INTERIOR FINISH SCHEDULE – CONCESSIONS

RM. NO.	RM. NAME	FLOOR	BASE	DETAILS FRONT	DETAILS R SIDE	DETAILS REAR	DETAILS L SIDE	CEILING	CEILING HEIGHTS	REMARKS
FIRST FLOOR										
101	ENTRANCE	EPOXY	VINYL	PT. CMU	PT. CMU	PT. CMU	PT. CMU	PT. PLYWOOD	10'-7 1/4"	EPOXY FLOORING W/ 4" INTEGRAL COVE BASE
102	STORAGE	EPOXY	VINYL	PT. CMU	PT. CMU	PT. CMU	PT. CMU	PT. PLYWOOD	10'-7 1/4"	EPOXY FLOORING W/ 4" INTEGRAL COVE BASE
103	MECHANICAL ROOM	EPOXY	VINYL	PT. CMU	PT. CMU	PT. CMU	PT. CMU	PT. PLYWOOD	10'-7 1/4"	EPOXY FLOORING W/ 4" INTEGRAL COVE BASE
104	CONCESSIONS AREA	EPOXY	VINYL	PT. CMU	PT. CMU	PT. CMU	PT. CMU	PT. PLYWOOD	10'-7 1/4"	EPOXY FLOORING W/ 4" INTEGRAL COVE BASE
105	WOMEN'S	EPOXY	VINYL	PT. CMU	PT. CMU	PT. CMU	PT. CMU	PT. PLYWOOD	10'-7 1/4"	EPOXY FLOORING W/ 4" INTEGRAL COVE BASE (WATER RESISTANT WALLS AND CEILINGS)
106	MEN'S	EPOXY	VINYL	PT. CMU	PT. CMU	PT. CMU	PT. CMU	PT. PLYWOOD	10'-7 1/4"	EPOXY FLOORING W/ 4" INTEGRAL COVE BASE (WATER RESISTANT WALLS AND CEILINGS)

FINISH LEGEND:

EPOXY: FLUID APPLIED FLOORING. EPOXY W/ AGGREGATE
VINYL: 4" VINYL COVE BASE (JOHNSONITE, #44 DARK BROWN B) – SEE DETAIL 11/A-4.1
PT. CMU: EPOXY PAINTED CONCRETE BLOCK
PT. PLYWOOD: PAINTED PLYWOOD

GENERAL SHEET NOTES FLOOR PLAN

1. DIMENSIONS ARE TAKEN TO FACE OF STUD OR MASONRY/CONCRETE, UNLESS INDICATED OTHERWISE.
2. PRIOR TO ROUGH-IN, COORDINATE LOCATION OF ALL LAVATORIES, MIRRORS, LIGHT FIXTURES, ELECTRICAL, AND ALL OTHER ITEMS THAT COINCIDE WITH INTERIOR FINISHES. IF THERE IS A DISCREPANCY BETWEEN THE I.D. DRAWINGS AND THE ACCESSIBILITY STANDARDS, REPORT THE DISCREPANCY TO THE ARCHITECT FOR RESOLUTION PRIOR TO PROCEEDING WITH THE WORK.
3. PRIOR TO WALL ENCLOSURE, CONTRACTOR SHALL PROVIDE FIRE-RETARDANT TREATED WOOD BLOCKING BEHIND ALL WALL MOUNTED ITEMS, INCLUDING OWNER FURNISHED ITEMS. THIS INCLUDES, BUT IS NOT LIMITED TO, TOILET AND BATHROOM ACCESSORIES, ANY CLEANING ACCESSORIES, AND ALL OTHER ITEMS MOUNTED TO WALLS. COORDINATE LOCATIONS WITH OWNER AND THIRD PARTY VENDOR FURNISHED ITEMS.
4. APPROXIMATE LOCATIONS OF MISCELLANEOUS ACCESSORIES PROVIDED BY OWNER ARE NOTED IN THESE DRAWINGS. CONTRACTOR SHALL PROVIDE FIRE-TREATED WOOD BLOCKING AT ALL LOCATIONS EXCEPT AT WET LOCATIONS; PROVIDE METAL STRAP BLOCKING AT WET LOCATIONS. COORDINATE FINAL LOCATIONS AND QUANTITIES WITH OWNER AND VENDOR PRIOR TO INSTALLATION.

TOILET AND BATHROOM ACCESSORY KEYNOTES

NOTE: NOT ALL ACCESSORIES MAY BE USED ON SHEET

A. N.I.C. (NOT IN CONTRACT) ITEMS. FURNITURE PROVIDED BY OWNER.
B. STAINLESS STEEL TOILET PARTITIONS: SATIN STAINLESS STEEL FINISH TOILET PARTITIONS. FLOOR ANCHORED AND OVERHEAD BRACED. LAYOUT AS INDICATED IN THE DRAWINGS.
C. 32"W ADA COMPLIANT TOILET PARTITION DOOR AND HARDWARE.
D. 24"W STANDARD TOILET PARTITION DOOR AND HARDWARE.
E. STAINLESS STEEL URINAL SCREENS: SATIN STAINLESS STEEL FINISH URINAL SCREENS. WALL ANCHORED. LAYOUT AS INDICATED IN THE DRAWINGS. 18"Wx42"H, SET 1'-0" A.F.F. PROVIDE CONTINUOUS SATIN STAINLESS STEEL WALL ANGLES.
F. COAT HOOK/DOOR STOP: BY TOILET PARTITION MANUFACTURER. MATCH PARTITION HARDWARE.
G. WALL STOP: BY TOILET PARTITION MANUFACTURER. MATCH PARTITION HARDWARE.
H. PAPER TOWEL DISPENSER (SURFACE MOUNTED): SATIN STAINLESS STEEL FINISH.
I. SOAP DISPENSER (SURFACE MOUNTED ON WALL): SATIN STAINLESS STEEL FINISH.
J. MIRROR, CHANNEL FRAMED: BOBRICK, MIRROR WITH STAINLESS STEEL CHANNEL FRAME B-165 2436. SATIN STAINLESS STEEL FINISH, POLISHED MIRROR GLASS (COATING ON SECOND FACE).
K. TOILET TISSUE DISPENSER (SURFACE MOUNTED): SATIN STAINLESS STEEL FINISH.
L. SANITARY NAPKIN DISPOSAL (SURFACE MOUNTED): SATIN STAINLESS STEEL FINISH.
M. SANITARY NAPKIN DISPENSER (SURFACE MOUNTED): SATIN STAINLESS STEEL FINISH.
N. TOILET GRAB BAR – 36"L, HORIZONTAL: SATIN STAINLESS STEEL FINISH.
O. TOILET GRAB BAR – 42"L, HORIZONTAL: SATIN STAINLESS STEEL FINISH.
P. TOILET GRAB BAR – 18"L, VERTICAL: SATIN STAINLESS STEEL FINISH.
Q. STANDARD WALL-HUNG TOILET – SEE PLUMBING DRAWINGS.
R. ADA-COMPLIANT WALL-HUNG TOILET – SEE PLUMBING DRAWINGS.
S. STANDARD WALL-HUNG URINAL – SEE PLUMBING DRAWINGS.
T. ADA-COMPLIANT WALL-HUNG URINAL – SEE PLUMBING DRAWINGS.
U. ADA-COMPLIANT WALL-HUNG LAVATORY WITH INTEGRAL PIPING SHROUD – SEE PLUMBING DRAWINGS.
V. HI-LO ADA COMPLIANT DRINKING FOUNTAIN.
W. MOP SINK.
X. ZURN FLOOR DRAIN: MODEL Z415B OR Z525.
Y. MOP SINK UTILITY SHELF: SATIN STAINLESS STEEL FINISH.
Z. BABY CHANGING STATION.
AA. COMBINATION PAPER TOWEL DISPENSER AND TRASH RECEPTACLE (RECESSED): SATIN STAINLESS STEEL FINISH.
AB. ELECTRIC HAND DRYER (SURFACE MOUNTED): EXCEL DRYER INC., XLERATOR HAND DRYER XL-C-1.1N-110-120V. POLISHED CHROME FINISH.
AC. TOILET SEAT COVER DISPENSER (SURFACE MOUNTED): SATIN STAINLESS STEEL FINISH.
AD. WALL MOUNTED HOOK: SATIN STAINLESS STEEL FINISH.

LEGEND FLOOR PLAN

C.M.U. WALL LOCATION. UNINSULATED AT INTERIOR WALLS. INSULATED AT EXTERIOR WALLS.

WOOD FRAMED STUD WALL WITH BATT INSULATION AT EXTERIOR WALLS. UNINSULATED AT INTERIOR WALLS.

FEC — WALL MOUNTED FIRE EXTINGUISHER LOCATION. PROVIDE WITH A MINIMUM SIZE 2A:10B:10C FIRE EXTINGUISHER. LOCATION AND QUANTITIES OF FIRE EXTINGUISHERS SHOWN ARE BASED UPON A 75FT TRAVEL RADIUS AND 3,000 SF AREA. SHOULD THE LOCAL AUTHORITY HAVING JURISDICTION REQUIRE ADDITIONAL LOCATIONS, OR DIFFERING LOCATIONS FROM THOSE SHOWN IN THESE DOCUMENTS, REVIEW THESE WITH THE ARCHITECT OR OWNER PRIOR TO PROCEEDING.

GENERAL SHEET NOTES RCP

1. DIMENSIONS ARE TAKEN TO FACE OF STUD OR MASONRY/CONCRETE, UNLESS INDICATED OTHERWISE.
2. CONTRACTOR SHALL COORDINATE CEILING HEIGHTS WITH ALL STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING COMPONENTS MOUNTED IN THE CEILING. PRIOR TO THE START OF ALL CEILING WORK, INCLUDING DUCT FABRICATION AND PLUMBING ROUGH-IN, THE CONTRACTOR SHALL PREPARE COORDINATION DRAWINGS FOR REVIEW AND COMMENT. INCLUDE ALL PERTINENT ELEVATION INFORMATION FOR S/M/E/P ITEMS AND ALL CEILING/SOFFIT HEIGHTS. INDICATE ALL OFFSETS AND TRANSITIONS REQUIRED TO CLEAR STRUCTURAL ELEMENTS. ALL POTENTIAL CONFLICTS WITH CEILING HEIGHTS OR ALIGNMENTS SHALL BE CLOUDED AND NOTED IN THE DOCUMENTS FOR RESOLUTION BY THE ARCHITECT.
3. ALL LIGHTS, EMERGENCY SWITCHES, STROBES, DIFFUSERS, ETC., SHALL BE CENTERED. ALL STROBES SHALL BE CEILING MOUNTED.
4. ALL FIXTURES, CONDUITS, PIPING, DUCTWORK, ETC. SHALL BE MOUNTED AS HIGH AS POSSIBLE TO ENSURE PROPER CLEARANCES AND CEILING HEIGHTS ARE MAINTAINED. CONTRACTOR SHALL LOCATE ALL CONDUITS AND PIPING AS CLOSE TO THE FLOOR/ROOF DECK ABOVE, TO MAXIMIZE SPACE FOR DUCT INSTALLATION.
5. ADDITIONAL DIRECTIONAL EXIT SIGNS MAY BE REQUIRED. CONTRACTOR TO VERIFY QUANTITIES AND LOCATIONS WITH THE LOCAL AUTHORITY HAVING JURISDICTION.
6. SEE ELECTRICAL DRAWINGS FOR ALL LIGHT FIXTURE TYPES AND MODELS. SEE MECHANICAL DRAWINGS FOR ALL DIFFUSER TYPES AND SIZES.

KEYNOTES RCP

1. OPEN STRUCTURE ABOVE.
2. 24x30 CEILING ACCESS PANEL – SEE X/A-X.X.
3. PROVIDE R-30 BATT INSULATION AT CEILING.

LEGEND RCP

RT C-7 1/4" — CEILING TYPE. CEILING HEIGHT
T.O.S./B.O.S. — INDICATES TOP OF SOFFIT/ BOTTOM OF SOFFIT AT LOCATIONS WHERE FRAMING DOES NOT CONTINUE TO HIGHER CEILING.

CEILING TYPES
PLY.: 4'X4'X3/4" PLYWOOD SHEETS
F.G.P.: 4'X4'X3/4" EXTERIOR GRADE PLYWOOD SHEETS

SUPPLY DIFFUSER — LINEAR SOFFIT VENT
RETURN DIFFUSER — EXHAUST DIFFUSER
SURFACE MOUNTED STRIP LIGHT
EXTERIOR WALL SCONCE
EXTERIOR EXIT LIGHT
EXIT SIGN — EMERGENCY LIGHT
CEILING ACCESS PANEL/ ATTIC HATCH. SEE X/A-X.X.

GENERAL SHEET NOTES

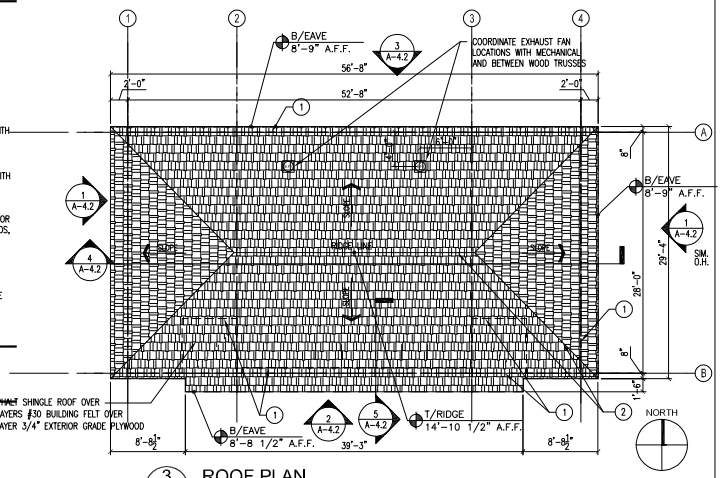
1. DIMENSIONS ARE TAKEN TO FACE OF STUD OR MASONRY/CONCRETE, UNLESS INDICATED OTHERWISE.
2. ALL HEIGHTS SHOWN ARE FROM FIRST FLOOR FINISH SLAB ELEVATION.
3. CONTRACTOR SHALL CONFIRM ALL AREAS ARE PROVIDED WITH POSITIVE DRAINAGE PRIOR TO FRAMING AND SHEATHING THE ROOF.
4. ALL ROOF EQUIPMENT AND PENETRATIONS SHALL BE PROVIDED WITH STRUCTURAL SUPPORT, SEE STRUCTURAL DRAWINGS FOR FRAMING INFORMATION AND LOCATIONS.
   4.1. VERIFY LOCATIONS OF ALL VENTS AND ROOF PENETRATIONS WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS.
   4.2. VERIFY LOCATIONS OF ALL MECHANICAL EQUIPMENT WITH STRUCTURAL DRAWINGS. THE INTENT IS FOR THE EQUIPMENT TO ALIGN WITH STRUCTURAL JOIST/PURLIN.
   4.3. NO EQUIPMENT SHALL BE LOCATED WITHIN 10'-0" OF THE EDGE OF THE ROOF. THIS INCLUDES, BUT IS NOT LIMITED TO, RTUs, EXHAUST FANS, CONDENSING UNITS, AND VENTS.
   4.4. THE MECHANICAL CONTRACTOR SHALL COORDINATE INSTALLATION AND ACCEPTANCE OF PREFABRICATED CURBS AND PENETRATIONS WITH THE ROOFING CONTRACTOR AND THE G.C. IN ORDER TO PROVIDE ALL NECESSARY BLOCKING, NAILING, FLASHING, ETC. AS REQUIRED FOR A WATER-TIGHT INSTALLATION.
5. THE GENERAL CONTRACTOR, AND ANY ROOFING SUBCONTRACTOR WORKING UNDER THE GENERAL CONTRACTOR, SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE WARRANTED, WATER-TIGHT ROOFING SYSTEM. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, SEPARATION BOARDS, VAPOR BARRIERS, NAILERS AND BLOCKING, ROOF INSULATION, TAPERED OVERBUILD INSULATION, TAPERED OVERBUILD CRICKETS, ROOF MEMBRANE, WALL FLASHING, TERMINATIONS AND FLASHING, ETC. AS REQUIRED FOR PROVIDING A COMPLETE WARRANTED, WATER-TIGHT ROOFING SYSTEM.
6. ALL ROOFING SLOPES SHALL HAVE A MINIMUM 1/4" PER FOOT SLOPE. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT OF ANY DISCREPANCIES PRIOR TO BID. NO CHANGE ORDERS SHALL BE ACCEPTED FOR ADDITIONAL ROOFING MATERIAL REQUIRED TO CREATE THE SLOPES.

KEYNOTES ROOF PLAN

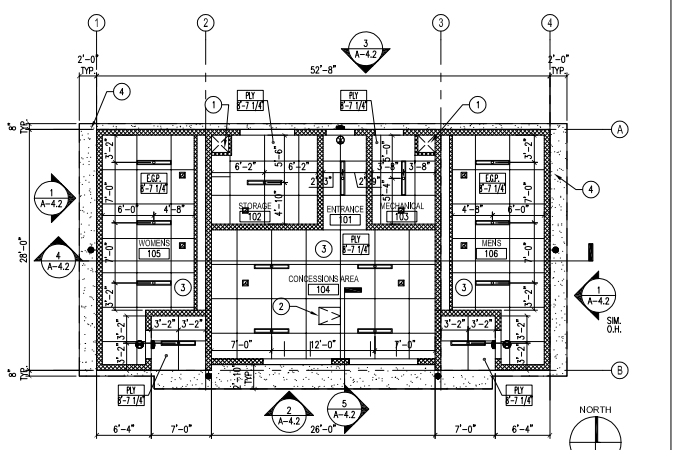
1. DASHED LINE INDICATES FACE OF WALL BELOW.

LEGEND ROOF PLAN

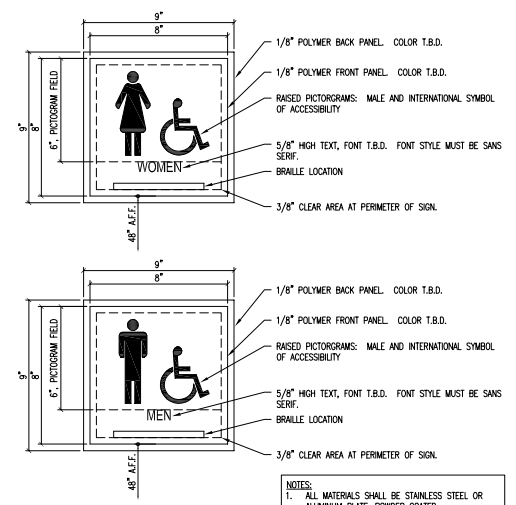
ET — ROOF MOUNTED EQUIPMENT
SLOPE 1/4"/FT — GENERAL DIRECTION WATER FLOW AND MINIMUM SLOPE REQUIREMENT



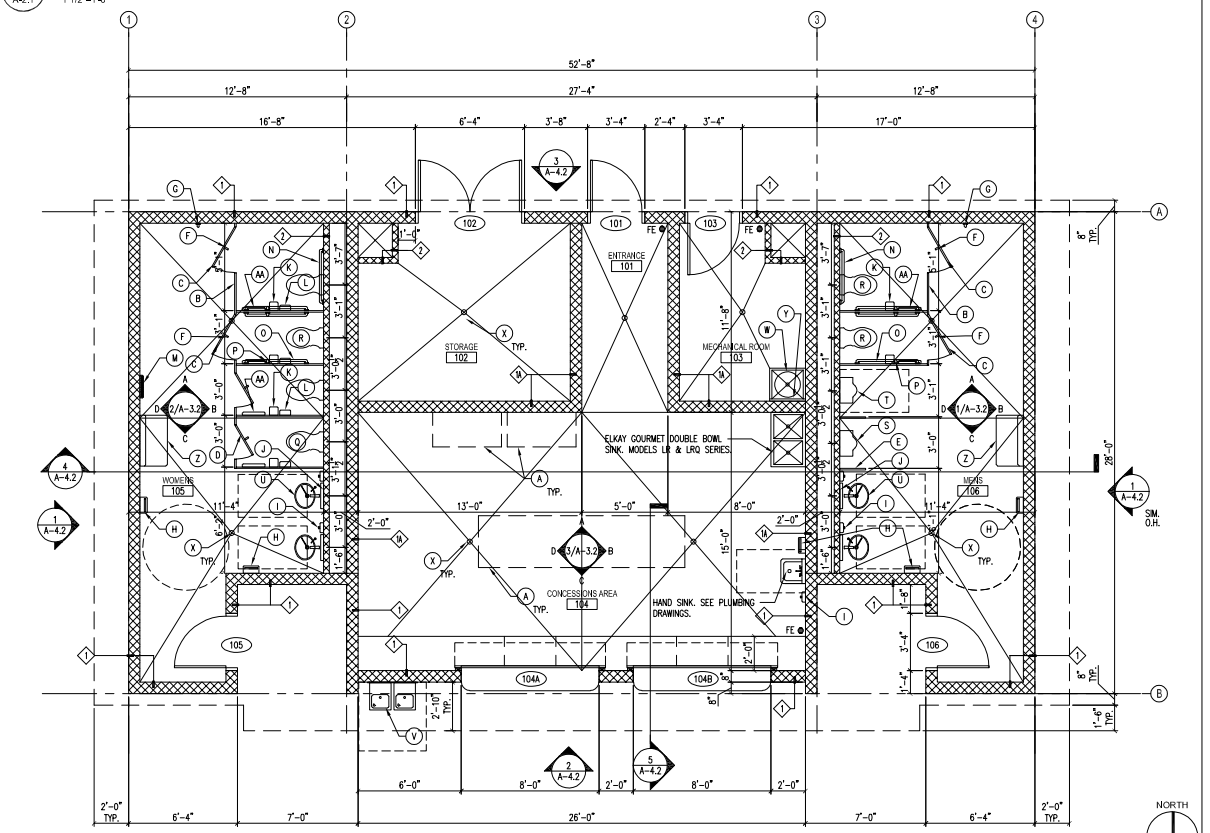
3 ROOF PLAN — A-2.1 — 1/8"=1'-0"



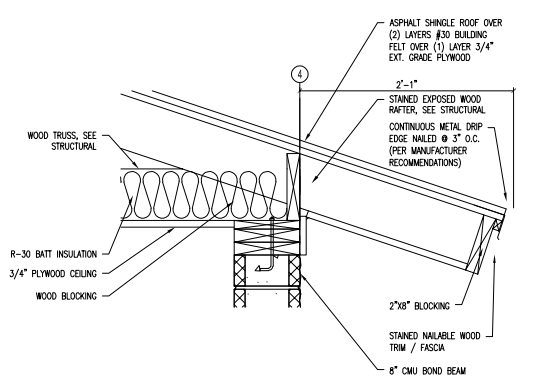
2 REFLECTED CEILING PLAN — A-2.1 — 1/8"=1'-0"



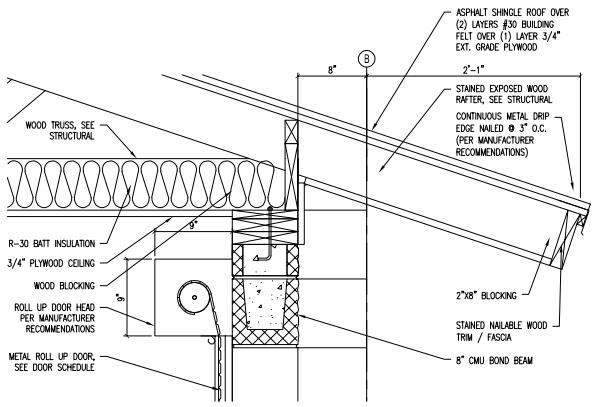
8 RESTROOM SIGNAGE — A-2.1 — 1 1/2"=1'-0"



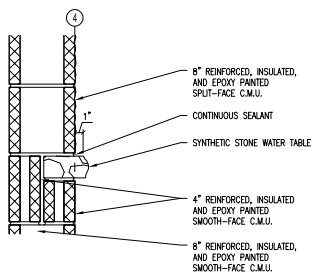
1 FIRST FLOOR PLAN - SKATE PARK / CONCESSIONS — A-2.1 — 1/4"=1'-0"



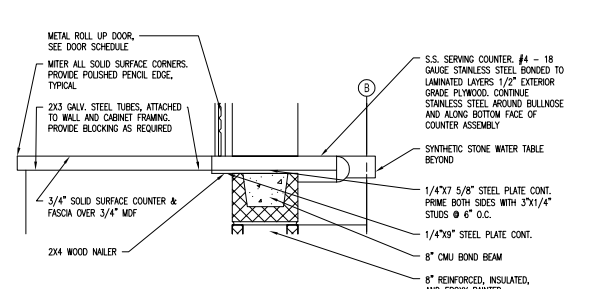
7 OVERHANG DETAIL — A-2.1 — 1 1/2"=1'-0"



5 ROLL UP DOOR HEAD — A-2.1 — 1 1/2"=1'-0"



6 MASONRY WATER TABLE — A-2.1 — 1 1/2"=1'-0"



4 ROLL UP DOOR SILL — A-2.1 — 1 1/2"=1'-0"

ESTABLISHED 1911
MBC MACON-BIBB COUNTY RECREATION DEPARTMENT

MACON-BIBB COUNTY
RECREATION DEPARTMENT
115 Willie Smokie Glover Drive
Macon, Georgia 31201
Contact: Mr. Reggie Moore, Director

FREEDOM PARK PAVILLION PACKAGE

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Stamp:

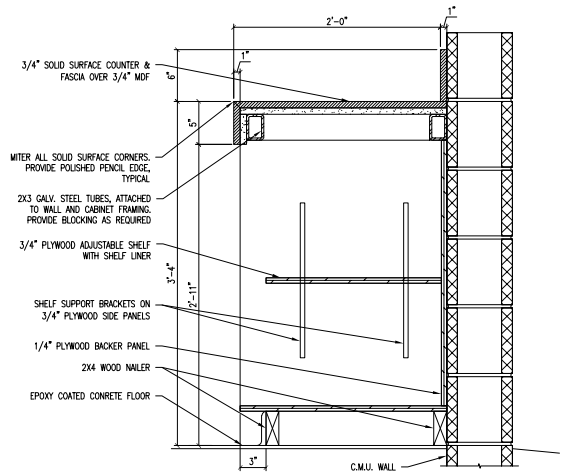
Project Name:
FREEDOM PARK CONCESSIONS BLDG
115 WILLIE SMOKIE GLOVER DRIVE
MACON, GEORGIA 31201

Project Number: 170502
Drawn By: BL Ck'd By: KC
Date: 02/26/2016 Scale: AS SHOWN

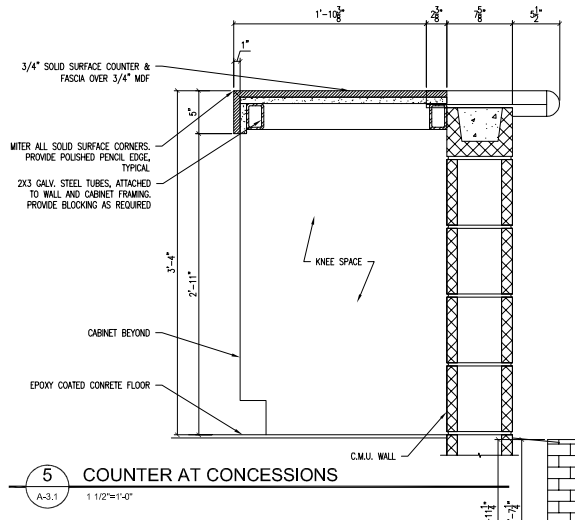
Rev:	Description:	Date:

Sheet Title:
FLOOR PLAN, REFLECTED CEILING PLAN, ROOF PLAN, AND FINISH SCHEDULE

Sheet Number:
A-2.1

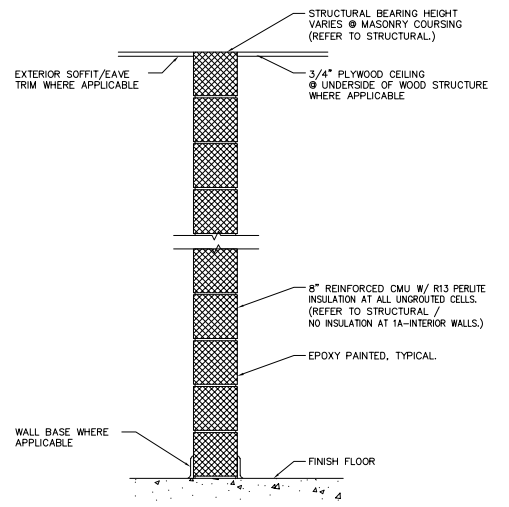


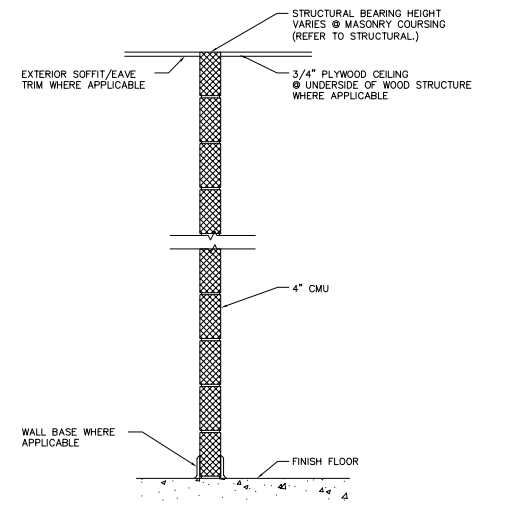
6 CABINET AT CONCESSIONS
A-3.1 1 1/2"=1'-0"

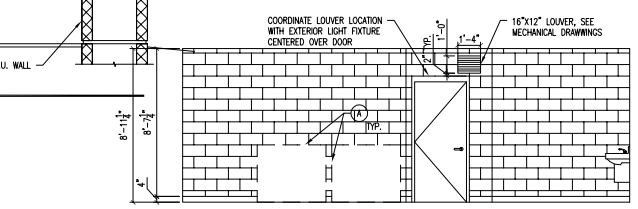


5 COUNTER AT CONCESSIONS
A-3.1 1 1/2"=1'-0"

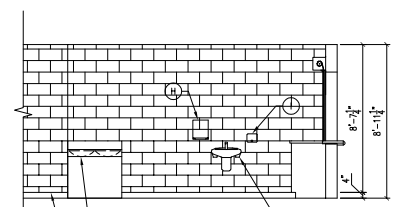
1	8" REINFORCED SPLIT FACE OR GROUND FACE CMU WALL W/ PERLITE INSULATION AT ALL UNGROUTED CELLS. REFER TO SECTIONS FOR SPLIT FACE AND SMOOTH FACE LOCATIONS.	2	4" SMOOTH FACE EPOXY PAINTED CMU.
1A	8" REINFORCED SMOOTH FACE EPOXY PAINTED CMU.		



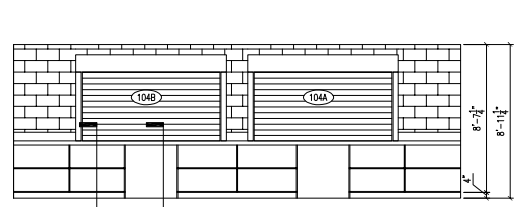




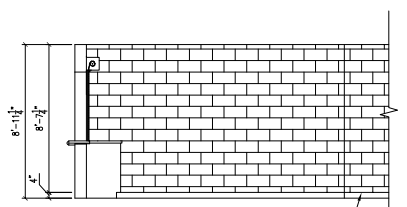
ELEVATION A



ELEVATION B

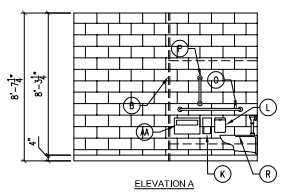


ELEVATION C

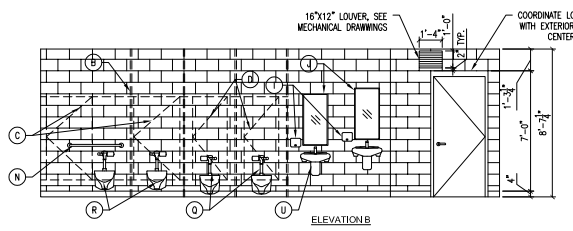


ELEVATION D

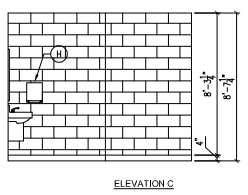
3 CONCESSIONS AREA 104 - ELEVATIONS (CONCESSIONS)
A-3.1 1/4"=1'-0"



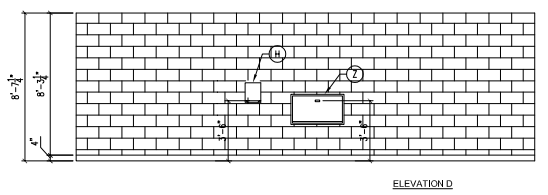
ELEVATION A



ELEVATION B

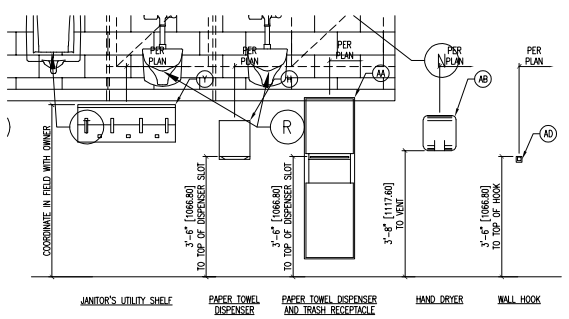


ELEVATION C

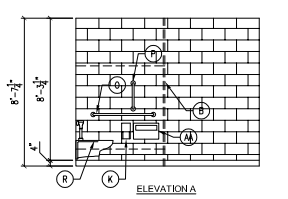


ELEVATION D

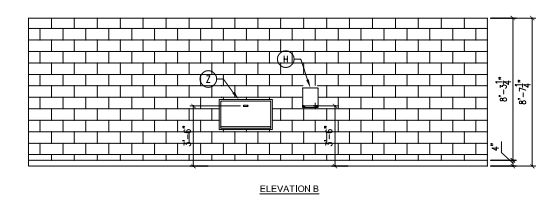
2 WOMENS 105 - ELEVATIONS (CONCESSIONS)
A-3.1 1/4"=1'-0"



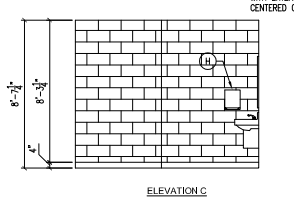
MISCELLANEOUS ACCESSORIES



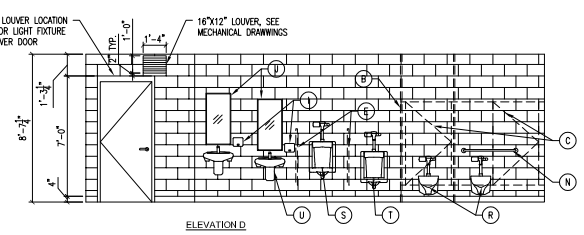
ELEVATION A



ELEVATION B



ELEVATION C



ELEVATION D

1 MENS 106 - ELEVATIONS (SKATE PARK / CONCESSIONS)
A-3.1 1/4"=1'-0"

MACON-BIBB COUNTY
RECREATION DEPARTMENT
115 Willie Smokie Glover Drive
Macon, Georgia 31201
Contact: Mr. Reggie Moore, Director

FREEDOM PARK PAVILLION PACKAGE

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Stamp:

Project Name:
FREEDOM PARK CONCESSIONS BLDG
115 WILLIE SMOKIE GLOVER DRIVE
MACON, GEORGIA 31201

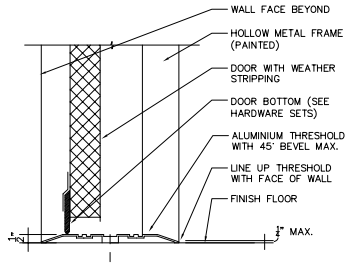
Project Number: 170502
Drawn By: BL Ck'd By: KC
Date: 02/26/2016 Scale: AS SHOWN

Rev:	Description:	Date:

Sheet Title:
INTERIOR ELEVATIONS, WALL TYPES, AND MILLWORK DETAILS

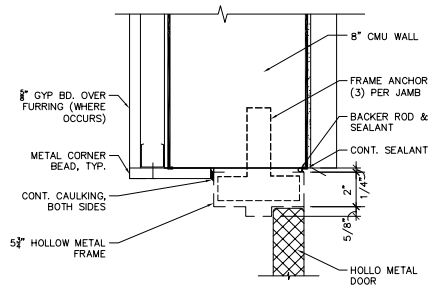
Sheet Number:

A-3.1

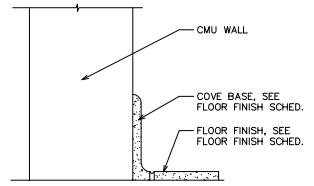


12 DOOR THRESHOLD DETAIL
A-4.1 3"=1'-0"

10 NOT USED
A-4.1 3"=1'-0"

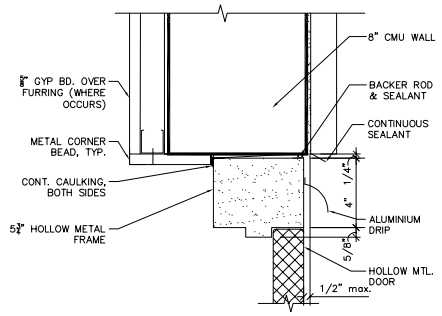


8 EXT. HOLLOW MTL. JAMB
A-4.1 3"=1'-0"



11 COVE BASE TILE DETAIL
A-4.1 3"=1'-0"

9 NOT USED
A-4.1 3"=1'-0"



7 EXT. HOLLOW MTL. HEAD
A-4.1 3"=1'-0"

DOOR SCHEDULE – SKATE

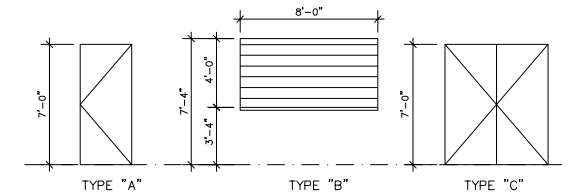
DR. NO.	RM. NO.	WIDTH		HEIGHT	THK	TYPE	MATERIAL	FINISH	LITE SIZE	DETAILS LABEL	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	FRAME MATERIAL	FRAME FINISH	THRESH	HDW	REMARKS	DR. NO.
FIRST FLOOR																			
101	101	3'-0"	X	7'-0"	1 3/4"	A	HOLLOW METAL	PAINT	–	N/A	7/A-4.1	8/A-4.1	12/A-4.1	HOLLOW METAL	PAINT	ALUM.	1	PROVIDE DOOR CLOSER	101
102	102	(2)3'-0"	X	7'-0"	1 3/4"	A	HOLLOW METAL	PAINT	–	N/A	7/A-4.1	8/A-4.1	12/A-4.1	HOLLOW METAL	PAINT	ALUM.	2	PROVIDE DOOR CLOSER	102
103	103	3'-0"	X	7'-0"	1 3/4"	C	HOLLOW METAL	PAINT	–	N/A	7/A-4.1	8/A-4.1	12/A-4.1	HOLLOW METAL	PAINT	ALUM.	2	PROVIDE DOOR CLOSER	103
104A	104	8'-0"	X	4'-0"	–	B	ROLL UP GARAGE DOOR	–	–	–	7/A-4.1	8/A-4.1	12/A-4.1	–	–	ALUM.	6	PROVIDE DOOR LOCK	104
104B	104	8'-0"	X	4'-0"	–	B	ROLL UP GARAGE DOOR	–	–	–	7/A-4.1	8/A-4.1	12/A-4.1	–	–	ALUM.	6	PROVIDE DOOR LOCK	104
105	105	3'-0"	X	7'-0"	1 3/4"	A	HOLLOW METAL	PAINT	–	N/A	7/A-4.1	8/A-4.1	12/A-4.1	HOLLOW METAL	PAINT	ALUM.	3	PROVIDE DOOR CLOSER	105
106	106	3'-0"	X	7'-0"	1 3/4"	A	HOLLOW METAL	PAINT	–	N/A	7/A-4.1	8/A-4.1	12/A-4.1	HOLLOW METAL	PAINT	ALUM.	3	PROVIDE DOOR CLOSER	106

**NOTE: PROVIDE DOOR SIGNAGE FOR ALL NON-PUBLIC DOORS

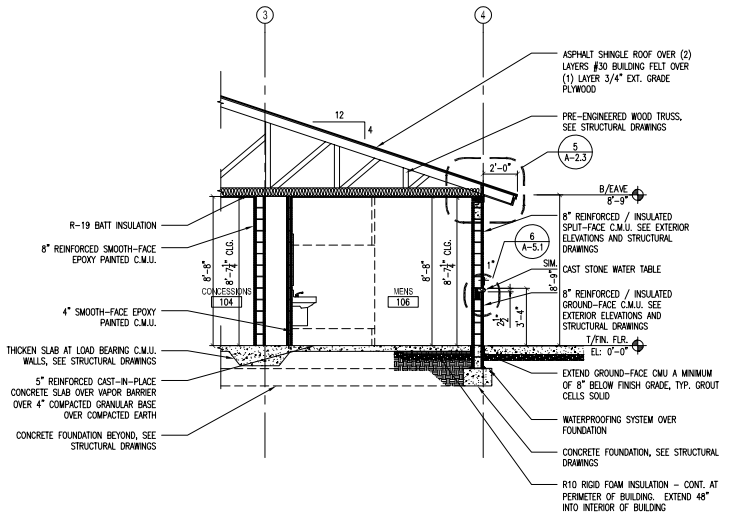
GENERAL DOOR NOTES

1. DOOR HARDWARE SHALL BE OF THE LEVER TYPE, MOUNTED 30 INCHES TO 40 INCHES ABOVE THE FLOOR. THE DOOR OPERATION SHALL MEET ALL APPLICABLE CODES FOR BOTH EXTERIOR AND INTERIOR DOORS. THE LOWER 12 INCHES OF THE DOOR SHALL ALSO MEET ALL APPLICABLE CODES TO ALLOW THE DOOR TO BE OPENED BY A WHEELCHAIR FOOTREST.
2. PROVIDE ASTRAGALS AT ACTIVE EXTERIOR DOOR LEAFS & WEATHERSTRIPPING AT EXTERIOR DOORS HEAD, JAMB AND SILL.
5. ILLUMINATED "EXIT" SIGNS TO HAVE A MINIMUM OF 6" HIGH "RED" LETTERS.
6. PROVIDE POSITIVE KEY-LOCKING CYLINDERS AND CYLINDER GUARDS ON ALL MORTISE OR RIM TYPE CYLINDER ON FACE OF DOOR OR IS OTHERWISE ACCESSIBLE TO GRIPPING TOOLS.
8. ALL PIN TYPE HINGES WHICH ARE ACCESSIBLE FROM THE OUTSIDE WHEN THE DOOR IS CLOSED SHALL HAVE NON REMOVABLE HINGE PINS.
9. PROVIDE LEVER TYPE HARDWARE, PANIC BARS, PUSH-PULL ACTIVATING BARS, OR OTHER HARDWARE DESIGNED TO PROVIDE PASSAGE WITHOUT REQUIRING THE ABILITY TO GRASP THE OPENING HARDWARE.
10. EXIT DOORS SHALL SWING IN THE DIRECTION OF EXIT TRAVEL WHEN SERVING ANY HAZARDOUS AREA OR WHEN SERVING AN OCCUPANT LOAD OF 50 OR MORE. ALL EXTERIOR DOORS TO HAVE EXIT DEVICES (PANIC HARDWARE).
11. ALL DOORS INCLUDING EXIT DOORS SHALL BE OPERABLE FROM THE INSIDE WITHOUT THE USE OF A KEY, SPECIAL KNOWLEDGE, OR EFFORT. ALL EXIT DOORS EXCEPT AT MAIN ENTRY TO BUILDING EXTERIOR SHALL BE PROVIDED WITH 'SLIMLINE' PANIC HARDWARE AND CLOSER AND ALARM
15. HARDWARE SCHEDULE SHALL BE PREPARED AND SUBMITTED FOR REVIEW AND APPROVAL.

