

Addendum No. 02

Issue Date: 10/19/2026

SAUK COUNTY COURTHOUSE HVAC AND LIGHTING UPGRADES

515 Oak Street, Baraboo WI 53913

Project No.: 2025012

BID DATE: Thursday, October 29th, 2026 at 10:00am

This Addendum is issued to modify, explain or correct the original drawings and specifications and is hereby made a part of the Contract Documents. Please attach this Addendum to the Bid Documents in your possession. Insert the number and issue date of this Addendum on the Bid Form.

SPECIFICATIONS

DIVISION 00

Section 00 01 10-Table of Contents

1. Revise section to add structural specifications to Table of Contents

DIVISION 03

Section 03 30 00-Cast-in-Place Concrete

2. Add spec section to Project Manual.

DIVISION 04

Section 04 20 00-Unit Masonry

3. Add spec section to Project Manual.

DIVISION 05

Section 05 12 00-Structural Steel Framing

4. Add spec section to Project Manual.

Section 05 50 00-Metal Fabrications

5. Add spec section to Project Manual.

Section 05 53 05-Metal Gratings and Floor Plates

6. Add spec section to Project Manual.

DIVISION 23

Section 23 09 54-Electric Temperature Control Systems

7. 1.02.E.4 & 1.02.F.2: Deleted references to Distech DDC controls.

DRAWINGS

TITLE

Sheet T001 – TITLE SHEET

8. Revise sheet index to add Structural sheets.

STRUCTURAL

Sheet S001 – STRUCTURAL GENERAL NOTES

9. Add sheet to drawing set.

Sheet S002 – STRUCTURAL SPECIAL INSPECTIONS – IBC 2021

10. Add sheet to drawing set.

Sheet S200 – FIRST FLOOR FRAMING PLAN AND PARTIAL FOUNDATION PLAN (PHASE 1)

11. Add sheet to drawing set.

Sheet S202 – THIRD FLOOR FRAMING PLAN (PHASE 2)

12. Add sheet to drawing set.

Sheet S203 – ROOF FRAMING PLAN (PHASE 3)

13. Add sheet to drawing set.

Sheet S300 – STRUCTURAL DETAILS

14. Add sheet to drawing set.

Attachments:

Specifications: As indicated above.

Drawings: As indicated above.

END OF ADDENDUM

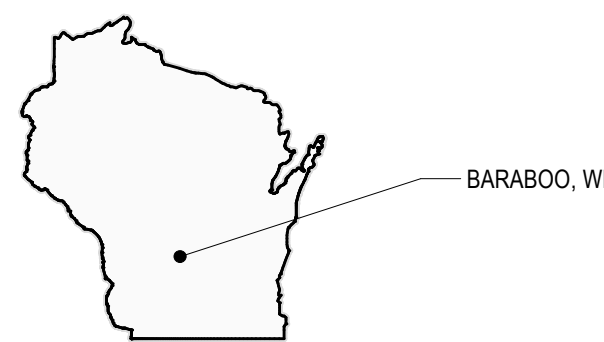
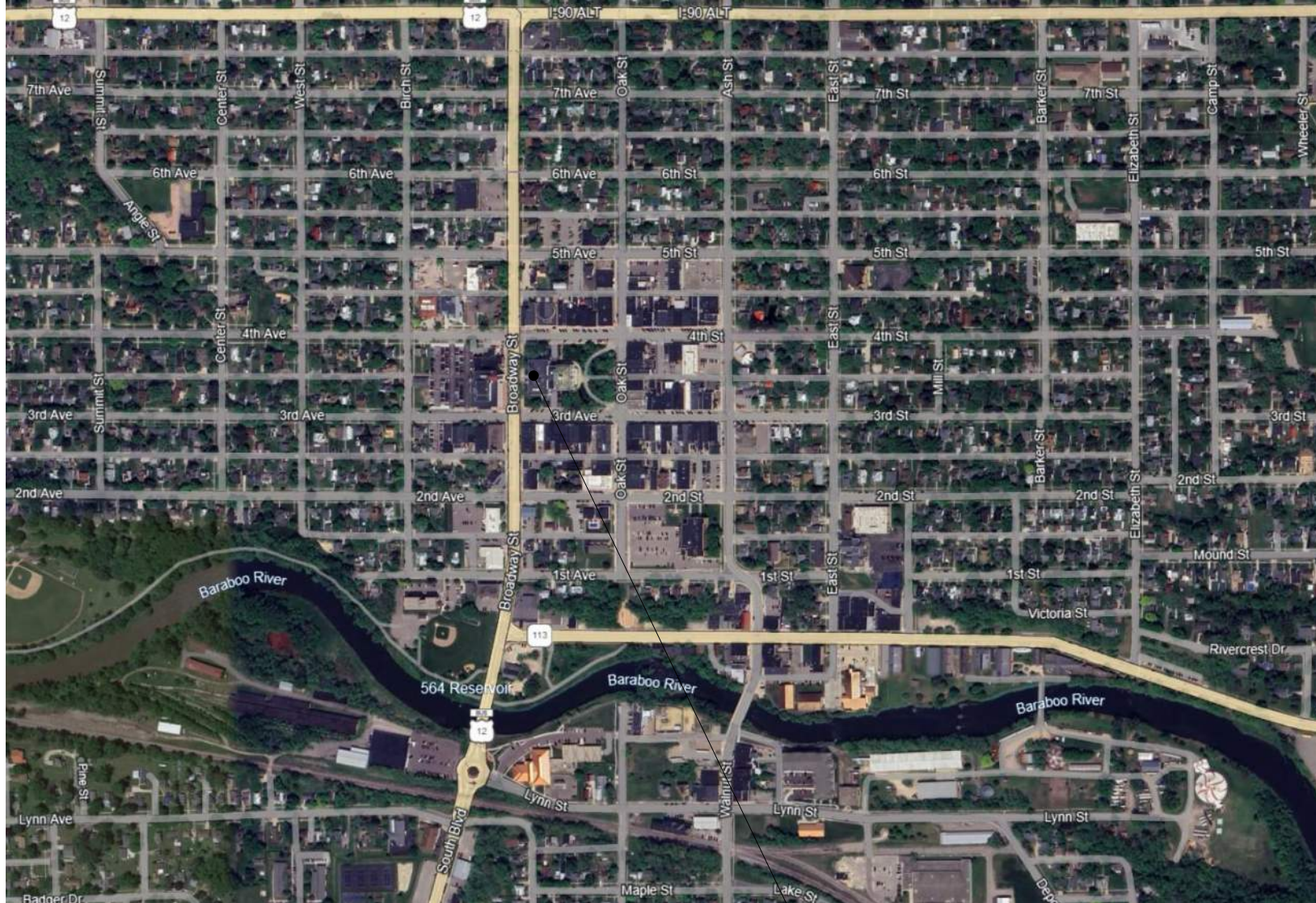
STRANG, INC.

811 EAST WASHINGTON AVENUE, SUITE 200

MADISON, WI 53703

(608) 276-9200

SITE LOCATION MAP



DESIGN TEAM

ARCHITECTURAL DESIGN, MECHANICAL AND
ELECTRICAL ENGINEERING
STRANG, INC.

STRUCTURAL ENGINEERING
CORE 4 ENGINEERING, INC.

CODE INFORMATION

PROJECT SCOPE:
The scope includes but is not limited to equipment replacement and partial conversion to a Variable Air Volume system, lighting and controls, power, fire alarm, and removal and replacement of ceilings. Work shown in the following documents does not change size / area of building, egress or occupancy. Work will be completed in (3) phases: Starting in the Basement level and west part of First floor (Phase 1), then in the east part of First floor and all of Second floor (Phase 2), and lastly in Third floor and on Roof level and in Penthouse (Phase 3).

HISTORIC INFORMATION:
The original 1906 Court house, and 1963 Annex Building including the connection between the two predates the requirements of 2021 IBC Table 1002.2 and are considered still under the code in effect at the time of construction (1906 & 1963) which is silent on the need for fire resistance rating of corridors. Since the building use is not changing and the rooms will not be reconstructed beyond standard maintenance and repair or limited alterations, the rooms are not required to meet the fire separation requirements of 2021 IBC (Tables 1002.2, 508.4 & 509.1). In reviewing the various construction documents provided to us, no subsequent alterations that would have altered or required corridor construction adhering to current building code requirements were found within the areas of work.

APPLICABLE CODES:
Wisconsin Commercial Building Code and Administrative Codes including SPS
Accessibility: ICCANSI A117.1-2017 Edition
Commercial Building: 2021 IBC as amended
Electrical: 2017 NFPA-70 (NEC) as amended
Energy Conservation: 2021 IECC as amended
Existing Building Code: 2021 IBC as amended
Fire Protection: 2021 IFC as amended
Mechanical: 2021 IMC as amended
Plumbing: 2024 Wisconsin Plumbing Code

CLASSIFICATION OF WORK: (IEBC 2021 Sections 503, 504, 505)
Level 2 Alteration

BUILDING AREA:
Work Area 42,300 gross sq. ft. (includes areas on all floors)

	Work Area	Total Existing Floor Area
Basement Floor	10,729 gross sq. ft.	10,842 gross sq. ft.
First Floor	15,144 gross sq. ft.	21,688 gross sq. ft.
Second Floor	10,655 gross sq. ft.	21,688 gross sq. ft.
Third Floor	5,802 gross sq. ft.	21,688 gross sq. ft.
Totals	42,330 gross sq. ft.	75,906 gross sq. ft.

BUILDING HEIGHT:
Existing 3 story

PRIMARY BUILDING USES: (IBC 2021 Chapter 3)
Non-Separated Uses

OCCUPANCY TYPE:
Group B - Business

ACCESSORY USES: (IBC 2021 Section 508.2)
Assembly (A-3) - Courtrooms

TYPE OF CONSTRUCTION: 3B (IBC 2021 Chapter 6)

FIRE RESISTANCE RATINGS:
Fire Resistance Hourly Ratings for Structural Components: (IBC 2021 Table 601)
Primary Structural Frame 0 Hour
Bearing Walls, Exterior 2 Hour
Bearing Walls, Interior 0 Hour
Floor Construction 0 Hour
Roof Construction 0 Hour

Fire Resistance Hourly Ratings for Separations:
*Refer to Historic Information

FIRE SPRINKLER SYSTEM:
None

FIRE ALARM SYSTEM:
Fire Alarm Initiation and Notification Devices

ALLOWABLE AREA:
No change. Existing Floor Area to remain the same.

ALLOWABLE HEIGHT:
No change. Existing Height to remain.

OCCUPANT LOAD:
No change. Existing Occupant Load to remain.

EXIT WIDTH:
No change. Existing Exit Widths to remain.

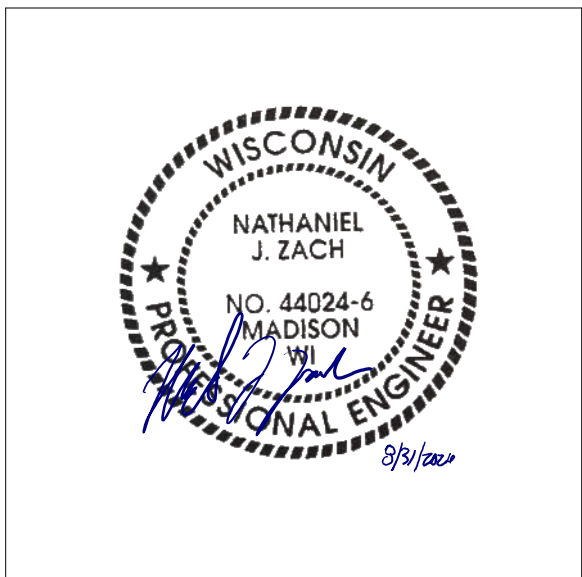
PLUMBING FIXTURE:
No change. Existing Plumbing Fixture count to remain.

STAMPS

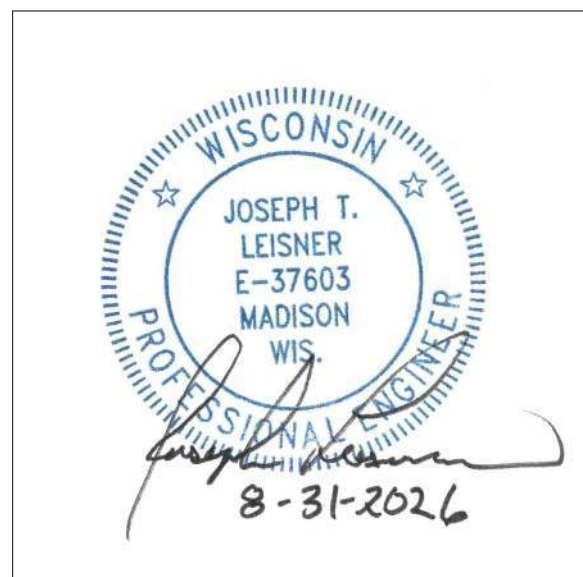
ARCHITECTURAL



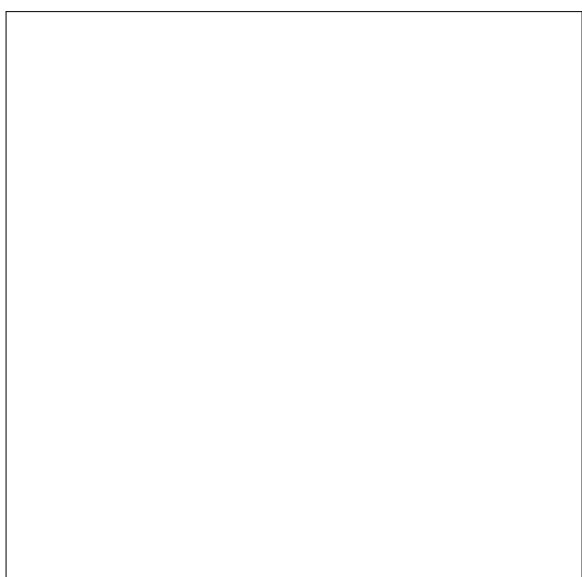
MECHANICAL



ELECTRICAL



STRUCTURAL



SHEET INDEX

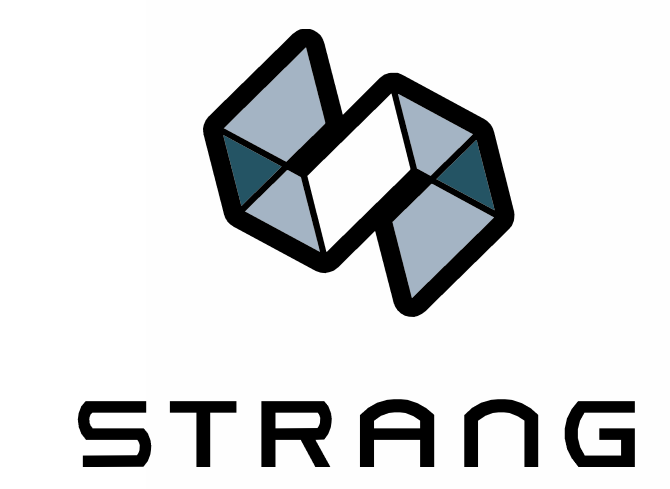
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A501	WALL SECTIONS & DETAILS	

CONSTRUCTION
DOCUMENTS

ISSUED FOR
CONSTRUCTION

No.	DESCRIPTION	DATE
1	ADD-02	10/05/2026

COPYRIGHT STRANG, INC.	2026
DRAWING SET	CD
DATE	08/31/2026
PROJECT NO.	2025012
SHEET NAME	TITLE SHEET



ARCHITECTURE
ENGINEERING
INTERIOR DESIGN

MADISON, WI | WAUKESHA, WI



CONSTRUCTION
DRAWINGS

ISSUED FOR
CONSTRUCTION

REVISIONS	
No.	DESCRIPTION
	DATE

KEYPLAN (NOT TO SCALE)

COPYRIGHT STRANG, INC.	2025
DRAWING SET	CD
DATE	08/31/2026
PROJECT NO.	2025012

PROJECT TITLE

SAUK COUNTY
COURTHOUSE HVAC
AND LIGHTING
UPGRADES

515 Oak St.
Baraboo, WI 53913

SHEET NAME

STRUCTURAL
GENERAL NOTES

SHEET NO.

S001

DESIGN CRITERIA

- BUILDING CODE - INTERNATIONAL BUILDING CODE (IBC) 2021 / ASCE7-16
- FLOOR LIVE LOADS
 - OFFICES 50 PSF
 - PARTITIONS 15 PSF
 - CORRIDORS 100 PSF
 - PUBLIC AREAS 100 PSF
 - STORAGE (LIGHT) 125 PSF
 - STAIRS 100 PSF
- SNOW LOADS
 - GROUND SNOW, P_g 35 PSF
 - EXPOSURE FACTOR, C_e 1.0
 - TEMPERATURE FACTOR, C_t 1.0
 - SLOPED ROOF FACTOR, C_s 1.0
 - IMPORTANCE FACTOR, I_s 1.1
 - FLAT ROOF SNOW, P_f 27 PSF
 - SLOPED ROOF SNOW, P_s 27 PSF
 - SLIDING & DRIFTING SNOW, IN ADDITION TO FLAT ROOF SNOW, SEE PLANS
 - UNBALANCED SNOW PER ASCE 7

GENERAL REQUIREMENTS

- THE CONTRACT DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INCLUDE THE METHOD OF CONSTRUCTION. CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO: BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, TEMPORARY STRUCTURES, AND PARTIALLY COMPLETED WORK. OBSERVATION VISITS TO THE SITE BY STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.
- GENERAL CONTRACTOR TO DISTRIBUTE ALL SHEETS IN THE SET TO SUBCONTRACTORS.
- THE ARCHITECT AND/OR ENGINEER OF RECORD SHALL NOT HAVE CONTROL OVER OR BE IN CHARGE OF, AND SHALL NOT BE RESPONSIBLE IN ANY WAY FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, OR PROCEDURES, OR FOR SAFETY OR SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH ANY CONSTRUCTION ACTIVITIES, SINCE THESE ARE SOLELY THE CONTRACTOR'S RESPONSIBILITY.
- SUBMITTALS PREPARED BY SUBCONTRACTORS SHALL BE REVIEWED BY CONTRACTOR PRIOR TO SUBMITTING TO ARCHITECT/ENGINEER.
- CONTRACTOR SHALL VERIFY DIMENSIONS AND CONDITIONS AT THE JOB SITE. ANY DISCREPANCIES BETWEEN THE CONDITIONS FOUND AND THOSE INDICATED IN THE CONTRACT DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF ARCHITECT PRIOR TO PROCEEDING WITH THE WORK.
- SEE DOCUMENTS FROM OTHER DISCIPLINES FOR FLOOR, WALL, AND ROOF OPENINGS, TRENCHES, PITS, PIPE SLEEVES, EQUIPMENT PADS, METAL PAN STAIRS, MISCELLANEOUS IRON, ETC.
- DO NOT PLACE PIPES, DUCTS, CHASES, ETC. IN STRUCTURAL BEAM AND COLUMN MEMBERS. DO NOT CUT ANY STRUCTURAL MEMBER FOR PIPES, DUCTS, ETC., UNLESS NOTED OTHERWISE. NOTIFY STRUCTURAL ENGINEER WHEN DOCUMENTS BY OTHER DISCIPLINES SHOW OPENINGS, POCKETS, ETC. NOT INDICATED IN THE STRUCTURAL DRAWINGS BUT ARE LOCATED IN THE STRUCTURAL MEMBERS. CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM STRUCTURAL ENGINEER FOR INSTALLATION OF SUCH PIPES, DUCTS, CHASES, ETC.
- DETAILS LABELED "TYPICAL" ON THE STRUCTURAL DRAWINGS APPLY TO ALL SITUATIONS OCCURRING ON PROJECT THAT ARE THE SAME OR SIMILAR TO THOSE LOCATIONS SPECIFICALLY INDICATED. WHERE A DETAIL IS NOT INDICATED, THE DETAIL SHALL BE THE SAME AS FOR OTHER SIMILAR CONDITIONS.
- DELEGATED DESIGNED ELEMENTS SHALL BE DESIGNED BY LICENSED PROFESSIONAL ENGINEERS REGISTERED IN THE STATE WHERE THE PROJECT IS LOCATED. GENERAL CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, DESIGN LOAD DATA, SUPPORT REACTIONS, AND CERTIFICATION THAT ELEMENTS WERE DESIGNED FOR LOADS SPECIFIED IN THE CONTRACT DOCUMENTS OR IN THE BUILDING CODE. ALLOW MINIMUM TO BUSINESS DAYS FOR REVIEW BY EOR. ALL DOCUMENTS NOTED SHALL BE SEALED BY THE LICENSED ENGINEER. IF CRITERIA INDICATED ARE NOT SUFFICIENT, SUBMIT A WRITTEN REQUEST FOR ADDITIONAL INFORMATION TO THE ARCHITECT. THE FOLLOWING ELEMENTS AND THEIR CONNECTIONS SHALL BE CONTRACTOR DESIGNED:
 - STRUCTURAL STEEL CONNECTIONS NOT DETAILED OR SHOWN ON THE DRAWINGS
 - TEMPORARY SHORING DURING CONSTRUCTION

EXISTING CONSTRUCTION

- ALL EXISTING FRAMING SHOWN ON THESE DRAWINGS IS BASED ON AVAILABLE DOCUMENTATION & FIELD OBSERVATION TO DATE. CONTRACTOR SHALL FIELD VERIFY ALL SIZES, DIMENSIONS, ELEVATIONS AND CONFIGURATIONS OF EXISTING STRUCTURAL ELEMENTS (COLUMNS, BEAMS, WALLS, ETC.) AS NECESSARY TO PROPERLY INSTALL ALL NEW STRUCTURAL ELEMENTS AS SHOWN. COORDINATE DIFFERENCES BETWEEN FIELD CONDITIONS AND STRUCTURAL DRAWINGS WITH STRUCTURAL ENGINEER PRIOR TO PROCEEDING WITH WORK, AND PROCUREMENT/FABRICATION OF MATERIALS.
- REMOVE AND REPLACE AND/OR MODIFY ALL EXISTING CONSTRUCTION (ARCHITECTURAL, STRUCTURAL, ELECTRICAL, AND MECHANICAL) AS REQUIRED IN ORDER TO PLACE NEW STRUCTURAL WORK SHOWN ON THE CONSTRUCTION DOCUMENTS. DO NOT MODIFY STRUCTURAL COMPONENTS UNLESS DETAILED ON THE CONSTRUCTION DOCUMENTS.
- IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND CONSTRUCTION MEANS & METHODS OF CONSTRUCTION. THIS INCLUDES, BUT IS NOT LIMITED TO, SHORING, UNDERPINNING, TEMPORARY BRACING, ETC. CONTRACTOR SHALL DESIGN AND PROVIDE ALL SHORING DESIGN, MATERIALS AND FABRICATION REQUIRED TO SUPPORT EXISTING CONSTRUCTION AND NEW CONSTRUCTION AS REQUIRED TO BUILD THIS PROJECT.

