

YELLOWSTONE COUNTY, MONTANA
Invitation For Bid
Cedar Hall Renovation

1. Introduction

Notice is hereby given that Yellowstone County is seeking bids from qualified vendors for the renovation of the Cedar Hall building, located on the MetraPark campus at 308 6th Ave North, Billings, MT 59101. Bids should include the cost of all materials, permits, labor and equipment necessary to complete the project. The desired completion date for this no later than March 27th, 2026

The Dance Hall pavilion is being renovated into a new office space for the Yellowstone County's Election offices. The building will be renovated on the inside of the building with very limited renovations to the exterior of the building. The existing mechanical system will be removed and replaced in its entirety with four new mechanical units and ductwork. The electrical system will be renovated and updated. The interior of the space will receive new walls and finishes to create the office spaces required. Limited structural work to include exterior concrete ramps and sidewalk. Along with interior wall and limited ceiling framing.

Please see Exhibit A (Construction Documents) and Exhibit B (Project Manual), attached to this IFB, for the full scope of work for the project.

2. Bid Submission Requirements

In order to provide a complete understanding of the project, a **mandatory, in-person** Pre-Bid meeting will be held on Wednesday, October 15th, at 2:30PM. The meeting will be held onsite at the Cedar Hall building. Attendance will be taken through sign-in sheets. Bids submitted without a representative attending the pre-bid meeting will not be considered.

Offerors shall submit five (5) hard copies of the bid in a sealed envelope. All bids must be labeled "**Cedar Hall Renovation**". Bids may either be mailed or physically delivered to the following addresses.

Mail To:

Yellowstone County BOCC
PO Box 35000
Billings, MT 59107

Physically Deliver To:

Yellowstone County BOCC
Stillwater Building, Room 3101, 3rd Floor
316 North 26th Street
Billings, MT 59101

All bids must be received no later than 3:00 PM on Monday, October 20th, 2025. Bids received after this deadline will not be considered.

All bids must include a Bid Security made in favor of Yellowstone County in an amount equal to 10% of the total bid. The security may consist of a bid bond, cash, a cashier's check, a certified check, a bank money order, a certificate of deposit, a money market certificate, or a bank draft. The security must be: a) drawn and issued by a federally chartered or state chartered bank or savings and loan association that is insured by or for which insurance is administered by the Federal Deposit Insurance Corporation; or b) drawn and issued by a credit union insured by the National Credit Union Share Insurance Fund; or c) a bid bond or bonds, original only, no photocopies, executed by a surety company authorized to do business in the State of Montana. Facsimiles, personal and/or business checks are not an acceptable form of security. Bids received without a bid security will be considered non-responsive.

Timely bids will be opened and read aloud at 9:00 AM, on Tuesday, Tuesday, October 21st, in Room 3108 on the 3rd Floor of the City Hall Building, 316 North 26th Street, Billings, MT 59101.

3. Timeline & Selection Process

Event	Date/Time
Publication Dates for IFB	Friday, October 3 rd , 2025 Friday, October 10 th , 2025
Mandatory Pre-Bid Meeting	Wednesday, October 15 th , 2025, at 2:30PM
Deadline for Bids	Monday, October 20 th , 2025, by 3:00 PM
Review of Bids by Selection Committee	Tuesday, October 21 st , 2025 through Thursday, October 23 rd , 2025
Notice of Intent to Award Posting	Tuesday, October 28 th , 2025
Notice of Award	Tuesday, November 4 th , 2025

Yellowstone County reserves the right to modify the above timeline as needed.

A selection committee will be formed and review all bids that meet the submittal requirements. The committee will review to ensure that minimum specifications are clearly met and make a recommendation of award which will be submitted to the BOCC. Bids that do not meet minimum specifications provided will be considered non-responsive.

The Board of County Commissioners intend to award the contract to the lowest responsive and best responsible bid. The Board reserves the right to reject any or all bids received, to

waive informalities to evaluate the bids submitted, and to accept the bid that best serves the interests of Yellowstone County.

4. Amendments to Solicitation

Any interpretation, correction, or addition of this request will be published on the County website at <https://www.yellowstonecountymt.gov/purchasing/>.

5. Contact Information & Questions

Any questions regarding the project or bid submittal procedures should be submitted, in writing, to Matt Kessler, Purchasing Agent, at mkessler@yellowstonecountymt.gov.

6. Miscellaneous

Compliance With Laws

Each bidder must have a current Montana Public Contractor's Registration number when submitting their bid. The number must appear on the bid. All subcontractors, if any, must obtain a registration number prior to beginning any work on the project. Bid only registrations are acceptable for the bidding process. No bid may be withdrawn for at least 45 days after the scheduled deadline time for receipt of the bids.

The successful bidder will be required to follow all the directives included in section 18-2-422 of the Montana Code Annotated concerning Montana Prevailing Wages for Building Construction 2025. Those directives are as follows:

- (1) The contractor and employers shall pay the standard prevailing wage rate, including fringe benefits, for each job classification as stated in the current prevailing wage rate schedules. The current schedules are available at the State of Montana website. It is the responsibility of the contractors to obtain and use the applicable Wage Rate Schedules.
- (2) each contractor and employer are required to maintain payroll records in a manner readily capable of being certified for submission under statute 18-2-423, for not less than 3 years after the contractor's or employer's completion of work on the project; and
- (3) Each contractor is required to post a statement of all wages and fringe benefits in compliance with 18-2-423.

Statute 18-2-423 is as follows: If a complaint is filed with the department alleging noncompliance with 18-2-422, the department may require the project to submit to it certified copies of the payroll records for workers employed on that project. A contractor or a subcontractor shall pay employees receiving an hourly wage on a weekly basis. If a wage violation complaint is filed with the department, the contractor or subcontractor shall provide the employee's payroll records to the department within 5 days of receiving the payroll request from the department.

The Contractor is required to comply with all other applicable provisions of Title 18, Chapter 2, and Part 4 of the Montana Code Annotated.

The successful bidder will be required to give preference to the employment of bona fide Montana residents in the performance of the work on this project.

The Contractor must, in performance of work under this contract, fully comply with all applicable federal, state or local laws, rules, and regulations, including the Montana Human Rights Act, Civil Rights Act of 1964, the Age Discrimination Act of 1975, and the American with Disabilities Act of 1990. Any subletting or subcontracting by the Contractor subjects Subcontractors to the same provisions. In accordance with Section 49-3-207, MCA, the Contractor agrees that the hiring of persons to perform the contract will be made on the basis of merit and qualifications and there will be no discrimination based upon race, color, religion, creed, political ideas, sex, age, marital status, physical or mental disability, or national origin by the persons performing under the contract.

Insurance Requirements

The Contractor shall maintain at its sole cost and expense, commercial general liability insurance naming Yellowstone County, as additional insured for this project against liability for damages for bodily injury, including death and completed operations and property damages in a minimum amount of Seven Hundred Fifty Thousand Dollars (\$750,000.00) for each claim and One Million Five Hundred Thousand Dollars , (\$1,500,000.00), in the aggregate arising from incidents which occur as the result of Contractors negligence during the project and for which Yellowstone County, sole basis of liability is vicarious liability for the acts or omissions of the Contractor or/and subcontractors. Contractor shall maintain for this project at its cost and expense, insurance against claims for injuries to persons or damages to property, including contractual liability which may arise from or in connection with the project by Contractor, agents, employees, representatives, assigns and sub-contractors. This insurance shall cover claims as may be caused by any negligent act or omission. The policy of insurance shall be an occurrence policy with a Best Rating of A- or better and must be in force throughout the project.

Contractor shall name on the Certificate of liability insurance Yellowstone County, as additional insured throughout the project. In addition, Contractor will furnish to

Yellowstone County, a copy of the policy endorsement, CG 32 87 05 10, indicating that Yellowstone County, are named as an additional insured under the Contractors insurance policy for this project. Contractor agrees to furnish both the Certificate of insurance and policy endorsement at least ten (10) days prior to beginning work on the project.

Contractor agrees to defend, indemnify and hold harmless Yellowstone County, from and against any and all claims demands, obligations causes of action, lawsuits and all damages and liabilities fines, judgments, costs, (including settlement costs), and expenses associated there with (including reasonable attorney's fees and disbursements), arising from incidents that occur the result of Contractors negligence during this project. And for which Yellowstone County, sole basis of liability is vicarious liability for the acts or omissions of Contractor. The defense and indemnification obligations under this paragraph shall not be limited by any assertions or finding that Yellowstone County, is liable for any damages by reason of a non-delegable duty.

The Board of County Commissioners intend to award the contract to the lowest responsive and responsible bid. The Board reserves the right to reject any or all bids received, to waive informalities to evaluate the bids submitted, and to accept the bid that best serves the interests of Yellowstone County.

Board of County Commissioners
Yellowstone County, Montana

Mark Morse
Chair

Attest:

Jeff Martin
Clerk and Recorder

Cedar Hall Renovation

Bid Sheet

Vendor: _____

Bid Amount: \$ _____

Written Amount: _____

Bid Alternate #1 – Lighting Wireless Controls _____

Estimated Start Date*: _____

Expected Completion Date: _____

***Earliest date for start of construction is November 5th, 2025. This is the desired start date for the project.**

SCHEDULE OF VALUES

1. General Conditions	_____
2. Concrete; ramps, sidewalk, Gravel	_____
3. Metal Framing and Bracing	_____
4. Rough Carpentry	_____
5. Casework	_____
6. Interior Windows	_____
7. Toilet Compartments	_____
8. Doors and Hardware	_____
9. Drywall	_____
10. Paint	_____
11. ACT Ceilings	_____
12. Division 10 Specialties	_____
13. Plumbing	_____
14. HVAC	_____
15. Electrical (E sheets)	_____
16. Communications (T sheets)	_____
17. Final Cleaning	_____
18. Permit (plan review already paid)	_____
19. Builder's Risk	_____
20. GC Fee	_____
Sub-Total	_____
Construction Contingency	_____
Alternate #1: Lighting wireless controls	_____
Grand Total	_____

Notes and Assumptions:

- 1.
- 2.
- 3.

CHECK LIST

Please be sure you have completed the following prior to submitting your bid.

1. Read and understand the specifications.
2. Enclosed a ten (10) percent bid security
3. Made yourself familiar with any State laws that pertain to the bid
4. Asked and received any answers to any questions regarding the bid procedure, specifications or general information.
5. Addressed and mailed or delivered your bid to be received at the correct address by the time and date indicated in the Invitation to Bid.

- END OF IFB -

07.25.2025

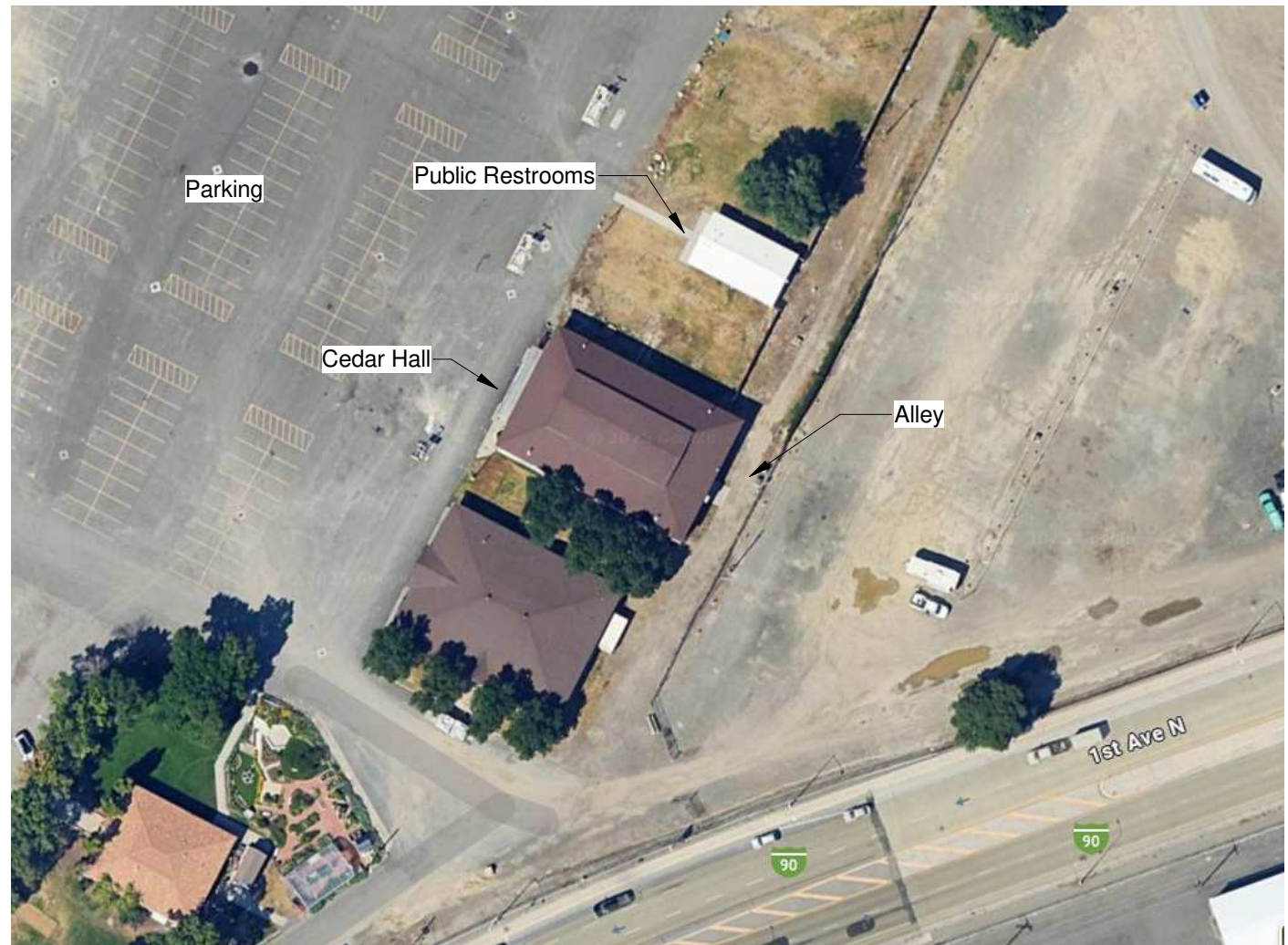
YELLOWSTONE COUNTY
ELECTIONS OFFICES - CEDAR HALL RENOVATION
CONSTRUCTION DOCUMENTS



PROJECT ADDRESS

MetraPark Arena
306 6th Ave N
Billings, MT 59101
Cedar Hall Pavilion

VICINITY MAP:



OWNER

Yellowstone County
PO. Box 36015
Billings, MT 59107
406.256.2717
Contact: Matt Keller

ARCHITECT/ENGINEER

Cushing Terrell
13 N. 23rd Street
Billings, MT 59101
406.248.7455
Contact: Jeff Rupp

SHEET INDEX

GENERAL

G001 COVER SHEET, GENERAL INFORMATION
G100 CODE PLAN

ARCHITECTURAL

AD100 DEMOLITION PLAN
A101 FLOOR PLAN
A301 BUILDING SECTIONS
A401 RAMPS
A501 FINISH PLANS, SCHEDULES & DETAILS
A601 DOOR AND WINDOW SCHEDULES AND DETAILS
A701 ENLARGED PLANS / INTERIOR ELEVATIONS
A702 ENLARGED PLANS / INTERIOR ELEVATIONS
A703 INTERIOR ELEVATIONS / CASEWORK DETAILS
A901 REFLECTED CEILING PLANS

MECHANICAL

M001 HVAC SCHEDULES & LEGENDS
M100 HVAC PLANS

ELECTRICAL

E001 LEGENDS, SCHEDULES AND PANELS
E002 ELECTRICAL SCHEDULES AND ONELINE
E003 ELECTRICAL SPECIFICATIONS
E100 SITE PLAN
E200 LIGHTING PLANS
E300 POWER PLANS

TECHNOLOGY

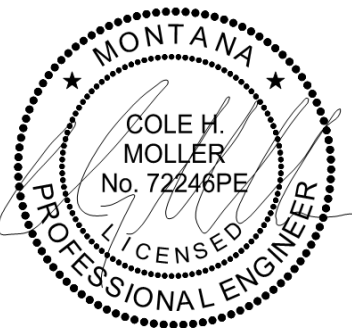
T001 LEGENDS AND SCHEDULES
T400 SYSTEMS PLAN

STRUCTURAL

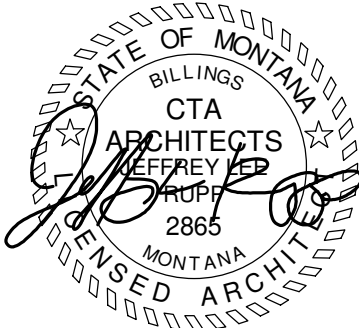
S001 STRUCTURAL GENERAL NOTES
S002 STRUCTURAL GENERAL NOTES
S100 FOUNDATION PLAN
S101 FIRST FLOOR FRAMING PLAN
S102 CEILING FRAMING PLAN
S201 STRUCTURAL DETAILS

PLUMBING

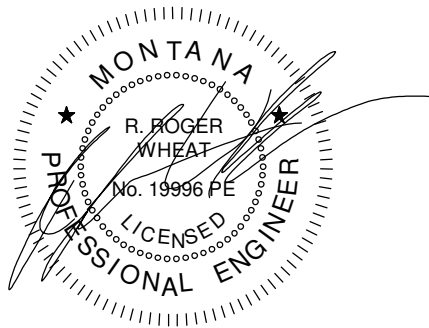
P001 PLUMBING SCHEDULES AND LEGENDS
P002 PLUMBING SPECIFICATIONS
P101 PLUMBING DWV PLANS
P201 PLUMBING DOMESTIC WATER PLANS



STRUCTURAL
COLE MOLLER
07.25.2025



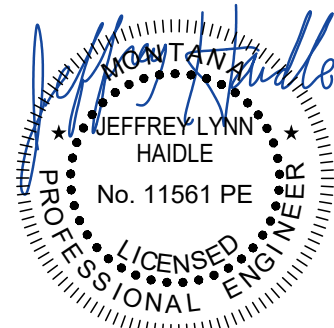
ARCHITECTURAL
JEFF RUPP
07.25.2025



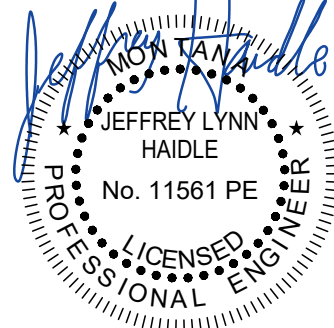
PLUMBING
ROGER WHEAT
07.25.2025



MECHANICAL
JOE WOLSTEIN
07.25.2025

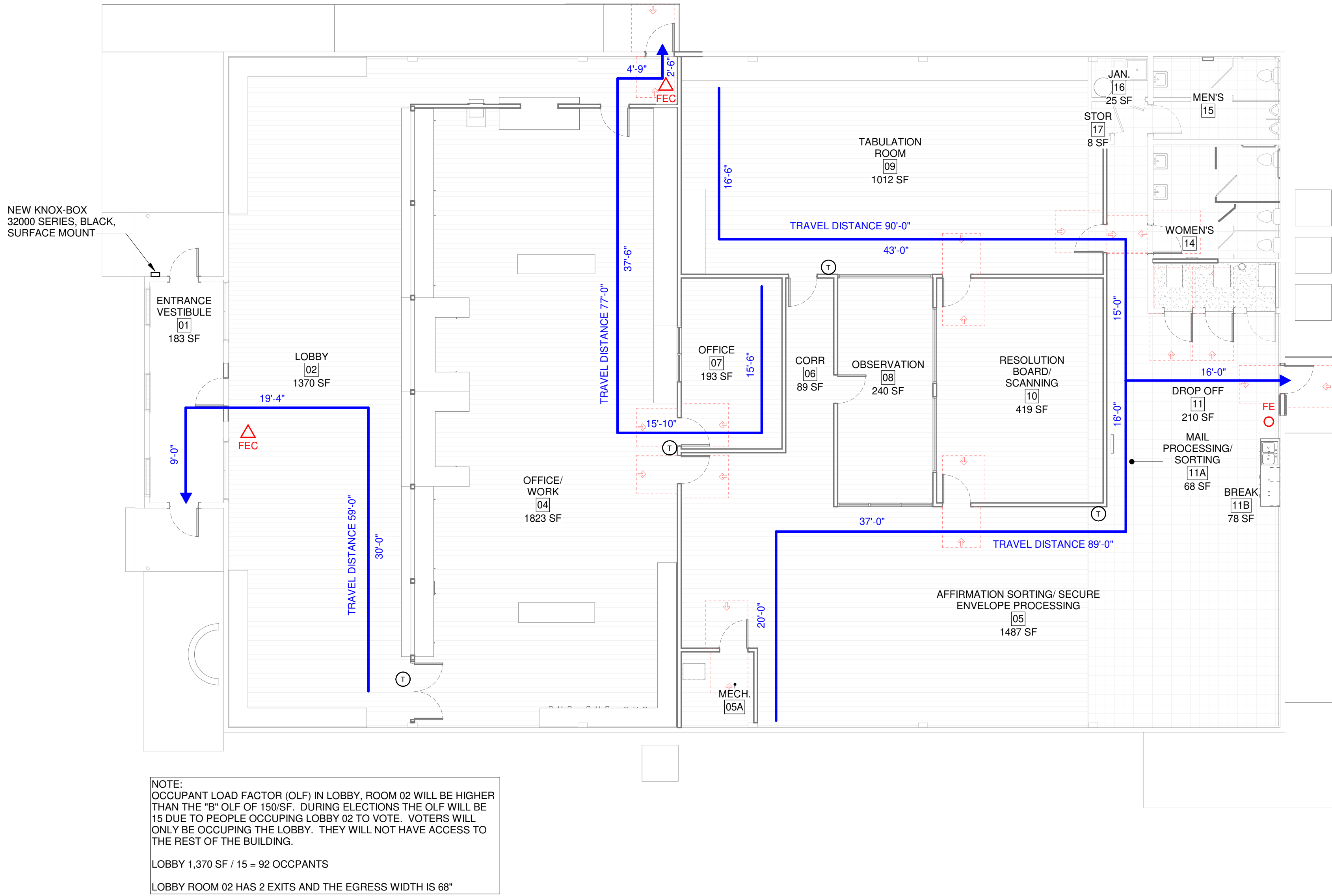
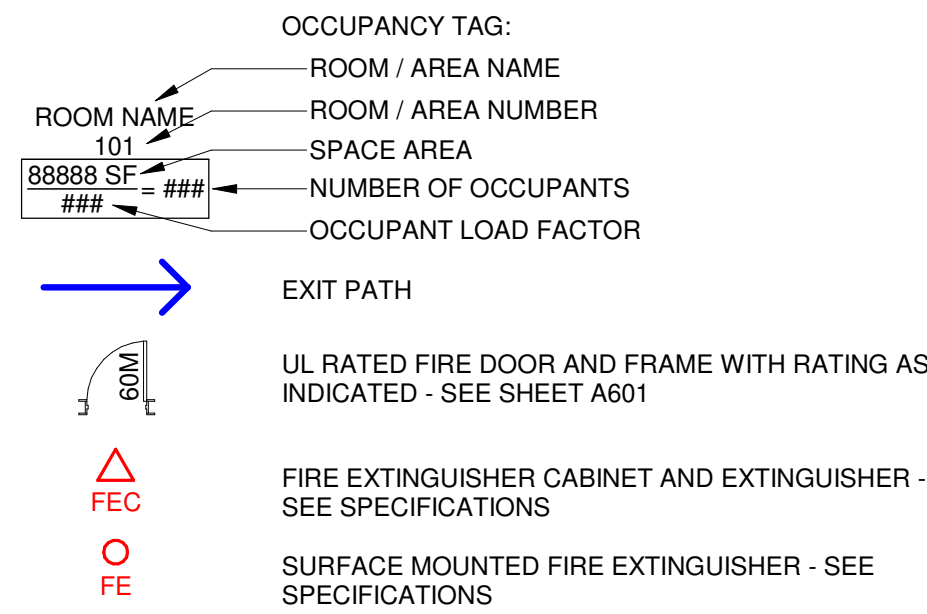


ELECTRICAL
JEFF HAIDLE
07.25.2025



TECHNOLOGY
JEFF HAIDLE
07.25.2025

CODE PLAN LEGEND



1
G100
CODE PLAN
1/8" = 1'-0"



CODE REVIEW INFORMATION

GOVERNING CODE: INTERNATIONAL EXISTING BUILDING CODE - 2021
CHAPTER 6 - CLASSIFICATION OF WORK

604.1 - SCOPE
THIS PROJECT IS CONSIDERED A LEVEL 3 ALTERATION. THE WORK AREA EXCEED 50% OF THE BUILDING AREA.

604.2 - APPLICATION
LEVEL 3 ALTERATIONS SHALL COMPLY WITH PROVISIONS OF CHAPTER 7, 8, AND 9 FOR LEVEL 1, 2, AND 3 ALTERATIONS.

CHAPTER 7 - ALTERATIONS, LEVEL 1

SECTION 702 - BUILDING ELEMENTS AND MATERIALS

702.2 - INTERIOR FLOOR FINISHES
ALL NEWLY INSTALLED INTERIOR FLOOR FINISHES COMPLY WITH SECTION 804 OF THE INTERNATIONAL BUILDING CODE.

702.7 - MATERIALS AND METHODS
ALL NEW WORK WILL COMPLY WITH THE MATERIALS AND METHODS REQUIREMENTS IN THE INTERNATIONAL BUILDING CODE, INTERNATIONAL MECHANICAL CODE, AND INTERNATIONAL PLUMBING CODE.

CHAPTER 8 - ALTERATIONS, LEVEL 2

SECTION 803 - FIRE PROTECTION

803.4 - FIRE ALARM AND DETECTION SYSTEMS
AN APPROVED FIRE DETECTION SYSTEM SHALL BE INSTALLED.

SECTION 804 - MEANS OF EGRESS

804.4 - NUMBER OF EXITS
TWO EXITS REQUIRED PER FLOOR IN ACCORDANCE WITH IBC.

SECTION 806 - ELECTRICAL

806.1 - NEW INSTALLATIONS
THE NEWLY INSTALLED ELECTRICAL EQUIPMENT AND WIRING ASSOCIATED WITH THIS PROJECT WILL COMPLY WITH APPLICABLE SECTIONS OF NFPA 70.

SECTION 807 - MECHANICAL

807.2 - ALTERED EXISTING SYSTEMS
THE ALTERATION OF THE EXISTING MECHANICAL VENTILATION SYSTEM PROVIDES THE REQUIRED LEVEL OF VENTILATION AIR AS REQUIRED BY ASHRAE 62.1.

CHAPTER 9 - ALTERATIONS, LEVEL 3

SECTION 902 - SPECIAL USE AND OCCUPANCY

902.1.2 - ELEVATORS
WHERE ELEVATORS ARE FOR PUBLIC USE SERVING THE WORK AREA, NOT LESS THAN ONE SHALL COMPLY WITH THIS SECTION. ELEVATORS INTENDED TO SERVE THE NEEDS OF THE EMERGENCY PERSONNEL OR FIRE-FIGHTING OR RESCUE PURPOSES, SHALL BE PROVIDED WITH EMERGENCY OPERATION IN ACCORDANCE WITH ASME A17.3.

SECTION 903 - BUILDING ELEMENTS AND MATERIALS

904.2 - FIRE ALARM AND DETECTION SYSTEMS

FIRE ALARM AND DETECTION SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 907 OF IBC AS REQUIRED FOR NEW CONSTRUCTION.

904.2.1 - MANUAL FIRE ALARM SYSTEMS

WHERE REQUIRED BY THE IBC, A MANUAL FIRE ALARM SYSTEM SHALL BE PROVIDED THROUGHOUT THE WORK AREA.

904.2.2 - AUTOMATIC FIRE DETECTION SYSTEMS

WHERE REQUIRED BY THE IBC FOR NEW BUILDINGS, AUTOMATIC FIRE DETECTION SYSTEM SHALL BE PROVIDED THROUGHOUT THE WORK AREA.

SECTION 905 - MEANS OF EGRESS

905.1 GENERAL

THE MEANS OF EGRESS SHALL COMPLY WITH THE REQUIREMENTS OF SECTION 804 EXCEPT AS REQUIRED IN SECTIONS 905.2 AND 905.3.

905.2 - MEANS OF EGRESS LIGHTING

MEANS OF EGRESS FROM THE HIGHEST WORK AREA FLOOR TO THE LEVEL OF EXIT DISCHARGE SHALL BE PROVIDED WITH EGRESS LIGHTING IN ACCORDANCE WITH REQUIREMENTS OF THE IBC.

INTERNATIONAL BUILDING CODE - 2021

GOVERNING CODES:
IBC 2021 (PRIMARY CODE IS IBC 2021)
IMC 2021
NEC 2020
UPC 2021

OCCUPANCY CLASSIFICATION: B (OFFICES)

FIRE SPRINKLER SYSTEM: NOT SPRINKLERED

CONSTRUCTION TYPE: V-B

BASIC ALLOWABLE HEIGHT AND AREA FROM TABLE 504.3 & 506.2:
ALLOWABLE HEIGHT: 40 FEET - COMPLIES
ALLOWABLE AREA: 9,000 SF - COMPLIES

TOTAL GROSS BUILDING AREA = 8,290 SF

INCIDENTAL USE OCCUPANCIES FROM TABLE 509:
NO INCIDENTAL USE AREAS.

FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS FROM TABLE 601, BUILDING IS TYPE V-B:
FOR ALL REQUIREMENTS LISTED IN TABLE = 0 HOURS

FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE FROM TABLE 602 = 0 HOURS

INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY FROM TABLE 803.13 FOR GROUP B, SPRINKLERED:
EXIT ENCLOSURES AND EXIT PASSAGEWAYS = A
CORRIDORS = B
ROOMS AND ENCLOSED SPACES = C

OCCUPANT LOAD FACTOR FROM TABLE 1004.5
BUSINESS AREAS OCCUPANT LOAD FACTOR = 150 SF GROSS
FIRST FLOOR = 8,290 SF / 150 OLF = 53 OCCUPANTS

SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY FROM TABLE 1006.2.1
FOR B OCCUPANCY, MAXIMUM OCCUPANT LOAD = 49

MINIMUM NUMBER OF PLUMBING FIXTURES FROM THE ADMINISTRATIVE RULES OF MONTANA RULE 24.301.351
BASED ON BUSINESS OCCUPANCY = 27 MALES, 27 FEMALES

WATER CLOSETS: 1 PER 25 FOR THE FIRST 50, THEN 1 PER 50 FOR THE REMAINING
REQUIRED: 1 MALES, 1 FEMALES
PROVIDED: 1 MALES, 3 FEMALES

LAVATORIES: 1 PER 40 FOR THE FIRST 80 THEN 1 PER 80 FOR THE REMAINDER
REQUIRED: 1 MALE, 1 FEMALES
PROVIDED: 1 MALES, 2 FEMALES

DRINKING FOUNTAIN: 1 PER 100
REQUIRED: 1
PROVIDED: 1 WATER COOLER DISPENSER PROVIDED

SERVICE SINK: 1 SERVICE SINK



STRUCTURAL GENERAL NOTES

A. GOVERNING CODES

- 1) INTERNATIONAL BUILDING CODE (IBC), 2021 EDITION.
- 2) INTERNATIONAL EXISTING BUILDING CODE (IEBC), 2021 EDITION.
- 3) MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES, ASCE/SEI 7-16.
- 4) NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS, AISI S100-16 WITH SUPPLEMENT 2, 2020 EDITION.
- 5) NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, ANSI/AWC NDS-2018.

B. DESIGN LOADS AND CRITERIA

- 1) GRAVITY LOADS:

a) ROOF LOADS:

1. ROOF DEAD LOAD: 20 psf

2. ROOF LIVE LOAD: 20 psf

b) FLOOR LOADS:

1. FLOOR DEAD LOAD:70 psf

2. FLOOR LIVE LOAD: 50 psf + 15 psf PARTITION (OFFICE BUILDINGS — OFFICES)

3. FLOOR LIVE LOAD: 100 psf (CORRIDORS — FIRST FLOOR)

4. FLOOR LIVE LOAD: 100 psf (ASSEMBLY AREAS — LOBBIES)
- 2) SEISMIC CRITERIA:

a) $SS = 0.128\text{ g} / S1 = 0.056\text{ g}$ MAPPED MCER VALUES

b) RISK CATEGORY = II

c) PROJECT SITE CLASS = D

d) $I_e = 1$

e) $SDS = 0.137\text{ g} / SD1 = 0.09\text{ g}$ DESIGN RESPONSE COEFFICIENT

f) SEISMIC DESIGN CATEGORY = B

C. MATERIALS SECTION

- 1) COLD-FORMED STEEL MEMBERS:

a) DESIGNATION THICKNESS 43 MIL OR LESS: ASTM A653 Fy = 33 ksi - GALVANIZED COATING WEIGHT G60

b) DESIGNATION THICKNESS 54 MIL OR GREATER: ASTM A653 Fy = 50 ksi - GALVANIZED COATING WEIGHT G60

D. COLD-FORMED (LIGHT GAUGE) STEEL FRAMING

- 1) COLD-FORMED STEEL MEMBERS SHALL COMPLY WITH THE LATEST EDITION OF AISI S200 "NORTH AMERICAN STANDARD FOR COLD-FORMED STEEL FRAMING — GENERAL PROVISIONS".
- 2) COLD-FORMED STEEL SHAPES INDICATED ON THE DRAWINGS ARE DESIGNATED PER THE STEEL STUD MANUFACTURERS ASSOCIATION (SSMA) NOMENCLATURE.

a) NOMENCLATURE EXAMPLE: 600S162-54 (50 ksi)

1. 600 = DEPTH X 1/100 INCH I.E. 6"

2. S = STYLE I.E. STUD OR JOIST SECTION

3. 162 = FLANGE WIDTH X 1/100 INCH I.E. 1-5/8"

4. 54 = MINIMUM BASE STEEL THICKNESS IN MILS (1/1000 INCH) I.E. 0.054"

5. (50 ksi) = YIELD POINT I.E. 50 ksi - PROVIDE 33 ksi UNLESS NOTED OTHERWISE
- 3) ALL COLD-FORMED STEEL ELEMENTS INCLUDING ACCESSORIES SHALL BE SUPPLIED BY A SINGLE MANUFACTURER.
- 4) THE INTENT OF THE DESIGN IS FOR THESE ITEMS TO BE ATTACHED TO EACH OTHER AND TO THE SURROUNDING STRUCTURE TO BEHAVE AS A SYSTEM. WHETHER SHOWN OR NOT, PROVIDE ACCESSORY ITEMS (BLOCKS, ANGLES, CLIPS, STIFFENERS, STRAPS, ETC) DESIGNED BY THE MANUFACTURER, FOR A COMPLETE SYSTEM. FOLLOW ALL MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION AND USE.
- 5) INSTALL SUPPLEMENTARY FRAMING, BLOCKING, ETC TO SUPPORT FIXTURES AND OTHER ITEMS PROVIDED BY OTHER TRADES. COORDINATE ALL LOCATIONS WITH RESPECTIVE TRADES.
- 6) FASTEN ELEMENTS AND ACCESSORIES WITH MINIMUM NO. 10 TAPPING SCREWS. INSTALL SCREWS AT 1/2" MINIMUM EDGE DISTANCE AND AT 3/4" MINIMUM SPACING.
- 7) BOTTOM TRACK WEBS OF LOAD BEARING WALLS MUST BEAR UNIFORMLY ON FOUNDATION — GROUT BEARING SURFACE(S) IF NECESSARY.
- 8) SEAT SQUARE STUD ENDS SNUG IN TOP AND BOTTOM TRACK WEBS OF LOAD BEARING WALLS OR INSTALL CLIPS ON STUD WEBS TO TRANSFER ENTIRE STUD REACTION.
- 9) PROVIDE HEADERS FOR ALL OPENINGS PER SCHEDULE. WHERE NOT INDICATED, INSTALL 362T150-54 FLATWISE.
- 10) INSTALL BRIDGING AS FOLLOWS:

a) WALL STUD HORIZONTAL BRIDGING AT 4'-0", UNLESS NOTED OTHERWISE ON CONSTRUCTION DOCUMENTS.

E. MISCELLANEOUS

- 1) DRAWING ELEVATION REFERENCE 100'-0" = TOP OF EXISTING FLOOR.

- 2) CONTRACTOR SHALL REVIEW AND VERIFY ALL DIMENSIONS SHOWN ON THE CONSTRUCTION DOCUMENTS AND SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN ARCHITECTURAL AND STRUCTURAL DRAWINGS PRIOR TO PROCEEDING WITH CONSTRUCTION.
- 3) USE ONLY WRITTEN DIMENSIONS FOR CONSTRUCTION. WHERE NO DIMENSION IS PROVIDED, CONSULT THE ENGINEER FOR CLARIFICATION PRIOR TO CONSTRUCTION.
- 4) DETAIL MARKS ANNOTATED ON PLANS ARE INTENDED TO INDICATE SPECIFIC CONFIGURATION(S) AND INFORMATION. FOR PLAN CLARITY, NOT EVERY LOCATION WHERE A SPECIFIC DETAIL MAY APPLY IS ANNOTATED. CONTACT THE ENGINEER IF CLARIFICATION IS NEEDED.
- 5) NOTIFY ENGINEER OF ANY DISCREPANCIES DISCOVERED WITH OTHER TRADES.
- 6) CONSTRUCTION LOADS SHALL NOT BE GREATER THAN THE DESIGN LOADS INDICATED IN DESIGN LOADS AND CRITERIA SECTION B.1, UNLESS REVIEWED AND APPROVED BY THE ENGINEER.
- 7) EQUIPMENT OPENINGS INDICATED ARE FOR REFERENCE ONLY. COORDINATE EXACT LOCATIONS, DIMENSIONS AND DETAILS WITH EQUIPMENT MANUFACTURERS AND TRADES. ALL OPENINGS IN FLOORS, ROOFS OR OTHER STRUCTURAL MEMBERS THAT ARE NOT SPECIFICALLY DETAILED IN THE STRUCTURAL DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF AND REVIEWED BY THE ENGINEER.
- 8) TEMPORARILY BRACE THE STRUCTURE TO RESIST ALL LOADS OR COMBINATIONS OF LOADS UNTIL ALL PERMANENT ELEMENTS ARE IN PLACE AND ALL CONNECTIONS ARE COMPLETE AS SHOWN. THE DESIGN AND SAFETY OF ALL ERECTION BRACING, SHORING AND TEMPORARY SUPPORTS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- 9) COSTS ASSOCIATED WITH STRUCTURAL DRAWING CHANGES RESULTING FROM USE OF ALTERNATES OR SUBSTITUTIONS, INCLUDING MECHANICAL EQUIPMENT, IS THE CONTRACTOR'S RESPONSIBILITY.
- 10) CONTRACTOR IS RESPONSIBLE FOR LOCATING, PROTECTING AND STABILIZING ALL ADJACENT STRUCTURES AND UTILITIES THROUGH ALL PHASES OF CONSTRUCTION.

F. ABBREVIATIONS LIST (SOME OF THE LISTED ABBREVIATIONS MAY NOT APPEAR ON THE DRAWINGS)

- 1) & AND
- 2) @ AT
- 3) AB ANCHOR BOLT
- 4) ACI AMERICAN CONCRETE INSTITUTE
- 5) AFF ABOVE FINISH FLOOR
- 6) AISC AMERICAN INSTITUTE OF STEEL CONSTRUCTION
- 7) AISI AMERICAN IRON AND STEEL INSTITUTE
- 8) AITC AMERICAN INSTITUTE OF TIMBER CONSTRUCTION
- 9) ALT ALTERNATE
- 10) ANC ANCHOR
- 11) ANSI AMERICAN NATIONAL STANDARDS INSTITUTE
- 12) APPR APPROXIMATE
- 13) ARCH ARCHITECTURE OR ARCHITECTURAL
- 14) ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS
- 15) ASD ALLOWABLE STRESS DESIGN
- 16) ASTM AMERICAN SOCIETY FOR TESTING AND MATERIALS
- 17) AWC AMERICAN WOOD COUNCIL
- 18) AWS AMERICAN WELDING SOCIETY
- 19) BF BRACED FRAME
- 20) BLDG BUILDING
- 21) BLK BLOCK
- 22) BM BEAM
- 23) BOD BOTTOM OF DECK
- 24) BOF BOTTOM OF FOOTING
- 25) BOSH BOTTOM OF SHEATHING
- 26) BOT BOTTOM
- 27) BRG BEARING
- 28) BRKT BRACKET
- 29) BTWN BETWEEN
- 30) CFS COLD-FORMED STEEL
- 31) CIP CAST-IN-PLACE
- 32) CJ CONTROL JOINT
- 33) CL CENTER LINE
- 34) CLR CLEAR
- 35) CMU CONCRETE MASONRY UNIT
- 36) CNJT CONTRACTION JOINT
- 37) COL COLUMN
- 38) CONC CONCRETE
- 39) CONN CONNECTION OR CONNECTOR
- 40) CONST JT CONSTRUCTION JOINT
- 41) CONT CONTINUE OR CONTINUOUS
- 42) CRSI CONCRETE REINFORCING STEEL INSTITUTE

- 43) CVN CHARPY V-NOTCH
- 44) DBA DEFORMED BAR ANCHOR
- 45) DBL DOUBLE
- 46) DE DECK EDGE
- 47) DEPR DEPRESSION
- 48) DET DETAIL
- 49) DIA DIAMETER
- 50) DIM DIMENSION OR DIMENSIONS
- 51) DIR DIRECTION
- 52) DL DEVELOPMENT LENGTH
- 53) DWLS DOWELS
- 54) EA EACH
- 55) EE EACH END
- 56) EF EACH FACE
- 57) EJ EXPANSION JOINT
- 58) EL ELEVATION
- 59) ELEC ELECTRIC OR ELECTRICAL
- 60) EQ EQUAL
- 61) EQPM EQUIPMENT
- 62) ES EACH SIDE
- 63) EW EACH WAY
- 64) EXIST OR (E) EXISTING
- 65) EXP EXPANSION
- 66) EXP BOLT EXPANSION BOLT
- 67) EXP JT EXPANSION JOINT
- 68) FF FAR FACE
- 69) FIN FINISH
- 70) FL FLOOR
- 71) FDN FOUNDATION
- 72) FT FOOT OR FEET
- 73) FTG FOOTING
- 74) FT-LB FOOT POUND
- 75) GA GAUGE OR GAGE
- 76) GALV GALVANIZED OR GALVANIZE
- 77) GB GRADE BEAM
- 78) GC GENERAL CONTRACTOR
- 79) GL GLUED LAMINATED TIMBER
- 80) GP GUSSET PLATE
- 81) GR GRADE
- 82) HAS HEADED ANCHOR STUD
- 83) HEF HORIZONTAL EACH FACE
- 84) HIF HORIZONTAL INSIDE FACE
- 85) HOF HORIZONTAL OUTSIDE FACE
- 86) HORZ HORIZONTAL
- 87) HP HIGH POINT
- 88) HS HIGH STRENGTH
- 89) HSS HOLLOW STRUCTURAL SECTION (TUBE STEEL)
- 90) HT HEIGHT
- 91) IBC INTERNATIONAL BUILDING CODE
- 92) ICBO INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
- 93) ID INSIDE DIAMETER
- 94) IN INCH OR INCHES
- 95) INV INVERT
- 96) IP INFLECTION POINT
- 97) ISJT ISOLATION JOINT
- 98) JB JOIST BEARING
- 99) JST JOIST
- 100) JT JOINT
- 101) K KIP (1000 POUNDS)
- 102) KSI KIPS PER SQUARE INCH
- 103) LB(S) POUND OR POUNDS
- 104) LF LINEAR FEET OR LINEAL FEET
- 105) LLH LONG LEG HORIZONTAL
- 106) LLV LONG LEG VERTICAL
- 107) LONG LONGITUDINAL
- 108) LP LOW POINT
- 109) LRFD LOAD AND RESISTANCE FACTOR DESIGN
- 110) LW LIGHT WEIGHT
- 111) LWC LIGHT WEIGHT CONCRETE
- 112) MAS MASONRY
- 113) MAX MAXIMUM
- 114) MC MECHANICAL CONTRACTOR

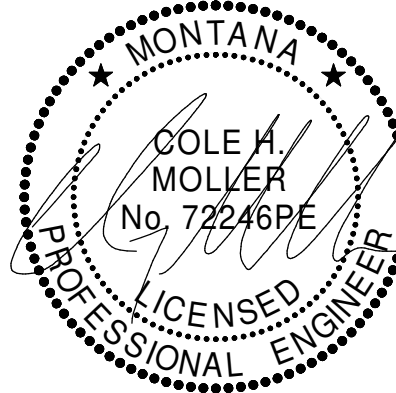
- 115) MF MOMENT FRAME
- 116) MFG MANUFACTURING
- 117) MFR MANUFACTURER
- 118) MECH MECHANICAL
- 119) MIN MINIMUM
- 120) MTL METAL
- 121) (N) NEW
- 122) N/A NOT APPLICABLE
- 123) NF NEAR FACE
- 124) NIC NOT IN CONTRACT
- 125) NO OR # NUMBER
- 126) NOM NOMINAL
- 127) NTS NOT TO SCALE
- 128) NWC NORMAL WEIGHT CONCRETE
- 129) OC ON CENTER
- 130) OD OUTSIDE DIAMETER
- 131) OPNG OPENING
- 132) PC PILE CAP
- 133) PCB PRECAST BEARING
- 134) PCI PRECAST/PRESTRESSED CONCRETE INSTITUTE
- 135) % PERCENT
- 136) PERP PERPENDICULAR
- 137) PL PLATE
- 138) PLMB PLUMBING OR PLUMB
- 139) PROJ PROJECTION
- 140) PSF POUNDS PER SQUARE FOOT
- 141) PSI POUNDS PER SQUARE INCH
- 142) PT POST-TENSIONED
- 143) PTI POST-TENSIONING INSTITUTE
- 144) PVC POLYVINYL CHLORIDE
- 145) QTY QUANTITY
- 146) (R) RELOCATE OR RELOCATED
- 147) R RADIUS
- 148) RE RIGHT END
- 149) REINF REINFORCE, REINFORCED, REINFORCEMENT OR REINFORCING
- 150) REQD REQUIRED
- 151) RET RETURN
- 152) RETG RETAINING
- 153) REV REVISION
- 154) SC SHEAR CONNECTOR
- 155) SCHED SCHEDULE
- 156) SDI STEEL DECK INSTITUTE
- 157) SECT SECTION
- 158) SF STEP FOOTING
- 159) SF SQUARE FOOT OR SQUARE FEET
- 160) SFRS SEISMIC FORCE-RESISTING SYSTEM
- 161) SHT SHEET
- 162) SIM SIMILAR
- 163) SJI STEEL JOIST INSTITUTE
- 164) SL SPLICE LENGTH
- 165) SLV SHORT LEG VERTICAL
- 166) SOG SLAB ON GRADE
- 167) SPA SPACE OR SPACES
- 168) SPEC SPECIFIED OR SPECIFICATION
- 169) SQ SQUARE
- 170) STD STANDARD
- 171) STIFF STIFFENER
- 172) STL STEEL
- 173) STIR STIRRUP
- 174) STRUCT STRUCTURAL OR STRUCTURE
- 175) SUP SUPPORT
- 176) SYM SYMMETRICAL
- 177) T&B TOP AND BOTTOM
- 178) TB TRUSS BEARING
- 179) THK THICK OR THICKNESS
- 180) THRD THREAD OR THREADED
- 181) TMS THE MASONRY SOCIETY
- 182) TOB TOP OF WOOD BEAM/GLUED LAMINATED TIMBER
- 183) TOCB TOP OF CONCRETE BEAM
- 184) TOCC TOP OF CONCRETE CORBEL
- 185) TOCP TOP OF CONCRETE PIER/PILASTER

- 186) TOCS TOP OF CONCRETE SLAB
- 187) TOCW TOP OF CONCRETE WALL
- 188) TOD TOP OF DECK
- 189) TOF TOP OF FOOTING
- 190) TOGB TOP OF GRADE BEAM
- 191) TOMP TOP OF MASONRY PIER/PILASTER
- 192) TOMW TOP OF MASONRY WALL
- 193) TOP TOP OF PIER/PILE
- 194) TOPC TOP OF PILE CAP
- 195) TOS TOP OF STEEL BEAM/COLUMN
- 196) TOSH TOP OF SHEATHING
- 197) TOW TOP OF WOOD/LIGHT GAGE WALL
- 198) TOWL TOP OF WOOD LEDGER
- 199) TRANS TRANSVERSE
- 200) TYP TYPICAL
- 201) UNO UNLESS NOTED OTHERWISE
- 202) US UNDERSIDE
- 203) VEF VERTICAL EACH FACE
- 204) VERT VERTICAL
- 205) VIF VERIFY IN FIELD OR VERTICAL INSIDE FACE
- 206) VOF VERTICAL OUTSIDE FACE
- 207) W/ WITH
- 208) W/O WITHOUT
- 209) WP WORKING POINT
- 210) WWF WELDED WIRE FABRIC

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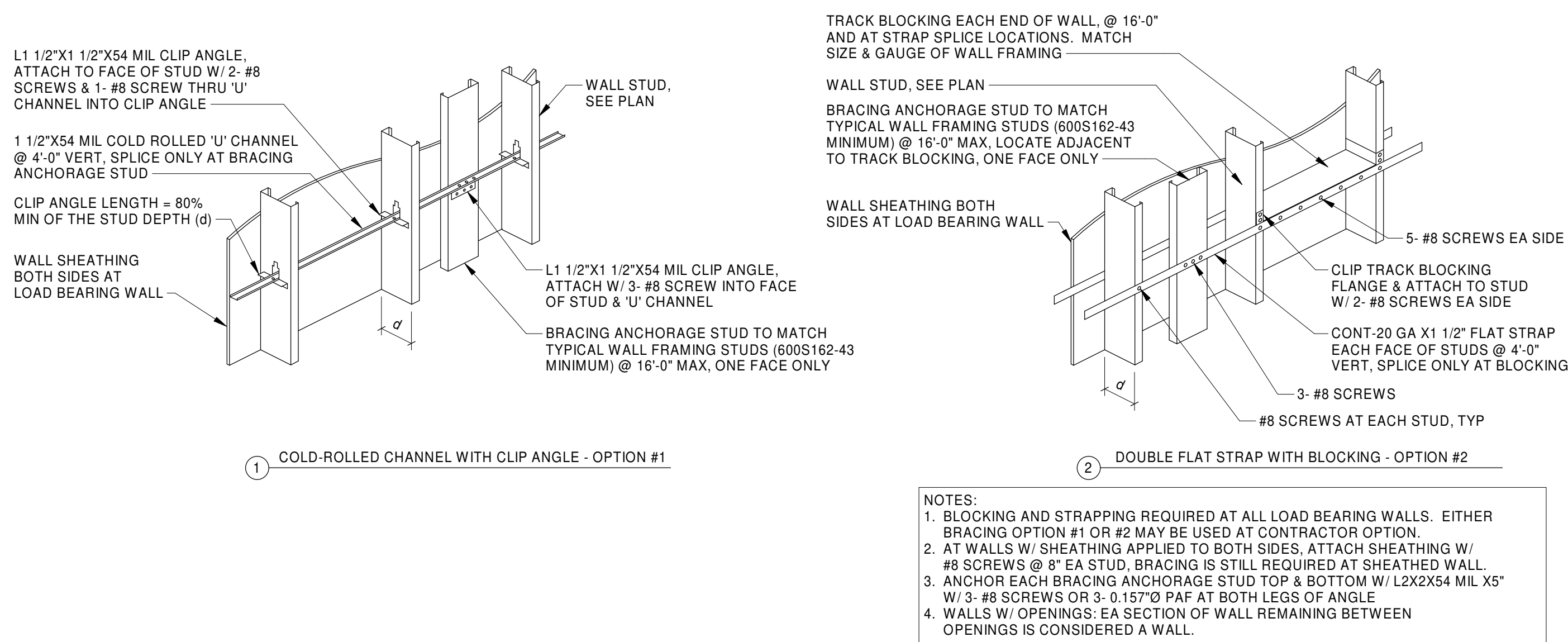
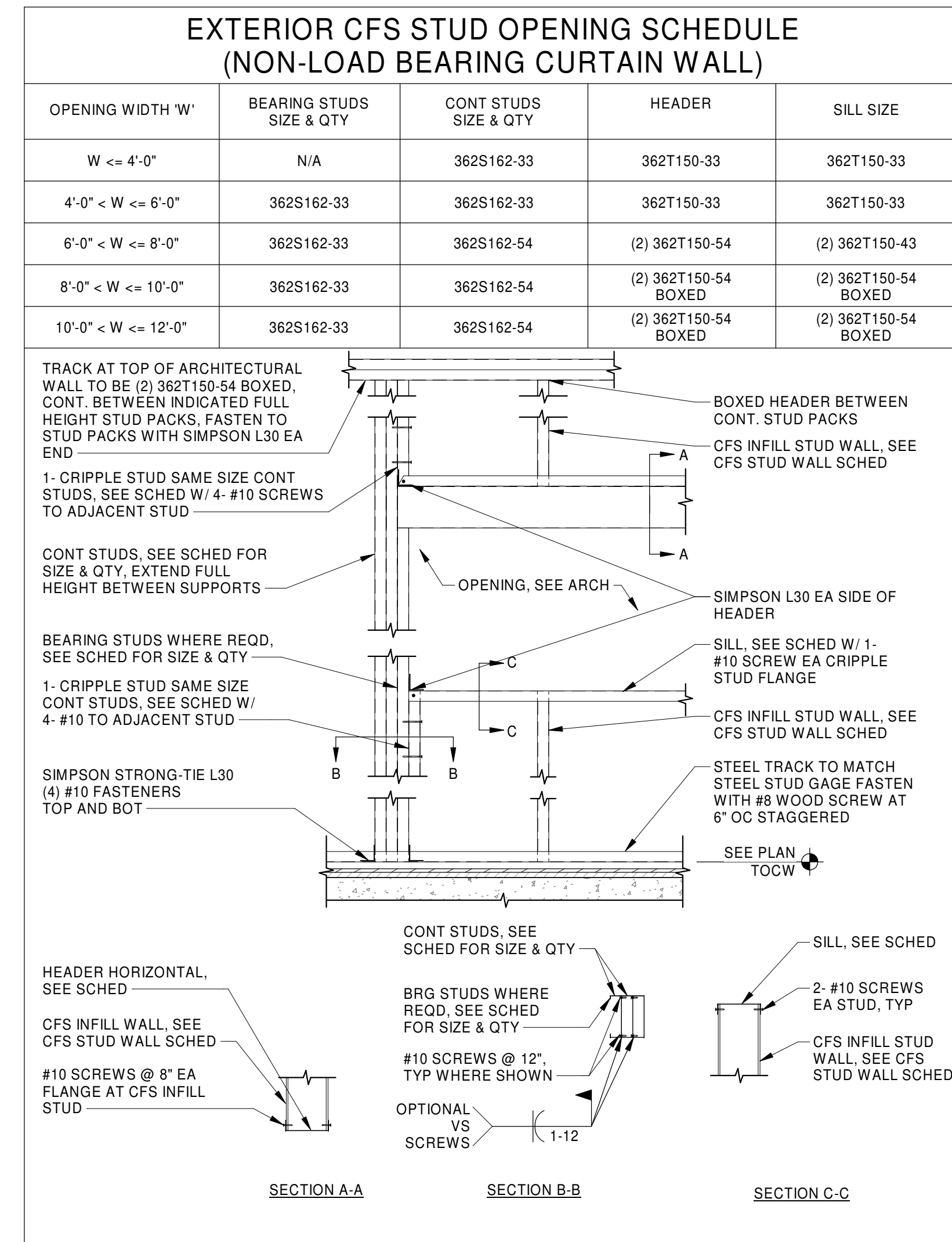
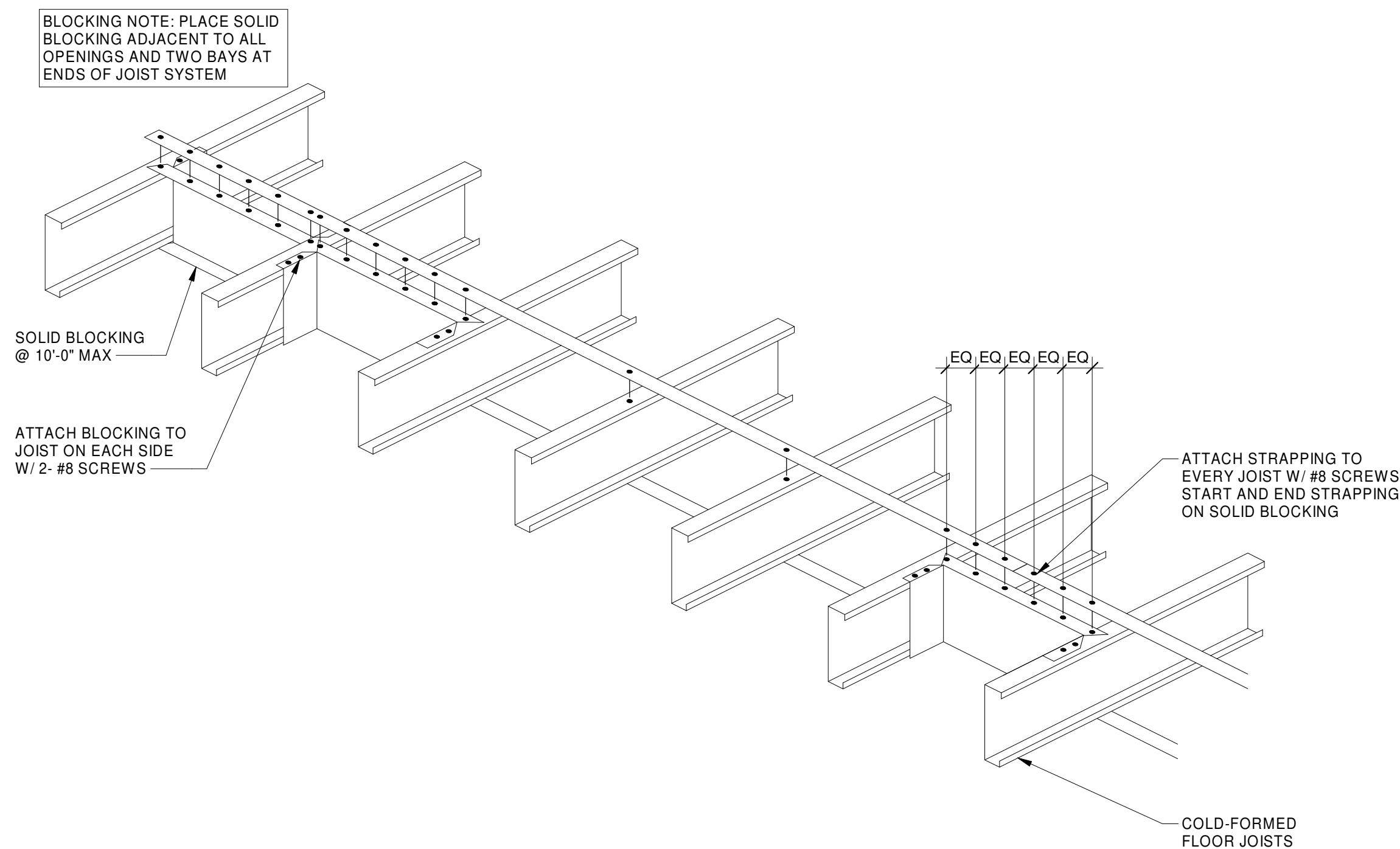
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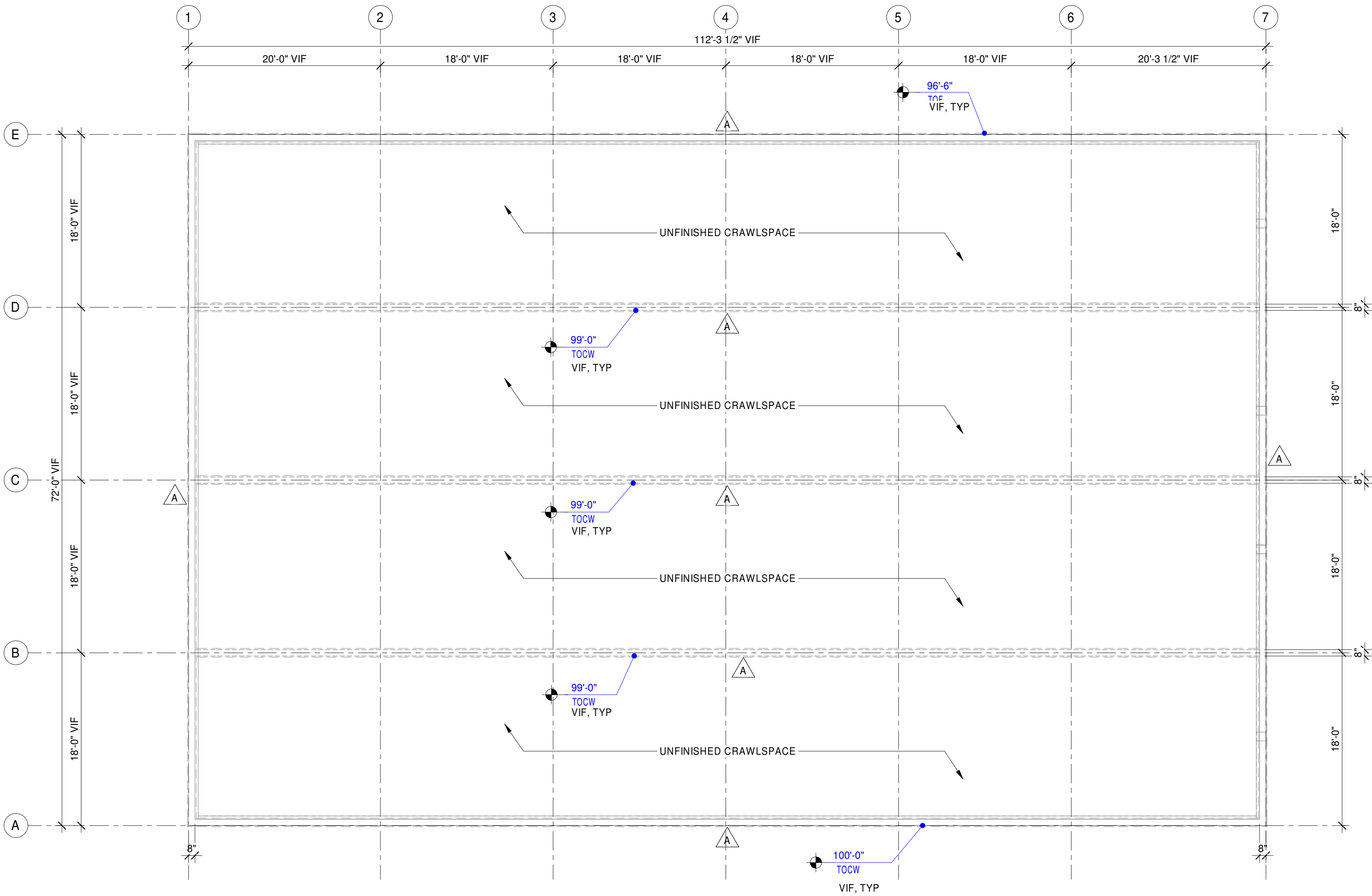
07.25.2025
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DESIGNED BY | MOLLER
DRAWN BY | TUTTY
REVIEWED BY | MOLLER
REVISIONS

STRUCTURAL
GENERAL NOTES

S001

1
S002
TYP COLD-FORMED STEEL WALL BRACING
3/4" = 1'-0"

FOOTING SCHEDULE		
MARK	TYPE (WxLxD)	REINFORCING
A	(E) 11"x10"xCONT (VIF)	



1
S100

FOUNDATION PLAN

1/8" = 1'-0"



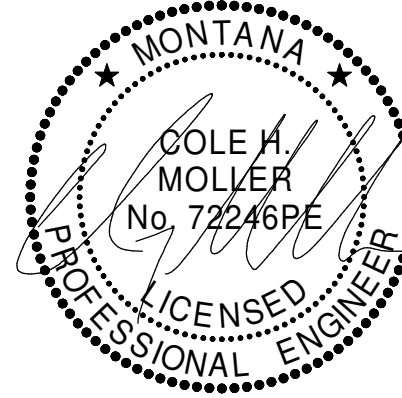
FOUNDATION PLAN NOTES

1. ALL GRID DIMENSIONS ARE LOCATED AT OUTSIDE FACE OF FOUNDATION WALL OR AT CL OF COLUMN.
2. PLAN SHEET "CUT" PLANE IS ASSUMED TO OCCUR 48" ABOVE FLOOR/SLAB LEVEL.
3. COORDINATE FOUNDATION WALL PENETRATION SIZE AND LOCATIONS WITH OTHER TRADE(S).
4. NOTIFY ENGINEER IF HOLES ARE REQUIRED PRIOR TO CUTTING.
5. SEE ELECTRICAL, MECHANICAL AND PLUMBING FOR LOCATION AND SIZE OF EQUIPMENT. NOTIFY ENGINEER IF UNIT SUPPORT PADS ARE REQUIRED PRIOR TO INSTALL.
6. REFERENCE ARCHITECTURAL/PLUMBING PLANS FOR FLOOR DRAIN LOCATIONS AND SLOPED SLAB LIMITS. DO NOT OVER CUT, AND VERIFY EXISTING FRAMING LOCATIONS PRIOR TO CUTTING. DO NOT CUT EXISTING FRAMING.
7. TOP OF INTERIOR CONCRETE FOOTING ELEVATION = 96'-6", VIF, UNO.

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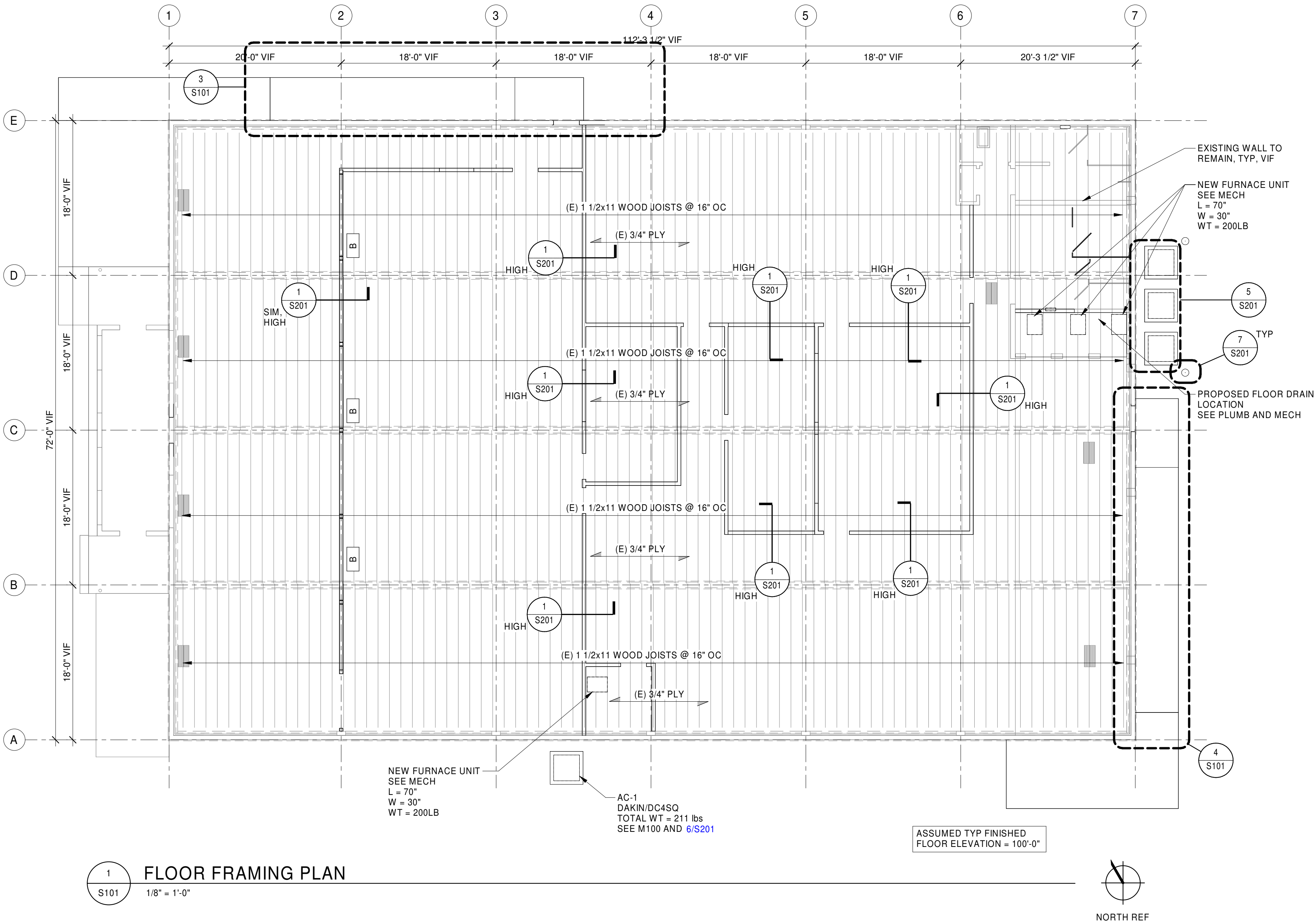
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REVIEWED BY | MOLLER
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FOUNDATION PLAN

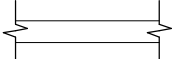
S100



FRAMING PLAN NOTES

1. ALL GRID DIMENSIONS ARE LOCATED AT OUTSIDE FACE OF FOUNDATION WALL OR AT CL OF COLUMN.
2. PLAN SHEET "CUT" PLANE IS ASSUMED TO OCCUR 48" ABOVE FLOOR/ROOF LEVEL.
3. SEE STRUCTURAL GENERAL NOTES SECTION "B" FOR DESIGN LOADS REQUIRED.
4. REFERENCE OTHER DISCIPLINES INDICATING EQUIPMENT FOR SPECIFIC PLAN LOCATION.
5. SEE SHEET [S002](#) FOR LIGHT GAUGE HEADER DETAIL AND SCHEDULE.
6. (2) 362S162-54 BACK-TO-BACK STUD PACK TO ROOF DECK AT 12" MAX FOR ALL WALLS. SEE DETAILS [1/S201](#) AND [2/S201](#) FOR CONNECTIONS.
7. NEW CFS JOIST FRAMING IS PROVIDED FOR ACT AND ELECTRICAL SUPPORT ONLY. FRAMING IS NOT INTENDED FOR STORAGE, MAINTENANCE, AND OTHER OTHER LOADING. EXPOSURE TO ANY OTHER LOADING BEYOND THE ACT AND PROPOSED LIGHTING IS NOT PERMITTED. NO PLYWOOD OR WALKING SURFACE IS PERMITTED TO BE PLACED ON THE TOP SIDE OF THE JOISTS, NOR ANYTHING THAT WOULD ALLOW ACCESS TO THE TOP SIDE OF THE FRAMING. SEE REQ JOIST BRACING ON [S002](#) FOR ALL LOCATIONS UNO.

PLAN ANNOTATIONS

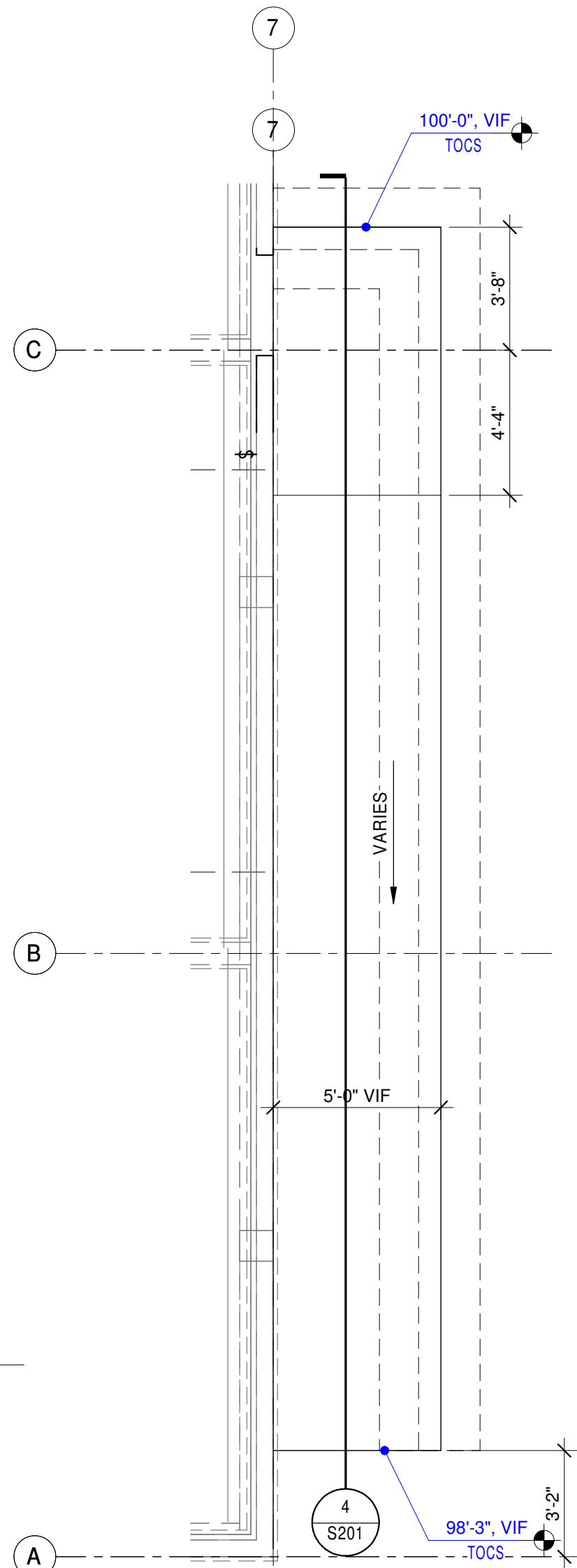
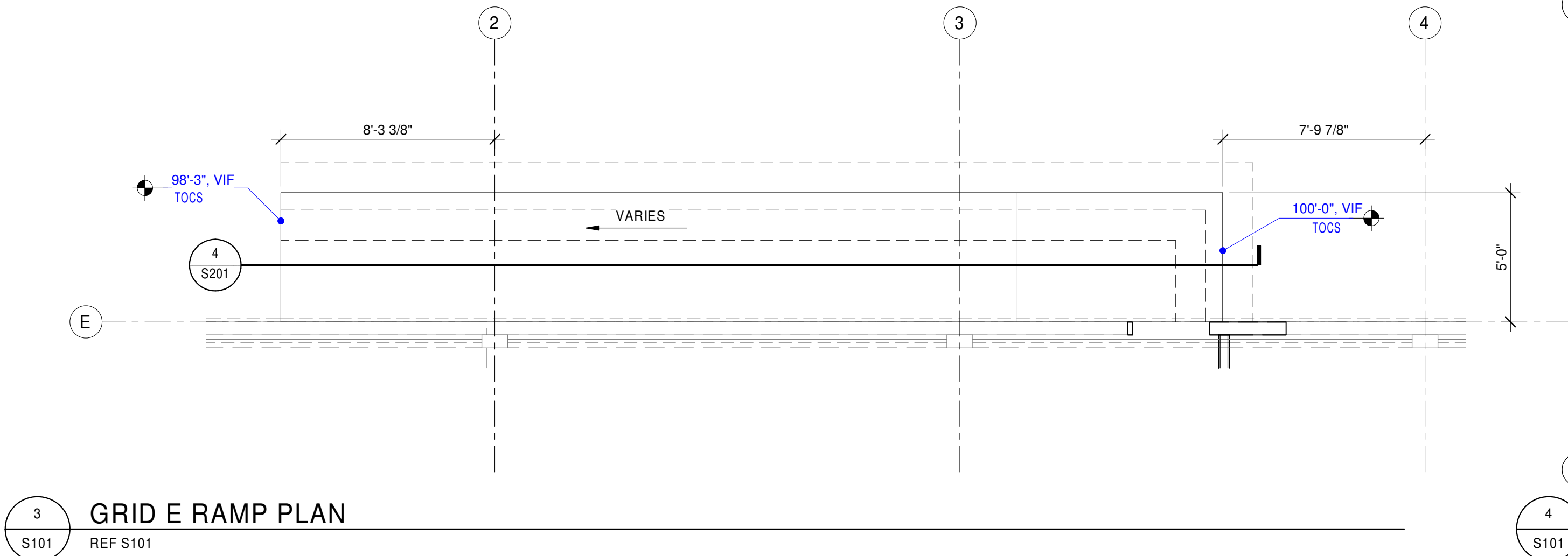
-  INDICATES NEW CFS WALL, SEE SCHEDULE THIS SHEET AND ARCH FOR WALL LOCATIONS AND EXTENTS
-  INDICATES EXISTING VENT/PENETRATION TO CRAWLSPACE. VERIFY ACTUAL DIMENSIONS AND LOCATIONS IN THE FIELD. REPRESENTS ONLY ACCESS POINTS TO CRAWLSPACE.

