout and diagnosis.

V. Place exposed control wiring in conduit with proper identification.

W. Controllers above ceiling shall be in a PSD approved enclosure and approved location only when necessary

3.2 GRAPHIC DISPLAY

A. Create a customized graphic for each piece of equipment indicated on the itemized points list.

B. Components shall be arranged on graphic as installed in the field.

C. Include each graphic point listed in the itemized points list using real time data.

D. Provide a graphic representation of the following:
1. Where there are multiple buildings, color code the campus map by the systems serving that building. The building graphic shall be linked to the graphic for that building's systems.
2. Where there are multiple floors, provide color codes/designations for the areas served by each AHU and TAB by floor.
3. Where multiple AHUs serve one floor, color code the areas served by each AHU. The area shall be linked to the graphic for that area's AHU.
4. Provide an overall floor plan of each floor of the building color coded by zone linked to the TAB for that zone. The zone shall be linked to the graphic for that zone's TAB graphic.
5. Show the location of each thermostat on the floor plan.
6. Provide separate graphics showing the chilled and heating water system flow diagram. Show temperatures and flows on the flow diagram. Each piece of equipment shown on the flow diagram shall be linked to the graphic for that piece of equipment.
7. Provide a graphic showing the steam system flow diagram. Show pressures and flows on the flow diagram. Each piece of equipment shown on the flow diagram shall be linked to the graphic for that piece of equipment.

E. The FMCS shall include full graphic operator interface to display the following graphics as a minimum:
1. Home page to include a minimum of six critical points: Outside Air Temperature, Outside Air Relative Humidity, Enthalpy, KWH, KW, etc.
2. Graphic floor plans accurately depicting rooms, walls, hallways, and showing accurate locations of space sensors and major mechanical equipment.
3. Detailed graphics for each mechanical system including AHUs, ERUs, EFs, chillers, and boilers, as a minimum.
4. Access corresponding system drawings, technical literature, and sequences of operations directly from each system graphic.

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F. The FMCS shall include individual graphical buttons to access the following data stored in PDF format:
   1. Project control as-built documentation including all TCS drawings, diagrams and sequences of operation.
   2. TCS Bill of Material for each system, e.g. AHU, RTU, FCU, boiler, etc.
   3. Technical literature specification data sheets for all components listed in the TCS Bill of Material.

3.3 CONTROL CABINETS

A. Accurately labeled terminal strips representative of the control drawings

B. Labeled wires to exterior devices and on interior cabinet wiring

C. Labeled relays, transformers and safeties

D. Controller labeled to corresponding device/s

E. GFI protected outlet for computer charging station

F. Power supply disconnect for the entire cabinet

G. Transformers to have a resettable overload

H. PSD freeze alarm relay to have points available to land to the PSD burglar alarm panel (landed by PSD personnel)

I. Properly sized wire tracking

J. Controllers need to have HOA's for ease of testing

K. Ethernet cable to be provided by PSD to meet IT spec (if required for Jace connection)

L. Jace controllers shall be Tridium 8000 unless otherwise approved by PSD (if a Jace enclosure), with no NDIO board attached to the Jace unless approved by PSD

3.4 CONDUIT AND BOXES INSTALLATION

A. Conduit and Box Installation: Refer to Electrical Section 26 05 33 for execution and installation.

B. Conduit and Box Identification (color and labeling) installation. Refer to Electrical Section 26 05 53 for raceway and box identification installation.

C. Outlet Box Schedule: Thermostat/temperature sensor:
   1. Dry Interior Locations: Provide 4"100mm square galvanized steel with raised cover to fit flush with finished wall line. When located in concrete block walls, provide square edge title cover of sufficient depth to extend out to face of block or masonry boxes.
   2. Other Conditions: Refer to Electrical Section 26 05 33 for requirements.

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3.5 WIRE AND CABLE INSTALLATION

A. Wire and Cable Installation: Refer to Electrical Section 26 05 13 for execution and installation.

B. Field Quality Control:
   1. Inspect wire and cable for physical damage and proper connection.
   2. Torque test conductor connections and terminations to manufacturer's recommended values.
   3. Perform continuity test on all conductors.
   4. Protection of cable from foreign materials:
      a. It is the Contractor's responsibility to provide adequate physical protection to prevent foreign material application or contact with any cable type. Foreign material is defined as any material that would negatively impact the validity of the manufacturer's performance warranty. This includes, but is not limited, to overspray of paint (accidental or otherwise), drywall compound, or any other surface chemical, liquid or compound that could come in contact with the cable, cable jacket or cable termination components.
      b. Overspray of paint on any cable, cable jacket or cable termination component will not be accepted. It shall be the Contractor's responsibility to replace any component containing overspray, in its entirety, at no additional cost to the project. Cleaning of the cables with harsh chemicals is not allowed. This requirement is regardless of the PASS/FAIL test results of the cable containing overspray. Should the manufacturer and warrantor of the structured cabling system desire to physically inspect the installed condition and certify the validity of the structured cabling system (via a signed and dated statement by an authorized representative of the structured cabling manufacturer), the Owner may, at their sole discretion, agree to accept said warranty in lieu of having the affected cables replaced. In the case of plenum cabling, in addition to the statement from the manufacturer, the Contractor shall also present to the Owner a letter from the local Authority Having Jurisdiction stating that they consider the plenum rating of the cable to be intact and acceptable.

C. Installation Schedule:
   1. Conduit terminations to all devices installed in applications with rotating equipment, expansion/contraction or vibration shall be made with flexible metallic conduit, unless noted otherwise. Final terminations to exterior devices installed in damp or wet locations shall be made with liquidtight flexible metallic conduit. Terminations in hazardous areas, as defined in the National Electrical Code, shall be made with flexible conduit rated for the environment.

3.6 FMCS INSTALLATION

A. Coordinate voltage and ampacity of all contacts, relays, and terminal connections of equipment being monitored or controlled. Voltage and ampacity shall be compatible with equipment voltage and be rated for full ampacity of wiring or overcurrent protection of circuit controlled.

B. Naming Conventions: Coordinate all point naming conventions with Owner standards. In the absence of Owner standards, naming conventions shall use equipment designations shown on plans.

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3.7 COMMISSIONING

A. Upon completion of the installation, this Contractor shall load all system software and start up the system. This Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to ensure that the system is functioning in full accordance with these specifications.

B. This Contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the FMCS system operation.

C. This Contractor shall prove that the controls network is functioning correctly and within acceptable bandwidth criteria and shall test the system with an approved protocol analysis tool. Provide a log and statistics summary showing that each channel is within acceptable parameters. Each channel shall be shown to have at least 25% spare capacity for future expansion.

D. Upon completion of the performance tests described above, repeat these tests, point by point, as described in the validation log above in the presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

E. System Acceptance: Satisfactory completion is when this Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.8 PREPARATION FOR BALANCING

A. Verify that all dampers are in the position indicated by the controller (e.g., open, closed or modulating).

B. Check the calibration and setpoints of all controllers.

C. Check the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.

D. Check that all sequences operate as specified. Verify that no simultaneous heating and cooling occurs, unless specified. Observe that heating cannot begin at TAB reheat terminals until the unit is at the minimum cfm airflow.

E. Verify the operation of all interlock systems.

3.9 TEST AND BALANCE COORDINATION

A. The Contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.

B. The Contractor shall provide a minimum of four (4) hours training for the Balancing Contractor in the use of these tools.

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C. In addition, the Contractor shall provide a qualified technician to assist in the test and balance process until the first 20 terminal units are balanced.

D. The tools used during the test and balance process shall be returned at the completion of the testing and balancing.

3.10 ACCESSIBILITY

A. Install all control devices in "Readily Accessible" locations not above any hard lid ceilings unless within 2 feet of the access hatch.

B. All devices (sensors, VAV controllers, remote controllers) accessible from a 6 ft ladder, or approved by PSD personnel

C. Above ceiling controllers shall be located on the equipment or as close to equipment as possible, to be approved and located by PSD personnel

D. Corresponding transformers shall be mounted on the outside of the controller enclosure with the wiring step down inside the enclosure

E. Sensor and controller locations to be labeled with adhesive labels on the drop ceiling grid, and identified on the construction drawings

3.11 DEMONSTRATION AND ACCEPTANCE

A. At completion of installation, provide two days minimum instruction for operators. Demonstrate operation of all controls and systems. Describe the normal operation of all equipment.

3.12 TRAINING

A. On-Site:
1. After completion of commissioning, the manufacturer shall provide 18 hours of training on consecutive days for 4 Owner's representatives. The training course shall enable the Owner's representatives to perform Day-to-Day Operations as defined herein. A factory-trained instructor with experience in presenting the training material and the system programmer for this project shall perform the training.

B. Off-Site:
1. Provide 24 hours minimum of formal classroom training to District personnel in the theory, function and application of each hardware and software element and each component in the control system, plus 8 hours of telephone consultation.
2. All classroom training shall be done using a network of working controllers representative of the installed hardware for this project.

C. Day-to-Day Operations - Training Description:
1. Proficiently operate the system.
2. Understand control system architecture and configuration.
3. Understand FMCS systems components.

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4. Understand system operation, including FMCS system control and optimizing routines (algorithms).
5. Operate the workstation and peripherals.
6. Log-on and off the system.
7. Access graphics, point reports, and logs.
8. Adjust and change system setpoints, time schedules, and holiday schedules.
9. Recognize malfunctions of the system by observation of the printed copy and graphic visual signals.
10. Understand system drawings and Operation and Maintenance manual.
11. Understand the job layout and location of control components.
12. Access data from FMCS controllers and ASCs.
13. Operate portable operator's terminals.

D. Advanced Operations - Training Description:
1. Make and change graphics on the workstation.
2. Create, delete, and modify alarms, including annunciation and routing of these.
3. Create, delete and modify point trend logs and graph or print these both on and ad-hoc basis and at user-definable time intervals.
4. Create, delete, and modify reports.
5. Add, remove, and modify system's physical points.
6. Create, modify and delete programming.
7. Add panels when required.
8. Add operator interface stations.
9. Create, delete, and modify system displays, both graphic and others.
10. Perform FMCS system field checkout procedures.
11. Perform FMCS controller unit operation and maintenance procedures.
12. Perform workstation and peripheral operation and maintenance procedures.
13. Perform FMCS system diagnostic procedures.
14. Configure hardware including PC boards, switches, communication, and I/O points.
15. Maintain, calibrate, troubleshoot, diagnose, and repair hardware.
16. Adjust, calibrate, and replace system components.

E. System Management - Training Description:
1. Maintain software and prepare backups.
2. Interface with job-specific, third-party operator software.
3. Add new users and understand password security procedures.

F. Provide course outline and materials in accordance with the "SUBMITTALS" article in Part 1 of this section. The instructor(s) shall provide one copy of training material per student.

3.13 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequately for the environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

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D. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

E. Averaging sensors and low limits shall be installed at the top of the assembly with the element on a slight downward incline away from the sensor making a serpentine pattern over the cross-sectional area with elements spaced not over 12"300 mm apart and within 6"150 mm of the top and bottom of the area.

F. All pipe-mounted temperature sensors shall be installed in immersion wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

G. Install outdoor air temperature sensors on exterior of north wall, complete with sun shield at designated location approved by Architect/Engineer. TCC shall prime and paint the device enclosure. Color selection by Architect.

H. Install all wall-mounted CO2 sensors between 3 feet and 6 feet above the floor.

I. Place thermostats or temperature control sensors inside locking transparent plastic covers (in common spaces, and in aluminum covers (Kele ATK04 for gyms) that discourage tampering and vandalism at all locations in Middle and High Schools. Not required in administration spaces, or anywhere in elementary schools except gyms. Use surface mounted sensors with digital display mounted on interior walls, installed with necessary insulation from wall.

J. Surface mount with standard plastic covers with exposed knobs only in classrooms to permit a ±3° deviation from setpoint.

K. Install liquid temperature sensors inside of pipe wells with an appropriate heat transfer compound inside the well.

3.14 INSTALLATION OF FLOW METERS

A. Provide manufacturer's recommended lengths of straight piping upstream and downstream of the flow meter. Up to 30 diameters upstream of the flow meter may be required depending on the piping arrangement and flow meter type.

B. Maintain adequate pull/service space.

END OF SECTION

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SECTION 23 09 13 - INSTRUMENTATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pressure Gauge.

B. Pressure Gauge Accessories.

C. Thermometers.

D. Test Plugs.

E. Static and Differential Airflow Pressure Gauges.

1.2 REFERENCES

A. ANSI/AWWA C700 - Cold Water Meters - Displacement Type, Bronze Main Case.

B. ANSI/AWWA C701 - Cold Water Meters - Turbine Type, for Customer Service.

C. ANSI/AWWA C702 - Cold Water Meters - Compound Type.

D. ANSI/AWWA C706 - Direct Reading, Remote Registration Systems for Cold Water Meters.

E. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.

F. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi.

G. ASTM E1 - Specification for ASTM Thermometers.

1.3 SUBMITTALS

A. Submit shop drawings per Section 23 05 00. Include list that indicates use, operating range, total range and location for manufactured components.

PART 2 - PRODUCTS

2.1 PRESSURE GAUGES

A. Pressure Gauges: Three-inch minimum face diameter, 1/4" pipe thread bottom mount, steel case, accuracy 1% of full scale or better.

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B. Pressure gauges in pipelines shall be phosphor bronze bourdon tube with stainless steel movement.

C. Gauges shall be compound, pressure or vacuum as required with 4-1/2 inch diameter dial.
   1. Each gauge shall be complete with pulsation dampener, and 1/4" or 3/8" ball valve. Gauges on steam and steam condensate lines shall also have a siphon loop.

D. The gauges shall be located and mounted to be conveniently read by a person standing on the equipment room floor. Accuracy shall be 1/2 percent. Case shall be aluminum.

E. For water or air services, use a bronze bourdon tube, steam services, a stainless steel tube, and materials for corrosive services shall be custom selected by the Engineer.

F. Maximum Range: Approximately double the expected working pressure of the service.

G. Install with an isolation valve and a drain valve between the gauge and the isolation valve.

H. Install a pressure snubber and needle valve in services with rapid pressure pulses at pump locations.

I. White face with black lettering.

J. Have the capacity to be calibrated with a screwdriver.

K. Acceptable Manufacturers:
   1. Ashcroft
   2. Dwyer
   3. Foxboro
   4. Honeywell
   5. Johnson
   6. Marsh
   7. Marshalltown
   8. Meriam
   9. Mueller Brass
   10. U.S. Gauge
   11. Weiss
   12. Trerice

L. Manometers and gauges calibrated in pressures less than 50 inches of water shall be by Dwyer or Meriam.

2.2 THERMOMETERS

A. Painted vertical metal case at least 8" long with a glass or Lucite face.

B. Furnish and install thermometers in pipe lines and equipment as scheduled and/or indicated. Thermometers shall be Taylor, Moeller, Rochester, Weiss, Trerice, or approved equal. Nine inch scale with separable socket, cast aluminum case, red reading mercury, adjustable industrial type complete with thermometer wells. Scale range shall be 30°F to 240°F with 2-degree divisions.

Draft

C. Thermometer installation will not be accepted unless easily read by an operator standing on the floor.

D. Bottom or back pipe thread connection.

E. Use thermal wells with heat transfer enhancement compound in piping services.

F. Range: At least 50% higher than the highest expected temperature of the service and at least 20 degrees lower than the lowest expected temperature.

G. Accuracy: 1% of full scale or better

2.3 PRESSURE AND TEMPERATURE SENSING PLUGS

A. Provide where indicated 1/4" NPT fitting to receive either a 1/8" O.D. temperature or pressure probe. Fittings shall be brass with valve core suitable for 275°F. Plugs shall be complete with gasketed cap and units shall be rated for 1000 psi. "Pete's Plug" by Peterson or Nordel, Model 45PT-N- 1-1/2".

B. Provide for use with Pete's Plug, two 2" dial pocket testing thermometers, having a range of 0 to 250°F, and two 2" pressure gauges having a range of 0 to 150 psi. (Acceptable manufacturers are the same as above.)

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:
1. Install per manufacturer's instructions.
2. Coil and conceal excess capillary on remote element instruments.
3. Install gauges and thermometers in locations where they are easily read from normal operating level.
4. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

B. Special Devices:
1. Install a pressure-temperature tap on each side of each pump and heat transfer device such as coils, heat exchangers, radiators and radiant panels.

C. Pressure Gauges:
1. Connect pressure gauges to suction and discharge side of all pumps.
2. Provide snubber for each pressure gauge.
3. Provide coil syphon for each pressure gauge connected to steam piping.

D. Thermometers:
1. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2" for installation of thermometer sockets.
2. Install thermometer sockets adjacent to control system thermostat, transmitter and sensor sockets.

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3. Locate duct thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

END OF SECTION

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SECTION 23 21 00 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and Pipe Fittings.

B. Valves.

C. Heating Water Piping System.

1.2 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.

B. Welding Materials, Procedures, and Operators: Conform to ASME Section 9, ANSI/AWS D1.1, and applicable state labor regulations.

C. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

D. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

E. Inspection for grooved piping systems: A factory trained representative's review on any project or jobsite for correct assembly is based solely on an external examination of the visible and accessible manufacturer's couplings after being installed as part of a mechanical pipe joint. The external examination will be limited to the visual assembly requirements of the coupling specified in the coupling manufacturer's published installation instruction handbooks and where required, a confirmation on bolt/nut torque using a torque wrench as specified in the coupling manufacturer's installation handbooks.

F. Confirmation of Visual Examinations: The factory trained representative will document and provide a written report stating compliance or noncompliance of all of the manufacturer's couplings as described in Jobsite Examinations.

G. Locations of limited or no pipe joint accessibility preventing examination will be documented and reported to the owner for disposition

H. Upon completion of the manufacturer's inspection of the installation and any identified corrections, the manufacturer will provide the owner or purchaser with a limited warranty on manufacturer's products of 50 years.

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I. The grooved coupling manufacturer warrants that the Warranted Products have been installed in accordance with the grooved coupling manufacturer's instructions and shall perform in accordance with the applicable grooved coupling manufacturer's published specifications subject to a successful inspection, limitation to inspected products, reasonable access to the jobsite as well as the conditions and limitations contained within the warranty.

J. Owner must notify the grooved coupling manufacturer by certified mail, return receipt requested, within thirty (30) days of discovering any alleged failure of the Warranted Products;

K. Owner allows the grooved coupling manufacturer's employees or agent's reasonable access to the Warranted Products and the piping system to conduct an investigation following any notice of alleged failure.

L. Upon completion of the investigation, the grooved coupling manufacturer will authorize the repair to the Warranted Products and the piping system if they determine the failure is covered by the manufacturer's warranty; and,

M. At the grooved coupling manufacturer's option, the grooved coupling manufacturer may approve the contractor who makes the repair to the Project and the grooved coupling manufacturer retains the right to inspect following such repairs.

1.3 REFERENCES

A. ANSI/ASTM D2466 - PVC Plastic Pipe Fittings, Schedule 40.

B. ANSI/AWS D1.1 - Structural Welding Code.

C. ANSI/AWWA C104/A21.4 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.

D. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings 3" through 48", for Water and Other Liquids.

E. ANSI/AWWA C111/A21.11 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

F. ANSI/AWWA C150/A21.50 - Thickness Design of Ductile Iron Pipe.

G. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

H. ANSI/AWWA C153/A21.51 - Ductile Iron Compact Fittings, Centrifugally Cast for Water or Other Liquids.

I. ASME - Boiler and Pressure Vessel Code.

J. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

K. ASME B16.3 - Malleable Iron Threaded Fittings Class 150 and 300.

L. ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.

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M. ASME B16.5 - Pipe Flanges and Flanged Fittings.

N. ASME B16.9 - Factory-Made Wrought Steel Butt Welding Fittings.

O. ASME B16.12 - Cast Iron Threaded Drainage Fittings.

P. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings

Q. ASME B16.21 - Nonmetallic Flat Gaskets for Pipes Flanges.

R. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

S. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).

T. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

U. ASME B18.2.1 - Square and Hex Bolts and Screws, Inch Series.

V. ASME B18.2.2 - Square and Hex Nuts, Inch Series.

W. ASME B31.3 - Chemical Plant and Petroleum Refinery Piping.

X. ASME B31.9 - Building Services Piping.

Y. ASME Section 9 - Welding and Brazing Qualifications.

Z. ASTM A126 - Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings.

AA. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

BB. ASTM A181 - Forgings, Carbon Steel for General Purpose Piping.

CC. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

DD. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

EE. ASTM A536 - Standard Specification for Ductile Iron Castings

FF. ASTM A733 - Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples.

GG. ASTM B32 - Standard Specification for Solder Metal.

HH. ASTM B88 - Seamless Copper Water Tube.

II. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube.

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JJ. ASTM D1599 - Standard Test Method for Short-Time Hydraulic Failure Pressure of Plastic Tubing and Fittings.

KK. ASTM D1785 - Polyvinylchloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.

LL. ASTM D2105 - Standard Test Method for Longitudinal Tensile Properties of Fiberglass Pipe and tube.

MM. ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate loading.

NN. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings

OO. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

PP. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.

QQ. ASTM D2992 - Standard Practice for Obtaining Hydrostatic Design Basis for Fiberglass pipe and fittings.

RR. ASTM D2996 - Standard Specification for Filament Wound Fiberglass Pipe.

SS. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

TT. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

UU. ASTM D4024 - Standard Reinforced Thermosetting Resin Flanges.

VV. ASTM D5685 - Standard for Fiberglass Pressure Pipe Fittings.

WW. ASTM E90-02 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions

XX. ASTM E413-87 - Classification for Rating Sound Insulation

YY. ASTM F2389 - Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems.

ZZ. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipes.

AAA. ASTM F1476: Standard for Performance of Gasketed Mechanical Couplings in Piping Applications.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 23 05 00. Include data on pipe materials, fittings, valves, and accessories. Include manufacturers' support spacing requirements for plastic piping.

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1.5 DELIVERY, STORAGE, AND HANDLING

A. Store and protect piping to prevent entrance of foreign matter into pipe and to prevent exterior corrosion.

B. Deliver and store valves in shipping containers with labeling in place.

1.6 COORDINATION DRAWINGS

A. Reference Coordination Drawings article in Section 23 05 00 for required hydronic systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

PART 2 - PRODUCTS
CONDENSER WATERHEATING WATER

A. Design Pressure: 125 psig.
Maximum Design Temperature: 225ºF.

B. Piping - 2" and Under:
1. Type L hard drawn copper, wrought copper fittings. Silver solder with 5% silver content (Harris StaySilv 5 Silver Brazing Alloy, or equal) for all brazed joints except when connecting to equipment that could be damaged by excessive heat. No heating or condenser piping to be located in exterior walls.
2. Fittings: Wrought Copper Fittings
   a. T-drill, Shark Bit Fittings, Copper Grooved, Grooved fittings are not acceptable in hydronic, chilled, or domestic water systems.

C. Piping - 2-1/2" and Over:
1. Schedule 40, black steel with flanged or welded joints.
2. Fittings: Standard weight, seamless steel, butt weld type.
   a. All welding fittings shall be Tube Turn, Taylor Forge, B&W, Ladish or Yoloy.
   b. T-drill,Shark Bit Fittings, Copper Grooved, Grooved fittings are not acceptable in hydronic, chilled, or domestic water systems.
3. Flanges: 150 lb. forged steel slip-on or welding neck type.
4. Bolting: Regular square head machine bolts with heavy hexagonal nuts. H. Gaskets: Thickness, material type suitable for fluid to be handled, design temperatures, and pressures

D. Piping - 2-1/2" and Over All Sizes(Contractor Option):
1. Pipe: Standard weight black steel, grooved ends, ASTM A53, Type E or S, Grade B.
2. Joints: Grooved type, with:
   a. Grade EHP EPDM-HP center-leg gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth, suited for 32°F0ºC to 250°F120ºC.
   b. Grade E EPDM molded pressure-responsive gaskets suited for 32°F0ºC to 230°F110ºC per ASTM D2000.
3. Couplings:

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a. Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Installation-Ready for complete installation without field disassembly. Basis of Design: Victaulic Style 107N.
b. Flexible Type: For use in locations where vibration attenuation and stress relief are required. Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.
c. AGS two-segment couplings for pipe sizes 14" and larger, with wide-width FlushSeal® gasket and lead-in chamfer on housing key. Basis of Design: Victaulic Style W07 (rigid) and Style W77 (flexible).

4. Fittings: ASTM A536 Grade 65-45-12 ductile iron, ASTM A234 Grade WPB, or factory fabricated from ASTM A53 steel pipe, grooved type.
5. Flanges: Grooved end, flanged adapter, suitable for direct connection to ANSI Class 150 flanged components. Basis of Design: Victaulic Style 741 and AGS W741.

E. Shutoff Valves:
1. Ball Valves:
a. 3" and under, 600 psi CWP, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals.
1) Apollo
2) Jomar
3) Centerline
4) Red and White
5) Nibco
6) Crane

NOTES:
7) Provide extended shaft for all valves in insulated piping.
8) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

2. Butterfly Valves:
a. BF-1:
1) 2 1/2" thru 6", 175 psi CWP, elastomers rated for 20°F to 250°F at 125 psig, grooved or fully lugged ends, ductile or cast iron body (not in contact with fluid); bronze, aluminum bronze or EPDM coated ductile iron disc; EPDM seat, stainless steel stem, extended neck, 175 psi bubble tight, bi directional dead end shutoff without backing flange or nuts and with cap screws extending to centerline of valve body (for pipe extension without draining system), 10 position locking operator up to 6" size. Cv of at least 1580 in 6" size.
a) Stockham
b) Mueller
c) Centerline
d) Red and White
e) NIbco
f) Crane
g) Victaulic Vic300 MasterSeal (grooved end valves)

Draft

F. Throttling Valves:
1. For pipe systems where mechanical press connections are allowed, throttling valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
2. Globe Valves:
a. GL-1: 3" and under, 125 psi saturated steam, 300 psi WOG, screwed, bronze. Crane #7TF, Stockham #B22T, Walworth #95, Milwaukee #590, Hammond #IB413T, Watts #B-4010-T, or NIBCO #T-235.
b. GL-2: 4" thru 10", 125 psi S @ 353ºF, 200 psi WOG @ 150ºF, flanged, iron body, bronze mounted. Crane #351, Hammond #IR116, Stockham #G-512, Walworth #906F, Milwaukee #F2981, Watts #F-501, or NIBCO #F-718.

G. Check Valves:
1. CK-1: 2" and under, 125# steam @ 406ºF, 200# CWP @ 150ºF, screwed, bronze, horizontal swing.
a. Manufactures:
1) Stockham
2) Crane
3) Nibco
4) Red and White
5) Jenkins
6) Powell
2. Grooved End Check Valves: 300-psig CWP, spring-assisted swing type, suitable for vertical or horizontal installation. Stainless steel spring and shaft, with stainless steel disc and elastomer seat/seal or elastomer coated ductile iron disc with welded in nickel seat. Victaulic Series 716.
3. CK-14: 2-1/2" thru 12", 200# CWP, double disc wafer type, bronze or iron body, bronze trim, metal-to-metal or Viton seat, 316 SS shaft, Inconel 600 spring. Mission Duo Chek #12HPP (with Inconel springs),
a. Manufactures:
1) Stockhan
2) Centerline
3) Duocheck
4) Metraflex

H. Strainers:
1. For pipe systems where mechanical press connections are allowed, strainers with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
2. ST-1: Bronze body, screwed ends, screwed cover, 125 psi S @ 353°F, 200 psi WOG @ 150°F. Armstrong #F4SC, Metraflex #TS, Mueller Steam Specialty Co. #351, Sarco #BT, Watts #777, NIBCO T-122-A.
3. ST-2: Cast or ductile iron body, grooved ends or 125 lb. flanged ends, bolted cover, 125 psi S @ 353°F, 175 psi WOG @ 150°F. Armstrong #A1FL, Metraflex #TF, Mueller Steam Specialty Co.#758, Sarco #CI-125, Watts #77F-D, Victaulic #732 or #W732, NIBCO F-721-A.

2.2 HEATING WATER
Maximum Design Temperature: 225ºF.

Draft

A. Piping All Size (Contractor's Option):
   1. Tubing: Type L hard drawn seamless copper tube, ASTM B88.
   2. Joints: Mechanical press connection.
   3. Fittings: Copper, ANSI B-16.22, with embedded EPDM O-ring, NSF-61.
   4. Acceptable Manufacturers: Viega ProPress, Approved Equal

B. Shutoff Valves:
   1. For pipe systems where mechanical press connections are allowed, shutoff valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
   2. Ball Valves:
      a. 3" and under, 600 psi CWP, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals.
         1) Apollo
         2) Jomar
         3) Centerline
         4) Red and White
         5) Nibco
         6) Crane
      b. NOTES:
         1) Provide extended shaft with operating handle of non-thermal conductive material and protective sleeve that allows operation of valve, adjustment of the packing, and adjustment of the memory stop without breaking the vapor seal or disturbing the insulation for all valves in insulated piping.
         2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

2.3 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: DWV drawn temper seamless copper drainage tube, ASTM B306.
   1. Fittings: ASME B16.23 cast brass, or ASME B16.29 solder wrought copper.
   2. Joints: Solder with Type 95-5 solder. 50-50 solder is not acceptable.

B. Piping Under 1-1/4" Size:
   1. In sizes where drainage type fittings are not available, tees with threaded caps to permit rodding are acceptable.

Draft

2.4 AIR VENTS

A. Provide manual (not automatic) air vent valves at the high point wherever drops occur in the direction of water flow, at the top of all supply risers and at the high point of return risers on all hot water heating supply and return mains. Air vent ball valves shall be installed on the top of the risers in an accessible location. A 1/4" copper tube shall extend from a reducer provided at the high point to a point where a bucket can be placed to catch any drips. No Armstrong air vents will be allowed. Use Hoffman of applicable size. Or approved equal.

B. Add air vents to high points in RTU piping.

C. Provide isolation ball valves for replacement.

D. The high side of heating elements on up-fed cabinet unit heaters, etc., shall be piped complete with a 3/4" x 4" high air chamber with a reducer at the top from which a 1/4" copper tube shall be extended to an accessible manual (not automatic) air vent valve as above.

2.5 STRAINERS

A. Strainers for water, 2" and smaller shall be cast iron or semi-steel, screwed "Y" strainer, 250 lb. construction, and 1/2 inch ball valve with capped hose adapter, to be capped with brass not plastic, for blow-down. Strainer shall be Armstrong No. A1SC, or prior approved equal for 2-1/2" and less, Armstrong No. A1FL for 2 1/2" and larger.

B. Screens for water service shall be stainless steel. For strainers 2 inches and less, strainers shall be 20-mesh or 1/32" perforations. For strainers 2 1/2" to 8", mesh shall be perforated brass with 1/16" openings.

2.6 SAFETY RELIEF VALVES

A. SRV-1 (Hydronic Heating Systems): Spring-loaded disc type with cast iron or bronze body, bronze or stainless steel disc, side outlet and lifting lever for maximum service of 125 psig at 250ºF. For relieving water during pressure fluctuations and in case of control failure. Capacities shall be ASME Section IV certified and labeled. Acceptable Manufacturers: Kunkle # 537, B&G, Conbraco, McDonnell & Miller, or Watts.

2.7 SUCTION DIFFUSER

A. Furnish and install on base mounted pumps with inlet size same as pipe size shown on the drawing.

B. In no case shall pressure drop exceed 3.0 psi.

Draft

C. Suction diffuser shall consist of angle body with inlet vanes and combination diffuser-strainer-orifice cylinder with 5/32" or 3/16" diameter openings for pump protection, gauge tappings, and blowdown connection. Orifice cylinder, with bronze or stainless steel strainer with free area at least 2:1. Furnish adjustable foot to support weight of suction piping. Connect drain valve to blowdown connection. Provide 20 mesh stainless steel or bronze startup strainer. The startup strainer shall be removed after the system has been started, cleaned, and is operating under normal conditions, but before the system is turned over to the Owner. Hang the startup strainer on the piping near the pump after it is removed.

D. Acceptable Manufacturers: Armstrong, Bell & Gossett, Taco.Victaulic (for grooved inlet diffusers).

2.8 BALANCING VALVE

A. Rated for 125 psi working pressure and 250ºF operating temperature, taps for determining flow with a portable meter, positive shutoff valves for each meter connection, memory feature, tight shutoff, and a permanent pressure drop between 1' and 2' water column at full flow with valve 100% open. Furnish with molded, removable insulation covers.

B. Provide a nomograph to determine flow from meter reading (and valve position on units which sense pressure across a valve). Graph shall extend below the specified minimum flow.

C. Furnish one meter kit equivalent to Victaulic/IMI TA Hydronics or Bell & Gossett Model RO-5 meeting the following requirements:
1. Carrying case with handle.
2. Pressure gauge with 0-25 feet of head scale with 3.0% full scale accuracy.
3. High and low side hoses with 5 feet length and 250 psig pressure rating, equipped with shutoff valves, vent valves, and probes for insertion into pressure and temperature plugs.

D. Valves in copper piping shall be DZR brass or bronze.
1. Quarter-Turn Venturi Style:
   a. Griswold "Quickset"
   b. Gerand "BALVALVE Venturi"
   c. HCI "Terminator B"
   d. Nexus Valve "UltraXB Orturi"
   e. MI Hydronic Engineering "Accusetter"
2. Multi-Turn Y-Pattern Globe Style:
   a. Tour&Anderson (STAD)
   b. Armstrong "CBV"
   c. Victaulic 786
   d. NIBCO 1710

E. Valves in ferrous piping 2" or smaller shall have threaded ends and steel, brass or bronze construction. Option to balancing valves noted above are flow sensors specified in Section 23 09 00 with a specified throttling valve.
1. Quarter-Turn Venturi Style:
   a. Gerand "BALVALVE Venturi"
   b. HCI "Terminator B"
   c. Nexus Valve "UltraXB Orturi"
   d. IMI Hydronic Engineering "Accusetter"

Draft

2. Multi-Turn Y-Pattern Globe Style:
   a. TA Hydronics "786-789"
   b. Armstrong "CBV"
   c. Victaulic 787

F. Balancing valves in ferrous piping over 2" size shall have flanged ends and steel or cast iron construction. Option to balancing valves noted above are flow sensor specified in Section 23 09 00 with a specified throttling valve.
1. Quarter-Turn Venturi Style:
   a. Taco "Accu-flo",
   b. HCI "Terminator G"
   c. Nexus Valve "Nextrol NXFB",
   d. IMI Hydronic Engineering "Accusetter",
2. Multi-Turn Y-Pattern Globe Style:
   a. Armstrong "CVB-II",
   b. Tour&Anderson (STAF, STAG),
   c. Victaulic 788/789
   d. NIBCO 737

G. Manufacturer shall size balancing valves for the scheduled flow rate. Flow rate shall be measurable on manufacturer's standard meters.

2.9 COMBINATION PIPING PACKAGES

A. Combination piping packages are allowed in lieu of individual components specified for hydronic coils and devices containing hydronic coils. Combination piping packages shall include shutoff valves, wye strainers, 1/4 turn strainer blow down valves with hose thread and cap, manual balancing valves with memory stop, test plugs, manual air vents, and unions. Automatic flow control devices are not allowed. Configuration of combination pieces shall match layouts on the drawings. Each component of the combination piping packages shall meet these specifications for the individual components being combined.

B. Acceptable Manufacturers: FDI Flowset, Griswold, Hays Fluid Controls, HCI Terminator, Nexus Coil Pak, NIBCO, Victaulic Coil-Kit.

2.10 FACTORY-ASSEMBLED HEADERS AND EQUPIMENT DROPS

A. Factory-fabricated grooved end header all-in-one assembly for fluid distribution. Header shall consist of an ASTM A53, Grade B, standard weight pipe spool with required outlet connections. Grooved ends roll grooved to Victaulic dimensions, with enamel coating or galvanized to project requirements. Victaulic Vic-Header.

B. Factory Assembled Grooved End Vibration Pump Drops: 3" through 12" (DN80 though DN300). Orange enamel coated installation-ready assembly with flexible couplings to accommodate vibration attenuation and stress relief. Rated for working pressure to 300-psig.

Draft

1. Discharge Drop: Class 150 flange for pump connection, base elbow for horizontal pump connection or straight line with concentric reducer for vertical pump connections, tri-service valve assembly consisting of a spring-actuated check Venturi-Check valve and butterfly valve with offset stem for 360-degree circumferential seating, and pipe spool with thermometer and pressure ports. Victaulic Series 380.
2. Suction Drop: Suction diffuser with stainless steel basket and diffuser and Class 150 flange for pump connection, butterfly valve with offset stem for 360-degree circumferential seating, and pipe spool with thermometer and/or pressure ports. Victaulic Series 381.
3. Suction Drop: 90-degree base elbow with Class 150 flange for pump connection, Wye pattern strainer with stainless steel perforated metal basket, butterfly valve with offset stem for 360-degree circumferential seating, and pipe spool(s) with thermometer and/or pressure ports. Victaulic Series 382.

C. Manufactured grooved end vibration isolation drop for air handling unit coil supply and return connections in sizes 2" through 6" (DN50 though DN150) to accommodate isolation, straining, balancing, and drainage. Installation-ready, with flexible couplings to accommodate vibration attenuation and stress relief, rated for working pressure to 300-psig. Victaulic Series 385

2.11 EXPANSION TANK

A. Bladder Type:
1. Tank shall be welded steel, ASME construction and stamped.
2. Tank shall be complete with heavy-duty replaceable butyl bladder, charging valve, lifting ring, drain tapping, and system connection.
3. 125 psig gauge working pressure and 240ºFmaximum operating temperature.
4. With vertical mounting support feet, air charging valve, and air pressure gauge. Accessible floor-type with isolation and union.
5. Acceptable Manufacturers: Taco, Bell & Gossett, Armstrong, Amtrol, .

2.12 COALESCING TYPE COMBINATION AIR ELIMINATOR AND DIRT SEPARATOR

A. Coalescing type air eliminator and dirt separator shall be fabricated from steel and ASME constructed and certified for 125 psi working pressure and 270ºF operating temperature. Units 2-1/2 inches and smaller shall have threaded connections. Units 3 inches and larger shall have flanged connections.

B. Air elimination and dirt separation shall be by coalescing action by either:
1. Stainless steel PALL rings.
2. Copper tubes with continuous wound, permanently attached copper wire and followed by a separate continuous wound permanently affixed copper wire.

C. Provide unit with factory mounted air vent at the top of the air elimination chamber.

D. Provide brass flushing cock on the separator side to facilitate system fast-fill and to blow down impurities from the water surface within the separator.

E. Provide factory mounted blow-down valve on the unit bottom to allow for draining and cleaning.

Draft

F. Coalescing separators shall be as sized on the construction drawings, but in no case shall it have less than line size connections nor shall pressure drop exceed 1 psi at design flow. Include on submittal the pressure drop of each unit at its design flow rate.

G. Coalescing separators shall be equipped with removable cover to allow for removal, inspection and cleaning of the internal coalescing media.

H. Separator shall be the centrifugal type, with strainer, line size, with a Hoffman #79 auto air release valve. 125 psi working pressure. Pipe discharge to glycol feeder (preferred) or floor drain

I. Acceptable Manufacturers: Spirotherm VDN Series, Taco 4900ADR Series, B&G, Amtrol.

2.13 DRAIN VALVES AND BLOWDOWN VALVES

A. Drain valve and blowdown valve shall mean a shutoff valve as specified for the intended service with added 3/4" male hose thread outlet, cap, and retaining chain.

2.14 CONNECTIONS BETWEEN DISSIMILAR METALS

A. Connections between dissimilar metals shall be insulating dielectric types that provide a water gap between the connected metals, and that either allow no metal path for electron transfer or that provide a wide water gap lined with a non-conductive material to impede electron transfer through the water path.

B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.

C. Aluminum, iron, steel, brass, copper, bronze, and stainless steel are commonly used and require isolation from each other with the following exceptions:
1. Iron, steel, and stainless steel connected to each other.
2. Brass, copper, and bronze connected to each other.
3. Brass or bronze valves and specialties connected in closed systems with steel, iron, or stainless steel on both sides of the brass or bronze valves and specialties. Where two or more brass or bronze items occur together, they shall be connected with brass nipples. Brass or bronze valves and specialties cannot be used as a dielectric separation between pipe materials.

D. Dielectric protection is required at connections to equipment of a material different than the piping.

E. Screwed Joints (acceptable up to 2" size):
1. Dielectric waterway rated for 300 psi CWP and 225°F.
2. Acceptable Manufacturers: Elster Group ClearFlow fittings, Victaulic Series 647, Grinnell Series 407, Matco-Norca.

F. Grooved Joints (any size):
1. Copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service.

Draft

2. Fittings shall have threaded ends, grooved ends, or a combination.
3. Acceptable Manufacturer: Victaulic Style 647.

G. Flanged Joints (any size):
1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.
2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.
3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.
4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.
5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.
6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator, F. H. Maloney, or Calpico.

H. Dielectric unions are not acceptable.

2.15 PROPYLENE GLYCOL

A. Fill systems with a mixture of water and industrially inhibited propylene glycol low temperature industrial heat transfer fluid with an expected life of at least 12 years in normal use. Water shall meet the glycol manufacturer's recommendations (generally < 25ppm chloride, sulfite, and hardness). Distilled, deionized, or reverse osmosis water is acceptable, as are pre-diluted solutions from the manufacturer.

B. All ingredients shall be FDA recognized as safe food additives. Fluid suitable for use from -28ºF to 250ºF.

C. Glycol shall pass ASTM D1384 (less than 0.5 mils annual penetration of all system metals). Glycol supplier shall provide a certificate of assurance.

D. A 50% solution by weight shall depress the freezing point to at least -34ºF. At 40ºF the solution shall have viscosity of not over 14 centipoise, thermal conductivity of at least 0.199 Btu/hr*ft*ºF, specific heat of at least 0.839 Btu/lbm*ºF, and specific gravity of at least 1.06.

E. Manufacturer shall offer a testing service to determine if inhibitor addition is needed.

F. Heating Water System: Provide 30% solution.

G. Provide on extra 55 gallon drum of propylene glycol.

H. Thoroughly clean and flush system before adding propylene glycol solution. Notify PSD Plumbing Department 24 hours in advance, to verify clean and flush.

I. Feed propylene glycol to system through make-up line with pressure regulator. Do not use glycol feeder to fill system. Set to fill at 12 psi.

Draft

J. Perform tests determining strength of propylene glycol solution before system is turned over to the Owner. Provide test prior to end of the first year of operation and replenish as required. PSD to confirm 30% solution maintained at end of the year.

K. Acceptable Manufacturer: Dow Chemical "Dowfrost", Interstate Chemical "P-323", Houghton Chemical "Safe-T-Therm", and Texaco.

2.16 GLYCOL FEED SYSTEM

A. Package system complete with storage tank, pump(s) and controls with audio and visual alarm, designed to add glycol solution to a closed loop water system. System shall automatically maintain pressure in the piping system.

B. Provide cut-off and alarm to stop pump in case of low level or high pressure. Provide dry contact for alarm point to the DDC.

C. Complete with polyethylene storage tank and lid. Mount on floor above pumping assembly in a steel frame with legs. Lid shall be removable for filling and provide means for system relief valve outlet to be piped back to tank without removal of piping from relief valve or automatic air vent

D. Pumping system shall consist of a pump, starter, pressure tank with pressure control, pressure reducing valve, shutoff valve and pressure gauge. Refer to schedule for pump requirements.

E. 100 gallon tank.

F. Acceptable Manufacturer: Axiom SF100-L, Approved Equal.

2.17 LOCK OUT TRIM

A. Provide lock out trim for all quarter turn valves opening to atmosphere installed in heating water piping over 120°F and as indicated on the drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends, remove burrs, bevel plain end ferrous pipe.
   1. All copper tubing to be reamed to full inside diameter of the tubing.
      a. If copper pipe is found NOT reamed at any one location, contractor may be required to disassemble all piping and have a consultant approved by the engineer and school district to verify reaming. Cost for ALL deconstruction and put back to be paid by the contractor whether all locations are non-compliant or not.

B. Remove scale and dirt on inside and outside before assembly.

C. Connect to all equipment with flanges or unions.

Draft

D. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.

E. After completion, fill, clean, and treat systems. Refer to Section 23 25 00 for treatment.

3.2 TESTING PIPING

A. Heating Water:
1. Test pipes underground or in chases and walls before piping is concealed.
2. Complete testing before insulation is applied. If insulation is applied before pipe is tested and a leak ruins the insulation, replace all damaged insulation.
3. Test the pipe with water at 100 psig gauge pressure. Hold pressure for at least two hours.
4. Test to be witnessed by the Architect/Engineer or their representative, if requested by the Architect/Engineer.

B. Poudre school district shall witness/verify all testing. Please coordinate with school district project manager.

3.3 CLEANING PIPING

A. Assembly:
1. Prior to assembly of pipe and piping components, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer. Blow chips and burrs out of pipe before assembly. Wipe cutting oil from internal and external surfaces.
2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing to the degree consistent with good piping practices.
3. Notify the Architect/Engineer prior to starting any post erection cleaning operation in time to allow witnessing the operation. Properly dispose of cleaning and flushing fluids.
    a. Notification: Notify District's Project Manager and PSD Plumbing Department 24 hours in advance of the beginning of the cleaning process. The cleaning process will not be deemed acceptable unless witnessed and approved by the District's representative. This shall be a requirement for final payment.
    b. Procedure: Flush all systems with clean city water until the discharge is clear. Clean or replace the baskets of all strainers after cleaning.
    c. Drain system, and fill system with clean water, mixed with propylene glycol with inhibitors to 30% by volume. If there is excess propylene glycol, turn remaining over to Owner.
4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, control valves, and balance valves, and verify all strainer screens are in place.

B. Chemical Cleaning:
1. Flush pipe and components with clean water until all discharge from system is clean. Maintain minimum velocities at all points of 5 feet/second for 30 minutes. Flow shall be in same direction as when system is in normal operation. Discharge shall be from low points of pipes, ends of headers and as otherwise needed to flush entire system. After flushing, all residual water shall be drained and/or blown out.

Draft

2. Add 2 pounds of trisodium phosphate per 100 gallons of system capacity. Use an alternate chemical if discharge of trisodium phosphate is not permitted. Maintain 150°F in the system if possible. If heat is not available, use 3 pounds per 100 gallons.
3. Drain the system after circulating the chemical cleaner for six hours at 150°F, or 12 hours at a lower temperature. Refill. Test a water sample. Drain and fill again if excessive cleaning chemicals remain and until water appears clear.
4. After each system has been cleaned and thoroughly flushed of pretreatment chemicals, it shall be immediately refilled with water and treated with chemical treatment as specified in Section 23 25 00. The system shall not be allowed to sit empty for any length of time.
5. When system water is clear, remove, clean and replace all strainers.
6. Water samples may be taken by the Architect/Engineer to verify a clean system. If system is not clean, the entire process, including chemical treatment specified in Section 23 25 00, shall be repeated at the Contractor's expense.
7. Chemical cleaning applies to the following systems:
   a. Heating Water

C. Poudre school district shall witness/verify all pipe cleaning. Please coordinate with school district project manager.

3.4 INSTALLATION

A. General Installation Requirements:
1. Route piping in orderly manner, straight, plumb, with consistent pitch, parallel to building structure, with minimum use of offsets and couplings. Provide only offsets required for needed headroom or clearance and needed flexibility in pipe system.
2. Install piping to conserve building space, and not interfere with other work.
3. Group piping whenever practical at common elevations.
4. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
5. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it. Where pipe sizes are not shown, the larger size in either direction shall continue through the fitting nearest to the indication of a smaller pipe size.
6. Install bell and spigot pipe with bells upstream.
7. Seal pipes passing through exterior walls with a wall seal per Section 23 05 29. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.
8. Branch takeoffs shall be from the *top, side, bottom* (if branch is two sizes smaller than main), or any angle from the horizontal plane to the top of piping.
9. The hot water heating system shall have manual air vents at all high points and at all points where drops occur in lines. Actual locations of manual air vents shall be marked on As Built Drawings.
10. Provide low point drains at all low points in system. Note all low points on As Built Drawings.
11. Use straight round pipe. Reamed to full size after cutting. Remove all chips from reaming.
12. Install piping to take advantage of every available means to facilitate thermal expansion of pipe. Provide anchors and guides to control direction of travel. Guides shall be Keflex type B with BH hanger, or Adsco, or type P, for insulated pipe. Provide ample length to maintain 25% engagement with maximum pipe travel. Provide anchors for domestic water piping serving automatic dishwashers.

Draft

13. Expansion loops shall be used for expansion compensation. Install anchors at both ends of pipe lengths served by expansion loops so that pipe movement due to expansion is directed toward the expansion loop without damaging the building construction. Both sides of the expansion loop shall be anchored. As a minimum, locate one guide 4 pipe diameters and the second guide 14 pipe diameters from each side of the expansion loop. Both sides of the expansion loop shall have two guides.

B. Installation Requirements in Electrical Rooms:
1. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment plus its required clearance space.

C. Buried Piping:
1. Install thrust blocking and restraints on all buried piping at elbows and other changes in pipe direction.

D. Valves/Fittings and Accessories:
1. Install one hydronic balancing valve as defined above in series with each air handling unit coil, heat exchanger, each section of fin tube radiators or radiant panels. A section is defined as that assembly controlled by one stat/temperature control valve combination. Provide isolation valves and unions on each side of control valve. Circuit setters are not to be used as isolation valves.
2. Provide isolation valves and unions on both sides of flow switches.
3. Provide chain operators for all valves over 2" size that are over 10'-0" above finished floor. Extend to 7'-0"above finished floor.
4. Provide clearance for installation of insulation, and access to valves and fittings.
5. Provide access doors where valves are not exposed.
6. Where a manual balance valve is shown to be installed in series with a service (isolation) valve, separate balance and service (isolation) valves shall be installed.
7. Install balancing valves with the manufacturer's recommended straight upstream and downstream diameters of pipe.
8. Prepare pipe, fittings, supports, and accessories for finish painting.
9. Install valves with stems upright or horizontal, not inverted, except install manual quarter turn valves in radiation cabinets and all butterfly valves with stems horizontal.
10. Provide shutoff valves and flanges or unions at all connections to equipment, traps, and items that require servicing.
11. Provide flanges or unions at all final connections to equipment, traps and valves.
12. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.
13. Arrange piping and piping connections so equipment may be serviced or totally removed without disturbing piping beyond final connections and associated shutoff valves.

E. Unions:
1. Make connections at each piece of equipment with unions or flanges located for quick/easy disconnect for maintenance. Provide unions or flanges on:
    a. Control Valves
    b. Equipment
    c. Meters
    d. Tanks
2. Unions shall be installed at the coil connection for all unit ventilators.
3. Use the same materials and finish as the piping system.

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4. Unions and flanges are not required at equipment where flanged valves, strainers, control valves, etc., are used.
5. Omit unions and flanges in straight pipe runs or in concealed locations, except for flanged valve applications.
6. Union Schedule:
    a. Copper Piping:
        1) All pipe sizes: Copper, ground joint union. Chase 402, Mueller WC407.
    b. Hot-water heating, compressed air, natural gas.
        1) Piping sizes 2" and smaller:
            a) Malleable iron unions with ground joint brass to iron seat, 150 pound working steam pressure. Grinnell 463, Stockham 694, black or galvanized.
            b) Flexible gas connectors shall not be used. All ground joint unions must have upstream shutoff. Connectors to be heavy duty, quick couple type as approved by PSD and the Engineer, except:
            c) Commercial grade braided gas connectors, with tether, shall be used for gas-fired cooking equipment in kitchens (as required by Health Dept,) Examples are ranges, fryers, etc.
            d) Stainless Steel braided flex gas connectors required on generators.
            e) Pipe sized 2-1/2" and larger (welded):
                a) Forged steel flanges, 150 pound, welding neck or slip on with raised faces and 1/16" Garlock 9712 EPDM or Gylon Style 3565 Envelon gaskets and carbon steel bolts. Grinnell Fig. 1911 and 1921. Tube Turn Series 15, Walworth.
                b) Pipe sizes 2-1/2" and larger (screwed)
7. Cast iron flanged unions, threaded, galvanized or black, 175-pound water, gasket type with carbon steel bolts. Grinnell 487, Stockham 489.

F. Underground Piping:
1. Lay all underground piping in trenches. Provide and operate pumping equipment to keep trenches free of water.
2. Refer to Section 23 05 00 for Excavation, Fill, Backfill and Compaction requirements.

3.5 PIPE ERECTION AND LAYING

A. Carefully inspect all pipe, fittings, valves, equipment and accessories prior to installation. Immediately reject and remove from the job any items which are unsuitable, cracked or otherwise defective.

B. All pipe, fittings, valves, equipment and accessories shall have factory-applied markings, stampings, or nameplates sufficient to determine their conformance with specified requirements.

C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any unclean item.

D. During construction, until system is fully operational, keep all openings in piping and equipment closed at all times except when actual work is being performed on that item. Closures shall be plugs, caps, blind flanges or other items designed for this purpose.

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E. Change direction of pipes only with fittings or pipe bends. Change size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. 2-1/2" and larger fittings shall be long radius type, unless otherwise shown on the drawings or specified. Construct welded elbows of angles not available as standard fittings by cutting and welding standard elbows to form smooth, long radius fittings.

F. Use full and double lengths of pipe wherever possible.

G. Unless otherwise indicated, install all inlet and outlet piping, including shutoff valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or pump.

H. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.

I. Do not create, even temporarily, undue loads, forces or strains on valves, equipment or building elements.

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3.6 DRAINING AND VENTING

A. Unless otherwise indicated on the drawings, all horizontal pipes, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate, and venting.

B. Provide drain valves at all low points of water piping systems or where indicated on drawings for complete or sectionalized draining. Drain valves are defined above.

C. Use eccentric reducing fittings on horizontal runs when changing size for proper drainage and venting. Install all liquid lines with top of pipe and eccentric reducers in a continuous line.

D. Provide air vents at all high points and wherever else required for elimination of air in all water piping systems. Do not use automatic air vents in glycol systems unless they are piped to the fill tank.

E. Air vents shall be in accessible locations. If needed to trap and vent air in a remote location, a 1/8" pipe shall connect the tapping location to a venting device in an accessible location.

F. All vent and drain piping shall be of same materials and construction as the service involved.

3.7 BRANCH CONNECTIONS

A. Make branch connections with standard tee or cross fittings of the type required for the service unless otherwise specified herein or detailed on the drawings.

3.8 JOINING OF PIPE

A. Threaded Joints:
   1. Ream pipe ends and remove all burrs and chips.
   2. Protect plated pipe and valve bodies from wrench marks when making up joints.
   3. Apply Teflon tape to male threads.

B. Flanged Joints:
   1. Bronze flanges shall conform to B16.24 and ductile iron flanges to B16.42. Steel flanges shall be raised face except when bolted to flat face cast iron flange.
   2. Bolting shall be ASTM A307 Grade B with bolts and heavy hexagonal nuts conforming to ASME B18.2.1 and B18.2.2.
   3. Torque bolts in at least three passes, tightening to 1/3, 2/3, and final torque in a cross pattern with an indicating torque wrench for equal tension in all bolts.
   4. Gaskets for flat face flanges shall be full-face type. Gaskets for raised faced flanges shall conform to requirements for "Group I gaskets" in ASME B16.5. All gaskets shall conform to ASME B16.21. Unless otherwise specified, gaskets shall meet the following requirements:
      a. Gasket material and thickness approved by manufacturer for intended service, chemical compatibility, pipe system test pressure, and operating temperature range.
      b. Maximum pressure rating of at least 250 psig.
      c. Minimum temperature rating: -10°F.
      d. Maximum temperature rating of at least 170°F for water and glycol solution systems operating 140°F and less.
      e. Maximum temperature rating of at least 250°F for water and glycol solution systems operating above 140°F and up to 180°F.

C. Solder Joints:
   1. Make up joints with 95% tin and 5% antimony (95-5) solder conforming to ASTM B32 Grade 95TA. Cut copper tubing ends perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but sparingly, to all surfaces to be joined. Heat joints uniformly to proper soldering temperature so solder flows to all mated surfaces. Wipe excess solder, leaving a uniform fillet around cup of fitting.
   2. Flux shall be non-acid type conforming to ASTM B813.
   3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470ºF melting point solder. Remove composition discs and all seals during soldering if not suitable for 470ºF.

D. Welded Joints:
   1. Welding of all pipe joints, both as to procedures and qualification of welders, shall be in accordance with Section IX, ASME "Boiler & Pressure Vessel Code" unless local codes take precedence.
   2. Furnish certificates qualifying each welder to the Owner's Representative prior to start of work.
   3. The Owner's Representative reserves the right to require qualifying demonstration, at the Contractor's expense, of any welders assigned to the job.
   4. Ends of pipe and fittings to be joined by butt-welding shall be beveled, cleaned to bare metal and internal diameters aligned before tack welding.
   5. Single-welded butt joints may be employed with or without the use of backing rings in all sizes. Where backing rings are not used on pumped pressurized systems, the root side of the weld shall either be chipped or ground flush with the piping wall. For services such as vents, overflows, and gravity drains, the backing ring may be eliminated, and the root of the weld need not be chipped or ground. Backing rings shall be of the material being welded.
   6. Weld all black steel piping 2-1/2" and larger except where flanges are required. End to end butt weld joints 3/4" through 2" pipe are allowed only with internal welding rings.
   7. Where welding rings are used, machine pipe ends for proper fit.

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8. Elbows: Use welding elbows.
9. Tees: Use welding tees. Weldolets are allowed in shop prefabricated assemblies or in lines 5" and larger, providing all slag is removed from inside the piping.
10. Reducers: Use welding reducers.
11. Caps: Use welding caps.
12. Prepare pipe ends in tees, laterals, and reducers for weld penetration in accordance with ASA standards.
13. Mitered elbows, tees, and reducers are prohibited in welded lines.
14. Elbows: Use long radius butt-welding elbows in expansion loops and bends.
15. Use long radius reducing butt-welding elbows at equipment where a 90-degree bend and size change is required.
16. National Certified Pipe Welding Bureau or AWS shall certify welders and procedures.

E. Mechanical Press Connection:
1. Copper press fitting shall be made in accordance with the manufacturer's installation instructions.
2. Fully insert tubing into the fitting and mark tubing.
3. Prior to making connection, the fitting alignment shall be checked against the mark made on the tube to ensure the tubing is fully engaged in the fitting.
4. Joint shall be pressed with a tool approved by the manufacturer.

END OF SECTION

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SECTION 23 25 00 - CHEMICAL (WATER) TREATMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Treatment for Closed Systems (Glycol).

1.2 REFERENCES

A. ASTM D 859-00: Test Method for Silica in Water

B. ASTM D 1066-97: Practice for Sampling Steam

C. ASTM D 1067-92: Test Methods for Acidity or Alkalinity in Water

D. ASTM D 1068-03: Test Methods for Iron in Water

E. ASTM D 1126-02: Test Method for Hardness in Water

F. ASTM D 1129-03a: Terminology Relating to Water

G. ASTM D 3370-95a: Practices for Sampling Water from Closed Conduits

H. AWWA C700-02: Cold-Water Meters - Displacement Type

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00.

B. Include system schematics, equipment locations, and controls schematics.

C. Submit product data indicating chemicals and equipment.

D. Submit manufacturer's installation instructions.

E. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

F. Submit reports indicating start-up of treatment systems is completed and operating properly. Include reports indicating analysis of system water after cleaning and after treatment.

G. Manufacturer shall provide special seismic certification per OSHPD CAN 2-1708A.5 with submittal. Submittals without certification will be returned and not reviewed.

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1.4 EXTRA STOCK

A. Provide clean cartridges or bags in all bypass (pot) feeders with filters and sidestream filters.

B. Provide two complete sets of replacement cartridges or filters for each bypass (pot) feeder with filters and sidestream filter installed. Deliver to Owner at job site.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include data on pumps and other equipment including spare parts lists, procedures, and treatment programs.

C. Include step-by-step instructions on test procedures including target concentrations and test frequencies.

D. Include list of treatment chemicals and associated SDS.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience. Company shall have local representatives with water analysis laboratories and full-time service personnel.

1.7 REGULATORY REQUIREMENTS

A. Conform to all applicable codes and regulations for addition of non-potable chemicals to building mechanical systems, and for discharge to public sewage systems.

B. Provide only chemicals approved for use and disposal by local authorities. Contact the Architect/Engineer if any specified chemicals are prohibited.

1.8 MAINTENANCE SERVICE

A. Prior to time of final acceptance, submit four copies of "Agreement for continued Service and Maintenance" for water treatment system, for Owner's possible acceptance. Offer terms and conditions for furnishing chemicals and providing continued testing and servicing, and including replacement of materials and equipment, for one-year period with option for renewal of Agreement by Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. U.S. Filter

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B. H-O-H Chemical

C. Clear Water Systems Corperation

2.2 MATERIALS

A. Closed System Treatment (Water):
   1. Provide one bypass feeder on each system. Install inlet, outlet and drain valves, and necessary piping.
   2. Proprietary blend containing the following items:
      a. Corrosion Inhibitors for Water Systems Operating Above 145°F: Sodium nitrite-borax or molybdate with added inhibitors such as mercaptobenzothiazole, sodium tolytriazole, or phenyltriazole to protect copper and brass and minimize dielectric pitting of steel. Maintain 1,000 ppm nitrite or 100 ppm molybdate. Adjust borax content to keep correct pH for type of system (mainly steel or mainly copper).Adjust borax content to keep correct pH for type of system. Though the system is mainly steel or copper, aluminum is present. Inhibitors shall be selected to properly protect aluminum. pH shall not exceed 8.5 to avoid disruption of the aluminum oxide film.
      b. Corrosion Inhibitors for Chilled Water Systems and Heating Systems operating at =145°F: Sodium molybdate with added inhibitors such as mercaptobenzothiazole, sodium tolytriazole, or phenyltriazole to protect copper and brass and minimize dielectric pitting of steel. Maintain 50 ppm molybdate. Adjust borax content to keep correct pH for type of system (mainly steel or mainly copper).
      c. Scale Inhibitor: Organic phosphonates such as aminomethylene-phosphonate; phosphonates such as hydroxyethylidenediphosphonate or polyamino-substituted phosphonates; or synthetic polymers such as low-molecular-weight polyacrylates, poly-methacrylates and polyacrylanides. Inorganic phosphates are not acceptable. Maintain residual concentration as recommended by the manufacturer.

B. Closed System Treatment (Glycol):
   1. The specified glycols contain initial charge of corrosion inhibitors, however, the pH after installation must be checked and adjusted to maintain between 8.0 and 10.0 using inhibitors recommended by the manufacturer (normally dipotassium phosphate).
   2. The specified glycols contain an initial charge of corrosion inhibitors. However, the pH after installation shall be checked and adjusted to maintain between 8.0 and 8.5 using inhibitors recommended by the manufacturer (normally dipotassium phosphate). Though the system is mainly copper or steel, aluminum is present. Inhibitors shall be selected to properly protect aluminum. pH shall not exceed 8.5 to avoid disruption of the aluminum oxide film.

2.3 TEST EQUIPMENT

A. Provide white enamel test cabinet with light, capable of accommodating four 10 ml zeroing titrating burettes and associated reagents.

B. Provide the following test kits:
   1. Alkalinity titration test kit.
   2. Chloride titration test kit.

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3. Sulfite titration test kit.
4. Total hardness titration test kit.
5. Organic phosphate test kit for steam and cooling tower system.
6. pH test kit.
7. Portable electronic conductivity meter with 0-10, 0-100, 0-1,000 and 0-10,000 microhm scales.
8. High nitrite test kit.
9. Chlorine test kit.
10. Kits to test residuals of all chemicals added to all systems.
11. Test kit for microbiological population and biocide effectiveness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install bypass (pot) feeder with top approximately 36" above the floor.

C. Coordinate with Contractor to provide temporary metering capabilities during system fill to determine overall system volume. Notify Architect/Engineer of overall system volume so that expansion tank sizing can be confirmed.

D. For systems containing glycol, carefully review the glycol manufacturer's water requirements and coordinate to provide system cleaning, flushing, and initial fill with the proper quality of water conforming to the manufacturer's and these specifications.

3.2 CLOSED-LOOP HYDRONIC SYSTEM WATER QUALITY STANDARDS

A. Review equipment manufacturer's water quality standard to ensure water quality is sufficient to meet their warranty requirements as well as to ensure peak heat transfer efficiency. Contractor shall maintain hydronic systems within the more stringent of either the equipment manufacturer's requirements or those listed below:

Measured Value	Multi-Metal Systems with Aluminum	Multi-Metal Systems with Stainless Steel	Multi-Metal Systems with Copper
pH Range	8.5	8.5	9.0
Alkalinity as CaCO3	100 - 500 mg/l	100 - 500 mg/l	100 - 500 mg/l
Hardness as CaCO3*	100 - 500 mg/l	100 - 500 mg/l	100 - 500 mg/l
Suspended Solids	< 10 mg/l	< 10 mg/l	< 10 mg/l
Dissolved Solids	< 1,000 mg/l	< 1,000 mg/l	< 1,000 mg/l
Chlorides	< 150 mg/l	< 150 mg/l	< 150 mg/l
Iron	< 5.0 mg/l	< 5.0 mg/l	< 5.0 mg/l
Manganese	< 0.4 mg/l	< 0.4 mg/l	< 0.4 mg/l
Nitrate	< 100 mg/l	< 100 mg/l	< 100 mg/l
Sulfate	< 200 mg/l	< 200 mg/l	< 200 mg/l

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Ammonia	< 5.0 mg/l	< 5.0 mg/l	< 5.0 mg/l
Free Copper	< 0.10 mg/l	< 0.10 mg/l	< 0.10 mg/l
Free Aluminum	< 3.0 mg/l		

* Minimum hardness only applies to softened water. If water from rivers or lakes is below 100 mg/l, remineralizing is not required.

