CRAWFORD AUSABLE SCHOOL DISTRICT

GRAYLING MIDDLE SCHOOL HVAC UPGRADES

ALTERNATE #1

BID SET - 01.17.2025

GENERAL NOTES

OWNERSHIP AND USE OF DOCUMENTS:

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- ALL WORK AND MATERIALS SHALL BE IN FULL CONFORMANCE WITH THE LATEST FEDERAL, STATE AND LOCAL LAWS, CODES AND ORDINANCES, INCLUDING THEIR MOST RECENT REVISIONS, ADDITIONS, AMENDMENTS, AND INTERPRETATIONS. ALL SUCH CODES AND COMPLIANCE ARE TO BE DEEMED AS PART OF THIS CONTRACT AND PART OF THE CONSTRUCTION DOCUMENTS AS THEY HAVE BEEN WRITTEN IN FULL. IN THE EVENT OF CONFLICT, THE MOST STRINGENT REQUIREMENTS SHALL APPLY.
- ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY THE CONTRACTOR AT THE SITE.
- HOLD INDICATED DIMENSIONS. DO NOT SCALE DRAWINGS. RESOLVE ANY DISCREPANCIES WITH THE ARCHITECT BEFORE BEGINNING WORK.
- IN THE CASE OF AN INCONSISTENCY BETWEEN THE DRAWINGS AND SPECIFICATIONS, OR WITHIN EITHER DOCUMENT NOT CLARIFIED BY ADDENDUM, THE BETTER QUALITY, MORE EXPENSIVE, OR GREATER QUANTITY OF WORK SHALL BE PROVIDED IN ACCORDANCE WITH THE ARCHITECTS INTERPRETATION.
- ALL CONSTRUCTION THAT IS ALREADY IN PLACE THAT IS TO REMAIN AS PART OF THE PROJECT SHALL BE PROTECTED FROM DAMAGE SHALL BE PROTECTED THROUGHOUT THE PERIOD OF CONSTRUCTION WORK. ANY DAMAGED CONSTRUCTION OR FEATURES SHALL BE REPLACED AT THE EXPENSE OF THE CONTRACTOR TO THE SATISFACTION OF THE OWNER WITH MATERIALS EQUIVALENT OR SUPERIOR TO THE ORIGINAL ITEM(S).
- IT SHALL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO VERIFY ALL DIMENSIONS AND INSPECT CONDITIONS OF PRIOR WORK OF THE OTHER TRADES BEFORE STARTING WORK. PROCEEDING WITH THE WORK SHALL CONSTITUTE ACCEPTANCE OF PRIOR WORK.
- ALL ELECTRICAL OUTLETS, DATA & TELEPHONE OUTLETS/JACKS, SWITCHES, PULL STATIONS, THERMOSTATS, EXIT LIGHTS, AND ALL OTHER WALL MOUNTED ACCESSORIES SHALL BE ALIGNED VERTICALLY AND HORIZONTALLY WHEN IN PROXIMITY.
- UNLESS OTHERWISE SHOWN, PLACING OF ACCESS DOORS IN GYPSUM CEILINGS SHALL NOT BE ACCEPTED. LOCATE AND INSTALL ALL WORK AS REQUIRED TO PRECLUDE THE NEED FOR ACCESS THROUGH THE CEILINGS. COORDINATION OF THIS REQUIREMENT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- PROVIDE BLOCKING IN PARTITIONS AS REQUIRED FOR ALL MILLWORK, CASEWORK, ACCESSORIES OR OTHER SIMILAR ITEMS ATTACHED TO WALLS. ALL WOOD BLOCKING TO BE FIRE-RETARDENT TREATED AS REQUIRED BY CODE, CONTINUOUS FROM STUD TO STUD.
- ALL MATERIALS AND EQUIPMENT SHALL BE INSTALLED PER MANUFACTURE'S WRITTEN INSTRUCTIONS.
- SEALANT, CAULKING, AND FLASHING LOCATIONS SHOWN ON DRAWINGS ARE NOT INTENDED TO BE INCLUSIVE. FOLLOW MANUFACTURE'S INSTALLATION RECOMMENDATIONS AND STANDARD INDUSTRY AND BUILDING PRACTICE.
- IN ALL CASES WHERE WORK DEPICTED IN THESE DRAWINGS REPRESENTS A COMPLETE SYSTEM COMPOSED OF SEPARATE PARTS, IT IS THE RESPONSIBILITY OF THE CM/GENERAL CONTRACTOR TO PROVIDE ALL OF THE PARTS, COMPONENTS, ACCESSORIES, HARDWARE, FASTENERS, ETC. REQUIRED FOR A COMPLETE AND FULLY FUNCTIONING ASSEMBLY WITHIN THE DEFINITIONS OF NORMAL INDUSTRY STANDARDS, WHETHER OR NOT THESE MISCELLANEOUS ITEMS ARE DIRECTLY SPECIFIED IN THE CONSTRUCTION DOCUMENTS.

ABBREVIATIONS

A.F.F.	ABOVE FINISHED FLOOR
ABV.	ABOVE
AC	AIR CONDITIONING
ADJ.	ADJUSTABLE
ALUM.	ALUMINUM
ALT.	ALTERNATE
ASPH.	ASPHALT
B.O.	BOTTOM OF
BD.	BOARD
BLDG.	BUILDING
BLKG.	BLOCKING
BLW.	BELOW
BM.	BEAM
BTW.	BETWEEN
CMU	CONCRETE MASONRY UNIT
COL.	COLUMN
CONC.	CONCRETE
CAB.	CABINET
CLO.	CLOSET
CLR.	CLEAR
CONT.	CONTINUOUS
COORD.	COORDINATE
CTR	CENTER
DEMO	DEMOLITION
DIA.	DIAMETER
DR.	DOOR
DN.	DOWN
DIM.	DIMENSION
DTL.	DETAIL
ELEV.	ELEVATINO
EQ.	EQUAL
EQUIP.	EQUIPMENT
EXIST.	EXISTING
EXT.	EXTERIOR
F.G.	FINISHED GRADE
F.O.C.	FACE OF CONCRETE
F.O.F.	FACE OF FINISH
F.O.M.	FACE OF MASONRY
F.O.S.	FACE OF STUD
FDN.	FOUNDATION
FR.	FRAME
FIN.	FINISH
FLR.	FLOOR
FRPR.	FIREPROOFING
FTG.	FOOTING
GALV.	GALVANIZED
GWB	GYPSUM WALLBOARD
GL.	GLASS
GC	GENERAL CONTRACTOR
H.W.	HOT WATER
H.C.	HOLLOW CORE
HM	HOLLOW METAL
HB	HOSEBIB
HDR.	HEADER
HDW	HARDWARE
I.D.	INSIDE DIAMETER
INSUL.	INSULATION
INT.	INTERIOR
J.H.	JOIST HANGER
JB	JUNCTION BOX
JST.	JOIST
K.D.	KILN-DRIED
LAV.	LAVATORY
LT.	LIGHT
MAT	MATERIAL
MAX	MAXIMUM
MFR.	MANUFACTURER
MIN.	MINIMUM
MO	MASONRY OPENING
MIR.	MIRROR
MTL.	METAL
(N)	NEW
N.T.S.	NOT TO SCALE
NIC	NOT IN CONTRACT
o/	OVER
OC	ON CENTER
OPNG.	OPENING
OPP.	OPPOSITE
P.T.	PRESSURE TREATED
PL.	PLATE
PLAM.	PLASTIC LAMINATE
PLYWD	PLYWOOD
PNL.	PANEL
PTD.	PAINTED
RO	ROUGH OPENING
R.W.L.	RAINWATER LEADER
RESIL.	RESILIENT
REQ'D	REQUIRED
RM.	ROOM
RTG	RATING
RAD./R.	RADIUS
S.A.D.	SEE ARCHITECTURAL DWGS
S.A.S.F.	SELF-ADHERED SHEET FLASHING
S.E.D.	SEE ELECTRICAL DRAWINGS
S.C.D.	SEE CIVIL DRAWINGS
S.M.D.	SEE MECHANICAL DWGS
S.S.	STAINLESS STEEL
S.S.D.	SEE STRUCTURAL DWGS
SIM.	SIMILAR
SPEC	SPECIFICATIONS
STL.	STEEL
STN.	STAIN
SQ.	SQUARE
SFTY	SAFETY
T&G	TONGUE AND GROOVE
T.O.	TOP OF
T.O.C.	TOP OF CONCRETE
T.O.S.	TOP OF STEEL
T.O.P	TOP OF PLATE
TYP.	TYPICAL
U.O.N.	UNLESS OTHERWISE NOTED
V.I.F.	VERIFY IN FIELD
W.O.	WHERE OCCURS
w/	WITH
WC	WATER CLOSET
WDW.	WINDOW
WD.	WOOD
WH	WATER HEATER

LOCATION MAP

SHEET INDEX

PROJECT INFORMATION

PROJECT DESCRIPTION:
UPGRADES AND REPLACEMENT OF HVAC EQUIPMENT TO BE EQUIPPED WITH AIR CONDITIONING AT THE EXISTING GYMNASIUM

USE & OCCUPANCY CLASSIFICATION
EDUCATIONAL GROUP (E)
(MBC SECTION 305.1) & (NFPA 101 6.1.3 & 15.1 EXISTING EDUCATIONAL OCCUPANCIES)

CONSTRUCTION TYPE (PER NFPA 101 LIFE SAFETY CODE, 2012 EDITION)
TYPE III(200)

CONSTRUCTION TYPE (PER MBC)
TYPE IIIB

FIRE SUPRESSION SYSTEM: FULLY SPRINKLERED w/ NFPA 13 SYSTEM

BUILDING AREAS PER FLOOR
STORIES ABV. GRADE PLANE PER MBC
FIRST FLOOR OF (E) EAST WING.....15,260 SF
MAIN LEVEL & (E) SECOND FLOOR OF EAST WING.....59,020 SF
UPPER LEVEL & (E) THIRD FLOOR OF EAST WING.....22,570 SF

TOTAL.....**96,850 SF** *(NO CHANGE)*

CALCULATED OCCUPANT LOAD (1004)

TOTAL.....2,613 OCCUPANTS *(NO CHANGE)*
TOTAL w/o GYMNASIUM.....1,707 OCCUPANTS *(NO CHANGE)*

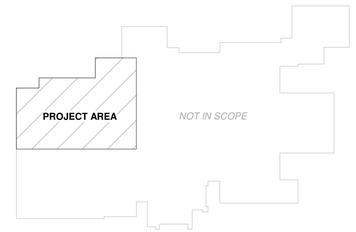
ACTUAL OCCUPANT LOAD OF SCHOOL
458 STUDENTS *(20-24 STUDENTS PER CLASSROOM)*
48 STAFF *(INCLUDING OFFICE, CAFETERIA, PARAPROFESSIONAL, & SHARED STAFF)*
TOTAL = 506 OCCUPANTS

CORRIDOR RATING
(MBC 1020.1) 'E' OCCUPANCY w/ AUTOMATIC SPRINKLER SYSTEM = 0 HOURS

(NFPA 101 SECTION 10-3.6) INTERIOR CORRIDORS, EXCEPTION No. 2:
IN BUILDINGS PROTECTED THROUGHOUT BY AN APPROVED, SUPERVISED AUTO. SPRINKLER SYSTEM [...] CORRIDOR WALLS SHALL NOT BE REQUIRED TO BE RATE, PROVIDED SUCH WALLS [...] RESIST THE PASSAGE OF SMOKE

THIS RENOVATION TO SN EXISTING SCHOOL BUILDING IS DESIGNED IN ACCORDANCE WITH THE FOLLOWING CODES THAT GOVERN STATE OF MICHIGAN PROJECTS:

MICHIGAN BUILDING CODE.....2015
MICHIGAN MECHANICAL CODE....2021
MICHIGAN PLUMBING CODE.....2021
MICHIGAN ELECTRICAL CODE....2023
NFPA 101.....2012



KEY PLAN

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contact: Joe Powers

M / E / P
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OWNER
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ph: 989.344.6822
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GRAYLING MIDDLE SCHOOL
HVAC UPGRADES
500 SPRUCE ST. GRAYLING, MI 49738

Date	Issued For
01/17/25	BID SET

PIC:
PM:
DRAFTS:
PROJECT NO:
22.516MS
SHEET TITLE:
TITLE SHEET

ATS-1

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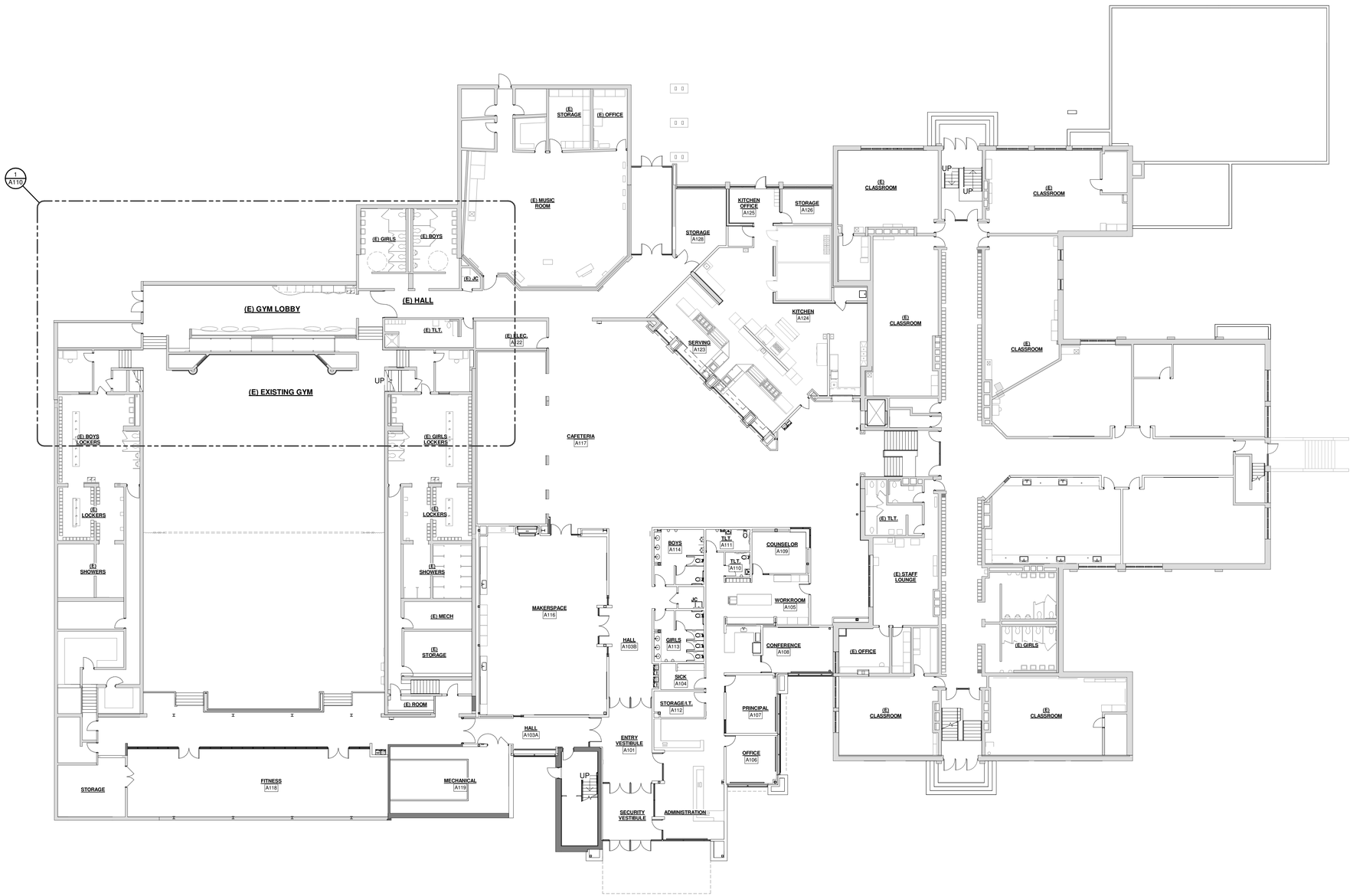

N

OVERALL MAIN LEVEL FLOOR PLAN (SECOND FLOOR EAST WING)

SCALE: 1/16" = 1'-0"

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GRAYLING MIDDLE SCHOOL

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Date	Issued For
01/17/25	BID SET

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DRAFTS:

PROJECT NO:
22.516MS

SHEET TITLE:
OVERALL MAIN LEVEL FLOOR PLAN

A101

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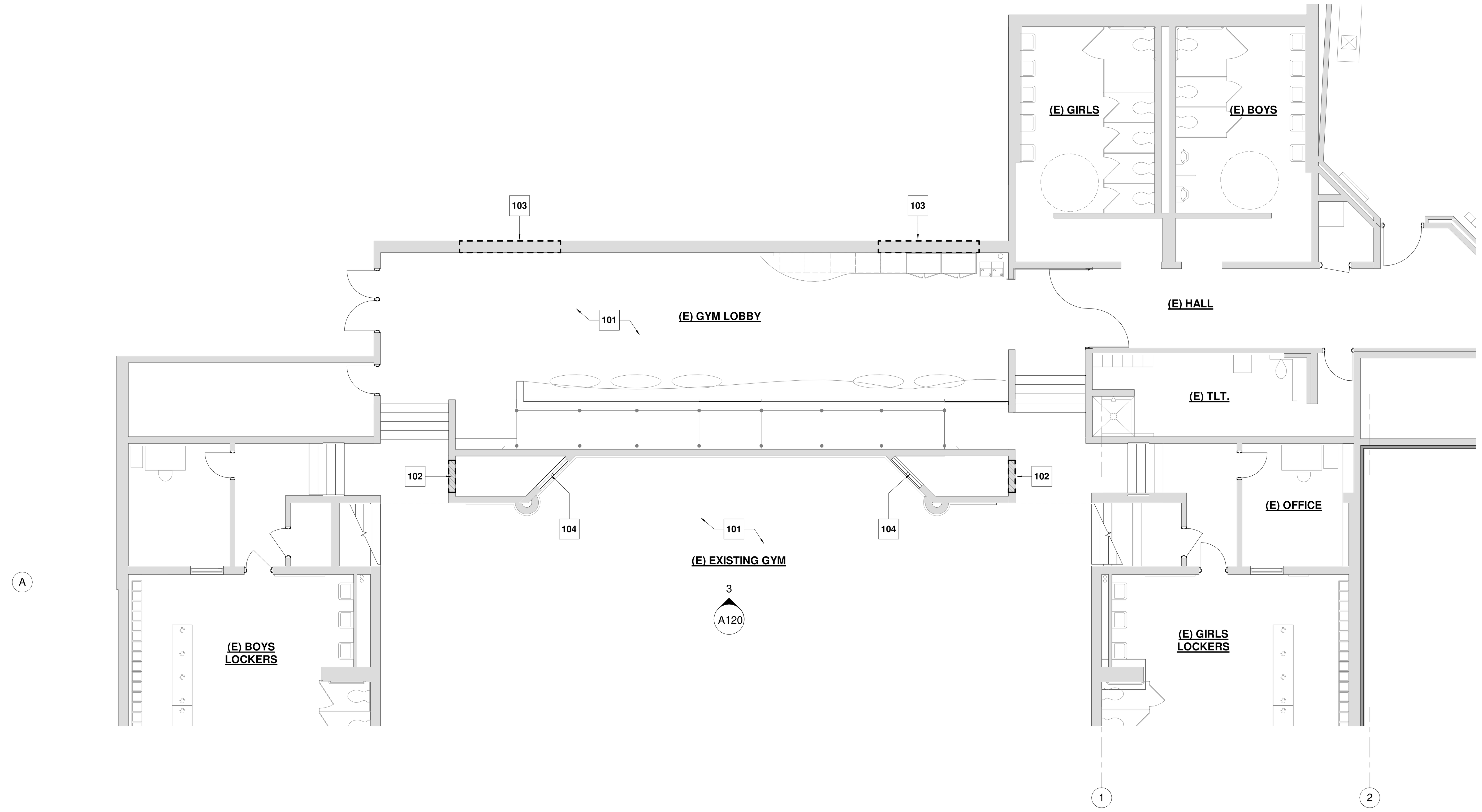

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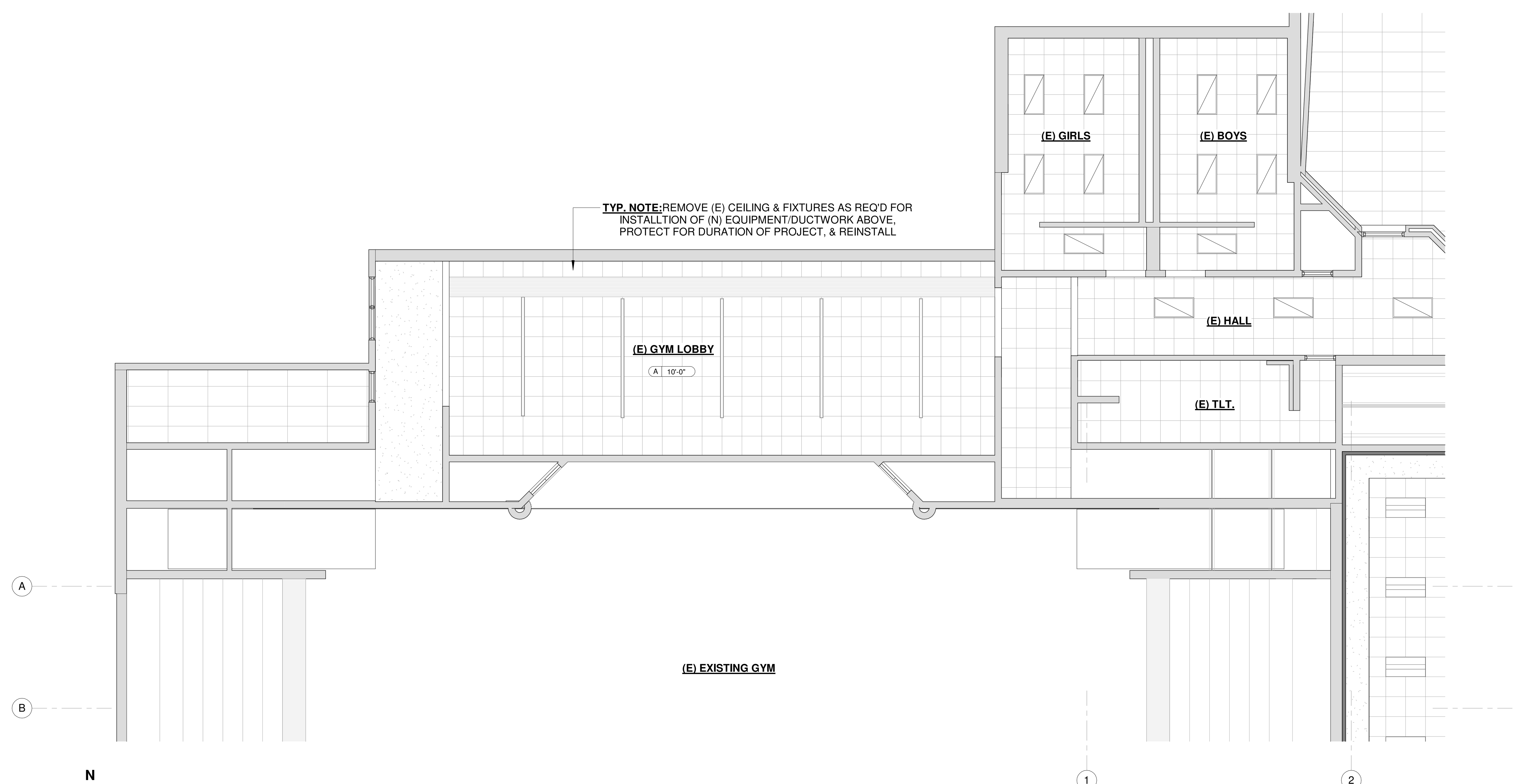
ENLARGED GYM FLOOR PLAN

SCALE: 1/8" = 1'-0"



N

MAIN LEVEL SOUTH RCP

SCALE: 1/8" = 1'-0"

GENERAL FLOOR PLAN NOTES

- ALL INTERIOR DIMENSIONS ARE TO FACE OF FRAMING, U.O.N.
- ALL EXTERIOR DIMENSIONS ARE TO EXTERIOR FACE OF FOUNDATION WALL
- REFER TO WALL SECTION AND WALL TYPE LEGEND FOR WALL CONSTRUCTION
- REFER TO MECHANICAL & ELECTRICAL DRAWINGS FOR EQUIPMENT MOUNTING REQUIREMENTS

KEY PLAN

GENERAL INTERIOR FINISH NOTES

- PROVIDE INTERIOR WALL TOUCH-UP, PATCHING, & PAINTING AS REQ'D AT ALL NEW WORK LOCATIONS
- ALL FLOORING TO BE PROTECTED WHERE NEW WORK IS TO OCCUR. ANY INCEDENTAL DAMAGE TO EXISTING FLOORING DUE TO NEW CONTRUCTION WORK WITHOUT PROPER PRECAUTIONS/PROTECTION SHALL BE RESPONSIBILITY OF CONTRACTOR TO REPAIR AT NO ADDITIONAL COST.

FLOOR PLAN KEYNOTE LEGEND

101	PROTECT EXISTING FLOORING & CASEWORK PRIOR TO START OF DEMOLITION & NEW CONSTRUCTION
102	REMOVE (E) WALL GRILLE & INFILL w/ CMU WALL CONSTRUCTION TO MATCH EXISTING, V.I.F. (E) CONDITIONS
103	(E) LOUVER ABANDONED; CAP INTERIOR w/ INSULATED METAL PANEL, SEE MECH. DETAIL
104	(N) RETURN AIR LOUVER, SEE MECH; ALIGN OPENING w/ GROUT JOINT. (N) LINTEL REQUIRED, SEE STRUCT.

CEILING FINISH LEGEND

X — CEILING TYPE; HEIGHT ABOVE FINISH FLOOR

A — SUSPENDED 2'-0" x 2'-0" TEGULAR EDGE LAY-IN ACOUSTICAL CEILING TILE

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HVAC UPGRADES

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Date	Issued For
01/17/25	BID SET

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PROJECT NO:
22.516MS
SHEET TITLE:
ENLARGED GYM FLOOR PLAN

A110

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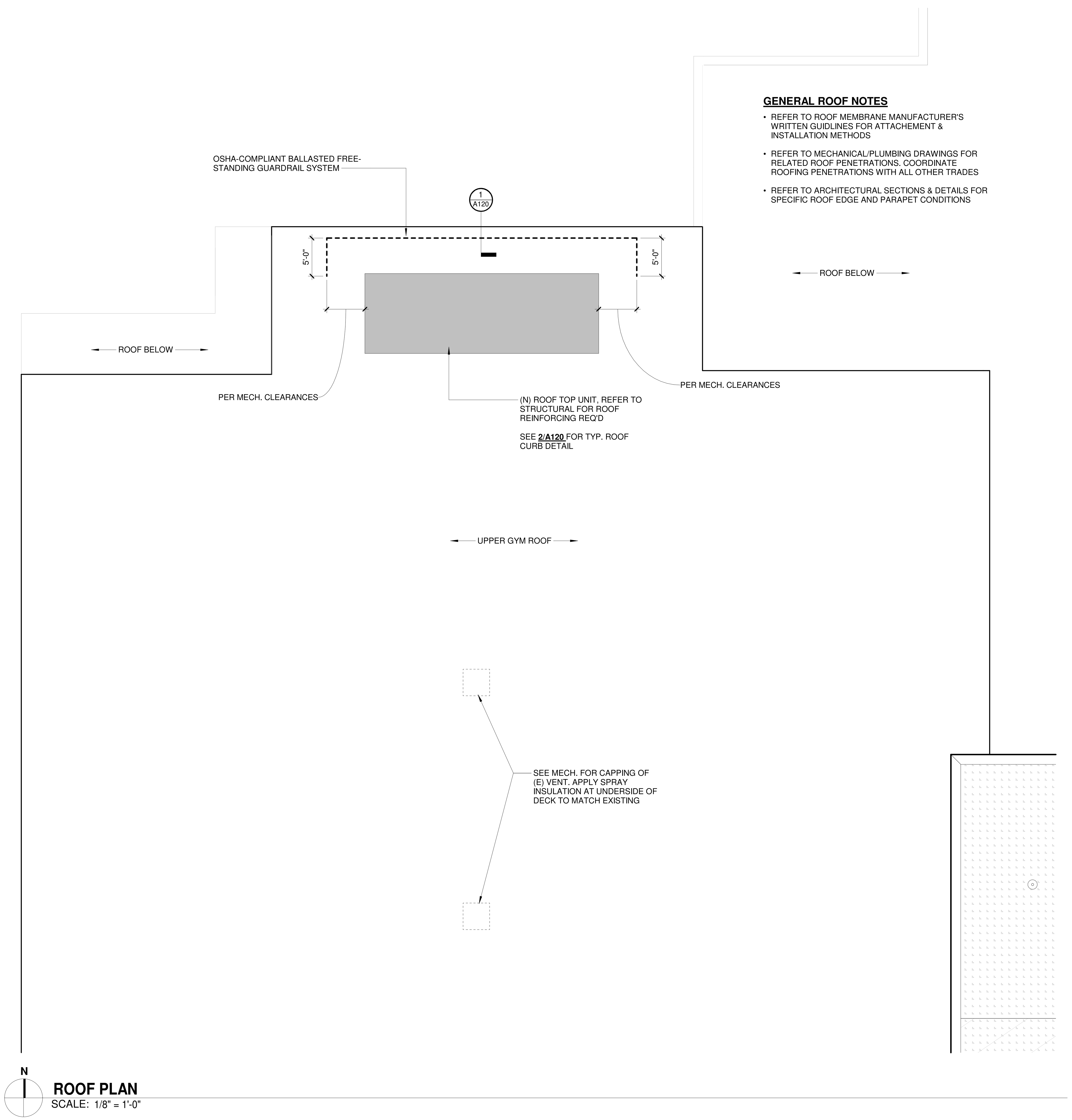
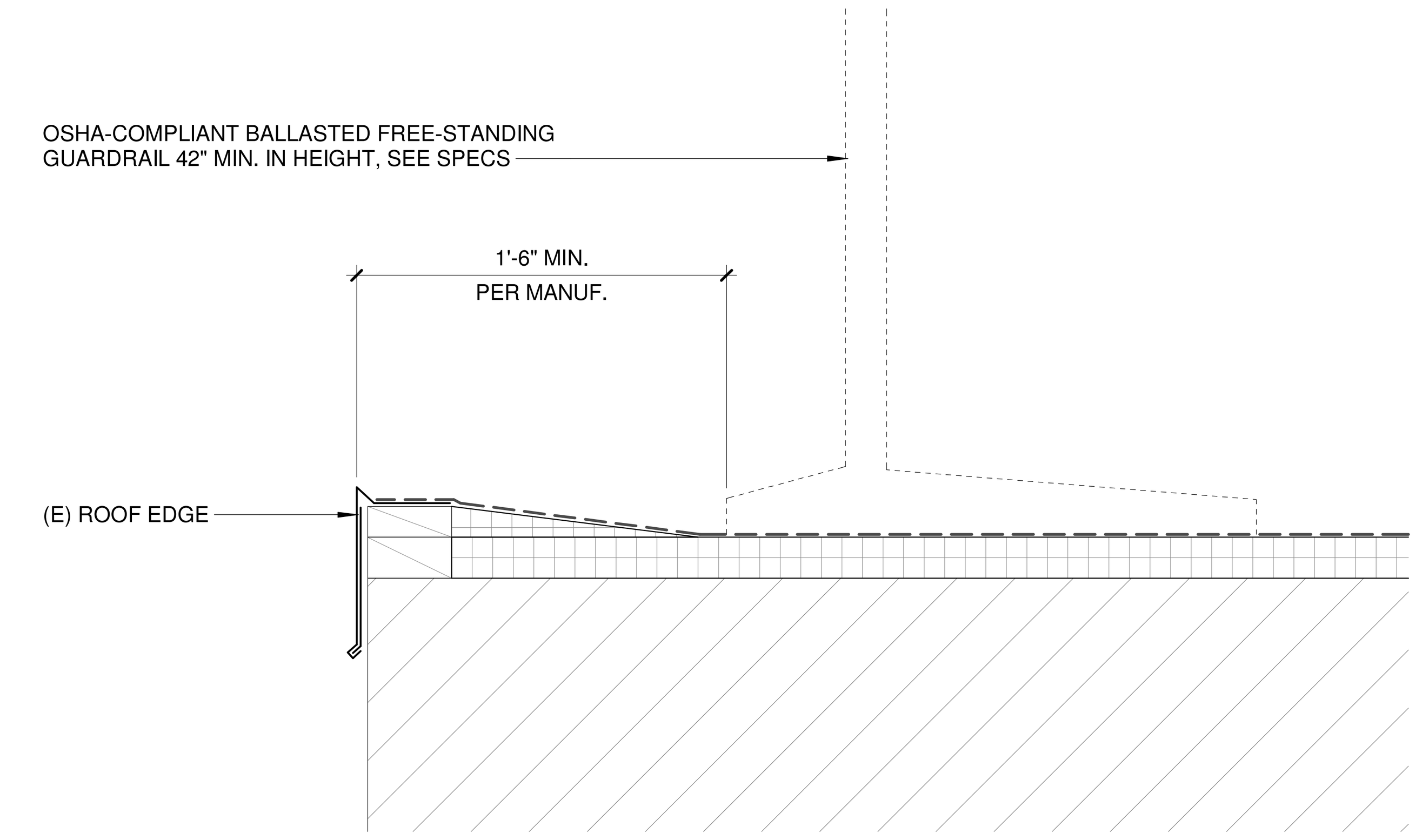


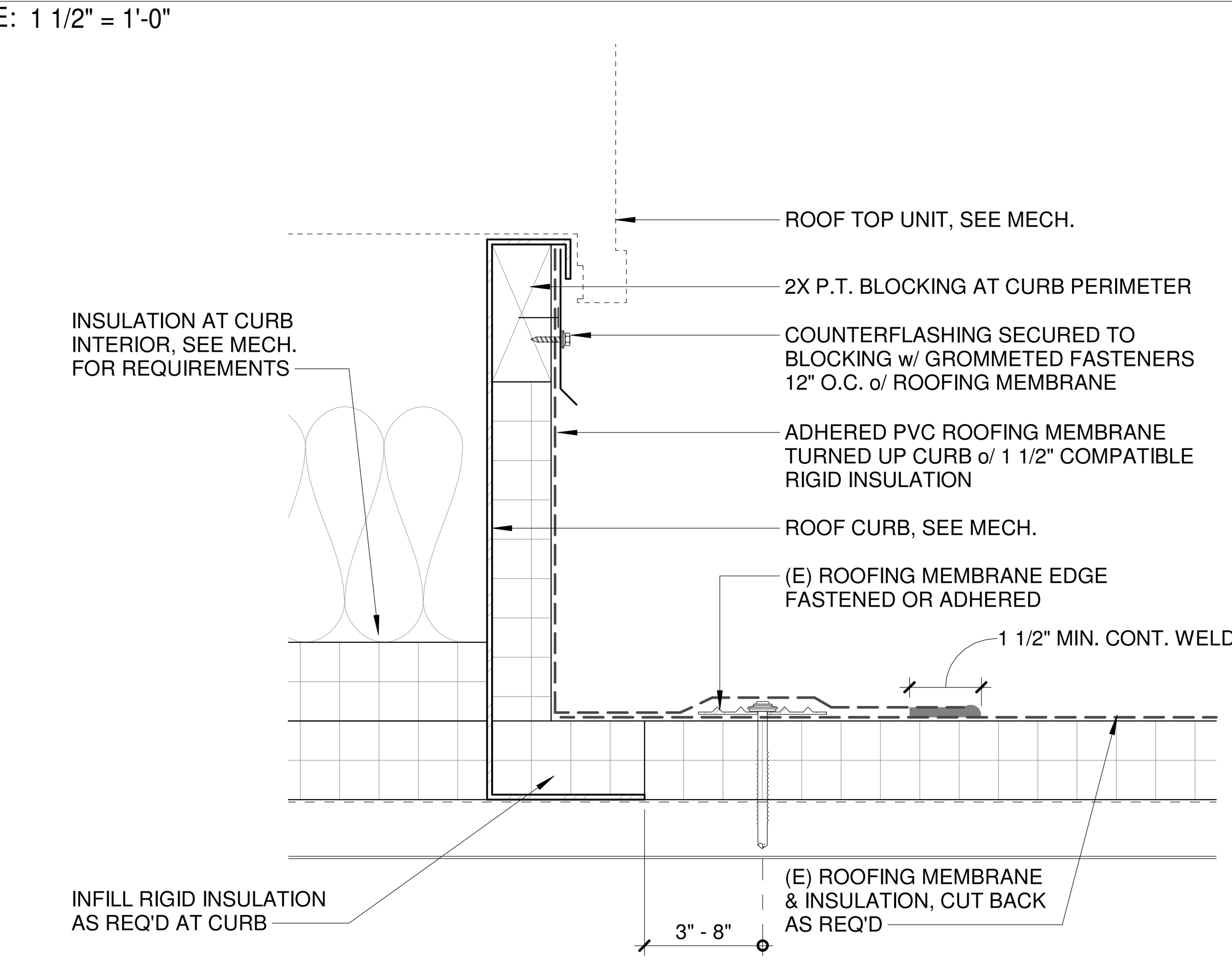
GENERAL ROOF NOTES

- REFER TO ROOF MEMBRANE MANUFACTURER'S WRITTEN GUIDLINES FOR ATTACHEMENT & INSTALLATION METHODS
- REFER TO MECHANICAL/PLUMBING DRAWINGS FOR RELATED ROOF PENETRATIONS. COORDINATE ROOFING PENETRATIONS WITH ALL OTHER TRADES
- REFER TO ARCHITECTURAL SECTIONS & DETAILS FOR SPECIFIC ROOF EDGE AND PARAPET CONDITIONS

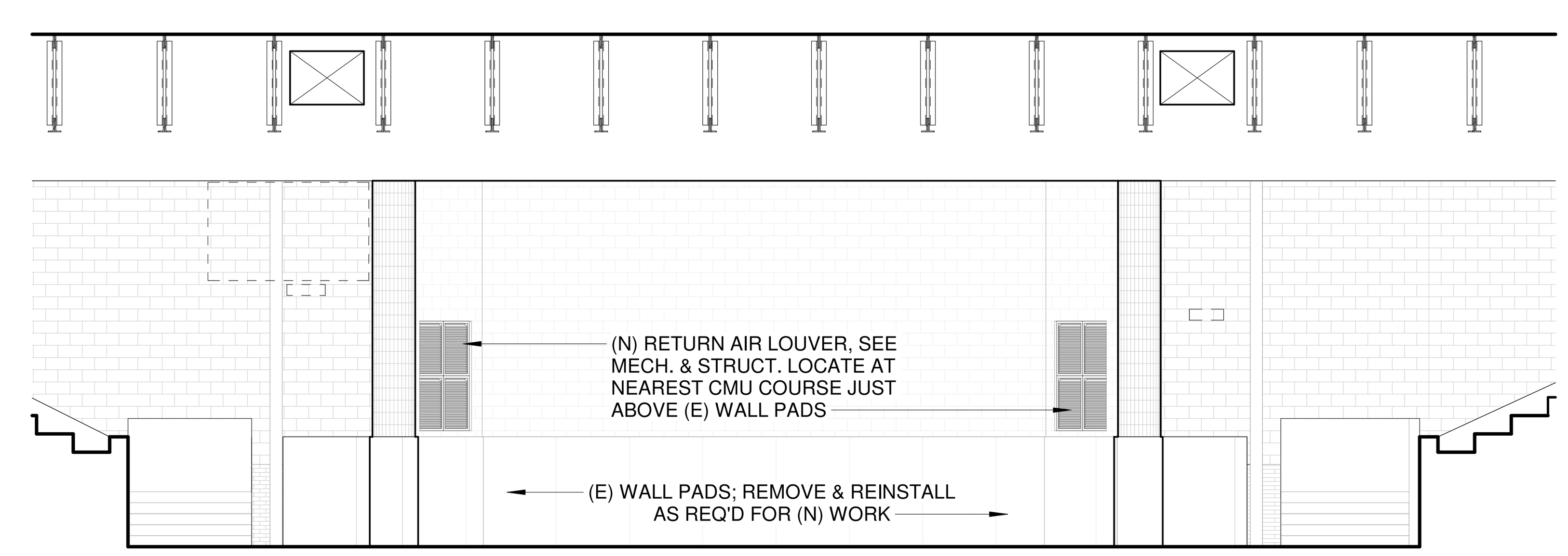
ROOF PLAN
SCALE: 1/8" = 1'-0"



1 A120 **TYP. DETAIL AT GUARD**
SCALE: 1 1/2" = 1'-0"



2 A120 **TYP. ROOF CURB DETAIL**
SCALE: 3" = 1'-0"



3 A120 **INTERIOR GYM ELEVATION**
SCALE: 1/8" = 1'-0"

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Date	Issued For
01/17/25	BID SET

PIC: –
PM: –
DRAFTS: –
PROJECT NO: 22.516MS
SHEET TITLE: GYM ROOF PLAN & INTERIOR ELEVATION

A120

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STRUCTURAL SPECIAL INSPECTION SCHEDULE (2015 IBC - Chapter 17)

row #	ITEM	CONT²	PERIODIC²	REFERENCE STANDARD	NOTES
1	PRE-FABRICATED CONSTRUCTION (1704.2.5)				3&4
2					
3	STRUCTURAL STEEL CONSTRUCTION (1705.2)				13
7	Verify Structural Steel Materials		X	ASTM A 6/ASTM A 568	
8	Verify Weld Filler Materials		X	AISC 360 - A3.5	
10	Single-pass Fillet Welds ≤ 5/16", Anchor / Stud Welds, Stair / Railing Welds		X	AWS D1.1	6

STRUCTURAL SPECIAL INSPECTION SCHEDULE NOTES:

1. Items marked with an 'X' shall be inspected in accordance with chapter 17 of the building code by a certified special inspector from an established testing agency. For material sampling and testing requirements, refer to the project specifications and the specific general notes, sections. The testing agency shall send copies of all structural testing and inspection reports directly to the architect, engineer, contractor, and building official. Any items which fail to comply with the approved construction documents shall immediately be brought to the attention of the contractor for correction. If discrepancies are not corrected, they shall be brought to the attention of the building official, architect, and engineer prior to completion of that phase of the work. Special inspection testing requirements apply equally to all bidder designed components.
2. Continuous special inspection means the full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed. Periodic special inspection means the part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work. (sect 1702)
3. Special inspection is not required for work performed by an approved fabricator per section 1704.2.5.1.
4. Inspection for pre-fabricated construction shall be the same as if the material used in the construction took place on site. Continuous inspection will not be required during pre-fabrication if the approved agency certifies the construction and furnishes evidence of compliance.
5. Not used.
6. All welds shall be visibly inspected.
7. All complete penetration welds shall be tested ultrasonically or by using another approved method.
8. Not used.
9. Not used.
10. Not used.
11. Not used.
12. Not used.
13. Special inspection for structural steel shall be per AISC 303, Section 8 or the project contract documents, whichever is more stringent.
14. Any construction or material that has failed inspection shall be subject to removal and replacement.
15. This table and notes represent code requirements for structural portions of the project and is not a complete representation of what may be required by chapter 17 of the building code. See chapter 17 and project specifications for additional requirements.