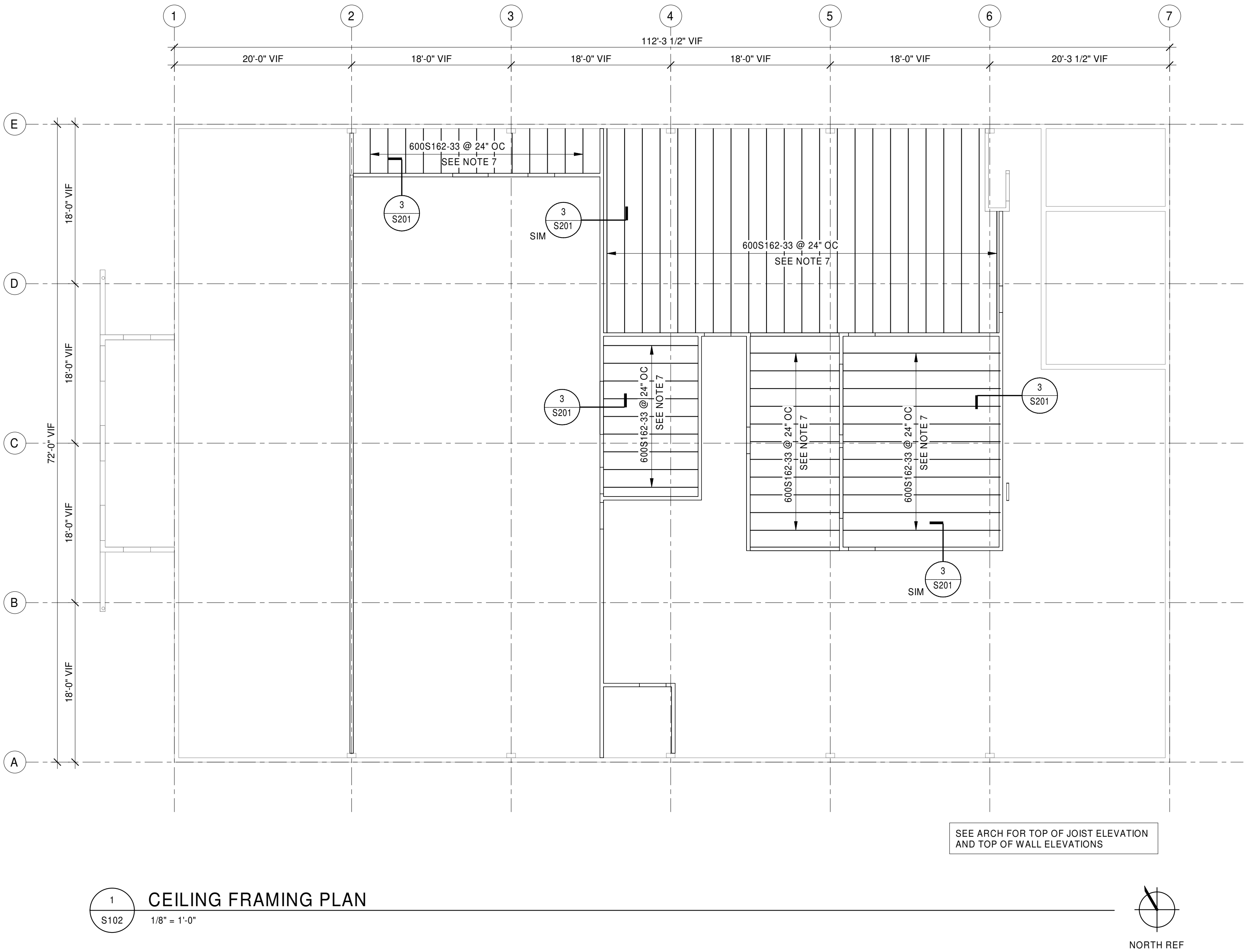
STRUCTURAL CFS STUD WALL SCHEDULE

WALL MARK	STUD SIZE	STUD SPACING	WEB STIFFENERS	MAXIMUM STUD HEIGHT
A	362S162-33 (50 KSI)	16"	--	10'-0"
B	362S162-43 (50 KSI)	16"	--	14'-0"

WALL SCHEDULE NOTES:

1. ALL INTERNAL WALLS TO BE TYPE A UNLESS DESIGNATED OTHERWISE.
2. SEE [2/S201](#) FOR CFS STUD FRAMING AT CORNER.
3. SEE [1/S002](#) FOR TYP COLD-FORMED STEEL WALL BRACING.
4. SEE CFS HEADER SCHEDULE ON SHEET [S002](#) FOR FRAMING REQUIRED AT WALL OPENINGS.
5. ORIENT STUD PAIRS, WHERE INDICATED, BACK TO BACK. INSTALL TYPICAL SHEATHING FASTENER SPACING TO BOTH STUD FLANGES.
6. SEE ARCH FOR WALL LOCATIONS, EXTENTS AND ELEVATIONS.





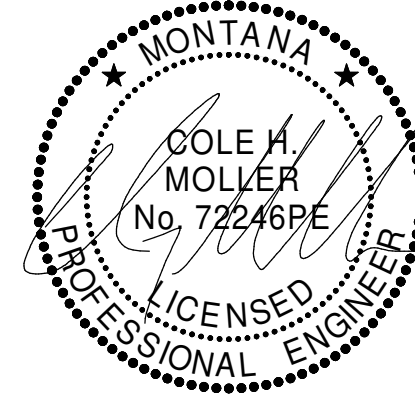
- FRAMING PLAN NOTES**
- ALL GRID DIMENSIONS ARE LOCATED AT OUTSIDE FACE OF FOUNDATION WALL OR AT CL OF COLUMN.
 - PLAN SHEET "CUT" PLANE IS ASSUMED TO OCCUR 48" ABOVE FLOOR/ROOF LEVEL.
 - SEE STRUCTURAL GENERAL NOTES SECTION "B" FOR DESIGN LOADS REQUIRED.
 - REFERENCE OTHER DISCIPLINES INDICATING EQUIPMENT FOR SPECIFIC PLAN LOCATION.
 - SEE SHEET **S002** FOR LIGHT GAUGE HEADER DETAIL AND SCHEDULE.
 - (2) 362S162-54 BACK-TO-BACK STUD PACK TO ROOF DECK AT 12" MAX FOR ALL WALLS. SEE DETAILS **1/S201** AND **2/S201** FOR CONNECTIONS.
 - NEW CFS JOIST FRAMING IS PROVIDED FOR ACT AND ELECTRICAL SUPPORT ONLY. FRAMING IS NOT INTENDED FOR STORAGE, MAINTENANCE, AND OTHER OTHER LOADING. EXPOSURE TO ANY OTHER LOADING BEYOND THE ACT AND PROPOSED LIGHTING IS NOT PERMITTED. NO PLYWOOD OR WALKING SURFACE IS PERMITTED TO BE PLACED ON THE TOP SIDE OF THE JOISTS, NOR ANYTHING THAT WOULD ALLOW ACCESS TO THE TOP SIDE OF THE FRAMING. SEE REQ JOIST BRACING ON **S002** FOR ALL LOCATIONS UNQ.

- PLAN ANNOTATIONS**
- INDICATES NEW CFS WALL, SEE SCHEDULE THIS SHEET AND ARCH FOR WALL LOCATIONS AND EXTENTS
 - INDICATES EXISTING VENT/PENETRATION TO CRAWLSPACE. VERIFY ACTUAL DIMENSIONS AND LOCATIONS IN THE FIELD. REPRESENTS ONLY ACCESS POINTS TO CRAWLSPACE.

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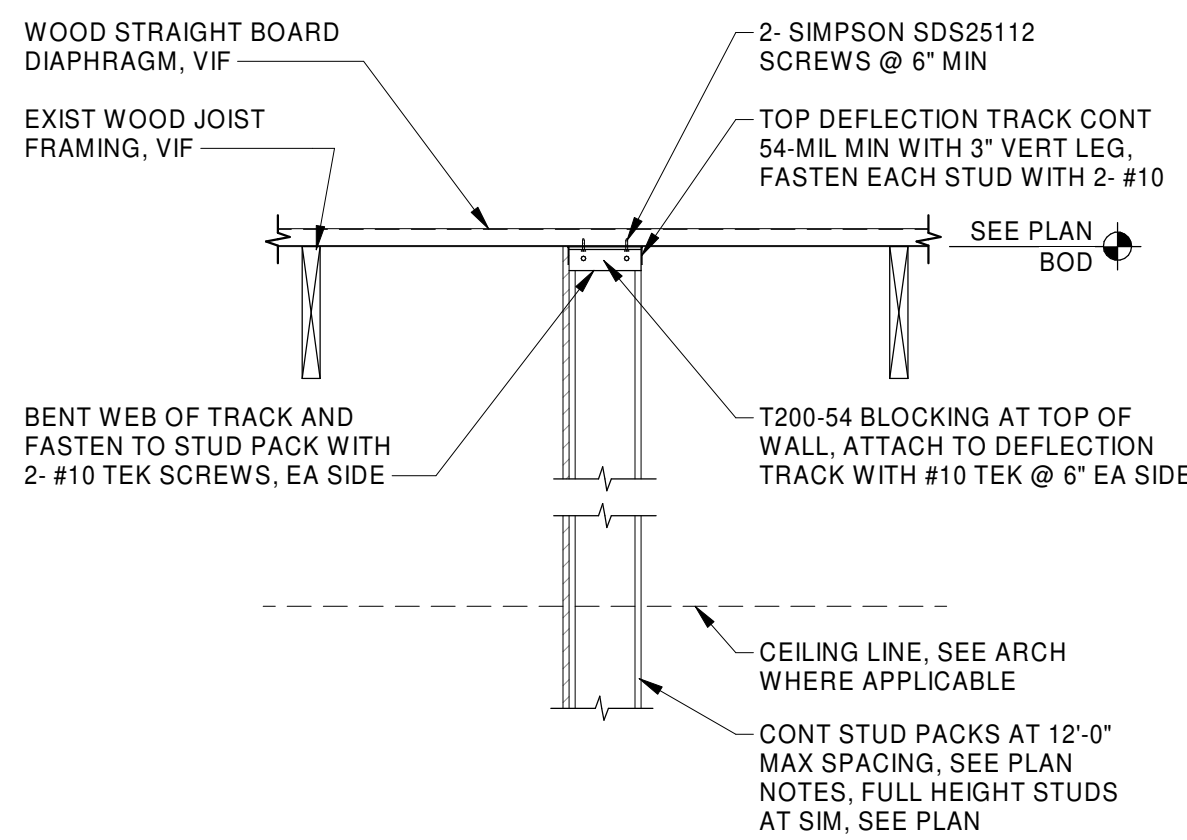
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CEILING FRAMING
PLAN

S102

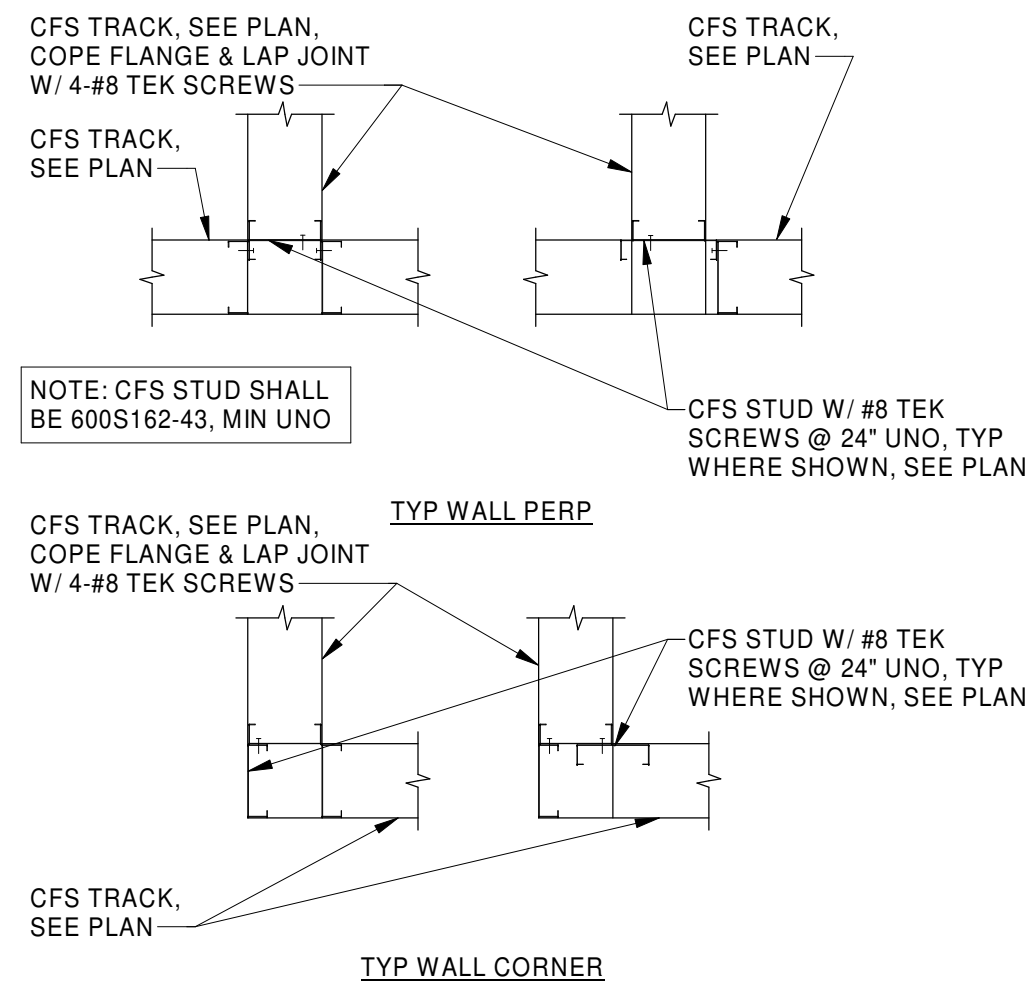


CFS SHEAR WALL ATTACHMENT TO METAL DECK

1
S201

REF S101

3/4" = 1'-0"

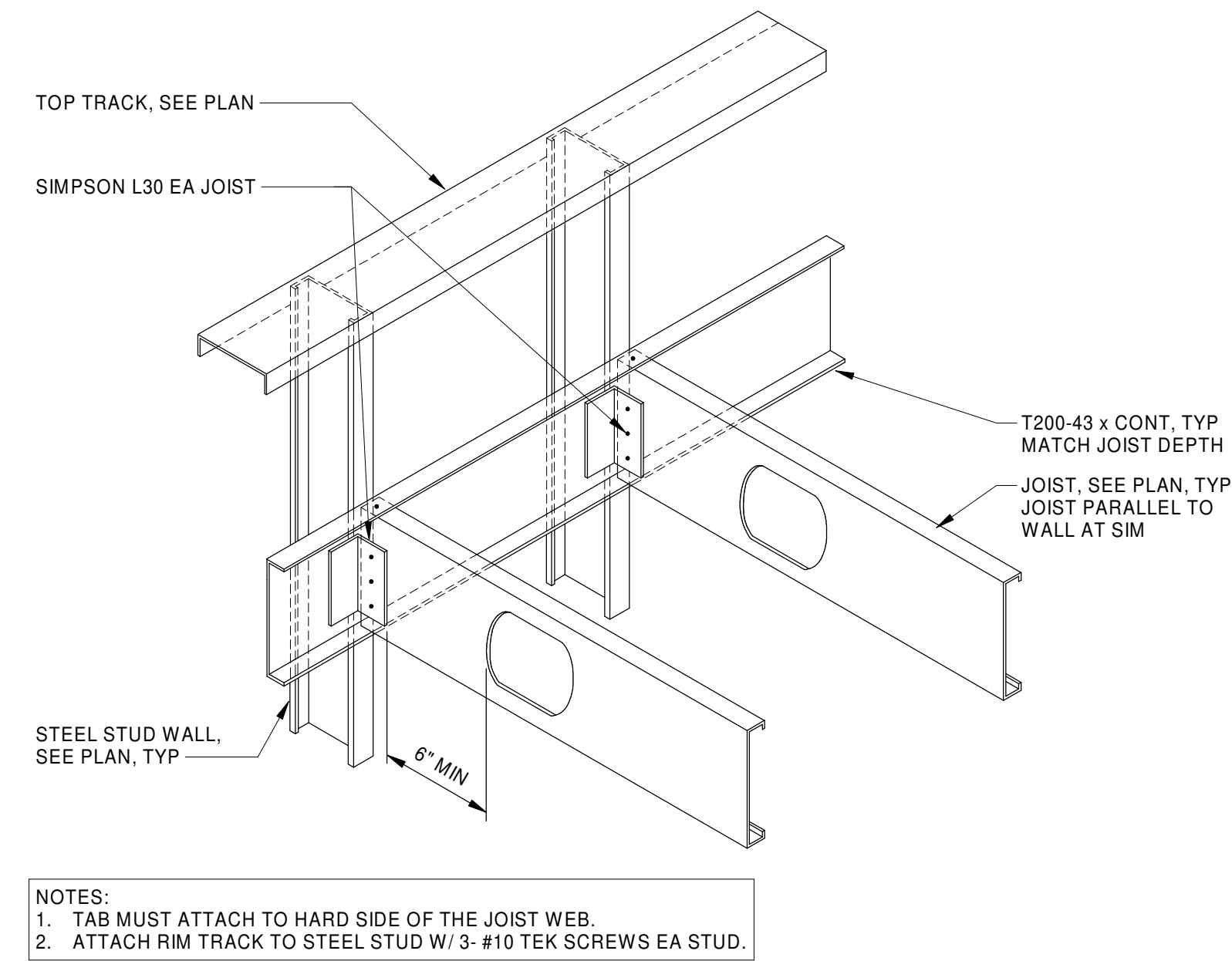


CFS STUD FRAMING AT CORNER & PERP

2
S201

REF S101

3/4" = 1'-0"

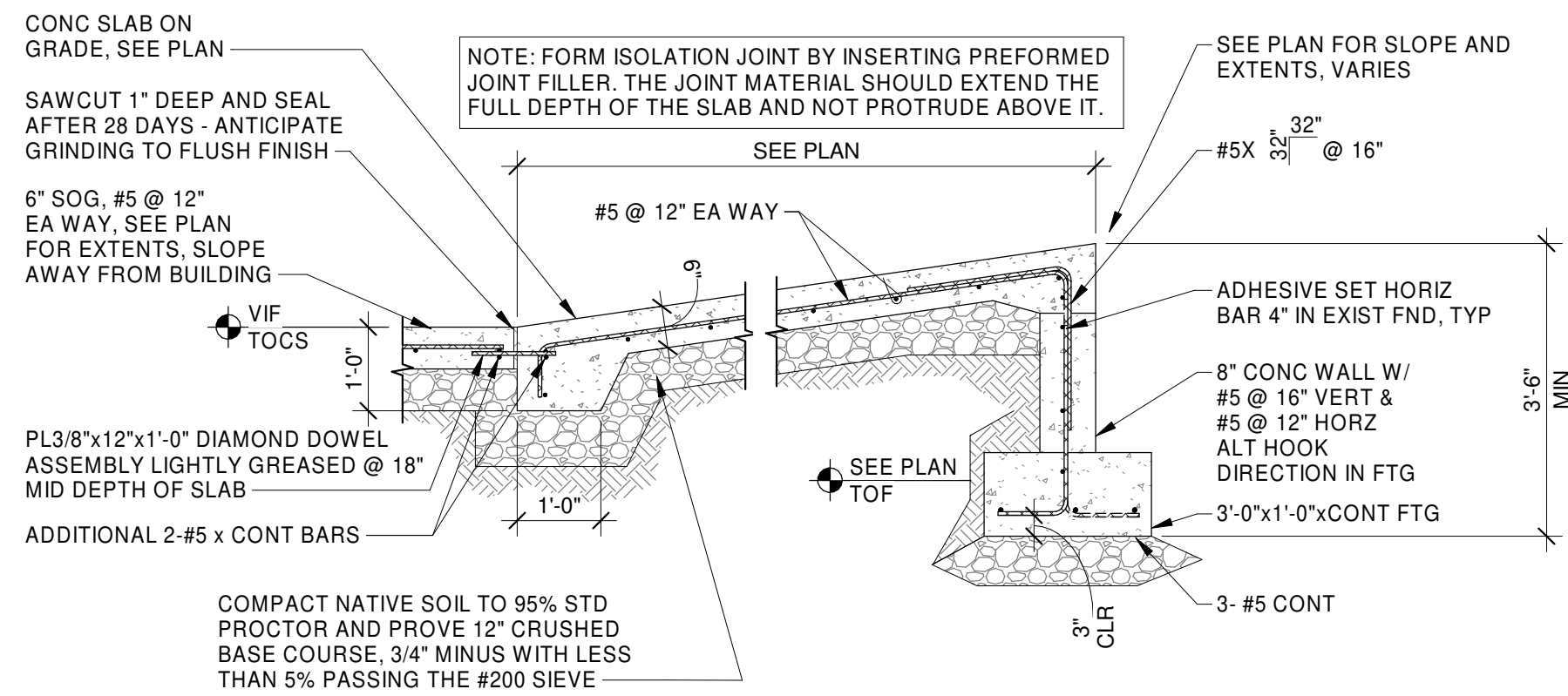


TYPICAL FLOOR FRAMING CONSTRUCTION

3
S201

REF S102

3/4" = 1'-0"

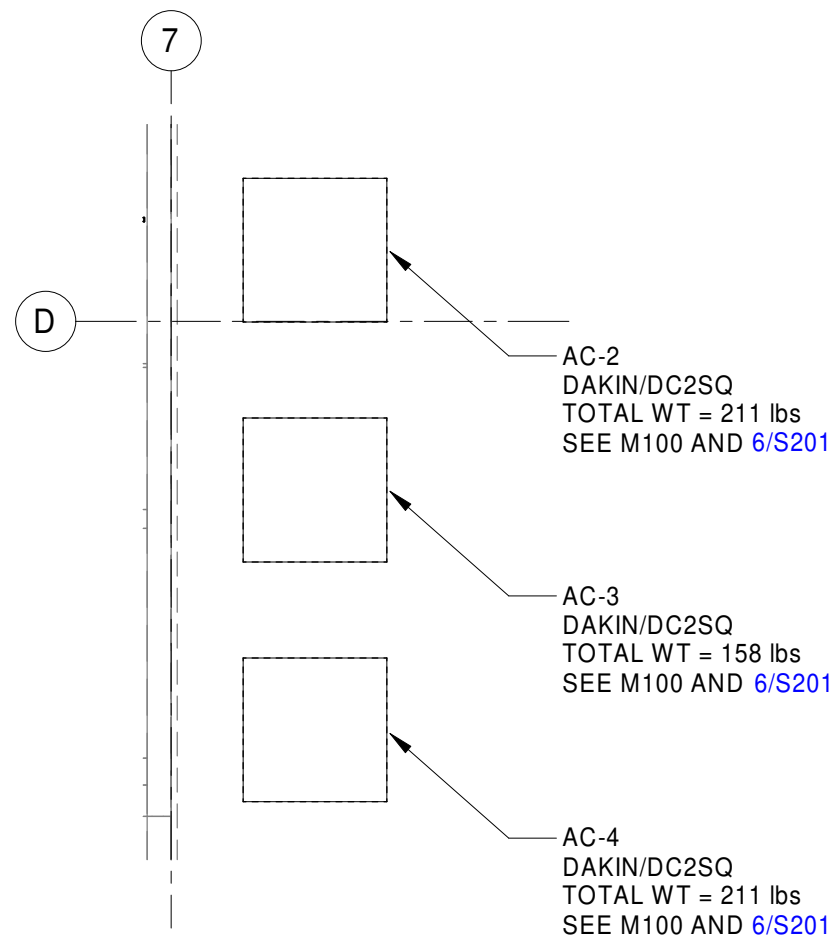


CAST IN PLACE CONC RAMP

4
S201

REF S101

1/2" = 1'-0"

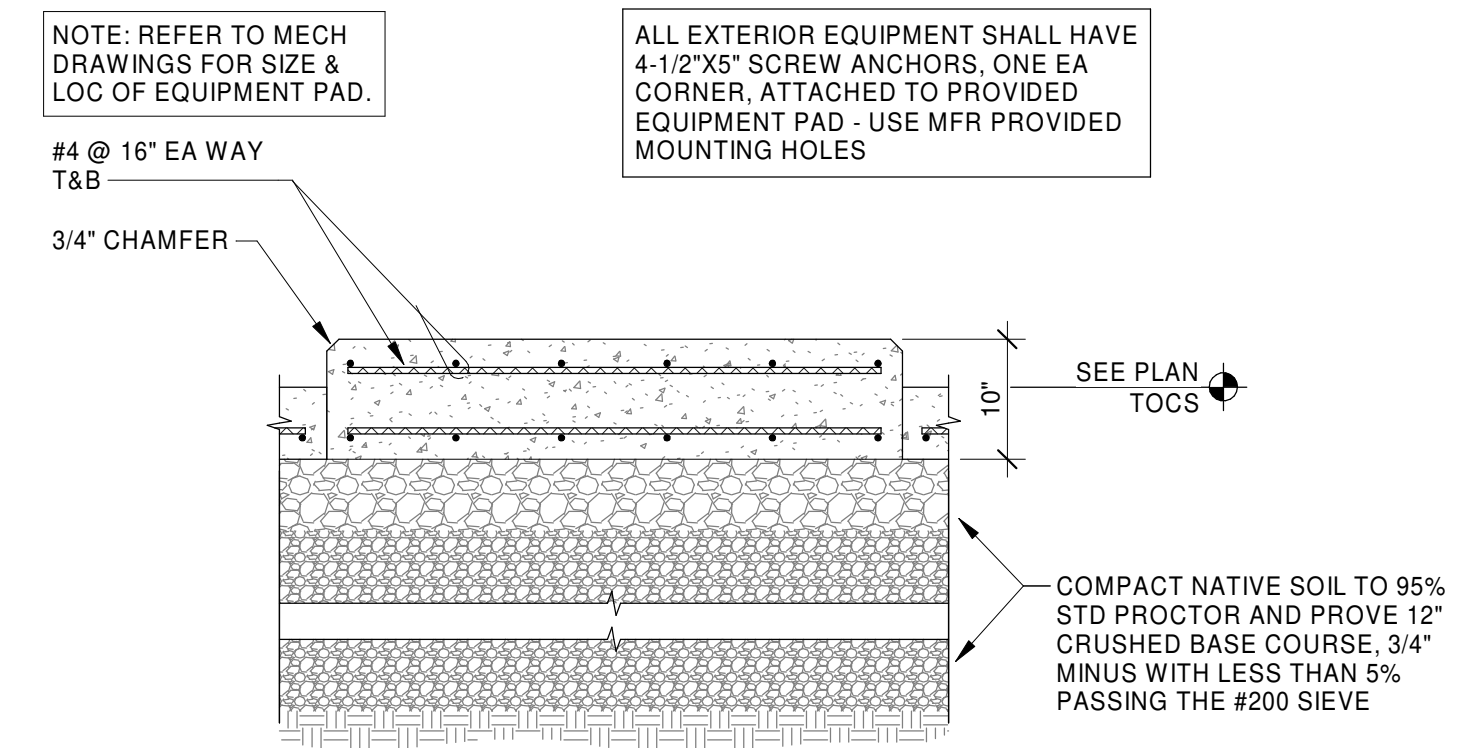


FURNACE LAYOUT

5
S201

REF S101

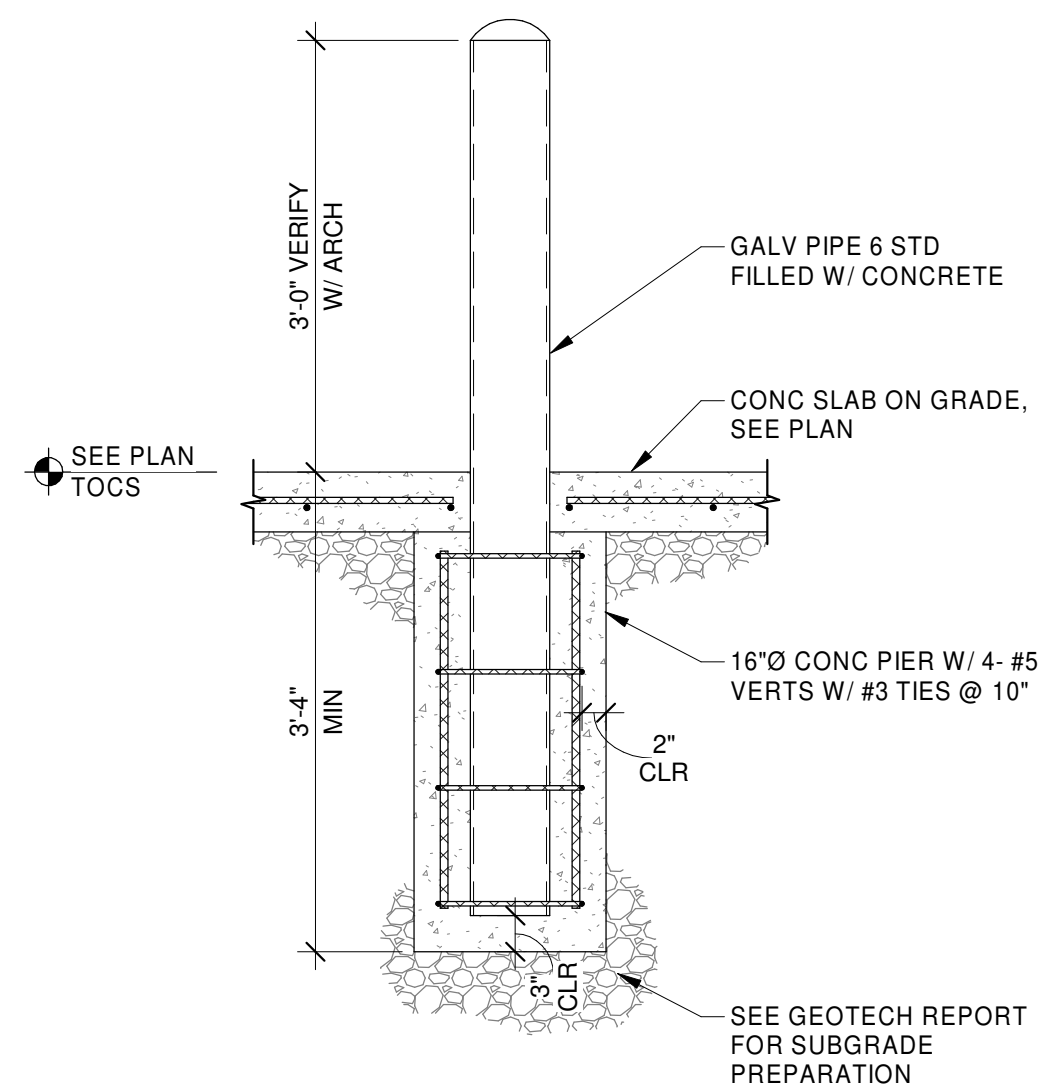
1/4" = 1'-0"



EQUIPMENT PAD

6
S201

3/4" = 1'-0"

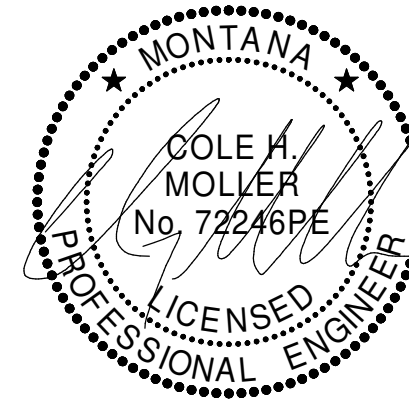


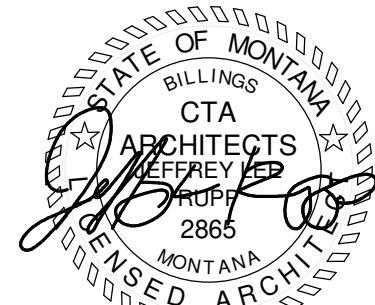
STEEL PIPE BOLLARD

7
S201

REF S101

3/4" = 1'-0"





GENERAL DEMOLITION NOTES

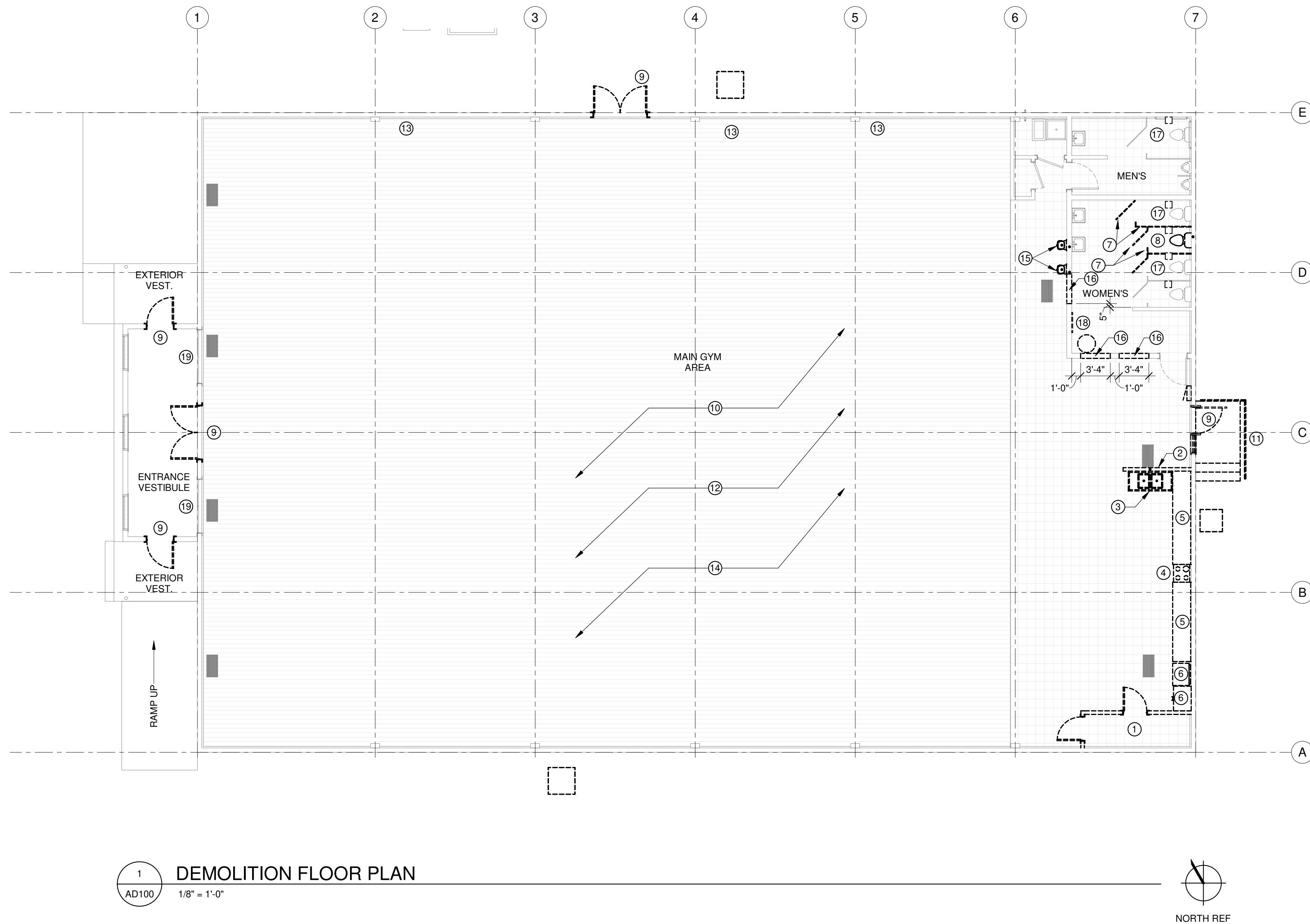
- A. REFERENCE: MECHANICAL, AND ELECTRICAL DRAWINGS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
B. PROTECT ALL EXISTING ELECTRICAL AND MECHANICAL, ANY OTHER EQUIPMENT, COVERS, WIRING, ETC., TO REMAIN. REPLACE ANY DAMGED ITEM WITH NEW TO MEATCH EXISTING.
C. VERIFY ALL EXISTING CONDITIONS AND COORDINATE ALL DEMOLITION WITH NEW CONSTRUCTION.
D. WHETHER SPECIFICALLY INDICATED OR NOT, REMOVE PORTION OF EXISTING CONSTRUCTION AS REQUIRED TO COMPLETE WORK INDICATED AND PREP EXISTING CONSTRUCTION TO REMAIN FOR NEW CONSTRUCTION.
E. DASHED LINES INDICATES LIMITS OF DEMOLITION. DEMOLITION OF ITEMS INDICATED ON PLANS REFERS TO THE ITEM AND ITS RELATED ASSEMBLIES, U.N.O.
F. SOLID LINES INDICATE ITEMS TO REMAIN.
G. EXPECT TO CAREFULLY REMOVE OR DISASSEMBLE VARIOUS ITEMS SO ADJACENT ITEMS AND FINISHES THAT ARE EXISTING TO REMAIN ARE NOT DAMAGED. PROPERLY REPAIR / REPLACE DAMAGED ITEMS AND FINISHES WITH NEW TO MATCH EXISTING.
H. COORDINATE WITH OWNER FOR ANY REMOVED OR DEMOLISHED ITEMS TO BE RETURNED TO THE OWNER.

DEMOLITION PLAN LEGEND

- (X) DEMOLITION KEYNOTE
— EXISTING CONSTRUCTION TO REMAIN
--- EXISTING CONSTRUCTION TO BE DEMOLISHED
NAME
101 ROOM NAME AND NUMBER
EXISTING VENTS / CRAWL SPACE ACCESS - F.V. FOR LOCATION - ARE TO REMAIN IN PLACE
DIMENSION TO FACE OF FRAMING
DIMENSION TO GRID LINE
DIMENSION TO CENTER LINE

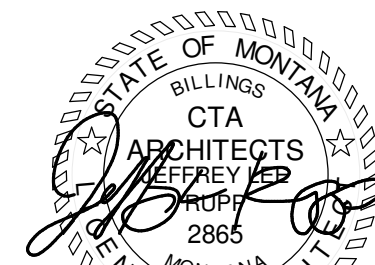
DEMOLITION KEYNOTES

1. REMOVE STORAGE UNIT INCLUDING DOORS, WALLS AND LID IN ITS ENTIRETY.
2. DEMOLISH PARTITION WALL IN ITS ENTIRETY.
3. DEMOLISH DOUBLE SINK UNIT, AND SUPPORT CABINET.
4. REMOVE STOVE UNIT, RETURN TO OWNER.
5. DEMOLISH BASE CABINETS AND COUNTERTOP.
6. REMOVE INDICATED CABINETS.
7. REMOVE INDICATED PORTIONS OF TOILET PARTITIONS AND DOORS, SET ASIDE FOR POSSIBLE RE-UTILIZATION OF PARTS.
8. REMOVE INDICATED TOILET, SEE PLUMBING.
9. DEMOLISH DOOR, FRAME AND HARDWARE, PREPARE FOR NEW.
10. EXISTING CEILING TO REMAIN. ACCOUNT FOR REMOVAL OF +/- 20 DAMAGED OR STAINED TILES.
11. NOT USED
12. SELECTIVE CEILING REMOVAL WILL BE REQUIRED FOR INSTALLTION OF WALLS STUCTURAL SUPPORTS - SEE STRUCTURAL.
13. DEMOLISH CRANKS, HOOK, & PULLY CHORD.
14. EXTERIOR WALLS AND WOOD BASE ARE TO REMAIN AS ARE - REMOVE HOOKS/NAILS AND ANY OTHER OBJECT ON WALL NOT PERTINENT TO THE NEW USE OF THE BUILDING.
15. DEMOLISH WATER FOUNTAINS SEE PLUMBING.
16. CUT AND REMOVE APPROXIMATELY INDICATED PORTIONS OF WALL FOR NEW DOORS, BUILD HEADERS AS REQUIRED.
17. REMOVE TOILET PAPER DISPENSERS.
18. REMOVE WALL MIRROR.
19. REMOVE PLYWOOD CARTOON PAINTING. VERIFY WITH OWNER FOR DISPOSAL.



1 DEMOLITION FLOOR PLAN
AD100 1/8" = 1'-0"





PLAN LEGEND

- ASSEMBLY TYPE (SEE ASSEMBLIES SHEET)
 ASSEMBLY MODIFIER, PER TYPE
- NAME
 ROOM NAME AND NUMBER
- WINDOW TYPE (SEE A600s)
- KEYNOTE
- DIRECTION OF VIEW, IF APPLICABLE
 DRAWING NUMBER
 SHEET WHERE DRAWN
- DOOR NUMBER (SEE SHEET A601)
- DIMENSION TO FACE OF FRAMING
- DIMENSION TO CENTER LINE

PLAN KEYNOTES

- EAST RAMP. PROVIDE NEW CONCRETE RAMP AND STAGING PAD, SEE A401
- NORTH RAMP. PROVIDE NEW CONCRETE RAMP, GUARDRAIL, AND PORTION OF SIDEWALK TO CONNECT TO FRONT SIDEWALK, AS INDICATED, SEE A401
- PATCH FLOOR WITH 3/4" OSB PLYWOOD AND VINYL TILE TO MATCH EXISTING
- PATCH EXISTING WINDOW OPENING, ABOVE, WITH WALL TYPE 'E', AFTER MECHANICAL EQUIPMENT HAS BEEN REMOVED. SEE ELEVATION 2/A401
- PATCH FOUNDATION CRAWL SPACE OPENING AS REQUIRED WITH NEW INSULATED METAL PANEL. EXISTING OPENING IS LESS THAN 1'X1'
- PIPE BOLLARD, SEE STRUCTURAL
- AC UNIT, SEE MECHANICAL
- 3'-10" X 3'-10" CONCRETE PAD, SEE STRUCTURAL
- P-LAM COUNTERTOPS, PROVIDE CORD GROMMETS, ONE PER WORKSTATION, COORDINATE WITH OWNER
- INSTALL NEW TOILET PARTITION PER INDICATED CONFIGURATION, MATCH MATERIAL, FINISH AND COLOR
- INSTALL NEW TOILET PAPER DISPENSERS
- PATCH AND REPAIR WALL AS REQUIRED AFTER REMOVAL OF DRINKING FOUNTAINS
- CUT ABANDONED DUCT THRU WALL AND FILL WITH FOAM INSULATION. REPAIR BOTH SIDES TO MATCH EXISTING FINISHES, APPROXIMATE LOCATION SHOWN
- REPAIR ACT AND INSULATION AT CEILING LEVEL AFTER MECHANICAL VENT THRU ROOF REMOVAL. ROOF PENETRATION TO BE REPAIRED. REPAIR ROOF WITH PLYWOOD INFILL, ROOF FELT PAPER AND ASPHALT/SHINGLES TO MATCH EXISTING ROOFING PER ROOFING MANUFACTURER'S RECOMMENDED METHOD.

WALL TYPES

- 5/8" TYPE 'X' GYPSUM WALL BOARD FLUSH WITH EXISTING INTERIOR FINISH
- VAPOR BARRIER
- 3 5/8" METAL STUDS @16" O.C. - STAGGER TO MATCH EXISTING WALL THICKNESS
- BATT INSULATION
- 1/2" PLYWOOD
- AIR-MOISTURE BARRIER, TAPE TO EXISTING
- 1" 'ALCLAD' INSULATED PANEL, OR APPROVED EQUAL.

E EXTERIOR (INFILL) WALL

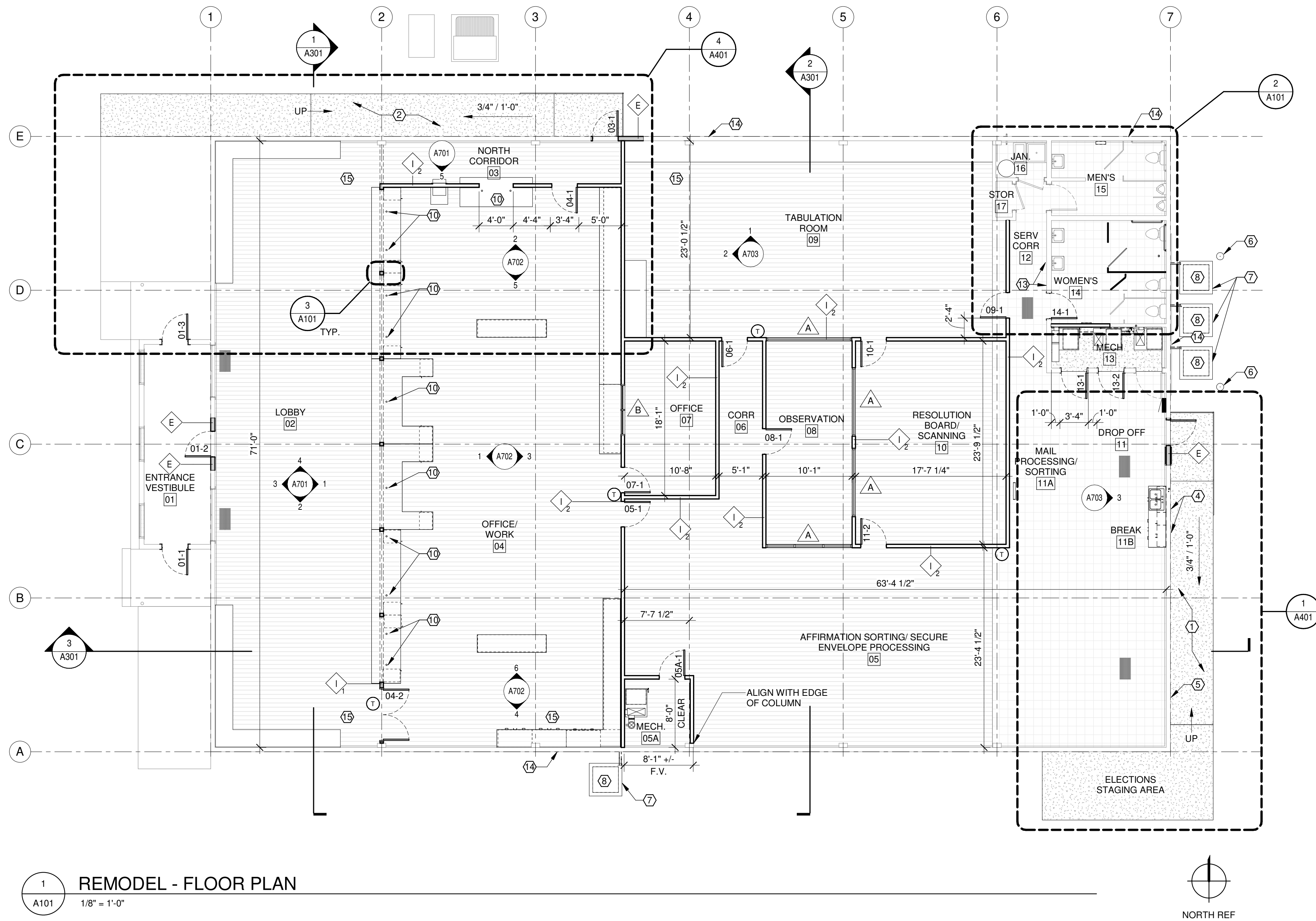
- 5/8" TYPE 'X' GYPSUM WALL BOARD EACH SIDE
- 3 5/8" METAL STUDS @16" O.C.
- SOUND BATTS WHERE INDICATED

I INTERIOR WALL

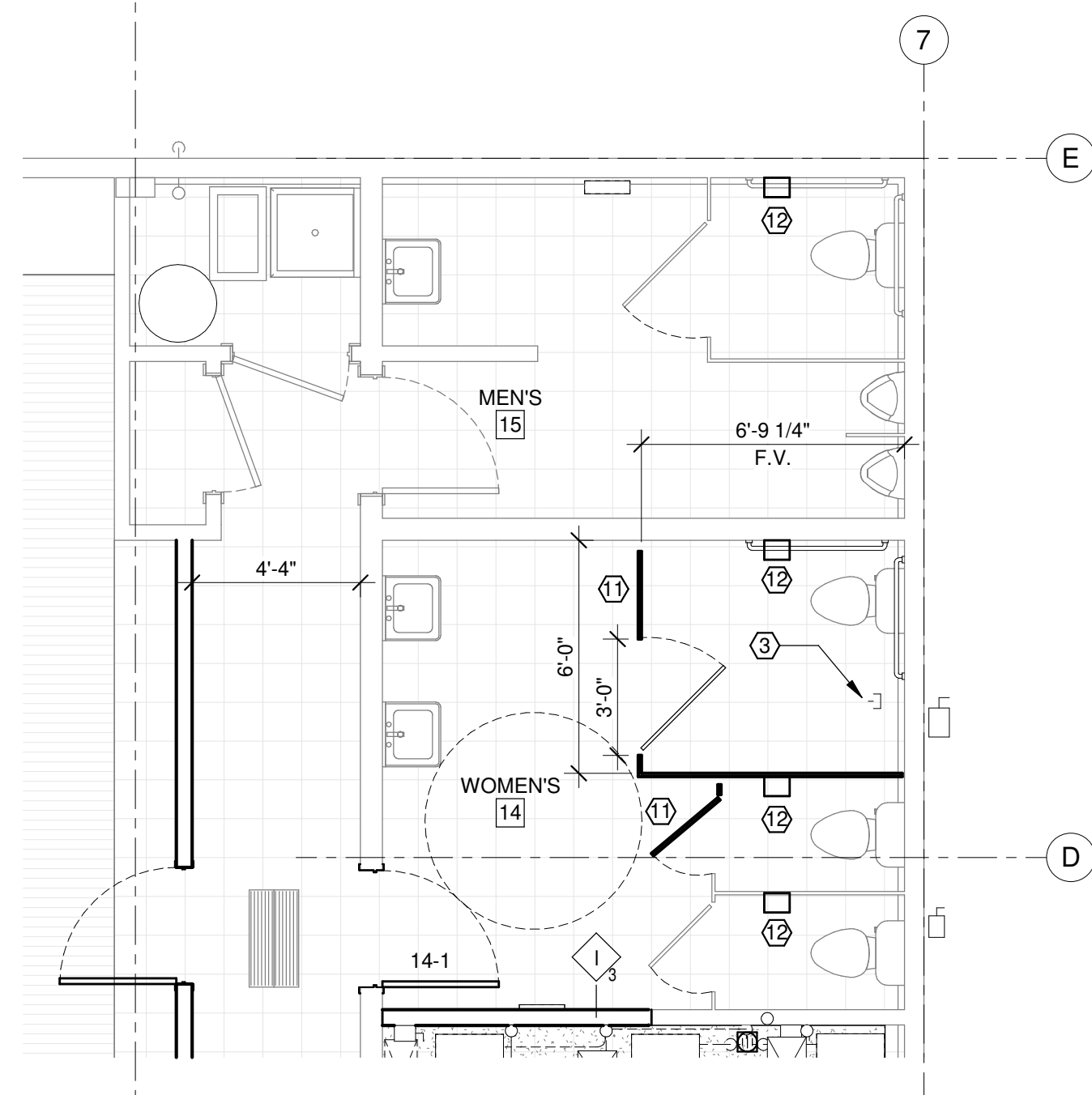
WALL TYPE MODIFIERS

- INDICATED WALL IS TO GO UP TO 14'-10" TO BOTTOM OF EXISTING ACT CEILING. REFER TO STRUCTURAL FOR SHORING TO STRUCTURE.
- INDICATED WALL IS TO GO UP TO 10'-0" - SEE STRUCTURAL FOR SHORING TO STRUCTURE ABOVE.
- CONTINUE EXISTING WALL AT WOMEN'S RESTROOM, SEE A501, FINISH PLAN.

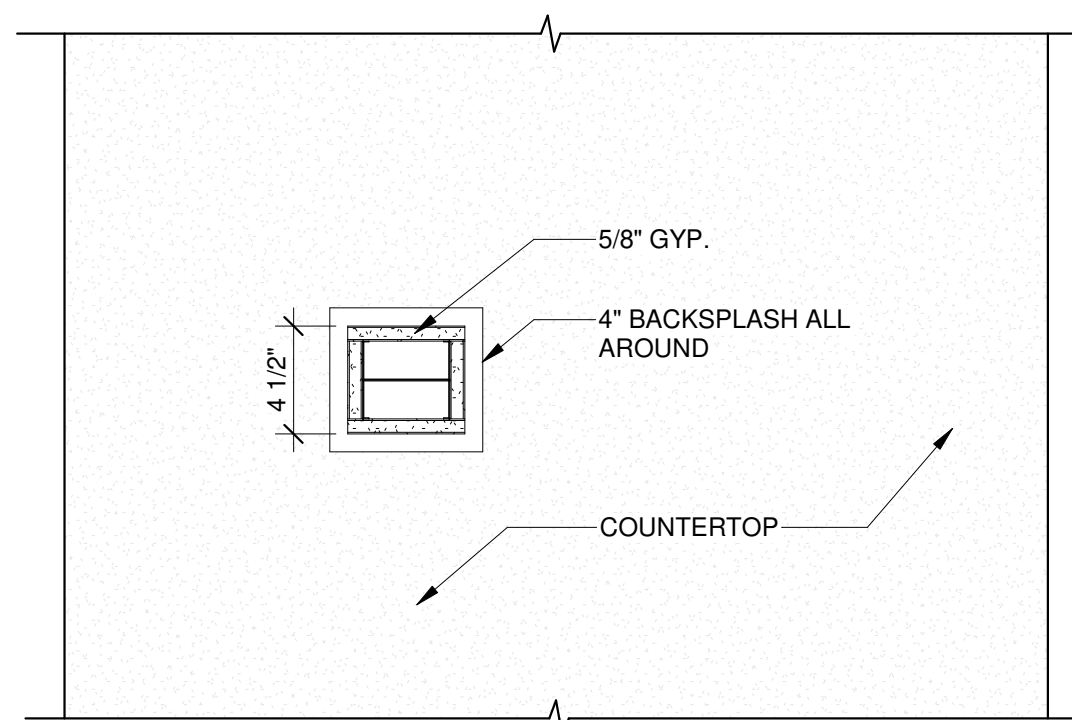
ROOM LEGEND	
NUMBER	Name
01	ENTRANCE VESTIBULE
02	LOBBY
03	NORTH CORRIDOR
04	OFFICE/ WORK
05	AFFIRMATION SORTING/ SECURE ENVELOPE PROCESSING
05A	MECH.
06	CORR
07	OFFICE
08	OBSERVATION
09	TABULATION ROOM
10	RESOLUTION BOARD/ SCANNING
11	DROP OFF
11A	MAIL PROCESSING/ SORTING
11B	BREAK
12	SERV CORR
13	MECH
14	WOMEN'S
15	MEN'S
16	JAN.
17	STOR



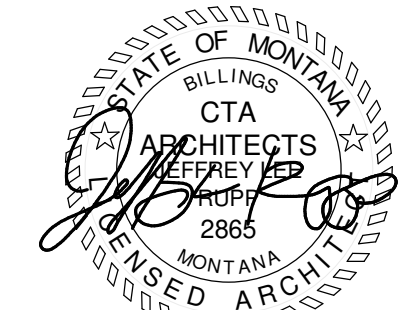
1 REMODEL - FLOOR PLAN
1/8" = 1'-0"



2 RESTROOMS PLAN
1/4" = 1'-0"



3 STUD PACK DETAIL
1 1/2" = 1'-0"



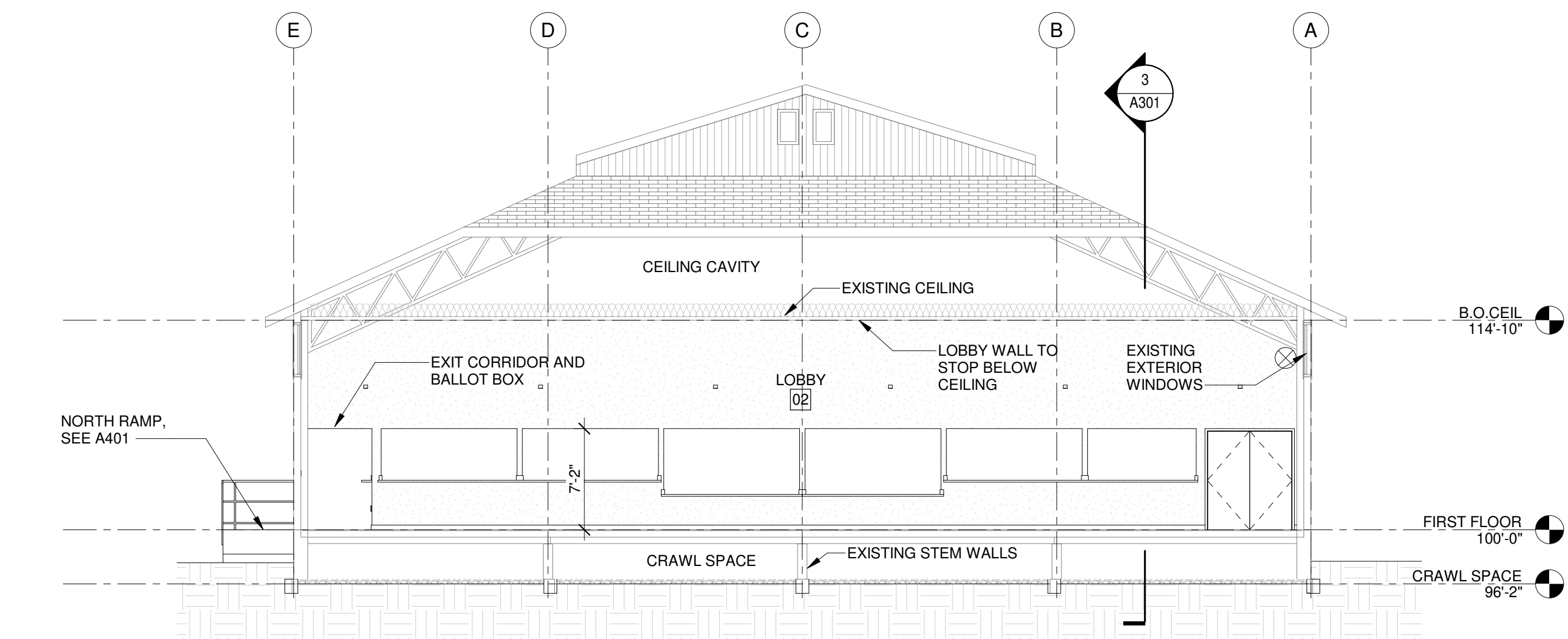
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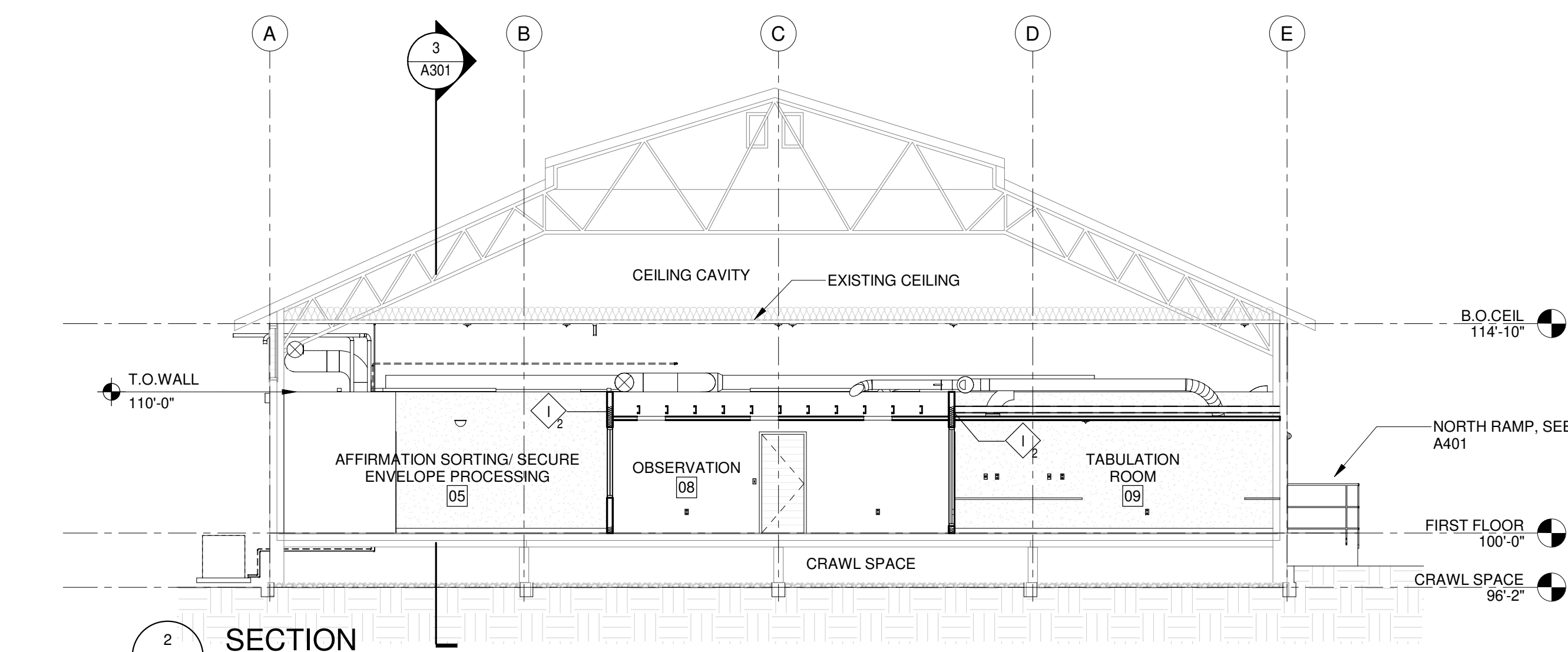
07.25.2025
PROJ# | YC ELECTIONS
DESIGNED BY | LAST NAME
DRAWN BY | LAST NAME
REVIEWED BY | LAST NAME
REVISIONS

BUILDING SECTIONS

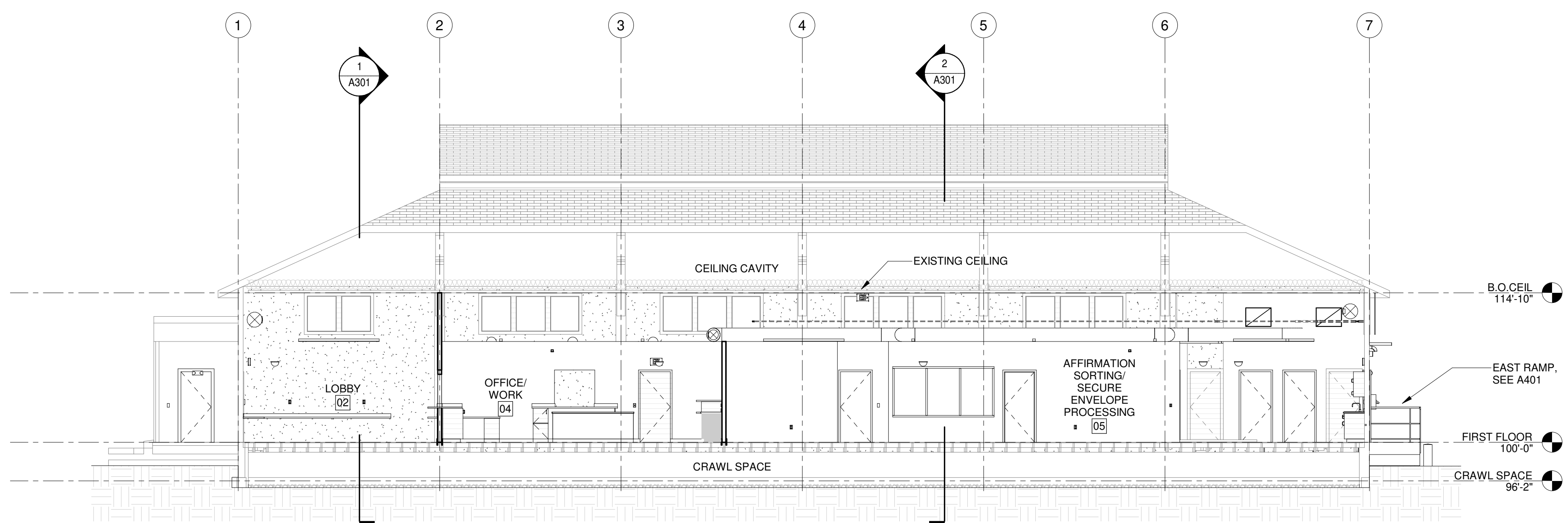
A301



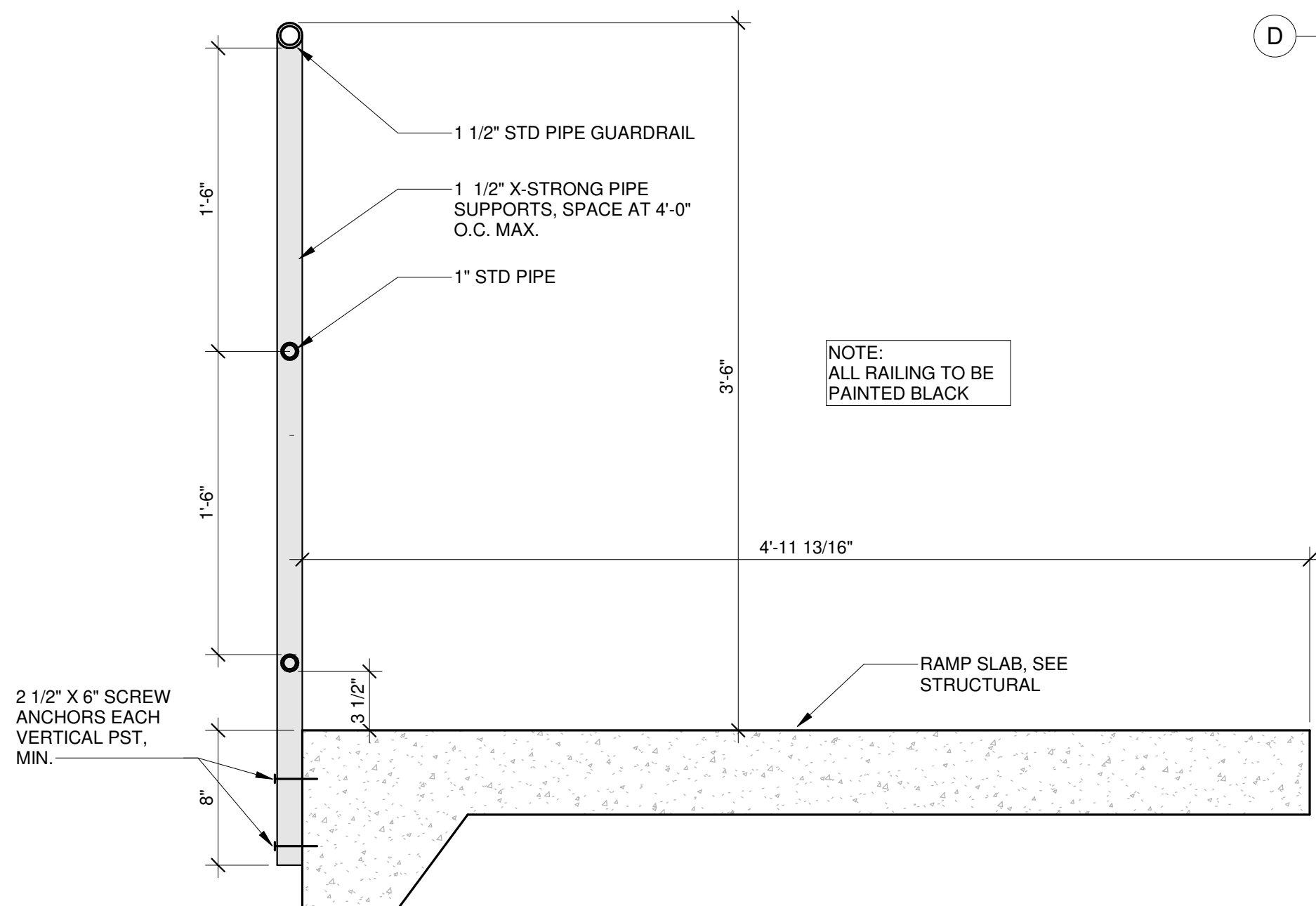
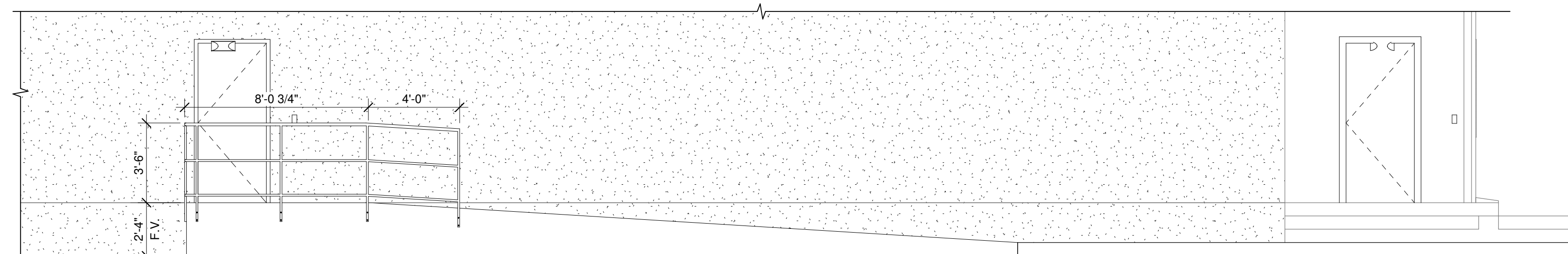
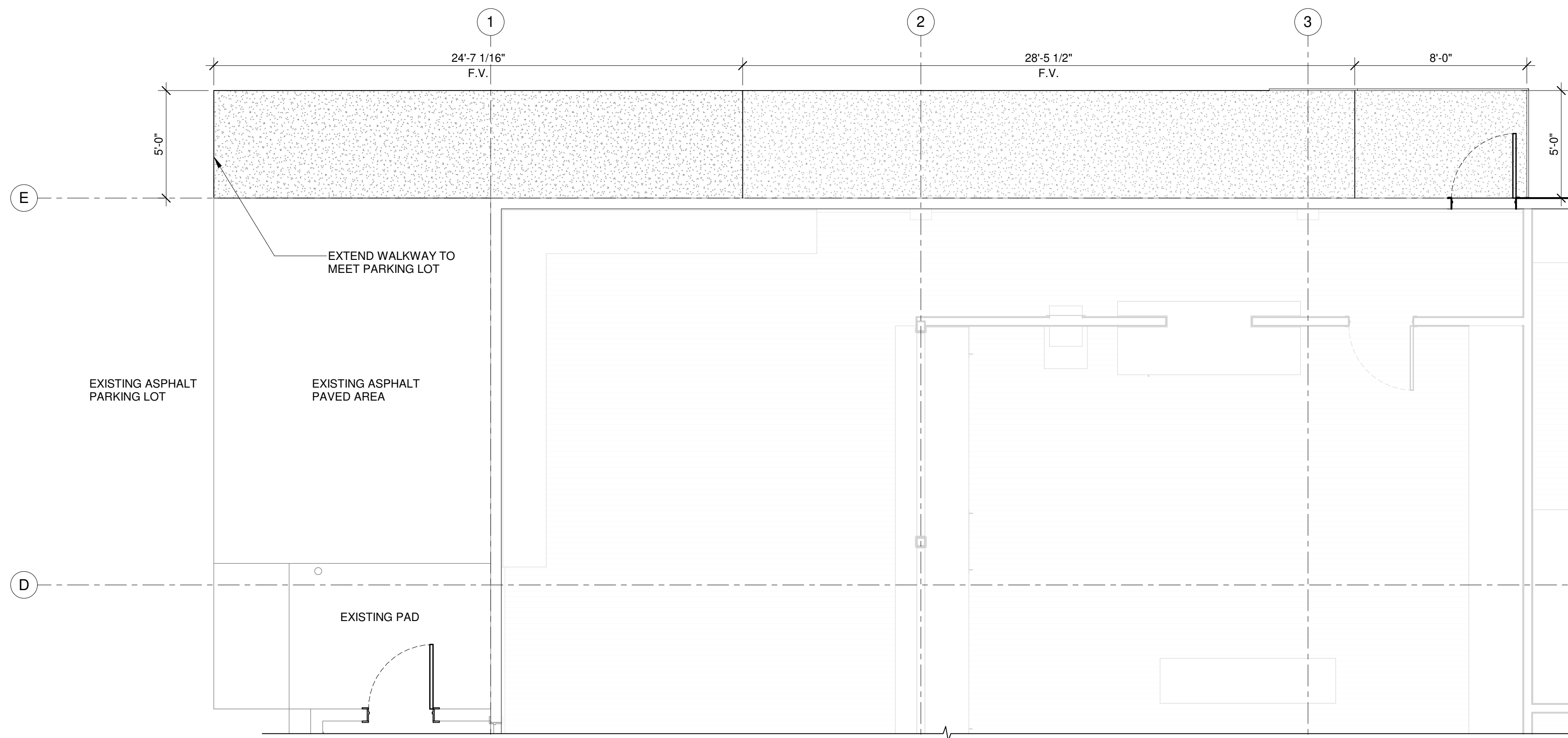
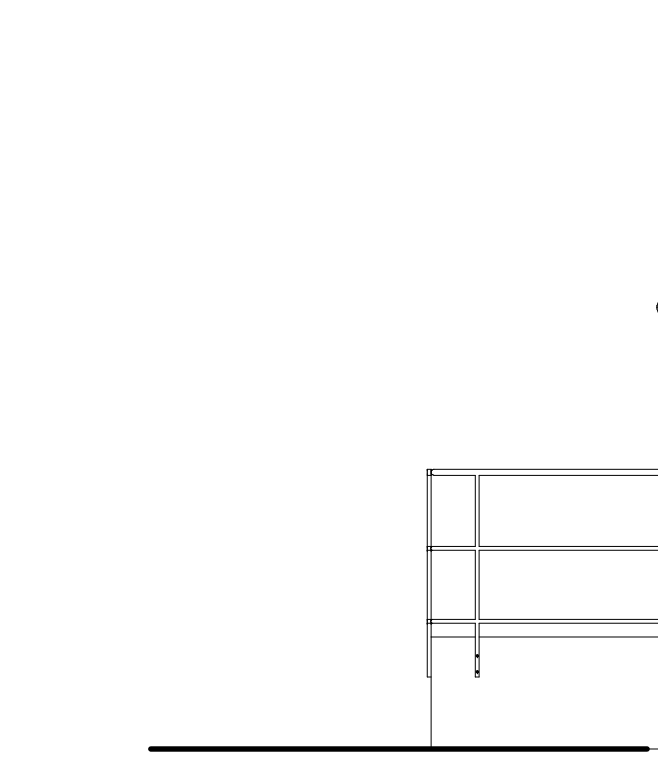
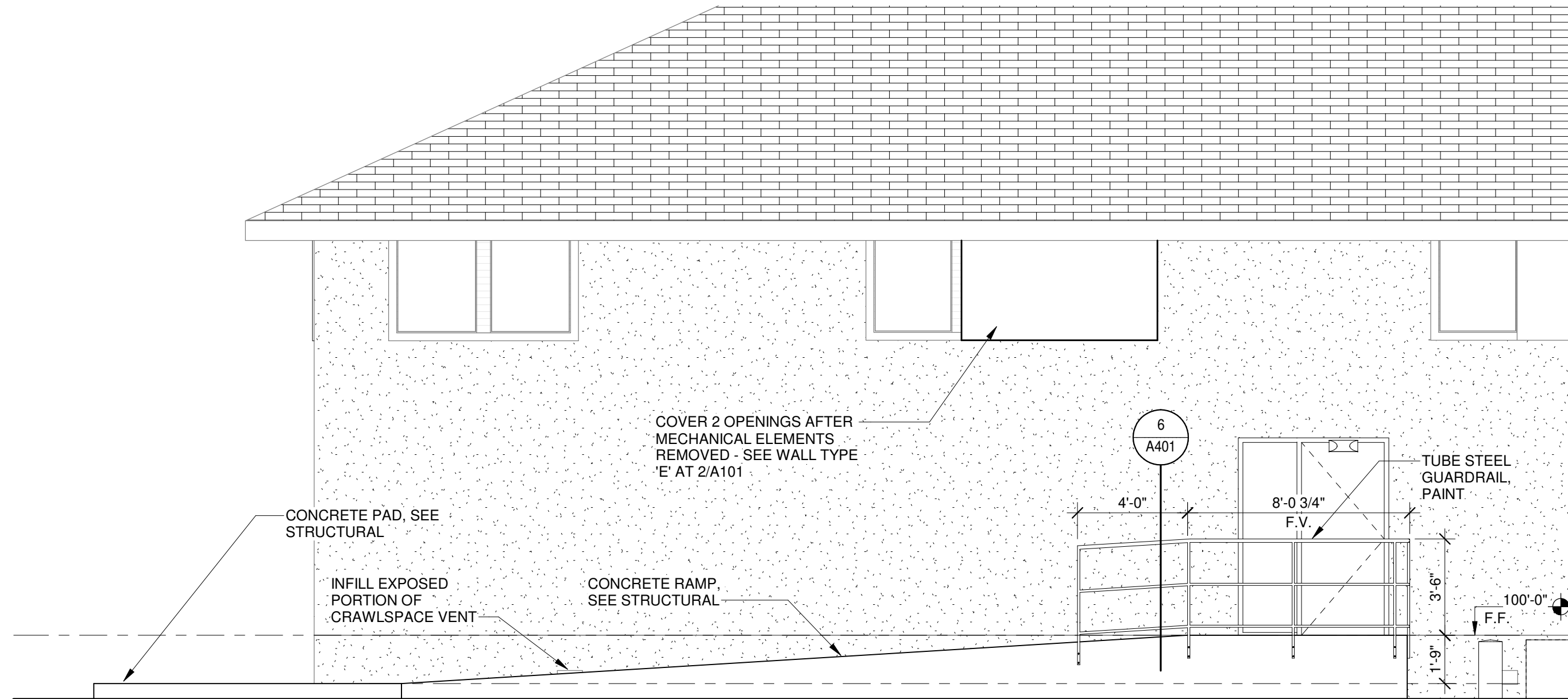
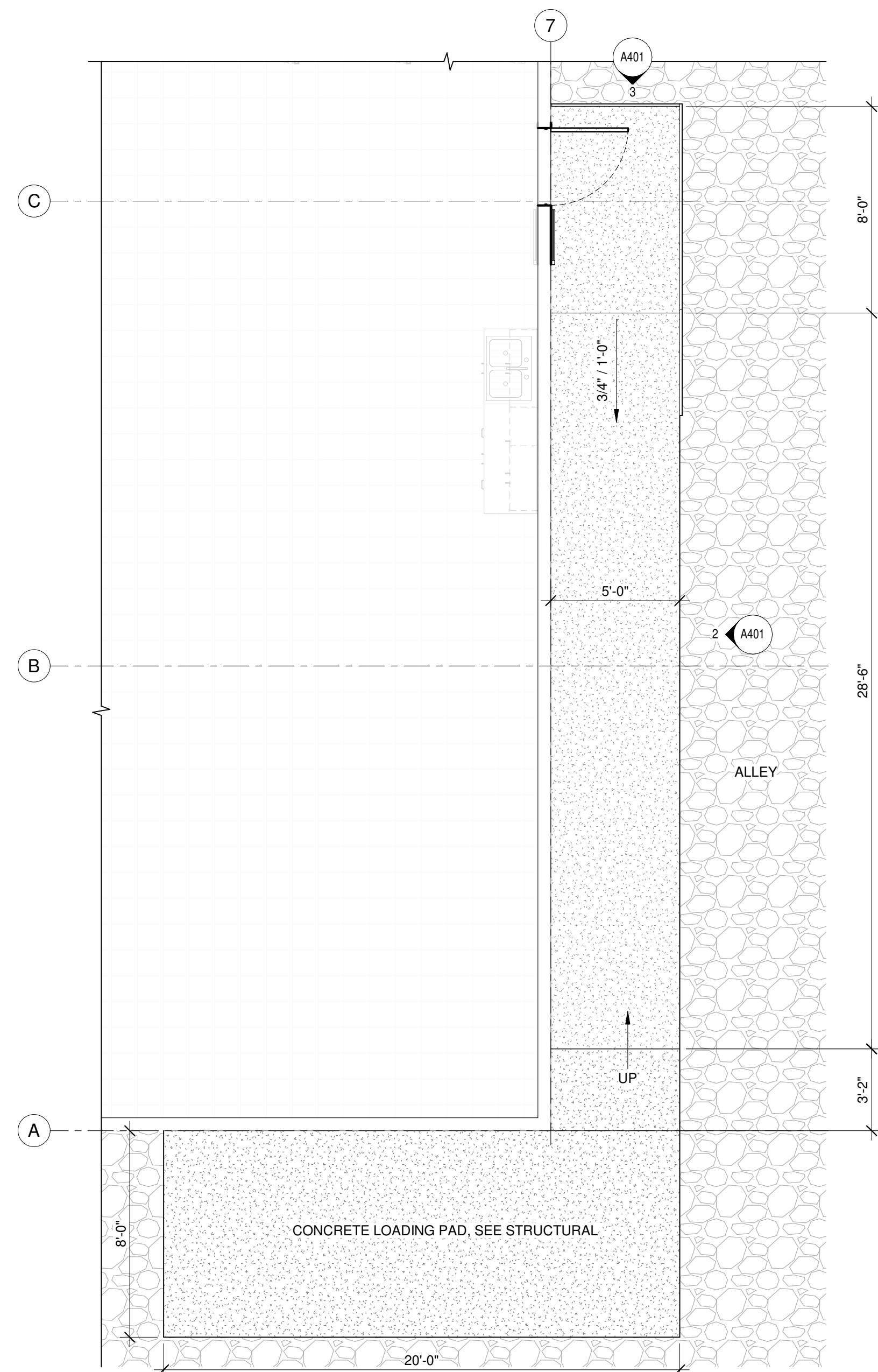
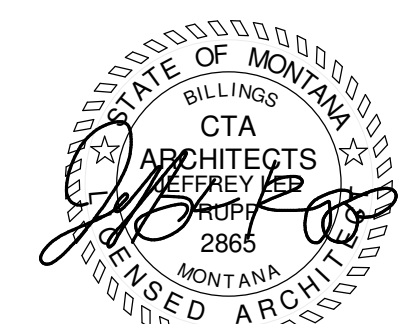
1 SECTION AT LOBBY
A301 1/8" = 1'-0"

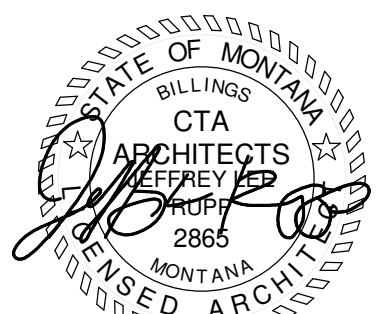


2 SECTION
A301 1/8" = 1'-0"



3 EAST WEST SECTION
A301 1/8" = 1'-0"





FINISH PLAN LEGEND

- NAME
[101] ROOM NAME AND NUMBER
- (A8##) # INTERIOR ELEVATION CALLOUT AND DIRECTION OF ELEVATION VIEW
- XX### FINISH TAG
- XX### EXTENT OF ACCENT PAINT OR WALL FINISHES

FINISH TAGS DISPLAYED IN GROUPING ON FINISH PLAN REPRESENT MAJORITY ROOM FINISH SELECTIONS. ORDER OF GROUPING DEFINED IN EXAMPLE BELOW:

- XX### — MAJORITY WALL FINISH
XX### — MAJORITY BASE FINISH
XX### — MAJORITY FLOOR FINISH
- INSTALL DIRECTION OF DIRECTIONAL FLOOR FINISH

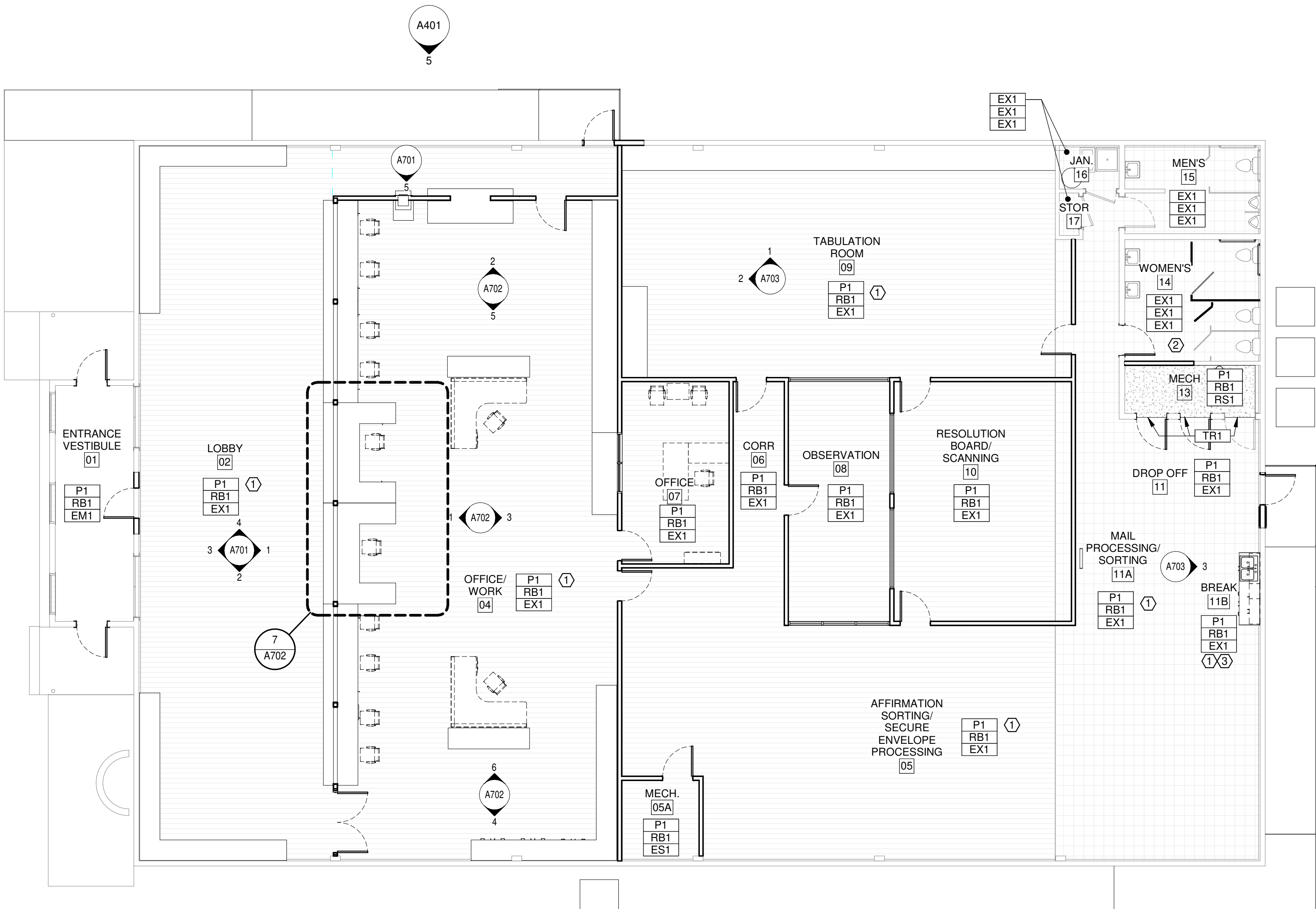
- FLOOR FINISH 'EX1' - BATHROOMS
- FLOOR FINISH 'EX1' - MAIN FLOORING
- FLOOR FINISH 'RS1' - MECHANICAL

GENERAL FINISH NOTES

- A. INSTALL ALL MATERIALS USING MANUFACTURERS RECOMMENDED ADHESIVES, TOOLS, METHODS, ETC.
- B. PREP FLOOR AS REQUIRED FOR NEW FLOOR FINISHES PRIOR TO INSTALLATION.
- C. SEE REFLECTED CEILING PLAN FOR CEILING FINISHES.
- D. ALL HOLLOW METAL DOORS AND WINDOW TRIM TO BE SHERWIN WILLIAMS, PRO INDUSTRIAL, SEMI-GLOSS ACRYLIC COATING, B66 SERIES. COLOR TO MATCH WALL COLOR UNLESS OTHERWISE NOTED ON ELEVATIONS.
- E. ALL PAINT TO HAVE A MINIMUM OF ONE COAT PRIMER, TWO FINISH COATS.
- F. ALL FLOORING TRANSITIONS TO OCCUR DIRECTLY BENEATH DOORWAYS UNLESS OTHERWISE NOTED.
- G. PAINT MECHANICAL GRILLS TO MATCH ADJACENT WALL PAINT.
- H. THE GRAIN OF THE PLASTIC LAMINATE IN ALL INSTALLATIONS IS TO RUN VERTICAL.
- I. FINISH PATTERNS IN THE LEGEND REPRESENT THE AREA OF FLOORING AND ARE NOT MEANT TO SHOW ACTUAL FLOORING PATTERN OR DIRECTION.
- J. ALL FINISHES ARE TO BE SUBMITTED FOR REVIEW PRIOR TO ORDERING.
- K. PROVIDE A&M HARDWARE STANDARD COUNTERTOP BRACKETS AS REQUIRED AT ALL COUNTERTOPS.