Submit an independent third-party test report for each chemically treated closed-loop system showing compliance with all measured values shown in the above table as part of project closeout documentation.

3.3 CLEANING AND PROTECTION

A. CLEANING OF PIPE LINES AND BOILERS

1. All cleaning and flushing of hydronic systems shall be witnessed by a Poudre School District Plumbing Department Representative. Provide minimum 24 hours notice prior to performing work.
2. The Water Treatment Contractor shall be responsible for furnishing the cleaning material and supervising the cleaning of the chilled and/or heating piping.
3. The system to be cleaned shall be filled with a solution of 10% by weight of a heavy duty alkaline liquid cleaner. The cleaner shall be capable of wetting and penetrating heavy soil deposits of oil or grease, and keeping these products in suspension, for removal through flushing the system to drain.
4. The cleaning solution shall be circulated for a minimum of 8 hours. At the end of the eight hours, the system shall be flushed to drain, and then refilled with fresh water, taking care to remove any entrapped air from the system.
5. At the end of the cleaning period, the system shall be chemically treated as specified. In no case shall the system being cleaned be left in an untreated condition for more than 8 hours.
6. At the conclusion of the cleaning operation, the Water Treatment Contractor shall certify in writing that the system was cleaned as specified.

B. CHLORINATION

1. Acceptable products are:
   a. Liquid Chlorine Fed. Spec. BB-C120B Hypochlorite Fed. Spec 0-C-114, Type 11, Grade B Fed. Spec. 0-S-60D, Grade A or B
2. After all pressure tests have been performed and piping has been flushed clean, the chemical treatment contractor shall be responsible for sterilizing the domestic water lines.
3. Chlorination procedures shall comply with local code and health department regulations.
   a. Before commencing the chlorination process, the Water Treatment Contractor shall post signs at each water fountain, and on each restroom door, stating that the water is not fit for drinking, and that the water is being chlorinated. ii. Introduce sufficient chlorine into the domestic water system to provide a dosage of not less than 50 parts per million at each faucet and valve. The chlorine solution shall then be allowed to stand for a minimum of 24 hours in the system. iii. At the end of 24 hours test shall be made for residual chlorine at the extreme end of the system from the point where chlorine was introduced. If chlorine residual is less than 10 ppm, the chlorination procedure shall be repeated. iv. Flush the system with a clean supply of water until the chlorine residual in the system is reduced to less than 1 ppm, or to the chlorine residual of the supply water. During the flushing, each faucet and valve in the system shall be opened and closed a minimum of 4 times.

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b. After 24 hours, the water treatment representative will have samples taken and tested by an independent laboratory. The system must be free of bacteriological contamination. If the system is contaminated, it shall be re-chlorinated until a satisfactory test is made.
c. The Water Treatment Contractor shall write a letter, informing the Mechanical Contractor that the building has been successfully chlorinated, and that the water is fit for human consumption.

C. TESTING
1. Closed Systems:
a. Provide a Nitrite "Drop Test" kit for determining the level of Nitrite or Molybdate in the closed system.

D. SYSTEM START-UP
1. The Water Treatment Supplier shall put the system into operation, and make adjustments necessary for proper operation.
2. The Water Treatment Supplier shall provide a written report indicating that the start-up has been completed and that all Water Treatment Equipment is operating properly.

E. TESTING AND CLEANING
1. Sample all treated water systems at one-week intervals after start-up for period of 4 weeks and prepare certified test report for each system being treated.
2. Start-up test, and adjust water conditioners in presence of manufacturer's authorized representative. Operate units including regeneration, back washing, rinsing and flushing. Adjust unit to maintain required steady state effluent water quality.
3. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

F. CLOSEOUT PROCEDURES
1. Provide services of manufacturer's technical representative for one 8 hour day to instruct Owner's personnel in operation and maintenance of water treatment systems.

END OF SECTION

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SECTION 23 31 00 - DUCTWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Galvanized Ductwork

B. Aluminum Ductwork

C. Stainless Steel Ductwork

D. Carbon Steel Ductwork

E. Ductwork Reinforcement

F. Ductwork Sealants

G. Rectangular Ductwork

H. Round and Flat Oval Ductwork

I. Exposed Ductwork (Rectangular, Round, or Oval)

J. Flexible Duct

K. Grease Exhaust Duct

L. Dishwasher Exhaust Duct

M. Fume Exhaust Duct

N. Welding Exhaust Duct

O. Acoustical Lagging

P. Leakage Testing

Q. Ductwork Penetrations

R. Duct Cleaning

S. Painting

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1.2 REFERENCES: Conform to all applicable requirements of the following publications:

A. ADC Flexible Duct Performance and Installation Standards, 3rd Edition 1996.

B. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. ANSI/AWS A5.11M (1997) - Specification for Nickel and Nickel Alloy Welding Electrodes for Shielded Metal Arc Welding.

D. ASHRAE - Handbook 2012 Systems and Equipment; Chapter 19 - Duct Construction.

E. ASHRAE - Handbook 2013 Fundamentals; Chapter 21 - Duct Design.

F. ASHRAE 170 (latest published edition) - Ventilation of Health Care Facilities.

G. ASTM A90 - Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

H. ASTM A167- Stainless & Heat-Resisting Chromium-Nickel Steel Plate, Sheet, & Strip.

I. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

J. ASTM A924 - Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

K. ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

L. ASTM E90-02 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

M. ASTM E413-87 - Classification for Rating Sound Insulation.

N. AWS A5.14M (1997) - Specification for Nickel and Nickel Alloy Bare Welding Electrodes and Rods.

O. AWS D9.1M/D9.1 - Sheet Metal Welding Code.

P. NADCA ACR 2002 - Assessment, Cleaning, and Restoration of HVAC Systems.

Q. NADCA Standard 05 1997 - Requirements for the Installation of Service Openings in HVAC Systems.

R. NFPA 90A - Installation of Air-Conditioning and Ventilating Systems.

S. NFPA 90B - Installation of Warm Air Heating and Air- Conditioning Systems.

T. NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Equipment.

U. SMACNA - Air Duct Leakage Test Manual - 1985 Edition.

V. SMACNA - HVAC Duct Construction Standards - 2005 Edition.

W. SMACNA - Phenolic Duct Construction Standard 022.

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X. SMACNA - Round Industrial Duct Construction Standards - 1999 Edition.

Y. UL 181 - Factory-Made Air Ducts and Air Connectors.

Z. UL 181A - Closure Systems for Use with Rigid Air Ducts and Air Connectors

AA. UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors.

BB. UL 1978 - Standard for Grease Ducts.

CC. UL 2221 - Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies.

1.3 SUBMITTALS

A. Submit shop drawings per Section 23 05 00.

B. Submit duct fabrication standards in compliance with SMACNA and these specifications. Clearly indicate metal gauges, reinforcement, and joining methods intended for use for each pressure classification. Furnish details of all common duct fittings and joint connections to be used on this project.

C. The Architect/Engineer may require field verification of sheet metal gauges and reinforcing to verify compliance with these specifications. At the request of the Architect/Engineer, the contractor shall remove a sample of the duct for verification. The contractor shall repair as needed.

D. Duct Layout Drawings: Submit detailed duct layout drawings at 1/4" minimum scale complete with the following information:
1. Actual duct routing, ductwork fittings, actual sheet metal dimensions including insulation liner and wrap, duct hanger and support types, ductwork accessories, etc. with lengths and weights noted.
2. Differentiate ducts that are wrapped. Include insulation thickness, type of insulation, and acoustical lagging.
3. Room names and numbers, ceiling types, and ceiling heights.
4. Verify clearances and interferences with other trades prior to preparing drawings. IMEG will provide electronic copies of ventilation drawings for contractor's use if the contractor signs and returns the "Electronic File Transfer" waiver. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for this submittal. Refer also to Section 23 05 00.

1.4 DEFINITIONS

A. Duct Sizes shown on drawings are outside dimensions. Maintain clearance for any ducts to be wrapped.

B. Transitions are generally not shown in single-line ductwork. Where sizes change at a divided flow fitting, the larger size shall continue through the fitting.

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1.5 COORDINATION DRAWINGS

A. Reference Coordination Drawings article in Section 23 05 00 for required duct systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

B. Duct drawings shall be at 1/4" minimum scale complete with the following information:
1. Actual duct routing, ductwork fittings, actual sheet metal dimensions including insulation liner and wrap, duct hanger and support types, ductwork accessories, etc. with lengths and weights noted.
2. Differentiate ducts that are lined or wrapped. Include insulation thickness, type of insulation, and acoustical lagging.
3. Location and size of all duct access doors.
4. Room names and numbers, ceiling types, and ceiling heights.

C. IMEG will provide electronic file copies of ventilation drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings. Architectural plans will need to be obtained from the Architect.

PART 2 - PRODUCTS

2.1 GALVANIZED DUCTWORK

A. General Requirements:
1. Duct and reinforcement materials shall conform to ASTM A653 and A924.
2. Interior Ductwork and reinforcements: G60 galvanized (0.60 ounces per square foot total zinc coating for two sides per ASTM A90) unless noted otherwise.
3. Exterior Ductwork: G90 galvanized (0.90 ounces per square foot total zinc coating for two sides per ASTM A90) unless noted otherwise. G60 is not acceptable for exterior use.
4. Ductwork reinforcement shall be of galvanized steel.
5. Ductwork supports shall be of galvanized or painted steel.
6. Strap hanger shall be a minimum of 1 inch, 18 gauge galvanized steel attached to the bottom of ducts with spacing as required by SMACNA at 8'-0" OC and as required by CMC/UMC and SMACNA guidelines.
7. Aircraft cable and slip cable hangers are acceptable for ducts up to 18"ø. Protective sleeve tubing shall be used on the cable when supporting duct with exterior insulation. Corner saddles are required when supporting rectangular ductwork. Acceptable manufacturers are Gripple, Ductmate, Duro Dyne, or Architect/Engineer approved.
8. All fasteners shall be galvanized or cadmium plated.

2.2 ALUMINUM DUCTWORK

A. General Requirements:
1. Material: ASTM B209; aluminum sheet, Alloy 3003-H14. Aluminum connectors and bar stock: Alloy 6061-T6. Aluminum or stainless steel fasteners are acceptable.
2. All duct gauges and reinforcement shall be as called for in Tables 2-50, 2-51, 2-52, and 3-14 of the SMACNA HVAC Duct Construction Standards.

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3. Ductwork reinforcement shall be of aluminum.
4. Ductwork supports shall be of aluminum, galvanized steel or painted steel. Slip cable hangers are acceptable. Acceptable manufacturers are Gripple, Ductmate, Duro Dyne, or Architect/Engineer approved.
5. All other requirements are as noted for galvanized rectangular sheet metal duct.

2.3 STAINLESS STEEL DUCTWORK

A. General Requirements:
1. Ductwork shall be Type *304L* stainless steel, 16 gauge minimum.
2. Exposed ductwork shall have a #3 finish. Concealed ductwork may have milled finish.
3. Ductwork reinforcement shall be of stainless steel.
4. Ductwork supports shall be of stainless steel. Slip cable hangers are acceptable. Acceptable manufacturers are Gripple, Ductmate, Duro Dyne, or Architect/Engineer approved.
5. All fasteners shall be cadmium plated or stainless steel.

2.4 CARBON STEEL DUCTWORK

A. General Requirements:
1. Phenolic duct shall be constructed per the latest edition of the SMACNA Phenolic Duct Construction Standard 022.
2. Material: CFC-free, closed cell rigid thermoset resin thermally bonded to aluminum foil faced fiberglass scrim inside and out. 3.4 lb./cu.ft. density. Minimum compressive strength of 28 psi. 7/8" thick 1-3/16" thick.
3. Insulation:
   a. Thermal Conductivity: 0.13 maximum 'K' value at 75°F.
   b. Minimum R-Value = 6.0 =8.0.
4. Rated Velocity: ≤ 5000 FPM
5. Rated Pressure:
   a. Positive: 3"w.c.
   b. Negative: 3"w.c.
6. Flame spread/smoke developed ratings of less than 25/50 per ASTM E84.

B. General Requirements:
1. Ductwork shall be black carbon steel. Refer to Grease Exhaust Duct below for thicknesses.

2.5 DUCTWORK REINFORCEMENT

A. General Requirements:
1. All reinforcement shall be external to the duct except that tie rods may be used with the following limitations.
   a. Ducts must be over 18" wide.
   b. Tie rods must not exceed 1/2" diameter.
   c. Manufacturer of tie rod system must certify pressure classifications of various arrangements, and this must be in the shop drawings.

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2.6 DUCTWORK SEALANTS

A. One-part joint sealers shall be water-based mastic systems that meet the following requirements: maximum 48-hour cure time, service temperature of -20°F to +175°F, resistant to mold, mildew and water, flame spread rating below 25 and smoke-developed rating below 50 when tested in accordance with ASTM E84, suitable for all SMACNA seal classes and pressure classes. Mastic used to seal flexible ductwork shall be marked UL 181B-M.

B. Two-part joint sealers shall consist of a minimum 3"75 mm wide mineral-gypsum compound impregnated fiber tape and a liquid sealant. Sealant system shall meet the following requirements: maximum 48-hour cure time, service temperature of 0°F to 200°F, resistant to mold, mildew, and water, flame spread rating below 25 and smoke developed rating below 50 when tested in accordance with ASTM E84, suitable for all SMACNA seal classes and pressure classes.

C. Pressure sensitive tape used for sealing ductwork shall be minimum 2.5-inch wide, listed and marked UL 181A-P, having minimum 60 oz/inch peel adhesion to steel, and service temperature range from -20°F to +250°F.

D. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:
   1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
   2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.

E. Where pressure sensitive tape is called for on drawings and specifications for sealing flexible ductwork, tape shall be minimum 2.5-inch wide, UL 181 B-FX listed, and marked tape having minimum 60 oz/inch peel adhesion to steel and service temperature range from -20°F to +250°F. Acceptable manufacturers include: Venture Tape 1581A, Compac #340, Scotch Foil Tape 3326, Polyken 339.

2.7 RECTANGULAR DUCT - SINGLE WALL

A. General Requirements:
   1. All ductwork gauges and reinforcements shall be as listed in SMACNA Duct Construction Standards Chapter 2. Where necessary to fit in confined spaces, furnish heaviest duct gauge and least space consuming reinforcement
   2. Transitions shall not exceed the angles in Figure 4-7.

B. Exceptions and modifications to the 2005 HVAC Duct Construction Standards are:
   1. All ducts shall be cross-broken or beaded.
   2. Snap lock seams are not permitted.
   3. Turning vanes shall be used in all 90° mitered elbows, unless clearly noted otherwise on the drawings. Vanes shall be as follows:
      a. Type 1:

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1) Description: Single wall type with 22-gauge (0.029") or heavier vanes, 3-1/4" blade spacing, and 4" to 4-1/2" radius. Vanes hemmed if recommended by runner manufacturer. Runners shall have extra-long locking tabs. C-value independently tested at below 0.26. EZ Rail II by Sheet Metal Connectors or equal.
2) Usage: Limited to 3,000 fpm and vane lengths 36" and under.

b. Type 2:
1) Description: Double wall type with 3-1/4" blade spacing, 4-1/2" radius, 24-gauge minimum, and SMACNA Type 1 runners. C-value below 0.27.
2) Usage: No limits other than imposed by the manufacturer. Provide intermediate support for vanes over 48" long.

c. Type 3 (acoustical - where acoustical lagging is located or as noted on drawings):
1) Description: Same as Type 2, except filled with fiberglass and with slotted or perforated inner curve. Minimum insertion loss of 9 dB at 250 Hz and 6 dB at 1 KHz.
2) Usage: No limits other than imposed by the manufacturer. Provide intermediate support for vanes over 48" long.

d. Turning vanes shall operate quietly. Repair or replace vanes that rattle or flutter.
e. Runners must be installed at a 45° angle. Elbows with different size inlet and outlet must be radius type.
f. Omitting every other vane is prohibited.

4. Where smooth radius rectangular elbows are shown, they shall be constructed per SMACNA Figure 4-2. Type RE1 shall be constructed with a centerline duct radius R/W of 1.0. Where shown on drawings, Type RE3 elbows with 3 vanes shall be used with centerline duct radius R/W of 0.6 (SMACNA r/W=0.1). RE1 or RE3 elbows may be used where mitered elbows are shown if space permits. Mitered elbows (with or without turning vanes) may not be substituted for radius elbows. Do not make branch takeoffs within 4 duct diameters on the side of the duct downstream from the inside radius of radius elbows.
5. Rectangular branch and tee connections in ducts over 1" pressure class shall be 45° entry type per Figs. 4-5 and 4-6. Rectangular straight taps are not acceptable above 1" pressure class *unless approved by engineer. Provide all straight tap locations for Engineer review.*
6. Bellmouth fittings shown on return duct inlets shall expand at a 60-degree total angle horizontally and vertically (space permitting) and have length of at least 25% of the smallest duct dimension.
7. Round taps off rectangular unlined ducts shall be flanged conical or bellmouth type (equal to Buckley Bellmouth or Sheet Metal Connectors E-Z Tap), or 45° rectangular with transition to round (equal to Sheet Metal Connectors Inc. High Efficiency Takeoff). Straight taps are acceptable if pressure class is 1" or less, round duct is 12" diameter or less, and the tap is not located between fans and TAB devices.
8. Duct offsets shall be constructed as shown on drawings. Additional offsets required in the field shall be formed of mitered elbows without turning vanes for offsets up to 30° maximum angle in accordance with SMACNA offset Type 2. Offsets of greater than 30° angle shall be formed of radius elbows with centerline radius R/W=1.0 or greater. SMACNA Type 1 offsets shall be permitted in spaces with tight clearances.
9. Cushion heads are acceptable only downstream of TAB devices in ducts up to ± 2" pressure class, and must be less than 6" in length.
10. Slide-on flanged transverse joint systems are acceptable provided they are a manufactured product that has been tested for conformance with Chapter 2 of the SMACNA HVAC Duct Construction Standards for sheet and joint deflection at the specified pressure class.

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a. Apply sealant to all inside corners. Holes at corners are not acceptable.
b. Acceptable Manufacturers: Ductmate Industries - 25/35/45, Nexus, Mez, or WDCI. Other manufacturers must submit test data and fabrication standards and receive Architect/Engineer's approval before any fabrication begins.

11. Formed-on flanged transverse joint systems are acceptable provided they are a manufactured product that has been tested for conformance with Chapter 2 of the SMACNA HVAC Duct Construction Standards for sheet and joint deflection at the specified pressure class.
    a. Apply sealant to all inside corners. Holes at corners are not acceptable.
    b. Flanges shall be 24-gauge minimum (not 26 gauge).
    c. Acceptable Manufacturers: Lockformer TDC, TDF, United McGill, or Sheet Metal Connectors. Other manufacturers must submit test data and fabrication standards and receive Architect/Engineer's approval before any fabrication begins.

2.8 RECTANGULAR DUCT - DOUBLE WALL

A. All applicable portions of Rectangular Duct - Single Wall shall apply.

B. Furnish and install double-wall insulated airtight duct as shown on the drawings.

C. Duct Construction:
1. Galvanized steel exterior wall with solid galvanized steel interior wall.
2. Rectangular double wall duct shall be suitable for pressures listed in the ductwork application schedule.
3. All ductwork gauges and reinforcement shall be as listed in SMACNA Duct Construction Standards Chapter 2. Where necessary to fit in confined spaces, furnish heaviest duct gauge and least space-consuming reinforcement.
    a. Ducts shall be 1" thick and completely metal enclosed with annular space completely filled with 1-1/2# density glass fiber insulation. Insulation shall have flame spread/smoke developed ratings of less than 25/50 per ASTM E84, NFPA 255, or UL 723.
    b. Divided flow fittings may be separate fittings or factory installed taps with the following construction requirements:
        1) Airtight, continuous welds at intersection of fitting body and tap.
        2) Tap liner spot welded to inner liner with weld spacing not over 3"80 mm.
        3) Insulation packed around the tap area for complete cavity filling.
        4) Carefully fit branch connections to cut-out openings in inner liner without spaces for air erosion of insulation or sharp projections for noise and airflow disturbance.
    c. Spot weld and bond all fitting seams in the pressure shell. Coat galvanizing damaged by welding with corrosion resistant paint to match galvanized duct color.
    d. Support inner liner of ducts and fittings with metal spacers welded to maintain spacing and concentricity.
    e. Formed-on flanged transverse joint systems are acceptable if they are a manufactured product that has been tested for conformance with Chapter 2 of the SMACNA HVAC Duct Construction Standards for sheet and joint deflection at the specified pressure class.
        1) Apply sealant to all inside corners. Holes at corners are not acceptable.
        2) Flanges shall be 24-gauge minimum (not 26 gauge).

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3) Acceptable Manufacturers: Lockformer TDC, TDF, United McGill, or Sheet Metal Connectors. Other manufacturers must submit test data and fabrication standards and receive Architect/Engineer's approval before any fabrication begins.

2.9 ROUND AND FLAT OVAL SPIRAL SEAM DUCTWORK - SINGLE WALL

A. Conform to applicable portions of Rectangular Duct Section. Round or flat oval ductwork may be substituted for rectangular ductwork where approved by the Architect/Engineer. The spiral seam ductwork shall meet the standards set forth in this specification. The ductwork shall meet or exceed the specified cross-sectional area and insulation requirements. The substitution shall be coordinated with all other trades prior to installation.

B. Flat oval duct in negative pressure applications shall have flat sides reinforced as required for rectangular ducts of the same gauge with dimensions equal to the flat span of the oval duct.

C. 90° elbows shall be smooth radius or have a minimum of five sections with mitered joints and R/D of at least 1.5.

D. Duct and fittings shall meet the required minimum gauges listed in chapter 3 of the SMACNA requirements for the specified pressure class. Ribbed and lightweight duct are not permitted.

E. Ductwork shall be suitable for velocities up to 5,000 fpm25 m/s.

F. Divided flow fittings may be made as separate fittings or factory installed taps with sound, airtight, continuous welds at intersection of fitting body and tap.

G. Spot weld and bond all fitting seams in the pressure shell. Coat galvanizing damaged by welding with corrosion resistant paint to match galvanized duct color.

H. Ducts with minor axis less than 22" shall be spiral seam type. Larger ducts may be rolled, longitudinal welded seam type. SMACNA seams RL-2 and RL-3 are not permitted.

I. Reinforce flat oval ducts with external angles. Internal tie rods are permitted only as indicated for rectangular ductwork.

J. Transverse Joint Connections:
1. Crimped joints are not permitted.
2. Ducts and fittings 36" in diameter and smaller shall have slip joint connections. Size fitting ends to slip inside mating duct sections with minimum 2-inch insertion length and a stop bead. Use inside slip couplings for duct-to-duct joints, and outside slip couplings for fitting-to-fitting joints.
3. Ducts and fittings larger than 36"900 mm shall have flanged connections.
4. Secure all joints with at least 3 sheet metal screws before sealing.
5. Slide-on flanges as manufactured by Ductmate Industries - SpiralMate, Accuflange, or Sheet Metal Connectors are acceptable. Self-sealing duct systems are also acceptable (Lindab, Ward "Keating Coupling").

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2.10 ROUND AND FLAT OVAL SPIRAL SEAM DUCTWORK - DOUBLE WALL

A. Conform to applicable portions of Rectangular Duct Section. Spiral seam round or flat oval double wall ductwork may be substituted for double wall rectangular ductwork where approved by the Architect/Engineer. Double wall spiral seam ductwork shall meet the standards set forth in this specification. Ductwork shall meet or exceed the specified cross-sectional area and insulation requirements. The substitution shall be coordinated with all other trades prior to installation. Interior wall shall be perforated if substituting for lined or double wall rectangular ductwork.

B. Interior ducts shall have an airtight outer pressure shell, a 1" insulation layer, and a solid inner wall that completely covers the insulation.

C. Exterior ducts shall have an airtight outer pressure shell, a 2" insulation layer, and a solid inner wall that completely covers the insulation.

D. All perforated inner walls shall have a 25/50 compliant liner between the insulation and the perforated inner wall to prevent contact between fiberglass and air stream. For exterior ductwork this shall form a continuous vapor barrier.

E. Insulation shall have flame spread/smoke developed ratings of under 25/50 per ASTM E84, NFPA 255, or UL 723.

F. 90° elbows shall be smooth radius or have a minimum of 5 mitered joints, and R/D of at least 1.5.

G. Duct and Fittings shall meet the required minimum gauges listed in chapter 3 of the SMACNA standards for the specified pressure class. Ribbed and lightweight duct are not permitted.

H. Ductwork shall be suitable for up to 5,000 fpm25 m/s velocity.

I. Divided flow fittings may be separate fittings or factory installed taps with the following construction requirements:
   1. Sound airtight, continuous welds at intersection of fitting body and tap.
   2. Tap liner welded to inner liner with weld spacing not over 3"80 mm.
   3. Insulation packed around the tap area for complete cavity filling.
   4. Carefully fit branch connections to cut-out openings in inner liner without spaces for air erosion of insulation or sharp projections for noise and airflow disturbance.

J. Spot weld and bond all fitting seams in the pressure shell. Coat galvanizing damaged by welding with corrosion resistant paint to match galvanized duct color.

K. Support inner liner of ducts and fittings with metal spacers welded to maintain spacing and concentricity.

L. Ducts with minor axis under 22" shall be spiral seam type. Larger ducts may be rolled, longitudinal welded seam type. SMACNA seams RL-2 and RL-3 are not permitted.

M. Transverse Joint Connections:
   1. Crimped joints are not permitted.

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2. Provide couplings to align the inner liners. Butt joints are not permitted for inner liners. Make alignment by extending the liner of the fitting into the duct or by using a double concentric coupling with the two couplings held by spacers for rigidity and wall spacing.
3. Above 34" ID provide a separate coupling for inner alignment with the pressure shells joined by angle ring flanged connections.
4. Use outside slip couplings for fitting-to-fitting joints.
5. Secure all joints with at least 3 sheet metal screws before sealing.
6. Slide-on flanges as manufactured by Ductmate Industries - SpiralMate, Accuflange or Sheet Metal Connectors are acceptable. Self-sealing duct system is also acceptable (Lindab, Ward "Keating Coupling").

2.11 EXPOSED DUCTWORK (RECTANGULAR, ROUND, AND FLAT OVAL)

A. The following applies to all ductwork exposed in finished areas in addition to requirements noted above:
1. Provide extra shipping protection. Use Cardboard or other protective means to prevent dents and deformed ends.
2. Provide cardboard or other means of protection during field fabrication. Protect from scratches. Provide stiffeners to retain shape during fabrication.
3. Remove all identification stickers and thoroughly clean exterior of all ducts.
4. Locate fitting seams on least visible side of duct.
5. Provide exterior finish suitable for field painting without further oil removal.
a. Finishes for Surfaces Exposed to View: G90 Mill phosphatized or "Paint Lock".
b. Provide in all exposed areas but limted to the commons, audotorium, art rooms, CTE (excluding dust collector duct), GYM, Scene shop, etc. Coordinate with Architectural RCP.
6. Provide ramp-type internal joint couplings. Provide bead of sealant around the inside of the duct about 1/2" from the end of the duct. Slide-on flanges as manufactured by Ductmate Industries, Accuflange or Sheet Metal Connectors are acceptable. Self-sealing duct system is also acceptable (Lindab, Ward "Keating Koupling").
7. The system shall be free of visible dents and scratches when viewed from normal occupancy.
8. All insulation shall be internal, except at reheat coils.

B. Alternate manufacturers, including shop fabricated duct, must be reviewed before installation. The following information is required:
1. Metal gauge of duct and fittings.
2. Fitting type and construction.
3. Type and size of reinforcement.

C. Hangers for Exposed Ductwork:
1. Round Ducts:
a. Threaded rod with duct fixing bracket and metal strap. Provide single threaded rod centered on the duct. Strap hanger shall be a minimum of 1 inch, 18 gauge galvanized steel wrapping the circumference of the duct. Spacing as required by SMACNA guidelines.

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b. Aircraft cable and slip cable hangers are acceptable for ducts up to 18"ø. Protective sleeve tubing shall be used on the cable when supporting duct with exterior insulation. Spacing and cable size as required by SMACNA guidelines. Acceptable manufacturers are Gripple, Ductmate, Duro Dyne, or Architect/Engineer approved.
c. Aircraft cable with 2-point support in standard horseshoe arrangement. Protective sleeve tubing shall be used on the cable when supporting duct with exterior insulation. Spacing and cable size as required by SMACNA guidelines

2. Rectangular Ducts
a. Aircraft cable and slip cable hangers are acceptable for ducts up to 18" in maximum dimension. Protective sleeve tubing shall be used on the cable when supporting duct with exterior insulation. Corner saddles are required when supporting rectangular ductwork. Spacing and cable size as required by SMACNA guidelines. Acceptable manufacturers are Gripple, Ductmate, Duro Dyne, or Architect/Engineer approved.
b. Aircraft cable with 2-point support in standard horseshoe arrangement. Protective sleeve tubing shall be used on the cable when supporting duct with exterior insulation. Corner saddles are required when supporting rectangular ductwork. Spacing and cable size as required by SMACNA guidelines
3. Strut-channel and all-thread rod is not acceptable for exposed ductwork.
4. All fasteners shall be galvanized or cadmium plated.

2.12 FLEXIBLE DUCT

A. Flexible duct shall be listed and labeled as UL 181 Class 1 Air Duct Material, and shall comply with NFPA 90A and 90B, and meet GSA, FHA and other U.S. Government agency standards. Flexible duct shall bear the ADC Seal of Certification.

B. Flame Spread/Smoke Developed: Not over 25/50.

C. Flexible duct shall have corrosion resistant wire helix, bonded to an inner liner that prevents air from contacting the insulation, covered with minimum 1-1/2", 3/4 lb/cf density fiberglass insulation blanket, sheathed in a vapor barrier of metalized polyester film laminated to glass mesh.

D. Inner liner shall be airtight and suitable for 6" WC static pressure through 16" diameter through 10" diameter and shall be airtight and suitable for 4" WC static pressure 12" through 16" diameter. Outer jacket shall act as a vapor barrier only with permeance not over 0.1 perm per ASTM E96, Procedure A. "R" value shall not be less than 4.0 ft2*ºF*hr/Btuh. Temperature range of at least 0 180ºF. Maximum velocity of 4,000 fpm.

E. Usage:
1. Connections to air inlets and outlets. Do not exceed 5'-0" in length.

F. Stretch all flexible duct to prevent sags and reduce air friction. Shorten and reinstall all sagging or loose flexible duct. Avoid sharp elbows. Elbows shall maintain 1.5 diameter centerline turning radius. *Short radiaus elbows can be used, submit to engineer locations for approval.*

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G. Install per the SMACNA Flexible Duct Manual. Secure inner layer with draw band. Wrap with pressure sensitive tape for protection prior to installing draw band. Pressure sensitive tape alone is not acceptable.

H. Lay in diffusers will require adjustable 90 for flex connection.

I. No flex connected directly to lay in diffuser.

2.13 GREASE EXHAUST DUCT FIELD FABRICATED

A. Exposed All ductwork shall be 16 gauge minimum, Type 304L stainless steel. Concealed ductwork may be 16 gauge black steel.

B. Concealed Ductwork:
   1. Range hood/grease exhaust ducts having an area of 4 sf or less shall be 16 gauge carbon steel.
   2. Range hood/Grease exhaust ducts having an area greater than 4 sf shall be 14 gauge carbon steel.

C. All joints and fittings shall be continuously welded and liquid-tight.

D. Exposed ductwork shall have a #3 finish. Concealed ductwork may have a mill finish.

E. Do not penetrate fire rated partitions, unless protected as required by applicable codes.

F. Provide pre-fabricated access doors and labels required by NFPA 96 and California Mechanical Code on sides of duct at least 1.5" from bottom. Provide access at each change in direction and at maximum 20-foot intervals in horizontal ducts. Provide access at every floor for vertical ducts.

G. Install grease traps in kitchen grease and dishwasher ducts at base of all vertical risers and low points in the system.

H. Where grease ducts are 20" x 20" or larger, install access for personnel to enter duct. Duct supports must be sized to support the duct weight and an additional 800 lbs per NFPA 96.

I. Install ducts with proper clearance to combustible and limited-combustible materials.

J. Grease ducts installed with volume dampers shall conform to the damper specified in ductwork accessories.

K. Grease exhaust duct doors shall be grease and airtight, UL 1978 listed, meet NFPA 96 standards, and all mechanical codes. Grease duct access doors can be sandwich type or with a weld-on frame, with/without hinge.
   1. Approved Manufacturer: Ductmate Industries "Ultimate I" or "Ultimate II" Style door or approved equal.

L. All grease duct access doors used must be accompanied by independent testing in conjunction with each manufacturer's respective wrap system for high temperature applications.

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M. Refer to Section 23 07 13 for duct insulation material and insulated access door when required to provide proper enclosure of ductwork.

2.14 GREASE EXHAUST DUCT (ROUND) PREFABRICATED SYSTEM

A. Ductwork shall have a 0.035" Type 304 stainless inner wall and 0.025" aluminized steel 0.024" thick type 304/316 stainless steel outer wall.

B. 4" annular space between inner and outer walls shall be filled with 4" of high temperature ceramic fiber insulation.

C. Seal ductwork liquid-tight by mechanical joint consisting of integral flanges, with stainless steel flange band and sealed with type P080 sealant.

D. Ductwork shall include hood and fan transitions, cleanout ports, fire suppression and washdown nozzles, expansion joints, and other ductwork provided by manufacturer to ensure completely rated system.

E. Ductwork shall require zero clearance to combustibles. Seal and/or firestop ductwork through non-rated and up to two hour rated penetrations. Firestop with ductwork manufacturer approved materials.

F. Provide all duct access doors and labels required by NFPA 96. Provide access at each change in direction and at maximum 12-foot intervals.

G. Where grease ducts are 20" diameter or larger, install access for personnel to enter duct. Duct supports must be sized to support the duct weight and an additional 800 lbs per NFPA 96.

H. Do not penetrate fire rated partitions, unless protected as required by applicable codes.

I. Anchor duct with manufacturer approved materials of a minimum 5/8" diameter.

J. Grease exhaust duct doors shall be grease and airtight, UL 1978 listed, meet NFPA 96 standards, and all mechanical codes. Grease duct access doors can be sandwich type or with a weld-on frame, with/without hinge.
   1. Approved Manufacturer: Ductmate Industries "Ultimate Round" style door or approved equal

K. All grease duct access doors used must be accompanied by independent testing in conjunction with each manufacturer's respective wrap system for high temperature applications.

L. Ductwork shall be rated for continuous operation at 500°F and intermittently at 2000°F.

M. System shall be listed as a 2-hour fire rated shaft enclosure per UL 2221.

N. Acceptable Manufacturers: Metal-Fab No Chase, Schebler.

2.15 DISHWASHER EXHAUST DUCT

A. Ductwork shall be 16 gauge minimum Type 316L stainless steel.

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B. All joints and fittings shall be continuously welded and liquid-tight.

C. Ductwork exposed in kitchens shall have a #3 finish. Concealed ductwork may have a standard mill finish.

D. Do not penetrate fire rated partitions, unless protected as required by applicable codes.

2.16 FUME EXHAUST DUCT

A. Unless shown otherwise on the drawings, all fume exhaust ductwork shall be 14 or 16 gauge (1.98 mm 1.6 mm) Type 304L stainless steel with continuously welded joints.

B. Elbows up to 30° shall be mitered two-piece type. Elbows 31° to 50° shall be mitered three-piece type. Elbows 51° to 90° shall be mitered five-piece type. All elbows shall have a minimum centerline R/D of 1.5. Elbows 10" in diameter and smaller may be die-formed.

C. Expanders in horizontal ducts shall be eccentric type with a minimum length of (diameter change x 10) and shall maintain a positive pitch for drainage to the fume hood or exhaust outlet. Expanders in ducts over 30º from horizontal shall be concentric with a minimum length of (diameter change x 5).

D. Ducts shall maintain the maximum possible pitch toward their inlets unless a different drainage location is indicated on the drawings. If at least 1/8" per foot pitch cannot be maintained, notify the Architect/Engineer before installing ductwork or other items with which ductwork may conflict.

E. All welds shall conform to AWS D9.1M. Welds shall be Gas Tungsten Arc Weld (TIG) or Gas Metal Arc Weld (MIG) type. All filler metal shall conform to AWS A5.9 or A5.22 and be AWS Classification ER308L or ER308LSi with a carbon content of not over 0.03%.

F. Supports shall not penetrate duct surfaces. Ductwork shall be completely leak-tight from the inlet to the discharge to the atmosphere, at pressures up to 10" WG. Install caps to seal the ductwork for pressure testing. Plug all spray and drain connections when testing ductwork.

G. Where flanged joints are indicated, they shall have 1/4" "Gore-Tex Joint Sealant" gaskets (W. L. Gore & Associates, Industrial Products Division, 100 Airport Road, Box 1550, Elkton, MD 21921 (410) 392-4440 or (410) 392-3200). PTFE gaskets are also acceptable.

H. Furnish one 50' spool of gasket material or 10 spare gaskets of each size used to the Owner for future use.

I. Do not penetrate fire rated partitions, unless protected as required by applicable codes.

2.17 WELDING EXHAUST DUCT

A. Ductwork shall be spiral seam single wall type. Construct to requirements of SMACNA Class I Industrial Duct with a pressure rating of 7" negative. Flexible ducts shall be weld proof tubing. Furnish magnetic receptors at each welding table.

B. Do not penetrate fire rated partitions, unless protected as required by applicable codes.

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C. Acceptable Manufacturers for Tubing and Receptors: Car-Mon Products, Inc., Engwald, or National.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide openings in ducts for thermometers and controllers.

B. Locate ducts with space around equipment for normal operation and maintenance.

C. Do not install ducts or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the electrical equipment. Unless intended to serve these rooms, do not install any ductwork or equipment in electrical rooms, transformer rooms, electrical closets, telephone rooms or elevator machine rooms.

D. Provide temporary closures of metal or taped polyethylene on open ducts to prevent dust from entering ductwork. Supply ductwork shall be free of construction debris, and shall comply with Level "B" OR "C" of the SMACNA Duct Cleanliness for New Construction Guidelines.

E. Repair all duct insulation and liner tears.

F. Install manual volume dampers in branch supply ducts so all outlets can be adjusted. Do not install dampers at air terminal device or in outlets, unless specifically shown.

G. Insulate terminal air box reheat coils. Seal insulation tight to form a tight vapor barrier.

H. Install flexible duct in accordance with the ADC Flexible Duct Performance and Installation Standards.

I. Install all exterior ductwork per SMACNA Fig. 6-3. Where drawings do not indicate otherwise, ductwork seams and joints shall be sealed watertight and pitched to shed water.

J. Adhesives, sealants, tapes, vapor retarders, films, and other supplementary materials added to ducts, plenums, housing panels, silencers, etc. shall have flame spread/smoke developed ratings of under 25/50 per ASTM E84, NFPA 255, or UL 723.

K. All duct support shall extend directly to building structure. Do not support ductwork from pipe hangers. Do not allow lighting or ceiling supports to be hung from ductwork or ductwork supports.

L. Kitchen Grease and Dishwasher Ductwork:
   1. All kitchen grease and dishwasher ductwork shall be installed with a continuous slope and grease tight welds on all seams and joints.

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M. Routing: vertically and horizontally and avoid diagonal runs wherever possible. Run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Locate insulated ductwork for 1" clearance outside of insulation. Conceal ductwork from view.

N. Electrical Equipment Spaces: Do not route ductwork through transformer vaults and their electrical equipment spaces and enclosures.

3.2 DUCTWORK APPLICATION SCHEDULE

USAGE	MATERIAL	PRESSURE CLASS	SEAL CLASS †	INSULATION (Refer to Schedule on drawings)
Supply Duct from Fan to Terminal Air Boxes - Single Wall	Galvanized Sheet Metal - Rectangular	+3"	A	(Refer to Schedule on drawings
Supply Duct from Fan to Terminal Air Boxes - Single Wall	Galvanized Sheet Metal - Spiral Seam Round	+3"	A	(Refer to Schedule on drawings
Supply Duct from Fan to Terminal Air Boxes	Galvanized Sheet Metal w/Slide-On Flange System or Formed-on Flanges	+3" (+6")	A	(Refer to Schedule on drawings
Supply Duct from Fan to Terminal Air Boxes - Double Wall	Galvanized Sheet Metal (spiral seam round or rectangular)	+3"	A	(Refer to Schedule on drawings
Exterior Supply Duct from Fan to Terminal Air Boxes - Double Wall	Galvanized Sheet Metal (spiral seam round or rectangular)	+3"	A	(Refer to Schedule on drawings
Exterior Supply Duct from Fan to Terminal Air Boxes - Single Wall with Aluminum Jacket	Galvanized Sheet Metal (spiral seam round or rectangular)	+3"	A	(Refer to Schedule on drawings
Supply Duct from Terminal Air Boxes to Outlets	Galvanized Sheet Metal - Rectangular	+2"	A	(Refer to Schedule on drawings

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Supply Duct from Terminal Air Boxes to Outlets	Galvanized Sheet Metal - Spiral Seam Round or Snap-lock Seam Round	+2"	A	(Refer to Schedule on drawings)
Constant Volume from Fan to Outlet	Galvanized Sheet Metal - Rectangular	+2"	A	(Refer to Schedule on drawings
Constant Volume from Fan to Outlet	Galvanized Sheet Metal - Spiral Seam Round or Snap-lock Seam Round	+2"	A	(Refer to Schedule on drawings
Return Duct	Galvanized Sheet Metal	-2"	A	(Refer to Schedule on drawings)
Exterior Return Duct	Galvanized Sheet Metal	-2"	A	(Refer to Schedule on drawings)
General Exhaust Duct	Galvanized Sheet Metal	-1"	A	(Refer to Schedule on drawings
Combustion Air Duct	Galvanized Sheet Metal	-1"	A	(Refer to Schedule on drawings)
AHU Exhaust Air Duct	Galvanized Sheet Metal	+2"	A	(Refer to Schedule on drawings
Relief/Exhaust Air Duct from fan to Exhaust Outlet	Galvanized Sheet Metal	+2"	A	(Refer to Schedule on drawings
Grease Exhaust Duct	Refer to "Grease Exhaust Duct"	-3″	---	(Refer to Schedule on drawings
Dishwasher Exhaust Duct	Refer to "Dishwasher Exhaust Duct"	-1"	A	(Refer to Schedule on drawings
Fume Exhaust Duct	Refer to "Fume Exhaust Duct"	---	---	(Refer to Schedule on drawings
Outside Air Intake from Louver to Heating Coil	Galvanized Sheet Metal	-2"	A	(Refer to Schedule on drawings)
Mixed/Make-up Air Duct	Galvanized Sheet Metal	-2"	A	(Refer to Schedule on drawings
Tempered Outdoor or Makeup Air Duct from Fan to Outlet	Galvanized Sheet Metal	+2"	A	(Refer to Schedule on drawings
Relief Air Louver to Backdraft Damper	Galvanized Sheet Metal	+2"	A	(Refer to Schedule on drawings
Transfer Ducts	Galvanized Sheet Metal	-1/2"	---	(Refer to Schedule on drawings

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Ductwork Accessories (Fabric Flex Connectors, Equipment Flanges, etc.)	---	---	---	(Refer to Schedule on drawings
All Terminal Air Box/ Reheat Coil Headers and Duct Mounted Coil Headers	--	--	(Note 2)	(Refer to Schedule on drawings
Linear Diffuser Supply Plenum	-	-	-	(Refer to Schedule on drawings
Supply Duct from MAU to Outlets	Galvanized Sheet Metal	---	A	(Refer to Schedule on drawings
Dust collector Recirculating duct after the abort gate. (Exterior)	Galvanized Sheet Metal Double Wall	---	A	(Refer to Schedule on drawings
Dust collector Recirculating duct after the abort gate. (Interior)	Galvanized Sheet Metal	---	A	(Refer to Schedule on drawings

†? Seal Class is per SMACNA HVAC Air Duct Leakage Test Manual ± Type A insulation (Flexible Fiberglass Wrap) R-values noted are based on installed values (25% compression). Note 1: Apply aluminum based adhesive sealant tape at non-flanged joints on ducts serving dedicated outside air supply (DOAS) and exhaust system in addition to Class A sealant. Note 2: Apply aluminum based adhesive sealant tape on TAB boxes (all seams and joints of the box and duct connections) serving dedicated outside air supply (DOAS) system.

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3.3 DUCTWORK SEALING

A. General Requirements:
   1. Openings, such as rotating shafts, shall be sealed with bushings or similar.
   2. Pressure sensitive tape shall not be used as the primary sealant unless it has been certified to comply with UL-181A or UL-181B by an independent testing laboratory and the tape is used in accordance with that certification.
   3. All connections shall be sealed including, but not limited to, taps, other branch connections, access doors, access panels, and duct connections to equipment. Sealing that would void product listings is not required. Spiral lock seams need not be sealed.
   4. Mastic-based duct sealants shall be applied to joints and seams in minimum 3 inch wide by 20 mil thick bands using brush, putty knife, trowel, or spray, unless manufacturer's data sheet specifies other application methods or requirements.

B. For Seal Class A ducts, all transverse joints, longitudinal seams, and duct wall penetrations shall be sealed. Joints are inclusive of, but not limited to, girth joints, branch and sub-branch intersections, duct collar tap-ins, fitting subsections, louver and air terminal connections to ducts, access door and access panel frames and jambs, duct, plenum, and casing abutments to building structures.

C. Double-wall ductwork: Install insulation end fittings at all transitions from double to single-wall construction.

3.4 TESTING

A. Duct - 2" WG or Less (positive or negative):
   1. Systems shall not leak more than shown in Table 4-1 of SMACNA HVAC Air Duct Leakage Test Manual for Seal Class A.
   2. Leak testing of these systems is not normally required for interior ductwork. However, leak tests will be required if, in the opinion of the Architect/Engineer, the leakage appears excessive. All exterior ductwork shall be tested. If duct has outside wrap, testing shall be done before it is applied.
   3. Leak test shall be at the Contractor's expense and shall require capping and sealing all openings.
   4. Seal ducts to bring the air leakage into compliance.
   5. Contractor shall notify the Architect/Engineer five business days prior to pressurizing ductwork for testing.

B. Duct - 3" WG and Above (positive or negative):
   1. Duct system shall be completely pressure tested. If duct has outside wrap, testing shall be done before it is applied.
   2. Leak test shall be at the Contractor's expense and shall require capping and sealing all openings.
   3. Seal ducts to bring the air leakage into compliance.
   4. Contractor shall notify the Architect/Engineer five business days prior to pressurizing ductwork for testing.

C. Test procedure shall be as listed in the latest edition of the SMACNA HVAC Duct Leakage Manual, with the following additional requirements:
   1. Test pressure shall be the specified duct pressure class. Testing at reduced pressures and converting the results mathematically is not acceptable. This is required to test the structural integrity of the duct system.
   2. If any leak causes discernible noise at a distance of 3 feet1 m, that leak shall be eliminated, regardless of whether that section of duct passed the leakage test.
   3. All joints shall be felt by hand, and all discernible leaks shall be sealed.
   4. Totaling leakage from several tested sections and comparing them to the allowable leakage for the entire system is not acceptable. Each section must pass the test individually.
   5. Contractor shall notify the Architect/Engineer five business days prior to pressurizing ductwork for testing. Failure to notify the Architect/Engineer of pressure testing may require the contractor to repeat the duct pressure test after proper notification.
   6. Upon completion of the pressure test, the contractor shall submit an air duct leakage test summary report as outlined in the SMACNA HVAC Duct Leakage Test Manual.
   7. All access doors, taps to terminal air boxes, and other accessories and penetrations must be installed prior to testing. Including terminal air boxes in the test is not required.
   8. The required leakage class for Seal Class A, both round and rectangular ducts, shall be 4.
   9. Positive pressure leakage testing is acceptable for negative pressure ductwork.

D. Fume Exhaust Duct:
   1. Testing shall be done before any exterior insulation is applied.

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2. Cap each exhaust system at all inlets and at the discharge to atmosphere. Fans, dampers and flexible connections shall be included in the testing.
3. Pressurize each duct system to 7" water column. Leakage shall not exceed 4 cfm regardless of system size.
4. Where several fans discharge into a large collection duct, the collection duct and each individual exhaust duct may be treated as separate systems.

E. Grease Exhaust Duct:
1. A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of ductwork to be tested. The lamp shall be open to emit light equally in all four directions.
2. Testing of the entire exhaust duct system including the hood-to-duct connection shall be performed. Ductwork shall be permitted to be tested in sections provided every joint is tested.
3. Leakage testing shall occur prior to use or concealment of the duct system. Ducts shall be considered concealed where installed in shafts or covered by insulation or wrap that prevents ductwork from being visibly inspected on all sides. The test shall be performed in the presence of the code official.

3.5 DUCTWORK PENETRATIONS

A. All duct penetrations of firewalls shall have fire or fire/smoke dampers where required by code.

B. Dampers shall be compatible with fire rating of wall assembly. Verify actual rating of any wall being penetrated with Architect/Engineer.

C. Seal all duct penetrations of walls that are not fire rated by caulking or packing with fiberglass. Install trim strip to cover vacant space and raw construction edges of all openings in finished rooms. Install escutcheon ring at all round duct openings in finished rooms. Trim strips and rings shall be same material and finish as exposed duct.

3.6 ACOUSTICAL LAGGING

A. Where indicated on drawings, completely wrap ductwork with lagging and seal all joints airtight with tape recommended by the lagging manufacturer to prevent acoustical leakage at joints. Overlap lagging 2" at any wall, floor, or structural deck penetration to prevent acoustical leakage.

3.7 PAINTING

A. Paint interior of ducts black within twice the largest duct dimension of inlets and outlets where interior of duct is visible.

B. Paint bottom of ducts black within twice the largest duct dimension where a duct is routed above an unducted perforated grill and the duct is visible.

END OF SECTION

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SECTION 23 33 00 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manual Volume Dampers.

B. Fire Dampers.

C. Ceiling Fire Dampers.

D. Fire/Smoke Dampers.

E. Control/Fire/Smoke Dampers.

F. Smoke Dampers.

G. Pressure Relief Doors.

H. Backdraft Dampers.

I. Fabric Connectors.

J. Drip Pans.

K. Duct Access Doors.

L. Duct Test Holes.

M. Duct Silencers.

N. Remote Volume Control Devices.

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1.2 REFERENCES

A. ASTM E477-06a - Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.

B. ASTM E2336-04 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems.

C. NFPA 90A - Installation of Air-Conditioning and Ventilating Systems.

D. SMACNA - HVAC Duct Construction Standards - Third Edition - 2005.

E. UL 33 - Heat Responsive Links for Fire-Protection Service.

F. UL 555 - Fire Dampers and Ceiling Dampers.

G. UL 555C - Ceiling Dampers.

H. UL 555S - Leakage Rated Dampers for Use in Smoke Control Systems.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00.

B. Submit manufacturer's installation instructions.

C. Include UL ratings, California State Fire Marshal approval and NFPA 90A, dynamic ratings, leakage, pressure drop and maximum pressure data.

1.4 FIELD QUALITY CONTROL

A. 1. Test every fire/smoke damper for proper operation, letter REQUIRED certifying this work is complete and all dampers are functioning properly.

1.5 EXTRA STOCK

A. One EXTRA FUSIBLE link for every 10 installed of each temperature range; obtain receipt.

PART 2 - PRODUCTS

2.1 MANUAL VOLUME DAMPERS

A. Fabricate in accordance with SMACNA Duct Construction Standards, and as indicated.

B. Fabricate single blade dampers for duct sizes to 9 1/2 x 30 inches.

C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12" x 72". Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide molded synthetic or oil-impregnated nylon or sintered bronze bearings.

E. Provide locking quadrant regulators on single and multi-blade dampers.

F. On insulated ducts, mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

G. If blades are in open position and extend into the main duct, mount damper so blades are parallel to airflow.

H. Manufacturer: Ruskin, Greenheck.Nailor Industries. Pottorff, Approved equal.

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2.2 DYNAMIC CURTAIN BLADE FIRE DAMPERS (FD)

A. Furnish and install fire dampers in ducts, where shown on the drawings, at the point where they pass through a fire wall or a floor and in all other locations required by the local fire department, The National Fire Protection Association's Pamphlet No. 90A and all other applicable codes.

B. Fire dampers shall be UL 555 listed for 1-1/2-hour fire resistance unless noted otherwise, dynamic rated with heated airflow at 2,000 fpm and 4" WC, and have all blades stacked out of the airstream (Type B).

C. Where dampers are in aluminum or stainless steel duct, provide stainless steel dampers.

D. Fire dampers shall be held open by a fusible link rated at 165ºF unless otherwise called for on the drawings or by local codes.

E. Dampers shall be installed in sleeves of sufficient thickness to comply with the UL555 Standard for Safety Fire Dampers listing of the damper. Where UL555 permits sleeve thickness to be the same as that of the duct gauge, such thickness shall not be less than that specified in NFPA 90A for breakaway style sleeves. If a breakaway style duct/sleeve connection is not used, the sleeve shall be a minimum of 16 gauge for dampers up to 36" wide by 24" high and 14 gauge for dampers exceeding 36" wide by 24" high. Damper sleeve shall not extend more than 6" beyond the firewall or partition unless damper is equipped with a factory installed access door. Sleeve may extend up to 16" beyond the firewall or partition on sides equipped with the factory installed access door.

F. Locate access door in the ductwork for visual inspection and on the latch side to replace link easily. Each access door shall have a label with letters at least 1/2" high, reading "FIRE DAMPER".

G. Manufacturer: Ruskin, Greenheck.Nailor Industries. Pottorff, Approved equal.

2.3 DYNAMIC MULTIPLE BLADE FIRE DAMPERS (FD)

A. Furnish and install fire dampers in ducts, where shown on the drawings, at the point where they pass through a fire wall or a floor and in all other locations required by the local fire department, The National Fire Protection Association's Pamphlet No. 90A and all other applicable codes.

B. Fire dampers shall be UL 555 listed for 1-1/2-hour fire resistance unless noted otherwise, dynamic rated at 2,000 fpm and 4" WC, with the blades located in the air stream.

C. Where dampers are in aluminum or stainless steel duct, provide stainless steel dampers.

D. Blades shall be airfoil shaped, double skin construction with stainless steel bearings.

E. Fire dampers shall be held open by a fusible link rated at 165ºF74°C unless otherwise called for on the drawings or by local codes.

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F. Dampers shall be installed in sleeves of sufficient thickness to comply with the UL 555 Standard for Safety Fire Dampers listing of the damper. Where UL555 permits sleeve thickness to be the same as that of the duct gauge, such thickness shall not be less than that specified in NFPA 90A for breakaway style sleeves. If a breakaway style duct/sleeve connection is not used, the sleeve shall be a minimum of 16 gauge for dampers up to 36" wide by 24" high and 14 gauge for dampers exceeding 36" wide by 24" high. Damper sleeve shall not extend more than 6" beyond the firewall or partition unless damper is equipped with a factory installed access door. Sleeve may extend up to 16" beyond the firewall or partition on sides equipped with the factory installed access door.

G. Locate access door in the ductwork for visual inspection and on the latch side to replace link easily. Each access door shall have a label with letters at least 1/2" high, reading "FIR DAMPER".

H. Manufacturer: Ruskin, Greenheck.Nailor Industries. Pottorff, Approved equal.

2.4 CEILING FIRE DAMPERS

A. Furnish and install ceiling fire dampers where shown on the drawings, at the point where they pass through a rated ceiling, and in all other locations required by the local fire department, the NFPA Standard 90A, and all other applicable codes.

B. Ceiling fire dampers shall be UL 555C Warnock Hersey listed for the applicable ceiling and fire resistance rating, and shall be held open by a fusible link rated at 165ºF unless otherwise called for on the drawings or by local code.

C. A means for balancing airflow shall be incorporated in the damper.

D. Manufacturer: Ruskin, Greenheck.Nailor Industries. Pottorff, Approved equal.

2.5 FIRE/SMOKE DAMPERS (FSD)

A. Furnish and install fire/smoke dampers in ducts, where shown on the drawings, at the point where they pass through a fire/smoke partition and in all other locations required by the local Fire Department, the National Fire Protection Association Pamphlet No. 90A, and all other applicable codes.

B. Fire/smoke dampers shall be furnished complete with operators factory mounted and the damper/operator assemblies shall meet all requirements listed below.

C. Assemblies shall be 1 1/2 hour rated under UL Standard 555 unless noted otherwise; and be dynamic rated at 2,000 fpm and 4" WC.

D. Assemblies shall be UL 555S listed as leakage rated dampers for use in smoke control system with a 250ºF temperature rating and a leakage rating of not over 10 cfm per square foot at 1" WC (Class II).

E. Where dampers are located in aluminum or stainless steel duct, provide stainless steel dampers.

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F. FSD shall contain a heat sensor capable of remote override of fire-induced closure to permit reopenable operation in a dynamic smoke management system. Wire to fire annunciator panel. Wiring by Mechanical Electrical Contractor.

G. Dampers shall be rated for at least 20,000 complete cycles.

H. Locate access door in ductwork for visual inspection and on the latch side to replace link easily. Each access door shall have a label with letters at least 1/2"12 mm high reading "FIRE DAMPER".

I. All operators shall be located with easy access for servicing.

J. Dampers shall be installed in sleeves of sufficient thickness to comply with the UL555 Standard for Safety Fire Dampers listing of the damper. Where UL555 permits sleeve thickness to be the same as that of the duct gauge, such thickness shall not be less than that specified in NFPA 90A for breakaway style sleeves. If a breakaway style duct/sleeve connection is not used, the sleeve shall be a minimum of 16 gauge for dampers up to 36" wide by 24" high and 14 gauge for dampers exceeding 36" wide by 24" high. Damper sleeve shall not extend more than 6" beyond the firewall or partition unless damper is equipped with an actuator or factory installed access door. Sleeve may extend up to 16" beyond the firewall or partition on sides equipped with the actuator or factory installed access door.

K. FSD shall be held open by 120V 24 VAC, single phase operator. Motors shall be direct coupled gear type with power open and spring return. Torque type (stall) motors are not acceptable. Wiring by Mechanical Electrical Contractor.

L. Damper shall have airfoil type blades and the static pressure drop shall not exceed 0.15" at 2,000 FPM in a 24" x 24" damper.

M. Contractor to field verify actuator installation and clearance requirements prior to ordering. Actuator should not be taller than duct height. Rotate or turn over the actuator if this is the case.

N. Manufacturer: Ruskin, Greenheck.Nailor Industries. Pottorff, Approved equal.

2.6 SMOKE DAMPER (SD)

A. Furnish and install smoke dampers in ducts, where shown on the drawings, at the point where they pass through a smoke partition and in all other locations required by the local Fire Department, The National Fire Protection Association Pamphlet No. 90A, and all other applicable codes.

B. Smoke dampers and operators shall be supplied as a package meeting all of the requirements below.

C. Locate access door in ductwork for visual inspection. Each access door shall have a label with letters at least 1/2"12 mm high, reading "SMOKE DAMPER".

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D. Smoke damper and operator assemblies shall be UL 555S listed as leakage rated dampers for use in smoke control systems, shall have a leakage rating of not over 10 cfm per square foot per square meter at 1" WC (Class II), a 250ºF temperature rating, a 2,000 fpm velocity rating, and 4" WC pressure rating.

E. Where dampers are located in aluminum or stainless steel duct, provide stainless steel dampers.

F. All operators shall be located with easy access for servicing.

G. Smoke dampers shall be held open by a 120V 24VAC, single phase operator. Motors shall be direct coupled gear type with power open, spring return. Torque type (stall) motors shall not be acceptable. Wiring by Mechanical Electrical Contractor.

H. Damper shall have airfoil type blade and the static pressure drop shall not exceed 0.15" at 2,000 fpm in a 24" x 24" damper.

I. Contractor to field verify actuator installation and clearance requirements prior to ordering. Actuator should not be taller than duct height. Rotate or turn over the actuator if this is the case.

J. Manufacturer: Ruskin, Greenheck.Nailor Industries. Pottorff, Approved equal.

2.7 BACKDRAFT DAMPERS

A. Gravity backdraft dampers, size 18 inches450 mm x 18 inches450 mm or smaller, furnished with air moving equipment, may be air moving equipment manufacturer's standard construction.

B. Fabricate multi-blade, parallel action gravity balanced backdraft dampers of extruded aluminum, with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90º stop, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

C. Acceptable Models: Ruskin CBD4, Greenheck EM.

2.8 FABRIC CONNECTORS

A. Fabric connectors shall be installed between all fans or fan units and metal ducts or casings to prevent transfer of fan or motor vibration.

B. The fabric connectors shall be completely flexible material which shall be in folds and not drawn tight.

C. Fabric connectors shall be of glass fabric double coated with neoprene, with UL approval. Weight = 30 oz. per square yard minimum. Fabric shall not be affected by mildew and shall be absolutely waterproof, airtight and resistant to acids, alkalis, grease and gasoline, and shall be noncombustible.

D. Fabric connections shall not exceed 6" in length on ductwork that has a positive pressure. On ductwork that has a negative pressure, the length shall not exceed 2" in length.

E. All corners shall be folded, sealed with mastic and stapled on 1" centers.

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F. Fabric connectors shall not be painted.

G. Unless otherwise shown on the drawings, the fabric connection at the inlet to centrifugal fans shall be at least one duct diameter from the fan to prevent inlet turbulence.

H. Acceptable Materials: Durodyne MFN-4-100, Vent Fabrics, Inc. "Ventglas", or Proflex PFC3NGA.

I. Fabric connectors exposed to sunlight and weather shall be as described above, except the coating shall be hypalon in lieu of neoprene.

J. Acceptable Materials: Durodyne "Duralon MFD-4-100", Vent Fabrics, Inc. "Ventlon", or Proflex PFC3HGA.

2.9 DRIP PANS

A. Install drip pans under all rooftop exhaust fans, intake hoods, exhaust hoods and other roof penetrations that do not have ductwork below them to intercept dripping water.

B. Drip pans shall be 22 gauge minimum cross-broken or reinforced sheet metal with 2"50 mm welded upturned lips.

C. Pans shall extend 6" in all directions beyond the opening and shall have the top of the lip located 25% of the maximum throat dimension below the opening.

D. Insulate interior of drip pan with 1" thick elastomeric foam insulation. Adhere foam to drip pan with standard foam adhesive.

2.10 DUCT ACCESS DOORS

A. Fabricate per Fig. 7-2 and 7-3 of the SMACNA HVAC Duct Construction Standards and as indicated.

B. General: Provide access doors, at all fire dampers, smoke dampers, temperature control dampers, branch balancing dampers, duct heating coils, upstream of all turning vanes, outside air plenums, inlet of fans, upstream of all duct smoke detectors and all other equipment requiring service and/or access.

C. Review locations prior to fabrication. Install access doors at fire dampers, smoke dampers, motorized dampers, fan bearings, filters, automatic controls, humidifiers, louvers, duct coils and other equipment requiring service inside the duct.

D. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. All access doors shall have gasket and will be air tight. Provide one side hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handletype latches for larger doors. For spiral ductwork, use United McGill combination access section type ARF-SD for non-insulated duct systems and type ARF-ID double wall insulated door for insulated ducted systems (all supply ductwork).

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E. Hand entry access door openings: 24" x 24" minimum if the duct permits. Personnel entry doors: 18" x 42" minimum.

2.11 ACCESS PANELS

A. Permit inspection and maintenance of all automatic dampers, fire dampers, control equipment, coils, and other equipment requiring maintenance. Panels shall not be located in top side of ducts. Ceiling panels to be compatible with type ceiling used.

B. Panels shall be attached to duct with zinc-plated cam latches. 18" x 18" and smaller panels shall have a minimum of two latches. Larger panels shall have a minimum of 4 latches. Panels shall set in rigid frame with sponge rubber gasketing to prevent air leakage. Panels may be of single wall uninsulated construction.

2.12 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.

2.13 DUCT SILENCERS

A. Straight Silencer
1. All silencers shall be factory fabricated by the same manufacturer, except that 'No-Loss" silencers (thicker than normal double-wall ducts) may be Contractor fabricated.
2. Duct silencers shall have length, air pressure drop, and self-generated sound ratings not to exceed the values scheduled on the drawings. Dynamic insertion ratings shall not be less than those scheduled on the drawings. Silencer inlet and outlet dimensions must match the sizes on the drawings. Transitions are not acceptable unless shown on the drawings.
3. All silencer ratings shall be determined in accordance with the ASTM E477-06a test standard. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.
4. Silencers shall be constructed of galvanized steel, have 26 gauge minimum perforated interior (22 gauge [0.85 mm] for transitional silencers), be able to withstand 8" of positive and 4" of negative pressure, and shall have inorganic, bacteria, and fungus resistant glass fiber filler with not less than 5% compression. Silencers shall meet SMACNA standards for the duct pressure class specified.
5. Fiberglass cloth or other scheduled liners shall completely separate the media from the airstream. No-media silencers shall not contain absorptive packing of any kind.
6. Silencers shall not exceed 25/50 flame spread/smoke developed per ASTM E84, NFPA 255, or UL 723.
7. Acceptable Manufacturers: Vibro-Acoustics, VAW, United McGill, Semco, Ruskin Sound Control (Rink), Dynasonics, Price. All silencers shall be by the same manufacturer.