CONCRETE

CODES & STANDARDS:	
ACI 301	SPECIFICATIONS FOR CONCRETE CONSTRUCTION
ACI 305	GUIDE TO HOT WEATHER CONCRETING
ACI 306	GUIDE TO COLD WEATHER CONCRETING
ACI 318	BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE

MATERIALS (28 DAY COMPRESSIVE STRENGTH):	
FOOTINGS	f _c =3,000 PSI
INTERIOR SLAB ON GRADE	f _c =4,000 PSI
EXTERIOR SLAB ON GRADE (EXCLUDING SIDEWALKS)	f _c =5,000 PSI
FOUNDATION WALLS / GRADE BEAMS / PIERS	f _c =4,500 PSI
BEAMS / COLUMNS	f _c =4,000 PSI
CONCRETE ON METAL DECK	f _c =4,000 PSI
CONCRETE TOPPING	f _c =4,000 PSI

- CONCRETE MIX DESIGN (INCLUDING AGGREGATE SIZE, WATER CEMENT RATIO, AIR ENTRAINMENT, ADMIXTURES, SLUMP AND HISTORY OF BREAK TESTS) SHALL BE SUBMITTED TO THE EOR FOR APPROVAL PRIOR TO THE COMMENCEMENT OF ANY WORK. CONCRETE SHALL BE NORMAL WEIGHT UNO.
- MAXIMUM WATER/CEMENT RATIO PERMITTED SHALL BE 0.55 FOR FOOTINGS, 0.50 FOR INTERIOR SLABS ON GRADE, 0.45 FOR BELOW GRADE CONCRETE AND 0.40 FOR CONCRETE EXPOSED TO WATER AND DEICING CHEMICALS.
- CONCRETE WHICH WILL BE EXPOSED TO THE WEATHER (INCLUDING FOUNDATION WALLS) SHALL HAVE AIR-ENTRAINING ADMIXTURE AS REQUIRED TO PROVIDE 6% ± 1% AIR ENTRAINMENT.
- MAXIMUM AGGREGATE SIZE SHALL BE 3/4" FOR SLABS ON GRADE, WALLS, BEAMS & COLUMNS, 1" FOR FOOTINGS AND 3/8" FOR TOPPING SLABS. NORMAL WEIGHT AGGREGATE TO CONFORM TO ASTM C33. LIGHTWEIGHT AGGREGATE TO CONFORM TO ASTM C330.
- CONCRETE SHALL BE EVALUATED ACCORDING TO METHOD 1 OR METHOD 2 AS DESCRIBED IN ACI 301. THE RESULTS OF THESE ANALYSES SHALL BE SUBMITTED TO THE EOR FOR APPROVAL PRIOR TO ANY WORK.
- THE CONTRACTOR SHALL MAKE PROVISIONS TO ALLOW AN INDEPENDENT TESTING AGENCY TO CAST 4 TEST CYLINDERS FOR EACH 50 CUBIC YARDS OF CONCRETE PLACED, OR FOR ANY DAY'S OPERATION. THE TESTING AGENCY SHALL BE RESPONSIBLE FOR CASTING AND CURING SPECIMENS IN COMPLIANCE TO ASTM C31 AND CASTING TESTING SPECIMENS IN COMPLIANCE TO ASTM C39.
- DRAWINGS SHOWING THE LOCATION OF CONSTRUCTION JOINTS, CONTROL JOINTS, AND PLACING SEQUENCE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO THE PREPARATION OF REINFORCING SHOP DRAWINGS. MAXIMUM POUR LENGTHS OF WALLS TO BE 40'-0" AND A MINIMUM OF 4'-0" AWAY FROM INTERSECTIONS AND CORNERS.
- GROUT USED TO SET PLATES SHALL BE NON-SHRINK AND NON-METALLIC.
- THE CONTRACTOR SHALL USE SMOOTH FORMS FOR EXPOSED CONCRETE SURFACES. BOARD FORMS MAY BE USED FOR UNEXPOSED CONCRETE SURFACES. EARTH FORMS ARE FORBIDDEN.
- PROVIDE COMPACTED GRANULAR FILL UNDER ALL SLABS ON GRADE, SEE CONCRETE SLAB ON GRADE SCHEDULE.
- VAPOR BARRIER TO BE AS INDICATED ON TYPICAL SLAB JOINT DETAIL. LAP MINIMUM 6" AND TAPE ALL SEAMS. VERIFY ADDITIONAL REQUIREMENTS WITH ARCHITECTURAL SPECIFICATIONS.
- FLOOR FLATNESS AND LEVELNESS OF SLAB ON GRADE CONCRETE SHALL HAVE THE FOLLOWING TOLERANCES, AS RECOGNIZED BY THE MOST CURRENT VERSION OF ASTM E 1155 AND ACI 302.1. SEE SPECIFICATION FOR FURTHER REQUIREMENTS (F_R) SPECIFIED OVERALL VALUE (SOV) OF 50, MINIMUM LOCALIZED VALUE (MLV) OF 25 AND F_L(1) SPECIFIED OVERALL VALUE (SOV) OF 33, MINIMUM LOCALIZED VALUE (MLV) OF 17).

LINTEL SCHEDULE				
MARK	LINTEL	JAMB REINF	LINTEL TYPE	REMARKS
L4	W8x10 W/ 3/8" BOTTOM PL	(1)#5	A	
L6	(2) W8x10 W/ 3/8" BOTTOM PL	N/A	21/S300	

CONCRETE REINFORCING

CODES & STANDARDS:		
ACI 315	GUIDE TO PRESENTING REINFORCING STEEL DESIGN DETAILS	
ACI 318	BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE	
MSP2	CSI MANUAL OF STANDARD PRACTICE	
AWS D1.4	STRUCTURAL WELDING CODE - REINFORCING STEEL	
WRI	WELDED WIRE FABRIC MANUAL OF STANDARD PRACTICE	

MATERIALS:		
REINFORCING BARS	ASTM A615 Gr 60	Fy=60 KSI
WELDED WIRE FABRIC	ASTM A185	
MACRO FIBER REINFORCING	ASTM C1116 Type III	
WELDABLE REINFORCING BARS	ASTM A706	Fy=60 KSI

- THE REINFORCEMENT FABRICATOR SHALL PROVIDE AND SCHEDULE ON SHOP DRAWINGS ALL REQUIRED REINFORCING STEEL AND NECESSARY ACCESSORIES TO HOLD REINFORCEMENT SECURELY IN PLACE AT THE CORRECT LOCATIONS.
- THE REQUIRED CLEARANCE FOR REINFORCEMENT (UNO) SHALL BE 3" FOR CONCRETE PLACED DIRECTLY AGAINST EARTH, 2" (#6 & LARGER) AND 1 1/2" (#6 & SMALLER) FOR CONCRETE EXPOSED TO EARTH OR WEATHER, 1 1/2" (#14 & LARGER) AND 3/4" (#11 & SMALLER) FOR CONCRETE NOT EXPOSED TO EARTH OR WEATHER.
- THE CONTRACTOR SHALL REFER TO TYPICAL DETAILS SHOWN ON THE CONTRACT DRAWINGS FOR ADDITIONAL REINFORCING REQUIREMENTS.
- WHERE REINFORCEMENT IS REQUIRED IN SECTIONS, REINFORCEMENT IS CONSIDERED TYPICAL WHEREVER THE SECTION APPLIES.
- WELDED WIRE FABRIC SHALL HAVE A MINIMUM OF 6" LAP AND BE TIED TOGETHER.
- THE CONTRACTOR SHALL NOTIFY THE ARCHITECT OF COMPLETION OF REINFORCEMENT INSTALLATION AND ALLOW AT LEAST 24 HOURS BEFORE SCHEDULED CONCRETE PLACEMENT FOR THE ARCHITECT TO INSPECT REINFORCEMENT.
- MACRO FIBER TO BE 1-1/2" MINIMUM LENGTH, WHERE INDICATED IN CONCRETE SLAB ON GRADE OR METAL DECK SCHEDULE.

REINFORCED MASONRY

CODES:	
ACI 530.1/ASCE 6/TMS 602	SPECIFICATION FOR MASONRY STRUCTURES
ACI 530/ASCE 5/TMS 402	BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES

MATERIALS:		
CONCRETE MASONRY BLOCK	ASTM C-90	2,000 PSI
TYPE M/S MORTAR	ASTM C270	
GROUT (28 DAY STRENGTH)	ASTM C476	2,000 PSI
REINFORCING BARS	ASTM A615 Gr 60	Fy=60 KSI

- THE REQUIRED MINIMUM 28 DAY COMPRESSIVE STRENGTH OF THE COMBINATION OF CONCRETE BLOCK, GROUT AND MORTAR ON THE NET AREA OF THE CONSTRUCTION (f_m) SHALL BE A MINIMUM OF 2,000 PSI.
- ALL CONCRETE BLOCK MASONRY UNITS SHALL BE NORMAL WEIGHT.
- ALL CONCRETE BLOCK MASONRY UNITS SHALL BE LAID IN RUNNING BOND, UNO.
- MASONRY BLOCK CELLS CONTAINING VERTICAL REINFORCING SHALL BE GROUTED SOLID. FILLING CELLS WITH MORTAR IS UNACCEPTABLE.
- ALL BOND BEAMS TO BE GROUTED SOLID.
- THE BASE OF EACH CELL IN WHICH REINFORCING BAR IS PLACED MUST HAVE A CLEAN OUT HOLE.
- VERTICAL REINFORCING BARS SHALL BE LAPPED PER SCHEDULE. MECHANICAL SPLICES MAY BE USED IN LIEU OF LAP SPLICES.
- PROVIDE CONTINUOUS REINFORCED BOND-BEAMS IN ALL REINFORCED MASONRY WALLS AT THE TOP, AND AS REQUIRED IN THE CONTRACT DRAWINGS. BOND-BEAMS AT THE TOP OF THE WALL SHALL BE CONTINUOUS AT MASONRY CONTROL JOINTS. ALL OTHER BOND-BEAMS SHALL NOT BE CONTINUOUS AT MASONRY CONTROL JOINTS. BOND-BEAM REINFORCING SHALL EXTEND INTO AND BE CONTINUOUS WITH ALL INTERSECTING BOND-BEAMS.
- REINFORCED MASONRY WALLS SHALL HAVE #9 GAUGE (LADDER TYPE) HORIZONTAL REINFORCING AT SPACING AS NOTED ON CONTRACT DRAWINGS, BUT AT A MAXIMUM OF 16" O.C. VERTICALLY.
- FILL CORES OF MASONRY UNDER ALL BEARING PLATES. THE MINIMUM WIDTH SHALL BE 3 TIMES THE BEARING PLATE LENGTH FOR THREE COURSES BELOW BEARING, UNO.
- BRACE ALL MASONRY WALLS DURING CONSTRUCTION AS REQUIRED TO RESIST WIND AND OTHER TEMPORARY LOADS UNTIL FINAL STRUCTURAL MEMBERS ARE INSTALLED.
- PROVIDE BAR POSITIONERS ON ALL REINFORCING TO HOLD AND MAINTAIN PROPER REBAR LOCATIONS AND COVER DURING GROUTING.

STRUCTURAL STEEL

CODES & STANDARDS:	
AISC 360	SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS
AISC	CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES
AWS D1.1	STRUCTURAL WELDING CODE - STEEL
AISC	STRUCTURAL STEEL DETAILING MANUAL

MATERIALS:		
HOT ROLLED W & WT SHAPES	ASTM A992	Fy=50 KSI
ANGLES, CHANNELS & PLATES	ASTM A36	Fy=36 KSI
S + M SHAPES	ASTM A36	Fy=36 KSI
HP SHAPES	ASTM A572 Gr 50	Fy=50 KSI
STEEL PIPE	ASTM A53 Gr B	Fy=35 KSI
RECTANGULAR HSS	ASTM A500 Gr C	Fy=50 KSI
ROUND HSS	ASTM A500 Gr C	Fy=48 KSI
HIGH STRENGTH BOLTS	ASTM A325	
HEAVY HEX NUTS	ASTM A563	
HARDENED STEEL WASHERS	ASTM A436	
ANCHOR RODS	ASTM F1554 Gr 36	Fy=36 KSI
THREADED RODS	ASTM A36	Fy=36 KSI
HEADED STUD ANCHORS	ASTM A108	

- PROVIDE 2 MIL THICKNESS RED OR GRAY OXIDE PRIMER ON ALL STEEL SURFACES (UNO).
- ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED PER ASTM A123 AND FASTENERS HOT DIPPED GALVANIZED PER ASTM A153.
- ANCHOR RODS SHALL BE PRESET WITH TEMPLATES.
- COLUMN BASE PLATES SHALL BE GROUTED UNDER WITH NON-SHRINK, NON-METALLIC GROUT.
- CONNECTIONS MAY BE BOLTED OR WELDED AT THE FABRICATORS OPTION. BOLTED CONNECTIONS SHALL BE A MINIMUM BOLT DIAMETER OF 3/4" (UNO). HIGH STRENGTH BOLTS IN SINGLE OR DOUBLE SHEAR (UNO) AND SIMPLE SHEAR CONNECTIONS SHALL BE CAPABLE OF END ROTATION PER AISC REQUIREMENTS FOR UNRESTRAINED MEMBERS.
- THE MINIMUM FILLET WELD SIZE SHALL NOT BE LESS THAN 3/16" (UNO).
- ALL WELDS SHALL USE WELD METAL CONFORMING TO E70XX AND CONFORMING TO AWS WELDING PROCEDURES AND STANDARDS.
- ALL WELDS SHALL BE MADE BY A LICENSED STRUCTURAL WELDER IN THE STATE AND AREAS OF THE BUILDING WHERE STRUCTURAL WELDING WILL OCCUR IN THE POSITION IN WHICH THE WELD IS TO BE MADE.
- THE ERECTION OF ANY STRUCTURAL STEEL MEMBERS SHALL NOT COMMENCE UNTIL ALL SUPPORTING CONCRETE/MASONRY ELEMENTS HAVE ATTAINED AT LEAST 75% OF THEIR INTENDED MINIMUM COMPRESSIVE STRENGTH.
- THE CONTRACTOR SHALL PROVIDE TEMPORARY ERECTION BRACING AND SUPPORTS AS REQUIRED FOR THE SAFE ERECTION OF ALL STEEL. TEMPORARY BRACING SHALL REMAIN IN PLACE UNTIL PERMANENT BRACING HAS BEEN INSTALLED AND FLOOR SLAB CONCRETE HAS ATTAINED 75% OF ITS REQUIRED STRENGTH.
- STRUCTURAL STEEL SHALL BE TRUE AND PLUMB BEFORE FINAL BOLTING OR WELDING OF CONNECTIONS.
- THE CONTRACTOR SHALL NOT MODIFY OR CUT ANY STRUCTURAL STEEL WITHOUT WRITTEN APPROVAL FROM THE EOR.
- THE CONTRACTOR SHALL FIELD TOUCH UP ALL ABRASIONS, BURNS, AND SIMILAR DEFECTS IN PAINT OF STRUCTURAL STEEL.
- PROVIDE 1/4" CLOSURE/END PLATES FOR ALL OPEN ENDS OF HSS & PIPE MEMBERS.
- CONTRACTOR SHALL INCLUDE IN PROPOSAL COST TO FURNISH, DELIVER, FABRICATE AND ERECT 1.0 TONS OF STRUCTURAL STEEL IN ADDITION TO THAT SPECIFIED IN THE CONSTRUCTION DOCUMENTS. ANY UNUSED MATERIAL SHALL BE CREDITED TO THE OWNER AT THE END OF THE PROJECT.

STEEL DECK AND SHEAR CONNECTORS

CODES:	
AISC	SPECIFICATION FOR DESIGN, FABRICATION AND ERECTION OF STEEL FOR BUILDINGS
ASIS	SPECIFICATION FOR THE DESIGN OF LIGHT GAUGE COLD FORM STEEL STRUCTURAL MEMBERS
AWS D1.3	STRUCTURAL WELDING CODE - SHEET METAL
SDI	CODE OF PRACTICE

MATERIALS:		
ROOF DECK - PAINTED	ASTM A611 Gr C	Fy=33 KSI
ROOF DECK - GALVANIZED	ASTM A446 Gr A	Fy=33 KSI
NONCOMPOSITE DECK - PAINTED	ASTM A446 Gr E	Fy=50 KSI
COMPOSITE DECK - GALVANIZED	ASTM A446 Gr 1	Fy=50 KSI
GALVANIZING	ASTM A525 CLASS G60 MIN	

- PRIMER PAINT SHALL BE SHOP APPLIED OVER CLEAN AND PHOSPHATIZED STEEL.
- STEEL DECK SHALL EXTEND OVER THREE OR MORE SPANS WHENEVER POSSIBLE. MINIMUM BEARING AT ENDS SHALL BE 1' 1/2".
- STEEL DECK SHALL BE FASTENED AS SHOWN ON THE PLANS.
- IF STEEL DECK IS TO BE FASTENED WITH THE USE OF WELDS, USE 1/8 GA. WELD WASHERS AT ALL THICKNESS LESS THAN 22 GA. WELDS SHALL NOT BE USED AT SIDE LAP FASTENERS AND DECK SHALL BE WELDED TO SUPPORTS WITH ROBART 1150 WIRE (IRON POWER RODS) OR AN APPROVED EQUAL.
- SHEAR CONNECTORS, NUMBER INDICATED ON THE FRAMING PLANS AT EACH BEAM BY (X) SHALL BE EQUALLY SPACED OVER THE LENGTH OF THE BEAM STARTING AS NEAR AS POSSIBLE TO THE BEAM SUPPORTS. WHERE STEEL DECK CORRUGATIONS DO NOT ALLOW FOR AN EVEN SPACING, THE SPACING SHALL BE VARIED SO THAT THE HIGHEST DENSITY OF CONNECTORS OCCURS NEAREST THE SUPPORT.

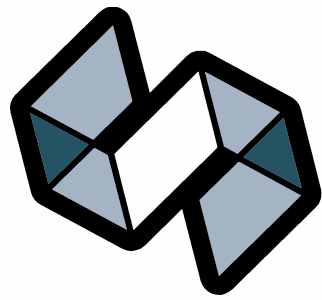
STEEL STAIRS, LADDERS, HANDRAILS AND GUARD RAILS

- ENGINEERED STEEL STAIR SYSTEM: STRINGERS, HEADERS, LANDINGS, RAILINGS, GUARD RAILS AND CONNECTIONS TO THIS STRUCTURE SHALL BE DESIGNED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE LOCATION OF THIS BUILDING. PROVIDE SIGNED & SEALED STRUCTURAL CALCULATIONS WITH SHOP DRAWING SUBMITTAL.
- THE CONFIGURATION OF THE STEEL STAIR SYSTEM SHALL BE AS SHOWN ON THE ARCHITECTURAL DRAWINGS.
- THE LOADS REQUIRED FOR THE DESIGN OF THE STEEL STAIR SYSTEM SHALL BE AS INDICATED ON THE "DESIGN LOADS" SECTION OF THESE NOTES.
- THE SHOP DRAWINGS SHALL INDICATE LOADS IMPOSED ON THE BUILDING STRUCTURE BY THE STAIR STRUCTURE.

POST-INSTALLED ANCHORS

- THE DIAMETER, EMBEDMENT LENGTH AND TYPE OF ADHESIVE ANCHORS AND SCREW ANCHORS SHALL BE AS SPECIFIED ON THE DRAWINGS.
- THE SUBSTITUTION OF OTHER MANUFACTURER'S SIMILAR PRODUCTS IS ALLOWED, PROVIDED THAT THE SIZE IS EQUAL TO, AND CAPACITY IN SHEAR AND UPLIFT ARE EQUAL TO OR GREATER THAN WHAT IS SPECIFIED ON THE DRAWINGS. THE COST OF REDESIGN OF SUCH SUBSTITUTIONS SHALL BE BORE BY THE CONTRACTOR.
- INSTALLATION OF ANCHORS SHALL STRICTLY FOLLOW ALL MANUFACTURER'S WRITTEN INSTRUCTIONS AND SPECIFICATIONS. ALL DRILL HOLE PREPARATIONS SHALL BE FOLLOWED.
- NO LOAD SHALL BE APPLIED TO ADHESIVE ANCHORS PRIOR TO THE FULL CURE TIME AS SPECIFIED BY THE MANUFACTURER.
- TESTING OF 10% OF ALL INSTALLED ANCHORS IS REQUIRED. TESTED ANCHORS SHALL MEET THE MANUFACTURERS PROOF LOAD REQUIREMENTS AND/OR INSTALLATION TORQUE REQUIREMENTS. MALFUNCTIONING FASTENERS SHALL BE REPLACED.
- ALL ADHESIVE ANCHOR INSTALLATIONS IN THE HORIZONTAL TO VERTICALLY OVERHEAD ORIENTATION SHALL BE CONDUCTED BY A CERTIFIED ADHESIVE ANCHOR INSTALLER AS CERTIFIED BY ACI PER 318-11 §2.2 OR ACI 318-14 17.8.2.2 OR ACI 318-19 17.2.3 OR APPROVED EQUIVALENT. CURRENT AAI CERTIFICATE MUST BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL PRIOR TO COMMENCEMENT OF ANY ADHESIVE ANCHOR INSTALLATIONS.
- ADHESIVE ANCHORS IN CRACKED AND UNCRACKED CONCRETE SHALL BE DEWALT PURE 220+ (ICC-ES ESR-1544) OR SIMPSON SET 3G OR HILTI RE 500 V3. SCREW ANCHORS IN CRACKED AND UNCRACKED CONCRETE SHALL BE DEWALT SCREW-BOLT+ (ICC-ES ESR-4042) OR SIMPSON TITEN HD OR HILTI KWIK KH-EZ/ KWIK.

STRUCTURAL SHEET INDEX	
Sheet Number	Sheet Name
S001	STRUCTURAL GENERAL NOTES
S002	STRUCTURAL SPECIAL INSPECTIONS - IBC 2021
S200	FIRST FLOOR FRAMING PLAN AND PARTIAL FOUNDATION PLAN (PHASE 1)
S202	THIRD FLOOR FRAMING PLAN (PHASE 2)
S203	ROOF FRAMING PLAN (PHASE 3)
S300	STRUCTURAL DETAILS



STRANG

ARCHITECTURE
ENGINEERING
INTERIOR DESIGN

MADISON, WI | WAUKESHA, WI



CONSTRUCTION
DRAWINGS

ISSUED FOR
CONSTRUCTION



REVISIONS

No. | DESCRIPTION

DATE

KEYPLAN (NOT TO SCALE)

COPYRIGHT STRANG, INC. 2025
DRAWING SET CD
DATE 08/31/2026
PROJECT NO. 2025012

PROJECT TITLE

SAUK COUNTY
COURTHOUSE HVAC
AND LIGHTING
UPGRADES

515 Oak St.
Baraboo, WI 53913

SHEET NAME

STRUCTURAL SPECIAL
INSPECTIONS - IBC
2021

SHEET NO.

S002

SPECIAL INSPECTION - STEEL CONSTRUCTION (STRUCTURAL STEEL) 2021 IBC				
SPECIAL INSPECTION REQUIRED Y/N	VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA
		CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	REFERENCED STANDARD
PRIOR TO WELDING				
YES	1. QUALIFIED WELDER	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	2. VERIFY WELDING PROCEDURES (WPS) AND CONSUMABLE CERTIFICATES	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	3. MATERIAL IDENTIFICATION	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	4. WELDER IDENTIFICATION	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	5. FIT-UP GROOVE WELDS	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	6. FIT-UP OF CJP GROOVE WELDS	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	7. ACCESS HOLES	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	8. FIT-UP OF FILLET WELDS	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
DURING WELDING				
YES	1. CONTROL AND HANDLING OF WELDING CONSUMABLES	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	2. CRACKED TACK WELDS	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	3. ENVIRONMENTAL CONITIONS	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	4. WPS FOLLOWED	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	5. WELDING TECHNIQUES	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	6. STEEL HEADED ANCHORS	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
AFTER WELDING				
YES	1. WELD IS CLEANED	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	2. SIZE, LENGTH AND LOCATION OF WELDS	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	3. WELDS MEET VISUAL ACCEPTANCE CRITERIA	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	4. ARC STRIKES	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	5. K-AREA	X	----	1705.2.1IBC 1705.2.1 N5.4-1, AISC 360-16
YES	6. WELD ACCESS HOLES	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	7. BACKING AND WELD TABS REMOVED	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	8. REPAIR ACTIVITIES	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	9. DOCUMENT ACCEPTANCE OR REJECTION OF WELDED JOINT/NUMBER	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	10. NO PROHIBITED WELDS	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
NON-DESTRUCTIVE TESTING				
NO	1. CJP WELDS (RISK CAT. II)	----	ONCE AFTER INSTALLATION	IBC 1705.2.1 N5.4-1, AISC 360-16
NO	2. CJP WELDS (RISK CAT. III OR IV)	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
NO	3. WELDED JOINTS SUBJECT TO FATIGUE	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16

SPECIAL INSPECTION - STEEL CONSTRUCTION (STRUCTURAL STEEL) 2021 IBC (CONTINUED)				
SPECIAL INSPECTION REQUIRED Y/N	VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA
		CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	REFERENCED STANDARD
PRIOR TO BOLTING				
YES	1. CERTIFICATIONS OF FASTENERS	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	2. FASTENERS MARKED	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	3. PROPER FASTENERS FOR JOINT	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	4. PROPER BOLTING PROCEDURE	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	5. CONNECTING ELEMENTS	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	6. PRE-INSTALLED VERIFICATION TESTING	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	7. PROPER STORAGE	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
DURING BOLTING				
YES	1. FASTENER ASSEMBLIES	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
NO	2. SNUG TIGHT PRIOR TO PRE-TENSIONING	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	3. FASTENER COMPONENT	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
NO	3. PRE-TENSIONED FASTENERS	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
AFTER BOLTING				
YES	1. DOCUMENT ACCEPTANCE OR REJECTION OF BOLTED CONNECTIONS	X	----	IBC 1705.2.1 N5.4-1, AISC 360-16
OTHER STEEL INSPECTIONS				
YES	1. STRUCTURAL STEEL DETAILS	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16
YES	2. ANCHOR RODS AND OTHER EMBEDMENTS SUPPORTING STRUCTURAL STEEL	----	ONCE AFTER ERECTION	IBC 1705.2.1 N5.4-1, AISC 360-16