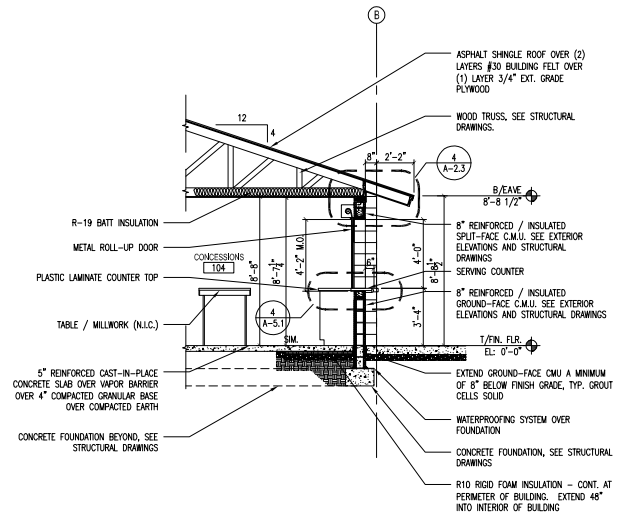
DOOR TYPES
SCALE: 1/4" = 1'-0"



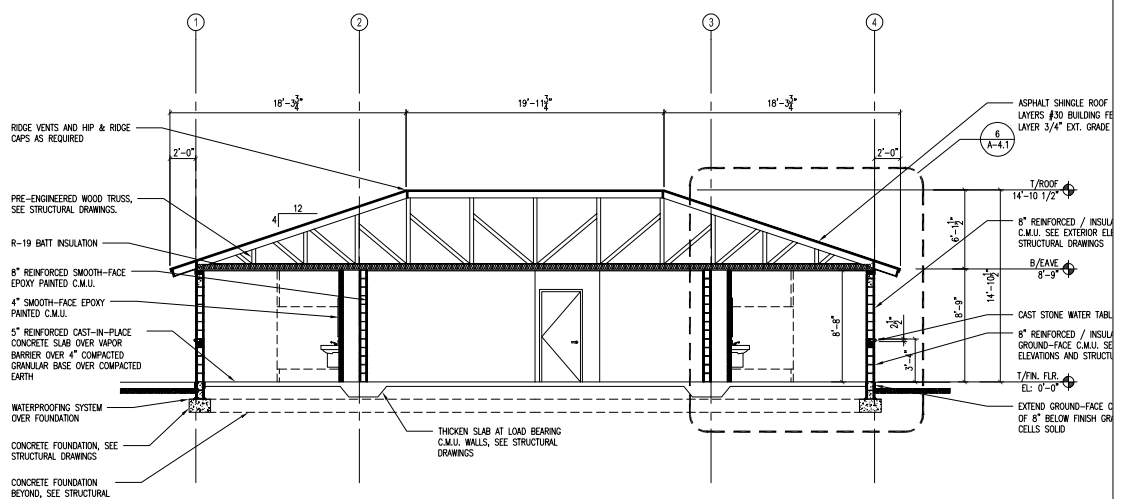
DOOR HARDWARE GROUPS: DOOR HARDWARE TO BE DETERMINED



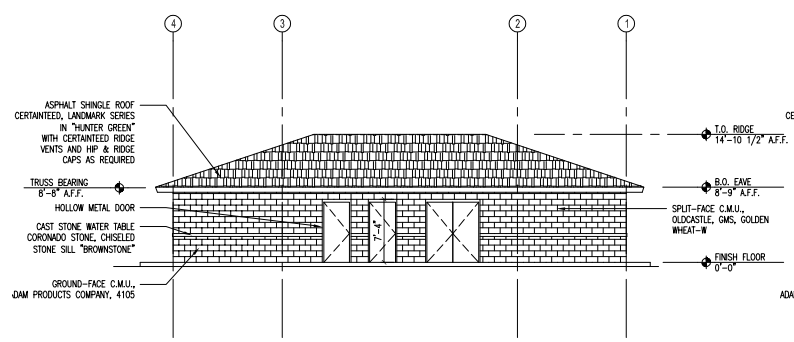
6 WALL SECTION - SKATE PARK / CONCESSIONS
A-4.1 1/4"=1'-0"



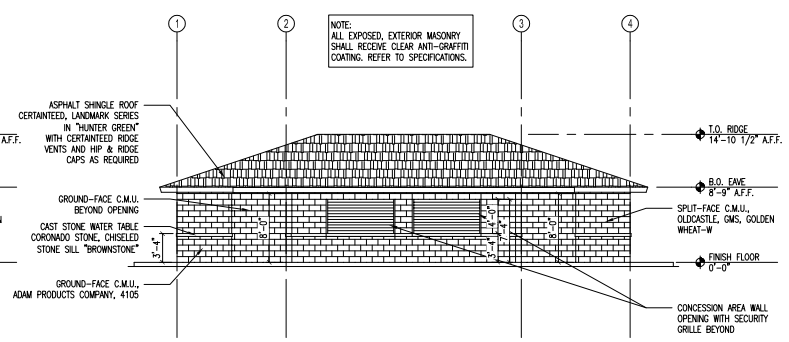
5 WALL SECTION - SKATE PARK / CONCESSIONS
A-4.1 1/4"=1'-0"



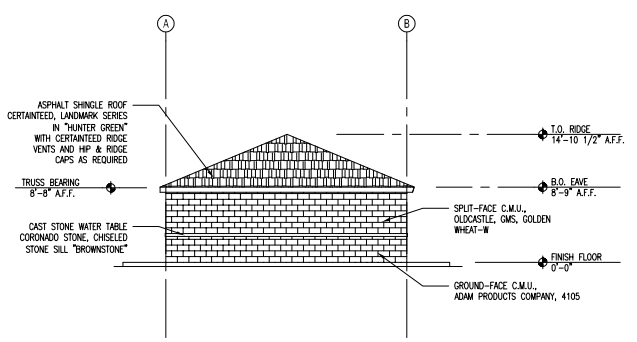
4 BUILDING SECTION - SKATE PARK / CONCESSIONS
A-4.1 3/16"=1'-0"



3 REAR ELEVATION - SKATE PARK / CONCESSIONS
A-4.1 1/8"=1'-0"



2 FRONT ELEVATION - SKATE PARK / CONCESSIONS
A-4.1 1/8"=1'-0"



1 SIDE ELEVATION - SKATE PARK / CONCESSIONS
A-4.1 1/8"=1'-0"

MACON-BIBB COUNTY
RECREATION DEPARTMENT
115 Willie Smokie Glover Drive
Macon, Georgia 31201
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FREEDOM PARK PAVILLION PACKAGE

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Stamp:

Project Name:
FREEDOM PARK CONCESSIONS BLDG
115 WILLIE SMOKIE GLOVER DRIVE
MACON, GEORGIA 31201

Project Number: 170502
Drawn By: BL Ck'd By: KC
Date: 02/26/2016 Scale: AS SHOWN

Rev:	Description:	Date:

Sheet Title:
EXTERIOR ELEVATIONS, BUILDING SECTION, WALL SECTIONS, DOOR SCHEDULE, AND DETAILS

Sheet Number:

A-4.1

GENERAL NOTES

1. LIVE LOADS
   A. ROOF (LL_R).. 20 PSF
   B. FLOORS:
      1. GROUND FLOOR.. 100 PSF

2. DESIGN WIND LOADS
   A. BASIC WIND SPEED (V_{ULT}).......................... 115 MPH
   B. NOMINAL WIND SPEED (V_{ASD})......................... 89 MPH
   C. RISK CATEGORY.......................................II
   D. WIND EXPOSURE CATEGORY "C"
   E. INTERNAL PRESSURE COEFFICIENT..........."GC_{pi}" = ±0.18
   F. COMPONENTS & CLADDING DESIGN WIND PRESSURES:

		A = EFFECTIVE WIND AREA (FT²)			
	ZONE	A=10	A=20	A=50	A=100
WALLS	CORNER (5)	+31 / -41	+30 / -39	+28 / -35	+26 / -32
	OTHER (4)	+31 / -34	+30 / -32	+28 / -30	+26 / -291
ROOF (4/12)	CORNER (3)	+19 / -79	+18 / -74	+15 / -67	+14 / -62
	EDGE (2)	+19 / -54	+18 / -49	+15 / -43	+14 / -39
	OTHER (1)	+19 / -31	+18 / -30	+15 / -29	+14 / -28

ALL PRESSURES ARE INTENDED TO BE APPLIED AND INTERPRETED IN STRICT ACCORDANCE WITH ASCE 7-10.
FOR THE PURPOSES OF APPLYING THESE LOADS IN ACCORDANCE WITH COMPONENTS & CLADDING FIGURES IN ASCE 7-10, a=3 FT.

3. SEISMIC DESIGN
   A. SEISMIC IMPORTANCE FACTOR.......................... I = 1.00
   B. MAPPED SPECTRAL RESPONSE ACCELERATIONS.............
      S_S = 0.160
      S_1 = 0.082
   C. SITE CLASS "D" ASSUMED
   D. SPECTRAL RESPONSE COEFFICIENTS.............. S_{DS}= 0.171
      S_{D1}= 0.132
   E. SEISMIC DESIGN CATEGORY "B"
   F. BASIC LATERAL FORCE RESISTING SYSTEM: ORDINARY REINF. MASONRY SHEAR WALLS & STEEL SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE.
   G. DESIGN BASE SHEAR
      BASEBALL/CONCESSIONS............ 11 KIPS
      OPEN PAVILIONS............ 1.5 KIPS
      SKATE PARK/CONCESSIONS............ 7 KIPS
      RESTROOMS............ 5 KIPS
   H. SEISMIC RESPONSE COEFFICIENT .... C_S = 0.085
   I. RESPONSE MODIFICATION FACTOR .... R = 2
   J. ANALYSIS PROCEDURE USED: EQUIVALENT LATERAL FORCE PROCEDURE FOR SEISMIC DESIGN OF BUILDINGS

4. SNOW LOADS
   A. GROUND SNOW LOAD................................"P_G" = 5 PSF

5. CODES
   A. INTERNATIONAL BUILDING CODE, 2012 ED. WITH 2014 GEORGIA AMENDMENTS.
   B. REINFORCED CONCRETE: ACI 318-11.
   C. ALL STEEL WORK SHALL COMPLY WITH APPLICABLE STANDARDS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INCLUDING THE SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS, LATEST EDITION AND THE AMERICAN WELDING SOCIETY'S STRUCTURAL WELDING CODE, AWS D1.1-LATEST EDITION.

6. CONCRETE
   A. CONCRETE SHALL BE OF NORMAL WEIGHT (150 PCF) AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS (EXCEPTIONS NOTED).
   B. CONCRETE FOR FOUNDATIONS AND EXTERIOR SLABS ON GRADE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI AT 28 DAYS.
   C. REINFORCING SHALL CONFORM TO ASTM A615-09, GRADE 60, HAVING A MIN. YIELD STRENGTH OF 60 KSI.
   D. WELDED WIRE REINFORCING (W.W.R.) SHALL BE PLAIN WIRE AND SHALL CONFORM TO ASTM A1064.

REINFORCED C.M.U. GENERAL NOTES

1. ALL MASONRY CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ASCE 6-11 ("SPECIFICATION FOR MASONRY STRUCTURES"). ALL SUPERVISORY PERSONNEL HAVING ANY CONNECTION WITH THE MASONRY WORK SHALL CERTIFY THAT THEY HAVE FAMILIARIZED THEMSELVES WITH THESE PUBLICATIONS.
2. BLOCK SHALL BE LAID IN A RUNNING BOND.
3. ALL FACE SHELLS OF BLOCKS SHALL BE COMPLETELY MORTARED IN BED JOINTS (⅝" MAX.); HEAD JOINTS SHALL BE COMPLETELY MORTARED VERTICALLY FOR SAME WIDTH AS BED JOINTS. WHERE CELLS ARE TO BE FILLED WITH GROUT, FACE AND WEB SHELLS SHALL BE COMPLETELY MORTARED EXCEPT WHERE ADJACENT CELLS ARE TO BE FILLED. WHERE ADJACENT CELLS ARE TO BE FILLED, THE WEBS COMMON TO BOTH CELLS NEED NOT BE MORTARED.
4. CONCRETE MASONRY UNITS SHALL COMPLY WITH ASTM C 90, LIGHT WEIGHT. UNIT COMPRESSIVE STRENGTH SHALL BE 1900 PSI, MINIMUM. MANUFACTURER SHALL PROVIDE A WRITTEN CERTIFICATION OF THE UNIT COMPRESSIVE STRENGTH WHICH SHALL BE SAMPLED AND TESTED IN ACCORDANCE WITH ASTM C140-03.
5. ALL BLOCK WORK BELOW THE FINISHED FLOOR ELEVATION SHALL BE LAID USING TYPE M MORTAR. ALL BLOCK WORK ABOVE THE FINISHED FLOOR ELEVATION SHALL BE LAID USING TYPE S OR TYPE M MORTAR. MORTAR SHALL COMPLY WITH ASTM C 270-04.
6. ASSUMED F'_m FOR EXTERIOR WALLS = 1500 PSI @ 28 DAYS.
7. ASSUMED F'_m FOR INTERIOR WALLS = 1500 PSI @ 28 DAYS.
8. PROVIDE CONT. HORIZONTAL REINFORCING AT 16" MAX. O.C. VERTICALLY. HORIZONTAL REINFORCING SHALL BE W1.7 (9 GA. x 9 GA.) TRUSS-TYPE JOINT REINFORCING. HORIZONTAL JOINT REINFORCING SHALL COMPLY WITH ASTM A951-02 AND SHALL BE HOT DIP GALVANIZED PER ASTM A153-03. LAP SPLICE ALL JOINT REINFORCING IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS. USE PREFABRICATED SECTIONS AT INTERSECTIONS AND CORNERS. DO NOT CUT OR BEND.
9. ALL CELLS AND VOIDS NOTED AS FILLED SHALL BE FILLED SOLID WITH GROUT CONFORMING TO ASTM C476-02. COARSE AGGREGATE SHALL NOT EXCEED 3/8" IN DIMENSION.
10. VERTICAL WALL REINFORCING WILL BE REQUIRED AS SHOWN ON PLANS AND IN DETAILS. LAP SPLICE VERTICALS 48 BAR DIAMETERS AS REQUIRED.
11. PROVIDE A CONTINUOUS GROUT FILLED BOND BEAM (WITH 2-CONTINUOUS #5'S) AT 8'-0" MAXIMUM ON CENTER VERTICALLY IN ALL 7⅝" REINFORCED MASONRY WALLS.
12. PROVIDE A CONTINUOUS GROUT FILLED BOND BEAM (WITH 2-CONTINUOUS #6'S) AT 8'-0" MAXIMUM ON CENTER VERTICALLY IN ALL 11⅝" REINFORCED MASONRY WALLS.
13. PROVIDE A CONTINUOUS GROUT FILLED BOND BEAM (WITH 2-CONTINUOUS #5'S) AT THE TOPS OF ALL 7⅝" MASONRY WALLS.
14. PROVIDE A CONTINUOUS GROUT FILLED BOND BEAM (WITH 2-CONTINUOUS #6'S) AT THE TOPS OF ALL 11⅝" MASONRY WALLS.
15. PROVIDE KNOCK-OUT BLOCKS FOR BOND BEAMS WHERE SHOWN SHOWN OR NOTED. PROVIDE U-BLOCKS FOR BOND BEAMS IN ALL OTHER WALLS.
16. PROVIDE A MINIMUM OF 1-#5 IN FULLY GROUTED CELLS EACH SIDE OF ALL OPENINGS IN 7⅝" C.M.U. WALLS. PROVIDE #5 DOWELS WITH 8" HOOKS FROM FOOTINGS. LAP SPLICES TO BE 48 BAR DIAMETERS MINIMUM, TYP. IN INTERIOR AND EXTERIOR C.M.U. WALLS. PROVIDE 1-#5 IN EACH OF 3 FULLY GROUTED CELLS AT ALL CORNERS AND INTERSECTIONS OF 7⅝" MASONRY UNITS.
17. PROVIDE A MIN. OF 1-#6 IN FULLY GROUTED CELLS EA. SIDE OF ALL OPENINGS IN 11⅝" C.M.U. WALLS. PROVIDE #6 DOWELS WITH 8" HOOKS FROM FOOTINGS. LAP SPLICES TO BE 48 BAR DIAMETERS MINIMUM, TYP. IN INTERIOR AND EXTERIOR C.M.U. WALLS. PROVIDE 1-#6 IN EACH OF 3 FULLY GROUTED CELLS AT ALL CORNERS AND INTERSECTIONS OF 11⅝" MASONRY UNITS. (EXCEPTIONS NOTED. SEE DETAILS.)
18. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATE SHORING FOR WALLS DURING CONSTRUCTION.
19. SHOP DRAWINGS SHALL BE SUBMITTED TO APPROVAL SHOWING ALL FABRICATION DIMENSIONS AND LOCATIONS FOR PLACING REINFORCING STEEL AND ACCESSORIES. SHOW WALL STEEL IN PLAN & ELEVATION. INDICATE CONTROL JOINT LOCATIONS. NO FABRICATION SHALL BEGIN UNTIL SHOP DRAWINGS ARE COMPLETED AND REVIEWED.
20. UNLESS NOTED OTHERWISE PROVIDE VERTICAL CONTROL JOINTS ACCORDING TO THE FOLLOWING CRITERIA.
    - 25'-0" ON CENTER MAXIMUM
    - 12'-0" MAXIMUM FROM BUILDING CORNERS
    - NO CLOSER THAN 1'-4" TO OPENING EDGES
    - NO CLOSER THAN 1'-4" TO BEAM OR JOIST BEARINGS.

    DISCONTINUE HORIZONTAL REINFORCING AT CONTROL JOINTS IN THE FIELD OF THE WALL, BUT NOT AT CORNERS OR INTERSECTIONS.

REINFORCED CONCRETE GENERAL NOTES

1. ALL CONCRETE WORK SHALL CONFORM TO ACI 301, "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS". DESIGN IS BASED ON ACI 318, "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE."
2. UNLESS NOTED OTHERWISE, ALL CONCRETE SHALL BE NORMAL WEIGHT AND HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI.
3. CONCRETE FOR ELEVATED FLOOR SLAB SHALL BE LIGHTWEIGHT (110 PCF) WITH MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI @ 28 DAYS.
4. SUBMIT CONCRETE MIX DESIGNS FOR REVIEW, IN ACCORDANCE WITH ACI 318 TO THE ARCHITECT AND TESTING AGENCY.
5. THE PROPOSED MATERIALS AND MIX DESIGN SHALL BE FULLY DOCUMENTED AND REVIEWED. RESPONSIBILITY FOR OBTAINING THE REQUIRED DESIGN STRENGTH IS THE CONTRACTOR'S.
6. USE OF CALCIUM CHLORIDE, CHLORIDE IONS, OR OTHER SALTS IN CONCRETE IS NOT PERMITTED.
7. THE AIR CONTENT AT THE POINT OF PLACEMENT SHALL BE PER ACI 318 TABLE 4.2.1 FOR MODERATE EXPOSURE. HARD TROWELED SLABS OR SLABS ON GRADE THAT WILL RECEIVED TOPPINGS SHALL NOT RECEIVE AIR ENTRAINMENT UNLESS PERMITTED BY TOPPING MANUFACTURER.
8. THE TESTING AGENCY SHALL SAMPLE AND TEST EACH 100 CU. YARDS OR FRACTION THEREOF OF EACH CLASS OF CONCRETE PLACED EACH DAY. SAMPLE CONCRETE IN ACCORDANCE WITH ASTM C172. PERFORM THE FOLLOWING TESTS IN ACCORDANCE WITH THE INDICATED STANDARD:

   SLUMP: ASTM C143
   AIR CONTENT: ASTM C231 (NORMAL WEIGHT CONCRETE)
   ASTM C173 (LIGHT WEIGHT CONCRETE)
   COMPRESSIVE STRENGTH: ASTM C39, WITH ONE CYLINDER AT 7 DAYS, 2 CYLINDERS AT 28 DAYS, AND ONE SPECIMEN HELD IN RESERVE.
   CONCRETE TEMPERATURE: ASTM C1064
   UNIT WEIGHT: ASTM C567
9. MOIST CURE CONCRETE WITH MOISTURE PROTECTIVE COVER FOR A MINIMUM OF 7 DAYS.
10. HORIZONTAL CONSTRUCTION JOINTS ARE PERMITTED ONLY WHERE INDICATED. THE LOCATION OF VERTICAL CONSTRUCTION JOINTS SHALL BE APPROVED BY THE ARCHITECT. CONSTRUCTION JOINTS SHALL BE THOROUGHLY ROUGHENED BY MECHANICAL MEANS, CLEANED, AND CAULKED.
11. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60, UNLESS NOTED OTHERWISE.
12. WELDED WIRE REINFORCING (W.W.R.) SHALL CONFORM TO ASTM A185 AND SHALL BE PROVIDED IN FLAT SHEETS. LAP MESH 24" MINIMUM AT SPLICES.
13. TIE ALL REINFORCING STEEL AND EMBEDMENTS SECURELY IN PLACE PRIOR TO PLACING CONCRETE. PROVIDE SUFFICIENT SUPPORTS TO MAINTAIN THE POSITION OF REINFORCEMENT WITHIN SPECIFIED TOLERANCES DURING ALL CONSTRUCTION ACTIVITIES. "STICKING" DOWELS INTO WET CONCRETE IS NOT PERMITTED.
14. REINFORCING STEEL SHALL HAVE THE FOLLOWING CONCRETE COVER UNLESS NOTED OTHERWISE:

   CONCRETE CAST AGAINST EARTH (NOT FORMED): 3"
   FORMED CONCRETE EXPOSED TO EARTH OR WEATHER
   #6 BARS THROUGH #12 BARS 2"
   #5 BARS AND SMALLER 1½"
   CONCRETE NOT EXPOSED TO EARTH OR WEATHER
   SLABS AND WALLS 1"
15. DO NOT PLACE PIPES EXCEEDING ONE-THIRD THE SLAB OR WALL THICKNESS WITHIN THE SLAB OR WALL UNLESS SPECIFICALLY SHOWN AND DETAILED ON STRUCTURAL DRAWINGS.
16. DO NOT WELD OR TACK WELD REINFORCING STEEL UNLESS APPROVED OR DIRECTED BY THE STRUCTURAL ENGINEER.
17. EXTERIOR SLABS SHALL DRAIN FREELY WITH A MAXIMUM VARIATION FROM THE INDICATED PLANE OF ¼" PER 1'-0".

REINF. CONCRETE GENERAL NOTES (CONT.)

18. FLOOR SLAB FLATNESS AND LEVELNESS SHALL BE MEASURED WITHIN 48 HOURS OF SLAB INSTALLATION BY THE OWNER'S REPRESENTATIVE. RESULTS SHALL BE PROVIDED TO THE CONTRACTOR WITHIN 72 HOURS OF SLAB INSTALLATION. TESTING SHALL COMPLY WITH ASTM E1155.

    OVERALL VALUES:
    F(F)=30 FOR ALL AREAS WITH THINSET FINISHES
    F(F)=25 FOR ALL OTHER AREAS
    LEVELNESS, F(L)=20
    LEVELNESS TESTING IS NOT REQUIRED AT ELEVATED SLABS.
    IF VALUES DO NOT MEET THE ABOVE CRITERIA, CONTACT PROJECT ARCHITECT IMMEDIATELY FOR REMEDIAL MEASURES.

STRUCTURAL STEEL GENERAL NOTES

1. ALL STRUCTURAL STEEL CONSTRUCTION SHALL CONFORM TO THE 2005 AISC "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" AND THE "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES."
2. UNLESS NOTED OTHERWISE:
   2.A. STEEL SHALL CONFORM TO ASTM A36 (36 KSI YIELD STRENGTH), EXCEPTIONS NOTED.
   2.B. ALL WIDE FLANGE SHAPES SHALL CONFORM TO ASTM A992 (50 KSI YIELD STRENGTH).
   2.C. ALL HSS SECTIONS SHALL CONFORM TO ASTM A500 (46 KSI YIELD STRENGTH).
   2.D. ELECTRODES SHALL CONFORM TO E70-XX.
   2.E. ALL BOLTS TO BE A325X, WITH THREADS EXCLUDED FROM THE SHEAR PLANE.
   2.F. ALL ANCHOR RODS SHALL CONFORM TO ASTM F1554 (36 KSI YIELD STRENGTH) WITH HEAVY HEX NUTS AND STANDARD WASHERS.
   2.G. ALL PL.'S SHALL BE SUPPLIED FREE OF LAMINATIONS & IMPURITIES & SHALL CONFORM TO ASTM A36, U.N.O.
   2.H. ALL MOMENT CONNECTION PLATES (TOP, BOTTOM, STIFFENER, & CONNECTING CAP PL.'S) SHALL CONFORM TO ASTM A 572, GRADE 50. THESE PLATES SHALL BE CLEARLY MARKED FOR EASE OF IDENTIFICATION.
3. HEADED ANCHORS AND SHEAR CONNECTORS (STUDS) SHALL CONFORM TO ASTM A108.
4. SHOP DRAWINGS PREPARED IN ACCORDANCE WITH THE LATEST "STRUCTURAL STEEL DETAILING MANUAL" OF AISC SHALL BE SUBMITTED FOR APPROVAL. NO FABRICATION SHALL BEGIN UNTIL SHOP DRAWINGS ARE COMPLETED AND APPROVED.
5. STEEL FRAMING CONNECTIONS SHALL BE BOLTED OR WELDED, AS INDICATED.
   5.A. BOLTED JOINTS SHALL CONFORM TO AISC "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS". BOLTS SHALL CONFORM TO ASTM A325 AND SHALL BE MINIMUM ¾" DIAMETER, UNLESS NOTED OTHERWISE.
   5.B. WELDS SHALL CONFORM TO THE "STRUCTURAL WELDING CODE" OF THE AMERICAN WELDING SOCIETY, AWS D1.1. USE E70XX ELECTRODES. WEDING PROCESSES AND OPERATORS SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATIONS PROCEDURES". WELDERS SHALL CARRY PROOF OF QUALIFICATIONS TO JOBSITE.
6. ANCHOR RODS SHALL CONFORM TO ASTM F1554, GRADE 36, WELDABLE UNLESS NOTED OTHERWISE.
7. PROVIDE SHOP COAT OF STANDARD PRIMER PAINT. PRIMER TO BE COMPATIBLE WITH FINISH COAT. TOUCH-UP AREAS DAMAGED IN HANDLING AND ERECTION WITH THE SAME PAINT USED FOR SHOP COAT. STEEL SURFACES TO BE WELDED OR ENCASED IN CONCRETE OR FIREPROOFING, OR SURFACES RECEIVING WELDED SHEAR CONNECTORS SHALL NOT BE PAINTED.
8. PROVIDE A NON-SHRINK, NON-METALLIC, SELF-LEVELING GROUT (F'c = 5000 PSI, MIN.) UNDER BASE PLATES, AFTER SETTING AND LEVELING. NO "DRY-PACKING" PERMITTED.
9. PROVIDE TEMPORARY BRACING OF STRUCTURAL FRAMING UNTIL ALL PERMANENT BRACING, MOMENT CONNECTIONS AND FLOOR AND ROOF DECKS (DIAPHRAGMS) ARE COMPLETELY INSTALLED. THE STRUCTURAL ELEMENTS ARE UNSTABLE UNTIL THE STRUCTURE IS COMPLETED IN ACCORDANCE WITH THE PLANS.

WOOD FRAMING

1. ALL STRUCTURAL WOOD FRAMING MEMBERS SHALL BE SOUTHERN YELLOW PINE NO. 2 GRADE OR BETTER, U.N.O.
2. ALL WALL STUDS SHALL BE S.P.F. NO. 2 OR BETTER. ALL WALLS SHALL HAVE HORIZONTAL 2X BLOCKING AT 4'-0" MAXIMUM O.C. BLOCKING SHALL BE SAME SIZE AND GRADE AS WALL STUDS.
3. ALL MEMBERS IN CONTACT WITH CONCRETE OR MASONRY SHALL BE PRESSURE TREATED.
4. ALL CONNECTORS SHALL BE AS MANUFACTURED BY SIMPSON STRONG TIE, OR APPROVED EQUAL.
5. ALL CONNECTORS SHALL BE INSTALLED WITH FASTENER TYPE AND QUANTITY AS PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
6. WHERE MANUFACTURER LISTS OPTIONS FOR NO. OF FASTENERS USED, USE MAX. NO. UNLESS SPECIFICALLY INDICATED OTHERWISE.
7. SEE SHEET SUBSEQUENT SHEETS FOR TRUSS NOTES AND DIAGRAMS.
8. DIMENSIONAL LUMBER CONNECTIONS NOT SPECIFICALLY CALLED OUT ON THESE DRAWINGS SHALL HAVE THE MINIMUM SIZE AND NUMBER OF FASTENERS AS REQUIRED IN CHAPTER 23 OF THE INTERNATIONAL BUILDING CODE, 2012 ED. WITH 2015 AMENDMENTS.
9. ROOF SHEATHING SHALL BE 5/8" CDX EXTERIOR GRADE PANELS FASTENED WITH 12D NAILS @ 8" MAX. O.C. BLOCK ALL PANEL EDGES WITHIN 6'-0" OF EAVES AND RIDGES AND NAIL SHEATHING TO BLOCKING WITH 12D NAILS SPACED AT 6" MAX. O.C.

SOIL PARAMETERS

1. FOOTINGS ARE DESIGNED FOR A MINIMUM ALLOWABLE SOIL BEARING PRESSURE OF 2500 POUNDS PER SQUARE FOOT. IF SITE CONDITIONS INDICATE OTHERWISE, THE PROJECT ARCHITECT SHALL BE NOTIFIED IMMEDIATELY.
2. SPECIFIC SITE PREPARATION AND STRUCTURAL FILL REQUIREMENTS ARE REQUIRED TO BRING THE SITE UP TO GRADE AND SUPPORT THE BEARING PRESSURE INDICATED. SEE. REQUIREMENTS OUTLINED IN THE GEOTECHNICAL REPORT DESCRIBED BELOW.
3. IF SITE CONDITIONS DIFFER FROM THOSE REPORTED, THE PROJECT ARCHITECT SHALL BE NOTIFIED IMMEDIATELY.
4. NOTE THAT SOME FOOTINGS WILL BE PLACED ON STRUCTURAL FILL. FILL SHOULD BE PLACED AND MONITORED IN STRICT ACCORDANCE WITH THE SPECIFICATIONS.

LINTEL SCHEDULE

FOR EACH 4" OF BRICKWORK

SPAN	LINTEL
0'-0" TO 1'-0"	FB 3 1/2 x 1/4
OVER 1'-0" TO 6'-0"	L 6 x 6 x 5/16
OVER 6'-0" TO 10'-0"	L 6 x 6 x 3/8
OVER 10'-0" TO 12'-0"	L 6 x 6 x 3/8 (ANCHORED TO BLOCK, SEE NOTE 8)

NOTE!
TO MAINTAIN REQUIRED REINFORCING LOCATIONS, A TRUE 'LINTEL BEAM' (WITH NO WEBS) IS REQUIRED. CONTRACTOR TO COORDINATE.

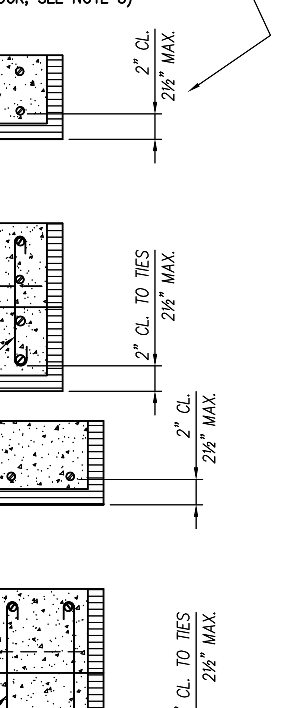
FOR CONCRETE BLOCK (C.M.U.)

FOR EACH 8" WYTHE OR FRACTION THEREOF

SPAN		LINTEL
LINTEL ONE COURSE DEEP		
0' TO 3'-0"		1-#4 T; 1-#5 B
OVER 3'-0" TO 5'-0"		1-#5 T; 1-#6 B
MULTI-COURSE LINTELS		
OVER 5'-0" TO 7'-0"	2 COURSES DEEP	2-#6 T; 2-#7 B
OVER 7'-0" TO 11'-0"	2 COURSES DEEP	2-#8 T; 2-#9 B
OVER 11'-0" TO 14'-0"	3 COURSES DEEP	2-#9 T; 2-#9 B

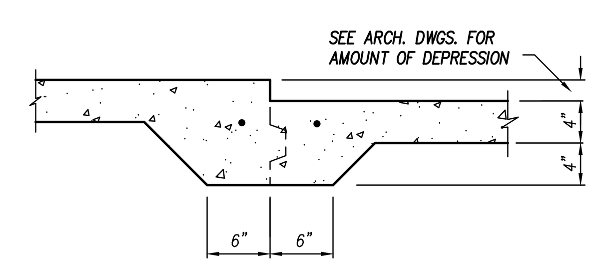
FOR EACH 12" WYTHE OR FRACTION THEREOF

SPAN		LINTEL
LINTEL ONE COURSE DEEP		
0' TO 3'-0"		2-#5 B
OVER 3'-0" TO 5'-0"		2-#6 B
MULTI-COURSE LINTELS		
OVER 5'-0" TO 8'-6"	2 COURSES DEEP	2-#6 T; 2-#7 B
OVER 8'-6" TO 10'-0"	2 COURSES DEEP	2-#8 T; 2-#7 9



NOTES:

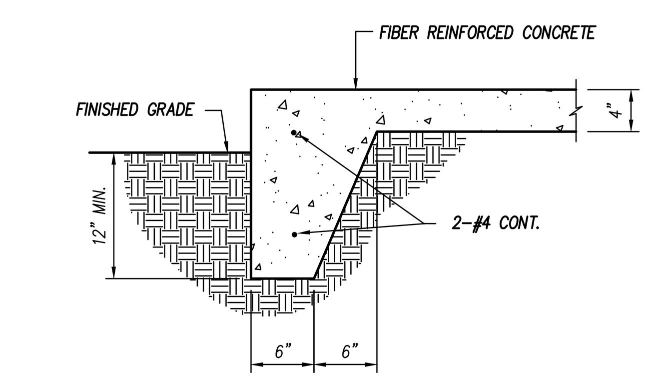
1- LINTELS SCHEDULED ABOVE SHALL BE USED UNLESS SHOWN OR NOTED OTHERWISE.
2- STEEL LINTELS SUPPORTING BRICK SHALL HAVE 1" BEARING, EACH END, FOR EACH 1'-0" OF SPAN, BUT NOT LESS THAN 6" BEARING, EACH END.
3- C.M.U. LINTELS AND REINFORCING SHALL EXTEND PAST EACH SIDE OF OPENING 48 BAR DIAMETERS (BASED ON LARGEST BAR) WHERE SPACE PERMITS. WHERE SPACE DOES NOT PERMIT EXTENSION, BEND BARS 90° INTO FULLY GROUTED CELL EACH SIDE OF OPENING.
4- CONCRETE BLOCK (C.M.U.) LINTELS SHALL BE MADE WITH FILLED "U" BLOCKS, EXCEPT AS NOTED. FILL SHALL BE COARSE GROUT CONFORMING TO ASTM C476, ⅜" MAXIMUM STONE SIZE. SHORE POURED LINTELS 7 DAYS, MINIMUM.
5- WHERE C.M.U. LINTEL SPAN ≥ 6'-0" IN 7⅝" MASONRY WALLS, FILL CELLS OF CONCRETE BLOCK UNDER EACH BEARING FOR 16" LENGTH FROM FOOTING TO TOP OF WALL & PROVIDE 1-#5 (MIN.) VERTICAL BAR IN EACH OF 2 FILLED CELLS, EACH SIDE OF EACH OPENING. WHERE C.M.U. LINTEL SPAN < 6'-0" IN 7⅝" MASONRY WALLS, FILL CELLS OF CONCRETE BLOCK UNDER EACH BEARING FOR 8" LENGTH FROM FOOTING TO TOP OF WALL & PROVIDE 1-#5 (MIN.) VERTICAL BAR, EACH SIDE OF OPENING, IN FILLED CELL. EXTEND ALL VERTICALS FROM FOOTING MAT TO BOND BEAM AT TOP OF WALL.
6- WHERE C.M.U. LINTEL SPAN ≥ 6'-0" IN 11⅝" MASONRY WALLS, FILL CELLS OF CONCRETE BLOCK UNDER EACH BEARING FOR 16" LENGTH FROM FOOTING TO TOP OF WALL & PROVIDE 1-#6 VERTICAL BAR IN EACH OF 2 FILLED CELLS, EACH SIDE OF EACH OPENING. WHERE C.M.U. LINTEL SPAN < 6'-0" IN 11⅝" MASONRY WALLS, FILL CELLS OF CONCRETE BLOCK UNDER EACH BEARING FOR 8" LENGTH FROM FOOTING TO TOP OF WALL & PROVIDE 1-#6 VERTICAL BAR, EACH SIDE OF OPENING, IN FILLED CELL. EXTEND ALL VERTICALS FROM FOOTING MAT TO BOND BEAM AT TOP OF WALL.
7- WHERE C.M.U. LINTEL SPAN ≥ 12'-0" IN 11⅝" MASONRY WALLS, FILL CELLS OF CONCRETE BLOCK UNDER EACH BEARING FOR 24" LENGTH FROM FOOTING TO TOP OF WALL & PROVIDE 1-#6 VERTICAL BAR IN EACH OF 3 FILLED CELLS, EACH SIDE OF EACH OPENING. EXTEND ALL VERTICALS FROM FOOTING MAT TO BOND BEAM AT TOP OF WALL.
8- TYPICAL BRICK SUPPORT @ OPENINGS > 10'-0" IN C.M.U. WALLS: PROVIDE LINTEL L6x6x⅜. ATTACH TO FULLY GROUTED C.M.U. LINTEL WITH ½"ø HAS-E THREADED RODS @ 24" MAX. O.C. EMBED 4¼" MINIM IN HILTI HY200 MAX EPOXY ANCHORING SYSTEM. LOCATE ROD IN CENTER OF CELL.



PROVIDE METAL KEYWAY, CONT. REINF., CORNER BARS ETC. WHERE FJ OCCURS @ SAME LOCATION AS SLAB DEPRESSION.

TYPICAL SLAB DEPRESSION

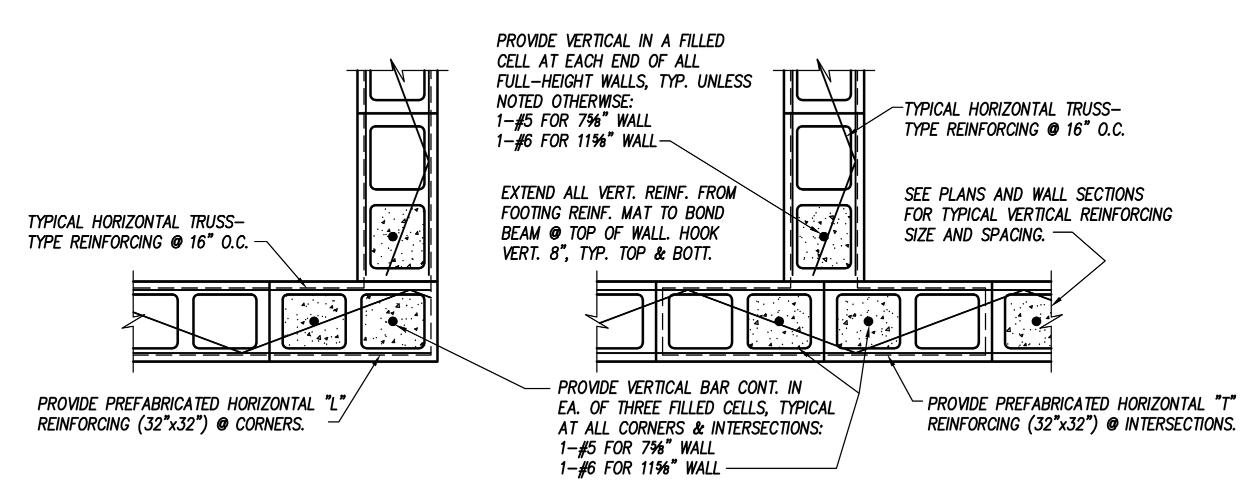
SCALE : 1"=1'-0"



USE @ EXPOSED EDGES OF ALL EXTERIOR SLABS

TYPICAL EXTERIOR SLAB TURNDOWN

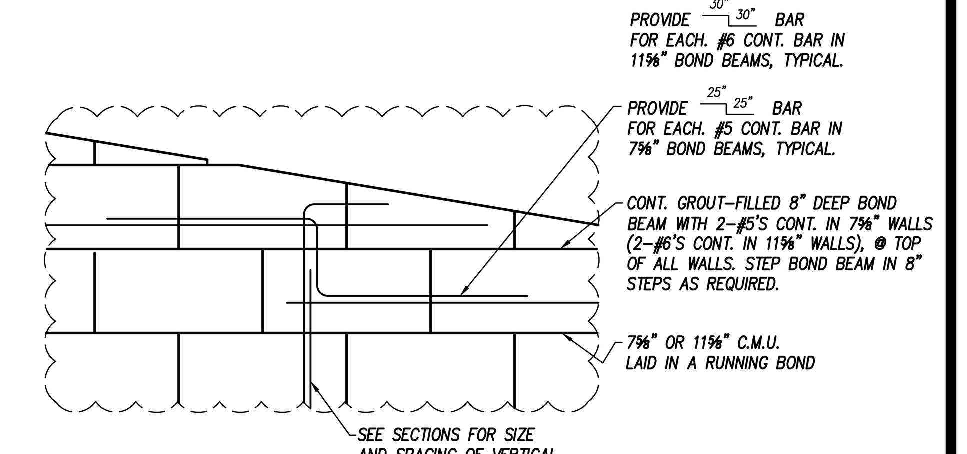
SCALE : 1"=1'-0"



TYP. CORNER TYP. INTERSECTION

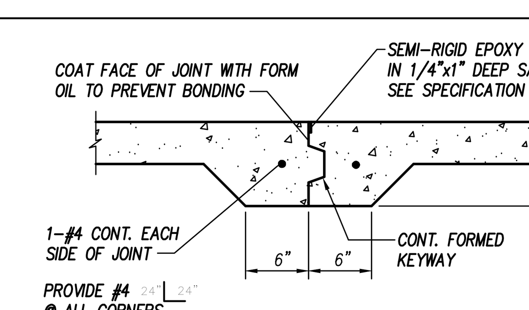
WALL THICKNESS VARIES, SEE PLANS AND ARCH DWGS.

PLAN DETAILS @ WALL INTERSECTIONS



TYPICAL BOND BEAM STEP

INTERIOR CONCRETE SLAB ON GRADE JOINTING NOTES & DETAILS

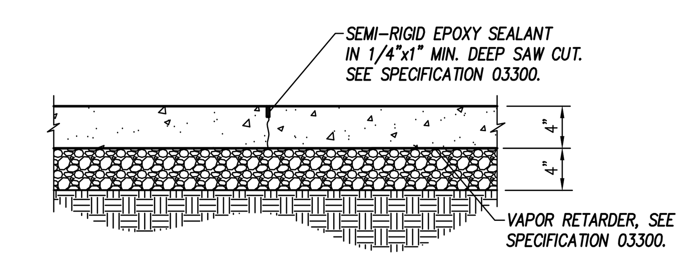


TYPICAL CONSTRUCTION JOINT (FJ) DETAIL

SCALE: 1"=1'-0"

THIS DETAIL MAY BE USED AT THE CONTRACTOR'S DISCRETION WHERE A CONSTRUCTION JOINT IN THE SLAB IS REQUIRED.
ALL CONSTRUCTION JOINTS AND SAWCUT FLOOR JOINTS SHALL BE LOCATED ON THE SUBMITTAL DESCRIBED AT RIGHT.

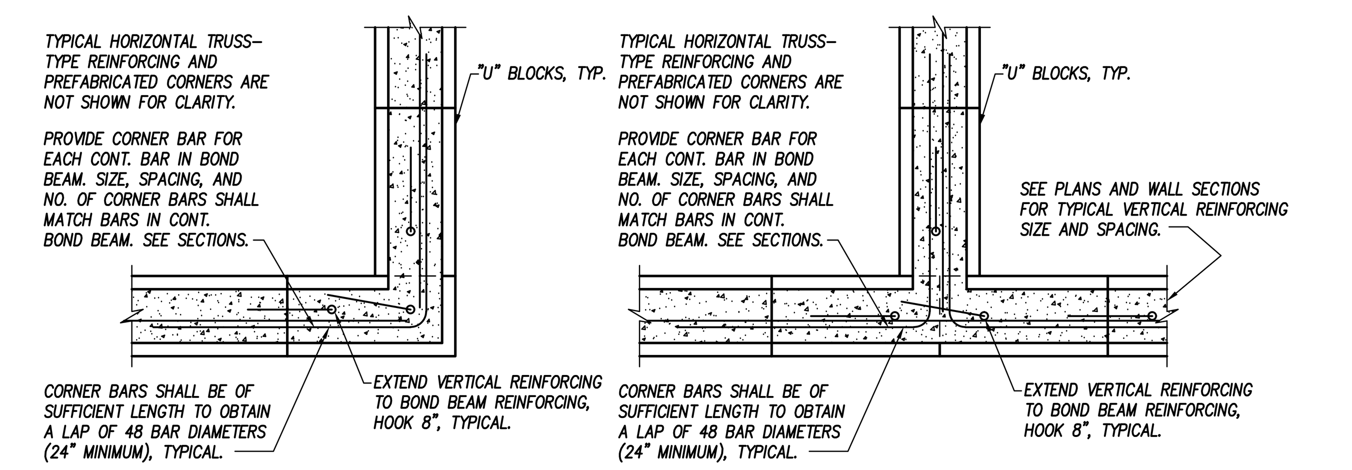
ISOLATION JOINTS ARE REQUIRED BETWEEN THE SLAB AND ADJOINING BUILDING ELEMENTS SUCH AS WALLS & COLUMNS. ISOLATION JOINTS SHALL BE FORMED BY INSERTING THE SPECIFIED PREFORMED EXPANSION JOINT MATERIAL (P.E.J.) BETWEEN THE SLAB AND THE ADJOINING ELEMENT. WHERE REQUIRED BY THE ARCHITECT, THE TOP OF THE P.E.J. SHALL BE REMOVED AND CAULKED WITH AN ELASTOMERIC SEALANT.