B. Elbow Silencer

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1. All silencers shall be factory fabricated by the same manufacturer, except that 'No-Loss" silencers (thicker than normal double-wall ducts) may be Contractor fabricated.
2. Duct silencers shall have length, air pressure drop, and self-generated sound ratings not to exceed the values scheduled on the drawings. Dynamic insertion ratings shall not be less than those scheduled on the drawings. Silencer inlet and outlet dimensions must match the sizes on the drawings. Transitions are not acceptable unless shown on the drawings
3. All silencer ratings shall be determined in accordance with the ASTM E477-06a test standard. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.
4. Silencers shall be constructed of galvanized steel with an 18 gauge galvanized steel outer casing and 22 gauge galvanized perforated steel. All acoustical splitters shall be internally radiused and aerodynamically designed for efficient turning of the air. Half and full splitters are required as necessary to achieve the scheduled insertion loss. All elbow silencers with a turning cross-section dimension greater than 48 shall have at least two half splitters and one full splitter. Silencers shall be able to withstand 8" of positive and 4" of negative pressure, and shall have inorganic, bacteria, and fungus resistant glass fiber filler with not less than 5% compression. Silencers shall meet SMACNA standards for the duct pressure class specified.
5. Fiberglass cloth or other scheduled liners shall completely separate the media from the airstream. No-media silencers shall not contain absorptive packing of any kind.
6. Silencers shall not exceed 25/50 flame spread/smoke developed per ASTM E84, NFPA 255, or UL 723.
7. Acceptable Manufacturers: Vibro-Acoustics, VAW, United McGill, Semco, Ruskin Sound Control (Rink), Dynasonics, Price. All silencers shall be by the same manufacturer.

2.14 REMOTE VOLUME CONTROL DEVICES

A. Volume control devices shall be supplied with either miter gears or right angle worm gears. Provide all damper shafts, gearboxes, couplings, U-joints, bearings, shafts, offsets, adapters, and adjustable concealed covers as required.

B. When distances, angles, or offsets prevent installing solid rods, the cable control system may be utilized. Provide all damper shafts, rack and pinion gear operator, cables and sleeves, and adjustable ceiling mounting cups.

C. Acceptable Manufacturers: Young Regulator Company, Metropolitan Air Technology.

2.15 DUCTWORK ACCESSORY SEALANTS

A. Ductwork accessory sealants and adhesives shall conform to Section 23 31 00.

B. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:
1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.

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2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.

2.16 FLEXIBLE CONNECTIONS

A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment. Shelf life shall be verified to not exceed six (6) months. Any sign of cracking on interior or exterior shall be cause for replacement immediately.

B. Flexible Piping shall be used to connect exhaust drop pipes to machines.
1. Flexible pipe shall be kept to a length not to exceed 36 inches. ii. Automation Industries, Inc., Flexible Tubing Division, "Spiratube TDS", nylon cover, with vinyl scuff straps, galvanized spring steel helix, nylon liner; with operating range of -10 degrees to 200 degrees F; High-Tech type RFH or approved equal. iii. Use stainless steel clamps and other accessories as required for a complete installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:
1. Install accessories in accordance with manufacturer's instructions.
2. Where duct access doors are located above inaccessible ceilings, provide ceiling access doors. Coordinate location with the Architect/Engineer.
3. Coordinate and install access doors provided by others.
4. Provide access doors for all equipment requiring maintenance or adjustment above an inaccessible ceiling. Minimum size shall be 24" x 24".
5. Grease duct access doors shall be installed per approvals from manufacturer's ICC-ES Evaluation Report.
6. Provide duct test holes where indicated and as required for testing and balancing purposes.
7. Label access doors in per label and identification requirements.
8. Label Final positioning of manual dampers.

B. Manual Volume Damper:
1. Provide manual volume dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts where indicated on drawings and as required for air balancing. Use splitter dampers only where indicated.
2. Provide ceiling access doors for manual volume dampers. When manual volume dampers are located above an inaccessible ceiling and an access door cannot be installed, provide a remote-controlled volume control device for operation of the damper. Coordinate location with the Architect/Engineer.

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3. Grease duct volume dampers shall be continuously welded to duct and/or hoods so that system is liquidtight.

C. Fire Damper, Fire Smoke Damper, Smoke Damper:
1. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves and duct connections.
2. Provide ceiling access doors for smoke and/or fire dampers. Coordinate location with the Architect/Engineer.
3. Demonstrate resetting of fire dampers to authorities having jurisdiction and Owner's representative.
4. At fire dampers, smoke dampers and combination fire smoke damper where duct is:
   a. Internally insulated, exterior duct wrap shall be installed from the wall out to 1 foot from the wall. All edges shall be taped.
   b. Externally insulated, the exterior duct wrap shall extend up to the wall.

D. Drain Pan:
1. Drain pans shall be installed per ASHRAE 62.1.
   a. All drain pans shall be field tested under normal operating conditions to ensure proper drainage.
   b. Field testing of drain pans is not required if units with factory installed drain pans have been certified (attested in writing) by the manufacturer for proper operation when installed as recommended.

END OF SECTION

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SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single Duct Variable Air Volume Terminal Box.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NFPA 90A - Installation of Air-Conditioning and Ventilation Systems.

C. UL 181 - Factory-Made Air Ducts and Connectors.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00.

B. Submit shop drawings indicating configuration, general assembly, and materials used in fabrication.

C. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate airflow, static pressure, and NC designation.

D. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of one to 4 inch WG.

E. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

F. Submit manufacturer's installation instructions.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.

C. Include directions for resetting constant volume regulators.

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1.5 PRODUCTSSINGLE DUCT VARIABLE AIR VOLUME TERMINAL BOX

A. Casing: Minimum 22 gauge galvanized steel.
   1. Fully lined with minimum 1/2", minimum 1-1/2 pound density fiberglass insulation. Insulation shall be UL listed and meet NFPA 90A requirements.

B. Damper Blade: Extruded aluminum or minimum 18 gauge galvanized steel. Nylon or bronze bushings on damper shafts. Dampers shall seal against gasketed stops. Leakage shall not exceed 4% of unit nominal cfm at 3.0 inches WG inlet static pressure.

C. Inlet Flow Sensor: Provide "cross" • • or "ring• • " style velocity and static sensor at inlet to box for use by unit controller.
   1. Operator shall be UL listed, electronic direct coupled with spring return to normal position for modulating or two-position control as noted in the sequence of control. Actuator shall be 24 VAC with proportional control, electronic overload protection to prevent actuator damage due to over-rotation and "V" bolt clamp with matching "V" toothed cradle (single bolt or setscrew fasteners not acceptable).

D. Electronic Volume Regulator/Controller: Provided and installed by the manufacturer. Boxes shall have pressure independent control to maintain constant air volume regardless of duct pressure changes up to 6 inches w.c. and shall be accurate down to 0.004" velocity pressure. Set boxes for maximum and minimum settings shown on the drawings.

E. Hot Water Coils: Copper tubes, aluminum fins, minimum 0.016" wall thickness, leak tested at 300 psig. Air pressure drop shall not exceed scheduled value. Provide access door or removable panel for access to the upstream side of the heating coil. Capacity shall be as scheduled on the drawings. Hot water control valve shall be by the TCC.

F. Boxes shall not exceed the static pressure drop and N.C. level scheduled on the drawings. It is the manufacturer¢¢s responsibility to increase inlet size to meet pressure drop and N.C. levels scheduled.

G. Refer to control diagrams and notes on control drawings for complete sequence of control.

H. Manufacturers:
   1. Titus
   2. Krueger
   3. E.H. Price

PART 2 - EXECUTION

2.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Maintain minimum working clear space for all electrical connections in accordance with NFPA 70, National Electrical Code.

C. Provide ceiling access doors or locate units above easily removable ceiling components.

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D. Support units individually from structure. Do not support from adjacent ductwork.

E. Where boxes are located adjacent to a wall or joist, the damper motors and control valves shall be located on the side of the box away from the wall or joist to permit easy access.

F. Comb fins on coils to repair bent fins.

G. Insulate terminal air box reheat coils to prevent condensation. Tape insulation tight to box. Do not insulate the box itself to prevent interference with actuator, access panel and control panel.

2.2 ADJUSTING

A. All boxes shall be set to the cfm shown on the drawings. TCC shall be responsible to field recalibrate all boxes that are not set correctly.

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SECTION 23 37 00 - AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grilles And Registers.

B. Architectural Square Panel Diffusers.

C. Square Stepdown Cone Diffusers.

D. Laminar Flow Diffusers.

E. Radial Flow Diffusers.

F. Linear Diffusers.

G. Linear Diffuser Supply Plenum.

H. Fan Filter Units.

I. Louvers.

J. Roof Hoods.

K. Roof Curbs.

L. Goosenecks.

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1.2 QUALITY ASSURANCE

A. Test and rate performance of air inlets and outlets per ASHRAE 70.

B. Test and rate performance of louvers per AMCA 500L-99.

C. All air handling and distribution equipment mounted outdoors shall be designed to prevent rain intrusion into the airstream when tested at design airflow and with no airflow, using the rain test apparatus described in Section 58 of UL 1995.

1.3 REFERENCES

A. AMCA 500L-07 - Test Method for Louvers, Dampers and Shutters.

B. ANSI/ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Inlets and Outlets.

C. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. ASHRAE 170 (latest published edition) - Ventilation of Health Care Facilities.

E. SMACNA - Duct Construction Standards.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 23 05 00.

B. Submit schedule of inlets and outlets indicating type, size, location, application, and noise level.

C. Review requirements of inlets and outlets as to size, finish, and type of mounting prior to submitting product data and schedules of inlets and outlets.

D. Submit manufacturer's installation instructions.

E. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

B. Conform to ASHRAE 90.1.

PART 2 - PRODUCTS

2.1 GRILLES AND REGISTERS

A. Reference to a grille means an air supply, exhaust or transfer device without a damper.

B. Reference to a register means an air supply, exhaust or transfer device with a damper.

C. The type of unit, margin, material, finish, etc., shall be as shown on the drawing schedule and suitable for the intended use.

D. All margins shall be compatible with ceiling types specified (including 'Thin-Line' T-bar lay-in grid system). Any discrepancies in contract documents shall be brought to the attention of the Architect/Engineer, in writing, prior to Bid Date. Submission of Bid indicates ceiling and air inlet and outlet types have been coordinated.

E. The capacity and size of the unit shall be as shown on the drawings.

F. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10-12 watts with a 10 dB room effect. Noise in classrooms may not exceed 35 dBA or 55 dBC per ANSI Standard S12.60-2002 and ASHRAE 70.

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G. Refer to the drawings for construction material, color and finish, margin style, deflection, and sizes of grilles and registers.

H. Provide with 3/4" blade spacing. Blades shall have steel friction pivots to allow for blade adjustment, plastic pivots are not acceptable.

I. Corners of steel grilles and registers shall be welded and ground smooth before painting. Aluminum grilles and registers shall have staked corners.

J. Where specified to serve registers, provide opposed blade volume dampers operable from the face of the register.

K. Where specified to have filters, provide with filter rack suitable for 1" thick MERV-8 pleated media filters. Grille border shall be fabricated from minimum 22 gauge steel or minimum 0.040-inch thick for aluminum grilles. Provide removable grille face with metal knurled knob or quarter turn fastener to allow for filter media replacement.

L. Screw holes for surface fasteners shall be countersunk for a neat appearance. Provide concealed fasteners for installation in lay-in ceilings and as specified on the drawings.

M. Acceptable Manufacturers: Titus, Price, Nailor, Krueger.

2.2 ARCHITECTURAL SQUARE PANEL DIFFUSERS

A. Reference to a diffuser means an air supply device, ceiling mounted, that shall diffuse air uniformly throughout the conditioned space.

B. The type of unit, margin, material, finish, etc., shall be as shown on the drawing schedule. Flat-oval inlets are not acceptable for connection to flexible ducts.

C. All margins shall be compatible with ceiling types specified (including 'Thin-Line' T-bar lay-in grid system). Any discrepancies in contract documents should be brought to the attention of the Architect/Engineer, in writing, prior to Bid Date. Submission of Bid indicates ceiling and air inlet and outlet types have been coordinated.

D. The capacity and size of the unit shall be as shown on the drawings.

E. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10-12 watts with a 10 dB room effect. Noise in classrooms may not exceed 35 dBA or 55 dBC per ANSI Standard S12.60-2002 and ASHRAE 70.

F. Diffusers shall be architectural solid square panel and flush with ceiling.

G. The exposed surface shall be smooth, flat and free of visible fasteners. The face panel shall be 22 gauge steel with a rolled edge or shall be 18 gauge with a smooth ground, uniform edge.

H. The back pan shall be one piece 22 gauge stamped and shall include an integral inlet. (Welded inlets and corner joints are not acceptable).

I. Diffusers with a 24x24back pan shall have a minimum 18x18 face panel size. Diffusers with a 12x12 back pan shall have a minimum 9x9 face panel size.

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J. The face panel shall be mechanically fastened to the back panel with steel components. (Plastic fasteners are not acceptable.)

K. Acceptable Manufacturers: Titus, Price, Nailor, Krueger.

2.3 SQUARE STEPDOWN CONE DIFFUSERS

A. Reference to a diffuser means an air supply device, ceiling mounted, that shall diffuse air uniformly throughout the conditioned space.

B. The type of unit, margin, material, finish, etc., shall be as shown on the drawing schedule. Flat-oval inlets are not acceptable for connection to flexible ducts.

C. All margins shall be compatible with ceiling types specified (including 'Thin-Line' T-bar lay-in grid system). Any discrepancies in contract documents should be brought to the attention of the Architect/Engineer, in writing, prior to Bid Date. Submission of Bid indicates ceiling and air inlet and outlet types have been coordinated.

D. The capacity and size of the unit shall be as shown on the drawings.

E. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10-12 watts with a 10 dB room effect. Noise in classrooms may not exceed 35 dBA or 55 dBC per ANSI Standard S12.60-2002 and ASHRAE 70.

F. Diffusers shall be drop face construction.

G. Diffuser shall be entirely constructed of stamped panel and a minimum of three two stepdown diffusion cones.

H. Stepdown cones shall be mechanically fastened to panel with metal fasteners. Diffuser stepdown cones glued, fastened with plastic clips, or otherwise attached to face panel will not be acceptable.

I. Each stepdown cone shall be one-piece stamped construction. The cones shall be removable for cleaning.

J. Diffusers shall be constructed of minimum 24 gauge steel.

K. Acceptable Manufacturers: Titus, Price, Nailor, Krueger.

2.4 SQUARE MODULAR CORE DIFFUSERS

A. Reference to a diffuser means an air supply device, ceiling mounted, that shall diffuse air uniformly throughout the conditioned space.

B. The type of unit, margin, material, finish, etc., shall be as shown on the drawing schedule.

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C. All margins shall be compatible with ceiling types specified (including 'Thin-Line' T-bar lay-in grid system). Any discrepancies in contract documents should be brought to the attention of the Architect/Engineer, in writing, prior to bid date. Submission of bid indicates ceiling and air inlet and outlet types have been coordinated.

D. The capacity and size of the unit shall be as shown on the drawings.

E. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10-12 watts with a 10 dB room effect. Noise in classrooms may not exceed 35 dBA or 55 dBC per ANSI Standard S12.60-2002 and ASHRAE 70.

F. Modular core diffusers shall consist of an outer frame assembly to facilitate mounting and shall include an integral square collar to allow connection to the square duct. Where shown on the drawings, the diffuser shall be supplied with a square to round adapter. Flat-oval inlets are not acceptable for connection to flexible ducts.

G. The diffuser core shall consist of fixed louver directional modules that may be field adjusted from the diffuser face without any type of tools or mechanical device for one-way, two-way, two-way corner, three-way, or four-way horizontal discharge airflow.

H. Each louvered module shall be removable to allow access to any damper or other component in or near the diffuser neck.

I. The core's blade spacing shall be 1 inch on center.

J. Acceptable Manufacturers: Titus, Price, Nailor, Krueger.

2.5 LINEAR DIFFUSERS

A. Plenum Slot Diffusers (Lay-In):
1. The type of unit, margin size, material, finish, etc., shall be as shown on the Drawing Schedule. Flat-oval inlets are NOT acceptable for connection to flexible ducts. Provide sheet metal oval-to-round transition if required.
2. The capacity and size of the unit shall be as shown on the drawings.
3. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10-12 watts with a 10 dB room effect. Noise in classrooms may not exceed 35 dBA or 55 dBC per ANSI Standard S12.60-2002 and ASHRAE 70.
4. Install T-bars on both sides of diffusers for lay-in ceiling system, install manufacturer frame for sheetrock or plaster ceiling system. Diffuser margins system shall be compatible with ceiling types specified, color to match ceiling system. Contractor shall coordinate margin types with ceilings prior to submitting shop drawings.
5. Linear diffusers and mounting frames shall be furnished as one piece up to 5'1.5 m in length.
6. Diffusers shall be furnished with factory installed adjustable "ice tong" style pattern deflectors capable of providing 180° pattern adjustment gasket edged blade deflector.
7. A manual volume damper shall be furnished and installed by the Contractor in branch ductwork to each slot diffuser. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings.
8. Number and width of slots shall be as shown on the drawings.

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9. Provide integral insulated plenum for each linear diffuser. Refer to linear diffuser supply plenum specification section for details.
10. Acceptable Manufacturers: Tuttle & Bailey ITPS, Carnes DA, Price TBD, Krueger PTBS, Nailor 5800, Titus TBD, Metalaire, Anemostat API, Raymon Donco SAT.
11. Linear diffusers for fire-rated ceiling shall be UL labeled with a non-adjustable air pattern. Airflow direction shall be as shown on the drawings.
12. Acceptable Manufacturers: Titus, Price, Nailor, Metalaire, Krueger.

B. Linear Slot Diffusers (Continuous):
1. The type of unit, margin size, material, finish, etc., shall be as shown on the Drawings Schedule.
2. The capacity and size of the unit shall be as shown on the drawings.
3. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10-12 watts with a 10 dB room effect. Noise in classrooms may not exceed 35 dBA or 55 dBC per ANSI Standard S12.60-2002 and ASHRAE 70.
4. Install T-bars on both sides of diffusers for lay-in ceiling system, install manufacturer frame for sheetrock or plaster ceiling system. Diffuser margins system shall be compatible with ceiling types specified, color to match ceiling system. Contractor shall coordinate margin types with ceilings prior to submitting shop drawings.
5. Provide with concealed fasteners for installation in the field.
6. Linear diffusers and mounting frames shall be furnished as one piece up to 6' in length. Provide auxiliary support per manufacturer's recommendations for slot diffusers greater than 4' in length.
7. Diffusers shall be furnished with adjustable pattern deflectors capable of providing 180° pattern adjustment.
8. A manual volume damper shall be furnished and installed by the Contractor in branch ductwork to each slot diffuser. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings.
9. Number and width of slots shall be as shown on the drawings.
10. Provide insulated plenum for each linear diffuser. Refer to linear diffuser supply plenum specification section for details.
11. Acceptable Manufacturers: Titus, Price, Nailor, Krueger.

C. Linear Slot Diffusers (High Performance):
1. The type of unit, margin size, material, finish, etc., shall be as shown on the Drawings Schedule.
2. The capacity and size of the unit shall be as shown on the drawings.
3. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10-12 watts with a 10 dB room effect per ANSI/ASHRAE 70.
4. Install T-bars on both sides of diffusers for lay-in ceiling system, install manufacturer frame for sheetrock or plaster ceiling system. Diffuser margins system shall be compatible with ceiling types specified, color to match ceiling system. Contractor shall coordinate margin types with ceilings prior to submitting shop drawings.
5. Provide with concealed fasteners for installation in the field.
6. Linear slot diffusers and mounting frames shall be furnished as one piece up to 6' in length. Provide auxiliary support per manufacturer's recommendations for slot diffusers greater than 4' in length.
7. Diffusers shall be furnished with adjustable pattern deflectors.

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8. A manual volume damper shall be furnished and installed by the Contractor in branch ductwork to each slot diffuser. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings.
9. Number and width of slots shall be as shown on the drawings.
10. Provide insulated plenum for each linear diffuser. Refer to linear diffuser supply plenum specification section for details.
11. Acceptable Manufacturers: Titus, Price, Nailor, Krueger.

D. Linear Bar Grille Diffusers:
1. The type of unit, margin size, material, finish, etc., shall be as shown on the Drawings Schedule.
2. The capacity and size of the unit shall be as shown on the drawings.
3. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10-12 watts with a 10 dB room effect per ANSI/ASHRAE 70.
4. Install T-bars on both sides of diffusers for lay-in ceiling system, install manufacturer frame for sheetrock or plaster ceiling system. Diffuser margins system shall be compatible with ceiling types specified, color to match ceiling system. Contractor shall coordinate margin types with ceilings prior to submitting shop drawings.
5. Provide with concealed fasteners for installation in the field.
6. Linear bar diffusers and mounting frames shall be furnished as one piece up to 6' in length. Provide auxiliary support per manufacturer's recommendations for slot diffusers greater than 4' in length.
7. A manual volume damper shall be furnished and installed by the Contractor in branch ductwork to each bar grille. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings.
8. Diffuser length and width, bar width, and spacing between bars shall be as shown on the drawings.
9. Provide insulated plenum for each linear diffuser. Refer to linear diffuser supply plenum section for details.
10. Acceptable Manufacturers: Titus, Price, Nailor, Krueger.

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2.6 LINEAR DIFFUSER SUPPLY PLENUM

A. Linear diffusers shall be provided with field fabricated or prefabricated supply plenums. Plenum shall be a minimum of 2-1/2" wider than total slot width, minimum length of slot, and minimum height of 10". Plenums with end fed duct connections shall not exceed 8' in length. The cross-sectional area of the plenum shall be designed for a maximum velocity of 500 fpm and the aspect ratio shall be limited to a width-to-height ratio of less than 1.5. Plenums with side outlets shall be designed for a maximum velocity of 600 fpm and inlet ducts to plenum shall be spaced 5' on center maximum. Inlet ducts to plenums shall have a maximum velocity of 900 fpm.

B. Plenum shall be constructed with 24 gauge galvanized steel and shall have side inlets unless shown otherwise on the drawings. Refer to Ductwork Application Schedule in Section 23 31 00 for insulation requirements.

C. End caps and required accessories shall be integral with the plenum or furnished and installed by the Mechanical Contractor.

D. A manual volume damper shall be furnished and installed by the Mechanical Contractor in branch ductwork to each slot diffuser. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings

E. Prefabricated plenums shall be by the same manufacturer as the linear diffuser or Kees Inc.

2.7 LOUVERS - FIXED - ALUMINUM

A. Louvers shall be minimum 4" deep and constructed of extruded aluminum. Frame thickness shall be minimum 0.081". Blade thickness shall be 0.63".

B. Blades shall be a horizontal, compound sinusoidal type arrangement spaced approximately 2" apart.

C. Louvers shall be furnished with aluminum bird screen mounted on the inside surface.

D. Size, cfm, finish, and pressure drop for louvers shall be as scheduled on the drawings.

E. AMCA Certified performance for 48" x 48" samples with intake airflow of 8,000 cfm shall not exhibit more than 0.35" pressure drop.

F. AMCA Certified Wind Driven Rain performance shall be as follows:
1. 29 MPH wind and 3" per hour rainfall at 1,000 FPM free area velocity: Minimum 99.7% and Class A effectiveness.
2. 50 MPH wind and 8" per hour rainfall at 500 FPM free area velocity: Minimum 98.4% and Class B effectiveness.

G. Contractor shall provide the General Contractor with the correct sizes and locations of all louvers required in masonry walls.

H. Louvers shall be sealed around perimeter to avoid moisture penetration between the louver frame and wall.

I. Louvers shall be suitable for duct connection.

J. Acceptable Manufacturers: Ruskin - "420DD", Greenheck - "EHH-401".

2.8 ROOF HOODS

A. Hoods shall be constructed of all-welded aluminum.

B. Curb cap shall be of 14 gauge formed aluminum with mitered corners continuously heliarc-welded. Hood shall be of the same material and cross-broken for added strength. Underside of hood shall be coated with insulating mastics.

C. Hoods shall be furnished with aluminum bird screen.

D. Hood and throat shall be reinforced with extruded aluminum angle and have a minimum snow load rating of 30 lbs. per square foot.

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E. Size, cfm, finish and pressure drop for hoods shall be as scheduled on the drawings.

F. Inlet area shall be minimum 150% of throat area for intake hoods. Outlet area shall be minimum 125% of throat area for exhaust hoods and relief vents.

G. Hoods shall be furnished with 14" high curb (above top of roof) and be of the size and type as shown on the drawings.

H. Hood shall be furnished with motorized damper unless otherwise noted on the drawings.

I. Acceptable Manufacturers: Cook, Greenheck.

2.9 ROOF CURBS

A. Furnish and install, where shown on the drawings, prefabricated roof curbs for all rooftop hood openings.

B. Curbs shall be sized to match curb cap of the hood. The top of all curbs shall be 14" above the top of the roof.

C. Curbs shall be unitized construction, 18 gauge galvanized steel, with continuous arc welded corner seams, insulated with 1-1/2" thick, 3 lb. density rigid fiberglass board and damper support angle.

D. Curb without cant - suitable for use with membrane type roof.

E. Acceptable Manufacturers: Same manufacturer as the equipment it serves.

2.10 GOOSENECKS

A. Fabricate in accordance with SMACNA Duct Construction Standards of minimum 18 gauge galvanized steel.

B. Mount on minimum 14 inch high curb base.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:
   1. Install items in accordance with manufacturers' instructions.
   2. Check location of inlets and outlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.
   3. Install diffusers to ductwork with air tight connections.
   4. Supply grille and register blades shall be aimed in the field to provide adequate air distribution in the space. All return grilles and registers blades shall be oriented to minimize sight distance beyond installed device.

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B. Volume Damper:
   1. Provide manual volume dampers on duct take-off to diffusers when there are multiple connections to a common duct. Locate volume dampers as far as possible from the air inlet or outlet.

C. Roof Hood:
   1. If manufacturer has no recommendations, secure roof hoods and louvered penthouses to curbs with 1/4" lag bolts on 8" maximum centers.
   2. Provide 20 gauge sheet metal duct blank-off behind louvers at unused portions of louver openings in exterior walls. Back with 2" rigid 3# density fiberglass board insulation with foil scrim facing the room. Seal watertight.

END OF SECTION

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SECTION 23 74 11 - PACKAGED ROOFTOP UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged Rooftop Unit.

B. Unit Controls.

C. Roof Mounting Frame and Base.

D. Economizers.

E. Power Exhaust.

1.2 QUALITY ASSURANCE

A. All insulation inside the unit and in the air stream must comply with the requirement of NFPA 90A (maximum flame spread of 25 and maximum smoke developed of 50).

B. All units must be UL or ETL listed and must contain UL labeled components.

C. Fans shall be tested and rated in cabinet in accordance with AMCA Standard 210. All fan assemblies shall be dynamically balanced in cabinet at final assembly.

D. Conform to ASHRAE 90.1.

E. All air handling and distribution equipment mounted outdoors shall be designed to prevent rain intrusion into the airstream when tested at design airflow and with no airflow, using the rain test apparatus described in Section 58 of UL 1995.

1.3 REFERENCES

A. AHRI 210 - Unitary Air Conditioning Equipment.

B. AHRI 240 - Air Source Unitary Heat Pump Equipment.

C. AHRI 270 - Sound Rating of Outdoor Unitary Equipment.

D. ASHRAE 37 - Methods of Testing for Rating Unitary Air Conditioning and Heat Pump Equipment.

E. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

F. NFPA 70 - National Electrical Code.

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G. NFPA 90A - Installation of Air Conditioning and Ventilating System.

H. UL - Underwriters' Laboratory.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00.

B. Indicate electrical service and duct connections on shop drawings or product data.

C. Submit manufacturer's installation instructions.

D. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

E. Provide 8 octave maximum sound power levels at unit discharge and return connection.

F. Manufacturer shall provide special seismic certification per OSHPD CAN 2-1708a.5 with submittal. Submittals without certification will be returned and not reviewed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting frames are in place, ready for immediate installation of units.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, installation instructions, maintenance and repair data, and parts listing.

1.7 WARRANTY

A. Provide five (5) year manufacturer's warranty for compressors.

B. Provide five (5) year manufacturer's warranty for heat exchanger.

C. Provide three (3) year manufacturer's warranty for controls and electrical components (thermostats, VFD, etc.).

1.8 MAINTENANCE SERVICE

A. Furnish complete service and maintenance of packaged roof top units for one year from Date of Substantial Completion.

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B. Provide maintenance service with a two-month interval as maximum time period between calls. Provide 24-hour emergency service on breakdowns and malfunctions.

C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibrations.

D. Submit copy of service call work order or report, and include description of work performed.

1.9 GENERAL DISCRIPTION

A. Package RTU with dx cooling, hydronic heating and heat wheel.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Daikin

B. Aaon

C. Approved Equal

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2.2 MANUFACTURED UNITS

A. Unit shall be self-contained, packaged, factory assembled, pre-wired and tested, consisting of cabinet and frame, supply fan, exhaust fan, controls, air filters, refrigerant cooling coil and compressor, condenser coil, condenser fan, and a full refrigerant charge.

B. Unit shall be furnished with non-fused disconnect switch, short fuse protection of all internal electrical components, and all necessary motor starters, contactors, and over-current protection.

2.3 CONSTRUCTION

A. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

B. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.

C. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.

D. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

E. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.

F. Access to filters, dampers, cooling coils, exhaust fans, energy recovery wheels, compressors, water-cooled condensers, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.

G. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

H. Units with cooling coils shall include double sloped 304 stainless steel drain pans.

I. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.

J. Unit shall include lifting lugs on the top of the unit.

2.4 SUPPLY FANS

A. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.

B. Blowers and motors shall be dynamically balance and mounted on rubber isolators.

C. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.

D. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency. Refer to 23 2923 variable frequency motor controllers.

2.5 EXHAUST FANS

A. Exhaust dampers shall be sized for 100% relief.

B. Fans and motors shall be dynamically balanced.

C. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.

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D. Access to exhaust fans shall be through double wall, hinged access doors with quarter turn lockable handles.

E. Unit shall include belt driven, unhoused, backward curved, plenum exhaust fans.

F. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency. Refer to 23 2923 variable frequency motor controllers.

2.6 FANS/MOTORS

A. Supply and Exhaust Fan: airfoil centrifugal type resiliently mounted direct drive motor, and rubber isolated hinge mounted motor. Isolate complete fan assembly. All fan bearings must be capable of being lubricated by easily accessible grease fittings.

B. All fans must be statically and dynamically balanced.

C. Motors shall be open drip-proof with grease lubricated bearings.

D. Motors shall be "variable frequency drive rated" when controlled by VFDs. Refer to Section 23 05 13.

E. Units used with variable speed drives shall have fixed sheaves. This Contractor shall provide replacement sheaves and belts as required to allow final air balancing.

F. No equipment shall be selected or operate above 90% of its motor nameplate rating.

G. Motor shall have 1.15 service factor.

2.7 COIL SECTION

A. Casing: Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.

B. Drain Pans: 24 inch downstream of coil and down spouts for cooling coil banks more than one coil high. Provide 2" spray foam insulation beneath the entire drain pan.

C. Eliminators: Three break of galvanized steel, mounted over drain pan.

D. Air Coils:
1. Certify capacities, pressure drops, and selection procedures in accordance with AHRI 410.

E. Fabrication:
1. Tubes: 5/8 inch OD seamless copper expanded into fins, brazed joints.
2. Fins: Aluminum.
3. Casing: Die formed channel frame of galvanized steel.

F. Refrigerant Coils:

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1. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
2. Headers: Seamless copper tubes with silver brazed joints.
3. Liquid Distributors: Brass or copper venturi distributor with seamless copper distributor tubes.
4. Configuration: Down feed with bottom suction.
5. Selection had incorporate a maximum face velocity of 500 FPM.

2.8 COMPRESSOR (Dx Units)

A. Provide hermetic or semi-hermetic compressors (quantity as scheduled on drawings), 3600 rev/min maximum, resiliently mounted with positive lubrication, crankcase heater for operation down to 0°F, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

B. Five minute timed off circuit shall delay compressor start.

C. Provide capacity control by providing digital scrolls.

D. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

E. The use of chlorofluorocarbon (CFC)-based refrigerants is prohibited.

2.9 CONDENSER (Dx units)

A. Provide copper tube aluminum fin coil assembly with sub-cooling rows.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.

C. Provide refrigerant pressure switches to cycle condenser fans.

D. Provide hail guards on all condenser coils.

2.10 FILTERS

A. Unit shall include 2 inch thick, pleated panel filters with a MERV rating of 7, upstream of the heat wheel on both the supply and exhaust airstreams.

B. Unit shall include 2 inch thick, pleated panel filters with a MERV rating of 13 as the final filter.

C. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return DDC actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers.

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D. Units shall include a 0-1" Magnehelic gauge for MERV-8 filters (and 0-2" for MERV-7 filters), mounted in the controls compartment.

2.11 ENERGY ROCEVERY

A. Unit shall contain a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings. Frame shall slide out for service and removal from the cabinet.

B. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.

C. Wheel shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop-to-efficiency ratios. The layers shall be effectively captured in stainless steel wheel frames or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix.

D. Wheel shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.

E. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.

F. The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratory Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

G. Energy recovery wheel cassette shall carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory. The first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less, shall be covered under the standard limited parts warranty. The remaining period of the warranty shall be covered by Airxchange. The 5 year warranty applies to all parts and components of the cassette, with the exception of the motor, which shall carry an 18 month warranty. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided the Airxchange written instructions for Installation, Operation, and Maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts. Refer to the Airxchange Energy Recovery Cassette Limited Warranty Certificate.

H. Unit shall include 2 inch thick, pleated panel outside air filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the wheels.

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I. Hinged service access doors shall allow access to the wheel.

J. Sensible energy recovery wheels shall be constructed of lightweight polymer and shall be provided without desiccant coating and shall not degrade nor require additional coatings for application in marine or coastal environments. Segments shall be washable with detergent or alkaline coil cleaner and water.

2.12 Curbs

A. Curbs shall to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

B. Knockdown curb (with duct support rails) shall be factory furnished for field assembly.

C. New Roof Curb (Refer to schedule on drawings): Galvanized steel with factory-installed wood nailer; complying with NRCA standards; minimum height of 24 inches. Curb wall shall be insulated.

D. Adapt in Place Curb (Refer to schedule on drawings): Galvanized steel with factory-installed wood nailer; complying with NRCA standards; minimum height of 24 inches. Curb wall shall be insulated. Curb shall match existing supply and return roof openings with new unit openings.

E. Units set on roof curbs shall have a tube steel or C-Channel curb overhang to prevent moisture from entering the curb. Unit base rail shall not sit directly on the roof curb.

2.13 ELECTRICAL

A. Single electrical connection. Fused disconnect by electrical contractor.

B. Unit shall be provided with a factory installed and factory wired 115V, 13 amp GFI outlet disconnect switch in the unit control panel.

C. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

2.14 CONTROLS: REFER TO CONTROL SEQUENCE AND DIAGRAM FOR CONTROLS REQUIREMENTS

A. Packaged controls shall be prohibited with the exception of a refrigeration safety controller. Third party controls shall be programmed by the DDC contractor and factory installed by the unit manufacturer.

B. A door safety kill switch shall be provided on all blower section access doors. The door safety kill switch shall de-energize the blower motor if the access door is opened. The kill switch shall prevent motor startup if the blower section access door is open.

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2.15 SEE SCHEDULE FOR CAPACITES AND CHARACTERISTICS

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings and illustrated by the manufacturer.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting frame level.

C. All field wiring shall be in accordance with the National Electrical Code.

D. P-traps must be provided for all drain pans.

E. Comb all coils to repair bent fins.

F. Install on vibration isolation as scheduled on drawings.

G. Contractor shall coordinate unit access stair and walkway placement to ensure compliance with OSHA requirements.

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3.3 MANUFACTURER'S FIELD SERVICES

A. Provide initial start-up and shutdown during first year of operation, including routine servicing and check-out.

END OF SECTION

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SECTION 26 05 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 26 Sections. Also refer to Division 1 - General Requirements. Coordinate requirements with Fire Alarm and Detection Systems Section 28 31 00 and Division 27.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code (NEC)

B. IBC - International Building Code

C. IFC - International Fire Code

D. IEC - International Electrical Code

E. NFPA 70E - Standards for Electrical Safety in the Work Place

F. NFPA 101 - Life Safety Code

G. Governing (AHJ) Building Department Requirements

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1.3 SCOPE OF WORK

A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Electrical Systems.

B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make his portion of the Electrical Work a finished and working system.

C. Description of Systems shall be as follows:
1. Electrical power system to and including luminaires, equipment, motors, devices, etc.
2. Wiring system for temperature control system as shown on the drawings.
3. Wiring of equipment furnished by others.

D. Work Not Included:
1. Telecommunications cabling will be by others, in raceways and conduits furnished and installed as part of the Electrical work.

2. Temperature control wiring for plumbing and HVAC equipment (unless otherwise indicated) will be by other Contractors.

1.4 OWNER FURNISHED PRODUCTS

A. The Owner will supply manufacturer's installation data for new equipment purchased by him for this project.

B. This Contractor shall make all electrical system connections shown on the drawings or required for fully functional units.

C. This Contractor is responsible for all damage to Owner furnished equipment caused during installation.

1.5 WORK SEQUENCE

A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours are required.

1.6 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL, AND CONTROL CONTRACTORS

A. Division of work is the responsibility of the Prime Contractor. Any scope of work described at any location on the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described on the contract documents on bid day. The following division of responsibility is a guideline based on typical industry practice.

B. Definitions:
1. "Mechanical Contractors" refers to the Contractors listed in Division 21/22/23 of this Specification.
2. Motor Power Wiring: The single phase or 3 phase wiring extending from the power source (transformer, panelboard, feeder circuits, etc.) through disconnect switches and motor controllers to, and including the connections to the terminals of the motor.
3. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case, the devices are usually single phase, have "Manual-Off-Auto" provisions, and are usually connected into the motor power wiring through a manual motor starter.
4. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
5. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. When the motor power wiring exceeds 120 volts, a control transformer is usually used to give a control voltage of 120 volts.

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6. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring that directly powers or controls a motor used to drive equipment such as fans, pumps, etc. This wiring will be from a 120-volt source and may continue as 120 volt, or be reduced in voltage (24 volt), in which case a control transformer shall be furnished as part of the temperature control wiring.
7. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.

C. General:
1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractors' responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors, etc. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals approved. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall furnish complete wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements, California Code of Regulation Title 24, Article E725.

D. Mechanical Contractor's Responsibility:
1. Assumes responsibility for internal wiring of all equipment furnished by the Mechanical Contractor.
2. Assumes all responsibility for miscellaneous items furnished by the Mechanical Contractor that require wiring but are not shown on the electrical drawings or specified in the Electrical Specification. If items such as relays, flow switches, or interlocks are required to make the mechanical system function correctly or are required by the manufacturer, they are the responsibility of the Mechanical Contractor.
3. Assumes all responsibility for Temperature Control wiring, if the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

E. Temperature Control Contractor's or Subcontractor's Responsibility:
1. Wiring of all devices needed to make the Temperature Control System functional.
2. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Contractor or Subcontractor.
3. Coordinating equipment locations (such as PE's, EP's, relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

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F. Electrical Contractor's Responsibility:
1. Furnishes and installs all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor in the Mechanical Drawings or Specifications.
2. Installs and wires all remote-control devices furnished by the Mechanical Contractor or Temperature Control Contractor when so noted on the Electrical Drawings.
3. Furnishes and installs motor control and temperature control wiring, when noted on the drawings.
4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.7 COORDINATION DRAWINGS

A. Definitions:
1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.
   a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
   b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
   c. Maintenance clearances and code-required dedicated space shall be included.
   d. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.
2. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:
1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:
1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.
   a. Scale of drawings:
      1) General plans: 1/4 Inch = 1 '-0" (minimum).
      2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).

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3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1 '-0" (minimum).
5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
3. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:
1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in his/her bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, re-routings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.
    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.
10. Complete the coordination drawing process and obtain sign-off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

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1.8 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing/Bid Data:
   1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guides, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Architect/Engineer any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
   2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Architect/Engineer will be done at the Contractor's risk.

B. Qualifications:
   1. Only products of reputable manufacturers as determined by the Architect/Engineer are acceptable.
   2. All Contractors and subcontractors shall employ only workmen who are skilled in their trades. At all times, the number of apprentices at the job site shall be no more than three for every one journeymen at the job site, per local AHJ requirements.

C. Compliance with Codes, Laws, Ordinances:
   1. Conform to all requirements of the State of Colorado Codes, Laws, Ordinances and other regulations having jurisdiction.
   2. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
   3. If the Contractor notes, at the time of bidding, any parts of the drawings or specifications that do not comply with the codes or regulations, he shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, he shall submit with his proposal a separate price to make the system comply with the codes and regulations.
   4. All changes to the system made after the letting of the contract to comply with codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.
   5. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
   6. If there are no local codes having jurisdiction, the current issue of the NEC shall be followed.

D. Permits, Fees, Taxes, Inspections:
   1. Procure all applicable permits and licenses.
   2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
   3. Pay all charges for permits or licenses.
   4. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.
   5. Pay all charges arising out of required inspections by an authorized body.

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6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.
8. Pay all telephone company charges related to the service or change in service.

E. Examination of Drawings:
1. The drawings for the electrical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of raceways to best fit the layout of the job. Conduit entry points for electrical equipment including, but not limited to, panelboards, switchboards, switchgear and unit substations, shall be determined by the Contractor unless noted in the contract documents.
3. Scaling of the drawings will not be sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either shown on the drawings or called for in the specifications, it shall be included in this contract.
7. The Contractor shall determine quantities and quality of material and equipment required from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater and better-quality number shall govern.
8. Where used in electrical documents the word "furnish" shall mean supply for use, the word "install" shall mean connect up complete and ready for operation, and the word "provide" shall mean to supply for use and connect up complete and ready for operation.
9. Any item listed as furnished shall also be installed unless otherwise noted.
10. Any item listed as installed shall also be furnished unless otherwise noted.

F. Electronic Media/Files:
1. Construction drawings for this project have been prepared utilizing AutoCAD MEP Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.

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7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

G. Field Measurements:
1. Verify all pertinent dimensions at the job site before ordering any conduit, conductors, wireways, bus duct, fittings, etc.

1.9 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.
1. Submittals list:

Referenced Specification Section	Submittal Item
26 05 13	Wire and Cable
26 05 26	Grounding and Bonding
26 05 33	Conduit and Boxes
26 05 35	Surface Raceways
26 05 53	Electrical Identification
26 09 33	Lighting Control System
26 27 26	Wiring Devices
26 28 13	Fuses
26 28 16	Disconnect Switches
26 28 21	Contactors
26 51 00	Lighting
26 52 00	Emergency Lighting Equipment

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B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:
1. Transmittal: Each transmittal shall include the following:
a. Date
b. Project title and number
c. Contractor's name and address
d. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
e. Description of items submitted and relevant specification number
f. Notations of deviations from the contract documents
g. Other pertinent data
2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:
a. Date
b. Project title and number
c. Architect/Engineer
d. Contractor and subcontractors' names and addresses
e. Supplier and manufacturer's names and addresses
f. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)

g. Description of item submitted (using project nomenclature) and relevant specification number
h. Notations of deviations from the contract documents
i. Other pertinent data
j. Provide space for Contractor's review stamps

3. Composition:
   a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
   b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
   c. All sets shall contain an index of the items enclosed with a general topic description on the cover.
4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:
   a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
   b. Unstamped submittals will be rejected.
   c. The Contractor's review shall include, but not be limited to, verification of the following:
      1) Only approved manufacturers are used.
      2) Addenda items have been incorporated.
      3) Catalog numbers and options match those specified.
      4) Performance data matches that specified.
      5) Electrical characteristics and loads match those specified.
      6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
      7) Dimensions and service clearances are suitable for the intended location.
      8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
      9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).
   d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
   e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.
6. Submittal Identification and Markings:

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a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
b. The Contractor shall clearly indicate the size, finish, material, etc.
c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.

C. Electronic Submittal Procedures:
1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
a. Submittal file name: 26 XX XX.description.YYYYMMDD
b. Transmittal file name: 26 XX XX.description.YYYYMMDD
5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files shall be transmitted via a pre-approved method.

1.10 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 1.

B. Format:
1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

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1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:
   a. Material: Delivered cost of product with taxes paid.
   b. Labor: Labor cost, excluding overhead and profit.

D. Update Schedule of Values when:
1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.11 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders with inadequate breakdown will be rejected.

B. Change order work shall not proceed until authorized.

1.12 PRODUCT DELIVERY, STORAGE, HANDLING AND MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage.

B. Keep all materials clean, dry and free from damaging environments.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Electrical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate his/her work with other trades.

1.13 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.14 WARRANTY

A. Provide one-year warranty for all fixtures, equipment, materials, and workmanship.

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B. The warranty period for all work in this specification Division shall commence on the date of Substantial Completion or successful system performance whichever occurs later. The warranty may also commence if a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization of the Owner. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements extend to correction, without cost to the Owner, of all work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage due to defects or nonconformance with contract documents excluding repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Architect/Engineer.

1.15 INSURANCE

A. This Contractor shall maintain insurance coverage as set forth in Division 1 of these specifications.

1.16 CONTINGENCY

A. Include in the Base Bid a contingency of one percent (1%) to be used only by change orders issued by the Architect/Engineer. The unused portion of the contingency shall be deducted from the Contract price before final payment is made.

1.17 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis of design and establishes the quality required.

B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications, and fit in the allocated space. The Architect/Engineer shall make the final determination of whether a product is equivalent.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer via addendum. The Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on his part or on the part of other Contractors whose work is affected.

D. Voluntary add or deduct prices for alternate materials may be listed on the bid form. These items will not be used in determining the low bidder. This Contractor assumes all costs incurred as a result of using the offered material or equipment on his part or on the part of other Contractors whose work is affected.

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E. All material substitutions requested after the final addendum must be listed as voluntary changes on the bid form.

1.18 PROJECT COMMISSIONING

A. The Contractor shall work with the Commissioning Agent (CxA) as described in Section 01 91 00 and 26 08 00, and provide all services necessary for compliance with LEED Prerequisite EAp1, Fundamental Commissioning, and EAc3 Enhanced Commissioning.

B. The Contractor shall work with the Commissioning Agent (CxA) as described in Section 01 91 00 and 26 08 00, and provide all services as described in the Commissioning Plan.

PART 2 - PRODUCTS

2.1 GENERAL

A. All items of material having a similar function (e.g., safety switches, panelboards, switchboards, contactors, motor starters, dry type transformers) shall be of the same manufacturer unless specifically stated otherwise on drawings or elsewhere in specifications.

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or his or her employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and his or her personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 ARCHITECT/ENGINEER OBSERVATION OF WORK

A. The contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:
   1. Covering exterior walls, interior partitions and chases.
   2. Installing hard or suspended ceilings and soffits.

B. The Architect/Engineer will review the installation and provide a written report noting deficiencies requiring correction. The contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

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C. Above-Ceiling Final Observation:
   1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:
      a. All junction boxes are closed and identified in accordance with Section 26 05 53 Electrical Identification.
      b. Luminaires, including ceiling-mounted exit and emergency lights, are installed and operational.
      c. Luminaire whips are supported above the ceiling.
      d. Conduit identification is installed in accordance with Section 26 05 53 Electrical Identification.
      e. Luminaires are suspended independently of the ceiling system when required by these contract documents.
      f. All wall penetrations have been sealed.
   2. To prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
   3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to seven days elapsing, the Architect/Engineer may not recommend further payments to the contractor until full access has been provided.

3.3 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 1.

B. IDPH Pre-Occupancy Requirements:
   1. Each Contractor must submit all forms and certifications required by IDPH relating to their work at 85% completion of the project or when directed by the Owner/Architect/Engineer.

C. Final Jobsite Observation:
   1. To prevent the Final Jobsite Observation from occurring too early, the Contractor shall review the completion status of the project and certify that the job is ready for the final jobsite observation.
   2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review. The Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
   3. It is understood that if the Architect/Engineer finds the job not ready for the final observation and additional trips and observations are required to bring the project to completion, the cost of the additional time and expenses incurred by the Architect/Engineer will be deducted from the Contractor's final payment.
   4. Contractor shall notify Architect/Engineer 48 hours prior to installation of ceilings or lay-in ceiling tiles.

D. The following must be submitted before Architect/Engineer recommends final payment:
   1. Operation and maintenance manuals with copies of approved shop drawings.
   2. Record documents including marked-up drawings and specifications.
   3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of this Contractor and shall be signed by the Owner's representatives.

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4. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and submit receipt to Architect/Engineer.
5. Inspection and testing report by the fire alarm system manufacturer.
6. Start-up reports on all equipment requiring a factory installation or start-up.

E. Circuit Directories:
1. Provide custom typed circuit directory for each branch circuit panelboard. Provide updated custom typed circuit directory for each existing branch circuit panelboard with new or revised circuits per the scope of work. Label shall include equipment name or final approved room name, room number, and load type for each circuit (examples: SUMP SP-1 or ROOM 101 RECEPT). Revise directory to reflect circuit changes required to balance phase loads. Printed copies of the bid document panel schedules are not acceptable as circuit directories.

3.4 OPERATION AND MAINTENANCE MANUALS

A. General:
1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:
1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
   a. O&M file name: O&M.div26.contractor.YYYYMMDD
   b. Transmittal file name: O&Mtransmittal.div26.contractor.YYYYMMDD
5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files shall be divided into files that are clearly labeled as "1 of 2", "2 of 2", etc.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

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C. Paper Copy Submittal Procedures:
1. Once the electronic version of the manuals has been approved by the Architect/Engineer, 3 paper copies of the O&M manual shall be provided to the Owner. The content of the paper copies shall be identical to the corrected electronic copy.
2. Binder Requirements: The Contractor shall submit O&M manuals in heavy duty, locking three ring binders. Incorporate clear vinyl sheet sleeves on the front cover and spine for slip-in labeling. "Peel and stick" labels are not acceptable. Sheet lifters shall be supplied at the front of each notebook. The three-ring binders shall be 1/2" thicker than initial material to allow for future inserts. If more than one notebook is required, label in consecutive order. For example; 1 of 2, 2 of 2. No other form of binding is acceptable.
3. Binder Labels: Label the front and spine of each binder with "Operation and Maintenance Instructions", title of project, and subject matter.
4. Index Tabs: Divide information by specification section, major equipment, or systems using index tabs. All tab titling shall be clearly printed under reinforced plastic tabs. All equipment shall be labeled to match the identification in the construction documents.

D. Operation and Maintenance Instructions shall include:
1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copies of all factory inspections and/or equipment startup reports.
5. Copies of warranties.
6. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
7. Dimensional drawings of equipment.
8. Detailed parts lists with lists of suppliers.
9. Operating procedures for each system.
10. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
11. Repair procedures for major components.
12. Replacement parts and service material requirements for each system and the frequency of service required.
13. Instruction books, cards, and manuals furnished with the equipment.
14. Include record drawings of the one-line diagrams for each major system. The graphic for each piece of equipment shown on the one-line diagram shall be an active link to its associated Operation & Maintenance data.
15. Copies of all panel schedules in electronic Microsoft Excel spreadsheet (.xlsx) file. Each panelboard shall be a separate tab in the workbook.

3.5 INSTRUCTING THE OWNER'S REPRESENTATIVE

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of the complete systems installed under this contract.

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B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. Contractor shall make a DVD video recording of instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video recording shall be the property of the Owner.

D. The instructions shall include:
1. Maintenance of equipment.
2. Start-up procedures for all major equipment.
3. Description of emergency system operation.

E. Notify the Architect/Engineer of the time and place for the verbal instructions to the Owner's representative so his representative can be present if desired.

F. Minimum hours of instruction time for each item and/or system shall be as indicated in each individual specification section.

G. Operating Instructions:
1. Contractor is responsible for all instructions to the Owner's representatives for the electrical and specialized systems.
2. If the Contractor does not have staff that can adequately provide the required instructions, he shall include in his bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.6 RECORD DOCUMENTS

A. The following paragraphs supplement the requirements of Division 1.

B. Maintain at the job site a separate and complete set of electrical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings and specifications to indicate approved substitutions; Change Orders, and actual equipment and materials used. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should this Contractor fail to complete Record Documents as required by this contract, this Contractor shall reimburse Architect/Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly rates in effect at the time of work.

D. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

E. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

F. Record actual routing of conduits exceeding 2 inches.

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3.7 PAINTING

A. This Contractor shall paint the following items:

B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available. All equipment shall have a finished coat of paint applied unless specifically allowed to be provided with a prime coat only.

C. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, he shall have the equipment and all its supports, hangers, etc., painted to match the room decor. Painting shall be performed as described in project specifications.

D. Equipment cabinets, casings, covers, metal jackets, etc., located in equipment rooms or concealed spaces, shall be furnished in standard finish, free from scratches, abrasions, chippings, etc.

E. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chipping, etc. If color option is specified or is standard to the unit, verify with the Architect his color preference before ordering.

F. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, and storage rooms. Equipment furnished with a suitable factory finish need not be painted; provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.

G. All electrical conduit and equipment, fittings, hangers, structural supports, etc., in unfinished areas, such as equipment and storage room area, shall be painted two (2) coats of oil paint of colors selected by the Architect.

H. Do NOT paint electric conduits in crawl spaces, tunnels, or spaces above suspended ceilings except that where conduit is in a damp location give exposed threads at joints two coats of sealer after joint is made up.

I. After surfaces have been thoroughly cleaned and are free of oil, dirt or other foreign matter, paint all raceway and equipment with the following:
   1. Bare Metal Surfaces - Apply one coat of metal primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
   2. Plastic Surfaces - Paint plastic surfaces with two coats of semi-gloss acrylic latex paint.
   3. Color of paint shall be as follows:

J. In accordance with LEED EQc4.2: Low-Emitting Materials - Paints and Coatings, all paints and coatings used on the interior of the building must comply with the following criteria:
   1. Architectural paints and coatings applied to interior walls and ceilings must not exceed the volatile organic compound (VOC) content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.
   2. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 g/L (2 lb./gal) established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.

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3.8 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.

B. Clean all foreign paint, grease, oil, dirt, labels, stickers, etc. from all equipment.

C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.9 SPECIAL REQUIREMENTS

A. Coordinate the installation of all equipment, controls, devices, etc., with other trades to maintain clear access area for servicing.

B. Install all equipment to maximize access to parts needing service or maintenance. Review the final location, placement, and orientation of equipment with the Owner's representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's representative will result in removal and reinstallation of the equipment at the Contractor's expense.

D. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:
   1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.

3.10 INDOOR AIR QUALITY (IAQ) MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

A. Within the limits of Construction:
   1. The Electrical Contractor shall coordinate all work with the contractor responsible for IAQ.
   2. The means, methods and materials used by the Electrical Contractor shall be coordinated with the contractor responsible for IAQ and shall comply with the IAQ requirements set forth in Division 1 and Division 21/22/23 of these specifications.

B. Outside the limits of Construction:
   1. IAQ shall be the responsibility of the electrical contractor for work that is required outside the limits of construction.
   2. The Electrical Contractor is responsible for the IAQ set forth in Division 1 and Division 21/22/23 of these specifications.
   3. The Electrical Contractor shall review and coordinate all IAQ plans and procedures with the owner's IAQ representative.

C. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:

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1. General Contractor shall erect and maintain dust barriers throughout the construction work. These barriers shall be reasonably airtight and shall prevent entry into the construction zone by unauthorized persons. Reasonably airtight means construction equivalent to full-height temporary or permanent walls with joints taped or sealed, and shafts and other penetrations sealed as well as possible. Fire resistant polyethylene is acceptable; if flame spread/smoke developed ratings are demonstrated to conform to the applicable building codes and licensing acts.
2. The Contractor shall continuously maintain the construction zone under a negative pressure of at least 0.01" w.g. minimum relative to all adjacent areas of the building.
    a. Exhaust fans used for this purpose shall filter air and discharge it outdoors or to the least populated area adjacent to the construction work using negative air machines designed specifically for this purpose. All filtration for air recirculated back into the building shall be HEPA (99.97% DOP efficiency) for work adjacent to healthcare or elderly facilities. If no work is adjacent to these areas, 95% filtration is acceptable. Filtering air discharged to outdoors shall be accomplished with 30% filters.
    b. If air is discharged outdoors, maintain all required distances to doors, windows, air intakes, etc.
    c. If high levels of Volatile Organic Compounds (VOC's) or odors are released, activated carbon or equivalent filtration shall also be employed. Exhaust shall not discharge near doors, air intakes, pedestrians, gathering areas, or operable windows.
    d. Adjusting existing air handling equipment to assist in pressure control is acceptable, if approved by the Owner and the authority having jurisdiction.
    e. Seal return, exhaust, and supply air openings in or near the construction zone that serve existing air handling systems, and rebalance the systems for proper operation. If this is impractical, add filters at the intakes of sufficient cross sectional area to minimize the pressure drop and avoid the need for rebalancing.
    f. Maintain pressure control one hour before and after all construction periods, and 24 hours per day in healthcare or elderly facilities.
3. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:
    a. Minimizing the amount of dust generated.
    b. Reducing solvent fumes and VOC emissions.
    c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
4. Request that the Owner designate an IAQ representative.
5. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
6. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
7. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
8. Request copies of and follow all Owner's IAQ and infection control policies.
9. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
10. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
11. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings under Construction".

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3.11 SYSTEM STARTING AND ADJUSTING

A. The electrical systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes all calibration and adjustment of electrical controls, balancing of loads, troubleshooting and verification of software, and final adjustments that may be needed.

B. Complete all manufacturer-recommended startup procedures and checklists to verify proper equipment operation and does not pose a danger to personnel or property.

C. All operating conditions and control sequences shall be tested during the start-up period. Testing all interlocks, safety shut-downs, controls, and alarms.

D. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.12 FIELD QUALITY CONTROL

A. General:
1. Conduct all tests required during and after construction. Submit test results in NETA format, or equivalent form, that shows the test equipment used, calibration date, tester's name, ambient test conditions, humidity, conductor length, and results corrected to 40°C.
2. Supply necessary instruments, meters, etc., for the tests. Supply competent technicians with training in the proper testing techniques.
3. All cables and wires shall be tested for shorts and grounds following installation and connection to devices. Replace shorted or grounded wires and cables.
4. Any wiring device, electrical apparatus or luminaire, if grounded or shorted on any integral "live" part, shall have all defective parts or materials replaced.
5. Test cable insulation of service and panel feeder conductors for proper insulation values. Tests shall include the cable, all splices, and all terminations. Each conductor shall be tested and shall test free of short circuits and grounds and have an insulation value not less than NEC Standards. Take readings between conductors, and between conductors and ground.
6. If the results obtained in the tests are not satisfactory, make adjustments, replacements, and changes as needed. Then repeat the tests, and make additional tests, as the Architect/Engineer or authority having jurisdiction deems necessary.

B. Ground Resistance:
1. Conduct service ground resistance tests using an approved manufactured ground resistance meter. Submit to the Architect/Engineer a proposed test procedure including type of equipment to be used. (The conventional ohmmeter is not an acceptable device.)

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2. Make ground resistance measurements during normal dry weather and not less than 48 hours after a rain. Ground resistance values shall be verified by the Architect/Engineer at the time the readings are taken.
3. If the ground resistance value obtained is more than the value set forth in Section 26 05 26, the following shall be done to obtain the value given:
    a. Verify that all connections in the service ground system are secure.
    b. Increase the depth to which ground rods are driven by adding section lengths to the rods and retest. If the resistance is still excessive increase the depth by adding an additional rod section and retest.
    c. If the resistance is still excessive, furnish and install additional ground rods, spaced not less than 20 feet from other ground rods unless otherwise noted on plans, and connect into the ground electrode system. Retest.
    d. Review results with the Architect/Engineer.
4. Before final payment is made to the Contractor submit a written report to the Architect/Engineer including the following:
    a. Date of test.
    b. Number of hours since the last rain.
    c. Soil condition at the time of the test in the ground electrode location. That is: dry, wet, moist, sand, clay, etc.
    d. Diagram of the test set-up showing distances between test equipment, ground electrode, auxiliary electrodes, etc.
    e. Make, model, and calibration date of test equipment.
    f. Tabulation of measurements taken and calculations made.

C. Other Equipment:
1. Give other equipment furnished and installed by the Contractor all standard tests normally made to assure that the equipment is electrically sound, all connections properly made, phase rotation correct, fuses and thermal elements suitable for protection against overloads, voltage complies with equipment nameplate rating, and full load amperes are within equipment rating.

D. If any test results are not satisfactory, make adjustments, replacements and changes as needed and repeat the tests and make additional tests as the Architect/Engineer or authority having jurisdiction deem necessary.

E. Contractor shall thermographic study all electrical gear, switchboard, panelboards, etc. at the end of construction to identify any unusual conditions/heating within the equipment. Coordinate with Owner/Architect/Engineer to have an Owner/Architect/Engineer representative present during testing.

F. Report shall include color printouts, in binder, of pictures taken to use as a baseline reading after building is occupied.

G. Upon completion of the project, the Contractor shall provide amperage readings for all panelboards and switchboards and turn the results over to the Owner for "benchmark" amperages.

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3.13 CONSTRUCTION WASTE MANAGEMENT

A. This Contractor shall comply with all construction and demolition waste disposal and recycling requirements outlined in LEED MRc2: Construction Waste Management (follow latest edition at the time of bidding or as referenced in these specifications).
   1. This Contractor shall coordinate with the General Contractor to develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or co-mingled.
   2. The Contractor shall track waste disposal and recycling efforts throughout the construction process for all materials associated with this Contractor's scope of work. The Contractor shall provide this information to the General Contractor so that it can be incorporated with similar information from all other contractors for the project.
      a. Calculations for waste and recycled material can be done by weight or volume, but they must be consistent throughout the project. The Contractor shall coordinate with the General Contractor to establish the preferred calculation method and report the results accordingly.
      b. Excavated soil and land-clearing debris do not count towards the waste disposal or recycled material.
   3. At a minimum, 50% of the construction and demolition debris for this project must be recycled or salvaged.

3.14 UTILITY REBATE

A. Submit utility rebate forms, where offered at project location, with rebate items completed. Rebate may include lighting, lighting controls, variable speed drives, heat pumps, package terminal A/C, air conditioners, chillers, water heaters, programmable thermostats, and motors.

B. Contractor must submit notification of any value engineering or product substitution that will affect the utility rebate amount prior to approval.

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SECTION 26 05 03 - THROUGH PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Through-Penetration Firestopping.

1.2 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this Section.

B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

1.3 REFERENCES

A. UL 263 - Fire Tests of Building Construction and Materials.

B. UL 723 - Surface Burning Characteristics of Building Materials

C. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops

D. UL 2079 - Tests for Fire Resistance of Building Joint Systems

E. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)

F. Intertek / Warnock Hersey - Directory of Listed Products

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

H. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops

I. The Building Officials and Code Administrators National Building Code

J. 1994 Uniform Building Code

K. 2000 International Building Code

L. NFPA 5000 - Building Construction Safety Code

M. OSHPD - Office of State Wide Health Planning and Development (California)

1.4 SUBMITTALS

A. Submit under provisions of Division 1.

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B. Submit Firestopping Installers Certification for all installers on the project.

C. Shop Drawings: Submit for each condition requiring firestopping. Include descriptions of the specific penetrating item, actual wall/floor construction, manufacturer's installation instructions, and UL or Interek / Warnock Hersey Assembly number.

D. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
   1. Types of penetrating items.
   2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
   3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
   4. F and T ratings for each firestop system.

E. Maintain a notebook on the job site at all times that contains copies of approved submittals for all through penetration firestopping to be installed. Notebook shall be made available to the Authority Having Jurisdiction at their request and turned over to the Owner at the end of construction as part of the O&M Manuals.

F. Submit VOC rating of firestopping material in g/L (less water) with documentation that it meets the limits set forth in SCAQMD Rule 1168.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.

B. Install material prior to expiration of product shelf life.

1.6 PERFORMANCE REQUIREMENTS

A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
   1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.
   2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
   1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
   2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings:

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a. Floor penetrations located outside wall cavities.
b. Floor penetrations located outside fire-resistance-rated shaft enclosures.
c. Wall penetrations above corridor ceilings which are not part of a fire-resistive assembly.
d. Wall penetrations below any ceiling that are larger than 4" diameter or 16 square inches.

3. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 5.0 cfm/sq.ft. at both ambient temperature and 400°F (204°C) for smoke barriers.

C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. For through-penetration firestop systems in air plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

F. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:
1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.

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1.7 MEETINGS

A. Pre-installation meeting: A pre-installation meeting shall be scheduled and shall include the Construction Manager, General Contractor, all Subcontractors associated with the installation of systems penetrating fire barriers, Firestopping Manufacturer's Representative, and the Owner.
1. Review foreseeable methods related to firestopping work.
2. Tour representative areas where firestopping is to be installed; inspect and discuss each type of condition and each type of substrate that will be encountered, and preparation to be performed by other trades.

1.8 WARRANTY

A. Provide one year warranty on parts and labor.

B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers. All firestopping systems installed shall be provided by a single manufacturer.
1. 3M; Fire Protection Products Division
2. Hilti, Inc.
3. RectorSeal Corporation, Metacaulk
4. Tremco; Sealant/Weatherproofing Division
5. Johns-Manville
6. Specified Technologies Inc. (S.T.I.)
7. Spec Seal Firestop Products
8. AD Firebarrier Protection Systems
9. Wiremold/Legrand: FlameStopper
10. Dow Corning Corp
11. Fire Trak Corp
12. International Protective Coating Corp

2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

A. Provide materials and systems classified by or listed by Intertek / Warnock Hersey to provide firestopping equal to time rating of construction being penetrated.

