WAYNE STATE UNIVERSITY



DESIGN AND CONSTRUCTION SERVICES

PROJECT # 064-340774

BEECHER HOUSE

HVAC IMPROVEMENTS

5475 WOODWARD AVE.,

DETROIT, MI 48202



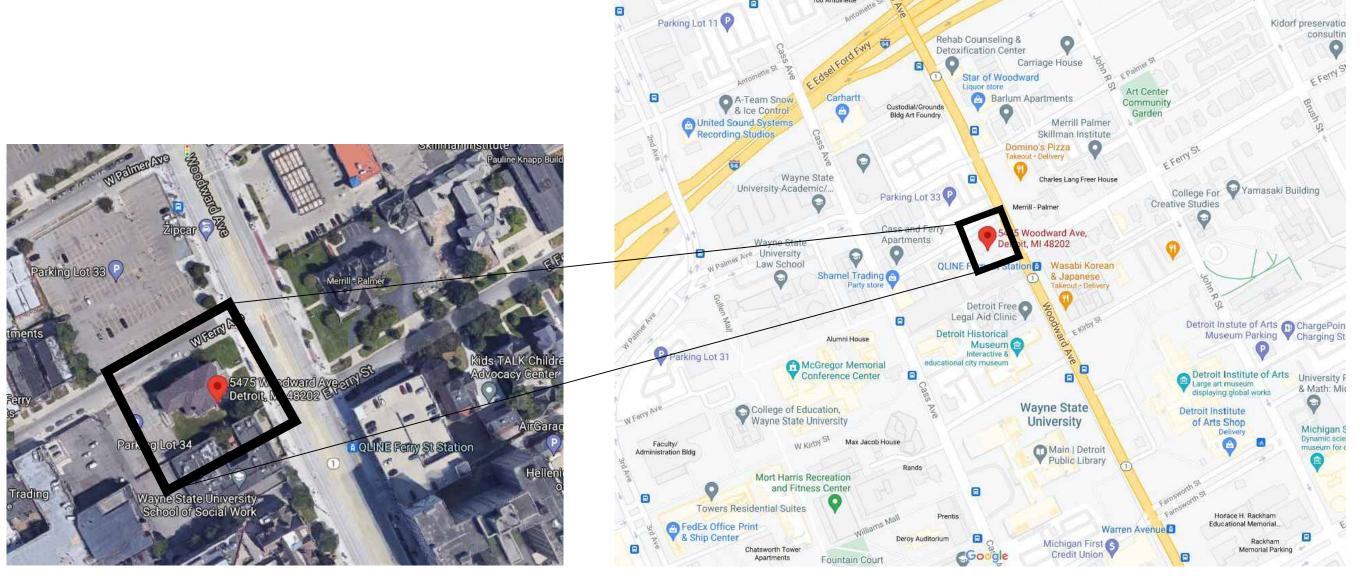
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ABBREV.	DESCRIPTION
AAV	AUTOMATIC AIR VENT / AIR ADMITTANCE V
AD	ACCESS DOOR
AE	AIR EXTRACTOR
AFF	ABOVE FINISHED FLOOR
APD	AIR PRESSURE DROP
ASR	AUTOMATIC SPRINKLER RISER
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BOD	BOTTOM OF DUCT
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
BWV CAP	BACKWATER VALVE CAPACITY
CAP	CONSTANT AIR VOLUME
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CIRC	CIRCULATING
CLG	COOLING
CCC	CLEAN OUT
CONT	CONTINUATION OR CONTINUED
CONV	CONVECTOR
CUH	CABINET UNIT HEATER
CV	CONTROL VALVE
DB	DRY BULB TEMPERATURE
DEG	DEGREES
DDC	DIRECT DIGITAL CONTROL
DN	DOWN
DTC	DRAIN TILE CONNECTION
DWH	DOMESTIC WATER HEATER
(E)	EXISTING
EA/EXH	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EDB	ENTERING DRY BULB TEMPERATURE
EF	EXHAUST FAN
EJ	EXPANSION JOINT
EL	FI FVATION
ELECT	ELECTRICAL
EMS	ENERGY MANAGEMENT SYSTEM
ESP	EXTERNAL STATIC PRESSURE
EWB	ENTERING WET BULB TEMPERATURE
EWC	ELECTRIC WATER COOLER
•F	DEGREES FAHRENHEIT
FA	FACE AREA (COIL) / FREE AREA (LOUVER
FC	FLEXIBLE CONNECTION
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE RACK
FHV	FIRE HOSE VALVE
FLA	FULL LOAD AMPS
FLR	FLOOR
FPM	FEET PER MINUTE
FFD	FUNNEL FLOOR DRAIN
FFE	FINISHED FLOOR ELEVATION
FS	FLOOR SINK
	FEET
FT	
	FURNISHED
FT	FURNISHED
FT FURN FV	FURNISHED FACE VELOCITY
FT FURN	FURNISHED
FT FURN FV FVC GAL	FURNISHED FACE VELOCITY FIRE VALVE CABINET GALLON
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REQD REQUIRED REL.A RELIEF AIR RPM REVOLUTIONS PER MINUTE RPZ REDUCED PRESSURE ZONE RS ROOF SUMP SA SUPPLY AIR SH SHOWER SP STATIC PRESSURE QFt / SF SQUARE FOOT/SQUARE FEET SS SERVICE SINK TC TEMPERATURE CONTROL T & P TEMPERATURE AND PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER		
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SA SUPPLY AIR SH SHOWER SP STATIC PRESSURE qFt / SF SQUARE FOOT/SQUARE FEET SS SERVICE SINK TC TEMPERATURE CONTROL T & P TEMPERATURE AND PRESSURE TSP TOTAL STATIC PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	RPZ	REDUCED PRESSURE ZONE
SH SHOWER SP STATIC PRESSURE qFt / SF SQUARE FOOT/SQUARE FEET SS SERVICE SINK TC TEMPERATURE CONTROL T & P TEMPERATURE AND PRESSURE TSP TOTAL STATIC PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	RS	ROOF SUMP
SP STATIC PRESSURE qFt / SF SQUARE FOOT/SQUARE FEET SS SERVICE SINK TC TEMPERATURE CONTROL T & P TEMPERATURE AND PRESSURE TSP TOTAL STATIC PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	SA	SUPPLY AIR
SS SERVICE SINK TC TEMPERATURE CONTROL T & P TEMPERATURE AND PRESSURE TSP TOTAL STATIC PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	SH	SHOWER
SS SERVICE SINK TC TEMPERATURE CONTROL T & P TEMPERATURE AND PRESSURE TSP TOTAL STATIC PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	SP	STATIC PRESSURE
TC TEMPERATURE CONTROL T & P TEMPERATURE AND PRESSURE TSP TOTAL STATIC PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	qFt / SF	SQUARE FOOT/SQUARE FEET
T & P TEMPERATURE AND PRESSURE TSP TOTAL STATIC PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	SS	SERVICE SINK
TSP TOTAL STATIC PRESSURE TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	TC	TEMPERATURE CONTROL
TYP TYPICAL UG UNDERGROUND UH UNIT HEATER	T & P	TEMPERATURE AND PRESSURE
UG UNDERGROUND UH UNIT HEATER	TSP	TOTAL STATIC PRESSURE
UH UNIT HEATER		TYPICAL
	UG	
•	UH	UNIT HEATER

MECHANICAL ABBREVIATIONS			
ABBREV.	DESCRIPTION		
UR	URINAL		
VD	VOLUME DAMPER (MANUALLY ADJUSTABLE)		
VTR	VENT THRU ROOF		
W	WASTE		
W&V	WASTE AND VENT		
WB	WET BULB TEMPERATURE		
WC	WATER CLOSET		
WG	WATER GAUGE		
WH	WALL HYDRANT		