SAWCUT FLOOR JOINT (FJ) DETAIL

SCALE: 1"=1'-0"

THE CONTRACTOR SHALL SUBMIT A FLOOR JOINT LAYOUT & PLACING SEQUENCE FOR REVIEW A MINIMUM OF 3 WEEKS PRIOR TO SLAB POUR.
JOINTING LAYOUT AND SEQUENCE SHALL CONFORM TO ACI 302.
THE SLAB MAY BE POURED MONOLITHICALLY (IN LIEU OF KEYED JOINTS) PROVIDED THAT THE JOINTS ARE CUT AS SOON AS THE SLAB CAN SUPPORT AN OPERATOR AND EQUIPMENT (BUT NO MORE THAN 4 HOURS AFTER THE POUR). SAW CUT JOINTS SHOULD BE A MIN. OF 1" DEEP FOR A 4" THICK SLAB AND SHALL BE LOCATED AT 15'-0" MAX. ON CENTER. JOINTS SHOULD BE LOCATED SUCH THAT THE SIDE RATIO OF EACH AREA DOES NOT EXCEED 3:2. HOWEVER A RATIO OF 1:1 IS PREFERRED. PROVIDE EITHER A SAW CUT JOINT OR 2-#4'S x 6'-0" AT ALL INTERIOR CORNERS AND DISCONTINUOUS JOINTS.



TYP. CORNER TYP. INTERSECTION

WALL THICKNESS VARIES, SEE PLANS AND ARCH DWGS.

PLAN DETAILS @ BOND BEAM INTERSECTIONS

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SHEET TITLE

FREEDOM PARK
BOYS BASEBALL FIELDS

LOCATED IN LAND LOTS 2 AND 3 OF THE 11TH DISTRICT

STRUCTURAL DESIGN BY PI-TECH, INC.
GEORGIA REGISTERED No. 035676 PROFESSIONAL ENGINEER MATTHEW N. ELLIS
For The Firm Travis Pruitt & Associates, Inc.

DATE:	10-24-2017
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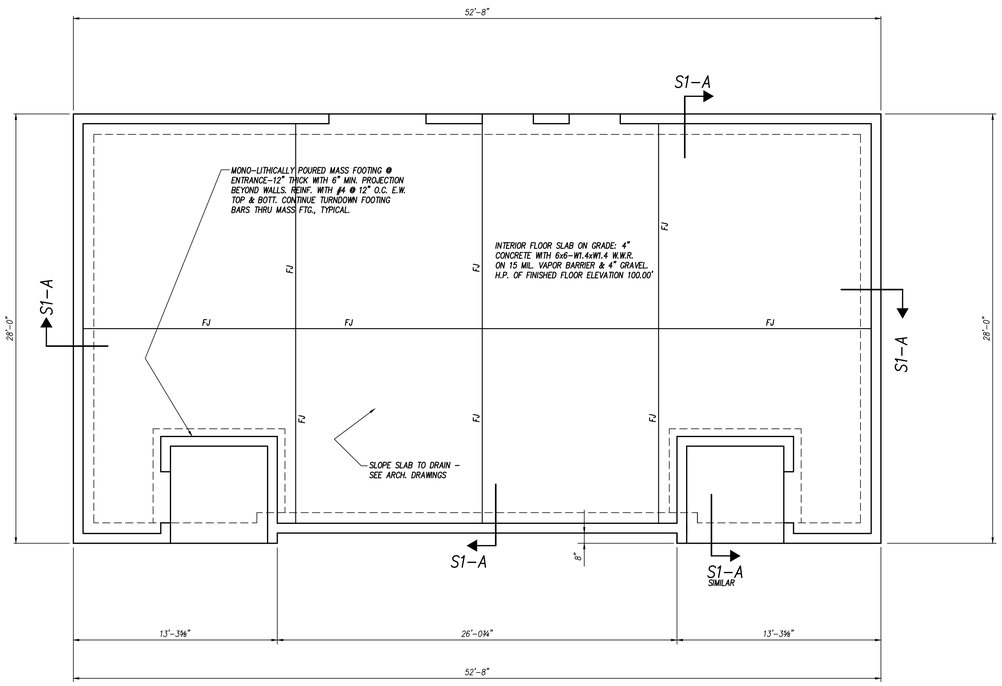
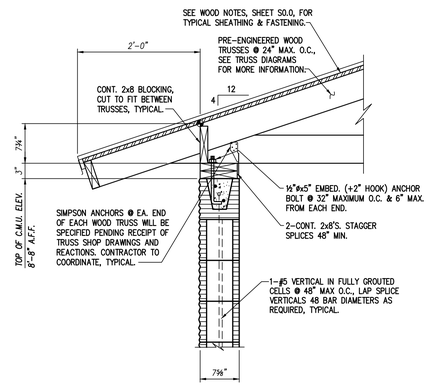


FOUNDATION PLAN – BASEBALL CONCESSIONS

SCALE: ¼"=1'-0"



S1-B

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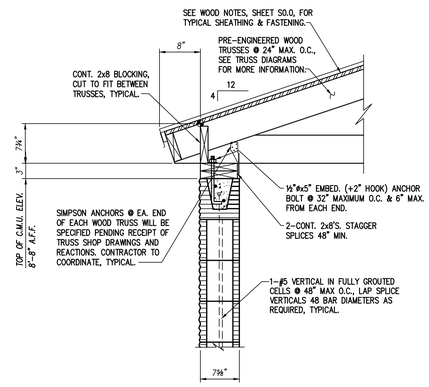

S1-D

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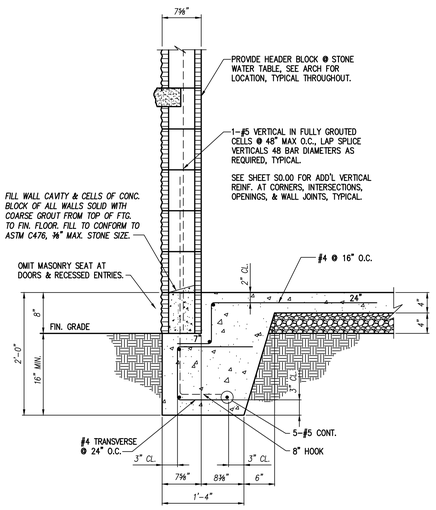
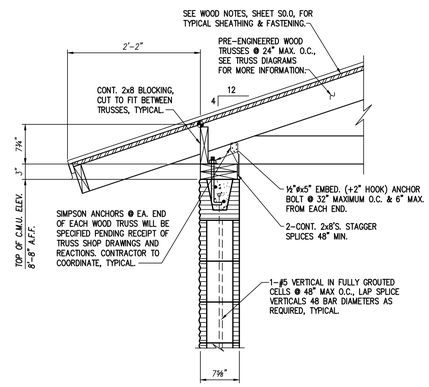


S1-A

TYPICAL EDGE OF SLAB TURNDOWN

SCALE: 1"=1'-0"



S1-C

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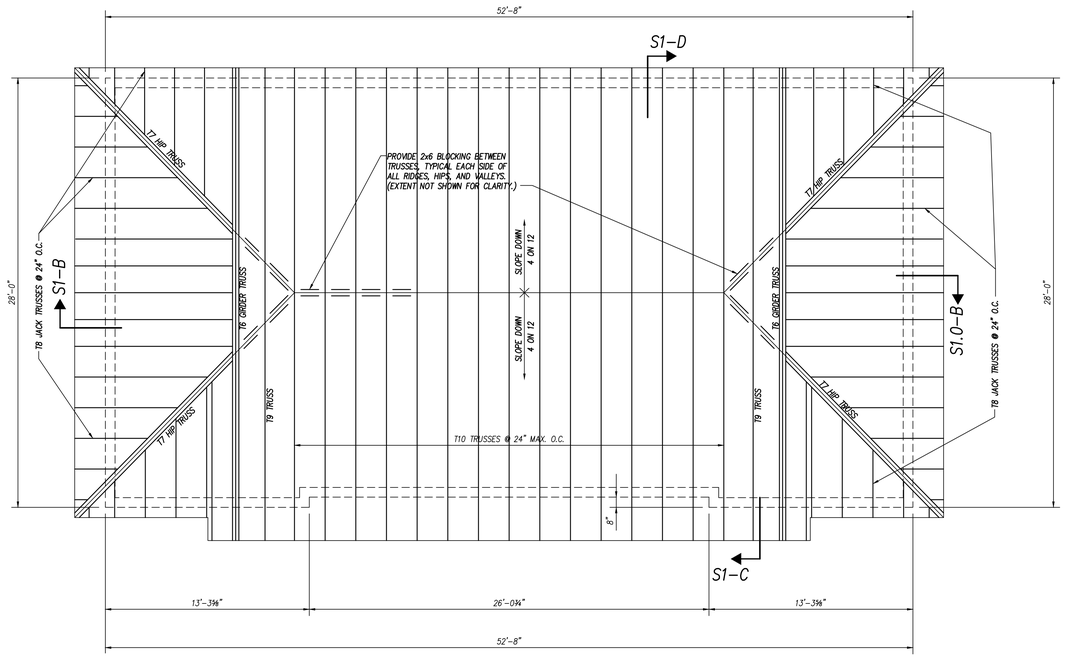

ROOF FRAMING PLAN – BASEBALL CONCESSIONS

SCALE: ¼"=1'-0"

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CT

STRUCTURAL DESIGN BY PI-TECH, INC.

GEORGIA REGISTERED No. 029870 PROFESSIONAL ENGINEER MATTHEW N. ELLIS

For The Firm Travis Pruitt & Associates, Inc.

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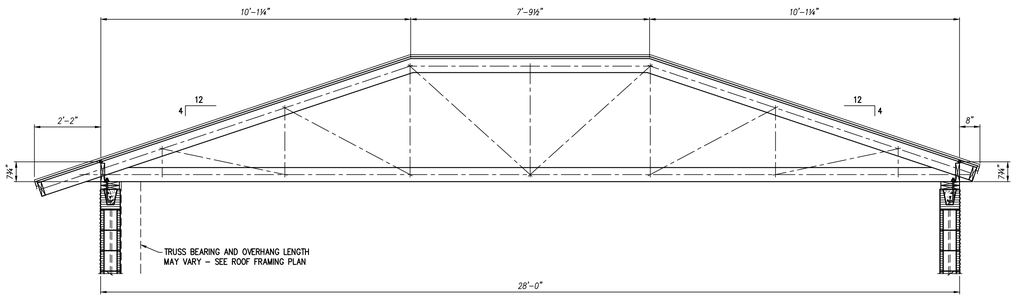

T6 GIRDER TRUSS

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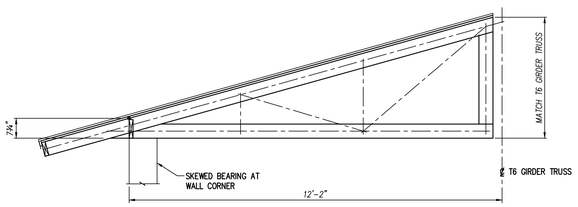

T7 HIP TRUSS

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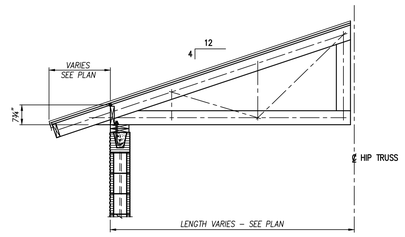

T8 JACK TRUSS

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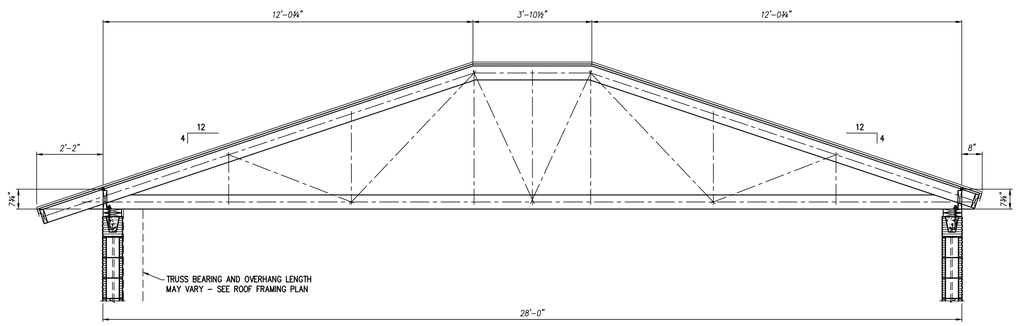

T9 TRUSS

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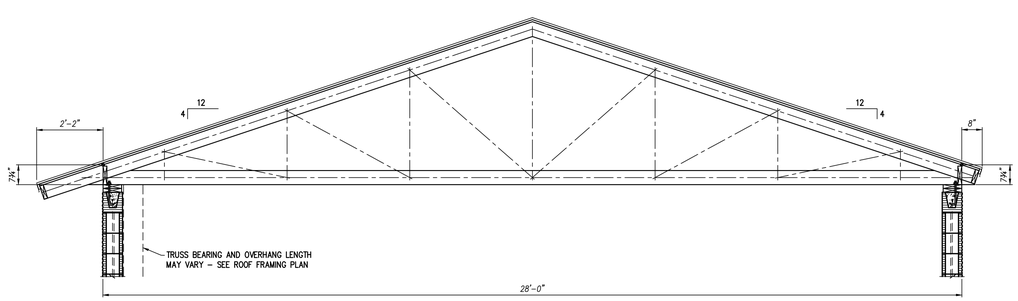

T10 TRUSS

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PREFABRICATED WOOD TRUSS GENERAL NOTES

1. TRUSS DIAGRAMS AND ROOF FRAMING PLAN ARE TO BE FOLLOWED FOR OVERALL DIMENSIONS AND GENERAL CONFIGURATION. SPECIFICS OF CONFIGURATION AND MEMBER SIZES ARE TO BE DETERMINED BY TRUSS MANUFACTURER'S ENGINEER, WITH MINIMUM SIZES AS SPECIFIED BELOW.
2. TRUSS DESIGN SHALL BE PERFORMED BY AN ENGINEER, EMPLOYED BY THE TRUSS MANUFACTURER, LICENSED TO PRACTICE IN THE STATE OF GEORGIA. DESIGN CALCULATIONS AND SHOP DRAWINGS SHALL BEAR SAID ENGINEER'S SEAL, AND SHALL BE SUBMITTED FOR REVIEW. TRUSS ENGINEER TO DESIGN AND SPECIFY ALL TRUSS-TO-TRUSS CONNECTIONS.
3. DESIGN SHALL CONFORM TO APPLICABLE STANDARDS OF THE STANDARD BUILDING CODE AND THE TRUSS PLATE INSTITUTE, INCLUDING THE NATIONAL DESIGN STANDARD FOR METAL PLATE CONNECTED WOOD TRUSS CONSTRUCTION.
4. DEAD LOADS, SNOW LOADS, LIVE LOADS, ROOF LIVE LOADS, SEISMIC LOADS AND WIND LOADS (AND THEIR COMBINATIONS) TO BE IN ACCORDANCE WITH THE ABOVE REFERENCED CODE. SEE ALSO, SHEET S0.
5. MEMBER SIZES ARE TO BE DETERMINED BY TRUSS ENGINEER'S CALCULATIONS, BUT MINIMUM SIZES FOR TOP AND BOTTOM CHORDS TO BE 2x6. MINIMUM SIZE FOR ALL WEB MEMBERS TO BE 2x4 U.N.O. ALL MEMBERS FOR ALL TRUSSES TO BE #2 OR BETTER, SOUTHERN YELLOW PINE.
6. MINIMUM SIZES SHOWN ABOVE SHALL NOT PRECLUDE A COMPLETE DESIGN AND ANALYSIS OF THE ROOF SYSTEM AND INDIVIDUAL TRUSSES. MEMBER SIZES LARGER THAN THOSE SHOWN ABOVE SHALL BE USED IF INDICATED BY TRUSS ENGINEER'S CALCULATIONS. USE MULTIPLE PLY TRUSSES FOR GIRDER TRUSSES AS REQUIRED.
7. ALL TRUSSES SHALL BE FABRICATED IN THE MANUFACTURER'S SHOP AND DELIVERED ASSEMBLED TO THE JOB SITE. TRUSSES SHALL BE LOADED AND UNLOADED ACCORDING TO LIFTING DIRECTIONS GIVEN BY THE TRUSS ENGINEER. "DUMPING" OF TRUSSES SHALL BE GROUNDS FOR REJECTION, AS WILL ANY OTHER DAMAGE CAUSED BY FABRICATION, TRANSPORTING OR HANDLING OF TRUSSES.
8. TRUSSES SHALL BE ERECTED BY THE MANUFACTURER'S REPRESENTATIVE AT THE DIRECTION OF THE TRUSS ENGINEER, EITHER IN PERSON OR BY SPECIFIC DIRECTIONS SHOWN ON SHOP DRAWINGS.
9. SHOP DRAWINGS MUST BE SUBMITTED TO THE ARCHITECT FOR REVIEW PRIOR TO COMMENCEMENT OF ANY FABRICATION. SHOP DRAWINGS SHALL SHOW ALL DETAILS, DIMENSIONS, SIZES AND DESIGN CALCULATIONS NECESSARY TO FABRICATE AND ERECT TRUSSES AND ALL ASSOCIATED ACCESSORIES.
10. ALL TRUSSES SHALL BE ANCHORED TO RESIST UPLIFT (10 PSF MIN NET UPLIFT) AND HORIZONTAL FORCES COMPUTED BY TRUSS ENGINEER AS SHOWN ON SHOP DRAWINGS. CONNECTIONS, ANCHORAGE, AND ALL ACCESSORIES TO BE FURNISHED & INSTALLED BY CONTRACTOR.
11. ROOF TRUSSES SHALL BE DESIGNED FOR ALL HVAC ROOF TOP UNITS. COORDINATE LOCATIONS WITH ARCH.

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SHEET TITLE

FREEDOM PARK
BOYS BASEBALL FIELDS

LOCATED IN LAND LOTS 2 AND 3 OF THE 11TH DISTRICT

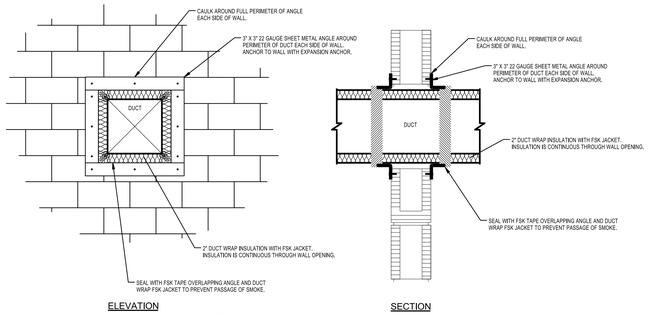
STRUCTURAL DESIGN BY
PI-TECH, INC.

GEORGIA REGISTERED No. 026676 PROFESSIONAL ENGINEER MATTHEW N. ELLIS

For The Firm Travis Pruitt & Associates, Inc.

DATE:	10-24-2017
SCALE:	NOTED
CN:	CN
LSV:	SHEET-LSV
JN:	JN
FN:	FN
INDEX No.	S-2
SHEET No.	1

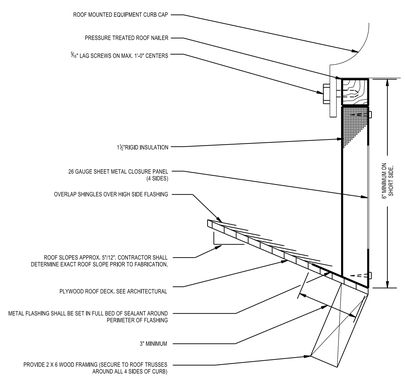
NOT RELEASED FOR CONSTRUCTION



NOTE: DETAIL IS SIMILAR FOR UNINSULATED DUCTS.

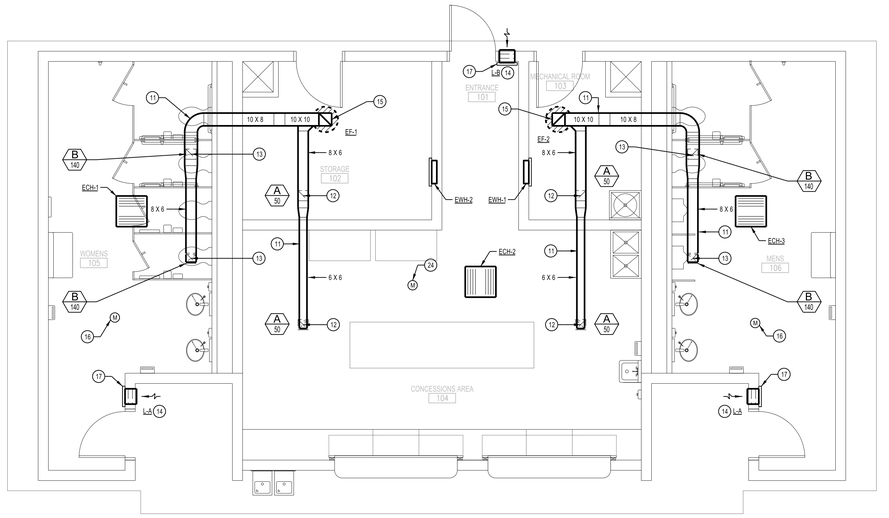
DUCT PENETRATION THRU WALL DETAIL

SCALE: NONE



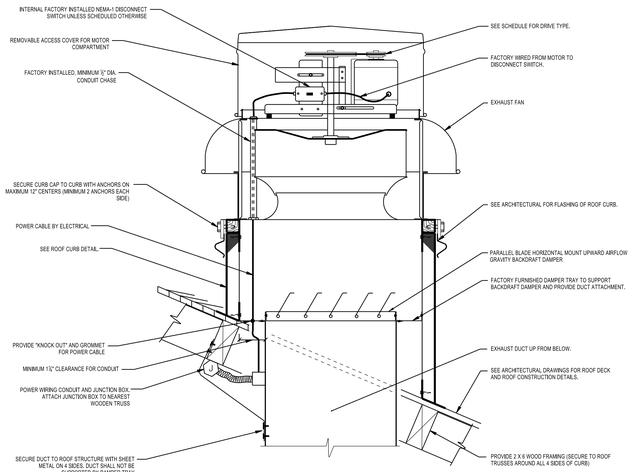
ROOF CURB DETAIL - SHINGLE ROOF

SCALE: NONE



MECHANICAL NEW WORK FLOOR PLAN

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



CENTRIFGUAL ROOF EXHAUST FAN DETAIL

SCALE: NONE

NOTES: (STATIONARY LOUVER DETAIL ONLY)

1. EXTERIOR WALL. SEE ARCHITECTURAL FOR EXACT CONSTRUCTION.
2. LINTEL BY STRUCTURAL
3. PROVIDE ½" X ½" MESH GALVANIZED BIRD SCREEN ON INTERIOR FACE OF LOUVER.
4. SEAL AND CAULK FULL PERIMETER OF LOUVER WATERTIGHT. PROVIDE PAINTABLE CAULK ON EXTERIOR SIDE OF LOUVER. SEE SCHEDULE FOR LOUVER FRAME SPECIFIED (FLANGED OR CHANNEL).
5. 2" X 1" SHEET METAL FINISHING ANGLE FRAMING AROUND OPENING PERIMETER.
6. PROVIDE 22 GAUGE GALVANIZED SLEEVE ANCHORED TO WALL AROUND PERIMETER.
7. PROVIDE 16 GAUGE PLAIN STEEL PERFORATED METAL WITH ½" ROUND HOLES ON 1" STAGGERED CENTERS WITH MIN. 51% FREE AREA. PERFORATED METAL SHALL EXTEND 1" BEYOND MASONRY OPENING ON 4 SIDES. MUNCHOLS MODEL PR1. PRIME AND PAINT WITH 2 COATS OF PAINT PER ARCHITECTURAL SPECIFICATIONS.
8. LOUVER. SEE LOUVER SCHEDULE FOR ADDITIONAL INFORMATION.
9. EXTERIOR GRADE.
10. FLOOR.
11. SEE SCHEDULE FOR MOUNTING HEIGHT.
12. PROVIDE FACTORY MANUFACTURED 16 GAUGE PLAIN STEEL HEMMED EDGE FRAMING AROUND FULL PERIMETER OF PERFORATED METAL SHEET. WIDTH OF HEMMED EDGE SHALL BE 1½". PRIME AND PAINT WITH 2 COATS OF PAINT PER ARCHITECTURAL SPECIFICATIONS. CORNERS SHALL BE NEATLY MITERED. MUNCHOLS MODEL 40019104X8.
13. SECURE HEMMED EDGE FRAMING AND PERFORATED METAL PANEL TO WALL WITH REMOVABLE TAMPER-PROOF FASTENERS.

STATIONARY LOUVER DETAIL

SCALE: NONE

NOTES: (THIS SHEET ONLY)

1. GENERAL: DRAWINGS SHOW GENERAL ARRANGEMENT, LAYOUT AND LOCATION OF DUCTWORK APPURTENANCES AND OFFSETS THAT MAY BE NECESSARY TO RUN DUCTWORK AND CONNECT TO EQUIPMENT ETC. OFFSET DUCTWORK AROUND ALL OBSTRUCTIONS. FABRICATE AND INSTALL DUCTWORK, FITTINGS AND OFFSETS BASED ON FIELD MEASUREMENTS AND AT NO ADDITIONAL COST TO THE OWNER. DUCT ROUTING SHOWN ON DRAWINGS SHALL BE ALTERED BY CONTRACTOR WHERE REQUIRED TO AVOID INTERFERENCE AND CLEARANCE DIFFICULTIES. CAREFULLY COORDINATE DUCT ROUTING WITH ELECTRICAL TO AVOID CONFLICTS WITH ELECTRICAL CONDUIT, CABLE TRAY, LIGHTS, ETC. COORDINATE DUCT ROUTING WITH PLUMBING PIPES (E.G. SPRINKLER VENT PIPING, STORM DRAIN, DOMESTIC WATER, PROCESS PIPING, ETC.) TO AVOID CONFLICTS.
2. GENERAL: REFER TO THE ELECTRICAL NOTES FOR VOLTAGE, PHASE, MAXIMUM ALLOWABLE CURRENT DRAW AMPERAGE AND CONNECTION ARRANGEMENT (SINGLE OR MULTI -POINT CONNECTION, ETC.) OF ALL MECHANICAL EQUIPMENT PRIOR TO ORDERING/INSTALLING EQUIPMENT.
3. GENERAL: DUCT SIZES INDICATED ON THE PLANS ARE CLEAR INSIDE DIMENSIONS REQUIRED.
4. GENERAL: SUPPORT ALL DUCTS, PIPING AND EQUIPMENT FROM PRIMARY BUILDING STRUCTURAL MEMBERS AND PROVIDE SUPPLEMENTAL STRUCTURAL FRAMING AS REQUIRED BETWEEN PRIMARY BUILDING STRUCTURAL MEMBERS TO SUPPORT ALL SYSTEMS INSIDE THE BUILDING.
5. GENERAL: PROVIDE NEW PIPE HANGERS FOR ALL SUSPENDED PIPING AS SHOWN IN HANGER DETAIL
6. GENERAL: PROVIDE PIPE SLEEVE WHERE REFRIGERANT PIPING PENETRATES WALL (TYP). SEE PIPE SLEEVE DETAIL - REFRIGERATE PIPE THRU WALL.
7. GENERAL: PROVIDE NEW REFRIGERANT LINES AND ACCESSORIES INSTALLED AND SIZED PER MANUFACTURERS RECOMMENDATION AND AS SPECIFIED.
8. GENERAL: ANY WORK WHICH INTERFERES WITH THE OWNERS OPERATIONS OF THE SURROUNDING AREA AND ANY INTERRUPTION OF SERVICES, INCLUDING THE SHUTDOWN OF UTILITIES, SHALL BE PERFORMED AT A TIME APPROVED BY THE OWNER.
9. GENERAL: COORDINATE LOCATION OF GRILLS, REGISTERS, AND DIFFUSERS WITH LIGHTING LAYOUT, SPRINKLER HEADS AND CEILING GRID SYSTEMS AND APPURTENANCES.
10. GENERAL: NOTIFY ENGINEERS IF ANY EXISTING ITEM THAT CONFLICTS WITH THE INTENDED FINAL PRODUCT IS NOT SPECIFICALLY CALLED OUT HERE. CONTRACTOR TO NOTIFY ENGINEERS OF ANY DISCREPANCIES IN THE DOCUMENTS AND FIELD CONDITIONS BEFORE PROCEEDING WITH DEMOLITION AND/OR CONSTRUCTION.
11. DUCTWORK TO BE ROUTED IN ATTIC SPACE.
12. 6X6 EXHAUST DUCT DOWN TO CEILING MOUNTED GRILLE.
13. 8X6 EXHAUST DUCT DOWN TO CEILING MOUNTED GRILLE.
14. LOUVER SHALL MOUNTED BELOW CEILING.
15. 10X10 EXHAUST AIR DUCT, EQUAL TO UNITS FULL SIZE OPENING, DOWN THROUGH ROOF CURB. TRANSITION AS REQUIRED FROM FAN INTAKE IN ATTIC SPACE AFTER TRUSSES.
16. CEILING MOUNTED OCCUPANCY SENSOR (BY ELECTRICAL) FOR CONTROL OF EXHAUST FAN. SEE ELECTRICAL DRAWINGS FOR EXACT LOCATION. SEE MECHANICAL SPECIFICATIONS FOR REQUIRED SEQUENCE OF OPERATION FOR FANS.
17. 16 GAUGE PAINTED PERFORATED METAL PANEL WITH 16 GAUGE HEMMED AND MITERED PAINTED PERIMETER FRAME AROUND MASONRY OPENING. SEE LOUVER DETAIL FOR ADDITIONAL REQUIREMENTS FOR PERFORATED METAL PANEL.

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GEORGIA REGISTERED No. 17029 PROFESSIONAL ENGINEER JAMES A. ANDREWS

DATE:	NOVEMBER 10,2017
SCALE:	
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INDEX No.	M101
SHEET No.	

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EXHAUST FANS

TAG	GREENHECK MODEL NO.	CFM	FAN STATIC PRESSURE IN W.G.	FAN RPM	MOTOR HP	MAX SONES	NOTES:
EF-1	G-090-D	380	0.35	1486	1/15	5.8	1:2:3:4
EF-2	G-090-D	380	0.35	1486	1/15	5.8	1:2:3:4

1. CENTRIFUGAL CURB MOUNTED EXHAUST FAN. PROVIDE BIRDSCREEN, GRAVITY BACKDRAFT DAMPER, AND ROOF CURB. SEE CENTRIFUGAL ROOF EXHAUST FAN DETAIL.
2. DIRECT DRIVE.
3. PROVIDE FACTORY MOUNTED DISCONNECT SWITCH.
4. PROVIDE SPEED CONTROLLER.

ELECTRIC WALL HEATERS

TAG	Q-MARK MODEL NUMBER	CFM	B.E. AFF MOUNTING HEIGHT	HEATING OUTPUT WATTS	NOTES:
EWH-1	CWH-1000	65	6'-0"	750	1:2:3
EWH-2	CWH-1000	65	6'-0"	750	1:2:3

1. WALL MOUNTED FAN FORCED ELECTRIC HEATER WITH COMMERCIAL GRADE STEEL GRILLE.
2. UNIT TO BE RECESS MOUNTED IN WALL.
3. PROVIDE INTEGRAL TAMPER PROOF THERMOSTAT. DISCONNECT AND HIGH TEMPERATURE LIMIT CUT-OFF.

ELECTRIC CEILING HEATERS

TAG	Q-MARK MODEL NUMBER	KW	BTU/HR OUTPUT	CFM	NOTES:
ECH-1	CDF-548-SE	2	6,800	280	1:2:3:4:5
ECH-2	CDF-548-SE	3	10,200	280	1:2:3:4:5
ECH-3	CDF-548-SE	2	6,800	280	1:2:3:4:5

1. COMMERCIAL DOWN FLOW FAN FORCED CEILING MOUNTED ELECTRIC HEATER.
2. PROVIDE FAN DELAY SWITCH AND HIGH TEMPERATURE CUT-OUT.
3. PROVIDE POWER DISCONNECT SWITCH (OPTION CFD-DS).
4. PROVIDE INTEGRAL LINE VOLTAGE THERMOSTAT.
5. PROVIDE SURFACE MOUNTING FRAME FOR MOUNTING BELOW CEILING.

GRILLES

TAG	TITUS MODEL No.	SIZE OR LENGTH	FINISH	THROW	NOTES
A	50F	6X6	WHITE	-	1:2:3:4
B	50F	8X6	WHITE	-	1:2:3:4

1. ALL ALUMINUM 1" X 1" X 1" "EGG CRATE" EXHAUST/RETURN GRILLE.
2. PROVIDE OPPOSED BLADE DAMPER.
3. FLANGED FRAME FOR SURFACE MOUNTING.
4. NC LEVEL NOT TO EXCEED NC 35.

LOUVERS

TAG	GREENHECK MODEL No.	MINIMUM FREE AREA FT. SQ.	WIDTH INCHES	HEIGHT INCHES	DEPTH INCHES	CFM	MOUNTING HEIGHT B.E. A.F.F.	NOTES
L-A	EDK-602	0.45	12	16	6	280	7'-0"	1:2:3:4:5:6
L-B	EDK-602	0.45	12	16	6	200	7'-0"	1:2:3:4:5:6

1. AMCA CERTIFIED LOUVER WITH BACK MOUNTED 1#2" MESH BIRDSCREEN.
2. SEE SPECIFICATIONS FOR FINISH COLOR SELECTED BY ARCHITECT. BASIS OF BID SHALL BE KYNAR.
3. STATIONARY LOUVER WITH DRAINABLE HEADS, AND NONDRAINABLE BLADES. SEE STATIONARY LOUVER DETAIL.
4. SEAL AND CAULK FULL PERIMETER OF LOUVER WATERTIGHT.
5. SECURE LOUVER TO WALL ON MAXIMUM 2'-0" CENTERS ON FOUR SIDES. PROVIDE 22 GAUGE GALVANIZED SLEEVE THROUGH WALL.
6. PROVIDE OPTIONAL 11/2" WIDE FLANGED FRAME AROUND PERIMETER.

LEGEND

A 500	GRILLE, REGISTER, DIFFUSER DESIGNATION ABOVE WITH CFM SHOWN BELOW FOR TAB AGENT TO BALANCE DEVICE AT
16 X 12	DUCT SIZE: FIRST DIMENSION IS SIDE DRAWN
	RIGID ROUND DUCTWORK OR FLUE PIPING
	FLEXIBLE ROUND DUCTWORK
	RECTANGULAR - TO - ROUND DUCT TRANSITION
	FLEXIBLE CONNECTION
	ACOUSTICAL/THERMAL DUCT LINER - ½" THICK OR 1" THICK, RESPECTIVELY
	SQUARE ELBOW WITH TURNING VANES
	45° BRANCH ENTRY FITTING
FD	FIRE DAMPER. SEE FIRE DAMPER DETAIL.
MVD MVD	MANUAL VOLUME DAMPER (OPPOSED BLADE)
	BELLMOUTH TAKE-OFF COLLAR AT RUN-OUT W/BALANCING DAMPER. SEE BELLMOUTH AND 45° FITTING TAKEOFF DETAIL.
	45° FITTING TAKEOFF WITH BALANCING DAMPER. SEE BELLMOUTH AND 45° FITTING TAKEOFF DETAIL.
	SUPPLY DUCT TO OR FROM ABOVE
	RETURN OR EXHAUST DUCT TO OR FROM ABOVE
	RETURN OR EXHAUST AIR FLOW
T	THERMOSTAT/SENSOR WITH LOCKING PLASTIC OR METAL COVER AS SPECIFIED
H	HUMIDITY SENSOR
S	DUCT MOUNTED SMOKE DETECTOR (PROVIDED AND WIRED BY ELEC. AND INSTALLED BY MECH.)
R	REFRIGERANT PIPING
DB, WB	DRY BULB, WET BULB
FPM	FEET PER MINUTE
CFM, ℓ	CUBIC FEET PER MINUTE
OA	OUTDOOR AIR
MBH	BTU/HR x 1000
APPROX.	APPROXIMATELY
ESP IN WG	EXTERNAL STATIC PRESSURE INCHES WATER GUAGE
HP	HORSEPOWER
RPM	REVOLUTIONS PER MINUTE
UNO	UNLESS NOTED OTHERWISE
AFF	ABOVE FINISHED FLOOR
UC	UNDERCUT DOOR ¾"
GPM	GALLONS PER MINUTE
KW	KILOWATTS
Δt	TEMPERATURE DIFFERENCE
B.E. T.E.	BOTTOM ELEVATION, TOP ELEVATION
LB/HR	POUNDS PER HOUR
2 / M1	SECTION OR DETAIL IDENTIFICATION NUMBER / SHEET NUMBER ON WHICH SECTION OR DETAIL IS DRAWN

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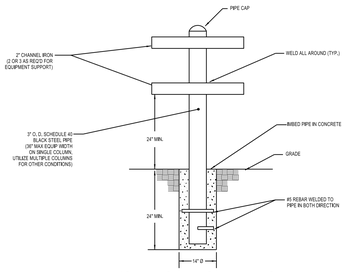
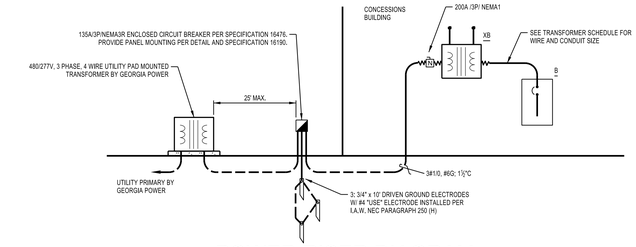
SHEET No.	



PANEL/SWITCH MOUNTING DETAIL

SCALE: NONE



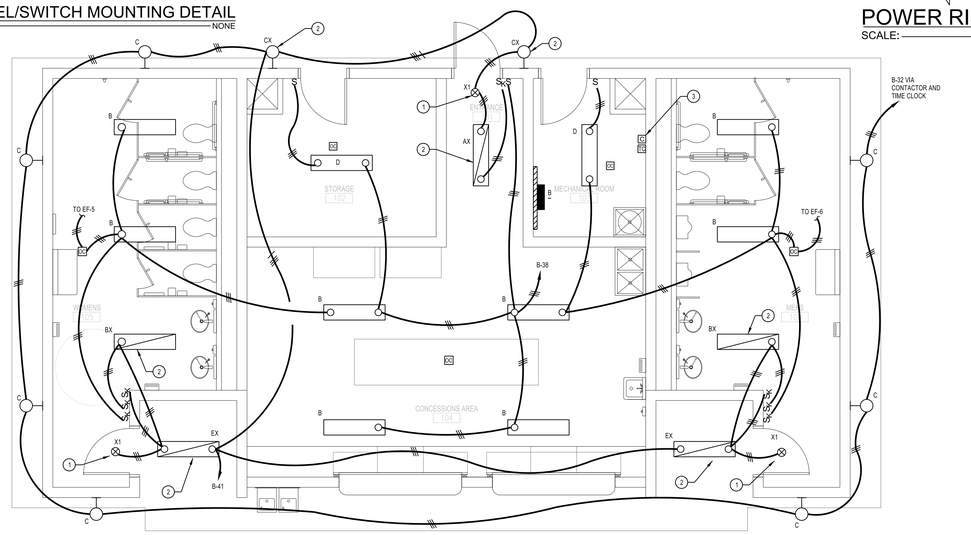
POWER RISER DIAGRAM

SCALE: NONE

MECHANICAL EQUIPMENT POWER SCHEDULE

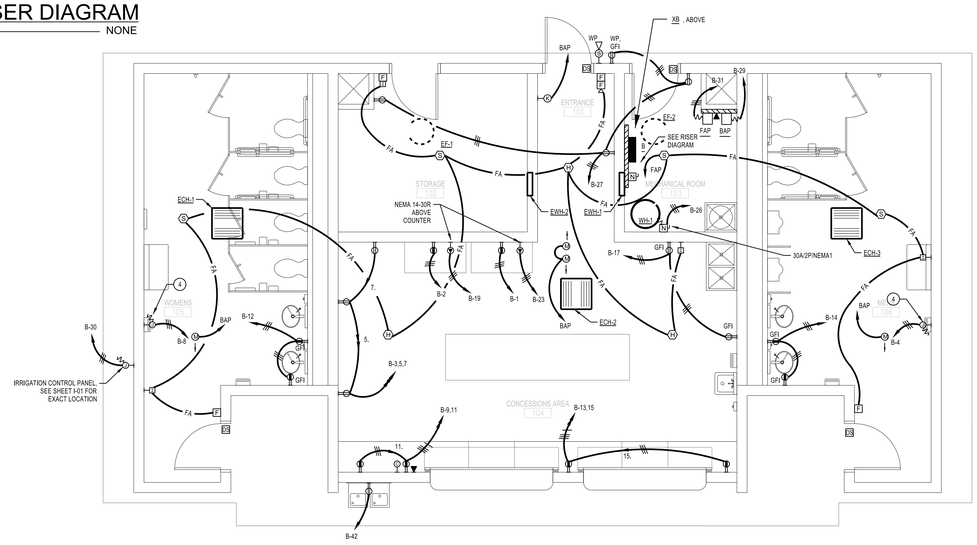
MECHANICAL TAG	VOLTAGE	DISCONNECT	PANEL/ CIRCUIT	NOTES
EF-1	120		B-33	1,2,3,5
EF-2	120	INTEGRAL DISCONNECT	B-33	1,2,3,5
WATER HEATER - WH-1	208/1PH	30A/2P/NEMA1	B-26	
ECH-1	208/1PH	INTEGRAL DISCONNECT	B-43	1
ECH-2	208/1PH	INTEGRAL DISCONNECT	B-53	1
ECH-3	208/1PH	INTEGRAL DISCONNECT	B-57	1
EWH-1	120	INTEGRAL DISCONNECT	B-51	1
EWH-2	120	INTEGRAL DISCONNECT	B-57	1

NOTES:
1. DISCONNECT BY MECHANICAL.
2. WIRE THRU SPEED CONTROLLER BY MECHANICAL.
3. WIRE THRU OCCUPANCY SENSOR BY DIVISION 16.
4. WIRE THRU LIGHT SWITCH BY BY DIVISION 16.
5. CIRCUIT SHARED BY OTHER EQUIPMENT.
6. ROUTE CIRCUIT FROM DHP TO DFCU PER MANUFACTURER'S INSTRUCTIONS.



ELECTRICAL LIGHTING FLOOR PLAN

SCALE: 1/4=1'-0"



ELECTRICAL POWER & LOW VOLTAGE FLOOR PLAN

SCALE: 1/4=1'-0"

NOTES: (THIS SHEET ONLY)

1. EMERGENCY EGRESS AND EXIT SIGNS SHALL BE UNSWITCHED.
2. BATTERY INVERTER SHALL BE UNSWITCHED. LAMPS SHALL BE SWITCHED
3. PROVIDE CONTACTOR AND TIMECLOCK PER SPECIFICATION 16785.
4. FUTURE HAND DRYER: PROVIDE BLANK COVERPLATE AND "SAFE OFF" CIRCUIT.
5. SEE SHEET E103 FOR TYPICAL FAN/LIGHT CONTROLS.