STRUCTURAL ABBREVIATION INDEX

ABBREV.	ITEM
A/E	Architect/Engineer
AB	Anchor Bolt/Column Anchor Rod
ACIP	Augered Cast In Place
AESS	Architecturally Exposed Structural Steel
AFF	Above Finished Floor
ALT	Alternate
AP	Anchor Plate
ARCH	Architectural
BB	Bond Beam
BC	Bottom Chord
BCX	Bottom Chord Extension
BFF	Below Finished Floor
BL	Brick Ledge
BM	Beam
BO	Bottom of
BOS	Bottom of Steel
BP	Bearing Plate
BRG	Bearing
BT	Bent
C/C	Center-to-Center
CANT	Cantilever
CBP	Column Base Plate
CFMF	Cold Formed Metal Framing
CFMT	Cold Formed Metal Truss
CJ	Construction Joint
CJ	Contraction Joint
CJ	Control Joint
CJP	Complete Joint Penetration Weld
CL	Centerline
CLR	Clear
CMU	Concrete Masonry Unit
COL	Column
CONC	Concrete
CONN	Connection, Connect
CONT	Continuous
COORD	Coordinate
DA	Deck Angle
DB	Deck Bar
DBE	Deck Bearing Elevation
DIA, Ø	Diameter
DP	Deck Plate
DWG	Drawing(s)
EA	Each
EF	Each Face
EL	Elevation
EQ	Equal
ES	Each Side
EW	Each Way
EX	Existing
EXP	Expansion
EXT	Exterior
FD	Floor Drain
FDN	Foundation
FF	Finished Floor
FFE	Finished Floor Elevation
FP	Foundation Pier
FS	Far Side
FTG, F	Footing
FV	Field Verify
GA	Gauge
GALV	Galvanized
GB	Grade Beam
GS	Grout Solid
GT	Girder Truss
HD	Hold Down Anchor
HORZ	Horizontal
HP	High Point
HS	Headed Stud
HT	Height
ID	Inside Diameter
IF	Inside Face

STRUCTURAL ABBREVIATION INDEX

ABBREV.	ITEM
INT	Interior
JB	Joist Bearing Elevation
L	Lintel
L	Angle
LAT	Lateral
LD	Load
LF	Linear Foot
LG	Long
LLH	Long Leg Horizontal
LLV	Long Leg Vertical
LOC'N	Location
LP	Low Point
LT	Light
LW	Long Way
LWB	Laminated Wood Beam
MAX	Maximum
MCJ	Masonry Control Joint
MECH	Mechanical
MIN	Minimum
NS	Near Side
NTS	Not To Scale
O/O	Out-to-Out
OC	On-Center
OD	Outside Diameter
OF	Outside Face
OFD	Overflow Drain
OH	Opposite Hand
P	Pier
PAF	Power Actuated Fastener
PC	Precast
PEMB	Pre-Engineered Metal Building
PERP	Perpendicular
PL	Plate
PT	Pressure Treated
R, RAD	Radius
RD	Roof Drain
RE:	Reference, Refer to
REINF	Reinforce
REM	Remainder
REQ'D	Required
RMW	Reinforced Masonry Wall
RTU	Roof Top Unit
RXN	Reaction
SC	Slip Critical
SF	Step Footing
SIM	Similar
SIP	Structural Insulated Panel
SOG	Slab On Grade
SPCS	Spaces
SS	Stainless Steel
SST	Simpson Strong Tie
STL	Steel
SW	Short Way
T&B	Top and Bottom
TC	Top Chord
TCX	Top Chord Extension
TO	Top of
TOB	Top of Beam
TOF	Top of Footing
TOL	Top of Ledge
TOM	Top of Masonry
TOS	Top of Steel
TOW	Top of Wall
TYP	Typical
UNO	Unless Noted Otherwise
VERT	Vertical
w/	With
w/o	Without
WF	Wall Footing
WP	Working Point
WWF	Welded Wire Fabric

GENERAL STRUCTURAL NOTES

1. All work shall be performed in accordance with the contract documents. In case of a conflict within the contract documents, the more stringent condition shall govern, unless directed otherwise by the engineer of record. Prior to implementation, any discrepancies shall be reported to the architect for clarification.
2. In the event that certain details of construction are not indicated or noted in the drawings, details for similar conditions that are indicated or noted shall be utilized, subject to the structural engineer's approval.
3. Openings and penetrations through structural elements, and items embedded in structural elements that are not indicated in the structural drawings shall be reviewed by the structural engineer prior to fabrication, erection and/or construction.
4. Materials or equipment shall not be placed on unfinished floors or roofs in excess of 20 psf nor on finished floors in excess of the design live loads which are indicated in the structural drawings. Impact loading shall be avoided.
5. The structure has been designed for the in-service loads only. The methods, procedures and sequences of construction are the responsibility of the contractor. Contractor shall take all necessary precautions to maintain and ensure the integrity of the structure at all stages of construction. Contractor shall immediately notify the structural engineer of any condition which, in his opinion, might endanger the stability of the structure or cause distress in the structure.
6. All existing conditions and all related dimensions indicated in the contract documents shall be field verified prior to fabrication, erection and/or construction. Any condition that differs from that indicated in the contract documents shall be submitted to the architect for review prior to fabrication, erection and/or construction.
7. The structure has been designed to meet or exceed serviceability requirements of section 1604.3 of the Michigan Building Code. All non-structural components & their connections that are anchored to the structure shall be designed to allow for the movement of the structure caused by wind, snow, live, thermal, shrinkage/creep and earthquake loads. Non-structural components include items such as non-load bearing walls, MEP components, bulkheads, etc.
8. Provide special inspection in accordance with chapter 17 of the Michigan Building Code and with project specifications.
9. Unless noted otherwise, all loads specified in these documents are nominal loads and are to be entered into the appropriate strength or allowable stress design load combinations with appropriate factors, as defined by ASCE 7, by the building component engineer in the design of their product. Gravity load shear beam reactions on plan for steel framing represent the combined service load effect from allowable stress design load combinations.
10. Copies or reproductions of architectural or structural drawings and details will not be accepted as shop drawings. Submittals recieved as such will not be reviewed and will be rejected.

CONCRETE MASONRY NOTES

1. Concrete masonry units shall conform to ASTM C90, below grade units shall be medium or normal weight.
2. Mortar shall conform to ASTM C270, and shall be made with Type I portland cement/lime or mortar cement. Mortar shall be Type S.
3. Grout shall conform to ASTM C476, with a minimum compressive strength of 2000 psi.
4. Reinforcing bars shall conform to ASTM A615, Grade 60, unless noted.
5. Horizontal joint reinforcing (continuous wire reinforcing) shall be hot-dipped galvanized ladder type fabricated units with a single pair of 9 gage side rods and 9 gage cross rods at 16" oc fabricated from cold drawn steel wire complying with ASTM A82.
6. Horizontal joint reinforcing shall be spaced at 16" oc in all masonry walls and shall be lapped 8", unless noted otherwise on the drawings.
7. No chases, risers, conduits or toothing of masonry shall occur in masonry walls within 18" of centerline of beam bearing.
8. Reinforcing shall be secured in place before grouting starts.
9. Vertical bars shall be held in position at top and bottom of grout lifts, and at intervals not exceeding 200 diameters of the reinforcing bar.
10. Consolidate grout lifts greater than 12" by mechanical means and reconsolidate by mechanical means after initial water loss and settlement. Lifts less than 12" may be consolidated by puddling or by mechanical means.
11. All bolts, anchors, etc. inserted into the walls shall be grouted solidly into position.
12. Joist and beam bearing plates shall be centered on the member that they support, within a tolerance of 1" on either side of the member centerline.
13. Provide "Dur-O-Stop" grout screens (or equal) to terminate grout pours over open cells below, such as at bond beams.
14. Coordinate bond beam locations with Architectural & Structural drawings.
15. The masonry has been engineered, and shall be inspected in accordance with chapter 1 of TMS 402/ACI 530/ASCE 5 (Building Code Requirements for Masonry Structures). A minimum Level B Quality Assurance program is required. Periodic inspection shall be performed daily with a minimum of one inspection for every 1,500 square feet or portion thereof.
16. Masonry has been designed and shall be built in conformance to TMS 402/ACI 530/ASCE 5 (Building Code Requirements for Masonry Structures) and TMS 602/ACI 530.1/ASCE 6 (Specifications for Masonry Structures).
17. Contractor shall design and provide all temporary bracing required for strength and stability of the masonry throughout construction. At a minimum, comply with OSHA and local requirements for temporary bracing of walls.

CONCRETE MASONRY SPEC NOTES

1. Provide solid masonry or fill cores of block under all beam and lintel bearing points down to concrete wall or footing below.
2. All reinforced cells shall be grouted solid.
3. Spliced reinforcing shall be lapped 48 times the bar diameter, in inches.
4. Vertical reinforcing bars shall have a minimum clearance of 3/4 of an inch from the masonry and not less than one bar diameter between bars.
5. Bond beams are intended to be open-cell with "Dur-O-Stop" or equivalent grout stop below. Vertical reinforcing shall extend through or into bond beam. All bond beams shall be filled with grout. Refer to Architectural & Structural drawings for locations.

STEEL NOTES

1. Structural steel shall be finished as follows:
   A. Non-fireproofed interior steel shall be shop painted with min. 1.5 mil dry film thickness of a rust inhibiting primer.
   B. Unless noted otherwise, exterior exposed steel, including veneer relief angles, shall be:
      • Galvanized and prepared for paint
   C. Refer to lintel schedule for finish requirements of lintels.
2. Erector is to provide temporary bracing sufficient to hold frame in position until all construction necessary for building stability is complete.
3. Beam and lintel bearing on concrete and masonry wall shall be 8" unless otherwise shown. Provide beam bearing plates and wall anchors as required.
4. Camber beams upward the designated amount indicated on the structural drawings. Beams without a specified camber shall be oriented such that any incidental camber is upward.
5. All bolted moment, brace frame, and truss connections shall be done with slip critical bolts including the gravity shear connection. Slip critical joints shall be prepared with a Class A faying surface, and oversized holes in slip critical joints may be used at the fabricator's option.
6. Bolted connections not specified to be slip critical shall be tightened snug tight (all metal surfaces in contact).
7. Refer to specs. and Arch. drawings for all fireproofing requirements and UL assembly Nos. Beams and columns do not necessarily conform to minimum size requirements of the UL assembly. Adjust thickness of fireproofing as required based on (W/D) ratio as outlined in the latest edition of the "Fire Resistance Directory" by Underwriters' Laboratories, Inc. All beams and assemblies shall be considered unrestrained.
8. Where aluminum or steel will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer and applying sealant or tape, or by installing nonconductive spacers as recommended for this purpose.
9. All gusset plates to be minimum 3/8" thick. Unless noted otherwise, all column and beam web stiffeners and gusset plates shall be 3/8" thick.

STEEL SPEC NOTES

1. All steel shall be fabricated, detailed, and erected in accordance with AISC" Code of Standard Practice", ASTM A6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use", and Research Council on Structural Connections (RCSC) "Specifications for Structural Joints Using ASTM A325 or A490 Bolts."
2. Inspect all steel in accordance with Michigan Building Code and AISC requirements. At a minimum visually inspect all fillet welds, non-destructively test all full penetration welds, inspect all bolted connections, etc.
3. All welding shall be done in accordance with AWS D1.1 "Structural Welding - Steel."
4. All metal deck shall be in accordance with SDI Standards and Specifications. Roof deck shall be cleaned, pretreated, and primed with manufacturer's baked-on, lead and chromate-free rust inhibitive primer. Deck supplier shall provide closures and edge stiffeners as required.
5. Deck strengths shall be as follows:
   A. Roof Deck shall be minimum 33 ksi

STEEL NOTES

1. Unless otherwise shown on plans, provide lintels for masonry walls as follows:
   For 6" Walls
   (2)L3-1/2x2-1/2x5/16, spans to 6'-0"
   For each 4" of wall thickness:
   (1)L3-1/2x31/2x1/4, SPANS TO 4'-0"
   (1)L4x3-1/2x5/16, SPANS TO 6'-0"
   (1)L5x3-1/2x5/16, SPANS TO 8'-0"

ENGINEERING DATA

Design stresses

Steel	
W shapes	Fy = 50000 psi
Rectangular HSS shapes (A500 Gr. C)	Fy = 46000 psi
Round HSS & Pipe shapes (A500)	Fy = 42000 psi
All other shapes	Fy = 36000 psi
Welding electrode	E70XX
Masonry	
CMU	f'm = 2000 psi
Grout	f'c = 2250 psi
Reinforcing steel	Fy = 60000 psi

Structural design requirements

Roof live load	20 psf
Risk Category	III
Roof snow load	
Ground snow load (Pg)	50 psf
Flat roof snow load (Pf)	39 psf + Drift
Snow exposure (Ce)	1.0
Snow load importance factor (I)	1.1
Thermal factor (Ct)	1.0
Wind Load	
Ultimate design wind speed (3 sec)	115 mph
Wind exposure category	B
Internal pressure coeff (GCpi)	0.18
Components & cladding (varies)	
Wall stud design pressure	varies - per ASCE7
Earthquake	
Seismic importance factor, Ie	1.25
Spectral response	Ss = 0.051
	S1 = 0.032
	SDs = 0.054
	SD1 = 0.052
Site class	D
Seismic design category	A
Basic seismic force resisting system:	
Ordinary reinforced masonry shear walls	
Design base shear	0.034W
Seismic response coefficient Cs	0.034
Response Modification Factor R	2
Analysis Procedure	"Equivalent lateral force"

Specific Design Loads

Roof dead loads	
Roofing (Adhered)	2
Insulation	4
Metal deck	3
Structure	5
Ceiling	3
M/E/P	3
Fire protection	3
Misc	2
	25 psf Total

Design codes

General building code	Michigan Building Code 2015
Steel	AISC 360 - ASD
Masonry	TMS 402/ACI 530/ASCE 5
Environmental Loads	ASCE 7
Joists and Joist Girders	SJI 2010

EXISTING BUILDING NOTE:

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Date	Issued For
01/17/2025	BID SET

PRELIMINARY -NOT FOR CONSTRUCTION-

PIC: T. NEMITZ
PM: J. CARDINAL
DRAFTS: M. FOX
PROJECT NO:
22.516MS
SHEET TITLE:
STRUCTURAL NOTES & SCHEDULES
S0.1

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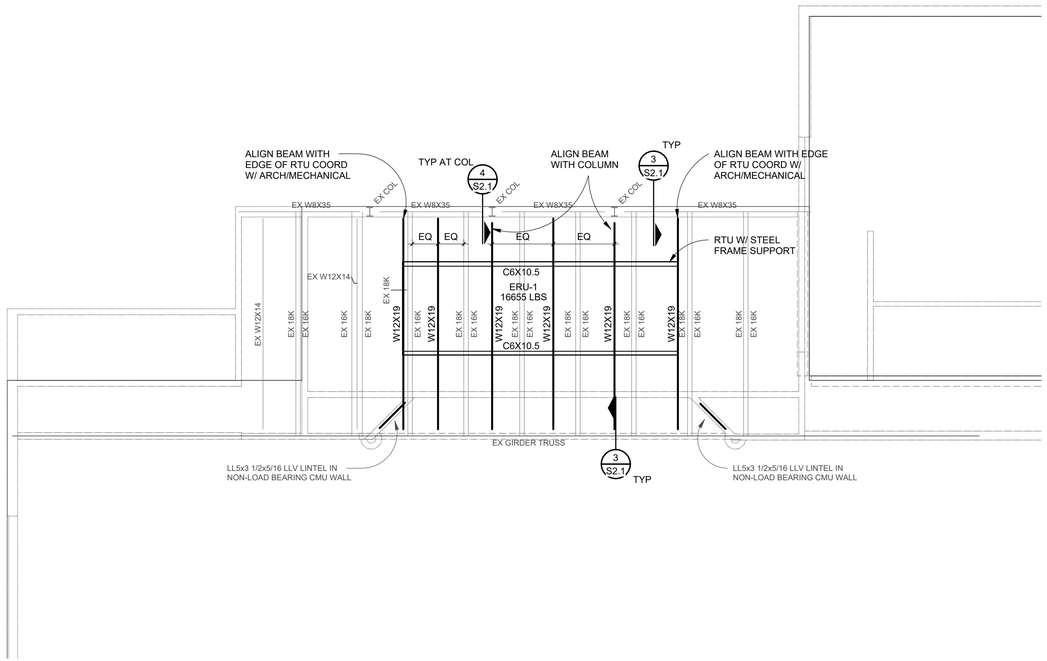
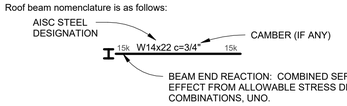


ROOF FRAMING PLAN
SCALE: 1/8" = 1'-0"

ROOF FRAMING PLAN NOTES

Roof beam nomenclature is as follows:



1. Beams are equally spaced between grids or columns unless dimensioned otherwise.
2. Roof top mechanical equipment:
   A. Refer to Mechanical drawings for exact size, qty and location of mechanical equipment.
   B. Mechanical equipment weight shall be as indicated on plan and/or in mechanical equipment schedules. Any deviation or discrepancy in equipment weight, location or quantity shall be reported to the architect and structural engineer.
   C. Provide support framing under all mechanical unit curbs and around all roof penetrations.

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ROOF FRAMING PLAN

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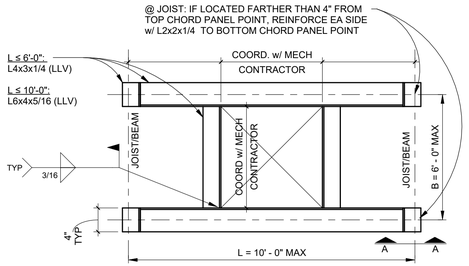
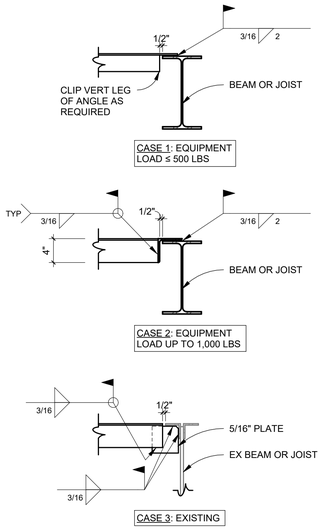


NOTES:

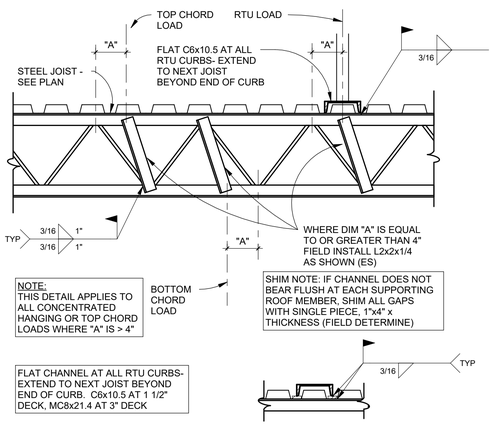
1. This detail applies to all roof openings larger than 18". All openings are not necessarily shown on structural drawings. Coordinate openings with final Arch and Mechanical drawings.
2. At existing building, field weld frame together as required to allow for installation and tolerance.

1 / S2.1 TYPICAL ROOF OPENING FRAME

SCALE: 1" = 1'-0"

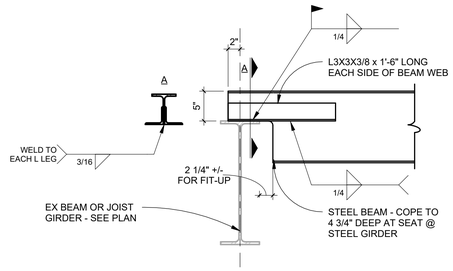


DETAIL "A-A"



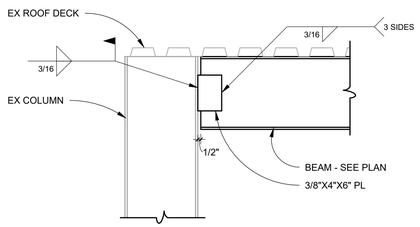
2 / S2.1 TYPICAL RTU SUPPORT & JOIST STRUT DETAIL

SCALE: 1" = 1'-0"



3 / S2.1 TYPICAL 5" BEAM SEAT DETAIL

SCALE: 1" = 1'-0"



4 / S2.1 BEAM TO COLUMN CONN DETAIL

SCALE: 1" = 1'-0"

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SHEET TITLE: FRAMING DETAILS

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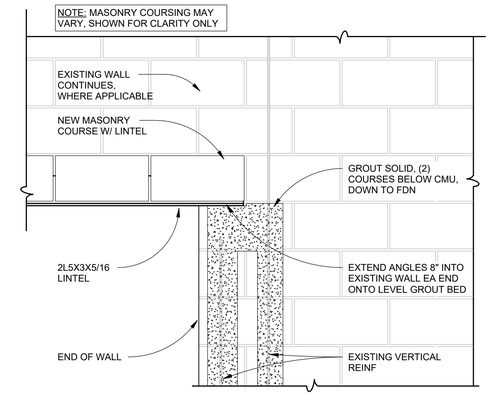
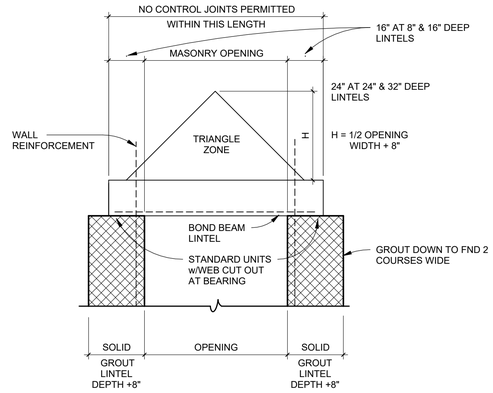


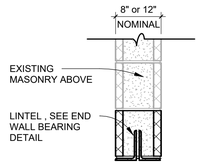
1 / S3.1 END WALL BEARING DETAIL

SCALE: 1" = 1'-0"



2 / S3.1 TYPICAL MASONRY LINTEL DETAIL

SCALE: 1" = 1'-0"



EXTERIOR

3 / S3.1 TYPICAL LINTEL DETAIL

SCALE: 1" = 1'-0"

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LINTEL DETAILS

S3.1

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MECHANICAL ABBREVIATION LIST

ABBREVIATION	DESCRIPTION
A	COMPRESSED AIR
A(__#)	COMPRESSED AIR (SPECIFIC PSIG)
AAV	AUTOMATIC AIR VENT
ACC	AIR COOLED CONDENSER
ACCU	AIR COOLED CONDENSING UNIT
AD	ACCESS DOOR
AD	AREA DRAIN
AE	AIR EXTRACTOR
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
AMP	AMPERE
APD	AIR PRESSURE DROP
AR	ARGON
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONING ENGINEERS
ASR	AUTOMATIC SPRINKLER RISER
ATD	AIR TRANSFER DUCT
AUX	AUXILIARY
AV	ACID VENT
AVTR	ACID VENT THROUGH ROOF
AW	ACID WASTE
BAS	BUILDING AUTOMATION SYSTEM
BCU	BLOWER COIL UNIT
BDD	BACKDRAFT DAMPER
BFF	BELOW FINISHED FLOOR
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BVC	BEVERAGE CONDUIT
BWV	BACKWATER VALVE
C	COMMON
CAP	CAPACITY
CAV	CONSTANT AIR VOLUME
CB	CATCH BASIN
CC	COOLING COIL
CD	COLD DECK
CD	CONDENSATE DRAIN
CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CHW	CHILLED WATER
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CLG	COOLING
CNDS	CONDENSATE
CNDS (__#)	CONDENSATE (SPECIFIC PSIG)
CO	CLEAN OUT
CO2	CARBON DIOXIDE
CONT	CONTINUATION OR CONTINUED
CONTR	CONTRACTOR
CONV	CONVECTOR
COP	COEFFICIENT OF PERFORMANCE
CP	CIRCULATING PUMP
CRU	CONDENSATE RETURN UNIT
CSS	CLINICAL SERVICE SINK
CT	COOLING TOWER
CUH	CABINET UNIT HEATER
CW	DOMESTIC COLD WATER
CWF	DOMESTIC COLD WATER – FILTERED
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
D&T	DRIP AND TRAP
DA	DISCHARGE AIR
DAT	DISCHARGE AIR TEMPERATURE
DB	DRY BULB
DDC	DIRECT DIGITAL CONTROL
DEG	DEGREE
DFU	DRAINAGE FIXTURE UNITS
DIA	DIAMETER
DMPR	DAMPER
D/N	DAY/NIGHT
DN	DOWN
DNZ	DOWNSPOUT NOZZLE
DS	DUCT SILENCER
DT	DRAIN TILE
DTC	DRAIN TILE CONNECTION
DWH	DOMESTIC WATER HEATER
DWG	DRAWING
(E)	EXISTING
E	EXHAUST GRILLE OR REGISTER
EA	EACH
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EC	EXPANSION COMPENSATOR
ECM	ELECTRONICALLY COMMUTATED MOTOR
ECUH	ELECTRIC CABINET UNIT HEATER
EDB	ENTERING DRY BULB
EER	ENERGY EFFICIENCY RATIO
EES	EMERGENCY EYE WASH / SHOWER
EEW	EMERGENCY EYE WASH
EF	EXHAUST FAN
EFF	EFFICIENCY
EHC	ELECTRIC HEATING COIL
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
EMS	ENERGY MANAGEMENT SYSTEM
ERL	ENERGY RECOVERY LOOP
ERLR	ENERGY RECOVERY LOOP RETURN
ERLS	ENERGY RECOVERY LOOP SUPPLY
ERU	ENERGY RECOVERY UNIT
ESH	EMERGENCY SHOWER
ESP	EXTERNAL STATIC PRESSURE
EUH	ELECTRIC UNIT HEATER
EWB	ENTERING WET BULB
EWC	ELECTRIC WATER COOLER
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
F	FIRE PROTECTION
°F	DEGREES FAHRENHEIT
F&B	FACE AND BYPASS
F&T	FLOAT AND THERMOSTATIC
FA	FACE AREA
FCU	FAN COIL UNIT
FD	FLOOR DRAIN
FFD	FUNNEL FLOOR DRAIN
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE RACK
FHV	FIRE HOSE VALVE
FLA	FULL LOAD AMPS
FLR	FLOOR
FM	FLOW METER
FMS	FLOW MEASURING STATION
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FP	FIRE PUMP
FPTU	FAN POWERED (AIR) TERMINAL UNIT
FS	FLOOR SINK
FSEC	FOOD SERVICE EQUIPMENT CONTRACTOR
FT	FEET
FTR	FINNED TUBE RADIATION
FV	FACE VELOCITY
G	NATURAL GAS
GA	GAUGE
GAL	GALLON
GRH	GRAVITY RELIEF HOOD
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GSAN	GREASE SANITARY WASTE
H	HYDROGEN
HB	HOSE BIBB
HC	HEATING COIL
HD	HOT DECK
HEPA	HIGH EFFICIENCY PARTICULATE ARRESTANCE
HL	HIGH LIMIT
HOA	HAND/OFF/AUTO
HP	HEAT PUMP
HP	HORSEPOWER
HPCW	HIGH PRESSURE DOMESTIC COLD WATER
HPHW	HIGH PRESSURE DOMESTIC HOT WATER
HPHWR	HIGH PRESSURE DOMESTIC HOT WATER RETURN
HPL	HEAT PUMP LOOP
HPLR	HEAT PUMP LOOP RETURN
HPLS	HEAT PUMP LOOP SUPPLY
HR	HOUR
HTG	HEATING
HV	HEATING VENTILATING
HVAC	HEATING, VENTILATING, AIR CONDITIONING
HWH	HOT WATER HEATING
HWHR	HOT WATER HEATING RETURN
HWHS	HOT WATER HEATING SUPPLY
HW	DOMESTIC HOT WATER
HW(__)	DOMESTIC HOT WATER (SPECIFIC TEMP °F)
HWR	DOMESTIC HOT WATER RETURN
HX	HEAT EXCHANGER
HZ	HERTZ
IAQ	INDOOR AIR QUALITY
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IH	INTAKE HOOD
IN	INCHES
IR	INFRARED HEATER
IW	INDIRECT WASTE
JC	JANITOR'S CLOSET
JP	JOCKEY PUMP
KA	THOUSAND AMP
KW	KILOWATT
KWH	KILOWATT-HOUR
LAT	LEAVING AIR TEMPERATURE
LAB	LABORATORY
LAV	LAVATORY
LBS	POUNDS
LDB	LEAVING DRY BULB
LL	LOW LIMIT
LPC	LOW PRESSURE CONDENSATE
LPS	LOW PRESSURE STEAM
LRA	LOCKED ROTOR AMPS
LWB	LEAVING WET BULB
LWT	LEAVING WATER TEMPERATURE
MA	MIXED AIR
MAT	MIXED AIR TEMPERATURE
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
MCA	MEDICAL COMPRESSED AIR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MH	MANHOLE
MIL	1/1000th INCH
MIN	MINIMUM
MISC	MISCELLANEOUS
MMBH	MILLION BRITISH THERMAL UNITS PER HOUR
MOP	MAXIMUM OVERCURRENT PROTECTION
M/S	MOTOR STARTER
MTD	MOUNTED
MTR	MOTOR
MV	MANUAL AIR VENT
MVAC	MEDICAL VACUUM
N	NITROGEN
N2O	NITROUS OXIDE
NC	NOISE CRITERIA
NC	NORMALLY CLOSED
NCTC	NORMALLY CLOSED TIMED CLOSED
NCTO	NORMALLY CLOSED TIMED OPEN
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NOTC	NORMALLY OPEN TIMED CLOSED
NOTO	NORMALLY OPEN TIMED OPEN
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NOM	NOMINAL
NPCW	NON POTABLE COLD WATER
O	OXYGEN
OA	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
OB	OUTLET BOX
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER/CENTER TO CENTER
OD	OUTSIDE DIAMETER
OED	OPEN ENDED DUCT
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OL	OVERLOAD
ORC	OVERFLOW RAIN CONDUCTOR
ORD	OVERFLOW ROOF DRAIN
OS&Y	OUTSIDE SCREW AND YOKE
OV	OUTLET VELOCITY
OWS	OPERATOR WORKSTATION
PACU	PACKAGED AIR CONDITIONING UNIT
PBD	PARALLEL BLADE DAMPER
PC	PUMPED CONDENSATE
PCW	PROCESS COOLING WATER
PCWR	PROCESS COOLING WATER RETURN
PCWS	PROCESS COOLING WATER SUPPLY
PD	PRESSURE DROP (FEET OF WATER)
PH	PERIMETER HEAT
PHR	PERIMETER HEAT RETURN
PHS	PERIMETER HEAT SUPPLY
PNL	PANEL
PPM	PARTS PER MILLION
PRESS	PRESSURE
PRV	PRESSURE REDUCING VALVE
PSAN	PUMPED SANITARY
PST	PUMPED STORM
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH – ABSOLUTE
PSIG	POUNDS PER SQUARE INCH – GAUGE
PW	PURIFIED WATER
PWR	PURIFIED WATER RETURN
PWS	PURIFIED WATER SUPPLY
(R)	RELOCATED
R	RETURN GRILLE OR REGISTER
RA	RETURN AIR
RAT	RETURN AIR TEMPERATURE
RC	RAIN CONDUCTOR
RCP	RADIANT CEILING PANEL
RD	ROOF DRAIN
REQD	REQUIRED
REF	ROOF EXHAUST FAN
RF	RETURN FAN
RH	RELATIVE HUMIDITY
RL	REFRIGERANT LIQUID
RLFA	RELIEF AIR
RPM	REVOLUTIONS PER MINUTE
RPDA	REDUCED PRESSURE BACKFLOW PREVENTION DETECTION ASSY
RPZA	REDUCED PRESSURE BACKFLOW PREVENTION ZONE ASSY
RS	REFRIGERANT SUCTION
RTU	ROOFTOP UNIT
S	SUPPLY AIR DIFFUSER OR GRILLE
SA	SOUND ATTENUATOR
SA	SUPPLY AIR
SAN	SANITARY WASTE
SAT	SUPPLY AIR TEMPERATURE
SECT	SECTION
SCCR	SHORT CIRCUIT CURRENT RATING
SF	SUPPLY FAN
SH	SHOWER
SK	SINK
SMR	SNOW MELT RETURN
SMS	SNOW MELT SUPPLY
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SPKLR	SPRINKLER
SQFT	SQUARE FOOT/SQUARE FEET
S/S	START/STOP
SS	SERVICE SINK
ST	STORM
STD	STANDARD
STK	STACK
STM	STEAM
STM(__#)	STEAM (SPECIFIC PSIG)
S/W	SUMMER/WINTER
SW	SWITCH
T	TRANSFER GRILLE
TC	TEMPERATURE CONTROL
TC	TEMPERING COIL
TCP	TEMPERATURE CONTROL PANEL
TD	TRENCH DRAIN
TEMP	TEMPERATURE
TEMP	TEMPORARY
TH	TERMINAL HEATING
THA	TOTAL HEAT ABSORBED
THR	TERMINAL HEATING RETURN
THR	TOTAL HEAT REJECTED
THS	TERMINAL HEATING SUPPLY
TK	TANK
TMR	TIMER SWITCH
TPD	TEPID WATER
TSP	TOTAL STATIC PRESSURE
TU	(AIR) TERMINAL UNIT
TV	TURNING VANES
TW	TEMPERED WATER
TYP	TYPICAL
UH	UNIT HEATER
UL	UNDERWRITER'S LABORATORY
UON	UNLESS OTHERWISE NOTED
UR	URINAL
UV	UNIT VENTILATOR
V	VALVE
V	VENT
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VB	VACUUM BREAKER
VD	VOLUME DAMPER (MANUALLY ADJUSTABLE)
VOL	VOLUME
VFC	VARIABLE FREQUENCY CONTROLLER
VTR	VENT THROUGH ROOF
VTU	VENTURI TERMINAL UNIT
VUV	VERTICAL UNIT VENTILATOR
W	WASTE
W&V	WASTE AND VENT
WAGD	WASTE ANESTHETIC GAS DISPOSAL
WB	WET BULB
WC	WATER CLOSET
WC	WATER COLUMN
WG	WATER GAUGE
WH	WALL HYDRANT
WMSD	WASHING MACHINE SUPPLY AND DRAIN BOX
WPD	WATER PRESSURE DROP
WT	WEIGHT
XFMR	TRANSFORMER
ZVB	ZONE VALVE BOX

TEMPERATURE CONTROL - PARTIAL SYMBOLS LIST

SYMBOL	DESCRIPTION
CO2	CARBON DIOXIDE SENSOR
CO	CARBON MONOXIDE SENSOR
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
FM	FLOW METER
	GUARD FOR STAT OR SENSOR
H	HUMIDISTAT OR HUMIDITY SENSOR (AS DEFINED ON TC DRAWINGS)
OS	OCCUPANCY SENSOR
PT	PRESSURE TRANSMITTER
SP	STATIC PRESSURE SENSOR OR PROBE
	VALVE – 2 WAY CONTROL VALVE
	VALVE – 3 WAY CONTROL VALVE
T	THERMOSTAT OR TEMPERATURE SENSOR (AS DEFINED ON TC DRAWINGS)

NOTE: LIST OF ADDITIONAL SYMBOLS & ABBREVIATIONS ASSOCIATED WITH TEMPERATURE CONTROLS ARE IDENTIFIED ON TC DRAWINGS.

