

# OAKWOOD VENEER - WAREHOUSE ADDITION

## 1830 STEPHENSON HIGHWAY, TROY MI 48083

### SHEET INDEX

- A0 COVERSHEET
- A1.0 FOUNDATION PLAN AND DETAILS
- A1.1 FLOOR PLAN
- A2.0 ELEVATIONS AND DETAILS
- A3.0 BUILDING SECTION
- A4.0 SECTIONS AND DETAILS
- A5.0 DETAILS
- A6.0 SPECIFICATIONS
- M0.1 MECHANICAL INFO, GAS PIPING DIAGRAM, SCHEDULE AND SPECIFICATIONS
- M1.1 PLUMBING, HEATING AND VENTILATING PLANS, DETAILS AND SCHEDULES
- M2.1 FIRE PROTECTION PLAN, SPECIFICATIONS, NOTES AND RISER DIAGRAM
- E001 SYMBOLS, LIGHTING FIXTURE SCHEDULE, & DRAWING LIST
- E100 PARTIAL FLOOR PLAN - LIGHTING DEMOLITION AND NEW WORK
- E200 PARTIAL FLOOR PLAN - POWER & SYSTEMS DEMOLITION AND NEW WORK
- E300 PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK
- E310 ELECTRICAL SCHEDULES
- E311 ELECTRICAL SCHEDULES
- E312 ELECTRICAL SCHEDULES
- E400 MISCELLANEOUS WIRING DIAGRAMS AND DETAILS
- E401 MISCELLANEOUS WIRING DIAGRAMS AND DETAILS
- E500 ELECTRICAL SPECIFICATIONS
- E501 ELECTRICAL SPECIFICATIONS
- E502 ELECTRICAL SPECIFICATIONS
- E503 ELECTRICAL SPECIFICATIONS
- E504 ELECTRICAL SPECIFICATIONS
- E505 ELECTRICAL SPECIFICATIONS
- EX100 EMERGENCY EGRESS LIGHTING PHOTOMETRY

- C1.0 EXISTING CONDITIONS
- C2.0 DEMOLITION AND SOIL EROSION AND SEDIMENTATION CONTROL PLAN
- C2.1 DEMOLITION AND SOIL EROSION AND SEDIMENTATION CONTROL PLAN
- C.0 LAYOUT AND MATERIALS
- C4.0 GRADING AND UTILITY
- C4.1 GRADING AND UTILITY
- C4.2 GRADING AND UTILITY
- C5.0 STANDARD DETAILS
- C6.0 UTILITIES DETAILS

### DESIGN NOTES:

MICHIGAN BUILDING CODE 2015  
MICHIGAN MECHANICAL CODE 2021  
MICHIGAN PLUMBING CODE 2021  
NATIONAL ELECTRICAL CODE 2023

USAGE GROUP: S1 addition to existing B, F1, and S1 usage - NON-SEPARATED  
AREA - 9375 GSF addition  
FULL BUILDING AREA - 53,442 GSF with addition  
OCCUPANCY - B (1:100) = 40, F-1 (1:200) = 161 and S-1 (1:500) = 35  
TOTAL OCCUPANCY - 236 with addition  
HEIGHT - 20'-6" addition and 19'-6" existing  
STORIES - 1  
CONSTRUCTION TYPE - II-B addition to II-B existing building  
FULLY SPRINKLERED

DESIGN LOADS:  
ROOF LIVE LOAD - 20 psf  
COLLATERAL LOADS - 38 lbs + 10 plf FOR RADIANT HEATERS  
25 lbs LOAD AT LIGHT FIXTURE  
10 psf LOAD FOR OVERHEAD DOOR

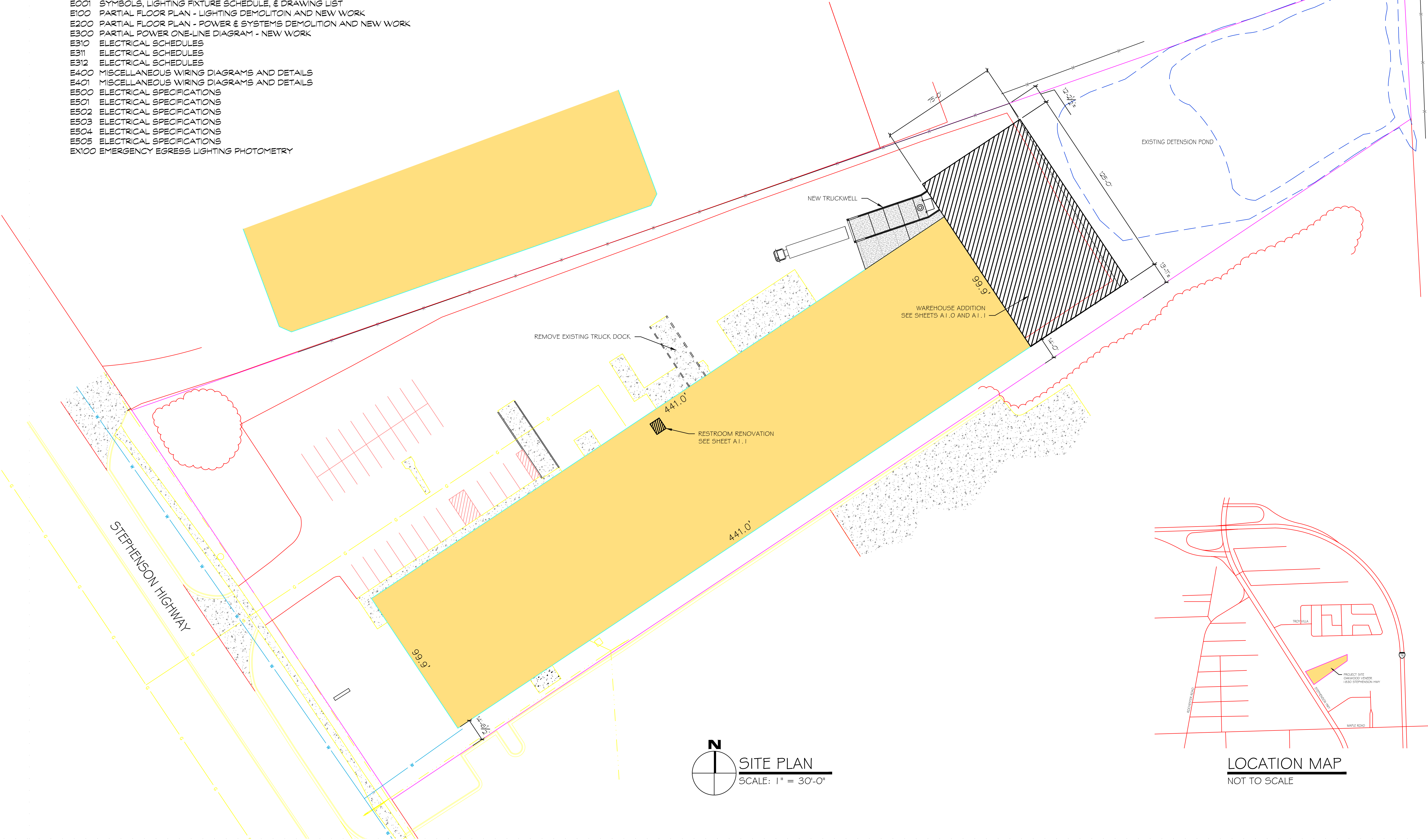
SNOW LOAD - GROUND SNOW LOAD = 25 psf  
SNOW EXPOSURE COEFFICIENT = C PARTIALLY EXPOSED  
THERMAL COEFFICIENT = 1.1  
ROOF SNOW LOAD = 19.25 psf

WIND LOAD - BASIC WIND SPEED = 90 mph  
ULTIMATE WIND SPEED = 115 mph  
WIND EXPOSURE = C

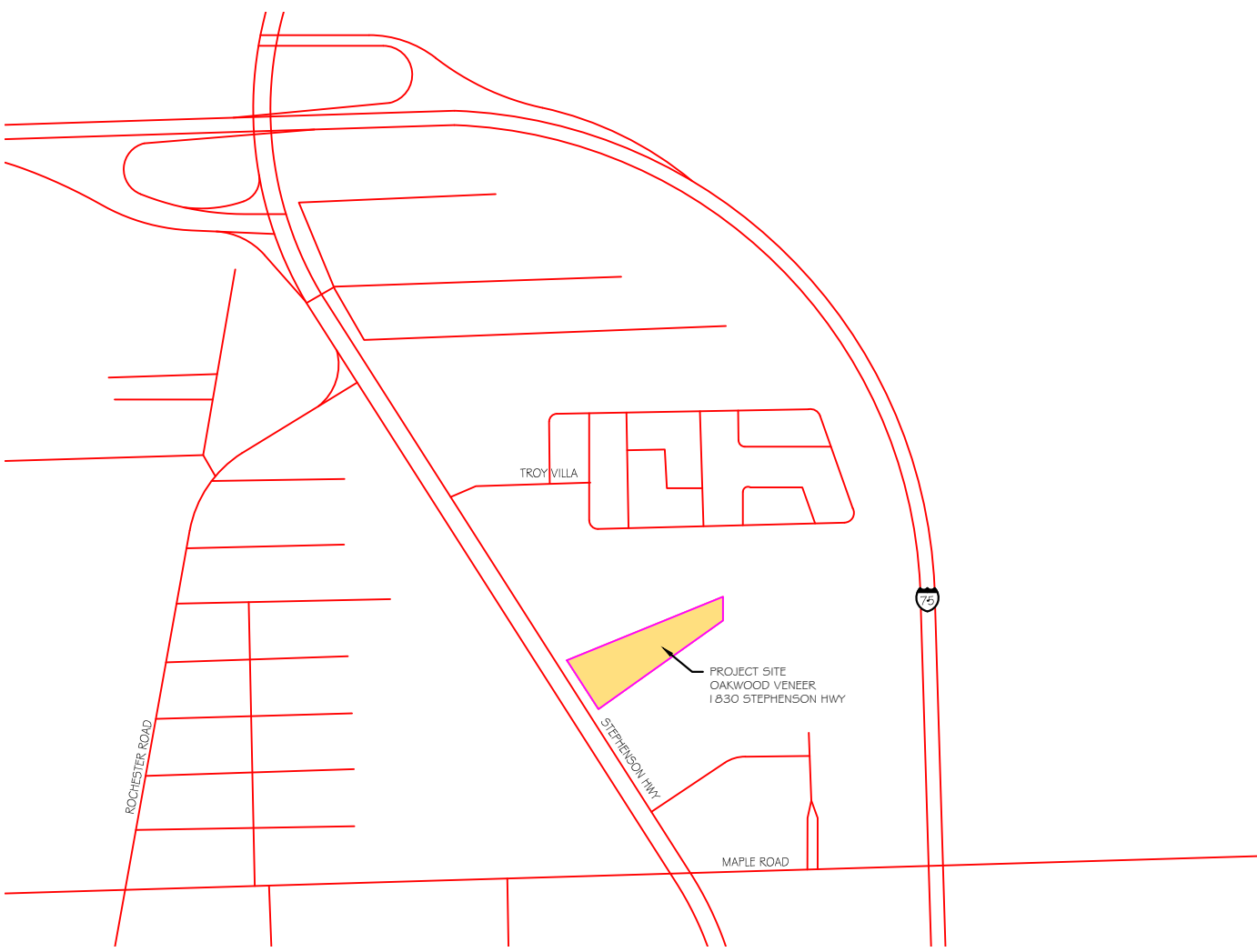
SEISMIC DESIGN - SPECTRAL RESPONSE ACCELERATION FOR 0.2 SECONDS = BETWEEN 5 AND 10  
SPECTRAL RESPONSE ACCELERATION FOR 1 SECOND = BETWEEN 4 AND 6  
SITE CLASS = D

FLOOR LOAD - 100 psf

SOIL BEARING CAPACITY: 2000 PSF



**SITE PLAN**  
SCALE: 1" = 30'-0"



**LOCATION MAP**  
NOT TO SCALE

ISSUED FOR PERMITS 3/21/2025

**OAKWOOD VENEER  
COMPANY**  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083  
**2443**

**Straub  
Pettitt  
Yaste**

850 NORTH CROOKS ROAD  
SUITE 200  
CLARKSON, MICHIGAN 48017-1311

248-658-7777 PHONE  
248-658-7781 FAX



COVERSHEET







Architectural floor plan showing the layout of a restrooms renovation project. The plan includes the following elements and annotations:

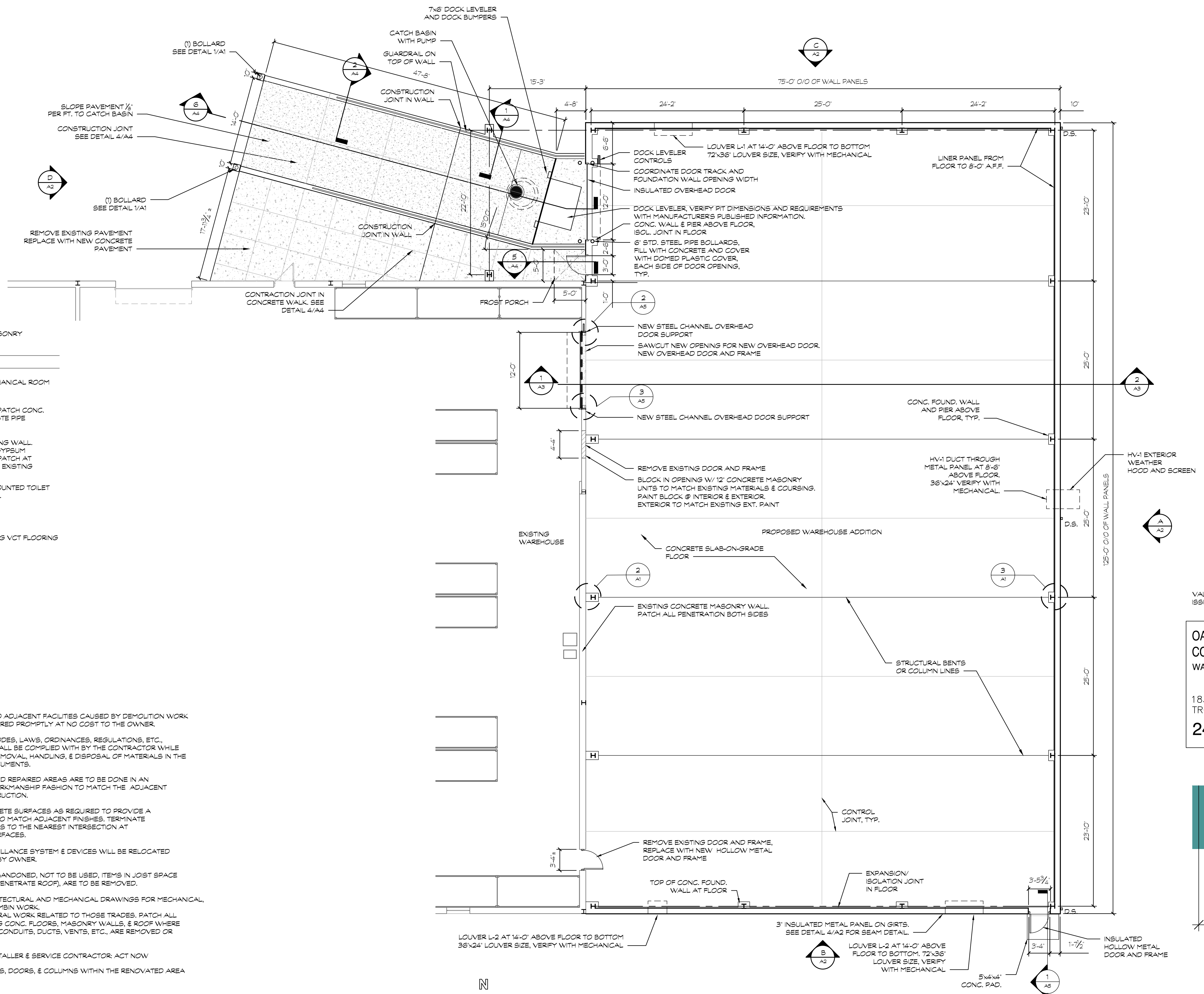
- EXISTING MENS TOILET ROOM**: Located on the left side of the plan.
- EXISTING WATER HEATER TO REMAIN**: Located in the upper central area.
- EXISTING MECHANICAL ROOM**: Located at the top right.
- NEW TOILETS**: Indicated by arrows pointing to the new toilet stalls.
- SAWCUT AND PATCH CONC. SLAB FOR WASTE PIPE INSTALLATION**: Indicated by an arrow pointing to the new waste pipe installation area.
- REMOVE EXISTING WALL. INSTALL NEW GYPSUM BOARD WALL. PATCH AT JUNCTION WITH EXISTING WALLS.**: Indicated by an arrow pointing to the wall area to be removed and replaced.
- NEW FLOOR MOUNTED TOILET COMPARTMENT.**: Indicated by an arrow pointing to the new floor-mounted toilet compartment.
- PATCH EXISTING VCT FLOORING**: Indicated by an arrow pointing to the existing VCT flooring area.
- EXISTING LAVATORY, MIRROR AND OTHER ACCESSORIES TO REMAIN.**: Located in the central area.
- EXISTING WOMENS TOILET ROOM**: Located on the right side of the plan.
- ADD SIGN DIRECTING ADA RESTROOM UP IN FRONT OFFICE AREA**: Indicated by an arrow pointing to the entrance area.
- CORE DRILL HOLE THROUGH MASONRY AS REQUIRED FOR NEW EXHAUST FAN.**: Indicated by an arrow pointing to the core drill hole location.
- Dimensions**:
  - 7'-0" (width of the new toilet area)
  - 6'-0" (width of the new floor-mounted toilet compartment)
  - 2'-3 1/4" (depth of the new floor-mounted toilet compartment)

SCALE: 1/4" = 1'-0"

1. VERIFY ALL EXISTING FIELD CONDITIONS IN ORDER TO PROPERLY PRODUCE THE INTENDED END RESULT OF THE NEW WORK.
2. REPORT ANY DISCREPANCIES WITH THE CONTRACT DOCUMENTS AND THE ACTUAL CONDITIONS AT THE JOB SITE TO THE ARCHITECT BEFORE PROCEEDING WITH ANY NEW CONSTRUCTION.
3. ALL PATCHED AND REPAIRED AREAS ARE TO BE DONE IN AN ACCEPTABLE WORKSMANSHIP FASHION TO MATCH THE ADJACENT EXISTING CONSTRUCTION.
4. REFINISH COMPLETE SURFACES AS REQUIRED TO PROVIDE A UNIFORM FINISH TO MATCH ADJACENT FINISHES. TERMINATE REFINISHED AREAS TO THE NEAREST INTERSECTION AT CONTINUOUS SURFACES.
5. MAKE PROVISIONS IF NECESSARY TO PROTECT FIRE SPRINKLER HEADS FROM PAINT OVER SPRAY.
6. WORK SHALL BE DONE IN A METHOD AND PROCEDURE TO PRODUCE MINIMUM INTERFERENCE TO THE ADJACENT USED OR UNOCCUPIED AREAS, AND OBSTRUCTION, ETC., OF MANIPULATING OF EXISTING DRIVES, PARKING, WALKS, OR OTHER AREAS ARE PROHIBITED UNLESS APPROVED BY OWNER IN WRITING.
7. WORK IN THIS CONTRACT SHALL BE CONDUCTED IN A SYSTEMATIC METHOD FROM START TO FINISH.
8. PROTECTION: PROVIDE ALL REQUIRED FORMS OF PROTECTION, INCLUDING TEMPORARY BARRICADES, DUST PARTITIONS, ETC., IN ORDER TO PROTECT THE OWNERS PERSONNEL AND GENERAL PUBLIC FROM INJURY, HEALTH HAZARDS, AND OBSTRUCTION TO GOING TO WORK. ALL PROVISIONS SHALL BE REMOVED AFTER WORK IS COMPLETED OR NO LONGER BENEFICIAL, WHICHEVER OCCURS FIRST.

0 2' 4' 8'

SCALE: 1/4"=1'-0"

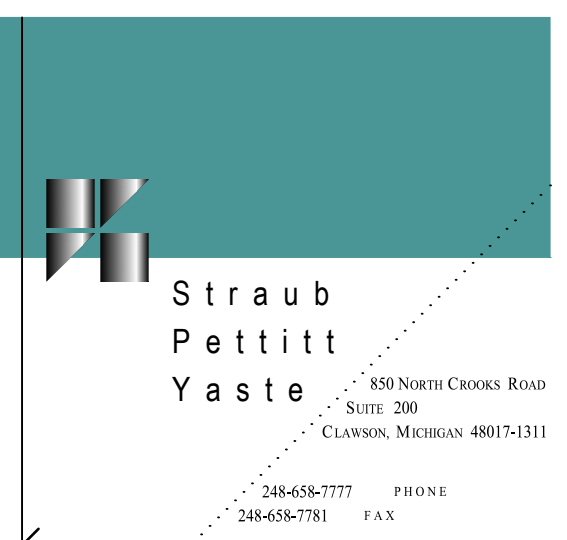


VALUE ENGINEERING	5/15/2025
ISSUED FOR PERMITS	3/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443



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

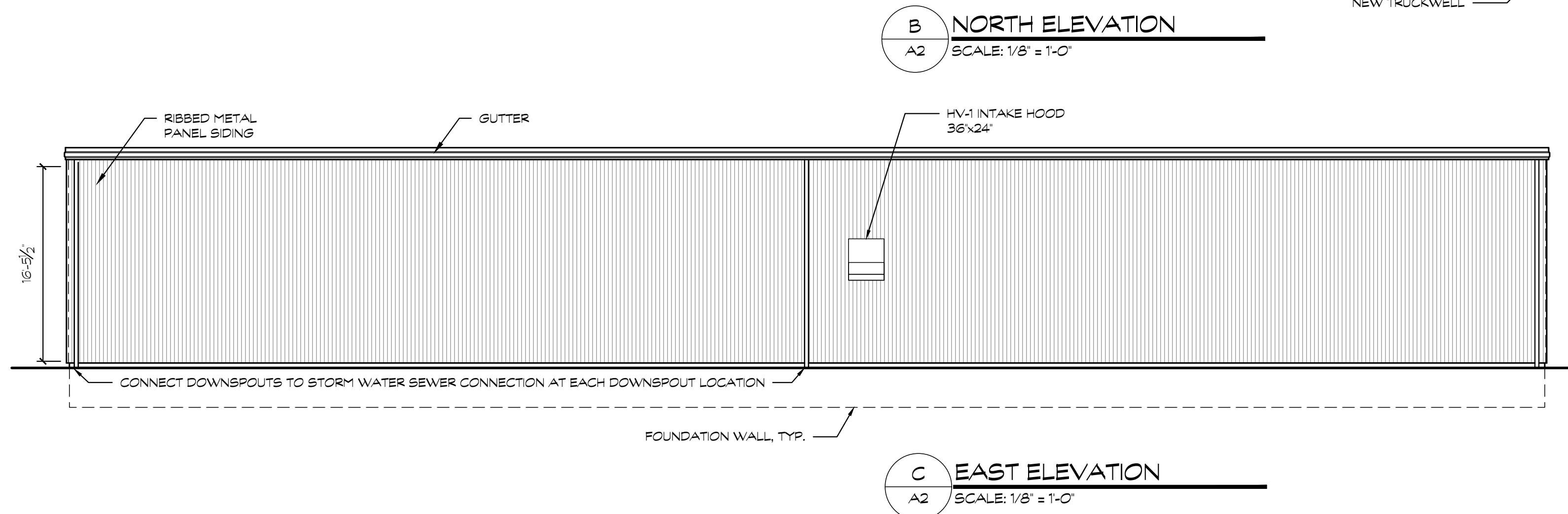
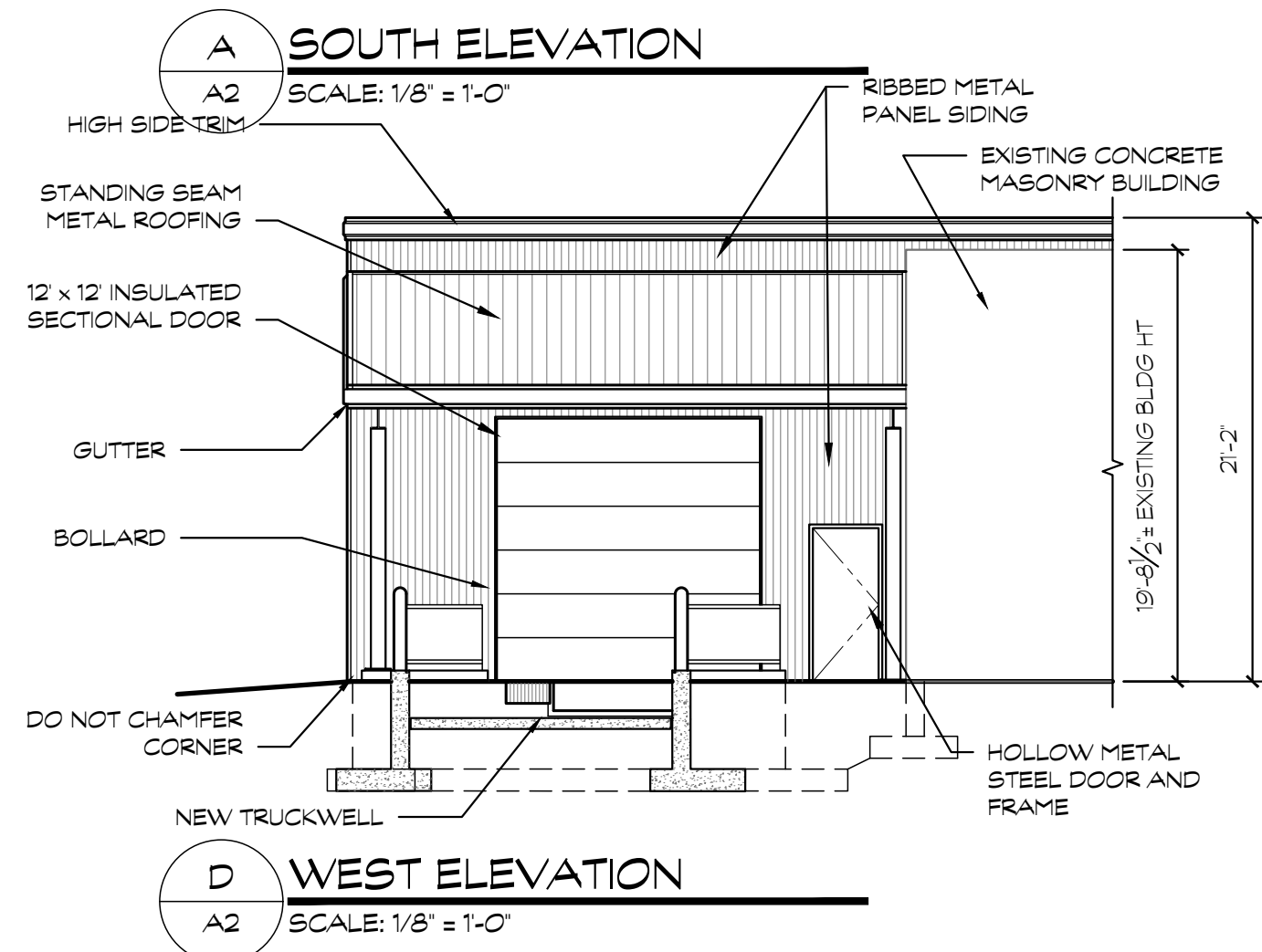
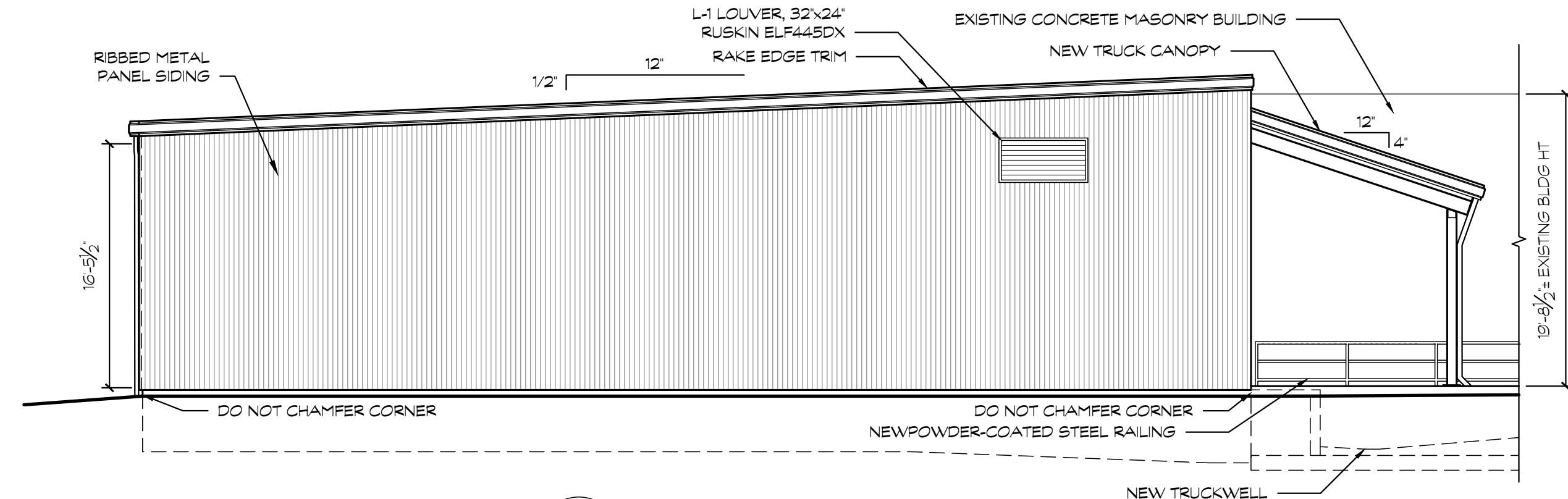
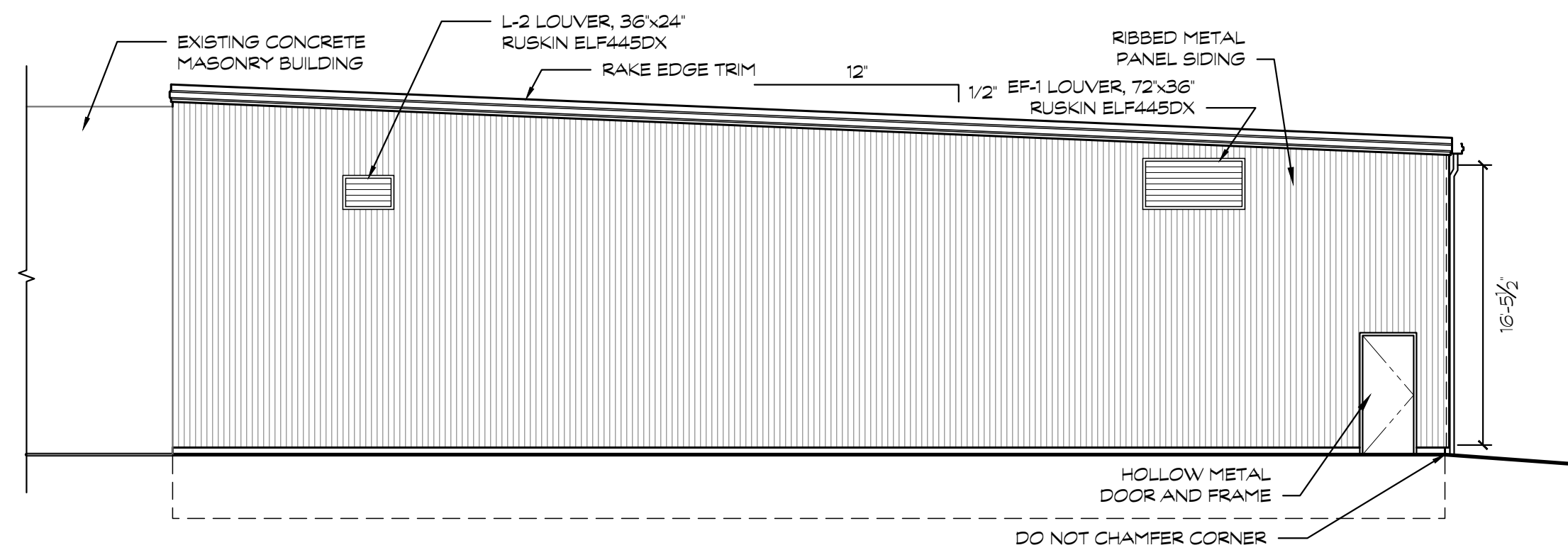
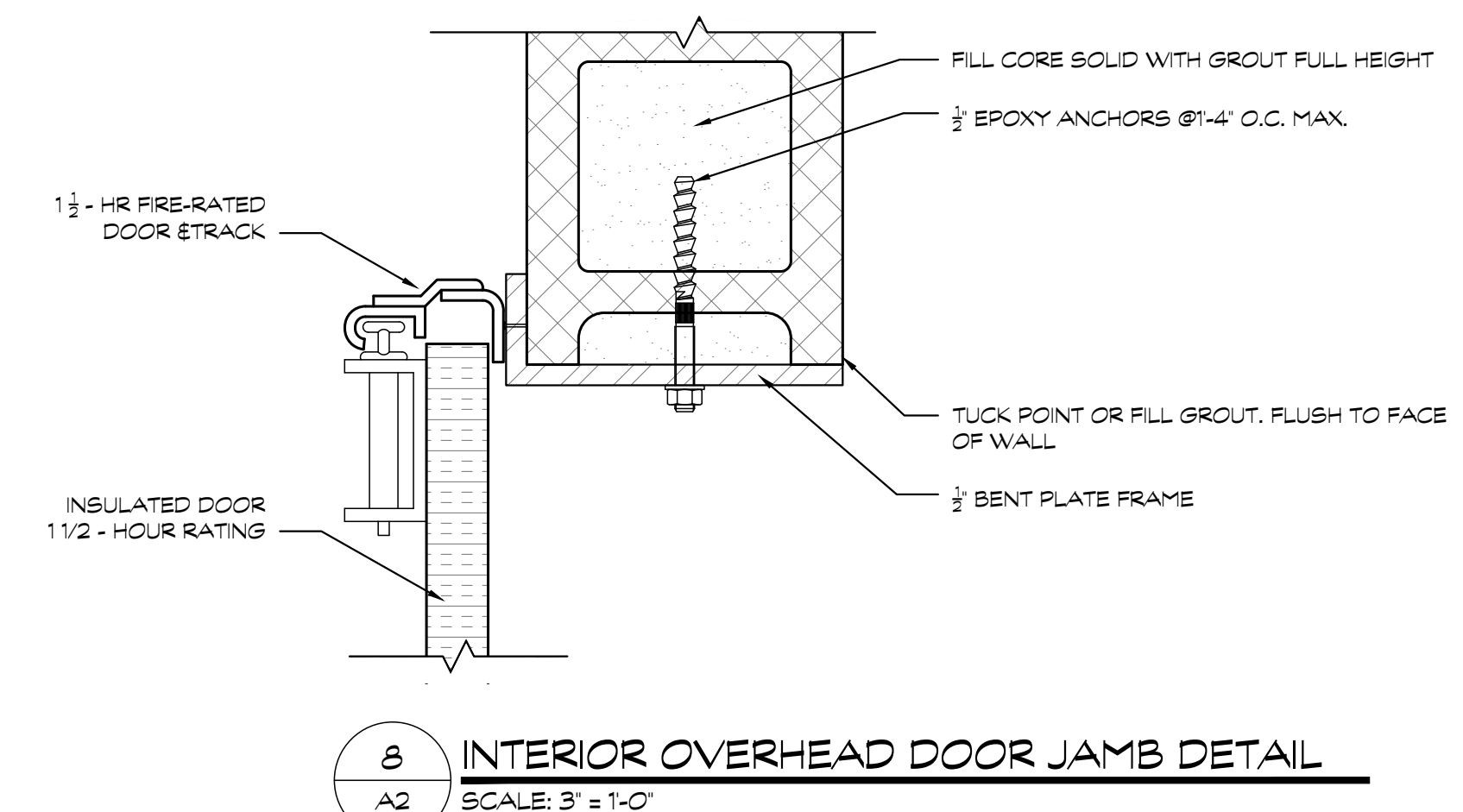
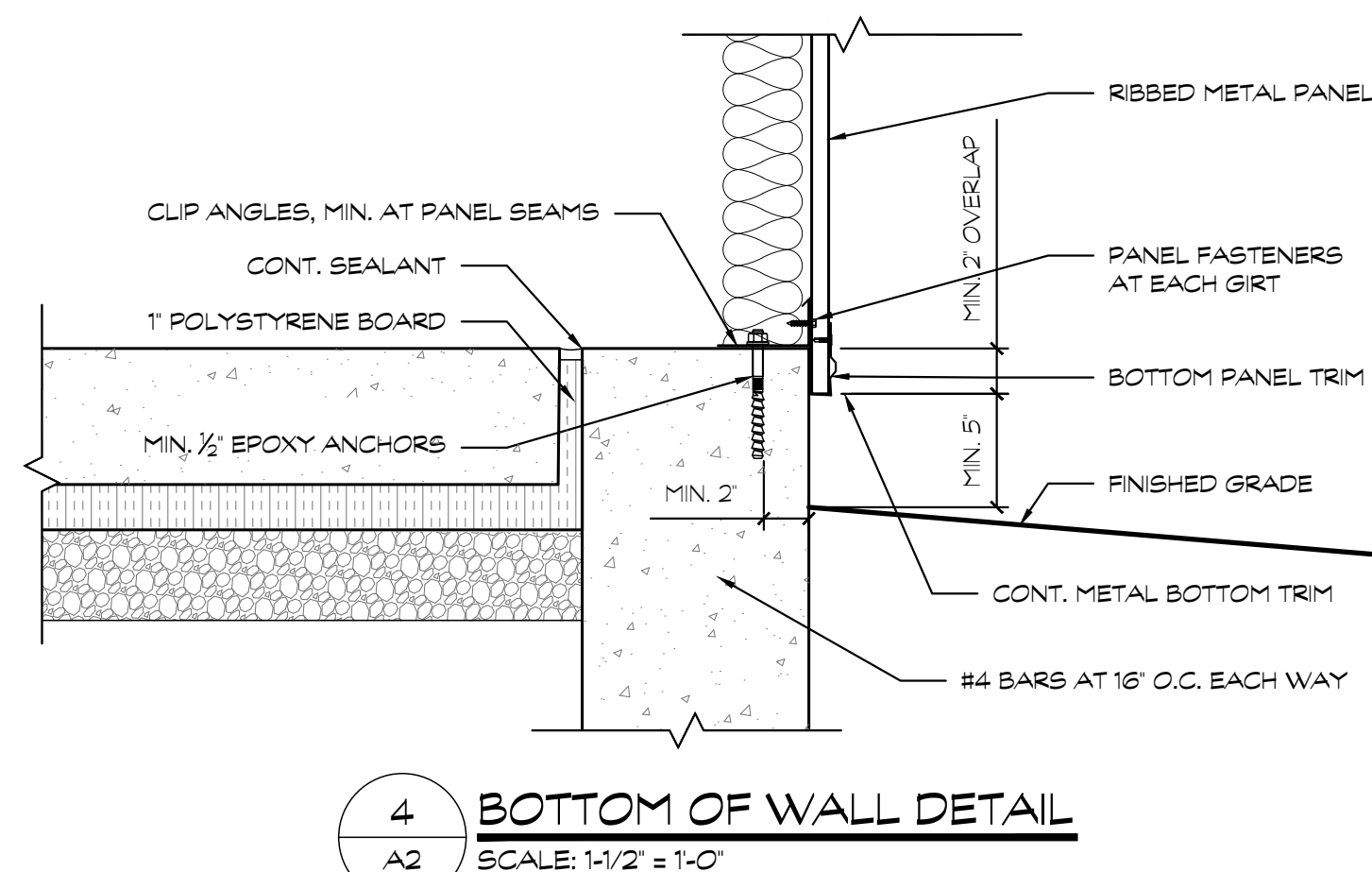
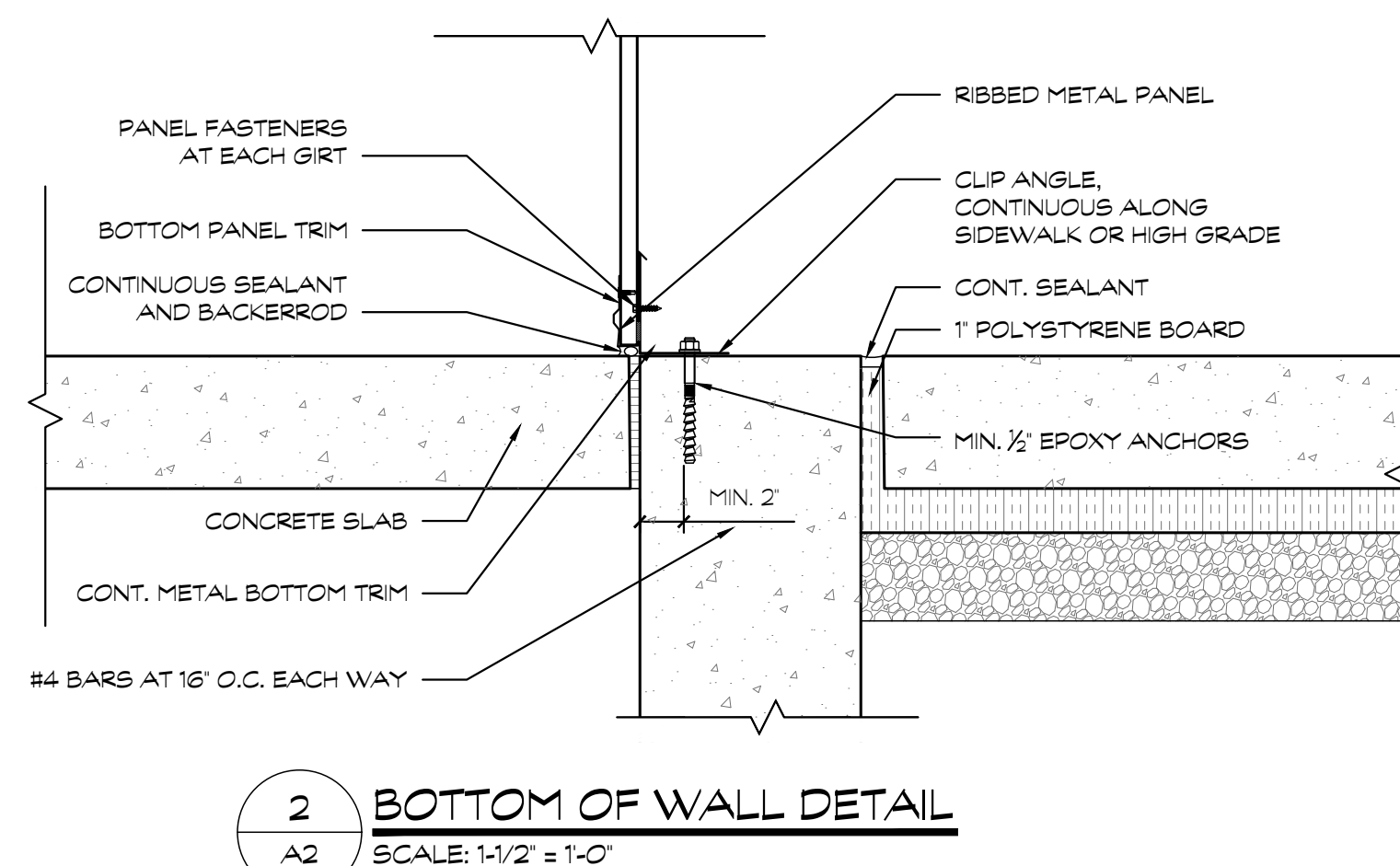
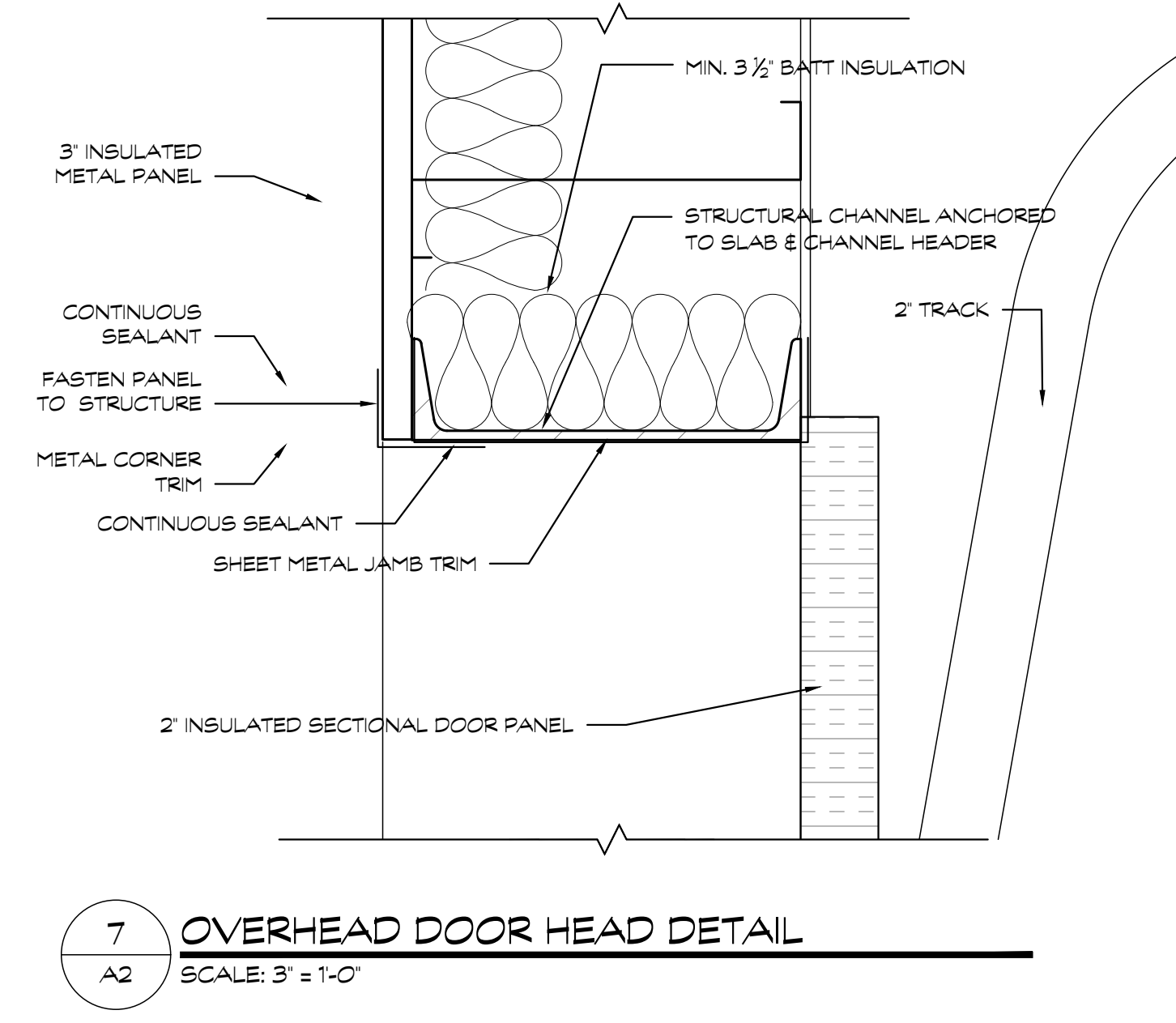
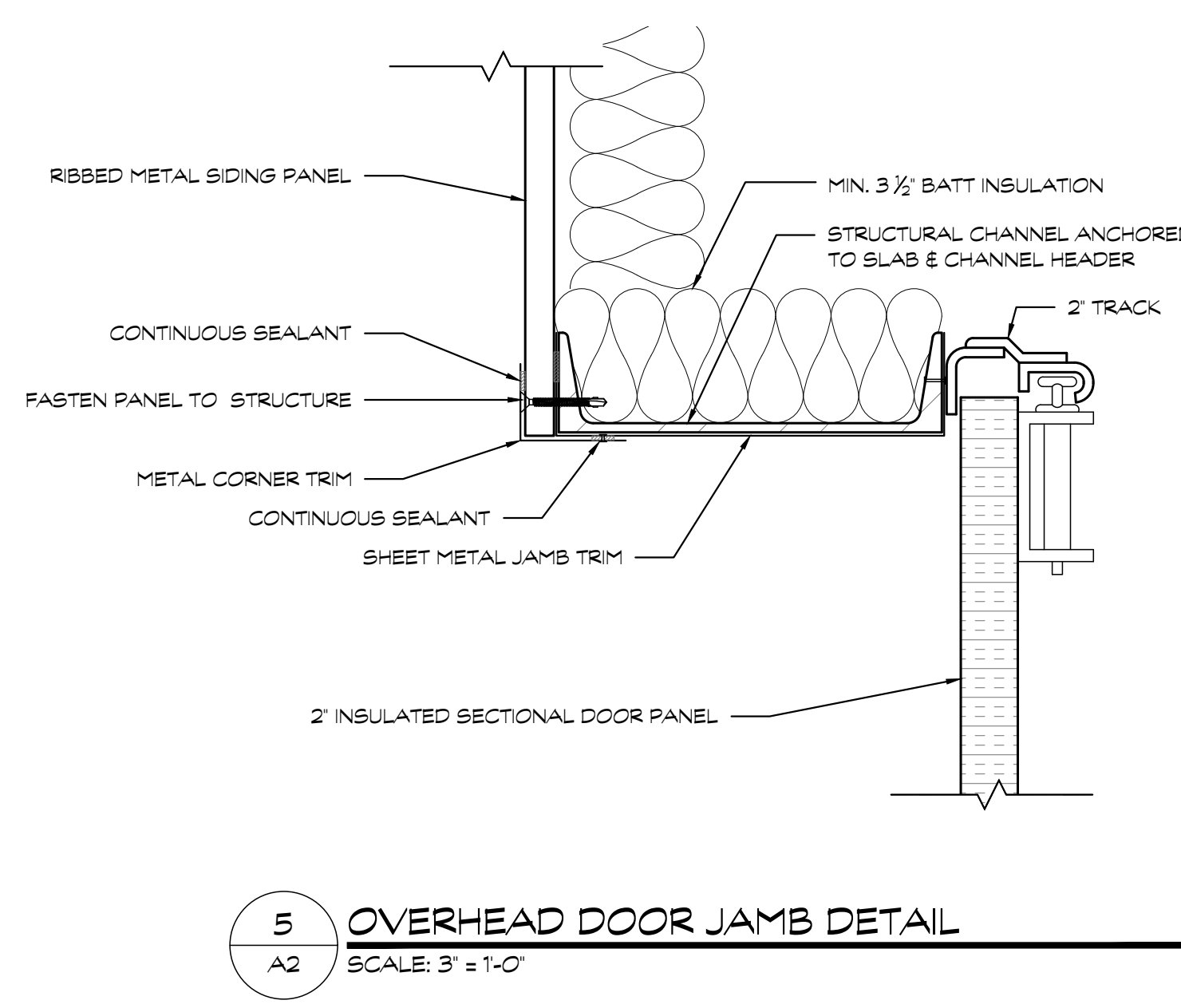
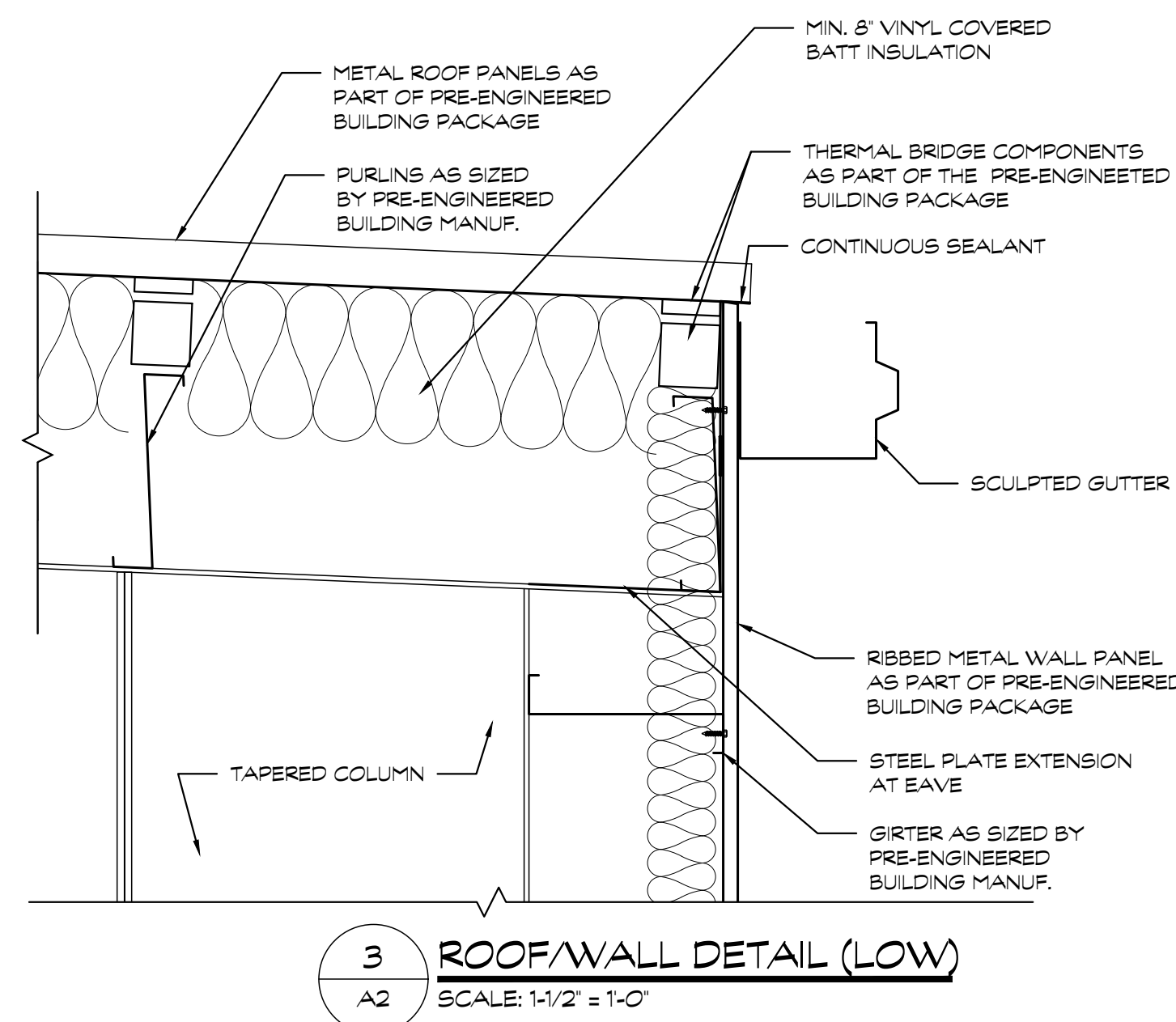
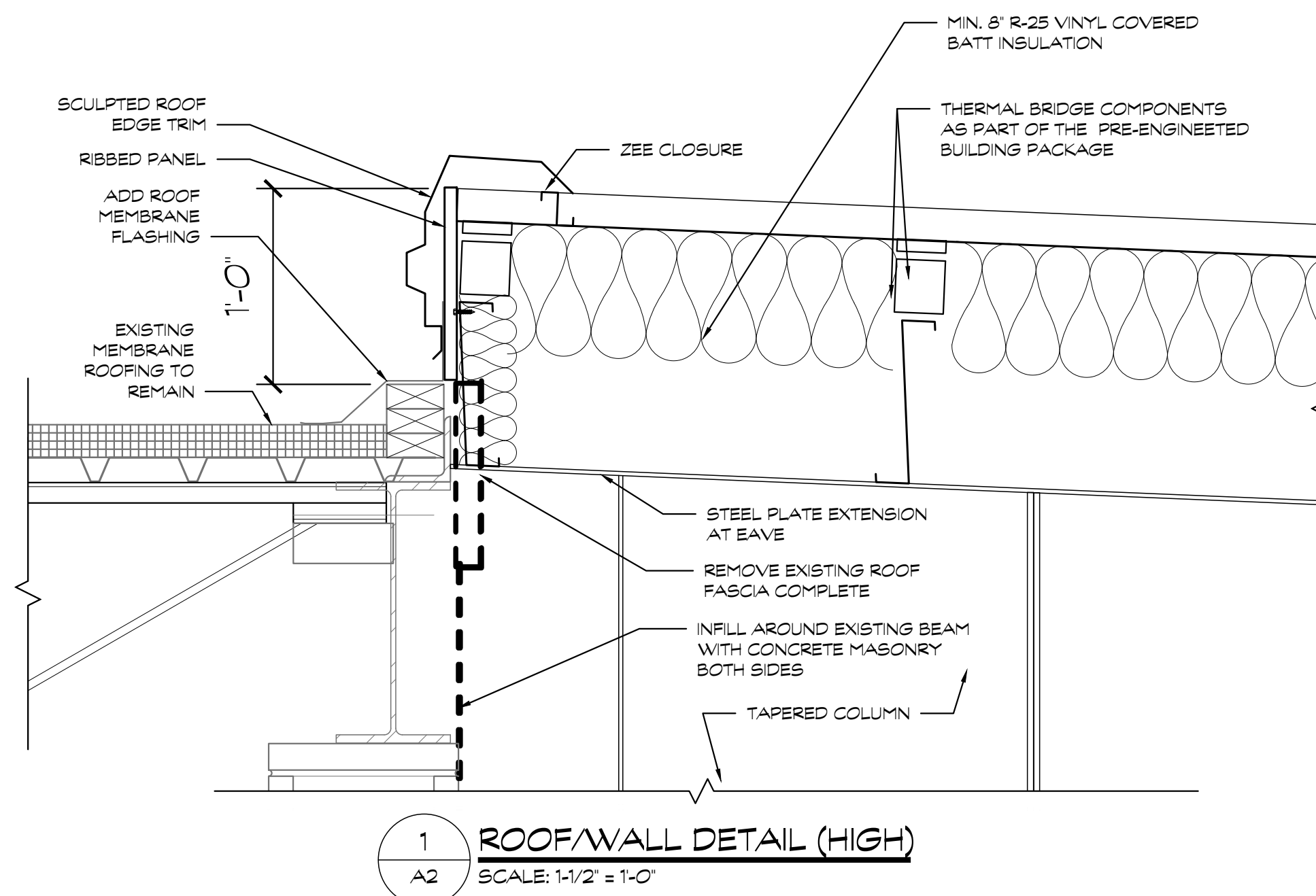


NOTE:  
DOWNSPOUTS: MIN. 3"x4" FABRICATED ALUMINUM TUBE, MIN. 0.032"  
ALUMINUM SHEETS, COLOR MATCH BUILDING SIDING.  
LOCATE DOWNSPOUTS MAX. 50'-0" APART AND SYMMETRICAL ON THE  
BUILDING FAÇADE.  
DOWNSPOUTS ARE TO CONNECT TO UNDERGROUND STORM PIPING  
SHOWN ON CIVIL PLANS.