MECHANICAL PIPING SYMBOLS				
ABBREV.	DESCRIPTION			
 0	PIPE ELBOW UP			
——— э	PIPE ELBOW DOWN			
	PIPE TEE DOWN			
-	DIRECTION OF FLOW			
——-II	UNION			
<u> </u>	STRAINER			
$\overline{}$	CONCENTRIC REDUCER			
	ECCENTRIC REDUCER			
	EXPANSION JOINT			
	FLEXIBLE CONNECTION			
	PIPE ANCHOR			
	PIPE GUIDE			
	PIPE CAP OR PLUG			
	ISOLATION VALVE			
	CIRCULATING PUMP			
	GLOBE VALVE			
——————————————————————————————————————	BALL VALVE			
	BUTTERFLY VALVE			
	BACKWATER VALVE			
<u> </u>	ANGLE VALVE			
N	CHECK VALVE (SWING)			
	CHECK VALVE (SPRING)			
——I√I———	PLUG VALVE			
<u> </u>	NEEDLE VALVE			
<u> </u>	OUTSIDE SCREW AND YOKE VALVE (OS&Y)			
<u> </u>	PRESSURE REGULATING VALVE			
	SOLENOID VALVE			
\$	CONTROL VALVE (2-WAY / 3-WAY)			
$ \mathcal{C} $	CENTRIFUGAL FAN			
6	AUTOMATIC GAS SHUT-OFF VALVE			
œ—	TRAP (PLAN VIEW)			
	FLOOR DRAIN / FUNNEL FLOOR DRAIN (PLAN VIEW)			
-Y -\P	FLOOR DRAIN / FUNNEL FLOOR DRAIN (ELEVATION)			
<u></u>	ROOF SUMP			
—— co	CLEAN OUT (IN FLOOR)			
	CLEAN OUT (IN LINE)			
wco	CLEAN OUT (WALL)			
BFP	BACKFLOW PREVENTER			
1/1/M-M-M	WATER METER ASSEMBLY			
+	HOSE BIBB, WALL HYDRANT			
_	DIRECTION OF PIPE PITCH			
0	SPRINKLER HEAD (UPRIGHT)			
—FS	FLOW SWITCH			
₫,	SIAMESE CONNECTION (YARD)			
~	SIAMESE CONNECTION (WALL MOUNTED)			
<u>→</u>	FIRE HYDRANT			
-	FLOW MEASURING DEVICE			
<i>≫</i>	BALANCING VALVE			
₩	COMBINATION FLOW MEASURING AND BALANCING DEVICE			
⊠ ∏AAV				
AUTOMATIC AIR VALVE MANUAL AIR VALVE				

М	ECHANICAL SYMBOLS		
ABBREV.	DESCRIPTION		
\$ \	RECTANGULAR TAKE-OFF (SINGLE LINE)		
	RECTANGULAR TAKE—OFF (DOUBLE LINE)		
	ROUND TAKE-OFF (SINGLE LINE)		
<u> </u>	ROUND TAKE-OFF (DOUBLE LINE)		
	SPIN-IN FITTING (WITH VOLUME DAMPER)		
	ELBOW (WITH TURNING VANES)		
	,		
	RADIUS RECTANGULAR ELBOW		
	RADIUS ROUND ELBOW		
	RECTANGULAR ELBOW UP		
	ROUND ELBOW UP		
	RECTANGULAR ELBOW DOWN		
	ROUND ELBOW DOWN		
	CONCENTRIC TRANSITION (DOUBLE LINE)		
→	CONCENTRIC TRANSITION (SINGLE LINE)		
	ECCENTRIC TRANSITION (DOUBLE LINE)		
<u> </u>	ECCENTRIC TRANSITION (SINGLE LINE)		
R	INCLINED RISE IN DIRECTION OF AIR FLOW		
<u>R</u> , ((DOUBLE LINE) INCLINED RISE IN DIRECTION OF AIR FLOW		
, , , ,	(SINGLE LINE) INCLINED DROP IN DIRECTION OF AIR FLOW		
<u> </u>	(DOUBLE LINE) INCLINED DROP IN DIRECTION OF AIR FLOW		
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	(SINGLE LINE)		
	FLEXIBLE CONNECTION		
	FLEXIBLE DUCT CONNECTION TO SUPPLY DIFFUSER		
	SUPPLY DIFFUSER		
	LINEAR SLOT DIFFUSER		
<u> </u>	RETURN OR EXHAUST GRILLE		
#	TRANSFER GRILLE		
	CROSS SECTION OF SUPPLY AIR DUCT		
	CROSS SECTION OF EXHAUST OR RETURN AIR DUCT		
	EXISTING		
	FIRE DAMPER (HORIZONTAL) NEW		
	EXISTING FIRE DAMPER (VERTICAL)		
	NEW		
	EXISTING SMOKE DAMPER NEW		
	FXISTING		
	COMBINATION FIRE/SMOKE DAMPER NEW (VERTICAL)		
7	EXISTING COMBINATION FIRE/SMOKE DAMPER		
_	NEW (HORIZONTAL)		
	VOLUME DAMPER (MANUALLY ADJUSTABLE)		
— – <u>M</u>	MOTORIZED DAMPER		
SD	SMOKE DETECTOR		
(CO2)	CO2 SENSOR		
T	THERMOSTAT OR TEMPERATURE SENSOR		
\mathbb{H}	HUMIDISTAT OR		
	HUMIDITY SENSOR		

RETURN OR EXHAUST / SUPPLY AIR FLOW

	PIPING LEGEND		
ABBREV.	DESCRIPTION		
——CA——	COMPRESSED AIR PIPING		
CD	CONDENSATE DRAIN PIPING		
——DT ——	DRAIN TILE		
——F——	FIRE PROTECTION PIPING		
——FOR——	FUEL OIL RETURN PIPING		
——F0S——	FUEL OIL SUPPLY PIPING		
G	NATURAL GAS PIPING		
——BCW——	BOOSTED-DOMESTIC COLD WATER PIPING		
——BHW——	BOOSTED-DOMESTIC HOT WATER PIPING		
CW	DOMESTIC COLD WATER PIPING		
NPCW	NON POTABLE COLD WATER PIPING		
TW	TEMPERED WATER PIPING		
——НW——	DOMESTIC HOT WATER PIPING		
—HW(XXX)—	DOMESTIC HOT WATER PIPING CIRCULATED AT XXX TEMPERATURE		
——HWR——	DOMESTIC HOT WATER RETURN PIPING		
——SAN——	SANITARY WASTE PIPING		
PSAN	PUMPED SANITARY PIPING		
V	VENT PIPING		
——ST——	STORM SEWER PIPING		
——PST——	PUMPED STORM PIPING		
RC	RAIN CONDUCTOR PIPING		
ORC	OVERFLOW RAIN CONDUCTOR PIPING		
——CHWR——	CHILLED WATER RETURN PIPING		
——CHWS——	CHILLED WATER SUPPLY PIPING		
——CWR——	CONDENSER WATER RETURN PIPING		
CWS	CONDENSER WATER SUPPLY PIPING		
——HHWR——	HEATING HOT WATER RETURN PIPING		
—HHWS—	HEATING HOT WATER SUPPLY PIPING		
—HPLR—	HEAT PUMP LOOP RETURN PIPING		
—HPLS—	HEAT PUMP LOOP SUPPLY PIPING		
——RL——	REFRIGERANT LIQUID PIPING		
——RS——	REFRIGERANT SUCTION PIPING		
——HGB——	HOT GAS BY-PASS PIPING		
——GXHR——	GEO HEAT EXCHANGE RETURN		
GXHS	GEO HEAT EXCHANGE SUPPLY		
——STM——	STEAM PIPING		
——HPS——	HIGH PRESSURE STEAM PIPING		
——LPS——	LOW PRESSURE STEAM PIPING		
——CR——	STEAM CONDENSATE RETURN PIPING		
——PCR——	PUMPED STEAM CONDENSATE RETURN PIPING		
——LPC——	LOW PRESSURE CONDENSATE PIPING		
——HPC——	HIGH PRESSURE CONDENSATE PIPING		
——МА——	MEDICAL AIR PIPING		
N	NITROGEN GAS PIPING		
<u>02</u>	OXYGEN GAS PIPING		
VAC	VACUUM PIPING		