SPECIAL INSPECTION - CONCRETE CONSTRUCTION 2021 IBC				
SPECIAL INSPECTION REQUIRED Y/N	VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA
		CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	REFERENCE STANDARD
YES	1. INSPECTION OF REINFORCING STEEL, INCLUDING PRE-STRESSING TENDONS AND VERIFY PLACEMENT.	----	ONCE PRIOR TO POURING	IBC 1908.4 ACI 318: CH. 20, 25.2, 25.3, 26.6.1-26.6.3
2. REINFORCING BAR WELDING				
NO	a. VERIFY WELDABILITY OF REINFORCING BARS OTHER THAN ASTM A706;	----	ONCE PRIOR TO POURING	AWS D1.4 ACI 318: 26.6.4
NO	b. INSPECT SINGLE-PASS FILLET WELDS, MAXIMUM	----	ONCE PRIOR TO POURING	
NO	c. INSPECT OTHERS WELDS	X	----	
YES	3. INSPECTION OF ANCHORS CAST IN CONCRETE	----	ONCE PRIOR TO POURING	ACI318: 17.8.2
YES	4. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS			
NO	a. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATION TO RESIST SUSTAINED TENSION LOADS	X	----	ACI 318: 17.8.2.4
YES	b. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4a.	----	ONCE PRIOR TO POURING	ACI 318: 17.8.2
YES	5. VERIFYING USE OF REQUIRED DESIGN MIX	----	ONCE PRIOR TO POURING	IBC 1904.1, 1904.2, 1908.2, 1908.3 ACI 318: CH. 19, 26.4.3, 26.4.4
YES	6. PRIOR TO CONCRETE PLACEMENT, FABRICATE FOR STRENGTH TESTS, PREFORM SLUMP AND AIR ENTRAINMENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE	X	----	IBC 1908.10 ASTM C 172 ASTM C 31 ACI 318: 26.5, 26.12
YES	7. INSPECTION OF CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES	X	----	IBC 1908.6, 1908.7, 1908.8 ACI 318: 26.5
YES	8. INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES	----	ONCE PRIOR TO POURING	ACI 318: 26.5.3-26.5.5
9. INSPECTION OF PRESTRESSED CONCRETE:				
NO	a. APPLICATION OF PRESTRESSING FORCES	X	----	ACI 318: 26.10
NO	b. GROUTING OF BONDED PRESTRESSING TENDONS	X	----	
NO	10. ERECTION OF PRECAST (TILT UP PANELS) CONCRETE MEMBERS.	----	ONCE PRIOR TO POURING	ACI 318: CH. 26.9
NO	11. VERIFICATION OF IN-SITU CONCRETE STRENGTH PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORING AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	----	ONCE PRIOR TO POURING	ACI 318: 26.13.1.3
	a. INSTALLATION OF THE EMBEDDED PARTS	X	----	ACI 550.5
	b. COMPLETION OF THE CONTINUITY OF...	X	----	
	c. COMPLETION OF CONNECTIONS IN THE FIELD	X	----	
YES	12. INSPECT INSTALLATION TOLERANCES FOR PRECAST CONCRETE DIAPHRAGM CONNECTIONS FOR COMPLIANCE WITH ACI 550.5	----	ONCE AFTER INSTALLATION	ACI 318: 26.13.1.3

SPECIAL INSPECTION - MASONRY 2021 IBC						
MINIMUM TESTS						
VERIFICATION OF SLUMP FLOW AND VISUAL STABILITY INDEX (VSI) AS DELIVERED TO THE PROJECT SITE IN ACCORDANCE WITH SPECIFICATION ARTICLE 1.5B.1.b.3 FOR SELF-CONSOLIDATING GROUT						
VERIFICATION OF FM AND FACO IN ACCORDANCE WITH SPECIFICATION ARTICLE 1.4B PRIOR TO CONSTRUCTION, EXCEPT WHERE SPECIFICALLY EXEMPTED BY THIS CODE						
MINIMUM INSPECTION						
SPECIAL INSPECTION REQUIRED Y/N	VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA		
		CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	IBC SECTION	TMS 402/ ACI 530/ ASCE 5	TMS 602/ ACI 530.1/ ASCE 6
YES	1. VERIFY COMPLIANCE WITH THE APPROVED SUBMITTALS	----	X	1705.4		ART. 1.5
2. AS MASONRY CONSTRUCTION BEGINS, VERIFY THAT THE FOLLOWING ARE IN COMPLIANCE:						
YES	a. PROPORTIONS OF SITE-PREPARED MORTAR	----	X	1705.4		ART. 2.1, 2.6A
YES	b. CONSTRUCTION OF MORTAR JOINTS	----	X			ART. 3.3B
NO	c. GRADE AND SIZE OF PRE-STRESSING TENDONS AND ANCHORAGES	----	X	1705.4		ART 2.4B, 2.4H
YES	d. LOCATION OF REINFORCEMENT, CONNECTORS, AND PRE-STRESSING TENDONS AND ANCHORAGES	----	X	1705.4		ART. 3.4, 3.6A
NO	e. PRE-STRESSING TECHNIQUE	----	X	1705.4		ART. 3.6B
NO	f. PROPERTIES OF THIN-BED MORTAR FOR ACC MASONRY	----	X	1705.4		ART. 2.1C
3. PRIOR TO GROUTING, VERIFY THAT THE FOLLOWING ARE IN COMPLIANCE:						
YES	a. GROUT SPACE	----	X			ART. 3.2D, 3.2F
YES	b. GRADE, TYPE AND SIZE OF REINFORCEMENT, AND ANCHOR BOLTS, AND PRE-STRESSING TENDONS AND ANCHORAGES	----	X	1705.4	SEC. 6.1	ART. 2.4, 3.4
YES	c. PLACEMENT OF REINFORCEMENT, CONNECTORS AND PRE-STRESSING TENDONS AND ANCHORAGES	----	X	1705.4	SEC. 6.1.6.2.1, 9.3.3.4(c), 11.3.3.4(b)	ART. 3.2E, 3.4, 3.6A
YES	d. PROPORTIONS OF SITE-PREPARED GROUT AND PRE-STRESSING GROUT FOR BONDED TENDONS	----	X	1705.4		ART. 2.6B, 2.4G.1.b
YES	e. CONSTRUCTION OF MORTAR JOINTS	----	X	1705.4		ART. 3.3B
4. VERIFY DURING CONSTRUCTION:						
YES	a. SIZE AND LOCATION OF STRUCTURAL ELEMENTS	----	X	1705.4		ART. 3.3F
YES	b. TYPE, SIZE AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION	----	X	1705.4	SEC. 1.2.1(a), 6.1.4.3, 6.2.1	
NO	c. WELDING OF REINFORCEMENT	X	----			
YES	d. PREPARATION, CONSTRUCTION, AND PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40°F(4.4°C)) OR HOT WEATHER (TEMPERATURE ABOVE...)	----	X	1705.4		ART. 1.8C, 1.8D
NO	e. APPLICATION AND MEASUREMENT OF PRE-STRESSED FORCE	X	----	1705.4		ART. 3.6B
NO	f. PLACEMENT OF GROUT AND PRE-STRESSING GROUT FOR BONDED TENDONS IS IN COMPLIANCE	X	----	1705.4		ART. 3.5, 3.6C
NO	g. PLACEMENT OF AAC MASONRY UNITS AND CONSTRUCTION OF THIN-BASED MORTAR JOINTS	----	X	1705.4		ART. 3.3B.9, 3.3F.1.b
YES	5. OBSERVE PREPARATION OF GROUT SPECIMENS, MORTAR SPECIMENS, AND/OR PRISMS	----	X	1705.4		ART. 1.4B.2.a.3, 1.4B.2.b.3, 1.4B.2.c.3, 1.4B.3, 1.4B.4

SPECIAL INSPECTION - WOOD CONSTRUCTION 2021 IBC					
SPECIAL INSPECTION REQUIRED Y/N	VERIFICATION AND INSPECTION TASK		CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	IBC REFERENCE
NO	1. HIGH-LOAD DIAPHRAGMS		----	ONCE PRIOR TO POURING	1705.5.1
NO	2. METAL-PLATE CONNECTED WOOD TRUSSES SPANNING > 60 FEET		----	ONCE PRIOR TO POURING	1705.5.2

SPECIAL INSPECTION - WIND RESISTANCE 2021 IBC					
SPECIAL INSPECTION REQUIRED Y/N	VERIFICATION AND INSECTION TASK		CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	IBC REFERENCE
NO	1. NAILING, BOLTING, ANCHORING AND OTHER FASTENING TO OTHER COMPONENTS OF THE MAINFORCE-RESISTING SYSTEM, INCLUDING WOOD SHEAR WALLS, WOOD DIAPHRAGMS, DRAG STRUTS, BRACES AND HOLD-DOWNS WHERE FASTERER SPACING FOR SHEATHING IS 4" ON-CENTER OR LESS.		-----	ONCE PRIOR TO POURING	1705.11.1
NO	2. FIELD GLUING OPERATIONS OF ELEMENTS OF THE MAIN WINDFORCE-RESISTING SYSTEM		X	-----	1705.11.1
NO	3. COLD-FORMED STEEL WELDING OPERATIONS OF ELEMENTS OF THE MAIN WINDFORCE-RESISTING SYSTEM		-----	ONCE PRIOR TO POURING	1705.11.2
NO	4. COLD-FORMED STEEL SCREW ATTACHMENT, BOLTING, ANCHORING AND OTHER FASTENING OF COMPONENTS WITHIN THE MAINFORCE-RESISTING SYSTEM, INCLUDING SHEAR WALLS, DIAPHRAGMS, COLLECTORS (DRAG STRUTS), AND HOLD-DOWNS WHERE NON-GYPSUM BOARD/FIBERBOARD SHEATHING FASTERER SPACING IS 4" ON-CENTER OR LESS.		-----	ONCE PRIOR TO POURING	1705.11.2
NO	5. ROOF CLADDING		-----	ONCE PRIOR TO POURING	1705.11.3
NO	6. WALL CLADDING		-----	ONCE PRIOR TO POURING	1705.11.3

SPECIAL INSPECTION - SOIL 2021 IBC					
SPECIAL INSPECTION REQUIRED Y/N	VERIFICATION AND INSPECTION TASK		CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	REFERENCED STANDARD
YES	1. VERIFY MATERIALS BELOW SHALLOW FOOTINGS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.		----	ONCE PRIOR TO POURING FOOTINGS	IBC 1705.6
YES	2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.		----	ONCE PRIOR TO POURING FOOTINGS	IBC 1705.6
YES	3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.		----	ONCE PRIOR TO POURING FOOTINGS	IBC 1705.6
YES	4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESS DURING PLACEMENT AND COMPACTION OF CONTROLLED FILL.		X	----	IBC 1705.6
YES	5. PRIOR TO PLACEMENT OF COMPACTED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.		----	ONCE PRIOR TO POURING FOOTINGS	IBC 1705.6

SPECIAL INSPECTION - HELICAL PILE FOUNDATIONS 2021 IBC					
SPECIAL INSPECTION REQUIRED Y/N	VERIFICATION AND INSPECTION TASK		CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	IBC REFERENCE
NO	1. INSTALLATION EQUIPMENT USED, PILE DIMENSIONS, TIP ELEVATIONS, FINAL DEPTH, FINAL INSTALLATION TORQUE AND OTHER PERTINENT INSTALLATION DATA AS REQUIRED BY THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE.		----	----	1705.9

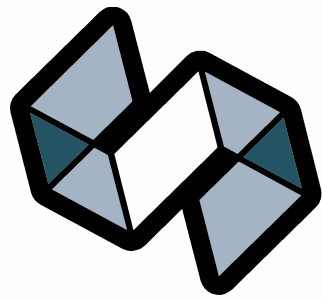
SPECIAL INSPECTIONS

- SPECIAL INSPECTIONS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 1705 OF **THE 2021 INTERNATIONAL BUILDING CODE, WITH LOCAL AMENDMENTS**.
- THE OWNER WILL EMPLOY THE SERVICES OF ONE OR MORE SPECIAL INSPECTORS TO PROVIDE SPECIAL INSPECTIONS DURING CONSTRUCTION FOR THE REQUIRED SPECIAL INSPECTION ITEMS.
- THE SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE BUILDING OFFICIAL, AND THE REGISTERED DESIGN PROFESSIONAL RESPONSIBLE FOR THE DESIGN OF THE STRUCTURE, FOR INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION.
- A. THE SPECIAL INSPECTOR SHALL OBSERVE THE WORK ASSIGNED FOR CONFORMANCE WITH THE APPROVED DESIGN DRAWINGS AND SPECIFICATIONS. THE INSPECTOR MAY NOT ALTER, MODIFY, ENLARGE OR WAIVE ANY OF THE REQUIREMENTS OF THE DOCUMENTS.

B. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL, THE PROFESSIONAL-OR-RECORD, AND THE CONTRACTOR. ALL DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. THEN, IF UNCORRECTED, SUBMIT A COMPLETE LIST OF ALL OUTSTANDING DISCREPANCIES ON A WEEKLY BASIS TO THE OWNER, THE BUILDING OFFICIAL, AND THE PROFESSIONAL-OF-RECORD, UNTIL ALL CORRECTIONS HAVE BEEN COMPLETED.

C. THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL SIGNED REPORT STATING WHETHER THE WORK REQUIRING SPECIAL INSPECTION WAS, TO THE BEST OF THE INSPECTOR'S KNOWLEDGE, IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE BUILDING CODE.
- STRUCTURAL OBSERVATION (AS DEFINED IN CHAPTER 17 OF THE BUILDING CODE) IS NOT REQUIRED, UNLESS SPECIFICALLY REQUIRED BY THE BUILDING OFFICIAL.
- THE FOLLOWING AREAS OF WORK REQUIRE SPECIAL INSPECTIONS IN ACCORDANCE WITH THE LISTED SECTIONS/LOCATIONS:

FLOOR FRAMING PLAN NOTES:
1. SEE SHEET S201 FOR STRUCTURAL GENERAL NOTES.
2. SEE SHEET S300 FOR TYPICAL STEEL SECTIONS AND DETAILS.
3. COORDINATE FINAL SIZE AND LOCATION OF OPENINGS AND EQUIPMENT WITH MECHANICAL CONTRACTORS.
4. GENERAL CONTRACTOR TO PROVIDE ALL SHORING REQUIRED FOR EXISTING BUILDING AND/OR NEW BUILDING. SEE GENERAL REQUIREMENTS NOTE 1 AND EXISTING CONSTRUCTION NOTE 3 FOR ADDITIONAL INFORMATION.
5. ALL UNTAGGED GRAY FRAMING MEMBERS ARE EXISTING TO REMAIN. UNO.



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N70W5185 Columbia Road
Cedarburg, WI 53012 | 262.236.3372
C4E Project #: 25057

**CONSTRUCTION
DRAWINGS**

**ISSUED FOR
CONSTRUCTION**

REVISIONS

No.	DESCRIPTION	DATE
-----	-------------	------

KEYPLAN (NOT TO SCALE)

COPYRIGHT STRANG, INC.	2025
DRAWING SET	CD
DATE	08/31/2026
PROJECT NO.	2025012

PROJECT TITLE

**SAUK COUNTY
COURTHOUSE HVAC
AND LIGHTING
UPGRADES**

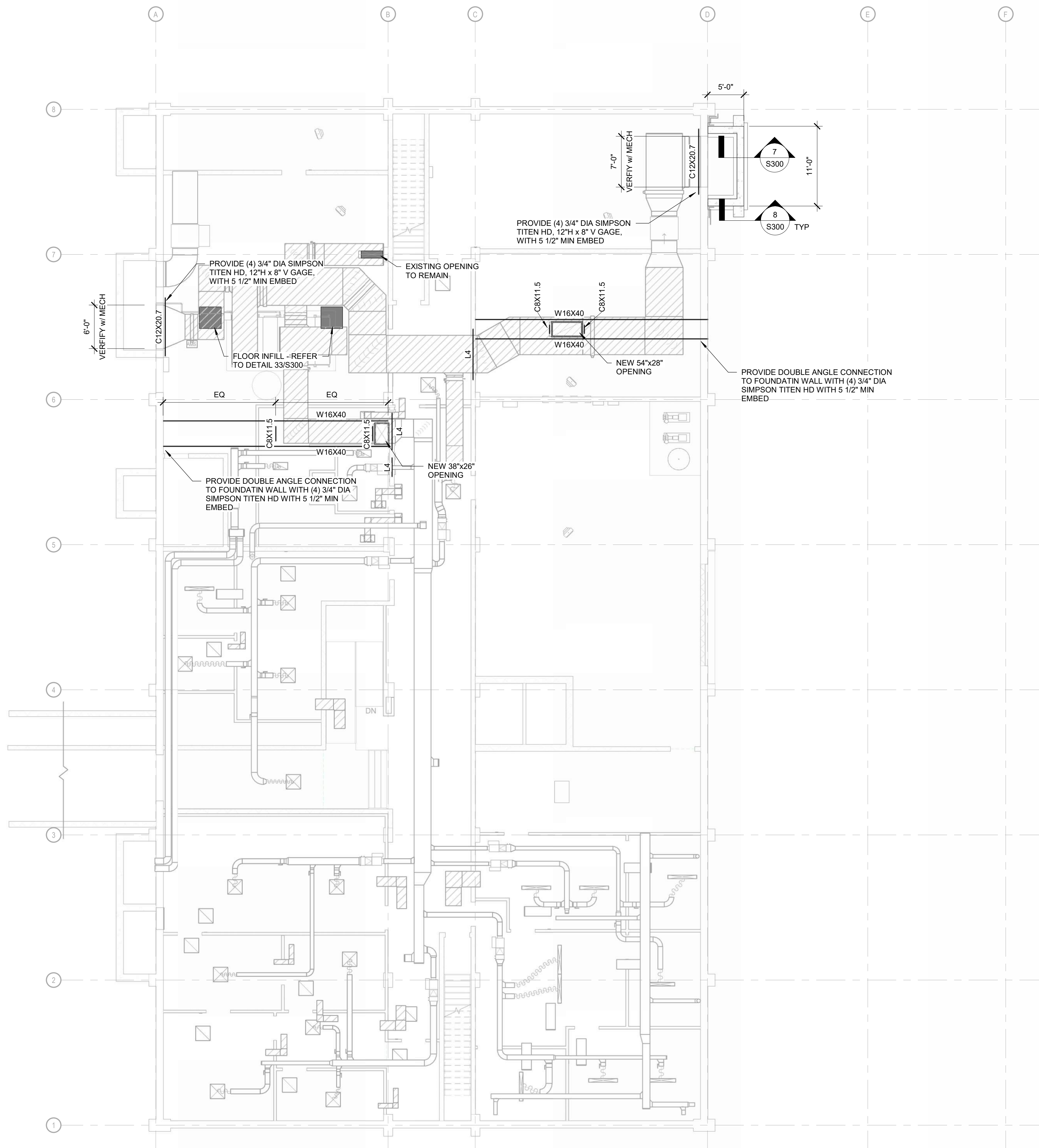
515 Oak St.
Baraboo, WI 53913

SHEET NAME

**FIRST FLOOR
FRAMING PLAN AND
PARTIAL FOUNDATION
PLAN (PHASE 1)**

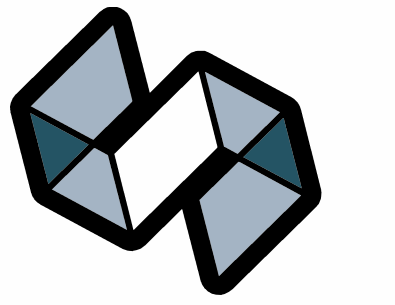
SHEET NO.

S200



BASEMENT AND FIRST FLOOR FRAMING PLAN AND FOUNDATION PLAN (PHASE 1)

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



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engineering
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Cedarburg, WI 53012 | 262.236.3372
C4E Project #: 25057

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COURTHOUSE HVAC
AND LIGHTING
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515 Oak St.
Baraboo, WI 53913

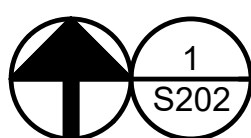
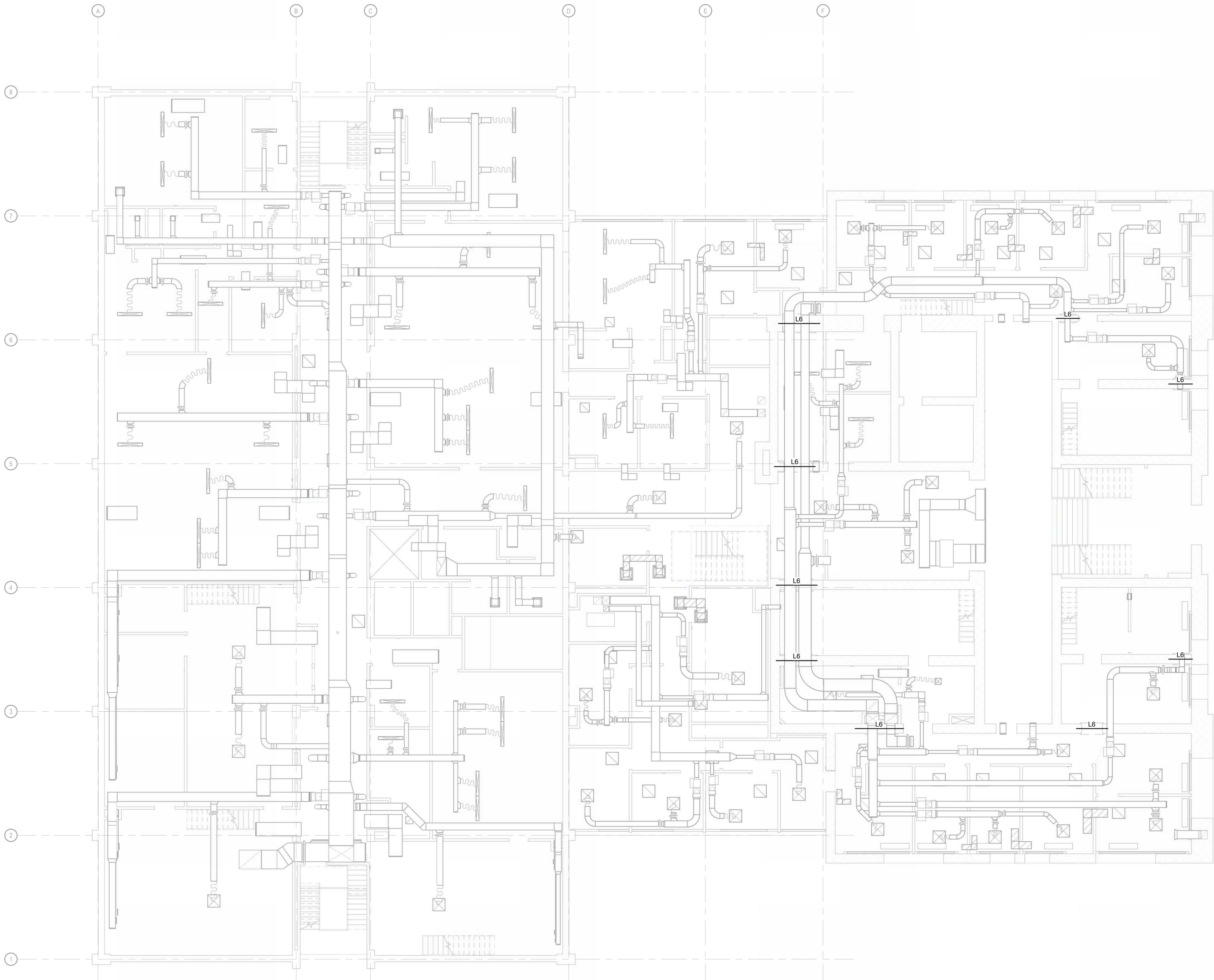
SHEET NAME

THIRD FLOOR
FRAMING PLAN
(PHASE 2)

SHEET NO.

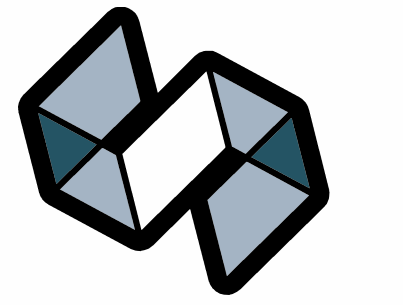
S202

- FLOOR FRAMING PLAN NOTES:**
- SEE SHEET S001 FOR STRUCTURAL GENERAL NOTES.
 - SEE SHEET S300 FOR TYPICAL STEEL SECTIONS AND DETAILS.
 - COORDINATE FINAL SIZE AND LOCATION OF OPENINGS AND EQUIPMENT WITH MECHANICAL CONTRACTORS.
 - GENERAL CONTRACTOR TO PROVIDE ALL SHORING REQUIRED FOR EXISTING BUILDING AND/OR NEW BUILDING. SEE GENERAL REQUIREMENTS NOTE 1 AND EXISTING CONSTRUCTION NOTE 3 FOR ADDITIONAL INFORMATION.
 - ALL UNTAGGED GRAY FRAMING MEMBERS ARE EXISTING TO REMAIN, UNO.