## FLOOR PLAN

## A1.1



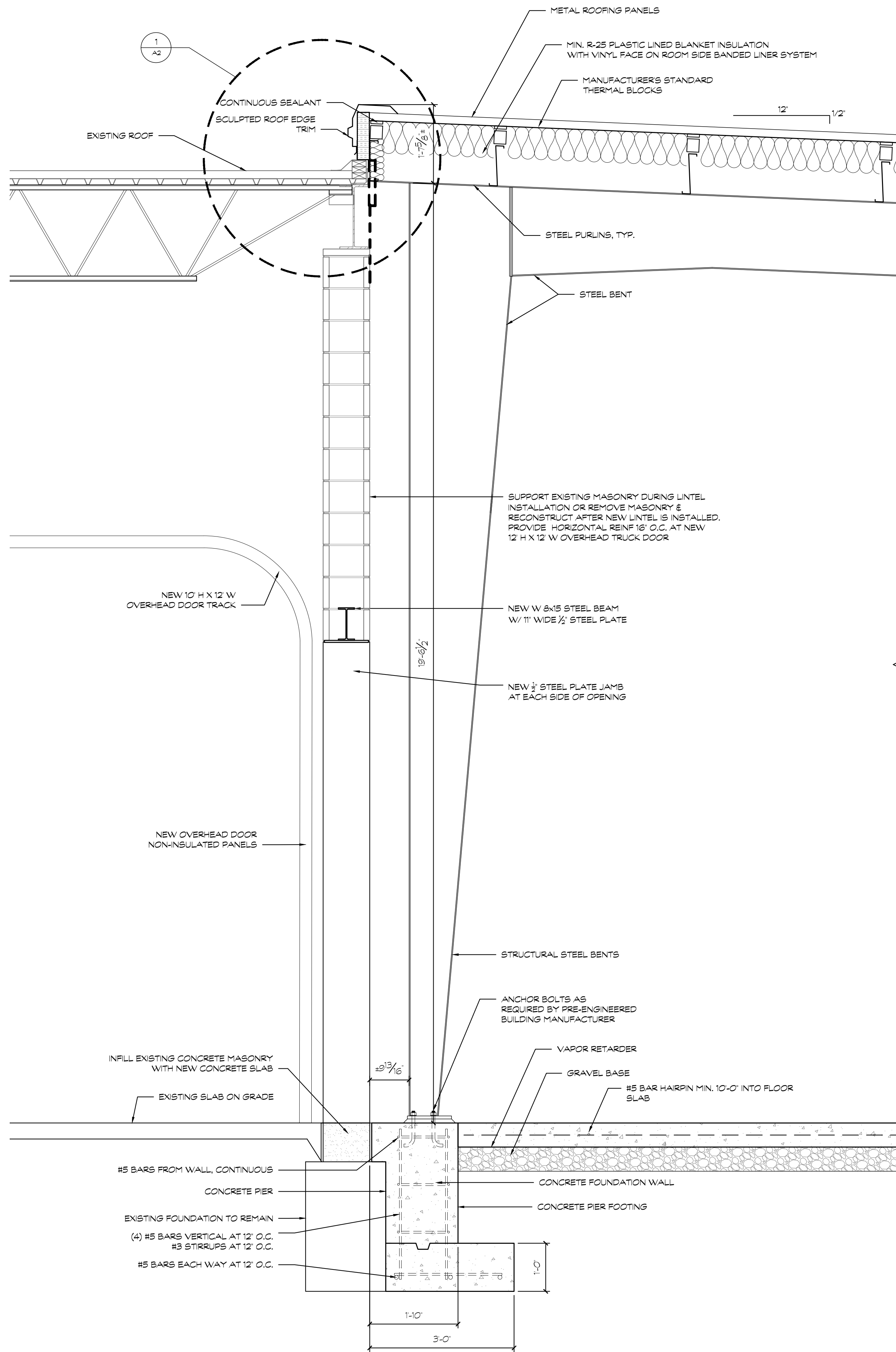


VALUED ENGINEERED  
ISSUED FOR PERMITS  
5/15/2025  
3/21/2025

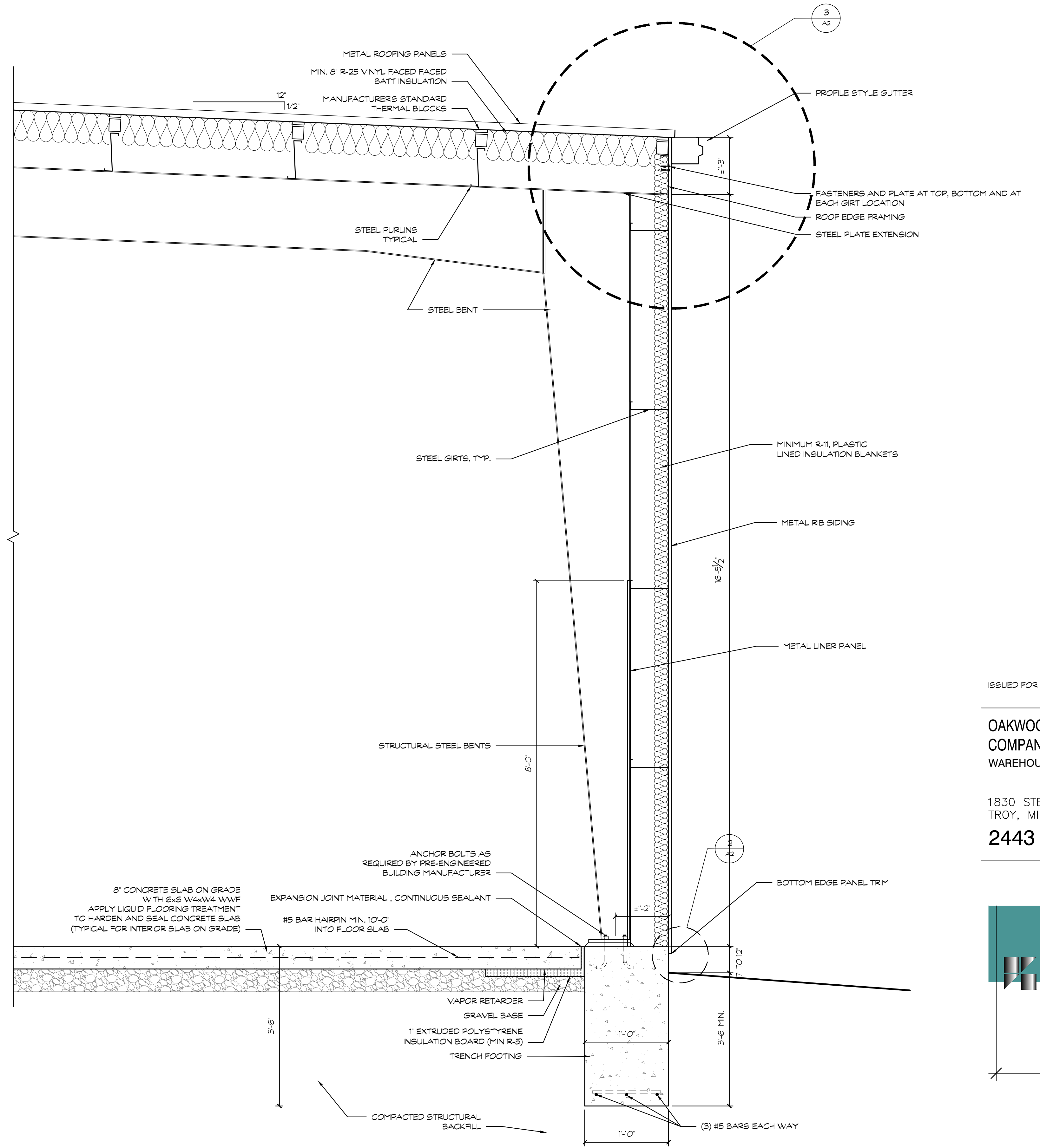
**OAKWOOD VENEER  
COMPANY**  
WAREHOUSE ADDITION  
  
1830 STEPHENSON HWY  
TROY, MICHIGAN 48063  
**2443**

**Straub  
Pettitt  
Yaste**  
850 NORTH CROSS ROAD  
SUITE 200  
CLARKSVILLE, MICHIGAN 48017-1311  
248-658-7777 PHONE  
248-658-7761 FAX





1 WALL SECTION (HIGH SIDE)  
A3 SCALE: 3/4" = 1'-0"



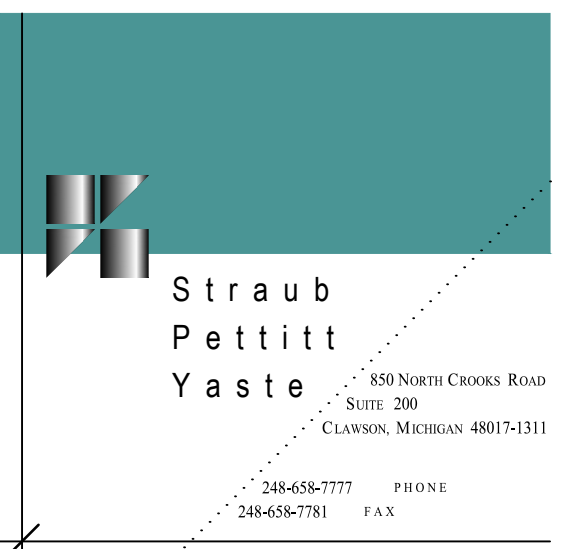
2 WALL SECTION (LOW SIDE)  
A3 SCALE: 3/4" = 1'-0"

ISSUED FOR PERMITS 3/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48219

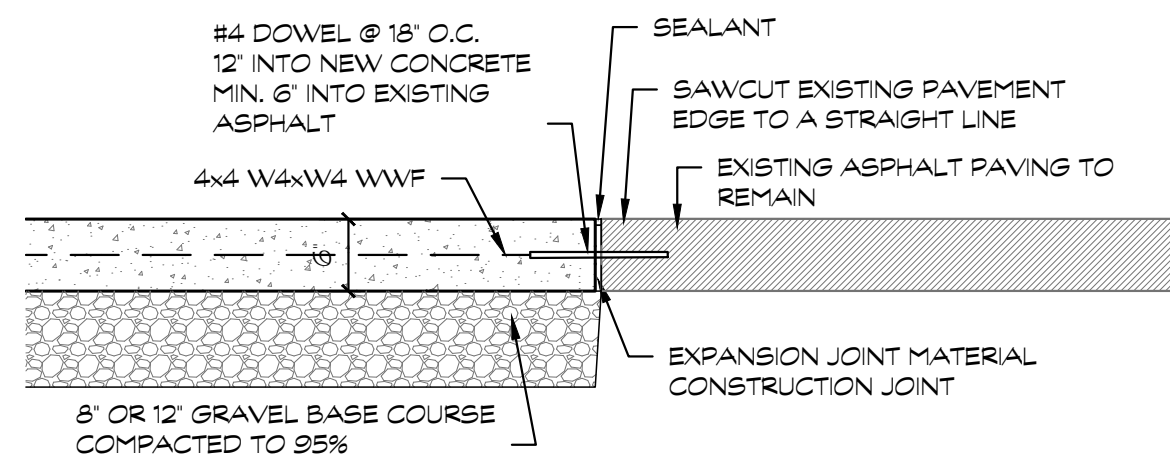
2443



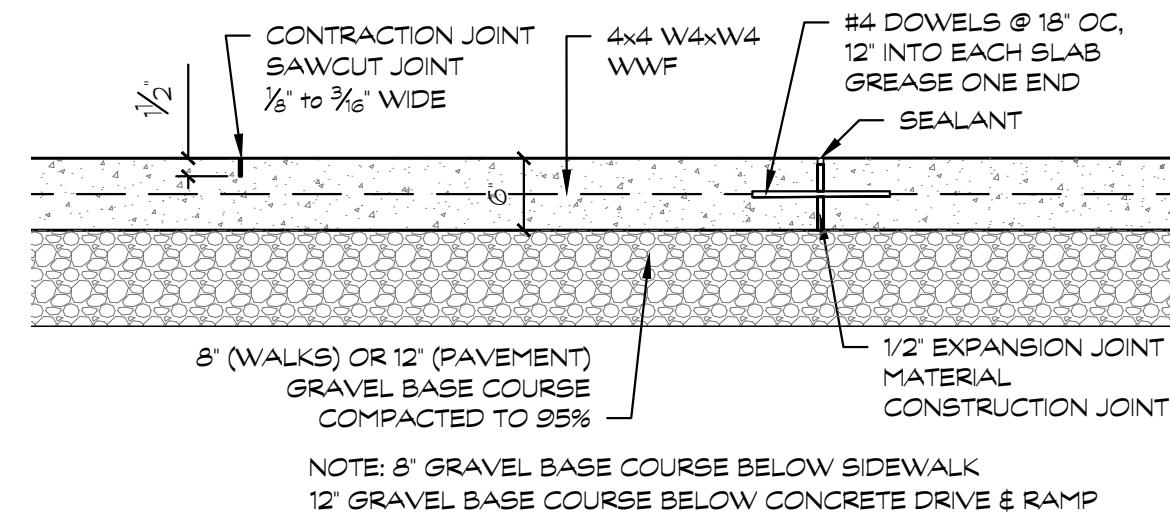
BUILDING SECTION

A3.0

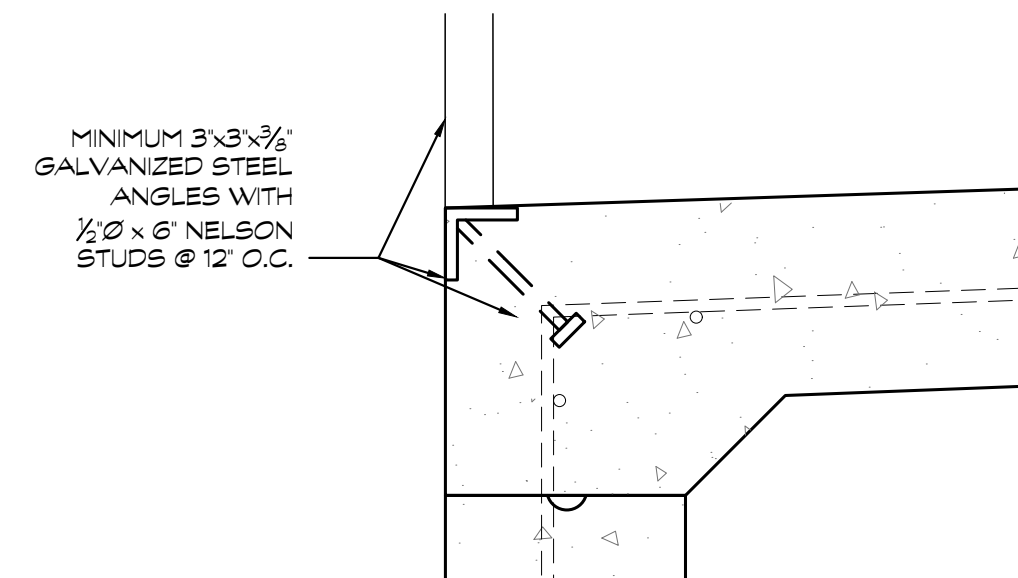




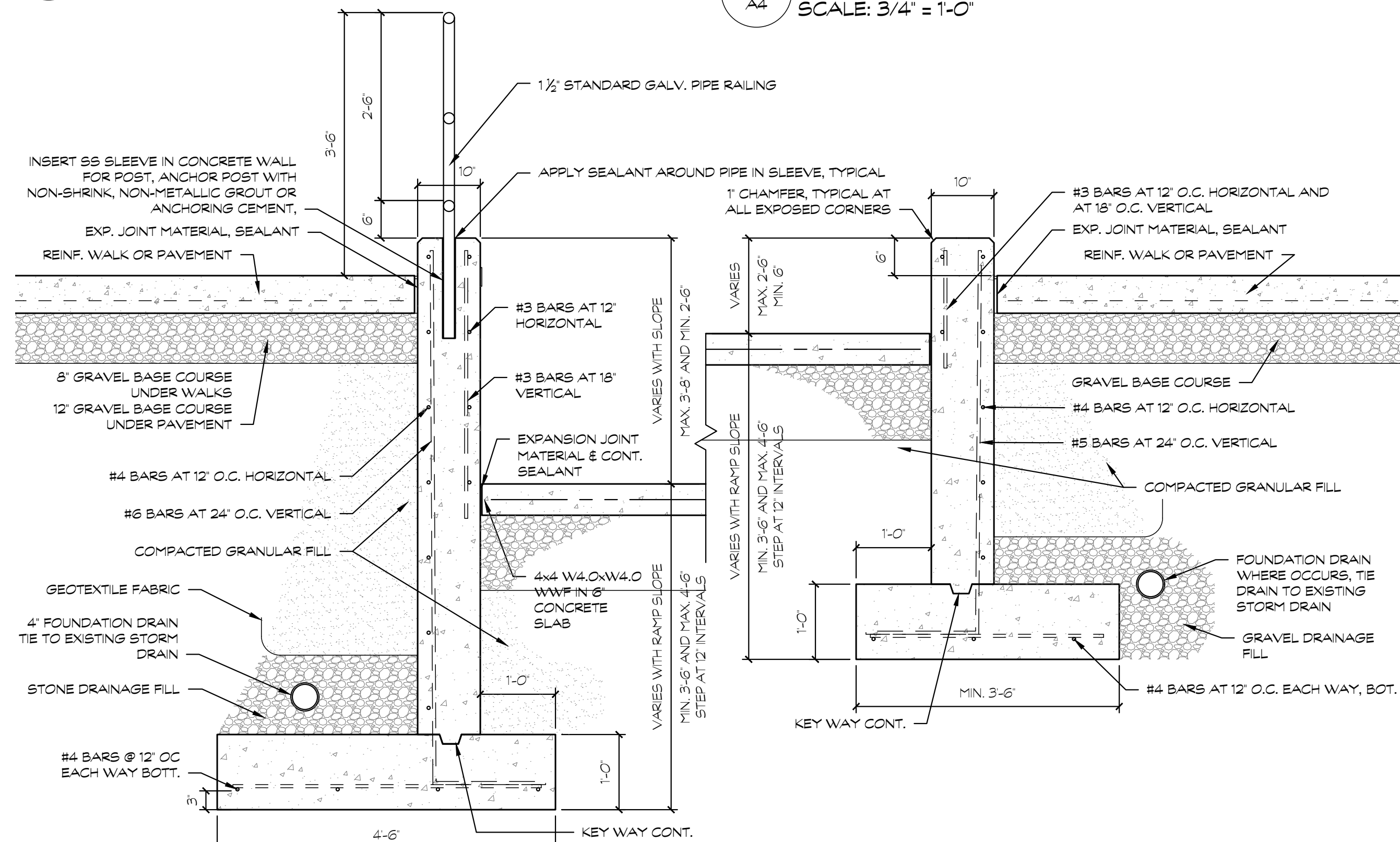
**3 WALK TO EXIST. ASPHALT DETAIL**  
SCALE: 3/4" = 1'-0"



**4 CONTRACTION & CONSTRUCTION JTS**  
SCALE: 3/4" = 1'-0"

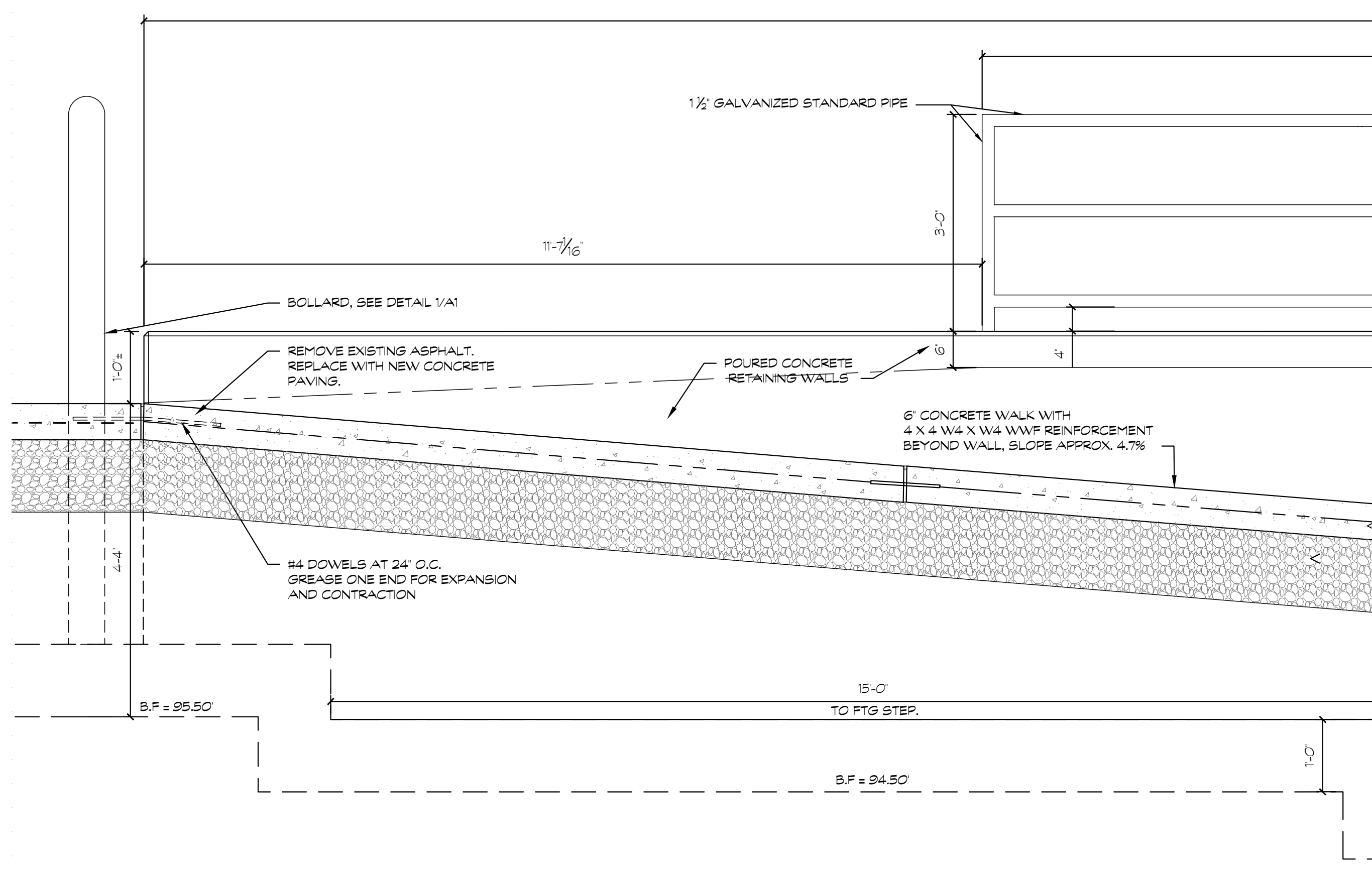


**5 DOCK PIT EDGE DETAIL**  
SCALE: 1-1/2" = 1'-0"

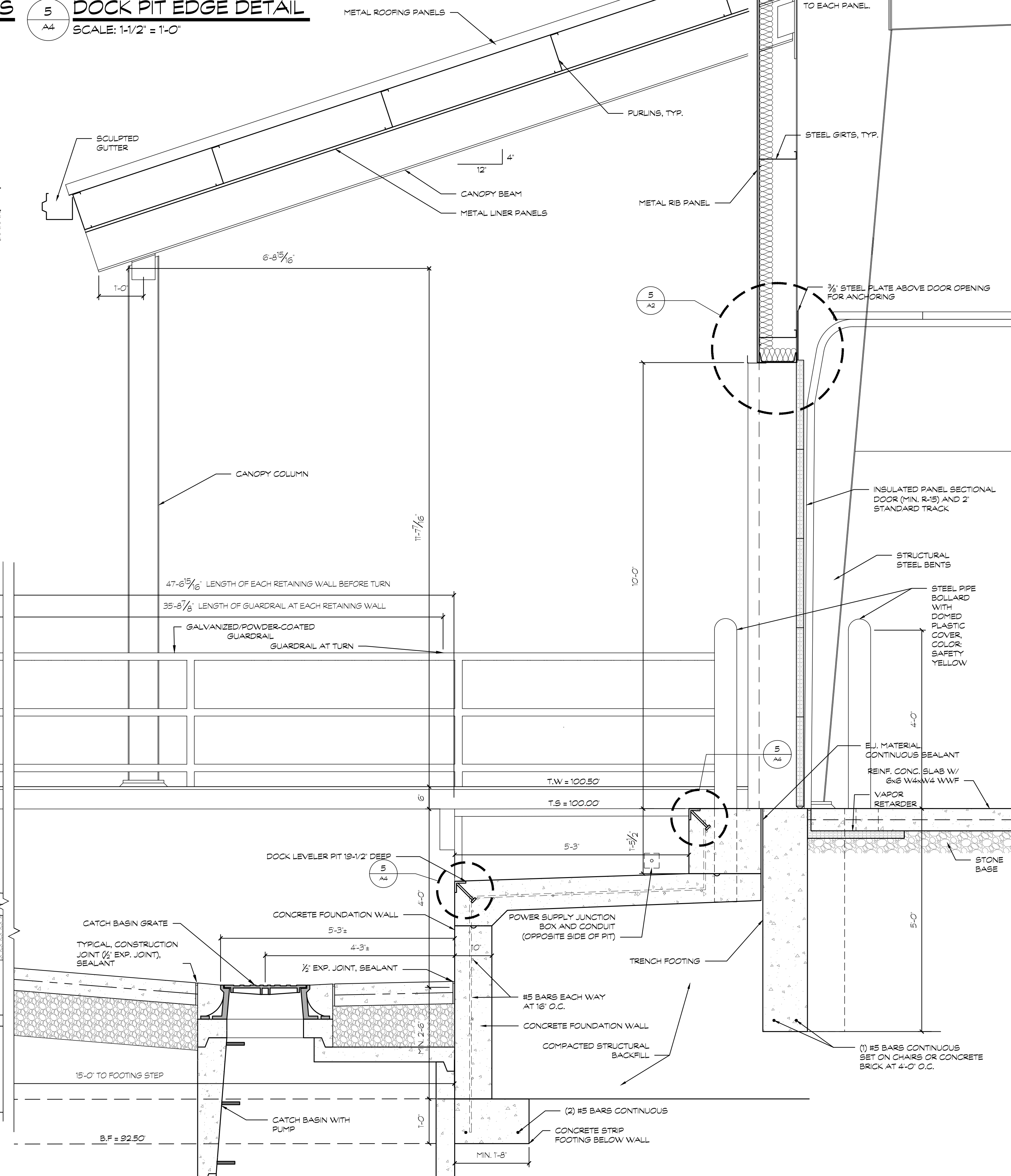


**1 TALL RETAINING WALL SECTION**  
SCALE: 3/4" = 1'-0"

**2 SHORT RETAINING WALL SECTION**  
SCALE: 3/4" = 1'-0"



**6 TRUCKWELL SECTION**  
SCALE: 3/4" = 1'-0"



VALUE ENGINEERED  
ISSUED FOR PERMITS

5/15/2025  
3/21/2025

**OAKWOOD VENEER  
COMPANY**  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48063

**2443**

**Straub  
Pettitt  
Yaste**

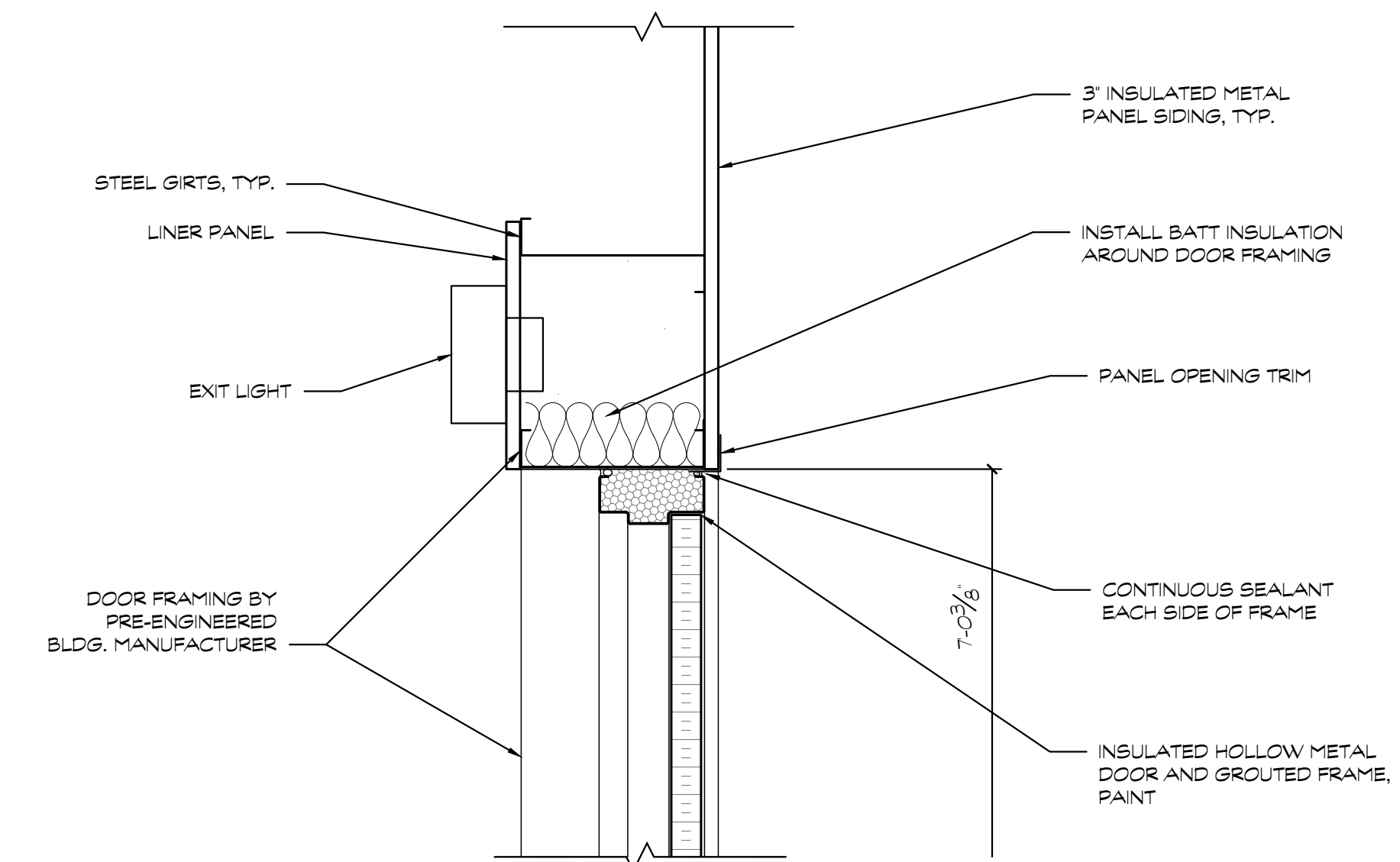
850 NORTH CROOKS ROAD  
SUITE 200  
CLARKS, MICHIGAN 48017-1311

248-658-7777 PHONE  
248-658-7761 FAX

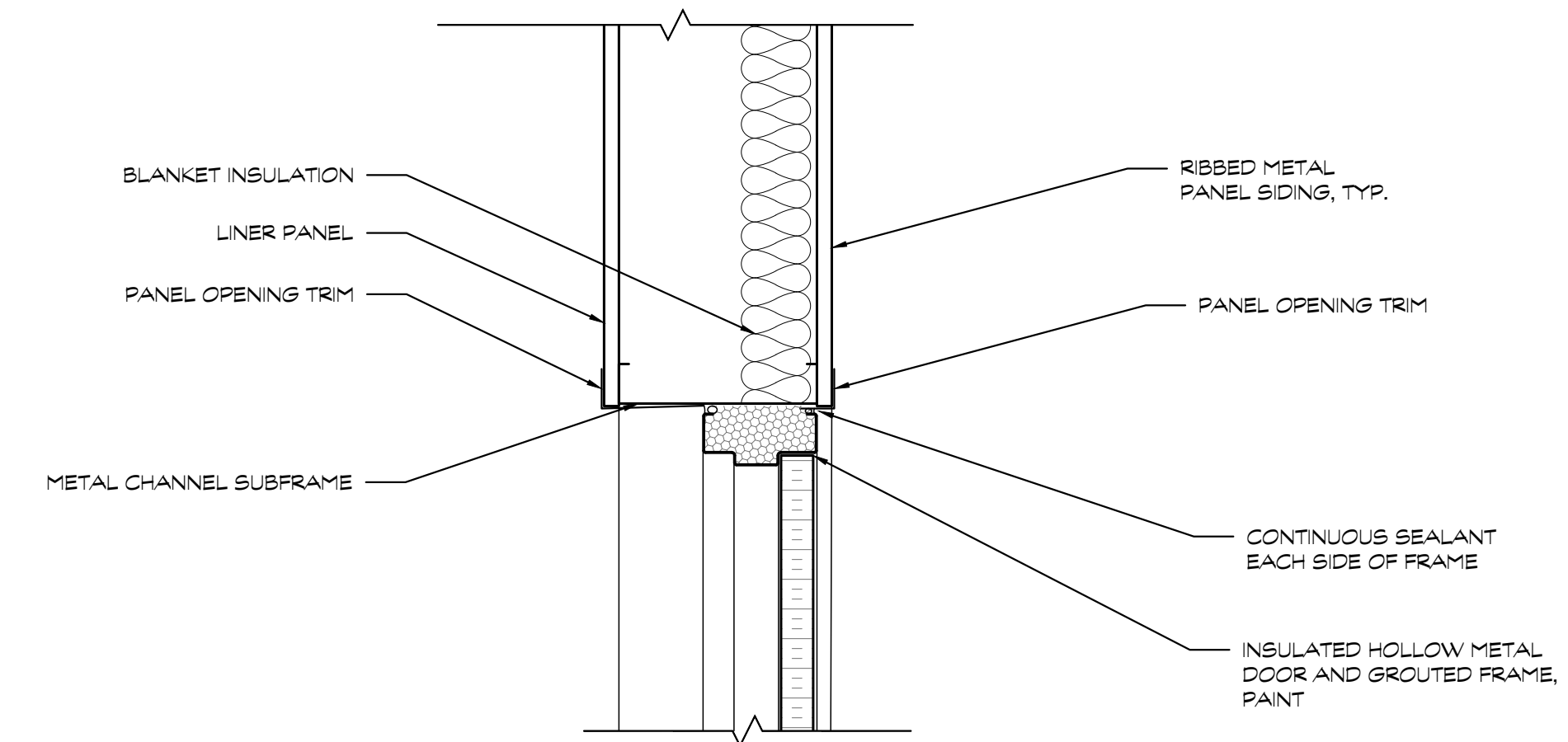
SECTIONS AND DETAILS

**A4.0**

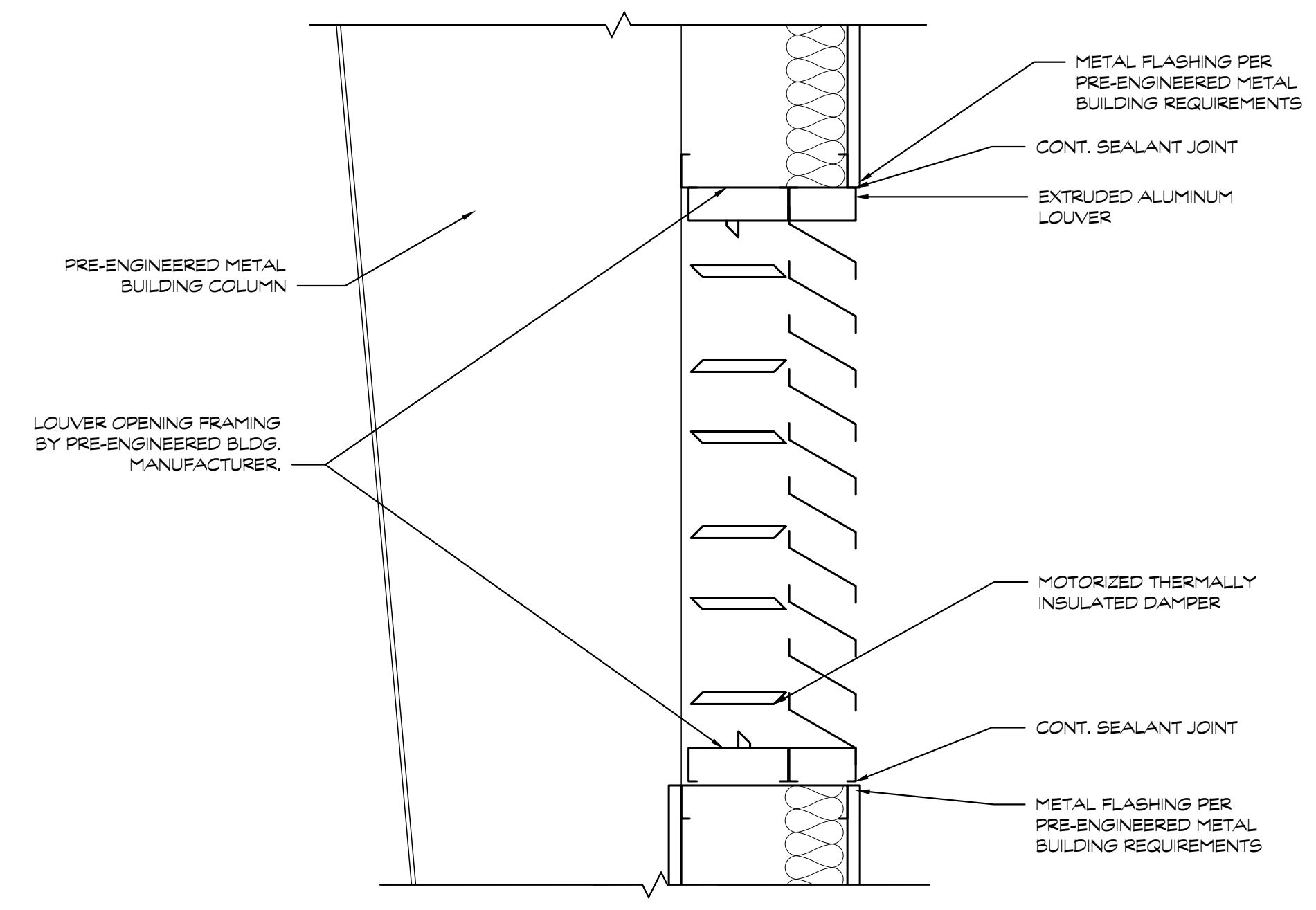




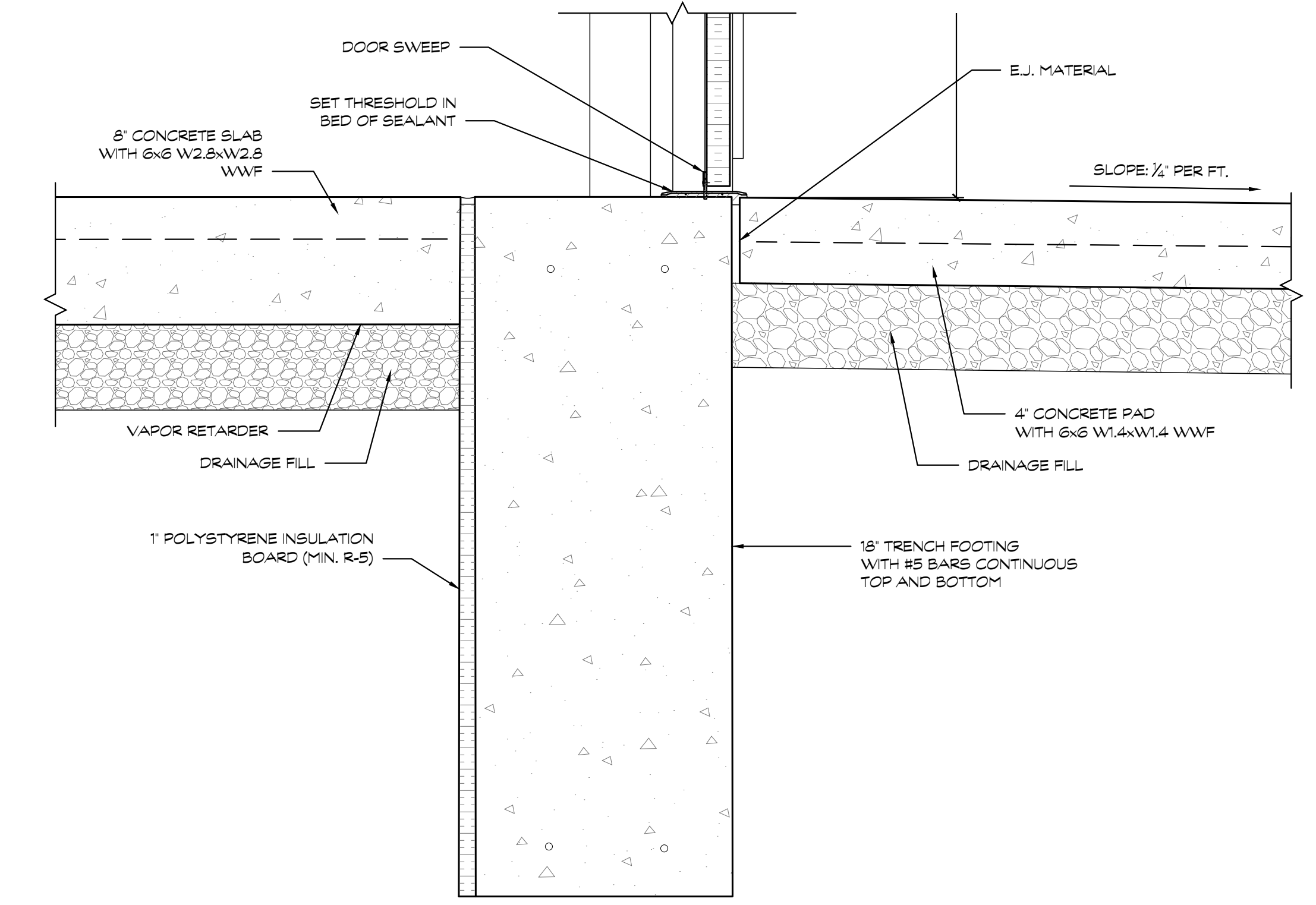
**3 MAN-DOOR HEAD DETAIL**  
 SCALE = 1-1/2" = 1'-0"



**4 MAN-DOOR JAMB DETAIL**  
 SCALE = 1-1/2" = 1'-0"



**1 WALL LOUVER DETAIL**  
 SCALE = 1-1/2" = 1'-0"



**5 MAN-DOOR SILL DETAIL**  
 SCALE = 1-1/2" = 1'-0"

VALUE ENGINEERED  
 ISSUED FOR PERMITS

5/15/2025  
 3/21/2025

**OAKWOOD VENEER COMPANY**  
 WAREHOUSE ADDITION

1830 STEPHENSON HWY  
 TROY, MICHIGAN 48063

**2443**

**Straub Pettitt Yaste**

850 NORTH CROSS ROAD  
 SUITE 200  
 CLARKSVILLE, MICHIGAN 48017-1311

248-658-7777 PHONE  
 248-658-7761 FAX



SPECIFICATIONS

REINFORCING BARS:  
PRODUCTS:  
1. STEEL REINFORCEMENT - ASTM A615, GRADE 60, DEFORMED.  
2. WELDED WIRE REINFORCEMENT - ASTM 1064, PLAIN OR DEFORMED MESH, FLAT SHEET.  
3. BAR SUPPORTS - BOLSTERS, CHAIRS, SPACERS, AND OTHER DEVICES FOR SPACING, SUPPORTING AND FASTENING REINFORCING BARS AND WELDED WIRE REINFORCEMENT IN PLACE, IN ACCORDANCE WITH CRSI's "MANUAL OF STANDARD PRACTICE," OF GREATER COMPRESSIVE STRENGTH THAN CONCRETE.  
4. STEEL TIE WIRE: ASTM A1064, ANNEALED STEEL, NOT LESS THAN 0.0508 IN DIAMETER, PLAIN FINISH.  
EXECUTION:  
1. PROTECT VAPOR RETARDER FROM PUNCTURE.  
2. REPAIR AND RESEAL DAMAGED VAPOR RETARDER BEFORE PLACING CONCRETE.  
3. CLEAN REINFORCEMENT STEEL OF LOOSE RUST, MILL SCALE, DIRT, ICE, AND OTHER FOREIGN MATERIALS.  
4. INSTALL REINFORCEMENT STEEL IN COMPLIANCE WITH CRSI's "MANUAL OF STANDARD PRACTICE," ACCURATELY PLACE BARS, AND SUPPORTS.  
5. DO NOT TACK WELD CROSSING BARS.  
6. MAINTAIN A MINIMUM OF 1 BAR DIAMETER BETWEEN BARS.  
7. LOCATE BARS TO PROVIDE COVERAGE IN ACCORDANCE WITH ACI 318.  
8. LAP BARS NO LESS THAN 24 INCHES OR 36 BAR DIAMETERS, WHICHEVER IS GREATER, STAGGER SPLICES.

CAST IN PLACE CONCRETE:  
PRODUCTS:  
1. CEMENTITIOUS MATERIALS:  
PORTLAND CEMENT - ASTM C150, TYPE II, GRAY.  
POZZOLANS - ASTM C618, CLASS C, F, OR N.  
SLAG CEMENT - ASTM C989, GRADE 100 OR 120.  
NORMAL WEIGHT AGGREGATES - COURSE AGGREGATE, ASTM C33, CLASS 48, MAXIMUM 1-1/2 INCHES.  
FINE AGGREGATE - ASTM C33.  
2. NON-CALCIUM CHLORIDE ADMIXTURES - WATER-REDUCING, RETARDING, OR WATER-REDUCING AND -RETARDING ARE PERMITTED.  
3. AIR ENTRAINMENT - ASTM C260.  
4. EXPANSION AND ISOLATION JOINT-FILLER STRIPS, ASTM D1751, ASPHALTIC-SATURATED CELLULOSE FIBER.  
5. CURING MATERIALS - CLEAR, WATERBORNE, MEMBRANE-FORMING, NONDISSIPATION CURING COMPOUND, ASTM C309, TYPE 1, CLASS B.  
EXECUTION:  
1. MIX CEMENTITIOUS MATERIALS - LIMIT PERCENTAGE BY WEIGHT OF THE FOLLOWING:  
FLY ASH OR OTHER POZZOLANS: 25 PERCENT BY MASS.  
SLAG CEMENT: 50 PERCENT BY MASS.  
TOTAL OF FLY ASH OR OTHER POZZOLANS AND SLAG CEMENT: 35 PERCENT BY MASS WITH FLY ASH NOT EXCEEDING 25 PERCENT MASS.  
2. NORMAL WEIGHT CONCRETE FOR FOOTINGS AND FOUNDATION WALLS: MINIMUM 3000 PSI STRENGTH IN 28 DAYS, MAXIMUM 0.50 WATER TO CEMENT RATIO, 4 INCH SLUMP +/-1 INCH.  
3. NORMAL WEIGHT CONCRETE FOR SLABS: MINIMUM 4000 PSI STRENGTH IN 28 DAYS, MAXIMUM 0.45 WATER TO CEMENT RATIO, 4 INCH SLUMP +/-1 INCH.  
4. READY-MIXED CONCRETE: MEASURE, BATCH, MIX, AND DELIVER CONCRETE IN ACCORDANCE WITH ASTM C94 AND FURNISH DELIVERY TICKET.  
5. VERIFY FORMS, ACCESSORIES, REINFORCEMENT AND EMBEDDED ITEMS ARE COMPLETE AND REQUIRED INSPECTIONS PERFORMED.  
CORRECT UNSATISFACTORY CONDITIONS BEFORE POURING.  
6. CONTROL JOINTS - FORM WEAKEND-PLANE CONTROL JOINTS SECTIONING CONCRETE INTO AREAS AS INDICATED. CONSTRUCT CONTROL JOINTS FOR A DEPTH EQUAL TO AT LEAST ONE QUARTER THE CONCRETE THICKNESS. CUT JOINTS 1/8 INCH WIDE INTO CONCRETE WHEN CUTTING ACTION DOES NOT TEAR, ABRASE, OR OTHERWISE DAMAGE SURFACE AND BEFORE CONCRETE DEVELOPS RANDOM CRACKS.  
7. ISOLATION JOINTS - INSTALL JOINT-FILLER STRIPS AT SLAB JUNCTIONS WITH VERTICAL SURFACES, SUCH AS COLUMN PEDESTALS, FOUNDATION WALLS AND OTHER LOCATIONS INDICATED. EXTEND JOINT-FILLER STRIPS FULL WIDTH AND DEPTH OF JOINT, TERMINATING 1/2 INCH BELOW FLOOR SURFACE.  
8. FINISH SLABS ON GRADE WITH A TROWEL FINISH. FLOAT CONCRETE WITH POWER-DRIVEN FLOATS OR HAND FLOATS. REPEAT FLOATING PASSSES UNTIL SURFACE IS LEFT UNIFORM, SMOOTH, GRANULAR TEXTURE AND COMPLIES WITH ACI 1171 AFTER FLOATING CONCRETE, APPLY FIRST TROWELING AND CONSOLIDATE CONCRETE BY HAND OR POWER-DRIVEN TROWEL. CONTINUE TROWELING UNTIL SURFACE IS FREE OF TROWEL MARKS AND UNIFORM IN TEXTURE AND APPEARANCE. DO NOT ADD WATER.  
9. APPLY CURING COMPOUND BY POWER SPRAY OR ROLLER IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS. RECOAT AREAS SUBJECT TO HEAVY RAINFALL WITHIN THREE HOURS AFTER INITIAL APPLICATION. REPEAT APPLICATION FOR A SECOND COAT AFTER 24 HOURS.  
10. PROTECT CONCRETE SURFACE FOR MINIMUM 7 DAYS BEFORE PLACING LOADS ON SLAB. DO NOT INSTALL BUILDING COMPONENTS ON CONCRETE UNTIL AFTER 28 DAYS.

PIPE AND TUBE RAILINGS  
PRODUCTS:  
1. PIPE: ASTM A53, TYPE F OR TYPE S, GRADE A, STANDARD WEIGHT (SCHEDULE 40).  
2. PLATES, SHAPES AND BARS: ASTM A36.  
3. HOT-DIPPED GALVANIZED RAILING COMPONENTS.  
4. FASTENERS: TYPE 304 STAINLESS STEEL FASTENERS.  
5. WELDING RODS AND BARE ELECTRODES: SELECT IN ACCORDANCE WITH AWS SPECIFICATIONS.  
6. ETCHING CLEANER FOR GALVANIZED METAL: COMPLYING WITH MPI #25.  
7. ANCHORING CEMENT: FACTORY-PACKAGED, NON-SHRINK, NON-STAINING, HYDRAULIC-CONTROLLED EXPANSION CEMENT FORMULATION FOR MIXING WITH WATER AT PROJECT SITE TO CREATE POLE OR RAIL ANCHORS AND GROUTING COMPOUND.  
8. FINISHES: HOT-DIP GALVANIZE EXTERIOR RAILINGS, MINIMUM 6-90 FINISH.  
EXECUTION:  
1. PERFORM CUTTING, DRILLING, AND FITTING REQUIRED FOR INSTALLING RAILINGS.  
2. FIT EXPOSED CONNECTIONS TOGETHER TO FROM TIGHT, HAIRLINE JOINTS.  
3. INSTALL RAILINGS LEVEL, PLUMB, AND IN TRUE TO LINE, WITHOUT WARP OR RACK.  
4. CORE DRILL TOP OF RETAINING WALL FOR POSTS.  
5. SET POSTS IN HOLES AND ALIGN SECTIONS OF RAILING WITH EACH OTHER, TRUE TO LINE.  
6. ANCHOR POSTS IN HOLES WITH ANCHORING CEMENT. SLOPE TOP OF CEMENT AWAY FROM POST IN A SMOOTH SLOPE, WITHOUT FINGERPRINTS OR OTHER INDENTATIONS, 1/8 INCH BUILDUP ON POST.  
7. CLEAN RAILING AFTER INSTALLATION.  
8. PROTECT FINISH AGAINST DAMAGE DURING INSTALLATION. IF DAMAGED, CONTACT THE ARCHITECT FOR REPAIR INSTRUCTIONS.

VAPOR RETARDER:  
PRODUCTS:  
SHEET VAPOR RETARDER - CLASS A OR C, ASTM E1745.  
EXECUTION:  
1. INSTALL VAPOR RETARDER SHEETS ON DRAINAGE FILL. INSTALL WITH 6 INCH OVERLAPS IN BOTH DIRECTIONS. TAPE JOINTS TO PREVENT MOVEMENT.  
2. PATCH PUNCTURES WITH TAPE.  
3. PATCH TEARS WITH A STRIP 12 INCHES WIDER THAN TEAR AND TAPE IN PLACE.  
SEALANTS:  
PRODUCTS:  
1. URETHANE SEALANT - S, NS, SO, T, NT - SINGLE-COMPONENT, NONSAG, TRAFFIC, NON-TRAFFIC USE SEALANT - FOR INTERIOR, SIDING AND ROOFING USE.  
2. URETHANE IMMERSIBLE SEALANT - S, NS, SO, T, NT, I - IMMERSIBLE SINGLE-COMPONENT, NONSAG, TRAFFIC, NON-TRAFFIC USE SEALANT - FOR EXTERIOR SLAB AND WALL USE.  
EXECUTION:  
1. CLEAN JOINTS IMMEDIATELY BEFORE INSTALLING JOINT SEALANT. BRUSH, GRIND, ABRASE, OR A COMBINATION OF THESE METHODS TO PRODUCE A CLEAN, SOUND SUBSTRATE CAPABLE OF DEVELOPING OPTIMUM BOND WITH JOINT SEALANTS. REMOVE LOOSE PARTICLES REMAINING AFTER CLEANING BY VACUUMING OR BLOWING OUT JOINTS.  
2. PRIME JOINT ONLY WHERE RECOMMENDED BY THE MANUFACTURER.  
3. INSTALL SEALANT IN ISOLATION JOINTS.  
4. TOOL SEALANT IMMEDIATELY AFTER APPLICATION AND BEFORE SKINNING OR CURING BEGINS. TOOL JOINTS TO FORM A SMOOTH, UNIFORM SURFACE, ELIMINATE AIR POCKETS, AND ENSURE CONTACT AND ADHESION OF SEALANT TO JOINT SIDES. FORM A CONCAVE JOINT PROFILE.  
5. REMOVE EXCESS SEALANT FROM ADJACENT SURFACES.  
6. PROTECT SEALANTS DURING AND AFTER CURING PERIOD FROM CONTACT WITH CONTAMINATING SUBSTANCES AND FROM CONSTRUCTION DAMAGE.

THERMAL INSULATION:  
PRODUCTS:  
1. EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION - TYPE X, 15 PSI MINIMUM COMPRESSIVE STRENGTH, UNFACED.  
2. FIBERGLASS BLANKET INSULATION - POLYPROPYLENE-SCRM-KRAFT FACED, ASTM C665, TYPE II, CLASS A, CATEGORY 1 VAPOR BARRIER MEMBRANE.  
3. FIBERGLASS INSULATION - ASTM C764, TYPE II, LOOSE FILL FOR MISCELLANEOUS VOIDS.  
ADHESIVE FOR BONDING INSULATION: A PRODUCT COMPATIBLE WITH THE INSULATION AND AIR/VAPOR BARRIER MATERIALS, CAPABLE OF BONDING INSULATION SECURELY TO AIR/VAPOR BARRIER WITHOUT DAMAGE TO INSULATION OR AIR/VAPOR BARRIER.  
EXECUTION:  
1. COMPLY WITH INSULATION MANUFACTURERS WRITTEN INSTRUCTION APPLICABLE TO PRODUCTS AND APPLICATIONS.  
2. INSTALL INSULATION THAT IS UNDAMAGED, DRY AND UNOILED AND THAT HAS NOT BEEN LEFT EXPOSED TO ICE, RAIN OR SNOW AT ANY TIME.  
3. INSTALL WITH MANUFACTURERS R-VALUE LABEL EXPOSED AFTER INSULATION IS INSTALLED. EXTEND INSULATION TO ENVELOP ENTIRE AREA TO BE INSULATED. FIT TIGHTLY AROUND OBSTRUCTIONS AND FILL VOIDS WITH INSULATION. REMOVE PROJECTIONS THAT INTERFERE WITH PLACEMENT.  
4. INSTALL VERTICAL INSULATION ON SLAB EDGE AND FOUNDATION SURFACES WITH RECOMMENDED ADHESIVE ACCORDING TO MANUFACTURERS WRITTEN INSTRUCTIONS.  
INSTALL CAVITY-WALL INSULATION WITH ADHESIVE AT MAXIMUM 24 INCHES ON CENTER EACH DIRECTION.  
5. BUTT INSULATION BOARD ENDS TIGHT TOGETHER. INSTALL BOARD TIGHT TO WALL TIES, AND OTHER OBSTRUCTIONS.  
6. INSTALL BLANKET INSULATION IN ACCORDANCE WITH PRE-ENGINEERED METAL BUILDING COMPANY'S WRITTEN INSTRUCTIONS.

JOINT SEALANTS:  
PRODUCTS:  
1. SILICONE - S, NS, SO, T, NT - SINGLE COMPONENT SILICON SEALANT, ASTM C920, WHERE RECOMMENDED AT DOORS AND WINDOWS.  
2. URETHANE - M OR S, NS, SO, T, NT - MULTI- OR SINGLE COMPONENT URETHANE SEALANT; ASTM C920, FOR MOVEMENT JOINTS IN WALLS AND ISOLATION JOINTS IN FLOORS.  
3. CYLINDRICAL SEALANT BACKINGS - ASTM C1330, TYPE C, O OR B AS RECOMMENDED BY THE SEALANT MANUFACTURER FOR EACH SPECIFIC APPLICATION. INSTALL BACKING OF A SIZE AND DENSITY OPTIMAL FOR SEALANT PERFORMANCE.  
4. BOND-BREAKER TAPE - POLYETHYLENE TAPE OR OTHER PLASTIC TAPE RECOMMENDED BY SEALANT MANUFACTURER FOR PREVENTING SEALANT ADHESION.  
EXECUTION:  
1. CLEAN SURFACES TO RECEIVE SEALANT OR BACKING MATERIAL.  
2. REMOVE ANY LAITANCE OR OTHER COATING WHICH MAY HINDER PROPER ADHESION. PRIME SURFACES IF RECOMMENDED BY SEALANT MANUFACTURER. PRIME WITH RECOMMENDED COATING.  
3. MASK OFF JOINT TO BE SEALED.  
4. COMPLY WITH RECOMMENDATIONS IN ASTM C1193 FOR USE OF JOINT SEALANTS IN APPLICABLE MATERIALS.  
5. INSTALL BACKINGS WHERE INDICATED OR REQUIRED TO MAINTAIN RECOMMENDED WIDTH-TO-DEPTH RATIO.  
6. INSTALL BOND-BREAKER TAPE WHERE SEALANT BACKINGS ARE NOT USED BETWEEN SEALANT AND BACKS OF JOINTS.  
7. INSTALL SEALANT USING PROVEN TECHNIQUES. PLACE SEALANT SO THAT IT DIRECTLY CONTACTS AND FULLY WETS JOINT SUBSTRATES. COMPLETELY FILL RECESSES IN EACH JOINT CONFIGURATION. INSTALL UNIFORMLY IN CROSS-SECTION SHAPE AND DEPTHS.  
8. TOOL SEALANT IMMEDIATELY AFTER APPLICATION AND BEFORE SKINNING OR CURING BEGINS. TOOL TO CONCAVE PROFILE AT NON-TRAFFIC LOCATIONS AND FLUSH AT TRAFFIC LOCATIONS.  
9. REMOVE EXCESSIVE SEALANT FROM SURFACES ADJACENT TO JOINTS. USE TOOLING AGENTS THAT ARE APPROVED BY THE SEALANT MANUFACTURER AND WILL NOT DISCOLOR THE SEALANT OR ADJACENT SURFACES.  
10. PROTECT JOINT SEALANTS DURING CURING PROCESS FROM CONTACT AND CONTAMINATION.

HOLLOW METAL DOORS AND FRAMES:  
PRODUCTS:  
1. HEAVY DUTY: INSULATED DOORS AND FRAMES - ANSI/SDI A250.8, LEVEL 2; ANSI/SDI A250.4, LEVEL B; 1 1/2 INCH THICK METAL-COATED STEEL DOORS AND FRAMES. THICKNESS OF DOOR: MINIMUM 18 GAUGE. CORE: POLYSTYRENE. EDGE: MODEL 1, FULL FLUSH. FRAME THICKNESS: 16 GAUGE. CONSTRUCTION: KNOCK-DOWN.  
2. ANCHORS - TYPE OF ANCHORS AND TYPE FOR MOUNTING TO CONCRETE MASONRY. MINIMUM 3 JAMB ANCHORS PER JAMB. FLOOR ANCHOR FOR EACH JAMB.  
3. PRIME FINISH ON DOORS FROM MANUFACTURER FOR FIELD FINISH PAINTING.  
EXECUTION:  
1. COMPLY WITH ANSI/SDI A250.11 FOR INSTALLATION OF DOOR FRAMES. SET FRAMES ACCURATELY IN POSITION, PLUMB, AND SQUARE. SECURELY UNTIL PERMANENT ANCHORS ARE SET. REMOVE BRACING AFTER ANCHORS ARE SET.  
2. PACK FRAME WITH MINERAL WOOL INSULATION.  
3. COORDINATE INSTALLATION OF FRAMES WITH MASONRY WALL CONSTRUCTION. FIT HOLLOW METAL DOOR ACCURATELY IN FRAME.

DOOR HARDWARE:  
1. CLASS 1 THREE (3) STAINLESS STEEL MORTISED HINGES WITH STAINLESS STEEL, NON-RISING PIN - 4 1/2 x 4 1/2, US 32D FINISH.  
2. CLASS 1 BORED LOCKSET - ENTRANCE FUNCTION WITH INTERIOR THUMBTURN, LEVER, ROSETTE, US32D FINISH.  
3. CLASS 1 BORED DEADBOLT - INTERIOR THUMBTURN, US32D FINISH.

FIXED LOUVERS:  
PRODUCTS:  
1. EXTRUDED-ALUMINUM LOUVERS - FIXED HORIZONTAL NONDRAINABLE BLADE LOUVER, 4 INCH DEPTH, PLAIN FINISH, WITH 1/8 CENTER HAIRPIN, NOT LESS THAN 0.080 INCH THICKNESS OF BLADES, AND FRAME, NOT LESS THAN 50% FREE AREA.  
2. INSECT SCREEN, ALUMINUM 18-BY-16 MESH OF 0.012 INCH WIRE, AT EACH LOUVER.  
ALUMINUM EXTRUSIONS: ASTM B221, ALLOY 6063-T5 OR T6.  
3. FASTENERS: USE TYPE AND SIZES SUITED FOR INSTALLATION CONDITIONS.  
4. FABRICATE FRAMES, INCLUDING INTEGRAL SILLS, TO FIT IN OPENINGS OF SIZES INDICATED, WITH ALLOWANCES MADE FOR FABRICATIONS AND INSTALLATION TOLERANCES, ADJOINING MATERIAL TOLERANCES, AND PERIMETER SEALANT JOINTS.  
5. ALUMINUM FINISH: COLOR ANODIC AAMA 611, 11-M1C222A42/A44, CLASS I, DARK BRONZE.

EXECUTION:  
1. LOCATE AND PLACE LOUVERS LEVEL, PLUMB, AND AT INDICATED ALIGNMENT WITH ADJACENT WORK.  
2. USE CONCEALED ANCHORAGES WHERE POSSIBLE. PROVIDE BRASS WASHERS FITTED TO SCREWS WHERE REQUIRED TO PROTECT METAL SURFACES AND TO MAKE A WEATHERTIGHT CONNECTION.  
3. PROVIDE PERIMETER REVEALS AND OPENINGS OF UNIFORM WIDTH FOR SEALANTS AND JOINT FILLERS.  
4. PROTECT ALUMINUM SURFACES THAT ARE IN CONTACT WITH CONCRETE MASONRY OR DISSIMILAR METALS FROM CORROSION AND GALVANIC ACTION BY APPLYING A HEAVY COATING OF BITUMINOUS PAINT OR BY SEPARATING SURFACES WITH WATERPROOF GASKETS OR NON-METALLIC FLASHING.