APPLICABLE CODES

AND REGULATIONS

2015 MICHIGAN REHABILITATION CODE FOR EXISTING BUILDINGS

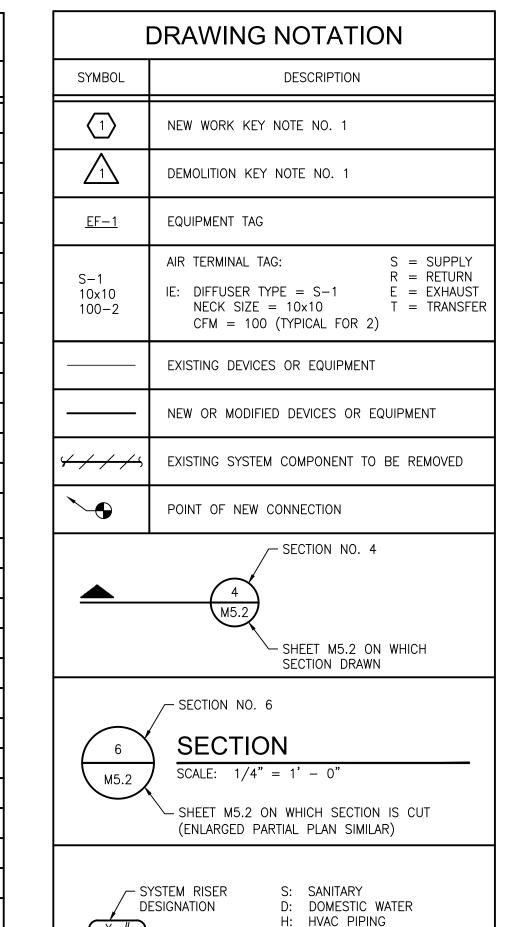
2015 MICHIGAN PLUMBING CODE

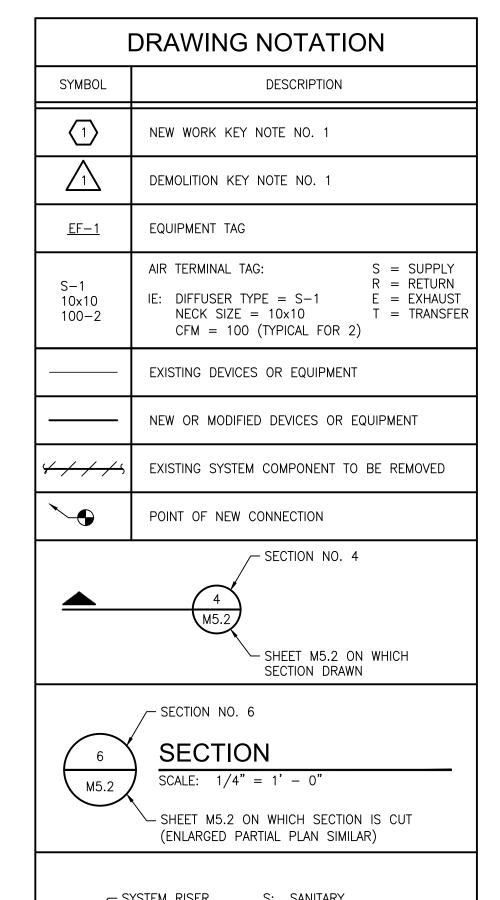
2015 MICHIGAN MECHANICAL CODE

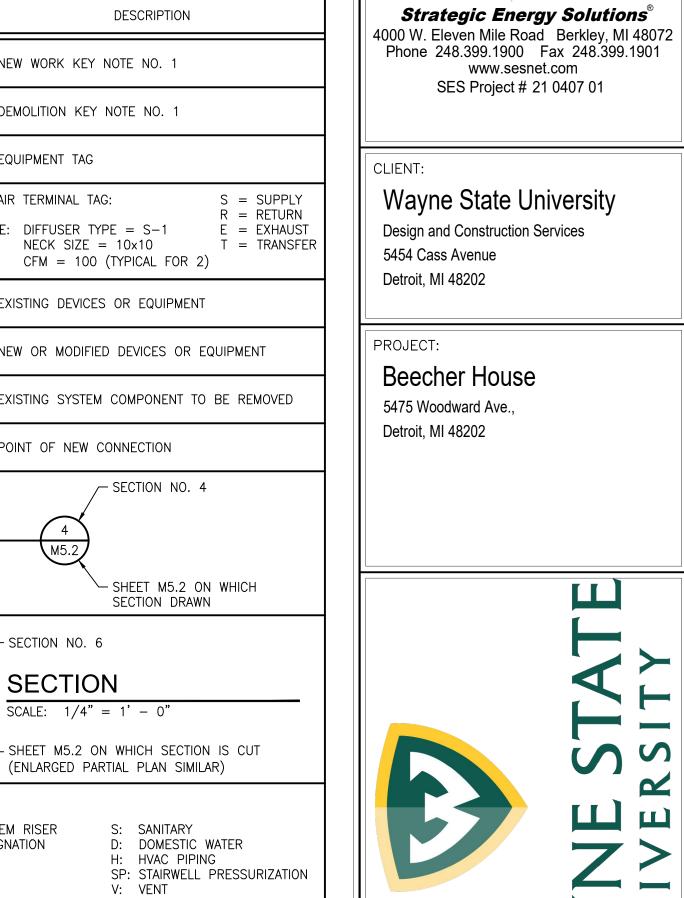
2015 MICHIGAN UNIFORM ENERGY CODE

2015 INTERNATIONAL FUEL GAS CODE

EGEND		DRAWING NOTATION		
DESCRIPTION		SYMBOL	DESCRIPTION	
PIPING]	1	NEW WORK KEY NOTE NO. 1	
PIPING	 		DEMOLITION KEY NOTE NO. 4	
	-		DEMOLITION KEY NOTE NO. 1	
PIPING	_	<u>EF-1</u>	EQUIPMENT TAG	
PIPING	-		AIR TERMINAL TAG: S =	
PIPING	_	S-1 10x10	R = IE: DIFFUSER TYPE = S-1 E =	
G	_	100-2	NECK SIZE = 10×10 T = CFM = 100 (TYPICAL FOR 2)	
COLD WATER PIPING	┦ ├		CFM = 100 (TIPICAL FOR 2)	
C HOT WATER PIPING	_		EXISTING DEVICES OR EQUIPMENT	
TER PIPING	_		NEW OR MODIFIED DEVICES OF FOURDA	
) WATER PIPING	-		NEW OR MODIFIED DEVICES OR EQUIPMI	
PIPING	_	4///	EXISTING SYSTEM COMPONENT TO BE R	
ER PIPING	-			
ER PIPING CIRCULATED AT		•	POINT OF NEW CONNECTION	
ER RETURN PIPING			SECTION NO. 4	
PING			4	
PIPING			M5.2	
			SHEET M5.2 ON WHIC	
NG	7		SECTION DRAWN	
PING			SECTION NO. 6	
PIPING			CECTION	
NDUCTOR PIPING		6	$\frac{\text{SECTION}}{\text{SCALE: } 1/4" = 1' - 0"}$	
TURN PIPING		M5.2		
PPLY PIPING			SHEET M5.2 ON WHICH SECTION IS C (ENLARGED PARTIAL PLAN SIMILAR)	
RETURN PIPING	1		(,	
SUPPLY PIPING		∠ S`	YSTEM RISER S: SANITARY	
R RETURN PIPING		DI	ESIGNATION D: DOMESTIC WATER H: HVAC PIPING	
R SUPPLY PIPING		<u> </u>	SP: STAIRWELL PRESS V: VENT	
RETURN PIPING			- RISER NUMBER E: EXHAUST	
SUPPLY PIPING				
) PIPING				
ON PIPING				
PIPING				
GE RETURN				
GE SUPPLY				
EAL DIDING	\dashv			