MECHANICAL SYMBOL LIST

PIPING SYMBOLS

SYMBOL	DESCRIPTION
AV	AIR VENT – AUTOMATIC
MV	AIR VENT – MANUAL
BFP	BACKFLOW PREVENTER
	CATCH BASIN
	CIRCULATING PUMP
CO	CLEAN OUT – IN FLOOR
	CLEAN OUT – FLANGE
	DIRECTION OF FLOW
	DIRECTION OF PITCH – DOWN
	FINNED TUBE RADIATION
	FIRE PROTECTION – SIAMESE CONNECTION – FREE STANDING
	FIRE PROTECTION – SIAMESE CONNECTION – WALL MOUNTED
	FIRE PROTECTION – SPRINKLER HEAD, CONCEALED
	FIRE PROTECTION – SPRINKLER HEAD, PENDANT
	FIRE PROTECTION – SPRINKLER HEAD, UPRIGHT
	FIRE PROTECTION – SPRINKLER HEAD, SIDEWALL
	FLOOR DRAIN
	FLOOR DRAIN – ELEVATION
	FLOOR DRAIN – FUNNEL
	FLOOR DRAIN – FUNNEL, ELEVATION
	FLOW MEASURING DEVICE (FOR TEST AND BALANCING)
FS	FLOW SWITCH
FM	FLOW METER
HB	HOSE BIBB
MH	MANHOLE
	OPEN SITE DRAIN
	PIPE – ANCHOR
	PIPE – CAP OR PLUG
	PIPE – ELBOW DOWN
	PIPE – ELBOW UP
	PIPE – EXPANSION JOINT OR COMPENSATOR
	PIPE – FLANGE
	PIPE – HOSE AND BRAID FLEXIBLE CONNECTION
	PIPE – RUBBER FLEXIBLE CONNECTION
	PIPE – GUIDE
	PIPE – TEE DOWN
	PIPE – TEE UP
	PIPE – UNION
P/T	PRESSURE AND TEMPERATURE TEST PLUG
	PRESSURE GAUGE AND COCK
	REDUCER – CONCENTRIC
	REDUCER – ECCENTRIC
	ROOF/OVERFLOW DRAIN
	STEAM TRAP – FLOAT AND THERMOSTAT
	STEAM TRAP – BUCKET
	STRAINER
	STRAINER WITH VALVE AND BLOW-OFF
	THERMOMETER
	TRAP
	VALVE – ANGLE
	VALVE – BALL
	VALVE – BUTTERFLY
0.5	VALVE – BALANCE (i.e. BALANCE VALVE TO 0.5 GPM)
0.5	VALVE – COMBINATION BALANCE & FLOW MEASURING (i.e. BALANCE VALVE TO 0.5 GPM)
	VALVE – CHECK
	VALVE – SPRING CHECK
	VALVE – GAS (MANUAL)
	VALVE – GLOBE
	VALVE – ISOLATION
	VALVE – NEEDLE
	VALVE – OS&Y
	VALVE – PLUG
	VALVE – PRESSURE REGULATING
	VALVE – PRESSURE REDUCING
	VALVE – PRESSURE RELIEF
	VALVE – PRESSURE & TEMPERATURE RELIEF
VTR	VENT THROUGH ROOF
WH	WALL HYDRANT
WM	WATER METER
GM	GAS METER

DOUBLE LINE PIPING SYMBOLS

SYMBOL	DESCRIPTION
	FLANGE
	FLEX CONNECTION
	STRAINER – BASKET
	STRAINER – Y TYPE
	VALVE – 2 WAY CONTROL
	VALVE – 3 WAY CONTROL
	VALVE – BUTTERFLY
	VALVE – CHECK
	VALVE – DETECTOR CHECK
	VALVE – OS&Y HORIZONTAL STEM
	VALVE – OS&Y VERTICAL STEM

DUCTWORK SYMBOLS

SYMBOL	DESCRIPTION
TU-101	AIR TERMINAL UNIT
TU-101	AIR TERMINAL UNIT WITH HEATING COIL
VTU-101	VENTURI AIR TERMINAL UNIT
VTU-101	VENTURI AIR TERMINAL UNIT WITH HEATING COIL
	DAMPER – HORIZONTAL FIRE (EXISTING, NEW)
	DAMPER – HORIZONTAL FIRE / SMOKE (EXISTING, NEW)
	DAMPER – SMOKE (EXISTING, NEW)
	DAMPER – VERTICAL FIRE (EXISTING, NEW)
	DAMPER – VERTICAL FIRE / SMOKE (EXISTING, NEW)
BDD	DAMPER – BACK DRAFT
M	DAMPER – MOTORIZED
	DAMPER – VOLUME (MANUALLY ADJUSTABLE)
	DIFFUSER – BLANK OFF
	DIFFUSER – LINEAR SLOT
	DIFFUSER – SQUARE OR RECTANGULAR
	DUCT CROSS SECTION – SUPPLY
	DUCT CROSS SECTION – RETURN
	DUCT CROSS SECTION – EXHAUST
	DUCT – FLEXIBLE CONNECTION
	DUCT – FLEXIBLE DUCT
	DUCT TAKE-OFF – ROUND CONICAL
	DUCT TAKE-OFF – RECTANGULAR WITH SHOE TAP
	ELBOW – RECTANGULAR WITH TURNING VANES
	ELBOW – RECTANGULAR/ ROUND SMOOTH RADIUS
	ELBOW DOWN – RECTANGULAR
	ELBOW DOWN – ROUND
	ELBOW UP – RECTANGULAR
	ELBOW UP – ROUND
	FAN – AXIAL
	FAN – CENTRIFUGAL (ELEVATION)
VFC XX-#	VARIABLE FREQUENCY CONTROLLER SERVING EQUIPMENT XX-#
	HEATING COIL
D	INCLINED DROP IN DIRECTION OF AIRFLOW
R	INCLINED RISE IN DIRECTION OF AIRFLOW
	INTAKE OR RELIEF HOOD
	REGISTER – RETURN OR EXHAUST
	REGISTER – RETURN WITH BOOT
	REGISTER – TRANSFER GRILLE
	ROOF EXHAUST FAN
	TRANSITION – CONCENTRIC
	TRANSITION – ECCENTRIC
	UNIT HEATER – HORIZONTAL THROW
	UNIT HEATER – VERTICAL THROW

DOUBLE LINE DUCTWORK SYMBOLS

SYMBOL	DESCRIPTION
	DUCT TAKE-OFF – RECTANGULAR WITH SHOE TAP
	DUCT TAKE-OFF – ROUND CONICAL
	ELBOW – RECTANGULAR WITH TURNING VANES
	ELBOW – RECTANGULAR SHORT RADIUS WITH SPLITTER VANES
	ELBOW – ROUND
	ELBOW – RECTANGULAR SMOOTH RADIUS
	ELBOW DOWN – RECTANGULAR
	ELBOW DOWN – ROUND
	ELBOW UP – RECTANGULAR
	ELBOW UP – ROUND
	HEATING COIL
D	INCLINED DROP IN DIRECTION OF AIRFLOW
R	INCLINED RISE IN DIRECTION OF AIRFLOW
	TRANSITION – CONCENTRIC
	TRANSITION – ECCENTRIC

MECHANICAL DRAWING INDEX

STANDARD METHODS OF NOTATION

SYMBOL	DESCRIPTION
S-1 10Ø 350-4	SUPPLY DIFFUSER WITH SCHEDULE TAG "1", 10" DIAMETER NECK SIZE 350 CFM TYPICAL FOR 4
R-1 22x22 640-2	RETURN REGISTER WITH SCHEDULE TAG "1", 22"x 22" NECK SIZE 640 CFM TYPICAL FOR 2 EXHAUST REGISTER E DESIGNATION SIMILAR.
TU-101	AIR TERMINAL UNIT WITH HEATING COIL NO. 101 WITH SERVICE CLEARANCE SHOWN
VTU-101	VENTURI AIR TERMINAL WITH HEATING COIL NO. 101 WITH SERVICE CLEARANCE SHOWN
(2)WC-1, FD-1	PLUMBING FIXTURE UNIT IDENTIFICATION TAG WATER CLOSET TYPE "1" TYPICAL FOR 2
8	PIPE DIAMETER NOTATION ALL SIZES IN INCHES
8Ø, 22x10, 18x14Ø	DUCT SIZE NOTATION ALL SIZES IN INCHES OVAL DUCT RECTANGULAR DUCT
1	CONSTRUCTION KEY NOTE (NUMBER) OR DEMOLITION KEY NOTE (LETTER)
EF 1	EQUIPMENT DESIGNATION, (i.e. EXHAUST FAN NUMBER 1)
HW-1	PIPING RISER DESIGNATION (i.e. HOT WATER RISER NUMBER 1)
	NEW SYSTEM COMPONENT EXISTING SYSTEM COMPONENT TO REMAIN POINT OF NEW CONNECTION SYMBOL
1 / M5.1	SECTION OR PLAN NUMBER SHEET WHERE SECTION IS DRAWN
1 / M5.1	AREA OF ENLARGEMENT PLAN NUMBER SHEET WHERE ENLARGED PLAN IS DRAWN
1 / M5.1	SECTION OR PLAN NUMBER **SECTION OR ENLARGED PLAN** SCALE: 1/8" = 1' - 0" SHEET WHERE SECTION IS CUT OR ENLARGED PLAN IS REFERENCED
SHEET M1.0 / SHEET M1.1	MATCH LINE
	HEAVY LINE WEIGHT INDICATES NEW WORK
	LIGHT LINE WEIGHT INDICATES EXISTING EQUIPMENT OR REFERENCED INFORMATION
	GRAY LINE INDICATES BACKGROUND INFORMATION
	DASHED LINES INDICATE PIPING ROUTED BELOW SLAB OR GRADE
	HATCH MARKS INDICATE EQUIPMENT OR MATERIALS TO BE DISCONNECTED AND REMOVED.

NOTE: SOME SYMBOLS AND ABBREVIATIONS SHOWN MAY NOT APPLY TO THIS PROJECT.

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DATE	ISSUED FOR
11/20/24	DD
12/02/24	COORDINATION
12/06/24	50% CD
01/17/25	BID SET

STATE OF MICHIGAN – DENNIS P. SCZOMAK ENGINEER No. 6201036881 – LICENSED PROFESSIONAL ENGINEER

PIC:	WEK
PM:	WEK
DRAFTS:	EMW

PROJECT NO: 22.516 MS

SHEET TITLE: MECHANICAL STANDARDS AND DRAWING INDEX

SHEET NO: M0.1

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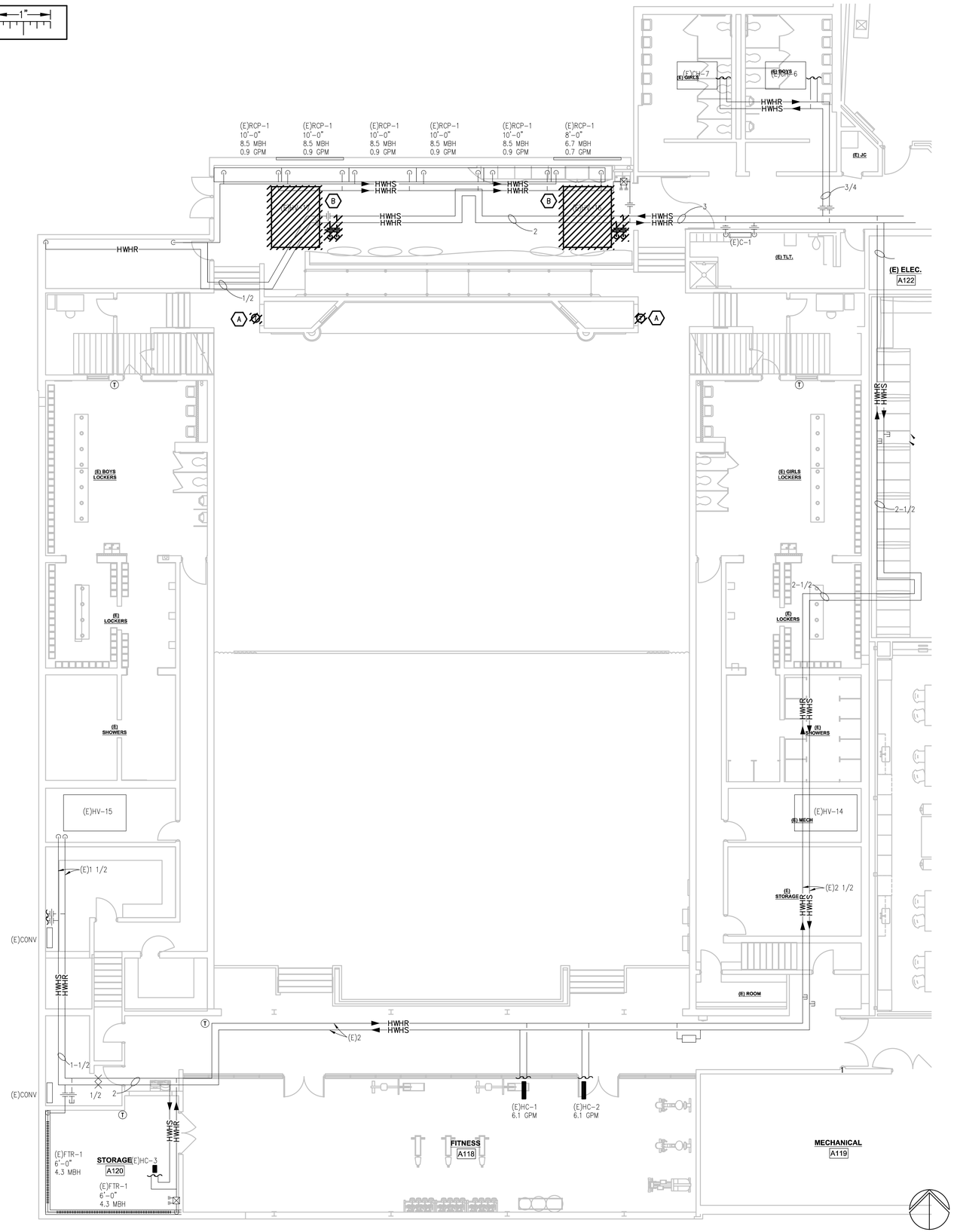
THE FOLLOWING DIMENSION EQUALS ONE INCH WHEN PRINTED TO SCALE. 1"



MECHANICAL DEMOLITION GENERAL NOTES:

1. ANY INTERRUPTION OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE.
2. THESE DRAWNGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF THE WORK. ACTUAL ROUTING AND SIZES OF EXISTING PIPING AND DUCTWORK MIGHT DIFFER TO A LIMITED EXTENT FROM WHAT IS SHOWN. MAJOR DISCREPANCIES BETWEEN THE DRAWINGS AND ACTUAL EXISTING CONDITIONS SHALL BE REPORTED TO THE ENGINEER.
3. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.
4. ALL MECHANICAL ITEMS TO BE REMOVED SHALL BE REMOVED COMPLETE, INCLUDING ALL RELATED ITEMS SUCH AS HANGERS, SUPPORTS, CONTROLS, ETC. CAP ALL OPEN ENDED PIPES AND DUCTWORK.

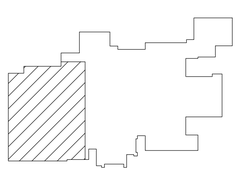
(#) DEMOLITION KEY NOTES:

A. REMOVE EXISTING TEMPERATURE CONTROLS.

B. DISCONNECT AND REMOVE EXISTING H&V UNIT AND ASSOCIATED HWHS, HWHR AND CONTROLS. CUT AND CAP PIPING AT MAIN.

MIDDLE SCHOOL HVAC PIPING DEMOLITION PLAN

SCALE: 1/8" = 1' - 0"



KEY PLAN
NO SCALE

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STATE OF MICHIGAN
DENNIS P. SCZOMAK
ENGINEER
No. 6201036881
LICENSED PROFESSIONAL ENGINEER

PIC: WEK
PM: WEK
DRAFTS: EMW

PROJECT NO: 22.516 MS

SHEET TITLE: MIDDLE SCHOOL HVAC PIPING DEMOLITION PLAN

SHEET NO: MD3.1

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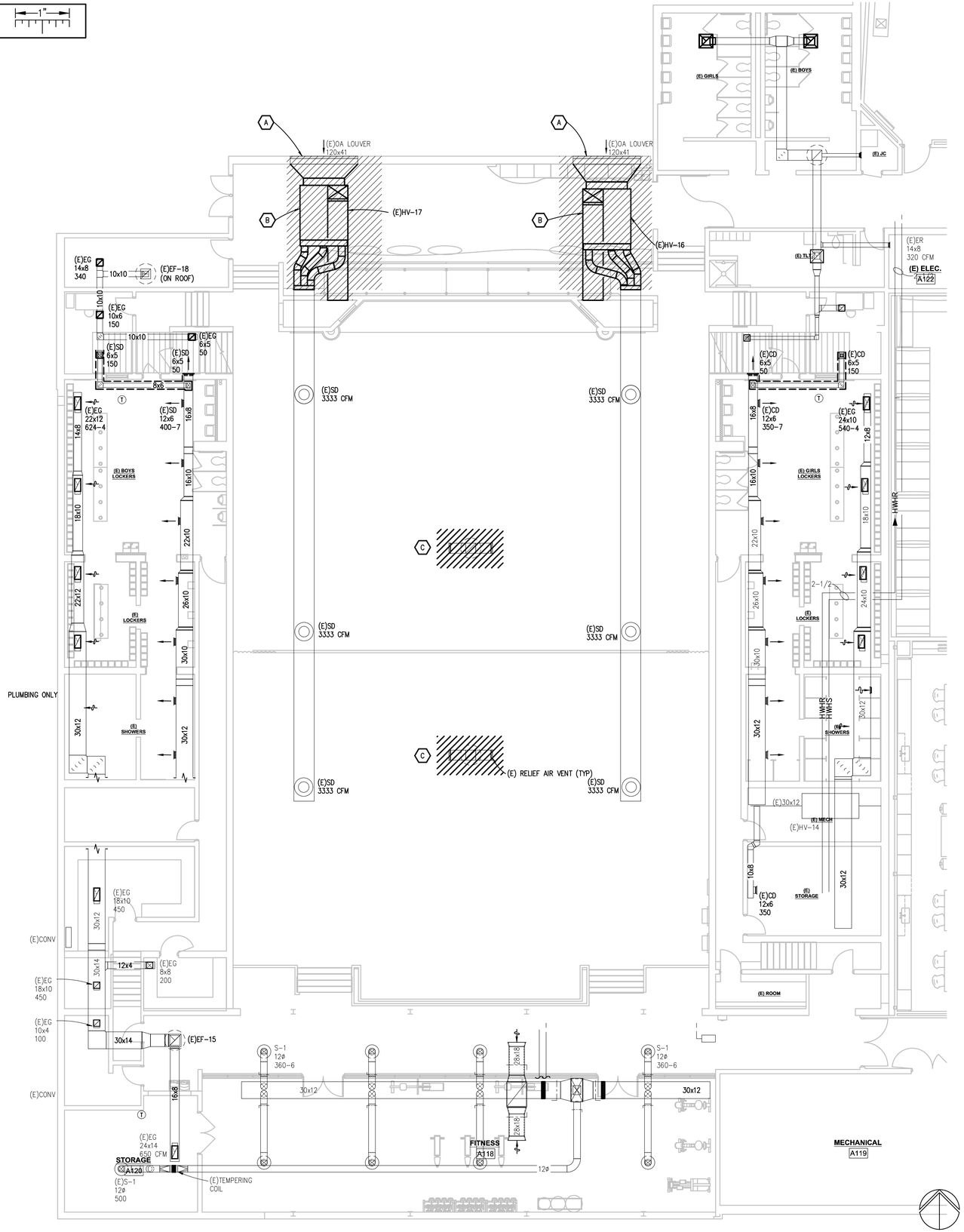

MECHANICAL DEMOLITION GENERAL NOTES:

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3. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.
4. ALL MECHANICAL ITEMS TO BE REMOVED SHALL BE REMOVED COMPLETE, INCLUDING ALL RELATED ITEMS SUCH AS HANGERS, SUPPORTS, CONTROLS, ETC. CAP ALL OPEN ENDED PIPES AND DUCTWORK.

(#) DEMOLITION KEY NOTES:

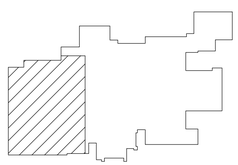
A. DISCONNECT AND REMOVE DUCT TO EXISTING OUTSIDE AIR LOUVER COMPLETE. INSULATE LOUVER AS SEEN IN DETAIL ON SHEET 6.1.

B. DISCONNECT AND REMOVE EXISTING H&V UNIT AND ASSOCIATED SUPPLY, OUTSIDE AIR AND RETURN DUCTWORK AND CAP AT LOCATION INDICATED ON DRAWINGS.

C. REMOVE EXISTING RELIEF VENT ON ROOF AND CAP. DETAILS ON SHEET 6.1.

MIDDLE SCHOOL SHEET METAL DEMOLITION PLAN

SCALE: 1/8" = 1' - 0"



KEY PLAN
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DRAFTS:	EMW

PROJECT NO: 22.516 MS

SHEET TITLE: MIDDLE SCHOOL SHEET METAL DEMOLITION PLAN

SHEET NO: MD4.1

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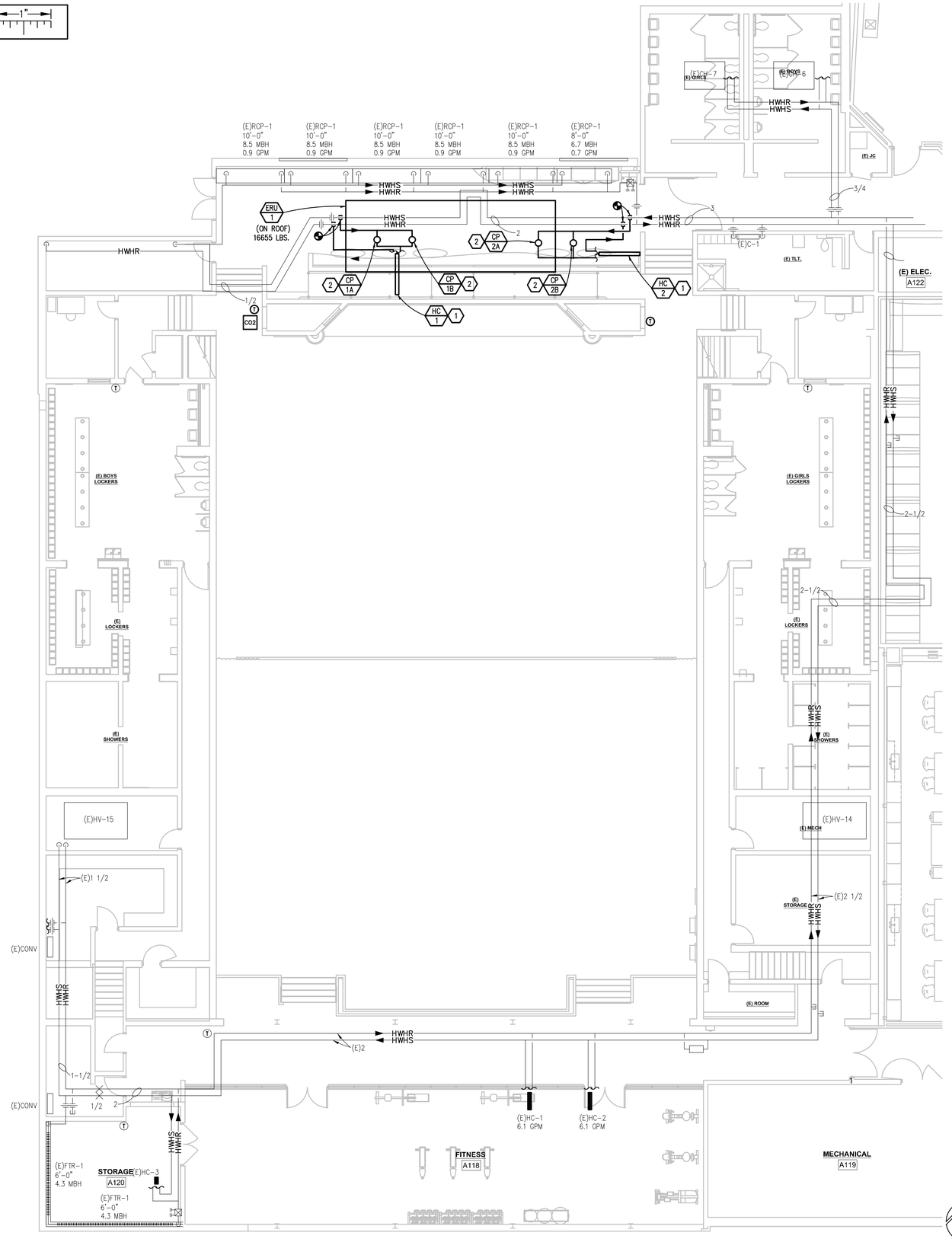


HVAC PIPING GENERAL NOTES:

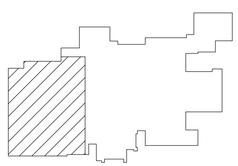
1. THESE DRAWINGS ARE DIAGRAMMATIC, AND REPRESENT THE GENERAL INTENT AND ARRANGEMENT OF SYSTEMS. THEY ARE NOT TO BE CONSIDERED FABRICATION/COORDINATION/SHOP DRAWINGS. COORDINATION WITH OTHER TRADES IS REQUIRED. PROVIDE THE ADDITIONAL FITTINGS AND OFFSETS THAT WILL BE REQUIRED TO COMPLETE EACH SYSTEM AND TO AVOID INTERFERENCES WITH ALL OTHER SYSTEMS INCLUDING THE STRUCTURE, SHEET METAL, OTHER PIPING SYSTEMS, ELECTRICAL CONDUITS, BUS DUCTS, CABLE TRAY, LIGHT FIXTURES, ETC. AND/OR OTHER SPACE CONSTRAINTS.
2. INSTALL SYSTEMS SUCH THAT REQUIRED CLEARANCE AND SERVICE ACCESS SPACE IS PROVIDED AROUND ALL MECHANICAL AND ELECTRICAL EQUIPMENT, AND AROUND ANY COMPONENTS WHICH REQUIRE SERVICE ACCESS.
3. PIPING AND DUCTWORK SHALL NOT BE INSTALLED ABOVE ELECTRICAL TRANSFORMERS, SWITCHBOARDS, PANELBOARDS OR MOTOR CONTROL CENTERS.
4. COORDINATE AND PROVIDE ACCESS DOORS WITHIN INACCESSIBLE CEILING, SHAFT, AND CHASE AREAS FOR ALL COMPONENTS WHICH REQUIRE SERVICE ACCESS. REFER TO ARCHITECTURAL DRAWINGS FOR CEILING TYPES.
5. PROVIDE SUPPLEMENTARY STEEL AS REQUIRED FOR THE PROPER SUPPORT OF ALL SYSTEMS.
6. SUBMIT PROPOSED METHODS OF ANCHORING AND GUIDING PIPING SYSTEMS TO STRUCTURAL ENGINEER FOR APPROVAL.
7. COORDINATE LOCATION OF DUCT-MOUNTED HYDRONIC DEVICES WITH SHEET METAL TRADES.
8. BRANCH PIPING SERVING TERMINAL UNIT HEATING COILS OR RADIANT CEILING PANELS SHALL BE 3/4" UNLESS OTHERWISE NOTED. BRANCH PIPING SERVING MORE THAN ONE TERMINAL UNIT HEATING COIL SHALL BE 1" UNLESS OTHERWISE NOTED. BRANCH PIPING SERVING HOT WATER UNIT HEATERS AND CABINET UNIT HEATERS SHALL BE 1" UNLESS OTHERWISE NOTED.
9. REFER TO TEMPERATURE CONTROLS STANDARD MOUNTING HEIGHTS DETAIL FOR ELEVATIONS OF WALL MOUNTED TEMPERATURE CONTROL DEVICES.

(#) CONSTRUCTION KEY NOTES:

1. ROUTE HWHS AND HWHR TO HEATING COIL. SEE HOT WATER HEATING COIL DETAIL ON M6.3.
2. LOCATE NEW PUMPS NEAR EXISTING SERVICE PLATFORM IN PENTHOUSE.

MIDDLE SCHOOL HVAC PIPING PLAN

SCALE: 1/8" = 1' - 0"



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CRAWFORD AUSABLE SCHOOL DISTRICT

GRAYLING MIDDLE SCHOOL

HVAC UPGRADES

500 SPRUCE ST. GRAYLING, MI 49738

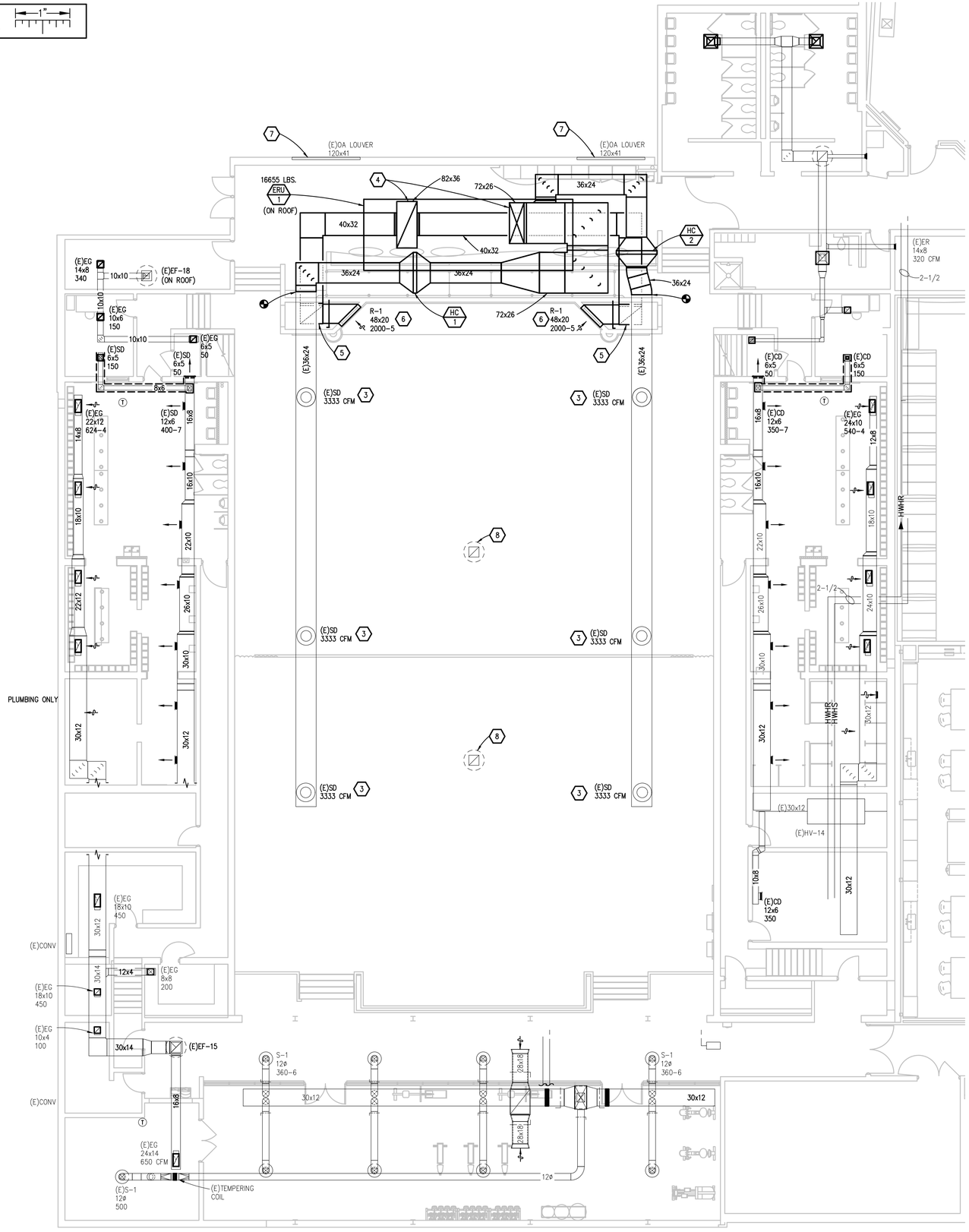
DATE	ISSUED FOR
11/20/24	DD
12/02/24	COORDINATION
12/06/24	50% CD
01/17/25	BID SET

STATE OF MICHIGAN
DENNIS P. SCZOMAK
ENGINEER
No. 6201036881
LICENSED PROFESSIONAL ENGINEER

PIC:	WEK
PM:	WEK
DRAFTS:	EMW
PROJECT NO:	22.516 MS
SHEET TITLE:	MIDDLE SCHOOL HVAC PIPING PLAN
SHEET NO:	M3.1

g:\2024\2024-0338-00\CAD\50 casd ms gym air conditioning\2024-0338-M3-HP1-MS.dwg, M3.1, 1/16/2025 4:39:49 PM, Robert W. MacKinnon, Peter Basso Associates Inc.

THE FOLLOWING DIMENSION EQUALS ONE INCH WHEN PRINTED TO SCALE. 1"



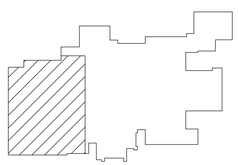
SHEET METAL GENERAL NOTES:

1. THESE DRAWINGS ARE DIAGRAMMATIC, AND REPRESENT THE GENERAL INTENT AND ARRANGEMENT OF SYSTEMS. THEY ARE NOT TO BE CONSIDERED FABRICATION/COORDINATION/SHOP DRAWINGS. COORDINATION WITH OTHER TRADES IS REQUIRED. PROVIDE THE ADDITIONAL FITTINGS AND OFFSETS THAT WILL BE REQUIRED TO COMPLETE EACH SYSTEM AND TO AVOID INTERFERENCES WITH ALL OTHER SYSTEMS INCLUDING THE STRUCTURE, PIPING SYSTEMS, ELECTRICAL CONDUITS, BUS DUCTS, CABLE TRAY, LIGHT FIXTURES, ETC. AND/OR OTHER SPACE CONSTRAINTS.
2. INSTALL SYSTEMS SUCH THAT REQUIRED CLEARANCE AND SERVICE ACCESS SPACE IS PROVIDED AROUND ALL MECHANICAL AND ELECTRICAL EQUIPMENT, AND AROUND ANY COMPONENTS WHICH REQUIRE SERVICE ACCESS.
3. PIPING AND DUCTWORK SHALL NOT BE INSTALLED ABOVE ELECTRICAL TRANSFORMERS, SWITCHBOARDS, PANELBOARDS OR MOTOR CONTROL CENTERS.
4. COORDINATE AND PROVIDE ACCESS DOORS WITHIN INACCESSIBLE CEILING, SHAFT, AND CHASE AREAS FOR ALL COMPONENTS WHICH REQUIRE SERVICE ACCESS. REFER TO ARCHITECTURAL DRAWINGS FOR CEILING TYPES.
5. PROVIDE SUPPLEMENTARY STEEL AS REQUIRED FOR THE PROPER SUPPORT OF ALL SYSTEMS.
6. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR DIMENSIONED LOCATION OF GRILLES, REGISTERS, AND DIFFUSERS.
7. REFER TO TEMPERATURE CONTROLS STANDARD MOUNTING HEIGHTS DETAIL FOR ELEVATIONS OF WALL MOUNTED TEMPERATURE CONTROL DEVICES.

(#) CONSTRUCTION KEY NOTES:

1. PROVIDE CONDENSATE DRAIN PIPING TO THE NEAREST ROOF DRAIN AND PROVIDE HEAT TRACE.
2. PORTABLE GUARD RAIL PER OSHA REQUIREMENTS. PROVIDED BY ARCHITECTURAL TRADES.
3. RE-BALANCE ALL DIFFUSERS WITH CFM INDICATED ON DRAWINGS.
4. ROUTE NEW SUPPLY AND RETURN DUCTWORK INTO PENTHOUSE.
5. ROUTE NEW RETURN DUCT WORK DOWN EXISTING RETURN PLENUM TO NEW RETURN GRILLES.
6. PLACE NEW RETURN GRILLES ABOVE EXISTING WALLS PADS. MATCH COLOR OF RETURN GRILLE WITH PAINT ON WALL. STACK 48X20 GRILLES ON TOP OF EACH OTHER. TOTAL OF 5 48X20 GRILLES.
7. INSULATE OUTSIDE AIR LOUVER. SEE DETAIL ON SHEET M6.1.
8. CAP EXISTING RELIEF VENT AFTER REMOVAL ON ROOF. SEE DETAIL ON SHEET M6.1.

MIDDLE SCHOOL SHEET METAL PLAN
SCALE: 1/8" = 1' - 0"



KEY PLAN
NO SCALE

Peter Basso Associates Inc
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5145 Livernois, Suite 100
Troy, Michigan 48098-3276
Tel: 248-879-5666
www.PeterBassoAssociates.com
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ENGINEER
No. 6201036881
LICENSED PROFESSIONAL ENGINEER

PIC:	WEK
PM:	WEK
DRAFTS:	EMW

PROJECT NO: 22.516 MS

SHEET TITLE: MIDDLE SCHOOL SHEET METAL PLAN

SHEET NO: M4.1

g:\2024\2024-0338-00\CAD\50 casd ms gym air conditioning\2024-0338-M4-SM1-MS.dwg, M4.1, 1/16/2025 4:39:59 PM, Robert W. MacKinnon, Peter Basso Associates Inc.