ELECTRICAL LEGEND

LIGHTING FIXTURES - SEE LIGHTING FIXTURE SCHEDULE

- RECESSED GRID FLUORESCENT
- EMERGENCY EGRESS FLUORESCENT
- SURFACE MOUNTED FLUORESCENT
- BRACKET MOUNTED FLUORESCENT
- SELF-CONTAINED EMERGENCY LIGHTING
- EXIT LIGHT - WALL, CEILING
- SURFACE MOUNTED DOWNLIGHT
- RECESSED MOUNTED DOWNLIGHT
- WALL BRACKET
- FLOODLIGHT
- AREA LIGHT
- TRACK LIGHTING

CONVENIENCE OUTLETS

- SIMPLEX
- DUPLEX - WALL (WP=WEATHERPROOF, GFI=GROUND FAULT PROTECTED, TR = TAMPER RESISTANT, CR = CORROSION RESISTANT), DOUBLE DUPLEX
- DUPLEX ABOVE COUNTER
- SPECIAL PURPOSE (CONFIG, AS NOTED)
- JUNCTION BOX - WALL, CEILING

SWITCHES

- S — SINGLE POLE (WP=WEATHERPROOF)
- S_M — SINGLE POLE, MOTOR RATED
- S_K — SINGLE POLE, KEY OPERATED
- OC — OCCUPANCY SENSOR
- S_{OC} — SINGLE POLE, OCCUPANCY SENSOR
- S_3 — THREE WAY

PANELS

- 120/208V, 3PH, 4W OR 240V, 1PH, 3W
- PLYWOOD BACKBOARD

CIRCUITS

- RACEWAY IN CEILING OR WALL
- ONE CROSSMARK PER WIRE, 2 WIRES UNLESS SHOWN
- HOMERUN - ONE ARROW PER CIRCUIT
- RACEWAY UNDER FLOOR OR SLAB
- FA — FA=FIRE ALARM, IC=INTERCOM, TV=TELEVISION, C=COMPUTER
- EXPOSED RACEWAY
- FLEXIBLE RACEWAY
- CONDUIT - UP, DOWN
- SURFACE WIREWAY
- TYPE TC CABLE IN CABLE TRAY

GENERAL EQUIPMENT

F, U	DISCONNECT SWITCH (F=FUSED, N=NON-FUSED)
	MOTOR CONTROLLER
	ENCLOSED CIRCUIT BREAKER
C	CONTACTOR
PC	PHOTO-CELL
	TRANSFORMER (DRY-TYPE)
T	THERMOSTAT
TC	TIME CONTROL

COMMUNICATION AND PROTECTION

FAP	FIRE ALARM PANEL (FAA=ANNUNCIATOR PANEL)
BAP	SECURITY ALARM PANEL - ADEMCO VISA 128 FBDT
F	FIRE ALARM PULL STATION
F, S	FIRE ALARM HORN - STROBE , SPEAKER - STROBE
S	SMOKE DETECTOR - WALL, CEILING
H	HEAT DETECTOR
I	INDICATING STROBE
M	MOTION DETECTOR- ADEMCO 997
S	HIGH POWER SPEAKER- ADEMCO WAVE2- 2 TONE INTERIOR SPEAKER, ADEMCO 784LC- EXTERIOR SPEAKER- TAMPER RESISTANT
K	SECURITY SYSTEM KEYPAD
CCTV	CLOSED CIRCUIT TV CAMERA- INTERIOR- MINIDOME, 720P- HONEYWELL H3D1F1/ EXTERIOR CAMERA- MINIDOME WITH IR, 720P- HONEYWELL H4D1FR1 WITH HONEYWELL HD4CHP- WK WALL MOUNT KIT
DS	SECURITY DOOR SWITCH

LIGHTING FIXTURE SCHEDULE

MARK	LAMPS	VOLTAGE	MANUFACTURER & CATALOG NO.	MOUNTING	DESCRIPTION	NOTES
A	LED	120	LITHONIA #ZL2NL485000LMM0D-MVOLT-40K-80CRI METALUX, LIGHTOLIER, DAY-BRITE, COLUMBIA	SURFACE	PROVIDE BSL722 BATTERY INVERTER WHEN "AX" FIXTURE IS SHOWN ON PLANS	3
B	LED	120	LITHONIA #VAP12000LMPCLMDMVOLT GTZ10 40K 80CRI METALUX, LIGHTOLIER, DAY-BRITE, COLUMBIA	SURFACE, CEILING	VAPORTIGHT, VANDAL RESISTANT, POLYCARBONATE LENSED FIXTURE, PROVIDE BSL722 BATTERY INVERTER WHEN "BX" FIXTURE IS SHOWN ON PLANS	1,3
C	LED	120	COOPER INVUE #ENC-EO2-LED-E1BL4-TP GARDCO, MCGRAW EDISON, SPAULDING, LSI	WALL, SURFACE	PROVIDE CWB BATTERY INVERTER WHEN "CX" FIXTURE IS SHOWN ON PLANS	2
D	2-28WT5	120	LITHONIA #UN228-WGCUN METALUX, LIGHTOLIER, DAY-BRITE, COLUMBIA	SURFACE, CEILING	HEAVY DUTY STRIP WITH WIRE GUARD	
E	45W LED	UNV	KENALL #MLHA848RMWPP45L40KDCC1DV9500 EQUALS BY FAILSAFE, MORELITE	SURFACE, CEILING	LED LENSED, DAMP LOCATION LISTED, TAMPER RESISTANT HARDWARE	3
X	-----	120	LITHONIA #PS1400 SURE-LITES, EMERGI-LITE	INSIDE FIXTURE BALLAST CHANNEL	1400 LUMEN EMERGENCY BATTERY INVERTER	
X1	WUNIT	120	LITHONIA #LESW1RELN SURE-LITES, EMERGI-LITE	UNIVERSAL	CAST ALUMINUM, STENCIL FACE, WITH NICAD BATTERY. LED SINGLE FACE EXIT WITH CHEVRON ARROWS	

NOTES:
1. GASKETED WET LOCATION LISTED
2. FURNISH PHOTOCELL CONTROL
3. MOUNT FIXTURE PARALLEL TO THE FLOOR & WALL

PANEL: B — MAINS: 250 A MCB — A.I.C.: 25,000
VOLTAGE: 120/208V, 3PH, 4W — ENTRY: TOP — MOUNTING: SURFACE

DEVICE NOTE	DEVICE POLE	DEVICE TRIP	BRANCH CIRCUIT DESIGNATION	CONDUCTOR	CONDUIT	KVA	No.	PHASE LOAD (KVA) A	B	C	No.	BRANCH CIRCUITS KVA	CONDUIT	CONDUCTOR	DESIGNATION	DEVICE TRIP	DEVICE POLE	DEVICE NOTE
	1	20	MICROWAVE	#12,#12G	1/2"	1.4	01	3.2			02	1.4	1/2"	#12,#12G	MICROWAVE	20	1	
	1	20	CONV OUTLETS	#12,#12G	1/2"	0.4	03		2.4		04	2.0	1/2"	#10,#10G	HAND DRYER	25	1	2
	1	20	CONV OUTLETS			0.4	05			0.4	06				SPARE	20	1	
	1	20	CONV OUTLETS			0.4	07	2.4			08	2.0	1/2"	#10,#10G	HAND DRYER	25	1	2
	1	20	CONV OUTLETS	#12,#12G	1/2"	0.4	09		0.4		10				SPARE	20	1	
	1	20	CONV OUTLETS			0.4	11			1.0	12	0.4	1/2"	#12,#12G	CONV OUTLETS	20	1	
	1	20	CONV OUTLETS	#12,#12G	1/2"	0.4	13	0.6			14	0.4	1/2"	#12,#12G	CONV OUTLETS	20	1	
	1	20	CONV OUTLETS			0.4	15		0.4		16				SPARE	20	1	
	1	20	CONV OUTLETS	#12,#12G	1/2"	0.8	17			0.8	18				SPARE	20	1	
	2	30	POPCORN MACHINE	#10,#10G	1/2"	1.3	19	1.3			20				SPARE	20	1	
						1.3	21		1.3		22				SPARE	20	1	
	2	30	HOT DOG MACHINE	#10,#10G	1/2"	1.3	23			1.3	24				SPARE	20	1	
						1.3	25	3.4			26	2.3	1/2"	#10,#10G	WATER HEATER - WH-1	30	2	
	1	20	CONV OUTLETS	#12,#12G	1/2"	0.8	27		3.1		28	2.3						
	1	20	BAP	#12,#12G	1/2"	0.2	29			0.3	30	0.1	1/2"	#12,#12G	IRRIGATION SPKLER CNTRL PNL	20	1	
	1	20	FAP	#12,#12G	1/2"	0.4	31	2.1			32	1.7	1/2"	#12,#12G	OUTSIDE LIGHTS	20	1	
	1	20	EF-1 & EF-2	#12,#12G	1/2"	0.5	33		1.5		34	1.0	1/2"	#12,#12G	UPSTAIRS LIGHTS	20	1	
	1	20	SPARE				35			1.8	36	1.8	1/2"	#12,#12G	CONCESSION LIGHTS	20	1	
	1	20	SPARE				37	0.2			38	0.2	1/2"	#10,#10G	SCOREBOARD	20	1	
	1	20	SPARE				39		0.1		40	0.1	1/2"	#10,#10G	FIELD LIGHTING CNTRL SWITCES	20	1	
	1	20	EMERGENCY EGRESS LIGHTS	#10,#10G	1/2"	1.0	41			2.2	42	1.2	1/2"	#10,#10G	EWC	20	1	1
	2	20	ECH-1	#10,#10G	1/2"	1.0	43	1.0			44				SPARE	20	1	
						1.0	45		1.0		46				SPARE	20	1	
	2	20	ECH-3	#10,#10G	1/2"	1.0	47			1.0	48				SPARE	20	1	
						1.0	49	1.0			50				SPARE	20	1	
	1	20	EWH-1	#12,#12G	1/2"	0.8	51		0.8		52				SPARE	20	1	
	2	20	ECH-2	#10,#10G	1/2"	1.5	53			1.5	54				SPARE	20	1	
						1.5	55	1.5			56				SPARE	20	1	
	1	20	EWH-2	#12,#12G	1/2"	0.8	57		0.8		58				SPARE	20	1	
	1	20	SPARE				59			0.0	60				SPARE	20	1	
	1	20	SPARE				61	0.0			62				SPARE	20	1	
	1	20	SPARE				63		0.0		64				SPARE	20	1	
	1	20	SPARE				65			0.0	66				SPARE	20	1	
	1. PROVIDE GFI CIRCUIT BREAKER							17.3	12.0	10.3	2. SAFE OFF CIRCUIT FOR FUTURE HAND DRYER							

TRANSFORMER SCHEDULE

MARK	LOCATION	VOLTAGE PRIMARY	VOLTAGE SECONDARY	KVA	SECONDARY CONDUCTOR	MOUNTING
XB	ELECT/MECH RM	480 DELTA	120/208 WYE, 3PH, 4W	75	4#2/0KCMIL, #4G, 2 1/2"C	SUSPENDED

1. SEE STRUCTURE SUSPENDED TRANSFORMER DETAIL

AH&P CONSULTING ENGINEERS
ANDREWS, HAMMOCK & POWELL, INC.
250 Charter Lane
Suite 100
MACON, GEORGIA 31210
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FREEDOM PARK
BOYS BASEBALL FIELDS
LOCATED IN LAND LOTS 2 AND 3 OF THE 11TH DISTRICT

GEORGIA REGISTERED No. 17029 PROFESSIONAL ENGINEER JAMES A. ANDREWS

DATE:	NOVEMBER 10,2017
SCALE:	AS SHOWN
DN:	
LSV:	
JN:	
FN:	
INDEX NO.	E101
SHEET NO.	

PLUMBING LEGEND

	SOIL OR WASTE PIPING
	VENT PIPING
	COLD WATER PIPING
	HOT WATER PIPING
	BALL VALVE (2" & SMALLER) OR BUTTERFLY VALVE (2½" & LARGER)
	VALVE IN PIPING DROP
	PIPING DROP IN DIRECTION OF FLOW
	PIPING RISE IN DIRECTION OF FLOW
	DIELECTRIC UNION
	PIPING TEE FROM TOP OF MAIN
	PIPING TEE FROM BOTTOM OF MAIN
C.P.H.B.	CHROME PLATED HOSE BIBB
W.H.	FREEZE PROOF WALL HYDRANT
F.D.	FLOOR DRAIN
F.C.O.	FLOOR CLEANOUT
W.C.O.	WALL CLEANOUT
O.S.C.O.	OUTSIDE CLEANOUT
V.T.R.	VENT THRU ROOF

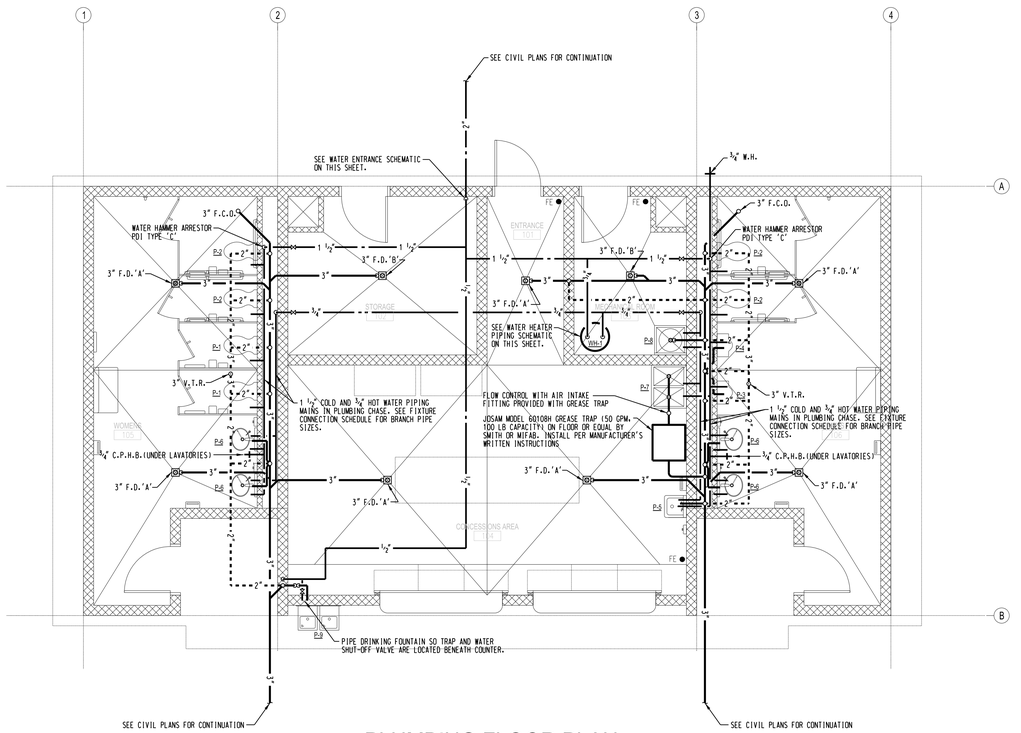
GENERAL NOTES

1. THESE DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS.
2. INSTALLATION OF PIPE AND EQUIPMENT SHOWN AND SPECIFIED SHALL BE COORDINATED WITH ALL OTHER WORK RELATED TO THE CONSTRUCTION OF THIS FACILITY INCLUDING BUT NOT LIMITED TO: BUILDING STRUCTURE; HVAC EQUIPMENT, DUCT WORK AND PIPING; ELECTRICAL WORK AND OWNER FURNISHED EQUIPMENT.
3. STRUCTURAL MEMBERS SHALL NOT BE PENETRATED WITHOUT APPROVAL FROM ARCHITECT.
4. ROUTE ALL PIPING CONTAINING FLUIDS SUBJECT TO FREEZING WITHIN THE BUILDING INSULATION ENVELOPE OR PROVIDE HEAT TAPE.
5. ROUTE SANITARY VENT PIPING SO VENTS THRU ROOF WILL BE A MINIMUM OF 15'-0" FROM ALL OUTSIDE AIR INTAKES AND A MINIMUM OF 5'-0" FROM EXTERIOR WALLS, ROOF EXPANSION JOINTS AND ROOF MOUNTED EQUIPMENT.
6. WHERE CHASE WALLS ARE NOT FURNISHED, PIPING SHALL NOT BE ROUTED HORIZONTALLY. AVOID CUTTING STUDS.

FIXTURE CONNECTION SCHEDULE

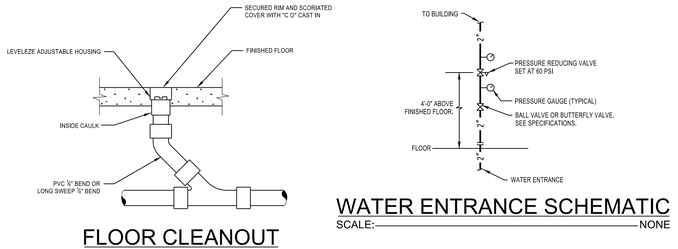
MARK	FIXTURE	NOTES	RIM HEIGHT	COLD WATER		HOT WATER		WASTE	
				BRANCH	CONN.	BRANCH	CONN.	BRANCH	CONN.
P-1	WATER CLOSET	1	15"	1"	1"	—	—	3"	3"
P-2	WATER CLOSET	1,2	18"	1"	1"	—	—	3"	3"
P-3	URINAL	1	16"	¾"	¾"	—	—	2"	2"
P-4	URINAL	1,2	16"	¾"	¾"	—	—	2"	2"
P-5	LAVATORY	2,3	34"	½"	⅜"	½"	⅜"	2"	1¼"
P-6	LAVATORY	2	C.T.	½"	⅜"	½"	⅜"	2"	1¼"
P-7	TWO COMPARTMENT SINK	—	—	½"	⅜"	½"	⅜"	2"	1½"
P-8	SERVICE SINK	—	—	½"	½"	½"	½"	2"	2"
P-9	DRINKING FOUNTAIN	4	36"/40"	½"	⅜"	—	—	2"	1½"

1. WALL HUNG, FLUSH VALVE
2. HANDICAP ACCESSIBLE
3. WALL HUNG.
4. DUAL HEIGHT FOUNTAIN. MOUNT AS REQUIRED BY MANFACTURER TO MEET ADA.



PLUMBING FLOOR PLAN

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

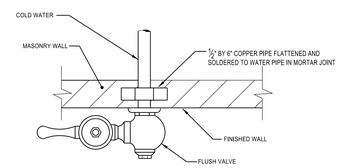


FLOOR CLEANOUT

SCALE: NONE

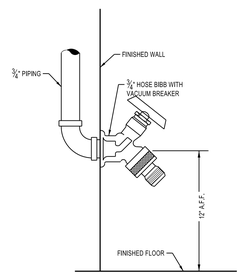
WATER ENTRANCE SCHEMATIC

SCALE: NONE



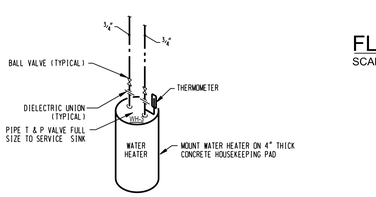
FLUSH VALVE ANCHOR

SCALE: NONE



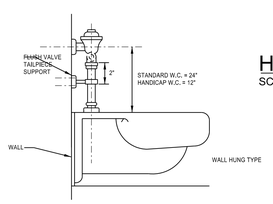
HOSE BIBB DETAIL

SCALE: NONE



ELECTRIC WATER HEATER PIPING SCHEMATIC

SCALE: NONE



WATER CLOSET FLUSH VLAVE MOUNTING DETAIL

SCALE: NONE

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FREEDOM PARK
BOYS BASEBALL FIELDS

LOCATED IN LAND LOTS 2 AND 3 OF THE 11TH DISTRICT

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FN:	
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SHEET NO.	

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

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 RELATED WORK

A. All Division 15 sections.

1.3 WORK SEQUENCE

A. Install mechanical piping, duct, controls, equipment and accessories as construction progresses so cutting and patching of new construction will not be required. See also paragraph "Sequencing and Scheduling" herein.

1.4 SUBMITTALS

A. Provide submittals in accordance with Section 01300 - Submittals.

B. Submittal data containing manufacturer's data shall be sent to the Architect, Engineer and Owner for review.

C. Electronic submittal data shall be assembled in Adobe Acrobat's Portable Data Format (PDF) for review.

D. Electronic submittal data shall be assembled in one (1) complete PDF file and shall include an index sheet (TOC) listing each submittal item by specification number and its content. Each file shall also be organized with "Bookmarks" of each section. Submittals that do not have each submittal item referenced by "Bookmarks" shall be rejected.

E. All electronic submittal data for a trade shall be submitted at one time except as noted herein.

F. Data not submitted shall have a statement explaining why the data was not submitted.

G. Submittals not conforming to any of the above requirements shall be rejected.

H. The contractor shall go to each specification section to determine all technical information/data required and organize information/data using tabs for major headings as follows:

I. Plumbing Submittal Data
   1. Section 15060 - Hangers and Supports
      a. Upper attachments
      b. Pipe attachment (hangers and clamps)

c. Pipe Positioning Systems
d. Insulation Shields
e. Non-penetrating equipment supports

2. Section 15080 - Mechanical Insulation
   a. Insulation
   b. Jackets and Accessories
   c. Proof of Contractor's three years experience
3. Section 15110 - Valves
   a. Ball valves.
4. Section 15122 - Meters and gauges
   a. Stem type thermometers.
5. Section 15140 - Domestic Water Piping
   a. Single sheet indicating piping system and application and the pipe material intended to be used. Do not submit data sheets on piping.
6. Section 15145 Domestic Water Piping Specialties
   a. Dielectric Connections
   b. Solder
   c. Chrome plated hose bibbs
   d. Wall hydrants.
   e. Water hammer arresters.
   f. Water pressure-reducing valves.
7. Section 15150 - Sanitary Waste and Vent Piping
   a. Single sheet indicating piping system and application and the pipe material intended to be used. Do not submit data sheets on piping.
8. Section 15155 - Drainage Piping Specialties
   a. Floor drains.
   b. Cleanouts.
   c. Flashing.
9. Section 15410 - Plumbing Fixtures
   a. Plumbing Fixtures
10. Section 15485 - Electric Water Heaters
    a. Electric water heaters

J. HVAC Submittal Data
1. Section 15060 - Hangers and Supports
   a. Upper attachments
   b. Pipe attachment (hangers and clamps)
   c. Roof mounted equipment supports
      1) Roof curbs for exhaust fans
2. Section 15075 - Mechanical Identification
   a. Equipment markers.
3. Section 15765 - Electric Heaters
   a. Electric wall heaters
   b. Electric ceiling heaters

4. Section 15815 - Metal Ducts
   a. Note Concerning Duct Shop Drawings: The Contractor may generate ductwork shop drawings for their use in coordination with structural, sprinkler, electrical, plumbing, etc., but these are not required for submittal review and shall not be submitted to the Engineer for review.
5. Section 15820 - Duct Accessories
   a. Backdraft dampers.
   b. Volume dampers.
   c. 45-degree take-off collars.
6. Section 15838 - Power Ventilators
   a. Centrifugal Roof Mounted Exhaust Fans
7. Section 15855 - Diffusers, Registers, And Grilles
   a. Diffusers, registers and grilles
8. Section 15856 - Intake and Relief Products
   a. Louvers.
   b. Expanded metal screen.
9. Section 15900 - HVAC Instrumentation and Controls
   a. Control Product Data
   b. Sequence of Control
10. Section 15950 - Testing, Adjusting, and Balancing
    a. TAB Agent NEBB or AABC Certificate (Do not submit samples of TAB forms)
11. Letter from Contractor stating submittals have been checked and comply with the Contract Documents
12. Certification that all items are furnished under this contract are free of hazardous materials (e.g. asbestos, PCBs)

K. Manufacturer's data sheets shall be marked to clearly indicate the manufacturer, model number, size, color, accessories, required clearances, field connection details, weight loading, electrical characteristics, capacities, etc. being submitted. Submittals shall only include the products relevant to this specific project. Submittals shall not include other products produced by the manufacturer which are not specified on this project. Submittals containing several products on the same sheet shall have an arrow or other marker to identify the specific product submitted. Also, submittals for a single product that have options shall have an arrow or other marker to identify that the specified options are being provided. Submittals that include products not specified for this project, or that include several products on one sheet without being marked, or that do not show options selected shall be rejected. Variations from specifications shall be explained. Submittal preparer's name and telephone number shall be listed on the index sheet.

L. Piping Submittals: Submittal data required for piping systems shall consist of a single sheet of paper with the type of piping systems on this project, and the corresponding piping the contractor intends to provide. For example: “Cooling Water Piping Above Grade – Schedule 40 black steel”, “Cooling Water Piping Below Grade – Class 52 Ductile Iron.” Contractor shall not submit manufacture’s data sheets on piping.

M. Review, Corrections, or Comments made on the Submittals do not relieve the Contractor from compliance with the requirements of the Drawings, Specifications and Addenda (Contract Documents). By entering into this Contract, the Contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the Contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he

intends to furnish and install and use. Review of shop drawing will be general only for basic conformance with the design concept. The review of such drawings, schedules or cuts shall not relieve the Contractor from the responsibility for correcting all errors of any sort contained in the submittals. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

N. Below are the submittal item codes that will be used when reviewing the submittal data. These codes show up on the "Submittal Review" sheet. Only one copy of the submittal review sheet is returned upon completion of the review for each trade.
   1. RNE - Reviewed, No Exceptions Noted
      a. Indicates the information provided has been reviewed and no exceptions are taken. Contractor must still comply with the contract documents.
      b. No corrective action required at this time.
   2. FNC - Furnish with Noted Corrections
      a. Indicates the contractor shall insure that all necessary or noted corrections are incorporated into equipment furnished to the project.
      b. Contractor shall incorporate items requested in review comments, but re-submittal not required.
   3. RES - Revise and Resubmit
      a. Indicates item is not presently acceptable as submitted, but may be accepted provided additional information and/or changes are made.
      b. Contractor shall revise and resubmit item to Engineer with additional information indicating compliance with Contract Documents prior to proceeding with work.
   4. PSD - Provide Submittal Data
      a. Indicates submittal data was not provided for this item or section.
      b. Contractor shall provide submittal data meeting the explicit requirements of the plans, specifications, and all addenda.

O. Shop drawings and data submittals for materials requiring extra long delivery time shall be submitted for approval as soon as possible after execution of contract. All items shall be submitted for approval in a timely manner (prior to other submittals if necessary) so they may be properly incorporated in the building's structure. Allow a minimum of three weeks for review. No substitutions of materials or extensions of contract time will be allowed for Contractors failure to submit or order such materials sufficiently in advance of the work. See Architectural specification section for additional requirements for submittals.

1.5 REGULATORY REQUIREMENTS

A. All work installed under Division 15 shall conform to the current adopted Edition of Building/Mechanical Codes and their appropriate amendments:
   1. Life Safety Code, NFPA 101
   2. International Building Code with Georgia Amendments
   3. International Mechanical Code with Georgia Amendments
   4. Standard for the Installation of Air Conditioning and Ventilating Systems, NFPA 90A
   5. International Plumbing Code with Georgia Amendments
   6. International Gas Code with Georgia Amendments
   7. National Fuel Gas Code, NFPA-54

8. Installation of Sprinkler Systems, NFPA 13
9. City of Macon-Bibb County Codes
10. Requirements of the State of Georgia Fire Marshall's Office.
11. GA State Minimum Standard Energy Code.

B. Obtain and pay for all permits, and request inspections from all authorities having jurisdiction, in a timely manner.

C. Materials and Equipment included in Underwriter's Label Service shall bear that label. Electrical equipment shall be UL approved as installed, and bear the UL label, unless noted otherwise herein. All fans shall be AMCA certified and bear that label for performance and sound. All air conditioning equipment shall be ARI certified and bear that label.

D. Where requirements of these specifications differ from specified codes and ordinances, conform to the more stringent requirements.

1.6 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions. Shift or relocate equipment or systems to avoid conflicts with other trades. Modifications to the work required to accommodate project conditions encountered in the field shall be made at no additional cost to the contract.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. Install items so that there are no obstructions (e.g., pipes, conduits, etc.) blocking service panels of the equipment, or preventing the removal of the equipment.

1.7 SEQUENCING AND SCHEDULING

A. Contractor shall coordinate work so as to avoid conflicts with other work in progress.

B. Work shall progress in a manner that will not interfere with other trades. The Division 15 Contractor shall have coordination meetings with all other Contractors to ensure that all systems installed in "share areas" (e.g. ceiling plenums, mechanical rooms, etc.) are coordinated and installed to insure proper fit and access. All costs required for the coordination of the work between trades shall be borne solely by the Contractor.

C. Phasing: Contractor shall conform to phasing plans as stated in the Architectural contract documents.

1.8 ACCEPTABLE PRODUCTS

A. Basis of Design: Model numbers indicated herein or shown on the drawings are the Basis of Design and are based on the most recent literature provided to the Engineer from the Manufacturer's Representative. The Contractor may substitute equal and approved equipment from the basis of design manufacturer or manufacturers listed in this specification (or set forth

in an addendum) provided said equipment has all features which are inherent with the "Basis of Design" equipment, meets all requirements of the plans and specifications, has like electrical characteristics (e.g., same voltage, phase, ampacity/fusing/circuit breaker requirements, single or multiple points of connection as indicated on the electrical drawings), and will properly fit in the available spaces in the building. If the Contractor chooses to provide equipment which meets all of the aforementioned requirements, but has different characteristics, from that shown on the Contract Electrical Drawings, he shall bear all costs associated with that substitution. Electrical costs include, but are not limited to materials (breakers, fuses, disconnects, wiring, conduits, panels, starters, contactors, and the like) installation costs and re-engineering. All electrical connections shall be coordinated with the Engineer and with the electrical subcontractor. Other costs may include, but are not limited to, additional structural support for heavier equipment than basis of design.

B. Prior Approval: Substitutions of specified items will be considered only if written request has been submitted for review at least ten days prior to the receipt of bid proposals. Each request shall include a description of the proposed substitute, the specification page and line number where it is referenced, the name of material or equipment for which it is to be substituted, drawings, cuts, performance and test data for an evaluation and a statement from the equipment manufacturer's representative that the items to be substituted meet or exceed the specification of the item substituted for.

C. Addenda: If the substitution is allowed, such approval will be set forth in an Addendum.

D. Costs: All costs incurred by the acceptance of substitutions shall be borne by the contractor.

E. Acceptable Products: Where a manufacturer has been listed as being acceptable in the various specification sections (or addenda) hereinafter for a certain product, it shall be understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of their standard product. The manufacturer's product shall still comply with all of the requirements and standards of this specification and not necessarily their standard specification, to the extent that it might require special custom manufacture to meet the requirements and standards of this specification, the requirements of the drawings and the inherent features of the "Basis of Design". Submitted products, not complying with the explicit requirement of these specifications and drawings and with the features of the "Basis of Design" will be rejected even if their manufacturer is listed in the specifications.

1.9 DRAWINGS

A. General: Both the drawings and specifications shall be considered supplemental to one another so that materials and labor required by one but not the other shall be supplied and installed as though specifically called for by both. Where drawings and specification conflict, Contractor shall conform to the more stringent or costly of the two requirements.

B. Scaling: The drawings are diagrammatic only and show generally the location of the equipment, ducts and pipes but are not to be scaled. All dimensions shall be verified at the building site. Prefabrication of work from the drawings shall be at the Contractor's risk.

C. Existing Conditions: It shall be the Contractor's responsibility to visit the site prior to bidding the project and prior to beginning work to make himself familiar with existing conditions.

1.10 SPACE CONDITIONS AND SERVICE CLEARANCE

A. All equipment and materials shall fit into the available spaces in the building and must be introduced into the building so as not to cause damage to the structure. All equipment normally requiring service shall be made readily accessible by not locating it above (behind, etc.) piping, ductwork, conduit or other systems. Contractor shall also provide access by means of access panels, doors, etc. to be provided under this section of specifications where required or specified. Provide sufficient space to allow service (e.g. filter removal) of all equipment. Coordinate with all trades to insure accessibility and service of all equipment. Equipment located above lift out ceilings shall be considered to be accessible. Equipment located above hard (unremovable) ceilings shall be considered to be unaccessible and access panels shall be provided as specified herein.

B. The contractor shall be responsible for verifying that the particular manufacturer's equipment that he chooses will fit in the available space, and shall verify (prior to submitting equipment) that the service clearances that the manufacturer requires are available, and shall not submit equipment that will not allow the manufacturer's service clearances. During construction, the contractor shall install the equipment such that the manufacturer's service clearances are provided by reading the installation instructions. The contractors shall bear all costs associated with providing equipment that requires service clearances different from the basis of design equipment. If the manufacturer's service clearances are not provided, the contractor shall remove the equipment and provide equipment with service clearances equal to the basis of design equipment. The contractor shall submit a detailed sketch and description of any modifications to install the particular manufacturer's equipment that he chooses, to demonstrate that the equipment will fit and have the manufacturer's service clearances. The sketch is not submitted for review or approval or for confirmation that it is correct, only to certify that the contractor has completely considered the installation of substitute equipment.

1.11 MOISTURE INTEGRITY

A. Roof: All roof penetrations shall be watertight and comply with the roof manufacturer's requirements and recommendations so as to be covered by the roof "Bond". All roof penetrations shall be made inside roof curbs (conforming to the requirements of Section 15060). Pitch pockets are not acceptable.

B. Wall: All wall penetrations shall be sealed and caulked watertight.

1.12 NOISE AND VIBRATION

A. When in operation, all systems included in this section of specifications shall be free from objectionable or abnormal noise and vibration. See Section 15060 of the specifications for specific vibration isolation requirements.

1.13 PROTECTION OF MATERIALS AND EQUIPMENT

A. Delivery, Storage and Handling: Deliver products to site in factory-fabricated protective containers, with (where appropriate) factory-installed shipping skids and lifting lugs. Store in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

B. Maintenance of Filters: The Contractor shall be responsible for maintaining all air filters until Architect's Final Certificate. No air system shall be operated at any time without air filters and filters shall not be allowed to become overloaded with dust and dirt. For throwaway filters, new clean filters shall be installed. See also paragraph "Air Handling Equipment Operation During Construction Period".

C. During Construction: Pipe openings shall be closed with caps or plugs. All open duct shall be sealed tight with polyethylene. All equipment and material shall be stored in accordance with manufacturer's recommendations. No equipment, ductwork, piping, or materials shall be stored inside or outside the building unless it is properly protected from the weather. The Engineer reserves the right to reject any items furnished under Division 15 which have been damaged or are not in "like-new" condition.

D. Suspended Ductwork, Suspended Equipment and Suspended Piping: Installation of suspended HVAC ductwork in areas where the roof is not "dried in" is only acceptable if the Contractor coats each joint of the supply, return, outdoor air and exhaust duct with duct sealant as specified. Contractor is also required to wrap suspended ductwork, equipment and piping on three sides with a minimum 4 mil thickness polyethylene taped to the bottom of the ductwork, equipment and piping. Polyethylene covering is required to protect from the weather, water, dirt, roof tar, concrete, etc.

E. Non-Suspended Ductwork, Equipment and Piping: Contractor is required to wrap mechanical equipment, ductwork and piping that is not suspended with two layers of 4 mil polyethylene.

F. Prior to Final Construction Review: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match. All dents and sags in ductwork and equipment casings shall be straightened or replaced.

G. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match the original finish shall be repainted in accordance with the Architectural painting section.

1.14 ELECTRICAL

A. General: Motors, controls, relays and switches required for proper operation of equipment covered under this section shall be furnished and installed under this division of the specifications.

B. Wiring: All control and interlock wiring shall be furnished and installed under Divisions 15 - Mechanical. Power wiring through the disconnect and starter and to the motor shall be furnished and installed under Electrical Section. All control wiring and conduit shall conform to the material and installation requirements of Division 16.

C. Electrical Connections: Voltage, phase, ampacity and connection arrangement (e.g. single or multiple point) of each item of electrically driven equipment provided under this section of specifications shall conform to that shown on the Electrical drawings. Two speed motor winding arrangement shall match the starter type specified by Division 16.

D. Electrical Characteristics: The horsepowers, voltages and phases shown on the drawings and specified herein, are the estimated power requirements of all equipment furnished herein and is the basis of the design shown on the electrical drawings. If the Contractor provides equipment from the "Basis of Design" manufacturer or from other approved manufacturers with larger horsepowers, different voltages, different phases or ampacity, he shall coordinate with other trades to provide any additional wiring, circuitry, starters, breakers, transformers, etc., as required at no additional cost to the Contract.

1.15 MOTORS

A. General: This paragraph is applicable to all Division 15 specification sections. Motors less than 250 watts and used for intermittent service may be manufacturer's standard.

B. Motor Enclosures: Motor enclosure shall be appropriate for the environment that the motor will be in. In the absence of specifically identified motor enclosure style, the following requirements shall apply. Motors located in exterior locations, wet air streams, etc. shall be totally enclosed fan cooled (TEFC). Motors located in interior locations, in mechanical rooms, in dry air streams, etc. shall be open drip proof (ODP).

C. Motors Efficiency: Each motor 1 hp and above shall have a guaranteed minimum efficiency complying with the Energy Independence and Security Act of 2007 (EISA), and as specified below, and a minimum power factor of 82.5. Multi-speed motors do not have to comply with these efficiencies. Each motor's NEMA nominal efficiency shall be shown on the motor nameplate. Efficiency and losses shall be determined in accordance with the latest revision of IEEE Standard 112, Method B, using "Accuracy improvement by segregated loss determination including stray load loss measurement." Motors shall meet the minimum NEMA premium motor efficiency, as outline in MG1 Table 12-12, which is higher than the EPACT efficiency. Each submittal shall show that motor meets this guaranteed minimum efficiency, and that efficiency was measured according to this specification. Minimum efficiencies for 4-pole 1750 rpm motors are listed below:
1. Motor HP 1: Minimum Premium Efficiency: 85.5
2. Motor HP 1.5 to 2: Minimum Premium Efficiency: 86.5
3. Motor HP 3 to 5: Minimum Premium Efficiency: 89.5

D. Motor Service Factor: Motor service factor for all equipment 1/8 hp and above shall be 1.15 for ODP motors and 1.0 for totally enclosed motors.

E. Motor Speed: Maximum 1800 rpm. Single phase, ODP motors shall be equipped with speed controllers as specified on plans.

F. Motor Thermal Overload Protection: All single-phase motors shall be provided with integral overload protection. Internal protection shall automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

G. Bearings (Single Phase Motors): Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, pre-lubricated-sleeve type for other single-phase motors.

H. Bearings (Three Phase Motors): Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading.

I. Motor Nameplate: Provide on all motors 1/4 hp and above a permanent visible engraved nameplate indicating horsepower, RPM, voltage, phase, amps, cycles, full load amps, locked rotor amps, frame size, service factor, power factor and efficiency.

J. Motor Type: All single-phase motors shall be provided with motor type suitable for starting and operating torque. Shaded pole motors shall be allowed on 1/20 hp or less motors only. Split-phase, capacitor start, permanent split capacitor and capacitor start/capacitor run shall be provided on all single-phase motors above 1/20 hp based on specific torque requirements.

K. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

L. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor. Whenever starting requirements exceed operating requirements, the motor shall be large enough to start the equipment without overheating. As a minimum, motors shall be sized at 120% of design BHP requirements. Each motor shall be sized to drive the equipment taking into account belt losses.

1.16 PAINTING

A. All bare steel piping, pipe hangers, supports and miscellaneous metal exposed to view provided under this section of specifications, shall be cleaned and painted under the Architectural painting section of the specifications. Supports, hangers and accessories exposed to view shall not be electroplated, in order to allow them to be painted. In the event that there is no Architectural painting section, painting shall be done under this division of the specifications in accordance with the requirement of ANSI A13.1.81.

1.17 CLEANING

A. The Contractor shall maintain the site reasonably clean and free of excessive debris and leftover materials at all times. All trash and debris shall be hauled from the job site on a daily basis for disposal. Prior to testing and adjusting, equipment shall be clean and free of any construction debris and litter.

B. Contractor shall meet all contractual requirements as related to site cleanliness including dust control.

1.18 HAZARDOUS MATERIAL ALERT FOR NEW MATERIALS

A. Contract Materials which are scheduled to be incorporated into the work under this Contract shall first either be certified by the Manufacturer to be free of hazardous materials or be inspected and tested by accredited laboratories and certified to be free of hazardous material content (e.g. Asbestos, PCBs, lead, etc.) in accordance with OSHA, EPA and AHERA Rules (and 1982 School Rules).

1.19 ACCESS PANELS

A. Some mechanical systems may be made inaccessible by the installation of "hard" ceilings or by walls above the ceiling. See the finish schedule and the floor plans (architectural drawings) for the location of all "hard" ceilings and walls which extend above the ceiling. Provide access panels in these ceilings or walls (and any other locations where mechanical items are made inaccessible by ceilings or walls) for access to mechanical equipment and items requiring access above these ceilings.

B. For all access panels in gyp board and masonry, provide in accordance with specification section 08311 - Access Doors and Frames.

C. For all access panels in masonry, construction shall be as follows: Panels shall be sized as required for proper access and removal of the equipment but as a minimum shall be 18" x 18". Access panels shall have concealed continuous hinge, flush (not recessed) door, 14 gauge galvanized steel frame with prime coated finish, with pre-drilled anchor holes in corners, 1/4 turn flush mounted screwdriver operated latch(es) (on maximum 8" centers) and 14 gauge steel door with prime coated finish and rounded corners. Entire panel shall be painted to match ceiling or wall. Provide fire-rated access panel where required. Access panels shall be manufactured by Venco Products, Inc., Elmdor or Cesco.

1.20 STRUCTURAL COORDINATION

A. The party responsible for the installation of the system furnished under Division 15 shall provide the General Contractor with the weight of all mechanical equipment and ductwork and piping and the exact location. General Contractor shall then insure all structural members are properly sized and all mechanical penetrations are properly framed to support the full perimeter of the equipment. See also paragraph "Acceptable Products".

1.21 ROOM NUMBERS

A. The room numbers indicated on the Contract Documents were provided by the Architect to assist in identifying spaces during construction. These room numbers may not necessarily be the Owner's final choice of room numbers. The contractor shall obtain from the Owner the final choice of room numbers, and shall use these numbers wherever required. (For example, room numbers are used in programming of control systems, and shall match the Owner's final choice.)

1.22 CONTRACTOR REQUESTS FOR ELECTRONIC COPIES OF CAD DRAWINGS

A. If the Contractor requests to obtain electronic copies (emailed files or disc files) of CAD drawings from Andrews, Hammock & Powell, Inc., (AH&P) this paragraph shall describe the conditions for this action to take place.
   1. The Contractor must obtain written permission from the Architectural client, that the Architect does not object to providing electronic copies when AH&P is hired by an Architect to perform Engineering services.
   2. If AH&P is prime party (i.e. not hired by an Architect, but hired by the client directly), Contractor must obtain permission of AH&P to obtain electronic copies.
   3. If approval by Architect or Engineer (as noted above) is obtained, Contractor may obtain electronic copies based on the following rates: $25 per sheet, with minimum $200 per project.
   4. Contractor shall mail a copy of the check to AH&P, payable to AH&P and shall sign the enclosed indemnification letter, and send this letter to AH&P, along with requested sheets. If time is of essence, a copy of the check and indemnification may be faxed as evidence of the Contractor’s intent to mail said documents.
   5. Upon receiving the check or faxed copy, and signed indemnification letter, electronic copies of requested sheets shall be provided. AH&P reserves the right to alter the electronic copies by removing Professional Engineering Stamp, title block information, company logo, and similar information that is not relevant to the Contractor’s needs. Contractor shall indicate the desired format for CAD drawings (DWG or DGN).

END OF SECTION

Andrews, Hammock and Powell, Inc.
250 Charter Lane
Macon, GA 31210

Re: Letter of Indemnification

_____
(Project Name)

Gentlemen:

By hereby executing this Letter of Indemnification on behalf of itself and its subcontractors and suppliers, _____(company name) agrees to hold harmless and indemnify Andrews, Hammock and Powell, Inc. and the project architect and the consultants from and against all claims, liabilities, losses, damages and costs including but not limited to attorney's fees, arising out of or in any way connected with the use of, modification of, misinterpretation of, misuse of, or reuse by others of computer aided design (CAD) information and data provided on the above referenced project. The foregoing information applies, without limitation, to any use of the project information on this project, other projects, for additions to this project, or for any changes to this project by others.

_____ (company name) also acknowledges that the drawings prepared by Andrews, Hammock and Powell, Inc. is schematic in nature and is not intended as a shop drawing, dimensional drawing or fabrication drawing. Any dimensional information extracted from the CAD data by

_____(company name) is done purely at their own risk.
_____ (company name) agrees to ensure that any use of the above referenced CAD information without the expressed written authorization for any other projects other than referenced project is hereby prohibited.

Signing on behalf of_____(company name),

_____
Signature

_____
Print Name

_____
Date

SECTION 15051

MECHANICAL CLOSEOUT DOCUMENT REQUIREMENTS

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 SECTION INCLUDES

A. Mechanical Closeout Document Requirements which are specifically applicable to all Division 15 Sections, in addition to the requirements of Division 1 - General Requirements.

B. Individual Plumbing, Fire Protection, and HVAC Closeout document requirements.

C. Record Document Submittals "As-Builts".

D. Contractor Guarantee.

E. Manufacturer Warranties.

F. Operating Instructions and Training.

G. Operation and Maintenance (O&M) Manuals.

H. O&M Instruction Form.

I. Extra Materials and Spare Parts.

J. Maintenance and Service.

K. Manufacturer's Field Services and Start-up by Factory Authorized Personnel

1.3 RELATED WORK

A. All Division 15 sections.

1.4 RECORD DOCUMENT SUBMITTALS “AS-BUILTS”

A. The contractor shall be required to maintain a clean, undamaged set of blue or black line white prints of contract drawings and shop drawings.

B. The mechanical contractors (plumbing, HVAC and Fire Protection) shall mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
   2. Mark new information that is important but was not shown on Contract Drawings or Shop Drawings.
   3. Note related Change Order numbers where applicable.
   4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
   5. "As-builts" shall be submitted to the architect/engineer for review of the mechanical, plumbing and fire protection as installed upon completion of the work. Changes on "as-builts" are to be shown using standard engineering drafting practices. Freehand drawn changes will not be accepted.