OVERHEAD DOORS:  
PRODUCTS:  
INSULATED METAL PANEL DOOR SYSTEM WITH THE FOLLOWING REQUIREMENTS:  
A. EXTERIOR DOOR CAPABLE OF WITHSTANDING A UNIFORM PRESSURE OF 20 psf ACTING INWARD AND OUTWARD.  
B. DOOR COMPONENTS AND OPERATORS CAPABLE OF OPERATING FOR NOT LESS THAN 20,000 CYCLES, ELECTRICAL OPERATION AT MAX. 3/4hp, 208v - 1 ph.  
C. INSULATED SECTIONAL PANELS MINIMUM 2" THICK, MINIMUM 0.015 THICK GALVANIZED STEEL FACING, URETHANE CORE WITH MINIMUM R-VALUE OF 17.  
D. MAXIMUM AIR INFILTRATION OF 0.08 cfm/sf AT 15" WITH MINIMUM R-VALUE OF 17.  
E. FINISH: BAKED-ENAMEL OR POWDER-COATED. COLOR TO BE SELECTED FROM MANUFACTURERS STANDARD COLORS.  
F. EMERGENCY CHAIN RELEASE AND MANUAL PUSH-UP.  
G. PHOTOELECTRIC SENSOR, INTERIOR MOUNTED CONTROL STATION AND WIRELESS CONTROL UNITS.  
EXECUTION:  
1. INSTALL OVERHEAD DOORS, OPERATING EQUIPMENT COMPLETE WITH NECESSARY HARDWARE, ANCHORS, INSERTS, HANGERS, AND EQUIPMENT SUPPORTS; ACCORDING TO MANUFACTURERS WRITTEN INSTRUCTIONS.  
2. INSTALL DOORS IN ACCORDANCE WITH UL 325.

PRE-ENGINEERED METAL BUILDING:  
PRODUCTS:  
1. SOURCE LIMITATIONS: OBTAIN METAL BUILDING COMPONENTS, INCLUDING PRIMARY AND SECONDARY FRAMING AND METAL PANEL ASSEMBLIES, FROM SINGLE SOURCE MANUFACTURER.  
A. RIGID CLEAR-SPAN PRIMARY FRAMING SYSTEM: SOLID MEMBER STRUCTURAL FRAMING SYSTEM WITHOUT COLUMNS.  
B. END WALL: MANUFACTURERS STANDARD, CAPABLE OF SUPPORTING SINGLE BAY DESIGN LOADS, AND END WALL COLUMNS.  
C. SECONDARY FRAMING: MANUFACTURERS STANDARD PURLINS AND EXTERIOR FRAMED (BYPASS) GIRTS.  
D. EAVE HEIGHT AS INDICATED ON DRAWINGS.  
E. BAY SPACING AS INDICATED ON DRAWINGS.  
F. ROOF SLOPE: 1/2 INCH PER 12 INCHES (1/2 : 12).  
G. ROOFING SYSTEM: MANUFACTURERS STANDARD STANDING-SEAM, VERTICAL-RIB METAL PANELS.  
H. EXTERIOR WALL SYSTEM: MANUFACTURERS STANDARD FOAM-INSULATION-CORE METAL WALL PANELS.  
2. DELEGATE DESIGN: ENGAGE A QUALIFIED PROFESSIONAL ENGINEER TO DESIGN METAL BUILDING SYSTEM.  
3. STRUCTURAL PERFORMANCE:  
A. DESIGN LOADS: AS OUTLINED ON THE DRAWINGS.  
B. DESIGN METAL BUILDING SYSTEM ASSEMBLIES TO WITHSTAND SERVICEABILITY DESIGN LOAD WITH NO EXCEEDING DEFLECTIONS AND DRIFT LIMITS RECOMMENDED IN AISI STEEL DESIGN GUIDE NO. 3 "SERVICEABILITY DESIGN CONSIDERATIONS FOR STEEL BUILDINGS:"  
I. NO GREATER THAN THE FOLLOWING:  
1) PURLINS: VERTICAL DEFLECTION OF 1/240 OF THE SPAN.  
2) GORTS: HORIZONTAL DEFLECTION OF 1/80 OF THE SPAN.  
3) METAL ROOF PANELS: VERTICAL DEFLECTION OF 1/240 OF THE SPAN.  
4) METAL WALL PANELS: HORIZONTAL DEFLECTION OF 1/80 OF THE SPAN.  
5) DESIGN SECONDARY FRAMING SYSTEM TO ACCOMMODATE DEFLECTION OF PRIMARY AND CONSTRUCTION TOLERANCES AND TO MAINTAIN CLEARANCES AT OPENINGS.  
6) LATERAL DRIFT: MAXIMUM 1/200 OF THE BUILDING HEIGHT.  
D. THERMAL MOVEMENTS: ALLOW FOR THERMAL MOVEMENTS FROM AMBIENT AND SURFACE TEMPERATURE CHANGES BY PREVENTING BUCKLING, OPENING OF JOINTS, OVERSTRESSING OF COMPONENTS, FAILURE OF JOINT SEALANTS, FAILURE OF CONNECTIONS, AND OTHER DETRIMENTAL EFFECTS. BASE CALCULATIONS ON SURFACE TEMPERATURES OF MATERIALS DUE TO BOTH SOLAR HEAT GAIN AND NIGHTTIME SKY HEAT LOSS - 120 DEG. F. AMBIENT AND 180 DEG. F. MATERIAL SURFACE TEMPERATURE CHANGE.  
E. FIRE-RATED DOOR ASSEMBLIES: ASSEMBLIES COMPLYING WITH NFPA 80 THAT ARE LISTED AND LABELED BY A QUALIFIED TESTING AGENCY, FOR FIRE-PROTECTION RATINGS INDICATED, BASED ON TESTING AT POSITIVE PRESSURE ACCORDING TO NFPA 252 OF UL 10C.  
F. AIR INFILTRATIONS FOR ROOF AND WALL PANELS: AIR LEAKAGE OF NOT MORE THAN 0.08 cfm/sf WHEN TESTED ACCORDING TO ASTM E233 AT THE TEST PRESSURE 157 lbf/sf.  
G. WATER PENETRATION FOR METAL ROOF PANELS AND WALL PANELS OF NO WATER PENETRATION WHEN TESTED IN ACCORDANCE WITH ASTM E331 AT 6.24 lbf/sf.  
H. WIND UPLIFT RATING: UL 60.  
I. THERMAL PERFORMANCE AS INDICATED ON DRAWINGS.  
4. STRUCTURAL STEEL FRAMING:  
A. COMPLY WITH AISI 360, "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS."  
B. BOLTED CONNECTIONS: COMPLY WITH AISC 360, "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS."  
C. COLD-FORMED STEEL: COMPLY WITH AISI'S "NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS" FOR DESIGN REQUIREMENTS AND ALLOWABLE STRESSES.  
D. PRIMARY FRAMING: MANUFACTURERS STANDARD PRIMARY-FRAMING SYSTEM - ONE-DIRECTIONAL SLOPED, TAPERED COLUMNS, TAPERED OR UNIFORM RAFTER.  
E. END WALL FRAMING: MANUFACTURERS STANDARD PRIMARY END-WALL FRAMING.  
F. SECONDARY FRAMING: MANUFACTURERS STANDARD SECONDARY FRAMING, INCLUDING PURLINS, GIRTS, EAVE STRUTS, PLANGE BRACING, BASE MEMBERS, GABLE ANGLES, CLIPS, HEADERS, JAMBS, AND OTHER MISCELLANEOUS STRUCTURAL MEMBERS. FABRICATED FROM COLD-FORMED, STRUCTURAL-STEEL SHEET OR ROLL-FORMED, METALLIC-COATED STEEL SHEET, PREPAINTED WITH COIL COATING.  
G. ANCHOR RODS: HEADED ANCHOR RODS AS INDICATED IN ANCHOR ROD PLAN FOR ATTACHMENT OF METAL BUILDING TO FOUNDATION.  
5. METAL ROOF PANELS:  
A. STANDING-SEAM, VERTICAL-RIB, METAL PANELS, FORMED WITH INTERLOCKING RIBS AT PANEL EDGES AND STIFFENERS BETWEEN RIBS, DESIGNED FOR SEQUENTIAL INSTALLATION BY MECHANICALLY ATTACHING PANEL TO SUPPORTS USING CONCEALED CLIPS LOCATED UNDER ONESIDE OF PANELS AND ENGAGING OPPOSITE EDGE OF ADJACENT PANELS. MATERIAL: ZINC-COATED (GALVANIZED) PREPAINTED COIL-COATED STEEL COMPLYING WITH ASTM A755.  
B. FINISH: TWO-COAT FLUOROPOLYMER.  
6. METAL WALL PANELS AND LINER PANELS:  
A. R PANELS, MINIMUM 26 GAUGE STEEL, WITH EXPOSED FINISHING COLOR FASTERS.  
B. FINISH: TWO-COAT FLUOROPOLYMER.  
7. METAL SOFFIT PANELS  
A. METAL SOFFIT PANELS MATCHING THE MATERIAL OF THE ROOFING PANEL, FLAT INTERLOCKING PROFILE.  
B. FINISH: TWO-COAT FLUOROPOLYMER.  
8. THERMAL INSULATION  
A. FACED METAL BUILDING INSULATION: ASTM C991, TYPE II, FIBERGLASS BLANKET INSULATION, VAPOR-TIGHT EDGE TABS WITH A FLAME-SPREAD INDEX OF 25 OR LESS, PERMEANCE NOT GREATER THAN 0.02 PERM.  
9. PERSONNEL DOORS AND FRAMES: SEE SPECIFICATIONS ABOVE.  
10. ACCESSORIES: MANUFACTURERS STANDARD ACCESSORIES TO THE GREATEST EXTENT POSSIBLE, FORM EXPOSED SHEET METAL ACCESSORIES FROM SAME MATERIAL AS ROOF, SIDING OR SOFFIT PANELS, FORM ACCESSORIES WITHOUT OIL-CANNING, BUCKLING, AND TOOL MARKS.

PRE-ENGINEERED METAL BUILDING: (CONTINUED)  
11. ROOF PANEL ACCESSORIES: PROVIDE COMPONENTS REQUIRED FOR A COMPLETE METAL ROOF PANEL ASSEMBLY, INCLUDING COPINGS, FASCIAE, CORNER UNITS, RIDGE CLOSURES, CLIPS, SEALANTS, GASKETS, FILLERS, CLOSURES, STRIPS, AND SIMILAR ITEMS. MATCH MATERIAL AND FINISH OF METAL ROOF PANELS.  
12. WALL PANEL ACCESSORIES: PROVIDE COMPONENTS REQUIRED FOR A COMPLETE METAL WALL PANEL ASSEMBLY, INCLUDING COPINGS, FASCIAE, MULLIONS, SILLS, CORNER UNITS, CLIPS, SEALANTS, GASKETS, FILLERS, CLOSURE STRIPS, AND SIMILAR ITEMS. MATCH MATERIAL AND FINISH OF METAL WALL PANELS.  
13. FLASHING, TRIM, GUTTER AND DOWNSPOUTS: FABRICATE COMPONENTS FROM ZINC-COATED (GALVANIZED) STEEL, PRE-PAINTED COIL-COATED SHEETS, FABRICATE UP TO 10 FEET IN LENGTH.

EXECUTION  
1. ERECT METAL BUILDING SYSTEM ACCORDING TO MANUFACTURERS WRITTEN INSTRUCTIONS AND DRAWINGS.  
2. DO NOT FIELD CUT, DRILL, OR ALTER STRUCTURAL MEMBERS WITHOUT WRITTEN APPROVAL FROM METAL BUILDING SYSTEM MANUFACTURERS PROFESSIONAL ENGINEER.  
3. SET STRUCTURAL FRAMING ACCURATELY IN LOCATIONS AND TO ELEVATIONS INDICATED, ACCORDING TO AISI SPECIFICATIONS REFERENCED IN THIS SECTION. MAINTAIN STRUCTURAL STABILITY OF FRAME DURING ERECTION.  
4. BASE AND BEARING PLATES: CLEAN CONCRETE SURFACES OF BOND-REDUCING MATERIALS AND ROUGHEN SURFACES PRIOR TO SETTING PLATES.  
A. SET PLATES ON WEDGES, SHIM, OR SETTING NUTS AS REQUIRED.  
B. TIGHTEN ANCHOR RODS AFTER SUPPORTED MEMBERS HAVE BEEN POSITIONED AND PLUMBED. DO NOT REMOVE WEDGES OR SHIMS, BUT CUT OFF FLUSH WITH EDGE OF PLATE BEFORE PACKING WITH GROUT.  
C. PROPERLY PACK GROUT SOLIDLY BETWEEN BEARING SURFACES AND PLATES SO NO VOIDS REMAIN. NEATLY FINISH EXPOSED SURFACES. PROTECT GROUT DURING CURING.  
5. ALIGN AND ADJUST STRUCTURAL FRAMING BEFORE PERMANENTLY FASTENING.  
6. ERECT PRIMARY AND SECONDARY FRAMING LEVEL, PLUMB, RIGID, SECURE, AND TRUE TO LINE, LEVEL.  
7. INSTALL BRACING IN ROOF AND SIDEWALLS WHERE INDICATED ON ERECTION DRAWINGS.  
A. TIGHTEN ROD AND CABLE BRACING TO AVOID SAG.  
B. LOCATE INTERIOR END-BAY BRACING ONLY WHERE INDICATED.  
8. PROVIDE SHAPES OF PROPER ORIGIN AND SIZE TO REINFORCE OPENINGS AND TO CARRY LOADS AND VIBRATIONS IMPOSED, INCLUDING EQUIPMENT FURNISHED UNDER MECHANICAL AND ELECTRICAL WORK, SECURELY ATTACH TO STRUCTURAL FRAMING.  
9. MAINTAIN ERECTION TOLERANCES OF STRUCTURAL STEEL FRAMING WITHIN AISI.  
10. FASTEN METAL ROOF PANELS TO SUPPORTS WITH CONCEALED CLIPS AT EACH STANDING-SEAM JOINT, AT LOCATION AND SPACING AND WITH FASTENERS RECOMMENDED BY MANUFACTURER.  
A. INSTALL CLIPS TO SUPPORTS WITH SELF-DRILLING OR SELF-TAPPING FASTENERS.  
B. INSTALL PRESSURE PLATES AT LOCATIONS INDICATED IN MANUFACTURERS WRITTEN INSTALLATION INSTRUCTIONS.  
C. NEST STANDING SEAMS AND FASTEN TOGETHER BY INTERLOCKING AND COMPLETELY ENGAGING FACTORY-APPLIED SEALANT.  
D. RIGIDLY FASTEN EAVE END OF METAL ROOF PANELS AND ALLOW RIDGE END FREE MOVEMENT FOR THERMAL EXPANSION AND CONTRACTION. PREDRILL PANELS FOR FASTENERS.  
E. PROVIDE METAL CLOSURES AT PEAKS, RAKE EDGES, RAKE WALLS, AND RIDGE.  
F. ALIGN BOTTOM OF METAL PANELS AND FASTEN WITH BLIND RIVETS, BOLTS OR SELF-DRILLING OR SELF-TAPPING SCREWS. FLASH AND SEAL METAL PANELS WITH WEATHER CLOSURES WHERE FASCIAE MEET SOFFITS, WLONG LOWER PANEL EDGES, AND AT PERIMETER OF ALL OPENINGS.  
11. INSTALL WALL AND LINER PANELS IN VERTICAL ORIENTATION. EXTEND FULL HEIGHT OF WALL, UNLESS INDICATED OTHERWISE. ANCHOR METAL WALL PANELS AND OTHER COMPONENTS OF THE WORK SECURELY IN PLACE WITH PROVISIONS FOR THERMAL AND STRUCTURAL MOVEMENT.  
A. BEGIN METAL PANEL INSTALLATION AT CORNERS WITH CENTER OF RIB LINED UP WITH LINE OF FRAMING.  
B. SHIM OR OTHERWISE PLUMB SUBSTRATES RECEIVING METAL WALL PANELS.  
C. INSTALL WALLS AND LINER PANELS WITH PROPOSED EDGES FOLDED BACK TO FORM TIES TO SUPPORTS WITH FASTENERS AS RECOMMENDED BY MANUFACTURER.  
12. INSTALL SOFFIT PANELS THE FULL WIDTH OF SOFFITS. INSTALL PANELS PERPENDICULAR TO SUPPORT FRAMING. FLASH AND SEAL SOFFIT PANELS WITH WEATHER CLOSURES WHERE PANELS MEET WALLS AND AT PERIMETER OF ALL OPENINGS.  
13. INSTALL INSULATION CONCURRENTLY WITH METAL PANEL INSTALLATION IN THICKNESS INDICATED ON THE DRAWINGS. FOLLOW MANUFACTURERS WRITTEN INSTRUCTION.  
A. SET VAPOR-RETARDER-FACED UNITS WITH VAPOR RETARDER TOWARD INTERIOR OF THE ROOF.  
B. TAPE JOINTS AND RUPTURES IN VAPOR RETARDER AND SEAL EACH CONTINUOUS AREA OF INSULATION TO THE SURROUNDING CONSTRUCTION TO ENSURE AIRTIGHT INSTALLATION.  
C. INSTALL BLANKETS STRAIGHT AND TRUE IN ONE-PIECE LENGTHS. INSTALL VAPOR RETARDER OVER INSULATION WITH BOTH SETS OF FACING TABS SEALED TO PROVIDE A COMPLETE VAPOR BARRIER.  
D. INSTALL ROOF INSULATION IN TWO LAYERS WITH INSULATION BLOCK SPACERS. EXTEND INSULATION AND VAPOR RETARDER OVER PURLINS. CARRY VAPOR-RETARDER-FACING TABS UP AND OVER PURLIN, OVERLAPPING ADJOINING FACING OF NEXT INSULATION COURSE AND MAINTAINING CONTINUITY OF RETARDER. INSTALL LAYER OF FILER INSULATION OVER FIRST LAYER TO GILL SPACE BETWEEN PURLINS. COVER PURLINS WITH THERMAL SPACER BLOCKS. HOLD IN PLACE WITH BANDS AND CROSSBANDS BELOW INSULATION.  
14. INSTALL ACCESSORIES WITH POSITIVE ANCHORAGE TO BUILDING AND WEATHER-TIGHT MOUNTING, AND PROVIDE FOR THERMAL EXPANSION. COORDINATE INSTALLATION WITH FLASHINGS AND OTHER COMPONENTS.  
15. INSTALL EXPOSED FLASHING AND TRIM SUCH THAT IT WILL NOT OIL-CAN, BUCKLE OR SHOW TOOL MARKS. INSTALL EDGES FOLDED BACK TO FORM TIES. INSTALL TO SUBSTRATE TO CREATE A WATERPROOF AND WEATHER-RESISTANT PERFORMANCE.  
16. INSTALL GUTTERS AND DOWNSPOUTS IN RIVETED AND SEALED SEAMS, ATTACH TO BUILDING WITH MANUFACTURERS RECOMMENDED FASTENERS.

DOCK LEVELER  
PRODUCT:  
1. BASIS OF DESIGN: RITE-HITE, MODEL RHM-4000 SERIES, 7 FEET WIDE AND 6 FEET LONG WITH 18 INCH LIP, 37,000 POUND MINIMUM CAPACITY.  
2. DOCK LEVELER SHALL MEET ANSI MH30.1-2000 TEST LOAD SPECIFICATIONS WITH PROPER DOCUMENTATION FROM A THIRD PARTY.  
3. DOCK LEVELER SHALL BE APPROVED BY THE MANUFACTURER FOR EXTERIOR INSTALLATION.  
4. PROVIDE MANUFACTURERS STANDARD REINFORCED PLATFORM.  
5. WHEN STORED POSITION, THE LEVELER LIP WILL PROVIDE AN INTEGRAL AND AUTOMATICALLY, POSITIONED, IMPACT-RATED, SOLID BARRIER 5 INCHES ABOVE DOCK FLOOR.  
6. LEVELERS SHALL AUTOMATICALLY RETURN TO SAFE, STORED POSITION WHEN TRAILER DEPARTS.  
7. AUTOMATIC NIGHT LICKS TO BE INTEGRAL PART OF THE MANUFACTURERS STANDARD DOCK LEVELERS.  
8. FULL OPERATING RANGE TELESCOPING TO GUARDS TO CLOSE OFF SIDES WHEN LEVELER IS IN THE HIGHEST UPWARD POSITION. WORKING RANGE OF 12 INCHES.  
9. POSITIVE ACTING SAFE-T-STRUT MAINTENANCE SUPPORT SYSTEM WILL SUPPORT LIP AND DECK. DESIGN LOAD OF 10,000 POUND MOVING LOAD AND PROVIDE OSHA APPROVED LOCK-OUT/TAG-OUT CAPABILITIES.  
10. LEVELERS SHALL HAVE RAMP FLUX OF 4 INCHES TO COMPENSATE FOR UNLEVEL TRAILER BEDS. REAR HINGES SHALL BE FIXED AND SHALL NOT RISE ABOVE FLOOR LEVEL.  
11. DOCK LEVELER CONTROL BOX: ALL INDIVIDUAL COMPONENTS, AS WELLAS THE COMPLETE BOX UNIT, SHALL BE UL-APPROVED.  
12. CONTROL BOX SHALL INCLUDE INFINITE LIP CONTROL TO EXTEND THE LIP AT ANY TIME DURING THE OPERATION OF THE LEVELER AND SHALL ALSO PROVIDE A CONSTANT PRESSURE EMERGENCY STOP.  
13. HYDRAULIC FLUID SHALL BE BIODEGRADABLE AND HAVE A POUR POINT OF -60 DEGREES BELOW ZERO FAHRENHEIT.  
EXECUTION  
1. INSTALLER SHALL EXAMINE THE SUBSTRATE AND CONDITIONS UNDER WHICH DOCK LEVELERS AND TRUCK RESTRAINTS ARE TO BE INSTALLED AND NOTIFY THE A/E AND CONTRACTOR IN WRITING OF ANY CONDITIONS DETRIMENTAL TO THE PROPER AND TIMELY COMPLETION OF THE WORK. DO NOT PROCEED WITH THE WORK UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED IN A MANNER ACCEPTABLE TO THE INSTALLER.  
2. DOCK LEVELER MANUFACTURERS REPRESENTATIVE SHALL INSTALL DOCK LEVELER IN ACCORDANCE WITH APPROVED SHOP DRAWINGS AND MANUFACTURERS RECOMMENDATIONS. LOCATION OF DOCK LEVELER IS INDICATED ON DRAWINGS.  
3. SHIM DOCK LEVELER AS NECESSARY. WELD DOCK LEVELER ANCHOR PLATES TO FIT.  
4. ADJUST UNIT TO OPERATE SMOOTHLY.  
5. AFTER INSTALLATION IS COMPLETED, A REPRESENTATIVE OF THE MANUFACTURER SHALL EXAMINE THE INSTALLATION AND REQUIRE THAT ALL CONNECTIONS AND ADJUSTMENTS NECESSARY TO ASSURE PROPER OPERATION OF DOCK LEVELER BE MADE, BEFORE ACCEPTANCE. A DEMONSTRATION SHALL BE CONDUCTED IN THE PRESENCE OF THE OWNERS REPRESENTATIVE TO GUARANTEE THAT LEVELER OPERATES PROPERLY IN EVERY RESPECT. IN ADDITION, A DETAILED USER/OPERATOR TRAINING SESSION SHALL BE CONDUCTED AT TIME AND PLACE AGREED UPON BY OWNERS REPRESENTATIVE AND MANUFACTURERS REPRESENTATIVE.

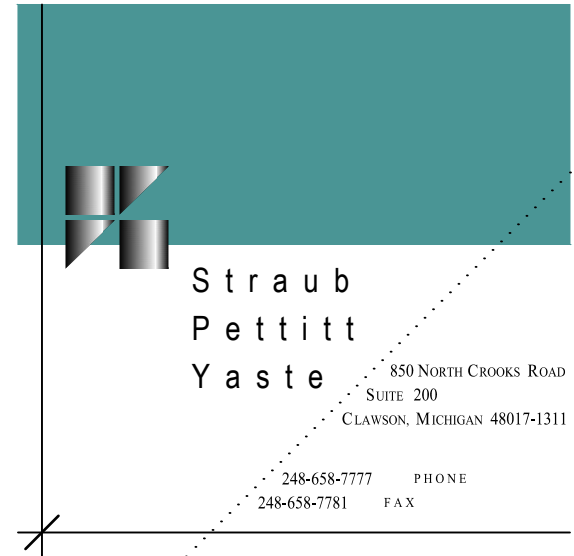
VALUE ENGINEERED  
ISSUED FOR PERMITS

5/15/2025  
3/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443





HEATING, VENTILATING AND AIR CONDITIONING SPECIFICATIONS

SCOPE

THE WORK TO BE PERFORMED UNDER THE HVAC SPECIFICATIONS CONSISTS OF PROVIDING ALL LABOR AND MATERIALS FOR THE COMPLETE INSTALLATION FOR ALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS. THE WORK SHALL INCLUDE BUT IS NOT NOT LIMITED TO THE FOLLOWING:

- HEATING & VENTILATION EQUIPMENT
- DUCTWORK AND ACCESSORIES
- AIR DEVICES

GENERAL

THIS SPECIFICATION IS INCLUSIVE FOR EACH ITEM REQUIRING ALL LABOR, EQUIP. AND MATERIALS NECESSARY TO PROPERLY INSTALL, ALTER, ADJUST AND PUT IN OPERATION, THE COMPLETE HVAC SYSTEMS.

THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER LAYOUT AND CONSTRUCTION OF THE WORK INCLUDED IN THIS CONTRACT.

THE CONTRACTOR SHALL VISIT THE PROJECT SITE TO COMPLETELY UNDERSTAND THE CONDITIONS UNDER WHICH THE WORK MUST BE PERFORMED.

ALL DEMOLITION, CUTTING AND PATCHING AS REQUIRED FOR THE WORK UNDER THIS CONTRACT SHALL BE PROVIDED BY THIS CONTRACTOR.

THIS CONTRACTOR SHALL COORDINATE THIS WORK WITH THAT OF ALL OTHER TRADES ON THIS PROJECT.

GUIDE LINES, REGARDLESS OF DETAILS INDICATED ON THE DRAWINGS. ALL EQUIP. SHALL BE INSTALLED IN ACCORDANCE WITH ALL MANUFACTURERS' REQUIREMENTS.

REGULATIONS

SYSTEMS IN ALL AND / OR IN PART SHALL CONFORM TO ALL PERTINENT LAWS, CODES, ORDINANCES AND REGULATIONS OF ALL BODIES HAVING JURISDICTION, AT ALL GOVERNING LEVELS, NOTWITHSTANDING ANYTHING IN THESE PLANS AND SPECIFICATIONS TO THE CONTRARY. IN CASE OF CONFLICT BETWEEN GOVERNING LEVELS, THE MORE STRINGENT REGULATIONS SHALL APPLY.

THIS CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS AND INSPECTIONS REQUIRED BY ANY AUTHORITY HAVING JURISDICTION IN CONNECTION WITH THIS WORK.

WORKMANSHIP

THE WORK UNDER THIS CONTRACT SHALL BE INSTALLED BY SKILLED CRAFTSMEN. ALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS SHALL BE INSTALLED IN A WORKMANLIKE MANNER IN ACCORDANCE WITH ACCEPTED HVAC INDUSTRY STANDARDS.

DUCTWORK

EXHAUST AIR FAN DUCTWORK SHALL BE GALVANIZED STEEL, CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH ASHRAE & SMACNA STANDARDS.

TESTING AND BALANCING

THIS CONTRACTOR SHALL HAVE THE AIR DISTRIBUTION SYSTEMS TESTED AND BALANCED BY A CERTIFIED INDEPENDENT AIR BALANCE CONTRACTOR TO WITHIN 5% OF CFM QUANTITIES INDICATED ON THE DRAWINGS. BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH NEBB OR AABC STANDARDS. PROVIDE FINAL AIR BALANCE REPORTS FOR A.H.J. REVIEW.

TEMPERATURE CONTROLS

THIS CONTRACTOR SHALL PROVIDE CONTROL SYSTEMS COMPATIBLE WITH ALL OF THE HVAC EQUIPMENT PROVIDED BY THE OWNER AND BY THIS CONTRACTOR. ALL CONTROL WIRING SHALL BE BY THIS CONTRACTOR & INSTALLED IN ACCORDANCE WITH NEC CODE REQUIREMENTS & THE ELECTRICAL SPECIFICATIONS.

ALL THERMOSTATS SHALL BE MOUNTED 48" ABOVE FINISHED FLOOR. ( PER A.D.A. )

SHOP DRAWINGS

THIS CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR REVIEW IF REQUESTED BY THE ARCHITECT FOR EQUIPMENT LISTED BELOW, AND / OR SCHEDULED ON THE DRAWINGS, FOR THE ARCHITECT / ENGINEER REVIEW. ALL SHOP DRAWINGS MUST INDICATE EQUIPMENT MANUFACTURER AND CAPACITIES.

- HEATING AND VENTILATION EQUIPMENT & DEVICES
- FINAL AIR BALANCE REPORT

OPERATING AND MAINTENANCE

THIS CONTRACTOR SHALL PROVIDE THE OWNER WITH ALL WRITTEN AND VERBAL OPERATING & MAINTENANCE INSTRUCTIONS FOR ALL HVAC SYSTEMS INSTALLED UNDER THIS PROJECT.

GUARANTEE

THIS CONTRACTOR SHALL UNCONDITIONALLY GUARANTEE, IN WRITING, ALL MATERIALS, EQUIPMENT AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER AND SHALL PROVIDE FREE SERVICE FOR REPAIR OF ALL EQUIPMENT INVOLVED IN THIS CONTRACT DURING THE GUARANTEE PERIOD. ALL EQUIPMENT WARRANTIES SHALL ALSO BE PROVIDED TO THE OWNER.

PLUMBING SPECIFICATIONS

SCOPE

THE WORK TO BE PERFORMED UNDER THE PLUMBING SPECIFICATIONS CONSISTS OF PROVIDING ALL LABOR AND MATERIALS FOR THE COMPLETE RENOVATION AND INSTALLATION OF ALL PLUMBING SYSTEMS, WHICH SHALL BE AN EXTENSION OF THE EXISTING BUILDING PLUMBING SYSTEMS. THE WORK SHALL INCLUDE BUT IS NOT LIMITED TO THE FOLLOWING:

- PLUMBING FIXTURES
- PIPING & INSULATION
- PLUMBING SPECIALTIES

GENERAL

THIS SPECIFICATION IS INCLUSIVE FOR EACH ITEM REQUIRING ALL LABOR, EQUIPMENT AND MATERIALS NECESSARY TO PROPERLY INSTALL, ALTER, ADJUST AND PUT IN OPERATION, THE COMPLETE PLUMBING SYSTEM.

THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER LAYOUT AND CONSTRUCTION OF THE WORK INCLUDED IN THIS CONTRACT.

THE CONTRACTOR SHALL VISIT THE PROJECT SITE TO COMPLETELY UNDERSTAND THE CONDITIONS UNDER WHICH THE WORK MUST BE PERFORMED.

ALL DEMOLITION CUTTING AND PATCHING, AS REQUIRED FOR THE WORK UNDER THIS CONTRACT SHALL BE PROVIDED BY THIS CONTRACTOR.

THIS CONTRACTOR SHALL COORDINATE THIS WORK WITH THAT OF ALL OTHER TRADES ON THIS PROJECT.

EQUIPMENT SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER GUIDE LINES REGARDLESS OF DETAILS INDICATED ON THE DRAWINGS.

REGULATIONS

SYSTEMS IN ALL AND/OR IN PART SHALL CONFORM TO ALL PERTINENT LAWS, CODES, ORDINANCES AND REGULATIONS OF ALL BODIES HAVING JURISDICTION, AT ALL GOVERNING LEVELS, NOTWITHSTANDING ANYTHING IN THESE PLANS AND SPECIFICATIONS TO THE CONTRARY. IN CASE OF CONFLICT BETWEEN GOVERNING LEVELS, THE MORE STRINGENT REGULATIONS SHALL APPLY.

THIS CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS AND INSPECTIONS REQUIRED BY ANY AUTHORITY HAVING JURISDICTION IN CONNECTION WITH THIS WORK.

WORKMANSHIP

THE WORK UNDER THIS CONTRACT SHALL BE INSTALLED BY SKILLED CRAFTSMEN. ALL PLUMBING SYSTEMS SHALL BE INSTALLED IN A WORKMANLIKE MANNER IN ACCORDANCE WITH ACCEPTED PLUMBING INDUSTRY STANDARDS.

SHOP DRAWINGS

THIS CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR REVIEW IF REQUESTED BY THE ARCHITECT FOR EQUIPMENT LISTED BELOW, AND / OR SCHEDULED ON THE DRAWINGS, FOR THE ARCHITECT / ENGINEER REVIEW. ALL SHOP DRAWINGS MUST INDICATE EQUIPMENT MANUFACTURER AND CAPACITIES.

- PLUMBING FIXTURES AND TRIM
- PLUMBING SPECIALTIES

PIPING

SANITARY WASTE & ALL RELATED VENT PIPING SHALL BE CAST IRON " NO HUB " OR " SINGLE WALL " SCHEDULE 40 PVC WITH CEMENTED JOINTS.

DOMESTIC HOT WATER, COLD WATER AND CONDENSATE DRAIN PIPING SHALL BE TYPE "M" COPPER WITH 95/5 SOLDER JOINTS.

NATURAL GAS PIPING SHALL BE SCHEDULE 40 BLACK IRON PIPE WITH THREADED JOINTS. PIPE INSULATION NOT REQUIRED.

HOT WATER & COLD WATER PIPING SHALL BE COVERED WITH 1/2" THICK - 1 lb DENSITY ( MIN ) FIBERGLASS INSULATION WITH VAPOR BARRIER AND R-VALUE THAT CONFORMS WITH THE LATEST I.E.C.C. REQUIREMENTS. PROVIDE W / PIPE IDENTIFICATION AND FLOW ARROWS

TESTING

ALL PIPING SYSTEMS INSTALLED BY THIS CONTRACTOR SHALL BE TESTED IN ACCORDANCE WITH CODES AND ACCEPTED BY THE INSPECTING AUTHORITY BEFORE PLACING THESE SYSTEMS IN OPERATION.

OPERATING AND MAINTENANCE

THIS CONTRACTOR SHALL PROVIDE THE OWNER WITH WRITTEN AND VERBAL OPERATING AND MAINTENANCE INSTRUCTIONS FOR ALL PLUMBING SYSTEMS INSTALLED UNDER THIS PROJECT.

GUARANTEE

THIS CONTRACTOR SHALL UNCONDITIONALLY GUARANTEE, IN WRITING, ALL MATERIALS, EQUIPMENT AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER AND SHALL PROVIDE FREE SERVICE FOR REPAIR OF ALL EQUIPMENT INVOLVED IN THIS CONTRACT DURING THE GUARANTEE PERIOD. ALL EQUIPMENT WARRANTIES SHALL ALSO BE PROVIDED TO THE OWNER.

GENERAL MECHANICAL NOTES

( NOTES APPLY TO ALL HVAC, PLUMBING & FIRE PROTECTION PLANS )

CONTRACTOR'S PRE-BID NOTIFICATION:

ALL EXISTING ITEMS INDICATED IN THE CONTRACT DRAWINGS HAVE BEEN TAKEN FROM THE OWNER'S LIMITED RECORD DRAWINGS & CERTAIN FIELD OBSERVATIONS. THE CONTRACTORS AND ALL THEIR SUB CONTRACTORS SHALL VISIT THE JOB SITE & COMPLETELY UNDERSTAND THE CONDITIONS UNDER WHICH THE WORK MUST BE PERFORMED. IF A CHANGE FROM THE DESIGN INTENT OF THE DOCUMENTS IS REQUIRED, DUE TO ACTUAL FIELD CONDITIONS OBSERVED BY THE CONTRACTOR, THE CONTRACTOR SHALL NOTIFY THE ARCH. IN WRITING FOR RESOLUTION BEFORE SUBMITTING A FINAL BID OR ENTERING INTO A CONSTRUCTION CONTRACT. FAILURE TO PROVIDE THE WRITTEN NOTIFICATION TO THE ARCHITECT SHALL RESULT IN THE CONTRACTOR BEING HELD RESPONSIBLE TO COMPLETE ALL WORK TO MEET THE DESIGN INTENT WITH NO ADDED COST BEING INCURRED BY THE BUILDING OWNER.

INSTALLATION COORDINATION

WHEN A CONFLICT BETWEEN INSTALLATION DETAILS, SUCH AS, BUT NOT LIMITED TO PIPING DIAGRAMS, EQUIPMENT DETAILS & CONNECTIONS, ETC., INDICATED ON THE DRAWINGS AND THE MANUFACTURERS INSTALLATION INSTRUCTIONS PROVIDED WITH REVIEWED SHOP DRAWINGS, THE MANUF. INSTALLATION INSTRUCTIONS SHALL TAKE PRECEDENT. NO ADDITIONAL COST WILL BE ALLOWED IF THE MANUF. INSTALLATION INSTRUCTIONS ARE NOT FOLLOWED.

SEALING OF DUCTWORK JOINTS:

ALL SUPPLY, RETURN AND EXHAUST DUCT JOINTS SHALL BE SEALED WITH HIGH VELOCITY DUCT SEALANT. DUCT TAPE OF ANY KIND SHALL NOT BE USED FOR SEALING DUCT JOINTS.

MECHANICAL DRAWING SCHEDULE

SHEET	SHEET TITLE
M0.1	MECHANICAL GENERAL INFORMATION, GAS PIPING DIAGRAM, PLUMBING FIXTURE SCHEDULE AND SPECIFICATIONS
M1.1	HEATING & VENTILATION & PLUMBING PLANS, DETAILS & SCHEDULES
M2.1	FIRE PROTECTION PLAN, SPECIFICATIONS, NOTES AND RISER DIAGRAM.

PLUMBING FIXTURE & SPECIALTIES SCHEDULE

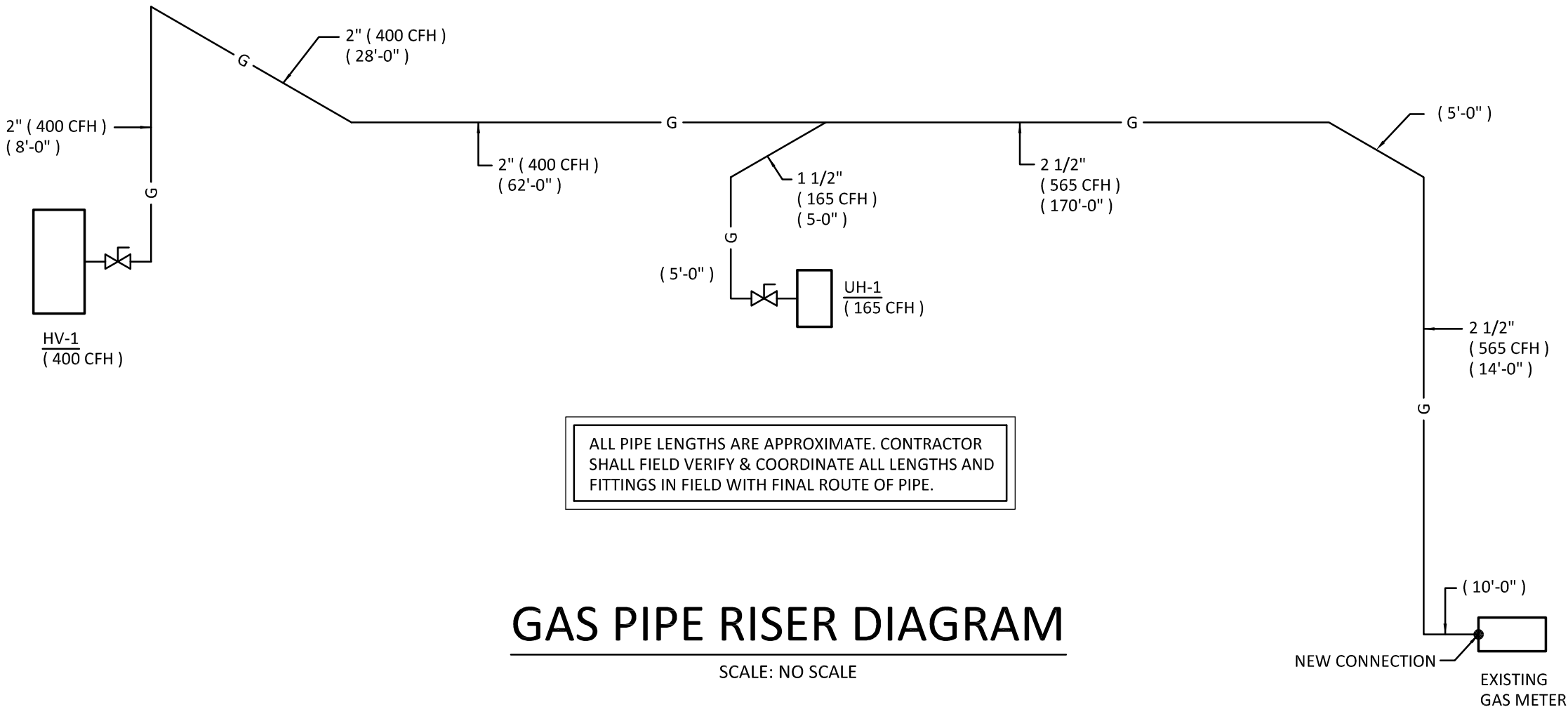
MARK	FIXTURE	MNFR.	MODEL	MATERIAL	TRIM	FIXTURE CONNECTION				REMARKS
						CW	HW	W	V	
WC-1	WATER CLOSET TANK TYPE FLOOR MOUNTED ( BARRIER FREE )	AMERICAN STANDARD	CHAMPION 4 731AA001S	WHITE VITREOUS CHINA	ELONGATED FRONT, TWO-PIECE TOILET WITH TANK, 1.6 GPF, EVERCLEAN SURFACE, 4" FLUSH VALVE, 2-3/8" TRAPWAY, BOLT CAPS, CHROME PLATED METAL TRIP LEVER	1/2"	-	4"	1-1/2"	PROVIDE WITH #5901110T.020 ELONGATED TOILET SEAT W / STAINLESS STEEL BRAIDED HOSE & 1/4-TURN SHUT OFF VA.
FD-1	FLOOR DRAIN	MIFAB	F1000	LACQUERED CAST IRON	5" DIAMETER LIGHT DUTY DRAIN WITH ROUND TOP AND MEMBRANE FLASHING CLAMP	-	-	3"	-	FURNISH WITH STAINLESS STEEL STRAINER & TS
TMV	THERMOSTATIC MIXING VALVE	WATTS	MMV-M1	BRONZE	ASSE 1070 LISTED FOR POINT OF USE APPLICATION WITH ADJUSTABLE THERMOSTAT AND SOLDERED CONNECTIONS	1/2"	1/2"	-	-	INSTALL AT EXISTING LAVATORY IN RENOVATED TOILET ROOM TO LIMIT HW TO 110°F
TS	TRAP SEAL	SURE SEAL	SS3000	ABS PLASTIC	IN-LINE FLOOR DRAIN TRAP SEALER WITH NEOPRENE RUBBER DIAPHRAGM AND RUBBER SEALING GASKETS. REFER TO PLAN OR SCHEDULE FOR FD SIZES.	-	-	-	-	INSTALL IN NEW FLOOR DRAIN TO PROVIDE TRAP SEAL

ADDED NATURAL GAS LOAD SCHEDULE

APPLIANCE	GAS INPUT ( CFH )	GAS PRESSURE REQ'D ( IN WC )	REMARKS
HV-1	400	7"	HEATING
UH-1	165	7"	HEATING
TOTAL	565	7"	ADDED GAS LOAD TO EX. METER

NOTES:

- PIPE SIZES ARE BASED ON USING SCHEDULE 40 STEEL PIPE WITH A INLET GAS PRESSURE OF LESS THAN 2 PSI. A PRESSURE DROP OF LESS THAN 0.3 IN. w.c. AND AN OVERALL PIPE LENGTH OF 390 FEET FROM HV-1 TO THE GAS METER AT A 0.60 SPECIFIC GRAVITY. ( WITH FITTINGS )
- ALL GAS PIPING SHALL BE SIZED & INSTALLED IN COMPLIANCE WITH THE 2015 INTERNATIONAL FUEL GAS CODE.



GAS PIPE RISER DIAGRAM

SCALE: NO SCALE

HVAC & PLUMBING SYMBOL LEGEND

SYMBOL	DESCRIPTION
E- / EX / EXIST.	EXISTING ITEM
V.I.F.	VERIFY IN FIELD
— · — · — CW	DOMESTIC COLD WATER PIPING ( INSULATED )
— · · — · — HW	DOMESTIC HOT WATER PIPING ( INSULATED )
— SAN —	SANITARY PIPING
— V — — V —	SANITARY VENT PIPING
— G —	NATURAL GAS PIPING
— [Symbol] —	I.F.G.C. APPROVED GAS SHUT-OFF VALVE
HV	HEATING AND VENTILATING UNIT
UH	UNIT HEATER
EF	EXHAUST FAN
L	LOUVER
OA	OUTDOOR AIR
[Symbol]	MOTORIZED DAMPER
MBH / CFH	1000 BTU PER HOUR
[Symbol]	THERMOSTAT
[Symbol]	ZONE TRANSMITTER ( CO / NO2 )
WC	WATER CLOSET
LAV	LAVATORY
FD	FLOOR DRAIN
TS	TRAP SEAL
TMV	THERMOSTATIC MIXING VALVE
I.E.	INVERT ELEVATION
W & V	WASTE AND VENT
A.F.F.	ABOVE FINISHED FLOOR
B.F.F.	BELOW FINISHED FLOOR
DN / UNGRD	DOWN / UNDERGROUND
M.M.C.	MICHIGAN MECHANICAL CODE
M.P.C.	MICHIGAN PLUMBING CODE
I.F.G.C.	INTERNATIONAL FUEL GAS CODE
I.E.C.C.	INTERNATIONAL ENERGY CONSERVATION CODE
P.C.	PLUMBING CONTRACTOR
M.C.	MECHANICAL CONTRACTOR
E.C.	ELECTRICAL CONTRACTOR
A.H.J.	AUTHORITY HAVING JURISDICTION



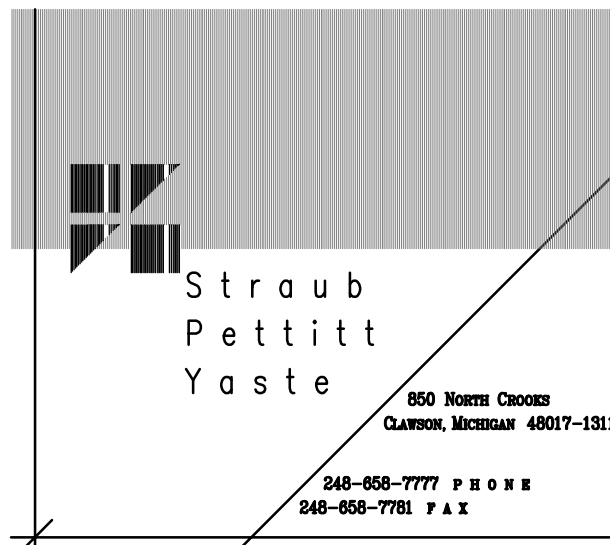
OWNER CHANGES  
ISSUED FOR PERMITS

5/16/25  
3/21/25

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443



MECHANICAL GENERAL  
INFORMATION, GAS PIPING  
DIAGRAM, PLUMBING FIXTURE  
SCHEDULE & SPECIFICATIONS

M0.1



OUTDOOR AIR VENTILATION SCHEDULE											
HVAC SYSTEMS	OCCUPANCY CATEGORY	ZONE FLOOR AREA A <sub>Z</sub>	OCCUPANT DENSITY No. / 1000 S.F. (M.M.C. 403.3)	ZONE POPULATION P <sub>Z</sub>	PEOPLE OUTDOOR AIR RATE R <sub>P</sub>	AREA OUTDOOR AIR RATE R <sub>A</sub>	BREATHING ZONE OUTDOOR AIRFLOW V <sub>BZ</sub>	ZONE AIR DISTRIBUTION EFFECTIVENESS E <sub>Z</sub>	DESIGN ZONE OUTDOOR AIRFLOW V <sub>OZ</sub>	OUTDOOR AIR REQUIRED	OUTDOOR AIR PROVIDED
HV-1 100% O.A. (1,897 CFM)	WAREHOUSE	9,500	-	-	-	0.12	1,140	.80	1,425	1,425	1,897 <span>Ⓢ</span>
HV-1, EF-1 & L-1 100% O.A. (7,400 CFM)	WAREHOUSE	9,500	EXHAUST AIRFLOW RATE REQUIRED ( DEMAND VENTILATION FOR CO / NO <sub>2</sub> DETECTORS ( "FORKLIFTS" ) ( COORDINATE IF REQUIRED BY A.H.J. )			0.75 sq ft	7,125	1.0	7,125	7125	7,400 <span>Ⓢ</span>

( TOTAL OUTDOOR AIR & EXHAUST PROVIDED IS IN COMPLIANCE WITH THE REQUIRED OUTDOOR VENTILATION AIR PER 2021 MICHIGAN MECHANICAL CODE SECTIONS 402, 403 & 404. )

Ⓢ HV-1 SHALL OPERATE CONTINUOUS DURING OCCUPIED BUILDING TIMES.  
IF REQUIRED BY THE AUTHORITY HAVING JURISDICTION: EF-1 AND HV-1 SHALL BE ENERGIZED AND THE MOTORIZED DAMPER IN LOUVER L-1 SHALL OPEN BY THE COMBINATION CO / NO<sub>2</sub> MONITOR IN THE EVENT THAT CO LEVELS RISE ABOVE 25 PPM OR NO<sub>2</sub> LEVELS RISE ABOVE 3 PPM DURING OCCUPIED OR UNOCCUPIED BUILDING TIMES. IF ENERGIZED BY THE CO / NO<sub>2</sub> MONITOR, HV-1 AND EF-1 SHALL OPERATE UNTIL CO & NO<sub>2</sub> LEVELS DROP BELOW 25 PPM & 3 PPM RESPECTIVELY AND CONTINUE TO OPERATE FOR 30 MINUTES AFTER LEVELS DROP.  
HV-1 SHALL CONTINUE TO OPERATE DURING OCCUPIED HOURS.

HEATING & VENTILATING UNIT SCHEDULE															
MARK	CAMBRIDGE MODEL NO.	SUPPLY FAN				GAS HEATING				MIN CFM G.A.	VOLTAGE	FILTERS		APPROX. WEIGHT ( LBS )	REMARKS
		CFM	ESP ("WC)	TSP ("WC)	HP	MBH IN	MBH OUT	EAT "F DB	LAT "F DB			SIZE	TYPE		
HV-1	S-400	1,897	-	.25"	1	400	360	0	160	1,897	240V 3 PH	2"	WASHABLE	1,285	<span>Ⓢ</span>

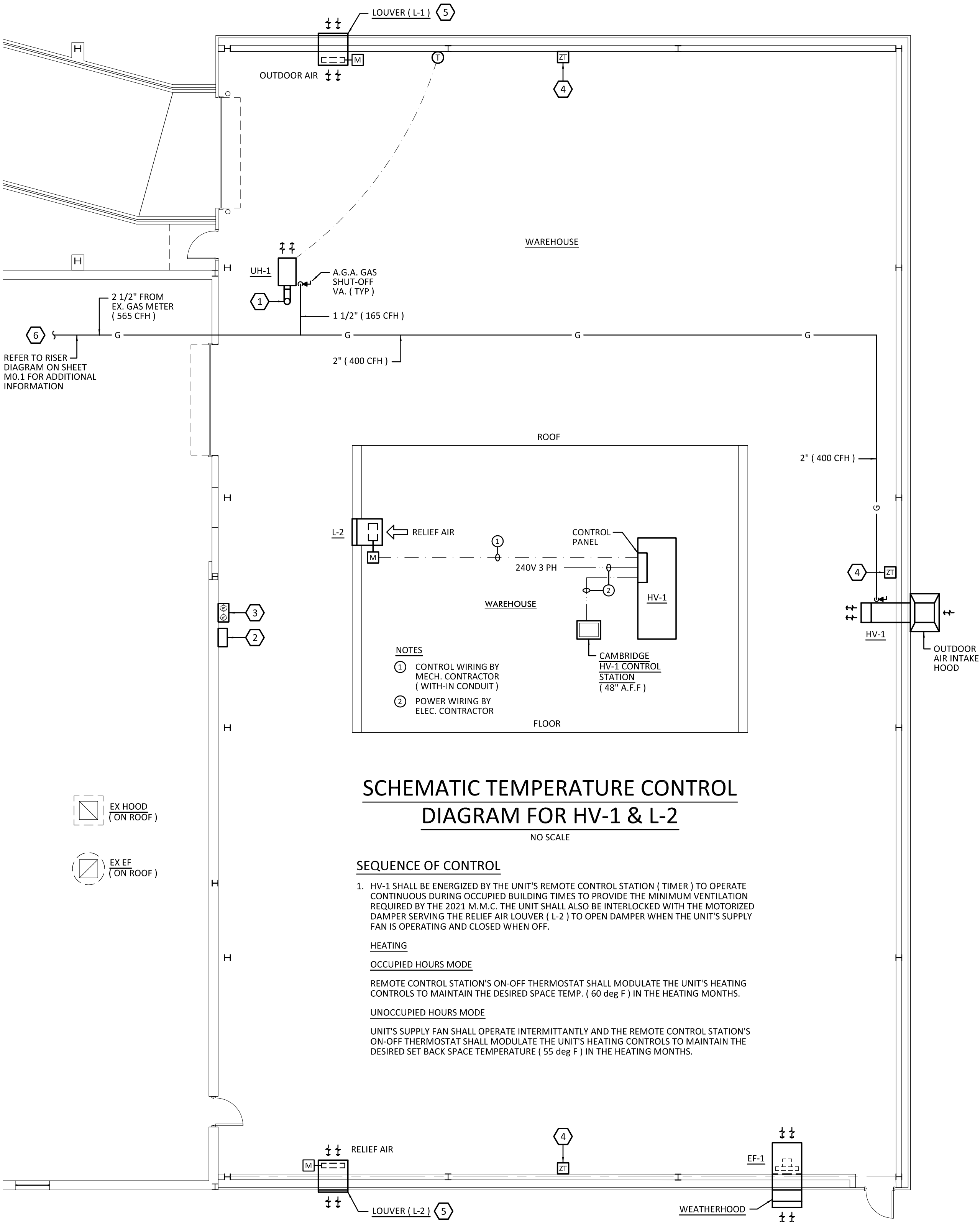
Ⓢ PROVIDE HEATING AND VENTILATING UNIT COMPLETE WITH THE FOLLOWING:  
1. ACCEPTABLE EQUIVALENT MANUFACTURERS INCLUDE CAMBRIDGE.  
2. FACTORY MOUNTED AND WIRED DISCONNECT SWITCH AND 120 V GFI RECEPTACLE.  
3. UNIT SHALL BE VERTICAL WALL MOUNTED UPBLAST ARRANGEMENT  
4. PROVIDE WITH ALL REQUIRED MOUNTING ACCESSORIES SPECIFIC TO UNIT.  
5. PROVIDE WEATHER INLET HOOD WITH BIRDSCREEN AND 2" V-BANK FILTER SECTION  
6. FURNISH WITH REMOTE CONTROL STATION INCLUDING OPERATING THERMOSTAT  
7. CLOGGED FILTER SWITCH AND ALARM LIGHT.  
8. PROVIDE CONTROLS WITH TERMINALS FOR INTERLOCKING WITH EF-1 & TIME CLOCK  
9. PROVIDE MOTORIZED 2 POSITION INLET AND OUTLET DAMPERS.  
10. PROVIDE WITH ( 2 ) DIRECTIONAL ELBOWS ( 45 DEG ).

EXHAUST FAN SCHEDULE									
MARK	GREENHECK MODEL No.	CFM	SP "WG	MOTOR ( VARI-GREEN )		CONTROL	LOCATION	DRIVE	APPLICATION
EF-1	AER-24-VG	7,400	0.30	2	240 V 3 PH	T-STAT & GAS MONITOR	WAREHOUSE	DIRECT	SUMMER VENTILATION & CO / NO <sub>2</sub> DEMAND EXHAUST
EF-2	SP-A200	160	0.25	67 W	120V 1 PH	INTERLOCK W/ LIGHTS	EX WOMEN'S TOILET RM	DIRECT	CEILING MOUNTED TOILET ROOM EXHAUST

Ⓢ COMPLETE WITH DISCONNECT SWITCH, BACKDRAFT DAMPER, WALL HOUSING WITH GRILLE AND WEATHERHOOD. PROVIDE ALL ACCESSORIES REQUIRED FOR WALL INSTALLATION. ( COORDINATE WITH ARCHITECTURAL TRADES ).

Ⓢ COMPLETE WITH DISCONNECT SWITCH, BACKDRAFT DAMPER AND WALL DISCHARGE CAP.

GAS FIRED UNIT HEATER SCHEDULE									
MARK	REZNOR MODEL No.	AREA SERVED	MBH		MOTOR		FLUE SIZE	APPROX. WEIGHT	REMARKS
			INPUT	OUTPUT	HP	VOLT			
UH-1	F-165	WAREHOUSE	165	132	1/8	120V - 1Ø	8" OVAL	200 lbs	PROVIDE WITH STANDARD REMOTE THERMOSTAT & ENCLOSED MOTOR



## SCHEMATIC TEMPERATURE CONTROL DIAGRAM FOR HV-1 & L-2

NO SCALE

### SEQUENCE OF CONTROL

1. HV-1 SHALL BE ENERGIZED BY THE UNIT'S REMOTE CONTROL STATION ( TIMER ) TO OPERATE CONTINUOUS DURING OCCUPIED BUILDING TIMES TO PROVIDE THE MINIMUM VENTILATION REQUIRED BY THE 2021 M.M.C. THE UNIT SHALL ALSO BE INTERLOCKED WITH THE MOTORIZED DAMPER SERVING THE RELIEF AIR LOUVER ( L-2 ) TO OPEN DAMPER WHEN THE UNIT'S SUPPLY FAN IS OPERATING AND CLOSED WHEN OFF.

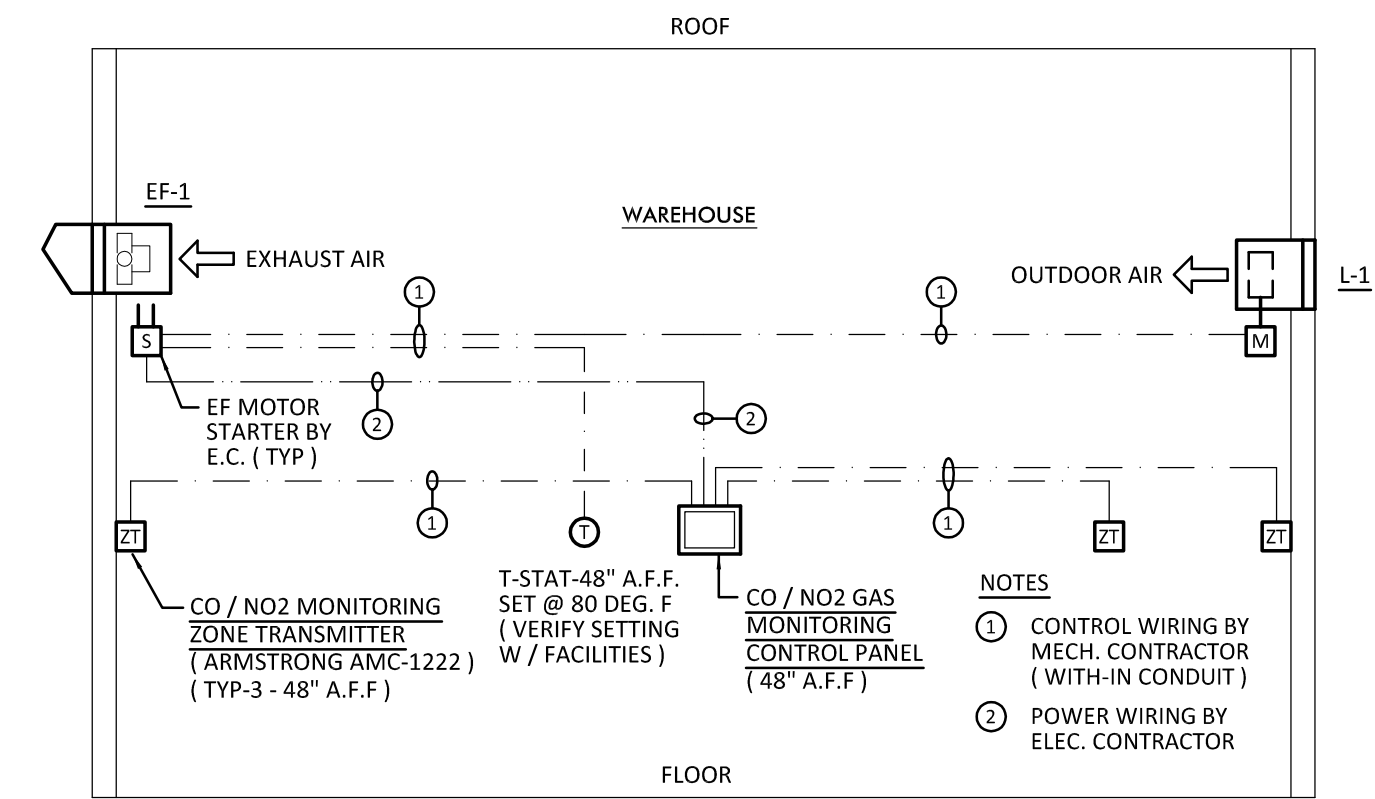
#### HEATING

#### OCCUPIED HOURS MODE

REMOTE CONTROL STATION'S ON-OFF THERMOSTAT SHALL MODULATE THE UNIT'S HEATING CONTROLS TO MAINTAIN THE DESIRED SPACE TEMP. ( 60 deg F ) IN THE HEATING MONTHS.

