PROJECT DATA

PROJECT: NORTH OAKLAND TRANSPORTATION (NOTA) HEADQUARTERS

DESCRIPTION: NEW EMPLOYEE OFFICE AREA OF 2,516 SF. 4,838 SF WAREHOUSE A FOR VEHICLE STORAGE. CLEAN AND PREP 8,988 SF WAREHOUSE "B" FOR SUB-LEASE SPACE.

BUILDING DATA

1. CODE COMPLIANCE
2015 MICHIGAN BUILDING CODE.
2015 MICHIGAN ENERGY CODE
2015 MICHIGAN MECHANICAL CODE
2015 MICHIGAN PLUMBING CODE
2014 MICHIGAN ELECTRICAL CODE
ICC A117.1-2009

2. USE & OCCUPANCY CLASSIFICATION MBC CHAPTER 3
NON-SEPARATED MIXED USE S-1 MODERATE HAZARD STORAGE; MOTOR VEHICLE REPAIR GARAGE COMPLYING WITH MAXIMUM ALLOWABLE QUANTITIES OF HAZARDOUS MATERIALS LISTED IN TABLE 307.1 MIXED WITH BUSINESS GROUP "B".

3. SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY
VENTILATION- REPAIR GARAGES SHALL BE MECHANICALLY VENTILATED IN ACCORDANCE WITH THE 2015 MICHIGAN MECHANICAL CODE. THE VENTILATION SYSTEM SHALL BE CONTROL AT GARAGE ENTRANCE.

GAS DETECTION SYSTEM- REPAIR GARAGES USED FOR REPAIR OF VEHICLES FUELED BY NON-ODORIZED GASES SUCH AS HYDROGEN AND NON-ODORIZED LNG SHALL BE PROVIDED WITH AN APPROVED FLAMMABLE GAS DETECTION SYSTEM.

4. CONSTRUCTION TYPE MBC CHAPTER 6
CONSTRUCTION TYPE 3B

5. FIRE SUPPRESSION MBC 903
FULLY SUPPRESSED. STORAGE OF COMMERCIAL VEHICLES WHERE FIRE AREA EXCEEDS 5,000 SF IS TO BE FULLY SUPPRESSED.

6. FIRE ALARMS MBC 907

7. ALLOWABLE BUILDING HEIGHT AND AREAS MBC TABLE 504.3
USING MOST RESTRICTIVE CATEGORY:
S-1, TYPE 3B, SUPPRESSED:
ALLOWABLE BUILDING HEIGHT: 75 FT. ALLOWED; 25 FT. EXISTING
ALLOWABLE NUMBER OF STORIES: 3 STORIES ALLOWED; I STORY EXISTING
ALLOWABLE AREA FACTOR: 70,000 S.F. (S1) ALLOWED; 13,829 S.F. EXISTING INCLUDING MEZZANINE

AREA MODIFICATIONS MBC SECTION 506
ALLOWABLE AREA: S-1, 17,500 SF, NONSEPARATED MIXED USE S-1 & B
Aa =(At+[Atxlf]+[Atxls]) W=30
If = [F/P-0.25] W/30
= [660'/ 660'-0.25] 30/30 = 0.75 Is = 0
=17,500+[17,500x.75]+[17,500x1]
=48,125 SF ALLOWABLE > 13,829 SF EXISTING

9. OCCUPANT LOAD MBC 1004, 1004.6 TABLE 1004.1.2
MODERATE HAZARD EXIST. GARAGE A S-1 4,838 SF/500 = 10 PERSONS
BUSINESS "B" 2,516 SF/100 = 25 PERSONS
EXIST. GARAGE B S-1 8,988 SF/500 = 18 PERSONS
TOTAL OCCUPANCY = 53 PERSONS

10. EXIT ACCESS & NUMBER OF EXITS
MBC 1015 TABLE 1015.1, 1016.2, 1019.1, 1019.2
EGRESS WIDTH (1005.1):
REQUIRED STAIRS = 0.2 PER OCCUPANT X 58 PERSONS = 11.6"; NA
REQUIRED DOORS = 0.15 PER OCCUPANT X 60 PERSONS = 9"; 180" PROVIDED

COMMON PATH OF EGRESS TRAVEL (1006.3.2):
B & S-1 OCCUPANCY 100 FT. MAX. WITH SUPPRESSION

NUMBER OF EXITS (1006):
S-1 OCCUPANCY 35 OCCUPANTS > 28 = 2 REQUIRED; 3 PROVIDED
B OCCUPANCY 25 OCCUPANTS < 49 = 1 REQUIRED; 2 PROVIDED

EXIT ACCESS TRAVEL DISTANCE (TABLE 1017.2)
S-1 & B OCCUPANCY WITH SUPPRESSION 300 FT. MAX. FROM MOST REMOTE POINT WITH S-1 INCREASE PER 1017.2.2

11. REQUIRED FIRE RESISTANCE OF BUILDING ELEMENTS MBC 508, CHAPTER 7, 1020, 1022, 3006.4 AND TABLE 601
TYPE 3B CONSTRUCTION

PRIMARY STRUCTURAL FRAME	0 HRS.
BEARING WALLS	
EXTERIOR	2 HRS.
INTERIOR	0 HRS.
NON-BEARING WALLS & PARTITIONS	0 HRS.
FLOOR CONSTRUCTION & SECONDARY MEMBERS	0 HRS.
ROOF CONSTRUCTION & SECONDARY MEMBERS	0 HRS.

12. PROTECTION OF OPENINGS DUE TO LOCATION ON PROPERTY OR MAX. AREA OF EXTERIOR WALL OPENINGS, MBC 705.8, TABLE 705.8
> 30' (SUPPRESSED) = NO LIMIT, NOT REQUIRED

13. SPACES REQUIRING FIRE RESISTANCE RATING SEPARATION MBC 419, 420, 508.2.4, 508.3 AND TABLE 508.4
NON-SEPARATED USE S-1 & B; S-1 MOST RESTRICTIVE

14. ROOF COVERING MATERIAL MBC TABLE 1505.1
CLASS C ROOF ASSEMBLY

15. FIRE RESISTANCE RATING FOR EXTERIOR WALLS BASED ON DISTANCE MBC TABLE 602
S-1 OCCUPANCY; 3B CONSTRUCTION > 30' = 0 HR REQUIRED.

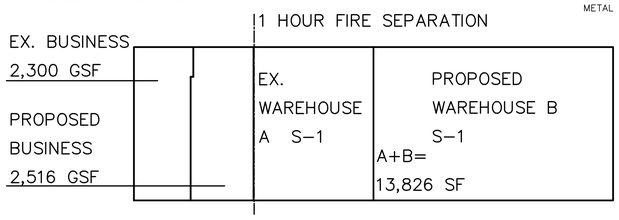
16. REQUIRED PLUMBING FIXTURES MPC 403 TABLE 403.1
BUSINESS B:
WATER CLOSETS
MALE/FEMALE: 1/25 FOR < 50 23 < 25 = 1 REQ'D FOR EACH
LAVATORIES: 1 /25 < 50 = 2 REQ'D
DRINKING FOUNTAIN: 1/100 = 1 REQ'D
SERVICE SINK: 1 REQ'D

MOD HAZARD STORAGE S-1:
WATER CLOSETS
MALE/FEMALE 1/100 37/100 = 1 REQ'D FOR EACH
LAVATORIES: 1 /100 = 1 REQ'D FOR EACH
DRINKING FOUNTAIN: 1/1000 = 1 REQ'D
SERVICE SINK: 1 REQ'D
PLUMBING TOTALS:
WATER CLOSETS: MALE - 2 REQ'D; 4 PROVIDED
FEMALE - 2 REQ'D; 2 PROVIDED
UNISEX - 1 PROVIDED
DRINKING FOUNTAIN: 1 PROVIDED
SERVICE SINK: 2 PROVIDED

17. 2015 MICHIGAN UNIFORM ENERGY CODE (CHAPTER 5) & ANSI/ASHRAE/IESNA STANDARD 90.1-2013
BUILDING ENVELOPE REQUIREMENTS FOR CLIMATE ZONE 5 (TABLE 5.5-5)

	INSULATION MIN R-VALUE	ASSEMBLY MAXIMUM
ROOFS		
ABOVE DECK	R-30.0 C.I.	U-0.032
METAL BUILDING	R-19.0 + R-11 Ls OR R-25 + R-8 Ls	U-0.037
ATTIC AND OTHER	R-49.0	U-0.021
WALLS, ABOVE-GRADE		
MASS	R-11.4 C.I.	U-0.090
METAL BUILDING	R-0 + R-19 C.I.	U-0.050
STEEL-FRAMED	R-13 + R-10 C.I.	U-0.055
WOOD-FRAMED AND OTHER	R-13 + R-7.5 C.I. OR R-19 + R-5 C.I.	U-0.051
WALLS, BELOW-GRADE		
BELOW GRADE WALLS	R-7.5 C.I.	C-0.119
FLOORS		
MASS	R-14.6 C.I.	U-0.057
STEEL JOISTS	R-30	U-0.038
WOOD FRAMED AND OTHER	R-30	U-0.033
SLAB-ON-GRADE FLOORS		
UNHEATED	R-15 FOR 24"	F-0.520
HEATED	R-20 FOR 48"	F-0.688
VERTICAL GLAZING		
NONMETAL FRAMING (ALL)		U-0.32, SHGC-0.40
METAL FRAMING (FIXED)		U-0.42, SHGC-0.40
METAL FRAMING (OPERABLE)		U-0.50, SHGC-.040
METAL FRAMING (ENTRANCE DOOR)		U-0.77, SHGC-0.40

BUILDING KEY PLAN



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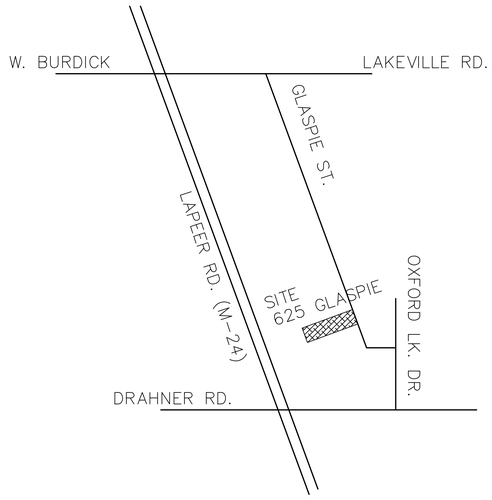

Location Map
No Scale

JUNE 10, 2025
90% REVIEW CM RFP

Project
NOTA North Oakland Transportation Authority
Dispatch Center
675 Glaspie Street
Oxford, Michigan

AKA Architects Inc. Project Number 2428.00

06.10.2025 90% REVIEW CM RFP	09.06.2024 OWNER REVIEW	SHEET INDEX Sheet No.	Sheet Description
■	■		Drawing Issued
□	□		For Reference Only
			ARCHITECTURAL
■	■		Cover Sheet
■	■	A.001	Specifications
■	■	A.002	Specifications
■	■	A.003	Specifications
■	■	A.004	Specifications
■	■	A.005	Life Safety Plan
■	■	AD.101	Demolition Floor Plan
■	■	A.101	Overall Floor Plan
■	■	A.102	Enlarged Plans /Interior Elevations & Partial Exterior Elevation
■	■	A.103	Enlarged Finish & Reflected Ceiling Plan

06.10.2025 90% REVIEW CM RFP	09.06.2024 OWNER REVIEW	SHEET INDEX Sheet No.	Sheet Description
■	■		Drawing Issued
□	□		For Reference Only
			MECHANICAL
■	■	M.001	Index, Symbols & Abbreviations
■	■	M.002	Standard Materials Schedules
■	■	M.003	Specifications
■	■	M.004	Specifications
■	■	M.014	Mechanical Demolition Plan
■	■	M.100	Fire Protection
■	■	M.200	Pluming Plans
■	■	M.400	Mechanical Plan
■	■	M.500	Details
■	■	M.600	Diagrams
			ELECTRICAL
■	■	E.001	Electrical Legend, Symbols & Notes
■	■	E.002	Electrical Circuit & Conduit Schedules
■	■	E.003	Electrical Specifications
■	■	E.101	Electrical Demolition Plan
■	■	E.201	Lighting Plan
■	■	E.301	Power Plan
■	■	E.601	Electrical One Line & Panel Schedules

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NOTA Dispatch 2428.00

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010: SUMMARY OF WORK

1. Scope: Furnish all materials, labor, transportation, fees, permits, etc. as required to complete the Work as shown on the Drawings and as specified herein.

2. The basic intent of the Drawings and Specifications is to describe the complete Project, including materials, labor, equipment and incidentals necessary for the execution and completion of the Work. The Scope of the Work shall include all items directly called for by the Drawings and Specifications and all work reasonably to be foreseen and/or inferred in order to completely perform the Work and produce the complete Project as intended.

3. **Occupancy During Construction**

A. None

4. **Temporary Facilities**

A. Fire extinguishers as required by the local fire jurisdiction shall be furnished by the Contractor.

5. **Permits**

A. All required permits and inspections, unless otherwise noted, shall be obtained and paid for by the Contractor without an increase in the Contract Sum and without an extension of the Contract Time.

B. Plan Check fee and Building Permit fee will be reimbursed at cost by Owner. Reimbursement requests shall be included with final Payment Request and shall be accompanied with a copy of the pertinent receipts.

6. **General Conditions**: American Institute of Architects Document A-201, "General Conditions of the Contract for Construction" (latest edition) is hereby made a part of the Contract Documents by reference and shall have the same effect as if included herein.

7. **Tests and Inspections**

A. All tests and inspections stipulated in the Specifications and/or Drawings shall be performed by the Owner's Testing Laboratory at the Owner's expense.

B. The Contractor shall cooperate with the Testing Laboratory and notify the Testing Laboratory sufficiently in advance so that the specified samples, tests, etc. can be accomplished.

8. **Guarantees**: Contractor shall guarantee installation of the Work for a period of one year following the date of Substantial Completion.

9. **Cleaning**

A. Contractor shall dispose of all debris, rubbish, etc. for the Project site in a lawful manner during the course of construction without an increase in the Contract Sum and without an extension of the Contract time.

B. Upon completion of the Work, the contractor shall clean Project Area, including, but not limited to; adjacent flooring.

10. **Submittals**

A. Submittals include, but is not limited to, samples, shop drawings, product data, installation instruction for all work to be installed or as requested. Contractor shall not purchase items requiring submittal until submittal has been review and accepted by Architect.

B. Samples, including, but not limited to colors, materials textures, finishes, etc. shall be submitted when specified herein or upon request from the Architect. Quantity of samples shall be determined by Architect.

C. Tenant shall select colors, accept samples, etc. prior to the installation of the item.

SECTION 01630: PRODUCT SUBSTITUTIONS

1. Substitutions for items specified herein and on the Drawings shall be allowed. The Owner and Architect shall be the sole judge of equivalent substitute items.

2. Wherever catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with a designated material, product, thing, or service mentioned in these Specifications, the catalog numbers and specific brands are used to establish the standards of quality, utility, appearance, etc. required.

3. When materials are specified by first manufacturer's name and product number followed by a second manufacturer's name and the designation "or equal", the second manufacturer's and the "or equal" manufacturer's product shall be considered a substitution and shall be submitted in accordance with the requirements for substitute items.

4. Substitutions which are equal in quality, utility, and appearance to those specified as judged by the Architect.

5. All substitutions must be accepted by the Architect in writing.

6. Sufficient data, Drawings, samples, literature, modifications required to incorporate the proposed substitution and other detailed information as will demonstrate to the Architect that the proposed substitute is equal in quality, appearance, etc. to the specified shall be submitted to the Architect for review and acceptance or rejection.

7. The Contractor is solely responsible for submitting sufficient information for the Architect to evaluate the proposed substitution. The submission of insufficient information shall be just cause for the rejection of the proposed substitution.

8. The Architect's acceptance of a substitution shall not relieve the Contractor from complying with the requirements of the Drawings and Specifications, and the Contractor shall be responsible, without an increase in the Contract Sum and without an extension of the Contract Time, for any changes resulting for the Contractor's proposed substitutions which affect other parts of the Contractor's own work or the work of others.

9. Failure of the Contractor to submit proposed substitutions for review in the manner described above and a timely manner so as not to cause a delay in the Work shall be sufficient cause for rejection of the proposed substitution by the Architect.

10. Only one proposed substitution (when allowed) will be submitted for each item. If a proposed substitution is judged by the Architect to be unacceptable, the specified item shall be provided; further substitution submissions for the same item will not be allowed.

11. Contractor representation of substitutions:

A. Request for substitution constitutes a representation that Contractor has investigated proposed product and has determined that it is equal to or superior in all respects to specified product.

B. Contractor will provide same warranty for substitution as for specified product.

C. Contractor will coordinate installation of accepted substitute, making such changes be required for Work to be complete in al respects without an increase in the Contract sum and without an extension of the Contract Time.

DIVISION 2 - DEMOLITION

SECTION 2305 - BUILDING EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. All earthwork operations shall conform to the current Michigan Department of Transportation standards and specifications.

C. 1.2 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for utility trenches, pits and structures inside the building footprint.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
2. Divisions 15 and 16 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a utility trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a utility trench.

B. Bedding Course: Course placed over the excavated sub-grade in a utility trench before laying pipe.

C. Blotter Course: Fine graded granular material placed directly beneath the concrete floor slab.

D. Capillary Break Course: Fine graded granular material placed directly beneath the floor slab vapor barrier that minimizes upward capillary flow of pore water.

E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

F. Engineered Fill: Fill placed and compacted to densities specified herein, in a controlled manner using lift thickness limited herein, monitored and tested by the Testing Agency or independent Geotechnical Inspector.

G. Excavation: Removal of material encountered above sub-grade elevations and to lines and dimensions indicated.

H. Fill: Soil materials used to raise existing grades.

I. Rock: Rock material in beds, ledges, un-stratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Sub-Base Course: Coarse graded granular material placed over Sub-Grade.

L. Sub-Grade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials. Grade surface resulting from the building pad construction work.

M. Undercutting: Necessary excavation of poor quality soils which occur below the existing topsoil and any uncontrolled fill soils as described in the Geotechnical Investigation.

N. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials without additional cost to Owner when sufficient satisfactory soil materials are not available from excavations. Contractor is responsible for doing an independent earthwork calculation and including any import of appropriate fill material required to bring the site to the proposed grades.

B. Satisfactory Soil Material (ASTM D 2487): Free of stones larger than 2 inches in any dimension, trash, debris, organic material and other objectionable material and classified as follows:
1. GW (well-graded gravel).
2. GP (poorly graded gravel).
3. GM (silty gravel).
4. GC (clayey gravel).
5. SW (well-graded sand).
6. SP (poorly graded sand).
7. SM (silty sand).

C. Unsatisfactory Soil Material (ASTM D 2487):
1. SC (clayey sand).
2. CL (lean clay).
3. ML (silt).
4. OL (organic clay).
5. OL (organic silt).
6. CH (fat clay).
7. MH (elastic silt).
8. OH (organic clay).
9. OH (organic silt).
10. PR (peat).

D. Backfill and Fill: Satisfactory soil materials.

E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940 - generally either an MDOT Class II sand or 21AA gravel will meet this requirement.
1. Clean granular fill meeting MDOT Class II grading requirements.
2. On-site soils within the excavation that are free from organic matter and debris, such as most of the fill and native soils encountered may be used as engineered fill if approved by the geotechnical engineer and if tight moisture controls can be implemented and placement occurs under favorable weather conditions.
3. Import fill as required to make-up volumes necessary to raise the building site.

F. Sub-Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; generally either an MDOT Class II sand or 21AA gravel will meet this requirement.

G. Blotter Course or Capillary Break Course: Naturally or artificially graded mixture of natural or crushed sand; ASTM D 2940; generally an MDOT Class II sand.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; Generally either an MDOT 3G, 5G, 6A, or 34R will meet this requirement. Bedding requirements of the agencies having jurisdiction over the utility installation take precedence over these specifications.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; Generally either an MDOT 6A or 34R will meet this requirement. Refer to the plans for specific requirements.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

K. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of sub-grade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.

D. Provide protective insulating materials to protect sub-grades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.

B. Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated utility trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. General: Excavation includes the removal of any materials necessary to achieve the required sub-grade elevations and includes reuse or disposal of such materials.
1. When required by the architect due to the unforeseen presence of unsatisfactory materials or other factors, perform additional excavation and replace with approved compacted fill material in accordance with the geotechnical engineer's instructions.
2. Payment for unforeseen additional work will be made in accordance with established unit prices or, if none, in accordance with provisions for changes in the work. No payment will be made for correction of sub-grades improperly protected against damage from freeze-thaw or accumulation of water, or for correction of otherwise defective sub-grades.

D. Excavation Stabilization: Slope faces of excavations to maintain stability in compliance with requirements of governing authorities. Do not use shoring and bracing where faces can be sloped.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
3. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
4. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Coordinate excavations with construction of foundations to allow concreting on the same day in order to minimize disturbance of the sub-grade.
1. Refer to Article 3.12 for Soil Moisture Control.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate utility trenches to indicated gradients, lines, depths, and elevations.

B. Excavate utility trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate utility trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

C. Utility trench Bottoms: Excavate and shape utility trench bottoms in accordance with the plans and standard details. Excavate utility trenches a minimum 4 inches deeper than bottom of pipe elevation to allow for bedding course (excavate deeper as required by the regulating agency). Hand excavate for bell of pipe. Remove projecting stones and sharp objects along utility trench sub-grade.
1. Excavate utility trenches a minimum 4 inches deeper than bottom of pipe elevation to allow for bedding course (excavate deeper as required by the regulating agency). Hand excavate for bell of pipe. Remove projecting stones and sharp objects along utility trench sub-grade. Provide bedding course per the plan notes and/or details.

3.7 SUB-GRADE INSPECTION

A. Perform mass earthwork operations to remove all existing topsoil and other organic materials in their entirety within the footprint of the proposed building and pavement areas.

B. Buried objects should be removed in their entirety.

C. Notify Testing Agency when excavations have reached required subgrade elevations.

D. Proof-roll sub-grade in the presence of the Testing Agency to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. For granular site soils: Completely proof-roll sub-grade in one direction repeating proof-rolling in direction perpendicular to the first direction. Limit vibratory roller speed to 3 mph; turn of vibratory function within 25 feet of any existing structure. 10 complete passes shall be made in each of two perpendicular directions.
2. For clay site soils: Proof-roll sub-grade with heavy pneumatic-tired equipment or loaded 10-wheel, tandem-axle truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by the Testing Agency, and replace with engineered fill as directed.

E. If Testing Agency determines that unsatisfactory soil is present, continue excavations and replace with compacted backfill or fill materials as directed.
1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

F. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities.

3.8 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Place and compact initial backfill of sub-base material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit. All pipe backfill to be done according to the details shown on the plans or the requirements of the regulating agency.

C. Backfill with MDOT Class II sand engineered fill.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate sub-grade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.9 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
3. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing sub-grade and each layer of backfill or fill soil material at 95 percent.
4. Under walkways, scarify and re-compact top 6 inches below sub-grade and compact each layer of backfill or fill soil material at 95 percent.
5. Under lawn or unpaved areas, scarify and re-compact top 6 inches below sub-grade and compact each layer of backfill or fill soil material at 95 percent.
6. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.10 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Grading inside Building Lines: Finish sub-grade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.11 SUB-BASE COURSE

A. Install separation fabric on prepared sub-grade according to manufacturer's written instructions, overlapping sides and ends.

B. Under pavements and walks, place sub-base on prepared sub-grade as follows:
1. Place sub-base course material separation fabric.
2. Compact sub-base at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
3. When thickness of compacted sub-base exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.12 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Refer to Article 3.11 for Soil Moisture Control.

C. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

E. Protect all existing trees, bushes, plants, etc. indicated to remain during construction activities.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.
1. Do not burn materials on the Owner's property.
2. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 2305

DIVISION 3 - CONCRETE

SECTION 03300 - CAST-IN-PLACE CONCRETE

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. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

A. Footings.
1. Slabs-on-grade.
2. Concrete curing process and procedures.
3. Curing compounds, sealers and hardeners.
4. Under-slab vapor barriers.

B. Related Sections:
1. Division 02 Section "Earth Moving" for course graded granular sub-base and fine graded granular capillary break or blotter course under slabs-on-grade.
2. Division 02 Section "Concrete Paving" for concrete pavement and walks.
3. Division 09 Sections for requirements relating specified floor coverings to finishing and curing of interior concrete floor slabs.

1.3 DEFINITIONS

A. Action Submittals: Mandatory submittals by the Sub-Contractor which require action on the part of the General Contractor, Construction Manager and Design Professional.
1. General Contractor and Construction Manager: Review, Stamp and Forward to the Design Professional.
2. Design Professional: Review, Stamp and Return to the General Contractor or Construction Manager.

B. Informational Submittals: Mandatory submittals by the Sub-Contractor to the General Contractor, Construction Manager and Design Professional which are not returned but kept by each for their project record.

C. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Mix design submittal shall include:
a. Project name
b. Project component which pertains to submitted mix design
c. Admixtures
d. Historical break data from past projects on which the proposed mix was used
e. General Contractor or Construction Manager review stamp

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure and/or floor slabs.
1. Location of construction joints is to be coordinated with control joint layout and is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Qualification Data: For Installer and noted manufacturers.

C. Product Data: For each type of product indicated or proposed for use on the project.

D. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Curing compounds.
6. Floor and slab treatments.
7. Bonding agents.
8. Adhesives.
9. Vapor barriers.
10. Semi-rigid joint filler.
11. Joint-filler strips.
12. Repair materials.

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
14. Aggregates. **Note:** Prior to submittal of proposed mix designs, include aggregate supplier's service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity (AAR) or alkali silica reactivity (ASR).

F. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Services
1. The Construction Manager/Owner will secure and pay for the services of a qualified, independent materials engineer to perform quality assurance testing of concrete materials, to confirm re-bar placement, to verify compliance of materials with specified requirements, and to perform required field and laboratory testing. Testing Agency shall be acceptable to the architect and the owner and shall be licensed to practice in the state in which the project is located.
2. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
3. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. CRSI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. MSP-1, "Manual of Standard Practice.".

G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.
e. Special concrete finish subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-barrier installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.8 PROJECT CONDITIONS

A. Cold-Weather Concreting: Comply fully with the recommendations of ACI 306.
1. Well in advance of proposed concreting operations, advise the architect of planned protective measures including but not limited to heating of materials, heated enclosures, and insulating blankets.

B. Hot-Weather Concreting: Comply fully with the recommendations of ACI 306.
1. Well in advance of proposed concreting operations, advise the architect of planned protective measures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
a. High-density overlay, Class 1 or better.
b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
c. Structural 1, B-B or better; mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

C. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 82, as drawn.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I, II or I/II. At contractor's option supplement with the following (only if historical mix design break data is available for submittal):
a. Fly Ash: ASTM C 618, Class C or F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded - typical except for architecturally exposed concrete. Provide Class 5S for architecturally exposed concrete. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Foundations, Walls and Piers: Nominal Maximum Aggregate Size: 1-1/2 inches.
2. Floor Slabs on Grade: Nominal Maximum Aggregate Size: 1 inch.

C. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 VAPOR BARRIERS

A. Vapor Barrier must meet or exceed the following standards:
1. ASTM E 1745, Class B or better.
2. ASTM E 96 Water Vapor Transmission Rate: Less than or equal to 0.009 Grains/Ft.²/Hr.

B. Available Products:
1. ""Stego Wrap 15 Mil. Vapor Barrier" by Stego Industries: (877) 464-7843
2. "Vapor Block 15" by Raven Industries: (605) 336-2750
3. "Perminator 15 Mil. Under-Slab Vapor Barrier" by W.R. Meadows: (800) 214-2100
4. "Reflex 275" by Carlisle Coatings & Waterproofing: (800) 527-7092

C. Accessories
1. Manufacturer's recommended pressure-sensitive seam tape.
2. Manufacturer's recommended vapor-proofing mastic.
3. Manufacturer's recommended termination and seal appliances.
4. Pipe Boots: Construct penetration seals from vapor barrier material, pressure-sensitive seam tape and/or mastic in accordance with the manufacturer's instructions.

D. Granular Sub-Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; generally either an MDOT Class II sand or 21AA gravel will meet this requirement.

E. Blotter Course or Capillary Break Course: Naturally or artificially graded mixture of natural or crushed sand; ASTM D 2940; generally an MDOT Class II sand.

2.8 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing 3/8-inch sieve, unless otherwise indicated.
1. Products: Subject to compliance with requirements, provide one of the following-
a. Anti-Hydro International, Inc.; Emery.
b. Dayton Superior Corporation; Emery Non-Slip.
c. Emeri-Crete, Inc.; Emeri-Topcrete.
d. Lambert Corporation; EMAG-20.
e. L&M Construction Chemicals, Inc.; Grip It.
f. Metalcrete Industries; Metco Anti-Skid Aggregate.

B. Un-pigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.
1. Products: Subject to compliance with requirements, provide one of the following-
a. Burke by Edoco; NonMetallic Floor Hardener.
b. ChemMasters; Concolor.
c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Conshake 500.
d. Dayton Superior Corporation; Quartz Tuff.
e. Euclid Chemical Company (The); Surflex.
f. Kaufman Products, Inc.; Tycron.
g. Lambert Corporation; Colorhard.
h. L&M Construction Chemicals, Inc.; Quartzplate FF.
i. MBT Protection and Repair, Div. of ChemRex; Maximent.
j. Metalcrete Industries; Floor Quartz.
k. Scofield, L. M. Company; Lithochrome Color Hardener.
l. Symons Corporation, a Dayton Superior Company; Hard Top.
m. Vexcon Chemicals, Inc.; Durag Premium..

C. Penetrating Liquid Floor Treatment (noted on architectural drawings as Concrete Hardener and Sealer): Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following-
a. Burke by Edoco; Titan Hard.
b. ChemMasters; Chemisil Plus.
c. ChemTec International; ChemTec One.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.
e. Curecrete Distribution Inc.; Ashford Formula.
f. Dayton Superior Corporation; Day-Chem Sure Hard.
g. Euclid Chemical Company (The); Euco Diamond Hard.
h. Kaufman Products, Inc.; SureHard.
i. L&M Construction Chemicals, Inc.; Seal Hard.
j. Meadows, W. R., Inc.; Liqui-Hard.
k. Metalcrete Industries; Floorsaver.
l. Nox-Crete Products Group, Kinsman Corporation; Duranox.
m. Symons Corporation, a Dayton Superior Company; Buff Hard.
n. US Mix Products Company; US Spec Industraseal.
o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, provide one of the following-
a. Axim Concrete Technologies; Cimfilm.
b. Burke by Edoco; BurkeFilm.
c. ChemMasters; Spray-Film.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
e. Dayton Superior Corporation; Sure Film.
f. Euclid Chemical Company (The); Eucobar.
g. Kaufman Products, Inc.; Vapor Aid.
h. Lambert Corporation; Lambco Skin.
i. L&M Construction Chemicals, Inc.; E-Con.
j. MBT Protection and Repair, Div. of ChemRex; Confilm.
k. Meadows, W. R., Inc.; Sealtight Evapre.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
n. Sika Corporation, Inc.; SikaFilm.
o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
p. Unitex; Pro-Film.
q. US Mix Products Company; US Spec Monofilm ER.
r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, non-dissipating.
1. Products: Subject to compliance with requirements, provide one of the following-
a. Anti-Hydro International, Inc.; AH Clear Cure WB.
b. Burke by Edoco; Spartan Cote WB II.
c. ChemMasters; Safe-Cure & Seal 20.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
f. Euclid Chemical Company (The); Aqua Cure VOX.
g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
h. Lambert Corporation; Glazecote Sealer-20.
i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
j. Meadows, W. R., Inc.; Vocomp-20.
k. Metalcrete Industries; Metcure.
l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
n. Tamms Industries, Inc.; Clearseal WB 150.
o. Unitex; Hydro Seal.
p. US Mix Products Company; US Spec Hydrasheen 15 percent
q. Vexcon Chemicals, Inc.; Starseal 309.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Review: Do not begin concrete operations until proposed mix has been reviewed by architect.

B. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

C. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

D. Mix design submittal shall include:

1. Project name
2. Project component which pertains to submitted mix design
3. Admixtures
4. Historical break data from past projects on which the proposed mix was used
5. General Contractor or Construction Manager review stamp

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

F. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

G. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing or high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.
4. Use air-entraining admixture in exterior exposed concrete.
5. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

1.2 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Minimum cement content - 470 # /cy, Maximum W/C 0.55
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

B. Slabs-on-Grade (Interior): Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Minimum cement content - 517 # /cy, Maximum W/C 0.50
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

C. Column Piers, Foundation Walls and Retaining Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum cement content - 564 # /cy, Maximum W/C 0.45
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch and 3/4-inch nominal maximum aggregate size.

D. Exterior Exposed Concrete: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum cement content - 564 # /cy, Maximum W/C 0.45
3. Slump Limit: 4 inches.
4. Air Content: 6 percent, plus or minus 1.0 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.

E. Mix Adjustments: Provided that no additional expense to owner is involved, contractor may submit for architect's review requests for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

AUGER KLEIN ALLER ARCHITECTS INC.

303 E. THIRD STREET SUITE 100
ROCHESTER, MI 48307
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PROJECT
NOTA Transit Terminal

675 S. Glaspie St.
Oxford, MI 48371

DATE ISSUED	ISSUED FOR
09.06.2024	OWNER REVIEW
06.10.2025	**CM RFP**

DRAWN LP
CHECKED SA
APPROVED SA

SHEET
Specifications

scale as shown

FILE NUMBER
2428

SHEET NUMBER
A.001

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.2 VAPOR BARRIERS

A. Vapor Barriers: Place, protect, and repair vapor barriers according to ASTM E 1643 and manufacturer's written instructions.

1. Place vapor barrier sheeting with the longest dimension parallel with the direction of the concrete pour.
2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate barrier at the top of the slab, otherwise:
   a. At a point acceptable to the architect or:
   b. Where obstructed by impediments such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier.
3. At the point of termination, seal vapor barrier to the foundation wall, grade beam of slab.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Provide all manufacturer's recommended appliances and accessories necessary to achieve appropriate seals and terminations.
6. Apply seam tape to a clean and dry vapor barrier.
7. Seal all penetrations using site constructed boots, mastic, pressure-sensitive tape, etc.
8. Avoid the use of non-permanent stakes driven through vapor barrier.
9. If non-permanent stakes are driven through vapor barrier, repair as recommended by vapor barrier manufacturer.
10. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile strengths.

B. Course Graded Granular Sub-Base: Install over rough graded building pad sub-grade.

C. Coordinate installation of vapor barrier and use of blotter course and/or capillary break course with the anticipated construction schedule and ACI 302.1R-96, Figure 1 for complete slab curing and drying in order to receive moisture sensitive floor finishes.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Interrupt placement sequence as needed for practical or logistical placement. Install construction joints such that strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. If not indicated, locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction (Control) Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. General: Install and locate joints in concrete slabs according to concrete institute standards and where indicated in the Drawings.
   a. Drawing locations are schematic.
   b. Review and coordinate exact locations with the Architect and proposed joints in finish materials.
2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
3. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division-07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect as part of the original mix design review process.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

A. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   a. Monitor floor structure deflection during placement and supply concrete in sufficient quantity necessary to achieve specified floor elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING - FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet cure concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

1. Apply scratch finish to surfaces indicated and to receive concealed floor coverings or mortar setting beds for ceramic or quarry tile, portland cement terrazzo or other bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to entrance slabs, platforms, and ramps and similar surfaces. Apply according to manufacturer's written instructions and as follows:

1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

H. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.10 LIQUID FLOOR TREATMENTS (CONCRETE HARDENER AND SEALER)

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
4. Install concrete hardener and sealer at all exposed floor surfaces where floors do not receive other finished material.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.11 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month(s) or as long as possible given the project schedule. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through un-reinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Construction Manager/Owner will engage a special inspector and/or a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
   b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
   a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results and Inspection Reports shall be reported in writing to Architect, concrete supplier / manufacturer, Contractor, and Authorities having jurisdiction within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Non-destructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 03300

DIVISION 6 - WOOD, PLASTICS, AND COMPOSITES

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Framing with dimension lumber.

B. Related Sections include the following:
   1. Division 6 Section "Shop Fabricated Wood Products" for framing utilizing laminated veneer lumber.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Exposed Framing: Dimension lumber not concealed by other construction.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NELMA - Northeastern Lumber Manufacturers Association.
   2. NLGA - National Lumber Grades Authority.
   3. RIS - Redwood Inspection Service.
   4. SPIB - Southern Pine Inspection Bureau.
   5. WCLIB - West Coast Lumber Inspection Bureau.
   6. WWPA - Western Wood Products Association.

D. Panelized Construction: Factory constructed wall or floor panels which are then shipped to and erected on-site.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Engineered wood products.
   2. Metal framing anchors.

C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

D. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Metal Framing Anchors:
      a. Simpson Strong-Tie Company, Inc.

2.2 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
   3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
   4. Provide dressed lumber, S4S, unless otherwise indicated.
   5. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.3 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

B. Joists: Construction or No. 2 grade and any of the following species:
   1. Design Basis:
      a. Hem-fir; WCLIB or WWPA.
      b. Hem-fir (north); NLGA.
   2. Other Approved Species:
      a. Douglas fir-larch; WCLIB or WWPA.
      b. Douglas fir-south; WWPA.
      c. Douglas fir-larch (north); NLGA.
      d. Southern pine; SPIB.
      e. Mixed southern pine; SPIB.
      f. Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.
      g. Spruce-pine-fir; NLGA.

DIVISION 5 - METALS

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Undercut or Adhesive Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.6 METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, which meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

C. Joist Hangers: U-shaped joist hangers with nailing flanges at least 85 percent of joist depth.
1. Design Basis: Simpson LUU/HU Series.

D. Bridging: Rigid, V-section, nail-less type, 0.062 inch thick, length to suit joist size and spacing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. Table 2304.9.1, "Fastening Schedule," in the current edition of the Michigan Building Code for all connections of dimension lumber, by use and application.
4. Refer to the drawings for nailing requirements of roof sheathing to trusses, floor sheathing to joists or trusses and wall sheathing to studs.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD FRAMING INSTALLATION, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Do not splice structural members between supports.

D. Where built-up beams or girders of 2-inch nominal- dimension lumber on edge are required, fasten together with 2 rows of 20d nails spaced not less than 32 inches o.c. Locate one row near top edge and other near bottom edge.

1. For continuous members, locate end joints over supports.
2. Adhesives:
   a. Adhesives shall be of the waterproof type conforming to the requirements of ASTM D-2559.
   b. Adhesive to be bonded under pressure and heat.
3. Identification
   a. Each piece shall be identified by a stamp indicating the its series and ICC ES evaluation report number, manufacturer's name, plant number and the independent inspection agency's logo.

2.4 ACCESSORIES

A. Provide engineered connectors specifically designed for connection type and application. Refer to drawings and schedules.

B. Provide nail and fastener types and sizes per member manufacturer's details and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the installation under the project conditions.

3.3 GENERAL

A. Install wood framing products only after supporting construction is in place and is braced and secured.

B. Install wood framing products in accordance with manufacturer's instructions.
1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

C. Install wood framing products in compliance with approved shop drawings.

A. Install wood framing products only after supporting construction is in place and is braced and secured.

B. Install wood framing products in accordance with manufacturer's instructions.
1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

C. Install wood framing products in compliance with approved shop drawings.

AKA ARCHITECTS
30 YEARS
FOUNDED 1994
AUGER KLEIN ALLER
ARCHITECTS INC.

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PROJECT

NOTA Transit Terminal

675 S. Glaspie St.
Oxford, MI 48371

DATE ISSUED	ISSUED FOR
09.06.2024	OWNER REVIEW
06.10.2025	**CM RFP**

DRAWN	LP
CHECKED	SA
APPROVED	SA

SHEET

Specifications

scale as shown

FILE NUMBER

2428

SHEET NUMBER

A.002

DIVISION 5 - METALS

SECTION 05400: LIGHT GAUGE METAL FRAMING

1. Scope: Furnish all labor, materials and equipment required for light metal framing as shown on the Drawings and specified herein.

2. Metal Framing:
   A. Metal studs shall conform with ASTM A446 Grade A unless otherwise noted.
   B. Metal Stud Sizes and Gauges
      1. 3 5/8" wide, 20 gauge unless otherwise noted.
      2. Other sizes and gauges as shown on Drawings and as required.
   C. Top and Bottom Tracks
      1. Tracks shall conform with ASTM A446, Grade A or ASTM A570 as required to match metal studs.
      2. Track width shall be the same nominal width as metal stud.
      3. Minimum gauge of track shall be the same as the gauge of the metal stud.
      4. Superior "Flex-Track" or equal shall be installed where top track is located at the underside of roof structure.
   D. Wall Stiffeners: Cold-rolled steel channel 1-1/2", 0.476 pounds per lineal foot.
   E. Furring Channels: Rolled formed, hat shaped section 7/8" deep, 25 gauge galvanized steel specifically designed for screw attachment of gypsum board.
   F. Non-Bearing Metal Framing Installation
      1. Install metal studs at 16" on center (unless noted otherwise) and track per requirements of USG "Gypsum Construction Handbook."
      2. Place horizontal steel stiffeners at 5'-0" on center (vertical dimension). Secure to metal studs with 16-gauge wire.

3. Fasteners: Type, size, length, spacing, etc. as required by the Uniform Building Code.

4. Suspended Ceiling/Soffit Metal Framing System:
   A. Cold Rolled Carrying Channels: Galvanized 16 gauge, 1-1/2" with 17/32" flanges, approximately 500 pounds per 1000 lineal feet.
   B. Furring Channels: Rolled formed, hat shaped section 7/8" deep, 25 gauge galvanized steel specifically designed for screw attachment of gypsum board.
   C. Clips: USG furring channel clips or galvanized wire manufactured for attaching furring channels to 1-1/2" carry channels.
   D. Hanging Wire
1. Pre-straightened, galvanized, soft annealed carbon steel wire per Federal Specification QQ-W-461.
2. Minimum 9-gauge for 1-1/2" carry channels.
   E. Compression struts and Accessories: Length and accessories as required for Project conditions.
   F. Installation:
1. Install suspended ceiling grid per USG "Gypsum Construction Handbook" and Uniform Building Code (UBC) Tables 23C, 23J, and 47A.
2. Install compression struts as required by UBC.

END OF SECTION

DIVISION 6 - WOOD AND PLASTICS

SECTION 06100: ROUGH CARPENTRY

1. SCOPE: Furnish and install all rough carpentry, including rough hardware, etc. as shown on drawings and specified herein.

2. MATERIALS

2.1 WOOD PRODUCTS, GENERAL
   A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
   4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.2 DIMENSION LUMBER
   A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
   B. Non-Load-Bearing Interior Partitions: Construction, Stud, or No. 2 grade and any of the following species:
1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
   3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.3 MISCELLANEOUS LUMBER
   A. General: Provide lumber for support or attachment of other construction, including blocking, nailers and furring.
   B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:
1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.
   C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or Hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or 2 Common grade; NELMA, NLGA, WCLIB, or WWPA.
   D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 ROUGH HARDWARE
   A. Furnish all items of rough hardware, connections to metal studs, bolts, and other miscellaneous items as required to complete the work. Bolts, nuts and washers shall be hot dipped galvanized, conforming to ASTM A-153. Washers shall be malleable iron. Hardware for attachment of wood blocking to metal studs shall also be galvanized. Nailing shall conform to applicable codes.

END OF SECTION

SECTION 06200 - FINISH CARPENTRY

1. Scope: Furnish and install all finish carpentry, millwork and related items including installation of building specialties as shown on the drawings and specified herein. AWI tolerances and standards and tolerances. Fabricate per approval of shop drawings showing verified field dimensions.
2. Materials:
   A. Hardwood: WIC-MM Premium Grade of Species included in building standard.
   B. Solid cores for plastic laminate:
      1. Veneer Plywood Cores: For shelves spanning more than 2'-0" without intermediate supports, closed grain plywood 3/4" thick.
      At counters to receive sinks use only marine plywood.
      2. Where plywood cores are not required, cores may be medium densities, 40lb Mat formed wood particleboard, per CS236-61.
D. Interior Trim and Millwork: Furnish and install all interior wood trim as indicated and detailed on the drawings.
   E. Counter Work: Countertops as selected by owner shall be furnished and installed on all interior cabinet work as called for in the drawings, unless noted otherwise.
   F. Mirrors: Furnish and install 1/4" plate glass for mirrors where shown in drawings.
   G. Fasteners: Include fasteners as required.
   H. Nails: Bright Finnish nails for interior, exposed work.
3. Installation.
   A. Installation of Finish carpentry and millwork shall conform to the applicable requirements of the WIC-MM, sections 10,11,12, and 13 for interior work.In general, all work to Receive stain or transparent finish shall conform to "Custom" grade requirements.
   B. Hammer or tool marks or marred surfaces and edges will not be accepted on any exposed finished surfaces and as evidence of inferior workmanship, may be cause for rejection of such work.
   C. All end slices exposed in finish members shall be accurately and neatly itered or scarified. Install members in long lengths as possible.
   D. All work shall be installed to details shown, plumb, level, true to line, and securely anchored. Exterior corner joints shall be mitered. Interior corner joints may be coped. Where molded members adjoin or plain sections, the molded members shall be carefully and accurately scribed to the other members. All exposed edges shall be eased.
   E. Set all nails for putty at exposed finish work.
   F. Finishes as specified under section 09900.

END OF SECTION

SECTION 06415 - PLASTIC LAMINATE COUNTERTOPS AND SHELVING

1. Scope: Furnish and install all plastic laminate countertops and shelving as shown on the drawings and specified herein.

2. Plastic laminate is to be by manufacturer of style and color from the accepted manufacturer's standard range of styles and colors as indicated in the Room Finish Schedule.

3. Installation: Methods: Laminate shall be bonded to a core material such as laminate grade plywood, particleboard, MDF, or metal using adhesives and techniques as recommended by reliable adhesive manufacturers. Care should be taken to assure that a moisture imbalance does not exist between plastic laminate and the substrate prior to fabrication. Inside corners of cut-outs should have a minimum radius of 1/8" with edges filed smooth to prevent stress cracking.

END OF SECTION

SECTION 06610 - SOLID SURFACING FABRICATIONS

1. SUMMARY
   A. Provide and install solid surfacing fabrications as indicated in the drawings.

1.2 SUBMITTALS
   A. Product Data: Indicate product description including solid surface sheets and illustrating full range of standard colors, fabrication information and compliance with specified performance requirements. submit product data with resistance to list of chemicals.
   B. Shop Drawings: Submit shop drawings for work of this section. Indicate plans, sections, dimensions, component sizes, edge details, thermosetting requirements, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in solid surface.
   C. Samples: Submit minimum 6" x 6" samples. cut sample and seam together for representation of inconspicuous seam. indicate full range of color and pattern variation.

1.3 WARRANTY
   A. Manufacturer warranty: provide manufacturer's standard warranty for material only for period of 10 years against defects and/or deficiencies.

2.0 PRODUCTS
   A. Manufacturer list: products of following manufacturers are acceptable subject to conformance to requirements of drawings, schedules and specifications:

1. CORIAN® BY DUPONT; WWW.CORIAN.COM

2. AVONITE SURFACES; WWW.ARISTECHSURFACES.COM

3. WILSONART CONTRACT; WWW.WILSONARTCONTRACT.COM

2.1 MATERIALS
   A. DESCRIPTION:
      1. Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction.
      2. Flammability: Class 1 and A when tested to UL 723.
      3. Adhesive for bonding to other products: one component silicone to ASTM C920.
      4. Sealant: A standard mildew-resistant, FDA/UL® recognized silicone color matched sealant or clear silicone sealants.
      5. Sink/bowl mounting hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

2.3 Components
   A. Window sills: 1/2" thick solid surfacing material, adhesively joined with inconspicuous seams, edge details as indicated on drawings. Color as selected by architect from manufacturer's full color range.
   B. Counter perimeter frame: Ensure 1/2" thick, moisture resistant [cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive, fir or poplar plywood, veneer core only.] [mdf core conforming to ansi/npa a208.2 balanced design, manufactured from recycled materials, meeting ansi standards for emissions, of minimum density of 48 lb/cu ft and surface character to match sample approved by architect.
   C. Solid surfacing material, cast to desired profiles and sizes having edge details as indicated on drawings conforming to csa b45.5/iapmo z124, complete with [1] undermount bowl. provide countertops complete with backsplashes of size shown on drawings. use undermount hardware according to manufacturer's instructions. Ensure vanity top and backsplash is color as selected by architect.

2.4 FABRICATION:

1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. provide factory cutouts for plumbing fittings and bath accessories as indicated on drawings.

2. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.

3. Ensure no blistering, whitening and cracking of components during forming.

4. Fabricate backsplashes from solid surfacing material with optional radius cove where counter and backsplashes meet as indicated on drawings. Backsplashes for most colors may be fabricated by traditional means discussed in k-25294 *backsplashes*. Colors with metallic/mica particle or veined colors creating directional aesthetics (k-26833 *directional aesthetics*) may require the techniques in technical bulletin K-28235 *Thermoformed Backsplash*.

5. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint.

6. Provide holes and cutouts for plumbing and bath accessories as indicated on drawings.

7. Rout and finish component edges to a smooth, uniform finish. rout cutouts, then sand edges smooth.

8. Finish: Ensure surfaces have uniform finish:
   a. Matte, with a 60° gloss rating of 5 - 20.

9. Installation
   A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed shop drawings and product installation details.
   B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.
   C. Route radii and contours to template. Anchor securely to base component or other supports. align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.
   D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.
   E. Adhere undermount/submount/bevel mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
   F. Seal between wall and components with joint sealant as specified herein.
   G. Provide backsplashes and endsplashes as indicated on drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed shop drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.
   H. Coordinate connections of plumbing fixtures and make plumbing connections to sinks.

END OF SECTION

DIVISION 7 - THERMAL AND MOISTURE (AND SOUND) PROTECTION

SECTION 07210 - BUILDING INSULATION

1. Scope: Furnish and install all sound insulation as shown on the drawings and specified herein.
2. Sound insulation:
   A. Unfaced glass fiber noise barrier batts as manufactured by Owens-Corning fiberglass corporation, Manville or equal. Install between studs, full depth of studs and full height of wall or as indicated on drawings.
   C. Install insulation above suspended gypsum board and acoustical ceilings by laying on top of ceiling panels, butting batts tightly together extended 2' minimum beyond each side of partition.

END OF SECTION.

SECTION 074213 - METAL WALL PANELS

1.1 SUMMARY
   A. SECTION INCLUDES: METAL LAP-SEAM WALL PANELS WITH CONCEALED FASTENERS, INCLUDING TRIM AND ACCESSORIES.

1.2 REFERENCES
   A. GENERAL: STANDARDS LISTED BY REFERENCE FORM A PART OF THIS SPECIFICATION SECTION. STANDARDS LISTED ARE IDENTIFIED BY ISSUING AUTHORITY, ABBREVIATION, DESIGNATION NUMBER, TITLE OR OTHER DESIGNATION. STANDARDS SUBSEQUENTLY REFERENCED IN THIS SECTION ARE REFERRED TO BY ISSUING AUTHORITY ABBREVIATION AND STANDARD DESIGNATION.
   B. ASTM INTERNATIONAL:
      1. ASTM E 84 - STANDARD TEST METHOD FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS.
      2. ASTM A 653 - STANDARD SPECIFICATION FOR STEEL SHEET, ZINC-COATED (GALVANIZED) OR ZINC-IRON ALLOY-COATED (GALVANNEALED) BY THE HOT-DIP PROCESS.
      3. ASTM A 1011 - STANDARD SPECIFICATION FOR STEEL, SHEET AND STRIP, HOT-ROLLED, CARBON, STRUCTURAL, HIGH-STRENGTH LOW-ALLOY, HIGH-STRENGTH LOW-ALLOY WITH IMPROVED FORMABILITY, AND ULTRA-HIGH STRENGTH.
      4. ASTM D 2244 - STANDARD PRACTICE FOR CALCULATION OF COLOR TOLERANCES AND COLOR DIFFERENCES FROM INSTRUMENTALLY MEASURED COLOR COORDINATES.
   C. UNDERWRITERS LABORATORIES (UL):
      1. UL 263 - FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS.
   D. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA): "ARCHITECTURAL SHEET METAL MANUAL."

1.4 SUBMITTALS
   A. PRODUCT TECHNICAL DATA: FOR EACH TYPE OF PRODUCT REQUIRED, INCLUDING MANUFACTURER'S PREPARATION RECOMMENDATIONS, STORAGE AND HANDLING REQUIREMENTS, AND RECOMMENDED INSTALLATION METHODS.
   B. SHOP DRAWINGS: SHOWING METHODS OF INSTALLATION, PLANS, SECTIONS, ELEVATIONS AND DETAILS WALL PANELS, SPECIFIED LOADS, FLASHINGS, VENTS, SEALANTS, INTERFACES WITH ALL MATERIALS NOT SUPPLIED BY THE METAL PANEL SYSTEM MANUFACTURER, AND IDENTIFICATION OF PROPOSED COMPONENT PARTS AND THEIR FINISHES. DO NOT PROCEED WITH FABRICATION PRIOR TO APPROVAL OF SHOP DRAWINGS.
   C. SAMPLES: SELECTION AND VERIFICATION SAMPLES FOR FINISHES, COLORS AND TEXTURES. SUBMIT TWO COMPLETE SAMPLE SETS OF EACH TYPE OF PANEL, TRIM, CLIP AND FASTENER REQUIRED.
   D. CERTIFICATES: PRODUCT CERTIFICATES SIGNED BY MANUFACTURER CERTIFYING MATERIALS COMPLY WITH SPECIFIED PERFORMANCE CHARACTERISTICS, CRITERIA AND PHYSICAL REQUIREMENTS.
   E. TEST AND EVALUATION REPORTS: SHOWING COMPLIANCE WITH SPECIFIED PERFORMANCE CHARACTERISTICS AND PHYSICAL PROPERTIES.

1.5 CLOSEOUT SUBMITTALS
   A. OPERATION AND MAINTENANCE DATA: FOR INSTALLED PRODUCTS INCLUDING MAINTENANCE METHODS AND PRECAUTIONS AGAINST CLEANING MATERIALS AND METHODS DETRIMENTAL TO FINISHES AND PERFORMANCE.
   B. WARRANTY: WARRANTY DOCUMENTS REQUIRED IN THIS SECTION.

1.7 QUALITY ASSURANCE
   A. MANUFACTURER QUALIFICATIONS:
      1. PROVIDER OF ADVANCED INSTALLER TRAINING.
      2. MINIMUM OF TEN YEARS OF EXPERIENCE IN MANUFACTURING METAL WALL PANEL SYSTEMS.
      3. PROVIDER OF PRODUCTS PRODUCED IN A PERMANENT FACTORY ENVIRONMENT WITH FIXED ROLL-FORMING EQUIPMENT.
   B. MOCK-UPS: INSTALL AT PROJECT SITE A MOCK-UP USING REQUIRED PRODUCTS AND MANUFACTURER'S APPROVED INSTALLATION METHODS. OBTAIN OWNER AND ARCHITECT APPROVAL OF FINISH, COLOR, TEXTURE, PATTERN, TRIM, FASTENERS AND QUALITY OF INSTALLATION BEFORE PROCEEDING WITH FURTHER WORK.
      1. SIZE: 48" WIDE X FULL HEIGHT OF WALL.
      2. REMOVE AND LAWFULLY DISPOSE OF MOCK-UP CONSTRUCTION WHEN NO LONGER REQUIRED.
      3. INCORPORATION: MOCK-UP MAY BE INCORPORATED INTO FINAL CONSTRUCTION UPON OWNER APPROVAL.
   C. FIRE RESISTANCE RATINGS: DETERMINED BY TESTING IDENTICAL PRODUCTS AND ASSEMBLIES ACCORDING TO UL 263 AND ASTM E 84 BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
      1. FLAME-SPREAD INDEX: 200 (CLASS C) OR LESS.

1.9 WARRANTY
   A. SPECIAL CONCEALED FASTENED WALL PANEL FINISH WARRANTY: MANUFACTURER'S STANDARD FORM PVDF FLUOROCARBON SYSTEM WARRANTY FOR FILM INTEGRITY, CHALK RATING AND FADE RATING IN WHICH MANUFACTURER AGREES TO REPAIR OR REPLACE PANELS THAT SHOW EVIDENCE OF DETERIORATION WITHIN SPECIFIED WARRANTY PERIOD.
      1. DETERIORATION SHALL INCLUDE BUT IS NOT LIMITED TO:
         a. COLOR FADING OF MORE THAN 5 HUNTER UNITS WHEN TESTED ACCORDING TO ASTM D 2244.
         b. CHALKING IN EXCESS OF A NO. 8 RATING WHEN TESTED ACCORDING TO ASTM D 4214.
         c. CRACKING, CHECKING, PEELING OR FAILURE OF PAINT TO ADHERE TO BARE METAL.
      2. WARRANTY PERIOD: FILM INTEGRITY FOR 45 YEARS AND CHALK AND FADE RATING FOR 35 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

2.1 METAL WALL PANELS

   A. BASIS OF DESIGN PRODUCT: SUBJECT TO COMPLIANCE WITH REQUIREMENTS PROVIDE METAL SALES MANUFACTURING CORPORATION; CONCEALED FASTENED WALL PANEL
   B. MP-1: EMPIRE SERIES EM1-1653
   C. MP-2: EMPIRE SERIES EM15-1266
   D. ARCHITECT APPROVED EQUAL.
   E. PRODUCT OPTIONS:
      1. PANEL COVERAGE: 12 INCHES (304.8 MM) AND 16 INCHES (406.4 MM).
      2. RIB HEIGHT: 1.5 INCH.
      3. RIB CONFIGURATION: BOX.
      4. MATERIAL: ALUMINUM-ZINC ALLOY-COATED STEEL SHEET, ASTM A 792, AZ50, AZ55 OR ASTM A 653 G90 COATING DESIGNATION, STRUCTURAL QUALITY, GRADE 50, 0.0236-INCH (0.60-MM) MINIMUM THICKNESS.
      5. ATTACHMENT: CONCEALED CLIP FASTENED PANEL.
      6. APPLICATION: DESIGNED FOR APPLICATION OVER OPEN FRAMING OR SOLID SUBSTRATE.
      7. PERFORATION: NONE.
      8. SURFACE FINISH: PVDF (KYNAR 500)
      9. COLOR: AS SELECTED BY ARCHITECT
      10. FIRE RESISTANCE RATING: COMPLY WITH UL 263 FIRE RESISTANCE RATINGS.

2.5 ACCESSORIES
   A. GENERAL: PROVIDE ACCESSORIES AS REQUIRED TO COMPLETE INSTALLATION OF WALL PANELS AS SPECIFIED IN THE DRAWINGS AND HEREIN.
   B. PRODUCTS:
      1. BASIS OF DESIGN PRODUCT: SUBJECT TO COMPLIANCE WITH REQUIREMENTS PROVIDE METAL SALES MANUFACTURING CORPORATION.
      2. COLOR: TO MATCH WALL PANEL AS SELECTED BY ARCHITECT.

2.6 SOURCE QUALITY CONTROL
   A. SOURCE: OBTAIN METAL WALL PANELS, TRIM AND OTHER ACCESSORIES FROM A SINGLE MANUFACTURER.

3.1 PREPARATION
   A. MISCELLANEOUS FRAMING: INSTALL FURRING, ANGLES, SUBPURLINS, AND OTHER MISCELLANEOUS WALL PANEL SUPPORT MEMBERS AND ANCHORAGE ACCORDING TO METAL WALL PANEL PER MANUFACTURER'S RECOMMENDATIONS.

3.2 ACCESSORY INSTALLATION
   A. GENERAL: INSTALL ACCESSORIES USING TECHNIQUES RECOMMENDED BY MANUFACTURER AND WHICH WILL ASSURE POSITIVE ANCHORAGE TO WALL.
   B. FLASHING AND TRIM: COMPLY WITH PERFORMANCE REQUIREMENTS, MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS, AND THE SMACNA "ARCHITECTURAL SHEET METAL MANUAL." PROVIDE CONCEALED FASTENERS WHERE POSSIBLE, AND INSTALL UNITS TO TRUE LEVEL.

END OF SECTION

DIVISION 5 - OPENINGS

SECTION 08710 - DOOR HARDWARE

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. Mechanical door hardware for the following:
         a. Swinging doors.
         b. Sliding doors.
         c. Folding doors.
      2. Cylinders for door hardware specified in other Sections.
      3. Electrified door hardware.
   B. Related Sections:
      1. Section 081113 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
      2. Section 081216 "Aluminum Frames" for door silencers provided as part of aluminum frames.
      3. Section 081416 "Flush Wood Doors" for astragals and integral intumescent seals provided as part of labeled fire-rated assemblies.
      4. Section 081433 "Stile and Rail Wood Doors" for astragals and integral intumescent seals provided as part of labeled fire-rated assemblies.
      5. Section 084113 "Aluminum-Framed Entrances and Storefronts" for installation of entrance door hardware, except cylinders.
1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
   B. Schedules shall be kept current with all changes to the project. If changes occur, project hardware schedules shall be maintained to reflect the changes as they are approved. Omitted items shall be deleted from openings, added and replaced items shall be included. Installation submittals shall be kept current as changes occur. Upon request, a complete updated hardware schedule shall be provided to the contractor. Supplemental submittals that include only the changed openings will not be acceptable.
   C. Prior to final payment, provide a record copy of hardware schedules, including all revisions and updates. All openings shall be listed to reflect final installed configuration only.
   D. Other Action Submittals:
      1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
         a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
         b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
         c. Format: Use same scheduling sequence and format as in the Contract Documents.
         d. Content: Include the following information:
            1) Identification number, location, hand, fire rating, size, and material of each door and frame.
            2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
            3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
            4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
            5) Fastenings and other pertinent information.
            6) Explanation of abbreviations, symbols, and codes contained in schedule.
            7) Mounting locations for door hardware.
            8) List of related door devices specified in other Sections for each door and frame.
      2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.
1.4 INFORMATIONAL SUBMITTALS
   E. Qualification Data: For Installer and Architectural Hardware Consultant.
   F. Product Certificates: For electrified door hardware, from the manufacturer.
      1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
   D. Warranty: Special warranty specified in this Section.
1.5 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
1.6 QUALITY ASSURANCE
   A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
      1. Warehousing Facilities: In Project's vicinity.
      2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
      3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
   B. Hardware Supplier Qualifications: The hardware supplier must be a corporate member in good standing of The Door and Hardware Institute (DHI), employing at least one Architectural Hardware Consultant (AHC) who is currently participating in DHI's continuing education program (CEP).
   C. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
      1. For door hardware, an Architectural Hardware Consultant (AHC).
   D. Source Limitations: Obtain each type of door hardware from a single manufacturer.
      1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
   E. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in 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 or UL 10C, unless otherwise indicated.
   F. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
      1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
   G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
   H. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
1.7 DELIVERY, STORAGE, AND HANDLING
   A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
   B. Tag each item or package separately with id
   C. ntification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
   D. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
   E. Deliver keys to Owner by registered mail or overnight package service.
1.8 COORDINATION
   A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
   B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
   C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
   D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
   E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

DIVISION 9 - ARCHITECTURAL FINISHES

SECTION 09250 - GYPSUM BOARD
1. Scope: Furnish and install gypsum board, accessories. treat joints and corners and finish texture as shown on drawings and specified herein.
2. Materials:
   A. Typical Interior Gypsum Board: 5/8" thick type x per ASTM C36, 4'-0" wide tapered edges in lengths as long as practicable.
   B. Metal Corner Accessories.
      1. Manufacturer: BeadeX Manufacturing Co. or equal.
      2. Outside Corner Bead: BeadeX B-1
1. Inside Corner Bead: BeadeX B-2
2. Edge Trim Bead: BeadeX B-4
3. Other accessories as shown on Drawings and as required for complete installation.
   D. Fasteners: USG type S bugle head size, length and location as required by UBC.
   E. Join Treatment per ASTM C475:
      1. Taping and embedding compound specifically formulated and and manufactured for use in embedding tape at gypsum board joints and fastener heads completely compatible with tape and substrate.
      2. Joint Tape: Perforated reinforcin.
3. Installation.
   A. Joints and Corners:
      1. All joints and corners shall be treated in accordance with manufacturer recommendations.
      2. Exposed joints, screw head depressions or any defects incurred during installation of gypsum board shall be finished with tape cement.
      3. Internal and external corners shall be protected and finished with metal corner bead and joint compound.
      4. Install metal edge trim at intersection of gypsum board and dissimilar material and elsewhere as shown.
      5. Tape and feather smooth surface of metal edge trim with surface of gypsum board. Typical unless noted otherwise.
   B. Finishes.
      1. All exposed surfaces shall receive a smooth surface.
      2. Concealed areas shall have joints and fastener heads taped and covered with joint compound.

END OF SECTION

SECTION 09300 - TILE WORK

1. Scope: Furnish and install tile as shown on drawings and as specified herein.

2. Samples: Submit four samples of each tile selected by Tenant from Owner approved manufacturer's range of styles and colors.

3. Quality Assurance: Tile council of America (TCA) Handbook for Tile Installation & American National Standards Inc. (ANSI)

4. Materials:
   A. Tile and size indicated in the drawings as selected by Architect from selected manufacturer's range of styles and colors.
   B. Setting Materials: Interior Floor Tile Thinset Materials TCA Handbook Method F113.
   C. Concrete Filler: Non-crumbling, non-staining white pre-mixed with water to produce a cementitious paste compatible with tile setting materials.
   D. Grout: Colors as selected by Architect. Submit samples.

5. Inspection.
   A. Examine surfaces, which will receive setting materials, tile and accessories.
   B. Do not proceed with installation until defects and other conditions adversely affecting quality, executing and permanence of tile installation is corrected.
   C. Maximum allowable variations where tile is thin set directly to substrate shall not exceed the following from level and plum:
      1. Floors & horiz. surfaces: 1/8" in 10'-0" in any direction.
      2. Walls and vertical surfaces: 1/8" in 8'-0" in any direction.

6. Prepare existing surfaces as required to receive tile, including but not limited to, patching and leveling of existing concrete slab floor.

7. Installation methods: Interior Floor Tile: Thinset per TCA Handbook Method F142.

END OF SECTION

SECTION 09650 - RESILIENT FLOORING

1. Scope: Furnish and install resilient flooring and topset base as shown on Drawings and specified herein.

2. Materials:
   A. Vinyl Composition Tile: Product to be selected by Architect. See finish schedule.
   B. Topset Rubber Base: Johnsonite wall base (or approved equal) standard colors, 1/8" thick with 1/4" round exposed edge. Color as selected by Architect.
   C. Edge Strip: Molded vinyl, 1 1/2" wide by 1/8" thick, with 1/4" round exposed edge. Color shall match topset base.
   D. Adhesive and Primer: Waterproof type as recommended by base, edge, strip, and vinyl composition tile manufacturers.
   E. Concrete Filler: Non-crumbling, non-staining, white pre-mix latex mixed with water to produce a cementitious paste compatible with resilient flooring adhesive.

3. Vinyl Composition Tile Installation
   A. Vinyl composition tile flooring and wall base shall be installed in adhesive in accordance with the approved installation instructions of the manufacturer.
   B. Tile lines and joints shall be kept square, symmetrical, tight, and even; each floor shall be in a true, lever plane except where indicated as sloped.
   C. Edge width shall vary as necessary to maintain full size tiles in the field, but no edge tile shall be less than one-half the field size, except where irregular shaped rooms and and tile area profiles make it impossible.
   D. Flooring is to be cut to and fitted around all permanent fixtures, built-in furniture and cabinets, pipes and outlets.
   E. Edges shall be cut, fitted, and cribbed to walls and partitions after field flooring has been applied.
   F. Edging strips shall be provided where flooring terminates at points higher than the continuous finish flooring, except at doorways where thresholds are provided.

4. Topset Base Installation
   A. Install according to manufacturer's recommendations. All joints shall be tight and securely adhered to wall surface.
   B. Topset base shall be installed at permanent casework except where shown on Drawings.

END OF SECTION

AKA ARCHITECTS 30 YEARS
FOUNDED 1994
AUGER KLEIN ALLER ARCHITECTS INC.