KEYNOTES

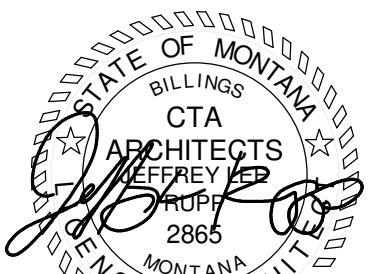
- 1 ALL NEW WALLS TO RECEIVE RUBBER BASE 'RB1'. ALL EXISTING WALLS AND BASE TO REMAIN.
- 2 PATCH IN FLOORING AND WALL FINISHES TO MATCH EXISTING. COORDINATE WITH INTERIOR DESIGNER.
- 3 PATCH IN FLOORING WHERE NEEDED. NEW FLOORING TO MATCH EXISTING FLOOR - COORDINATE WITH INTERIOR DESIGNER.



1 REMODEL FINISH FLOOR PLAN
A501 1/8" = 1'-0"

MATERIALS LIST

ITEM NO	PRODUCT TYPE	MANUFACTURER	DESCRIPTION	COLOR	SIZE	NOTES
BASE						
RB1	RESILENT BASE	JOHNSONITE	STANDARD 4"BASE WITH TOE KICK	460 COTTON	4"H X 0.25"	
CEILING						
AC1	ACOUSTIC CEILING	ARMSTRONG	ULTIMA	WHITE	24" X 48"	INSTALL WITH ARMSTRONG PRELUDE XL 15/16" EXPOSED TEE GRID SYSTEM.
FLOOR						
EM1	ENTRY CARPET TILE	MILLIKEN	OBEX TILE, CUTX/FIBER	TAUPE FRC174-133	50CM X 50CM X 0.5"THICK	INSTALL IN A MONOLITHIC PATTERN.
ES1	STATIC DISSIPATIVE TILE	STATICSMART	STATICSMART	GREYLOCK C6062	24" X 24" X 1/8"THICK	INSTALL WITH GROUNDING STRIPS.
RS1	RESILIENT SHEET	PATCRAFT	SENSE SHEET, WITHIN 1624V	EASE 00100	20 MIL, 0.02 INCHES THICK, 78.72"W X 68.58"L - ROLL SIZE	
GENERAL						
EX1	EXISTING TO REMAIN					
MILLWORK						
PL1	PLASTIC LAMINATE	FORMICA	MATTE FINISH	PALOMA POLAR 6698		HORIZONTAL WORKSURFACES
PL2	PLASTIC LAMINATE	WILSONART	FINE VELVET FINISH	HANDSPUN CHESTNUT 5036-38		CASEWORK LAMINATE
TRANSITIONS						
TR1	TRANSITION PROFILE	JOHNSONITE	PROFILE TO ACCOMODATE FLOOR MATERIAL TO EXISTING WOOD FLOORS	55 SILVER GRAY		PROVIDE AT RESILIENT SHEET 'RS1' TO EXISTING WOOD FLOORS.
WALL						
P1	PAINT	SHERWIN WILLIAMS		SW7035 AESTHETIC WHITE		



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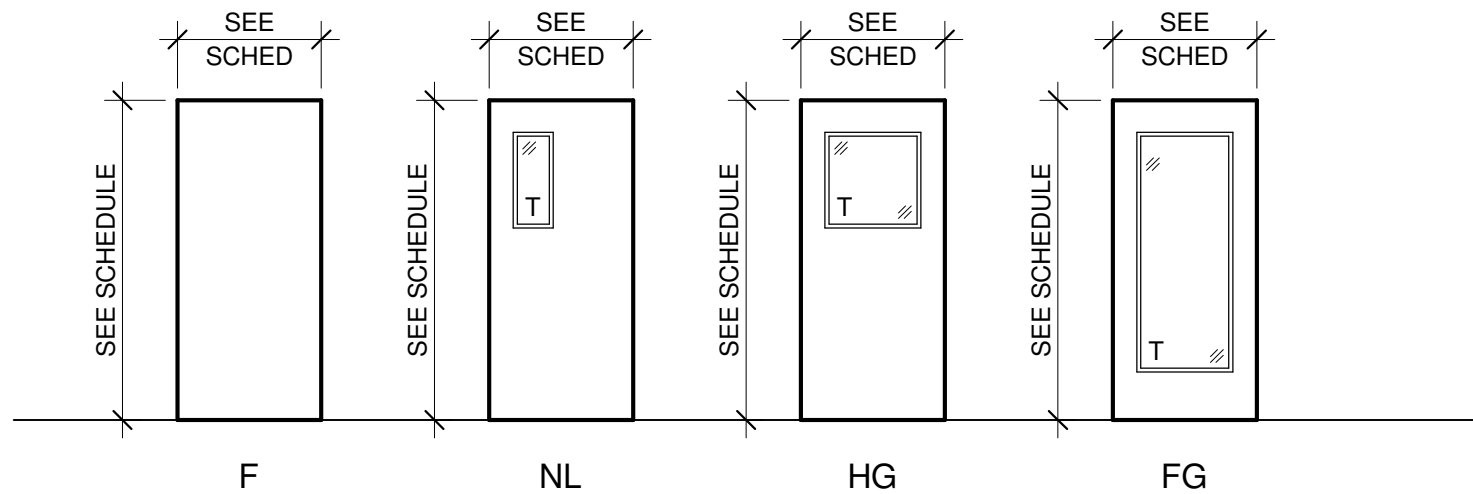
07.25.2025
PROJ# | YC ELECTIONS
DESIGNED BY | LAST NAME
DRAWN BY | LAST NAME
REVIEWED BY | LAST NAME
REVISIONS

DOOR AND WINDOW
SCHEDULES AND
DETAILS

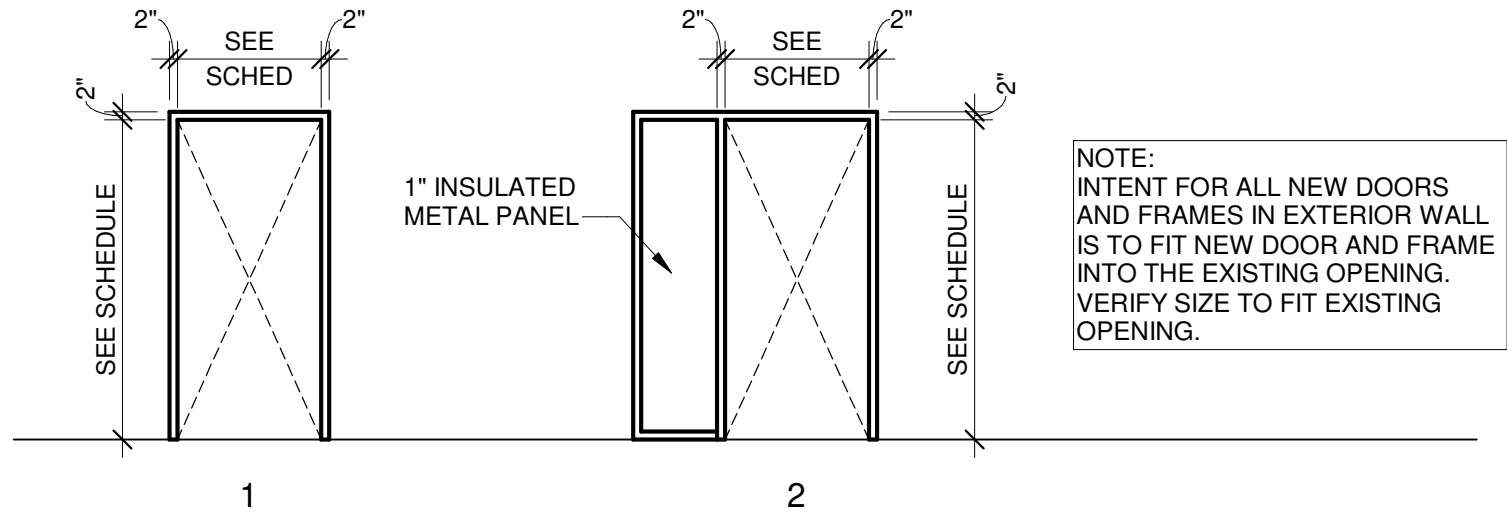
A601

DOOR, FRAME AND HARDWARE SCHEDULE

DOOR NUMBER	ROOM NUMBER	ROOM NAME	DOOR					FRAME			HARDWARE										
			SIZE			MTL	TYPE	GLAZE	NOTES	MTL	TYPE	NOTES	THRES	HINGE	LOCK	PUSH PULL	CLOSE	STOP HOLD	MISC	WTH R	NOTES
W	H	T																			
01-1	01	ENTRANCE VESTIBULE	3'-0"	7'-0"	1 3/4"	HM	NL	1" INS W/ WIRE		HM	1	1	1	1	2		1			1	1
01-2	02	LOBBY	3'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1	1		1	3				1		
01-3	01	ENTRANCE VESTIBULE	3'-0"	7'-0"	1 3/4"	HM	NL	1" INS W/ WIRE		HM	1	1	1	1	2		1			1	1
03-1	03	NORTH CORRIDOR	3'-0"	7'-0"	1 3/4"	HM				HM	1		1	1	3		1			1	1
04-1	04	OFFICE/ WORK	3'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1			1	2		1	1	1		1
04-2	04	OFFICE/ WORK	6'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1			1	2		1	1			1
05-1	04	OFFICE/ WORK	3'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1			1	1				1		
05A-1	05	AFFIRMATION SORTING/ SECURE ENVELOPE PROCESSING	3'-0"	7'-0"	1 3/4"	HM	F				1			1	2				1		
06-1	06	CORR	3'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1			1	2		1	2	1		1
07-1	07	OFFICE	3'-0"	7'-0"	1 3/4"	HM	F			HM	1			1	2			2	1		
08-1	08	OBSERVATION	3'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1			1	1				1		
09-1	09	TABULATION ROOM	3'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1			1	2		1		1		1
10-1	10	RESOLUTION BOARD/ SCANNING	3'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1			1	2		1		1	1	1
11-1	11	DROP OFF	3'-0"	7'-0"	1 3/4"	HM				HM	2	2	1	1	2		1	2		1	1
11-2	05	AFFIRMATION SORTING/ SECURE ENVELOPE PROCESSING	3'-0"	7'-0"	1 3/4"	HM	HG	1/4" T		HM	1			1	1				1		
13-1	11	DROP OFF	3'-0"	7'-0"	1 3/4"	HM	F			HM	1			1	2				1		
13-2	11	DROP OFF	3'-0"	7'-0"	1 3/4"	HM	F			HM	1			1	2				1		
14-1	14	WOMEN'S	3'-0"	7'-0"	1 3/4"	HM	F			HM	1			1			1	2	1		1



DOOR TYPES



FRAME TYPES

DOOR HARDWARE

ABBREVIATIONS

AL ALUMINUM
HM HOLLOW METAL
IN 1" INSULATED TEMPERED GLAZING
T 1/4" TEMPERED GLAZING
WD WOOD
CLAD ALUMINUM CLAD WOOD

DOOR NOTES

1. VERIFY EXISTING DOOR HEIGHT AND WIDTH. DESIGN INTENT IS TO STAY WITHIN EXISTING OPENING FOR NEW DOOR

FRAME NOTES

1. EXISTING FRAME DESIGN INTENT IS RE-USE EXISTING FRAME FOR NEW DOOR
2. DESIGN INTENT IS TO REMOVE EXISTING FRAME AND INFILL EXISTING OPENING WITH NEW FRAME.

THRESHOLDS

1. EXTERIOR THRESHOLD

HINGES

1. BEST, FULL MORTISE, FB179NRP 4 1/2 X 4 1/2, US26D

LOCKS

1. CORBIN RUSSWIN, PASSAGE LEVER SET
2. CORBIN RUSSWIN, STOREROOM LEVEL LOCKSET CL3357 NZD, 626
3. LATCH EXIT DEVICE PUSH BAR

PUSH/PULLS

1. PUSH / PULL

CLOSERS

1. NORTON, SURFACE CLOSER, 410 TPN, 689

STOPS/HOLDS

1. IVES, FLOOR STOP
2. IVES, WALL STOP

MISCELLANEOUS

1. ROCKWOOD, SILENCER, 608-RKW, 689

WEATHERSTRIPPING

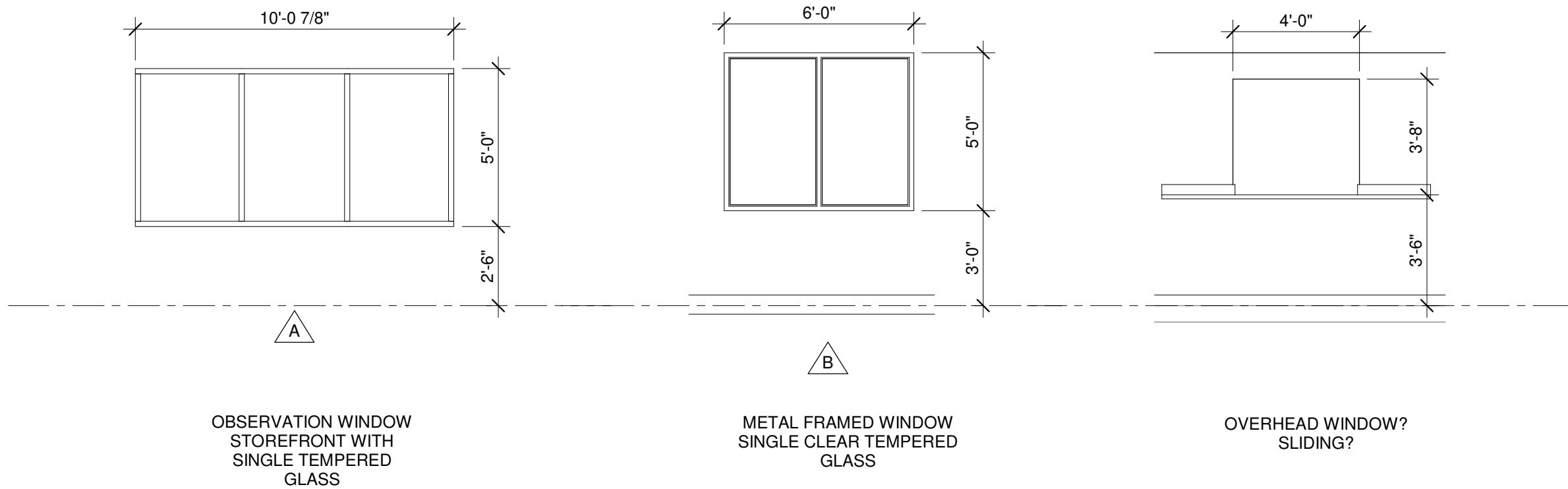
1. IVES, WEATHERSTRIPPING, HEAD AND JAMBS

HARDWARE NOTES

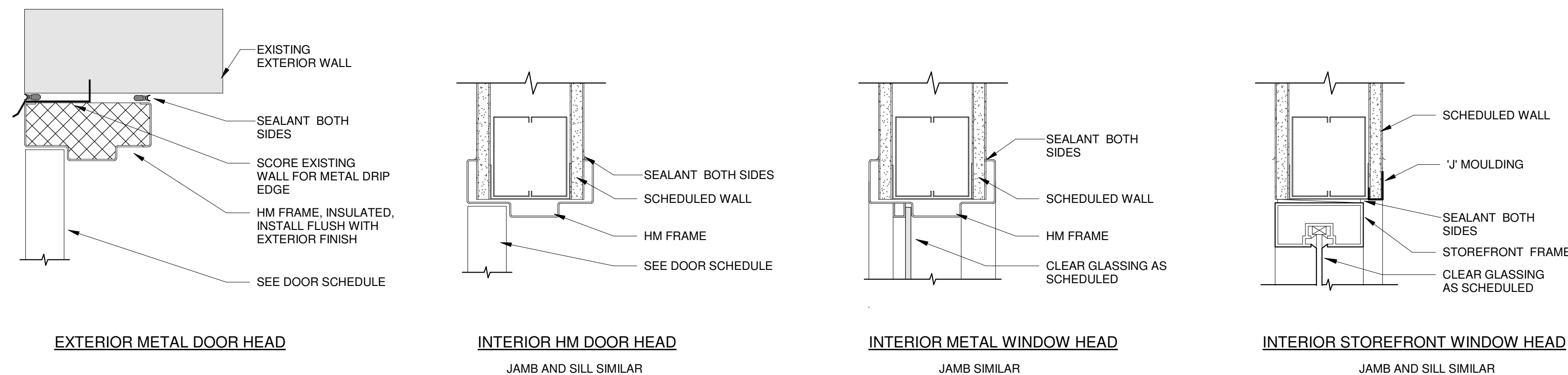
1. COORDINATE CARD READERS AND ELECTRICAL ROUGH IN REQUIREMENTS. SEE ELECTRICAL AND TECNOLOGY SHEETS.

GENERAL NOTES

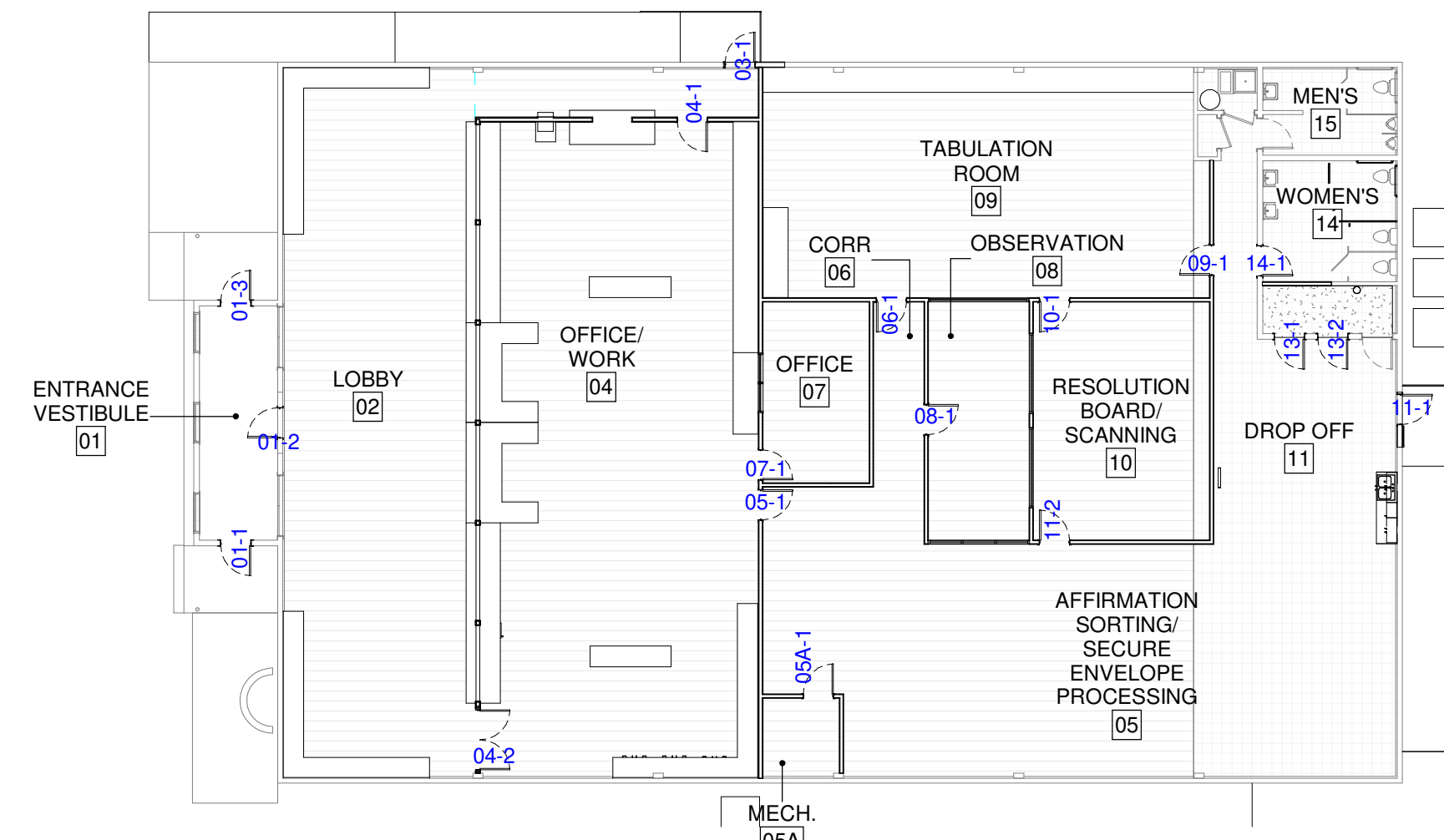
1. VERIFY CYLINDER/KEYING TO MATCH METRAPARK OR/AND Y.C. KEYING REQUIREMENTS
2. DOOR HARDWARE TO BE LISTED MAKE AND MANUFACTURER OR APPROVED EQUAL
3. SUBMITTALS REQUIRED ON ALL DOORS, FRAMES AND DOOR HARDWARE



WINDOW TYPES



5
A601 DOOR AND WINDOW DETAILS
3" = 1'-0"



1
A601 DOOR SCHEDULE KEY PLAN
1/16" = 1'-0"

CASEWORK LEGEND

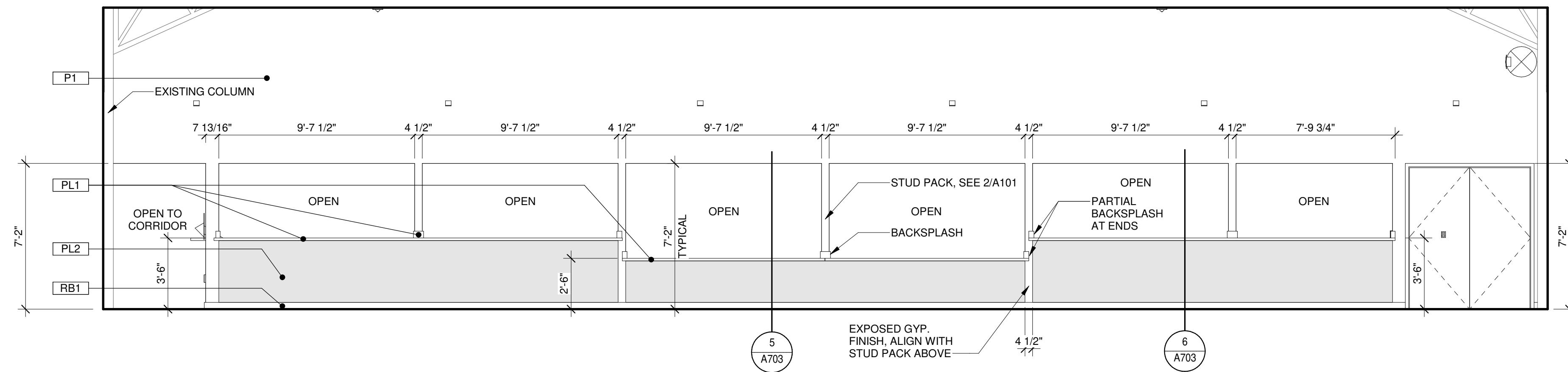
- LOCK → L # → MODIFICATION NOTE
CABINET NUMBER***
HEIGHT** → H W D → DEPTH*
WIDTH
- * INDICATES DEPTH OF BASE CABINET
- COUNTERTOPS OVERHANG 1 1/2"
- ** INDICATES APPROXIMATE HEIGHT OF CABINET, SEE ELEVATIONS
FOR OVERALL HEIGHT OF CABINET AND COUNTERTOP.
- *** "M" INDICATES A DESIGN MODIFICATION TO THE STANDARD
CASEWORK DESIGNATED

CASEWORK MODIFICATIONS

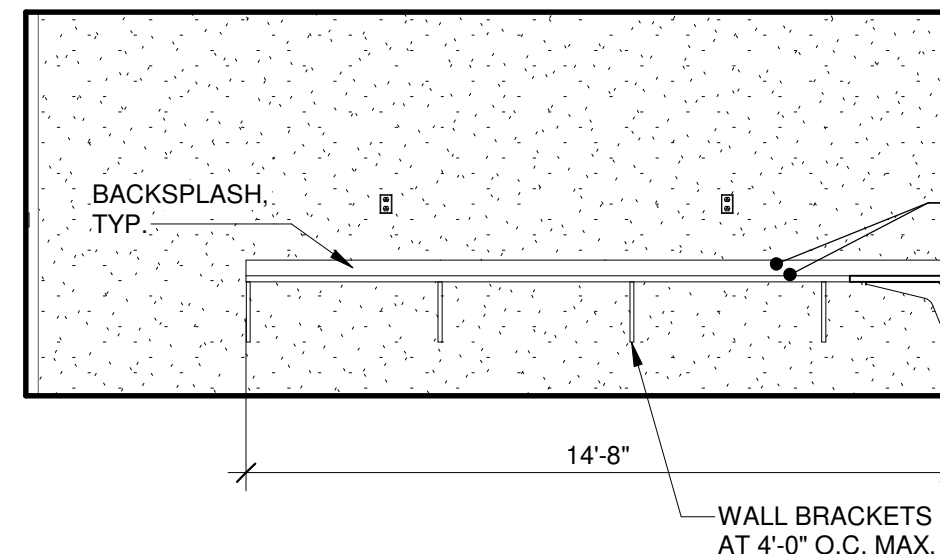
1. CASEWORK TO HAVE 99 DIVIDERS PER ROW WITH A TOTAL OF 100 SLOTS
ON EACH ROW.

KEYNOTES

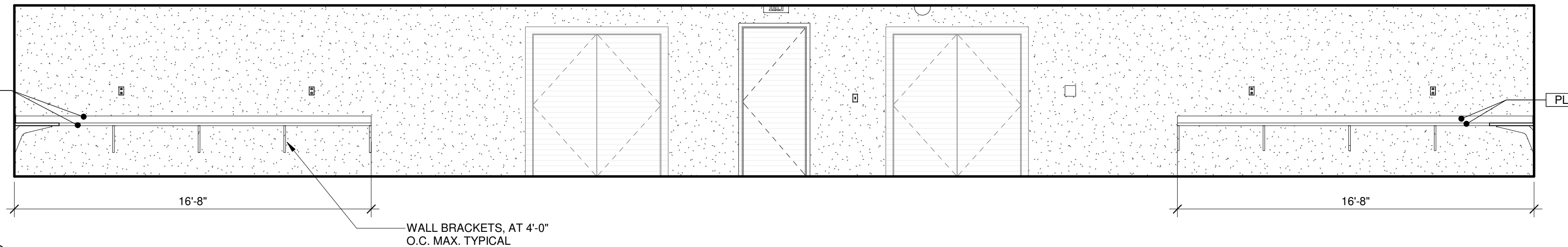
1. BALLOT DROP BOX - BASIS OF DESIGN "LARGE THRU-WALL BALLOT
DROP (810) BY AMERICAN SECURITY CABINETS"



1 LOBBY 2 - EAST
A701 1/4" = 1'-0"

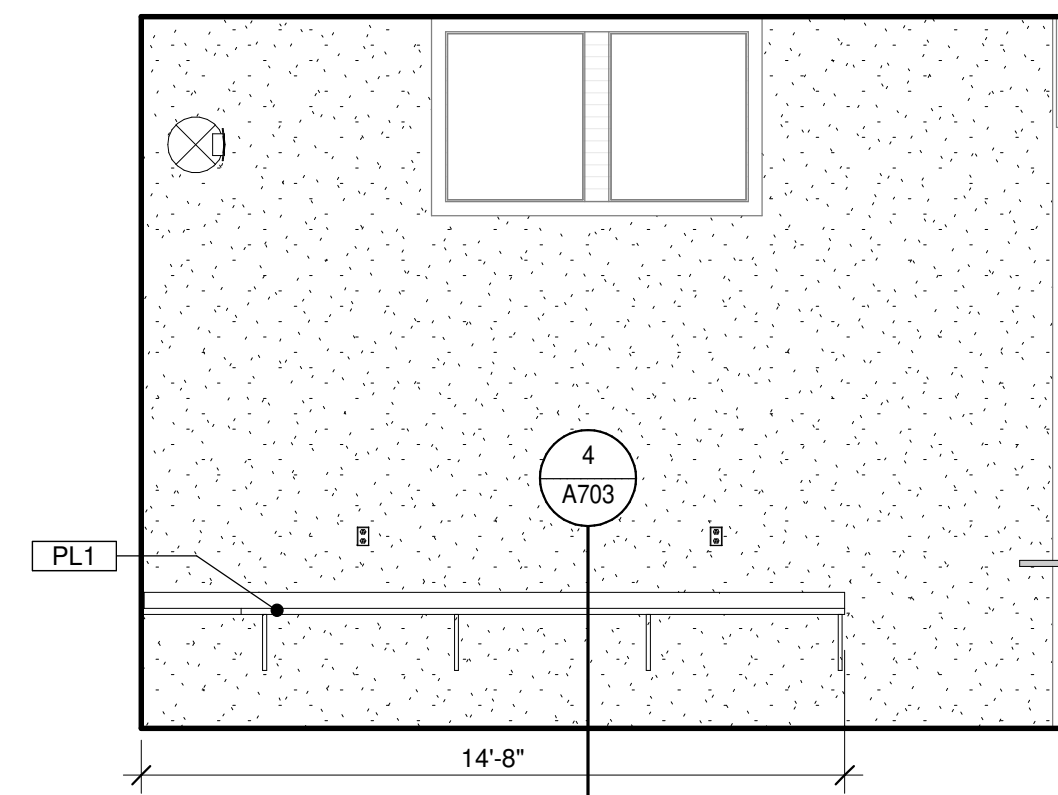


2 LOBBY 2 - SOUTH
A701 1/4" = 1'-0"

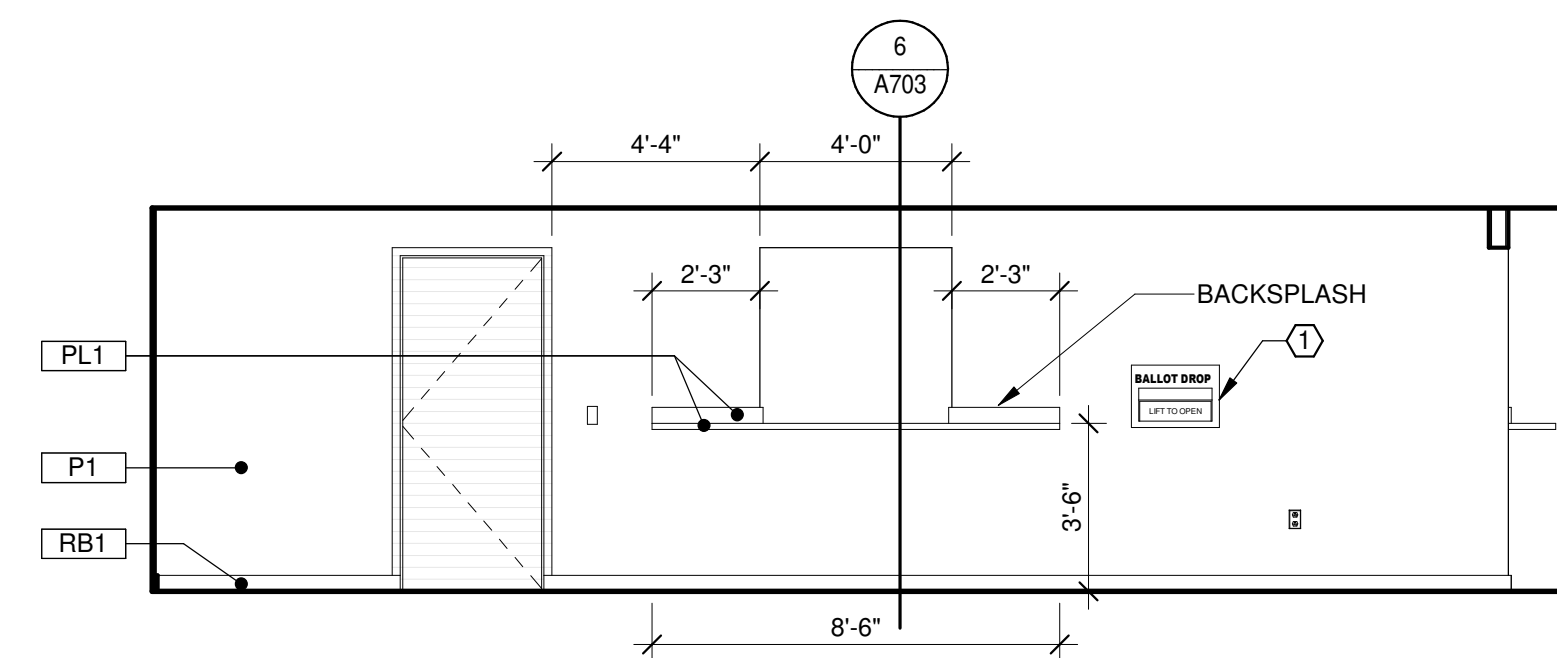


3 LOBBY 2 - WEST
A701 1/4" = 1'-0"

NOTES:
1. EXTERIOR WALLS, INCLUDING BASE ARE TO
REMAIN AS ARE.
2. VERIFY WALL BRACKETS FOR WALL
MOUNTED COUNTERTOPS OR CASEWORK
FASTENERS LINE UP WITH EXTERIOR STUDS
ON THE EXTERIOR BUILDING WALLS. WALL
WILL NOT BE OPENED UP FOR ADDING
ADDITIONAL BRACING.

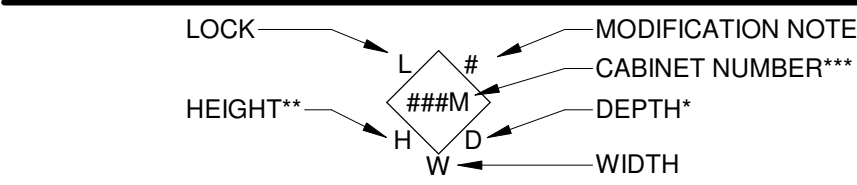


4 LOBBY 02 - NORTH
A701 1/4" = 1'-0"



5 LOBBY/HALL 2 - SOUTH
A701 1/4" = 1'-0"

CASEWORK LEGEND



* INDICATES DEPTH OF BASE CABINET
- COUNTERTOPS OVERHANG 1 1/2"

** INDICATES APPROXIMATE HEIGHT OF CABINET, SEE ELEVATIONS
FOR OVERALL HEIGHT OF CABINET AND COUNTERTOP.

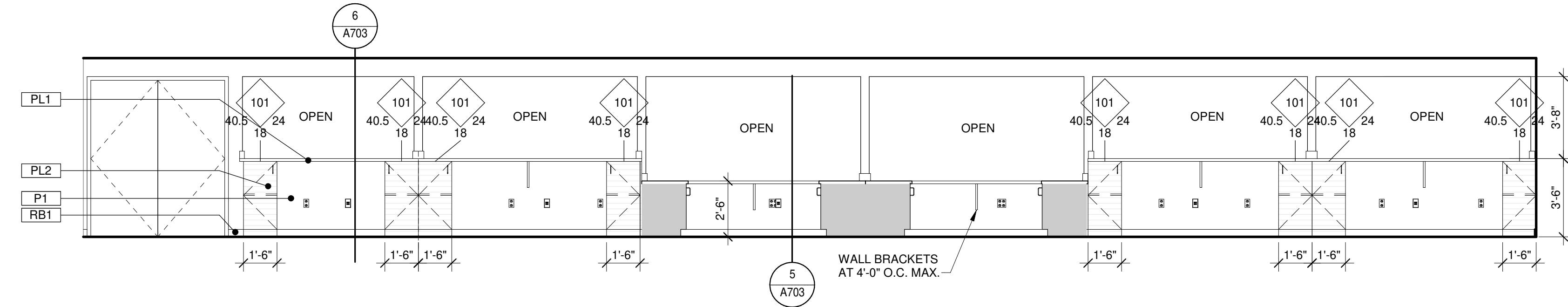
*** "M" INDICATES A DESIGN MODIFICATION TO THE STANDARD
CASEWORK DESIGNATED

CASEWORK MODIFICATIONS

- CASEWORK TO HAVE 99 DIVIDERS PER ROW WITH A TOTAL OF 100 SLOTS
ON EACH ROW.

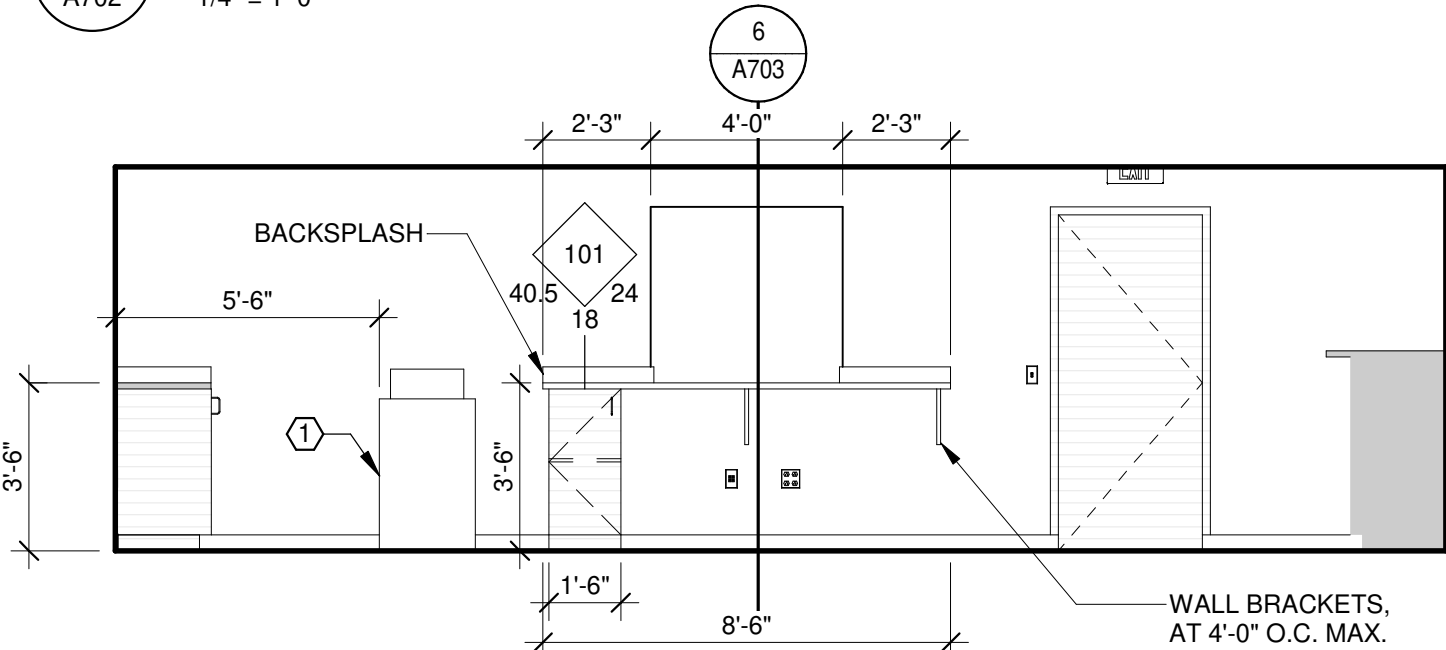
KEYNOTES

- BALLOT DROP BOX - BASIS OF DESIGN "LARGE THRU-WALL BALLOT
DROP (810) BY AMERICAN SECURITY CABINETS"



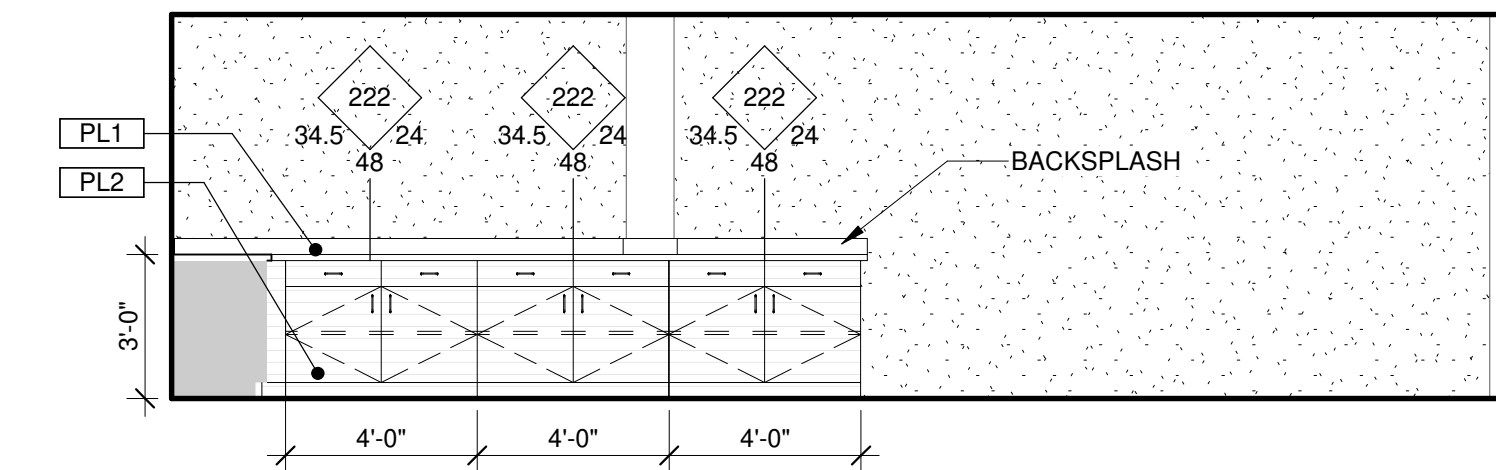
1 OFFICE/WORK 3 - WEST

A702 1/4" = 1'-0"



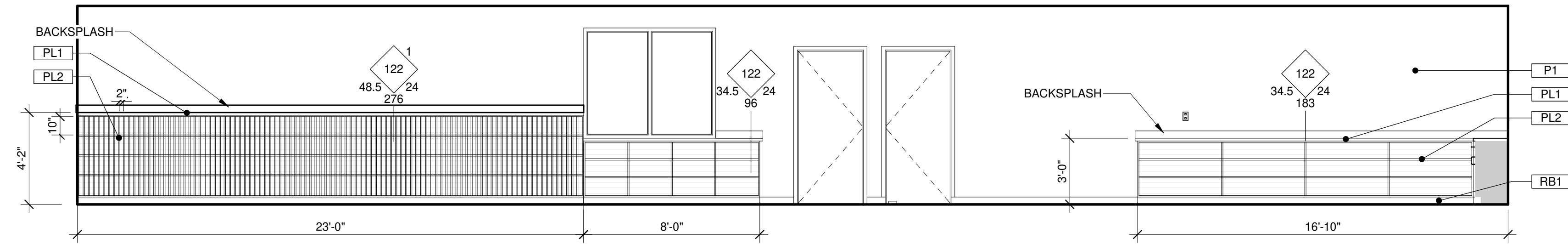
2 OFFICE/WORK 3 - NORTH 1

A702 1/4" = 1'-0"



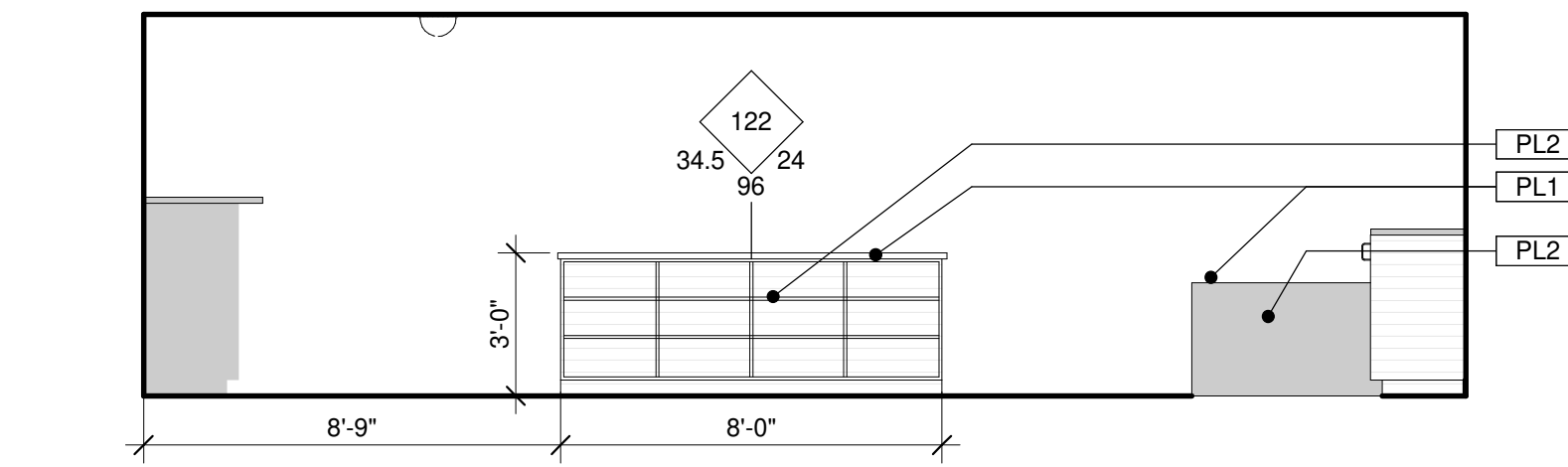
4 OFFICE WORK 3 - SOUTH

A702 1/4" = 1'-0"



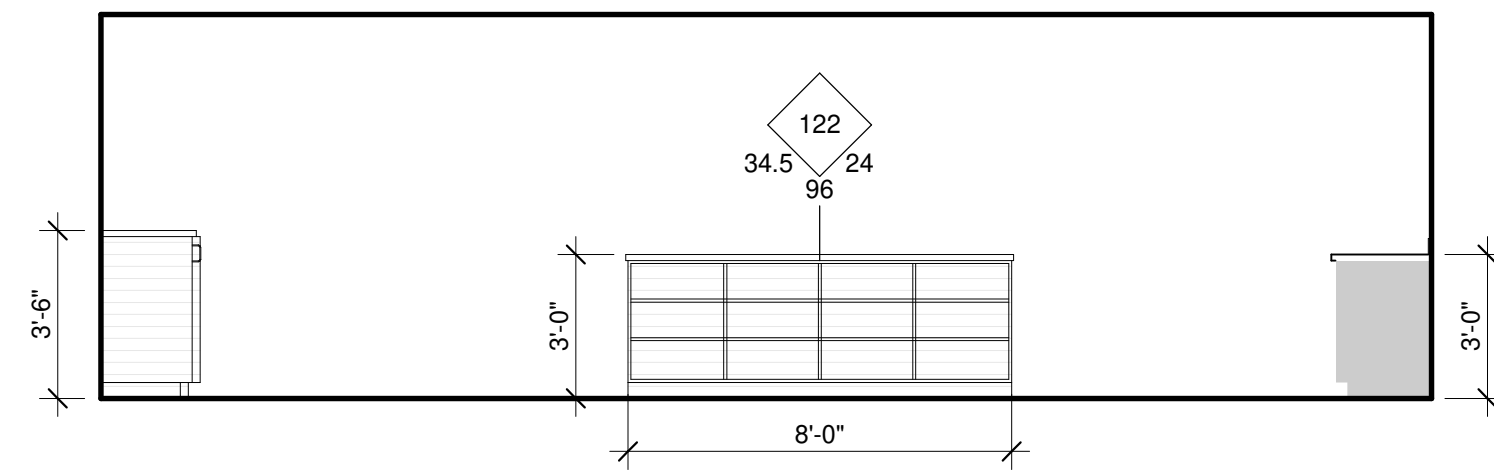
3 OFFICE/WORK 3 - EAST

A702 1/4" = 1'-0"



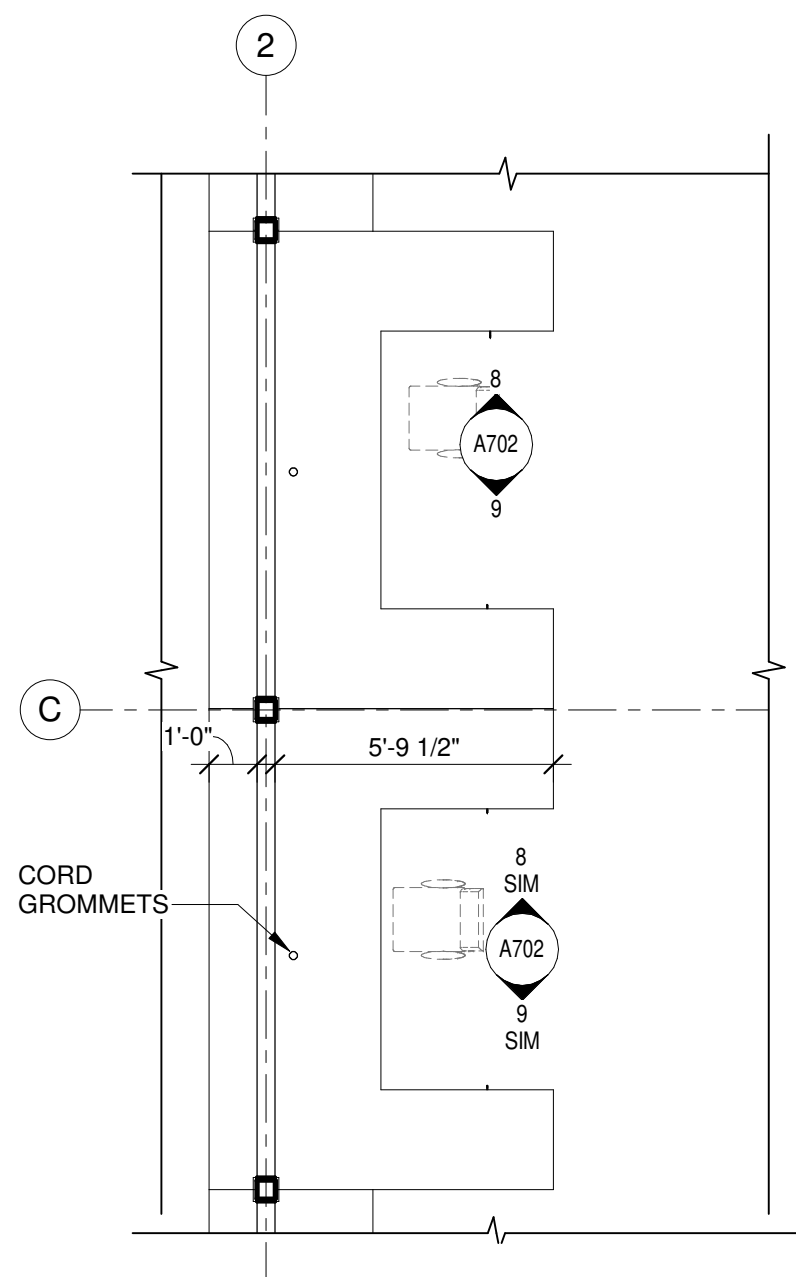
5 OFFICE/WORK 3 - ISLAND PLAN NORTH

A702 1/4" = 1'-0"



6 OFFICE/WORK 3 - ISLAND PLAN SOUTH

A702 1/4" = 1'-0"

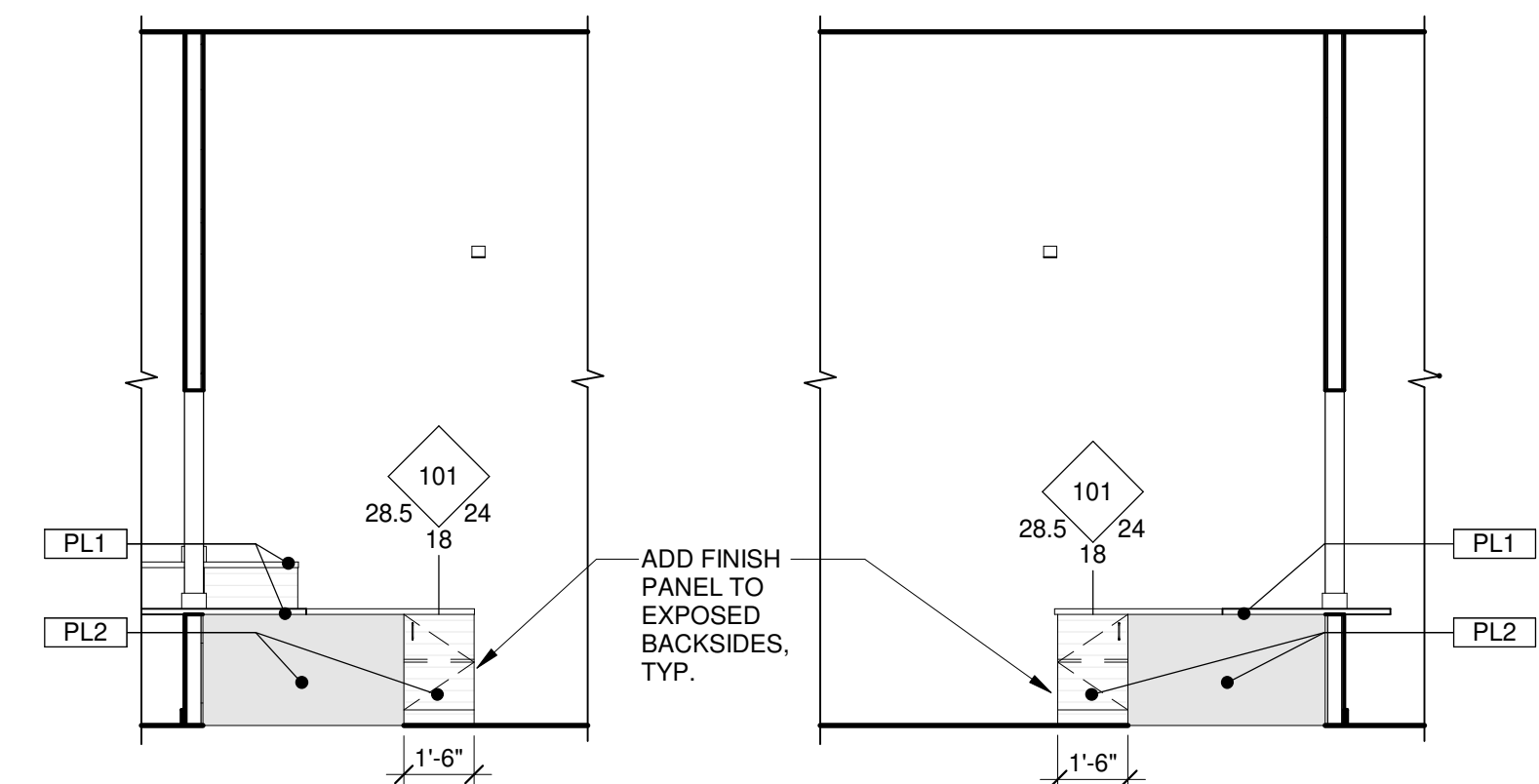


7 ENLARGED ADA DESK PLAN

A702 1/4" = 1'-0"

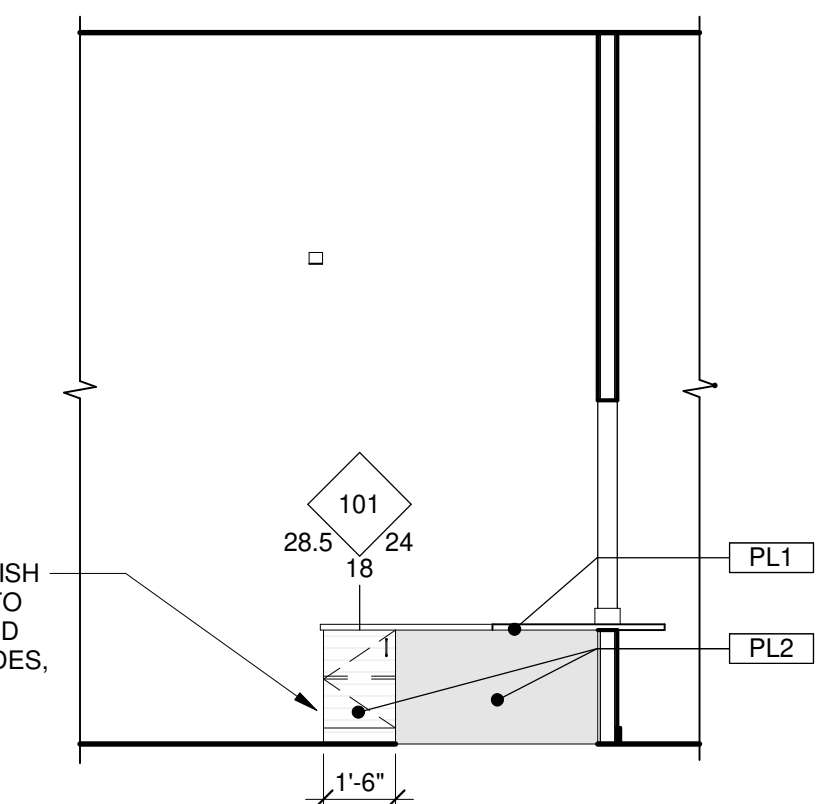
NOTES:

- EXTERIOR WALLS, INCLUDING BASE ARE TO REMAIN AS ARE.
- VERIFY WALL BRACKETS FOR WALL MOUNTED COUNTERTOPS OR CASEWORK FASTENERS LINE UP WITH EXTERIOR STUDS ON THE EXTERIOR BUILDING WALLS. WALL WILL NOT BE OPENED UP FOR ADDING ADDITIONAL BRACING.



8 ADA DESK - NORTH

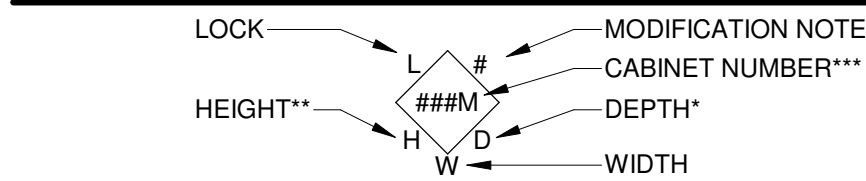
A702 1/4" = 1'-0"



9 ADA DESK - SOUTH

A702 1/4" = 1'-0"

CASEWORK LEGEND



* INDICATES DEPTH OF BASE CABINET
- COUNTERTOPS OVERHANG 1 1/2"

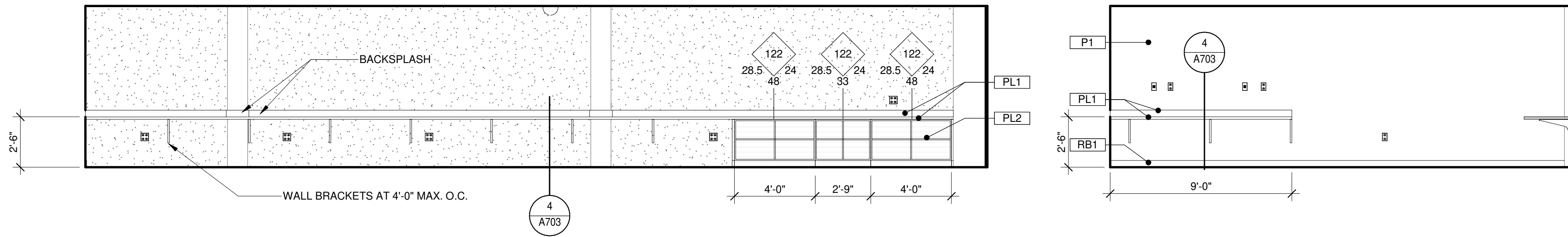
** INDICATES APPROXIMATE HEIGHT OF CABINET, SEE ELEVATIONS
FOR OVERALL HEIGHT OF CABINET AND COUNTERTOP.

*** "M" INDICATES A DESIGN MODIFICATION TO THE STANDARD
CASEWORK DESIGNATED

CASEWORK MODIFICATIONS

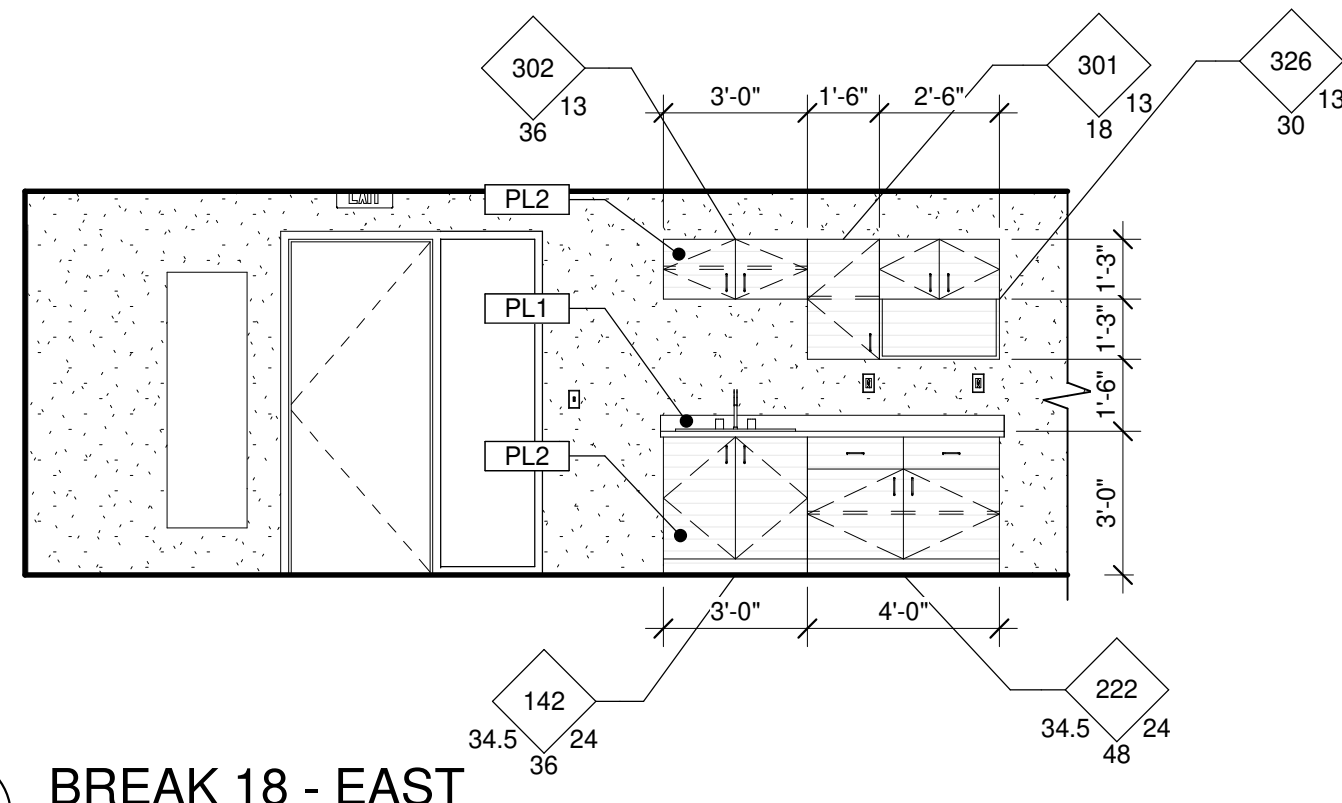
- CASEWORK TO HAVE 99 DIVIDERS PER ROW WITH A TOTAL OF 100 SLOTS
ON EACH ROW.