B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that would require hazardous waste removal.

C. Firestopping shall be flexible to allow for normal penetrating item movement due to expansion and contraction.

D. Provide firestopping systems capable of supporting floor loads where systems are exposed to possible floor loading or traffic.

E. Provide firestopping systems allowing continuous insulation for all insulated pipes.

F. Provide firestopping systems classified by UL or listed by Intertek / Warnock Hersey for penetrations through all fire rated construction. Firestopping systems shall be selected from the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory Category XHEZ based on substrate construction and penetrating item size and material and shall fall within the range of numbers listed:
1. Combustible Framed Floors and Chase Walls - 1 or 2 Hour Rated
   a. F Rating = Floor/Wall Rating
   b. T Rating = Floor/Wall Rating
   c. L Rating = Penetrations in Smoke Barriers

Penetrating Item	UL System No.
No Penetrating Item	FC 0000-0999*

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Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999
Insulated Pipes	FC 5000-5999
Bus Duct and Misc. Electrical	FC 6000-6999
Duct without Damper and Misc. Mechanical	FC 7000-7999
Multiple Penetrations	FC 8000-8999

2. Non-Combustible Framed Walls - 1 or 2 Hour Rated
   a. F Rating = Wall Rating
   b. T Rating = 0
   c. L Rating = Penetrations in Smoke Barriers

Penetrating Item	UL System No.
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999

3. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated
   a. F Rating = Wall/Floor Rating
   b. T Rating (Walls) = 0 or Wall Rating
   c. T Rating (Floors) = Floor Rating
   d. L Rating = Penetrations in Smoke Barriers

Penetrating Item	UL System No.
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999

*Alternate method of firestopping is patching opening to match original rated construction.

G. Any opening in walls or floors not covered by the listed series of numbers shall be coordinated with the firestopping manufacturer.

H. Any openings in floors or walls not described in the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having Jurisdiction.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form-release agents from concrete.

B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.

C. Surfaces to which sealing materials are to be installed must meet the selected UL or Intertek / Warnock Hersey system substrate criteria.

D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

3.2 INSTALLATION

A. In existing construction, provide firestopping of openings prior to and after installation of penetrating items. Remove any existing coatings on surfaces prior to firestopping installation. Temporary firestopping shall consist of packing openings with fire resistant mineral wool for the full thickness of substrate, or an alternate method approved by the Authority Having Jurisdiction. All openings shall be temporarily fire stopped immediately upon their installation and shall remain so until the permanent UL or listed by Intertek / Warnock Hersey listed firestopping system is installed.

B. Install penetration seal materials in accordance with printed instructions of the UL or Intertek / Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application instructions.

C. Install dams as required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Remove combustible damming after appropriate curing.

3.3 CLEANING AND PROTECTING

A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

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3.4 IDENTIFICATION

A. Provide and install labels adjacent to each firestopping location. Label shall be provided by the firestop system supplier and contain the following information in a contrasting color:
   1. The words "Warning - Through Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
   2. Firestop System Supplier; UL or listed by Intertek / Warnock Hersey system number; date installed; contractor name and phone number; manufacturer's representative name, address, and phone number.

3.5 INSPECTION

A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.

B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.

C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.

D. The contractor shall allow for visual destructive review of 5% of installed firestop systems (minimum of one) to prove compliance with specifications and manufacturer's instructions and details. Destructive system removal shall be performed by the contractor and witnessed by the Architect/Engineer and manufacturer's factory representative. The Architect/Engineer shall have sole discretion of which firestop system installations will be reviewed. The contractor is responsible for all costs associated with this requirement including labor and material for removing and replacing the installed firestop system. If any firestop system is found to not be installed per manufacturer's specific instructions and details, all firestop systems are subject to destructive review and replacement at the Architect/Engineer's discretion and the contractor's expense.

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SECTION 26 05 13 - WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building wire

B. Cabling for remote control, signal, and power limited circuits

C. Fire rated and circuit integrity (CI) cable and assemblies

D. Healthcare facilities cable (HFC)

E. Armored cable (AC)

F. Metal-clad cable (MC)

1.2 RELATED WORK

A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

1.3 REFERENCES

A. NEMA WC 70 - Power Cables Rated 2,000V or Less for the Distribution of Electrical Energy

B. NFPA 70 - National Electrical Code (NEC)

C. UL 44 - Thermoset-Insulated Wires and Cables

D. UL 83 - Thermoplastic-Insulated Wires and Cables

E. UL 854 - Service-Entrance Cables

F. UL 1581 - Standard for Electrical Wires, Cables, and Flexible Cords

G. UL 2196 - Fire Resistive, Fire Resistant and Circuit Integrity Cables

1.4 SUBMITTALS

A. Submit shop drawings and product data under the provisions of Section 26 05 00.

B. Submit manufacturer's installation instructions.

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PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600-volt insulation, THHN/THWN or XHHW-2.

B. Feeders and Branch Circuits Larger Than 6 AWG in Underground Conduit: Copper, stranded conductor, 600-volt insulation, THWN or XHHW-2.

C. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600-volt insulation, THHN/THWN. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded conductor, unless otherwise noted on the drawings. Aluminum, compact stranded conductor is not acceptable for feeder and branch circuits 6 AWG and smaller.

D. Motor Feeder from Variable Frequency Drives: Copper conductor, 600-volt XHHW-2 insulation, stranded conductor, unless otherwise noted on the drawings. Three conductor stranded coverall helical copper tape shield. Shield shall be terminated at both ends of cable with an approved termination.

E. Control Circuits: Copper, stranded conductor 600-volt insulation, THHN/THWN.

F. Aluminum conductors are not to be used for feeds to motor loads.

G. Each 120 and 277-volt branch circuit shall have a dedicated neutral conductor. Neutral conductors shall be considered current-carrying conductors for wire derating.

2.2 CABLING FOR REMOTE CONTROL, SIGNAL, AND POWER LIMITED CIRCUITS:

A. Wire for the following specialized systems shall be as designated on the drawings, or elsewhere in these specifications. If not designated on the drawings or specifications, the system manufacturer's recommendations shall be followed.
   1. Low voltage switching
   2. Building automation systems and control

B. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600-volt insulation, rated 60°C, individual conductors twisted together, shielded, and covered with a PVC jacket.

C. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300-volt insulation, rated 60ºC, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.

D. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300-volt insulation, rated 60°C, individual conductors twisted together, shielded, and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

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2.3 FIRE-RATED AND CIRCUIT INTEGRITY (CI) CABLE AND ASSEMBLIES

A. Properties and requirements of fire rated cables and assemblies:
   1. 2HR fire rated for horizontal and vertical installations.

B. Acceptable fire-rated cables and listed assemblies:
   1. Feeder assembly located outside the structure (example: below finished grade) or encased in concrete; minimum 2 inches [50mm] of concrete).
   2. Mineral Insulated Cables: Copper conductor, 600-volt insulation, rated 90ºC, Type MI.

2.4 ARMORED CABLE (AC)

A. AC cable is not allowed for use unless approved for use by PSD electrical department.

2.5 METAL-CLAD CABLE (MC)

A. MC is not allowed for use unless approved for use by PSD electrical department. .

PART 3 - EXECUTION

3.1 WIRE AND CABLE INSTALLATION SCHEDULE

A. Above Accessible Ceilings:
   1. Building wire shall be installed in raceway.

B. All Other Locations: Building wire in raceway.

C. Above Grade: All conductors installed above grade shall be type "THHN".

D. Underground or In Slab: All conductors shall be type "THWN".

E. Low Voltage Cable (less than 100 volts): Low voltage cables in ducts, plenums, and other air handling spaces shall be plenum listed. Low voltage cables in non-accessible areas shall be installed in conduit. Low voltage cable may be installed without conduit in accessible areas using the following types of cable supports. Cable support types/systems shall comply with the warranty requirements of the low voltage cable manufacturer.
   1. J-hooks
   2. Bridle rings with saddle supports
   [* * * * * OR * * * * *]

F. Fire-Rated 2-Hour Feeders and Circuit Requiring Continuous Operation (CI): Refer to Part 2 of this section for acceptable products and assemblies. Installation shall meet UL 2196.

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3.2 CONTRACTOR CHANGES

A. The basis of design is copper conductors installed in raceway based on ambient temperature of 30°C, NEC Table 310.15(B)(16) (formerly 310.16 for NEC 2008 and earlier). Service entrance conductors are based on copper conductor installed in underground electrical ducts, NEC Table B.310.15(B)(2)(7) (formerly B.310.7 for NEC 2008 and earlier).

B. The Contractor shall be responsible for derating and sizing conductors and conduits to equal or exceed the ampacity of the basis of design circuits, if he/she chooses to use methods or materials other than the basis of design.

C. Underground electrical duct ampacity rating shall be in accordance with NEC Table B.310.15(B)(2)(7) or calculated in accordance with Annex B Application Information for Ampacity Calculation. The calculations and a sketch of the proposed installation shall be submitted prior to any conduit being installed.

D. Record drawing shall include the calculations and sketches.

3.3 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.

B. Use no wire smaller than 18 AWG for low voltage control wiring (<100 volts).

C. Use 10 AWG conductor for 20 ampere, 120-volt branch circuit home runs longer than 75 feet. and for 20 ampere, 277-volt branch circuit home runs longer than 150 feet.

D. For circuits other than 20A and for distances greater than listed above, calculate voltage drop and size conductors for a maximum of 3 percent from the last overcurrent device.

E. Use no wire smaller than 8 AWG for outdoor lighting circuits.

F. The ampacity of multiple conductors in one conduit shall be derated per NEC 310. Avoid more than 4 conductors be installed in one conduit to such loads as motors larger than 1/4 HP, panelboards, motor control centers, etc. The exception would be for grouped 3-phase motor loads only.

G. Where installing parallel feeders, place an equal number of conductors for each phase of a circuit in same raceway or cable.

H. Splice only in junction or outlet boxes.

I. Neatly train and lace wiring inside boxes, equipment, and panelboards.

J. Make conductor lengths for parallel circuits equal.

K. All conductors shall be continuous in conduit from last outlet to their termination.

L. Terminate all spare conductors on terminal blocks, and label the spare conductors.

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M. Cables or wires shall not be laid out on the ground before pulling.

N. Cables or wires shall not be dragged over earth or paving.

O. Care shall be taken so as not to subject the cable or wire to high mechanical stresses that would cause damage to the wire and cable.

P. At least six (6)-inch loops or ends shall be left at each outlet for installation connection of luminaires or other devices.

Q. All wires in outlet boxes not connected to fixtures or other devices shall be rolled up, spliced if continuity of circuit is required, and insulated.

3.4 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires. Do not use wire pulling lubricant for isolated (ungrounded) power system wiring.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Pulling shall be continuous without unnecessary stops and starts with wire or cable only partially through raceway.

D. Where reels of cable or wire are used, they shall be set up on jacks close to the point where the wire or cable enters the conduit or duct so that the cable or wire may be unreeled and run into the conduit or duct with a minimum of change in the direction of the bend.

E. Conductors shall not be pulled through conduits until plastering or masonry work is completed and conduits are free from moisture. Care shall be taken so that long pulls of wire or pulls around several bends are not made where the wire may be permanently stretched and the insulation damaged.

F. Only nylon rope shall be permitted to pull cables into conduit and ducts.

G. Completely and thoroughly swab raceway system before installing conductors.

H. Conductor Supports in Vertical Raceways:
   1. Support conductors in vertical raceways in accordance with NEC 300.19 and Table 300.19(A) Spacing of Conductors Supports.
   2. Supports shall be of insulated wedge type (OZ Gedney Type S, or equal) and installed in a tapered insulated bushing fitting or a metal woven mesh with a support ring that fits inside conduit fitting installed in an accessible junction box (Hubbell Kellems support grip or equal).

3.5 CABLE INSTALLATION

A. Provide protection for exposed cables where subject to damage.

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B. Use suitable cable fittings and connectors.

C. Run all open cable parallel or perpendicular to walls, ceilings, and exposed structural members. Follow the routing as illustrated on the drawings as closely as possible. Cable routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatical, unless noted otherwise. The correct routing, when shown diagrammatically, shall be chosen by the Contractor based on information in the contract documents; in accordance with the manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", recognized industry standards; and coordinated with other contractors.

D. Open cable shall be supported by the appropriate size J-hooks or other means if called for on the drawings. Wire and cable from different systems shall not be installed in the same J-hook. J-hooks shall be sized with 20% spare capacity. J-hooks shall provide proper bend radius support for data cable and fiber cables.

E. Open cable installed above suspended ceilings shall not rest on the suspended ceiling construction, nor utilize the ceiling support system for wire and cable support.

F. J-hook supports shall be installed at a maximum of five-foot (5') intervals. All J-hooks shall be installed where completely accessible and not blocked by piping, ductwork, inaccessible ceilings, etc. J-hooks shall be independently rigidly attached to a structural element. J-hooks shall be installed to provide 2" horizontal separation and 6" vertical separation between systems.

G. Open cable shall only be installed where specifically shown on the drawings, or permitted in these specifications.

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3.6 FIRE-RATED CABLE AND ASSEMBLY INSTRUCTIONS

A. Terminations of the fire-rated cable must be outside of the fire zone.

B. Fire-rated cable shall be installed according to the manufacturer's instructions, recommendations, and UL listing.

C. Route fire-rated cable and assemblies separate from other feeders and distribution. Install cable and assemblies in locations protected from physical damage.

D. Refer to Electrical Identification Section 26 05 53 for specific identification requirements.

3.7 WIRING CONNECTIONS AND TERMINATIONS

A. Splice and tap only in accessible junction boxes.

B. Use solderless, tin-plated copper, compression terminals (lugs) applied with circumferential crimp for conductor terminations, 8 AWG and larger.

C. Use solderless, tin-plated, compression terminals (lugs) applied with indenter crimp for copper conductor terminations, 10 AWG and smaller.

D. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.

E. Use compression connectors applied with circumferential crimp for all aluminum conductor splices and taps and ~~or~~ mechanical lugs with manufacturer-designated torques applied for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.

F. Thoroughly clean wires before installing lugs and connectors.

G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

H. Phase Sequence: All apparatus shall be connected to operate in the phase sequence A-B-C representing the time sequence in which the phase conductors so identified reach positive maximum voltage.

I. As a general rule, applicable to switches, circuit breakers, starters, panelboards, switchgear and the like, the connections to phase conductors are intended thus:
   1. Facing the front and operating side of the equipment, the phase identification shall be:
      a. Left to Right - A-B-C
      b. Top to Bottom - A-B-C

J. Connection revisions as required to achieve correct rotation of motors shall be made at the load terminals of the starters or disconnect switches.

3.8 AC, MC CABLE INSTALLATION

A. AC/MC shall NOT be used for circuits serving the Essential Electrical System.

B. Cable shall be supported by an approved means every 4.5' and within 12" of outlet boxes, junction boxes, cabinets, or fittings.

C. Cable may be unsupported in the following conditions:
   1. Cable is no longer than 2' in length at terminals where flexibility is necessary.
   2. Cable is not more than 4.5' from the last point of support for connections within an accessible ceiling to light fixtures or equipment.

D. Conductor ampacity shall be derated as required by the NEC where more than three current carrying conductors are used.

E. Each 120 and 277-volt circuit shall have a dedicated neutral conductor. Neutral conductors shall be considered current-carrying conductors for cable derating.

F. Cables shall be cut using a rotary cutter as recommended by the manufacturer to eliminate nicking and cutting of the conductors.

G. Bending radius shall comply with the requirements listed in the NEC for the type and size of cable being installed, but shall not be less than 5-times the diameter of the cable in any case.

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H. At cable terminations, a fitting shall be provided to protect wires from abrasion, unless the design of the outlet boxes or fittings is such as to afford equivalent protection, and, in addition, an insulating bushing or its equivalent protection shall be provided between the conductors and the armor.

3.9 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Building Wire and Power Cable Testing: Perform an insulation-resistance test on each conductor with respect to ground and adjacent conductors. Test shall be made by means of a low-resistance ohmmeter, such as a "Megger". The applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. The test duration shall be one minute. Insulation resistance must be greater than 100 mega-ohm for 600 volt and 25 mega-ohm for 300 volt rated cables per NETA Acceptance Testing Standard. Verify uniform resistance of parallel conductors.

C. MI cable shall have the insulation resistance of each cable tested with a 500-volt dc megohmmeter prior to energizing the cables. Tabulate resistance values and submit to Architect/Engineer for acceptance.

D. Inspect wire and cable for physical damage and proper connection.

E. Torque test conductor connections and terminations to manufacturer's recommended values.

F. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

G. Provide documentation of the manufacturer's recommended lug torque value for copper and aluminum conductors, the date the lugs were torqued, and installed torque readings. Documentation indicating that the torque wrench has been calibrated not more than 30 days prior to tightening of lugs shall be provided.

H. Protection of wire and cable from foreign materials:
   1. It is the Contractor's responsibility to provide adequate physical protection to prevent foreign material application or contact with any wire or cable type. Foreign material is defined as any material that would negatively impact the validity of the manufacturer's performance warranty. This includes, but is not limited to, overspray of paint (accidental or otherwise), drywall compound, or any other surface chemical, liquid, or compound that could come in contact with the cable, cable jacket, or cable termination components.

I. Overspray of paint on any wire or cable will not be accepted. It shall be the Contractor's responsibility to replace any component containing overspray, in its entirety, at no additional cost to the project. Cleaning of the cables with harsh chemicals is not allowed.

END OF SECTION

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SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Equipment grounding system

B. Bonding system

C. Grounding electrode system

1.2 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise on-site testing specified in Part 3.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with UL 467 Grounding and Bonding Equipment.

E. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

F. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE/ANSI C2 National Electrical Safety Code (NESC).

1.3 REFERENCES

A. NFPA 70 - National Electrical Code (NEC)

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Section 26 05 00.

B. Product Data: For the following:
1. Ground rods.
2. Chemical electrodes.

[*****OR*****]

C. Product Data: For each type of product indicated.

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D. Field Test Reports: Submit written test reports to include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Indicate layout of ground field, location of system grounding electrode connections, and routing of grounding electrode conductor and ground ring.

1.5 SUMMARY

A. This section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section 26 05 13 "Wire and Cable".

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated. Refer to Section 26 05 53 for insulation color.

D. Isolated Ground Conductors: Insulated. Refer to Section 26 05 53 for insulation color.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Copper Bonding Conductors: As follows:
   1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
   2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
   3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Grounding Bus:
   1. Bare, annealed copper bars of rectangular cross section, with insulators. 1/4" x 2", length of electrical room.

I. Intersystem Bonding Termination:
   1. Copper bar, 1/4" x 2" x 24". Provide with wall mounting brackets, insulators and pre-tapped holes.
   2. Approved Manufacturers: Harger GBI Series, Erico B544 Series.

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2.2 CONNECTOR PRODUCTS

A. Comply with UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Connectors: in kit form, and selected per manufacturer's written instructions.

C. Bolted Connectors: Bolted-pressure-type connectors.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel Stainless steel.
[*****OR*****]

B. Ground Rods: Sectional type; copper-clad steel.
1. Size: 3/4" in diameter by 120 inches per section.

C. Chemical Electrodes: Copper tube, straight or L-shaped, filled with nonhazardous chemical salts, terminated with a 4/0 bare conductor. Provide backfill material recommended by manufacturer.

D. Concrete-Encased Grounding Electrode (Ufer): Fabricate according to NFPA 70, Paragraph 52-(3), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG or 20 feet of 1/2" (13mm) steel reinforcing bar.

PART 3 - EXECUTION

3.1 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

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D. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

E. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

F. Structural Steel Connection: Exothermic-welded connections to structural steel. Coordinate with structure to provide physical protection.

G. Underground Connections: Exothermic-welded connections. Use for underground connections, except those at test wells.

H. Connections at Test Wells: Use compression-type connectors on conductors and make two bolted- and clamped-type connections between conductors and ground rods.

I. Connections at back boxes, junction boxes, pull boxes, and equipment terminations: The equipment grounding conductor(s) associated with all circuits in the box shall be connected together and to the box using a suitable grounding screw. The removal of the respective receptacle, luminaire, or other device served by the box shall not interrupt the grounding continuity. The connection to the non-metallic boxes shall be made to any metallic fitting or device requiring grounding.

J. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

K. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

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3.2 INSTALLATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage. Each grounding conductor that passes through a below grade wall must be provided with a waterstop.

C. Grounding electrode conductor (GEC) shall be protected from physical damage by rigid polyvinyl chloride conduit (PVC) in exposed locations.

D. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then use a bolted clamp. Bond straps directly to the basic structure, taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

E. In raceways, use insulated equipment grounding conductors.

F. Underground Grounding Conductors: No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

G. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, below access floors, and elsewhere as indicated, with bolted connections to form a continuous ground path.

3.3 EQUIPMENT GROUNDING SYSTEM

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits. Terminate each end on a grounding lug or bus.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
1. Lighting and receptacle circuits. Terminate each end on a grounding lug or bus.
2. Single-phase and three-phase motor and appliance branch circuits.
3. Flexible raceway runs, including FMC and LFMC.

D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

F. Isolated Grounding Circuits: Install an insulated equipment grounding conductor connected to the receptacle or equipment grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at isolated equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

G. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

3.4 BONDING SYSTEM

A. At building expansion joints, provide flexible bonding jumpers to connect to columns or beams on each side of the expansion joint.

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B. Isolated Equipment Enclosure: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment bonding conductor.

C. Exterior Metallic Pull and Junction Box Covers, Metallic Hand Rails: Bond to grounding system using flexible grounding conductors.

D. Bond metal ducts of dust collectors, particulate conveying, fume hoods, and other hazardous materials to the equipment grounding conductors of associated pumps, fans, or blowers. Use braided-type bonding straps. Provide braided bare copper bonding conductor in nonmetallic dust collector ductwork to each equipment inlet location, and bond to equipment.

E. Water Heater, Heat-Tracing, Metal Well Casing, and Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and anti-frost heating cable. Bond conductor to heater units, piping, well casing, connected equipment, and components.

F. Connect bonding conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.

G. Terminal Cabinets: Terminate bonding conductor on cabinet grounding terminal.

H. Remote control, signaling, and fire alarm circuits shall be bonded in accordance with the most recent version of the National Electric Code.

3.5 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
   1. Measure ground resistance from system neutral connection at service entrance to convenient ground reference points using suitable ground testing equipment. Resistance shall not exceed 5 ohms.
   2. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:
   3. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
   4. Testing: Perform the following field quality-control testing:
      a. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
      b. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

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c. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
   1) Equipment Rated 500 kVA and Less: 10 ohms.
   2) Equipment Rated 500 to 1000 kVA: 5 ohms.
   3) Equipment Rated More Than 1000 kVA: 3 ohms.
   4) Substations and Pad-Mounted Switching Equipment: 5 ohms.
   5) Manhole Grounds: 10 ohms.

d. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect/Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

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SECTION 26 05 27 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports

B. Fastening hardware

C. Concrete housekeeping pads

1.2 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.3 COORDINATION

A. Coordinate size, shape and location of concrete pads with section on Cast-in-Place Concrete or Concrete Topping.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Allied Support Systems

B. Cooper B-Line

C. Erico, Inc.

D. Hilti

E. Power Fasteners

F. Orbit Industries

2.2 MATERIAL

A. Support Channel: Hot-dip galvanized stainless steel for wet/damp locations; painted steel for interior/dry locations. All field cut ends shall be touched up with matching finish to inhibit rusting.

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B. Hardware: Corrosion resistant.

C. Anchorage and Structural Attachment Components:
1. Only anchors that use removeable bolts or screws will be allowed. Screw type anchors approved for the application are to be used.
2. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to Authorities Having Jurisdiction.
   a. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.
3. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
4. Welding Lugs: Comply with MSS-SP-69, Type 57.
5. Beam clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.
6. Bushings for Floor-Mounted Equipment Anchors: Neoprene units, and matched to the type and size of anchor bolts and studs used.
7. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves , and matched to the type and size of attachment devices used.
8. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318-05. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.
9. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

D. Conduit Sleeves and Lintels:
1. Each Contractor shall provide, to the General Contractor for installation, lintels for all openings required for the Contractor's work in masonry walls and conduit sleeves for floors, unless specifically shown as being by others.
2. Fabricate all lintels from structural steel shapes or as indicated on the drawings. All lintels and grouped wall openings shall be approved by the Architect or Structural Engineer.
3. Fabricate all sleeves from standard weight black steel pipe. Provide continuous sleeve. Cut or split sleeves are not acceptable. Sleeves through concrete walls may be high density polyethylene pipe penetration sleeve with a water stop collar, suitable for use with Link-Seal mechanical seals. Century-Line Model CS.
4. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed squared ends extending 1" above the floor in unfinished areas, and flush with the floor in finished areas, to accept spring closing floor plates.
5. Sleeves shall not penetrate structural members without approval from the Structural Engineer.
6. Openings through unexcavated floors and/or foundation walls below the floor shall have a smooth finish with sufficient annular space around material passing through opening so slight settling will not place stress on the material or building structure.
7. Install all sleeves concentric with conduits. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.
8. Where conduits rise through concrete floors that are on earthen grade, provide 3/4" resilient expansion joint material (asphalt and cork) wrapped around the pipe, the full depth of concrete, at the point of penetration. Secure to prevent shifting during concrete placement and finishing.
9. Size sleeves large enough to allow expansion and contraction movement.

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E. Concrete Housekeeping Pads:
   1. Concrete bases for all floor mounted equipment and wall mounted equipment which is surface mounted and extends to within 6" of the finished floor, unless shown otherwise on the drawings, shall be 3-1/2" thick concrete.
   2. Bases shall extend 3" on all sides of the equipment (6" larger than factory base).
   3. Where the base is less than 12" from a wall, the base shall be carried to the wall to prevent a "dirt-trap".
   4. Concrete materials and workmanship required for the Contractor's work shall be provided by him. Materials and workmanship shall conform to the applicable standards of the Portland Cement Association. Reinforce with 6" x 6", W1.4-W1.4 welded wire fabric. Concrete shall withstand 3,000 pounds compression per square inch at twenty-eight days.

F. Rooftop Support System:
   1. Provide pre-fabricated roof supports for all conduit and equipment installed above the roof. Support all conduit and equipment a minimum of 4" above roof.
   2. Support system shall be compatible with single ply, bituminous, metal, and spray foam roof systems. The base shall be rounded to prevent damage to the roof, and drainage holes shall prevent ponding of water in the support.
   3. All metal components shall be hot dipped galvanized. Mounting hardware shall be stainless steel or hot dipped galvanized. Support shall be UV, corrosion, and freeze/thaw resistant. Support shall include orange paint, reflective safety orange accents, or similar markings for increased visibility.
   4. Acceptable Products: Anvil International HBS-Base Series, Cooper B-Line Dura-Blok, Erico Caddy Pyramid 50, 150, 300, or 600 (to match load).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors in concrete and beam clamps on structural steel.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not fasten supports to ceiling systems, piping, ductwork, mechanical equipment, or conduit, unless otherwise noted.

D. Do not use powder-actuated anchors without specific permission.

E. Do not drill structural steel members.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

G. In wet locations and on all building floors below exterior earth grade install free-standing electrical equipment on concrete pads.

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H. Install cabinets and panelboards with minimum of four anchors. Provide horizontal backing/support framing in stud walls for rigid mounting. Provide steel channel supports to stand surface-mounted panelboard or cabinet one inch off wall.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

J. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

K. Refer to Section 26 05 33 for special conduit supporting requirements.

3.2 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.

B. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

END OF SECTION

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SECTION 26 05 33 - CONDUIT AND BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Rigid metallic conduit and fittings (RMC)

B. Stainless steel conduit (316SS) and fittings

C. Intermediate metallic conduit and fittings (IMC)

D. Electrical metallic tubing and fittings (EMT)

E. Electrical nonmetallic tubing (ENT)

F. Flexible metallic conduit and fittings (FMC)

G. Liquidtight flexible metallic conduit and fittings (LFMC)

H. Rigid polyvinyl chloride conduit and fittings (PVC)

I. High density polyethylene conduit and fittings (HDPE)

J. Reinforced thermosetting resin conduit (RTRC)

K. Phenolic reinforced thermosetting resin conduit (Phenolic RTRC)

L. Wall and ceiling outlet boxes

M. Electrical connection

N. Pull and junction boxes

O. Rough-ins

P. Handholes

Q. Accessories

1.2 RELATED WORK

A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

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1.3 REFERENCES

A. American National Standards Institute (ANSI):
1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated and Fittings
3. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
4. ANSI C80.6 - Intermediate Metal Conduit, Zinc Coated
5. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
6. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

B. Federal Specifications (FS):
1. A-A-50553A - Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall (EMT) Type
2. A-A-55810 - Specification for Flexible Metal Conduit

C. NECA "Standards of Installation"

D. National Electrical Manufacturers Association (NEMA):
1. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
2. RN 1 - Polyvinyl chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit, Rigid Aluminum Conduit, and Intermediate Metal Conduit
3. TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit
4. TC 9 - Fittings for PVC Plastic Utilities Duct for Underground Installation

E. NFPA 70 - National Electrical Code (NEC)

F. Underwriters Laboratories (UL): Applicable Listings
1. UL 1 - Flexible Metal Conduit
2. UL 6 - Rigid Metal Conduit
3. UL 360 - Liquid Tight Flexible Steel Conduit
4. UL514-B - Conduit Tubing and Cable Fittings
5. UL651-A - Type EB and a PVC Conduit and HDPE Conduit
6. UL651-B - Continuous Length HDPE Conduit
7. UL746A - Standard for Polymeric Materials - Short Term Property Evaluations
8. UL797 - Electrical Metal Tubing
9. UL1242 - Intermediate Metal Conduit

G. American Standard of Testing and Materials (ASTM):
1. ASTM D 570 - Standard Test Method for Water Absorption of Plastics
2. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics
3. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edge Wise Position
4. ASTM D 2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
5. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
6. ASTM D 3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Material

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H. Definitions:
1. Fittings: Conduit connection or coupling.
2. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only.
3. Mechanical Spaces: Enclosed areas, usually kept separated from the general public, where the primary use is to house service equipment and to route services. These spaces generally have exposed structures, bare concrete and non-architecturally emphasized finishes.
4. Finished Spaces: Enclosed areas where the primary use is to house personnel and the general public. These spaces generally have architecturally emphasized finishes, ceilings and/or floors.
5. Concealed: Not visible by the general public. Often indicates a location either above the ceiling, in the walls, in or beneath the floor slab, in column coverings, or in the ceiling construction.
6. Above Grade: Not directly in contact with the earth. For example, an interior wall located at an elevation below the finished grade shall be considered above grade but a wall retaining earth shall be considered below grade.
7. Slab: Horizontal pour of concrete used for a floor or sub-floor.

1.4 SUBMITTALS

A. Include fittings and conduits 1.5" and larger in coordination files. Include all in--floor and underfloor conduit in coordination files. Refer to Section 26 05 00 for coordination drawing requirements.

PART 2 - PRODUCTS

2.1 RIGID METALLIC CONDUIT (RMC) AND FITTINGS

A. Acceptable Manufacturers:
1. Acceptable Manufacturers: Allied, LTV, Steelduct, Calbond Calpipe, Wheatland Tube Co, O-Z Gedney, or approved equal.
2. Acceptable Manufacturers of RMC Conduit Fittings: Appleton Electric, O-Z/Gedney Co., Electroline, Raco, Bridgeport, Midwest, Regal, Thomas & Betts, Crouse-Hinds, Killark, Orbit Industries or approved equal.

B. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

C. Fittings and Conduit Bodies:
1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.
3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.

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4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. High impact phenolic threaded type bushings are not acceptable.
5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

D. PVC Externally Coated Conduit: Compliant with NEMA RN 1; rigid galvanized steel conduit with external 40 mil PVC coating and internal 2 mil urethane coating surface. All fittings and conduit bodies shall be complete with coating. The PVC coated system shall include necessary PVC coated fittings, boxes and covers to form a complete encapsulated system. Acceptable Manufacturers: Calbond Calpipe, Robroy, T&B Ocal or approved equal.

2.2 STAINLESS STEEL CONDUIT (316SS) AND FITTINGS

A. Acceptable Manufacturers: Gibson Stainless & Specialty, Calbond Calpipe, Calbrite, Eaton/Crouse-Hinds, Thomas & Betts, or approved equal.

B. All material shall be Type 316 stainless steel, meet ASTM A-321 and SA-312 standards, and be UL 6A approved.

C. All conduit shall be heavy wall Schedule 40 with standard NPT threads.

D. Minimum Size Stainless Steel: 3/4 inch, unless otherwise noted.

E. Fittings, conduit bodies, couplings, nipples, bushings, connectors, supports, clamps, and all accessory hardware shall be made of Type 316 stainless steel.

2.3 INTERMEDIATE METALLIC CONDUIT (IMC) AND FITTINGS

A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

B. Acceptable Manufacturers: Allied, LTV, Steelduct, Wheatland Tube Co, O-Z Gedney, or approved equal.

C. Fittings and Conduit Bodies:
1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.
3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.
4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. High impact phenolic threaded type bushings are not acceptable.

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5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

2.4 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Minimum Size Electrical Metallic Tubing: 3/4 inch, unless otherwise noted.

B. Thin wall type is not permitted embedded in poured concrete floors, walls or roofs.

C. Acceptable Manufacturers of EMT Conduit: Allied, Calbond Calpipe, LTV, Steelduct, Wheatland Tube Co, or approved equal.

D. Fittings and Conduit Bodies:
1. 2" Diameter or Smaller: Compression type of steel designed for their specific application.
2. Larger than 2": Compression type of steel designed for their specific application.
3. Acceptable Manufacturers of EMT Conduit Fittings: Appleton Electric, O-Z/Gedney Co., Electroline, Raco, Bridgeport, Midwest, Regal, Thomas & Betts, Orbit Industries or approved equal.

2.5 ELECTRICAL NONMETALLIC TUBING (ENT) AND FITTINGS

A. Minimum Size Electrical Metallic Tubing: 3/4 inch, unless otherwise noted.

B. Flexible "Smurf" tube to be used in light poles to separate low voltage wiring from line voltage. Color:Blue

C. Acceptable Manufacturers of EMT Conduit: Carlon or approved equal.

2.6 FLEXIBLE METALLIC CONDUIT (FMC) AND FITTINGS

A. Minimum Size Galvanized Steel or Aluminum: 3/4 inch, unless otherwise noted. Lighting branch circuit wiring to an individual luminaire may be a manufactured, UL listed 3/8" flexible metal conduit and fittings with #14 AWG THHN conductors and an insulated ground wire. Maximum length of 3/8" FMC shall be six (6) feet.

B. Acceptable Manufacturers: American Flex, Alflex, Electri-Flex Co, or approved equal.

C. Construction: Flexible steel or aluminum, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel or aluminum. Provide a separate equipment grounding conductor when used for equipment where flexibility is required.

D. Fittings and Conduit Bodies:
1. Threadless hinged clamp type, galvanized zinc coated cadmium plated malleable cast iron or screw-in type, die-cast zinc.
2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.

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3. Acceptable Manufacturers: O-Z/Gedney Co., Thomas & Betts, Appleton Electric, Electroline, Bridgeport, Midwest, Regal, Orbit Industries, or approved equal.

2.7 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC) AND FITTINGS

A. Acceptable Manufacturers: Anaconda Type UA, Electri-Flex Type LA, Alflex, Carlon (Lamson & Sessions), or approved equal.

B. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel and an extruded PVC cover.

C. Fittings and Conduit Bodies:
1. Watertight, compression type, galvanized zinc coated cadmium plated malleable cast iron, UL listed.
2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
3. Acceptable Manufacturers: Appleton Electric, O-Z/Gedney Co., Electroline, Bridgeport, Thomas & Betts, Midwest, Regal, Carlon (Lamson & Sessions), Orbit Industries, or approved equal.

2.8 RIGID NON-METALLIC CONDUIT (PVC) AND FITTINGS

A. Minimum Size Rigid Smooth-Wall Nonmetallic Conduit: 3/4 inch, unless otherwise noted.

B. Acceptable Manufacturers: Carlon (Lamson & Sessions) Type 40, Cantex, J.M. Mfg., or approved equal.

C. Construction: Schedule 40 and Schedule 80 rigid polyvinyl chloride (PVC), UL labeled for 90°C.

D. Fittings and Conduit Bodies: NEMA TC 3; sleeve type suitable for and manufactured especially for use with the conduit by the conduit manufacturer.

E. Plastic cement for joining conduit and fittings shall be provided as recommended by the manufacturer.

2.9 HIGH DENSITY POLYETHYLENE (HDPE)

A. Minimum Size: 1 inch, unless noted otherwise.

B. Acceptable Manufacturers: Carlon, Chevron Phillips Chemical Company, or approved equal.

C. Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high-density polyethylene resin. The material shall be listed by PPI (Plastic Pipe Institute) and shall meet the following resin properties:

ASTM Test	Description	Values HDPE

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D-1505	Density g/CM 3	< .941
D-1238	Melt Index, g/10 min Condition E	> .55 grams/10 min.
D-638	Tensile Strength at yield (psi)	3000 min.
D-1693	Environmental Stress Crack Resistance Condition B, F 20	96 hrs.
D-790	Flexural Modulus, MPa (psi)	< 80,000
D-746	Brittleness Temperature	-75°C Max

D. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same raw material, including both the base resin and coextruded resin. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

E. Fitting and Conduit Bodies:
1. Directional Bore and Plow Type Installation: Electrofusion or Universal Aluminum threaded couplings. Tensile strength of coupled pipe must be greater than 2,000 lbs.
2. For all other type of installation: Coupler must provide a water tight connection. The tensile strength of coupled pipe must be greater than 1,000 lbs.
3. E-loc type couplings are not acceptable in any situations.
4. Acceptable Manufacturers: ARCON, Carlon, or approved equal.

2.10 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC) AND FITTINGS

A. Minimum Size: 1 inch.

B. Acceptable Manufacturers: Champion Fiberglass, FRE Composites, or approved equal.

C. Conduit shall be fiberglass reinforced epoxy using a filament winding process. Conduit, elbows and fittings shall be manufactured from the same resin/hardener/glass system and the same filament wound system. Resin systems shall be epoxy with no fillers. Glass used shall be E-type.

D. Fitting and Conduit Bodies:
1. Expansion fittings for RTRC shall be provided in accordance with NEC Table 355.44.
2. Joints in wet locations and underground locations shall be watertight.

2.11 PHENOLIC REINFORCED THERMOSETTING RESIN CONDUIT AND FITTINGS (PHENOLIC RTRC)

A. Minimum Size: 1 inch.

B. Acceptable Manufacturers: Champion Fiberglass Flameshield XW, FRE Composites BreathSaver, or approved equal.

C. Conduit shall be low smoke, no flame, low toxicity. Conduit shall be fiberglass reinforced phenolic using a filament winding process. Conduit, elbows, conduit bodies, and fittings shall be manufactured from the same resin/hardener/glass system and the same filament wound system. Resin systems shall be phenol with no fillers. Fiberglass used shall be E-type.

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D. Fitting and Conduit Bodies:
   1. Expansion fittings shall be provided in accordance with NEC Table 355.44.
   2. Joints in wet locations and underground locations shall be watertight.

2.12 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, minimum of 14 gauge, with 1/2-inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

C. Cast Boxes: NEMA FB1, Type FD, Aluminum, cast feralloy, or stainless steel deep type, gasketed cover, threaded hubs.

D. Outlet boxes for luminaires to be not less than 1-1/2" deep, deeper if required by the number of wires or construction. The box shall be coordinated with surface luminaires to conceal the box from view or provide a finished trim plate.

E. Switch outlet boxes for local light control switches, dimmers and occupancy sensors shall be 4 inches square by 2-1/8 inches deep, with raised cover to fit flush with finish wall line. Multiple gang switch outlets shall consist of the required number of gang boxes appropriate to the quantity of switches comprising the gang. Where walls are plastered, provide a plaster raised cover. Where switch outlet boxes occur in exposed concrete block walls, boxes shall be installed in the block cavity with a raised square edge tile cover of sufficient depth to extend out to face of block or masonry boxes.

F. Outlet boxes for telephone substations in walls and columns shall be 4 inches square and 2-1/8 inches deep with single gang raised cover to fit flush with finished wall line equipped with flush telephone plate.

G. Wall or column receptacle outlet boxes shall be 4 inches square with raised cover to fit flush with finished wall line. Boxes in concrete block walls shall be installed the same as for switch boxes in block walls.

H. Outlet boxes in boiler rooms, mechanical/electrical rooms, storage rooms and above ceilings shall be a minimum of 4 inch square 2 1/8" deep with combination knock outs of 1/2" and 3/4" concentric.

I. Outlet boxes in public spaces shall be cast weather-proof type.

2.13 [ECONN]: ELECTRICAL CONNECTION

A. Electrical connection to equipment and motors, sized per NEC. Coordinate requirements with contractor furnishing equipment or motor. Refer to specifications and general installation notes for terminations to motors.

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2.14 [JB]: PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.

B. Sheet metal boxes larger than 12 inches in any dimension that contain terminations or components: Continuous hinged enclosure with 1/4 turn latch and white back panel for mounting terminal blocks and electrical components.

C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

D. Cast Metal Boxes for Underground Installations: NEMA 250; Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron box and plain cover with neoprene gasket and stainless steel cover screws.

E. Flanged type boxes shall be used where installed flush in wall.

2.15 ROUGH-IN

A. Provide with one (1) flush mount double gang box with single gang plaster ring and appropriate cover plate,

B. Conduit stubbed to above the lay-in ceiling.

2.16 ACCESSORIES

A. Fire Rated Moldable Pads: UL #9700, moldable sheet putty at required thickness on all five sides of back boxes. Kinetics Noise Control - IsoBacker Pad, SpecSeal - SSP Putty and Pads, 3M #MPP-4S or equal.

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PART 3 - EXECUTION

3.1 INSTALLATION TRAINING

A. PVC coated rigid metal conduit, phenolic reinforced thermosetting resin conduit (phenolic RTRC), and reinforced thermosetting resin conduit (RTRC) manufacturers shall provide Contractor installation training for field cutting, joint preparation, joint assembly, field bending, and field cut sealing.

3.2 CONDUIT INSTALLATION SCHEDULE AND SIZING

A. In the event the location of conduit installation represents conflicting installation requirements as specified in the following schedule, a clarification shall be obtained from the Architect/Engineer. If this Contractor is unable to obtain a clarification as outlined above, concealed rigid galvanized steel conduit installed per these specifications and the NEC shall be required.

B. The following schedule shall be adhered to unless they constitute a violation of applicable codes or are noted otherwise on the drawings. The installation of RMC conduit will be permitted in place of all conduit specified in this schedule.

Installation Type	RMC	IMC	EMT	RTRC	PVC Coated RMC	PVC
Feeders: Switchboards, distribution panels, panelboards, motor control centers, etc.		X	X			
Branch Circuits: Lighting, receptacles, controls, etc.		X	X			
Mechanical Equipment Feeders: Pumps, chillers, air handling units, etc.		X	X			
Floor Mounted Equipment Feeders: Pumps, etc. (include no more than 6 feet of LFMC to pump)		X	X			
Controls (lighting, power, building automation, etc.)		X	X			
Finished Spaces / Concealed			X			
Wet and Damp Locations: (conduit, boxes, fittings, installed and equipped to prevent water entry)	X			?		
Corrosive Locations				X	X	
Elevated Concrete Slabs (above grade)	X					X
Interior Locations: Concealed			X			
Interior Locations: Exposed		X	X			
Exterior Locations: Exposed	*X*					
Interior Locations: Existing walls and exposed installation (finished spaces) Refer to Section 26 05 35 Surface Raceway for additional information related to Architectural Surface Raceway ASR requirements			?			

C. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to NEC. Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the NEC (to include enlarged conductors due to temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.

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D. Minimum Conduit Size (Unless Noted Otherwise):
   1. Above Grade: 3/4 inch. (The use of 1/2 inch would be allowed for installation conduit to individual light switches, individual receptacles and individual fixture whips from junction box.)
   2. Below Grade 5' or less from Building Foundation: 1 inch.
   3. Below Grade More than 5' from Building Foundation: 1 inch.
   4. Telecommunication Conduit: 1 inch.
   5. Controls Conduit: 1/2 inch.

E. Conduit Embedded in Slabs above Grade:
   1. Embedded installation NOT allowed in elevated slabs with metal composite decks nor structural pour in place slabs less than 6 inches in depth unless specifically noted or shown on drawings otherwise.
   2. Maximum size 1-1/4 inch for conduits crossing each other.

F. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

3.3 CONDUIT ARRANGEMENT

A. In general, conduit shall be installed concealed in walls, in finished spaces and where possible or practical, or as noted otherwise. Conduit shall be installed parallel or perpendicular to walls, ceilings, and exposed structural members. In unfinished spaces, mechanical and utility areas, conduit may run either concealed or exposed as conditions dictate and as practical unless noted otherwise on drawings. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.

B. Exposed conduit on exterior walls or above roof will not be allowed without prior written approval of Architect/Engineer. A drawing of the proposed routing and a photo of the location shall be submitted 14 days prior to start of conduit rough-in. Routing shall be shown on coordination drawings.

C. Conduit arrangement in elevated slabs (restricted to applications specifically noted or shown on drawings):
   1. Conduit size shall not exceed one-third of the structural slab thickness. Place conduit between the top and bottom reinforcing with a minimum of 3" concrete cover.
   2. Parallel conduits shall be spaced at least 8 inches apart. Exception: Within 18 inches of commonly served floor boxes, junction boxes, or similar floor devices. Arrange conduits parallel or perpendicular to building lines and walls.

D. Conduit shall not share the same cell as structural reinforcement in masonry walls.

E. Conduit runs shall be routed as shown on large scale drawings. Conduit routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatic, unless noted otherwise. The correct routing, when shown diagrammatically shall be chosen by the Contractor based on information in the contract documents, in accordance with manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", in accordance with recognized industry standards, and coordinated with other contractors.

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F. Contractor shall adapt his work to the job conditions and make such changes as required and permitted by the Architect/Engineer, such as moving to clear beams and joists, adjusting at columns, avoiding interference with windows, etc., to permit the proper installation of other mechanical and/or electrical equipment.

G. Contractor shall cooperate with all Contractors on the project. He shall obtain details of other Contractor's work to ensure fit and avoid conflict. Any expense due to the failure of This Contractor to do so shall be paid for in full by him. The other trades involved as directed by the Architect/Engineer shall perform the repair of work damaged as a result of neglect or error by This Contractor. The resultant costs shall be borne by This Contractor.

3.4 CONDUIT SUPPORT

A. Conduit runs installed above a suspended ceiling shall be properly supported. In no case shall conduit rest on the suspended ceiling construction, nor utilize ceiling support system for conduit support.

B. Conduit shall not be supported from ductwork, water, sprinkler piping, or other non-structural members, unless approved by the Architect/Engineer. All supports shall be from structural slabs, walls, structural members, and bar joists, and coordinated with all other applicable contractors, unless noted otherwise.

C. Conduit shall be held in place by the correct size of galvanized one-hole conduit clamps, two-hole conduit straps, patented support devices, clamp back conduit hangers, or by other means if called for on the drawings.

D. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

E. Spring-steel conduit clips specifically designed for supporting single conduits or tubing may be used in lieu of malleable-iron hangers for 1-1/2" 1" and smaller raceways serving lighting and receptacle branch circuits above accessible ceilings and for securing raceways to slotted channel and angle supports.

F. Group conduits in parallel runs where practical and use conduit racks or trapeze hangers constructed of steel channel, suspended with threaded solid rods or wall mounted from metal channels with conduit straps or clamps. Provide space in each rack or trapeze for 25% additional conduits.

G. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

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I. Supports for metallic conduit shall be no greater than 10 feet. A smaller interval may be used if necessitated by building construction, but in no event shall support spans exceed the NEC requirements. Conduit shall be securely fastened within 3 feet of each outlet box, junction box, device box, cabinet, or fitting.

J. Supports of flexible conduit shall be within 12 inches of each outlet box, junction box, device box, cabinet, or fitting and at intervals not to exceed 4.5 feet.

K. Supports for non-metallic conduit shall be at sufficiently close intervals to eliminate any sag in the conduit. The manufacturer's recommendations shall be followed, but in no event shall support spans exceed the NEC requirements.

L. Where conduit is to be installed in poured concrete floors or walls, provide concrete-tight conduit inserts securely fastened to forms to prevent conduit misplacement.

M. Finish:
1. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.
2. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

3.5 CONDUIT INSTALLATION

A. Conduit Connections:
1. Shorter than standard conduit lengths shall be cut square using industry standards. The ends of all conduits cut shall be reamed or otherwise finished to remove all rough edges.
2. Metallic conduit connections in slab on grade installation shall be sealed and one coat of rust inhibitor primer applied after the connection is made.
3. Where conduits with tapered threads cannot be coupled with standard couplings, then approved split or Erickson couplings shall be used. Running threads will not be permitted.
4. Install expansion/deflection joints where conduit crosses structure expansion/seismic joints.

B. Conduit terminations for all low voltage wiring shall have nylon bushings installed on each end of every conduit run.

C. Conduit Bends:
1. Use a hydraulic one-shot conduit bender or factory elbows for bends in conduit 2" in size or larger. All steel conduit bending shall be done cold; no heating of steel conduit shall be permitted.
2. All bends of rigid polyvinyl chloride conduit (PVC) shall be made with the manufacturer's approved bending equipment. The use of spot heating devices will not be permitted (i.e. blow torches).
3. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360°), including those bends located immediately at the outlet or body.

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4. Telecommunications conduits shall have no more than two (2) 90-degree bends between pull points and contain no continuous sections longer than 100 feet. Insert pull points or pull boxes for conduits exceeding 100 feet in length.
    a. A third bend is acceptable if:
        1) The total run shall not be longer than (33) feet.
        2) The conduit size is increased to the next trade size.
5. Telecommunications pull boxes shall not be used in lieu of a bend. Align conduits that enter the pull box from opposite ends with each other. Pull box size shall be twelve (12) times the diameter of the largest conduit. Slip sleeves or gutters can be used in place of a pull box.
6. Telecommunications conduit bend radius shall be six (6) times the diameter for conduits under 2" and ten (10) times the diameter for conduits over 2".
7. Rigid polyvinyl chloride conduit (PVC) runs longer than 100 feet or runs which have more than two 90° equivalent bends (regardless of length) shall use rigid metal or RTRC factory elbows for bends.
8. Use conduit bodies to make sharp changes in direction (i.e. around beams).

D. Conduit Placement:
1. Conduit shall be mechanically continuous from source of current to all outlets. Conduit shall be electrically continuous from source of current to all outlets, unless a properly sized grounding conductor is routed within the conduit. All metallic conduits shall be bonded per the NEC.
2. Route exposed conduit and conduit above suspended ceilings (accessible or not) parallel/perpendicular to the building structural lines, and as close to building structure as possible. Wherever possible, route horizontal conduit runs above water and steam piping.
3. Route conduit through roof openings provided for piping and ductwork where possible. If not provided or routing through provided openings is not possible, route through roof jack with pitch pocket. Coordinate roof penetrations with other trades.
4. Conduits, raceway, and boxes shall not be installed in concealed locations in metal deck roofing or less than 1.5" below bottom of roof decking.
5. Avoid moisture traps where possible. Where unavoidable, provide a junction box with drain fitting at conduit low point.
6. All conduits through walls shall be grouted or sealed into openings. Where conduit penetrates firewalls and floors, seal with a UL listed sealant. Seal penetrations with intumescent caulk, putty, or sheet installed per manufacturer's recommendations. All materials used to seal penetrations of firewalls and floors shall be tested and certified as a system per ASTM E814 Standard for fire tests or through-penetration fire stops as manufactured by 3M or approved equal; refer to Section 26 05 03 for through penetration firestopping requirements.
7. Contractor shall be responsible for all openings required in masonry or exterior walls under this division. a qualified mason at the expense of this contractor shall repair all openings to match existing conditions.
8. Seal interior of conduit at exterior entries, air handling units, coolers/freezers, etc., and where the temperature differential can potentially be greater than 20°F, to prevent moisture penetration. Seal shall be placed where conduit enters warm space. Conduit seal fitting shall be a drain/seal, with sealing compound, equal to O-Z/Gedney type EYD.
9. Horizontal conduit routing through slabs above grade

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a. Conduits, if run in concrete structure, shall be in middle one-third of slab thickness, and leave at least 3" min. concrete cover. Conduits shall run parallel to each other and spaced at least 8" apart centerline to centerline. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement. Maximum conduit outside diameter 1".
b. No conduits are allowed in concrete on metal deck unless expressly approved in writing by the Structural Engineer.
c. No conduits are allowed to be routed horizontally through slabs above grade.

10. Do not route conduits across each other in slabs on grade.
11. Rigid polyvinyl chloride conduit (PVC) shall be installed when material surface temperatures and ambient temperature are greater than 40°F.
12. Where rigid polyvinyl chloride conduit (PVC) is used below grade, in a slab, below a slab, etc., a transition to rigid galvanized steel or PVC-coated steel conduit shall be installed before conduit exits earth. The metallic conduit shall extend a minimum of 6" into the surface concealing the non-metallic conduit.
13. Contractor shall provide suitable mechanical protection around all conduits stubbed out from floors, walls or ceilings during construction to prevent bending or damaging of stubs due to carelessness with construction equipment.
14. Contractor shall provide a polypropylene pull cord with 2000 lbs. tensile strength in each empty conduit (indoor and outdoor), except in sleeves and nipples.
15. Telecommunications conduits that protrude through the structural floor shall be installed 1 to 3" above finished floor (AFF).
16. Telecommunications conduits that enter into Telecommunications rooms below the finished ceiling shall terminate a minimum of 4" below ceiling and as close to the wall as possible.
17. Telecommunications conduits that are below grade and enter into a building shall terminate a minimum of 4" above finished floor (AFF) and as close to the wall as possible.

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3.6 CONDUIT TERMINATIONS

A. Where conduit bonding is indicated or required in the contract documents, the bushings shall be a grounding type sized for the conduit and ground bonding conductor as manufactured by O-Z/Gedney, Appleton, Thomas & Betts, Burndy, Regal, Orbit Industries or approved equal.

B. Conduits with termination fittings shall be threaded for one (1) lock nut on the outside and one (1) lock nut and bushing on the inside of each box.

C. Where conduits terminate in boxes with knockouts, they shall be secured to the boxes with lock nuts and provided with approved screw type tinned iron bushings or fittings with plastic inserts.

D. Where conduits terminate in boxes, fittings, or bodies with threaded openings, they shall be tightly screwed against the shoulder portion of the threaded openings.

E. Conduit terminations to all motors shall be made with flexible metallic conduit (FMC), unless noted otherwise. Final connections to roof exhaust fans, or other exterior motors and motors in damp or wet locations shall be made with liquidtight flexible metallic conduit (LFMC). Motors in hazardous areas, as defined in the NEC, shall be connected using flexible conduit rated for the environment. Flexible conduit shall not exceed 6' in length. Route equipment ground conductors from circuit ground to motor ground terminal through flexible conduit.

F. Rigid polyvinyl chloride conduit (PVC) shall be terminated using fittings and bodies produced by the manufacturer of the conduit, unless noted otherwise. Prepare conduit as per manufacturer's recommendations before joining. All joints shall be solvent welded by applying full even coat of plastic cement to the entire areas that will be joined. Turn the conduit at least a quarter to one half turn in the fitting and let the joint cure for 1-hour minimum or as per the manufacturer's recommendations.

G. All conduit ends shall be sealed with plastic immediately after installation to prevent the entrance of any foreign matter during construction. The seals shall be removed and the conduits blown clear of all foreign matter prior to any wires or pull cords being installed.

3.7 RIGID POLYVINYL CHLORIDE CONDUIT (PVC) OVERHEAD CONDUIT INSTALLATION

A. Conduit shall be installed away from high temperature piping and equipment.

B. Conduit shall be installed to prevent exposure to ultraviolet radiation.

C. Proper allowances shall be made for expansion and/or contraction of the conduit during installation.

D. Expansion fittings shall be installed in any 100' continuous run of conduit and at each 100' thereafter.

E. Supports shall be made from non-corroding materials and spacing shall not be greater than the listing in the NEC, but also shall not exceed the manufacturer's recommendations depending on the expected surface temperature.

3.8 UNDERGROUND CONDUIT INSTALLATION

A. Conduit Bends (Lateral):
   1. Conduits shall have long sweep radius elbows instead of standard elbows wherever special bends are indicated and noted on the drawings, or as required by the manufacturer of the equipment or system being served.
   2. Telecommunications conduit bend radius shall be six times the diameter for conduits under 2" and ten times the diameter for conduits over 2". Where long cable runs are involved, sidewall pressures may require larger radius bends. Coordinate with Architect/Engineer prior to conduit installation to determine bend radius.

B. Conduit Elbows (vertical):

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1. Minimum metal or RTRC elbow radiuses shall be 30 inches for primary conduits (>600V) and 18 inches for secondary conduits (<600V). Increase radius, as required, based on pulling tension calculation requirements.

C. Conduit Placement:
1. Conduit runs shall be pitched a minimum of 4" per 100 feet to drain toward the terminations. If required pitch is not achievable due to site conditions, conduits shall be permitted to be sealed in lieu of meeting the required pitch. Sealing shall be done using components and materials produced for this purpose and listed accordingly. Duct runs shall be installed deeper than the minimum wherever required to avoid any conflicts with existing or new piping, tunnels, etc.
2. For parallel runs, for parallel runs, use suitable separators and chairs for feeders in duct banks. Band conduit together with suitable banding devices. Securely anchor conduit to prevent movement during concrete placement or backfilling.
3. Where concrete is required, the materials for concreting shall be thoroughly mixed to a minimum f'c = 2500 and immediately placed in the trench around the conduits. No concrete that has been allowed to partially set shall be used.
4. Before the Contractor pulls any cables into the conduit he shall have a mandrel 1/4" smaller than the conduit inside diameter pulled through each conduit and if any concrete or obstructions are found, the Contractor shall remove them and clear the conduit. Spare conduit shall also be cleared of all obstructions.
5. Conduit terminations in manholes, masonry pull boxes, or masonry walls shall be with malleable iron end bell fittings.
6. All spare conduits not terminated in a covered enclosure shall have its terminations plugged as described above.
7. Ductbanks and conduit shall be installed a minimum of 18" below finished grade per *NEC*, unless otherwise noted on the drawings or elsewhere in these specifications.
8. All non-metallic conduit installed underground outside of a slab shall be rigid.

D. Horizontal Directional Drilling:
1. Entire drill path shall be accurately surveyed, with entry and exit stakes placed and coordinated with other contractors. If using a magnetic guidance system, entire drill path shall be surveyed for any surface geo-magnetic variations or anomalies.
2. Any utility locates within 20 feet of the bore path shall have the exact location physically verified by hand digging or vacuum excavation. Restore inspection holes to original condition after verification.

E. Raceway Seal:
1. Where a raceway enters a building or structure, it shall be sealed with a sealing bushing or duct seal to prevent the entry of liquids or gases. Seal must be compatible with conductors and raceway system. Spare or unused raceway shall also be sealed.
2. All telecommunications conduits and innerducts, including those containing cables, shall be plugged at the building and vault with "Jack Moon" or equivalent duct seal, capable of withstanding a 10-foot head of water (5 PSI).

3.9 BOX INSTALLATION SCHEDULE

A. Galvanized steel boxes may be used in:
1. Concealed interior locations above ceilings and in hollow studded partitions.

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2. Exposed interior locations in mechanical rooms and in rooms without ceilings; higher than 8' above the highest platform level.
3. Direct contact with concrete except slab on grade.
4. Recessed in stud wall of kitchens and laundries.

B. Cast boxes shall be used in:
1. Exterior locations.
2. Hazardous locations.
3. Exposed interior locations within 8' of the highest platform level.
4. Direct contact with earth.
5. Direct contact with concrete in slab on grade.
6. Wet locations.
7. Kitchens and laundries when exposed on wall surface.

3.10 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on the Contract Drawings are approximate, unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. Locate and install boxes to allow access. Avoid interferences with ductwork, piping, structure, equipment, etc. Where installation is inaccessible, provide access doors. Coordinate locations and sizes of required access doors with the Architect/Engineer and General Contractor.

D. Locate and install to maintain headroom and to present a neat appearance.

E. Coordinate locations with Heating Contractor to avoid baseboard radiation cabinets.

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3.11 OUTLET BOX INSTALLATION

A. Do not install boxes back-to-back in walls.
1. Provide a minimum horizontal separation of 6 inches between boxes installed on opposite sides of non-rated stud walls.
2. Provide a minimum horizontal separation of 24 inches between boxes installed on opposite sides of fire-rated walls. When the minimum separation cannot be maintained, the box is greater than 16 square inches or the total box area (all trades) per 100 square feet is greater than or equal to 100 square inches, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.

B. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound Transmission Class (STC) rating.

C. The Contractor shall anchor switch and outlet box to wall construction so that it is flush with the finished masonry, paneling, drywall, plaster, etc. The Contractor shall check the boxes as the finish wall surface is being installed to assure that the box is flush. Provide plaster rings as necessary.

D. Mount at heights shown or noted on the drawings or as generally accepted if not specifically noted.

E. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.

F. Provide knockout closures for unused openings.

G. Support boxes independently of conduit.

H. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

I. Install boxes in walls without damaging wall insulation.

J. Coordinate mounting heights and locations of outlets mounted above counters, benches, backsplashes, and below baseboard radiation.

K. Position outlets to locate luminaires as shown on reflected ceiling drawings.

L. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.

M. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioned to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

N. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

O. Provide cast outlet boxes in exterior locations and wet locations, and where exposed rigid or intermediate conduit is used.

3.12 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

C. Do not install boxes back-to-back in walls.
   1. Provide a minimum horizontal separation of 6 inches between boxes installed on opposite sides of non-rated stud walls.

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2. Provide a minimum horizontal separation of 24 inches between boxes installed on opposite sides of fire-rated walls. When the minimum separation cannot be maintained, the box is greater than 16 square inches or the total box area (all trades) per 100 square feet is greater than or equal to 100 square inches, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.

D. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound Transmission Class (STC) rating.

3.13 EXPOSED BOX INSTALLATION

A. Boxes shall be secured to the building structure with proper size screws, bolts, hanger rods, or structural steel elements.

B. On brick, block and concrete walls or ceilings, exposed boxes shall be supported with no less than two (2) Ackerman-Johnson, Paine, Phillips, or approved equal screw anchors or expansion shields and round head machine screws. Cast boxes shall not be drilled.

C. On steel structures, exposed boxes shall be supported to the steel member by drilling and tapping the member and fastening the boxes by means of round head machine screws.

D. Boxes may be supported on steel members by APPROVED beam clamps if conduit is supported by beam clamps.

E. Boxes shall be fastened to wood structures by means of a minimum of two (2) wood screws adequately large and long to properly support. Quantity depends on size of box.

F. Wood, plastic, or fiber plugs shall not be used for fastenings.

G. Explosive devices shall not be used unless specifically allowed.

END OF SECTION

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SECTION 26 05 35 - SURFACE RACEWAYS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Multi-outlet assemblies

B. Architectural surface raceways

C. Surface metal raceways

D. Surface non-metallic raceways

E. Auxiliary gutters (metal wireways)

F. Auxiliary gutters (non-metallic wireways)

1.2 REFERENCES

A. FS W-C-582 - Conduit, Raceway, Metal, and Fitting; Surface

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 26 05 00.

B. Include product data for surface metal raceways, multi-outlet assemblies, surface non-metallic raceways, auxiliary gutters, and accessories.

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PART 2 - PRODUCTS

2.1 ARCHITECTURAL SURFACE RACEWAY

A. Surface Metal Raceway: Steel channel with fitted cover, 3/4"x1/2".

B. Finish: White.

C. Fittings: Couplings, elbows, and connectors designed for use with the raceway system.

D. Boxes and Extension Rings: Designed for use with the raceway system.

E. Approved Manufacturers: Wiremold V500/V700 series, Mono-Systems SMS500/SMS700 series, Hubbell HBL500/HBL700 series.

2.2 SURFACE METAL RACEWAY

A. Surface Metal Raceway: FS W-C-582; sheet metal channel with fitted cover, suitable for use as a continuous surface metal raceway.

B. Finish: Gray.

C. Fittings: Couplings, elbows, and connectors designed for use with raceway system.

D. Boxes and Extension Rings: Designed for use with raceway systems.

E. Coverplates shall be same material and finish as raceway.

F. Normal power receptacles shall be same color as raceway. Coordinate color with Architect.

G. Receptacles and outlets shown on raceway on drawings shall be mounted with overlapping faceplates in the raceway and shall not be mounted in boxes unless specifically noted otherwise.

H. [WW-#]: Surface metal raceway, metallic cover, minimum 2" opening, minimum 3 square inch capacity.
   1. Approved Manufacturers: Wiremold G3000, Mono-Systems SMS3200, Hubbell HBL3000 Series.

I. [WW-#]: Surface metal raceway, metallic cover, minimum 4" opening, power / communication divider, minimum 7.5 square inch capacity.
   1. Approved Manufacturers: Wiremold G4000/G4048, Mono-Systems SMS4200, Hubbell HBL4750 Series.

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2.3 SURFACE NON-METALLIC RACEWAY

A. Surface Non-Metallic Raceway: Polyvinyl chloride channel with fitted cover; UL listed for power conductors.

B. Length: As shown on the drawings.

C. Finish: Ivory.

D. Fittings and Accessories: Couplings, elbows, outlet and device boxes, and connectors designed for use with the raceway system.