#### UNOCCUPIED HOURS MODE

UNIT'S SUPPLY FAN SHALL OPERATE INTERMITTANTLY AND THE REMOTE CONTROL STATION'S ON-OFF THERMOSTAT SHALL MODULATE THE UNIT'S HEATING CONTROLS TO MAINTAIN THE DESIRED SET BACK SPACE TEMPERATURE ( 55 deg F ) IN THE HEATING MONTHS.



## SCHEMATIC TEMPERATURE CONTROL DIAGRAM FOR EF-1, L-1 & CO / NO2 MONITORING SYSTEM

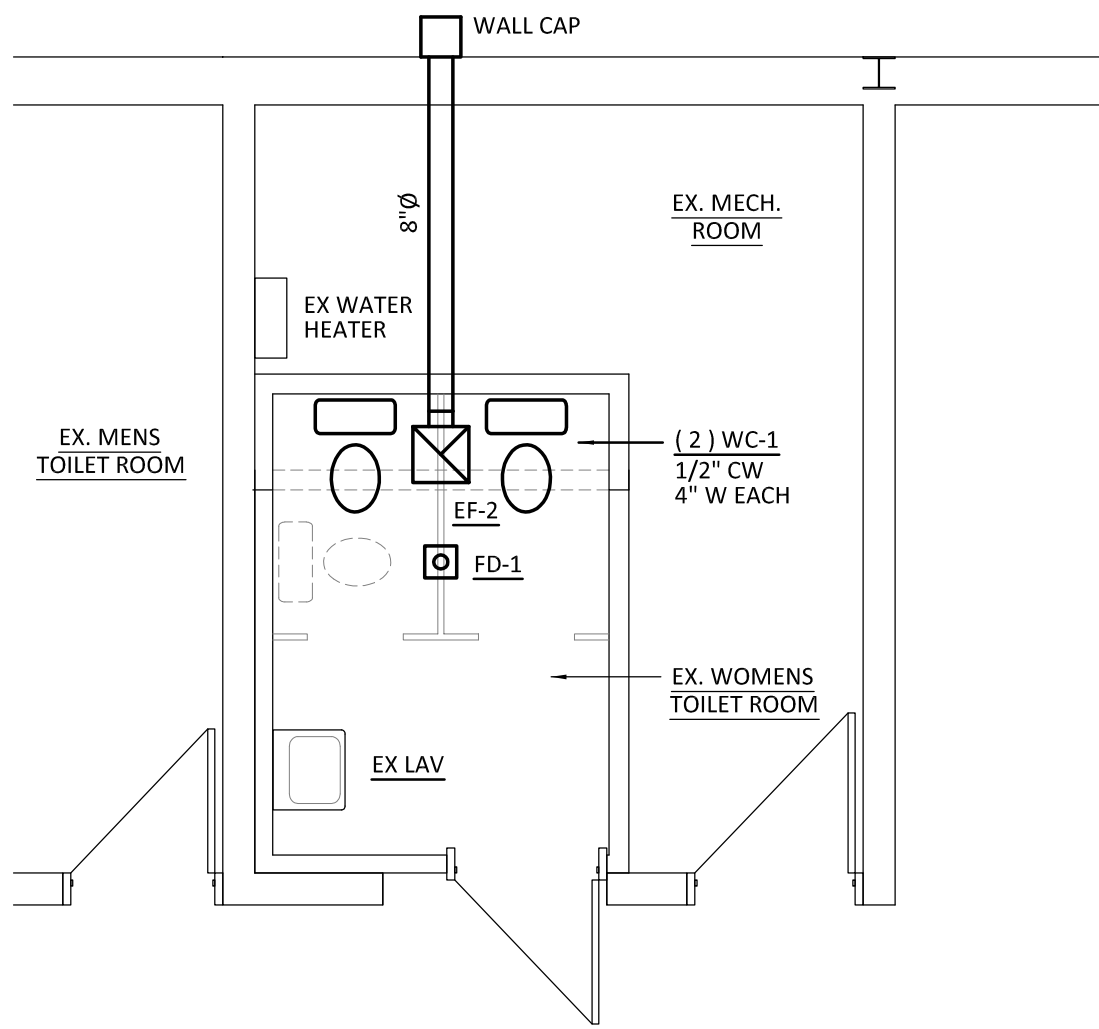
NO SCALE

### SEQUENCE OF CONTROL

1. THERMOSTAT SHALL ENERGIZE EXHAUST FAN ( EF-1 ) & FULLY OPEN MOTORIZED DAMPER IN LOUVER ( L-1 ) TO PROVIDE SUMMER VENTILATION FOR THE SPACE BASED ON THE SET POINT OF EF-1'S THERMOSTAT ( 80 deg F RECOMMENDED ). THE CO / NO<sub>2</sub> MONITOR SHALL OVERRIDE THE THERMOSTAT WHEN REQUIRED IF THE THERMOSTAT IS NOT CALLING FOR FAN OPERATION. ( FIELD VERIFY & COORDINATE WITH E.C. )

2. CO / NO<sub>2</sub> MONITOR ( EQUAL TO " ARMSTRONG " AMC-1AD ) SHALL ENERGIZE EF-1 AND FULLY OPEN THE MOTORIZED DAMPER FOR LOUVER ( L-1 ) TO PROVIDE THE MAXIMUM EXHAUST AIR REQUIRED ( 7,400 CFM ) IN THE EVENT THAT CO LEVELS RISE ABOVE 25 PPM AND / OR NO<sub>2</sub> LEVELS RISE ABOVE 3 PPM AT OCCUPIED OR UNOCCUPIED BUILDING TIMES. EF-1 ALONG WITH THE OUTDOOR AIR LOUVER ( L-1 ) WILL PROVIDE THE M.M.C. REQUIRED VENTILATION AIR ( .75 CFM / FT<sup>2</sup> ) UNTIL THE CO AND / OR NO<sub>2</sub> LEVELS DROP BELOW 25 PPM AND 3 PPM RESPECTIVELY AND CONTINUE TO OPERATE FOR 30 MINUTES AFTER THE LEVELS DROP AS REQUIRED BY THE M.M.C. ( THE CO / NO<sub>2</sub> MONITOR SHALL OVERRIDE THE THERMOSTAT WHEN REQUIRED IF THE THERMOSTAT NOT CALLING FOR FAN OPERATION )

3. MOTORIZED DAMPER FOR LOUVER ( L-1 ) SHALL BE FULLY CLOSED WHEN EF-1 IS OFF.



## RESTROOM MECHANICAL PLAN

SCALE: 1/4"=1'-0"

PLUMBING NOTE: REMOVE EXISTING WATER CLOSET & PROVIDE ( 2 ) NEW WATER CLOSETS AND ( 1 ) FLOOR DRAIN. PROVIDE NEW COLD WATER PIPING, SANITARY & VENT PIPING FOR WCS AND FD CONNECTED TO THE EXISTING PIPING SERVING THE REMOVED WATER CLOSET AND EXISTING LAVATORY. FIELD COORDINATE / VERIFY ALL REQ'D WORK. ( EX WOMEN'S TOILET RM )

PLUMBING CONTRACTOR SHALL FIELD VERIFY EXACT LOCATION, INVERT E.L.'S, SIZE & CONFIGURATION OF ALL EXIST. SANITARY, VENT & DOMESTIC WATER PIPING BEFORE PROCEEDING.

**SPECIAL TEMPERATURE CONTROLS NOTE**  
THE CONTROL DIAGRAMS AND SEQUENCE OF CONTROLS SHOWN ON THESE DRAWINGS ARE FOR DESIGN INTENT ONLY & MUST NOT BE CONSTRUED AS COMPLETE SYSTEM WIRING DIAGRAMS OR FINAL SEQUENCE OF CONTROLS. MECHANICAL CONTRACTOR MUST PROVIDE COMPLETE SHOP DRAWINGS INDICATING ALL CONTROL WIRING, SYSTEM COMPONENTS, COMPONENT MANUFACTURER AND APPLIED SEQUENCE OF CONTROLS FOR ALL SYSTEMS FOR THE ENGINEERS REVIEW BEFORE PURCHASING ANY EQUIPMENT OR PERFORMING ANY INSTALLATION. ALL CONTROL WIRING SHALL BE INSTALLED IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS.

### MECHANICAL GENERAL NOTES

1. THIS DRAWING IS DIAGRAMATIC & SHOULD BE USED TO DETERMINE THE DESIGN INTENT. THE M.C. SHALL FIELD VERIFY ALL WORK AND SHALL NOTIFY THE ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES IN THE DOCUMENTS BEFORE PROCEEDING. FAILURE TO DO SO WILL RESULT IN THE M.C. TAKING FULL RESPONSIBILITY & LIABILITY FOR SAID DISCREPANCIES.

2. ALL WORK SHALL BE DONE IN ACCORDANCE W / ALL LOCAL, STATE, COUNTY CODE REGULATIONS, OSHA, AND ADA.

3. DUE TO LIMITED SPACE IT IS CRITICAL THAT THE LOCATION OF ALL EQUIPMENT, PIPING & RELATED ACCESSORIES IN CEILING SPACE BE COORDINATED WITH ALL OTHER TRADES IN FIELD.

### MECHANICAL KEY NOTES

Ⓢ 8" DIA TYPE "B" FLUE DISCHARGE CAP MOUNTED ON PITCHED 12" H ROOF CURB. PROVIDE FLASHING & ALL REQUIRED SEALS FOR WATER TIGHT INSTALLATION. EXTEND AND TERMINATE AT CODE APPROVED HEIGHT. ( FIELD VERIFY WITH ROOF PITCH )

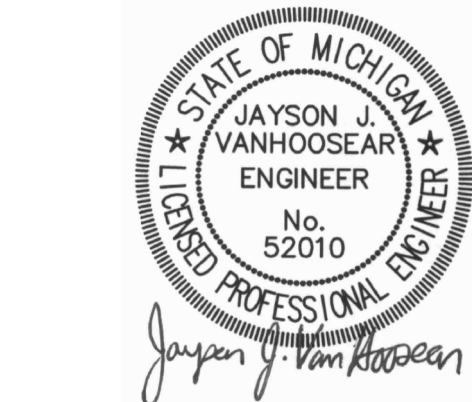
Ⓢ HV-1 CONTROL STATION WITH THERMOSTAT, CLOGGED FILTER SWITCH AND ALARM LIGHT.

Ⓢ CO / NO<sub>2</sub> MONITOR EQUAL TO " ARMSTRONG " AMC-1AD. FIELD VERIFY EXACT LOCATION ( SEE CONTROL DIAGRAM THIS SHEET )

Ⓢ REMOTE CO / NO<sub>2</sub> GAS SENSOR MONITORING MODULE EQUAL TO " ARMSTRONG " AMC-1222. FIELD VERIFY EXACT LOCATION ( REFER CONTROL DIAGRAM THIS SHEET )

Ⓢ LOUVER WITH 50% ( MIN ) FREE AREA PROVIDED BY ARCHITCTURAL TRADES. M.C. SHALL VERIFY THE SIZE INDICATED & REC'D FREE AREA IS PROVIDED. MOTORIZED DAMPER & CONTROLS BY M.C.

Ⓢ COORDINATE GAS LOAD REQUIRED FOR AREA WITH THE GAS UTILITY COMPANY. PROVIDE ALL ADJUSTMENTS IF NECESSARY TO GAS METER AND SERVICE TO SUPPORT 565 CFH WITH EXISTING GAS PRESSURE. ( COORDINATE IN FIELD )



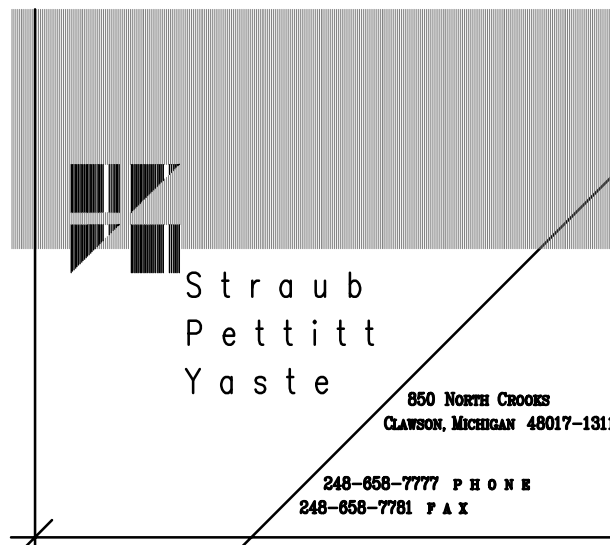
OWNER CHANGES  
ISSUED FOR PERMITS

5/16/25  
3/21/25

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443



Potapa - Van Hoosear  
Engineering, Inc.  
Consulting Engineers  
48653 Van Dyke Ave.  
Shelby Twp., MI 48317  
Phone: 586-997-0922

PLUMBING PLAN, HEATING  
AND VENTILATION PLAN,  
DETAILS & SCHEDULES

M1.1



FIRE PROTECTION NOTES

- THE FIRE PROTECTION CONTRACTOR ( F.P.C. ) SHALL PROVIDE A NEW SPRINKLER SYSTEM FOR THE BUILDING ADDITION TO FACILITATE THE NEW FLOOR PLAN AS REQUIRED PER THE LOCAL AUTHORITY HAVING JURISDICTION ( A.H.J. ) AND AS DETERMINED BY THE F.P.C. INSTALLING THE NEW COMPONENTS. THE SPRINKLER SYSTEM SHALL BE AN EXTENSION OF THE EXISTING SYSTEM OR NEW W/ AN A.S.R. F.P.C. SHALL FIELD VERIFY ALL REQUIREMENTS FOR COMPLETE INSTALLATION.
- ALL AREAS OF THE BUILDING ADDITION SHALL BE FULLY SPRINKLERED.
- FPC SHALL FIELD VERIFY EXISTING CONDITIONS AT THE SITE. NEW SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST NFPA 13, MICHIGAN BUILDING AND INTERNATIONAL FIRE CODES. FPC SHALL OBTAIN ALL REQUIRED PERMITS FROM ALL AUTHORITITIES HAVING JURISDICTION. FPC SHALL BE RESPONSIBLE FOR ALL FEES ASSOCIATED WITH OBTAINING APPROVALS.
- FPC SHALL COORDINATE SPRINKLER HEAD LOCATIONS & PIPE ROUTING WITH OTHER TRADES TO AVOID INTERFERENCES. THE FPC SHALL COORDINATE FINAL LOCATIONS AND ELEVATIONS OF PIPING AND SPRINKLER HEADS WITH ARCHITECT FOR APPROVAL.
- REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL PLANS FOR LOCATIONS OF CEILING DIFFUSERS, GRILLES, LIGHTS, AND OTHER CEILING ORNAMENTATION.
- ALL NEW FIRE PROTECTION PIPING SHAL BE INSTALLED TO ALLOW DRAINAGE BACK TO SYSTEM RISERS WHEN POSSIBLE. WHERE THIS IS IMPRACTICAL, AUXILIARY DRAINS SHALL BE INSTALLED AND DRAINED TO AN ACCEPTABLE LOCATION AS DETERMINED BY THE GENERAL CONTRACTOR OR OWNER'S REPRESENTATIVE..
- PROVIDE ESCUTCHEON PLATES FOR ALL PIPING AND HEAD PENETRATIONS THROUGH WALLS, FLOORS, AND CEILINGS.
- SYSTEM SHALL BE DESIGNED TO PROVIDE A DENSITY OF 0.15 GPM/SQ.FT. OVER THE MOST REMOTE 1500 SQ.FT. FOR ORDINARY HAZARD GROUP I OCCUPANCIES FOR ALL AREAS SPRINKLER HEAD SPACING AND COVERAGE AREA SHALL BE IN ACCORDANCE WITH NFPA REQUIREMENTS. HYDRAULIC CALCULATIONS SHALL INCLUDE 100 GPM FOR THE OUTSIDE HOSE DEMAND. ( FPC SHALL VERIFY HAZARD GROUP OCCUPANCY W/ A.H.J. BEFORE SUBMITTING BID & PROCEEDING W/ HYDRAULIC CALCULATIONS.
- FPC IS RESPONSIBLE FOR CORE DRILLING ALL PENETRATIONS REQUIRED TO COMPLETE THEIR WORK. PROVIDE SLEEVES AND FIRESTOP SEALANTS WHERE PIPES PENETRATE FIRE RATED WALLS. COMPLY WITH ASTM E-814 AND UL 1479. PROVIDE SLEEVES IN ALL WALL PENETRATIONS: SCHEDULE 40 IN MASONRY AND CONCRETE WALLS, SHEET METAL IN DRYWALL PARTITIONS. PENETRATIONS THROUGH EXTERIOR WALLS SHALL BE WEATHER TIGHT.
- ALL HANGER CONNECTIONS FOR PIPING 3" & LARGER SHALL BE FROM PANEL POINT ON TOP CHORD OF JOISTS. ALL HANGER CONNECTIONS FOR PIPING 2 1/2" & LESS SHALL BE WITHIN SIX INCHES FROM PANEL POINT ON TOP CHORD OF JOISTS. ALL PIPING SHALL BE SUPPORTED IN ACCORDANCE WITH NFPA 13.
- INSTALL ALL PIPING TIGHT TO BOTTOM CHORD OF JOIST WHENEVER POSSIBLE.
- IN AREAS WITH LAY-IN CEILINGS, SPRINKLERS SHALL BE PIPED WITH A SWING JOINT TO ALLOW CENTERING OF SPRINKLERS IN CEILING TILE WITH A ONE INCH VARIANCE IN EITHER DIRECTION.
- FPC MUST BE LICENSED BY THE STATE OF MICHIGAN TO PERFORM FIRE PROTECTION WORK.
- FPC SHALL FIELD VERIFY LOCATION OF MECHANICAL EQUIPMENT PER MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS, DUCTWORK, ROOF OPENINGS & FRAMING THAT WILL IMPACT SPRINKLER INSTALLATION.
- ALL PIPING AND HEAD LOCATIONS SHALL BE COORDINATED WITH OTHER TRADES TO AVOID INTERFERENCE AND CONFLICTS.
- FPC SHALL PROVIDE PIPE SUPPORTS AS REQUIRED PER NFPA 13-1996 ( RE: NOTE 10 ABOVE ).
- ALL SPRINKLERS TO BE INSTALLED IN BULKHEADS, SOFFITS, OR GYPSUM BOARD CEILINGS SHALL BE CONCEALED TYPE WITH COVER PLATE. COLOR OF COVER PLATE SHALL MATCH AREA AND BE COORDINATED WITH ARCHITECT AT INSTALLATION.
- ALL UPRIGHT SPRINKLER HEADS SHALL BE INSTALLED WITH A MAX. 12" DEFLECTOR DISTANCE.
- PROVIDE HIGH TEMPERATURE HEADS AS REQUIRED NEAR HIGH HEAT GENERATING EQUIPMENT AND APPLIANCES.
- TWO (2) LEVELS OF PROTECTION SHALL BE REQUIRED OVER AREAS WITH CEILINGS IF CONSTRUCTION OF PERIMETER BULKHEADS AND WALLS ARE NOT INSTALLED TO THE ROOF DECK.
- ALL PIPING AND HEAD LOCATIONS SHALL BE COORDINATED WITH OTHER TRADES TO AVOID INTERFERENCES AND CONFLICTS.
- ALL PIPING 1 1/4" DIAMETER AND SMALLER SHALL BE SCHEDULE 40 BLACK STEEL PIPE WITH CLASS 125 - 175 PSI THREADED FITTINGS OR UL LISTED AND ASTM F442 APPROVED CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPING EQUIVALENT TO BLAZEMASTER ( INSTALLED PER MANUFACTURERS INSTALLATION REQUIREMENTS ). ALL PIPING 1 1/2" DIAMETER AND LARGER SHALL BE SCHEDULE 10 BLACK STEEL PIPE WITH GROOVED TYPE FITTINGS.
- PROVIDE TAGS ON ALL VALVES AND LABELS ON CONCEALED PIPING.
- PROVIDE AUXILIARY DRAINS WITH VALVES, THREADED CAPS, AND TAGS FOR EACH TRAPPED SECTION OF SPRINKLER PIPING. PROVIDE ACCESS DOORS AT EACH DRAIN LOCATION IF REQUIRED. COORDINATE DRAIN & ACCESS DOOR LOCATION WITH THE CONSTRUCTION MANAGER AND ALL OTHER TRADES PRIOR TO INSTALLATION.
- FPC SHALL LAYOUT SPRINKLER SYSTEM & PERFORM HYDRAULIC CALCULATIONS. FPC SHALL OBTAIN A FLOW TEST TO DETERMINE THAT THERE IS ADEQUATE PRESSURE & FLOW AVAILABLE FOR TO SERVE THE REVISED FIRE PROTECTION SYSTEM. FPC SHALL NOTIFY THE ENGINEER OF RECORD IMMEDIATELY IF THE NEW SYSTEM FLOW OR PRESSURE EXCEEDS WHAT IS AVAILABLE AT EXISTING RISER. PROVIDE SUBMITTALS OF THE SPRINKLER SYSTEM LAYOUT, HYDRAULIC CALCULATIONS & FIRE PROTECTION EQUIPMENT TO THE AUTHORITY HAVING JURISDICTION & THE ENGINEER OF RECORD FOR REVIEW BEFORE PROCEEDING WITH ANY WORK.
- PROVIDE SPRINKLER HEAD CABINET NEAR RISERS WITH SPRINKLER WRENCH AND QUANTITY OF HEADS PER NFPA 13 FOR ALL SPRINKLER HEAD TYPES.
- FPC SHALL INSTALL NEW SPRINKLERS AS REQUIRED PER THE NEW LAYOUT & SHALL PROVIDE SPRINKLERS OF THE SAME TYPE, TEMPERATURE RATING, K-FACTOR, AND MANUFACTURER OF THE EXISTING SPRINKLER HEADS IF POSSIBLE.
- FPC SHALL INSTALL FIRE EXTINGUISHERS AS REQ'D, COORDINATE WITH ARCHITECT FOR LOCATIONS.
- ADDITIONAL SPRINKLERS SHALL BE REQUIRED UNDER OBSTRUCTIONS, LARGE DUCTS, ETC. AS REQUIRED FOR NFPA 13, REFER TO MECHANICAL & ARCHITECTURAL PLANS FOR OBSTRUCTIONS AND DUCT SIZES.
- ALL SPRINKLER PIPING SHALL BE HYDROSTATICALLY PRESSURE TESTED AT 200 PSI FOR TWO HOURS WITH NO LEAKAGE. ALL LEAKS SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE. REPAIRS SHALL BE MADE BY TIGHTENING OR REPLACEMENT OF FITTINGS, CAULKING OR WRAPPING OF JOINTS SHALL NOT BE ALLOWED.
- FPC SHALL PROVIDE FINAL SYSTEM LAYOUT OF SPRINKLER PIPING, HEAD LOCATIONS, HEAD TYPES, PIPE SIZES, PIPE ELEVATIONS, AND HYDRAULIC CALCULATIONS TO THE ENGINEER OF RECORD AND TO THE AUTHORITY HAVING JURISDICTION FOR REVIEW BEFORE PROCEEDING WITH ANY WORK.
- FPC SHALL SUBMIT ALL REQUIRED PLANS AND CALCULATIONS TO LOCAL AUTHORITY HAVING JURISDICTION AS WELL AS ARCHITECT OF RECORD FOR APPROVAL OF PIPE ROUTING AND SPRINKLER HEAD LOCATIONS.
- ACCEPTABLE MANUFACTURERS FOR FIRE PROTECTION EQUIP., VALVES, SPRINKLER HEAD & ACCESSORIES TO BE INSTALLED SHALL INCLUDE: VIKING, TYCO, CENTRAL, RELIABLE, GUARDIAN, AES CO., ELKHART BRASS, VICTAULIC, HERSEY, ORION, AKRON BRASS, HYDRO FLOW, POTTER-ROEMER, FIRE PROTECTION PRODUCTS, FLEX-ARM, 3M, AMES, WATTS, APOLLO, FIREMATIC, ASCO, FLEXHEAD, SYSTEM SENSOR AND HARRINGTON SIGNAL. MANUFACTURER SHALL BE APPROVED BY BUILDING OWNER
- FPC SHALL COORDINATE TYPE OF HEAD REQUIRED ( IE: CONCEALED, PENDANT ) AND COLOR / FINISH WITH ARCHITECT PRIOR TO FINALIZING BID.

FIRE PROTECTION SPECIFICATIONS

SCOPE

THE ENTIRE INSTALLATION SHALL CONFORM TO THE RULES AND REGULATIONS OF THE STATE OF MICHIGAN, NFPA, UL, FM, IRI, BUILDING OWNER'S INSURANCE UNDERWRITER AND ANY OTHER CODES HAVING JURISDICTION. IN THE EVENT OF CONFLICT BETWEEN APPLICABLE CODES THE MORE STRINGENT REQUIREMENTS SHALL GOVERN. THE SPRINKLER SYSTEM SHALL BE A HYDRAULICALLY DESIGNED AND CALCULATED NEW SYSTEM WITH ALL NEW DEVICES PROVIDED AS REQUIRED TO CONFORM TO ALL STATE AND LOCAL CODES.

COMPLETE INSTALLATION SHALL INCLUDE ALL PIPING, HEADS, AND SPECIALTIES, AND ALL REQUIRED ACCESS PANELS FOR A COMPLETE OPERABLE AND APPROVED SYSTEM.

AUTOMATIC FIRE SPRINKLING SHALL BE PROVIDED FOR ALL AREAS OF THE BLDG.

SUBMIT COMPLETE SYSTEM CONSTRUCTION SHOP DRAWINGS FOR ALL SPRINKLER SYSTEMS FOR REVIEW AND APPROVAL PRIOR TO START OF ANY INSTALLATION OF SYSTEM. ALL SHOP DRAWINGS SHOWING FIRE PROTECTION WORK SHALL FIRST BE SUBMITTED TO THE PROPER INSURANCE COMPANY, STATE AND LOCAL FIRE MARSHAL FOR THEIR SIGNED SEAL OF APPROVAL PRIOR TO SUBMITTAL TO THE ENGINEER/ARCHITECT

ARRANGE AND PAY FOR ALL FEES, COSTS, INSPECTIONS AND PERMITS RELATED TO THE FIRE PROTECTION WORK.

PIPE MATERIALS AND FITTINGS

PIPE: SCHEDULE 40 BLACK STEEL ASTM A53.

FITTINGS:

STANDARD WEIGHT CAST IRON SCREWED FITTINGS, CLASS 125 CONFORMING TO ANSI STANDARD B16.4 EXCEPT WHERE FLANGED JOINTS ARE REQUIRED BY CODES

VITAULIC STYLE 75 FOR CUT GROOVE PIPING METHOD WITH GASKETS AS RECOMMENDED FOR SERVICE.

APPROVED MANUFACTURES:

VICTAULIC  
AEROQUIP  
ITT GRINNELL

SPRINKLER HEADS

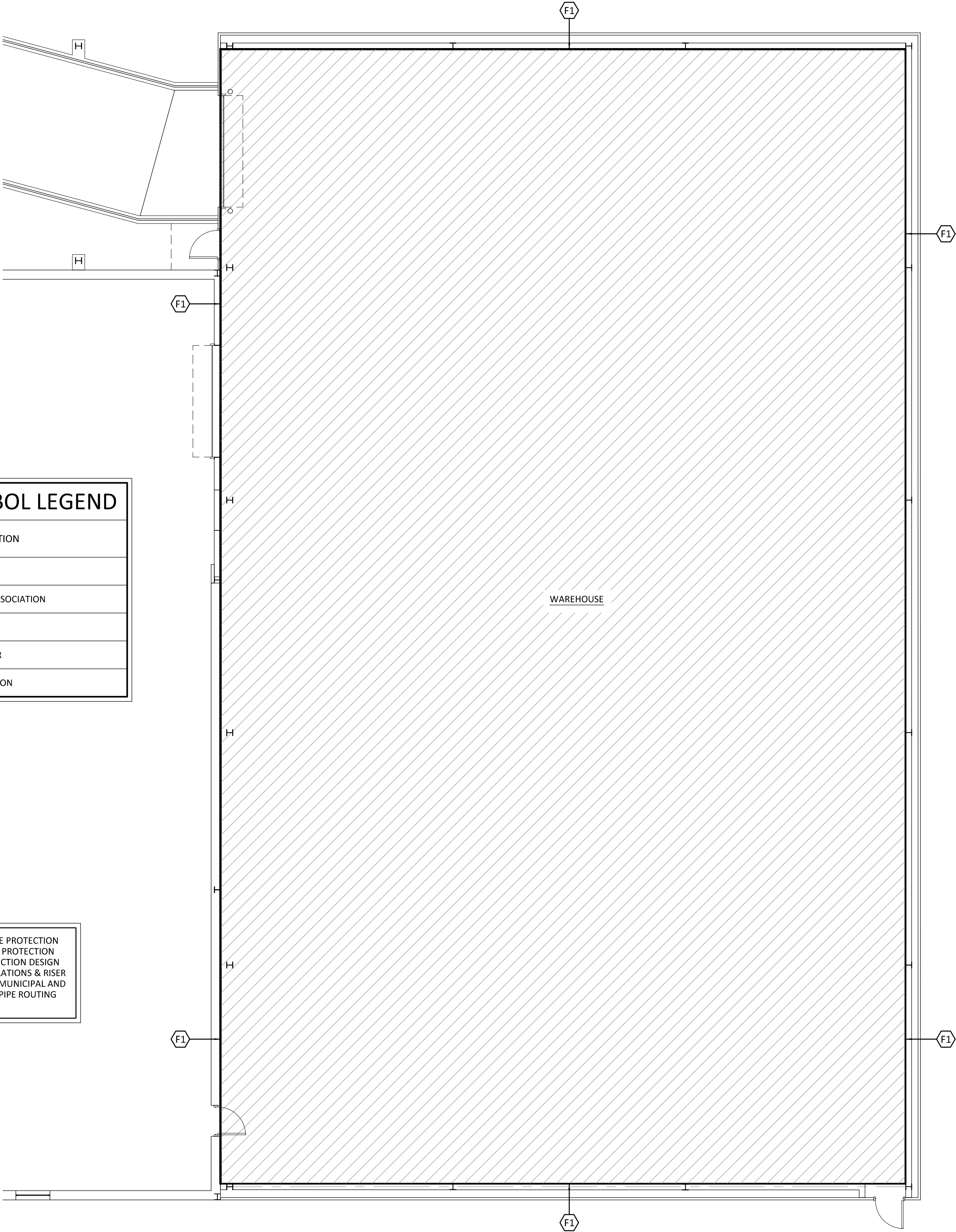
EXPOSED CONSTRUCTION:

- UPRIGHT AUTOMATIC SPRAY TYPE RATED AT 165° F ( QUICK RELEASE )

FIRE PROTECTION SYMBOL LEGEND

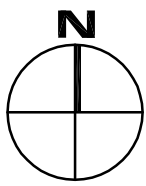
SYMBOL	DESCRIPTION
V.I.F.	VERIFY IN FIELD
N.F.P.A.	NATIONAL FIRE PROTECTION ASSOCIATION
I.F.C.	INTERNATIONAL FIRE CODE
F.P.C.	FIRE PROTECTION CONTRACTOR
A.H.J.	AUTHORITY HAVING JURISDICTION

ALL ITEMS INDICATED ON PLANS & DETAILS FOR FIRE PROTECTION SPRINKLER SYSTEM ARE FOR REFERENCE ONLY. FIRE PROTECTION CONTRACTOR IS RESPONSIBLE FOR FULL FIRE PROTECTION DESIGN AND INSTALLATION, INCLUDING HYDRAULIC CALCULATIONS & RISER COMPONENTS ( IF REQUIRED ) COMPATABLE WITH MUNICIPAL AND CURRENT CODE REQUIREMENTS. COORDINATE ALL PIPE ROUTING WITH ALL OTHER TRADES IN FIELD.



FIRE PROTECTION PLAN

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



GENERAL FIRE PROTECTION NOTES:

- THIS DRAWING IS DIAGRAMATIC & SHOULD BE USED TO DETERMINE THE DESIGN INTENT. THE M.C. SHALL FIELD VERIFY ALL WORK AND SHALL NOTIFY THE ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES IN THE DOCUMENTS BEFORE PROCEEDING. FAILURE TO DO SO WILL RESULT IN THE M.C. TAKING FULL RESPONSIBILITY & LIABILITY FOR SAID DISCREPANCIES.
- ALL WORK SHALL BE DONE IN ACCORDANCE W / ALL LOCAL, STATE, COUNTY CODE REGULATIONS, OSHA, AND ADA.
- DUE TO LIMITED SPACE IT IS CRITICAL THAT THE LOCATION OF ALL PIPING & RELATED ACCESSORIES BE COORDINATED WITH ALL OTHER TRADES IN FIELD.
- COORDINATE THE EXACT LOCATION OF ALL CEILING MOUNTED AND WALL MOUNTED SPRINKLER HEADS WITH ARCHITECT'S REFLECTED CEILING PLAN, SECTIONS, ELEVATIONS, MECHANICAL & ELECTRICAL PLANS TO AVOID INTERFERENCES WITH DIFFUSERS, GRILLES, LIGHTS & OTHER WALL AND CEILING ORNAMENTATION.

FIRE PROTECTION KEY NOTES

- INSTALL NEW SPRINKLERS IN THIS AREA. FPC SHALL COORDINATE LOCATIONS WITH EXISTING EXPOSED CONSTRUCTION ALONG WITH NEW LIGHTING AND DUCT LAYOUT. FPC SHALL INSTALL NEW PIPING PIPING AS REQUIRED TO FACILITATE NEW SPRINKLER HEAD LAYOUT. FIELD VERIFY & COORDINATE ALL REQUIRED WORK.



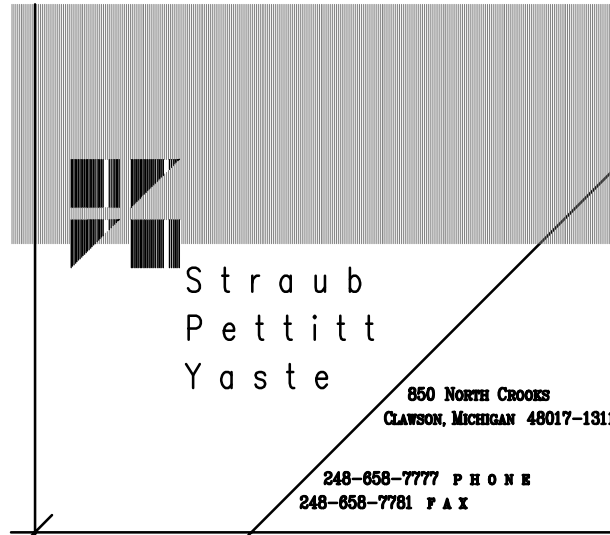
OWNER CHANGES  
ISSUED FOR PERMITS

5/16/25  
5/21/25

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443



FIRE PROTECTION PLAN,  
SPECIFICATIONS, NOTES  
& RISER DIAGRAM

M2.1



LIGHTING FIXTURE SCHEDULE	
TYPE	DESCRIPTION
"OA1"	LED FULL CUT-OFF TYPE WALL MOUNTED LUMINAIRE. HIGH OUTPUT LED LIGHT ENGINE USING ACCUED OPTICS SYSTEM, MODIFIED IES TYPE IV FORWARD THROW OPTICS, AND PROVIDING A TOTAL DELIVERED LUMEN OUTPUT OF 11,998 LUMENS AT A COLOR TEMPERATURE OF 4,000 DEGREE K AND A MINIMUM OF 70 CRI, RATED FOR A MINIMUM OF 100,000 HOURS OF CONTINUOUS OPERATION FROM MINUS 30 DEGREE C TO PLUS 40 DEGREE C. FIXTURE TO BE DLC COMPLIANT. FIXTURE TO HAVE A B.U.G. RATING OF B2-U0-G3. ALUMINIUM HOUSINGS. 15-11/16" WIDE X 6-1/2" HIGH X 12-1/8" DEEP. BRONZE FINISH. 800MA DRIVE CURRENT. TOTAL FIXTURE WATTAGE TO BE 86 WATTS. FIXTURE TO BE UL LISTED FOR WET LOCATION USE. FIXTURE TO INCLUDE INTEGRAL POWER SUPPLY (DRIVER), UL LISTED. FIXTURE TO INCLUDE WAVELINX PRO WIRELESS DIMMING, MOTION AND DAYLIGHT SENSOR TO ALLOW FOR MOTION CONTROL, WIRELESS TIME OF DAY ON/OFF CONTROL AND WIRELESS TIME OF DAY DIMMING CONTROL FOR THE FIXTURE, AND INDEPENDENT GROUPING OF FIXTURES BASED ON FIXTURE LOCATIONS. FIXTURE TO INCLUDE 10K SURGE MODULE. UNIVERSAL 120-277 VOLT OPERATION. 5-YEAR WARRANTY. MCGRAW-EDISON GALLEON WALL GWC-SA2B-740-U-T4FT-BZ-10K- WPS2BZ SERIES OR EQUAL KIM LIGHTING "WDM" (WITH NX WIRELESS CONTROLS) OR LITHONIA WEDG3 (WITH NUGHTAIR WIRELESS CONTROLS).
"OA2"	LED FULL CUT-OFF TYPE WALL MOUNTED LUMINAIRE. HIGH OUTPUT LED LIGHT ENGINE USING ACCUED OPTICS SYSTEM, MODIFIED IES TYPE II WITH SPILL LIGHT CONTROL OPTICS, AND PROVIDING A TOTAL DELIVERED LUMEN OUTPUT OF 4,874 LUMENS AT A COLOR TEMPERATURE OF 4,000 DEGREE K AND A MINIMUM OF 70 CRI, RATED FOR A MINIMUM OF 100,000 HOURS OF CONTINUOUS OPERATION FROM MINUS 30 DEGREE C TO PLUS 40 DEGREE C. FIXTURE TO BE DLC COMPLIANT. FIXTURE TO HAVE A B.U.G. RATING OF B1-U0-G2. ALUMINIUM HOUSING. 15-11/16" WIDE X 6-1/2" HIGH X 12-1/8" DEEP. BRONZE FINISH. 615MA DRIVE CURRENT. TOTAL FIXTURE WATTAGE TO BE 34 WATTS. FIXTURE TO BE UL LISTED FOR WET LOCATION USE. FIXTURE TO INCLUDE INTEGRAL POWER SUPPLY (DRIVER), UL LISTED. FIXTURE TO INCLUDE WAVELINX PRO WIRELESS DIMMING, MOTION AND DAYLIGHT SENSOR TO ALLOW FOR MOTION CONTROL, WIRELESS TIME OF DAY ON/OFF CONTROL AND WIRELESS TIME OF DAY DIMMING CONTROL FOR THE FIXTURE, AND INDEPENDENT GROUPING OF FIXTURES BASED ON FIXTURE LOCATIONS. FIXTURE TO INCLUDE 10K SURGE MODULE. UNIVERSAL 120-277 VOLT OPERATION. 5-YEAR WARRANTY. MCGRAW-EDISON GALLEON WALL GWC-SA1A-740-U-SL2-BZ-10K- WPS2BZ SERIES OR EQUAL KIM LIGHTING "WDM" (WITH NX WIRELESS CONTROLS) OR LITHONIA WEDG3 (WITH NUGHTAIR WIRELESS CONTROLS).
"OB"	LED CUT-OFF TYPE WALL MOUNTED LUMINAIRE PROVIDING "NORMALLY ON" AC AND EMERGENCY LIGHTING. HIGH OUTPUT LED LIGHT ENGINE USING A HIGH EFFICIENCY LED OPTICAL SYSTEM CONSISTING OF EIGHT (8) HIGH-POWER LEDS, AND PROVIDING A TOTAL LUMEN OUTPUT OF 1,530 LUMENS IN AC MODE AND 600 LUMENS IN EMERGENCY MODE. COLOR TEMPERATURE OF 3,000 DEGREE K AND A MINIMUM OF 70 CRI, L70 LUMEN MAINTENANCE OF 72,000 HOURS. FULLY SEALED AND GASKETED HOUSING, 9-9/16" WIDE X 6-7/8" HIGH X 2-7/8" DEEP. BRONZE FINISH. FIXTURE TO INCLUDE INTEGRAL PHOTO-CELL FOR DUSK-TO-DAWN OPERATION; 7.2-VOLT NICKEL CADMIUM BATTERY FOR 90-MINUTE OPERATION IN EMERGENCY MODE; INTEGRAL HEATER FOR LOW-TEMPERATURE BATTERY OPERATION, WITH AN OPERATING TEMPERATURE RANGE OF -25-DEGREE C TO 30-DEGREE C. SELF-DIAGNOSTIC / SELF-TEST FEATURE TO MONITOR PROPER FIXTURE OPERATION. INTEGRAL WATER-PROOF TEST SWITCH AND AC-ON INDICATOR. UL924 LISTED. TOTAL FIXTURE WATTAGE TO BE 32 WATTS WITH THE HEATER; 17 WATT FOR LIGHTING PORTION ONLY. FIXTURE TO BE UL LISTED FOR WET LOCATION USE. FIXTURE TO INCLUDE INTEGRAL POWER SUPPLY (DRIVER), UL LISTED. UNIVERSAL 120-277 VOLT OPERATION. 5-YEAR WARRANTY. ISOLITE "OWL" OWL-EM-BZ-MB-HX SERIES OR EQUAL MULE LIGHTING.
"LA"	SOLID-STATE TYPE SUSPENDED HIGH-BAY LED LIGHT FIXTURE. LED ENGINE TO BE 4,000 DEGREE K, WITH 80 CRI AND A DELIVERED LUMEN OUTPUT OF 24,751 LUMENS (24,000 LUMEN OPTION), WITH WIDE DISTRIBUTION. L70 PER TM-21 CALCULATIONS OF 117,000 HOURS. 5-YEAR WARRANTY. CODE GAUGE STEEL CONSTRUCTION WITH STEEL END CAPS FOR MAXIMUM RIGIDITY. WIDE DISTRIBUTION LENS OPTION CONSTRUCTED OF FROSTED ACRYLIC TO DIFFUSE LEDS AND MINIMIZE GLARE. FIXTURE TO INCLUDE CABLE KIT CONSISTING OF TWO (2) 10 FOOT AIRCRAFT CABLES (ONE PAIR) FOR SUSPENSION MOUNTING OF THE FIXTURE AT THE ELEVATION NOTED ON THE FLOOR PLANS. UV HIGH IMPACT FROSTED. POLYCARBONATE LENS WITH WIDE DISTRIBUTION. 15-5/8" WIDE X 23-1/2" LONG X 2-7/8" DEEP. HIGH-EFFICIENCY ELECTRONIC LED DRIVER MOUNTED IN CENTER CHANNEL OF FIXTURE. INPUT WATTAGE OF FIXTURE IS 147 WATTS, WITH AN EFFICACY OF 168 LUMENS PER WATT. 0-10V DIMMING DRIVER STANDARD. COOPER WAVELINX PRO IN-FIXTURE WIRELESS CONTROL, OPTION WITH PASSIVE INFRARED OCCUPANCY AND DIMMING DAYLIGHT HARVESTING SENSOR AND WAVELINX WIRELESS RADIO, SUITABLE FOR MOUNTING HEIGHT NOTED ON FLOOR PLANS. FIVE-YEAR LIMITED WARRANTY. UNIVERSAL 120-277 VOLT OPERATION, THERMALLY PROTECTED, U.L. LISTED AND LABELED. METALUX "OHB" OHB-245E-W-UNV -L840-CD-WPS4-Y-TOGGLE-10-2PK OR EQUAL COLUMBIA LIGHTING PELOTON OR LITHONIA.
"LA-EM"	SIMILAR TO TYPE "LA" EXCEPT WITH EMERGENCY DRIVER CAPABLE OF DRIVING THE FIXTURE AT 20 WATTS FOR 90 MINUTES, PROVIDING A TOTAL LUMEN OUTPUT OF APPROXIMATELY 3,360 LUMENS. EMERGENCY DRIVER TO BE FACTORY INSTALLED IN FIXTURE. METALUX "OHB" OHB-245E-W-120-L840-EL20W-CD-WPS4 -Y-TOGGLE-10-2PK OR EQUAL COLUMBIA LIGHTING PELOTON OR LITHONIA.
"XA"	UNIVERSAL MOUNTING "EXIT" LIGHT FIXTURE, HIGH BRIGHTNESS LEDS, 25 YEAR LIFE, ACRYLIC DIFFUSING LENS, SINGLE FACE, ARROWS AS INDICATED ON PLAN, POLYCARBONATE HOUSING AND FACE, 6" RED LETTERS, WHITE FINISH, LED POWER SUPPLY CIRCUIT, SEALED NICKEL CADMIUM BATTERY AND CHARGER, UNIVERSAL 120-277 VOLT OPERATION. ISOLITE RL-EM-R-U-WH-METB SERIES OR EQUAL SURE-LITES LPX7 SERIES, LIGHTALARMS, DUAL-LITE OR LITHONIA.
"XB"	SIMILAR TO TYPE "XA" EXCEPT DOUBLE FACE.

ELECTRICAL SYMBOL LIST	
SYMBOL	DESCRIPTION
	SITE LIGHTING FIXTURE - BUILDING MOUNTED. SEE FIXTURE SCHEDULE
S	SINGLE POLE SWITCH
S 3	THREE WAY SWITCH
S 4	FOUR WAY SWITCH
S A	WALL MOUNTED OCCUPANCY SENSOR LIGHT SWITCH ("AUTOMATIC SWITCH")
	FLUORESCENT LIGHT FIXTURE, TYPE AS INDICATED ON FLOOR PLANS
	ROUND FLUORESCENT, LED OR INCANDESCENT FIXTURE
	SQUARE LIGHT FIXTURE, TYPE AS INDICATED ON FLOOR PLANS
	WALL MOUNTED LIGHTING FIXTURE, TYPE AS INDICATED ON PLANS.
	DUPLEX RECEPTACLE
	DOUBLE DUPLEX RECEPTACLE
	DUPLEX RECEPTACLE MOUNTED 6" ABOVE COUNTER TOP (OR AT 42" A.F.F)
	SPECIAL PURPOSE OUTLET
	LOW VOLTAGE / DATA OUTLET
	PANELBOARD
	JUNCTION BOX
	SINGLE PHASE MOTOR
	THREE PHASE MOTOR
	MANUAL MOTOR STARTER WITH OVERLOADS (P= WITH PILOT LIGHT)
	COMBINATION MAGNETIC MOTOR STARTER
	DISCONNECT SWITCH
N.L.	NIGHT LIGHT
EM	EMERGENCY
AFF	ABOVE FINISHED FLOOR
WP	WEATHERPROOF
GFI	GROUND FAULT INTERRUPTER

ELECTRICAL DRAWING INDEX	
SHEET NUMBER	SHEET TITLE
E001	ELECTRICAL SYMBOL LIST, LIGHTING FIXTURE SCHEDULE & ELECTRICAL GENERAL NOTES
E100	PARTIAL FLOOR PLAN - LIGHTING DEMOLITION & NEW WORK
E200	PARTIAL FLOOR PLAN - POWER & SYSTEMS DEMOLITION & NEW WORK
E300	PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK
E310	ELECTRICAL SCHEDULES
E311	ELECTRICAL SCHEDULES
E312	ELECTRICAL SCHEDULES
E400	MISCELLANEOUS DIAGRAMS AND DETAILS
E401	MISCELLANEOUS DIAGRAMS AND DETAILS
E500	ELECTRICAL SPECIFICATIONS
E501	ELECTRICAL SPECIFICATIONS
E502	ELECTRICAL SPECIFICATIONS
E503	ELECTRICAL SPECIFICATIONS
E504	ELECTRICAL SPECIFICATIONS
E505	ELECTRICAL SPECIFICATIONS
EX100	PARTIAL FLOOR PLAN - EMERGENCY EGRESS LIGHTING PHOTOMETRY

ELECTRICAL GENERAL NOTES	
1.	EXTENT OF DEMOLITION IS NOT INTENDED TO BE SHOWN IN FULL ON THESE DRAWINGS. FINAL DESIGNED CONDITIONS ARE SHOWN. EACH TRADE/CONTRACTOR IS RESPONSIBLE FOR REMOVAL AS REQUIRED TO ACHIEVE FINAL DESIGN CONDITIONS. REFERENCES TO EXISTING AS IDENTIFIED ARE TO CLARIFY SCOPE OF NEW CONSTRUCTION.
2.	ALL WORK CONDITIONS ARE TO BE FIELD VERIFIED AND DETAILS ADJUSTED AS REQUIRED TO MAINTAIN FIRE RESISTIVE RATINGS. INTEGRITY OF INSTALLED SYSTEMS (EXISTING AND NEW) AND THE MATCHING OF WORK WITH EXISTING CONDITIONS AND FINISHES.
3.	REMOVAL WORK SHALL BE EXECUTED WITH DUE CARE, INCLUDING PROTECTION OF EXISTING MATERIALS/SYSTEMS TO REMAIN SHORING, BRACING, ETC. EACH TRADE/SUBCONTRACTORS WILL BE RESPONSIBLE FOR ANY DAMAGE THEY CAUSE TO OTHER'S WORK.
4.	THE FULL EXTENT OF THE WORK FOR EACH TRADE IS IDENTIFIED THROUGHOUT ALL THE DRAWINGS. DO NOT ASSUME OR OMIT INDIVIDUAL TRADE WORK NOT SHOWN IN THE INDIVIDUAL TRADE DRAWINGS. FAILURE TO REVIEW ALL DRAWINGS FOR AN INDIVIDUAL TRADE'S COMPLETE SCOPE OF WORK WILL RESULT IN DENIAL FOR ANY CHANGE ORDER REQUESTS FOR MISSED ITEMS DURING BIDDING.
5.	SUBCONTRACTORS AND ALL TRADES MUST EXAMINE AREAS, DIMENSIONS CONDITIONS AND SUBSTRATES AFFECTING THE WORK. AND THE CONDITIONS UNDER WHICH THE WORK IS TO BE INSTALLED, APPLIED AND COMPLETED. NOTIFY THE ARCHITECT IN WRITING OF UNSATISFACTORY CONDITIONS AND OTHER CONDITIONS DETRIMENTAL TO THE PROPER AND TIMELY COMPLETION OF THE WORK. <div><div>A. DO NOT PROCEED WITH THE WORK UNTIL THE UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED IN THE MANNER ACCEPTABLE TO THE CONTRACTOR OR TRADE PERFORMING THE WORK. PROCEED WITH INSTALLATION ONLY AFTER UNSAFE OR UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.</div><div>B. BEGINNING WORK MEANS ACCEPTANCE OF THE CONDITIONS.</div><div>C. NO CHANGE ORDERS FOR ADDITIONAL WORK WILL BE ACCEPTED FOR CONDITIONS NOT IDENTIFIED DURING THE EXAMINATION PERIOD PRIOR TO THE COMMENCING OF WORK.</div></div>
6.	CONTRACTOR(S) WARRANTS THEY HAVE EXAMINED THOROUGHLY ALL DRAWINGS AND SPECIFICATIONS DIRECTLY AND INDIRECTLY RELATED TO THEIR WORK. BY BEGINNING THE WORK, CONTRACTOR CERTIFIES THAT ALL NECESSARY ITEMS REQUIRED TO PERFORM HIS WORK HAVE BEEN IDENTIFIED AND DOCUMENTED IN THE DRAWINGS AND/OR SPECIFICATIONS. <div><div>A. NOTIFY THE ARCHITECT IN WRITING OF ANY DISCREPANCIES, MISSING INFORMATION OR ANY UNCLEAR ITEMS WHICH WILL AFFECT THE WORK TO BE PERFORMED. DO NOT PROCEED WITH THE WORK UNTIL THE DISCREPANCIES, MISSING INFORMATION OR ANY UNCLEAR ITEMS HAVE BEEN CLARIFIED OR CORRECTED TO THE CONTRACTOR OR TRADE PERFORMING THE WORK.</div><div>B. BEGINNING THE WORK INDICATES FULL ACCEPTANCE AND CORRECTNESS OF THE INFORMATION PROVIDED.</div><div>C. NO CHANGE ORDERS FOR ADDITIONAL WORK WILL BE ACCEPTED FOR ANY DISCREPANCIES, MISSING INFORMATION OR UNCLEAR ITEMS OR INFORMATION NOT IDENTIFIED DURING THE EXAMINATION PERIOD PRIOR TO THE COMMENCING OF WORK.</div></div>
7.	THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY FIRESTOPPING AROUND ALL PENETRATIONS OF FIRE RATED WALLS, CEILINGS AND FLOORS. REFER TO ARCHITECTURAL AND ELECTRICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION REGARDING THE SPECIFIC FIRESTOPPING REQUIREMENTS AND PRODUCT SPECIFICATIONS.
8.	ALL ANCHORS FOR ELECTRICAL SYSTEMS SHALL BE STEEL. REFER TO SPECIFICATIONS FOR SPECIFIC APPROVED PRODUCTS. <b>UNDER NO CIRCUMSTANCES SHALL PLASTIC ANCHORS BE USED.</b>

TAC ASSOCIATES, LLC  
Consulting Engineers  
4321 East Camden Road  
Oshtemo, MI 49266  
Ph: (517) 254-4789 • Fax: (517) 254-4886  
http://www.tac-associates.com  
TAC Project No. 25-002

THOMAS GERARD EROW  
ENGINEER  
License No. 3201055658  
EXPIRES 01/01/2025  
SEAL & SIGNED 03/21/2025. SEAL APPLIES ONLY TO THE ELECTRICAL DOCUMENTS PREPARED BY TAC ASSOCIATES, LLC

ISSUED FOR PERMITS03/21/2025

OAKWOOD VENEER COMPANY

WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

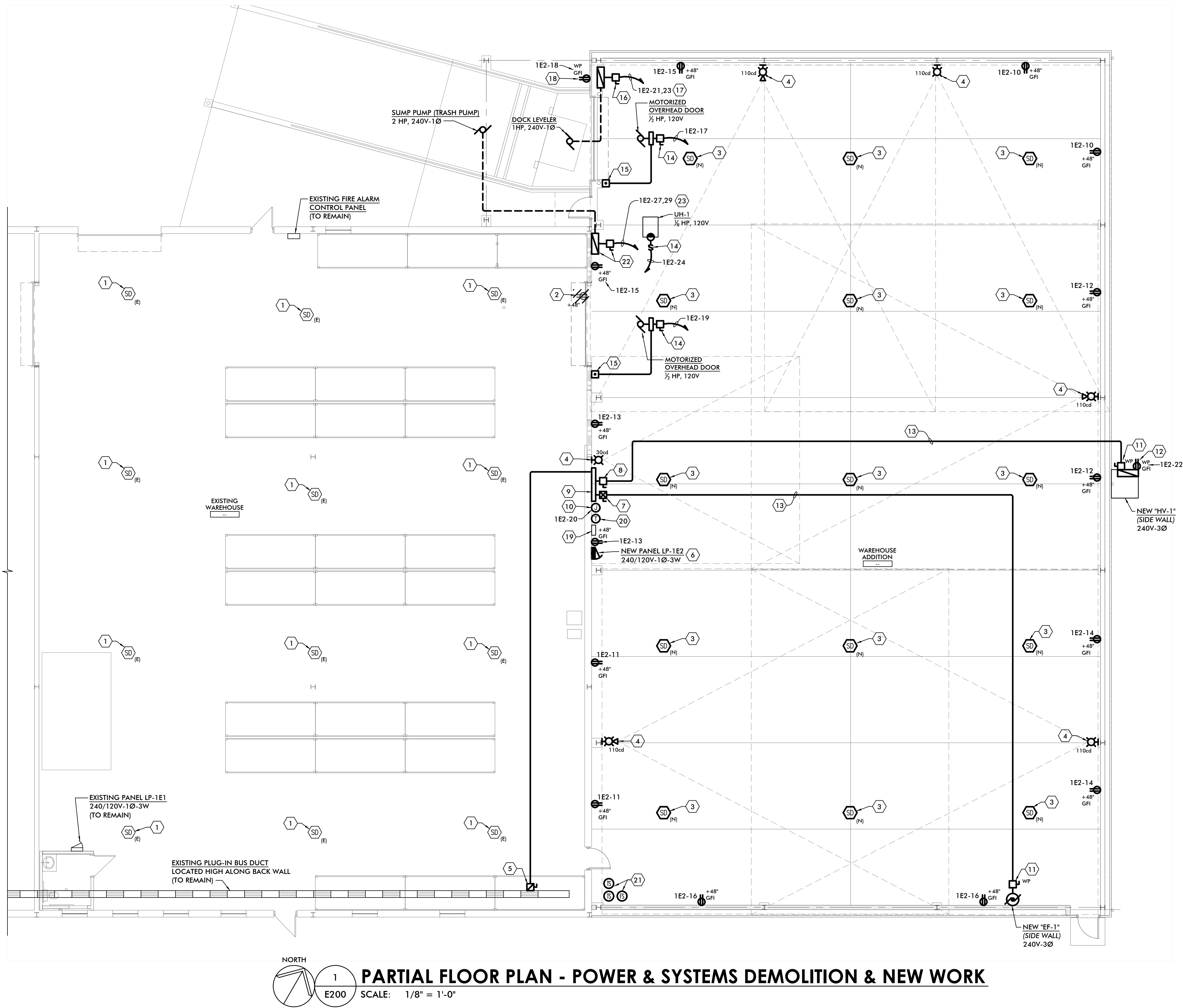
© 2025 STRAUB PETTITT YASTE

Straub  
Pettitt  
Yaste  
850 NORTH CROSS ROAD  
SUITE 200  
CLAWSON, MICHIGAN 48017-1311  
248-658-7777 PHONE  
248-658-7781 FAX









## PARTIAL FLOOR PLAN - POWER & SYSTEMS DEMOLITION & NEW WORK

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

### CONTRACTORS PRE-BID NOTIFICATION:

ALL EXISTING ITEMS INDICATED IN THE CONTRACT DRAWINGS HAVE BEEN TAKEN FROM THE OWNER'S LIMITED RECORD DRAWINGS AND SUBSTANTIAL FIELD OBSERVATIONS AND VERIFICATION. THIS CONTRACTOR AND ALL RELATED SUB-CONTRACTORS SHALL VISIT THE SITE AND COMPLETELY UNDERSTAND THE CONDITIONS UNDER WHICH THE WORK MUST BE PERFORMED. IF A DEPARTURE FROM THE DESIGN INTENT OF THE DOCUMENTS IS REQUIRED DUE TO THE ACTUAL FIELD CONDITIONS OBSERVED BY THE CONTRACTOR, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT IN WRITING FOR RESOLUTION PRIOR TO SUBMITTING FINAL BID OR ENTERING INTO A CONTRACT FOR CONSTRUCTION. FAILURE TO PROVIDE THE ARCHITECT WITH NOTIFICATION SHALL RESULT IN THE CONTRACTOR BEING HELD RESPONSIBLE TO COMPLETE ALL WORK TO MEET THE DESIGN INTENT WITH NO ADDITIONAL COST BEING INCURRED BY THE OWNER.

### ELECTRICAL GENERAL NOTES:

- ALL JUNCTION BOXES SERVING BRANCH CIRCUIT WIRING SHALL BE LABELED WITH CIRCUITS SERVED. USE BROTHER P-TOUCH LABEL OR EQUAL ON BOX COVER.
- REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATION OF ALL CEILING MOUNTED LIGHT FIXTURES AND OTHER CEILING MOUNTED DEVICES.
- ALL DEVICES INDICATED WITH SOLID LIGHT LINES ARE EXISTING DEVICES TO REMAIN.
- ALL DEVICES INDICATED WITH SOLID CROSS-HATCHED LINES ARE EXISTING DEVICES TO BE REMOVED OR RELOCATED BY THE ELECTRICAL CONTRACTOR AS PART OF THIS SCOPE OF WORK.
- ALL DEVICES INDICATED WITH SOLID DARK LINES ARE NEW DEVICES TO BE INSTALLED BY THE ELECTRICAL CONTRACTOR AS PART OF THIS SCOPE OF WORK.
- COORDINATE DEMOLITION & NEW WORK REQUIREMENTS WITH THE WORK OF OTHER TRADES.
- PRIOR TO START OF CONSTRUCTION, AND PRIOR TO ANY DEMOLITION WORK THE ELECTRICAL CONTRACTOR SHALL PERFORM CIRCUIT TRACING TO IDENTIFY ALL EXISTING BRANCH CIRCUITS SERVING THE RENOVATION AREA, AND TO IDENTIFY THE AVAILABLE BRANCH CIRCUITS THAT MAY BE RE-USED AS PART OF THE PROPOSED RENOVATION, AS WELL AS CIRCUITS THAT SERVE EXISTING LIGHTING FIXTURES OR DEVICES OUTSIDE OF THE WORK AREA THAT ARE TO REMAIN AND BE MAINTAINED.
- TO ACCOUNT FOR VOLTAGE DROP OVER THE LENGTH OF THE BRANCH CIRCUIT CONDUCTOR RUN THE ELECTRICAL CONTRACTOR SHALL INCREASE THE BRANCH CIRCUIT CONDUCTOR SIZES AS FOLLOWS: ALL 120-VOLT BRANCH CIRCUITS OVER 100 FEET IN LENGTH SHALL UTILIZE AWG #10 CONDUCTORS; ALL 120-VOLT BRANCH CIRCUITS OVER 200 FEET IN LENGTH SHALL UTILIZE AWG #8 CONDUCTORS; ALL 120-VOLT BRANCH CIRCUITS OVER 300 FEET IN LENGTH SHALL UTILIZE AWG #6 CONDUCTORS. FOR ALL BRANCH CIRCUITS WHERE THE CONDUCTORS ARE INCREASED TO ACCOUNT FOR VOLTAGE DROP, THE EQUIPMENT GROUND CONDUCTOR SHALL BE INCREASED PROPORTIONALLY IN ACCORDANCE WITH THE N.E.C. ARTICLE 250.
- SECURITY SYSTEM, VIDEO SURVEILLANCE SYSTEM, ACCESS CONTROL SYSTEM AND/OR INTERCOM SYSTEM ARE OWNER FURNISHED SYSTEMS, INSTALLED BY THE OWNER'S CONTRACTOR. ELECTRICAL CONTRACTOR SHALL COORDINATE ALL WORK ASSOCIATED WITH THE INSTALLATION OF THE OWNER FURNISHED SYSTEMS WITH THE OWNER'S CONTRACTOR IN THE FIELD PRIOR TO START OF CONSTRUCTION AND SHALL PROVIDE ALL REQUIRED 120-VOLT BRANCH CIRCUITS, EMPTY RACEWAYS AND OTHER ELECTRICAL COMPONENTS NECESSARY TO SUPPORT THE INSTALLATION OF THE OWNER FURNISHED SYSTEM.