KEYNOTES



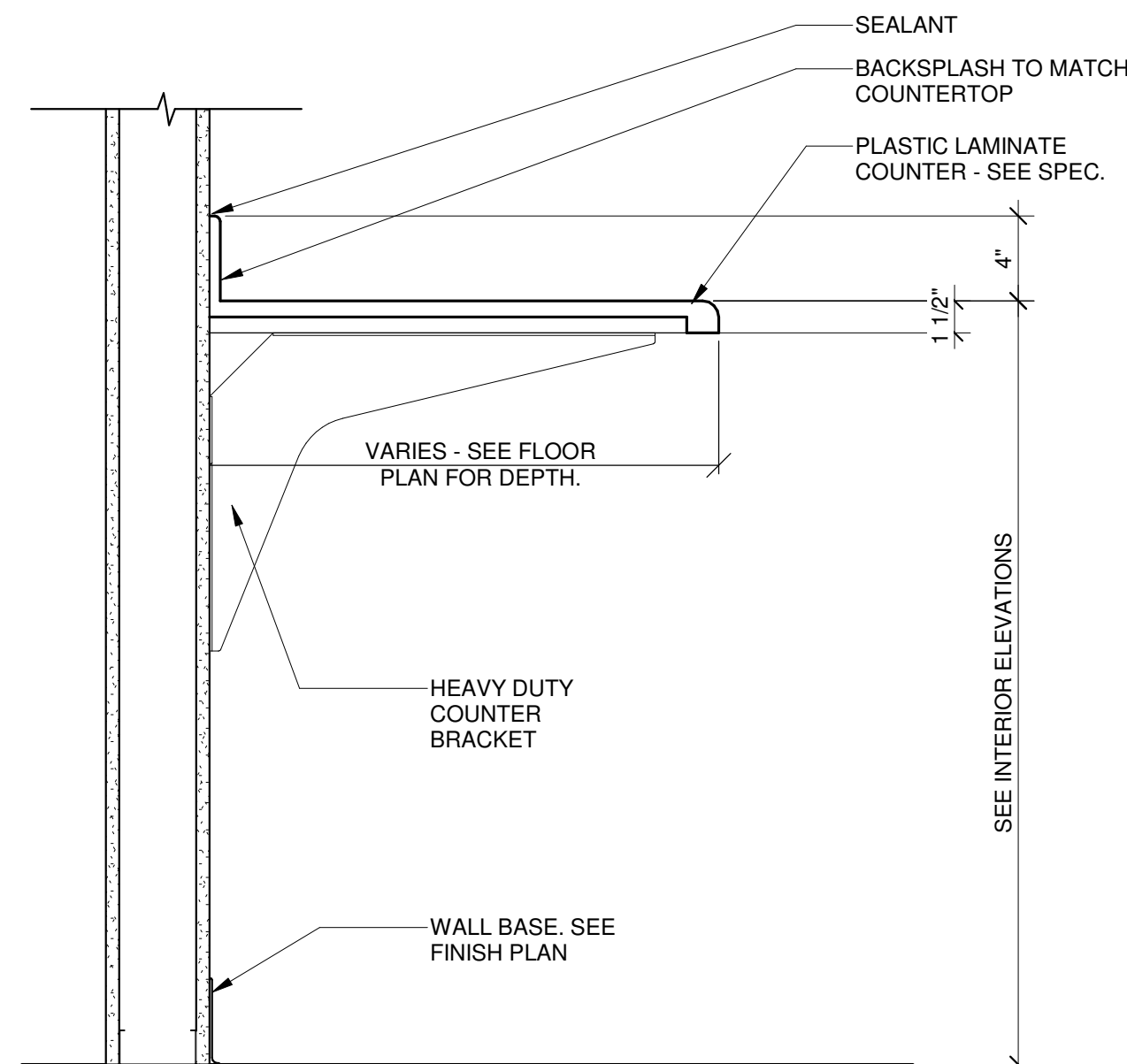
1 TABULATION ROOM 7 - NORTH
1/4" = 1'-0"

2 TABULATION ROOM 7 - WEST
1/4" = 1'-0"

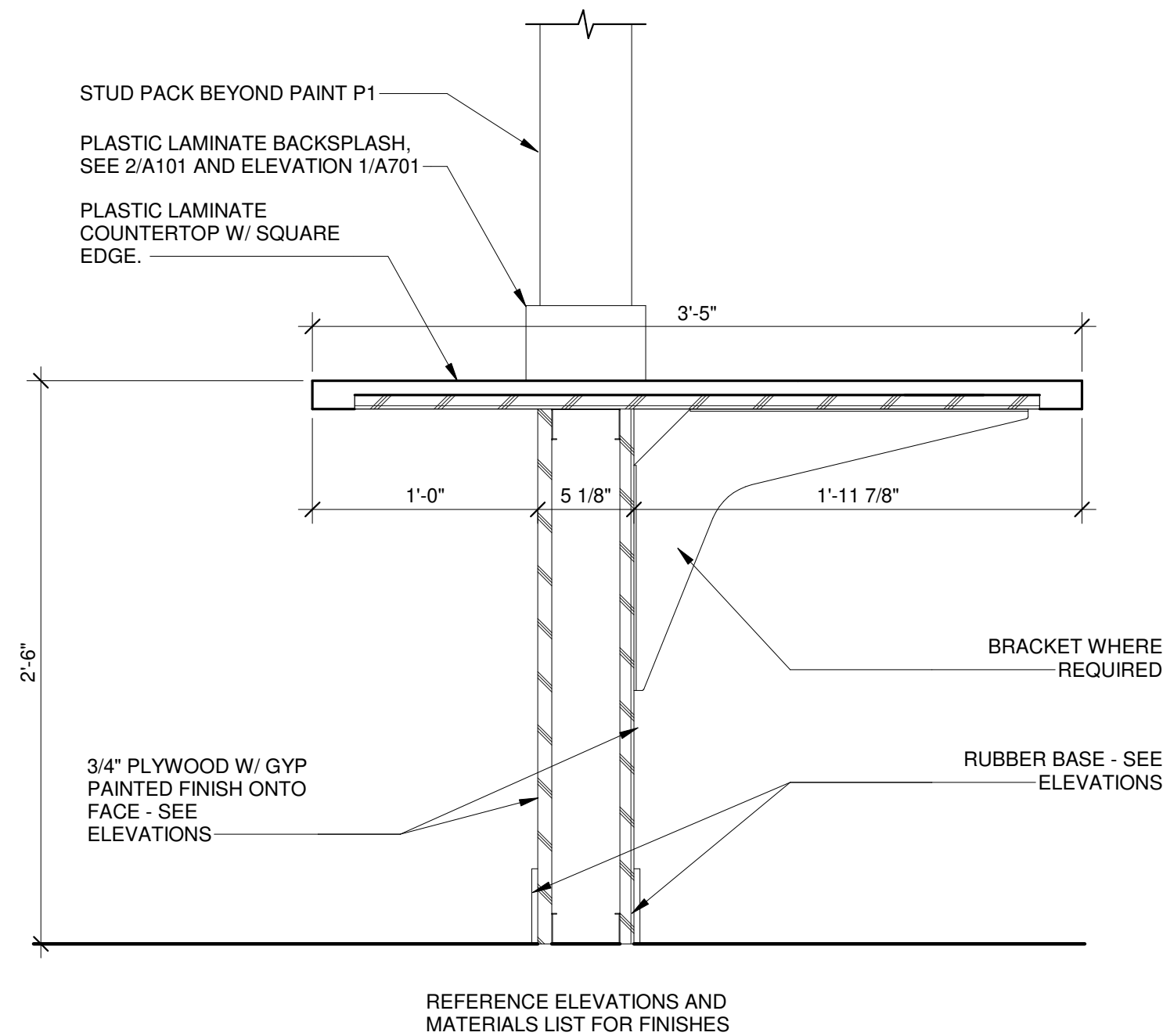


3 BREAK 18 - EAST
1/4" = 1'-0"

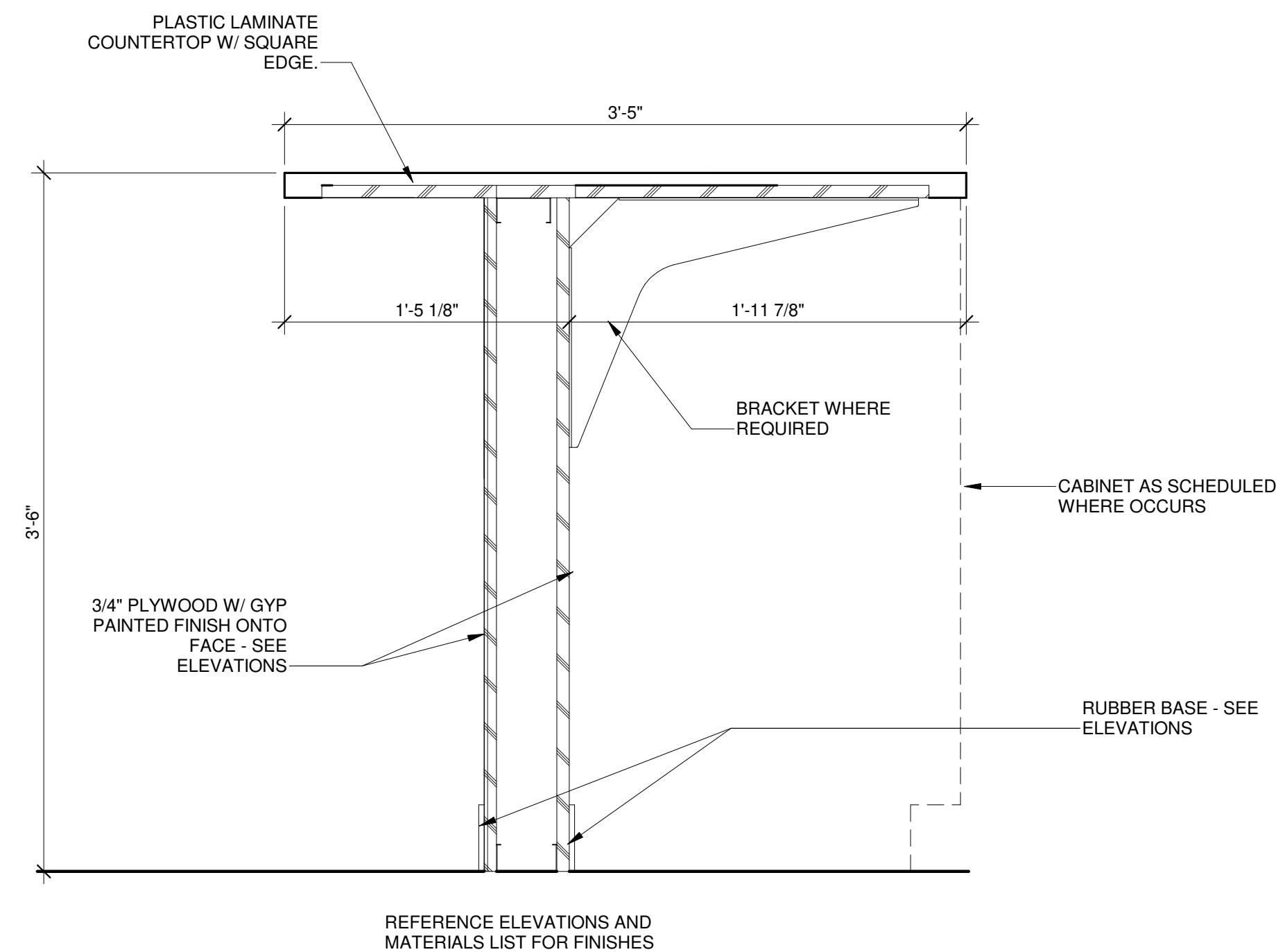
NOTES:
1. EXTERIOR WALLS, INCLUDING BASE ARE TO
REMAIN AS ARE.
2. VERIFY WALL BRACKETS FOR WALL
MOUNTED COUNTERTOPS OR CASEWORK
FASTENERS LINE UP WITH EXTERIOR STUDS
ON THE EXTERIOR BUILDING WALLS. WALL
WILL NOT BE OPENED UP FOR ADDING
ADDITIONAL BRACING.



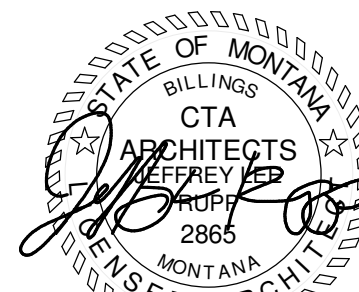
4 CONCEALED BRACKET COUNTERTOP
1 1/2" = 1'-0"



5 ADA TRANSACTION COUNTER
1 1/2" = 1'-0"



6 STANDARD TRANSACTION COUNTER
1 1/2" = 1'-0"



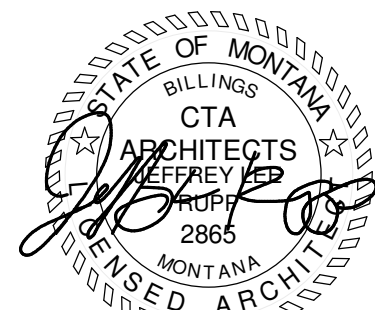
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CONSTRUCTION
DOCUMENTS

07.25.2025
PROJ# | YC_ELECTIONS
DESIGNED BY | LAST NAME
DRAWN BY | LAST NAME
REVIEWED BY | LAST NAME
REVISIONS

INTERIOR ELEVATIONS
/ CASEWORK DETAILS

A703



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CONSTRUCTION
DOCUMENTS07.25.2025
PROJ# | YC ELECTIONS
DESIGNED BY | LAST NAME
DRAWN BY | LAST NAME
REVIEWED BY | LAST NAME
REVISIONSREFLECTED CEILING
PLANS

A901

REFLECTED CEILING LEGEND

CEILING MATERIAL	ACT
CEILING HEIGHT	VARIABLES
ADDITIONAL NOTES	NOTES
ACT - 2X4 ACOUSTICAL LAY-IN CEILING	GYP - EXISTING GYP. BD. CEILING - PAINT
EXIST - EXISTING 2X4 LAY IN CEILING, TO REMAIN	EXP - EXPOSED STRUCTURE AND DECK
LIGHTING - SEE ELECTRICAL	HVAC REGISTERS - SEE MECHANICAL

ADDITIONAL NOTES

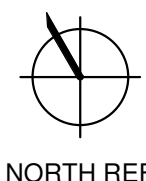
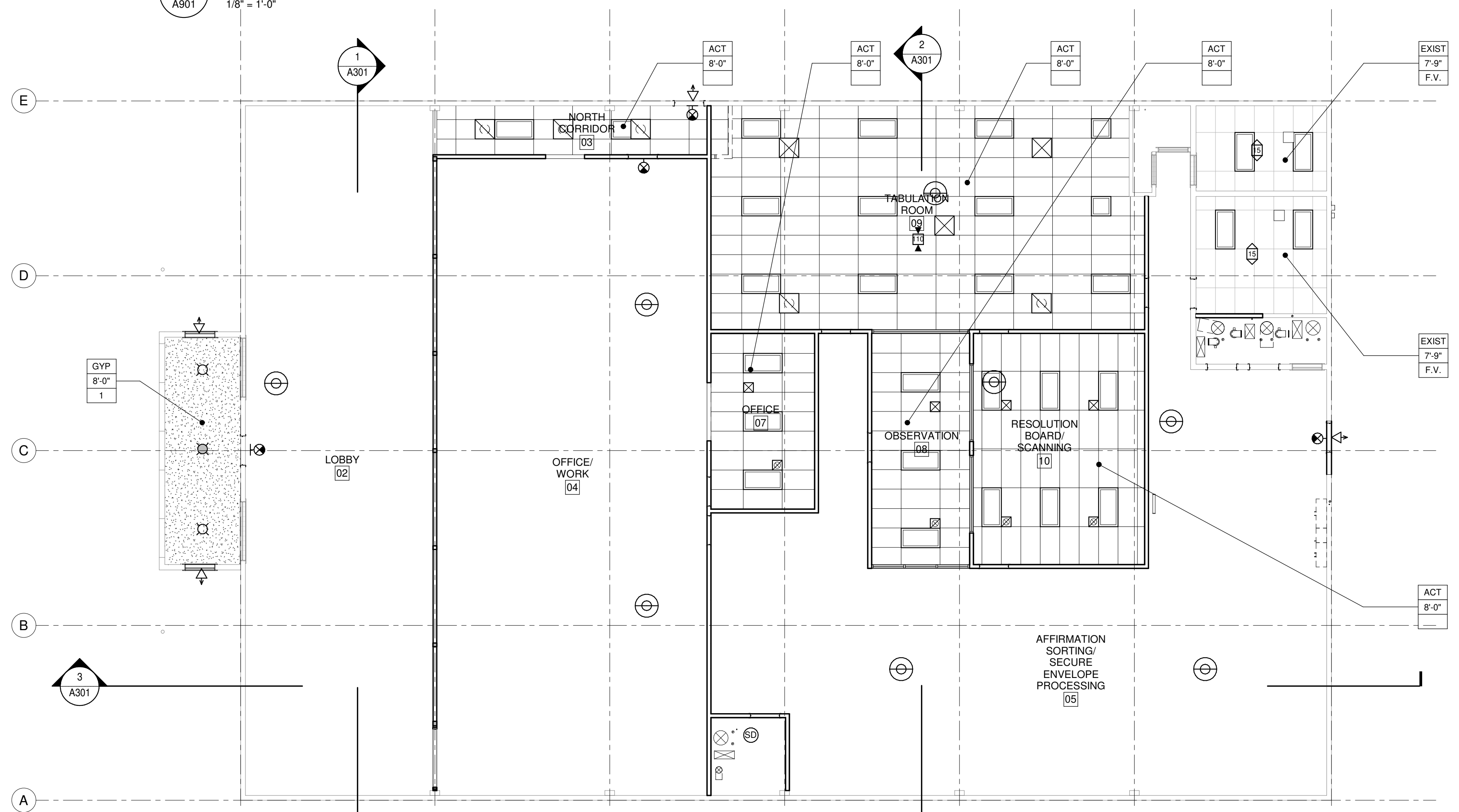
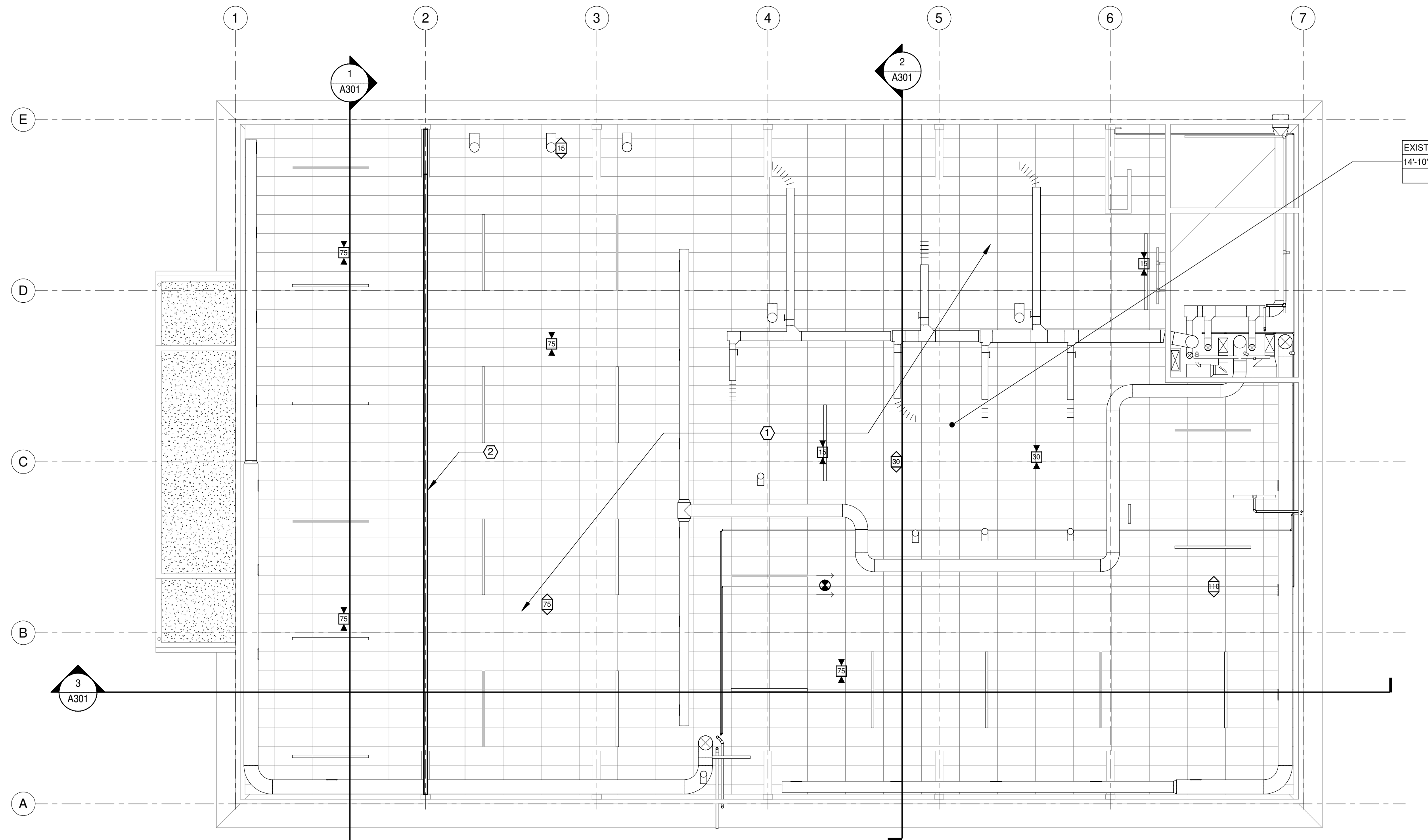
- EXISTING CEILING TO BE PAINTED 'P1'.

RCP DEMO PLAN NOTES

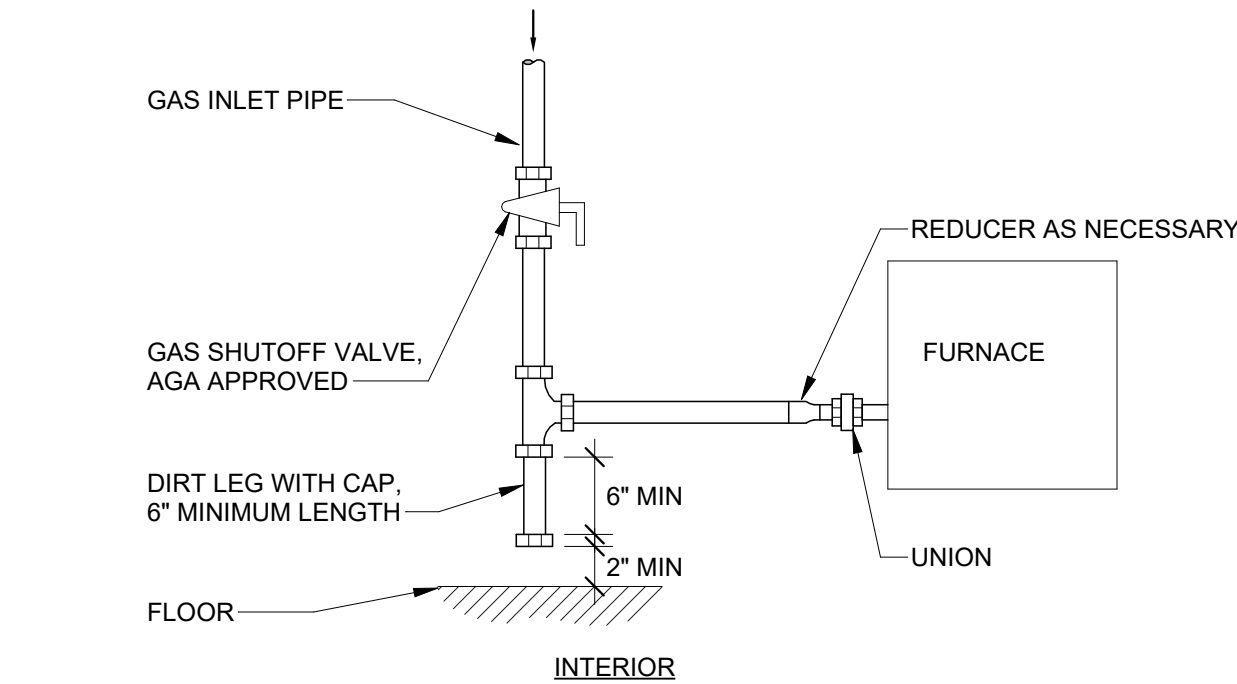
- THE BASE BID DESIGN INTENT IS FOR THE EXISTING CEILING TO REMAIN INTACT AS MUCH AS POSSIBLE. THE EXISTING ACT CEILING HAS BATT INSULATION ON TOP OF THE TILES. AT THE COMPLETION OF THE PROJECT ALL EXISTING BATT INSULATION WILL NEED TO BE REPAIRED AROUND STRUCTURAL PENETRATIONS AND REPLACED ON TOP OF THE ACT CEILING AND ANY NEW LIGHTFIXTURES OR OTHER ITEMS IN EXISTING CEILING GRID.
- ADD ALTERNATE #1 IS TO DEMO EXISTING HIGH ACT CEILING, GRID AND BATT INSULATION. INSTALL NEW 2X4 ACT CEILING AND GRID AT THE SAME HEIGHT. WITH 8" BATT INSULATION LOOSE LAID ON TOP OF THE ACT CEILING.

PLAN KEY NOTES

- EXISTING CEILING TO REMAIN. ACCOUNT FOR REMOVAL OF +/- 40 PANELS, SET TILES ASIDE FOR REPLACEMENT OF DAMAGED OR STAINED TILES.
- PARTITION WALL TO STOP BELOW EXISTING CEILING, PROVIDE BRACING TO STRUCTURE AS REQUIRED, SEE STRUCTURAL.



PLUMBING FIXTURE & CONNECTION SCHEDULE																			
PLAN CODE	ADA	FIXTURE						TRIM		ACCESSORIES			CONNECTIONS				NOTES	PLAN CODE	
		ITEM	MANUFACTURER	MODEL	TYPE	MATERIAL	COLOR	TRIM	MANUFACTURER	MODEL	ITEM	MANUFACTURER	MODEL	COLD	HOT	WASTE			VENT
FD-1		FLOOR DRAIN	JAY R. SMITH	2005	FLOOR MOUNT.	DUCO CAST	-	-	-	-	-	-	-	-	-	2"	2"	1	FD-1
S-1	X	SINK	ELKAY	LRAD332265	COUNTER MOUNT	304 SS	-	FAUCET	AMERICAN STANDARD	4932300.002	-	-	-	1/2"	1/2"	2"	2"	2	S-1
NOTES:																			
1. DUCO CAST IRON FLOOR SINK WITH ADJUSTABLE STRAINER HEAD. PROVIDE WITH QUAD CLOSE TRAP SEAL. LOCATE DRAIN BETWEEN FLOOR JOIST. JOIST SHALL NOT TO BE CUT.																			
2. ADA 33X22X6.5 TWO COMPARTMENT 304 STAINLESS STEEL SINK. PROVIDE WITH AMERICAN STANDARD 4392.300 PULL DOWN 1.5 GPM FAUCET. PROVIDE QUARTER TURN ANGLE STOPS. BRAIDED SS SUPPLY HOSES. GRID DRAINS, CONTINUOUS 17 GA. WASTE, 17 GA. P-TRAP, ESCUTCHEONS. PROVIDE WITH DEARBORN BRASS TAILPIECE ADAPTER TO RECEIVE CONDENSATE FROM FURNACE.																			



1
P001

GAS CONNECTION DETAIL

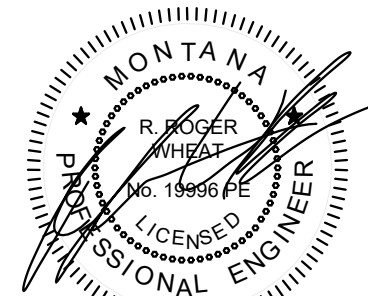
NOT TO SCALE

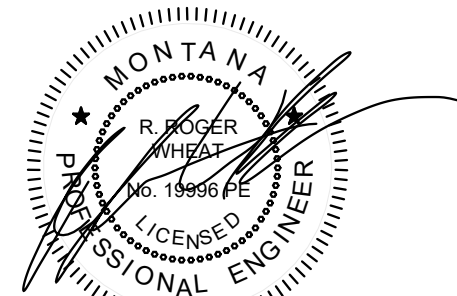
PLUMBING LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
-----CW-----	DOMESTIC COLD WATER		VALVE IN RISER
-----HW-----	DOMESTIC HOT WATER		SLOPE DOWN IN DIRECTION OF FLOW
-----W-----	WASTE		BALL VALVE
-----V-----	VENT		GAS SHUT-OFF COCK
CO/WCO	CLEANOUT/ WALL CLEANOUT		SWING CHECK VALVE
FCO	FLOOR CLEANOUT		WATER OUTLET (TYPE INDICATED)
GCO	GRADE CLEANOUT		BACKFLOW PREVENTER (TYPE INDICATED)
CD	CONDENSATE DRAIN		HOSE END DRAIN VALVE
D	DRAIN		PRESSURE REDUCING VALVE
NG	NATURAL GAS		
tee up	TEE UP		
tee down	TEE DOWN		
elbow up	ELBOW UP		
elbow down	ELBOW DOWN		
pipe cap	PIPE CAP		
pipe drain & cap	PIPE DRAIN & CAP		
connect to existing	CONNECT TO EXISTING		
disconnect from existing	DISCONNECT FROM EXISTING		
new piping	NEW PIPING		
existing piping	EXISTING PIPING		
-----	PIPING TO BE REMOVED		

PLUMBING ABBREVIATIONS

(E)	EXISTING
(N)	NEW
AFF	ABOVE FINISHED FLOOR
BG	BELOW GRADE
CD	CONDENSATE DRAIN
CO	CLEANOUT
CW	COLD WATER
CX	CONNECT TO EXISTING
DN	PIPE DROP TO NEXT LEVEL
FCO	FLOOR CLEANOUT
GCO	GRADE CLEANOUT
HW	HOT WATER
IE	INVERT ELEVATION
NC	NORMALLY CLOSED (VALVE)
NG	NATURAL GAS
V	VENT
VA	VALVE
VTR	VENT THRU ROOF





PLUMBING SPECIFICATIONS, DIVISION 22

REGULATORY REQUIREMENTS, GENERAL

- A. CONSTRUCT THE BUILDING SYSTEMS IN FULL COMPLIANCE WITH ALL APPLICABLE LOCAL BUILDING CODES, LATEST EDITION. COMPLY WITH THE FOLLOWING AS MODIFIED BY THE LOCAL JURISDICTION: 2021 UNIFORM PLUMBING CODE AND 2021 INTERNATIONAL FUEL GAS CODE OR CODES ENFORCED BY LOCAL AUTHORITY HAVING JURISDICTION.
- B. IN ADDITION, COMPLY WITH THE FOLLOWING: THE LATEST VERSION OF THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND THE UNIFORM FEDERAL ACCESSIBILITY STANDARD, WHICHEVER IS MORE STRINGENT. ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS. OBTAIN REQUIRED PERMITS, PLAN REVIEW AND INSPECTIONS FROM AUTHORITIES HAVING JURISDICTION.

BASIC MECHANICAL REQUIREMENTS

GENERAL

- A. SCOPE: THE CONTRACTOR SHALL, INSTALL AND COORDINATE ALL PLUMBING WORK TO PROVIDE COMPLETE AND OPERATIONAL PLUMBING INSTALLATIONS.
- B. SUPPLY AND INSTALL COMPLETE PLUMBING SYSTEMS THROUGHOUT TO COMPLETE PROJECT FOR PLUMBING SYSTEMS DESCRIBED HEREIN AND INDICATED ON DRAWINGS. DRAWINGS ARE IN-PART DIAGRAMMATIC.
- C. PROVIDE SHOP DRAWINGS FOR ALL PIPING AND EQUIPMENT PRIOR TO ORDERING. CONTRACTOR SHALL BE RESPONSIBLE FOR SCHEDULING WORK FOR A TWO WEEK SHOP DRAWING REVIEW PERIOD.
- D. CONTRACTOR SHALL GUARANTEE THAT ALL MATERIAL FURNISHED BE ACCEPTABLE IN EVERY RESPECT AND, IF NOT FOUND ACCEPTABLE, SHALL REPLACE THE SAME IMMEDIATELY. ALL WORK AND MATERIAL SHALL BE GUARANTEED FOR ONE (1) YEAR FROM DATE OF SUBSTANTIAL COMPLETION.
- E. AT PROJECT COMPLETION, THE CONTRACTOR SHALL PROVIDE TRAINING TO THE OWNER THAT DESCRIBES THE CORRECT OPERATIONAND MAINTENANCE OF ALL EQUIPMENT FIXTURES AND EQUIPMENT USING THE O&M MANUAL.
- F. PLUMBING PERFORMANCE REQUIREMENTS: PROVIDE COMPONENTS AND INSTALLATION CAPABLE OF PRODUCING PIPING SYSTEMS WITH THE FOLLOWING:
- a. MINIMUM WORKING PRESSURE RATINGS, UNLESS OTHERWISE INDICATED: DOMESTIC WATER PIPING: 125 PSIG
 - b. SANITARY WASTE AND VENT PIPING: 10 FT. HEAD OF WATER.
- G. PLUMBING DESIGN REQUIREMENTS: COMPLY WITH THE REQUIREMENTS OF THE CITY OF BILLINGS AND AUTHORITIES HAVING JURISDICTION.

INSULATION

(VALUES BASED ON IECC)

- A. ALL FIBERGLASS INSULATION TO INCLUDE WHITE ALL SERVICE JACKET AND PVC FITTING COVERS.
- B. DOMESTIC COLD WATER, ABOVE GRADE: 1/2" PRE-FORMED FIBERGLASS.
- C. DOMESTIC HOT WATER AND RECIRCULATING WATER
- a. WATER TEMPERATURES 140°F AND BELOW:
 - PIPE SIZES 1" AND SMALLER: 1" PRE-FORMED FIBERGLASS.

PLUMBING PIPING

MATERIALS

- A. DRAIN, WASTE, VENT:
- a. ABOVE GRADE:
 - PVC PIPE, ASTM D2729 OR ASTM D2665, WITH PVC FITTINGS AND ASTM D2564 SOLVENT WELDED JOINTS. INCLUDE PRIMER ACCORDING TO ASTM F656.
 - CAST IRON PIPE, CISPI 301, HUBLESS, WITH CAST IRON FITTINGS AND CISPI 310 JOINTS WITH NEOPRENE GASKETS AND STAINLESS STEEL CLAMP-AND-SHIELD ASSEMBLIES.
- B. DOMESTIC WATER PIPING, ABOVE GRADE:
- a. TYPE L COPPER TUBE, ASTM B88 WITH ONE OF THE FOLLOWING FITTINGS:
 - ASME B16.18 CAST COPPER ALLOY OR ASME B16.22 WROUGHT COPPER AND BRONZE FITTINGS.
 - CAST IRON, COATED, WITH GROOVED MECHANICAL COUPLINGS.
 - MECHANICAL PRESS-SEAL FITTINGS, DOUBLE-PRESSED TYPE, NSF 61 AND NSF 372 APPROVED OR CERTIFIED, UTILIZING EPDM, NON-TOXIC, SYNTHETIC RUBBER SEALING ELEMENTS.
 - b. PEX PIPE, ASTM F876 OR ASTM F877, SIZED BASED ON PPI TR-4 PRESSURE DESIGN. PROVIDE INFORMATION ON PIPING FOR ENGINEER'S APPROVAL THROUGH SHOP DRAWING PROCESS. PROVIDE WITH BRASA ND ENGINEERED POLYMER ASTM F1960 FITTINGS WITH ASTM F1960 COLD-EXPANSION FITTINGS.
 - PIPE SIZING BASED ON METAL PIPE. IF CONTRACTOR SELECTS PLASTIC PIPE, THAT CONTRACTOR SHALL INCLUDE RESIZING PIPING ACCORDING TO MANUFACTURER'S INSTRUCTIONS IN THEIR BID AND SEND RESIZED INFORMATION TO ENGINEER FOR REVIEW AND AS BUILT DRAWINGS.
- C. CONDENSATE DRAIN PIPING:
- a. EXTERIOR: COPPER TUBING, ASTM B 88, TYPE L, HARD-DRAWN TEMPER WITH CAST BRASS OR WROUGHT COPPER FITTINGS AND SOLDER JOINTS. USE ASTM B 32.95-5 TIN-ANTIMONY, OR TIN AND SILVER SOLDER, WITH MELTING RANGE 430 TO 535° F.
 - b. INTERIOR: PVC PIPE, ASTM D-1784, PVC SOCKET FITTINGS, AND SOLVENT-CEMENTED JOINTS.
- D. NATURAL GAS PIPING:
- a. ABOVE GRADE:
 - STEEL PIPE, SCHEDULE 40, ASTM A53 / A 53M, WITH MALLEABLE IRON (ASME B16.3 OR WROUGHT STEEL WELDING (ASTM A234 / A234M) FITTINGS, THREADED OR WELDED JOINTS, ASME B31.1.
 - CORRUGATED STAINLESS STEEL TUBING SYSTEM COMPLYING WITH ANSI LC 1/ CSA 6.26. PROVIDE PLASTIC JACKET OR COATING. FITTINGS SHALL BE COPPER ALLOY TYPE DESIGNED TO FIT CORRUGATED TUBING. PROVIDE STRIKER PLATES TO PROTEC TUBING FROM PENETRATIONS. GASTITE, TRACPIPE, OR APPROVED EQUAL.
- E. VALVES:
- a. DOMESTIC WATER: BALL VALVES, 2" AND SMALLER, ASTM B 584, BRONZE BODY AND BONNET, 2-PIECE CONSTRUCTION, CHROME-PLATED BRASS BALL, CONVENTIONAL PORT, BLOWOUT PROOF, BRASS OR BRONZE STEM, TEFLON SEAT AND SEALS, STEM EXTENSION FOR VALVES INSTALLED IN INSULATED PIPING, THREADED ENDS.
 - b. NATURAL GAS (2 PSIG AND LOWER): GAS STOPS 2" AND SMALLER, AGA CERTIFIED, BRONZE BODY, PLUG TYPE WITH BRONZE PLUG OR BALL TYPE WITH CHROME PLATED BRASS BALL. INCLUDE AGA STAMPED AND THREADED ENDS.

HANGERS AND SUPPORTS

- A. DESIGN CHANNEL SUPPORT SYSTEMS FOR PIPING TO SUPPORT MULTIPLE PIPES CAPABLE OF SUPPORTING COMBINED WEIGHT OF SUPPORTED SYSTEMS, SYSTEM COMPONENTS AND SYSTEM FLUIDS.
- B. DESIGN AND OBTAIN APPROVAL FROM AUTHORITIES HAVING JURISDICTION FOR SEISMIC RESTRAINT HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT.
- C. PIPE HANGER AND SUPPORT INSTALLATION: COMPLY WITH MSS SP-69 AND MSS SP-89. INSTALL HANGERS, SUPPORTS, CLAMPS, AND ATTACHMENTS AS REQUIRED TO PROPERLY SUPPORT PIPING FROM BUILDING STRUCTURE.
- D. PROVIDE COPPER-COATED HANGERS FOR DIRECT CONTACT WITH COPPER TUBING.
- E. PROVIDE POLYISOCYANURATE THERMAL INSULATION SHIELDS AT HANGER LOCATIONS ON ALL INSULATED PIPING.
- F. PROVIDE STRUCTURAL WORK AND EQUIPMENT AS REQUIRED TO CONTROL THERMAL AND SEISMIC MOVEMENT OF PIPING SYSTEMS. VERIFY THAT ALL ANCHORS, GUIDES, AND EXPANSION JOINTS PROVIDED ADEQUATELY PROTECT SYSTEM.

LABELS AND TAGS

- A. PROVIDE PIPE LABELS ON ALL PLUMBING PIPING INSIDE BUILDING. USE PRETENSIONED PIPE LABELS WITH SERVICE AND DIRECTIONAL FLOW ARROWS.
- B. PROVIDE BRASS VALVE TAGS WITH BEAD CHAIN OR S-HOOK SHOWING VALVE SERVICE AND NUMBER. PROVIDE VALVE CHART TO INCLUDE IN O&M MANUALS AND A LAMINATED COPY POSTED IN THE MECHANICAL ROOM.
- C. PROVIDE ENGRAVED PLASTIC EQUIPMENT TAGS WITH PERMANENT ADHESIVE MATCHING SCHEDULE PLAN LABEL FOR ALL GAS OR ELECTRIC FIRED EQUIPMENT.

PLUMBING PIPING CONTINUED

CLEANING AND DISINFECTING FOR POTABLE DOMESTIC WATER PIPING

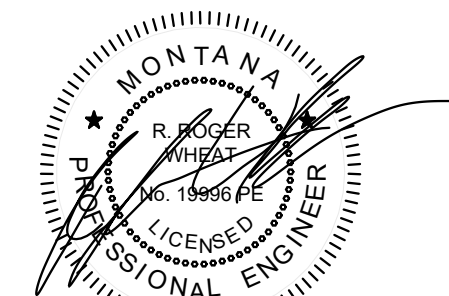
- A. PURGE NEW PIPING AND PARTS OF EXISTING PIPING THAT HAVE BEEN ALTERED, EXTENDED, OR REPAIRED BEFORE USING.
- B. USE PURGING AND DISINFECTING PROCEDURES PRESCRIBED BY AUTHORITIES HAVING JURISDICTION. IF METHODS ARE NOT PRESCRIBED, USE PROCEDURES DESCRIBED IN AWWA "DISINFECTING BUILDING POTABLE WATER PLUMBING IN NEW OR REPAIRED SYSTEMS" OR FOLLOW PROCEDURES DESCRIBED BELOW:
- a. FLUSH PIPING SYSTEM WITH CLEAN, POTABLE WATER UNTIL DIRTY WATER DOES NOT APPEAR AT OUTLETS.
 - b. FILL AND ISOLATE SYSTEM ACCORDING TO EITHER OF THE FOLLOWING:
 - PROVIDE NECESSARY CONNECTIONS THROUGHOUT THE PIPING SYSTEM TO INJECT CHLORINE SOLUTION FOR STERILIZATION.
 - STERILIZATION SHALL NOT OCCUR UNTIL ALL PIPING SYSTEMS HAVE BEEN FLUSHED.
 - MEASURE INCOMING WATER PH AND ADJUST AS NECESSARY USING AN ALKALI (CAUSTIC SODA OR SODA ASH) OR AN ACID (HYDROCHLORIC ACID) TO MAINTAIN PH IN THE RANGE OF 7.4 TO 7.6.
 - INJECT CHLORINE DISINFECTANT (FREE CHLORINE IN LIQUID, POWDER, OR TABLET FORM) INTO THE SYSTEM UNTIL RESIDUAL CHLORINE OF 50 TO 80 mg/L OCCURS IN EACH BRANCH LINE.
 - BLEED WATER FROM SYSTEM TO ENSURE CHLORINE DISTRIBUTION IN EACH BRANCH AND OBTAIN TEST SAMPLES FROM 15 PERCENT OF SPRINKLER LOCATIONS FOR EACH ZONE.
 - MAINTAIN CHLORINE SOLUTION IN SYSTEM FOR 24 HOURS.
 - MEASURE CHLORINE CONTENT AT END OF 24 HOUR PERIOD. REDOSE AND BLEED WATER FROM EACH BRANCH IF RESIDUAL CHLORINE CONTENT IS LESS THAN 25 mg/L, OR EQUAL TO THE CHLORINE CONTENT OF THE INCOMING WATER.
 - ONCE SYSTEM RESIDUAL MEETS OR EXCEEDS 25 mg/L AFTER 24 HOURS, FLUSH ALL SYSTEM PIPING UNTIL RESIDUAL CHLORINE LEVEL IS 1 mg/L OR EQUAL TO THE CHLORINE CONTENT OF THE INCOMING WATER.
- TAKE WATER SAMPLES FROM TWO PERCENT OF THE SPRINKLER LOCATIONS FOR EACH ZONE AND AT THE WATER ENTRY POINT. ANALYZE SAMPLES IN ACCORDANCE WITH AWWA C851 AND REPORT RESULTS TO OWNER.
- C. CLEAN AND DISINFECT POTABLE DOMESTIC WATER PIPE AND FITTINGS WHERE NEW SYSTEM PIPING WILL BE CONNECTED TO EXISTING AS FOLLOWS:
1. PROCEDURE IS BASED ON THE FOLLOWING ASSUMPTIONS. THE NEW PIPING INSTALLATION HAS BEEN COMPLETED TO THE POINT OF CONNECTION.
 2. SUBMERGE PIPE AND TUBE SECTIONS, FITTINGS AND VALVES IN SOLUTION OF 200 PPM CHLORINE AND WATER FOR FOUR HOURS.
 3. WASH PIPING AT LOCATION OF TIE INS IN A 200 PPM CHLORINE SOLUTION FOR 5 MINUTES, EXTEND THE WASHED ARE A MINIMUM OF 12 INCHES EACH SIDE OF THE NEW CONNECTION.
 4. RINSE TUBE SECTIONS, FITTINGS AND VALVES USING CLEAN CITY WATER BY FLOWING WATER THROUGH THE ASSEMBLY TO COMPLETELY RINSE ALL INTERIOR SURFACES FOR A MINIMUM OF 15 MINUTES. AVOID INSERTING HANDS OR OTHER ARTICLES INTO THE PIPING UNLESS CLEANED USING A CHLORINE SOLUTION FOR 5 MINUTES.
 5. ONCE RINSING IS COMPLETED, FINAL ASSEMBLY OF THE NEW PIPING INTO THE EXISTING SYSTEM SHALL BE ACCOMPLISHED WITHIN 30 MINUTES. REPEAT PROCEDURES IF BIOLOGICAL EXAMINATION SHOWN CONTAMINATION.
- D. PREPARE AND SUBMIT REPORTS OF PURGING AND DISINFECTING ACTIVITIES. INCLUDE COPIES OF WATER-SAMPLE APPROVALS FROM AUTHORITIES HAVING JURISDICTION.
- E. CLEAN INTERIOR OF DOMESTIC WATER PIPING SYSTEM. REMOVE DIRT AND DEBRIS AS WORK PROGRESSES.
- F. CLEAN FIXTURES, FAUCETS AND OTHER FITTINGS WITH MANUFACTURER'S RECOMMENDED CLEANING METHODS AND MATERIALS.

TESTING

- A. GENERAL: THE PURPOSE OF PIPE TESTING IS TO OBTAIN EVIDENCE OF SATISFACTORY WORKMANSHIP AND MATERIALS. REMAKE OR REPAIR ALL SYSTEMS WHICH DO NOT PRODUCE SATISFACTORY RESULTS. SHOW A SIGNATURE FROM OWNER, CODE OFFICIAL, OR ENGINEER'S ASSIGNEE THAT EACH TEST WAS WITNESSED.
- B. DOMESTIC WATER: INSTALL ALL PIPING TO THE POINT OF CONNECTION TO MAIN BUT DO NOT MAKE THE TIE-IN. USE THE STANDARD 2-HOUR AIR PRESSURE TST WITH NO LOSS OF AIR PRESSURE. MAKE THE TIE-IN TO EXISTING, PRESSURIZE, AND INSPECT FOR LEAKS. FLUSH NEW PIPING THOROUGHLY, OPERATING ALL VALVES AND FAUCETS DURING FLUSH.
- C. DRAIN, WASTE, VENT: INSTALL ALL PIPING TO THE POINT OF CONNECTION TO MAIN BUT DO NOT MAKE TIE-IN. USE THE STANDARD AIR PRESSURE TEST AND SOAP APPLIC JOINTS. INSPECT FOR LEAKS. MAKE THE TIE-IN TO EXISTING AND INSPECT FOR LEAKS, OPERATING ALL FIXTURES DISCHARGING INTO THE PIPING BEING TESTED FOR AT LEAST 5 MINUTES CONTINUOUSLY.
- D. TEST INSPECT, AND PURGE NATURAL GAS PIPING IN ACCORDANCE WITH NFPA 54 AND THE INTERNATIONAL FUEL GAS CODE.
- E. TEST INSTALLED FIXTURES AFTER WATER SYSTEMS ARE PRESSURIZED FOR PROPER OPERATION. REPLACE MALFUNCTIONING FIXTURES AND COMPONENTS, THEN RETEST. REPEAT PROCEDURE UNTIL UNITS OPERATE PROPERLY.

PLUMBING EXECUTION

- A. SLOPE DRAIN, WASTE, RAINLEADER, AND RAINLEADER OVERFLOW PIPING IN DIRECTION OF FLOW UNLESS NOTED OTHERWISE ON PLANS:
- a. PIPE SIZE 3" OR SMALLER: 1/4" PER FOOT
 - b. PIPE SIZE 4" AND GREATER: 1/8" PER FOOT
- B. SLOPE VENT PIPE 1/8" PER FOOT BACK TO FIXTURES.
- C. INSTALL ALL EQUIPMENT, ACCESSORIES AND SPECIALTIES ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND PROVIDE ACCESS FOR PERIODIC MAINTENANCE, CLEANING AND SERVICING. PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES.
- D. INSTALL PIPING TO PERMIT VALVE SERVICING.
- E. INSTALL EQUIPMENT AND COMPONENTS LEVEL AND PLUMB.
- F. INSULATE AND COVER ALL DRAINAGE AND WATER SUPPLY PIPING LOCATED UNDER LAVATORIES AND SINKS.
- G. EXTEND CLEANOUTS TO FINISHED FLOOR OR WALL SURFACE. INSTALL CHROME PLATED ROUND COVER. DO NOT INSTALL FLOOR CLEANOUTS IN TRAFFIC AREAS OF FINISHED CORRIDORS.
- H. INTERIOR COORDINATION: THE CEILING SPACE SHALL BE LAYERED WITH A HVAC DUCT ZONE IMMEDIATELY BELOW, HVAC AND PLUMBING PIPING IN THE MIDDLE, CABLE TRAYS/CONDUITS ABOVE LIGHTING, AND THE LIGHTING ZONE IMMEDIATELY ABOVE THE CEILING. PROVIDE 6 INCHES MINIMUM CLEAR SPACE TO ALLOW THE RELOCATION OF LIGHT FIXTURES.
- I. INSTALL PIPING IN CONCEALED LOCATIONS, UNLESS OTHERWISE INDICATED AND EXCEPT IN EQUIPMENT ROOMS AND SERVICE AREAS. INSTALL PIPING TO PERMIT REMOVAL OF CEILING PANELS.
- J. INSTALL PIPING INDICATED TO BE EXPOSED AND PIPING IN EQUIPMENT ROOMS AND SERVICE AREAS AT RIGHT ANGLES OR PARALLEL TO BUILDING WALLS. DIAGONAL RUNS ARE PROHIBITED UNLESS SPECIFICALLY INDICATED OTHERWISE.
- K. RUN WATER BEARING PIPE IN HEATED SPACES (EXCLUDING DRAINAGE PIPING WHEN INSTALLED WITH SLOPE).
- L. MAINTAIN INDICATED FIRE RATING OF WALLS, PARTITIONS, CEILINGS, AND FLOORS AT PIPE PENETRATIONS. SEAL PIPE PENETRATIONS WITH UL LISTED FIRE STOP MATERIALS.
- M. BRANCH SHUT-OFF VALVES SHALL BE PROVIDED FOR ALL DOMESTIC WATER TAKEOFFS.
- N. INSTALL PIPING FREE OF SAGS AND BENDS.
- O. INSTALL FITTINGS FOR CHANGES IN DIRECTION AND BRANCH CONNECTIONS.
- P. INSTALL PIPING TO ALLOW APPLICATION OF INSULATION.
- Q. INSTALL COPPER WATER TUBE ACCORDING TO CDA'S "COPPER TUBE HANDBOOK" LATEST EDITION.
- R. INSTALL PVC SOIL AND WASTE DRAINAGE VENT PIPING ACCORDING TO ASTM D 2665.
- S. PROVIDE DIELECTRIC NIPPLES AT CONNECTIONS BETWEEN DISSIMILAR METALS. DIELECTRIC COUPLINGS OR UNIONS ARE NOT ACCEPTABLE.
- T. INSTALL EACH FIXTURE WITH TRAP, EASILY REMOVABLE FOR SERVICING AND CLEANING. FOR LAVATORIES AND SINKS SUBJECT TO ADA REQUIREMENTS, PROVIDE MANUFACTURED FORMED INSULATING JACKETS FOR ALL EXPOSED WASTES, P-TRAPS, AND WATER SUPPLY RISER FITTINGS AND PIPING.
- U. PROVIDE STAINLESS STEEL, BRAIDED, FLEXIBLE SUPPLIES TO FIXTURES WITH BALL-TYPE STOPS, REDUCERS, AND CHROME PLATED ESCUTCHEONS.
- V. INSTALL CHROME PLATED ESCUTCHEONS AT WALL, FLOOR, AND CEILING PENETRATIONS IN EXPOSED FINISHED LOCATIONS AND WITHIN CABINETS AND MILLWORK.
- W. PIPING ROUTING SHOWN IS EXPANDED FOR CLARITY. EXACT ROUTING MAY VARY TO ACCOMMODATE EQUIPMENT AND ACCESSIBILITY REQUIREMENTS.



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CONSTRUCTION
DOCUMENTS07.25.2025
PROJ# | YC ELECTIONS
DESIGNED BY | WHEAT
DRAWN BY | PIMLEY
REVIEWED BY | WHEAT
REVISIONS

PLUMBING DWV PLANS

P101

GENERAL PLUMBING NOTES

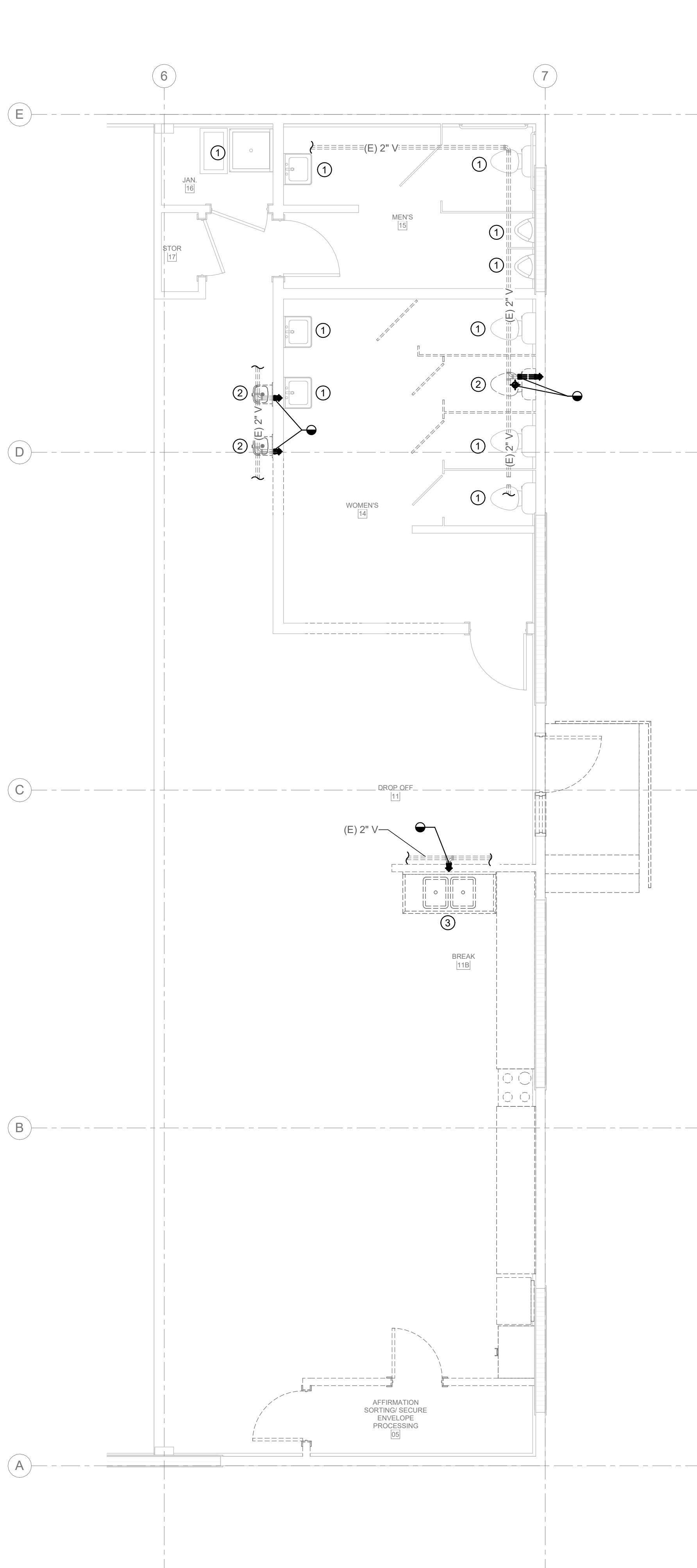
- A. REVIEW ARCHITECTURAL, STRUCTURAL, CIVIL, MECHANICAL, AND ELECTRICAL PLANS THOROUGHLY TO BECOME FAMILIAR WITH THIS PROJECT. ALL PLANS AND ALL SPECIFICATIONS COMPRISE ONE DOCUMENT OF WHICH THESE SHEETS ARE ONLY A PART.
- B. PIPING SHOWN IS DIAGRAMMATIC ONLY. ANY MAJOR DEVIATION FROM THESE PLANS SHOULD BE COORDINATED WITH THE ENGINEER OF RECORD BEFORE PROCEEDING.
- C. ALL NEW PIPING ON MAIN FLOOR SHALL BE CONCEALED IN WALLS, ABOVE CEILING, OR IN CRAWL SPACE UNLESS OTHERWISE NOTED ON THESE PLANS. COORDINATE ROUTING WITH OTHER DISCIPLINES.
- D. ALL WORK SHALL COMPLY WITH THE 2021 EDITION OF THE UPC, AND ALL APPLICABLE CODES OF LOCAL JURISDICTION.
- E. SLOPE SOIL PIPE 1/4" PER FOOT IN DIRECTION OF FLOW, UNLESS NOTED OTHERWISE ON PLANS. SLOPE VENT PIPE 1/8" PER FOOT BACK TO FIXTURES.
- F. ALL FLOOR/WALL PATCHING SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

1/P101 KEYNOTES

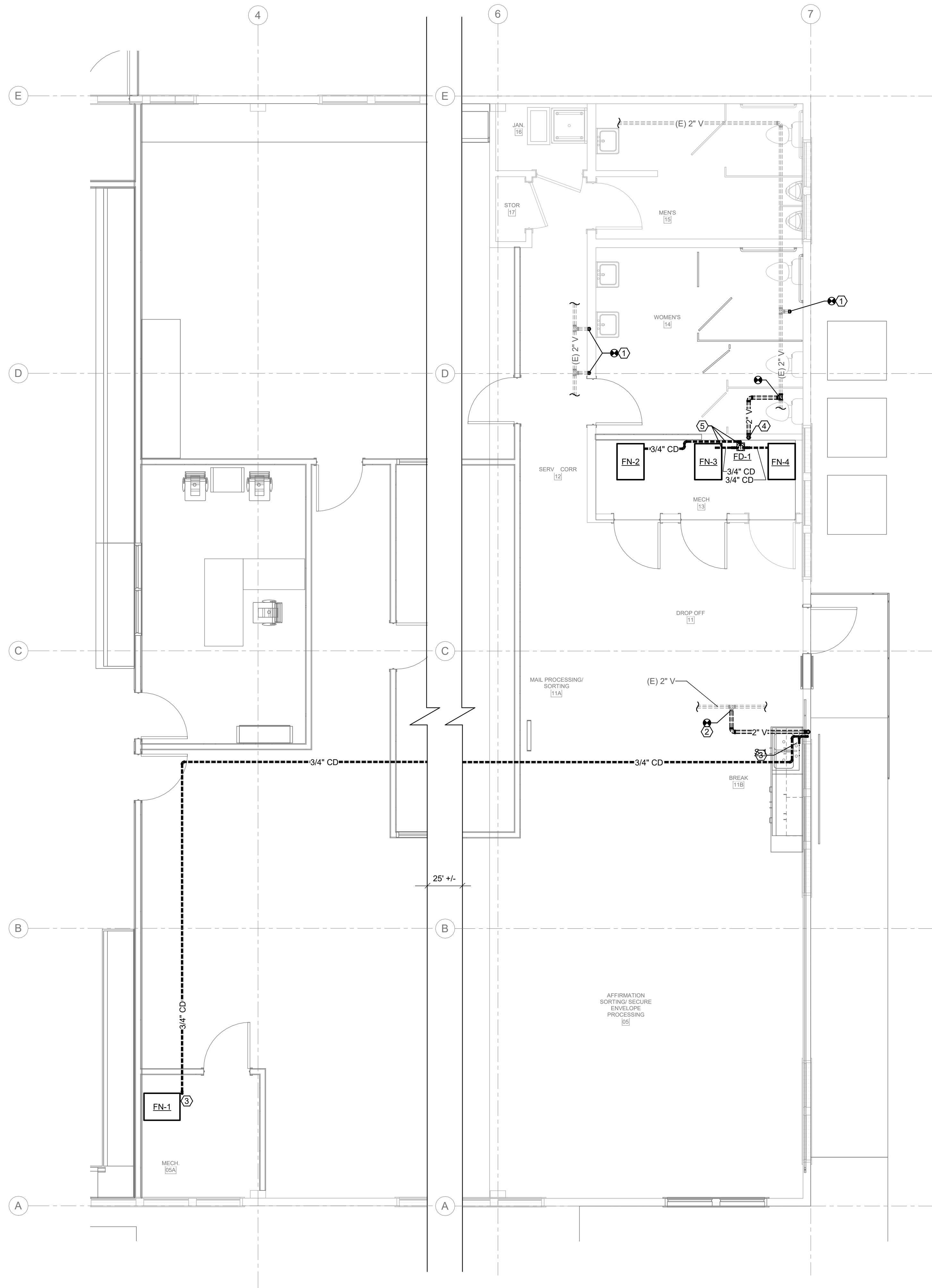
- ① EXISTING FIXTURE TO REMAIN.
- ② REMOVE FIXTURE AND ALL ASSOCIATED PIPING. CAP VENT LINE IN CEILING AND WASTE/SUPPLY LINES IN CRAWL SPACE WITHIN 1 FT. OF MAIN.
- ③ REMOVE FIXTURE. CAP VENT LINE IN CEILING SPACE. PREPARE SUPPLY AND WASTE PIPING CONNECTION IN CRAWLSPACE TO BE EXTENDED TO NEW SINK LOCATION.

2/P101 KEYNOTES

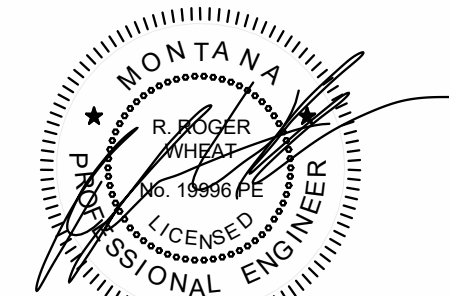
- ① CAP (TYP.)
- ② CONNECT VENT FROM NEW SINK TO EXISTING IN CEILING SPACE. CONNECT NEW 2" WASTE LINE BACK TO LOCATION OF EXISTING SINK IN CRAWLSPACE.
- ③ ROUTE 3/4" CONDENSATE DRAIN FROM CONDENSATE PUMP TO SINK TAILPIECE ADAPTER. CONDENSATE PUMP PROVIDED WITH FURNACE.
- ④ 2" V. FROM NEW FLOOR SINK. CONNECT TO EXISTING 2" V. IN CEILING SPACE. CONNECT WASTE IN CRAWLSPACE TO EXISTING WASTE LINE 2" OR GREATER IN SIZE.
- ⑤ ROUTE CONDENSATE LINE FROM FURNACE INDIRECT TO FLOOR DRAIN.

1 PLUMBING DWV DEMO PLAN
1/4" = 1'-0"

NORTH REF

2 PLUMBING DWV PLAN
1/4" = 1'-0"

NORTH REF



GENERAL PLUMBING NOTES

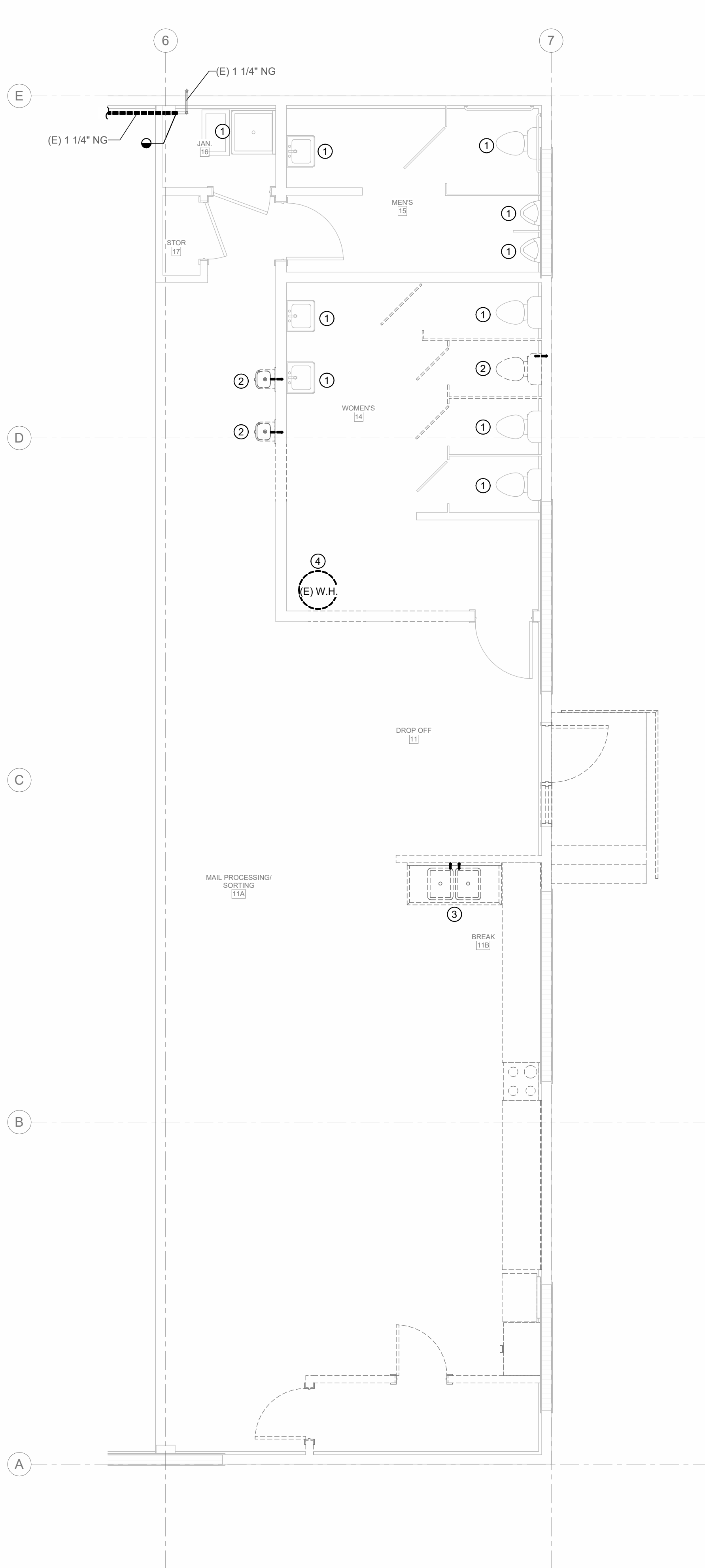
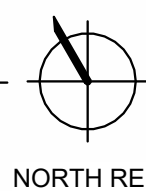
- A. REVIEW ARCHITECTURAL, STRUCTURAL, CIVIL, MECHANICAL, AND ELECTRICAL PLANS THOROUGHLY TO BECOME FAMILIAR WITH THIS PROJECT. ALL PLANS AND ALL SPECIFICATIONS COMPRISE ONE DOCUMENT OF WHICH THESE SHEETS ARE ONLY A PART.
- B. PIPING SHOWN IS DIAGRAMMATIC ONLY. ANY MAJOR DEVIATION FROM THESE PLANS SHOULD BE COORDINATED WITH THE ENGINEER OF RECORD BEFORE PROCEEDING.
- C. ALL NEW PIPING ON MAIN FLOOR SHALL BE CONCEALED IN WALLS, ABOVE CEILING, OR IN CRAWL SPACE UNLESS OTHERWISE NOTED ON THESE PLANS. COORDINATE ROUTING WITH OTHER DISCIPLINES.
- D. ALL WORK SHALL COMPLY WITH THE 2021 EDITION OF THE UPC, AND ALL APPLICABLE CODES OF LOCAL JURISDICTION.
- E. SLOPE SOIL PIPE 1/4" PER FOOT IN DIRECTION OF FLOW, UNLESS NOTED OTHERWISE ON PLANS. SLOPE VENT PIPE 1/8" PER FOOT BACK TO FIXTURES.
- F. ALL FLOOR/WALL PATCHING SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

1/P201 KEYNOTES

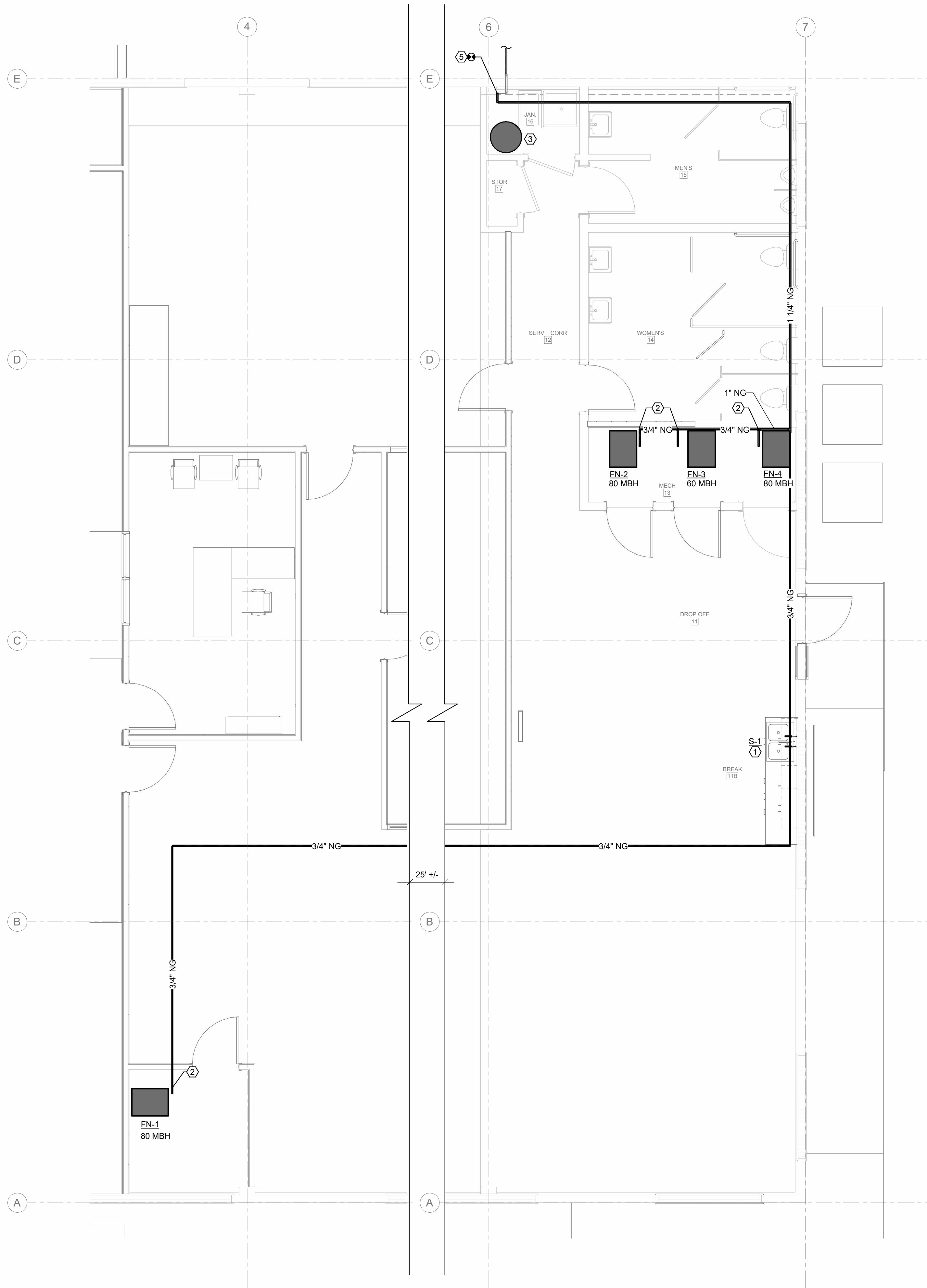
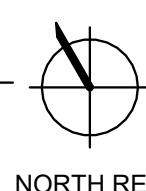
- ① EXISTING FIXTURE TO REMAIN.
- ② REMOVE FIXTURE AND ALL ASSOCIATED PIPING. CAP VENT LINE IN CEILING AND WASTE/SUPPLY LINES IN CRAWL SPACE WITHIN 1 FT. OF MAIN.
- ③ REMOVE FIXTURE. CAP VENT LINE IN CEILING SPACE. PREPARE SUPPLY AND WASTE PIPING CONNECTION IN CRAWLSPACE TO BE EXTENDED TO NEW SINK LOCATION.
- ④ REMOVE EXISTING ELECTRIC WATER HEATER AND ATTACHED PIPING. WATER HEATER TO BE RELOCATED TO JAN. RM 16. REMOVE SUPPLY LINES FROM WATER HEATER DOWN TO CRAWLSPACE AND PREPARE ENDS FOR RECONNECTION. PATCH FLOOR TO MATCH EXISTING.
- ⑤ REMOVE ALL GAS PIPING FROM UNIT HEATERS BACK TO POINT INDICATED AND PREPARE PIPING FOR NEW CONNECTION. SEE MECH. SHEET MD100 FOR UNIT HEATER LOCATIONS.

2/P201 KEYNOTES

- ① CONNECT VENT FROM NEW SINK TO EXISTING IN CEILING SPACE. CONNECT NEW 1/2" SUPPLY LINES AND 2" WASTE LINE BACK TO LOCATION OF EXISTING SINK IN CRAWLSPACE.
- ② 3/4" NG LINE DN. TO SERVE NEW FURNACE.
- ③ RELOCATED ELECTRIC WATER HEATER. ROUTE LINES DN. INTO CRAWLSPACE, OVER TO PREVIOUS LOCATION AND RECONNECT. PROVIDE CHECK VALVE ON CW SUPPLY TO WATER HEATER. PROVIDE AND INSTALL AMTROL ST-5 EXPANSION TANK DOWNSTREAM OF CHECK VALVE.