E. Coverplates shall be same material and finish as raceway.

F. Normal power receptacles shall be same color as raceway. Coordinate color with Architect.

G. Acceptable Manufacturers: Wiremold PN20A Series, Hubbell PW2 Series.

2.4 [WW-#]: METAL WIREWAYS AND TROUGHS

A. General purpose Oil-tight and dust-tight Rain-tight type wireway, with knockouts without knockouts.

B. Size: 4" x 4" with lengths as noted on the drawings. Actual lengths required shall be determined from actual site measurements and not from scaling drawings.

C. Cover: Hinged Screw applied Flanged and gasketed cover.

D. Connector: Slip-in construction; Flanged; hinged cover. screw applied cover.

E. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold down straps, end caps, and other fittings to match and mate with wireways as required for a continuous enclosed complete system.

F. Finish: Rust inhibiting primer coat. Coordinate paint color with Architect.

G. Acceptable Manufacturers: Hoffman F30G, Square D 5100, Hubbell-Wiegmann.

2.5 [WW-#]: NON-METALLIC WIREWAYS AND TROUGHS

A. Fiberglass polyester, extruded and fabricated to size and shape indicated, with without knockouts. Gasketed cover with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Flanged connections with stainless-steel screws and oil-resistant gaskets.

B. Size: 4" x 4" with lengths as noted on the drawings. Actual lengths required shall be determined from actual site measurements and not from scaling the drawings.

C. PVC plastic, extruded and fabricated to size and shape indicated, with snap on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold down straps, end caps, and other fittings to match and mate with wireways as required for a complete system.

E. Finish: Standard manufacturer's gray.

F. Acceptable Manufacturers: Hoffman F25 Series or pre-approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION - SURFACE METAL RACEWAY AND MULTI-OUTLET ASSEMBLY

A. Use flat-head screws to fasten channel to surfaces. Mount plumb and level.

B. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

C. Maintain grounding continuity between raceway components to provide a continuous grounding path.

D. Fastener: Use clips and straps suitable for the purpose.

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E. Field cuts to be clean and straight and use the proper tools as recommended by the system manufacturer to prohibit damage to factory finish or raceway. Joints to be matched so there are no gaps or spaces in the cover. Furnish and install manufacturer's raceway accessories as needed.

F. Provide conduits to technology raceway per drawings or provide a minimum of one (1) 1-1/4" conduit per six feet of assembly (minimum 2) to above ceiling for technology requirements if assembly has technology raceway (Contractor shall provide quantities of conduits that provide maximum capacity to assembly). Provide conduits equally spaced within entire length of assembly.

G. Provide one (1) 3/4" empty conduit per six feet of assembly (minimum 1) to above ceiling for future power needs. Provide conduits equally spaced within entire length of assembly.

3.2 INSTALLATION - ARCHITECTURAL SURFACE RACEWAY

A. Use flat-head screws to fasten channel to surfaces. Mount plumb and level.

B. Maintain grounding continuity between raceway components to provide a continuous grounding path.

C. Fastener: Use clips and straps suitable for the purpose.

D. Field cuts to be clean and straight and use the proper tools as recommended by the system manufacturer to prohibit damage to factory finish or raceway. Joints to be matched so there are no gaps or spaces in the cover. Furnish and install manufacturer's raceway accessories as needed.

E. Routing and Planning: Coordinate routings with existing vertical/horizontal building lines and features (doorways, wall trim, at wall/ceiling interface, etc.). Match the square / parallel lines of other existing features. Do not route raceway across large open spaces of the wall unless required by the application.

3.3 INSTALLATION - SURFACE NON-METALLIC RACEWAY

A. Use flat-head screws to fasten channel to surfaces. Mount plumb and level.

B. Do not locate raceway near heating elements, open flames or surfaces with a probable temperature greater than 150°F.

C. Do not locate raceway where there is a probability of contact with oils, chemicals or moisture.

D. Contractor shall install a bonded ground conductor the entire length of the raceway.

E. Field cuts to be clean and straight and use the proper tools as recommended by the system manufacturer to prohibit damage to factory finish or raceway. Joints to be matched so there are no gaps or spaces in the cover. Furnish and install manufacturer's raceway accessories as needed.

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F. Provide conduits to technology raceway per drawings or provide a minimum of one (1) 1-1/4" conduit per six feet of assembly (minimum 2) to above ceiling for technology requirements if assembly has technology raceway (Contractor shall provide quantities of conduits that provide maximum capacity to assembly). Provide conduits equally spaced within entire length of assembly.

G. Provide one (1) 3/4" empty conduit per six feet of assembly (minimum 1) to above ceiling for future power needs. Provide conduits equally spaced within entire length of assembly.

3.4 INSTALLATION - WIREWAY AND TROUGH

A. Bolt auxiliary gutter to steel channels fastened to the wall or in self-supporting structure. Install level.

B. Gasket each joint in oil-tight gutter.

C. Mount rain-tight gutter in horizontal position only.

D. Coordinate installation with other trades on project to avoid interferences. Relocation of equipment shall be at Contractor's expense at the direction of the Architect/Engineer to resolve interference problems.

END OF SECTION

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SECTION 26 05 42 - EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment specified under other Sections or furnished by the Owner.

1.2 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices

B. NEMA WD 6 - Wiring Device Configurations

C. ANSI/NFPA 70 - National Electrical Code

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

A. Straight-blade Attachment Plug: NEMA WD 1.

B. Locking-blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermoset insulated Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit over-current protection.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

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3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make cord connections to equipment using flexible conduit. Use liquid tight flexible conduit in damp or wet locations.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

G. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION

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SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Adhesive labels, markings, nameplates, and signs

B. Wire and cable markers

C. Raceway, box, and wire identification

D. Equipment short circuit current rating (SCCR) labeling

E. Electrical equipment labeling

F. Electrical working clearance identification

G. Pole identification

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1.2 REFERENCES

A. ANSI C2 - National Electrical Safety Code

B. NFPA 70 - National Electrical Code (NEC)

C. ANSI A13.1 - Standard for Pipe Identification

D. ANSI Z535.4 - Standard for Product Safety Signs and Labels

1.3 SUBMITTALS

A. General: Submit the following in accordance with Division 1 Specification Sections and under provisions of Section 26 05 00.
   1. Product Data for each type of product specified.
   2. Schedule of nomenclature to be used for identification signs and labels for each piece of equipment including, but not limited to, the following equipment types as specified in Division 26.
   3. Samples of each color, lettering style and other graphic representation required for identification materials including samples of labels and signs.
   4. Identification required in this section shall apply to equipment furnished in Division 26 and any other applicable Divisions including Division 21/22/23.

PART 2 - PRODUCTS

2.1 ADHESIVE MARKINGS AND FIELD LABELS

A. Adhesive Marking Labels for Raceway: Pre-printed, flexible, self-adhesive vinyl labels with legend indicating voltage and service (Emergency, Lighting, Power, HVAC, Communications, Control, Fire).
   1. Label Size as follows:
      a. Raceways: Kroy or Brother labels 1-inch high by 12-inches long (minimum).
   2. Color: As specified for various systems.

B. Colored Adhesive Marking Tape for banding Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.

C. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Cable Identification: flexible acrylic bands sized to suit the cable diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the cable.

D. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.

E. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50°F to 350°F (10°C to 176°C). Provide ties in specified colors when used for color coding.

F. Underground Plastic Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inches wide by 4 mil thick, printed legend indicating type of underground line, manufactured for direct burial service. Tape shall contain a continuous metallic wire to allow location with a metal detector.

G. Aluminum, Wraparound Marker Bands: 1-inch width, 0.014 (5mm) inch thick aluminum bands with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

H. Brass or aluminum Tags: 2" (50mm) by 2" (50mm) by .05-inch metal tags with stamped legend, punched for fastener.

I. Indoor/Outdoor Number and Letters: Outdoor grade vinyl label with acrylic adhesive designed for permanent application in severe indoor and outdoor environments.

2.2 NAMEPLATES AND SIGNS

A. Engraved, Plastic-Laminated Labels, Signs and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Labels shall be punched for mechanical fasteners.

B. Text Sizes:
   1. The following information shall be used for text heights, fonts, and size, unless otherwise noted.

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a. Text Height: 1/4 inch minimum

C. Baked-Enamel Signs for interior Use: Preprinted aluminum signs, punched, or drilled for fasteners, with colors, legend, and size required for application. Mounting ¼" grommets in corners.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396 inch galvanized-steel backing: and with colors, legend, and size required for application. Mounting 1/4" grommets in corners.

E. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

F. Fasteners for Plastic-Laminated Signs; Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

2.3 PRODUCT COLORS

A. Adhesive Markings and Field Labels:
1. All Labels: Black letters on white or clear face
2. Normal Power and General Labels: Black letters on white face or black letters on clear face
3. Control Labels: Black letters on white face or black letters on clear face
4. Medium Voltage (greater than 100 volts): Black letters on white face or black letters on clear face
5. Emergency: Red letters on white face or red letters on clear face

B. Nameplates and Signs:
1. NORMAL POWER: Black letters on white face
2. Control Labels: Black letters on white face
3. EMERGENCY: White letters on red face
4. GROUNDING: White letters on green face.
5. CAUTION or UPS: Black letters on yellow face

C. Raceways and Conduit:
1. Provide color coded conduit as indicated below. Conduit shall be colored by the manufacturer:
   a. Normal Power and General Distribution: Silver
   b. Emergency Power Distribution System:
      1) Life Safety and Critical Branch: Yellow
      2) Equipment Branch: Orange
   c. Low Voltage and Telephone: Purple

D. Box Covers:
1. Box covers shall be painted to correspond with system type as follows:
   a. Normal Power and General: Silver
   b. Emergency Power and Distribution:
      1) Life Safety and Critical Branch: Yellow
      2) Equipment Branch: Orange
   c. Temperature Controls: Refer to mechanical cover sheet for color
   d. Ground: Green

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e. Low Voltage and Telephone: Purple

2. Box cover colors shall match conduit colors listed above.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

B. Install identification devices in accordance with manufacturer's written instruction and requirements of NEC.

C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work. All mounting surfaces shall be cleaned and degreased prior to identification installation.

D. Circuit Identification: Tag or label conductors as follows:
1. Multiple Power or Lighting Circuits in Same Enclosure: Where multiple branch circuits are terminated or spliced in a box or enclosure, label each conductor with source and circuit number.
2. Multiple Control Wiring and Communication/Signal Circuits in Same Enclosure: For control and communications/signal wiring, use wire/cable marking tape at terminations in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tape.
3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

E. Apply warning, caution and instruction signs as follows:
1. Install warning, caution or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operating Signs: Install, where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect, engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

F. Apply circuit/control/item designation labels of engraved plastic laminate for pushbuttons, pilot lights, alarm/signal components, and similar items, except where labeling is specified elsewhere.

G. Install labels parallel to equipment lines at locations as required and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
[* * * * * OR * * * * *]

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H. Install ARC FLASH WARNING signs on all switchboards, panelboards, industrial control panels, and motor control centers. Sign at a minimum shall contain:

I. Circuits with more than 600V: Identify raceway and cable with "DANGER-HIGH VOLTAGE" in black letters 2 (50mm) inches high on orange background at 10'-0 foot intervals.
1. Entire floor area directly above conduits running beneath and within 12 inches of a basement or ground floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to conduits concealed within wall.
3. All accessible surfaces of concrete envelope around conduits in vertical shafts, exposed in building, or concealed above suspended ceilings.

J. Underground Electrical Lines: For exterior underground power, control, signal, and communication lines, install continuous *detectable underground tape* located directly above line at 6 (150mm) to 8 (205mm) inches below grade. A single *underground tape* is permitted when the width of the common trench does not exceed 16 inches; provide a second *underground tape* to mark each edge of the trench when 16 inches of width is exceeded. Limit line markers to direct-buried cables. Install *underground tape* for underground wiring, both direct-buried cables and cables in raceway.

3.2 LIGHTING CONTROL AND RECEPTACLE COVER PLATES

A. Product:
1. Adhesive labels and field markings

B. Identification material to be a clear, 3/8-inch Kroy tape or Brother self-laminating vinyl label with black letters. Embossed Dymo-Tape labels are not acceptable. Permanently affix identification label to cover plates, centered above the receptacle openings.
[* * * * * OR * * * * *]

C. Provide identification on all switch and receptacle cover plates. Identification shall indicate source and circuit number serving the device (e.g. "C1A #24"). Identification for switch cover plates shall be installed on the inside cover.

3.3 CONDUIT AND EXPOSED CABLE LABELING

A. Product:
1. Adhesive labels and field markings

B. Conduit Identification: Pre-printed, flexible, self-adhesive vinyl labels with legend at 10 foot intervals to identify all conduits run exposed or located above accessible ceilings. Conduits located above non-accessible ceiling or in floors and walls shall be labeled within 3 feet of becoming accessible. Labels for multiple conduits shall be aligned. Refer to color requirements in Part 2 when applicable in addition to the following:
1. Medium Voltage (greater than 1,000 volt): Indicate feeder identification and voltage.
2. 1000 Volt or less Normal/Emergency Power: Indicate feeder identification and voltage.
3. Grounding: Indicate "GROUND" and equipment and designation.
4. Security System: Indicate "Security".
5. Telephone System: Indicate "Telephone".

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C. Blank conduit ends or outlet boxes for future extension of system shall have permanent identification marker indicating purpose of conduit or box and where the raceway originated.

3.4 BOX LABELING

A. Products:
   1. Adhesive labels and field markings

B. Identify Junction, Pull and Connection Boxes: Labeling shall be 3/8-inch Kroy tape or Brother self-laminating vinyl label, letters/numbers color coded same as conduits. In rooms that are painted out, provide labeling on inside of cover.

C. All junction, pull, and connection boxes shall be identified as follows:
   1. For power and lighting circuits, indicate system voltage and identity of contained circuits ("120V, 1LA1-3,5,7").

3.5 CONDUCTOR COLOR CODING

A. Products:

B. Color coding shall be applied at all panels, switches, junction boxes, pull boxes, vaults, manholes etc., where the wires and cables are visible and terminations are made. The same color coding shall be used throughout the entire electrical system, therefore maintaining proper phasing throughout the entire project.

C. Colored cable ties shall be applied in groups of three ties of specified color to each conductor at each terminal or splice point starting 3 inches from the termination and spaced at 3- inches centers. Tighten to a snug fit, and cut off excess length.

D. Where more than one nominal voltage system exists in a building or facility, each ungrounded conductor of a multi-wire branch circuit, where accessible, shall be identified by phase and system.

E. Conductors shall be color coded as follows:
   1. 208Y/120 Volt, 4-Wire:
      a. A-Phase - Black
      b. B-Phase - Red
      c. C-Phase - Blue
      d. Neutral - White
      e. Ground Bond - Green
   2. 480Y/277 Volt, 4-Wire:
      a. A-Phase - Brown
      b. B-Phase - Orange
      c. C-Phase - Yellow
      d. Neutral - Gray
      e. Ground Bond - Green
   3. 120 Volt, 2-Wire Isolated (Ungrounded) Power System:
      a. A-Phase - Orange with distinctive colored stripe other than white, green or gray along the entire length of the conductor

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b. B-Phase - Brown with distinctive colored stripe other than white, green or gray along the entire length of the conductor
c. Ground Reference - Green

4. Grounding Conductors:
   a. Equipment grounding conductors, main/system/supply-side bonding jumpers: Green.
   b. Isolated Equipment Ground Conductors: Green with colored distinctive yellow stripe along the entire length of the conductor. Isolated ground for feeders, use colored tape with alternating bands of green and yellow to provide a minimum of three bands of green and two bands of yellow.
5. Cabling for Remote Control, Signal, and Power Limited Circuits:

a.
   a. Low Voltage Switching: Per manufacturer recommendations and code requirements.
   b. Building Automation Systems and Control: Refer to the Temperature Control Contactor notes located on the mechanical cover sheet.
   c. Electronic Control: Per manufacturer recommendations and code requirements.

3.6 CONTROL EQUIPMENT IDENTIFICATION

A. Products:
   1. Nameplates and signs

B. Provide identification on the front of all control equipment such as combination starters, starters, VFDs, contactors, motor control centers, etc.

C. Identification shall be provided for all connections to equipment furnished by this Contractor, other contractors, or the Owner.

D. Labeling shall include:
   1. Equipment type and contract documents designation of equipment being served.
   2. Location of equipment being served if it is not located within sight.
   3. Voltage and phase of circuit(s).
   4. Panel and circuit number(s) serving the equipment.
   5. Available fault current; refer to one-line diagram or panel schedule of panel serving equipment.
   6. Date of fault current study, refer to one-line diagram

EXHAUST FAN EF-1 ("LOCATED ON ROOF") 480V: 3-PHASE FED FROM "1HA1-1" AUTO CONTROL BY FCMS 22,000 AMPS AVAILABLE FAULT CURRENT DATE OF STUDY: 1 JAN 2017

3.7 EQUIPMENT CONNECTION IDENTIFICATION

A. Products:
   1. Nameplates and signs

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B. Provide identification for hard wired electrical connections to equipment such as disconnects switches, starters, etc. Plug and cord type connections do not require this specific label.

C. Identification shall be provided for all connections to equipment furnished by this Contractor, other contractors, or the Owner. The following list of equipment is specifically being listed to receive an equipment connection label; this list does not limit the equipment that shall receive a label:

D. Labeling shall include:
1. Equipment type and contract documents designation of equipment being served
2. Location of equipment being served if it is not located within sight.
3. Voltage and rating of the equipment.
4. Panel and circuit numbers(s) serving the equipment
5. Available fault current; refer to one-line diagram or panel schedule of panel serving equipment.
6. Date of fault current study; refer to one-line diagram

UNIT HEATER UH-1 ("LOCATED IN STORAGE ROOM 200") 480V: 3-PHASE FED FROM "1HA1-1" AUTO CONTROL BY FCMS 22,000 AMPS AVAILABLE FAULT CURRENT DATE OF STUDY: 1 JAN 2017

3.8 POWER DISTRIBUTION EQUIPMENT IDENTIFICATION

A. Products:
1. Nameplates and signs

B. Provide identification on the front of all power distribution equipment such as panelboards, switchboards, switchgear, motor control centers, generators, UPS, storage battery disconnects, transfer switches, etc. Labels shall be visible on the exterior of the gear, correspond to the one-line diagram nomenclature, and identify each cubicle of multi-section gear.
1. Interior Equipment: The identification material shall be engraved plastic-laminated labels.
2. Exterior Equipment: The identification material shall be engraved vinyl labels.
3. Labeling shall include:
   a. Equipment type and contract documents designation of equipment.
   b. Voltage of the equipment.
   c. Name of the upstream equipment and location of the upstream equipment if it is not located within sight.

DISTRIBUTION PANEL DP-H1 480Y/277V FED FROM SWITCHBOARD "SB-1" (LOCATED IN MAIN ELEC ROOM)

4. Provide the following on a separate label, installed below the label above:
   a. Available fault current; refer to one-line diagram or panel schedules
   b. Date of fault current study; refer to one-line diagram

22,000 AMPS AVAILABLE FAULT CURRENT DATE OF STUDY: 1 JAN 2017

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C. Arc Energy Reduction Label:
   1. Provide a separate engraved plastic laminate label centered at the top of each vertical section of the electrical gear indicating the following when applicable.
      a. Label: "This equipment is designed with a system listed below".
      b. Applicable Systems:
         1) Zone-selective interlocking system for selective coordination and arc energy reduction
         2) Differential relaying system for selective coordination and arc energy reduction
         3) Arc energy reducing maintenance switch
         4) Energy reducing active arc flash mitigation system

D. Nominal System Voltage Label:
   1. Where more than one nominal voltage system exists in a building or facility, the identification of color coding used in the panelboard or equipment shall be permanently posted on the interior of the door or cover.

E. Distribution panelboards and switchboards shall have each overcurrent protection device identified with name and location of the load being served ("AHU-1 LOCATED IN PENTHOUSE 1").

F. Branch panelboards shall be provided with typed panel schedules upon completion of the project. Existing panelboards shall have their existing panel schedules typed, with all circuit changes, additions or deletions also typed on the panel schedules. A copy of all panel schedules for the project shall be turned over as part of the O&M Manuals. Refer to Section 26 05 00 for other requirements.

3.9 TRANSFORMER EQUIPMENT IDENTIFICATION

A. Products:
   1. Nameplates and signs

B. Provide identification on the front of all transformers. The identification nameplate shall be an engraved plastic-laminated label.

C. Labeling shall include:
   1. Equipment type and contract documents designation of equipment
   2. Name of the upstream equipment.
   3. Voltage and rating of the equipment.
   4. Location of the upstream equipment if it is not located within sight.

TRANSFORMER TR-15 480V: 208Y/120V 15KVA FED FROM SWITCHBOARD "SB-1" (LOCATED IN ELEC 123)

3.10 ELECTRICAL WORKING CLEARANCE IDENTIFICATION

A. Products:
   1. Safety Yellow paint and custom stencils

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B. Provide custom identification of electrical equipment working clearances in mechanical, electrical, storage, janitorial, and similar non-public areas.

C. Identification shall include a painted rectangular box (on the finished floor) in front of the electrical equipment to define the code-required working clearance. Provide additional diagonal stripping inside the rectangle box. All painted stripping shall be safety yellow paint with 3 inch wide stripes.
   1. Width of area: Width of equipment or as required by code
   2. Depth of area: Depth as required by code

3.11 POLE IDENTIFICATION

A. Product:
   1. Nameplates and signs

B. Lighting poles and overhead distribution poles shall be individually identified with a unique number, for maintenance purposes. Apply the vinyl label number above the hand hole cover or 24" (610mm) above grade. Bollards may be identified with a number applied inside the luminaire that is visible from the exterior.

END OF SECTION

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SECTION 26 09 33 - LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Line and low voltage standalone lighting controls

B. Emergency transfer devices

C. Central lighting controls

1.2 RELATED WORK

A. Section 01 91 00 - Commissioning

B. Section 23 09 00 - Facility Management Control System (FMCS)

C. Section 26 51 00 - Lighting

1.3 QUALITY ASSURANCE

A. Manufacturers shall be regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. All components and assemblies are to be factory pre-tested prior to delivery and installation.

C. Comply with NEC as applicable to electrical wiring work.

D. Comply with applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

E. Panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Panels and accessories used for control of life safety and critical branch circuits shall be listed under UL 924 Emergency Lighting and Power Equipment.

F. All assemblies are to be in compliance with FCC emissions standards specified in Part 15 Subpart J for Class A applications.

1.4 REFERENCES

A. FCC Rules and Regulations, Part 15, Subpart J - Radio Frequency Interference

B. FS W S 896 Switch, Toggle

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C. International Energy Conservation Code (IECC)

D. NEMA WD 1 - General Color Requirements for Wiring Devices

E. NEMA WD 7 - Occupancy Motion Sensors

F. NFPA 70 - National Electrical Code (NEC)

G. UL Standard 916 Energy Management Equipment

H. UL 924 - Emergency Lighting and Power Equipment

I. UL 1472 - Solid-State Dimming Controls

1.5 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Submit a comprehensive package including devices, hardware, software, product specification, finishes, dimensions, installation instructions, warranty, system software requirements, and roles and responsibilities of all persons and groups involved in installation, execution, and commissioning.

C. Provide floor plan showing location, orientation, and coverage area of each control device, sensor, and controller/interface. For areas requiring multiple sensor devices for appropriate coverage, submit specific manufacturer-approved sensor layout as an overlay directly on the project drawings, either in print or approved electronic form.

D. Submit a list of devices and equipment that will be installed for each sequence of operation.

E. Submit project specific control wiring diagrams showing all equipment, line voltage, and control wiring requirements for all components including, but not limited to, dimmers, relays, low voltage switches, occupancy sensors, control stations, dimmer panels, relay panels, and communication interfaces and programming instructions for each sequence of operation. Include network cable specification and end-of-line termination details, if required.

F. Project specific network riser diagram including floor and building level details. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.

G. Verify acceptance of communications connection to building automation system. Submit BACnet IP parameters.

1.6 EXTRA STOCK

A. Provide extra stock under provisions of Section 26 05 00.

B. Sensors, Controls, Power Supplies, and Relays: Five (5) percent of quantity installed. Minimum of two (2) of each configuration and type.

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C. Relays and Dimmer Modules: Five (5) percent of quantity installed. Minimum of two (2) of each size and type.

D. Control Stations: One (1) of each configuration and type, except for LCD touch screens requiring factory setup prior to installation.

1.7 PROJECT RECORD DOCUMENTS

A. Submit project record documents under provisions of Section 26 05 00.

B. Accurately record location of all controls and devices. Include description of switching sequences and circuiting arrangements.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit emergency, operation, and maintenance data under provisions of Section 26 05 00. Data shall also include the following:
   1. Schedule for routine maintenance, inspection, and calibration of all lighting control devices and system components. Recommended schedule for inspection and recalibration of sensors.
   2. Complete narrative describing intended operation and sequence for each control scenario and system component, updated to reflect all changes resulting from commissioning of systems. Narrative shall indicate recommended settings for devices where applicable.
   3. Replacement part numbers for all system components.

B. Identify installed location and labeling for each luminaire controlled by automated lighting controls.

C. Submit software operating and maintenance manuals, program software backup on compact disc or compatible media with data files, device address list, and a printout of software application and graphic screens, where applicable.

1.9 SYSTEM DESCRIPTION

A. Performance Statement: This specification section and the accompanying lighting design documents describe the minimum material quality, required features, and operational requirements of the lighting control system (LCS). These documents do not convey every wire that must be installed and every equipment connection that must be made. Based on the performance required of the system, as presented in these documents, the Contractor and system manufacturer/vendor are solely responsible for determining all equipment, wiring, and programming required for a complete and operational system.

B. Provide an integrated lighting controls system consisting of panels, power supplies, controllers, sensors, relays, switches, devices, wiring, etc. necessary to perform the Lighting Control Sequence of Operation as defined on the plans and specifications. Contractor is responsible for confirming that all components and luminaires interoperate as a single system.
   1. Sequence of Operation: Describes the required operation and performance for lighting control in each space. Sequences of operation are indicated on the drawings.

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2. Drawings: The drawings include sequences of operation, locations of control interface devices, sensors, and control zones. Wiring and additional equipment to make a complete and functioning system has not been shown, but shall be submitted with the shop drawings.

C. The following control types and features are acceptable. Acceptable control locations are shown on the drawings.
1. Line Voltage Control: Control equipment consists of traditional line voltage wiring devices and equipment such as switches, dimmers and combination occupancy/vacancy sensor switches, etc.
2. Centralized Control: Control equipment is in a central location serving multiple spaces/zones and provides time-based schedule and remote control.
a. The lighting control system (LCS) shall be networked with BACnet IP capabilities.
b. The lighting control system (LCS) shall have DMX512 capabilities.
3. Wireless Control: Equipment that uses radio frequency to transmit lighting control signals.

1.10 COMMISSIONING

A. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Agent. Project closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure. Refer to Division 1 for detailed commissioning requirements.

B. The Contractor shall provide all services necessary for compliance with the IECC Section C408 Commissioning. The commissioning shall include, but not be limited to, a commissioning plan, preliminary commissioning report, construction documents, manuals, final commissioning report, and lighting system functional testing.

C. This project will have selected building systems commissioned. The Contractor is responsible to execute commissioning. The commissioning process, equipment, and systems to be commissioned are defined in Division 1. A third-party Commissioning Agent will direct the commissioning process.

D. The Contractor shall notify the Commissioning Agent, Architect/Engineer and Owner's Representative ten (10) working days prior to scheduled commissioning date.

E. The commissioning process requires meeting attendance. Refer to Division 1 for meeting requirements.

F. The system shall be functionally tested by a factory-authorized engineer and comply with the Sequence of Operation. All loads shall be tested live for continuity and freedom from defects, and all control wiring shall be tested for continuity and connections prior to energizing the system.

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1.11 WARRANTY

A. Manufacturer shall warrant products under normal use and service to be free from defects in materials and workmanship for a period of two (2) years from date of commissioning.

B. Occupancy, vacancy, daylight sensors and controls shall have a five (5) year warranty from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LIGHTING CONTROLS

A. All items of material having a similar function (e.g., switches, dimmers, sensors, contactors, relays, etc.) shall be of the same manufacturer, unless specifically stated otherwise on drawings or elsewhere in the specifications.

B. Color of lighting controls and sensors shall match the receptacle wiring devices specified in the space.

C. The functions described in the lighting sequence of operation shall dictate the actual lighting control device required to accomplish the functions described for the space.

2.2 LIGHTING CONTROL STATION

A. The lighting control station shall contain the controls required by the lighting sequence of operation in a common coverplate. The controls may consist of switches, dimmers, occupancy sensors, pushbuttons, etc.
   1. In spaces where the wall control station is shown in multiple locations, the sequence of operation shall be the same at all locations, unless noted otherwise.
   2. The controls supplier shall prepare control station shop drawings showing arrangement of controls, dimensioned elevations, wiring diagram, and recommended backboxes. The shop drawing submittal should be identified with the lighting sequence that the station provides. Submit data sheets on the switches, dimmers, sensors, buttons, etc. contained in the control station.

2.3 DEVICE COLOR

A. All switch, lighting controls, and coverplate colors shall be the same as wiring devices, unless indicated otherwise.

B. Devices controlling life safety circuits shall be red.

2.4 COVERPLATES

A. All switches and lighting controls shall be complete with coverplates that match material and color of the wiring device coverplates in the space.

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B. Where several devices are ganged together, the coverplate shall be of the ganged style for the number of devices used.

C. Install nameplate identification as indicated in Section 26 05 53.

D. Plate-securing screws shall be metal with head color matching the wall plate finish.

2.5 WALL SWITCHES

A. Refer to Electrical Symbols List for device type.

B. SW-1P: Single Pole Switch:
1. Single throw, 120/277-volt, 20-amp maintained contact. Toggle handle, side and back wired.
2. Approved Manufacturers: Hubbell HBL1221, Leviton 1221-2, Pass & Seymour PS20AC1, Cooper AH1221.

3. Single throw, 120/277-volt, 20-amp maintained contact. Rocker handle, side and back wired.
4. Approved Manufacturers: Hubbell DS120, Leviton 5621, Pass & Seymour 2621, Cooper 7601.

C. SW-1P-EM: Emergency Single Pole Switch:
1. Single throw, 120/277-volt, 20-amp maintained contact. Red handle, side and back wired. Switch shall have with illuminated handle that is illuminated when load is off.
2. Approved Manufacturers: HBL1221R, Leviton 1221-2R, Pass & Seymour PS20AC1-RED, Cooper AH1221RD.

3. Approved Manufacturers: Pass & Seymour 2625RED.

D. SW-1P-M: Momentary Contact Single Pole Switch:
1. 120/277-volt, 20 amp. Three position, two circuit. Center off toggle spring return handle.
2. Approved Manufacturers: Hubbell HBL1557, Leviton 1257, Pass & Seymour 1251, Cooper 1995.

E. SW-1P-WP: Weatherproof Single Pole Switch:
1. Single throw, 120/277-volt, 20-amp maintained contact. Toggle handle, side and back wired. Provide with weatherproof coverplate.
2. Approved Manufacturers: Hubbell1221/HBL1795, Leviton 1221-2, Taymac MM180, Pass & Seymour PS20AC1/CA1-GL, Cooper 2221.

F. SW-2P: Two Pole Switch:
1. Single throw, 120/277-volt, 20-amp maintained contact. Toggle handle, side and back wired.
2. Approved Manufacturers: Hubbell HBL 1222, Leviton 1222-2, Pass & Seymour PS20AC2, Cooper 2222.

3. Single throw, 120/277-volt, 20-amp maintained contact. Rocker handle, side and back wired.

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4. Approved Manufacturers: Hubbell DS220, Leviton 5622, Pass & Seymour 2622, Cooper 7622.

G. SW-3W: Three-way Switch:
1. 120/277 volt, 20 amp. Toggle handle, side and back wired.
2. Approved Manufacturers: Hubbell 1223, Leviton 1223-2, Pass & Seymour PS20AC3, Cooper AH1223.

3. 120/277-volt, 20-amp maintained contact. Rocker handle, side and back wired.
4. Approved Manufacturers: Hubbell DS320, Leviton 5623, Pass & Seymour 2623, Cooper 7623.

H. [SW-3W-EM]: Emergency Three-way Switch:
1. 120/277 volt, 20 amp. Red toggle handle, side and back wired.
2. Approved Manufacturers: Hubbell 1223R, Leviton 1223-2R, Pass & Seymour PS20AC3-RED, Cooper AH1223RD.

I. SW-4W: Four-way Switch:
1. 120/277 volt, 20 amp. Toggle handle, side and back wired.
2. Approved Manufacturers: Hubbell 1224, Leviton 1224-2, Pass & Seymour PS20AC4, Cooper AH1224.

J. SW-COMB: Combination Single Pole Switch and GFCI Receptacle:
1. Single throw switch, 120-volt, 15-amp maintained contact. Toggle handle, side and back wired. NEMA 5-15R GFCI receptacle with test and reset buttons.
2. Approved Manufacturers: Hubbell GFSP15, Leviton 7229, Pass & Seymour 1595-SWTTR, Cooper VGFS15.

2.6 WALL DIMMERS

A. UL listed with integral air-gap switch for on/off control.

B. Integral EMI/RFI suppression.

C. Non-viewable heat sink.

D. Dimmer compatibility and wiring with the load being controlled shall be verified by Contractor prior to purchase and installation.

E. Dimmer to match device color.

F. SW-D-LED: LED Electronic Driver Dimmer:
1. 277-volt, decora style linear slider operator with positive off. Color to match adjacent devices. Luminaire manufacturer shall list compatible dimmer manufacturers and models. 0-10V dimmers shall comply with IEC 60629 Annex E.
2. Approved Manufacturers: Compatible with provided LED driver.

G. SW-D3-LED: LED Electronic Driver Three-Way Dimmer:

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1. 277-volt, decora style linear slider operator with positive off. Color to match adjacent devices. Luminaire manufacturer shall list compatible dimmer manufacturers and models. 0-10V dimmers shall comply with IEC 60929 Annex E.
2. Approved Manufacturers: Compatible with provided LED driver.

H. SW-OD: Wall 0-10V Dimmer / Occupancy sensor:
1. Wall switch with manual on/auto off. 120VAC load rating of 0-800 W for electronic ballast, LED. 277VAC load rating of 0-1,800 W for electronic ballast, LED. adjustable OFF delay. 0-10V dimming with up to 30ma sink. Automatic ON/OFF, manual ON/automatic OFF, or occupancy on to predetermined dimming level go to last dimming setting upon occupancy.
2. Approved Manufacturers: Sensor Switch WSX D Series

2.7 LOCAL DAYLIGHTING CONTROLS

A. Standalone Interior Photo Sensors:
1. SW-LS-D: Daylight Level Sensor and Controller - 0-10V Dimming - One Zone:
   a. Dimming control of one 0-10V zone. Range of 10 to 200 FC. Adjustable deadband prevents cycling. Adjustable time delay. Coordinated with dimming ballast prior to submittal.
   b. Approved Manufacturers: Watt Stopper LS-301, Hubble Automation DLC7, Sensor Switch N-CMADC.
2. SW-LS-D-3Z: Daylight Level Sensor and Controller - Dimming - Three Zones:
   a. Dimming control of up to three zones of 0-10V. Range of 10 to 200 FC. Adjustable deadband prevents cycling. Adjustable time delay. Coordinate with dimming ballasts prior to submittal.
   b. Approved Manufacturers: Watt Stopper LCD-203/LS-290C, Hubbell Automation LUXSTATDCM/LUXSTATLS, LC&D Micro GR/2404 IDIM/Pcell, Sensor Switch N-CMADC.
3. Sensor shall detect changes in ambient light level and provide triggering of lighting groups in area based on sequence of operation.
4. Sensor shall be configurable via DIP switches at device or via handheld wireless remote programming unit. Settings shall include:
   a. Ambient sensitivity range between 1 and 1,000 foot-candles.
   b. Time delay of 5 to 300 seconds.
   c. Trigger setpoints with deadband adjustment.
5. Sensor shall provide on/off setpoints in quantity as specified on drawings and as shown in the sequence of operation.
6. Sensor shall be ceiling- or wall-mounted for range and viewing angle meeting application requirements as outlined in the sequence of operation.
7. Output signal from sensor shall be linear with light level.

2.8 INDOOR OCCUPANCY AND VACANCY SENSORS

A. General Description: Wall- or ceiling-mounting, solid-state units with a separate power supply/relay unit.

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1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied, with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes. Vacancy sensors require a manual switch operation to turn lights on and off, with a time delay for turning lights off when unoccupied.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20 A ballast load at 120 and 277 VAC, for 13-amp tungsten at 120 VAC, and for 1 hp at 120 VAC. Power supply to sensor shall be 24 V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:
    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure. Mount relay above accessible ceiling near entry door to room or area.
    c. Time Delay and Sensitivity Adjustments: Recessed and concealed.
5. Indicator: LED to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Power Supply and Slave Packs: Provide as required for sensor quantity and switching scheme. Mount to standard 1/2" knockout on electrical box above accessible ceiling near entry door to room or area. Sensor power shall be from emergency circuit if emergency lighting is in the area.
8. Detection Coverage (Room): Detect occupancy anywhere in an area based on hand motion.
9. Detection Coverage (Corridor): Detect occupancy based on a half-step motion.
10. Warranty: Five (5) year warranty.

B. Dual-Technology Type: Detect occupancy by using a combination of PIR and ultrasonic or acoustic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.
    1. SW-VS-D or SW-OC-D: 360 Degree Coverage Pattern:
        a. Frequency greater than 40 KHz. Dual sensing verifications (requires both technologies to activate), either technology maintains on status. Integrated ambient light level sensor (2 to 200 FC range), adjustable sensitivity and time delay. Sensor shall control all circuits in area, unless noted otherwise. Initial settings: ambient sensor 40 FC.
        b. Approved Manufacturers: Watt Stopper DT 300 Series, Hubbell OMNI-DT2000 or ATD2000C, Greengate OAC-DT, Leviton OSC##-MOW, Sensor Switch CM PDT 10.
    2. SW-VS-D-W or SW-OC-D-W: Wall Mounted on Adjustable Swivel Mount:
        a. Wall or ceiling sensor with adjustable settings to allow manual on/auto off or auto on/auto off. Integrated ambient light level sensor (2 to 100 FC range).
        b. Approved Manufacturers: Watt Stopper DT-200 Series, Hubbell LODTRP, Leviton OSM12--M series, Sensor Switch WvPDT 16 Series.
    3. SW-O: Wall Switch:
        a. Wall switch with manual on/auto off. 120/277 VAC load rating of 0-800 W for ballast, LED or tungsten. 5-, 15-, 30-minute adjustable OFF delay. Coverage of minor motion in 12' x 15' pattern.
        b. Approved Manufacturers: Watt Stopper DW-100 Series, Hubbell LHMTS, Leviton OSSMT series, Sensor Switch WSD-PDT SA Series.
    4. SW-O2: Wall Switch:

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a. Multi-relay wall switch with manual on/auto off for two separate loads. 120/277 VAC load relay rating of 0-800 W for ballast, LED or tungsten. 5-, 15-, 30-minute adjustable OFF delay. Coverage of minor motion in 12' x 15' pattern.
b. Approved Manufacturers: Watt Stopper DW-200 Series, Hubbell LHMTD, Leviton OSSMD series, Sensor Switch WSD-PDT 2P Series.

5. Sensitivity Adjustment: Separate for each sensing technology.
6. Detection Coverage:
   a. Task Areas: Detect occupancy anywhere in an area based on hand motion.
   b. Circulation Areas: Detect occupancy anywhere in an area based upon half-step walking motion.

C. Mask sensors where necessary to prevent nuisance switching from adjacent areas.

D. PIR Type: Detect occupancy by sensing a combination of heat and movement in area of coverage.
1. SW-O: Wall Switch Occupancy Sensor:
   a. Passive infrared, zero crossing circuitry, integrated ambient light sensor (10 to 150 FC range), adjustable sensitivity and time delay, no minimum load requirements, manual or auto on operation, Initial settings: 10 minutes, ambient sensor 40 FC. Manual ON for vacancy sensing.
   b. Approved Manufacturers: Watt Stopper PW-100 Series, Sensor Switch WSX, Hubbell LHIRS1 or AP1277, Leviton ODS15, Greengate OSW-P-0451.
2. SW-O2: Dual Wall Switch Occupancy Sensor:
   a. Passive infrared, zero crossing circuitry. Switches control two separate circuits or relays. Integrated ambient light sensor (10 to 150 FC range), adjustable sensitivity and time delay, no minimum load requirements, manual or auto on operation, Initial settings: 10 minutes, ambient sensor 40 FC. Manual ON for vacancy sensing.
   b. Approved Manufacturers: Watt Stopper PW-200 Series, Sensor Switch WSD-2, Hubbell LHIRD2 or AP127712, Leviton ODS, Greengate OSW-P-0451.
3. SW-OC-P-P: Ceiling Mounted - 360 Degree Coverage Pattern:
   a. Passive infrared, zero crossing circuitry, integrated ambient light sensor (4 to 190 FC Range), adjustable sensitivity and time delay. Sensor shall control all circuits in the area unless noted otherwise. Initial settings: ambient sensor 40 FC.
   b. Approved Manufacturers: Watt Stopper CI Series, Sensor Switch CM-9, Hubbell Automation Omni-IR, Leviton OSC Series, Greengate OMR-P Series.
4. SW-OC-P-P2: Ceiling Mounted - 100 Degree Coverage Pattern:
   a. Passive infrared, zero crossing circuitry, integrated ambient light sensor (4 to 190 FC Range), adjustable sensitivity and time delay. Sensor shall control all circuits in the area unless noted otherwise. Initial settings: ambient sensor 40 FC.
   b. Approved Manufacturers: Watt Stopper WPIR Series, Sensor Switch CM-9, Hubbell LOIRWV or ATD1600W.
5. SW-OC-P-W: Wall Mounted - 100 Degree Coverage Pattern:
   a. Passive infrared, zero crossing circuitry, integrated ambient light sensor (4 to 190 FC range), adjustable sensitivity and time delay. Sensor shall control all circuits in the area unless noted otherwise. Initial settings: Ambient sensor 40 FC.
   b. Approved Manufacturers: Watt Stopper WPIR Series, Sensor Switch CM-9, Hubbell LOIRWV or ATD1600W.
6. With daylight filter and lens to afford coverage applicable to space to be controlled.

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E. Ultrasonic Type: Ceiling mounting. Detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
   1. SW-OC-U: 360 Degree 20' x 20' Hand Motion Coverage Pattern:
      a. Frequency greater than 32 KHz solid state, adjustable sensitivity and time delay, temperature and humidity resistant receivers. Sensor shall control all circuits in area, unless noted otherwise.
      b. Approved Manufacturers: Watt Stopper WT-1100 series, Hubbell OMNI-US or ATU series, Leviton OSC series, Greengate ODC-U series.
   2. SW-OC-U2: 35' x 30' Hand Motion Coverage Pattern:
      a. Frequency greater than 32 KHz solid state, adjustable sensitivity and time delay, temperature and humidity resistant receivers. Sensor shall control all circuits in area, unless noted otherwise.
      b. Approved Manufacturers: Watt Stopper WT-2200 series, Hubbell OMNI-US or ATU series, Leviton OSC series, Greengate ODC-U series.
   3. SW-OC-U-A: 360 Degree Two-Sided Corridor Coverage Pattern:
      a. Frequency greater than 32 KHz solid state, adjustable sensitivity and time delay, temperature and humidity resistant receivers. Sensor shall control all circuits in area, unless noted otherwise.
      b. Approved Manufacturers: Watt Stopper WT-2250 Series, Hubbell OMNI-US or ATU series, Greengate ODC-U Series.
   4. Crystal controlled with circuitry that causes no detection interference between adjacent sensors.

2.9 BRANCH CIRCUIT EMERGENCY LIGHTING TRANSFER SWITCH BCELTS

A. BCELTS: Branch Circuit Emergency Lighting Transfer Switch BCELTS, 120/277 volt, dry/damp listed, 32 - 131F (0 - 55C) operating temperature, plenum NEMA 1 rated, test button with visual indicator, remote test and fire alarm control, UL1008 listed, UL924 listed latest edition, National Electrical Code NEC Article 700 compliant.
   1. Rating: 20 Amp (16 A permitted) LED driver, ballast, incandescent.
   2. Lighting Control Coordination: Provide BCELTS device compatible with designated lighting zone controls. Example: switched, 0-10 volt dimming, DALI control, 2 wire dimming, or DMX.
   3. Operation:
      a. BCELTS device shall allow the same local lighting control devices to control both the normal lights and emergency designated lighting. Devices that require separate local lighting controls for the normal and designated emergency lighting are NOT allowed.
      b. BCELTS device shall monitor the normal power circuit, shunt/bypass the local lighting controls, and transfer the load from the normal circuit to the emergency circuit upon loss of power, remote test switch, security system override via BAS system, or fire alarm override to provide full lumen output for designated emergency lighting.
      c. BCELTS device shall return designated emergency lighting to local lighting control after a 15-minute delay upon return of normal power or remote test/fire alarm override release.

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d. Equivalent facilitation and performance: A limitation of equivalent comparable products may require some of the required functions of the BCELTS device to be provided by an alternative component of the lighting control system. The following functions may be performed by alternative components of the lighting control system when the device is listed for the required function and compatible with the lighting control system.
   1) Remote test switch / fire alarm override interface
   2) The 15-minute time delay upon return of normal power or remote test/fire alarm override release.

e. Accessory - Remote Test Switch: Provide a remote button test switch. The test switch shall be a single gang type switch compatible with the ALCR device and allow the remote fire alarm override to function.
   1) Test switch mounting:
   2) Finished spaces (ceiling height 10 feet or less): Flush mounted adjacent in finished ceiling adjacent to one of the emergency lights.
   3) Finished spaces (ceiling height greater than 10 feet): Flush mounted in wall. Refer to architect/engineer for location.
   4) Unfinished spaces: Adjacent and aligned with to local wall mounted lighting controls.
   5) Option: ALCR device(s) with a test button, visual indicator, and flush mounting plate may be installed in the location of the remote test switch in lieu of providing a separate remote test switch.

4. Approved Manufacturers:
   a. LVS Controls EPC-D-F-ATS Series
   b. Bodine Signify GTD20A
   c. Hubbell Dual Lite ATSD/BCCR Series
   d. Lighting control manufacturer
   e. Approved Equal

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2.10 CONDUCTORS AND CABLES

A. Control Wiring:
   1. Where installed with the line-voltage wiring, control wiring shall be copper conductors not smaller than No. 16 AWG with insulation voltage rating and temperature rating equal to that of the line-voltage wiring, complying with Division 26 Section 26 05 13 "Wire and Cable."
   2. Tap conductors to switches or relays: Stranded copper conductors of 16 AWG or solid 16 or 18 AWG with insulation rating equal to that of the line-voltage wiring.
   3. Tap conductors to dimming ballasts: Solid copper conductors of 18 AWG with insulation voltage rating equal to that of the line-voltage wiring and insulation temperature rating not less than 90°C.
   4. Network cabling as required by manufacturer.

B. Splices and Taps:
   1. Tapping or wire trap connectors shall be used to splice all Class 1 and Class 2 control wiring. Twist-on, wire-nut type connectors are not allowed.

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION MEETING

A. Schedule a pre-construction meeting with the controls representative, installing contractor, Architect/Engineer, and Owner to explain the proposed lighting control centralized, wireless, and distributed systems.

3.2 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify field dimensions and coordinate physical size of all equipment with the architectural requirements of the spaces into which they are to be installed. Allow space for adequate ventilation and circulation of air.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Beginning of installation means installer accepts existing conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings.

B. All wiring shall be installed in conduit.

C. All branch load circuits shall be live tested before connecting the loads to the lighting control panel.

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3.4 SUPPORT SERVICES

A. System Startup:
1. Manufacturer shall provide factory authorized technician to confirm proper installation and operation of all system components.

B. Testing:
1. System shall be completely functional tested by a factory-authorized technician. All loads shall be tested live for continuity and freedom from defects, and all control wiring shall be tested for continuity and connections prior to energizing the system components.
2. Programming of initial zones, schedules, lighting levels, control station groups, and sensor settings shall be performed by a factory-authorized technician. Lighting Control Sequence of Operation shall serve as a basis for programming, However, all final decisions regarding groups and schedules shall be at the direction of the Owner. The following procedures shall be performed at a minimum:
    a. Confirm occupancy sensor placement, sensitivity, and time delay settings to meet specified performance criteria.
    b. Confirm daylight sensor placement, sensitivity, deadband, and delay settings to meet specified performance criteria.

c. Confirm that schedules and time controls are configured to meet specified performance criteria and Owner's operating requirements.

3. Verify occupancy/vacancy and daylight sensor operation is correct after furniture and equipment is installed in each area. Make adjustments to sensor settings and time delays to allow proper operation.
4. Verify occupancy/vacancy sensors are located to provide complete coverage for the area served with no nuisance switching.
   a. Relocate sensors or provide additional sensors as necessary to provide adequate coverage.
   b. Mask occupancy sensors where necessary to prevent nuisance switching from adjacent areas.

C. Training:
1. Manufacturer shall provide competent factory-authorized technician to train Owner personnel in the operation, maintenance and programming of the lighting control system. Submit training plan with notification seven (7) days prior to proposed training dates.
2. Training duration shall be no less than three (3) days, with one (1) day being scheduled at least two (2) weeks after initial training.

D. Documentation:
1. Manufacturer shall provide system documentation including:
   a. System one-line showing all panels, number and type of control stations and sensors, communication line, and network or BMS/BAS interface unit.
   b. Drawings for each panel showing hardware configuration and numbering.
   c. Panel wiring schedules.
   d. Typical diagrams for each component.

3.5 SYSTEM COMMISSIONING

A. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements. Refer to Section 01 09 00, General Commissioning, for further details.

B. System verification testing is part of the commissioning process. Verification testing shall be performed by the Contractor and witnessed and documented by the Commissioning Agent. Refer to Section 01 09 00, General Commissioning, for system verification tests and commissioning requirements.

C. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative. The instruction shall be scheduled in coordination with the Owner's Representative after submission and approval of formal training plans. Refer to Section 01 09 00, General Commissioning, for Contractor training requirements.

END OF SECTION

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SECTION 26 27 16 - CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hinged cover enclosures

B. Cabinets

C. Terminal blocks and accessories

1.2 REFERENCES

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

B. ANSI/NEMA ICS 1 - Industrial Control and Systems

C. ANSI/NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems

D. ANSI/NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems

1.3 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in ANSI/NEMA ICS 1.

C. Include cabinets and enclosures in composite electronic coordination files. Refer to Section 26 05 00 for coordination drawing requirements.

D. Custom Utility Pedestal:
   1. Provide dimensioned diagram of cabinet including front, side, and floor plan views. Show layout of power and control components in evaluation views.
   2. Provide schematic diagram of power, control functions, panelboards, and other components.
   3. Submit installation instructions.

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PART 2 - PRODUCTS

2.1 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 1 3R 4, 14 gauge steel. Provide stainless steel construction for operating rooms, invasive procedure rooms, and medical scanning rooms.

B. Finish: Manufacturer's standard polyester powder paint finish.

C. Covers: Continuous hinge with stainless steel hinge pin. Covers longer than 24 inches shall have 3-point latching.

D. Locks: Flush 1/4 turn cylinder key latch.

E. Provide interior white painted metal panel for mounting terminal blocks and electrical components.

2.2 CABINETS

A. Cabinet Boxes:
1. Galvanized steel with removable end walls, 18 inches wide, 24 inches high, 6 inches deep.

B. Cabinet Fronts: Steel, flush type with concealed trim clamps, concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.3 TERMINAL BLOCKS AND ACCESSORIES

A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.

B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.4 FABRICATION

A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.

B. Provide conduit hubs on enclosures.

C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

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PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

B. Provide accessory feet for free-standing equipment enclosures.

C. Install trim plumb.

END OF SECTION

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SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Device plates and box covers

B. Modular connectors

C. Receptacles

D. Countertop and furniture receptacle assemblies

E. Pin and sleeve devices

F. Floor boxes

G. Service fitting

H. Pedestal style box

I. Poke-through fittings

J. Pendant cord/connector devices

K. Cord and plug sets

L. Cord reel

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1.2 QUALITY ASSURANCE

A. Provide similar devices from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the NEC Article 100, by a testing agency to Authorities Having Jurisdiction and marked for intended use.

C. Comply with the NEC.

1.3 REFERENCES

A. DSCC W-C-896F - General Specification for Electrical Power Connector

B. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet

C. NEMA WD 1 - General Color Requirements for Wiring Devices

D. NEMA WD 6 - Wiring Devices - Dimensional Requirements

E. NFPA 70 - National Electrical Code (NEC)

F. UL 498 - Standard for Attachment Plugs and Receptacles

G. UL 943 - Standard for Ground Fault Circuit Interrupters

1.4 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

C. Submit manufacturer occupancy sensor coverage patterns applicable to this project. For areas requiring multiple sensor devices for appropriate coverage, submit specific manufacturer approved sensor layout as an overlay directly on the project drawings, either in print or approved electronic form.

1.5 COORDINATION

A. Receptacles for Owner Furnished Equipment: Match plug configurations.

B. Cord and Plug Sets: Match equipment requirements.

C. Coordinate installation of receptacle assemblies in countertops with the contractor providing the countertops. Contractor shall coordinate penetrations and conduit routing in countertops with drawings and other obstacles below the installation surface.

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PART 2 - PRODUCTS

2.1 DEVICE COLOR

A. All switch, receptacle, outlet, and coverplate colors shall be ivory, unless indicated otherwise.

2.2 COVERPLATES

A. All switches, receptacles, and outlets shall be complete with the following:
   1. #302 stainless steel coverplates in finished spaces where walls are finished.
   2. Decorator #302 stainless steel wall plates in public finished spaces where walls are finished. Approved Manufacturer: Leviton Decora, Hubbell Decorator, Cooper Decorator, or approved equal.
   3. #302 stainless steel coverplates in unfinished spaces for flush boxes.

B. Where several devices are ganged together, the coverplate shall be of the ganged style for the number of devices used.

C. Install nameplate identification as indicated in Section 26 05 53.

D. Plate securing screws shall be metal with head color matching the wall plate finish.

2.3 MODULAR CONNECTORS

A. Devices listed below are traditional wired devices. Contractor option to provide equivalent modular connector-type devices (Hubbell Snap Connect, Pass & Seymour Plug Tail, Leviton Lev-Lock, Copper Arrow Link) where applicable.

B. Wiring devices with modular wiring type quick connectors shall comply with the following in addition to the above:
   1. Wired with #12 THHN Cu, stranded or solid, 3 or 4 wire as required for device, minimum 6" lead length.
   2. Connector contacts shall be crimped or welded.

2.4 RECEPTACLES

A. Refer to Electrical Symbols List for device type.

B. Devices that are shaded on the drawings shall be red.

C. NEMA 5-20R Duplex Receptacle:
   1. 125-volt, 20 amp, 3-wire grounding type heavy duty industrial grade with impact resistant thermoplastic face and one-piece brass back strap with integral ground contacts.
   2. Approved Manufacturers: Hubbell 5362, Leviton 5362, Pass & Seymour 5362A, Cooper AH5362.

D. NEMA 5-20R Ground Fault Duplex Receptacle:
   1. 125-volt, 20 amp, 3-wire grounding type with test and reset buttons in impact resistant thermoplastic face.
   2. Device shall perform self-test of GFCI circuitry in accordance with UL 943.
   3. Approved Manufacturers: Hubbell GF20L, Leviton GFNT2, Pass & Seymour 2097, Cooper SGF20.

E. Remote Ground Fault Device:
   1. Ground fault device for remote downstream receptacles. 125-volt, 20 amp. Test and reset buttons in impact resistance thermoplastic face.
   2. Approved Manufacturers: Hubbell GFBF20, Leviton 6895, Pass & Seymour 2085, Cooper VGFD20.

F. NEMA 5-20R Weatherproof Ground Fault Duplex Receptacle:
   1. 125-volt, 20 amp, 3-wire grounding type with test and reset buttons in impact resistant thermoplastic face. Provide NEMA 3R rated while-in-use clear cast aluminum cover.
   2. Device shall perform self-test of GFCI circuitry in accordance with UL 943.
   3. Approved Manufacturers: Hubbell GFTR20/(RW57300) WP826, Leviton GFWT2/(5977-CL) M5979, Pass & Seymour 2097TRWR/(WIUC10-C) WIUCAST1, Cooper WRSGF20/(WIU-1) WIUMV-1.

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G. NEMA 5-20R Explosion Proof Duplex Receptacle:
1. 125-volt, 20 amp, 3-wire grounding type, Class 1, Division 1 rated. Spring-loaded cover with gasket. Mount in cast box with threaded openings.
2. Approved Manufacturers: Appleton EFSC175, Crouse-Hinds ENRC21201, Killark UGR5-20231.

H NEMA 5-20R Simplex Receptacle:
3. 125-volt, 20 amp, 3-wire grounding type with impact resistant thermoplastic face.
4. Approved Manufacturers: Hubbell HBL5361, Leviton, 5361, Pass & Seymour 5361, Cooper 5361.

H. NEMA 5-30R Simplex Receptacle:
1. 125-volt, 30 amp, 3-wire grounding type, phenolic face.
2. Approved Manufacturers: Hubbell HBL9308, Leviton 5371, Pass & Seymour 3802, Cooper 5716N.

I. NEMA 5-50R Simplex Receptacle:
1. 125-volt, 50 amp, 3-wire grounding type, phenolic face.
2. Approved Manufacturers: Hubbell HBL9360, Cooper 1253.

J. Cooper.

K. NEMA 14-20R Simplex Receptacle:
1. 125/250-volt, 20 amp, 3-pole, 4-wire grounding type with thermoplastic face.
2. Approved Manufacturers: Hubbell HBL8410, Pass & Seymour 3820, Cooper 5759.

L. NEMA 14-30R Simplex Receptacle:
1. 125/250-volt, 30 amp, 3-pole, 4-wire grounding type with thermoplastic face. Flush mounted at +24 AFF.
2. Approved Manufacturers: Hubbell HBL9430A, Leviton 278, Pass & Seymour 3864, Cooper 5744N.

M. NEMA 5-20R Double Duplex Receptacle:
1. Consists of two duplex receptacles, double gang box, plaster ring and faceplate.
2. Approved manufacturers: Refer to Duplex Receptacle above.

N. NEMA 5-20R Double Duplex GFI Receptacle:
1. Consists of two duplex GFI receptacles, double gang box, plaster ring and faceplate.
2. Approved Manufacturers: Refer to Duplex GFI Receptacle above.

O. NEMA 5-20R Weatherproof Ground Fault Quad Receptacle:
1. Consists of two duplex, GFI receptacles. Double gang box. Provide NEMA 3R rated while-in-use cast aluminum cover.
2. Approved Manufacturers:
   a. Receptacle: Refer to GFCI Receptacle above.
   b. Cover: Intermatic WP1030MXD, Pass & Seymour WIUCAST2, Thomas & Betts Red Dot 2CKU.

P. Back wired devices shall be complete with eight holes that are screw activated with metal clamps for connection to #12 or #10 copper conductors.

Q. Side wired devices shall have four binding screws that are undercut for positive wire retention.

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R. Ground fault circuit interrupter (GFCI) receptacles shall comply with UL 943 requiring increased surge immunity, improved corrosion resistance, improved resistance to false tripping and diagnostic indication for miswiring if the line and load conductors are reversed during installation.

S. Isolated ground receptacles shall have the equipment ground contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from the mounting strap.

T. Integral surge suppression receptacles with integral surge suppression shall comply with the following:
1. Category A3 listed.
2. Line to ground, line to neutral, and neutral to ground modes.
3. Metal-oxide varistors with a nominal clamp level rating of 500 volts and minimum single transient pulse energy dissipation of 210 joules per mode.
4. Status indication: Light visible in the face of the device and audible alarm to indicate device is no longer active or in service.
5. Distinctive symbol on device face to denote SPD-type device.
6. Device shall be blue with blue stainless coverplate.
7. NEMA 5-20R duplex receptacle, 125-volt, 20 amp, 3-wire grounding type heavy duty industrial grade with impact resistant thermoplastic face and one-piece brass back strap.
    a. Approved Manufacturers: Hubbell HBL5362SA, Leviton, Pass & Seymour, Cooper.

U. Hazardous (Classified) location receptacles shall comply with NEMA FB 11.

2.5 PIN AND SLEEVE DEVICES

A. Industrial heavy-duty pin and sleeve devices shall comply with IEC 309-1.
1. IEC rated pin and sleeve watertight IP67 receptacle, raintight screw cap with safety chain and matching plug.

2.6 FLOOR BOXES

A. Color: Verify with Architect.

B. Coordinate with Technology drawings for voice/data outlet requirements.

C. Floor Boxes for Installation in Cast-In-Place Concrete Floors: Fully adjustable, cast iron.

D. [FB-#]: Flush-mounted, round, cast iron floor box with one (1) [REC-DUP]. Fully adjustable, round brass cover with duplex flap cover and brass carpet flange. [SPECIFIER: Minimum 3" concrete pour.]
1. Approved Manufacturers:
    a. Hubbell B2537 (Box), S3925 (Cover), S3082 (Flange), HBL5362 (Recept)
    b. Wiremold 880 CS1
    c. Steel City 602-SC / P60-DS

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2.7 PENDANT CORD/CONNECTOR DEVICES

A. Description: Matching, locking type plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, heavy-duty grade or refer to Details as shown on drawings.
   1. Body: Nylon with screw-open cable gripping jaws and provisions for attaching external cable grip.

B. External Cable Grip: Woven wire mesh type made of high strength galvanized steel wire stand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.8 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
   1. Cord: Rubber-insulated, stranded copper conductors, with Type SOW-A jacket; with green insulated grounding conductor and equipment rating ampacity plus a minimum of 30 percent.
   2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection, FS/UL listed.

2.9 CORD REELS

A. 25' 3#16 AWG type 'SJOW-A' cord with adjustable ball stop. Two 120-volt NEMA 5-15R receptacles mounted in cast outlet box, rated 10 amps.
   1. Approved Manufacturers:
      a. Daniel Woodhead 925
      b. Appleton RL2510
      c. Hubbell HBLC25163C

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PART 3 - EXECUTION

3.1 INSTALLATION

A. Install convenience receptacles at elevations indicated in the General Installation Notes on the contract drawings.

B. Install specific-use receptacles at heights shown on the contract drawings. Install devices level, plumb, and square with building lines. Coordinate installation of adjacent devices of separate systems with common mounting heights, including lighting, power, systems, technology, and temperature control device rough-ins.

C. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions. This Contractor is responsible for taking any measures required to ensure no conduits or other services are damaged. This may include X-ray or similar non-destructive means.

D. Install receptacles vertically with ground slot up or where indicated on the drawings, horizontally with ground slot to the left.

E. Install decorative plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.

F. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

G. Install devices and wall plates flush and level.

H. Install nameplate identification to receptacle cover plates indicated. Identification shall identify panel name and circuit number. Refer to Specification Section 26 05 53 - Electrical Identification.

I. Test receptacles and modular wiring connectors for proper polarity, ground continuity and compliance with requirements.

J. Healthcare devices shall be tested in accordance with NFPA 99 6.3.3 for grounding, voltage, and impedance measurements.

K. Floor Box Installation:
   1. Set boxes level and flush with finish flooring material.
   2. Use cast iron floor boxes for installations in slab on grade. Trim shall match floor covering to be used.
   3. Provide a minimum horizontal offset of 24 inches between boxes.
   4. Provide saw-cutting and patching of existing concrete floors as necessary for floor box installations within existing floors.

END OF SECTION

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SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fuses

B. Spare Fuse Cabinet

1.2 REFERENCES

A. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Types

B. UL 198E - Class R Fuses

C. FS W-F-870 - Fuse holders (For Plug and Enclosed Cartridge Fuses)

D. NEMA FU 1 - Low Voltage Cartridge Fuses

E. NFPA 70 - National Electrical Code

1.3 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

1.4 EXTRA MATERIALS

A. Provide two fuse pullers.

B. Provide three of each size and type of fuse installed.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40°F (5°C) or more than 100°F (38°C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FUSES

A. Bussman, Division of Eaton

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B. Edison Fuse, Division of Cooper Industries

C. Mersen

D. Littelfuse Inc

2.2 FUSES

A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.

B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.

C. Fuses with ratings larger than 600 amperes: Class L (time delay), unless otherwise noted on the drawings.

D. Fuses with ratings larger than 200 amperes but equal to or less than 600 amperes: Class RK-1 (time delay), unless otherwise noted on the drawings.

E. Fuses with ratings less than or equal to 200 amperes (not including control transformer fuses): Class RK-5, unless otherwise noted on the drawings.

F. Control transformer fuses: Class CC (time delay).

G. Fuses for packaged equipment: Size and type as recommended by equipment manufacturer.

2.3 SPARE FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
   1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
   4. Fuse Pullers: For each size of fuse.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses where indicated on the drawings and specifications.

B. Install fuses in accordance with manufacturer's instruction.

C. Install fuses in packaged equipment as required by equipment manufacturer.

D. Install fuse with label oriented such that manufacturer, type, and size are easily read.

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E. Install spare fuse cabinet in the Main Electrical Room .

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SECTION 26 28 16 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fusible switches

B. Non-fusible switches

C. Molded case circuit switches

D. Molded case switches

E. Motor disconnect switch

F. Mechanically interlocked disconnect

G. Enclosures

1.2 RELATED SECTIONS AND WORK

A. Refer to the Disconnect and Starter Schedule for rating and configuration.

1.3 REFERENCES

A. NEMA KS 1 - Enclosed Switches

1.4 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Product Data: For each type of enclosed switch, circuit breaker, accessory and component indicated, include dimensions, weights, and manufacturer's technical data on features, performance, and ratings.