THIRD FLOOR FRAMING PLAN (SECOND FLOOR LINTEL PLAN)

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



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CONSTRUCTION
DRAWINGS

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No.	DESCRIPTION	DATE
-----	-------------	------

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PROJECT TITLE
SAUK COUNTY
COURTHOUSE HVAC
AND LIGHTING
UPGRADES

515 Oak St.
Baraboo, WI 53913

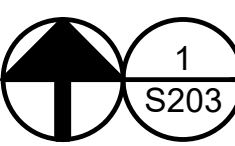
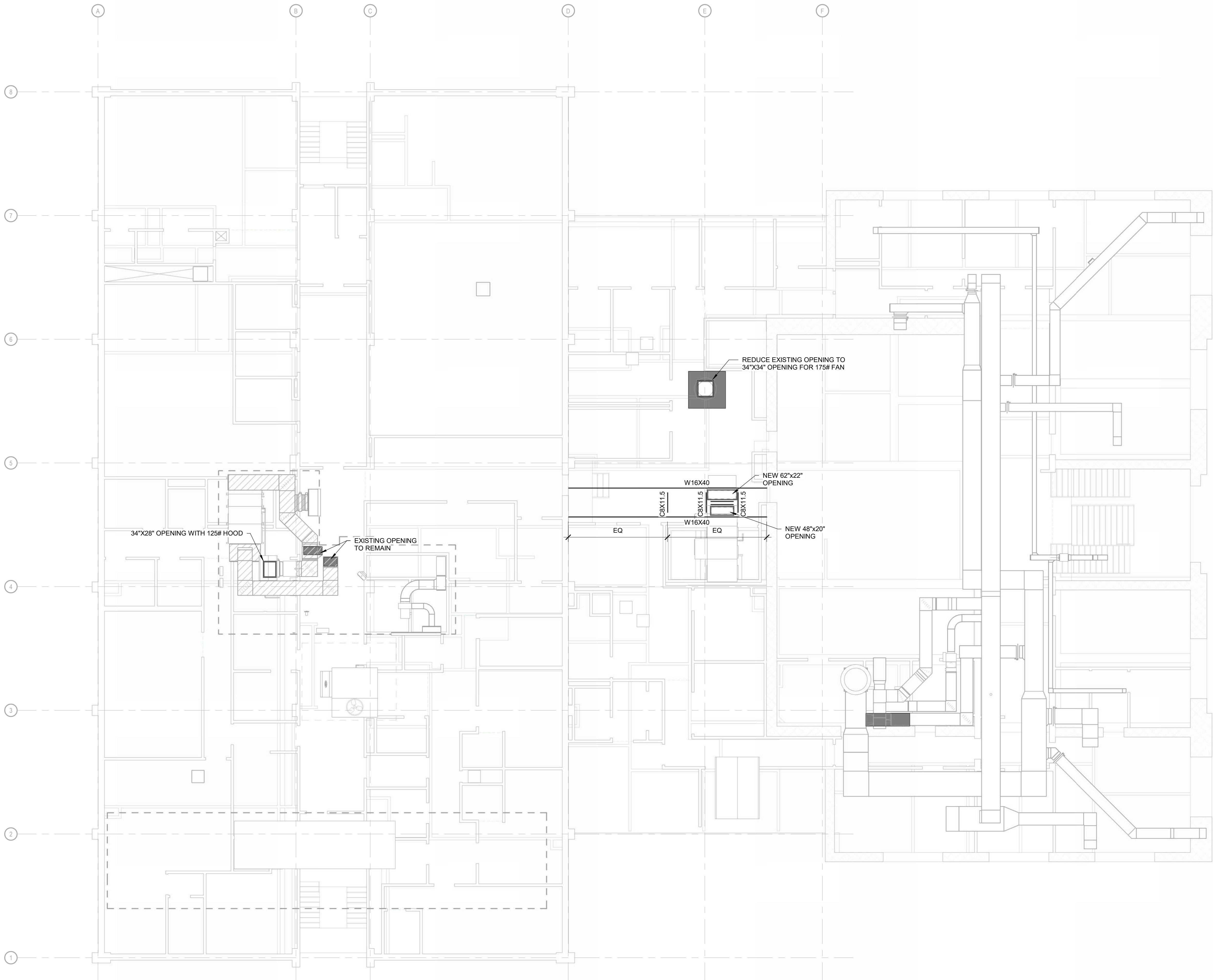
SHEET NAME

ROOF FRAMING PLAN
(PHASE 3)

SHEET NO.

S203

- ROOF PLAN NOTES:**
- SEE SHEET S001 FOR STRUCTURAL GENERAL NOTES.
 - SEE SHEET S300 FOR TYPICAL STEEL SECTIONS AND DETAILS.
 - COORDINATE FINAL SIZE AND LOCATION OF OPENINGS AND EQUIPMENT WITH MECHANICAL CONTRACTORS.
 - GENERAL CONTRACTOR TO PROVIDE ALL SHORING REQUIRED FOR EXISTING BUILDING AND/OR NEW BUILDING. SEE GENERAL REQUIREMENTS NOTE 1 AND EXISTING CONSTRUCTION NOTE 3 FOR ADDITIONAL INFORMATION.
 - ALL UNTAGGED GRAY FRAMING MEMBERS ARE EXISTING TO REMAIN, UNO.



ROOF FRAMING PLAN

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

BAR SIZE	#3	#4	#5	#6	#7	#8	#9	#10	#11
INSIDE BEND ϕ	2.25"	3	3.75	4.5	5.25	6	9.0	10.2	11.3
L_{dev} - 90° HOOK	4.5"	6	7.5	9	10.5	12	13.5	15.2	16.8
L_{dev} - 180° HOOK	2.5"	2.5	2.5	3	3.5	4	4.5	5.1	5.6

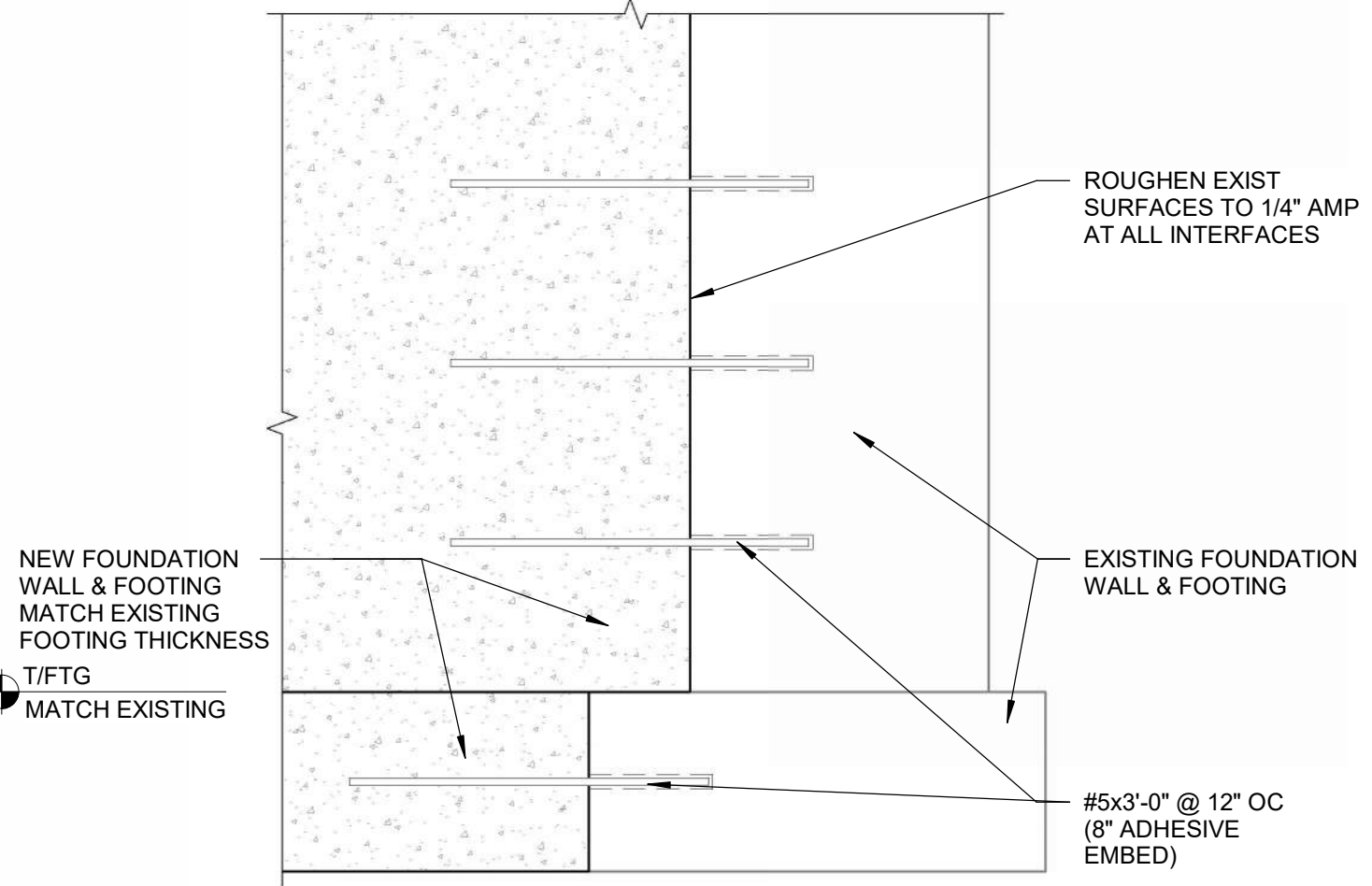
3000 PSI	L_d	16.4	21.9	27.4	32.9	47.9	54.8	1.8	69.6	77.2
	L_{db}	8.2	11.0	13.7	16.4	19.2	21.9	24.7	27.8	30.9
	L_{dev} TOP BARS	28	38	47	56	81	93	105	118	131
4000 & 4500 PSI	L_d	14.2	19.0	23.7	28.5	41.5	47.4	53.5	60.2	66.9
	L_{db}	7.1	9.5	11.9	14.2	16.6	19.0	21.4	24.1	26.8
5000 PSI	L_d TOP BARS	25	33	41	49	71	81	91	102	114
	L_{dev} OTHERS	19	25	31	37	54	62	70	79	87

- NOTE:
- TABULATED VALUED ARE BASED ON GRADE 60 REINFORCING BARS AND NORMAL WEIGHT CONCRETE.
 - TENSION LAP SPICE LENGTHS ARE CALCULATED PER ACI 318-14. LENGTHS ARE IN INCHES.
 - TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS.
 - SPICE COVERS IN THIS SCHEDULE ARE BASED ON CLEAR COVER AT LEAST 1.0 BAR ϕ AND CLEAR SPACING AT LEAST 2.0 BAR ϕ .

REINFORCING STEEL TYPICAL DEVELOPMENT LENGTHS & LAP SPLICES

1
S300

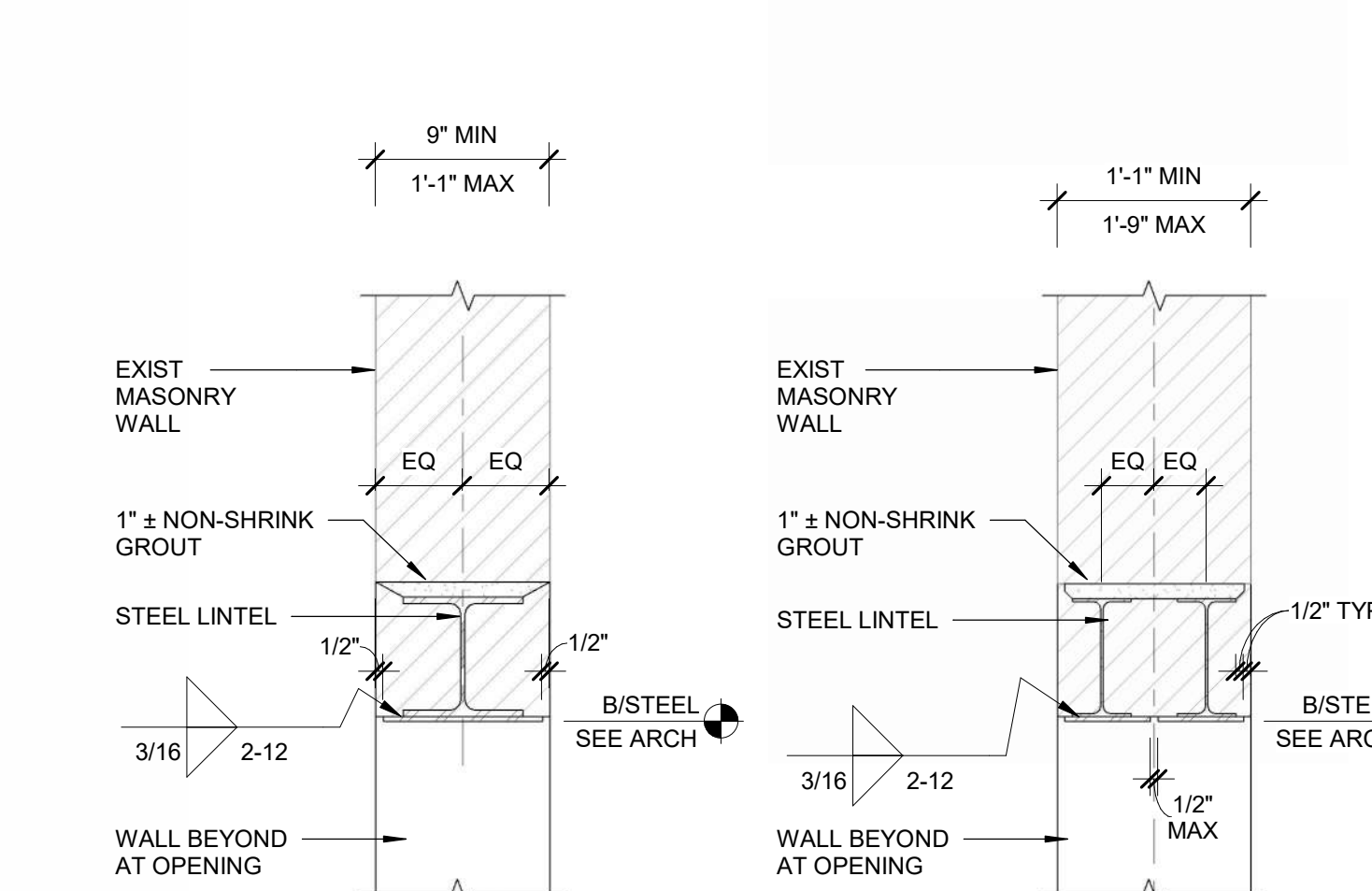
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TYPICAL EXISTING FOUNDATION INTERSECTION

6
S300

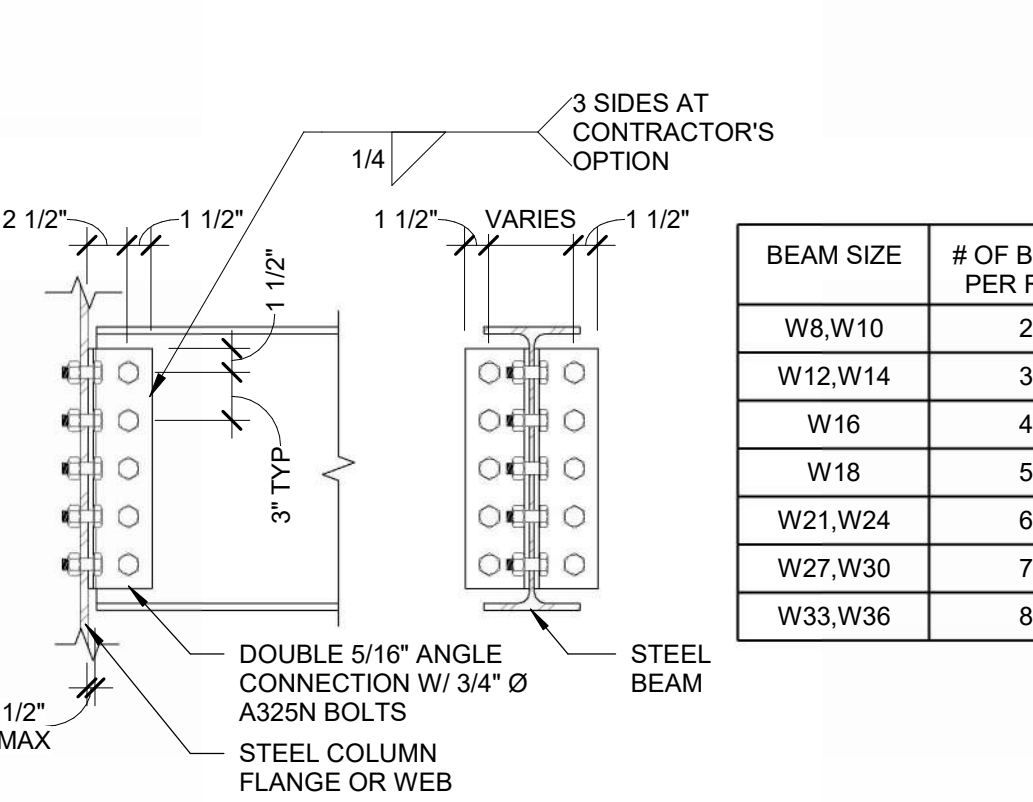
SCALE: NTS



STEEL LINTEL

21
S300

SCALE: NTS

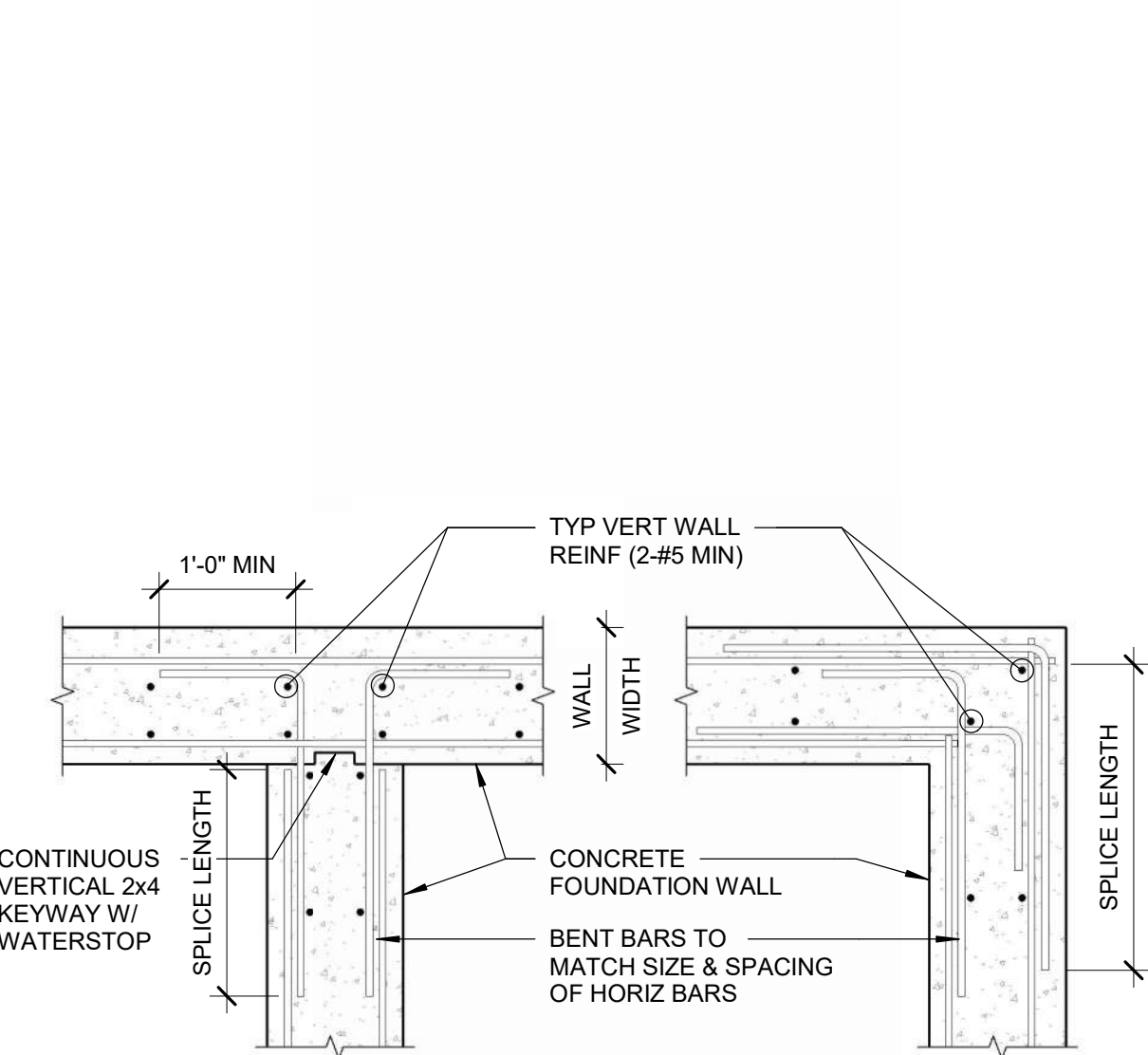
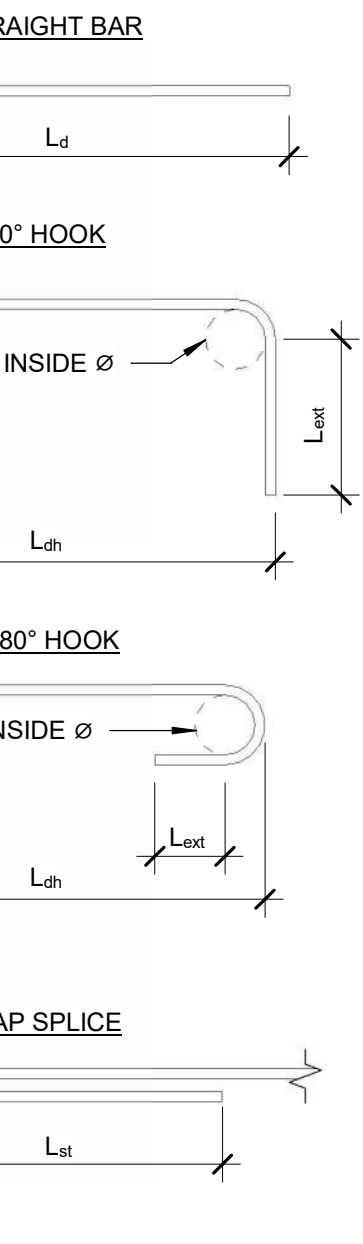


- NOTES:
- ALL FRAMING CONNECTIONS TO CONFORM TO SCHEDULE ABOVE UNLESS DETAILED OTHERWISE ON PLANS.
 - L_{db} = 1 1/2"; L_{ev} = 1 1/4" MINIMUM ANGLES AND BEAM.
 - PROVIDE STANDARD HOLES IN ANGLE TO COLUMN AND SHORT-SLOTTED HOLES IN ANGLE TO BEAM.