1.5 CONTRACTOR GUARANTEE

A. All equipment and materials furnished (and/or installed under this section) and all work performed under this section of specifications, shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after date of substantial completion. Upon notice of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

1.6 MANUFACTURER'S WARRANTIES

A. Provide as a minimum a one (1) year manufacturer's equipment warranty against defective components for each piece of equipment and its components installed under their respective specification section prior to final inspection in accordance with each of the trades listed below. Equipment warranties shall commence on the date of Substantial Completion as established in the Certificate of Substantial Completion issued by the Architect. Contractor shall note that there may be more than one certificate of Substantial Completion and date of Substantial Completion for this contract. Any parts which fail during the first year shall be replaced by the Contractor at no additional cost to the Owner.

B. Plumbing: Each piece of equipment and its components furnished shall carry a minimum one (1) year warranty for replacement of parts and the labor required to complete such warranty work. Equipment and parts requiring warranties longer than one (1) year are listed below.
   1. Section 15410:
      a. Flush Valves: 3 year parts only
      b. Water Coolers: 5 year refrigeration system
   2. Section 15485:
      a. Electric Water Heaters (80 Gallons and Smaller): 3 year heater and parts

3. Section 15486:
   a. Water Heaters: 5 year non-prorated that pays for all costs of material, labor and/or freight in the event of tank failure or heat exchanger.

C. Fire Protection: Each piece of equipment and its components furnished shall carry a minimum one (1) year warranty for replacement of parts and the labor required to complete such warranty work.

D. HVAC: Each piece of equipment and its components furnished shall carry a minimum one (1) year warranty for replacement of parts and the labor required to complete such warranty work. Equipment and parts requiring warranties longer than one (1) year will be listed below.

1.7 OPERATING INSTRUCTIONS AND TRAINING

A. Instructions: Instruct operating personnel as required (but a minimum of 16 hours) in operation and maintenance of all systems included in this Division (15) of the specifications. In addition, there shall be the quantity of dedicated instruction for certain specific pieces of equipment as specified in the individual specification sections herein. Provide signed O & M Instruction Verification Form as specified in later paragraph certifying instructions have been received.

B. Training: See each specification section for specific training requirements.

1.8 OPERATING AND MAINTENANCE (O&M) MANUALS

A. Operating and maintenance manuals shall comply with Division 1 Section “Operation and Maintenance Data.

B. One bound and indexed Operating and Maintenance Manual and one electronic (PDF format) copy shall be prepared by the Contractor and be submitted for approval prior to delivery to operating personnel. Binder shall be 3-ring commercial grade, complete with inside storage pockets, sheet protectors, spine and front cover labels.

C. Each Manual shall contain the following information, data and drawings. The exact format and order of the following information shall comply with Division 1 requirements. If no Division 1 requirement exist, format and order shall be as listed below.
1. Plumbing:
   a. List of Contents. Insert under clear front cover of binder.
   b. Contractors one (1) year guarantee.
   c. Manufacturer's equipment warranties (provide a warranty for each piece of equipment).
   d. Copy of O & M Instruction Form showing Contractor has instructed designated personnel in the proper operation of all Division 15 systems.
   e. Installation, operating and maintenance instructions for each item of equipment. Provide trouble shooting checklist guide.
   f. Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.
   g. Copy of approved submittals, shop drawings showing layouts and construction details.

2. Fire Protection:
   a. List of Contents. Insert under clear front cover of binder.
   b. Contractors one (1) year guarantee.
   c. Manufacturer's equipment warranties (provide a warranty for each piece of equipment).
   d. Copy of O & M Instruction Form showing Contractor has instructed designated personnel in the proper operation of all Division 15 systems.
   e. Installation, operating and maintenance instructions for each item of equipment. Provide trouble shooting checklist guide.
   f. Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.
   g. Copy of approved submittals, shop drawings showing layouts and construction details.
3. HVAC
   a. List of Contents. Insert under clear front cover of binder.
   b. Contractors one (1) year guarantee.
   c. Manufacturer's equipment warranties (provide a warranty for each piece of equipment).
   d. Copy of O & M Instruction Form showing Contractor has instructed designated personnel in the proper operation of all Division 15 systems.
   e. Installation, operating and maintenance instructions for each item of equipment. Provide trouble shooting checklist guide.
   f. Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.
   g. Copy of approved submittals, shop drawings showing layouts and construction details.

1.9 MAINTENANCE AND SERVICE

A. Maintenance: The Contractor shall provide any necessary services for all systems installed under these contract specifications for one year from date of substantial completion.

B. Parts and Labor: Provide repair parts and all labor during maintenance periods.

1.10 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. After the potable water piping systems (hot, cold and recirculating) have been completed, these piping systems shall be flushed to remove foreign materials from piping. The piping systems shall then be adequately disinfected as per federal specifications BB-C-120.

B. Subsequent to the disinfection, water samples shall be sent to the local health department (LHD) for testing. LHD approval shall be obtained before the system is put into service.

C. Repeat disinfection and/or flushing until the samples are approved by the local health department. Provide health department approved certificate in O&M manuals. All cost associated with disinfection and sample testing shall be borne by the Contractor.

1.11 MANUFACTURER'S FIELD SERVICES AND START-UP BY FACTORY AUTHORIZED PERSONNEL

A. Refer to each specification section for additional requirements the manufacturer shall provide under the provisions of this specification.

B. Upon completion of the equipment installation the Contractor shall obtain the services of the factory authorized and trained representative at no additional cost to the owner to perform a start-up of the piece of installed equipment. The factory authorized and trained representative shall submit a certificate or letter stating the equipment has been successfully started, adjusted and tested in accordance with the manufacturer's recommendations. Contractor shall refer to each specification section to determine which equipment/systems require start-up by factory authorized personnel. Some representative equipment/systems which require start-up are listed below.
   1. Fire Protection Systems
   2. Water Heater

1.12 O & M INSTRUCTION FORM

A. Contractor shall provide instruction to operating personnel for the minimum hours specified in each specification section.

B. Contractor shall coordinate a schedule of startup/operation and maintenance instruction meetings between the Owner's representatives, various subcontractors and manufacturer's representatives. Submit the following completed form. Some representative systems and equipment are included in the form below, but contractor shall customize the form based on the specific systems and equipment on this project.

OPERATIONAL INSTRUCTION VERIFICATION FORM

Operation and maintenance procedures for major systems and equipment were thoroughly explained to the Representatives as follows:

Equipment Item	**Date Instruction Received**	**Owner's Representative Name (printed)**	**Owner Representative Initial or Signature**
HVAC			
Electric Heaters			
Ductless Split Systems			
Fans			
"I certify that the operation and maintenance procedures of all the major mechanical systems have been thoroughly explained to the Owner’s Representative."			
Company:			
Name:			
Title:			
Signature:			
Date:			

END OF SECTION

SECTION 15060

HANGERS AND SUPPORTS

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 hangers, supports and accessories for mechanical system piping and equipment:
   1. Coatings
   2. Upper attachments
   3. Pipe attachment (hangers and clamps)
   4. Metal framing channel
   5. Hanger rods
   6. Pipe positioning systems
   7. Insulation shields
   8. Flashings
   9. Sleeves
   10. Roof mounted equipment supports

1.3 PERFORMANCE REQUIREMENTS

A. All supports utilized under Division 15 shall meet the sizing criteria specified herein. No support shall be loaded to more than 20% of its yield strength (thereby providing a safety factor of 5). All support sizes specified herein (for hanger rods, trapeze hangers, pipe attachments, etc.) are minimum sizes required. Contractor shall utilize larger size supports where actual loads dictate a larger support.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 15050.

B. Submit product data on roof equipment curbs and supports, upper attachments, pipe attachments, lower pipe supports, pipe positioning systems, and vibration isolators.

1.5 WELDING REQUIREMENTS

A. Welding Requirements: All welding performed to support Mechanical piping and equipment shall comply with AWS D1.1, "Structural Welding Code - Steel". Welders shall be qualified per AWS and welding certificates shall be posted at the jobsite.

1.6 COATINGS

A. All supports for piping and equipment, hangers and accessories, including but not limited to bolts, nuts, washers, rods, beam clamps, etc. shall be galvanized, except as indicated in the following paragraphs.

B. Hangers and supports in direct contact with copper piping shall be copper plated.

PART 2 - PRODUCTS

2.1 UPPER ATTACHMENT

A. Steel Beams:
   1. Piping 2" and smaller: Malleable Iron C-Clamp with Lock Nut.
      a. B-Line: B 3033 or B3034
      b. C&P: 192
      c. Anvil: 94
      d. Erico/Michigan: 280
      e. PHD: 350 or 360
      f. FNW: 7203 or 7204
   2. Piping 2-1/2" and larger: Malleable Iron Beam Clamp.
      a. B-Line: B 3054
      b. C&P: 82
      c. Anvil: 218
      d. Erico/Michigan: 360
      e. PHD: 630 w/25
      f. FNW

B. Steel Bar Joist: Malleable Iron C-Clamp with Lock Nut.
   1. B-Line: B 3033 or B3034
   2. C&P: 192
   3. Anvil: 94
   4. Erico/Michigan: 280
   5. PHD: 350 or 360
   6. FNW: 7203 or 7204

C. Wood Joists: When piping is routed perpendicular to the wood joist, the upper attachment shall consist of either option 1 or 2 as stated below.
   1. Option 1: The upper attachment shall be a 3/8" coach screw rod 3-1/2" long. The hanger rod shall be attached to the coach screw rod with a 3/8" rod coupling. The coach screw rod and rod coupling shall be:
      a. B-Line:
         1) Coach Screw Rod: B3213-3/8" X 3-1/2"
         2) Rod Coupling: B3220-3/8
      b. C & P:
         1) Coach Screw Rod: 28
         2) Rod Coupling: 167

c. Anvil:
   1) Coach Screw Rod: 142
   2) Rod Coupling: 136, 136R
d. PHD:
   1) Coach Screw Rod: 40
   2) Rod Coupling: 100, 105
e. Erico/Michigan:
   1) Coach Screw Rod: 41
   2) Rod Coupling: ----

2. Option 2: The upper attachment shall be a 3/8" ceiling flange. The ceiling flange shall be attached to the wood joist with 2" long No. 18 wood screws. The ceiling flange shall be:
   a. B-Line: B3199
   b. C&P: 85
   c. Anvil: 128R
   d. PHD: 940, 940-1
   e. Erico/Michigan: 365
      1) When duct is routed perpendicular to the wood joist, the duct hanger shall be screwed to the wood joist with 2" long No. 18 wood or sheet metal screws.
      2) When piping or duct is routed parallel to the joist and cannot be hung directly from joists, provide a metal framing system of channels, fittings and hardware as specified for trapeze hangers herein.

2.2 PIPE ATTACHMENT

A. PVC and cast iron pipe hangers: Size sanitary waste and vent and storm drain pipe hangers to fit piping inside the insulation.
   1. B-Line: B3100
   2. C&P: 100
   3. Anvil: 260
   4. Erico/Michigan: 400, 401
   5. PHD: 450, 451

B. Copper tubing hangers: Size hot, cold and recirculating water pipe hangers to fit piping inside insulation.
   1. B-Line: B3170CT
   2. C&P: 800CT
   3. Anvil: CT-69
   4. Erico/Michigan: 101
   5. PHD: 152
   6. FNW: 7015EC

C. Steel Pipe Hangers: Size uninsulated steel pipe hangers to fit outside the piping. Size insulated steel pipe hangers to fit outside the insulation with insulation shield installed between the hanger and the pipe insulation.
   1. For Pipe Sizes 2" and Smaller:
      a. B-Line: B3170
      b. C&P: 800

c. Anvil: 70
d. Erico/Michigan: 100
e. PHD: 151

2. For Pipe Sizes 2-1/2" and Larger
a. B-Line: B3100
b. C&P: 100
c. Anvil: 260
d. Erico/Michigan: 400, 401
e. PHD: 450, 451

D. Vertical supports shall be:
1. Offset pipe clamp:
a. B-Line: B3148
b. C&P: 179
c. Anvil: 103
d. Erico/Michigan: 700
e. PHD: 535
2. Riser clamp:
a. Steel:
1) B-Line: B-3373
2) C&P: 126
3) Anvil: 2612
4) PHD: 500, 551
5) Erico/Michigan: 510
6) FNW: 7022EP
b. Copper:
1) B-Line: 3373CT
2) C&P: 126CT
3) Anvil: CT121
4) PHD: 552
5) Erico/Michigan: 511
6) FNW: 7023EC

2.3 METAL FRAMING CHANNEL

A. Where possible and practical, piping shall be supported with trapeze hangers consisting of a metal framing system of channel, fittings, and hardware as defined in the Metal Framing Manufacturer's Association Standard Publication MFMA-1. Length of trapeze supports shall not exceed 4 feet unless contractor performs and submits calculations which indicate the channel is within the manufacturer's recommendations with a safety factor of 30% added to the load.

B. Vertical Pipe Supports: Where shown on the drawings, vertical routed piping shall be supported and/or stabilized by steel channel meeting the requirements for channel as specified herein.

C. Channel shall be constructed of 12 gauge steel. Nominal width shall be 1-5/8" x 1-5/8" with a 9/16" wide and 7/8" long slot face opening, with slots on 2" centers. Channel shall be pre-galvanized in accordance with ASTM A 653 G90, or have a factory applied electro-deposited epoxy finish.

D. Pipe clamps shall be sized as follows:
1. Non-insulated Steel Piping: Sized to fit piping.
2. Insulated Piping: Sized to fit outside of insulation.
3. Copper Piping: Sized to fit outside of piping plus elastomeric isolation material.

E. Approved Manufacturers: B-Line Model B22SH, Elcen, Unistrut, and Superstrut by Midland-Ross.

2.4 HANGER RODS

A. Steel Hanger Rods: Continuous threaded rod. Size as indicated in individual piping specification sections.

B. Rods supporting trapeze hangers shall be 1/2" unless actual loads dictate a larger rod. Rods supporting mechanical equipment shall be sized in accordance with the manufacturer's installation instructions. If no size is given, rod size shall be minimum 3/8", unless actual load dictates a larger rod. No support shall be loaded to more than 20% of its yield strength (thereby providing a safety factor of 5).

C. Rod couplings shall be:
1. B-Line: B3220
2. C&P: 167
3. Anvil: 136, 136R
4. Erico/Michigan: 26
5. PHD: 100, 105

2.5 PIPE POSITIONING SYSTEMS

A. Definition: A combination of straps, brackets and clips designed to correctly locate pipes in walls relative to fixtures or equipment.

B. Metal Components: Metal components of the system must be pre-galvanized steel ASTM A446 Grade A or better. Metal parts in contact with copper pipe shall be copper plated steel ASTM A611 Grade C or better. All metal components must be stamped with the manufacturer's name and part number and the UPC certification mark.

C. Plastic Components: Plastic components shall be made of polypropylene or Lexan 141 with a flame retardant rating UL94V2 or better. All plastic parts must be stamped with the manufacturer's name and part number.

D. Manufacturers: B-Line RufflinJ, Holdrite Corp by Hubbard or equal by Erico/Michigan.

2.6 INSULATION SHIELD

A. Provide insulation shields at all pipe hangers installed on the exterior of the insulation and at all pipe clamps and trapeze supports. Shields shall be fabricated from minimum 18 gauge galvanized steel. Shields at pipe hangers shall be 12" long with a 180 degree arc. Shields at pipe clamps shall cover entire pipe. Contractor may utilize the following shields:
1. B-Line: B3151
2. C&P: 265P
3. Anvil: 167
4. Erico/Michigan: 121
5. PHD: 170
6. FNW: 7750

2.7 EQUIPMENT BASES

A. Bases shall be 3,000 psi concrete and provided in accordance with Division 3, Section Cast-In-Place Concrete.

B. Bases shall be rectangular, unless otherwise indicated, with vertical side 6 inches from centerline of anchor bolts or 4 inches from edge of equipment, whichever provides larger dimension. Provide 1 inch chamfer on edges and corners. Provide 6 inch x 6 inch 10/10 WWF reinforcing wire at mid-depth of slabs, 6 inch deep or less, or at 1/3 and 2/3 depth of slabs thicker than 6 inches. Provide 1" clearance from adjacent walls for pumps. All equipment shall be anchor bolted to the concrete pad unless noted otherwise. Base height shall be as follows:
1. Water Heaters - 4 inches

2.8 FLASHING

A. Vents Thru Roof: 4 lb. /sq. ft sheet lead for modified bitumen roofing system and ethylene propylene diener monomer (E.P.D.M.) pipe flashing on metal roofing system. E.P.D.M. pipe flashing shall have a 0.040" thick aluminum ring on base. E.P.D.M. pipe flashing shall be "Dektite" pipe flashing as manufactured by Design Components, Inc., 1047 Lee's Mill Road, College Park, Georgia, 30349; Phone 800-868-9910; Fax 404-991-6951, or Pate or Thy Curb.

2.9 SLEEVES

A. Pipe Sleeves: Pipe sleeves thru floors shall be fabricated from schedule 10 (minimum) steel pipe, and shall extend 1 inch above floor. Pipe sleeves thru walls shall be fabricated as shown on mechanical drawings. Sleeve shall be flush with both sides of walls, unless noted otherwise on drawings. Sleeves on copper piping through slab on grade shall be Schedule 40 PVC (minimum). Omit sleeves on sanitary waste and vent and storm drain pipe penetrations thru slabs on grade.

2.10 ROOF MOUNTED EQUIPMENT SUPPORTS (CURB TYPE)

A. General:
1. Furnish and install roof mounted equipment supports as specified below. Unless otherwise indicated, the supports shall be installed on the roof deck before the application of roofing insulation materials. All roofing membranes shall be continuous up to the nailer.
2. Metal Roofs: Curbs for metal roofs are provided and installed under the Architectural Sections, but the Division 15 Contractor shall provide exact dimensions required to the curb supplier. Curbs for sloping metal roofs shall be approved by the metal roof manufacturer. They shall also conform to the detail on the drawing and shall be finished in Kynar in a color matching the metal roof.

B. Roof Curbs: 18 gauge galvanized steel, unitized construction with full mitered corners and all seams welded or bolted/screwed. Provide 1-1/2" thick, 3 lb. density rigid fiberglass insulation on the exterior or interior surfaces. Provide a 1-1/2" wide pressure treated wood nailer strip around the top perimeter above the insulation and below the top of the curb. 45° fiber cants, minimum of 4" high around perimeter of curb shall be provided under Architectural Section.. Curbs shall have vertical sides. Provide curbs for the following roof mounted equipment:
1. Roof Exhaust Fans

C. Height: Roof mounted equipment supports shall be a minimum of 14" high from the base plate to the top of the curb and 12" above the roof surface. Exact height shall be determined by the supplier, by selecting a curb height that will insure the top of the flashing is a minimum of 12" above the highest elevation of adjacent roof surface.

D. Slope: Roof mounted equipment supports shall be fabricated to incorporate a slope to match the roof slope, so that the top of the curb is level with its base plate resting flat on the roof deck. Refer to the Architectural drawings for the exact roof slope. Where roof equipment is installed on moderately to steep sloped roofs (greater than 2 in 12 pitch), the shortest side of the curb may be reduced to 6" high.

E. Insulation: If roof curb provider does not furnish factory installed insulation, contractor shall notify insulation contractor so that insulation contractor can indicate this in submittals and provide insulation.

F. Manufacturer's: Pate, A.E.S., Thy, Custom Curb, Curbs Plus, S & L Manufacturing, Creative Metals, Metal Form, Shipman, Roof Products and Systems or by the equipment manufacturer of the rooftop equipment.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support spacing requirements are specified in Sections specifying piping systems and equipment.

B. Use galvanized hangers and supports for piping and equipment that will not have field-applied finish.

C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

D. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Hanger Shield Installation: Install shield in pipe hanger or shield for insulated piping.

D. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 15 Section "Plumbing Fixtures" for plumbing fixtures.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, 2-1/2" and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

I. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

3.3 CONCRETE EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete. To reduce vibration to adjacent walls, bases shall not be placed within 1/4" of adjacent walls. Obtain templates, anchor bolts, and accessories for mounting and anchoring equipment. Provide concrete bases at least 6" beyond the footprint of the equipment that the contractor provides, or as shown on the plans, whichever is larger.

3.4 PIPE HANGER ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Painting Section.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. In areas that are to be painted and also are exposed to view in public areas, supports for piping and equipment, hangers and accessories including but not limited to bolts, nuts, washers, rod, angle iron, beam clamps, etc. shall be plain steel with a coat of rust inhibiting primer. Primer shall be applier prior to installation of supports. Supports, hangers and accessories exposed to view shall not be galvanized or electroplated, in order to allow them to be painted in accordance with the Architectural painting section. Areas that are to be painted but that are not exposed to view to the public, such as mechanical rooms, shall be galvanized as required above.

3.6 SLEEVES AND PENETRATIONS

A. Provide pipe sleeves for all piping and conduit penetrations through floors and walls.

B. Set sleeves in position during construction of walls or floors prior to placement of brick, concrete block or cast-in-place concrete.

C. Piping and Conduit Penetrations through Rated Walls or Floors: Firestopping methods and materials shall be in accordance with Architectural "Through-Penetration Firestop System" specification section. Assembly shall meet the wall or floor rating as specified by the Architect. See Architectural drawings for rating requirements. Sleeve's size and material shall be coordinated with Architectural "Through-Penetration Firestop System" specification section.

D. Piping and Conduit Penetrations through Non-rated Walls or Floors: Pack space between pipe or conduit and sleeve with fiberglass batts and with a minimum of 1 inch thick, non-sagging caulking material on one side. Caulk material is not required to be fire rated, but shall comply with Architectural caulking specification section.

E. Install chrome plated steel escutcheons at finished surfaces for piping.

F. Duct Penetrations through Walls: All duct penetrations through non-rated walls shall be neatly finished off on both sides of the wall. Provide sheet metal angle around full perimeter of rectangular duct on both sides of the wall and provide sheet metal escutcheon around full perimeter of round duct on both sides of the wall, and seal off with FSK tape. See also detail on the drawings. Penetrations through rated walls shall be provided with fire dampers, smoke dampers, or combination fire/smoke dampers as required to provide the appropriate protection for the wall penetration. See Architectural drawings for identification of rated walls. See Section 15820 - Ductwork Accessories, for damper material and installation requirements.

G. Division 15 Contractor shall furnish the General Contractor with the clear opening dimensions and elevations and locations of all penetrations through walls and floors, so that the General Contractor may provide appropriate wall and floor openings for these penetrating items. Penetrating items include, but are not limited to, ducts and piping. Clear opening dimensions and elevations and locations shall be furnished in a timely manner to allow General Contractor to frame openings during wall and floor construction, and to prevent the need for removing new work.

3.7 SUSPENDED EQUIPMENT, DUCTWORK AND PIPING SUPPORTS

A. Provide steel drop rod supports or angle iron supports, secured (spot welded or clamped in bar joist areas) to building main structural components for all suspended mechanical equipment, ductwork and piping. Supplemental angle iron framing shall be provided where required between bar joists and shall be minimum 3 x 3 x 1/4 for equipment and large piping (4" and larger), and minimum 2 x 2 x 1/4 for large ductwork, small equipment and small piping, and 2 x 2 x 1/8 for small ductwork and refrigerant and condensate drain piping. 1-5/8 x 1-5/8 x 12 gauge channel may be used to span bar joist in lieu of 2 x 2 x 1/4 angle provided that previous paragraph “Performance Requirements” are met. Contractor shall note that supplemental angle sizes are minimum. Contractor shall provide larger size supplemental angle iron framing as appropriate to safely and appropriately support equipment. Provide vibration isolation where specified. Coordinate all mechanical equipment, duct and pipe supports with steel fabricator/erector and do not overload any building structural members or supplemental framing members. Provide securely tightened lock nuts on all drop rod supports and connections.

3.8 ROOF MOUNTED EQUIPMENT SUPPORTS

A. Coordinate with General Contractor to insure full perimeter structural steel framing is provided either under Division 5 or herein, around all roof mounted equipment supports. Framing must comply with requirements of Division 5.

B. All curb mounted equipment shall be anchored to the curb/nailer with cadmium plated anchors, minimum 5/16" x 1-1/2" hex head screws, on 12" centers. Provide minimum two screws per side. Where roof mounted equipment manufacturer's requirements exceed the above requirements, provide installation complying with manufacturer's requirements.

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

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 mechanical identification materials and their installation:
   1. Equipment nameplates.
   2. Equipment markers.

1.3 SUBMITTALS

A. Product data for each type of product included herein shall be submitted under provisions of Section 15050.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. General: Provide nameplates for all equipment and panel mounted controls. Location shall be accessible and visible.

B. Equipment Nameplates: Metal with data engraved or stamped, permanently attached to equipment. As a minimum, nameplate shall include manufacturer, model number, serial number and electrical data.

2.2 EQUIPMENT MARKERS

A. Markers shall be Contractor fabricated to have equipment "tag" or number (e.g., EF-1, AHU-2, etc.) on marker.

B. Designation:
1. Equipment tag shall be etched in 1/4" maximum, 1/8" minimum height letters and mounted on or adjacent to device cover or attached to the item of equipment. For items above ceiling, marker shall be attached to ceiling on t-bar grid in location approved by Owner.
2. Type: White core black bakelike secured with epoxy glue or screws, unless otherwise noted.

PART 3 - EXECUTION

3.1 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
2. Data: Equipment "tag".
3. Locate markers where accessible and visible.

3.2 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.3 CLEANING

A. Clean faces of mechanical identification devices to an "as new" condition immediately prior to Architect's Final Certification.

END OF SECTION

SECTION 15080

MECHANICAL INSULATION

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 mechanical insulation for duct, equipment, and pipe, including the following:
   1. Insulation materials
   2. Fitting materials.
   3. Insulation finish materials
   4. Accessories

1.3 SUBMITTALS

A. Product data shall be submitted under provisions of Section 15050 for each type of product indicated; identify thermal conductivity, thickness, and jackets (both factory and field applied, if any). Provide a sheet that identifies each system (e.g., cold water piping, supply duct, etc.), and the submitted material, thickness, and finish for each system.

B. Submit proof of three years minimum experience in insulation installation.

1.4 QUALITY ASSURANCE

A. Insulation and related materials shall meet the requirements of NFPA-90A.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing products per ASTM E 84. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Applicator: Company specializing in insulation application with three years minimum experience.

1.5 GENERAL INSULATION NOTES

A. Any HVAC equipment which is factory insulated, and which has sweating/condensation forming on the equipment while operating under design conditions, shall be replaced or field insulated by the contractor until the condensation is eliminated.

B. Piping and ductwork is considered concealed for purposes of this Specification Section when located above ceilings or in chases.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Certain Teed, Owens-Corning, Johns Manville, Armacell, IMCOA, Nomaco, Knauf, Pittsburg Corning, The Dow Chemical Company, Dyplast, Foster, Childers and Hi-Therm.

B. Substitutions: Under provisions of Section 15010.

2.2 INSULATION MATERIALS

A. I1: Glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75 degrees F. Jacket shall be factory applied all service jacket with self sealing lap (ASJ-SSL). Provide ASJ tape where insulation butts. Provide 12" of type I7 insulation at hangers installed on the exterior of the insulation on piping sizes 2" and larger. ASJ jacket shall be continuous. Provide insulation shield on exterior of insulation at all hangers.

B. I2: Preformed flexible elastomeric expanded closed-cell pipe insulation having a flame spread rating of 25 or less and a smoke density of 50 or less when tested by ASTM E-84 method. Temperature range -40°F to 220°F. Insulation shall be CFC and HCFC free and formaldehyde free. Thermal conductivity of 0.27 btu-in/hr sq. ft °F at 75°F mean temperature. All seams and butt joints shall be sealed with factory applied adhesive. Provide insulation shield on exterior of insulation at all hangers.

C. I3: Blanket Insulation: Glass fiber blanket insulation minimum 3/4 lb. density, installed R3.5 per inch, with FSK facing. On ductwork, wrap blanket insulation around duct, being careful not to compress it more than 25% at the corners, butting insulation and overlapping facing jacket 2" minimum at all joints. Two-inch (2") thick insulation shall have a minimum R5.3 at 25% compression. Where scheduled, provide 3" thick insulation with installed R8.0. Staple the overlap with outward clinching staples a maximum of 3" on centers. For ducts over 30" wide, additionally support insulation on bottom of horizontal ducts and sides of vertical ducts with rows of welded or adhered clips and washers on not more than 18" centers. Seal all joints and clips with pressure sensitive FSK tape. Seal all penetrations, such as at duct supports, and all terminations of insulation with pressure sensitive FSK tape. When blanket insulation is used on storm drain system, blanket shall cover roof drain body, vertical pipe from roof drain body to horizontal piping and all horizontal piping. Install similar to duct systems.

D. I5: Internal fiberglass duct liner as specified in Section 15815 “Metal Ducts”.

2.3 FITTING INSULATION MATERIALS

A. Type P1: Precut fiberglass insulation fitting inserts covered with PVC fitting covers. PVC fitting covers shall have a flame spread of 25 or less and a smoke development of 50 or less. Nominal 0.75 lb. density, K factor maximum 0.32 at 75°F for temperatures -20°F to 450°F.

2.4 INSULATION FINISH MATERIALS

A. F1: Two coats of Armacell Armaflex finish or equal

B. F2: Pre-molded PVC jacket, maximum permeance of 0.09. PVC jacketing shall be minimum 0.02" thick (20 mils).

C. F4: 0.016" Aluminum jacketing and 0.024" aluminum fitting covers with joints sealed water tight with sealant, Foster Elastolar 95-44, Childers Chil Byl CP-76, or prior approved equal, installed over white vapor barrier mastic (Type F3) with 10 x 10 glass or polyester cloth reinforcing membrane to develop 37 mil dry film thickness.

D. F6: 0.010" Aluminum jacketing with joints sealed watertight with sealant, Foster Elastolar 95-44, Childers Chil Byl CP-76 or prior approved equal;

2.5 ACCESSORIES

A. Insulation Bands for Cellular Glass: 3/4-inch wide; 0.015-inch thick aluminum.

B. Metal Jacket Bands: 2 inch wide; 0.015-inch thick aluminum.

C. Adhesives: Compatible with insulation materials, jackets and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

D. Insulation Shields: Provided in accordance with Section 15060.

E. Mastics: Materials shall be compatible with insulation materials, jackets, and substrates.

F. Tapes: FSK foil face, vapor retardant type tape matching factory applied jacket with acrylic adhesive; complying with ASTM C1136 and UL listed. Width shall be three inches; thickness shall be 6.5 mils.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 COORDINATION

A. Coordinate with contractor to confirm (based on contractor's preference) which sections of piping will be welded and which sections of piping shall be grooved. See Part 3 - "Execution" herein for additional insulation requirements specific to grooved piping system.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Coordinate with trade installing piping to verify all piping has been pressure tested prior to application of insulation.

3.3 COMMON INSTALLATION REQUIREMENTS

A. Install insulation, fitting materials, finish materials and accessories in accordance with manufacturer's installation requirements and recommendations.

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

C. Install insulation with longitudinal seams at top and bottom of horizontal runs. Install multiple layers of insulation with longitudinal and end seams staggered. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

D. Keep insulation materials dry during application and finishing.

E. Install insulation with least number of joints practical.

F. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic (Type F3).

G. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

H. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

I. Continue insulation with vapor barrier through penetrations. At fire dampers, smoke dampers, and fire/smoke dampers, extend insulation to wall on both sides of wall and seal.

J. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

K. On insulated piping without vapor barrier and piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation with mastic (Type F3) at such locations.

L. Insure duct access panels are not blocked by the installation of external duct insulation.

M. For above ambient service, do not install insulation to vibration control devices, testing agency labels, nameplates or cleanouts ASME stamps, etc.

N. Internal Acoustical duct liner is specified in certain ducts for acoustical purposes to reduce high frequency noise. These ducts may also be specified with external duct insulation. The Contractor is not permitted to omit specified external duct insulation (duct wrap, duct board, etc.) just because the duct is also lined.

3.4 INSULATION SCHEDULE

Service/Location	INSULATION Pipe/Duct	Fitting	FINISH Thickness	Pipe/Duct	Fitting
PIPING:					
Hot, Cold & Recirculating Water Piping:					
Above Ceilings & Inside Exterior Walls	I1	P1	1"	--	--
Interior Walls & Chases	I1	P1	1/2"	--	--
Exposed	I1	P1	1"	F2	F2
P-traps and waste piping 10 feet downstream receiving condensate	I3	I3	1-1/2"	--	--
DUCT:					
General Exhaust Duct	--	--	--	--	--

EQUIPMENT:

Mechanical Equipment	Shall have factory installed insulation to prevent condensation or excessive heat loss/gain
Roof Curbs	If contractor utilizes roof curbs furnished by roof curb equipment manufacturers, and if roof curbs are not factory insulated, insulation contractor shall insulate curbs with 1-1/2" thick 3-pound density rigid fiberglass insulation on the interior or exterior surfaces.

END OF SECTION

SECTION 15110

VALVES

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 general-duty valves:
   1. Ball valves.

1.3 SUBMITTALS

A. Product data for each type of valve indicated shall be submitted under provisions of Section 15050.

1.4 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.9 for building services piping valves.
   1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.5 STORAGE

A. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 SHUT OFF VALVES

A. Shut off valves for the (domestic) hot water, recirculating hot water and cold water systems shall be:
   1. Ball Valves: 2" and smaller; 400 psi WOG; standard port, 2-pc. bronze construction, blow-out proof stem, solder or threaded ends as applicable. Provide chrome plated forged brass ball. Provide teflon (TFE) packing and packing nut to allow stem leakage correction. "O" ring seals are not allowed. Valve shall conform with MSS-SP110.

Provide a stem extension on insulated piping. Length of extension shall be a minimum of 2-1/4". If stem extension is not factory installed, contractor shall field install stem extension.

a. FNW: 421
b. Milwaukee: BA250/BA200
c. Hammond: 8211/8201
d. Stockham: S-255/T-255
e. Flow Design: HB
f. Watts: B-6001/B-6000
g. Kitz: 69/68
h. Apollo: 70-200-01, 70-100-01
i. American Valves: G100

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Where flanged connections are provided to connect butterfly valves to other flanged piping components, the contractor shall provide spool pieces as necessary to allow the disc to extend to the fully open position.

F. Install valves with stems upright or horizontal, not inverted.

G. Use ball valves (or butterfly valves, as specified) for shutoff and to isolate equipment, to isolate systems and vertical risers.

3.2 JOINT CONSTRUCTION

A. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION

SECTION 15122

METERS AND GAUGES

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 meters and gauges for mechanical systems:
   1. Stem type thermometers.
   2. Separable socket wells.

1.3 SUBMITTALS

A. Product data shall be submitted under provisions of Section 15050. For each type of product herein, include performance curves.

B. Shop Drawings: Schedule for thermometers and gauges indicating manufacturer's number, scale range, and location for each. Identify the specific ranges for the equipment used on this project for thermometers and gauges. Submittals showing thermometers and gauges with multiple sizes, ranges, materials, etc., without showing specific sizes, ranges, materials, etc., for this project will be rejected.

C. Operation and maintenance data shall be submitted under provisions of Section 15051.

PART 2 - PRODUCTS

2.1 STEM TYPE THERMOMETERS

A. General: Adjustable angle industrial type constructed of brass or cast aluminum (no plastic allowed) case, rattle-proof glass window, black scale graduations and red reading mercury tube. Stem to be constructed of brass or stainless steel, with 3/4" thread for use with separable socket well. Scale to be 7" long with 3-1/2" long stem.

B. Ranges:
   1. Domestic Hot Water: 30° to 240°F in 2° divisions.

C. Manufacturers: Stem type thermometers shall be manufactured by Ashcroft, Trerice, Weksler, FNW, Weiss, Palmer or Moeller.

2.2 SEPARABLE SOCKET WELLS

A. Provide for all thermometers and control bulbs mounted in piping. Wells shall be constructed of brass or stainless steel, be furnished complete with screwed cap and on insulated piping shall have lagging extension. Wells shall be suitable for 3-1/2" stems. Where wells are installed in straight runs of pipe smaller than 2-1/2", increase pipe size to 2-1/2" for minimum 4" either side of well. Wells shall be installed at 45 degrees or greater above horizontal and be filled with SAE 10 W oil.

PART 3 - EXECUTION

3.1 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install direct-mounting pressure gauges in piping tees with pressure gauge located on pipe at most readable position.

C. Install flow indicators, in accessible positions for easy viewing, in piping systems.

D. All gauges, flow meters, venturis, etc. shall be installed in accessible locations in accordance with manufactures instructions.

3.2 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow service and maintenance for meters, gauges, machines, and equipment.

3.3 ADJUSTING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjust faces of meters and gauges to proper angle for best visibility.

END OF SECTION

SECTION 15140

DOMESTIC WATER PIPING

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 domestic water piping within 5'-0" of the building.

1.3 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings shall be submitted under provisions of Section 15050.

1.4 QUALITY ASSURANCE

A. All piping and fittings shall be new and of domestic (USA) manufacturer. The ASTM number and schedule shall be stamped on each length of piping.

B. Potable water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked "NSF-pw".

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 15050.

B. Store and protect products under provisions of Section 15050.

PART 2 - PRODUCTS

2.1 COLD WATER PIPING BURIED BEYOND 5 FEET OF BUILDING

A. Piping Sizes 3" and Smaller: Contractor has the option of providing copper tubing or PVC piping as follows:
   1. Copper Tubing: ASTM B88 Type "K" hard drawn. Fitting: ANSI/ASME B16-22 pressure pattern wrought copper. Joints: AWS A5.8, BCUP silver braze. Use solder as specified herein.
   2. PVC Pipe: ASTM D1785, Schedule 40. Fittings: ANSI/ASTM D2466, Schedule 40 pressure pattern, Joints: ASTM D2855 solvent weld.

2.2 140°F HOT, 120°F HOT, RECIRCULATING AND COLD WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Piping Sizes 3" and Smaller:
1. Copper Tubing: ASTM B88 Type "K" hard drawn. Fitting: ANSI/ASME B16.9 pressure pattern wrought copper. Joints: AWS A5.8, BCUP silver braze. Use solder as specified herein.

2.3 140°F HOT, 120°F HOT, COLD AND RECIRCULATING WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88 type 'L' hard drawn. Fitting: ANSI/ASME B16.9 pressure pattern wrought copper. Joints 2" and smaller: ANSI/ASTM B32 Lead free solder, having a composition of 95.5% tin, 4% copper and 0.5% silver. Joints over 2": Braze using AWS A.58 BCUP – 4 silver (minimum 5.8%) filler metal. "Backing" with solder (melting temperature less than 1,100˚F) is prohibited.

B. On piping 2" and larger, the Contractor has the option of using grooved couplings and grooved fittings as manufactured by Victaulic, Anvil and Grinnell.
1. Mechanical Couplings: 2"-8" for copper tubing consisting of ductile iron cast housings, complete with a synthetic rubber gasket of a pressure-responsive design, with plated nuts and bolts to secure unit together. Couplings shall be manufactured to connect copper tubing sized tube and fittings. (Flaring of tube and fitting ends to IPS dimensions is not allowed.)
2. Coupling Housings: Ductile iron conforming to ASTM A-536, Grade 65-45-12, coated with copper colored alkyd enamel. Housings shall be cast with offsetting, angle-pattern bolt pads to provide rigidity.
3. Coupling Gaskets: Gasket shall be Grade "EHP" EPDM compound designed for operating temperatures from -30 deg F to +250 deg F.
4. Victaulic Style 607 or equal by prior approved manufacturers. Installation ready rigid coupling for direct stab installation without field disassembly.

C. In lieu of manufactured copper tee fittings, the Contractor has the option of using mechanically formed tee connections. Mechanically formed tees shall conform to the following:
1. Mechanically extracted collars shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. The collaring device shall be fully adjustable as to insure proper tolerance and complete uniformity of the joint.
2. The branch shall be notched to conform with the inner curve of the run tube and dimpled to insure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the mainline tube. Dimples shall be in line with the run of the tube and visible through the braze. All joints shall be brazed with BCUP-2 braze. The method shall be provided by T-drill7.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 EXCAVATION

A. Excavate trenches to the elevation required by the pipe. Trench shall not be undercut unless the trench bottom is in rock or hard strata, cinders, organic soils or injurious materials. Under cut shall be a minimum of 6" below the invert of the piping and shall be refilled with inorganic soil or sand tamped in place.

B. Contractor shall furnish all labor, materials, and equipment to keep the excavation free of water either from surface sources or from underground sources or from both. When underground water is encountered, undercut the trench 6" and backfill with graded aggregate base type C (crush and run gravel). The selections of the equipment and method of the removal of the water shall be the responsibility of the Contractor. The Contractor shall be and is responsible for all damage incurred in handling water conditions. The present provision supersedes and replaces all other provisions relating to the removal of water from the site.

C. After piping has been tested, inspected and approved, trenches shall be backfilled to the first 12 inches over the pipe in 4 inch lifts and hand tamped.

D. After the first 12 inches, lifts shall not exceed 8 inches. The backfill in all trenches shall be compacted to 95% of the maximum dry density determined by the standard Proctor Compaction Test (ASTD D 698). Field density shall be taken at the rate of 1 for each 50 feet of trench for each 2 feet of fill. Cost of test shall be borne by the contractor.

3.3 PIPE AND FITTING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

E. Install unions downstream of valves and at equipment or apparatus connections.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use ball valves for piping NPS 2and smaller. Use butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
   2. Hot-Water-Piping, Balancing Duty: Balancing valves.
   3. Drain Duty: Hose-end drain valves.

B. Cast-iron, grooved-end valves may be used with grooved-end piping.

C. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller. Use butterfly valves for piping NPS 2-1/2 and larger.

D. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
   1. Install hose-end drain valves at low points in water mains, risers, and branches.
   2. Install stop-and-waste drain valves where indicated.

E. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Balancing valves are specified in Division 15 Section "Domestic Water Piping Specialties."

3.5 PIPING INSTALLATION

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Provide chrome plated escutcheon plates for all piping penetrations through walls exposed to view.

C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

D. Route piping in orderly manner and maintain gradient.

E. Install piping to conserve building space and not interfere with use of space.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Slope water piping and arrange to drain at low points.

J. Establish elevations of buried piping outside the building to ensure not less than 2 feet of cover.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply two coats of galvanized paint to welding.

L. Mitered Fittings and Tapped Pipes: Mitered fittings and tapped pipes are not allowed. All changes in direction and pipe branches shall be accomplished by the use of fittings.

M. Pipe Routing: Pipes shall be run level (except as required for grading) plumb and parallel with the building structure unless otherwise indicated on the drawings.

N. Spacing Pipe: Maintain 4" minimum clearance between parallel runs of piping after insulating, space permitting.

O. Coring: On new construction, pre-cast sleeves in all masonry and concrete walls, floor and ceiling slab. For a limited number of openings, contractor may core drill openings in masonry and concrete walls and floor slabs where sleeves were inadvertently not installed as the wall or floor slab was constructed. Also, see pipe sleeve detail on the mechanical drawing. On existing construction, sleeve openings must be core drilled.

P. Grooved: Where specified herein, piping shall be grooved in accordance with ANSI/AWWA C-606, CSA B-242, and the manufacturers published specifications. Provide lubricant furnished or approved by the manufacturer. Lubricate the gasket exterior thoroughly (including lips).

Q. Install Schedule 40 steel sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

R. Install water-pressure regulators downstream from shutoff valves. Water-pressure regulators are specified in Division 15 Section "Domestic Water Piping Specialties."

3.6 JOINT CONSTRUCTION

A. General: Joints shall be determined by the equipment connections or by the valve or fitting specified herein.

B. Threaded: All threads shall be National Pipe Thread. Apply a commercial grade compound to the male threads only. Ream cut ends and remove all burrs.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

D. Grooved Joints: Assemble joints with grooved-end-pipe or grooved-end-tube coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

E. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.7 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 15 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Pipe hanger and support devices are specified in Division 15 Section "Hangers and Supports."

C. Install supports according to Division 15 Section "Hangers and Supports."

D. Support vertical piping and tubing at base and at each floor.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials. Flush water piping prior to placing in service.

3.9 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:
1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
   a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:
1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 150 psig. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
   b. Adjust calibrated balancing valves to flows indicated.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING AND DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. After the potable water piping systems (hot, cold and recirculating) have been completed, these piping systems shall be flushed to remove foreign materials from piping. The piping systems shall then be adequately disinfected as per federal specifications BB-C-120.

B. Subsequent to the disinfection, water samples shall be sent to the local health department (LHD) for testing. LHD approval shall be obtained before the system is put into service.

C. Repeat disinfection and/or flushing until the samples are approved by the local health department. Provide health department approved certificate in O&M manuals. All cost associated with disinfection and sample testing shall be borne by the Contractor.