303 E. THIRD STREET SUITE 100
ROCHESTER, MI 48307
248.814.9160

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PROJECT
NOTA Transit Terminal

675 S. Glaspie St.
Oxford, MI 48371

DATE ISSUED	ISSUED FOR
09.06.2024	OWNER REVIEW
06.10.2025	**CM RFP**

DRAWN	LP
CHECKED	SA
APPROVED	SA

SHEET
Specifications

scale as shown

FILE NUMBER
2428

SHEET NUMBER
A.003

SECTION 09685 - CARPET

1. Scope: Furnish and install carpet and accessories as shown on drawings and specified herein.

2. Submittals:
   A. Submit ten (10) year written guarantee covering surface wear, colorfast, and static of material.

3. Design Criteria: Carpet shall conform to the following.
   A. Flammability: Astm e-648, and passed doc ff-i-70.
   B. Acoustics: 0.03 NRC installed over concrete.
   C. Static protection: Positive protection to 2.5 kv at 70 f., 20% R.H.
   D. FHA approved for heavy traffic.

4. Carpet:
   A. Style and color selected by Architect. See interior finish schedule.

5. Carpet Accessories:
   A. Concrete Filler: Non-crumbling, non-staining, white pre-mix latex mixed with water to produce a cementitious paste compatible with resilient flooring adhesive.
   B. Carpet Tile Adhesive: Per written recommendation of manufacturer for each type of contact surface.
   C. Concrete Sealer: 35% solution of 42 deg. Baume sodium silicate and non-acid penetrating agent, compatible with adhesives.
   D. Seaming cement: Hot melt seaming adhesive or similar product recommended by carpet manufacturer, for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.

6. Installation:
   A. Install carpeting using qualified mechanics in strict accordance with the manufacturer's instructions.
   B. Install trimstrips and moldings on exposed edges of carpet that abut adjacent floor finishes of a different type and/or elevation.
   C. Install per manufacturer's written instructions for direct glue-down onto concrete slab.
   D. Install carpet in largest possible pieces, minimum number of seams, with the grain of the carpet in the same direction.
   E. No seams shall occur at doorways and entries perpendicular to door or entries.
   F. Completed installation shall be free of scraps, raveling, ripples, puckers, and fully adhered to substrate.

7. Defect:Contractor shall be responsible for the replacement of defective carpets without an increase in the Contract Sum and without extension of the Contract Time. Defects including, but not limited to, the following:
   A. High or low tufts or rows
   B. Stop marks
   C. Off color tufts or rows
   D. Visually apparent mend lines
   E. Visually apparent yard splices
   F. Mixed dye lots
   G. Uneven shearing
   H. Persistent latex or chemical odors

END OF SECTION

SECTION 09900 - PAINT

1. Scope: Furnish all labor, materials, and equipment required to prepare surfaces to receive paint and to paint existing surfaces as required and all new unpainted surfaces as shown on drawings and specified herein.
2. Manufacturers:
A. Benjamin Moore
B. Pittsburgh Paints
C. Sherman Williams
D. Owner Approved Equal

3. Colors:
   A. To be selected by Architect. See Finish Schedule.

4. Paint systems.
   A. Paint system coatings listed are Fuller-O'Brien and are specified as a standard of quality, utility and appearance.
   B. Interior Paint Systems
      1. Paint System 1: Gypsum Board
         1st Coat 220-20 latex wall primer
         2nd Coat 220-XX latex wall finish
         3rd Coat 212-XX AA acrylic eggshell enamel

      2. Paint System 2: Hardwood
         1st Coat 220-01 lacquer sanding sealer
         2nd Coat ww0-XX latex wall finish
         3rd Coat ww0-XX latex wall finish

      3. Paint System 3: Metals
         1st Coat 220-02 latex enamel undercoat.
         2nd Coat 212-XX AA acrylic semi-gloss enamel
         3rd Coat 212-XX AA acrylic semi-gloss enamel

      4. Paint System 4: Wood
         1st Coat 220-02 latex enamel undercoat.
         2nd Coat 212-XX AA acrylic semi-gloss enamel
         3rd Coat 212-XX AA acrylic semi-gloss enamel

C. Miscellaneous Paint System
   1. All existing surfaces shall receive new paint finish where required.
   2. All new surfaces shall receive paint finish except factory finished items as excluded herein.
   3. Apply three coat paint system compatible with surface required to be painted.

Preparation.
A. Surfaces Previously Painted
   1. Existing surfaces previously painted shall receive a new paint finish where required to match new finishes & colors.
   2. Existing surfaces shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter.
   3. Blistering, cracking, flaking, and peeling or other deteriorated coatings shall be removed.
   4. Smooth surfaces shall be lightly roughened to receive new paint finish. Roughening shall not telegraph through new paint.
   5. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spills shall be repaired with suitable materials to match adjacent undamaged areas.
   6. Edges of chipped paint shall be feather edged and sanded smooth.
   7. Rusty metal surfaces shall be cleaned to clean bare metal.
   8. Solvent, mechanical or chemical cleaning methods shall be used to provide surfaces suitable for repainting.
   9. Contractor shall be solely respoinsible for determining the amount of preparation previously painted surfaces require in order to receive new paint finishes. Contract Sum will not be increased and the Contract Time will not be extended for preparation work on previously painted surfaces.

B. Surface preparation.
   1. General
      a. Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations.
      b. Exposed ferrous metals including nails on or in contact with surfaces to be painted with water thinned paints shall be spot primed with zinc dust, zinc oxide, zinc yellow iron oxide, or zinc chromate primer.
      c. Surfaces to be painted shall be clean before applying paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning.
      d. Cleaning solvents shall be of low toxicity with a flash point in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.
   2. Ferrous Surfaces: Ferrous surfaces that have not been shop coated shall be solvent cleaned. Surfaces that contain rust, loose mill scale, and other foreign substances shall be mechanically cleaned by power wire brushing or sandblasting. Minor amounts of residual rust that cannot be removed exept by blast cleaning and tight mill scale that cannot be removed except by applying a sharp knife to any edge will be allowed to remain. After cleaning, one coat of ferrous metal primer shall be applied to all ferrous surfaces to receive paint. The semi-transparent film applied to some pipes and tubing at the mill is not to be considered as a shop coat, but shall be overcoated with the specified ferrous metal primer prior to application of finish coats. Shop coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.
   3. Galvanized and Nonferrous Surfaces: Galvanized, aluminum and aluminum alloy, lead, copper and other nonferrous surfaces to be painted shall be solvent cleaned and treated with vinyl type wash coat.

SECTION 09900 - PAINT (CONTINUED)

4. Gypsum Board Surfaces: Shall be dry and shall have all loose dirt and dust removed by brushing with a soft brush or rubbing with a dry cloth prior to application of the first coat material.
5. Mastic Type Surfaces: Shall be prepared by removing foreign material.
6. Wood Surfaces: Shall be cleaned of foreign matter. Wood surfaces adjacent to surfaces to receive water thinned paints shall be primed and/or touched-up prior to the application of such paints. Surfaces shall be checked to insure that finishing nails have been properly set and all holes and surface imperfections shall be primed. After priming all holes and imperfections in finish surfaces shall be filled with putty or plastic wood filler, colored to match the finish coat if antural finish is required, allow to dry, and sandpaper smooth. Wood trim shall be back primed. Putty or wood filler used shall be compatible with subsequent coatings. Painting shall proceed when the moisture content of the wood does not exceed 12% as measured by a moisture meter.
7. Metal Surfaces: Contractor shall verify compatibility of paint system specified herein with factory primer or factory finish. In case of conflict, Contractor shall apply equivalent, compatible paint system at no increase in the Contract Sum and not extension of Contract Time.
8. Application:
   A. Paint may be applied by brush, roller, or spray, except as hereinafter specified. At time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application.
   B. Paint shall be applied so finish surfaces shall be free of runs, drops, ridges, waves, laps, brush marks, and variations in color, texture and finish. Each coat shall be applied as a film of uniform thickness.
   C. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated.
   D. Special attention shall be given to insure that all surfaces including edges, corners and crevices, welds, and rivets receive a film thickness equivalent to that of adjacent surfaces.
   E. Adequate ventilation shall be provided during paint application. Adjacent areas shall be protected by the use of drop cloths or other approved precautionary measures shall be taken.
   F. The first coat on gypsum wallboard and other surfaces shall include repeated touching up suction spots or overall applications of primer or sealer to produce a uniform color and gloss.
   G. The first coat on both faces of wood doors shall be applied at essentially the same time. Paints, except where water thinned types, shall be applied only to surfaces that are completely free of surface moisture, as determined by sight and touch.
   H. Coating progress: sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit adverse weather conditions.
   I. Time between surface preparation and painting: Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specific first coat as soon as practicable after such pretreatment has been complete, but prior to any deterioration of the prepared surface.
   J. Interior painting:
9. All exposed items or surfaces (except items or surfaces specified not to be painted) shall be painted to match background adjacent colors unless color schedule indicated otherwise. Such items shall include, but not limited to, brackets, piping, conduit, access panels, unfinished or prime coated hardware, grills louvers, registers, fire equipment cabinets, electrical panels,speaker enclosures, and any other similar items.
10. Hardware and fixtures: Hardware, hardware accessories, plate, lighting fixtures and similar items in place shall be removed prior to painting and replaced upon completion of each space. Heating and other equipment adjacent to walls shall be disconnected; using workman skilled I appropriate trades and moved to permit wall surfaces to be painted. Following completion of painting, they shall be experly replaced and reconnected.

7. Surfaces not to be painted.
   A. Exposed Masonry
   B. Items having complete factory finish.
   C. Anodized aluminum, stainless steel, chromium plate, glass, copper, bronze or similar materials.
   D. Moving parts, valves, operating units, mechanical and electrical parts such as valve and damper operators, sending devices, motor and fan shafts.
   E. Code labels, equipment identification, or rating plates, fusible links, and sprinkler heads.
   F. Do not paint over Underwriter's Label.
8. Quality and Finish of Work:
   A. All work may be inspected for proper surface preparation, pretreatment, priming, dry film thickness, curing, color, and workmanship.

END OF SECTION

DIVISION 10 SPECALTIES

SECTION 10800 - TOILET ACCESSORIES

1. Furnish and install toilet accessories as shown on the drawings and as specified herein.
2. Accessories: Bradley Inc. or Architect approved equal:
   A. 5A10-11 Toilet tissue dispensers
   B. 2A10-11 Paper towel dispenser
   C. 832 Grab bars.
   D. 4A10-11 Sanitary napkin disposal
   E. 781 Series Mirror
   F. 6A00-11 Soap dispenser

3. Installation:
   A. Furnish and install blocking as required for installation of toilet accessories.

B. Install with tamper proof fasteners.
   C. Installation shall conform with requirements of the Americans With Disabilities Act (ADA) and state and local codes.

END OF SECTION

DIVISION 12 - FURNISHINGS

SECTION 12304 - CASEWORK

PART-1 GENERAL
1.1 SCOPE OF WORK: Provide all materials (cabinets and countertops), labor (for installation) and services and necessary accessories required for the installation.
1.2 QUALITY ASSURANCE: Equal or exceed ANSI 161.1 current edition Performance standards for Kitchen and Vanity Cabinets.
1.3 SUBMITTALS: Submit shop drawings showing both plan and Elevations of the Cabinets. Show methods of attachment to the floor and wall. Indicate the locations and sizes of all spacers. Indicate all drawer and door faced units together with door swings. Coordinate the cabinets and base units with any appliances to be installed. Submit manufacture's maintenance recommendations for all the units.
1.4 WARRANTIES: Provide one (1) year manufacture's written warranty against defective workmanship and materials.
1.5 PROJECT CONDITIONS: Confirm in field the conditions that exist for mounting.
PART - 2 PRODUCTS
2.1 MATERIALS: All materials are to meet the Quality Assurance standards set in Part 1.
2.2 PREFABRICATION: All base and wall cabinets are to be fabricated off site, properly packaged and shipped to the site ready for installation.
PART - 3 EXECUTION
3.1 PREPARATION: Prior to installing the cabinets, blocking is to be installed to receive the wall and base cabinets.
3.2 SURFACE CONDITIONS: Prior to installation examine all surface conditions to confirm that they are proper for the installation of the cabinets.
3.3 INSTALLATION: Install the base cabinets, wall cabinet and vanities in accordance with the manufacture's written instructions.
3.4 COORDINATION: Coordinate the installation of the plumbing, electrical, and countertop items that are required for the complete installation.
3.5 ERECTION: Install all the cabinets plumb, vertical, square, and filling the full space in the locations required. All doors and drawers are to swing and pull as designed with no binding or sticking. All connections and spacers are to be flush with adjoining cabinets and top of base cabinets to be level.
3.6 FIELD ADJUSTMENTS: After the installation of the cabinets together with the plumbing, electrical, and countertop, check all doors for alignment, proper operation, and adjust, if required. Check all drawers for proper alignment, stops, and smooth operation, adjust if required. Leave in ready operation for the owner with no further adjustments required.

END OF SECTION

SECTION 12500 - FURNITURE
1. Coordinate all furniture with Owner / Architect &Furniture Supplier.z e
2. Coordinate delivery and installation of furniture with construction trades.

END OD SECTION

SECTION 12700 - SYSTEMS FURNITURE
1. Coordinate all furniture with Furniture Supplier and Furniture Plan.
2. Coordinate delivery and installation of furniture with construction trades.

END OF SECTION

DIVISION 15 - MECHANICAL

SECTION 15000 - DESIGN-BUILD MECHANICAL

1. General: Provide all labor and materials required for the design-build installation of HVAC system & accessories, plumbing, plumbing fixtures, vent piping, gas piping, piping insulation and final connections to fixtures and equipment as indicated on the drawings, specified herein, and as required for the proper and complete performance of the work. All work is to be done in strict compliance with all applicable codes, laws, and regulations.
2. The contractor shall submit shop drawings on all pipe work and systems prior to fabrications and installation. Shop drawings shall be in complete coordination with mechanical and general trades. The contractor shall be responsible for obtaining all applicable permits.
3. Code Compliance: All equipment, materials, and work shall conform to all applicable codes as adopted by the State of Michigan, Michigan Department of Public Health, and the local municipality.
4. Contractor shall be responsible for the coordination of chases, supplies, and returns with Architectural drawings and shall notify Architect of conflicts.
5. Ductwork: Shall be galvanized steel. Installer shall adjust or resolve any ductwork, at owner's discretion, which bangs or pings.
6. Supply and Return Grilles: Shall be approved by Architect.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16000 - DESIGN-BUILD ELECTRICAL

1. General: The work under this section includes, but is not limited to the design-build furnishing and installation of all materials, labor, services, and incidental items required for all electrical work as shown on the drawings. All materials and labor shall be in strict accordance with all applicable codes, laws, and regulations. Switches to be installed at 48" height to center unless noted otherwise. Duplex outlets to be at 12" height to center unless noted otherwise. The contractor shall be responsible for obtaining all applicable permits.
2. Code Compliance: All equipment, materials, and work shall conform to all applicable codes as adopted by the State of Michigan, Michigan Department of Public Health, and the local municipality.
3. Electrical contractor too coordinate all new locations of power, cable, and data with owner per proposed floor plan and furniture layout. Terminate and remove all wires and power not being used in new design.

END OF SECTION

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FOUNDED 1994
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DRAWN LP
CHECKED SA
APPROVED SA

SHEET
Specifications

scale as shown

FILE NUMBER
2428

SHEET NUMBER
A.004

MATERIAL KEY

SYMBOL	DESCRIPTION
	BRICK
	CMU LEFT: HOLLOW RIGHT: GROUTED SOLID
	CONCRETE
	FINISHED WOOD
	PLYWOOD
	TILE
	MARBLE
	EARTH
	METAL (in elevation)
	STEEL
	LUMBER / WOOD BLOCK'G Left: Continuos right: discontinuous
	LOOSE OR BATT INSULATION
	RIGID INSULATION
	CARPET
	GYPSUM WALL BOARD OR PLASTER
	GRANULAR OR GRAVEL FILL

PLAN LEGEND

	EXISTING TO REMAIN
	PROPOSED

SYMBOLS KEY

SYMBOL	DESCRIPTION
	PROJECT NORTH ARROW VERIFY ORIENTATION ON PLAN SHEETS
X	EXIST COLUMN CENTER LINES
X	NEW COLUMN CENTER LINES
	WORK POINT
T.O. FIN. FLR. ELEV. = 100'-0"	FLOOR ELEVATION POINT REFERENCE
8'-4" A.F.F.	CEILING HEIGHT TAG
BLDG. SECT. 1 A.301	BUILDING SECTION CUT SYMBOL
1 A.401	DETAIL CUTS
P1	PARTITION TYPE
X X A.702 X X	INTERIOR ELEVATION
EXIST. RM_NAME 100	EXISTING ROOM NAME
New RM_NAME 100	NEW ROOM NAME/NUMBER
EX	EXIST DOOR TO REMAIN
	ITEMS SCHEDULED FOR DEMO
100	NEW DOOR AND NUMBER
	LEADER LINE
	DIMENSION LINE
X	WINDOW TYPE
1	BULLETIN
1	ADDENDUM

BUILDING DATA

1. CODE COMPLIANCE

2015 MICHIGAN REHABILITATION CODE FOR EXISTING BUILDINGS
2015 MICHIGAN BUILDING CODE
2015 MICHIGAN ENERGY CODE
2015 MICHIGAN MECHANICAL CODE
2015 MICHIGAN PLUMBING CODE
2017 MICHIGAN ELECTRICAL CODE
ICC A117.1-2009

2. USE & OCCUPANCY CLASSIFICATION (MBC CHAPTER 3)

BUSINESS (B) – CIVIC ADMINISTRATION

3. CONSTRUCTION TYPE (MBC CHAPTER 6)

CONSTRUCTION TYPE 2A NONCOMBUSTIBLE, PROTECTED W/ SPRINKLERS
HIGH-RISE BUILDING

4. FIRE SUPPRESSION (MBC 903)

EXIST'G BUILDING

5. FIRE ALARMS (MBC 907)

EXIST'G BUILDING EQUIPPED WITH AN AUTOMATIC FIRE ALARM SYSTEM PER NFPA 72

6. ALLOWABLE BUILDING HEIGHT AND AREAS (MBC TABLES 504.3 & 506.2)

EXIST'G BUILDING WITH NO PROPOSED CHANGES

7. EXIT ACCESS & NUMBER OF EXITS (MBC 1006 TABLE 1006.2.1, TABLE 1006.3.1, 1017.2)

EGRESS WIDTH (MBC 1005.1): 36" MIN
NO PROPOSED CHANGES TO NUMBER OR WIDTH OF EXITS

COMMON PATH OF EGRESS TRAVEL (MBC TABLE 1006.2.1):
B OCCUPANCIES W/ SPRINKLER = 100 FT. MAX.

NUMBER OF EXITS (MBC TABLE 1006.3.1):
OCCUPANT LOAD 1-500 = MIN. 2 REQUIRED, 2 PROVIDED = COMPLIES

EXIT ACCESS TRAVEL DISTANCE (MBC TABLE 1017.2)
B OCCUPANCIES W/ SPRINKLER = 300 FT. MAX. FROM MOST REMOTE POINT

8. REQUIRED FIRE RESISTANCE OF BUILDING ELEMENTS (MBC 508, CHAPTER 7, 1022, 1022, 30056.4 AND TABLE 601)

TYPE 2A CONSTRUCTION – EXIST'G BUILDING WITH NO PROPOSED CHANGES

9. REQUIRED PLUMBING FIXTURES (MPC 403 TABLE 403.1)

NO PROPOSED WATER CLOSET, LAVATORY, OR DRINKING FOUNTAIN COUNT CHANGES
TO EXISTING BUILDING.

10. 2015 MICHIGAN UNIFORM ENERGY CODE (CHAPTER 5 & ANSI/ASHRAE/IESNA STANDARD 90.1-2013)

NO PROPOSED CHANGES

11. CLASSIFICATION OF WORK (MRC SECTION 503 ALTERATION – LEVEL 1)

LEVEL 1 ALTERATION – PROPOSED SCOPE TO INCLUDE THE REMOVAL AND REPLACEMENT OR THE COVERING OF EXISTING MATERIALS, ELEMENTS, EQUIPMENT, OR FIXTURES USING NEW MATERIALS, ELEMENTS, EQUIPMENT, OR FIXTURES THAT SERVE THE SAME PURPOSE.

LEVEL 1 ALTERATIONS SHALL COMPLY WITH THE PROVISION OF CHAPTER 7

12. CHAPTER 7 ALTERATIONS – LEVEL 1 (MRC SECTION 702)

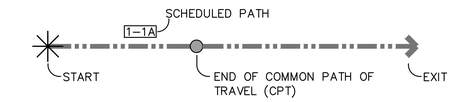
ALL NEW WORK SHALL COMPLY WITH THE MATERIALS AND METHODS REQUIREMENTS IN THE INTERNATIONAL BUILDING CODE, INTERNATIONAL ENERGY CONSERVATION CODE, INTERNATIONAL MECHANICAL CODE, AND INTERNATIONAL PLUMBING CODE, AS APPLICABLE, THAT SPECIFY MATERIAL STANDARDS, DETAIL OF INSTALLATION AND CONNECTION, JOINTS, PENETRATIONS, AND CONTINUITY OF ANY ELEMENT, COMPONENT OR SYSTEM IN THE BUILDING.

GENERAL NOTES

1. ALL APPLICABLE LAWS, ORDINANCES AND REGULATIONS OF ALL AUTHORITIES WITH JURISDICTION OVER THE CONSTRUCTION SHALL APPLY IN THE PERFORMANCE OF ALL WORK ASSOCIATED WITH THIS PROJECT. IN CASE OF CONFLICT, THE MOST STRINGENT CODE SHALL APPLY.
2. THE CONTRACTOR SHALL SECURE AND ASSUME ALL COSTS OF ALL REQUIRED PLAN REVIEW AND BUILDING PERMIT FEES AND BONDS.
3. CONTRACTORS AND SUBCONTRACTORS SHALL VERIFY SITE CONDITIONS. ANY INCONSISTENCIES BETWEEN DRAWINGS AND FIELD CONDITIONS SHALL BE RESOLVED WITH ARCHITECT PRIOR TO COMMENCEMENT OF THE WORK.
4. CONTRACTOR SHALL NOTIFY THE ARCHITECT OF ANY CONDITIONS DISCOVERED WHERE MODIFICATION OF THE INTENT OF THE DESIGN WOULD PRODUCE BENEFICIAL RESULTS.
5. CONTRACTOR AND SUBCONTRACTORS TO PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO INSURE THE SAFETY OF THE GENERAL PUBLIC DURING CONSTRUCTION.
6. THE STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH THE BUILDING CODES AND DESIGN STANDARDS TO SUPPORT IN-PLACE DESIGN LOADS IN A COMPLETED BUILDING STRUCTURE. PROVIDE ADDITIONAL SUPPORTS OR TEMPORARY OR TEMPORARY SHORING/ BRACING FOR THE STRUCTURE AS NEEDED DUE TO THE FORCES IMPOSED DURING HANDLING AND ERECTION.
7. CONSTRUCTION METHODS, PROCEDURES, AND SEQUENCES ARE THE CONTRACTORS' RESPONSIBILITY, CONTRACTOR SHALL TAKE ALL NECESSARY MEANS TO MAINTAIN AND PROTECT STRUCTURAL INTEGRITY OF CONSTRUCTION AT ALL STAGES.
8. THE CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS PRIOR TO ANY WORK AND SHALL BE RESPONSIBLE FOR ALL WORK AND MATERIALS INCLUDING THOSE FURNISHED BY SUBCONTRACTORS AND OWNERS.
9. ANY DETAILS OR NOTES REQUIRING FIELD VERIFICATION BY THE CONTRACTOR ARE TO BE DONE DURING THE BID PROCESS. DISCREPANCIES FOUND AFTER THE GENERAL CONTRACTOR IS SELECTED WILL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND CORRECTED AT HIS EXPENSE.
10. APPROVED PLANS SHALL BE KEPT IN A PLAN BOX AND SHALL NOT BE USED BY WORKMEN. ALL CONSTRUCTION SETS SHALL REFLECT SAME INFORMATION. CONTRACTOR SHALL MAINTAIN ONE COMPLETE SET OF PLANS WITH ALL REVISIONS, ADDENDA, AND CHANGE ORDERS IN GOOD CONDITION ON THE PREMISES AT ALL TIMES.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION, TESTING AND BALANCING OF HVAC SYSTEM. SUPPLY AND RETURN DUCTS SHALL BE DAMPERED IF REQUIRED. PROVIDE FIRE DAMPERS ON ALL RETURN OPENINGS IN RATED CONSTRUCTION, TYPICAL.
12. IF ANY GENERAL NOTE CONFLICTS WITH ANY DETAIL OR NOTE ON THE PLANS OR IN THE SPECIFICATIONS, THE STRICTEST PROVISION SHALL GOVERN.

PROJECT DATA

PROJECT: NOTA NORTH OAKLAND TRANSPORTATION AUTHORITY DISPATCH CENTER
DESCRIPTION: PARTIAL RENOVATION TO ADD NEW OFFICE AREA, CONFERENCE AND CALL CENTER AREA. ALSO, INSTALLING NEW UNISEX SHOWER.

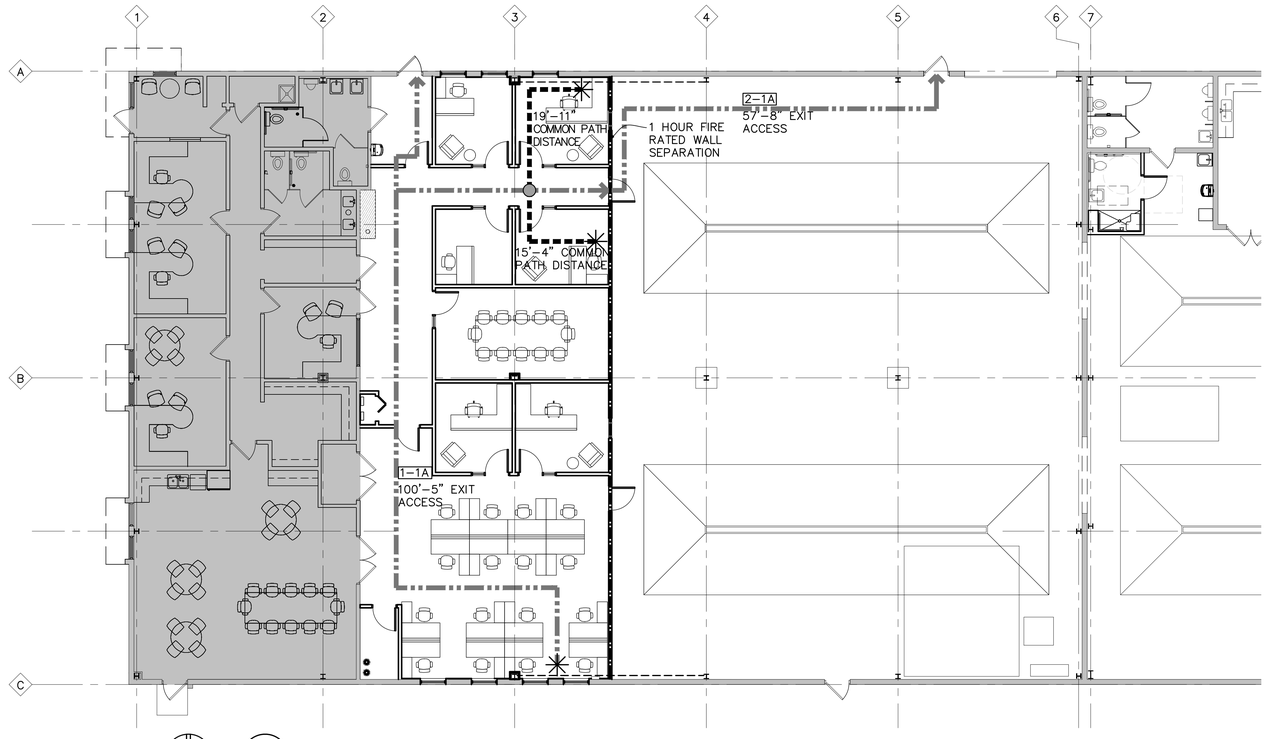


EXIT ACCESS TRAVEL DISTANCE – W/ SPRINKLER SYSTEM:
OCCUPANCY B – MAX. 250 FT. W/ SPRINKLER SYSTEM PER MBC TABLE 1017.2

COMMON PATH OF EGRESS TRAVEL DISTANCE:
OCCUPANCY B – MAX. 100 FT. W/ SPRINKLER SYSTEM PER MBC TABLE 1006.2.1

BUILDING OCCUPANCY LOAD

USE	AREA(SF)	FACTOR	OCCUPANTS
S-1	13,826	500	28
B	2,516	100	25
TOTAL			53



1 A.003 Life Safety Plan
SCALE: 1/8" = 1'-0"

AKA ARCHITECTS 30 YEARS
FOUNDED 1994
AUGER KLEIN ALLER
ARCHITECTS INC.
303 E. THIRD STREET SUITE 100
ROCHESTER, MI 48307
248.814.9160
WWW.AKA-ARCHITECTS.NET

PROJECT
NOTA Transit Terminal

675 S. Glaspie St.
Oxford, MI 48371

DATE ISSUED	ISSUED FOR
09.06.2024	OWNER REVIEW
06.10.2025	CM RFP

DRAWN LP
CHECKED SA
APPROVED SA

SHEET
Life Safety Plan

scale as shown

FILE NUMBER
2428

SHEET NUMBER
A.005

PLAN LEGEND

- EXISTING TO REMAIN
- EXISTING WALL TO BE REMOVED
- NEW INTERIOR PARTITION, SEE SHEET A.801 FOR PARTITION TYPES
- EXISTING DOOR AND FRAME TO BE REMOVED
- EXISTING DOOR AND FRAME TO REMAIN
- NEW DOOR AND FRAME
- (P1) PARTITION TYPE – REFER TO A.601

GENERAL INTERIOR NOTES

1. REFER TO MATERIAL RESOURCES AND SCHEDULE FOR PERTINENT EQUIPMENT AND FINISH INFORMATION.
2. CONTRACTOR TO COORDINATE DELIVERY OF EQUIPMENT AND FURNISHINGS WITH OWNER.
3. COORDINATE MILLWORK DETAILS WITH MILLWORK PACKAGE PROVIDED BY FABRICATOR.
4. MANUFACTURER TO FIELD MEASURE PRIOR TO FABRICATION AND AGAIN BEFORE INSTALLATION.
5. COORDINATE FINISHES WITH FINISH SCHEDULE AND LEGEND.
6. REFERENCE FLOOR PLAN FOR PARTITION TYPE. PROVIDE BLOCKING FOR ALL WALL-HUNG INSTALLATIONS.

KEYNOTES

1. LOW-E INSULATING GLASS IN ALUMINUM CLAD WOOD WINDOWS.
2. 5/8" GWB FURRING ON 7/8" HAT TRACK W/RIGID INSULATION AT EXPOSED CMU WALLS – TYP.
3. 3 5/8" MET. STUDS @ 16" O.C. W/ SOUND BATT INSULT FULL HEIGHT. 5/8" GWB EA. SIDE-TYP.
4. SEE REFLECTED CEILING PLAN FOR ACOUSTIC LAY-IN CLG. PANELS AND SUSPENSION GRID.
5. REFER TO MECHANICAL DRAWINGS FOR PLUMBING AND MECH. SYSTEMS AS SPECIFIED.
6. REFER TO ELECTRICAL DRAWINGS FOR ELEC. SYSTEMS AS SPECIFIED.
7. POWER WASH AND DEGREASE EXISTING SURFACES, PREP FOR FINISH TREATMENT SPECIFIED.

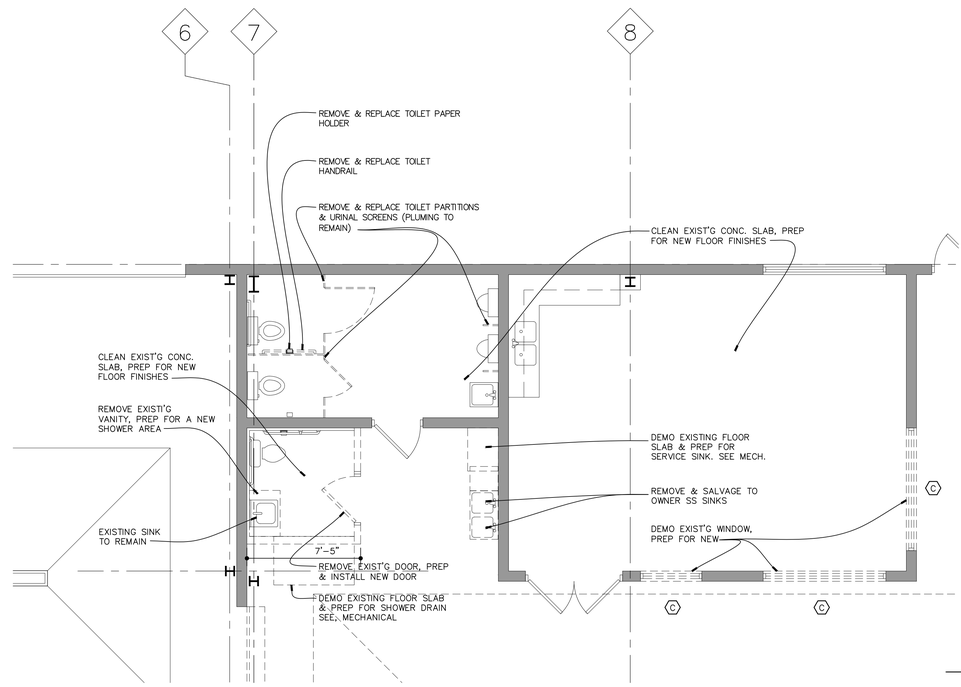
GENERAL DEMOLITION NOTES

1. SEE CIVIL, MECHANICAL, AND ELECTRICAL DRAWINGS FOR ADDITIONAL DEMOLITION NOTES.
2. CONTRACTOR SHALL COMPARE DEMOLITION DRAWINGS WITH FIELD CONDITIONS, MECHANICAL/ ELECTRICAL DRAWINGS AND NEW CONSTRUCTION REQUIREMENTS FOR COMPLIANCE PRIOR TO EXECUTION OF DEMOLITION.
3. SEE SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
4. CONTRACTOR SHALL PROVIDE TEMPORARY PROTECTION AS REQUIRED TO PREVENT DAMAGE TO EXISTING CONSTRUCTION/ FINISHES TO REMAIN.
5. PATCH AND REPAIR EXISTING CONSTRUCTION ADJACENT TO DEMOLISHED CONSTRUCTION AS REQUIRED. COORDINATE WITH NEW CONSTRUCTION.
6. DASHED LINES INDICATE CONSTRUCTION TO BE REMOVED. COORDINATE EXTENT OF REMOVAL WITH ARCHITECT AND ARCHITECTURAL DRAWINGS.
7. PROVIDE AND MAINTAIN TEMPORARY ENTRYWAY TO BUILDING DURING CONSTRUCTION, COORDINATE WITH OWNER.

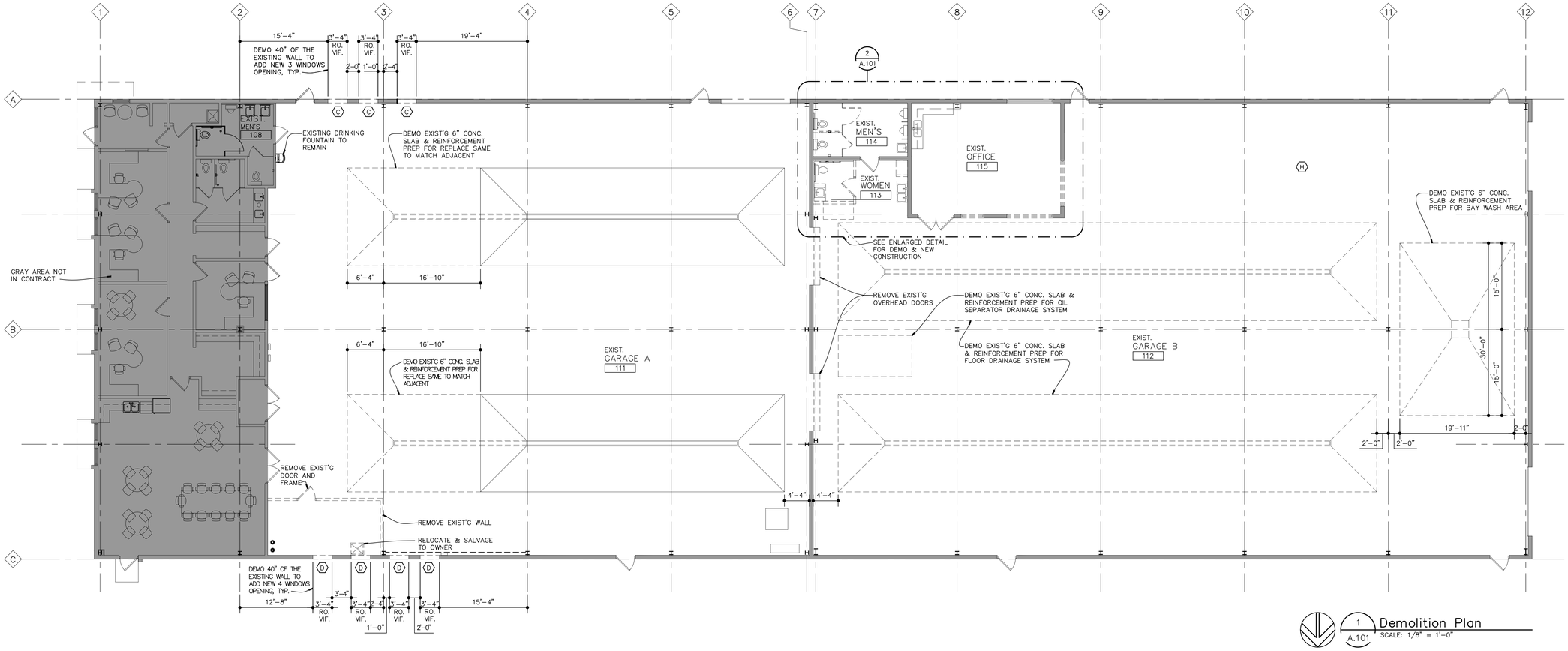
DEMOLITION KEYNOTES

DEMO GENERAL NOTES:
PATCH & REPAIR DEMOED AREAS TO MATCH ADJACENT. PREP. FOR FINISH AS SPECIFIED.

- (A) REPLACE EXIST'G DOORS & FRAMES AS SPECIFIED
- (B) REMOVE EXISTING LIGHT FIXTURES. PREP FOR NEW CLG. AND LIGHT FIXTURES
- (C) DEMO EXIST'G WALL, PREP FOR NEW OPENING
- (D) DEMO EXISTING BRICK CMU AND PREP FOR WINDOW PLACEMENT. TOOTH VENEER REPLACEMENT TO MATCH ADJACENT.
- (E) REMOVE EXIST'G PLUMBING FIXTURES, PREP FOR NEW EYE WASH STATION
- (F) RELOCATE EXIST'G ELEC. PANEL
- (G) REMOVE EXIST'G WINDOW AND REPLACE W/ 2HR. RATED GWB INFILL. MATCH ADJ. (PAINT)
- (H) REMOVE EXISTING INSULATION AT WALLS & CEILING PREP FOR REPLACE WITH R-19 VINYL COVERED BATT INSULATION.



2 A.101 Enlarged Demo Plan
SCALE: 1/4" = 1'-0"



1 A.101 Demolition Plan
SCALE: 1/8" = 1'-0"

AKA ARCHITECTS 30 YEARS FOUNDED 1994
AUGER KLEIN ALLER ARCHITECTS INC.
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PROJECT
NOTA Transit Terminal

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06.10.2025	**CM RFP**

DRAWN	LP
CHECKED	SA
APPROVED	SA

SHEET
Demolition Floor Plan
scale as shown

FILE NUMBER
2428

SHEET NUMBER
AD.101

PLAN LEGEND

- EXISTING TO REMAIN
- EXISTING WALL TO BE REMOVED
- NEW INTERIOR PARTITION, SEE SHEET A.801 FOR PARTITION TYPES
- EXISTING DOOR AND FRAME TO BE REMOVED
- EXISTING DOOR AND FRAME TO REMAIN
- NEW DOOR AND FRAME
- P1 PARTITION TYPE – REFER TO A.601

GENERAL INTERIOR NOTES

1. REFER TO MATERIAL RESOURCES AND SCHEDULE FOR PERTINENT EQUIPMENT AND FINISH INFORMATION.
2. CONTRACTOR TO COORDINATE DELIVERY OF EQUIPMENT AND FURNISHINGS WITH OWNER.
3. COORDINATE MILLWORK DETAILS WITH MILLWORK PACKAGE PROVIDED BY FABRICATOR.
4. MANUFACTURER TO FIELD MEASURE PRIOR TO FABRICATION AND AGAIN BEFORE INSTALLATION.
5. COORDINATE FINISHES WITH FINISH SCHEDULE AND LEGEND.
6. REFERENCE FLOOR PLAN FOR PARTITION TYPE. PROVIDE BLOCKING FOR ALL WALL–HUNG INSTALLATIONS.

KEYNOTES

1. LOW–E INSULATING GLASS IN ALUMINUM CLAD WOOD WINDOWS.
2. 5/8" GWB FURRING ON 7/8" HAT TRACK W/RIGID INSULATION AT EXPOSED CMU WALLS – TYP.
3. 3 5/8" MET. STUDS @ 16" O.C. W/ SOUND BATT INSULT FULL HEIGHT. 5/8" GWB EA. SIDE–TYP.
4. SEE REFLECTED CEILING PLAN FOR ACOUSTIC LAY–IN CLG. PANELS AND SUSPENSION GRID.
5. REFER TO MECHANICAL DRAWINGS FOR PLUMBING AND MECH. SYSTEMS AS SPECIFIED.
6. REFER TO ELECTRICAL DRAWINGS FOR ELEC. SYSTEMS AS SPECIFIED.
7. POWER WASH AND DEGREASE EXISTING SURFACES, PREP FOR FINISH TREATMENT SPECIFIED.

DOOR SCHEDULE

DOOR NUMBER	LOCATION	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR SIZE THK	DOOR TYPE	DOOR MAT.	DOOR FIN.	FRAME TYPE	FRAME MAT.	FRAME FIN.	U.L. LABEL	HARDWARE SET	REMARKS
E111A	EXISTING GARAGE A	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
E111B	EXISTING GARAGE A	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
E112A	EXISTING GARAGE B	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
E112B	EXISTING GARAGE B	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
E112C	EXISTING GARAGE B	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
E112D	EXISTING GARAGE B	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
E112E	EXISTING GARAGE B	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
E112F	EXISTING GARAGE B	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
113	UNISEX SHOWER	3'–0"	7'–0"	1–3/4"	B	HM.	PT.	1	HM	PT.	–	–	CLOSER
E114	EXISTING MEN'S	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
E115	EXISTING OFFICE	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
116	RISER ROOM	3'–0"	7'–0"	1–3/4"	B	HM.	PT.	1	HM	PT.	–	–	–
117A	DISPATCH	3'–0"	7'–0"	1–3/4"	A	HM.	PT.	1	HM	PT.	–	–	–
117B	DISPATCH	3'–0"	7'–0"	1–3/4"	A	HM.	PT	1	HM	PT.	60 MIN.	–	PANIC & CLOSER
118	OFFICE	3–0"	7'–0"	1–3/4"	B	WD	STN.	2	KD	PREFIN.	–	–	–
119	DISPATCH OFFICE	3'–0"	7'–0"	1–3/4"	B	WD	STN.	2	KD	PREFIN.	–	–	MATCH EXISTING
120	CONFERENCE	3'–0"	7'–0"	1–3/4"	B	WD	STN.	2	KD	PREFIN.	–	–	MATCH EXISTING
121	OFFICE	3'–0"	7'–0"	1–3/4"	B	WD	STN.	2	KD	PREFIN.	–	–	MATCH EXISTING
122	OFFICE	3'–0"	7'–0"	1–3/4"	B	WD	STN.	2	KD	PREFIN.	–	–	MATCH EXISTING
123	OFFICE	3'–0"	7'–0"	1–3/4"	B	WD	STN.	2	KD	PREFIN.	–	–	MATCH EXISTING
124	OPERATIONS MANAGER	3'–0"	7'–0"	1–3/4"	B	WD	STN.	2	KD	PREFIN.	–	–	MATCH EXISTING
125	CORRIDOR	3'–0"	7'–0"	1–3/4"	A	HM.	PT.	1	HM	PT.	60 MIN.	–	PANIC & CLOSER
E126A	VESTIBULE	ETR	ETR	ETR	ETR	ETR	PT.	ETR	ETR	PT.	–	–	–
126B	VESTIBULE	3'–0"	7'–0"	1–3/4"	A	HM.	PT.	1	HM	PT.	–	–	PANIC & CLOSER

DOOR SCHEDULE GENERAL NOTES:

1. S = SAFETY GLASS, LAMINATED TEMPERED
2. F = FIRE RATED
3. ETR = EXISTING TO REMAIN

DOOR GLAZING NOTES:

1. 1/4" CLEAR AT ALL INTERIOR LOCATIONS – TYP.

DOOR SCHEDULE REMARKS:

1. COORD. ELECTRIC STRIKE AND CARD READER BY OTHERS
2. COORD. SECURITY AND AUTOMATIC LATCHING BY OTHERS
3. PROVIDE CLOSER, REF. SPECIFICATION
4. PROVIDE NEW DOOR, W/NEW FRAME AS NEEDED
5. NEW DOOR TO MATCH EXISTING DOOR OPENING & SIZE

HARDWARE GENERAL NOTES:

A. OPERATING DEVICES SHALL BE CAPABLE OF OPERATION WITH ONE HAND AND NOT REQUIRE GRASPING, TIGHT PINCHING OR TWISTING OF WRIST TO OPERATE.

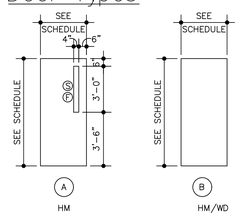
B. THRESHOLD SHALL NOT BE GREATER THAN 1/4" HEIGHT, BEVELED BOTH SIDES, BEVEL NOT GREATER THAN 1 VERTICAL TO 2 HORIZONTAL

C. INCLUDE $20,000.00 ALLOWANCE FOR DOOR HARDWARE.

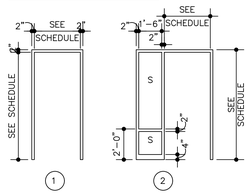
ABBREVIATIONS

GL= GLASS
WD= WOOD
KD= KNOCK DOWN METAL
PT= PAINT
HM= HOLLOW METAL

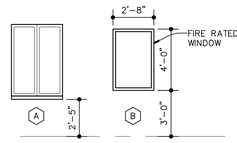
Door Types

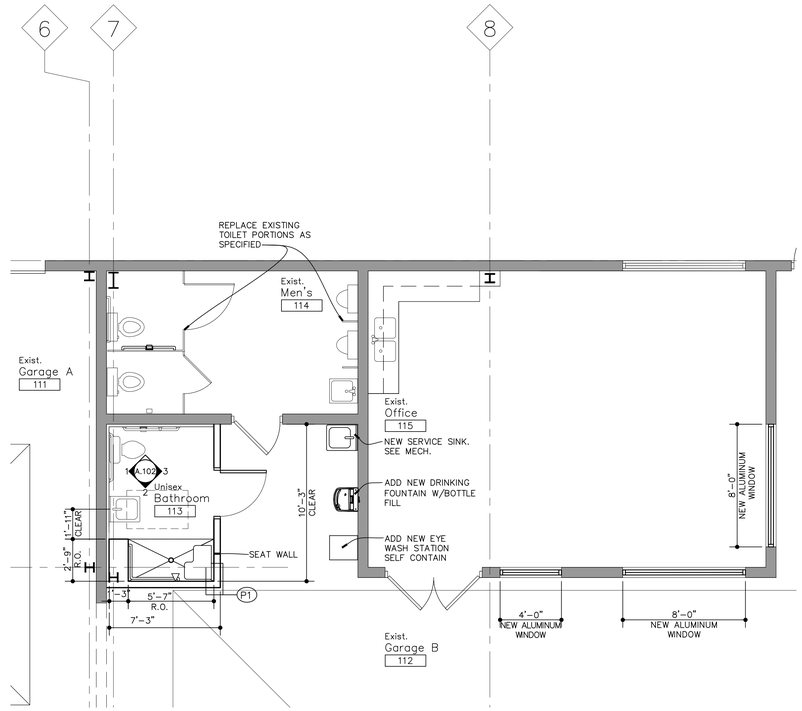


Door Frames

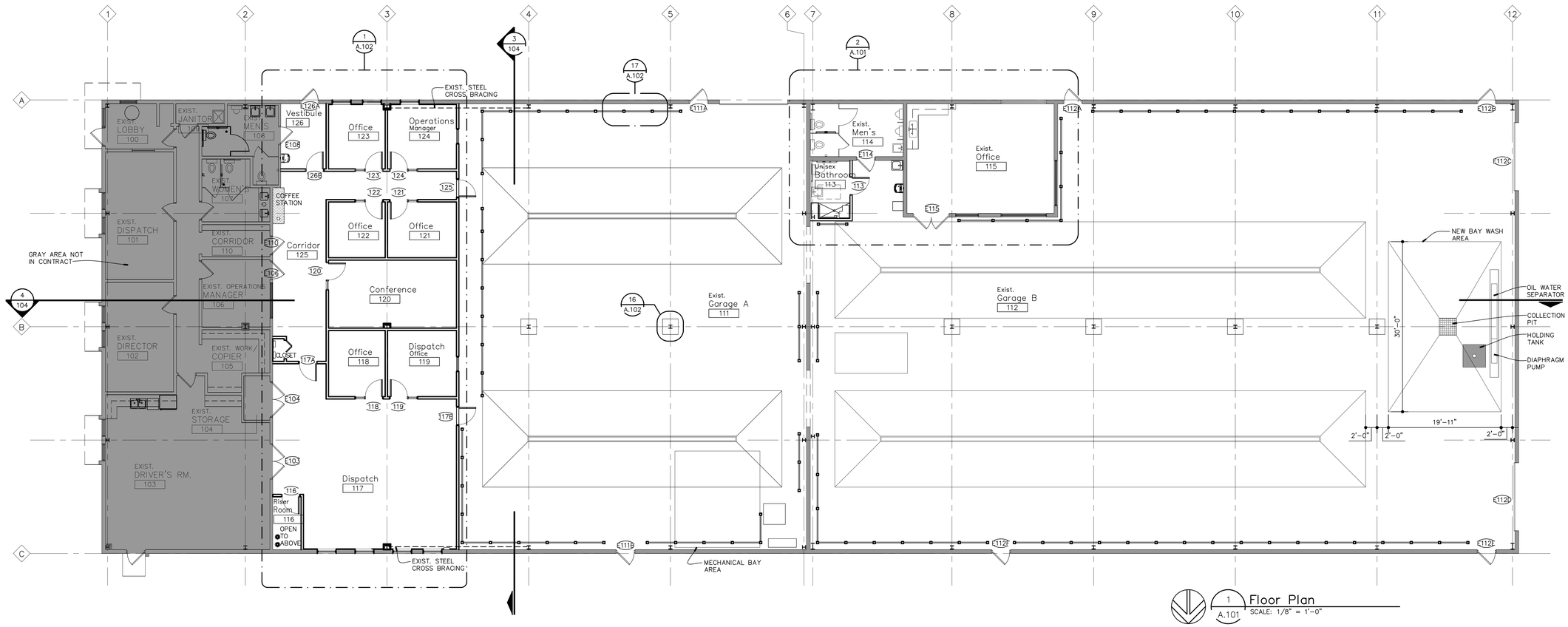


Window Types





2 A.101 Unisex Bathroom Enlarged Plan
SCALE: 1/4" = 1'–0"



1 A.101 Floor Plan
SCALE: 1/8" = 1'–0"

AKA ARCHITECTS 30 YEARS FOUNDED 1994

AUGER KLEIN ALLER ARCHITECTS INC.
303 E. THIRD STREET SUITE 100
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PROJECT
NOTA Transit Terminal

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06.10.2025	**CM RFP**

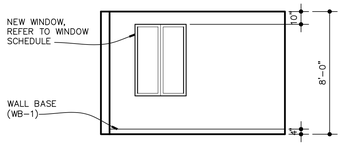
DRAWN	LP
CHECKED	SA
APPROVED	SA

SHEET
Overall Floor Plan

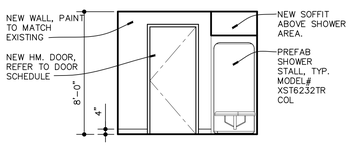
scale as shown

FILE NUMBER
2428

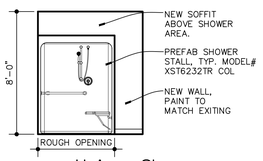
SHEET NUMBER
A.101



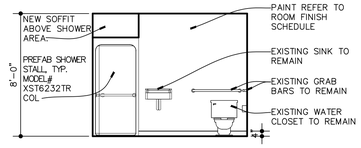
4 A.102 Operations Manager 124
SCALE: 1/4" = 1'-0"



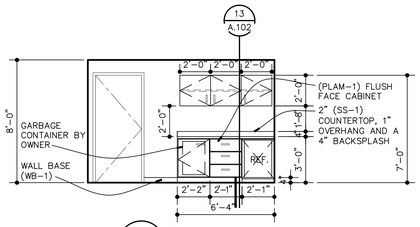
3 A.102 Unisex Shower Interior Elevation
SCALE: 1/4" = 1'-0"



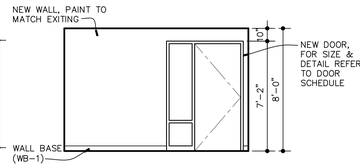
2 A.102 Unisex Shower Interior Elevation
SCALE: 1/4" = 1'-0"



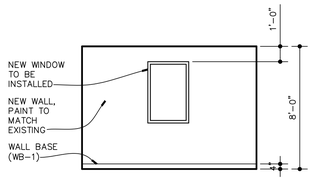
1 A.102 Unisex Shower Interior Elevation
SCALE: 1/4" = 1'-0"



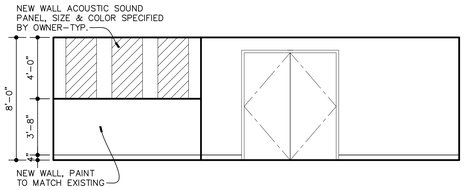
7 A.102 Coffee Station Area
SCALE: 1/4" = 1'-0"



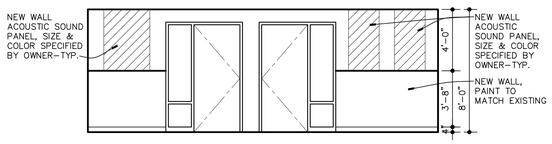
6 A.102 Operations Manager 124/Corridor 125
SCALE: 1/4" = 1'-0"



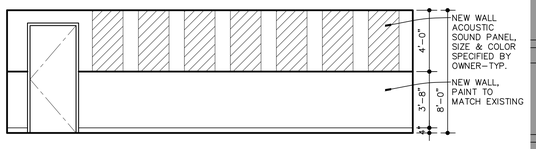
5 A.102 Operations Manager 124
SCALE: 1/4" = 1'-0"



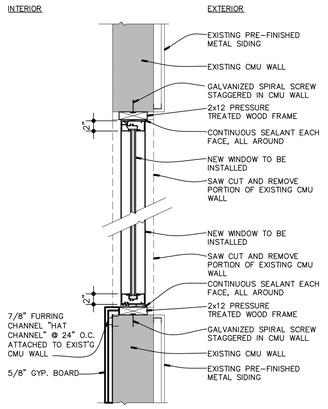
10 A.102 Dispatch Center
SCALE: 1/4" = 1'-0"



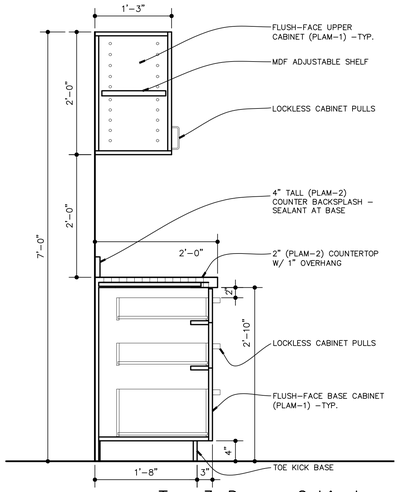
9 A.102 Dispatch Center
SCALE: 1/4" = 1'-0"



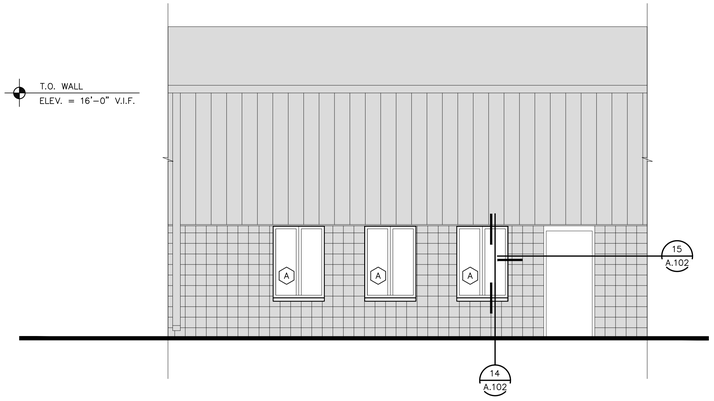
8 A.102 Dispatch Center
SCALE: 1/4" = 1'-0"



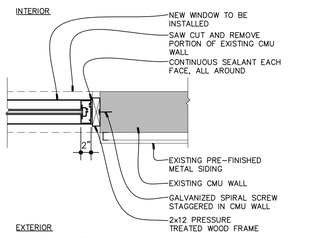
14 A.102 Window Head/Sill Detail
SCALE: 1"=1'-0"



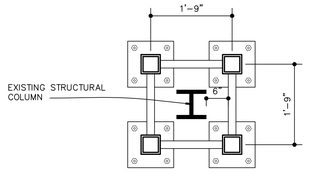
13 A.102 Typ. 3-Drawer Cabinet Base w/ Uppers Section
SCALE: 1"=1'-0"



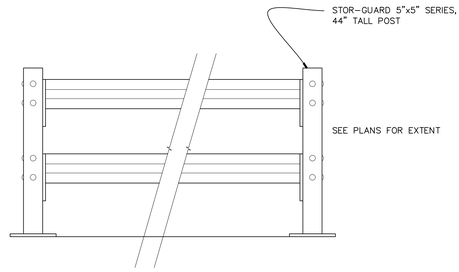
11,12 A.102 Partial South Elevation
SCALE: 1/4" = 1'-0"



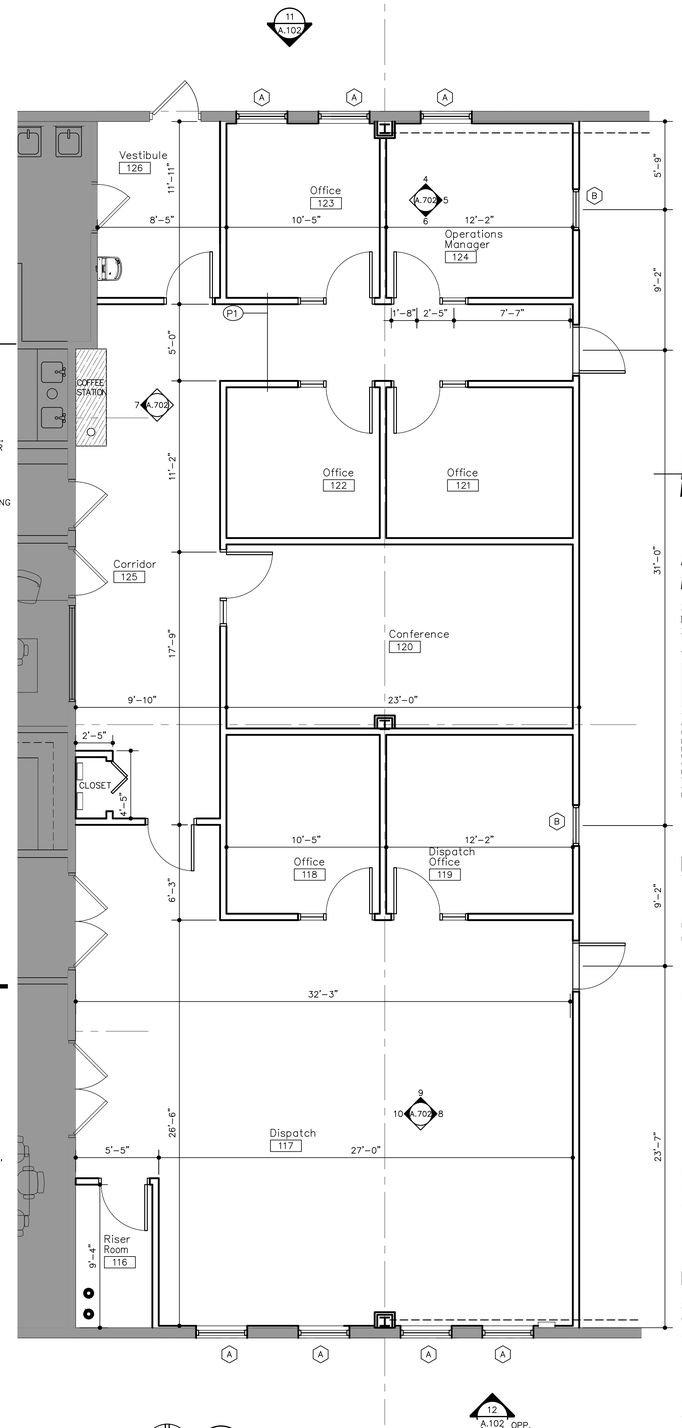
15 A.102 Window Jamb Detail
SCALE: 1"=1'-0"



16 A.101 Typical Column Protection Detail
SCALE 3/4"=1'-0"



17 A.101 Garage Guardrail
SCALE 3/4"=1'-0"



1 A.102 Enlarged Floor Plan
SCALE: 1/4" = 1'-0"

AKA ARCHITECTS 30 YEARS
FOUNDED 1994

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CHECKED	SA
APPROVED	SA

SHEET
Enlarged Plan /Interior Elevations & Partial Exterior Elevation
scale as shown

FILE NUMBER
2428

SHEET NUMBER
A.102

REFLECTED CEILING LEGEND

	NEW GYPSUM CEILING BOARD
	NEW 2'X4' FIXTURE
	4"x 4' LINEAR LED FIXTURE
⊗	EXIT SIGN W/ EMERGENCY BATTERY BACK-UP, SINGLE FACE
⊠	SUPPLY AIR DIFFUSER (SEE MECH. DWGS.)
▨	RETURN AIR DIFFUSER (SEE MECH. DWGS.)
⊛	SMOKE DETECTOR
⊠	SPRINKLER HEAD

MATERIAL LEGEND

CARPET TILE (CPT-1)

CORRIDOR VINYL (LVT-1)

LEGEND

XX-X — EXTENT OF FINISH MATERIAL

XX-X — FLOOR
XX-X — TRANSITION
XX-X — BASE
XX-X — WALLS

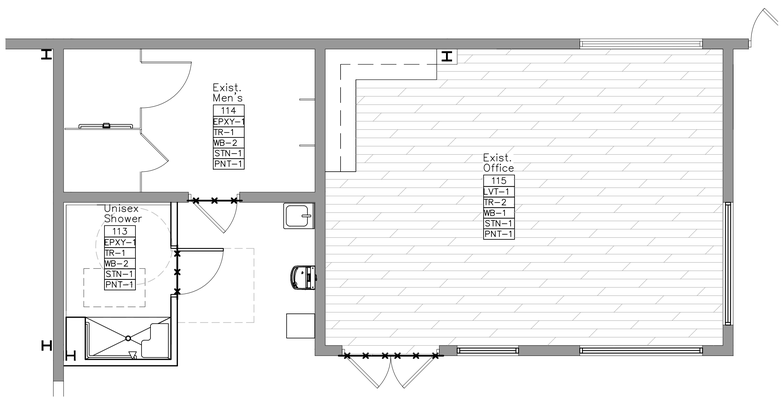
A — ALIGN

TRANSITION STRIP - SEE FINISH SCHEDULE

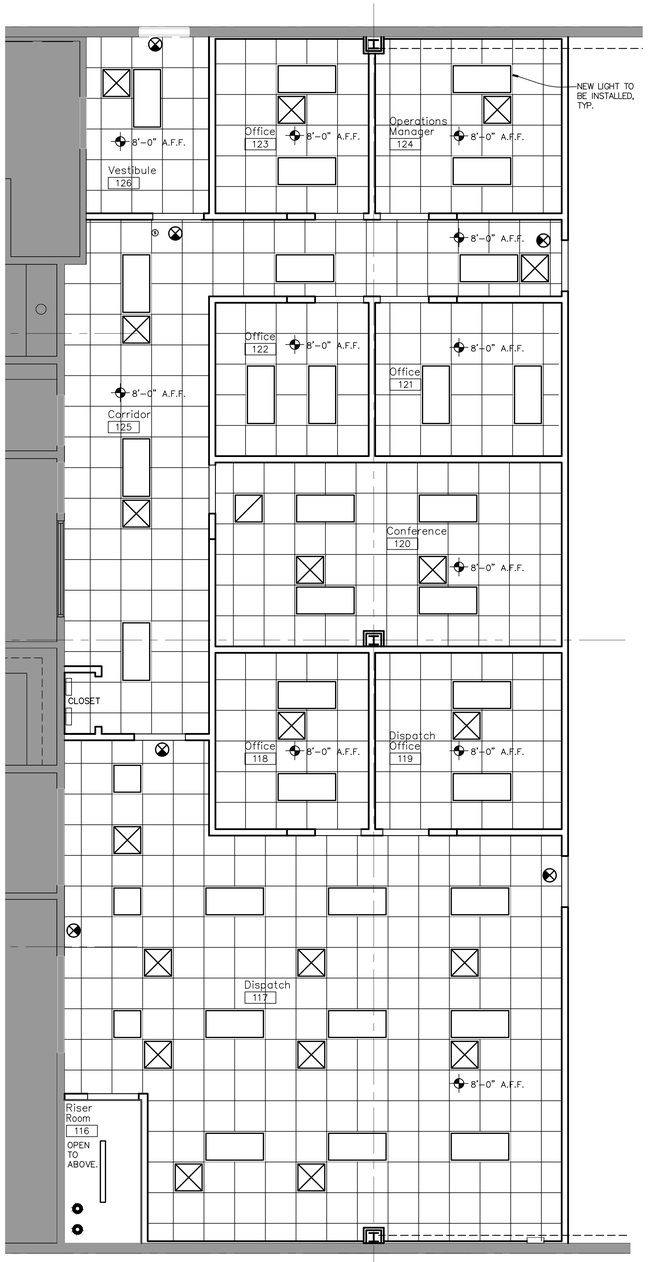
X — WALL TYPE SEE SHEET A.702

FINISH MATERIALS

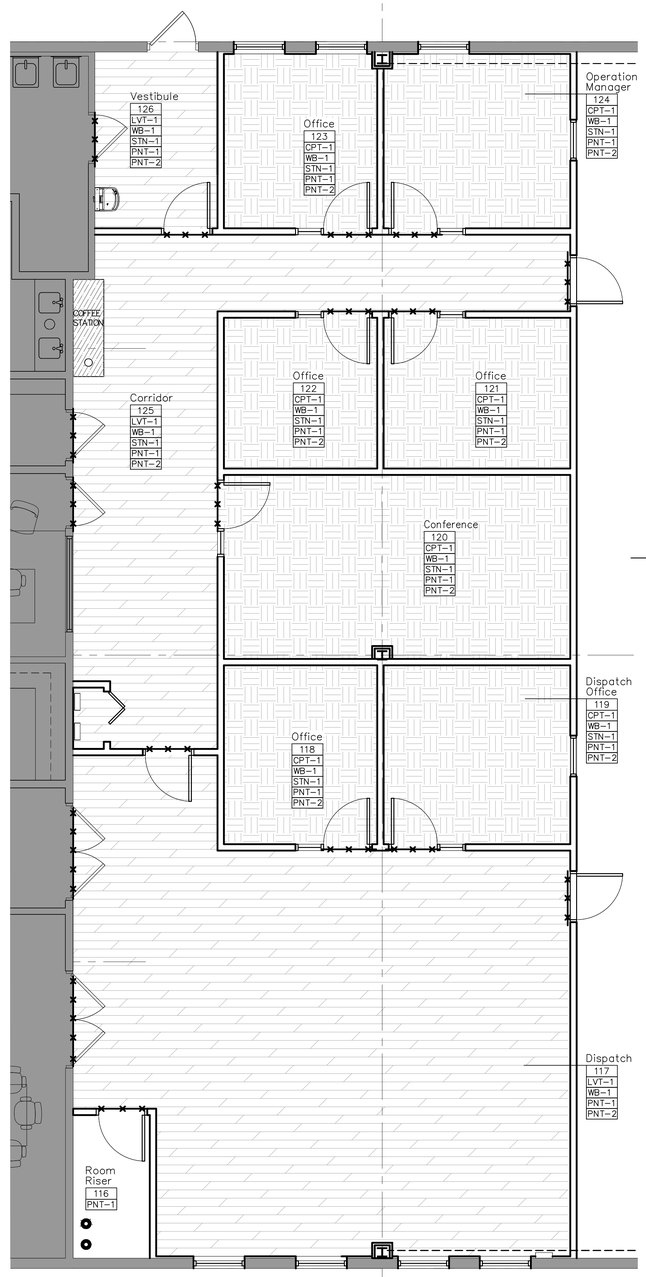
CODE	MATERIAL	DESCRIPTION	REP CONTACT INFO
ACT-1	ACOUSTICAL CEILING TILE - STANDARD	MANUF: MATCH EXISTING	
		STYLE:	
		SIZE:	
		GRID FACE/COLOR:	
		EDGE:	
CPT-1	CARPET TILE	MANUF: MATCH EXISTING	
		STYLE/PATTERN:	
		COLOR:	
		INSTALL:	
CON-1	SEALED CONCRETE	MANUF: MATCH EXISTING	
		COLLECTION:	
EPXY-1	EPOXY FLOORING	MANUF: MATCH EXISTING	
		STYLE:	
		COLOR:	
LVT-1	LUXURY VINYL TILE	MANUF: MATCH EXISTING	
		STYLE:	
		COLOR:	
PNT-1	INTERIOR PAINT FIELD	MANUF: MATCH EXISTING	
		COLOR:	
		FINISH:	
PNT-2	PAINT HIGHLIGHT COLOR	MANUF: MATCH EXISTING	
		COLOR:	
		FINISH:	
SS-1	SOLID SURFACE	MANUF: MATCH EXISTING	
		COLOR:	
		FINISH:	
STN-1	DOOR AND WALL BASE STAIN	MANUF: MATCH EXISTING	
		SIZE:	
		COLOR:	
		SUBSTRATE:	
WB-1	WALL BASE - TILE	MANUF: MATCH EXISTING	
		COLOR:	
		SIZE:	
WB-2	EPOXY WALL BASE	MANUF: MATCH EXISTING	
		COLOR:	
		SIZE: 6" INTEGRAL COVE	
TR-1	TRANSITION MATERIAL	MANUF: MATCH EXISTING	
		COLOR:	
		SIZE:	
		TYPE: SOLID SURFACE	
TR-2	TRANSITION MATERIAL	MANUF: MATCH EXISTING	
		COLOR:	
		SIZE:	
		TYPE: ALUM. STRIP	



3 A.103 Partial Floor Finish Plan
SCALE: 1/4" = 1'-0"



2 A.103 Reflected Ceiling Plan
SCALE: 1/4" = 1'-0"



1 A.103 Floor Finish Plan
SCALE: 1/4" = 1'-0"

AKA ARCHITECTS 30 YEARS
FOUNDED 1994
AUGER KLEIN ALLER
ARCHITECTS INC.
303 E. THIRD STREET SUITE 100
ROCHESTER, MI 48307
248.814.9160
WWW.AKA-ARCHITECTS.NET

PROJECT

NOTA Transit Terminal

675 S. Glaspie St.
Oxford, MI 48371

DATE ISSUED	ISSUED FOR
09.06.2024	OWNER REVIEW
06.10.2025	**CM RFP**

DRAWN	LP
CHECKED	SA
APPROVED	SA

SHEET

Enlarged Finish & Reflected Ceiling Plan

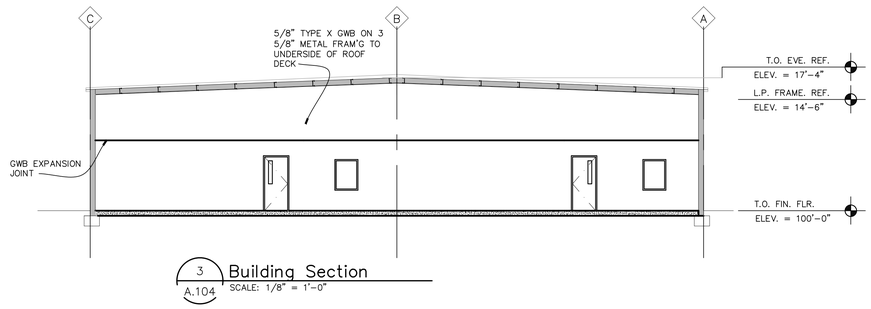
scale as shown

FILE NUMBER

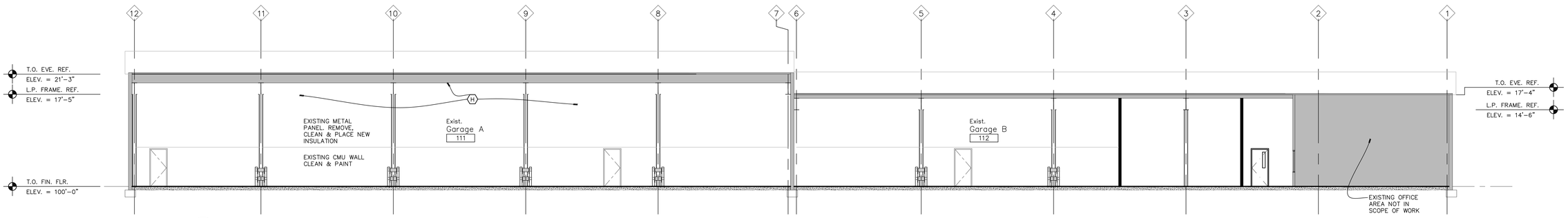
2428

SHEET NUMBER

A.103



3 A.104 Building Section
SCALE: 1/8" = 1'-0"



4 A.104 Building Section
SCALE: 1/8" = 1'-0"

AKA ARCHITECTS 30 YEARS
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ARCHITECTS INC.