DOUBLE ANGLE BEAM TO COLUMN CONNECTION

31
S300

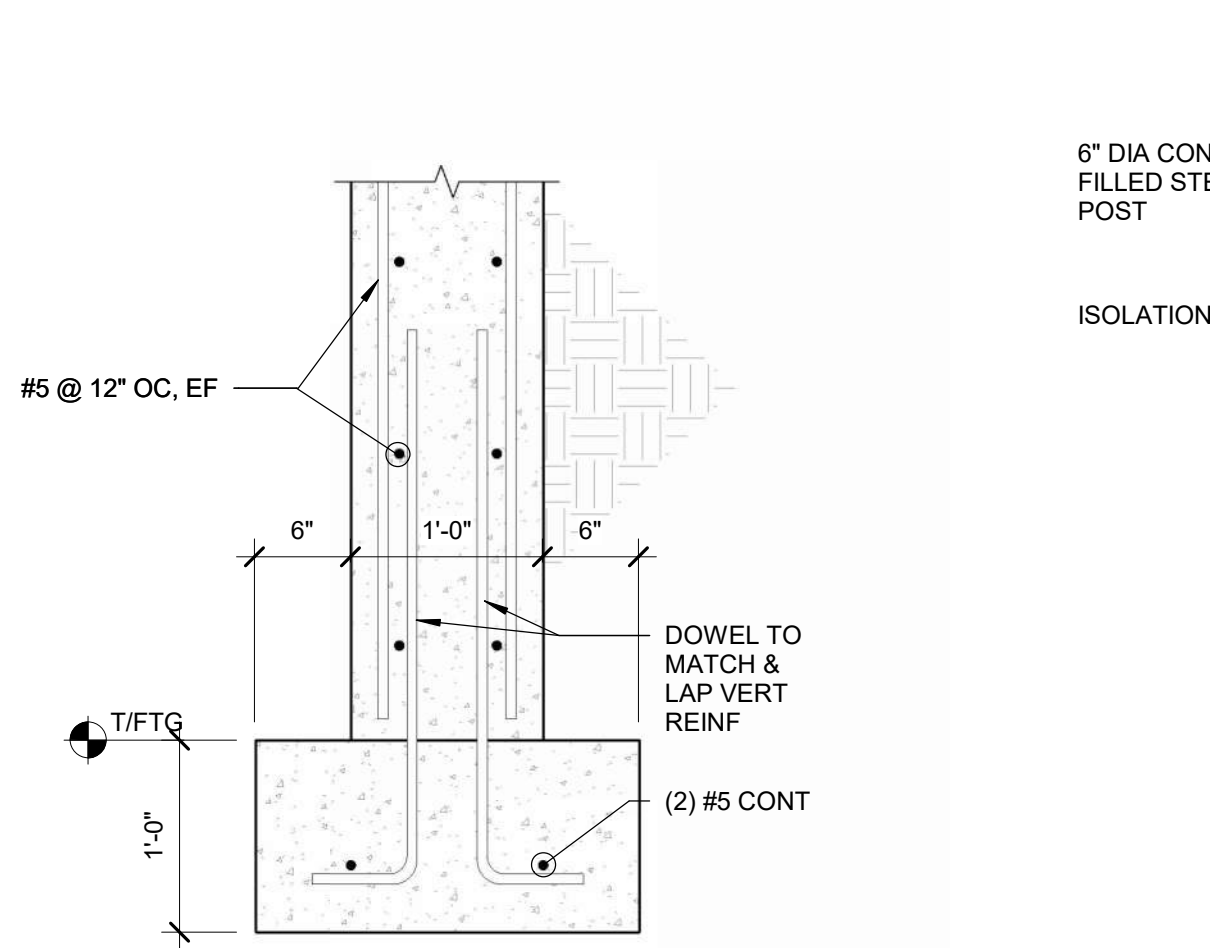
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TYPICAL WALL REINFORCING

2
S300

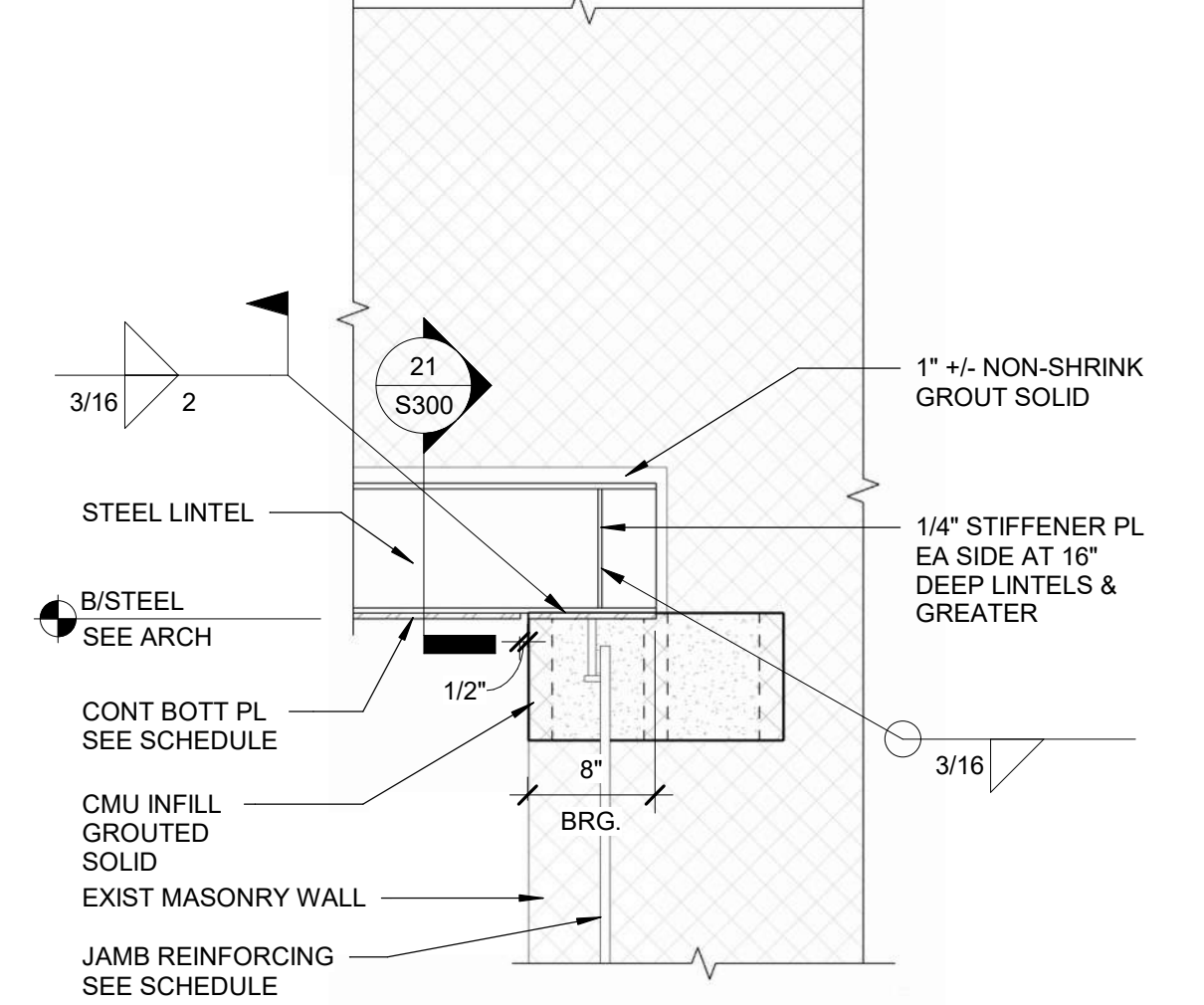
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SECTION

7
S300

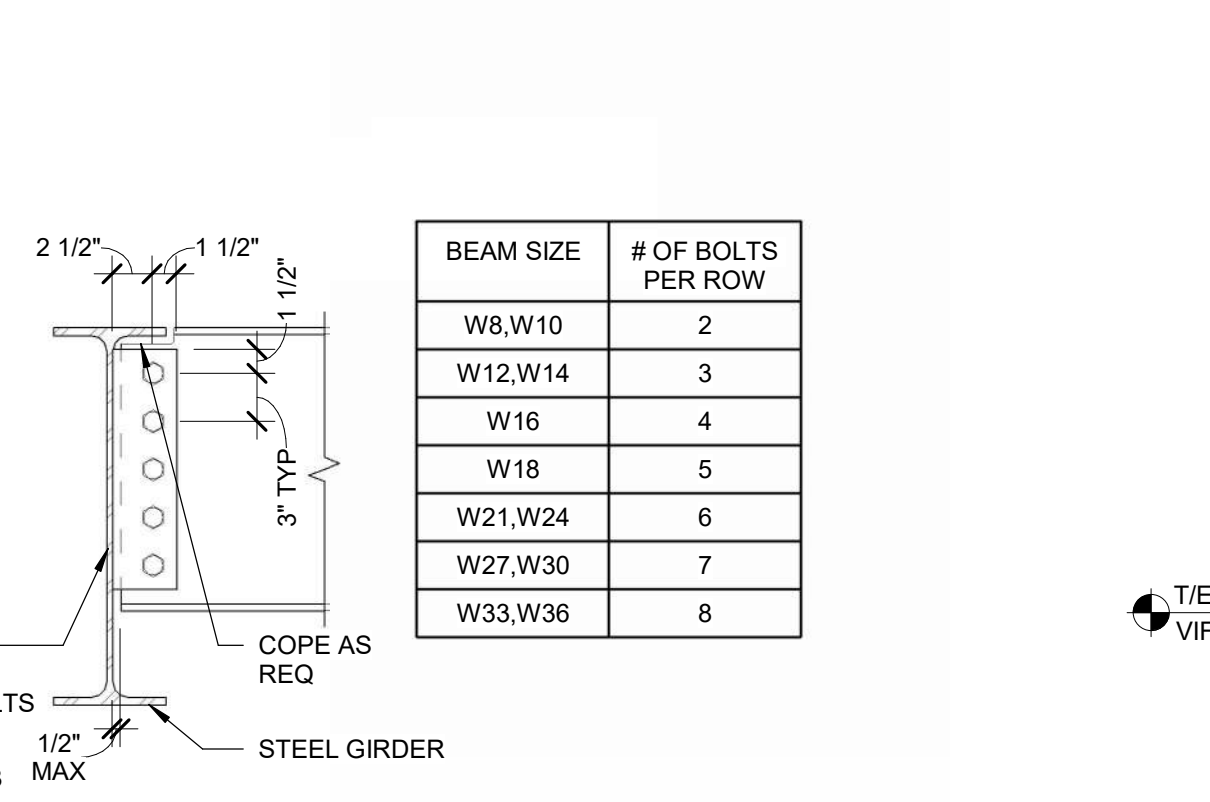
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STEEL LINTEL BEARING DETAIL EXISTING MASONRY WALL

22
S300

SCALE: NTS

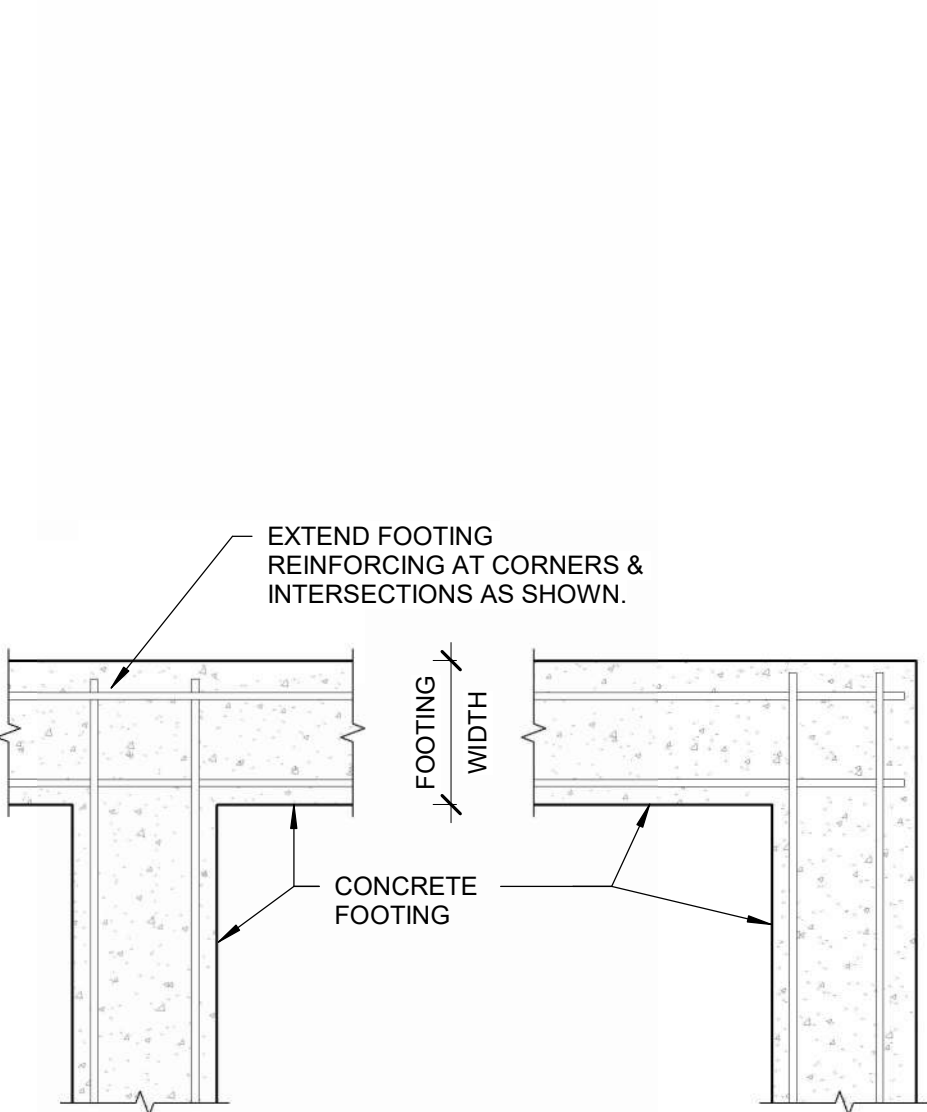


- NOTES:
- ALL FRAMING CONNECTIONS TO CONFORM TO SCHEDULE ABOVE UNLESS DETAILED OTHERWISE ON PLANS.
 - L_{db} = 1 1/2"; L_{ev} = 1 1/4" MINIMUM ANGLES AND BEAM.
 - PROVIDE STANDARD OR SHORT-SLOTTED HOLES IN PLATE.
 - # OF BOLTS PER ROW APPLIES FOR W, S OR C STEEL SHAPES.

SINGLE PLATE BEAM TO BEAM CONNECTION

32
S300

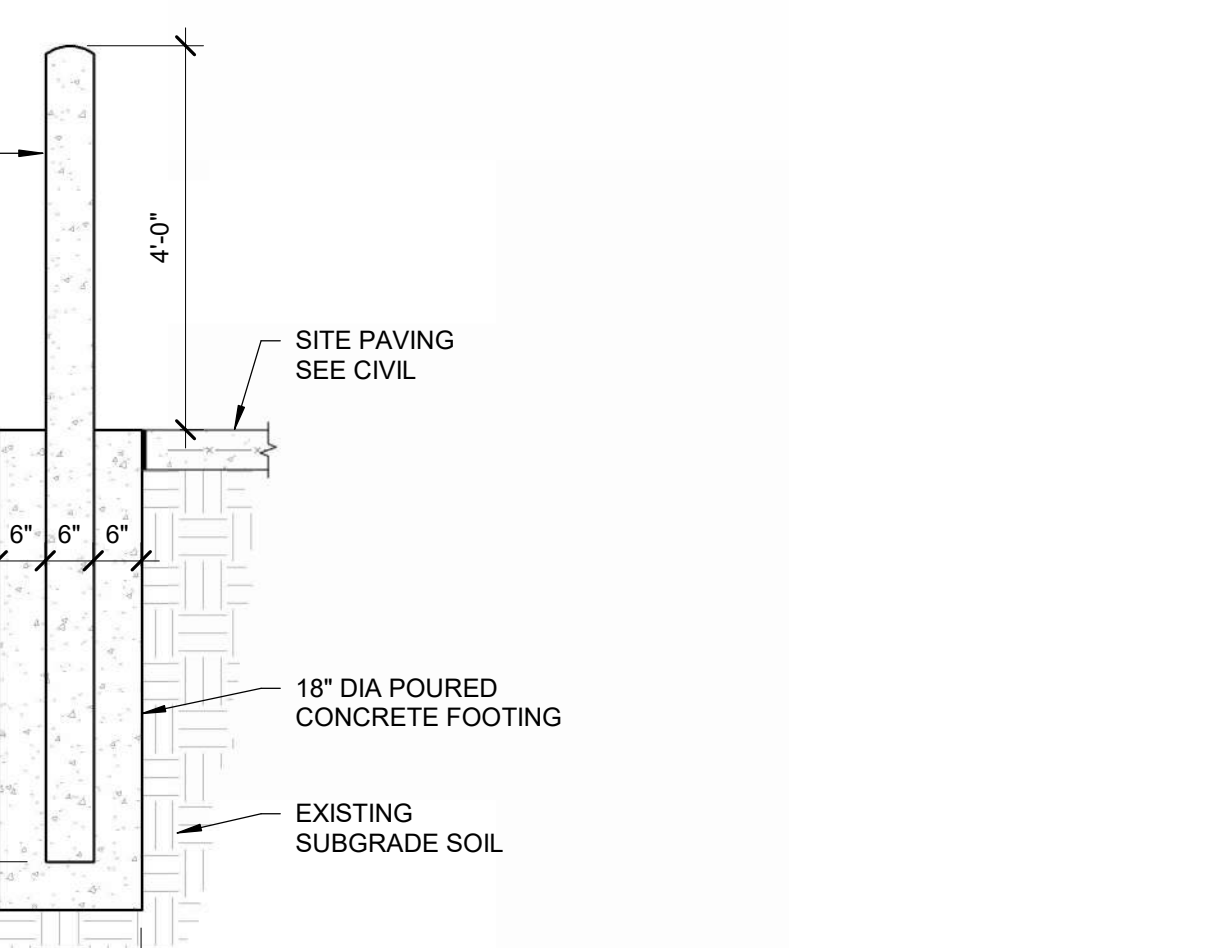
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TYPICAL FOOTING REINFORCING

3
S300

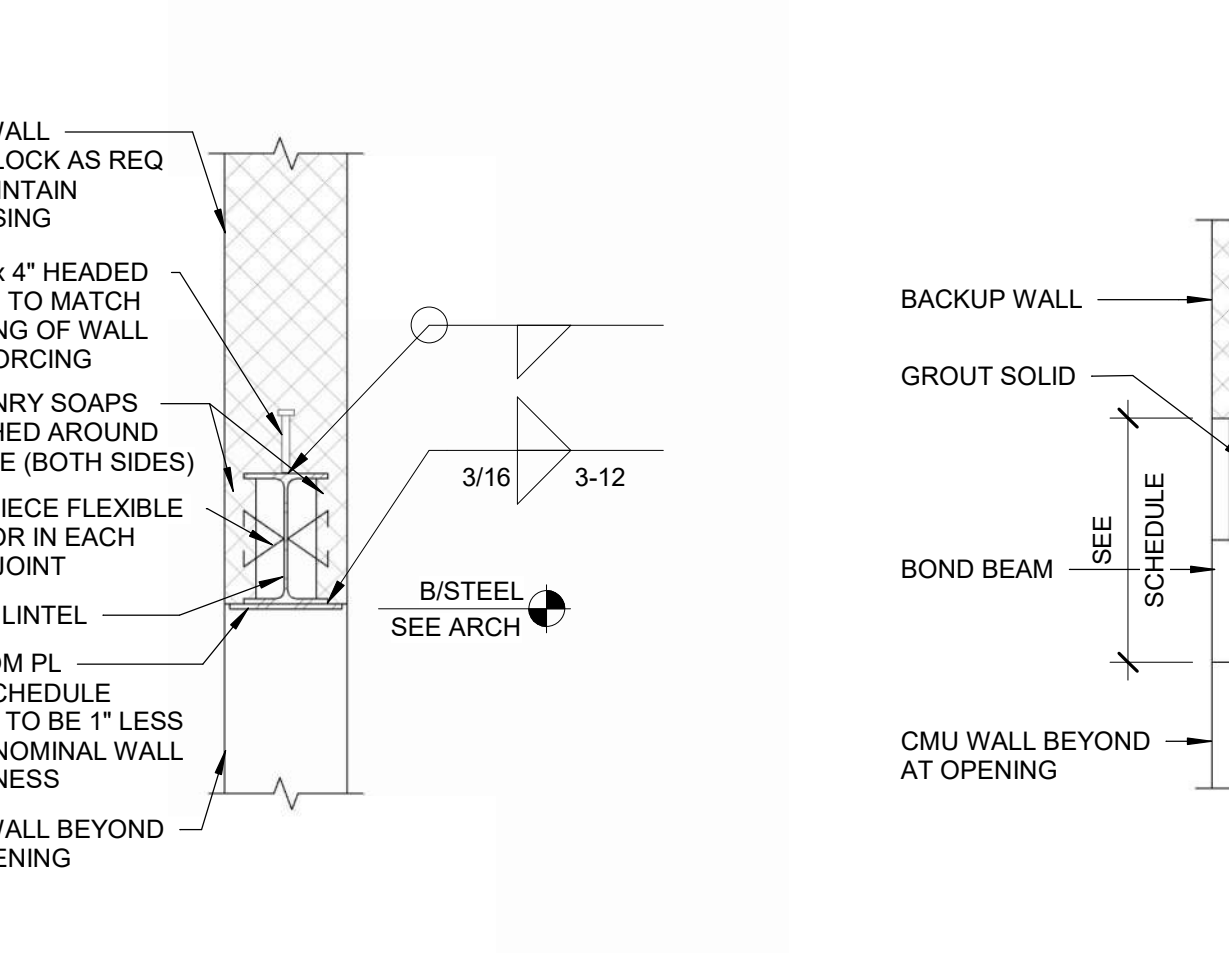
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TYPICAL BOLLARD

8
S300

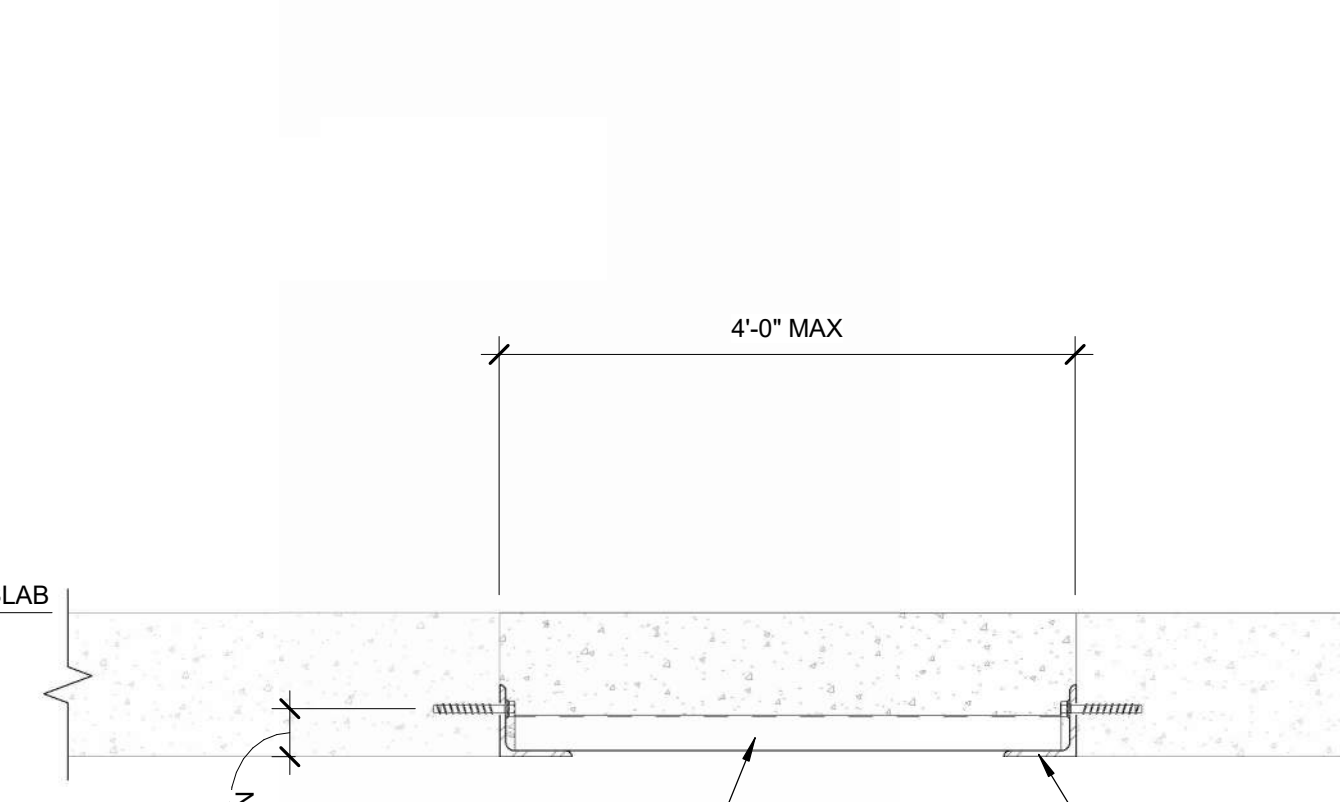
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LINTEL TYPE A