### POWER & SYSTEMS KEY NOTES

- EXISTING FIRE ALARM SYSTEM SMOKE DETECTOR TO REMAIN.
- ELECTRICAL CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING DUPLEX RECEPTACLE. DISCONNECT AND REMOVE EXISTING BRANCH CIRCUIT CONDUIT AND WIRING SERVING RECEPTACLE TO NEAREST JUNCTION BOX SERVING EXISTING RECEPTACLES OR DEVICES TO REMAIN. PROVIDE NEW CONDUIT AND WIRING AS REQUIRED TO MAINTAIN SERVICE TO EXISTING RECEPTACLES AND/OR DEVICES TO REMAIN. ELECTRICAL CONTRACTOR SHALL PERFORM CIRCUIT TRACING IN FIELD PRIOR TO START OF DEMOLITION WORK TO IDENTIFY EXISTING BRANCH CIRCUIT SERVING THE RECEPTACLE(S) TO BE REMOVED AND THE ASSOCIATED EXISTING RECEPTACLES AND/OR DEVICES THAT ARE TO REMAIN.
- NEW CEILING MOUNTED FIRE ALARM SYSTEM SMOKE DETECTOR. EXTEND EXISTING INITIATING CIRCUIT FROM THE ADJACENT WAREHOUSE AREA TO SERVE NEW SMOKE DETECTOR INDICATED. EXACT WIRING DETAILS AND INITIATING CIRCUIT NUMBER TO BE DETERMINED BY THE FIRE ALARM SYSTEM MANUFACTURE AND REFLECTED ON SHOP DRAWINGS / INSTALLATION DRAWINGS PREPARED BY THE MANUFACTURE FOR SUBMISSION TO THE LOCAL FIRE MARSHAL FOR APPROVAL. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- NEW WALL MOUNTED FIRE ALARM SYSTEM NOTIFICATION APPLIANCE (TYPE AS INDICATED). NOTIFICATION APPLIANCE TO BE CIRCUITED TO AN EXISTING OR NEW SIGNAL CIRCUIT IN THE EXISTING FIRE ALARM CONTROL PANEL, OR TO A NEW NOTIFICATION APPLIANCE CIRCUIT (N.A.C.) PANEL AS DETERMINED BY THE EXISTING FIRE ALARM SYSTEM MANUFACTURE, ACTING AS A SUB-CONTRACTOR TO THIS ELECTRICAL CONTRACTOR, AND REFLECTED ON INSTALLATION DRAWINGS PREPARED BY THE EXISTING FIRE ALARM SYSTEM MANUFACTURE. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- NEW FUSIBLE PLUG-IN BUS PLUG, INSTALLED ON EXISTING BUS DUCT INDICATED ALONG THE SOUTH WALL, TO SERVE NEW MECHANICAL EQUIPMENT. REFER TO REFERENCE TO PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK ON SHEET E300 FOR BUS PLUG SIZE, FEEDER SIZES AND ADDITIONAL INFORMATION.
- REFER TO PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK ON SHEET E300 FOR ADDITIONAL INFORMATION.
- NEW NEMA SIZE 1, FUSIBLE, COMBINATION MAGNETIC MOTOR STARTER FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR TO SERVE NEW MECHANICAL EQUIPMENT. REFER TO PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK ON SHEET E300 FOR ADDITIONAL INFORMATION REGARDING FUSING AT THE STARTER, BRANCH CIRCUIT WIRING AND OTHER DETAILS.
- NEW FUSIBLE DISCONNECT SWITCH FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR TO SERVE NEW MECHANICAL EQUIPMENT. REFER TO PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK ON SHEET E300 FOR ADDITIONAL INFORMATION REGARDING FUSING AT THE STARTER, BRANCH CIRCUIT WIRING AND OTHER DETAILS.
- NEW SURFACE MOUNTED WIREWAY TO SERVE FEEDER TO THE MOTOR STARTER AND DISCONNECT SWITCH INDICATED TO SERVE MECHANICAL EQUIPMENT NOTED. REFER TO PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK ON SHEET E300 FOR ADDITIONAL INFORMATION.
- NEW JUNCTION BOX WITH 120 VOLT CIRCUIT TO SERVE NEW CO / NO2 MONITORING CONTROL PANEL, FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR, WIRED BY ELECTRICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL WIRE THE CO / NO2 CONTROL PANEL TO START THE EXHAUST FAN "EF-1" UPON DETECTION OF HIGH LEVELS OF CO OR NO2 IN THE SPACE, AS REPORTED BY THE CO / NO2 MONITORING CONTROL PANEL. REFER TO EXHAUST FAN "EF-1" CONTROL WIRING DIAGRAM ON SHEET E400 FOR ADDITIONAL INFORMATION. NOT SHOWN BUT REQUIRED AT THE CONTROL PANEL, THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL A 20A-1P DISCONNECT SWITCH TO SERVE THE CONTROL PANEL PER THE MANUFACTURE'S INSTALLATION DRAWINGS AND WIRING DIAGRAMS. COORDINATE EXACT MOUNTING LOCATION IN FIELD WITH MECHANICAL CONTRACTOR BASED ON THE MANUFACTURE'S INSTALLATION DRAWINGS AND WIRING DIAGRAMS.
- DISCONNECT SWITCH FURNISHED WITH MECHANICAL EQUIPMENT, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR. COORDINATE ALL WIRING DETAILS WITH MANUFACTURE'S APPROVED INSTALLATION DRAWINGS AND WIRING DIAGRAMS IN FIELD WITH MECHANICAL TRADES.
- NEW WEATHER-PROOF / GFCI DUPLEX RECEPTACLE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR, AND MOUNTED ON MECHANICAL EQUIPMENT INDICATED. COORDINATE EXACT MOUNTING LOCATION AND INSTALLATION DETAILS IN FIELD WITH THE MECHANICAL TRADES BASED UPON THE EQUIPMENT CONFIGURATION AND FIELD CONDITIONS. ELECTRICAL CONTRACTOR SHALL PROVIDE A "WR" LABELED WEATHER-RESISTANT GFCI DUPLEX RECEPTACLE, IN ADDITION TO A WEATHER-PROOF COVER TO COMPLY WITH THE N.E.C.
- NEW BRANCH CIRCUIT CONDUIT AND WIRING SERVING EQUIPMENT INDICATED. REFER TO PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK ON SHEET E300 FOR ADDITIONAL INFORMATION REGARDING BRANCH CIRCUIT CONDUIT AND WIRING SIZING AND OTHER DETAILS.
- NEW 20A-1P NON-FUSED DISCONNECT SWITCH (MOTOR-RATED TOGGLE SWITCH) WITH LOCKING HASP FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR AT EQUIPMENT INDICATED. COORDINATE EXACT MOUNTING LOCATION OF DISCONNECT SWITCH AND WIRING CONNECTION TO EQUIPMENT WITH THE EQUIPMENT MANUFACTURE'S INSTALLATION DRAWINGS AND WIRING DIAGRAMS. NOTE THAT THE EQUIPMENT SELECTED BY THE RESPECTIVE SUPPLIER AND/OR CONTRACTOR MAY BE CORD AND PLUG CONNECTED RATHER THAN A HARD-WIRED CONNECTION AS INDICATED AS THE BASIS OF DESIGN. WHERE THE EQUIPMENT TO BE INSTALLED IS CORD AND PLUG CONNECTED, THE ELECTRICAL CONTRACTOR SHALL REVISE THE DISCONNECT FROM THE DISCONNECT SWITCH INDICATED TO A DUPLEX RECEPTACLE. COORDINATE EXACT MOUNTING ELEVATION OF DUPLEX RECEPTACLE WITH RESPECTIVE EQUIPMENT SUPPLIER AND/OR CONTRACTOR IN FIELD BASED ON THE FINAL MOUNTING ELEVATION OF THE EQUIPMENT.
- OVERHEAD DOOR CONTROLLER PUSH-BUTTON STATION MOUNTED AT 48" A.F.F. COORDINATE EXACT WIRING REQUIRED BETWEEN THE PUSH-BUTTON STATION AND THE OVERHEAD DOOR WITH THE MANUFACTURE'S APPROVED INSTALLATION DRAWINGS AND SHOP DRAWINGS. ALL WIRING TO BE INSTALLED IN CONDUIT.
- NEW 30A-2P NON-FUSED DISCONNECT SWITCH FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR AT DOCK LEVELER CONTROL PANEL INDICATED. COORDINATE EXACT MOUNTING OF DISCONNECT SWITCH AT THE DOCK LEVELER WITH THE DOCK LEVELER CONTRACTOR IN FIELD PRIOR TO START OF CONSTRUCTION. PROVIDE MISCELLANEOUS SUPPORT STEEL AS REQUIRED FOR MOUNTING THE DISCONNECT SWITCH AT THE DOCK LEVELER CONTROL PANEL LOCATION.
- NEW 2 #12 + 1 #12 GRD - 3/4"C. TO 15A-2P HACR CIRCUIT BREAKER IN NEW PANEL NOTED, CIRCUIT NUMBER AS INDICATED.
- NEW WEATHER-PROOF / GFCI DUPLEX RECEPTACLE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL PROVIDE A "WR" LABELED WEATHER-RESISTANT GFCI DUPLEX RECEPTACLE, IN ADDITION TO A WEATHER-PROOF COVER TO COMPLY WITH THE N.E.C.
- NEW H&V UNIT CONTROL PANEL STATION FURNISHED AND INSTALLED BY MECHANICAL TRADES, WIRED BY ELECTRICAL CONTRACTOR. REFER TO TYPICAL H&V-1 UNIT CONTROL WIRING DIAGRAM ON SHEET E400 FOR INTERLOCKING OF H&V UNIT TO THE LIGHTING CONTROL SYSTEM TIME CLOCK / RELAY INDICATED. COORDINATE EXACT LOCATION OF CONTROL PANEL AND ALL WIRING DETAILS WITH THE MECHANICAL CONTRACTOR IN THE FIELD BASED ON THE MANUFACTURE'S APPROVED WIRING DIAGRAMS AND INSTALLATION DETAILS.
- NEW LINE-VOLTAGE THERMOSTAT FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR, WIRED BY ELECTRICAL CONTRACTOR TO SERVE EXHAUST FAN "EF-1". COORDINATE EXACT LOCATION OF THERMOSTAT IN FIELD WITH THE MECHANICAL CONTRACTOR PRIOR TO START OF CONSTRUCTION AND PRIOR TO ROUGH-IN OF ANY BOXES, RACEWAYS, ETC. REFER TO MECHANICAL CONTROL DIAGRAMS ON MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION. REFER TO CONTROL WIRING DIAGRAM ON SHEET E400 FOR WIRING OF LINE-VOLTAGE THERMOSTAT TO COMBINATION MOTOR STARTER SERVING EXHAUST FAN.
- NEW FIRE PROTECTION SYSTEM FLOW SWITCH AND TAMPER SWITCHES TO BE MONITORED BY THE FIRE ALARM SYSTEM. COORDINATE EXACT FLOW SWITCH AND TAMPER SWITCH LOCATIONS, AND QUANTITY OF TAMPER SWITCHES WITH FIRE PROTECTION SYSTEM CONTRACTOR IN THE FIELD PRIOR TO START OF CONSTRUCTION.
- NEW 30A-2P NON-FUSED DISCONNECT SWITCH FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR AT SUMP PUMP (TRASH PUMP) CONTROL PANEL INDICATED. COORDINATE LOCATION OF SUMP PUMP CONTROL PANEL WITH CIVIL TRADES IN FIELD PRIOR TO START OF CONSTRUCTION. MOUNT DISCONNECT SWITCH NEXT TO CONTROL PANEL. IF PANEL IS MOUNTED OUTDOORS, PROVIDE NEMA 3R RATED DISCONNECT SWITCH. PROVIDE MISCELLANEOUS SUPPORT STEEL AS REQUIRED FOR MOUNTING THE DISCONNECT SWITCH AT THE CONTROL PANEL LOCATION.
- NEW 2 #12 + 1 #12 GRD - 3/4"C. TO 20A-2P HACR CIRCUIT BREAKER IN NEW PANEL NOTED, CIRCUIT NUMBER AS INDICATED. SEE PANEL SCHEDULE FOR ADDITIONAL REQUIREMENTS ASSOCIATED WITH THE BRANCH CIRCUIT, INCLUDING NEED TO ADJUST CIRCUIT BREAKER SIZE AND WIRE SIZE BASED ON INSTALLED HORSEPOWER SIZE OF SUMP PUMP INSTALLED BY CIVIL TRADES.

AREA OF WORK



**KEY PLAN**  
NOT TO SCALE

ISSUED FOR PERMITS 03/21/2025

**OAKWOOD VENEER  
COMPANY**  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

**2443**

© 2025 STRAUB PETTITT YASTE

**PARTIAL FLOOR PLAN -  
POWER & SYSTEMS  
DEMOLITION & NEW WORK**

**E200**



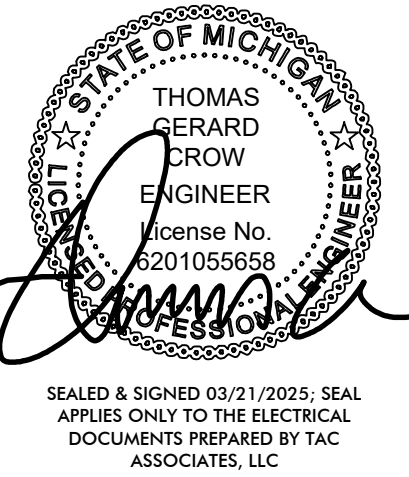


# E300


ALL EXISTING ITEMS INDICATED IN THE CONTRACT DRAWINGS HAVE BEEN TAKEN FROM THE OWNERS' LATEST RECORD DRAWINGS AND SUBSTANTIAL FIELD OBSERVATIONS AND VERIFICATION. THIS CONTRACTOR AND ALL RELATED SUB-CONTRACTORS SHALL VISIT THE SITE AND COMPLETELY UNDERSTAND THE PROJECT CONDITIONS AND REQUIREMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INTENT OF THE DOCUMENTS IS REQUIRED DUE TO THE ACTUAL FIELD CONDITIONS OBSERVED BY THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT IN WRITING FOR RESOLUTION PRIOR TO SUBMITTING FINAL BID OR ENTERING INTO A CONTRACT FOR CONSTRUCTION. FAILURE TO PROVIDE THE ARCHITECT WITH NOTIFICATION SHALL RESULT IN THE CONTRACTOR BEING FULLY RESPONSIBLE TO COMPLETE ALLOW TO MEET THE DESIGN INTENT WITH NO ADDITIONAL COST BEING INCURRED BY THE OWNER.

1. REFER TO SHEETS E310 AND E311 FOR ELECTRIC SERVICE LOAD CALCULATIONS AND PANEL SCHEDULES FOR ALL DISTRIBUTION, LIGHTING, POWER AND RECEPTACLE PANELS TO BE INSTALLED OR MODIFIED AS PART OF THIS PROJECT.
2. REFER TO SPECIFICATIONS FOR REQUIREMENTS REGARDING SHORT-CIRCUIT, TIME CURRENT AND ARC FLASH HAZARD ANALYSIS STUDY TO BE PERFORMED BY THIS ELECTRICAL CONTRACTOR AS PART OF HERIN'S SCOPE OF WORK. REFER TO THE PRELIMINARY SHORT-CIRCUIT FAULT CURRENT AND ARC FLASH HAZARD EVALUATION SCHEDULE ON SHEET E312 FOR ADDITIONAL INFORMATION REGARDING THE STUDY AND THE RESULTS OF THE PRELIMINARY SHORT-CIRCUIT FAULT CURRENT STUDY AND ARC FLASH HAZARD EVALUATION.

- 1 EXISTING BUS DUCT END CABLE TAP BOX, LOCATED AT THE MAIN SWITCHBOARD AREA, TO REMAIN.
- 2 EXISTING 200A-3P FUSIBLE PLUG-IN BUS PLUG SERVING EXISTING LIGHTING PANEL "LP-1E1", TO REMAIN.
- 3 DISCONNECT SWITCH ["WP" = WEATHER-PROOF] FURNISHED AT EQUIPMENT BY MECHANICAL TRADES, WIRED BY ELECTRICAL CONTRACTOR. COORDINATE ALL WORK WITH MECHANICAL TRADES IN FIELD PRIOR TO START OF CONSTRUCTION.
- 4 NEW 30A-3P FUSIBLE PLUG-IN BUS PLUG, INSTALLED ON EXISTING BUS DUCT INDICATED ALONG THE SOUTH WALL, TO SERVE NEW MECHANICAL EQUIPMENT. FUSE AT 20 AMPERE.
- 5 NEW NEMA SIZE 1, FUSIBLE, COMBINATION MAGNETIC MOTOR STARTER FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR TO SERVE NEW MECHANICAL EQUIPMENT. FUSE AT 15 AMPERE. PROVIDE MOTOR OVERLOADS ("HEATERS") SIZED PER THE MOTOR NAMEPLATE DATA. REFER TO TYPICAL THREE PHASE NO2/CO DETECTION SYSTEM EXHAUST FAN CONTROL WIRING DIAGRAM ON SHEET E400 FOR ADDITIONAL INFORMATION.
- 6 NEW FUSIBLE DISCONNECT SWITCH FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR TO SERVE NEW MECHANICAL EQUIPMENT INDICATED. FUSE AT 15 AMPERE.
- 7 NEW SURFACE MOUNTED WIREWAY TO SERVE FEEDER TO THE MOTOR STARTER AND FUSED DISCONNECT SWITCH INDICATED TO SERVE MECHANICAL EQUIPMENT NOTED. ELECTRICAL CONTRACTOR SHALL SIZE THE WIREWAY TO ACCOMMODATE THE CONDUIT AND WIRING TUB CONTAINED WITHIN THE RACEWAY. WIREWAY TO EXTEND THE ENTIRE LENGTH OF THE MOTOR STARTER AND FUSIBLE SWITCH MOUNTED NEXT TO EACH OTHER AS INDICATED ON THE POWER AND SYSTEMS PLAN ON SHEET E200.
- 8 NEW 100A-2P CIRCUIT BREAKER INSTALLED IN EXISTING SPACE OF EXISTING LIGHTING PANEL INDICATED. NEW CIRCUIT BREAKER TO BE MANUFACTURED BY THE SAME MANUFACTURE AS THE EXISTING LIGHTING PANEL. SHALL BE U.L. LISTED FOR USE IN THE EXISTING LIGHTING PANEL AND SHALL HAVE AN A.I.C. RATING EQUAL TO THAT OF THE OTHER CIRCUIT BREAKERS IN THE PANEL. UPDATE PANEL TYPED CIRCUIT DIRECTORY TO REFLECT NEW LOAD SERVED.



2443



**Straub  
Pettitt  
Yaste**

850 NORTH CROOKS ROAD  
SUITE 200  
CLAWSON, MICHIGAN 48017-1311

248-658-7777      PHONE  
248-658-7781      FAX

## PARTIAL POWER ONE-LINE DIAGRAM - NEW WORK



EXISTING PANEL SCHEDULE												
TYPE	DESCRIPTION	CB	VA	#	ØA	ØB	#	VA	CB	DESCRIPTION		TYPE
L	Existing Warehouse Area Lights	20/1	1287	1	2565		2	1278	20/1	Existing Emergency Lights and Night Lights		L
L	Existing Warehouse Area Lights	20/1	1260	3		1260	4		20/1	SPARE		C
L	Existing Warehouse Toilet Room Lights & Exhaust Fan (20W)	20/1	97	5	97		6		20/1	SPARE		C
C	SPARE	20/1		7			8		20/1	SPARE		C
D	Existing (2) Duplex West Side Warehouse Area	20/1	360	9	720		10	360	20/1	Existing (2) Duplex East Side Warehouse Area		D
D	Existing (2) Duplex West Side Warehouse Area	20/1	360	11		720	12	360	20/1	Existing (2) Duplex East Side Warehouse Area		D
D	Existing (2) Duplex West Side Warehouse Area	20/1	360	13	720		14	360	20/1	Existing (2) Duplex East Side Warehouse Area		D
D	Existing (2) Duplex Center Warehouse Area	20/1	360	15		1530	16	1170	20/1	Existing Overhead Door Operator		O
D	Existing (1) GFI Duplex - Toilet Room Warehouse Area	20/1	180	17	180		18		20/1	SPARE		C
H	Existing EWH-1 (1.5kW, 120V)	20/1	1500	19		1500	20		20/1	SPARE		C
M	Existing CO / NO2 Monitoring Panel	20/1	600	21	780		22	180	20/1	Existing WP/GFI Duplex at MAU-1 (On Roof)		D
M	Existing Time Clock Serving Mechanical Equipment	20/1	300	23		300	24		20/1	SPARE		C
O	Existing Air Compressor - 240V-1PH.	20/2	1500	25	1500		26		20/1	SPARE		C
O			1500	27		2500	28	1000	15/2	Existing EDWH (2kW, 240V-1PH) - SEE NOTE - 4		M
O	Existing Fire Alarm Control Panel	20/1	1000	29	2000		30	1000				M
C	SPARE	20/1		31			32		20/1	SPARE		C
C	SPARE	20/1		33			34		20/1	SPARE		C
C	SPARE	20/1		35			36		20/1	SPARE		C
C	NEW PANEL "LP-1E2" - WAREHOUSE ADDITION	100/2	7097	37	7097		38			SPACE		
C			6855	39		6855	40			SPACE		
					15659	14665						
					ØA	ØB						
					130.49	122.21						
					AMPS PER PHASE							
					PANEL LOCATION							
					Southwest Corner by Toilet Room							

- NOTES:
1. ALL EXISTING LOADS INDICATED IN THE ABOVE PANEL SCHEDULE ARE ESTIMATED BASED UPON THE LIMITED ACCURATE AS-BUILT INFORMATION, PANEL SCHEDULES AND CIRCUIT NUMBERS AT DEVICES.
  2. ELECTRICAL CONTRACTOR SHALL PERFORM CIRCUIT TRACING OF ALL EXISTING BRANCH CIRCUITS PRIOR TO START OF CONSTRUCTION TO VERIFY EXISTING LOAD SERVED.
  3. ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL A NEW MULTI-POLE CIRCUIT BREAKER IN EXISTING SPACE TO SERVE NEW LOAD INDICATED. NEW CIRCUIT BREAKER TO BE MANUFACTURED BY THE SAME MANUFACTURE AS THE EXISTING PANEL, AND BE U.L. LISTED FOR USE IN THE EXISTING PANEL. NEW CIRCUIT BREAKER TO HAVE AN A.I.C. RATING EQUAL TO THAT OF THE OTHER CIRCUIT BREAKERS IN THE PANEL. UPDATE PANEL TYPED CIRCUIT DIRECTORY TO REFLECT NEW LOAD ADDED.

NEW PANEL SCHEDULE												
TYPE	DESCRIPTION	CB	VA	#	ØA	ØB	#	VA	CB	DESCRIPTION	TYPE	
L	New (4) LA + (1) LA-EM - Warehouse Addition Zone 1	20/1	835	1	1226		2	391	20/1	New Exterior Lights, Exit Lights & Lighting Area Controller	L	
L	New (3) LA + (2) LA-EM - Warehouse Addition Zones 2 & 3	20/1	855	3		855	4		20/1	SPARE	C	
L	New (3) LA + (2) LA-EM - Warehouse Addition Zones 3 & 4	20/1	855	5	855		6		20/1	SPARE	C	
C	SPARE	20/1		7			8		20/1	SPARE	C	
C	SPARE	20/1		9	360		10	360	20/1	New (2) Duplex North & East Side Warehouse Area	D	
D	New (2) Duplex West Side Warehouse Area	20/1	360	11		720	12	360	20/1	New (2) Duplex East Side Warehouse Area	D	
D	New (2) Duplex West Side Warehouse Area	20/1	360	13	720		14	360	20/1	New (2) Duplex East Side Warehouse Area	D	
D	New (2) Duplex West & North Warehouse Area	20/1	360	15		720	16	360	20/1	New (2) Duplex South Side Warehouse Area	D	
O	New Overhead Door (1/2HP, 120V) - SEE NOTE - 4	20/1	1176	17	1356		18	180	20/1	New (1) WP/GFI Duplex @ Loading Dock	D	
O	New Overhead Door (1/2HP, 120V) - SEE NOTE - 4	20/1	1176	19		1776	20	600	20/1	New CO / NO2 Monitoring Panel	M	
O	New Dock Leveler (1HP, 240V-1PH) - SEE NOTE - 4	15/2	960	21	1140		22	180	20/1	New (1) WP/GFI Duplex at HV-1	D	
O			960	23		1344	24	384	15/1	New Unit Heater UH-1 (1/8HP, 120V) - SEE NOTE - 4	M	
C	SPARE	20/1		25			26		20/1	SPARE	C	
M	New Sump Pump (2HP, 240V-1PH) - SEE NOTE - 4	20/2	1440	27		1440	28			SPACE		
M			1440	29	1440		30			SPACE		

		7097	6855		
		ØA	ØB		
		59.14	57.13		

PANELBOARD INFORMATION

DESIGNATION: LP-1E2

VOLTAGE: 120/240

PHASE-WIRE: 1Ø-3W

BUS AMPACITY: 125A

MAIN TYPE: MLO

MINIMUM A.I.C.: 22,000

NEUTRAL SIZE: 100%

MOUNTING: SURFACE

TOTAL POLES: 30

ENGINEER: TGC

DATE: 2/27/25

AMPS PER PHASE

PANEL LOCATION

West Wall Warehouse Addition

REMARKS

See Note 5 for Minimum A.I.C. Note

NEC ARTICLE 220 DEMAND CALCULATIONS

CONTINUOUS LOAD (C):

KITCHEN LOAD (K):

RECEPT BASE LOAD (D): 2880

RECEPT DEMAND LOAD (D):

LIGHTING LOAD (L): 2936

ELECTRIC HEAT LOAD (H):

MECHANICAL LOAD (M): 3864

OTHER LOAD (O): 4272

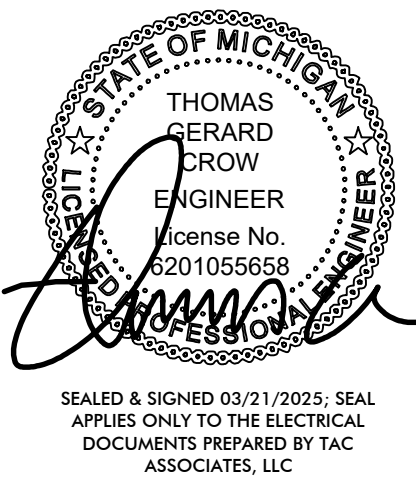
CONNECTED 1Ø LOAD (kVA): 13.95

CONNECTED 1Ø LOAD (AMPS): 58.13

DEMAND 1Ø LOAD (kVA): 13.95

DEMAND 1Ø LOAD (AMPS): 58.13

- NOTES:
1. ELECTRICAL CONTRACTOR SHALL PROVIDE NEW BRANCH CIRCUIT NOTED TO RE-FEED EXISTING LOAD INDICATED. VERIFY IN FIELD EXACT CONNECTIONS DETAILS TO EXISTING EQUIPMENT.
  2. ALL CIRCUIT BREAKERS SERVING MOTOR LOADS SHALL BE HACR RATED CIRCUIT BREAKERS, LISTED FOR THE LOAD SERVED.
  3. PRIOR TO ORDERING OF PANELS, ELECTRICAL CONTRACTOR SHALL VERIFY RECOMMENDED OVER-CURRENT PROTECTIVE DEVICE SETTING WITH THE OWNER FURNISHED EQUIPMENT SHOP DRAWINGS
  4. VERIFY EXACT OVERCURRENT PROTECTIVE DEVICE SETTING WITH MECHANICAL, PLUMBING, CIVIL AND/OR ARCHITECTURAL TRADES IN FIELD PRIOR TO START OF CONSTRUCTION BASED UPON THE ACTUAL MECHANICAL, PLUMBING, CIVIL OR ARCHITECTURAL EQUIPMENT TO BE INSTALLED BY THE RESPECTIVE CONTRACTOR, AND BASED ON THE MANUFACTURERS INSTALLATION DRAWINGS AND WIRING DIAGRAMS. ADJUST CIRCUIT BREAKER SIZE AND WIRING AS REQUIRED BASED ON THE EQUIPMENT NAMEPLATE DATA AND THE EQUIPMENT VOLTAGE. NOTE THAT THE INSTALLED EQUIPMENT MAY BE A LOWER VOLTAGE, OR A DIFFERENT HORSEPOWER THAN THE BASIS OF DESIGN SHOWN, REQUIRING THE ELECTRICAL CONTRACTOR TO REVISE THE CIRCUIT BREAKER SIZE, NUMBER OF POLES AND THE EQUIPMENT WIRING BASED ON THE FINAL INSTALLED EQUIPMENT PROVIDED BY THE RESPECTIVE CONTRACTOR IN THE FIELD.
  5. EXACT SHORT CIRCUIT AND INTERRUPTING RATINGS OF THE PANEL AND OVER-CURRENT PROTECTIVE DEVICES TO BE DETERMINED BY STUDY TO BE PERFORMED BY THE ELECTRICAL CONTRACTOR AS PART OF THEIR SCOPE OF WORK. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.

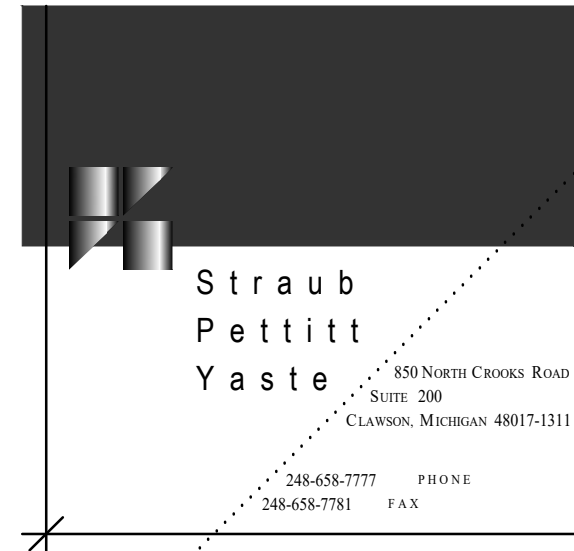
ISSUED FOR PERMITS 03/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

© 2025 STRAUB PETTITT YASTE





Existing South Bus Duct Feeder Sizing Calculations						
Load Description	Load (VA)		Sizing Factor	Sizing Load (VA)		
Single Phase Loads - New & Existing						
Lighting	6,858		1.25	8,573		
Receptacles	5,760		100% first 10,000VA, 50% thereafter	5,760		
Mechanical	6,764		1.00	6,764		
Electric Heat	1,500		1.00	1,500		
Other Power Loads	9,442		1.00	9,442		
SUB-TOTAL (VA) - SINGLE PHASE LOADS	30,324			32,039		
at 240v single phase (Amperes)	126	Amperes		133	Amperes	
Three Phase Loads						
New Mechanical	8,731		1.00	8,731		
Largest Motor (New AHU-1 - 2 HP)			25% Additional Load per NEC 220.50 and 430.24	707		
Existing Industrial Equipment ("Other")	179,929		1.00	179,929		
SUB-TOTAL (VA) - THREE PHASE LOADS	188,660			189,367		
TOTALS (VA)	218,984			221,405		
at 240v three phase (Amperes)	Phase A 580	Phase B 454	Phase C 580	Phase A 589	Phase B 456	Phase C 589
AS DEMONSTRATED ABOVE, THE EXISTING 600 AMPERE BUS DUCT HAS SUFFICIENT AMPACITY TO SUPPORT THE EXISTING LOADS AND THE NEW LOADS TO BE ADDED TO THE BUS DUCT AND ASSOCIATED FEEDER.						
Service Calculations Based Upon the Following:						
NEC Article 230.42						
Lighting: Per NEC 220.12 AND Table 220.12; NEC 220.42; and calculated at 125% as continuous load						
Fixed Electric Heating: per NEC 220.51 and calculated at 125% as continuous load per NEC 424.3(B)						
Receptacles: Per NEC 220.44						
Mechanical / Motors: Per NEC 220.50, 430.24 - 430.26, 430.62, Table 430.250 and NEC 440.6, based upon the equipment served.						
Elevators / Intermittent Duty Motors: Per NEC 430.22 and Table 430.22(E).						
Noncoincident Loads: Per NEC 220.60 Where Electric Heating is the Largest Load when compared to Air Conditioning.						
Commercial Kitchen Equipment: Per NEC 220.56 and Table 220.56						

Existing Electric Service Sizing Calculations						
Load Description	Load (VA)		Sizing Factor	Sizing Load (VA)		
<u>Single Phase Loads</u>						
<b>Existing Building Load</b> (At Existing Main Switchboard) - A 30 day time recorder meter was placed on the existing incoming service at the Main Switchboard "MSB" and recorded the peak demand data in accordance with NEC Article 220.87. The peak demand Phase A was recorded to be 346 Amperes and the peak demand on Phase C was recorded to be 360 Amperes. Value indicated in the Load to the right is based on the peak demand noted for each phase (on the Single Phase Portion of the Service).						
	84,720		Per NEC Article 220.87; the maximum demand taken at 125%	105,900		
Lighting	6,858		1.25	8,573		
Receptacles	5,760		100% first 10,000VA, 50% thereafter	5,760		
Mechanical	6,764		1.00	6,764		
Electric Heat	1,500		1.25	1,875		
Other Power Loads	9,442		1.00	9,442		
<b>SUB-TOTAL (VA) - SINGLE PHASE LOADS</b>		<b>115,044</b>		<b>138,314</b>		
<b>at 240v single phase (Amperes)</b>		<b>479</b>	<b>Amperes</b>	<b>576</b>		<b>Amperes</b>
<u>Three Phase Loads</u>						
<b>Existing Building Load</b> (At Existing Main Switchboard) - <b>Three Phase Load</b> - A 30 day time recorder meter was placed on the existing incoming service at the Main Switchboard "MSB" and recorded the peak demand data in accordance with NEC Article 220.87. The peak demand on the High-Leg phase (phase B) was recorded to be 292 Amperes. Value indicated in the Load to the right is based on the High-Leg (Phase B) value of 292 Amperes.						
	60,736		Per NEC Article 220.87; the maximum demand taken at 125%	75,920		
Mechanical	8,731		1.00	8,731		
Largest Motor (New AHU-1 - 2 HP)			25% Additional Load per NEC 220.50 and 430.24	707		
"Other" Loads	42,400		1.00	42,400		
<b>SUB-TOTAL (VA) - THREE PHASE LOADS</b>		<b>111,867</b>		<b>127,758</b>		
<b>TOTALS (VA)</b>		<b>226,911</b>		<b>266,071</b>		
		<b>Phase A</b>	<b>Phase B</b>	<b>Phase C</b>	<b>Phase A</b>	<b>Phase B</b>
<b>at 240v (Amperes)</b>		<b>748</b>	<b>561</b>	<b>748</b>	<b>701</b>	<b>490</b>
					<b>701</b>	<b>701</b>
AS DEMONSTRATED ABOVE, THE THE EXISTING 2,000 AMPERE MAIN SWITCHBOARD "MSB" HAS SUFFICIENT AMPACITY TO SUPPORT THE ADDITION OF THE NEW LOADS PROPOSED TO BE INSTALLED AS PART OF THIS RENOVATION PROJECT.						
<u>Service Calculations Based Upon the Following:</u>						
NEC Article 230.42						
Lighting: Per NEC 220.12 AND Table 220.12; NEC 220.42; and calculated at 125% as continuous load						
Fixed Electric Heating: per NEC 220.51 and calculated at 125% as continuous load per NEC 424.3(B)						
Receptacles: Per NEC 220.44						
Mechanical / Motors: Per NEC 220.50, 430.24 - 430.26, 430.62, Table 430.250 and NEC 440.6, based upon the equipment served.						
Elevators / Intermittent Duty Motors: Per NEC 430.22 and Table 430.22(E).						
Noncoincident Loads: Per NEC 220.60 Where Electric Heating is the Largest Load when compared to Air Conditioning.						
Commercial Kitchen Equipment: Per NEC 220.56 and Table 220.56						
Existing Load based on 30-Day Time Recorder Metering as noted above, and per NEC Article 220.87, with the Maximum Demand defined as the maximum measure of average power demand over a 15-minute period. The Time Recorder Meter used took 156 Samples per Cycle, and calculated the average power over the 15-minute period, as well as the minimum and maximum values over the 15-minute period. These values are reflected on this sheet. The meter uses the term "mean" as equivalent to the word "average" used in the NEC, and for the purposes of this metering and these calculations the terms "average" and "mean" are equivalent terms. Due to the number of samples taken per Cycle, the maximum value recorded by the meter and indicated on the schedule on this sheet reflects the transient motor starting load, and not the average power over the 15-minute period. The NEC Article referenced does not require the maximum recorded value (i.e. the transient motor starting load) to be used for this calculation, but rather the average power over the 15-minute period, which is reflected in the calculations above.						

TAC

TAC ASSOCIATES, LLC

Consulting Engineers

4321 East Camden Road  
Oshtemo, MI 49266  
Ph: (517) 254-4789 • Fax: (517) 254-4886  
http://www.tac-associates.com  
TAC Project No. 25-002

STATE OF MICHIGAN  
THOMAS  
ERARD  
EROW  
ENGINEER  
License No.  
3201055658  
PROFESSIONAL  
SEAL

SEALED & SIGNED 03/21/2025; SEAL  
APPLIES ONLY TO THE ELECTRICAL  
DOCUMENTS PREPARED BY TAC  
ASSOCIATES, LLC

ISSUED FOR PERMITS 03/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443


© 2025 STRAUB PETTITT YASTE

Straub  
Pettitt  
Yaste

850 NORTH CROSS ROAD  
SUITE 200  
CLARKSON, MICHIGAN 48017-1311  
248-658-7777 PHONE  
248-658-7781 FAX



YELLOW BACKGROUND  
WITH BLACK TEXT.



# WARNING

## Arc Flash and Shock Hazard Appropriate PPE Required

31 Inches  
2.9 cal/cm ^ 2

Flash Hazard Boundary  
Flash Hazrad at 18 Inches

Category 1

Arc-rated FR Shirt & Pants

480 VAC  
00  
42 Inches  
12 Inches  
1 Inches

Shock Hazard when cover is removed  
Glove Class  
Limited Approach  
Restricted Approach  
Prohibited Approach

LOCATION:


"DP-A"

Warning: Changes in equipment settings or system configuration will  
invalidate the calculated values and PPE requirements.

TYPICAL CATEGORY 1 AND 2 ARC  
FLASH HAZARD LABEL DETAIL

NO SCALE

YELLOW BACKGROUND  
WITH BLACK TEXT.



# WARNING

## Arc Flash and Shock Hazard Appropriate PPE Required

123 Inches  
28 cal/cm ^ 2

Flash Hazard Boundary  
Flash Hazrad at 18 Inches

Category 4

Arc-rated FR Shirt & Pants & Arc Flash  
Suit

480 VAC  
00  
42 Inches  
12 Inches  
1 Inches

Shock Hazard when cover is removed  
Glove Class  
Limited Approach  
Restricted Approach  
Prohibited Approach

LOCATION:


"MCC-1"

Warning: Changes in equipment settings or system configuration will  
invalidate the calculated values and PPE requirements.

TYPICAL CATEGORY 3 AND 4 ARC  
FLASH HAZARD LABEL DETAIL

NO SCALE

RED BACKGROUND WITH  
WHITE TEXT.



# DANGER

## NO SAFE PPE EXISTS ENERGIZED WORK PROHIBITED

183 Inches  
54 cal/cm ^ 2

Flash Hazard Boundary  
Flash Hazrad at 18 Inches

Dangerous!

No FR Category Found

480 VAC  
00  
42 Inches  
12 Inches  
1 Inches

Shock Hazard when cover is removed  
Glove Class  
Limited Approach  
Restricted Approach  
Prohibited Approach

LOCATION:

MAIN DISTRIBUTION PANEL "MDP"

Warning: Changes in equipment settings or system configuration will  
invalidate the calculated values and PPE requirements.

TYPICAL CATEGORY "DANGEROUS"  
ARC FLASH HAZARD LABEL DETAIL

NO SCALE

NOTE: REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS REGARDING SHORT-CIRCUIT STUDY & ARC-FLASH HAZARD ANALYSIS TO BE PERFORMED BY THE ELECTRICAL CONTRACTOR AS PART OF THE PROJECT SCOPE OF WORK. LABEL SHOWN IS INTENDED TO CONVEY THE GENERAL CONFIGURATION OF THE ARC-FLASH WARNING LABEL. ALL LABELS SHALL COMPLY WITH THE REQUIREMENTS OF N.E.C. 110.16 AND NFPA 70E.

PRELIMINARY SHORT-CIRCUIT FAULT CURRENT STUDY AND ARC FLASH EVALUATION SCHEDULE														
BUS NAME	BUS KV	PROTECTIVE DEVICE NAME	BUS BOLTED FAULT (kA)	BUS ARCING FAULT (kA)	PROT BOLTED FAULT (kA)	PROT ARCING FAULT (kA)	TRIP / DELAY TIME (sec)	BREAKER OPENING TIME (sec)	EQUIP TYPE	GAP (mm)	ARC FLASH BOUNDARY (in)	WORKING DISTANCE (in)	INCIDENT ENERGY (cal/cm2)	REQUIRED PROTECTIVE FR CLOTHING CATEGORY
Existing Main Switchboard "MSB"	0.240	MSB_Main	42.66	12.98	42.66	12.98	0.000	2.000	PNL	25	289.63	18.00	114.12	SEE NOTE - 1
New Mechanical Equipment Wireway	0.240	New_Bus_Plug_1	0.83	0.76	0.83	0.76	0.000	2.000	PNL	25	44.66	18.00	5.31	SEE NOTE - 1
Existing Lighting Panel LP-1E1	0.240	Reloc_Bus_Plug	8.36	--	8.36	--	--	--	--	--	--	--	--	SEE NOTE - 1
New Lighting Panel LP-1E2	0.240	LP-1E1_CB1	2.83	1.84	2.83	1.84	0.000	2.000	PNL	25	79.95	18.00	13.80	SEE NOTE - 1
All short-circuit and Arc Flash analysis performed using SKM Systems Analysis, Inc. Power Tools for Windows software v8.0. Short-circuit fault current values are based upon an arbitrary maximum available primary fault current (750 MVA three phase and 250 MVA line to ground, both with an X/R of 15), with the existing bank of three (3) pole mounted 100kVA tank type transformer, each with a transformer impedance of 1.6% as the basis for this preliminary short-circuit current study and arc flash hazard analysis. The preliminary study results documented in the above schedule are provided as support for the minimum AIC ratings indicated for the new panel and disconnect switches / motor starters to be installed as part of the renovation project, and is intended to provide an example to the Electrical Contractor for Arc Flash Hazard labeling requirements. This preliminary study is based on the primary fault current contribution noted above, and does not include any motor contribution. The final study to be performed by this Electrical Contractor shall utilize the actual available primary fault current contribution from the existing DTE Energy service, as well as the actual transformer impedance values and contributions for ALL MOTORS installed on the project. The final study and arc flash hazard analysis shall also be based upon the actual distribution equipment and over-current protective devices installed in the field on the project, and the actual installed feeder lengths, wiring types (i.e. THHN or THWN) and conduit type (i.e. metallic or non-metallic). The use of generic over-current protective devices or arbitrary feeder lengths in the study shall result in the study being REJECTED and the Electrical Contractor being forced to revise the study to reflect the actual installed conditions prior to final acceptance of the study and the required verification of equipment ratings. THE SHORT-CIRCUIT PORTION OF THE STUDY SHALL BE PERFORMED PRIOR TO ORDERING OF ANY EQUIPMENT TO VERIFY THAT THE AIC RATINGS OF THE EQUIPMENT ORDERED IS SUFFICIENT TO ACCOMMODATE THE MAXIMUM AVAILABLE FAULT CURRENT THAT WILL BE SEEN AT THE DISTRIBUTION EQUIPMENT. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND INFORMATION. The preliminary study looked at two scenarios: one using the actual clearing time expected for the specified fuses used in the distribution equipment; and a second scenario looks at a worst case approach to the Trip / Delay Time and the fuse Opening Time, and the incident energy in this scenario has been calculated at the maximum 2 seconds discussed in the IEEE1584 Standard. The actual incident energy is expected to be lower once the final analysis is performed by the Electrical Contractor as part of their scope of work; however consideration should be given to the potential for a device mal-function or delay in operation of the device when determining the labeling requirements, and serious consideration given to using a longer clearing time in the study to ensure that maintenance workers are provided with the necessary protection in the event that the breaker takes longer to clear than would normally be expected. REFER TO SPECIFICATIONS FOR EXACT REQUIREMENTS ASSOCIATED WITH THE STUDY TO BE PERFORMED BY THE ELECTRICAL CONTRACTOR AS PART OF THEIR SCOPE OF WORK. NOTE THAT IN ADDITION TO THE SHORT-CIRCUIT CURRENT STUDY AND ARC FLASH HAZARD ANALYSIS DISCUSSED ABOVE, THE SPECIFICATION ALSO REQUIRES THE ELECTRICAL CONTRACTOR TO INCLUDE A TIME-CURRENT COORDINATION STUDY AS PART OF THE SCOPE OF WORK TO ENSURE THAT ALL OVERCURRENT PROTECTIVE DEVICE SETTINGS ARE COORDINATED TO AVOID A MIS-COORDINATION BETWEEN OVER-CURRENT PROTECTIVE DEVICES. NOTE THAT THE FINAL STUDY SHALL INCLUDE ONLY THE NEW LIGHTING PANEL, DISCONNECT SWITCHES, TRANSFORMER AND MOTOR STARTERS, AND MOTORS, BOTH EXISTING MOTORS AND NEW MOTORS TO BE INSTALLED AS PART OF THE RENOVATION PROJECT AND CONNECTED TO THE ELECTRIC SERVICE AS INDICATED ON THE ONE-LINE DIAGRAM ON SHEET E300. THE ABOVE PRELIMINARY STUDY ONLY LOOKED AT A PORTION OF THE NEW EQUIPMENT TO PROVIDE A WORST-CASE ANALYSIS OF THE MAXIMUM FAULT CURRENT THAT MAY BE EXPECTED. THE ABOVE LIST OF EQUIPMENT IS NOT INTENDED TO BE THE TOTAL NUMBER OF PANELS OR EQUIPMENT TO BE INCLUDED IN THE STUDY. THE STUDY TO BE PERFORMED BY THE ELECTRICAL CONTRACTOR SHALL ALSO INCLUDE SHORT-CIRCUIT CURRENT AND ARC FLASH HAZARD ANALYSIS AT ALL DISCONNECT SWITCHES SERVING MECHANICAL EQUIPMENT AND OTHER LARGE MOTORS / EQUIPMENT.														

SHORT-CIRCUIT AND ARC FLASH HAZARD EVALUATION SCHEDULE NOTE:

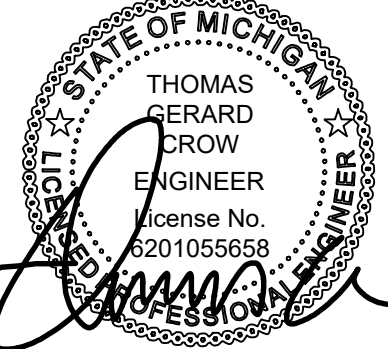
1. PER NFPA 70E, THE EMPLOYER / BUILDING OWNER SHALL BE RESPONSIBLE FOR DEVELOPING AN OVERALL SAFETY PROGRAM THAT DIRECTS ACTIVITY APPROPRIATE TO THE RISK ASSOCIATED WITH THE ELECTRICAL HAZARD. THE DETERMINATION OF THE PROPER PERSONAL PROTECTIVE EQUIPMENT (PPE) FOR THE ASSOCIATED RISK AT EACH PIECE OF ELECTRICAL DISTRIBUTION EQUIPMENT SHALL BE DETERMINED BASED ON THE CALCULATED INCIDENT ENERGY INDICATED IN THE SCHEDULE AND THE ASSOCIATED PPE LEVELS INDICATED IN THE NFPA 70E DOCUMENT. THE PPE LEVELS ARE NO LONGER PROVIDED AS PART OF THE ARC FLASH HAZARD EVALUATION AT THIS PRELIMINARY STAGE OF THE PROJECT DUE TO THE NEED FOR PERFORMING A DETAILED RISK ASSESSMENT AS PART OF THE OVERALL SAFETY PROGRAM THAT IS TO BE DEVELOPED BY THE BUILDING OWNER / EMPLOYER.



TAC ASSOCIATES, LLC

Consulting Engineers

4321 East Camden Road  
Oshtemo, MI 49224  
Ph: (517) 254-4789 • Fax: (517) 254-4886  
http://www.tac-associates.com  
TAC Project No. 25-002



THOMAS  
GERARD  
BROWN  
ENGINEER  
License No.  
3201055658  
MICHIGAN  
PROFESSIONAL

SEALED & SIGNED 03/21/2025, SEAL  
APPLIES ONLY TO THE ELECTRICAL  
DOCUMENTS PREPARED BY TAC  
ASSOCIATES, LLC

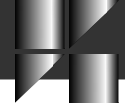
ISSUED FOR PERMITS 03/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

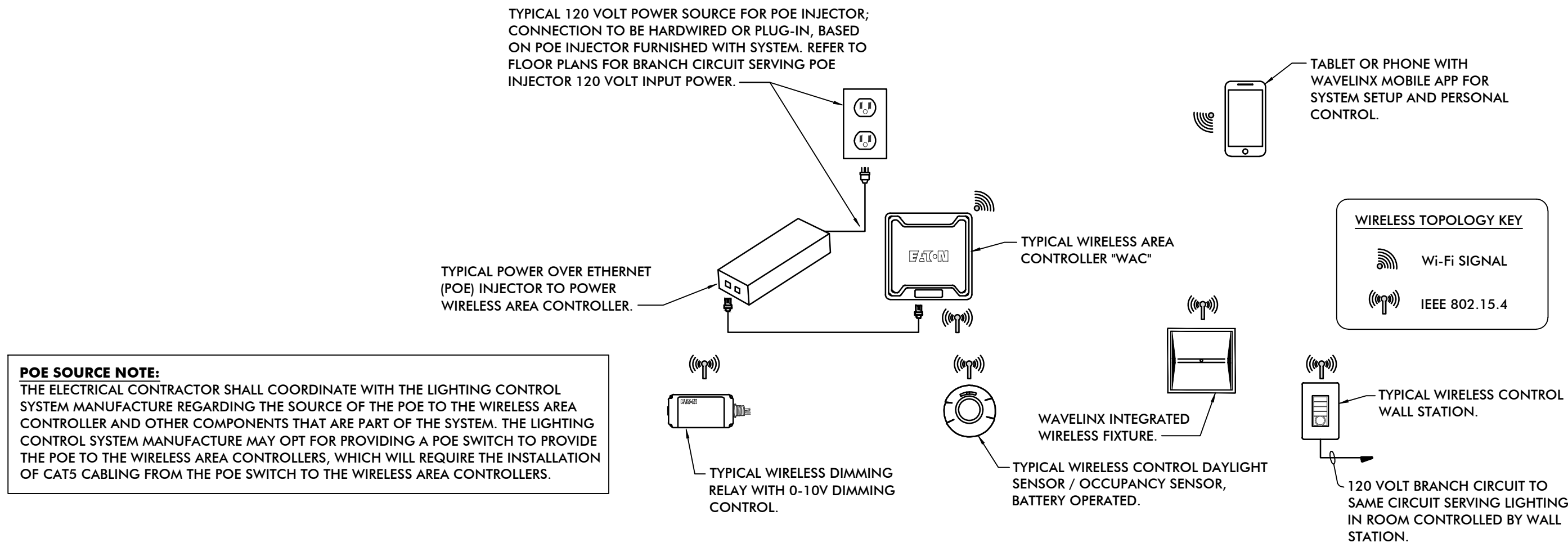
© 2025 STRAUB PETTITT YASTE



Straub  
Pettitt  
Yaste

850 NORTH CROSS ROAD  
SUITE 200  
CLAWSON, MICHIGAN 48017-1311  
248-658-7777 PHONE  
248-658-7781 FAX





## WIRELESS LIGHTING CONTROL SYSTEM - GENERAL SYSTEM TOPOLOGY DIAGRAM

NO SCALE

WIRING DIAGRAM SHOWN IS BASED ON A WIRELESS LIGHTING CONTROL SYSTEM MANUFACTURED BY COOPER; THE COOPER "WAVELINX" SYSTEM. SYSTEMS FROM "EQUAL" MANUFACTURES ARE THE SENSOR SWITCH "nLIGHTAIR" SYSTEM AND THE CURRENT LIGHTING "NX WIRELESS" SYSTEM.

### WIRELESS LIGHTING CONTROL SYSTEM GENERAL NOTES:

#### GENERAL REQUIREMENTS

- The general system topology diagram is diagrammatic only, and intended to convey the general configuration of the lighting control system components used on the project and the method in which the system is interconnected, programmed and operates. Refer to the manufacturer's approved shop / installation drawings for exact system installation and locations where interconnecting wiring may be required. Refer to wireless lighting control system schedule on this sheet for additional information.
- Electrical contractor shall provide and install 1" conduit sleeves between fire rated walls to accommodate routing of the low voltage cabling that may be required in order to support the system installation. The intent of the project is that the system is completely wireless; however, the lighting control system manufacture shall be responsible for directing the contractor where interconnecting wiring and cabling may be required. Provide fire proofing at all penetrations of fire rated walls, floors and ceilings to maintain the fire rating of the surface penetrated.

#### COORDINATION REQUIREMENTS

- Prewire meeting: conducted on-site or during design meeting with lighting control system manufacturers or designated representative prior to commencing work as part of the manufacturer's standard practice and startup services. Manufacturer to review with the installer:
  - Installation of lighting area controller and supervisory controller and locations
  - Lighting control network wiring
  - Network IT requirements
  - Low voltage wiring requirements
  - Lighting control integration requirements
  - Lighting control system integration network wiring and connectivity
  - Installer responsibilities
  - Startup and training schedule and actions

#### CLOSEOUT SUBMITTALS

- Sustainable design closeout documentation.
- Wireless lighting control system manufacturer to provide an operation and maintenance manual that details the start-up procedure being performed including a process to follow, details on tests performed and an area that documents any test results.

#### APPROVALS

- 10-working days prior approval before bid date is required for alternate proposals.
- Complete catalog data, specifications and technical information on alternate equipment must be furnished to the architect and owner at least 30 business days in advance of the submission of approved construction documents.
- For wired alternatives, manufacturer shall provide wiring diagrams and architectural details of interconnecting wiring for power signal and control. Contractor shall provide a labor cost (adder or deduction) to install the wired alternative to the lighting control system.

#### COMMISSIONING

- Provide factory-certified field service engineer to a site visit to ensure proper system installation and operation.
- Qualifications for factory-certified field service engineer:
  - Certified by the equipment manufacturer on the system installed.
- Conclude commissioning with or make a follow-up visit to:
  - Verify system control operation area by area.
  - Obtain sign-off on system functions.
  - User to be trained on system operation.

#### MAINTENANCE MATERIAL SUBMITTALS

- The manufacturer shall make available to the End-User a method of ordering new equipment for expansions, replacements and spare parts through established distributor channels.
- The manufacturer shall make new replacement parts available for minimum of 5 years from date of manufacture.
- The manufacturer shall make directly available to the owner additional software apps that may be desired for a minimum of 10 years from the system's date of purchase.

#### LIGHTING CONTROL APPLICATIONS

- Minimum lighting control performance required, unless local energy code is more stringent.
- Occupancy/vacancy requirements - provide an occupancy/vacancy sensor with manual on/ automatic off or automatic on/ automatic off functionality in all spaces. Manual on vacancy sensors should be used for any enclosed space with a manual on switch that does not require hands free operation. Spaces with multiple occupants or where line of sight might be obscured ceiling or corner mount sensors and manual verifications would be required. Automatic on of lighting via occupancy sensor cannot exceed 50% of lighting. Systems that do that allow the user to select occupancy or vacancy mode shall not be acceptable.
- Daylight zones - primary sidelit or toplit areas within an enclosed space shall be controlled separately and automatically by individual integrated daylight sensors. Adjustments to the daylight zones must be provided by a simple to use, intuitive mobile application.
- Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to dim electric light to the lowest light level and off.
- Provide the ability to adjust the high-end and low-end trim of the dimmers to ensure the lighting automatically provides energy saving even when daylighting calls for full illumination.
- Provide the ability for the dimmers and the relays to function separately. Systems where the 0-10v dimmers and relays are tied together reduce design capabilities and shall not be acceptable.

#### CYBERSECURITY

- The network connectable products within the Wireless Lighting Control system must be UL2900-1 listed to the Standard for Software Cybersecurity for Network-Connectable Products. Wireless Lighting Control Systems that fail to meet this requirement will not be accepted.

#### INSTALLATION

- The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits.
- Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.
- Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
  - Sensor parameters, time delays, sensitivities and daylighting setpoints.
  - Sequence of operation, (e.g. manual ON, Auto OFF, Etc.).
  - Load parameters (e.g. blink warning, etc.).

#### PRODUCT SUPPORT AND SERVICE

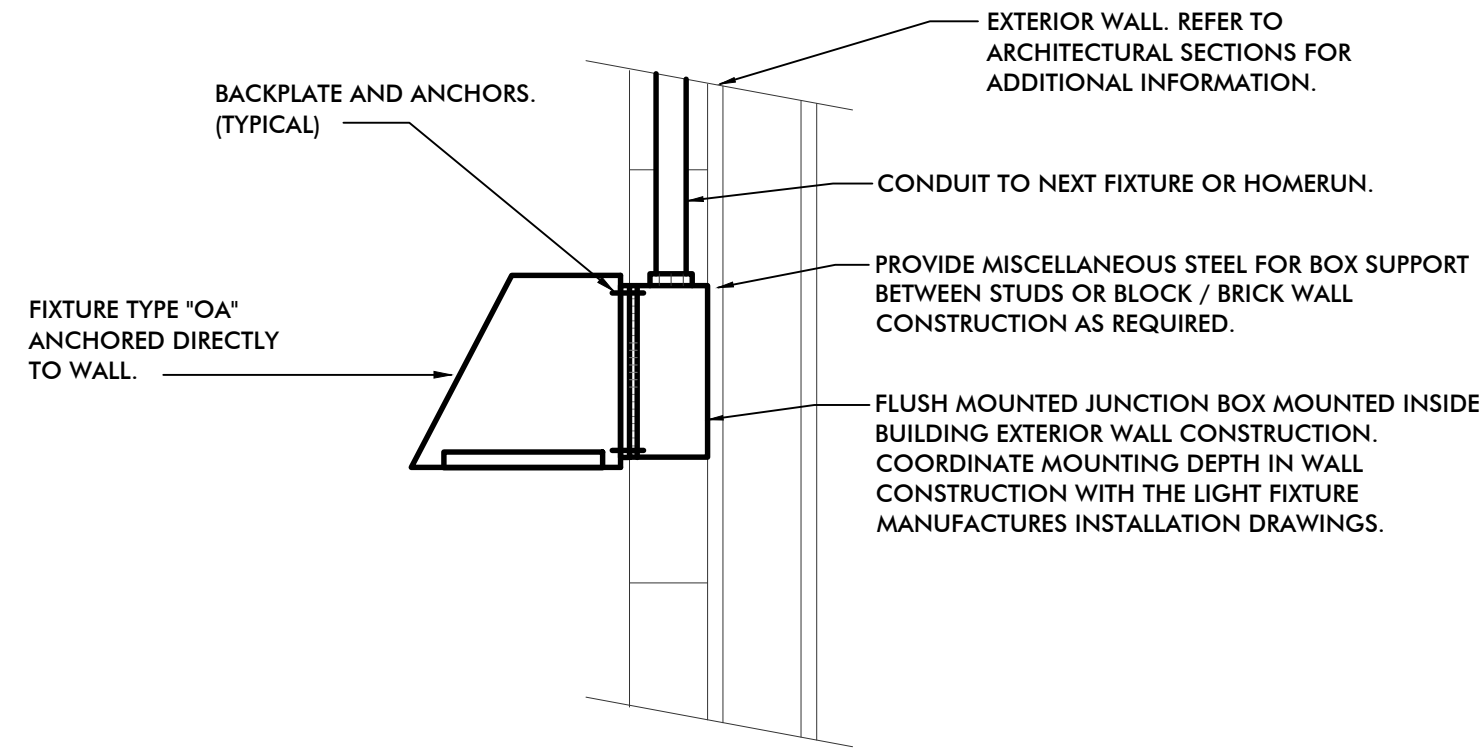
- Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of solving programming or application questions concerning the control equipment.