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CHECKED	SA
APPROVED	SA

SHEET

Building Sections

scale as shown

FILE NUMBER

2428

SHEET NUMBER

A.104

TEMPERATURE CONTROLS SCHEMATIC SYMBOLS

MS	MOTOR STARTER	CONTACTS - NORMALLY CLOSED	
S/S	START/ STOP RELAY	CONTACTS - NORMALLY OPEN	
CS	CURRENT SWITCH	PUSH BUTTONS - NORMALLY CLOSED	
LS	LIMIT SWITCH	PUSH BUTTONS - NORMALLY OPEN	
R	RELAY	SWITCH - NORMALLY CLOSED TIMING CLOSED	
H	HUMIDITY SENSOR, DUCT MOUNTED	SWITCH - NORMALLY OPEN TIMING CLOSED	
T	TEMPERATURE SENSOR - DUCT MOUNTED RIGID ELEMENT	SWITCH - NORMALLY CLOSED TIMING OPEN	
T	TEMPERATURE SENSOR - RIGID ELEMENT WITH THERMAL WELL	SWITCH - NORMALLY OPEN TIMING OPEN	
DD	DUCT SMOKE DETECTOR	SWITCH - NORMALLY OPEN	
FM	FLOW METER	THERMAL OVERLOAD, SINGLE PHASE	
FS	FLOW SWITCH	TRANSFER SWITCH - TEMPERATURE ACTUATED	
M	DAMPER ACTUATOR	SWITCH - LIMIT- NORMALLY OPEN	
DPT	DIFFERENTIAL PRESSURE TRANSMITTER	SWITCH - LIMIT- NORMALLY CLOSED	
DPS	DIFFERENTIAL PRESSURE SENSOR	HAND/OFF/AUTO SWITCH	HAND OFF AUTO
PS	PRESSURE SWITCH		
T	THERMOSTAT OR TEMPERATURE SENSOR	TRANSFORMER	
T/H	TEMPERATURE & HUMIDITY SENSOR	FUSE	
CO2	CARBON DIOXIDE SENSOR	GROUND	
<>	ALARM & STROBE	MOTOR, SINGLE PHASE	
LEL	FLAMMABILITY SENSOR	VARIABLE FREQUENCY CONTROLLER	VFC
O2	OXYGEN SENSOR	ELECTRICALLY COMMUTATED MOTER	ECM
PS	POWER SUPPLY	DAMPER - PARALLEL BLADE	
AI	ANALOG INPUT - SIGNAL - BAS/EMS/DDC	DAMPER - OPPOSED BLADE	
AO	ANALOG OUTPUT - SIGNAL - BAS/EMS/DDC	GUARD FOR STAT OR SENSOR	
DI	DIGITAL INPUT - SIGNAL - BAS/EMS/DDC	CONTROLLER	C
DO	DIGITAL OUTPUT - SIGNAL - BAS/EMS/DDC	EMERGENCY SHUT-OFF SWITCH	SW
AI	ANALOG INPUT - SIGNAL - BAS/EMS/DDC - PACKAGED EQUIPMENT		
AO	ANALOG OUTPUT - SIGNAL - BAS/EMS/DDC - PACKAGED EQUIPMENT		
DI	DIGITAL INPUT - SIGNAL - BAS/EMS/DDC - PACKAGED EQUIPMENT		
DO	DIGITAL OUTPUT - SIGNAL - BAS/EMS/DDC- PACKAGED EQUIPMENT		

ABBREVIATIONS AND DESCRIPTIONS

A	COMPRESSED AIR	LRA	LOCKED ROTOR AMPS
ACC	AIR COOLED CONDENSER	LTU	LAB AIR TERMINAL UNIT
ACCU	AIR COOLED CONDENSING UNIT	LWB	LEAVING WET BULB
AFF	ABOVE FINISHED FLOOR	LWT	LEAVING WATER TEMPERATURE
AHU	AIR HANDLING UNIT		
ALT	ALTERNATE	MAT	MIXED AIR TEMPERATURE
AMP	AMPERE	MAU	MAKE UP AIR UNIT
APD	AIR PRESSURE DROP	MAX	MAXIMUM
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONING ENGINEERS	MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
		MCA	MINIMUM CIRCUIT AMPACITY
AUX	AUXILIARY	MECH	MECHANICAL
AV	ACID VENT	MFR	MANUFACTURER
AVTR	ACID VENT THROUGH ROOF	MIN	MINIMUM
AW	ACID WASTE	MISC	MISCELLANEOUS
		MMBH	MILLION BRITISH THERMAL UNITS PER HOUR
BAS	BUILDING AUTOMATION SYSTEM	M/S	MOTOR STARTED
BCU	BLOWER COIL UNIT	MV	MANUAL AIR VENT
BDD	BACK DRAFT DAMPER		
BFP	BACK FLOW PREVENTER	NC	NORMALLY CLOSED
BHP	BRAKE HORSE POWER	NC	NOISE CRITERIA
BOD	BOTTOM OF DUCT	NFPA	NATIONAL FIRE PROTECTION AGENCY
BOP	BOTTOM OF PIPE	NIC	NOT IN CONTRACT
BTU	BRITISH THERMAL UNIT	NO	NORMALLY OPEN
BTUH	BRITISH THERMAL UNIT PER HOUR	NPCW	NON POTABLE COLD WATER
C	COMMON	OA	OUTSIDE AIR
CAP	CAPACITY	OAT	OUTSIDE AIR TEMPERATURE
CC	COOLING COIL	OBD	OPPOSED BLADE DAMPER
CD	CONDENSATE DRAIN	OD	OUTSIDE DIAMETER
CFH	CUBIC FEET PER HOUR	ORC	OVERFLOW ROOF CONDUCTOR
CFM	CUBIC FEET PER MINUTE	ORD	OVERFLOW ROOF DRAIN
CH	CHILLER	OS&Y	OUTSIDE SCREW AND YOLK
CHW	CHILLED WATER	OV	OUTLET VELOCITY
CHWS	CHILLED WATER SUPPLY		
CHWR	CHILLED WATER RETURN	PC	PUMPED CONDENSATE
CNDS	CONDENSATE	PCR	PROCESS COOLING RETURN
CO	CLEAN OUT	PCS	PROCESS COOLING SUPPLY
CO2	CARBON DIOXIDE	PD	PRESSURE DROP (FEET OF WATER)
CP	CIRCULATING PUMP	PH	PERIMETER HEAT
CRU	CONDENSATE RETURN UNIT	PHR	PERIMETER HEAT RETURN
CT	COOLING TOWER	PHS	PERIMETER HEAT SUPPLY
CUH	CABINET UNIT HEATER	PRV	PRESSURE REDUCING VALVE
CW	DOMESTIC COLD WATER	PS	PUMPED STORM
CWS	CONDENSER WATER SUPPLY	PSI	POUNDS PER SQUARE INCH
CWR	CONDENSER WATER RETURN	PSIA	POUNDS PER SQUARE INCH - ABSOLUTE
		PSIG	POUNDS PER SQUARE INCH - GAUGE
DAT	DISCHARGE AIR TEMPERATURE	PW	PROCESS WATER
DB	DRY BULB	PWR	PROCESS WATER RETURN
DDC	DIRECT DIGITAL CONTROL	PWS	PROCESS WATER SUPPLY
DEG	DEGREE		
DFU	DRAINAGE FIXTURE UNIT	RA	RETURN AIR
DN	DOWN	RAT	RETURN AIR TEMPERATURE
DNZ	DOWNSPOUT NOZZLE	RC	ROOF CONDUCTOR
DT	DRAIN TILE	RCP	RADIANT CEILING PANEL
DWH	DOMESTIC WATER HEATER	RD	ROOF DRAIN
DX	DIRECT EXPANSION COOLING	RF	RETURN FAN
		RH	RELATIVE HUMIDITY
F	FIRE PROTECTION	RH	ROOF HYDRANT
°F	DEGREES FAHRENHEIT	RL	REFRIGERANT LIQUID
FCU	FAN COIL UNIT	RLFA	RELIEF AIR
FD	FLOOR DRAIN	RPM	REVOLUTIONS PER MINUTE
FLA	FULL LOAD AMPS	RS	REFRIGERANT SUCTION
FP	FIRE PUMP	RTU	ROOFTOP UNIT
FS	FLOOR SINK		
FT	FEET	SA	SUPPLY AIR
FTR	FINNED TUBE RADIATION	SA	SOUND ATTENUATOR
		SAN	SANITARY WASTE
G	NATURAL GAS	SF	SUPPLY FAN
GA	GAUGE	SH	SHOWER
GAL	GALLON	SK	SINK
GRH	GRAVITY RELIEF HOOD	SMR	SNOW MELT RETURN
GPH	GALLON PER HOUR	SMS	SNOW MELT SUPPLY
GPM	GALLON PER MINUTE	SP	STATIC PRESSURE
		SPEC	SPECIFICATION
HB	HOSE BIBB	SQFT	SQUARE FEET
HC	HEATING COIL	S/S	START/STOP
HEPA	HIGH EFFICIENCY PARTICULATE ARRESTANCE	SS	SERVICE SINK
HL	HIGH LIMIT	ST	STORM
HOA	HAND/OFF/AUTO	STM	STEAM
HP	HEAT PUMP	SW	SWITCH
HP	HORSEPOWER		
HPLR	HEAT PUMP LOOP RETURN	TC	TEMPERATURE CONTROL
HPLS	HEAT PUMP LOOP SUPPLY	TC	TEMPERING COIL
HTG	HEATING	TCP	TEMPERATURE CONTROL PANEL
HUV	HORIZONTAL UNIT VENTILATOR	TD	TRENCH DRAIN
HV	HEATING VENTILATION	TEMP	TERMPERATURE
HVAC	HEATING, VENTILATION, AIR CONDITIONING	TSP	TOTAL STATIC PRESSURE
HWH	HOT WATER HEATING	TU	AIR TERMINAL UNIT
HWHR	HOT WATER HEATING RETURN	TYP	TYPICAL
HWHS	HOT WATER HEATING SUPPLY		
HW	DOMESTIC HOT WATER	UH	UNIT HEATER
HWR	DOMESTIC HOT WATER RETURN	UL	UNDERWRITER
HX	HEAT EXCHANGER	UR	URINAL
HZ	HERTZ	UV	UNIT VENTILATOR
ID	INSIDE DIAMETER	V	VENT
IE	INVERT ELEVATION	VAC	VACUUM
IH	INTAKE HOOD	VAV	VARIABLE AIR VOLUME
IN	INCHES	VB	VACUUM BREAKER
IW	INDIRECT WASTE	VFC	VARIABLE FREQUENCY CONTROLLER
		VIF	VERIFY IN FIELD
KW	KILOWATT	VTR	VENT THROUGH ROOF
KWH	KILOWATT HOUR	VUV	VERTICAL UNIT VENTILATOR
LAT	LEAVING AIR TEMPERATURE	W	WASTE
LAV	LAVATORY	WB	WET BULB
LBS	POUNDS	WC	WATER CLOSET
LDB	LEAVING DRY BULB	WC	WATER COLUMN
LL	LOW LIMIT	WH	WALL HYDRANT
LPC	LOW PRESSURE CONDENSATE	WPD	WATER PRESSURE DROP
LPS	LOW PRESSURE STEAM		

SYMBOLS AND NOTATION STANDARDS

	DASHED LINES INDICATE PIPING ROUTED BELOW SLAB OR GRADE	FINNED TUBE ELEMENT LENGTH FINNED TUBE ELEMENT HEAT IN MBH GALLONS PER MINUTE FOR ELEMENT	FTR A X - 'X' X MBH X GPM
	HATCH MARKS INDICATE EQUIPMENT OR MATERIALS TO BE DISCONNECTED AND REMOVED	SUPPLY DIFFUSER TYPE 1 (SCHEDULED) 8" DIAMETER NECK SIZE TWO DIFFUSERS WITH 100 CFM	S-1 8Ø 100-2
	LIGHT LINE WEIGHT INDICATES EXISTING EQUIPMENT OR REFERENCED INFORMATION		
	HEAVY LINE WEIGHT INDICATES NEW WORK		
	MANUAL VOLUME DAMPER	EQUIPMENT TAG	X X
FD	FIRE DAMPER DYNAMIC; VERTICAL OR HORIZONTAL	CONSTRUCTION NOTES	X
SD	SMOKE DAMPER; VERTICAL OR HORIZONTAL	THERMOSTAT/ TEMPERATURE SENSOR	T
		NEW CONNECTION	
	COMBINATION FIRE & SMOKE DAMPER; HORIZONTAL	EXHAUST/RETURN/TRANSFER ARROW	
		SUPPLY ARROW	
	COMBINATION FIRE & SMOKE DAMPER; VERTICAL	BLANK OFF SECTION	
		PIPE ENDCAP	
	TRANSITION; SYMMETRIC	VENT THROUGH ROOF	VTR
		PIPE ELBOW DOWN	
	TRANSITION; ASYMMETRIC	PIPE ELBOW UP	
		BACKFLOW PREVENTER	BFP
	90 DEG RADIUS ELBOW (R/W = 1.5)	ISOLATION VALVE	
		BALANCE VALVE	
		BALANCE VALVE WITH FLOW MEASURING	
	MITERED ELBOW WITH TURNING VANES	CONTROL VALVE	
		BALL VALVE	
		GAS VALVE (MANUAL)	
	TEE, BOOT ENTRY BRANCH	PIPE CONTINUATION	
		PRESSURE REGULATING VALVE	
		OUTSIDE STEM AND YOKE VALVE	
	TEE, ROUND BRANCH	OUTSIDE STEM AND YOKE VALVE WITH TAMPER SWITCH	TS
		CHECK VALVE	
		PIPE FLEXIBLE CONNECTION	
		PIPE UNION	
	TEE, CONICAL ROUND BRANCH	CLEAN OUT - PIPE FLANGE	CO
		CLEAN OUT - IN FLOOR	CO
		PUMP	
	CEILING MOUNTED RETURN GRILLE / REGISTER	HOSE BIBB	HB
		WALL HYDRANT	WH
	CEILING MOUNTED SUPPLY DIFFUSER/GRILLE	WATER METER	M
		FLOOR DRAIN/ SINK	
	CEILING MOUNTED EXHAUST GRILLE/REGISTER	FLOW MEASURING DEVICE	
		THERMOMETER	
24x12	INTERIOR CLEAR DUCTWORK DIMENSIONS; WIDTHxHEIGHT	PRESSURE GAUGE AND COCK	
12Ø	INTERIOR CLEAR DUCTWORK DIMENSIONS-ROUND; DIAMETER	AIR VENT - MANUAL	MV
24/12 OR 24x12Ø	INTERIOR CLEAR DUCTWORK DIMENSIONS-OVAL; WIDTHxHEIGHT	AIR VENT - AUTOMATIC	AV
	SUPPLY AIR DUCT UP	PRESSURE RELIEF VALVE	
	SUPPLY AIR DUCT DOWN	STRAINER WITH HOSE CONNECTION	
	RETURN AIR DUCT UP	STRAINER	
	RETURN AIR DUCT DOWN	REDUCER - CONCENTRIC	
	EXHAUST AIR DUCT UP	REDUCER - ECCENTRIC	
	EXHAUST AIR DUCT DOWN	FUNNEL FLOOR DRAIN - ELEVATION (DETAILS)	
	FLEXIBLE DUCT	FLOOR DRAIN -ELEVATION (DETAIL)	
	AIR TERMINAL UNIT WITH HOT WATER COIL	ACCESS DOOR	
	AIR TERMINAL UNIT WITH ELECTRIC COIL	FLEXIBLE CONNECTOR	
		VARIABLE FREQUENCY CONTROLLER	VFC
		AUTOFLOW VALVE	

1 M-001 ZONING PLAN
3/32" = 1'-0"

N

SHEET LIST - MECHANICAL

Sheet Number	Sheet Name
M-001	INDEX, SYMBOLS, & ABBREVIATIONS
M-002	STANDARD MATERIALS SCHEDULES
M-003	SPECIFICATIONS
M-004	SPECIFICATIONS
M-014	MECHANICAL DEMOLITION PLAN
M-100	FIRE PROTECTION
M-200	PLUMBING PLANS
M-400	MECHANICAL PLAN
M-500	DETAILS
M-600	DIAGRAMS
M-700	SCHEDULES

DESIGN CONDITIONS

	OUTSIDE AIR	RETURN AIR
COOLING DB (°F)	90.3	75
COOLING WB (°F)	73.4	--
HEATING DB (°F)	0	72
CLIMATE ZONE		5A

NOTE: DESIGN CONDITIONS BASED ON ASHRAE 2013 CLIMATIC DESIGN INFORMATION

GREENPATH DESIGN
www.greenpath.design
139 W Liberty St.
Plymouth, MI 48170
Phone: (248) 310-7286

AKA
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PROJECT
NOTA TRANSIT TERMINAL

675 S. GLASPIE ST.
OXFORD, MI 48371

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DRAWN: Author
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APPROVED: Approver

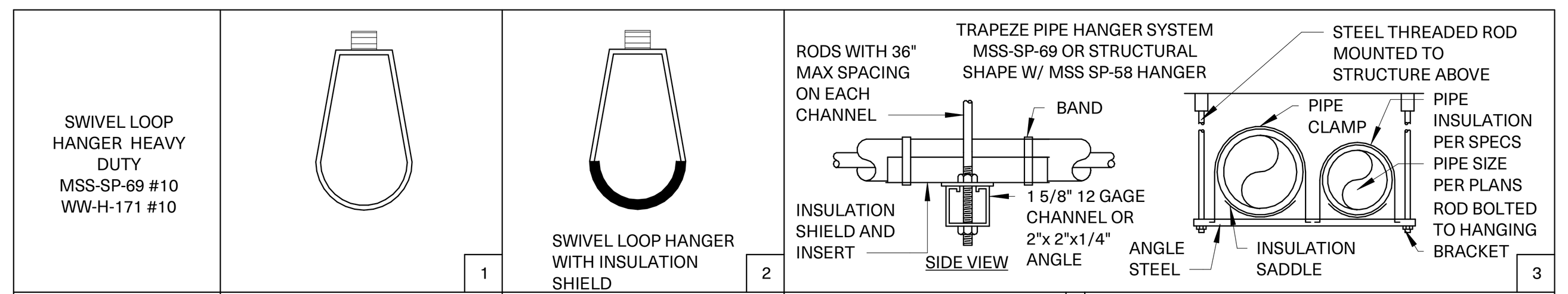
SHEET
INDEX, SYMBOLS, & ABBREVIATIONS

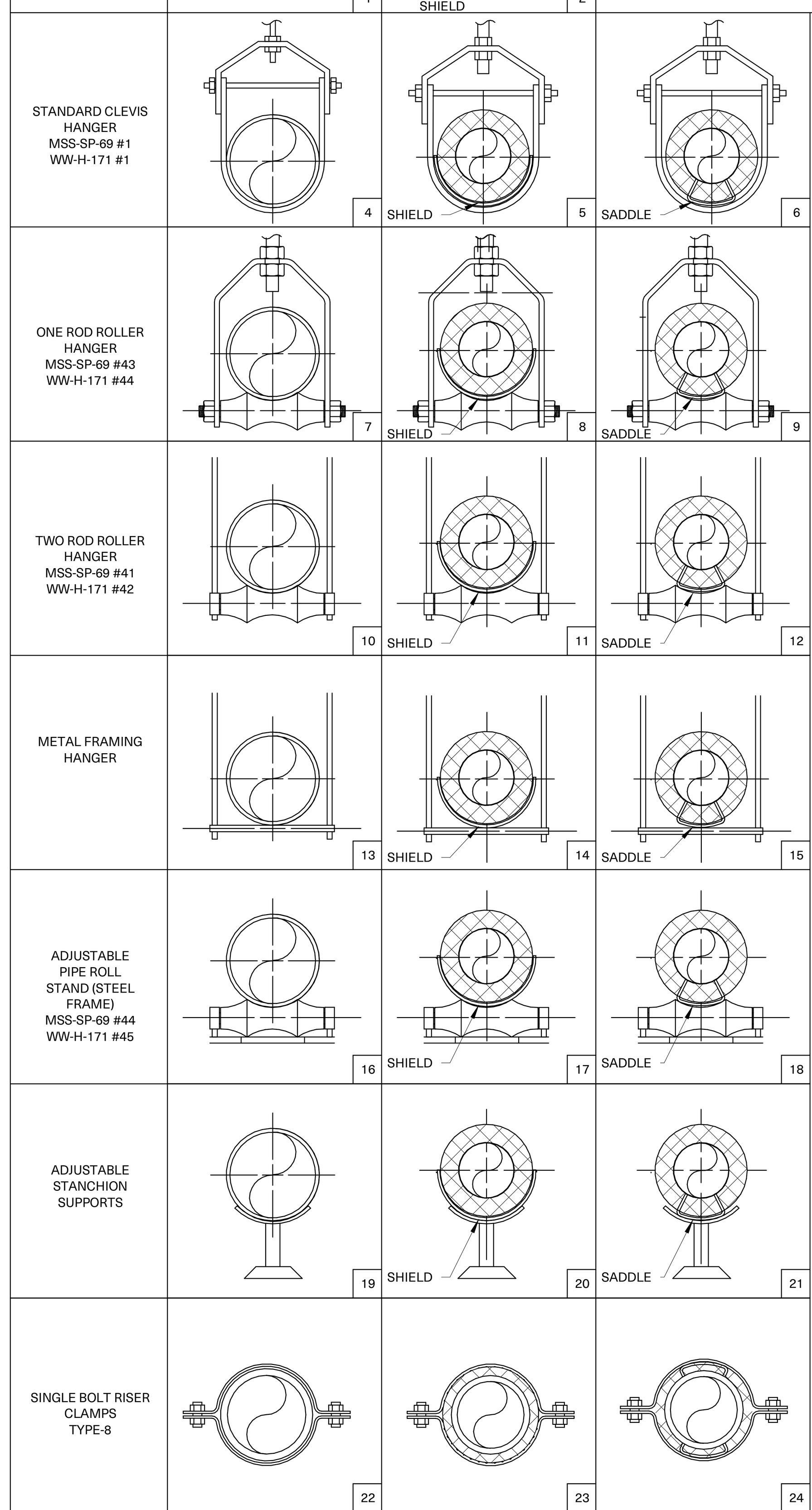
FILE NUMBER
2024-0074

SHEET NUMBER
M-001

STATE OF MICHIGAN
KELLY B. SUGG
ENGINEER
No. 6201061005
LICENSED PROFESSIONAL ENGINEER

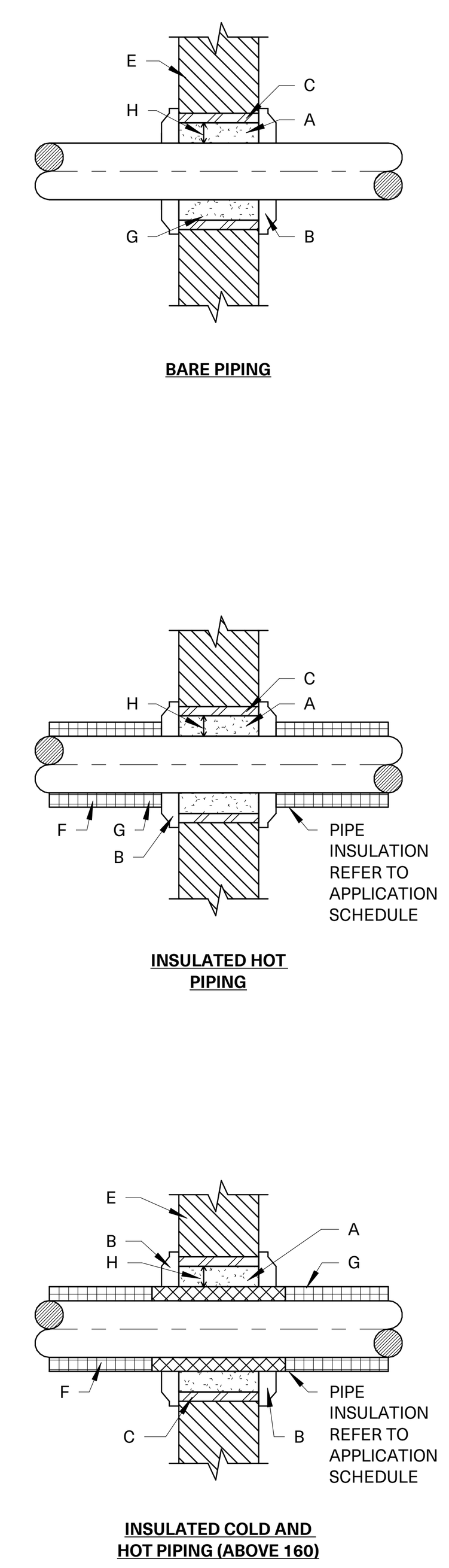
PROJ. NO 2024-0074
3/12/2025 10:24:17 PM

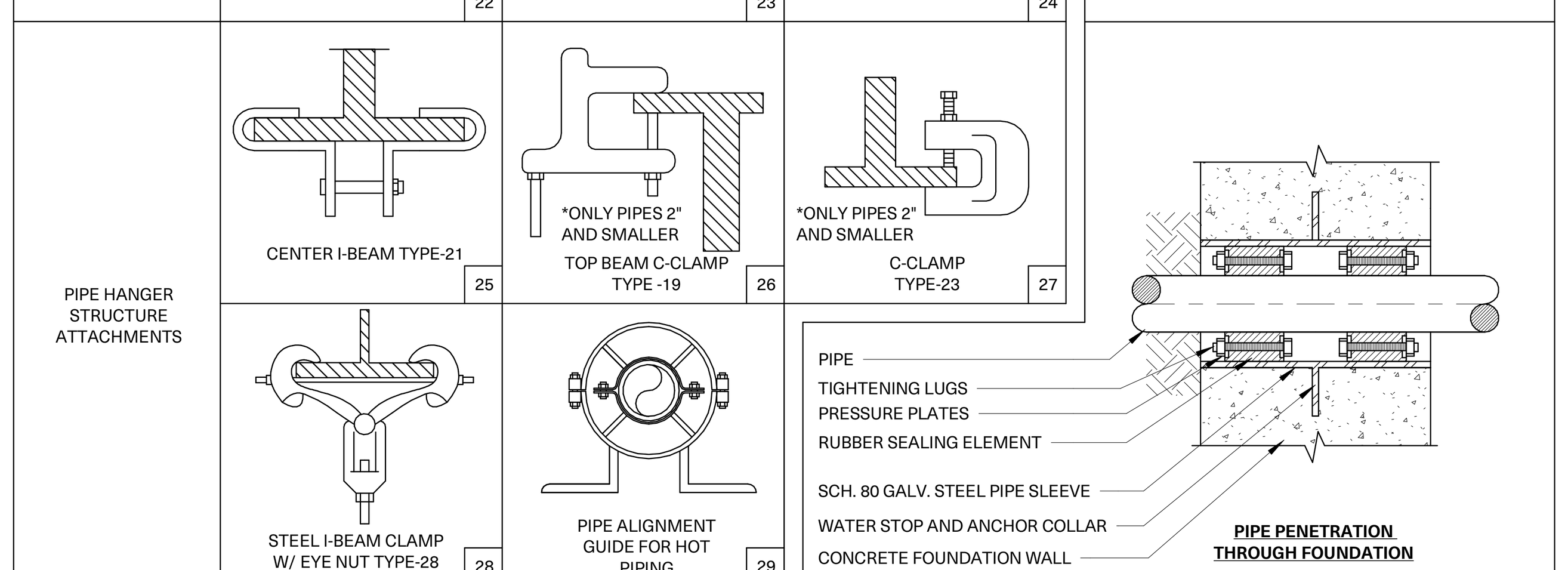


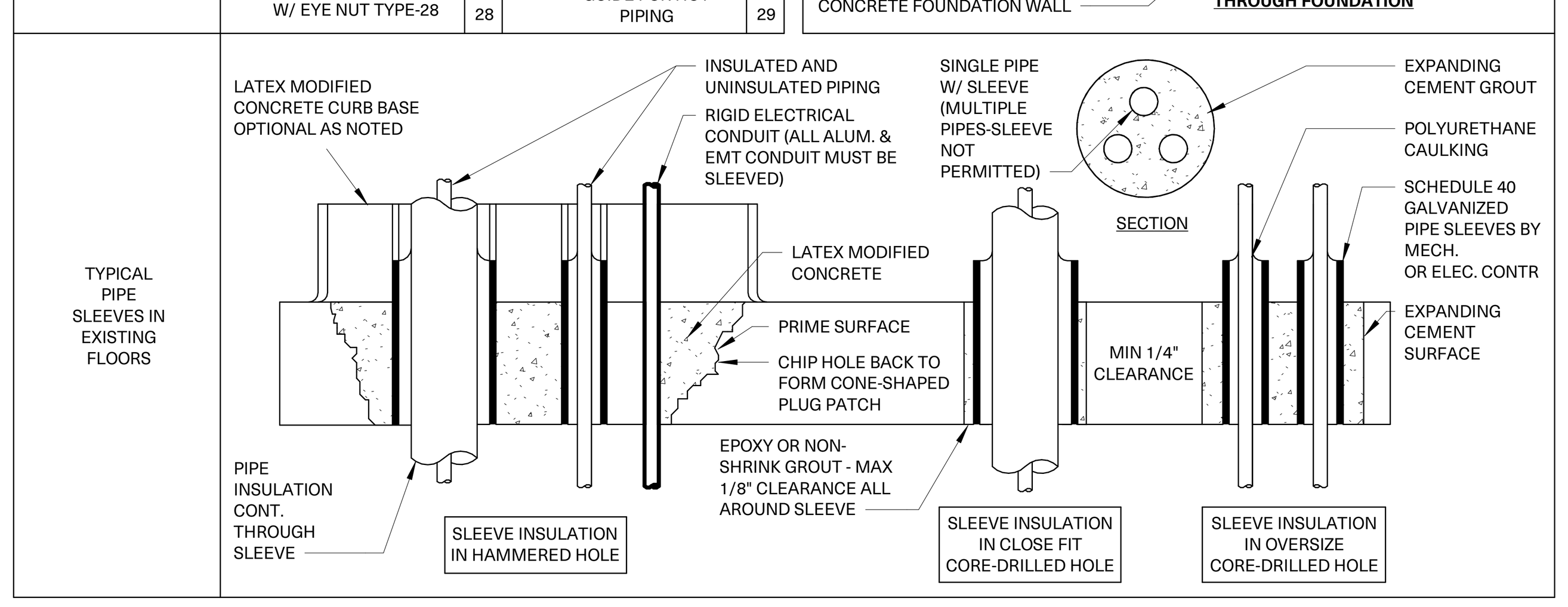


FIRE RATED PIPE PENETRATION DETAILS (BELOW)

A. PACK ALL SPACES FULL DEPTH WITH MINERAL WOOL OR OTHER EQUALLY APPROVED FIRE RESISTIVE MATERIAL.
B. ESCUTCHEON BOTH SIDES.
C. SLEEVE
D. ANHYDROUS CALCIUM SILICATE INSULATION THROUGH SLEEVE.
E. FIRE RATED PARTITION, BARRIER, WALL, OR FLOOR.
F. INSULATION, REFER TO APPLICATION SCHEDULE
G. TERMINATE INSULATION AT ESCUTCHEON.
H. MAX 1/2" CLEARANCE BETWEEN INSIDE OF SLEEVE AND PIPE.







PIPING APPLICATION SCHEDULE

SIZE

PIPING SYSTEM	PIPE SYSTEM PRESSURE	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	6
ABOVEGROUND DOMESTIC WATER	125 PSIG	X	X	X	X						
ABOVEGROUND DOMESTIC WATER	125 PSIG					X	X				
ABOVEGROUND DOMESTIC WATER	125 PSIG							X	X		
ABOVEGROUND DOMESTIC WATER	125 PSIG									X	
ABOVEGROUND DOMESTIC WATER	125 PSIG										X
ABOVEGROUND SANITARY WASTE & VENT	10 FT HD					X	X				
ABOVEGROUND SANITARY WASTE & VENT	10 FT HD							X	X		
ABOVEGROUND SANITARY WASTE & VENT	10 FT HD									X	
ABOVEGROUND SANITARY WASTE & VENT	10 FT HD										X
UNDERGROUND SANITARY WASTE AND VENT	10 FT HD					X	X	X	X	X	X
ABOVEGROUND FUEL GAS	125 PSIG	X	X	X	X	X	X				
ABOVEGROUND FUEL GAS	125 PSIG							X	X		
ABOVEGROUND FUEL GAS	125 PSIG									X	
ABOVEGROUND FUEL GAS	125 PSIG										X
UNDERGROUND FUEL GAS	125 PSIG	X	X	X	X	X	X	X	X	X	X
ABOVEGROUND PUMPED COLD CONDENSATE	125 PSIG	X	X	X	X	X	X				
ABOVEGROUND INDIRECT SANITARY WASTE	10 FT HD	X	X	X	X	X	X				
ABOVEGROUND COLD CONDENSATE	10 FT HD	X	X	X	X	X	X				
REFRIGERANT LIQUID AND HOT GAS	125 PSIG	X	X	X	X	X	X				
FIRE SUPPRESSION	150 PSIG			X	X	X	X				
FIRE SUPPRESSION	150 PSIG							X	X		
FIRE SUPPRESSION	150 PSIG									X	
FIRE SUPPRESSION	150 PSIG										X
FIRE SUPPRESSION	150 PSIG										

MATERIAL

PIPING SYSTEM	COPPER TYPE L	COPPER TYPE K	COPPER DWV	CARBON STEEL SCH. 40	CARBON STEEL SCH. 80	GALVANIZED STEEL (SCH. 40)	POLYPROPYLENE	POLYETHYLENE	PVC SCH. 40	CPVC	HDPE	PEX	NO HUB CISP	STD. BALCK STEEL	CPVC FIRE
ABOVEGROUND DOMESTIC WATER	X														
ABOVEGROUND DOMESTIC WATER	X														
ABOVEGROUND DOMESTIC WATER	X														
ABOVEGROUND DOMESTIC WATER	X														
ABOVEGROUND DOMESTIC WATER	X														
ABOVEGROUND SANITARY WASTE & VENT									X				X		
ABOVEGROUND SANITARY WASTE & VENT									X				X		
ABOVEGROUND SANITARY WASTE & VENT									X				X		
ABOVEGROUND SANITARY WASTE & VENT									X				X		
UNDERGROUND SANITARY WASTE AND VENT									X				X		
ABOVEGROUND FUEL GAS														X	
ABOVEGROUND FUEL GAS														X	
ABOVEGROUND FUEL GAS														X	
ABOVEGROUND FUEL GAS														X	
UNDERGROUND FUEL GAS								X							
ABOVEGROUND PUMPED COLD CONDENSATE	X								X						
ABOVEGROUND INDIRECT SANITARY WASTE	X		X						X						
ABOVEGROUND COLD CONDENSATE	X		X						X						
REFRIGERANT LIQUID AND HOT GAS	X														
FIRE SUPPRESSION														X	
FIRE SUPPRESSION														X	
FIRE SUPPRESSION														X	
FIRE SUPPRESSION														X	
FIRE SUPPRESSION														X	

PRESSURE CONNECTION / GRAVITY CONNECTION

PIPING SYSTEM	SOLDERED	BRAZED	WELDED	FLANGED	THREADED	SOLVENT WELDED	MECHANICALLY JOINT	GROOVED	FUSION	GRAVITY: SOLDERED	SOLVENT WELD	CISP HUBLESS	HEAVY DUTY HUBLESS
ABOVEGROUND DOMESTIC WATER	X			X									
ABOVEGROUND DOMESTIC WATER	X			X									
ABOVEGROUND DOMESTIC WATER	X			X				X					
ABOVEGROUND DOMESTIC WATER	X			X				X					
ABOVEGROUND DOMESTIC WATER	X			X				X					
ABOVEGROUND SANITARY WASTE & VENT											X	X	
ABOVEGROUND SANITARY WASTE & VENT											X	X	
ABOVEGROUND SANITARY WASTE & VENT											X	X	
ABOVEGROUND SANITARY WASTE & VENT											X	X	
UNDERGROUND SANITARY WASTE AND VENT											X		X
ABOVEGROUND FUEL GAS			X		X								
ABOVEGROUND FUEL GAS			X		X								
ABOVEGROUND FUEL GAS			X	X									
ABOVEGROUND FUEL GAS			X	X									
UNDERGROUND FUEL GAS									X				
ABOVEGROUND PUMPED COLD CONDENSATE	X	X				X							
ABOVEGROUND INDIRECT SANITARY WASTE										X	X		
ABOVEGROUND COLD CONDENSATE										X	X		
REFRIGERANT LIQUID AND HOT GAS		X											
FIRE SUPPRESSION					X			X					
FIRE SUPPRESSION			X	X				X					
FIRE SUPPRESSION			X	X				X					
FIRE SUPPRESSION			X	X				X					
FIRE SUPPRESSION			X	X				X					

ISOLATION VALVE / INSULATION MATERIAL

PIPING SYSTEM	BALL	BUTTERFLY	HIGH PERF. BUTTERFLY	GAS BALL VALVE	LUBRICATED PLUG	FIBERGLASS	FLEXIBLE ELASTOMERIC	MINERAL WOOL	CALCIUM SILICATE	POLYISOCYANURATE	PHENOLIC	CELLULAR GLASS
ABOVEGROUND DOMESTIC WATER	X					X	X					
ABOVEGROUND DOMESTIC WATER	X					X	X					
ABOVEGROUND DOMESTIC WATER		X				X	X					
ABOVEGROUND DOMESTIC WATER		X				X	X					
ABOVEGROUND DOMESTIC WATER		X				X	X					
ABOVEGROUND SANITARY WASTE & VENT												
ABOVEGROUND SANITARY WASTE & VENT												
ABOVEGROUND SANITARY WASTE & VENT												
ABOVEGROUND SANITARY WASTE & VENT												
UNDERGROUND SANITARY WASTE AND VENT												
ABOVEGROUND FUEL GAS				X								
ABOVEGROUND FUEL GAS				X								
ABOVEGROUND FUEL GAS					X							
ABOVEGROUND FUEL GAS					X							
UNDERGROUND FUEL GAS												
ABOVEGROUND PUMPED COLD CONDENSATE	X					X	XX					
ABOVEGROUND INDIRECT SANITARY WASTE												
ABOVEGROUND COLD CONDENSATE						X	XX					
REFRIGERANT LIQUID AND HOT GAS							X					
FIRE SUPPRESSION												
FIRE SUPPRESSION												
FIRE SUPPRESSION												
FIRE SUPPRESSION												
FIRE SUPPRESSION												

INSULATION THICKNESS, IN / MINIMUM R-VALUE / FIELD APPLIED JACKETING

PIPING SYSTEM	1/2	3/4	1	1 1/2	2	2 1/2	3	MINIMUM R-VALUE	PVC	ALUMINUM	SELF ADHESIVE	STAINLESS STEEL
ABOVEGROUND DOMESTIC WATER			X					3.5	X	X		
ABOVEGROUND DOMESTIC WATER				X				5	X	X		
ABOVEGROUND DOMESTIC WATER				X				5	X	X		
ABOVEGROUND DOMESTIC WATER				X				5	X	X		
ABOVEGROUND DOMESTIC WATER				X				5	X	X		
ABOVEGROUND SANITARY WASTE & VENT												
ABOVEGROUND SANITARY WASTE & VENT												
ABOVEGROUND SANITARY WASTE & VENT												
ABOVEGROUND SANITARY WASTE & VENT												
UNDERGROUND SANITARY WASTE AND VENT												
ABOVEGROUND FUEL GAS												
ABOVEGROUND FUEL GAS												
ABOVEGROUND FUEL GAS												
ABOVEGROUND FUEL GAS												
UNDERGROUND FUEL GAS												
ABOVEGROUND PUMPED COLD CONDENSATE		XX	X					3.5				
ABOVEGROUND INDIRECT SANITARY WASTE												
ABOVEGROUND COLD CONDENSATE		XX	X					3.5				
REFRIGERANT LIQUID AND HOT GAS			X					3.5				
FIRE SUPPRESSION												
FIRE SUPPRESSION												
FIRE SUPPRESSION												
FIRE SUPPRESSION												
FIRE SUPPRESSION												

SUPPORT

PIPING SYSTEM	HANGER FIGURE NUMBER: LESS THAN 1/4" MOVEMENT	HANGER FIGURE NUMBER: GREATER THAN 1/4" OF MOVEMENT	HANGER FIGURE NUMBER: VERTICAL	SUPPORT: LESS THAN 1/4" MOVEMENT	SUPPORT: GREATER THAN 1/4" OF MOVEMENT	MAX SPACING HORIZONTAL, FT	MAX SPACING VERTICAL, FT	ROD DIAMETER	KEYED NOTES
ABOVEGROUND DOMESTIC WATER	2/5	2/5	23	20	17	6	10	3/8	A, E
ABOVEGROUND DOMESTIC WATER	2/5	2/5	23	20	17	6	10	3/8	A, E
ABOVEGROUND DOMESTIC WATER	5	8	23	20	17	10	10	1/2	A, E
ABOVEGROUND DOMESTIC WATER	5	8	23	20	17	10	10	5/8	A, E
ABOVEGROUND DOMESTIC WATER	5	8	23	20	17	10	10	3/4	A, E
ABOVEGROUND SANITARY WASTE & VENT	1/4	1/4	22	19	16	4	10	3/8	D, F, G
ABOVEGROUND SANITARY WASTE & VENT	4	7	22	19	16	4	10	1/2	D, F, G
ABOVEGROUND SANITARY WASTE & VENT	4	7	22	19	16	4	10	5/8	D, F, G
ABOVEGROUND SANITARY WASTE & VENT	4	7	22	19	16	4	10	3/4	D, F, G
UNDERGROUND SANITARY WASTE AND VENT	-	-	-	-	-	-	-	-	G
ABOVEGROUND FUEL GAS	1/4	1/4	22	19	16	12	15	3/8	B
ABOVEGROUND FUEL GAS	4	7	22	19	16	12	15	1/2	B
ABOVEGROUND FUEL GAS	4	7	22	19	16	12	15	5/8	B
ABOVEGROUND FUEL GAS	4	7	22	19	16	12	15	3/4	B
UNDERGROUND FUEL GAS	-	-	-	-	-	-	-	-	C
ABOVEGROUND PUMPED COLD CONDENSATE	2/5	2/5	23	20	17	12	10	3/8	
ABOVEGROUND INDIRECT SANITARY WASTE	1/4	1/4	22	19	16	12	10	3/8	D
ABOVEGROUND COLD CONDENSATE	2/5	2/5	23	20	17	4	10	3/8	D
REFRIGERANT LIQUID AND HOT GAS	2/5	2/5	23	20	17	12	10	3/8	H
FIRE SUPPRESSION	1/4	1/4	22	19	16	12	10	3/8	
FIRE SUPPRESSION	4	7	22	19	16	12	10	1/2	
FIRE SUPPRESSION	4	7	22	19	16	12	10	5/8	
FIRE SUPPRESSION	4	7	22	19	16	12	10	3/4	
FIRE SUPPRESSION	13	10	22	19	16	12	10	3/4	

GENERAL NOTES:

1. EACH ACCEPTABLE MATERIAL IS INDICATED WITH AN "X". IF MORE THAN ONE IS SELECTED, THE CONTRACTOR HAS THE OPTION TO CHOOSE BETWEEN SELECTED MATERIALS.
2. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
3. EQUIPMENT CONNECTIONS SHALL BE EITHER GROOVED OR FLANGED OR USE UNIONS.
4. EQUIPMENT DRAINS, RELIEF VALVES, AND VENTS SHALL BE THE SAME MATERIAL AS PIPING SYSTEM.
5. DISSIMILAR METAL PIPING JOINTS SHALL USE DIELECTRIC FITTINGS COMPATIBLE WITH BOTH MATERIALS.
6. ALL INSULATING MATERIALS, THICKNESS, AND THERMAL RESISTANCE SHALL COMPLY WITH THE INTERNATIONAL ENERGY CONSERVATION CODE 2015 OR ASHRAE STANDARD 90.1-2013.
7. INSULATION IS NOT REQUIRED FOR STRAINERS, CONTROL VALVE BODIES, AND BALANCE VALVES ASSOCIATED WITH PIPING 1 INCH AND SMALLER.
8. INSULATION IS NOT REQUIRED FOR PIPING CONVEYING FLUIDS OPERATING BETWEEN 60°F AND 105°F AND DIRECT BURIED PIPING CONVEYING FLUIDS AT OR BELOW 60°F.
9. PIPE HANGER SPACING IS BASED ON WORST CASE ALLOWED MATERIAL. HANGER SPACING FOR SELECTED MATERIAL SHALL COMPLY WITH CURRENT PLUMBING AND MECHANICAL CODE OR APPROVED BY AHJ.

KEYED NOTES:

A. GROOVED FITTINGS SHALL ONLY BE USED IN ACCESSIBLE SPACE(S) (I.E. MECHANICAL ROOMS OR ABOVE LAY-IN CEILINGS).
B. FUEL GAS PIPING LOCATED WITHIN RETURN AIR PLENUM SHALL BE WELDED. VALVES, FLANGES, AND UNIONS ARE PROHIBITED.
C. NO JOINTS ALLOWED UNDERGROUND.
D. PLASTIC PIPE SHALL NOT BE USED IN RETURN AIR PLENUMS. CONTRACTOR SHALL PROVIDE FIRE RATED INSULATION OR GYPSUM ENCLOSURE WHEN ROUTED THROUGH A PLENUM SPACE.
E. PROVIDE INSULATION JACKETS FOR ALL AREAS SUSCEPTABLE FOR DAMAGE INCLUDING BUT NOT LIMITED TO MECHANICAL ROOMS, EQUIPMENT ROOMS, JANITOR CLOSET, RECIEVING. JACKETS SHALL BE INSTALLED UP TO 10 FEET ABOVE FINISHED FLOOR.
F. THE MAXIMUM HORIZONTAL SPACING OF PIPE HANGERS SHALL BE INCREASED TO 10 FEET WHERE 10 FOOT LENGTHS ARE INSTALLED.
G. WASTE PIPING RECIEVING WATER ABOVE 120 DEG SHALL BE METAL.
H. PROVIDE PROTECTIVE COATING FOR INSULATION LOCATED OUTDOORS.
I. INSULATE EXTERIOR PIPE & PROVIDE ALUMINUM JACKET.

LOW PRESSURE DUCTWORK JOINT AND SUPPORT SCHEDULE

RECTANGULAR JOINT CONSTRUCTION											RECTANGULAR HANGERS AND SUPPORTS							ROUND HANGERS AND SUPPORTS				
STEEL GAUGE	MINIMUM DUCT SIZE	MAXIMUM DUCT SIZE	PLAIN "S" SLIP	DRIVE SLIP	HEMMED "S" SLIP	FLANGED WITH GASKET	STANDING DRIVE SLIP	STANDING S	STANDING S (BAR REINFORCED)	STANDING S (ANGLE REINFORCED)	MAXIMUM HALF OF DUCT PERIMETER	GALVANIZED SHEET STEEL STRAPS	LOAD RATED CABLE	GALVANIZED THREADED STEEL ROD	MAXIMUM SPACING FT	WIRE/ ROD DIAMETER	STRAP WIDTH AND GAUGE	DIAMETER	MAXIMUM SPACING FT	WIRE DIAMETER	ROD DIAMETER	STRAP WIDTH AND GAUGE
24	4	12	X	X	X		X	X			P/2=30"	X		X	10	10 ga	1' x 22 ga	10	12	12 ga	1/4"	1' x 22 ga
24	13	18	X	X	X		X	X			P/2=72"	X		X	10	3/8"	1' x 18 ga	11-18	12	8 ga	1/4"	1' x 22 ga
24	19	30	X	X	X		X	X			P/2=96"	X		X	10	3/8"	1' x 16 ga	19-24	12	(2) 10 ga	1/4"	1' x 22 ga
22	31	42				X	X	X	X	X	P/2=120"	X		X	10	1/2"	1 1/2' x 16 ga	25-36	12	(2) 8 ga	3/8"	1' x 20 ga
22	43	54				X	X	X	X	X	P/2=168"	X		X	10	1/2"	1 1/2' x 16 ga	37-50	12	-	(2) 3/8"	(2) 1' x 20 ga
20	55	60				X	X	X	X	X	P/2=192"	X		X	10	1/2"	-	51-60	12	-	(2) 3/8"	(2) 1' x 18 ga

GENERAL NOTES:

1. JOINT CONSTRUCTION SHALL COMPLY WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE AND NAIMA FIBROUS GLASS DUCT CONSTRUCTION STANDARDS.
2. "X" NOTES ALLOWED JOINT CONSTRUCTION AND SUPPORT TYPE.
3. HANGERS AND SUPPORTS SHALL COMPLY WITH CHAPTER 5 SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE AND LOCAL CODE AUTHORITY HAVING JURSIDICTION.
4. REFER TO SMACNA FOR JOINT GAUGE, BRACING, TRANVERSE REINFORCEMENT, AND JOINT REINFORCEMENT REQUIREMENTS.
5. ROUND METALLIC DUCTS SHALL BE MECHANICALLY FASTENED WITH A MINIMUM OF THREE (3) SHEET METAL SCREWS OR RIVETS EQUALLY SPACED.

DUCT APPLICATION SCHEDULE

DUCT MATERIAL

AIR SYSTEMS	G90 GALV. SHEET METAL	G90 GALV. SHEET METAL W/ 1" DUCT LINER	ALUMINUM	TYPE 304 STAINLESS STEEL	FABRIC	DOUBLE WALL LINED G90 GALV. W/ SOLID INNER	DOUBLE WALL LINED G90 GALV. W/ PERF. INNER	14 GAUGE CARBON STEEL	PVC COATED G90 GALV SHEET METAL	UL 1978 PRE-FAB ZERO-CLEARANCE GREASE DUCT	RIGID PHENOLIC PRE-INSULATED DUCT	MAXIMUM AIR VELOCITY, FPM	MAX FRICTION LOSS (IN. WG.)	DESIGN PRESSURE CLASS (IN. WG.)	MAXIMUM ALLOWABLE LEAKAGE (%)	SEAL CLASS
LOW PRESSURE SUPPLY		X				X						1000	0.1	+2	5	A
LOW PRESSURE SUPPLY	X											1000	0.1	+2	5	A
LOW PRESSURE SUPPLY	X											1000	0.1	+2	5	A
LOW PRESSURE SUPPLY	X											1000	0.1	+2	5	A
LOW PRESSURE EXHAUST	X											1000	0.1	-2	5	A
LOW PRESSURE RETURN		X				X						1000	0.1	-2	5	A
LOW PRESSURE RETURN	X											1000	0.1	-2	5	A
LOW PRESSURE RETURN	X											1000	0.1	-2	5	A
LOW PRESSURE RETURN	X											1000	0.1	-2	5	A
AIR TRANSFER DUCT		X										500	0.05	+2	5	A
LOW PRESSURE OUTSIDE AIR AND MIXED AIR	X											1000	0.1	-2	5	A
LOW PRESSURE PLENUMS ADJACENT TO EXTERIOR						X						1000	0.1	+/-2	5	A
LOW PRESSURE EXHAUST (DAMPER TO EXTERIOR)	X						X					1000	0.1	+/-2	5	A

DUCT LOCATION / INSULATION MATERIAL/THICKNESS (INCH) / FIELD APPLIED JACKET

AIR SYSTEMS	EXPOSED (SERVING SPACE)	EXPOSED (NOT SERVING SPACE)	ABOVE CEILING/ CONCEALED/ OUTSIDE THE SPACE SERVED	MECHANICAL ROOM	NATATORIUM/ HIGH HUMIDITY	OUTDOOR/ ATTIC	FIBERGLASS BLANKET	FIBERGLASS BOARD	FLEXIBLE ELASTOMERIC	ASTM E2336 2-HOUR FIRE BLANKET	2-HOUR FIRE BLANKET	MINIMUM THERMAL RESISTANCE R-VALUE	ALUMINUM	SELF-ADHERED CLADDING	FULLY ADHERED TPO ROOFING	NOTES
LOW PRESSURE SUPPLY		X														
LOW PRESSURE SUPPLY	X															
LOW PRESSURE SUPPLY			X	X			1.5	1.5				4.7				
LOW PRESSURE SUPPLY						X	3	3	2			8	X	X	X	PROVIDE PROTECTIVE COATING FOR FLEXIBLE ELASTOMERIC INSULATION
LOW PRESSURE EXHAUST	X		X	X		X										
LOW PRESSURE RETURN		X														
LOW PRESSURE RETURN	X		X													RETURN AIR PLENUM; PROVIDE LINED DUCTWORK FOR THE FIRST 15 FEET FROM AHU
LOW PRESSURE RETURN						X	3	3	2			8	X	X	X	PROVIDE PROTECTIVE COATING FOR FLEXIBLE ELASTOMERIC INSULATION
LOW PRESSURE RETURN			X	X			1.5	1.5				4.7				DUCTED RETURN; PROVIDE LINED DUCTWORK FOR THE FIRST 15 FEET FROM AHU
AIR TRANSFER DUCT			X	X												
LOW PRESSURE OUTSIDE AIR AND MIXED AIR	X		X	X			1.5	1.5				4.7				
LOW PRESSURE PLENUMS ADJACENT TO EXTERIOR	X		X	X			1.5	1.5				4.7				
LOW PRESSURE EXHAUST (DAMPER TO EXTERIOR)	X		X	X			1.5	1.5				4.7				

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PROJECT
NOTA TRANSIT TERMINAL

675 S. GLASPIE ST.
OXFORD, MI 48371

DATE ISSUED	ISSUED FOR
06.10.2025	CM RFP

DRAWN	Author
CHECKED	Checker
APPROVED	Approver

STATE OF MICHIGAN ★ KELLY B. SUGG ENGINEER No. 6201061005 LICENSED PROFESSIONAL ENGINEER

SHEET
STANDARD MATERIALS SCHEDULES

FILE NUMBER
2024-0074

SHEET NUMBER
M-002

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SECTION 20 05 00 - MECHANICAL AND PLUMBING GENERAL REQUIREMENTS

1.01 WORK INCLUDED
A. THE WORK INCLUDED BY THIS DIVISION OF THE SPECIFICATIONS INCLUDES FURNISHING ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICES, INCLUDING MINOR ITEMS OMITTED BUT NECESSARY TO CONSTRUCT AND INSTALL THE COMPLETE SYSTEMS DESCRIBED BY THE CONTRACT DOCUMENTS AND SPECIFIED BELOW. "CONTRACTOR" REFERS TO THE MECHANICAL/PLUMBING CONTRACTOR. THE GENERAL CONDITIONS OF THE SPECIFICATIONS APPLY AND ARE INCLUDED IN THIS PART OF THIS SECTION.

1.02 CODES AND REGULATIONS
A. COMPLY WITH STATE AND LOCAL CODES, AND UTILITY COMPANY REGULATIONS. FINAL INTERPRETATIONS WILL BE MADE BY THE LOCAL INSPECTION AUTHORITY. THE CONTRACTOR TO VERIFY THE GOVERNANCE OF THE FOLLOWING CODES, INCLUDING ANY LOCAL AMENDMENTS AND SUPPLEMENTARY CODES SUCH AS THE CODES OF THE NATIONAL FIRE PROTECTION ASSOCIATION:
1. BUILDING CODE: 2015 MICHIGAN BUILDING CODE
2. PLUMBING CODE: 2018 MICHIGAN PLUMBING CODE
3. MECHANICAL CODE: 2015 MICHIGAN MECHANICAL CODE
4. FIRE CODE: 2015 INTERNATIONAL FIRE CODE
5. GAS CODE: 2015 INTERNATIONAL FUEL GAS CODE
6. ENERGY CODE: 2015 INTERNATIONAL ENERGY CONSERVATION CODE/ ASHRAE 90.1-2013
7. ELECTRICAL CODE: 2011 NATIONAL ELECTRICAL CODE

1.03 QUALITY ASSURANCE
A. PERFORM WORK TO AVOID INTERFERENCE WITH THE WORK OF OTHER TRADES. REMOVE AND RELOCATE WORK WHICH IN THE OPINION OF THE OWNER'S REPRESENTATIVES CAUSES INTERFERENCE
B. EQUIPMENT AND MATERIALS SHALL BE NEW, UL-LISTED FOR THE USE INTENDED, AND FREE FROM DAMAGE OR DEFECT. THEY SHALL COMPLY WITH THE LATEST INDUSTRY STANDARDS.
C. PACKAGED EQUIPMENT SHALL BEAR ALL LABELS BY RECOGNIZED NATIONAL TESTING LABORATORY.
D. PERFORM ALL TESTS AND INSPECTIONS REQUIRED BY AUTHORITIES HAVING JURISDICTION.
E. ALL EQUIPMENT OR COMPONENTS OF THIS SPECIFICATION SECTION SHALL MEET OR EXCEED THE REQUIREMENTS AND QUALITY OF THE ITEMS HEREIN SPECIFIED, OR AS DENOTED ON THE DRAWINGS.

1.04 CONTRACT DRAWINGS
A. ILLUSTRATE THE GENERAL DESIGN AND EXTENT OF PERFORMANCE REQUIRED. ALL DIMENSIONS AND LOCATIONS SHALL BE TAKEN FROM THE ARCHITECTURAL DRAWINGS. CONSULT WITH ARCHITECTURAL PLANS AND LOCATE ALL CEILING EQUIPMENT WHERE INDICATED ON REFLECTED CEILING PLANS.
B. DEVIATIONS FROM THE DRAWINGS, WITH THE EXCEPTION OF MINOR CHANGES IN ROUTING AND OTHER SUCH INCIDENTAL CHANGES THAT DO NOT AFFECT THE FUNCTIONING OR SERVICEABILITY OF THE SYSTEMS, SHALL NOT BE MADE WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECT/ENGINEER.
C. THE ARCHITECTURAL AND STRUCTURAL DRAWINGS TAKE PRECEDENCE IN ALL MATTERS PERTAINING TO THE BUILDING STRUCTURE, MECHANICAL DRAWINGS IN ALL MATTERS PERTAINING TO MECHANICAL TRADES AND ELECTRICAL DRAWINGS IN ALL MATTERS PERTAINING TO ELECTRICAL TRADES. WHERE THERE ARE CONFLICTS OR DIFFERENCES BETWEEN THE DRAWINGS FOR THE VARIOUS TRADES, REPORT SUCH CONFLICTS OR DIFFERENCES TO THE ARCHITECT/ENGINEER FOR RESOLUTION.
D. DRAWINGS ARE NOT INTENDED TO SERVE AS SHOP DRAWINGS. TAKE ALL FIELD MEASUREMENTS REQUIRED TO COMPLETE THE WORK.

1.05 SHOP DRAWINGS
A. SUBMIT PROJECT SPECIFIC SUBMITTALS FOR REVIEW IN COMPLIANCE WITH DIVISION 01.
B. PREPARE SHOP DRAWINGS TO SCALE FOR THE ARCHITECT/ENGINEER FOR REVIEW. EQUIPMENT AND MATERIAL SUBMITTALS REQUIRED ARE INDICATED IN THE MECHANICAL; FIRE SUPPRESSION; PLUMBING; AND HEATING, VENTILATING AND AIR CONDITIONING SECTIONS.
C. ALL SUBMITTALS SHALL BE SUBMITTED IN GROUPINGS OF SIMILAR AND/OR RELATED ITEMS.
D. SHOP DRAWINGS SHALL BE REVIEWED BY THE MECHANICAL CONTRACTOR FOR COMPLETENESS AND ACCURACY PRIOR TO SUBMITTING TO THE ARCHITECT/ENGINEER FOR REVIEW. THE SHOP DRAWINGS SHALL BE DATED AND SIGNED BY THE MECHANICAL CONTRACTOR PRIOR TO SUBMISSION.
E. SUBMITTALS MUST BE JOB SPECIFIC AND NOT GENERIC IN NATURE.
F. NO EQUIPMENT SHALL BE SHIPPED FROM STOCK OR FABRICATED UNTIL SHOP DRAWINGS FOR THEM HAVE BEEN REVIEWED BY THE ARCHITECT/ENGINEER.
G. BY THE REVIEW OF SHOP DRAWINGS, THE ARCHITECT/ENGINEER DOES NOT ASSUME RESPONSIBILITY FOR ACTUAL DIMENSIONS OR FOR THE FIT OF COMPLETED WORK IN POSITION, NOR DOES SUCH REVIEW RELIEVE MECHANICAL TRADES OF FULL RESPONSIBILITY FOR THE PROPER AND CORRECT EXECUTION OF THE WORK REQUIRED.
H. CONTRACTOR IS RESPONSIBLE FOR:
a. DIMENSIONS, WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE.
b. FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION.
c. QUANTITIES.
d. COORDINATION OF CONTRACTOR'S WORK WITH ALL OTHER TRADES.
e. SATISFACTORY PERFORMANCE OF CONTRACTOR'S WORK.
f. TEMPORARY ASPECTS OF THE CONSTRUCTION PROCESS.
g. SUBMIT DETAILED SHOP DRAWINGS OF PIPING SYSTEMS SHOWING PIPE ROUTING AND TYPES AND LOCATIONS OF ALL PIPE HANGERS.
I. IF DEVIATIONS (NOT SUBSTITUTIONS) FROM CONTRACT DOCUMENTS ARE DEEMED NECESSARY BY THE CONTRACTOR, DETAILS OF SUCH DEVIATIONS, INCLUDING CHANGES IN RELATED PORTIONS OF THE PROJECT AND THE REASONS THEREFORE, SHALL BE SUBMITTED WITH THE SUBMITTAL FOR APPROVAL.
J. MANUFACTURERS NOT LISTED MAY SUBMIT FOR ACCEPTANCE AS AN "APPROVED EQUAL." REQUESTS FOR AN "EQUIVALENT" MEANS "APPROVED EQUIVALENT". FOUR COPIES OF SUCH SUBMITTAL MUST BE RECEIVED BY THE ENGINEER SEVEN (7) WORKING DAYS PRIOR TO BID DATE.
a. THE TERMS "APPROVED", "APPROVED EQUAL", AND "EQUAL" REFER TO APPROVAL BY THE ARCHITECT OR ENGINEER AS AN ACCEPTABLE ALTERNATE BID. NO SUBSTITUTIONS WILL BE CONSIDERED THAT ARE NOT BID AS AN ALTERNATE. NO MATERIAL SUBSTITUTIONS SHALL BE CONSIDERED FOR APPROVAL PRIOR TO AWARD OF CONTRACT.
b. COORDINATE AND VERIFY WITH OTHER TRADES WHETHER OR NOT THE SUBSTITUTED EQUIPMENT CAN BE INSTALLED AS SHOWN ON THE CONSTRUCTION DRAWINGS WITHOUT MODIFICATION TO ASSOCIATED SYSTEMS OR ARCHITECTURAL OR ENGINEERING DESIGN. INCLUDE ADDITIONAL COSTS FOR ARCHITECTURAL AND ENGINEERING DESIGN FEES IN BID IF DRAWING MODIFICATIONS ARE REQUIRED BECAUSE OF SUBSTITUTED EQUIPMENT.