C. Electrical Characteristics: For each type of enclosed switch, enclosure types, current and voltage ratings, short-circuit current ratings, UL listing for series rating of installed devices, features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

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1.5 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE AND NON-FUSIBLE SWITCHES

A. [FDS-#]: Fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Class 'R' fuse clips only, unless indicated otherwise on the drawings.

B. [DS-#]: Non-fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: Type as indicated on the disconnect schedule.

D. Accessories: As indicated on the disconnect schedule.

2.2 MOLDED CASE CIRCUIT BREAKERS AND SWITCHES

A. [CB-#]: Molded Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
   1. Thermal Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip settings.
   3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
      a. Instantaneous trip.
      b. Long- and short-time pickup levels.
      c. Long- and short-time adjustments.
      d. Ground-fault pickup level, time delay, and I2t responses.
   4. Current Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.

B. [CB-#]: Molded Case Switches: Molded case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Accessories: As indicated on the disconnect schedule.

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2.3 MOTOR DISCONNECT SWITCH

A. [DS-#]: Rotary Switch Assemblies: Rated for making and breaking loads, rotary type enclosed switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Enclosures: Type as indicated on the Disconnect Schedule.

C. Ground lug connection provided in enclosure.

D. Accessories: As indicated on the Disconnect Schedule.

E. Listed UL 508 suitable for motor control.

2.4 MECHANICALLY INTERLOCKED DISCONNECT

A. [DSS-#]: Switch and Plug Assemblies: Rated for making and breaking loads, enclosed switch with externally operable interlock to prevent disconnecting receptacle with switch in ON position or inserting receptacle in ON position. Padlock lockable provision to meet OSHA lockout/tagout regulations.

B. Enclosures: Type as indicated on the Disconnect Schedule.

C. Ground lug connection provided in enclosure.

D. Accessories: Matching male pin and sleeve plug, two auxiliary/pilot contacts. As indicated on the Disconnect Schedule.

E. Listed UL 2682 suitable for motor disconnect.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on the drawings.

B. Install fuses in fusible disconnect switches.

C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

3.2 ADJUSTING

A. Set field-adjustable circuit breaker trip ranges.

END OF SECTION

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SECTION 26 51 00 - LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires and accessories

B. Exterior luminaires and accessories

C. Lamps

D. Poles

1.2 REFERENCES

A. ANSI C78.377 - Specifications for the Chromaticity of Solid State Lighting Products

B. ANSI C82.4 - High-Intensity Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

C. ANSI C82.6 - Ballasts for HID Lamps - Method of Measurement

D. ANSI C82.16 - Light-Emitting Diode Drivers - Method of Measurement

E. ANSI C82.11 - High Frequency Fluorescent Lamp Ballasts

F. ANSI C82.77 - Standard for Harmonic Emission Limits and Related Power Quality Requirements for Lighting Equipment

G. IEEE C2 - National Electrical Safety Code

H. NEMA SSL1 - Electronic Drivers for LED Devices, Arrays or System

I. UL 935 - Standard for Fluorescent Lamp Ballasts

J. UL 8750 - Light Emitting Diode (LED) Equipment for use in Lighting Products

K. LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

L. LM-80 - Measuring Luminous Flux and Color Maintenance of LED

M. Project site classification as defined in IESNA RP-33 LZ0 LZ1 LZ2 LZ3 LZ4

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1.3 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Basic Requirements of Submittal:
1. Submit product data sheets for luminaires, lamps, ballasts, drivers and poles. Include complete product model number with all options as specified. Submittal shall be arranged with luminaires listed in ascending order, and with each luminaire's associated lamp, ballast, driver, or pole information following luminaire's product data. Failure to organize submittal in this manner will result in the submittal being rejected.
2. Submit lens product data, dimensions and weights if not included in product data sheet submittal.
3. Include outline drawings, support points, weights, and accessory information for each luminaire.
4. Submit manufacturer origin of LED chipset and driver.

C. LED Lighting - Performance Testing Submittal (when requested by Architect/Engineer):
1. IESNA LM-79: Include photometric report for the latest generation system being furnished. Provide name of independent testing laboratory, report number, date of test, luminaire series/model number, input wattage, and light source specifications.
2. IESNA LM-80: Measuring Lumen Maintenance of LED Light Sources

D. LED Lighting - Control Compatibility Submittal:
1. Submit lighting control capability data for each LED luminaire. The submittal shall clearly identify device data proposed by the Contractor and approved by the luminaire manufacturer for dimming, switching, addressable, wireless, and similar control characteristics.

E. Submit utility rebate forms where offered at project location. Submit completed rebate forms within 30 days of Substantial Completion.

F. LEED Requirements:
1. Light Pollution Reduction:
a. Exterior Luminaires: Submit manufacturer backlight uplight glare (BUG) rating including data showing percentage of light lumens emitted at or above 90° from nadir for each luminaire type.
2. Toxic Material Reduction:
a. Submit manufacturer published data for each lamp type being furnished, indicating mercury content in milligrams per lamp.

1.4 EXTRA STOCK

A. Provide extra stock under provisions of Section 26 05 00.

B. LED Light Engines or Modules: 10 percent of quantity installed, minimum one (1) of each size and type of field replaceable light engine or module. Provide field replacement installation instructions.

C. Lenses: Three (3) percent of quantity installed, minimum one (1) of each size and type.

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D. LED Drivers: 10 percent of quantity installed, minimum one (1) of each size and type.

E. Exit Signs: Provide 10% spare, but not less than 3 additional exit sign luminaires complete with labor, conduit, and wire. Additional exit luminaires shall be located per the Architect/Engineer or provided as attic stock when a location is not defined prior to Owner occupancy. When multiple exit signs are scheduled, the quantity listed above shall represent each type listed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site. Store and protect under provisions of Section 26 05 00.

B. Protect luminaire finishes, lenses, and trims from damage during storage and installation. Do not remove protective films until construction cleanup within each area is complete.

C. Handle site lighting poles carefully to prevent breakage and damage to finish.

1.6 MOCKUP

A. Provide and install luminaires with power and control connections in mockup rooms as identified in Division 1. Approved luminaires in mockup may be reused as part of complete work if in original condition.

1.7 WARRANTY

A. The warranty period begins at the date of Substantial Completion.

B. Ballasts and Drivers:
1. LED Drivers: Five (5) years

C. Lamps and LED Systems:
1. Light Emitting Diode (LED) Light Engines: Five (5) years

D. Emergency Ballasts:
1. Emergency fluorescent ballast shall have a three or five-year warranty from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES AND ACCESSORIES - GENERAL

A. Lensed Troffers: Provide hinged frames with latches and 0.125-inch thick virgin acrylic lenses. Prismatic lenses shall have depth of no less than 0.080", KSH12 or equal. Other lenses as scheduled.

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B. Recessed Luminaires: Confirm ceiling and wall type and furnish trim and accessories necessary to permit proper installation in each system. Where fire-rated ceiling or wall assemblies are specified, furnish and install listed enclosures around luminaires that maintain the system rating.

C. Luminaires: Louvers shall be anodized low iridescent specular aluminum with mitered corners and interlocking construction. Provide ballast covers to separate inboard/outboard lamps when multi-level switching is indicated, so light does not spill into unlit cells.

D. Suspended Luminaires: Coordinate power feed and suspension canopies with ceiling type and architectural RCP for proper fit and location. Ensure finished installations are plumb and level at elevations specified. Verify suspension length prior to submittal.

E. Exit Signs: Stencil face, 6-inch high letters, directional arrows as indicated, universal mounting type as indicated on the drawings.

F. Self-Powered Emergency Lighting Units: One-piece, self-contained unit with sealed, maintenance-free nickel cadmium battery, automatic charger and electronic circuitry. Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

G. Painted reflector surfaces shall have a minimum reflectance of 90%.

2.2 EXTERIOR LUMINAIRES AND ACCESSORIES - GENERAL

A. Listed for wet or damp location as scheduled.

B. Provide low temperature ballasts or LED drivers, with reliable starting to -20°F.

C. In-grade luminaires shall have lamp/optic separation to prevent surface temperature from exceeding 115°F. Compartment separation of wire entry and control gear/lamp chamber.

D. Exterior LED luminaires shall contain separate, easily accessible and replaceable Category C surge protection device.

2.3 LIGHT EMITTING DIODE (LED) LUMINAIRE SYSTEMS

A. Refer to the luminaire schedule for color temperature and minimum color rendering index CRI requirements. Provide light source color consistency by utilizing a binning tolerance within a maximum 3-step McAdam ellipse unless noted otherwise.

B. LED chip arrays specified as color changing shall have chip colors as noted on the luminaire schedule.

C. Rated life shall be minimum of 50,000 hours at L70.

D. LED chips shall be wired so that failure of one chip does not prohibit operation of the remainder of the chip array.

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E. Luminaire minimum lumens is defined as the absolute lumens per the manufacturers LM-79-08 test report.

F. LED luminaires shall be designed for ease of component replacement including modular replaceable boards or Zhaga sockets. Luminaires that are factory sealed and do not have field replaceable parts shall provide a 10-year warranty.

G. LED light engine shall have a maximum LLD of 0.85 at 50,000 hours at 25°C ambient.

H. LED Driver:
1. Solid state driver with integral heat sink. Driver shall have over-heat, short-circuit and overload protection, power factor 0.90 or above and maximum total harmonic distortion of 10 or 20%. Driver shall have a voltage fluctuation tolerance of +/- 10%.
2. Drivers shall have dimming capabilities as outlined in the luminaire schedule for each luminaire type. Dimming shall control light output in a continuous curve from 100% to 10% unless noted otherwise.
3. Driver shall have a minimum of 50,000 hours rated life.
4. Driver shall be tested to ANSI C82-16 for input current inrush, total harmonic distortion (THD), and power factor. Driver start time shall be less than 0.5 seconds to 98% of initial light output. Flicker should be less than 30% throughout the operating range.
5. Driver shall be field replaceable without removal of the luminaire.

2.4 ACCEPTABLE MANUFACTURERS - LAMPS

MANUFACTURER	HALOGEN	FLUORESCENT	COMPACT FLUOR.
Philips Lighting Company	X	X	X
Osram Sylvania	X	X	X
Venture Lighting International Inc.			
GE Lighting	X	X	X
USHIO America, Inc.	X	X	X

A. Lamps used with dimming shall be verified for compatibility with dimmer manufacturer prior to ordering.

2.5 ACCEPTABLE MANUFACTURERS - POLES

A. Manufacturer of Luminaire

B. Valmont Poles

C. U. S. Pole Company

D. KW Industries

E. Kim Lighting

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2.6 LIGHTING POLES

A. Metal Poles: Square or Round base.
   1. Painted poles shall have electrostatic applied polyester powder coated paint finish thermally cured with UV protection. Interior of pole shall be coated with same coating for a minimum of 12" from base plate.
   2. Galvanized steel hot dipped finish to standard AASHTO M 111.
   3. Anodized aluminum finish to MIL-A-8625 Type II, minimum 0.8 mil thickness. Provide anodized color sample to Architect/Engineer prior to ordering.

B. Wind Load: 100 MPH velocity, with 1.3 gust factor with luminaires and brackets mounted.

C. Hand Hole: 2 x 4 inches with removable weatherproof cover installed at manufacturer's standard location. Provide matching gasketed cover plate.

D. Pole Top: Provide slipfitter OR Provide mast arm(s) in array as indicated.

E. Anchor Bolts: As recommended by pole manufacturer. Provide template, flat washers, lock washers, and hex nuts for each pole. Grout between anchor plate and concrete base with non-shrink grout after pole is plumbed.

F. Vibration Damper: Canister or snake type second mode vibration damper internal to the metal pole as recommended by pole manufacturer. Provide additional pole top damper for first mode vibration on single-head metal poles where recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Securely fasten luminaires to the listed and labeled ceiling framing member by mechanical means such as bolts, screws, rivets or listed clips identified for use with the type of ceiling framing members. If ceiling framing is not listed for luminaire size or weight, support luminaires independent of ceiling grid with a minimum of two (2) #12 gauge wires located on diagonal corners.

B. Install recessed flanged luminaires to permit removal from below. Use manufacturer-supplied plaster frames and swing gate supports. Support luminaires independent of ceiling with a minimum of two (2) #12 gauge wires located on diagonal corners.

C. Support surface-mounted luminaires directly from building structure. Install luminaires larger than eight square feet (8 ft2) or weighing more than 30 pounds independent of ceiling framing. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit, unless otherwise noted.

D. Support suspended or pendant mounted luminaires independent of ceiling grid with a minimum of two #12 gauge wires. Suspension assembly and anchors shall be capable of supporting 300 pounds dead load at each suspension point.

E. Install lamps in lamp holders of luminaires.

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F. Adjust aimable luminaires to obtain lighting levels on objects and areas as directed to obtain desired lighting levels.

G. Recessed luminaires and other optical accessories shall remain in protective wraps or films until construction in area is complete and area has been cleaned.

H. Industrial Pendant Luminaires: Use power hook hangers rated 500 pounds minimum or provide safety chain between ballast and structure. Provide safety chain between reflector and ballast.

I. Luminaire Pole Bases: Sized and constructed as indicated on the drawings. Project anchor bolts 2 inches minimum above base. Install poles plumb with double nuts for adjustment. Grout around pole anchor base.

J. Embedded Luminaire Poles: Depth as indicated on drawings. Install plumb.

K. Use belt slings or non-chafing ropes to raise and set pre-finished luminaire poles.

3.2 LAMP SEASONING

A. Operate all fluorescent and HID lamps for 100 hours prior to requesting final observation. Operate dimming fluorescent lamps at 100% output during seasoning. Operate lamps for minimum 8 hour intervals during seasoning.

3.3 CONSTRUCTION USE OF PROJECT LUMINAIRES

A. The Contractor shall provide temporary construction lighting per the requirements of Division 1.

B. The project luminaires shown on the construction documents shall not be used for temporary construction purposes without providing a plan for Owner approval that addresses energy and luminaire operating hours.

3.4 RELAMPING

A. Replace failed lamps at completion of work. Replacement of incandescent and other lamp burnouts after the warranty period starts shall be the responsibility of the final user.

3.5 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire and pole finish at completion of work.

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3.6 LUMINAIRE SCHEDULE

A. As shown on the drawings.

END OF SECTION

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Exhibit B
Bid Response

Saunders North Bid Response and Intent to Award Letter.

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9.0 REFERENCES

References are mandatory – List three (3) references for which your company has completed similar services for projects of similar scope. Colorado K-12 public school references are preferred, if available.

9.1 Company Name Eaton School District RE-2

Address 211 1st St. Eaton, CO 80651

Contact Person Mr. Luke Gonzalez

Telephone 970-454-3402 x 616

Email lgonzales@eaton.k12.co.us

Describe type of work/service performed or items supplied Construction of new school district transportation and maintenance facility.

9.2 Company Name Thompson School District

Address 800 S Taft Ave. Loveland, CO 80537

Contact Person Mr. John Sinnet, Bond Project Manager

Telephone 970-566-2909

Email john.sinnett@thompsonschools.org

Describe type of work/service performed or items supplied Multi-year summer renovation of eight TSD school locations.

9.3 Company Name Teaching Tree Early Childhood Learning Center

Address 424 Pine St. Fort Collins, CO 80524

Contact Person Mrs. Anne Lance

Telephone 970-493-2628

Email alance@teaching-tree.org

Describe type of work/service performed or items supplied Renovation of existing facility to expand classroom and office space.

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10.0 BID CERTIFICATION

DUNN ELEMENTARY SCHOOL HVAC UPGRADES-PHASE 2
IFB #24-121-001

The District will only accept and consider electronically submitted proposals from Contractors, which must be submitted and received in the www.bidnetdirect.com electronic solicitation portal on or before December 13, 2023, 2:00 p.m. MT.

The undersigned hereby affirms that:

- Contractor is a duly authorized agent of the company issuing this IFB and that all information provided in the Bid is true and accurate.
- Contractor has read the conditions and technical specifications, which were made available to the company in conjunction with this IFB, and fully understands and accepts these terms unless specific variations have been expressly listed in the Bid.
- Contractor will adhere to all terms and conditions and provide, at a minimum, all services as expressed in the IFB and/or the company's Bid responding to the IFB.
- Contractor meets or exceeds all of the required criteria as specified by this IFB, or if not, has submitted a Justification for Consideration addressing any failure to meet the criteria.
- Contractor's Bid is being offered independently of any other Contractor and in full compliance with the terms specified in the IFB.
- Contractor will accept any awards made to it, as a result of this IFB for a minimum of ninety (90) calendar days following the date and time of the IFB closing.

Company Name: Saunders North, LLC

Signature of Agent:

Printed Name: Dave Sandlin

Title: President

E-mail address: d.sandlin@saundersinc.com

Mailing address: 1212 Riverside Avenue, Suite 130, Fort Collins, CO 80524

Phone Number: 970-221-4195

Contact Person: Dave Sandlin
(If different from Agent – include e-mail address and phone number)

NOTE: Bids submitted without the signature of an authorized agent of the company may be considered non-responsive and ineligible for the award.

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11.0 BID FORM

DUNN ELEMENTARY SCHOOL HVAC UPGRADES-PHASE 2
IFB #24-121-001

Provide the information requested. Poudre School District reserves the right to reject any or all Bids or any parts thereof. This IFB may be awarded to one (1) Contractor. Contractor agrees to furnish all labor and materials to complete the execution of the scope described in the Bid Documents and any relating Q&A/addenda.

Base Bid Lump Sum – Dunn Elementary School HVAC Upgrades-Phase 2

One Million, Four Hundred and Forty-Five Thousand Dollars($ 1,445,000.00)

Confirm the Q&A Document/Addenda have been received. The modifications to the Bid Documents noted in all Addenda issued have been considered and all costs are included in the above cost(s). It is the responsibility of the Contractor to confirm all project Addenda have been received and included in the submitted Bid (and alter the list below).

Q&A/Addendum # 1 Dated 11/27/2023 Signature David Sandlin

Q&A/Addendum # 2 Dated 12/11/2023 Signature David Sandlin

Company Name: Saunders North, LLC

Authorized Agent's Name: Dave Sandlin, President

Authorized Agent's Signature: David Sandlin

Email: d.sandlin@saundersinc.com

Phone: 970-221-4195

Date: Wednesday December 13, 2023

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SAUNDERS

PSD Dunn Elementary HVAC Upgrades | Subcontractor List

December 13, 2023

Demolition:	Dynamis Demolition
Structural Steel:	Distinctive Welding, Inc.
Roofing:	Front Range Roofing Systems
Doors:	LaForce, LLC (Collins Door & Hardware)
Infill Panels:	Aglasco, Inc.
Acoustical Ceilings:	Acoustics & Interiors
Freezer & Cooler Equip:	Oztek Commercial Services
Full Mechanical:	Wray Plumbing & Heating Co
Electrical & Fire Alarm:	Greiner Electric, LLC
Tele/Data:	Interface Communications, Co.

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Poudre School District

Poudre School District is pleased to announce its intent to award **Invitation for Bid (IFB) 24-121-001, Dunn Elementary School HVAC Upgrades-Phase 2** to:

Saunders North, LLC

The final award of this solicitation is contingent on a successfully negotiated agreement, as well as other requirements set forth by the District and any parties therein.

Poudre School District wishes to express our gratitude for your interest and efforts responding to this Solicitation.

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Poudre School District
Strategic Sourcing
2407 Laporte Avenue
Fort Collins, CO 80524

Exhibit C
General Contract Conditions

See attached .pdf named “Contract - Exhibit C General Conditions”

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GENERAL CONDITIONS OF THE CONSTRUCTION AGREEMENT

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GC 1.00 CONTRACT DOCUMENTS AND DEFINITIONS

All Work under the Construction Agreement shall be accomplished in accordance with the Contract Documents, which shall consist of the Request for Qualifications, Request for Proposals, Proposal(s), Notice of Award, Notice to Proceed, Performance Bond, Labor and Material Payment Bond, Construction Agreement, General Contract Conditions, Supplementary Conditions, Asbestos Management Plan Contractor Responsibility Form, Drawings and Specifications, tests and engineering data, approved Change Orders, Contractor's Requests for Payment, Architect's Certificates, and all addenda issued by theOwner or Architect prior to execution of the Construction Agreement and all modifications issued by theOwner or Architect after execution of the Construction Agreement.

With respect to the Contract Documents, the following definitions and understandings shall control:

1.01 *"Contract" or "Contract Documents"* shall include all of the items enumerated in GC-1.00 above.

1.02 *"Owner"* shall mean Poudre School District R-1, and shall include its duly authorized representatives.

1.03 *"Contractor"* shall mean the corporation, company, partnership, firm, entity, or individual named and designated as such in the Construction Agreement, and any persons or entities acting on its behalf.

1.04 *"Subcontractor"* shall mean any corporation, partnership, entity, or individual having a direct contract with the Contractor or another subcontractor for performing Work and/or furnishing laboror material on the Project covered by the Contract.

1.05 *"Architect"* shall mean the corporation, partnership, entity or individual named and designated as "architect" or "engineer" in the Construction Agreement, and any persons or entities actingon the Architect's behalf and within the scope of the particular duties properly entrusted to them in eachcase. In the event that there is no Architect on the Project, then "Architect" shall refer to Owner and its duly authorized representative.

1.06 *"Notice to Contractor"* shall be deemed to have been duly served if made in writing and delivered in person to the individual or to a member of the firm or to an officer of the corporation for which it is intended, or if sent by registered or certified mail, to Contractor's last known business address.

1.07 *"The Work"* shall mean the construction and services required by the Contract Documents for completion of the Project, and includes all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations, whether on or off the Project site, and all labor, materials equipment and services provided or to be provided by subcontractors,sub-subcontractors, or any other entity for whom the Contractor is responsible.

1.08 *"The Project"* is the total construction designed by the Architect of which the Work performed under the Contract Documents may be the whole or a part.

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1.09 *The "date of final completion" and "finally completed"* shall mean the date when construction is certified by the Architect to be finally completed in accordance with the Contract Documents, as modified by any Change Orders processed under the terms of GC-23.00 below and when the Owner has fully accepted the Project for the use for which it was intended. Such date will be set forth on a letter of acceptance issued by the Owner.

1.10 *"Drawings" or "plans"* shall mean all (a) drawings furnished by the Owner and/or Architect as a basis for the award of Contract and for construction of the Project; (b) supplementary drawings furnished by the Owner and/or Architect to clarify and to define in greater detail the intent of the Contract drawings and specifications; (c) drawings submitted by the successful Contractor as may be required after the Contract is awarded; (d) drawings furnished by the Owner and/or Architect to the Contractor during the progress of the Work; and (e) engineering data and drawings submitted by the Contractor during the progress of the Work, provided such drawings are acceptable to the Architect and Owner.

1.11 *"Specifications"* are the written technical information concerning materials, components, systems, equipment, and manner of installation as indicated on the drawings or plans and which state the quality, performance, and characteristics to be achieved by application of construction methods.

1.12 *"Change Order"* shall mean a written order to the Contractor signed by the Owner or its authorized agent issued after the execution of the Construction Agreement, authorizing a change in the Work and/or adjustment in the Guaranteed Maximum Price ("GMP") or the contract time schedule. Each adjustment in the GMP resulting from a Change Order shall clearly separate the amount attributable to the Cost of the Work and the Contractor's Fee.

1.13 *"day" or "days"* shall mean calendar days. In computing a period of days, when the ending date is not specified, the first day is excluded and the last day is included. If any deadline falls on a Saturday, Sunday, or federal or Colorado state holiday, such deadline will be extended to the next day that is not a Saturday, Sunday or federal or Colorado state holiday.

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GC 2.00 REFERENCE STANDARDS

Reference to the standards of any technical society, organization, or association, or to codes of local or state authorities, shall mean the latest standard, code, specification, or tentative standard adopted and published as of the date of execution of the Construction Agreement, unless specifically stated otherwise.

GC 3.00 DRAWINGS AND SPECIFICATIONS

3.01 *Ownership of Drawings.* All drawings, specifications, and copies thereof furnished by the Architect are the property of the Architect and the Owner, whether or not the Work for which they are made is performed, and are not to be used on other Work except by written agreement with the Architect and the Owner.

3.02 *Figured Dimensions to Govern.* Dimensions and elevations shown on the drawings shall be accurately followed. No Work shown on the drawings, the dimensions of which are not indicated, shall

be executed until necessary dimensions have been obtained from the Architect.

3.03 *Contractor to Check Drawings and Schedules.* The Contractor shall check and verify all dimensions, elevations, and quantities shown on the drawings and furnished to it by the Architect, and shall notify the Architect of any discrepancy between the drawings and the conditions on the ground, or any error or omission in drawings, or in the layout as given by stakes, points, or instructions that it may discover. Before ordering any material or doing any Work, the Contractor shall verify all measurements concerning the Project and shall be responsible for the correctness of same. No extra charge orcompensation shall be allowed on account of any difference between actual dimensions and the measurements indicated on the drawings. Any difference that may be found shall be submitted to the Architect for consideration and written determination before proceeding with the Work. The Contractor shall not be allowed to take advantage of any error or omission in the drawings or Contract Documents. Full written instructions shall be furnished by the Architect should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified.

3.04 *Detail Drawings and Instructions.* The Architect shall furnish with reasonable promptness additional instructions, by means of drawings or otherwise, necessary for the proper execution of the Work. All such drawings and instructions shall be consistent with the Contract Documents. The Work shall be executed in conformity with the Architect's drawings and instructions, andthe Contractor shall do no Work without proper drawings and instructions.

3.05 *Drawings and Specifications Available on the Site.* The Contractor shall maintain at the Project site for the Owner and the Architect a Project record set of drawings, including addenda, approved shop drawings, Change Orders, and other modifications, with all changes or deviations from the original drawings neatly marked thereon in a contrasting color. The Contractor shall also maintain a Project record set of specifications at the Project site, noting therein by appropriate section the names, models, and other distinguishing characteristics of the materials actually incorporated into the Work. This Project record set of drawings and specifications shall be updated daily as the Project progresses and shall be made available to the Owner and Architect for inspection at all times. Upon final completion of the Workand before final payment, three (3) copies and one (1) electronic of this Project record set of drawings and specifications shall be delivered to the Owner. One (1) copy of this Project record set of drawings andspecification shall be delivered to the Architect.

3.06 *Laws and Regulations.* The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations bearing on the conduct of the Work as drawn and specified. If the Contractor observes that the drawings and specifications are at variance therewith, it shall promptly notify the Architect in writing, and any necessary adjustments shall be made as provided in the Contract for changes in the Work. If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules, or regulations without giving the required notice to the Architect and receiving a writtendirective to proceed, it shall bear all costs arising therefrom and to correct and/or remedy same.

GC 4.00 ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend all suits or claims for infringement of patent rights and shall hold the Owner harmless from any and all liability or loss

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on account thereof. If the Contractor has information that the process or article specified involves the infringement of a patent, it shall be responsible for any and all liability or loss resulting therefrom unless it promptly furnishes such information to the Architect in writing.

GC 5.00 ITEMS COVERED BY CONTRACT PRICE

5.01 *Items Supplied by Owner.* Owner shall supply the following items for the Project:

a. Building Permit;

b. Initial Survey;

c. Materials Testing Including Soil Testing;

d. Third Party Inspections;

e. Commissioning; and

f. Test and Balance as Required for Commissioning.

5.02 *Items Supplied by Contractor.* Unless specifically stated otherwise, the Contractor shall accept the compensation stated in the Construction Agreement as full payment for furnishing all the materials, transportation, apparatus, temporary structures, equipment, services, fuel, energy, light, water, labor and tools, and all other things necessary for the complete and proper execution of the Work contemplated by or reasonably implied from the Contract Documents, within the time limits indicated therein. Such amount shall include any loss or damage resulting from the nature of the Work, from the elements or from any unforeseen difficulties that may be encountered; all risks of every description connected with the prosecution of the Work; all expenses incurred in consequence of any suspension or discontinuance of the Work; and all other amounts necessary for completing the Work pursuant to the Contract Documents within the time limits indicated therein.

GC 6.00 EXECUTION, CORRELATION, INTENT, AND INTERPRETATION OF CONTRACT DOCUMENTS

6.01 *Execution.* The Construction Agreement and other Contract Documents shall be signed in multiple copies as directed by the Owner. Within ten (10) days of Notice of Award, the Contractor shall submit to the Owner a minimum of five (5) fully executed original sets of the Construction Agreement; Performance Bond, and Labor and Material Payment Bond with original Power of Attorney; and certificates of required insurance coverage. The date of the Contract for purposes of these documents shall be the date of the Notice of Award letter. The Owner shall execute the Construction Agreement, assemble all copies, and distribute the Contract Documents. The Contractor shall not commence the Work until it receives the Notice to Proceed. All bonds and insurance certificates shall be submitted to the Owner prior to the award of the first subcontract.

6.02 *Correlation.* By executing the Construction Agreement, the Contractor represents that it has visited the Project site, familiarized itself with the local conditions under which the Work is to be

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performed, and correlated its observations with the requirements of the Contract Documents.

6.03 *Intent.* The intention of the Contract Documents is to include all labor and materials, tools, equipment, construction equipment, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work. Materials or Work described in words that, as applied, have a well-known technical or trade meaning shall be held to refer to such recognized meaning. The organization of the specifications into divisions, sections, and articles, as the case may be, and the arrangement of drawings shall not control the Contractor in dividing the Work among subcontractors or in establishing the extent of Work to be performed by any trade. It is intended that even though Work is not covered under any heading, division, section, article, branch, class, or trade of the specifications, it shall nevertheless be supplied if it is required elsewhere in the Contract Documents or is reasonably inferable therefrom as being necessary to produce the intended results. The specifications and drawings are intended to supplement but not necessarily duplicate each other. Any Work exhibited in the one and not in the other shall be executed as if it had been set forth in both, so that the Work will be constructed according to the complete design as determined by the Architect.

6.04 *Interpretation.* Should anything necessary for a clear understanding of the Work be omitted from the specifications and drawings, or should the requirements appear to be in conflict, the Contractor shall secure written interpretations or instructions from the Architect before proceeding with the Work affected thereby. The Contractor shall secure written interpretations or instructions by submitting the Owner's form Request for Interpretation to the Architect. Oral requests shall not be acknowledged by the Architect or Owner. Additional costs incurred by the Owner as a result of unnecessary requests made by the Contractor, as determined by the Owner, shall be the responsibility of the Contractor. It is understood and agreed that the Work shall be performed according to the true intent of the Contract Documents.

6.05 *Conflict in Interpretation.* In the case of discrepancy or in the event of a conflict between the different Contract Documents, the documents shall take precedence in the following order:

a. Change Orders;

b. Written Amendments to Construction Agreement (including, if applicable, the GMP);

c. Construction Agreement;

d. General Conditions;

e. Drawings and specifications; and

f. Bid Documents, including addenda.

Where two or more of the Contract Documents are complementary, the more detailed provision shall control over the more general provision.

GC 7.00 MATERIALS, LABOR, FACILITIES, AND STORAGE

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7.01 *Contractor's Responsibility.* Unless otherwise agreed in writing, the Contractor shall provide and pay for all materials, labor, tools, equipment, machinery, transportation, and other facilities necessary for the proper execution and completion of the Work. The Contractor shall provide and pay for all the temporary facilities required to supply all the power, light, water, and heat needed by it and its subcontractors for their Work and shall install and maintain all such facilities in such manner as to protect the public and workers and to conform with any applicable laws and regulations. If temporary heat and/or protection is required for the expeditious prosecution of the Work and before the permanent heating apparatus is available for use, the temporary heating apparatus shall be installed and operated in such a manner that the finish Work and/or construction will not be damaged thereby. Unless otherwise specified, the Contractor shall pay for all the power, light, and water used by it and its subcontractors, without regard to whether such items are metered by temporary or permanent meters. The cutoff date on permanent meters shall be either the agreed date of full occupancy by the Owner or the date of final acceptance of the Project, whichever shall be the earlier date. Upon completion of the Work, the Contractor shall remove all surplus materials, tools and such temporary facilities and structures, furnished by the contractor from the Project site. All debris and rubbish caused by the operations of the contractor shall be removed, and the area occupied during construction activities shall be restored to its original condition, within 48 hours of project completion, unless otherwise directed by the municipality or owner's representative.

7.02 *Materials.* Unless otherwise specified, all materials shall be new and both Workmanship and materials shall be of the highest quality. The Contractor shall furnish satisfactory evidence to the Owner as to the kind and quality of materials. Samples shall be furnished, when specified, and the Work shall be in accordance with those samples that have been approved.

7.03 *Toilet Facilities.* The Contractor shall provide and maintain, in a neat and sanitary condition, adequate temporary toilet facilities for the use of any and all employees engaged on the Work, in strict compliance with the requirements of all applicable codes, regulations, laws, and ordinances. In no event may present toilet facilities of any existing building at the site of the Work be used by employees of the Contractor or its subcontractors. Upon final completion of the Work, the Contractor shall remove all such temporary facilities from the site and disinfect the premises.

7.04 *Facilities and Storage.* The Contractor shall provide suitable temporary facilities and quarters for workers, as needed, and shall maintain on premises water-tight storage sheds or tool houses for storage of building materials and tools that could be damaged by weather. The Contractor shall allow space for the erection of sheds and provide similar facilities for storage by subcontractors of their materials and tools. Storage of materials shall be confined to the site. These facilities or quarters shall further provide for protection against theft and damage of building materials and tools. Upon final completion of the Work, the Contractor shall remove all such temporary facilities from the site.

7.05 *Office Space.* The Contractor shall provide adequate, weatherproofed, heated and well-lighted office space at the site of the Work, for use by the Architect and the Owner and their representatives, unless otherwise directed by the Owner in writing. The Contractor shall also provide telephone service at such office, which shall be available for use by the Architect, the Owner, and their representatives without charge, except for toll calls, unless otherwise directed by the Owner in writing.

7.06 *Quality and Location of Facilities.* All of the foregoing facilities shall be of a quality and

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placed in locations acceptable to the Architect and the Owner.

GC 8.00 PERFORMANCE AND PAYMENT BONDS

8.01 *Required Bonds.* The Contractor shall, within ten (10) days from the Notice of Award furnish bonds to the Owner in the full amount of the contract price, covering both the faithful performance of the Contract and the payment of all obligations for labor and materials arising thereunder, on such customary forms as the Owner may prescribe and with such sureties as it may approve. The amount of the bonds shall be increased, if necessary, to reflect approved changes in the Work that result in an increase in the total cost of the Work plus the Contractor's fees. Such bonds shall be duly executed by a qualified surety licensed to do business in the State of Colorado, conditioned upon the true and faithful performance of the Contract, and shall provide that if the Contractor or its subcontractors fail to duly pay for any labor, materials, or other supplies used or consumed by such Contractor or its subcontractors in the performance of the Work contracted to be done, the surety will pay the same in an amount not exceeding the sum specified in the bond, as adjusted by approved Change Orders, and together with interest as provided by law. The performance bond shall additionally guarantee that the Contractor shall remedy any omissions, correct any and all defects, and adjust and make operable all component parts of Work falling under the requirements of the Contract that may be called to the Contractor's attention within a period of twenty-four (24) months following the date of the letter of acceptance.

8.02 *Additional Bond Requirements.* The premium for all bonds shall be paid by the Contractor and included in the bid price in the bid proposal. The Owner will accept and approve bonds written by sureties legally authorized to write such bonds in the State of Colorado, provided such surety companies are rated in Best's Insurance Guide (latest edition), not lower than A- or have Best's Financial Rating of at least X. If, at any time a surety on such a bond becomes irresponsible or loses its right to do business in the State of Colorado, new bonds shall be provided by an alternate surety licensed to do business in the State and meeting the requirements of this Section 8.00.

GC 9.00 PERMITS AND COMPLIANCE WITH STATUTES, RULES, AND REGULATIONS

9.01 *Permits.* Any local permits, governmental fees, and licenses necessary for the proper execution and completion of the Work shall be secured and paid for by the Contractor. Owner will pay for and secure building permit from Colorado Division of Fire Prevention and Control. Easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner, unless otherwise specified in writing. The Owner is generally exempt from paying any fee for any building permit issued by any building departments or agencies located in Larimer County, and the Contractor shall see that no building permit fee is paid. The Owner shall negotiate and provide for all electrical, gas, water, and sewer mains for the Contractor's connections. The Contractor shall arrange with the utility company for actual connection, make necessary connections, and pay for all associated inspection fees and permits as required by any government agency. In addition, the Contractor shall furnish all material and items required to complete all connections. The Contractor shall call for all inspections on a timely basis by any agency having jurisdiction over the Work.

9.02 *Compliance with Statutes, Rules and Regulations.* The Contractor and all subcontractors

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shall comply with all applicable federal and state statutes, rules, regulations, and directives of the State Division of Fire Prevention and Control, and other governmental body having jurisdiction over the work to be performed. If any of the provisions of the Contract Documents are in conflict therewith, such portions shall be considered stricken and the applicable statute, ordinance, regulation, or ruling substituted therefor. All such cases of apparent conflict coming to the attention of any party shall immediately be called to the attention of the Owner. The Contractor shall strictly observe and comply with all federal and state laws pertaining to the employment and payment of labor.

GC 10.00 SURVEYS, BENCHMARKS, MONUMENTS, STAKES, AND MEASUREMENTS

10.01 *Surveys.* As provided by the Owner, the Contractor shall obtain from the Architect a copy of all surveys describing property lines, elevation benchmarks, physical characteristics, and utility locations.

10.02 *Benchmarks.* The Contractor shall properly stake out the Work and provide and rigidly set benchmarks and batter boards as necessary for the proper performance of the Work. The Contractor shall remain responsible for their maintenance and their accuracy. A permanent benchmark, approved as to location and type by the Architect, from which all grades are to be taken, shall be established near the site of the Work by the Contractor. From this benchmark the Contractor shall ascertain all grades and levels to Project buildings as needed. The Contract Documents shall include all necessary information to establish the benchmark.

10.03 *Preservation of Monuments and Stakes.* The Contractor shall carefully preserve all monuments, benchmarks, property markers, reference points, and stakes. In case of the destruction thereof, the Contractor shall be charged with the expense of replacement and shall be responsible for anymistake or loss of time that may be caused. Permanent monuments and/or benchmarks that must be removed or disturbed shall be protected until properly referenced for relocation. The Contractor shall furnish all materials, labor and assistance for the proper replacement of such monuments and benchmarks.

10.04 *Measurements.* Before ordering any material or performing any Work, the Contractor shall verify all measurements on the Project and shall be responsible for the accuracy of same. No extra charge or compensation shall be allowed because of any difference between actual dimensions and the measurements indicated in the drawings or specifications. Any discrepancies shall be submitted to the Architect and Owner for consideration before proceeding with the Work.

GC 11.00 CHANGED CONDITIONS

The Contractor shall promptly, and before such conditions are disturbed, notify the Owner and the Architect in writing of: (1) sub-surface or latent physical conditions at the Project site differing materially from those indicated in the Contract Documents, or (2) unknown physical conditions at the Project site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract Documents. The Owner and the Architect shall promptly investigate the conditions, and if the Owner finds that such conditions do so materially differ and cause an increase or decrease in the cost of or the time required for performance of the Work, an equitable adjustment shall be made and the Contract modified in writing accordingly. Any claim of the

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Contractor for adjustment hereunder shall not be allowed unless it has given notice as required.

GC 12.00 PROTECTION OF PERSONS, WORK AND PROPERTY

12.01 *Building Exits and Barricades.* During the course of construction, the Contractor shall keep all required building exits free and unimpeded. Such exits shall not be closed at any time for any reason while the building is occupied or at any time when the building is unoccupied, except after writtenapproval is given by the Owner and proper warning and directional signs are posted. Barricades shall be erected so that traffic is separated and protected from the construction.

12.02 *Precautions.* The Contractor shall take all necessary precautions to ensure the safety of all employees and other persons on the Project or who may be affected by the Contractor's Work thereon.The Contractor shall also take all necessary precautions to protect the Work and all temporary facilities, as well as materials, tools, and equipment incorporated therein or to be incorporated therein from damage or destruction, whether in storage on or off the Project site and whether in the custody or control of the Contractor or any of its subcontractors. The Contractor shall also take all necessary precautions toprotect all property at the Project site and adjacent thereto not designated for removal, relocation or replacement, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities.

12.03 *OSHA Compliance.* The Contractor shall comply with all applicable provisions of the Occupational Safety and Health Administration ("OSHA") and all laws, ordinances, rules, regulations, and orders of all governmental agencies or authorities having jurisdiction to protect the safety of employees and/or other persons who may be affected by the Work. The Contractor shall erect and maintain all necessary safeguards to protect workers on the Project site and the owners and users of adjacent property, and shall post danger signs and other warnings against hazards created by the Work including but not limited to protruding nails, hoists, well holes, elevator shafts, hatchways, scaffolding, window openings, stairways, excavations, and falling materials. The Contractor shall designate a responsible employee at the Project site as a safety officer to ensure the Contractor's compliance with this section. Said employee shall be the Contractor's superintendent unless otherwise designated in writing by theContractor to the Owner and the Architect.

12.04 *Contractor's Liability.* The Contractor shall be liable for all injury, damage or loss to any person or property caused in whole or in part by the Contractor, any of its subcontractors, or any person employed by or under the direction of the Contractor or any of its subcontractors. To the extent possible and unless otherwise directed by the Owner or Architect, the Contractor shall promptly repair, pay for or otherwise remedy any such injury, damage or loss and shall indemnify and hold harmless the Owner against any and all liability, claims, damages, losses and expenses arising therefrom. The terms of this section shall not apply in the case of injury, damage or loss proximately caused by the acts or omissions of the Owner and/or Architect and not attributable to any fault or negligence of the Contractor.

12.05 *Emergencies.* In the event of an emergency that threatens the safety or life of any personor threatens to damage or destroy the Project and/or any Work, materials, equipment or property thereon or to be used thereon, the Contractor shall act at its discretion to prevent such injury, death, damage or destruction. The Contractor shall immediately notify the Owner and Architect in writing of any such emergency and any action taken by the Contractor in response thereto. Any compensation due the

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Contractor for such emergency action shall be determined by agreement of the Contractor, Owner and Architect, and an appropriate Change Order shall be issued therefor.

GC 13.00 WORK ON EXISTING BUILDINGS

13.01 *Protection of Occupants.* In addition to all other requirements of the Contract Documents, if the Work involves an addition or alteration to an existing building, the Contractor shall erect and maintain during the progress of the Work suitable dustproof partitions to protect such building and the occupants thereof. If necessary, in the Owner's or Contractor's judgment or pursuant to manufacturer's directives or recommendations in order to protect occupants from noxious fumes, odors,or hazardous substances, the Contractor may be required to provide additional ventilation and/or work different or extended hours to avoid disruption to other activities within the existing building. Contractorshall protect and keep from harm all occupants of an existing building from construction activities, and shall include a safe pathway into and out of the school.

13.02 *Partitions and Scheduling.* If any portions of an existing building are to be remodeled or repaired, such portions shall be adequately partitioned off with dustproof partitions and well ventilated. All remodeling Work shall be scheduled and submitted to the Owner and Architect for approval. The various contractors shall schedule their Work jointly, in order that each may accomplish its Work within such existing building in an orderly fashion during regular school vacation periods where possible, or in such a manner as to permit full use of the building and without impairment of any existing facilities.

13.03 *Existing Systems.* Existing building systems, such as fire alarm, temperature controls and air distribution, security systems, public announcement systems, irrigation systems, and the like, shall be demonstrated and noted by Owner to the Contractor as operational prior to Contractor's commencing the Work and Contractor may participate in observation of such systems. Such systems are the responsibility of the Contractor to maintain in pre-construction condition.

GC 14.00 CONTRACTOR'S SUPERINTENDENCE AND SUPERVISION

14.01 *Superintendent.* During the progress of the Work, the Contractor shall ensure that a competent superintendent and any necessary assistants, all satisfactory to the Architect and the Owner, are on the Project site at all times while Work is in progress. The superintendent shall not be changed bythe Contractor except with the written consent of the Architect and the Owner, unless the superintendentceases to be in the Contractor's employ. The superintendent shall represent the Contractor on the Projectand all directions given to him/her shall be as binding as if given to the Contractor. The Architect and theOwner shall not be responsible for the acts or omissions of the superintendent or his/her assistants.

14.02 *Supervision.* The Contractor shall provide full-time, qualified, and efficient supervision of the Work, using competent skill and attention. The Contractor is responsible for determining and supervising all temporary and permanent erection and construction sequences, techniques, means, or methods. The Contractor shall direct, schedule, coordinate the Work to ensure that all parts fit together properly and in accordance with the Contract Documents. The Contractor shall carefully study and compare all Contract Documents and other instructions and shall at once report to the Architect and theOwner any error, inconsistency, or omission that Contractor may discover.

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14.03 *Additional Supervision Duties.* The Contractor shall see that the Work is carried out in accordance with the Contract Documents and in a thorough and first-class manner in every respect. The Contractor shall provide engineering, surveying, and coordination to accurately establish all lines, levels, and marks necessary to facilitate the operations of all parties involved in the Contractor's Work. The Contractor shall lay out the Work in a manner satisfactory to the Architect, making permanent records of all lines and levels required for excavation, grading, and foundations, and for all other parts of the Work. The Contractor shall be responsible for the commencement and the proper completion of the various stages and sequences of construction. The Contractor shall strictly adhere to the approved construction schedule.

GC 15.00 SUBSTITUTIONS

The Contractor shall be held to have used in its base proposal and to furnish under the Contract those items of equipment and/or materials that are specifically identified in the plans and specifications by a manufacturer's name, model, or catalog number. Items of equipment and/or materials of the Contractor's choice may be offered as alternates to the items named in the plans and specifications by submitting, with the proposal and on the form provided, identifying data on the articles proposed together with a statement of the amount of addition or deduction from the base bid if the bidder's alternate is accepted. Prior approval by the Architect is not required on items submitted as alternate bids. After execution of the Construction Agreement, substitution of equipment and/or materials of makes other than those specifically named in the Contract Documents may be approved by the Owner so long as the equipment or material proposed for substitution in the opinion of the Owner is just as suitable as the equipment and/or materials named in the plans and specifications so far as performance, construction, efficiency, and utility are concerned. A request for substitution shall ordinarily be required to be based upon one or more of the following grounds: the specified equipment or material is no longer available, a substitution will improve lead time, quality will be improved (documented detail required), or the Owner will incur substantial savings. All requests for substitution must be submitted in writing with supporting documentation by or through the Contractor to the Architect for initial review and recommendation before being submitted to the Owner for evaluation and final approval. In the absence of the Owner's written approval, no substitution of equipment or materials shall be allowed for any items specified in the Contract Documents. In case of a difference in price, occurring as a result of an approved substitution, the Owner shall receive all benefit of the difference in cost involved in the substitution. All approved substitutions shall be documented by the issuance of a formal Change Order as provided in these General Conditions.

GC 16.00 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

16.01 *Shop Drawings.* "Shop drawings" are drawings, diagrams, illustrations, schedules, performance charts, brochures, manufacturer's literature, and other data that are prepared by the Contractor or any subcontractor, manufacturer, supplier, or distributor, and that illustrate some portion of the Work. Shop drawings shall be submitted in both hard copy and electronic format.

16.02 *Samples.* "Samples" are physical examples furnished by the Contractor to the Owner and/or Architect to illustrate materials, finishes, equipment, or Workmanship, and to establish standards by which the Work will be judged.

16.03 *Product Data.* "Product data" are illustrations, standard schedules, performance charts,

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instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work. Product data shall be submitted in both hard copyand electronic format.

16.04 *Contractor's Obligations.* The Contractor shall review, approve, stamp an then submit to the Architect shop drawings, product data, samples, and similar submittals required by the Contract Documents with reasonable promptness and in such a sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Shop drawings, product data, samples, and similar submittal required by the Contract Documents shall properly identify specified items. At the time of submission, the Contractor shall inform the Architect in writing of any deviation in the shop drawings, product data, or samples from the requirements of the Contract Documents. Substitutions will be allowed only in accordance with the provisions of GC-15.00. The number of copies and format of submittal shall be as required by the Architect, but, at a minimum, shall include three (3) copies and one (1) electronic copy of the original shop drawings and product data for the Owner.

16.05 *Verification.* By approving and submitting shop drawings, product data, and samples, the Contractor thereby represents that it has determined and verified all field measurements, field construction criteria, dimensions, elevations, quantities, materials, catalog numbers, and similar data, as shown on the drawings and specifications furnished by the Architect, or will do so, and that it has checkedand coordinated each shop drawing, product data, and sample with the requirements of the Work and ofthe Contract Documents.

16.06 *Architect/Owner Review.* The Architect shall review and approve shop drawings, product data, and samples with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The Architect's approval of a separate item shall not indicate approval of any assembly in which the item functions. Upon the final completion of the Work, the Contractor shall furnish to the Architect two corrected copies of all shop or setting drawings showing the as-built condition of the Work. The Architect, after review, shall submit one of these copies to the Owner.

16.07 *Corrections.* The Contractor shall make any corrections required by the Architect and shall resubmit the required number of corrected copies of shop drawings or new samples until approvedby the Architect. The Contractor shall direct specific attention in a separate writing or on resubmitted shop drawings to revisions other than the corrections requested by the Architect on previous submissions.

16.08 *Contractor's Responsibility.* The Architect's approval of shop drawings, product data, or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval of the specific deviation. The Architect's approval shall also not relieve the Contractor from responsibility for errors or omissions in the shop drawings, product data, or samples.

16.09 *Architect Approval Required.* No portion of the Work requiring the submission of a shop drawing, product data, or sample shall be commenced until such submittal has been approved in writingby the Architect. All such portions of the Work shall be in accordance with approved shop drawings, product

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data, and samples. All material finishes and samples shall be approved at one time. The Contractor shall submit all items requiring approval of finishes, color, material, etc., with sufficient lead time to allow simultaneous consideration and preparation of complete finish color schedule. No approvals of single items shall be considered.

16.10 *Copies to Owner.* When shop drawings, product data, samples or similar submittals have been approved and stamped by both Contractor and Architect, Contractor shall immediately forward an electronic copy of each to the Owner.

GC 17.00 CASH ALLOWANCE

The Contractor shall include in the Contract Sum, if applicable, all allowances named in the Contract Documents and shall cause the work so covered to be done by such contractors and for such sums as the Owner may direct, the Contract Sum being adjusted in conformity therewith. The Contractor declares that the Contract Sum includes such sums for expenses and profit on account of cash allowances as Contractor deems proper. No demand for expenses or profit other than those included in the Contract Sum shall be allowed. The Contractor shall not be required to employ for any such work persons against whom he has filed a lien or has a reasonable objection due to previous legal claims.

GC 18.00 EXPEDITING MATERIALS

The Contractor shall, immediately after receipt of the Notice of Award and approval of its list of subcontractors and material suppliers, place orders for all equipment, materials, and supplies required for the Work. The Contractor shall, when requested, submit to the Architect evidence that such orders have been placed. The Contractor shall exercise due diligence in seeing that all equipment, materials, and supplies are delivered well in advance of the time they are needed on the Project and shall properly store and protect same at its expense and in accordance with these General Conditions, either at the Project site or elsewhere as approved by the Architect.

GC 19.00 BLASTING

No explosives of any nature except for those normally employed in powder actuated tools, .38 caliber or smaller, shall be employed or used on the Project site except with the express and specific prior written approval of the Architect and the Owner and any appropriate governmental authorities, in each instance. The Contractor shall notify the Architect of need for such approval three (3) days prior to the proposed use of such explosives.

GC 20.00 SOIL TEST REPORT

The Owner may arrange for a separate consultant to conduct field and laboratory soil investigations on the Project site and to prepare a report of its findings. Such a report, if prepared, shall be available for review by the Contractor in the Architect's office. Such data is offered solely for reference and is not to be considered a part of the Contract Documents. The data contained in any such document prepared for the Owner by a separate consultant is believed to be reliable; however, the Owner and Architect do not

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guarantee its accuracy or completeness. All applicable subcontractors shall be fully familiar with the contents of such reports, if prepared, and shall consider and evaluate them in the performance of their contracts and the Work.

GC 21.00 HAZARDOUS MATERIALS

21.01 *Responsibility and Reporting.* Unless otherwise provided in the Contract Documents, the Contractor shall have no responsibility for the presence, handling, removal or disposal of hazardous materials in any form at the Project site, including but not limited to asbestos, asbestos products, polychlorinated biphenyl (PCB), lead, or other hazardous materials. Prior to its commencement or continuation of any portion of the Work, the Contractor shall provide notice to the Owner of the presence, location, amount and condition of any known or suspected hazardous materials that are discovered at the Project site. Such notice shall be in writing and shall be submitted no more than twenty-four (24) hours after the presence of such materials becomes known or suspected.

21.02 *Contractor's Obligations.* In the event hazardous materials become known or suspected by the Contractor as described in GC-21.01 above, the Contractor shall not proceed with or continue the Work until it has received written authorization from the Owner. If the Contractor proceeds with the Work without said authorization, it assumes any and all responsibility and liability for contamination and cleanup at the Project site according to applicable federal and state laws, and for any death or personal injury, including but not limited to medical expenses that may be incurred by any individual as a result of exposure to hazardous materials on the Project site.

21.03 *Owner's Obligations.* In the event hazardous materials are identified or encountered during the course of the Project, the Owner at its expense shall take reasonable actions to properly and safely deal with such materials.

21.04 *Management Plan.* The Contractor acknowledges that it and its employees, agents and subcontractors have the responsibility of being fully informed of the Owner's Management Plan as it relates to buildings located at the Project site and shall consult with the Owner about how such plan addresses suspected or active asbestos-containing material areas within such buildings.

GC 22.00 DAMAGE TO UTILITIES

22.01 *Adequate Precautions.* The Contractor shall take adequate precautions to protect existing utilities on and off the Project site and avoid damage thereto. The Contractor shall repair or replace or have repaired or replaced at its expense any damage to streets, water, sewer, light, power, cable, or telephone lines or fiber network that are damaged by reason of the Contractor's Work.

22.02 *Location.* The location and extent of underground utilities, fiber network, cables and conduit indicated on the drawings are not guaranteed. This information is shown only for such use as bidders and contractors may choose to make of it. The Contractor shall check with all public utility companies for locations and shall comply with their regulations regarding such utilities in performing the Work.

22.03 *Protection from Damage.* The Contractor shall adequately protect active underground

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utilities from damage, and if damaged shall immediately effect all necessary repairs. Removal or relocation of active underground utilities shall be done only as indicated on the drawings. If such utilities are in use, they shall be maintained in continuous service. If not indicated on the drawings or not known to exist, the Contractor shall report discovery of such utilities to the Architect and shall not proceed further until directed to do so.

22.04 *Inactive or Abandoned Utilities.* Inactive or abandoned utilities, whether or not they are indicated on the drawings, shall be recorded as to location and depth and shall be removed for a distance of not less than three (3) feet from the outside line of all concrete Work unless otherwise required by regulations. Ends shall be capped or plugged. There shall be no adjustment of the Contract amount for Work due to inactive or abandoned utilities.

GC 23.00 CHANGES IN THE WORK

23.01 *Change Orders.* The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Project consisting of additions, deletions, or other revisions. Under such circumstances, the GMP, if applicable and established, and the Contract Time Schedule shall be adjusted accordingly. All such changes in the Work shall be authorized by Change Order. No Change Order or other form of order or directive by the Owner or Architect requiring additional compensable Work to be performed, which causes the aggregate amount payable under the Contract Documents to exceed the amount appropriated for the original agreement, shall be issued unless the Contractor is given written assurance by the Owner that lawful appropriations to cover the costs of the additional Work have been made. Any claim of the Contractor for adjustment under this section must be asserted in writing within ten (10) days from the date of the Contractor's receipt of the Change Order.

23.02 *Minor Changes.* The Architect shall have authority to order minor changes in the Work not involving an adjustment in the GMP or an extension of the Contract Time Schedule and not inconsistent with the intent of the Contract Documents. Such changes may be effected by field order or by other written order. Such changes shall be binding on the Owner and the Contractor. In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in this Article.

23.03 *Price Differential.* The cost or credit resulting from a change in the Work shall be determined in one or more of the following ways:

a. By estimate, with a detailed cost breakdown as set forth in GC-23.03(c) below, and acceptance in a lump sum, with a maximum combined markup to the Owner, for the Contractor and all affected subcontractors, not to exceed a total of fifteen percent (15%).

b. By unit prices named in the Contract or subsequently agreed upon.

c. If the parties are unable to agree on one of the above methods, then the amount shall be determined by force account under the following formula:

i. The actual cost of all direct labor performed (including foremen employed continuously on the Work, but not the salary, or any part thereof, of the Contractor's superintendent) and the actual materials furnished for and used in such Work, less all available cash, trade, or other discounts.

ii. Rental for the use of such items of equipment as have an individual value in excess of One Thousand Dollars ($1,000); provided, however, that the amount of such rental charge and the length of time and probable cost of the use of such equipment shall have been authorized in writing by the Owner.

iii. All proportionate sums paid for royalties, permits, and inspection fees.

iv. All proportionate premiums for public liability insurance, workers' compensation, and other proper and necessary insurance, as well as all applicable payroll taxes.

v. Either a predetermined lump sum; fixed fee; or a fee of fifteen percent (15%), which fee shall be applied to the total of GC-23.03(c)(i), GC-23.03(c)(ii) and GC-23.03(c)(iii) only, and shall constitute full compensation to the Contractor and all its subcontractors for all costs and expenses, including all overhead and profit, which are not otherwise enumerated in this GC-23.03(c).

vi. The Contractor shall keep and present, in such manner as the Owner may direct, an accurate accounting of all the fees and costs described in this GC-23.03(c), together with all supporting vouchers and other documentation, all subject to audit by the Owner.

GC 24.00 CLAIMS FOR EXTRA COST

If the Contractor claims that any instructions by drawings or otherwise, after the date of the Construction Agreement, involve extra costs under this Contract that were not included in the original bid, or require an extension in the construction schedule, the Contractor shall give the Owner and the Architect written notice thereof no later than ten (10) days after the receipt of such instructions, and in any event before proceeding to execute the Work, except in an emergency endangering life or property, and the procedure shall then be as provided for changes in the Work. No such claim shall be valid unless so made. Any change in the Contract amount or construction schedule must be authorized by Change Order.

GC 25.00 DELAYS AND EXTENSIONS OF TIME

25.01 *Delays and Extensions of Time.* If the Contractor is delayed at any time in the progress of the Work by the negligence or other improper act of the Owner or the Architect, or by any employee of either, or by any separate contractor employed by the Owner, or by changes ordered in the Work, or by any other cause that the Owner determines may justify the delay, then the completion date shall be extended by Change Order for such reasonable time as the Owner may determine.

a. Extension of the Contract completion time will be considered for delays due to weather conditions only when such conditions have had a material, adverse impact upon the critical path of the construction schedule, are more severe and extended than those reflected by the ten (10) year average for the month as evidenced by climatological data, U.S. Department of Commerce, for the area where the

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Project is located, and only if a request for such an extension of time is received within seven (7) days of the first date of each delay. Extensions of time due to weather or other allowable reasons will be granted on the basis of 1.4 calendar days' credit for every working day lost with each separate extension figured to the nearest whole calendar day.

b. All Contractor requests for extension of time shall be subject to the Owner's approval and shall be made in writing to the Owner no more than seven (7) days after the occurrence causing the delay; otherwise they shall be deemed waived. Any request for extension of time for a change in the Work or for any occurrence allegedly causing a delay as provided for herein must be substantiated by demonstrating the effect of the change or occurrence on the critical path of the construction schedule.

c. If no schedule or agreement is made stating the dates upon which written interpretations or detail drawings shall be furnished, then no claim for delay shall be allowed on accountof failure to furnish such interpretations or detail drawings until fifteen (15) days after demand is made for them, and then only if such claim is reasonable.

d. Should the time for completion of the Contract be extended, the Owner reserves the right to occupy any part of the structure upon written notice to the Contractor from the Architect or the Owner, but only after the Architect has made a thorough inspection, accompanied by the Contractor's superintendent, to note any defects in workmanship or materials that are the responsibility of the Contractor. Such inspection shall not be deemed to modify any other Contract requirements or provisionsrelating to observations, inspections or acceptance of the Work. Any such partial occupancy shall not bedeemed a waiver of any provision for liquidated damages for delay in final completion.

e. When the whole or a portion of the Work is suspended for any reason, the Contractor shall properly cover over, secure, and protect all Work as may be susceptible to damage in the absence of such action.

25.02 *Article Not Exclusive.* This GC-25.00 does not exclude the recovery of damages by the Owner for delay under other provisions of the Contract Documents.

GC 26.00 ACCESS TO WORK

26.01 *Access.* The Architect, the Owner, and their representatives shall at all times have access to the Work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access so that the Architect may perform its functions under the Contract Documents.

26.02 *Inspection.* If the specifications, the Architect's instructions, laws, ordinances, or any public authority require any Work to be specially tested or approved, the Contractor shall give the Architect timely notice of its readiness for such testing or approval by the Architect or inspection by another authority, and if the inspection is by another authority, of the date fixed for such inspection. All required certificates of inspection shall be secured by the Contractor. If any Work is covered up without approval or consent of the Architect, it must, if required by the Architect, be uncovered for examination at the Contractor's expense.

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26.03 *Reinspection.* Reinspection of questioned Work may be ordered by the Owner, and if so ordered, the Work must be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, the Owner shall pay the cost of reinspection and replacement. If such Work is found not to be in accordance with the Contract Documents, the Contractor shall pay such cost.

26.04 *Testing.* Materials incorporated into the Project shall be subject to routine tests as required to ensure their compliance with the specifications. Such tests may include, but shall not necessarily be restricted to, the following: concrete (primary mix design, slump tests, cylinder compressions tests, and air entrainment tests); steel (tensile tests); welds (field inspection and x-ray examination); soils (sub-soil investigation, physical analysis, and compaction tests); asphalt pavement (physical analysis and compaction tests); and roofing samples cut from in-place built-up roof. Any other basic materials for which standard laboratory test procedures have been established may also be included if doubt as to their quality should arise. Any testing contemplated by this section shall be done at the discretion of the Owner, who shall bear all costs, unless otherwise provided in the Contract Documents. The Contractor shall be held responsible for providing samples of sufficient size for test purposes and for cooperating with the Owner or its representative in obtaining and preparing samples for tests. All tests shall be in accordance with standard test procedures and shall be performed by persons or firms selected by the Owner. Contractor shall schedule and coordinate all tests and inspections directly with the owner's testing and/or inspection agency. Contractor shall give the architect and owner 48 hours' notice of when and where tests and inspections are to be made so that the architect may be present for such procedures.

GC 27.00 CORRECTION OF WORK

27.01 *Correction of Work Before and After Completion.* The Architect or Owner has the authority to reject Work that is defective or otherwise does not conform to the Contract Documents. The Contractor, following written demand, shall promptly correct all Work rejected by the Architect or Owner as defective or as otherwise failing to conform to the Contract Documents, whether observed before or after the date of final completion and whether or not fabricated, installed, or completed. The Contractor shall bear all costs of correcting such rejected Work, including the cost of the Architect's and/or Owner's consultant's additional services necessitated thereby. If the Contractor proceeds to build in or cover the item that has been rejected, the Contractor shall be totally responsible for the cost of removal and replacement of said item and removal and replacement of all necessary Work surrounding or covering the item.

27.02 *Tests to Determine Conformance.* Whenever in the opinion of the Architect or the Owner tests are essential to assure the professional evaluation of the Work that is subject to being rejected or condemned, the necessary number of tests shall be performed by consultants designated by the Owner. The recommendation of such consultants shall be final and all parties to the Contract shall comply with the methods and extent of the corrections submitted in writing to the Owner and the Architect by such consultants. The cost of the tests shall become the Contractor's responsibility when corrections of any nature are recommended by the consultant to the investigated Work; otherwise, the Owner shall pay for all tests performed. Should such special testing, inspection, or approval be caused by the Contractor's failure to follow the requirements of the Contract Documents or required tests under GC-26.04 indicating conditions not in conformance with the Contract Documents, the costs of such additional testing, inspection, or approval shall be borne by the Contractor, regardless of the results.

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27.03 *Removal of Rejected Work.* The Contractor shall promptly remove from the Project site all Work rejected by the Architect or Owner as failing to conform to the Contract Documents, whether or not the Work is physically incorporated. Thereafter, the Contractor shall promptly replace and re-execute such Work in accordance with the Contract Documents and without expense to the Owner. The Contractor shall further bear the expense of making good all Work of other contractors and/or subcontractors destroyed or damaged by such removal or replacement, and shall bear the expense of making good all of its Work and the Work of its subcontractors found to be defective by such removal or replacement. If the Contractor does not remove such rejected Work within a reasonable time, fixed by written notice from the Owner through the Architect, the Owner may remove it and may store the material at the expense of the Contractor. If the Contractor does not pay the expenses of such removal and storage within ten (10) days' time thereafter, the Owner may, upon ten (10) days' written notice, sell such materials at auction or at private sale. In such case, the Owner shall account to the Contractor for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor, including compensation for additional Architect or consultant services. If the net proceeds of sale do not cover all costs that the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner. In addition, the Owner shall have any other remedies that may be available to it.

27.04 *Correction of Work After Final Payment.* Neither the final estimate or payment, nor any provision in the Contract Documents, shall relieve the Contractor of responsibility for faulty materials or workmanship and, unless otherwise specified, the Contractor shall remedy any defects due thereto and pay for any damage to other Work or property resulting therefrom, which appear within a period of two (2) years from the date of final completion and acceptance. This warranty shall be in addition to and not in lieu of all other remedies available to the Owner.