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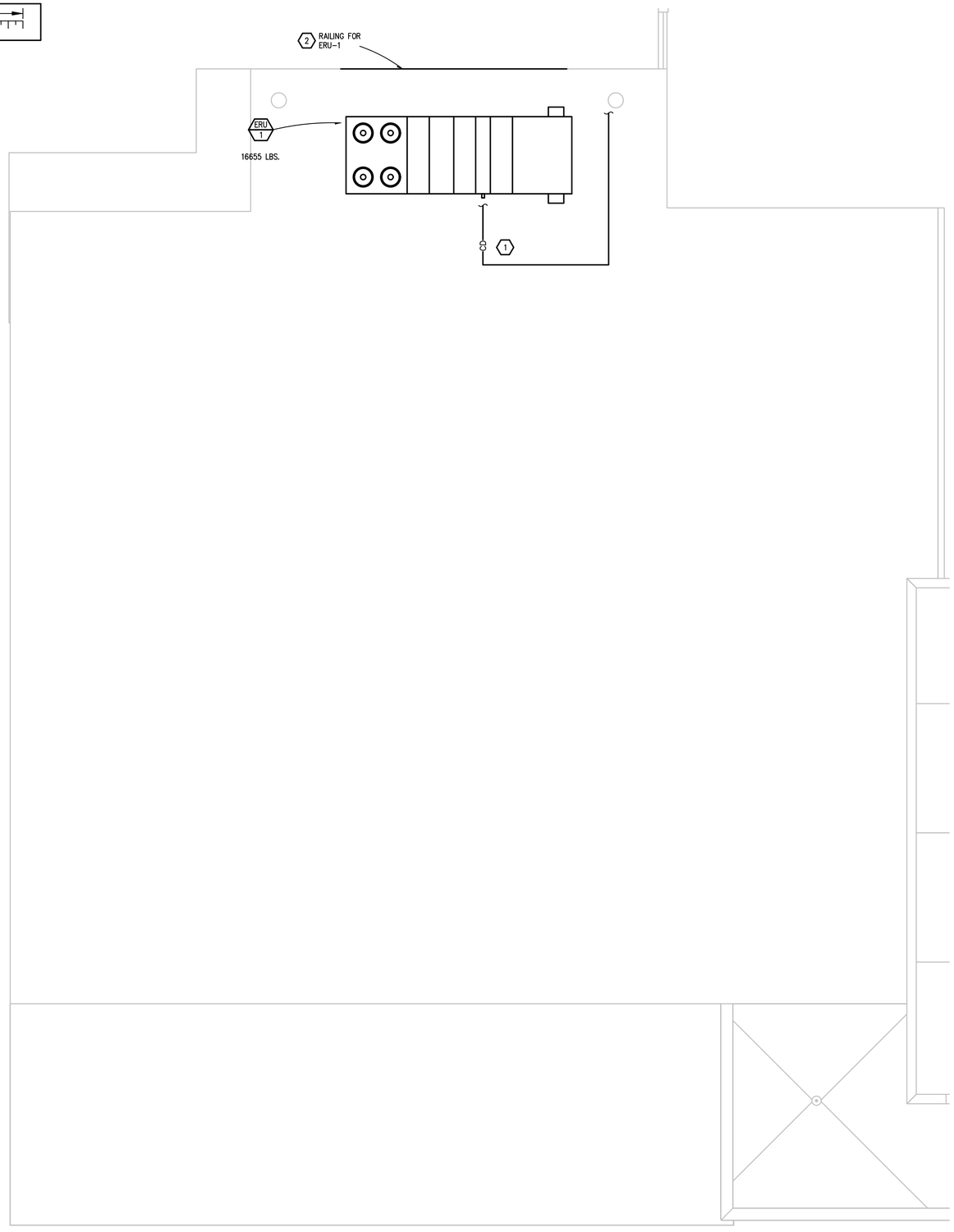

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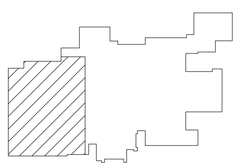
MIDDLE SCHOOL ROOF MECHANICAL PLAN

SCALE: 1/8" = 1' - 0"



KEY PLAN

NO SCALE

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No. 6201036881
LICENSED PROFESSIONAL ENGINEER

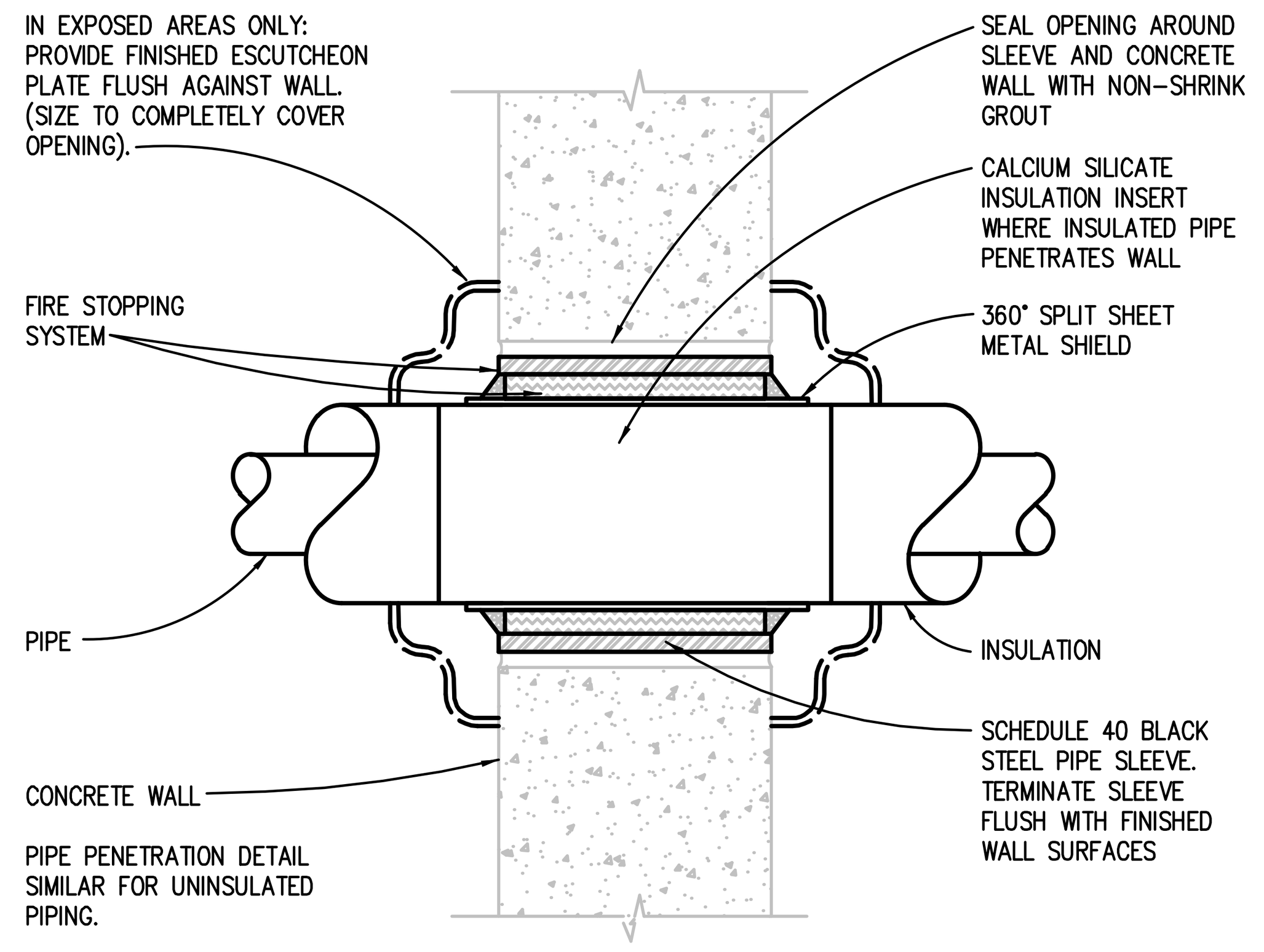
PIC:	WEK
PM:	WEK
DRAFTS:	EMW

PROJECT NO: 22.516 MS

SHEET TITLE: MIDDLE SCHOOL ROOF MECHANICAL PLAN

SHEET NO: M5.1

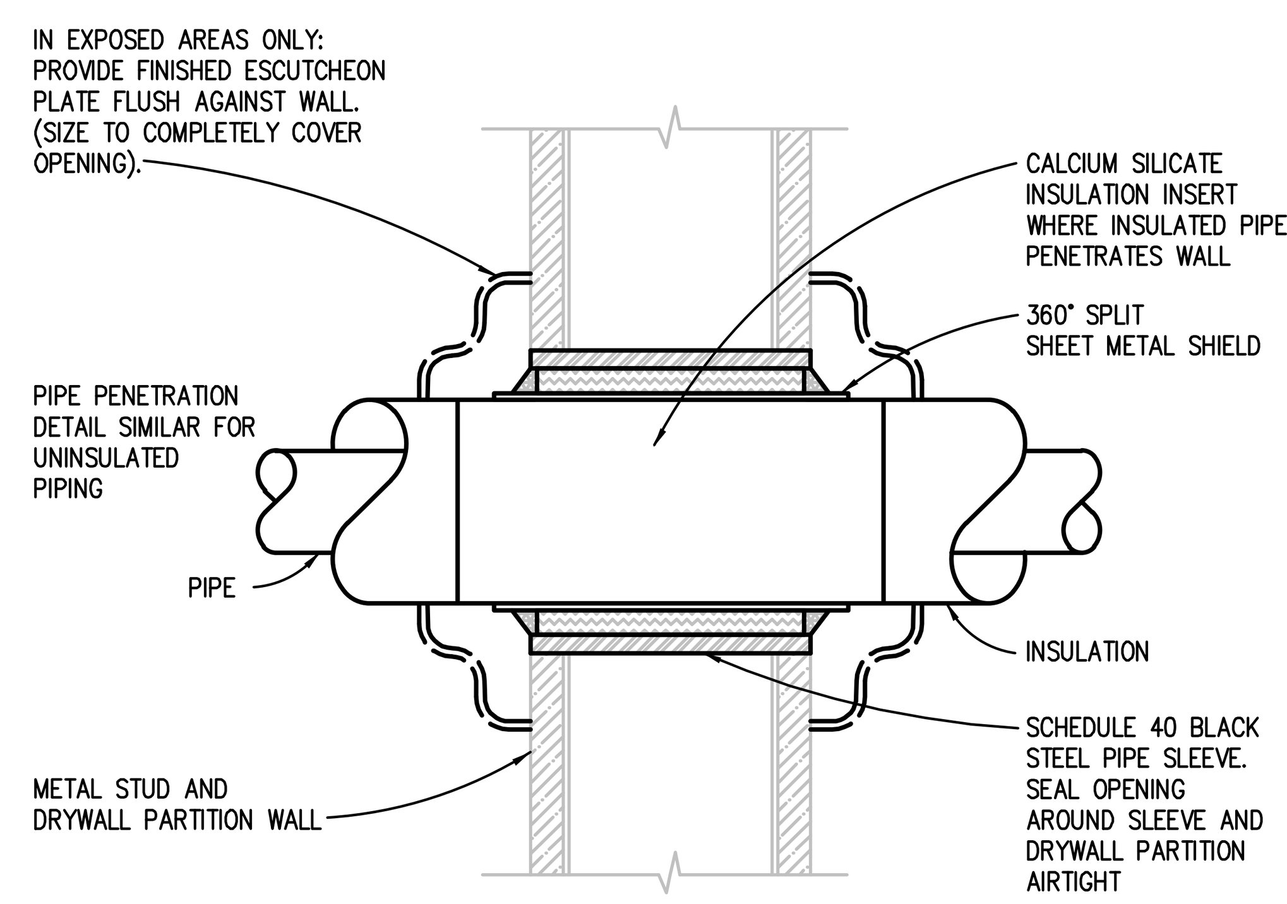
g:\2024\2024-0338-00\CAD\50 casd ms gym air conditioning\2024-0338-M5-RF-MS.dwg, M5.1, 1/16/2025 5:13:06 PM, Robert W. MacKinnon, Peter Basso Associates Inc.



DETAIL INDICATES THE INSTALLATION REQUIREMENTS FOR A FIRE RATED ASSEMBLY. FOR A NON-FIRE RATED ASSEMBLY PACK SLEEVED OPENING WITH INSULATION MATERIAL AND CAULK WITH NON-HARDENING SEALANT.

FIRE RATED AND NON-FIRE RATED POURED CONCRETE OR BLOCK WALL PIPE PENETRATION DETAIL

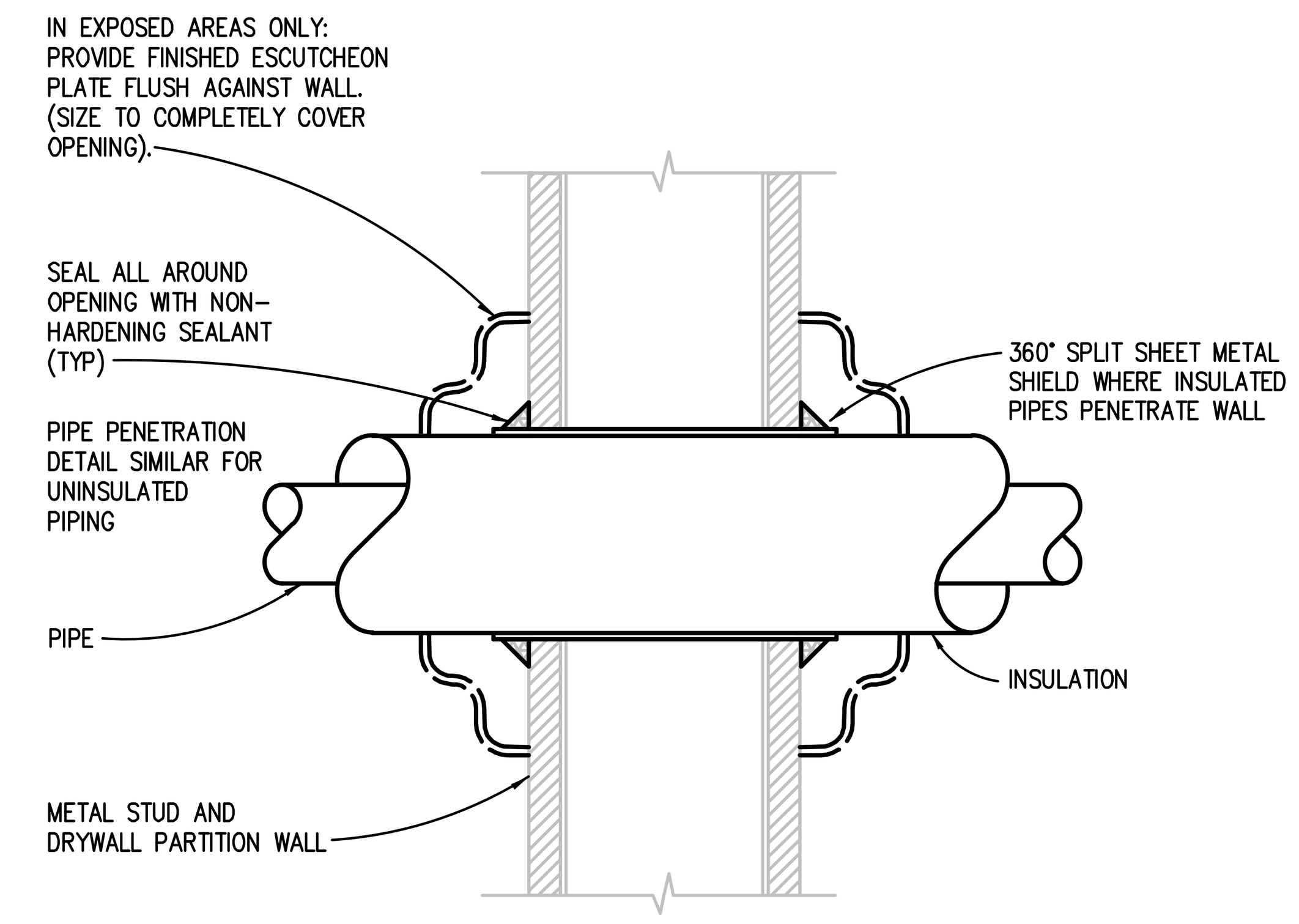
NO SCALE



DETAIL INDICATES THE INSTALLATION REQUIREMENTS FOR A FIRE RATED ASSEMBLY. FOR A NON-FIRE RATED ASSEMBLY PACK SLEEVED OPENING WITH INSULATION MATERIAL AND CAULK WITH NON-HARDENING SEALANT.

FIRE RATED AND NON-FIRE RATED METAL STUD AND DRYWALL PARTITION WALL PIPE PENETRATION DETAIL

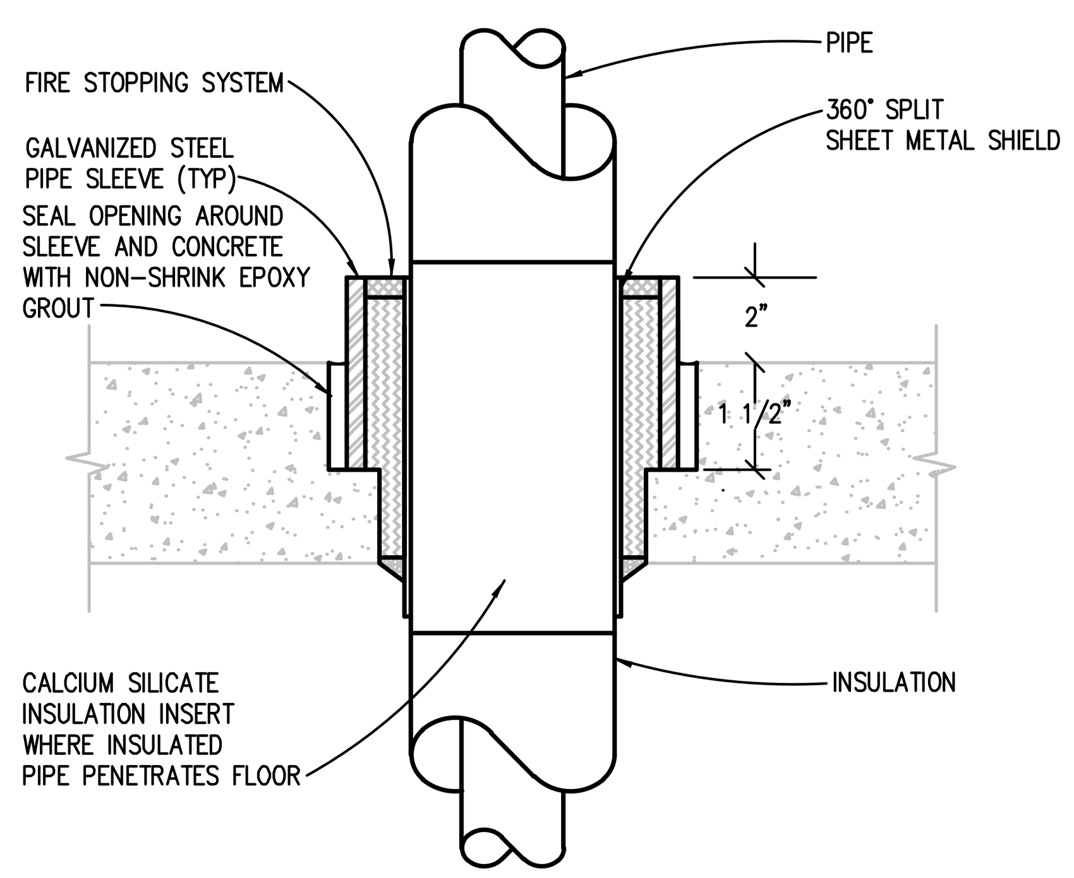
NO SCALE



THIS DETAIL DOES NOT APPLY TO HEATING PIPING 2" AND LARGER. FOR HEATING PIPING 2" AND LARGER REFER TO "FIRE RATED AND NON-FIRE RATED METAL STUD AND DRYWALL PARTITION WALL PIPE PENETRATION DETAIL"

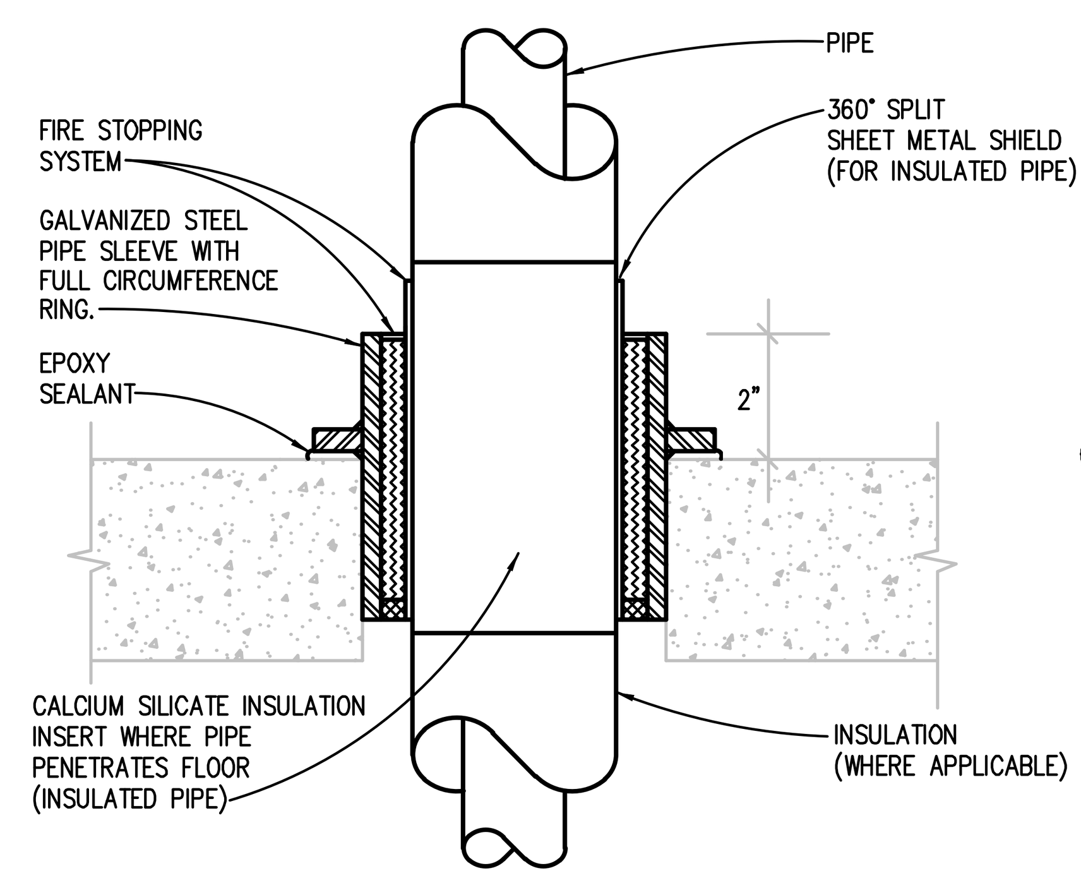
NON-FIRE RATED METAL STUD AND DRYWALL PARTITION WALL PIPE PENETRATION DETAIL

NO SCALE



EXISTING FLOOR PIPE PENETRATION DETAIL

NO SCALE



EXISTING FLOOR PIPE PENETRATION DETAIL

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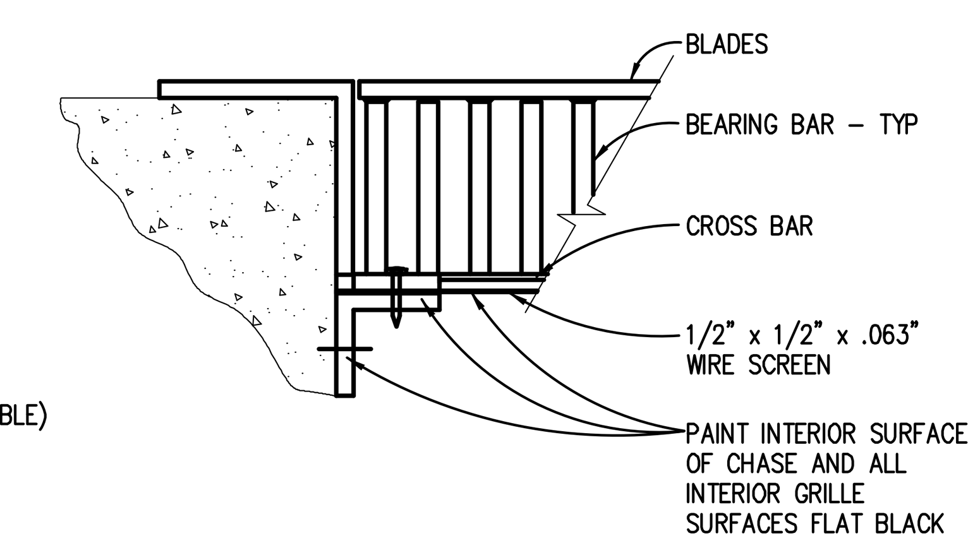

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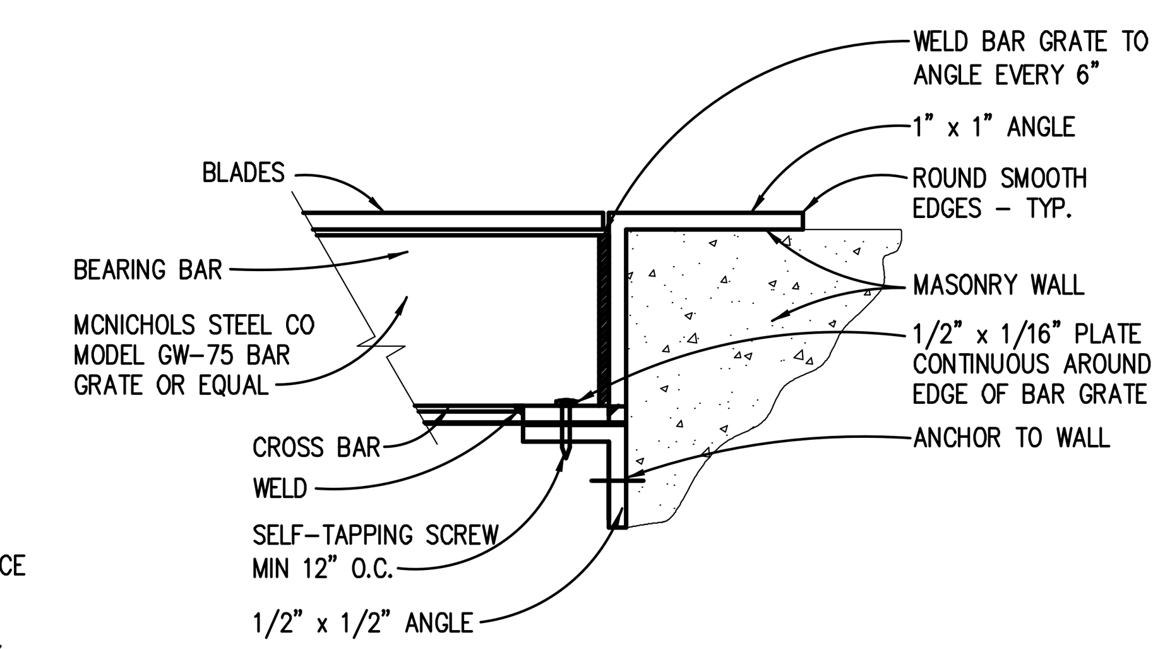

SECTION "A-A"

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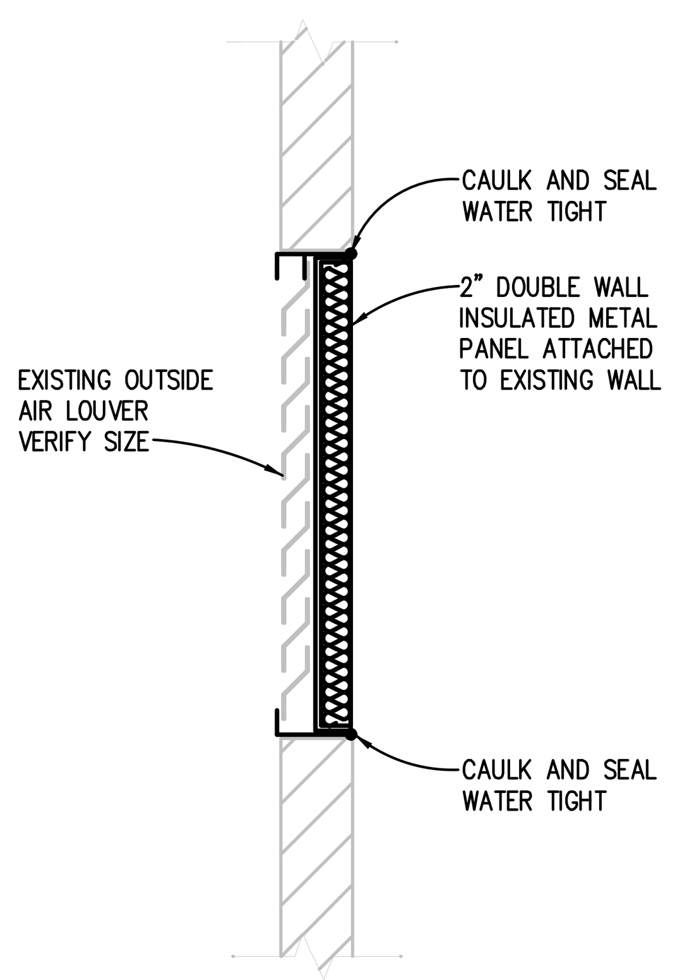
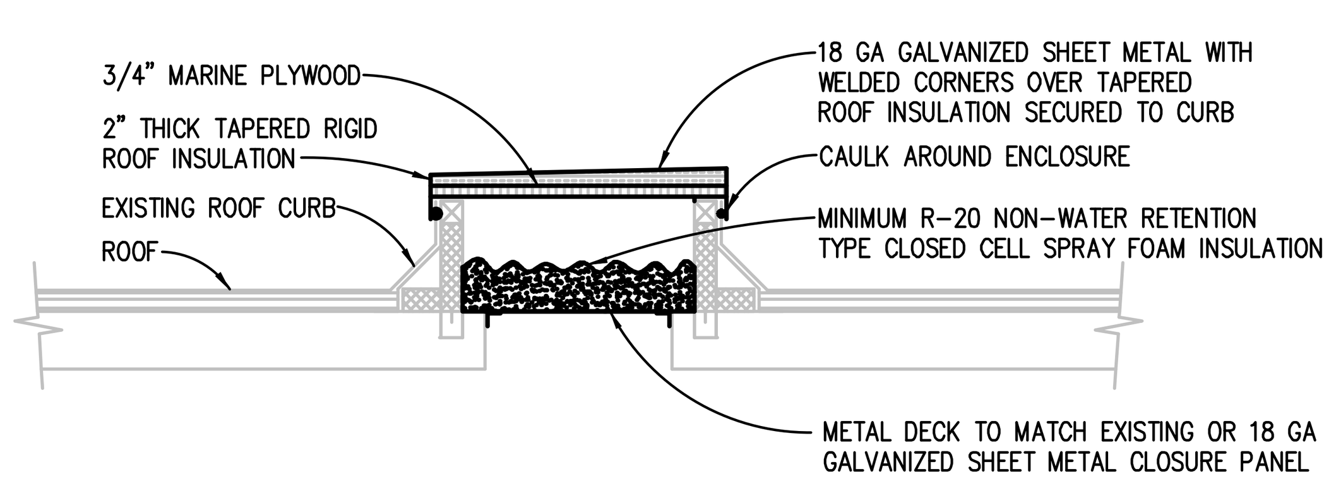


EXISTING EXTERIOR LOUVER AND/OR GRILLE CLOSURE DETAIL

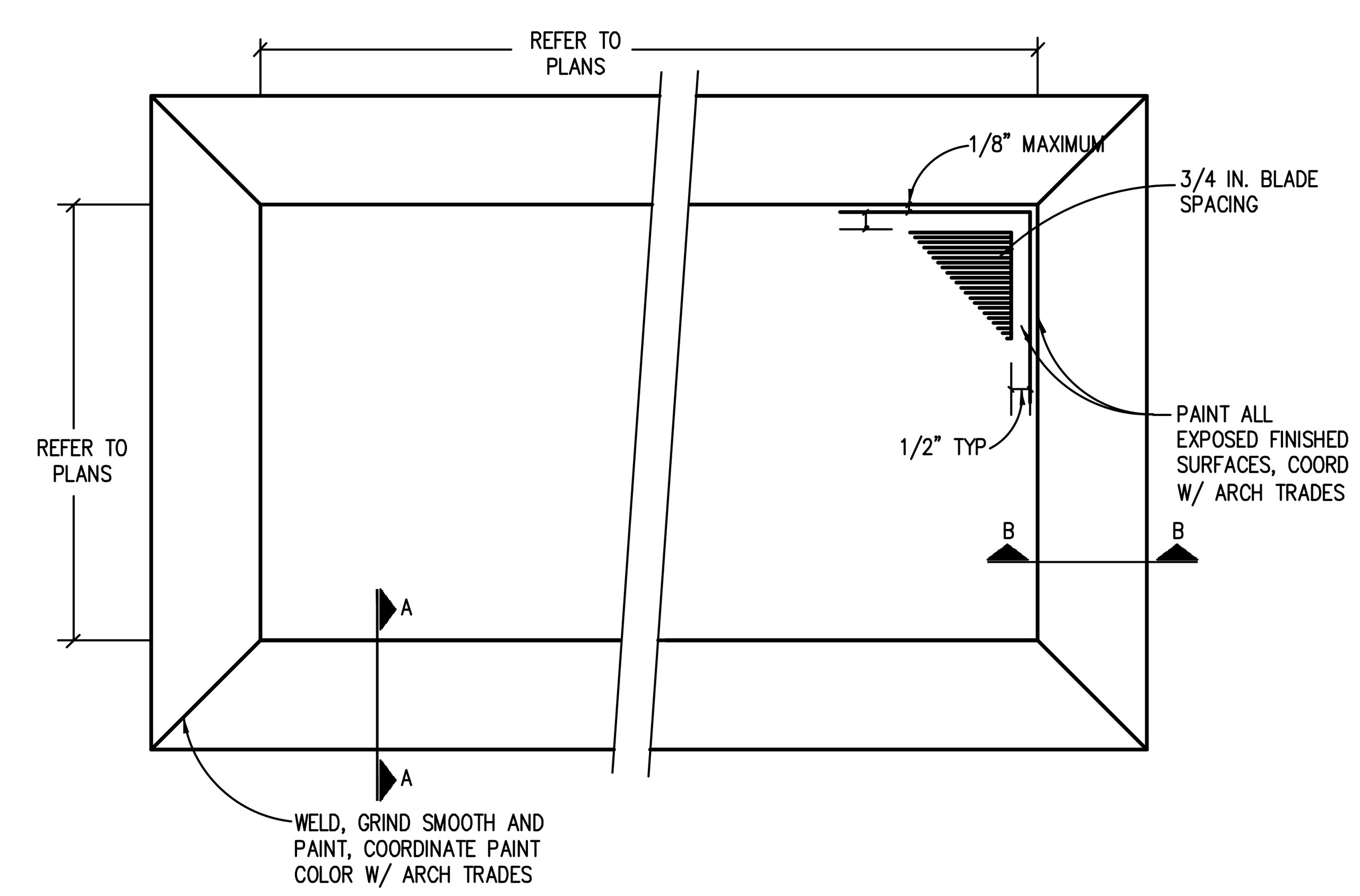
NO SCALE



NOTE:
1. FASTEN TOP CLOSURE, WITH SCREWS THROUGH SIDE.
2. NOT TO BE USED FOR CURBS GREATER THAN 24" IN ANY DIMENSION

SMALL ROOF CURB CAP DETAIL

NO SCALE



NOTES:
GRIND AND DEBURR ALL SURFACES PRIOR TO APPLYING FINISH.

HEAVY DUTY RETURN AIR GRILLE DETAIL

NO SCALE

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SHEET TITLE:
MECHANICAL DETAILS

SHEET NO:
M6.1

g:\2024\2024-0338-00\CAD\50 casd ms gym air conditioning\2024-0338-M6-DT.dwg, M6.1, 1/16/2025 5:13:12 PM, Robert W. MacKinnon, Peter Basso Associates Inc.