1.06 WARRANTY
A. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SUCCESSFUL OPERATION OF MECHANICAL SYSTEMS, EQUIPMENT, AND MATERIALS INSTALLED UNDER THIS CONTRACT FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE UNLESS SPECIFIC ITEMS ARE NOTED TO CARRY A LONGER WARRANTY IN THE CONSTRUCTION DOCUMENTS OR MANUFACTURER'S STANDARD WARRANTY EXCEEDS ONE YEAR . WARRANT EACH SYSTEM AND EACH ELEMENT THEREOF AGAINST ALL DEFECTS DUE TO FAULTY WORKMANSHIP, DESIGN OR MATERIAL. DEFECTIVE EQUIPMENT OR MATERIALS SHALL BE REPAIRED OR REPLACED AT NO EXPENSE TO THE OWNER. PROVIDE FOUR COMPLETE SERVICE AND MAINTENANCE CALLS SPACED AT EQUAL INTERVALS DURING THE WARRANTY PERIOD.
B. WARRANTIES SHALL INCLUDE LABOR AND MATERIAL. MAKE REPAIRS OR REPLACEMENTS WITHOUT ANY ADDITIONAL COSTS TO THE OWNER.
C. AT THE TIME OF FINAL ACCEPTANCE, DELIVER TO THE OWNER ALL WARRANTIES, IN WRITING AND PROPERLY EXECUTED, INCLUDING TERM LIMITS FOR WARRANTIES EXTENDING BEYOND THE ONE YEAR PERIOD, EACH WARRANTY INSTRUMENT BEING ADDRESSED TO THE OWNER AND STATING THE COMMENCEMENT DATE AND TERM.

1.07 DELIVERY, PRODUCT HANDLING, AND CLEAN UP
A. DELIVER MATERIALS TO THE SITE IN SUCH A MATTER AS TO PROTECT THE MATERIALS FROM SHIPPING AND HANDLING DAMAGE. PROVIDE MATERIALS ON FACTORY PROVIDED SHIPPING SKIDS AND LIFTING LUGS IF REQUIRED FOR HANDLING. MATERIALS DAMAGED BY THE ELEMENTS SHOULD BE PACKAGED IN SUCH A MATTER THAT THEY COULD WITHSTAND SHORT-TERM EXPOSURE TO THE ELEMENTS DURING TRANSPORTATION.
B. STORE MATERIALS IN CLEAN, UNDAMAGED, DRY PLACE AND PROTECT FROM WEATHER AND CONSTRUCTION TRAFFIC. HANDLE CAREFULLY TO AVOID DAMAGE. THE GENERAL CONDITIONS TAKE PRECEDENCE.
C. USE ALL MEANS NECESSARY TO PROTECT EQUIPMENT BEFORE, DURING, AND AFTER INSTALLATION.
D. ALL SCRATCHED, DENTED, AND OTHERWISE DAMAGED UNITS SHALL BE REPAIRED OR REPLACED AS DIRECTED BY THE ARCHITECT/ENGINEER.
E. KEEP JOBSITE CLEAN AND TIDY ALLOWING OTHER TRADES TO CONTINUE WORK.

1.08 OPERATING AND MAINTENANCE DATA
A. PROVIDE THE OWNER WITH OPERATING AND MAINTENANCE INSTRUCTIONS (FOUR COPIES) REQUIRED FOR OPERATION OF ALL MECHANICAL SYSTEMS. BIND THE WRITTEN INSTRUCTIONS IN A NOTEBOOK. THE GENERAL CONDITIONS TAKE PRECEDENCE. THE MANUALS SHALL INCLUDE THE FOLLOWING ITEMS:
1. OPERATING MANUAL AND SPARE PARTS LIST FOR EACH PIECE OF EQUIPMENT.
2. PREVENTIVE MAINTENANCE SCHEDULE FOR LUBRICATING AND CHECKING EACH PIECE OF EQUIPMENT.
3. INSTRUCTIONS ON WHO TO CALL FOR SERVICE DURING THE WARRANTY PERIOD.

1.09 PERMITS
A. THE CONTRACTOR SHALL PAY FOR ALL FEES, TAXES, SECURE PERMITS, LICENSES, AND INSPECTIONS REQUIRED FOR THE PROJECT.
B. RULES OF LOCAL UTILITY COMPANIES SHALL BE COMPLIED WITH. CHECK WITH EACH UTILITY COMPANY SUPPLYING SERVICE TO THE INSTALLATION AND DETERMINE ALL DEVICES INCLUDING, BUT NOT LIMITED TO, ALL VALVES, METER BOXES, AND METERS WHICH WILL BE REQUIRED AND INCLUDE THE COST OF ALL SUCH ITEMS IN PROPOSAL.

1.10 TEMPORARY SERVICES
A. PROVIDE TEMPORARY WATER SERVICE FOR CONSTRUCTION, AS REQUIRED BY THE GENERAL CONTRACTOR.

1.11 COORDINATION
A. COORDINATE OUTLET DEVICE AND EQUIPMENT LOCATIONS WITH THE ARCHITECTURAL PLANS AND WORK OF OTHER TRADES. LOCATE ON HORIZONTAL AND VERTICAL LINES TO AVOID INTERFERENCE AND TO PROVIDE FUNCTIONAL USE OF ALL EQUIPMENT. VERIFY ELECTRICAL POWER CHARACTERISTICS BEFORE ORDERING EQUIPMENT.
B. THE GENERAL GUIDELINE FOR THE DIVISION BETWEEN CONTROL (BY MC) WIRING AND POWER WIRING (BY EC) IS THAT POWER WIRING CARRIES THE CURRENT WHICH ENERGIZES A MOTOR, CONTROL WIRING DOES NOT. CONTROL WIRING MAY BE 120V, WHICH WOULD BE THE RESPONSIBILITY OF THE MC. CONTROL MOTORS ARE WIRED BY THE MC.
C. FURNISH WIRING DIAGRAMS TO THE ELECTRICAL CONTRACTOR AS REQUIRED FOR PROPER EQUIPMENT HOOKUP. COORDINATE WITH THE ELECTRICAL CONTRACTOR THE ACTUAL WIRE SIZING AMPS FOR MECHANICAL EQUIPMENT (FROM THE EQUIPMENT NAMEPLATE) TO ENSURE PROPER INSTALLATION.
D. EXAMINE THE SITE AND BECOME AWARE OF EXISTING CONDITIONS, UTILITIES, AND OTHER ISSUES AFFECTING THE SATISFACTORY COMPLETION OF THE PROJECT.
E. ELECTRICAL WORK PERFORMED BY THIS CONTRACTOR WILL CONFORM TO THE STANDARDS OF DIVISION 26-28. MECHANICAL EQUIPMENT MOTORS AND CONTROLS SHALL BE FURNISHED, SET IN PLACE, AND WIRED ACCORDING WITH THE FOLLOWING SCHEDULE UNLESS OTHERWISE NOTED OR SPECIFIED. MC = DIVISION 21-23 EC = DIVISION 26-28

ITEM	FURN BY	SET BY	POWER WIRING	CONTROL WIRING
COMBINATION STARTERS	MC	EC	EC	MC
EQUIPMENT MOTORS	MC	MC	EC	--
MOTOR STARTERS & O.L. RELAYS	MC	EC	EC	MC
DISCONNECT SWITCHES	EC	EC	EC	MC
THERMAL OVERLOAD HEATERS (1)	EC	EC	EC	--
VARIABLE SPEED DRIVES	MC	EC	EC	MC
CONTROL RELAYS/TRANSFORMERS	MC	MC	EC	MC
TEMPERATURE CONTROL PANELS	MC	MC	EC	MC
TEMP. CONTROLS CONDUIT/WIRING	MC	MC	--	MC
ACTUATOR AND SOLENOID WIRING	MC	MC	--	MC
PUSHBUTTONS & PILOT LIGHTS	MC	MC	--	MC
ROOM THERMOSTATS	MC	MC	--	MC
THERMOSTATS: LINE VOLTAGE	EC	EC	EC	--

1.12 ELECTRICAL
A. LUGS: LUGS FOR WIRING CONNECTIONS SHALL BE RATED FOR COPPER AND ALUMINUM, NAD SHALL HAVE A MINIMUM RATING OF 75C.
B. ELECTRIC MOTORS SHALL BE RATED FOR THE APPROPRIATE APPLICATION: WET LOCATION (TEFC); SUBMERSIBLE; EXPLOSION PROOF, VFD'S, ETC.
C. ALL LOW VOLTAGE CONTROL WIRING (24 -VOLT) SHALL BE IN CONDUIT AND IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND ALL STATE AND LOCAL CODES AND ORDINANCES AND SHALL BE DONE BY THIS HVAC CONTRACTOR.

1.13 DELIVERY, STORAGE, HANDLING
A. PROVIDE NECESSARY HAULING AND HOISTING EQUIPMENT. PROTECT THE MATERIALS OF THIS DIVISION BEFORE, DURING, AND AFTER INSTALLATION.

1.14 AS-BUILT DRAWINGS
A. KEEP A CURRENT SET OF "AS-BUILT" DRAWINGS ON SITE. UPON COMPLETION OF THE WORK, FURNISH ENGINEER WITH A REPRODUCIBLE PRINTS SHOWING THE "AS-BUILT" INSTALLATION.

1.15 PROJECT/SITE CONDITIONS
A. VISIT THE SITE, EXAMINE AND VERIFY THE CONDITIONS UNDER WHICH THE WORK MUST BE CONDUCTED BEFORE SUBMITTING PROPOSAL. THE SUBMITTING OF A PROPOSAL IMPLIES THAT THE CONTRACTOR HAS VISITED THE SITE AND UNDERSTANDS THE CONDITIONS UNDER WHICH THE WORK MUST BE CONDUCTED. NO ADDITIONAL CHARGES OR TIME EXTENSIONS WILL BE ALLOWED BECAUSE OF FAILURE TO MAKE THIS EXAMINATION OR TO INCLUDE ALL MATERIALS AND LABOR TO COMPLETE THE WORK.

1.16 PLAN VERIFICATION
A. AFTER COMPLETION OF THE BIDDING AND SELECTION PROCESS, PRIOR TO AWARDING THE CONTRACT, THE CONTRACTOR MUST REVIEW AND VERIFY THE CONTRACT DOCUMENTS IN THEIR ENTIRETY, INCLUDING THOSE OF OTHER TRADES. AT THIS TIME, DISCREPANCIES, CONFLICTS, OMISSIONS, ETC IN THE CONTRACT DOCUMENTS MUST BE DOCUMENTED. ALTERATIONS TO THE CONTRACT WILL BE MADE AT THAT TIME TO INCLUDE SUCH ITEMS, AS WELL OTHER MODIFICATIONS WHICH MIGHT BE MADE BY THE OWNER. AFTER AWARD OF THE CONTRACT, CHANGE ORDERS CAUSED BY DISCREPANCIES, CONFLICTS, OMISSIONS IN THE CONTRACT DOCUMENTS WILL NOT BE ALLOWED.

1.17 INSTRUCTION OF OWNER PERSONNEL
A. AT A TIME MUTUALLY AGREED UPON BETWEEN THE OWNER AND CONTRACTOR, PROVIDE THE SERVICES OF A FACTORY TRAINED AND AUTHORIZED REPRESENTATIVE TO TRAIN OWNER'S DESIGNATED PERSONNEL ON THE OPERATION AND MAINTENANCE OF THE EQUIPMENT PROVIDED FOR THIS PROJECT. PROVIDE TRAINING TO INCLUDE, BUT NOT BE LIMITED TO, AN OVERVIEW OF THE SYSTEM AND/OR EQUIPMENT AS IT RELATES TO THE FACILITY AS A WHOLE, OPERATION AND MAINTENANCE PROCEDURES AND SCHEDULES RELATED TO STARTUP AND SHUTDOWN, TROUBLESHOOTING, SERVICING, PREVENTIVE MAINTENANCE AND APPROPRIATE OPERATOR INTERVENTION; AND REVIEW OF DATA INCLUDED IN THE OPERATION AND MAINTENANCE MANUALS.
B. SUBMIT A CERTIFICATION LETTER TO THE ARCHITECT STATING THAT THE OWNER'S DESIGNATED REPRESENTATIVE HAS BEEN TRAINED AS SPECIFIED HEREIN. LETTER SHALL INCLUDE DATE, TIME, ATTENDEES AND SUBJECT OF TRAINING. THE CONTRACTOR AND THE OWNER'S REPRESENTATIVE SHALL SIGN THE CERTIFICATION LETTER INDICATING AGREEMENT THAT THE TRAINING HAS BEEN PROVIDED.
C. SCHEDULE OWNER TRAINING WITHIN AT LEAST 7 DAYS ADVANCE NOTICE.
D. PROVIDE TWO (2) COMPLETE SETS OF OPERATING AND MAINTENANCE INSTRUCTION BOOKLETS.

1.18 HVAC USE DURING CONSTRUCTION
A. HVAC EQUIPMENT SHALL NOT BE USED DURING CONSTRUCTION AS A MEANS TO HEAT OR COOL THE SPACE, UNLESS SPECIFIC APPROVAL IS GIVEN BY THE OWNER. IF SUCH EQUIPMENT IS USED, IT MUST BE COMPLETELY CLEANED AND REPAIRED AS NECESSARY. CLEANING INVOLVES REPLACING ALL FILTERS; CLEANING ALL COILS AND HEAT EXCHANGERS; INSPECTING FANS, PLENUMS, AND DUCTWORK AND CLEANING AS DIRECTED BY THE OWNER.
B. IF HVAC EQUIPMENT IS USED DURING THE CONSTRUCTION PERIOD, THIS CONTRACTOR SHALL PROVIDE MINIMUM MERV-8 FILTERS OR FILTRATION MEDIA OVER ANY RETURN AIR GRILLES AND OPEN RETURN AIR DUCT WORK FOR THE DURATION OF THE CONSTRUCTION PERIOD. CONTRACTOR SHALL PROVIDE ONE SET OF FILTERS WHEN THE UNIT IS STARTED AND REPLACE FILTERS AS NEEDED, BUT NOT LESS THAN EVERY FOUR WEEKS.
C. ON THE DAY OF SUBSTANTIAL COMPLETION, THE CONTRACTOR SHALL CLEAN THE UNIT AND PROVIDE A NEW SET OF FILTERS IN THE UNIT.

1.19 REFRIGERANT AND OIL
A. PROVIDE FULL REFRIGERANT AND OIL CHARGE IN NEW AIR CONDITIONING REFRIGERATION SYSTEMS, AND MAINTAIN IT FOR FULL TERM OF THE GUARANTEE.
B. ALL NEW MECHANICAL EQUIPMENT SHALL UTILIZE R-410A.
C. DISPOSE OF RECOVERED REFRIGERANT LEGALLY, IN ACCORDANCE WITH APPLICABLE RULES AND REGULATIONS.

2.07 MATERIALS AND EQUIPMENT
A. PROVIDE NECESSARY EQUIPMENT, PIPING, DUCTWORK, AND ACCESSORIES THAT ARE NOT PROVIDED BY THE EQUIPMENT SUPPLIER OR OWNER TO COMPLETE INSTALLATION OF EQUIPMENT FURNISHED BY OTHERS/ EXISTING EQUIPMENT IN LOCATIONS AS INDICATED ON THE DRAWINGS AND/OR DESCRIBED IN THE GENERAL NOTES TO THIS CONTRACTOR. EQUIPMENT AND ACCESSORIES NOT PROVIDED BY THE EQUIPMENT SUPPLIER MAY INCLUDE CONDENSATE DRAINS, FLUES, VENTS, INTAKES, ASSOCIATED ROOF JACKS AND CAPS TO EXTERIOR, DAMPERS, INLINE FANS, ROOF FANS, CONTROL INTERLOCKS, ETC. AS REQUIRED FOR PROPER OPERATION OF THE COMPLETE SYSTEM IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
B. CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECT ROUGH-IN DIMENSIONS AND SHALL VERIFY SAME WITH ARCHITECT AND/OR EQUIPMENT SUPPLIER PRIOR TO SERVICE INSTALLATIONS.
C. IF AN APPROVED MANUFACTURER IS OTHER THAN THE MANUFACTURER USED AS THE BASIS FOR DESIGN, THE EQUIPMENT OR PRODUCT PROVIDED SHALL BE EQUAL IN SIZE, QUALITY, DURABILITY, APPEARANCE, CAPACITY, AND EFFICIENCY THROUGH ALL RANGES OF OPERATION, SHALL CONFORM WITH ARRANGEMENTS AND SPACE LIMITATIONS OF THE EQUIPMENT SHOWN ON THE PLANS AND/OR SPECIFIED, SHALL BE COMPATIBLE WITH THE OTHER COMPONENTS OF THE SYSTEM AND SHALL COMPLY WITH THE REQUIREMENTS FOR ITEMS REQUIRING PRIOR APPROVAL SPECIFIED IN THIS SECTION OF THE SPECIFICATIONS. ALL COSTS TO MAKE THESE ITEMS OF EQUIPMENT COMPLY WITH THESE REQUIREMENTS INCLUDING, BUT NOT LIMITED TO, PIPING, SHEET METAL, ELECTRICAL WORK, AND BUILDING ALTERATIONS SHALL BE INCLUDED IN THE ORIGINAL BID.
D. CHANGES INVOLVING ELECTRICAL WORK: THE DESIGN OF THE MECHANICAL SYSTEMS IS BASED ON THE EQUIPMENT SCHEDULED ON THE DRAWINGS. EQUIPMENT OF HIGHER ELECTRICAL CHARACTERISTICS MAY BE FURNISHED PROVIDED SUCH PROPOSED EQUIPMENT IS APPROVED IN WRITING AND CONNECTING ELECTRICAL SERVICES, CIRCUIT BREAKERS, AND CONDUIT SIZES ARE APPROPRIATELY MODIFIED WITH NO ADDITIONAL COST TO PROJECT. IF MINIMUM ENERGY RATINGS OR EFFICIENCIES ARE SPECIFIED, EQUIPMENT SHALL COMPLY WITH REQUIREMENTS.
a. WHERE EQUIPMENT CHANGES ARE MADE THAT INVOLVE ADDITIONAL ELECTRICAL WORK (LARGER SIZE MOTOR, ADDITIONAL WIRING OF EQUIPMENT, ETC.) THE MECHANICAL TRADES INVOLVED SHALL COMPENSATE THE ELECTRICAL TRADES FOR THE COST OF THE ADDITIONAL WORK REQUIRED.

SECTION 20 05 10 - MECHANICAL AND PLUMBING BASIC MATERIALS AND METHODS

1.01 GENERAL
A. COMPLY WITH REQUIREMENTS IN PUBLIC LAW 111-380, "REDUCTION OF LEAD IN DRINKING WATER ACT," ABOUT LEAD CONTENT IN MATERIALS THAT WILL BE IN CONTACT WITH POTABLE WATER FOR HUMAN CONSUMPTION.
B. COMPLY WITH NSF 14, "PLASTICS PIPING SYSTEM COMPONENTS AND RELATED MATERIALS," FOR PLASTIC, POTABLE DOMESTIC WATER PIPING AND COMPONENTS. INCLUDE MARKING "NSF-PW" ON PIPING.
C. COMPLY WITH NSF 61, "DRINKING WATER SYSTEM COMPONENTS - HEALTH EFFECTS; SECTIONS 1 THROUGH 9," FOR POTABLE DOMESTIC WATER PIPING AND COMPONENTS.
D. COMPLY WITH NSF 372, "DRINKING WATER SYSTEM COMPONENTS – LEAD CONTENT" FOR POTABLE DOMESTIC WATER PIPING AND COMPONENTS.
E. STEEL SUPPORT WELDING: QUALIFY PROCESSES AND OPERATORS ACCORDING TO AWS D1.1, "STRUCTURAL WELDING CODE--STEEL."
F. STEEL PIPE WELDING: QUALIFY PROCESSES AND OPERATORS ACCORDING TO ASME BOILER AND PRESSURE VESSEL CODE: SECTION IX, "WELDING AND BRAZING QUALIFICATIONS." COMPLY WITH PROVISIONS IN ASME B31 SERIES, "CODE FOR PRESSURE PIPING." CERTIFY THAT EACH WELDER HAS PASSED AWS QUALIFICATION TESTS FOR WELDING PROCESSES INVOLVED AND THAT CERTIFICATION IS CURRENT.
G. BRAZING: QUALIFY PROCESSES AND OPERATORS ACCORDING TO ASME BOILER AND PRESSURE VESSEL CODE: SECTION IX, "WELDING AND BRAZING QUALIFICATIONS," OR AWS B2.2, "STANDARD FOR BRAZING PROCEDURE AND PERFORMANCE QUALIFICATION."
H. SOLDERING: QUALIFY PROCESSES AND OPERATORS ACCORDING TO AWS B2.3/2.3M, "SPECIFICATION FOR SOLDERING PROCEDURE AND PERFORMANCE QUALIFICATION."

2.01 JOINING MATERIALS
A. UNIONS: PIPE SIZE 2 INCHES AND SMALLER:
a. FERROUS PIPE: MALLEABLE IRON GROUND JOINT TYPE UNIONS.
b. UNIONS IN GALVANIZED PIPING SYSTEM SHALL BE GALVANIZED.
c. COPPER TUBE AND PIPE: BRONZE UNIONS WITH SOLDERED JOINTS.
B. FLANGES: PIPE SIZES 2-1/2 INCH AND LARGER:
a. FERROUS PIPE: STANDARD WEIGHT, FORGED STEEL WELD NECK FLANGES.
b. COPPER TUBE AND PIPE: SLIP-ON BRONZE FLANGES.
c. PIPE-FLANGE GASKET MATERIALS: SUITABLE FOR CHEMICAL AND THERMAL CONDITIONS OF PIPING SYSTEM CONTENTS.
C. DIELECTRIC CONNECTONS: UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATON BARRIER. PROVIDE NON-CONDUCTNG DIELECTRIC CONNECTONS WHEREVER JOINTNG DISSIMILAR METALS.
D. FLANGE BOLTS AND NUTS: ASME B18.2.1, CARBON STEEL, UNLESS OTHERWISE INDICATED. SQUARE HEAD BOLTS AND NUTS ARE NOT ACCEPTABLE.
E. SOLDER FILLER METALS: ASTM B 32, LEAD-FREE, ANTIMONY-FREE, SILVER-BEARING ALLOYS. INCLUDE WATER-FLUSHABLE FLUX ACCORDING TO ASTM B 813.
F. BRAZING FILLER METALS: ALLOYS MEETING AWS A5.8.
a. USE TYPE BCUP SERIES, SILVER-BEARING, COPPER-PHOSPHORUS ALLOYS FOR JOINING COPPER OR BRONZE SOCKET FITTINGS WITH COPPER PIPE. FLUX IS PROHIBITED UNLESS USED WITH BRONZE FITTINGS.
b. USE TYPE BAG SERIES, CADMIUM-FREE SILVER ALLOYS FOR JOINING COPPER WITH STEEL, STAINLESS STEEL, OR OTHER FERROUS ALLOYS.
G. WELDING FILLER METALS: COMPLY WITH AWS D10.12/D10.12M FOR WELDING MATERIALS APPROPRIATE FOR WALL THICKNESS AND CHEMICAL ANALYSIS OF STEEL PIPE BEING WELDED.
H. WELDING MATERIALS: COMPLY WITH SECTION II, PART C, OF ASME BOILER AND PRESSURE VESSEL CODE FOR WELDING MATERIALS APPROPRIATE FOR WALL THICKNESS AND FOR CHEMICAL ANALYSIS OF PIPE BEING WELDED.
I. SOLVENT CEMENTS FOR JOINING PVC PIPING: ASTM D 2564. INCLUDE PRIMER ACCORDING TO ASTM F 656.
J. SOLVENT CEMENTS FOR JOINING CPVC PIPING AND TUBING: ASTM F 493.
K. SOLVENT CEMENTS FOR JOINING ABS PIPING: ASTM D 2235.
L. SOLVENT CEMENTS FOR JOINING PVC TO ABS PIPING TRANSITION: ASTM D 3138.
M. PIPE THREAD COMPOUND FOR NATURAL GAS: USE TETRAFLUOROETHYLENE (TEFLON) TAPE 2 TO 3 MILS THICK
N. PIPE THREAD COMPOUNG FOR STEEL PIPEL INORGANIC ZINC-RICH COATINGS OR CORROSION INHIBITED PROPRIETARY COMPOUND.

2.02 MOTORS AND STARTERS
A. PROVIDE MOTORS AND STARTING EQUIPMENT WHERE NOT FURNISHED WITH THE EQUIPMENT PACKAGE. MOTORS SHALL HAVE COPPER WINDINGS, CLASS B INSULATION, AND STANDARD SQUIRREL CAGE WITH STARTING TORQUE CHARACTERISTICS SUITABLE FOR THE EQUIPMENT SERVED. MOTORS FOR AIR HANDLING EQUIPMENT SHALL BE SELECTED FOR QUIET OPERATION. EACH MOTOR SHALL BE CHECKED FOR PROPER ROTATION AFTER ELECTRICAL CONNECTION HAS BEEN COMPLETED. PROVIDE DRIP-PROOF ENCLOSURE FOR LOCATIONS PROTECTED FROM WEATHER AND NOT IN AIR STREAM OF FAN; AND TOTALLY ENCLOSED FAN-COOLED ENCLOSURE FOR MOTORS EXPOSED TO WEATHER. MOTORS SHALL BE MANUFACTURED BY CENTURY, GENERAL ELECTRIC, WESTINGHOUSE, LOUIS-ALLIS OR APPROVED EQUAL.
B. PROVIDE EVERY MOTOR, EXCEPT FRACTIONAL HORSEPOWER SINGLE PHASE MOTORS WITH AN APPROVED TYPE OF BUILT-IN THERMAL OVERLOAD PROTECTION, WITH A MOTOR STARTER. EACH STARTER SHALL BE PROVIDED WITH OVERLOAD HEATERS SIZED TO THE MOTOR RATING, AND EVERY THREE-PHASE MOTOR STARTER SHALL HAVE OVERLOAD HEATERS IN EACH PHASE. AMBIENT COMPENSATED HEATERS SHALL BE INSTALLED WHEREVER NECESSARY, UNLESS NOTED OTHERWISE. MOTOR STARTERS SHALL BE FURNISHED BY THE DIVISION 26 CONTRACTOR. FOR INSTALLATION AND CONNECTION BY THE DIVISION 16 CONTRACTOR, STARTERS SHALL BE ALLEN-BRADLEY, CLARK, FURNAS, SQUARE D, OR APPROVED EQUAL.

2.03 ACCESS PANELS
A. THE MECHANICAL CONTRACTOR SHALL FURNISH AND GENERAL CONTRACTOR SHALL INSTALL ACCESS PANELS WHERE REQUIRED FOR ACCESS TO EQUIPMENT. THE MECHANICAL CONTRACTOR SHALL INCLUDE THE COST OF INSTALLATION IN HIS BID. ACCESS PANELS SHALL BE ADEQUATELY SIZED, OF A TYPE APPROVED BY THE ARCHITECT AND SHALL BE FIRE OR SMOKE-RATED AS REQUIRED. ACCESS PANELS SHALL BE MINIMUM 18"X18".

2.04 STRUCTURAL STEEL
A. STRUCTURAL STEEL USED FOR SUPPORT OF EQUIPMENT, DUCTWORK AND PIPING SHALL BE NEW, CLEAN AND CONFORM TO ASTM DESIGNATION A-36.
B. SUPPORT MECHANICAL COMPONENTS FROM THE BUILDING STRUCTURE. DO NOT SUPPORT MECHANICAL COMPONENTS FROM CEILINGS, OTHER MECHANICAL OR ELECTRICAL COMPONENTS, NOR OTHER NON-STRUCTURAL ELEMENTS.

2.05 PENETRATIONS AND SLEEVES
A. SLEEVE-SEAL SYSTEMS SHALL INCLUDE MODULAR SEALING-ELEMENT DESIGNED FOR FIELD ASSEMBLY FOR FILLING AN ANNULAR SPACE BETWEEN PIPE AND SLEEVE. SEAL SHALL BE DESIGNED FOR HYDROSTATIC PRESSURE OF 20 PSIG. SEAL SHALL BE MADE OF EPDM-RUBBER WITH INTERLOCKING LINKS SHAPED TO FIT SURFACE OF PIPE. PRESSURE PLATES SHALL BE MADE OF STAINLESS STEEL WITH STAINLESS STEEL CONNECTING BOLTS AND NUTS. APPROVED MANUFACTURE ARE METRAFLEX, CALPICO, PIPELINE SEAL AND INSULATOR.
B. PIPE SLEEVES SHALL BE STEEL PIPE IN ACCORDANCE WITH ASTM A 53, TYPE E, GRADE B, SCHEDULE 40 WITH PLAIN ENDS AND INTEGRAL WELDED WATERSTOP COLLAR.
C. SEAL ELEVATED FLOOR, EXTERIOR WALL AND ROOF PENETRATIONS WATERTIGHT AND WEATHERTIGHT WITH NON- SHRINK, NON-HARDENING COMMERCIAL SEALANT. PACK WITH MINERAL WOOL AND SEAL BOTH ENDS WITH MINIMUM OF 1/2" OF SEALANT. SEAL AROUND PENETRATIONS OF FIRE-RATED ASSEMBLIES. COORDINATE FIRE RATINGS AND LOCATIONS WITH THE ARCHITECTURAL DRAWINGS. REFER TO STANDARD PENETRATION DETAILS.
D. INSTALL SLEEVES IN CONCRETE FLOORS, WALLS, ROOFS AS THEY ARE CONSTRUCTED. CUT SLEEVES TO LENGTH FOR MOUNTING FLUSH. EXTEND SLEEVES IN MECHANICAL ROOM FLOORS OR AREAS PIPE IS SUBJECT TO DAMAGE 2 INCHES ABOVE FINISHED FLOOR.

2.06 FIRE STOPPING
A. SEAL OPENINGS OF FIRE RATED CONSTRUCTION WITH A MATERIAL OR PRODUCT THAT HAS BEEN TESTED AT AN INDEPENDENT TESTING LABORATORY SUCH AS UL OR FM. FIRE STOPPING SHALL CONFORM TO ASTM E-814, UL 1479, OR UL 2079. PRODUCTS SHALL BE SIMILAR TO RECTORSEAL METACAULK, 3M BRAND FIRE BARRIER PENETRATION SEALING SYSTEMS, OR HILTI.

2.08 SPARE PARTS
A. CONTRACTOR SHALL PROVIDE TO THE OWNER, WITH RECEIPT, THE FOLLOWING SPARE PARTS FOR THE EQUIPMENT INSTALLED FOR THIS PROJECT:
a. ONE SET OF SPARE FILTERS OF EACH TYPE REQUIRED FOR EACH UNIT. IN ADDITION TO THE SPARE SET OF FILTERS, INSTALL NEW FILTERS PRIOR TO TESTING, ADJUSTING AND BALANCING WORK AND BEFORE TURNING SYSTEM OVER TO OWNER.
b. ONE COMPLETE SET OF BELTS FOR EACH FAN.
c. THREE OPERATING KEYS FOR EACH TYPE OF AIR OUTLET AND INLET THAT REQUIRE THEM.

2.09 LOW EMITTING MATERIALS
A. ALL SEALANTS & ADHESIVES REQUIRED FOR THE INSTALLATION OF MECHANICAL & PLUMBING SYSTEM WITHIN THE BUILDING ENVELOPE SHALL MEET THE REQUIREMENTS FOR LOW EMITTING MATERIALS AS SET FOR IN THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) RULE #1168 (OR LEED NEW CONSTRUCTION REQUIREMENTS), WHICH INCLUDES BUT IS NOT LIMITED TO:
a. METAL TO METAL ADHESIVE: VOC LIMIT OF 30G/L.
b. FIBERGLASS ADHESIVE: VOC LIMIT OF 80G/L.
c. MULTIPURPOSE CONSTRUCTION ADHESIVE: VOC LIMIT OF 70 G/L.

3.01 UTILITIES AND PROTECTION OF SERVICES
A. DO NOT INTERRUPT AND UTILITY OR SERVICE WITHOUT ADEQUATE NOTICE AND SCHEDULE. CONTRACTOR SHALL, AT OWN EXPENSE, REPAIR, REPLACE, AND MAINTAIN IN SERVICE ANY UTILITIES DAMAGED OR BROKEN OR OTHERWISE RENDERED INOPERATIVE DURING THE COURSE OF CONSTRUCTION.

3.02 PROTECTION DURING CONSTRUCTION
A. PLUMBING FIXTURES, TRIM AND OTHER EQUIPMENT SHALL BE PROTECTED AGAINST DAMAGE OR INJURY. ALL FIXTURES AND EQUIPMENT DAMAGED BY ANY CAUSE AND ANY TRIM WITH MARRED OR SCRATCHED FINISH SHALL BE REPLACED AT NO ADDITIONAL COST TO THE OWNER. THE FIXTURE PROTECTION SHALL BE REMOVED AT THE COMPLETION OF THE WORK OR FOR FINAL INSPECTION.

3.03 EXCAVATION AND BACKFILLING
A. PERFORM EXCAVATION AND BACKFILL REQUIRED FOR INSTALLATION OF UNDERGROUND WORK UNDER THIS CONTRACT. TRENCHES SHALL BE OF SUFFICIENT WIDTH. CRIB OR BRACE TRENCHES TO PREVENT CAVE-IN OR SETTLEMENT. DO NOT EXCAVATE TRENCHES CLOSE TO COLUMNS AND WALLS OF NEW BUILDING WITHOUT PRIOR CONSULTATION WITH THE ARCHITECT. USE PUMPING EQUIPMENT IF REQUIRED TO KEEP TRENCHES FREE OF WATER. BACKFILL TRENCHES IN MAXIMUM 6" LAYERS OF WELL-TAMPED DRY EARTH IN A MANNER TO PREVENT FUTURE SETTLEMENT.
B. EXCAVATION AS HEREIN SPECIFIED SHALL BE UNCLASSIFIED. COMMON EXCAVATION SHALL COMPRISE THE SATISFACTORY REMOVAL AND DISPOSITION OF MATERIAL OF WHATEVER SUBSTANCES AND OF EVERY DESCRIPTION ENCOUNTERED, INCLUDING ROCK, IF ANY, WITHIN THE LIMITS OF THE WORK AS SPECIFIED AND SHOWN ON THE DRAWINGS. EXCAVATION SHALL BE PERFORMED TO THE LINES AND GRADES INDICATED ON THE DRAWINGS. EXCAVATED MATERIALS WHICH ARE CONSIDERED UNSUITABLE FOR BACKFILL, AND SURPLUS OF EXCAVATED MATERIAL WHICH IS NOT REQUIRED FOR BACKFILL, SHALL BE DISPOSED OF BY THE CONTRACTOR AT HIS OWN EXPENSE AND RESPONSIBILITY, AND TO THE SATISFACTION OF THE ARCHITECT.

3.04 CUTTING AND REPAIRING
A. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING, DRILLING, WELDING, AND REPAIR OF WALLS, FLOORS, CEILINGS, ETC. AS REQUIRED FOR TO INSTALL WORK UNDER THIS SECTION. OBTAIN PERMISSION FROM THE ARCHITECT PRIOR TO CUTTING. DO NOT CUT OR DISTURB STRUCTURAL MEMBERS WITHOUT PRIOR APPROVAL FROM THE ARCHITECT. CUT HOLES AS SMALL AS POSSIBLE. GENERAL CONTRACTOR SHALL PATCH WALLS, FLOORS, ETC. AS REQUIRED BY WORK UNDER THIS SECTION. PATCHING SHALL MATCH THE ORIGINAL MATERIAL AND CONSTRUCTION. REPAIR AND REFINISH AREAS DISTURBED BY WORK TO THE CONDITION OF ADJOINING SURFACES IN A MANNER SATISFACTORY TO THE ARCHITECT. THE GENERAL CONDITIONS TAKE PRECEDENCE.

3.05 CONCRETE WORK
A. NEW FLOOR MOUNTED EQUIPMENT/ FIXTURES SHALL BE CONNECTED TO THE EXISTING SANITARY DRAINAGE SYSTEM AS SHOWN ON THE DRAWINGS OR AS REQUIRED. SAW-CUT EXISTING CONCRETE FLOOR AS REQUIRED TO INSTALL NEW UNDERFLOOR PIPES, AND PATCH TO MATCH EXISTING SUB-FLOOR INCLUDING ANY WIRE MESH. REFER TO ARCHITECTURAL SPECIFICATIONS FOR FINISH FLOOR PATCHING REQUIREMENTS.
B. CONTRACTOR SHALL PROVIDE CONCRETE EQUIPMENT BASES AS SHOWN ON PLANS.

3.06 START-UP PROCEDURES
A. FOLLOW MANUFACTURER'S RECOMMENDED PROCEDURES IN STARTING UP THE EQUIPMENT; DAMAGE CAUSED DURING START-UP SHALL BE REPLACED AT NO EXPENSE TO THE OWNER.
B. EQUIPMENT PROVIDER SHALL BE RESPONSIBLE FOR PROVIDING EQUIPMENT START-UP AND, WHEN NOTED, AN IN THE FIELD CERTIFIED TRAINING SESSION. NEW EQUIPMENT START-UP SHALL BE FOR THE PURPOSE OF INSPECTING EQUIPMENT INSTALLATION MANNER AND CONTROL SYSTEM START-UP. A COPY OF THE START-UP REPORT SHALL BE MADE AND SENT TO BOTH THE CONTRACTOR AND TO THE ENGINEER.

SECTION 20 05 19 - METERS AND GAUGES

2.01 THERMOMETERS
A. 9 INCH LONG DIE-CAST ALUMINUM OR CHROME PLATED BRASS WITH GLASS WINDOW. RED, BLUE, OR GREEN INDICATORS. ADJUSTABLE CONNECTOR WITH 180 DEG VERTICAL PLANE AND 360 DEG HORIZONTAL ORIENTATION. ACCURACY SHALL BE PLUS OR MINUS 1 PERCENT. APPROVED MANUFACTURE ARE AMETEK, MILIJOCO, TRERICE, OR WEISS INSTRUMENTS.
B. THERMOWELLS SHALL BE PRESSURE-TIGHT, SOCKET-TYPE METAL FITTING MADE FOR INSERTION INTO PIPING AND OF TYPE, DIAMETER, AND LENGTH REQUIRED TO HOLD THERMOMETER. BRASS FOR COMPATIBLE SERVICES LESS THAN 353 DEGREES F ; STAINLESS STEEL FOR ALL OTHERS TO SUIT SERVICE. FURNISH EXTENSION NECK TO ACCOMMODATE INSULATION WHERE APPLICABLE. SAME MANUFACTURER OF THERMOMETER BEING USED.

2.02 PRESSURE GAUGES
A. PRESSURE GAUGES SHALL BE DIRECT MOUNTING, DIAL-TYPE WITH STAINLESS STEEL CASE OR ALUMINUM. PRESSURE ELEMENT SHALL BE BOURDON TUBE WITH BRASS CONNECTION. THE DIAL SHALL BE NONREFLECTIVE WITH PERMANENT SCALE MARKINGS. ACCURACY SHALL BE PLUS OR MINUS 1 PERCENT.
B. PROVIDE VALVES, SYPHONS, AND SNUBBERS AS REQUIRED.

SECTION 20 05 29 - HANGERS AND SUPPORTS

1.01 GENERAL
A. REFER TO DUCT AND PIPING APPLICATION SCHEDULE FOR HANGER, ROD, SPACING, AND TYPES APPROVED FOR DIFFERENT SYSTEMS AND SIZES.
B. SUPPORT EQUIPMENT, PIPING, DUCTWORK FROM THE STRUCTURE TO PREVENT SAGGING, POCKETING, SWAYING, AND VIBRATIONS, AND ARRANGED TO PROVIDE FOR EXPANSION AND CONTRACTION. HANGERS SUPPORTING VIBRATING EQUIPMENT SHALL BE PROVIDED WITH SPRING ISOLATORS. CHAIN, PERFORATED IRON OR WIRE HANGERS ARE NOT PERMITTED. SUPPORTS SHALL BE CONNECTED TO THE BUILDING STRUCTURE ONLY. EQUIPMENT, PIPES, DUCTWORK SHALL NOT BE SUPPORTED FROM ONE ANOTHER.
C. DUCT HANGER SPACING: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," TABLE 5-1 (TABLE 5-1M), "RECTANGULAR DUCT HANGERS MINIMUM SIZE," AND TABLE 5-2, "MINIMUM HANGER SIZES FOR ROUND DUCT," FOR MAXIMUM HANGER SPACING; INSTALL HANGERS AND SUPPORTS WITHIN 24 INCHES OF EACH ELBOW AND WITHIN 48 INCHES OF EACH BRANCH INTERSECTION.

2.01 METAL PIPE HANGERS
A. CARBON STEEL WITH GALVANIZED COATING, STAINLESS STEEL, AND COPPER PIPE HANGERS SHALL BE MSS SP-58 TYPES 1 THROUGH 58. COPPER HANGERS SHALL BE USED WITH COPPER PIPE. WET AND CORROSIVE ENVIRONMENTS SHALL USE STAINLESS STEEL.
B. HANGER RODS SHALL BE CONTINUOUS THREAD WITH NUTS AND WASHERS MADE OF CARBON STEEL UNLESS LOCATED IN WET OR CORROSIVE ENVIRONMENT, WHICH SHALL BE STAINLESS STEEL. USE COPPER COATED STEEL ROD FOR COPPER PIPING.

2.02 METAL FRAMING SYSTEMS
A. SHOP OR FIELD FABRICATED ASSEMBLY OF STEEL CHANNELS AND COMPONENTS WITH GALVANIZED COATING. PLASTIC OR JACKET IN WET OR CORROSIVE ENVIRONMENTS. APPROVED MANUFACTURES ARE ANVIL, EATON, UNISTRUT.

2.03 SHIELDS, SADDLES, AND INSERTS
A. PROVIDE MSS SP-69 TYPE 40 METAL SHIELDS, MSS SP-69 TYPE 391 AND TYPE 39B SADDLES, AND THERMAL PIPE SHIELDS AS REQUIRED. APPROVED MANUFACTURERS ARE EATON, ERICO, PIPE SHIELDS INC.

2.04 STAINLESS STEEL LOAD RATE SUSPENSION CABLE
A. APPROVED MANUFACTURES: DUCTMATE, DURO DYNE CORP., GRIPPLE INC.
B. AIRPLANE QUALITY STAINLESS STEEL 7X7 AND 7X19 WIRE ROPE COMPLYING WITH ASTM A 492. ONE PIECE STAINLESS STEEL FASTENER AND LOOP ENDS, STUD END, OR PLAIN ENDS. CABLE SHALL BE USED FOR DUCTWORK ONLY.

2.05 ROOF CURBS AND SUPPORTS
A. EQUIPMENT CURB: GALVANIZED STEEL WELDED 18-GAUGE SHELL WITH MITERED CORNERS; 1-1/2-INCH- (40-MM-) THICK, 3 POUND RIGID, FIBERGLASS INSULATION ADHERED TO INSIDE WALLS; AND 1-1/2-INCH (40-MM) WOOD NAILER. SIZE AS REQUIRED TO SUIT ROOF OPENING AND FAN BASE. SELF-FLASHING WITHOUT A CANT STRIP, WITH MOUNTING FLANGE. CURB SHALL BE 16 INCHES TALL MINIMUM.

2.06 NON-PENETRATING ROOF SUPPORTS
A. APPROVED MANUFACTURERS: B-LINE BY EATON, ECO SUPPORT PRODUCTS, ERICO, MIRO, PORTABLE PIPE, PATE
B. TYPES:
a. LOW, FIXED-HEIGHT, SINGLE-BASE STAND: ASSEMBLY OF BASE AND HORIZONTAL MEMBER, AND PIPE SUPPORT, FOR ROOF INSTALLATION WITHOUT MEMBRANE PENETRATION.
b. LOW, ADJUSTABLE-HEIGHT, SINGLE-BASE STAND: ASSEMBLY OF BASE, HORIZONTAL MEMBER, AND ADJUSTABLE VERTICAL MEMBERS, AND PIPE SUPPORT, FOR ROOF INSTALLATION WITHOUT MEMBRANE PENETRATION.
c. HIGH, ADJUSTABLE-HEIGHT, SINGLE-BASE STAND: ASSEMBLY OF BASE, HORIZONTAL MEMBER, AND ADJUSTABLE VERTICAL MEMBERS, AND CLEVIS TYPE PIPE SUPPORT, FOR ROOF INSTALLATION WITHOUT MEMBRANE PENETRATION.
d. LOW, FIXED-HEIGHT, SINGLE-BASE ROLLER STAND: ASSEMBLY OF BASE AND HORIZONTAL ROLLER, FOR ROOF INSTALLATION WITHOUT MEMBRANE PENETRATION.
e. LOW, ADJUSTABLE-HEIGHT, SINGLE-BASE ROLLER STAND: ASSEMBLY OF BASE AND HORIZONTAL ROLLER, FOR ROOF INSTALLATION WITHOUT MEMBRANE PENETRATION.
C. BASESHALL BE PLASTIC, STAINLESS STEEL, OR RECYCLED RUBBER.
D. HORIZONTAL MEMBER SHALL BE CADMIUM-PLATED-STEEL OR GALVANIZED-STEEL STRUT DESIGNED FOR USE WITH STANDARD STRUT CLAMPS AND ACCESSORIES.
E. VERTICAL MEMBERS SHALL BE THREADED, HOT ROLLED, STEEL ROD CONFORMING TO ASTM A 36 OR A575 WITH CADMIUM PLATED NUTS AND WASHERS. ROD CONTINUOUSLY THREADED.

SECTION 20 05 33 - MECHANICAL IDENTIFICATION

2.01 IDENTIFICATION
A. APPROVED MANUFACTURERS: BRADY, SETON NAMEPLATE COMPANY, EMED, BRIMAR INDUSTRIES, AND KOLBI
B. TYPES LISTED BELOW SHALL BE IN ACCORDANCE ASME A13.1:
1. EQUIPMENT NAMEPLATES: METAL WITH DATA STAMPED FOR PERMANENT ATTACHMENT WITH FASTENER
2. EQUIPMENT MARKER: ENGRAVED, COLOR-CODED LAMINATED PLASTIC WITH ADHESIVE
3. ACCESS PANEL DOOR MARKER: ENGRAVED LAMINATED PLASTIC WITH CENTER HOLE FOR FASTENER
4. PIPE MARKER: PRE-TENSIONED SEMIRIGID PLASTIC FORMED TO COVER PIPE OR SHAPED PREFORMED SEMIRIGID PLASTIC FORMED TO PARTIALLY COVER PIPE
5. DUCT MARKERS: ENGRAVED PLASTIC WITH ADHESIVE OR VINYL WITH ADHESIVE INCLUDE DIRECTION
6. VALVE TAGS: STAMPED OR ENGRAVED BRASS WITH CHAIN
C. INSTALL IDENTIFICATION ON DUCTS, PIPES, EQUIPMENT IN VISIBLE LOCATIONS IN FINISHED SPACES, SHAFTS, MACHINE ROOMS, PLENUMS, CONCEALED LOCATIONS AND ON BOTH SIDES OF PENETRATIONS.

SECTION 20 07 00 - INSULATION

1.01 GENERAL
1. REFER TO DUCT AND PIPING APPLICATION SCHEDULES FOR INSULATION MATERIAL AND THICKNESS.
2. INSULATING MATERIALS, ADHESIVES, COATINGS, ETC. SHALL NOT EXCEED FLAME SPREAD RATING OF 25 AND SMOKE DEVELOPMENT RATING OF 50 PER ASTM E 84; ADHESIVES, COATINGS, ETC. CONTAINERS FOR MASTICS AND ADHESIVES SHALL HAVE UL LABEL.
3. CONTRACTOR SHALL INSPECT THE INSULATION OF ALL EXISTING AND NEW SUPPLY AIR DUCTWORK CONNECTIONS AND REPAIR AS REQUIRED.

2.01 PIPE INSULATION
A. FLEXIBLE ELASTOMERIC
a. APPROVED MANUFACTURES: ARMACELL OR IK INSULATION GROUP
b. INSULATION SHALL BE CLOSED-CELL, EXPANDED RUBBER MATERIAL HAVING A CONDUCTIVITY OF 0.26 AT 75 °F MEAN, IN ACCORDANCE WITH ASTM C 534.
c. EXTERIOR PIPING INSULATION WILL BE PAINTED WITH A WHITE SOLVENT BASED ALKYD FINISH(ARMAFLEX AB OR EQUIVALENT), INCLUDING ALL FITTINGS, VALVES, ETC. JACKET AND INSULATION WILL BE SEALED WEATHERTIGHT AND INSTALLED PER MANUFACTURERS INSTRUCTIONS. WHERE EXPOSED TO PHYSICAL DAMAGE, EXTERIOR PIPING INSULATION WILL BE COVERED WITH ALUMINUM JACKET, INCLUDING ALL FITTINGS, VALVES, ETC. JACKET AND INSULATION WILL BE SEALED WEATHERTIGHT AND INSTALLED PER MANUFACTURERS INSTRUCTIONS.
B. GLASS-FIBER
a. APPROVED MANUFACTURES: JOHNS MANVILLE, KNAUF, MANSON, AND OWENS CORNING.
b. PREFORMED PIPE INSULATION, TYPE I, 850 DEG GLASS FIBER WITH THERMOSETTING RESIN, COMPLY ASTM C 547, GRADE A, WITH FACTORY APPLIED ALL SERVICE JACKET. CONDUCTIVITY OF 0.26 AT 75 °F MEAN.

2.02 DUCT LINER
A. APPROVED MANUFACTURES: JOHNS MANVILLE, OWENS-CORNING, CERTAINEED OR KNAUF.
B. DUCT LINER SHALL BE 1-1/2 LB DENSITY (3.0LB FOR EXTERIOR DUCTS), CONSTRUCTED OF GLASS FIBER LINER. THE AIR STREAM SURFACE IS COATED WITH BLACK-COATED MAT SURFACE. LINER SHALL HAVE A K-FACTOR OF .25 AT 75 °F MEAN.
C. DUCT LINER SHALL BE INSTALLED AS FOLLOWS OR AS SHOWN ON THE PLANS:
a. RETURN AIR DUCTS (WITHIN 15' OF FAN)
D. LINER SHALL BE SECURED TO ALL DUCT SURFACES BY PRESSING INTO WET ADHESIVE, APPLIED TO 100% OF THE DUCT SURFACE. IN ADDITION, LINER SHALL BE HELD IN PLACE WITH INSULPINS WELDED TO DUCT, SAME MATERIALS, AND WITH CLIPS SLIPPED OVER THE PINS. INSULPINS SHALL BE LOCATED PER SMACNA STANDARDS. LINER SHALL BE LAPPED AND COMPRESSED IN ALL FOUR CORNERS OF THE DUCT. BOTH UPSTREAM AND DOWNSTREAM TRANSVERSE EDGES SHALL BE COATED WITH ADHESIVE, COATED A MINIMUM OF 1" OVER THE EDGE IN ALL PLACES.

2.03 DUCT INSULATION
A. FIBERGLASS
1. APPROVED MANUFACTURERS: JOHNS MANVILLE, KNAUF, OWENS-CORNING, AND CERTAINTEED
2. DUCT BLANKET INSULATION SHALL BE FLEXIBLE FIBERGLASS INSULATION, 1.5 PCF, WITH FACTORY-APPLIED, REINFORCED, ALUMINUM FOIL VAPOR BARRIER/JACKET. INSULATION SHALL HAVE A K-FACTOR OF .25 AT 75 °F MEAN. SHALL BE IN ACCORDANCE WITH ASTM C 553, TYPE II.
3. DUCT BOARD INSULATION SHALL BE RIGID FIBERGLASS INSULATION, 1.5 PCF, WITH FACTORY-APPLIED, ALUMINUM FOIL VAPOR BARRIER/JACKET. INSULATION SHALL HAVE A K-FACTOR OF .25 AT 75 °F MEAN. SHALL BE IN ACCORDANCE WITH ASTM C 553.
4. WRAP THE FIBERGLASS BLANKET WITH HEAVY DUTY FOIL SCRIM FACING AROUND THE DUCTWORK WITH OVERLAPPING FLANGES STAPLED AT 6" ON CENTER. STRIP THE LAP OF INSULATION AND STAPLE THE FACING DIRECTLY TO THE OVERLAPPED FOIL. SECURE THE INSULATION TO THE DUCTWORK WITH 18-GAUGE GALVANIZED WIRE AT 12" ON CENTER. ON DUCTS LARGER THAN 48", USE MECHANICAL FASTENERS ON THE BOTTOM OF THE DUCT.
5. TAPE ALL JOINTS WITH 3" WIDE FOIL REINFORCED KRAFT TAPE. TAPE ALL PIN PENETRATIONS OR PUNCTURES IN THE FACING.

2.05 INSULATING SEALANTS, ADHESIVES, AND MASTICS
A. SEALANTS
a. FOIL SCRIM KRAFT AND METAL JACKET FLASHING SEALANT SHALL BE FIRE AND WATER RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT WITH TEMP RANGE AND ALUMINUM COLOR. APPROVED MANUFACTURE: MARATHON INDUSTRIES, FOSTER PRODUCTS, MON-ECO INC.
b. ALL SERVICE JACKET FLASHING SEALANTS, PVC, PVDC, AND VINYL SEALANTS SHALL BE FIRE AND WATER RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT WITH TEMP RANGE AND ALUMINUM WHITE. APPROVED MANUFACTURE: CHILDERS PRODUCTS
B. ADHESIVES
a. FLEXIBLE ELASTOMERIC ADHESIVE: COMPLY WITH MIL-A-24179A, TYPE II, CLASS I. APPROVED MANUFACTURE: ARMACELL, FOSTER PRODUCTS, RBX CORP.
b. MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A. APPROVED MANUFACTURE: MARATHON INDUSTRIES, FOSTER PRODUCTS, MON-ECO INC.
c. ALL SERVICE JACKET ADHESIVE, AND FOIL SCRIM KRAFT AND PVDC JACKET ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING INSULATION JACKET LAP SEAMS AND JOINTS. APPROVED MANUFACTURE: MARATHON INDUSTRIES, FOSTER PRODUCTS, MON-ECO INC.
C. MASTICS
a. VAPOR BARRIER MASTIC SHALL COMPLY WITH ASTM E 96 WITH 0.013 PERM AND SHALL BE WHITE. APPROVED MANUFACTURE: MARATHON INDUSTRIES, FOSTER PRODUCTS, MON-ECO INC.
b. BREATHER MASTIC SHALL COMPLY WITH ASTM F 1249 WITH 03 PERM AND SHALL BE WHITE. APPROVED MANUFACTURE: MARATHON INDUSTRIES, FOSTER PRODUCTS, MON-ECO INC.

2.06 FACTORY APPLIED JACKETS
A. INSULATION SYSTEMS INDICATE FACTORY-APPLIED JACKETS ON VARIOUS APPLICATIONS. WHEN FACTORY-APPLIED JACKETS ARE INDICATED, COMPLY WITH THE FOLLOWING:
a. ALL SERVICE JACKET WHITE, KRAFT-PAPER, FIBERGLASS-REINFORCED SCRIM WITH ALUMINUM-FOIL BACKING; COMPLYING WITH ASTM C 1136, TYPE I.
b. ALL SERVICE JACKET SELF SEALING LAP: ASJ WITH SELF-SEALING, PRESSURE-SENSITIVE, ACRYLIC-BASED ADHESIVE COVERED BY A REMOVABLE PROTECTIVE STRIP; COMPLYING WITH ASTM C 1136, TYPE I.
c. FOIL SCRIM KRAFT JACKET: ALUMINUM-FOIL, FIBERGLASS-REINFORCED SCRIM WITH KRAFT-PAPER BACKING; COMPLYING WITH ASTM C 1136, TYPE II.

2.07 FIELD APPLIED JACKETS
A. PVC JACKETS SHALL BE HIGH IMPACT RESISTANT, UV-RESISTANT, COMPLY WITH ASTM D 1784 ROLL STOCK FOR FIELD CUTTING AND INSTALLATION. JACKET SHALL BE WHITE WITH ADHESIVE BACKING. PROVIDE ALL NECESSARY FITTING COVERS AND SHAPES. APPROVED MANUFACTURES: JOHNS MANVILLE, P.I.C. PLASTICS, PROTO PVC CORP., AND SPEEDLINE
B. METAL JACKETS SHALL BE ALUMINUM AND COMPLY WITH ASTM B 209 3003, 3005, 3015 OR 5005 TEMPER H-14. SHALL BE ROLL STOCK READY FOR FIELD CUTTING WITH STANDARD FINISH. INDOOR/OUTDOOR APPLICATION SHALL BE HEAT BONDED POLYETHYLENE AND KRAFT PAPER 1 MIL AND 3 MIL THICK RESPECTIVELY.

2.08 TAPES
A. ALL SERVICE JACKET TAPE SHALL BE WHITE, 3 INCHES WIDE AND 11.5 MILS THICK WITH MATCHING FACTORY APPLIED JACKET WITH ACRYLIC ADHESIVE. APPROVED MANUFACTURES: AVERY DENNISON CORP, VENTURE, COMPACT CORP.
B. FOIL SCRIM KRAFT TAPE SHALL BE FOIL FACE, 3 INCHES WIDE AND 6.5 MILS THICK WITH MATCHING FACTORY APPLIED JACKET/VAPOR RETARDER WITH ACRYLIC ADHESIVE. APPROVED MANUFACTURES: AVERY DENNISON CORP, VENTURE, COMPAC CORP.
C. PVC TAPE SHALL BE WHITE AND SUITABLE FOR INDOOR AND OUTDOOR APPLICATION, 2 INCHES WIDE AND 6 MILS THICK WITH MATCHING FACTORY APPLIED JACKET/VAPOR RETARDER WITH ACRYLIC ADHESIVE. APPROVED MANUFACTURES: AVERY DENNISON CORP, VENTURE, COMPAC CORP.
D. COVER JOINTS AND ALL SEAMS WITH TAPE AS RECOMMENDED BY MANUFACTURE TO MAINTAIN VAPOR SEAL.

SECTION 21 11 00 - FIRE SUPPRESSION SYSTEM

2.01 PIPE AND FITTINGS
B. STANDARD-WEIGHT BLACK STEEL PIPE AND FITTINGS
1. THREADED-END, STANDARD-WEIGHT STEEL PIPE: ASTM A 53/A 53M, ASTM A 135, OR ASTM A 795, WITH FACTORY- OR FIELD-FORMED THREADED ENDS, AND WITH FACTORY APPLIED ANTIMICROBIAL COATING ON INNER WALL OF PIPE.
a. CAST-IRON THREADED FLANGES: ASME B16.1.
b. MALLEABLE-IRON THREADED FITTINGS: ASME B16.3.
c. GRAY-IRON THREADED FITTINGS: ASME B16.4.
d. STEEL THREADED PIPE NIPPLES: ASTM A 733, MADE OF ASTM A 53/A 53M OR ASTM A 106, SCHEDULE 40, SEAMLESS STEEL PIPE. INCLUDE ENDS MATCHING JOINING METHOD.
e. STEEL THREADED COUPLINGS: ASTM A 865.
2. PLAIN-END, STANDARD-WEIGHT STEEL PIPE: ASTM A 53/A 53M, ASTM A 135, OR ASTM A 795, AND WITH FACTORY APPLIED ANTIMICROBIAL COATING ON INNER WALL OF PIPE.
a. STEEL WELDING FITTINGS: ASTM A 234/A 234M, AND ASME B16.9 OR ASME B16.11.
b. STEEL FLANGES AND FLANGED FITTINGS: ASME B16.5.
3. GROOVED-END, STANDARD-WEIGHT STEEL PIPE: ASTM A 53/A 53M, ASTM A 135, OR ASTM A 795, WITH FACTORY- OR FIELD-FORMED, SQUARE-CUT- OR ROLL- GROOVED ENDS, AND WITH FACTORY APPLIED ANTIMICROBIAL COATING ON INNER WALL OF PIPE.
a. APPROVED MANUFACTURES: ANVIL INTERNATIONAL, INC., TYCO FIRE & BUILDING PRODUCTS; GRINNELL MECHANICAL PRODUCTS, VICTAULIC CO. OF AMERICA
b. GROOVED-END FITTINGS: UL-LISTED, ASTM A 536, DUCTILE-IRON CASTING WITH OD MATCHING STEEL-PIPE OD.
c. GROOVED-END-PIPE COUPLINGS: UL 213 AND AWWA C606, RIGID PATTERN, UNLESS OTHERWISE INDICATED; GASKETED FITTING MATCHING STEEL-PIPE OD. INCLUDE DUCTILE-IRON HOUSING WITH KEYS MATCHING STEEL-PIPE AND FITTING GROOVES, PRELUBRICATED RUBBER GASKET LISTED FOR USE WITH HOUSING, AND STEEL BOLTS AND NUTS.
C. SCHEDULE 10 BLACK STEEL PIPE AND FITTINGS
1. PLAIN-END, SCHEDULE 10 STEEL PIPE: ASTM A 135 OR ASTM A 795, SCHEDULE 10 IN NPS 5 (DN 125) AND SMALLER; AND NFPA 13 SPECIFIED WALL THICKNESS IN NPS 6 TO NPS 10 (DN 150 TO DN 250), AND WITH FACTORY APPLIED ANTIMICROBIAL COATING ON INNER WALL OF PIPE.
a. STEEL WELDING FITTINGS: ASTM A 234/A 234M, AND ASME B16.9 OR ASME B16.11.
b. STEEL FLANGES AND FLANGED FITTINGS: ASME B16.5.
2. GROOVED-END, SCHEDULE 10 STEEL PIPE: ASTM A 135 OR ASTM A 795, SCHEDULE 10 IN NPS 5 (DN 125) AND SMALLER; AND NFPA 13-SPECIFIED WALL THICKNESS IN NPS 6 TO NPS 10 (DN 150 TO DN 250); WITH FACTORY- OR FIELD-FORMED, ROLL-GROOVED ENDS, AND WITH FACTORY APPLIED ANTIMICROBIAL COATING ON INNER WALL OF PIPE.
A. APPROVED MANUFACTURES: ANVIL INTERNATIONAL, INC., TYCO FIRE & BUILDING PRODUCTS; GRINNELL MECHANICAL PRODUCTS, VICTAULIC CO. OF AMERICA
B. GROOVED-END FITTINGS: UL-LISTED, ASTM A 536, DUCTILE-IRON CASTING WITH OD MATCHING STEEL-PIPE OD.
C. GROOVED-END-PIPE COUPLINGS: UL 213 AND AWWA C606, RIGID PATTERN, UNLESS OTHERWISE INDICATED; GASKETED FITTING MATCHING STEEL-PIPE OD. INCLUDE DUCTILE-IRON HOUSING WITH KEYS MATCHING STEEL-PIPE AND FITTING GROOVES, PRELUBRICATED RUBBER GASKET LISTED FOR USE WITH HOUSING, AND STEEL BOLTS AND NUTS.

2.03 SPRINKLER SPECIALTY FITTINGS
A. SPRINKLER SPECIALTY FITTINGS SHALL BE UL LISTED OR FMG APPROVED, WITH 175-PSIG MINIMUM WORKING-PRESSURE RATING, AND MADE OF MATERIALS COMPATIBLE WITH PIPING. SPRINKLER SPECIALTY FITTINGS SHALL HAVE 300-PSIG MINIMUM WORKING-PRESSURE RATING IF FITTINGS ARE COMPONENTS OF HIGH-PRESSURE PIPING SYSTEM.
B. DROP-NIPPLE FITTINGS: UL 1474, ADJUSTABLE WITH THREADED INLET AND OUTLET, AND SEALS.
1. APPROVED MANUFACTURERS: CECA, LLC. AND MERIT.
C. FLEXIBLE SPRINKLER DROP FITTINGS
1. APPROVED MANUFACTURERS: VICTAULIC CO. OF AMERICA; AQUAFLEX SPRINKLER FITTINGS; AH-2 WITH AB1 BRACKET ASSEMBLY OR FLEXHEAD INDUSTRIES, INC.
2. DESCRIPTION: UL LISTED AND FMG APPROVED FLEXIBLE HOSE FOR CONNECTION TO SPRINKLER, AND WITH BRACKET FOR CONNECTION TO COMMERCIAL CEILING GRID.
3. STANDARD: UL 2443.
4. PRESSURE RATING: 175 PSIG
5. SIZE: SAME AS CONNECTED PIPING, FOR SPRINKLER.
6. DRY-PIPE-SYSTEM FITTINGS: UL LISTED FOR DRY-PIPE SERVICE.

2.04 LISTED FIRE-PROTECTION VALVES
A. VALVES SHALL BE UL LISTED OR FMG APPROVED, WITH 175-PSIG (1200 KPA) MINIMUM PRESSURE RATING. VALVES SHALL HAVE 300-PSIG PRESSURE RATING IF VALVES ARE COMPONENTS OF HIGH-PRESSURE PIPING SYSTEM.
B. BALL VALVES: COMPLY WITH UL 1091, EXCEPT WITH BALL INSTEAD OF DISC.
1. APPROVED MANUFACTURERS: NIBCO., VICTAULIC CO. OF AMERICA, MUELLER COMPANY, TYCO FIRE AND BUILDING PRODUCTS
2. NPS 1-1/2 AND SMALLER: BRONZE BODY WITH THREADED ENDS.
3. NPS 2 AND NPS 2-1/2 : BRONZE BODY WITH THREADED ENDS OR DUCTILE-IRON BODY WITH GROOVED ENDS.
4. NPS 3 : DUCTILE-IRON BODY WITH GROOVED ENDS.
C. BUTTERFLY VALVES: UL 1091.
1. APPROVED MANUFACTURERS: NIBCO., VICTAULIC CO. OF AMERICA, MUELLER COMPANY, TYCO FIRE AND BUILDING PRODUCTS
2. NPS 2-1/2 AND LARGER: BRONZE, CAST-IRON, OR DUCTILE-IRON BODY; WAFER TYPE OR WITH FLANGED OR GROOVED ENDS.
D. CHECK VALVES NPS 2 AND LARGER: UL 312, SWING TYPE, CAST-IRON BODY WITH FLANGED OR GROOVED ENDS.
1. APPROVED MANUFACTURERS: NIBCO., VICTAULIC CO. OF AMERICA, MUELLER COMPANY, TYCO FIRE AND BUILDING PRODUCTS, WATTS

2.11 SPRINKLERS
A. SPRINKLERS SHALL BE UL LISTED OR FMG APPROVED, WITH 175-PSIG MINIMUM PRESSURE RATING. SPRINKLERS SHALL HAVE 300-PSIG PRESSURE RATING IF SPRINKLERS ARE COMPONENTS OF HIGH-PRESSURE PIPING SYSTEM.
B. APPROVED MANUFACTURERS: RELIABLE AUTOMATIC SPRINKLER CO., INC., TYCO FIRE & BUILDING PRODUCTS., VICTAULIC CO. OF AMERICA., VIKING CORP.
C. AUTOMATIC SPRINKLERS WITH HEAT-RESPONSIVE GLASS BULB ELEMENT COMPLYING WITH THE FOLLOWING:
1. UL 199, FOR NONRESIDENTIAL APPLICATIONS.
2. UL 1626, FOR RESIDENTIAL APPLICATIONS.
3. UL 1767, FOR EARLY-SUPPRESSION, FAST-RESPONSE APPLICATIONS.
D. OPEN SPRINKLERS: UL 199, WITHOUT HEAT-RESPONSIVE ELEMENT.
1. ORIFICE: 1/2 INCH, WITH DISCHARGE COEFFICIENT K BETWEEN 5.3 AND 5.8.
2. ORIFICE: 17/32 INCH, WITH DISCHARGE COEFFICIENT K BETWEEN 7.4 AND 8.2.
E. SPRINKLER TYPES AND CATEGORIES: NOMINAL 1/2-INCH ORIFICE FOR 165 DEG F "ORDINARY", 212 DEG F "INTERMEDIATE", 286 DEG F "HIGH" TEMPERATURE CLASSIFICATION RATING, UNLESS OTHERWISE INDICATED OR REQUIRED BY APPLICATION.
F. SPRINKLER TYPES, FEATURES, AND OPTIONS AS FOLLOWS: CONCEALED CEILING SPRINKLERS, INCLUDING COVER PLATE; EXTENDED-COVERAGE SPRINKLERS; FLUSH CEILING SPRINKLERS, INCLUDING ESCUTCHEON; HIGH-PRESSURE SPRINKLERS; OPEN SPRINKLERS; PENDENT SPRINKLERS; PENDENT, DRY-TYPE SPRINKLERS; QUICK-RESPONSE SPRINKLERS; RECESSED SPRINKLERS, INCLUDING ESCUTCHEON; SIDEWALL SPRINKLERS; SIDEWALL, DRY-TYPE SPRINKLERS; UPRIGHT SPRINKLERS.
G. SPRINKLER FINISHES: CHROME PLATED, BRONZE, AND PAINTED. BY ARCH OR MATCH EXISTING.
H. SPRINKLER ESCUTCHEONS: MATERIALS, TYPES, AND FINISHES FOR THE FOLLOWING SPRINKLER MOUNTING APPLICATIONS. ESCUTCHEONS FOR CONCEALED, FLUSH, AND RECESSED-TYPE SPRINKLERS ARE SPECIFIED WITH SPRINKLERS. ESCUTCHEONS LISTED, SUPPLIED, AND APPROVED FOR USE WITH THE SPRINKLER BY THE SPRINKLER MANUFACTURER.
1. CEILING MOUNTING: CHROME-PLATED STEEL, 2 PIECE, WITH 3/4-INCH VERTICAL ADJUSTMENT.
2. SIDEWALL MOUNTING: CHROME-PLATED STEEL, ONE PIECE, FLAT.
I. SPRINKLER GUARDS: WIRE-CAGE TYPE, INCLUDING FASTENING DEVICE FOR ATTACHING TO SPRINKLER. SPRINKLER GUARDS LISTED, SUPPLIED, AND APPROVED FOR USE WITH THE SPRINKLER BY THE SPRINKLER MANUFACTURER.