27.05 *Failure to Correct the Work.* If the Contractor fails to correct defective or nonconforming Work, the Owner may correct it and otherwise proceed against the Contractor for the cost thereof in accordance with the provisions of these General Conditions.

27.06 *Deductions for Uncorrected Work.* If the Owner deems it inexpedient to correct Work that has been damaged, is defective or has not been done in accordance with the Contract Documents, then an appropriate deduction from the price shall be made and reflected by a Change Order or, if the amount is determined after final payment, it shall be paid by the Contractor.

27.07 *Additional Obligations.* The obligations of the Contractor to correct the Work shall be in addition to, and not in lieu of, any other obligations imposed upon it by law, special guarantees,warranties, or other rights of the Owner.

GC 28.00 OWNER'S RIGHT TO CARRY OUT WORK

If the Contractor should neglect to prosecute the Work properly or fail to perform any requirement of the Contract Documents, the Owner, after three (3) working days' written notice to the Contractor, may, without prejudice to any other remedy it may have, make good such deficiencies, and may deduct the reasonable cost thereof from the payment then or thereafter due the Contractor. In the event such Work is

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performed by the Owner, the Owner's employees, or by persons other than the Contractor at the Owner's request, the Owner shall not be liable to the Contractor for inconvenience expense or subsequent cost of removal of such Work. The amount to be deducted as the cost of doing the Work shall include the cost of the Architect's additional services made necessary by such default. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

GC 29.00 OWNER'S RIGHT TO TERMINATE CONTRACT

29.01 *Termination for Cause.* If the Contractor should be adjudged bankrupt; or if it should make a general assignment for the benefit of its creditors without approval of the Owner; or if a receiver should be appointed on account of its insolvency; or if it should refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workers, competent supervision and superintendence of the Work, proper materials, or competent management of the Project; of if it should fail to make prompt payment to subcontractors or for material or labor; or disregard any laws, ordinances, or the instructions of the Architect or Owner; or otherwise be guilty of a material violation of any provision of the Contract Documents; then the Owner, when in its sole opinion sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor, and its surety, if any, seven (7) days' written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools, and appliances thereon and finish the Work by whatever method the Owner may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finally completed and accepted by the Owner. If the unpaid balance of the Contract amount exceeds the expense of completing the Work, including the cost of additional architectural, engineering, managerial, consultant, and administrative services, such excess shall be paid to the Contractor. If such expense exceeds such unpaid balance, the Contractor shall pay the difference to the Owner and the Owner shall be justified in withholding payment of any unpaid amounts. The expense incurred by the Owner, as herein provided, and the damages incurred through the Contractor's default, shall be determined by the Owner. The Contractor will not be reimbursed for any anticipated profit.

29.02 *Termination Without Cause.* Should conditions arise that in the Owner's opinion make it necessary or advisable to discontinue Work under the Contract Documents, the Owner may terminate the Contract in whole or in part without cause or fault by the Contractor by giving seven (7) days' written notice to the Contractor. The notice shall specify the date and extent to which the Contract is terminated. Upon any such termination, the Owner shall take possession of the Project site and all or any part of the materials and equipment delivered or en route to the site. In the event of termination without cause under this section, the Contractor shall be equitably paid for all Work properly completed, based upon the approved schedules of values. The Contractor will not be reimbursed for any anticipated profit.

GC 30.00 CONSTRUCTION SCHEDULE AND PROGRESS REPORTS

30.01 *Construction Schedule.* The Contractor shall submit, within ten (10) days after the date of the notice of award in a format acceptable to the Owner, an overall timetable of the construction schedule for the Project. This schedule shall start with the date of the notice of award, and the completion date shall be a date that will enable the Owner to accept the Work on the date specified in the Construction Agreement. The schedule shall portray fully a timetable representing the various elements in the schedule of values and shall provide for the expeditious and practicable execution of the Work. The time shown between the

starting and completion dates of the various elements within the schedule shall represent one hundred percent (100%) completion of each element. Additional detailed schedules of separate elements of the Work such as commissioning, test and balance, and owner training, may be requested at the Owner's discretion. No request for payment shall be accepted by the Owner until this schedule has been submitted as required herein. This schedule shall be revised from time to time during the course of the Work when the actual progress, in the opinion of the Architect or the Owner, varies materially from that previously approved.

30.02 *Monthly Progress Reports.* The Contractor shall submit monthly progress reports with each request for payment. Basically, these reports shall reflect the Contractor's "Work in place" progress and shall be certified by the Contractor as to the date and contents of such "Work in place" progress report. If requested by the Owner, the monthly progress reports shall also include representative photographs of the actual Work in place. Such reports shall depict progress and percentage of completion, consistent with the values and amounts contained on the counterpart request for payment. The subcontractors shall be supplied copies of the Contractor's approved schedule. These subcontractors shall develop a similar schedule based on their respective Work. Failure to submit an approved schedule or monthly progress report shall be deemed cause to reject requests for payment.

30.03 *Scheduling.* The Contractor shall schedule all Work so as to reduce to a minimum any disruption in the use of the existing facilities and interruptions of utility service of any type. Where electrical or mechanical Work performed under this Contract will necessitate interruptions of service to existing facilities, the Contractor shall furnish and install temporary service to such facilities or perform such Work at such times when said existing utilities are not in normal use. The Contractor shall bear the cost of all overtime or inconvenience resulting therefrom. Any remodeling work which may interrupt normal building functions, especially periodic standardized testing, shall be scheduled and coordinated with the Owner at least one (1) week prior.

30.04 *Noise Ordinance Violation.* The Contractor shall at all times comply with the local noise ordinance requirements relating to the Work. To the extent there are any violations of any applicable noise ordinances imposed on the Owner as a direct or indirect result of the Contractor's Work, then the Contractor shall reimburse the Owner for any sums paid or due and payable by the Owner as a result of such violations. The Owner reserves the right to deduct any expenses incurred by the Owner as a result of any noise ordinance violations by the Contractor from any amount due to the Contractor under this Construction Agreement or, at its option, to collect such sum directly from the Contractor or its surety.

GC 31.00 SCHEDULE OF VALUES

Progress payments shall be made on the valuation of the Work done. Before beginning work and prior to the first Application for Payment, the Contractor shall the Contractor shall submit to the Architect and the Owner a complete, itemized schedule of the values of the various parts of the Work, aggregating the total sum of the Contract and separating material costs from other costs. Such schedule shall include as costs the material costs of all subcontractors under the Contractor and the costs of all materials to be taken from the Contractor's or subcontractors' own stocks of material. The schedule of values shall be supported by such evidence as to its correctness as the Architect and/or the Owner may direct. Each item on the schedule of values shall include its proper share of overhead and profit. The schedule of values shall be used for the estimates and progress payments provided for in these General Conditions. Along with such

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schedule of values, the Contractor shall submit a schedule of estimated monthly application amounts to be submitted over the course of the Project to assist the Owner in arranging payments.

GC 32.00 PAYMENT

32.01 *Certificates for Payment.* No request for payment shall be submitted to the Owner until and unless it has been certified by the Architect. No certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by the Owner shall constitute any acceptance of any Work not completed in accordance with the Contract Documents.

32.02 *Payments to Contractor.* Partial payments shall be made as the Work progresses within twenty-one (21) days after the close of the calendar month. Requests for payment, along with the appropriate supporting documentation shall be submitted to the Architect on a regularly established monthly schedule approved by the Owner. Supporting documentation is defined as: Job cost variance report; schedule of values; equipment rental information; updated schedules, including recovery schedule if behind, lien release, subcontractor pay applications and supplier invoices; contractor general conditions billed to correct line from payment matrix (GCs or fee). All materials stored off site require the following: certificate of insurance for stored materials, bill of sale, supplier invoices and photos. The Owner reserves the right to withhold payments at any time regardless of the Architect's recommendations or issuance of certificate for payment. The request for payment shall be based on the same items as are shown in the schedule of values itemizing the material used and Work performed for which payment is claimed. In preparing estimates, material delivered and properly stored on the site and preparatory Work done may be taken into consideration. The Contractor shall provide the Owner with a completed federal Form W-9 upon submission of the Contractor's first request for payment.

a. If payments are made on account of materials not incorporated in the Work, but delivered and suitably stored at the Project site or at some other location agreed upon in writing, such payments shall be conditioned upon submission by the Contractor of bills of sale or such other procedures that will establish the Owner's interest, including applicable insurance and transportation to the Project site.

b. Payments shall be made in the full value of the Work performed and material stored, less five percent (5%) of such value which shall be retained until completion and acceptance of all Work unless otherwise agreed by Owner, and less the aggregate of any previous payments.

c. Under any Contract exceeding One Hundred Fifty Thousand Dollars ($150,000) pursuant to which sums are withheld to assure satisfactory performance, the Contractor may withdraw the whole or any portion of such sums withheld if the Contractor deposits acceptable securities with the Owner in an amount at all times at least equal to the amount withdrawn. All such withdrawals shall be on the Owner's approved forms and shall require that the acceptable securities be endorsed in favor of the Owner, authorizing the Owner to negotiate the acceptable securities and to receive the payments due.

d. The Contractor warrants and guarantees that title to all Work, materials, and equipment covered by a request for payment, whether incorporated in the Project or not, shall pass to the Owner upon the receipt of such payment by the Contractor, free and clear of all liens, claims, security interests, or encumbrances; and that no Work, materials, or equipment covered by a request for payment

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shall have been acquired by the Contractor or by any other person performing the Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person. This provision shall not be construed as relieving the Contractor from the sole responsibility for all materials and Work upon which payments have been made or the restoration of any damaged Work, or as a waiver of the right of the Owner to require the fulfillment of all the terms of the Contract.

e. After the date of final completion of the Work, final settlement for the Project shall be advertised in accordance with Colorado law.

f. On the date of final settlement, as advertised, and after the Contractor has submitted a written notice to the Owner that no claims have been filed, final payment shall be made in full. Notwithstanding the foregoing, the Owner may withhold sufficient funds, if available, for unpaid claims as specified in GC-46.04.

32.03 *Payments Withheld.* The Owner may withhold payment or the Architect may decline to issue a certificate for payment in whole or in part, or the Architect may withhold or nullify the whole or any part of any certificate previously issued, because of subsequently discovered evidence or subsequent inspections, for such an amount or to such extent as may be necessary in the opinion of either the Owneror the Architect to protect the Owner from loss on account of:

a. defective Work not remedied;

b. claims filed or reasonable evidence indicating probable filing of claims;

c. failure of the Contractor to make payments properly to subcontractors or for material or labor;

d. a reasonable doubt that the Contract can be completed for the balance then unpaid;

e. damage to another contractor or to the property;

f. failure of the Contractor to perform any portion of the Work in a timely manner or in compliance with any approved schedules; or

g. failure of the Contractor to submit on a timely basis any documentation required by the Contract Documents, including without limitation monthly progress reports, schedule of values, or request for approval of subcontractors.

32.04 *Recordkeeping.* As further described in GC-56.00, the Contractor shall keep complete and accurate records, accounts and books with regard to all materials, equipment and labor involved in the performance of the Work in accordance with generally accepted accounting principles. The Owner and Architect shall have access to the Contractor's accounting records at all reasonable times, and the Contractor agrees to make any changes to its system of keeping these records as the Owner may reasonably request in writing. All such records shall be preserved and the Owner shall have access to them for six (6)

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years after final payment to the Contractor.

GC 33.00 INSURANCE

33.01 The Contractor, at its expense, shall procure and maintain in effect at all times throughout the duration of the Project, including the one- or two-year warranty period, as applicable, all insurance requirements and limits as set forth below. The Contractor shall continue to provide evidence of such coverage to the Owner on an annual basis during the aforementioned period including all of the terms of the insurance and indemnification requirements of this Construction Agreement. All insurance policies specified below shall include a provision preventing cancellation without thirty (30) days' prior notice by certified mail. Completed certificates of insurance shall be filed with the Owner within ten (10) days after the date of the Notice of Award. Such certificates shall specifically state the inclusion of the coverages and the provisions set forth herein and shall state whether the coverage is "claims made" or "per occurrence". If the coverage is written on a "claims made" basis, Contractor shall confirm that any retroactive date for the coverage precedes the effective date of the Construction Agreement and is in effect for a period of three (3) years from the date of final acceptance of the Work.

a. Workers' Compensation Insurance. The Contractor shall procure and maintain workers' compensation insurance at its own expense during the term of the Construction Agreement, including occupational disease provisions for all employees per statutory requirements. Such policy shall contain a waiver of subrogation in favor of the Owner. The Contractor shall also require each subcontractor to furnish workers' compensation insurance, including occupational disease provisions for all of the latter's employees, and to the extent not furnished, the Contractor accepts full liability and responsibility for subcontractor's employees. In cases where any class of employees engaged in hazardous work under this Construction Agreement at the site of the Project is not protected under the Workers' Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide, adequate and suitable insurance for the protection of employees not otherwise protected.

b. Commercial General Liability Insurance. The Contractor, at its own expense, shall procure and maintain commercial general liability insurance to protect the Contractor from all claims for bodily injury, including death and all claims for destruction of or damage to property (other than the Work itself), arising out of or in connection with any operations under this Construction Agreement, whether such operations be by the Contractor or by any subcontractor under it or anyone directly or indirectly employed by the Contractor or by a subcontractor. All such insurance shall be written with limits and coverages as specified below and shall be written on an occurrence form:

Project Amount	$0-10M	$10M-30M	$30M-50M	$50M-$100M
Insurance Required				
General Aggregate	$ 2,000,000	$ 5,000,000	$ 10,000,000	$ 25,000,000

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Products- Completed Operations Aggregate	$ 2,000,000	$ 5,000,000	$ 10,000,000	$ 25,000,000
Each Occurrence	$ 1,000,000	$ 1,000,000	$ 5,000,000	$ 10,000,000
Personal Injury	$ 1,000,000	$ 1,000,000	$ 5,000,000	$ 10,000,000
Fire Damage Limit for any one fire	$ 50,000	$ 50,000	$ 50,000	$ 50,000
Medical payments per person	$ 5,000	$ 5,000	$ 5,000	$ 5,000

[Coverage limits shall be a function of the project amount.]

The following coverages shall be included in the Commercial General Liability Insurance:

1. Designated Construction Projects General Aggregate Limit (ISO CG 2503-1997 edition orequivalent.

2. Owner, its subsidiary, parent, associated and/or affiliated entities, successors or assigns, its elected officials, trustees, employees, agents, and volunteers shall be named as Additional Insureds with respect to liability and defense of suits arising out of the activities performed by, or on behalf of the Contractors, including completed operations, and must include both ONGOING Operations and COMPLETED Operations per CG 2010 12/19 and CG 2037 12/19 or equivalent as permitted by law.

3. Additional Insured—Owners, Lessees or Contractors Endorsement, ISO Form 2038 or equivalent.

4. The policy shall be endorsed to be **primary and non-contributory** with any insurance maintained by Additional Insureds.

5. A waiver of subrogation in favor of all Additional Insured parties.

6. Personal/Advertising Injury Liability

7. Contractual Liability coverage to support Contractor's indemnification obligations

8. Explosion, collapse and underground (xcu)

9. Independent contractors

10. Products/Completed Operations

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11. Premises and Operations

The following exclusionary endorsements are prohibited in the Commercial General Liability Insurance policy:

1. Damage to Work performed by Subcontract/Vendor (CG 22-94 or similar)

2. Contractual Liability Coverage Exclusion modifying or deleting the definition of an"insured contract" from the unaltered SO CG 0001 1001 policy from (CG 2426 or similar)

The Contractor shall maintain general liability coverage including Products and Completed Operations insurance, and the Additional Insured with primary and non-contributory coverage as specified in this Contract for two (2) years after completion of the Project.

c. Comprehensive Automobile Liability Insurance. The Contractor shall maintain comprehensive automobile liability insurance, including coverage for liability arising out of any auto (including owned, hired, and non-owned autos), with a combined single limit of $1,000,000/person, $1,000,000/accident, and $1,000,000/property damage. Such insurance shall include a waiver of subrogation in favor of the Owner.

d. Umbrella Liability Insurance (for projects exceeding $10,000,000). The Contractor shall maintain umbrella/excess liability insurance on an occurrence basis in excess of the underlying insurance described in Subsections a through c above. Coverage shall follow the terms of the underlying insurance, included the additional insured and waiver of subrogation provisions. The amountsof insurance required above may be satisfied by the Contractor purchasing coverage for the limits specified or by any combination of underlying and umbrella limits, so long as the total amount of insurance is not less than the limits specified in each section previously mentioned.

Each occurrence	$5,000,000
Aggregate	$5,000,000

e. Builder's Risk Insurance. The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in Colorado, Builder's Risk insurance or equivalent policy form in the amount of the initial contract sum, plus the value of subsequent contract modifications, change orders, and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such Builder's Risk insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Owner has an insurable interest in the property, or the Date of Notice specified on the Notice of Acceptance, State Form SBP-6.27 or whichever is later. This insurance shall include interests of the Owner, the Contractor, subcontractors and subsubcontractors in the Project as named insureds. All associated deductibles shall be the responsibility of the Contractor. Such policy may have a deductible clause but not to exceed ten thousand dollars ($10,000.00). Builder's Risk insurance shall be on a special cause of loss form and shall include, without limitation, insurance against

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the perils of fire (with extended coverage), transit, increased cost of construction, architect's fees and expenses and all below and above ground structures, piping, foundations including underground water and sewer mains including the ground on which the structure rests, excavation, backfilling, filling and grading, and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (including water damage), windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss. Such Builder's Risk insurance shall include equipment breakdown coverage (aka boiler and machinery) which shall specifically cover insured equipment during installation and testing (including cold and hot testing) and such insurance must provide coverage from the time any covered property becomes the responsibility of the Contractor, and continue without interruption during construction, renovation, or installation, including any time during which the covered property is being transported to the construction installation site, or awaiting installation, whether on or off site. Contractor shall maintain Builders Risk coverage including partial use by Owner during construction. Contractor will take reasonable steps to obtain consent of the Builders Risk carrier to delete any provisions with regard to restrictions within any Occupancy Clause within the Builders Risk Policy. The Contractor shall waive all rights of subrogation as regards the Owner, its officials, officers, agents and employees, all while acting within the scope and course of their employment for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section or other property insurance applicable to the Work. The Contractor shall require all subcontractors at any tier to similarly waive all such rights of subrogation and shall expressly include such a waiver in all subcontracts. Upon request, the amount of such insurance shall be increased to include the cost of any additional work to be done on the Project, or materials or equipment to be incorporated in the Project, under other independent contracts let or to be let. In such event, the Contractor shall be reimbursed for this cost as his or her share of the insurance in the same ratio as the ratio of the insurance represented by such independent contracts let or to be let to the total insurance carried. The Owner shall have the power to adjust and settle any loss. Unless it is agreed otherwise, all monies received shall be applied first on rebuilding or repairing the destroyed or injured work.

f. Professional Liability Insurance. Contractor shall maintain professional liability insurance covering wrongful acts, errors and/or omissions, including design errors, if applicable for damage sustained by reason of or in the course of operations under this Contract resulting from professional services provided by the Contractor as part of this Contract. The policy coverages shall be amended to provide that coverage shall apply for three (3) years after project is complete. The policy is to be on a primary basis if other professional coverage is carried. Minimum coverage shall be in the amount of $1,000,000 per loss and $3,000,000 aggregate.

g. Contractor's Pollution Liability. Owner requires this coverage whenever work at issue under this Contract involves potential pollution risk to the environment or losses caused by pollution conditions (including asbestos) that may arise from the operations of the Contractor described in the Contractor's scope of services. Policy shall cover the Contractor's completed operations. Coverage shall apply to sudden and gradual pollution conditions resulting from the escape of release of smoke, vapors, fumes, acids, alkalis, toxic chemicals, liquids, or gases, natural gas, waste materials, or other irritants, contaminants, or pollutants (including asbestos). If the coverage is written on a claims-made basis, the

Contractor warrants that any retroactive date applicable to coverage under the policy precedes the effective date of this Contract; and that continuous coverage will be maintained or an extended discovery period will be exercised for a period of three (3) years beginning from the time that work under this contract is completed. The policy shall be endorsed to include the following as Additional Insureds: "Owner, its subsidiary, parent, associated and/or affiliated entities, successors, or assigns, its elected officials, trustees, employees, agents, and volunteers named as an additional insured with respect to liability and defense of suits arising out of the activities performed by, or on behalf of the Contractor, including completed operations". The policy shall have the following minimum limits:

Per Loss	**$**	**1,000,000**
Aggregate	**$**	**1,000,000**

33.02 *Immunity* The parties understand and agree that the Owner does not waive or intend to waive any provision of the Contract, including the provisions of this Article; the monetary limitations of the Contract; or any of the rights, immunities, and protections provided by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101 *et seq.*, as from time to time amended, or otherwise available to the Owner.

33.03 *Additional Miscellaneous Insurance Provisions.* Certificates of insurance and/or insurance policies required under this Contract shall be subject to the following stipulations and additional requirements:

a. Any and all deductibles or self-insured retentions contained in any insurance policy shall be assumed by and at the sole risk of the Contractor;

b. If any of the said policies shall fail at any time to meet the requirements of the Contract Documents as to form or substance, or if a company issuing any such policy shall be or at any time cease to be approved by the Division of Insurance of the State of Colorado, or be or cease to be in compliance with any stricter requirements of the Contract Documents, the Contractor shall promptly obtain a new policy, submit the same to the Owner and State Building Programs for approval if requested, and submit a certificate of insurance as hereinbefore provided. Upon failure of the Contractor to furnish, deliver and maintain such insurance as provided herein, this Agreement, in the sole discretion of the State of Colorado, may be immediately declared suspended, discontinued, or terminated. Failure of the Contractor in obtaining and/or maintaining any required insurance shall not relieve the Contractor from any liability under the Agreement, nor shall the insurance requirements be construed to conflict with the obligations of the Contractor concerning indemnification;

c. All requisite insurance shall be obtained from financially responsible insurance companies, authorized to do business in the State of Colorado and acceptable to the Owner;

d. Receipt, review or acceptance by the Owner of any insurance policies or certificates of insurance required by this Agreement shall not be construed as a waiver or relieve the Contractor from its obligation to meet the insurance requirements contained in these General Conditions.

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GC 34.00 SEPARATE CONTRACTS

34.01 *Other Contracts.* The Owner reserves the right to enter into other contracts inconnection with the Work. The Contractor shall afford such other contractors reasonable opportunity forthe introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate its Work with theirs.

34.02 *Duty to Inspect and Report.* If any part of the Contractor's Work depends on proper execution or results upon the Work of any other contractor, the Contractor shall inspect and promptly report to the Owner through the Architect any defects in such Work that render it unsuitable for such proper execution and results. The Contractor's failure to so inspect and report shall constitute an acceptance of the other contractor's Work as fit and proper for the reception of the Contractor's Work, except as to defects that may subsequently develop in the other contractor's Work.

34.03 *Duty to Measure.* To ensure the proper execution of its subsequent Work, the Contractor shall measure Work already in place and shall immediately report to the Owner through the Architect any discrepancy between the executed Work and the Contract Documents.

GC 35.00 SUBCONTRACTORS

35.01 *Subcontractors and Suppliers.* Within ten (10) days of the mutual execution of the Contract, the Contractor shall include with on the forms provided, the names of its subcontractors and suppliers of labor and materials. The Contractor shall, before awarding any subcontracts, re-verify to the Owner and Architect in writing on the standard form "Request of Approval of Subcontractors" the names of subcontractors proposed for the Project. Any deviation from the original subcontractor and supplier list shall not be allowed unless justification is submitted in writing to the Owner by the Contractor that the subcontractor or supplier is deemed unfit or unable to perform the specified Work, is unwilling to enter into a subcontract, or is not in compliance with the Contract Documents. The Contractor shall not employ any subcontractors that the Owner or Architect may, within a reasonable time, object to as incompetent, unfit, or otherwise undesirable. Substitutions of subcontractors listed in the executed proposal form may not be made without written approval of the Owner.

a. If, before or after the execution of the Contract, a change of any subcontractor on such list is required by the Architect or by the Owner prior to the award of the relevant contract, the contract sum may be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued.

35.02 *Obligations.* The Owner shall, on request, furnish to a subcontractor, wherever practicable, evidence of the amounts certified on the subcontractor's account. The Contractor agrees that it is as fully responsible to the Owner for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

35.03 *Final Listing.* The Contractor, at the conclusion of the Work and before final payment is made, shall furnish to the Owner a listing of the names, contact persons, addresses, and telephone numbers of all subcontractors and material suppliers who furnished labor and materials on the Project, with

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identification of the services rendered and materials provided.

35.04 *No Contractual Relationship.* Nothing contained in the Contract Documents shall create any direct contractual relationship between any subcontractor and the Owner.

GC 36.00 RELATIONS OF CONTRACTOR AND SUBCONTRACTOR

36.01 *Written Agreement.* Unless specifically noted to the contrary in a subcontract approved in writing as adequate by the Owner, the Contractor agrees to bind each of its subcontractors by a written agreement and require in such agreements that every subcontractor be bound by the terms of the Construction Agreement, these General Conditions, any Supplementary Conditions, and the drawings and specifications as far as applicable to the subcontractor's Work.

36.02 *Subcontractors' Agreement.* Each subcontractor shall agree:

a. To be bound to the Contractor by the terms of the Construction Agreement, these General Conditions, the Supplementary Conditions, the drawings and specifications, and any other Contract Documents, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes toward the Owner.

b. To preserve and protect the rights of the Owner and the Architect under the Contract with respect to the Work to be performed under the subcontract so that the subcontracting thereof will not prejudice such rights.

c. To perform all Work in accordance with the requirements of the Contract Documents.

d. To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment as specified in the General Conditions.

e. To make all claims for extras, for extensions of time, and for damages for delays or otherwise, to the Contractor in the manner provided in the General Conditions of the Contract and the Supplementary Conditions for like claims by the Contractor upon the Owner, except that the time for making claims for extra cost is one week.

f. To purchase and maintain for the duration of the Project and completion of the Work and any warranty periods such insurance as required by Contractor in Article GC-47.00.

36.03 *Contractor's Agreement.* The Contractor agrees:

a. To be bound to the subcontractor by all the obligations that the Owner assumes to the Contractor under the Construction Agreement, these General Conditions, any Supplementary Conditions, the drawings and specifications, and by all the provisions thereof affording remedies and redress to the Contractor from the Owner.

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b. To pay the subcontractor not later than seven (7) days immediately following the payment of each certificate issued under the schedule of values described in these General Conditions, the amount allowed to the Contractor on account of the subcontractor's Work to the extent of the subcontractor's interest therein.

c. To pay the subcontractor, upon the payment certificates, if issued otherwise than as in GC 36.03(b) above, so that at all times the Contractor's total payments shall be as large in proportion to the value of the Work done by it as the total amount certified to the Contractor is to the value of the Work done by the subcontractor.

d. To pay the subcontractor to such extent as may be provided by the Contract Documents or the subcontract, if either of these provides for earlier or larger payments than the above.

e. To pay the subcontractor a just share of any insurance payment received by the Contractor, applicable to Work performed by such subcontractor.

36.04 *Verified Documentation.* The Owner may require the Contractor to submit verified documentation evidencing that full and timely payments have been made to its subcontractors and suppliers, and/or that legal justification exists for withholding payments. In addition, the Owner may contact the subcontractors and suppliers directly to obtain verification that payments have been made asrequired by law or the Contract Documents.

36.05 *No Obligation.* Nothing in this GC-36.00 shall create any obligation on the part of the Owner to pay or to see to the payment of any sums to any subcontractor, nor shall it form the basis for any action by the subcontractor against the Owner on any contractual theories.

36.06 *Meeting with Architect.* The Contractor shall arrange for the foreman of each subcontractor (mechanical, electrical, masonry, plastering, painting, etc.) on the job to meet with the Architect at the job prior to any Work being started by the subcontractor so that phases of the subcontractor's Work can be thoroughly discussed and the quality of materials and workmanship expected can be completely understood and agreed upon.

GC 37.00 CONTRACTORS' MUTUAL RESPONSIBILITY

The entire Project may be covered by more than one contract and in such case there will of necessity be a certain overlapping of obligations and responsibilities. Each contractor shall, therefore, take due notice of the Work called for in contracts other than its own. If the Contractor causes damage to the Work of another contractor, the Contractor agrees, upon notice of said damage, to settle with such other contractor by agreement, if it will so settle. If such other contractor sues the Owner on account of any damage alleged to have been caused by the Contractor, the Owner may notify the Contractor who shall, at the Owner's option, defend such proceedings at the Contractor's expense or reimburse the Owner for the expenses incurred in its defense, and if any judgment against the Owner results therefrom, the Contractor shall pay or satisfy the judgment and pay all costs and expenses thereby incurred by the Owner.

GC 38.00 CUTTING, PATCHING, AND EXCAVATING

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38.01 *Standards.* The Contractor shall do all cutting, fitting, and patching that may be required to make the several parts of the Work come together properly and receive or be received by Work of other contractors or subcontractors shown upon, or reasonably implied by, the drawings and specifications for the completed Project.

38.02 *Responsibility.* Any cost caused by defective or improperly timed Work shall be borne by the party responsible therefor. The Contractor shall not endanger any Work by cutting, excavating, or otherwise altering the Work and shall not cut or alter the Work of any subcontractor except with the consent of the Architect.

38.03 *Cutting and Sizing.* The Contractor and each subcontractor shall leave all chases, holes, or openings straight, true, and of proper size in its own Work, or cut the same in existing Work as may be necessary for the proper installation of its own or another contractor's or subcontractor's Work, consulting with the Architect regarding proper location and size of same. In case of a failure to leave or cut said chases, holes, or openings in the proper place, the Contractor or subcontractors shall cut them afterward at their own expense. No excessive cutting shall be permitted, nor shall any piers or other structural members be cut or modified in the field without the written consent of the Architect. After such Work has been installed, the Contractor and subcontractors shall carefully fit around, close up, repair, patch, and point up same as directed to the entire satisfaction of the Architect. Each section of this specification shall include all cutting, patching, and excavating for that trade division unless specifically stated to the contrary.

GC 39.00 EMPLOYEES

39.01 *Qualifications.* The Contractor and its subcontractors shall at all times enforce strict discipline and good order among their employees, and shall not employ any persons on the Project considered by the Architect or the Owner to be unfit or not skilled in the work assigned to them. The Contractor shall also keep its employees and those of its subcontractors from socializing on the Project site before and after working hours and from fraternizing at any time with staff, students, parents, and other persons who are at the school or the Project site.

39.02 *Drug- and Tobacco-Free Zone.* Poudre School District R-1 properties are drug-free zones and tobacco-free zones. In furtherance of this standard, the Contractor shall establish and maintain a safe and efficient work environment for all its employees, free from the effects of alcohol, controlled substances, and illegal drugs. The use of tobacco products on school grounds is prohibited. The manufacture, distribution, dispensing, possession, or use of alcohol, controlled substances, and illegal drugs is prohibited on or adjacent to the Project site and all of the Owner's other property at all times. Illegal drug use is the use of illegal drugs and the abuse of alcohol and other drugs, including anabolic steroids. Controlled substances are drugs specifically identified and regulated under state and/or federal law and include but are not limited to opiates, narcotics, cocaine, amphetamines and other stimulants, depressants, hallucinogenic substances, and marijuana. The Contractor shall strictly enforce this prohibition among its own employees and its subcontractors and their employees while they are on Owner's property. The Contractor and subcontractors shall require all of their employees to undergo drug and alcohol testing if an employee is involved in an accident on the Project site that may have been caused by human error that could be drug- or alcohol-related, or when a supervisor has reasonable suspicion or notice that an employee shows signs of possible intoxication, use, or being under the influence of drugs, alcohol, or controlled substances.

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Employees who violate these prohibitions shall be subject to disciplinary action by their employers up to and including termination, and may be denied access to the Project site. Violation of this provision shall also constitute sufficient grounds for termination of the Contract or any subcontract by the Owner and payment by Contractor of any damages or penalties to the Owner.

39.03 *Equal Employment.* During the performance of this Contract, the Contractor agrees not to discriminate against any employee or applicant for employment because of religion, race, creed, color, sex, sexual orientation, gender identity or gender expression, national origin, disability, age or other protected status. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their religion, race, creed, color, sex, sexual orientation, gender identity or gender expression, national origin, disability, age or other legally protected status. Such action shall include, but not be limited to, employment, promotion, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. The Contractor shall state, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, that all qualified applicants will receive consideration for employment without regard to religion, race, creed, color, sex, sexual orientation, gender identity or gender expression, national origin, disability, age or other legally protected status.

39.04 *Responsibility for Employees.* The Contractor shall be responsible to the Owner for the acts and omissions of all its agents and employees. The Contractor shall also be responsible for the acts and omissions of all its subcontractors and their agents and employees, and all other persons acting on behalf of the Contractor or subcontractors as set forth herein.

39.05 *Removal of Employee*. Removal of a specific person(s) from a project as a result of any condition mentioned above will not relieve the Contractor from timely performance of work completion and will not be considered grounds for a request for additional funds or time extension to complete the Project

GC 40.00 CLEANING UP

40.01 *Contractor's Responsibilities.* The Contractor shall at all times keep the Project site free from accumulations of waste material and rubbish caused by its employees or Work, and shall remove all rubbish as often as it deems necessary or as directed by the Owner or the Architect. Upon completion of the Work, the Contractor shall remove all its rubbish, tools, scaffolding, and surplus materials from and about the Project site, and shall wash all glazing and window frames inside and outside where work was performed removing all stains, paint, etc., from same. Care shall be taken not to scratch the glazing in this clean up.

40.02 *Standards.* All floors and wall coverings shall be left thoroughly clean and finished; all walls and ledges shall be dusted; all plumbing fixtures shall be cleaned; all hardware shall be free of all labels, paint, stains, dust, dirt, and the like; all marks, stains, fingerprints, oil, and dirt shall be removed from painted, decorated, or natural finish Work and the Project building(s) shall be ready for occupancy except for being further equipped by the Owner. In case of dispute, the Owner may perform such cleaningup

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as may be required and charge the cost to the Contractor.

GC 41.00 USE OF PREMISES

The Contractor shall confine its equipment, the storage of materials, and the operations of its workers to locations indicated by law, ordinances, permits, and the Contract Documents, and shall not unreasonably encumber the Project site with its materials. The Contractor shall not load or permit any part of a structure to be loaded with a weight that will endanger the safety of persons or property. During the performance of the Work, the Contractor and his subcontractors and their employees, agents or suppliers, will use such entrance or entrances to the construction site that may be designated from time to time by the Owner. Further, the Contractor and its subcontractors, their employees and agents, shall perform the Work at such times of the day and days of the week as may be designated by the Owner fromtime to time. The Contractor shall enforce all Owner instructions and other regulations regarding signs, advertisements, fires, and smoking and shall not allow the possession or consumption of alcohol or drugson the Project site by its or any subcontractor's workers.

GC 42.00 OCCUPANCY

The Contractor, upon the Owner's written request, shall allow the Owner to occupy portions of the Work and to place and install, subject to reasonable restrictions, as much equipment and furnishings during the progress of the Work as is possible without interfering with the progress of the Work. Such occupancy and the placing or installing of equipment and furnishings shall not in any way evidence the final completion of the Work or signify the Owner's acceptance of the Work, or any part of it. Equipment includes such things as kitchen equipment, etc. Furnishings include such things as lockers, benches, desks, etc. Prior to occupancy, when practicable, the Architect shall make a thorough inspection accompanied by the Contractor's superintendent to note any defects in workmanship or materials that are the responsibility of the Contractor. The provisions of this section shall not be in limitation of the Owner's rights set forth in GC-24 and GC-25.

GC 43.00 TEMPORARY OR TRIAL USAGE

43.01 *Not Evidence of Acceptance.* Temporary or trial usage by the Owner of any mechanical device, machinery, apparatus, equipment, or any Work or material supplied under the Contract before final completion and written acceptance by the Architect shall not be construed as evidence of the Architect's or Owner's acceptance of same or the commencement of any warranty period.

43.02 *Authorization.* The Owner has the privilege of such temporary or trial usage, for such reasonable time as the Owner and the Architect deem proper. The Contractor shall make no claim for damage or injury to or breaking of any parts of such Work that may be caused by weakness or inaccuracy of structural parts or by defective material or workmanship. If the Contractor so elects, it may, without cost to the Owner, make such trial usage. However, trials shall only be conducted with the Architect's prior approval and under the Architect's observation.

GC 44.00 TESTING OF BUILDING SYSTEMS

44.01 *Testing Plan.* The Contractor shall submit a written plan prior to completion and acceptance, consistent with the Contract Documents and applicable codes, for the testing and training of owner's maintenance staff of all building systems. All testing shall be of the complete system, before covering, or of individually separable larger portions of the system and shall be performed in the presence of the appropriate consultant and representative of the Owner. A written report shall be filed in the Owner's office Facilities and Construction, recording each test, and signed by such consultant. All owner training shall be videotaped, a copy of which shall accompany the O&M manuals presented at the job completion.

44.02 *Contractor's Responsibility.* When heating, air conditioning, ventilation, exhaust, or items of electrical or other equipment are installed, it shall be the responsibility of the Contractor installing such equipment to operate it for a sufficient period of time as required by the Architect for proper testingof the equipment and instructing the Owner's operating personnel. All items of equipment, testing meters, testing instruments, and incidentals required for proper testing and for instructing the Owner's operating personnel shall be provided by the Contractor responsible for providing and installing the equipment.

GC 45.00 LIQUIDATED DAMAGES FOR DELAY IN COMPLETION

It is understood and agreed that completion of the entire Project within the time specified in the Construction Agreement is a matter of vital necessity to the Owner, that the Owner will suffer substantial damages if the entire Project is not completed within the specified time, and that it would not be possible to accurately determine the amount of such damages. In view of these facts, the Contractor agrees to pay the Owner liquidated damages in the sum set forth in the Construction Agreement for each calendar day, if any, which elapses between the date stated in the Construction Agreement, as extended by any extensions of time under the provisions of these General Conditions, and the date of final completion when the entire Project is finally accepted within the meaning of the acceptance and final payment provision of these General Conditions. If the Contractor fails to pay such liquidated damages promptly upon demand therefor, the surety on the Contractor's performance bond shall pay such damages. Also, the Owner may withhold all or any part of such liquidated damages from any payment due the Contractor. No changes in the Work shall extend the time for completion or the contract schedule unless set forth in a properly approved Change Order.

GC 46.00 ACCEPTANCE AND FINAL PAYMENT

46.01 *Final Inspection.* Within a reasonable time after final completion of the Work and before final acceptance thereof, a final inspection shall be made by the Architect, accompanied by the Owner, to determine whether the Work has been completed in accordance with the Contract Documents. A written report of inspection and detailed punch list, certified as to contents and date of inspection, shall be completed by the Owner and the Architect and delivered or mailed to the Contractor.

46.02 *Acceptance.* All prior requests for payment shall be subject to correction in the final request for payment. When all Work, including the punch list, has been certified by the Architect as finally and satisfactorily completed, and approved by the Owner's Board of Education, it shall be deemed accepted as of the date of the issuance of the Owner's letter of acceptance.

46.03 *Final Settlement.* Upon submission of the final request for payment, the time of final

settlement for the Work shall be established and shall thereafter be advertised by two (2) publications of notice, the last of which shall appear at least ten (10) days prior to the time of final settlement. Final payment and settlement shall be made at the time of final settlement as advertised, or as soon thereafter as appropriate and practicable, in the judgment of the Owner. The Owner shall not authorize final payment until all items on the final punch list are complete, all operations and maintenance manuals accepted, all Owner training is complete, and all close out documents are filed with the Owner.

46.04 *Unpaid Claims.* Neither the final payment nor any part of any sums withheld shall become due until the Contractor delivers to the Owner verified documentation showing full payment for all labor, materials, supplies, and equipment expended upon or incorporated in the Work under the Contract. If any unpaid claim for such labor, materials, supplies, or equipment is filed with the Owner before payment in full of all sums due the Contractor on the final settlement date, the Owner shall withhold from the Contractor sufficient funds, if available, to provide for the payment of such claim, until the same is paid or withdrawn. Such payment or withdrawal shall be evidenced by filing with the Owner a receipt for payment in full or an order authorizing withdrawal signed by the claimant or its duly authorized agent or assignee. Such funds shall ordinarily not be withheld longer than ninety (90) days following the date fixed for final settlement with the Contractor, as set forth in the published notice of final settlement, unless an action at law has been commenced within that time to enforce such unpaid claim and a notice of lis pendens has been filed with the Owner. At the expiration of the ninety (90) day period, the Owner shall release to the Contractor all funds that are not the subject of such action at law. Notwithstanding the provisions in this section, in the event the Colorado statutory procedure as set forth herein is amended during the term of the Construction Agreement, such amended procedure shall be substituted accordingly.

46.05 *Unsatisfied Claims.* If any claim for such labor, materials, supplies, or equipment remains unsatisfied after all payments are made by the Owner to the Contractor, the Contractor shall refund to the Owner all sums which the latter may for any reason be compelled to pay to satisfy such claim, includingall costs and attorneys' fees incurred by the Owner as a result of the Contractor's default in such respect.

46.06 *No Waiver.* The making and acceptance of final payment shall not constitute a waiver of any claims by the Owner, including, among others, those arising from unpaid claims, from faulty Work that appears before or after final payment, or from any failure to comply with any requirements of the Contract Documents.

GC 47.00 WARRANTIES ON PORTIONS OF THE WORK

The Contractor shall, in case of Work performed or materials or equipment provided for which warranties are required by the Contract Documents, secure the required warranties and deliver copies thereof to the Architect and the Owner at the time that the Work is finally completed. There shall be provided one copy for the Architect and two (2) copies (one electronic and one printed) for the Owner, bound into the operations and maintenance manuals. All such warranties shall commence on the date set forth in the letter of acceptance and shall not in any way reduce the Contractor's responsibilities under the Contract. Notwithstanding the foregoing, the warranty period shall not begin with respect to any item that is not completed on the date set forth in the letter of acceptance until such item is finally completed. Whenever guarantees or warranties are required by the specifications for a longer period than two years, such longer period shall govern. Contractor shall make use of web-based program for reporting of warranty

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issues to the Contractor with weekly status reports given to the Architect and Owner.

GC 48.00 CONTRACTOR'S PROJECT GUARANTEE AFTER COMPLETION

48.01 *Warrant and Guarantee.* The Contractor expressly warrants and guarantees that the Project will be constructed in a first-class, workmanlike manner; that it will be safe, free from structural and workmanship defects and defects in materials; and that the improvements will be suitable and fit for occupancy and for the purpose for which they were intended. Contractor shall, as a condition of acceptance, provide a certification letter that no asbestos containing materials were used in the Project.

48.02 *Unconditional Agreement to Remedy.* Neither the Architect's approval of the final request for payment nor payment of any request for payment or of any sum previously withheld from the Contractor shall relieve the Contractor of responsibility for its warranty and guarantee hereunder or for faulty materials or workmanship or the faulty workmanship of its subcontractors, and, unless otherwise agreed, the Contractor unconditionally agrees to remedy any defects due thereto, and pay for any damages resulting therefrom, which shall appear within a period of two (2) years from the date set forth in the letter of acceptance of its Work.

48.03 *Inspections.* The Owner, the Architect, and the Contractor together shall make at least three (3) complete inspections of the Work after the Work has been accepted by the Architect and the Owner. One such inspection shall be made approximately six (6) months after the acceptance of the Work, another such inspection shall be made approximately twelve (12) months after the acceptance of the Work, and a third such inspection shall be made approximately twenty-three (23) months after the acceptance of the Work. The Architect shall make a written report of these inspections, certified as to contents and date of inspection, and forward these reports electronically to the Owner and the Contractor within seven (7) days after completion of each inspection. The Contractor shall immediately initiate such remedial Work as may be necessary to correct any deficiencies or defective Work shown by this report, and shall promptly complete all such remedial Work in a manner deemed satisfactory to the Owner.

48.04 *Owner's Remedies.* If the Contractor fails to promptly correct all deficiencies and defects shown by the report, the Owner may do so, after giving the Contractor ten (10) days' written notice of its intent to do so. The Owner shall be entitled to collect from the Contractor all costs and expenses incurred in correcting such deficiencies and defects, as well as all damages resulting from such deficiencies and defects. The guarantee and warranties of the Contractor provided for herein are in addition to and not in lieu of any other remedies available to the Owner.

GC 49.00 MISCELLANEOUS KEYS, SWITCHES, ETC.

Except as otherwise specifically required by the technical specifications, at the completion of the Project all loose keys for hose bibs, adjustment keys and wrenches for door closers and panic hardware, keys for electric switches, electrical panels, and all other equipment shall be identified, accounted for and turned over to the Architect for transmittal to the Owner.

GC 50.00 INDEMNIFICATION

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To the fullest extent permitted by law, the Contractor shall indemnify and hold the Owner and the Architect and their directors, agents and employees harmless from and against all liabilities, costs, and expense, including attorneys' fees, arising out of, involving, or in connection with any death, personal injury or property damage, including the Work itself and including the loss of use therefrom, caused in whole or in part by Contractor's acts or omissions or the acts or omissions of Contractor's subcontractors, agents, or employees. This specific indemnification by the Contractor is in addition to and not in lieu of other remedies which may be available to the Owner. This provision shall survive the termination of the Contract.

GC 51.00 LABOR DISPUTES

Notwithstanding any other provision contained elsewhere in the Contract Documents and superseding any contrary term expressed in the Contract Documents, the Contractor agrees that in the event of any picket or other form of labor dispute at the Project site, whether such dispute or picket is in connection with the Contractor, subcontractor, or any other person or entity on the Project site, the Contractor shall continue to perform the Work required under the Contract Documents without interruption or delay. In the event the Contractor fails to continue the performance of the Work without interruption or delay because of such picket or other form of labor dispute, the Owner may terminate the services of the Contractor after giving seventy-two (72) hours' written notice of its intent to do so. The terminated Contractor may then be replaced at the discretion of the Owner and all extra costs involved in doing so shall be payable by the terminated Contractor.

GC 52.00 LIMITATION OF ACTIONS

Any actions against the Contractor, its subcontractors, suppliers, or others providing materials or services for the Project, brought to recover damages for injury to person, damage to property (including loss or damage to property on the Project itself), or defects in materials caused by the design, manufacture, supplying, planning, supervision, inspection, construction, or observation of construction of the Project shall be brought within six (6) years after such claim for relief arises and the nature and extent are fully discovered. In no case shall such an action be brought more than ten (10) years after the date of final completion and acceptance of the Project; provided, however, that in any case where the cause of action arises during the tenth year, such action shall be brought within six (6) years after such cause of action arises and the nature and extent are fully discovered by the Owner.

GC 53.00 PREFERENCE FOR COLORADO LABOR, MATERIALS, AND RESIDENT BIDDERS

53.01 *Colorado Labor.* In compliance with Colorado Revised Statutes §§ 8-17-101 and 8-17-102, Colorado labor shall be employed to perform at least eighty percent (80%) of the Work. Owner, in Owner's sole discretion after consultation with the State of Colorado, shall have the right to waive the eighty percent requirement if, in the Owner's sole discretion, there is reasonable evidence to demonstrate insufficient Colorado labor to perform the Work and if compliance with this Section 53.01 would create an undue burden that would substantially prevent a project from proceeding to completion. Owner shall not impose contractual damages on Contractor for a delay in the Work due to the Owner's decision to exercise this right. The term "Colorado labor" means any person who is a resident of the state of Colorado, at the time of the public works project, without discrimination as to race, color, creed, sex, sexual orientation,

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national origin, ancestry, age, or religion except when sex or age is a bona fide occupational qualification. A resident of the state of Colorado is a person who can provide a valid Colorado driver's license, a valid Colorado state-issued photo identification, or documentation that he or she has resided in Colorado for the last thirty days.

53.02 *Resident Bidders.* In compliance with Colorado Revised Statutes § 24-103-908, preference shall be given to resident bidders against nonresident bidders from a state or foreign country equal to the preference given or required by the state or foreign country in which the nonresident bidder is a resident. The term "resident bidder" means a person, partnership, corporation, or joint venture that is (a) authorized to transact business in Colorado and maintains its principal place of business in Colorado; or (b) authorized to transact business in Colorado, maintains a place of business in Colorado, and has paid Colorado unemployment compensation taxes in at least six (6) of the eight (8) quarters immediately prior to bidding on a construction contract for the Project.

GC 54.00 SALES AND USE TAX

The Contractor shall coordinate with the Owner to ascertain whether a sales or use tax may be collectible on the purchase of building materials, supplies, and equipment used on the Project by the Contractor. Some cities and municipalities will charge a sales or use tax on building materials, supplies, and equipment "picked up" and/or used within that city or municipality by a Contractor. Whenever possible, the Contractor shall have building materials, supplies, and equipment for the Project delivered to the construction site by common carrier, conveyance by the seller, or by mail, to avoid city or municipal sales and use taxes for which refunds will not be made. The Owner is exempt from the payment of any state sales and use taxes for materials, supplies, and equipment used on the Project by the Contractor and subcontractors. For the purpose of exercising such exemption, the Contractor and all its subcontractors shall apply for and obtain a certificate of exemption for the Work from the Colorado Department of Revenue. Copies of such certificates shall be filed with the Owner before any materials are purchased or any Work commenced hereunder. No amounts paid to Contractor pursuant to the Construction Agreement shall include reimbursement for such taxes. The final bill submitted by the Contractor for final payment shall show the net cost of all materials purchased by the Contractor and all subcontractors. At the time of final completion, the Contractor and his subcontractors shall execute affidavits, in duplicate, showing the amount of local municipal sales or use taxes, if any, paid by the Contractor or subcontractors upon materials used on the project, which affidavits shall further state that all such materials have been "built in" to the project, and where books and records and other substantiating evidence of payment of said tax are located and where they may be examined by appropriate governmental authorities, if such examination is required. The Contractor and all subcontractors shall maintain sufficient records to verify the amount of sales and use taxes paid to any local governmental entity. Failure to keep such records, resulting in the inability of the Owner to claim a refund for sales and use taxes for such materials, if allowed, shall render the Contractor or subcontractor liable for the amounts of such tax refund as determined by the Architect's/Consultant's cost estimates of such materials.

GC 55.00 LIENS

It is hereby mutually understood by and between the parties hereto that no contractor, subcontractor, materialman, vendee, laborer, mechanic, or other person, can or will contract for or in any

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other manner have or acquire any lien upon the Project building or Works covered by this Contract, or the land upon which the same is situated.

GC 56.00 OWNER'S INSPECTION OF CONTRACTOR'S RECORDS

The Contractor's records and the records of any of the Contractor's affiliates, subsidiaries or parent companies shall be subject to inspection and audit in connection with the Contract. "Records" shall include, but not be limited to, accounting records (hard copy, as well as computer readable data), written policies and procedures, subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.), original estimates, estimating worksheets, correspondence, Change Order files (including documentation covering negotiated settlements), back charge logs and supporting documentation, general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends, and any other supporting evidence reasonably deemed necessary by the Owner to substantiate charges related to the Contract. All of the foregoing shall be open to inspection and subject to audit and/or reproduction by the Owner or its agent or authorized representative to the extent necessary to adequately permit evaluation and verification of the cost of the Work, the appropriateness of the adjustedguaranteed maximum, the quality of the Work installed, and/or any invoices, Change Orders, payments or claims submitted by the Contractor or any of its payees pursuant to the execution of the Contract.

GC 57.00 CERTIFICATION BY CONTRACTOR REGARDING PREMISES ACCESS

The Contractor certifies to Owner that Contractor will not knowingly employ on Poudre School District premises persons convicted of any felony or misdemeanor crime of unlawful sexual behavior involving children.

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GC 58.00 CONTRACTOR SAFETY RESPONSIBILITIES

Poudre School District is dedicated to providing a safe and injury free environment for the students, faculty, District employees, occupants, vendors, visitors, and the general public associated with their properties. This is of the utmost importance to the Owner and shall be a priority of the Contractor and its Subcontractors in the execution of their obligations to the Contract. In addition, the Contractor and its subcontractors shall, at no additional cost to the Owner, comply with the following provisions:

58.01 *Contractor's Obligation to Provide Safety Compliance.* The Contactor will submit a copy of its Safety Program for review by the Owner's Safety Representative. Contractor has the sole responsibility for the adequacy and enforcement of its Safety Program. Contractor's Safety Program shall provide a basis for periodic compliance observation by Owner of Contractor's work areas. The Contractor shall submit to Owner written verification that all subcontractors engaged for services in the executions of the Contract are contractually obligated to comply with all provisions of Contractor's Safety Program. The Owner's Safety Representative is authorized to make written documentation of any safety and health hazards or violations brought to the attention of the Owner and shall request Contractor undertake expeditious corrective measures.

58.02 *Contractor Safety Representative.* In order to form an integrated team to effectively provide safe services to the Owner, the Contractor shall provide the name and contact information of Contractor's designated Safety Representative. This individual will have the responsibility and authority to ensure the Contractor's implementation, compliance with, and enforcement of, the Contractor's Safety Program and all applicable federal, state and local safety and health standards, rules and regulations. Owner reserves the right to require the Contractor to replace its designated Safety Representative if Owner determines the individual is not qualified, is ineffective or is not fulfilling all applicable safety and health responsibilities. Contractor shall conduct bi-monthly Toolbox talks to supplement the OSHA training efforts of their company or organization, and to keep safety front and center in their workers' minds. These are designed to heighten employee awareness of workplace hazards and supplement, not replace, OSHA regulations. These shall be bi-lingual if necessary.

58.03 *Contractors Obligation to Report Accidents and Incidents to Owner.* Contractor shall notify Owner of all incidents or injuries occurring on Owner's property and/or related to the Project. This notification obligation includes any injury or loss to District students, faculty, administrative personnel, visitors, vendors, Contractor's or subcontractor's workers, the general public and/or premises or property. Contractor and its subcontractors shall notify the Owner immediately of the incident or injury and shall investigate, compile and provide to Owner all relevant information within 24 (twenty-four) hours after occurrence on District-provided forms, if applicable. Contractor shall develop corrective actions for incident and injury prevention and timely report same to the District. Contractor agrees to perform Post Accident/Incident drug and alcohol testing. The expense of testing shall be borne by the Contractor at no additional cost to the Owner. The results of said testing will be provided to the Owner as part of the incident/injury report.

58.04 *Owner's Observation of Safety, Health and Environmental Compliance.* Owner will have the right to observe the Project and Contractor's work area to monitor compliance with Contractor's own Safety Program. Owner's Safety Representative will make recommendations as to the practices observed and provide a written report with concerns and/or documenting compliance issues observed. At any time a condition of threat to life and limb is observed with respect to any individual, including students, staff, District employees, occupants, vendors, visitors, the general public and/or workers, or to District property, Owner has the authority to immediately issue a Stop Work Order. Any stop work ordered by the Owner for such a safety reason must be effective immediately upon issuance. All associated costs and corrective action shall be the responsibility of Contractor. Work schedules will not be extended to accommodate the period of any such Stop Work Order, including any time required to implement corrective work or abate unsafe conditions. Any request or notice regarding, or visit of, the Project by an OSHA Compliance Officer must be immediately reported to the Owner's Safety Representative. Contractor must advise the Compliance Officer that the Owner is not the general contractor. Contractor must promptly provide the Compliance Officer with any and all information requested.

58.05 *Contractor's Prohibited Articles and Actions on Owner's Property.* The Contractor and its Subcontractors shall comply with the following District prohibitions:

a. Firearms, explosives, fireworks, shall not be allowed on Owner's Property: Pursuant to the Gun-Free School Zones Act, (18 U.S.C. §§ 921(a) (25, 26), 922(q) (1), it is unlawful for anyone to knowingly possess firearms in school zones.

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b. Harassment Policy: Owner prohibits verbal and/or sexual harassment of students, faculty, personnel and general public on its property. Owner reserves the right to ban offenders of this policy from all District premises.

c. Sex Offenders: Pursuant to Colorado Revised Statute 16-22-110, Public's Right to Know of Registered Sex Offenders, Owner reserves the right to investigate the status of any Contractor and/or subcontractor personnel with respect to Colorado Sex Offender Registry.

Contractor is obligated to notify all workers, vendors and employees associated with their work on the Project of the above policies and prohibitions. Contractor must conduct a Site Specific Orientation for such persons, as more fully set forth in the District's Construction Safety Manual. Any worker, vendor or employee that is engaged in an illegal act, refuses to submit to a search of property or person; or refuses, delays, is uncooperative with, or alters a urine and/or blood analysis shall be immediately removed from District property and the Project and shall prohibited from re-entering District premises.

58.06 *Project Site Conditions.*

a. Housekeeping: Contractor shall maintain a level of organization and cleanliness of the Project site that is conducive to the safety, health and well-being of all persons.

b. Security: Contractor shall secure materials, equipment, tools and access to the Project site.

c. Indoor Air Quality: Contractor agrees to make every reasonable effort to control, reduce,or abate nuisance odors, dust or fumes from products, equipment or site work to ensurethat minimum air quality standards are achieved and maintained.

d. Storm Water and Waste Water: Contractor agrees to comply with all applicable Federal,State and local codes, laws and regulations concerning permits, controls and best practices for SWPPP controls and compliance. Contractor shall apply and pay for and adhere to Colorado Discharge Permit System.

58.07 *Site Specific Orientation and Safety Plans in Place.* Contractor agrees to provide to all Contractors and subcontractors Project workers a mandatory site-specific orientation ("Site Specific Orientation") that covers the following information and practices:

a. Information as to the requirements of the District's Construction Safety Manual;

b. Information as to the requirements of the Contractor's Safety Program and policies;

c. Information as to the requirements of the Owner's Contract and all Prohibited Articles and Actions;

d. Specific guidelines to follow in the event of an emergency;

e. Communication of expectations concerning safety, safe practices and site-specific

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logistics; and

f. Security mechanism(s) to ensure that only authorized personnel who have participated in a site-specific safety orientation are permitted to access the Project site Contractor shall issue an Owner-approved Hard Hat self-adhesive label with identifying number that evidences a person's participation in the Site-Specific Orientation. Only those persons with the approved Hard Hat label shall be authorized to access the Project premises. Contractor shall maintain a current and accurate record of each person's issued number by name, date of issuance, record of attendance at the Project site and, as applicable, date of deactivation. Owner shall provide the labels at no cost to the Contractor for the term of the Contract.

58.08 *Record Keeping.* Contractor agrees to produce, maintain, and store on the Project site, all safety-related reports and records. Such documentation shall be produced by Contractor to Owner upon request. All such records shall be made accessible to governmental authorities upon request.

GC 59.00 CONTRACTOR ASBESTOS MANAGEMENT AND LEAD PAINT RESPONSIBILITIES

Contractor shall adhere to all AHERA, EPA, and Colorado Department of Public Health and Environment regulations regarding asbestos treatment and management before and during any construction, renovation or maintenance project. To that end, Contractor shall review the asbestos management plan before the work begins. Any activity that could potentially disturb asbestos containing building materials must be brought to the attention of Owner's Environmental Services Department prior to the start of work, and if the scope of work changes during the course of the project. Owner's Environmental Services will identify all areas of concern and facilitate any necessary abatement in order to help make all projects successful. Contractor shall adhere to all federal and state regulations regarding the treatment and management of lead based paint before, during, and after any construction, renovation, or maintenance project. To that end, Contractor shall review the lead based paint (LBP) records before work begins, and complete additional testing for LBP as necessary. Any activity that potentially disturbs LBP must be brought to the attention of the Owner's Facilities and Construction Department prior to the start of work. All records of supplemental inspection and testing and any change in the scope of work will be provided to Owner.

GC 60.00 ARCHITECT'S STATUS AND INSPECTIONS

60.01 *Authority.* The Architect shall be the Owner's representative during construction and until the expiration of the warranty period. The Architect shall have authority to act on behalf of the Owner only to the extent expressly provided in the Contract Documents or otherwise in writing. The Architect, with written approval of the Owner, shall have authority to stop the Work whenever such stoppage may be reasonably necessary in its opinion to ensure the proper execution of the Contract.

60.02 *Decisions.* The Architect shall be, in the first instance, the interpreter of the conditions of the Contract and the judge of its performance, although the Owner shall retain the final authority in decisions regarding such matters. The Architect shall, within a reasonable time, make recommendations on all claims of the Contractor and on all other matters relating to the execution and progress of the Work.All such decisions shall be subject to review by the Owner. The Architect's decisions in matters relating to

artistic effect, after consultation with the Owner, shall be final, if within the terms of the Contract Documents.

60.03 *Inspections.* The Contractor shall provide timely notice to the Architect when inspections are desirable or required by the terms of the Contract Documents or the Architect's Agreement with the Owner. Such notice shall be given in order to allow for the following reviews and inspections, among others:

a. Reviewing and approving shop drawings, samples and other submissions for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents.

b. Inspection of load-bearing surfaces or excavations before footings are poured.

c. Inspection of reinforcing steel after installation and before concrete is poured.

d. Inspection of structural and architectural concrete before, during, and after pouring.

e. Evaluation of all laboratory reports.

f. Inspection of structural steel after erection and prior to its being covered or enclosed.

g. Inspection of mechanical work following its installation and prior to its being covered or enclosed.

h. Inspecting of electrical work following its installation and prior to its being covered or enclosed.

i. Inspection of exposed surfaces for compliance with the Contract Documents.

GC 61.00 ORAL STATEMENTS

It is understood and agreed that the written terms and provisions of the Contract Documents shall supersede all oral statements of the Owner, Architect, Contractor and their representatives, and that oral statements shall not be effective or be construed as being a part of this Contract.

GC 62.00 PROJECT SIGN

Owner shall provide Project signs which Contractor shall install at Owner's direction at the Project site. Except as approved by Owner, no advertising or signage shall be permitted on the Project site.

GC 63.00 HISTORICAL DATA

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In addition to the warranties, guarantees, operating instructions, etc., elsewhere specified in the Contract Documents, at the conclusion of the Work and before final payment is made, the Contractor shall furnish a listing of the principal's names, addresses, and telephone numbers of all subcontractors and suppliers that furnished labor and/or materials on the Project, with identification of the services and materials rendered by each. There shall be provided one (1) copy for the Architect and three (3) copies and one (1) electronic copy for the Owner. All copies shall be delivered to the Architect for review and distribution.

GC 64.00 ASSIGNMENT

The Contractor shall not assign its interests herein in whole or in part without the written consentof the Owner; nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner.

GC 65.00 TIME OF THE ESSENCE

All time limits stated in the Contract Documents are of the essence of the Contract.

GC 66.00 DISPUTES

The Contract shall be governed by and construed in accordance with the laws of the State of Colorado. Venue for any dispute concerning the Contract or the Project shall be exclusively in the federal court located in Colorado or the state court located in Larimer County, Colorado.

GC 67.00 SURVIVAL

The provisions of the Contract relating to indemnification from Contractor to Owner shall survive any termination or expiration of the Contract. Additionally, any provisions of the Contract which require performance subsequent to the termination or expiration of the Contract shall also survive such termination or expiration.

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Poudre School District
Board of Education Meeting Coversheet

Action Item

Agenda Item Title: Annual Mill Levy Certification

Policy Facts:

E.L. 2.3 - Financial Conditions and Activities - "The Superintendent shall neither cause nor allow the development of fiscal jeopardy or a material deviation of actual expenditures from Board priorities established in District Ends policies."

E.L.2.8.9 - Communication and Support to the Board - "Submit to the Board all matters regarding which Board action is required by law, along with the Superintendent's recommendations and required policy compliance assurances."

Summary and/or Background:

Subsequent to the Mill Levy Presentation provided to the Board of Education meeting on December 12, 2023, as planned the District has now received an updated assessed valuation. This update reflects changes from Senate Bill 23B-001-Concerning a Reduction in 2023 Residential Property Taxes, approved by the Colorado Legislature in Special Session November 2023.

The final assessed valuation did not materially change from the December estimates, therefore, the presentation on December 12, 2023 is accurate with minor changes shown in the following table:

	Assessed Valuation	Total Mill Levy	Net Tax Generated
January 9, 2024 Board Action - Final	$4,877,226,467	53.434	$260,609,719
December 12, 2023 Presentation to the Board	$4,888,286,129	53.375	$260,912,270

All attachments included in the January 9, 2024 Board Agenda have been updated to reflect the final assessed valuation.

SB23B-001 was modeled after Proposition HH by the legislature in special session November 2023 and resulted in lowering the property tax rate for residential properties to 6.7% and expanding value deductions to $55,000. The non-residential property tax rate will be 27.9%.

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“New” Timeline under SB23B-001:

	Old	New
Certification of Values from the Assessor	~~December 10~~	January 3
District submits levies to County Commissioners	~~December 15~~	January 10
County Commissioners Certify Levies	~~December 22~~	January 17
Tax Rolls Delivered to Treasurer	~~January 10~~	January 24

The Board of Education is required to certify the local property tax mill levy for the District to the Board of County Commissioners no later than January 10, 2024.

Recommendation:

The Superintendent and Chief of Finance recommend the Board certify the mill levy by the following resolution:

BE IT RESOLVED BY THE BOARD OF EDUCATION OF POUDRE SCHOOL DISTRICT R-1 that the Secretary of the Board of Education formally certify to the Board of Larimer County Commissioners the mill levy as presented in the Board packet in the following manner: For the tax year 2023 (collectable in 2024), the Governing Board of the Poudre School District R-1 hereby certifies a total levy of 53.434 mills to be extended by you upon the total net assessed valuation of $4,877,226,467 to produce $260,609,719 in revenue.