A
S300

SCALE: NTS

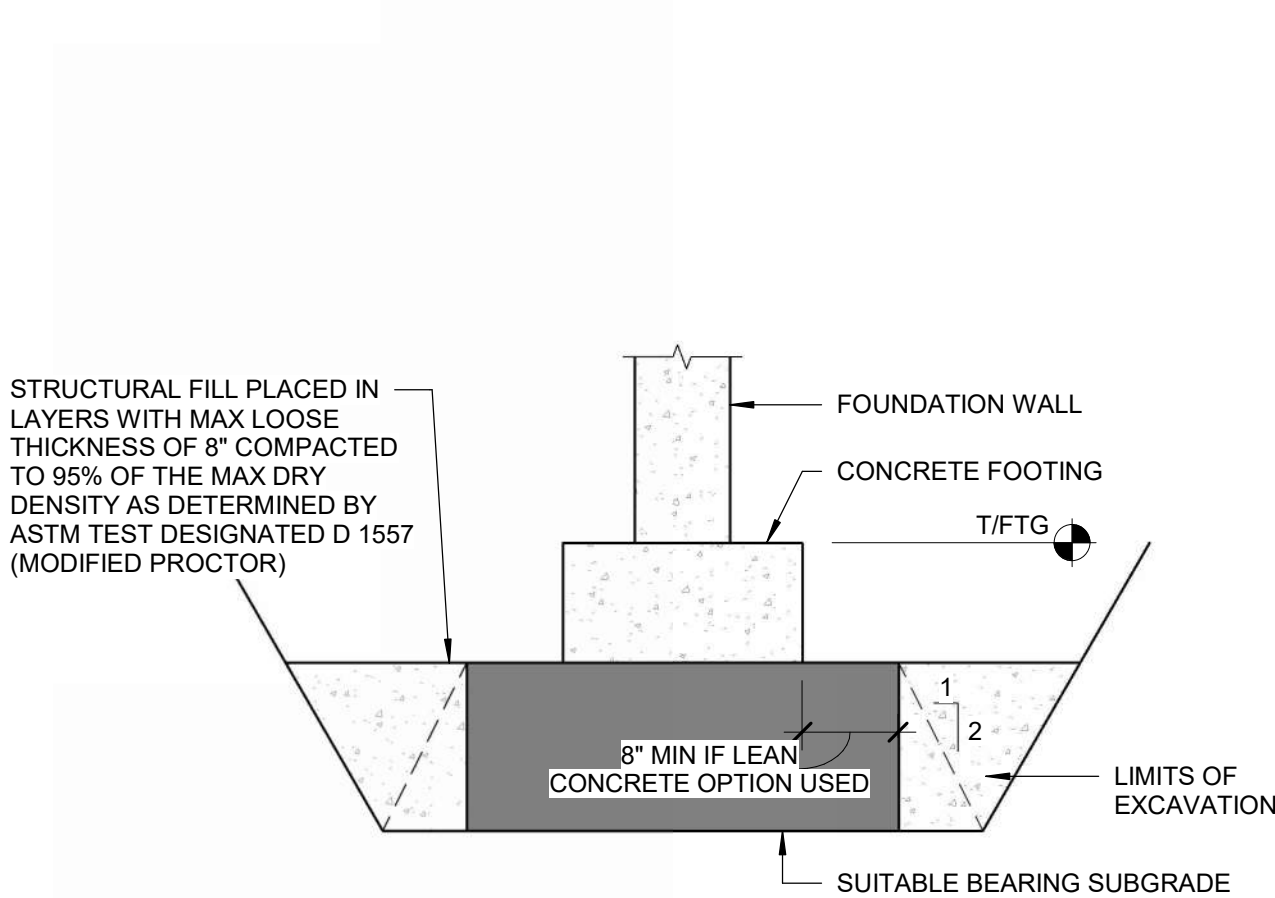
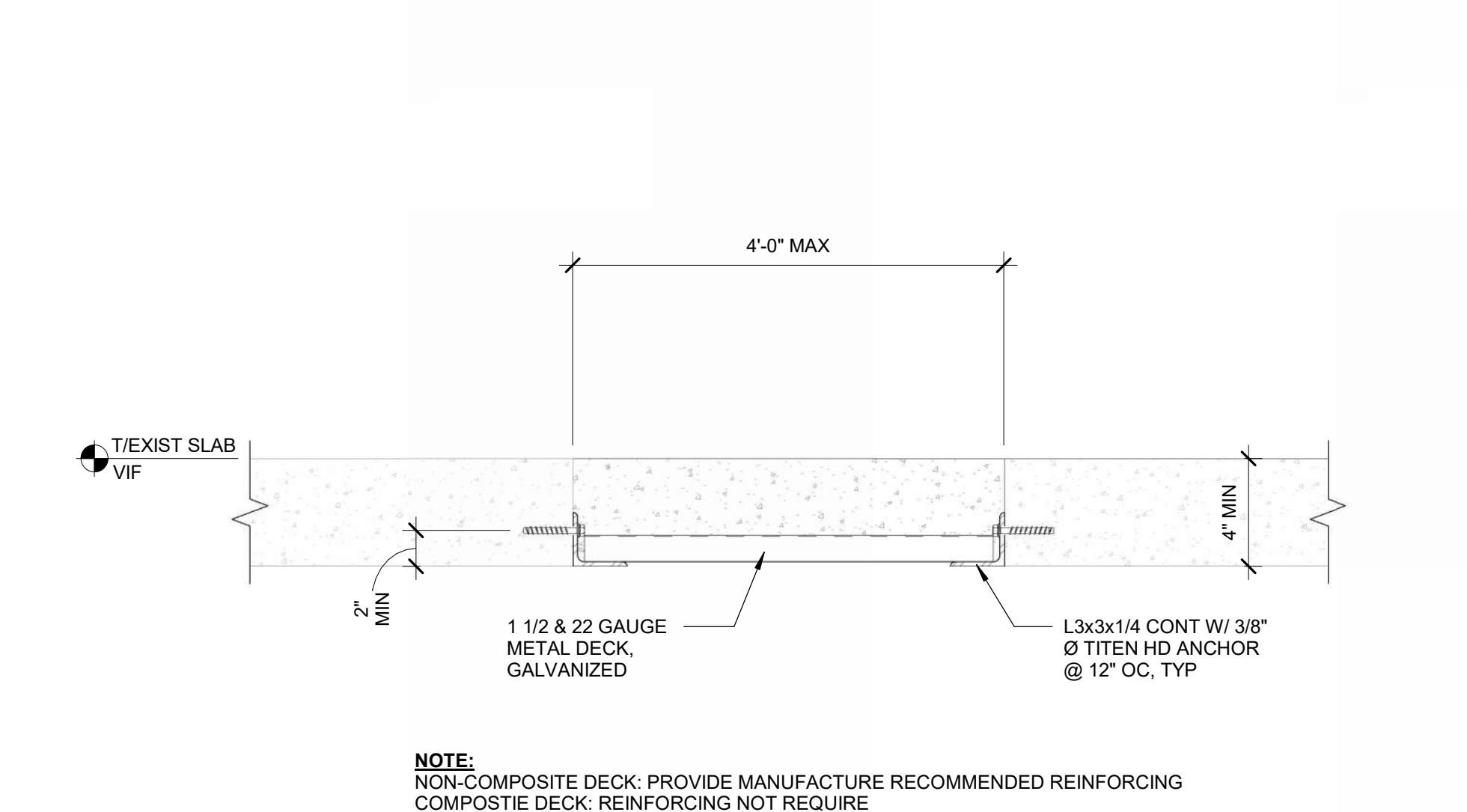


- NOTE:
- NON-COMPOSITE DECK: PROVIDE MANUFACTURE RECOMMENDED REINFORCING
COMPOSITE DECK: REINFORCING NOT REQUIRE

STRUCTURAL CONCRETE SLAB OPENING INFILL DETAIL

33
S300

SCALE: NTS

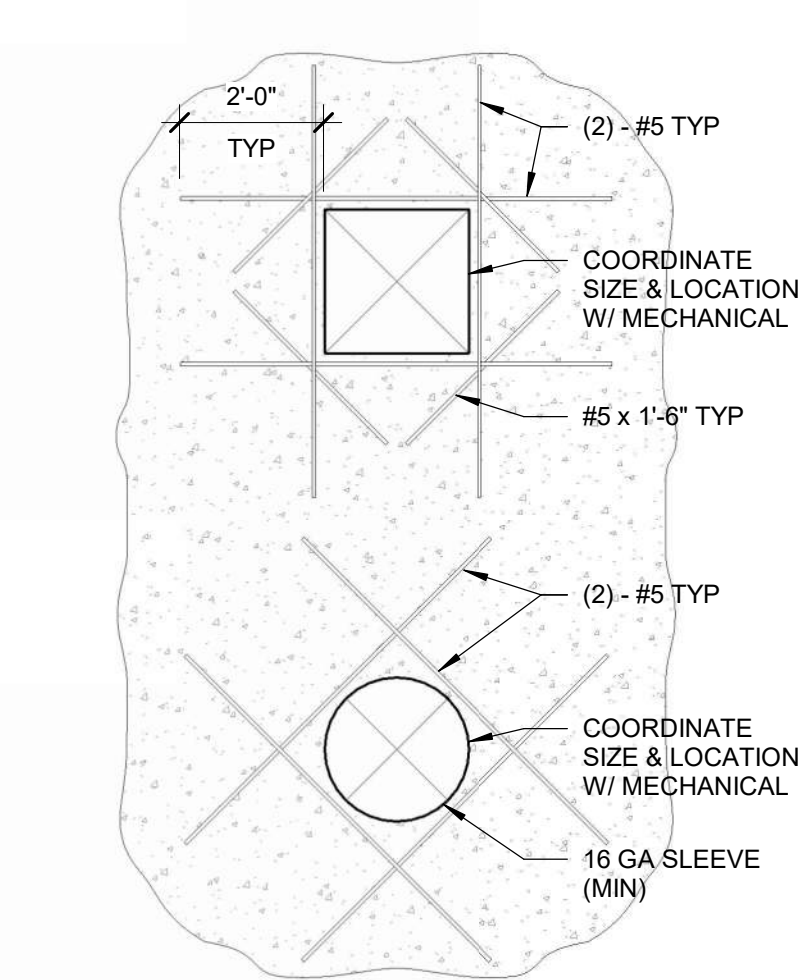


- NOTES:
- CONTRACTOR'S OPTION: ELIMINATE STRUCTURAL FILL BY LOWERING DESIGNED FOOTING ELEVATION SO THAT FOOTING RESTS DIRECTLY ON SUITABLE BEARING SUBGRADE, PROVIDE LEAN CONCRETE (f_c = 500 PSI MIN) UNDER THE FOOTING AS SHOWN HATCHED ABOVE, OR INCREASE FOOTING THICKNESS TO REACH SUITABLE BEARING SUBGRADE.
 - THIS DETAIL APPLIES ONLY AT THOSE LOCATIONS WHERE GEOTECH ENGINEER DEEMS SOILS AT DESIGNED FOOTING ELEVATIONS ARE INADEQUATE FOR FOOTING SUPPORT. WHERE THIS WORK IS REQUIRED, CONTRACTOR WILL BE COMPENSATED ON A PRE-ESTABLISHED UNIT COST AGREED UPON BY THE CONTRACTOR, ARCHITECT/ENGINEER, AND OWNER.

TYPICAL OVER EXCAVATION DETAIL

4
S300

SCALE: NTS

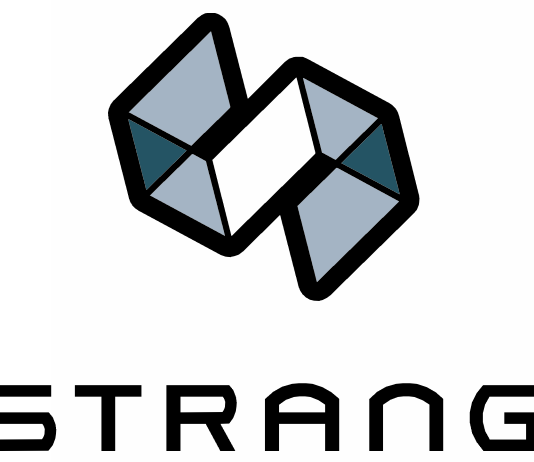


- NOTES:
- APPLIES TO 24" (MAX) OPENINGS THROUGH FOUNDATION WALL.
 - TOP OF OPENING TO BE 24" (MIN) FROM TOP OF WALL.
 - REINFORCING LAYERS TO MATCH FOUNDATION WALL.
 - USE 90° STANDARD HOOK AT CORNERS AND ENDS OF WALL.

TYPICAL CONCRETE WALL PENETRATION

5
S300

SCALE: NTS



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engineering
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Cedarburg, WI 53012 | 262.236.9372
C4E Project #: 25057

CONSTRUCTION
DRAWINGS

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CONSTRUCTION

REVISIONS	DATE
No. DESCRIPTION	

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DATE	08/31/2026
PROJECT NO.	2025012

PROJECT TITLE

SAUK COUNTY
COURTHOUSE HVAC
AND LIGHTING
UPGRADES

515 Oak St.
Baraboo, WI 53913

SHEET NAME

STRUCTURAL DETAILS

SHEET NO.

S300

SECTION 00 01 10 - TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

- 00 01 00 - Project Cover Page
- 00 01 03 - Project Directory
- 00 01 10 - Table of Contents
- 00 01 12 - Request for Bids
- 00 50 00 - Contracting Forms and Supplements
- 00 73 00 - Supplementary Conditions

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- 01 10 00 - Summary
- 01 20 00 - Price and Payment Procedures
- 01 23 00 - Alternates
- 01 25 00 - Substitution Procedures
- 01 25 01 - Substitution Request Form During Construction
- 01 25 02 - Substitution Request Form During Procurement
- 01 30 00 - Administrative Requirements
- 01 40 00 - Quality Requirements
- 01 42 16 - Definitions
- 01 50 00 - Temporary Facilities and Controls
- 01 60 00 - Product Requirements
- 01 70 00 - Execution and Closeout Requirements
- 01 71 23 - Field Engineering
- 01 74 19 - Construction Waste Management and Disposal
- 01 78 00 - Closeout Submittals
- 01 79 00 - Demonstration and Training

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- 02 41 00 - Demolition

DIVISION 03 -- CONCRETE ~~(NOT USED)~~

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- ~~04 20 00 - Unit Masonry~~

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05 50 00 - Metal Fabrications

05 53 05 - Metal Gratings and Floor Plates

DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

06 10 00 - Rough Carpentry

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

07 05 53 - Fire and Smoke Assembly Identification

07 13 00 - Sheet Waterproofing

07 53 23 - Ethylene-Propylene-Diene-Monomer Roofing (EPDM) -

07 84 00 - Firestopping

07 92 00 - Joint Sealants

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09 21 16 - Gypsum Board Assemblies

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23 05 13 - Common Motor Requirements for HVAC Equipment

23 05 23 - General-Duty Valves for HVAC Piping

23 05 29 - Hangers and Supports for HVAC Piping and Equipment

23 05 53 - Identification for HVAC Piping and Equipment

23 05 93 - Testing, Adjusting, and Balancing for HVAC

23 07 13 - Duct Insulation

23 07 19 - HVAC Piping Insulation

23 09 15 - DDC Points List

23 09 23 - Direct-Digital Control System for HVAC

23 09 34 - Variable-Frequency Motor Controllers

23 09 54 - Electric Temperature Control Systems

23 09 93 - Sequence of Operations for HVAC Controls

23 21 13 - Hydronic Piping

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23 21 23 - Hydronic Pumps

23 31 00 - HVAC Ductwork

- 23 33 00 - Air Duct Accessories
- 23 34 23 - HVAC Fans
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- 23 37 00 - Air Outlets and Inlets
- 23 73 13 - Indoor Air Handling Units
- 23 73 23 - Outdoor Air-Handling Units
- 23 74 16 - Packaged Rooftop Air-Conditioning Units
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- 26 05 05 - Selective Demolition for Electrical
- 26 05 19 - Low-Voltage Electrical Power Conductors and Cables
- 26 05 26 - Grounding and Bonding for Electrical Systems
- 26 05 29 - Hangers and Supports for Electrical Systems
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- 26 05 53 - Identification for Electrical Systems
- 26 05 83 - Wiring Connections
- 26 09 16 - Electric Controls and Relays
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- 26 27 26 - Wiring Devices
- 26 28 13 - Fuses
- 26 28 16.16 - Enclosed Switches
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- 28 46 00 - Fire Detection and Alarm

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- 31 23 16 - Excavation
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32 12 16 - Asphalt Paving

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete reinforcement.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including equipment pads.
- F. Concrete curing.

1.02 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary.
- B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide.
- C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction.
- D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- E. ACI PRC-308 - Guide to External Curing of Concrete.
- F. ACI PRC-347 - Guide to Formwork for Concrete.
- G. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials.
- H. ACI SPEC-301 - Specifications for Concrete Construction.
- I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- J. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- K. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
- O. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- P. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- Q. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- R. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- S. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.
- T. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.

- U. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- V. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types).
- W. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- X. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- Y. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Shop Drawings: Submit shop drawings for each equipment pad showing slab dimensions, reinforcement, anchorage details, conduit, piping connections, and drain locations serving the associated piece of equipment.
 - 1. Provide information that indicates equipment pad will resist the maximum lateral and vertical forces required by the equipment manufacturer.
 - 2. Provide information that indicates anchor bolt sizing and anchor embedment are adequate for associated piece of equipment.
- D. Mix Design: Submit proposed concrete mix design.
 - 1. See plan documents for specific concrete requirements
 - 2. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.
- E. Test Reports: Submit report for each test or series of tests specified.

1.04 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.
 - 1. Electrical Equipment Pads: Provide formwork for electrical equipment, minimum 3-1/2 inches high, at least 2 inches greater in plan than the associated equipment footprint. Provide chamfer strips to all edges.
 - 2. Mechanical Equipment Pads:

3. Plumbing Equipment Pads:
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT MATERIALS

- A. See plans for additional material requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 1. Finish: Unfinished, unless otherwise indicated.
- C. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
 1. Form: Flat Sheets.
- D. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 3. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.

2.03 CONCRETE MATERIALS

- A. See plans for additional material requirements.
- B. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- C. Fine and Coarse Aggregates: ASTM C33/C33M.
- D. Fly Ash: ASTM C618, Class C or F.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI PRC-211.1.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- G. Structural Fiber Reinforcement: ASTM C1116/C1116M.
 1. Fiber Type: Alkali-resistant synthetic.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Accelerating Admixture: ASTM C494/C494M Type C.
- H. Retarding Admixture: ASTM C494/C494M Type B.
- I. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 - 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Epoxy Bonding System:
 - 1. Complying with ASTM C881/C881M and of Type required for specific application.
- C. Waterstops: PVC, complying with COE CRD-C 572.
- D. Waterstops: Bentonite and butyl rubber.
 - 1. Configuration: As indicated on drawings.
- E. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.

2.07 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.

2.08 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

- C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- D. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

2.09 MIXING

- A. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
 - 1. Equipment Pads: Provide chamfer strips at all edges, minimum
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.
- E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Place concrete for floor slabs in accordance with ACI PRC-302.1.
- C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15.
 - 2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15.
 - 3. Under Carpeting: F(F) of 25; F(L) of 20.
 - 4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.
- B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155/E1155M (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- D. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 - 1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI PRC-302.1; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
 - 2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 3. Decorative Exposed Surfaces: Trowel as described in ACI PRC-302.1; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
- E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
3. Final Curing: Begin after initial curing but before surface is dry.
 - a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 04 20 00 - UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block infill and repair
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- F. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
- G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- H. ASTM C150/C150M - Standard Specification for Portland Cement.
- I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- J. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- K. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- L. ASTM C476 - Standard Specification for Grout for Masonry.
- M. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- N. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.
- O. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- P. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.
- Q. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls.
- R. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.
- S. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Nonloadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.
 - b. Lightweight.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Aggregate: ASTM C144.
- D. Grout Aggregate: ASTM C404.
- E. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1. Color(s): As selected by Architect from manufacturer's full range.
- F. Water: Clean and potable.
- G. Accelerating Admixture: Nonchloride type for use in cold weather.
- H. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Color: Mineral pigments added as required to produce approved color sample.
- I. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:

1. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 2. Heckmann Building Products, Inc.
 3. WIRE-BOND: www.wirebond.com/#sle.
 4. Or approved equal.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized .
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss or ladder.
 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to 16 CFR 1201 Class B.
 3. Size: 0.1875 inch side rods with 0.1875 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

2.04 FLASHINGS

- A. Metal Flashing Materials:
1. Stainless Steel Flashing: ASTM A666/A666M, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.
- B. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.05 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
- B. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.
- C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Property Specification.
1. Masonry below grade and in contact with earth: Type S.
 2. Exterior, loadbearing masonry: Type S.
 3. Exterior, non-loadbearing masonry: Type N.
 4. Interior, loadbearing masonry: Type S.
 5. Interior, non-loadbearing masonry: Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- E. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave, except strike flush where air barrier coatings are indicated.

3.05 PLACING AND BONDING

- A. Lay hollow masonry units with face shell bedding on head and bed joints.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

- G. Cut mortar joints flush where wall tile is scheduled, cement parging is required, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen dampproofing is applied.
- H. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.07 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
 - 2. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.08 LINTELS

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.

3.09 GROUTED COMPONENTS

- A. Reinforce bond beams with 2, No. 5 bars, 1 inch from bottom web.

- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.10 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

3.11 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.12 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/8 inch, plus 1/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.13 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.

- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.15 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

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SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members.
- B. Structural steel support members and struts.
- C. Grouting under base plates.

1.02 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual.
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- D. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- G. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).
- H. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- I. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
- J. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
- K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- M. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections not detailed.
 - 3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Rolled Steel Structural Shapes: ASTM A992/A992M.
- D. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.
- E. Steel Plates and Bars: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel.
- F. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
- G. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.
- H. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- J. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Shop fabricate to greatest extent possible.

2.03 FINISH

- A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

PART 3 EXECUTION

3.01 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Do not field cut or alter structural members without approval of Architect.
- D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

- E. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.02 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.
- B. Bollards

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- K. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).
- L. SSPC-SP 2 - Hand Tool Cleaning.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.

- D. Pipe: ASTM A53/A53M Grade B Schedule 80, black and hot-dip galvanized finish, as indicated
- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- F. Slotted Channel Fittings: ASTM A1011/A1011M.
- G. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- H. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking and masonry; galvanized finish.
- C. Lintels: As detailed; galvanized finish.

2.04 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Prime Painting: One coat.
- D. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.
- E. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 05 53 05 - METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formed metal floor, mezzanine, and stair tread gratings.
- B. Flat surface floor and stair tread plating.
- C. Metal bar gratings over area wells

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
- D. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual.
- E. SSPC-SP 2 - Hand Tool Cleaning.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Floor Plate: ASTM A786/A786M; manufacturer's standard pattern.

2.02 ACCESSORIES

- A. Fasteners and Saddle Clips: Galvanized steel:

2.03 FABRICATION

- A. Fabricate grates and plates to accommodate design loads.

2.04 FINISHES

- A. Prepare surfaces to be primed in accordance with SSPC-SP 2.
- B. Galvanizing for Steel Hardware: ASTM A153/A153M.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install components in accordance with manufacturer's instructions.
- B. Place frames in correct position, plumb and level.

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- C. Set perimeter closure flush with top of grating and surrounding construction.
- D. Secure to prevent movement.

SECTION 23 09 54 - ELECTRIC TEMPERATURE CONTROL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 23 05 93 – Testing, Adjusting, and Balancing
- C. Section 23 09 15 – DDC Points List
- D. Section 23 09 23 - Direct Digital Control Systems
- E. Section 23 09 93 – Automatic Controls Sequences
- F. Section 23 21 13 – Hydronic Systems – for well/tap installation
- G. Section 23 33 00 – Ductwork Accessories – for airflow measuring station or control damper installation

1.02 DESCRIPTION OF WORK

- A. The intent of this project is to provide automated temperature control and a Building Automation System for the building.
- B. Provide DDC for the following HVAC systems. See sequence of operations in 23 09 93 and DDC Points List in 23 09 15 for a more comprehensive description of DDC requirements
 - 1. Hot Water System
 - 2. Chilled Water and Condenser Water System
 - 3. Qty (5) Air Handling Units
 - 4. Exhaust and Ventilation Fans
 - 5. VAV Boxes
 - 6. Fan Coil Units
 - 7. Radiant Heat
 - 8. Unit Heaters
- C. Work in the section includes:
 - 1. Includes, but is not necessarily limited to, furnishing and installing a complete, calibrated, tested, adjusted and as intended, electric control system; including all thermostats, controllers, electric actuators, valves, switches, relays, transducers, sensors, transmitters, conduit, wiring and other equipment and accessories necessary to constitute a complete and coordinated automatic electric temperature control system, as described herein and shown on the drawings.
 - 2. Control and data wiring, except for power wiring, necessary for electric or electronic temperature control systems, is work of this section. Electrical work under this section shall be performed in accordance of Division 26 requirements.
 - 3. Automatic Control Dampers shall be furnished by this section and installed as a part of the Division 23 Work.

4. Thermowells (Temperature Sensing Wells), Automatic Control Valves, hydronic pressure sensors, and hydronic flow sensors/meters shall be furnished by this section and installed as a part of Division 23 Work.
 5. All control systems identified in Section 23 09 93 - Automatic Control Sequences is exclusively work of this section.
 6. Analog input signals and binary input signals shall be transmitted to the Direct Digital Control systems using electronic equipment, sensors, transmitters and transducer specified herein. The DDC system shall transmit binary and/or analog output signals to equipment to obtain specified control sequences.
 7. All controls installation, furnishing of devices, software, and programming, etc. shall be furnished, except where already included with packaged control systems. Graphics shall be provided for both directly controlled equipment and integrated equipment.
 8. Temperature Control Panels shown on the Mechanical Plans shall reuse the existing 120V power to the panel. This contractor shall be responsible for all other 120VAC power, not provided in the Division 26 specifications, required for equipment provided in this section.
- D. Work not included in this section:
1. Direct digital controls and energy management interface, as specified in Section 23 09 23.
 2. Refer to Division 26 sections for power wiring to line voltage devices.
 3. Access doors are not included under this section, but are included under Division 23.
 4. The installation of automatic control dampers, air flow stations, and air flow valves is part of the sheetmetal work of Division 23.
 5. The installation of thermowells, automatic control valves, wet-media sensors, flow meters, and wet-media transmitters is part of the piping work of Division 23.
- E. Reuse of existing controls infrastructure:
1. See 23 09 15 DDC Points List for a description on expectation of reusing or replacing controls devices.
 2. Temperature Control Panel enclosures are expected to be reused at their existing locations, reusing the 120V at the panel locations. Furnish new mounting backplates to house all new DDC and associated relays, power supplies, etc. and replace contents of existing control panel. Where enclosure size is insufficient for design needs, furnish additional temperature control panels as needed.
 3. Existing conduit containing HVAC controls wiring may be reused.
 4. Reuse of control wiring between the temperature control panel and the field device may be reused if deemed in good condition and meets specifications of ~~Distech-DDC and~~ associated field components.
- F. Demolition of existing controls infrastructure:

1. Remove all existing DDC, power supplies, and associated controls components that are to be replaced as part of this project. Maintain integrity of existing DDC field communication trunk for continuation of service during phased approach to DDC replacement.