END OF SECTION

SECTION 15145

DOMESTIC WATER PIPING SPECIALTIES

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 domestic water piping specialties:
   1. Dielectric Connections
   2. Solder
   3. Chrome plated hose bibbs
   4. Wall hydrants.
   5. Water hammer arresters.
   6. Backflow preventers.
   7. Water pressure-reducing valves.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated shall be submitted under provisions of Section 15050.

B. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals shall be submitted under provisions of Section 15051.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance: Comply with NSF 61 Annex G.

PART 2 - PRODUCTS

2.1 DIELECTRIC CONNECTIONS

A. Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier. Provide at connection of Ferrous and Non-ferrous materials.

2.2 SOLDER

A. Solder shall be lead free having composition of 95.5% tin, 4% copper and 0.4% silver. Solder shall have a tensile strength of 6,900 psi at 70 degrees F. Solder shall conform to ASTM B-32 and shall be applied in conformance with ASTM B-828. Flux shall conform to ASTM B-813.

2.3 CHROME PLATED HOSE BIBB

A. Loose Key, Chicago 387LK with Watts 8A chrome plated vacuum breaker. Equals by T & S Brass, Prier, Mifab or Woodford are acceptable.

2.4 WALL HYDRANT

A. Freeze-proof loose key with nickel bronze face, Woodford B65, Josam 71000-54, J.R. Smith 5509, Wade W-8625-1, Zurn Z-1320-NB, Watts HY-725, Mifab MHY 2000 or Prier C-634.

2.5 WATER HAMMER ARRESTORS

A. PDI –"A":
1. Josam: ----
2. Smith: 5205
3. Zurn: 1250XL-A
4. Souix-Chief: 652-A
5. Equals by Watts, Mifab or Precision Plumbing Products are acceptable.

B. PDI –"B":
1. Josam: ----
2. Smith: 5210
3. Zurn: 1250XL-B
4. Souix-Chief: 653-B
5. Equals by Watts, Mifab or Precision Plumbing Products are acceptable.

C. PDI –"C":
1. Josam: ----
2. Smith: 5220
3. Zurn: 1250XL-C
4. Souix-Chief: 654-C
5. Equals by Watts, Mifab or Precision Plumbing Products are acceptable.

D. PDI –"D":
1. Josam: ----
2. Smith: 5230
3. Zurn: 1250XLD
4. Souix-Chief: 655-D
5. Equals by Watts, Mifab or Precision Plumbing Products are acceptable.

E. PDI –"E":
1. Josam: ----

2. Smith: 5240
3. Zurn: 1250XL-E
4. Souix-Chief: 656-E
5. Equals by Watts, Mifab or Precision Plumbing Products are acceptable.

F. PDI –"F":
1. Josam: ----
2. Smith: 5250
3. Zurn: 1250XL-F
4. Souix-Chief: 657-F
5. Equals by Watts, Mifab or Precision Plumbing Products are acceptable.

2.6 BACKFLOW PREVENTER

A. Reduced pressure zone principle: bronze body, ball valve test cocks, replaceable seats, with strainer, quarter-turn valves and manufacturer furnished air gap fitting. Watts series LF909-S-QT, Apollo 4A20XT2F or equal by Zurn.

2.7 WATER PRESSURE REDUCING VALVES

A. Bronze body, nickel alloy seat, high temperature resisting diaphragm with stainless steel perforated strainer screen and built-in bypass check valve feature to relieve thermal expansion pressure. Adjusting screw and cage screws shall be corrosion resistant.

B. Provide pressure gauge on both sides of valve.

C. For domestic water entrance and other locations or equipment having pressure requirements of 25-75 psi provide Watts LF223SB with number 146 spring.

D. For booster heaters, food disposal and any other equipment having a pressure requirement for 10-35 psi, provide Watts LF223SBLP with number 69 spring.

E. Equals by Apollo or Zurn with appropriate springs are acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

C. Install wall hydrants approximately 24" above finish grade unless noted otherwise.

D. Install hose bibs approximately 12" above finish floor unless noted otherwise.

E. Install water hammer arresters in water piping as indicated on drawings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 16 Section "Grounding and Bonding."

C. Connect wiring according to Division 16 Section "Conductors and Cables."

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

END OF SECTION

SECTION 15150

SANITARY WASTE AND VENT PIPING

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 for waste, and vent piping within 5'-0" of the building:
   1. Pipe, tube, and fittings.
   2. Special pipe fittings.
   3. Encasement for underground metal piping.

1.3 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings shall be submitted under provisions of Section 15050.

1.4 QUALITY ASSURANCE

A. All piping and fittings shall be new and of domestic (USA) manufacturer. The ASTM number and schedule shall be stamped on each length of piping.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 15050.

B. Store and protect products under provisions of Section 15050.

C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 GRAVITY SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Contractor has the option of providing either cast iron or PVC piping as follows (materials shall not be mixed):
   1. Cast Iron Pipe: ASTM A74, service weight. Fittings: Hub and Spigot service weight cast iron. Joints: ASTM C564, neoprene gaskets or lead and oakum.
   2. PVC Pipe: ASTM D2241, SDR-200 with compression joints. Fittings: ANSI/ASTM D2466 schedule 40 PVC, Drainage pattern. Joints: Push type on piping and ASTM D2855 solvent weld at fittings.

2.2 SANITARY WASTE, AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Contractor has the option of providing either cast iron or PVC piping as follows (materials shall not be mixed):
   1. Cast Iron Pipe: ASTM A74 hub and spigot service weight cast iron. Fittings: Hub and spigot service weight cast iron. Joints: ASTM C564 neoprene gaskets or lead and oakum. Sanitary tees and crosses and 1/4 bends may be used only when the flow is from horizontal to vertical and on vent piping.
   2. PVC Pipe: ASTM D1785, Schedule 40. Fittings: ANSI/ASTM D2665, Drainage Pattern schedule 40 PVC. Joints ASTM D2855, Solvent Weld.

2.3 SANITARY WASTE AND VENT PIPING, ABOVE GRADE

A. Piping in return air plenums above ceilings shall be cast iron as follows. Piping not in return air plenums may be cast iron or PVC as follows:
   1. Cast Iron Pipe: ASTM A888, hubless, service weight. Fittings: Cast Iron. Joints: Heavy duty no hub couplings. Acceptable manufacturers: Clamp-All Hi-Torq 80, Husky SD-4000 or M-G.
   2. PVC Pipe: ASTM D1785, Schedule 40. Fittings: ANSI/ASTM D2466, Drainage Pattern schedule 40 PVC. Joints ASTM D2855, Solvent Weld.

B. Copper Pipe: ASTM B306, DWV. Fittings: ANSI/ASME B16-23, cast bronze, or ANSI/ASME B16-22, wrought copper. Joints: Lead free solder as specified herein. Acceptable for water cooler, lavatory and sink fixture arms only.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate trenches to the elevation required by the pipe. Trench shall not be undercut unless the trench bottom is in rock or hard strata, cinders, organic soils or injurious materials. Under cut shall be a minimum of 6" below the invert of the piping and shall be refilled with inorganic soil or sand tamped in place.

B. Contractor shall furnish all labor, materials, and equipment to keep the excavation free of water either from surface sources or from underground sources or from both. When underground water is encountered, undercut the trench 6" and backfill with graded aggregate base type C (crush and run gravel). The selections of the equipment and method of the removal of the water shall be the responsibility of the Contractor. The Contractor shall be and is responsible for all damage incurred in handling water conditions. The present provision supersedes and replaces all other provisions relating to the removal of water from the site.

C. After piping has been tested, inspected and approved, trenches shall be backfilled to the first 12 inches over the pipe in 4 inch lifts and hand tamped.

D. After the first 12 inches, lifts shall not exceed 8 inches. The backfill in all trenches shall be compacted to 95% of the maximum dry density determined by the standard Proctor Compaction Test (ASTD D 698). Field density shall be taken at the rate of 1 for each 50 feet of trench for each 2 feet of fill. Cost of test shall be borne by the contractor.

3.2 PIPING INSTALLATION

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Establish elevations of buried piping outside the building to ensure not less than 2 feet of cover.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply two coats of galvanized paint to welding.

H. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum (unless noted otherwise). Maintain gradients.

I. Install bell and spigot pipe with bell end upstream.

J. Remove burrs and all loose material from the interior of piping prior to assembly.

K. Pipe Routing: Pipes shall be run level (except as required for grading) plumb and parallel with the building structure unless otherwise indicated on the drawings.

L. Spacing Pipe: Maintain 4" minimum clearance between parallel runs of piping after insulating, space permitting.

M. Coring: On new construction, pre-cast sleeves in all masonry and concrete walls, floor and ceiling slab. For a limited number of openings, contractor may core drill openings in masonry and concrete walls and floor slabs where sleeves were inadvertently not installed as the wall or floor slab was constructed. Also, see pipe sleeve detail on the mechanical drawing. On existing construction, sleeve openings must be core drilled.

N. Horizontal piping shall be installed in uniform alignment (i.e. STRAIGHT) and at uniform slope.

O. Trenches in acceptable soils shall be dug to slope. If a trench is inadvertently over excavated, the trench shall be backfilled and compacted as specified in the "Excavation and Backfill" paragraph in this specification section.

P. Trenches in unacceptable soils shall be undercut as specified in the "Excavation and Backfill" paragraph in this specification section.

Q. Piping shall be supported the entire length on undisturbed earth or compacted backfill. Supporting piping on concrete block, brick, wood block or other similar items is unacceptable.

R. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 15 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

S. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

T. Make changes in direction for waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used for lavatories, sinks and water coolers on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double combination wye and 1/8-bend fittings when water closets are installed back to back or side by side with common drain pipe. Sanitary tees and double sanitary tees shall not be used for water closets. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

U. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

V. Install waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   1. Waste Piping: One-quarter inch (1/4") per foot in direction of flow for piping NPS 2 and smaller; one-eighth inch (1/8") per foot in direction of flow for piping NPS 3 and larger.
   2. Vent Piping: One-eighth inch (1/8") per foot down toward vertical fixture vent or toward vent stack.

W. Install engineered waste drainage and vent piping systems as follows:
   1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

X. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

Y. Install PVC waste drainage and vent piping according to ASTM D 2665.

Z. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

AA. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.4 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 15 Section "Vibration Controls and Seismic Restraints for Plumbing Piping and Equipment."

B. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports."

C. Install supports according to Division 15 Section "Hangers and Supports."

D. Support vertical piping and tubing at base and at each floor.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
   2. NPS 3: 60 inches with 1/2-inchrod.
   3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
   4. NPS 6: 60 inches with 3/4-inch rod.
   5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
   2. NPS 3: 48 inches with 1/2-inch rod.
   3. NPS 4 and 5: 48 inches with 5/8-inch rod.
   4. NPS 6: 48 inches with 3/4-inch rod.
   5. NPS 8 to NPS 12: 48 inches with 7/8-inch rod.

H. Install supports for vertical PVC piping every 48 inches.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

3.6 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.7 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.8 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

SECTION 15155

DRAINAGE PIPING SPECIALTIES

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 drainage piping specialties:
1. Floor drains.
2. Cleanouts.
3. Flashing.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated shall be submitted under provisions of Section 15050.

B. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals shall be submitted under provisions of Section 15051.

1.4 QUALITY ASSURANCE

A. All piping and fittings shall be new and of domestic (USA) manufacturer. The ASTM number and schedule shall be stamped on each length of piping.

B. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 15050.

B. Store and protect products under provisions of Section 15050.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

A. Provide and install floor drains as shown on the drawings and as specified herein. Floor drains shall have coated cast iron bodies with cast iron double drainage flanges and bottom outlet, inside caulk connections, with strainers and special items as indicated in Schedule. **All drains shall be provided with deep seal trap.** All drains shall also have a Pro Set Trap Guard alternative trap primer device installed.

B. Schedule (Basis of Design: Josam, equals by Watts, Sioux Chief or Mifab are acceptable)
1. Floor Drain FD "A":
   a. Josam: 30000-A
   b. Smith: 2010A
   c. Wade: W-1100-STD
   d. Zurn: ZN-415-B
   e. 7" satin finished Nikaloy top.
2. Floor Drain FD "B":
   a. Josam: 31100
   b. Smith: 2310
   c. Wade: W-1340
   d. Zurn: Z-525
   e. 8-1/8" cast iron top.

2.2 CLEANOUTS

A. Provide cleanouts where shown on the drawings.

B. All cleanouts shall be accessible and shall be installed allowing a clearance of not less than 18" for the purpose of rodding.

C. Cleanout Schedule: (Basis of Design-Josam, equals by Watts or Mifab are acceptable):
1. Location: Finished floor
   a. Finish: Nickel bronze
   b. Josam: 56000
   c. Smith: 4025
   d. Wade: W-6000
   e. Zurn: Z-1400
2. Location: Wall
   a. Finish: Stainless steel
   b. Josam: 58600
   c. Smith: 4710
   d. Wade: W-8480-R
   e. Zurn: Z-1469
3. Location: Outside
   a. Finish: Cast iron
   b. Josam: 58180
   c. Smith: 4288

d. Zurn: Z-1449

4. Notes:
   a. Floor cleanout shall be round.
   b. Cleanout plugs shall be brass.
   c. Provide wrench with each type cleanout.
   d. For final inspection, contractor shall remove all cleanout plugs and place next to cleanout. After inspection of cleanouts, grease threads and replace plugs.
   e. Provide a carpet marker on all cleanouts installed in carpeted floors. See Architectural Drawings for finish schedule.
   f. Provide 18" X 18" X 6" concrete pad around outside cleanouts.

2.3 FLASHING

A. Vents Thru Roof: 4 lb./sq. ft sheet lead for modified bitumen roofing system and ethylene propylene diener monomer (E.P.D.M.) pipe flashing on metal roofing system. E.P.D.M. pipe flashing shall have a 0.040" thick aluminum ring on base. E.P.D.M. pipe flashing shall be "Dektite" pipe flashing as manufactured by Design Components, Inc., 1047 Lee's Mill Road, College Park, Georgia, 30349; Phone 800-868-9910; Fax 404-991-6951, or Pate or Thy Curb.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at maximum intervals of 50 feet for piping NPS 3 and smaller and 80 feet for NPS 4 and larger piping.
   4. Locate at base of each vertical soil and waste stack.

C. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated. The Plumbing subcontractor shall coordinate the slope of the floor to floor drains with the quarry tile subcontractor. In general, the tile floor shall uniformly slope from wall to floor drain 5/8" in rooms 10' x 10' or smaller and 3/4" in rooms larger than 10' x 10'. In the case of a floor drain serving a specific piece of equipment the floor drain and tile shall be set 1/2" lower than the surrounding floor and "dish-pan" in a 30" diameter around the floor drain.

D. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

F. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 7.
   1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
   2. Position roof drains for easy access and maintenance.

G. Install deep-seal traps on all floor drains.

H. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
   1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
   2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
   3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 15410

PLUMBING FIXTURES

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 conventional plumbing fixtures P-1 through P-9 and related components.

1.3 SUBMITTALS

A. Product data shall be submitted under provisions of Section 15050. For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 15051: Data shall include but not limited to:
   1. Fixture trim exploded view and replacement parts list.
   2. Water cooler parts list

1.5 WARRANTIES

A. See Section 15051 for specific warranty information.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

B. Regulatory Requirements: 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 fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61 Annex G, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers" for style classifications.

E. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

F. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. Provide all equipment, fittings, trim and accessories required for a complete installation.

B. Kohler is basis of design. Equals by Sloan, Crane and Zurn shall be acceptable. Additional acceptable manufacturers for faucets are Moen and T & S Brass.

2.2 FIXTURE SCHEDULE

A. P-1:
1. Water Closet: Wall hung, elongated with 1.28 GPF battery operated sensor flush valve.
   a. Kohler: K-4325 with K-10673
   b. American Standard: 3351.001 with 6065.121.002
   c. Zurn: Z5615-BWL with ZTR6200EV
2. Flush Valve: See Note 1
3. Seat: See Note 3
4. Carrier: See Note 10

B. P-2
1. Water Closet: Wall hung, elongated, handicap with 1.28 GPF battery operated sensor flush valve.
   a. Kohler: K-4325 with K-10673
   b. American Standard: 3351.001 with 6065.121.002
   c. Zurn: Z5615-BWL with ZTR6200EV
2. Flush Valve: See Note 1
3. Seat: See Note 3
4. Carrier: See Note 10

C. P-3
1. Urinal: Provide with beehive strainer and 1/8 GPF battery operated sensor flush valve.
   a. Kohler: K-4904-ET with K-10949
   b. American Standard: 6590.001 with 6063.013.002
   c. Zurn: Z5798.205.00
2. Flush Valve: See Note 2

D. P-4
1. Urinal: Handicap, provide with beehive strainer and 1/8 GPF battery operated sensor flush valve.
   a. Kohler: K-4904-ET with K-10949
   b. American Standard: 6590.001 with 6063.013.002
   c. Zurn: Z5798.205.00
2. Flush Valve: See Note 2

E. P-5
1. Lavatory: 20 x 18
   a. Kohler: K-2006
   b. American Standard: 0356.015
   c. Zurn: Z5368
2. Faucet: 0.5 GPM sensor operated, battery powered, with mixing valve.
   a. Zurn: Z6915-XL-F-TMV-1
   b. Equals by Kohler, American Standard or Eljer
3. Drain: 1-1/4" Grid
   a. Kohler: K-7715
   b. American Standard: 2411.015
   c. Zurn: Z-8743
4. Trap: Size 1-1/4". See Note 4
5. Supplies: See Note 5
6. Carrier: See Note 6

F. P-6
1. Counter-top Lavatory: Self rimming, Vitreous China, Oval with 8" faucet drilling, Handicap
   a. Kohler: K-2196-8
   b. American Standard: 0476.020
   c. Zurn: Z5118
2. Faucet: 0.5 GPM sensor operated, battery powered, with mixing valve.
   a. Zurn: Z6915-XL-F-TMV-1
   b. Equals by Kohler, American Standard or Eljer
3. Drain: 1-1/4" Offset Grid
   a. Kohler: K-13885
   b. American Standard: 7723.018
   c. Zurn: Z-8746
4. Trap: Size 1-1/4". See Notes 4 and 9
5. Supplies: See Notes 5 and 9

G. P-7
1. Double Bowl Sink: 18 gauge, stainless steel, 3 hole punching, maximum 5-1/2" deep with rear center drain punching
   a. Just: DL-ADA-2133-A-GR
   b. Elkay: LRAD-3321
   c. Equal by Kohler
2. Faucet: See Note 7
   a. Kohler: K-R72509

b. Equals by American Standard or Zurn

3. Drain: Offset basket strainer, 2 required
   a. Just: J-ADA-35
   b. McGuire: 1151 AWC
   c. Zurn: Z-8748
4. Trap: Size 1-1/2". See Notes 4 and 9
5. Supplies: See Notes 5 and 9
6. Waste : End outlet
   a. Just: J53S
   b. Elkay: LK-53
   c. Zurn: Z-8756
7. Flow Control: See Note 8

H. P-8

1. Service Sink: Floor mounted
   a. Fiat: MSB2424
   b. Equals by Stern Williams or Acorn.
2. Drain: 2" caulk connection
   a. Kohler: K-9147
   b. American Standard: 8303.076
   c. Eljer: 803-0640
   d. Zurn: Z841M1-RC
3. Faucet: With 5' rubber hose and wall hook, See Note 7
   a. Kohler: K-8928
   b. American Standard: ----
   c. Zurn:Z842L1-LSI-WHK

I. P-9

1. Drinking Fountain: Two-level wall mounted freeze-resistant drinking fountain for all weather applications. Construction of 18 gauge, Type 304 stainless steel.
   a. Elkay: EDFP217FPK
   b. Equal by Oasis, Halsey Taylor or Acorn Aqua.
2. Trap: Size 1-1/4". See Notes 4 and 9
3. Supply: See Note 5

J. PLUMBING FIXTURE NOTES

1. Manual flush valves shall be piston type and have vandal-proof trim, solid ring pipe support, and sweat adaptor kit. Mount 24" above bowl on standard water closets and 12" above bowl for handicap water closets. Additional acceptable manufacturers of flush valve are Moen and Sloan.
2. Manual flush valves shall be piston type and vandal-proof trim, solid ring pipe support, and sweat adaptor kit. Flush valve shall be from same manufacturer as the fixture.
3. Water closet seats shall be white, solid plastic with self-sustaining check hinge. Bemis 1955SSC, Beneke 533SS, Church 295SSC, or Olsonite 10-CC-SS.
4. Traps shall be 17 gauge adjustable "P" traps with cleanout and wall plate. Exposed surfaces shall be polished chrome. Manufacturers: Kohler, Eljer, EBC, McGuire, Brasscraft or Zurn. Provide tail piece pipe to equipment furnished under other sections or by Owner.

5. Stops shall be angle type 1/2" copper sweat extension tube inlet x 3/8" O.D. compression riser and loose key, lock shield. Risers shall be flexible copper one-piece with insert. Exposed surfaces shall be chrome plated. Provide bell escutcheon at wall. Brass Craft SCS400AC, McGuire LF170 LK, or Zurn Z-8808-LR-LK-XL.
6. Lavatories carriers shall be concealed arm type. Josam 17100, Smith 700, Wade 520, Zurn ZR 1231 or equal by Watts. Anchor to floor per manufacturer's recommendations with bolts equal to Hilti "Kwik Bolt II".
7. Provide quarter turn ceramic disc cartridge, rigid connector and lever handles on faucets.
8. Flow control shall be laminar flow, pressure compensating delivering 1.5 gpm on sink faucets over inlet pressure range of 40-120 psig. Device shall be vandal resistant. OMNI series 200, T & S Brass B-199-21 or equal by Kohler.
9. Insulate water supplies, offset grid drain and 'P' Trap on lavatories and drain and 'P' trap only on water coolers with fully molded Handi Lav-Guard insulation manufactured by Truebro., P.O. Box 429, Ellington, CT 06029; Phone (203) 875-2868. Color shall be white. Equals by Skal Gard, McGuire (ProWrap), Plumberex (Pro 2000) or EBC are acceptable.
10. Water closet carriers shall be Josam Series 12000 or equal by J.R. Smith, Zurn or Mifab.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

C. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
   1. Exception: Use ball valves if supply stops are not specified with fixture. Valves are specified in Division 15 Section "Valves."

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install traps on fixture outlets. Traps shall be readily accessible for servicing and cleaning.
   1. Exception: Omit trap on fixtures with integral traps.
   2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

P. Install chrome plated escutcheons at piping penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

Q. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

R. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

3.3 CONNECTIONS

A. Wall Hung and Back Outlet Water Closets: Fixture carrier as specified with fixture.

B. Urinals: 2" PVC waste arm with 2" PVC to MIP adapter at stack.

C. Lavatories and Water Coolers: 1-1/4" type "M" copper arm with 1-1/4" C-PVC adapter at stack.

D. Counter Sink: 1-1/2" Type "M" copper arm with 1-1/2" C-PVC adapter at stack.

E. Service Sink: 2" caulk drain as specified in Section 15400. (3" galvanized wrought iron with galvanized cast iron drain fitting).

F. Hot and Cold Water Supply Piping to Fixtures: Chrome plated when exposed.

3.4 FIELD QUALITY CONTROL

A. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

B. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

C. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

D. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. Adjust all wrist blade and lever handles to be parallel with the wall the fixture is mounted on when in the "off" position.

C. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 15485

ELECTRIC WATER HEATERS

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 electric water heaters.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 15050. For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 15051: Data shall include but not limited to water heater data.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.6 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.7 WARRANTY

A. See Section 15051 for specific warranty information.

PART 2 - PRODUCTS

2.1 WATER HEATER

A. Water heater WH-1 shall be constructed as follows: Water heater shall be glass lined, electric heater and shall have two elements wired for non-simultaneous operation each with its own thermostat set to maintain delivery temperature scheduled. The tank shall be insulated with R-16 foam which meets ASHRAE 90A for heat loss efficiency. Basis of design is Lochinvar. Provide with an ASME approved temperature and pressure relief valve.
   1. WH-1:
      a. Tank Capacity: 50 gallon
      b. Wattage of Elements:
         1) Upper: 4500
         2) Lower: 4500
      c. Voltage: 208V, 1Ø
      d. Delivery Temperature: 120°F
      e. Manufacturer:
         1) Lochinvar Model No. LTJ052KK
         2) A.O. Smith Model No. DEN-50
         3) Bradford White Model No. M-2-50T6DS

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases unless noted otherwise.
   1. Concrete base construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge as shown on drawings.

D. Install thermometer on outlet piping of water heaters. Refer to Division 15 Section "Meters and Gages" for thermometers.

E. Fill water heaters with water.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 16 Section "Grounding and Bonding."

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports for inclusion in Operation and Maintenance Manuals:
1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain electric water heaters. Refer to Section 15051 for closeout requirements."

END OF SECTION

SECTION 15765

ELECTRIC HEATERS

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 heaters with integral fans and electric heating elements.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories. Product data for each type of equipment shall be submitted under the provisions of Section 15050.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For electric heaters, submit operation and maintenance data under provisions of Section 15051.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

A. See Section 15051 for warranty information.

PART 2 - PRODUCTS

2.1 ELECTRIC FAN FORCED CEILING HEATERS

A. General: Furnish and install electric fan forced ceiling heaters as indicated on the drawings. Each unit shall be completely factory assembled consisting of a cabinet, electric heating element, fan and controls as specified below. All heaters shall be UL listed and meet the requirements of the National Electrical Code.

B. Cabinet: The housing shall be fabricated from 20-gauge galvanized steel and the supply faceplate fabricated from 20-gauge cold rolled steel, phosphatized. Finish shall be baked enamel paint antique white and the front grille shall be attached with partially concealed screws. See schedule for housing type (T-bar ceiling, recessed in hard ceiling or surface mounted).

C. Heating Element: Electric heating element shall be copper clad steel sheath type with steel fins. Fan motor shall be totally enclosed and permanently lubricated, with the aluminum propeller fan direct-connected to the motor shaft.

D. Controls: Operating and safety controls for each heater shall include a manual or automatic reset thermal overload protector, contactors, fan delay switch to energize fan motor only after element is heated, and continue to operate fan after thermostat is satisfied and all heat discharged. Provide an internal-mounted line voltage thermostat, adjustable with a range between 45° and 95°F with manually set "no heat" position.

E. Manufacturers: Electric fan forced ceiling heaters shall be of the capacities indicated on the drawings and shall be manufactured by Q-Mark, Redd-I, Indeeco, Markel, Raywall or Berko.

2.2 ELECTRIC WALL HEATERS

A. General: Furnish and install surface or recessed mounted, heavy-duty architectural electric wall heaters as indicated on the drawings. Each unit shall be completely factory assembled consisting of a cabinet, electric heating element, fan and controls as specified below. All heaters shall be UL listed and meet the requirements of the National Electrical Code.

B. Cabinet: The wall housing shall be fabricated from 20-gauge galvanized steel and the architecturally styled front grille fabricated from 16-gauge steel with closely spaced down flow discharge bars. Finish shall be baked enamel paint and the front grille shall be attached with partially concealed screws. All units shall be recessed mounted into wall which has been cut only to sufficient depth for insertion of the unit, unless indicated otherwise.

C. Heating Element: Electric heating element shall be copper clad steel sheath type with aluminum fins. Fan motor shall be totally enclosed and permanently lubricated, with the statically and dynamically balanced aluminum propeller fan direct-connected to the motor shaft.

D. Controls: Operating and safety controls for each heater shall include thermostat, automatic reset thermal overload protector, contactors, fan delay switch to energize fan motor only after element is heated, thermal limit switch and double-pole disconnect switch complying with NEC requirements. The built-in comfort thermostat shall have an adjustable range between 55 degrees and 85 degrees F with manually set "no heat" position. Thermostat shall be tamper-resistant, requiring the use of a long blade screwdriver to accomplish adjustment through the front grille.

E. Manufacturers: Electric wall heaters shall be of the capacities indicated on the drawings and shall be manufactured by Q-Mark, Redd-i, Indeeco, Electromode, Erincraft, Chromalox, Markel, Raywall or Berko.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive wall and ceiling heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before wall and ceiling heater installation. Verify proper power supply is available.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly.

B. Install heaters to comply with NFPA 90A.

C. Suspend ceiling heaters from structure with 18-gauge galvanized straps or threaded rod. Provide 2" x 2" x 1/4" angle framing secured to structural members to prevent ceiling from supporting unit.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

3.4 ADJUSTING

A. Adjust initial temperature set points.

END OF SECTION

SECTION 15815

METAL DUCTS

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 metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch w.g. Metal ducts include the following:
   1. Low pressure galvanized steel ducts

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select the air-moving equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 15050. The Contractor may generate ductwork shop drawings for their use in coordination with structural, sprinkler, electrical, plumbing, etc., but these are not required for submittal review and shall not be submitted to the Engineer for review.

1.5 QUALITY ASSURANCE

A. Construct ductwork to International Mechanical Code, currently-enforced edition.

B. Construct ductwork to ASHRAE Handbook.

C. Fabricate ductwork in accordance with SMACNA HVAC Duct Construction Standards.

D. NFPA Compliance:
   1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
   2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 SEALANT MATERIALS

A. General: All sealants shall have a maximum flame spread of 25 and smoke development rating of 50. Sealants shall be designed for service temperature that the duct is expected to see.

B. Water-Based Duct Joint and Seam Sealant Mastic: Flexible, adhesive sealant, and complying with NFPA requirements for Class 1 ducts. Sealant shall be low odor/low VOC with less that 32 grams/liter VOC per ASTM D-6886 or EPA Method 24. Sealant shall be SMACNA pressure class rated for -0.5" w.g. to +10.0" w.g., and shall meet SMACNA class seal for A, B and C classes. Service temperature limits of sealant shall be -10°F to 190°F. Sealant shall be fiber reinforced, and shall meet UL-181A-M and UL-181B-M for mold growth test. Sealant shall use soap and water for clean up. Sealant shall be RCD #6, Foster 95-90 Vapor Safe, Childers CP-181 Comfort Seal or prior approved equal.

2.3 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
   1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
   2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.

3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

E. Upper Supports: Provide supplemental angle iron (minimum size: 2" x 2" x 3/16") or Uni-Strut channels between primary building structural members in all areas of building with steel roof structure of building to support rods and straps connected to ductwork. Size supplemental supports and hanger to adequate support load without overloading or excessive deflection.

2.4 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details. Contractor has the option of using prefabricated slide-on joints and components for transverse joints, constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement. Prefabricated slide on joints shall be manufactured by Ductmate Industries, Inc., Nexus Inc., or Ward Industries, Inc.

C. Longitudinal Seams: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-5.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
1. Exhaust Ducts (Negative Pressure): 1-inch w.g.

3.2 DUCT INSTALLATION

A. Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid. Duct sizes on the drawings are inside dimensions which shall be altered by Contractor to other dimensions with the same air handling characteristics where necessary to avoid interferences and clearance difficulties.

B. Provide pilot tube openings where required for testing of systems, complete with neoprene plug.

C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. During construction provide temporary closures of metal or taped 5 mil polyethylene on open ductwork to prevent construction dust from entering ductwork system. Ductwork may not be hung prior to "drying in" of the facility unless all joints are sealed with mastic.

E. Branches from trunk duct and tap-in connection shall be constructed in accordance with Paragraph "Low Pressure Galvanized Steel Ductwork".

F. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

G. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.

H. Install ducts with fewest possible joints.

I. Install fabricated fittings for changes in directions, size, and shape and for connections.

J. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

K. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

L. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

M. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

N. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

O. Coordinate layout with ceiling, dampers, lighting layouts, and similar finished work.

P. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

Q. Electrical Equipment Spaces: Contractor shall not route ducts over electrical panels.

R. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

S. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

T. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

U. Paint interiors of metal ducts that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.3 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

B. Seal all circumferential and longitudinal duct joints in low pressure supply, return, outdoor air and exhaust ducts with sealant as specified herein in accordance with the manufacturer's installation instructions. This includes, but is not limited to Pittsburgh connections, snap locks (all types), etc. Duct tape is not suitable as a substitute. Notify Engineer for on-site review of ductwork joints prior to insulation application. Where gaps exceed manufacturer’s recommendations for sealant only, provide fibrous backing tape.

C. Seal ducts before external insulation is applied.

3.4 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet and at each floor.

C. Install concrete inserts before placing concrete.

D. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

E. Use double nuts and lock washers on threaded rod supports. Duct hangers shall be constructed in accordance with Figures No. 4-1,2,4,5,6,7 and 8 as well as tables 4-1,2 and 3. Duct shall not be supported directly from metal decks. Provide upper supplemental framing as required between building structural members.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors according to Division 15 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline (Figure 2-2, Type RE-3 and Figure 2-5,2-6). Where there is not sufficient space and at the Contractor's option in all other locations, rectangular elbows with turning vanes may be substituted.

D. For turning vane construction see Figure 2-2, Type RE-2 and Figure 2-3 and 2-4. Provide at all square elbows in supply, return and exhaust ductwork and where noted.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees. Provide Type 2 or Type 3 offsets where required. See Figure 2-9.

F. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area. See Figure 2-10 for easement construction.

G. All branch take-offs of rectangular ducts shall be made with "45-degree entry" fitting in accordance with Figure 2-8 or by means of "parallel flow branches" with turning vanes and locking splitter dampers (Figure 2-7) where indicated. All branch take-offs of round ducts shall be made with "Bellmouth take-off collar," or “45° take-off collars" as specified in Section 15820.

3.6 EXPOSED RECTANGULAR DUCTWORK

A. On all rectangular ductwork, exposed to view as indicated on the drawings, special attention shall be given to its appearance, including the duct construction, reinforcing and hanging. All exposed ductwork is to be fabricated from "Paint-Grip" steel sheets or similarly etched galvanized sheet metal field painted with two coats of paint in accordance with the Architectural Painting specification section of the specifications. Finish color for shall match adjacent building component color(s).

END OF SECTION

SECTION 15820

DUCT ACCESSORIES

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. Backdraft dampers.
2. Volume dampers.
3. Turning vanes.
4. Duct accessory hardware.

1.3 SUBMITTALS

A. Product Data: Submit under provisions of Section 15050 for the following:
1. Backdraft dampers.
2. Volume dampers.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Install in accordance with 2000 International Mechanical Code.

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

A. Fabricate multi-blade, parallel action backdraft dampers of 18 gage galvanized steel or extruded aluminum, with center pivoted roll formed aluminum blades with felt or flexible vinyl blade seals, linked together with 20-gauge galvanized tie bar in rattle-free manner with 90-degree stop, synthetic (acetal) sleeve bearings, and plated steel pivot pin axles.

B. Damper manufacturer’s printed application and performance data including maximum pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for pressures to 2” w.g., velocities to 2,500.0ft/min. and temperatures to 180°F. Testing and ratings to be in accordance with AMCA Standard 500. Backdraft damper shall have maximum 3-1/2” depth when blades are in the closed position. Backdraft damper shall be suitable for horizontal air flow (vertical mount) or vertical up or vertical down air flow (horizontal mount) based on the arrangement shown on the drawings. Backdraft dampers shall

be provided with no flanged frame unless flange is specifically identified on the drawings. If so, see drawings for location of flange (flange on discharge or flange on intake). Backdraft damper shall be gravity type, opening by air pressure differential and closing by gravity, unless a motor pack is specified on the drawings. When motor pack is specified, backdraft dampers shall be powered open, spring closed. Motor voltage shall match fan voltage, and quantity and torque requirements of motors shall be determined by manufacturer's installation instructions. Multiple section dampers shall be assembled per manufacturer's installation instructions.

C. Backdraft dampers shall be manufactured by Airstream, Air Balance, Pottorff, Greenheck, American Warming, Dowco, Louvers and Dampers, Empco, Industrial Louvers, Cesco or Arrow-United. Gravity backdraft dampers, furnished with air moving equipment, may be provided by equipment manufacturer, provided the damper meets the specification above.

2.2 VOLUME CONTROL DAMPERS, MANUAL BALANCING TYPE

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated. See Section 15900 for air control damper specifications for automatic dampers. Provide corrosion resistant end bearings. On multiple blade dampers, provide oil-impregnated nylon, molded synthetic or sintered bronze bearings. Provide hexagonal or square steel axles positively locked into the damper blade. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends. Mark final position(s) of all damper handles with magic markers on side of duct/insulation after TAB is complete. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

B. Single Blade: Fabricate single blade rectangular dampers for duct sizes up to 12 inches in height and 36 inches in width. Duct sizes over 12 inches in height and over 36 inches in width shall require multiple blades arranged in opposed blade style. Fabricate single blade round dampers for duct sizes up to 16 inches diameter. Single blade damper frames shall be constructed of 18-gauge steel and blades shall be 20-gauge steel, minimum.

C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware. Frame shall be 16-gauge galvanized steel structural hat channel. Blades shall be single skin 16-gauge galvanized steel.

D. Performance: Dampers shall be designed for 1500 fpm maximum system velocity; maximum 65 cfm/ft^2 leakage at 1-inch w.g. pressure per AMCA Standard 500. Wide open pressure drop shall not exceed 0.1" w.g. at scheduled size and airflow.

E. Manual volume control dampers shall be manufactured by Ruskin, Pottorff, Nailor, Louvers and Damper, Dowco, Prefco, United Air, Arrow, Vent Products, Air Control Products, Phillips-Aire, National Controlled Air, Greenheck, Air Balance or Cesco. Single blade dampers shall be Ruskin Model MD25 (rectangular) or MDRS25 (round) or equal by the above listed manufacturers. Multi-blade damper shall be Ruskin Model MD35 or equal by the above listed manufacturers.

2.3 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate single or double-vane, curved blades of galvanized sheet steel set 2" or 3-1/4" o.c. and set into vane rail runners suitable for duct mounting.
1. Turning Vanes shall be manufactured by Ductmate Industries, Inc., Areo/Dyne Company, Duro Dyne Corp., METALAIRE, Inc., or Ward Industries, Inc.

2.4 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in accordance with manufacturer’s instructions.

B. Provide balancing dampers at points on low pressure systems where branches are taken from larger ducts and as required for air balancing. Use splitter dampers where indicated.

C. Provide air turning devices in all elbows in supply, return, outdoor air and exhaust ducts.

D. Some branch duct take-offs to ceiling diffusers may be indicated on the plans to be made with square or rectangular duct take-offs out the bottom of the supply ducts due to space restrictions. At these take-offs, provide equalizing grids behind the diffusers to insure uniform airflow behind the diffuser.

E. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, use stainless-steel accessories in stainless-steel ducts, and use aluminum accessories in aluminum ducts.

F. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

G. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

H. Install duct test holes where indicated and required for testing and balancing purposes.

I. Branch take-offs of sheet metal ductwork from truck ducts shall be made with 45-degree branch entries or splitter dampers and elbows with turning vanes as indicated. See Section 15815. Air scoops, deflectors, extractors and other devices are prohibited unless noted otherwise.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION

SECTION 15838

POWER VENTILATORS

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 centrifugal roof ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on 500-foot site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product data shall be submitted under the provisions of Section 15050. Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Roof curbs, if furnished by fan manufacturer.
   7. Fan speed controllers.

B. Operation and Maintenance Data: For power ventilators, submit operation and maintenance data under the provisions of Section 15051.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 15 Section "Hangers and Supports."

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Centrifugal Roof Exhaust and Supply Fans: Curb mounted, adjustable belt drive or direct drive as indicated, centrifugal type, complete with aluminum housing, gravity or motorized backdraft shutter, bird screen, disconnect switch and other accessories as scheduled on the drawings. Where bird screens are specified, they shall be provided as an accessory item and not as an integral part of the support structure. The fan wheel shall be centrifugal backward inclined, constructed of aluminum. Motors shall be mounted out of the airstream on vibration isolators. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance. Disconnect switch shall be factory installed and wired from the fan motor to a junction box within the motor compartment. Where upblast centrifugal fans are specified, provide optional drain connection. All upblast centrifugal fans used for dishwasher exhaust duty shall be provided with a backdraft damper entirely coated with a hi-pro polyester coating. Supply fan shall be provided with 1" washable aluminum filters, and are not required to have bird screen since filter acts as screen.

2.2 MOTORS

A. Comply with requirements in Division 15 Section "Basic Mechanical Materials and Methods."

B. Motors and Drives: All fans shall have drives selected at 125% of motor HP with standard motors. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speeds. Belt drive fans shall have motors mounted on sliding rails for ease of belt adjustment. Motor sheaves shall be adjustable with mid-position at specified conditions. Single phase motors shall be capacitor start with resilient base. Motor efficiency shall be as specified in Section 15010.

2.3 ROOF CURBS

A. Refer to section 15060 specifications.

2.4 TESTS

A. Wheels shall be statically balanced before assembly and the assembled fans shall be dynamically balanced at the speeds at which they are scheduled to operate.

2.5 ACCESSORIES

A. Provide the accessories noted or shown in the schedule. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification. Speed controllers shall be solid state type designed to reduce speed from 100% to 50%. Backdraft dampers shall be parallel blade type, either gravity or motorized as scheduled.

2.6 FINISH

A. All non-corrosion resistant ferrous metal fan parts shall be cleaned and painted with a heavy coat for primer finish and two coats of enamel paint.

2.7 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

2.8 MANUFACTURERS

A. Fan capacities shall be as scheduled on the drawings and shall be manufactured by Carnes, Twin City, Aerovent, Woods, Cook, Jenn-Aire, I.L.G., Venco, American Coolair, Stanley, Greenheck, Penn, Acme, Breidert, Delhi, Shipman or Barry Blower. Fume hood exhaust fans shall be manufactured by Greenheck, Strobic Air, Twin City or Cook.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and International Mechanical Code.

B. Install power ventilators level and plumb.

C. Secure roof-mounting fans to roof curbs with cadmium-plated hardware on 12-inch on center, minimum two per side. Seal and caulk watertight. Refer to Division 15 Section "Hangers and Supports" for installation of roof curbs.

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Division 15 Section "Mechanical Identification."

F. Speed controllers for fans shall be field mounted and wired by Division 16. Exact location of speed controllers for fans shall be determined by the contractor, with the following requirements to be adhered to:
   1. Unless specifically shown otherwise, speed controllers shall not be mounted on wall below the ceiling and accessible by building occupants. Speed controllers are intended to be adjusted by the Test and Balance agent and left in the same position to maintain specified airflow rates.
   2. Where roof mounted fans or in-line fans are served by speed controllers, speed controller shall be mounted under the motor cover for roof mounted fans and at the fan for in-line fans.

END OF SECTION

SECTION 15855

DIFFUSERS, REGISTERS, AND GRILLES

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 ceiling- and wall-mounted diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product data shall be submitted under the provisions of Section 15050. For each product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate grille designation (i.e., tag), model number, size, and accessories furnished. Do not indicate quantity in the submittal.

1.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The grilles, registers, and diffusers shall be manufactured by Carnes, Krueger, E. H. Price, Air Devices, Kees, Nailor-Hart, Air Louvers, Anemostat, Tuttle and Bailey, Titus/J & J or Metal*Aire.

2.2 GRILLES AND REGISTERS

A. Egg Crate Grilles and Registers: All aluminum extruded grille with aluminum opposed blade damper, where scheduled, 1" x 1" x 1" egg crate grid and baked enamel finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. See architectural reflected ceiling plan for location of ceiling grid. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. Provide round to square adapters at all round duct connections to square neck diffusers. For supply diffusers, adapter shall be insulated.

E. Install items in accordance with manufacturer's instructions.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 15856

INTAKE AND RELIEF PRODUCTS

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 types of roof-mounting intake and relief ventilators:
   1. Louvers.
   2. Perforated metal screen.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Intake and relief ventilators shall be capable of withstanding the effects of gravity loads, wind loads, and thermal movements without permanent deformation of components, noise or metal fatigue, or permanent damage to fasteners and anchors.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, submit under the provisions of Section 15050. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals. Submit color chart for louvers.

1.5 COORDINATION

A. Coordinate installation of roof curbs and roof penetrations. These items are specified in Division 15 Section "Hangers and Supports."

PART 2 - PRODUCTS

2.1 LOUVERS

A. General: Furnish and install louvers as indicated on the drawings. Louver sizes shall be manufactured from actual dimensions taken on site. Dimensions shown on the drawings are nominal. Provide lintels above all louvers and sleeves in all walls where louvers are installed.

B. Materials:
   1. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.
   2. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer to produce required finish.

3. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are corrosive or incompatible with joined materials.
   a. Use types and sizes to suit unit installation conditions.
   b. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
4. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

C. Stationary Louvers: Louvers shall be 4" or 6"deep, as shown on the schedule, mechanically fastened extruded aluminum, non-drainable type with drainable head. Frame shall be channel type. Frames and blades shall be minimum 0.081-inch thick on a 37° angle with 4" blade spacing with reinforcing bosses. Head, sill, and jambs shall be one-piece structural members and shall have integral caulking slot and retaining bead. Provide back-mounted ½" mesh by 0.063-inch diameter wire bird screen, held in place with screws and washers spaced 6 inches maximum from each corner and at 12" O.C. between. Allowance for expansion shall be provided at the jambs. Louver blades shall be horizontal. Provide extended sill where specified. Supporting framework concealed from view from outside face of louver by placing braces, mullions, and brackets on inside face, designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and channels in jambs and mullions; with close-fitting, field-made splice joints in blades designed to permit expansion and contraction without deforming blades or framework.