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MILL LEVY RESOLUTION

WHEREAS, the Board of Education is required to formally certify to the Board of Larimer County Commissioners the mill levy in accordance with CRS 39-5-128 (1) no later than January 10, 2024: and

WHEREAS, analysis of existing statutes and amendments to the Colorado constitution has been done to determine what mill levy is allowed under those statutes and amendments,

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF EDUCATION OF POUDRE SCHOOL DISTRICT R-1 that the secretary of the board of education formally certify to the Board of Larimer County Commissioners the mill levy in accordance with CRS 39-5-128 (1) in the following manner:

For the tax year 2023 (collectable in 2024, the Governing Board of the Poudre School District R-1 hereby certifies a total levy of 53.434 mills to be extended by you upon the total net assessed valuation of $4,877,226,467 to produce $260,609,719 in revenue.

This is based on:

Total Assessed Valuation	5,164,299,905
Less: Tax Increment Financing	(287,073,438)
Net Valuation	$4,877,226,467

For Tax Year 2023 Collectable in 2024 :

Description	Mills	Gross Tax Generated	Less TIF	Net Tax Generated
General Fund State Levy	27.000	$ 139,436,098	$ (7,750,983)	$ 131,685,115
Taxes Abated and Refunded	0.191	986,381	(54,831)	931,550
1988 Override Election Levy	0.626	3,232,852	(179,708)	3,053,144
1996 Override Election Levy	1.222	6,310,775	(350,804)	5,959,971
2000 Override Election Levy	2.050	10,586,815	(588,501)	9,998,314
2010 Override Election Levy	3.281	16,944,068	(941,888)	16,002,180
2016 Override Election Levy	1.640	8,469,451	(470,800)	7,998,651
2019 Override Election Levy	4.287	22,139,354	(1,230,684)	20,908,670
Bond Redemption Levy	13.137	67,843,408	(3,771,284)	64,072,124
Totals	53.434	$ 275,949,202	$ (15,339,483)	$ 260,609,719

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You are hereby authorized and directed to extend said levies upon your tax list.

In accordance with CRS 22-40-102 (6), Poudre School District is required to inform the county treasurer of the general fund mill levy that would be required in the absence of state funding received pursuant to the "Public School Finance Act of 1994" and the estimated funds to be received for the general fund. The Colorado Department of Education has estimated the amount of funding Poudre School District will receive for the general fund to be $186,823,065 and that in the absence of this funding the District's general fund state mill levy would be 63.564 instead of 27.000.

Approved and adopted this 9th day of January 2024.

POUDRE SCHOOL DISTRICT R-1

By:_____
President, Board of Education

ATTEST:

By:_____
Secretary, Board of Education

CERTIFICATION OF VALUATION BY LARIMER COUNTY ASSESSOR

Name of Jurisdiction: **006 - POUDRE R-1 SCHOOL DISTRICT**

IN LARIMER COUNTY ON 12/20/2023 New Entity: No

USE FOR STATUTORY PROPERTY TAX REVENUE LIMIT CALCULATIONS (5.5% LIMIT) ONLY

IN ACCORDANCE WITH 39-5-121(2)(a) AND 39-5-128(1),C.R.S. AND NO LATER THAN AUGUST 25, THE ASSESSOR CERTIFIES THE TOTALVALUATION FOR ASSESSMENT FOR THE TAXABLE YEAR 2023 IN LARIMER COUNTY. COLORADO

1.	PREVIOUS YEAR'S NET TOTAL TAXABLE ASSESSED VALUATION:	$3,910,628,903
2.	CURRENT YEAR'S GROSS TOTAL TAXABLE ASSESSED VALUATION: *	$5,164,299,905
3.	LESS TIF DISTRICT INCREMENT, IF ANY:	$287,073,438
4.	CURRENT YEAR'S NET TOTAL TAXABLE ASSESSED VALUATION:	$4,877,226,467
5.	NEW CONSTRUCTION: **	$94,839,743
6.	INCREASED PRODUCTION OF PRODUCING MINES: #	$0
7.	ANNEXATIONS/INCLUSIONS:	$0
8.	PREVIOUSLY EXEMPT FEDERAL PROPERTY: #	$0
9.	NEW PRIMARY OIL OR GAS PRODUCTION FROM ANY PRODUCING OIL AND GAS LEASEHOLD OR LAND (29-1-301(1)(b) C.R.S.): ##	$0
10.	TAXES COLLECTED LAST YEAR ON OMITTED PROPERTY AS OF AUG. 1 (29-1-301(1))(a) C.R.S.):	$43,599.02
11.	TAXES ABATED AND REFUNDED AS OF AUG. 1 (29-1-301(1)(a) C.R.S.) and (39-10-114(1)(a)(I)(B) C.R.S.):	$932,941.39

* This value reflects personal property exemptions IF enacted by the jurisdiction as authorized by Art. X, Sec.20(8)(b),Colo.

** New construction is defined as: Taxable real property structures and the personal property connected with the structure.

Jurisdiction must submit respective certifications (Forms DLG 52 AND 52A) to the Division of Local Government in order for the values to be treated as growth in the limit calculation.

Jurisdiction must apply (Forms DLG 52B) to the Division of Local Government before the value can be treated as growth in the limit calculation.

USE FOR 'TABOR' LOCAL GROWTH CALCULATIONS ONLY

IN ACCORDANCE WITH THE PROVISION OF ARTICLE X, SECTION 20, COLO CONST, AND 39-5-121(2)(b),C.R.S. THE ASSESSOR CERTIFIES THE TOTAL ACTUAL VALUATION FOR THE TAXABLE YEAR 2023 IN LARIMER COUNTY, COLORADO ON AUGUST 25, 2023

1.	CURRENT YEAR'S TOTAL ACTUAL VALUE OF ALL REAL PROPERTY: @	$0
	ADDITIONS TO TAXABLE REAL PROPERTY:	
2.	CONSTRUCTION OF TAXABLE REAL PROPERTY IMPROVEMENTS: !	$0
3.	ANNEXATIONS/INCLUSIONS:	$0
4.	INCREASED MINING PRODUCTION: %	$0
5.	PREVIOUSLY EXEMPT PROPERTY:	$0
6.	OIL OR GAS PRODUCTION FROM A NEW WELL:	$0
7.	TAXABLE REAL PROPERTY OMITTED FROM THE PREVIOUS YEAR'S TAX WARRANT:	$0
	(If land and/or a structure is picked up as omitted property for multiple years, only the most current year's actual value can be reported as omitted property.)	
	DELETIONS FROM TAXABLE REAL PROPERTY:	
8.	DESTRUCTION OF TAXABLE REAL PROPERTY IMPROVEMENTS:	$0
9.	DISCONNECTIONS/EXCLUSION:	$0
10.	PREVIOUSLY TAXABLE PROPERTY:	$0

@ This includes the actual value of all taxable real property plus the actual value of religious, private schools, and charitable real property.

! Construction is defined as newly constructed taxable real property structures.

% Includes production from new mines and increases in production of existing producing mines.

IN ACCORDANCE WITH 39-5-128(1),C.R.S. AND NO LATER THAN AUGUST 25, THE ASSESSOR CERTIFIES TO SCHOOL DISTRICTS : 1. TOTAL ACTUAL VALUE OF ALL TAXABLE PROPERTY:---------->	$52,249,258,531

NOTE: All levies must be Certified to the Board of County Commissioners NO LATER THAN DECEMBER 15, 2023

IN ACCORDANCE WITH 39-5-128(1.5)C.R.S. THE ASSESSOR PROVIDES: HB21-1312 ASSESSED VALUE OF EXEMPT BUSINESS PERSONAL PROPERTY (ESTIMATED): **	$8,126,845

** The tax revenue lost due to this exempted value will be reimbursed to the tax entity by the County Treasurer in accordance with 39-3-119 f(3). C.R.S.

Data Date: 12/21/2023

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CDE Mill Levy Certification Form

1550

Primary County: LARIMER

District Name: POUDRE

Certification of Mill Levies
Property Tax Year 2023, to be Collected in 2024

Input Column E into the SmartSheet (link in Row 79)

CATEGORY	August Column Comments	School District Final Mill Certified: December 15, 2022	Colorado Department of Education (CDE) Mill Levy Estimated as of August 25, 2023	School District Final Mill Levy Certified as of January 10, 2024	Estimated School District Revenue from Mill Levy January 10, 2024
Assessed Valuation	**August Column Comments**				
Gross Assessed Valuation	Provided by County Assessor	$4,143,175,927	$5,405,411,810	$5,164,299,905	
Tax Increment Financing	Provided by Assessor (may not be included)	($232,547,024)	($295,961,347)	($287,073,438)	
Net Assessed Valuation	Provided by County Assessor	$3,910,628,903	$5,109,450,463	$4,877,226,467	
Abatements (Total across all counties)	Provided by County Assessor	$1,051,676	$932,941	$932,941	
1. Mill Levy per HB20-1418	Fixed for FY24-Both Aug & Jan	27.000	27.000	27.000	
1a. HB20-1418 Tax Credit	Fixed for FY24-Both Aug & Jan	0.000	0.000	0.000	
1b. HB20-1418 Net Mill Levy (amt collected by county)	Fixed for FY24-Both Aug & Jan	27.000	27.000	27.000	$131,685,115
2. Categorical Buyout	ONLY FULLY LOCALLY FUNDED Based on Aug 25 NAV	0.000	0.000	0.000	$0
3. Total Program Reserve Fund	ONLY FULLY LOCALLY FUNDED Based on Aug 25 NAV	0.000	0.000	0.000	$0
4. Total Program Mill		**27.000**	**27.000**	**27.000**	**$131,685,115**
5. Overrides:					
a. Hold harmless		0.000	0.000	0.000	$0
b. Excess hold harmless		0.000	0.000	0.000	$0
Voter Approved Override **5c. Total Voter Approved Override**		15.950	6.852	**13.106**	**$63,920,930**
6. Abatement		0.269	0.183	0.191	$931,550
7. Total General Fund		**43.219**	**34.035**	**40.297**	**$196,537,595**
8. Bond Redemption Fund		12.646	Not Provided	13.137	$64,072,124
9. Transportation Fund		0.000	Not Provided	0.000	$0
10. Special Building and Technology		0.000	Not Provided	0.000	$0
11. Supplemental capital construction, technology, & maintenance Fund		0.000	Not Provided	0.000	$0
12. Other (Loan, Charter School,)		0.000	Not Provided	0.000	$0
Details for #12 other					
13. Total		**55.865**	**34.035**	**53.4340**	**$260,609,719**

Information provided by state for certification to county treasurer:

No Need to Calculate with change in Dec AV from Aug 25

14. Estimated Full Funding Mill Levy	Fixed for FY24-Both Aug & Jan, Based off Aug 25's NAV	75.923	63.564	63.564
15. Projected Gross Funding from State (Before budget stabilization factor)	Fixed for FY24-Both Aug & Jan, Based off Aug 25's NAV	$191,336,733	$186,823,065	$186,823,065

Dave Montoya, CFO
Form completed by

970-218-4794
Phone Number

Submit Data via CDE online application no later than January 10, 2024

https://idm.cde.state.co.us/equal/

Mandatory
FORM # PSF-119
EDAC REVIEWED
03/24/2023 for 2023-2024

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Poudre School District Change in Taxes
Estimated Tax Collections - For the Tax Years 2022 and 2023

	2023		2024	
Total Assessed Valuation	$ 4,143,175,927		$ 5,164,299,905	
Less Tax Increment Financing (TIF)	(232,546,024)		(287,073,438)	% Change
Net Valuation	$ 3,910,629,903		$ 4,877,226,467	24.7%
All Levies	**Mills**	**Net Tax**	**Mills**	**Net Tax**
General Fund State Levy	27.000	$105,587,007	27.000	$131,685,115
Taxes Abated and Refunded	0.269	1,051,959	0.191	931,550
1988 Override Election Levy	0.780	3,050,291	0.626	3,053,144
1996 Override Election Levy	1.524	5,959,800	1.222	5,959,971
2000 Override Election Levy	2.557	9,999,481	2.050	9,998,314
2010 Override Election Levy	4.092	16,002,298	3.281	16,002,180
2016 Override Election Levy	2.046	8,001,149	1.640	7,998,651
2019 Override Election Levy	4.951	19,361,529	4.287	20,908,670
Bond Redemption	12.646	49,453,826	13.137	64,072,124
	55.865	$218,467,340	53.434	$260,609,719
		Change	(2.43)	$42,142,379
		% Change	-4.4%	19.3%
Voter Approved Overrides Only	**Mills**	**Net Tax**	**Mills**	**Net Tax**
1988 Override Election Levy	0.780	3,050,291	0.626	3,053,144
1996 Override Election Levy	1.524	5,959,800	1.222	5,959,971
2000 Override Election Levy	2.557	9,999,481	2.050	9,998,314
2010 Override Election Levy	4.092	16,002,298	3.281	16,002,180
2016 Override Election Levy	2.046	8,001,149	1.640	7,998,651
2019 Override Election Levy	4.951	19,361,529	4.287	20,908,670
	15.950	62,374,548	13.106	63,920,930

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Poudre School District Taxation Impact Estimate
For the Tax Year 2023 Collectable in 2024

Collection Year	*2023*	*2024*	Change
Total Mill Levy	55.865	53.434	-2.431

Residential

Median Home Value (est. increase 30.84%)	$ 535,000	$ 700,000
Exemption	-	(55,000)
Adjusted Home Value	$ 535,000	$ 645,000
Residential Assessment Rate	6.950%	6.700%
Estimated Tax on Median Home	$ 2,077	$ 2,309

Increase in Residential Tax for Median Home		
Annual	Monthly	Daily
$ 231.95	$ 19.33	$ 0.64

Non-Residential (Commercial Multiplier)

Non-Residential Value	$ 1,000,000
Non-Residential Assessment Rate	27.900%
	$ 14,908

Tax per $1 Million in Non-Residential Value		
Annual	Monthly	Daily
$ 14,908	$ 1,242	$ 41

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Poudre School District
Board of Education Meeting Coversheet

Action Item

Agenda Item Title: Intergovernmental Agreement for the Southeast Community Center

Policy Facts:

Under paragraph 10 of Policy EL 2.6, the Superintendent shall not make or authorize any District purchase, contract, or other financial obligation of $250,000 or more without prior Board approval.

Under paragraph 7 of Policy EL 2.3, the Superintendent shall not cause or allow the District to acquire, lease, encumber or dispose of real property.

Summary and/or Background:

The purpose of this item is to review the terms of an intergovernmental agreement (IGA) covering land acquisition, constructions, and operation of the Southeast Community Center (SCC).

As part of the IGA, Poudre School District (PSD or the District) intends to convey to the City of Fort Collins (the City) at no charge a parcel of land adjacent to Fossil Ridge High School as the site for the SCC. This no-charge conveyance is contingent upon the District's full funding of a 15% cost share of the indoor swim lanes construction, which includes of the value of the land.

This IGA is a critical first agreement, and throughout 2024 there will be additional agreements drafted and executed:

- Purchase and Sale Agreement between the City and PSD for the land acquisition (PSA, April 2024);
- Facility Use Agreement between the City and PSD governing PSD's use of City aquatic facilities (subsequent to November 2024 elections);

The District currently uses swim lanes at existing City recreation facilities for practices and meets for its high school swim teams. Access to lanes for both PSD and public at large is constrained within the City's recreation system based on current capacity.

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Moreover, the District is likely to add an additional swim team soon constraining lane availably further.

PSD has approximately 10 acres of land available adjacent to Fossil Ridge High School (the “Land”) that, in the City’s opinion based on preliminary information, represents a suitable site for the construction of the SCC to include all of the facility requirements to an expanded library branch, and the construction of an indoor aquatics facility that would serve the recreation needs of the community and allow PSD access to indoor lanes for its swim programs (the “Aquatics Facility”).

KEY PROVISIONS OF THE IGA:

1. Land Acquisition

   The District intends to convey the Land to the City. The IGA is conditioned on the City and PSD negotiating and executing a Purchase and Sale Agreement (“PSA”) for the Land, including any necessary approvals by the City and PSD’s respective governing bodies, by April 30, 2024.

   The City and PSD have agreed on a value for the Land of $3,180,000, based on a recent professional appraisal.

   The value of the Land represents part of the District’s overall capital commitment to the cost of constructing the Aquatics Facility. If the Land value is not sufficient to cover PSD’s 15% share of the cost of constructing the Aquatics Facility, PSD will pay the City the difference, contingent on a 2024 ballot measure that PSD intends to run. If the Land value exceeds PSD’s 15% share, the City will pay PSD the difference.

   If PSD can secure funding for the remaining portion of its 15% share by January 31, 2025, escrowed funds will be returned to the City as part of the District’s 15% share of costs for the Aquatics Facility. If PSD cannot secure funding, the funds will be released to PSD as payment for the Land, and the City will have no obligation to build the indoor swim lanes.

2. Construction of the SCC/Aquatics Facility

   The City will be responsible for contracting, design and construction of the SCC. The City will consult with the District, but the City will have final decision-making authority, on-site planning for the SCC, and on the designs for the Aquatics.

3. Ownership, Maintenance and Use of the Aquatics Facility

   The Aquatics Facility will be solely owned and maintained by the City. The District’s use of City pool facilities, including the Aquatics Facility, will be governed by a separate Facility Use Agreement between the City and PSD to be

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executed following the outcome of the November 2024 election.

As further consideration for its use of the Aquatics Facility, once the facility is open PSD shall pay the City $150,000 annually, which the City will use for the operation and maintenance of the Aquatics Facility. The City shall establish a long-term equipment replacement fund associated with the Aquatics Facility and PSD agrees to also pay the City $45,000 annually as its contribution to this fund. The District and City intend that these annual payments will continue so long as the District continues to use the Aquatics Facility, but after the initial seven-year term of the IGA these amounts may be adjusted as agreed to by the City and PSD.

The City, Poudre River Public Library District, and PSD have been highly collaborative partners in drafting this agreement.

Recommendation:

The Superintendent recommends the Board authorize staff to enter into an Intergovernmental Agreement for the Southeast Community Center in substantially the form attached in this agenda item.

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INTERGOVERNMENTAL AGREEMENT

RELATED TO THE SOUTHEAST COMMUNITY CENTER

THIS INTERGOVERNMENTAL AGREEMENT ("Agreement") dated _____, 2023, is entered into by and between THE CITY OF FORT COLLINS, COLORADO, a municipal corporation ("City"), POUDRE SCHOOL DISTRICT R-1, a statutory Colorado school district ("School District") and the POUDRE RIVER PUBLIC LIBRARY DISTRICT, a political subdivision of the State of Colorado ("Library"). The City, School District, and Library are referred to herein individually as a "Party" and collectively as the "Parties."

RECITALS

A. The City is a home-rule municipality that was settled by non-native homesteaders in the mid-1800's, was originally platted as a town site in 1866, and became the seat of Larimer County government in 1868. In 1873 the town of Fort Collins was incorporated. Fort Collins has a current population of more than 174,000, having grown steadily over the last 60 plus years from a 1960 population of 25,000.

B. The School District is a duly organized and validly existing school district, political subdivision and body corporate of the State of Colorado under the Constitution and laws of the State of Colorado.

C. The Library is a Colorado Library District established by a citizen initiative in 2006 pursuant to the Colorado Library Law, Sections 24-90-101 et seq. C.R.S.

D. The Colorado Constitution, Article XIV, Section §18, and §29-1-201, C.R.S., et seq. provide for and encourage political subdivisions of the State of Colorado to make the most efficient and effective use of their powers and responsibilities by cooperating and contracting with each other; and

E. Section 29-1-203, C.R.S., as amended, authorizes any political subdivisions or agencies of the State of Colorado to cooperate or contract with one another to provide any function, service, or facility lawfully authorized to each of the cooperating or contracting entities, including the sharing of costs, imposition of taxes, or incurring of debt; and

F. The Parties have a lengthy history of working together to provide park, recreation and library facilities to the Fort Collins community.

G. In April 2015 the voters of Fort Collins overwhelmingly approved Ordinance No. 013, 2015, extending for ten years a quarter-cent sales tax to be dedicated to the "Community Capital Improvement Program" capital projects and related operation and maintenance ("CCIP"). Ordinance No. 013, 2015 includes a requirement that the City construct a Community Center in southeast Fort Collins focused on innovation, technology, art, recreation and the creative process, including a "large outdoor leisure pool with water slides, sprays and jets, decks, a lazy

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river and open swimming area," as well as meeting spaces dedicated to innovation and creativity.

H. The School District utilizes swim lanes within existing City recreation facilities for practices and meets of its multiple high school swim teams. Access to lanes for both the School District and public at large is constrained within the recreation system based on current capacity. Moreover, the School District is likely to add an additional swim team in the near future.

I. The School District currently has approximately 10 acres of land (the "Land", as defined below) available that, based on preliminary information, represents a suitable site for the construction of a new Community Center that includes all of the facility requirements contained in the 2015 ballot language in addition to an expanded library branch, and the construction of an indoor aquatics facility that would both serve the recreation needs of the Fort Collins community and allow the School District access to indoor lanes for its swim programs.

J. Since the CCIP tax measure was approved by the voters, the Parties have participated in extensive discussions focused on planning, developing and establishing the Community Center to meet the needs and desires of the Fort Collins community.

K. The City has secured funding for a currently estimated $30-34 million of capital costs for the indoor Aquatics Facility. The Parties acknowledge that the School District plans to secure funding for the School District's share of the indoor Aquatics Facility, and also contribute to the operation, maintenance, and replacement costs of the Aquatics Facility.

L. On August 15, 2023, the Fort Collins City Council adopted resolution 2023-074, which stated the "City Council's intent that access for [School District] students is conditional on the District's and City's agreement on the District's share in the full cost of those swimming lanes," and the School District has agreed to fund 15% of such costs.

M. The Library is interested in constructing a southeast branch library as part of the Community Center.

N. In the spirit of these stated objectives, the Parties seek by this Agreement to memorialize the terms on which they have agreed, in a collaborative manner and as partners, to develop and operate the Community Center, with the intent that their collaborative partnership shall continue for many years to come.

O. This Agreement is conditional on the execution of a Purchase and Sale Agreement ("PSA") for the Land, including any necessary approvals by the City and School District's respective governing bodies. This Agreement will automatically terminate if the City and School District are unable to execute the PSA by April 30, 2024.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained in this Agreement, the Parties agree as follows:

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I. GENERAL TERMS

1. Definitions.

a. Appraised Price: the agreed upon fair market value of the Land, as further described below in Section II.1(b).

b. Aquatics Base: the total capital cost of designing and constructing the Aquatics Facility, including but not limited to the cost of constructing indoor lap lanes and deck, aquatic support (office space, pumping and filtration equipment and fixtures, lockers, and storage), Common Amenities, and Site Costs.

c. Aquatics Facility: the indoor lap pool facility the City plans to construct as part of the Community Center, this facility does not include any indoor elements of the Leisure Pool.

d. Common Amenities: means common areas of the Community Center that serve the Aquatics Facility or Library Branch as well as the City's other facilities, based on the 100% design of the Community Center.

e. Community Center: the Southeast Community Center, to potentially include the Aquatics Facility, Library Branch, Leisure Pool, and other facilities to serve a community purpose.

f. Effective Date: the date the Agreement is fully executed by all Parties.

g. Land: Approximately 10 acres of the larger parcel, as depicted in Exhibit A attached, currently owned by the School District identified as Larimer County Assessor's Parcel No. 8604000904 that the City intends to acquire as part of this Agreement subject to the terms and conditions of a separate Purchase and Sale Agreement. The Parties agree that Exhibit A will be updated with additional information pertaining to the Land, including the legal description.

h. Leisure Pool: all elements of an outdoor/indoor leisure pool with water slides, sprays and jets, decks, a lazy river and open swimming area specified in the CCIP ballot measure.

i. Library Branch: a facility to serve as a public library meeting the definitions promulgated by the Office of Colorado State Librarian and providing community meeting spaces with access to information of all kinds and programing that fosters reading, lifelong learning, innovation and creativity.

j. Purchase and Sale Agreement or PSA: the agreement to be entered into by the City and School District outlining the sale of the Land, as described above.

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k. Project: the acquisition of land, planning, design, construction and furnishing of the facilities encompassing the Community Center.

2. Term and Termination. The term of this Agreement will begin on the Effective Date and shall continue for 7 years. The Parties have agreed to review and update this Agreement as needed and to engage in good faith negotiations regarding the need for potential term extensions. This Agreement is subject to early termination only as described herein.

II. COMMUNITY CENTER AND AQUATICS FACILITY

1. Land Acquisition

a. Land. The City intends to acquire the Land from the School District, and both Parties will engage in good faith negotiations to reach agreement on and execute a Purchase and Sale Agreement on terms and conditions satisfactory to both Parties.

b. Appraisal. The City and the School District agree that the Appraised Price of the Land is $3,180,000. This is the amount at which the Land was appraised on July 26, 2023, by Jon Vaughan of CBRE.

c. City Land Acquisition and Aquatics Facility Construction Funding. The School District intends to convey the Land to the City as an in-kind consideration as part of an overall capital commitment of 15% towards the Aquatics Base, in exchange for the City agreeing to build the Aquatics Facility and coordinate the School District's shared use of it for School District swim programs.

d. The School District agrees that the City is under no obligation to build the Aquatics Facility unless the City and District secure sufficient funding as stated below. The City and District have identified the following potential funding sources for their respective shares of the Aquatics Facility construction costs:

i. On November 7, 2023, Fort Collins voters passed a ballot measure approving a .50% sales tax, with 50% of the revenues to be spent on replacement, upgrade, maintenance, and accessibility of parks facilities and for the replacement and construction of indoor and outdoor recreation and pool facilities. These revenues will provide funding for the Aquatics Facility. The City and the School District intend to sign a PSA for the Land by April 30, 2024, if not sooner, and close on the Land by November 30, 2024.

ii. The School District intends to seek voter approval of a November 2024 ballot measure to fund the School District's share of the Aquatics Facility.

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iii. The City and School District agree that they intend to close on the Land following the November 2024 election. If the School District's November 2024 ballot measure is approved by the voters, then at closing the School District will convey the Land to the City at no cost as part of the School District's share of funding for the Aquatics Facility.

iv. If the School District's November 2024 ballot measure is not approved by the voters, at closing the City will deposit the Appraised Price of the Land into an interest-bearing escrow account. The escrow agreement shall be in substantially the form attached as Exhibit B to this Agreement. This funding will remain in the escrow account until the expiration of the reimbursement obligation described below.

v. If the School District's November 2024 ballot is not approved but the School District secures a new source of funding after the execution of the PSA and conveyance of the Land to the City but before January 31, 2025, the escrowed funds and any accrued interest shall be released to the City as part of the School District's share of funding for the Aquatics Facility.

vi. If the School District's November 2024 ballot measure is not approved and the School District is not able to secure a new source of funding by January 31, 2025, the escrowed funds and any accrued interest shall be released to the School District, unless the City and School District mutually agree to extend the funding deadline. The City and School District agree that if funding cannot be secured by February 1, 2025, they intend to enter into good-faith negotiations in the future regarding an aquatics facility on the Land and the School District's use thereof.

e. As of the execution of this Agreement the Parties do not have knowledge of any restrictions on the Land or title commitments.

f. The City will coordinate with the School District to arrange any site access required by the City or its contractors prior to closing on the Land.

2. Funding and Construction of the Community Center

a. Construction and Design. The City will design and construct the Community Center. The City and Library will jointly design and construct the Library Branch portion of the Project and the Library will have input on Common Amenities, as set forth in a separate Intergovernmental Agreement between the Library and the City described in Section III below. The City will consult with the School District, but will have final decision-making authority, on site planning for the

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Community Center, and on the designs for the Aquatics Facility at the 50% design stage.

b. Contracting. Contracting for the Project and related products and services shall be done by the City through its purchasing processes, and subject to applicable requirements of the City Code and City Purchasing Policies. The Parties acknowledge that, pursuant to the City's Charter, the City may not expend funds or enter into any contract for materials or services related to the Project unless the full amount of the funds necessary for such expenditure or contract has been appropriated to the Project by the City Council. The City and the Library will each designate a respective project manager through their standard processes, or may agree to hire a joint agent or project manager for the design process. The Parties understand that the construction of the Project is subject to approval through the City's development review process. The Project is expected to be designed to a LEED gold level.

c. School District Cost Sharing.

   i. The Parties agree that all cost sharing for the Project will be expressed as a percentage share of the cost categories, as established in Exhibit C. The cost sharing percentages will apply to the final design and construction costs rather than the current 2022/2023 cost estimates.

   ii. The School District shall fund 15% of the total of the Aquatics Base upon the City's presentation to the School District of a pay application detailing the City's estimated costs at the time of groundbreaking on the Aquatics Facility, subject to a reconciliation of actual construction costs upon issuance to the City of a Certificate of Occupancy covering the Aquatics Facility. Upon reasonable notice, the School District shall have the right to audit the records of the City as they relate to the Aquatics Facility. School District payments to the City shall be due thirty (30) days from the date of the City's invoice to the School District.

   iii. The Aquatics Base will include any change orders agreed to by the City and School District that relate to the total cost of the Aquatics Facility. The School District will pay 15% of any such change orders.

   iv. The School District's 15% obligation is based on the current occupancy of the School District's swim teams in existing City aquatics facilities compared to the total annual lane-hour availability at such facilities, as established in Exhibit D. Per Section II.1c. above, if the School District gives the Land to the City as an in-kind contribution, the Appraised Price of the Land will count towards this 15% share. The remainder of the

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School District's 15% share will be paid in cash as described in subparagraph ii above. Should the School District fail to make the required payment(s), the City may terminate this Agreement with respect to the obligations between the City and the School District. Such termination under this subsection will not affect the relationship and obligations between the Library and the City under this Agreement.

v. Should the Appraised Price exceed the School District's 15% share of the Aquatics Base, upon completion of the Aquatics Facility the City will make a cash contribution to the School District equal to the difference between the Appraised Price and the 15% share. Upon receipt of this payment by the School District, the School District's cost share of the Aquatics Base will be considered fully satisfied.

3. Aquatics Facility Operation. The Aquatics Facility will be solely owned and maintained by the City. The School District's use of City pool facilities, including this Aquatics Facility, shall be governed by a separate Facility Use Agreement between the City and School District to be executed within 120 days after the School District's 2024 election.

4. School District Consideration for Use of Aquatics Facility. As further consideration for its use of the Aquatics Facility, subject to the successful execution of the Facility Use Agreement but separate and apart from the rights and obligations contained within the Facility Use Agreement, the School District shall pay the City $150,000 annually, which the City will use for the operation and maintenance of the Aquatics Facility. The City shall establish a long-term equipment replacement fund associated with the Aquatics Facility and the School District agrees to also pay the City $45,000 annually as its contribution to this fund. These payments shall be due to the City no later than January 31 of each year starting the first January following the public opening of the Aquatics Facility. The City and the School District intend that these annual payments will continue so long as the School District continues to use the Aquatics Facility. Following completion of the initial term of this Agreement the amounts are subject to adjustment as agreed to by the City and the School District.

III. COMMUNITY CENTER AND LIBRARY BRANCH

1. The Library is under no obligation to participate in the Project. If the Library participates in the Project, it will share in design and construction costs; and will equip and operate a Library Branch consisting of at least 30,000 square feet including meeting rooms and programming spaces to foster research, reading, lifelong learning innovation and creativity.

2. The Library and the City intend to negotiate and enter into a separate Intergovernmental Agreement memorializing their partnership in the Project before the commencement of any land and building design. The Intergovernmental Agreement will include but not be limited to:

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a. The form of the Library's interest in the real property;
b. Designation of the Parties Project Managers;
c. Whether the Library Branch will be a stand-alone structure or part of a larger facility;
d. Cost sharing of land acquisition, design, and construction costs; and
e. Ongoing maintenance and operations of the real property and facilities.

IV. ADDITIONAL TERMS AND CONDITIONS

1. Obligations Subject to Appropriations. The obligations of the Parties to commit or expend funds in any subsequent fiscal year are subject to and conditioned upon the annual appropriation of funds sufficient and intended to carry out said obligations by each Party's respective governing body in its sole discretion. If any Party's governing body does not appropriate funds necessary to carry out any such obligations, such Party will notify the other Parties promptly of such non-appropriation. If such non-appropriation results in a material impairment of any of the Parties' rights hereunder, such Party may terminate the Agreement, with no further recourse against the other Parties, by providing thirty (30) days written notice.

2. Liability. Only to the extent permitted by applicable law, each Party will be responsible for its own negligent acts or omissions and that of its officers, employees, agents and contractors. Any liability of the City, School District, Library, or their officers and employees is subject to all the defenses, immunities, and limitations of the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, *et seq*., as amended (the "CGIA"), and to any other defenses, immunities, and limitations to liability available under the law. It is expressly understood and agreed that nothing contained in this Agreement shall be construed as an express or implied waiver by the City, School District, or Library of its governmental and sovereign immunities, as an express or implied acceptance by the City, School District, or Library of liabilities arising as a result of actions which lie in tort or could lie in tort in excess of the liabilities allowable under the CGIA, as a pledge of the full faith and credit of the State of Colorado, or as the assumption by any of the Parties of a debt, contract or liability or each other in violation of Article XI, Section 1 of the Constitution of Colorado.

3. Existing Rights and Agreements. Nothing in this Agreement shall act to amend, modify, or supersede any related agreements or any other agreements, rights, or legal positions by and between the City, School District, and the Library external to this Agreement, or to alter in any way their recourse under the same, unless specifically agreed upon herein.

4. Default; Dispute Resolution. If any Party defaults in its obligations under the terms of this Agreement, a non-defaulting Party may give the defaulting Party written notice specifying the nature of the default. If the defaulting Party has not cured the default within thirty (30) days, or, for a default reasonably requiring more than thirty (30) days to effect a cure, has not commenced a cure within thirty (30) days and pursued it with diligence, the non-defaulting Party may terminate this Agreement—provided that, if there is any dispute, controversy or claim arising out of or relating to this Agreement or the breach, termination

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or invalidity thereof, the Parties agree to attempt to resolve the dispute informally before terminating the Agreement. Accordingly, the Parties will first elevate the disputed issues to senior administration, and if the matters are not resolved, the Parties may then engage in mediation or other non-binding dispute resolution methods. The Parties agree that in the event of a breach of this Agreement by any Party, that is not resolved through the means described in this section, the non-breaching Party or Parties shall be entitled to pursue any available legal or equitable remedies, including but not limited to injunctive relief or specific performance. In any dispute between the Parties, each Party will bear its own attorney's fees and costs.

5. Notices. Any notice or other communication given by any Party to another relating to this Agreement must be e-mailed, hand-delivered, or sent by registered or certified mail, return receipt requested, or by overnight commercial courier, addressed to such other Party at its respective addresses set forth below. A Party may update its address(es) for giving notice at any time by notifying the other Parties in writing. Any notice or other communication provided under this Section will be deemed given when so e-mailed or hand-delivered, or three (3) business days after so mailed, or the next business day after being deposited with an overnight commercial courier:

If to the City:
City Manager
City of Fort Collins
P.O. Box 580
Fort Collins, CO 80522

With a copy to:
City Attorney's Office
City of Fort Collins
P.O. Box 580
Fort Collins, CO 80522

If to the School District:
Finance Department
2407 Laporte Avenue
Fort Collins, CO 80521

With a copy to:
General Counsel
2407 Laporte Avenue
Fort Collins, CO 80521

If to the Library:

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V. MISCELLANEOUS PROVISIONS

1. Words in the singular include the plural and vice-versa.

2. This Agreement is to be construed according to its fair meaning and as if prepared by all Parties and is deemed to be and contain the entire understanding and agreement between the Parties. There shall be deemed to be no other terms, conditions, promises, understandings, statements, or representations, expressed or implied, concerning this Agreement unless set forth in writing and signed by the Parties.

3. Except as otherwise described herein, this Agreement cannot be modified or assigned except in writing signed by all Parties.

4. Subject to the provisions hereof, the benefits of this Agreement and the burdens hereunder inure to and are binding upon the Parties and their respective, administrators, successors, agents and permitted assigns.

5. This Agreement will be governed by and its terms construed under the laws of the State of Colorado. Any judicial proceedings commenced by a party to enforce any of the obligations, covenants, and agreements contained herein, must be commenced in the Larimer County District Court located in Fort Collins, Colorado.

6. Nothing contained herein is deemed or should be construed by the Parties nor by any third party as creating the relationship of principal and agent, a partnership or a joint venture between the Parties, or any employment relationship between the Parties.

7. This Agreement is made for the sole and exclusive benefit of the Parties, and it is not made for the benefit of any third party.

8. If any term or condition of this Agreement is held to be invalid by final judgment of any court of competent jurisdiction, the invalidity of such a term or condition, will not in any way affect any of the other terms or conditions of this Agreement, provided that the invalidity of any such term or condition does not materially prejudice any party in their respective rights and obligations under the valid terms and conditions of this Agreement.

9. No Party will be deemed in violation of this Agreement if prevented from performing any of its respective obligations hereunder by reason of strikes, boycotts, labor disputes, embargoes, shortage of energy or materials, acts of God, acts of public enemies, acts of superior governmental authorities, weather conditions, rights, rebellions, sabotage, or any other circumstances for which it is not responsible or that are not within its control.

10. The Parties agree that this Agreement and related documents may be subject to disclosure under the Colorado Open Records Act ("CORA").

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date of the most recent signatory.

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THE CITY OF FORT COLLINS, COLORADO

Date: _____ By: _____
Jeni Arndt, Mayor

ATTEST:

APPROVED AS TO FORM:

_____
City Clerk

_____
Sr. Assistant City Attorney

POUDRE SCHOOL DISTRICT R-1

Date: _____ By: _____
Chair of the Board

ATTEST:

_____
Board Secretary

POUDRE RIVER PUBLIC LIBRARY DISTRICT
Board of Trustees

Date: _____ By:_____
President

ATTEST:

_____
Secretary

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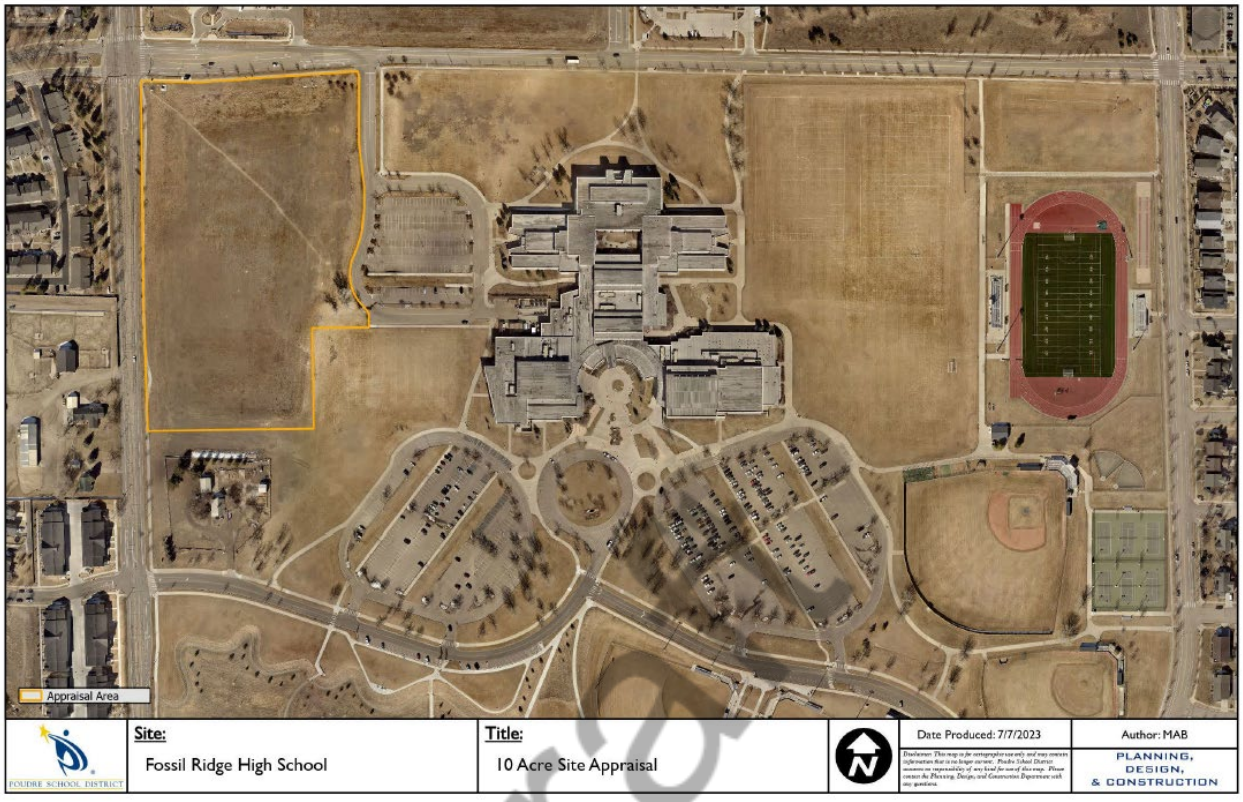
Exhibit A – Land Depiction



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ESCROW AGREEMENT [DRAFT]

THIS AGREEMENT is entered into this _____ day of _____, 20___, by and between the City of Fort Collins, Colorado, a Colorado home rule municipality ("City") and Poudre School District R-1, a statutory Colorado school district ("School District"), and _____ ("Escrow Holder"). City and School District may be referred to hereafter as a "Party" or "Parties."

City shall deposit with Escrow Holder on or before _____, 20__, cash in the amount of $_____.00 (the "Escrow Deposit Funds"), to be held and distributed by Escrow Holder subject to the general terms and conditions hereof and the Special Instructions set forth below.

GENERAL PROVISIONS

1. Amendments. These instructions may not be altered, amended, modified, or revoked except by a writing signed by the parties hereto and approved by the Escrow Holder.

2. Form of Notice. Any notice, instruction or demand required or desired to be given to the Escrow Holder or by the Escrow Holder to any other party must be in writing and may be delivered personally, by U.S. or private mail or courier to the addresses listed below, or by telefax or telegram.

   If to City: If to School District:

3. Reliance on Notice. Escrow Holder may act in reliance upon any writing or instrument or signature which it, in good faith, believes to be genuine, and may assume the validity and accuracy of any statement or assertion contained in such a writing or instrument, and may assume that any person purporting to give any writing, notice, advice or instruction in connection with the provisions hereof has been duly authorized to do so.

4. Disbursement Time Requirements. Any notice to Escrow Holder hereunder shall be given not later than 24 hours prior to the date and time for action by Escrow Holder. Escrow Holder agrees to act upon all notices given to it that are fully approved by all appropriate parties and are not conditioned upon any event other than Escrow Holder's actions, not later than 5:00 p.m. on the business day next following the date upon which such notice was received.

5. Laws of Escheat. All Parties are hereby advised that unclaimed funds may be payable to the State of Colorado at some future date pursuant to the laws of escheat, and should Escrow Holder so pay any such funds held in the Escrow, Escrow Holder shall be released from all further responsibility under this Agreement and shall not be liable to

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any Party so long as such payment was made pursuant to the statues of Colorado or regulations of the Colorado Department of Revenue.

6. Interest Earned on Escrow Deposit Funds. Deposits of less than $1,000 shall not bear interest. Deposits of $1,000 to $100,000 shall bear interest at the rate paid by the financial institution (the "Institution") where deposited. Deposits of $100,000 or more may be directed by the Parties to other types of investments. Under no circumstances shall Escrow Holder be liable for loss of funds due to bank, savings and loan association or other Institution failure, or for acts or omissions of the employees or agents of such Institution, suspension or cessation of business, or any action or inaction on the part of the bank, savings and loan association or other Institution, or any delivery service transporting funds to and from such Institution.

7. Receipt and Deposit of Proceeds. The Escrow Deposit Funds will be deposited in a federally insured banking institution. If the Escrow Deposit Funds exceed $100,000, Escrow Holder may invest the Escrow Deposit Funds in Government Repurchase Agreements for U.S. Treasury obligations. Escrow Holder shall not be responsible for maximizing the yield on the Escrow Deposit Funds. All Parties shall execute and deliver to Escrow Holder all forms required by Federal, state, or other governmental agencies relative to taxation matters and Escrow Holder will file appropriate 1099 or other required forms.

8. Fees and Expenses of Escrow Holder. The Escrow Holder shall be entitled to reimbursement in full, or may demand payment in advance, for all costs, expenses, charges, fees or other payments made or to be made by Escrow Holder in the performance of Escrow Holder's duties and obligations under this Agreement. _____ shall be liable for the payment to Escrow Holder of all Fees and Expenses. Escrow Holder is authorized and directed to disburse up to 50% of the Fees to itself in payment of Fees or Expenses from the Escrow Deposit Funds whether from principal or interest or both, at any time and from time to time.

9. Non-Liability of Escrow Holder. Escrow Holder shall not be liable for any mistakes of fact, or errors of judgment, or for any acts or omissions of any kind unless caused by the willful misconduct or gross negligence of Escrow Holder. Escrow Holder shall not be liable for any taxes, assessments, or other governmental charges which may be levied or assessed upon the Escrow Deposit Funds or any part thereof, or upon the income therefrom. Escrow Holder may rely upon the advice of counsel and upon statements of accountants, brokers or other person reasonably believed by it in good faith to be expert in the matters upon which they are consulted, and for any reasonable action taken or suffered in good faith based upon such advice or statements. Escrow Holder shall not be liable to anyone, except as set forth in the above and foregoing.

10. Compliance with Orders. Except as provided in section 3 above, the Escrow Holder is hereby expressly authorized and directed to disregard any and all notices or warning given by any of the parties hereto, or by any other person or corporation, excepting only orders or process of court, and is hereby expressly authorized to comply with and obey

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any and all orders, judgments, or decrees of any court, and in case Escrow Holder obeys or complies with any such order, judgment, or decrees of any court, it shall not be liable to any of the parties hereto or to any other persons, firm or corporation by reason of such compliance.

11. Indemnity of Escrow Holder. The Parties, severally, on a 50%-50% basis and to the extent permitted by law, agree to release and indemnify Escrow Holder as to any liability by reason of this Escrow Agreement, or in connection herewith and to reimburse Escrow Holder for all its expenses, including, but not necessarily limited to, attorney's fees and court costs incurred in connection herewith, except for Escrow Holder's own misconduct or negligence. However, with respect to any third-party claims against the Parties, nothing herein shall be deemed a waiver of the notice requirements, defenses, immunities and limitations to the liability available to the Parties and their respective officers and employees under the Colorado Governmental Immunity Act (C.R.S. 24-10-101 et. seq.) or under any other law.

12. Disputes. In the event of any dispute between the Parties as to either law or fact as to any such demand or other matter, such dispute shall be between the Parties and Escrow Holder shall be excused from further responsibility and the Parties hereby agree, to the extent permitted by law, to hold Escrow Holder harmless from any and all damages, liability, costs and fees in connection therewith.

13. Request for Written Instructions. Escrow Holder may at any time, and from time to time, request the Parties to provide written instructions concerning the propriety of a proposed payment of funds on deposit, distribution of documents, or other action or refusal to act by Escrow Holder. Should the Parties fail to provide such written instructions within a reasonable time, Escrow Holder may take such action, or refuse to act, as it may deem appropriate and shall not be liable to anyone for such action or refusal to act. Notwithstanding the foregoing, should the terms of the Escrow Agreement be complied with, in the judgment of the Escrow Holder, then the Escrow Holder may disburse any funds, distribute any documents, or take such action without specific further written instructions from any Party.

14. Resignation of Escrow Holder. Escrow Holder may resign under this Agreement by giving written notice to all of the Parties, effective 30 days after the date of the notice. Upon the appointment by the Parties of a new escrow holder or custodian, or upon written instructions to Escrow Holder for other disposition of the Escrow Deposit, Escrow Holder shall, after retention of its accrued escrow fees and expenses, if any, deliver the Escrow Deposit within a reasonable period of time as so directed, and shall be relieved of any and all liability.

15. Applicable Law. This Agreement shall be governed by the laws of the State of Colorado.

16. Obligations Subject to Appropriation. The obligations of the Parties to commit or expend funds in any subsequent fiscal year are subject to and conditioned upon the annual appropriation of funds sufficient and intended to carry out said obligations by each

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Party's respective governing body in its sole discretion. If such non-appropriation results in a material impairment of the Escrow Holder's rights hereunder, the Escrow Holder may terminate the Agreement, with no further recourse against the Parties, by providing 30 days written notice to the Parties.

SPECIAL INSTRUCTIONS

1. The purpose of this Escrow is to ensure payment by the City to the School District for real property conveyed by the School District to the City simultaneously with this Escrow for the "Project", which is defined as the planning, design, construction and furnishing of a new Southeast Community Center (the "Facility"), as required by the language of the Community Capital Improvement Program ballot measure approved by Fort Collins voters in April, 2015, if the School District is not able to secure funding by January 31, 2025, to add to the Project an indoor aquatics facility including swim lanes that the School District would be able to use (the "Aquatics Facility").

2. If the City, on or before January 31, 2025, notifies the Escrow Holder in writing that it is satisfied the School District has secured funds sufficient and intended for design and construction of the Aquatics Facility, the Escrow Holder shall release the Escrow to the City.

3. If the City does not notify the Escrow Holder in writing before the close of business on January 31, 2025, that it is satisfied the School District has secured funds sufficient and intended for design and construction of the Aquatics Facility, and the Parties have not negotiated an extension to this Agreement, the Escrow Holder shall release the Escrow to the School District.

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CITY OF FORT COLLINS
A Colorado municipal corporation

By: _____
Kelly DiMartino,
City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM

_____
Assistant City Attorney

POUDRE SCHOOL DISTRICT R-1
A statutory Colorado school district

By: _____
Chair of the Board

ATTEST:

_____
Board Secretary

Accepted:

_____
Escrow Agent

By: _____

Title: _____

Date: _____

Draft

Exhibit C– School District Cost Share

Capital Cost Category	PSD
Common areas as determined @ 100% Design -- anticipated to be Entry, Offices, Lounge, Gymnasium	5%* (15% of 33.33%)
Community Center -- Creation Space / Art Studio / Library Branch	0%
Outdoor Leisure Pool	0%
Indoor 10-Lane Lap Pool	15%*
Indoor Leisure Pool	0%
Indoor Aquatic Support (Offices, Lockers, Storage, Mechanical)	7.5%* (15% of 50%)
Site Costs as determined at 100% design	5%* (15% of 33.33%)
Land (contributed capital)	100%*

*PSD overall capital contribution is limited to 15% of the attributable Aquatics Base, including any change orders agreed upon by the City and School District. Cash contributions over and above the Land would be billed according to Exhibit E.

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Exhibit D – School District Lane Usage

PSD Utilization*		
Number of teams utilizing facility	3	teams
Lanes used	5	lanes
Hours used per team	2	hours
Lane hours utilized at facility per day	30	
Overall Community + PSD Pool Utilization - Peak	70.0%	**A**
Overall Community + PSD Pool Utilization - Off-peak	30.0%	
PSD usage of gross available lane-hours	20.0%	
PSD usage per day of available peak lane-hours	42.9%	**B**
PSD overall utilization during swim season	30%	**A x B**
6-month swim season	50%	Calendar year
PSD weighted average utilization of annual lane-hours	15.0%	To be applied to capital share

*Information current as of the Effective Date of the IGA

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Poudre School District
Board of Education Meeting Coversheet

Non-Action Item

Agenda Item Title: 9th and 10th grade English Language Arts Adoption Overview

Policy Facts: Policies IJ – Instructional Resources and Materials, IJ-AR – Instructional Resources and Materials, IJ – R - Instructional Resources and Materials

The Board of Education shall officially approve textbooks and required curriculum materials for use in district schools upon recommendation of the superintendent or designee. The intent of this policy is to encourage the selection of the best learning materials available for the students and staff of Poudre School District. All textbooks and instructional materials shall be integral to the district's instructional programs and supportive of its vision and educational standards for all students. Selection procedures will include appropriate input from curriculum specialists, teachers, administrators, parents, and community members in the review and recommendation process.

Textbooks shall be defined as the major information resource(s) and bound materials provided in multiple copies for use by a total class or a major portion of such a class. Required curriculum materials shall be defined to include print and non-print resources such as computer programs, maps, kits, audiovisual materials, and teaching tools, which are required to supplement the planned curriculum.

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Summary and/or Background: The 9/10 Language Arts adoption is an action item in the PSD Strategic Plan.

PSD committees are working on the following adoptions: Middle School Science, Middle School U.S. History (8th grade), High School World History (Genocides & Holocaust), Discrete Mathematics and Data Analysis & Probability, and 9/10 grades Language Arts. This informational presentation will focus on the 9th and 10th grade English Language Arts adoption process while also highlighting parallel processes being conducted for all adoptions. This presentation will provide context regarding the PSD literacy vision, explain the adoption process including a focus on the work of the review team, identify the three program finalists, and outline next steps.

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Secondary Language Arts Adoption Grades 9/10 Update

Poudre School District | January 9, 2024

Board of Education Meeting

Instructionals Materials Adoptions in Progress

- Committees are working on the following adoptions:
  - Middle School Science
  - Middle School U.S. History (8th grade)
  - High School World History (Genocides & Holocaust)
  - Discrete Mathematics and Data Analysis & Probability
  - 9/10 Language Arts
- Tonight's focus in on 9th and 10th grade English Language Arts.
  - Strategic Plan Priority

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District Priority: Literacy

- Effective **reading**, **writing**, and **communicating** skills create equitable access to learning across disciplines.
- Literacy is the key to **building knowledge** and **engaging** with the world.
- Students read, write, and communicate **in all subjects** all the time. In a sense, **all teachers** are literacy teachers.

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Literacy Vision

All students *have equitable access to high-quality literacy instruction and engage in opportunities to develop and apply literacy skills across disciplines from early childhood through graduation.*

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Disciplinary Literacy

Students use their content knowledge, experiences, and skills to demonstrate understanding through the ability to read, write, communicate, and think critically using approaches unique to a specific discipline.

Media Literacy

Students analyze information, claims, and sources presented to them through traditional and digital media to understand context, think critically about the information they are presented, and be free from indoctrination.

Content Area Literacy

Students apply reading, writing, and communicating processes that are common across disciplines to complex materials to more fully learn the content.

Foundational Literacy

Students learn and apply language comprehension and word recognition skills to become skilled readers through Structured Literacy.

• *Phonological Awareness* • *Phonics* • *Fluency* • *Vocabulary* •
• *Comprehension* • *Oral Language* •

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Students engage with high-quality text to build knowledge.

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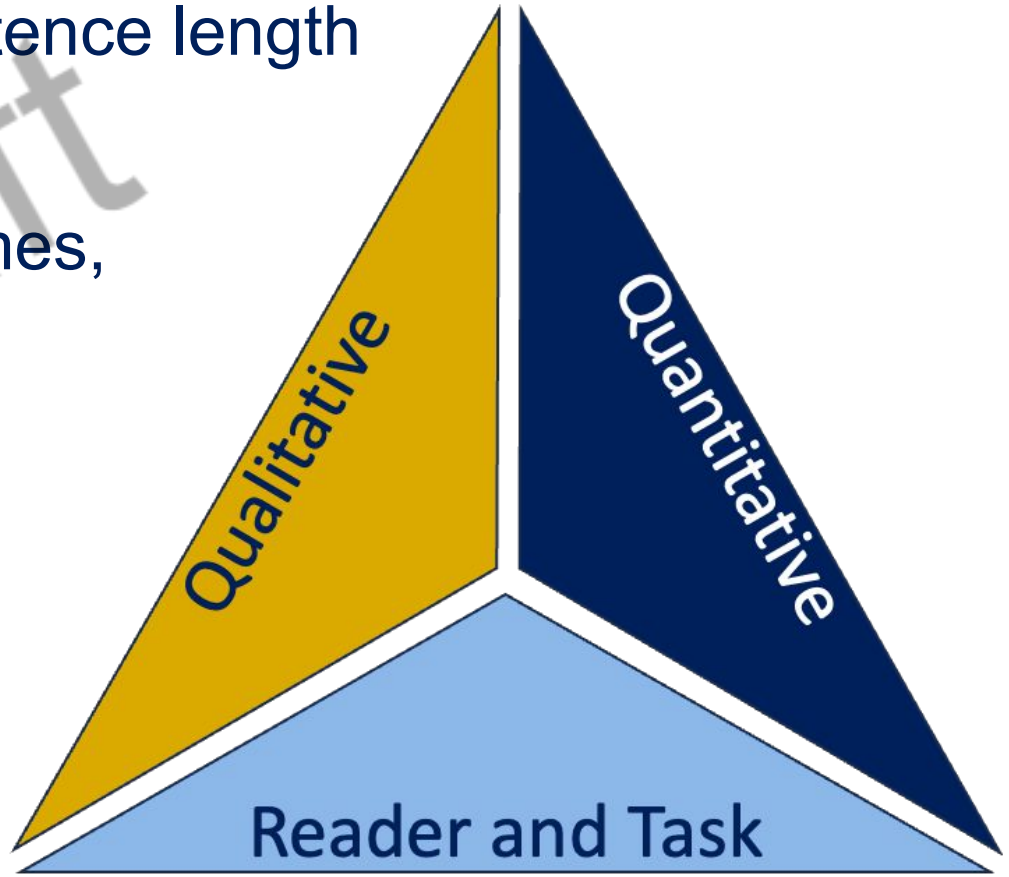
High Quality Complex Text

- **Quantitative** - objective factors like sentence length and word frequency and difficulty
- **Qualitative** - subjective factors like themes, structure, and author's style
- **Reader and Task Considerations** - Considers the reader's background and purpose to ensure text-reader compatibility.



Text that is worth students' time.

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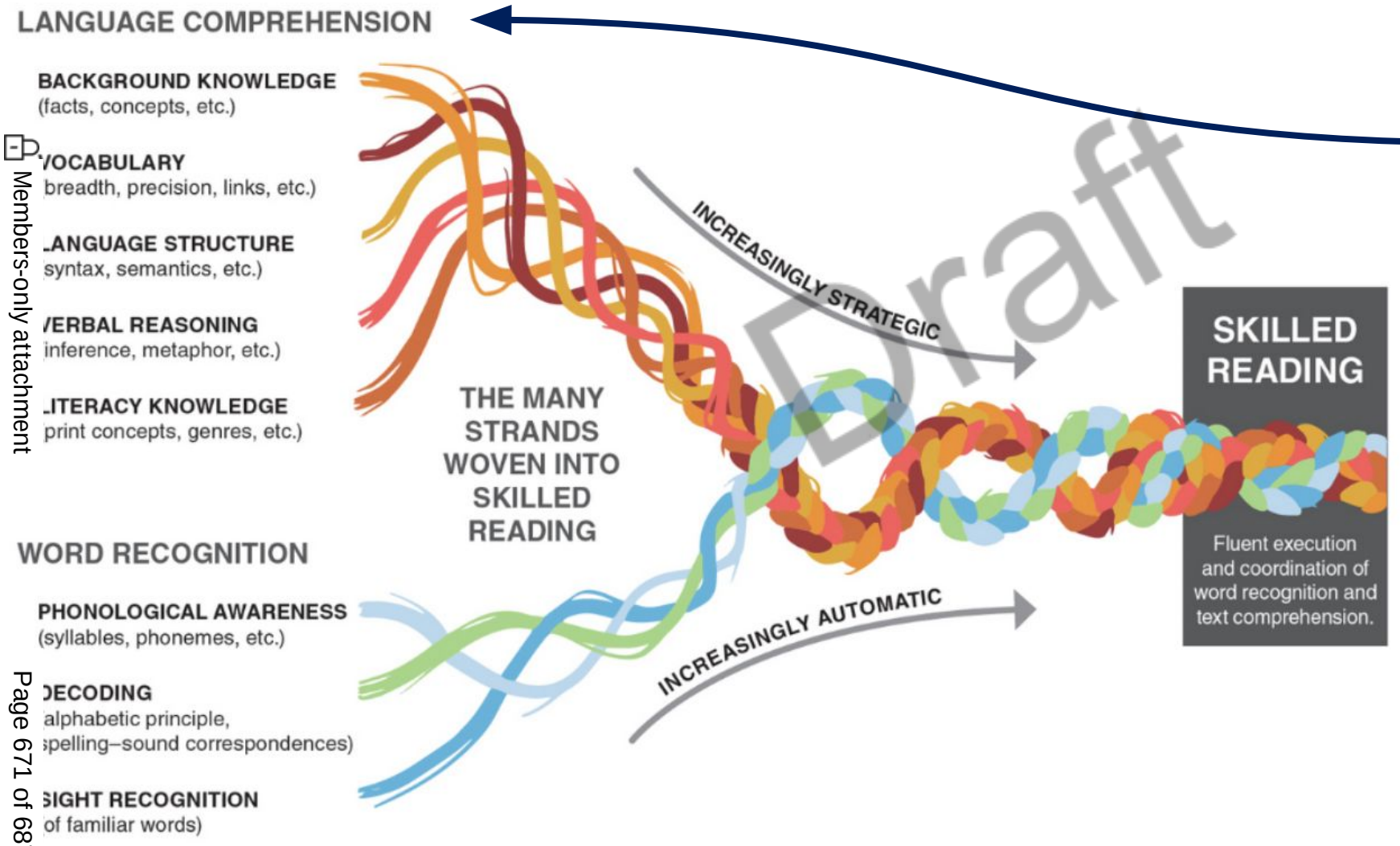
Scarborough's Reading Rope & Disciplinary Literacy



- Literary
- Science
- Social Studies
- Media
- Content

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Members-only attachment

The Adoption Process

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Adoption Goals

- Students reading and writing with high-quality complex texts for **authentic purpose and knowledge-building**
- **Guaranteed access** to rigorous skills and standards for **all students**
- Ninth and tenth grade **consistency across the district**
- Ongoing professional development for 9/10 educators for **cohesive, effective instructional practices**

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The Review Team

Membership

- 18 high school educators
- 1 high school administrator
- 6 central office staff
- 1 parent
- 10 middle and high school students

Members of the team represent:

- Classroom teachers
- Language, Culture, & Equity
  - Multilingual Learners
  - Equity & Diversity
- Integrated Services (Students with IEPs)
- Information Technology

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Grounding in Research (Day One)

- Colorado Academic Standards
- Curated Research Articles
- Checking of Biases
- Review of Evaluation Tools
  - PSD Secondary Literacy Instructional Framework
  - Instructional Materials Evaluation Tool (IMET)
  - Culturally Responsive Curriculum Scorecard
  - Combined Scoring Tool

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PSD Secondary Literacy Instructional Framework

- Establish a **culture of literacy** centered on belonging, dignity, and civic-mindedness.
- Focus on standards to prepare students for **career, college, and community success**.
- Build skills through scaffolded tasks and complex texts, **accessible to all students**.
- Value diverse voices and perspectives to **engage and empower every student**.

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IMET - Instructional Materials Evaluation Tool

01	Complex Texts	Regular practice with **complex texts** and their **academic language**
02	Evidence-based Tasks	Reading, writing, and speaking grounded in **evidence from text** both literary and informational
03	Building Knowledge	**Building knowledge** through **content-rich non-fiction**

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Diversity in Poudre School District

100 Countries
82 Languages
One Community

Students	Countries of Birth	Languages Spoken
27.38K	100	82

Countries of Birth

Countries of Birth
Afghanistan
Anguilla
Argentina
Australia
Austria
Bangladesh
Belgium
Bolivia
Brazil

Languages Spoken
Akan
Amharic
Arabic
Assamese
Bemba Zambia
Bengali
Bulgarian
Burmese
Chinese Mandarin

Race/Ethnicity	Students
American Indian or Alaska Native	106
Asian	697
Black or African American	345
Hispanic	5795
Native Hawaiian or other Pacific Islander	33
Two or More	1275
White	19133

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*Across the country, rigorous evaluations and studies have shown that **culturally responsive curriculum** increases student academic engagement, attendance, grade point averages, graduation rates, civic engagement, positive racial self-images, and self-definition.*

(Browman, 2011; Butler-Barnes, 2017; Cabrera, 2012; Carter, 2008; Dee & Penner 2016; Morell, 2013)

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Culturally Responsive Curriculum Scorecard

- NYU Steinhardt Affiliated
- Developed by NYC parents, students, educators, and researchers
- Determine extent to which curricula are culturally responsive
  - Representation
  - Social Justice Orientation
  - Teachers' Materials

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Evaluation Elements

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Combined Scoring Tool Elements:

- PSD Instructional Framework
- IMET
- Culturally Responsive Curriculum Scorecard
- **Accessibility Standards**
- **Technology Platform**

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Work of the Review Team

- September 14: Team norming and research review
- October 16
  - Reviewed 6 programs.
  - Only 3 were comprehensive programs meeting proposal criteria.
  - Agreed on three programs to move forward.
- December 6:
  - Publisher presentations of top three programs
  - Evaluation and debrief of top three

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Three Program Finalists

HMH | into Literature™

McGraw Hill | studysync®

SAVVAS LEARNING COMPANY

my Perspectives ENGLISH LANGUAGE ARTS

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The Finalists

- These three comprehensive programs met all requirements of the RFP and were evaluated using the combined scoring tool.
- All programs Meet requirements on edReports for:
  - Text Quality
  - Knowledge Building
  - Usability

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Next Steps

- January 17: Committee meets for deeper review
- January 25: Community Engagement Session
  - Materials available for review
  - Q & A with vendors and committee members
- February 12: Committee Meeting to Summarize
- February-March:
  - Consult with Cabinet
  - Finalize recommended selection
  - Negotiate with vendor
  - Board proposal

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January 25 Staff & Community Engagement

- Central Location (Likely Lesher)
- Staff and Community preview of finalists for all current adoptions
  - 9/10 Language Arts
  - Middle School Science
  - Middle School U.S. History (8th grade)
  - High School World History (Genocides & Holocaust)
  - Discrete Mathematics and Data Analysis & Probability
- Elementary Literacy Engagement

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Q&A
Adoption Site

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