~~Metasys Network Automation Engines (NAE) shall be demo'd last, after all DDC has been converted to Distech. Turn NAEs over to owner.~~

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code.
- B. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
- C. ANSI/ASTM B32 Specification for Solder Metal
- D. ASTM B75 Seamless Copper Tube
- E. ASTM D1693 Environmental Stress-Cracking of Ethylene Plastics
- F. ASTM D 635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
- G. Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
- H. AMCA 500-D Laboratory Method of Testing Dampers for Rating

1.04 SUBMITTALS

- A. The following sections shall be submitted together as one package and shall be referenced on submittal cover page and paperwork.
 1. 23 09 15
 2. 23 09 54
 3. 23 09 93
- B. The following shall be included:
 1. Building Automation System Network Architecture Diagram indicating network layout of all communication buses including all hardware, operator workstation and software, and integrated devices. Where multiple field-level controllers are installed (e.g. VAV Box controller), references made to "typical of #" are acceptable.
 2. Manufacturer's data sheets indicating model number, pressure/temperature ratings, capacity, methods and materials of construction, installation instructions, and recommended maintenance. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked.

3. Schematic flow diagrams of systems showing fans, pumps, coils, dampers, valves, and other control devices. Each control device provided under this section shall be uniquely labeled. Duplicate labeling may be used within similar mechanical systems. Label each device with setting or adjustable range of control. Indicate all wiring, clearly, differentiating between factory and field installed wiring. Wiring should be shown in schematics that detail contact states, relay references, etc. Diagrammatic representations of devices alone are not acceptable.
4. Details of construction, layout, and location of each temperature control panel within the building, including instruments location in panel and labeling. Also include on drawings location of mechanical equipment controlled (room number), locations of all remote sensors and control devices (either by room number or column lines).
5. A list of all inputs and outputs associated with each controller.
6. Bill of Materials for all controls devices provided on the project, indicating part numbers, device manufacturer, and description of part.
7. Schedule of control dampers indicating size, leakage rating, arrangement, pressure drop at design airflow, and number and size of operators required.
8. Schedule of control valves indicating system in which the device is to be used, rated capacity, flow coefficient, flow required by device served, actual pressure drop at design flow, size of operator required, close-off pressure, and locations where valves are to be installed.
9. Sequence of operations for all DDC equipment.
10. All submittals are to comply with submission and content requirements specified in applicable provisions of Division 1.

1.05 QUALITY ASSURANCE

- A. Installer: Installing contractor must be a manufacturer's branch office or an authorized representative of a Direct Digital Control (DDC) equipment manufacturer that provides engineering and commissioning of the DDC equipment. DDC equipment may or may not be required to be installed by this contractor as part of the project, but the intent of this quality assurance specification is to ensure that the installing contractor has the capabilities to engineer, install, and commission the field devices supplied under this section for temperature control. Installer response time during the warrantee period shall be four (4) hours or less (24 hours/day, 7 days/week).
- B. Electrical Standards: Provide electrical products that have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.
- C. Provide control devices subject to corrosive environments with corrosion protection or construct them so they are suitable for use in such an environment.

- D. Provide devices exposed to outside ambient conditions with weather protection or construct them so they are suitable for outdoor installation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide factory shipping cartons for each piece of equipment and control device. Provide factory applied plastic end caps on each length of pipe and tube. Maintain cartons and end caps through shipping, storage and handling as required to prevent equipment and pipe end damage and to eliminate dirt and moisture from equipment and inside of pipe and tube. Store equipment and materials inside and protected from weather.

1.07 OPERATION AND MAINTENANCE DATA

- A. The following sections shall be submitted together as one package for O&M Data: 23 09 15, 23 09 54, and 23 09 93. Specification sections shall be referenced on O&M submittal cover page and paperwork. Controls drawing package (as described below) shall clearly reference "As-built" or "Record Drawings" on title sheets with appropriate date. Simply submitting a copy of the original submittal with original submittal date in lieu of providing what is described herein is not acceptable and will be rejected. Include the following information:
 - 1. As-built Building Automation System Network Architecture Diagram indicating network layout of all communication buses including all hardware, operator workstation and software, and integrated devices.
 - 2. As-built communication bus routing of all connected devices. Each DDC controller shall be indicated and clearly shown which communication bus it resides on and the order of devices along the communication bus. Indicate where "End Of Line" is.
 - 3. Manufacturer's data sheets indicating model number, pressure/temperature ratings, capacity, methods and materials of construction, installation instructions, and recommended maintenance. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked.
 - 4. As-built list of all inputs and outputs associated with each controller.
 - 5. As-built Bill of Materials for all controls devices provided on the project, indicating part numbers, device manufacturer, and description of part.
 - 6. As-built schematic flow diagrams of systems showing fans, pumps, coils, dampers, valves, and other control devices. Each control device provided under this section shall be uniquely labeled. Duplicate labeling may be used within similar mechanical systems. Label each device with setting or adjustable range of control. Indicate all wiring, clearly, differentiating between factory and field installed wiring. Wiring should be shown in schematics that detail contact states, relay references, etc. Diagrammatic representations of devices alone are not acceptable.

7. As-built details of construction, layout, and location of each temperature control panel within the building, including instruments location in panel and labeling. Also include on drawings location of mechanical equipment controlled (room number), locations of all remote sensors and control devices (either by room number or column lines).
8. As-built schedule of control dampers indicating size, leakage rating, arrangement, pressure drop at design airflow, and number and size of operators required.
9. As-built schedule of control valves indicating system in which the device is to be used, rated capacity, flow coefficient, flow required by device served, actual pressure drop at design flow, size of operator required, close-off pressure, and locations where valves are to be installed.
10. As-built sequence of operations for all DDC equipment, including final setpoints established with balancing contractor.
11. Completed Functional Performance Testing forms, as detailed in Section 23 08 00.

1.08 AGENCY TRAINING

- A. At project close-out, contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section.
- B. Unless otherwise directed by Agency DDC operations personnel, training provided by contractor shall include the following topics:
 1. OPERATOR INTERFACE TASKS, demonstrating how to:
 - a. Login/Logout
 - b. Define and modify schedules for equipment operation
 - c. View point data in lists and on graphics
 - d. View live trend data
 - e. View historical trend data
 - f. Acknowledge alarms
 - g. Adjust setpoints
 - h. Manually override logic and force actions, and release back to auto control
 - i. Edit time schedule parameters
 2. WALKING TOUR OF DDC SYSTEM:
 - a. Locations of all controlled HVAC systems (excluding terminal units unless in obscure location)
 - b. Locations of all Temperature Control Panels and designated function
 - c. Locations of any system sensors or controlled devices located outside of mechanical or electrical rooms (e.g. outdoor air temperature sensor, outdoor air static pressure reference, water differential pressure sensors, AHU supply static sensor, emergency HVAC shutdown switch)

3. TRAINING REFERENCE MATERIAL: At the time of owner training, provide a binder to the building operator containing the following information:
 - a. Simple step-by-step instructions, in a clear format, outlining the most commonly executed operator interface tasks as listed above. In lieu of printed material, contractor may provide instructional video demonstrating the tasks.
 - b. A copy of the DDC completed as-built drawings as defined above in "OPERATION AND MAINTENANCE DATA".
 - c. In each temperature control panel, provide a copy of the control drawings that pertain to equipment served by the temperature control panel. This should include a flow schematic of the system(s) served, the control panel and field wiring diagrams, and the sequence of operations.
 - d. Provide two follow-up visits for troubleshooting and instruction, one six months after substantial completion and the other at the end of the warranty period. Length of each visit to be not less than 4 hours or the time necessary to provide required information and complete troubleshooting and inspection activity for all controls installed. Coordinate the visit with the owner/Agency and provide an inspection report to the owner of any deficiencies found.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. General:

1. Provide electric temperature control products in sizes and of capacities as required, conforming to manufacturer's standard materials and components as published in their product information; designed and constructed as recommended by manufacturer and as required for application indicated.
2. Provide control devices subject to corrosive environments with corrosion protection or construct them so they are suitable for use in such an environment.
3. Provide devices exposed to outside ambient conditions with weather protection or construct them so they are suitable for outdoor installation.
4. Use only UL labeled products that comply with NEMA Standards. Electrical components and installation to meet all requirements of the electrical sections (Division 26) of project specifications.
5. All valve and damper operators shall fail safe upon control power failure where indicated with a "NO" or "NC" on the HVAC controls schematics in the plans.

B. Control Valves:

1. Provide all control valves as shown on the plans/details and as required to perform functions specified.

2. Size operators to allow smooth and positive operation of devices served and to provide sufficient torque capacity for tight shutoff against system temperatures and pressure encountered.
3. For electric modulating actuation, use fully proportional actuators with 0-10VDC inputs unless specified otherwise in the chart below. For two-position electric actuation use 24 VAC for DDC controlled actuators, 120 VAC actuators may be used for hardwire interlocking. Electric actuators, for applications other than terminal units, shall be provided with a manual override capability. All electric actuators shall be provided with a visible position indicator.
4. Provide operators that are full proportioning or two-position, as required for specified sequence of operation. Provide spring-return for applications involving fire, freeze protection, moisture protection or specified normally open/closed operation. Valves shall move to their fail positions on loss of electrical power.
5. Two-position shut-off valves used for isolation of mechanical devices shall be sized for a maximum pressure drop of 2 PSI at design flow and shall be a minimum of line size.
6. Valve selections shall conform with the following table:

VALVE SERVING	TYPE Globe, Butterfly (BF), Ball, Press Independent t Ball (PI Ball)	SIGNAL 0-10 VDC TriState (24VAC) 2-Position Elect	SPRING RETUR N REQUIR ED Yes No	FAIL POSITION Open (thru Coil) Closed (bypass Coil) Last Position
Reheat Coil	Globe or Ball	0-10 VDC	No	Last Position
Radiation w/ Reheat	Globe or Ball	0-10VDC, TriState, or 2-Pos	No	Last Position
Standalone Radiation	Globe or Ball	0-10 VDC or TriState	No	Last Position
CUH and UH	Globe or Ball	TriState or 2-Pos	Yes	Open
Fan Coil Heating	Globe or Ball	0-10 VDC	Yes	Open
Fan Coil Cooling	Globe or Ball	0-10 VDC	Yes	Closed
AHU Hot Water Heating Coil	Globe or Ball	0-10 VDC	Yes	Open
AHU Cooling Coil	Globe, Ball, or BF (BF only when	0-10 VDC	Yes	Closed

VALVE SERVING	TYPE Globe, Butterfly (BF), Ball, Press Independent t Ball (PI Ball)	SIGNAL 0-10 VDC TriState (24VAC) 2-Position Elect	SPRING RETUR N REQUIR ED Yes No	FAIL POSITION Open (thru Coil) Closed (bypass Coil) Last Position
	3" or greater)			

C. Control Valves in Water Systems:

1. Use equal percentage valves for two-way control valves serving coils. Use linear valves for two-way control valves meant to satisfy flow conditions (e.g. chiller minimum flow valve, boiler minimum flow valve, chiller heat recovery flow valve). Consult with AE for acceptable pressure drop if available valve selections do not fall within the desired pressure range. Note: For low flows, the required minimum Cv size will result in lower pressure drop than 4 psi.
2. Use three-way valves sized for a maximum pressure drop of 5 psi and that have linear characteristics so that the valve pressure drop remains constant regardless of the valve position.
3. Globe valves 2" and smaller: Cast bronze or forged brass body, brass plug and brass or stainless steel seat, stainless steel stem, screwed ends, suitable for use on water systems at 150 psig and 240° F. Seat leakage with actuator supplied will meet ANSI class IV leakage (0.01%). For globe valves that are specified to fail in place, valves shall be open when the stem is up. Only the following globe valve body styles will be acceptable for terminal unit control: Siemens Powermite 599 VF Series (599 VE Series Zone Valves are not acceptable), Invensys VB7200 Series, Johnson Controls VG7000 Series, and Honeywell V5011/V5013 Series. Minimum size for globe valves shall be 1.5 Cv. No minimum size for CCV ball valves.
4. Globe valves 2 1/2" and larger: Iron body, brass plug and seat, stainless steel stem, spring loaded Teflon, or EPDM packing, flanged ends, suitable for use on water systems at 150 psig and 240° F.

5. Butterfly valves: Iron body, stainless steel shaft, bronze bearings, and resilient seat. Disc to be aluminum-bronze, nickel-plated ductile iron, cast iron with welded nickel edge, Nylon 11 coated, or stainless steel. Valve assembly to be bubble tight, suitable for use on water systems at 150 psig and 240° F. For pneumatically actuated valves, provide pilot positioners on all operators for butterfly valves used in modulating applications. When butterfly valves are used in modulating applications, entering and leaving pipe sizes and required transition distances shall be detailed on the control valve submittals. The control contractor shall be responsible for coordinating the proper pipe sizes and transitions with the mechanical contractor to provide the correct Cv at 70° open position.
6. Characterized Ball Valves: The following manufacturers are acceptable: Honeywell, Belimo, Johnson Controls, KMC Controls, Yamatake, Bray. For use on terminal units only where specified above. Forged brass or bronze body, stainless steel shaft and ball, reinforced Teflon or PTFE ball seals, double O-ring stem seals, characterized disk, maximum of ANSI Class IV (0.01%) leakage, suitable for use on water systems at 150 psig and 212° F. Note: Only ball valves with a characterized disk shall be acceptable.

D. Control Dampers:

1. Provide control dampers shown on the plans and as required to perform the specified functions. Dampers shall be rated for velocities that will be encountered at maximum system design and rated for pressure equal or greater than the ductwork pressure class as specified in [Section 23 31 00] of the ductwork where the damper is installed.
2. Use only factory fabricated dampers with mechanically captured replaceable resilient blade seals, stainless steel jamb seals and with entire assembly suitable for the maximum temperature and air velocities encountered in the system.
3. All dampers in stainless steel, PCD coated steel, PVC, PTFE, or fiberglass ductwork shall be constructed of stainless steel.
4. All dampers in aluminum ductwork shall be constructed of stainless steel or aluminum.
5. Dampers in galvanized ductwork shall be constructed of galvanized steel and/or aluminum.
6. All dampers, unless otherwise specified, to be rated at a minimum of 180° F working temperature. Leakage testing shall be certified to be based on latest edition of AMCA Standard 500-D and all dampers, unless otherwise specified, shall have leakage ratings as follows:

Class IA	1" w.g.	=/<3 CFM/ft2
Class I	4" w.g.	=/<8 CFM/ft2
Class I	8" w.g.	=/<11 CFM/ft2

Class I	12" w.g.	=/≤14 CFM/ft ²	Damper Class	Differenti al Pressure	Leakage
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7. Leakage rate dampers for differential pressures that they will encounter at maximum system design pressures.
8. Steel framed dampers: Nailor models 2010 & 2020; Greenheck models VCD-33 & VCD-42; Johnson Controls model V-1330; Ruskin Models CD60 & CD40; other approved equal.
9. Aluminum frame and blade dampers: Nailor models 2010EAF & 202EAF; Greenheck model VCD-43; Ruskin model CD50; Arrow model AFD-20; other approved equal.
10. Dampers used for directed mixing of airstreams, i.e. outside air and return air, to be parallel blade type and sized for an air velocity of 1800 to 2000 fpm with the damper blades shall be arranged so that the air streams are directed at one another to facilitate mixing. Dampers used for throttling or modulating applications other than air stream mixing to be opposed blade type. Two position dampers may be parallel or opposed blade type.
11. Dampers used for isolation on the discharge of centrifugal fans shall have damper blades perpendicular to the fan shaft to minimize system effect. Dampers mounted with blades vertically shall be designed for vertical blade orientation.
12. Dampers for applications other than fume exhaust to have frames of not less than 16 gauge galvanized steel or 12 gauge extruded aluminum. Blades to be two-ply steel airfoil of not less than 2 x 20 gauge galvanized steel (14 gauge equivalent) or extruded aluminum airfoil, with stainless steel, acetal, Celcon, bronze, or nylon bearings. Maximum allowable blade width is 8 inches. Use plated steel linkage hardware.
13. Maximum damper width is 48 inches; where required width exceeds 48 inches, use multiple damper sections. Inside frame free area shall be a minimum of 90% of total inside duct area.
14. Multiple width damper sections shall utilize jack shaft linkages unless noted below.
Sections over 144 inches wide shall be actuated from two locations on the jack shaft.
Double width damper sections for two-position operation may be actuated without jack shafts if each damper section is actuated separately. Dampers that have multiple width and multiple vertical sections shall have a jackshaft for each vertically stacked set of dampers and be provided with crossover linkages between jack shafts to transfer uneven loading.

15. Jack shafts shall be extended outside of the ductwork for external actuator mounting. Provide bearings on the point of exit for support of damper shafts to prevent wear on the shaft and the ductwork. If locating actuators out of the air stream is impossible, obtain mounting location approval from the designer unless the contract documents indicate in air stream mounting is acceptable. In no cases shall damper actuators for fume exhaust systems be located in the air stream or require entering the air stream to service an actuator.

E. Electric Operators:

1. Provide weatherproof NEMA 4 enclosures that have removable covers that have clasps or machine screws (no sheet metal screws) and that do not require removing fasteners from the ductwork to prevent actuator failure or freeze-up when mounting in locations exposed to harsh environments or outdoor locations.
2. Size operators for smooth and positive operation of devices served, and with sufficient torque capacity to provide tight shutoff against system temperatures and pressure encountered. For electric modulating actuation, use fully proportional actuators with zero and span adjustments. For two-position electric actuation use 24 VAC for DDC controlled actuators, 120 VAC actuators may be used for hardwire interlocking.
3. Actuator stroke times shall match the requirements of the DDC controllers provided under 23 09 23 and/or the specific system requirements for proper operation. All electric actuators will be provided with overload protection to prevent motor from damage when stall condition is encountered. Equip operators with spring return or stored energy fail-safe return for applications involving fire, freeze protection, moisture protection or specified normally open/closed operation. Face and bypass dampers for heating applications shall fail to the face position.
4. Provide independently mounted damper end switches (Kele TS-475, Ruskin SP-101/105, or equal) with form "C" contacts where control sequences require damper position indication or interlock. Damper end switches shall be independent of the damper actuators and be mounted directly to the damper shaft or auxiliary shaft that is mounted to a drive blade of the damper. End switches shall not contain mercury.
5. All power required for electric actuation shall be provided by this contractor if it is not able to be directly provided from the DDC controller.
6. Provide operators with linkages and brackets for mounting on device served.

F. Electric/Electronic Thermostats (Stand-alone operation where points not specified in 23 09 15):

1. Electric Thermostats:
 - a. For single setpoint applications, provide line or low voltage electric type suitable for heating or heating and cooling as required.
2. Low Voltage Electronic Thermostats:

- a. Where unoccupied setpoints are specified, provide electronic programmable type with seven-day setup/setback scheduling with setpoints and occupancy times as indicated in 23 09 93. For heating and cooling applications, provide automatic heating/cooling switchover. For applications that control fans, provide fan override switch. For ventilation or packaged economizer applications provide a dry contact for ventilation damper or economizer initiation. For thermostat control of economizer, provide a 0-10VDC modulated output for economizer damper control.
 - b. For applications that require integration to the building automation system, provide a BACnet communication interface. If a communication interface is specified, occupancy scheduling in the thermostat is not required.
3. Low Limit Thermostats (Freezestats):
 - a. Electric two-position type with temperature sensing element and manual reset for all applications. Unit to be capable of opening control circuit if any one-foot length of sensing element is subject to a temperature below the setpoint. Length of sensing element to be not less than one lineal foot per square foot of coil surface areas.
Unless otherwise indicated, set low limit controls at 36°F.
4. Aquastats:
 - a. Line voltage type with single pole, double throw switch of adequate rating for the applied load.
- G. Electronic Temperature Sensors/Transmitters:
 1. Thermistor temperature sensor manufacturers: PreCon, BAPI, Veris, JCI, and ACI
 2. Use thermistor or RTD type temperature sensing elements constructed so accuracy and life expectancy is not affected by moisture, physical vibration, or other conditions that exist in each application. RTD's shall be of nickel or platinum construction and have a base resistance of 1000 ohm at 70°F and 32°F respectively. 100 ohm platinum RTD's are acceptable if used with temperature transmitters.
 3. The temperature sensing device used must be compatible with the DDC controllers used on the project.
 - a. RTD
 - 1) Accuracy (Room Sensor Only): minimum + 1.0°F
 - 2) Accuracy (Averaging): minimum + 1.2°F
 - 3) Accuracy (Other than Room Sensor or Averaging): minimum + 0.65°F
 - 4) Range: minimum -40 - 220°F
 - b. Thermistor
 - 1) Accuracy (All): minimum + 0.36°F
 - 2) Range: minimum -30 - 230°F
 - 3) Heat Dissipation Constant : minimum 2.7 mW/°C
 - c. Temperature Transmitter
 - 1) Accuracy: minimum + 0.1°F or +0.2% of span

- 2) Output: 4-20 mA
 4. Provide limited range or extended range sensors if required to sense the range expected for a respective point. Use RTD type sensors for extended ranges beyond -30 to 230°F. If RTD's are incompatible with DDC controller direct temperature input use temperature transmitters in conjunction with RTD's.
 5. Use wire size appropriate to limit temperature offset due to wire resistance to 1.0°F. If offset is greater than 1.0°F due to wire resistance, use temperature transmitter. If feature is available in DDC controller, compensate for wire resistance in software input definition.
 6. Zone temperature sensors shall be provided with digital displays that indicate room temperature and setpoint and have a manual occupancy override where indicated in 23 09 15 DDC Points List. Provide setpoint adjustment as specified in the DDC Input/Output Summary Table and sequence of operation.
 7. Use averaging elements on duct sensors when the ductwork is ten square feet or larger. All mixed air and heating coil discharge sensors shall have averaging elements regardless of duct size.
 8. In piping systems use temperature sensors with separable wells designed to be used with temperature element.
- H. Humidity Sensors:
1. Use capacitive thin-film polymer sensor types with a range of 0-100% RH. Accuracy to be no less than $[+/-2\%]$ in the range of 20% RH to 80% RH with a response time of 120 seconds or less. Provide covers for room humidity sensors as specified for temperature sensors.
 2. For outside air applications, use sensor designed for outside air use along with weather enclosure. Provide sensor equal to Vaisala Model HMD60UO w/ DTR503B enclosure and weather resistant mounting hardware.
- I. Pressure Transducers (Air):
1. Provide pressure transducers specified below for the following applications:
 - a. Duct static pressure applications where setpoints are specified to control at greater than 0.1" w.c.
 - b. Pitot type fan inlet air flow stations.
 2. Manufacturers: Mamac Systems, Setra, and Veris Industries.
 3. Provide a transmitter that operates on the capacitance principle and is capable of sensing low positive, negative or differential pressures. Transmitter shall have a minimum of three pressure ranges adjustable by an onboard switch or jumper. Size the transmitter where the middle or high range is suitable for the application. Use a bi-directional transmitter for applications that may have both positive and negative pressure excursions. Transmitter shall be provided with an integral four-digit display of the pressure sensed.