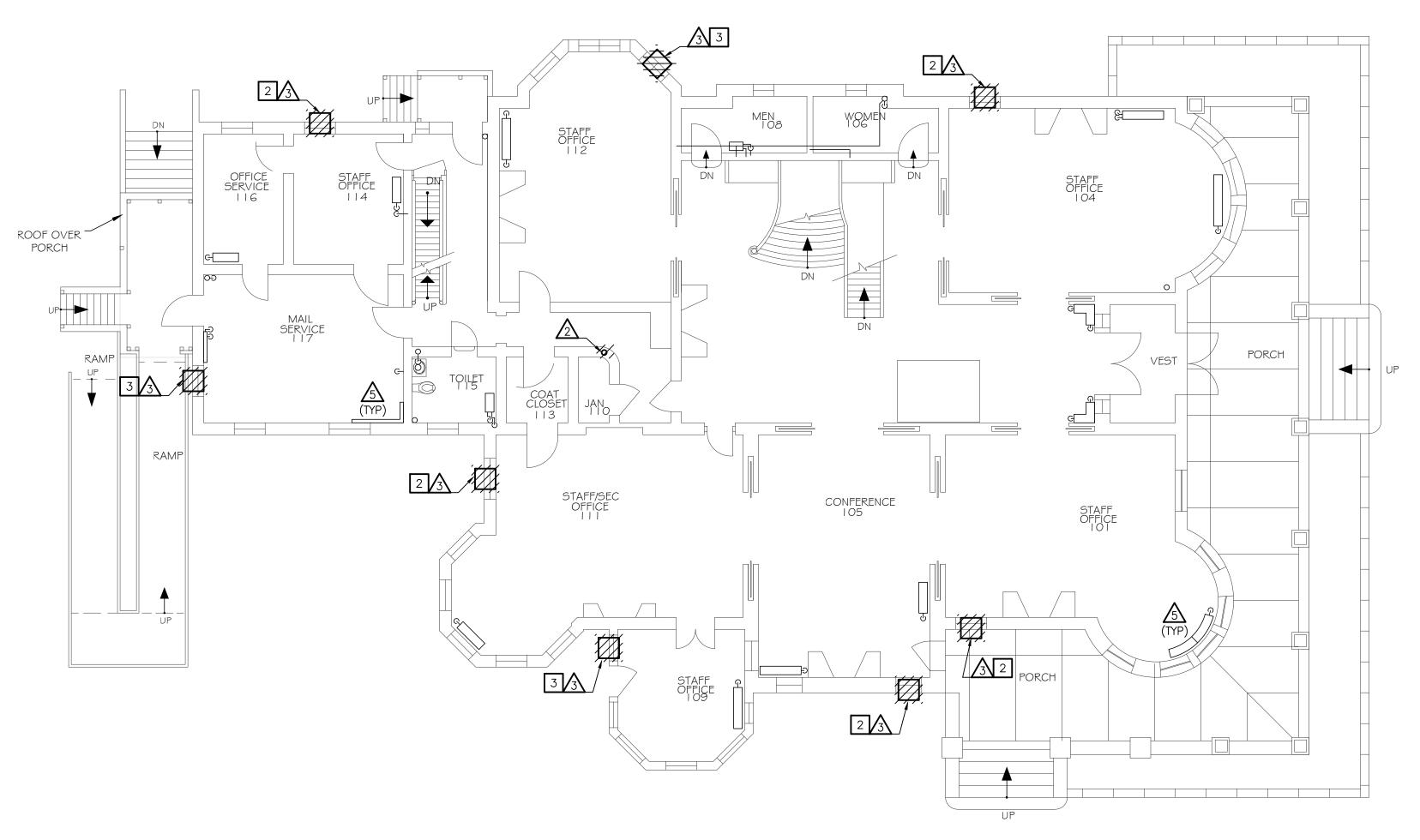
ISSUED FOR: 08/27/21 ISSUED DESIGNER: ENGINEER:

Seal:

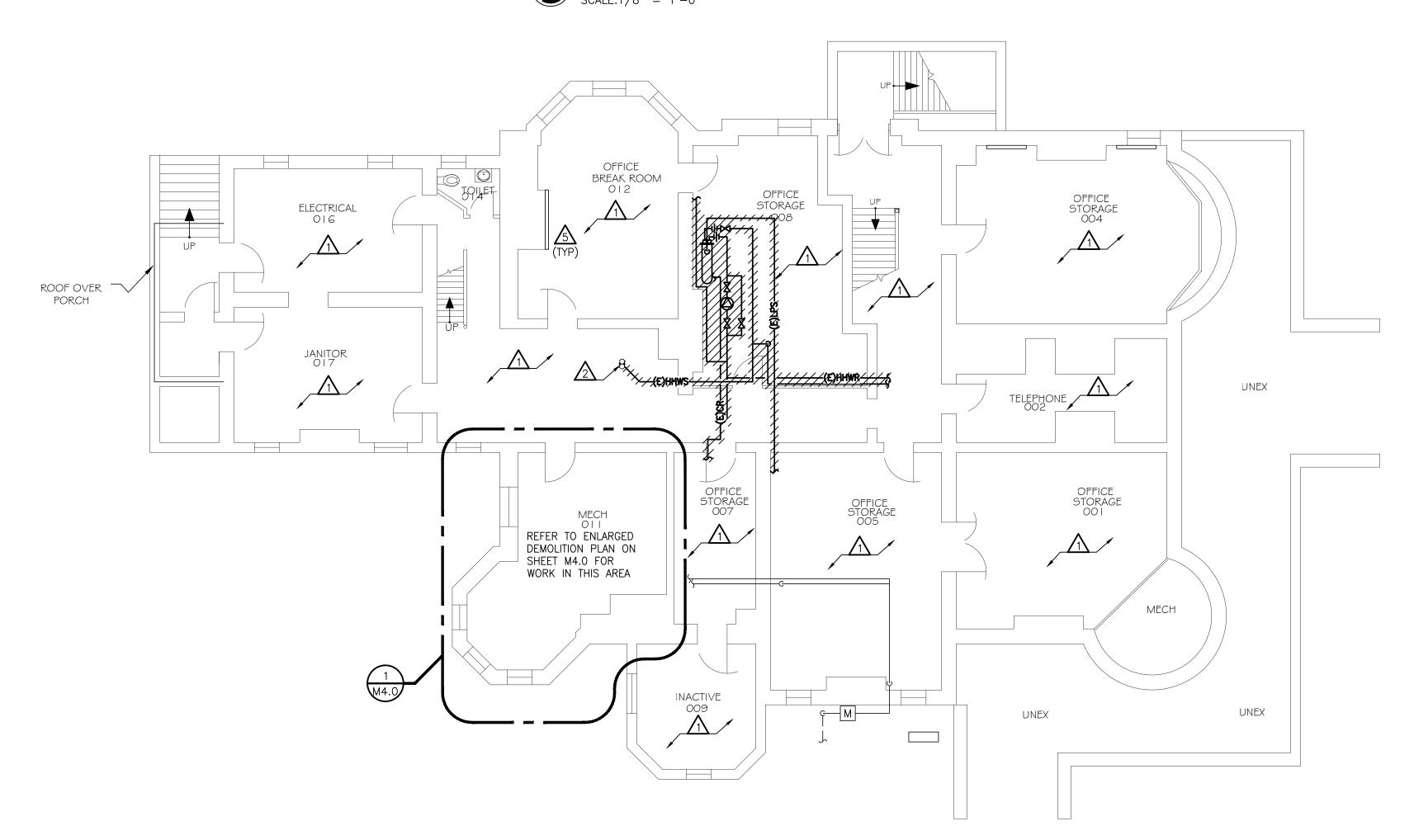
MECHANICAL GENERAL INFORMATION

SHEET NUMBER:

SHEET TITLE:



FIRST FLOOR MECHANICAL DEMOLITION PLAN SCALE:1/8" = 1'-0"



BASEMENT MECHANICAL DEMOLITION PLAN SCALE:1/8" = 1'-0"

MECHANICAL DEMOLITION NOTES

- THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.
- 2. PRIOR TO COMMENCEMENT OF WORK, CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH EXISTING SITE CONDITIONS, SYSTEMS, AND UTILITIES. NOTIFY ARCHITECT OF ANY INTERFERENCES OR DISCREPANCIES.
- 3. VERIFY DEPTH, SIZE, LOCATIONS AND CONDITION OF EXISTING UTILITIES IN THE FIELD, INCLUDING POINTS OF CONNECTION PRIOR TO STARTING ANY WORK.
- 4. ANY INTERRUPTIONS OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE PRESENT BUILDING'S OPERATION.
- 5. ALL ITEMS ON DEMOLITION PLAN SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED. ALL WORK INDICATED ON PLANS HAS BEEN LOCATED PER EXISTING DRAWINGS AND/OR FIELD OBSERVATION AND REQUIRES FIELD VERIFICATION.
- 6. ALL ITEMS INDICATED WITH CROSS—HATCHING SHALL BE REMOVED COMPLETE, WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, INSULATION, CONTROLS, ETC. CAP ALL OPEN ENDED PIPES AND DUCTS.
- 7. ALL EXISTING WORK TO REMAIN SHALL BE PROTECTED FROM DAMAGE. WHERE DUCT OR PIPE INSULATION HAS BEEN DAMAGED DURING DEMOLITION, THE CONTRACTOR SHALL REPAIR INSULATION AS REQUIRED TO MATCH EXISTING.
- 8. THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL EQUIPMENT BEING REMOVED. ALL ITEMS REMOVED SHALL BE LEGALLY DISPOSED OF. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXISTING RELOCATED AND OWNER PROVIDED EQUIPMENT.

DEMOLITION KEYED NOTES

- DISCONNECT AND COMPLETELY REMOVE HEATING HOT WATER, STEAM AND CONDENSATE PIPING AND ALL ASSOCIATED EQUIPMENT I.E. HEAT EXCHANGER, PUMPS, VALVES, HANGERS, CONTROLS AND ACCESSORIES FROM BASEMENT LEVEL. CAP ALL PIPING RISERS UP TO FIRST FLOOR AT CEILING LEVEL OF BASEMENT.
- REMOVE HEATING HOT WATER/STEAM MAIN RISER PIPING FROM BASEMENT TO ATTIC LEVEL FIELD VERIFY RISER LOCATION. COORDINATE WITH NEW CONSTRUCTION. RESTORE/PATCH AREAS TO MATCH EXISTING CONDITIONS.
- 3. REMOVE EXISTING WINDOW AIR CONDITIONING UNIT. COORDINATE WINDOW REPAIR OR IN-FILL WITH NEW CONSTRUCTION.
- 4. DISCONNECT AND REMOVE PORTABLE WATER COOLED AIR CONDITIONING UNIT AND ASSOCIATED DRAIN PIPING, WATER SUPPLY PIPING BACK TO MAINS AND
- 5. EXISTING RADIATOR/BASEBOARD TO REMAIN.

WINDOW SASH REPAIRS

- 1. LOWER EXISTING BOTTOM SASH TO WINDOW SILL AFTER REMOVAL OF AC UNIT.
- 2. REMOVE INTERMEDIATE MUNTIN, GLASS, AND AC PANEL IN BOTTOM SASH AND REGLAZE WITH GLASS.
- 3. REMOVE A/C PANEL IN BOTTOM SASH AND REGLAZE WITH GLASS.



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SES Project # 21 0407 01

CLIENT:

Detroit, MI 48202

Wayne State University
Design and Construction Services
5454 Cass Avenue

PROJECT:

Beecher House 5475 Woodward Ave., Detroit, MI 48202



Seal:

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	ISSUED	DATE

SHEET TITLE:

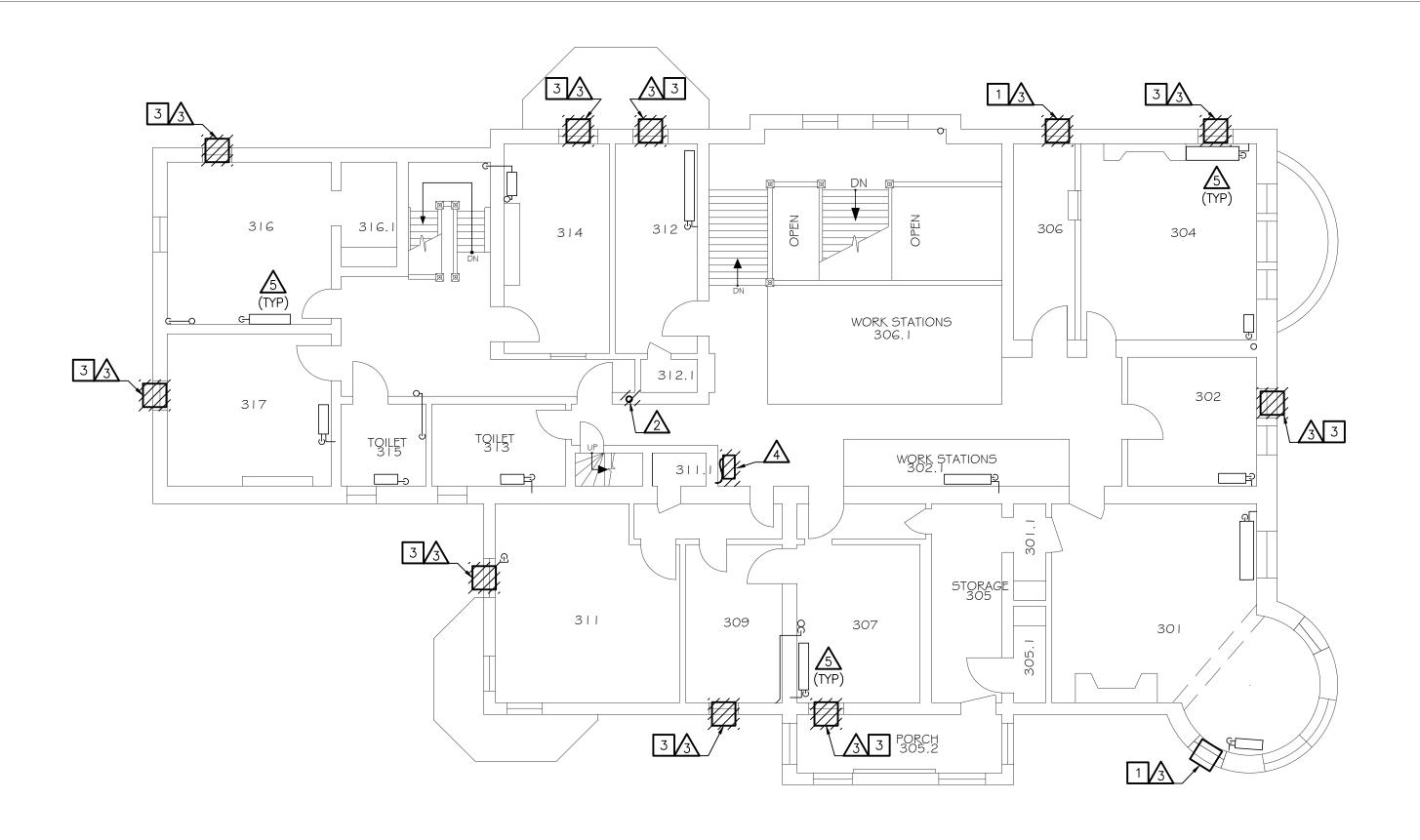
DESIGNER: ENGINEER:

BASEMENT AND FIRST FLOOR MECHANICAL DEMOLITION PLANS

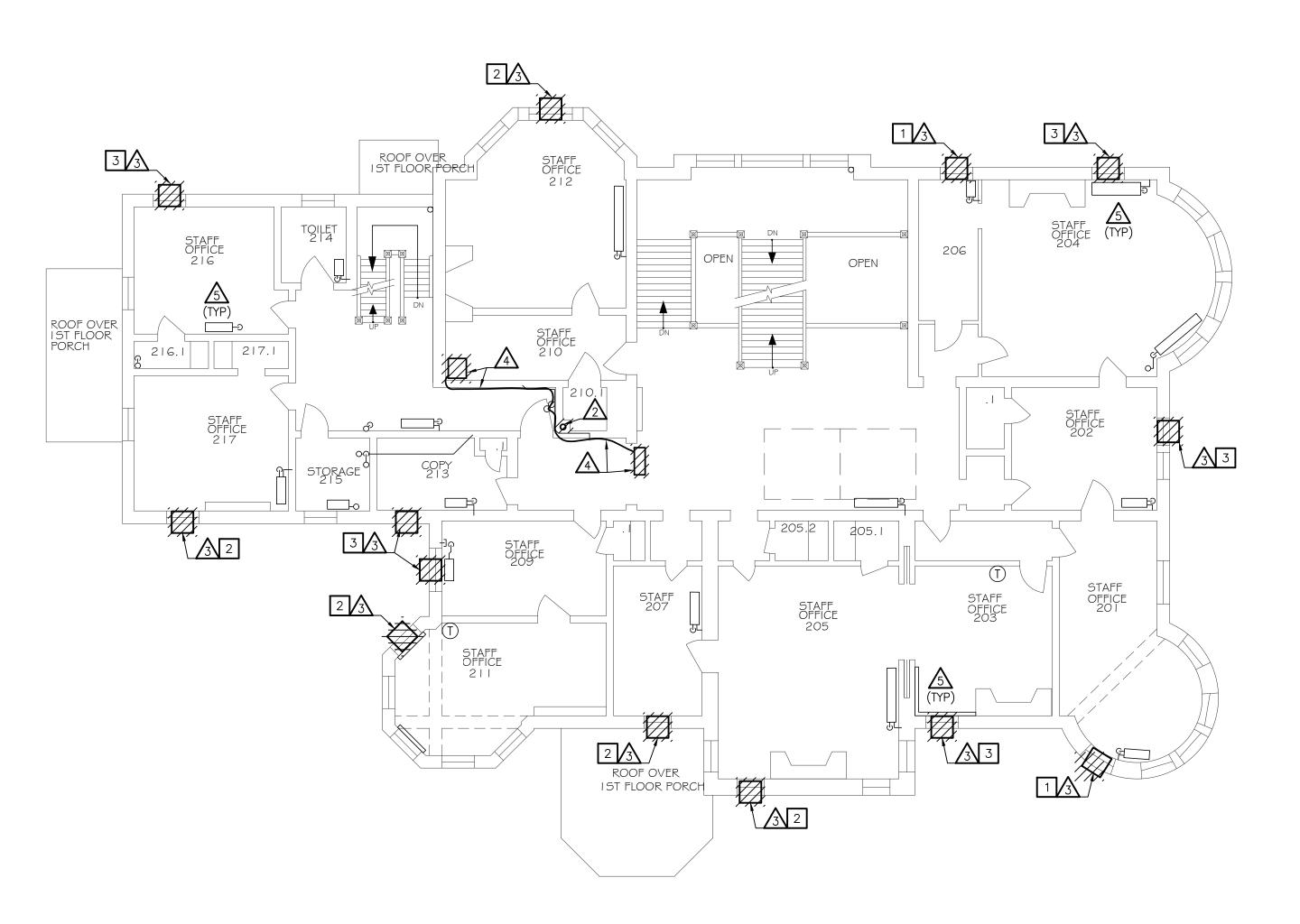
SHEET NUMBER:

MD1.1





THIRD FLOOR MECHANICAL DEMOLITION PLAN | SCALE:1/8" = 1'-0"



SECOND FLOOR MECHANICAL DEMOLITION PLAN SCALE:1/8" = 1'-0"



- THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.
- 2. PRIOR TO COMMENCEMENT OF WORK, CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH EXISTING SITE CONDITIONS, SYSTEMS, AND UTILITIES. NOTIFY ARCHITECT OF ANY INTERFERENCES OR DISCREPANCIES.
- 3. VERIFY DEPTH, SIZE, LOCATIONS AND CONDITION OF EXISTING UTILITIES IN THE FIELD, INCLUDING POINTS OF CONNECTION PRIOR TO STARTING ANY WORK.
- 4. ANY INTERRUPTIONS OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE PRESENT BUILDING'S OPERATION.
- 5. ALL ITEMS ON DEMOLITION PLAN SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED. ALL WORK INDICATED ON PLANS HAS BEEN LOCATED PER EXISTING DRAWINGS AND/OR FIELD OBSERVATION AND REQUIRES FIELD VERIFICATION.
- 6. ALL ITEMS INDICATED WITH CROSS—HATCHING SHALL BE REMOVED COMPLETE, WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, INSULATION, CONTROLS, ETC. CAP ALL OPEN ENDED PIPES AND DUCTS.
- 7. ALL EXISTING WORK TO REMAIN SHALL BE PROTECTED FROM DAMAGE. WHERE DUCT OR PIPE INSULATION HAS BEEN DAMAGED DURING DEMOLITION, THE CONTRACTOR SHALL REPAIR INSULATION AS REQUIRED TO MATCH EXISTING.
- 8. THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL EQUIPMENT BEING REMOVED. ALL ITEMS REMOVED SHALL BE LEGALLY DISPOSED OF. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXISTING RELOCATED AND OWNER PROVIDED EQUIPMENT.

DEMOLITION KEYED NOTES

- 1. DISCONNECT AND COMPLETELY REMOVE HEATING HOT WATER, STEAM AND CONDENSATE PIPING AND ALL ASSOCIATED EQUIPMENT I.E. HEAT EXCHANGER, PUMPS, VALVES, HANGERS, CONTROLS AND ACCESSORIES FROM BASEMENT LEVEL. CAP ALL PIPING RISERS UP TO FIRST FLOOR AT CEILING LEVEL OF BASEMENT.
- REMOVE HEATING HOT WATER/STEAM MAIN RISER PIPING FROM BASEMENT TO ATTIC LEVEL FIELD VERIFY RISER LOCATION. COORDINATE WITH NEW CONSTRUCTION. RESTORE/PATCH AREAS TO MATCH EXISTING CONDITIONS.
- 3. REMOVE EXISTING WINDOW AIR CONDITIONING UNIT. COORDINATE WINDOW REPAIR OR IN-FILL WITH NEW CONSTRUCTION.
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- 5. EXISTING RADIATOR/BASEBOARD TO REMAIN.