3.02 PIPING AND VALVE INSTALLATION
A. INSTALL SUPPRESSION SYSTEM IN ACCORDANCE WITH NFPA 13 OR 13R AND AUTHORITIES HAVING JURISDICTION.
B. INSTALL STANDPIPES AND HOSE SYSTEMS IN ACCORDANCE WITH NFPA 14 AND AUTHORITIES HAVING JURISDICTION.

3.02 SPRINKLER APPLICATIONS
A. USE THE FOLLOWING SPRINKLER TYPES:
1. ROOMS WITHOUT CEILINGS: UPRIGHT SPRINKLERS.
2. ROOMS WITH SUSPENDED CEILINGS: PENDENT, RECESSED, FLUSH, AND CONCEALED SPRINKLERS, AS INDICATED.
3. WALL MOUNTING: SIDEWALL SPRINKLERS.
4. SPACES SUBJECT TO FREEZING: UPRIGHT, PENDENT, DRY SPRINKLERS; AND SIDEWALL, DRY SPRINKLERS AS INDICATED.
5. SPECIAL APPLICATIONS: EXTENDED-COVERAGE, AND QUICK-RESPONSE SPRINKLERS WHERE INDICATED.
B. SPRINKLER FINISHES:
1. UPRIGHT, PENDENT, AND SIDEWALL SPRINKLERS: CHROME PLATED IN FINISHED SPACES EXPOSED TO VIEW; ROUGH BRONZE IN UNFINISHED SPACES NOT EXPOSED TO VIEW; WAX COATED WHERE EXPOSED TO ACIDS, CHEMICALS, OR OTHER CORROSIVE FUMES; WHITE POLYESTER FINISH IN NATATORIUMS.
2. CONCEALED SPRINKLERS: ROUGH BRASS, WITH FACTORY-PAINTED WHITE COVER PLATE.
3. FLUSH SPRINKLERS: BRIGHT CHROME, WITH PAINTED WHITE ESCUTCHEON.
4. RECESSED SPRINKLERS: BRIGHT CHROME, WITH BRIGHT CHROME ESCUTCHEON.
5. RESIDENTIAL SPRINKLERS: DULL CHROME.
6. SPRINKLER GUARDS: FOR EXPOSED SPRINKLER HEADS SUBJECT TO DAMAGE.

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SECTION 22 33 00 ELECTRIC WATER HEATERS

2.01 LIGHT COMMERCIAL ELECTRIC WATER HEATERS
A. APPROVED MANUFACTURERS: LOCHINVAR CORPORATION, BRADFORD WHITE, STATE, A.O. SMITH, AND PVI
B. STORAGE-TANK CONSTRUCTION SHALL BE STEEL, VERTICAL ARRANGEMENT. TAPPINGS SHALL COMPLY WITH ASME B1.20.1 PIPE THREAD. 150 PSIG PRESSURE RATING. INTERIOR FINISH SHALL COMPLY WITH NSF 61 BARRIER MATERIALS FOR POTABLE-WATER TANK LININGS, INCLUDING EXTENDING LINING MATERIAL INTO TAPPINGS. FACTORY-INSTALLED STORAGE-TANK APPURTENANCES: REPLACEABLE MAGNESIUM ANODE ROD REQUIRED FOR GLASS LINED TANKS; DIP TUBE UNLESS COLD-WATER INLET IS NEAR BOTTOM OF TANK; ASSE 1005 DRAIN VALVE; INSULATION SHALL COMPLY WITH ASHRAE/IESNA 90.1; STEEL JACKET WITH ENAMELED FINISH; HEAT TRAP FITTINGS SHALL BE INLET TYPE IN COLD-WATER INLET AND OUTLET TYPE IN HOT-WATER OUTLET; TWO ELECTRIC SCREW-IN IMMERSION TYPE HEATING ELEMENTS THATARE WIRED FOR SIMULTANEOUS OPERATION, UNLESS OTHERWISE INDICATED; ADJUSTABLE THERMOSTAT FOR EACH ELEMENT; HIGH-TEMPERATURE-LIMIT CUTOFF DEVICE OR SYSTEM; RELIEF VALVE SHALL BE ASME RATED AND STAMPED AND COMPLYING WITH ASME PTC 25.3 FOR COMBINATION TEMPERATURE AND PRESSURE RELIEF VALVES. INCLUDE RELIEVING CAPACITY AT LEAST AS GREAT AS HEAT INPUT, AND INCLUDE PRESSURE SETTING LESS THAN WATER HEATER WORKING-PRESSURE RATING. SELECT RELIEF VALVE WITH SENSING ELEMENT THAT EXTENDS INTO STORAGE TANK.
C. REFER TO SCHEDULES ON DRAWINGS FOR CAPACITY.

2.02 TANKLESS, ELECTRIC-WATER HEATERS
A. APPROVED MANUFACTURERS: EEMAX
B. THERMOSTAT-CONTROL, ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS:
a. STANDARD: NSF AND UL 499 FOR ELECTRIC, TANKLESS, (DOMESTIC-WATER HEATER) HEATING APPLIANCE.
b. CONSTRUCTION SHALL BE COPPER PIPING OR TUBING COMPLYING WITH NSF 61 ANNEX BARRIER MATERIALS FOR POTABLE WATER, WITHOUT STORAGE CAPACITY. CONNECTIONS SHALL BE ASME B1.20.1 PIPE THREAD. PRESSURE RATING SHALL BE 150 PSIG. HEATING ELEMENT SHALL BE RESISTANCE HEATING SYSTEM. TEMPERATURE CONTROL SHALL BE THERMOSTAT. SAFETY CONTROL SHALL BE HIGH-TEMPERATURE-LIMIT CUTOFF DEVICE OR SYSTEM. JACKET: ALUMINUM OR STEEL WITH ENAMELED FINISH OR PLASTIC. PROVIDE SUPPORT BRACKET FOR WALL MOUNTING.
C. PROVIDE A COMBINATION TEMPERATURE-AND-PRESSURE RELIEF VALVE. ASME RATED AND STAMPED.
D. REFER TO SCHEDULES ON DRAWINGS FOR CAPACITY.

2.03 EXPANSION TANKS
A. APPROVED MANUFACTURERS: AMTROL INC., ARMSTRONG PUMPS, BELL & GOSSETT, TACO
B. STEEL, PRESSURE-RATED TANK, ASME-CODE CONSTRUCTED WITH WELDED JOINTS AND FACTORY-INSTALLED, BUTYL-RUBBER DIAPHRAGM. INCLUDE AIR PRECHARGE TO MINIMUM SYSTEM-OPERATING PRESSURE AT TANK. FACTORY-FABRICATED STEEL TAPS WELDED TO TANK BEFORE TESTING AND LABELING. INCLUDE ASME B1.20.1 PIPE THREAD. INTERIOR FINISH SHALL COMPLY WITH NSF 61 BARRIER MATERIALS FOR POTABLE-WATER TANK LININGS, INCLUDING EXTENDING FINISH INTO AND THROUGH TANK FITTINGS AND OUTLETS. PROVIDE AIR CHARGING VALVE.
C. CONTRACTOR SHALL ADJUST THE PNEUMATIC PRESSURE INTERNAL TO EXPANSION TANK PRIOR TO SYSTEM CONNECTION. TANK PRESSURE SHALL MATCH SYSTEM PRESSURE.

SECTION 22 42 00 PLUMBING FIXTURES

1.01 GENERAL
A. OBTAIN PLUMBING FIXTURES, FAUCETS, AND OTHER COMPONENTS OF EACH CATEGORY THROUGH ONE SOURCE FROM A SINGLE MANUFACTURER. IF FIXTURES, FAUCETS, OR OTHER COMPONENTS ARE NOT AVAILABLE FROM A SINGLE MANUFACTURER, OBTAIN SIMILAR PRODUCTS FROM OTHER MANUFACTURERS SPECIFIED FOR THAT CATEGORY.
B. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, ARTICLE 100, BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, AND MARKED FOR INTENDED USE.
C. FIXTURES WITH ADA NOTED SHALL COMPLY WITH REQUIREMENTS IN ICC A117.1, "ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES"; PUBLIC LAW 90-480, "ARCHITECTURAL BARRIERS ACT"; AND PUBLIC LAW 101-336, "AMERICANS WITH DISABILITIES ACT"; FOR PLUMBING FIXTURES FOR PEOPLE WITH DISABILITIES.
D. COMPLY WITH REQUIREMENTS IN PUBLIC LAW 102-486, "ENERGY POLICY ACT," ABOUT WATER FLOW AND CONSUMPTION RATES FOR PLUMBING FIXTURES.
E. COMPLY WITH REQUIREMENTS IN PUBLIC LAW 111-380, "REDUCTION OF LEAD IN DRINKING WATER ACT," ABOUT LEAD CONTENT IN MATERIALS THAT WILL BE IN CONTACT WITH POTABLE WATER FOR HUMAN CONSUMPTION.
F. COMPLY WITH NSF 61, "DRINKING WATER SYSTEM COMPONENTS - HEALTH EFFECTS; SECTIONS 1 THROUGH 9," AND NSF 372 DRINKING WATER SYSTEM COMPONENTS – LEAD CONTENT FOR POTABLE DOMESTIC WATER PIPING AND COMPONENTS.
G. SELECT COMBINATIONS OF FIXTURES AND TRIM, FAUCETS, FITTINGS, AND OTHER COMPONENTS THAT ARE COMPATIBLE.
H. COMPLY WITH APPLICABLE ANSI, ASME, ASSE, ASTM, ICC, NSF, AND UL STANDARDS AND OTHER REQUIREMENTS SPECIFIED FOR PLUMBING FIXTURES, TRIM, FITTINGS, COMPONENTS, AND FEATURES.
I. REFER TO PLUMBING FIXTURE SCHEDULES FOR BASIS OF DESIGN AND REQUIREMENTS.

2.01 PLUMBING FIXTURES
A. APPROVED WATER CLOSET MANUFACTURES: AMERICAN STANDARD, KOHLER, SLOAN, AND ZURN
B. APPROVED WATER CLOSET FLUSH VALVE MANUFACTURES: AMERICAN STANDARD, MOEN, DELTA, SPEAKMAN, KOHLER, SLOAN, AND ZURN
C. APPROVED TOILET SEAT MANUFACTURES: AMERICAN STANDARD, BEMIS, PROFLO, ZURN, AND KOHLER
D. APPROVED SERVICE SINK MANUFACTURES: AMERICAN STANDARD, KOHLER, AND ZURN
E. APPROVED SERVICE SINK FAUCET MANUFACTURES: AMERICAN STANDARD, KOHLER, T&S BRASS AND BRONZE WORKS, AND ZURN
F. APPROVED SHOWER MANUFACTURES: AMERICAN STANDARD, KOHLER, CRANE, AND STERLING
G. APPROVED SHOWER TRIM AND VALVE MANUFACTURES: AMERICAN STANDARD, KOHLER, HANSGROHE, DELTA, SPEAKMAN, CHICAGO FAUCET, ZURN, AND MOEN
H. APPROVED DRINKING FOUNTAIN MANUFACTURES: ELKAY AND FILTRINE
I. APPROVED ELECTRIC WATER COOLER MANUFACTURES: ELKAY AND FILTRINE
J. APPROVED FIXTURE SUPPLY MANUFACTURES: ANY APPROVED FIXTURE MANUFACTURE

SECTION 22 05 23 AND 23 05 23 GENERAL VALVES FOR PLUMBING AND HVAC

2.01 VALVES, GENERAL
A. REFER TO PIPING APPLICATION SCHEDULES FOR SIZE, TYPE, AND CONNECTIONS.
B. VALVE PRESSURE RATING SHALL NOT BE LESS THAT INDICATED AS REQUIRED FOR SYSTEM TEMPERATURE AND PRESSURE RATINGS.
C. DOMESTIC WATER VALVES
a. REGULATORY REQUIREMENTS: COMPLY WITH REQUIREMENTS IN PUBLIC LAW 111-380, "REDUCTION OF LEAD IN DRINKING WATER ACT," ABOUT LEAD CONTENT IN MATERIALS THAT WILL BE IN CONTACT WITH POTABLE WATER FOR HUMAN CONSUMPTION.
b. NSF COMPLIANCE: NSF 61 AND NSF 372 FOR VALVE MATERIALS FOR POTABLE-WATER SERVICE.
c. BRONZE VALVES SHALL BE MADE WITH DEZINCIFICATION-RESISTANT MATERIALS. BRONZE VALVES MADE WITH COPPER ALLOY (BRASS) CONTAINING MORE THAN 15 PERCENT ZINC ARE NOT PERMITTED UNLESS OTHERWISE NOTED. WETTED SURFACES OF VALVES CONTACTED BY CONSUMABLE WATER SHALL CONTAIN NOT MORE THAN 0.25 PERCENT WEIGHTED AVERAGE LEAD CONTENT.
D. VALVE ACTUATORS:
a. CHAINWHEEL: FOR ATTACHMENT TO VALVES
b. GEAR DRIVE OPERATOR: FOR QUARTER-TURN VALVES 8 INCH AND LARGER.
c. HANDWHEEL: FOR VALVES OTHER THAN QUARTER-TURN TYPES.
d. LEVER HANDLE: FOR QUARTER-TURN VALVES 6 INCH AND SMALLER.
E. EXTENDED STEMS ON INSULATED VALVES.

2.02 BRONZE BALL VALVES
A. APPROVED MANUFACTURERS: APOLLO VALVES, HAMMOND, NIBCO, WATTS, MILWAUKEE VALVE CO.
B. BRONZE BALL VALVES SHALL COMPLY WITH MSS SP-110 AND HAVE BRONZE BODY COMPLYING WITH ASTM B 584, EXCEPT FOR CLASS 250 WHICH SHALL COMPLY WITH ASTM B 61, FULL-DEPTH ASME B1.20.1 THREADED OR SOLDER ENDS, AND BLOWOUT-PROOF STEMS.
C. TWO-PIECE, REGULAR PORT BRONZE BALL VALVES WITH STAINLESS-STEEL TRIM SHALL BE TYPE 316 STAINLESS-STEEL BALL AND STEM, REINFORCED TFE SEATS, BLOW-OUT-PROOF STEM, WITH ADJUSTABLE STEM PACKING, SOLDERED OR THREADED ENDS; AND 150 PSIG SWP AND 600-PSIG CWP RATINGS.
D. TWO-PIECE, FULL-PORT, BRONZE BALL VALVES WITH STAINLESS-STEEL TRIM SHALL BE TYPE 316 STAINLESS-STEEL BALL AND STEM, REINFORCED TFE SEATS, BLOW-OUT-PROOF STEM, WITH ADJUSTABLE STEM PACKING, SOLDERED OR THREADED ENDS; 150 PSIG SWP AND 600-PSIG CWP RATINGS.

2.04 BRONZE CHECK VALVES
A. APPROVED MANUFACTURERS: APOLLO VALVES, NIBCO, WATTS, MILWAUKEE VALVE CO.
B. CHECK VALVES SHALL COMPLY WITH MSS SP-80. CLASS 125, BRONZE, SWING CHECK VALVES WITH BRONZE DISC COMPLYING WITH ASTM B-62 BRONZE BODY AND SEAT WITH REGRINDING-TYPE BRONZE DISC, Y-PATTERN DESIGN, SOLDERED OR THREADED END CONNECTIONS, AND HAVING 200 PSIG CWP RATING.

2.08 BRONZE GLOBE VALVES
A. APPROVED MANUFACTURERS: APOLLO VALVES, NIBCO, WATTS, MILWAUKEE VALVE CO., AND HAMMOND
A. VALVES SHALL COMPLY WITH MSS SP-80, WITH MALLEABLE-IRON HANDWHEEL. CLASS 125, TFE DISC, BRONZE GLOBE VALVES COMPLY WITH ASTM B-62 BRONZE BODY, BONNET, AND SEAT, TFE DISC, COPPER-SILICONE BRONZE STEM, UNION-RING BONNET, SOLDERED OR THREADED END CONNECTIONS; AND HAVING 200 PSIG CWP RATING.

SECTION 22 11 16 - DOMESTIC WATER PIPING

1.01 GENERAL
A. POTABLE-WATER PIPING AND COMPONENTS SHALL COMPLY WITH NSF 14 AND NSF 61 ANNEX G. PLASTIC PIPING COMPONENTS SHALL BE MARKED WITH "NSF-PW."
B. COMPLY WITH NSF STANDARD 372 FOR LOW LEAD.

2.01 COPPER TUBE AND FITTINGS
A. SOFT COPPER, TYPE K
a. TUBE SHALL BE IN ACCORDANCE WITH ASTM B 88, TYPE K (ASTM B 88M, TYPE A), WATER TUBE, ANNEALED TEMPER.
b. COPPER PRESSURE FITTINGS SHALL BE IN ACCORDANCE WITH ASME B16.18, CAST-COPPER-ALLOY OR ASME B16.22, WROUGHT-COPPER, SOLDER-JOINT FITTINGS.
c. BRONZE FLANGES SHALL BE IN ACCORDANCE WITH ASME B16.24, CLASS 150, WITH SOLDER-JOINT ENDS.
d. COPPER UNIONS SHALL BE IN ACCORDANCE WITH MSS SP-123, CAST-COPPER-ALLOY, HEXAGONAL-STOCK BODY, WITH BALL-AND-SOCKET, METAL-TO-METAL SEATING SURFACES, AND SOLDER-JOINT OR THREADED ENDS.
B. HARD COPPER, TYPE L
a. TUBE SHALL BE IN ACCORDANCE WITH ASTM B 88, TYPE L (ASTM B 88M, TYPE B), WATER TUBE, DRAWN TEMPER.
b. COPPER PRESSURE FITTINGS SHALL BE IN ACCORDANCE WITH ASME B16.18, CAST-COPPER-ALLOY OR ASME B16.22, WROUGHT- COPPER, SOLDER-JOINT FITTINGS.
c. BRONZE FLANGES SHALL BE IN ACCORDANCE WITH ASME B16.24, CLASS 150, WITH SOLDER-JOINT ENDS.
d. COPPER UNIONS SHALL BE IN ACCORDANCE WITH MSS SP-123, CAST-COPPER-ALLOY, HEXAGONAL-STOCK BODY, WITH BALL-AND-SOCKET, METAL-TO-METAL SEATING SURFACES, AND SOLDER-JOINT OR THREADED ENDS.

2.02 CROSSLINKED POLYETHYLENE PIPE
A. PEX DISTRIBUTION SYSTEM SHALL BE IN ACCORDANCE WITH ASTM F 876 AND ASTM F 877, SDR 9 TUBING. FITTINGS FOR PEX TUBE SHALL BE IN ACCORDANCE WITH ASTM F 1807, METAL-INSERT TYPE WITH COPPER CRIMP RINGS AND MATCHING PEX TUBE DIMENSIONS; OR PLASTIC-INSERT TYPE COLD EXPANSION FITTINGS AND CORRESPONDING RINGS, MATERIAL MEETING REQUIREMENTS OF ASTM F 1960.
a. MANIFOLD: MULTIPLE-OUTLET, PLASTIC OR CORROSION-RESISTANT-METAL ASSEMBLY COMPLYING WITH ASTM F 877 AND WITH PLASTIC OR CORROSION-RESISTANT-METAL VALVE FOR EACH OUTLET.
B. PEX PIPING JOINTS: JOIN ACCORDING TO ASTM F 1807.

SECTION 22 11 19 DOMESTIC WATER PIPING SPECIALTIES

2.02 VACUUM BREAKERS
A. APPROVED MANUFACTURERS: APOLLO VALVES, FEBCO, WATTS, AND ZURN
B. ATMOSPHERIC TYPE
a. SHALL COMPLY WITH ASSE 1001 FOR SIZES 1/4 TO 3, AS REQUIRED TO MATCH CONNECTED PIPING. DEVICE SHALL HAVE A BRONZE BODY, INLET AND OUTLET CONNECTION SHALL BE THREADED, AND CHROME PLATED FINISH.
C. HOSE CONNECTION TYPE
a. SHALL COMPLY WITH ASSE 1011. DEVICE SHALL HAVE A BRONZE OR BRASS BODY WITH DRAIN, OUTLET CONNECTION SHALL BE GARDEN HOSE THREADED, AND CHROME OR NICKEL PLATED FINISH.

2.03 TEMPERATURE ACTUATED MIXING VALVES (TMV)
A. APPROVED MANUFACTURERS: APOLLO VALVES, BRADLEY, LAWLER, LEONARD, WATTS, AND ZURN
B. WATER TEMPERATURE LIMITING DEVICE (FIXTURE)
a. SHALL COMPLY WITH ASSE 1070 WITH MINIMUM PRESSURE RATING OF 125 PSIG. THERMOSTATICALLY CONTROLLED WITH BRONZE BODY CHROME PLATED. 1/2 INCH UNION OR 3/8 COMPRESSION WITH INTEGRAL CHECK VALVES AND TEMPERATURE ADJUSTMENT.
C. PRIMARY THERMOSTATIC MIXING VALVE (HOT WATER DISTRIBUTION SYSTEM - MASTER MIXER)
a. SHALL COMPLY WITH STANDARD ASSE 1017. TYPE SHALL BE EXPOSED-MOUNTING OR IN CABINET AS SHOWN ON PLANS OR SCHEDULED, THERMOSTATICALLY CONTROLLED WATER MIXING VALVE. MATERIAL SHALL BE BRONZE BODY WITH CORROSION-RESISTANT INTERIOR COMPONENTS. CONNECTIONS SHALL BE THREADED UNION INLETS AND OUTLET. ACCESSORIES SHALL BE MANUAL TEMPERATURE CONTROL, CHECK STOPS AND STRAINERS ON HOT- AND COLD-WATER SUPPLIES, AND ADJUSTABLE, TEMPERATURE-CONTROL HANDLE. VALVE PRESSURE RATING SHALL BE 125 PSIG MINIMUM, UNLESS OTHERWISE INDICATED. VALVE FINISH SHALL BE CHROME PLATED. CABINET SHALL BE FACTORY-FABRICATED, STAINLESS STEEL, FOR RECESSED OR SURFACE AS SHOWN ON PLANS WITH MOUNTING AND WITH HINGED, STAINLESS-STEEL DOOR.

2.04 HOSE BIBBS (HB-1)
A. APPROVED MANUFACTURERS: JOSAM, MIFAB, ZURN, WOODFORD, WATTS
B. SHALL COMPLY WITH ASME A112.18.1 AND HAVE BRONZE BODY, BRONZE REPLACEABLE SEAT, VACUUM BREAKER INTEGRAL AND NONREMOVABLE, 1/2 OR 3/4 INCH THREADED OR SOLDERED CONNECTIONS, OUTLET SHALL BE A GARDEN HOSE CONNECTOR, PRESSURE RATING SHALL BE 125 PSIG.

2.07 WATER HAMMER ARRESTORS
A. APPROVED MANUFACTURERS: MIFAB, SIOUX CHIEF, WATTS, PPP
B. COMPLY WITH ASSE 1010 OR PDI-WH 201. ARRESTORS SHALL BE COPPER TUBE WITH PISTON. SIZE PER ASSE 1010.

SECTION 22 13 16 DRAINAGE PIPING

2.01 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS
A. PIPE AND FITTINGS SHALL COMPLY WITH ASTM A 888 OR CISPI 301.
B. CAST-IRON SOIL PIPE, HUBLESS-PIPING COUPLINGS SHALL BE NSF CERTIFIED FOR COMPLIANCE WITH CISPI 310. STAINLESS-STEEL CORRUGATED SHIELD WITH STAINLESS-STEEL BANDS AND TIGHTENING DEVICES; AND ASTM C 564, RUBBER SLEEVE WITH INTEGRAL, CENTER PIPE STOP.
C. HEAVY DUTY CAST-IRON SOIL PIPE, HUBLESS-PIPING COUPLINGS SHALL COMPLY WITH ASTM C 1277 AND ASTM C 1540, OR ASTM C 1277 AND FM 1680 CLASS I. STAINLESS-STEEL SHIELD WITH STAINLESS-STEEL BANDS AND TIGHTENING DEVICES; AND ASTM C 564, RUBBER SLEEVE WITH INTEGRAL, CENTER PIPE STOP.
D. APPROVED MANUFACTURERS: ANACO-HUSKY, FERGUSON ENTERPRISES, INC., IDEAL-TRIDON., MISSION RUBBER COMPANY, TYLER PIPE, FERNCO INC.

2.02 COPPER PIPE AND FITTINGS
A. DRAIN WASTE AND VENT (DWV) COPPER
a. TUBE SHALL COMPLY WITH ASTM B 306, DRAINAGE TUBE, DRAWN TEMPER.
b. FITTINGS SHALL COMPLY WITH ASME B16.23, CAST COPPER OR ASME B16.29, WROUGHT COPPER, SOLDER-JOINT FITTINGS.
B. HARD COPPER, TYPE L
a. TUBE SHALL BE IN ACCORDANCE WITH ASTM B 88, TYPE L (ASTM B 88M, TYPE B), WATER TUBE, DRAWN TEMPER.
b. COPPER PRESSURE FITTINGS SHALL BE IN ACCORDANCE WITH ASME B16.18, CAST-COPPER-ALLOY OR ASME B16.22, WROUGHT- COPPER, SOLDER-JOINT FITTINGS.
c. BRONZE FLANGES SHALL BE IN ACCORDANCE WITH ASME B16.24, CLASS 150, WITH SOLDER-JOINT ENDS.
d. COPPER UNIONS SHALL BE IN ACCORDANCE WITH MSS SP-123, CAST-COPPER-ALLOY, HEXAGONAL-STOCK BODY, WITH BALL-AND-SOCKET, METAL-TO-METAL SEATING SURFACES, AND SOLDER-JOINT OR THREADED ENDS.

2.03 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS
A. SOLID-WALL PVC PIPE SHALL BE SCHEDULE 40, ASTM D 2665, DRAIN, WASTE, AND VENT.
B. PVC SOCKET FITTINGS SHALL BE ASTM D 2665, SOCKET TYPE, MADE TO ASTM D 3311, DRAIN, WASTE, AND VENT PATTERNS AND TO FIT SCHEDULE 40 PIPE.

SECTION 22 13 19 DRAINAGE PIPING SPECIALTIES

2.01 CLEANOUTS
A. APPROVED MANUFACTURERS: JOSAM, MIFAB, JAY R. SMITH, ZURN
B. CLEANOUTS SHALL BE THE SAME NOMINAL SIZE AS PIPE THEY SERVE UP TO 4 INCHES. PIPES LARGE THAN 4 INCHES SHALL HAVE A CLEANOUT OF 4 INCHES MINIMUM.
C. BODY SHALL BE HUB-AND-SPIGOT, CAST-IRON SOIL PIPE T-BRANCH OR HUBLESS, CAST-IRON SOIL PIPE TEST TEE AS REQUIRED TO MATCH CONNECTED PIPING. CLOSURE SHALL BE COUNTERSUNK OR RAISED-HEAD, DRILLED-AND-THREADED BRONZE OR BRASS PLUG WITH TAPERED THREADS.
D. CLEANOUTS IN FINISHED FLOOR SHALL HAVE A NICKEL-BRONZE, COPPER ALLOY WITH SCORIATED COVER IN SERVICE AREAS, AND RECESSED COVER TO ACCEPT FLOOR FINISH MATERIAL IN FINISHED FLOOR AREAS.
E. CLEANOUTS IN FINISHED WALL SHALL HAVE A ROUND, CHROME-PLATED BRONZE FLAT, CHROME-PLATED BRASS OR STAINLESS-STEEL COVER PLATE WITH SCREW.
F. A CLEAN-OUT SHALL BE INSTALLED AT THE BASE OF EACH SOIL AND WASTE STACK, AND AT NOT MORE THAN 100'-0" INTERVALS ON HORIZONTAL RUNS AND AS REQUIRED BY CODE.

2.02 FLOOR DRAINS, SINKS, AND TRENCH DRAINS
A. APPROVED MANUFACTURERS: JOSAM, MIFAB, JAY R. SMITH, ZURN
B. REFER TO PLUMBING SCHEDULES.

2.03 AIR ADMITTANCE VALVES
A. APPROVED MANUFACTURERS: OATEY, STUDOR, RECTORSEAL
B. STANDARD ASSE 1051 TYPE A FOR SINGLE FIXTURE OF TYPE B FOR BRANCH PIPING. HOUSING SHALL BE PLASTIC WITH MECHANICAL SEALING DIAPHRAGM THE SAME SIZE AS BRANCH VENT.
C. STANDARD ASSE 1050 TYPE FOR VENT STACKS. HOUSING SHALL BE PLASTIC WITH MECHANICAL SEALING DIAPHRAGM THE SAME SIZE AS VENT STACK.
D. PROVIDE A WHITE PLASTIC WALL BOX WITH GRILLE FOR RECESSED INSTALLATION. SIZE SHALL BE MINIMUM 9 INCHES WIDE BY 9 INCHES TALL BY 4 INCHES DEEP.

2.06 TRAP SEAL PROTECTION DEVICE
A. APPROVED MANUFACTURERS: ZURN, JAY R. SMITH, SURESEAL MANUFACTURING
B. BARRIER TYPE TRAP SEAL PROTECTION DEVICE SHALL COMPLY WITH ASSE 1072 AND SHALL HAVE A NEOPRENE RUBBER OR CHEMICAL RESISTANT ELASTOMER SEAL ELEMENT. DEVICE SHALL BE SAME SIZE AS DRAIN WITH A COMPRESSION FIT SEALING GASKET.

2.08 OIL INTERCEPTORS
A. APPROVED MANUFACTURERS: ZURN, JAY R. SMITH, WATTS, MIFAB, SCHIER, JOSAM, THERMACO
B. STANDARD: ASTM C 913, FOR INTERCEPTING AND RETAINING OIL. PLUMBING AND DRAINAGE INSTITUTE SEAL IS REQUIRED. CLEANING SHALL BE MANUAL. PROVIDE FLOW-CONTROL FITTING AS REQUIRED.
C. BODY MATERIAL: CAST IRON, STEEL, OR POLYPROPYLENE. INTERIOR LINING SHALL BE CORROSION-RESISTANT ENAMEL FOR CAST IRON OR STEEL BODIES. NOT REQUIRED FOR POLYPROPYLENE BODIES. EXTERIOR COATING SHALL BE CORROSION-RESISTANT ENAMEL FOR CAST IRON OR STEEL BODIES. NOT REQUIRED FOR POLYPROPYLENE BODIES.
D. CLEANOUT SHALL BE INTEGRAL OR FIELD INSTALLED ON OUTLET.
E. MOUNTING: ABOVE FLOOR OR RECESSED IN ACID-RESISTANT, COATED STEEL FRAME AND CRADLE OR RECESSED, FLUSH WITH FLOOR. REFER TO DRAWINGS. BODY EXTENSION IS REQUIRED TO BE FLUSH WITH FLOOR.
F. CAPACITIES AND CHARACTERISTICS: REFER TO SCHEDULE(S) ON DRAWINGS.

2.10 TRAP-SEAL PRIMER VALVES
A. SUPPLY-TYPE, TRAP-SEAL PRIMER VALVES:
a. APPROVED MANUFACTURERS: MIFAB, INC., PPP INC., SIOUX CHIEF MANUFACTURING COMPANY, SMITH, JAY R. MFG. CO., WATTS WATER TECHNOLOGIES, INC.
b. STANDARD: ASSE 1018.
c. PRESSURE RATING: 125 PSIG MINIMUM.
d. BODY: BRONZE.
e. INLET AND OUTLET CONNECTIONS: NPS 1/2 THREADED, UNION, OR SOLDER JOINT.
f. GRAVITY DRAIN OUTLET CONNECTION: NPS 1/2 THREADED OR SOLDER JOINT.
g. FINISH: CHROME PLATED, OR ROUGH BRONZE FOR UNITS USED WITH PIPE OR TUBE THAT IS NOT CHROME FINISHED.

SECTION 23 05 93-TESTING, ADJUSTING, AND BALANCING

1.01 GENERAL
A. BALANCING SHALL BE DONE BY AN INDEPENDENT FIRM SPECIALIZING SOLELY IN THE DISCIPLINE OF BALANCING AIR AND WATER SYSTEMS, AND A MEMBER OF NEBB.. FIRMS DESIRING TO FURNISH SERVICES FOR THIS PROJECT SHALL SUBMIT FOR WRITTEN APPROVAL DURING BIDDING. ALL AIR AND HYDRONIC SYSTEMS SHALL BE BALANCED USING APPLICABLE PROPORTIONATE PROCEDURE.
B. CONTRACTOR SHALL FURNISH SERVICES FOR TWO COMPLETE ADJUSTMENTS OF THE HEATING, AIR CONDITIONING AND AIR DISTRIBUTION SYSTEMS WITH A REPORT FOR EACH VISIT. REPORTS MUST BE SUBMITTED TO ENGINEER FOR REVIEW AND APPROVAL.
C. SYSTEM SHALL BE TESTED, ADJUSTED & BALANCED BY 'NEBB' CERTIFIED PERSONNEL.

2.01 TESTING CONDITIONS
A. (AIR) BEFORE ADJUSTMENTS ARE MADE, CHECK THE SYSTEM FOR SUCH ITEMS AS DIRTY FILTERS, DUCT AND DAMPER LEAKAGE, VIBRATIONS, ETC. ALL DIFFUSERS, DUCT SECTIONS, ETC SHALL BE ADJUSTED TO DELIVER DESIGN QUANTITIES WITHIN 5%. AIR QUANTITIES SHALL BE TESTED SIMULATING FILTERS BEING 50% LOADED. ADJUST/REPLACE SHEAVES AND BELTS AS REQUIRED TO ACHIEVE DESIGN AIR QUANTITIES. REPLACE THERMAL MOTOR OVERLOADS AS REQUIRED.
B. MERV-8 FILTERS SHALL BE INSTALLED PRIOR TO TEST AND BALANCE.

2.02 VERIFICATION OF TEMPERATURE CONTROL
A. THE TEST AND BALANCE AGENCY SHALL BE ASSISTED BY THE CONTROL CONTRACTOR IN VERIFYING THE OPERATION AND CALIBRATION OF ALL TEMPERATURE CONTROL SYSTEMS. THE FOLLOWING TESTS SHALL BE CONDUCTED:
a. VERIFY THAT ALL CONTROL COMPONENTS ARE INSTALLED IN ACCORDANCE WITH PROJECT REQUIREMENTS AND ARE FUNCTIONAL, INCLUDING ALL ELECTRICAL INTERLOCKS, DAMPER SEQUENCES, AND FIRE AND SMOKE DETECTORS.
b. VERIFY THAT ALL CONTROLLING INSTRUMENTS ARE CALIBRATED AND SET FOR DESIGN OPERATING CONDITIONS.
c. VERIFY THE ACCURACY OF THE FINAL SETTING BY TAKING TEMPERATURE READINGS. THE READINGS SHALL BE IN A TYPICAL CONDITIONED SPACE FOR EACH SEPARATELY CONTROLLED ZONE.

2.03 REPORT
A. AFTER ALL ADJUSTMENTS ARE MADE, A DETAIL WRITTEN REPORT SHALL BE PREPARED AND SUBMITTED FOR APPROVAL. FINAL ACCEPTANCE OF THE PROJECT WILL NOT BE MADE UNTIL A SATISFACTORY REPORT IS RECEIVED AND FIELD VERIFIED. THE REPORT SHALL DETAIL THE TEST EQUIPMENT AND BALANCING PROCEDURES BEING USED; THE GENERAL STATUS OF THE SYSTEM BEING TESTED INCLUDING EQUIPMENT DETAILS; PROVIDE DATA SHEETS INDICATING THE REQUIRED AND ACTUAL CFM OF ALL OUTLETS AND INLETS.
B. SIX (6) COPIES OF THE TEST AND BALANCE REPORT ARE REQUIRED AND SHALL BE SUBMITTED TO THE ARCHITECT.
C. TEST & BALANCE REPORT TO INCLUDE OUTSIDE AIRFLOW READINGS.
D. THE REPORT SHALL CONTAIN THE FOLLOWING GENERAL DATA IN A FORMAT SELECTED BY THE TEST AND BALANCE AGENCY: PROJECT NUMBER, PROJECT TITLE, PROJECT LOCATION, PROJECT ARCHITECT, PROJECT MECHANICAL ENGINEER, TEST AND BALANCE AGENCY, TEST AND BALANCE ENGINEER, OWNER, MECHANICAL SUBCONTRACTORS, DATES TESTS WERE PERFORMED, CERTIFICATION.
E. THE TEST AND BALANCE REPORT SHALL BE RECORDED ON REPORT FORMS CONFORMING TO THE RECOMMENDED FORMS IN THE A.A.B.C. NATIONAL STANDARDS.
a. PREFACE - A GENERAL DISCUSSION OF THE SYSTEM, ANY ABNORMALITIES AND PROBLEMS ENCOUNTERED (DEFICIENCIES OUTSTANDING LISTED).
b. INSTRUMENTATION LIST - THE LIST OF INSTRUMENTS INCLUDE TYPE, MODEL, MANUFACTURER, SERIAL NUMBER AND CALIBRATION DATE.
c. SYSTEM IDENTIFICATION - IN EACH REPORT, THE VAV BOXES, ZONES, SUPPLY, RETURN, DATA SHEETS, ALONG WITH A DRAWING SHOWING THE ABOVE.
d. AIR HANDLING EQUIPMENT TEST REPORT FORMS - RECORD THE FOLLOWING ON EACH AIR-HANDLING EQUIPMENT TEST FORM:
e. MANUFACTURER, MODEL NUMBER AND SERIAL NUMBER
f. ALL DESIGN AND MANUFACTURER-RATED DATA.
g. TOTAL ACTUAL CFM BY TRAVERSE IF PRACTICAL, IF NOT PRACTICAL, THE SUM OF THE OUTLETS MAY BE USED, OR A COMBINATION OF EACH OF THESE PROCEDURES.
h. SUCTION AND DISCHARGE STATIC PRESSURE OF EACH FAN, AS APPLICABLE.

2.04 ACCEPTANCE OF TEST AND BALANCE REPORT
A. AT THE TIME OF ACCEPTANCE OF THE TEST AND BALANCE REPORT, THE TEST AND BALANCE AGENCY SHALL, IF REQUESTED, RECHECK IN THE PRESENCE OF THE OWNER REPRESENTATIVE, SPECIFIC AND RANDOM SELECTIONS OF DATA RECORDED IN THE CERTIFIED TEST AND BALANCE REPORT.
B. POINTS AND AREAS FOR RECHECK SHALL BE SELECTED BY THE ENGINEER OF RECORD.
C. MEASUREMENTS AND TEST PROCEDURES SHALL BE THE SAME AS THE ORIGINAL TEST AND BALANCE.
D. SELECTIONS FOR RECHECK, SPECIFIC PLUS RANDOM, SHALL NOT NORMALLY EXCEED 15% OF THE TOTAL NUMBER TABULATED IN THE REPORT, EXCEPT WHERE SPECIAL AIR SYSTEMS REQUIRE A COMPLETE RECHECK FOR SAFETY REASONS.
E. IF RANDOM TESTS DEMONSTRATED A MEASURED FLOW DEVIATION OF 15% OR MORE FROM THAT RECORDED, A NEW CERTIFIED TEST AND BALANCE REPORT MUST BE SUBMITTED, AND A NEW INSPECTION TEST MADE, ALL AT NO ADDITIONAL COST TO OWNER.

3.01 AIR SYSTEM PROCEDURES
A. THE TEST AND BALANCE AGENCY SHALL PERFORM THE FOLLOWING TESTING AND BALANCING FUNCTIONS:
1. DESIGN CONDITIONS INCLUDING SUPPLY/ EXHAUST AIRFLOW, MOTOR HP, FAN RPM, OUTLET VELOCITY, STATIC PRESSURE.
2. INSTALLED EQUIPMENT INFORMATION INCLUDING BELT, SHEAVE SIZE, MOTOR, MODEL NUMBERS.
3. FAN SPEEDS - TEST AND ADJUST FAN RPM TO ACHIEVE DESIGN CFM REQUIREMENTS.
4. CURRENT AND VOLTAGE - MEASURE AND RECORD MOTOR CURRENT AND VOLTAGE.
5. PITOT TUBE TRAVERSE - PERFORM A PITOT TUBE TRAVERSE OF MAIN SUPPLY AND RETURN DUCTS TO OBTAIN TOTAL CFM. IF A PITOT TUBE TRAVERSE IS NOT PRACTICAL, THE SUMMATION OF THE OUTLETS OR INLETS MAY BE USED. AN EXPLANATION WHY A TRAVERSE WAS <u>NOT</u> MADE MUST APPEAR ON THE APPROPRIATE DATA SHEET.
6. OUTSIDE AIR - TEST AND ADJUST SYSTEM MINIMUM OUTSIDE AIR BY PITOT TUBE TRAVERSE. IF A PITOT TUBE TRAVERSE IS NOT PRACTICAL, THE PERCENTAGE OF OUTSIDE AIR MAY BE DETERMINED BY CALCULATIONS FROM THE RETURN AIR, OUTSIDE AIR, AND MIXED AIR TEMPERATURE. MAKE ALLOWANCES FOR HEAT OF COMPRESSION AND MOTOR HEAT WHERE APPLICABLE.
7. STATIC PRESSURE - TEST AND RECORD SYSTEM STATIC PRESSURES, INCLUDING SUCTION AND DISCHARGE STATIC PRESSURE PROFILE OF EACH FAN.
8. AIR TEMPERATURE - TAKE WET-BULB AND DRY-BULB AIR TEMPERATURES ON THE ENTERING AND LEAVING SIDE OF EACH HEATING COIL.
9. TOLERANCE - TEST AND BALANCE EACH DIFFUSER, GRILLE, AND REGISTER TO WITHIN 10 PERCENT OF DESIGN AND REQUIREMENT.
10. DESCRIPTION - RECORD THE SIZE AND TYPE OF EACH DIFFUSER, GRILLE, AND REGISTER ON AIR OUTLET DATA SHEETS.
11. TERMINAL BOXES - ALL ASSOCIATED TEMPERATURE CONTROLS SHALL BE CHECKED FOR PROPER OPERATION AND CALIBRATION
12. MINIMIZING DRAFTS - ADJUST ALL DIFFUSERS, GRILLES, AND REGISTERS TO MINIMIZE DRAFTS IN ALL AREAS
13. EQUIPMENT SHALL BE BALANCED TO AIRFLOWS WITHIN:
A. TERMINAL DEVICES & BRANCH LINES: ±10% OF DESIGNED LOADS
B. MAIN DUCTS & AHU'S: ± 5% OF DESIGNED LOADS
14. EXHAUST FANS/HOODS
a. MEASURE EXHAUST FAN STATIC PRESSURE, TOTAL CFM. MAKEUP AIR AND FAN RPM.
b. MEASURE MOTOR OPERATING VOLTAGE AND AMPERAGE.
c. MEASURE HOOD AVERAGE FACE VELOCITIES AND ADJUST AS NECESSARY. WHERE POSSIBLE, BALANCE FLOW USING A PITOT TRAVERSE WITHIN HOOD WHERE DUCTS ARE CONNECTED.
d. RECORD THE SPECIFIED AGAINST THE ACTUAL SUPPLIED HORSEPOWER AND ELECTRICAL CHARACTERISTICS OF ALL MOTORS. RECORD, IF SPECIFIED, TO BE SELF OR PERMANENTLY LUBRICATED.

SECTION 23 11 23 - FUEL GAS PIPING

2.01 BLACK STEEL PIPE AND FITTINGS
A. PROVIDE BLACK STEEL PIPE IN ACCORDANCE WITH ASTM A 53/A 53, TYPE E OR S, GRADE B, SCHEDULE 4O.
B. PROVIDE MALLEABLE-IRON THREADED FITTINGS ASME B16.3, CLASS 150 OR STEEL THREADED FITTINGS ASME B16.11 FORGED STEEL THREADED FITTINGS.
C. STEEL WELDED FITTING SHALL COMPLY WITH ASME B16.9 AND SHALL BE WROUGHT STEEL OR ASME B16.11 FORGED STEEL.
D. UNIONS SHALL BE ASME B16.39, CLASS 150, MALLEABLE IRON AND HAVE THREADED ENDS.
E. CAST IRON FLANGES AND FLANGED FITTINGS SHALL BE ASME B16.1, CLASS 125 OR STEEL FLANGES AND FLANGED FITTINGS IN ACCORDANCE WITH ASME B16.5. GASKET MATERIAL SHALL BE SUITABLE FOR GAS.

2.04 PIPING SPECIALTIES
A. FLEXIBLE CONNECTORS: ANSI Z21.24, COPPER ALLOY.
B. QUICK-DISCONNECT DEVICES: ANSI Z21.41, CONVENIENCE OUTLETS AND MATCHING PLUG CONNECTOR.
C. Y-PATTERN STRAINERS SHALL BE ASTM A 126, CLASS B, CAST IRON BODY WITH BOLTED COVER AND BOTTOM DRAIN CONNECTION. END CONNECTIONS SHALL BE THREADED ENDS FOR 2 INCH AND SMALLER; FLANGED ENDS FOR 2-1/2 INCH AND LARGER. PERFORATED STAINLESS-STEEL BASKET WITH 50 PERCENT FREE AREA. COLD WORKING PRESSURE OF 125 PSIG
D. WEATHERPROOF VENT CAP: CAST- OR MALLEABLE-IRON INCREASER FITTING WITH CORROSION-RESISTANT WIRE SCREEN, WITH FREE AREA AT LEAST EQUAL TO CROSS-SECTIONAL AREA OF CONNECTING PIPE AND THREADED-END CONNECTION.

2.05 VALVES
A. NATURAL GAS VALVES 3 INCH AND SMALLER
a. BALL VALVES: BRONZE OR BRASS BODY WITH AGA OR CSA STAMP, UL LISTED OR FM APPROVED FOR SERVICE, WITH CHROME-PLATED BRASS BALL AND LEVER HANDLE; 125-PSIG MINIMUM PRESSURE RATING. VALVE SHALL HAVE LOCKING CAPABILITY.
b. APPROVED MANUFACTURERS: APOLLO VALVE; CONBRACO INDUSTRIES, INC., NIBCO INC., WATTS WATER TECHNOLOGIES, INC.; WATTS REGULATOR CO.

2.06 PRESSURE REGULATORS
A. DESCRIPTION: SINGLE STAGE AND SUITABLE FOR FUEL GAS SERVICE. INCLUDE STEEL JACKET AND CORROSION-RESISTANT COMPONENTS, ELEVATION COMPENSATOR, AND ATMOSPHERIC VENT.
B. APPROVED MANUFACTURERS: ELSTER GAS NORTH AMERICA; FISHER CONTROLS INTERNATIONAL, INC.; ITRON GAS.
a. NPS 2 AND SMALLER: THREADED ENDS ACCORDING TO ASME B1.20.1 FOR PIPE THREADS.
b. NPS 2-1/2 AND LARGER: FLANGED ENDS ACCORDING TO ASME B16.5 FOR STEEL FLANGES.
c. SERVICE PRESSURE REGULATORS: ANSI Z21.80. INCLUDE 100-PSIG- MINIMUM INLET PRESSURE RATING.
d. LINE PRESSURE REGULATORS: ANSI Z21.80/GCA 6.22 OR ANSI B109.4/CGA 6.18, WITH INLET PRESSURE RATING AS SCHEDULED ON THE DRAWINGS.
e. APPLIANCE PRESSURE REGULATORS: ANSI Z21.18. REGULATOR MAY INCLUDE VENT LIMITING DEVICE, INSTEAD OF VENT CONNECTION, IF APPROVED BY AUTHORITIES HAVING JURISDICTION.
C. PRESSURE REGULATOR VENTS: FACTORY- OR FIELD-INSTALLED, CORROSION-RESISTANT SCREEN IN OPENING IF NOT CONNECTED TO VENT PIPING.

SECTION 23 31 13 - METAL DUCTS

1.01 DUCTWORK
A. GENERAL
1. ALL DUCTWORK SHALL BE CONSTRUCTED STRICTLY ACCORDING TO THE LATEST ASHRAE 90A, SMACNA, AND IMC STANDARDS. DUCT SIZES SHOWN ARE INSIDE CLEAR DIMENSIONS; MAINTAIN SIZES INSIDE LINING FOR LINED DUCTS.
2. REFER TO DUCT APPLICATION SCHEDULES FOR MATERIALS, PRESSURE CLASS, SEAL CLASS, AND LOCATIONS.
3. DUCT PRESSURE DEFINITIONS:
A. LOW PRESSURE: UP TO 2 INCH WG AND VELOCITIES LESS THAN 1,500 FPM. CONSTRUCT FOR 2 INCH WG POSITIVE OR NEGATIVE STATIC PRESSURE.
B. MEDIUM PRESSURE: GREATER THAN 2 INCH WG TO 6 INCH WG AND VELOCITIES GREATER THAN 1,500 FPM AND LESS THAN 2,500 FPM. CONSTRUCT FOR 6 INCH WG POSITIVE OR NEGATIVE STATIC PRESSURE.
C. HIGH PRESSURE: GREATER THAN 6 INCH WG TO 12 INCH WG AND VELOCITIES GREATER THAN 2,500 FPM. CONSTRUCT FOR 12 INCH WG POSITIVE OR NEGATIVE STATIC PRESSURE.

2.01 SHEET METAL
A. MATERIALS
a. GALVANIZED STEEL CONFORMING TO ASTM STANDARDS ASTM A-653/ A 653M. GALVANIZED COATING DESIGNATION SHALL BE G90 WITH FINISHES FOR EXPOSED SURFACES MILL PHOSPHATIZED. REINFORCEMENT SHALL BE CONSTRUCTED OF GALVANIZED STEEL.
b. CARBON-STEEL SHEETS CONFORMING WITH ASTM A 366/A 366A, WITH OILED, MATTE FINISH FOR EXPOSED DUCTS.
c. ALUMINUM SHEETS CONFORMING WITH ASTM B 209 (ASTM B 209M) ALLOY 3003, H14 TEMPER; WITH MILL FINISH FOR CONCEALED DUCTS, AND STANDARD, ONE-SIDE BRIGHT FINISH FOR DUCT SURFACES EXPOSED TO VIEW.
d. STAINLESS-STEEL SHEETS CONFORMING WITH ASTM A 480/A 480M, TYPE 304 OR 316, COLD ROLLED, ANNEALED, SHEET. EXPOSED SURFACE FINISH SHALL BE NO. 4.
e. PVC-COATED GALVANIZED STEEL CONFORMING WITH UL 181, CLASS 1 LISTING. LOCK-FORMING-QUALITY, GALVANIZED SHEET STEEL COMPLYING WITH ASTM A 653/A 653M AND HAVING G60 (Z180) COATING DESIGNATION. FACTORY-APPLIED PVC COATINGS SHALL BE 4 MILS THICK ON INTERIOR SHEET METAL SURFACES OF DUCTS AND FITTINGS EXPOSED TO CORROSIVE CONDITIONS AND MINIMUM 1 MIL THICK ON INTERIOR AND/OR EXTERIOR SURFACES.
B. DUCT THICKNESS SHALL CONFORM TO THE ABOVE STANDARDS. WHERE THERE IS A DISCREPANCY, THE GREATER THICKNESS SHALL APPLY. REINFORCEMENT, JOINT TYPE, SPACING AND THICKNESS MAY BE VARIED AT THE CONTRACTORS DISCRETION, IN CONFORMANCE WITH THE ABOVE STANDARDS, EXCEPT WHERE SPECIFICALLY NOTED. MINIMUM THICKNESS OF DUCTS SHALL BE 26-GAUGE SHEET METAL.
C. RECTANGULAR DUCTWORK
a. PROVIDE RECTANGULAR DUCTWORK AND HOUSINGS TO SIZES AS SHOWN ON DRAWINGS.
b. PROVIDE RADIUS ELBOWS, TURNS AND OFFSETS WITH A MINIMUM CENTERLINE RADIUS OF 1-1/2 TIMES THE DUCT WIDTH. WHERE SPACE DOES NOT PERMIT FULL RADIUS ELBOWS PROVIDE SHORT RADIUS ELBOWS WITH A MINIMUM OF TWO CONTINUOUS SPLITTER VANES. VANES SHALL BE THE ENTIRE LENGTH OF THE BEND. PROVIDE MITERED ELBOWS WHERE SPACE DOES NOT PERMIT RADIUS ELBOWS WHERE SHOWN ON THE DRAWINGS OR AT THE OPTION OF THE CONTRACTOR WITH THE ENGINEER'S APPROVAL. MITERED ELBOWS LESS THAN 45 DEGREES SHALL NOT REQUIRE TURNING VANES. MITERED ELBOWS 45 DEGREES AND GREATER SHALL HAVE DOUBLE WALL AIRFOIL FORMED TYPE TURNING VANES OF SAME GAUGE AS DUCTWORK RIGIDLY FASTENED WITH GUIDE STRIPS IN DUCTWORK. VANES FOR MITERED ELBOWS SHALL BE PROVIDED IN ALL SUPPLY, RETURN, OUTSIDE AIR, AND EXHAUST DUCTWORK.
D. ROUND AND FLAT-OVAL DUCTWORK
a. PROVIDE ROUND AND FLAT-OVAL DUCT TO SIZES AS SHOWN ON DRAWINGS.
b. LOW PRESSURE FITTINGS 24" IN DIAMETER AND LESS SHALL BE PREFABRICATED, SPOTWELDED AND INTERNALLY SEALED. CONTINUOUSLY WELD FITTINGS LARGER THAN 24" IN DIAMETER. FITTING GAUGE SHALL BE 22-GAUGE FOR 36" FITTINGS AND UNDER 20-GAUGE FOR LARGER SIZES. 90- DEGREE TEE'S SHALL BE CONICAL-TYPE. SEAL LONGITUDINAL AND TRANSVERSE DUCTWORK JOINTS AIR-TIGHT WITH HEAVY WATER BASED LIQUID SEALANT APPLIED ACCORDING TO MANUFACTURER'S INSTRUCTIONS. PROVIDE GAUGE THICKNESS IN MEDIUM PRESSURE DUCTWORK AS RECOMMENDED BY SMACNA.
c. APPROVED MANUFACTURERS OF ROUND AND FLAT-OVAL SPIRAL LOCK-SEAM DUCTS ARE LINDAB INC, MCGILL AIRFLOW CORP, SEMCO INC, LAPINE METAL PRODUCTS, OR APPROVED EQUAL. ROUND AND FLAT-OVAL SPIRAL LOCK-SEAM SUPPLY AND RETURN DUCTS SHALL BE FABRICATED ACCORDING TO SMACNA STANDARDS BASED ON PRESSURE CLASS. MINIMUM THICKNESS OF DUCT SHALL BE 26 GAUGE SHEET METAL. ROUND AND FLAT-OVAL FITTINGS SHALL BE FACTORY FABRICATED WELDED DESIGN. DUCTS UP TO 20" INCHES IN DIAMETER SHALL HAVE CENTER-BEADED SLIP COUPLING, SEALED BEFORE AND AFTER FASTENING, ATTACHED WITH SHEET METAL SCREWS. DUCTS 21" TO 72" INCHES SHALL HAVE A THREE-PIECE GASKETED FLANGED JOINT CONSISTING OF TWO INTERNAL FLANGES WITH SEALANT AND ONE EXTERNAL CLOSURE BAND WITH GASKET. PREFABRICATED CONNECTION SYSTEM CONSISTING OF FLANGES AND GASKET ARE ACCEPTABLE, APPROVED MANUFACTURERS ARE DUCTMATE INDUSTRIES INC AND LINDAB. ELBOWS, TEES, AND BENDS SHALL HAVE A RADIUS NOT LESS THAN 1-1/2 TIMES THE WIDTH OF THE CENTERLINE. TRANSITIONS IN DUCT SIZE SHALL BE GRADUAL NOT EXCEEDING 15 DEGREES WHERE POSSIBLE. ROUND ELBOWS UP TO 14 INCHES SHALL BE PLEATED AND GORED FOR 16" AND ABOVE. ALL FLAT OVAL ELBOWS SHALL BE GORED. 90 DEGREE TEES, LATERALS, AND CONICAL TEES SHALL BE FABRICATED TO SMACNA.
d. ROUND DUCTWORK EXPOSED TO THE PUBLIC SHALL BE GALVANIZED STEEL, SPIRAL WOUND, MAINTAINING IN A CLEAN, SHINY APPEARANCE, AND NOT UTILIZING VISIBLE SEALING MATERIAL. CONCEALED ROUND DUCTWORK MAY SPIRAL WOUND, OR SNAP LOCK TYPE GALVANIZED STEEL DUCTWORK.
E. SEAL DUCTWORK WITH HEAVY LIQUID WATER BASED SEALANT - SEALANTS SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS: MILL FINISH ALUMINUM SUBSTRATE WITH GRAY ADHESIVES, MINIMUM 30 MIL THICK, MINIMUM 17 LB/IN PEEL STRENGTH, MAX SMOKE DEVELOPED OF 50 WHEN TESTED IN ACCORDANCE WITH ASTM G-53, VOC CONTENT OF 250 g/L OR LESS, PRESSURE CLASS UP TO 10" W.C. - HARDCAST FLEXGRIP 550, UNITED MCGILL DUCT SEALER, MON-ECO INDUSTRIES ECO DUCT SEAL 44-50 OR EQUIVALENT, OR APPROVED EQUAL APPLIED ACCORDING TO SEALANT MANUFACTURER'S INSTRUCTIONS.
F. LOCATION: SHEET METAL MAY BE USED THROUGHOUT THE PROJECT.
G. SUPPORTS
a. SUPPORT HORIZONTAL RUNS OF DUCT ON CENTERS NOT TO EXCEED 8'-0". DO NOT SUPPORT CEILING GRID, CONDUITS, PIPES, EQUIPMENT, ETC. FROM DUCTWORK. COORDINATE ROUTING OF DUCTWORK WITH OTHER CONTRACTORS SUCH THAT PIPING, ELECTRICAL CONDUIT, AND ASSOCIATED SUPPORTS ARE NOT ROUTED THROUGH THE DUCTWORK.

SECTION 23 72 00 - AIR-TO-AIR ENERGY RECOVERY VENTILATOR

1.01 SUMMARY
A. THE ENERGY RECOVERY VENTILATOR SHALL BE A PACKAGED UNIT AND SHALL TRANSFER BOTH SENSIBLE AND LATENT ENERGY USING STATIC PLATE CORE TECHNOLOGY.
B. SUBMITTALS SHALL INCLUDE PRODUCT DATA FOR EACH TYPE OR MODEL OF ENERGY RECOVERY VENTILATOR, INCLUDE THE FOLLOWING:
a. HVI CERTIFIED PERFORMANCE DATA FOR BOTH SUPPLY AIR AND EXHAUST AIR WITH NET AIRFLOW AT VARYING EXTERNAL STATIC PRESSURES.
b. DIMENSIONED DRAWINGS SHOWING FRONT, SIDE AND PLAN VIEWS, TO INCLUDE LOCATION OF ATTACHED DUCTWORK AND SERVICE CLEARANCE REQUIREMENTS.
c. ESTIMATED GROSS WEIGHT OF EACH INSTALLED UNIT.
d. FILTER TYPES, QUANTITIES, AND SIZES
e. INSTALLATION, OPERATING AND MAINTENANCE MANUAL (IOM) FOR EACH MODEL.
f. OPERATION AND MAINTENANCE DATA FOR AIR-TO-AIR ENERGY RECOVERY VENTILATOR

1.02 QUALITY ASSURANCE
A. SOURCE LIMITATIONS: OBTAIN AIR-TO-AIR ENERGY RECOVERY VENTILATOR WITH ALL APPURTENANT COMPONENTS OR ACCESSORIES FROM A SINGLE MANUFACTURER. THE ERV CORE SHALL BE WARRANTED TO BE FREE OF MANUFACTURING DEFECTS AND TO RETAIN ITS FUNCTIONAL CHARACTERISTICS, UNDER CIRCUMSTANCES OF NORMAL USE, FOR A PERIOD OF TEN (10) YEARS FROM THE DATE OF PURCHASE. THE BALANCE-OF-UNIT SHALL BE WARRANTED TO BE FREE OF MANUFACTURING DEFECTS AND TO RETAIN ITS FUNCTIONAL CHARACTERISTICS, UNDER CIRCUMSTANCES OF NORMAL USE, FOR A PERIOD OF FIVE (5) YEARS FROM THE DATE OF PURCHASE.
B. MANUFACTURER SHALL BE ABLE TO PROVIDE EVIDENCE OF INDEPENDENT TESTING OF THE CORE BY UNDERWRITERS LABORATORY (UL), VERIFYING A MAXIMUM FLAME SPREAD INDEX (FSI) OF 25 AND A MAXIMUM SMOKE DEVELOPED INDEX (SDI) OF 50 THEREBY MEETING NFPA90A AND NFPA 90B REQUIREMENTS FOR MATERIALS IN A COMPARTMENT HANDLING AIR INTENDED FOR CIRCULATION THROUGH A DUCT SYSTEM. THE METHOD OF TEST SHALL BE UL STANDARD 723.
C. UNIT SHALL BE LISTED UNDER UL 1812 STANDARD FOR DUCTED AIR TO AIR HEAT EXCHANGERS. THE UNIT MUST PASS COMMERCIAL FLAMMABILITY REQUIREMENTS AND SHALL NOT BE LABELED "FOR RESIDENTIAL USE ONLY"

2.01 MANUFACTURERS
A. AVAILABLE MANUFACTURERS: RENEWAIRE, SOLER & PALAU, HONEYWELL, GREENHECK

2.02 MANUFACTURED UNITS
A. AIR-TO-AIR ENERGY RECOVERY VENTILATORS (ERV) SHALL BE FULLY ASSEMBLED AT THE FACTORY AND CONSIST OF A FIXED-PLATE CROSS-FLOW HEAT EXCHANGER WITH NO MOVING PARTS, AN INSULATED SINGLE WALL G90 GALVANIZED PAINTED 22-GAUGE STEEL CABINET, FILTER ASSEMBLIES FOR BOTH INTAKE AND EXHAUST AIR, ENTHALPY CORE, SUPPLY AIR BLOWER ASSEMBLY, EXHAUST AIR BLOWER ASSEMBLY AND ELECTRICAL CONTROL BOX WITH ALL SPECIFIED COMPONENTS AND INTERNAL ACCESSORIES FACTORY INSTALLED AND TESTED AND PREPARED FOR SINGLE-POINT HIGH VOLTAGE CONNECTION. ENTIRE UNIT WITH THE EXCEPTION OF FIELD-INSTALLED COMPONENTS SHALL BE ASSEMBLED AND TEST OPERATED AT THE FACTORY.
B. THE ERV SHALL BE PROVIDED WITH VIBRATION ISOLATION SPRINGS
C. THE ERV SHALL HAVE PRESSURE TAPS ON THE UNIT DOOR AND ONBOARD ADJUSTABLE AIRFLOW CONTROLS FOR EASY AIRFLOW BALANCING OF UNIT.
D. THE ONBOARD AIRFLOW SETTING CONTROLS SHALL BE FACTORY INSTALLED AND TESTED. THE ERV ONBOARD CONTROL CENTER SHALL HAVE THE ABILITY TO SET THE HIGH AND LOW AIRFLOW FOR THE SUPPLY AND EXHAUST FANS INDEPENDENTLY OF EACH AIRSTREAM. THE ONBOARD CONTROL SHALL HAVE THE CAPABILITY TO SET THE HIGH AND LOW AIRFLOW SETTING FOR THE SUPPLY AND EXHAUST FAN USING EASY TO USE ADJUSTABLE AIRFLOW DIALS THAT ARE CLEARLY LABELED OUTDOOR AIR OR RETURN AIR AND HIGH OR LOW FOR AIRFLOW SETTING.

2.03 CABINET
A. MATERIALS: FORMED SINGLE WALL INSULATED METAL CABINET, FABRICATED TO PERMIT ACCESS TO INTERNAL COMPONENTS FOR MAINTENANCE. THE ENERGY RECOVERY COMPONENT SHALL BE OF FIXED-PLATE CROSS-FLOW CONSTRUCTION, WITH NO MOVING PARTS.
B. ENTHALPY CORE: ENERGY RECOVERY CORE SHALL BE OF THE TOTAL ENTHALPY TYPE. THE ENERGY RECOVERY CORE SHALL BE DESIGNED AND CONSTRUCTED TO PERMIT CLEANING AND REMOVAL FOR SERVICING.
C. OUTSIDE CASING: SHALL BE CONSTRUCTED OF 22-GAUGE STEEL, WITH LAPPED CORNERS AND ZINC-PLATED SCREW FASTENERS. THE CASE SHALL BE FINISHED WITH TEXTURED, POWDER COAT PAINT.
D. CASE WALLS AND DOORS SHALL BE FULLY INSULATED WITH 1 INCH, EXPANDED POLYSTYRENE FOAM INSULATION FACED WITH A CLEANABLE FOIL FACE ON ALL EXPOSED SURFACES.
E. ACCESS DOOR SHALL PROVIDE EASY ACCESS TO BLOWERS, ERV CORES, AND FILTERS. ACCESS DOOR SHALL BE HINGED WITH AIRTIGHT CLOSED CELL FOAM GASKETS. DOORS SHALL HAVE AN AIRTIGHT COMPRESSION SEAL USING CLOSED CELL FOAM GASKETS.
F. THE ERV SHALL HAVE LOCKING DOOR HINGES SO THAT THE ERV CAN BE INSTALLED IN MULTIPLE ORIENTATIONS.
G. DOOR PRESSURE TAPS, WITH CAPTIVE PLUGS, SHALL BE PROVIDED FOR CROSS-CORE PRESSURE MEASUREMENT ALLOWING FOR ACCURATE AIRFLOW MEASUREMENT. UNIT SHALL HAVE (4) PRESSURE PORTS ALLOW FOR EASY AIRFLOW BALANCING AND VERIFICATION.
H. NO CONDENSATE DRAIN PANS OR DRAINS SHALL BE ALLOWED AND UNIT SHALL BE CAPABLE OF OPERATING IN BOTH WINTER AND SUMMER CONDITIONS WITHOUT GENERATING CONDENSATE.
I. UNIT SHALL HAVE FACTORY-SUPPLIED 6"/8" DUCT COLLARS FOR EASY INSTALLATION OF DUCTWORK TO THE UNIT.

2.04 BLOWER SECTION
A. THE IMPELLER TYPE SHALL BE BACKWARD-CURVED.
B. BLOWER ASSEMBLIES: SHALL BE STATICALLY AND DYNAMICALLY BALANCED AND DESIGNED FOR CONTINUOUS OPERATION AT MAXIMUM RATED FAN SPEED AND HORSEPOWER.