- a. Accuracy (including non-linearity and hysteresis): + 1% FS
 - b. Compensated Temperature Range: 32°-140° F
 - c. Temperature Effect: 0-1"wc Range .09% FS/°F; >1"wc Range .02% FS/°F
 - d. Output: 4-20 MA
 - e. Load Impedance (smallest maximum acceptable): 800 ohm max.
 - f. Operating Temperature: 32°-140° F
4. Provide pressure transducers specified below for the following applications:
 - a. Duct static pressure applications where setpoints are specified to control at 0.1" w.c. or lower.
 - b. All duct mounted pitot type air flow stations.
 - c. Space/building static control or monitoring.
5. Manufacturers: Setra 267, Paragon Controls MicroTrans, Air Monitor Veltron DPT2500 Plus, or approved equal. The airflow transducer shall provide zero and span adjustment for calibration. Use a bi-directional transmitter for applications that may have both positive and negative pressure excursions. Transmitter shall be provided with an integral four-digit display of the pressure sensed.
 - a. Transducer Span: <2 times the design velocity pressure at maximum flow, single range
 - b. Accuracy: +/-0.25% of full scale, including non-linearity, hysteresis, deadband, and non-repeatability
 - c. Temperature Effect: +/-0.15% of full scale/°F
 - d. Response: 0.5 sec. for 98% of full span change
 - e. Overpressure: 5 PSIG Proof
 - f. Power: 24VAC/VDC
 - g. Analog Output: 0-5VDC, 0-10VDC, or 4-20mA field adjustable
6. For space or building static pressure monitoring, use Vaisala model SPH10 Static Pressure Head, or approved equal for outside air reference. Mount in location above roofline away from any air exchanges.
- J. Pressure Transducers (Liquid/Steam):
 1. Differential Pressure Transducers utilized for measuring flow across each chiller shall have an accuracy of +/-0.2%. All other criteria shall be met as detailed below.
 2. Provide a transmitter that utilizes capacitive or thin film strain gauge sensing. Provide for an analog gauge piped in parallel with the transducer. Gauge shall meet specifications as specified in Section 23 05 15. Coordinate with mechanical contractor to provide and install this gauge. For differential pressure applications provide with bypass valve manifold assembly with valved venting capability.
 - a. Accuracy (including non-linearity and hysteresis): + 0.5% FS

- b. Compensated Temperature Range: 32°-150° F
 - c. Temperature Effect (over compensated range): 0.03%/°F;
 - d. Output: 4-20 MA
 - e. Load Impedance (smallest maximum acceptable): 600 ohm Minimum
 - f. Operating Temperature: 0°-175° F
 - g. Hysteresis: 0.75% of span
- K. Differential Pressure Switches:
 - 1. Differential pressure switches shall sense both inlet and outlet of pressure across a component. Device shall be rated for 150% of maximum system pressures that may be encountered. Provide with pressure differential that will be required to meet specified operation and/or to prevent nuisance "toggling" of the device in the system served.
- L. Air Pressure Safety Switches:
 - 1. Air pressure safety switches shall be a differential pressure switch that will sense differential, negative, or positive pressure as required by the sequence of operation specification. Device shall be rated for a minimum of 150% of maximum system pressures that may be encountered. Provide with pressure range that will be required to meet specified operation in the system served. Provide with a normally closed contact that will open above setpoint and will not close until the manual reset button is depressed. Setpoint shall be manually adjustable.
- M. Current Status Switches:
 - 1. Provide a current sensor with adjustable threshold and digital output with LED display, equal to a Veris model H-708/H-904. Threshold adjustment must be by a multi-turn potentiometer or set by multiprocessor that will automatically compensate for frequency and amperage changes associated with variable frequency drives. When used on variable speed motor applications, use a current sensor that will not change state due to varying speeds.
- N. Carbon Dioxide (CO2) Sensor:
 - 1. For rooms where a CO2 sensor and temperature sensor are both required, provide a combination device such that one wall sensor measures both temperature and CO2.
 - 2. Provide a Carbon Dioxide (CO2) sensor that shall utilize non-dispersive infrared (NDIR) technology. The sensor shall have a linear analog output over a range of 0-2000 ppm and have built in display of CO2 level. The sensor shall have an automatic calibration algorithm that will compensate for sensor drift over time due to sensor element degradation. Unit shall be provided with a 0-10VDC or 4-20mA analog output that is selectable and a field adjustable relay alarm output. Accuracy shall be better than ±5% of reading or ±50ppm whichever is higher.
 - 3. The sensor shall be user calibratable with a minimum calibration interval of five years.

O. Airflow Measuring Stations:

1. Provide airflow measuring stations (AMS) for ducts, fan inlets, and outside air as required on plans.
2. Acceptable Manufacturers: Accutrol IAQ-TEK for outside airflow measurement, where scheduled.
3. Substitution Requirements:
 - a. For any product to be considered for substitution, a written document shall be submitted to the engineer detailing exceptions and compliance, section-by-section with supporting documentation, before an approval will be considered
 - b. Any product submitted as an equal shall be expected to comply with all performance capabilities and functional aspects of this specification.
4. Excluded Devices:
 - a. Measurement technologies such as Thermal Dispersion type using multipoint "bead-in-glass" thermistors are not acceptable.
 - b. Measurement technologies such as Thermal Dispersion type using "chip-in-glass", "chip-in-epoxy" or "chip" type thermistors for the heated sensor component are not acceptable.
 - c. Transmitter and probe assemblies that state factory recalibration is required to maintain accuracy are not acceptable.
 - d. Airflow sensors that are affected by dust, humidity and altitude are not acceptable.
5. Airflow measuring stations for ducts:
 - a. General
 - 1) Provide AMS location as shown on the plans, schedules and/or control diagrams to determine the average airflow rate for monitoring and/or control.
 - 2) Each VorTek AMS shall be provided with a microprocessor-based transmitter and one or more sensors.
 - 3) Airflow measurement device shall be field configurable and adjustable to determine the average airflow rates.
 - b. Transmitter:
 - 1) The transmitter shall be capable of utilizing a remote display when the location of the transmitter is not accessible, connected with factory assembled cables that are available in lengths of 25', 50', 75' and 100' as required for remote digital readout locations.
 - 2) The measurement input shall be digital and will not require an Analog-to-Digital convertor. The transmitter shall provide a scalable analog output, which is field configurable using a free intuitive graphical user interface. The output signal of the transmitter shall be 0-10VDC. Power requirement for the transmitter shall be 24VAC or DC.

- 3) Measurement system accuracy shall be +/- 3% of volumetric airflow rate with recommended sensor density, installation distribution and proper upstream requirements. Individual sensor accuracy shall be +/- 2% of reading to NIST-traceable standards. Measurement system accuracy of duct airflow measurement shall be +/-3% of volumetric airflow rate; +/-5% of reading for fan inlet and fan array systems.
- 4) Configuration parameters and adjustments shall be accessible via a free Graphical User interface (GUI) PC application that connects to the transmitter locally, or through the remote display via a standard USB Mini B port. This GUI application shall be available to the technician or the balancer via a free download, thereby reducing start-up and commissioning time without dependence on factory trained personnel to be onsite for this work. Menu driven interfaces using push button and simple alpha numeric display are not acceptable.
- 5) The transmitter shall have the ability through the GUI, to provide a simple calculator for the balancer's field adjustment.
- 6) The transmitter shall be CE Marked and RoHS compliant.
- c. IAQ-TEK for Outdoor Air:
 - 1) General:
 - a) Provide IAQ-TEK measurement location as shown on the plans, schedules and/or control diagrams to determine the average airflow rate for monitoring and/or control of Outside Air.
 - b) Each IAQ-TEK shall be provided with a microprocessor-based transmitter and one or more sensor probes.
 - c) Airflow measurement shall be field configurable and adjustable to determine the average airflow rates.
 - d) Each IAQ-TEK measurement location shall be comprised of a set of probes to properly sample the air intake.
 - 2) Velocity Sensing Probes:
 - a) Velocity Range: Probe shall operate over the range of 1000 to 75 fpm with a 0.100"wc transmitter, higher range transmitters shall be available for greater velocities. Turndown in any specific application shall be a minimum of eight to one.
 - b) Quantity: Probes are to be provided in the quantity recommended by the manufacturer for the specific area to be monitored.
 - c) Mounting: Probes shall be provided with any special hardware required to assure secure mounting. Mounting hardware shall be 304SS. Galvanized or aluminum hardware shall be unacceptable. Probe shall be mounted to minimize extreme angular velocities. Installer to follow manufacturer's mounting instructions.
 - d) Orientation: Probe must be located facing into air stream and isolated from return airflow. Pressure connection barbs must be upright.
 - e) Cleaning: Probes shall be able to withstand periodic wash-down with water without a degradation in signal quality. If probes cannot be cleaned in this manner, provide upstream filter assemblies to protect the probes from dirt. Filters shall be provided upstream due to contaminants in outside air.

- f) Humidity: Sensor shall not be affected by high levels of water vapor, including entrained rain and fog. Thermal devices shall not be acceptable due to condensation affecting the operation of the unit.
- 3) Transducer:
 - a) Style: Differential pressure type, high accuracy, complete with auto-zero valve and ambient temperature sensor.
 - b) Range: Differential pressure range shall be selected for the corresponding air velocity range being measured.
 - c) Temperature range: Transducer shall be capable of operating over the range of -30 to 120 degrees F without any temperature induced errors including zero or span shift.
 - d) Environment: Transducer shall be mounted in a sealed NEMA 4 enclosure, suitable for mounting in the outdoor air plenum.
 - e) Pressure Connections: 1/4 inch barbed connections shall be provided for high and low pressure sensing.
 - f) Electrical Connections: A weather tight connection cable with weatherproof Amphenol type connector shall be provided. Cable shall be plenum rated.
 - g) Humidity: Transducer shall be protected from condensation in sensing chamber and connection tubing when transducer temperature is lower than the dew point of the measured air stream.
- 4) Monitor Electronics:
 - a) Style: Microprocessor based electronics including integral display and operator keypad.
 - b) Function: Receive signals from transducer and probes, calculate outdoor air volume and temperature, display information to user, transmit information to building automation system, perform self-diagnostics, and alarm on low outdoor air volume.
 - c) Display: A 4-line by 20-character alpha-numeric LCD operator's display shall be provided and shall be backlit for use in low light areas.
 - d) Temperature range: Monitor shall be capable of operating over the range of +30 to 110 degrees F.
 - e) Environment: Monitor shall be mounted in a sealed NEMA 4 enclosure, suitable for mounting outdoors if required. Enclosure shall include clear window to allow viewing of monitor display without opening the door.
 - f) Calculations: Monitor shall perform calculations including: differential pressure to velocity and velocity to volume conversions; and, correct for altitude, intake air temperature, transducer zero drift and span shift.
 - g) Analog Outputs: Monitor shall provide industry standard 4-20mA outputs for corrected volume and outdoor air temperature. Scaling of volume output shall be adjustable by the user. Diagnostic functions shall be provided to assist in troubleshooting connections.
 - h) Contact Outputs: A SPDT contact shall be available which will be normally energized and shall indicate either an alarm condition or unit problem.
 - i) Setup Wizards: The monitor shall include preprogrammed setup wizards to lead the building automation contractor, test and balance contractor, and/or user through the steps necessary to commission the system.

P. Temperature Control Panels:

1. Constructed of steel or extruded aluminum, with hinged door, keyed lock, and baked enamel finish. Install controls, relays, transducers and automatic switches inside panels. Label devices with permanent printed labels and provide asbuilt wiring/piping diagram within enclosure. Provide raceways for wiring and poly within panel for neat appearance. Provide termination blocks for all wiring terminations. Label outside of panel with panel number corresponding to plan tags and asbuilt control drawings as well as building system(s) served.
 2. Control panels that have devices or terminations that are fed or switch 50V or higher shall enclose the devices, terminations, and wiring so that Personal Protective Equipment (PPE) is not required to service the under 50V devices and terminations within the control panel. As an alternative, a separate panel for only the 50V and higher devices may be provided and mounted adjacent to the under 50V control panel.
 3. Provide a disconnect switch inside the temperature control panel that interrupts power to all powered devices inside the panel as well as field devices powered from the panel.
- Q. Power Supplies:
1. Provide all required power supplies for actuators, transducers, sensors, transmitters and relays. All low voltage transformers shall have a resettable secondary circuit breaker and be listed as class 2 power supplies.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install system with trained mechanics and electricians employed by the control equipment manufacturer or an authorized representative of the manufacturer. Where installing contractor is an authorized representative of the control manufacturer, such authorization shall have been in effect for a period of no less than three years.
- B. Install all control equipment, accessories, wiring, and piping in a neat and workmanlike manner. All control devices must be installed in accessible locations. This contractor shall verify that all control devices furnished under this Section are functional and operating the mechanical equipment as specified in Section 23 09 93.
- C. Label all control devices with the exception of terminal unit devices with permanent printed labels that correspond to control drawings. Labeling for each device shall be unique within each mechanical system.
- D. All control devices and electrical boxes mounted on insulated ductwork shall be mounted over the insulation. Provide mounting stand-offs where necessary for adequate support. Cutting and removal of insulation to mount devices directly on ductwork is not acceptable. This contractor shall coordinate with the insulation contractor to provide for continuous insulation of ductwork.

- E. Mounting of electrical or electronic devices shall be protected from weather if the building is not completely enclosed. This Contractor shall be solely responsible for replacing any equipment that is damaged by water that infiltrates the building if equipment is installed prior to the building being enclosed.
- F. Provide all electrical relays and wiring, line and low voltage, for control systems, devices and components. Install all high voltage and low voltage wiring (includes low voltage cable) in Electrical Metallic Tubing (EMT) except above accessible ceilings. All raceways, enclosures, fittings and associated supports shall be provided and installed according to the requirements set forth in Division 26, NFPA 90 (NEC), Chapter SPS 316 of the Wisconsin Administrative Code. All conduits shall be routed parallel and/or perpendicular to walls and adjacent piping. Raceways shall be located to maintain headroom and working clearance around equipment and devices that require inspection and service. All cable routed to devices within spaces with exposed finished structure shall be installed in EMT raceway routed to the nearest accessible ceiling cavity and the raceway, junction box, supports, fittings, backbox, junction box cover plates, etc. shall be painted to match the architectural finish color.
- G. In general, support all raceways from the building structure. No component of a raceway system shall be secured to corrugated metal roof deck. Do not impose on the installations of other trades. Securing conduit, rods, straps, hangers, etc. to suspended ceiling components, electrical raceways, plumbing piping, fire protection sprinkler piping, HVAC piping or ductwork, or their associated support systems, will not be accepted.
- H. Conduit shall be a minimum of 1/2 " for low voltage control provided the pipe fill does not exceed 40%.
- I. Where HVAC equipment control panels, or devices, do not provide for the direct connection of conduits, exposed wiring may be extended to complete the final connections, providing it does not exceed 18 inches in length.
- J. Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. All low voltage wiring to be stranded. IP Cable shall be CAT6.
- K. Low voltage wiring and data cabling can be run without conduit above accessible lay-in tile ceilings. All wiring and data cabling in mechanical rooms, above inaccessible hard ceilings, exterior locations, and in any exposed areas, and in all other locations shall be in conduit. Wire for wall sensors shall be run in conduit. Wiring for radiation valves shall be run in conduit where routed through walls. Existing raceways for sensors shall be reused to limit exposed conduit on walls.
- L. Where wiring/cabling is installed free-air, installation shall comply with the following:
 - 1. Wiring shall utilize the cable tray wherever possible.
 - 2. Wiring shall run at right angles and be kept clear of other trades work.

3. Wiring shall be supported utilizing "J" or "Bridal-type" steel mounting rings anchored to ceiling concrete, piping supports, walls above ceiling or structural steel beams. Mounting rings shall be of open design (not a closed loop) to allow additional wire to be strung without being threaded through the ring. For mounting rings that do not completely surround the wire, attach the wire to the mounting ring with a strap.
 4. At HVAC terminal units only, where the wiring serves a specific device; e.g. controller, actuator, transmitter, etc. associated with the unit, the j-hooks or Bridal rings required to support the wiring, may be secured to the rods or straps that support the ductwork or piping that serves the unit. Wall penetrations shall be sleeved.
 5. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If wiring "sag" at mid-span exceeds 6-inches; another support shall be used.
 6. Wall penetrations shall be sleeved and fire stopped as specified.
 7. Wiring shall not be supported from existing cabling, existing tubing, plumbing or steam piping, ductwork, any component of a suspended ceiling, or electrical or communications conduit.
- M. IP Communication Cabling:
1. CAT6
 2. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 3. Do not over-cinch or crush cables.
 4. Do not exceed manufacturer's recommended cable pull tension.
 5. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
 6. Manufacturer approved conduit bushings MUST be in place on every conduit opening that cable will be installed in prior to running the cable. Confirm before cable installation.
- N. Line voltage wiring to control panels shall be served by permanent power – under no circumstances shall a control panel be served from receptacle power.
- O. All wiring in control panels shall be terminated on a terminal strip. Wire nuts are not acceptable. A maximum of two wires shall be terminated under any one terminal.
- P. All pneumatic tubing and electrical wiring are to be permanently tagged or labeled within one inch of terminal strip with a numbering system to correspond with the asbuilt drawing package.
- Q. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

3.02 AIR PIPING

- A. Mechanically attach tubing to supporting surfaces. Sleeve through concrete surfaces in minimum one-inch sleeves, extended 6 inches above floors and one inch below bottom surface of slabs. Fire stop any open space in the sleeve after the air piping is installed if the sleeve is in a fire rated surface.
- B. Install all polyethylene tubing in conduit as scheduled below unless specified otherwise hereafter. Exposed polyethylene tubing not exceeding 18 inches may be used for connection to an instrument or operator without being installed in conduit. All Conduit to be independently supported, all boxes must be supported, all conduit ends to have bushings for protection of tubing.
- C. Conduit shall be a minimum of 1/2 " for poly tubing provided the pipe fill does not exceed 40%.
- D. Minimum poly tubing size allowed is 1/4" OD. If an instrument has a barbed fitting that will only accept 5/32" tubing, connection to the device can be made with 5/32" tubing that is as short as is practical. Couplings are acceptable in this instance.
- E. Install all exposed piping and conduit parallel to or at right angles to the building structure and support adequately at uniform intervals. Use only tool made bends in copper air pipe.
- F. Where polyethylene tubing is installed free-air, installation shall consider the following:
 - 1. Tubing shall run at right angles and be kept clear of other trades work.
 - 2. Tubing shall be supported utilizing "J-" or "Bridal-type" mounting rings anchored to ceiling concrete, piping supports or structural steel beams. Rings shall be designed to maintain tubing bend to larger than the minimum bend radius (typically 4 x tubing diameter).
 - 3. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If tubing "sag" at mid-span exceeds 6-inches, another support shall be used.
 - 4. Tubing shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
- G. Tubing shall not be attached to existing cabling, existing tubing, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.
- H. Tubing connected to air terminal unit devices shall be attached to the terminal unit device to prevent tubing from becoming kinked or becoming disconnected. Tubing serving air terminals may be routed on top of ductwork serving that terminal unit for a maximum distance of eight feet.
- I. Tubing directly connected to steam valve actuators shall be copper tubing for a minimum of six inches.
- J. Where tubing is connected to ductwork at an exterior location for sensing purposes, the tubing shall be sloped to a heated interior location without sags or traps in the tubing to prevent condensation to be trapped in the tubing and prevent accurate sensing. Install drip leg at low point at interior location and note location on control record drawings.

- K. Number code all polyethylene tubing and install neatly with no concealed splices.
- L. Piping material used shall be as follows:
 - 1. Polyethylene tubing in block, stud, or concrete walls must be in conduit and associated boxes to be of steel.
 - 2. Where air piping is within concrete slab or under grade use only polyethylene tubing in conduit
 - 3. For exposed outdoor locations, use hard copper or polyethylene tubing in conduit.
Provide shielding for polyethylene tubing that is used for final device connection that will be exposed to direct sunlight.
 - 4. For static sensing lines connected to ductwork located in exposed outdoor locations, slope piping from connection into building to a location that will be above freezing so any condensation will run into the building and not freeze in piping. Piping tap shall not be on the bottom of the ductwork. Provide a drip leg of 3/8" tubing a minimum of one foot in length in an accessible location inside the building that will collect condensation from the sensing line.
 - 5. Polyethylene tubing may be used in exposed areas if run in a fully enclosed rigid metal raceway or metal conduit and ambient temperature is less than 150°F.
 - 6. Use copper tubing, where subject to temperatures in excess of 150°F or where adjacent to heating pipes passing through a common sleeve.
 - 7. When polyethylene tubing is used above accessible lay-in acoustical panel ceilings it must be fire resistance "FR" rated pass the UL 94 vertical flame test with a rating of V2, be rated as self-extinguishing under ASTM D 635, and may be run without conduit.

3.03 WIRE AND AIR PIPING CONDUIT AND TUBING INSTALLATION SCHEDULE

- A. The following conduit schedule shall apply to both polyethylene tubing and wire in conduit where conduit is specified for air tubing or wiring. Conduit and tubing referenced below shall meet specifications in Division 26 and as defined below.
 - 1. Conduit other than that specified below for specific applications shall not be used.
 - 2. Underground Installations within Five Feet (1.5 m) of Foundation Wall: Rigid steel conduit.
 - 3. Underground Installations More than Five Feet (1.5 m) From Foundation Wall: Rigid steel conduit. Plastic-coated rigid steel conduit. Schedule 40 PVC conduit.
 - 4. Under Slab on Grade Installations: Schedule 40 PVC conduit.
 - 5. Exposed Outdoor Locations: Rigid steel conduit.
 - 6. Concealed in Concrete and Block Walls: Rigid steel conduit. Schedule 40 PVC conduit. Electrical Nonmetallic Tubing (ENT).
 - 7. Wet Interior Locations: Rigid steel conduit.
 - 8. Concealed Dry Interior Locations: Rigid steel conduit. Intermediate metal conduit. Electrical metallic tubing.

9. Exposed Dry Interior Locations: Rigid steel conduit. Intermediate metal conduit. Electrical metallic tubing.

3.04 CONTROL DAMPERS

- A. All control dampers furnished by the control manufacturer are to be installed by the Mechanical Contractor under the coordinating control and supervision of the Control Contractor in locations shown on plans or where required to provide specified sequence of control.
- B. Damper end switches, where required, shall be independently mounted to the damper drive shaft or auxiliary shaft attached to a damper drive blade. End switches shall be adjusted to prove the damper the position opposite the fail position of the damper actuator unless the control sequence requires a different position to be proven to accomplish the specified control sequence.
- C. Coordinate installation with the sheetmetal installer to obtain smooth duct transitions where damper size is different than duct size. Blank off plates will not be accepted.
- D. Each operator shall serve a maximum damper area of 36 square feet. Where larger dampers are used, provide multiple operators.

3.05 CONTROL VALVES

- A. All temperature control valves furnished by the control manufacturer are to be installed by the Mechanical Contractor under the coordinating control and supervision of the Control Contractor in locations shown on plans or where required to provide specified sequence of control.
- B. Steam valve actuators shall be mounted at a 45 degree angle from upright vertical to prevent overheating of the actuator unless shielding is provided and the manufacturer indicates it is acceptable to mount in the upright vertical position. All other valves shall be mounted in the upright vertical position. If upright vertical mounting is not possible due to lack of space, obtain approval from the mechanical engineer of record on the project for alternate mounting that meet the manufacturers recommended installation.

3.06 ROOM THERMOSTATS AND TEMPERATURE SENSORS

- A. Check and verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Room sensors/thermostats shall be mounted at existing locations. Any new locations should be installed at ADA height (42-48") and aligned with wall switches. For drywall installations, thermostat mounting shall use a back-box attached to a wall stud, drywall anchors are not acceptable.
- B. Any room thermostats or sensors mounted on an exterior wall shall be mounted on a thermally insulated sub-base. Subbase to provide a minimum of one half inch of insulation.
- C. Where thermostats or sensors are mounted on exterior walls or in any location where air transfer will affect the measured temperature or humidity seal the conduit and any other opening that will affect the measurement.

3.07 ZONE CO2 SENSORS

- A. For rooms where a CO2 sensor and temperature sensor are both required, provide a combination device such that one wall sensor measures both temperature and CO2.

3.08 LOW LIMIT THERMOSTATS (FREEZESTATS)

- A. Install low limit controls where indicated on the drawings or as specified. Unless otherwise indicated, install sensing element on the downstream side of heating coils.
- B. Mount units using flanges and element holders. Provide duct collars or bushings where sensing capillary passes through sheetmetal housings or ductwork; seal this penetration to eliminate air leakage. Mount the units in an accessible location as to allow for resetting after low limit trips while still meeting manufacturer's installation requirements for proper function.
- C. Distribute (serpentine) sensing element horizontally across the coil to cover every square foot of coil; on larger coils this may require more than one instrument. Install controls at accessible location with mounting brackets and element duct collars where required.
- D. Integral Face and Bypass Steam Heating Coil Freezestats:
 - 1. For integral face and bypass coils the elements are to be run vertically on the face of the heating coil inside the damper enclosure, this will require drilling the frame to run element around the by-pass. Provide an auto-reset freezestat for each coil vertical heating tube. The head of the freezestat shall be mounted outside the unit, if possible, above the coils and any excess capillary shall be mounted out of the air stream above the coil. If the head of the freezestat cannot be mounted outside of the unit, it should be mounted downstream of the coil. Provide latching relays with LED indicator of relay status for each freezestat so that the relay will remain latched after the freezestat resets. Label each freezestat and corresponding relay to provide an easy method to determine which freezestat(s) have tripped. Provide a momentary reset switch and connection for remote contact reset from the DDC system for resetting the freezestat alarm. The relays shall be unlatched after a power fail. Mount latching relays in a hinged cover panel mounted at a maximum of five feet above the floor in an accessible location on the AHU. Reset switch shall be mounted on the cover and be labeled "Freezestat Reset".

3.09 AIRFLOW STATIONS

- A. Install airflow stations in accordance with manufacturer's recommendations. Transmitter displays shall be mounted in accessible location for viewing and installation setup.

3.10 TEMPERATURE CONTROL PANELS

- A. Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle iron supports. All control panel openings shall be plugged. Conduits and other penetrations on the top of the cabinets shall be sealed on the exterior of the cabinet with silicone caulk to resist water penetration. One cabinet may accommodate more than one system in same equipment room. Provide permanent printed labeling for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face. Clear all debris and clean inside of cabinet at project closeout.
- B. Provide as-built control drawings of all systems served by each local panel in a location adjacent to or inside of panel cover.

3.11 CURRENT STATUS SWITCHES

- A. Provide for each fan or pump specified, or shown on point list. Set threshold adjustment to indicate belt or coupling loss. Readjust threshold for proper operation after final balancing is completed. Use the variable frequency drive (VFD) integrated relay output for motor status, if provided on the VFD, in lieu of a discrete current switch. A separate current switch provided under this Section shall be wired in parallel with the VFD motor status relay when a bypass starter is provided on the VFD to prove motor status in the bypass mode.

END OF SECTION

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