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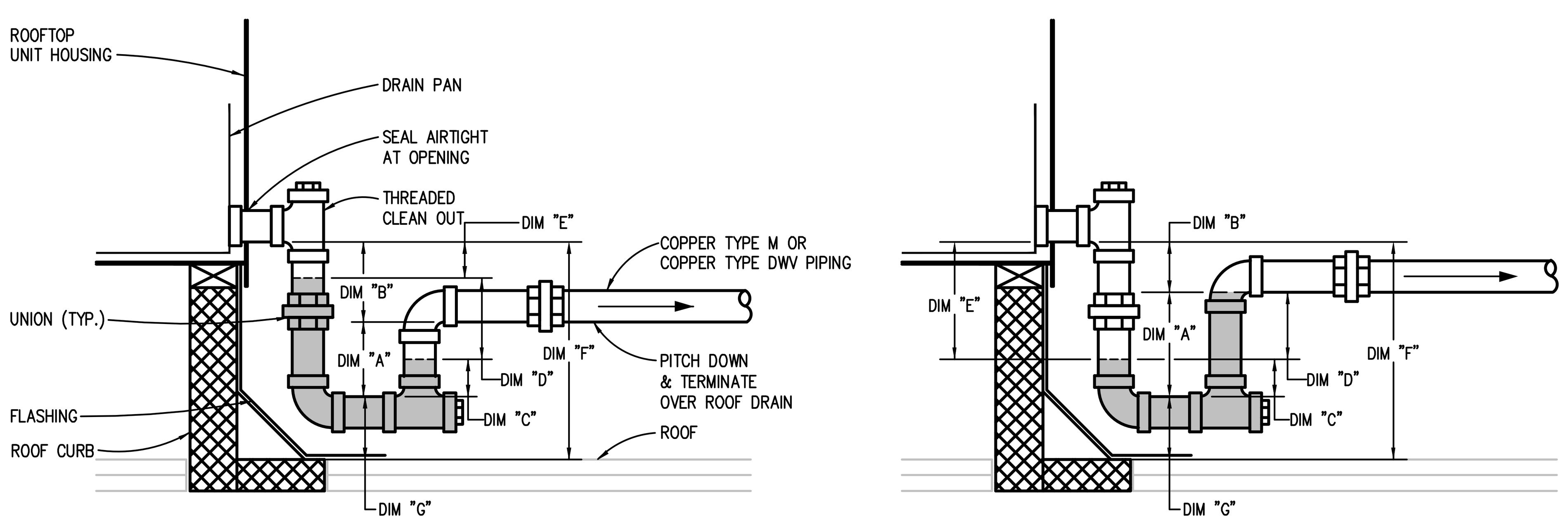
TRAP DIMENSION TABLE

TYPE OF SYSTEM	S.P. AT DRAIN PAN (IN.) (NOTE A)	DIMENSION "A" (INCHES) MIN.	DIMENSION "B" (INCHES)	DIMENSION "C" (INCHES) (TRAP SEAL)	DIMENSION "D" (INCHES)	DIMENSION "E" (INCHES)	DIMENSION "F" (INCHES) DRAIN PIPE SIZE (INCHES) 1 1/2	2	2 1/2, 3	4
DRAW THROUGH	-5.1 TO -6	5.0	5.0	2	6	2	13.0	14.0	15.0	16.0
	-4.1 TO -5	4.5	4.5	2	5	2	12.0	13.0	14.0	15.0
	-3.1 TO -4	4.0	4.0	2	4	2	11.0	12.0	13.0	14.0
	-2.1 TO -3	3.5	3.5	2	3	2	10.0	11.0	12.0	13.0
	UP TO -2	3.0	3.0	2	2	2	9.0	10.0	11.0	12.0
BLOW THROUGH	UP TO +2	4.0	2.0	2	2	4	9.0	10.0	11.0	12.0
	+2.1 TO +3	5.0	2.0	2	3	5	10.0	11.0	12.0	13.0
	+3.1 TO +4	6.0	2.0	2	4	6	11.0	12.0	13.0	14.0
	+4.1 TO +5	7.0	2.0	2	5	7	12.0	13.0	14.0	15.0
	+5.1 TO +6	8.0	2.0	2	6	8	13.0	14.0	15.0	16.0

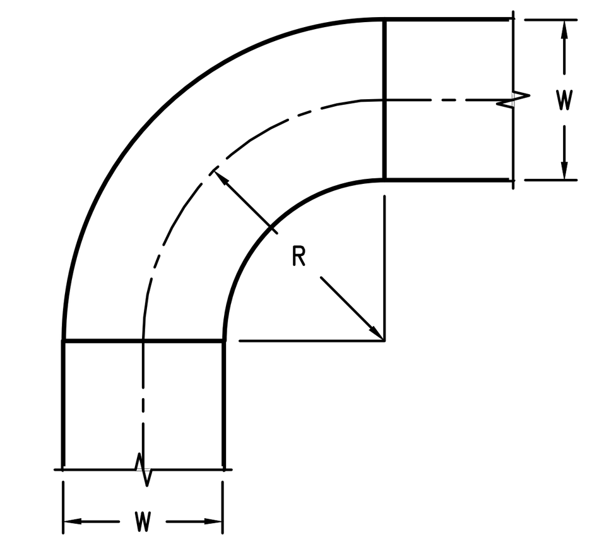
NOTES:
A. REFER TO ROOFTOP AIR HANDLING UNIT (COMMERCIAL, UNITARY, MODULAR) SCHEDULE FOR (-) OR (+) STATIC PRESSURE AT DRAIN PAN.
B. CONDENSATE DRAIN PAN TRAP PIPING SERVING ENERGY RECOVERY UNIT HEAT EXCHANGER AND HUMIDIFIER SECTIONS, WHERE LOCATED OUTDOORS, SHALL BE INSULATED AND HEAT TRACED.
C. DIMENSION "G" IS MIN: 3" FOR UP TO 1 1/2" DRAIN PIPE
   4" FOR 2" DRAIN PIPE
   5" FOR 2 1/2" OR 3" DRAIN PIPE
   6" FOR 4" DRAIN PIPE
D. PROVIDE ROOF CURB WITH ADEQUATE HEIGHT TO MEET DIMENSION "F"



DRAW THROUGH　　BLOW THROUGH

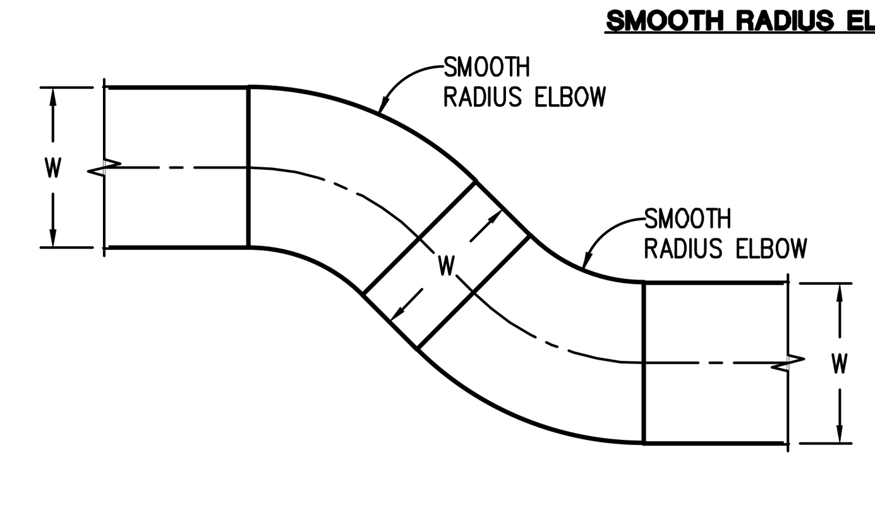
ENERGY RECOVERY UNIT CONDENSATE DRAIN PAN TRAP DETAIL

NO SCALE

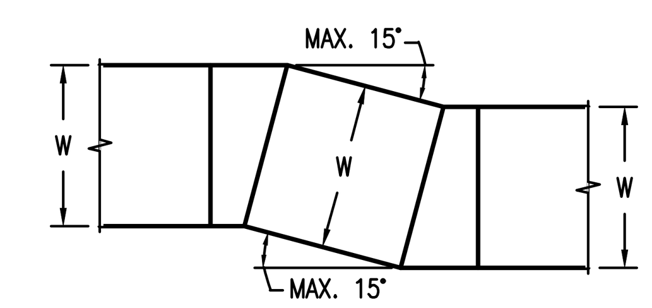


NOTES:
1. R/W = 1.0 FOR VELOCITIES <= 2,000 FPM UNLESS OTHERWISE INDICATED, R/W = 1.5 FOR VELOCITIES > 2,000 FPM UNLESS OTHERWISE INDICATED.
2. ALL CHANGES IN DIRECTION SHALL BE SMOOTH RADIUS ELBOW UNLESS OTHERWISE INDICATED.
3. THIS DETAIL APPLIES TO CHANGES IN DIRECTION FOR ALL ANGLES.

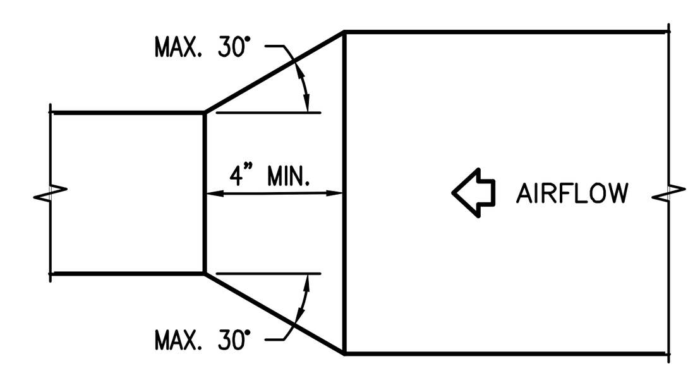
SMOOTH RADIUS ELBOW DETAIL



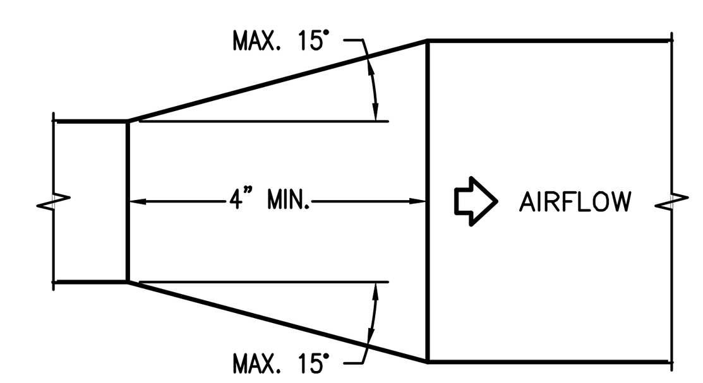
SMOOTH RADIUS ELBOW OFFSET



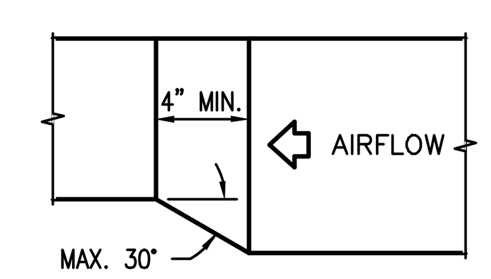
ANGLED OFFSET



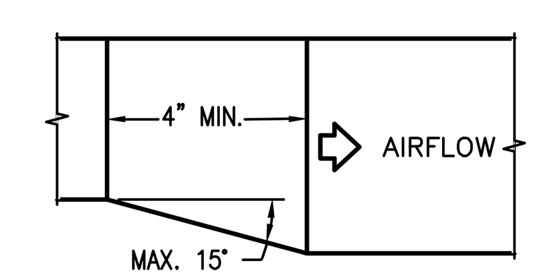
CONCENTRIC CONVERGING TRANSITION



CONCENTRIC DIVERGING TRANSITION



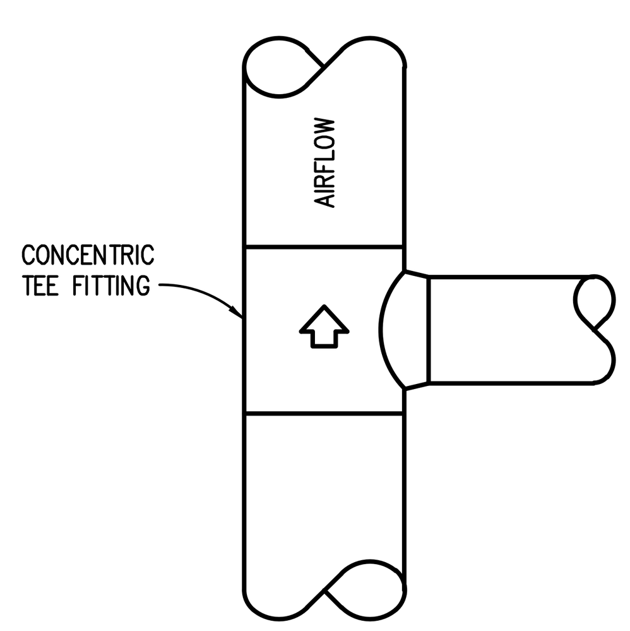
ECCENTRIC CONVERGING TRANSITION



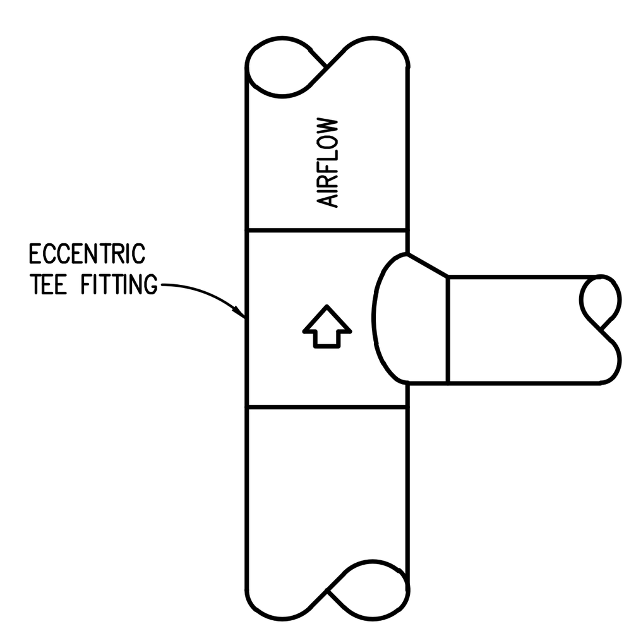
ECCENTRIC DIVERGING TRANSITION

DUCT TRANSITION AND OFFSET DETAILS

NO SCALE



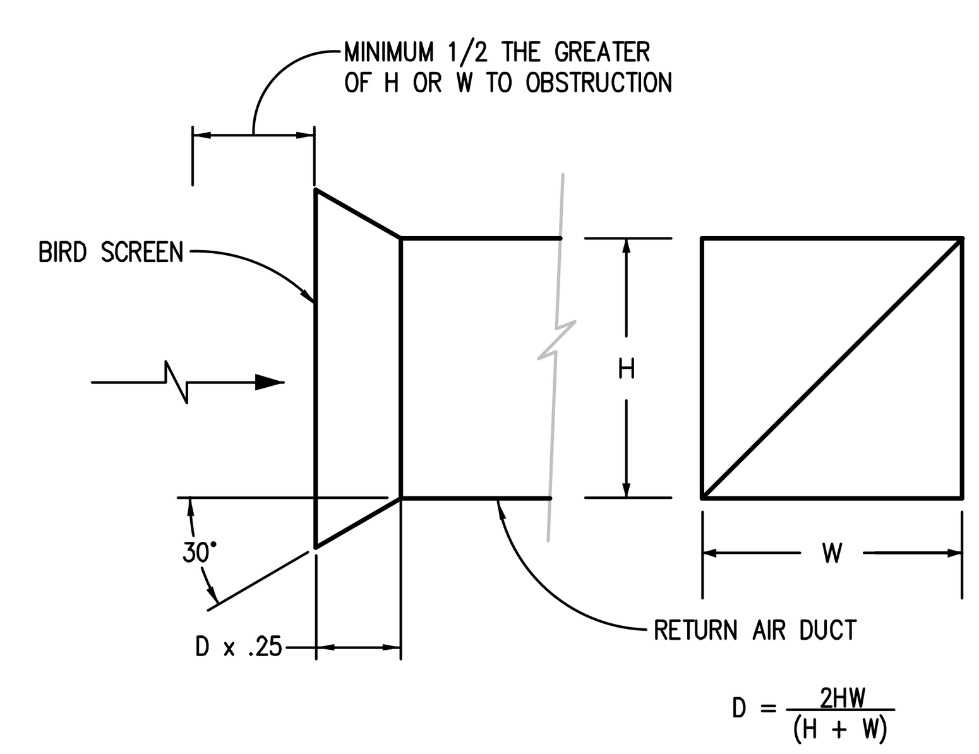
SUPPLY DUCT



RETURN OR EXHAUST DUCT

SPIRAL DUCT BRANCH TAKE-OFF DETAILS

NO SCALE (ROUND AND FLAT OVAL SIMILAR)



$D = \frac{2HW}{(H + W)}$

BELLMOUTH DETAIL

NO SCALE

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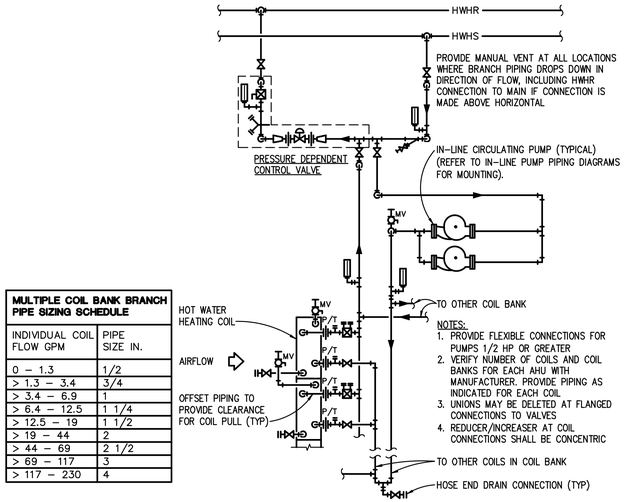
DRAFTS: EMW

PROJECT NO: 22.516 MS

SHEET TITLE: MECHANICAL DETAILS

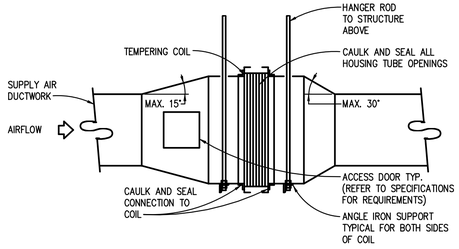
SHEET NO: M6.2



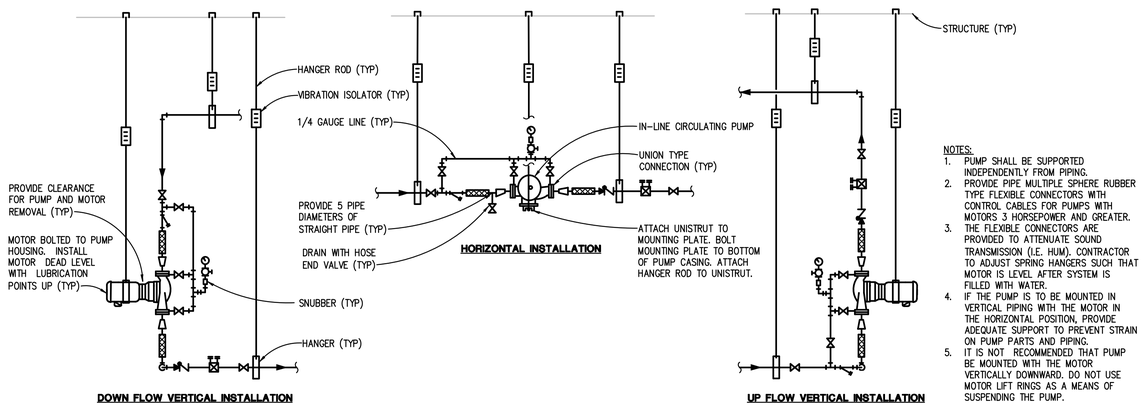
MULTIPLE COIL BANK BRANCH PIPE SIZING SCHEDULE	
INDIVIDUAL COIL FLOW GPM	PIPE SIZE IN.
0 – 1.3	1/2
> 1.3 – 3.4	3/4
> 3.4 – 6.9	1
> 6.4 – 12.5	1 1/4
> 12.5 – 19	1 1/2
> 19 – 44	2
> 44 – 69	2 1/2
> 69 – 117	3
> 117 – 230	4

NOTES:
1. PROVIDE FLEXIBLE CONNECTIONS FOR PUMPS 1/2 HP OR GREATER
2. VERIFY NUMBER OF COILS AND COIL BANKS FOR EACH AHU WITH MANUFACTURER. PROVIDE PIPING AS INDICATED FOR EACH COIL.
3. UNIONS MAY BE DELETED AT FLANGED CONNECTIONS TO VALVES
4. REDUCER/INCREASER AT COIL CONNECTIONS SHALL BE CONCENTRIC

AHU HOT WATER HEATING COIL PIPING DIAGRAM
NO SCALE



DUCT MOUNTED TEMPERING COIL INSTALLATION DETAIL
NO SCALE



NOTES:
1. PUMP SHALL BE SUPPORTED INDEPENDENTLY FROM PIPING.
2. PROVIDE PIPE MULTIPLE SPHERE RUBBER TYPE FLEXIBLE CONNECTORS WITH CONTROL CABLES FOR PUMPS WITH MOTORS 3 HORSEPOWER AND GREATER.
3. THE FLEXIBLE CONNECTORS ARE PROVIDED TO ATTENUATE SOUND TRANSMISSION (I.E. HUM). CONTRACTOR TO ADJUST SPRING HANGERS SUCH THAT MOTOR IS LEVEL AFTER SYSTEM IS FILLED WITH WATER.
4. IF THE PUMP IS TO BE MOUNTED IN VERTICAL PIPING WITH THE MOTOR IN THE HORIZONTAL POSITION, PROVIDE ADEQUATE SUPPORT TO PREVENT STRAIN ON PUMP PARTS AND PIPING.
5. IT IS NOT RECOMMENDED THAT PUMP BE MOUNTED WITH THE MOTOR VERTICALLY DOWNWARD. DO NOT USE MOTOR LIFT RINGS AS A MEANS OF SUSPENDING THE PUMP.

IN-LINE CLOSE COUPLED (BELL AND GOSSETT SERIES 90) TYPE CIRCULATING PUMP PIPING DIAGRAM
NO SCALE

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DATE	ISSUED FOR
11/20/24	DD
12/02/24	COORDINATION
12/06/24	50% CD
01/17/25	BID SET

STATE OF MICHIGAN
DENNIS P. SCZOMAK
ENGINEER
No. 6201036881
LICENSED PROFESSIONAL ENGINEER

PIC:	WEK
PM:	WEK
DRAFTS:	EMW

PROJECT NO: 22.516 MS

SHEET TITLE: MECHANICAL DETAILS

SHEET NO: M6.3

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ABOVEGROUND HVAC PIPING & VALVE APPLICATION SCHEDULE

	MATERIAL							CONNECTION								ISOLATION VALVES				
PIPE SIZE (INCHES)	SOFT COPPER TYPE K	HARD COPPER TYPE L	HARD COPPER TYPE M	CARBON STEEL (SCHED. 40)	CARBON STEEL (SCHED. 80)	CARBON STEEL (STD.)	COPPER TYPE DWV	SOLDERED	BRAZED	WELDED	THREADED	FLANGED	GROOVED	PRESSURE SEAL	MECHANICALLY FORMED TEE	BALL	GENERAL SERVICE BUTTERFLY	HI-PERF BUTTERFLY	GATE	KEYED NOTES
HEATING HOT WATER SUPPLY & RETURN - MIN. WORKING PRESS. & TEMP., 125 PSIG AT 200 DEG F																				
UP TO 2				X							X					X				
UP TO 2		X						X	X							X				
2-1/2 TO 4				X						X		X					X			A
2-1/2 TO 4		X							X								X			A
6 TO 8				X						X		X					X			A
6 TO 8		X							X								X			A
10				X						X		X					X			A
12						X				X		X					X			A
14 AND LARGER						X				X		X					X			A

GENERAL NOTES

1. 'X' INDICATES ACCEPTABLE SELECTION. IF MORE THAN ONE SELECTION IS INDICATED FOR A PIPING SYSTEM, CONTRACTOR MAY SELECT FROM THOSE INDICATED SELECTIONS.
2. DISSIMILAR-METAL PIPING JOINTS: CONSTRUCT JOINTS USING DIELECTRIC FITTINGS COMPATIBLE WITH BOTH PIPING MATERIALS. IF A BRONZE VALVE CONNECTS THE DISSIMILAR METALS NO FURTHER DIELECTRIC ISOLATION IS REQUIRED.
   a. NPS 2 AND SMALLER: USE BRASS COUPLING, NIPPLE, OR UNION.
   b. NPS 2-1/2 AND LARGER: USE DIELECTRIC FLANGE KITS.
3. USE UNIONS OR FLANGES AT VALVE AND EQUIPMENT CONNECTIONS.
4. HVAC EQUIPMENT DRAINS, VENTS, SAFETY VALVE PIPING, BLOWDOWN PIPING AND THE LIKE SHALL BE SAME PIPING MATERIAL AS ASSOCIATED PIPING SYSTEM.
5. GROOVED END VALVES MAY BE USED WITH GROOVED PIPING.

KEYED NOTES

A. GROOVED AND FLANGED FITTINGS, JOINTS, AND COUPLINGS, IF INDICATED AS AN ACCEPTABLE SELECTION, MAY BE USED IN ACCESSIBLE LOCATIONS FOR THIS PIPING SYSTEM ONLY. ACCESSIBLE LOCATIONS ARE DEFINED AS EXPOSED CONSTRUCTION OR ABOVE LAY-IN CEILINGS.
B. BALL VALVE WITH 250 PSIG STEAM TRIM.
C. BALL VALVE WITH 150 PSIG STEAM TRIM.

ABOVEGROUND HVAC PIPE & ACCESSORY INSULATION APPLICATION SCHEDULE

	INSULATION MATERIAL & THICKNESS (INCHES)							FIELD-APPLIED JACKET MATERIAL						
	FLEXIBLE ELASTOMERIC	FIBERGLASS	MINERAL WOOL	POLYISOCYANURATE	PHENOLIC	CELLULAR GLASS	CALCIUM SILICATE	ALUMINUM	STAINLESS STEEL	PVC	SELF-ADHESIVE (FOR OUTDOOR APPLICATIONS)	PVDC (INDOOR)	PVDC (OUTDOOR)	KEYED NOTES
INDOOR PIPE SYSTEM AND SIZE (INCHES)														
HEATING HOT WATER SUPPLY & RETURN 200 DEG F AND LOWER														
NPS 1-1/4 AND SMALLER		1.5						X		X				A
NPS 1-1/2 AND LARGER		2						X		X				A
REFRIGERANT SUCTION & HOT GAS (RIGID COPPER)														
NPS 6 AND SMALLER	1	1		1	1	1		X		X				
NPS 8 AND LARGER	1.5	1.5		1.5	1.5	1.5		X		X				
REFRIGERANT SUCTION & HOT GAS (SOFT COPPER)	1							X		X				

UNLESS OTHERWISE INDICATED OR SCHEDULED, THE FOLLOWING DO NOT REQUIRE INSULATION:
DIRECT BURIED COOLING SYSTEM PIPING
PIPING THAT CONVEYS FLUIDS HAVING DESIGN OPERATING TEMPERATURE RANGE BETWEEN 60 DEG F. AND 105 DEG F., INCLUSIVE.

GENERAL NOTES

1. 'X' OR THICKNESS IN INCHES INDICATES ACCEPTABLE SELECTION. IF MORE THAN ONE SELECTION IS INDICATED, CONTRACTOR MAY SELECT FROM THOSE INDICATED SELECTIONS.
2. INSULATE PIPING WITHIN AIR HANDLING EQUIPMENT THE SAME AS INDOOR PIPING. PROVIDE ALUMINUM OR STAINLESS STEEL JACKET.
3. FOR PIPING NPS 1-1/4 AND SMALLER WITHIN PARTITIONS IN CONDITIONED SPACES INSULATION MAY BE REDUCED BY ONE-INCH THICKNESS, BUT NOT TO LESS THAN ONE-INCH THICKNESS.
4. FOR PIPING NPS 1 AND SMALLER, INSULATION IS NOT REQUIRED FOR STRAINERS, CONTROL VALVES, AND BALANCING VALVES.

KEYED NOTES

A. PROVIDE FIELD APPLIED JACKET FOR PIPING EXPOSED IN EQUIPMENT ROOMS, STORAGE ROOMS, JANITORS CLOSETS, RECEIVING ROOMS, TEST AREAS, CIRCULATION AREAS AND SUCH AREAS SUBJECT TO DAMAGE WITHIN 10 FEET (3 METERS) OF FINISHED FLOOR.
B. PROVIDE MANUFACTURER'S RECOMMENDED PROTECTIVE COATING FOR FLEXIBLE ELASTOMERIC THERMAL INSULATION.
C. STEAM AND CONDENSATE PIPING JACKET SHALL BE STUCCO EMBOSSED.
D. PIPING WITHIN ENERGY RECOVERY UNITS SHALL BE TYPE 304 STAINLESS STEEL, SMOOTH; 0.010 INCH THICK. SEAMS AND JOINTS CAULKED WITH CHEMICALLY RESISTANT SEALER.

DUCT SYSTEM INSULATION APPLICATION SCHEDULE

	INSULATION MATERIAL & THICKNESS (INCHES)							FIELD APPLIED JACKET MATERIAL		
	FIBERGLASS BLANKET 0.75 LB/CU FT	FIBERGLASS BLANKET 1.0 LB/CU FT	FIBERGLASS BOARD 2.25 LB/CU FT	FIBERGLASS BOARD 6.0 LB/CU FT	FLEXIBLE ELASTOMERIC	ASTM E2336 2-HOUR FIRE RATED BLANKET	2-HOUR FIRE RATED BLANKET	ALUMINUM	SELF-ADHESIVE (FOR OUTDOOR APPLICATIONS)	KEYED NOTES
DUCT SYSTEMS LOCATED INDOORS										
SUPPLY AIR, EXCEPT AS NOTED BELOW		1.5								A, E
OUTSIDE AIR AND MIXED AIR, EXCEPT AS NOTED BELOW		1.5								
OUTSIDE AIR INTAKE, RELIEF AIR AND EXHAUST AIR PLENUMS ADJACENT TO EXTERIOR LOUVERS			1.5							

PLENUMS, DUCTS, AND DUCT ACCESSORIES NOT REQUIRING INSULATION:
FIBROUS-GLASS DUCTS
DOUBLE-WALL METAL DUCTS WITH INSULATION OF SUFFICIENT THICKNESS TO COMPLY WITH ENERGY CODE AND ASHRAE/IESNA 90.1 - 2013
METAL DUCTS WITH DUCT LINER OF SUFFICIENT THICKNESS TO COMPLY WITH ENERGY CODE AND ASHRAE/IESNA 90.1 - 2013
FABRIC SUPPLY DUCTS
FACTORY-INSULATED FLEXIBLE DUCTS
FACTORY-INSULATED PLENUMS AND CASINGS
FLEXIBLE CONNECTORS
VIBRATION-CONTROL DEVICES
FACTORY-INSULATED ACCESS PANELS AND DOORS

GENERAL NOTES

1. 'X' OR THICKNESS IN INCHES INDICATE ACCEPTABLE SELECTION. IF MORE THAN ONE SELECTION IS INDICATED FOR A DUCT SYSTEM, CONTRACTOR MAY SELECT FROM THOSE INDICATED SELECTIONS.
2. REFER TO METAL DUCT SECTION OF SPECIFICATIONS FOR DUCT LINING AND DOUBLE-WALL INSULATED DUCT.
3. REFER TO HVAC CASINGS SECTION OF SPECIFICATIONS FOR DOUBLE-WALL INSULATED PLENUMS.

KEYED NOTES

A. INCLUDE INSULATION AROUND DUCT MOUNTED COILS AND AIR TERMINAL UNIT COILS.
B. NUMBER OF LAYERS AND TOTAL INSULATION THICKNESS AS RECOMMENDED BY SELECTED MANUFACTURER.
C. DOES NOT APPLY TO PREFABRICATED, ZERO-CLEARANCE GREASE DUCT.
D. PROVIDE MANUFACTURER'S RECOMMENDED PROTECTIVE COATING FOR FLEXIBLE ELASTOMERIC THERMAL DUCT INSULATION.
E. EXPOSED SUPPLY DUCTWORK LOCATED IN A CONDITIONED SPACE SERVED BY THE SAME AIR HANDLING SYSTEM IS NOT REQUIRED TO BE INSULATED.

DUCT SYSTEM APPLICATION SCHEDULE

	DUCT MATERIAL																		
AIR SYSTEMS	G90 GALV. SHEET METAL	DOUBLE-WALL LINED G90 GALV. SHEET METAL (SOLID INNER WALL)	DOUBLE-WALL LINED G90 GALV. SHEET METAL (PERF. INNER WALL)	G90 GALV. SHEET METAL WITH 1-INCH LINING	GALVANNEALED SHEET METAL	ALUMINUM	TYPE 304 STAINLESS STEEL	TYPE 316 STAINLESS STEEL	PVC COATED GALV. SHEET METAL (4X1)	PVC COATED GALV. SHEET METAL (1X4)	PVC COATED GALV. SHEET METAL (4X4)	16 GA. CARBON STEEL	ZERO-CLEARANCE PREFABRICATED RANGE HOOD EXHAUST DUCT	FABRIC	DESIGN PRESSURE CLASS (INCHES WG)	SEAL CLASS	MAX. ALLOWABLE LEAKAGE RATE (PERCENT)	KEYED NOTES
SUPPLY AIR WITHOUT TERMINAL UNITS	X														+2	A	5	
RETURN AIR WITHOUT TERMINAL UNITS	X														-2	A	5	

GENERAL NOTES

1. 'X' INDICATES ACCEPTABLE SELECTION. IF MORE THAN ONE SELECTION IS INDICATED FOR A DUCT SYSTEM, CONTRACTOR MAY SELECT FROM THOSE INDICATED SELECTIONS.
2. 4 X 1 PVC-COATED GALVANIZED STEEL: FACTORY-APPLIED PVC COATINGS SHALL BE 4 MILS (0.10 MM) THICK ON EXTERIOR SHEET METAL SURFACES OF DUCTS AND FITTINGS EXPOSED TO CORROSIVE CONDITIONS AND MINIMUM 1 MIL (0.025 MM) THICK ON INTERIOR SURFACES.
3. 1 X 4 (4 X 1 REVERSE COATED) PVC-COATED GALVANIZED STEEL: FACTORY-APPLIED PVC COATINGS SHALL BE 4 MILS (0.10 MM) THICK ON INTERIOR SHEET METAL SURFACES OF DUCTS AND FITTINGS EXPOSED TO CORROSIVE CONDITIONS AND MINIMUM 1 MIL (0.025 MM) THICK ON EXTERIOR SURFACES.
4. 4 X 4 PVC-COATED GALVANIZED STEEL: FACTORY-APPLIED PVC COATINGS SHALL BE 4 MILS (0.10 MM) THICK ON SHEET METAL SURFACES OF DUCTS AND FITTINGS EXPOSED TO CORROSIVE CONDITIONS AND 4 MILS (0.10 MM) THICK ON OPPOSITE SURFACES.

KEYED NOTES

A. SCREWS, DAMPERS, OR PROJECTIONS OF ANY TYPE ON INTERIOR OF DUCT SURFACE ARE PROHIBITED.
B. DUCT SHALL BE LINED WITHIN 25 FEET UPSTREAM OF FANS.
C. ALL WELDED CONSTRUCTION.

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SCHEDULES GENERAL NOTES:

TYPICAL FOR ALL SCHEDULE SHEETS:

1. REFER TO ELECTRICAL STANDARD SCHEDULES, ONE LINE DIAGRAM AND PANEL SCHEDULES FOR ADDITIONAL ELECTRICAL INFORMATION
2. PROVIDE THE FOLLOWING FACTORY-WIRED ELECTRICAL OPTIONS/ACCESSORIES WHERE INDICATED IN SCHEDULE:
   A - NON-FUSED DISCONNECT SWITCH
   B - UNIT SHALL BE SINGLE POINT ELECTRICAL CONNECTION WITH FACTORY INSTALLED DISCONNECTING MEANS AND ALL REQUIRED STARTERS AND CONTROLS
   C - SERVICE RECEPTACLE
   D - FUSED DISCONNECT SWITCH
   E - COMBINATION STARTER
   F - UNIT SHALL HAVE (2) SINGLE POINT CONNECTIONS WITH FACTORY INSTALLED DISCONNECTING MEANS AND ALL REQUIRED STARTERS AND CONTROLS. (1) CONNECTION SHALL BE FOR CONDENSING SECTION AND (1) CONNECTION SHALL BE FOR THE REMAINDER OF THE UNIT.
3. FOR MODULATION/CONTROL TYPE COLUMN, "VFC" INDICATES VARIABLE FREQUENCY CONTROLLERS, "AUTO" INDICATES AUTOMATIC OPERATION (CONTROLLED BY TEMPERATURE CONTROLS OR SELF CONTAINED CONTROLS), "MANUAL" INDICATES HAND OPERATION.
4. IF VARIABLE FREQUENCY CONTROLLERS ARE INDICATED TO BE PROVIDED AND ARE NOT INSTALLED INTEGRAL TO THE UNIT, VARIABLE FREQUENCY CONTROLLERS SHALL BE SUPPLIED BY THE MECHANICAL CONTRACTOR (UNLESS OTHERWISE NOTED) AND INSTALLED BY THE ELECTRICAL CONTRACTOR INCLUDING THE LINE SIDE AND LOAD SIDE WIRING TO THE MOTOR AND INCLUDING MISCELLANEOUS STEEL REQUIRED FOR THE SUPPORT AND MOUNTING OF THE VFC. REFER TO FLOOR PLANS FOR LOCATION.
5. WHERE EQUIPMENT IS INDICATED TO HAVE A SINGLE POINT ELECTRICAL CONNECTION, THAT EQUIPMENT SHALL COME COMPLETE WITH FACTORY INSTALLED STARTERS, MOTOR OVERLOAD PROTECTION, CONTACTORS, FUSING AND ALL NECESSARY INTERNAL WIRING AND CONTROLS. PROVIDE A FACTORY MOUNTED UNIT DISCONNECTING MEANS WHERE THE ELECTRICAL CONTRACTOR SHALL MAKE SINGLE POINT CONNECTION. INSTALL PACKAGED EQUIPMENT SUCH THAT THE ELECTRICAL CONNECTION AND CONTROLS ARE ACCESSIBLE AND HAVE CLEARANCES MEETING THE NATIONAL ELECTRICAL CODE.
6. WHERE PACKAGED EQUIPMENT IS PROVIDED, NAMEPLATE MUST INDICATE MAXIMUM OVERCURRENT PROTECTION BY HACR RATED CIRCUIT BREAKERS OR FUSES. IF FUSE PROTECTION ONLY IS INDICATED, PROVIDE A FUSIBLE DISCONNECT AND FUSES WITH THE UNIT.
7. WHERE EQUIPMENT IS DESIGNATED BY MANUFACTURER AND MODEL NUMBER, THIS IS THE BASIS OF DESIGN. IF THE CONTRACTOR ELECTS TO PROVIDE EQUIPMENT BY OTHER SPECIFIED MANUFACTURERS OR PROPOSED ALTERNATE EQUIPMENT BY THE BASIS OF DESIGN MANUFACTURER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REVISIONS TO ELECTRICAL REQUIREMENTS, STRUCTURAL LOADING, OR ARCHITECTURAL APPURTENANCES AND SHALL INCLUDE THE COST OF SUCH REVISIONS IN HIS BID.
8. WHERE EQUIPMENT IS SCHEDULED TO INCLUDE A SERVICE RECEPTACLE, PROVIDE A FACTORY MOUNTED SERVICE RECEPTACLE WITH APPROPRIATE FUSES AND TRANSFORMERS CONNECTED ON THE LINE SIDE OF THE UNIT DISCONNECT. PROVIDE A NAMEPLATE ON THE DISCONNECT SWITCH INDICATING THE PRESENCE OF LIVE POWER TO THE SERVICE RECEPTACLE WHEN THE UNIT DISCONNECT IS IN THE OFF POSITION.
9. SIZE ALL EQUIPMENT FEEDERS BASED ON THE LISTED MOP (MAXIMUM OVERCURRENT PROTECTION). REFER TO THE FEEDER AND BRANCH CIRCUIT SIZING SCHEDULE ON THE ELECTRICAL STANDARD SCHEDULES SHEET.