2.05 MOTORS
A. THE SUPPLY AND EXHAUST FANS SHALL BE ELECTRONICALLY COMMUTATED (EC) MOTORS WITH MULTISPEED CAPABILITY AS STANDARD OFFERING.
B. THE TWO (2) DC BRUSHLESS MOTORS SHALL BE TOTALLY ENCLOSED DC BRUSHLESS MOTORS RATED FOR CONTINUOUS OPERATION.

2.06 UNIT CONTROLS
A. UNIT SHALL HAVE THE CAPACITY TO OPERATE CONTINUOUSLY WITHOUT THE NEED FOR BYPASS, RECIRCULATION, PRE-HEATERS, OR DEFROST CYCLES UNDER NORMAL OPERATING CONDITIONS.
B. THE UNIT SHALL BE CAPABLE OF OPERATING CONTINUOUSLY OR INTERMITTENTLY AT THE LOW AIRFLOW (ADJ.) SETTING WITH THE ABILITY TO GO TEMPORARILY TO THE HIGH AIRFLOW (ADJ.) BOOST MODE. WHEN THE ERV SENSES STATIC PRESSURE, ITS SPEED IS AUTOMATICALLY INCREASED TO ENSURE THAT THE DESIRED CFM IS NOT COMPROMISED, WHICH ALLOWS THE ERV TO PERFORM AS RATED.
C. THE UNIT SHALL HAVE AN INTERNAL 24 VAC TRANSFORMER AND RELAY.
D. DC MOTOR SPEED SHALL AUTOMATICALLY INCREASE WHEN THE FAN SENSES STATIC PRESSURE TO MAINTAIN SELECTED CFM.

2.07 FILTER SECTION
A. THE ERV CORES SHALL BE PROTECTED BY A MERV-8 OR 13 RATED, SPUN POLYESTER, DISPOSABLE FILTER IN BOTH AIRSTREAMS.
B. ALL FILTERS SHALL BE ACCESSIBLE FROM THE EXTERIOR OF THE UNIT.

PART 3 – EXECUTION
3.01 INSTALLATION
A. INSTALLATION SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THESE WRITTEN SPECIFICATIONS, PROJECT DRAWINGS, MANUFACTURER'S INSTALLATION INSTRUCTIONS AS DOCUMENTED IN MANUFACTURER'S IOM, BEST PRACTICES AND ALL APPLICABLE BUILDING CODES.
B. INSTALL UNIT WITH CLEARANCES FOR SERVICE AND MAINTENANCE, PROVIDE VIBRATION ISOLATORS.

SECTION 23 82 16 REFRIGERANT COOLING COILS

COOLING COIL
A. APPROVED MANUFACTURES: LENNOX, RHEEM, CARRIER, TRANE, AND YORK
B. PROVIDE A COOLING COIL TESTED AND RATED ACCORDING TO AHRI 410 AND ASHRAE 33. MINIMUM WORKING-PRESSURE RATING: 300 PSIG AND FACTORY TESTED TO 450 PSIG. TUBES SHALL BE ASTM B 743 COPPER, MINIMUM 0.049 INCH THICK. FINS SHALL BE ALUMINUM, MINIMUM 0.010 INCH THICK. SUCTION AND DISTRIBUTOR PIPING SHALL COMPLY WITH ASTM B 88, TYPE L (ASTM B 88M, TYPE B) COPPER TUBE WITH BRAZED JOINTS. FRAMES SHALL BE GALVANIZED-STEEL CHANNEL FRAME, MINIMUM 0.064 INCH THICK FOR SLIP-IN OR FLANGED MOUNTING. CABINETS INSULATED WITH THICK FIBERGLASS INSULATION.

SECTION 23 82 39 - ELECTRIC WALL AND CEILING HEATERS

2.01 ELECTRIC WALL HEATER
A. APPROVED MANUFACTURES: INDEECO, MARKEL, QMARK, BERKO, AND STERLING
B. DESCRIPTION: AN ASSEMBLY INCLUDING CHASSIS, ELECTRIC HEATING COIL, FAN, MOTOR, AND CONTROLS. COMPLY WITH UL 2021.
C. CABINET:
a. FRONT PANEL: EXTRUDED-ALUMINUM BAR GRILLE, WITH REMOVABLE PANELS FASTENED WITH TAMPERPROOF FASTENERS.
b. FINISH: BAKED ENAMEL OVER BAKED-ON PRIMER WITH MANUFACTURER'S CUSTOM COLOR SELECTED BY ARCHITECT, APPLIED TO FACTORY-ASSEMBLED AND -TESTED WALL AND CEILING HEATERS BEFORE SHIPPING.
c. AIRSTREAM SURFACES: SURFACES IN CONTACT WITH THE AIRSTREAM SHALL COMPLY WITH REQUIREMENTS IN ASHRAE 62.1.
d. SURFACE-MOUNTING CABINET ENCLOSURE: STEEL WITH FINISH TO MATCH CABINET.
e. ELECTRIC-RESISTANCE HEATING COIL: NICKEL-CHROMIUM HEATING WIRE, FREE FROM EXPANSION NOISE AND HUM, EMBEDDED IN MAGNESIUM OXIDE REFRACTORY AND SEALED IN CORROSION-RESISTANT METALLIC SHEATH. TERMINATE ELEMENTS IN STAINLESS-STEEL, MACHINE-STAKED TERMINALS SECURED WITH STAINLESS-STEEL HARDWARE, AND LIMIT CONTROLS FOR HIGH TEMPERATURE PROTECTION. PROVIDE INTEGRAL CIRCUIT BREAKER FOR OVERCURRENT PROTECTION.
f. FAN: ALUMINUM PROPELLER DIRECTLY CONNECTED TO MOTOR.
g. MOTOR: PERMANENTLY LUBRICATED.
h. CONTROLS: UNIT-MOUNTED THERMOSTAT.
i. ELECTRICAL CONNECTION: FACTORY WIRED MOTORS AND CONTROLS FOR A SINGLE FIELD CONNECTION INCLUDING FACTORY WIRED DISCONNECT SWITCH AND STARTER.
j. CAPACITIES AND CHARACTERISTICS: REFER TO SCHEDULE ON DRAWINGS.

SECTION 23 33 00 - DUCT ACCESSORIES

2.01 BALANCING DAMPERS
A. APPROVED MANUFACTURES: GREENHECK, KRUEGER, NAILOR, RUSKIN, OR APPROVED EQUAL.
B. WHERE SHOWN ON DRAWINGS AND WHEREVER NECESSARY FOR COMPLETE ACCESS & CONTROL OF AIR FLOW:
a. ROUND VOLUME DAMPERS SHALL BE BUTTERFLY OR SINGLE BLADE TYPE CONSISTING OF CIRCULAR BLADE MOUNTED TO A SHAFT. AMCA CERTIFIED. INSTALL WITH GASKETS ON OUTSIDE OF DUCT. BLADES SHALL NOT BE LESS THAN 16 GAUGE GALVANIZED, ROLL-FORMED STEEL WITH GALVANIZED STEEL AXLE. OIL-IMPREGNATED BRONZE WITH MOLDED SYNTHETIC STAINLESS STEEL BEARINGS. ZINC PLATED STEEL DAMPER HARDWARE AND 1 INCH GALVANIZED STEEL JACKSHAFT.
b. RECTANGULAR VOLUME DAMPERS SHALL BE MULTIPLE OPPOSED BLADE, AMCA CERTIFIED. INSTALL WITH GASKETS ON OUTSIDE OF DUCT. BLADES AND FRAME SHALL NOT BE LESS THAN 16 GAUGE GALVANIZED, ROLL-FORMED STEEL WITH GALVANIZED STEEL AXLE. OIL-IMPREGNATED BRONZE WITH MOLDED SYNTHETIC STAINLESS STEEL BEARINGS. ZINC PLATED STEEL DAMPER HARDWARE AND 1 INCH GALVANIZED STEEL JACKSHAFT.
c. DAMPERS FRAMES SHALL BE FLANGED FOR INSTALLATION IN WALLS AND FLANGELESS FOR INSTALLATION IN DUCTWORK.

2.02 BACKDRAFT DAMPERS
A. DAMPERS SHALL BE PARALLEL ACTION COUNTER BALANCED FACTORY MADE OF 0.05" EXTRUDED ALUMINUM BLADES WITH EDGE SEALS, 16 GAUGE ALUMINUM FRAME SUPPORTED BY BRONZE OR ALUMINUM RODS. BLADES SHALL NOT BE LARGER THAN 30INCHES LENGTH AND 6 INCHES WIDE. DAMPERS SHALL COMPLY WITH AMCA 500. BACKDRAFT DAMPERS SHALL BE MANUFACTURED BY GREENHECK, RUSKIN, OR APPROVED EQUAL.

2.03 FIRE DAMPERS
A. APPROVED MANUFACTURES: RUSKIN, GREENHECK, NAILOR, OR APPROVED EQUAL.
B. DYNAMIC FIRE DAMPERS WITH CURTAIN STYLE BLADES, AND LABELED ACCORDING TO UL 555, MAXIMUM VELOCITY 2000 FPM, MAXIMUM STATIC PRESSURE 4 INCHES W.G. FRAME SHALL BE TYPE B OR TYPE C CURTAIN TYPE WITH BLADES OUTSIDE AIRSTREAM; FABRICATED WITH ROLL-FORMED, GALVANIZED STEEL IN GAGES REQUIRED BY MANUFACTURER'S UL LISTING; WITH MITERED AND INTERLOCKING CORNERS. DAMPERS SHALL HAVE REPLACEABLE FUSIBLE LINK RATED AT 165 OR 212 DEGREES, COORDINATE WITH SPRINKLER RATING, AND SHALL BE ACCESSIBLE OR ACCESS DOOR IN DUCT/CEILING SHALL BE PROVIDED. DAMPER BLADES SHALL BE FABRICATED WITH 21 GAUGE GALVANIZED STEEL. DAMPERS SHALL BE LOW-PROFILE TYPE WITH BLADES OUTSIDE THE AIRSTREAM. PROVIDE MOUNTING SLEEVES AS REQUIRED AND THEY SHALL BE THE SAME GAUGE AS DUCTWORK AND LENGTH SUITABLE TO FIT APPLICATION. MOUNTING ORIENTATION: VERTICAL OR HORIZONTAL AS INDICATED. FIRE DAMPERS SHALL COMPLY WITH UL 555 AND NFPA 90A.
C. RATING:
a. 1-1/2 HOUR FOR 2 HOUR RATED WALL
b. 3 HOURS FOR A 4 HOUR RATED WALL

2.04 MOTORIZED CONTROL DAMPERS
A. CONTROL DAMPERS SHALL COMPLY WITH AMCA 500. FRAME SHALL BE MINIMUM 16 GAUGE GALVANIZED STEEL. BLADES SHALL BE MINIMUM 14 GAUGE GALVANIZED STEEL MAXIMUM 8" WIDE AND 60" LONG ATTACHED TO MINIMUM 1/2" SHAFTS. DAMPERS RATED TO 4 INCH WG. SHALL HAVE 3/4" SHAFTS. PROVIDE SYNTHETIC ELASTOMERIC OR NEOPRENE BLADE SEALS. JAMB SEALS SHALL BE STAINLESS STEEL. RATED PRESSURE AND VELOCITY TO EXCEED DESIGN AIRFLOW CONDITIONS.
a. APPROVED MANUFACTURES: RUSKIN, GREENHECK, TAMCO, JOHNSON CONTROLS, HONEYWELL, OR APPROVED EQUAL
B. ELECTRIC DAMPER OPERATORS/ DAMPER MOTOR SHALL BE 24V OR 120V TWO-POSITION OR MODULATING AS REQUIRED WITH SPRING RETURN. OPERATOR SHALL BE SIZED TO OPERATE WITH SUFFICIENT RESERVE POWER FOR SMOOTH OPERATION FROM FULL CLOSE TO FULL OPEN AND TIGHT SHUTOFF. DAMPER MOTOR SHALL HAVE O-RINGS FOR WEATHERPROOF OPERATION
a. APPROVED MANUFACTURES: BELIMO, HONEYWELL, JOHNSON CONTROLS, SIEMENS, SCHNEIDER ELECTRIC.

2.06 PLENUMS AND SCREENS
A. CONSTRUCT PLENUMS WITH GALVANIZED STEEL FRAMING MEMBERS AND GALVANIZED SHEETMETAL BRACED WITH GALVANIZED ANGLES. GAUGES AND BRACING SHALL CONFORM TO SMACNA RECOMMENDATIONS FOR DUCTWORK SIZES. WHERE ACCESS DOORS ARE SHOWN, PROVIDE HINGED DOORS WITH #202 VENTLOK LATCH. MAKE WATERTIGHT CONNECTIONS TO LOUVERS, SLOPING BOTTOM OF PLENUM TO DRAIN WATER TO WEEPHOLES IN BOTTOM OF LOUVER.
B. PROVIDE SCREENS ON LOUVERS, DUCTS, HOODS, FANS, AND OPENINGS TO THE OUTDOORS AS SCHEDULED AND/OR NOTED ON THE DRAWINGS. BIRD SCREENS SHALL BE 0.041-INCH, 1/2-INCH MESH GALVANIZED STEEL WIRE.

2.07 TURNING VANES
A. DOUBLE WALL AIRFOIL FORMED TYPE TURNING VANES WITH VANE RUNNERS SHALL BE INSTALLED AT EACH CHANGE IN DIRECTION FOR ALL SQUARE/ RECTANGULAR DUCTWORK. SHALL BE MANUFACTURED BY AERO/DYNE COMPANY, DUCTMATE, DURO DYNE CORP, OR WARD INDUSTRIES.

2.08 FLEXIBLE DUCTWORK (POLYMER LINER):
A. APPROVED MANUFACTURES: FLEXMASTER TYPE 1M, HART & COOLEY, HART & COOLER OR EQUIVALENT.
B. FLEXIBLE DUCTWORK SHALL BE CONSTRUCTED OF A SPRING STEEL HELIX SUPPORTING A PLASTIC CORE. IT SHALL BE INSULATED WITH 1" FIBERGLASS HAVING A DENSITY OF 1 LB./CU.FT (R-6.0). THE INSULATION SHALL BE SHEATHED IN A FIRE-RETARDANT POLYETHYLENE PROTECTIVE JACKET/VAPOR BARRIER, U.L.181 CLASS 1.
C. THE DUCT SHALL BE RATED AT 10" W.G., AND A MAXIMUM VELOCITY OF 4000 FPM. THE DUCT SHALL BE LISTED IN CONFORMANCE WITH UL STANDARD 181, CLASS 1.
D. FLEXIBLE DUCT SHALL BE LIMITED TO A MAXIMUM LENGTH OF 5'-0", AS A MEANS OF CONNECTING BOXES, DIFFUSERS, ETC. TO THE DUCT SYSTEM.
E. FLEXIBLE DUCT RUNS SHALL BE INSTALLED FULLY EXTENDED AND STRAIGHT AS POSSIBLE AVOIDING TIGHT TURNS. INSTALL FLEXIBLE DUCT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. NO MORE THAN ONE (1) 90-DEGREE BEND SHALL BE CREATED. BENDS SHALL NOT EXCEED A CENTERLINE RADIUS OF ONE DUCT DIAMETER. DUCT SAG SHALL NOT EXCEED 1/2-INCH. SUPPORTING MATERIAL IN DIRECT CONTACT WITH THE DUCT SHALL NOT BE LESS THAN 1-1/2-INCHES IN WIDTH.
F. CONNECT FLEXIBLE DUCT TO RIGID METAL DUCT OR AIR DEVICES AS RECOMMENDED BY THE MANUFACTURER. AT A MINIMUM, INSTALL TWO WRAPS OF DUCT TAPE AROUND THE INNER CORE CONNECTION AND A METALLIC OR NON- METALLIC CLAMP OVER THE TAPE AND TWO WRAPS OF DUCT TAPE OR A CLAMP OVER THE OUTER JACKET. DUCT CLAMPS SHALL BE LABELED IN ACCORDANCE WITH U.L.181B AND MARKED 181B-C. DUCT TAPE SHALL BE LABELED IN ACCORDANCE WITH U.L.181B AND MARKED 181B-FX.
G. PROVIDE FLEXIBLE ELBOW SUPPORT CONSTRUCTED OF DURABLE COMPOSITE THAT IS FULLY ADJUSTABLE MANUFACTURE BY AUTOMATION INDUSTRIES THERMAFLEX OR SMART AIR AND ENERGY SOLUTIONS.

2.09 DUCT ACCESS DOORS
A. WHERE MOTORIZED DAMPERS, FIRE DAMPERS, CONTROL EQUIPMENT, ETC. ARE INSTALLED IN DUCTS, AND FOR CLEANING DUCTWORK, ACCESS DOORS SHALL BE PROVIDED IN THE DUCTS, MADE AIR-TIGHT WITH GASKETED EDGES. USE VENTLOK, OR EQUAL, SPONGE RUBBER OR FELT GASKETING MATERIAL. THE DOORS SHALL BE DOUBLE-WALL CONSTRUCTION WITH 1" OF RIGID INSULATION FILL AND SHALL BE ATTACHED TO THE DUCT WITH CAM LATCHES. PROVIDE HINGES AND MULTIPLE COMPRESSION CAM LOCKS FOR ACCESS DOORS GREATER THAN 12 INCHES. OMIT ACCESS DOOR INSULATION AND DOUBLE-WALL CONSTRUCTION IF DUCTS ARE NOT SPECIFIED TO BE INSULATED. ACCESS DOORS SHALL BE CONSTRUCTED OF THE SAME MATERIALS AS THE DUCTWORK. APPROVED MANUFACTURES ARE DUCTMATE AND FLEXMASTER.
B. PROVIDE ACCESS PANELS WHERE REQUIRED FOR ACCESS TO THE "DUCT ACCESS DOORS." IF THESE ACCESS PANELS ARE PLACED IN FIRE-RATED WALLS OR CEILING OR FLOOR, THEN THE ACCESS PANEL SHALL HAVE THE SAME RATING.

2.10 FLEXIBLE CONNECTIONS
A. ALL SUPPLY AND EXHAUST FANS AND OTHER AIR HANDLING UNITS WITH INLET AND OUTLET DUCT OR CASING CONNECTIONS SHALL HAVE A FLEXIBLE CONNECTOR IN EACH CONNECTION. CONNECTOR SHALL BE MADE OF AT LEAST ONE LAYER OF VENTGLAS OR GLASS CLOTH FABRIC, TWO-SIDE, NEOPRENE-COATED, 3-1/2 INCHES WIDE FABRIC WITH 2-1/2 INCH STRIPS, UL APPROVED AND LABELED, FLAME SPREAD OF 25 OR LESS AND SMOKE DEVELOPED RATING NOT HIGHER THAN 50. MAKE AIRTIGHT JOINTS AND INSTALL WITH MINIMUM 1-1/2" SLACK. APPROVED MANUFACTURES ARE DURO-DYNE, ADSCO MANUFACTURING, VENTFABRICS, OR EQUAL.

2.11 DUCT DETECTORS
A. DUCT SMOKE DETECTORS SHALL BE SOLID STATE PHOTO-ELECTRIC TYPE. DETECTOR SHALL INCLUDE AIR SAMPLING CHAMBER WITH SAMPLING TUBES EXTENDING THROUGH THE WIDTH OF THE AIR DUCT. LED ALARM STATUS INDICATING LIGHTS SHALL BE VISIBLE ON THE FRONT OF THE DETECTOR. KEY CONTROLLER TEST AND RESET SWITCHES PLUS AN EASILY ACCESSIBLE TEST JACK SHALL BE PROVIDED. THEY SHALL INCLUDE ALARM RELAY CONTACTS (DPDT) CAPABLE OF HANDLING LOADS OF UP TO FIVE (5) AMPERES AT 210 VAC OR 28 VDC RESISTIVE. UNIT SHALL HAVE SELF-CONTAINED POWER SUPPLY REQUIRING 120/220/240V POWER. DETECTOR SHALL INCLUDE A REMOTE INDICATING LIGHT/TEST SWITCH (THIS MAY BE DELETED IF THE UNIT IS CLEARLY VISIBLE AND READILY ACCESSIBLE). PROVIDE NECESSARY INTERLOCKS WITH AIR HANDLERS, SMOKE DAMPERS, ETC AS REQUIRED BY THE LOCAL FIRE DEPARTMENT, INCLUDING RELAYS, TRANSFORMERS, ETC. DETECTORS SHALL BE LISTED BY UNDERWRITERS' LABORATORIES FOR USE IN AIR CONDITIONING AND VENTILATING DUCT SYSTEMS IN COMPLIANCE WITH THE NATIONAL FIRE PROTECTION ASSOCIATION AND UNDERWRITERS' LABORATORIES, STANDARD UL 167.

SECTION 23 34 23 POWER VENTILATORS

2.06 CEILING-MOUNTING VENTILATORS
A. APPROVED MANUFACTURES: GREENHECK, LOREN COOK, ACME, AEROVENT, AND PENN BARRY
B. DESCRIPTION: CENTRIFUGAL FANS DESIGNED FOR INSTALLING IN CEILING OR WALL OR FOR CONCEALED IN-LINE APPLICATIONS.
C. HOUSING: STEEL, LINED WITH ACOUSTICAL INSULATION.
D. FAN WHEEL: CENTRIFUGAL WHEELS DIRECTLY MOUNTED ON MOTOR SHAFT. FAN SHROUDS, MOTOR, AND FAN WHEEL SHALL BE REMOVABLE FOR SERVICE.
E. GRILLE: PLASTIC OR ALUMINUM OR PAINTED ALUMINUM, LOUVERED GRILLE WITH FLANGE ON INTAKE AND THUMBSCREW ATTACHMENT TO FAN HOUSING.
F. ELECTRICAL REQUIREMENTS: JUNCTION BOX FOR ELECTRICAL CONNECTION ON HOUSING AND RECEPTACLE FOR MOTOR PLUG-IN.
G. ACCESSORIES:
a. VARIABLE-SPEED CONTROLLER: SOLID-STATE CONTROL TO REDUCE SPEED FROM 100 TO LESS THAN 50 PERCENT.
b. MANUAL STARTER SWITCH: SINGLE-POLE ROCKER SWITCH ASSEMBLY WITH COVER AND PILOT LIGHT.
c. TIME-DELAY SWITCH: ASSEMBLY WITH SINGLE-POLE ROCKER SWITCH, TIMER, AND COVER PLATE.
d. MOTION SENSOR: MOTION DETECTOR WITH ADJUSTABLE SHUTOFF TIMER.
e. CEILING RADIATION DAMPER: FIRE-RATED ASSEMBLY WITH CERAMIC BLANKET, STAINLESS-STEEL SPRINGS, AND FUSIBLE LINK.
f. FILTER: WASHABLE ALUMINUM TO FIT BETWEEN FAN AND GRILLE.
g. ISOLATION: RUBBER-IN-SHEAR VIBRATION ISOLATORS.
h. MANUFACTURER'S STANDARD ROOF JACK OR WALL CAP, AND TRANSITION FITTINGS.
H. CAPACITIES AND CHARACTERISTICS: REFER TO SCHEDULE(S) ON DRAWINGS.

SECTION 23 37 13 - GRILLES, REGISTERS, AND DIFFUSERS

2.01 GRILLES, REGISTERS, AND DIFFUSERS
A. APPROVED MANUFACTURES: TITUS, PRICE, METALLAIRE, NAILOR OR APPROVED EQUAL
B. PROVIDE GRILLES, REGISTERS, AND DIFFUSERS OF THE SIZE AND TYPE SHOWN ON THE PLANS. GRD'S SHALL BE MADE WITH A BAKED WHITE ENAMEL FINISH UNLESS OTHERWISE NOTED. COORDINATE FRAME TYPES WITH ARCHITECTURAL REFLECTED CEILING PLANS. PROVIDE PLASTER FRAMES FOR UNITS INSTALLED IN PLASTER CEILINGS. SECURE GRD'S TO STRUCTURE WHERE CONNECTED BY FLEX DUCTWORK, OR WHERE REQUIRED BY LOCAL CODE. PAINT DUCTWORK VISIBLE BEHIND GRD'S FLAT BLACK.
C. PROVIDE DEVICES WITH A SOFT PLASTIC GASKET TO MAKE AN AIR-TIGHT SEAL AGAINST THE MOUNTING SURFACE. COORDINATE FINAL LOCATION, FRAME, AND MOUNTING TYPE OF AIR DEVICES WITH ARCHITECTURAL REFLECTED CEILING PLANS.

SECTION 23 51 23 - VENTS

2.01 LISTED TYPE B AND BW VENTS
A. APPROVED MANUFACTURES: AMPCO; AMERICAN METAL PRODUCTS, METAL-FAB, INC., SELKIRK INC.,FAMCO, HART & COOLEY
B. DOUBLE-WALL METAL VENTS TESTED ACCORDING TO UL 441 AND RATED FOR 480 DEG F CONTINUOUSLY FOR TYPE B, OR 550 DEG F CONTINUOUSLY FOR TYPE BW; WITH NEUTRAL OR NEGATIVE FLUE PRESSURE, COMPLYING WITH NFPA 211; AND SUITABLE FOR CERTIFIED GAS-FIRED APPLIANCES. INNER SHELL AND OUTER JACKET SEPARATED BY AT LEAST 1/4-INCH (6-MM) AIRSPACE. INNER SHELL SHALL COMPLY WITH ASTM B 209 (ASTM B 209M) ALUMINUM FOR VENTS LESS THAN 10 INCHES IN DIAMETER. ASTM A 666, TYPE 430 STAINLESS STEEL FOR VENTS 10 TO 24 INCHES IN DIAMETER. ASTM B 209 (ASTM B 209M) ALUMINUM FOR VENTS LARGER THAN 24 INCHES IN DIAMETER. OUTER JACKET SHALL BE GALVANIZED STEEL FOR VENTS LESS THAN 10 INCHES IN DIAMETER. ALUMINIZED STEEL INDOORS AND TYPE 304 STAINLESS STEEL OUTDOORS FOR VENTS 10 TO 24 INCHES IN DIAMETER. GALVANIZED STEEL FOR VENTS LARGER THAN 24 INCHES IN DIAMETER. PROVIDE ALL ACCESSORIES INCLUDING TEES, ELBOWS, INCREASERS, DRAFT-HOOD CONNECTORS, TERMINATIONS, ADJUSTABLE ROOF FLASHINGS, STORM COLLARS, SUPPORT ASSEMBLIES, THIMBLES, FIRESTOP SPACERS, AND FASTENERS; FABRICATED FROM SIMILAR MATERIALS AND DESIGNS AS VENT-PIPE STRAIGHT SECTIONS; ALL LISTED FOR SAME ASSEMBLY. TERMINATE WITH ROUND CHIMNEY TOP DESIGNED TO EXCLUDE 98 PERCENT OF RAINFALL.

2.03 POLYPROPYLENE VENT
A. PIPE, VALVES AND FITTINGS SHALL BE MADE FROM VIRGIN RESIN PRODUCED BY ONE SUPPLIER. THE RESIN SHALL MEET OR EXCEED THE GROUP 2 CLASS 1 REQUIREMENTS OUTLINED FOR IN ASTM D4101 FOR POLYPROPYLENE.
B. PIPE
a. ALL PIPE THROUGH 12" SHALL BE EXTRUDED FROM GROUP 2 CLASS 1 ASTM D 4101 POLYPROPYLENE RESIN. ALL PIPING IS PRODUCED BASED ON AN SDR SYSTEM AND CALCULATED UTILIZING A HYDROSTATIC DESIGN BASIS ACCORDING TO ASTM D 2837 PACKAGING PIPE IS SUPPLIED PACKAGED IN A MANNER TO PROTECT IT FROM DAMAGE DURING SHIPMENT. PACKAGING STYLE WILL VARY BASED ON QUANTITY AND SHIPMENT METHOD
C. FITTINGS
a. ALL FITTINGS THROUGH 12" SHALL BE INJECTED MOLDED. FITTINGS SHALL HAVE SAME WALL THICKNESS AND PRESSURE RATINGS AS THE PIPE. PACKAGING ALL FITTINGS ARE TO BE PACKAGED IN A SINGLE PE BAG OR BOXED DEPENDING ON SIZE. ALL FITTINGS ARE SHIPPED IN BOXES.

SECTION 23 54 16 GAS FIRED FURNACES

2.02 HIGH EFFICIENCY GAS FIRED FURNACE
A. APPROVED MANUFACTURES: LENNOX, RHEEM, CARRIER, TRANE, AND YORK
B. CABINET SHALL BE GALVANIZED STEEL. CABINET INTERIOR AROUND HEAT EXCHANGER AND BLOWER SHALL HAVE FACTORY-INSTALLED INSULATION. LIFT-OUT PANELS SHALL EXPOSE BURNERS AND ALL OTHER ITEMS REQUIRING ACCESS FOR MAINTENANCE. FACTORY PAINT EXTERNAL CABINETS IN MANUFACTURER'S STANDARD COLOR. AIRSTREAM SURFACES IN CONTACT WITH THE AIRSTREAM SHALL COMPLY WITH REQUIREMENTS IN ASHRAE 62.1. FAN SHALL BE CENTRIFUGAL, FACTORY BALANCED, RESILIENT MOUNTED, DIRECT DRIVE. FAN MOTORS SHALL BE ELECTRONICALLY CONTROLLED MOTOR (ECM) CONTROLLED BY INTEGRATED FURNACE/BLOWER CONTROL. GAS TYPE SHALL BE NATURAL OR PROPANE. HEAT EXCHANGER SHALL BE STAINLESS STEEL. BURNER SHALL HAVE 100 PERCENT SAFETY TWO-STAGE MAIN GAS VALVE, MAIN SHUTOFF VALVE, PRESSURE REGULATOR, SAFETY PILOT WITH ELECTRONIC FLAME SENSOR, LIMIT CONTROL, TRANSFORMER, AND COMBINATION IGNITION/FAN TIMER CONTROL BOARD; AND ELECTRIC PILOT IGNITION, WITH HOT-SURFACE IGNITER OR ELECTRIC SPARK IGNITION. GAS-BURNER SAFETY CONTROLS SHALL INCLUDE ELECTRONIC FLAME SENSOR THAT PREVENTS GAS VALVE FROM OPENING UNTIL PILOT FLAME IS PROVEN; STOPS GAS FLOW ON IGNITION FAILURE; FLAME ROLLOUT SWITCH SHALL BE INSTALLED ON BURNER BOX; PREVENTS BURNER OPERATION; AND LIMIT CONTROL WITH FIXED STOP AT MAXIMUM PERMISSIBLE SETTING; DE-ENERGIZES BURNER ON EXCESSIVE BONNET TEMPERATURE; AUTOMATIC RESET. COMBUSTION-AIR INDUCER SHALL BE CENTRIFUGAL FAN WITH THERMALLY PROTECTED MOTOR AND SLEEVE BEARINGS PREPURGES HEAT EXCHANGER AND VENTS COMBUSTION PRODUCTS; PRESSURE SWITCH PREVENTS FURNACE OPERATION IF COMBUSTION-AIR INLET OR FLUE OUTLET IS BLOCKED. FURNACE CONTROLS SHALL BE SOLID-STATE BOARD INTEGRATES IGNITION, HEAT, COOLING, AND FAN SPEEDS; AND ADJUSTABLE FAN-ON AND FAN-OFF TIMING; TERMINALS FOR CONNECTION TO ACCESSORIES. VENT MATERIALS SHALL COMPLY WITH MANUFACTURE REQUIREMENTS. PROVIDE ALL NECESSARY VENTING MATERIALS AND ACCESSORIES.

SECTION 23 62 00 PACKAGED COMPRESSOR AND CONDENSING UNITS

2.01 PACKAGED CONDENSING UNITS, AIR COOLED, 1 TO 5 TONS
A. APPROVED MANUFACTURES: LENNOX, RHEEM, CARRIER, TRANE, AND YORK
B. CONDENSER SHALL BE AHRI CERTIFIED TO AHRI STANDARD 210/240-2008. AIR CONDITIONERS AND COMPONENTS WITHIN BONDED FOR GROUNDING TO MEET SAFETY STANDARDS FOR SERVICING REQUIRED BY ETL, NEC, AND CEC. UNITS ARE TO MEET ETL CERTIFIED FOR THE U.S. COMPRESSOR SHALL BE SCROLL, HERMETICALLY SEALED, WITH RUBBER VIBRATION ISOLATORS. TWO SPEED MOTOR, AND INCLUDES THERMAL- AND CURRENT-SENSITIVE OVERLOAD DEVICES, START CAPACITOR, RELAY, AND CONTACTOR. VARIABLE SPEED INVERTER DUTY COMPRESSOR SHALL INCLUDE MANUAL-RESET, HIGH-PRESSURE SWITCH AND AUTOMATIC-RESET, LOW-PRESSURE SWITCH. PROVIDE ACCUMULATOR SUCTION TUBE.
C. REFRIGERANT: R-407C OR R-410A.
D. CONDENSER COIL: SEAMLESS COPPER-TUBE, ALUMINUM-FIN COIL; CIRCUITED FOR INTEGRAL LIQUID SUBCOOLER, WITH REMOVABLE DRAIN PAN AND BRASS SERVICE VALVES WITH SERVICE PORTS.
E. CONDENSER FAN: DIRECT-DRIVE, ALUMINUM PROPELLER FAN; WITH PERMANENTLY LUBRICATED, TOTALLY ENCLOSED FAN MOTOR WITH THERMAL-OVERLOAD PROTECTION.
F. UNIT CASING: GALVANIZED STEEL, FINISHED WITH BAKED ENAMEL; WITH REMOVABLE PANELS FOR ACCESS TO CONTROLS, WEEP HOLES FOR WATER DRAINAGE, AND MOUNTING HOLES IN BASE. MOUNT SERVICE VALVES, FITTINGS, AND GAGE PORTS ON EXTERIOR OF CASING.
G. ACCESSORIES: INCLUDE ELECTRONIC PROGRAMMABLE THERMOSTAT TO CONTROL COMPRESSOR AND CONDENSER UNIT AND EVAPORATOR FAN, FILTER-DRYER, HIGH-PRESSURE SWITCH: AUTOMATIC-RESET SWITCH CYCLES COMPRESSOR OFF ON HIGH REFRIGERANT PRESSURE, LIQUID-LINE SOLENOID, LOW-AMBIENT CONTROLLER: CONTROLS CONDENSER FAN SPEED TO PERMIT OPERATION DOWN TO 0 DEG F , LOW-PRESSURE SWITCH: AUTOMATIC-RESET SWITCH CYCLES COMPRESSOR OFF ON LOW REFRIGERANT PRESSURE, POLYETHYLENE MOUNTING BASE, PRECHARGED AND INSULATED SUCTION AND LIQUID TUBING, WRAP-AROUND SOUND ATTENUATION COVER FOR COMPRESSOR, THERMOSTATIC EXPANSION VALVE, TIME-DELAY RELAY: CONTINUES OPERATION OF EVAPORATOR FAN AFTER COMPRESSOR SHUTS OFF, REVERSING VALVE IF SPECIFIED AS A HEAT PUMP.

SECTION 23 81 26 - SPLIT SYSTEM AIR HANDLER

2.02 WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS:
A. APPROVED MANUFACTURES: MITSUBISHI, DAIKIN, SAMSUNG, TRANE, AND YORK
B. CABINET: WITH REMOVABLE PANELS FOR SERVICING, AND DISCHARGE DRAIN PANS WITH DRAIN CONNECTION.
a. AIRSTREAM SURFACES: SURFACES IN CONTACT WITH THE AIRSTREAM SHALL COMPLY WITH REQUIREMENTS IN ASHRAE 62.1.
b. DRAIN PAN AND DRAIN CONNECTION: COMPLY WITH ASHRAE 62.1.
C. REFRIGERANT COIL: COPPER TUBE, WITH MECHANICALLY BONDED ALUMINUM FINS, COMPLYING WITH AHRI 210/240, AND WITH THERMAL-EXPANSION VALVE.
D. ELECTRIC COIL: HELICAL, NICKEL-CHROME, RESISTANCE-WIRE HEATING ELEMENTS WITH REFRACTORY CERAMIC SUPPORT BUSHINGS; AUTOMATIC-RESET THERMAL CUTOUT; BUILT-IN MAGNETIC CONTACTORS; MANUAL-RESET THERMAL CUTOUT; AIRFLOW PROVING DEVICE; AND ONE-TIME FUSES IN TERMINAL BOX FOR OVERCURRENT PROTECTION.
E. FAN: DIRECT DRIVE, CENTRIFUGAL FAN.
F. FILTERS: DISPOSABLE, WITH ASHRAE 52.2 MERV RATING OF 6 OR HIGHER.

2.05 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS:
A. APPROVED MANUFACTURES: MITSUBISHI, DAIKIN, SAMSUNG, TRANE, AND YORK
B. CASING: STEEL, FINISHED WITH BAKED ENAMEL, WITH REMOVABLE PANELS FOR ACCESS TO CONTROLS, WEEP HOLES FOR WATER DRAINAGE, AND MOUNTING HOLES IN BASE. PROVIDE BRASS SERVICE VALVES, FITTINGS, AND GAGE PORTS ON EXTERIOR OF CASING.
C. COMPRESSOR: HERMETICALLY SEALED WITH CRANKCASE HEATER AND MOUNTED ON VIBRATION ISOLATION. COMPRESSOR MOTOR SHALL HAVE THERMAL- AND CURRENT-SENSITIVE OVERLOAD DEVICES, START CAPACITOR, RELAY, AND CONTACTOR.
a. COMPRESSOR TYPE SHALL BE SCROLL, INCLUDE REFRIGERANT CHARGE OF R-410A. UNIT SHALL INCLUDE AN INVERTER CONTROLLED COMPRESSOR.
D. REFRIGERANT COIL: COPPER TUBE, WITH MECHANICALLY BONDED ALUMINUM FINS, COMPLYING WITH AHRI 210/240, AND WITH LIQUID SUBCOOLER.
E. HEAT PUMP COMPONENTS: REVERSING VALVE AND LOW-TEMPERATURE AIR CUT-OFF THERMOSTAT.
F. FAN: ALUMINUM-PROPELLER TYPE, DIRECTLY CONNECTED TO MOTOR.
G. MOTOR: PERMANENTLY LUBRICATED, WITH INTEGRAL THERMAL-OVERLOAD PROTECTION, VFC CONTROLLED FOR MULTI-SPEED OPERATION.
H. LOW AMBIENT KIT: PERMITS OPERATION DOWN TO 0 DEG F (MINUS 18 DEG C). INCLUDE WIND MANUFACTURER'S WIND BAFFLE ACCESSORY.
I. MINIMUM ENERGY EFFICIENCY: COMPLY WITH ASHRAE/IESNA 90.1, "ENERGY STANDARD FOR BUILDINGS EXCEPT LOW-RISE RESIDENTIAL BUILDINGS."
J. THERMOSTAT: WALL-MOUNTED LOW VOLTAGE TYPE TO CONTROL COMPRESSOR AND EVAPORATOR FAN.
K. THERMOSTAT: WIRELESS INFRARED FUNCTIONING TO REMOTELY CONTROL COMPRESSOR AND EVAPORATOR FAN, WITH THE FOLLOWING FEATURES: LIQUID-CRYSTAL DISPLAY INDICATING TEMPERATURE, SET-POINT TEMPERATURE, TIME SETTING, OPERATING MODE, AND FAN SPEED. FAN-SPEED SELECTION, INCLUDING AUTO SETTING.
L. AUTOMATIC-RESET TIMER TO PREVENT RAPID/SHORT CYCLING OF COMPRESSOR.

2.05 ACCESSORIES
A. REFRIGERANT LINE KITS: SOFT-ANNEALED COPPER SUCTION AND LIQUID LINES FACTORY CLEANED, DRIED, PRESSURIZED WITH NITROGEN, AND SEALED; FACTORY-INSULATED SUCTION LINE WITH FLARED FITTINGS AT BOTH ENDS.
B. ROOF CURBS AND EQUIPMENT RAILS: MINIMUM 18 GAGE WELDED GALVANIZED STEEL CONSTRUCTION. INTEGRAL BASE FLANGE OR PLATE. BUILT-IN FULLY MITERED RAISED CANT WITH STEP MATCHING INSULATION THICKNESS. FACTORY INSTALLED INSECT AND DECAY RESISTANT WOOD NAILER. TOP OF CURB OR EQUIPMENT SUPPORT SHALL BE LEVEL AND EXTEND A MINIMUM OF 8 INCHES ABOVE THE TOP OF THE ROOF INSULATION.
C. AUTOMATIC CONDENSATE PUMP UNITS (FIELD INSTALLED)
a. MANUFACTURERS: LITTLE GIANT PUMP CO., HARTELL PUMPS DIV., HYDROMATIC PUMP COMPANY
b. DESCRIPTION: PACKAGED UNITS WITH CORROSION-RESISTANT PUMP, PLASTIC TANK WITH COVER, AND AUTOMATIC CONTROLS.
D. AUTOMATIC CONDENSATE PUMP UNITS (FIELD INSTALLED ABOVE CEILING APPLICATIONS)
a. MANUFACTURERS: HARTELL PUMPS DIV.
b. DESCRIPTION: PACKAGED UNITS WITH CORROSION-RESISTANT PUMP, DUAL-VOLTAGE THERMALLY PROTECTED MOTOR, CAST ALUMINUM TANK WITH COVER, AND AUTOMATIC CONTROLS. INCLUDE AUXILIARY SAFETY SWITCH; JUNCTION BOX WIRE CONNECTIONS, WITH 3/4-INCH KNOCK OUT FOR CONDUIT; AND FACTORY- OR FIELD-INSTALLED CHECK VALVE.

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SHEET
SPECIFICATIONS

FILE NUMBER
2024–0074

SHEET NUMBER
M–004

GENERAL MECHANICAL DEMOLITION NOTES

1 ALL DEMOLITION SHALL BE IN ACCORDANCE WITH THE APPLICABLE BUILDING CODE AND ALL LOCAL ORDINANCES.

2 DURING ALL PHASES OF DEMOLITION AND CONSTRUCTION, THE GENERAL CONTRACTOR SHALL MAINTAIN INTEGRITY TO THE STRUCTURE TO BE DEMOLISHED AND ADJACENT AREAS TO REMAIN WITH INTERIOR OR EXTERIOR SHORING, BRACING, OR SUPPORT TO PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF STRUCTURE. EXISTING STRUCTURE TO REMAIN SHALL BE SAFED OFF AND PROTECTED FROM ELEMENTS AT ALL TIMES.

3 WHERE THE EXISTING WORK IS TO BE CUT, UNDERPINNED, AND/OR SHORED, CONTRACTOR SHALL PROVIDE ALL SHORING, NEEDLING, BRACING, WEDGING, AND DRY PACKING, AND BE RESPONSIBLE FOR THE SAFETY OF THE STRUCTURE DURING THESE OPERATIONS.

4 AREA OF WORK SHALL BE KEPT CLEAN AT ALL TIMES.

5 ANY MATERIALS DEEMED AS HAZARDOUS, SUCH AS BUT NOT LIMITED TO ASBESTOS OR LEAD PAINTS SHALL BE REMOVED AS REQUIRED BY FEDERAL, STATE, OR LOCAL CODES. CONTRACTOR SHALL UTILIZE THE APPROPRIATE TECHNIQUES, PROCEDURES, AND DISPOSAL METHODS AS PER STANDARD PRACTICE AND ALL FEDERAL, STATE, AND LOCAL CODES.

6 CONTRACTOR SHALL REMOVE ALL EXISTING MECHANICAL EQUIPMENT, DUCTWORK, HANGERS, AND CONTROLS NOT SCHEDULED TO BE REUSED, BACK TO THE EXISTING CURB. CURBS NOT SCHEDULED TO BE REUSED OR ADAPTED FOR NEW UNITS SHALL BE CAPPED AND INSULATED FOR A WEATHERTIGHT SEAL. DO NOT ABANDON. SEAL ALL PENETRATIONS THROUGH WALLS, AND FLOORS AT REMOVED MECHANICAL COMPONENTS.

7 CONTRACTOR SHALL REMOVE ALL PLUMBING FIXTURES, DRAINS, PIPING SYSTEMS, ETC. NOT SCHEDULED FOR REUSE BACK TO NEAREST ACTIVE LINE SCHEDULED FOR REUSE. CAP AND SEAL LINES AT ACTIVE LINES WITH SAME MATERIALS. DO NOT ABANDON COMPONENT IN PLACE. SEAL ALL PENETRATIONS THROUGH WALLS AND FLOORS AT REMOVED PLUMBING SYSTEM COMPONENTS.

8 EXISTING CONCRETE FLOOR SLAB SHALL BE LEVELED, BROOM CLEAN WITH NO REMAINING ADHESIVE RESIDUES, AND SEALED.

9 REMOVAL OF ALL DEMOLITION AND CONSTRUCTION DEBRIS SHALL BE COORDINATED BETWEEN THE GENERAL CONTRACTOR AND THE LANDLORD AND SHALL COMPLY WITH ALL APPLICABLE CODES AND ORDINANCES.

10 IN AREA WHERE ELECTRICAL OR MECHANICAL SYSTEMS CONFLICT OR ALTERATIONS TO AN EXISTING SYSTEM IS REQUIRED BY THE GENERAL CONTRACT; NOTIFY AND COORDINATE ALL TRADES SO THAT THE PROPER ARRANGEMENTS AND SCHEDULING CAN BE MADE FOR INSTALLATION, CUTTING, REMOVING, TERMINATING, AND PATCHING OF SURROUNDING SYSTEMS AND MATERIALS CAN BE PROPERLY COMPLETED.

11 CONTRACTOR SHALL FAMILIARIZE WITH EXISTING BUILDING CONDITIONS AND OBSERVE THE SITE, STRUCTURE, AND PHYSICAL SPACE LIMITATIONS AND CHALLENGES TO COMPLETE WORK DESCRIBED ON DOCUMENTS.

12 ANY DEPARTURES FROM DESIGN INTENT ON DOCUMENTS, CONTRACTOR SHALL NOTIFY ARCHITECT/ENGINEER BEFORE PROCEEDING.

MECHANICAL DEMOLITION KEYNOTES

A CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING GAS TUBE RADIANT HEATER, GAS PIPING, SUPPORTS, ACCESSORIES, VENT, SHIELDS AS REQUIRED FOR INDICATED SECTIONS.

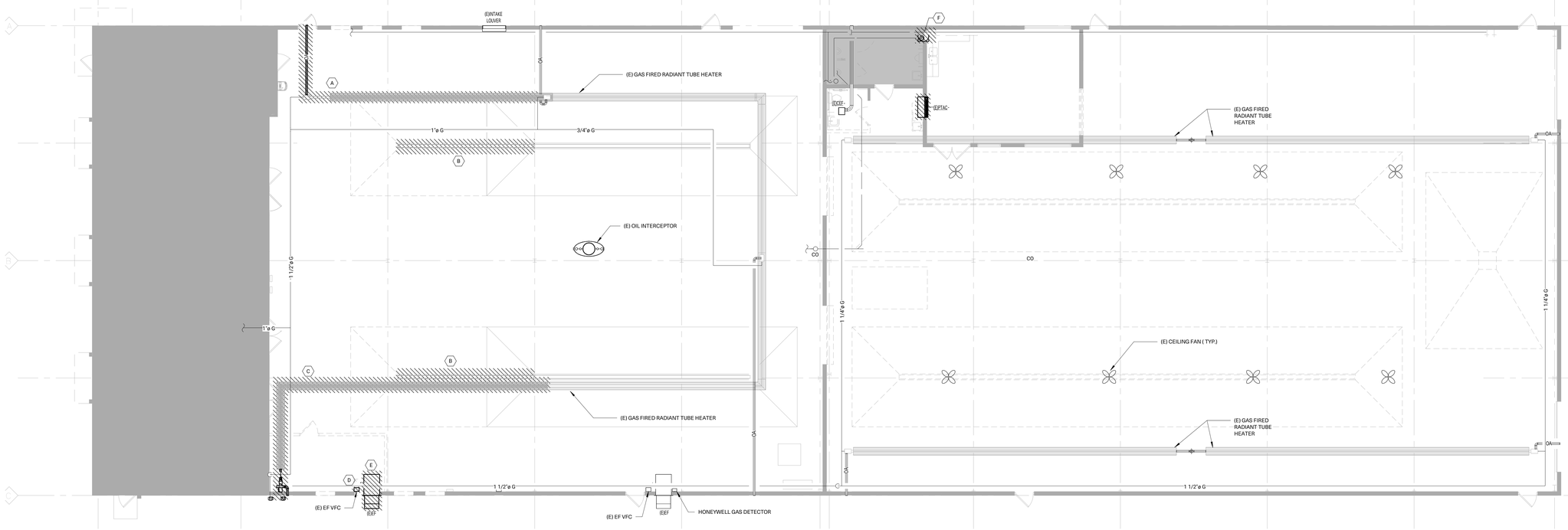
B CONTRACTOR SHALL DEMOLISH EXISTING TRENCH DRAIN AS INDICATED. CO-ORDINATE WITH INSTALLED TRENCH DRAIN MANUFACTURE FOR END CAP. RELOCATE AND RECONNECT ANY DRAIN OUTLETS AND ASSOSIATED PIPING AS REQUIRED. CONNECT TO EXISTING PIPE ROUTED TO EXISTING OIL INTERCEPTOR.

C CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING GAS TUBE RADIANT HEATER, GAS PIPING, SUPPORTS, ACCESSORIES, VENT, SHIELDS AS REQUIRED FOR INDICATED SECTIONS. REFER TO NEW WORK PLANS FOR RELOCATION OF TUBE HEATER.

D CONTRACTOR SHALL COORDINATE WITH ELECTRICAL, AND DISCONNECT AND REMOVE EXISTING VFC. REFER TO NEW WORK PLANS FOR RELOCATION.

E DISCONNECT AND REMOVE EXISTING EXHAUST FAN COMPLETE. REFER TO NEW WORK PLANS FOR NEW LOCATION.

F DEMOLISH EXISTING ELECTRIC WATER HEATER AND PIPE AS REQUIRED. PREPARE FOR NEW CONNECT REFER TO NEW WORK PLANS.



1 / M-014 FIRST FLOOR MECHANICAL DEMOLITION PLAN
1/8" = 1'-0"

N

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SHEET
MECHANICAL DEMOLITION PLAN

STATE OF MICHIGAN
KELLY B. SUGG
ENGINEER
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FILE NUMBER
2024-0074

SHEET NUMBER
M-014

3/12/2025 10:24:43 PM PROJ. NO 2024-0074

FIRE PROTECTION GENERAL NOTES

1. THESE DRAWINGS ARE INTENDED TO BE DIAGRAMATIC AND ARE NOT TO BE CONSIDERED FABRICATION OR SHOP DRAWINGS. COORDINATION WITH OTHER TRADES IS REQUIRED. PROVIDE THE ADDITIONAL FITTINGS AND OFFSETS THAT WILL BE REQUIRED TO COMPLETE EACH SYSTEM INCLUDING THE STRUCTURE, SHEET METAL, CONDUITS, CABLE TRAY, AND LIGHT FIXTURES.
2. INSTALL SYSTEMS SUCH THAT REQUIRED CLEARANCE AND SERVICE ACCESS SPACE IS PROVIDED AROUND ALL MECHANICAL AND ELECTRICAL EQUIPMENT, AND AROUND ANY COMPONENTS WHICH REQUIRE SERVICE ACCESS.
3. MINIMUM RUN-OUT PIPE SIZE TO SPRINKLER HEADS SHALL BE 1".
4. PROVIDE AN AUTOMATIC WET PIPE SPRINKLER SYSTEM IN ACCORDANCE WITH NFPA 13 FOR LIGHT HAZARD CLASSIFICATION FOR THE INDICATED AREAS. HYDRAULIC CALCULATIONS SHALL BE BASED ON DENSITY OF 0.10 GPM / SQ. FT. OVER THE MOST REMOTE 1500 SQ. FT.
5. PROVIDE AN AUTOMATIC WET PIPE SPRINKLER SYSTEM IN ACCORDANCE WITH NFPA 13 FOR ORDINARY HAZARD GROUP 2 CLASSIFICATION FOR THE INDICATED AREAS. HYDRAULIC CALCULATIONS SHALL BE BASED ON DENSITY OF 0.20 GPM / SQ. FT. OVER THE MOST REMOTE 1500 SQ. FT.
6. SPRINKLER HEADS INDICATED ARE SHOWN AS A GUIDE FOR LAYOUT IN ARCHITECTURALLY SENSITIVE AREAS. ANY DEVIATION FROM INDICATED LAYOUT OF HEADS AND ANY ADDITIONAL EXPOSED PIPING SHALL BE COORDINATED WITH ARCHITECT AND ENGINEER PRIOR TO INSTALLATION. PROVIDE ADDITIONAL HEADS AS REQUIRED FOR ABOVE PARTIAL CEILINGS AND TO MEET REQUIRED COVERAGE.
7. CONTRACTOR SHALL CONDUCT A PRESSURE AND FLOW TEST PRIOR TO HYDRAULIC CALCULATIONS TO DETERMINE STATIC AND FLOWING PRESSURES.
8. SPRINKLER MAINS & BRANCH PIPES SHOWN FOR REFERENCE ONLY AS A GUISE. COORDINATE ROUTING WITH OTHER TRADES.
9. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN(S) FOR CEILING TYPES SOFFITS, DROPS, OPEN, FOR DESIGN OF THE SYSTEM.

1 / M-100 FIRE PROTECTION PLAN
1/8" = 1'-0"

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SHEET
FIRE PROTECTION

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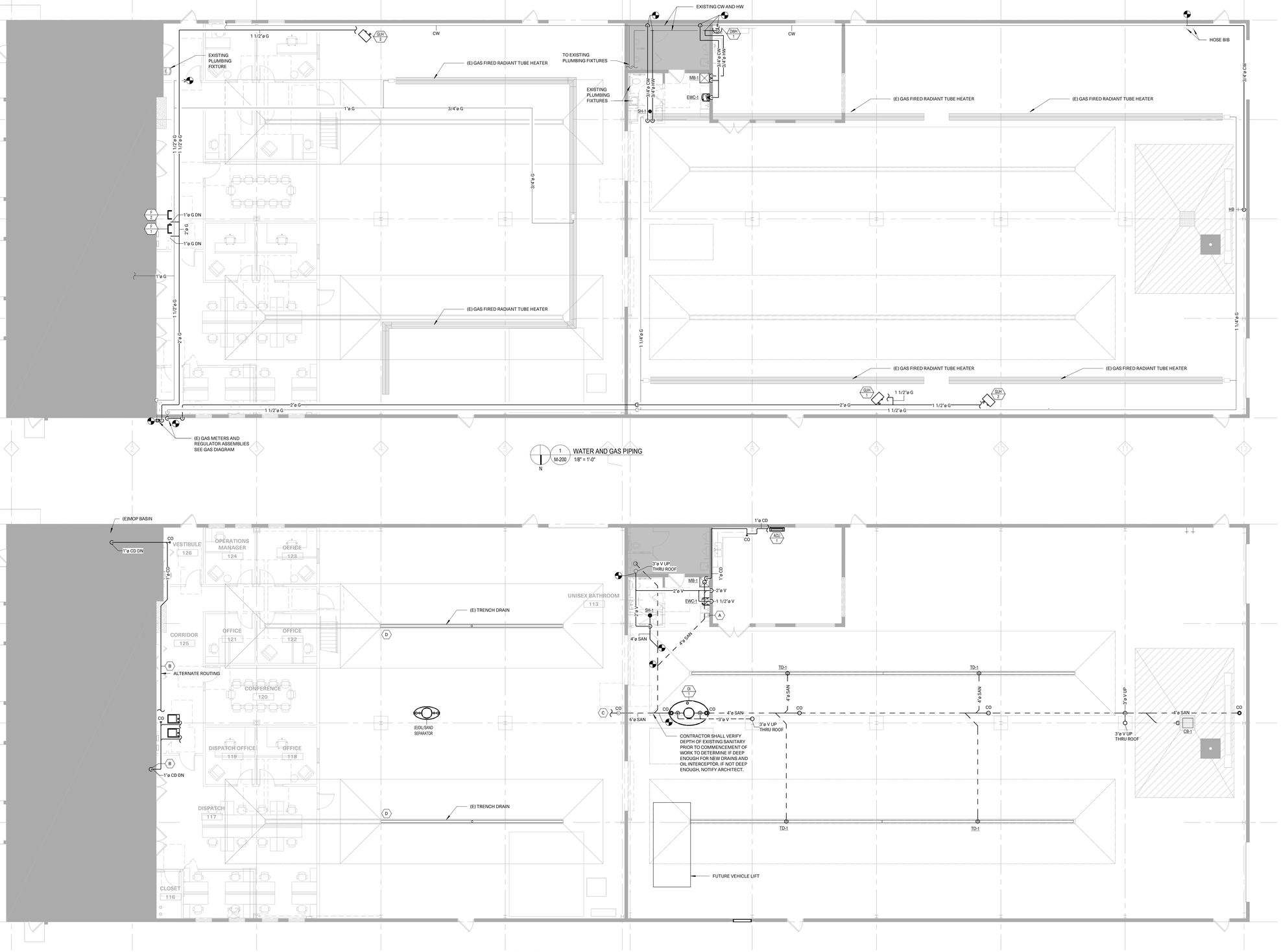

PLUMBING GENERAL NOTES

1. THESE DRAWINGS ARE INTENDED TO BE DIAGRAMATIC AND ARE NOT TO BE CONSIDERED FABRICATION OR SHOP DRAWINGS. COORDINATION WITH OTHER TRADES IS REQUIRED. PROVIDE THE ADDITIONAL FITTINGS AND OFFSETS THAT WILL BE REQUIRED TO COMPLETE EACH SYSTEM INCLUDING THE STRUCTURE, SHEET METAL, CONDUITS, CABLE TRAY, AND LIGHT FIXTURES.
2. PROVIDE ALL NECESSARY CLEARANCES AROUND MECHANICAL AND ELECTRICAL EQUIPMENT, DEVICES, VALVES, AND ANY COMPONENT REQUIRING MAINTENANCE PER MANUFACTURER RECOMMENDATIONS AND CODE REQUIREMENTS.
3. COORDINATE ROUTING OF PIPING AND SHEET METAL WITH ARCHITECTURAL, STRUCTURAL, AND ELECTRICAL TRADES TO AVOID INTERFERENCES. PROVIDE ADDITIONAL FITTINGS AND ELBOWS NECESSARY TO AVOID CONFLICTS.
4. ALL SANITARY PIPING BELOW SLAB SHALL BE A MINIMUM OF 4"Ø UNLESS NOTED OR AS REQUIRED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
5. ALL SANITARY AND STORM PIPING 2 AND SMALLER SHALL BE SLOPED AT A MINIMUM 1/4" PER FOOT, AND ALL SANITARY AND STORM PIPING 3 AND LARGER SHALL BE SLOPED AT A MINIMUM OF 1/8" PER FOOT, UNLESS OTHERWISE NOTED OR AS REQUIRED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
6. INSTALL PIPING SUCH THAT ALL VALVES, STRAINERS, TRAPS, FLANGES, UNIONS, AND PIPE ACCESSORIES ARE ACCESSIBLE.
7. SLEEVE AND FIRE STOP ALL PENETRATION OF RATED WALLS, FLOORS, CEILINGS, ETC. IN ACCORDANCE WITH APPLICABLE UL STANDARDS AND LISTINGS AND LOCAL CODES TO MAINTAIN RATINGS. REFER TO ARCHITECTURAL DRAWINGS FOR RATED ASSEMBLIES.
8. INSTALL WATER HAMMER ARRESTORS, BACKFLOW PREVENTERS, THERMOSTATIC MIXING VALVES, AND TRAP PRIMERS AS REQUIRED BY CODE IN THE DOMESTIC WATER SYSTEM.
9. ALL EQUIPMENT AND FIXTURES SHALL BE INSTALLED COMPLETE INCLUDING ISOLATION VALVES, ANGLE SUPPLIES, STOPS, SUPPORT HARDWARE, P-TRAPS, OFFSETS, MIXING VALVES, ETC.
10. ALL PIPING LOCATED WITHIN RETURN AIR PLENUM SHALL BE PLENUM RATED OR FIRE WRAPPED AS NEEDED. COORDINATE PLENUM LOCATIONS WITH MECHANICAL TRADES.
11. ALL ADA FIXTURES, WHERE DESIGNATED BY THE ARCHITECT SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF THE "BARRIER-FREE" DESIGN REQUIREMENTS OF THE APPLICABLE LOCAL CODE.
12. CONTRACTOR SHALL VIDEO CAMERA AND SCOPE ALL SANITARY AND STORM PIPING TO CONFIRM INTEGRITY AND IS FREE OF OBSTRUCTIONS AND DEFECTS TO ENSURE PROPER FLOW.

PLUMBING CONSTRUCTION KEYNOTES

- A WALL HUNG EYEWASH STATION PROVIDED BY OWNER.
- B TERMINATE 1" CONDENSATE ABOVE FLOOR DRAIN LOCATED IN FURNACE ROOM. IF A FLOOR DRAIN IS NOT PRESENT, ROUTE CONDENSATE TO MOP BASIN ON THE SOUTH SIDE OF THE EXISTING OFFICE AND TERMINATE WITH AIR GAP.
- C CONTRACTOR SHALL CONFIRM UNDERGROUND PIPE DOES NOT ROUTE THROUGH EXISTING OIL INTERCEPTOR. IF CAMERA PIPE DETERMINES IT DOES, PROVIDE SAW CUT AND PIPE AS REQUIRED TO TIE SANITARY PIPE IN MAIN AFTER OUTLET OF EXISTING OIL INTERCEPTOR.
- D PROVIDE NEW END CAP FOR EXISTING TRENCH DRAIN.

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SHEET
PLUMBING PLANS

STATE OF MICHIGAN
KELLY B. SUGG
ENGINEER
No. 6201061005
LICENSED PROFESSIONAL ENGINEER

FILE NUMBER
2024-0074

SHEET NUMBER
M-200

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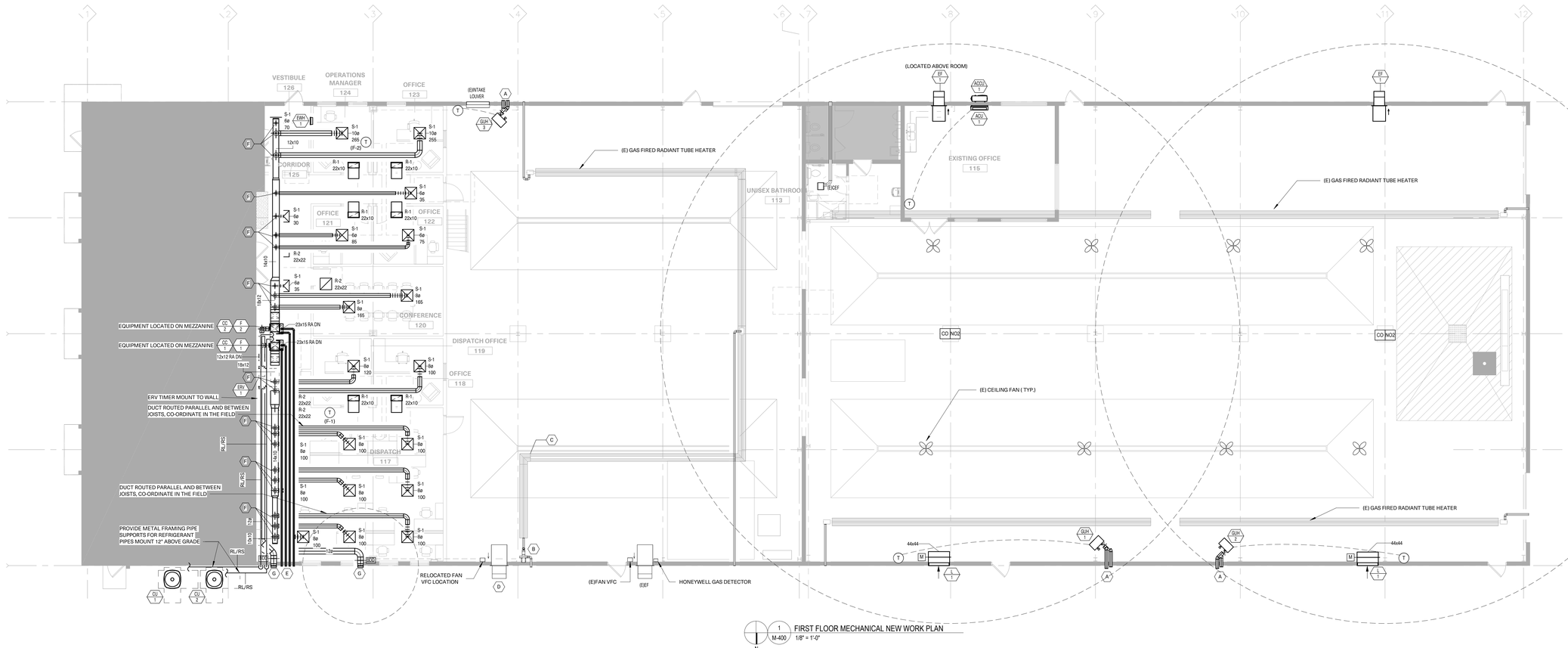
MECHANICAL - GENERAL NOTES

1. THESE DRAWINGS ARE INTENDED TO BE DIAGRAMMATIC AND ARE NOT TO BE CONSIDERED FABRICATION OR SHOP DRAWINGS. COORDINATE PIPING AND DUCTWORK AMONGST OTHER TRADES AS REQUIRED
2. PROVIDE ALL NECESSARY CLEARANCES AROUND MECHANICAL AND ELECTRICAL EQUIPMENT, DEVICES, VALVES, AND ANY COMPONENT REQUIRING MAINTENANCE PER MANUFACTURER RECOMMENDATIONS AND CODE REQUIREMENTS.
3. COORDINATE ROUTING OF PIPING AND SHEET METAL WITH ARCHITECTURAL, STRUCTURAL, AND ELECTRICAL TRADES TO AVOID INTERFERENCES. PROVIDE ADDITIONAL FITTINGS, OFFSETS, AND ELBOWS WHICH ARE REQUIRED DUE TO SPACE CONSTRAINTS OR OTHER FIELD CONDITIONS AND ARE NECESSARY TO AVOID CONFLICTS.
4. MOUNT THERMOSTATS 48" ABOVE FINISH FLOOR UNLESS NOTED OTHERWISE.
5. PROVIDE ACCESS DOORS IN DUCTWORK TO PROVIDE ACCESS FOR ALL SMOKE DETECTORS, FIRE DAMPERS, SMOKE DAMPERS, VOLUME DAMPERS, HUMIDIFIERS, COILS, AND OTHER ITEMS LOCATED IN THE DUCTWORK THAT REQUIRE SERVICE AND/OR INSPECTION.
6. PROVIDE ACCESS DOORS IN HARD CEILINGS FOR THE OPERATION, ADJUSTMENT, AND MAINTENANCE OF ALL FANS, VALVES, AND MECHANICAL EQUIPMENT.
7. DUCTWORK AND PIPING SHALL NOT BE LOCATED OVER ANY ELECTRICAL EQUIPMENT OR PANELS. PROVIDE REQUIRED N.E.C. CLEARANCE IN FRONT AND ABOVE ELECTRICAL EQUIPMENT.
8. CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL FOR THE PROPER INSTALLATION AND SUPPORT OF MECHANICAL SYSTEMS.
9. CONTRACTOR SHALL VERIFY THERE ARE NO COMBUSTIBLES IN ANY RETURN AIR PLENUM. IF COMBUSTIBLES ARE PRESENT CONTRACTOR SHALL COORDINATE WITH ARCHITECT/ENGINEER FOR COURSE OF ACTION. DUCTED RETURN SYSTEM OR ELIMINATE COMBUSTIBLES WITH FIREPROOF, WRAP, OR BY OTHER MEANS.
10. ALL EQUIPMENT SHALL BE INSTALLED PER MANUFACTURE RECOMMENDATIONS AND REQUIREMENTS.
11. MECHANICAL AIR HANDLING EQUIPMENT SHALL HAVE DUCT DETECTOR IN RETURN AND/OR SUPPLY DUCT. SMOKE DETECTION WILL SHUT OFF HVAC UNIT UPON ACTIVATION. THE ACTIVATION OF THE SMOKE DETECTOR SHALL ACTIVATE A VISIBLE AND AUDIBLE SUPERVISORY SIGNAL AT A CONSTANTLY ATTENDED LOCATION OR TIE INTO FIRE ALARM PANEL IF ONE EXISTS. SMOKE DETECTION DEVICES THAT ARE NOT VISIBLE SHALL BE PROVIDED WITH A REMOTE INDICATION DEVICE PER CODE.