1 PLUMBING WATER DEMO PLAN
P201 1/4" = 1'-0"

NORTH REF

2 PLUMBING WATER AND GAS PLAN
P201 1/4" = 1'-0"

NORTH REF

GAS FURNACE SCHEDULE																			
TAG	MAKE / MODEL	CABINET WIDTH	ORIENTATION	BLOWER				GAS BURNER				REFRIGERANT COIL				ELECTRICAL		WEIGHT	NOTES
				AIRFLOW	FAN TYPE	EXTERNAL STATIC	VENTILATION	GAS	EFFICIENCY	CAPACITY CONTROL	INPUT	MAKE / MODEL	CAPACITY	REFRIGERANT	SOURCE	VOLTAGE - PHASE	MCA / MOCP		
FN-1	DAIKIN / DR92SN	21"	VERTICAL	1600 CFM	ECM	< 0.5 IN WC	160 CFM	NATURAL	92% AFUE	SINGLE STAGE	80 MBH	AHRI MATCH	4-TON	R-32	AC-1	120V - 1	16.7 / 25	141 LBS	1, 2, 3, 4, 5, 6
FN-2	DAIKIN / DR92SN	21"	VERTICAL	1600 CFM	ECM	< 0.5 IN WC	215 CFM	NATURAL	92% AFUE	SINGLE STAGE	80 MBH	AHRI MATCH	4-TON	R-32	AC-2	120V - 1	16.7 / 25	141 LBS	1, 2, 4, 5, 6
FN-3	DAIKIN / DR92SN	17"	VERTICAL	1200 CFM	ECM	< 0.5 IN WC	195 CFM	NATURAL	92% AFUE	SINGLE STAGE	60 MBH	AHRI MATCH	3-TON	R-32	AC-3	120V - 1	10.1 / 15	114 LBS	1, 2, 4, 5, 6
FN-4	DAIKIN / DR92SN	21"	VERTICAL	1600 CFM	ECM	< 0.5 IN WC	245 CFM	NATURAL	92% AFUE	SINGLE STAGE	80 MBH	AHRI MATCH	4-TON	R-32	AC-4	120V - 1	16.7 / 25	141 LBS	1, 2, 4, 5, 6
NOTES: 1) COMBINATION FURNACE, COIL, AND AIR CONDITIONER TO BE AHRI MATCH 2) PROVIDE SOUTHWARK METAL 36" BASE SUPPORT CAN WITH INTEGRAL 20"x25"x4" FILTER RACK, MERV 8 FILTERS, LINE SUPPORT CAN WITH 1" INTERNAL SOUND LINING 3) PROVIDE CONDENSATE PUMP, REFER TO PLUMBING DRAWINGS FOR CONDENSATE PIPE ROUTING 4) FURNACE COMBUSTION AIR AND VENT PIPING TO BE 3" SCHED 40 PVC, ROUTING PER PLANS, PROVIDE BIRD SCREEN ON PIPE TERMINATIONS 5) PROVIDE HONEYWELL TRUEZONE VENTILATION DAMPER ON OUTSIDE AIR DUCT CONNECTION, BALANCE AIRFLOW TO SPECIFIED VOLUME 6) FURNACE TO A HAVE FACTORY INTEGRAL A2L REFRIGERANT MITIGATION CONTROL STRATEGY																			

AIR CONDITIONER SCHEDULE												
TAG	MAKE / MODEL	NOMINAL CAPACITY	CAPACITY CONTROL	REFRIGERANT	FACTORY CHARGE	SEER2	ELECTRICAL		ELECTRICAL		WEIGHT	NOTES
							LIQUID LINE	VAPOR LINE	VOLTAGE - PHASE	MCA / MOCP		
AC-1	DAIKIN / DC4SQ	4-TON	SINGLE STAGE	R-32	91 OZ	14.5	SIZED AND ROUTED PER MFR		240V-1	25.2 / 40	211 LBS	1, 2, 3, 4, 5, 6, 7, 8
AC-2	DAIKIN / DC4SQ	4-TON	SINGLE STAGE	R-32	91 OZ	14.5	SIZED AND ROUTED PER MFR		240V-1	25.2 / 40	211 LBS	1, 2, 3, 4, 5, 6, 7, 8
AC-3	DAIKIN / DC4SQ	3-TON	SINGLE STAGE	R-32	69 OZ	15.2	SIZED AND ROUTED PER MFR		240V-1	17.8 / 30	158 LBS	1, 2, 3, 4, 5, 6, 7, 8
AC-4	DAIKIN / DC4SQ	4-TON	SINGLE STAGE	R-32	91 OZ	14.5	SIZED AND ROUTED PER MFR		240V-1	25.2 / 40	211 LBS	1, 2, 3, 4, 5, 6, 7, 8
NOTES: 1) UNIT TO BE MOUNTED ON 4" CONCRETE HOUSEKEEPING PAD, COORDINATE WITH GC 2) INSTALL UNIT OUTSIDE OF ROOF DRIP EDGE 3) FACTORY INSTALLED FILTER DRIER 4) HIGH PRESSURE SWITCH 5) FIELD INSTALLED LOW AMBIENT COOLING KIT 6) FIELD INSTALLED CRANKCASE HEATER 7) FIELD INSTALLED HARD START KIT 8) FREEZE PROTECTION KIT												

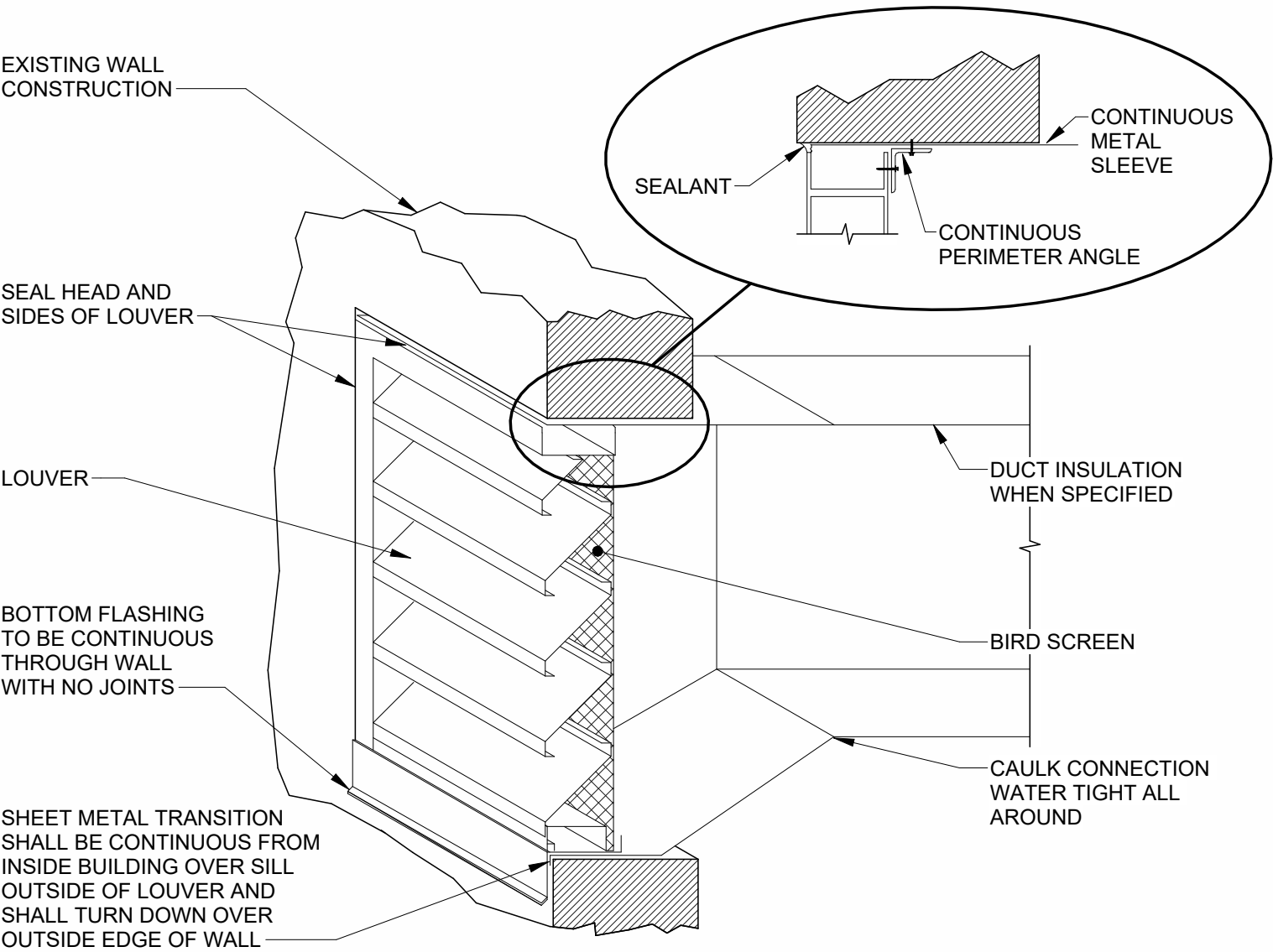
GRILLES, REGISTERS AND DIFFUSERS SCHEDULE															
PLAN CODE	MFGR	MODEL	FACE SIZE			NECK SIZE			MAX CFM	NOISE CRITERIA (NC)	TOTAL PRESSURE (IN WC)	STYLE	MATERIAL	FINISH	NOTES
			WIDTH	HEIGHT	Ø	WIDTH	HEIGHT	Ø							
S-1	PRICE	SDGE	14	8		12	6		200	--	0.06	DUCT	ALUMINUM	ANODIZED	2, 3
S-2	PRICE	SPD	24	24				10	290		0.05	LAY-IN CEILING	STEEL	WHITE	1
S-3	PRICE	SPD	12	12				8	210	17	0.15	LAY-IN CEILING	STEEL	WHITE	1
R-1	PRICE	PDR	24	24				12	530	--	0.01	LAY-IN CEILING	STEEL	WHITE	
R-2	PRICE	PDR	12	12				8	200	20	0.04	LAY-IN CEILING	STEEL	PRIMED	5
R-3	PRICE	530	32	24		30	22		1,600	20	0.04	SURFACE	STEEL	PRIMED	4, 5
NOTES: 1) FRAME STYLE 31 2) TYPE AS AIR SCOOP 3) DOUBLE DEFLECTION BLADES 4) 45 DEG DEFLECTION 5) PRIMED FINISH FOR FIELD PAINTING															

HVAC TEMPERATURE CONTROLS SCHEDULE						
TAG	MAKE	MODEL	SERVES / CONTROL	HEAT SOURCE	COOLING SOURCE	NOTES / SEQUENCE OF OPERATION
TS-1	HONEYWELL	T6 PRO WIFI	LOBBY	FN-1	AC-1	THERMOSTAT TO BE MOUNTED 44" AFF TO CENTER OF DEVICE, PROVIDE LOCKABLE CLEAR COVER ON THERMOSTAT. THERMOSTAT TO BE 7-DAY PROGRAMMABLE. CONNECTED EQUIPMENT 1-HEAT / 1-COOL. THERMOSTAT TO BE PROGRAMMED TO MATCH THE OWNERS BUILDING OCCUPANCY SCHEDULE. THERMOSTAT TO ENABLE HEATING OR COOLING TO MEET THE SPACE TEMPERATURE SETPOINT DURING OCCUPIED AND UNOCCUPIED PERIODS. DURING OCCUPIED PERIODS FAN TO BE ON, DURING UNOCCUPIED PERIODS FAN TO CYCLE WITH HEATING / COOLING DEMANDS. THERMOSTAT UNIVERSAL CONTACTS TO POWER NORMALLY CLOSED VENTILATION DAMPER OPEN DURING OCCUPIED PERIODS.
TS-2	HONEYWELL	T6 PRO WIFI	OFFICE / WORK	FN-2	AC-2	
TS-3	HONEYWELL	T6 PRO WIFI	TABULATION	FN-3	AC-3	
TS-4	HONEYWELL	T6 PRO WIFI	AFFIRMATION SORTING	FN-4	AC-4	

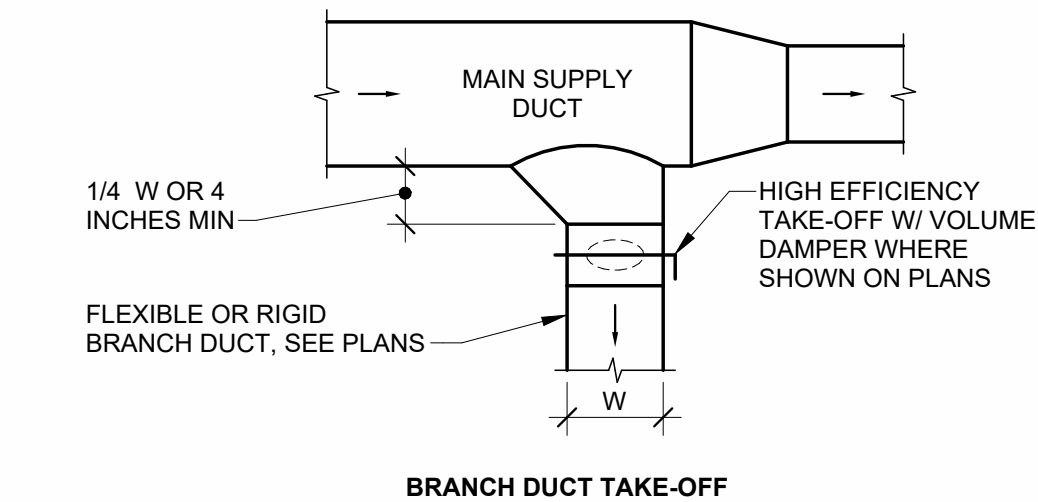
POWER VENTILATOR SCHEDULE										
PLAN CODE	MFGR	MODEL	DRIVE	CFM	ESP (IN WC)	MOTOR HP OR WATTS	POWER (V / PH / HZ)	TYPE	CONTROL	REMARKS
EF-1	PANASONIC	FV-30VQ3	DIRECT	210	0.25	62 W	115 / 1 / 60	CEILING	WITH LIGHTS	1, 2, 3, 4
EF-2	PANASONIC	FV-30VQ3	DIRECT	210	0.25	62 W	115 / 1 / 60	CEILING	WITH LIGHTS	1, 2, 3, 4
NOTES: 1) INSULATE DISCHARGE EXHAUST DUCT TO EXTERIOR PENETRATION 2) INTEGRAL BACKDRAFT DAMPER 3) ADJUST MANUAL VOLUME DAMPER TO MAKE SCHEDULED AIRFLOW 4) PROVIDE METAL WALL CAP WITH BACKDRAFT DAMPER AND BIRD SCREEN AT DUCT TERMINATION										

LOUVER SCHEDULE											
PLAN CODE	MFGR	MODEL	SERVICE	FRAME TYPE	FREE AREA (SF)	SIZE (IN) WIDTH HEIGHT	CFM	VELOCITY (FPM)	APD (IN WC)	MATERIAL	REMARKS
L-1	RUSKIN	ELF6375X	INTAKE	STANDARD	1.24	20 20	655	529	0.04	ALUMINUM	1, 2, 3
NOTES: 1) FACTORY COLOR TO BE SELECTED BY ARCHITECT 2) BIRDSCREEN 3) SEE SPECIFICATION SECTION 089119											

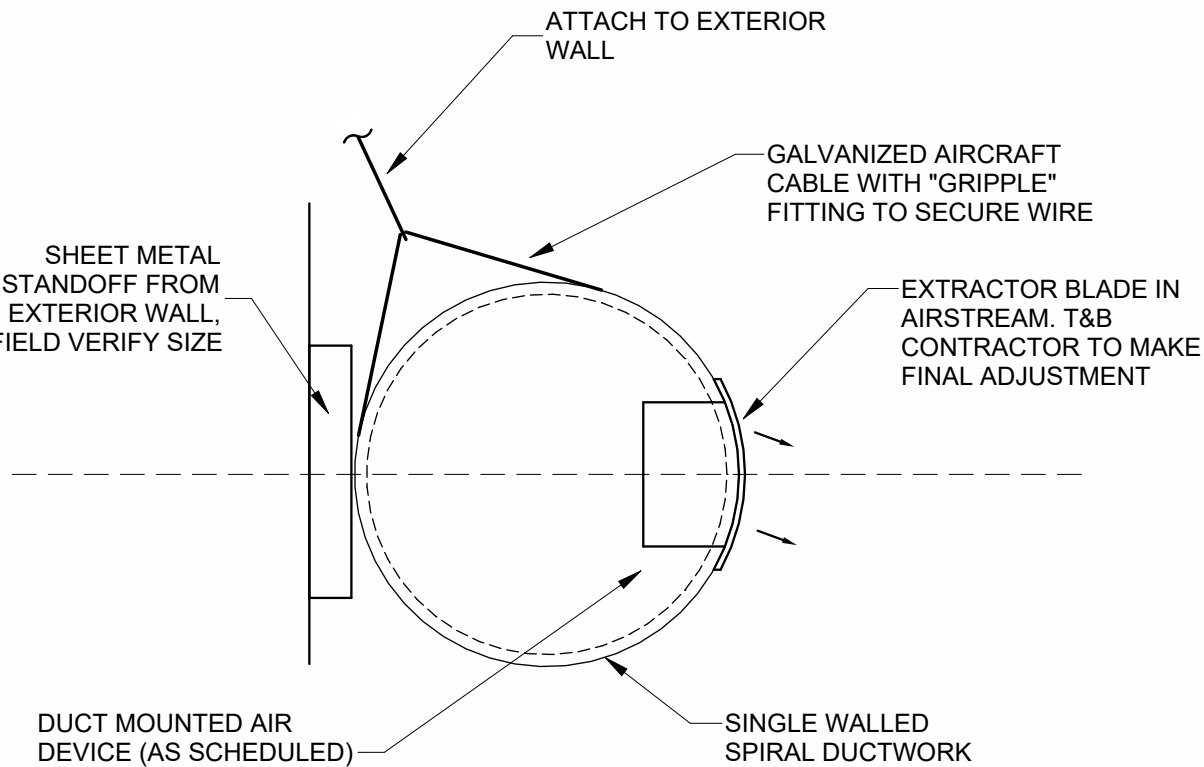
ELECTRIC HEATER SCHEDULE						
PLAN CODE	MFGR	MODEL	WATTS	POWER (V / PH / HZ)	SERVES	NOTES
EH-1	KING	PAW	1,500	120 / 1 / 60	WOMENS RESTROOM	1, 2, 3, 4
EH-2	KING	PAW	1,500	120 / 1 / 60	MENS RESTROOM	1, 2, 3, 5
NOTES: 1) WHITE COLOR 2) UNIT MOUNTED THERMOSTAT 3) MANUFACTURER DISCONNECT 4) RECESSED MOUNTED 5) SURFACE MOUNTED						



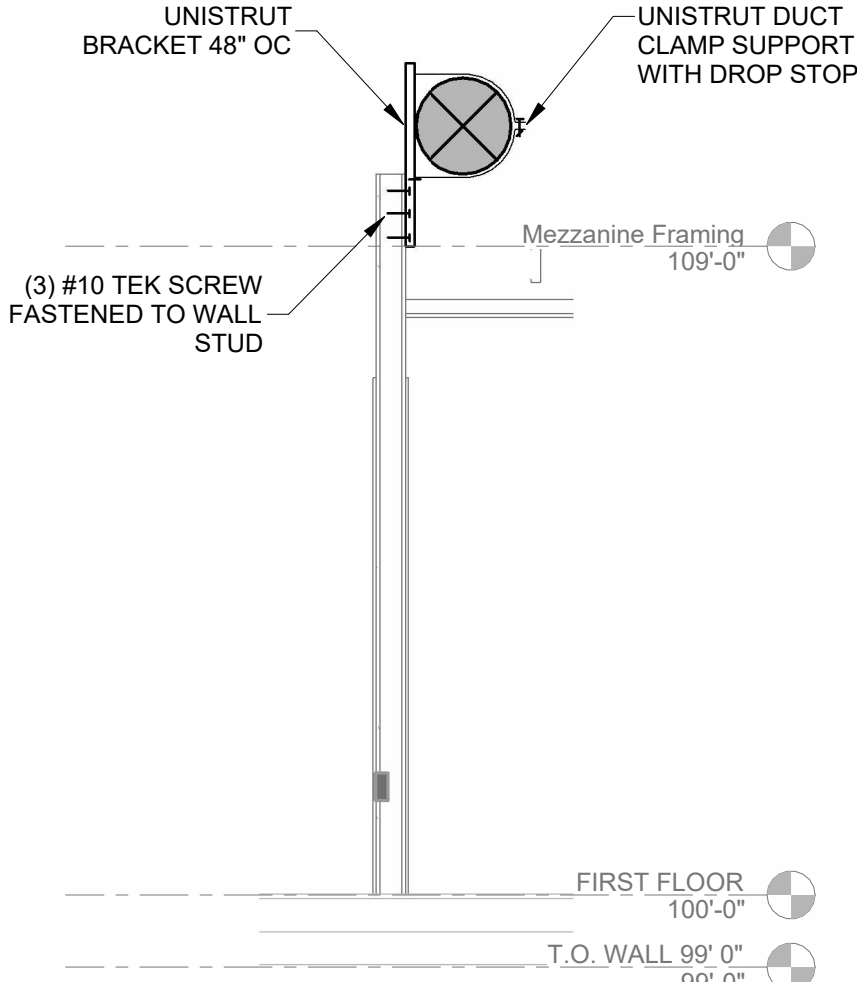
1 LOUVER INSTALLATION DETAIL
M001 NOT TO SCALE



2 BRANCH DUCT DETAIL
M001 NOT TO SCALE



3 EXPOSED ROUND DUCTWORK DETAIL
M001 NOT TO SCALE



4 DUCT SUPPORT SECTION
M001 3/8" = 1'-0"

HVAC SHEET INDEX

M001	HVAC SCHEDULES & LEGENDS
M100	HVAC PLANS

MECHANICAL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
RS	REFRIGERANT SUCTION LINE		ACOUSTICALLY LINED SHEET METAL DUCT
RL	REFRIGERANT LIQUID LINE		MANUAL BALANCING DAMPER
○	ELBOW UP		MOTORIZED DAMPERS
→	ELBOW DOWN		TURNING VANE ELBOW
⊕	THERMOSTAT/TEMPERATURE SENSOR		HIGH EFFICIENCY BRANCH TAKE-OFF HETO* WITH VOLUME DAMPER & FLEXIBLE DUCT
S-1 (PLAN CODE) 200 (CFM)	SUPPLY DIFFUSER, 4-WAY THROW UNLESS INDICATED OTHERWISE (W/ FLEXIBLE DUCT)		HIGH EFFICIENCY BRANCH TAKE-OFF HETO* WITH VOLUME DAMPER & RIGID DUCT
R-1 (PLAN CODE) 200 (CFM)	RETURN GRILLE		
E-1 (PLAN CODE) 200 (CFM)	EXHAUST GRILLE (W/ RIGID BRANCH DUCT)		

HVAC ABBREVIATIONS

%	PERCENT	MAX	MAXIMUM
ACFM	ACTUAL CFM	MBH	BTU PER HOUR (THOUSAND)
AFF	ABOVE FINISHED FLOOR	MC	MECHANICAL CONTRACTOR
AHU	AIR HANDLING UNIT	MIN	MINIMUM
AMP	AMPERE (AMP, AMPS)	N/A	NOT APPLICABLE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	NC	NORMALLY CLOSED
APD	AIR PRESSURE DROP	NIC	NOT IN CONTRACT
APPROX	APPROXIMATE	NO	NORMALLY OPEN
BHP	BRAKE HORSEPOWER, BOILER HORSEPOWER	NO	NUMBER
BOD	BOTTOM OF DUCT	NTS	NOT TO SCALE
BTU	BRITISH THERMAL UNIT	OA	OUTSIDE AIR
C	COMMON	OBD	OPPOSED BLADE DAMPER
CFM	CUBIC FEET PER MINUTE	OD	OUTSIDE DIAMETER
COD	CENTER OF DUCT	PD	PRESSURE DROP
CU FT	CUBIC FEET	PH	PHASE (ELECTRICAL)
CU IN	CUBIC INCH	PSI	POUNDS PER SQUARE INCH
DB	DECIBEL	PSIA	PSI ABSOLUTE
DBT	DRY-BULB TEMPERATURE	PSIG	PSI GAUGE
DIA	DIAMETER	R/O	RUN OUT
EAT	ENTERING AIR TEMPERATURE	RA	RETURN AIR
EC	ELECTRICAL CONTRACTOR	RH	RELATIVE HUMIDITY
EDR	EQUIVALENT DIRECT RADIATION	RPM	REVOLUTIONS PER MINUTE
EWT	ENTERING WATER TEMPERATURE	SA	SUPPLY AIR
EXP	EXPANSION	SCFM	CFM, STANDARD CONDITIONS
F	FAHRENHEIT	SH	SENSIBLE HEAT
FPM	FEET PER MINUTE	SP	STATIC PRESSURE
FPS	FEET PER SECOND	SP VOL	SPECIFIC VOLUME
FT	FOOT OR FEET	SPEC	SPECIFICATION
GA	GAGE OR GUAGE	STD	STANDARD
GAL	GALLONS	SUCT	SUCTION
GC	GENERAL CONTRACTOR	T STAT	THERMOSTAT
GPD	GALLONS PER DAY	TC	TEMPERATURE CONTROL
GPH	GALLONS PER HOUR	TD	TEMPERATURE DIFFERENCE
GPM	GALLONS PER MINUTE	TEMP	TEMPERATURE
HD	HEAD	TOD	TOP OF DUCT
HGT	HEIGHT	TONS	TONS OF REFRIGERATION
HP	HORSEPOWER	V	VOLT
HZ	FREQUENCY	VAC	VACUUM
ID	INSIDE DIAMETER	VAV	VARIABLE AIR VOLUME
KW	KILOWATT	VEL	VELOCITY
KWH	KILOWATT HOUR	VFD	VARIABLE FREQUENCY DRIVE
LAT	LEAVING AIR TEMPERATURE	VOL	VOLUME
LBS	POUNDS	W/	WITH
LF	LINEAR FEET	WPD	WATER PRESSURE DROP
LWT	LEAVING WATER TEMPERATURE		

Cushing Terrell

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YELLOWSTONE COUNTY
ELECTIONS OFFICES - CEDAR HALL RENOVATION



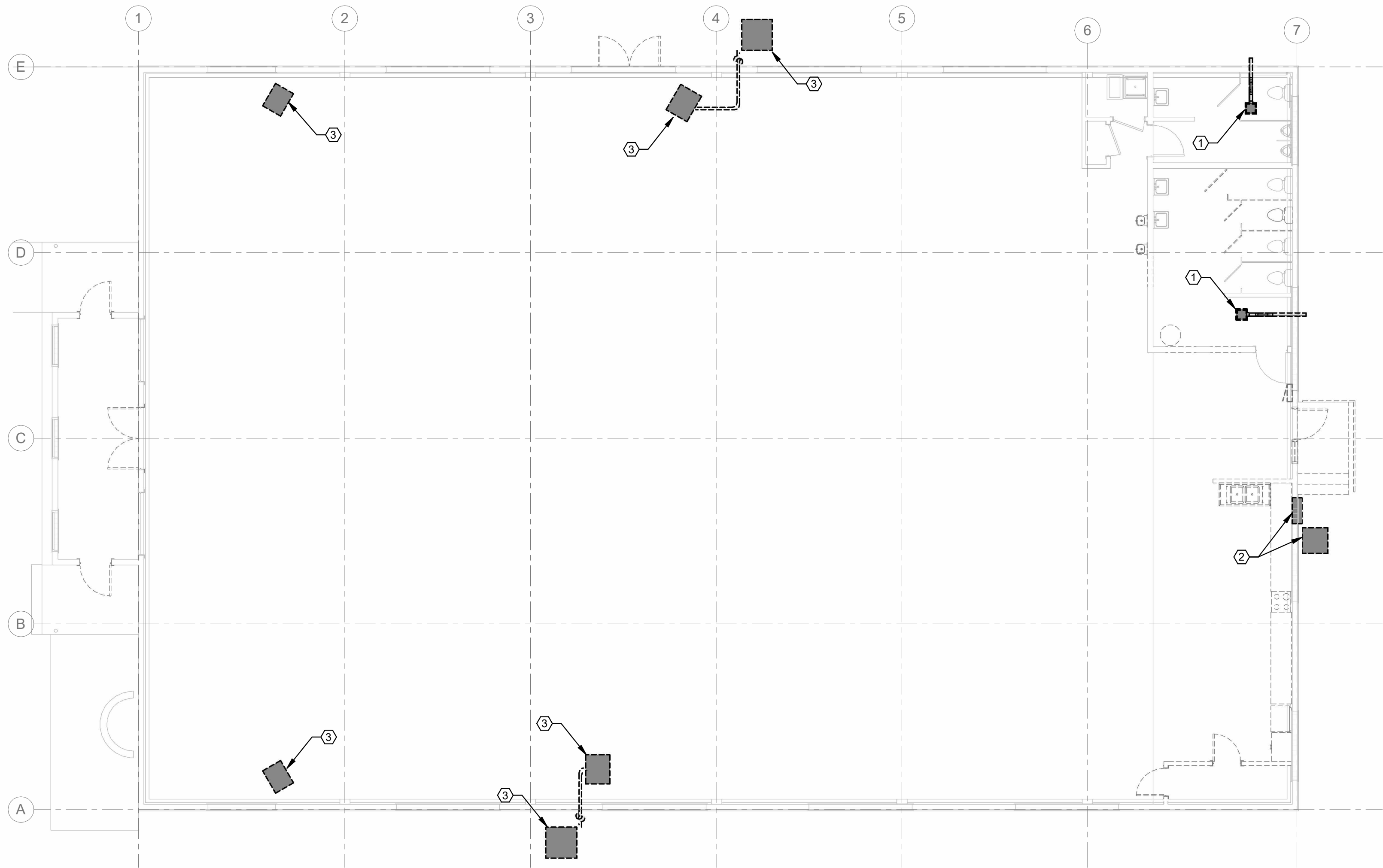
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CONSTRUCTION DOCUMENTS

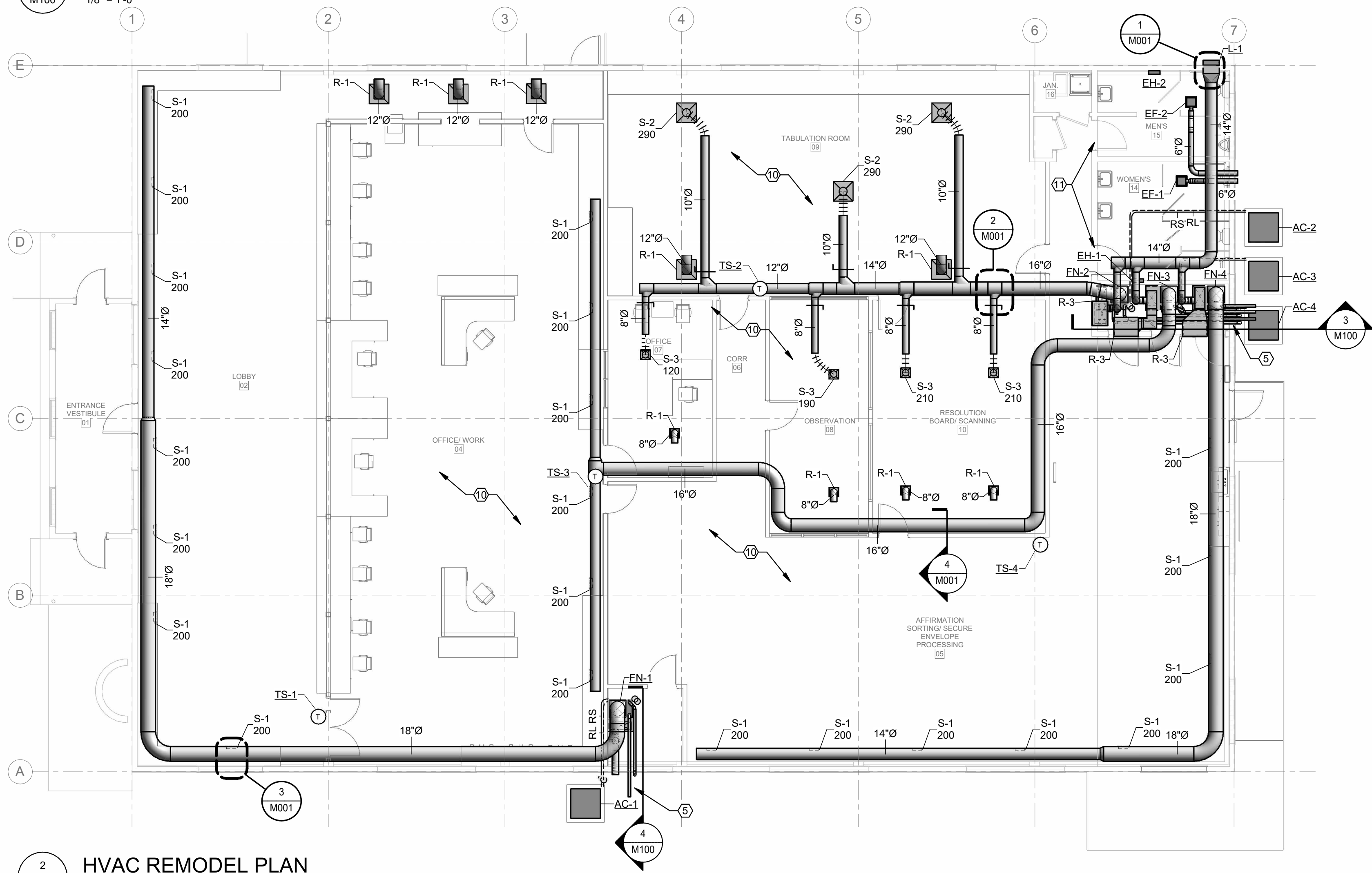
07.25.2025
PROJ# | YC_ELECTIONS
DESIGNED BY | WOLSTEIN
DRAWN BY | WOLSTEIN
REVIEWED BY | NICHOLS-PAGEL
REVISIONS

HVAC SCHEDULES & LEGENDS

M001



1 HVAC DEMOLITION PLAN
1/8" = 1'-0"



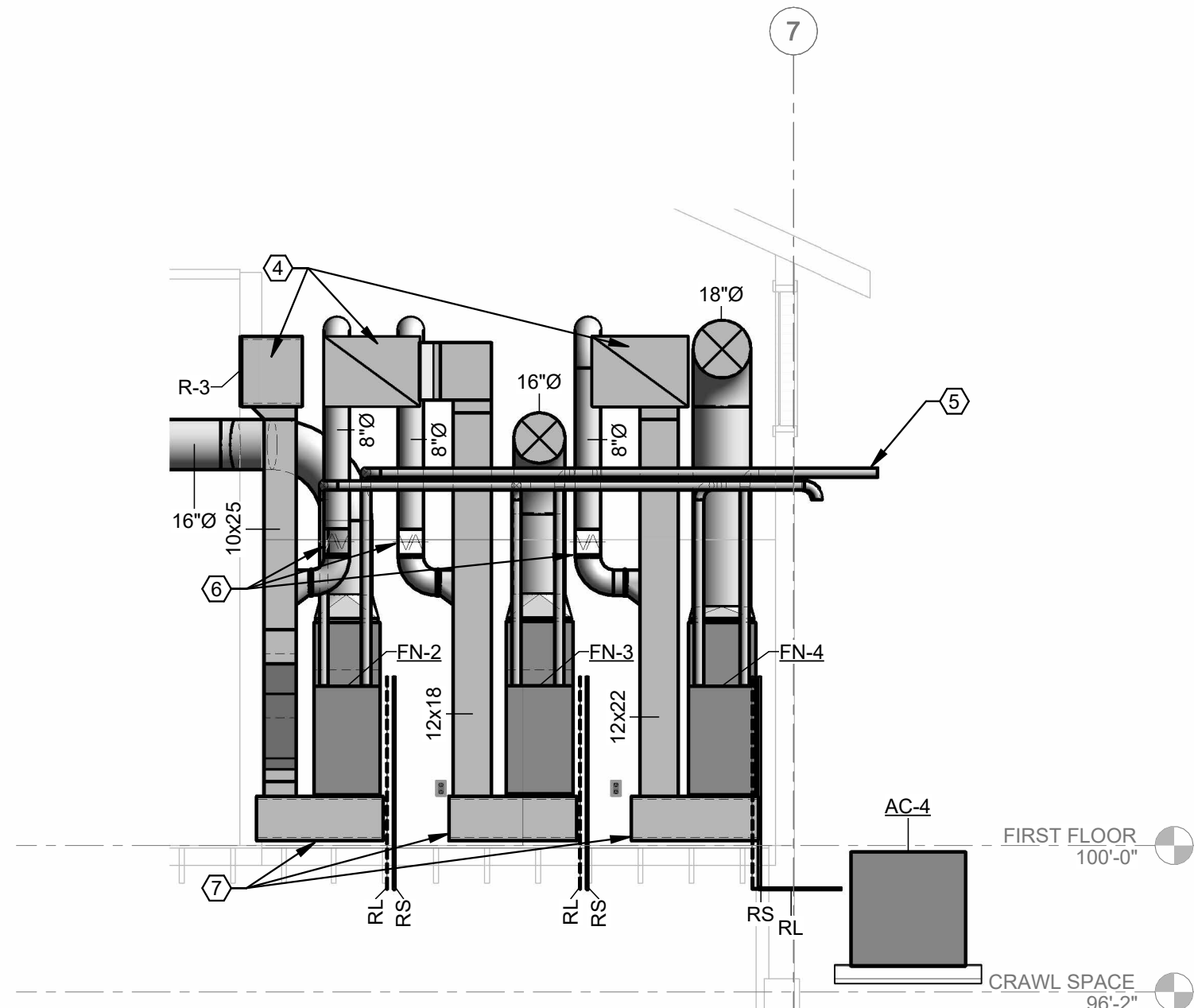
2 HVAC REMODEL PLAN
1/8" = 1'-0"

GENERAL NOTES

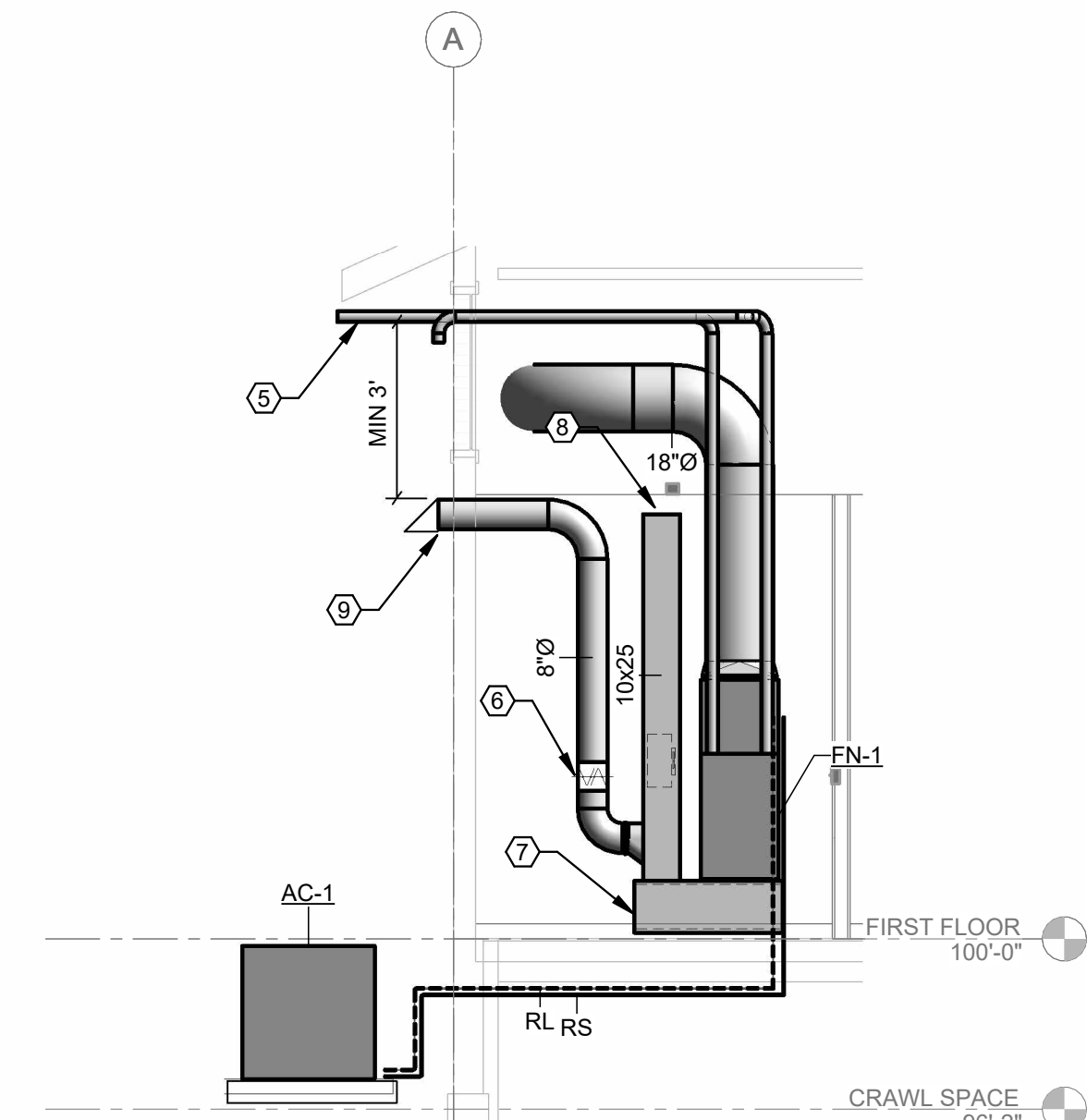
- ALL HVAC SYSTEMS ARE TO BE CONSTRUCTED AND INSTALLED PER 2021 INTERNATIONAL MECHANICAL CODE AND LOCAL CODE STANDARDS.
- DRAWING DISPLAYS INFORMATION SCHEMATICALLY AND MAY NOT IDENTIFY ALL SYSTEMS, COMPONENTS, OR MATERIALS REQUIRED TO COMPLETE THE WORK. CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING ALL MATERIALS AND SERVICES TO COMPLETE A FUNCTIONING HVAC SYSTEM THAT MEETS THE INTENT OUTLINED IN THESE DRAWINGS.
- THESE DRAWINGS REPRESENT GENERAL ROUTING OF PIPE AND DUCTING SCHEMATICALLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY THE FINAL LOCATION OF ALL INFRASTRUCTURE THAT DOES NOT COMPROMISE THE PERFORMANCE OUTLINED IN THESE DRAWINGS. THE CONTRACTOR IS TO PROVIDE GOOD WORKMANSHIP AND USE INDUSTRY CONSTRUCTION STANDARDS FOR ALL PHASES OF THE PROJECT.
- CONTRACTOR IS TO COORDINATE WITH OTHER TRADES TO AVOID CONFLICTS WITH OTHER SYSTEMS, COMPONENTS, AND MATERIALS IN OTHER CONTRACTOR'S SCOPE OF WORK.
- ALL EQUIPMENT TO BE INSTALLED PER MANUFACTURER'S WRITTEN INSTRUCTION. MAINTAIN SPECIFIED SERVICE CLEARANCES.

KEYNOTES

- REMOVE EXISTING EXHAUST FAN AND CONNECTED DUCTWORK TO BUILDING EXTERIOR. PATCH AND REPAIR ENVELOPE AS DETAILED ON ARCHITECTURAL PLANS.
- REMOVE EXISTING FAN AND SWAMP COOLER. PATCH AND REPAIR ENVELOPE AS DETAILED ON ARCHITECTURAL PLANS.
- REMOVE EXISTING UNIT HEATER / FAN COIL / AIR CONDITIONER AND ASSOCIATED INFRASTRUCTURE. PATCH AND REPAIR PIPING PENETRATIONS AND ROOF FLUE PIPE PENETRATIONS AS DETAILED ON ARCHITECTURAL PLANS.
- PROVIDE 1" INTERNAL SOUND LINING IN RETURN CAN.
- EXTEND FURNACE VENT TERMINATION BEYOND ROOF LINE WITH BIRD SCREEN. FURNACE INTAKE TO TERMINATE WITH LONG SWEEP 90 DEG WITH BIRD SCREEN.
- MOTORIZED VENTILATION DAMPER.
- PROVIDE 1" INTERNAL SOUND LINING IN BASE SUPPORT CAN. ELEVATE BASE SUPPORT CAN WITH INTEGRAL FILTER RACK ON CORK VIBRATION ISOLATION PADS AT EACH CORNER.
- OPEN ENDED RETURN DUCT WITH ELEVATION 6" BELOW ADJACENT WALL HEIGHT.
- PROVIDE METAL INTAKE WALL CAP WITH BIRD SCREEN AT OUTSIDE AIR INTAKE. INTAKE TO BE A MINIMUM 3' BELOW FURNACE VENT TERMINATION.
- DUCTWORK ROUTED AROUND BUILDING INTERIOR IS TO BE ROUTED ADJACENT TO AND SUPPORTED BY INTERIOR WALL FRAMING. BRANCH DUCTING TO BE SUPPORTED BY FRAMING HOLDING UP SUSPENDED CEILING.
- CUT UP DOOR 3/4" TO ALLOW AIR PASSAGE TO RESTROOM.



3 MECHANICAL ROOM SECTION 1
1/4" = 1'-0"

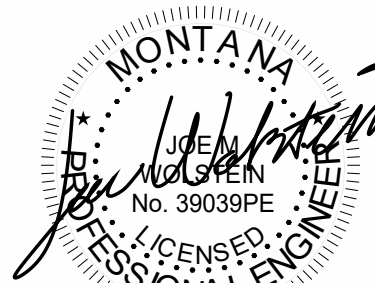


4 MECHANICAL ROOM SECTION 2
1/4" = 1'-0"

Cushing
Terrell

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YELLOWSTONE COUNTY
ELECTIONS OFFICES - CEDAR HALL RENOVATION



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CONSTRUCTION
DOCUMENTS

07.25.2025
PROJ# IYC ELECTIONS
DESIGNED BY I WOLSTEIN
DRAWN BY I WOLSTEIN
REVIEWED BY I NICHOLS-PAGEL
REVISIONS

HVAC PLANS

M100

Diagram illustrating the minimum clearances for the installation of a range hood, showing the relationship between the Finished Floor, the Hood, and the Finished Ceiling.

Minimum Clearances:

- 1'-6" (18") from Finished Floor to the bottom of the hood.
- 44" from Finished Floor to the bottom of the hood's upper section.
- 80" Minimum from the bottom of the hood to the Finished Ceiling.
- 4" Minimum from the hood's upper section to the Finished Ceiling.
- 1'-6" (18") Minimum from the bottom of the hood to the top of the range hood's control panel.
- 74" from the top of the hood to the Finished Ceiling.

Labels and Notes:

- BOD:** Bottom of Device
- COD:** Control of Device
- AC:** Above Counter, Minimum 4" Above Backsplash to Bottom of Device.
- 48" TOD is Acceptable for CMU Block Construction.**
- Panel Board:** Panel Board
- Mount 4" Above Door Frame**
- 1'-6" Min. in Hazardous Locations to Bottom of Can**
- 80" Aff. to Bottom of Device or 6" Below Ceiling to Top of Device Whichever is Lower**

LIGHTING		ABBREVIATIONS AND MISCELLANEOUS	
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	LAY-IN OR RECESSED FIXTURE, SIZE ON PLANS	AC	ABOVE COUNTER, 4" BACK SPLASH
	WALL MOUNTED FIXTURE, SIZE ON PLANS	ATS	AUTOMATIC TRANSFER SWITCH
	SURFACE MOUNTED FIXTURE, SIZE ON PLANS	AFG	ABOVE FINISHED GRADE
	PENDANT OR SURFACE MOUNTED FIXTURE, SIZE ON PLANS	AFF	ABOVE FINISHED FLOOR
	PENDANT MOUNTED FIXTURE, SIZE ON PLANS	BLG	BELOW GRADE
	SHADED FIXTURE INDICATES FIXTURE IS UNSWITCHED AND ALSO INDICATES EMERGENCY POWER.	BOD	BOTTOM OF DEVICE
	RECESSED DOWNLIGHT FIXTURE	C	CONDUIT
	SURFACE MOUNTED FIXTURE	CAS	CARD ACCESS SYSTEM
	WALL MOUNTED FIXTURE	CCTV	CLOSED CIRCUIT TV
	WALL WASH OR DIRECTIONAL FIXTURE	CLG	CEILING
	WALL SCONCE FIXTURE	COD	CENTER OF DEVICE
	TRACK FIXTURE, SEE PLAN FOR SIZE AND HEADS	CU	COPPER
	CEILING FAN FIXTURE	DVR	DIGITAL VIDEO RECORDER
	CEILING MOUNTED, WALL MOUNTED EXIT LIGHT (W/ DIRECTIONAL ARROWS)	(E)	EXISTING
	1 HEAD REMOTE EMERGENCY LIGHT	EC	ELECTRICAL CONTRACTOR
	2 HEAD EMERGENCY LIGHT BATTERY PACK	EF	EXHAUST FAN
	1 HEAD REMOTE EMERGENCY LIGHT BATTERY PACK	GC	GENERAL CONTRACTOR
	2 HEAD LIGHT WITH MOTION SENSOR	GND	GROUND
	SQUARE POLE MOUNTED FIXTURE, EXTERIOR	LSI	FIELD ADJUSTABLE LONG TIME, SHORT TIME AND INSTANTANEOUS
	ROUND POLE MOUNTED FIXTURE, EXTERIOR	LSIG	FIELD ADJUSTABLE LONG TIME, SHORT TIME, INSTANTANEOUS AND GROUND FAULT
	POST TOP FIXTURE, EXTERIOR	MC	MECHANICAL CONTRACTOR
	BOLLARD FIXTURE, EXTERIOR	NEW	NEW
	DIRECTIONAL INGROUND FIXTURE, EXTERIOR	NL	NIGHT LIGHT
		PTZ	PAN-TILT-ZOOM
		QTY	QUANTITY
		(R)	RELOCATED
		SF	SURFACE
		TBB	TELECOMMUNICATIONS BONDING BACKBONE
		TC	TEMPERATURE CONTROL CONTRACTOR
		TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUS BAR
		TTB	TELEPHONE TERMINAL BOARD
		TYP	TYPICAL
		UG	UNDERGROUND
		UON	UNLESS OTHERWISE NOTED
		W/	WITH
		WM	WIRE MOLD
		WP	WEATHER PROOF (WHILE IN USE)
		XFMR	TRANSFORMER
		a,b,c etc	SWITCH DESIGNATION
		BN1L-2,4,6	CIRCUIT DESIGNATION, PANEL BN1L, CIRCUITS 2,4,6
		1/E501	INDICATES DETAIL 1 ON SHEET E501
		(#)	SHEET WORK NOTE
		(#)	SHEET DEMO WORK NOTE
			HOME RUN TO PANEL
			CONDUIT CONCEALED IN CEILING OR WALL
			CONDUIT CONCEALED UNDER FLOOR
			LOW VOLTAGE CIRCUIT
			FIBER OPTIC CABLE
			CABLE TRAY
			CIRCUIT, NUMBER OF HASH MARKS INDICATES NUMBER OF CONDUCTORS IN CABLE/RACEWAY. GROUND WIRE IS NOT SHOWN BUT SHALL BE INCLUDED. NO HASH MARKS INDICATES 2 CONDUCTORS PLUS GROUND.

SYMBOL	DESCRIPTION
	SWITCH - SPST
	2 SINGLE POLE, DOUBLE THROW
	3 THREEWAY
	4 FOURWAY
	K KEY OPERATED
	P PILOT LIGHT
	WP WEATHERPROOF
	OS OCCUPANCY SENSOR
	D DIMMER
	MC SPOT-MOMENTARY CONTACT
	LV LOW VOLTAGE
	T TIMER SWITCH
	TS TEST SWITCH
	OCCUPANCY SENSOR (CEILING) - SUBSCRIPT IS TYPE
	RECEPTACLE - SIMPLEX
	RECEPTACLE - DUPLEX, MOUNTING IN CEILING GFI RECEPTACLE - DUPLEX, MOUNTING IN CEILING
	RECEPTACLE - DUPLEX USB DEVICE RECEPTACLE W/ USB & USB-C PORTS DC DROP CORD
	WP WEATHERPROOF COVER & WEATHER RESISTANT RECEPTACLE
	TR TAMPER RESISTANT S SURGE PROTECTED IG ISOLATED GROUND
	FILLED CENTER INDICATES HOSPITAL GRADE EMERGENCY RECEPTACLE
	RECEPTACLE - DUPLEX WITH TOP HALF CONTROLLED AND PERMANENTLY MARKED "CONTROLLED"
	- SAME INDICATORS AS SHOWN FOR DUPLEX RECEPTACLE
	GFI RECEPTACLE - DUPLEX (GROUND FAULT INTERRUPT) - SAME INDICATORS AS SHOWN FOR DUPLEX RECEPTACLE
	RECEPTACLE - DOUBLE DUPLEX GFI RECEPTACLE - DOUBLE DUPLEX
	- SAME INDICATORS AS SHOWN FOR DUPLEX RECEPTACLE
	RECEPTACLE - DOUBLE DUPLEX WITH TOP HALF CONTROLLED AND PERMANENTLY MARKED "CONTROLLED"
	- SAME INDICATORS AS SHOWN FOR DUPLEX RECEPTACLE
	RECEPTACLE - 208V
	R RANGE - NEMA 14-50R D DRYER - NEMA 14-30R W WELDER - NEMA 14-50R * NEMA CONFIGURATION AS NOTED
	208V RECEPTACLE IN RECESSED FLOORBOX
	DUPLEX RECEPTACLE/GFI IN RECESSED FLOORBOX - SAME INDICATORS AS SHOWN FOR DUPLEX RECEPTACLE
	DOUBLE DUPLEX RECEPTACLE/GFI IN RECESSED FLOORBOX - SAME INDICATORS AS SHOWN FOR DUPLEX RECEPTACLE
	J-BOX - BOX INDICATES FLOOR MOUNTING -4"x4"x2-1/8" DEEP UNLESS OTHERWISE NOTED
	POWER POLE
	THERMOSTAT/TEMPERATURE SENSOR BY MC OR TC, J-BOX AND CONDUIT TO CEILING BY EC
	CARBON MONOXIDE DETECTOR BY MC, J-BOX & CONDUIT TO CEILING BY EC
	MANUAL MOTOR DISCONNECT/STARTER SWITCH
	EMERGENCY PUSHBUTTON
	RELAY
	PHOTOCELL, PHOTOCELL WALL MOUNTED
	SPECIAL PURPOSE CONNECTION - BOX INDICATES FLOOR MOUNTING - WORK AS NOTED
	ELECTRIC MOTOR CONNECTION
	COMBINATION STARTER/DISCONNECT SWITCH
	DISCONNECT SWITCH
	CONTACTOR
	CIRCUIT BREAKER
	VARIABLE FREQUENCY DRIVE
	CONTROL PANEL
	LRP LIGHTING RELAY PANEL TCP TEMPERATURE CONTROL PANEL GAP GENERATOR ANNUNCIATOR PANEL PACP PA CONTROL PANEL MGA MED GAS ALARM PANEL
	TIME CLOCK
	EXISTING PANELBOARD, SURFACE MOUNTED
	EXISTING PANELBOARD, FLUSH MOUNTED
	PANELBOARD, SURFACE MOUNTED
	PANELBOARD, FLUSH MOUNTED
	ELECTRIC METER, BUILDING MOUNTED
	TRANSFORMER, INTERIOR
	TRANSFORMER, EXTERIOR

CONTROL EQUIPMENT SCHEDULE																
NOTES: 1) NONE		*ALL COMB FVNR STARTERS SHALL HAVE HOA AND (2) N/O AUX CONTACTS. *SIZE FUSES PER MANUFACTURERS RECOMMENDATIONS IF OTHER THAN SPECIFIED.						SCHEDULE ABBREVIATIONS: NF = NON-FUSIBLE F = FUSIBLE (60A/2P = 60 AMP, 2 POLE FUSIBLE) COMB FVNR = COMBINATION FULL LOAD NON-REVERSING MC = MECHANICAL CONTRACTOR				EC = ELECTRICAL CONTRACTOR TC = TEMPERATURE CONTROL CONTRACTOR CB = ENCLOSED CIRCUIT BREAKER				
UNIT	ITEMS BY OTHERS						ITEMS BY ELECTRICAL CONTRACTOR						CONTROL DEVICES	INSTALLED BY	FURNISHED BY	NOTES
	DESCRIPTION	VOLTAGE	PHASE	FLA	MCA	KVA	STARTER			DISCONNECT						
							DESCRIPTION	NEMA ENCLOSURE	MOCP	DESCRIPTION	NEMA ENCLOSURE	MOCP				
AC-1	AIR CONDITIONER	240 V	1	20.2 A	25.2A	4.84	INTEGRAL TO UNIT	-	-	60A 2P - FUSED	3R	40	T-STAT	TC	TC	
AC-2	AIR CONDITIONER	240 V	1	20.2 A	25.2A	4.84	INTEGRAL TO UNIT	-	-	60A 2P - FUSED	3R	40	T-STAT	TC	TC	
AC-3	AIR CONDITIONER	240 V	1	14.2 A	17.8A	3.42	INTEGRAL TO UNIT	-	-	30A 2P - FUSED	3R	30	T-STAT	TC	TC	
AC-4	AIR CONDITIONER	240 V	1	20.2 A	25.2A	4.84	INTEGRAL TO UNIT	-	-	60A 2P - FUSED	3R	40	T-STAT	TC	TC	
EF-1	EXHAUST FAN	120 V	1	0.5 A	0.63A	0.06	TOGGLE WITH OVERLOADS	1	15A	SEE STARTER	-	-	RESTROOM OCCUPANCY SENSOR	EC	EC	
EF-2	EXHAUST FAN	120 V	1	0.5 A	0.63A	0.06	TOGGLE WITH OVERLOADS	1	15A	SEE STARTER	-	-	RESTROOM OCCUPANCY SENSOR	EC	EC	
EH-1	ELECTRIC HEATER	120 V	1	12.5 A	15A	1.50	INTEGRAL TO UNIT	-	-	PROVIDED BY MANUFACTURER	-	-	INTEGRAL TSTAT	-	-	
EH-2	ELECTRIC HEATER	120 V	1	12.5 A	15A	1.50	INTEGRAL TO UNIT	-	-	PROVIDED BY MANUFACTURER	-	-	INTEGRAL TSTAT	-	-	
FN-1	GAS FURNACE	120 V	1	13.4 A	10.1A	1.60	INTEGRAL TO UNIT	-	-	30A 2P - FUSED	1	25	T-STAT	TC	TC	
FN-2	GAS FURNACE	120 V	1	13.4 A	16.7A	1.60	INTEGRAL TO UNIT	-	-	30A 2P - FUSED	1	25	T-STAT	TC	TC	
FN-3	GAS FURNACE	120 V	1	8.1 A	10.1A	0.97	INTEGRAL TO UNIT	-	-	30A 2P - FUSED	1	15	T-STAT	TC	TC	
FN-4	GAS FURNACE	120 V	1	13.4 A	16.7A	1.60	INTEGRAL TO UNIT	-	-	30A 2P - FUSED	1	30	T-STAT	TC	TC	

PANEL: MSB

LOCATION: MOUNTING TYPE: MANUFACTURER: GE MODEL TYPE: SPECTRA SERIES

AMPS: 800 A

VOLTAGE: 120/240 Single

PHASES: 1

WIRES: 3

MAIN TYPE: 800A MCB

MINIMUM AIC RATING: 10,000 AIC

FED FROM: ENCLOSURE:

NOTES:

CIRCUIT DESCRIPTION	CKT NO	POLE	FRAME	BKR AMP	A	B
SPARE	1	2	150	100		
SPARE	2	2	150	100		
SPARE	3	2	150	100		
SPARE	4	2	150	100		
PANEL A (NOTE 3)	5	2	250	225	26027	18582
UNKNOWN LOAD	6	2	250	225		
CLINTON PANEL	7	2	250	200		
RV PED 2	8	2	250	200		
4-H BUILDING	9	2	250	200		
RV PED 1	10	2	250	200		
PED 1 SOUTH OF CEDAR HALL	11	2	150	60		
PED 2 SOUTH OF CEDAR HALL	12	2	150	60		
TOTAL PHASE VA:					26026.6	18581.5
TOTAL PHASE AMPS:					216.9	154.8

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS
ELECTRIC HEAT	3000	0%	0	
EQUIPMENT	25335	100.00%	25335	TOTAL CONNECTED LOAD: 44608
LIGHTING	3494	125.00%	4367	TOTAL CONNECTED AMPS: 186 A
RECEPTACLES	12780	89.12%	11390	
				TOTAL EST. DEMAND: 41092
				TOTAL EST. DEMAND AMPS: 171 A

NOTES:

1. HALF TONE LOADS ARE EXISTING TO REMAIN.
2. BOLD LOADS ARE UPDATED IN PROJECT.
3. REPLACE EXISTING BREAKER WITH NEW 225A BREAKER, MATCH EXISTING AIC
4. LOAD INDICATED ONLY REFLECTS NEW REPLACEMENT LOADS.
5. NEW SERVICE DEMAND IS COMPARABLE TO EXISTING

EXISTING PANEL

LIGHTING CONTROL EQUIPMENT SCHEDULE

GENERAL NOTES:
A. LOW VOLTAGE WIRING NOT DEPICTED ON PLAN DIAGRAMS. REFER TO MANUFACTURERS CONNECTION DIAGRAMS FOR LOW VOLTAGE REQUIREMENTS.
B. ALL LOW-VOLTAGE CABLING AND CONTROLLERS SHALL BE PLENUM RATED.
C. CONTRACTORS WORK TO INCLUDE ALL LABOR, MATERIALS, AND EQUIPMENT REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM.
D. FIELD VERIFY EXACT LOCATION OF EACH SENSOR. LOCATE PER MANUFACTURER'S RECOMMENDATIONS. ULTRASONIC SENSORS SHALL BE INSTALLED A MINIMUM OF 5FT FROM ANY HVAC SUPPLY OR RETURN AIR DIFFUSER.
E. ALL CONTROLS SHALL BE FULLY ADJUSTED. ELECTRICAL CONTRACTOR TO PROVIDE TRAINING TO OWNER/MAINTENANCE STAFF FOR PROGRAMMING OF ALL LIGHTING CONTROLS IN PROJECT.
F. ELECTRICAL CONTRACTOR TO PROVIDE FOLLOW UP AT 6 MONTHS AND 1 YEAR TO ADJUST LIGHTING AND LIGHTING CONTROLS AND PROVIDE ADDITIONAL TRAINING TO OWNER/MAINTENANCE STAFF IF REQUESTED.

STANDARD SEQUENCE OF OPERATIONS:
1) SEE ALTERNATE LIGHTING CONTROL SCHEDULE FOR ALTERNATE FIXTURE SPECIFICATION

SYMBOL	SUBSCRIPT	MANUFACTURER	CATALOG NUMBER	VOLTAGE	MOUNTING HEIGHT	NOTES
§	1	SENSOR SWITCH	sPODMRA WH	120V	+44"	
§	OSD	SENSOR SWITCH	WSXA PDT D ASL WH	120V	+44"	
[PP]		nLIGHT	nPP16 D EFP	120V	ABOVE CEILING	
OS	1	nLIGHT	nCM PDT RJB	LV	CEILING	
OS	HM	nLIGHT	nCM PDT RJB	LV	CEILING	
§	LV	nLIGHT	nPODMA WH	LV	+44"	1
§	LVD1	nLIGHT	nPODMA DX WH	LV	+44"	
§	LVD2	nLIGHT	nPODMA DX WH	LV	+44"	1

LIGHTING FIXTURE SCHEDULE

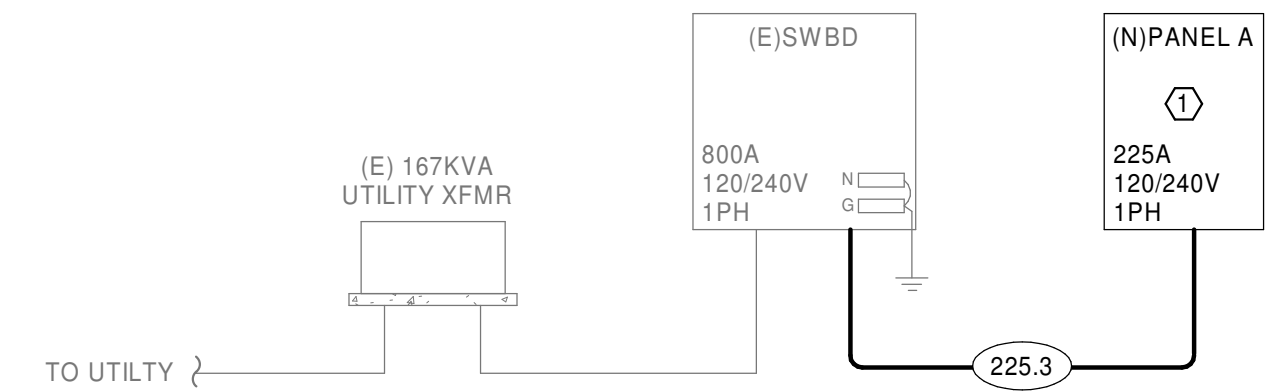
NOTES: 1) NOT USED																		
TYPE	DESCRIPTION	MANUFACTURER	FIXTURE				ENERGY LISTING	MOUNTING		VOLTAGE	VA	FINISH	LIGHT SOURCE			OPTIONS		NOTES
			CATALOG NUMBER					LOCATION	TYPE				HEIGHT	CRI	KELVIN	LUMENS	EMERGENCY	
A1	2x4 LAY IN FIXTURE	LITHONIA	CPX 2X4 4000LM 80CRI 35K SWL MIN10 ZT MVOLT			DLC	CEILING	RECESSED	CEILING	120 V	36.70	WHITE	80	3500K	4000 lm		0-10V - 10% DIMMING	
A2	2X2 LAY IN FIXTURE	LITHONIA	CPX 2X2 4000LM 80CRI 35K SWL MIN10 ZT MVOLT			DLC	CEILING	RECESSED	CEILING	120 V	36.30	WHITE	80	3500K	4000 lm		0-10V - 10% DIMMING	
P1	8FT LINEAR PENDANT	LITHONIA	CSS L96 AL04 MVOLT 35K 80CRI			DLC	CEILING	PENDANT	10FT AFF	120 V	90.40	WHITE	80	3500K	4000 lm		0-10V DIMMING	
P1E	8FT LINEAR PENDANT - WITH BATTERY BACKUP	LITHONIA	CSS L96 AL04 MVOLT 35K 80CRI 1E7WCP			DLC	CEILING	PENDANT	10FT AFF	120 V	90.40	WHITE	80	3500K	10000 lm	X	0-10V DIMMING	
P2	4FT LINEAR PENDANT	LITHONIA	CSS L48 AL04 MVOLT 35K 80CRI			DLC	CEILING	PENDANT	10FT AFF	120 V	90.40	WHITE	80	3500K	10000 lm		0-10V DIMMING	
S1	11" SURFACE MOUNT CIRCULAR FIXTURE	JUNO	JSF 11IN 13LM SWW5 90CRI MVOLT ZT WH			ENERGY STAR	CEILING	SURFACE	CEILING	120 V	14.30	WHITE	90	3500K	1500 lm		0-10V DIMMING	
S1E	11" SURFACE MOUNT CIRCULAR FIXTURE - WITH BATTERY BACK UP	JUNO	JSF 11IN 13LM SWW5 90CRI MVOLT ZT WH EM			ENERGY STAR	CEILING	SURFACE	CEILING	120 V	14.30	WHITE	90	3500K	1500 lm	X	0-10V DIMMING	
X1	SINGLE FACE EXIT SIGN - WITH 1 REMOTE HEAD	LITHONIA	LQM S W RG MVOLT EL ELMRW LP200L SGL			-	SURFACE	-	-	120 V	5.00	-	0	-	0 lm		-	
X2	SINGLE FACE EXIT SIGN - WITH 2 REMOTE HEADS	LITHONIA	LQM S W RG MVOLT EL ELMRW LP220 T			-	SURFACE	-	-	120 V	5.00	-	0	-	0 lm		-	
X3	DUAL FACE EXIT SIGN	LITHONIA	LQM S W 3 G MVOLT EL N			-	SURFACE	-	-	120 V	5.00	-	0	-	0 lm		-	

ALTERNATE 1 LIGHTING FIXTURE SCHEDULE

ALTERNATE 1 LIGHTING FIXTURE SCHEDULE																		
NOTES: 1) NONE																		
TYPE	DESCRIPTION	MANUFACTURER	FIXTURE			ENERGY LISTING	MOUNTING			VOLTAGE	VA	FINISH	LIGHT SOURCE			OPTIONS		NOTES
			CATALOG NUMBER				LOCATION	TYPE	HEIGHT				CRI	KELVIN	LUMENS	EMERGENCY	DIMMABLE	
P1	8FT LINEAR PENDANT	LITHONIA	CLX L96 HEF FDL MVOLT GZ10 35K 80CRI NLTAIR2RESPD WH ZACFPD240			DLC	CEILING	PENDANT	10FT AFF	120 V	90.40	WHITE	80	3500K	4000 lm		0-10V DIMMING	
P1E	8FT LINEAR PENDANT - WITH BATTERY BACKUP	LITHONIA	CLX L96 HEF FDL MVOLT GZ10 35K 80CRI NLTAIR2RESPDTEM WH ZACFPD240			DLC	CEILING	PENDANT	10FT AFF	120 V	90.40	WHITE	80	3500K	10000 lm	X	0-10V DIMMING	
P2	4FT LINEAR PENDANT	LITHONIA	CLX L48 4000LM HEF FDL MVOLT GZ10 35K 80CRI WH ZACFPD240			DLC	CEILING	PENDANT	10FT AFF	120 V	90.40	WHITE	80	3500K	10000 lm		0-10V DIMMING	

ONELINE KEYNOTES

1. MATCH EXISTING AIC RATING OF (E) SWBD FOR NEW PANEL A.

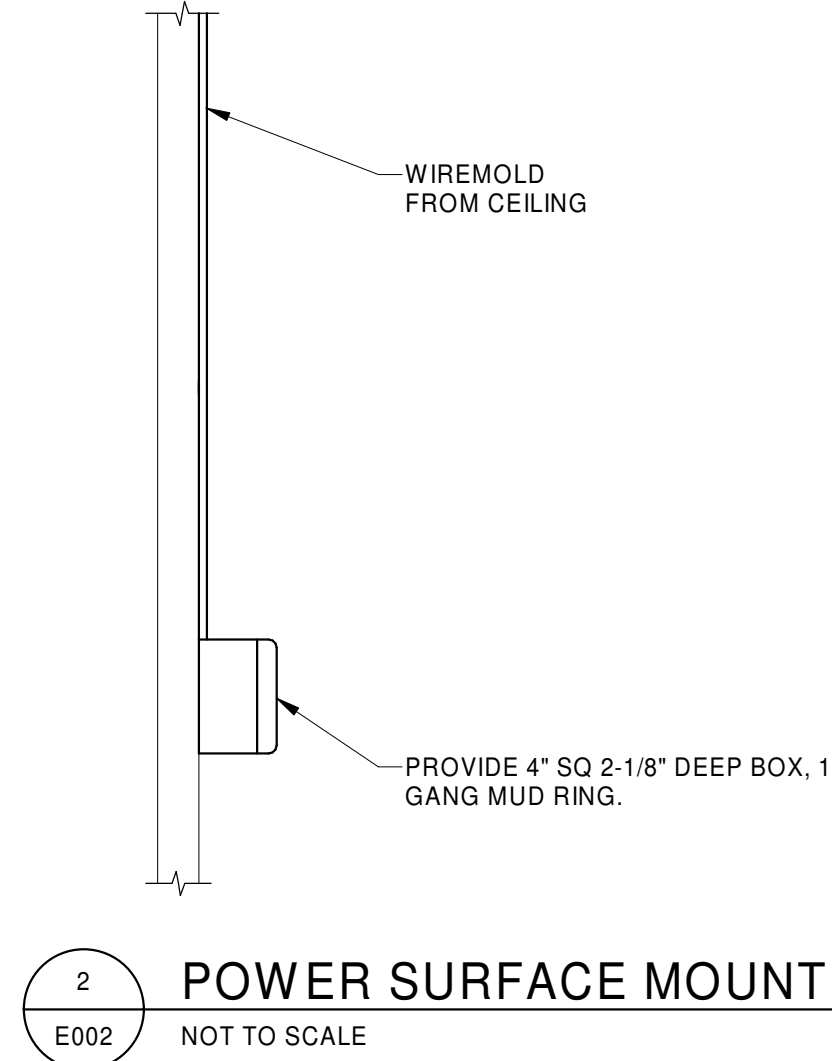


ONELINE DIAGRAM

NOT TO SCALE

FEEDER SCHEDULE

BASED ON THHN CONDUCTORS					
DESIGNATION	# OF PARALLEL RUNS	# OF CONDUCTORS EACH RUN NOT INCLUDING GROUND	CONDUCTOR SIZE	GROUND SIZE	SIZE OF CONDUIT
225.3	1	3	300 Al	#4 Cu	2-1/2"



POWER SURFACE MOUNTING DETAIL

NOT TO SCALE

ELECTRICAL SPECIFICATIONS

DIVISION 26 - ELECTRICAL

SCOPE

The provisions, terms and requirements of Division 1 and 2, the applicable Drawings and Technical Specifications herein shall apply to work under this Division.

This Work consists of, but is not necessarily limited to, the furnishing of all labor, equipment, appliances and materials and the performance of all operations in connection with the installation of all electrical work completed, in strict accordance with Specifications and/or Drawings, applicable codes, including incidental materials necessary and required for their completion.

"PROVIDE" = Furnished and installed complete. "OR EQUAL" = Or equal as approved to quote by Engineer. 10 days prior to Bid via addendum.

260000 - COMMON WORK RESULTS

- A. Intent of Drawings: Drawings are partly diagrammatic and do not show exact location of conduit unless specifically dimensioned.
- B. Workmanship:
 - 1. Work shall be accomplished by workmen skilled in particular trade, in conformance with best practices and accepted standards.
 - 2. Work shall contribute to efficiency of operation, accessibility, maintenance and appearance. No part of installation shall interfere with operation of any other system or part of building.
 - 3. Non-satisfactory work shall be corrected at no additional expense to Owner.
- C. Responsibility:

- 1. The Electrical Contractor is responsible for installation of satisfactory and complete work in accordance with the intent of Drawings and Specifications. Provide, at no extra cost, incidental items required for completion of work even though not specifically mentioned or indicated in Specifications or on Drawings.
 - 2. If, at any time, and in any case, change in location of conduit, outlets, fixtures, switches, panels, electrical equipment or associated components, etc., becomes necessary due to obstacles or installation of other trades, such required changes shall be made by Contractor at no extra cost.
 - 3. Conflicts discovered during construction shall be immediately called to the attention of the Engineer for decision. Do not proceed with installation in area of question until conflict has been fully resolved.
 - 4. Coordinate all electrical work with other trades to prevent unnecessary delays in the construction schedule.
 - 5. Excavation and backfill required by electrical installations shall be accomplished in accordance with Division 2 by this Contractor.
 - 6. Provide temporary electrical power and lighting for all trades that require service during the course of this Project. Provide temporary service and distribution as required. Comply with the NFPA 70 and OSHA requirements. (Energy costs by General Contractor.)
- D. Guarantee-Warranty: This Contractor shall and hereby does warrant and guarantee:
- 1. That all work executed under this Section will be free from defects of materials and workmanship for a period of one year from the date of final acceptance of this work.
 - 2. The Contractor agrees to, at the Contractor's own expense, repair and replace all such defective materials and work and all other work damaged thereby which becomes defective during the term of warranty. Agreement does not include damages done by Owner.
- E. Permits, Tests, Codes and Standards:
- 1. Electrical Contractor to pay for all permits and fees in connection with this work.
 - 2. WORK SHALL BE IN ACCORDANCE WITH THE MOST RECENT EDITIONS OF ADOPTED LOCAL, STATE AND NATIONAL CODES AND ORDINANCES, THE STATE FIRE MARSHAL, AND UTILITY COMPANY REGULATIONS.
 - 3. Electrical work shall conform to National Electrical Codes, latest editions, as a minimum requirement.
 - 4. All material to conform with applicable standards.
- F. Discrepancies: Prior to submitting Bid, Contractor shall refer any apparent discrepancies or omissions to engineer for clarification.
- G. Prior Approvals: All proposed substitutions shall be received by the Engineer **10 days prior to Bid. Priors received after 3 p.m. of the 10th day will be rejected.** Supply technical data, photometrics and dimensional Drawings showing that substitutes are equal to product specified.

- H. Shop Drawing Submittals:
- 1. In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," submit Electronic Drawings in pdf format for final and official approval through the General Contractor as listed below. **Provide pdf bookmark tabs for each type and section.** Provide separate pdf for each spec section; do not combine sections together unless they are 5 pages or less. If the Authority Having Jurisdiction requires Shop Drawings to have a Registered Engineers Stamp Affixed, this shall be the sole responsibility of the Contractor to acquire such stamp at Contractor's cost.

Additional copies may be required by individual Sections of these Specifications. Copies of price list sheets are not acceptable. Manufacturer's name and address must appear on each sheet. All copies shall be legible.

Shop Drawings shall include a completed specification sheet of all equipment along with fabrication, installation drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Installation drawings for fire alarm shall be done with a computer cadd program and include no other system. A basic floor plan in pdf electronic format can be obtained through the General Contractor. Autocad .dwg format will not be available.

- I. Project Close-Out Record Documents:
 - 1. Provide three full size sets, unless more are called for under Division 1 (one for Engineer and one for Owner). In addition to requirements called for under Division 1, indicate the following installed conditions:
 - a. Actual location of all electrical service gear/feeders, panel/motor/special equipment feeders, all major underground or underslab conduits, all conduit stubs for future use, any change in branch circuitry from Drawings, key junction boxes and pull boxes not indicated on Drawings, any control locations or indicator lights not shown on Drawings.
 - b. Addendum items, change order items and all changes made to Drawings from Bidding phase through to Project completion.
 - c. Actual equipment and materials installed. Where manufacturer and catalog number are indicated on Drawings, generally or in fixture or equipment schedules, change to reflect actual products installed.
 - d. Change service panel and branch panel breaker locations and schedules to reflect actual installed conditions.
- J. Project Close-out Maintenance Manuals:
 - 1. Prepare 3 copies, unless more are called for under Division 1 (one for Engineer, two for Owner). In addition to requirements under Division 1, provide heavy duty, durable 3-ring vinyl covered loose-leaf binder for each manual sized to receive 8.5 inch by 11 inch paper. Provide a clear plastic sleeve on the spine to hold labels and pockets in the cover to receive folded sheets. In manual, include all Shop Drawings, installation/operation/maintenance data furnished with electrical equipment, voice/data test reports, and letters from manufacturer's representatives that the fire alarm, has been completed and tested to satisfy requirements/codes. List project name, date, and Contractor's name, address and telephone number. Include index sheet for each Specification Section indicating equipment, with supplier and supplier's telephone number. Provide tabbed dividers indicating major groupings of equipment.
 - 2. Turn over to Owner all spare equipment and devices specified and shown.
- K. Supporting Equipment:
 - 1. Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a power charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws. All device boxes in sheetrock walls will be tight before, during and after installation of sheetrock.
 - 2. Provide supports for electrical items in accordance with NFPA 70 and all other applicable codes.
 - 3. Contractor responsible for providing watertight conduit penetrations at all watertight walls, floors roofs and membranes. Contractor also responsible to maintain fire rating of walls, floors, roofs and membranes penetrated.
 - 4. When applicable, center within insulation any electrical conduit routed in attic space. Provide sealing as per NFPA 70 300-7 for all conduits exposed to different temperatures.

260000 - COMMON WORK RESULTS (continued)

L. Electrical Identification:

- 1. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, FA duct detection, motor starters, panelboards and main control panel and similar systems.
- 2. Identify all 120 VAC and 208 VAC power receptacle cover plates with panel and circuit number utilizing a clear label with black designations. Designation example: L1-38.
- 3. Identify underground exterior electrical circuits by installation of continuous underground plastic marker, 6 - 8 inches below grade.

260300 - REMODEL WORK

- A. The Contractor shall carefully examine the Drawings and Specifications, visit the project site, and make note of all existing conditions, dimensions and limitations prior to Bid and make allowances thereto.
- B. No Change Orders will be issued for Contractor's failure to visit site, remodel work necessary for a complete installation of systems shown, and due to Contractor's lack of understanding of amount or difficulty of work involved.
- C. The Contractor shall also notify all corporations, companies, individuals or local authorities owning, or having jurisdiction over existing utilities and services which interfere in any manner with the execution of the work under this Contract, and shall remove, relocate or protect such utilities or equipment as required by the parties having jurisdiction over same.
- D. If existing active or non-active services (which may not be shown on plans) are encountered that require relocation or disconnecting, the Electrical Contractor shall make written request for decision on proper handling of the services. The Electrical Contractor shall not proceed with the work until so authorized by the Architect.
- E. When areas of the existing buildings are adjacent to the area of construction in which work is going on and are occupied, then this Contractor shall arrange the work so as to reduce to a minimum the periods of interruption or outages in the various services.
- F. Not less than one week before any system is to be put out of service, the Contractor shall notify and coordinate with other trades and the Owner of such necessity including the extent of the work to be done during the outage, possible length of time required for that phase of the work, and the desired time at which the outage is to begin.
- G. Balance additional loads to existing circuitry between phases. Furnish a revised, typed panel directory on existing panelboards where loads have been added or changed on this project.
- H. Carefully lay out all work in advance to minimize cutting, channeling or drilling. Where necessary, all cutting and patching shall be done in a manner approved by the Architect. Do not endanger the stability of the structure. Restore any damaged surfaces to original conditions. Contractor at fault to assume all costs.
- I. Remove or relocate existing conduits, wires, equipment, devices or fixtures indicated on Drawings and as required by remodel operations. Where the reuse of existing conduits, wires, devices, or fixture is permitted, verify that wiring is continuous. Existing outlets or junction boxes shall not be rendered inaccessible by structural changes made to the building.
- J. Where existing walls are being furred out or refinished, extend existing outlets and devices to new surface as required.
- K. Existing equipment which is indicated as being removed and not indicated for re-use shall be disposed of unless stated otherwise. Light fixture ballasts may contain PCB's and shall be disposed of according to environmental regulations.

260519 - CONDUCTORS AND CABLES

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Feeders: Copper THHN-THWN. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Branch Circuits: Copper THHN-THWN. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- D. Multi-conductor Cable: Copper Type AC and Type MC with separate insulated ground wire.
- E. Aluminum conductors are acceptable for sizes #1 Awg and larger.
- F. Conductor Insulation: Comply with NEMA WC 70 for types THHN-THWN. Utilize other types of insulation only where specifically noted or required by code for the installed condition.
- G. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening valves or as specified in UL Codes.
- H. Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

240v/120 Volts	Phase
Black	A
Red	B
White	Neutral
Green	Ground

260526 - GROUNDING AND BONDING

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Install separate insulated equipment grounding conductors for feeder and branch circuits in compliance with NFPA 70 Article 250.

260533 - RACEWAYS AND BOXES

- A. Submit Shop Drawings in accordance with the "Common Work Results" section.
- B. Conduit Raceway:
 - 1. Indoors, use the following, unless otherwise stated:
 - a. Concealed: EMT or MC cable.
 - b. Exposed: EMT, IMC or RMC.
 - c. Connection to vibrating equipment: Flexible metal conduit.
 - 2. Outdoors, use the following, unless otherwise stated:
 - a. Concealed: RMC or IMC.
 - b. Exposed: RMC or IMC.
 - c. Underground: Schedule 40 PVC with Schedule 80 PVC fittings.
 - d. Connection to Vibrating Equipment: Liquid tight flexible metal conduit.
 - 3. ENT IS NOT ALLOWED.
 - 4. Conceal conduit and cable, unless otherwise noted; conduit is permitted to be exposed in equipment rooms. All conduits shall have insulated ground wire installed. Do not install conduit embedded in slabs. EMT fittings shall be steel, compression or set screw type. All raceways shall be installed and supported in accordance with NFPA 70 and applicable codes.
- C. Outlet Boxes:
 - 1. Conform to UL 514A, "Metallic Boxes, Electrical," and UL 514B, "Fittings for Conduit and Outlet Boxes." Outlet boxes shall be metallic and installed flush in all areas, except mechanical rooms, above lay-in ceilings, or as otherwise indicated. Minimum size to be 4 inches square by 2-1/8 inches deep. Boxes shall be of type, shape, size and depth to suit each location and application. All fittings shall be steel.
- D. Pull and Junction Boxes:
 - 1. Comply with UL 50, "Electrical Cabinets and Boxes," for boxes over 100 cubic inches volume. Boxes shall have screwed or bolt-on covers, shall be suitable for the intended application and shall be labeled.
- E. All materials shall be UL listed, appropriate for intended application. Entire raceway system shall be in accordance with NFPA 70, ANSI, NEMA, UL, and all other applicable codes.

260923 - LIGHTING CONTROL DEVICES

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section. Shop drawings shall include background floor plans with device layouts and wiring/wire types, and coverages to demonstrate how this system will function to meet the design intent and the energy code.
- B. Manufacturer: As scheduled on the drawings.
- C. Perform the following tests and inspections:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
- E. Provide letter of verification that the system has been completed and successfully tested. Letter to be included in As-Built manuals.

262416 - PANELBOARDS

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Manufacturer: Siemens, Square-D, GE or Cutler Hammer.
- C. Load centers are not acceptable unless specifically noted.
- D. Branch Panelboards shall have aluminum bus including neutral and ground bars. Breakers shall be bolt on type. Main breakers shall have minimum of **an adjustable instantaneous feature**. Provide hinged front cover and hinged door (door in door) and feed through lugs. If indicated on the Panel Schedule, provide internal SPD with a 120 kA per phase surge rating and protect L-N, L-G and N-G modes; include status indicator. All panels shall be fully rated for the available AIC; series ratings are not allowed.
- E. Distribution Panelboards shall have aluminum bus including neutral and ground bars. Breakers shall be bolt on type for 125A and smaller. Breakers larger than 125A shall be bolt-on circuit breakers or plug-in circuit breakers where individual positive-locking device requires mechanical release for removal. All 3-pole breakers 50 amp and larger shall have minimum feature of a thermal magnetic adjustment. Breakers with 1200 amp frame or larger shall be equipped with an Arc Flash Energy-reducing maintenance switching with local status indicator. Provide hinged front cover and hinged door (door in door). If indicated on the Panel Schedule, provide internal SPD with a 120 kA per phase surge rating and protect L-N, L-G and N-G modes; include status indicator. All panels shall be fully rated for the available AIC; series ratings are not allowed.
- F. Provide typed circuit schedules for existing panelboards where loads have changed and framed, typed circuit schedules for all new panelboards with identification of items controlled by each individual breaker. Indicate room numbers of items controlled or room name where appropriate for Owner's convenience.