D. Finishes: Finish colors shall be selected by the Architect to match the building colors. The manufacturer shall verify the colors available and indicate same on his submittal. If the manufacturers "standard" color does not match the colors desired, the Architect will provide a color "chip" for the louver manufacturer to match. Basis of bid shall be "Kynar" 70% fluoropon resin coating. After cleaning louver with an acid cleaner, an alkali cleaner, an acid deoxidation, an amorphous chrome phosphate conversion coating and an acidulated final rinse, louver shall be dried before application of final finish. Kynar shall be electrostatically applied to a minimum dry thickness of 1.2 mils when baked at 450° for 10 minutes. Finish shall be warranted against color change, caulking and peeling for a period of five years.

E. Certification: Louvers shall bear the AMCA Certified Ratings Seal for air performance, pressure drop, and water penetration ratings. The manufacturer shall submit licensed test data on the louvers per AMCA Standard 500. Round louvers and other specialty shaped louvers are not required to be AMCA certified.

F. Performance Requirements: As follows, determined by testing units 48 inches wide by 48 inches high per AMCA 500:
   1. Free Area: Not less than 8.13 sq. ft.
   2. Static Pressure Loss: Not more than 0.15-inch w.g. at an airflow of 980 fpm free area intake velocity.
   3. Water Penetration: Not more than 0.01 oz. per sq. ft. of free area at an airflow of 950 fpm free area velocity when tested for 15 minutes.

G. Manufacturers: Pottorff, Ruskin, Industrial Louvers, Inc., Arrow, Dowco, Vent Products, Empco, Louvers and Dampers, Airolite, Air Stream, United Air, NCA, Greenheck, Cesco, Airline, Air Balance, Carnes or American Warming and Ventilating.

2.2 PERFORATED METAL SCREEN COVERING DUCT OPENINGS AND WALL OPENINGS

A. Steel: Where specified on the drawings, provide steel perforated metal screen to cover duct and wall openings, and to prevent large items from entering the opening. Perforated metal shall be plain steel, 16-gauge minimum, 3/4" round holes on 1" staggered centers. Free area shall be minimum 51% free area. Provide 16 gauge hemmed edging perimeter framing fastened securely to perforated metal screen. Edging shall be turned over duct 1.25" on all sides.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Secure all curb mounted equipment to roof curbs on maximum 12" centers, minimum 2 anchors per side.

B. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation.

C. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

D. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

E. Seal and caulk entire perimeter of all mechanical wall penetrations watertight with caulk to match color of wall. Caulk shall be in accordance with the Division 7 caulking specification.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

3.4 LOUVER INSTALLATION

A. Locate and place louver units plumb, level, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather tight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items that cannot be refinished in the field to the shop, make required alterations, and refinish entire unit, or provide new units.

F. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings and joint fillers as louver installation progresses, where required to make louver joints weather tight. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation of louver.

H. Protect louvers from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.

I. Restore louvers damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Architect, remove damaged units and replace with new units.

J. Periodically clean exposed surfaces of louvers that are not protected by temporary covering to remove fingerprints and soil during construction period.

K. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Rinse surfaces thoroughly and dry.

END OF SECTION

SECTION 15900

HVAC INSTRUMENTATION AND CONTROLS

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 control equipment for HVAC systems and components, including control components for equipment not supplied with factory-wired controls.

1.3 WORK INCLUDED

A. Complete control system for all heating, ventilating and air conditioning (HVAC) systems and exhaust systems including all integral and field mounted devices and control wiring. All control components shall be provided under this section of the specifications unless specifically provided elsewhere. A complete and fully operational control system shall be provided for all mechanical systems furnished under Division 15 to achieve the sequence of control specified: (1) herein (2) in other specification section or (3) as required to achieve proper operation of the equipment.

B. This system shall include all devices specified herein and shall include, but is not limited to; conventional thermostats, humidity sensors, relays, switches, contactors, transformers, etc.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15050 to the Owner and Architect/Engineer.

B. Each submittal shall contain the following information, as appropriate based on this particular project.
   1. Single line schematics and flow diagrams showing the location of all control devices.
   2. Vender’s own written description for each sequence of operation.
   3. Catalog cut sheets for all equipment used, including but not limited to: sensors, thermostats, actuators, etc.

C. Controls contractor shall not order material or begin field installation until receiving approved submittals.

D. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and terminal to terminal control wiring, clearly indicating factory-installed and field-installed wiring associated with all equipment. Wiring diagrams shall show all point-to-point wiring connections between all components of the control system. **No devices, conduit or wiring shall be installed until Contractor has received approved shop drawings from the Architect/Engineer.**

E. Field quality-control test reports.

F. Operation and Maintenance Data: For HVAC instrumentation and control system, submit under the provisions of Section 15051

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Complete control system and submittal data for this system shall be prepared and provided by a factory authorized representative of the Control System Manufacturer with a minimum of five (5) years experience in control systems of similar size and complexity. The control system manufacturer must be able to demonstrate 5 similar projects with control systems operating successfully in the field for a minimum of five years.

D. The control contractor shall be a factory authorized branch office that is regularly engaged in the engineering, programming, installation and service of the control systems of similar size and complexity. The controls contractor shall have a local branch office with a 100-mile radius of the job site. Emergency service shall be available on a 24-hour, seven day a week basis.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.7 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

1.8 WARRANTY

A. See Section 15051 for warranty information.

B. Warranty shall cover all costs for parts, labor, travel and expenses for a period of one year from completion of system acceptance.

C. Emergency Service: The controls contractor shall restore the control system to proper operating condition within 24 hours after receiving a request for service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The control system for this project consists of standard low voltage thermostats and factory installed controllers. The control system for this project is not a direct digital control (DDC) system and control vendors may not submit DDC control systems as an alternate for the standard conventional control system. Control components may be installed by the mechanical contractor or by a company hired by the contractor, and the controls contractor shall be designated as whichever party performs the installation.

2.2 WIRING

A. All control wiring (including but not limited to control, interlock, sensor, thermostat, etc.) shall be provided under this section of these specifications. If 120-volt AC power for control devices is required and if Division 26 electrical drawings do not indicate 120-volt AC is provided to control devices, the control contractor is responsible for providing 120-volt AC as specified herein.

2.3 CONTROL COMPONENTS AND THEIR FUNCTION

A. Conduit and Raceway: Provide and install under this section.
   1. Refer to Division 16 - Electrical for material requirements for conduit and flexible conduit. Conduit sleeves with bushing shall be provided at all control wiring penetrations through walls.
   2. Outlet Boxes: Refer to Division 16. Provide and install under this section.

B. Conductors:
   1. 50 to 600 volts: Refer to Section Division 16 for requirements.
   2. Below 50 volts: Minimum size for individual conductors is AWG. No. 18. Minimum conductor sizes for multiconductor cables is AWG No. 22. Provide shielded cable as required to avoid EMI where conduits natural shielding effect is insufficient. Conductors shall be sized within acceptable voltage drop parameters.
   3. Plenum Rated Cable: Plenum rated cable with flame spread of 25 or less and smoke development of 50 or less as tested by ASTM-E84.
   4. Conductor Insulation: "TFFN", unless noted otherwise.
   5. Taps and Joints: Mechanically and electrically sound.
   6. Tape: Per Division 16. Provide and install under this section.
   7. Lacing: Per Division 16. Provide and install under this section.
   8. Lubricants: Per Division 16. Provide and install under this section.
   9. Color Code: All low voltage control conductors shall be color coded by factory or provided with numbered ends.

C. Contactors and Disconnects:
1. All contactors for equipment specified in Division 15 shall be provided under this section of the specifications unless explicitly shown furnished by Electrical on the Electrical Drawings. Provide herein all relays and contactors necessary for the proper operation of all Division 15 equipment.
2. All electrical disconnects for equipment specified in Division 15 shall be provided under this section of the specifications unless explicitly shown furnished by Electrical on the Electrical Drawings.
3. Control Relays and Contactors: Relays for control purposes shall be the plug-in type with plastic enclosure surrounding the relay with contacts rated for a minimum of 110VAC and 24VDC. Relay shall operate properly over -25°C to 55°C ambient. Relay shall be UL recognized. Pick up voltage shall be a maximum of 80% of nominal and drop off voltage shall be a maximum of 30% of nominal. Contact rating, in-rush current, number of poles, coil voltage, etc. shall be appropriate for the application. Provide neon or LED "ON" indicator lamp.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that power supply is available to control devices and operator workstation.

B. Verify that duct- and equipment-mounted devices are installed before proceeding with installation.

3.2 INSTALLATION

A. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation. Install devices 54 inches above the floor, unless noted otherwise.

B. Install labels and nameplates to identify control components according to Division 15 Section "Mechanical Identification."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install all systems in accordance with manufacturer’s installation instructions, NFPA-70 and NFPA-90A.

B. Installation of Conduit and Wiring:
1. All wiring and conduit installed under this section of the specifications shall be installed by a state-licensed contractor(s) and all work shall be done by state-certified technicians. All wiring systems shall be color coded and conductors shall be tagged at all junctions and terminals. Label cables identification numbers as directed by Owner. The Engineer and Owner reserves the right to move any device fifteen (15) feet without additional costs before the device is installed. All wiring and conduit shall be installed in accordance with Division 16 - Electrical.
2. All wiring shall be installed in conduit, except for plenum rated cable as specified below.
3. All conduit shall be concealed, except in mechanical/ electrical rooms.

4. All control wiring above suspended ceiling, not made inaccessible by equipment, ductwork or structure, may be plenum rated cable with flame spread of 25 or less and smoke development of 50 or less as tested by ASTM-E84. This plenum rated cable is not required to be installed in conduit, but shall be run in a workmanlike manner, parallel to the building lines, properly supported at regular intervals, and not draped over conduit, piping and ductwork. Attach cable above ceiling to structure using appropriate fasteners for type of construction involved. Cable shall not lay atop ceiling. Where physical damage is possible, mechanical protection shall be used. All splices or connections shall be made at equipment served. Where communication loops are run, terminations shall be at terminal strip on equipment. No splices in field shall be allowed. The use of snap in bushings or connectors is required where cable is entering a knockout or equipment housing. All penetrations through wall sleeves shall be sleeved with conduit with bushings on both ends.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

3.5 TRAINING

A. Provide training of Owner’s personnel in accordance with provisions of Section 15051.

3.6 SEQUENCE OF OPERATION

A. Overall Building Control Description:
1. Time Clock Program: Owner shall provide Contractor with the required start/stop times for each piece of equipment so the Contractor can program the individual start/stop time for each piece of equipment. Equipment which shall be start/stopped by the time clock program is indicated in later paragraphs. All other equipment not started by the time clock program will be started and stopped as described in later paragraphs of this section of specifications.
2. Override Timer Programs: Override timer programs shall override the time clock program during its "OFF" cycles to re-start the equipment in its normal operating mode. Room temperature sensors shall be provided with integral pushbutton override to restart equipment in normal operating mode for a preprogrammed (one hour, adjustable) duration.
3. Night Setback Programs: Night setback temperature programs shall override the time clock program during its "off" cycles, when the space temperature drops below setpoint (55°F, adjustable) to restart the respective equipment to satisfy the room temperature night setback setpoint (as sensed by the respective room temperature sensor.) Anytime night setback program is activated, all exhaust fans shall remain off, outdoor air dampers shall remain shut.

4. Morning Warm Up and Cool Down Programs: During morning hours, prior to building occupancy, equipment as specified in later paragraphs shall operate until space temperature sensors reach 75°F (adjustable). Control system shall "learn" the time required to perform this function and shall adjust the start time to bring the equipment on at the appropriate time (optimum start). During morning warm up, equipment as specified in later paragraphs to remain off shall not operate.
5. Fire Safety Controls: All supply air systems above 2000 cfm shall be provided with a supply duct mounted smoke detector furnished under Division 16. Certain pieces of equipment may be identified on the drawings as being provided with factory installed smoke detectors.
6. Power Outage Recovery Control: In the event of a power outage, the control system shall be restored to its last state (prior to power outage) as quickly as possible after power has been restored. Setpoints shall not be lost during power outages.

B. Sequence of Operation for Exhaust and/or Supply Fans:
1. EF-1 shall be started/stopped by an occupancy sensor (by electrical) installed in Women's Restroom 105 and Concessions Area 104 (see plans for location), such that whenever occupancy is detected in either space, EF-1 shall operate. Exhaust fan shall continue to operate for an adjustable time period after occupancy is no longer detected in either space.
2. EF-2 shall be started/stopped by an occupancy sensor (by electrical) installed in Men's Restroom 106 and Concessions Area 104 (see plans for location), such that whenever occupancy is detected in either space, EF-2 shall operate. Exhaust fan shall continue to operate for an adjustable time period after occupancy is no longer detected in either space.

C. Sequence of Operation for Electric Wall Heater: Electric wall heater(s) shall cycle their blower (after heating element warm up) and heating element to satisfy the integral thermostat.

D. Sequence of Operation for Electric Ceiling Heater: Electric ceiling heater(s) shall cycle their blower (after heating element warm up) and heating element to satisfy the integral or wall mounted thermostat. See schedule/drawings for thermostat type.

END OF SECTION

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

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 TAB to produce design objectives for the following:
   1. Air Systems
   2. Verifying that automatic control devices are functioning properly.
   3. Reporting results of activities and procedures specified in this Section.

1.3 SUBCONTRACTOR COORDINATION

A. Testing, Adjusting and Balancing (TAB) work shall be performed by NEBB/AABC agent as described in this section of the specifications; however, all devices that the TAB agent will be required to perform work on described in this section, shall be provided by the Contractor's Division 15 mechanical sub-contractor(s). These devices include, but are not limited to: balancing dampers and the labor to install these devices. Sub-contractor(s) providing the Division 15 HVAC systems must provide labor to support the TAB Agent. The mechanical systems shall be fully operational and ready for TAB work to begin a minimum of four weeks prior to the Contractual date of "Substantial Completion". Additionally, the Division 15 Contractor(s) shall furnish a qualified technician(s)/mechanic(s) to assist the TAB agent in the performance of his duties until all work specified herein is accomplished. The Division 15 sub-contractor(s) shall correct all deficiencies found by the TAB agent.

1.4 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. TAB: Testing, adjusting, and balancing.

D. Test: A procedure to determine quantitative performance of systems or equipment.

E. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.5 SUBMITTALS

A. Qualification Data: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Sample Report Forms: Submit four sets of sample TAB report forms.

C. Contract Documents Examination Report: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of the Contract Documents review report as specified in Part 3.

D. Certified Final TAB Reports: Submit four copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.6 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB. Test and balancing by non-AABC or non-NEBB firms is not allowed.

B. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

C. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

D. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.
   1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.7 OCCUPANCY DURING TAB PROCEDURE

A. Owner Occupancy: TAB agent shall verify if Owner will occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.8 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times. Test and Balance Agent shall contact Engineer and Owner 48 hours prior to test and balance work to allow (but not require) Engineer and owner to be present during TAB work.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.9 WARRANTY

A. Performance Guarantee:
   1. Provide one of the following:
      a. Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents.
      b. Provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee for either AABC or NEBB shall include the following provisions:
         1) The certified TAB firm has tested and balanced systems according to the Contract Documents.
         2) Systems are balanced to optimum performance capabilities within design and installation limits.

B. TAB work shall be guaranteed by AABC or NEBB. Submit copy of AABC or NEBB National Performance Guaranty when final balance report is submitted. If for any reason, the TAB agency fails to comply with the specifications, with the exception of termination of business by the TAB agency, equipment malfunction or inadequacy, which prevents proper balancing of the systems, the Associated Air Balance Council or NEBB shall provide supervisory personnel to assist the TAB agency to perform work in accordance with AABC or NEBB standards. As part of this Performance Guaranty, the engineer or building owner may call upon AABC or NEBB to assist him with any technical and/or field problems pertaining to the final balanced condition of the systems. These services will be made available at no additional charge by the TAB agency or by AABC or NEBB National Headquarters.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment. Provide Contract Documents Examination Report to report on acceptability and/or deficiencies in Contract Documents.
   1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
   2. Verify that balancing devices, such as test ports and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

D. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

E. Report deficiencies discovered before and during performance of TAB procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.3 SAFETY CONTROLS DATA

A. Provide unit designation or location with description of device and setpoint. Activate and verify operation of all safety devices. Smoke detectors shall be activated with smoke. Test button activations is not acceptable.

3.4 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.
      c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
      d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
3. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Where installed, adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers in the bellmouth takeoff rather than the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.5 TEMPERATURE-CONTROL VERIFICATION

A. Record thermostat/sensor controller settings and note variances between set points and actual measurements.

B. Check free travel and proper operation of control devices such as damper and valve operators.

C. Check the sequence of operation of control devices. Note the speed of response to input changes.

D. Note operation of electric actuators using spring return for proper fail-safe operations.

3.6 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
1. Exhaust Fans and Equipment with Fans: Plus 10 percent to minus 10 percent.
2. Air Outlets and Inlets: Plus 10 percent to minus 10 percent.

3.7 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.8 CERTIFIED FINAL TAB REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
1. Include a list of instruments used for procedures, along with proof of calibration.

C. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
1. Title page.
2. Name and address of TAB firm and telephone number.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:
    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance.

D. Final Report Contents: In addition to certified field report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outside, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Position of balancing devices.

F. Fans
1. Identification (Tag)/Location
2. Manufacturer
3. Model
4. Air flow, design and actual
5. Static pressure (external), design and actual
6. Electric motor data (see later paragraph)

G. All Electric Motors (Data to Be Tabulated With Equipment Driven By Motor)
1. Manufacturer
2. HP (nameplate)
3. Phase, voltage, amperage; nameplate, actual
4. RPM
5. Service factor (if applicable)
6. Starter size, rating, heater elements (if applicable)
7. Motor winding insulation class

H. Air Distribution Test Sheet
1. Air outlet (grille or register) identification (tag)
2. Room number/location with identification numbers and diagrams
3. Terminal type
4. Terminal size
5. Design air flow
6. Test (final) air flow, CFM
7. Percent of design air flow

I. Electric Heaters
1. Tag/Location
2. Manufacturer
3. CFM (Nameplate and actual)
4. Electrical Data: voltage, phase, full load amps (actual and nameplate)
5. Entering and leaving dry bulb) air temperatures
6. KW (nameplate and actual)

3.9 INSPECTIONS

A. Initial Inspection:
1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:
a. Measure airflow of at least 10 percent of air outlets.

b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
c. Verify that balancing devices are marked with final balance position.
d. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:
1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner and Architect.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner and Architect.
3. Owner and Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.10 REPORT

A. Provide four copies of the Test and Balance report to the Architect/Engineer by the earlier of the following two dates:
1. A minimum of 48 hours prior to the semi-final on-site project construction site review by the Architect/Engineer.
2. Four weeks prior to the date the facility is scheduled to be turned over to the Owner.

B. TAB work shall be guaranteed by AABC or NEBB. Submit copy of AABC or NEBB National Performance Guaranty when final balance report is submitted. If for any reason, the TAB agency fails to comply with the specifications, with the exception of termination of business by the TAB agency, equipment malfunction or inadequacy, which prevents proper balancing of the systems, the Associated Air Balance Council or NEBB shall provide supervisory personnel to assist the TAB agency to perform work in accordance with AABC or NEBB standards. As part of this Performance Guaranty, the engineer or building owner may call upon AABC or NEBB to assist him with any technical and/or field problems pertaining to the final balanced condition of the systems. These services will be made available at no additional charge by the TAB agency or by AABC or NEBB National Headquarters.

END OF SECTION

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

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 SUBMITTALS

A. Provide submittals in accordance with Section 01300 "Submittal", and with additional requirements as follows: Contractor shall provide a sufficient number of copies of manufacturer's data for review so that the Architect, Engineer and Owner may each retain one copy, plus any additional copies as required for contractor's and contractor's affiliates (subcontractors, suppliers, etc.) usage. But in no event shall the contractor provide less than six (6) copies for review. Submittal data shall be assembled in complete sets, and bound in a hard cover commercial grade 3 ring binder with sheet protectors at the front and back of the binder. Binders shall have "pockets" inside the front and rear covers and project labels on the spine and front cover. All submittal data for a trade shall be submitted at one time except as noted herein. Data not submitted shall have a statement explaining why the data was not submitted. The submittal shall include an index sheet listing each tab number and contents. Submittals not conforming to any of the above requirements shall be rejected. The contractor shall go to each specification section to determine all technical information/data required and organize information/data using tabs for major headings as follows:
   1. Section 16111 - Conduit
      a. Rigid steel conduit
      b. IMC
      c. EMT
      d. Flexible metal conduit
      e. Liquidtight flexible metal conduit
      f. Non-metal conduit
      g. Conduit fittings and bodies
   2. Section 16123 - Building Wire and Cable
      a. Building wire and cable (600 volts and less)
      b. Connectors, splices and terminations (600 volts and less)
   3. Section 16130 - Boxes
      a. Outlet boxes
      b. Junction boxes
      c. Floor boxes
   4. Section 16141 - Wiring Devices
      a. Convenience receptacles
      b. Isolated ground receptacles
      c. Tamper resistant receptacles
      d. GFCI receptacles
      e. Twist locking receptacles

f. Pendent cord receptacles
g. Cord & Plug sets
h. Light switches
i. Pilot light switches
j. Key operated switches
k. Key operated momentary contact switch
l. Wall plates

5. Section 16145 - Building Lighting Controls
   a. Product Data
   b. Shop Drawings
6. Section 16170 - Grounding and Bonding
   a. Product Data
   b. Shop Drawings
7. Section 16195 - Electrical Identification
   a. Product Data
   b. Identification Schedule
   c. Samples
8. Section 16440 - Disconnect Switches
   a. Product data
   b. Shop drawings
9. Section 16461 – Low Voltage Transformers
   a. Product data
   b. Shop drawings
10. Section 16470 – Panelboards
    a. Product data
    b. Shop drawings
11. Section 16476 - Enclosed Circuit Breakers
    a. Product data
    b. Shop drawings
12. Section 16480 - Motor Control
    a. Product data
    b. Shop drawings
    c. Wiring diagrams
13. Section 16485 - Contactors
    a. Product data
    b. Shop drawings
14. Section 16510 – Luminaires
    a. Product data
    b. Warranties
15. Section 16721 - Fire Alarm
    a. Product Data
    b. Shop Drawings
    c. Qualification Data
    d. Field Quality Control Test Reports
    e. Submittals to Authority having jurisdiction
    f. Documentation
16. Section 16722 - Security System
    a. Product Data
    b. Shop Drawings

c. Equipment List
d. Field Quality Control Test Reports
e. Warranty

B. Manufacturer's data sheets shall be marked to clearly indicate the manufacturer, model number, size, color, accessories, required clearances, field connection details, weight loading, electrical characteristics, capacities, etc. being submitted. Variations from specifications shall be explained. Submittal preparer's name and telephone number shall be listed on the index sheet.

C. Only manufacturer's listed in specifications or addendums will be considered.

D. Review, corrections, or comments made on the submittals do not relieve the Contractor from compliance with the requirements of the Drawings, Specifications and Addendums (Contract Documents). By entering into this Contract, the Contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the Contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and use. Review of shop drawing will be general only for basic conformance with the design concept. The review of such drawings, schedules or cuts shall not relieve the Contractor from the responsibility for correcting all errors of any sort contained in the submittals. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

E. Below are the submittal item codes that will be used when reviewing the submittal data. These codes show up on the "Submittal Review" sheet. Only one copy of the submittal review sheet is returned upon completion of the submittal review.
1. RNE - Reviewed, No Exceptions Noted
   a. Indicates the information provided has been reviewed and no exceptions are taken. Contractor must still comply with the contract documents.
   b. No corrective action required at this time.
2. FNC - Furnish with Noted Corrections
   a. Indicates the contractor shall insure that all necessary or noted corrections are incorporated into equipment furnished to the project.
   b. Contractor shall incorporate items requested in review comments, but re-submittal not required.
3. RES - Revise and Resubmit
   a. Indicates item is not presently acceptable as submitted, but may be accepted provided additional information and/or changes are made.
   b. Contractor shall revise and resubmit item to Engineer with additional information indicating compliance with Contract Documents prior to proceeding with work.
4. PSD - Provide Submittal Data
   a. Indicates submittal data was not provided for this item or section.
   b. Contractor shall provide submittal data meeting the explicit requirements of the plans, specifications, and all addenda.

F. Shop drawings and data submittals for materials requiring extra-long delivery time shall be submitted for approval as soon as possible after execution of contract. All sleeves must be precast in concrete or concrete block and accordingly provided to the mason in a timely manner.

Accordingly, all items such as these shall be submitted for approval in a timely manner (prior to other submittals if necessary) so they may be properly incorporated in the building's structure. Allow a minimum of three weeks for review. No substitutions of materials or extensions of contract time will be allowed for Contractors failure to submit or order such materials sufficiently in advance of the work. See Architectural specification section for additional requirements for submittals.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable Building Code for Macon/Bibb County, Georgia.

B. Electrical: Conform to NFPA 70 (2014).

C. Obtain permits, and request inspections from authority having jurisdiction.

1.4 PROJECT/SITE CONDITIONS:

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.5 GUARANTEE AND WARRANTIES:

A. Guarantee: All equipment and materials furnished and all work performed under this section of specifications shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after final acceptance of the work by the Owner. Upon notice from the Owner of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

B. Warranties: Provide manufacturer's equipment warranties prior to final inspection. See other paragraphs in other sections of specifications for specific additional equipment warranties.

END OF SECTION

SECTION 16111

CONDUIT

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 SECTION INCLUDES:

A. Metal conduit.

B. Flexible metal conduit.

C. Liquidtight flexible metal conduit.

D. Electrical metallic tubing.

E. Nonmetal Conduit.

F. Fittings and conduit bodies.

1.3 RELATED SECTIONS:

A. Section 16130 - Boxes.

B. Section 16170 - Grounding and Bonding.

C. Section 16190 - Supporting Devices.

D. Section 16195 - Electrical Identification.

1.4 REFERENCES:

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

D. ANSI/NFPA 70 - National Electrical Code.

E. NECA "Standard of Installation."

F. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.5 DESIGN REQUIREMENTS:

A. Conduit Size: ANSI/NFPA 70.

1.6 SUBMITTALS:

A. Submit under provisions of Section 16010.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, non-metal conduit, fittings and conduit bodies.

1.7 PROJECT RECORD DOCUMENTS:

A. Accurately record actual routing of conduits larger than 2 inches.

1.8 REGULATORY REQUIREMENTS:

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.9 DELIVERY, STORAGE, AND HANDLING:

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade.

C. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.10 PROJECT CONDITIONS:

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS:

A. Minimum Size: 1/2 inch unless otherwise specified.

B. Underground or Under slab Installations: Use nonmetal conduit.
1. Non-metal conduit installed under slab shall have an acceptable earthen or sand cover (i.e. no aggregate in direct contact with conduit.)
2. Non-metal conduit installed underground shall be concrete encased if not below building slab.

C. Outdoor Locations, Above Grade: Use rigid steel conduit or intermediate metal conduit.

D. Wet and Damp Locations: Use rigid steel conduit or intermediate metal conduit.

E. Dry Locations: Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.

F. Metal Conduit:
a. Rigid Steel Conduit: ANSI C80.1.
b. Intermediate Metal Conduit (IMC): Rigid steel.
c. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

G. Flexible Metal Conduit:
1. Description: Interlocked steel construction.
2. Fittings: ANSI/NEMA FB 1.

H. Liquidtight Flexible Metal Conduit:
1. Description: Interlocked steel construction with PVC jacket.
2. Fittings: ANSI/NEMA FB 1.

I. Flexible plastic ENT "smurf" tubing is **not** acceptable

J. Electrical Metallic Tubing (EMT):
1. Description: ANSI C80.3; galvanized tubing.
2. Fittings and Conduit Bodies: ANSI/NEMA FB 1; insulated throat steel compression type. Set screw or indenter type are unacceptable.

K. Nonmetallic Conduit:
1. Description: NEMA TC2; Schedule 40 PVC, type DB.
2. Fittings and Conduit Bodies: NEMA TC3.

2.2 ACCEPTABLE MANUFACTURERS:

A. Acceptable manufacturers of conduit products specified herein are as follows: Allied, Triangle, Wheatland, LTV, Cantex or Carlon.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions and as specified herein.

C. All conduit shall be routed concealed where possible.

D. Arrange supports to prevent misalignment during wiring installation.

E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

G. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

I. Do not attach conduit to ceiling support wires.

J. Arrange conduit to maintain headroom and present neat appearance.

K. Route exposed conduit parallel and perpendicular to walls.

L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

M. Route conduit under slab from point-to-point.

N. Do not install conduits in slab.

O. Nonmetallic conduit will be allowed to penetrate floor slab, in on-grade construction, provided all of the following criteria are met:
   1. Conduit will be concealed within wall construction.
   2. Conduit terminates in an outlet at no more than 18 inches above finished floor. Otherwise, a transition to specified materials shall be made within this region.
   3. Conduit stubs are inspected by Architect following concrete pour. Damaged stubs shall be replaced in accordance with Architect's instructions at no additional cost.

P. Maintain adequate clearance between conduit and piping.

Q. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

R. Cut conduit square using saw or pipecutter; de-burr cut ends.

S. Bring conduit to shoulder of fittings; fasten securely.

T. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

U. Install no more than equivalent of four 90-degree bends between boxes. Use hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch size.

V. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

W. Provide insulating bushings on all RGS and IMC conduits entering wireways, pullboxes, cabinets, panelboards, etc.

X. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.

Y. Provide Thomas Jet-Line Polyolefin pull cord, minimum 500 lbs., in each empty conduit except sleeves and nipples.

Z. Use "Push-Pennies" to protect installed conduit against entrance of dirt and moisture.

AA. Ground and bond conduit under provisions of Section 16170.

BB. Identify conduit under provisions of Section 16195.

CC. Where connections to free-standing equipment in excess of 18" from structure are required, a vertical, minimum size 3/4", rigid conduit secured to ceiling and floor shall be utilized with wiring into this conduit by means of a rigid connection to a conduit body and wiring from this conduit by means of a conduit body with a flexible conduit connection to equipment.

DD. Flexible conduit shall not exceed 2'-0" in length unless specified otherwise.

3.2 INTERFACE WITH OTHER PRODUCTS:

A. Install conduit to preserve fire resistance rating of partitions and other elements in accordance with Section 07841.

B. Route conduit through roof openings for piping and ductwork or through "PCA" series roof curb as manufactured by Pate. Pitch pockets are unacceptable. This contractor shall provide curbs where required to roofing contractor for installation and coordination of installed locations.

END OF SECTION

SECTION 16123

BUILDING WIRE AND CABLE

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 SECTION INCLUDES:

A. Building wire and cable.

B. Wiring connectors and connections.

1.3 RELATED SECTIONS:

A. Section 16111 - Conduit.

B. Section 16130 - Boxes.

C. Section 16195 - Identification.

1.4 REFERENCES:

A. ANSI/NFPA 70 - National Electrical Code.

1.5 SUBMITTALS:

A. Submit under provisions of Section 16010.

1.6 REGULATORY REQUIREMENTS:

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. suitable for purpose specified and shown.

1.7 PROJECT CONDITIONS:

A. Verify that field measurements are as shown on Drawings.

B. All conductors shall be copper.

C. Routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions. Include wire and cable lengths within 10 feet of length shown.

D. Where routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 COORDINATION:

A. Determine required separation between this and other work.

B. Determine routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 BUILDING WIRE AND CABLE:

A. Description: Single conductor insulated wire.

B. Conductor: Copper no exceptions. Solid conductor for 10 AWG and smaller, stranded for 8 AWG and larger.

C. Insulation Voltage Rating:600 volts.

D. Insulation: ANSI/NFPA 70; Type XHHW insulation for circuits 6AWG and larger; Type THHN/THWN insulation for circuits 8 AWG and smaller. At the contractors option, type THHN/THWN insulation may be utilized throughout for all feeders and branch circuits.

E. Acceptable Manufacturers: Allied, American Insulated, Carol, Pirelli, Rome, Senator, Southwire or Triangle. Only product of domestic manufacture will be accepted.

2.2 WIRING CONNECTORS:

A. Solderless Pressure Connectors: 3M Skotch-loks, Thomas and Betts Firestopping or Ideal Wing Nut for 10 AWG and smaller

B. Compression Connectors: Burndy Hydent, Ilsco or Thomas and Betts, Color-Keyed for 8 AWG and larger.

C. Terminal Lugs: Thomas and Betts STA-KON for 10 AWG and smaller; Thomas and Betts Color-Keyed for 8 AWG and larger. Equal product as manufactured by Burndy or Ilsco is acceptable.

PART 3 - EXECUTION:

3.1 EXAMINATION:

A. Verify that interior of building has been protected from weather and that raceway systems are complete.

B. Verify that mechanical work likely to damage wire has been completed.

3.2 PREPARATION:

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS:

A. Use wiring methods as specified and indicated on Drawings.

3.4 INSTALLATION:

A. Install products in accordance with manufacturers instructions.

B. Use conductor not smaller than 12 AWG for power and lighting circuits.

C. Pull all conductors into raceway at same time.

D. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

E. Protect exposed cable from damage.

F. Neatly train and lace wiring inside boxes, equipment, and panelboards using nylon cable ties by Thomas and Betts, Panduit or Ideal.

G. Clean conductor surfaces before installing lugs and connectors.

H. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

I. Where compression connectors are used for conductor splices and taps; tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

J. Use terminal lugs for connecting all stranded conductors and for all multiple connections to terminals.

3.5 INTERFACE WITH OTHER PRODUCTS:

A. Identify wire and cable under provisions of Section 16195.

3.6 FIELD QUALITY CONTROL:

A. Inspect wire for physical damage and proper connection.

B. Measure tightness of bolted connections and compare torque measurements with code recommended values.

C. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 16130

BOXES

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 SECTION INCLUDES:

A. Wall and ceiling outlet boxes.

B. Floor Boxes.

C. Pull and junction boxes.

1.3 RELATED SECTIONS:

A. Section 16141 - Wiring Devices: Mounting heights of wiring device outlets.

B. Section 16180 - Equipment Wiring Systems.

C. Section 16721 - Fire Alarm System: Mounting height of fire alarm outlets.

D. Section 16741 – Telephone and Computer System Provisions: Mounting height of device outlets.

E. Section 16760 - Intercom and Master Clock System: Mounting height of device outlets.

1.4 REFERENCES:

A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. ANSI/NFPA 70 - National Electrical Code.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.5 REGULATORY REQUIREMENTS:

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.6 PROJECT CONDITIONS:

A. Verify field measurements are as shown on Drawings.

B. Verify locations of floor boxes and outlets prior to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown.

PART 2 - PRODUCTS

2.1 OUTLET BOXES:

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

B. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

C. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.2 FLOOR BOXES:

A. Floor Boxes: UL 514A, fully adjustable, multi-service recessed floor box.

B. Material: Cast iron.

C. Shape: Rectangular.

D. Activations: Recessed activation complete with brushed aluminum carpet trim plate and wire management blocks.

E. Manufacturer: Walker RFB4-C1 and RFB4-4DB or equal by Steel City or Wiremold.

2.3 PULL AND JUNCTION BOXES:

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Mounting heights as specified in other sections shall be to the bottom of the outlet.

C. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. Install boxes to preserve fire resistance rating of partitions and other elements.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished areas.

H. Secure flush mounting box to interior wall. Accurately position to allow for surface finish thickness.

I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

J. Use adjustable steel channel fasteners for hung ceiling outlet box.

K. Do not fasten boxes to ceiling support wires.

L. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

M. Use gang box where more than one line voltage device is mounted together. Do not use sectional box.

N. Use separate boxes for low voltage systems. Do not install line voltage and low voltage devices within same outlet.

O. Use 4 inch square box with plaster ring for single device outlets.

P. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Q. Set floor boxes level.

3.2 INTERFACE WITH OTHER PRODUCTS:

A. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

B. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes. Orient all outlets in like manner.

C. Coordinate locations of all floor outlets with Architectural furniture lay-outs.

D. Position outlet boxes to locate luminaries as shown on Architectural reflected ceiling plan.

E. Position outlet boxes which serve electric water coolers such that box, device and coverplate will be entirely concealed within equipment cabinet.

3.3 ADJUSTING:

A. Adjust floor box flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closure in unused box opening.

END OF SECTION

SECTION 16141

WIRING DEVICES

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 SECTION INCLUDES:

A. Wall switches.

B. Receptacles.

C. Device plates and decorative box covers.

1.3 RELATED SECTIONS:

A. Section 16130 - Boxes.

1.4 REFERENCES:

A. ANSI/NFPA 70 - National Electrical Code.

B. NEMA WD 1 - General Purpose Wiring Devices.

C. NEMA WD 6 - Wiring Device Configurations.

1.5 SUBMITTALS:

A. Submit under provisions of Section 16010.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.6 MANUFACTURER'S INSTRUCTIONS:

A. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.

B. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

1.7 REGULATORY REQUIREMENTS:

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 WALL SWITCHES:

A. Manufacturers: Arrow-Hart, Hubbell, Leviton, or Pass and Seymour.

B. Description: NEMA WD 1, heavy-duty, specification grade AC only snap switch.

C. Device Body: Grey plastic with toggle handle.

D. Voltage Rating: 120-277 volts, AC as applicable.

E. Current Rating: 20 amperes.

F. Pilot Lighted: Lighted handle with switch in "ON" position, Red color.

G. Keyed: Corbin lock type, keyed locking switch, Pass and Seymour #PS20ACXKL Series or equal by Leviton, Cooper or Arrow Hart.

2.2 RECEPTACLES:

A. Manufacturers: Arrow-Hart, Hubbell, Leviton, or Pass and Seymour.

B. Description: NEMA WD 1; heavy-duty specification grade receptacle.

C. Device Body: Grey plastic.

D. Configuration: NEMA WD 6; type as specified or noted.

E. Convenience Receptacle: Type 5-20R; single or duplex as indicated on Drawings.

F. Special Purpose Receptacle: NEMA type as noted on Drawings. Provide mating attachment plug for each special purpose receptacle.

G. GFCI Receptacle: Duplex convenience receptacle as specified herein with integral ground fault circuit interrupter to meet regulatory requirements.

H. Isolated Ground Receptacle: Type 5-20R, specification grade duplex, orange plastic body with indicating triangle (Green).

I. Tamper Resistant Receptacles: Type 5-20R duplex convenience receptacle with "floating shutter" to meet requirements of NFPA 70 Article 517-18(C).

2.3 WALL PLATES:

A. Decorative Cover Plate: Jumbo-oversize, type 302 stainless steel with stain finish, no equal.
1. Coverplates on shallow surface (SMR) boxes shall be standard size fitting to, not overlapping the box.

B. Exposed Cover Plate: Galvanized steel.

C. Weatherproof Cover Plate: Type 302 stainless steel with spring hinged gasketed device cover, unless noted otherwise.

D. Manufacturer: Mulberry, Leviton or Pass and Seymour.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify outlet boxes are installed at proper height.

B. Verify wall openings are neatly cut and will be completely covered by wall plates.

C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION:

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install duplex receptacles with grounding pole on top. Single outlets shall be installed with grounding pole on bottom.

E. Do not cascade convenience receptacles on the "load" side of GFCI devices, unless specifically noted otherwise.

F. Connect wiring device grounding terminal to outlet box with screw fastened bonding jumper.

G. Install decorative plates on switch, receptacle, and outlets in finished areas.

H. Install carpet flanges and coverplates on all floor boxes.

I. Connect wiring devices by wrapping solid conductor around screw terminal or by means of integral screw tensioned clamp, where applicable. Under no circumstances is "back wiring" of devices by a spring tensioned means acceptable.

J. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

K. Install weatherproof plates on outlets exposed to the elements and as noted.

3.4 INTERFACE WITH OTHER PRODUCTS:

A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on Drawings.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 16 inches above finished floor, unless noted otherwise.

D. Install convenience receptacle 6 inches above backsplash of counter.

E. All convenience receptacles which are located within 6 feet of a sink, basin, tub, shower, etc. shall be ground fault protected, regardless of indication. Verification of these requirements shall be responsibility of this Contractor.

3.5 FIELD QUALITY CONTROL:

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle for proper operation.

3.6 ADJUSTING:

A. Adjust devices and wall plates to be flush and level.

END OF SECTION

SECTION 16145

BUILDING LIGHTING CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes occupancy sensor control

B. Related Section
1. Section 16510 - Luminaires: Fluorescent electronic ballasts.
2. Drawings and general provision of the Contact, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section
3. Electrical Sections, including wiring devices, apply to the work of this Section.

C. Control Intent – Control Intent includes, but is not limited to:
1. Defaults and initial calibration settings for such items as time delay, sensitivity, etc.
2. Initial sensor and switching zones
3. Initial time switch settings
4. Emergency Lighting control

1.2 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)

B. International Organization for Standardization (ISO) (www.iso.ch):

C. National Electrical Manufacturers Association (NEMA) (www.nema.org)

D. Underwriters Laboratories, Inc. (UL) (www.ul.com):
1. 916 – Energy Management Equipment.
2. 924 – Emergency Lighting

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.4 SUBMITTALS

A. Submittals Package: Submit the product data specified below at the same time as a package.

B. Product Data: Catalog sheets, specifications and installation instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer: Minimum 5 years experience in manufacture of lighting controls.

1.6 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
   1. Ambient temperature: 0° to 40° C (32° to 104° F).
   2. Relative humidity: Maximum 90 percent, non-condensing.

1.7 WARRANTY

A. Provide a five year complete manufacturer's warranty on all products to be free of manufacturers' defects.

1.8 MAINTENANCE

A. Spare Parts:
   1. Provide three of each product to be used for maintenance with the exception of lighting control panel.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. WattStopper
   2. Lithonia Lighting; Acuity Lighting Group, Inc.
   3. Hubbell Lighting.
   4. Cooper Controls
   5. Sensor Switch

B. Basis of design product: WattStopper.

2.2 SINGLE / DUAL RELAY WALL SWITCH OCCUPANCY SENSORS

A. Type DW: Manual-ON, Automatic-OFF dual technology (passive infrared and ultrasonic) wall switch occupancy sensor. Furnish the Company's model which suits the electrical system parameters, and accommodates the square-foot coverage and wattage requirement for each area (and type of lighting) controlled; WattStopper DW-100, DW-200, DW-103, DW-203.

B. Ceiling Mounted Occupancy Sensors: Provide similar features to Type "DW" wall mount.

PART 3 - EXECUTION

3.1 INSTALLATION

A. When using wire for connections, provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements

B. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.

C. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.
   1. Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.

D. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
   1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
   2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
   3. Load Parameters (e.g. blink warning, etc.)

E. Re-commissioning – After 90 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

3.2 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.

C. Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

3.3 CLEANING

A. Division 1 - Execution Requirements: Final cleaning.

B. Clean photocell lens as recommended by manufacturer.

C. Clean all switch faceplates.

END OF SECTION

SECTION 16170

GROUNDING AND BONDING

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 WORK INCLUDED:

A. Power system grounding.

B. Electrical equipment and raceway grounding and bonding.

1.3 RELATED SECTIONS:

A. Section 16123 - Building Wire and Cable.

1.4 SYSTEM DESCRIPTION:

A. Ground the electrical service system neutral at service entrance equipment to building steel and to supplementary grounding electrodes.

B. Ground each separately-derived system neutral to building steel.

C. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, and receptacle ground connectors.

D. Provide a separate grounding conductor in all flexible conduits and all non-metal conduit.

1.5 SUBMITTALS:

A. Submit shop drawings/cut sheets under provisions of Section 16010.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Ground Rods: Copper-encased steel, 3/4 inch diameter, minimum length 10 feet.

B. Conductors: Soft drawn copper conductor as specified in Section 16123.

C. Exothermic Connections: Exothermic connections shall be suitable for direct burial without degradation over the lifetime of the grounding system, Erico "Cadweld", National Lightning Protection "Powerweld", or Lightning and Grounding Systems "Thermoweld."

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Supplementary Grounding Electrode: Use driven ground rods on exterior of building.

B. Use code, minimum 6 AWG, copper conductor for communications, computer and television service grounding conductor. Leave 6 feet slack conductor at terminal board.

C. Where multiple grounding electrodes are required or where other grounding electrodes are located within 6 feet each grounding electrode shall be interconnected below grade using code size bare copper conductor, minimum 6 AWG.

D. All connections to building steel and those below grade shall be made by exothermic process.

3.2 FIELD QUALITY CONTROL:

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

END OF SECTION

SECTION 16180

EQUIPMENT WIRING SYSTEMS

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 WORK INCLUDED:

A. Electrical connections to equipment specified under other Sections or furnished by Owner.

1.3 RELATED WORK:

A. Section 16111 - Conduit.

B. Section 16112 - Surface Raceway.

C. Section 16123 - Wire and Cable.

D. Section 16130 - Boxes.

E. Section 16141 - Wiring Devices.

PART 2 - PRODUCTS: NOT USED.