MECHANICAL CONSTRUCTION KEYNOTES

- A ROUTE 6" INTAKE AND VENT FOR GAS UNIT HEATER THROUGH EXTERIOR WALL AND TERMINATE PER MANUFACTURE REQUIREMENTS.
- B RELOCATED RADIANT TUBE HEATER VACUUM EXHAUST FAN AND VENT. TERMINATE EXHAUST VENT THROUGH EXTERIOR WALL PER MANUFACTURE REQUIREMENTS.
- C RECONNECT RELOCATED EXISTING GAS RADIANT TUBE HEATER AT THIS LOCATION.
- D RELOCATED EXISTING THROUGH WALL EXHAUST FAN. COORDINATE LOCATION WITH EXISTING STRUCTURE AND ARCHITECT. MOUNT AT SAME HEIGHT AS PREVIOUSLY INSTALLED.
- E TERMINATE 3" FURNACE INTAKE AND VENT THROUGH THE EXTERIOR WALL.
- F PROVIDE VOLUME DAMPER IN VERTICAL DUCT FOR EACH BRANCH DUCT TO DIFFUSER(TYPICAL)
- G PROVIDE 12" STAINLESS STEEL WALL CAP WITH BIRDSCREEN. LUXURY METAL DEFENDER.



1 M-400 FIRST FLOOR MECHANICAL NEW WORK PLAN
1/8" = 1'-0"

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SHEET
MECHANICAL PLAN

STATE OF MICHIGAN
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M-400

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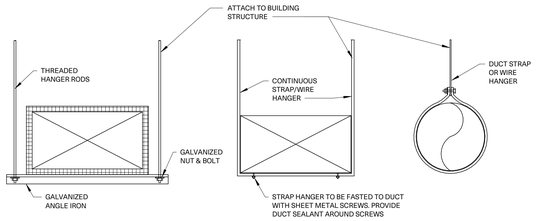
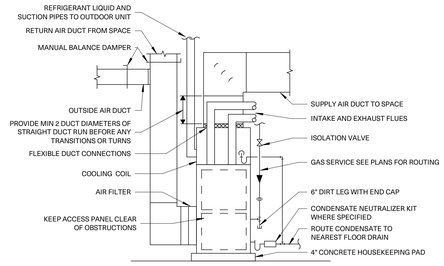


NOTES:
1. ALL HANGER STRAPS AND HANGER RODS SHALL BE FIRMLY SUPPORTED FROM THE STRUCTURAL STEEL.
2. REFER TO LOW PRESSURE DUCTWORK JOINT AND SUPPORT SCHEDULE FOR HANGER AND SUPPORT GAUGES, SPACING, STRAP SIZES, ETC.

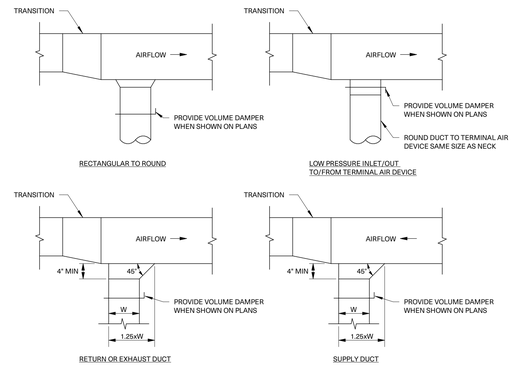
DUCT SUPPORT DETAIL

NO SCALE



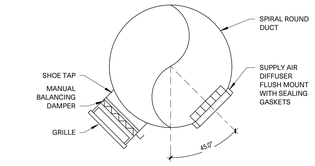
HIGH EFFICIENCY GAS FURNACE AND COOLING COIL DIAGRAM AND INSTALLATION DETAIL

NO SCALE



RECTANGULAR BRANCH DUCT DETAILS

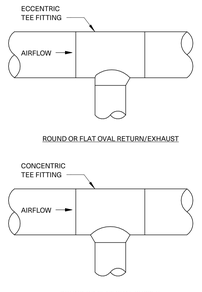
NO SCALE



EXPOSED ROUND DUCT DIFFUSER DETAIL

NO SCALE

NOTES:
1. REFER TO FLOOR PLAN FOR LOCATION AND QUANTITY.
2. REFER TO SCHEDULES FOR MOUNTING/GRILLE TYPE



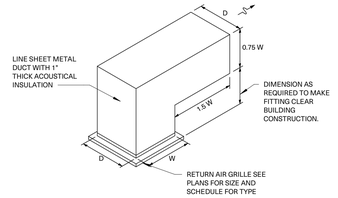
ROUND BRANCH DUCT DETAILS

NO SCALE

NOTE: MAY CONNECT FLEXIBLE DUCT TO DIFFUSER INLET IF A FLEXIBLE DUCT ELBOW SUPPORT IS PROVIDED.

ROUND NECK SUPPLY AIR DIFFUSER DETAIL

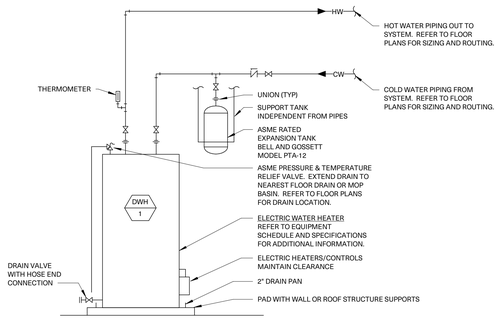
NO SCALE



NOTES:
1. SUPPORT ELBOW INDEPENDENT OF CEILING GRID
2. RIGID FIBER BOARD MAY BE USED IN LIEU OF LINED SHEET METAL DUCT

PLENUM RETURN AIR GRILLE DETAIL

NO SCALE

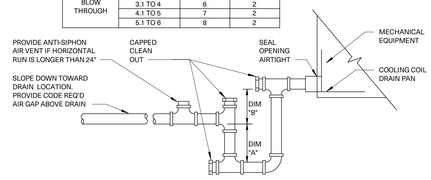


ELECTRIC STORAGE WATER HEATER DETAIL

NO SCALE

TRAP DIMENSION TABLE

AIR HANDLER ARRANGEMENT	TOTAL STATIC PRESSURE OF FAN (IN. WG.)	DIMENSION "A" (INCHES) MIN	DIMENSION "B" (INCHES)
DRAW THROUGH	UP TO -2	3	3
	-2.1 TO -3	3.5	3.5
	-3.1 TO -4	4	4
	-4.1 TO -5	4.5	4.5
	-5.1 TO -6	5	5
BLOW THROUGH	UP TO 2	4	2
	2.1 TO 3	5	2
	3.1 TO 4	6	2
	4.1 TO 5	7	2
	5.1 TO 6	8	2



CONDENSATE DRAIN TRAP DETAIL

NO SCALE

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STATE OF MICHIGAN
KELLY B. SUGG
ENGINEER
No. 6201061005
LICENSED PROFESSIONAL ENGINEER

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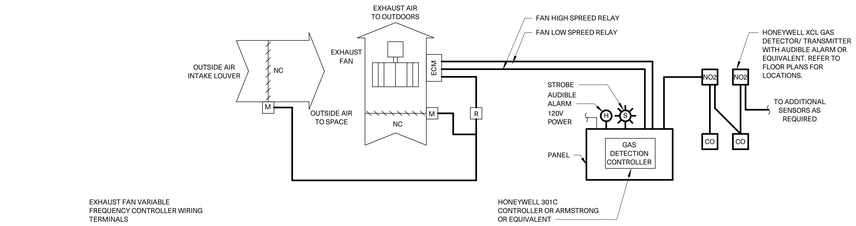
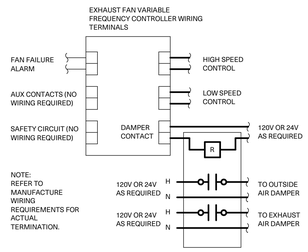


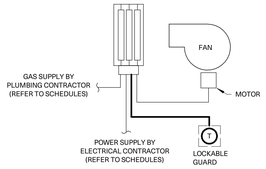


NOTES:
1. PROVIDE ADDITIONAL NO2 & CO SENSORS AS REQUIRED FOR ADEQUATE SENSOR COVERAGE OF THE GARAGE.
2. REFER TO MANUFACTURE INSTALLATION GUIDE FOR EXACT WIRING REQUIREMENTS & TERMINATIONS.
3. INSTALL NO2 SENSORS 10'-0" AFF.
4. INSTALL CO SENSORS 3'-0" AFF.
5. PROVIDE NEMA 1 ENCLOSURE FOR GAS DETECTION CONTROLLER. REFER TO FLOOR PLANS FOR LOCATION.

SEQUENCE OF OPERATIONS:
1. THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL BE INTERLOCKED AND OPEN WHEN THE EXHAUST FAN IS ON AND CLOSE WHEN THE FAN IS OFF.
2. EXHAUST FAN SHALL RUN CONTINUOUS AT LOW SPEED WHEN NO2 LEVELS ARE BELOW 3 PPM AND WHEN CO LEVELS ARE BELOW 25 PPM.
3. EXHAUST FAN AIRFLOW SHALL INCREASE TO HIGH SPEED WHEN NO2 LEVELS REACH 3 PPM OR WHEN CO LEVELS REACH 25 PPM AFTER A TIME DELAY OF 1 MINUTE.
4. IF NO2 LEVELS DROP BELOW 3 PPM FOR NO2 OR 25 PPM FOR CO DURING THE TIME DELAY THE FAN SHALL REMAIN AT LOW SPEED.
5. EXHAUST FAN STATUS SHALL BE MONITORED BY BAS. ABNORMAL OPERATION OF EXHAUST FAN SHALL ALARM THE BAS,

GARAGE VENTILATION CONTROL DIAGRAM

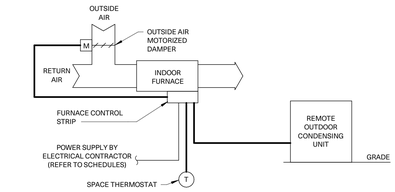
NO SCALE



TYPICAL GAS UNIT HEATER CONTROL

NOTE:
REFER TO FLOOR PLANS FOR QUANTITY AND LOCATION OF UNITS.

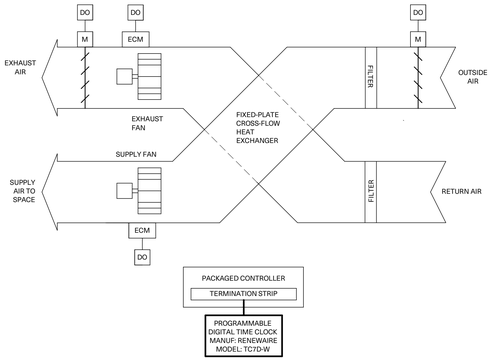
SEQUENCE OF OPERATION:
1. WHEN SPACE TEMPERATURE DROPS BELOW SETPOINT OF 60 DEGREES, THERMOSTAT SHALL ENERGIZE HEATER AND CYCLE ON/OFF AS REQUIRED TO MAINTAIN SPACE TEMEPERATURE SETPOINT.



SPLIT SYSTEM FURNACE AND AIR CONDITIONER FIELD WIRING & CONTROL

NOTES:
1. TEMPERATURE CONTROLS CONTRACTOR SHALL PROVIDE COMPONENTS AND WIRING INDICATED WITH HEAVY LINE WEIGHT. COORDINATE WITH PURCHASED MANUFACTURE FOR EXACT WIRING REQUIREMENTS.
2. CONTRACTOR SHALL PROVIDE FIELD WIRING BETWEEN INDOOR UNIT CONTROLS AND THE REMOTE CONDENSER. REFER TO MECH FLOOR PLANS FOR LOCATION OF UNITS.
3. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER FOR EXACT TERMINATIONS AND WIRING REQUIREMENTS.

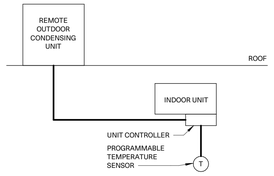
SEQUENCE OF OPERATION:
1. SUPPLY FAN OPERATION SHALL BE BASED ON MAIN THERMOSTAT TIME SCHEDULE AND RUN CONTINUOUSLY IN "AUTO" MODE.
2. GAS FURNACE SHALL CYCLE UPON CALL FOR HEATING AND DELIVER HEATED AIR UNTIL SPACE TEMPERATURE IS SATISFIED. WHEN SPACE TEMEPRATURE IS SATISFIED, GAS FURNACE SHALL SHUTOFF.
3. OUTDOOR CONDENSING UNIT SHALL BE ENERGIZED UPON CALL FOR COOLING. THE SYSTEM SHALL DELIVER COOL AIR UNTIL THE SPACE TEMPERATURE IS SATISFIED. WHEN SPACE TEMPERATURE IS SATISFIED, OUTDOOR CONDENSING UNIT SHALL TURN OFF.
4. WHEN SPACE IS OCCUPIED AND SUPPLY FAN IS ENERGIZED, THE OUTSIDE AIR DAMPER SHALL OPEN. WHEN THE SPACE IS UNOCCUPIED AND SUPPLY FAN IS OFF, THE OUTSIDE AIR DAMPER SHALL BE CLOSED.



ERV CONTROL & FIELD WIRING

GENERAL NOTES:
1. TEMPERATURE CONTROLS CONTRACTOR SHALL PROVIDE COMPONENTS AND WIRING INDICATED WITH HEAVY LINE WEIGHT. COORDINATE WITH PURCHASED MANUFACTURE FOR EXACT WIRING REQUIREMENTS.
2. ERV SHALL INCLUDE PACKAGED CONTROLS. THE PACKAGED ERV CONTROLS SHALL AT A MINIMUM MEET ALL REQUIREMENTS LISTED IN THE SEQUENCE OF OPERATION.
3. ERV CONTROLLER SHALL BE FACTORY PROGRAMMED, MOUNTED AND TESTED. CONTROLLER SHALL HAVE A LCD READOUT FOR CHANGING SET POINTS AND MONITORING UNIT OPERATION.
4. REFER TO FLOOR PLANS FOR QUANTITIES AND LOCATIONS OF DEVICES.

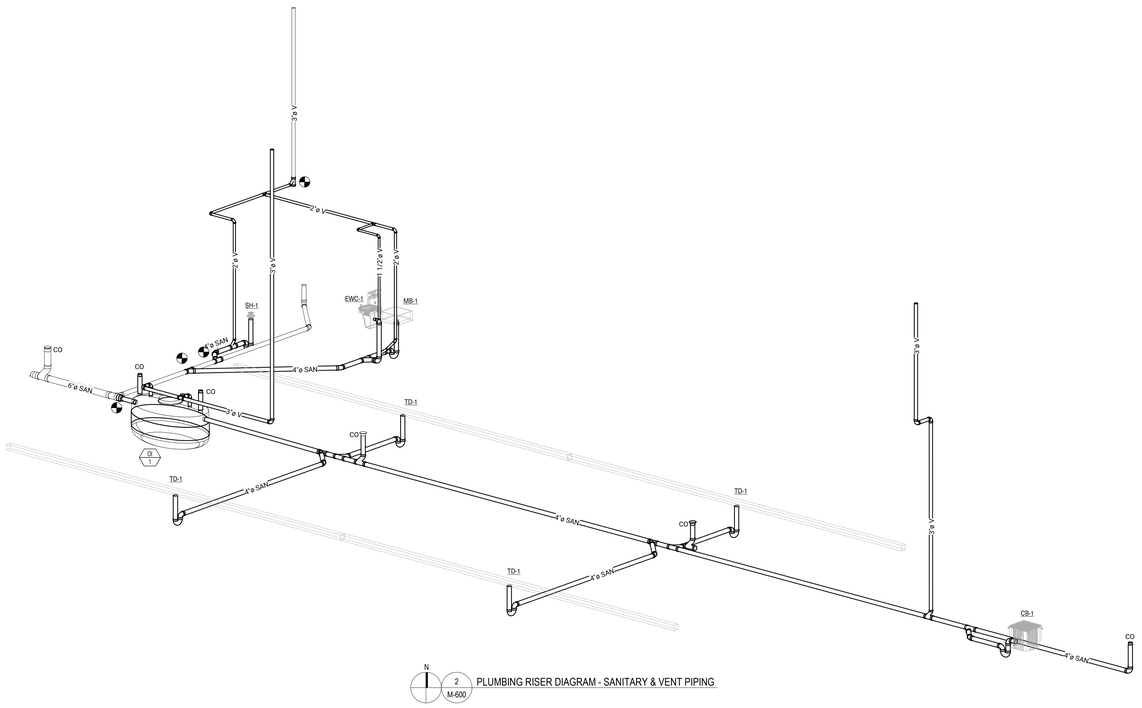
ERV SEQUENCE OF OPERATION:
1. ERV SHALL HAVE START/STOP CAPABILITY FROM THE PROGRAMMABLE DIGITAL TIME CLOCK.
2. ERV TO OPERATE BASED ON TIME SCHEDULED OCCUPIED MODE AND UNOCCUPIED CYCLE MODE.
3. WHEN THE ERV IS ACTIVATED FOR OCCUPIED MODE, CONTROLS SHALL ACTIVATE THE SUPPLY AND EXHAUST FANS.
4. DURING UNOCCUPIED MODE, THE SUPPLY AND EXHAUST FAN SHALL REMAIN OFF.



SPLIT SYSTEM FIELD WIRING & CONTROL

NOTES:
1. CONTRACTOR SHALL PROVIDE FIELD WIRING BETWEEN INDOOR UNIT CONTROLS AND REMOTE CONDENSER. REFER TO MECHANICAL FLOOR PLANS FOR LOCATION OF UNITS.
2. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER FOR EXACT TERMINATIONS AND WIRING REQUIREMENTS.
3. TC CONTRACTOR SHALL INSTALL PROGRAMMABLE TEMPERATURE SENSOR PROVIDED BY ACU SUPPLIER & WIRING REQUIRED.

SEQUENCE OF OPERATION:
1. SPLIT SYSTEM OPERATION SHALL BE BASED ON PROGRAMMABLE TEMPERATURE SENSOR TIME & TEMPERATURE SCHEDULE.



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2
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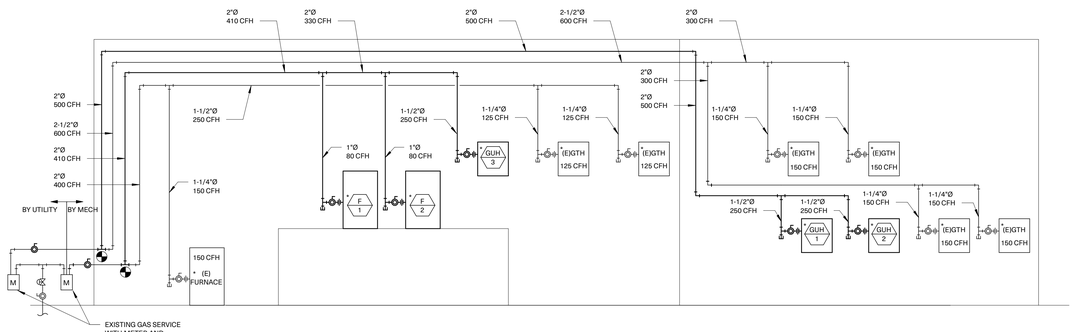
PLUMBING RISER DIAGRAM - SANITARY & VENT PIPING



NATURAL GAS PIPING DIAGRAM

NO SCALE

GAS PIPE DESIGN CRITERIA	
PIPE SIZING PER IFGC-2015 SECTION 402	
SYSTEM GAS PRESSURE	
LOW PRESSURE: 7-11 IN. WC.	X
MEDIUM PRESSURE: 2 PSIG	
MEDIUM PRESSURE: 3 PSIG	
MEDIUM PRESSURE: 5 PSIG	
HIGH PRESSURE: __ PSIG	
DEVELOPED PIPE LENGTH, FT	300
PIPE SIZE	CAPACITY CFH
1/2"	28
3/4"	58
1"	108
1-1/4"	223
1-1/2"	334
2"	643
2-1/2"	1025
3"	1813
4"	3700
6"	10848

* GAS TRAIN PROVIDED BY EQUIPMENT MANUFACTURER - SEE SPECIFICATIONS

GAS LOAD SCHEDULE

ITEM	TOTAL CFH
(E) F	150
F-1	80
F-2	80
GUH-3	250
(E) GTH	125
(E) GTH	125
TOTAL	810

CONNECTED GAS LOAD = 810 CFH @ 7"-11" W.C.

GAS PIPE DESIGN CRITERIA	
PIPE SIZING PER IFGC-2015 SECTION 402	
SYSTEM GAS PRESSURE	
LOW PRESSURE: 7-11 IN. WC.	X
MEDIUM PRESSURE: 2 PSIG	
MEDIUM PRESSURE: 3 PSIG	
MEDIUM PRESSURE: 5 PSIG	
HIGH PRESSURE: __ PSIG	
DEVELOPED PIPE LENGTH, FT	400
PIPE SIZE	CAPACITY CFH
1/2"	24
3/4"	49
1"	93
1-1/4"	191
1-1/2"	286
2"	551
2-1/2"	878
3"	1552
4"	3167
6"	9285

* GAS TRAIN PROVIDED BY EQUIPMENT MANUFACTURER - SEE SPECIFICATIONS

GAS LOAD SCHEDULE

ITEM	TOTAL CFH
(E) GTH	150
(E) GTH	150
GUH-1	250
GUH-2	250
(E) GTH	150
(E) GTH	150
TOTAL	1100

CONNECTED GAS LOAD = 1100 CFH @ 7"-11" W.C.

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LIGHTING SYMBOL LEGEND

(NOT ALL SYMBOLS USED)

XXX	LIGHT FIXTURE TYPE, REFER TO LIGHT FIXTURE SCHEDULE
	SURFACE OR PENDANT LIGHT FIXTURE, CHEVRON INDICATED WALL WASH AIMING, SHADING INDICATES EMERGENCY EGRESS LIGHT FIXTURE
	RECESSED LIGHT FIXTURE, CHEVRON INDICATED WALL WASH AIMING, HALF-SHADING INDICATES EMERGENCY EGRESS LIGHT FIXTURE
	SURFACE OR PENDANT LIGHT FIXTURE, HALF-SHADING INDICATES EMERGENCY EGRESS LIGHT FIXTURE
	RECESSED LIGHT FIXTURE, HALF-SHADING INDICATES EMERGENCY EGRESS LIGHT FIXTURE
	RECESSED ARCHITECTURAL LIGHT FIXTURE, HALF-SHADING INDICATES EMERGENCY EGRESS LIGHT FIXTURE
	SURFACE OR CHAIN HUNG STRIP LIGHT FIXTURE, HALF-SHADING INDICATES EMERGENCY EGRESS LIGHT FIXTURE
	WALL MOUNTED LIGHT FIXTURE, HALF-SHADING INDICATES EMERGENCY EGRESS LIGHT FIXTURE
	WALL MOUNTED LIGHT FIXTURE, HALF-SHADING INDICATES EMERGENCY EGRESS LIGHT FIXTURE
	EXIT SIGN, PROVIDE ARROWS/CHEVRONS AS INDICATED ON PLANS, SHADED AREA INDICATES FACE, FOOT ON SYMBOL INDICATES WALL MOUNTED, LIGHT HEADS INDICATE COMBINATION EXIT/BATTERY POWERED EMERGENCY LIGHTING UNIT
	BATTERY POWERED EMERGENCY LIGHTING UNIT, LIGHT HEADS ON SIDES OF UNIT INDICATES CEILING MOUNTED
$Xa	SINGLE POLE SWITCH - 20A, 125/277V UON, -'a' INDICATES WHICH FIXTURES/DEVICES ARE CONTROLLED VIA SWITCH -'X' DENOTES TYPE: BLANK - SINGLE POLE 2 - DOUBLE POLE 3 - THREE WAY 4 - FOUR WAY D - DIMMER K - KEY OPERATED I - ILLUMINATED (ILLUMINATED IN 'OFF' POSITION) P - WITH PILOT LIGHT (LIGHT ON IN 'ON' POSITION) T - TIME SWITCH L - LOW VOLTAGE C - MOMENTARY CONTACT O - WALL BOX OCCUPANCY SENSOR - PASSIVE INFRARED V - WALL BOX VACANCY SENSOR - PASSIVE INFRARED
OS Xa VS Xa OS Xa VS Xa	OCCUPANCY/VACANCY SENSOR, FOOT ON SYMBOL INDICATES WALL MOUNTED, -'a' INDICATES WHICH FIXTURES ARE CONTROLLED VIA SENSOR -'X' DENOTES TYPE: A - 180° DUAL TECHNOLOGY OCCUPANCY SENSOR B - 360° DUAL TECHNOLOGY OCCUPANCY SENSOR C - 180° PASSIVE INFRARED OCCUPANCY SENSOR D - 360° ULTRASONIC OCCUPANCY SENSOR
DS a DS a	DAYLIGHT SENSOR, FOOT ON SYMBOL INDICATES WALL MOUNTED, -'a' INDICATES WHICH FIXTURES ARE CONTROLLED VIA SENSOR
C	LIGHTING CONTACTOR, SIZE AS INDICATED ON DRAWINGS/DETAIL
TC	TIME CLOCK

ONE-LINE DIAGRAM SYMBOL LEGEND

(NOT ALL SYMBOLS USED)

	TERMINAL		DELTA
	TERMINATOR		WYE - SOLIDLY GROUNDED
	STAB	G	ENGINE GENERATOR
	STATIONARY CIRCUIT BREAKER	ST	SHUNT TRIP
	DRAWOUT CIRCUIT BREAKER	A	AMMETER
	STATIONARY SWITCH	M	UTILITY METER
	FUSE	V	VOLT METER
	MOTOR STARTER WITH OVERLOAD	EMU	ELECTRONIC MONITORING UNIT
	THERMAL OVERLOAD RELAY	PM	POWER MONITORING UNIT
	NORMALLY OPEN CONTACTS	K	KEYED INTERLOCK
	NORMALLY CLOSED CONTACTS	SPD	SURGE PROTECTION DEVICE
	GROUND	MH	MANHOLE
	CURRENT TRANSFORMER	XXXX	TRANSFORMER
	POTENTIAL TRANSFORMER	XX-XX	PANELBOARD, 'XX-XX' INDICATES PANELBOARD DESIGNATION
	TRANSFER SWITCH		

NOTE:
1. REFER TO POWER SYMBOLS SCHEDULE FOR MORE SYMBOL DESCRIPTIONS THAT MAY BE SHOWN ON THE ONE LINE DIAGRAM.

FLOOR BOX SCHEDULE

DEVICE	DESCRIPTION
FB1	STAMPED STEEL AND APPROVED FOR USE FOR ON GRADE OR ABOVE GRADE APPLICATIONS AS REQUIRED. GRAY DIE-CAST ALUMINUM FLANGED COVER. FOUR INDEPENDANT WIRING COMPARTMENTS THAT ALLOW CAPACITY FOR UP TO SIX DUPLEX RECEPTACLES, COMMUNICATIONS SERVICES OR COMBINATION OF DEVICES. PROVIDE (1) 5-20R SPECIFICATION GRADE RECEPTACLE. ROUTE (1)3/4"C.TO FLOOR BOX FOR POWER. PROVIDE BLANK COVER PLATES FOR UNUSED OPENINGS. PROVIDE (1)1-1/4"C. FOR COMMUNICATION DEVICES. WIREMOLD EFB6 SERIES WITH EFB610BT STYLE COVER.

POWER SYMBOL LEGEND

(NOT ALL SYMBOLS USED)

	SIMPLEX RECEPTACLE - NEMA 5-20R, HORIZONTAL LINE INDICATES MOUNTED AFC UON, SHADING INDICATES CIRCUITED TO GENERATOR/UPS POWER
	DUPLEX RECEPTACLE - NEMA 5-20R, HORIZONTAL LINE INDICATES MOUNTED AFC UON, SHADING INDICATES CIRCUITED TO GENERATOR/UPS POWER
	DUPLEX RECEPTACLE - NEMA 5-20R, GROUND FAULT INTERRUPTING, HORIZONTAL LINE INDICATES MOUNTED AFC UON, SHADING INDICATES CIRCUITED TO GENERATOR/UPS POWER
	DUPLEX RECEPTACLE - NEMA 5-20R, TAMPER RESISTANT, HORIZONTAL LINE INDICATES MOUNTED AFC UON, SHADING INDICATES CIRCUITED TO GENERATOR/UPS POWER
	SPLIT-WIRED DUPLEX RECEPTACLE - NEMA 5-20R, HORIZONTAL LINE INDICATES MOUNTED AFC UON, SHADING INDICATES CIRCUITED TO GENERATOR/UPS POWER
	COMBINATION DUPLEX RECEPTACLE (NEMA 5-20R/USB (TYPE A: 2.0), TWO CHARGING USB PORTS, HORIZONTAL LINE INDICATES MOUNTED AFC UON, SHADING INDICATES CIRCUITED TO GENERATOR/UPS POWER
	QUADPLEX RECEPTACLE - NEMA 5-20R, HORIZONTAL LINE INDICATES MOUNTED AFC UON, SHADING INDICATES CIRCUITED TO GENERATOR/UPS POWER (ALL OTHER NEMA 5-20R QUAD RECEPTACLE SYMBOLS FOLLOW SAME STACKED DUPLEX PATTERN)
J J J	JUNCTION BOX, LEG INDICATES WALL/EQUIPMENT MOUNTING IS REQUIRED, SQUARE INDICATES FLOOR MOUNTED
SM	MANUAL MOTOR STARTER/DISCONNECT SWITCH WITH THERMAL OVERLOAD PROTECTION
	ENCLOSED DISCONNECT SWITCH, SHADING INDICATES SWITCH IS FUSIBLE
	ENCLOSED CIRCUIT BREAKER
	COMBINATION MAGNETIC MOTOR CONTROLLER/STARTER, SHADING INDICATES STARTER IS FUSIBLE
	MAGNETIC MOTOR CONTROLLER
VFD	VARIABLE FREQUENCY DRIVE (FURNISHED BY OTHERS)
	PUSHBUTTON STATION
	MOTOR
	AUTOMATIC OR MANUAL TRANSFER SWITCH.
	UTILITY METER
T	TRANSFORMER, DASHED LINE INDICATES NEC WORKING SPACE.
	DISTRIBUTION PANELBOARD. SOLID FILL INDICATES 480V LINE TO LINE, NO FILL INDICATES 208V OR 240V LINE TO LINE. DASHED LINE INDICATES NEC WORKING SPACE.
	SURFACE MOUNTED PANELBOARD. SOLID FILL INDICATES 480V LINE TO LINE, NO FILL INDICATES 208V OR 240V LINE TO LINE. INSTALL DOOR HINGE ON THE SIDE SHOWN ON SYMBOL. DASHED LINE INDICATES NEC WORKING SPACE. HALF-TONE LINE INDICATES WALL.
	FLUSH/RECESSED MOUNTED PANELBOARD. SOLID FILL INDICATES 480V LINE TO LINE, NO FILL INDICATES 208V OR 240V LINE TO LINE. INSTALL DOOR HINGE ON THE SIDE SHOWN ON SYMBOL. DASHED LINE INDICATES NEC WORKING SPACE. HALF-TONE LINE INDICATES WALL.
	MULTI-SECTION SWITCHBOARD OR MOTOR CONTROL CENTER. DASHED LINE INDICATES NEC WORKING SPACE.
CP	CONTROL PANEL/CONTROL POWER PANEL (FURNISHED BY OTHERS)
PS	POWER SUPPLY
GA	GENERATOR ANNUNCIATOR
BMS	BUILDING MANAGEMENT SYSTEM PANEL (FURNISHED BY OTHERS)
FACP	FIRE ALARM CONTROL PANEL (FURNISHED BY OTHERS)
FAA	FIRE ALARM ANNUNCIATOR (FURNISHED BY OTHERS)
FNAC	FIRE ALARM NOTIFICATION APPLIANCE CIRCUIT PANEL (FURNISHED BY OTHERS)
	CONDUIT TURNING UP
	CONDUIT TURNING DOWN
RP1-1,3,5	INDICATES CIRCUITS TO PANEL, 'RP1' INDICATES PANEL DESIGNATION AND '1,3,5' INDICATED POLE POSITION(S)
X#Y, X#YG ,Z"C	'X' INDICATES QUANTITY AND 'Y' INDICATES SIZE OF CONDUCTORS, Z INDICATES CONDUIT SIZE
RP1	PANEL TAG, i.e. CIRCUITS WITHIN AREA WHERE TAG IS LOCATED ON PLAN ARE CIRCUITED TO PANEL 'RP1' UON
WSHP-2 MECH	MECHANICAL EQUIPMENT CONNECTION TAG. DESIGNATION ON TOP INDICATES EQUIPMENT IDENTIFIER AND DESIGNATION ON BOTTOM INDICATES ASSOCIATED EQUIPMENT CONNECTION SCHEDULE AS FOLLOWS: MECH = MECHANICAL, KTCH = KITCHEN, PUMP = PUMP, HEAT = HEATER, FAN = FAN. REFER TO ELECTRICAL SCHEDULES SHEETS FOR ADDITIONAL INFORMATION.

FIRE ALARM SYMBOL SCHEDULE

(NOT ALL SYMBOLS USED)

SYMBOL	DESCRIPTION
F	FIRE ALARM MANUAL STATION, MH=4'-0" AFF UNO
2	FIRE ALARM SMOKE DETECTOR, CEILING MOUNTED
2	FIRE ALARM ADDRESSABLE DUCT TYPE SMOKE DETECTOR, MOUNTED ON DUCT
	FIRE ALARM SPEAKER WITH STROBE, MH=6'-8" AFF UNO

ELECTRICAL DEMOLITION LEGEND

TAG	SYMBOLOGY	DESCRIPTION
(EX)		EXISTING DEVICE TO REMAIN.
(ED)		EXISTING DEVICE TO BE DEMOLISHED.
(ER)		EXISTING DEVICE TO BE RELOCATED.
(EL)		EXISTING DEVICE SHOWN IN NEW LOCATION TO BE REINSTALLED.
(EN)		EXISTING DEVICE TO BE REPLACED WITH NEW DEVICE IN SAME LOCATION

ELECTRICAL GENERAL NOTES

1. PRIOR TO BID, THE CONTRACTOR SHALL VISIT SITE TO SURVEY EXISTING CONDITIONS AFFECTING WORK. INCLUDE NECESSARY MATERIALS AND LABOR TO ACCOMPLISH THE ELECTRICAL WORK, INCLUDING RELOCATION OF EXISTING EQUIPMENT TO ALLOW FOR NEW CONSTRUCTION. ANY CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT/ENGINEER AND RESOLVED PRIOR TO BID. WORK SHALL BE COORDINATED WITH ALL OTHER TRADES.
2. THESE DRAWINGS ARE A PART OF A COMPLETE SET OF ARCHITECTURAL/ENGINEERING DRAWINGS. DRAWINGS SHOWING ELECTRICAL WORK ARE DIAGRAMATIC. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR GUIDANCE AND COORDINATION WITH DIMENSIONS, CEILINGS, DOOR SWINGS, ELEVATIONS, CASEWORK, FINISHES, STRUCTURAL CONCRETE, FRAMING, DUCTWORK, AND PIPING.
3. ALL ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH THE NEC AND LOCAL ORDINANCES INCLUDING ALL REQUIREMENTS OF APPLICABLE CODES. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS.
4. ALL SYMBOLS SHOWN ON THESE LEGENDS MAY NOT BE USED.
5. PROVIDE EXPANSION JOINT FITTINGS ON ALL CONDUITS THAT CROSS EXPANSION JOINTS OR CONDUITS THAT PENETRATE WALLS WITH SEISMIC BRACING. SEE ARCHITECTURAL DRAWINGS.
6. ALL FLUSH MOUNTED PANELS SHALL HAVE (4) 1" EMPTY CONDUITS STUBBED OUT ABOVE ACCESSIBLE CEILING FOR FUTURE CIRCUITS.
7. VERIFY LOCATION OF ALL FLOOR OUTLETS WITH ARCHITECT PRIOR TO ROUGH-IN.
8. ALL WALL OUTLETS NOT PROVIDED WITH A DEVICE BY THIS CONTRACTOR SHALL BE PROVIDED WITH BLANK WALL PLATES.
9. MULTI-WIRE BRANCH CIRCUITS ARE PROHIBITED UNLESS SPECIFICALLY NOTED OTHERWISE.
10. FINAL EQUIPMENT CONNECTIONS - THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL LABOR AND MATERIALS REQUIRED TO MAKE FINAL CONNECTIONS TO ALL EQUIPMENT FURNISHED BY THIS CONTRACTOR AND/OR EQUIPMENT FURNISHED BY OTHERS. VERIFY ALL REQUIREMENTS, CONDUCTOR SIZE, OVERCURRENT PROTECTION, PHASE, VOLTAGE, ETC., INDICATED ON DRAWINGS WILL SATISFY EQUIPMENT SUPPLIER REQUIREMENTS PRIOR TO ROUGH-IN. PROVIDE FUSED DISCONNECT IF REQUIRED BY MANUFACTURER.
11. REFER TO "TYPICAL MOUNTING AND ALIGNMENT CRITERIA" DETAIL FOR OUTLET DEVICE MOUNTING HEIGHT AND LOCATIONS.
12. TYPE "ENT" ELECTRICAL NON-METALLIC TUBING SHALL NOT USED.
13. PROVIDE ACCESS PANELS IN GYPBOARD CEILINGS WHERE ACCESS TO JUNCTION BOXES IS REQUIRED.
14. PROVIDE A MINIMUM OF (1) 3/4"C. WITH PULLSTRING AND NYLON END BUSHING STUBBED TO ABOVE ACCESSIBLE CEILING FOR ALL WALL MOUNTED AUXILIARY DEVICE, JUNCTION BOXES INCLUDING, BUT NOT LIMITED TO CARD READERS, PUSH PLATES, ETC. UON.
15. ALL 120V RECEPTACLE OUTLETS WITHIN 6FT OF A WATER SOURCE SHALL BE GFCI PROTECTED.
16. VERIFY ALL DOOR SWINGS W/ ARCHITECT PRIOR TO ROUGH-IN OF WALL MOUNTED LIGHTING CONTROLS, ACCESS CONTROLS, DOOR OPERATORS, ETC.
17. PROVIDE ADDITIONAL STEEL SUPPORTS FOR MOTOR CONTROLLERS, FIXTURES, RACEWAYS, CABINETS, BOXES, AND THE LIKE WHRE THE BUILDING, EQUIPMENT, OR STRUCTURE IS NOT SUITABLE FOR MOUNTING DIRECTLY THEREON.
18. "PROVIDE" USED IN SPECIFICATIONS AND DRAWINGS SHALL MEAN "TO FURNISH, INSTALL, CONNECT, AND PLACE IN SERVICE COMPLETELY IN SPECIFIED OR APPROVED MANNER THE ITEM DESCRIBED."
19. ELECTRICAL WORK EMBEDDED IN CONCRETE OR OTHERWISE PERMANENTLY CONCEALED SHALL NOT BE COVERED UNTIL INSPECTED BY THE OWNER'S REPRESENATIVE.
20. ALL PENETRATIONS THROUGH FIRE RESISTANT WALLS AND OTHER SUCH RATED ASSEMBLIES SHALL BE FIRESTOPPED TO MAINTAIN ITS RATING.
21. DIVISION 22 AND 23 EQUIPMENT CIRCUITING, DISCONNECT, AND OVERCURRENT PROTECTION CHARACTERISTICS ARE BASED ON THE BASIS OF DESIGN EQUIPMENT SPECIFICATION. CONTRACTOR SHALL BEAR ALL COSTS OF ELECTRICAL CHANGES RESULTING FROM PROVIDING EQUIPMENT FROM AN ALTERNATE MANUFACTURER.

ELECTRICAL DEMOLITION NOTES

1. THE CONTRACTOR SHALL REMOVE THE EXISTING ELECTRICAL WORK NECESSARY TO PROVIDE THE INTENDED ARRAEMENT OF WALLS AND CELINGS, AND SHALL RECONNECT ALL CIRCUITS INTERRUPTED BY THIS DEMOLITION WHERE THOSE CIRCUITS ARE UTILIZED BEYOND THE DEMOLITION, WHETHER SUCH CIRCUITS ARE INDICATED OR NOT.
2. WHERE AN ELECTRICAL DEVICE THAT IS TO BE REMOVED IS AN 'END OF LINE" OR A SINGLE DEVICE, THE CONDUCTORS SHALL BE DISCONNECTED AT THE NEXT UPSTREAM DEVICE TO REMAIN OR AT ITS RELATED PANELBOARD. ALL NON-FUNCTIONAL CONDUCTORS INCLUDING POWER AND TELECOMMUNICATION CABLES SHALL BE REMOVED.
3. DEMOLITION: ACCURACY OF ORIGINAL PLANS HAS NOT BEEN VERIFIED. THE CONTRACTORS SHALL MAINTAIN CIRCUIT CONTINUITY OF ALL EXISTING FIXTURES AND DEVICES THAT ARE TO REMAIN.
4. EXISTING CIRCUITS, IF INDICATED, ARE DIAGRAMMATIC ONLY. VERIFY EXACT CONDUIT LOCATION AND ROUTING OF EXISTING CONDUIT RUNS AND NUMBER OF CONDUCTORS. AND PROVIDE ADDITIONAL CONDUITS / CONDUCTORS AS NECESSARY TO ACCOMPLISH THE DESIGN INTENT.
5. CIRCUIT BREAKERS ADDED TO THE EXISTING PANELBOARDS SHALL MATCH THE EXISTING BREAKER TYPE, MANUFACTURER, AND AIC RATING. PROVIDE NEW TYPE WRITTEN, UPDATED DIRECTORIES IN THE EXISTING PANELBOARDS TO REFLECT CHANGES MADE BY THIS RENOVATION.
6. ALL ADDITIONS TO SYSTEMS SHALL MATCH THE MANUFACTURER'S EXISTING SYSTEMS PRESENTLY INSTALLED IN THE FACILITY UNLESS OTHERWISE NOTED.
7. EXISTING SYSTEMS SHALL REMAIN UNLESS NOTED FOR REMOVAL OR RELOCATION. ALL SYSTEMS SHALL BE CHECKED TO ENSURE THEY ARE IN PROPER WORKING ORDER BEFORE ANY DEMOLITION IS STARTED. SYSTEMS NOT FOUND TO BE IN SATISFACTORY WORKING CONDITION SHALL BE REPORTED TO THE OWNER IN WRITING PRIOR TO THE START OF ANY DEMOLITION WORK. ALL SYSTEMS SHALL BE CHECKED TO ENSURE THAT THEY ARE WORKING PROPERLY AFTER THE DEMOLITION WORK IS FINISHED AND AFTER THE NEW ELECTRICAL INSTALLATION IS COMPLETE.
8. DEMOLITION, WHERE INDICATED ON PLAN, IS BASED ON EXISTING DRAWINGS AND LIMITED FIELD INVESTIGATION OF EXISTING CONDITIONS. SELECT DEMOLITION MAY BE REQUIRED FOR NEW CONSTRUCTION AND MAY NOT BE DELINEATED ON THIS DRAWING. CAREFULLY COORDINATE DEMOLITION WITH NEW CONSTRUCTION PLANS OF ALL DISCIPLINES TO VERIFY ACTUAL EXTENT OF DEMOLITION. VISIT THE SITE PRIOR TO SUBMISSION OF BID TO EXAMINE THE EXISTING CONDITIONS AND FULLY UNDERSTAND THE EXTENT OF DEMOLITION WORK.
9. EXAMINE THE DRAWINGS OF OTHER TRADES AND BE FAMILIAR WITH THE DEMOLITION REQUIRED BY OTHER TRADES. PERFORM ALL INCIDENTAL ELECTRICAL DEMOLITION AND/OR RELOCATION REQUIRED TO FACILITATE THE DEMOLITION WORK OF OTHER TRADES, WHETHER OR NOT SPECIFICALLY INDICATED.
10. QUANTITY AND LOCATION OF EXISTING DEVICES SHOWN ON PLANS ARE APPROXIMATE. FIELD VERIFY DEVICES AND LOCATIONS.
11. ALL EXISTING EQUIPMENT MAY NOT BE INDICATED. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO BIDDING. EXISTING ITEMS NOT SHOWN HATCHED SHALL REMAIN IN OPERATION. REVISE THE EXISTING CIRCUITRY TO MAINTAIN OPERATION OF ITEMS TO REMAIN.
12. MAINTAIN ELECTRICAL SERVICE TO ALL LIGHTING FIXTURES, DEVICES, AND EQUIPMENT THAT ARE OUTSIDE AREA OF RENOVATION. EXTEND CONDUIT AND WIRE AS REQUIRED WHERE DEMOLITION WORK AFFECTS ELECTRICAL SERVICE TO DOWNSTREAM LOADS THAT ARE TO REMAIN.
13. RING OUT AND TAG ALL CIRCUITS AFFECTED BY THIS ALTERATION AT BOTH ENDS. MARK ALL UNUSED CIRCUIT BREAKERS "SPARE" AND PLACE IN THE "OFF" POSITION.
14. VERIFY ALL UNDERGROUND AND IN SLAB UTILITY LOCATIONS PRIOR TO SAW-CUTTING OR PENETRATING ANY FLOOR SLAB.

ELECTRICAL INDEX OF DRAWINGS

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E-601	ELECTRICAL ONE LINE AND PANEL SCHEDULES

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SHEET
ELECTRICAL LEGEND, SYMBOLS, & NOTES

FILE NUMBER
2024-0074

SHEET NUMBER
E-001

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CIRCUIT LENGTH TABLE. 120V 1PH
(NOTES 7,8,9)

OVERCURRENT DEVICE RATING	MAX. CIRCUIT LOAD (AMPS)	CIRCUIT SIZE 20A	30A	40A	50A	70A	
20A	4	215'	360'	555'	880'	-	ONE WAY CIRCUIT LENGTH
	8	105'	180'	275'	440'	700'	
	12	70'	120'	185'	295'	465'	
	16	50'	90'	140'	220'	350'	
30A	24	-	60'	90'	145'	230'	
40A	32	-	-	70'	110'	175'	
50A	40	-	-	-	85'	140'	
60A	48	-	-	-	-	115'	

CIRCUIT LENGTH TABLE. 240V 1PH
(NOTES 7,8,9)

OVERCURRENT DEVICE RATING	MAX. CIRCUIT LOAD (AMPS)	CIRCUIT SIZE 20A	30A	40A	50A	70A	
20A	4	375'	625'	965'	-	-	ONE WAY CIRCUIT LENGTH
	8	185'	310'	480'	765'	-	
	12	125'	205'	320'	510'	810'	
	16	90'	155'	240'	380'	605'	
30A	24	-	100'	160'	255'	405'	
40A	32	-	-	120'	190'	300'	
50A	40	-	-	-	150'	240'	
60A	48	-	-	-	-	200'	

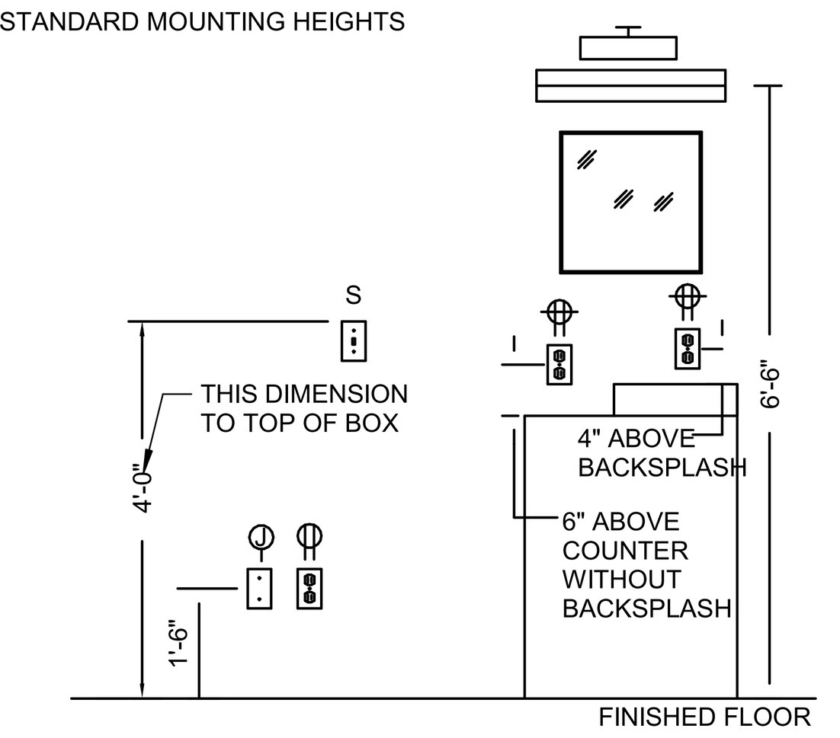
COPPER FEEDER & BRANCH CIRCUIT SIZING SCHEDULE
(NOTES 1,2,10,11,12)

OVERCURRENT DEVICE RATING	SETS PER PHASE	AWG OR KCMIL PHASE & NEUTRAL	AWG OR KCMIL EG	CONDUIT SIZE 3 WIRE (3W) (3PH)	CONDUIT SIZE 4 WIRE (4W) (3PH & 1N)
20A	1	12	12	3/4"	3/4"
30A	1	10	10	3/4"	3/4"
40A	1	8	10	3/4"	3/4"
50A	1	6	10	3/4"	1"
60A	1	4	10	1"	1-1/4"
70A	1	4	8	1"	1-1/4"
100A	1	2	8	1-1/4"	1-1/4"
110A	1	2	6	1-1/4"	1-1/4"
125A	1	1	6	1-1/4"	1-1/2"
150A	1	1/0	6	1-1/2"	1-1/2"
175A	1	2/0	6	1-1/2"	2"
200A	1	3/0	6	2"	2"
225A	1	4/0	4	2"	3"
250A	1	250	4	2"	3"
300A	1	350	4	3"	3"
400A	1	500	2	3"	3"
450A	2	4/0	2	2"	3"
500A	2	250	2	2"	3"
600A	2	350	1	3"	3"
800A	2	500	1/0	3"	3"
1000A	3	500	2/0	3"	3"
1200A	3	600	3/0	3"	4"
1600A	4	600	4/0	3"	4"
2000A	5	600	250	3"	4"

SHEET NOTES

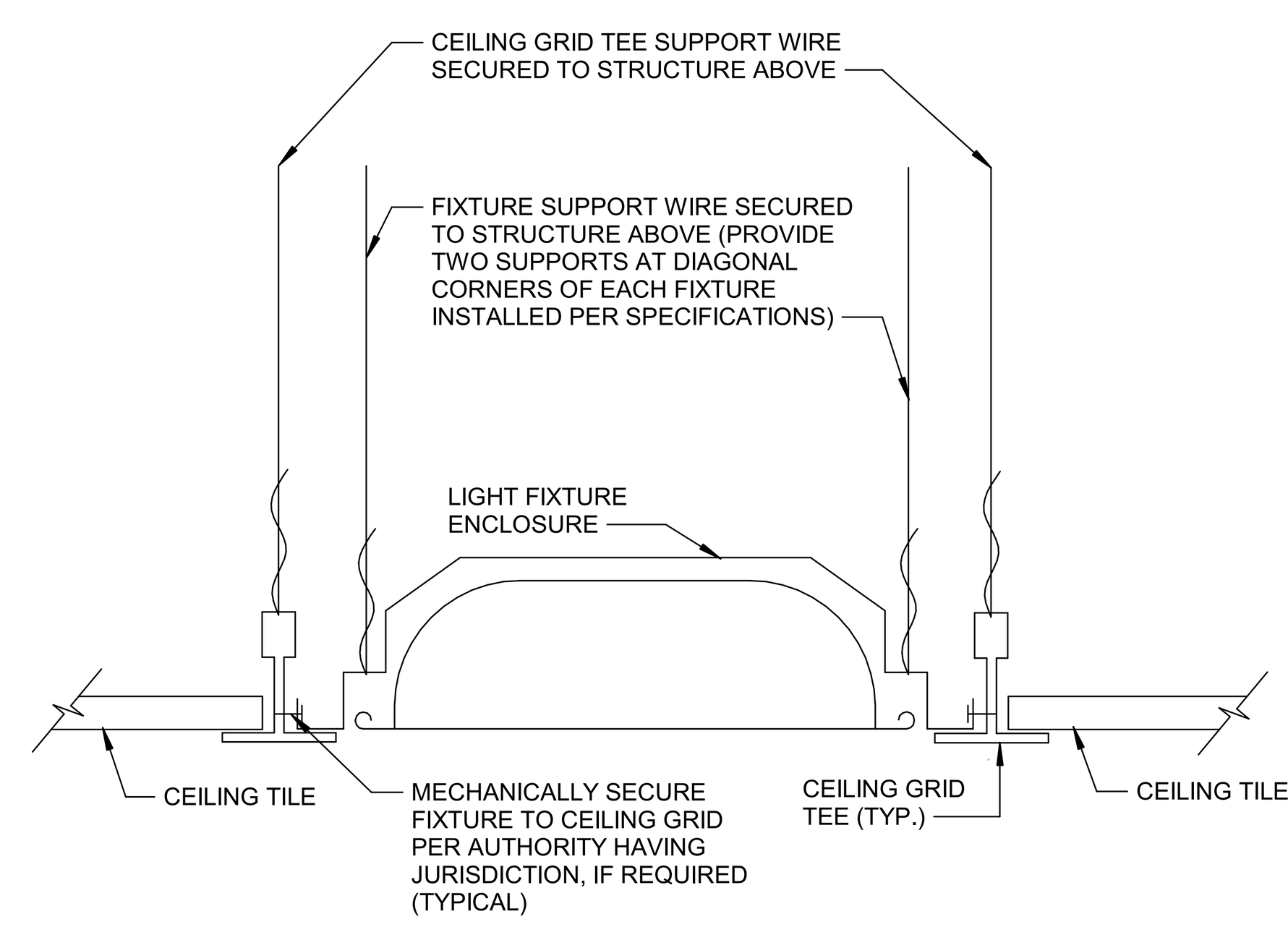
1. AMPACITIES BASED ON THHN/THWN, 90°., 600V., INSULATED, COPPER WIRE APPLIED AT 60° TERMINATIONS FOR CIRCUITS RATED 110A AND DOWN AND APPLIED AT 75° TERMINTATIONS FOR CIRCUITS RATED ABOVE 110A PER NEC 110.14(C)(1).
2. BASED ON WIRE OUTSIDE DIAMETERS AND NON-RIGID METALLIC CONDUIT INSIDE DIAMETERS AS PROVIDED IN THE NEC. REFER TO NEC FOR CONDUIT TYPES MORE RESTRICTIVE THAN NON-RIGID METALLIC. CONDUCTOR AND CONDUIT SIZES INDICATED ARE MINIMUM REQUIREMENTS. FOLLOW NEC REQUIRMENTS FOR DERATING AND PROVIDE LARGER CONDUCTORS AND CONDUIT WHERE APPLICABLE.
3. NOT USED
4. NOT USED
5. NOT USED
6. NOT USED
7. CIRCUIT MAXIMUM DISTANCE IS BASED ON NEC CHAPTER 9, TABLE 8 CONDUCTOR PROPERTIES FOR COATED COPPER AT 75 DEGREES CELSIUS. REFER TO NEXT LARGER OVERCURRENT DEVICE RATING IN THIS TABLE FOR OVERCURRENT DEVICES WITH RATINGS NOT INDICATED.
8. MAXIMUM CIRCUIT LOAD FOR DISTANCE IS BASED ON NEC 220-10.
9. REFER TO CIRCUIT SIZING SCHEDULE ON THIS SHEET FOR UPSIZING CONDUIT AND WIRING. E.G. SHALL BE INCREASED IN SIZE PROPORTIONATELY PER THE NEC. ONLY CONDUCTORS AND CONDUIT SHALL BE INCREASED IN SIZE. OVERCURRENT PROTECTION DEVICE SHALL REMAIN AS SPECIFIED.
10. CONDUCTORS SHALL BE STRANDED. COPPER CONDUCTORS ARE REQUIRED.
11. WHERE OVERCURRENT DEVICE REQUIRED IS NOT LISTED IN TABLE, USE CONDUIT AND WIRE REQUIREMENTS LISTED FOR NEXT LARGER LISTED OVERCURRENT DEVICE.
12. TABLE IS NOT APPLICABLE FOR SERVICE ENTRANCE FEEDERS. REFER TO ELECTRICAL PLANS AND DIAGRAMS FOR SERVICE ENTRANCE FEEDER REQUIREMENTS.

STANDARD MOUNTING HEIGHTS



NOTES:

1. MOUNTING HEIGHTS SHOWN ARE FROM FINISHED FLOOR TO CENTERLINE OF DEVICE/OUTLET/FIXTURE, UNLESS OTHERWISE NOTED.
2. MOUNTING HEIGHTS, WHERE INDICATED, ON FLOOR PLANS, SHALL TAKE PRECEDENCE OVER THESE MOUNTING HEIGHTS. LOCATIONS OF OUTLETS SHOWN ON ARCHITECTURAL ELEVATIONS SHALL TAKE PRECEDENCE OVER THESE MOUNTING HEIGHTS. FIELD LOCATE OUTLETS WITH ARCHITECT DURING ROUGH-IN.
3. INSTALL OUTLETS THAT ARE IN CLOSE PROXIMITY ON THE SAME CENTERLINE. OUTLETS THAT ARE WITHIN 2'-0" HORIZONTALLY AND WITHIN 1'-0" VERTICALLY SHALL BE INSTALLED ON THE SAME HORIZONTAL CENTERLINE LOCATED HALF WAY BETWEEN THE HEIGHTS SHOWN. OUTLETS THAT ARE MORE THAN 1'-0" APART VERTICALLY SHALL BE INSTALLED ON THE SAME VERTICAL CENTERLINE.
4. MAXIMUM MOUNTING HEIGHT FOR SWITCHES ABOVE A COUNTER TOP 20" DEEP OR LESS IS 48" AFF TO TOP OF BOX. SWITCHES MOUNTED ABOVE COUNTER TOPS DEEPER THAN 20" SHALL BE INSTALLED AT NO MORE THAN 44" ABOVE FINISHED FLOOR TO TOP OF BOX. NOTIFY ARCHITECT WHERE COUNTERTOP PROHIBITS SWITCH INSTALLTION.



RECESSED GRID TROFFER LIGHT FIXTURE INSTALLATION
SCALE: NOT TO SCALE

RACEWAY APPLICATION SCHEDULE

	RACEWAY	AC / MC CABLE	ALUMINUM RIGID CONDUIT	ELECTRICAL METALLIC TUBING (EMT)	SURFACE RACEWAY	ELECTRICAL NONMETALLIC TUBING (ENT)	FLEXIBLE METAL CONDUIT (FMC)	GENERAL-USE OPTICAL FIBER / COMMUNICATION CABLE RACEWAY	INTERMEDIATE METAL CONDUIT (IMC)	LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)	LIQUIDTIGHT FLEXIBLE NON METALLIC CONDUIT (LFNC)	PLENUM-TYPE OPTICAL FIBER / COMMUNICATIONS CABLE RACEWAY	RIGID STEEL CONDUIT	RISER-TYPE OPTICAL FIBER / COMMUNICATIONS CABLE RACEWAY	RIGID NONMETALLIC CONDUIT (RNC) TYPE EPC-40	RIGID NONMETALLIC CONDUIT (RNC) TYPE EPC-80	RIGID NONMETALLIC POLYTHYLENE (HDPE) SCHEDULE-40	RIGID NONMETALLIC POLYTHYLENE (HDPE) SCHEDULE-80	KEYED NOTES
OUTDOOR	EXPOSED								X				X						
	CONCEALED (ABOVE GROUND)								X				X						
	UNDERGROUND												X		X	X	X	X	EQUIPMENT INCLUDING: TRANSFORMERS, HYDRAULIC, PNEUMATIC, ELECTRIC, SOLENOID, MOTOR DRIVEN EQUIPMENT
	CONNECTED TO VIBRATING EQUIPMENT									X									PNEUMATIC, ELECTRIC SOLENOID, MOTOR DRIVEN EQUIPMENT
INDOOR	EXPOSED NOT SUBJECT TO PHYSICAL DAMAGE - UNFINISHED SPACES			X															
	EXPOSED NOT SUBJECT TO PHYSICAL DAMAGE - UNFINISHED SPACES				X														
	EXPOSED NOT SUBJECT TO PHYSICAL DAMAGE - UNFINISHED SPACES								X				X						(RIGID STEEL CONDUIT UP TO 10'-0" AFF.) LOCATIONS INCLUDE: LOADING DOCKS, CORRIDORS USED FOR TRAFFIC OF MECHANIZED CARTS AND PALLET HANDLING UNITS MEHANICAL ROOMS
	CONCEALED IN CEILINGS, INTERIOR WALL AND PARTITIONS	X		X															NOT TO EXCEED 6'-0" IN ACCESSIBLE CEILING SPACE
	CONNECTED TO VIBRATING EQUIPMENT						X			X									EQUIPMENT INCLUDING: TRANSFORMERS, HUYDRAULIC, PNEUMATIC, ELECTRIC SOLENOID, MOTOR DRIVEN EQUIPMENT USE LFMC IN DAMP/WET AREAS
	DAMP AND WET LOCATIONS								X				X						
	BELOW SLAB ON GRADE														X	X			PROVIDE RIGID STEEL ELBOWS WHERE CONDUIT PENETRATES SLAB. CONDUIT INSTALLED 6" BELOW BOTTOM OF SLAB
	EMBEDDED IN CONCRETE ABOVE GRADE												X		X	X			
	OPTICAL FIBER OR COMMUNICATIONS CABLE IN SPACES USED FOR ENVIRONMENTAL AIR			X								X							
	CONCEALED GENERAL PURPOSE DISTRIBUTION OF OPTICAL FIBER OR COMMUNICATION CABLE			X				X				X		X					
SPECIAL APPLICATIONS	MRI		X																
	NATATORIUMS/FOUNTAINS			X															USE COMPRESSION FITTINGS

GENERAL NOTES

1. "X" INDICATES ACCEPTABLE SELECTION. IF MORE THAN ONE SELECTION IS INDICATED FOR A DUCT SYSTEM, CONTRACTOR MAY SELECT FROM THOSE INDICATED SELECTIONS
2. REFER TO "CONDUCTORS AND CABLES" SPECIFICATION FOR APPLICATION LIMITATIONS OF AC/MC CABLE.

ELECTRICAL ABBREVIATIONS

ABBREVIATION	DESCRIPTION
(ED)	EXISTING TO BE DEMOLISHED
(EL)	EXISTING DEVICE SHOWN IN NEW LOCATION TO BE REINSTALLED
(EN)	EXISTING TO BE REPLACED WITH NEW. CONNECT TO NEW CIRCUIT WHERE INDICATED,
(ER)	EXISTING TO BE RELOCATED
(EX)	EXISTING TO REMAIN
A, AMP	AMPERES
AF	AMP FRAME - CIRCUIT BREAKER; AMP FUSE - FUSED SWITCH
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AIC	AMPERE INTERRUPTING CAPACITY
AL	ALUMINUM
AT	AMP TRIP
BKR, CB	CIRCUIT BREAKER
C	CONDUIT
CM	COFFEE MAKER
CU	COPPER
DISC	DISCONNECT
DW	DISHWASHER
EC	ELECTRICAL CONTRACTOR
EG	EQUIPMENT GROUND
EM	EMERGENCY
EWC	ELECTRIC WATER COOLER
FLA	FULL LOAD AMPS
G, GND	GROUND
GD	GARBAGE DISPOSAL
GFI, GFCI	GROUND FAULT INTERRUPTER
H	HORIZONTAL, HORIZONTALLY MOUNTED
HOA	HAND-OFF-AUTO
HP	HORSEPOWER
IM	ICE MACHINE
KV	KILOVOLT
KVA	KILOVOLT-AMPERES
LTS	LIGHTS
MCA	MAXIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MLO	MAIN LUGS ONLY
MOCP	MAXIMUM OVERCURRENT PROTECTION
NEC	NATIONAL ELECTRICAL CODE
NL	NIGHT LIGHT - FIXTURE CONTROLLED AT BRANCH CIRCUIT BREAKER ONLY
NTS	NOT TO SCALE
P	POLE
PH	PHASE
PNL	PANEL
RECEPT, RCPT	RECEPTACLE
REF	REFRIGERATOR
TYP	TYPICAL
UNO,UON	UNLESS NOTED OTHERWISE
V	VOLTS
VA	VOLT-AMPERES
W	WATTS, WIRE
WP	WEATHERPROOF WHILE IN USE COVER

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CHECKED	Checker
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SHEET
ELECTRICAL CIRCUIT & CONDUIT SCHEDULES

FILE NUMBER
2024-0074

SHEET NUMBER
E-002

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ELECTRICAL GENERAL REQUIREMENT:

A. SCOPE OF WORK: ALL MATERIAL SHALL BE NEW UNLESS OTHERWISE INDICATED. FURNISH ALL LABOR, EQUIPMENT, TECHNICAL SUPERVISION, AND INCIDENTAL SERVICES REQUIRED TO COMPLETE, TEST AND LEAVE READY FOR OPERATION THE ELECTRICAL SYSTEMS AS SPECIFIED AND AS INDICATED ON DRAWINGS.

B. ORDINANCES AND CODES: PERFORM ALL WORK IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL ORDINANCES AND REGULATIONS, THE RULES AND REGULATIONS OF NFPA, NECA, AND UL UNLESS OTHERWISE INDICATED.

C. UNLESS OTHERWISE INDICATED, ALL REQUIRED PERMITS, LICENSES, INSPECTIONS, APPROVALS AND FEES FOR ELECTRICAL WORK SHALL BE SECURED AND PAID FOR BY THE CONTRACTOR. ALL WORK SHALL CONFORM TO ALL APPLICABLE CODES, RULES AND REGULATIONS.

D. THE DRAWINGS SHOW THE LOCATION AND GENERAL ARRANGEMENT OF EQUIPMENT, ELECTRICAL SYSTEMS AND RELATED ITEMS. THEY SHALL BE FOLLOWED AS CLOSELY AS ELEMENTS OF NEW CONSTRUCTION WILL PERMIT.

E. EXAMINE THE DRAWINGS OF OTHER TRADES AND VERIFY THE CONDITIONS GOVERNING THE WORK ON THE JOB SITE. ARRANGE WORK ACCORDINGLY, PROVIDING LABOR AND MATERIALS AS MAY BE REQUIRED TO MEET SUCH CONDITIONS.

F. COORDINATE ARRANGEMENT, MOUNTING AND SUPPORT OF ELECTRICAL EQUIPMENT WITH OTHER TRADES.

G. VISIT THE SITE, EXAMINE AND VERIFY THE CONDITIONS UNDER WHICH THE WORK MUST BE CONDUCTED BEFORE SUBMITTING PROPOSAL THE SUBMISSION OF A PROPOSAL IMPLIES THAT THE CONTRACTOR HAS VISITED THE SITE AND UNDERSTANDS THE CONDITIONS UNDER WHICH THE WORK MUST BE CONDUCTED. NO ADDITIONAL CHARGES WILL BE ALLOWED BECAUSE OF FAILURE TO MAKE THIS EXAMINATION OR TO INCLUDE ALL MATERIALS AND LABOR TO COMPLETE THE WORK.

H. BIDS SHALL BE BASED UPON MANUFACTURED EQUIPMENT SPECIFIED. VOLUNTARY ALTERNATES MAY BE SUBMITTED FOR CONSIDERATION, WITH LISTED ADDITION OR DEDUCTION TO THE BID.

I. WARRANTY: CONTRACTOR SHALL WARRANTY THAT THE ELECTRICAL INSTALLATION IS FREE FROM DEFECTS AND AGREES TO REPLACE OR REPAIR, TO THE OWNER'S SATISFACTION, ANY PART OF THIS ELECTRICAL INSTALLATION WHICH BECOMES DEFECTIVE WITHIN A PERIOD OF ONE YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION FOLLOWING FINAL ACCEPTANCE, PROVIDED THAT SUCH FAILURE IS DUE TO DEFECTS IN THE EQUIPMENT, MATERIAL WORKMANSHIP OR FAILURE TO FOLLOW THE CONTRACT DOCUMENTS.

J. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY TEMPORARY SERVICES INCLUDING EQUIPMENT AND INSTALLATION REQUIRED TO MAINTAIN OPERATION AS A RESULT OF ANY EQUIPMENT FAILURE OR DEFECT DURING WARRANTY PERIOD.

K. FILE WITH THE OWNER ANY AND ALL WARRANTIES FROM THE EQUIPMENT MANUFACTURERS INCLUDING THE OPERATING CONDITIONS AND PERFORMANCE CAPACITIES THEY ARE BASED ON.