262726 - WIRING DEVICES

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Acceptable Manufacturers: Pass & Seymore, Bryant, GE, Hubbell, Leviton.
- C. Devices:
 - 1. General light switches shall be 20 amp, 120/277 volt AC rated and **Industrial Grade**.
 - 2. General receptacles shall be self-grounding 5-20R and Industrial Grade.
 - a. GFCI receptacles shall be 20 amp feed through type with two utilization points. Do not connect downstream devices to load side of GFCI.
 - b. USB receptacles shall have two USB 2.0 compatible 3.6A/5V ports.
 - c. Tamper-Resistance receptacles shall comply with NFPA 70 tamper-resistant requirements.
 - 3. Dimmers shall be as scheduled on the construction documents.
 - 4. General device color shall be **white**. Emergency power device color shall be red only.
- D. Device Plates:
 - 1. Device plates shall have opening for device intended and shall be **Lexan**. General device color shall be **white**.
 - 2. All device plates shall have a clear label with the panel and circuit number designation in black.
- E. Weatherproof receptacle covers shall be a corrosion resistant die cast metal, minimum 3 inch deep, flip cover with latch and with pad locking provisions.

262813 - OVER CURRENT PROTECTION DEVICES

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Manufacturer: Bussman, Gould, Littlefuse or Brush.
- C. Fuses:
 - 1. Motor or combination motor/branch circuit: UL listed RK-5.
 - 2. Feeder Loads: UL listed RK-1.
 - 3. Plug fuses shall be dual element Type S with adapter.

262816 - CIRCUIT AND MOTOR DISCONNECTS

- A. Submit Shop Drawings in accordance with the "Common Work Results for Electrical" Section.
- B. Manufacturer: Same as panelboard manufacturer.
- C. Disconnects shall be heavy duty type with Class R rejection feature when required to be fusible. Voltage rating shall be at or greater than the application voltage. Provide NEMA 3R enclosure for exterior locations. Service switches shall be UL listed for use as service equipment.

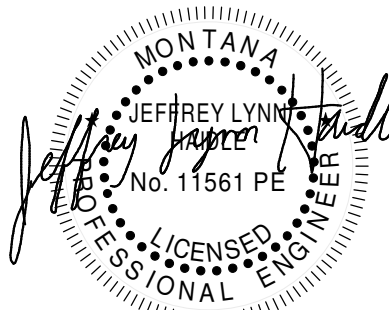
265100 - LIGHTING

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Manufacturer, model, style, color, size, etc., as scheduled. If no color has been selected, provide fixture with the standard finish as published by the manufacturer. All fixtures to be supplied as complete, housing, sockets, lamp holders, internal working, wire guards, lens guards, diffusing materials or lenses, pendants, hangers, canopies, aligners, end caps, ballasts and emergency battery packs, plaster frames, recessing boxes, hold down clips, anchor bolts, etc. Install plumb and true, free of light leaks, warps, dents and other irregularities.
- C. Support for Recessed and semi-recessed Grid-type Fixtures:
 - 1. All lighting fixtures shall be positively attached to the suspended ceiling system by mechanical means as specified in the National Electric Code, Section 410-36 (b) unless independently supported. The attachment device, a minimum of two per fixture, shall have a capacity of 100 percent of the lighting fixture weight acting in any direction.
 - 2. Pendant-hung lighting fixtures shall be supported directly from the structure above using No. 9-gage wire or an approved alternate support without using the ceiling suspension system for direct support.
 - 3. Lighting fixtures weighing less than 56 pounds shall have, in addition to the requirements outlined above, two No. 12-gage hangers connected from opposite corners of the fixture housing to the structure above. These wires may be slack.
 - 4. Lighting fixtures weighing 56 pounds or more shall be supported directly from the structure above by approved hangers.
- D. Support for Suspended Fixtures: Brace pendants and rods over 48 inches long to limit swinging. Support stem-mounted, single-unit, suspended fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.
- E. Surface-mounted light fixtures attached to a ceiling grid shall be attached with positive clamping devices surrounding the supporting members. Attach safety wires between the clamping device and the adjacent ceiling hanger or to the structure above.
- F. LED Modules:
 - 1. Comply with ANSI C78.377, UL 8750, IES LM-79 and IES LM-80.
 - 2. CRI minimum of 80 or as scheduled.
 - 3. Efficacy: 75 Lumens per watt minimum for down lights and 100 lumens minimum per watt minimum for other fixture types or as schedule on the drawings.
 - 4. Rated life of minimum 50,000 hours minimum or as scheduled.
 - 5. Fully serviceable and upgradable Light Engine.
 - 6. Warranty: 5-year minimum for all fixture components.
- G. LED Drivers:
 - 1. LED Driver/Power Supply: Integral high efficiency driver with power supply of 120V-277v input 60HZ. Power factor greater than 0.9 at full load. Drive current at 1,400ma maximum for interior applications, 1,400ma maximum for exterior applications. Class 2 power supply. Dimming utilizing 0-10V dimming control. Provide continuous flicker free dimming from 100 percent to 10 percent. The driver shall be capable of being serviced through the aperture for down light applications.
 - 2. Warranty: 5-year minimum for all fixture components.

Cushing
Terrell

cushingterrell.com
800.757.9522

YELLOWSTONE COUNTY
ELECTIONS OFFICES - CEDAR HALL RENOVATION



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CONSTRUCTION
DOCUMENTS

07.25.2025
PROJ# JYC_ELECTIONS
DESIGNED BY | Designer
DRAWN BY | Author
REVIEWED BY | Checker
REVISIONS

ELECTRICAL
SPECIFICATIONS

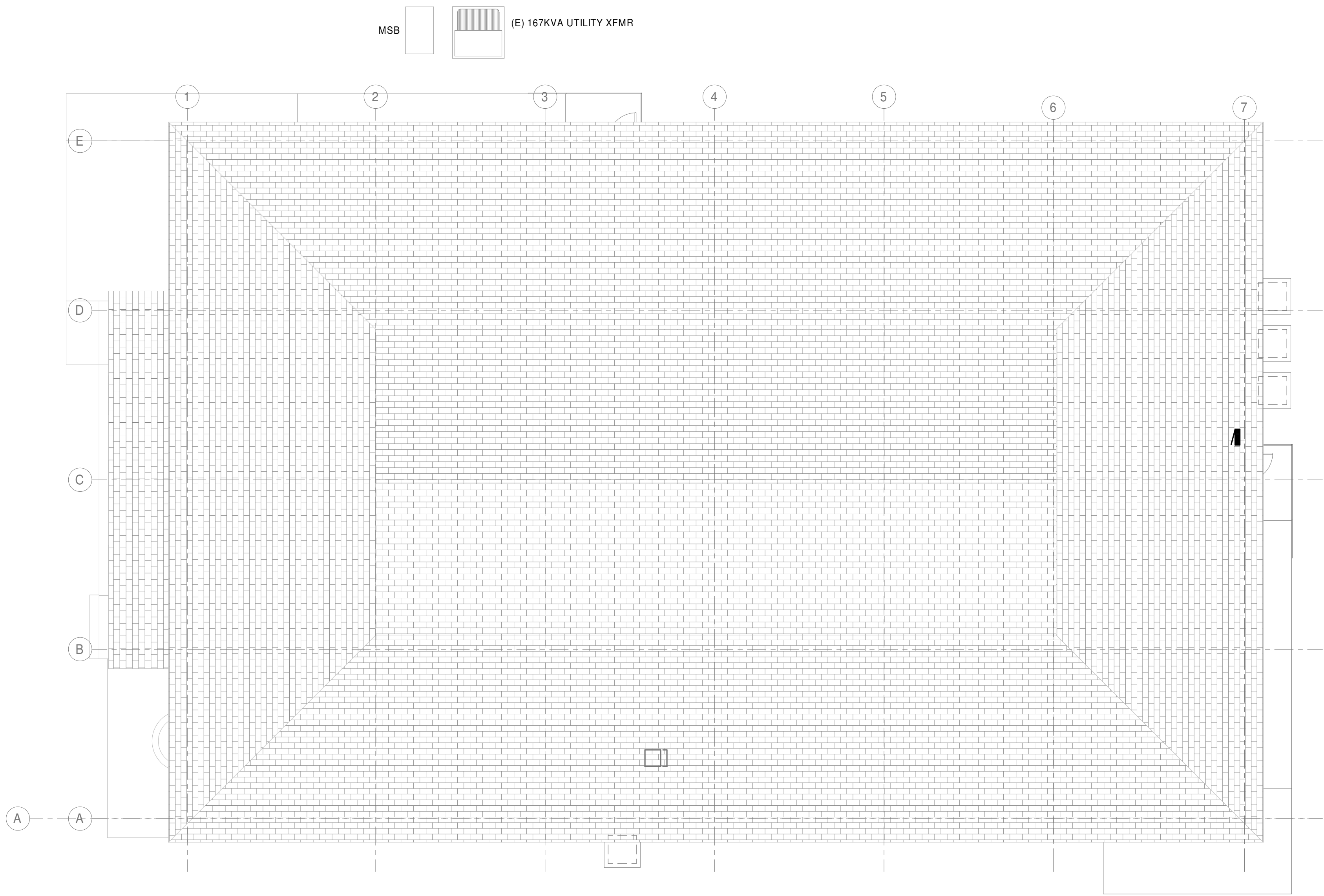
E003

GENERAL NOTES

- A. COMPLY WITH LATEST ADOPTED NEC AND APPLICABLE CODES/STANDARDS.
- B. SHARED NEUTRALS ARE NOT ALLOWED FOR SINGLE PHASE BRANCH CIRCUITS.

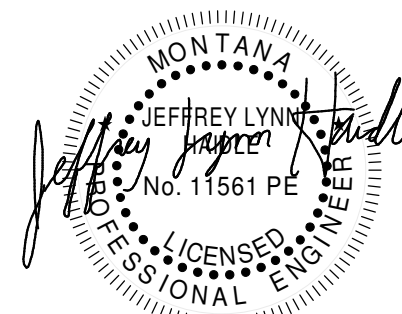
KEYNOTES

- 1. NONE



1 ELECTRICAL SITE PLAN
E100 1/8" = 1'-0"

YELLOWSTONE COUNTY
ELECTIONS OFFICES - CEDAR HALL RENOVATION



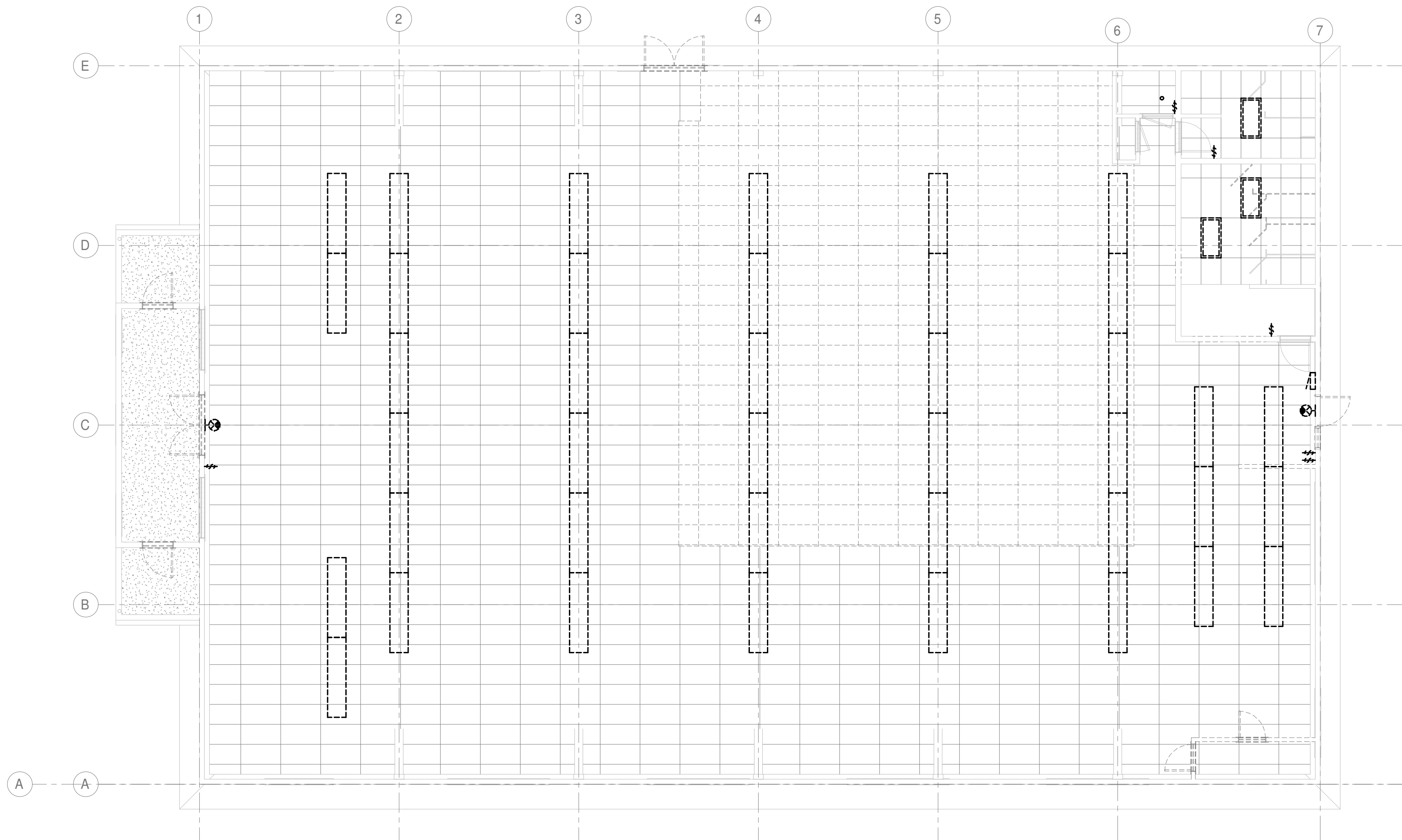
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CONSTRUCTION
DOCUMENTS

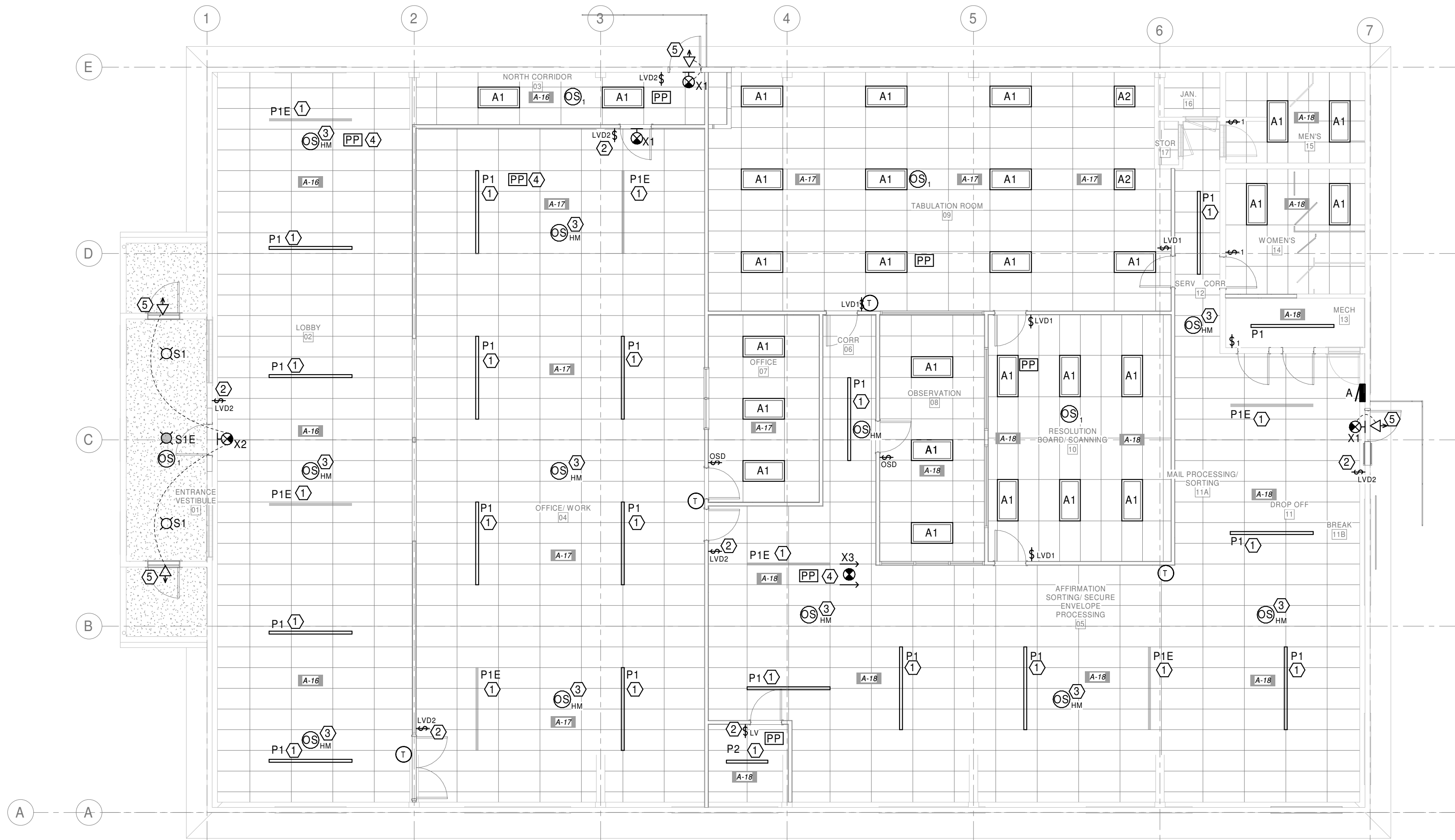
07.25.2025
PROJ# | YC_ELECTIONS
DESIGNED BY | RESTAD
DRAWN BY | GRIGGS
REVIEWED BY | HAIDLE
REVISIONS

SITE PLAN

E100



2 LIGHTING DEMOLITION PLAN
E200 1/8" = 1'-0"



1 LIGHTING REMODEL PLAN
E200 1/8" = 1'-0"

GENERAL DEMOLITION NOTES

- ELECTRICAL WORK IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. PATCHING AND PAINTING IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
- DISCONNECT ALL ELECTRICAL ITEMS WHICH ARE TO BE REMOVED AND/OR RELOCATED WHILE MAINTAINING CONTINUITY OF REMAINING CIRCUITRY.
- PROVIDE NEW CONDUCTORS, RACEWAYS, ETC., AS REQUIRED TO MAINTAIN OPERATION OF EXISTING OUTLETS, EQUIPMENT, ETC. WHICH REMAIN OR ARE RELOCATED.
- NO EXISTING WIRING MAY BE REUSED IN THE NEW ELECTRICAL WORK UNLESS OTHERWISE NOTED.
- ALL EXISTING CIRCUITS, CONDUIT AND WIRE THAT ARE NOT IN USE AFTER DEMOLITION IS COMPLETED SHALL BE REMOVED.
- EXISTING LIGHT FIXTURES WHICH ARE NOT REUSED SHALL BE DELIVERED TO THE OWNER.
- EXISTING CONDUITS IN THE FLOOR WHICH ARE NOT USED AND WHICH ARE ABANDONED SHALL BE TRIMMED TO FLOOR SURFACE, GROUND FLUSH AND FILLED WITH GROUT. FINISH FLOOR TO MATCH EXISTING.
- WORK SHALL BE PERFORMED WITH NO DISRUPTION OF THE OWNER'S BUSINESS. ALL ELECTRICAL POWER DISRUPTIONS SHALL BE SCHEDULED AND APPROVED BY THE OWNER.
- ALL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH NEC, STATE AND LOCAL BUILDING CODE.
- ALL DASHED ITEMS ON DEMOLITION PLANS ARE TO BE REMOVED UNLESS NOTED OTHERWISE. SOLID ITEMS ARE TO REMAIN OR TO BE RELOCATED AS NOTED. NOTE - ITEMS SHOWN IN THE DEMOLITION PLANS ARE BASED ON FIELD OBSERVATIONS. ADDITIONAL ELECTRICAL ITEMS MAY BE ENCOUNTERED THAT ARE NOT SHOWN - ALL GENERAL ELECTRICAL ITEMS ARE TO BE REMOVED THAT ARE NOT SHOWN, BUT ARE IN AREAS OF COMPLETE REMODEL.

GENERAL NOTES

- COMPLY WITH LATEST ADOPTED NEC AND APPLICABLE CODES/STANDARDS.
- SHARED NEUTRALS ARE NOT ALLOWED FOR SINGLE PHASE BRANCH CIRCUITS.
- EC SHALL VISIT SITE BEFORE BIDDING TO EXAMINE EXISTING CONDITIONS FOR LIGHTING CIRCUIT ROUTING AND MOUNTING FOR FIXTURES. INCLUDE LIGHTING SUPPORT AND CIRCUITRY IN BID.

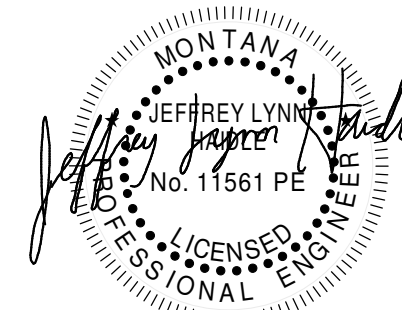
REMODEL KEYNOTES

- ALTERNATE 1: PROVIDE ALTERNATE BID FOR UPDATING FIXTURES SHOWN WITH THIS NOTE TO WIRELESS CONTROL ENABLED FIXTURES. SEE SHEET E002 FOR FUTURE SPECIFICATION.
- ALTERNATE 1: PROVIDE ALTERNATE BID FOR UPDATING CONTROLS SHOWN WITH THIS NOTE TO WIRELESS CONTROLS. SEE SHEET E002 FOR WIRELESS SWITCH SPECIFICATION.
- OCCUPANCY SENSORS TYPE HM INDICATED WITH THIS KEYNOTE SHALL ONLY BE INCLUDED IN BASEBID AND SHALL BE REMOVED FROM CONTROLS IN ALTERNATE 1.
- POWER PACK INDICATED WITH THIS KEYNOTE SHALL ONLY BE INCLUDED IN BASEBID AND SHALL BE REMOVED FROM CONTROLS IN ALTERNATE 1.
- REMOTE HEAD POWERED BY EXIT SIGN.

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ELECTIONS OFFICES - CEDAR HALL RENOVATION



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CONSTRUCTION
DOCUMENTS

07.25.2025
PROJECT | YC ELECTIONS
DESIGNED BY | RESTAD
DRAWN BY | GRIGGS
REVIEWED BY | HAIDLE
REVISIONS

LIGHTING PLANS

E200

GENERAL DEMOLITION NOTES

- ELECTRICAL WORK IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. PATCHING AND PAINTING IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
- DISCONNECT ALL ELECTRICAL ITEMS WHICH ARE TO BE REMOVED AND/OR RELOCATED WHILE MAINTAINING CONTINUITY OF REMAINING CIRCUITRY.
- PROVIDE NEW CONDUCTORS, RACEWAYS, ETC., AS REQUIRED TO MAINTAIN OPERATION OF EXISTING OUTLETS, EQUIPMENT, ETC. WHICH REMAIN OR ARE RELOCATED.
- NO EXISTING WIRING MAY BE REUSED IN THE NEW ELECTRICAL WORK UNLESS OTHERWISE NOTED.
- ALL EXISTING CIRCUITS, CONDUIT AND WIRE THAT ARE NOT IN USE AFTER DEMOLITION IS COMPLETED SHALL BE REMOVED.
- EXISTING LIGHT FIXTURES WHICH ARE NOT REUSED SHALL BE DELIVERED TO THE OWNER.
- EXISTING CONDUITS IN THE FLOOR WHICH ARE NOT USED AND WHICH ARE ABANDONED SHALL BE TRIMMED TO FLOOR SURFACE, GROUND FLUSH AND FILLED WITH GROUT. FINISH FLOOR TO MATCH EXISTING.
- WORK SHALL BE PERFORMED WITH NO DISRUPTION OF THE OWNER'S BUSINESS. ALL ELECTRICAL POWER DISRUPTIONS SHALL BE SCHEDULED AND APPROVED BY THE OWNER.
- ALL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH NEC, STATE AND LOCAL BUILDING CODE.
- ALL DASHED ITEMS ON DEMOLITION PLANS ARE TO BE REMOVED UNLESS NOTED OTHERWISE. SOLID ITEMS ARE TO REMAIN OR TO BE RELOCATED AS NOTED. NOTE - ITEMS SHOWN IN THE DEMOLITION PLANS ARE BASED ON FIELD OBSERVATIONS. ADDITIONAL ELECTRICAL ITEMS MAY BE ENCOUNTERED THAT ARE NOT SHOWN - ALL GENERAL ELECTRICAL ITEMS ARE TO BE REMOVED THAT ARE NOT SHOWN, BUT ARE IN AREAS OF COMPLETE REMODEL.

GENERAL NOTES

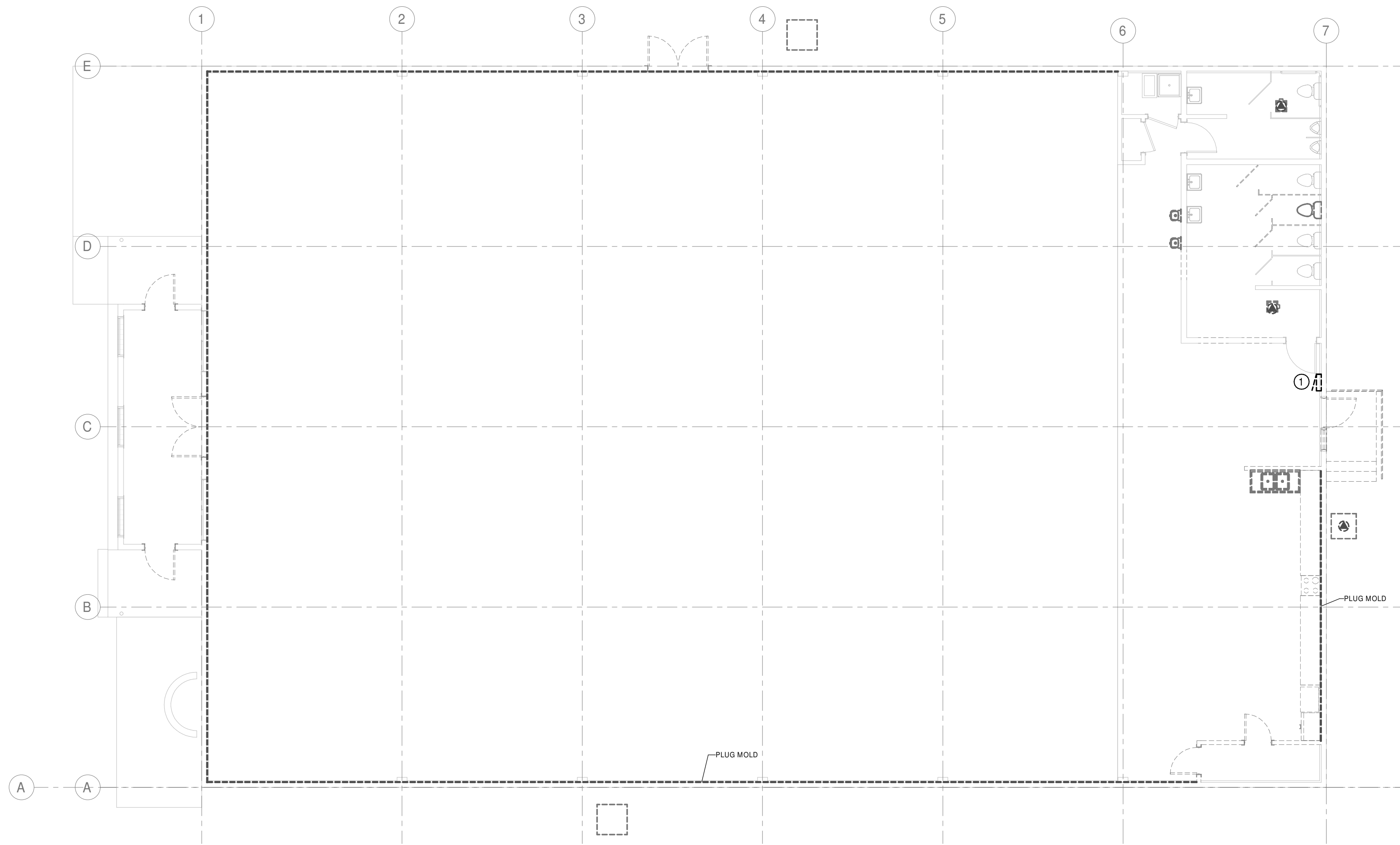
- COMPLY WITH LATEST ADOPTED NEC AND APPLICABLE CODES/STANDARDS.
- SHARED NEUTRALS ARE NOT ALLOWED FOR SINGLE PHASE BRANCH CIRCUITS.
- EC SHALL VISIT SITE BEFORE BIDDING TO EXAMINE INTERIOR EXISTING CONDITIONS AND CONDUIT ROUTING PATHS. EXISTING CEILING INTERSTITIAL SPACE AND UNDERFLOOR CRAWL SPACE CONDUIT ARE ALLOWABLE SOLUTIONS. INCLUDE ROUTING COST IN BID.

DEMOLITION KEYNOTES

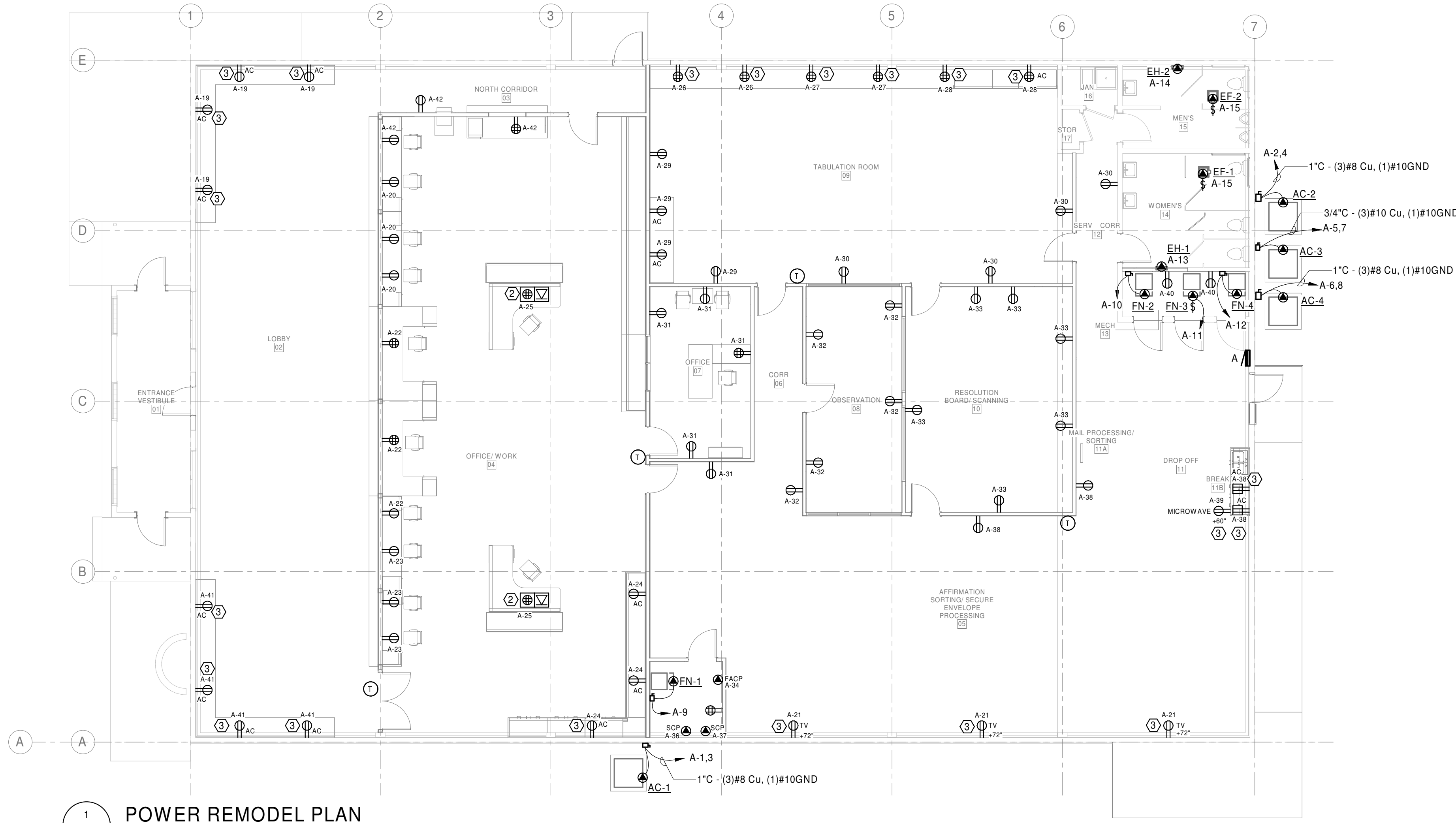
- REMOVE EXISTING FEEDER AND PANEL A. REMOVE FEEDER BACK TO (E) SWIBD

REMODEL KEYNOTES

- NOT USED.
- PROVIDE STEEL CITY 664 FLOOR WITH (2) DUPLEX RECEPTACLES AND LOW VOLTAGE PROVISIONS WITH SOLID ALUMINUM FLIP UP LID. PROVIDE 1" C FROM LOW VOLTAGE COMPARTMENT TO ABOVE LAY IN CEILING WITH BUSHING FOR LOW VOLTAGE CABLING.
- ALL RECEPTACLE ON EXISTING WALLS SHALL BE SURFACE MOUNTED SEE DETAIL 2/E002.



2 POWER DEMOLITION PLAN
E300 1/8" = 1'-0"



1 POWER REMODEL PLAN
E300 1/8" = 1'-0"

FIRE ALARM LEGEND

SYMBOLS APPLY ONLY WHEN USED ON DRAWINGS	
SYMBOL	DESCRIPTION
	VISUAL NOTIFICATION DEVICE (# INDICATES CANDELA RATING)
	COMBINATION AUDIO & VISUAL NOTIFICATION DEVICE (# INDICATES CANDELA RATING)
	AUDIO NOTIFICATION DEVICE (# INDICATES CANDELA RATING)
	VISUAL NOTIFICATION DEVICE (# INDICATES CANDELA RATING); CEILING MOUNTED
	COMBINATION AUDIO & VISUAL NOTIFICATION DEVICE (# INDICATES CANDELA RATING); CEILING MOUNTED
	COMBINATION AUDIO & VISUAL NOTIFICATION DEVICE (# INDICATES CANDELA RATING); CEILING MOUNTED
	ADDRESSABLE MANUAL PULL STATION
	ADDRESSABLE SYSTEM SMOKE DETECTOR
	DUCT SMOKE DETECTOR WITH RELAY CONTROL/OUTPUT AND FAN UNIT SHUTDOWN INTERFACE
	FIRE ALARM REMOTE TEST SWITCH
	FIRE ALARM REMOTE ANNUNCIATOR
	FIRE ALARM CONTROL PANEL
	FIRE ALARM COMMUNICATOR - LTE (CELLULAR)

COMMUNICATIONS

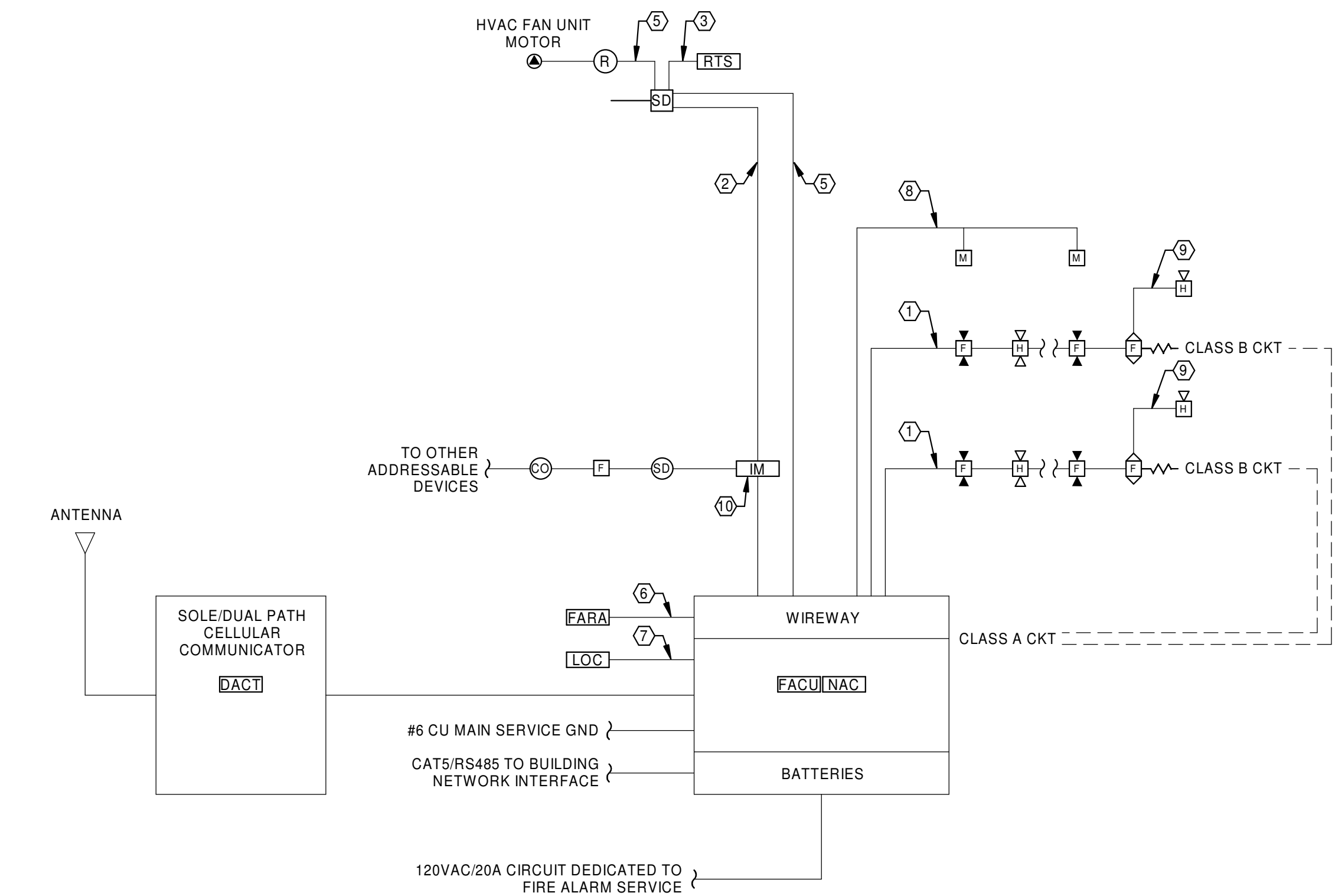
SYMBOL	DESCRIPTION
	CATV JACK, WALL MOUNTED
	CATV JACK CEILING MOUNTED
	MICROPHONE OUTLET
	VOICE/DATA JACK # NUMERICAL SUBSCRIPT INDICATES NUMBER OF CABLES/JACKS, NO SUBSCRIPT ASSUMES TWO CABLES/JACKS
	W WAP WALL MOUNT TELEPHONE READY JACK WIRELESS ACCESS POINT
	VOICE/DATA JACK MOUNTED IN FLOORBOX # NUMERICAL SUBSCRIPT INDICATES NUMBER OF CABLES/JACKS, NO SUBSCRIPT INDICATES TWO CABLES/JACKS
	DATA RACK

SURVEILLANCE SYSTEM

SYMBOL	DESCRIPTION
	A,B,E - CAMERA, CEILING AND WALL MOUNTED DOME, FIXED
	C - CAMERA, CEILING MOUNTED, 360 DEGREE, FIXED
	D - CAMERA, CEILING AND WALL MOUNTED 180, FIXED
	DIGITAL VIDEO RECORDER
	SURVEILLANCE POWER SUPPLY
	MONITOR
	WEATHER PROOF

SECURITY SYSTEM

SYMBOL	DESCRIPTION
	CARD READER
	KEYPAD
	CONNECTION TO ELECTRIC AUTO OPENER
	PANEL
	SCP SECURITY CONTROL PANEL
	SDC SECURITY DOOR CONTROLLERS

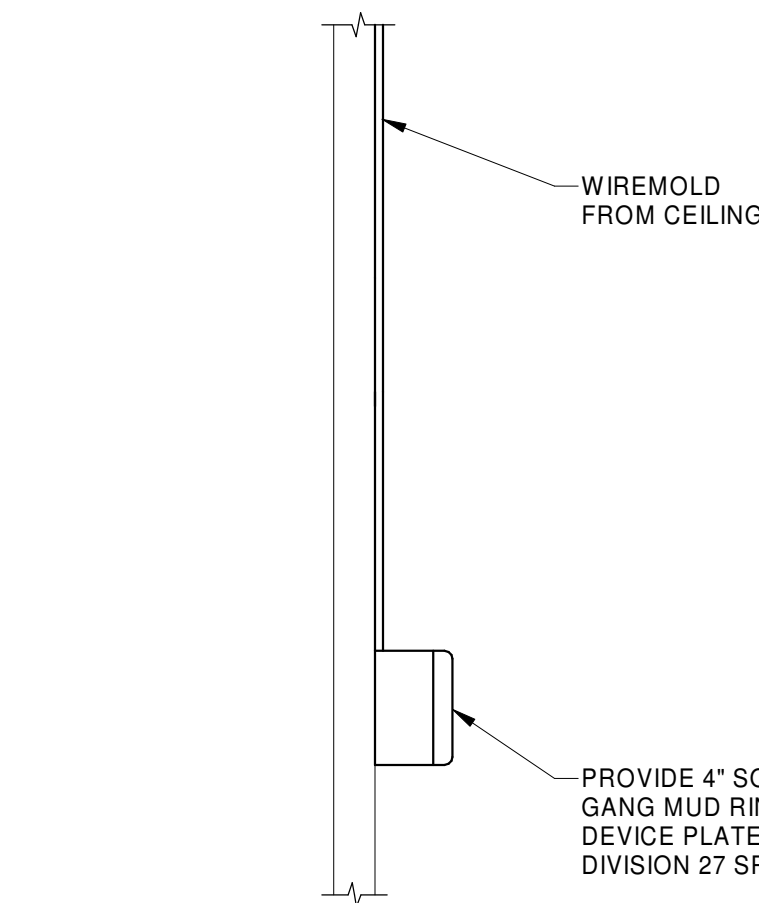


KEYNOTES

1. TYPICAL NOTIFICATION APPLIANCE CIRCUIT (NAC).
2. TYPICAL SIGNALING LINE CIRCUIT (SLC).
3. TYPICAL REMOTE INDICATING/TEST CIRCUIT.
4. TYPICAL END OF LINE DEVICE (EOL) CLASS 'B' CIRCUIT.
5. TYPICAL AUXILIARY 24VDC POWER CIRCUIT (FROM FACU).
6. TYPICAL ANNUNCIATOR CIRCUIT.

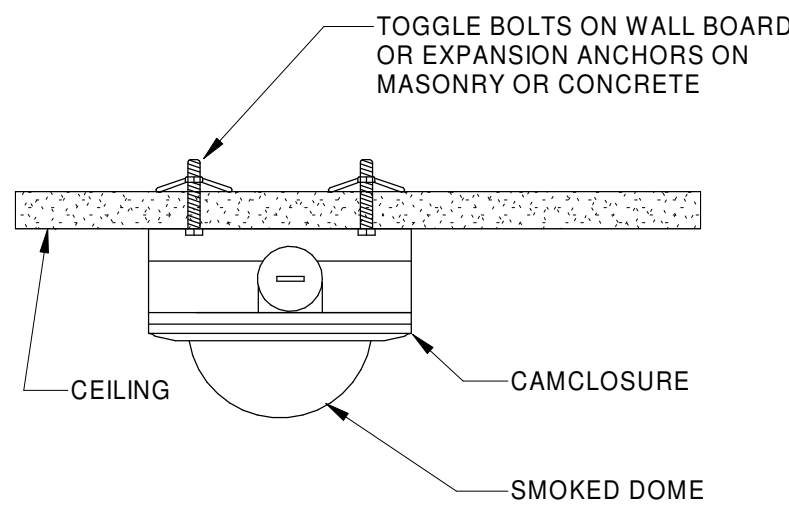
FIRE ALARM RISER DIAGRAM

T001 NOT TO SCALE



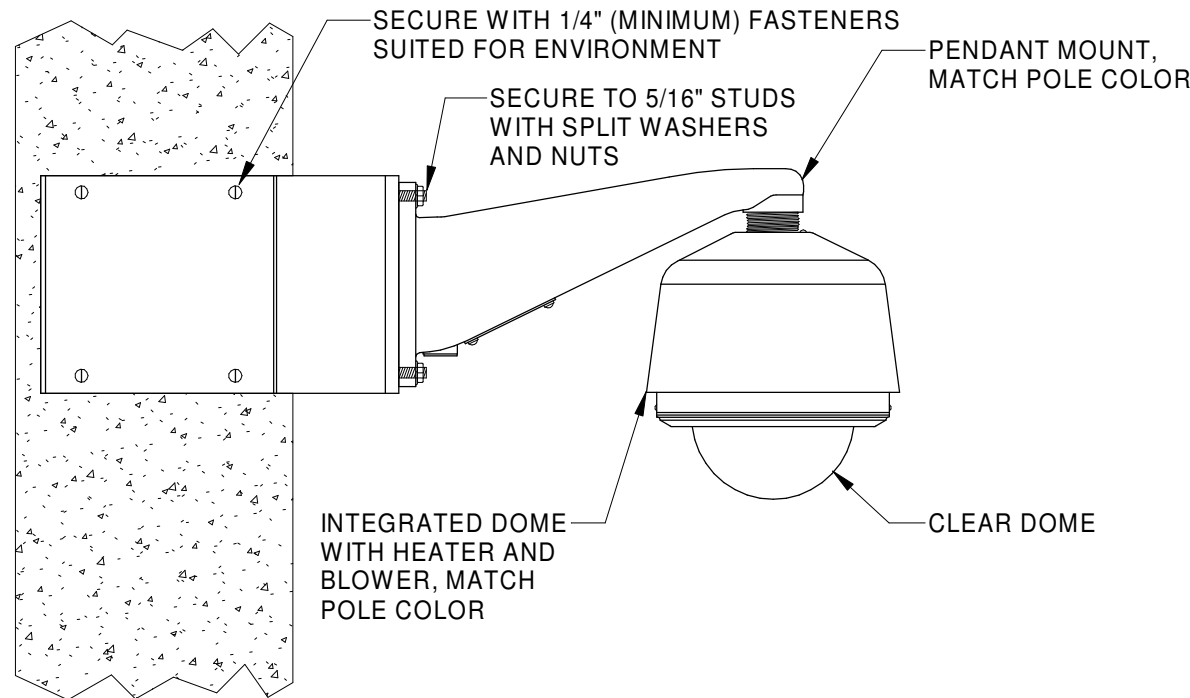
DATA SURFACE MOUNTING DETAIL

T001 NOT TO SCALE



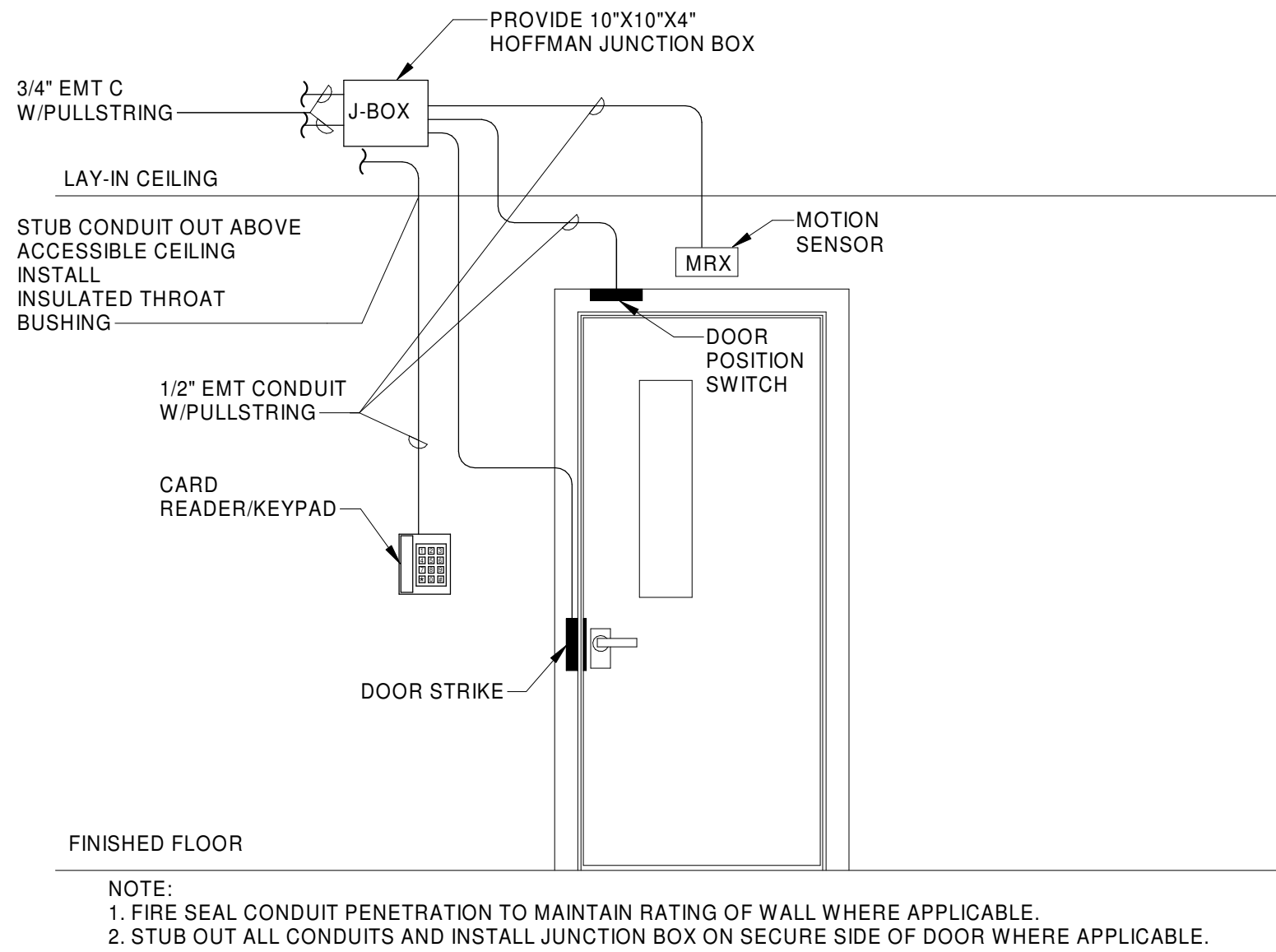
SECURITY CAMERA CEILING SURFACE MOUNT

T001 NOT TO SCALE



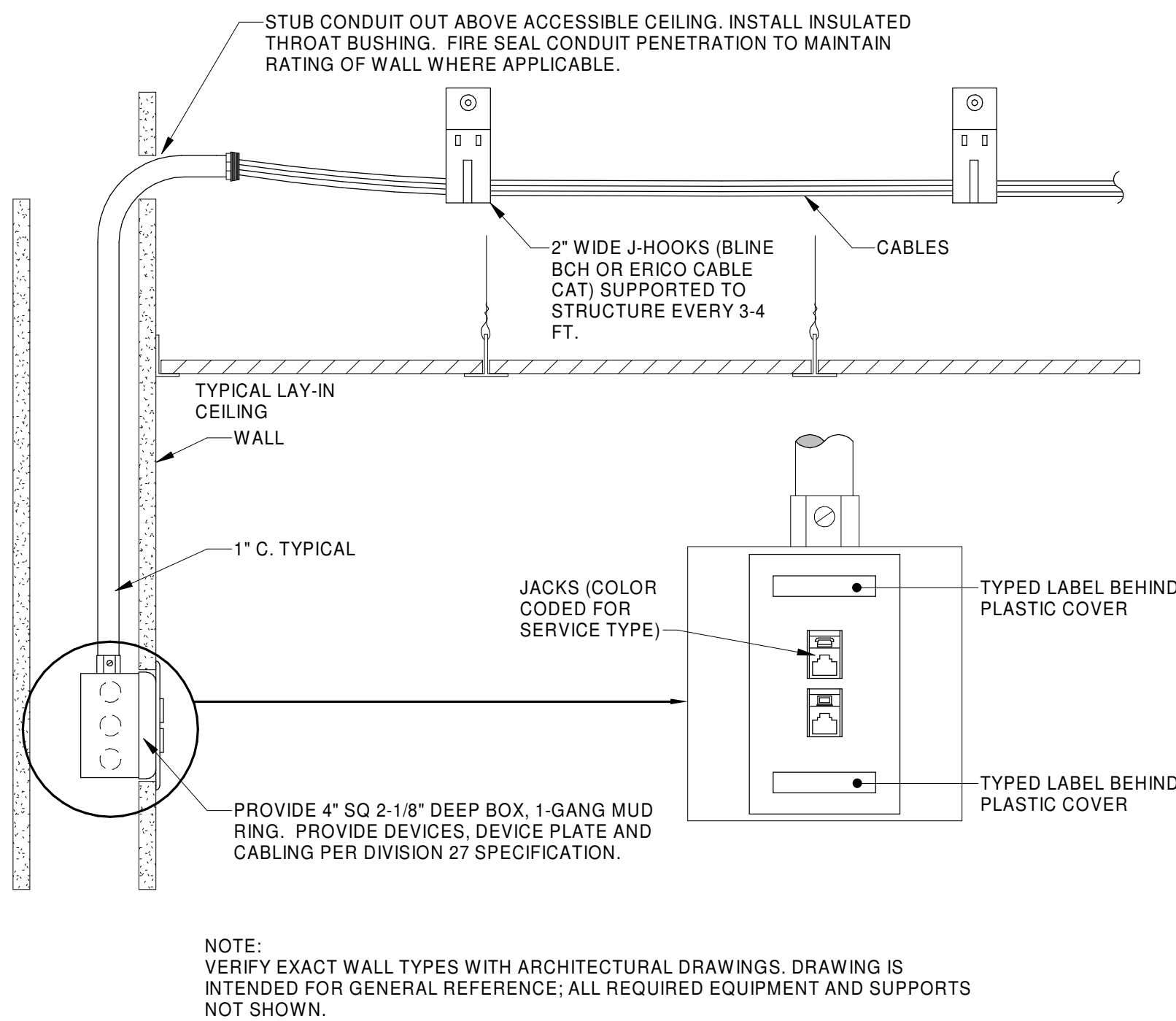
SECURITY CAMERA WALL CORNER MOUNT

T001 NOT TO SCALE



SECURITY DOOR ROUGH-IN DETAIL (ELECTRIC STRIKE)

T001 NOT TO SCALE



VOICE DATA ROUGH-IN J HOOKS

T001 NOT TO SCALE

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T400	SYSTEMS PLAN

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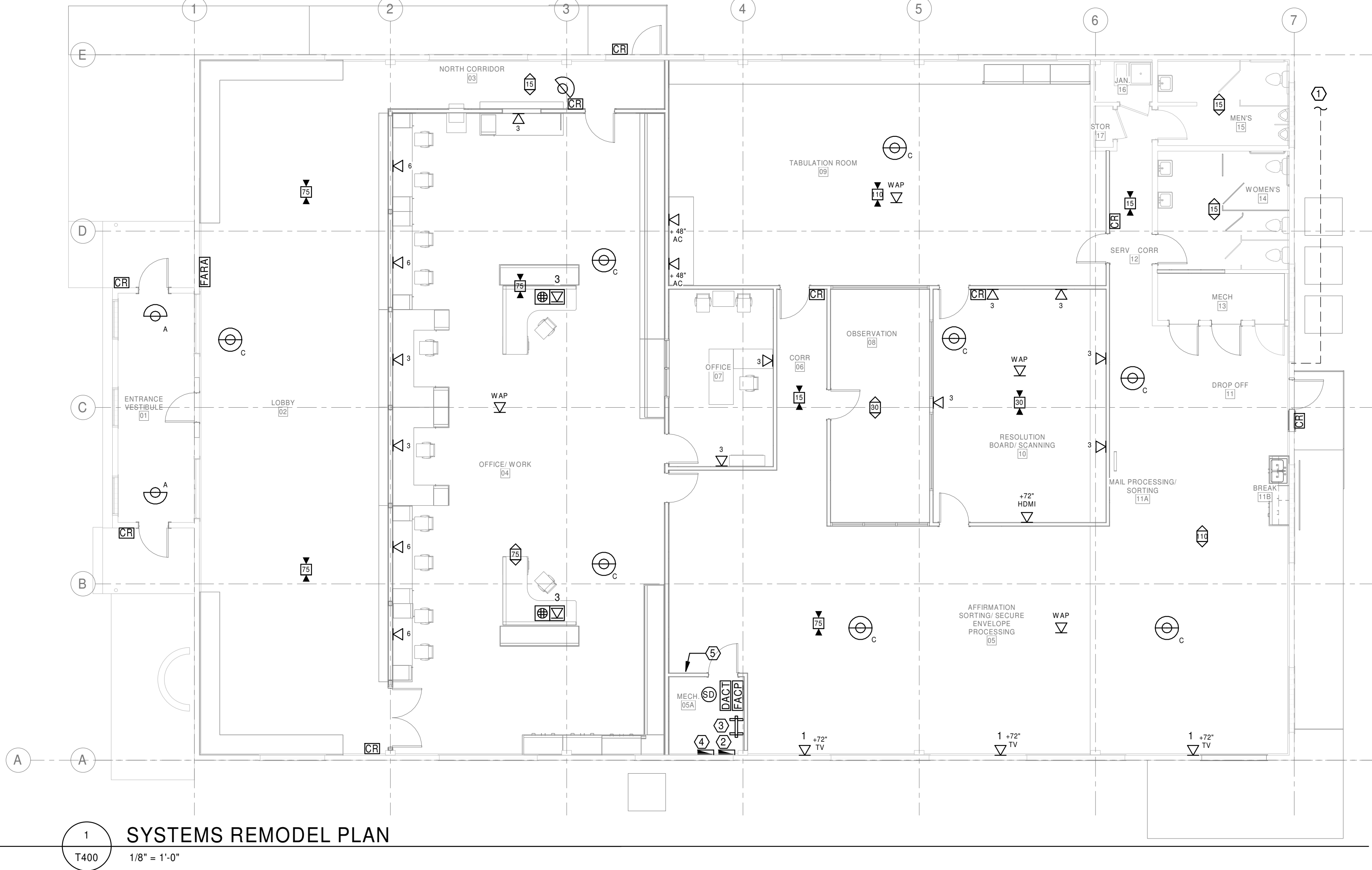
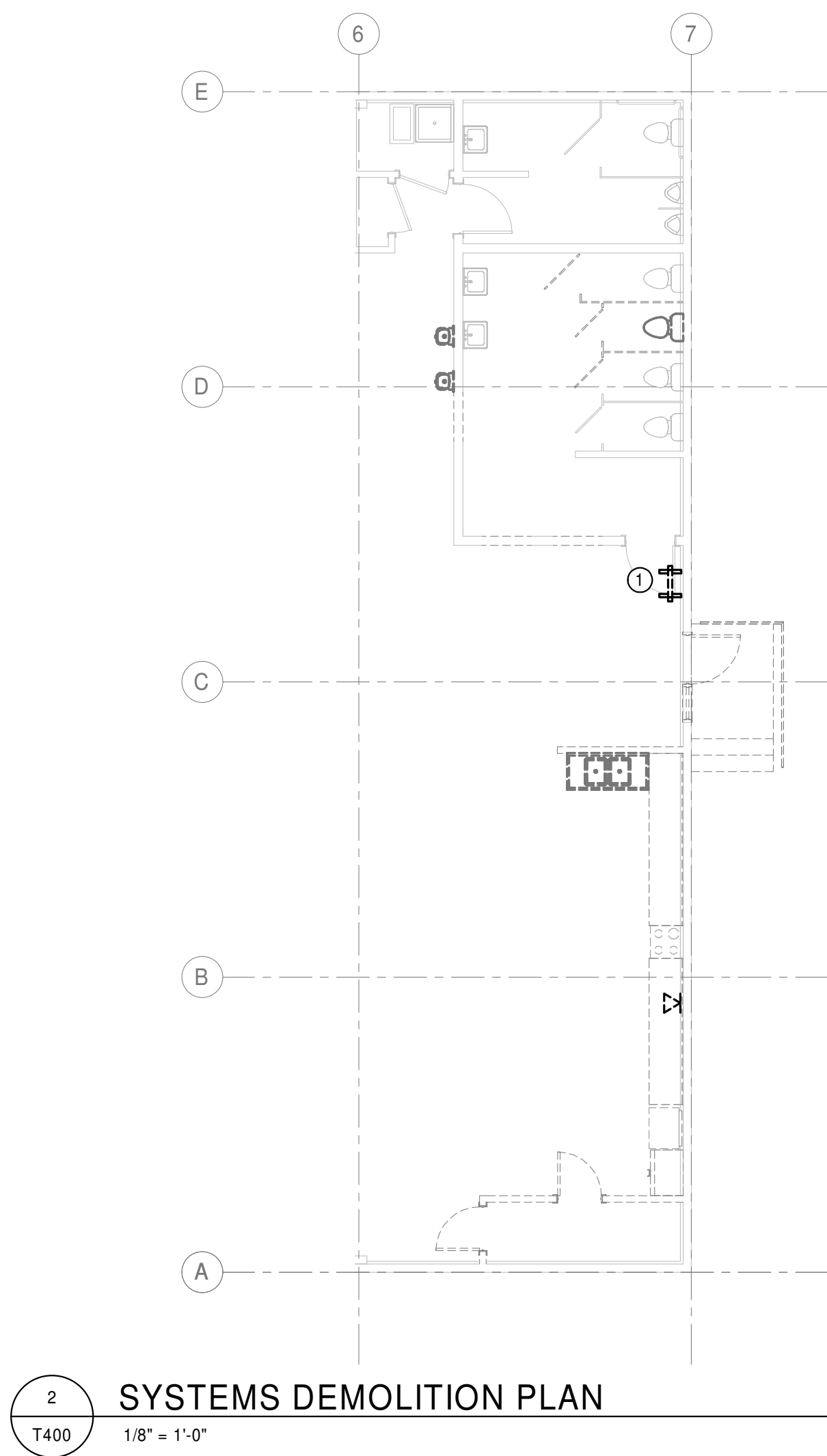
- A. COMPLY WITH LATEST ADOPTED NEC, NFPA 72 AND LATEST ADOPTED IBC/IFC.
- B. ALL CARD READERS SHALL BE NARROW PROFILE AND SHALL BE MOUNTED TO THE FRAME.
- C. ALL DEVICES, CABLING, RACKS, SWITCHES, PATCH PANELS, JACKS, FACEPLATES, AND ALL EQUIPMENT SHALL BE PROVIDED BY OWNERS VENDOR. E.C TO PROVIDE ROUGH IN.
- D. ALL LOW VOLTAGE SYSTEMS EQUIPMENT, DEVICES, AND CABLING PROVIDED BY OWNERS VENDOR. E.C. TO PROVIDE ROUGH IN.
- E. CRAWL SPACE IS ACCESSIBLE SEE SHEET A301. ABOVE CEILING IS ALSO ACCESSIBLE, CAUTION THAT BATT INSULATION IS LOOSE LAID ABOVE EXISTING AC CEILINGS AND WILL NEED TO BE REPOSITIONED PROPERLY.

DEMOLITION KEYNOTES

1. COMPLETELY REMOVE EXISTING NETWORK SWITCH AND ALL ASSOCIATED CABLING TO SINGLE DATA JACK. RETURN TO YELLOWSTONE COUNTY.

REMODEL KEYNOTES

1. NEW FIBER ROUTE FROM EXISTING FIBER LOCATION ROUTING. EXTEND MENS AND WOMENS RESTROOM STORAGE ROOM BUILDING DIRECTLY ADJECENT TO CEDAR HALL.
2. CONTRACTOR SHALL PROVIDE NVR. MONITOR PER SPECIFICATIONS, AND ALL ASSOCAITED CAMERA EQUIPMENT. VERIFY WITH OWNER LOCATION OF MONITOR AND WORKSTATION FOR CCTV SYSTEM.
3. CONTRACTOR SHALL PROVIDE WALL MOUNT ENCLOSED RACK.
4. CONTRACTOR SHALL PROVIDE SECURITY ACCESS CONTROL EQUIPMENT PANEL.
5. PROVIDE SIGNAGE INDICATING "MAIN FACP" MECH ROOM DOOR.





**Cushing
Terrell®**

Yellowstone County Elections Offices – Cedar Hall Renovation Billings, Montana

July 25th, 2025

Project Manual



OWNER

Yellowstone County
217 North 27th Street
Billings, Montana 59101
(406) 256- 2717

Architect/Engineer

Cushing Terrell
13 North 23rd Street
Billings, Montana 59101
(406) 248-7455

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DOCUMENT 000101 - PROJECT TITLE PAGE

1.1 PROJECT MANUAL

A. VOLUME 1.

1. Elections Offices – Cedar Hall Renovation.
2. Yellowstone County.
3. 217 North 27th Street, Billings, Montana 59101.
4. Architect Project No. YC23_AdmReno.

5. **Cushing
Terrell.**

6. Jeff Rupp
7. 13 North 23rd Street.
8. Billings, Montana 59101.
9. Phone: 406-248-7455.
10. Website: www.cushingterrell.com
11. Issued: July 25th, 2025.

END OF DOCUMENT 000101

DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect:

1. **Jeff Rupp**
2. MT 2865.
3. Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

B. Structural Engineer:

1. **Cole Moller**
2. MT 72246 PE.
3. Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

C. Plumbing Engineer:

1. **Roger Wheat**
2. MT 19996 PE.
3. Responsible for Divisions 22 Sections except where indicated as prepared by other design professionals of record.

D. Mechanical Engineer, HVAC:

1. **Joe Wolstein**
2. MT 39039 PE.
3. Responsible for Divisions 23 Sections except where indicated as prepared by other design professionals of record.

E. Electrical Engineer:

1. **Jeff Haidle**
2. MT 11561 PE.
3. Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

END OF DOCUMENT 000107

DOCUMENT 000115 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

- A. Drawings: Drawings that will be enumerated in the Owner/Contractor Agreement as part of the Contract Documents are listed on the Table of Contents page of the separately bound drawing set titled Yellowstone County Administration Building Remodel, dated **July 3, 2025**, as modified by subsequent Addenda and Modifications.
1. The words "Resource Drawing" or "For information" after the titles of drawings indicate that those drawings are not intended to be incorporated in the Contract Documents.
- B. List of Drawings: Drawings that will be enumerated in the Owner/Contractor Agreement as part of the Contract Documents are the following Drawings and other drawings of type indicated, as modified by subsequent Addenda and Modifications:

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G100 CODE PLANS

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S001 STRUCTURAL GENERAL NOTES
S002 STRUCTURAL GENERAL NOTES
S100 FOUNDATION PLAN
S102 CEILING FRAMING PLAN
S201 STRUCTURAL DETAILS

ARCHITECTURAL

AD100 DEMOLITION PLAN
A101 FLOOR PLAN
A301 BUILDING SECTIONS
A401 RAMPS
A501 FINISH PLANS SCHEDULES AND DETAILS
A601 DOORS AND WINDOW SCHEDULES AND DETAILS
A701 ENLARGED PLANS / INTERIOR ELEVATIONS
A702 ENLARGED PLANS / INTERIOR ELEVATIONS
A703 INTERIOR ELEVATIONS / CASEWORK DETAILS
A901 REFLECTED CEILING PLANS

PLUMBING

- P001 PLUMBING SCHEDULES AND LEGENDS
- P002 PLUMBING SPECIFICATIONS
- P101 PLUMBING DMV PLANS
- P201 PLUMBING DOMESTIC WATER PLANS

MECHANICAL

- M001 HVAC SCHEDULES & LEGENDS
- M100 HVAC PLANS

ELECTRICAL

- E001 LEGENDS, SCHEDULES AND PANELS
- E002 ELECTRICAL SCHEDULES AND ONELINE
- E003 ELECTRICAL SPECIFICATIONS
- E100 SITE PLAN
- E200 LIGHTING PLANS
- E300 POWER PLANS

TECHNOLOGY

- T001 LEGENDS AND SCHEDULES
- T400 SYSTEM PLAN

END OF DOCUMENT 000115

MONTANA
PREVAILING WAGE RATES FOR BUILDING CONSTRUCTION SERVICES 2025

Effective: January 11, 2025

Greg Gianforte, Governor
State of Montana

Sarah Swanson, Commissioner
Department of Labor & Industry

To obtain copies of prevailing wage rate schedules, or for information relating to public works projects and payment of prevailing wage rates, visit ESD at erd.dli.mt.gov/labor-standards or contact:

Employment Standards Division
Montana Department of Labor and Industry
P. O. Box 8011
Helena, MT 59604
Phone 406-444-6543

The department welcomes questions, comments, and suggestions from the public. In addition, we'll do our best to provide information in an accessible format, upon request, in compliance with the Americans with Disabilities Act.

MONTANA PREVAILING WAGE REQUIREMENTS

The Commissioner of the Department of Labor and Industry, in accordance with Sections 18-2-401 and 18-2-402 of the Montana Code Annotated (MCA), has determined the standard prevailing rate of wages for the occupations listed in this publication.

The wages specified herein control the prevailing rate of wages for the purposes of Section 18-2-401, et seq., MCA. It is required each employer pay (as a minimum) the rate of wages, including fringe benefits, travel allowance, zone pay and per diem applicable to the district in which the work is being performed as provided in the attached wage determinations.

All Montana Prevailing Wage Rates are available on the internet at <https://erd.dli.mt.gov/labor-standards/state-prevailing-wage-rates> or by contacting the department at (406) 444-6543.

In addition, this publication provides general information concerning compliance with Montana's Prevailing Wage Law and the payment of prevailing wages. For detailed compliance information relating to public works contracts and payment of prevailing wage rates, please consult the regulations on the internet at erd.dli.mt.gov/labor-standards or contact the department at (406) 444-6543.

SARAH SWANSON
Commissioner
Department of Labor and Industry
State of Montana

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A. Date of Publication January 13, 2025

B. Definition of Building Construction

For the purposes of Prevailing Wage, the Commissioner of Labor and Industry has determined that building construction occupations are defined to be those performed by a person engaged in a recognized trade or craft, or any skilled, semi-skilled, or unskilled manual labor related to the construction, alteration, or repair of a public building or facility, and does not include engineering, superintendence, management, office or clerical work.

The Administrative Rules of Montana (ARM), 24.17.501(2) – 2(c), states *“Building construction projects generally are the constructions of sheltered enclosures with walk-in access for housing persons, machinery, equipment, or supplies. It includes all construction of such structures, incidental installation of utilities and equipment, both above and below grade level, as well as incidental grading, utilities and paving.”*

Examples of building construction include, but are not limited to, alterations and additions to buildings, apartment buildings (5 stories and above), arenas (closed), auditoriums, automobile parking garages, banks and financial buildings, barracks, churches, city halls, civic centers, commercial buildings, court houses, detention facilities, dormitories, farm buildings, fire stations, hospitals, hotels, industrial buildings, institutional buildings, libraries, mausoleums, motels, museums, nursing and convalescent facilities, office buildings, out-patient clinics, passenger and freight terminal buildings, police stations, post offices, power plants, prefabricated buildings, remodeling buildings, renovating buildings, repairing buildings, restaurants, schools, service stations, shopping centers, stores, subway stations, theaters, warehouses, water and sewage treatment plants (buildings only), etc.”

C. Definition of Public Works Contract

Section 18-2-401(11)(a), MCA defines “public works contract” as *“...a contract for construction services let by the state, county, municipality, school district, or political subdivision or for nonconstruction services let by the state, county, municipality, or political subdivision in which the total cost of the contract is in excess of \$25,000...”*.

D. Prevailing Wage Schedule

This publication covers only Building Construction occupations and rates. These rates will remain in effect until superseded by a more current publication. Current prevailing wage rate schedules for Heavy Construction, Highway Construction, and Nonconstruction Services occupations can be found on the internet at <https://erd.dli.mt.gov/labor-standards/state-prevailing-wage-rates/> or by contacting the department at (406) 444-6543.

E. Rates to Use for Projects

ARM, 24.17.127(1)(c), states *“The wage rates applicable to a particular public works project are those in effect at the time the bid specifications are advertised.”*

F. Wage Rate Adjustments for Multiyear Contracts

Section 18-2-417, MCA states:

“(1) Any public works contract that by the terms of the original contract calls for more than 30 months to fully perform must include a provision to adjust, as provided in subsection (2), the standard prevailing rate of wages to be paid to the workers performing the contract.

(2) The standard prevailing rate of wages paid to workers under a contract subject to this section must be adjusted 12 months after the date of the award of the public works contract. The amount of the adjustment must be a 3% increase. The adjustment must be made and applied every 12 months for the term of the contract.

(3) Any increase in the standard rate of prevailing wages for workers under this section is the sole responsibility of the contractor and any subcontractors and not the contracting agency.”

G. Fringe Benefits

Section 18-2-412, MCA states:

“(1) To fulfill the obligation...a contractor or subcontractor may:

(a) pay the amount of fringe benefits and the basic hourly rate of pay that is part of the standard prevailing rate of wages directly to the worker or employee in cash;

(b) make an irrevocable contribution to a trustee or a third person pursuant to a fringe benefit fund, plan, or program that meets the requirements of the Employee Retirement Income Security Act of 1974 or that is a bona fide program approved by the U. S. department of labor; or

(c) make payments using any combination of methods set forth in subsections (1)(a) and (1)(b) so that the aggregate of payments and contributions is not less than the standard prevailing rate of wages, including fringe benefits and travel allowances, applicable to the district for the particular type of work being performed.

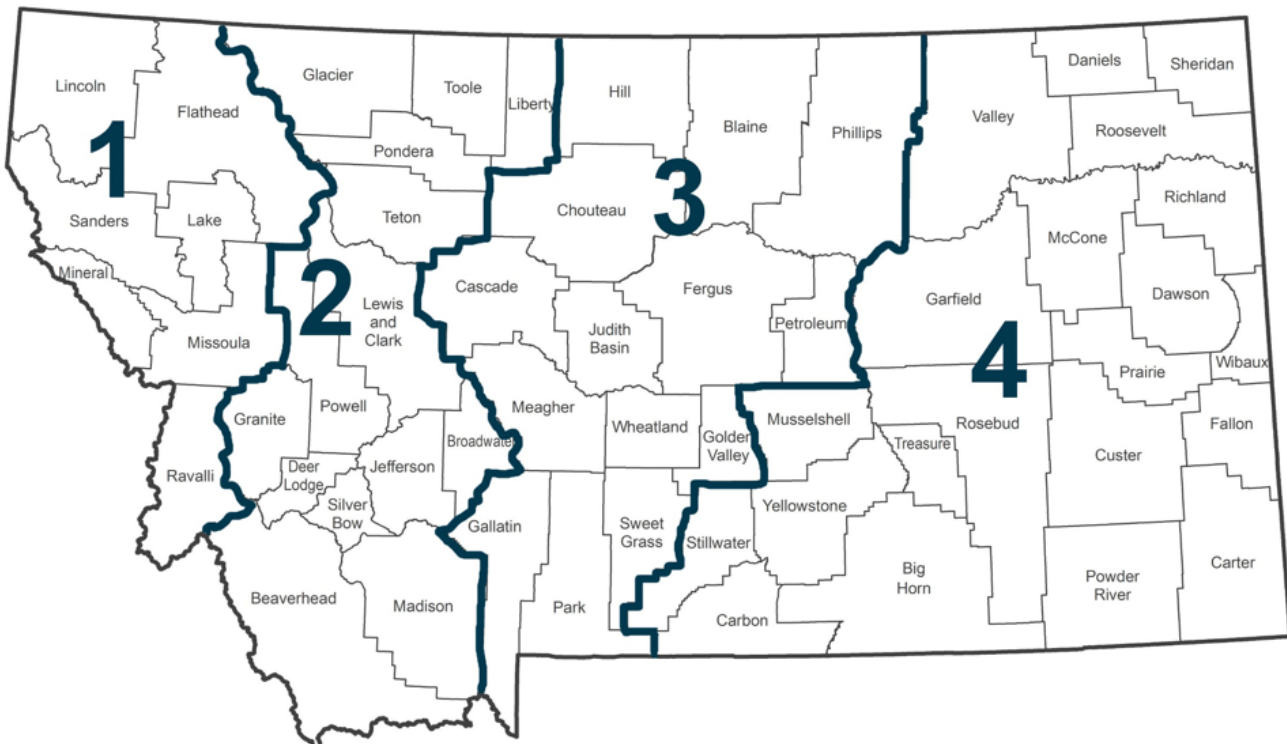
(2) The fringe benefit fund, plan, or program described in subsection (1)(b) must provide benefits to workers or employees for health care, pensions on retirement or death, life insurance, disability and sickness insurance, or bona fide programs that meet the requirements of the Employee Retirement Income Security Act of 1974 or that are approved by the U. S. department of labor.”

Fringe benefits are paid for all hours worked (straight time and overtime hours). However, fringe benefits are not to be considered a part of the hourly rate of pay for calculating overtime, unless there is a collectively bargained agreement in effect that specifies otherwise.