PART 3 - EXECUTION:

3.1 INSPECTION:

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION:

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION:

A. Do not make improper connections to equipment.

B. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

C. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit in damp or wet locations.

D. Where special purpose receptacle devices are indicated, install mating attachment plugs on cord sets furnished with owners equipment.

E. Provide suitable strain-relief clamps for cord connections to equipment connection boxes.

F. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

G. Install disconnect switches, controllers, control stations, and control devices such as limit switches, etc. as indicated. Make connections to and through these devices with conduit and wiring as indicated.

H. Where line voltage control devices are utilized for HVAC equipment specified under Division 15, make wiring connections to and through freezestats, fire stats, thermostats and other devices as required.

I. The motor horsepowers, voltages and phases shown on the drawings are the estimated power requirements of all equipment furnished under other sections of these specifications. If equipment with larger horsepower, different voltages or phases is selected by the Contractor then the Contractor is responsible for the circuits (wire and conduit) and protective devices (circuit breakers, switches and starters) to be changed for the ampacity, voltage and phase actually to be installed. This coordination shall be accomplished between trades at no additional cost to the contract.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

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 WORK INCLUDED:

A. Conduit and equipment supports.

B. Fastening hardware.

C. Plywood backboards.

1.3 QUALITY ASSURANCE:

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.4 RELATED SECTIONS:

A. Section 16195 - Electrical Identification: Color coding of Equipment Backboards

PART 2 - PRODUCTS

2.1 MATERIAL:

A. Support Channel: Galvanized steel.

B. Hardware: Corrosion resistant, zinc plated.

C. Plywood: Exterior glue, type AC.

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Use toggle bolts in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors in solid masonry walls; or concrete surfaces; and sheet metal screws on plywood backboards.

B. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

C. Do not use powder-actuated anchors.

D. Do not drill structural steel members.

E. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts or double nuts jammed tight.

F. Install surface-mounted cabinets, panelboards, etc. with minimum of four anchors.

G. Provide 3/4 inch plywood backboards with angle iron frame for all surface mounted equipment and as noted or specified.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

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 WORK INCLUDED

A. Nameplates.

B. Wire color coding.

C. Conduit color coding.

D. Equipment backboards color coding.

E. Panelboard directories.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 16010.

B. Include schedule for nameplates.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nameplates: Engraved two-layer laminated plastic, black letters on a white background.

B. Tape: Vinyl plastic electrical tape.

C. Paint: Flat Enamel.

PART 3 - EXECUTION:

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws. Do not apply with adhesives.

3.2 WIRE IDENTIFICATION

A. For building wire and cables in sizes 8 AWG and smaller provide with factory insulation to correspond to color code; in sizes 6 AWG and larger provide 3/4" colored tape bands in lieu of colored insulation.

B. Color coding for 120/208 volt system shall be as follows:
1. Phase A: Black
2. Phase B: Red
3. Phase C: Blue
4. Phase N: White
5. Phase G: Green

C. Color coding for 480/277 volt system shall be as follows:
1. Phase A: Brown
2. Phase B: Orange
3. Phase C: Yellow
4. Phase N: Grey
5. Phase G: Green

3.3 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates to identify all electrical distribution and control equipment, and loads served.

B. Provide nameplates of minimum letter height as scheduled below.

C. Panelboards: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating.
1. Panelboards: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating.
2. Enclosed Switches and Switchboard Distribution Breakers: 1/8 inch; identify load served.

3.4 CONDUIT COLOR CODING SCHEDULE

A. Paint conduit for identification by system.

B. Fire Alarm System: Red.

3.5 PANELBOARD DIRECTORIES

A. For all panelboards, provide neatly typewritten directory of each device usage including building room numbers (e.g. Convenience Outlets Room A101).

B. Locate directory inside panelboard door. Protect directory with clear plastic.

3.6 BACKBOARD COLOR CODING SCHEDULE

A. Paint before fabrication, both sides with two coats enamel.

B. Electrical Equipment Backboards: Medium grey.

END OF SECTION

SECTION 16420

SERVICE ENTRANCE

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 WORK INCLUDED:

A. Arrangement with Utility Company for permanent electric service including payment of Utility Company charges for service.

B. Underground service entrance.

C. Concrete transformer pad.

1.3 RELATED WORK:

A. Section 16111 - Conduit.

B. Section 16123 - Building Wire and Cable

1.4 SYSTEM DESCRIPTION:

A. Boys Baseball Fields System Voltage: 277/480-volts, three-phase, four-wire, 60 Hertz.

PART 2 - PRODUCTS

2.1 METERING EQUIPMENT:

A. Metering Equipment: Meter socket shall be furnished by the utility company and installed as shown on Drawings by this Contractor.

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Underground: Install service entrance from Utility Company's pad-mounted transformer to building service entrance equipment. Utility Company will connect service lateral conductors to transformer secondaries.

C. Provide concrete pad for transformer installation. Pad shall conform to any and all requirements of the Electric Utility.

D. Provide 1-1/4-inch conduit underground from transformer to meter socket. Coordinate installation with utility.

E. Contractor shall pay all costs for providing electrical service to the project.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

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 WORK INCLUDED:

A. Disconnect switches.

B. Fuses.

C. Enclosures.

1.3 RELATED WORK:

A. Section 16195 - Electrical Identification: Nameplates:

1.4 REFERENCES:

A. ANSI/UL 198E - Class R Fuses.

B. NEMA KS 1 - Enclosed Switches.

1.5 SUBMITTALS:

A. Submit product data under provisions of Section 16010.

1.6 SPARE PARTS:

A. Fuses: Furnish three of each size and type to Owner.

B. Fuse Puller: Furnish one fuse puller to Owner.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES:

A. Fusible Switch Assemblies: NEMA KS 1; heavy-duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Cover interlock shall be defeatable. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.

B. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Cover interlock shall be defeatable. Handle lockable in OFF position.

C. Enclosures: NEMA 1 indoor type unless noted otherwise on Drawings.

D. Acceptable Manufacturers: Square D, Cutler-Hammer or General Electric.

2.2 FUSES:

A. Fuses 600 Amperes and Less: ANSI/UL 198E, Class RK5; dual element, current limiting, time delay, 250 volt fuse as applicable.

B. Interrupting Rating: 200,000 rms amperes.

C. Acceptable Manufacturers: Bussman System 300 "yellow" series or Gould Amp-Trap 2000 "orange" series, or equal by Littlefuse.

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches.

C. Provide nameplates in accordance with Section 16195.

END OF SECTION

SECTION 16461

LOW-VOLTAGE TRANSFORMERS

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 types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
   1. Distribution transformers.

1.3 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, location and size of each field connection, sound level, voltage, kVA, and rated temperature rise.
   1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

B. Store in a warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.

C. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow if handled in inclement weather.

1.6 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Products.
2. Siemens Energy & Automation, Inc.
3. Square D; Schneider Electric.
4. GE; General Electric Company

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.
1. Internal Coil Connections: Brazed or welded.
2. Coil Material: Aluminum.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated, NEMA 250, Type 1.
1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
2. Provide lifting eyes or brackets.

D. Transformer Enclosure Finish: Comply with NEMA 250.
1. Finish Color: Gray.

E. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

G. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature. Non-linear shielded isolating transformers shall have a maximum hot spot temperature of 185 deg C and a K factor rating of 3.2 or greater.

H. Energy Efficiency for Transformers Rated 15 kVA and Larger:
1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

I. Wall Brackets: Manufacturer's standard brackets.

J. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

K. Case temperature shall not exceed 35 degrees C rise above ambient at its warmest point.

L. Basic Impulse Level: 10 KV.

M. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

N. Mounting: As scheduled and/or detailed on drawings. Floor mounted transformers shall be provided with, and installed atop a minimum of four (4) Mason Industries WMW-200 neoprene isolation pads.

O. Isolate core and coil from enclosure using integral vibration-absorbing mounts.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Include transformer connection data.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 16 Section "Grounding and Bonding" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
   1. Brace wall-mounting transformers as specified in Division 16 Section "Electrical Supports."

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions and requirements in Division 16 Section "Electrical Supports."

C. Use flexible conduit for connections to transformer case. Make conduit connections to side panel of enclosure. Under no circumstances shall both primary and secondary conductors occupy a common conduit.

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION

SECTION 16470

PANELBOARDS

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 WORK INCLUDED

A. Branch circuit panelboards.

1.3 RELATED WORK

A. Section 16195 - Electrical Identification: Nameplates and directory.

1.4 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers.

B. NEMA PB 1 - Panelboards.

C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.5 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Section 16010.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement and sizes.

1.6 SPARE PARTS

A. Keys: Furnish 2 each to Owner.

PART 2 - PRODUCTS

2.1 BRANCH CIRCUIT PANELBOARDS

A. Branch Circuit Panelboards: NEMA PB1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1.

C. Provide surface cabinet front as scheduled, with screw cover and hinged door with flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

D. Provide panelboards with aluminum bus, ratings as scheduled on Drawings. Provide grounding bus in all panelboards.

E. Minimum Integrated Short Circuit Rating: 14,000 amperes rms symmetrical for 480 volt Panelboards or 10,000 amperes rms symmetrical for 208 volt panelboards; unless noted otherwise on Drawings.

F. Molded Case Circuit Breakers: NEMA AB 1; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Circuit breakers shall be listed as suitable for use with 75 degrees C conductor.

G. Acceptable Manufacturers: Square D, Cutler-Hammer, Challenger, General Electric, Westinghouse, or Siemens ITE.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb in conformance with NEMA PB 1.1.

B. Top of Panel Height: Panelboards with box dimensions of 53 inches or less in height shall be installed with top of panel at 6 ft.-6 in. Panels with box dimensions in excess of 53 inches in height shall be installed such that the operating handle of the uppermost device is 72 inches above finished floor.

C. Provide filler plates for unused spaces in panelboards.

D. Provide nameplate and typed circuit directory in accordance with Section 16195 for each panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

E. Flush mounted panelboards shall be provided with two – 3/4" and one – 1-1/4" conduit per section, in accordance with Section 16111, from the panelboard to an accessible point above a suspended ceiling. These conduits shall be in addition to those required for circuits as scheduled.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, and lugs.

END OF SECTION

SECTION 16476

ENCLOSED CIRCUIT BREAKERS

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 SECTION INCLUDES:

A. Enclosed molded case circuit breakers.

1.3 RELATED WORK:

A. Section 16195 - Electrical Identification: Nameplates.

1.4 REFERENCES:

A. NEMA AB 1 - Molded Case Circuit Breakers.

1.5 SUBMITTALS:

A. Submit product data under provisions of Section 16010.

B. Include circuit breaker ratings, outline dimensions, and terminal lug sizes.

1.6 REGULATORY REQUIREMENTS:

A. Use circuit breakers listed by Underwriter's Laboratories, Inc., and suitable for specific application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers: Cutler Hammer, General Electric, Siemens or Square D.

2.2 MOLDED CASE CIRCUIT BREAKER:

A. Circuit Breaker: NEMA AB 1. Integral thermal and instantaneous magnetic trip in each pole.

B. Ratings: As noted on drawings, minimum 22 kAIC.

2.3 TERMINAL LUGS:

A. Size: Suitable for conductor sizes and types as scheduled on drawings.

2.4 ENCLOSURE:

A. Enclosure: NEMA 1 - Indoor, unless noted otherwise.

2.5 ACCESSORIES:

A. Handle Lock: Include provisions for padlocking.

B. Insulated Neutral: Include 200 percent insulated neutral termination block.

PART 3 - EXECUTION:

3.1 EXAMINATION:

A. Verify that surfaces are ready to receive work.

B. Verify field measurements are as shown on Drawings.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION:

A. Install enclosed circuit breakers where shown on Drawings, in accordance with manufacturer's instructions.

B. Provide nameplate in accordance with Section 16195.

3.3 FIELD QUALITY CONTROL:

A. Inspect visually and perform several mechanical ON-OFF operations on each circuit breaker.

B. Verify circuit continuity on each pole in closed position.

END OF SECTION

SECTION 16480

MOTOR CONTROL

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 WORK INCLUDED:

A. Manual motor starters.

B. Magnetic motor starters.

C. Combination magnetic motor starters.

1.3 RELATED WORK:

A. Section 16195 - Electrical Identification: Nameplates

B. REFERENCES:

C. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

D. NEMA AB 1 - Molded Case Circuit Breakers.

E. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

1.4 SUBMITTALS:

A. Submit shop drawings and product data under provisions of Section 16010.

B. Provide product data on motor starters and combination motor starter, relays, pilot devices, and switching and overcurrent protective devices.

1.5 OPERATION AND MAINTENANCE DATA:

A. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Store in a clean, dry space. Maintain factory wrapping or provide plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Handle carefully to avoid damage to motor control components, enclosure, and finish.

1.7 SPARE PARTS:

A. Overloads: Furnish 3 each size to Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS:

A. Acceptable Manufacturers: Square D, Cutler-Hammer, Siemens or General Electric.

2.2 MANUAL MOTOR STARTERS:

A. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated 2 pole, full-voltage controller for fractional horsepower induction motors, without thermal overload unit.

B. Enclosure: NEMA ICS 6; type 1, toggle style with handle lock accessory.

2.3 MAGNETIC MOTOR STARTERS:

A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Full Voltage Starting: Non-reversing type, unless scheduled or noted otherwise.

C. Coil Operating Voltage: 120 volts, 60 Hertz, from separate source.

D. Size: NEMA ICS 2; size as shown on Drawings.

E. Overload Relay: NEMA ICS 2; ambient compensated, bimetal.

F. Enclosure: NEMA ICS 6; Type 1.

G. Combination Motor Starters: Combine motor starters with motor circuit protector disconnect in common enclosure.

H. Auxiliary Contacts: NEMA ICS 2; two normally open field convertible contacts in addition to "latching" contact.

I. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover of all combination starters.

J. Indicating lights: NEMA ICS 2; Transformer base pilot device with 9 volt lamp, GREEN "motor run" in front cover.

K. Overload Reset: Externally operable in front cover.

2.4 OVERCURRENT PROTECTION AND DISCONNECTING MEANS:

A. Molded Case Thermal-Magnetic Circuit Breakers (non-motor loads): NEMA AB1; circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Minimum 65 kAIC device.

B. Motor Circuit Protector: NEMA AB 1; circuit breakers with integral instantaneous magnetic trip in each pole. Provide auxiliary contact for disconnection of starter control circuit(s).

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Install motor control equipment in accordance with manufacturer's instructions.

B. Select and install heater elements in motor starters to match installed motor characteristics.

C. Motor Data: Provide neatly typed label inside each motor starter enclosure cover identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

D. Provide nameplates for individual motor starters. Nameplates shall be in accordance with Section 16195.

END OF SECTION

SECTION 16485

CONTACTORS

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 SECTION INCLUDES:

A. Lighting and power contactors.

1.3 RELATED WORK:

A. Section 16195 - Electrical Identification: Nameplates

1.4 REFERENCES:

A. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

B. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

C. ANSI/NFPA 70 - National Electrical Code.

1.5 SUBMITTALS:

A. Submit under provisions of Section 16010.

B. Product Data: Include dimensions, size, voltage ratings and current ratings.

1.6 PROJECT RECORD DOCUMENTS:

A. Accurately record actual locations of each contactor and indicate circuits controlled.

1.7 OPERATION AND MAINTENANCE DATA:

A. Maintenance Data: Include instructions for replacing and maintaining coil and contacts.

1.8 REGULATORY REQUIREMENTS:

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 LIGHTING AND POWER CONTACTORS:

A. Description: NEMA ICS 2, magnetic contactor.

B. Configuration: Mechanically held. Provide coil clearing contacts.

C. Coils Voltage: 120 volts, 60 Hertz, from separate source.

D. Poles: As noted on Drawings.

E. Contact Rating: Minimum 20 Ampere, unless otherwise noted.

F. Enclosure: ANSI/NEMA ICS 6, Type 1, unless otherwise noted.

G. Acceptable Manufacturers: Square D, Cutler-Hammer, General Electric, or Siemens.

2.2 ACCESSORIES:

A. Time Clocks: Electronic style astronomical time control with battery back-up. Furnish complete with NEMA 1 enclosure and 9 volt battery. Paragon model EL 72 or equal by Intermatic or Tork.

B. Provide a two-wire relay kit option for contactors.

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Install in accordance with manufacturer's instructions.

B. Provide nameplates in accordance with Section 16195.

END OF SECTION

SECTION 16510

LUMINAIRES

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 SECTION INCLUDES:

A. Interior and exterior luminaires.

B. Ballasts.

C. Lamps.

D. Luminaire accessories.

1.3 RELATED SECTIONS:

A. Section 16111 - Conduit.

B. Section 16130 - Boxes.

C. Section 16145 - Building Lighting Controls.

1.4 REFERENCES:

A. ANSI/IEEE C62.41 - 1991 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. ANSI C78.379 - Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps - Classification of Beam Patterns.

C. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specification.

D. ANSI C82.4 - Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).

E. ANSI/NFPA 70 - National Electrical Code.

1.5 SUBMITTALS:

A. Submit under provisions of Section 16010.

B. Product Data: Provide dimensions, ratings, and performance data.

1.6 OPERATION AND MAINTENANCE DATA:

A. Submit under provisions of Section 16010.

B. Maintenance Data: Include replacement parts list.

1.7 REGULATORY REQUIREMENTS:

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 LUMINAIRES:

A. Furnish products as specified in schedule on Drawings.

B. Install ballasts, lamps, and accessories at factory.

2.2 BALLASTS:

A. Fluorescent Ballast: Provide ballast as applicable for lamp types as follows:
1. T-8 "Octron" Ballast:
a. High frequency, electronic, program-start, parallel wired type rated for full lumen output of lamp(s).
b. Light output shall remain constant for line voltage fluctuations of +5 percent minimum.
c. Ballast shall withstand line transients as defined in ANSI/IEEE C62.41, category A.
d. Lamps shall operate at a frequency of 20 KHz or higher with no detectable flicker.
e. Lamp current crest factor shall not exceed 1.7.
f. Ballast shall have a power factor of 90 percent or above.
g. Ballast shall not contain polychlorinated biphenyls (PCB's).
h. Acceptable Manufactures: Advance, Triad or Osram-Sylvania.
2. T-5 "HO" Ballast
a. Similar to T8 Ballast above.
3. Sound ratings of "A" are required, unless specified otherwise.
4. UL listing of Class P thermal protection required.
5. Voltage: Match luminaire voltage as scheduled.

B. High Intensity Discharge (HID) Ballast:
1. High power factor, Constant Wattage Auto- transformer (CWA) type.
2. Description: ANSI C82.4, or metal halide lamp ballast.
3. Provide ballast suitable for lamp specified.

4. Voltage: Match luminaire voltage.

2.3 LAMPS:

A. Fluorescent Lamps:
1. T-8's: 4100 Kelvin, tri-phosphor.
2. T-5's: 4100 Kelvin, tri-phosphor.

B. High-Intensity Discharge Lamps:
1. Metal Halide: Clear.

C. Provide lamp type specified for luminaire.

D. Acceptable Manufacturers: General Electric, Osram-Sylvania, Venture or Phillips.

2.4 LED LIGHT FIXTURES

A. General:
1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
3. LED drivers shall include the following features unless otherwise indicated:
   a. Minimum efficiency: 85% at full load.
   b. Minimum Operating Ambient Temperature: -20˚ C. (-4˚ F.)
   c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
   d. Integral short circuit, open circuit, and overload protection.
   e. Power Factor: ≥ 0.95.
   f. Total Harmonic Distortion: ≤ 20%.
   g. Comply with FCC 47 CFR Part 15.
4. LED modules shall include the following features unless otherwise indicated:
   a. Comply with IES LM-79 and LM-80 requirements.
   b. Minimum CRI 80 and color temperature 3000˚ K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
   c. Minimum Rated Life: 50,000 hours per IES L70.
   d. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

B. LED Downlights: Housing, LED driver, and LED module shall be products of the same manufacturer.

C. LED Troffers:
1. LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.
2. Housing, LED driver, and LED module shall be products of the same manufacturer.

2.5 ACCESSORIES:

A. This contractor is responsible to verify ceiling system type and to order appropriate accessories required for ceiling system compatibility.

B. Fusing: All HID fixtures shall have fusing on each ungrounded leg on line side of ballast. Fuses shall be Bussman conforming to fixture voltage and sized to 2.5 times normal operating current of ballast.

C. Troffer Lense: Where applicable, lense shall be pattern 12 .125 minimum overall thickness, full prism, Virgin Acrylic. Hogged prism lens are unacceptable.

D. Grid Troffers shall be independently supported of ceiling grid system. Provide hanger wire from structure to each corner of fixtures.

PART 3 - EXECUTION:

3.1 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.2 INSTALLATION

A. Install in accordance with manufacturers instructions.

B. Locate recessed ceiling luminaires as indicated on architectural reflected ceiling plan.

C. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

D. Install recessed luminaires to permit removal from below.

E. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating. Verification of these requirements shall be the responsibility of the Contractor.

F. Provide hanger wire from structure to each corner of fixture.

G. Install clips to secure recessed grid-supported luminaires in place.

H. Install wall mounted luminaires, at height as indicated on drawings or fixture schedule.

I. Install accessories furnished with each luminaire.

J. Connect grid troffers to branch circuit outlets provided under Section 16130 using flexible conduit or "fixture whips" (minimum 14 AWG) maximum 6 feet in length.

K. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

L. Bond products and metal accessories to branch circuit equipment grounding conductor where applicable.

M. Install specified lamps in each luminaire.

3.3 FIELD QUALITY CONTROL:

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING:

A. Relamp luminaires that have failed lamps prior to Owner's acceptance.

3.5 CLEANING:

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

END OF SECTION

SECTION 16721

FIRE ALARM

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 fire alarm systems.

1.3 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. NICET: National Institute for Certification in Engineering Technologies.

D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION

A. Intelligent analog-addressable system; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

1.5 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 72.

B. Fire alarm signal initiation shall be by one or more of the following devices:
1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Automatic sprinkler system water flow.
5. Fire extinguishing system operation.
6. Monitor module.

C. Fire alarm signal shall initiate the following actions:
1. Alarm notification appliances shall operate continuously.
2. Identify alarm at the FACP and remote annunciator.
3. De-energize electromagnetic door holders.
4. Activate voice/alarm communication system.

5. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
6. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
7. Record events in the system memory.
8. Call local fire department or others as directed by Owner.

D. Supervisory signal initiation shall be by one or more of the following devices or actions:
1. Operation of a fire-protection system valve tamper.

E. System trouble signal initiation shall be by one or more of the following devices or actions:
1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at the FACP.
4. Ground or a single break in FACP internal circuits.
5. Abnormal ac voltage at the FACP.
6. A break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at the FACP or annunciator.

F. Trouble Sequence of Operation: System trouble, including grounding or open circuit of supervised circuits, or power or system failure causes system to enter TROUBLE mode, including the following operations:
1. Visual and audible trouble alarm at control panel and at remote annunciator panel.
2. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm; visual alarm is displayed until initiating trouble is cleared.
3. Lamp Test: Manual LAMP TEST function causes alarm indication at fire alarm control panel and at annunciator panel.

G. Drill Sequence of Operation: Manual DRILL function causes ALARM mode operation to:
1. Sound local fire alarm signaling devices without sending signal to Municipal Fire Department.

1.6 SUBMITTALS

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

B. Shop Drawings:
1. Shop Drawings shall be prepared by persons with the following qualifications:
a. Trained and certified by manufacturer in fire alarm system design.
2. Device Address List: Coordinate with final system programming.
3. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
4. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
5. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

6. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

D. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

E. Submit manufacturer's certificate that system meets or exceeds specified requirements.

F. Submit a schedule of values in accordance with Section 01290 - Payment Procedures for the following fire alarm devices fully installed, programmed and displayed on graphic annunciator: smoke detector, heat detector, duct mounted smoke detector, door holder (magnetic), monitor module, interlock relay, sprinkler flow and tamper device connection, horn, horn/strobe, speaker/strobe, indicating strobe, manual pull station and emergency telephone handset (fire fighter).

G. Submit shop drawings to the local authority having jurisdiction for the project records and permitting. Pay all associated fees and charges.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
3. Smoke and Heat Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.

7. Fuses: Two of each type installed in the system.
8. Provide two keys of each type. Refer to Section 01100 - Summary for key requirements.

1.9 QUALIFICATIONS

A. Installer: Company specializing in smoke detection and fire alarm systems with five years experience. Installer shall be the manufacturer's factory authorized full-line distributor, no exceptions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. FACP and Equipment:
a. NOTIFIER; a GE-Honeywell Company. (NFS 320)
b. Edwards Systems Technology Inc. (EST3X)
c. Fire Control Instruments, Inc.; a GE-Honeywell Company. (S3)
2. Wire and Cable:
a. Comtran Corporation.
b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
d. West Penn Wire/CDT; a division of Cable Design Technologies.
3. Audible and Visual Signals:
a. Amseco; a division of Kobishi America, Inc.
b. Commercial Products Group.
c. Gentex Corporation.
d. System Sensor; a GE-Honeywell Company.

2.2 FACP

A. Control Panel: Microprocessor controlled, addressable point analog fire alarm panel of modular construction with surface wall-mounted enclosure. Field programming shall be possible through an integral 80 character supervised alpha/numeric display and keypad.

B. Power Supply: Adequate to serve control panel modules, remote detectors, remote annunciators, relays, alarm signaling devices and voice evacuation system. Include battery-operated emergency power supply with capacity for operating complete system in standby mode for 24 hours followed by alarm mode for 5 minutes.

C. Circuits:
1. Detection Circuits: Supervised with alarm and trouble indication.
2. Signal Circuits: Supervised signal module, sufficient for signal devices connected to system.
3. Actuation of alarm notification appliances, emergency voice communications, annunciation, shall occur within 10 seconds after the activation of an initiating device.

4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.

D. Notification-Appliance Circuit: Operation shall sound in a 60 beats per minute, march-time pattern.

E. Power Supply: Adequate to serve control panel modules, remote detectors, remote annunciators, relays, alarm signaling devices and voice evacuation system. Include battery-operated emergency power supply with capacity for operating complete system in standby mode for 24 hours followed by alarm mode for 5 minutes.

F. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciator, after initiating devices are restored to normal.
1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

G. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.

I. Service Modem: Ports shall be RS-232 for system printer and for connection to a dial-in terminal unit.
1. The dial-in port shall allow remote access to the FACP for programming changes and system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.

J. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, and trouble signal shall be powered by the 24-V dc source.
1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
2. Power supply shall have a dedicated breaker for this connection at the service entrance equipment. Paint the breaker red and identify it with "FIRE ALARM SYSTEM POWER."

K. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.
1. Batteries: Sealed lead calcium.
2. Battery and Charger Capacity: Comply with NFPA 72.

L. Surge Protection:
1. Install surge protection on normal ac power for the FACP and its accessories.
2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

M. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP. The force to activate the device shall be no greater than five (5) lbf.
2. Station Reset: Key- or wrench-operated switch.

2.4 SYSTEM SMOKE DETECTORS

A. General Description:
1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:
1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

C. Duct Smoke Detectors:
   1. Ionization Smoke Detectors:
      a. Sensor: Responsive to both visible and invisible products of combustion. Self-compensating for changes in environmental conditions.
      b. Detector Sensitivity: Between 0.5 and 1.7 percent/foot smoke obscuration when tested according to UL 268A.
   2. UL 268A listed, operating at 24-V dc, nominal.
   3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
   4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
      a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.
   5. Provide with auxiliary DPDT relay contact key-operated NORMA-RESET-TEST switch.
   6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status. Provide remote status and alarm indicator and test station where indicated.
   7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
   8. Each sensor shall have multiple levels of detection sensitivity.
   9. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
   10. Auxiliary contacts shall be rated minimum 4A at 28 VDC, 7.5A at 115 VAC.
   11. Two-wire detector with common power supply and signal circuits.

2.5 MONITOR MODULE

A. The monitor module shall be used to connect a supervised zone of conventional initiating devices (any N.O. dry contact device) to the system loop. The monitor module shall be addressable. An integral LED shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

2.6 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or rate-of-rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.
   1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.7 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.
   1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn not to exceed 120 dB maximum. Provide integral strobe lamp and flasher (minimum 1 Hz, maximum 3 Hz) with clear or nominal white lens with RED letter head FIRE on lens.

C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.
   1. Rated Light Output: 75 candela.
   2. Strobe Leads: Factory connected to screw terminals.
   3. Minimum 1 Hz, maximum 3 Hz

2.8 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing. Unit shall be supervised 80 characters, back-lit display with audible and visual indication of system trouble.
   1. Mounting: Flush cabinet, (NEMA 250, Class 1) with keyed access.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

2.9 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled according to UL 632.

B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising 2 lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

D. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.10 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
   1. Factory fabricated and furnished by manufacturer of the device.
   2. Finish: Paint of color to match the protected device.

2.11 WIRE AND CABLE

A. Fire alarm system initiating loop and signal circuit cables shall be UL listed NEC type FPL, power-limited cabling in accordance with this specification and NEC 760-55 through 58.

B. Initiating and Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG.

2.12 AUXILIARY DEVICES:

A. Interlock Relays: Industrial duty, long life, encapsulated coil; 8A - 120 VAC, SPDT, silver power contacts; in NEMA 1 enclosure. Relay shall be U.L. listed. Install such that no high voltage wiring will be in the same conduit with the fire alarm system wiring.

B. Sprinkler Water Flow Alarm Switches: The Sprinkler Water flow alarm and tamper switches shall be provided by others.

C. City Fire Department Connection: A telephone connection shall be utilized between this facility and the local Fire Department or as directed by Owner. Provide and install a dual line Digital Communicator/Transmitter within the control panel.

D. Strobe Synchronization Modules: The strobe synchronization modules shall be provided to enable all strobes within a field of view to flash synchronously.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Installation shall be in strict compliance with manufacturer's recommendations. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing conduits and pulling wire.

B. Smoke or Heat Detector Spacing:
   1. Smooth ceiling spacing shall not exceed 30 feet.

C. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

E. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

F. Install manual station and emergency telephone 48" above floor.

G. Install audio-visual and visual only signal devices 80" above floor.

H. Device Location-Indicating Lights: In accordance with Georgia Accessibility Code visual signal appliances shall be installed in each of the following areas
   1. Restrooms and any other general usage areas (e.g. classrooms, meeting rooms)
   2. Hallways, lobbies and any other area of common use.

I. FACP: Surface mount with tops of cabinets not more than 72 inches above the finished floor.

J. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

K. All Equipment shall be held firmly in place. Fastening and supports shall be adequate to support the loads with a reasonable safety factor.

L. All wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of any components, any open circuits or grounds in the system, an audible and visual trouble signal will be activated until the system is restored to normal.

M. Make conduit and wiring connections to sprinkler flow switches, sprinkler valve tamper switches, HVAC shut-down relay, smoke damper relays, master intercom interface relay, etc.

3.2 WIRING INSTALLATION

A. Install wiring according to the following:
   1. NECA 1.
   2. TIA/EIA 568-A.

B. Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways and Boxes."
   1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

D. Identify conduit in as specified in Section 16075.

3.4 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing.

B. Perform the following field tests and inspections and prepare test reports:
1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.
    a. Include the existing system in tests and inspections.
3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
    a. Detectors that are outside their marked sensitivity range shall be replaced.

5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

B. Semiannual Test and Inspection: Six months after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 1 Section "Closeout Procedures."

3.8 WARRANTY:

A. Guarantee on-site response to a trouble call within twenty-four (24) hours after receipt of such call.

B. Make available to the owner an authorized and trained service representative who will provide maintenance during normal working hours at no cost to the Owner for a period of twelve (12) months from the date of acceptance.

END OF SECTION

SECTION 16722

SECURITY SYSTEM

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 PURPOSE

A. Security System specified herein is intended to provide a level of protection of valuable property. This specification references manufacturers' guidelines and general requirements that shall be complied with to ensure the proper and reliable functioning of the system.

1.3 REFERENCES

A. NFPA 70 (2014) - National Electrical Code

1.4 RELATED SECTIONS

A. Section 16010 - Basic Electrical Requirements

B. Section 16111 - Conduit.

C. Section 16123 - Wire and Cable.

D. Section 16130 - Boxes

E. Section 16190 - Supporting Devices

F. Section 16195 - Electrical Identification

1.5 SCOPE OF WORK

A. Provide a microprocessor based control and intrusion security system that supports the indicated application and which includes but is not limited to the following functional components:
   1. Security system control panel
   2. Remote keypads
   3. Passive infrared motion detectors
   4. Protected Area Status Lights
   5. Interior and exterior sirens
   6. Addressable modules
   7. Security system software
   8. Related conduit and wiring.

B. The above items shall be provided as described in these specifications and as indicated on the drawings. The contractor shall provide the above items and all appurtenances as required to provide a fully functioning system as indicated.

1.6 WORK INCLUDED

A. This Extent of the Work is indicated by the requirements of this section and the Construction Drawings. A complete programmed operating system shall be furnished.

1.7 GENERAL CONDITIONS

A. Submittals/System Documentation:

B. The contractor shall provide the following data items as a submittal package in accordance with Section 16010.

C. Specification sheets (cut sheets) of all proposed equipment.

D. Equipment list identifying:
1. Model numbers of each unit.
2. Quantities of each type of device.

E. Specifications compliance: A letter shall be submitted responding to specification sub-sections individually, indicating exceptions, substitutions and alternates.

F. Drawings: The Contractor shall submit shop drawings to provide details of proposed system components, layout, and wiring. The following is a list of required drawings:
1. Equipment location drawings indicating locations of all system components such as the control panel, the console keypads, detectors, audible and visible alarm annunciators, power supply boxes and accessories.
2. Riser diagrams indicating the system in a block diagram form. This diagram shall indicate the block interconnection of system components, the distribution of detectors and alarm annunciators by floor or area, the types of detectors and annunciators, address of each device, partitioning information, number and type of conductors connecting these zoned devices to the panel, primary and secondary (Battery) power information and information regarding the interconnection of the security system to the telephone system.
3. Conduit and wiring drawings indicating conduit routing, junction boxes, splice locations, and types and counts of wiring in each conduit.
4. Typical color-coded wiring diagram for each type of device.
5. System point-to-point drawings indicating system component interconnection.

G. Documentation:
1. At the time of system acceptance, the contractor shall provide the following:
   a. "As-builts": Indicating actual installation details, including modifications to items listed in the submittal package. As-builts shall include configuration of devices, time delays, orientations and all such pertinent information.

b. Operation and Maintenance Manuals. These manuals shall include all reviewed and updated submittal data, manufacturer's installation and programming manuals, component and system wiring diagrams and code assignments. Also included shall be maintenance requirements and schedules, spare parts list, and service center information.

1.8 GUARANTEE AND WARRANTY

A. The Contractor shall provide a guarantee and warranty on the equipment and installation for a period of one year in accordance with Contract conditions and Section 16010.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The security system installed shall be a programmable, partitionable, point addressable security system. System shall be UL listed for application.

B. The security system shall provide protection through the use of passive infrared motion detectors.

C. Each initiating device shall be assigned to one or more zones or partitions. Each zone or partition shall have the ability to be armed or disarmed or be tested or programmed independently of other zones.

D. Key pads shall be provided to control the system. Remote keypads shall be provided to arm, disarm and control zones but not to program the system.

E. Upon initiation of a motion detector or other device, an alarm tone shall sound at the assigned keypad, sirens, and main panel and the user shall have a designated period of time to enter an identification code to reset the alarm system or an alarm call will be made by the system. This time period shall be originally set for 30 seconds but shall be adjustable from five seconds to 120 seconds minimum. The system shall have the capability to permit some designated devices to initiate an immediate alarm.

F. Once an alarm has been initiated and any preset delay has passed without proper reset code, the control panel shall indicate an alarm to the main panel and call a central reporting station and a digitally coded message will be sent as required by the control station with a proper access password, a user at the main keypad shall be capable of terminating outgoing phone calls even after they have been initiated.

G. The system shall have a scheduling function to activate and deactivate partitions or devices by a time schedule as required by Owner. The scheduling functions shall be a minimum of seven day with events controlled in 15 minute steps, minimum.

H. Event Logging: Provide time/date stamping of all events within the system. Categories for logged information are as follows:
1. System events only
2. All events

3. Alarms and restorals
4. Trouble and restorals
5. Openings/Closings
6. Bypasses

I. All events shall be displayed on the main keypad. Provide a serial interface module for connection between the main panel and a serial printer. A command shall be executed to print the log contents when required. Provide logging capacity of a minimum of 512 events of history for alarms and trouble events.

J. The system data shall be fully downloadable.

2.2 SYSTEM COMPONENT DESCRIPTION

A. Basis of Design Control Panel: VISTA-128FB control panel; or Engineer approved equal.

B. Remote Keypads:
1. Remote keypads (ADEMCO 6139) shall be capable of arming or disarming a local partition, or arming and disarming the entire system, or silencing or resetting any partition. It shall be provided with a LCD display capable of displaying status information. All keys shall be concealed behind a hinged cover. Keypad functions shall be available only after entry of proper access code.
2. The keypad shall be provided with an aural annunciator to provide audible indication of entry and exit delays or other indications as specified. The aural annunciator shall be built-in.
3. The aural annunciator shall sound at the key pad when any device in the key pad's partition has been tripped. Entry delay conditions shall sound until the entrant has entered the proper code.

C. Addressable Modules:
1. Each initiation devices shown on plans is to be provided with a unique system address either by a separate address module (ADEMCO 4193SN) or built-in addressing circuit.
2. If separate address modules are used, the module shall be permitted to provide addresses for multiple devices.

D. Protected Area Status Lights: Where shown on plans, provide an indicator light in a single gang box to indicate status of related area. The light shall be "ON" when the partition to be entered is being monitored. Provide an engraved stainless steel faceplate label "Security System". Provide the word "ON" adjacent to the light. Light shall be 24 volts or less and powered from the main control panel. Provide weatherproof installation in exterior locations.

E. Passive Infrared Detectors: Passive infrared motion detectors (ADEMCO 4278EX-SN) shall be provided by the system manufacturer. Each detector shall contain dual element detectors with minimum of two pulse counter for motion verification. Unit shall provide built-in temperature compensation and employ techniques to protect against ambient conditions. Switch contacts shall be 24V rated with units powered by 12V DC. Lenses or units shall provide the following patterns:
1. Ceiling Mounted Round: Provide 360E coverage. Minimum coverage shall be a circular area with diameter equal to mounting height.

2. Ceiling Mounted Corridor: Provide minimum 20' X 10' rectangular coverage at 9' ceiling height.
3. Wall Mounted Wide Angle: Provide 120E coverage horizontally and a 35E down from horizontal coverage with a minimum 50' distance.
4. Wall Mounted Long Distance Detector: Provide narrow beam coverage with a minimum 20' down from horizontal coverage and a detection range of 100' minimum.

F. Door Detectors: Magnetic door proximity detector switches shall be provided where indicated on plans. All door detectors shall be mounted concealed.

G. Sounders: Dual tone sirens (ADEMCO 748LC) shall be provided. The sirens shall be rated for interior and exterior installation. Unit shall produce minimum 112 dB (Warble/Steady) sound pressure at one meter.

H. Wire: The Contractor shall provide cables consistent with the manufacturer's recommendations. The following general guidelines shall be followed for wiring installation.
1. Wiring shall be appropriately color-coded with permanent wire markers. Copper conductors shall be used.
2. Wire size shall not be smaller than 16 AWG stranded/14 solid. Stranded wire must be bonded or shall have seven (7) strands max.
3. Manufacturer: West Penn, Belden or Mohawk.

I. Other Items: Manufacturer and contractor shall provide all necessary hardware, software, services and other items as required to provide a complete functioning system in accordance with plans and specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation shall be in accordance with the National Electrical Code, the Contract documents (drawings and specifications), and the manufacturer's instructions. In case of a conflict between requirements, notify the Architect. Contractor shall supply and install related items in accordance with the referenced sections of the specifications.

B. The location of devices and equipment shown on plans is approximate. Exact location shall be determined on site. Location of all devices may be adjusted up to ten (10) feet from the location shown to accommodate site conditions. Adjustment of locations shall not reduce the level of protection as shown.

C. Contractor shall provide any additional devices or capabilities as required by the site conditions required to maintain the level of protection shown.

D. Notify Architect of any conflicts or problems.

E. Coordinate with Architect for all final field programmable functions such as entry/exit details, partition assignments, user codes, access codes, etc.

3.2 WIRING

A. All wiring shall be in conduit. All splices or taps shall be made in junction boxes. Cables entering conduit shall be protected with insulated grommets and bushings. Cables entering boxes and enclosures shall be clamped and protected with insulated bushings.

3.3 DEVICE MOUNTING

A. All devices, surface mounted or recessed, shall be provided with and mounted to an outlet box. Recessed outlet boxes shall be supported by the wall. Outlet boxes for ceiling mounted devices shall be flush with ceiling and supported from structure by minimum of 12 gauge channel or 3/8" threaded rod.

B. The mounting heights of various devices are as follows:
1. Wall mounted passive infrared detectors - 90 inches.
2. Wall mounted key pad panels (top of unit) - 48 inches
3. Main control panel (top of unit) - 72 inches

C. The main control panel shall be mounted on a wooden backboard.

D. Assign devices according to the owner specified partition schedule.

3.4 SUPERVISION:

A. The Contractor shall provide supervision of all related sub-trades.

B. The security system installer shall provide coordination with other Contractors for system-related work. (Electrical contractor, finish hardware contractor, architect, general contractor, etc.).

C. The security system installer shall be responsible for attending and participating in site construction/coordination meetings as requested by Contractor.

D. The security system installer shall maintain updated construction drawings.

E. The security system installer shall support Construction Deadlines per the Construction Schedule.

3.5 PROGRAMMING:

A. The security system installer shall provide:
1. Programming System Configuration Parameters (hardware and software-zone/circuit numbers, and communication parameters).
2. Programming Operational Parameters (textual displays, telephone numbers, input/output event responses).
3. Other System Programming Tasks Required by the Owner. These additional programming requirements shall be submitted by the Owner to the Contractor prior to system programming.

3.6 TESTING/VERIFICATION OF SYSTEM PERFORMANCE:

A. The Contractor shall perform a complete operational test of the system and verify that all system components comply with the performance criteria defined by the manufacturer's specifications prior to the Architect's review for substantial completion.

B. The Security System Certification Document, the Certificate of completion for a Central Station Signaling, the "as-builts" and the Manufacturer's instruction manual(s) shall be available at the time of acceptance testing. The Contractor shall notify the Architect and pertinent personnel, prior to testing, that the system is under test.

C. All system components shall be 100% tested. Additional testing procedures specified by the Manufacturer shall be implemented.

3.7 SUBSTANTIAL COMPLETION REVIEW

A. The contractor shall demonstrate the function and operation of the security system at the Engineer's site visit to verify substantial completion. The Contractor shall provide the appropriate personnel and equipment to demonstrate entire system performance. The Engineer shall be permitted to be shown performance of any and all system functions and testing including a repeat of the entire acceptance test in the Engineer's presence. The Contractor shall provide radios on-site for two-way communication as needed.

END OF SECTION

SECTION 16741

TELEPHONE AND COMPUTER SYSTEM PROVISIONS

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 SECTION INCLUDES:

A. Telephone and computer raceway provisions.

B. Equipment and terminal backboards.

1.3 RELATED SECTIONS:

A. Section 16111 - Conduit: Telephone and computer raceway.

B. Section 16190 - Supporting Devices: Supports for conduit and backboards.

C. Section 16195 - Electrical Identification: Backboard color coding.

1.4 PROJECT RECORD DOCUMENTS:

A. Accurately record location of telephone service entrance conduit and termination backboard.

PART 2 - PRODUCTS

2.1 BACKBOARDS:

A. Material: Plywood with angle iron frame as specified in Section 16190.

B. Size: Minimum 4 ft. X 8 ft. plywood sheet installed on end.

C. Finish: Two (2) coats enamel, as specified in Section 16195.

2.2 CONDUIT:

A. Material: As specified in Section 16111.

B. Size: Minimum 3/4 inch, unless noted or specified otherwise.
1. Computer conduit shall be minimum 1 inch.

2.3 CABLE:

A. Telephone, cable television and computer cables are Not In Contract. The Owner is hereby notified that computer cabling requires a plenum rating.

PART 3 - EXECUTION:

3.1 EXAMINATION:

A. Verify that surfaces are ready to receive work.

B. Verify that field measurements are as shown on Drawings.

C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION:

A. Finish paint termination backboards with 2 coats enamel under provisions of Section 16195.

B. Support raceways and backboards under the provisions of Section 16190.

C. Install termination backboards plumb, and as a minimum attach securely at each corner.

D. Install pull cord, as specified in Section 16111, in each empty conduit over 10 ft in length.

E. Raceway terminations shall be fitted with insulating bushings.

F. Install telephone and computer outlets 48 inches above floor. Provide telephone and computer outlet coverplates. Coverplates shall be jumbo/oversize type 302 stainless steel.

G. Raceways from telephone outlets shall extend from each outlet back to closet backboard.

END OF SECTION