WINDOW SASH REPAIRS

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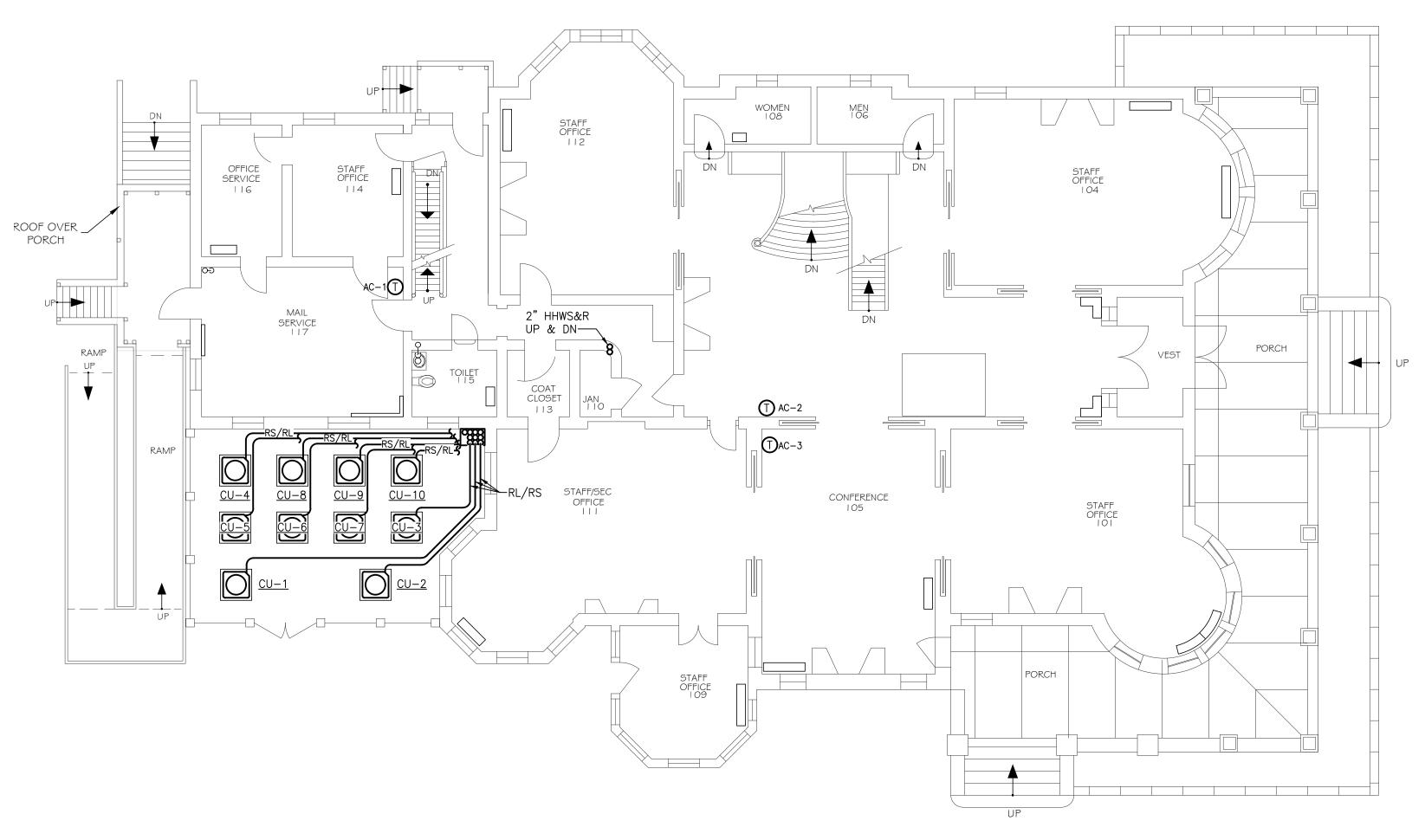
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SHEET TITLE:

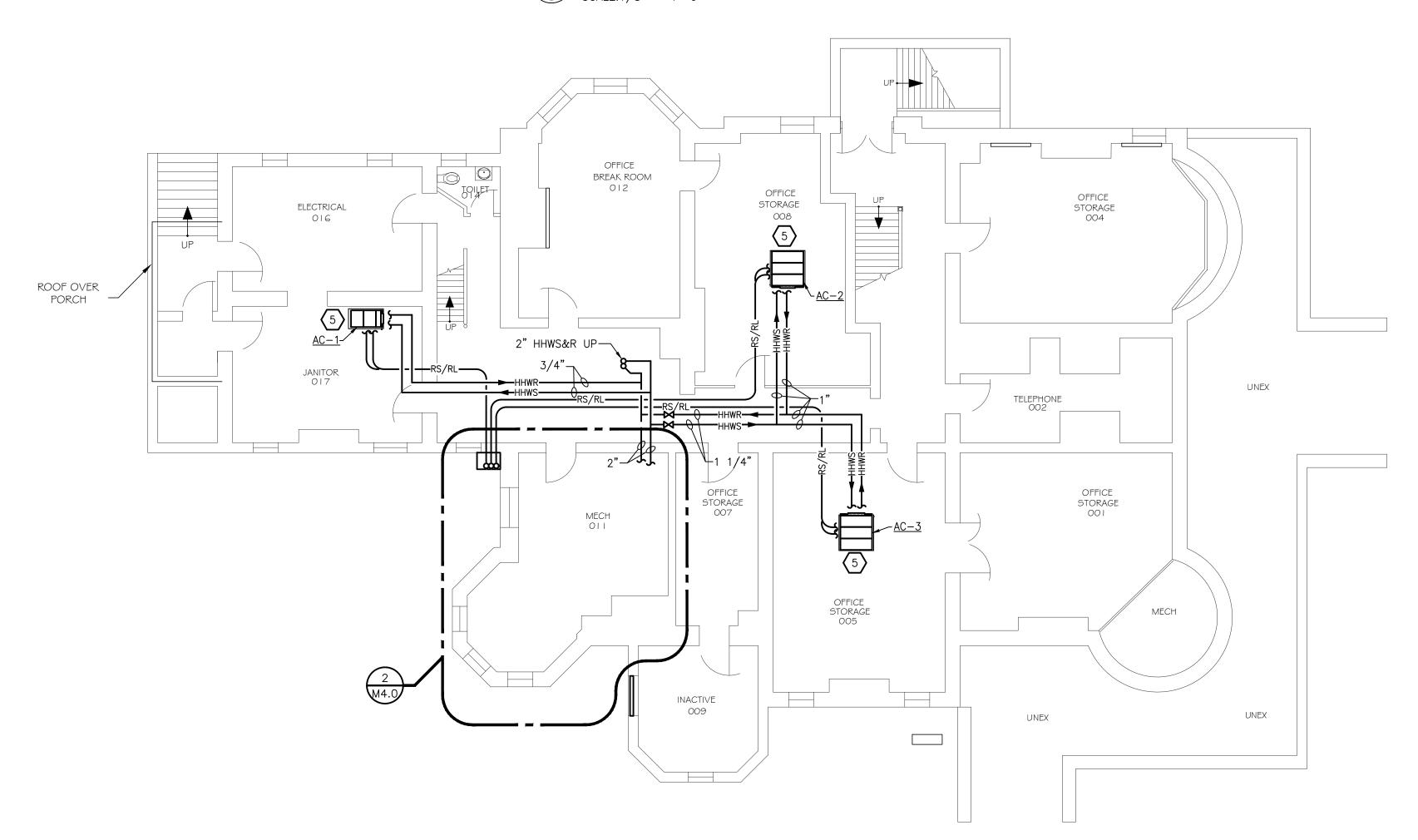
SECOND AND THIRD FLOOR MECHANICAL DEMOLITION PLANS