#### FACTORY COMMISSIONING

- Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.
- The electrical contractor shall provide both the manufacturer and the electrical engineer with twenty-one (21) working days written notice of the system startup and adjustment date.
- Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.
- Qualifications for factory certified field service engineer:
  - Certified by the equipment manufacturer on the system installed.
- Make first visit upon completion of installation of WaveLinX Connected Lighting system:
  - Verify locations of Wireless Area Controllers
  - Verify implementation of Construction Group process
- Identify connected devices and program using WaveLinX Mobile and Automatic Code Commissioning.
- Verify that system operation control based on defined Sequence of Operations (SOO).
- Obtain sign-off on system functions.

#### CLOSEOUT ACTIVITIES

- Training Visit
- Lighting control system manufacturer to provide one (1) day additional on-site system training to site personnel. This shall be a part of the second visit by field service to the site. A separate third visit will require an additional charge.
- During this visit, the manufacturer's Field Service Engineer will perform tasks, at the request of the facility representative or Commissioning Agent, such as to demonstrate wall control functions, explain or describe occupancy and/or daylight sensor functionality.

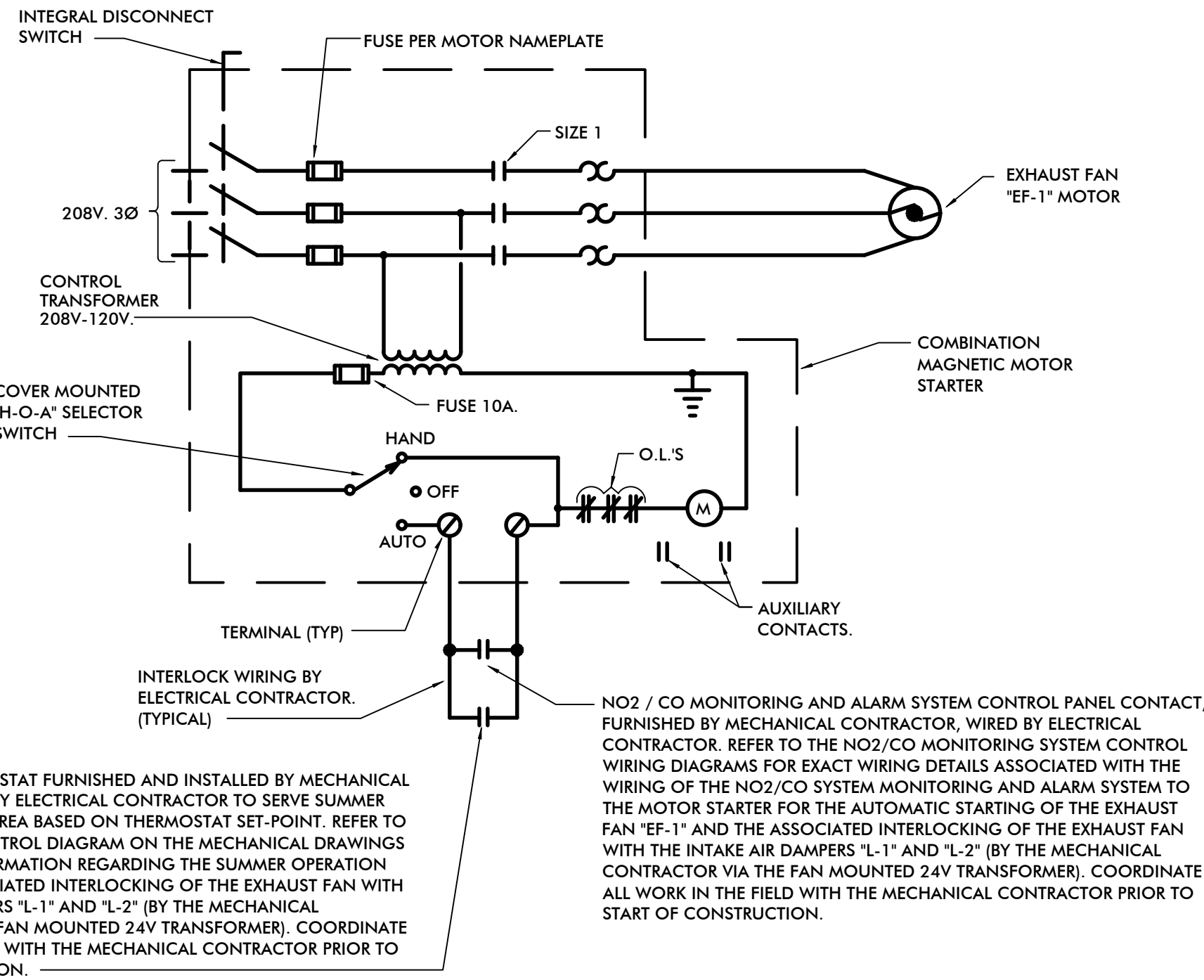


## FIXTURE TYPE "OA" MOUNTING DETAIL (SECTION)

NO SCALE

(DETAIL SIMILAR FOR FIXTURE TYPES "OA1" AND "OA2")

NOTE: FIXTURE SHAPE CONVEYED IN THE ABOVE DETAIL IS INTENDED TO REPRESENT THE GENERAL SHAPE OF THE LIGHT FIXTURE; HOWEVER THE DETAIL IS NOT INTENDED TO BE AN EXACT GRAPHICAL REPRESENTATION OF THE SPECIFIED FIXTURE. REFER TO THE LIGHTING FIXTURE SCHEDULE AND ASSOCIATED CUT SHEET FOR AN EXACT DESCRIPTION AND REPRESENTATION OF THE SPECIFIED FIXTURE.

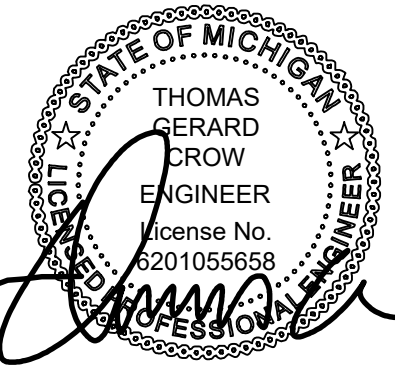


#### WIRING DIAGRAM NOTE:

ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE SEQUENCE OF OPERATION AND THE EXACT SYSTEM WIRING AND INTERLOCKING OF THE EXHAUST FAN "EF-1" AND INTAKE AIR LOUVERS "L-1" AND "L-2" WITH THE MECHANICAL CONTRACTOR IN THE FIELD PRIOR TO START OF CONSTRUCTION AND PRIOR TO THE ROUGH-IN OF ANY BOXES, RACEWAYS, STARTERS, ETC. THE WIRING DIAGRAM INDICATED IS DIAGRAMMATIC ONLY AND INTENDED TO DEMONSTRATE THE GENERAL SYSTEM POWER WIRING AND INTERLOCKING WITH THE NO2/CO DETECTION SYSTEM, AND INTERLOCKING WITH THE H&V UNIT "HV-1" FOR SUMMER TIME VENTILATION.

## TYPICAL THREE PHASE NO2 / CO DETECTION SYSTEM EXHAUST FAN CONTROL WIRING DIAGRAM

NO SCALE



SEALED & SIGNED 03/21/2025, SEAL APPLIES ONLY TO THE ELECTRICAL DOCUMENTS PREPARED BY TAC ASSOCIATES, LLC

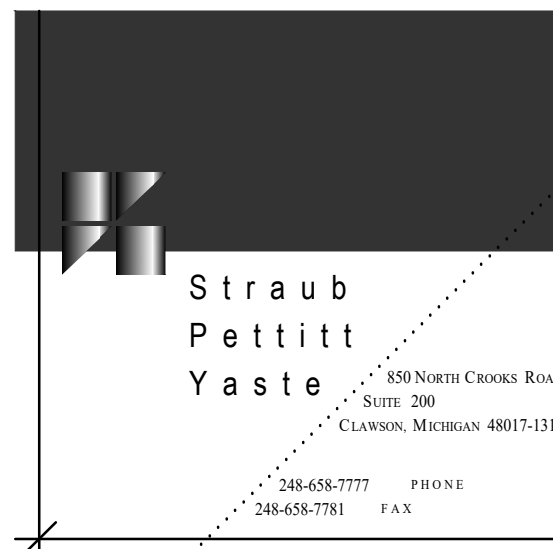
ISSUED FOR PERMITS 03/21/2025

OAKWOOD VENEER COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

© 2025 STRAUB PETTITT YASTE



MISCELLANEOUS WIRING  
DIAGRAMS & DETAILS

E400



WIRELESS LIGHTING CONTROL SYSTEM SCHEDULE																	
CIRCUIT TAG	ROOM CONTROLLER TAG	SWITCHPACK CONTROL FUNCTION (Cooper WSP-MV-010 SERIES)	BRANCH CIRCUIT No.	LIGHTING LOAD DESCRIPTION	CONTROL STATION - SEE NOTE - 4			ASTRO TIME CLOCK CONTROL		OCCUPANCY SENSOR CONTROL / OUTDOOR CONTROL MODULE				DAYLIGHT HARVESTING CONTROL			REMARKS
					STATION No.	ZONE No.	DIMMER	YES / NO	ON / OFF SET POINT	"ON" CONTROL	"OFF" CONTROL	TIME DELAY	SENSOR No.	"ON" SETPOINT	"OFF" SETPOINT	SENSOR No.	
LVLC-001	-	IN-FIXTURE SENSOR / RADIO WAVELINX WPS2	SEE FLOOR PLAN	LOADING DOCK EXTERIOR LIGHT	-	-	-	YES	DUSK TO DAWN 11PM DIM 30%	"ON AT DUSK 11PM DIM 30%	5AM - FULL ON "OFF" AT DAWN	N/A	W01	-	-	-	EXACT TIME CLOCK SETTING TO BE VERIFIED WITH OWNER'S CONSTRUCTION REPRESENTATIVE.
LVLC-002	-	IN-FIXTURE SENSOR / RADIO WAVELINX WPS2	SEE FLOOR PLAN	NORTH EXTERIOR PALLET STORAGE AREA	-	-	-	YES	DUSK TO DAWN 11PM DIM 30%	"ON AT DUSK 11PM DIM 30%	5AM - FULL ON "OFF" AT DAWN	N/A	W02	-	-	-	EXACT TIME CLOCK SETTING TO BE VERIFIED WITH OWNER'S CONSTRUCTION REPRESENTATIVE.
LVLC-003	-	IN-FIXTURE SENSOR / RADIO WAVELINX WPS4	SEE FLOOR PLAN	WAREHOUSE INTERIOR LIGHTING ZONE 1	"CS1", "CS2"	1	YES	YES	MIDNIGHT SWEEP - OFF	AUTO-ON AT 50% DIMMED LEVEL	AUTO-OFF (SWITCHED OFF)	20-MINUTES	"DO1" Thru "DO9"	-	-	-	
LVLC-004	-	IN-FIXTURE SENSOR / RADIO WAVELINX WPS4	SEE FLOOR PLAN	WAREHOUSE INTERIOR LIGHTING ZONE 2	"CS1", "CS2"	2	YES	YES	MIDNIGHT SWEEP - OFF	AUTO-ON AT 50% DIMMED LEVEL	AUTO-OFF (SWITCHED OFF)	20-MINUTES	"DO1" Thru "DO9"	-	-	-	
LVLC-005		IN-FIXTURE SENSOR / RADIO WAVELINX WPS4	SEE FLOOR PLAN	WAREHOUSE INTERIOR LIGHTING ZONE 3	"CS1", "CS2"	3	YES	YES	MIDNIGHT SWEEP - OFF	AUTO-ON AT 50% DIMMED LEVEL	AUTO-OFF (SWITCHED OFF)	20-MINUTES	"DO7" Thru "DO15"	-	-	-	
LVLC-006		IN-FIXTURE SENSOR / RADIO WAVELINX WPS4	SEE FLOOR PLAN	WAREHOUSE INTERIOR LIGHTING ZONE 4	"CS1", "CS2"	4	YES	YES	MIDNIGHT SWEEP - OFF	AUTO-ON AT 50% DIMMED LEVEL	AUTO-OFF (SWITCHED OFF)	20-MINUTES	"DO7" Thru "DO15"	-	-	-	

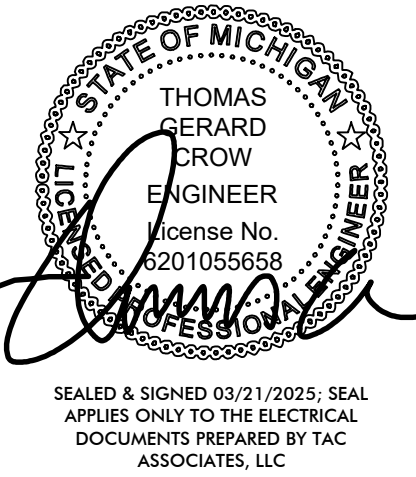
NOTES:

1.
- THE LIGHTING CONTROL SYSTEM MANUFACTURE SHALL BE RESPONSIBLE FOR THE SELECTION OF THE EXACT SWITCHPACK AND ADDITIONAL COMPONENTS REQUIRED FOR ALL "SWITCHPACKS" / RELAYS INDICATED IN THE ABOVE SCHEDULE. THE RELAY TYPE INDICATED IN THE SCHEDULE ABOVE PROVIDES ONLY THE GENERIC GENERAL TYPE OF RELAY, AND IS NOT INTENDED TO CONVEY THE EXACT SPECIFIC TYPE OR MODEL NUMBER REQUIRED.
2.
- REFER TO WIRELESS LIGHTING CONTROL SYSTEM - GENERAL SYSTEM TOPOLOGY DIAGRAM ON SHEET E301 FOR ADDITIONAL INFORMATION REGARDING THE GENERAL CONFIGURATION OF THE SYSTEM AND THE ASSOCIATED COMPONENTS THAT COMPRISE THE SYSTEM. THE SYSTEM MANUFACTURE SHALL BE RESPONSIBLE FOR PREPARING SYSTEM WIRING DIAGRAMS SPECIFIC TO THIS PROJECT FOR THE ELECTRICAL CONTRACTOR'S USE FOR THE SYSTEM INSTALLATION. THE NOTED WIRING DIAGRAM SHALL BE SUBMITTED DURING THE SHOP DRAWING PHASE OF THE PROJECT FOR REVIEW. THE MANUFACTURES GENERIC WIRING DIAGRAMS ARE NOT INCLUDED SINCE THESE DIAGRAMS DO NOT PROVIDE ANY CLARIFICATION OF HOW THIS SPECIFIC SYSTEM WILL BE INSTALLED. THE BIDDING CONTRACTOR SHALL CONTACT THE LOCAL MANUFACTURES REPRESENTATIVES TO GAIN A COMPLETE UNDERSTANDING OF HOW THE SYSTEM OPERATES AND HOW THE SYSTEM IS INSTALLED PRIOR TO SUBMITTING HIS/HER BID.
3.
- LIGHT FIXTURES CONTROLLED BY THIS SWITCHPACK RELAY (OR IN-FIXTURE CONTROLS) SHALL NOT BE CAPABLE OF BEING TURNED OFF, WHEN THE CONTROL STATION PUSHBUTTON SERVING THIS RELAY IS DEPRESSED TO THE "OFF" POSITION THE FIXTURES CONTROLLED BY THIS ROOM CONTROLLER SHALL DIM DOWN TO A DIMMED LEVEL OF 10%, TO ALLOW THE FIXTURES TO REMAIN ILLUMINATED AT A DIMMED LEVEL TO PROVIDE A LOW LEVEL OF NIGHT LIGHTING IN THE AREA. UPON DESPRESSING THE "ON" PUSHBUTTON, THE SWITCHPACK RELAY (OR IN-FIXTURE CONTROLS) SHALL BE ENERGIZED TO THE FULL ILLUMINATION LEVEL FOR THE FIXTURES, OR TO THE PRE-SET SCENE DIMMED STATE, WHICHEVER IS APPLICABLE FOR THE GIVEN CONTROL STATION. WHILE THE SWITCHPACK (OR IN-FIXTURE CONTROLS) IS CALLED TO BE "ON" THE FIXTURE SHALL OPERATE AS NORMAL, INCLUDING DIMMING CONTROL BASED ON THE OPERATION OF THE DIMMING PUSHBUTTONS ON THE CONTROL STATION AND THE DAYLIGHT HARVESTING CONTROLS; HOWEVER, THE SWITCHPACK (OR IN-FIXTURE CONTROLS) SHALL HAVE A PROGRAMMED MINIMUM DIMMED STATE LEVEL OF 10%, AND THE FIXTURE SHALL NOT BE CAPABLE OF BEING DIMMED ANY LOWER THAN THIS PRESET THRESHOLD.
4.
- REFER TO WIRELESS LIGHTING CONTROL STATION SCHEDULE THIS SHEET FOR PROGRAMMING AND ASSIGNING OF THE LIGHTING ZONES INDICATED TO THE RESPECTIVE CONTROL STATION SCENES AND/OR CONTROL BUTTONS.
5.
- REFER TO LIGHTING FLOOR PLANS FOR BRANCH CIRCUIT SERVING LIGHTING FIXTURES WITH IN-FIXTURE SENSORS AND WIRELESS RADIO. CIRCUIT NUMBER INDICATED IS THE BRANCH CIRCUIT SHOWN ON THE FLOOR PLANS TO SERVE THE FIXTURES WITH IN-FIXTURE SENSORS, BUT WILL ALSO SERVE THE ROOM CONTROLLER POWER FOR ALTERNATE MANUFACTURES LIGHTING CONTROL SYSTEMS WHICH REQUIRE A ROOM CONTROLLER TO BE PART OF THE WIRELESS CONTROL SYSTEM. THE BASIS OF DESIGN SYSTEM DOESNT REQUIRE A ROOM CONTROLLER, BUT THIS DETAIL IS NOTED IN THE EVENT ONE OF THE ALTERNATE MANUFACTURE SYSTEMS IS UTILIZED.

WIRELESS LIGHTING CONTROL STATION SCHEDULE												
STATION No.	CONTROL STATION MODEL NUMBER - SEE NOTES 1 & 2 (Cooper WaveLinx SERIES)	SCENE 1		SCENE 2		SCENE 3		SCENE 4		RAISE / LOWER BUTTON		REMARKS
		ZONES	DIM STATE	ZONES	DIM STATE	ZONES	DIM STATE	ZONES	DIM STATE	YES/NO	ZONES	
CS1	WW5-RL-X-ENGRV	1	ZONE 1 100%	2	ZONE 2 100%	3	ZONE 3 100%	4	ZONE 4 100%	YES	1,2,3,4	VERIFY EXACT PROGRAMMING OF SCENES WITH THE OWNERS CONSTRUCTION REPRESENTATIVE.
CS2	WW5-RL-X-ENGRV	1	ZONE 1 100%	2	ZONE 2 100%	3	ZONE 3 100%	4	ZONE 4 100%	YES	1,2,3,4	VERIFY EXACT PROGRAMMING OF SCENES WITH THE OWNERS CONSTRUCTION REPRESENTATIVE.

NOTES:

1.
- CONTROL STATION FINISH TO BE SELECTED BY ARCHITECT. FINISH OPTION IS DENOTED BY THE "-X" IN THE SCHEDULE ABOVE.
2.
- PROVIDE CUSTOM ENGRAVING OF PUSHBUTTONS TO REFLECT SCENE DESCRIPTION INDICATED IN THE SCHEDULE ABOVE.



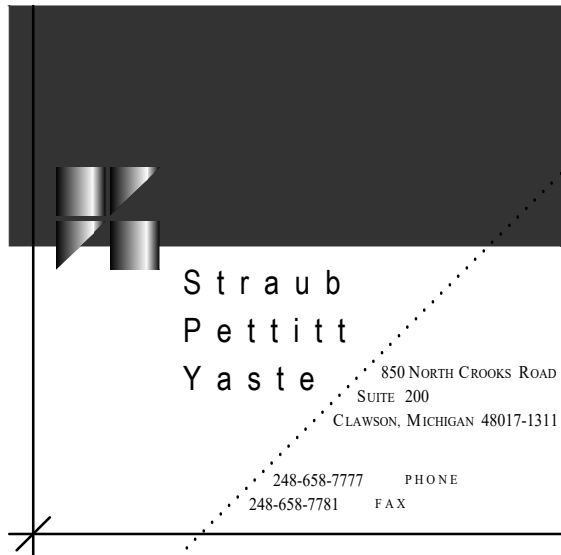
ISSUED FOR PERMITS 03/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

© 2025 STRAUB PETTITT YASTE



MISCELLANEOUS WIRING  
DIAGRAMS & DETAILS

E401



# Electrical Specifications

## SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

- Copper building wire rated 600 V or less.
- Aluminum building wire rated 600 V or less.
- Metal-clad cable, Type MC, rated 600 V or less.
- Connectors, splices, and terminations rated 600 V and less.

#### 1.2 INFORMATIONAL SUBMITTALS

##### A. Field quality-control reports.

### PART 2 - PRODUCTS

#### 2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

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

- Alpha Wire Company.
- Belden Inc.
- Cerro Wire LLC.
- General Cable Technologies Corporation.
- Service Wire Co.
- Southwire Company.

##### C. Standards:

- Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - RoHS compliant.
  - Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Conductor Insulation:
- Type THHN and Type THWN-2: Comply with UL 84.
  - Type THW and Type THW-2: Comply with NEMA WC-70/CEA 5-95-658 and UL 83.
  - Type XHHW-2: Comply with UL 44.

#### 2.2 ALUMINUM BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

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

- Alpha Wire Company.
- Belden Inc.
- Cerro Wire LLC.
- General Cable Technologies Corporation.
- Okonite Company (The).
- Southwire Company.

##### C. Standards:

- Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - RoHS compliant.
  - Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Aluminum, complying with ASTM B 800 and ASTM B 801.
- E. Conductor Insulation:
- Type THHN and Type THWN-2: Comply with UL 84.
  - Type THW and Type THW-2: Comply with NEMA WC-70/CEA 5-95-658 and UL 83.
  - Type XHHW-2: Comply with UL 44.

#### 2.3 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

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

- Alpha Wire Company.
- Belden Inc.
- General Cable Technologies Corporation.
- Okonite Company (The).
- Service Wire Co.
- Southwire Company.

##### C. Standards:

- Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - Comply with UL 1569.
  - RoHS compliant.
  - Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
- Single circuit and multicircuit with color-coded conductors.
- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

##### F. Ground Conductor: Insulated.

##### G. Conductor Insulation:

- Type TFF/THHN/THWN-2: Comply with UL 83.
- Type XHHW-2: Comply with UL 44.

##### H. Armor: Aluminum, interlocked.

##### I. Jacket: PVC applied over armor.

#### 2.4 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

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

- 3M Electrical Products.
- AFC Cable Systems; a part of Aikore International.
- Hubbell Power Systems, Inc.
- Ideal Industries, Inc.
- ILSCO.
- NSI Industries LLC.
- O-Z/Gedney; a brand of Emerson Industrial Automation.
- Service Wire Co.

- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

##### D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

- Material: Copper.
- Type: One hole with standard barrels.
- Termination: Compression.

### PART 3 - EXECUTION

#### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, unless noted otherwise on the drawings.

##### B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

#### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

##### A. Service Entrance: Type XHHW-2, single conductors in raceway.

##### B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

##### C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.

##### D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

##### E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.

##### F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC. For Branch Circuits serving Patient Care Areas, Hospital Grade Armored Cable, Type AC shall be used in lieu of Type MC.

##### G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

#### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

##### A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

##### B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

##### C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

##### D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

##### E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

##### F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

#### 3.4 CONNECTIONS

##### A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

##### B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unsplined conductors.

- Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

#### 3.5 IDENTIFICATION

##### A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

##### B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

#### 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

##### A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Coordinate installation and requirements for sleeves with Architectural specifications.

#### 3.7 FIRESTOPPING

##### A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

### END OF SECTION 260519

## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section includes grounding and bonding systems and equipment.

#### 1.2 INFORMATIONAL SUBMITTALS

- Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
- Qualification Data: For testing agency and testing agency's field supervisor.
- Field quality-control reports.

#### 1.3 CLOSEOUT SUBMITTALS

##### A. Operation and maintenance data.

- Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
  - Test wells.
  - Ground rods.
- Instructions for periodic testing and inspection of grounding features at test wells based on NFPA 70B.
  - Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
  - Include recommended testing intervals.

#### 1.4 QUALITY ASSURANCE

##### A. Testing Agency Qualifications: Certified by NETA.

### PART 2 - PRODUCTS

#### 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

##### B. Comply with UL 467 for grounding and bonding materials and equipment.

#### 2.2 MANUFACTURERS

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

- Burndy; Part of Hubbell Electrical Systems.
- ERICO International Corporation.
- Golvan Industries, Inc.; Electrical Products Division, LLC.
- Harger Lightning & Grounding.
- ILSCO.
- O-Z/Gedney; a brand of Emerson Industrial Automation.
- SIEMENS Industry, Inc.; Energy Management Division.

### 2.3 CONDUCTORS

##### A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

##### B. Bare Copper Conductors:

- Solid Conductors: ASTM B 3.
- Stranded Conductors: ASTM B 8.
- Tinned Conductors: ASTM B 33.
- Bonding Cable: 28 kmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
- Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
- Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

##### C. Grounding Bus: Prefabricated rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

### 2.4 CONNECTORS

##### A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

##### B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

##### C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

##### D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

##### E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

##### F. Conduit Hubs: Mechanical type, terminal with threaded hub.

##### G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

##### H. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

##### I. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

##### J. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

##### K. Straps: Solid copper, copper lugs. Rated for 600 A.

##### L. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

##### M. Water Pipe Clamps:

- Mechanical type, two pieces with stainless-steel bolts.
  - Material: Die-cast zinc alloy.
  - Listed for direct burial.
- U-bolt type with malleable-iron clamp and copper ground connector.

### 2.5 GROUNDING ELECTRODES

##### A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

### PART 3 - EXECUTION

#### 3.1 APPLICATIONS

##### A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

##### B. Underground Grounding Conductors: Install bare copper conductor, No. 3/0 AWG minimum.

##### 1. Bury at least 24 inches (600 mm) below grade.

##### C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

- Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
- Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

##### D. Conductor Terminations and Connections:

- Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
- Underground Connections: Welded connectors except at test wells and as otherwise indicated.
- Connections to Ground Rods at Test Wells: Bolted connectors.
- Connections to Structural Steel: Welded connectors.

#### 3.2 GROUNDING AT THE SERVICE

##### A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

#### 3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

##### A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

#### 3.4 EQUIPMENT GROUNDING

##### A. Install insulated equipment grounding conductors with all feeders and branch circuits.

##### B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

##### C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

##### D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

#### 3.5 FENCE GROUNDING

##### A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:

- Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).
  - Gates and Other Fence Openings: Ground fence on each side of opening.
- Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.
- Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

#### 3.6 INSTALLATION

##### A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

##### B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

##### C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

##### 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

##### D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

##### 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

##### 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

##### 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

##### E. Grounding and Bonding for Piping:

##### 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

##### 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

##### 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

### 3.7 FIELD QUALITY CONTROL

##### A. Perform tests and inspections.

##### B. Tests and Inspections:

##### 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

##### 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

##### 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before any conductors are connected.

##### a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

##### b. Perform tests by fall-of-potential method according to IEEE 81.

##### 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

##### C. Grounding system will be considered defective if it does not pass tests and inspections.

##### D. Prepare test and inspection reports.

##### E. Report measured ground resistances that exceed the following values:

- Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
- Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm[s].

##### F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

### END OF SECTION 260526

## SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

- Steel slotted support systems.
- Conduit and cable support devices.
- Support for conductors in vertical conduit.
- Structural steel for fabricated supports and restraints.
- Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
- Fabricated metal equipment support assemblies.

#### 1.2 INFORMATIONAL SUBMITTALS

##### A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

##### B. Welding certificates.

#### 1.3 QUALITY ASSURANCE

##### A. Welding Qualifications: Qualify procedures and personnel according to the following:

- AWS D1.1/D1.1M.
- AWS D1.2/D1.2M.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

##### Retain "Delegated Design" Paragraph below if Contractor is required to assume responsibility for design.

##### A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

##### B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- Flame Rating: Class 1.
- Self-extinguishing according to ASTM D 635.

#### 2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

##### A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-(10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

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

- Allied Tube & Conduit; a part of Aikore International.
- B-line, an Eaton business.
- ERICO International Corporation.
- G-Strut.
- Thomas & Betts Corporation; A Member of the ABB Group.
- Unistrut; Part of Aikore International.

##### 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.

##### 3. Material for Channel, Fittings, and Accessories: Galvanized steel.

##### 4. Channel Width: Selected for applicable load criteria.

##### 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

##### 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

##### 7. Protect finishes on exposed surfaces from damage by applying a stripable, temporary protective covering before shipping.

##### B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

##### C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

##### D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

##### E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

- Powder-



# Electrical Specifications (Continued)

## SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Metal conduits and fittings.
  - 2. Nonmetallic conduits and fittings.
  - 3. Metal wireways and auxiliary gutters.
  - 4. Surface raceways.
  - 5. Boxes, enclosures, and cabinets.
- B. Related Requirements:
  - 1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.
- 1.2 INFORMATIONAL SUBMITTALS
  - A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
    - 1. Structural members in paths of conduit groups with common supports.
    - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

### PART 2 - PRODUCTS

#### 2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. Allied Tube & Conduit; a part of Atkore International.
    - c. Electri-Flex Company.
    - d. O-Z/Gedney; a brand of Emerson Industrial Automation.
    - e. Republic Conduit.
    - f. Southwire Company.
    - g. Thomas & Betts Corporation; A Member of the ABB Group.
    - h. Western Tube and Conduit Corporation.
  - 2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 3. GRC: Comply with ANSI C80.1 and UL 6.
  - 4. IMC: Comply with ANSI C80.6 and UL 1242.
  - 5. EMT: Comply with ANSI C80.3 and UL 797.
  - 6. FMC: Comply with UL 1; zinc-coated steel or aluminum.
  - 7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. Allied Tube & Conduit; a part of Atkore International.
    - c. O-Z/Gedney; a brand of Emerson Industrial Automation.
    - d. Republic Conduit.
    - e. Southwire Company.
    - f. Thomas & Betts Corporation; A Member of the ABB Group.
    - g. Western Tube and Conduit Corporation.
  - 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 3. Fittings, General: Listed and labeled for type of conduit, location, and use.
  - 4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
  - 5. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: Setscrew.
  - 6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external banding jumper.
  - C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

#### 2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Nonmetallic Conduit:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. CANTEX INC.
    - c. CertainTeed Corporation.
    - d. Electri-Flex Company.
    - e. Kraloy.
    - f. RACO; Hubbell.
    - g. Thomas & Betts Corporation; A Member of the ABB Group.
  - 2. Fittings, General: Listed and labeled for type of conduit, location, and use.
  - 3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
  - 4. Solvents and Adhesives: As recommended by conduit manufacturer.
- 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. B-line, an Eaton business.
    - 2. Hoffman; a brand of Pentair Equipment Protection.
    - 3. MonoSystems, Inc.

- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 12 unless otherwise indicated, and sized according to NFPA 70.
  - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, and caps, and other fittings to match and mate with wireways as required for complete system.
- 2.4 BOXES, ENCLOSURES, AND CABINETS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Crouse-Hinds, an Eaton business.
    - 2. Erickson Electrical Equipment Company.
    - 3. Hoffman; a brand of Pentair Equipment Protection.
    - 4. Hubbell Incorporated.
    - 5. Milbank Manufacturing Co.
    - 6. O-Z/Gedney; a brand of Emerson Industrial Automation.
    - 7. Thomas & Betts Corporation; A Member of the ABB Group.
  - B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
  - C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
  - D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
  - E. Metal Floor Boxes:
    - 1. Material: Cast metal.
    - 2. Type: Fully adjustable.
    - 3. Shape: Rectangular.
    - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
  - G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).
    - 1. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
  - I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
  - J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
  - K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
  - L. Gangable boxes are prohibited.
  - M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 12 with continuous-hinge cover with flush latch unless otherwise indicated.
    - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
    - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
  - N. Cabinets:
    - 1. NEMA 250, Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
    - 2. Hinged door in front cover with flush latch and concealed hinge.
    - 3. Key latch to match panelboards.
    - 4. Metal barriers to separate wiring of different systems and voltage.
    - 5. Accessory feet where required for freestanding equipment.

### PART 3 - EXECUTION

#### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: GRC.
  - 2. Concealed Conduit, Aboveground: GRC or EMT.
  - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
  - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated.
  - 1. Exposed, Not Subject to Physical Damage: EMT.
  - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
  - 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
    - a. Mechanical rooms.
  - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  - 6. Damp or Wet Locations: GRC.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
  - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit above grade, inside the building or on the roof. Nonmetallic conduit shall ONLY BE USED BELOW GRADE. UNDER NO CIRCUMSTANCES SHALL NONMETALLIC CONDUIT BE INSTALLED ABOVE GRADE, WITHIN THE BUILDING ENVELOPE OR EXPOSED ON THE ROOF. Any nonmetallic conduit found on the project to be installed in any of the locations described above will result in the Electrical Contractor having to remove and replace the raceway with a specified metallic raceway at the Contractor's expense.
- 3.2 INSTALLATION
  - A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
  - B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
  - C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
  - D. Do not fasten conduits onto the bottom side of a metal deck roof.
  - E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
  - F. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
  - G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
  - H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- L. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  - 5. Change from ENT to GRC before rising above floor.
- M. Stub-ups to Above Recessed Ceilings:
  - 1. Use EMT for raceways.
  - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- 5. Surface Raceways:
  - 1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
  - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where an underground service raceway enters a building or structure.
  - 3. Conduit extending from interior to exterior of building.
  - 4. Conduit extending into pressurized duct and equipment.
  - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  - 6. Where otherwise required by NFPA 70.
- V. Expansion-Joint Fittings:
  - 1. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    - d. Attics: 135 deg F (75 deg C) temperature change.
  - 2. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  - 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a airtight connection between the box and cover plate or the supported equipment and box.
- Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- AA. Locate boxes so that cover or plate will not span different building finishes.
- BB. Support boxes of three gages or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- DD. Set metal floor boxes level and flush with finished floor surface.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
  - A. Direct-Buried Conduit:
    - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
    - 2. Install backfill as specified in Section 312000 "Earth Moving."
  - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
  - 4. Install manufactured duct elbows for stub-up and at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  - 5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
    - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
    - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
  - 6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

#### 3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

#### 3.5 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

#### 3.6 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

### END OF SECTION 260533

## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
  - 2. Labels.
  - 3. Tapes and stencils.
  - 4. Tags.
  - 5. Signs.
  - 6. Cable ties.
  - 7. Point for identification.
  - 8. Fasteners for labels and signs.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

#### 2.2 COLOR AND LEGEND REQUIREMENTS

- A. Color-Coding for Phase: Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
  - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  - 2. Colors for 240/120-V Circuits: Match existing color coding used in the facility. If there is not an existing color coding used in the facility, use the following:
    - a. Phase A: Black.
    - b. Phase B: Orange (High Leg).
    - c. Phase C: Red.
  - 3. Color for Neutral: White or gray.
  - 4. Color for Equipment Grounds: Green.
  - 5. Colors for Isolated Grounds: Green with white stripe.
- B. Warning labels and signs shall include, but are not limited to, the following legends:
  - 1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
  - 2. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 3. Arc Flash Hazard Warning: Refer to Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- C. Equipment Identification Labels:
  - 1. Black letters on a white field.

#### 2.3 LABELS

- A. Self-Adhesive Wraparound Labels: Preprinted, 3-mil (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Brother International Corporation.
    - c. Ideal Industries, Inc.
    - d. Panduit Corp.
  - 2. Self-Lamination: Clear, UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
  - 3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- 2.4 TAPES AND STENCILS
  - A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Carlton Industries, LP.
      - b. Ideal Industries, Inc.
      - c. Marking Services, Inc.
    - 2. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
      - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        - a. Brady Corporation.
        - b. Carlton Industries, LP.
        - c. emeco.
      - 2. Floor Marking Tape: 2-inch (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

#### D. Underground-Line Warning Tape:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Brady Corporation.
  - b. Ideal Industries, Inc.
  - c. LEM Products Inc.
  - d. Marking Services, Inc.
  - e. Reef Industries, Inc.
- 2. Tape:
  - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
  - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- 3. Color and Printing:
  - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
  - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
  - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".
- 4. Tag: :
  - a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
  - b. Width: 3 inches (75 mm).
  - c. Overall Thickness: 5 mils (0.125 mm).
  - d. Foil Core Thickness: 0.35 mil (0.0089 mm).
  - e. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
  - f. Tensile according to ASTM D 882: 70 lbf (311.3 N) and 4600 psi (31.7 MPa).

#### 2.5 SIGNS

- A. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Engraved legend.
  - 2. Thickness:
    - a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
    - b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
  - c. Engraved legend with black letters on white face.
  - d. Self-adhesive.
  - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

#### 2.6 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
  - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  - 4. Color: Black, except where used for color-coding.

#### 2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- J. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- K. Self-Adhesive Labels:
  - 1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch (13-mm-) high letters on 1-1/2-inch (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- L. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
  - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- M. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- N. Underground-Line Warning Tape:
  - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
  - 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- O. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch (13-mm-) high letters on minimum 1-1/2-inch (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- P. Cable Ties: General purpose, for attaching tags.



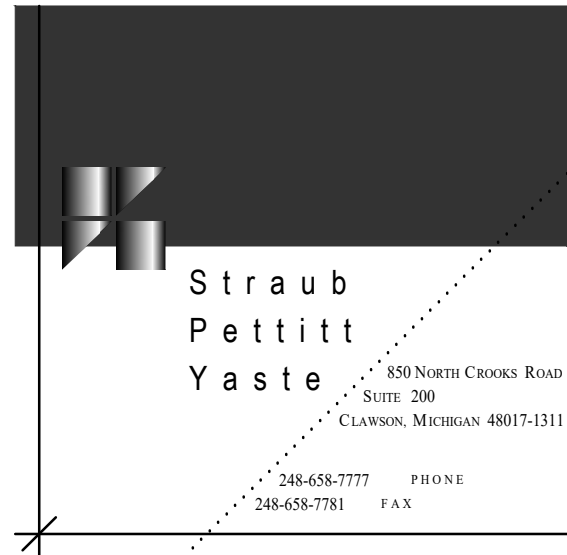
ISSUED FOR PERMITS 03/21/2025

## OAKWOOD VENEER COMPANY WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

© 2025 STRAUB PETTITT YASTE



ELECTRICAL  
SPECIFICATIONS

E501



# Electrical Specifications (Continued)

## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS (Continued)

### 3.2 IDENTIFICATION SCHEDULE

- Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive vinyl tape to identify the phase.
  - Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.
- Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive wraparound labels with the conductor designation.
- Conductors to be Extended in the Future: Attach write-on tags to conductors and list source.
- Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- Arc Flash Warning Labeling: Self-adhesive labels.
- Equipment Identification Labels:
  - Indoor Equipment: Laminated acrylic or melamine plastic sign.
  - Outdoor Equipment: Laminated acrylic or melamine sign.

### END OF SECTION 260553

## SECTION 260573.13 - SHORT-CIRCUIT STUDIES

### PART 1 - GENERAL

- SUMMARY
  - Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.
- ACTION SUBMITTALS
  - Product Data: For computer software program to be used for studies.
  - Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
    - Short-circuit study input data, including completed computer program input data sheets.
    - Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
      - Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
      - Revised single-line diagram, reflecting field investigation results and results of short-circuit study.
- INFORMATIONAL SUBMITTALS
  - Qualification Data: For Short-Circuit Study Specialist.
  - Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.
- QUALITY ASSURANCE
  - Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
  - Software algorithms shall comply with requirements of standards and guides specified in this Section.
  - Manual calculations are unacceptable.
    - Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.
    - Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
  - Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located, with local representation or office in the State where the project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
  - Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.
  - Power Systems Analysis Companies: The Study shall be performed by one of the following companies, as a sub-contractor to the bidding Electrical Contractor. Companies other than those listed will be Rejected for non-compliance: a) Utilities Instrumentation Services (UIS); b) Power Factor Engineering, LLC; c) Northern Electrical Testing; d) Schneider Electric (Square-D) (as part of the new distribution equipment); e) Eaton Power Systems (as part of the new distribution equipment); f) Siemens Power Systems (as part of the new distribution equipment).
  - Field Adjusting Agency Qualifications: Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work; A member company of NETA and Acceptable to authorities having jurisdiction.

### PART 2 - PRODUCTS

- COMPUTER SOFTWARE
  - Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - EDSA Micro Corporation.
    - SKM System Analysis, Inc.
  - Comply with IEEE 399 and IEEE 551.
- ANALYTICAL FEATURES OF FAULT-CURRENT-STUDY COMPUTER SOFTWARE PROGRAM SHALL HAVE THE CAPABILITY TO CALCULATE MANDATORY FEATURES AS LISTED IN IEEE 399.
- SHORT-CIRCUIT STUDY REPORT CONTENTS
  - Executive summary.
  - Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.
  - One-line diagram, showing the following:
    - Protective device designations and ampere ratings.
    - Cable size and lengths.
    - Transformer kilovolt ampere (kVA) and voltage ratings.
    - Motor and generator designations and kVA ratings.
    - Switchgear, switchboard, motor-control center, and panelboard designations.
  - Comments and recommendations for system improvements, where needed.

### E. Protective Device Evaluation:

- Evaluate equipment and protective devices and compare to short-circuit ratings.
  - Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
  - For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
  - For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
- Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.
- Short-Circuit Study Output:
- Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location: a) Voltage; b) Calculated fault-current magnitude and angle; c) Fault-point X/R ratio; d) Equivalent impedance.
  - Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location: a) Voltage; b) Calculated symmetrical fault-current magnitude and angle; c) Fault-point X/R ratio; d) Calculated asymmetrical fault currents: 1) Based on fault-point X/R ratio; 2) Based on calculated symmetrical value multiplied by 1.6; 3) Based on calculated symmetrical value multiplied by 2.7.
  - Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location: a) Voltage; b) Calculated symmetrical fault-current magnitude and angle; c) Fault-point X/R ratio; d) No AC Decrement (NACD) ratio; e) Equivalent impedance; f) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis; g) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- Obtain all data necessary for the conduct of the study.
  - Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Architect.
  - For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
- Gather and tabulate the following input data to support the short-circuit study:
  - Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
  - Obtain electrical power utility impedance at the service.
  - Power sources and ties.
  - For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
  - For reactors, provide manufacturer and model designation, voltage rating, and impedance.
  - For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
  - Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
  - Motor horsepower and NEMA MG 1 code letter designation.
  - Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

#### 3.2 SHORT-CIRCUIT STUDY

- Perform study following the general study procedures contained in IEEE 399.
- Calculate short-circuit currents according to IEEE 551.
- Base study on the device characteristics supplied by device manufacturer.
- The extent of the electrical power system to be studied is indicated on Drawings.
- Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:
  - To normal system low-voltage load buses where fault current is 10 kA or less.
- Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- The calculations shall include the ac fault-current decay from induction motors. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
  - For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:
  - Electric utility's supply termination point.
  - Incoming switchgear.
  - Low-voltage switchgear.
  - Control panels.
  - Branch circuit panelboards.
  - Disconnect switches.
- ADJUSTING
  - Make minor modifications to equipment as required to accomplish compliance with short-circuit study.
- DEMONSTRATION
  - Train Owner's operating and maintenance personnel in the use of study results.

### END OF SECTION 260573.13

## SECTION 260573.16 - COORDINATION STUDIES

### PART 1 - GENERAL

- SUMMARY
  - Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.
- ACTION SUBMITTALS
  - Product Data: For computer software program to be used for studies.
  - Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
    - Coordination-study input data, including completed computer program input data sheets.
    - Study and equipment evaluation reports.
    - Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.
      - Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

### 1.3 INFORMATIONAL SUBMITTALS

- Qualification Data: For Coordination Study Specialist.
  - Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.
- CLOSEOUT SUBMITTALS
- Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.
    - In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      - The following parts from the Protective Device Coordination Study Report:
        - One-line diagram.
        - Protective device coordination study.
        - Time-current coordination curves.
      - Power system data.

### 1.5 QUALITY ASSURANCE

- Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.
- Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
  - The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- Coordination Study Companies: The Study shall be performed by one of the following companies, as a sub-contractor to the bidding Electrical Contractor. Companies other than those listed will be Rejected for non-compliance: a) Utilities Instrumentation Services (UIS); b) Power Factor Engineering, LLC; c) Northern Electrical Testing; d) Schneider Electric (Square-D) (as part of the new distribution equipment); e) Eaton Power Systems (as part of the new distribution equipment); f) Siemens Power Systems (as part of the new distribution equipment).
- Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

### PART 2 - PRODUCTS

#### 2.1 COMPUTER SOFTWARE DEVELOPERS

- Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - EDSA Micro Corporation.
  - SKM Systems Analysis, Inc.
- Comply with IEEE 242 and IEEE 399.
- Analytical features of device coordination study computer software program shall have the capability to calculate mandatory features as listed in IEEE 399.
- Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

#### 2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

- Executive summary.
- Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.
- One-line diagram, showing the following:
  - Protective device designations and ampere ratings.
  - Cable size and lengths.
  - Transformer kilovolt ampere (kVA) and voltage ratings.
  - Motor and generator designations and kVA ratings.
  - Switchgear, switchboard, motor-control center, and panelboard designations.
- Study Input Data: As described in "Power System Data" Article.
- Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."
- Protective Device Coordination Study:
  - Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
    - Phase and Ground Relays:
      - Device tag.
      - Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
    - Recommendations on improved relaying systems, if applicable.
  - Circuit Breakers:
    - Adjustable pickups and time delays (long time, short time, ground).
    - Adjustable time-current characteristic.
    - Adjustable instantaneous pickup.
    - Recommendations on improved trip systems, if applicable.
  - Fuses: Show current rating, voltage, and class.
- Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
  - Device tag and title, one-line diagram with legend identifying the portion of the system covered.
  - Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
  - Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- Plot the following listed characteristic curves, as applicable:
  - Power utility's overcurrent protective device.
  - Low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
  - Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
  - Transformer full-load current, magnetizing inrush current.
  - Ground-fault protective devices.
  - The largest feeder circuit breaker in each motor-control center and panelboard.
- Provide adequate time margins between device characteristics such that selective operation is achieved.
- Comments and recommendations for system improvements.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
    - Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.
- PROTECTIVE DEVICE COORDINATION STUDY
- Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
  - Comply with IEEE 399 for general study procedures.
  - The study shall be based on the device characteristics supplied by device manufacturer.
  - The extent of the electrical power system to be studied is indicated on Drawings.
  - Begin analysis at the service, extending down to the system overcurrent protective devices as follows:
    - To normal system low-voltage load buses where fault current is 10 kA or less.

- Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- The calculations shall include the ac fault-current decay from induction motors. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
  - For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:
  - Electric utility's supply termination point.
  - Switchgear.
  - Low-voltage switchgear.
  - Branch circuit panelboards.
- Protective Device Evaluation:
  - Evaluate equipment and protective devices and compare to short-circuit ratings.
  - Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

#### 3.3 POWER SYSTEM DATA

- Obtain all data necessary for the conduct of the overcurrent protective device study.
  - Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Architect.
  - Use characteristics submitted under the provisions of action submittals and information submittals for this Project.
- Gather and tabulate the following input data to support coordination study. The list below is a guide.
  - Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
  - Electrical power utility impedance at the service.
  - Power sources and ties.
  - Short-circuit current at each system bus, three phase and line-to-ground.
  - Full-load current of all loads.
  - Voltage level at each bus.
  - For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
  - For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
  - Maximum demands from service meters.
  - Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
  - Motor horsepower and NEMA MG 1 code letter designation.
  - Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
  - Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
    - Special load considerations, including starting inrush currents and frequent starting and stopping.
    - Ratings, types, and settings of utility company's overcurrent protective devices.
    - Special overcurrent protective device settings or types stipulated by utility company.
    - Time-current-characteristic curves of devices indicated to be coordinated.
    - Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    - Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    - Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.

#### 3.4 FIELD ADJUSTING

- Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.
- Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.
- Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
  - Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

#### 3.5 DEMONSTRATION

- Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:
  - Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.
  - Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
  - Adjust, operate, and maintain overcurrent protective device settings.

### END OF SECTION 260573.16

## SECTION 260573.19 - ARC-FLASH HAZARD ANALYSIS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

#### 1.2 ACTION SUBMITTALS

- Product Data: For computer software program to be used for studies.
- Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form.
  - Arc-flash study input data, including completed computer program input data sheets.
  - Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.
    - Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

#### 1.3 INFORMATIONAL SUBMITTALS

- Qualification Data: For Arc-Flash Study Specialist.
- Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

#### 1.4 CLOSEOUT SUBMITTALS

- Operation and Maintenance Data:
  - Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.
  - Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

#### 1.5 QUALITY ASSURANCE

- Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.
- Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
  - The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- Arc-Flash Study Companies: The Study shall be performed by one of the following companies, as a sub-contractor to the bidding Electrical Contractor. Companies other than those listed will be Rejected for non-compliance: a) Utilities Instrumentation Services (UIS); b) Power Factor Engineering, LLC; c) Northern Electrical Testing; d) Schneider Electric (Square-D) (as part of the new distribution equipment); e) Eaton Power Systems (as part of the new distribution equipment); f) Siemens Power Systems (as part of the new distribution equipment).
- Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

### PART 2 - PRODUCTS

#### 2.1 SOFTWARE DEVELOPERS

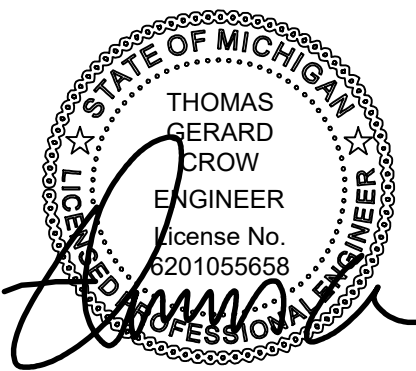
- Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - EDSA Micro Corporation.
  - SKM Systems Analysis, Inc.
- Comply with IEEE 1584 and NFPA 70E.
- Analytical features of device coordination study computer software program shall have the capability to calculate mandatory features as listed in IEEE 399.

#### 2.2 ARC-FLASH STUDY REPORT CONTENT

- Executive summary.
- Study descriptions, purpose, basis and scope.
- One-line diagram, showing the following:
  - Protective device designations and ampere ratings.
  - Cable size and lengths.
  - Transformer kilovolt ampere (kVA) and voltage ratings.
  - Motor and generator designations and kVA ratings.
  - Switchgear, switchboard, motor-control center and panelboard designations.
- Study Input Data: As described in "Power System Data" Article.
- Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."
- Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

#### G. Arc-Flash Study Output:

- Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
  - Voltage.
  - Calculated symmetrical fault-current magnitude and angle.
  - Fault-point X/R ratio.
  - No AC Decrement (NACD) ratio.
  - Equivalent impedance.
  - Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
  - Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- Incident Energy and Flash Protection Boundary Calculations:
  - Arcing fault magnitude.
  - Protective device clearing time.
  - Duration of arc.
  - Arc-flash boundary.
  - Working distance.
  - Incident energy.
  - Hazard risk category.
  - Recommendations for arc-flash energy reduction.
- Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.



SEALED & SIGNED 03/21/2025. SEAL APPLIES ONLY TO THE ELECTRICAL DOCUMENTS PREPARED BY TAC ASSOCIATES, LLC

ISSUED FOR PERMITS

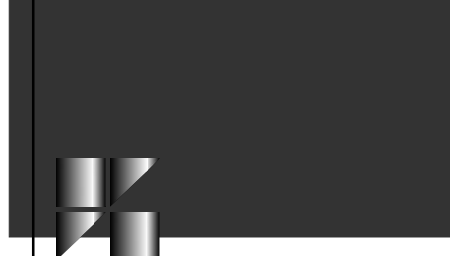
03/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

© 2025 STRAUB PETTITT YASTE



Straub  
Pettitt  
Yaste

850 NORTH CROSS ROAD  
SUITE 200  
CLARKSVILLE, MICHIGAN 48017-1311

248-658-7777 PHONE  
248-658-7781 FAX

ELECTRICAL  
SPECIFICATIONS

E502



# Electrical Specifications (Continued)

## SECTION 260573.19 - ARC-FLASH HAZARD ANALYSIS (Continued)

- PART 3 - EXECUTION
- 3.1 EXAMINATION
- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.
- 3.2 ARC-FLASH HAZARD ANALYSIS
- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies:
1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."
2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."
- C. Calculate maximum and minimum contributions of fault-current size.
1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
- D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.
- E. Include low-voltage equipment locations.
- F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.
- G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors shall be decremented as follows:
1. Fault contribution from induction motors should not be considered beyond three to five cycles.
- H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:
1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.
- I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section 8.1.2.
- 3.3 POWER SYSTEM DATA
- A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.
1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
- B. Electrical Survey Data: Gather and tabulate the following input data to support study.
1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
5. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
6. Motor horsepower and NEMA MG 1 code letter designation.
7. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
- 3.4 DEMONSTRATION
- A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

## END OF SECTION 260573.19

## SECTION 262416 - PANELBOARDS

- PART 1 - GENERAL
- 1.1 SUMMARY
- A. Section Includes:
1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
- 1.2 DEFINITIONS
- A. MCCB: Molded-case circuit breaker.
- B. SPD: Surge protective device.
- 1.3 ACTION SUBMITTALS
- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Include evidence of NRTL listing for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- 1.4 CLOSEOUT SUBMITTALS
- A. Operation and maintenance data.
- 1.5 FIELD CONDITIONS
- A. Service Conditions: NEMA PB 1, usual service conditions, as follows:
1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

- 1.6 WARRANTY
- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## PART 2 - PRODUCTS

- 2.1 PANELBOARDS COMMON REQUIREMENTS
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.
- D. Enclosures: Flush and Surface-mounted, dead-front cabinets.
1. Rated for environmental conditions at installed location.
- a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
- b. Outdoor Locations: NEMA 250, Type 3R.
- c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
- d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
2. Height: 84 inches (2.13 m) maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- E. Incoming Mains Location: Convertible between top and bottom.
- F. Phase, Neutral, and Ground Buses: Tin-plated aluminum.
- G. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- H. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices.
- I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

## 2.3 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. SIEMENS Industry, Inc.; Energy Management Division.
4. Square-D Company.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: As indicated on drawings.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

## 2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. SIEMENS Industry, Inc.; Energy Management Division.
4. Square-D Company.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: As indicated on drawings.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

## 2.5 ELECTRONIC-GRADE PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. SIEMENS Industry, Inc.; Energy Management Division.
4. Square-D Company.
- B. Panelboards: NEMA PB 1; with factory-installed, integral SPD; labeled by an NRTL for compliance with UL 67 and UL 1449 after installing SPD.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.
- E. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.
- F. SPD.

1. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
2. Protection modes and UL 1449 VPR for 208/120-V, three-phase, four-wire circuits shall not exceed the following:
- a. Line to Neutral: 700 V.
- b. Line to Ground: 700 V.
- c. Neutral to Ground: 700 V.
- d. Line to Line: 1200 V.

3. SCCR: Equal to the SCCR of the panelboard in which installed.
4. Nominal Rating: 20 kA.
- G. Buses:
1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
2. Copper equipment and isolated ground buses.
- 2.6 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. SIEMENS Industry, Inc.; Energy Management Division.
4. Square-D Company.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
- a. Inverse time-current element for low-level overloads.
- b. Instantaneous magnetic trip element for short circuits.
- c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
3. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
4. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
5. Subfeed Circuit Breakers: Vertically mounted.
6. MCCB Features and Accessories:
- a. Standard frame sizes, trip ratings, and number of poles.
- b. Breaker handle indicates tripped status.
- c. UL listed for reverse connection without restrictive line or load ratings.
- d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
- e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
- f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
- g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
- h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
- i. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

## 2.7 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NEMA PB 1.1.
- C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated. Adjust top elevation to ensure that operating handle of the highest overcurrent protective device does not exceed the maximum elevation noted in the NEC.
- D. Mount panelboard cabinet plumbs and rigid without distortion of box.
- E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
- G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- H. Install filler plates in unused spaces.
- I. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-EMT) empty conduits into raised floor space or below slab not on grade.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.
- C. Panelboards will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

## END OF SECTION 262416

## SECTION 262726 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
1. Straight-blade convenience, tamper-resistant receptacles.
2. USB charger devices.
3. GFCI receptacles.
4. Toggle switches.
5. Wall switch sensor light switches with dual technology sensors.
6. Digital timer light switches.
7. Wall plates.
- 1.3 DEFINITIONS
- A. Abbreviations of Manufacturers' Names:
1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated; Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.
- H. UTP: Unshielded twisted pair.
- 1.4 ACTION SUBMITTALS
- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- 1.5 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.

### PART 2 - PRODUCTS

- 2.1 GENERAL WIRING-DEVICE REQUIREMENTS
- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.
- D. Devices for Owner-Furnished Equipment:
1. Receptacles: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- 2.2 STRAIGHT-BLADE RECEPTACLES
- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596, Extra-Heavy-Duty Type.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Eaton (Arrow Hart).
- b. Hubbell Incorporated; Wiring Device-Kellems.
- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).
- B. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596, Extra-Heavy-Duty Type.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Eaton (Arrow Hart).
- b. Hubbell Incorporated; Wiring Device-Kellems.
- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).
2. Description: Labeled and complying with NFPA 70.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Eaton (Arrow Hart).
- b. Hubbell Incorporated; Wiring Device-Kellems.
- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).
2. Description: Labeled and complying with NFPA 70.

### 2.3 USB CHARGER DEVICES

- A. Tamper-Resistant USB Charger Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596, Extra-Heavy-Duty Type.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Eaton (Arrow Hart).
- b. Hubbell Incorporated; Wiring Device-Kellems.
- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).
2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
3. USB Receptacles: Dual, One (1) Type A and One (1) Type C.
4. Line Voltage Receptacles: Dual, two pole, three wire, and self-grounding.

### 2.4 GFCI RECEPTACLES

- A. General Description:
1. 125 V, 20 A, straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
4. Extra-Heavy-Duty Type.

### B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Eaton (Arrow Hart).
- b. Hubbell Incorporated; Wiring Device-Kellems.
- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).
- C. Tamper-Resistant, Duplex GFCI Convenience Receptacles, Extra-Heavy-Duty Type:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Hubbell Incorporated; Wiring Device-Kellems.
- b. Pass & Seymour/Legrand (Pass & Seymour).

### 2.5 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
1. Single Pole:
- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1) Eaton (Arrow Hart).
- 2) Hubbell Incorporated; Wiring Device-Kellems.
- 3) Leviton Manufacturing Co., Inc.
- 4) Pass & Seymour/Legrand (Pass & Seymour).
2. Three Way:
- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1) Eaton (Arrow Hart).
- 2) Hubbell Incorporated; Wiring Device-Kellems.
- 3) Leviton Manufacturing Co., Inc.
- 4) Pass & Seymour/Legrand (Pass & Seymour).
3. Four Way:
- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1) Eaton (Arrow Hart).
- 2) Hubbell Incorporated; Wiring Device-Kellems.
- 3) Leviton Manufacturing Co., Inc.
- 4) Pass & Seymour/Legrand (Pass & Seymour).

### 2.6 WALL SWITCH SENSOR LIGHT SWITCH, DUAL TECHNOLOGY

- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hubbell Incorporated; Wiring Device-Kellems.
2. Leviton Manufacturing Co., Inc.
3. Wattstopper.
- B. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual technology.
1. Connections: Provisions for connection to BAS.
2. Connections: Hard wired.
3. Connections: Wireless.
4. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
5. Integral relay for connection to BAS.
6. Adjustable time delay of 20 minutes.
7. Able to be locked to Manual-On mode.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux).
9. Comply with NEMA WD 1, UL 20, and FS W-S-896.

### 2.7 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

### 2.8 FINISHES

- A. Device Color:
1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
- B. Wall Plate Color: For plastic covers, match device color.



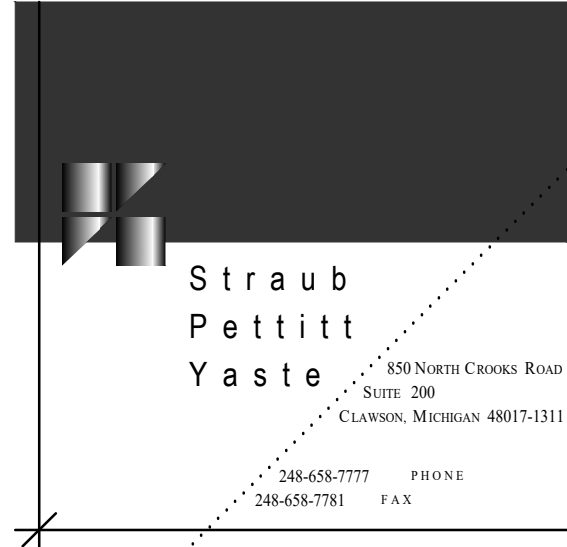
ISSUED FOR PERMITS 03/21/2025

## OAKWOOD VENEER COMPANY WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

© 2025 STRAUB PETTITT YASTE



ELECTRICAL  
SPECIFICATIONS

E503

# Electrical Specifications (Continued)

## SECTION 262726 - WIRING DEVICES (Continued)

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
  1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.
  9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
  1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
  2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
  1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan-speed control are listed for that application.
  3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

#### 3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

#### 3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

#### 3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Tests for Convenience Receptacles:
  1. Confirm receptacle energized.
  2. Confirm receptacle properly wired, and grounded. Correct any receptacles found to have hot/neutral reversed, open ground or other wiring faults.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### END OF SECTION 262726

## SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  1. Fusible switches.
  2. Nonfusible switches.
  3. Enclosures.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For enclosed switches and circuit breakers.
  1. Include plans, elevations, sections, details, and attachments to other work.
  2. Include wiring diagrams for power, signal, and control wiring.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Field quality-control reports.

### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
  1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. WARRANTY
  1. Warranty Period: One year(s) from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

#### 2.2 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. ABB Inc.
  2. Eaton.
  3. General Electric Company.
  4. SIEMENS Industry, Inc.; Energy Management Division.
  5. Square-D Company.
- B. Type HD, Heavy Duty:
  1. Single throw.
  2. Three pole.
  3. 240-V ac.
  4. 1200 A and smaller.
  5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
  6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  5. Service-Rated Switches: Labeled for use as service equipment.

#### 2.3 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Eaton.
  2. General Electric Company.
  3. SIEMENS Industry, Inc.; Energy Management Division.
  4. Square-D Company.
- B. Type HD, Heavy Duty, Three Pole, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  5. Service-Rated Switches: Labeled for use as service equipment.

#### 2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

### PART 3 - EXECUTION

#### 3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
  1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  2. Outdoor Locations: NEMA 250, Type 3R.
  3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
  4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
  5. Hazardous Areas Indicated on Drawings: NEMA 250, Type 9 with cover attached by Type 316 stainless steel bolts.

#### 3.2 INSTALLATION

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
  2. Indicate method of providing temporary electric service.
  3. Do not proceed with interruption of electric service without Construction Manager's written permission.
  4. Comply with NFPA 70E.
- B. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- C. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with NFPA 70 and NECA 1.

#### 3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

#### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
  1. Tests and Inspections for Switches:
    1. Visual and Mechanical Inspection:
      - a. Inspect physical and mechanical condition.
      - b. Inspect anchorage, alignment, grounding, and clearances.
    - c. Verify that the unit is clean.
    - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
    - e. Verify that fuse sizes and types match the Specifications and Drawings.
    - f. Verify that each fuse has adequate mechanical support and contact integrity.
    - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
      - 1) Use a low-resistance ohmmeter.
        - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
        - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
    - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
    - i. Verify correct phase barrier installation.
    - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
  2. Electrical Tests:
    - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
    - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
    - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
    - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
    - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.
  1. Test procedures used.
  2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
  3. List deficiencies detected, remedial action taken, and observations after remedial action.

### END OF SECTION 262816

## SECTION 262913.03 - MANUAL AND MAGNETIC MOTOR CONTROLLERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  1. Manual motor controllers.
  2. Enclosures.
  3. Accessories.
  4. Identification.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
  1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL 508 and UL 60947.4-1.
- C. NEMA Compliance: Fabricate motor controllers to comply with ICS 2.

#### 2.2 MANUAL MOTOR CONTROLLERS

- A. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Eaton.
  - b. General Electric Company.
  - c. Rockwell Automation, Inc.
  - d. SIEMENS Industry, Inc.; Energy Management Division.
2. Configuration: Nonreversing.
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
4. Pilot Light: Red.

#### 2.3 COMBINATION FULL-VOLTAGE MAGNETIC MOTOR CONTROLLER

- A. Description: Factory-assembled, combination full-voltage magnetic motor controller consisting of the controller described in this article, indicated disconnecting means, SCFD and OCPD, in a single enclosure.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Eaton.
  2. General Electric Company.
  3. Rockwell Automation, Inc.
  4. Siemens Industry, Inc.; Energy Management Division.
- C. Standard: Comply with NEMA ICS 2, general purpose, Class A.
- D. Configuration: Nonreversing.
- E. Contactor Coils: Pressure-encapsulated type.
  1. Operating Voltage: Manufacturer's standard, unless indicated.
- F. Control Power:
  1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.

#### G. Overload Relays:

1. Solid-State Overload Relay:
  - a. Switch or dial selectable for motor-running overload protection.
  - b. Sensors in each phase.
  - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
- H. Class II ground-fault protection shall comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.

#### I. Fusible Disconnecting Means:

1. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

#### J. Nonfusible Disconnecting Means:

1. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

#### 2.4 ENCLOSURES

- A. Comply with NEMA 250, type designations as indicated on Drawings, complying with environmental conditions at installed location.
- B. The construction of the enclosures shall comply with NEMA ICS 6.

#### 2.5 IDENTIFICATION

- A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 260553 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.
- B. Arc-Flash Warning Labels:
  1. Comply with requirements in Section 260573.19 "Arc-Flash Hazard Analysis." Produce a 3.5-by-5-inch (89-by-127-mm) self-adhesive equipment label for each work location included in the analysis.

2. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch (89-by-127-mm) self-adhesive equipment label for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.
  - a. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
    - 1) Location designation.
    - 2) Nominal voltage.
    - 3) Flash protection boundary.
    - 4) Hazard risk category.
    - 5) Incident energy.
    - 6) Working distance.
    - 7) Engineering report number, revision number, and issue date.
  - b. Labels shall be machine printed, with no field-applied markings.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Wall-Mounted Controllers: Install magnetic controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems" unless otherwise indicated.
- C. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- E. Setting of Overload Relays: Select and set overloads on the basis of full-load current rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for motors that are high-torque, high-efficiency, and so on.

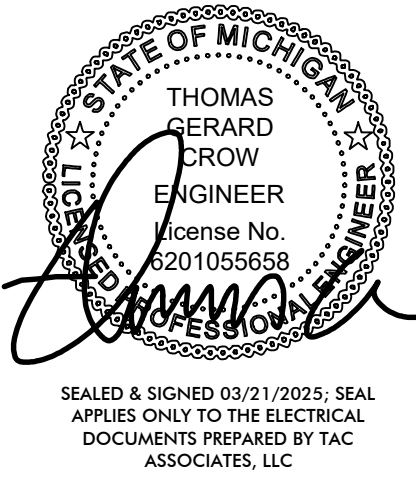
#### 3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

#### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - B. Tests and Inspections:
    1. Comply with the provisions of NFPA 70B, "Testing and Test Methods" Chapter.
    2. Visual and Mechanical Inspection
      - a. Compare equipment nameplate data with drawings and specifications.
      - b. Inspect physical and mechanical condition.
      - c. Inspect anchorage, alignment, and grounding.
      - d. Verify the unit is clean.
      - e. Inspect contactors:
        - 1) Verify mechanical operation.
        - 2) Verify contact gap, wipe, alignment, and pressure are according to manufacturer's published data.
      - f. Motor-Running Protection:
        - 1) Verify overload element rating is correct for its application.
        - 2) If motor-running protection is provided by fuses, verify correct fuse rating.
      - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
        - 1) Use a low-resistance ohmmeter. Compare bolted connection resistance values with values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
        - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
      - h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    - C. Motor controller will be considered defective if it does not pass tests and inspections.
    - D. Prepare test and inspection reports.

### END OF SECTION 262913.03



ISSUED FOR PERMITS

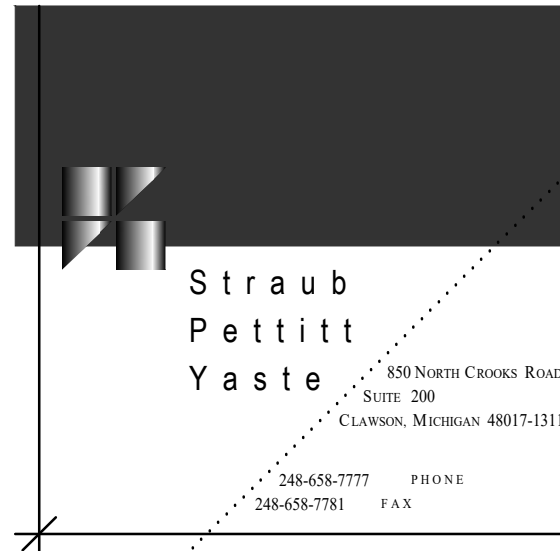
03/21/2025

OAKWOOD VENEER  
COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

2443

© 2025 STRAUB PETTITT YASTE



ELECTRICAL  
SPECIFICATIONS

E504



Electrical Specifications (Continued)

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Fire-alarm control unit.
  - 2. System smoke detectors.
  - 3. Notification appliances.

1.3 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. HLI: High Level Interface.
- D. NICET: National Institute for Certification in Engineering Technologies.
- E. PC: Personal computer.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For fire-alarm system.
  - 1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
  - 2. Include plans, elevations, sections, details, and attachments to other work.
  - 3. Include voltage drop calculations for notification-appliance circuits.
  - 4. Include battery-size calculations.
  - 5. Include input/output matrix.
  - 6. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
  - 7. Include performance parameters and installation details for each detector.
  - 8. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 9. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
- B. General Submittal Requirements:
  - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
  - 2. Shop Drawings shall be prepared by persons with the following qualifications:
    - a. Trained and certified by manufacturer in fire-alarm system design.
    - b. NICET-certified, fire-alarm technician; Level III minimum.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.7 PROJECT CONDITIONS

- A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.
- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
  - 1. Notify Owner no fewer than seven days in advance of proposed interruption of fire-alarm service.
  - 2. Do not proceed with interruption of fire-alarm service without Owner's written permission.
- C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.8 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
  - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: The renovation work indicated on the drawings and herein specified is an extension of the existing fire alarm system installed in the Facility. All new devices and equipment shall be manufactured by the existing fire alarm system manufacturer, and listed for operation on the existing system. Coordinate exact product numbers and system details with the existing fire alarm system manufacturer. The existing fire alarm system manufacturer shall act as a sub-contractor to this Electrical Contractor for the fire alarm system renovation work indicated on the construction document drawings, and herein specified.
- B. Automatic sensitivity control of certain smoke detectors.
- C. All components provided shall be listed for use with the selected system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
  - 1. Manual stations.
  - 2. Heat detectors.
  - 3. Smoke detectors.
  - 4. Duct smoke detectors.
  - 5. Automatic sprinkler system water flow.
- B. Fire-alarm signal shall initiate the following actions:
  - 1. Continuously operate alarm notification appliances.
  - 2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
  - 3. Transmit an alarm signal to the remote alarm receiving station.
  - 4. Unlock electric door locks in designated egress paths.
  - 5. Release fire and smoke doors held open by magnetic door holders.
  - 6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
  - 7. Record events in the system memory.

- C. Supervisory signal initiation shall be by one or more of the following devices and actions:

- 1. Valve supervisory switch.
- 2. User disabling of zones or individual devices.

- D. System trouble signal initiation shall be by one or more of the following devices and actions:

- 1. Open circuits, shorts, and grounds in designated circuits.
- 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
- 3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
- 4. Loss of primary power at fire-alarm control unit.
- 5. Ground or a single break in internal circuits of fire-alarm control unit.
- 6. Abnormal ac voltage at fire-alarm control unit.
- 7. Break in standby battery circuitry.
- 8. Failure of battery charging.
- 9. Abnormal position of any switch at fire-alarm control unit or annunciator.

- E. System Supervisory Signal Actions:

- 1. Initiate notification appliances.
- 2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
- 3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 FIRE-ALARM CONTROL UNIT

- A. The fire alarm system control unit is existing to remain, and is to be expanded to facilitate the renovation work indicated on the drawings. It shall be the responsibility of the Electrical Contractor, working with the existing fire alarm system manufacturer to identify all modifications and revisions to the existing fire alarm control panel, as well as all wiring methods for connecting new initiating and notification appliances to the control panel. The existing fire alarm system manufacturer shall act as a sub-contractor to this Electrical Contractor for all work associated with the renovation and expansion of the existing fire alarm system to serve the renovation area.

2.4 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:

- 1. Comply with UL 268; operating at 24-V dc, nominal.
- 2. Detectors shall match the existing wire type used in the existing facility as directed by the existing fire alarm system manufacturer.
- 3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
- 4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
- 5. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

- B. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

- B. Photoelectric Smoke Detectors:

- 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
- 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

- C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

- 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
- 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).
- 3. Each sensor shall have multiple levels of detection sensitivity.
- 4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
- 5. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.5 NOTIFICATION APPLIANCES

- A. Notification appliances shall be manufactured by the same manufacture as the existing appliances used in the facility and listed for use on the existing fire alarm system and associated Notification Appliance Circuit Panels installed in the facility.
- B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
  - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.
- D. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
  - 1. Rated Light Output:
    - a. 15/30/75/110 cd, selectable in the field.
  - 2. Mounting: Wall mounted unless otherwise indicated.
  - 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
  - 4. Flashing shall be in a temporal pattern, synchronized with other units.
  - 5. Strobe Leads: Factory connected to screw terminals.
  - 6. Mounting Faceplate: Factory finished, red.

2.6 ADDRESSABLE INTERFACE DEVICE

- A. General:
  - 1. Include address-setting means on the module.
  - 2. Store an internal identifying code for control panel use to identify the module type.
  - 3. Listed for controlling HVAC fan motor controllers.
- B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- C. Integral Relay: Capable of providing a direct signal to the equipment controlled.
  - 1. Allow the control panel to switch the relay contacts on command.
  - 2. Have a minimum of two normally open and two normally closed contacts available for field wiring.
- D. Control Module:
  - 1. Operate notification devices.
  - 2. Operate solenoids for use in sprinkler service.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
  - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems".
  - 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
  - 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
  - 1. Connect new equipment to existing control panel in existing part of the building.
  - 2. Expand, modify, and supplement existing control equipment as necessary to extend existing control functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- C. Smoke- or Heat-Detector Spacing:
  - 1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
  - 2. Smooth ceiling spacing shall not exceed 28 feet.
  - 3. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A in NFPA 72.
  - 4. HVAC: Locate detectors not closer than 36 inches (910 mm) from air-supply diffuser or return-air opening.
  - 5. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.
- D. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.
- E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.
  - 1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
- F. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- G. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.
- I. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 PATHWAYS

- A. Pathways shall be installed in EMT.
- B. Exposed EMT shall be painted in accordance with the building standards. Coordinate exact color with the Owner's Construction Representative and Siemens prior to start of Construction and prior to rough-in of any boxes, raceways, etc.

3.4 CONNECTIONS

- A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
  - 1. Smoke dampers in air ducts of designated HVAC duct systems.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

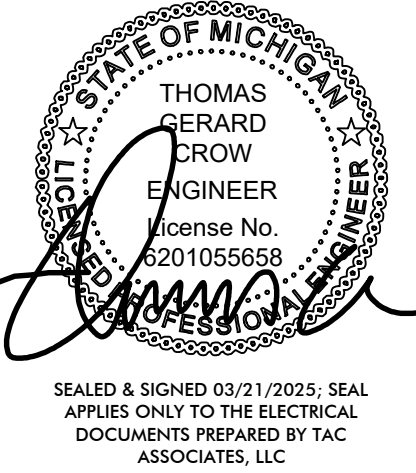
3.6 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Visual Inspection: Conduct visual inspection prior to testing.
- D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
  - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
  - 4. Test visible appliances for the public operating mode according to manufacturer's written instructions.
  - 5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

END OF SECTION 283111



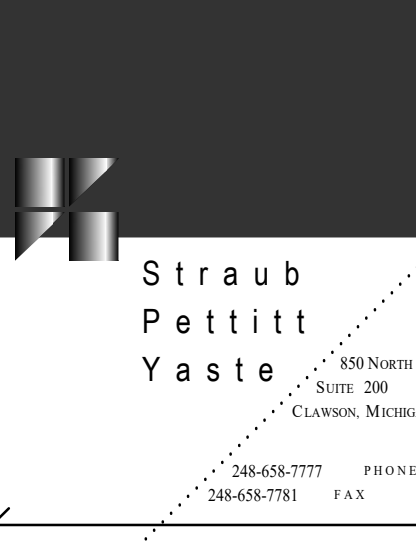
ISSUED FOR PERMITS 03/21/2025

OAKWOOD VENEER COMPANY  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

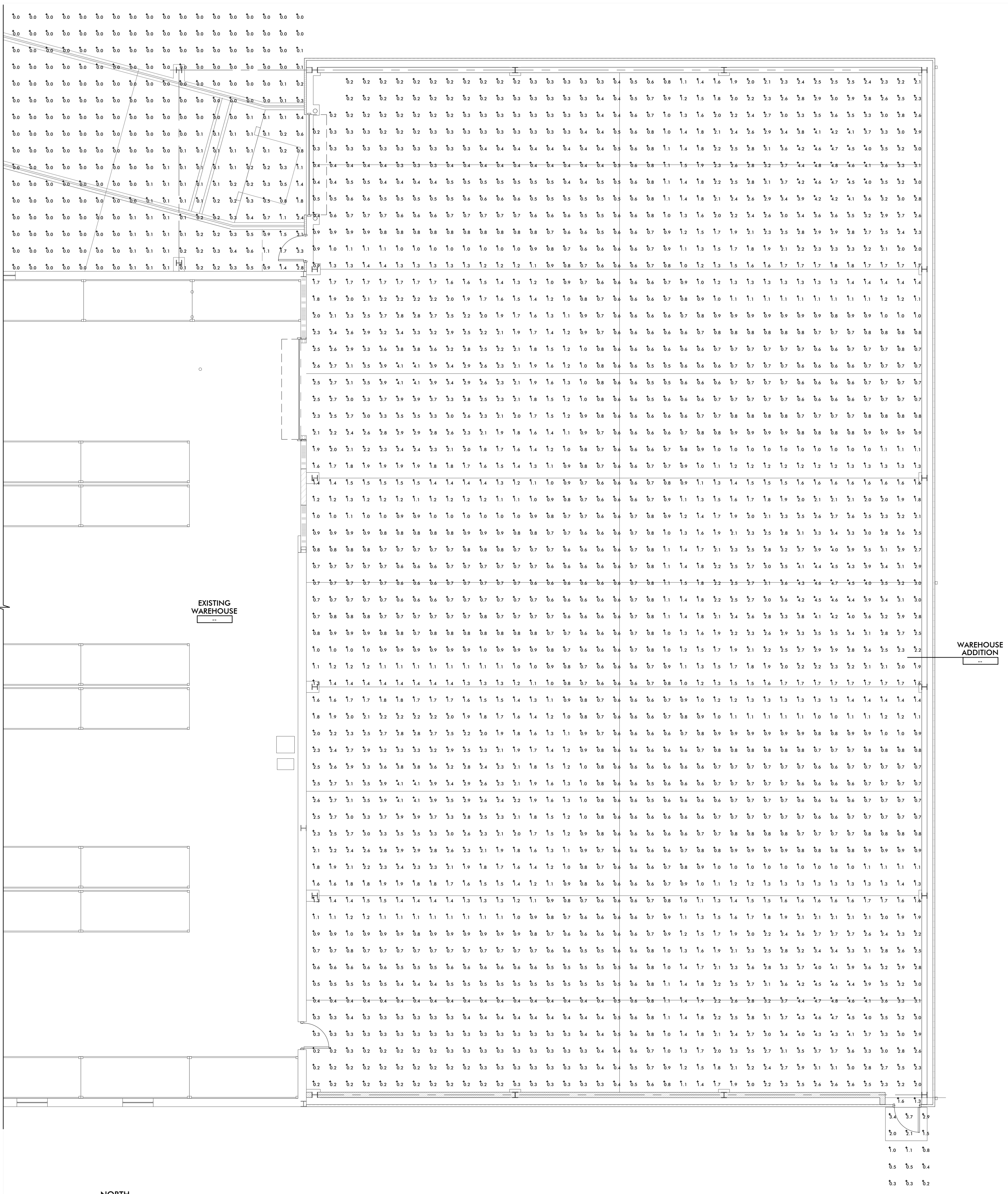
2443

© 2025 STRAUB PETTITT YASTE



ELECTRICAL  
SPECIFICATIONS

E505

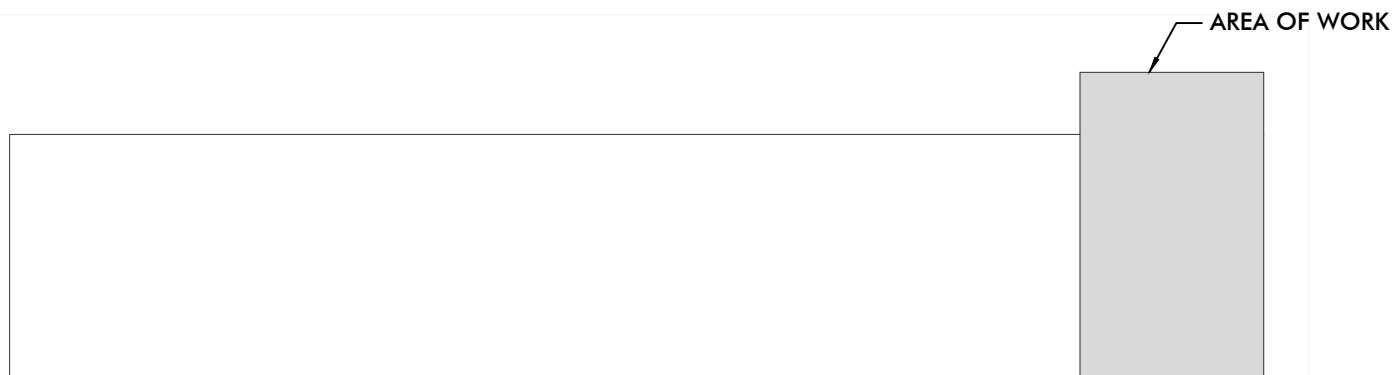


1  
EX100

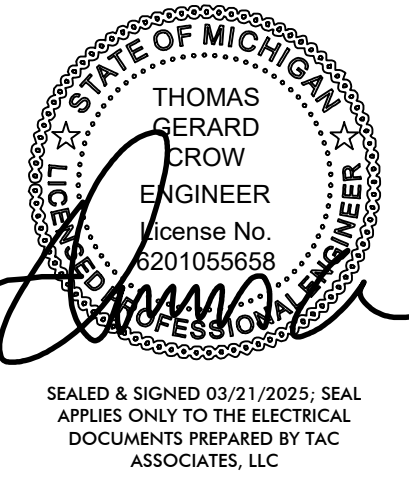
**PARTIAL FLOOR PLAN - EMERGENCY EGRESS LIGHTING PHOTOMETRY**

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

Emergency Egress Lighting Photometry Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
South Exterior Door Landing Plan	Illuminance	Fc	1.38	3.7	0.2	6.90	18.50
Warehouse Addition, Floor	Illuminance	Fc	1.44	4.8	0.2	7.20	24.00
Exterior Egress Door at Dock	Illuminance	Fc	1.29	3.3	0.3	4.30	11.00



**KEY PLAN**  
NOT TO SCALE



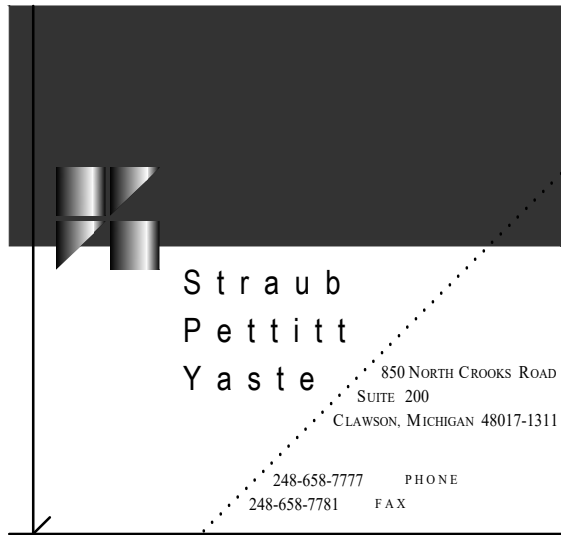
ISSUED FOR PERMITS 03/21/2025

**OAKWOOD VENEER  
COMPANY**  
WAREHOUSE ADDITION

1830 STEPHENSON HWY  
TROY, MICHIGAN 48083

**2443**

© 2025 STRAUB PETTITT YASTE

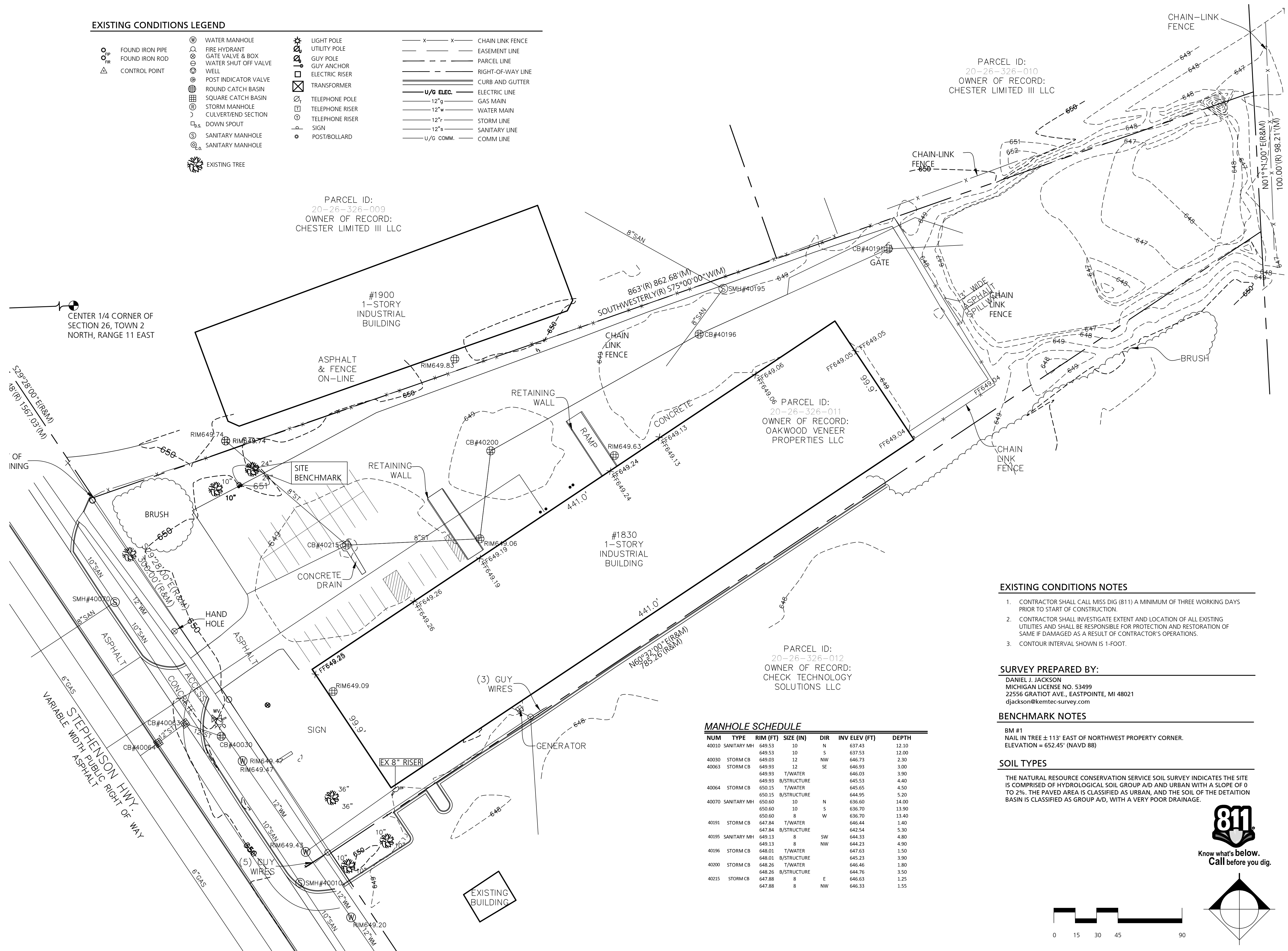


**PARTIAL FLOOR PLAN -  
EMERGENCY EGRESS  
LIGHTING PHOTOMETRY**

**EX100**



Dates	
Dates	Issued for
01.17.2025	90% Owner Review
01.30.2025	100% Owner Review
03.05.2025	City Review







SESC NOTES

1.

THIS PROJECT MUST BE CONSTRUCTED IN COMPLIANCE WITH PART 91 OF MICHIGAN NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT 451 OF 1994, AS AMENDED, THE SOIL EROSION AND SEDIMENT CONTROL ACT.
2.

PRIOR TO ANY SITE DISTURBANCE, INCLUDING DEMOLITION, CONTRACTOR SHALL PLACE EROSION CONTROL MEASURES ON ALL EXISTING STORM SEWER STRUCTURES AFFECTED BY WORK IN THIS CONTRACT. SUCH EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL PERMANENT MEASURES ARE IN PLACE.
3.

CONTRACTOR SHALL PLACE TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES AS REQUIRED AND SHOWN ON PLANS.
4.

CONTRACTOR SHALL PROVIDE AND MAINTAIN ALL EROSION CONTROL MEASURES AS REQUIRED BY STATE AND LOCAL GOVERNING AUTHORITIES.
5.

DAILY INSPECTIONS SHALL BE MADE BY THE CONTRACTOR TO DETERMINE THE EFFECTIVENESS OF EROSION AND SEDIMENT CONTROL MEASURES. ANY NECESSARY REPAIRS SHALL BE MADE WITHOUT DELAY.
6.

ALL EROSION AND SEDIMENT RESULTING FROM WORK ON SITE SHALL BE CONTAINED ON SITE AND NOT ALLOWED TO COLLECT IN ANY OFF-SITE AREAS OR WATERWAYS. WATERWAYS INCLUDE BOTH NATURAL AND MAN-MADE OPEN DITCHES, STREAMS, STORM DRAINS, RIVERS, OR PONDS.
7.

CONTRACTOR SHALL PLACE TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES AS REQUIRED AND SHOWN ON PLANS.
8.

CONTRACTOR SHALL PLACE INLET FILTER PROTECTION ON ALL STORM STRUCTURES AFFECTED BY THIS PROJECT.
9.

ALL TEMPORARY SEDIMENT BASINS USED DURING CONSTRUCTION SHALL BE CLEANED AND ALL SEDIMENT LEGALLY DISPOSED OF PRIOR TO STABILIZATION. REMOVAL OF ALL FINES AND SEDIMENT IS CRITICAL IN AREAS WHERE INFILTRATION PRACTICES SHALL BECOME PERMANENT BEST MANAGEMENT PRACTICE.
10.

CONTRACTOR SHALL CLEAN DEBRIS FROM STREETS ON A DAILY BASIS AS NEEDED. STREETS SHALL BE SWEEP WEEKLY.

DEMOLITION NOTES

1.

CONTRACTOR SHALL CALL MISS DIG (811) A MINIMUM OF THREE WORKING DAYS PRIOR TO START OF CONSTRUCTION.
2.

CONTRACTOR SHALL INVESTIGATE EXTENT AND LOCATION OF EXISTING UTILITIES AND SHALL BE RESPONSIBLE FOR PROTECTION AND RESTORATION OF SAME IF DAMAGED AS A RESULT OF CONTRACTOR'S OPERATIONS.
3.

ALL ITEMS NOT INDICATED FOR REMOVAL SHALL REMAIN UNDISTURBED AND PROTECTED. CONTRACTOR SHALL FULLY RESTORE ANY ITEMS/MATERIALS DAMAGED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
4.

ALL CONCRETE PAVEMENT AND CURB REMOVALS SHALL BE TO THE NEAREST JOINT BEYOND INDICATED EXTENT.
5.

CONTRACTOR SHALL MAINTAIN CLEAN SAW CUT EDGES FOR PROPOSED WORK TO ABUT. BROKEN EDGES RESULTING FROM CONTRACTOR'S FAILURE TO PROTECT THE EDGE WILL BE SAW CUT BEYOND THE BREAKS AT THE NEAREST JOINT, AT THE CONTRACTOR'S EXPENSE.
6.

ALL REMOVALS SHALL BE SAW CUT FULL DEPTH AND COORDINATED WITH LAYOUT / GRADING PLANS.
7.

REMOVALS SHALL INCLUDE SUBSOIL/EXISTING BASE MATERIALS TO FULL DEPTH REQUIRED FOR INSTALLATION OF NEW WORK INCLUDING BASE COURSE. ALL EXCAVATIONS SHALL PROVIDE ADEQUATE SOIL SUPPORT THROUGH THE USE OF ADEQUATE CUT SLOPES OR STRUCTURAL SHORING.
8.

CONTRACTOR SHALL REPAIR ALL DISTURBED TURF AREAS OUTSIDE OF PROJECT LIMITS DAMAGED DURING CONSTRUCTION.
9.

ALL TOPSOIL AND ORGANIC MATERIAL SHALL BE REMOVED FROM UNDER PROPOSED BUILDING, FOOTINGS, SLABS, AND PAVED AREAS.
10.

ALL SPOIL MATERIAL, INCLUDING TOPSOIL, TO BE REMOVED OFF SITE AND DISPOSED IN A LEGAL MANNER.
11.

DISCHARGE OF WATER, DUST, OR DEBRIS FROM CONCRETE AND ASPHALT WORK TO STORM OR SANITARY SYSTEMS IS PROHIBITED.
12.

STORM DRAINS MUST BE PROTECTED FROM DUST AND DEBRIS.
13.

ANY WATER USED DURING CONCRETE AND ASPHALT WORK (INCLUDING SWEEPING AND SAWCUTTING) MUST BE CONTAINED AND COLLECTED FOR PROPER DISPOSAL. SUGGESTED CONTROLS INCLUDE WET VACUUM OR ABSORBENTS.

TEMPORARY SESC CONTROLS  
MAINTENANCE SCHEDULE  
(DURING CONSTRUCTION BY  
CONTRACTOR)

TASK	COMPONENT			SCHEDULE
	STORM SEWER SYSTEM	CATCH BASIN SUMPS AND TRENCH DRAINS	CATCH BASIN INLET CASTINGS	
INSPECT FOR SEDIMENT ACCUMULATION	X	X		WEEKLY
REMOVAL OF SEDIMENT ACCUMULATION	X	X		AS NEEDED AND PRIOR TO TURNOVER
INSPECT FOR FLOATABLES AND DEBRIS		X		QUARTERLY AND AT TURNOVER
REMOVAL OF FLOATABLES AND DEBRIS		X		QUARTERLY AND AT TURNOVER
INSPECT FOR EROSION	X	X		AS NEEDED AND PRIOR TO TURNOVER
RE-ESTABLISH VEGETATION	X	X		AS NEEDED AND PRIOR TO TURNOVER
CLEANING STREETS/PAVEMENT	X	X		AS NEEDED
VACUUM TO REMOVE SEDIMENT		X		AS NEEDED AND PRIOR TO TURNOVER
MOWING AND/OR PLANTING MAINTENANCE				AS NEEDED AND PRIOR TO TURNOVER
INSPECT STRUCTURAL ELEMENTS DURING WET WEATHER AND COMPARE TO AS-BUILT PLANS (BY PROFESSIONAL ENGINEER)	X	X		ANNUALLY AND PRIOR TO TURNOVER
MAKE ADJUSTMENTS OR REPLACEMENTS AS DETERMINED BY PRE-TURNOVER INSPECTION	X	X		AS NEEDED

PERMANENT SESC  
CONTROLS MAINTENANCE  
SCHEDULE  
(POST CONSTRUCTION BY OWNER)

TASK	COMPONENT				SCHEDULE
	STORM SEWER SYSTEM	CATCH BASIN SUMPS AND TRENCH DRAINS	CATCH BASIN INLET CASTINGS	YARD BASIN OVERFLOW STRUCTURES	
INSPECT FOR SEDIMENT ACCUMULATION	X	X	X	X	ANNUALLY AT A MINIMUM
REMOVAL OF SEDIMENT ACCUMULATION	X	X	X	X	AS NEEDED
INSPECT FOR FLOATABLES AND DEBRIS	X	X	X	X	ANNUALLY AT A MINIMUM
REMOVAL OF FLOATABLES AND DEBRIS	X	X	X	X	AS NEEDED
INSPECT FOR EROSION	X	X	X	X	AS NEEDED AND PRIOR TO TURNOVER
RE-ESTABLISH VEGETATION	X	X	X	X	AS NEEDED AND PRIOR TO TURNOVER
CLEANING STREETS/PAVEMENT					AS NEEDED
VACUUM TO REMOVE SEDIMENT	X	X	X	X	ANNUALLY AT A MINIMUM
MOWING AND/OR PLANTING MAINTENANCE					AS NEEDED
INSPECT STRUCTURAL ELEMENTS DURING WET WEATHER AND COMPARE TO AS-BUILT PLANS (BY PROFESSIONAL ENGINEER)	X	X	X	X	ANNUALLY

B R ⓘ

Beckett&Raeder

Landscape Architecture  
Planning, Engineering &  
Environmental Services

Beckett & Raeder, Inc.  
535 West William, Suite 101  
Ann Arbor, MI 48103

734.663.2622 ph  
734.663.6759 fx

Consultants

Seal

Project Title

Oakwood Veneer  
Warehouse Addition

1830 Stephenson Hwy. Troy, MI 48083

Sheet Title

DEMOLITION & SESC

Dates

Dates	Issued for
01.17.2025	90% Owner Review
01.30.2025	100% Owner Review
03.05.2025	City Review

Scale

Quality Control

Drawn: FJ

Checked: KE

Approved: KE

Project Number

2024072

Sheet Number

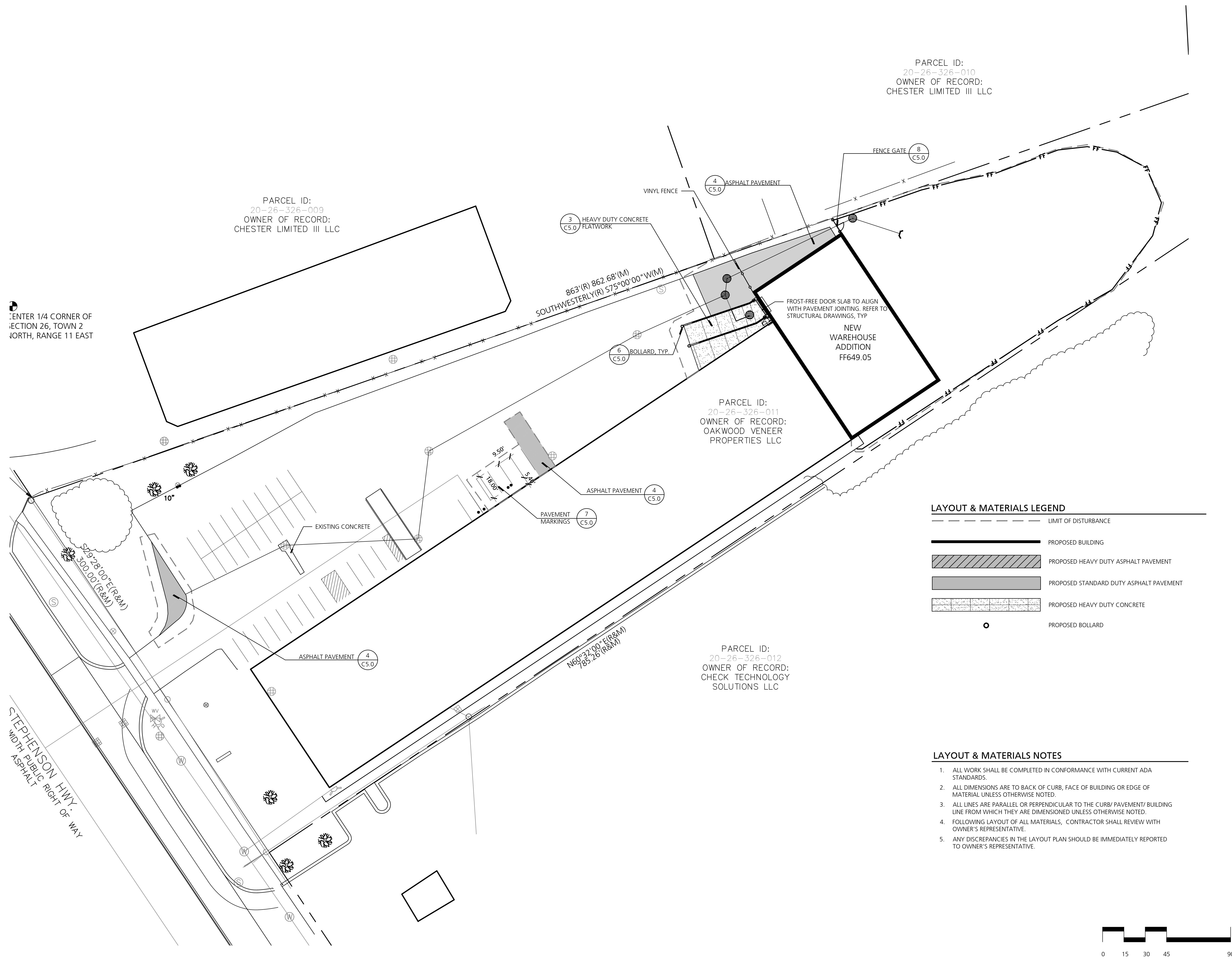
C2.1

## Oakwood Veneer Warehouse Addition

1830 Stephenson Hwy. Troy, MI 48083

## LAYOUT & MATERIALS

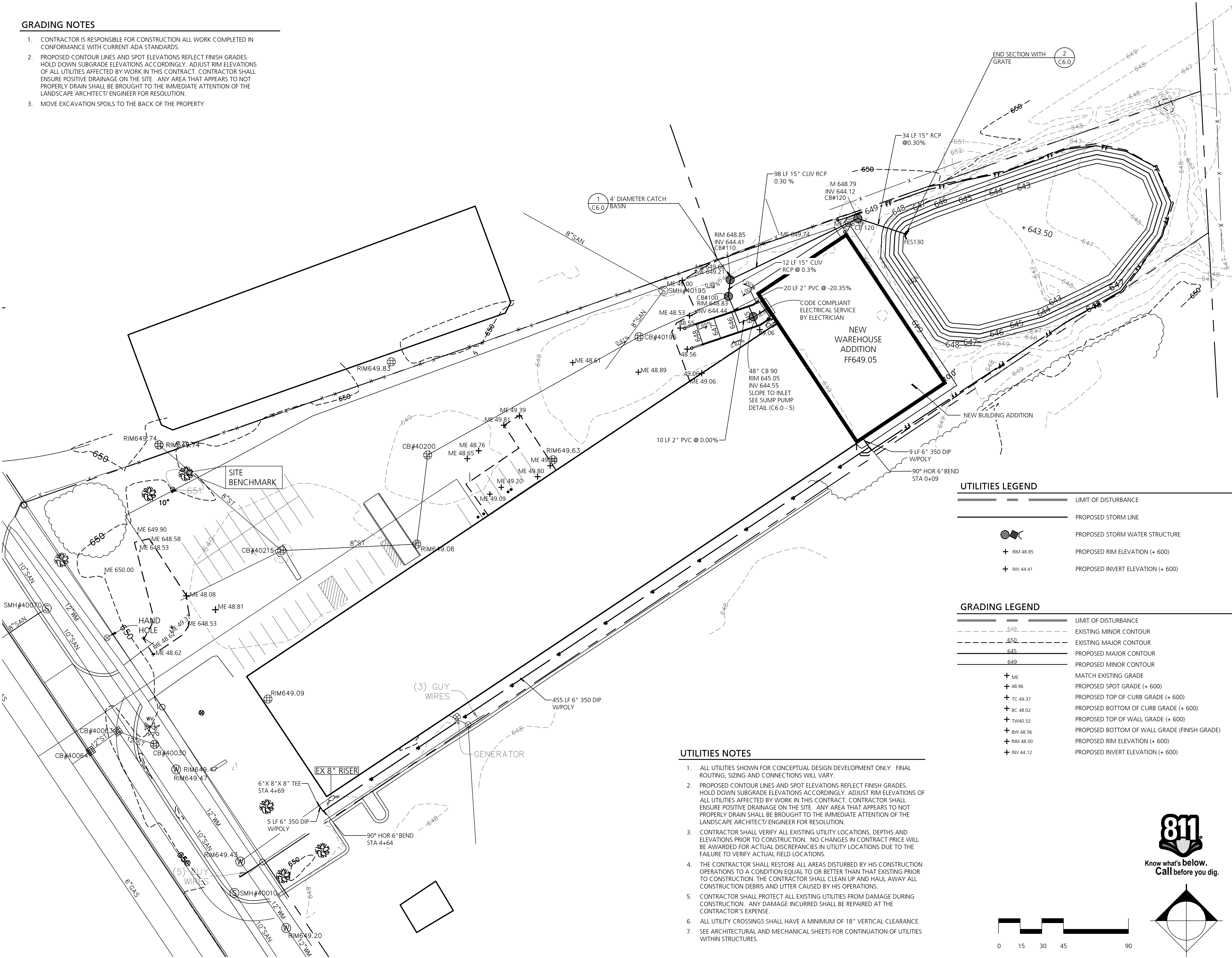
Dates	
Dates	Issued for
01.17.2025	90% Owner Review
01.30.2025	100% Owner Review
03.05.2025	City Review





GRADING NOTES

- CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION ALL WORK COMPLETED IN CONFORMANCE WITH CURRENT ADA STANDARDS.
- PROPOSED CONTOUR LINES AND SPOT ELEVATIONS REFLECT FINISH GRADES. HOLD DOWN SUBGRADE ELEVATIONS ACCORDINGLY. ADJUST RIM ELEVATIONS OF ALL UTILITIES AFFECTED BY WORK IN THIS CONTRACT. CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE ON THE SITE. ANY AREA THAT APPEARS TO NOT PROPERLY DRAIN SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE LANDSCAPE ARCHITECT/ ENGINEER FOR RESOLUTION.
- MOVE EXCAVATION SPOILS TO THE BACK OF THE PROPERTY



UTILITIES LEGEND

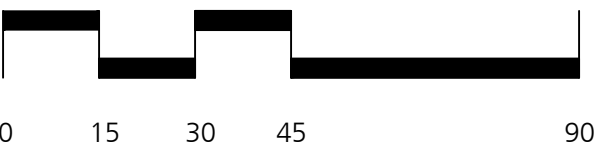
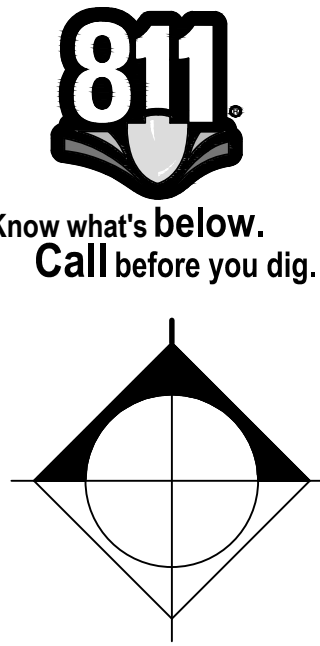
- LIMIT OF DISTURBANCE
- PROPOSED STORM LINE
- PROPOSED STORM WATER STRUCTURE
- PROPOSED RIM ELEVATION (+ 600)
- PROPOSED INVERT ELEVATION (+ 600)

GRADING LEGEND

- LIMIT OF DISTURBANCE
- EXISTING MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- MATCH EXISTING GRADE
- PROPOSED SPOT GRADE (+ 600)
- PROPOSED TOP OF CURB GRADE (+ 600)
- PROPOSED BOTTOM OF CURB GRADE (+ 600)
- PROPOSED TOP OF WALL GRADE (+ 600)
- PROPOSED BOTTOM OF WALL GRADE (FINISH GRADE)
- PROPOSED RIM ELEVATION (+ 600)
- PROPOSED INVERT ELEVATION (+ 600)

UTILITIES NOTES

- ALL UTILITIES SHOWN FOR CONCEPTUAL DESIGN DEVELOPMENT ONLY. FINAL ROUTING, SIZING AND CONNECTIONS WILL VARY.
- PROPOSED CONTOUR LINES AND SPOT ELEVATIONS REFLECT FINISH GRADES. HOLD DOWN SUBGRADE ELEVATIONS ACCORDINGLY. ADJUST RIM ELEVATIONS OF ALL UTILITIES AFFECTED BY WORK IN THIS CONTRACT. CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE ON THE SITE. ANY AREA THAT APPEARS TO NOT PROPERLY DRAIN SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE LANDSCAPE ARCHITECT/ ENGINEER FOR RESOLUTION.
- CONTRACTOR SHALL VERIFY ALL EXISTING UTILITY LOCATIONS, DEPTHS AND ELEVATIONS PRIOR TO CONSTRUCTION. NO CHANGES IN CONTRACT PRICE WILL BE AWARDED FOR ACTUAL DISCREPANCIES IN UTILITY LOCATIONS DUE TO THE FAILURE TO VERIFY ACTUAL FIELD LOCATIONS.
- THE CONTRACTOR SHALL RESTORE ALL AREAS DISTURBED BY HIS CONSTRUCTION OPERATIONS TO A CONDITION EQUAL TO OR BETTER THAN THAT EXISTING PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL CLEAN UP AND HAUL AWAY ALL CONSTRUCTION DEBRIS AND LITTER CAUSED BY HIS OPERATIONS.
- CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES FROM DAMAGE DURING CONSTRUCTION. ANY DAMAGE INCURRED SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
- ALL UTILITY CROSSINGS SHALL HAVE A MINIMUM OF 18" VERTICAL CLEARANCE.
- SEE ARCHITECTURAL AND MECHANICAL SHEETS FOR CONTINUATION OF UTILITIES WITHIN STRUCTURES.



Dates

Dates	Issued for
01.17.2025	90% Owner Review
01.30.2025	100% Owner Review
03.05.2025	City Review

Scale

Quality Control

Drawn: FJ  
Checked: KE  
Approved: KE

Project Number

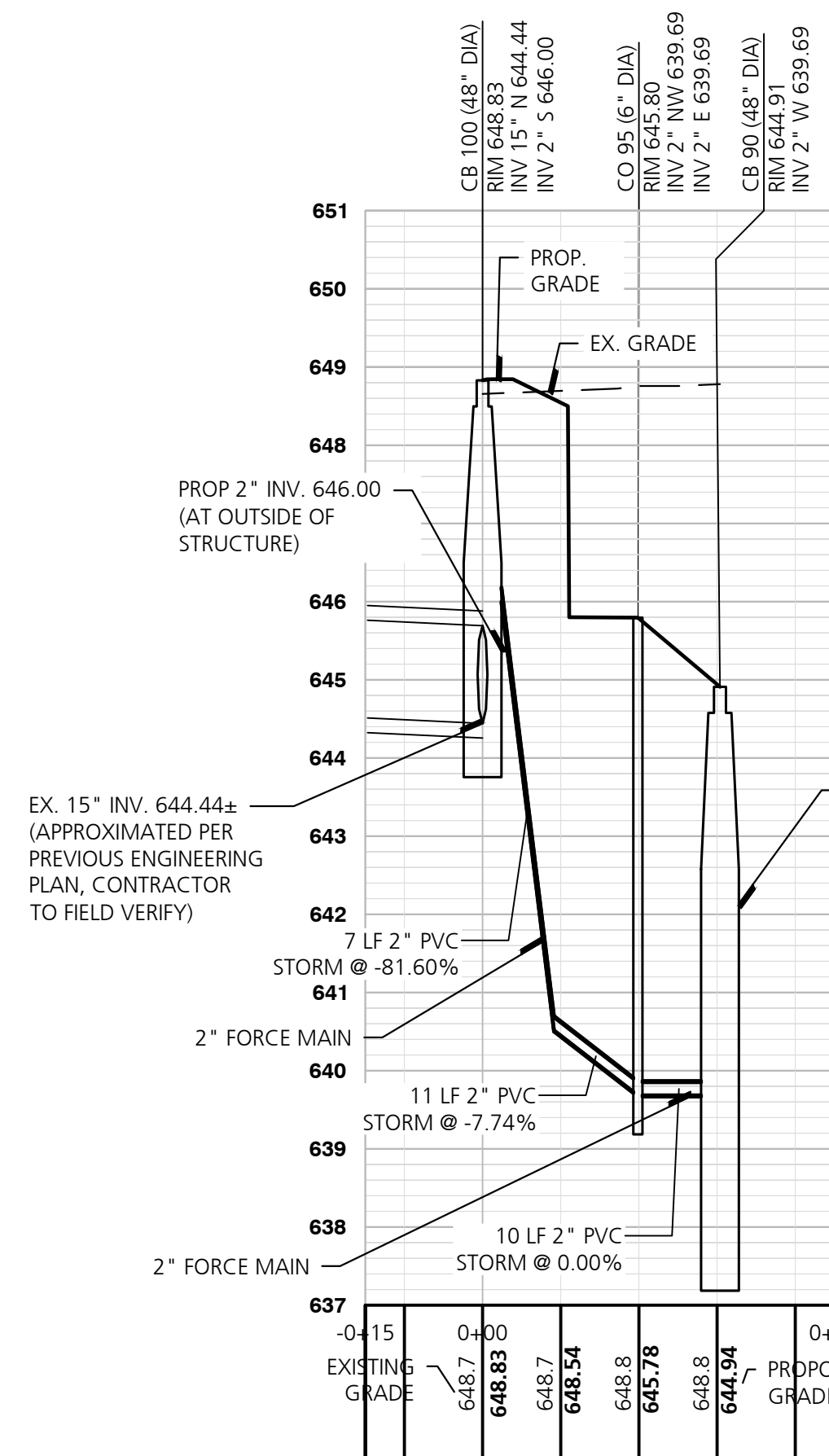
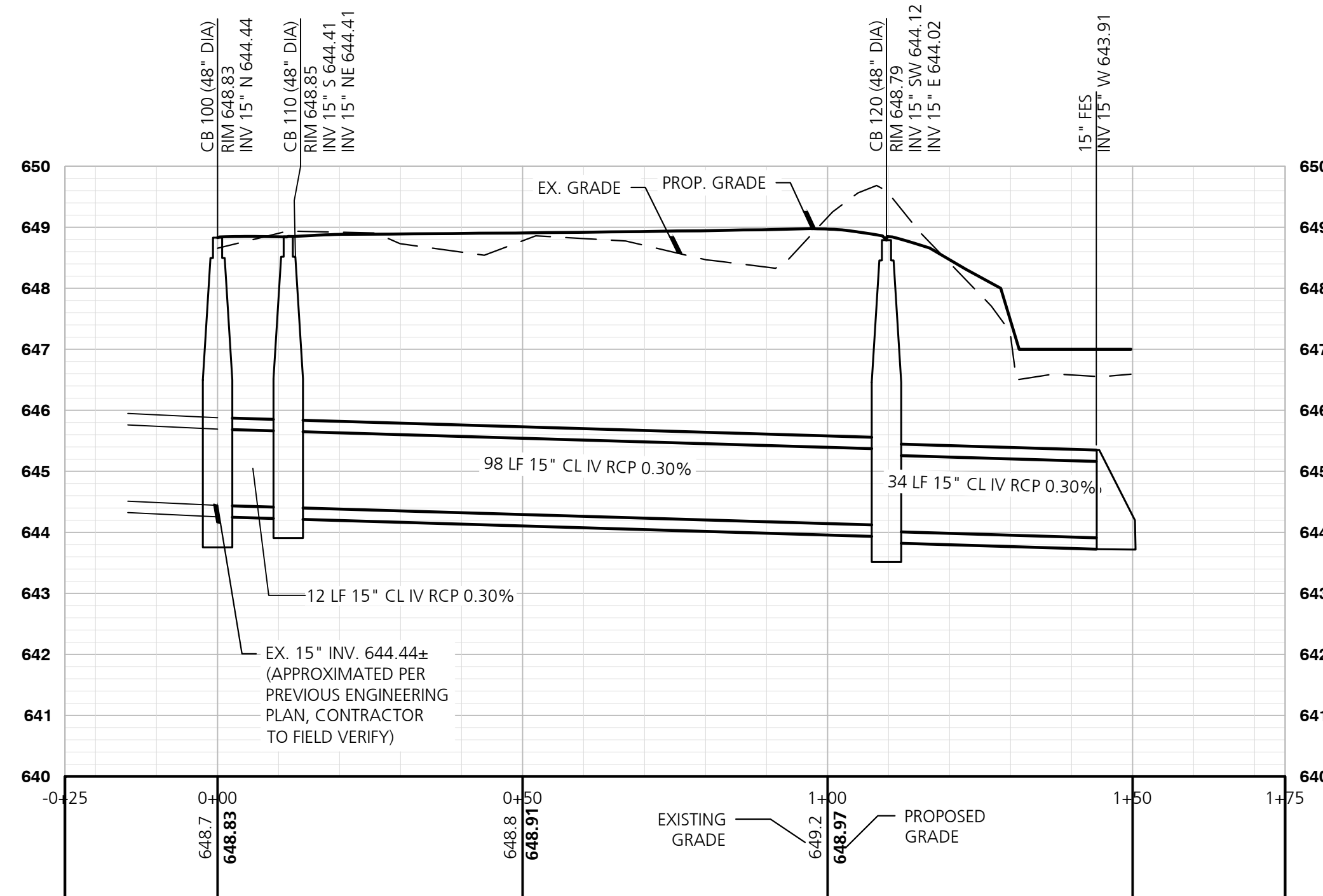
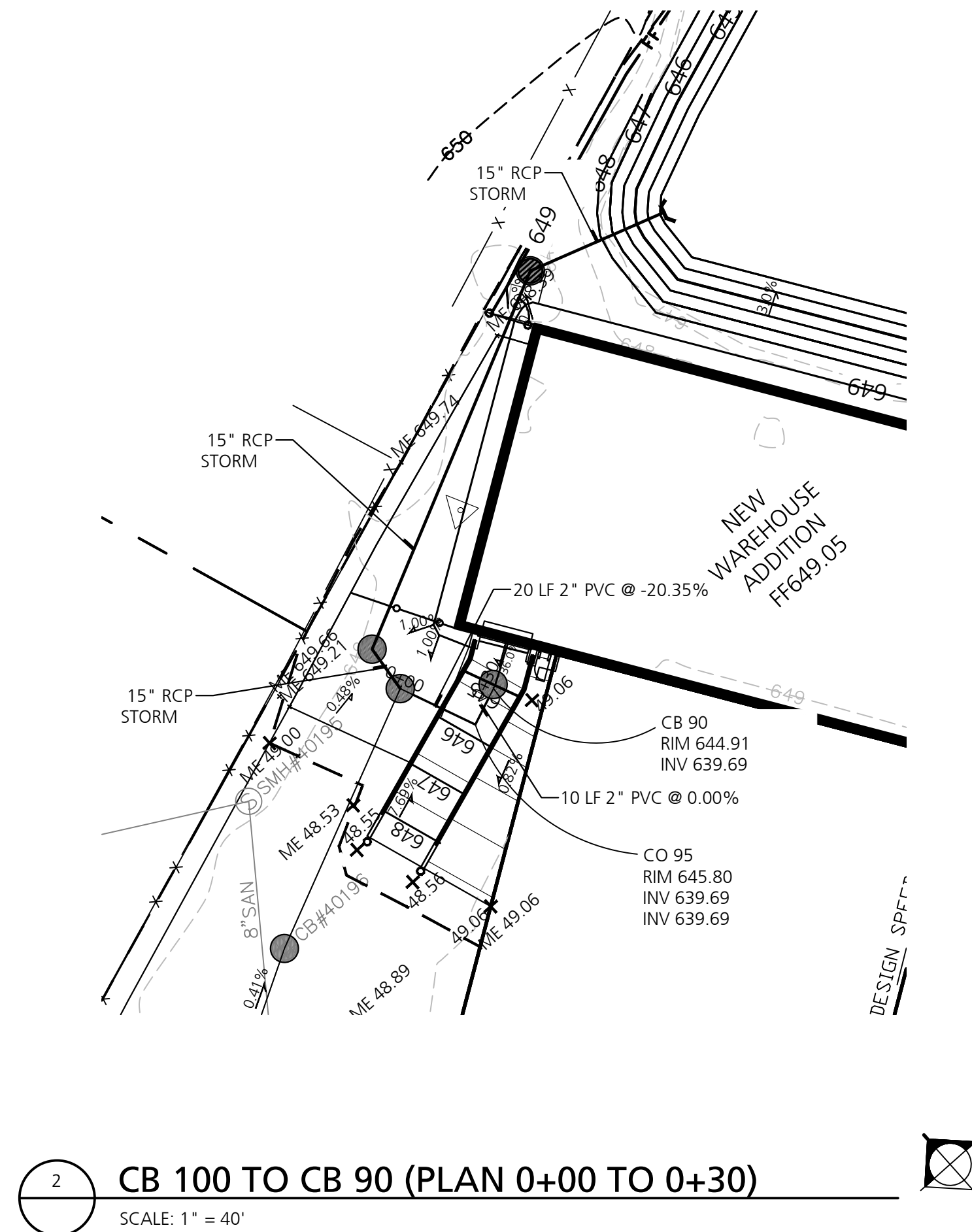
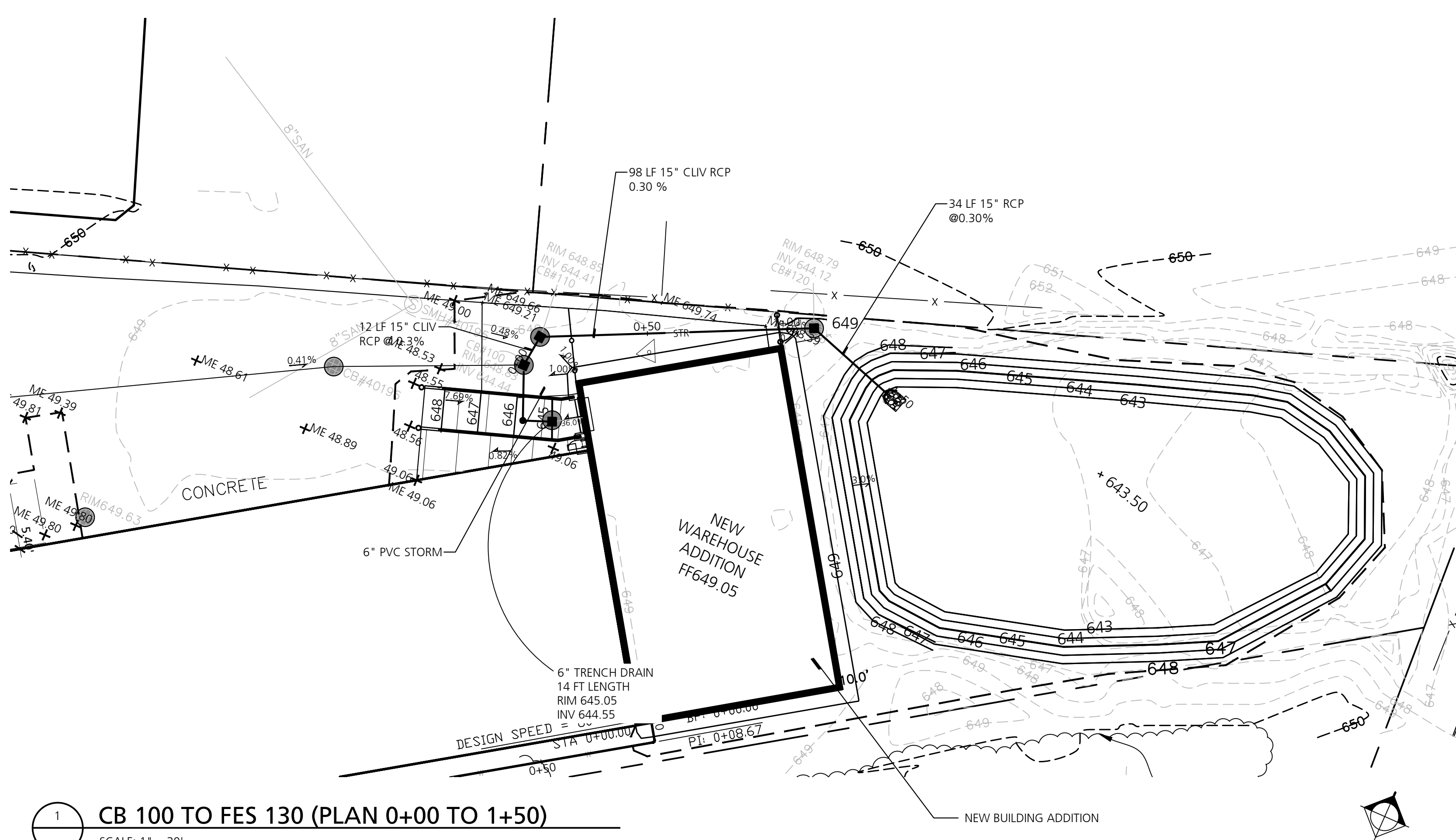
2024072

Sheet Number

C4.0

Dates	Issued for
01.17.2025	90% Owner Review
01.30.2025	100% Owner Review
03.05.2025	City Review

Drawn:FJ
Checked:KE
Approved:KE





INPUT CELLS:FORMULA CELLS:

PRELIMINARY IMPERVIOUS/PERVIOUS CALCULATIONS

Oakwood Veneer Warehouse

Soil Group: Dslopes (in percent): 0-2

AREA COMPARISON (TOTAL AREA)

Type	CN	Existing Area (SF)	Proposed Area (SF)	C	Ex. (acres)	Prop. (acres)
Green Space	84	0	0	0.30	0.00	0.00
Impervious	98	102 969	102 969	0.95	2.36	2.36
Gravel	91	0	0	0.85	0.00	0.00
Total Disturbed Area	-	102 969	102 969		2.36	2.36
Total Impervious	-	102 969	102 969		2.36	2.36
Composite CN	-	98	98			
Composite C		0.95	0.95			

ACRES2.362.36

Time of Concentration:

Sheet Flow:Waterway Flow:Pipe Flow:

K	0.48	K	2.1	n	0.013
S	1%	S	0%	r	0.5
L	350	L	0	R	0.25
				S	0.5%
				L	150
V=	K*S^0.5	V=	K*S^0.5	V=	(1.49/n)*R^(2.3)*(S^0.5)
V=	0.048 ft/s	V=	0 ft/s	V=	3.22 ft/s
Tt=	L/(3600*v)	Tt=	L/(3600*v)	Tt=	L/(3600*v)
Tt=	2.0 min	Tt=	0 min	Tt=	0.012955 min

Tc=10min

When determining the time of concentration for a pipe network, an initial time of concentration of 20 minutes for the farthest upstream inlet will be used for residential developments and 15 minutes for commercial or industrial developments. For sites less than 5 acres, an initial time of concentration of 10 minutes will be used.