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STATE OF MICHIGAN
DENNIS P. SCZOMAK
ENGINEER
No. 6201036881
LICENSED PROFESSIONAL ENGINEER

PIC: WEK
PM: WEK
DRAFTS: EMW

PROJECT NO:
22.516 MS

SHEET TITLE:
MECHANICAL SCHEDULES

SHEET NO:
M7.1

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ENERGY RECOVERY UNIT SCHEDULE

UNIT IDENT-IFICATION	AREA/ SYSTEM SERVED	SUPPLY FAN								EXHAUST FAN					
		CFM	MINIMUM OUTSIDE AIRFLOW CFM (NOTE 3)		ESP"	TSP"	CONTROL TYPE	MOTOR		CFM	ESP"	TSP"	CONTROL TYPE	MOTOR	
			MAX-MIN	MIN-MIN				BHP	HP					BHP	HP
ERU-1	MS GYM	20,000	11254	5649	1	4.86	VFC	26.24 TOTAL	4 @ 10	20,000	0.75	2.02	VFC	10.71 TOTAL	2 @ 10

UNIT IDENT-IFICATION	HEAT EXCHANGER (SUMMER)							HEAT EXCHANGER (WINTER)						
	SUPPLY SIDE			EXHAUST SIDE			EFFIC. (%)	SUPPLY SIDE			EXHAUST SIDE			EFFIC. (%)
	E.A.T. °F	L.A.T. °F	A.P.D. IN. WG.	E.A.T. °F	L.A.T. °F	A.P.D. IN. WG.		E.A.T. °F	L.A.T. °F	A.P.D. IN. WG.	E.A.T. °F	L.A.T. °F	A.P.D. IN. WG.	
ERU-1	91	83	0.94	75	80	0.94	42	-10	33	0.94	70	48	0.94	52.76

UNIT IDENT-IFICATION	COOLING COIL - DX COOLING							HOT GAS REHEAT		OUTSIDE AIR FILTERS			RETURN FILTERS		
	SENSIBLE CAPACITY MBH	TOTAL CAPACITY MBH	E.D.B. °F	L.D.B. °F	REFRIG. TYPE	MIN FACE ARE SQ. FT.	MAX. FACE VEL. F.P.M	E.D.B. °F	L.D.B. °F	EFF. %	AREA SQ. FT.	SP" TOTAL	EFF. %	AREA SQ. FT.	SP" TOTAL
ERU-1	518	612	80	56	R32	36	565	56	70	(8)MERV 8	42.7	0.71	(4)MERV 13	42.7	0.52

UNIT IDENT-IFICATION	ELECTRICAL						CURB			UNIT WEIGHT W/ CURB (LBS.)	SA/RA CONFIG.	EA/OA CONFIG.	MODEL NO.	KEYED NOTES
	VOLTS	PHASE	FLA	MOP	SCCR KA	OPTIONS/ ACCESS-ORIES	TYPE		HEIGHT					
							STANDARD	VIBRATION ISOLATION SPRING CURB						
ERU-1	460	3		175	10		N	Y	24	16655	DOWN/ DOWN THRU CURB	END ROOF	DPSA052	

GENERAL NOTES:
1. REFER TO SCHEDULES GENERAL NOTES.
2. MODEL NUMBERS ARE DAIKIN UNLESS OTHERWISE NOTED.
3. MINIMUM OUTSIDE AIRFLOW MAX-MIN CFM IS THE REQUIRED MINIMUM OUTSIDE AIRFLOW RATE WITH MAXIMUM OCCUPANT LOAD. MINIMUM OUTSIDE AIRFLOW MIN-MIN CFM IS THE REQUIRED MINIMUM OUTSIDE AIRFLOW RATE WITH ZERO OCCUPANT LOAD.
4. FLUID TYPE: W = WATER, PGXX = PROPYLENE GLYCOL SOLUTION XX PERCENTAGE OF GLYCOL, EGXX = ETHYLENE GLYCOL SOLUTION XX PERCENTAGE OF GLYCOL.
5. FOR UNITS LOCATED OUTDOORS, INSULATE AND PROVIDE ELECTRIC HEAT TRACE FOR HEAT EXCHANGER CABINET DRAIN PIPING.

HOT WATER HEATING COIL SCHEDULE

UNIT IDENTIFICATION	SYSTEM SERVED	MAXIMUM NUMBER ROWS	MAXIMUM FIN DENSITY FINS/INCH	CAPACITY MBH	AIR				MINIMUM FACE AREA SQ. FT.	WATER					CONTROL VALVE W.P.D. FT. HD.	MODEL NUMBER	KEYED NOTES
					AIRFLOW CFM	E.D.B. °F	L.D.B. °F	MAXIMUM A.P.D. IN. W.G.		FLOW GPM	FLUID TYPE	E.W.T. °F	L.W.T. °F	MAXIMUM W.P.D. FT. HEAD			
HC-1	MS GYM	3	11	460	10,000	48	90	0.25	22.5	23.0	W	130	90	5.5	5	5WQ1103B	
HC-2	MS GYM	3	11	460	10,000	48	90	0.25	22.5	23.0	W	130	90	5.5	5	5WQ1103B	

GENERAL NOTES:
1. MODEL NUMBERS ARE TRANE UNLESS OTHERWISE NOTED.
2. COIL SELECTION BASED ON .00025 FOULING FACTOR.
3. FLUID TYPE: W = WATER, PGXX = PROPYLENE GLYCOL SOLUTION XX PERCENTAGE OF GLYCOL, EGXX = ETHYLENE GLYCOL SOLUTION XX PERCENTAGE OF GLYCOL.

PUMP SCHEDULE

UNIT IDENTIFICATION	SYSTEM SERVED	LOCATION	TYPE	COUPLING TYPE	WATERFLOW GPM	FLUID TYPE	COLDEST SYSTEM OPERATING TEMP. °F FOR PUMP SELECTION	PUMP HEAD FT.	OVERLOAD GPM	MINIMUM EFFICIENCY %	MOTOR			MODULATION/ CONTROL TYPE	ELECTRICAL				MODEL NUMBER	KEYED NOTES
											BHP	HP	RPM		VOLTS	PHASE	SCCR KA (NOTE 4)	OPTIONS/ ACCESSORIES		
CP-1A	HC-1	MS GYM	INLINE	CLOSE	23	WATER	60	15	NON-OVERLOADING	61	0.154	1/3	1800	AUTO	120	1	10		E90-1.25AAB	PRIMARY
CP-1B	HC-1	MS GYM	INLINE	CLOSE	23	WATER	60	15	NON-OVERLOADING	61	0.154	1/3	1800	AUTO	120	1	10		E90-1.25AAB	BACKUP
CP-2A	HC-2	MS GYM	INLINE	CLOSE	23	WATER	60	15	NON-OVERLOADING	61	0.154	1/3	1800	AUTO	120	1	10		E90-1.25AAB	PRIMARY
CP-2B	HC-2	MS GYM	INLINE	CLOSE	23	WATER	60	15	NON-OVERLOADING	61	0.154	1/3	1800	AUTO	120	1	10		E90-1.25AAB	BACKUP

GENERAL NOTES:
1. REFER TO SCHEDULES GENERAL NOTES.
2. MODEL NUMBER ARE BELL & GOSSETT UNLESS OTHERWISE NOTED.
3. FLUID TYPE: W = WATER, PGXX = PROPYLENE GLYCOL SOLUTION XX PERCENTAGE OF GLYCOL, EGXX = ETHYLENE GLYCOL SOLUTION XX PERCENTAGE OF GLYCOL.
4. CONTROLLER (E.G. VARIABLE FREQUENCY CONTROLLER, MOTOR STARTER) FOR SPECIFIED EQUIPMENT SHALL BE MANUFACTURED AND MARKED PER NEC WITH A MINIMUM SHORT CIRCUIT CURRENT RATING AS INDICATED.

GRILLE, REGISTER, AND DIFFUSER SCHEDULE

UNIT IDENTIFICATION	TYPE	FACE SIZE	NECK SIZE	FRAME TYPE	ACCESSORY	CONSTRUCTION	FINISH	MODEL NUMBER	KEYED NOTES
R-1	GRILLE	48x20	SEE PLANS	F	--	STEEL	CUSTOM COLOR	95	

GENERAL NOTES:
1. MODEL NUMBERS ARE PRICE UNLESS OTHERWISE NOTED.

HORIZONTAL PIPING AND SUPPORT APPLICATION SCHEDULE

	HANGER OR SUPPORT TYPE						SHIELD TYPE			
METAL PIPE TYPE & SIZE	MSS TYPE 1 CLEVIS HANGER	MSS TYPE 10 SWIVEL RING BAND HANGER	MSS TYPE 41 DOUBLE ROD PIPE ROLLER	MSS TYPE 43 SINGLE ROD ROLLER HANGER	MSS TYPE 44 PIPE ROLLER & STAND	MSS TYPE 46 ADJUSTABLE PIPE ROLL STAND	MSS TYPE 39 PROTECTION SADDLE	MSS TYPE 40 INSULATION PROTECTION SHIELD	THERMAL-HANGER SHIELD	KEYED NOTES
UNINSULATED SINGLE PIPE										
UP TO 2 INCH	X	X								
2-1/2 INCH TO 4 INCH	X	X								
6 INCH TO 8 INCH	X									
10 INCH	X									
12 INCH			X							
14 INCH AND LARGER			X							
INSULATED SINGLE COLD PIPES										
UP TO 2 INCH	X	X						X	X	A
2-1/2 INCH TO 4 INCH	X								X	
6 INCH TO 8 INCH	X								X	
10 INCH	X								X	
12 INCH	X								X	
14 INCH AND LARGER	X								X	
INSULATED SINGLE HOT PIPES										
UP TO 2 INCH	X	X					X	X	X	A, C
2-1/2 INCH TO 4 INCH			X	X	X	X	X		X	B, C
6 INCH TO 8 INCH			X	X	X	X	X		X	B, C
10 INCH			X	X	X	X	X		X	B, C
12 INCH			X		X	X	X		X	B, C
14 INCH AND LARGER			X				X		X	B, C

GENERAL NOTES

1. "X" INDICATES APPROVED HANGER OR SUPPORT ELEMENTS. IF MORE THAN ONE HANGER OR SUPPORT ELEMENT IS INDICATED, SELECTION FROM APPROVED ELEMENTS IS CONTRACTOR'S OPTION.
2. REFER TO HANGER AND SUPPORT SECTION FOR APPROVED MANUFACTURERS.
3. HANGERS AND SUPPORTS USED FOR FIRE PROTECTION SERVICES SHALL BE UL LISTED OR FMG APPROVED.
4. HANGER ELEMENTS IN CONTACT WITH BARE COPPER PIPE SHALL BE COPPER PLATED, PLASTIC COATED, FELT LINED, OR USE MANUFACTURED COPPER TUBE ISOLATORS.
5. REFER TO INDIVIDUAL PIPING SPECIFICATION SECTIONS FOR HANGER SPACING.
6. MULTIPLE PARALLEL COLD PIPES MAY BE TRAPEZE SUPPORTED FROM BELOW USING U-BOLTS OR STRUT CLAMPS AND THERMAL HANGER SHIELDS. REFER TO KEYED NOTE A.
7. MULTIPLE PARALLEL COLD PIPES MAY BE TRAPEZE SUPPORTED FROM ABOVE USING STANDARD HANGER ELEMENTS INDICATED FOR SINGLE COLD PIPES.
8. MULTIPLE PARALLEL HOT PIPES MAY BE TRAPEZE SUPPORTED FROM BELOW USING ROLLER ELEMENTS AND THERMAL HANGER SHIELD OR INSULATION PROTECTION SADDLE. REFER TO KEYED NOTES B AND C.
9. MULTIPLE PARALLEL HOT PIPES MAY BE TRAPEZE SUPPORTED FROM ABOVE USING STANDARD ROLLER HANGERS INDICATED AND THERMAL HANGER SHIELD OR INSULATION PROTECTION SADDLE. REFER TO KEY NOTES B AND C.
10. REFER TO INDIVIDUAL PIPING SPECIFICATION SECTIONS FOR ADDITIONAL SYSTEM SPECIFIC HANGER APPLICATIONS.

KEYED NOTES

A. USE THERMAL HANGER SHIELD ON TRAPEZE SUPPORTED INSULATED PIPE TO PREVENT CRUSHING OF INSULATION.
B. USE THERMAL HANGER SHIELD DESIGNED FOR USE ON ROLLER SUPPORTS FOR INSULATED HOT PIPE .
C. USE TYPE 39 PROTECTION SADDLES IF INSULATION WITHOUT VAPOR BARRIER IS INDICATED. FILL INTERIOR VOIDS WITH INSULATION MATCHING ADJOINING INSULATION.

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DATE	ISSUED FOR
11/20/24	DD
12/02/24	COORDINATION
12/06/24	50% CD
01/17/25	BID SET

STATE OF MICHIGAN
DENNIS P. SCZOMAK
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PIC: WEK
PM: WEK
DRAFTS: EMW

PROJECT NO: 22.516 MS

SHEET TITLE: MECHANICAL SCHEDULES

SHEET NO: M7.2

g:\2024\2024-0338-00\CAD\50 casd ms gym air conditioning\2024-0338-M7-SH2.dwg, M7.2, 1/16/2025 4:40:23 PM, Robert W. MacKinnon, Peter Basso Associates Inc.

TEMPERATURE CONTROL - SYMBOLS LIST

SCHEMATIC SYMBOLS

SYMBOL	DESCRIPTION
AFC	AIR FLOW CONTROLLER
AQ	AQUASTAT, STRAP ON BULB
CO2	CARBON DIOXIDE SENSOR – WALL MOUNTED
CO2	CARBON DIOXIDE SENSOR – DUCT MOUNTED
CO	CARBON MONOXIDE SENSOR – WALL MOUNTED
CO	CARBON MONOXIDE SENSOR – DUCT MOUNTED
CS	CURRENT SWITCH
CT	CURRENT TRANSMITTER
	DAMPER – INLET VANES
	DAMPER – OPPOSED BLADE
	DAMPER – PARALLEL BLADE
M	DAMPER MOTOR
M	DAMPER MOTOR W/ POSITIVE POSITIONER
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
DPS	DIFFERENTIAL PRESSURE SWITCH
EP	ELECTRIC–PNEUMATIC RELAY
EPT	ELECTRIC TO PNEUMATIC TRANSDUCER
CM	FIRE ALARM SYSTEM, ADDRESSABLE CONTROL MODULE
IM	FIRE ALARM SYSTEM, ADDRESSABLE INTERFACE MODULE
FMS	FLOW MEASURING STATION
FM	FLOW METER
FS	FLOW SWITCH
FZ	FREEZESTAT
F	GAUGE – FLOW
P	GAUGE – PRESSURE
T	GAUGE – TEMPERATURE
	GUARD FOR STAT OR SENSOR
	HUMIDIFIER
H	HUMIDISTAT OR HUMIDITY SENSOR (AS DEFINED ON TC DRAWINGS)
H	HUMIDITY SENSOR, DUCT MOUNTED
LVL	LEVEL SWITCH OR TRANSMITTER
LS	LIMIT SWITCH
	LINE – ELECTRIC
	LINE – PNEUMATIC
M	MAIN CONTROL AIR SUPPLY
M/S	MOTOR STARTER
OS	OCCUPANCY SENSOR
R	PILOT LIGHT OR BEACON R – RED LENS A – AMBER LENS B – BLUE LENS G – GREEN LENS
PE	PNEUMATIC–ELECTRIC SWITCH
PS	PRESSURE SWITCH
PT	PRESSURE TRANSMITTER
R	RELAY, ELECTRIC
N	SELECTOR SWITCH, (N=NUMBER OF POSITIONS)
AI	SIGNAL – DDC/BAS, ANALOG INPUT
AO	SIGNAL – DDC/BAS, ANALOG OUTPUT
DI	SIGNAL – DDC/BAS, DIGITAL INPUT
DO	SIGNAL – DDC/BAS, DIGITAL OUTPUT
AI	SIGNAL – PACKAGED EQUIPMENT, ANALOG INPUT
AO	SIGNAL – PACKAGED EQUIPMENT, ANALOG OUTPUT
DI	SIGNAL – PACKAGED EQUIPMENT, DIGITAL INPUT
DO	SIGNAL – PACKAGED EQUIPMENT, DIGITAL OUTPUT

SCHEMATIC SYMBOLS (CONT.)

SYMBOL	DESCRIPTION
DD	SMOKE DETECTOR – DUCT MOUNTED
SD	SMOKE DETECTOR – SPACE MOUNTED
S/S	START/STOP RELAY
SPT	STATIC PRESSURE TRANSMITTER
SP	STATIC PRESSURE SENSOR OR PROBE
SW	SWITCH
T	TEMPERATURE SENSOR – RIGID ELEMENT IN WELL
T	TEMPERATURE SENSOR – STRAP ON BULB
T	TEMPERATURE SENSOR – DUCT MOUNTED AVG ELEMENT
T	TEMPERATURE SENSOR – DUCT MOUNTED RIGID ELEMENT
T	THERMOSTAT OR TEMPERATURE SENSOR (AS DEFINED ON TC DRAWINGS)
TN	THERMOSTAT FOR NIGHT SETBACK
XF	TRANSFORMER
	VALVE – 2 WAY CONTROL VALVE
	VALVE – 3 WAY CONTROL VALVE
M	VALVE – 2 WAY CONTROL W/ POSITIONER
M	VALVE – 3 WAY CONTROL W/ POSITIONER
VFC	VARIABLE FREQUENCY CONTROLLER
VS	VELOCITY SENSOR
VIB	VIBRATION SWITCH
V	VOLTAGE SENSOR

WIRING SYMBOLS

SYMBOL	DESCRIPTION
	AUDIBLE DEVICE (AS DEFINED ON TC DRAWINGS)
M/S	COIL – MOTOR STARTER CONTACTOR
R	COIL – RELAY
TDR	COIL – TIME DELAY RELAY
VFC	COIL – VARIABLE FREQUENCY CONTROLLER CONTACTOR
	COIL – EP OR SOLENOID VALVE
	CONTACT – INSTANT OPERATING, NO
	CONTACT – INSTANT OPERATING, NC
	CONTACT – TIMED AFTER COIL IS ENERGIZED, NOTC
	CONTACT – TIMED AFTER COIL IS ENERGIZED, NCTO
	CONTACT – TIMED AFTER COIL IS DE–ENERGIZED, NOTO
	CONTACT – TIMED AFTER COIL IS DE–ENERGIZED, NCTC
	GROUND
	MOTOR, SINGLE PHASE
R	PILOT LIGHT OR BEACON R – RED LENS A – AMBER LENS B – BLUE LENS G – GREEN LENS
R	PILOT LIGHT, WITH PUSH–TO–TEST
	PUSH BUTTON – MOMENTARY CONTACT, NO
	PUSH BUTTON – MOMENTARY CONTACT, NC
	PUSH BUTTON – MOMENTARY CONTACT, NO & NC
	PUSH BUTTON – MOMENTARY, NO (MUSHROOM HEAD)
	PUSH BUTTON – MOMENTARY, NC (MUSHROOM HEAD)

WIRING SYMBOLS (CONT.)

SYMBOL	DESCRIPTION
1 2	SWITCH – 2 POSITION SELECTOR
H O A	SWITCH – 3 POSITION SELECTOR HAND/OFF/AUTO
	SWITCH – FLOW (AIR, WATER, ETC.), NO
	SWITCH – FLOW (AIR, WATER, ETC.), NC
	SWITCH – LIMIT, NO, HELD CLOSED
	SWITCH – LIMIT, NC
	SWITCH – LIMIT, NC, HELD OPEN
	SWITCH – LIQUID LEVEL, NO
	SWITCH – LIQUID LEVEL, NC
	SWITCH – MANUAL SPST, NO
	SWITCH – MANUAL DPDT, NO
	SWITCH – MANUAL SPST, NC
	SWITCH – MANUAL DPDT, NC
	SWITCH – MANUAL SPDT
	SWITCH – MANUAL DPDT
	SWITCH – PRESSURE & VACUUM, NO
	SWITCH – PRESSURE & VACUUM, NC
	SWITCH – TEMPERATURE ACTUATED, NO
	SWITCH – TEMPERATURE ACTUATED, NC
	THERMAL OVERLOAD, SINGLE PHASE
OL'S	THERMAL OVERLOAD CONTACTS – 3 PHASE
	TRANSFORMER
	WIRE TERMINATION AT DEVICE
	WIRE TO WIRE TERMINATION
	WIRING NOT CONNECTED

WIRING TERMS

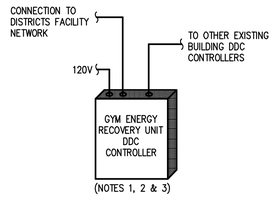
ABBREVIATION	DESCRIPTION
SPST	SINGLE POLE SINGLE THROW
SPDT	SINGLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DPDT	DOUBLE POLE DOUBLE THROW
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
NOTO	NORMALLY OPEN TIMED OPEN
NOTC	NORMALLY OPEN TIMED CLOSED
NCTO	NORMALLY CLOSED TIMED OPEN
NCTC	NORMALLY CLOSED TIMED CLOSED

PNEUMATIC CONTROL SYMBOLS (ADDITIONAL)

SYMBOL	DESCRIPTION
LA	LOAD ANALYZER
LR	LOW PRESSURE SELECTOR RELAY
	MANUAL GRADUAL POSITION SWITCH
PS	PNEUMATIC SWITCH
RR	RATIO RELAY
RC	RECEIVER CONTROLLER
	SWITCHED CONTROL AIR SUPPLY

NOTE: SOME SYMBOLS & ABBREVIATIONS SHOWN MAY NOT APPLY TO THIS PROJECT.

NOTE: REFER TO MECHANICAL STANDARDS ON DRAWING M0.1 FOR ADDITIONAL SYMBOLS & ABBREVIATIONS THAT MAY BE USED ON TEMPERATURE CONTROL DRAWINGS.



DDC SYSTEM ARCHITECTURE

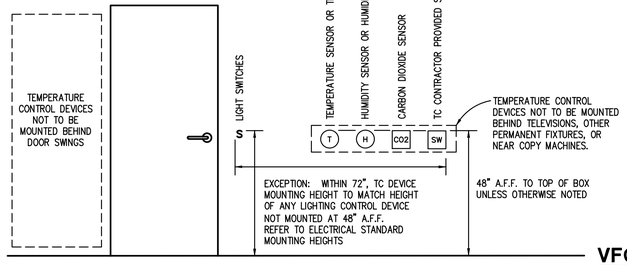
NO SCALE

NOTES:

1. REFER TO TEMPERATURE CONTROL SCHEMATICS FOR THE REQUIRED POINTS ASSOCIATED FOR EACH SYSTEM.
2. TC CONTRACTOR SHALL PROVIDE SYSTEM NETWORK CONTROL GRAPHICS FOR ALL NEW WORK. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
3. TC CONTRACTOR SHALL PROVIDE REQUIRED POWER SUPPLIES FROM DEDICATED AND/OR SPARE CIRCUITS IDENTIFIED ON ELECTRICAL PANEL SCHEDULES. COORDINATE WITH ELEC CONTRACTOR. REFER TO ELECTRICAL DWGS FOR PANEL SCHEDULES AND PANEL LOCATIONS.

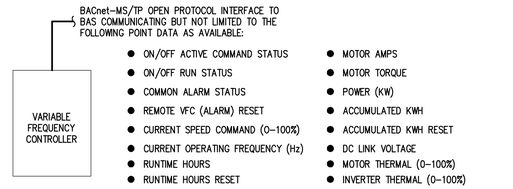
TEMPERATURE CONTROL GENERAL NOTES

1. THESE GENERAL SHALL BE APPLICABLE FOR ALL TC DRAWINGS.
2. "PROVIDE" IS DEFINED AS "FURNISH AND INSTALL".
3. TC CONTRACTOR SHALL BE RESPONSIBLE TO COMPLY WITH ALL APPLICABLE CODES AND STANDARDS.
4. THE PORTIONS OF CONTROL DIAGRAMS AND WIRING DIAGRAMS DRAWN IN HEAVY LINE WEIGHT INDICATE NETWORK. THE PORTIONS DRAWNS IN LIGHT LINE WEIGHT INDICATE EXISTING.
5. ALL CONTROL SCHEMATICS AND WIRING DIAGRAMS ARE FOR THE CLARIFICATION OF EQUIPMENT INTERLOCKING FUNCTIONS AND THE INTERFACE OF VARIOUS CONTRACTORS'S WORK AND SHALL NOT BE MISTAKEN AS SHOP DRAWINGS FOR ACTUAL INSTALLATION.
6. TC CONTRACTOR SHALL PROVIDE DDC CONTROLLERS AS REQUIRED TO MEET INTENT OF DESIGN DOCUMENTS. REFER TO THE PLANS FOR THE DDC FUNCTIONS THAT APPLY TO EACH MECHANICAL SYSTEM.
7. ALL TC PROVIDED COMPONENTS, AND ALL TC CONTRACTOR INSTALLED WIRING AND SHALL BE LABELED PER SPECIFICATIONS.
8. ALL WIRING AND SYSTEM CONTROL VOLTAGES SHALL BE IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURER'S RECOMMENDATION AND THE ELECTRICAL SPECIFICATIONS.
9. DESIGNATES DEVICE TO BE MOUNTED IN T.C. PANEL.
10. DUCT SMOKE DETECTORS SHALL BE FURNISHED, INSTALLED AND WIRED TO THE FIRE ALARM SYSTEM BY THE ELECTRICAL TC CONTRACTOR SHALL PROVIDE DUCT SMOKE DETECTOR WIRING INTERLOCK TO MOTOR STARTERS OR VSD'S.
11. ALL DDC AND CONTROL INTERLOCK WIRING SHALL BE BY TC CONTRACTOR UNLESS OTHERWISE NOTED. TC CONTRACTOR SHALL COORDINATE WITH VSD AND MOTOR STARTER SUPPLIERS TO DETERMINE EXACT WIRING REQUIREMENTS AND TERMINATION POINTS.
12. ALL DDC AND CONTROL INTERLOCK WIRING BETWEEN COMPONENTS SHALL BE INSTALLED WITHOUT INTERMEDIATE STOPS. WIRE SPLICING AT INTERMEDIATE TERMINAL STRIPS IS NOT ACCEPTABLE.
13. ALL ELECTRICAL WIRING AND RACEWAY SYSTEMS SHALL COMPLY WITH ELECTRICAL SPECIFICATION REQUIREMENTS. TWO SEPERATE ELECTRICAL RACEWAY SYSTEMS SHALL BE PROVIDED: ONE FOR A.C. WIRING AND THE OTHER FOR D.C. WIRING.
14. TC CONTRACTOR SHALL BE RESPONSIBLE FOR ALL POWER SUPPLIES REQUIRED FOR TC SYSTEM UNLESS OTHERWISE NOTED. REFER TO ELECTRICAL PANEL SCHEDULES FOR SPARE CIRCUITS OR CIRCUITS DEDICATED TO TEMPERATURE CONTROLS. COORDINATE CIRCUIT USE WITH ELECTRICAL CONTRACTOR.
15. TC CONTRACTOR SHALL VERIFY EXACT LOCATION OF ALL FIELD MOUNTED COMPONENTS.
16. THERMOSTATS AND SPACE TEMPERATURE SENSORS SHALL BE MOUNTED 4'–0" ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.
17. TC CONTRACTOR SHALL PROVIDE AUXILIARY PANELS FOR REQUIRED PANEL MOUNTED EQUIPMENT SUCH AS RELAYS, TRANSDUCERS, CONTROL TRANSFORMERS, ETC. AUXILIARY PANELS SHALL BE LOCATED NEXT TO ASSOCIATED DDC PANEL.
18. REMOTELY MOUNTED FIELD DEVICES SUCH AS RELAYS, CONTROL TRANSFORMERS, ETC., SHALL BE HOUSE IN AN ENCLOSURE PROVIDED BY THE TC CONTRACTOR.
19. CONTROL TRANSFORMERS WHEN REQUIRED SHALL BE SIZED FOR 150% OF ACTUAL LOAD.
20. FREEZE–STATS SHALL BE MOUNTED ON UPSTREAM FACE OF COOLING COILS.
21. CURRENT SWITCHES USED FOR OPERATIONAL STATUS SHALL HAVE CURRENT THRESHOLD SETPOINT ADJUSTED TO INDICATE BELT OR DRIVE FAILURE.
22. ALL CONTROL VALVES, CONTROL DAMPERS AND ASSOCIATED CONTROL ACTUATORS IDENTIFIED ON TC DRAWINGS SHALL BE FURNISHED BY TC CONTRACTOR UNLESS OTHERWISE NOTED. DAMPER SIZE AND LOCATIONS ARE INDICATED ON MECHANICAL FLOOR PLAN DRAWINGS.
23. ALL CONTROL VALVES AND DAMPERS FURNISHED BY THE TC CONTRACTOR SHALL BE INSTALLED BY THE MECHANICAL CONTRACTOR. ALL PIPE PENETRATIONS AND BASIC FITTINGS REQUIRED FOR SENSOR INSTALLATIONS SHALL BE PROVIDED BY MECHANICAL CONTRACTOR.
24. DAMPER ACTUATORS SHALL BE INSTALLED BY TC CONTRACTOR.
25. ALL INSTRUMENTATION TUBING REQUIRED FOR DPS, DPT AND SPT COMPONENT INSTALLATIONS SHALL BE PROVIDED BY TC CONTRACTOR.
26. TC CONTRACTOR SHALL FIELD MOUNT ALL REQUIRED PACKAGED CONTROL COMPONENTS FURNISHED BY EQUIPMENT SUPPLIERS WHERE INDICATED. ALL REQUIRED 24V PACKAGED CONTROL FIELD WIRING AND 120V FAN INTERLOCK WIRING SHALL BE PROVIDED BY TC CONTRACTOR UNLESS NOTED OTHERWISE. TC CONTRACTOR SHALL COORDINATE SPECIFIC SYSTEM WIRING REQUIREMENTS WITH PACKAGED EQUIPMENT SUPPLIERS.



TC DEVICE STANDARD MOUNTING HEIGHTS DETAIL

NO SCALE



VFC BACnet INTERFACE & MONITORING REQUIREMENTS

TYPICAL FOR NEW FAN & PUMP VFCs

NOTE:

TC CONTRACTOR SHALL COORDINATE BACnet–MS/TP OPEN PROTOCOL WIRE TERMINATION REQUIREMENTS AND POINT INTEGRATION CAPABILITIES WITH VFC SUPPLIER/MANUFACTURER AND PROVIDE APPROPRIATE BAS COMPONENTS FOR COMMUNICATION INTERFACE TO BAS.

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LICENSED PROFESSIONAL ENGINEER

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PM:	WEK
DRAFTS:	EMW

PROJECT NO: 22.516 MS

SHEET TITLE: TEMPERATURE CONTROL STANDARDS AND GENERAL NOTES

SHEET NO: M8.1

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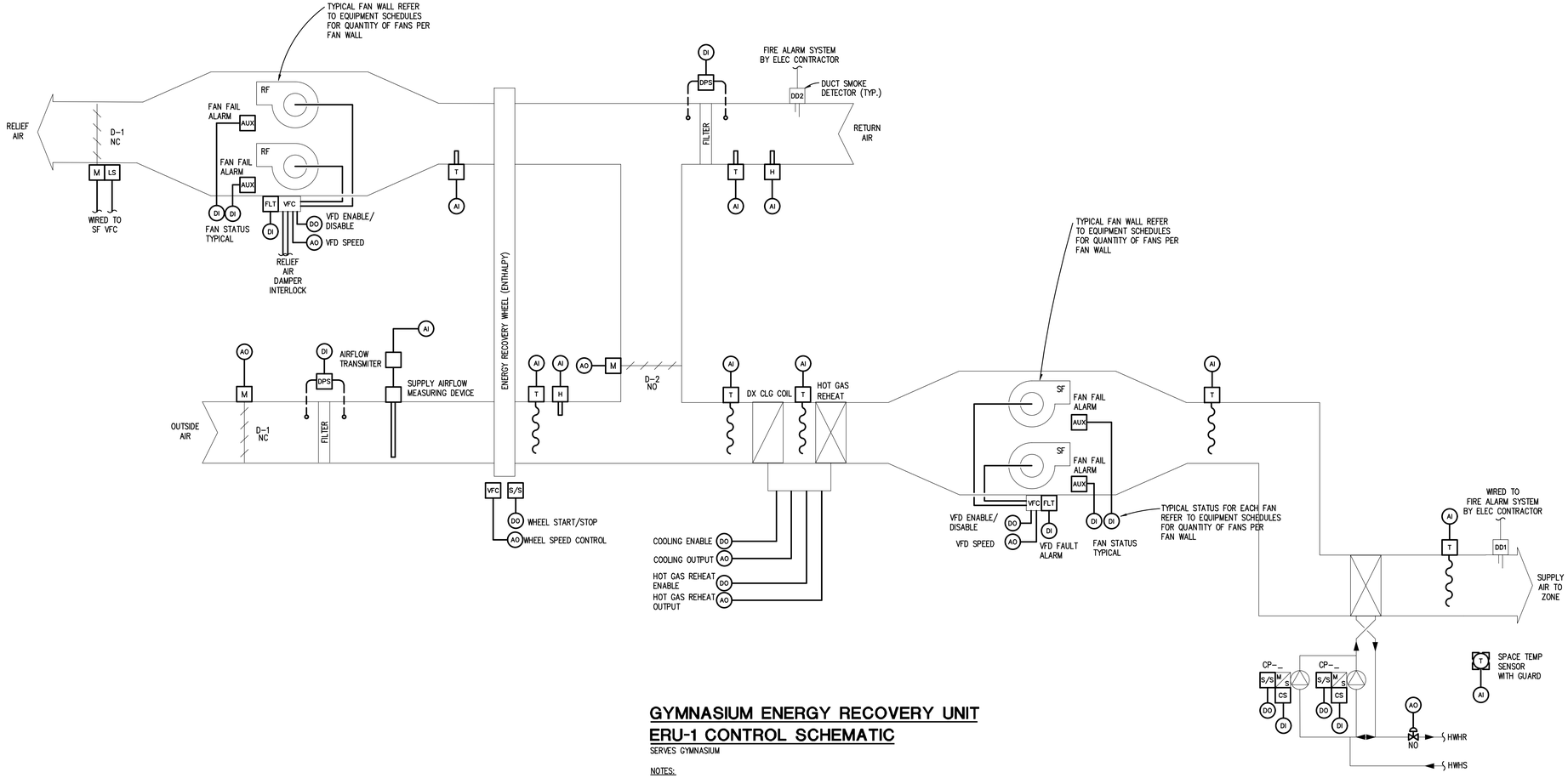
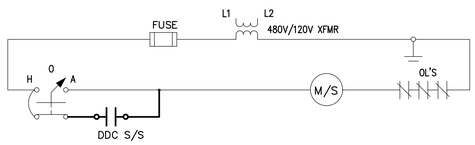


GYMNASIUM ENERGY RECOVERY UNIT ERU-1 CONTROL SCHEMATIC

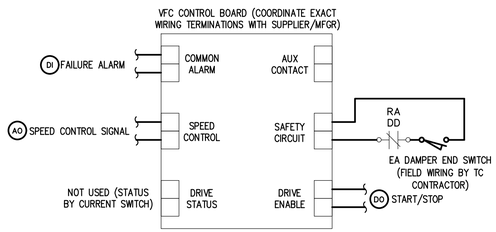
SERVES GYMNASIUM

NOTES:

1. DAMPERS SHALL BE FURNISHED AND FACTORY INSTALLED BY ERU MANUFACTURER. TC CONTRACTOR SHALL PROVIDE DAMPER ACTUATORS.
2. ELECTRICAL CONTRACTOR SHALL PROVIDE FIRE ALARM SYSTEM COMPONENTS AND WIRING FROM FIRE ALARM PANEL TO CONTROL MODULE. TC CONTRACTOR SHALL PROVIDE WIRING FROM CONTROL MODULE TO VFC SAFETY CIRCUIT.
3. COORDINATE EXACT CONTROL, WIRING, AND INTERFACE REQUIREMENTS WITH EQUIPMENT SUPPLIER. REQUIREMENTS MAY VARY DEPENDING ON MANUFACTURER.



TYPICAL COIL CIRC PUMP CP- M/S WIRING

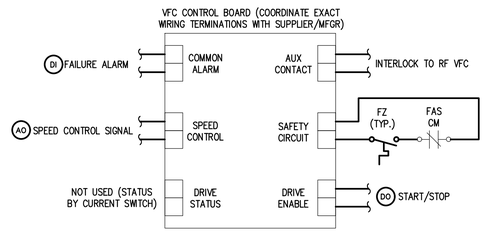


TYPICAL ERU RF VFC WIRING

TYPICAL FOR ERU-1 SERVING GYMNASIUM

NOTE:

1. WIRING DETAIL IDENTIFIES INTENT AND DOES NOT INDICATE ACTUAL WIRING REQUIREMENTS. CONSULT WITH VFC SUPPLIER FOR THE ACTUAL WIRING REQUIREMENTS.



TYPICAL ERU SF VFC WIRING

TYPICAL FOR ERU-1 SERVING GYMNASIUM

NOTE:

1. WIRING DETAIL IDENTIFIES INTENT AND DOES NOT INDICATE ACTUAL WIRING REQUIREMENTS. CONSULT WITH VFC SUPPLIER FOR THE ACTUAL WIRING REQUIREMENTS.

SEQUENCE OF OPERATION

ENERGY RECOVERY UNIT CONTROL:

NOTE: ALL SETPOINTS DESCRIBED IN SEQUENCE SHALL BE ADJUSTABLE BY SYSTEM OPERATORS (CREATE REQUIRED VIRTUAL POINTS). APPROPRIATE DEADBANDS SHALL BE USED TO PREVENT SHORT CYCLING SITUATIONS.