H. Prevailing Wage Districts

Montana counties are aggregated into 4 districts for the purpose of prevailing wage. The prevailing wage districts are composed of the following counties:

Montana Prevailing Wage Districts



I. Dispatch City

ARM, 24.17.103(11), defines dispatch city as *“...the courthouse in the city from the following list which is closest to the center of the job: Billings, Bozeman, Butte, Great Falls, Helena, Kalispell, Miles City, Missoula and Sidney.”* A dispatch city shall be considered the point of origin only for jobs within the counties identified in that district (as shown below):

District 1 – Kalispell and Missoula: includes Flathead, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sanders;

District 2 – Butte and Helena: includes Beaverhead, Broadwater, Deer Lodge, Glacier, Granite, Jefferson, Lewis and Clark, Liberty, Madison, Pondera, Powell, Silver Bow, Teton, and Toole;

District 3 – Bozeman and Great Falls: includes Blaine, Cascade, Chouteau, Fergus, Gallatin, Golden Valley, Hill, Judith Basin, Meagher, Park, Petroleum, Phillips, Sweet Grass, and Wheatland;

District 4 – Billings, Miles City and Sidney: includes Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, McCone, Musselshell, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Treasure, Valley, Wibaux, and Yellowstone.

J. Zone Pay

Zone pay is not travel pay. ARM, 24.17.103(25), defines zone pay as *“...an amount added to the base pay; the combined sum then becomes the new base wage rate to be paid for all hours worked on the project. Zone pay must be determined by measuring the road miles one way over the shortest practical maintained route from the dispatch city to the center of the job.”* See section I above for a list of dispatch cities.

K. Computing Travel Benefits

ARM, 24.17.103(23), states *“ ‘Travel pay,’ also referred to as ‘travel allowance,’ is and must be paid for travel both to and from the job site, except those with special provisions listed under the classification. The rate is determined by measuring the road miles one direction over the shortest practical maintained route from the dispatch city or the employee's home, whichever is closer, to the center of the job.”* See section I above for a list of dispatch cities.

L. Per Diem

ARM, 24.17.103(19), states *“ ‘Per diem’ typically covers costs associated with board and lodging expenses. Per diem is paid when an employee is required to work at a location outside the daily commuting distance and is required to stay at that location overnight or longer.”*

M. Apprentices

Wage rates for apprentices registered in approved federal or state apprenticeship programs are contained in those programs. Additionally, Section 18-2-416(2), MCA states *“...The full amount of any applicable fringe benefits must be paid to the apprentice while the apprentice is working on the public works contract.”* Apprentices not registered in approved federal or state apprenticeship programs will be paid the appropriate journey level prevailing wage rate when working on a public works contract.

N. Posting Notice of Prevailing Wages

Section 18-2-406, MCA provides that contractors, subcontractors and employers who are *“...performing work or providing construction services under public works contracts, as provided in this part, shall post in a prominent and accessible site on the project or staging area, not later than the first day of work and continuing for the entire duration of the project, a legible statement of all wages and fringe benefits to be paid to the employees.”*

O. Employment Preference

Sections 18-2-403 and 18-2-409, MCA requires contractors to give preference to the employment of bona fide Montana residents in the performance of work on public works contracts.

P. Projects of a Mixed Nature

Section 18-2-418, MCA states:

“(1) The contracting agency shall determine, based on the preponderance of labor hours to be worked, whether the public works construction services project is classified as a highway construction project, a heavy construction project, or a building construction project.

“(2) Once the project has been classified, employees in each trade classification who are working on that project must be paid at the rate for that project classification”

Q. Occupations Definitions

You can find definitions for these occupations on the following Bureau of Labor Statistics website:

http://www.bls.gov/oes/current/oes_stru.htm

R. Welder Rates

Welders receive the rate prescribed for the craft performing an operation to which welding is incidental.

S. Foreman Rates

Rates are no longer set for foremen. However, if a foreman performs journey level work, the foreman must be paid at least the journey level rate.

WAGE RATES

BOILERMAKERS

No Rate Established

Duties Include:

Construct, assemble, maintain, and repair stationary steam boilers, boiler house auxiliaries, process vessels, and pressure vessels.

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BRICK, BLOCK, AND STONE MASONS

	Wage	Benefit
District 1	\$33.81	\$18.06
District 2	\$33.81	\$18.06
District 3	\$33.81	\$18.06
District 4	\$33.81	\$18.06

Travel:

All Districts

0-70 mi. free zone

>70-90 mi. \$60.00/day

>90 mi. \$80.00/day

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CARPENTERS

	Wage	Benefit
District 1	\$30.24	\$14.33
District 2	\$30.24	\$14.33
District 3	\$30.24	\$14.33
District 4	\$30.24	\$14.33

Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$4.00/hr.

>60 mi. base pay + \$6.00/hr.

Duties Include:

Install roll and batt insulation, and hardwood floors.

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CARPET INSTALLERS

No Rate Established

Duties Include:

Lay and install carpet from rolls or blocks on floors. Install padding and trim flooring materials.

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CEMENT MASONS AND CONCRETE FINISHERS

	Wage	Benefit
District 1	\$37.54	\$17.04
District 2	\$37.54	\$17.04
District 3	\$37.54	\$17.04
District 4	\$26.39	\$17.04

Duties Include:

Smooth and finish surfaces of poured concrete, such as floors, walks, sidewalks, or curbs. Align forms for sidewalks, curbs, or gutters.

Travel and Per Diem:

All Districts

0-30 mi free zone

30-60 mi base pay+2.95/hr.

>60 mi base pay+4.75/hr.

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CONSTRUCTION EQUIPMENT OPERATORS GROUP 1

	Wage	Benefit
District 1	\$27.20	\$15.20
District 2	\$30.03	\$13.63
District 3	\$32.36	\$13.38
District 4	\$32.36	\$13.15

This group includes but is not limited to:

Air Compressor; Auto Fine Grader; Belt Finishing; Boring Machine (Small); Cement Silo; Crane, A-Frame Truck Crane; Crusher Conveyor; DW-10, 15, and 20 Tractor Roller; Farm Tractor; Forklift; Form Grader; Front-End Loader, under 1 cu. yd; Oiler, Herman Nelson Heater; Mucking Machine; Oiler, All Except Cranes/Shovels; Pumpman.

Travel Pay

District 1

0-45 mi. free zone

>45-85 mi. \$60.00/day

>85 mi. \$90.00/day

Zone Pay

District 2

0-30 mi. free zone

>30-60 mi. base pay + \$3.50/hr.

>60 mi. base pay + \$5.50/hr.

Districts 3 and 4

0-30 mi. free zone

>30-60 mi. base pay + \$3.05/hr.

>60 mi. base pay + \$4.85/hr.

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CONSTRUCTION EQUIPMENT OPERATORS GROUP 2

	Wage	Benefit
District 1	\$30.82	\$13.55
District 2	\$31.76	\$13.42
District 3	\$31.40	\$14.15
District 4	\$28.60	\$11.70

This group includes but is not limited to:

Air Doctor; Backhoe\Excavator\Shovel, up to and incl. 3 cu. yds; Bit Grinder; Bituminous Paving Travel Plant; Boring Machine, Large; Broom, Self-Propelled; Concrete Travel Batcher; Concrete Float & Spreader; Concrete Bucket Dispatcher; Concrete Finish Machine; Concrete Conveyor; Distributor; Dozer, Rubber-Tired, Push, & Side Boom; Elevating Grader\Gradall; Field Equipment Serviceman; Front-End Loader, 1 cu. yd up to and incl. 5 cu. yds; Grade Setter; Heavy Duty Drills, All Types; Hoist\Tugger, All; Hydralift Forklifts & Similar; Industrial Locomotive; Motor Patrol (except finish); Mountain Skidder; Oiler, Cranes\Shovels; Pavement Breaker, EMSCO; Power Saw, Self-Propelled; Pugmill; Pumpcrete\Grout Machine; Punch Truck; Roller, other than Asphalt; Roller, Sheepsfoot (Self-Propelled); Roller, 25 tons and over; Ross Carrier; Rotomill, under 6 ft; Trenching Machine; Washing /Screening Plant.

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Travel Pay

District 1

0-45 mi. free zone
>45-85 mi. \$60.00/day
>85 mi. \$90.00/day

Zone Pay

District 2

0-30 mi. free zone
>30-60 mi. base pay + \$3.50/hr.
>60 mi. base pay + \$5.50/hr.

Districts 3 and 4

0-30 mi. free zone
>30-60 mi. base pay + \$3.05/hr.
>60 mi. base pay + \$4.85/hr.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 3

	Wage	Benefit
District 1	\$33.45	\$12.53
District 2	\$33.40	\$13.65
District 3	\$34.16	\$13.82
District 4	\$31.51	\$13.88

This group includes but is not limited to:

Asphalt Paving Machine; Asphalt Screed; Backhoe\Excavator\Shovel, over 3 cu. yds; Cableway Highline; Concrete Batch Plant; Concrete Curing Machine; Concrete Pump; Cranes, Creter; Cranes, Electric Overhead; Cranes, 24 tons and under; Curb Machine\Slip Form Paver; Finish Dozer; Front-End Loader, over 5 cu. yds; Mechanic\Welder; Pioneer Dozer; Roller Asphalt (Breakdown & Finish); Rotomill, over 6 ft; Scraper, Single, Twin, or Pulling Belly-Dump; YO-YO Cat Haul Truck, Articulating Trucks, Vac Truck.

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Travel Pay

District 1

0-45 mi. free zone
>45-85 mi. \$60.00/day
>85 mi. \$90.00/day

Zone Pay

Districts 2 - 4

0-30 mi. free zone
>30-60 mi. base pay + \$3.50/hr.
>60 mi. base pay + \$5.50/hr.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 4

	Wage	Benefit
District 1	\$35.67	\$13.45
District 2	\$35.67	\$13.75
District 3	\$34.23	\$14.31
District 4	\$35.67	\$14.34

This group includes but is not limited to:

Asphalt\Hot Plant Operator; Cranes, 25 tons up to and incl. 44 tons; Crusher Operator; Finish Motor Patrol; Finish Scraper.

Travel Pay

District 1

0-45 mi. free zone
>45-85 mi. \$60.00/day
>85 mi. \$90.00/day

Zone Pay

Districts 2 - 4

0-30 mi. free zone
>30-60 mi. base pay + \$3.50/hr.
>60 mi. base pay + \$5.50/hr.

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CONSTRUCTION EQUIPMENT OPERATORS GROUP 5

	Wage	Benefit
District 1	\$35.05	\$14.76
District 2	\$36.77	\$14.95
District 3	\$36.77	\$15.02
District 4	\$36.77	\$15.11

This group includes but is not limited to:

Cranes, 45 tons up to and incl. 74 tons.

Travel Pay

District 1

0-45 mi. free zone
>45-85 mi. \$60.00/day
>85 mi. \$90.00/day

Zone Pay

Districts 2 - 4

0-30 mi. free zone
>30-60 mi. base pay + \$3.50/hr.
>60 mi. base pay + \$5.50/hr.

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CONSTRUCTION EQUIPMENT OPERATORS GROUP 6

	Wage	Benefit
District 1	\$37.86	\$16.50
District 2	\$37.86	\$16.50
District 3	\$37.86	\$16.50
District 4	\$37.20	\$16.55

This group includes but is not limited to:

Cranes, 75 tons up to and incl. 149 tons; Cranes, Whirley (All).

Zone Pay:

All Districts

0-30 mi. free zone
>30-60 mi. base pay + \$3.50/hr.
>60 mi. base pay + \$5.50/hr.

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CONSTRUCTION EQUIPMENT OPERATORS GROUP 7

	Wage	Benefit
District 1	\$38.96	\$16.35
District 2	\$38.96	\$16.31
District 3	\$38.96	\$16.50
District 4	\$38.96	\$16.31

This group includes but is not limited to:

Cranes, 150 tons up to and incl. 250 tons; Cranes, over 250 tons—add \$1.00 for every 100 tons over 250 tons; Crane, Tower (All); Crane Stiff-Leg or Derrick; Helicopter Hoist.

Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$3.50/hr.

>60 mi. base pay + \$5.50/hr.

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CONSTRUCTION LABORERS GROUP 1/FLAG PERSON FOR TRAFFIC CONTROL

	Wage	Benefit
District 1	\$24.55	\$12.00
District 2	\$24.55	\$12.00
District 3	\$24.55	\$12.00
District 4	\$24.55	\$12.00

Zone Pay:

All Districts

0-15 mi. free zone

>15-30 mi. base pay + \$0.65/hr.

>30-50 mi. base pay + \$0.85/hr.

>50 mi. base pay + \$1.25/hr.

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CONSTRUCTION LABORERS GROUP 2

	Wage	Benefit
District 1	\$22.44	\$7.71
District 2	\$24.72	\$11.38
District 3	\$28.46	\$12.00
District 4	\$24.43	\$9.44

Zone Pay:

All Districts

0-15 mi. free zone

>15-30 mi. base pay + \$0.65/hr.

>30-50 mi. base pay + \$0.85/hr.

>50 mi. base pay + \$1.25/hr.

This group includes but is not limited to:

General Labor; Asbestos Removal; Burning Bar; Bucket Man; Carpenter Tender; Caisson Worker; Cement Mason Tender; Cement Handler (dry); Chuck Tender; Choker Setter; Concrete Worker; Curb Machine-lay Down; Crusher and Batch Worker; Heater Tender; Fence Erector; Landscape Laborer; Landscaper; Lawn Sprinkler Installer; Pipe Wrapper; Pot Tender; Powderman Tender; Rail and Truck Loaders and Unloaders; Riprapper; Sign Erection; Guardrail and Jersey Rail; Spike Driver; Stake Jumper; Signalman; Tail Hoseman; Tool Checker and Houseman and Traffic Control Worker.

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CONSTRUCTION LABORERS GROUP 3

	Wage	Benefit
District 1	\$25.55	\$12.00
District 2	\$25.55	\$12.00
District 3	\$25.55	\$12.00
District 4	\$25.55	\$12.00

This group includes but is not limited to:

Concrete Vibrator; Dumpman (Grademan); Equipment Handler; Geotextile and Liners; High-Pressure Nozzleman; Jackhammer (Pavement Breaker) Non-Riding Rollers; Pipelayer; Posthole Digger (Power); Power Driven Wheelbarrow; Rigger; Sandblaster; Sod Cutter-Power and Tamper.

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Zone Pay:

All Districts

0-15 mi. free zone
>15-30 mi. base pay + \$0.65/hr.
>30-50 mi. base pay + \$0.85/hr.
>50 mi. base pay + \$1.25/hr.

CONSTRUCTION LABORERS GROUP 4

	Wage	Benefit
District 1	\$26.48	\$11.57
District 2	\$25.60	\$12.00
District 3	\$25.60	\$12.00
District 4	\$25.60	\$12.00

This group includes but is not limited to:

Hod Carrier***; Water Well Laborer; Blaster; Wagon Driller; Asphalt Raker; Cutting Torch; Grade Setter; High-Scaler; Power Saws (Faller & Concrete) Powderman; Rock & Core Drill; Track or Truck Mounted Wagon Drill and Welder incl. Air Arc.

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Zone Pay:

All Districts

0-15 mi. free zone
>15-30 mi. base pay + \$0.65/hr.
>30-50 mi. base pay + \$0.85/hr.
>50 mi. base pay + \$1.25/hr.

***Hod Carriers will receive the same amount of travel and/or subsistence pay as bricklayers when requested to travel.

DRYWALL APPLICATORS

No Rate Established

Duties Include:

Drywall and ceiling tile installation.

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Zone Pay:

All Districts

0-30 mi. free zone
>30-60 mi. base pay + \$4.00/hr.
>60 mi. base pay + \$6.00/hr.

ELECTRICIANS: INCLUDING BUILDING AUTOMATION CONTROL

	Wage	Benefit
District 1	\$36.88	\$15.78
District 2	\$36.00	\$15.87
District 3	\$36.50	\$16.76
District 4	\$40.00	\$16.95

Duties Include:

Electrical wiring; equipment and fixtures; street lights; electrical control systems. Installation and/or adjusting of building automation controls also during testing and balancing, commissioning and retro-commissioning.

Travel:

District 1

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

0-15 mi. free zone
>15-45 mi. \$0.585/mi. in excess of the free zone.
>45 mi. \$75.00/day

Districts 2 & 3

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

0-08 mi. free zone
>08-50 mi. current federal mileage rate/mi. in excess of the free zone.
>50 mi. \$71.57/day

District 4

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

0-18 mi. free zone
>18-60 mi. federal mileage rate/mi.

Per Diem

District 4

>60 mi. \$80.00/day

Per Diem in Big Sky and West Yellowstone \$125/day.

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ELEVATOR CONSTRUCTORS

	Wage	Benefit
District 1	\$64.87	\$46.38
District 2	\$64.87	\$46.38
District 3	\$64.87	\$46.38
District 4	\$64.87	\$46.38

Travel:

All Districts

0-15 mi. free zone
>15-25 mi. \$49.73/day
>25-35 mi. \$99.45/day
>35 mi. \$112.90/day

Special Provision:

.93/mile when added to amounts above if using employee vehicle.

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FLOOR LAYERS

No Rate Established

Apply blocks, strips, or sheets of shock-absorbing, sound-deadening, or decorative coverings to floors.

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GLAZIERS

	Wage	Benefit
District 1	\$24.13	\$3.66
District 2	\$24.13	\$3.66
District 3	\$24.13	\$3.66
District 4	\$23.73	\$4.02

Travel and Per Diem:

All Districts

No travel or per diem established.

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HEATING AND AIR CONDITIONING

	Wage	Benefit
District 1	\$32.95	\$14.16
District 2	\$33.15	\$15.35
District 3	\$34.69	\$16.88
District 4	\$35.76	\$18.44

Duties Include:

Testing and balancing, commissioning and retro-commissioning of all air-handling equipment and duct work.

All Districts

0-45 mi. free zone

>45 mi.

- \$0.25/mi. in employer vehicle.
- \$0.65/mi. in employee vehicle.

Per Diem:

All Districts

\$85/day

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INSULATION WORKERS - MECHANICAL (HEAT AND FROST)

	Wage	Benefit
District 1	\$43.81	\$21.99
District 2	\$43.81	\$21.99
District 3	\$43.81	\$21.99
District 4	\$43.81	\$21.99

Duties Include:

Insulate pipes, ductwork or other mechanical systems.

Travel:

0-30 mi. free zone

>30-40 mi. \$25.00/day

>40-50 mi. \$35.00/day

>50-60 mi. \$45.00/day

>60 mi. \$130.00/day plus

- \$0.56/mi. if transportation is not provided.
- \$0.20/mi. if in company vehicle.

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IRONWORKERS – REINFORCING IRON AND REBAR WORKERS

	Wage	Benefit
District 1	\$36.83	\$26.92
District 2	\$34.83	\$24.68
District 3	\$34.83	\$25.37
District 4	\$34.16	\$25.83

Travel:
All Districts
0-45 mi. free zone
>45-85 mi. \$100.00/day
>85 mi. \$150.00/day

Duties Include:

Structural steel erection; assemble prefabricated metal buildings; cut, bend, tie, and place rebar; energy producing windmill type towers; metal bleacher seating; handrail fabrication and ornamental steel.

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IRONWORKERS – STRUCTURAL IRON AND STEEL WORKERS

	Wage	Benefit
District 1	\$34.94	\$26.37
District 2	\$34.83	\$25.37
District 3	\$34.83	\$25.37
District 4	\$34.83	\$25.37

Travel:
All Districts
0-45 mi. free zone
>45-85 mi. \$100.00/day
>85 mi. \$150.00/day

Duties Include:

Structural steel erection; assemble prefabricated metal buildings; cut, bend, tie, and place rebar; energy producing windmill type towers; metal bleacher seating; handrail fabrication and ornamental steel.

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MILLWRIGHTS

	Wage	Benefit
District 1	\$40.45	\$21.25
District 2	\$40.45	\$21.25
District 3	\$40.45	\$21.25
District 4	\$40.45	\$21.25

Zone Pay:
All Districts
0-30 mi. free zone
>30-60 mi. base pay + \$4.00/hr.
>60 mi. base pay + \$6.00/hr.

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PAINTERS: INCLUDING PAPERHANGERS

	Wage	Benefit
District 1	\$29.40	\$21.48
District 2	\$20.30	\$21.48
District 3	\$29.40	\$21.48
District 4	\$26.64	\$21.48

Travel and Per Diem:
All Districts
No travel or per diem established.

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PILE BUCKS

No Rate Established

Duties Include:

Set up crane; set up hammer; weld tips on piles; set leads; insure piles are driven straight with the use of level or plum bob. Give direction to crane operator as to speed and direction of swing. Cut piles to grade.

Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$4.00/hr.

>60 mi. base pay + \$6.00/hr.

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PILOT CAR DRIVERS

No Rate Established

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PLASTERERS

No Rate Established

Duties Include:

All materials beyond the substrate, such as a moisture barrier, any type of drainage installation between the moisture barrier and insulation or EPS board, the attachment of the EPS board, installation of fiberglass mesh embedded in the base coat, any water-resistant coat that is applied on top of the insulation to serve as a weather barrier, and the application of the finish coat.

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PLUMBERS, PIPEFITTERS, AND STEAMFITTERS

	Wage	Benefit
District 1	\$40.90	\$17.47
District 2	\$44.90	\$17.47
District 3	\$44.90	\$17.47
District 4	\$40.90	\$20.86

Duties Include:

Assemble, install, alter, and repair pipe-lines or pipe systems that carry water, steam, air, other liquids or gases. Testing of piping systems, commissioning and retro-commissioning. Workers in this occupation may also install heating and cooling equipment and mechanical control systems.

Travel:

District 1

0-30 mi. free zone
>30-50 mi. \$35.00/day
>50-75 mi. \$45.00/day
>75 mi. \$100.00/day

Special Provision

If transportation is not provided, mileage at \$0.35/mi. for one trip out and one trip back is added to the amounts above. However, if the employee is traveling more than 75 miles/day, only subsistence at the rate of \$85.00/day is required.

Districts 2 & 3

0-45 mi. free zone
>45 mi.

- \$0.00/mi. in employer vehicle.
- \$0.65/mi. in employee vehicle.

Special Provision:

At the contractors' option, mileage for one trip out and one trip back per week may be paid plus subsistence at the rate of \$135.00/day.

District 4

0-70 free zone
>70 mi.

- On jobs when employees do not work consecutive days: \$0.55/mi. if employer doesn't provide transportation. Not to exceed two trips.
- On jobs when employees work any number of consecutive days: \$110.00/day.

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ROOFERS

	Wage	Benefit
District 1	\$32.97	\$9.40
District 2	\$32.97	\$9.40
District 3	\$32.97	\$9.40
District 4	\$25.08	\$5.19

Duties Include:

Metal roofing, covers roofs, walls and foundations with water proofing, insulation and vapor barriers in addition to metal flashings. Roofing includes shingles, low slope membranes, metal roofs, insulation, spray foam, coatings and vapor barriers. Wall coverings include metal panels, insulated metal panels and other waterproofing or rain screen systems. Foundation systems include waterproofing and insulation. Excludes prefabricated metal buildings.

Travel:

District 1

0-50 mi. free zone

>50 mi.

- \$0.00/mi. in employer vehicle.
- \$0.35/mi. in employee vehicle.

District 2 and 3

0-35 mi. free zone

>35 mi.

- \$0.00/mi. in employer vehicle.
- \$0.40/mi. in employee vehicle.

District 4

0-50 mi. free zone

>50 mi.

- \$0.00/mi. in employer vehicle.
- \$0.35/mi. in employee vehicle.

Per Diem:

District 1

\$84.00/day

District 2 and 3

Employer pays for room + \$30.00/day.

District 4

Employer pays for room + \$25.00/day.

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SHEET METAL WORKERS

	Wage	Benefit
District 1	\$38.14	\$21.61
District 2	\$38.14	\$21.61
District 3	\$38.14	\$21.61
District 4	\$38.14	\$21.61

Duties Include:

Testing and balancing, commissioning and retro-commissioning of all air-handling equipment and duct work. Manufacture, fabrication, assembling, installation, dismantling, and alteration of all HVAC systems, air conveyer systems, and exhaust systems. All lagging over insulation and all duct lining.

All Districts

0-45 mi. free zone

46-65 mi. \$35/day

>65 mi. \$155/day for overnight stay

>65 mi. if employee is driving/riding in a company vehicle and returns home the same day, drive time shall be paid both ways, and no subsistence paid.

Drive time will be at straight time and there shall be no benefits paid for drive time. Drive time will be outside the regular shift.

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SOLAR PHOTOVOLTAIC INSTALLERS

	Wage	Benefit
District 1	\$36.50	\$16.76
District 2	\$36.50	\$16.76
District 3	\$36.50	\$16.76
District 4	\$36.50	\$16.76

Travel:

Districts 1, 2 and 3

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

- 0-08 mi. free zone
- >08-50 mi. federal mileage rate/mi. in excess of the free zone.
- >50 mi. \$60.57/day

District 4

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

- 0-18 mi. free zone
- >18-60 mi. federal mileage rate/mi.
- >60 mi. \$75.00/day

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SPRINKLER FITTERS

	Wage	Benefit
District 1	\$44.11	\$32.36
District 2	\$44.11	\$23.55
District 3	\$38.70	\$20.37
District 4	\$44.11	\$21.97

Duties Include:

Duties Include but not limited to any and all fire protection systems: Installation, dismantling, inspection, testing, maintenance, repairs, adjustments, and corrections of all fire protection and fire control systems, including both overhead and underground water mains, all piping, fire hydrants, standpipes, air lines, tanks, and pumps used in connection with sprinkler and alarm systems.

Travel

All Districts

The following travel allowance is applicable when traveling in employee's vehicle.

- 0-60 mi. free zone
- >60-80 mi. \$19.00/day
- >80-100 mi. \$29.00/day
- >100 mi. \$105.00/day + the IRS rate per mile and \$8.92 for every 15 miles traveled for one trip out and one trip back

No travel allowance required when in employer's vehicle except when staying the night.

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TAPERS

No Rate Established

Travel and Per Diem:

All Districts

No travel or per diem established.

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TELECOMMUNICATIONS EQUIPMENT INSTALLERS

	Wage	Benefit
District 1	\$39.66	\$14.43
District 2	\$22.00	\$11.06
District 3	\$22.00	\$11.27
District 4	\$22.00	\$11.27

Travel:

All Districts

The federal mileage rate/mi. in effect when travel occurs if using own vehicle.

Per Diem:

All Districts

Employer pays for meals and lodging up to \$75.00/day. When jobsite is located in Big Sky, West Yellowstone, and Gardiner, lodging and meals will be provided by the employer for all actual and reasonable expenses incurred.

Duties Include:

Install voice; sound; vision and data systems. This occupation includes burglar alarms, fire alarms, fiber optic systems, and video systems for security or entertainment

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TERRAZZO WORKERS AND FINISHERS

No Rate Established

Duties Include:

Finish work on hard tile, marble, and wood tile to floors, ceilings, and roof decks

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Travel and Per Diem

No travel or per diem established.

TILE AND STONE SETTERS

No Rate Established

Duties Include:

Apply hard tile, stone, and comparable materials to walls, floors, ceilings, countertops, and roof decks.

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TRUCK DRIVERS

Pilot Car Driver **No Rate Established**

	Wage	Benefit
District 1	\$23.68	\$ 7.67
District 2	\$23.80	\$ 6.13
District 3	\$23.80	\$ 6.13
District 4	\$23.68	\$ 7.67

Zone Pay:
All Districts
No zone pay established.

Truck drivers include but are not limited to:

Combination Truck & Concrete Mixer; Distributor Driver; Dry Batch Trucks; Dump Trucks & Similar Equipment; Flat Trucks; Lowboys, Four-Wheel Trailers, Float Semitrailer; Powder Truck Driver (Bulk Unloader Type); Servicemen; Service Truck Drivers, Fuel Truck Drivers, Tiremen; Trucks with Power Equipment; Truck Mechanic; Water Tank Drivers, Petroleum Product Drivers.

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SECTION 010000 - GENERAL REQUIREMENTS

PART 1 - GENERAL (Not Used)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 010000

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work performed by Owner.
5. Work under Owner's separate contracts.
6. Owner's product purchase contracts.
7. Owner-furnished/Contractor-installed (OFICI) products.
8. Contractor's use of site and premises.
9. Coordination with occupants.
10. Work restrictions.
11. Specification and Drawing conventions.
12. Miscellaneous provisions.

- B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 017300 "Execution" for coordination of Owner-installed products.

1.3 DEFINITIONS

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

- A. Project Identification: Yellowstone County Administration Building Renovation

1. Project Location: MetraPark Arena, 306 6th Ave N, Billings MT 59101, Cedar Hall Pavillion.

- B. Owner: Yellowstone County, 217 North 27th Street, Billings, MT.
 - 1. Owner's Representative: Matt Kessler, mkessler@yellowstonecountymt.gov.
- C. Architect: Cushing Terrell , Billings Office.
 - 1. Architect's Representative: Jeff Rupp, JeffRupp@cushingterrell.com (406)896-6113 .
- D. Web-Based Project Software: Project software may be used for purposes of managing communication and documents during the construction stage.
 - 1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - a. The Dance Hall pavilion is being renovated into a new office space for the Yellowstone County's Election offices. The building will be renovated on the inside of the building with very limited renovations to the exterior of the building. The existing mechanical system will be removed and replaced in its entirety with four new mechanical units and ductwork. The electrical system will be renovated and updated. The interior of the space will receive new walls and finishes to create the office spaces required. Limited structural work to include exterior concrete ramps and sidewalk. Along with interior wall and limited ceiling framing.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.6 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
 - 1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
 - 2. Provide for delivery of Owner-furnished products to Project site.
 - 3. Upon delivery, inspect, with Contractor present, delivered items.
 - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFICI) Products:

1. Restroom accessories.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between 7:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 1. Hours for Utility Shutdowns: as approved in advance.

- C. Existing Utility Interruptions: Do not interrupt utilities serving MetraPark or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify Owner and MetraPark not less than two weeks in advance of proposed utility interruptions.
 - 2. Obtain Owner and MetraPark written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to MetraPark with Owner.
 - 1. Notify Owner and MetraPark not less than two weeks in advance of proposed disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.10 MISCELLANEOUS PROVISIONS

- A. NONE.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. ONE: Lighting wireless controls

1. Provide alternate bid to update pendant lighting fixtures to pendant fixture with integral occupancy sensing and wireless control option. Alternate bid shall include updating low voltage wired controls to wireless controls in rooms with existing 14' 11" ceilings. See electrical sheets E002 and E200 for information on alternate.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for products selected under an alternate.
 - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication, or installation method cannot be provided, if applicable.

- b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 10 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 10 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed unless otherwise indicated.
- C. Substitutions for Convenience: Architect will consider requests for substitution if received within 45 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
 - 2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

- a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 7. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

- 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 WORK CHANGE DIRECTIVE

- A. Work Change Directive: Architect or Construction Manager may issue a Work Change Directive on AIA Document G714. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

- 1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

- 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
 - 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Owner's name.
 - c. Owner's Project number.
 - d. Name of Architect.
 - e. Architect's Project number.
 - f. Contractor's name and address.
 - g. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
 5. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 6. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
 7. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
 8. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
 9. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
 10. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 11. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and Construction Manager and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Architect by the last day of the following month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
 - 1. Other Application for Payment forms proposed by the Contractor may be acceptable to Construction Manager and Owner. Submit forms for approval with initial submittal of schedule of values.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit one (1) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. The copy shall include waivers of

lien and similar attachments if required. Electronic submissions are acceptable, but a hard copy is required for owners file.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Submittal schedule (preliminary if not final).
 5. Certificates of insurance and insurance policies.
 6. Performance and payment bonds.
 7. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.

2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706.
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Proof that taxes, fees, and similar obligations are paid.
10. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Web-based Project management software package.
 - 6. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and in prominent location in built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format:
 - a. Same digital data software program, version, and operating system as original Drawings.
 - b. Operating in Microsoft Windows operating system.
 2. File Submittal Format: Submit or post coordination drawing files using PDF format.
 3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in REVIT 2023.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Name of Architect.
 3. Architect's Project number.
 4. Date.
 5. Name of Contractor.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.

13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: submitted using Procore.
 1. Attachments shall be electronic files in PDF format.
- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.
 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect or Construction Manager of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time, or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 5 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Use software log that is part of web-based Project management software. Include the Software log with not less than the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number, including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.

8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within three days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 3. Digital Drawing Software Program: Contract Drawings are available in REVIT 2023.
 4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
 - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement included in this Project Manual.
 5. The following digital data files will be furnished for each appropriate discipline:
 - a. Floor plans.
 - b. Reflected ceiling plans.
- B. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.
1. Web-based Project management software includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs,

- submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
- 2. Provide up to seven Project management software user licenses for use of Owner, Construction Manager, Architect, and Owner's consultants. .
 - 3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
- 1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
- 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three days of the meeting.

- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for moisture and mold control.
 - u. Procedures for disruptions and shutdowns.
 - v. Construction waste management and recycling.
 - w. Parking availability.
 - x. Office, work, and storage areas.
 - y. Equipment deliveries and priorities.
 - z. First aid.
 - aa. Security.
 - bb. Progress cleaning.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with

- other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting.

- Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - l. Coordination of separate contracts.
 - m. Owner's partial occupancy requirements.
 - n. Installation of Owner's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly or appropriate interval intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.

- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Status of sustainable design documentation.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of Proposal Requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
- 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at weekly or at appropriate interval intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind

- schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
- b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Status of RFIs.
 - 15) Proposal Requests.
 - 16) Change Orders.
 - 17) Pending changes.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Concealed Work photographs.
 - 3. Periodic construction photographs.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
 - 2. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.2 INFORMATIONAL SUBMITTALS

- A. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos CD-ROM or thumb-drive and or by uploading to web-based Project management software site.
 - 2. Identification: Provide the following information with each image description in file metadata tag in web-based Project management software site:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.3 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and

capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.

- C. File Names: Name media files with date, Project area and sequential numbering suffix.

1.4 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
 - 1. Piping.
 - 2. Electrical conduit.
 - 3. Waterproofing and weather-resistant barriers.
- C. Periodic Construction Photographs: Take 20 photographs weekly and or to coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- D. Additional Photographs: Architect or Construction Manager may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
 - 1. Three days' notice will be given, where feasible.
 - 2. In emergency situations, take additional photographs within 24 hours of request.
 - 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs are to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

YELLOWSTONE COUNTY
ELECTIONS OFFICES – CEDAR HALL RENOVATION
BILLINGS, MONTANA

YC23_ADMRENO - ELECTIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs.
4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
8. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Construction Manager.
 5. Name of Contractor.
 6. Name of firm or entity that prepared submittal.
 7. Names of subcontractor, manufacturer, and supplier.
 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 9. Category and type of submittal.

10. Submittal purpose and description.
 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 12. Drawing number and detail references, as appropriate.
 13. Indication of full or partial submittal.
 14. Location(s) where product is to be installed, as appropriate.
 15. Other necessary identification.
 16. Remarks.
 17. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect and Construction Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 3. Paper: Prepare submittals in paper form and deliver to Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 10 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to owner's consultants, allow **[15]** days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
 4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 5. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
 6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples

include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit two (2) sets of Samples. Architect will retain one (1) Sample; remainder will be returned. Mark up and retain one returned Sample as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the

Contract Documents. Include evidence of manufacturing experience where required.

4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.7 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract

Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
 2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
 3. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

- E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.

1.3 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.

- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.5 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- C. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 3. Owner-performed tests and inspections indicated in the Contract Documents.
- D. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements .
- E. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, telephone number, and email address of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.

3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement of whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.7 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor's Responsibilities:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
 - e. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform duties of Contractor.

- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
 - 1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 - 2. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections indicated on the drawings, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Construction Manager's and authorities' having jurisdiction reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
- C. Installation, removal, and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- D. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- E. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.2 INFORMATIONAL SUBMITTALS

- A. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

1.3 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in ICC A117.1 accessibility regulation.

1.4 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices:
 1. Contractor may provide if needed space for field offices for duration of Project as needed for the General Contractors use.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service:
 - 1. Install water service and distribution piping in sizes and pressures adequate for construction.
 - 2. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Electric Power Service:

1. Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
2. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - a. Install electric power service overhead unless otherwise indicated.
 - b. Connect temporary service to Owner's existing power source, as directed by Owner.

F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

C. Storage and Staging: Use designated areas of Project site for storage and staging needs.

D. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated by Owner.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

- a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

E. Waste Disposal Facilities:

1. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

2. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

F. Lifts and Hoists: Provide facilities necessary for hoisting materials.

1. host and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities. Verify weight load on wood floors prior to using host or lifts.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
2. Protect existing wood floors during construction. Existing wood floor is to remain the final product on completion of this project.

B. Temporary Erosion and Sedimentation Control:

1. Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent, and requirements specified in Section 311000 "Site Clearing."

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Enclosure Fence for stored materials: Before construction operations begin, furnish and install enclosure fence for any stored materials on the site.

1. Extent of Fence: As required to enclose any stored materials.

E. Security Enclosure and Lockup: Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Security fencing will not be required on this project. The MetraPark grounds are secured at night. No additional fencing is required for project or laydown area.

- H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary

facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
 - 2. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 3. Section 017700 "Closeout Procedures" for submitting warranties.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical

properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products will be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is inconspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.4 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
 1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Store materials in a manner that will not endanger Project structure.

4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections are to be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."

- b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
 - 5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
 - 6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
 - 7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp. See Section 013300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

YELLOWSTONE COUNTY
ELECTIONS OFFICES – CEDAR HALL RENOVATION
BILLINGS, MONTANA

YC23_ADMRENO - ELECTIONS

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering.
 - 3. Installation.
 - 4. Cutting and patching.
 - 5. Coordination of Owner's portion of the Work.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner's separate contracts, and limits on use of Project site.
 - 2. Section 017700 "Closeout Procedures" for submitting Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 - 3. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
 - 4. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result

from cutting and patching work. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

- a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Layout Conference: Conduct conference at Project site.

1. Prior to establishing layout of new and existing perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. Professional surveyor responsible for performing Project surveying and layout.
2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Certified Surveys: Submit two copies signed by land surveyor.
- B. Cutting and Patching Plan: Submit plan describing procedures at least **10** days prior to the time cutting and patching will be performed. Include the following information:
 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems

that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

- a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."
- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. 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. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or 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. Other construction elements include but are not limited to the following:

- a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction 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.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching 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 provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are

indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.5 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 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. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.

- D. 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.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- F. 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.
- G. 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 neatly to minimum 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. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. 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.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. 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 practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical 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.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 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.

- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel.
 1. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:

1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

PART 2 - PRODUCTS

2.1 RECYCLING RECEIVERS AND PROCESSORS

- A. Subject to compliance with requirements, available recycling receivers and processors include, but are not limited to, the following:

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

2. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

3.3 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final Completion procedures.
 - 3. List of incomplete items.
 - 4. Submittal of Project warranties.
 - 5. Final cleaning.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
 - 3. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 4. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 5. Section 017900 "Demonstration and Training" for requirements to train Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.

- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's Construction Manager's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of **10** days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final

inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.
4. Submit list of incomplete items in the following format:
 - a. PDF Electronic File: Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.

- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
 - i. Vacuum and mop concrete.
 - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
 - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment[, **elevator equipment**,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils.
 - 1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.
 - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls." and Section 017419 "Construction Waste Management and Disposal."

3.2 CORRECTION OF THE WORK

- A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Architect by uploading to web-based project software site or by email to Architect. Enable reviewer comments on draft submittals.

- C. Initial Manual Submittal: Submit draft copy of each manual at least [30] days before commencing demonstration and training. Architect[will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual to contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation in accordance with ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.7 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 1. Fire.
 2. Flood.

3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one set of file prints.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned Record Prints and [one] set of file prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.

- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories and (one) of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories and (one) paper copies of each submittal.
- E. Reports: Submit written report indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.

- j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
- 1. Format: Annotated PDF electronic file with comment function enabled.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to Architect for resolution.
 - 4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- 1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Construction Manager.

- e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 - 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
 - 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of

the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

SUBSTITUTION REQUEST FORM

One Specification Section per Form. (Fill in all Blanks)

Project: Yellowstone County Elections Offices – Cedar Hall Renovation (Project Code: YC23_AdmReno)

We hereby submit for your review the following substitution for the following specified material for the above project:

<u>Section</u>	<u>Paragraph</u>	<u>Specified Material</u>

Proposed Substitution: _____

Attach all technical data, including laboratory tests, if applicable, in duplicate to allow the Architect/Engineer to review this request.

Include complete information on changes to Drawings and/or Specifications, which proposed substitution would require for its proper installation.

A. Does the substitution affect dimensions shown on the Construction Documents? Yes ☐ No ☐
(Explain) _____

B. By signature below, the undersigned agrees to pay all costs, including engineering and detailing costs, associated with the incorporation of this product.

C. Does the substitution affect other trades? Yes ☐ No ☐
(Explain) _____

D. What are the differences between the proposed substitution and specified product?
(Explain) _____

E. Manufacturer's guarantees of the proposed and specified item are same ☐ different ☐
(Explain) _____

This request is accompanied by self-addressed, stamp envelope.

Cushing Terrell shall continue our policy of recognizing acceptable substitutions by Addendum.

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By:

For Use by Architect/Engineer:

Signature

Received Too Late ☐

Approved Except As Noted ☐

Not Accepted ☐

Firm

Address

Date _____

Phone _____

Date _____

By _____

For bidding only. Final approval
subject to submittal data in accordance
with requirements of specifications.

Date _____

By _____

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in construction documents to manufacturer of architectural cabinets; coordinate Shop Drawings and fabrication with hardware requirements.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

B. Product Data Submittals: For each product.

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

D. Samples for Verification: For the following:

1. Plastic Laminates: Manufacturer's standard size, for each type, color, pattern, and surface finish required.

2. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For the following:
 1. Composite wood products.
 2. High-pressure decorative laminate.
 3. Adhesives.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance and provide documentation for review, by the Architect of the following:
 1. Proof of minimum of 15 years' experience.
 2. List of similar projects:
 - a. Size and scope of project.
 - b. Contact person and information.
- B. Installer Qualifications: Manufacturer of products.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity is at levels planned for building occupants during the remainder of the construction period.

- C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS 'PL#'

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
- B. Architectural Woodwork Standards Grade: Premium.
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.
 - 1. Basis of Design: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. See Material List in the Construction Documents.
- F. Exposed Surfaces:
 - 1. Plastic-Laminate Grade: HGS.
 - 2. Edges: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
 - 3. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, ISO 4586-3.

- a. Edges of Plastic-Laminate Shelves: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, grade to match exposed surface.
2. Drawer Sides and Backs: Thermally fused laminate panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermally fused laminate panels.
- H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, ISO 4583-3, grade to match exposed surface.
- J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 1. See Material List in the Construction Documents.

2.2 WOOD MATERIALS

- A. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
 2. Particleboard (Medium Density): ANSI A208.1, Grade M-2.
 3. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of ISO 4586.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. Cabinet Hardware: Provide cabinet hardware and accessory materials associated with architectural cabinets.
 1. Basis of Design: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Accuride International Inc.
 - b. Amerock.
 - c. Hettich America L.P.
 - d. Julius Blum & Co., Inc.
 - e. Knape & Vogt Manufacturing Company.
 - f. Interior Designer approved equal.
- B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- C. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- E. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04102; with shelf brackets, B04112.
- G. Shelf Rests: ANSI/BHMA A156.9, B04013; metal.
- H. Drawer Slides: ANSI/BHMA A156.9.
 1. Heavy-Duty (Grade 1HD-100 and Grade 1HD-200): Side mount.
 - a. Type: Full extension.
 - b. Material: Zinc-plated ball bearing slides.
 - c. Motion Feature: Self-closing mechanism.
 2. General-purpose drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide 75 lb load capacity.
 3. File drawers more than 6 inches high or more than 24 inches wide, provide 100 lb load capacity.
 4. Lateral file drawers more than 6 inches high and more than 24 inches but not more than 30 inches wide, provide 150 lb load capacity.
- I. Door Locks: ANSI/BHMA A156.11, E07121.
- J. Drawer Locks: ANSI/BHMA A156.11, E07041.
- K. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.
- L. Grommets for Cable Passage: 3 inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
 1. Color: White.
- M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.

1. Satin Stainless Steel: ANSI/BHMA 630.

- N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.
- O. Countertop Brace - Basis of Design: For countertop braces, provide Hybrid Workstation Bracket, Steel Hybrid Bracket as provided by A&M Hardware, Inc., 400W. Gramby Street, Manheim, PA 17545; Phone 888-647-0200.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesive for Bonding Plastic Laminate: Type I, waterproof type as selected by fabricator to comply with requirements.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
 - 2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work, certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity is to prepare and submit report of inspection.

3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.

- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed extruded-aluminum louvers.

1.2 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- D. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing in accordance with AMCA 500-L.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

- A. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width in accordance with AMCA 500-L.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Continuous-Line, Drainable-Blade Louver, Extruded Aluminum: Drainable-blade louver with blade gutters (drains) in rear two-thirds of blades only.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Greenheck Fan Corporation.
 - b. Pottorff.
 - c. Ruskin Company.
 - 2. Louver Depth: 6 inches.
 - 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
 - 4. Mullion Type: Semirecessed.
 - 5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 - 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Screening Type: Bird screening.
- B. Louver Screening for Aluminum Louvers:
 - 1. Bird Screening, Aluminum: 1/2-inch- square mesh, 0.063-inch wire.

2.5 MATERIALS

- A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.

2.6 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel unless otherwise indicated.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
 - 1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
- F. Provide subsills made of same material as louvers for recessed louvers.
- G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required.

3.3 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

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END OF SECTION 089119

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone sealants.
2. Escutcheons.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES AND SLEEVE SEALS

A. Silicone Sealants:

1. Silicone Sealant, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) GE Construction Sealants; Momentive Performance Materials Inc.
 - 2) ITW Polymers Sealants North America.
 - 3) Polymeric Systems, Inc.
 - 4) Sherwin-Williams Company (The).
 - 5) Sika Corporation.
 - 6) The Dow Chemical Company.
 - 7) Tremco Incorporated.
 - b. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.
2. Silicone Foam Sealant: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Smooth-On.

2.2 ESCUTCHEONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. BrassCraft Manufacturing Co.; a Masco company.
- 2. Dearborn Brass.
- 3. Jones Stephens Corp.
- 4. Keeney Manufacturing Company (The).
- 5. Mid-America Fittings, LLC; A Midland Industries Company.
- 6. ProFlo; a Ferguson Enterprises, Inc. brand.

- B. Escutcheon Types:

- 1. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
- 2. One-Piece, Stainless Steel Type: With polished stainless steel finish.
- 3. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- 4. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
- 5. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
- 6. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION OF ESCUTCHEONS

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

3.2 FIELD QUALITY CONTROL

- A. Escutcheons:
 - 1. Using new materials, replace broken and damaged escutcheons and floor plates.

3.3 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Chrome-Plated Piping: One piece, steel or split-plate steel with polished, chrome-plated finish.
3. Insulated Piping:
 - a. One piece, steel with polished, chrome-plated finish.
 - b. One piece, stainless steel with polished stainless steel finish.
 - c. One piece, cast brass with polished, chrome-plated finish.
 - d. One piece, stamped steel or split plate, stamped steel with concealed hinge or split plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
4. Bare Piping at Wall and Floor Penetrations in Finished Spaces:
 - a. One piece, steel with polished, chrome-plated finish.
 - b. One piece, stainless steel with polished stainless steel finish.
 - c. One piece, cast brass with polished, chrome-plated finish.
 - d. One piece, stamped steel or split plate, stamped steel with concealed hinge or split plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
5. Bare Piping at Ceiling Penetrations in Finished Spaces:
 - a. One piece, steel with polished, chrome-plated finish.
 - b. One piece, stainless steel with polished stainless steel finish.
 - c. One piece, cast brass with polished, chrome-plated finish.
 - d. One piece, stamped steel or split plate, stamped steel with concealed hinge or split plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
6. Bare Piping in Unfinished Service Spaces:
 - a. One piece, steel with polished, chrome-plated finish.
 - b. One piece, cast brass with polished, chrome-plated finish.
 - c. One piece, stamped steel or split plate, stamped steel with concealed hinge or split plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
7. Bare Piping in Equipment Rooms:
 - a. One piece, steel with polished, chrome-plated finish.
 - b. One piece, cast brass with polished, chrome-plated finish.
 - c. One piece, stamped steel or split plate, stamped steel with concealed hinge or split plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.

- B. Install floor plates for piping penetrations of equipment-room floors.
- C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: Split floor plate.

END OF SECTION 230500

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Brimar Industries, Inc.
 - c. Carlton Industries, LP.
 - d. Champion America.
 - e. Craftmark Pipe Markers.
 - f. emedco.
 - g. Kolbi Pipe Marker Co.
 - h. LEM Products Inc.
 - i. Marking Services, Inc.
 - j. Seton Identification Products; a Brady Corporation company.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
3. Letter and Background Color: As indicated for specific application under Part 3.
4. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Services Inc.
11. Seton Identification Products; a Brady Corporation company.

- B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.
- C. Letter and Background Color: As indicated for specific application under Part 3.
- D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover or cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- F. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:
1. Flow-Direction Arrows: Include flow-direction arrows on main distribution piping. Arrows may be either integral with label or applied separately.
 2. Lettering Size: At least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.
- D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

- A. Permanently fasten labels on each item of mechanical equipment.
- B. Sign and Label Colors:
 - 1. White letters on a black background.
- C. Locate equipment labels where accessible and visible.

3.4 INSTALLATION OF PIPE LABELS

- A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.
- B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Within 3 ft. of each valve and control device.
 - 2. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 3. Within 3 ft. of equipment items and other points of origination and termination.
 - 4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping, ductwork, and equipment.

- C. Do not apply plastic pipe labels or plastic tapes directly to bare pipes conveying fluids at temperatures of 125 deg F or higher. Where these pipes are to remain uninsulated, use a short section of insulation or use stenciled labels.
- D. Flow-Direction Arrows: Use arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- E. Pipe-Label Color Schedule:
 - 1. Refrigerant Piping: Black letters on an ANSI Z535.1 safety-yellow background.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of this Section Includes:
 - 1. TAB of Air Systems:
 - a. Constant-volume air systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Certified TAB Reports: Within 14 days of completion of testing and balancing work.
- C. Sample report forms.
- D. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration and calibration interval.

1.4 QUALITY ASSURANCE

- A. TAB Specialist Firm's Qualifications: Certified by AABC, NEBB or TABB.

1. TAB Certified Professional: Employee of the TAB specialist firm and certified by AABC, NEBB or TABB.
 2. TAB Technician: Employee of the TAB specialist firm and certified by AABC, NEBB or TABB.
 3. TAB specialist firm is to be independent, third-party, and unaffiliated with Contractor.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE 111 compliance for testing and balancing of HVAC systems.
- D. Code and Authorities Having Jurisdiction Compliance: Furnish TAB services that comply with governing codes and requirements of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in system designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as manual volume dampers. Note the locations of devices that are not accessible for TAB.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- E. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean and permanent filters are installed, and equipment with functioning controls is ready for operation.
- F. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- G. Observe demonstration of operating safety interlocks and controls on HVAC equipment.
- H. Examine control dampers for proper installation for their intended function of isolating air flows.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Cut insulation, ducts equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. Installing Contractor to Perform the Following:
 - a. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - b. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish in accordance with Section 230713 "Duct Insulation."
- B. Mark equipment and balancing devices, including damper-control positions, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- C. Take and report testing and balancing measurements in inch-pound (IP) units.
- D. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain approved submittals and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Determine suitable locations in main and branch ducts for accurate duct-airflow measurements.
- C. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
- D. Verify that motor controllers are equipped with properly sized thermal protection.

3.4 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.

2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet.
 - b. Measure static pressure directly at the fan inlet.
 - c. Measure static pressure differential across each component that makes up the air-handling system.
 - d. Apply artificial loading of filters to simulate a dirty filter pressure drop condition at the time static pressures are measured.
 3. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed.
 4. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all volume dampers have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets' and outlets' airflow. Apply correction factors as applicable for each size and style of air device.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design range. Readjust to within design tolerance if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, speed, volts, amps, and static profile.
 4. Mark all final settings.
 5. Measure and record all operating data.
 6. Record final fan-performance data.

3.5 TOLERANCES

- A. Set HVAC system's airflow rates and water-flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent. If design value is less than 100 cfm, flow rate is within 10 cfm.

2. Air Outlets and Inlets: Plus or minus 10 percent. If design value is less than 100 cfm, flow rate is within 10 cfm.

3.6 FINAL TESTING AND BALANCING REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Fan curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 1. Title page.
 2. Name and address of the TAB specialist firm and technician.
 3. Project name.
 4. Project location.
 5. Project Architect's name, firm, and address.
 6. Project engineer's name, firm, and address.
 7. Project Contractor's name, firm, and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents, including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Notes to explain why certain final data in the body of reports vary from indicated values.
 14. Test conditions for fan performance forms, including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.

- d. Heating coil, dry-bulb conditions.
 - e. Fan drive settings, including settings and percentage of maximum pitch diameter.
 - f. Other system operating conditions that affect performance.
- D. Fan Test Reports: For supply, return, and exhaust fans, include the following:
 - 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - 2. Motor Data:
 - a. Motor make and frame type and size.
 - b. Horsepower and speed.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan speed.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- E. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 - 1. Report Data:
 - a. System fan and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- F. Instrument Calibration Reports:

1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration and interval.

3.7 VERIFICATION OF TAB REPORT

- A. The TAB specialist firm's test and balance technician is to conduct the final verification in the presence of Architect.
- B. Architect are to randomly select measurements, documented in the final report, to be rechecked. Rechecking is to be limited to the lesser of either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements are to be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the TAB are to be considered incomplete and are to be rejected.
- E. If recheck measurements find the number of failed measurements noncompliant with requirements indicated, proceed as follows:
 1. TAB specialists are to recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. All changes are to be tracked to show changes made to previous report.
 2. If the second final inspection also fails, Owner may pursue others Contract options to complete TAB work.
- F. Prepare test and inspection reports.

3.8 REVERIFICATION

- A. TAB specialist firm technicians are to recheck all measurements and make adjustments as required to complete the balancing. Revise the final report and balancing device settings to include all changes; resubmit final report and request a second verification.
- B. If the second verification also fails, Owner may contact AABC headquarters regarding the AABC National Performance Guaranty or TABB Quality Assurance Program, Customer Complaint Procedures.

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END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed outdoor air.
 - 3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 4. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or craft training program.

1.5 COORDINATION

- A. Coordinate clearance requirements with duct Installer for duct insulation application. Establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
 - 1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials are to be applied.
- B. Products do not contain asbestos, lead, mercury, or mercury compounds.
- C. Glass-Fiber Blanket: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 450 deg F in accordance with ASTM C411. Comply with ASTM C553, Type II, and ASTM C1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Certainteed; SAINT-GOBAIN.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Manson Insulation Inc.
 - e. Owens Corning.

2.3 ADHESIVES

- A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Glass-Fiber and Mineral Wool Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges - Marathon Industries.

- c. Foster Brand; H. B. Fuller Construction Products.
- d. Mon-Eco Industries, Inc.

2.4 MASTICS AND COATINGS

- A. Materials are compatible with insulation materials, jackets, and substrates.
- B. Vapor-Retarder Mastic, Water Based, Interior Use: Suitable for indoor use on below ambient services.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Knauf Insulation.
 - d. Vimasco Corporation.
 - 2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.

2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges - Marathon Industries.
 - c. Foster Brand; H. B. Fuller Construction Products.
 - d. Mon-Eco Industries, Inc.
 - 2. Materials are compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 5. Color: Aluminum.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.7 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. 3M Industrial Adhesives and Tapes Division.
- b. Avery Dennison Corporation, Specialty Tapes Division.
- c. Ideal Tape Co., Inc., an American Biltrite Company.
- d. Knauf Insulation.

2. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.8 SECUREMENTS

- A. Bands:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Johns Manville; a Berkshire Hathaway company.
- b. RPR Products, Inc.

2. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

- B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) AGM Industries, Inc.
- 2) Gemco.
- 3) Midwest Fasteners, Inc.
- 4) Nelson Stud Welding.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) AGM Industries, Inc.
 - 2) CL WARD & Family Inc.
 - 3) Gemco.
 - 4) Midwest Fasteners, Inc.
 - 5) Nelson Stud Welding.
3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) AGM Industries, Inc.
 - 2) Gemco.
 - 3) Midwest Fasteners, Inc.
 - 4) Nelson Stud Welding.
 - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- D. Wire: 0.062-inch soft-annealed, stainless steel.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C & F Wire.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. RPR Products, Inc.

2.9 CORNER ANGLES

- A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum in accordance with ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.5 INSTALLATION OF GLASS-FIBER AND MINERAL-WOOL INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
- B. Comply with manufacturer's written installation instructions.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

- b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 1. Indoor, concealed supply and outdoor air.
 2. Indoor, exposed outdoor air.
 3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 4. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
- B. Items Not Insulated:
 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 2. Factory-insulated flexible ducts.
 3. Factory-insulated plenums and casings.
 4. Flexible connectors.
 5. Vibration-control devices.
 6. Factory-insulated access panels and doors.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation is the following:
 - 1. Glass-Fiber Blanket: 2 inches thick and 0.75 lb/cu. ft. nominal density.
- B. Concealed, round and flat-oval, outdoor-air duct insulation is the following:
 - 1. Glass-Fiber Blanket: 2 inches thick and 0.75 lb/cu. ft. nominal density.
- C. Concealed, round and flat-oval, exhaust-air duct insulation is the following:
 - 1. Glass-Fiber Blanket: 2 inches thick and 0.75 lb/cu. ft. nominal density.
- D. Concealed, rectangular, supply-air duct insulation is the following:
 - 1. Glass-Fiber Blanket: 2 inches thick and 0.75 lb/cu. ft. nominal density.
- E. Concealed, rectangular, outdoor-air duct insulation is the following:
 - 1. Glass-Fiber Blanket: 2 inches thick and 0.75 lb/cu. ft. nominal density.
- F. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior is the following:
 - 1. Glass-Fiber Blanket: 2 inches thick and 0.75 lb/cu. ft. nominal density.
- G. Exposed, round and flat-oval, outdoor-air duct insulation is the following:
 - 1. Glass-Fiber Blanket: 2 inches thick and 0.75 lb/cu. ft. nominal density.
- H. Exposed, round and flat-oval, exhaust-air duct insulation is the following:
 - 1. Glass-Fiber Blanket: 2 inches thick and 0.75 lb/cu. ft. nominal density.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulation for HVAC piping systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied, if any).

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or craft training program.

1.5 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields.
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.6 SCHEDULING

- A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
 - 1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," and "Outdoor, Aboveground Piping Insulation Schedule" articles for where insulating materials are applied.
- B. Products do not contain asbestos, lead, mercury, or mercury compounds.
- C. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.
- D. Flexible Elastomeric: Closed-cell, or expanded-rubber materials; suitable for maximum use temperature between minus 70 deg F and 220 deg F. Comply with ASTM C534/C534M, Type I, for tubular materials, Type II for sheet materials.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aeroflex USA.
 - b. Armacell LLC.
 - c. K-Flex USA.

2.3 ADHESIVES

- A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Solvent-based adhesive.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aeroflex USA.
 - b. Armacell LLC.

- c. K-Flex USA.
2. Flame-spread index is 25 or less and smoke-developed index is 50 or less as tested in accordance with ASTM E84.
3. Wet Flash Point: Below 0 deg F.
4. Service Temperature Range: 40 to 200 deg F.
5. Color: Black.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Mon-Eco Industries, Inc.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

2.5 FIELD-APPLIED JACKETS

A. Field-applied jackets comply with ASTM C1136, Type I, unless otherwise indicated.

B. Metal Jacket:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. RPR Products, Inc.
2. Aluminum Jacket: Comply with ASTM B209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper or 3-mil- thick polysurlyn.
 - d. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.

- 3) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- C. Self-Adhesive Outdoor Jacket (Asphaltic): 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross-laminated polyethylene film covered with white or stucco-embossed aluminum-foil facing.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MFM Building Products Corp.
 - b. Polyguard Products, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Mix insulating cements with clean potable water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.

- D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.
- E. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with the Contract Documents.
- F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- G. Install insulation with least number of joints practical.
- H. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
 - 3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- I. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- J. Cut insulation in a manner to avoid compressing insulation.
- K. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- L. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- M. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.

3.4 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using prefabricated fitting insulation or mitered or routed fittings made from same material and density as that of adjacent pipe insulation. Each piece is butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Fittings and Elbows:
1. Install sections of pipe insulation and miter if required in accordance with manufacturer's written instructions.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF FIELD-APPLIED JACKETS

- A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches o.c. and at end joints.

3.8 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- B. Do not field paint aluminum or stainless steel jackets.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Insulation conductivity and thickness per pipe size comply with schedules in this Section or with requirements of authorities having jurisdiction, whichever is more stringent.
- B. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Refrigerant Suction Flexible Tubing:

1. All Pipe Sizes: Insulation is the following:
 - a. Flexible Elastomeric: 3/4 inch thick.

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation is the following:
 - a. Flexible Elastomeric: 3/4 inch thick.

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
 1. Aluminum, Smooth or Stucco Embossed: 0.016 inch thick.
 2. Self-adhesive outdoor jacket.

END OF SECTION 230719

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Automatic condensate pump units.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of pump.

1. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 AUTOMATIC CONDENSATE PUMP UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Beckett Corporation.
2. Crane Pumps & Systems.
3. Grundfos Pumps Corporation.
4. Hartell Pumps; Milton Roy.
5. Little Giant; a brand of Franklin Electric Co., Inc.

B. Source Limitations: Obtain pump units from single source from single manufacturer.

- C. Description: Packaged units with corrosion-resistant pump, plastic tank with cover, and automatic controls. Collects and removes condensate from fan coil units, air handling units, condensing boilers, and similar components. Include factory- or field-installed check valve and 72-inch- minimum, electrical power cord with plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

- A. Install pumps to provide access for periodic maintenance.
- B. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.
- C. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

3.3 PIPING CONNECTIONS

- A. Where installing piping adjacent to pump, allow space for service and maintenance.
- B. Install check valve on each condensate pump unit discharge unless unit has a factory-installed check valve.

3.4 ELECTRICAL CONNECTIONS

- A. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3.5 STARTUP SERVICE

- A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Hydronic pumps will be considered defective if they do not pass tests and inspections.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Copper tube and fittings.
 - 2. Refrigerants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Submit data for each type of refrigerant piping and refrigerant.

1.3 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Reports: For each field quality-control test and inspection.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASHRAE 15 and ASHRAE 34.
- B. Comply with ASME B31.5.
- C. Test Pressure for Refrigerant R-32 and R-454B:
 - 1. Suction Tubing for Refrigeration and Air-Conditioning Applications: 300 psig.
 - 2. Tubing Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B280, Type ACR.

2.3 REFRIGERANTS

- A. R-32, ASHRAE 34.
- B. R-454B, ASHRAE 34: R-32 (68.9 percent by mass) and R-1234yf (31.1 percent by mass).

PART 3 - EXECUTION

3.1 PIPING APPLICATION SCHEDULES

- A. Refrigerant: R-32 or R-454B.
- B. Suction and Liquid Tubing for Conventional Air-Conditioning (Cooling-Only) Applications, NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing.

3.2 INSTALLATION OF PIPING, GENERAL

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping in accordance with ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Arrange piping to allow inspection and service of refrigeration equipment.

L. Slope refrigerant piping as follows:

1. Install horizontal suction lines with a uniform slope downward to compressor.
2. Install traps and double risers to entrain oil in vertical runs.
3. Liquid lines may be installed level.

M. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

N. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

3.3 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Brazed Joints: Construct joints in accordance with AWS BRH, "Brazing Handbook," Ch. 35, "Pipe and Tubing."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.

E. Threaded Joints: Thread steel pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and to restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

A. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 ft. long.

2. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- B. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping within 12 inches of each fitting.
- D. Support vertical runs of copper tubing to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 1. Comply with ASME B31.5, Chapter VI.
 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System must maintain test pressure at the manifold gauge throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
- B. Prepare test and inspection reports.

3.6 SYSTEM CHARGING

- A. Charge system using the following procedures:
 1. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 2. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 3. Charge system.

3.7 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, in accordance with manufacturer's written instructions:
 - 1. Verify that compressor oil level is correct.
 - 2. Open compressor suction and discharge valves.
 - 3. Open refrigerant valves but not bypass valves that are used for other purposes.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings - single wall.
2. Round ducts and fittings - single wall.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Strut support system for ductwork - metal, cable type.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 RECTANGULAR DUCTS AND FITTINGS

A. Rectangular Ducts and Fittings - Single Wall:

1. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on static-pressure class indicated on the Drawings.

- a. Construct ducts of galvanized sheet steel.
2. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
3. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
4. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 ROUND DUCTS AND FITTINGS

A. Round Ducts and Fittings - Single Wall:

1. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on static-pressure class indicated on the Drawings.
 - a. Construct ducts of galvanized sheet steel.
2. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
3. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
4. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods. Sheet metal materials are to be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Lockforming Quality: Sheet steel and galvanized coating is to be able to be formed with back-to-back bends in seams such as the Pittsburgh lock at high speed without cracking or flaking of the coating on the outside of the bend.
- C. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
- D. Tie Rods: Galvanized steel, 1/4-inch- minimum diameter for lengths 36 inches or less; 3/8-inch- minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed; SAINT-GOBAIN.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - e. Sekisui Voltek, LLC.
 - 2. Source Limitations: Obtain fibrous-glass duct liner from single manufacturer.
 - 3. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 4. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound is to be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 5. Liner Adhesive: Water-based liner adhesive, complying with NFPA 90A or NFPA 90B and with ASTM C916.
- B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

2.6 SEALANTS AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets are to be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

2.7 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
- D. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
- G. Strut Support System for Ductwork - Metal, Cable Type:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CADDY; brand of nVent Electrical plc.
 - b. Gripple Inc.
 - 2. Source Limitations: Obtain metal cable type strut support system for ductwork from single manufacturer.
 - 3. Description: Factory-fabricated ductwork support system consisting of cable clamps, slotted channel brackets, wire-rope suspension components, and associated accessories for a complete ductwork suspension system. No tools required for manual assembly in the field to support ductwork routing.

PART 3 - EXECUTION

3.1 INSTALLATION OF DUCTS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- C. Install ducts in maximum practical lengths with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Install cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines" - intermediate cleanliness level.
- L. Elbows: Use long-radius elbows wherever they fit.
 - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
 - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.
- M. Branch Connections: Use lateral branch connections.
- N. Installation of Metal, Cable-Type Strut Support System for Ductwork: Install in accordance with manufacturer's written installation instructions.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Internally seal ducts.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

- D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
 - 3. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 4. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 ft..
- D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 DUCTWORK CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness in accordance with "Description of Method 3 - NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning, and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media is to not exceed 0.75 mg/100 sq. cm.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.8 DUCT CLEANING (only required if ducts are inadequately protected from dirt, debris, moisture, etc. during construction)

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use duct cleaning methodology as indicated in NADCA ACR.
- C. Use service openings for entry and inspection.
 - 1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- D. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

E. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

F. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.9 STARTUP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
 - 1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.
- B. Supply Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
- C. Return Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive or negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
- D. Exhaust Ducts:
 - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
- E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units :
 - a. Pressure Class: Positive or negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: A.
- F. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
- G. Elbow Configuration:
 - 1. Rectangular Duct - Requirements for All Velocities: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

- b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to-Diameter Ratio: 1.5.
 - b. Round Elbows:
 - 1) Stamped or pleated for 12 inches and smaller diameters.
 - 2) Standing seam for 14 inches and larger diameter.
 - 3) Welded for 14 inches and larger diameter.
- H. Branch Configuration: as indicated on Drawings.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Turning vanes.
2. Flexible connectors.
3. Duct accessory hardware.
4. Flexible ducts, insulated.
5. Flexible duct connectors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Construction details, material descriptions, and dimensions of individual components.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories.

PART 2 - PRODUCTS

2.1 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aero-Dyne Sound Control Co.
2. CL WARD & Family Inc.
3. Ductmate Industries, Inc; a DMI company.
4. Duro Dyne Inc.
5. DynAir; a Carlisle Company.
6. Elgen Manufacturing.
7. Ward Industries; a brand of Hart & Cooley, LLC.

B. Manufactured Turning Vanes for Metal Ducts: Fabricate curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Turning Vanes: Fabricate single-wall curved blades of galvanized steel.

- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2.2 DUCT FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc; a DMI company.
3. Duro Dyne Inc.
4. DynAir; a Carlisle Company.
5. Elgen Manufacturing.
6. Ventfabrics, Inc.
7. Ward Industries; a brand of Hart & Cooley, LLC.

- B. Fire-Performance Characteristics: Adhesives, sealants, fabric materials, and accessory materials are to have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.

- C. Airstream Surfaces: Surfaces in contact with the airstream are to comply with requirements in ASHRAE 62.1.

- D. Materials: Flame-retardant or noncombustible fabrics.

- E. Coatings and Adhesives: Comply with UL 181, Class 1.

- F. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel sheets.

- G. Indoor System, Duct Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.3 DUCT ACCESSORY HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc; a DMI company.

3. Duro Dyne Inc.
4. DynAir; a Carlisle Company.
5. Elgen Manufacturing.
6. Hardcast; Carlisle Construction Materials.
7. United Enertech Corp.
8. Ventfabrics, Inc.
9. Ward Industries; a brand of Hart & Cooley, LLC.

- B. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- C. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.4 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
1. Galvanized Coating Designation: G60.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 FLEXIBLE DUCTS, INSULATED

- A. Standard: Product is to be UL 181 listed and bearing the UL label.
- B. Acoustically-rated, flexible duct to be comprised of a perforated aluminum, chlorinated polyethylene (CPE), spunbond nylon, or other suitably transmissive inner face bonded to a wire helix, a fiberglass insulation wrap, and an outer aluminum or metalized film jacket.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. The Novaflex Group.
 2. Thermaflex.
 3. Flexmaster.
 4. Quietflex Manufacturing Co.
- D. Minimum Dynamic Insertion Loss (dB per linear foot) with no airflow at 6-inch diameter:

125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz

1.6 3.4 3.7 4.2 3.0 2.0 0.8

2.6 FLEXIBLE DUCT CONNECTORS

- A. Clamps: Stainless steel band with stainless steel or zinc-plated hex screw to tighten band with a worm-gear action or nylon strap in sizes 3 through 18 inches, to suit duct size.
- B. Non-Clamp Connectors: Adhesive plus sheet metal screws.

PART 3 - EXECUTION

3.1 INSTALLATION OF AIR DUCT ACCESSORIES

- A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having a duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.
- F. Install flexible connectors to connect ducts to equipment.
- G. Install duct test holes where required for testing and balancing purposes.
- H. Install flexible ducts in accordance with applicable details in the following publications:
 - 1. ADC's "Flexible Duct Performance & Installation Standards" for flexible ducts.
 - 2. SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- I. Install in indoor applications only. Do not install flexible duct in locations where it will be exposed to UV rays.
- J. Connect diffusers and light troffer boots to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

K. Connect flexible ducts to metal ducts with draw bands or adhesive plus sheet metal screws.

L. Installation of Flexible Ducts:

1. Install ducts fully extended.
2. Do not bend ducts across sharp corners.
3. Bends of flexible ducting must not exceed a minimum of one-duct diameter.
4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
5. Install flexible ducts in a direct line, without sags, twists, or turns.
6. Install in accordance with ADC instructions.

M. Supporting Flexible Ducts:

1. Support flexible duct at manufacturer's recommended intervals, but at no greater distance than 4 ft.. Provide sufficient support so that maximum centerline sag is 1/2 inch per ft. between supports. A connection to rigid duct or equipment may be considered a support joint.
2. Install extra supports at bends placed approximately one-duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports must not exceed the maximum spacing in accordance with manufacturer's written installation instructions.
4. Vertically installed ducts must be stabilized by support straps at a maximum of 72 inches o.c.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect turning vanes for proper and secure installation, and verify that vanes do not move or rattle.

END OF SECTION 233300

SECTION 233400 - HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ventilators, centrifugal - ceiling mounted.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
 - b. Rated capacities, furnished specialties, and accessories for each fan.
 - c. Fans:
 - 1) Certified fan performance curves with system operating conditions indicated.
 - 2) Certified fan sound-power ratings.
 - 3) Fan construction and accessories.
 - 4) Motor ratings and electrical characteristics, plus motor and electrical accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Startup service reports.
- B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fans and ventilators, include the following:
 1. Operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

2.2 VENTILATORS, CENTRIFUGAL - CEILING MOUNTED

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panasonic.
- B. Source Limitations: Obtain ceiling-mounted centrifugal ventilators from single manufacturer.
- C. Standards: Comply with UL 705.
- D. Housing: Steel, lined with acoustical insulation.
- E. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel are removable for service.
- F. Back-draft damper: Integral.
- G. Grille: Plastic, louvered grille with flange on intake and thumbscrew or spring retainer attachment to fan housing.
- H. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install fans level and plumb.
- B. Equipment Mounting:
 - 1. Support duct-mounted and other hanging fans directly from the building structure, using suitable hanging systems.
- C. Install units with adequate clearances for service and maintenance.

- D. Label fans in accordance with requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 DUCTWORK CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Where installing ducts adjacent to fans, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

- A. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.

3.5 STARTUP SERVICE:

- A. Perform startup service.
 - 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 - 2. Verify that shipping, blocking, and bracing are removed.
 - 3. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 4. Verify that cleaning and adjusting are complete.
 - 5. For direct-drive fans, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual volume control dampers in connected ductwork systems are in fully open position.
 - 9. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 10. Shut unit down and reconnect automatic temperature-control operators.
 - 11. Remove and replace malfunctioning units and retest as specified above.

3.6 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Lubricate bearings.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.7 CLEANING

- A. After completing system installation and testing, adjusting, and balancing and after completing startup service, clean fans internally to remove foreign material and construction dirt and dust.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safeties.
 - 3. Fans and components will be considered defective if they do not pass tests and inspections.
 - 4. Prepare test and inspection reports.

3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain HVAC fans.

END OF SECTION 233400

SECTION 233713.13 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceiling diffusers - rectangular and square face.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
2. Section 233713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - b. Diffuser Schedule: Indicate drawing designation, quantity, model number, size, and accessories furnished.

1.3 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS - RECTANGULAR AND SQUARE FACE

A. Ceiling Diffuser - Rectangular and Square :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger-HVAC; brand of Johnson Controls International plc, Global Products.

- b. Nailor Industries Inc.
 - c. Price Industries Limited.
 - d. Titus; brand of Johnson Controls International plc, Global Products.
- 2. Description: Square ceiling diffuser with round or rectangular duct collar and a series of curved louvers to provide discharge parallel to ceiling surface.
 - 3. Source Limitations: Obtain from single source from single manufacturer.
 - 4. Material: Steel.
 - 5. Finish: Baked enamel, white.
 - 6. Face Size: 24 by 24 inches.
 - 7. Face Style: Plaque.
 - 8. Pattern: Fixed.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers in accordance with ASHRAE 70.

PART 3 - EXECUTION

3.1 INSTALLATION OF AIR DIFFUSERS

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

SECTION 233713.23 - REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Registers - adjustable-blade face.
2. Grilles - fixed-blade face.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
2. Section 233713.13 "Air Diffusers" for various types of air diffusers.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - b. Register and Grille Schedule: Indicate drawing designation, quantity, model number, size, and accessories furnished.

1.3 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 REGISTERS

A. Registers - Adjustable-Blade Face :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger-HVAC; brand of Johnson Controls International plc, Global Products.

- b. Nailor Industries Inc.
 - c. Price Industries Limited.
 - d. Titus; brand of Johnson Controls International plc, Global Products.
- 2. Material: Aluminum.
 - 3. Finish: Clear anodized.
 - 4. Face-Blade Arrangement: Face blades with adjustable angle to permit manual adjustment of air discharge direction. Blades horizontally spaced 3/4 inch apart.
 - 5. Core Construction: Integral.
 - 6. Rear-Blade Arrangement: Rear blades with adjustable angle to permit manual adjustment of air discharge direction. Blades vertically spaced 3/4 inch apart.
 - 7. Frame: 1-1/4 inches wide.
 - 8. Mounting: Countersunk screw.
 - 9. Accessories:
 - a. Damper Type: Air Scoop with rod adjustment.

2.2 GRILLES

A. Grilles - Fixed-Blade Face :

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger-HVAC; brand of Johnson Controls International plc, Global Products.
 - b. Nailor Industries Inc.
 - c. Price Industries Limited.
 - d. Titus; brand of Johnson Controls International plc, Global Products.
- 2. Material: Steel.
- 3. Finish: Baked enamel, white or Primed for Field Painting.
- 4. Face-Blade Arrangement: Fixed-face blade position, horizontally spaced 3/4 inch apart.
- 5. Core Construction: Integral.
- 6. Frame: 1-1/4 inches wide.
- 7. Mounting: Countersunk screw or Lay in.
- 8. Accessory: Filter.

2.3 SOURCE QUALITY CONTROL

- ### A. Verification of Performance: Rate registers and grilles in accordance with ASHRAE 70.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF REGISTERS AND GRILLES

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

SECTION 235416.13 - GAS-FIRED FURNACES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gas-fired furnaces, condensing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Furnace and accessories complete with controls.
 - b. Refrigeration components.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Disposable Air Filters: Furnish two complete sets.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.

2.2 GAS-FIRED FURNACES, CONDENSING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bryant; Carrier Global Corporation.
2. Carrier Global Corporation.
3. Goodman Manufacturing Company, L.P.
4. Lennox Industries, Inc.; Lennox International.
5. Ruud Air Conditioning Division.
6. Trane.
7. YORK; brand of Johnson Controls International plc, Building Solutions North America.
8. Daikin.

- B. Cabinet: Steel.

1. Cabinet interior around heat exchanger shall be factory-installed insulation.
2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
3. Factory paint external cabinets in manufacturer's standard color.

- C. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.

1. Special Motor Features, ECM: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.

- D. Type of Gas: Natural.

- E. Heat Exchanger:

1. Primary: Stainless steel.
2. Secondary: Stainless steel.

- F. Burner:

1. Gas Valve: 100 percent safety one-stage main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.

G. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.

H. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.

I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.

J. Accessories:

1. PVC Plastic Vent Materials:

- a. PVC Plastic Pipe: Schedule 40, complying with ASTM D1785.
- b. PVC Plastic Fittings: Schedule 40, complying with ASTM D2466, socket type.
- c. PVC Solvent Cement: ASTM D2564.