				Impervious	Pervious	Average C value	Area	43560			Area
Structure	Pav.	Grass	Gravel	Pav/Grass	Grass		Square Ft	Pavement	Grass	Gravel	Acres
EX CB 40196	0.95	0.30	0.85	97 574	0	0.95	97 574	2.24	0.00	0.00	2.24
CB 100	0.95	0.30	0.85	2 290	0	0.95	2 290	0.05	0.00	0.00	0.05
CB 110	0.95	0.30	0.85	275	0	0.95	275	0.01	0.00	0.00	0.01
CB 120	0.95	0.30	0.85	1 625	0	0.95	1 625	0.037	0.00	0.00	0.04
FES 130	0.95	0.30	0.85	0		#DIV/0!	0	0.00	0.00	0.00	0.00
	0.95	0.30	0.85								
CB 90	0.95	0.30	0.70	900	0	0.95	900	0.02	0.00	0.00	0.02
	0.95	0.30	0.85			#DIV/0!	0	0.00	0.00	0.00	0.00
	0.95	0.30	0.85			#DIV/0!	0	0.00	0.00	0.00	0.00
							101 764				2.36
Total check:											

100-yr peak intensity:

$I_{100} = (30.20 \times 100^{0.22}) / (T_c + 9.17)^{0.81}$  in/hr

$I_{100} = 7.60$  in/hr

Eq. III-7

$I = \frac{30.20 \times 100^{0.22}}{(T_c + 9.17)^{0.81}}$

$I =$  Average rainfall intensity in inches/hour

$p =$  Design storm return period in years

$T_c =$  Time of concentration in minutes

Regional\* 24-Hour Average Rainfall Amounts

Storm Event	Rainfall Amount (inch)
1 Year	2.07
2 Year	2.36
5 Year	2.87
10 Year	3.32
100 Year	5.23

\* Region includes Livingston, Macomb, Oakland and Wayne counties

updated:3/30/2012

STORM SEWER COMPUTATIONS

Manning Equation:  $Q = 1.486 A (R^{2/3}) (S^{1/2}) / n$

Design Basis: 10 year storm  $I = X / (t + Y)$

Oakland

$X = 175$  ft/in

$Y = 25$  ft/in

Min Velocity = 2.5 (ft/sec)

Max Velocity = 8 (ft/sec)

RCP

$n =$  Manning's roughness coefficient= 0.013

$P =$  wetted perimeter (ft)

$R =$  hydraulic radius (A/P in feet)

$S =$  hydraulic gradient (ft/ft)

Designer's Name :

BRI Job # :

Client Name :

Project Name :

Project Location :

Today's Date :

	RUNOFF FROM	RUNOFF TO	INCR. AREA (ACRES)	IMPERVIOUS FACTOR "C"	EQUIV. AREA (acres)	ADD'T AREA (acres)	EQUIV. AREA (acres)	TIME OF CONCENT. (minutes)	RAINFALL RATE (in/hr)	QUANTITY OF RUNOFF (c.f./s)	ENTERING RUNOFF (c.f./s)	PIPE LENGTH (feet)	PIPE DIA. (inches)	UPPER INVERT (feet)	LOWER INVERT (feet)	PIPE SLOPE %	PIPE SLOPE CHECK	Manning n	SLOPE OF H.G. (%)	TIME TO NEXT M.I. (minutes)	TOTAL RUNOFF
	EX CB 40196	CB 100	648.83	1.79	0.95	1.70	1.70	10.00	5.00	8.50		68	15	645.23	644.44	0.00	1.16	0.013	1.73%	0.20	8.50
	CB 100	CB 110	648.83	0.05	0.95	0.05	1.75	3.50	10.20	4.97	17.40	12	15	644.44	644.41	0.25	0.25	0.013	7.26%	0.06	17.40
	CB 110	CB 120	648.79	0.01	0.95	0.01	1.85	5.36	10.28	4.96	26.59	98	15	644.41	644.12	0.30	0.30	0.013	16.84%	0.67	26.59
	CB 120	CB 130	N/A	0.04	0.95	0.04	1.86	7.26	10.85	4.88	35.42	34	15	644.02	643.91	0.30	0.32	0.013	30.06%	0.19	35.42
	CB 90	CB 100	648.80	0.02	0.95	0.02	0.02	10.00	5.00	0.10		31	2	639.69	646.00	-20.35	20.35	0.009	5.34%	0.06	0.10

Part C: The required Channel Protection Volume (VCP-R) is the post-development site runoff volume from a 1.3-inch rainfall event. volume from a 1.3-inch rainfall event.

DETENTION BASIN

$C = 0.95$  post-development runoff coefficient

$A = 2.36$  contributing area (AC)

$V_{CP-R} = 4,719 \text{ C}^* \text{A}$

$V_{CP-R} = 10,597 \text{ cft}$

Part D: Water Quality Control

Water Quality Control (WQC) focuses on limiting the concentration of Total Suspended Solids (TSS) in post-development runoff to either of the following water quality standards: 80 mg/L, or 80% TSS reduction.

1.) Channel Protection Volume (VCP-R, see Part D) meet the TSS requirements for only areas tributary to an infiltration BMP. If any areas on a site plan bypass infiltration BMPs, those areas must receive alternative TSS treatment (see below for other options).

2.) Mechanical separators designed for the required TSS removal at a peak flow rate (QWQ) generated by a 1-year peak flow as calculated below:

BASIN

$C = 0.95$  post-development runoff coefficient

$A = 2.36$  contributing area (AC)

$T_c = 10.00$  time of concentration (min)

$I_1 = 30.20 / (T_c + 9.17)^{0.81}$  rainfall intensity (in/hr)

$I_1 = 2.76$  in/hr

$Q_{WQC} = C^* I_1^* A$  peak flow rate for mechanical separator

$Q_{WQC} = 6.20 \text{ cfs}$

3.) Sediment forebay(s), when combined with downstream Extended Detention. Forebays shall be designed with a volume equal to 15% of the Water Quality Volume (0.15 x VWQ) and capture heavy

BASIN

$C = 0.95$  post-development runoff coefficient

$A = 2.36$  contributing area (AC)

$V_{WQ} = 545 \text{ C}^* \text{A}$  required water quality volume (cft)

$V_{WQ} = 1,224 \text{ cft}$

$V_F = 0.15 \text{ V}_{WQ}$  required sediment forebay volume (cft)

$V_F = 184 \text{ cft}$

Part E: Extended Detention is required for the site's post-development runoff volume from a 1.9-1.9-inch rainfall event. This Extended Detention Volume (VED) shall be dewatered in not less than 48 hours.

BASIN

$V_{ED} = 6,897 \text{ C}^* \text{A}$

$V_{ED} = 15,488 \text{ cft}$

Calculate the extended Detention release rate:

$Q_{ED} = V_{ED} / 172800$

$Q_{ED} = 0.09 \text{ cfs}$

Part F: Detention and Flood Control

Detention and Flood Control shall be implemented to manage the 100-year peak runoff rate

BASIN

$C = 0.95$  post-development runoff coefficient

$A = 2.36$  contributing area (AC)

$Q_{100} = 1,1055 - 0.206 \ln(A)$  allowable release rate (cfs/acre)

$Q_{100} = 0.93 \text{ cfs/acre}$

$Q_{100} \text{ final} = 0.93 \text{ cfs/acre}$

$Q_{100P} = A^* Q_{100}$  allowable 100-yr post development peak flow rate

$Q_{100P} = 2.19 \text{ cfs}$

When calculating the required detention volume, all on-site contributing drainage areas shall be used in the calculation. Volume stored within the forebay and extended detention 1.) Calculate the total 100-yr runoff volume under post-development conditions:

BASIN

$V_{100P} = 18,985 \text{ C}^* \text{A}$  post-development 100-yr runoff volume (cft)

$V_{100P} = 42,634 \text{ cft}$

2.) Calculate the 100-yr peak inflow rate into detention basin:

BASIN

$C = 0.95$  post-development runoff coefficient

$A = 2.36$  contributing area (AC)

$I_{100} = 7.60$  100-yr peak rainfall intensity (in/hr)

$Q_{100P} = C^* I_{100}^* A$  post-dev 100-yr peak inflow rate (cfs)

$Q_{100P} = 17.08 \text{ cfs}$

3.) Calculate the Storage Curve Factor for the 100-yr detention volume R:

BASIN

$R = 0.206 - 0.15 \ln(Q_{100P} / Q_{100P})$

$R = 0.51$

4.) Calculate the 100-yr detention basin size

BASIN

$V_{100P} = (V_{100P}^* R)$  required 100-yr detention volume (cft)

$V_{100P} = 21,905 \text{ cft}$

Check:  $V_{100P} > V_{ED}$  Okay

Summary:

$V_{CP-R} = 10,597 \text{ cft}$

$V_{WQ} = 15,488 \text{ cft}$

$V_{100P} = 21,905 \text{ cft}$

$V_{100P} \text{ VCP-R} = 11,307 \text{ cft}$

\* If the volume control requirement is met, the CPVC volume can be subtracted from (credited against)

Ksat Values

$K_{sat} \geq 0.50 \text{ in/hr}$  No supplemental measures are required for infiltration BMPs to provide the in 0.50 in/hr;  $K_{sat} \geq 0.24 \text{ in/hr}$  Install supplemental measures, which may include subsoil amendment, or an i bed layer to ensure dewatering in the event underlying soils fail to provide ade underdrains are selected, design shall allow stormwater to percolate through i

$K_{sat} \leq 0.24 \text{ in/hr}$  Soils are not suitable for infiltration. Alternative volume reducing LID practices

BASIN

Elevation	Area (ft <sup>2</sup> )	Depth (ft)	Volume (cft)	Total Volume (cft)	Goal	Elevation
687.08						
646.00	16 500	1.00	15 759	43 025	42,634	
645.00	15 030	1.00	14 317	27 266		
644.00	13 617	1.00	12 948	12 948		
643.00	12 291	0.00	0	0		

$57,437 \text{ sqft}$

$1.32$

$43,025 \text{ cft}$

Land Use Summary:

Characteristic	Existing Conditions	Proposed Conditions
Total Development Area (ac)	2.36	2.36
Impervious Area (ac)	2.36	2.36
Total Pervious Area (ac)	0.00	0.00
Pervious Area Breakdown by Cover Type		
Meadow		
Predominant NRCS Soil Type (A,B,C or D)	Type D	Type D
Improved Areas		
Predominant NRCS Soil Type (A,B,C or D)	Type D	Type D
Wooded Areas		
Predominant NRCS Soil Type (A,B,C or D)	Type D	Type D
Proposed Pond Area (ac)		52.685
Required CPVC Vol. (cft)		10,597
Provided CPVC Vol. (cft)		0
Required ED Vol. (cft)		15,488
Provided ED Vol. (cft)		32,566

Total Area2.36ac

Prop. Impervious2.36ac

Prop. Pervious0.00ac

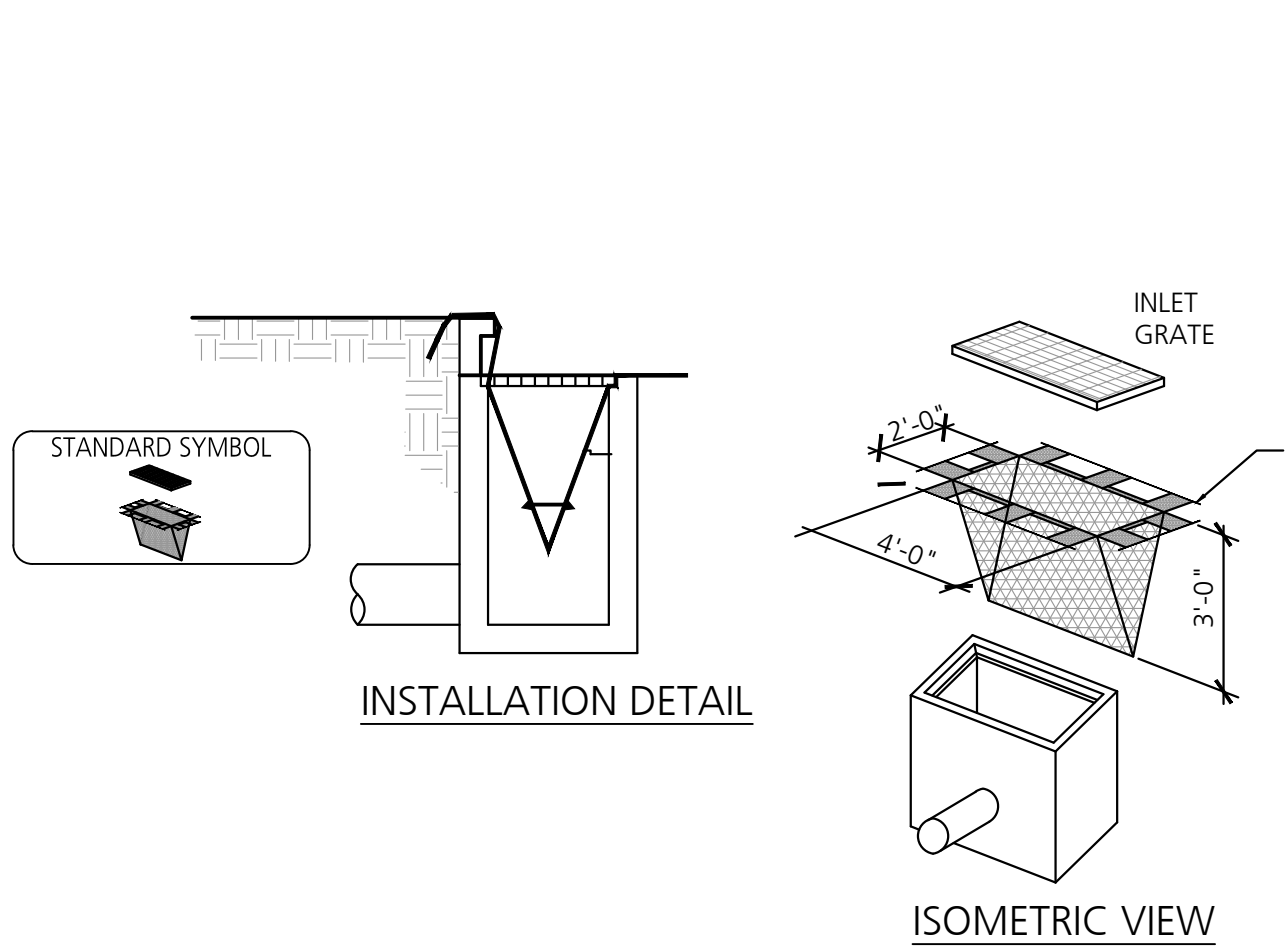
Infiltration Rate0.2 in/hr

Runoff Coefficient, C0.95

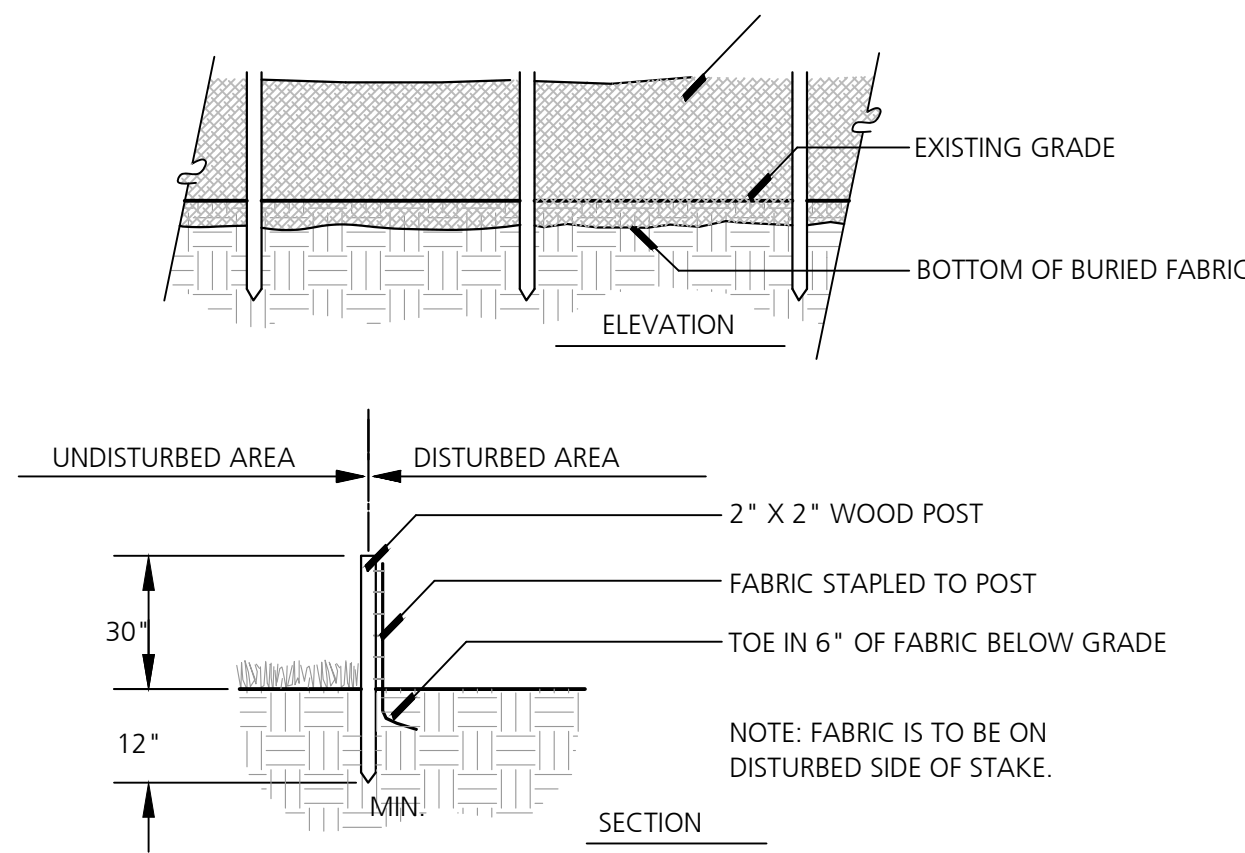
100-yr peak intensity7.60 in/hr

Surface area	900 SF				
Frequency of Storm (year)	Intensity (in/hr)	Intensity (ft/sec)	cubic feet / second	gallons per minute	
100	7.60	0.00018	0.15833	70.933	
50	6.53	0.00015	0.13604	60.947	
25	5.61	0.00013	0.11688	52.360	
10	4.58	0.00011	0.09542	42.747	
	10.00	0.00023	0.20833	93.333	
Proposed 10 gallon / min sump pump Handles					

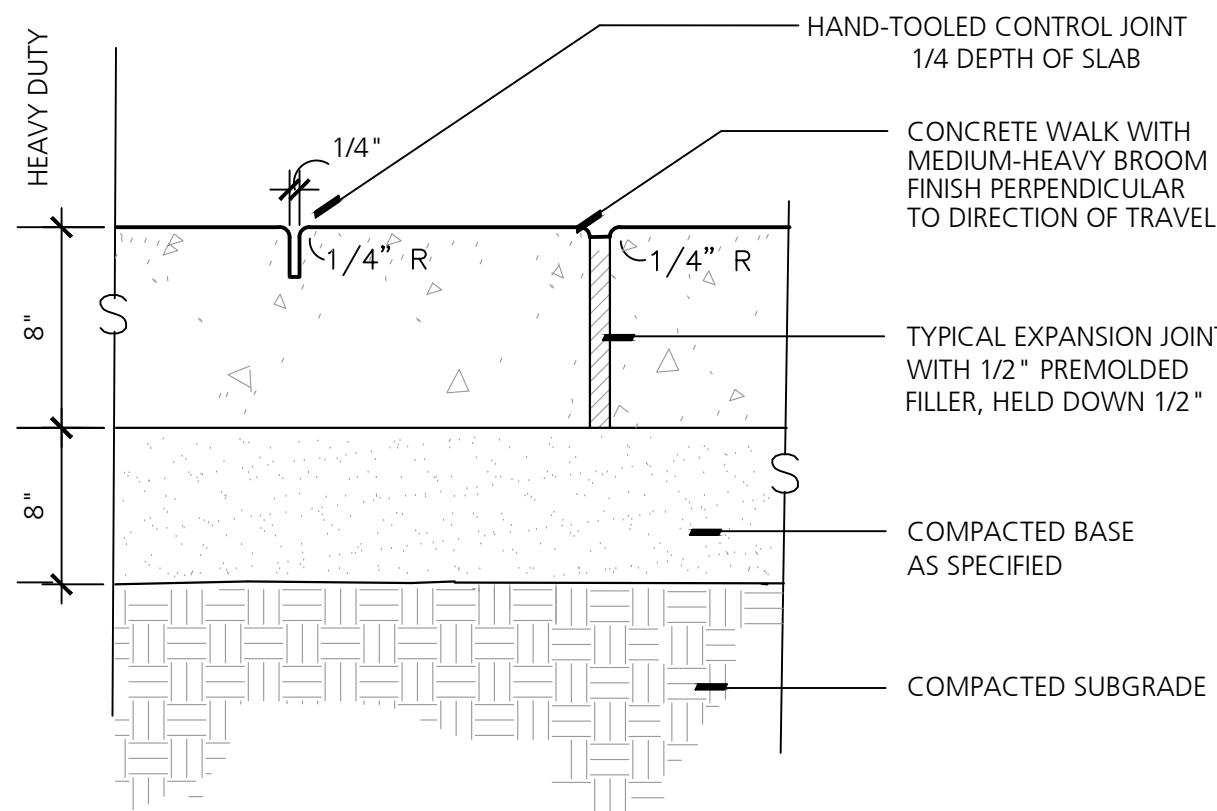
Dates	Issued for
01.17.2025	90% Owner Review
01.30.2025	100% Owner Review
03.05.2025	City Review



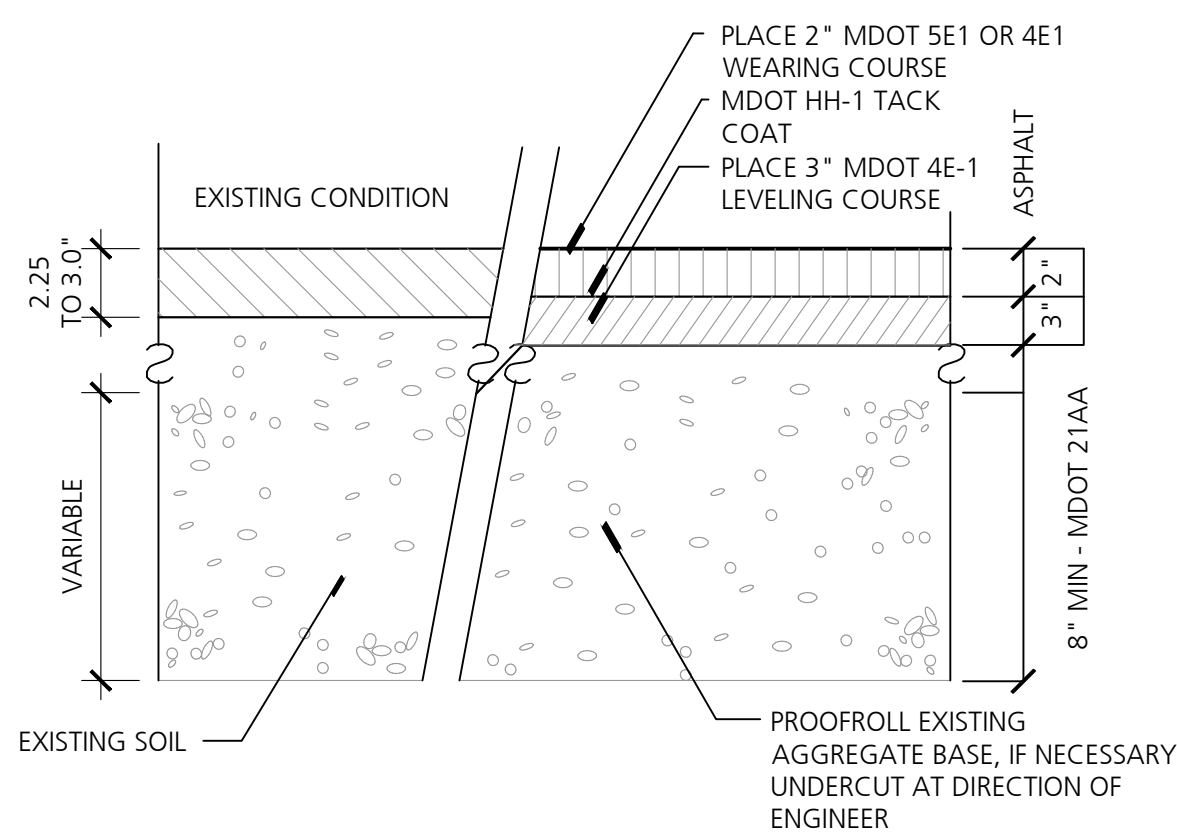
1 Inlet Protection Filter  
NO SCALE



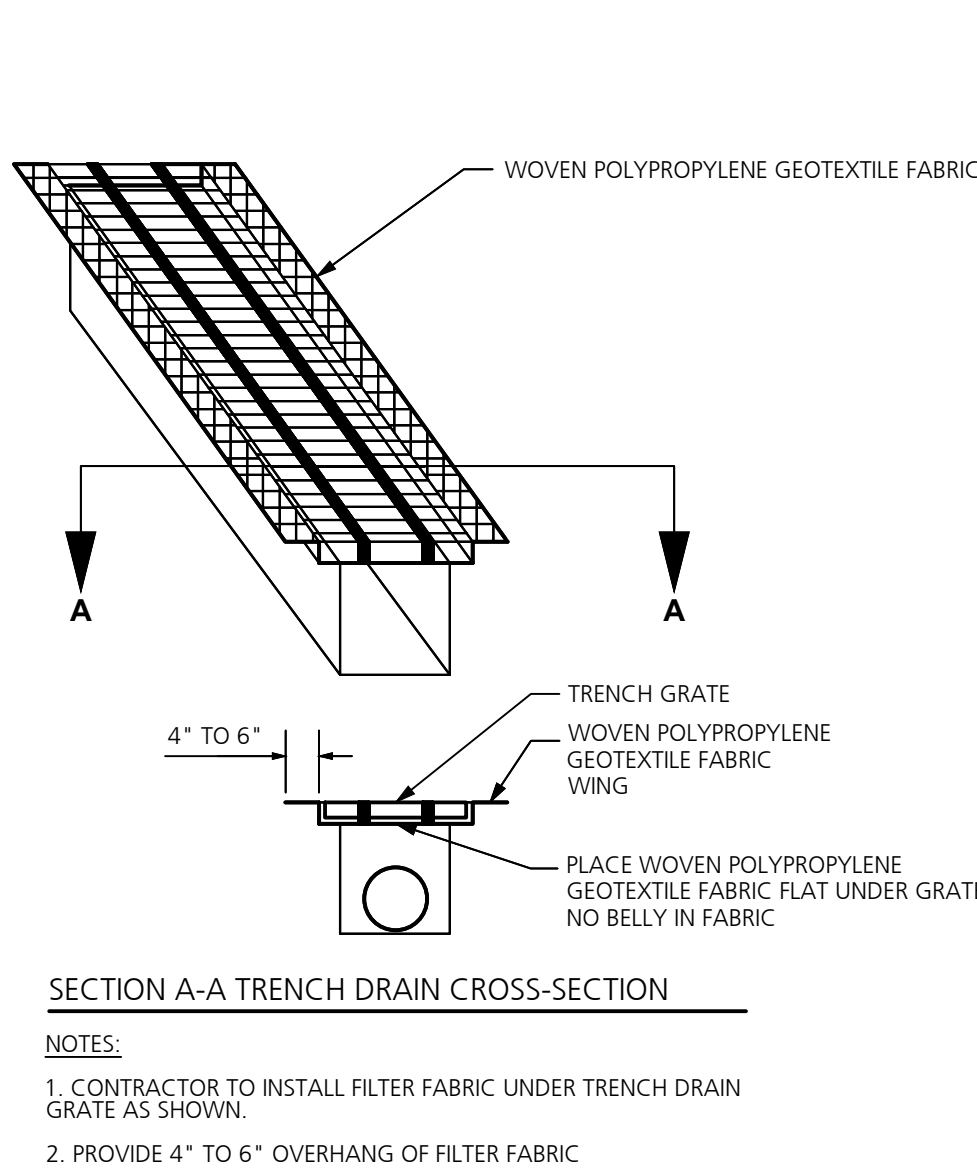
2 Filter Fabric Fence  
NO SCALE



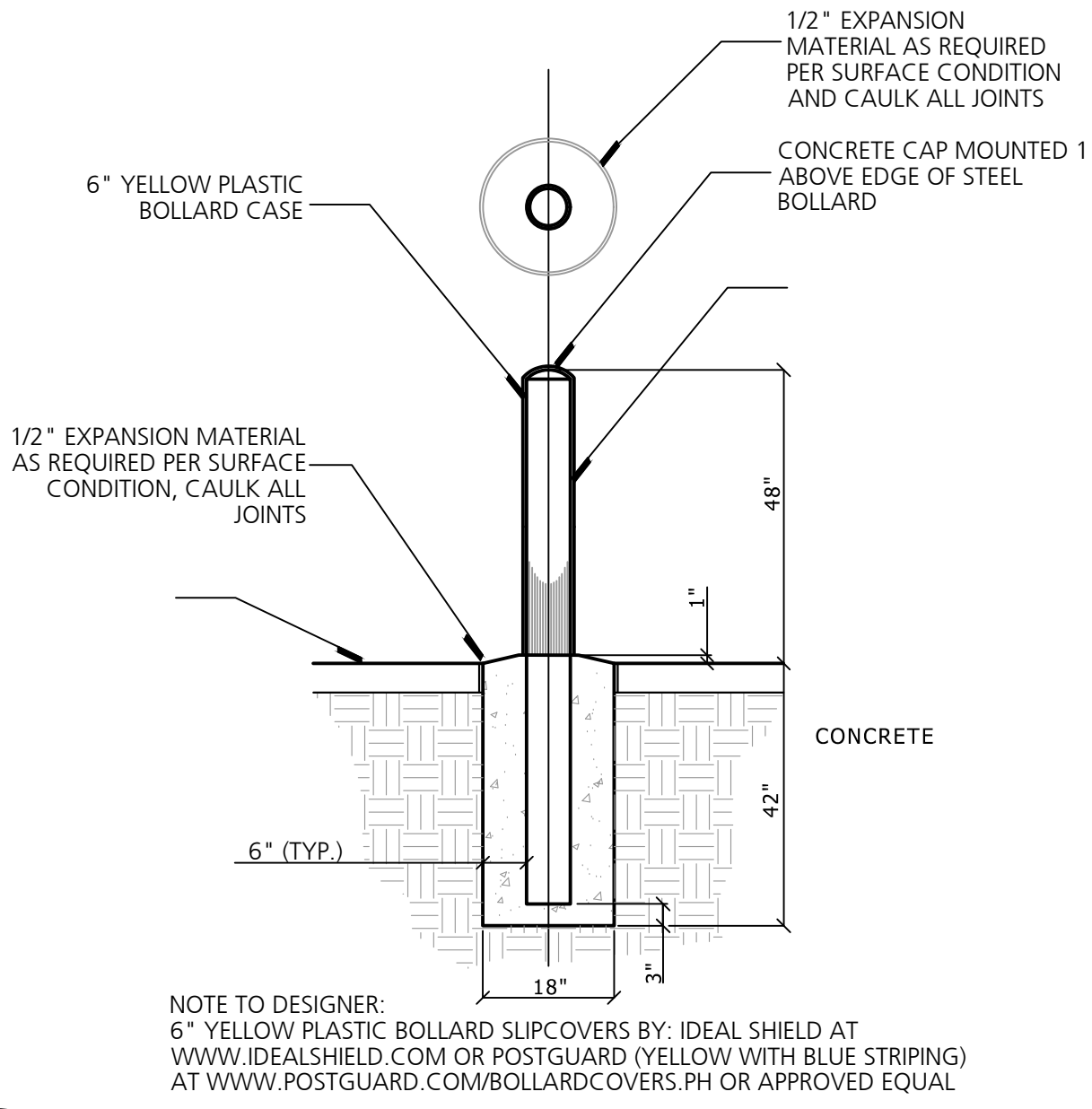
3 Heavy Duty Concrete Flatwork  
1-1/2" = 1'-0"



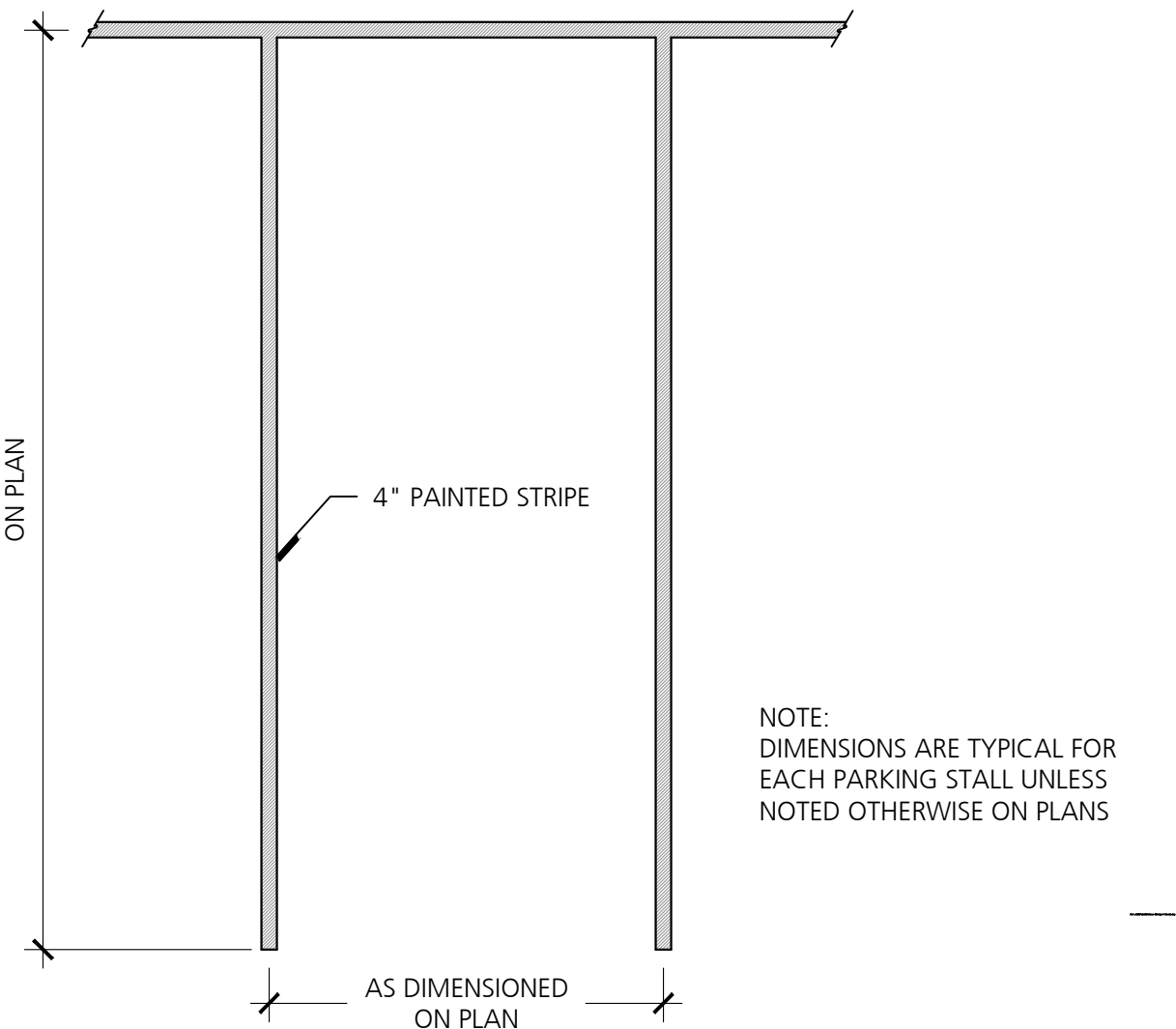
4 Asphalt Pavement  
SCALE: 1" = 1'-0"



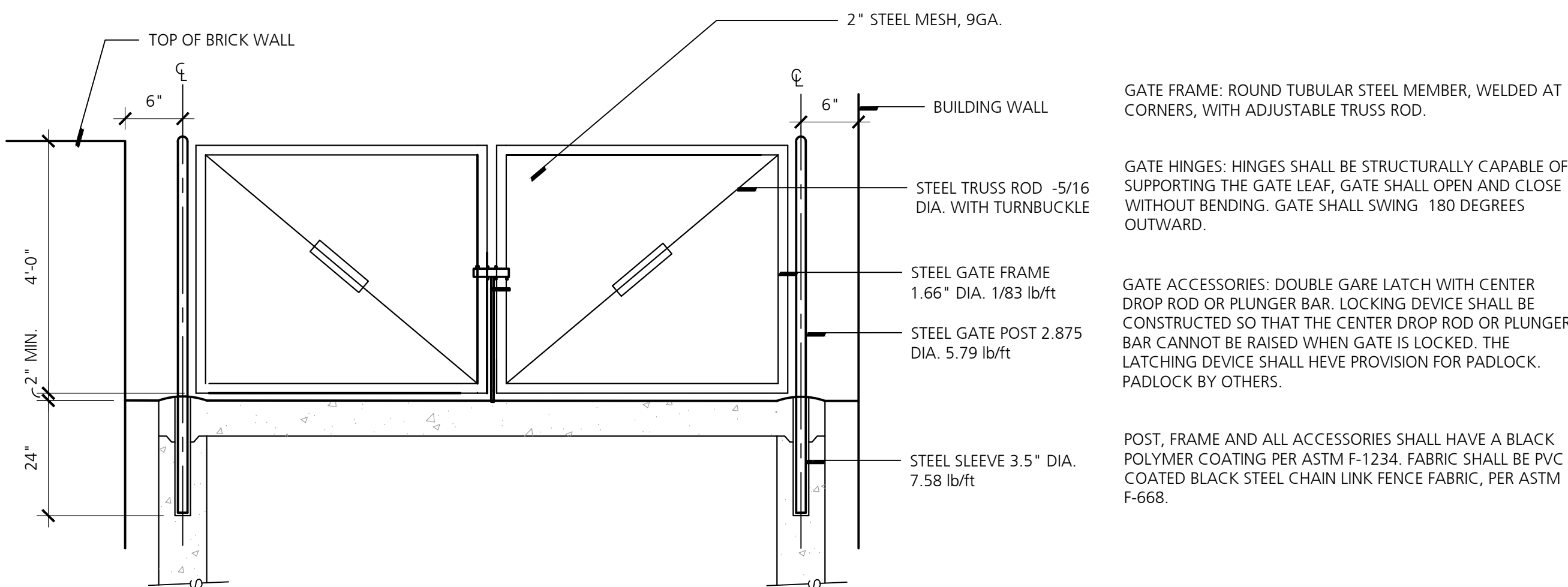
5 Trench Drain Inlet Filter  
SCALE: 1" = 1'-0"



6 Bollard  
NO SCALE



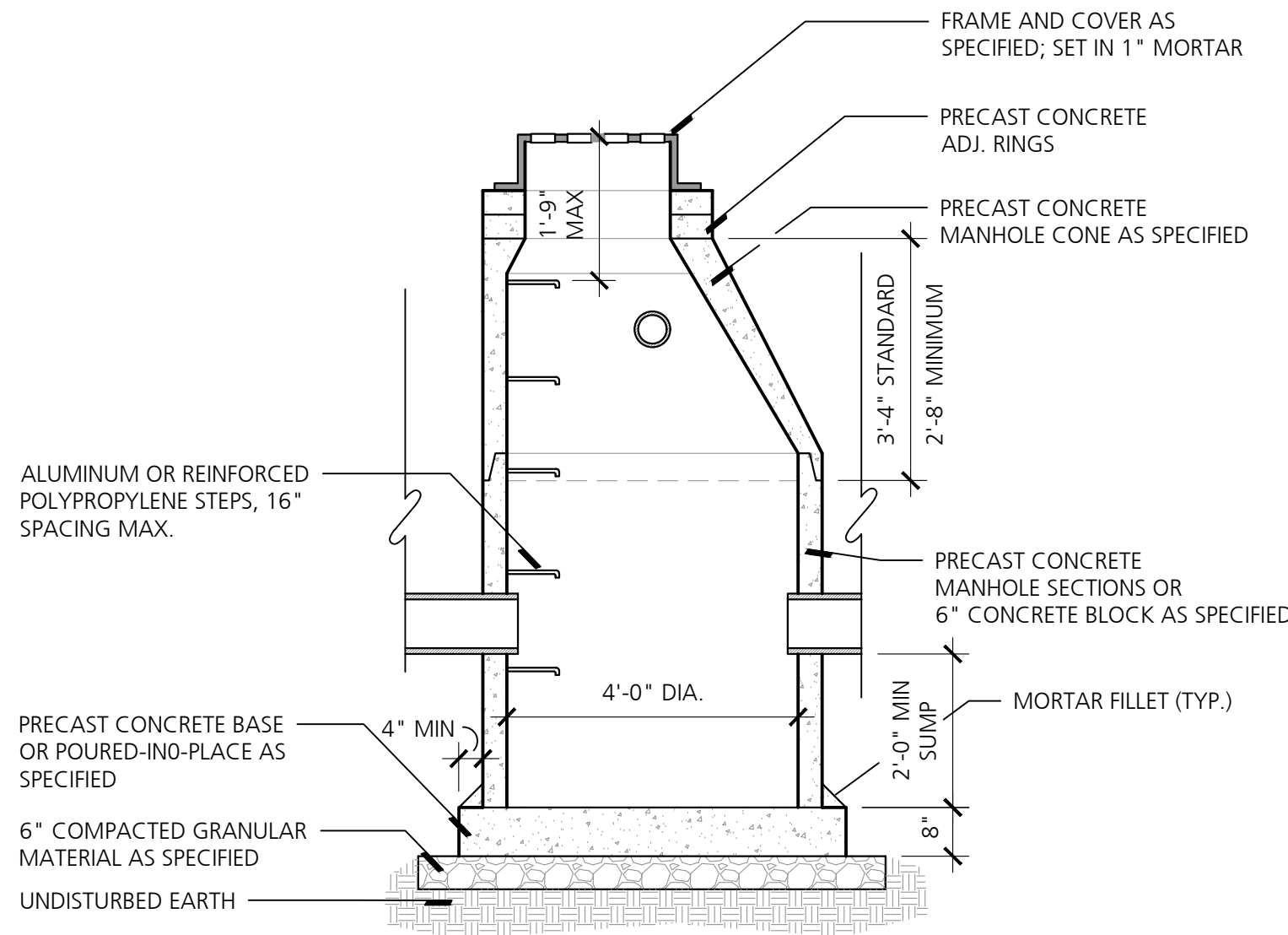
7 Standard Parking Striping  
SCALE 1/4" = 1' - 0"



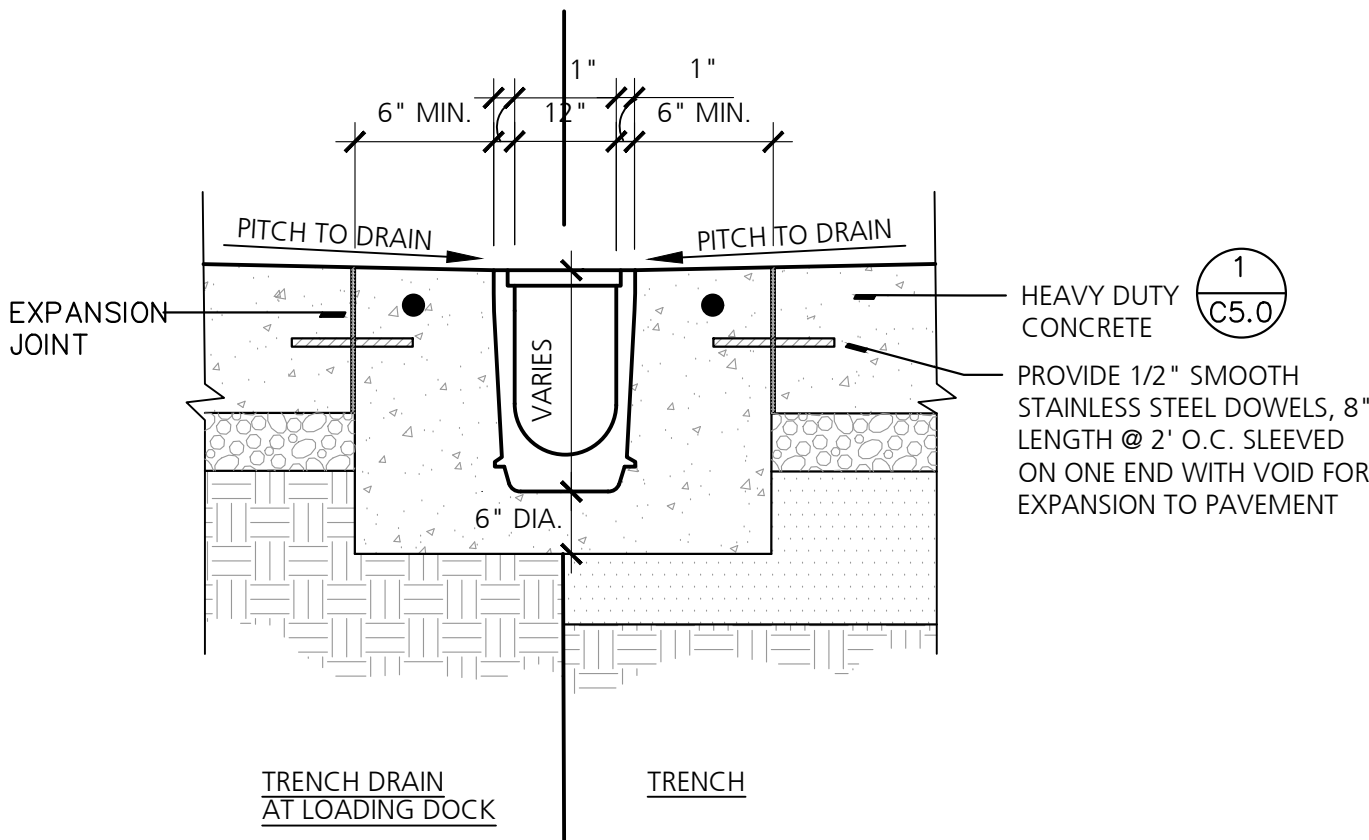
8 Utility Gate  
NO SCALE

Dates	
Dates	Issued for
01.17.2025	90% Owner Review
01.30.2025	100% Owner Review
03.05.2025	City Review

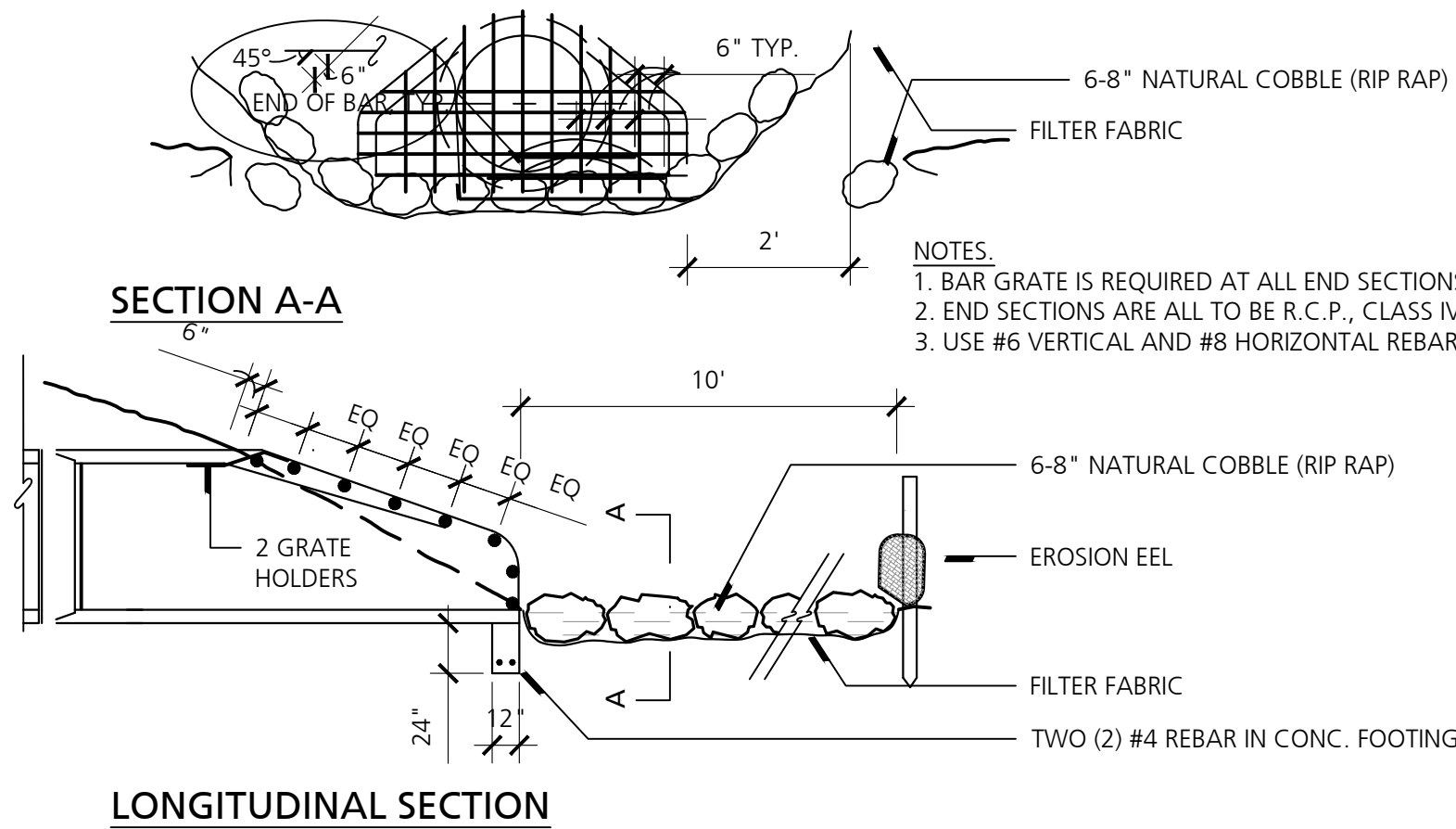




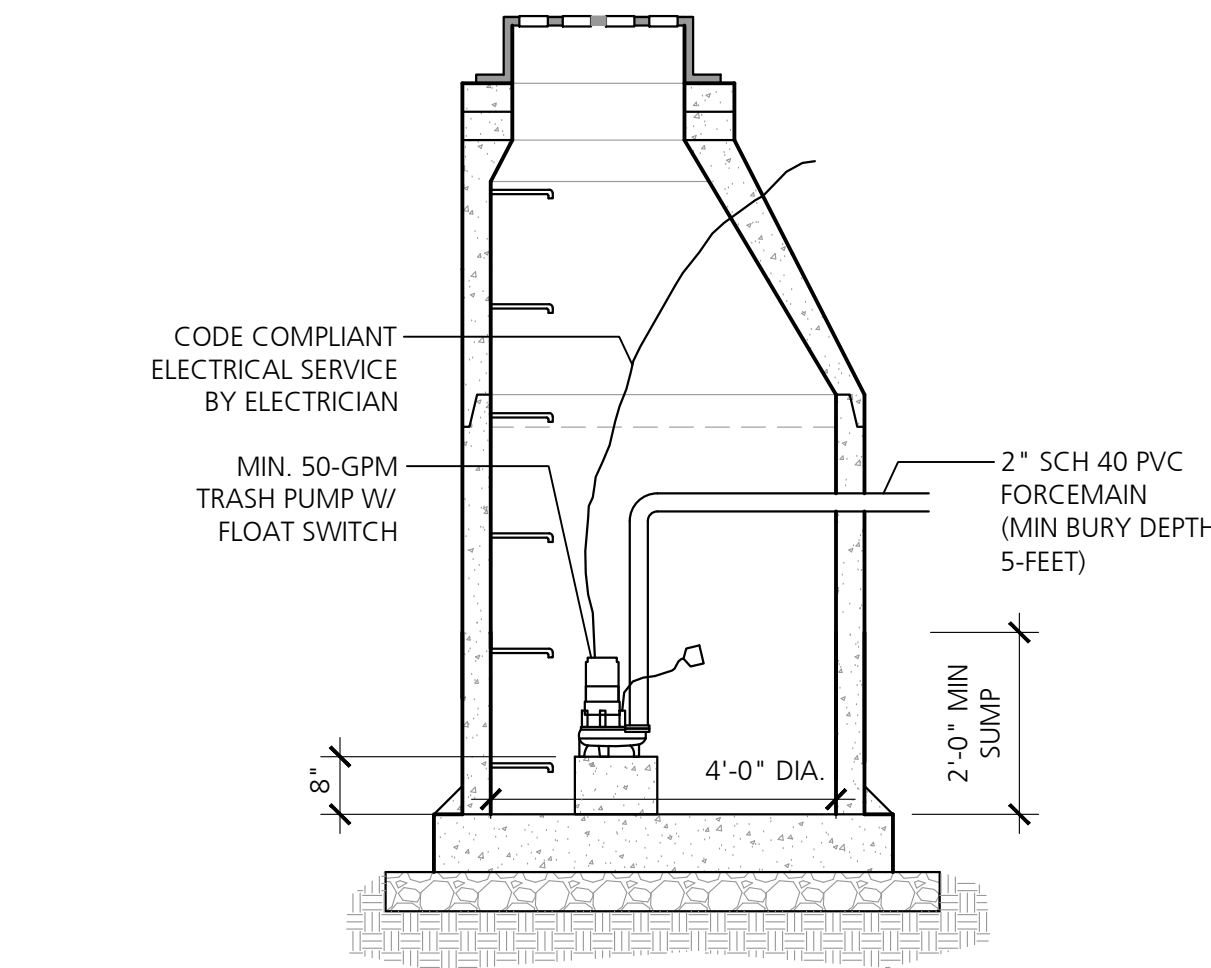
1 4' Diameter Catch Basin  
NO SCALE



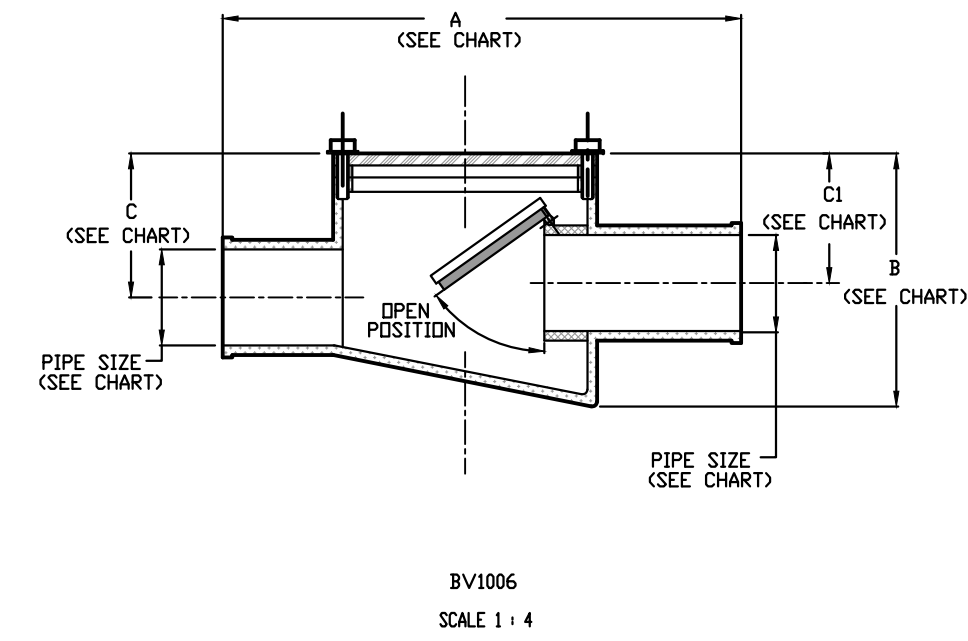
4 Trench Drain at Heavy Duty Concrete  
NO SCALE



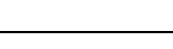
2 End Section With Grate  
NO SCALE



5 SUMP PUMP  
NO SCALE



MODEL NO.	PIPE SIZE	DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION C1
BV1006	6" N.D. 14.6	4-3/4"(120)	10-5/8"(273)	6-1/2"(165)	6-1/2"(165)
BV1008	8" N.D. 14.8	17-1/8"(438)	12-1/4"(311)	7-1/8"(180)	6-1/2"(165)

MIFAB				FOR CATALOGUE USE ONLY	
	SCALE : 1 : 4	in/(mm)	GENERAL TOLERANCE : LINEAR : N/A ANGULAR : N/A (UNLESS OTHERWISE SPECIFIED)	P/N :	BV1000
	SHEET : 1 OF 1	A5		REV :	0

3 Backflow Preventer  
SCALE: 1:4

Dates	Issued for
01.17.2025	90% Owner Review
01.30.2025	100% Owner Review
03.05.2025	City Review

Drawn: FJ
Checked: KE
Approved: KE