L. IN GENERAL DEMOLITION WORK IS INDICATED ON THE DRAWINGS. HOWEVER, THE CONTRACTOR SHALL VISIT THE JOB SITE TO DETERMINE THE FULL EXTENT AND CHARACTER OF THIS WORK.

M. UNLESS SPECIFICALLY NOTED TO THE CONTRARY, REMOVED MATERIALS SHALL NOT BE REUSED IN THE WORK. SALVAGED MATERIALS THAT ARE TO BE REUSED SHALL BE STORED SAFE AGAINST DAMAGE AND TURNED OVER TO THE APPROPRIATE TRADE FOR REUSE. SALVAGED MATERIALS OF VALUE THAT ARE NOT TO BE REUSED SHALL REMAIN THE PROPERTY OF THE OWNER UNLESS SUCH OWNERSHIP IS WAIVED. ITEMS ON WHICH THE OWNER WAIVES OWNERSHIP SHALL BECOME THE PROPERTY OF THE CONTRACTOR, WHO SHALL REMOVE AND LEGALLY DISPOSE OF SAME, AWAY FROM THE PREMISES.

N. CONSULT WITH THE OWNER'S REPRESENTATIVE AS TO THE METHODS OF CARRYING ON THE WORK SO AS NOT TO INTERFERE WITH THE OWNER'S OPERATION ANY MORE THAN ABSOLUTELY NECESSARY. ACCORDINGLY, ALL SERVICE LINES SHALL BE KEPT IN OPERATION AS LONG AS POSSIBLE AND THE SERVICES SHALL ONLY BE INTERRUPTED AT SUCH TIME AS WILL BE DESIGNATED BY THE OWNER'S REPRESENTATIVE.

O. ALL CUTTING, PATCHING AND REPAIR WORK SHALL BE PERFORMED BY THE CONTRACTOR THROUGH APPROVED, QUALIFIED SUBCONTRACTORS. CONTRACTOR SHALL INCLUDE FULL COST OF SAME IN BID.

P. PROVIDE ALL EXCAVATION, TRENCHING, TUNNELING, DEWATERING AND BACKFILLING REQUIRED FOR THE ELECTRICAL WORK. COORDINATE THE WORK WITH OTHER EXCAVATING AND BACKFILLING IN THE SAME AREA.

Q. INSPECT THE INSTALLATION OF ALL EQUIPMENT PER THE MANUFACTURER'S RECOMMENDATION AND APPLICABLE CODES.

R. PROVIDE UL APPROVED FIRE-STOPPING SYSTEM FOR ALL PENETRATIONS PASSING THROUGH FIRE RATED ASSEMBLES.

S. COMPLY WITH NECA 1.

T. PROVIDE COMPLETE OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS COVERING ALL ELECTRICAL EQUIPMENT HEREIN SPECIFIED, TOGETHER WITH PARTS LISTS.

U. CONTRACTOR SHALL SUBMIT TO THE ARCHITECT/ENGINEER, RECORD DRAWINGS ON ELECTRONIC MEDIA OR BLACK LINE REPRODUCTIONS WHICH HAVE BEEN NEATLY MARKED TO REPRESENT AS-BUILT CONDITIONS FOR ALL NEW ELECTRICAL WORK.

LIGHTING CONTROL DEVICES

A. DIGITAL TIME SWITCHES ELECTRONIC, 2-CHANNEL SOLID-STATE PROGRAMMABLE UNITS WITH ALPHANUMERIC DISPLAY COMPLYING WITH UL 917. 120/208-240/277VAC INPUT. NEMA TYPE 1-GENERAL PURPOSE STEEL ENCLOSURE WITH CORROSION-RESISTANT PRIMER AND BAKED ENAMEL FINISH IN MANUFACTURER'S STANDARD COLOR. TORK DTS200A OR EQUAL

B. LIGHTING CONTACTORS: MANUFACTURERS ELECTRICALLY-OPERATED MECHANICALLY-HELD CONTACTOR, PER NEMA ICS2 WITH SIZE AND NUMBER OF POLES INDICATED. SQUARE D CO. CLASS 8903 OR EQUAL

C. INSTALL LIGHTING CONTROL DEVICES AS INDICATED ON PLAN. INSTALL AT ACCESSIBLE LOCATIONS.

D. COORDINATE OCCUPANCY/VACANCY SENSOR LOCATIONS, COVERAGE AND REQUIRED QUANTITIES WITH MANUFACTURER'S RECOMMENDATIONS. COVERAGE AREAS INDICATED ON THE DRAWINGS ARE FOR MINOR MOTION (6 TO 8 INCHES OF HAND MOVEMENT). PROVIDE ADDITIONAL OCCUPANCY SENSORS AND CONTROL UNITS AS REQUIRED TO ACHIEVE COMPLETE MINOR MOTION COVERAGE OF THE SPACE INDICATED.

E. OCCUPANCY/VACANCY SENSOR ADJUSTMENTS: WHEN REQUESTED WITHIN 12 MONTHS OF DATE OF SUBSTANTIAL COMPLETION, PROVIDE ON-SITE ASSISTANCE IN ADJUSTING SENSORS TO SUIT ACTUAL OCCUPIED CONDITIONS PROVIDE UP TO TWO VISITS TO SITE OUTSIDE NORMAL OCCUPANCY HOURS FOR THIS PURPOSE.

F. OCCUPANCY/VACANCY SENSOR:
   1. LUTRON OR EQUAL

G. OCCUPANCY/VACANCY SENSOR CONTROL UNITS:
   1. DESCRIPTION: TRANSFORMER AND RELAY COMBINED IN SINGLE UNIT TO PROVIDE 24DC POWER TO SENSORS AND PROVIDE 20A CONTACT(S) FOR CONTROL OF LIGHTING LOADS AT 120 OR 277V. CONTROL UNIT INPUT POWER SHALL BE FROM UNSWITCHED LEG OF LIGHTING CIRCUIT IT IS CONTROLLING.
      a. CONTROL UNITS SHALL BE PROVIDED AS REQUIRED TO POWER CEILING MOUNTED OCCUPANCY SENSORS, CONTROL LIGHTING LOADS AND PROVIDE A MINIMUM OF ONE AUXILIARY CONTACT.
      b. OCCUPANCY SENSOR CONTROL UNITS SHALL MOUNT EXTERNAL TO 4-INCH SQ JUNCTION BOX IN THE CEILING SPACE. ALL WIRING BETWEEN CONTROL UNIT AND OCCUPANCY SENSOR SHALL BE PLENUM RATED.
      c. LOCATE CONTROL UNIT IN ACCESSIBLE LOCATION IN GYP-BOARD CEILINGS, ADJACENT TO RETURN AIR GRILLES, OR PROVIDE ACCESS PANEL
      d. ADDITIONAL AUXILIARY RELAY MODULES SHALL BE PROVIDED AS REQUIRED TO PROVIDE CONTROL OF ALL LIGHTING CIRCUITS AND ADDITIONAL AUXILIARY CONTACTS AS REQUIRED.
      e. IT IS ACCEPTABLE TO PROVIDE CONTROLS AND AUXILIARY CONTACTS AS REQUIRED INTEGRAL TO NEW CEILING SENSOR, PROVIDED ALL REQUIRED CONTACTS ARE PROVIDED.
      f. MAXIMUM OF 3 SENSORS PER POWER PACK. VERIFY EXACT QUANTITIES REQUIRED WITH MANUFACTURER.

IDENTIFICATION

A. COMPLY WITH ANSI A13.1, ANSI C2, NFPA 70, AND 29 CFR 1910.145.

B. COORDINATE IDENTIFICATION NAMES, ABBREVIATIONS, COLORS, AND OTHER FEATURES WITH REQUIREMENTS IN THE CONTRACT DOCUMENTS, SHOP DRAWINGS, MANUFACTURER'S WIRING DIAGRAMS, AND THE OPERATION AND MAINTENANCE MANUAL AND WITH THOSE REQUIRED BY CODES, STANDARDS, AND 29 CFR 1910.145. USE CONSISTENT DESIGNATIONS THROUGHOUT PROJECT.

C. COORDINATE INSTALLATION OF IDENTIFYING DEVICES WITH COMPLETION OF COVERING AND PAINTING OF SURFACES WHERE DEVICES ARE TO BE APPLIED, WITH LOCATION OF ACCESS PANELS AND DOORS.

D. INSTALL IDENTIFYING DEVICES BEFORE INSTALLING ACOUSTICAL CEILINGS AND SIMILAR CONCEALMENT.

E. INSTALL ENGRAVED, LAMINATED ACRYLIC OR MELAMINE LABELS THAT ARE PUNCHED OR DRILLED FOR SCREW MOUNTING WITH SELF TAPPING STAINLESS STEEL SCREW. LABELS SHALL HAVE BLACK LETTERS ON A WHITE BACKGROUND. MINIMUM LETTER HEIGHT SHALL BE 3/8 INCH (10 MM). LABELS SHALL BE INSTALLED ON ALL ELECTRICAL EQUIPMENT AFFECTED BY PROJECT.
   1. PANELBOARD AND TRANSFORMER NAMEPLATES IDENTIFY SOURCE FED FROM, VOLTAGE, SIZE, NAME.
   2. ENCLOSED CONTROLLERS, CIRCUIT BREAKERS, DISCONNECT SWITCHES IDENTIFY SOURCE AND LOAD SERVED.

F. WIRING DEVICES: USE ADHESIVE LABEL WITH BLACK FILM LETTERING ON FACE OF WALL PLATE AND DURABLE WIRE MARKERS OR TAGS INSIDE OUTLET BOXES. LABELS SHALL BE CLEAR POLYESTER WITH BLACK LETTERI, RED LETTER FOR EMERGENCY], FONT SIZE OF 7. IDENTIFY PANELBOARD AND CIRCUIT NUMBER FROM WHICH SERVED.

G. USE THE COLORS USED BELOW FOR UNGROUNDED SERVICE, FEEDER, AND BRANCH-CIRCUIT CONDUCTORS.
   1. COLOR SHALL BE FACTORY APPLIED OR, FOR SIZES LARGER THAN NO. 10 AWG IF AUTHORITIES HAVING JURISDICTION PERMIT, FIELD APPLIED.
   2. COLORS FOR 208/120-V CIRCUITS
      a. PHASE A BLACK
      b. PHASE B: RED
      c. PHASE C: BLUE
      d. NEUTRAL: WHITE
   3. COLORS FOR 480/277-V CIRCUITS:
      a. PHASE A: BROWN
      b. PHASE B: ORANGE
      c. PHASE C: YELLOW
      d. NEUTRAL: GRAY
   4. FIELD-APPLIED, COLOR-CODING CONDUCTOR TAPE APPLY IN HALF-LAPPED TURNS FOR A MINIMUM DISTANCE OF 6 INCHES FROM TERMINAL POINTS AND IN BOXES WHERE SPLICES OR TAPS ARE MADE. APPLY LAST TWO TURNS OF TAPE WITH NO TENSION TO PREVENT POSSIBLE UNWINDING. LOCATE BANDS TO AVOID OBSCURING FACTORY CABLE MARKINGS.

H. WARNING LABELS FOR INDOOR CABINETS, BOXES, AND ENCLOSURES FOR POWER AND LIGHTING: COMPLY WITH 29 CFR 1910.145 AND APPLY SELF-ADHESIVE WARNING LABELS. IDENTIFY SYSTEM VOLTAGE WITH BLACK LETTERS ON AN ORANGE BACKGROUND. APPLY TO EXTERIOR OF DOOR, COVER, OR OTHER ACCESS.
   1. EQUIPMENT WITH MULTIPLE POWER OR CONTROL SOURCES APPLY TO DOOR OR COVER OF EQUIPMENT INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:
      a. AUTOMATIC TRANSFER SWITCHES.
      b. SERVICE ENTRANCE EQUIPMENT.
   2. EQUIPMENT REQUIRING WORKSPACE CLEARANCE ACCORDING TO NFPA 70: UNLESS OTHERWISE INDICATED, APPLY TO DOOR OR COVER OF EQUIPMENT BUT NOT ON FLUSH PANELBOARDS AND SIMILAR EQUIPMENT IN FINISHED SPACES.

I. ACCESSIBLE RACEWAYS AND CABLES OF AUXILIARY SYSTEMS IDENTIFY THE FOLLOWING SYSTEMS WITH COLOR-CODED, SELF-ADHESIVE VINYL TAPE APPLIED IN BANDS OR PAINTED RACEWAY
   1. FIRE ALARM SYSTEM: RED.
   2. SECURITY SYSTEM: BLUE AND YELLOW.
   3. TELECOMMUNICATION SYSTEM: GREEN AND YELLOW.
   4. CONTROL WIRING: GREEN AND RED.

WIRING DEVICES

A. STRAIGHT-BLADE-TYPE RECEPTACLES: HEAVY DUTY SPECIFICATION GRADE. COMPLY WITH NEMA ID 1, NEMA ID 6, DSCC W-C-596G, AND UL 498. CONFIGURATION 5-20R DUPLEX RECEPTACLE HUBBELL HBL5362X OR EQUAL BY PASS & SEYMOUR OR COOPER.

B. GFI RECEPTACLES: STRAIGHT BLADE FEED-THROUGH TYPE, GENERAL DUTY GRADE, WITH INTEGRAL NEMA WD 6, CONFIGURATION 5-20R DUPLEX RECEPTACLE; COMPLYING WITH UL 498 AND UL 943. DESIGN UNITS FOR INSTALLATION IN A 2-3/4-INCH- (70-MM-) DEEP OUTLET BOX WITHOUT AN ADAPTER. HUBBELL GF20XL OR EQUAL BY PASS & SEYMOUR OR COOPER.

C. WALL SWITCHES: SINGLE AND DOUBLE-POLE SWITCHES COMPLY WITH DSCC W-C-896F AND UL 20. HUBBELL WIRING DEVICE, KELLEMS 1220 SERIES OR EQUAL BY PASS & SEYMOUR, COOPER OR LEVITON.

D. LED LAMP DIMMER SWITCHES: LUTRON OR EQUAL, COMPATIBLE WITH LED DIMMING DRIVER SPECIFIED.

E. DIMMERS:
   1. CONTROL: CONTINUOUSLY ADJUSTABLE SLIDER WITH PRE-SET; SINGLE-POLE OR THREE-WAY SWITCHING TO SUIT CONNECTIONS.
   2. INSTALL WALL DIMMERS TO ACHIEVE FULL RATING SPECIFIED AND INDICATED AFTER DERATNG FOR GANGING ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS
   3. INSTALL UNSHARED NEUTRAL CONDUCTORS ON LINE AND LOAD SIDE OF DIMMERS ACCORDING TO MANUFACTURERS' WRITTEN INSTRUCTIONS.

F. WALL PLATES:
   1. PROVIDE STAINLESS STEEL WALL PLATES IN FINISHED AREAS.
   2. PROVIDE GALVANIZED STEEL WALL PLATES IN UNFINISHED AREAS.
   3. PROVIDE WEATHERPROOF WHILE-IN-USE COVERPLATES FOR WET LOCATIONS.

G. WIRING DEVICE/WALL PLATE COLOR AS SELECTED BY ARCHITECT UNLESS OTHERWISE INDICATED OR REQUIRED BY NFPA 70.

H. CONNECT WIRING DEVICE GROUNDING TERMINAL TO OUTLET BOX WITH BONDING JUMPER. USE OF QUICK GROUND STRAP OR SCREW IS NOT ACCEPTABLE.

GROUNDING AND BONDING

A. EQUIPMENT GROUNDING: COMPLY WITH NFPA 70, ARTICLE 250, FOR TYPES, SIZES, AND QUANTITIES OF EQUIPMENT GROUNDING CONDUCTORS, UNLESS SPECIFIC TYPES, LARGER SIZES, OR MORE CONDUCTORS THAN REQUIRED BY NFPA 70 ARE INDICATED.

B. PROVIDE EQUIPMENT GROUNDING CONDUCTORS IN EACH RACEWAY.

CONDUCTORS AND CABLES

A. CONDUCTOR MATERIAL: COPPER COMPLYING WITH NEMA WC: 70; STRANDED CONDUCTOR.

B. CONDUCTOR INSULATION TYPES: TYPE THHN-THWN, SO, COMPLYING WITH NEMA WC 70.

C. CONCEAL CABLES IN FINISHED WALLS, CEILINGS, AND FLOORS, UNLESS OTHERWISE INDICATED.

D. USE CONDUCTOR NOT SMALLER THAN 12 AWG FOR POWER AND LIGHTING CIRCUITS. UNLESS INDICATED OTHERWISE, ALL 20A BRANCH CIRCUITS SHALL BE 2#12, 1#12G, 3/4"C.

E. USE CONDUCTOR NOT SMALLER THAN #14 AWG FOR CONTROL CIRCUITS PROVIDED BY ELECTRICAL CONTRACTOR.

F. SUPPORT COMMUNICATION CABLES ABOVE ACCESSIBLE CEILING, USING SPRING METAL CLIPS OR PLASTIC CABLE TIES TO SUPPORT CABLES FROM STRUCTURE DO NOT REST CABLE ON CEILING PANELS.

G. USE "STA-KON" CONNECTORS TO TERMINATE STRANDED CONDUCTORS #10 AWG AND SMALLER TO SCREW TERMINALS.

H. CONDUCTOR AND INSULATION APPLICATIONS:
   1. FEEDERS: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY
   2. BRANCH CIRCUITS, INCLUDING IN CRAWLSPACES: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY [OR TYPE MC CABLE] [OR ARMORED CABLE TYPE AC (HFC)] PROVIDE A DEDICATED NEUTRAL FOR EACH CIRCUIT.
   3. CORD DROPS AND PORTABLE APPLIANCE CONNECTIONS: TYPE SO, HARD SERVICE CORD
   4. CLASS I CONTROL CIRCUITS TYPE THHN -THWN IN RACEWAY
   5. CLASS II CONTROL CIRCUITS: POWER LIMITED CABLE

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

A. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY SQUARE D, EATON, GENERAL ELECTRIC, OR SIEMENS.

B. FUSIBLE AND NON-FUSIBLE SWTCHES: NEMA KS 1, QUICK MAKE QUICK-BREAK LOAD INTERRUPTER ENCLOSED KNIFE SWITCH TYPE HD, WITH CLIPS OR BOLT PADS TO ACCOMMODATE SPECIFIED FUSES (IF REQUIRED), EXTERNALLY OPERABLE LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT TWO PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION. SQUARE D OR EQUAL

C. TOGGLE DISCONNECT SWITCH: HEAVY DUTY, 30A, 600 VOLT, DOUBLE OR THREE POLE AS REQUIRED, SINGLE THROW, MOTOR RATED SWITCH WITHOUT OVERLOAD PROTECTION. PROVIDE NEMA 1 ENCLOSURE AND PADLOCK ATTACHMENT.

D. MOLDED-CASE CIRCUIT BREAKER: NEMA AB 1, WITH INTERRUPTING CAPACITY TO MEET AVAILABLE FAULT CURRENTS. THERMAL-MAGNETIC CIRCUIT BREAKER WITH INVERSE TIME-CURRENT ELEMENT FOR LOW-LEVEL OVERLOADS AND INSTANTANEOUS MAGNETIC TRIP ELEMENT FOR SHORT CIRCUITS. ADJUSTABLE MAGNETIC TRIP SETTING FOR CIRCUIT-BREAKER FRAME SIZES 250A AND LARGER.

E. MOLDED-CASE SWITCHES: MOLDED-CASE CIRCUIT BREAKER WITH FIXED, HIGH-SET INSTANTANEOUS TRIP ONLY, AND SHORT-CIRCUIT WITHSTAND RATING EQUAL TO EQUIVALENT BREAKER FRAME SIZE INTERRUPTING RATING.

F. COMPLY WITH APPLICABLE PORTIONS OF NECA 1, NEMA PB 1.1, AND NEMA PB 2.1 FOR INSTALLATION OF ENCLOSED SWITCHES AND CIRCUIT BREAKERS.

RACEWAYS AND BOXES

A. SURFACE METAL RACEWAYS: GALVANIZED STEEL WITH SNAP-ON COVERS. FINISH WITH MANUFACTURER'S STANDARD PRIME COATING. WIREMOLD OR EQUAL SIZE/TYPE AS SHOWN ON DRAWINGS.

B. MINIMUM RACEWAY SIZE 3/4-INCH TRADE SIZE

C. INSTALL CONDUIT IN ACCORDANCE WITH NECA "NATIONAL ELECTRICAL INSTALLATION STANDARDS".

D. ROUTE CONDUITS IN FINISHED AREAS WITH EXPOSED CEILINGS AT UNDERSIDE OF STRUCTURAL DECK OR AS HIGH AS POSSIBLE. WHERE STEEL METAL DECK ON STEEL JOIST CONSTRUCTION, ROUTE CONDUITS ABOVE JOISTS. DO NOT SECURE CONDUIT TO BOTTOM OF JOISTS.

E. FITTINGS FOR EMT: STEEL SET-SCREW TYPE.

FUSES

A. OBTAIN FUSES FROM A SINGLE MANUFACTURER.

B. COORDINATE FUSE RATINGS WITH UTILIZATION EQUIPMENT NAMEPLATE LIMITATIONS OF MAXIMUM FUSE SIZE.

C. EXAMINE UTILIZATION EQUIPMENT NAMEPLATES AND INSTALLATION INSTRUCTIONS. INSTALL FUSES OF SIZES AND WITH CHARACTERISTICS APPROPRIATE FOR EACH PIECE OF EQUIPMENT.

D. INSTALL LABELS INDICATING FUSE REPLACEMENT INFORMATION ON INSIDE DOOR OF EACH FUSED SWITCH.

E. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY COOPER BUSMAN, INC. OR EQUAL

F. CARTRIDGE FUSES: NEMA FU 1, NONRENEWABLE CARTRIDGE FUSE; CLASS AND CURRENT RATING INDICATED; VOLTAGE RATING CONSISTENT WITH CIRCUIT VOLTAGE
   1. SERVICE ENTRANCE: CLASS L TIME DELAY.
   2. FEEDERS: CLASS RK5 TIME DELAY.
   3. MOTOR BRANCH CIRCUITS: CLASS RK1, TIME DELAY.
   4. OTHER BRANCH CIRCUITS: CLASS RK1, TIME DELAY.

G. COMPLY WITH:
   1. NEMA FU 1 - LOW VOLTAGE CARTRIDGE FUSES.
   2. NFPA 70 - NATIONAL ELECTRICAL CODE.
   3. UL 198C - HIGH-INTERRUPTING-CAPACITY FUSES, CURRENT-LIMITING TYPES.
   4. UL 198E - CLASS R FUSES.
   5. UL 512 - FUSEHOLDERS.

LIGHTING

A. PROVIDE LIGHTING FIXTURES AS INDICATED ON DRAWINGS.

B. INSTALL DRIVERS/BALLASTS, AND SPECIFIED ACCESSORIES AT FACTORY.

C. FIXTURES SET LEVEL, PLUMB, AND SQUARE WITH CEILINGS AND WALLS. INSTALL LAMPS IN EACH FIXTURE WHERE REQUIRED.

D. SUPPORT LUMINARIES INDEPENDENT OF CEILING FRAMING. SUPPORT RECESSED GRID LUMINARIES FROM TWO OPPOSITE CORNERS DIRECTLY TO STRUCTURE. WIRE OR ROD SHALL HAVE BREAKING STRENGTH OF THE WEIGHT OF FIXTURE AT A SAFETY FACTOR OF 3.

E. INSTALL RECESSED LUMINARIES TO PERMIT REMOVAL FROM BELOW.

F. INSTALL SURFACE MOUNTED LUMINARIES AND EXIT SIGNS PLUMB AND ADJUST TO ALIGN WITH BUILDING LINES AND WITH EACH OTHER. SECURE TO PROHIBIT MOVEMENT.

G. 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 AND UL 486B.

H. MAKE WIRING CONNECTIONS TO BRANCH CIRCUIT USING BUILDING WIRE WITH INSULATION SUITABLE FOR TEMPERATURE CONDITIONS WITHIN LUMINAIRE

I. BOND PRODUCTS AND METAL ACCESSORIES TO BRANCH CIRCUIT EQUIPMENT GROUNDING CONDUCTOR.

J. CONNECT LUMINARIES TO BRANCH CIRCUIT OUTLET BOXES PROVIDED UNDER RACEWAYS AND BOXES SECTION USING 1/2" FLEXIBLE CONDUIT OF NO MORE THAN 6'-0" IN LENGTH.

K. CLEAN ELECTRICAL PARTS TO REMOVE CONDUCTIVE AND DELETERIOUS MATERIALS.

L. REMOVE DIRT AND DEBRIS FROM ENCLOSURES AND LENSES.

M. CLEAN PHOTOMETRIC CONTROL SURFACES AS RECOMMENDED BY MANUFACTURER.

N. CLEAN FINISHES AND TOUCH UP DAMAGE.

O. EXIT SIGNS: COMPLY WITH UL 924; FOR SIGN COLORS AND LETTERING SIZE, COMPLY WITH AUTHORITIES HAVING JURISDICTION.
   1. PROVIDE EXIT SIGNS WIN LIGHT-EMITTING DIODES, 70,000 HOURS MINIMUM OF RATED LAMP LIFE
   2. SELF-POWERED EXIT SIGNS (BATTERY TYPE): INTEGRAL AUTOMATIC CHARGER IN A SELF-CONTAINED POWER PACK.
   3. BATTERY: SEALED, MAINTENANCE-FREE NICKEL-CADMIUM TYPE WITH SPECIAL WARRANTY.
   4. CHARGER: FULLY AUTOMATIC, SOLID-STATE TYPE WITH SEALED TRANSFER RELAY.
   5. OPERATION: RELAY AUTOMATICALLY ENERGIZES LAMP FROM BATTERY WHEN CIRCUIT VOLTAGE DROPS TO 80 PERCENT OF NOMINAL VOLTAGE OR BELOW. WHEN NORMAL VOLTAGE IS RESTORED, RELAY DISCONNECTS LAMPS FROM BATTERY, AND BATTERY IS AUTOMATICALLY RECHARGED AND FLOATED ON CHARGER.

P. EMERGENCY LIGHTING UNITS SELF-CONTAINED UNITS COMPLYING WITH UL 924.
   1. BATTERY: SEALED, MAINTENANCE-FREE LEAD-ACID TYPE WITH MINIMUM 10-YEAR NOMINAL LIFE AND SPECIAL WARRANTY.
   2. CHARGER: FULLY AUTOMATIC, SOLID-STATE TYPE WITH SEALED TRANSFER RELAY.
   3. OPERATION: RELAY AUTOMATICALLY TURNS LAMP ON WHEN POWER SUPPLY CIRCUIT VOLTAGE DROPS TO 80 PERCENT OF NOMINAL VOLTAGE OR BELOW. LAMP AUTOMATICALLY DISCONNECTS FROM BATTERY WHEN VOLTAGE APPROACHES DEEP-DISCHARGE LEVEL WHEN NORMAL VOLTAGE IS RESTORED.
   4. WIRE GUARD: WHERE INDICATED, HEAVY-CHROME-PLATED WIRE GUARD PROTECTS LAMP HEADS OR FIXTURES.
   5. INTEGRAL TIME-DELAY RELAY: HOLDS UNIT ON FOR FIXED INTERVAL WHEN POWER IS RESTORED AFTER AN OUTAGE TIME DELAY PERMITS HIGH-INTENSITY-DISCHARGE LAMPS TO RE-STRIKE AND DEVELOP ADEQUATE OUTPUT.

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ELECTRICAL SPECIFICATIONS

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E-003

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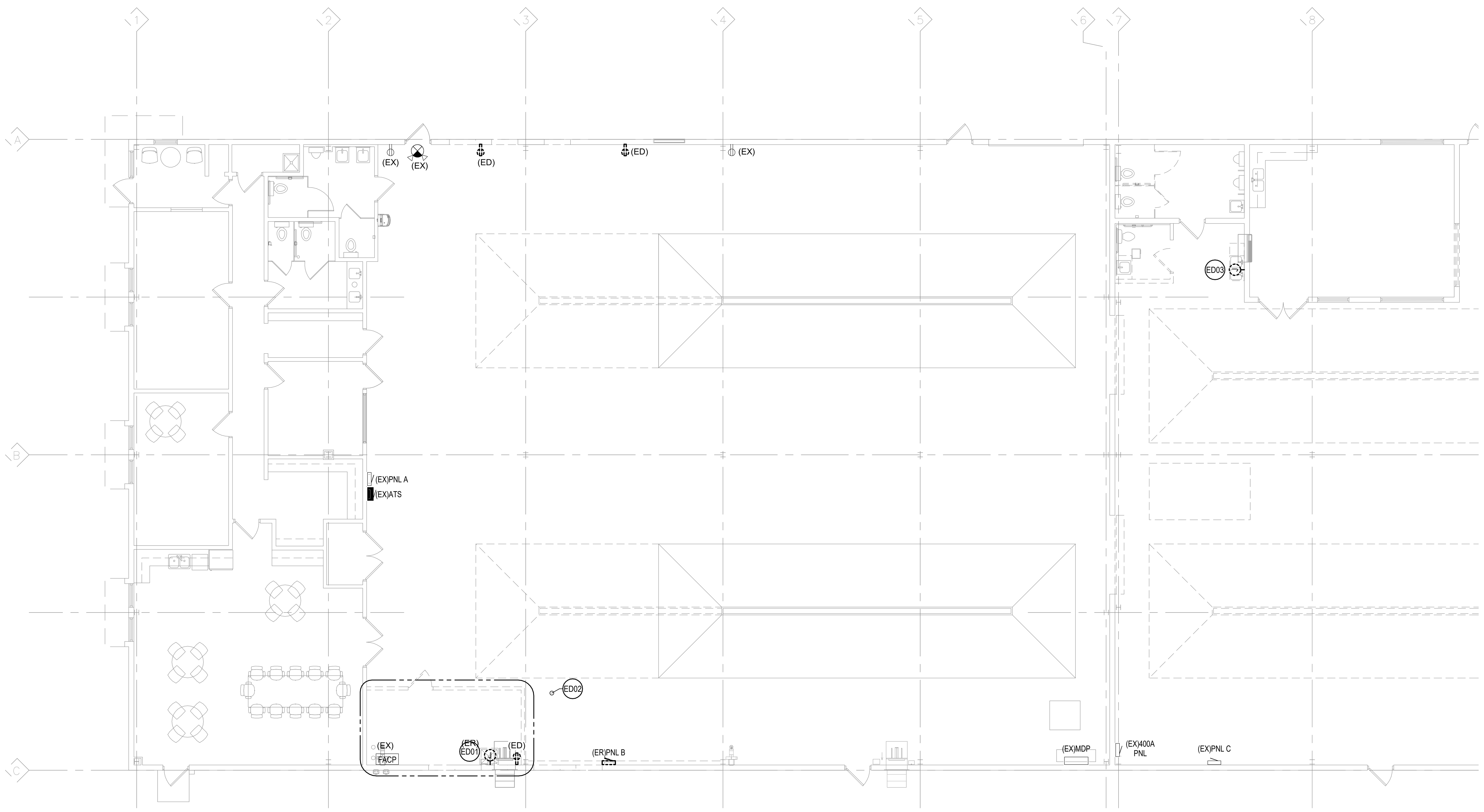

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E-101

ELECTRICAL DEMOLITION PLAN

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

GENERAL NOTES - DEMOLITION

A. DEMOLITION, WHERE INDICATED ON PLAN, IS BASED ON EXISTING DRAWINGS AND LIMITED FIELD INVESTIGATION OF EXISTING CONDITIONS. SELECT DEMOLITION MAY BE REQUIRED FOR NEW CONSTRUCTION AND MAY NOT BE DELINEATED ON THIS DRAWING. CAREFULLY COORDINATE DEMOLITION WITH NEW CONSTRUCTION PLANS OF ALL DISCIPLINES TO VERIFY ACTUAL EXTENT OF DEMOLITION. VISIT THE SITE PRIOR TO SUBMISSION OF BID TO EXAMINE THE EXISTING CONDITIONS AND FULLY UNDERSTAND THE EXTENT OF DEMOLITION WORK.

B. EXAMINE THE DRAWINGS OF OTHER TRADES AND BE FAMILIAR WITH THE DEMOLITION REQUIRED BY OTHER TRADES. PERFORM ALL INCIDENTAL ELECTRICAL DEMOLITION AND/OR RELOCATION REQUIRED TO FACILITATE THE DEMOLITION WORK OF OTHER TRADES, WHETHER OR NOT SPECIFICALLY INDICATED.

C. QUANTITY AND LOCATION OF EXISTING DEVICES SHOWN ON PLANS ARE APPROXIMATE. FIELD VERIFY DEVICES AND LOCATIONS.

D. ITEMS SHOWN HEAVY LINE WEIGHT DASHED LINES, HATCHED AND/OR NOTED SHALL BE DEMOLISHED AND ALL ASSOCIATED DEVICES, CONDUIT, AND WIRING SHALL BE REMOVED BACK TO THE NEAREST ACTIVE JUNCTION BOX OR SOURCE UNLESS NOTED OTHERWISE. SEE DEMOLITION LEGEND FOR ADDITIONAL INFORMATION.

E. ALL EXISTING EQUIPMENT MAY NOT BE INDICATED. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO BIDDING. EXISTING ITEMS NOT SHOWN HATCHED SHALL REMAIN IN OPERATION. REVISE THE EXISTING CIRCUITRY TO MAINTAIN OPERATION OF ITEMS TO REMAIN.

F. PROVIDE PROPER SUPPORT FOR EXISTING TO REMAIN CONDUITS AND BOXES WHERE EXISTING SUPPORT IS TO BE REMOVED. RE-ROUTE BRANCH CIRCUIT CONDUITS AND RELOCATE JUNCTION BOXES AS REQUIRED TO FACILITATE INSTALLATION OF NEW EQUIPMENT AND SYSTEMS IN CEILING SPACES.

G. COORDINATE WITH NEW WORK PLANS, ONE LINE DIAGRAMS AND RISER DIAGRAMS FOR EXTENT OF DEMOLITION WORK.

H. CIRCUITING SHOWN IS BASED ON CASUAL FIELD OBSERVATIONS AND/OR AS-BUILT DRAWINGS. CONTRACTOR SHALL FIELD VERIFY CIRCUITING.

I. MAINTAIN ELECTRICAL SERVICE TO ALL LIGHTING FIXTURES, DEVICES AND EQUIPMENT THAT ARE TO REMAIN. EXTEND CONDUIT AND WIRE AS REQUIRED WHERE DEMOLITION WORK AFFECTS ELECTRICAL SERVICE TO DOWNSTREAM LOADS THAT ARE TO REMAIN.

J. RECYCLE OR DISPOSE OF ALL MATERIALS OFF SITE AND INCLUDE ALL ASSOCIATED COSTS IN BID. ALL MATERIALS SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS, INCLUDING LEED REQUIREMENTS, TCLP TESTING, PROPER DISPOSAL AND/OR RECYCLING OF FLUORESCENT LAMPS.

K. PROVIDE BLANK COVER PLATES WHERE DEVICES ARE REMOVED BUT EXISTING WALLS/CEILINGS REMAIN INTACT.

L. RING OUT AND TAG ALL CIRCUITS AFFECTED BY THIS ALTERATION AT BOTH ENDS. MARK ALL UNUSED CIRCUIT BREAKERS "SPARE" AND PLACE IN THE "OFF" POSITION.

M. VERIFY ALL UNDERGROUND AND IN SLAB UTILITY LOCATIONS PRIOR TO SAW-CUTTING OR PENETRATING ANY FLOOR SLAB.

N. OFFER OWNERS REPRESENTATIVE FIRST RIGHT OF REFUSAL OF ALL EQUIPMENT REMOVED FROM SPACE.

O. PROVIDE CODE-COMPLIANT SUPPORT TO EXISTING-TO-REMAIN UNSUPPORTED CONDUITS AND BOXES WHERE CEILINGS ARE TO BE REMOVED. RE-ROUTE BRANCH CIRCUITS AND RELOCATE JUNCTION BOXES AS REQUIRED TO FACILITATE INSTALLATION OF NEW EQUIPMENT AND SYSTEMS IN CEILING SPACES.

PLAN NOTES

ED01 DISCONNECT POWER FROM EXISTING HVAC CONTROLLER AND EXHAUST FAN BEING RELOCATED. PREPARE CIRCUIT FOR EXTENSION TO NEW LOCATION. REFER TO NEW WORK POWER PLAN. COORDINATE WITH MECHANICAL TRADES.

ED02 REMOVE EXISTING LIGHT FIXTURES AND CONTROLS WITHIN THIS SPACE. REMOVE EXISTING CONDUIT AND WIRING BACK TO ACCESSIBLE CEILING SPACE. PREPARE LIGHTING CIRCUIT FOR EXTENSION TO NEW LIGHT FIXTURE IN NEW CLOSET. REFER TO NEW WORK LIGHTING PLAN.

ED03 DISCONNECT EXISTING P-TAC UNIT POWER AND REMOVE ASSOCIATED CONDUIT AND WIRING BACK TO SOURCE.

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LIGHTING PLAN

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

LIGHTING FIXTURE SCHEDULE

TYPE	MFR	MODEL	CCT	LAMP	LUMENS	Primary VoltageVoltage Nominal	DESCRIPTION	NOTES
EM	SURE-LITES LITHONIA (ELM2L)	APEL	3200 K	LED	80 lm		CONTEMPORARY LED TWO-HEAD EMERGENCY LIGHT IN WHITE HOUSING	
LA	LITHONIA METALUX	CPANL 2X4 AL06 SW77 M2	3500 K	LED	4000 lm	120 V	LED EDGE-LIT FLAT PANEL, RECESSED, 2X4 LAY-IN, ALUMINUM FRAME, SATIN WHITE LENS, 80 CRI, 0-10V DIMMING, DIMS TO 10%.. FULLY SWITCHABLE 4000/5000/6000 LUMENS, 30/40/50K	
LB	METALUX LITHONIA	4SNX-45SL-LW-UNV-L835-CD-1-AYC-CHAIN/SET-U	3500 K	LED	3200 lm	120 V	4' LONG CHAIN HUNG LED STRIP FIXTURE, ROUND DIFFUSE ACRYLIC LENS, 22-GAUGE DIE-FORMED C.R.S. HOUSING, WHITE POWDER COAT FINISH, (2) Y-HANGERS AND (2) 2' CHAINS, INSTALL AT 8' AFF, UL DAMP LOCATION LISTED, MOUNT TO CEILING/STRUCTURE	
LC	LITHONIA METALUX	LDN6 40/20 LO6AR LSS MVOLT GZ10	3500 K	LED	1500 lm	120 V	WET LISTED 6" LED DOWNLIGHT, POWDER COATED C.R.S. FRAME, MATTE WHITE REFLECTOR AND FLANGE, CLEAR REGRESSED LENS, SEMI-SPECULAR FINISH, 0 - 10V DIMMING	
LD	LITHONIA METALUX	CPANL 2X2 AL01 SW77 M2	3500 K	LED	4000 lm	120 V	LED EDGE-LIT FLAT PANEL, RECESSED, 2X2 LAY-IN, ALUMINUM FRAME, SATIN WHITE LENS, 80 CRI, 0-10V DIMMING, DIMS TO 10%.	
X1	SURE-LITES LITHONIA - LQM	APX7RG	4000 K	LED	200 lm	120 V	SINGLE FACE UNIVERSAL MOUNTED POLYCARBONATE SELF POWERED EXIT SIGN, RED LETTERS, WHITE BACKGROUND, DIRECTIONAL CHEVRONS AS INDICATED ON DRAWINGS. SELF DIAGNOSTICS. INTEGRAL LED TWO-HEAD EMERGENCY LAMPS. ARCHITECT TO SELECT FINISHES.	

GENERAL NOTES - LUMINAIRE SCHEDULE

A. MANUFACTURER CATALOG NUMBERS ARE SHOWN FOR GENERAL DESCRIPTIVE PURPOSES AND TO ESTABLISH STANDARD OF QUALITY ONLY. CONTRACTOR SHALL PROVIDE LUMINAIRES COMPLETE WITH ALL OPTIONS AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION. ALL PRODUCTS SHALL BE UL LISTED.

B. PROVIDE PROPER REFLECTOR ASSEMBLY SPECIFIED AND AS RECOMMENDED BY LUMINAIRE MANUFACTURER.

C. PROVIDE LUMINAIRES WITH JOINING PLATES, END CAPS, CANOPIES, MOUNTING HARDWARE, ETC., AS REQUIRED FOR COMPLETE INSTALLATION.

D. EXIT LIGHTS SHALL BE PROVIDED WITH COLOR OF LETTERS REQUIRED BY LOCAL CODE AUTHORITY. FURNISH WITH CHEVRON DIRECTIONAL INDICATORS AS INDICATED AND REQUIRED.

E. VERIFY CONSTRUCTION OF CEILINGS BEING INSTALLED AND PROVIDE THE LUMINAIRES SPECIFIED IN APPROPRIATE CONFIGURATION WITH ALL HARDWARE AND ACCESSORIES REQUIRED FOR COMPATIBLE INSTALLATION.

F. PROVIDE DEVICES FOR SECURING LAY-IN TYPE LUMINAIRES TO CEILING GRID TO COMPLY WITH ARTICLE 410 OF THE NATIONAL ELECTRICAL CODE.

G. FURNISH LUMINAIRES IN MECHANICAL SPACES COMPLETE WITH PENDANT STEMS OR CHAIN HANGERS AS REQUIRED TO MOUNT BELOW PIPING, DUCT, CONDUIT, ETC., MAINTAIN MINIMUM 7'-6"H. UNIFORM MOUNTING HEIGHT FOR ALL LUMINAIRES THROUGHOUT EACH AREA.

H. BATTERY EMERGENCY UNITS SHALL BE U.L. 924 LISTED AND PRODUCE 90 MINUTES MINIMUM ILLUMINATION.

GENERAL NOTES - POWER

A. REFER TO ARCHITECTURAL FLOOR PLAN AND ELEVATIONS FOR EXACT LOCATION OF DEVICES WHERE INDICATED.

B. RECEPTACLE OUTLETS SHALL BE RATED 20A U.O.N..

C. DISCONNECT SWITCHES SHALL BE HEAVY DUTY TYPE U.O.N..

D. PROVIDE GFCI PROTECTION WHERE REQUIRED BY THE NEC WHETHER INDICATED OR NOT.

E. BRANCH CIRCUIT JUNCTION BOXES SHALL BE LABELED WITH THE CIRCUITS ENCLOSED..

F. SINGLE PHASE 20A BRANCH CIRCUIT WIRING SHALL BE 2#12, 1#12GND IN 3/4"C UNLESS NOTED OTHERWISE.

G. EXISTING EQUIPMENT/DEVICES NOT SPECIFICALLY INDICATED TO BE DEMOLISHED SHALL REMAIN OPERATIONAL. REVISE EXISTING CIRCUITING TO MAINTAIN OPERATION TO SUCH EQUIPMENT/DEVICES AS REQUIRED.

H. CONDUITS SHALL BE ROUTED CONCEALED UNLESS NOTED OTHERWISE.

I. ELECTRICAL EQUIPMENT MOUNTED ON THE FLOOR SHALL BE MOUNTED ON A 4" CONCRETE HOUSEKEEPING PAD.

GENERAL NOTES - LIGHTING

A. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATION OF ALL LIGHTING FIXTURES UNLESS NOTED OTHERWISE.

B. REFER TO THE LUMINAIRE SCHEDULE LOCATED ON THE ELECTRICAL GENERAL INFORMATION DRAWING.

C. ELECTRICAL DEVICES INDICATED ON THIS PLAN SHALL BE NEW UNLESS NOTED OTHERWISE.

D. LIGHT SWITCHES SHALL BE GROUPED UNDER ONE COMMON FACEPLATE WHERE MORE THAN ONE LIGHT SWITCH IS INDICATED TO BE INSTALLED AT THE SAME LOCATION.

E. EXISTING LIGHTING INDICATED TO REMAIN SHALL BE RELAMPED AND CLEANED. REPAIR EXISTING FIXTURES THAT ARE MALFUNCTIONING WHERE FEASIBLE. OTHERWISE REPLACE WITH NEW. REVISE CIRCUITING AS INDICATED.

F. LIGHTING BRANCH CIRCUIT WIRING ASSOCIATED WITH NEW LIGHTING SHALL BE 2#12, 1#12GND IN 3/4"C UNLESS NOTED OTHERWISE.

G. EXISTING EQUIPMENT/DEVICES NOT SPECIFICALLY INDICATED TO BE DEMOLISHED SHALL REMAIN OPERATIONAL. REVISE EXISTING CIRCUITING TO MAINTAIN OPERATION TO SUCH EQUIPMENT/DEVICES AS REQUIRED.

H. REUSE THE EXISTING LEFT-IN-PLACE BRANCH CIRCUIT CONDUIT AND WIRING ASSOCIATED WITH THE LIGHTING FIXTURES REMOVED DURING DEMOLITION TO REFEED NEW LIGHTING FIXTURES IS ACCEPTABLE WHERE PRACTICAL UNO. REWORK THE EXISTING CIRCUIT TO PROVIDE LIGHTING CONTROL AS INDICATED ON THIS DRAWING

J. NIGHT LIGHT AND EXIT SIGNS SHALL BE UNCONTROLLED AND CONNECTED AHEAD OF THE LOCAL LIGHTING CONTROLS.

K. CONDUITS INSTALLED IN FINISHED AREAS SHALL BE ROUTED CONCEALED UNLESS NOTED OTHERWISE.

PLAN NOTES

EL01 CONNECT NEW LIGHT FIXTURES TO EXISTING SWITCHED LIGHTING CIRCUIT IN ROOM.

EL02 NOTIFY ELECTRICAL ENGINEER OF RECORD WHERE EXISTING GENERATOR IS ACCEPTABLE EMERGENCY LIGHTING SOURCE. NEW EMERGENCY LIGHTING LAYOUT SHALL BE PROVIDED IN LIEU OF TYPE 'EM' LIGHT FIXTURES.

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OXFORD, MI 48371

DATE ISSUED	ISSUED FOR
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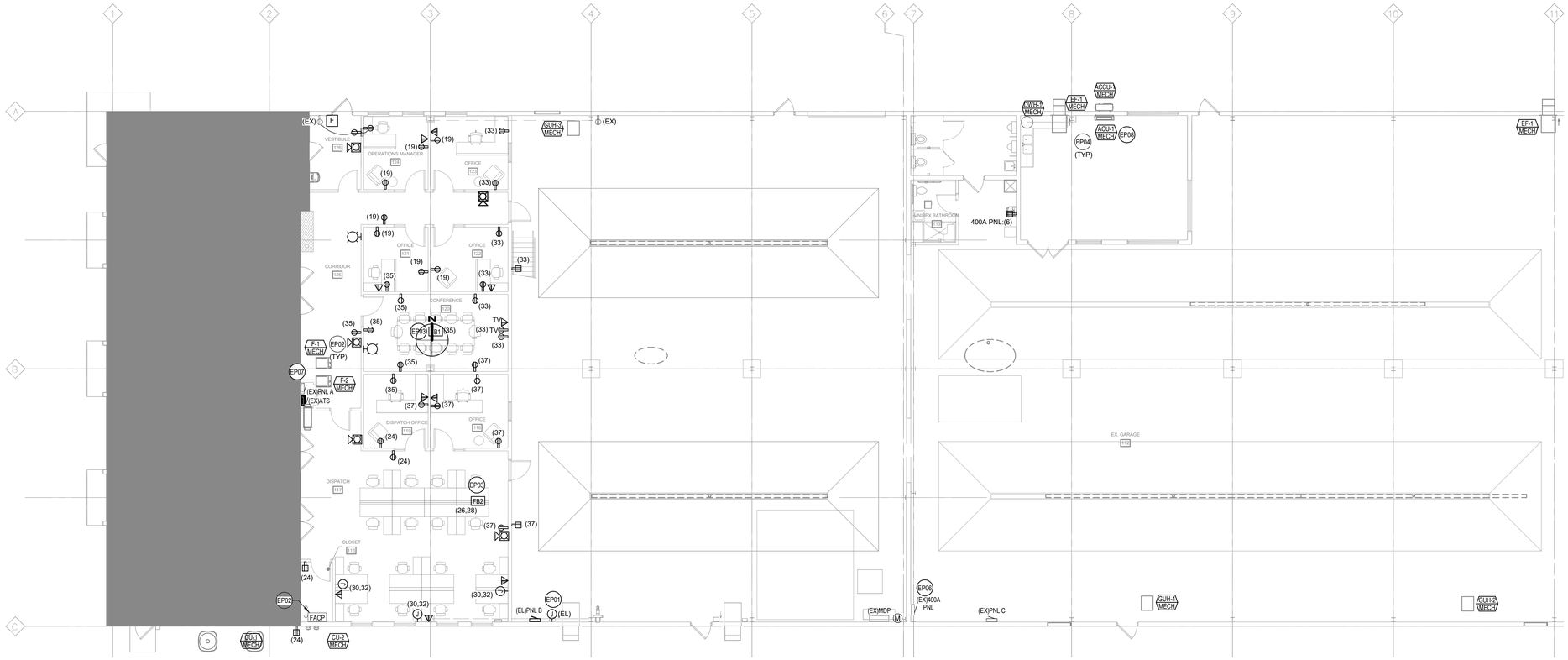
DRAWN Author
CHECKED Checker
APPROVED Approver

SHEET
LIGHTING PLAN

FILE NUMBER
2024-0074

SHEET NUMBER
E-201

PROJ. NO 2024-0074
3/13/2025 5:45:38 AM



1 E-301 POWER PLAN

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

GENERAL NOTES - POWER

A. REFER TO ARCHITECTURAL FLOOR PLAN AND ELEVATIONS FOR EXACT LOCATION OF DEVICES WHERE INDICATED.

B. RECEPTACLE OUTLETS SHALL BE RATED 20A U.O.N..

C. DISCONNECT SWITCHES SHALL BE HEAVY DUTY TYPE U.O.N..

D. PROVIDE GFCI PROTECTION WHERE REQUIRED BY THE NEC WHETHER INDICATED OR NOT.

E. BRANCH CIRCUIT JUNCTION BOXES SHALL BE LABELED WITH THE CIRCUITS ENCLOSED..

F. SINGLE PHASE 20A BRANCH CIRCUIT WIRING SHALL BE 2#12, 1#12GND IN 3/4"C UNLESS NOTED OTHERWISE.

G. EXISTING EQUIPMENT/DEVICES NOT SPECIFICALLY INDICATED TO BE DEMOLISHED SHALL REMAIN OPERATIONAL. REVISE EXISTING CIRCUITING TO MAINTAIN OPERATION TO SUCH EQUIPMENT/DEVICES AS REQUIRED.

H. CONDUITS SHALL BE ROUTED CONCEALED UNLESS NOTED OTHERWISE.

I. ELECTRICAL EQUIPMENT MOUNTED ON THE FLOOR SHALL BE MOUNTED ON A 4" CONCRETE HOUSEKEEPING PAD.

PLAN NOTES

EP01 EXTEND EXISTING CIRCUIT FOR RELOCATED HVAC CONTROLS TO NEW LOCATION INDICATED. COORDINATE WITH MECHANICAL TRADES.

EP02 CONNECT NEW FIRE ALARM DEVICES TO EXISTING FIRELITE (HONEYWELL) ES-50X FIRE ALARM CONTROL PANEL. DEVICE LOCATIONS AND QUANTITIES INDICATED FOR DESIGN INTENT. FIRE ALARM VENDOR SHALL PROVIDE DRAWINGS FOR SUBMISSION TO AHJ.

EP03 SAWCUT, PATCH, AND REPAIR CONCRETE SLAB TO INSTALL FLOORBOX AND CONDUITS. ROUTE CONDUITS IN DIRECTION OF PANELBOARD SERVING LOAD. ROUTE TELECOM CONDUITS IN DIRECTION IF I/T CLOSET AND/OR ASSOCIATED TV WHERE APPLICABLE.

EP04 REFER TO MECHANICAL CONNECTION SCHEDULE ON THIS SHEET FOR LOCAL DISCONNECT SWITCH AND CIRCUITING REQUIREMENTS.

EP06 EXISTING 400A PANEL NAMEPLATE IDENTIFIES THIS AS A 208Y/120V RATED PANEL. PANEL IS ASSUMED TO BE 240/120V 3PH, 4W. CONTRACTOR SHALL VERIFY L-L VOLTAGE OF PANEL AND WHETHER EXISTING PANEL RATING SATISFIES THE REQUIREMENTS. PROVIDE ADD ALTERNATE PRICE TO REPLACE PANEL WITH NEW PANEL HAVING CORRECT VOLTAGE RATING. LABEL PANEL WITH CORRECT VOLTAGE WHERE EXISTING RATINGS ARE SATISFACTORY.

EP07 RELOCATE (3)TOGGLE SWITCHES AND (1) 2-GANG JUNCTION BOX ADJACENT TO EXISTING PNL A TO ACCOMMODATE ARCHITECTURAL REVISIONS.

EP08 INDOOR HVAC UNIT POWER FED FROM ASSOCIATED OUT DOOR UNIT. PROVIDE POWER AND CONTROLS WIRING PER MANUFACTURER'S INSTRUCTION.

MECHANICAL EQUIPMENT CONNECTION SCHEDULE

EQUIPMENT ID	FLA	MCA	VOLTAGE	PHASE	CIRCUIT	LOCAL DISCONNECT SIZE/TYPE	NOTES
ACCU-1	15.2 A	19.0 A	240 V	1	400A PNL-8,10	NEMA 3R, 30A, 240V, 2P HEAVY-DUTY DISCONECT SWITCH	
ACU-1	1.0 A	2.0 A	240 V	3		30A, 240V, 2P TOGGLE TYPE DISCONNECT SWITCH	INDOOR UNIT POWER FED FROM ASSOCIATED OUTDOOR UNIT
CU-1	16.0 A	20.0 A	240 V	1	PNL B-25,27	30A, 240V, 2P HEAVY-DUTY DISCONECT SWITCH	
CU-2	16.0 A	20.0 A	240 V	1	PNL B-29,31	30A, 240V, 2P HEAVY-DUTY DISCONECT SWITCH	
DWH-1	19.0 A	24.0 A	240 V	1	400A PNL-2,4	30A, 240V, 2P HEAVY-DUTY DISCONECT SWITCH	
EF-1	6.9 A	9.0 A	240 V	3		30A, 240V, 3P HEAVY-DUTY DISCONECT SWITCH	CONNECT TO EXISTING NORTH BUS DUCT VIA NEW 30A/10AF BUS PLUG
EF-1	6.9 A	9.0 A	240 V	3		30A, 240V, 3P HEAVY-DUTY DISCONECT SWITCH	CONNECT TO EXISTING NORTH BUS DUCT VIA NEW 30A/10AF BUS PLUG
F-1	8.0 A	10.0 A	120 V	1	PNL B-21	30A, 120V, 2P MANUAL MOTOR STARTER	
F-2	8.0 A	10.0 A	120 V	1	PNL B-23	30A, 120V, 2P MANUAL MOTOR STARTER	
GUH-1	7.2 A	9.0 A	120 V	1	400A PNL-1	30A, 120V, 2P MANUAL MOTOR STARTER	
GUH-2	7.2 A	9.0 A	120 V	1	400A PNL-3	30A, 120V, 2P MANUAL MOTOR STARTER	
GUH-3	7.2 A	9.0 A	120 V	1	PNL B-22	30A, 120V, 2P MANUAL MOTOR STARTER	

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CHECKED	Checker
APPROVED	Approver

SHEET
POWER PLAN

FILE NUMBER
2024-0074

SHEET NUMBER
E-301

3/13/2025 5:45:48 AM | PROJ. NO 2024-0074

EX. PANELBOARD: 400A PNL

MAINS: 400 A
LOCATION: EX. GARAGE 112
FED FROM: MDP
VOLTAGE: 240D/120V 3Ø 4W.
ENCLOSURE: NEMA 1
MOUNTING: SURFACE

LOAD DESCRIPTION	BKR	P	CKT	A		CKT	B		CKT	C		CKT	P	BKR	LOAD DESCRIPTION
GUH-1	**20**	**1**	1	0.9	2.3							2	**2**	**20**	**DWH-1**
GUH-2	**20**	**1**	3				0.9	2.3				4			
SPACE	--	1	5						--	0.5		6	**1**	**20**	**WATER COOLER RECEPT.**
SPACE	--	1	7	--	1.8							8	**2**	**20**	**ACCU-1/ACU-1**
SPACE	--	1	9			--	1.8					10			
SPACE	--	1	11						--	--		12	1	--	SPACE
SPACE	--	1	13	--	--							14	1	--	SPACE
SPACE	--	1	15			--	--					16	1	--	SPACE
SPACE	--	1	17						--	--		18	1	--	SPACE
SPACE	--	1	19	--	--							20	1	--	SPACE
SPACE	--	1	21			--	--					22	1	--	SPACE
SPACE	--	1	23						--	--		24	1	--	SPACE
SPACE	--	1	25	--	--							26	1	--	SPACE
SPACE	--	1	27			--	--					28	1	--	SPACE
SPACE	--	1	29						--	--		30	1	--	SPACE
SPACE	--	1	31	--	--							32	1	--	SPACE
SPACE	--	1	33			--	--					34	1	--	SPACE
SPACE	--	1	35						--	0.0		36	1	20	METER
SPACE	--	1	37	--	0.0							38	1	20	METER
SPACE	--	1	39			--	--					40	1	--	SPACE
SPACE	--	1	41						--	--		42	1	--	SPACE
PNL C (SUBFEED BREAKER)	200	2	43	15.0								44			
			45			15.0						46			
TOTAL CONNECTED kVA:				20.0			20.0			0.5					
TOTAL CONNECTED AMPS:				166.4 A			166.4 A			4.2 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	DEMAND LOAD	PANEL TOTALS	
Receptacle	0.5 kVA	100.00%	0.5 kVA		
Spare	30.0 kVA	100.00%	30.0 kVA	**CONNECTED LOAD:**	40.4 kVA
Mechanical	9.9 kVA	100.00%	9.9 kVA	**DEMAND LOAD:**	40.4 kVA
				CONNECTED CURRENT:	97.3 A
				DEMAND CURRENT:	97.3 A

NOTES:
PROVIDE NEW BRANCH CIRCUIT BREAKERS FOR NEW LOADS INDICATED. EXISTING PANEL IS SIEMENS P1 SERIES.

EX. PANELBOARD: PNL B

MAINS: 200 A
FED FROM: MDP
VOLTAGE: 120/240 1Ø 3W.
ENCLOSURE: NEMA 1
MOUNTING: SURFACE
10,000 AMPS SYMM.

LOAD DESCRIPTION	BKR	P	CKT	A		CKT	B		CKT	P	BKR	LOAD DESCRIPTION
(EX)LOAD	20	1	1	0.5	0.5				2	1	20	(EX)LOAD
(EX)OFFICE A/C	40	2	3				3.6	0.5	4	1	20	(EX)LOAD
			5	3.6	0.5				6	1	20	(EX)LOAD
(EX)OFFICE A/C	30	2	7				2.4	0.5	8	1	20	(EX)LOAD
			9	2.4	0.5				10	1	20	(EX)LOAD
(EX)LOAD	20	1	11				0.5	0.5	12	1	20	(EX)LOAD
(EX)LOAD	20	1	13	0.5	0.5				14	1	20	(EX)LOAD
(EX)FUEL PUMP	20	2	15				1.0	0.5	16	1	20	(EX)LOAD
			17	1.0	0.5				18	1	20	(EX)FACP
RECEPTS - RMS 121-125	**20**	**1**	19				1.3	1.0	**20**	**1**	**20**	**LIGHTING - RMS 116-126**
F-1	**15**	**1**	21	1.0	0.9				**22**	**1**	**15**	**GUH-3**
F-2	**15**	**1**	23				1.0	0.7	**24**	**1**	**20**	**RECEPTS - RMS 117,119, EXTERIOR**
CU-1	**35**	**2**	25	1.9	0.7				**26**	**2**	**20**	**FURNITURE FLOORBOX RM 117 [1]**
			27				1.9	0.7	**28**			
CU-2	**35**	**2**	29	1.9	1.4				**30**	**2**	**20**	**FURNITURE - RM 117 [1]**
			31				1.9	1.4	**32**			
RECEPTS - RMS 120,122,123	**20**	**1**	33	1.4	--				34	1	--	SPACE
FLOORBOX, RECEPTS - RMS 119-121,125	**20**	**1**	35				1.4	--	36	1	--	SPACE
RECEPTS - RMS 117-119	**20**	**1**	37	1.3	--				38	1	--	SPACE
(EX)LOAD	20	1	39				0.0	0.0	40	1	20	(EX)LOAD
TOTAL CONNECTED kVA:				21.0			20.7					
TOTAL CONNECTED AMPS:				174.7 A			172.7 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	DEMAND LOAD	PANEL TOTALS	
Receptacle	10.4 kVA	98.08%	10.2 kVA		
Spare	19.9 kVA	100.00%	19.9 kVA	**CONNECTED LOAD:**	41.7 kVA
Lighting	1.0 kVA	100.00%	1.0 kVA	**DEMAND LOAD:**	41.5 kVA
Mechanical	10.5 kVA	100.00%	10.5 kVA	**CONNECTED CURRENT:**	173.7 A
				DEMAND CURRENT:	172.9 A

NOTES:
[1] PROVIDE NEUTRAL CONDUCTOR TO POWERED FURNITURE
PROVIDE NEW BRANCH CIRCUIT BREAKERS FOR NEW LOADS IN PANEL. EXISTING PANEL IS GE TL SERIES.

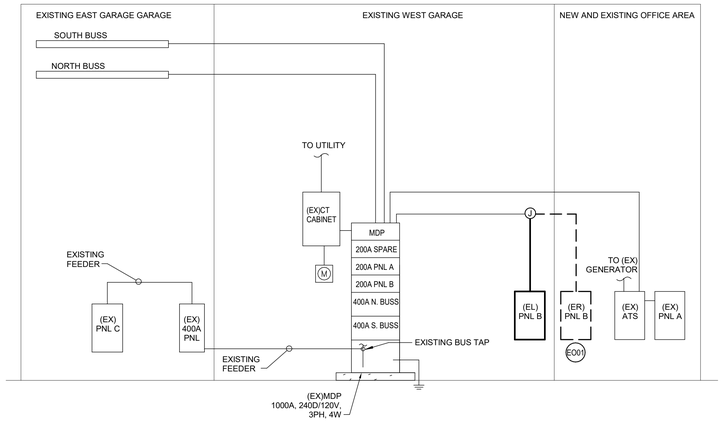
EX. DIST. PANEL: MDP

MAINS: 1000 A
FED FROM: (EX)UTILITY XFMR
VOLTAGE: 240D/120V 3Ø 4W.
ENCLOSURE: NEMA 1

CKT	CIRCUIT DESCRIPTION	# OF POLES	FRAME SIZE	TRIP RATING	LOAD	
1	SPARE (IN ON POSITION)	1	200 A	200 A	0.0 kVA	
2	(EX)PNL A	2	200 A	200 A	30.0 kVA	
3	(EX)PNL B	2	200 A	200 A	41.7 kVA	
4	(EX)NORTH BUS	3	400 A	400 A	83.0 kVA	
5	(EX)SOUTH BUS	1	400 A	400 A	83.0 kVA	
6	(EX)400A PNL BUS TAP	3	0 A	0 A	40.4 kVA	
7	SPACE	1	--	--	--	
			TOTAL CONNECTED kVA:		278.1 kVA	
			TOTAL CONNECTED AMPS:		669 A	

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	DEMAND LOAD	PANEL TOTALS	
Mechanical	20.4 kVA	100.00%	20.4 kVA		
Spare	245.9 kVA	100.00%	245.9 kVA	**CONNECTED LOAD:**	278.1 kVA
Lighting	1.0 kVA	100.00%	1.0 kVA	**DEMAND LOAD:**	277.7 kVA
Receptacle	10.9 kVA	95.87%	10.5 kVA	**CONNECTED AMPS:**	669.1 A
				DEMAND AMPS:	668 A

NOTES:



ELECTRICAL ONE-LINE DIAGRAM

SCALE: N.T.S.

GENERAL NOTES - PANEL SCHEDULES

A. PROVIDE CIRCUIT DIRECTORIES IN ALL ELECTRICAL PANELS AND NAMEPLATES ON SWITCHBOARDS PER THE SPECIFICATIONS.

B. PROVIDE ARC FLASH LABELS FOR ALL PANELBOARDS PER SECTION 110.16 OF THE NEC.

C. NEW WORK IN EXISTING PANELS IS NOTED IN BOLD TEXT.

GENERAL NOTES - ONE LINE

A. DISCONNECT SWITCHES SHALL BE HEAVY DUTY TYPE U.O.N..

B. JUNCTION AND PULL BOXES SHALL BE LABELED WITH THE CIRCUITS ENCLOSED.

C. PROVIDE CIRCUIT DIRECTORIES IN ALL ELECTRICAL PANELS AND NAMEPLATES ON SWITCHBOARDS PER THE SPECIFICATIONS.

D. EXISTING EQUIPMENT/DEVICES NOT SPECIFICALLY INDICATED TO BE DEMOLISHED SHALL REMAIN OPERATIONAL. REVISE EXISTING CIRCUITING TO MAINTAIN OPERATION TO SUCH EQUIPMENT/DEVICES AS REQUIRED.

E. CONDUITS IN FINISHED AREAS SHALL BE ROUTED CONCEALED UNLESS NOTED OTHERWISE.

F. PROVIDE ARC FLASH CALCULATIONS AND LABELS FOR ALL SWITCHBOARDS, PANELBOARDS, MOTOR CONTROLLERS, AND CONTROL PANELS PER SECTION 110.16 OF THE NEC AND NFPA 70E. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

G. ELECTRICAL EQUIPMENT MOUNTED ON THE FLOOR SHALL BE MOUNTED ON A 4" CONCRETE HOUSEKEEPING PAD.

H. PROVIDE ARC FAULT CIRCUIT INTERRUPTER TYPE CIRCUIT BREAKERS IN DWELLING AND DORMITORY UNITS AND FOR ALL BRANCH CIRCUITS INDICATED IN SECTION 210.12 OF THE NEC.

I. REFER TO THE FEEDER SCHEDULE LOCATED ON DRAWING EA-002.

J. FAULT CURRENT VALUES, WHERE INDICATED, ARE ESTIMATES BASED ON AVAILABLE INFORMATION AND ESTIMATED FEEDER LENGTHS AT THE TIME OF DESIGN. THE CONTRACTOR IS RESPONSIBLE FOR COLLECTING UPDATED AVAILABLE FAULT CURRENT FROM THE LOCAL UTILITY. MOTOR SIZES FOR NEW MECHANICAL AND PLUMBING EQUIPMENT, AND FIELD MEASUREMENTS TO PERFORM THE SHORT CIRCUIT CALCULATIONS REQUIRED PER THE ELECTRICAL SPECIFICATIONS. ELECTRICAL EQUIPMENT SHALL HAVE RATINGS GREATER THAN THE AVAILABLE FAULT CURRENT DETERMINED BY THE CONTRACTORS STUDY.

K. PROVIDE TEMPORARY EMERGENCY/STANDBY GENERATOR AND SUPPORTING EQUIPMENT TO BACKFEED EXISTING ESSENTIAL/OPTIONAL-STANDBY ELECTRICAL SYSTEM WHERE EXISTING NORMAL OR BACKUP POWER SYSTEM IS REMOVED FROM SERVICE DUE TO REQUIRED NEW WORK AND/OR CONSTRUCTION SCHEDULING/SEQUENCING. PROVIDE LABOR, MATERIALS, FUEL, ETC. AS NEEDED FOR LENGTH OF TIME REQUIRED TO BRING EXISTING/NEW GENERATOR INTO SERVICE.

PLAN NOTES

EO01 REMOVE AND RELOCATE EXISTING PNL B AND EXISTING BRANCH CIRCUITS TO NEW LOCATION AS INDICATED ON POWER PLAN. RELOCATE ASSOCIATED ADJACENT TIMECLOCKS, J-BOXES, ETC. TO ACCOMMODATE ARCHITECTURAL REVISIONS IN AREA. REVISE FEEDER AS NEEDED TO RELOCATE PANEL. PROVIDE ADD ALTERNATE PRICING TO REPLACE PNL B WITH NEW PANEL OF SAME VOLTAGE AND RATING IN NEW LOCATION.

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DATE ISSUED	ISSUED FOR
06.10.2025	CM RFP

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CHECKED	Checker
APPROVED	Approver

SHEET
ELECTRICAL ONE LINE AND PANEL SCHEDULES

FILE NUMBER
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SHEET NUMBER
E-601

PROJ NO 2024-0074
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