1. SUPPLY FAN SHALL HAVE START/STOP CAPABILITY FROM THE DDC SYSTEM. ERU SHALL OPERATE BASED ON TIME SCHEDULED OCCUPIED MODE (COMPENSATED BY OPTIMUM START PROGRAM) AND UNOCCUPIED CYCLE MODE.
2. DURING OCCUPIED MODE, EXHAUST FAN SHALL RUN CONTINUOUSLY. EXHAUST FAN SHALL REMAIN OFF FOR UNOCCUPIED CYCLING AND WARM-UP MODES OF OPERATION
3. SUPPLY AND EXHAUST FAN'S SHALL BE EQUIPPED WITH ECM MOTORS AND CONTROLLED BY TC CONTRACTOR TO MAINTAIN PROPER CONSTANT VOLUME AIR FLOW AND BALANCING. TC CONTRACTOR SHALL COORDINATE WITH TAB CONTRACTOR FOR PROPER ECM MOTOR SPEED CONTROL.
4. WHEN THE CONTROL CIRCUIT OF THE EXHAUST FAN IS ENERGIZED TO START, IT'S RESPECTIVE ISOLATION AIR DAMPER SHALL FULLY OPEN FIRST. AFTER THE DAMPER IS FULLY OPEN, THE ISOLATION AIR DAMPER LIMIT SWITCH SHALL COMPLETE THE CONTROL CIRCUITS TO START THE EXHAUST FAN.
5. FOR HEATING OCCUPIED MODE, ERU SHALL BE CONTROLLED TO MAINTAIN SPACE TEMP SETPOINT OF 70°F.
6. FOR COOLING OCCUPIED MODE, ERU SHALL BE CONTROLLED TO MAINTAIN SPACE TEMP SETPOINT OF 76°F.
7. FOR HEATING UNOCCUPIED MODE, ERU SHALL CYCLE ON & OFF TO MAINTAIN A SETBACK SPACE TEMP SETPOINT OF 62°F.
8. FOR COOLING UNOCCUPIED MODE, ERU SHALL CYCLE ON & OFF TO MAINTAIN A SETUP SPACE TEMP SETPOINT OF 85°F.
9. SUPPLY FAN AND EXHAUST FAN STATUS SHALL BE MONITORED BY DDC SYSTEM THRU RESPECTIVE CURRENT SWITCHES. ABNORMAL STATUS CONDITION FOR SF OR EF SHALL ACTIVATE ALARM.
10. WHEN ERU IS ACTIVATED DURING OCCUPIED MODE; OUTSIDE & RETURN AIR (MIXED AIR) DAMPERS AND ENERGY RECOVERY WHEEL SHALL BE ALLOWED TO MODULATE AS DESCRIBED. WHEN ERU IS DEACTIVATED OR OPERATING IN UNOCCUPIED CYCLE MODE OR MORNING WARM-UP MODE, DAMPERS SHALL REMAIN IN NORMAL POSITIONS (FULL CLOSED TO OA) AND ENERGY RECOVERY WHEEL AND EXHAUST FAN SHALL REMAIN OFF.
11. DURING THE OCCUPIED PERIOD, THE OUTSIDE AIR FLOW MEASURING DEVICE THROUGH DDC SHALL MODULATE THE OUTSIDE AIR DAMPER (D-1) AND RECIRCULATION DAMPER (D-2) TO MAINTAIN A MINIMUM OUTSIDE AIR FLOW VOLUME FROM IT MIN/MIN POSITION TO MIN/MAX OA POSITION (REFER TO ERU EQUIPMENT SCHEDULE FOR MIN/MIN AND MIN/MAX AIR FLOW SETPOINTS.
12. VFC COMMON FAILURE ALARM FOR SF SHALL BE MONITORED BY DDC THRU AVAILABLE CONTACTS AT FAN VFC.
13. WHEN SPACE TEMP IS BELOW HEATING SETPOINT, DDC SHALL KEEP MIXED AIR DAMPERS AT MINIMUM OA POSITION, KEEP ENERGY RECOVERY WHEEL RUNNING AT FULL SPEED, AND MODULATE THE ZONE HOT WATER HEATING COIL CONTROL VALVE TO ACHIEVE SETPOINT. IN HEATING MODE, DISCHARGE AIR TEMP LOW LIMIT SETPOINT OF 60°F SHALL PROVIDE OVERRIDE CONTROL.
14. HWH CIRC PUMPS ASSOCIATED WITH HEATING COIL SHALL HAVE START/STOP CAPABILITY FROM THE THE COIL PUMP SHALL BE ACTIVATED BY DDC TO OPERATE CONTINUOUSLY WHEN OA TEMP IS LESS THAN 55°F WHEN RTU IS ACTIVATED OR WHEN OA TEMP IS LESS THAN 35°F REGARDLESS OF RTU ACTIVATION. THE OTHER COIL CIRCULATING PUMP WILL SERVE AS STANDBY. BAS SHALL ALTERNATE PUMP OPERATION ON A WEEKLY BASIS. BAS SHALL MONITOR OPERATING STATUS OF EACH PUMP. UPON PUMP FAILURE, BAS SHALL ACTIVATE FAILURE ALARM AND AUTOMATICALLY START THE STANDBY PUMP.
15. DURING MORNING WARM-UP OR UNOCCUPIED MODE HEATING CYCLE, DAT SETPOINT SHALL BE 95°F UNTIL BUILDING OCCUPANCY TIME OR WHEN SPACE TEMPERATURE SETPOINT IS REACHED.
16. WHEN SPACE TEMP IS ABOVE COOLING SETPOINT AND OUTDOOR AIR TEMPERATURE IS GREATER THAN 70°F, DDC SHALL KEEP MIXED AIR DAMPERS AT MINIMUM OA POSITION, KEEP ENERGY RECOVERY WHEEL AT FULL SPEED, AND STAGE DX COOLING TO MAINTAIN SPACE TEMP SETPOINT. IN COOLING MODE, DISCHARGE AIR TEMP LOW LIMIT SETPOINT OF 45°F SHALL PROVIDE OVERRIDE CONTROL.
17. WHEN SPACE TEMP IS ABOVE COOLING SETPOINT AND OUTDOOR AIR TEMPERATURE IS LESS THAN 70°F, DDC SHALL MODULATE MIXED AIR DAMPERS ABOVE MINIMUM OA POSITION AND DECREASE WHEEL SPEED TO MAINTAIN SPACE TEMP SETPOINT. IN COOLING MODE, DISCHARGE AIR TEMP LOW LIMIT SETPOINT OF 45°F SHALL PROVIDE OVERRIDE CONTROL.
18. WHENEVER THE RETURN AIR HUMIDITY RISES ABOVE 60 PERCENT RELATIVE HUMIDITY (ADJUSTABLE), THE DX COOLING COILS DISCHARGE TEMPERATURE SETPOINT SHALL BE 50 DEGREES FAHRENHEIT AND THE HOT GAS REHEAT SHALL BE ENABLED AND MODULATED TO MAINTAIN DISCHARGE AND SPACE TEMPERATURE SETPOINTS.
19. DURING THE OCCUPIED MODE, THE RETURN AIR CARBON DIOXIDE (CO2) SENSOR THROUGH THE DDC SHALL OVERRIDE THE MIXED AIR DAMPER CONTROL TO MODULATE THE OUTSIDE AIR DAMPER TOWARDS OPEN AND RETURN AIR DAMPER TOWARDS CLOSE TO PREVENT THE CO2 LEVEL IN THE SPACE FROM RISING ABOVE 1,000 PARTS PER MILLION (PPM). WHEN OUTSIDE AIR TEMPERATURE IS 40 DEGREES F. OR BELOW AND THE CARBON DIOXIDE (CO2) DEMAND CONTROL IS ACTIVE, THE OUTSIDE AIR DAMPER DAMPER SHALL BE LIMITED TO A MIN/MAX AIRFLOW (REFER TO THE ERU EQUIPMENT SCHEDULE FOR MIN/MIN AND MIN/MAX OUTSIDE AIR FLOW SETPOINTS) AS MEASURED BY THE OUTSIDE AIR FLOW MEASURING DEVICE THROUGH DDC..
20. ENERGY RECOVERY WHEEL DEFROST CYCLE SHALL BE ACTIVATED WHEN THE WHEEL EXHAUST DISCHARGE AIR TEMPERATURE DROPS BELOW 35° F (ADJUSTABLE). DDC SHALL REDUCE ENERGY RECOVERY WHEEL SPEED TO KEEP EXHAUST AIR TEMPERATURE FROM FALLING BELOW 35°F.
21. DISCHARGE AIR TEMPERATURE LOW-LIMIT ALARM SHALL ACTIVATE REMOTE WARNING AT DDC SYSTEM FRONT-END WHEN TEMPERATURE IS 35°F OR BELOW. DISCHARGE AIR TEMPERATURE LOW-LIMIT CUTOUT THRU DDC SHALL DEACTIVATE ERU AND ACTIVATE REMOTE ALARM WHEN DISCHARGE AIR TEMP FALLS BELOW 30°F. LOW-LIMIT CUTOUT SHALL BE MANUALLY RESET THRU DDC.
22. DUCT SMOKE DETECTOR(S) SHALL DEACTIVATE SF AND EF WHEN PRODUCTS OF COMBUSTION ARE DETECTED.
23. SUPPLY AND EXHAUST FILTER STATUS SHALL BE MONITORED BY DDC SYSTEM THRU DIFFERENTIAL PRESSURE SWITCHES. FILTER STATUS ALARMS SHALL BE MONITORED BY DDC SYSTEM.
24. WHEN ERU IS DEACTIVATED, DX COOLING, AND ENERGY RECOVERY WHEEL SHALL REMAIN OFF.

REFER TO SHEET M801 FOR T.C. (TEMPERATURE CONTROL) GENERAL NOTES.

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DATE	ISSUED FOR
11/20/24	DD
12/02/24	COORDINATION
12/06/24	50% CD
01/17/25	BID SET

STATE OF MICHIGAN
DENNIS P. SCZOMAK
ENGINEER
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REGISTERED PROFESSIONAL ENGINEER

PIC:	WEK
PM:	WEK
DRAFTS:	EMW

PROJECT NO: 22.516 MS

SHEET TITLE: TEMPERATURE CONTROLS

SHEET NO: M8.2

g:\2024\2024-0338-00\CAD\50 cad ms gym air conditioning\2024-0338-M8-CP.dwg, M8.2, 1/16/2025 4:40:30 PM, Robert W. MacKinnon, Peter Basso Associates Inc.

ELECTRICAL SYMBOL LIST

(NOTE: SOME SYMBOLS AND ABBREVIATIONS SHOWN MAY NOT APPLY TO THIS PROJECT)

SYMBOL	DESCRIPTION
X (NL)	X DENOTES FIXTURE TYPE (NL INDICATES NIGHT LIGHT)
	FILL DENOTES EMERGENCY FIXTURE
	TROFFER LIGHT
	STRIP LIGHT
	LINEAR LIGHT
	MULTIHEAD ADJUSTABLE LIGHT
	DOWN LIGHT
	DIRECTIONAL DOWN LIGHT
	DECORATIVE LIGHT
	DECORATIVE LIGHT
	WALL MOUNTED LIGHT
	WALL SCONCE
	ARM MOUNTED LIGHT
	LIGHTING TRACK
	TRACK LIGHT
	ADJUSTABLE FLOOD LIGHT
	STEP LIGHT
	LED TAPE
	REMOTE DRIVER
	HIGH BAY LIGHT
	POLE MOUNTED LIGHT
	POST TOP LIGHT
	BOLLARD LIGHT
	IN GROUND LIGHT
	EMERGENCY LIGHT
	EXIT LIGHT WITH DIRECTIONAL ARROWS (FILLED AREA INDICATES FACE)
	EXIT LIGHT WITH DIRECTIONAL ARROWS (FILLED AREA INDICATES FACE)
	EXIT LIGHT – WALL MOUNTED (FILLED AREA INDICATES FACE)
	EXIT/EMERGENCY LIGHT COMBO – WALL MOUNTED (FILLED AREA INDICATES FACE)
BCELTS	BRANCH CIRCUIT EMERGENCY LIGHTING TRANSFER SWITCH
ALCR	AUTOMATIC LOAD CONTROL RELAY
LC	LIGHTING CONTROL DEVICE – REFER TO LIGHTING CONTROL SCHEDULE
XX	ROOM CONTROL DESIGNATION – REFER TO LIGHTING CONTROL SCHEDULE
S	SINGLE POLE TOGGLE SWITCH
S2	TWO POLE TOGGLE SWITCH
S3	3 WAY TOGGLE SWITCH
S4	4 WAY TOGGLE SWITCH
K	KEY OPERATED SWITCH
K3	3 WAY KEY OPERATED SWITCH
K4	4 WAY KEY OPERATED SWITCH
D	DIMMER SWITCH
D3	3 WAY DIMMER SWITCH
Do	DIMMER OCCUPANCY SENSOR SWITCH
DL	LOW VOLTAGE DIMMER SWITCH
SP	PILOT SWITCH

SYMBOL	DESCRIPTION
TWC	TWO-WAY COMMUNICATION SYSTEM CALL STATION
TWCD	TWO-WAY COMMUNICATION SYSTEM AUTO DIALER
TWCA	TWO-WAY COMMUNICATION SYSTEM ANNUNCIATOR & COMMUNICATION PANEL
TWCP	TWO-WAY COMMUNICATION SYSTEM POWER SUPPLY WITH BATTERY BACK-UP
TWCDP	TWO-WAY COMMUNICATION SYSTEM AUTO DIALER POWER SUPPLY WITH BATTERY BACK-UP
RGP	REMOTE GENERATOR ANNUCIATOR PANEL
ATS	AUTOMATIC TRANSFER SWITCH
UPS	UNINTERRUPTIBLE POWER SUPPLY
CSX	LOW VOLTAGE CONTROL STATION "X" INDICATES TYPE
"X"	SINGLE/DUPLEX RECEPTACLE OUTLET "X" INDICATES TYPE
	SINGLE/DUPLEX RECEPTACLE OUTLET CONTROLLED BY AUTOMATIC CONTROL DEVICE/SYSTEM
	QUAD RECEPTACLE OUTLET
	ABOVE COUNTER DUPLEX RECEPTACLE OUTLET (SIMILAR FOR TAMPER RESISTANT, CONTROLLED, QUADS, EMERGENCY, UPS, USB, AND GFCI RECEPTACLE OUTLETS)
	DUPLEX GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE OUTLET
	DEAD FRONT GROUND FAULT CIRCUIT INTERRUPTER
	DUPLEX EMERGENCY RECEPTACLE OUTLET
	DUPLEX TAMPER RESISTANT RECEPTACLE OUTLET
	QUAD TAMPER RESISTANT RECEPTACLE OUTLET
	DUPLEX UPS RECEPTACLE OUTLET
	DUPLEX RECEPTACLE OUTLET WITH 2 USB PORTS
	4 PORT USB CHARGING STATION
	CEILING MOUNTED DUPLEX/QUAD RECEPTACLE OUTLET
	POWER POLE
TGB	TELECOMMUNICATION GROUNDING BUS BAR
TMGB	TELECOMMUNICATION MAIN GROUNDING BUS BAR
IC	INTERCOM OUTLET
S	MULTI-SERVICE DROP SEE ELECTRICAL DETAILS AND DIAGRAMS SHEET "X" INDICATES TYPE
S	SPEAKER
S	SPEAKER – WALL MOUNTED
MIC	POKE-THROUGH ASSEMBLY "X" INDICATES TYPE
VC	MICROPHONE
B	FLOOR SERVICE FITTING "X" INDICATES TYPE
	ACCESS FLOOR SERVICE FITTING "X" INDICATES TYPE
	CORD REEL "X" INDICATES TYPE
S S	DUAL SWITCHING FOR INNER/OUTER LAMPS OF FLUORESCENT LIGHT FIXTURES
S3 S3	3-WAY DUAL SWITCHING FOR INNER/OUTER LAMPS OF FLUORESCENT LIGHT FIXTURES
S4 S4	4-WAY DUAL SWITCHING FOR INNER/OUTER LAMPS OF FLUORESCENT LIGHT FIXTURES
ST	DIGITAL TIME SWITCH
S1	ILLUMINATED TOGGLE SWITCH FOR CONTROL OF LIGHTING ON CRITICAL POWER-ILLUMINATED WHEN SWITCH IS IN "OFF" POSITION
SL	LOW VOLTAGE SWITCH
So	OCCUPANCY SENSOR
So2	OCCUPANCY SENSOR
OS X	OCCUPANCY SENSOR "X" INDICATES TYPE

REFER TO ELECTRICAL STANDARD SCHEDULES

SYMBOL	DESCRIPTION
CP	CONTROL PANEL
MD	MOTOR
VFC	VARIABLE FREQUENCY CONTROLLER.
K	MANUAL CONTROLLER
DC	MAGNETIC CONTROLLER
KP	COMBINATION MAGNETIC CONTROLLER
CR	NON-FUSIBLE DISCONNECT SWITCH
DB	FUSIBLE DISCONNECT SWITCH
CB	ENCLOSED CIRCUIT BREAKER
REX	PUSH BUTTON STATION
J	JUNCTION BOX
DO	HARD WIRE POWER CONNECTION
DA	GROUND ROD
AC	GROUND CONNECTION
HH	HANDHOLE
ACCP	ACCESS CONTROL CONTROL PANEL
ACPS	ACCESS CONTROL POWER SUPPLY
X	CONDUIT SLEEVE WITH BUSHINGS LENGTH AS REQUIRED "X" INDICATES CONDUIT SIZE
	CONDUIT UP
	CONDUIT DOWN
	EMPTY BOX FOR FUTURE TELECOMMUNICATION OUTLET
	ABOVE COUNTER EMPTY BOX FOR FUTURE TELECOMMUNICATION OUTLET
	EMPTY BOX FOR FUTURE CEILING MOUNTED TELECOMMUNICATION OUTLET
X	TELECOMMUNICATION OUTLET "X" INDICATES TYPE
X	ABOVE COUNTER TELECOMMUNICATION OUTLET "X" INDICATES TYPE
X	TELECOMMUNICATION CEILING MOUNTED OUTLET "X" INDICATES TYPE
	TELECOMMUNICATION BACKBOARD
	LIGHTNING ARRESTOR
X	PANELBOARD "X" INDICATES PANELBOARD NAME
	GROUND
	STRESS CONE TERMINATION
K	SECURITY KEY INTERLOCK
G	ENGINE GENERATOR
M	UTILITY METER
EMU	ELECTRONIC METERING UNIT
A	AMMETER
V	VOLTMETER
AS	AMMETER SWITCH
VS	VOLTMETER SWITCH
SPD	SURGE PROTECTIVE DEVICE
CR	CONTROL RELAY
TDR	TIME DELAY RELAY
PRM	PHASE ROTATION MONITOR
	CAMLOK – MALE
	CAMLOK – FEMALE
EVSE	ELECTRICAL VEHICLE SUPPLY EQUIPMENT
DCFC	DC FAST CHARGER – STANDALONE
DCPM	DC FAST CHARGER – POWER MODULE
DCDP	DC FAST CHARGER – DISPENSER

SYMBOL	DESCRIPTION
	SECURITY CAMERA
	MOTION DETECTOR
K	SECURITY KEY SWITCH
DC	DOOR CONTACT
KP	KEY PAD
CR	CARD READER
DB	DURESS PUSH BUTTON STATION
DE	DELAYED EGRESS
REX	REQUEST TO EXIT STATION
PP	AUTOMATIC DOOR PUSH PAD OPERATOR
DO	DOOR OPERATOR
DA	DOOR ACTUATOR
AC	ACCESS CONTROL STATION
ACCP	ACCESS CONTROL CONTROL PANEL
ACPS	ACCESS CONTROL POWER SUPPLY
	CIRCUIT BREAKER
	DRAWOUT CIRCUIT BREAKER MANUALLY/ OPERATED
	DRAWOUT CIRCUIT BREAKER ELECTRICALLY/ OPERATED
	SWITCH
	AUTOMATIC OR MANUAL TRANSFER SWITCH
	FUSE
	TRANSFORMER
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	LIGHTNING ARRESTOR
X	PANELBOARD "X" INDICATES PANELBOARD NAME
	GROUND
	STRESS CONE TERMINATION
	SECURITY KEY INTERLOCK
	ENGINE GENERATOR
	UTILITY METER
	ELECTRONIC METERING UNIT
	AMMETER
	VOLTMETER
	AMMETER SWITCH
	VOLTMETER SWITCH
	SURGE PROTECTIVE DEVICE
	CONTROL RELAY
	TIME DELAY RELAY
	PHASE ROTATION MONITOR
	CAMLOK – MALE
	CAMLOK – FEMALE
	ELECTRICAL VEHICLE SUPPLY EQUIPMENT
	DC FAST CHARGER – STANDALONE
	DC FAST CHARGER – POWER MODULE
	DC FAST CHARGER – DISPENSER

SYMBOL	DESCRIPTION
F	MANUAL FIRE ALARM BOX
SD	SMOKE DETECTOR
DD	DUCT SMOKE DETECTOR
CO	CARBON MONOXIDE DETECTOR
RT	REMOTE TEST STATION (FOR DUCT DETECTOR)
HD	HEAT DETECTOR
BD	PROJECTED BEAM DETECTOR
F	FIRE ALARM BELL
F XX	FIRE ALARM AUDIBLE NOTIFICATION APPLIANCE
XX	FIRE ALARM VISUAL NOTIFICATION APPLIANCE "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
XX	FIRE ALARM COMBINATION VISUAL/ AUDIBLE "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
F XX	FIRE ALARM COMBINATION VISUAL/ AUDIBLE NOTIFICATION APPLIANCE– CEILING MOUNTED "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
XX	FIRE ALARM VISUAL NOTIFICATION APPLIANCE CEILING MOUNTED "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
F	FIRE ALARM AUDIBLE NOTIFICATION APPLIANCE – CEILING MOUNTED
F	FIREFIGHTERS PHONE JACK
FACP	FIRE ALARM CONTROL PANEL
FAA	FIRE ALARM ANNUNCIATOR PANEL
NAC	NOTIFICATION APPLIANCE CIRCUIT EXTENDER PANEL
MM	ADDRESSABLE MONITORING MODULE
CM	ADDRESSABLE CONTROL MODULE
TS	ADDRESSABLE MONITORING MODULE FOR TAMPER SWITCH
FS	ADDRESSABLE MONITORING MODULE FOR FLOW SWITCH
DR	MAGNETIC DOOR RELEASE
	THERMAL OVERLOAD RELAY
	NORMALLY OPEN CONTACTS
	NORMALLY CLOSED CONTACTS
	N.O. PUSH BUTTON SINGLE CIRCUIT
	N.C. PUSH BUTTON SINGLE CIRCUIT
O X–X	CABLE VAULT "X–X" INDICATES TYPE
	BRANCH CIRCUIT PANELBOARD
	LOAD CENTER
	MOTOR CONTROL CENTER
T	TRANSFORMER
	DISTRIBUTION EQUIPMENT
GB	ELECTRICAL GROUNDING BUS BAR
PB	PLUG IN BUSWAY
FB	FEEDER BUSWAY
12x4	CABLE TRAY – ALL SIZES IN INCHES

ELECTRICAL DRAWING INDEX

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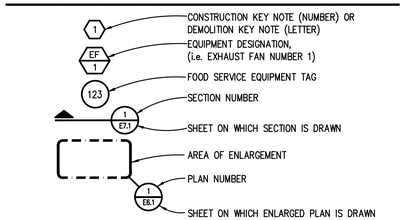
ELECTRICAL ABBREVIATION LIST

ABBREVIATION	DESCRIPTION
A	AMPERES
AER	ARC ENERGY REDUCTION
AF	AMPERES FRAME (BREAKER RATING)
AFCI	ARC FAULT CIRCUIT INTERRUPTER
A.F.F.	ABOVE FINISH FLOOR
AIC	AMPS INTERRUPTING CAPACITY
AL	AUDIENCE LEFT
ALCR	AUTOMATIC LOAD CONTROL RELAY
AR	AUDIENCE RIGHT
AT	AMPERES TRIP (BREAKER SETTING)
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
BCELTS	BRANCH CIRCUIT EMERGENCY LIGHTING TRANSFER SWITCH
BKR	BREAKER
BPS	BOLTED PRESSURE SWITCH
C	CONDUIT
CB	CIRCUIT BREAKER
CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
CKT	CIRCUIT
CT	CURRENT TRANSFORMER
DEMO	DEMOLITION
DIM	DIMENSION
DISC	DISCONNECT
DP	DISTRIBUTION PANEL
DS	DOWNSTAGE
DWG	DRAWING
EBU	EMERGENCY BATTERY UNIT
EC	ELECTRICAL CONTRACTOR
ECM	ELECTRONICALLY COMMUTATED MOTOR
ELEC	ELECTRICAL
EM/ EMERG	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EO	ELECTRICALLY OPERATED
EPO	EMERGENCY POWER OFF
EWC	ELECTRIC WATER COOLER
EXIST	EXISTING
FA	FIRE ALARM
FLA	FULL LOAD AMPS
FLR	FLOOR
FOH	FRONT OF HOUSE
FSEC	FOOD SERVICE EQUIPMENT CONTRACTOR
FU	FUSE
G/GRD/EG	GROUND
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFP	GROUND FAULT PROTECTION
HOA	HAND–OFF–AUTO
HP	HORSEPOWER
HV	HIGH VOLTAGE
HZ	HERTZ
IG	ISOLATED GROUND

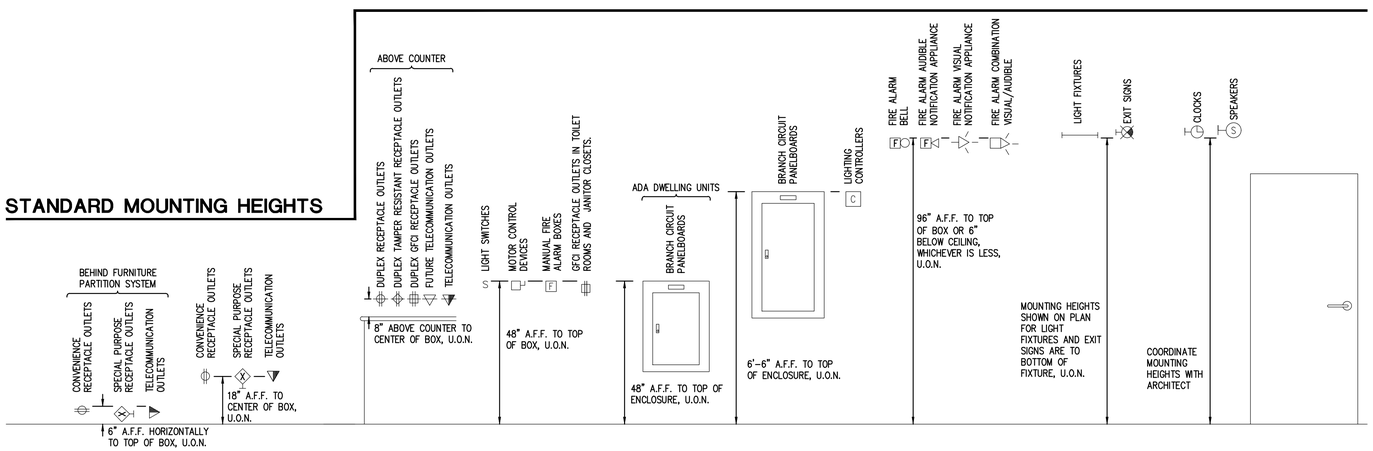
ABBREVIATION	DESCRIPTION
JB	JUNCTION BOX
KA	THOUSAND AMP
KV	KILOVOLT
KVA	KILOVOLT – AMPERES
KW	KILOWATT
KWH	KILOWATT – HOURS
LA	LIGHTNING ARRESTOR
LP	LIGHTING PANEL
LDP	LIGHTING DISTRIBUTION PANEL
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MECH	MECHANICAL
MIN	MINIMUM
MISC.	MISCELLANEOUS
MLO	MAIN LUGS ONLY
MOP	MAXIMUM OVERCURRENT PROTECTION
MTD	MOUNTED
MTG	MOUNTING
MTR	MOTOR
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NF	NON–FUSIBLE
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED

ABBREVIATION	DESCRIPTION
P	POLE
PB	PUSHBUTTON STATION
PH	PHASE
PT	POTENTIAL TRANSFORMER
PDP	POWER DISTRIBUTION PANEL
RECEPT.	RECEPTACLE
RDP	RECEPTACLE DISTRIBUTION PANEL
RP	RECEPTACLE PANEL
RSC	RIGID STEEL CONDUIT
SCCR	SHORT CIRCUIT CURRENT RATING
SCHED	SCHEDULE
SPD	SURGE PROTECTION DEVICE
ST	SHUNT TRIP
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
TB	TERMINAL BOX
TELECOM	TELECOMMUNICATIONS
TR	TAMPER RESISTANT
TTB	TELEPHONE TERMINAL BACKBOARD
TYP	TYPICAL
U.O.N.	UNLESS OTHERWISE NOTED
US	UPSTAGE
V	VOLTS
W	WIRE OR WATTS
WAP	WIRELESS ACCESS POINT
WG	WIRE GUARD
WP	WEATHERPROOF
WR	WEATHER RESISTANT
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
(E)	EXISTING
(R)	RELOCATED

STANDARD METHODS OF NOTATION



STANDARD MOUNTING HEIGHTS



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STATE OF MICHIGAN
MYRON SCOTT GIBBS
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PIC:	WEK
PM:	WEK
DRAFTS:	NCJ

PROJECT NO: 22.516 MS

SHEET TITLE: ELECTRICAL STANDARDS AND DRAWING INDEX

SHEET NO: E0.1

g:\2024\2024-0338-00\CAD\50 cosd ms gym air conditioning\2024-0338-E0-IND.dwg, E0.1, 1/16/2025 3:38:01 PM, Robert W. MacKinnon, Peter Basso Associates Inc.

g:\2024\2024-0338-00\CAD\50 casd ms gym air conditioning\2024-0338-E0-IND.dwg, E0.2, 1/16/2025 3:38:02 PM, Robert W. MacKinnon, Peter Basso Associates Inc.

RACEWAY / CONDUCTOR / CABLE APPLICATION SCHEDULE

	WIRE		RACEWAY						CABLE / CORD	
	COPPER, TYPE THHN/THWN-2	COPPER, TYPE XHHW-2	ELECTRICAL METALLIC TUBING (EMT)	INTERMEDIATE METAL CONDUIT (IMC)	RIGID STEEL CONDUIT (RSC)	LIQUID TIGHT FLEXIBLE METAL CONDUIT (LFMC)	CABLE TRAY		METAL CLAD TYPE CABLE WITH INSULATED GROUND WIRE (TYPE MC)
BRANCH CIRCUITS - EXTERIOR									
ROOFTOPS (WHEN APPROVED BY ENGINEER)		X		X	X				
BRANCH CIRCUITS - INTERIOR									
CONCEALED, ACCESSIBLE CEILINGS	X		X	X					X
EXPOSED, BELOW 10' AFF AND SUBJECT TO DAMAGE	X			X	X				
EXPOSED, BELOW 10' AFF AND NOT SUBJECT TO DAMAGE	X		X	X					
EXPOSED, ABOVE 10' AFF UNFINISHED SPACES	X		X	X					
EXPOSED, FINISHED SPACES	X								
CLASS 1 CONTROL CIRCUITS	X		X	X	X				
CLASS 2 CONTROL CIRCUITS	X		X	X	X		X		
CLASS 3 CONTROL CIRCUITS	X		X	X	X		X		
CONNECTIONS TO TRANSFORMERS, MOTORS AND VIBRATING EQUIPMENT		X				X			

GENERAL NOTES:

1. TRANSITION FROM PVC/HDPE AND PROVIDE RIGID STEEL OR RTRC SWEEPS WHERE CONDUITS PENETRATE WALLS, CONCRETE SLABS, CONCRETE BASES, AND ASPHALT.
2. REFER TO SPECIFICATIONS FOR RESTRICTIONS ON MC/AC CABLE INSTALLATION.
3. EMT SHALL NOT BE USED ON THE EXTERIOR OF A BUILDING OR IN AREAS SUBJECT TO DAMAGE BELOW 10' AFF.
4. INSTALL SURFACE RACEWAYS ONLY WHERE INDICATED ON DRAWINGS.

NOTE: SOME SYMBOLS AND ABBREVIATIONS SHOWN MAY NOT APPLY TO THIS PROJECT.

FEEDER AND BRANCH CIRCUIT SIZING SCHEDULE - GENERAL PURPOSE

OVERCURRENT DEVICE RATING (AMPERES)	COPPER CONDUCTORS						KEYED NOTES
	WIRE SIZE (AWG OR KCMIL)		CONDUIT SIZE				
	PHASE & NEUTRAL	GROUND	SINGLE PHASE 2 WIRE+G (1PH, 1N, 1G, 2PH, 1G)	SINGLE PHASE 3 WIRE+G (2PH, 1N, 1G)	THREE PHASE 3 WIRE+G (3PH, 1G)	THREE PHASE & NEUTRAL 4 WIRE+G (3PH, 1N, 1G)	
15–20	12	12	3/4"	3/4"	3/4"	3/4"	
25–30	10	10	3/4"	3/4"	3/4"	3/4"	
35–40	8	10	3/4"	3/4"	3/4"	3/4"	
45–50	8 (6)	10	3/4"	3/4"	3/4"	3/4"	1
60	6 (4)	10	3/4" (1")	3/4" (1")	3/4" (1")	1" (1 1/4")	1
70	4	8	1"	1 1/4"	1 1/4"	1 1/4"	
80	4 (3)	8	1"	1 1/4"	1 1/4"	1 1/4"	1
90–100	3 (2)	8	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1
110	2 (1)	6	–	1 1/4"	1 1/4"	1 1/4" (1 1/2")	1
125	1 (1/0)	6	–	1 1/4" (1 1/2")	1 1/4" (1 1/2")	1 1/2"	1
150	1/0	6	–	1 1/2"	1 1/2"	1 1/2"	
175	2/0	6	–	2"	2"	2"	
200	3/0	6	–	2"	2"	2 1/2"	
225	4/0	4	–	2"	2"	2 1/2"	
250	250	4	–	2 1/2"	2 1/2"	2 1/2"	
300	350	4	–	2 1/2"	2 1/2"	3"	
350	500	3	–	3"	3"	3"	
400	500	3	–	3"	3"	3"	

GENERAL NOTES:

1. CONTRACTOR TO SIZE FEEDERS AND BRANCH CIRCUITS BASED ON THIS SCHEDULE AND OVER CURRENT DEVICE SIZE, UNLESS NOTED OTHERWISE.
2. CONTRACTOR MAY COMBINE 20A CIRCUITS AS NOTED IN SPECIFICATION.
3. CONDUCTORS ARE BASED ON THHN/THWN-2 UP TO AND INCLUDING #4/0. LARGER THAN #4/0 ARE BASED ON TYPE XHHW.
4. CONDUIT SIZES ARE VALID FOR EMT OR RSC. CONDUIT SIZES SHALL BE ADJUSTED AS REQUIRED FOR OTHER TYPES OF CONDUIT.
5. SIZE OF DISCONNECT SWITCH LOCATED AT EQUIPMENT SHALL BE SIZED BASED UPON OVERCURRENT PROTECTION OF THAT DEVICE.
6. OBTAIN APPROVAL FROM ENGINEER PRIOR TO INSTALLING DIFFERENT SIZE/QUANTITY OF CONDUCTORS TO OBTAIN AN EQUIVALENT AMPACITY.

KEYED NOTES:

1. CONDUCTORS ARE BASED ON 90°C, 600V INSULATED WIRE APPLIED AT 75°C FOR TERMINATION RATED 60/75°C OR 75°C. FOR TERMINATION RATED AT 60°C, USE CONDUCTORS AND CONDUIT SIZES INDICATED IN PARENTHESES.

BRANCH CIRCUIT VOLTAGE DROP WIRING SCHEDULE FOR SINGLE PHASE CIRCUITS

BRANCH CKT RATING (A)	WIRE SIZE (AWG)	MAXIMUM BRANCH CIRCUIT LENGTH (IN FEET)				
		120V	208V	240V	277V	480V
20A	12	83	143	165	191	331
	10	128	222	256	295	511
	8	201	348	402	464	804
	6	313	542	625	721	1250
30A	10	85	148	170	197	341
	8	134	232	268	309	536
	6	208	361	417	481	833
	4	313	542	625	721	1250

GENERAL NOTES:

1. THE ABOVE TABLE VALUES ARE BASED ON COPPER CONDUCTORS, IN STEEL CONDUIT, WITH A LOAD POWER FACTOR OF 0.85 PER NEC CHAPTER 9, TABLE 9.
2. PROVIDE BRANCH CIRCUIT CONDUCTORS AS INDICATED IN THE TABLE ABOVE FOR ALL LIGHTING AND RECEPTACLE BRANCH CIRCUITS. WHERE BRANCH CIRCUITS SERVE DEDICATED EQUIPMENT, THE CONTRACTOR MAY PERFORM VOLTAGE DROP CALCULATIONS BASED ON ACTUAL EQUIPMENT CONNECTED LOAD AND PROVIDE CONDUCTORS APPROPRIATELY SIZED TO LIMIT VOLTAGE DROP TO A MAXIMUM OF 3%.
3. CONDUCTOR SIZES ARE BASED ON MAXIMUM OF 9 CURRENT CARRYING CONDUCTORS IN A SINGLE CONDUIT.
4. LIMITS FOR CONDUCTOR LENGTHS SHOWN ARE BASED ON A MAXIMUM BRANCH CIRCUIT LOADING OF 64% OF THE BRANCH BREAKER RATING AND A MAXIMUM OF 3 PERCENT VOLTAGE DROP TO COMPLY WITH ASHRAE 90.1 AND THE NEC. FOR CIRCUITS LOADED GREATER THAN 64% OF BRANCH BREAKER RATING, THE CONTRACTOR SHALL PROVIDE CONDUCTORS APPROPRIATELY SIZED TO LIMIT VOLTAGE DROP TO 3%.

MOTOR CIRCUIT SIZING SCHEDULE (120V, SINGLE PHASE)

MOTOR HP	CIRCUIT BREAKER	MANUAL MOTOR STARTER SIZE	COMBINATION STARTER SIZE	MOTOR DISCONNECT (NOTE 3)
1/6	15A	1 HP	0	20A
1/4	15A	1 HP	0	20A
1/3	15A	1 HP	0	20A
1/2	20A	1 HP	0	20A

GENERAL NOTES:

1. BASED ON MOTOR FULL LOAD AMPERES AS PROVIDED BY THE NEC
2. BASED ON MOTOR RUNNING OVERLOAD PROTECTIONS PROVIDED BY THERMAL OVERLOAD RELAYS.
3. WHERE THE STARTER IS LOCATED REMOTE FROM THE MOTOR, PROVIDE DISCONNECT LOCATED AT THE MOTOR, SIZE AS INDICATED.

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STATE OF MICHIGAN
MYRON SCOTT GIBBS
ENGINEER
No. 6201061469
LICENSED PROFESSIONAL ENGINEER

PIC:	WEK
PM:	WEK
DRAFTS:	NCJ

PROJECT NO: 22.516 MS

SHEET TITLE: ELECTRICAL STANDARD SCHEDULES

SHEET NO: E0.2

THE FOLLOWING DIMENSION EQUALS ONE INCH WHEN PRINTED TO SCALE.