2.3 THERMOSTATS AND HUMIDISTATS

A. Solid-State Thermostat: Wall-mounted, programmable, microprocessor-based unit with automatic switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, vacation mode, and battery backup protection against power failure for program settings.

2.4 REFRIGERATION COMPONENTS

A. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with AHRI 210/240. Match size with furnace. Include condensate drain pan with accessible drain outlet.

1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.

B. Refrigerant Piping: Comply with requirements in Section 232300 "Refrigerant Piping."

C. Air-Cooled Compressor-Condenser Unit:

1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed reciprocating or scroll type.
 - a. Crankcase heater.
 - b. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - c. Refrigerant Charge: Insert type.
 - d. Refrigerant: R-32 or R-454B.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with liquid subcooler.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for gas and refrigerant piping systems to verify actual locations of piping connections before equipment installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.
- C. Install ground-mounted, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Coordinate anchor installation with concrete base.

3.3 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
 - 1. Ream ends of pipes and tubes and remove burrs.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. PVC Pressure Piping: Join schedule number ASTM D1785 PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
 - 4. Slope pipe vent back to furnace or to outside terminal.
- D. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled compressor-condenser unit.
 - 1. Flared Joints: Use ASME B16.26 fitting and flared ends, following procedures in CDA's "Copper Tube Handbook."
 - 2. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Comply with requirements in Section 232300 "Refrigerant Piping" for installation and joint construction of refrigerant piping.

3.4 DUCTWORK CONNECTIONS

- A. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."

3.5 ELECTRICAL CONNECTIONS

- A. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

3.6 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.

3.7 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - 1. Inspect for physical damage to unit casings.
 - 2. Verify that access doors move freely and are weathertight.
 - 3. Clean units and inspect for construction debris.
 - 4. Verify that all bolts and screws are tight.
 - 5. Adjust vibration isolation and flexible connections.
 - 6. Verify that controls are connected and operational.
- B. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.
- C. Measure and record airflows.
- D. Verify proper operation of capacity control device.
- E. After startup and performance test, lubricate bearings.

3.8 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.9 CLEANING

- A. After completing installation, clean furnaces internally according to manufacturer's written instructions.
- B. Install new filters in each furnace within 14 days after Substantial Completion.

3.10 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform electrical test and visual and mechanical inspection.

2. Leak Test: After installation, charge systems with refrigerant and test for leaks. Repair leaks, replace lost refrigerant, and retest until no leaks exist.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
 4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.11 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 235416.13

SECTION 238239.19 - WALL AND CEILING UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Wall and ceiling unit heaters with propeller fans and electric-resistance heating coils.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wall and ceiling unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL AND CEILING UNIT HEATERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Berko; Marley Engineered Products.
 - 2. Chromalox, Inc.
 - 3. Glen Dimplex Americas.
 - 4. INDEECO.
 - 5. Markel Products Company; a subsidiary of TPI Corporation.
 - 6. Marley Engineered Products.
 - 7. Ouellet Canada Inc.
 - 8. QMark; Marley Engineered Products.
 - 9. Trane.
 - 10. King Electric.
- B. Heaters: Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 CABINET

- A. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
- B. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

2.3 COIL

- A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless steel, machine-staked terminals secured with stainless steel hardware, and limit controls for high-temperature protection.

2.4 FAN AND MOTOR

- A. Fan: Aluminum propeller directly connected to motor.
- B. Motor: Permanently lubricated. Comply with requirements in Section 230500 "Common Work Results for HVAC."

2.5 CONTROLS

- A. Controls: Unit-mounted thermostat.
- B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive wall and ceiling unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF WALL AND CEILING UNIT HEATERS

- A. Install wall and ceiling unit heaters level and plumb.

END OF SECTION 238239.19

SECTION 270000 - COMMUNICATIONS GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. The work covered under this Section consists of the general requirements for the furnishing of all necessary labor, supervision, materials, equipment, tests and services of the communications systems as specified.

1.2 RELATED WORK

- A. Related Work specified in other Sections:
 - 1. Section 270553 "Identification for Communications Systems."
 - 2. Section 271116 "Communications Racks and Frames."
 - 3. Section 271313 "Communications Copper Backbone Cabling."
 - 4. Section 271513 "Communications Copper Horizontal Cabling."

1.3 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions, and Division 01 General Requirements, apply to the Work of this Section.

1.4 DEFINITIONS

- A. A/E/D: Architect / Engineer / Designer.
- B. AHJ: Authority Having Jurisdiction.
- C. Server Room (MDF): The physical space within a building that houses data and telephony network and storage equipment. It is the central nexus for the network system.
- D. Contract Documents: The aggregate of documentation related to the Work, including, but not limited to: legal agreements, Construction Specification Institute (CSI) specifications (of which this Division and related Sections are a part thereof), Drawings, Supplemental Instructions, Bulletins, and Change Directives.
- E. CFI: Contractor-furnished, Owner installed.
- F. IDF: Intermediate Distribution Facilities. The physical space(s) within an individual building wherein the intermediated network distribution facilities serving a portion of the building are located.

- G. ISP: Inside Plant. Refers to cable and equipment within the building structure.
- H. MDF: Main Distribution Facilities. The physical space within a network infrastructure containing the main distribution equipment and the interconnect point between external and internal campus network services. This function is contained within the Computer Room at this location.
- I. MGB: Main Telecommunications Ground Bar.
- J. MPOE: Minimum Point of Entry (MDF): Building entry point for the Utility Service Provider (e.g., the local telephone company) and/or the Campus cabling.
- K. NEC: National Electric Code.
- L. NESC: National Electric Safety Code.
- M. OFCI: Owner-furnished, Contractor Installed.
- N. OFOI: Owner-furnished, Owner Installed.
- O. OSP: Outside Plant. Refers to exterior cabling and equipment that may be above or below ground, typically Carrier cabling.
- P. RoHS: Restriction of Hazardous Substances.
- Q. RU (or U): Rack Unit. A unit of measure (1.75 inches or 44.45mm) that describes the height of equipment mounted in a 19-inch or 23-inch-wide rack.
- R. sCATV: Satellite cable antenna TV system.
- S. Site: Physical location of the work contemplated. Local, regional, and national code and regulations shall govern work performed at the Site.
- T. Service Entrance: This is typically the place where the OSP and ISP cable cross-connect. Typically the existing Building MPOE is located in this area.
- U. Structured Cabling System: A building infrastructure that consists of a number of standardized smaller elements called subsystems, which are an assembly of trunk and tie cables connected to create a logical whole. Both cable ends commonly terminate in a distribution panel.
- V. TGB: Telecommunications Ground Bar.
- W. U.O.N.: Unless Otherwise Noted.
- X. UTP: Unshielded Twisted Pair. Refers to a cable type that is used primarily for telephony and data signal transport.
- Y. The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in

Sections of Division 27 and as appearing on the Drawings are to be interpreted as described in the Internet Engineering Task Force (IETF) RFC 2119.

1.5 REFERENCES

A. General:

1. Codes, standards, and industry manuals/guidelines listed by reference, including revisions by issuing authority, form a part of this Specification Section to extent indicated. Consider such codes and/or standards a part of this Specification as though fully repeated herein.
2. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
3. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid unless otherwise specifically stated.

B. Codes: Perform Work and furnish materials and equipment under Division 27 in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. United States Department Of Labor (DOL) Regulations (Standards - 29 CFR):
 - a. Part 1910, "Occupational Safety and Health Standards."
2. National Fire Protection Agency (NFPA):
 - a. NFPA 70, "National Electrical Code" (NEC).
 - b. NFPA 75, "Protection of Information Technology Equipment."
3. Administrative Rules of Montana (ARM) Title 24, Chapter 301.
4. Uniform Building Code (UBC).
5. Uniform Fire Code (UFC).
6. Uniform Mechanical Code (UMC).
7. National, State, Local and other binding building and fire codes.
8. FCC Regulations:
 - a. Part 15 - Radio Frequency Devices and Radiation Limits.
 - b. Part 68 - Connection of Terminal Equipment to the Telephone Network.

C. All work shall be performed in compliance with the most restrictive of Municipal, State, and/or Federal Codes that may govern this Work, including any standards, codes, etc. which will be adopted within 90 days following the Award of Contract.

- D. Code compliance is mandatory. Nothing in these Specifications and/or the Drawings permits work not conforming to applicable codes. Where work is shown to exceed minimum code requirements, comply with Drawings and Specifications. Where work is shown which is in apparent conflict with applicable codes, notify the Owner, Construction Manager, and Designer immediately, prior to proceeding with Work. Do not proceed with Work that is in apparent conflict with applicable codes without first receiving written direction from the Designer.
- E. Standards: Perform Work and furnish materials and equipment under Division 27 in accordance with the latest editions of the following standards as applicable:
 - 1. Underwriter's Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
 - a. UL 444: Communications Cables.
 - b. UL1655: Community-Antenna Television Cables.
 - c. UL 1690: Data-Processing Cable.
 - d. UL 1963: Communications-Circuit Accessories.
 - 2. ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard:
 - a. Part 1: General Requirements.
 - b. Part 2: Balanced Twisted-Pair Cabling Components.
 - c. Part 2, Addendum 1 (ANSI/TIA/EIA-568-B.2-1): Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cable.
 - 3. ANSI/TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces, including the following addenda:
 - a. TIA/EIA-569-A-1 Perimeter Pathway Addendum.
 - b. TIA/EIA-569-A-6 Multi-Tenant Pathways and Spaces.
 - c. TIA/EIA-569-A-7 Cable Trays and Wireways.
 - 4. ANSI/TIA/EIA-606-A Administration Standard for Commercial Telecommunications Infrastructure.
 - 5. ANSI/J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
 - 6. EIA testing standards.
 - 7. Insulated Cable Engineers Association (ICEA):
 - a. ANSI/ICEA S-90-661-2002 Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems.
 - 8. Building Industry Consulting Services International (BICSI):
 - a. Telecommunications Distribution Methods Manual (TDMM).

1.6 APPLICABLE PUBLICATIONS

- A. The Contractor is expected to have access to, and adhere to, the most recent version of, and all ratified addenda to, the following reference materials and standards appearing below to ensure conformity to the project requirements.
- B. Electronic Industries Alliance/Telecommunications Industry Association (EIA/TIA) publications and related material:
 - 1. TIA/EIA-310-D - Racks, Panels and Associated Equipment.
 - 2. TIA/EIA-568-1 - Commercial Building Telecommunications Cabling Standard Part 1: General Requirements.
 - 3. TIA/EIA-568-2 - Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components.
 - 4. TIA/EIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
 - 5. TIA/EIA-606 - Administration Standard for Commercial Telecommunications Infrastructure.
 - 6. TIA/EIA-J-STD-607 - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
 - 7. TIA-758 – Customer-owned Outside Plant Telecommunications Infrastructure Standard. National Electrical Safety Code (IEEE C2).
- C. IEEE 802.3 (10BaseT Ethernet Specifications), IEEE 802.3u (100BaseTX Specification), 802.3z (Gigabit Ethernet Specification), and IEEE 802.3af (Power over Ethernet).
- D. FCC Part 15 and Part 68.
- E. Rural Electrification Association (REA), Bulletin 345-63, REA Standards for Acceptance Tests and Measurements of Telephone Plant.
- F. Telcordia GR-1089-CORE.
- G. BICSI Telecommunications Distribution Methods Manual (TDMM).

1.7 GENERAL REQUIREMENTS AND CONDITIONS

- A. Safety and Indemnity:
 - 1. The Contractor, all its personnel, and any of its subcontractors working on the Project job site will be required to complete safety training courses as directed by the Owner's Representative prior to entering the construction areas and commencing work.
 - 2. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of persons and property during performance of work.
 - 3. The Contractor shall ensure that all personnel working in or anywhere on the site shall be provided a hard hat, safety shoes, a face shield or safety goggles, safety vest, etc. for their protection.

4. No act, service, drawing review, or construction observance by Owner project staff or any other party employed by Owner is intended to include review or approval of adequacy of the Contractor's safety measures, in, on, or near the construction site.
 5. The Trade Contractor performing work related to Sections 271313, 271333, 271513, and 271543 must be certified for the installation, termination, splicing, and testing of copper cables, riser cable, and inside wiring.
- B. The Drawings and these Specifications do not necessarily describe all work required to achieve the intent of the Contract Documents. On the basis of the scope of work described herein, and/or indicated on the Drawings, the Contractor shall furnish all items and labor required for the proper execution and completion of the work.
 - C. All installation practices shall be in accordance with, but not limited to, these Specifications and Drawings.
 - D. Where the Specifications and/or Drawings call for an installation to be made in accordance with the manufacturer's recommendations, a copy of such recommendations shall always be kept on the job site, and shall be available to the Owner and/or Designer.
 - E. Follow manufacturers' instructions where they cover points not specifically indicated on Drawings and Specifications. If said instructions differ from the Drawings and Specifications, obtain clarification from the Designer before commencing Work.
 - F. A visit to the site and/or buildings on the site is required of the Contractor prior to submission of final contract bid. Contractor will be held to have familiarized himself (herself) with existing site conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.
 - G. The Contractor must verify locations, routes, and dimensions by inspecting the site prior to installation. In addition, the Contractor must verify that all electrical requirements are installed and the installed conduits and sleeves have the capacity to carry the cabling defined on the Drawings. Any discrepancy noted between site conditions and information shown on plans must be brought to the attention of the Construction Manager in writing. Commencement of work after field examination implies acceptance of site conditions.
 - H. Verify equipment installation requirements with provisions specified herein, along with those appearing under other Sections of the Specifications and the Drawings. Verify room dimensions with equipment dimensions and requirements specified under this Section. Check actual job conditions prior to start of any work. The Contractor will be responsible for inspecting the previously performed work of other trades, and commencement of work will serve as evidence of the acceptance of this work as suitable for the work to follow. Report necessary changes in time to prevent needless work. Necessary changes made without prior authorization shall be at the Contractor's risk and expense.

- I. If, in the opinion of the Contractor, an installation practice is desired or required which is contrary to these Specifications or Drawings, a written request for modification shall be made to the Designer for approval.
- J. Cooperate at all times, and to the fullest extent, with all trades doing work in the building to the end that lost time, work stoppages, interference, and inefficiencies do not occur. Inform contractors of other trades of the required access to and clearances around equipment to maintain serviceability and code compliance.
- K. Additional cutting and patching may be required to facilitate the work specified herein and on the Drawings. Coordination of said cutting and patching with Owner and other trades is imperative. The Contractor shall bear the responsibility for, and any added expense associated with remedial work associated with improper holes, supports, and other openings.
- L. Lines of other services damaged, as a result of this work shall be promptly repaired at no expense to the Owner, and to the complete satisfaction of the Owner.
- M. Ceiling grid, ceiling and floor tiles, architectural features, paint work, broken or defaced by the Contractor during the installation and testing process must be replaced by the Contractor, at no cost, and to the complete satisfaction of the Owner.
- N. The Owner controls the job site and access to the work. All work, deliveries, and storage of materials must be coordinated with the Owner's Representative. The Contractor is responsible for the unloading, storage, and any moving of materials required for the work. The Contractor will coordinate scheduling of activities with the Owner's Representative.
- O. No work shall be concealed until after inspection and approval by proper authorities. If work is concealed without inspection and approval, the party that concealed said work shall be responsible for all work required opening and restoring the concealed areas, in addition to all required modifications.

1.8 GENERAL RESPONSIBILITIES

- A. The Contractor shall obtain from the General Contractor, projected dates when the relevant areas will be available for the on-site installation.
- B. Installation shall include the delivery to the installation site, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment and adjustment, and all other work whether or not expressly required herein which is necessary to result in complete and fully operational system.
- C. The Contractor shall furnish all equipment and materials, whether specifically mentioned herein or not, to ensure a complete and operating system. The Not in Contract (NIC) and Owner Furnished Equipment (OFE) and materials are specifically exempted from this requirement.

- D. During the installation, and up to the date of final acceptance, the Contractor shall be under obligation to protect his finished and unfinished work against damage and loss. In the event of such damage or loss, he (she) shall replace or repair such work at no cost to the Owner.
- E. The Contractor shall generate all Shop Drawings and information for the complete installation and wiring of the system. The Contractor shall provide (or subcontractor for) the on-site installation and wiring and shall provide on-going supervision and coordination during the implementation phase.
- F. The Contractor shall be responsible for the initial and final adjustment of the systems as herein prescribed and shall provide all test equipment for the system checkout and acceptance tests.
- G. The Contractor shall be responsible for field verifying all associated electrical infrastructure prior to fabrication and/or ordering of custom wall plates.

1.9 QUALIFICATIONS OF TRADE CONTRACTOR PERSONNEL

- A. All Contractors and employees performing the work outlined within this Section for telecommunications related work shall have a minimum of five (5) years' experience in satisfactory completion of jobs of similar scope and contract value.
- B. An on-site Contractor superintendent must be available at all times. Contact can be by person, telephone, or pager.
- C. All Contractors shall have completed a project of similar size and scope within the last twenty-four (24) months.
- D. The Trade Contractor performing telecommunications work on this project shall be certified for the installation, termination, splicing, and testing of copper cables, riser cable, and inside wiring.

1.10 QUALIFICATIONS OF SUBCONTRACTORS

- A. All subcontractors employed by the Contractor engaged in the work outlined within this Specification shall have a minimum of five (5) years' experience in satisfactory completion of jobs of similar scope and contract value.
- B. The Contractor shall compile detailed information relating to similar work completed by all subcontractors, including corporate references sufficient to enable the Owner to evaluate and agree to the subcontractors' responsibility, experience, and capacity to perform the work.
- C. The Trade Contractor performing work related to Sections 271313, 271323, 271513, and 271543 must be certified for the installation, termination, splicing, and testing of copper cables, riser cable, and inside wiring.

- D. An on-site Contractor superintendent for the subcontractor(s) must be available at all times. Contact can be by person, telephone, or pager.
- E. No subcontract shall be permitted for the Contractor's responsibilities, as herein defined, unless specifically identified in the quote response submission and approved by the Owner.
- F. The Contractor shall have sole responsibility for the satisfactory implementation of each system, even though the Contractor may have subcontracted a portion of the installation or had certain manufacturers install their own equipment.
- G. If the Contractor proposes to subcontract the wiring, installation, programming, or other portions of the work, the Contractor shall provide direct supervision of the subcontracted work.
- H. The supervision of such subcontracted work shall not be intermittent but shall be continuous during the installation.
- I. If it is the intention of the Contractor to "team" with one or more other Contractors, then this must be clearly identified in the response. The Contractor returning the quote shall be considered as the prime in respect of this and shall hold full responsibility for the performance of the members of their team, including themselves and all other subcontractors engaged in the performance of this Contract.

1.11 SUBMITTALS

- A. Submit under provisions of Section 013300 "Submittal Procedures."
- B. Required Submittals:
 - 1. The Contractor shall submit, prior to project start, a time line for the project, showing all major dependencies and interactions with other trades. The schedule shall:
 - a. Identify any and all disruption to existing services and/or service shutdowns on the schedule.
 - b. Identify specifically the anticipated completion date for each building and each floor within each building as applicable. These completion dates shall be designated as milestones on the schedule.
 - 2. The Contractor shall not take any facility out of service during the Owner's normal hours of operation without agreement from the Owner. Any out-of-service activity shall be requested in writing and be coordinated two weeks in advance. The activity should generally be scheduled after hours.
 - 3. The Contractor shall make updates to the time line and shall provide a weekly written status report to the Construction Manager.

- a. Each status report shall include details of project progress and shall describe any special incidents, activities, circumstances, or interruptions of workflow.
 - b. The status reports shall specifically itemize areas that shall be affected by project activities planned for the succeeding week.
4. Provide qualifications of the foreman in charge of the work.
5. Provide qualifications of the project management team.
6. Within ten (10) working days following the acceptance of the project, the Contractor shall provide to the Owner and the Designer:
 - a. One (1) complete set of "as-built" record Drawings consisting of both reproducible vellums and computer data files (on disc). Note that Drawing files must be in AutoCAD 2011 or higher file format following the Contract Drawing layering protocol.
 - b. One (1) hard copy of all cable installation and termination schedules and associated computer data files (on disc).
 - c. One (1) hard copy of all test results and associated computer data files (on disc).
 - d. A copy of the cable tester's display software.
 - e. Any equipment manuals or instructions provided by the manufacturer for the equipment and display software.

1.12 QUALITY ASSURANCE

- A. All telecommunications work is to be tested and documented as defined in Section 270800 "Commissioning of Communications."
- B. Provide a meaningful Quality Assurance program including installation training, materials testing, installation testing, and operational testing. To assist the Contractor in this program, the specifications contained herein are set forth as the minimum acceptable requirements. This does not relieve the Contractor from executing other Quality Assurance measures to ensure complete and fully functioning communications wiring systems within the scope of this Project.
- C. The Contractor shall ensure that all design, workmanship, materials employed, required equipment, and the manner and method of installation conforms to accepted practices. Where specific standards do not apply, the more stringent of industry publications, Owner policies, and manufacturer's guidelines shall apply.
- D. The Contractor shall certify that the cable manufacturers have carried out the quality assurance tests and procedures as specified herein. All cable must be manufactured by an ISO9001 Certified Manufacturer.
- E. The Contractor is responsible for ensuring that the cable packaging for shipping/storage purposes meets or exceeds the following requirements:
 1. One continuous length of cable per shipping reel/container.

2. Reels must be wooden or steel, sturdy, lagged, and shall have thermal protection jackets applied prior to lagging.
 3. Each reel/container shall be individually identified and marked with the length of the cable it contains. Said marking shall withstand weather and shipping conditions and remain readable.
 4. Cable shall be packed in a manner that facilitates the pre-installation tests to be conducted while the cable is still on the reel (i.e., both ends of the cable must be accessible while protected from moisture).
- F. In completing the Work, the Contractor shall adhere to all applicable professional practices, including but not limited to the standards set forth herein, governing the installation of Structured Building Cabling Systems wiring and associated components.
- G. The Contractor shall complete the Work in accordance with manufacturer's specifications (where applicable).
- H. The Contractor shall furnish his (her) best skill and judgment in performing the services requested.

1.13 WARRANTY

- A. The Contractor shall warrant that throughout the term of this Contract, prices charged for products and services are no higher than those charged to any other entity for products of like grade and quality in similar or lesser quantities.
- B. The installed structured telecommunications wiring (as applicable for given cable media) system, shall be certified for a minimum 20-year period. This warranty must cover, at a minimum, the following:
1. All defects of wire, cable, components and other materials in the system installation.
 2. All specifications provided herein and as presented in all design documentation (at time of installation).
 3. All workmanship associated with the system installation.
- C. The Contractor will correct any problems and malfunctions that are warranty-related issues without additional charge to the Owner for the entire warranty period. The 1-year construction warranty period shall commence following acceptance of the Work as specified herein. Any longer term warranties provided by the Contractor or passed through from the manufacturers shall also commence at this time.
- D. All extended material warranties shall be passed through to the Owner.
- E. See also Section 016000 "Product Requirements" for other conditions that may apply.

1.14 ACCEPTANCE

- A. The following criteria shall be met in order for the project to be accepted:

1. All testing by the Contractor shall be complete and all test results have been delivered to the Owner and the Designer.
 2. All of Contractor's test results have been examined and approved by the Designer and Owner.
 3. Owner Contractor's test results have been examined and approved by the Designer and Owner.
 4. All documentation required by this specification has been delivered to the Owner and the Designer.
 5. Any punch list items discovered have been corrected to the satisfaction of the Owner and the Designer.
- B. Following completion and/or compliance with the requirements listed above, the Owner will issue a Notice of Completion confirming that the project is complete. A 45-day Acceptance Period will begin immediately following the issuance of the Notice of Completion.
- C. During this Acceptance period, the wiring system is to be up and operational. If there is a major system failure, the Acceptance period will begin again once the problem is resolved and the system is back up and running.
- D. The Acceptance period is considered to be outside of the Warranty period. Once the Acceptance period has passed, the Warranty shall begin.
- E. Major systems failures are defined events that deleteriously impact 25 percent or more of the users.
- F. Failures, both major and minor, are to be reported to the Contractor telephonically, followed by written communications describing the problem, time and date of occurrence, etc.
- G. Contractor personnel shall respond to major failures within four hours. Minor failures shall be responded to at the Owner's discretion or within one business day.
- 1.15 DELIVERY, STORAGE AND HANDLING
- A. Deliver products, components, and accessories carefully to avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Store products, components, and accessories in original cartons and in clean dry space; protect from weather and construction traffic.
- C. All equipment delivered prior to installation shall be stored by the Contractor at his place of business.
- D. Costs of all shipping to the Contractor's place of business, the job site, inside handling, and of all unusual storage requirements, shall be borne by the Contractor.
- E. The Owner and/or General Contractor control the job site and access to the work. All work, deliveries, and storage of materials must be coordinated with the General

Contractor. The Contractor is responsible for the unloading, storage, and any moving of materials required for the work. The Contractor will coordinate scheduling of activities with the General Contractor.

- F. It shall be the responsibility of the Contractor to make appropriate arrangements, and to coordinate with authorized personnel at the site, for the acceptance, handling, protection, and storage of equipment so delivered.
- G. Responsibility for any materials that the Owner provides shall be that of the Contractor once delivered to the Contractor.

PART 2 - PRODUCTS

2.1 GENERAL

- A. These specifications define the minimum acceptable quality by designating a manufacturer's trade or brand name and catalog or model number, and by describing attributes, performance, or other standards.
- B. For products described only by attributes, performance, or standards, the Contractor shall select products that meet the specified requirements, treat them as substitute products, and submit a request for approval of their use.
- C. Products for which no known or allowable substitution exists are so designated.
- D. Such phrases as "or equal," "or equivalent," and "or acceptable substitute" indicate that an equivalent product may be submitted as a proposed substitute for that which is specified.
- E. Where a group of products comprise a "system," only a complete replacement system may be proposed for substitution.
- F. The Contractor shall provide product submittals adequate to demonstrate the conformance of the items submitted to the Drawings, Specifications, and intent of the design.

2.2 SUBSTITUTIONS

- A. Submit substitutions under the provisions of Section 012500 "Substitution Procedures."

2.3 REQUIRED MATERIALS - GENERAL

- A. All materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with Montana State Department of Labor and Industry, United States Environmental Protection Agency (US EPA), or

applicable national, federal, provincial, or state laws, standards, or regulations associated with the Site.

B. Materials to be provided and/or installed include, but are not limited to:

1. All materials specified within this Division and/or elsewhere within the Contract Documents.
2. Any other parts and/or miscellaneous equipment required providing a complete structured cabling system of the type intended by this Specification.

2.4 MATERIALS AND INSTALLATION PROVIDED BY OTHERS

A. Certain materials and equipment will be furnished and installed by parties other than the Trade Contractor(s) primarily responsible for the work outlined under Division 27 and illustrated on the Drawings. These certain materials and equipment include, but are not limited to, the following:

1. Air conditioning and ventilation systems and associated components.
2. Fire suppression systems and associated components, excluding fire-stop systems and/or components safe-guarding cabling installed as specified within Division 27.
3. Building management systems, controls, and associated components.
4. Uninterruptable Power Supplies (UPS) and associated components.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall provide all materials, tools, equipment, miscellaneous parts, and labor as required to complete the Work as outlined herein.
- B. The Contractor shall complete the Work as specified herein and on the Drawings.
- C. The Contractor agrees to use best efforts to furnish an adequate supply of technicians and materials at all times, and to do the work in the most appropriate, expeditious, and economical manner that is consistent with the interests of the Owner. This includes, but is not limited to: all labor, services, materials, installation, hoisting, supplies, insurance, equipment, tools, utilities, scaffolding, storage, and any other facilities and items of every kind and description required for the prompt and efficient completion of the work.

3.2 STAFFING

- A. The Project foreman shall be replaced immediately if unsatisfactory to the Owner, the Construction Manager, and/or the Designer.

- B. The Contractor shall designate, in writing to the Owner, the Construction Manager, and Designer, a dedicated full time project manager as contact for resolution of problems, job coordination, etc. This person shall have full authority to represent the Contractor.
- C. Only a skilled, experienced, and reliable work force shall be used. The Contractor shall immediately discontinue the services of anyone employed on this project, at the request of the Owner, the Construction manager, and/or the Designer.
- D. Craft personnel must be trained or certified by the manufacturer of the product they are installing.
- E. Craft personnel shall be required to provide and use the manufacturer's recommended tools in the performance of each activity.

3.3 PHYSICAL INSTALLATION

- A. All materials shall be firmly secured in place unless requirements of portability dictate otherwise.
- B. Fastenings and bracings shall be adequate to support their loads with a safety factor of at least three (3) times. All requirements for Zone 1 seismic bracing and earthquake safety shall be met.
- C. All boxes, equipment, etc., shall be secured plumb and square.
- D. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.
- E. Protective covers normally shipped with the connector shall remain over the connector after installation. The cover shall be temporarily held in place with electrical tape or permanently with plastic tie-wraps if there is any chance of it being dislodged during construction and move-in.
- F. Any connector that is not normally shipped with a protective cover shall be covered with a clear non-conductive medium, such as heat-shrink or plastic wrap, to protect against dust, paint and moisture. Protective covering shall not cover cable or station identification.
- G. Provide and install fire and moisture stop material in accordance with cable manufacturers' and stop manufacturer's specifications at all locations where required by applicable codes.
- H. All Trade Contractors must take such precautions as are necessary to guard against electromagnetic and electrostatic hum, to supply adequate ventilation, and to install the equipment so as to provide maximum safety to the person(s) operating said equipment.

3.4 FIRESTOPPING - GENERAL

- A. Codes and as indicated on the Drawings.
- B. All firestop materials and methods shall maintain the 'F' and 'T' ratings of the partition(s) wherein firestop materials are installed.
- C. The Contractor shall seal all penetrations for cable slots, rigid conduit, EMT conduit, or sleeves for communications wiring using approved materials installed according to the manufacturer's specifications.
- D. All slot or chase-type penetrations placed at time of construction shall be fire stopped.
- E. All individual cable or wire penetrations that are not in conduit shall be fire stopped.
- F. Any penetration in a fire-rated partition, sound-rated partition, or partition demising a pressurized area shall be sealed with a qualified fire stop system.
- G. "Through penetrations" in gypsum wallboard for cable trays shall be boxed-out with gypsum board and sealed with a design-tested, fire-stopping system installed per the manufacturer's specifications and instructions.
- H. A tested system shall be used to fire stop all openings made in concrete floors. Thickness or depth of fire-stopping material(s) shall be as recommended by the material manufacturer and backed by formal ASTM E-814 tests.
- I. Ceiling penetrations for conduit and cables shall be sealed with a system appropriate for the substrata and level of protection required.
- J. The methods of fire stopping roof penetrations shall be identical with those used for floor and ceiling assemblies.
- K. All metal and PVC conduits with or without wire and/or cable inside shall be fire stopped to restrict transfer of smoke and fumes.

3.5 CLEAN UP AND REPAIR

- A. Upon completion of an installation task, the relevant areas and equipment shall be left clean and in an operational state.
- B. The Contractor shall be responsible for debris removal and repairing any damage caused to the premises by the Contractor's installation activities, at no cost to the Owner or any other contractor working on the Project.
- C. Comply also with requirements appearing within Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 270000

SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

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. Communications equipment coordination and installation.
 - 2. Sleeves for pathways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common communications installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of communications equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed.
- D. Coordinate sleeve selection and application with building type.

PART 2 - PRODUCTS

2.1 SLEEVES FOR PATHWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
 - 2. Pressure Plates: Plastic. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications' equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install steel pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly.

END OF SECTION 270500

SECTION 270529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

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. Steel slotted support systems for communication raceways.
2. Aluminum slotted support systems for communication raceways.
3. Nonmetallic slotted support systems for communication raceways.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Slotted support systems, hardware, and accessories.
 - b. Clamps.
 - c. Hangers.
 - d. Sockets.
 - e. Eye nuts.
 - f. Fasteners.
 - g. Anchors.
 - h. Saddles.
 - i. Brackets.
2. Include rated capacities and furnished specialties and accessories.

- B. Shop Drawings: For fabrication and installation details for communications hangers and support systems.
 - 1. Trapeze hangers. Include product data for components.
 - 2. Steel slotted-channel systems.
 - 3. Aluminum slotted-channel systems.
 - 4. Nonmetallic slotted-channel systems.
 - 5. Equipment supports.
 - 6. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For hangers and supports for communications systems.
 - 1. Include design calculations and details of trapeze hangers.
 - 2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Ductwork, piping, fittings, and supports.
 - 3. Structural members to which hangers and supports will be attached.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling, including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Projectors.
- B. Seismic Qualification Data: Certificates, for hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. CADDY; a brand of nVent.
 - d. Flex-Strut Inc.
 - e. Gripple Inc.
 - f. GS Metals Corp.
 - g. G-Strut.
 - h. Haydon Corporation.
 - i. Metal Ties Innovation.
 - j. MIRO Industries.
 - k. Thomas & Betts Corporation; A Member of the ABB Group.
 - l. Unistrut; Part of Atkore International.
 - m. Wesanco, Inc.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Material for Channel, Fittings, and Accessories: Galvanized steel
 4. Channel Width: 1-5/8 inches
 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-
 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 9. Channel Dimensions: Selected for applicable load criteria.
- B. Aluminum Slotted Support Systems: Extruded aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Industries, Inc.
 - b. Flex-Strut Inc.
 - c. Haydon Corporation.
 - d. MKT Metal Manufacturing.
 - e. Thomas & Betts Corporation; A Member of the ABB Group.
 - f. Unistrut; Part of Atkore International.
 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Channel Material: 6063-T6 aluminum alloy.
 4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
 5. Channel Width: 1-5/8 inches.
 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 9. Channel Dimensions: Selected for applicable load criteria.
- C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least one surface.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. Fabco Plastics Wholesale Limited.
 - d. G-Strut.
 - e. Haydon Corporation.
 - f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.
 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Channel Width: 1-5/8 inches.
 4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
 5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
 6. Rated Strength: Selected to suit applicable load criteria.
 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Conduit and Cable Support Devices: Steel clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 2. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- 1) B-line, an Eaton business.
- 2) Empire Tool and Manufacturing Co., Inc.
- 3) Hilti, Inc.
- 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
- 5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
6. Toggle Bolts: Stainless-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
1. NECA 1.
 2. NECA/BICSI 568.
 3. TIA-569-D.
 4. NECA 101.
 5. NECA 102.
 6. NECA 105.
 7. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

- C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps, using spring friction action for retention in support channel.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to NFPA 70.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Use expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated-driven threaded studs, provided with lock washers and nuts, may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Section 099000.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 270529

SECTION 270544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS
AND CABLING

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. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
- 2. Sleeve-seal systems.
- 3. Sleeve-seal fittings.
- 4. Grout.
- 5. Silicone sealants.

- B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:

- 1. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
- 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized-steel sheet.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. HOLDRITE.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install Schedule 40 PVC (cast iron for rated assemblies). Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 270544

SECTION 270553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

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. Color and legend requirements for labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

- B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

- C. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with NFPA 70 and TIA 606-B.
- B. Comply with ANSI Z535.4 for safety signs and labels.
- C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Equipment Identification Labels:
 - 1. Black letters on a white field.

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible labels with acrylic pressure-sensitive adhesive.
 - 1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 - 2. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

2.4 BANDS AND TUBES

- A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
4. Tape shall be detectable for locating purposes with aluminum foil core sandwiched between two layers of polyester or equal material.
5. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
6. Width: 3 inches (75 mm).
7. Overall Thickness: 5 mils (0.125 mm).
8. Foil Core Thickness: 0.35 mil (0.00889 mm).
9. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
10. Tensile according to ASTM D882: 70 lbf (311.3 N) and 4600 psi (31.7 MPa).

B. Color and Printing:

1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
2. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL-FIBER CABLE".

2.6 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Use in standard indoor non-plenum areas.
2. Minimum Width: 3/16 inch (5 mm).
3. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
4. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
5. Color: Black, except where used for color-coding.

- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Use in areas exposed to sunlight.
 2. Minimum Width: 3/16 inch (5 mm).
 3. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
 4. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 5. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
1. Use in HVAC return air plenums.
 2. Minimum Width: 3/16 inch (5 mm).
 3. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 7000 psi (48.2 MPa).
 4. UL 94 Flame Rating: 94V-0.
 5. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 6. Color: Black.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.

- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.
- G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- H. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
 - 3. Provide label 6 inches (150 mm) from cable end.
- I. Snap-Around Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Provide label 6 inches (150 mm) from cable end.
- J. Self-Adhesive Wraparound Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Provide label 6 inches (150 mm) from cable end.
- K. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- M. Underground-Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
 - 2. Limit use of underground-line warning tape to direct-buried cables.
 - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.

N. Cable Ties: General purpose, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.
1. System legends shall be as follows:
 - a. Telecommunications.
 - b. Communications.
- D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, clear, with black lettering or use sequential designation, faceplate with clearview label the label covers with printed label composed of the following, in the order listed:
1. Wiring closet or communications room designation.
 2. Rack number.
 3. Patch panel - letter designation.
 4. Patch panel port number.
- E. Equipment Room Labeling:
1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels.
 2. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
 3. Data Outlets: Label each outlet with a self-adhesive label that matches the faceplate.
- F. Backbone Cables: Label each cable with a self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically. Label where accessible in cabinets or pull boxes, at patch panels, at termination blocks and at other locations designated on the Construction Documents.
- G. Horizontal Cables: Label each cable with a self-adhesive wraparound label indicating the same designation as the data outlet face plate. Label within workstation outlet

boxes, where accessible in cabinets or junction boxes, at rear of patch panels, at termination blocks and at other locations designated on the Construction Documents.

1. Room number.
 2. Colon.
 3. Faceplate number.
- H. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.
- I. Instructional Signs: Self-adhesive labels.
- J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Self-adhesive labels.
1. Apply to exterior of door, cover, or other access.
- K. Equipment Identification Labels:
1. Indoor Equipment: Self-adhesive label.
 2. Outdoor Equipment: Self-adhesive label rated for the environment.
 3. Equipment to Be Labeled:
 - a. Communications cabinets.
 - b. Uninterruptible power supplies.
 - c. Computer room air conditioners.
 - d. Egress points.
 - e. Power distribution components.

END OF SECTION 270553

SECTION 271116 - COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

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. 19-inch equipment racks.
2. 23-inch equipment racks.
3. 19-inch freestanding and wall-mounted equipment cabinets.
4. Open Rack equipment racks.
5. Power strips.
6. Grounding.
7. Labeling.

- B. Related Requirements:

1. Section 271313 "Communications Copper Backbone Cabling" for copper data cabling associated with system panels and devices.
2. Section 271323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
3. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.
4. Section 271523 "Communications Optical Fiber Horizontal Cabling" for optical-fiber data cabling associated with system panels and devices.

1.3 DEFINITIONS

- A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.
- B. BICSI: Building Industry Consulting Service International.
- C. LAN: Local area network.
- D. RCDD: Registered communications distribution designer.
- E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

- F. TGB: Telecommunications grounding bus bar.
- G. TMGB: Telecommunications main grounding bus bar.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.
- B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
 - 3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Data: Certificates, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Experienced installers, certified by the manufacturer, with at least five years experience installing Category 6 cabling systems and fiber optic systems in accordance with TIA-568 standards.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- B. UL listed.
- C. RoHS compliant.
- D. Compliant with requirements of the Payment Card Industry Data Security Standard.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements for plywood backing panels specified in Section 061000 "Rough Carpentry."

2.3 19-INCH EQUIPMENT RACKS

- A. Description: Two- and four- post racks with threaded rails designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch (482.6-mm) equipment mounting with an opening of 17.72-inches (450-mm) between rails.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Chatworth.
 - 2. Middle Atlantic Products, Inc.
 - 3. Or approved equal.
- C. General Requirements:
 - 1. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
 - 2. Material: Extruded steel.
 - 3. Finish: Manufacturer's standard, baked-polyester powder coat.
 - 4. Color: Black.
- D. Floor-Mounted Racks:

1. Overall Height: 84 inches (2133.6 mm) or as indicated on Drawings where specifically noted.
2. Overall Depth: 23 inches (584.2 mm).
3. Upright Depth: 3 inches (76.2 mm).
4. Two-Post Load Rating: 400 lb (181 kg).
5. Four-Post Load Rating: 1000 lb (454 kg).
6. Number of Rack Units per Rack: 45.
7. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug.
8. Base shall have a minimum of four mounting holes for permanent attachment to floor.
9. Top shall have provisions for attaching to cable tray or ceiling.
10. Self-leveling.

E. Wall-Mounted Racks:

1. Height: As indicated on Drawings.
2. Load Rating: 200 lb (91 kg).
3. Wall Attachment: Four mounting holes.
4. Equipment Access: Integral swing.

F. Cable Management:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.
5. Provide horizontal managers equal to Middle Atlantic Products, Inc. HCM series (2 RMS for each 48 port patch panel, 1 RMS for each 24 port patch panel, 1 RMS minimum for each 24 port switch, 2 RMS for each 48 port switch).
6. Rack-mounted Shelf: Include heavy-duty, double-side, 26 inch deep, 200 lb capacity shelf for each piece of equipment in the rack that does not have rack mounting capability.

2.4 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Rack and Cabinet TGBs: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-606-B. Predrilling shall be with holes for use with lugs specified in this Section.
 1. Cabinet-Mounted TGB: Terminal block, with stainless-steel or copper-plated hardware for attachment to cabinet.

2. Rack-Mounted Horizontal TGB: Designed for mounting in 19- or 23-inch (482.6- or 584.2-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical TGB: 72 or 36 inches (1828.8 or 914.4 mm) long, with stainless-steel or copper-plated hardware for attachment to rack.

2.5 LABELING

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout of communications equipment spaces.
- C. Comply with BICSI ITSIMM for installation of communications equipment spaces.
- D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.
 1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
 2. Record agreements reached in meetings and distribute them to other participants.
 3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
 4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.
- F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 GROUNDING

- A. Comply with NECA/BICSI 607.
- B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection."
- C. Locate TGB to minimize length of bonding conductors. Fasten to wall, allowing at least 2 inches (50 mm) of clearance behind TGB. Connect TGB with a minimum No. 4 AWG grounding electrode conductor from TGB to suitable electrical building ground. Connect rack TGB to near TGB or the TMGB.
 - 1. Bond the shield of shielded cable to patch panel, and bond patch panel to TGB or TMGB.

3.3 IDENTIFICATION

- A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 270553 "Identification for Electrical Systems."
- B. Comply with requirements in Section 099000 "Interior and High Performance Paints and Coatings" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. Paint and label colors for equipment identification shall comply with TIA-606-B.

END OF SECTION 271116

SECTION 271313 - COMMUNICATIONS COPPER BACKBONE CABLING

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. High-count Category 3 twisted pair cable.
- 2. High-count Category 5e twisted pair cable.
- 3. High-count Category 6 twisted pair cable.
- 4. Category 6 twisted pair cable.
- 5. Twisted pair cable hardware, including plugs, jacks, patch panels, and cross-connects.
- 6. Grounding provisions for twisted pair cable.
- 7. Cabling identification.
- 8. Source quality control requirements for twisted pair cable.

- B. Related Requirements:

- 1. Section 271513 "Communications Copper Horizontal Cabling."

1.3 DEFINITIONS

- A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- B. EMI: Electromagnetic interference.
- C. F/FTP: Overall foil screened cable with foil screened twisted pair.
- D. FTP: Shielded twisted pair.
- E. F/UTP: Overall foil screened cable with unscreened twisted pair.
- F. IDC: Insulation displacement connector.
- G. Jack: Also commonly called an "outlet," it is the fixed, female connector.
- H. LAN: Local area network.

- I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
- J. RCDD: Registered Communications Distribution Designer.
- K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- L. S/FTP: Overall braid screened cable with foil screened twisted pair.
- M. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- N. S/UTP: Overall braid screened cable with unscreened twisted pairs.
- O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER BACKBONE CABLING DESCRIPTION

- A. Copper backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
 - 2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
 - 3. Cabling administration Drawings and printouts.
 - 4. Wiring diagrams to show typical wiring schematics, including the following:
 - a. Telecommunications rooms plans and elevations.
 - b. Telecommunications pathways.
 - c. Telecommunications system access points.
 - d. Telecommunications grounding system
 - e. Cross-connects.
 - f. Patch panels.

- g. Patch cords.
- 5. Cross-Connects and Patch Panels: Detail mounting assemblies and show elevations and physical relationship between the installed components.
- C. Twisted pair cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Source quality-control reports.
- C. Product Certificates: For each type of product.
- D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For splices and connectors to include in maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Experienced Installers, certified by manufacturer, with at least five years' experience installing Category 6 cabling systems in accordance with TIA-568 standards.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of twisted pair cable for open and short circuits.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

- A. Cables: Provide products by one of the following or approved equal.

1. Belden.
2. Commscope.
3. General Cable.
4. Hitachi.
5. Hubbell.
6. Mohawk.
7. Occ.
8. Panduit.
9. Siemon.
10. Systimax.

- B. Hardware: Provide products by one of the following or approved equal.

1. Commscope.
2. Hubbell.
3. Occ.
4. Panduit.
5. Siemon.
6. Systimax.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

- C. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- D. Grounding: Comply with TIA-607-C.

2.3 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
 - 1. Communications, Plenum Rated: Type CMP complying with UL 1685.
 - 2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - 3. Communications, Riser Rated: Type CMR complying with UL 1666.
 - 4. Communications, Riser Rated: Type CMP or Type CMR in listed plenum or riser communications raceway.
 - 5. Communications, Riser Rated: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. RoHS compliant.

2.4 HIGH-COUNT CATEGORY 3 TWISTED PAIR CABLE

- A. Description: Balanced-twisted pair cable, certified to meet transmission characteristics of Category 3 cable at frequencies up to 16MHz. See Construction Documents for number of pairs (25 pair minimum).
- B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 3 cables.
- C. Conductors: 100-ohm, 24 AWG solid copper.
- D. Shielding/Screening: Unshielded balanced twisted pairs (UTP).
- E. Cable Rating: Riser rated for non-plenum areas, plenum rated when running in or through a return air plenum.
- F. Jacket: Blue thermoplastic.

2.5 HIGH-COUNT CATEGORY 5e TWISTED PAIR CABLE

- A. Description: Balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz. See Construction Documents for number of pairs (minimum 25).
- B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.
- C. Conductors: 100-ohm, 24 AWG solid copper.
- D. Shielding/Screening: Unshielded balanced twisted pairs (UTP).
- E. Cable Rating: Riser rated for non-plenum areas, plenum rated when running in or through a return air plenum.
- F. Jacket: Light blue thermoplastic.

2.6 HIGH-COUNT CATEGORY 6 TWISTED PAIR CABLE

- A. Description: Balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz. See Construction Documents for number of pairs.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Hitachi Cable America Inc.
 - 2. Mohawk; a division of Belden Networking, Inc.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100-ohm, 23 AWG solid copper.
- E. Shielding/Screening: Unshielded balanced twisted pairs (UTP).
- F. Cable Rating: Riser rated for non-plenum areas, plenum rated when running in or through a return air plenum.
- G. Jacket: Blue thermoplastic.

2.7 CATEGORY 6 TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

- B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- C. Conductors: 100-ohm, 23 AWG solid copper.
- D. Shielding/Screening: Unshielded balanced twisted pairs (UTP).
- E. Cable Rating: Riser rated for non-plenum areas, plenum rated when running in or through a return air plenum.
- F. Jacket: Blue thermoplastic.

2.8 TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. General Requirements for Cable Connecting Hardware:
 - 1. Twisted pair cable hardware shall meet the performance requirements of **Category 6**.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables shall be terminated with connecting hardware of same category or higher.
 - 4. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.
- C. Connecting Blocks: 110-style and 66-style as called out on the Construction Documents. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Telephone Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 - 1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.
 - d. 24 or 48 ports.
 - e. Category performance rating to match the cable.
 - f. 25 or 50 pair amphenol connectors at rear of the patch panel.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair twisted pair cable indicated plus 25 percent.

F. Plugs and Plug Assemblies:

1. Male; eight position (8P8C); color-coded modular telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

G. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

H. Patch Cords: Factory-made, four-pair cables in 36-inch and 48-inch lengths; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

2.9 CABLING IDENTIFICATION

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.10 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Comply with TIA-607-B.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA-568-C.1.

- C. Factory test cables according to TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install cables parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF PATHWAYS

- A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."
- B. Comply with Section 260528 "Pathways for Electrical and Communications Systems."
- C. Comply with Section 270529 "Hangers and Supports for Communications Systems."
- D. Comply with Section 270536 "Cable Trays for Communications Systems."
- E. Drawings indicate general arrangement of pathways and fittings.

3.4 INSTALLATION OF COPPER BACKBONE CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. General Requirements for Cabling:
 - 1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
 - 2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM)," Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
 - 5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section Use lacing bars and distribution spools.
 - 9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
 - 10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 - 11. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
 - 12. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.
- C. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
 - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- D. Installation of Cable Routed Exposed under Raised Floors:
 - 1. Install plenum-rated cable only.
 - 2. Install cabling after the flooring system has been installed in raised floor areas.
 - 3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
 - 1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
 - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
 - 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
 - 4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
 - 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
 - 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BICSI's "Telecommunications Distribution Methods Manual."

3.6 GROUNDING

- A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- B. Comply with TIA-607-C and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
 - 1. Administration Class: 3 (Class 1 for buildings with one Data Room).
 - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 3 level of administration.
- C. Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling" for cable and asset management software.
- D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- F. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
 - b. Label each unit and field within distribution racks and frames.
 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- G. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-C requirements for the following:
1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections.
- E. Tests and Inspections:
 1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with

measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

- F. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- G. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- H. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- I. Prepare test and inspection reports.

END OF SECTION 271313

SECTION 271323 - COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

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. 62.5/125-micrometer, multimode, optical fiber cable.
 - 2. 50/125 micrometer, multimode, optical fiber cable.
 - 3. 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable.
 - 4. 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable.
 - 5. 9/125 micrometer single-mode, indoor-outdoor optical fiber cable (OS2).
 - 6. 9/125 micrometer single-mode, inside plant optical fiber cable (OS2).
 - 7. 9/125 micrometer single-mode, outside plant optical fiber cable (OS2).
 - 8. Optical fiber cable connecting hardware, patch panels, and cross-connects.
 - 9. Cabling identification products.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- C. RCDD: Registered Communications Distribution Designer.

1.4 OPTICAL FIBER BACKBONE CABLING DESCRIPTION

- A. Optical fiber backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
 - 2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
 - 3. Cabling administration drawings and printouts.
 - 4. Wiring diagrams to show typical wiring schematics including the following:
 - a. Telecommunications rooms plans and elevations.
 - b. Telecommunications pathways.
 - c. Telecommunications system access points.
 - d. Telecommunications grounding system.
 - e. Cross-connects.
 - f. Patch panels.
 - g. Patch cords.
 - 5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
- C. Optical fiber cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Source quality-control reports.
- C. Product Certificates: For each type of product.
- D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Experienced Installers, certified by the manufacturer, with at least five years' experience installing fiber optic cabling systems in accordance with TIA-568 standards.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 1. Test optical fiber cable to determine the continuity of the strand end to end.
 2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products by one of the following manufacturers or approved equal:
 1. Commscope.
 2. Corning.
 3. General Cable.
 4. Hubbell.
 5. Leviton.
 6. OCC.
 7. Panduit.
 8. Siemon.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- D. Grounding: Comply with TIA-607-C.

2.3 850 NANOMETER LASER-OPTIMIZED, 50/125 MICROMETER, MULTIMODE OPTICAL FIBER CABLE (OM3)

- A. Description: Multimode, 50/125-micrometer-fiber, nonconductive, tight buffer, optical fiber cable. See Construction Documents for number of fiber strands.
- B. Standards:
 - 1. Comply with ICEA S-83-596 for mechanical properties.
 - 2. Comply with TIA-568-C.3 for performance specifications.
 - 3. Comply with TIA-492AAAC for detailed specifications.
- C. Conductive cable shall be steel armored type.
- D. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
- E. Minimum Overfilled Modal Bandwidth-length Product: 1500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- F. Minimum Effective Modal Bandwidth-length Product: 2000 MHz-km at 850 nm.
- G. Jacket:
 - 1. Jacket Color: Aqua.
 - 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
 - 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.
- H. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - 1. Plenum Rated Type OFNP for use in return air plenum spaces.
 - 2. Riser rated Type OFNR for non-plenum areas or between floors in EMT conduit.

2.4 850 NANOMETER LASER-OPTIMIZED, 50/125 MICROMETER, MULTIMODE OPTICAL FIBER CABLE (OM4)

- A. Description: Multimode, 50/125-micrometer-fiber, nonconductive, tight buffer, optical fiber cable. See Construction Documents for number of fiber strands.
- B. Standards:
 - 1. Comply with ICEA S-83-596 for mechanical properties.
 - 2. Comply with TIA-568-C.3 for performance specifications.
 - 3. Comply with TIA-492AAAD for detailed specifications.
- C. Conductive cable shall be steel armored type.
- D. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
- E. Minimum Overfilled Modal Bandwidth-length Product: 3500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- F. Minimum Effective Modal Bandwidth-length Product: 4700 MHz-km at 850 nm.
- G. Jacket:
 - 1. Jacket Color: Aqua.
 - 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
 - 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.
- H. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - 1. Plenum Rated Type OFNP for use in return air plenum spaces.
 - 2. Riser Rated Type OFNR for non-plenum areas or between floors in EMT conduit.

2.5 9/125 MICROMETER, SINGLE-MODE, INSIDE PLANT OPTICAL FIBER CABLE (OS1)

- A. Description: Single mode, 9/125-micrometer fibers, tight buffered, optical fiber cable. See Construction Documents for number of fiber strands.
- B. Standards:
 - 1. Comply with TIA-492CAAA for detailed specifications.
 - 2. Comply with TIA-568-C.3 for performance specifications.
 - 3. Comply with ICEA S-83-596 for mechanical properties.
- C. Conductive cable shall be steel armored type.
- D. Maximum Attenuation: 1.0 dB/km at 1310 nm; 1.0 dB/km at 1550 nm.

E. Jacket:

1. Jacket Color: Yellow.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

F. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

1. Plenum Rated Type OFNP for use in return air plenum spaces.
2. Riser rated Type OFNR for non-plenum areas or between floors in EMT conduit.

2.6 9/125 MICROMETER SINGLE-MODE, INSIDE PLANT OPTICAL FIBER CABLE (OS2)

A. Description: Single mode, 9/125-micrometer fibers, stranded loose tube, optical fiber cable. See Construction Documents for number of fiber strands.

B. Standards:

1. Comply with TIA-492CAAB for detailed specifications.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with ICEA S-83-596 for mechanical properties.

C. Maximum Attenuation: 0.5 dB/km at 1310 nm; 0.5 dB/km at 1550 nm.

D. Jacket:

1. Jacket Color: Yellow.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

E. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

1. Plenum Rated Type OFNP for use in return air plenum spaces.
2. Riser rated Type OFNR for non-plenum areas or between floors in EMT conduit.

2.7 9/125 MICROMETER SINGLE-MODE, OUTSIDE PLANT OPTICAL FIBER CABLE (OS2)

A. Description: Single mode, 9/125-micrometer fibers, stranded loose tube, optical fiber cable. See Construction Documents for number of fiber strands.

B. Standards:

1. Comply with TIA-492CAAB for detailed specifications.

2. Comply with TIA-568-C.3 for performance specifications.
 3. Comply with ICEA S-87-640 for mechanical properties.
- C. Maximum Attenuation: 0.5 dB/km at 1310 nm; 0.5 dB/km at 1550 nm.
- D. Jacket:
1. Jacket Color: Black.
 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.8 OPTICAL FIBER CABLE HARDWARE

- A. Standards:
1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.
 2. Comply with TIA-568-C.3.
- B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.
- D. Connector Type: Type SC complying with TIA-604-3-B, Type ST complying with TIA-604-2-B, Type LC complying with TIA-604-10-B, connectors.
- E. Plugs and Plug Assemblies:
1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
 2. Insertion loss not more than 0.25 dB.
 3. Marked to indicate transmission performance.
- F. Jacks and Jack Assemblies:
1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
 2. Insertion loss not more than 0.25 dB.
 3. Marked to indicate transmission performance.
 4. Designed to snap-in to a patch panel or faceplate.

2.9 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Comply with TIA-607-C.

2.10 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.
- C. Factory test pre-terminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for pathways specified in Section 260528 "Pathways for Electrical Systems."

- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

- A. Comply with NECA 1, NECA 301, and NECA/BICSI 568.
- B. General Requirements for Optical Fiber Cabling Installation:
 - 1. Comply with TIA-568-C.1 and TIA-568-C.3.
 - 2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
 - 3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 - 9. In the communications equipment room, provide a 10-foot- long service loop on each end of cable.
 - 10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
 - 11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
- C. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- D. Installation of Cable Routed Exposed under Raised Floors:
 - 1. Install plenum-rated cable only.
 - 2. Install cabling after the flooring system has been installed in raised floor areas.
 - 3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

- E. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

- A. Install grounding according to BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.
- B. Comply with TIA-607-C and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
 - 1. Administration Class: **Class 1**.
 - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for **Class 2** level of administration including optional identification requirements of this standard.
- C. Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling" for cable and asset management software.
- D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- F. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 - 4. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:
 - 1. Flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.

- 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.
- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- D. Remove and replace cabling where test results indicate that it does not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 271323

SECTION 271523 - COMMUNICATIONS OPTICAL FIBER HORIZONTAL CABLING

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.
- B. Section 271116 "Communications Racks, Frames, and Enclosures."
- C. Section 271323 "Communications Optical Fiber Backbone Cabling."

1.2 SUMMARY

- A. Section Includes:
 - 1. 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable (OM4).
 - 2. 9/125 micrometer, single-mode, indoor-outdoor optical fiber cable (OS2).
 - 3. Optical fiber cable connecting hardware, patch panels, and cross-connects.
 - 4. Grounding.
 - 5. Cabling identification products.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- C. RCDD: Registered Communications Distribution Designer.

1.4 OPTICAL FIBER HORIZONTAL CABLING DESCRIPTION

- A. Optical fiber horizontal cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C and the equipment outlet, otherwise known as "Cabling Subsystem 1" in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
 - 1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.

2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the equipment outlet.
 3. Bridged taps and splices shall not be installed in the horizontal cabling.
- B. A work area is approximately 100 sq. ft. (9.3 sq. m) and includes the components that extend from the equipment outlets to the equipment.
- C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
 2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
 3. Cabling administration Drawings and printouts.
 4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:
 - a. Telecommunications rooms plans and elevations.
 - b. Telecommunications pathways.
 - c. Telecommunications system access points.
 - d. Telecommunications grounding system.
 - e. Telecommunications conductor drop locations.
 - f. Typical telecommunications details.
 - g. Mechanical, electrical, and plumbing systems.
- C. Fiber optic cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.
- B. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Five years experience installing fiber optic systems for similar project type in accordance with TIA-568 standards.
- B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test optical fiber cable to determine the continuity of the strand end to end.
 - 2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications equipment and service suppliers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide products by one of the following manufacturers or approved equal:

1. Commscope.
2. Corning.
3. General Cable.
4. Hubbell.
5. Leviton.
6. OCC.
7. Panduit.
8. Siemon.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-C.

2.3 850 NANOMETER LASER-OPTIMIZED, 50/125 MICROMETER, MULTIMODE OPTICAL FIBER CABLE (OM4)

- A. Description: Multimode, 50/125-micrometer, 2-fiber, nonconductive, tight buffer, optical fiber cable.
- B. Standards:
1. Comply with ICEA S-83-596 for mechanical properties.
 2. Comply with TIA-568-C.3 for performance specifications.
 3. Comply with TIA-492AAAD for detailed specifications.
- C. Conductive cable shall be steel armored type.
- D. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
- E. Minimum Overfilled Modal Bandwidth-length Product: 3500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- F. Minimum Effective Modal Bandwidth-length Product: 4700 MHz-km at 850 nm.
- G. Jacket:
1. Jacket Color: Aqua.

2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).
 - H. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
- 2.4 9/125 MICROMETER, SINGLE-MODE, INDOOR-OUTDOOR OPTICAL FIBER CABLE (OS2)
- A. Description: Single mode, 9/125-micrometer, 2 fibers, tight buffered, nonconductive optical fiber cable.
 - B. Conductive cable shall be steel armored type.
 - C. Maximum Attenuation: 0.5 dB/km at 1310 nm; 0.5 dB/km at 1550 nm.
 - D. Jacket:
 1. Jacket Color: Yellow.
 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).
 - E. Standards:
 1. Comply with TIA-492CAAB for detailed specifications.
 2. Comply with TIA-568-C.3 for performance specifications.
 3. Comply with ICEA S-104-696 for mechanical properties.
 - F. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
- 2.5 OPTICAL FIBER CABLE HARDWARE
- A. Standards:
 1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.
 2. Comply with TIA-568-C.3.

- B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
 - 1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- C. Patch Cords: Factory-made, single-fiber cables in 36-inch (900-mm) lengths.
- D. Connector Type: Type LC complying with TIA-604-10-B connectors.
- E. Plugs and Plug Assemblies:
 - 1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
 - 2. Insertion loss not more than 0.25 dB.
 - 3. Marked to indicate transmission performance.
- F. Jacks and Jack Assemblies:
 - 1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
 - 2. Insertion loss not more than 0.25 dB.
 - 3. Marked to indicate transmission performance.
 - 4. Designed to snap-in to a patch panel or faceplate.
- G. Faceplate:
 - 1. Two-port, vertical single-gang faceplates designed to mount to single-gang wall boxes.
 - 2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
 - 3. Metal Faceplate: Steel (only in unfinished spaces), complying with requirements in Section 262726 "Wiring Devices."
 - 4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

2.6 GROUNDING

- A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with TIA-607-C.

2.7 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.
- C. Factory test preterminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for pathways specified in Section 260528 "Pathways for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

- A. Comply with NECA 1, NECA 301 and NECA/BICSI 568.
- B. General Requirements for Optical Fiber Cabling Installation:
 - 1. Comply with TIA-568-C.1 and TIA-568-C.3.
 - 2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
 - 3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.

4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, provide a 10-foot- (3-m-) long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet (1800 mm) long not less than 12 inches (300 mm) in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.

3.3 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.4 GROUNDING

- A. Install grounding according to BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.
- B. Comply with TIA-607-C and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.5 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
 - 1. Administration Class: **Class 1**
 - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B level of administration.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, horizontal pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 - 4. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:
 1. Flexible vinyl or polyester that flexes as cables are bent.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspection with the assistance of a factory-authorized service representative.
- E. Tests and Inspections:
 1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and Multimode Horizontal Link Measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
 - 2) Attenuation test results for horizontal links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.
- F. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or

transferred from the instrument to the computer, saved as text files, and printed and submitted.

- G. Remove and replace cabling where test results indicate that it does not comply with specified requirements.
- H. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- I. Prepare test and inspection reports.

END OF SECTION 271523

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

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. Electronic safety and security equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common electronic safety and security installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

- C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 3. Pressure Plates: Plastic. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

- A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 6 inches (152 mm) above finished floor level.

- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 280500

SECTION 284621.11 - ADDRESSABLE FIRE-ALARM SYSTEMS

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. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Remote annunciator.
7. Addressable interface device.
8. Digital alarm communicator transmitter.
9. Digital alarm communicator and wireless fire communicator.
10. Network communications.

1.3 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. HLI: High Level Interface.
- D. NICET: National Institute for Certification in Engineering Technologies.
- E. PC: Personal computer.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including furnished options and accessories.
 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
 2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
12. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
 - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
 - b. Show field wiring required for HVAC unit shutdown on alarm.
 - c. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
 - d. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' smoke-evacuation system.
 - e. Locate detectors according to manufacturer's written recommendations.
 - f. Show air-sampling detector pipe routing.
13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:

1. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 01 Section "Submittals," make an identical submittal to authorities having jurisdiction. This Submittal shall be reviewed and "approved" by the Project Engineer prior to submitting to the AHJ and shall bear the project design firm's Shop Drawing stamp with signature and indication that the Submittal is approved. To facilitate review, include copies of

annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review. Fire Alarm Contractor shall provide professional stamping of Shop Drawings in jurisdictions where it is required.

2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified, fire-alarm technician; Level III minimum.
 - c. Licensed or certified by authorities having jurisdiction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to Owner, Architect, and authorities having jurisdiction:
 - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
 - d. Riser diagram.
 - e. Device addresses.
 - f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
 - g. Record copy of site-specific software.
 - h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
 - 1) Equipment tested.
 - 2) Frequency of testing of installed components.
 - 3) Frequency of inspection of installed components.

- 4) Requirements and recommendations related to results of maintenance.
 - 5) Manufacturer's user training manuals.
 - i. Manufacturer's required maintenance related to system warranty requirements.
 - j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.
- B. Software and Firmware Operational Documentation:
1. Software operating and upgrade manuals.
 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 3. Device address list.
 4. Printout of software application and graphic screens.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
 3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
 4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
 5. Keys and Tools: One extra set for access to locked or tamper proofed components.
 6. Audible and Visual Notification Appliances: One of each type installed.
 7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.
 8. Filters for Air-Sampling Detectors: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
 9. Air-Sampling Fan: Quantity equal to one for every five detectors, but no fewer than one unit of each type.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

1.9 PROJECT CONDITIONS

- A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.
- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 - 1. Notify Architect, Construction Manager and Owner no fewer than two days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with interruption of fire-alarm service without Architect's, Construction Manager's and Owner's written permission.
- C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.10 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. FACP and Equipment:
 - a. Edwards Systems Technology Inc.
 - b. NOTIFIER; a GE-Honeywell Company.
 - c. Autocall.
2. Wire and Cable:
 - a. Comtran Corporation.
 - b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
 - c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
 - d. West Penn Wire/CDT; a division of Cable Design Technologies.

2.2 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.
- B. Noncoded, UL-certified addressable system.
- C. Automatic sensitivity control of certain smoke detectors.
- D. All components provided shall be listed for use with the selected system.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 1. Manual stations.
 2. Heat detectors.
 3. Smoke detectors.
 4. Duct smoke detectors.
 5. **Automatic sprinkler system water flow.**
 6. **Preaction system.**
 7. **Fire standpipe system.**
- B. Fire-alarm signal shall initiate the following actions:
 1. Continuously operate alarm notification appliances.
 2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels and remote annunciators.

3. Transmit an alarm signal to the remote alarm receiving station.
 4. Unlock electric door locks in designated egress paths.
 5. Activate stairwell and elevator-shaft pressurization systems.
 6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 7. **Activate preaction system.**
 8. Recall elevators to primary or alternate recall floors.
 9. Activate elevator power shunt trip.
 10. Activate emergency shutoffs for gas and fuel supplies.
 11. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
 2. **High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.**
 3. Elevator shunt-trip supervision.
 4. Loss of communication with any panel on the network.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
 4. Loss of primary power at fire-alarm control unit.
 5. Ground or a single break in internal circuits of fire-alarm control unit.
 6. Abnormal ac voltage at fire-alarm control unit.
 7. Break in standby battery circuitry.
 8. Failure of battery charging.
 9. Abnormal position of any switch at fire-alarm control unit or annunciator.
 10. Voice signal amplifier failure.
 11. Hose cabinet door open.
- E. System Supervisory Signal Actions:
1. Initiate notification appliances.
 2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels and remote annunciators.
 3. Record the event on system printer.
 4. **Transmit system status to building management system.**
 5. **Display system status on graphic annunciator.**

2.4 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
 - a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
 - b. Include a real-time clock for time annotation of events on the event recorder and printer.
 - c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
 - d. The FACP shall be listed for connection to a central-station signaling system service.
 - e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.
 2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
 3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.
- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.
- C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
- D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
1. Pathway Class Designations: NFPA 72, Class B for notification, Class B for initiation.
 2. Pathway Survivability:
 - a. Level 1: Standard initiation and notification circuits.

- b. Level 2: Backbone cabling between FACP, FA annunciators and notification extender panels.
- 3. **Install no more than 50 addressable devices on each signaling-line circuit.**
- 4. Serial Interfaces:
 - a. One dedicated RS 485 port for remote station operation using point ID DACT.
 - b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
 - c. One USB port for PC configuration.
 - d. One RS 232 port for VESDA HLI connection.
 - e. One RS 232 port for voice evacuation interface.
- E. Smoke-Alarm Verification:
 - 1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
 - 2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
 - 3. Record events by the system printer.
 - 4. Sound general alarm if the alarm is verified.
 - 5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.
- F. Notification-Appliance Circuit:
 - 1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
 - 2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
 - 3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.
- G. Elevator Recall:
 - 1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room.
 - c. Smoke detectors in elevator hoistway.
 - 2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
 - 3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

- a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.
- H. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.
- I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory and print out the final adjusted values on system printer.
- J. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- K. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided as a special module that is part of fire-alarm control unit.
 - 1. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711.
 - a. Allow the application of, and evacuation signal to, indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
 - b. Programmable tone and message sequence selection.
 - c. Standard digitally recorded messages for "Evacuation" and "All Clear."
 - d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of fire-alarm control unit.
 - 2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
 - 3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.
- L. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals, and supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
 - 1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- M. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed, valve-regulated, recombinant lead acid.

- N. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.5 PREACTION SYSTEM

- A. Initiate Presignal Alarm: This function shall cause an audible and visual alarm and indication to be provided at the FACP. Activation of an initiation device connected as part of a preaction system shall be annunciated at the FACP only, without activation of the general evacuation alarm.

2.6 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 2. Station Reset: Key- or wrench-operated switch.
 3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
 4. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.7 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
 1. Comply with UL 268; operating at 24-V dc, nominal.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
 3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
 4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 5. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

6. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
 - a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
 - b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).
 - c. Multiple levels of detection sensitivity for each sensor.
 - d. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.8 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
 - 1. Temperature sensors shall test for and communicate the sensitivity range of the device.
- B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature. 190 deg F (88 deg C) for elevator hoistways or machine rooms, 135 deg F (57 deg C) for all other applications.
 - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.9 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
 - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- B. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
 - 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 - 2. Mounting: Wall mounted unless otherwise indicated.
 - 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - 4. Flashing shall be in a temporal pattern, synchronized with other units.
 - 5. Strobe Leads: Factory connected to screw terminals.
 - 6. Mounting Faceplate: Factory finished, red.
- C. Addressable Relay Modules:
 - 1. Provide address-setting means on the module. Store an internal identifying code for control panel use to identify the module type.
 - 2. Allow the control panel to switch the relay contacts on command.
 - 3. Have a minimum of two normally open and two normally closed contacts available for field wiring.
 - 4. Listed for controlling HVAC fan motor controllers.

2.10 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
 - 1. Electromagnets: Require no more than 3 W to develop 25-lbf (111-N) holding force.
 - 2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
 - 3. Rating: 120-V ac.
- B. Material and Finish: Match door hardware.

2.11 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
 - 1. Mounting: Flush cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.12 ADDRESSABLE INTERFACE DEVICE

- A. General:
 - 1. Include address-setting means on the module.
 - 2. Store an internal identifying code for control panel use to identify the module type.
 - 3. Listed for controlling HVAC fan motor controllers.
- B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall or to circuit-breaker shunt trip for power shutdown.
 - 1. Allow the control panel to switch the relay contacts on command.
 - 2. Have a minimum of two normally open and two normally closed contacts available for field wiring.
- D. Control Module:
 - 1. Operate notification devices.
 - 2. Operate solenoids for use in sprinkler service.

2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.
- B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
- C. Local functions and display at the digital alarm communicator transmitter shall include the following:
 - 1. Verification that both telephone lines are available.
 - 2. Programming device.
 - 3. LED display.
 - 4. Manual test report function and manual transmission clear indication.
 - 5. Communications failure with the central station or fire-alarm control unit.
- D. Digital data transmission shall include the following:
 - 1. Address of the alarm-initiating device.
 - 2. Address of the supervisory signal.
 - 3. Address of the trouble-initiating device.
 - 4. Loss of ac supply.
 - 5. Loss of power.
 - 6. Low battery.
 - 7. Abnormal test signal.
 - 8. Communication bus failure.
- E. Secondary Power: Integral rechargeable battery and automatic charger.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.14 DIGITAL ALARM COMMUNICATOR TRANSMITTER AND WIRELESS FIRE COMMUNICATOR

- A. The FACP Dialer shall be Listed and labeled according to UL 632. The Wireless Fire Communicator shall be UL S789 listed.
- B. Functional Performance: The FACP dialer receives an alarm, supervisory, or trouble signal from the FACP, and automatically sends the alarm signal to the Wireless Fire Communicator. The Fire Communicator will transmit the signal to the remote alarm

receiving station. The unit supervises a primary and secondary communication line. Where supervising 2 lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of the line to the remote alarm receiving station over the remaining line. When line service is restored, unit automatically reports that event to the receiving station. If service is lost on both lines, the local trouble signal is initiated.

- C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.
- D. Self-Test: Conducted automatically every 24 hours with report transmitted to receiving station.
- E. The Wireless Fire Communicator (separate unit from the FACP dialer) shall be a Honeywell IPGSM-4G.

2.15 NETWORK COMMUNICATIONS

- A. Provide network communications for fire-alarm system according to fire-alarm manufacturer's written requirements.
- B. Provide network communications pathway per manufacturer's written requirements and requirements in NFPA 72 and NFPA 70.
- C. Provide integration gateway using BACnet for connection to building automation system.

2.16 CABLES

- A. **All horizontal cables shall be type FPL power-limited fire alarm non-plenum cable listed by the NEC as suitable for general purpose fire alarm use except for riser cables. All FPL cables shall be resistant to the spread of fire and shall comply with UL test 1424 and vertical flame test UL 1581.**
- B. All horizontal cables shall be type FPLP power-limited fire alarm plenum cable listed by the NEC as suitable for use in ducts, plenums and other space used for environmental air. All FPLP cables shall be listed as having adequate fire-resistant and low smoke-producing characteristics and shall comply with UL test 1424 and UL tunnel test 910.
- C. All riser cables shall be type FPLR power-limited fire alarm riser cable (non-plenum) listed as suitable for use in a vertical run in a shaft or from floor to floor. All FPLR cables shall be listed as having fire-resistant characteristics capable of preventing fire from traveling floor to floor. Riser cables shall comply with UL test 1424 and the vertical riser flame test UL 1666.
- D. **Pathway Survivability Classes:**
 - 1. **Level 0 for FPLP cables.**

2. **Level 1 for FPL and FPLR cables.**
3. **Level 2 for FPLR cables in systems with partial evacuation or relocation. (2 hour rating).**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
 1. Connect new equipment to existing control panel in existing part of the building.
 2. Connect new equipment to existing monitoring equipment at the supervising station.
 3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control or monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Section 270548.16 "Seismic Controls for Communications Systems."
- D. Manual Fire-Alarm Boxes:
1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
 2. Mount manual fire-alarm box on a background of a contrasting color.
 3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- E. Smoke- or Heat-Detector Spacing:
1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
 2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
 3. Smooth ceiling spacing shall not exceed 30 feet (9 m).
 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to NFPA 72.
 5. HVAC: Locate detectors not closer than 36 inches (910 mm) from air-supply diffuser or return-air opening.
 6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.
- F. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.
- G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.
1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
- H. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.
- I. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- J. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

- K. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.
- L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 PATHWAYS AND WIRING

- A. (Pathway Level 1) Cabling for the fire alarm system shall be installed in raceways as specified in Section 260533 "Raceways and Boxes for Electrical Systems" where installed concealed in walls, above non-accessible ceilings and in all spaces without accessible ceilings. Raceways shall be a minimum of 3/4 inch (19 mm). (Pathway Level 0) Wiring for the fire alarm system that is installed above accessible ceilings shall be secured to the building structure and installed perpendicular and parallel to building lines. J-hooks and D rings may be used to support the cabling from the structure. Supports shall be provided at all changes in direction of the cable and a maximum of four foot on center in straight runs.
- B. (Pathway Level 1) All cabling for the fire alarm system shall be installed in raceways as specified in Section 260533 "Raceways and Boxes for Electrical Systems." Raceways shall be a minimum of 3/4 inch (19 mm).
- C. All cables and raceways shall be identified as specified in Section 260553 "Identification for Electrical Systems."
- D. All electrical enclosures, raceways and conduits shall contain only those electrical circuits associated with the fire alarm system and shall not contain any circuit that is unrelated to the system.
- E. All conduit penetrations of walls, floors and ceilings, whether the opening was new or existing, shall be sealed around the conduit(s) by the Fire Alarm Installer, restoring the walls, floors and ceilings to their original condition, fire resistance and integrity. The Fire Alarm System Installer shall be responsible for all patching and touch-up painting necessitated by the performance of their work.
- F. Control panels shall not be used as raceways. Conductors that do not terminate within a control panel shall not be routed through that control panel.
- G. All cable taps shall utilize numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- H. Signaling line circuits shall not be installed in the same cable or raceway as power-limited circuits.
- I. Fire alarm system conductors shall be segregated as necessary to conform to the fire alarm system manufacturer's recommendations and as necessary to prevent electrical and/or audio crosstalk between conductors installed in common conduits. Conform with the requirements of NFPA 70, Article 760 for separation of power limited and non-power limited circuits.

- J. For surface installations, a surface mounted box by the fire alarm manufacturer shall be provided with each surface mounted device, matching the device color and manufactured for the device. Devices overlapping the surface box will not be acceptable. Use Wiremold 700 raceway for pathways between surface mounted devices.

3.4 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
 - 1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 - 1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
 - 2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
 - 3. Smoke dampers in air ducts of designated HVAC duct systems.
 - 4. Magnetically held-open doors.
 - 5. Electronically locked doors and access gates.
 - 6. Alarm-initiating connection to elevator recall system and components.
 - 7. Alarm-initiating connection to activate emergency lighting control.
 - 8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
 - 9. Supervisory connections at valve supervisory switches.
 - 10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
 - 11. Supervisory connections at elevator shunt-trip breaker.
 - 12. Data communication circuits for connection to building management system.
 - 13. Data communication circuits for connection to mass notification system.
 - 14. Supervisory connections at fire-extinguisher locations.
 - 15. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
 - 16. Supervisory connections at fire-pump engine control panel.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

- F. Prepare test and inspection reports.
- G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **12** months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

YELLOWSTONE COUNTY
ELECTIONS OFFICES – CEDAR HALL RENOVATION
BILLINGS, MONTANA

YC23_ADMRENO - ELECTIONS

END OF SECTION 284621.11