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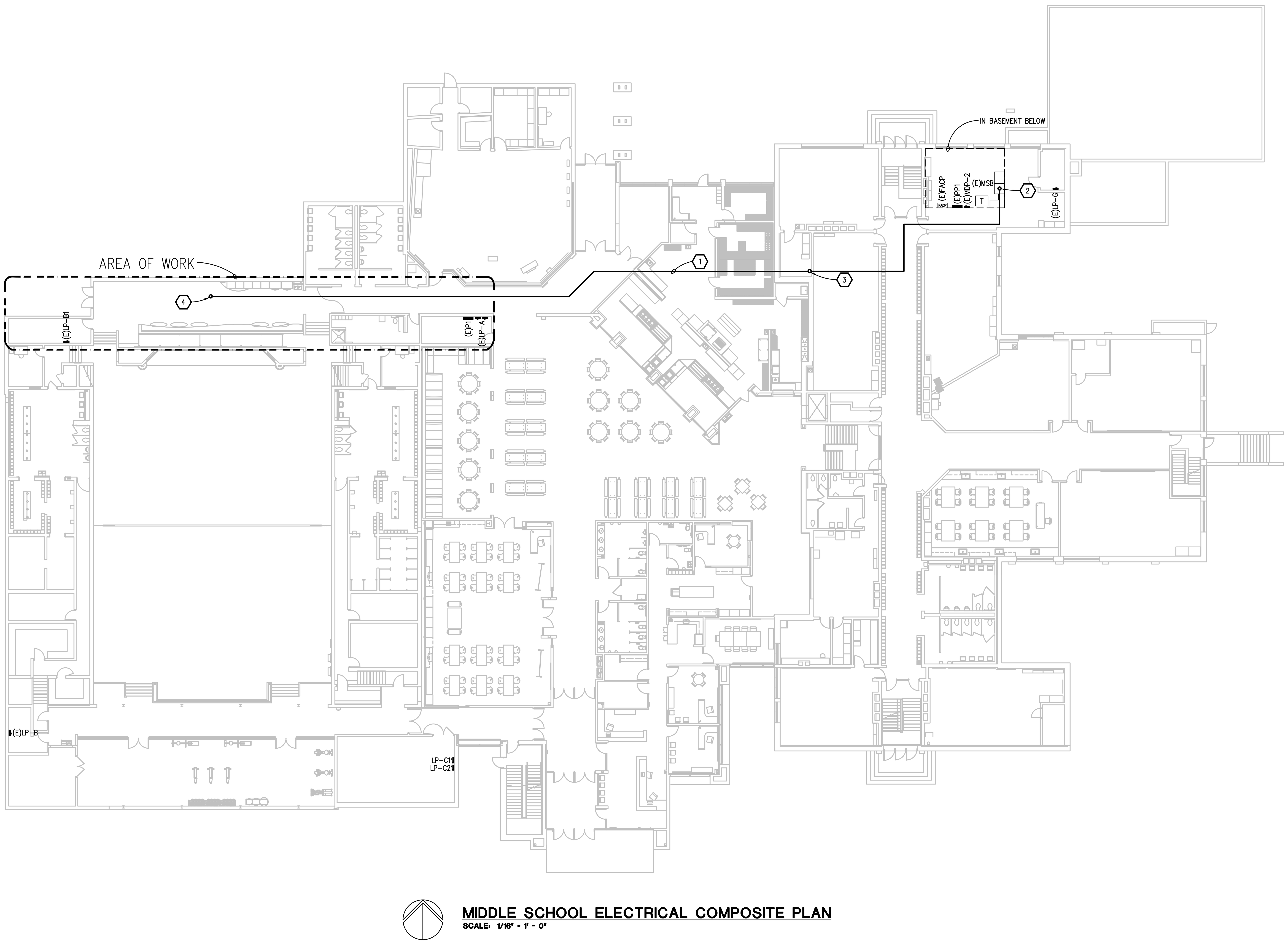
CONSTRUCTION KEY NOTES:

1. INSTALL (1)2"C WITH 4#2/0 CU AND 1#6G CU.
2. ROUTE FEEDER FOR ERU-1 INTO CEILING SPACE OF BASEMENT ELECTRICAL ROOM (5').
3. ROUTE FEEDER FOR ERU-1 INTO MAIN LEVEL CEILING SPACE (15').
4. ROUTE FEEDER FOR ERU-1 TO ROOF (20').



MIDDLE SCHOOL ELECTRICAL COMPOSITE PLAN
SCALE: 1/16" = 1' - 0"

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MYRON SCOTT GIBBS ENGINEER No. 6201061469
LICENSED PROFESSIONAL ENGINEER

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PROJECT NO: 22.516 MS

SHEET TITLE: MIDDLE SCHOOL ELECTRICAL COMPOSITE PLAN

SHEET NO: E0.3

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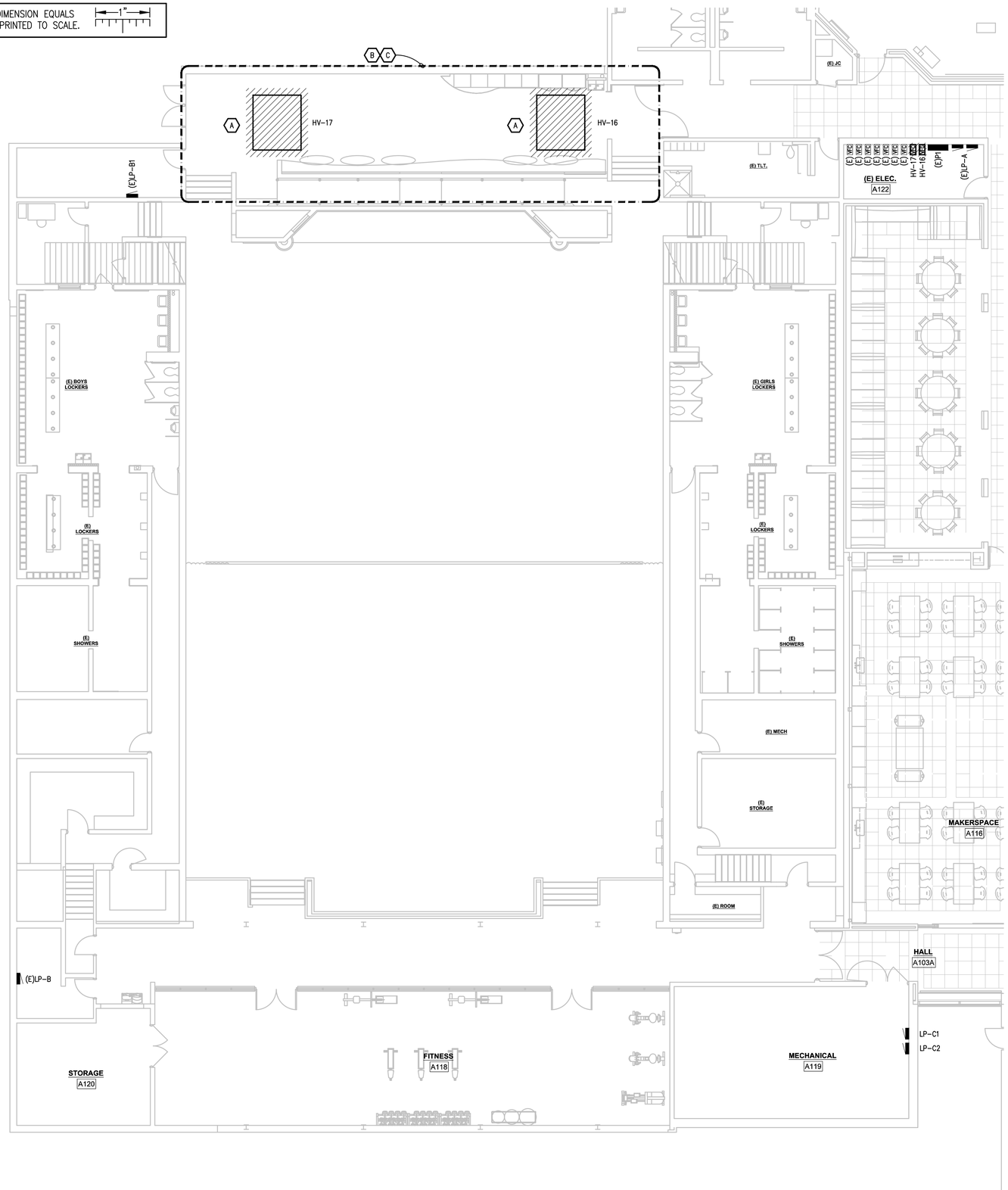
THE FOLLOWING DIMENSION EQUALS ONE INCH WHEN PRINTED TO SCALE. 1"



MIDDLE SCHOOL ELECTRICAL DEMOLITION PLAN
SCALE: 1/8" = 1' - 0"

ELECTRICAL DEMOLITION GENERAL NOTES:

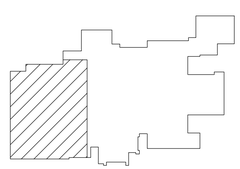
1. VISIT THE SITE PRIOR TO SUBMISSION OF BID TO EXAMINE THE EXISTING CONDITIONS AND THE EXTENT OF DEMOLITION WORK.
2. EXAMINE THE DRAWINGS OF OTHER TRADES AND BE FAMILIAR WITH THE DEMOLITION REQUIRED BY OTHER TRADES. PERFORM ALL INCIDENTAL ELECTRICAL DEMOLITION AND/OR RELOCATION REQUIRED TO FACILITATE THE DEMOLITION WORK OF OTHER TRADES, WHETHER OR NOT SPECIFICALLY INDICATED.
3. REMOVE EQUIPMENT OR MATERIALS AS INDICATED ON PLAN WITH CROSS HATCHING. DEMOLITION SHALL INCLUDE, BUT NOT BE LIMITED TO, THOSE COMPONENTS SHOWN.
4. COORDINATE WITH NEW WORK PLANS, ONE LINE DIAGRAMS AND RISER DIAGRAMS FOR EXTENT OF DEMOLITION WORK.
5. PROVIDE PROPER SUPPORT FOR EXISTING TO REMAIN CONDUITS AND BOXES WHERE EXISTING SUPPORT IS TO BE REMOVED. RE-ROUTE BRANCH CIRCUIT CONDUITS AND RELOCATE JUNCTION BOXES AS REQUIRED TO FACILITATE INSTALLATION OF NEW EQUIPMENT AND SYSTEMS IN CEILING SPACES.
6. REMOVE ALL CONDUIT AND WIRE BACK TO THE SOURCE OR NEAREST UPSTREAM DEVICE REMAINING IN SERVICE.
7. MAINTAIN ELECTRICAL SERVICE TO ALL LIGHTING FIXTURES, DEVICES AND EQUIPMENT THAT ARE TO REMAIN. EXTEND CONDUIT AND WIRE AS REQUIRED WHERE DEMOLITION WORK AFFECTS ELECTRICAL SERVICE TO DOWNSTREAM LOADS THAT ARE TO REMAIN.
8. DISPOSE OF ALL MATERIALS OFF SITE AND INCLUDE ALL COSTS FOR DISPOSAL IN BID. ALL MATERIALS SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS, INCLUDING TCLP TESTING, PROPER DISPOSAL AND/OR RECYCLING OF FLUORESCENT LAMPS.
9. PROVIDE BLANK COVER PLATES WHERE SWITCHES AND DEVICES ARE REMOVED BUT EXISTING WALLS REMAIN INTACT.
10. RING OUT AND TAG ALL CIRCUITS AFFECTED BY THIS ALTERATION AT BOTH ENDS. MARK ALL UNUSED CIRCUIT BREAKERS "SPARE".
11. PROVIDE UPDATED TYPED-IN DIRECTORIES FOR ALL PANELS AFFECTED BY THIS ALTERATION.

(#) DEMOLITION KEY NOTES:

A. DISCONNECT MECHANICAL EQUIPMENT AND MAKE ELECTRICALLY SAFE. MECHANICAL EQUIPMENT TO BE REMOVED BY OTHERS. REMOVE DISCONNECTS AND CONTROLS COMPLETE. REMOVE CONDUCTORS AND CONDUIT BACK TO SOURCE.

B. REMOVE BRANCH CIRCUITS BACK TO NEAREST ACCESSIBLE SOURCE AND MAKE ELECTRICALLY SAFE TO FACILITATE MECHANICAL INSTALLATION. EXTEND BRANCH CIRCUITS IN NEW WORK.

C. TEMPORARILY SUPPORT LIGHT FIXTURES AND ELECTRICAL/FIRE ALARM/TELECOMMUNICATION DEVICES TO FACILITATE CEILING DEMOLITION.



KEY PLAN
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ENGINEER
No. 6201061469
LICENSED PROFESSIONAL ENGINEER

PIC:	WEK
PM:	WEK
DRAFTS:	NCJ

PROJECT NO: 22.516 MS

SHEET TITLE: MIDDLE SCHOOL ELECTRICAL DEMOLITION PLAN

SHEET NO: ED1.1

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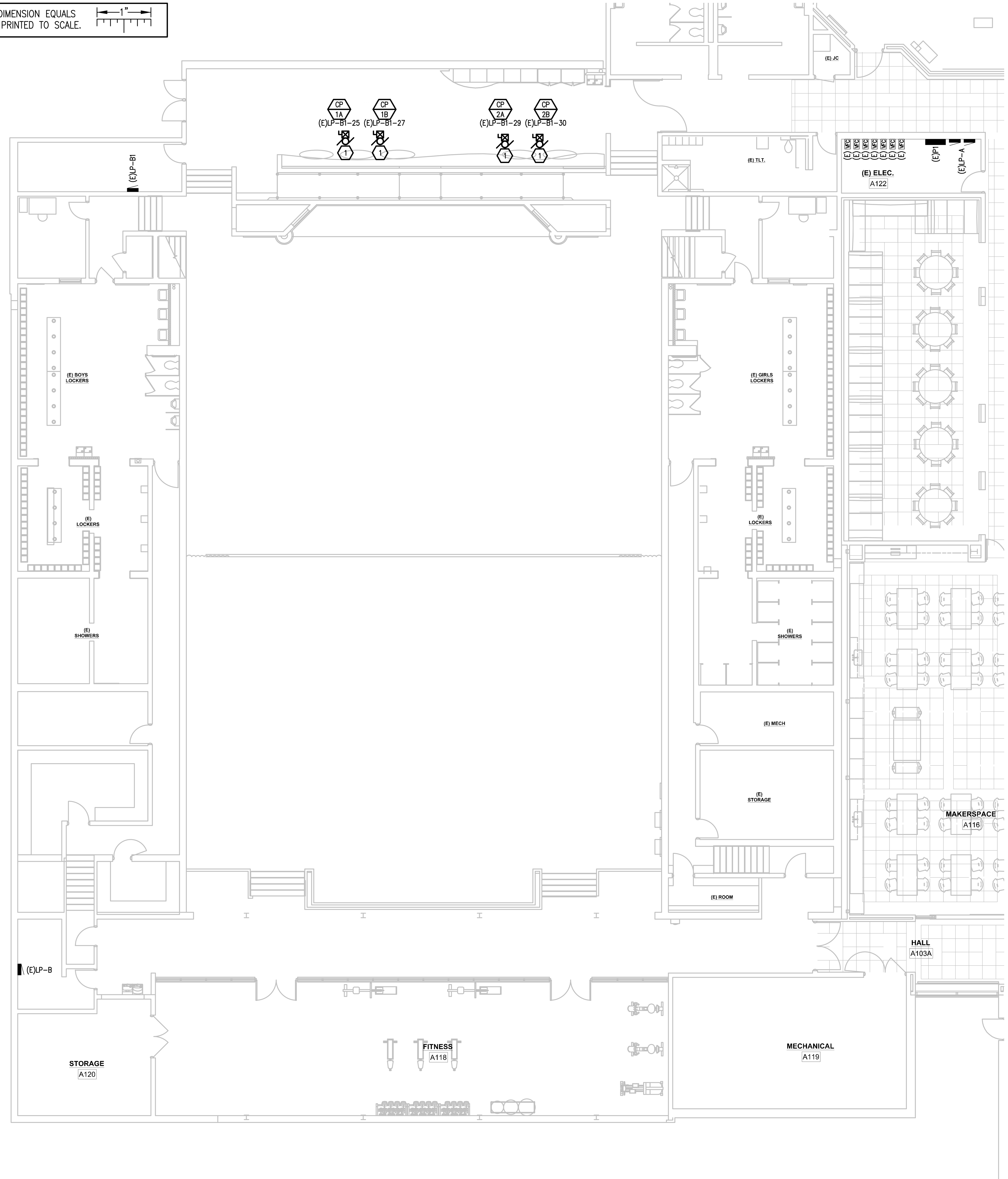

MIDDLE SCHOOL ELECTRICAL PLAN

SCALE: 1/8" = 1' - 0"

ELECTRICAL GENERAL NOTES:

1. THESE DRAWINGS REPRESENT THE GENERAL EXTENT AND ARRANGEMENT OF SYSTEMS. COORDINATE EXACT EQUIPMENT LOCATIONS, ELEVATIONS, AND FINAL CONNECTION REQUIREMENTS. PROVIDE EACH SYSTEM COMPLETE, INCLUDING ALL NECESSARY COMPONENTS, FITTINGS AND OFFSETS.
2. INSTALL SYSTEMS SUCH THAT REQUIRED CLEARANCE AND SERVICE ACCESS SPACE IS PROVIDED AROUND ALL MECHANICAL AND ELECTRICAL EQUIPMENT, AND AROUND ANY COMPONENTS WHICH REQUIRE SERVICE ACCESS.
3. PROVIDE SUPPLEMENTARY STEEL AS REQUIRED FOR THE PROPER SUPPORT OF ALL SYSTEMS.
4. MOTOR CIRCUIT PROTECTION SHALL BE SIZED IN ACCORDANCE WITH MOTOR CIRCUIT SIZING SCHEDULES SHOWN ON "ELECTRICAL STANDARD SCHEDULES DRAWING" UNLESS OTHERWISE NOTED.
5. REFER TO MECHANICAL SCHEDULE SHEETS FOR ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT. PROVIDE ALL CONNECTIONS, STARTERS, DISCONNECTS, ETC. AS REQUIRED BY SCHEDULES AND WHERE NOTED ELSEWHERE. VERIFY REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH SHOP DRAWINGS SUBMITTALS. NOTIFY ENGINEER OF ANY CONFLICTS BETWEEN EQUIPMENT SUBMITTALS AND ELECTRICAL DRAWINGS. WHERE CIRCUIT SIZES ARE SHOWN ON THE ELECTRICAL DRAWINGS THAT DIFFER FROM WHAT IS INDICATED ON THE MECHANICAL SCHEDULES, PROVIDE THE CIRCUIT OF HIGHER AMPACITY.
6. REFER TO TEMPERATURE CONTROLS SHEETS FOR REQUIRED FIRE ALARM CONTROL MODULES, DUCT SMOKE DETECTORS, AND MOTOR CONTROLLERS. PROVIDE ALL ACCESSORIES INDICATED.
7. ALL FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING EDWARDS FIRE ALARM SYSTEM. PROVIDE NECESSARY COMPONENTS, MODULES, ETC. AS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM. RE-TEST AND CERTIFY EXISTING FIRE ALARM SYSTEM AT COMPLETION OF PROJECT.

(#) CONSTRUCTION KEY NOTES:

1. PROVIDE COMBINATION STARTER WITHIN 6'-0" OF MECHANICAL EQUIPMENT.
2. PROVIDE CIRCUIT FOR HEAT TRACE SYSTEM. HEAT TRACE AND ASSOCIATED COMPONENTS TO BE PROVIDED BY MECHANICAL CONTRACTOR. COORDINATE EXACT REQUIREMENTS WITH HEAT TRACE MANUFACTURER AND INSTALLER. COORDINATE EXACT LOCATIONS WITH MECHANICAL DRAWINGS AND TRADES.

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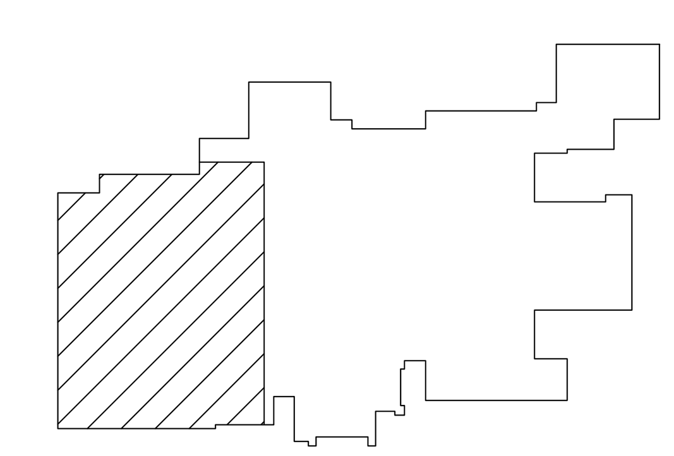
DRAFTS:	NCJ

PROJECT NO: 22.516 MS

SHEET TITLE: MIDDLE SCHOOL ELECTRICAL PLAN



KEY PLAN

NO SCALE

SHEET NO: E2.1

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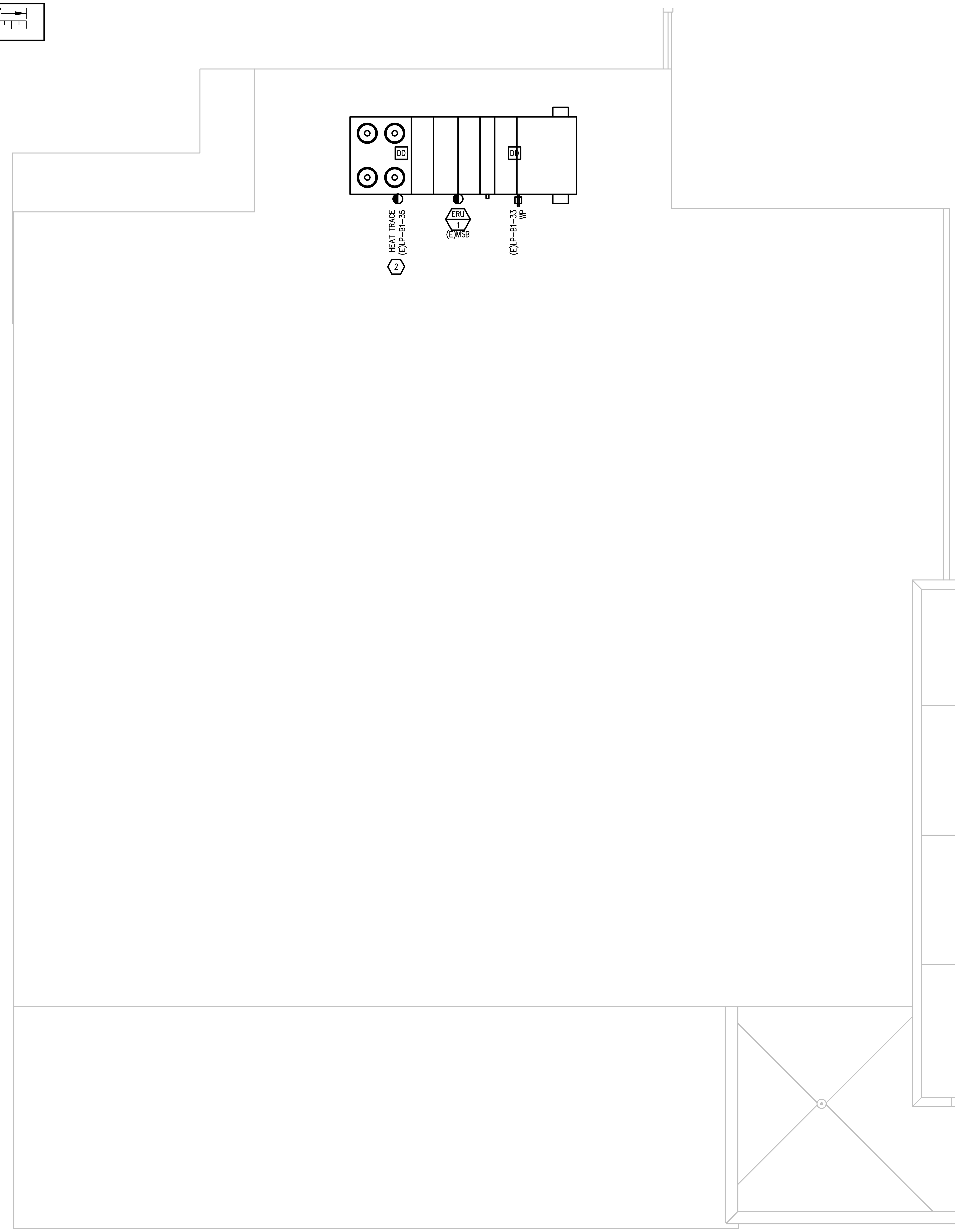

MIDDLE SCHOOL ELECTRICAL ROOF PLAN
SCALE: 1/8" = 1' - 0"

ELECTRICAL GENERAL NOTES:

1. THESE DRAWINGS REPRESENT THE GENERAL EXTENT AND ARRANGEMENT OF SYSTEMS. COORDINATE EXACT EQUIPMENT LOCATIONS, ELEVATIONS, AND FINAL CONNECTION REQUIREMENTS. PROVIDE EACH SYSTEM COMPLETE, INCLUDING ALL NECESSARY COMPONENTS, FITTINGS AND OFFSETS.
2. INSTALL SYSTEMS SUCH THAT REQUIRED CLEARANCE AND SERVICE ACCESS SPACE IS PROVIDED AROUND ALL MECHANICAL AND ELECTRICAL EQUIPMENT, AND AROUND ANY COMPONENTS WHICH REQUIRE SERVICE ACCESS.
3. PROVIDE SUPPLEMENTARY STEEL AS REQUIRED FOR THE PROPER SUPPORT OF ALL SYSTEMS.
4. MOTOR CIRCUIT PROTECTION SHALL BE SIZED IN ACCORDANCE WITH MOTOR CIRCUIT SIZING SCHEDULES SHOWN ON "ELECTRICAL STANDARD SCHEDULES DRAWING" UNLESS OTHERWISE NOTED.
5. REFER TO MECHANICAL SCHEDULE SHEETS FOR ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT. PROVIDE ALL CONNECTIONS, STARTERS, DISCONNECTS, ETC. AS REQUIRED BY SCHEDULES AND WHERE NOTED ELSEWHERE. VERIFY REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH SHOP DRAWINGS SUBMITTALS. NOTIFY ENGINEER OF ANY CONFLICTS BETWEEN EQUIPMENT SUBMITTALS AND ELECTRICAL DRAWINGS. WHERE CIRCUIT SIZES ARE SHOWN ON THE ELECTRICAL DRAWINGS THAT DIFFER FROM WHAT IS INDICATED ON THE MECHANICAL SCHEDULES, PROVIDE THE CIRCUIT OF HIGHER AMPACITY.
6. REFER TO TEMPERATURE CONTROLS SHEETS FOR REQUIRED FIRE ALARM CONTROL MODULES, DUCT SMOKE DETECTORS, AND MOTOR CONTROLLERS. PROVIDE ALL ACCESSORIES INDICATED.
7. ALL FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING EDWARDS FIRE ALARM SYSTEM. PROVIDE NECESSARY COMPONENTS, MODULES, ETC. AS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM. RE-TEST AND CERTIFY EXISTING FIRE ALARM SYSTEM AT COMPLETION OF PROJECT.

CONSTRUCTION KEY NOTES:

1. PROVIDE COMBINATION STARTER WITHIN 6'-0" OF MECHANICAL EQUIPMENT.
2. PROVIDE CIRCUIT FOR HEAT TRACE SYSTEM. HEAT TRACE AND ASSOCIATED COMPONENTS TO BE PROVIDED BY MECHANICAL CONTRACTOR. COORDINATE EXACT REQUIREMENTS WITH HEAT TRACE MANUFACTURER AND INSTALLER. COORDINATE EXACT LOCATIONS WITH MECHANICAL DRAWINGS AND TRADES.

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DRAFTS:	NCJ

PROJECT NO: 22.516 MS

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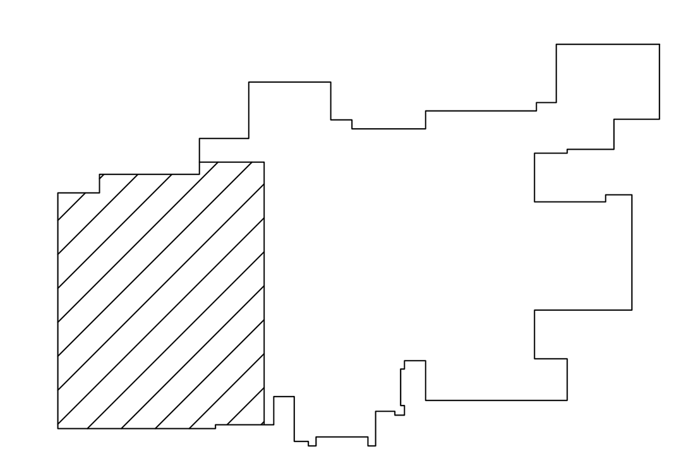

KEY PLAN
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SHEET NO: E2.2

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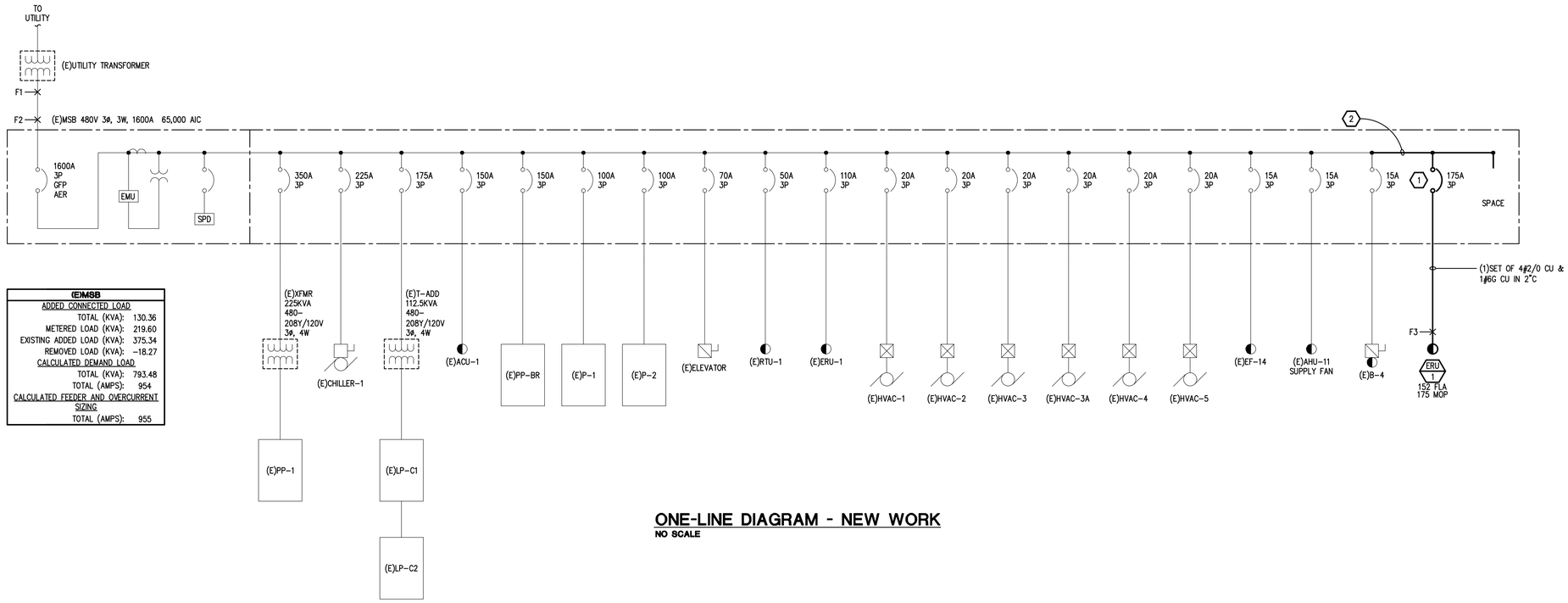

(E)MSB	
ADDED CONNECTED LOAD	
TOTAL (KVA):	130.36
METERED LOAD (KVA):	219.60
EXISTING ADDED LOAD (KVA):	375.34
REMOVED LOAD (KVA):	-18.27
CALCULATED DEMAND LOAD	
TOTAL (KVA):	793.48
TOTAL (AMPS):	954
CALCULATED FEEDER AND OVERCURRENT SIZING	
TOTAL (AMPS):	955

ONE-LINE DIAGRAM - NEW WORK

NO SCALE

SHORT-CIRCUIT CALCULATIONS

FAULT POINT	PANEL/ TRANSFORMER	SOURCE FAULT POINT	SOURCE Isc	CONDUIT TYPE	CONDUCTOR MATERIAL	CONDUCTOR OR BUS SIZE	'C' VALUE	E (V)	L (FT)	XFMR kVA	XFMR %Z	f	M	Isc
1	UTILITY XFMR							480						31,379
2	MSB	1	31,379	M	CU	4 SETS OF 600 KCML	22965	480				0.062	0.94	29,557
3	ERU-1	2	29,557	M	CU	1 SET OF 2/0	10755	480	300.0			2.975	0.25	7,436

THE FOLLOWING THREE PHASE CALCULATIONS ARE BASED ON THE "POINT-BY POINT" METHOD WHERE:

$Isc = Isc \times M$

$M = 1/(1+f)$

CONDUCTOR OR BUS: $f = \frac{1.732 \times L \times Isc}{C \times n \times E}$

UTILITY XFMR: $Isc = \frac{kVA \times 100,000}{E \times 1.732 \times \%Z}$

XFMR: $f = \frac{Ip(sc) \times Ep \times 1.73 \times \%Z}{100,000 \times KVA}$ $Is(sc) = \frac{Ep \times M \times Ip(sc)}{Es}$

L = LENGTH (ft) OF CONDUCTOR, C = CONSTANT FROM TABLE, n = NUMBER OF CONDUCTORS PER PHASE

Isc = AVAILABLE SHORT CIRCUIT (A), E = VOLTAGE OF CIRCUIT

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PANELBOARD (E)LP-B1

#	LOAD TYPE	DESCRIPTION	CB TYPE	CB	VA	ØA	ØB	ØC	VA	CB	CB TYPE	DESCRIPTION	LOAD TYPE	#
1	NC	(E)HAIR DRYER - A141	EXIST	20	1500	2700			1200	20	EXIST	(E)EWC - A139	NC	2
3	NC	(E)HAIR DRYER - A141	EXIST	20	1500		1680		180	20	EXIST	(E)RECEPT.: A139	R	4
5	NC	(E)HAIR DRYER - A141	EXIST	20	1500			1680	180	20	EXIST	(E)RECEPT.: A139	R	6
7	NC	(E)UNDER COUNTER COOLER - A133	EXIST	20	500	1700			1200	20	EXIST	(E)EWC - A155	NC	8
9	NC	(E)UNDER COUNTER COOLER - A133	EXIST	20	500		680		180	20	EXIST	(E)RECEPT.: A155	R	10
11	R	(E)COUNTER RECEPT.: A133	EXIST	20	360			540	180	20	EXIST	(E)RECEPT.: A155	R	12
13	R	(E)COUNTER RECEPT.: A133	EXIST	20	180	720			540	20	EXIST	(E)COUNTER RECEPT - A133	R	14
15	R	(E)COUNTER RECEPT.: A133	EXIST	20	540		540			20	EXIST	SPARE		16
17	NC	(E)HAND DRYER - A131	EXIST	20	1500			3000	1500	20	EXIST	(E)HAND DRYER - A131	NC	18
19	NC	(E)HAND DRYER - A131	EXIST	20	1500	3000			1500	20	EXIST	(E)HAND DRYER - A131	NC	20
21	K	(E)KITCHEN MICROWAVE	EXIST	30	1100		1640		540	20	EXIST	(E)RECEPT.: BOYS OFFICE	R	22
23	K		EXIST		1100			1100		20	EXIST	SPARE		24
25	MH	CP-1A	NEW	15	864	2364			1500	20	EXIST	(E)HAND DRYER - A131	NC	26
27	M	CP-1B	NEW	15	864		1404		540	20	EXIST	(E)RECEPT.: MUSIC ROOM	R	28
29	M	CP-2A	NEW	15	864			1584	720	20	EXIST	(E)RECEPT.: MUSIC ROOM	R	30
31	M	CP-2B	NEW	15	864	1944			1080	20	EXIST	(E)RECEPT.: MUSIC ROOM	R	32
33	R	RECEPT: ROOFTOP	EXIST	20	180		1800		1620	20	EXIST	(E)RECEPT.: MUSIC ROOM STORAGE/OFFICE	R	34
35	C	HEAT TRACE ERU-1	GFEP	20	500			500			EXIST	SPARE		36
37		SPARE	EXIST	20							EXIST	SPARE		38
39		SPARE	EXIST	20							EXIST	SPARE		40
41		SPARE	EXIST	20							EXIST	SPARE		42
						12428	7744	8404						
						ØA	ØB	ØC						

PANELBOARD INFORMATION

VOLTAGE: 208Y/120

BUS AMPACITY: 100A

MAIN TYPE: MLO

MINIMUM A.I.C.: 10,000

MOUNTING: SURFACE

☐ FEED-THROUGH LUGS
☐ DOUBLE LUGS
☐ INTEGRAL SPD

PANELBOARD LOCATION: ROOM A148

BRANCH CIRCUIT CONNECTED LOAD		DEMAND FACTOR	CALCULATED LOAD	FEEDER AND OVERCURRENT SIZING	
CONTINUOUS LOAD (C)	500	100%	500	125%	625
ELECTRIC HEAT (E)		100%		100%	
NON-CONTINUOUS LOAD (NC)	15400	100%	15400	100%	15400
KITCHEN LOAD (K)	2200	100%	2200	100%	2200
RECEPTACLE BASE LOAD (R)	7020	100%	7020	100%	7020
RECEPTACLE DEMAND LOAD (R)		50%		100%	
LIGHTING LOAD (L)		100%		125%	
ADDITIONAL TRACK LIGHTING LOAD				100%	
MOTORS, HIGHEST LOAD (MH)	864	125%	1080	100%	1080
MOTORS, REMAINING LOAD (M)	2592	100%	2592	100%	2592
		TOTAL(KVA):	28.79		
		TOTAL (AMPS):	80	TOTAL (AMPS):	80

NOTE: DEMAND AND SIZING INFORMATION IS CALCULATED FROM CONNECTED LOAD

NOTES:
PANEL IS SQUARE D NQ SERIES.

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DIAGRAM GENERAL NOTES:

1. THESE DRAWINGS REPRESENT THE GENERAL EXTENT AND ARRANGEMENT OF SYSTEMS. COORDINATE EXACT EQUIPMENT LOCATIONS, ELEVATIONS, AND FINAL CONNECTION REQUIREMENTS. PROVIDE EACH SYSTEM COMPLETE, INCLUDING ALL NECESSARY COMPONENTS, FITTINGS AND OFFSETS.
2. FEEDER AND BRANCH CIRCUIT CONDUCTORS SHALL BE SIZED IN ACCORDANCE WITH THE "FEEDER AND BRANCH CIRCUIT SIZING SCHEDULE-GENERAL PURPOSE" ON THE "ELECTRICAL STANDARD SCHEDULES DRAWING" UNLESS SPECIFICALLY NOTED OTHERWISE.
3. MOTOR CIRCUIT PROTECTION SHALL BE SIZED IN ACCORDANCE WITH THE MOTOR CIRCUIT SIZING SCHEDULES ON THE "ELECTRICAL STANDARD SCHEDULES DRAWING" UNLESS SPECIFICALLY NOTED OTHERWISE.

(#) CONSTRUCTION KEY NOTES:

1. NEW CIRCUIT BREAKER IN PREPARED SPACE. (E)MSB IS EATON POW-R-LINE XPERT.
2. PREPARE SPACE FOR INSTALLATION OF NEW CIRCUIT BREAKER. RE-LIST EQUIPMENT AS REQUIRED.

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CRAWFORD AUSABLE SCHOOL DISTRICT

GRAYLING MIDDLE SCHOOL

HVAC UPGRADES

500 SPRUCE ST. GRAYLING, MI 49738

DATE	ISSUED FOR
11/20/24	DD
12/02/24	COORDINATION
12/06/24	50% CD
01/17/25	BID SET

STATE OF MICHIGAN
MYRON SCOTT GIBBS
ENGINEER
No. 6201061469
LICENSED PROFESSIONAL ENGINEER

PIC:	WEK
PM:	WEK
DRAFTS:	NCJ

PROJECT NO: 22.516 MS

SHEET TITLE: MIDDLE SCHOOL ONE LINE DIAGRAM

SHEET NO: E5.2

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