SHEET NUMBER:

MD1.2



FIRST FLOOR HVAC PIPING PLAN





HVAC PIPING GENERAL NOTES

- 1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF THE WORK. PROVIDE HVAC SYSTEMS COMPLETE PER SPECIFICATION, SMACNA STANDARDS, AND PER APPLICABLE CODES INCLUDING ALL NECESSARY OFFSETS, FITTINGS, SPECIAL RADIUS OR MITERED ELBOWS WHICH ARE REQUIRED DUE TO SPACE CONSTRAINTS OR STRUCTURAL CONDITIONS OR OTHER CONDITIONS.
- CONTRACTOR SHALL COORDINATE THEIR WORK WITH THE WORK OF ALL OTHER TRADES. ALL DUCTWORK IS TO BE ROUTED AS HIGH A POSSIBLE. PROVIDE ACCESS AROUND ALL NEW EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. VERIFY ALL CLEARANCES PRIOR TO THE FABRICATION OF ANY WORK.
- 3. PIPING SHALL BE ROUTED AS HIGH AS POSSIBLE AND SHALL NOT BE LOCATED OVER ELECTRICAL EQUIPMENT/PANELS. PROVIDE REQUIRED CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT. PIPING SHALL NOT INTERFERE WITH ELECTRICAL EQUIPMENT CLEARANCE.
- 4. PIPING SHALL NOT BE INSTALLED IN A LOCATION THAT RESTRICTS THE ACCESS TO MECHANICAL DEVICES REQUIRING ACCESS.
- 5. THE CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL, ETC. FOR THE PROPER INSTALLATION OF ALL MECHANICAL SYSTEMS.
- 6. COORDINATE FLOOR, WALL, ROOF PENETRATIONS, LOUVER SIZES, PAD LOCATIONS ETC. WITH ARCHITECTURAL TRADES. SEAL ALL PIPING AND DUCT PENETRATIONS.
- 7. COORDINATE AND PROVIDE ACCESS DOORS IN HARD CEILING AREAS FOR ACCESS TO BALANCING DAMPERS, ETC.
- 8. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
- 9. PROVIDE CODE REQUIRED CLEARANCE/ACCESS DOORS FOR DAMPERS, VALVES, AND CLEANOUTS LOCATED IN WALLS OR ABOVE HARD CEILINGS. COORDINATE LOCATIONS WITH ARCHITECT.
- 10. CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS. TRANSITIONS TO ALL EQUIPMENT SHALL BE VERIFIED AND PROVIDED FOR EQUIPMENT FURNISHED.

<

KEYED NOTES

- ROUTE PIPING IN NEW 12" DEEP DRYWALL SOFFIT. COORDINATE PIPING INSTALLATION WITH DUCTWORK.
- 2. CONDENSATE DRAIN TO BE SAME SIZE AS A/C UNIT DRAIN CONNECTION WITH MINIMUM PIPE SIZE TO BE 3/4"
- 3. 1" CONDENSATE DRAIN DOWN.
- 4. EXTEND CONDENSATE DRAIN TO EXISTING HUB OUTLET.
- 5. EXTEND CONDENSATE DRAIN TO DISCHARGE ABOVE NEAREST FLOOR DRAIN.



Strategic Energy Solutions®
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Phone 248.399.1900 Fax 248.399.1901
www.sesnet.com

SES Project # 21 0407 01

CLIENT:

Detroit, MI 48202

Wayne State University

Design and Construction Services

5454 Cass Avenue

PROJECT:

Beecher House 5475 Woodward Ave., Detroit, MI 48202



Seal:

SSUED FOR: BIDS	08/27/21
ISSUED	DATE

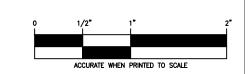
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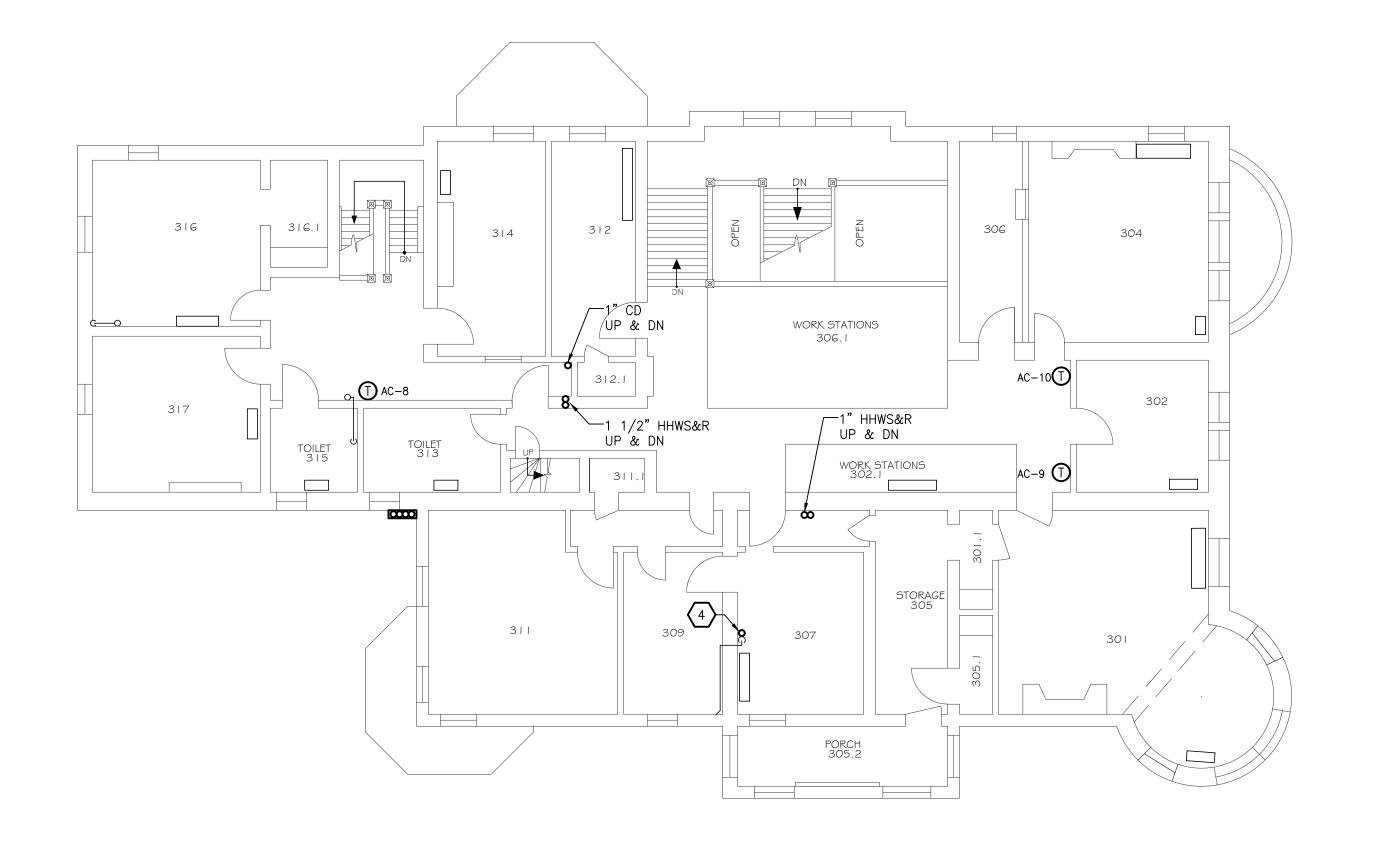
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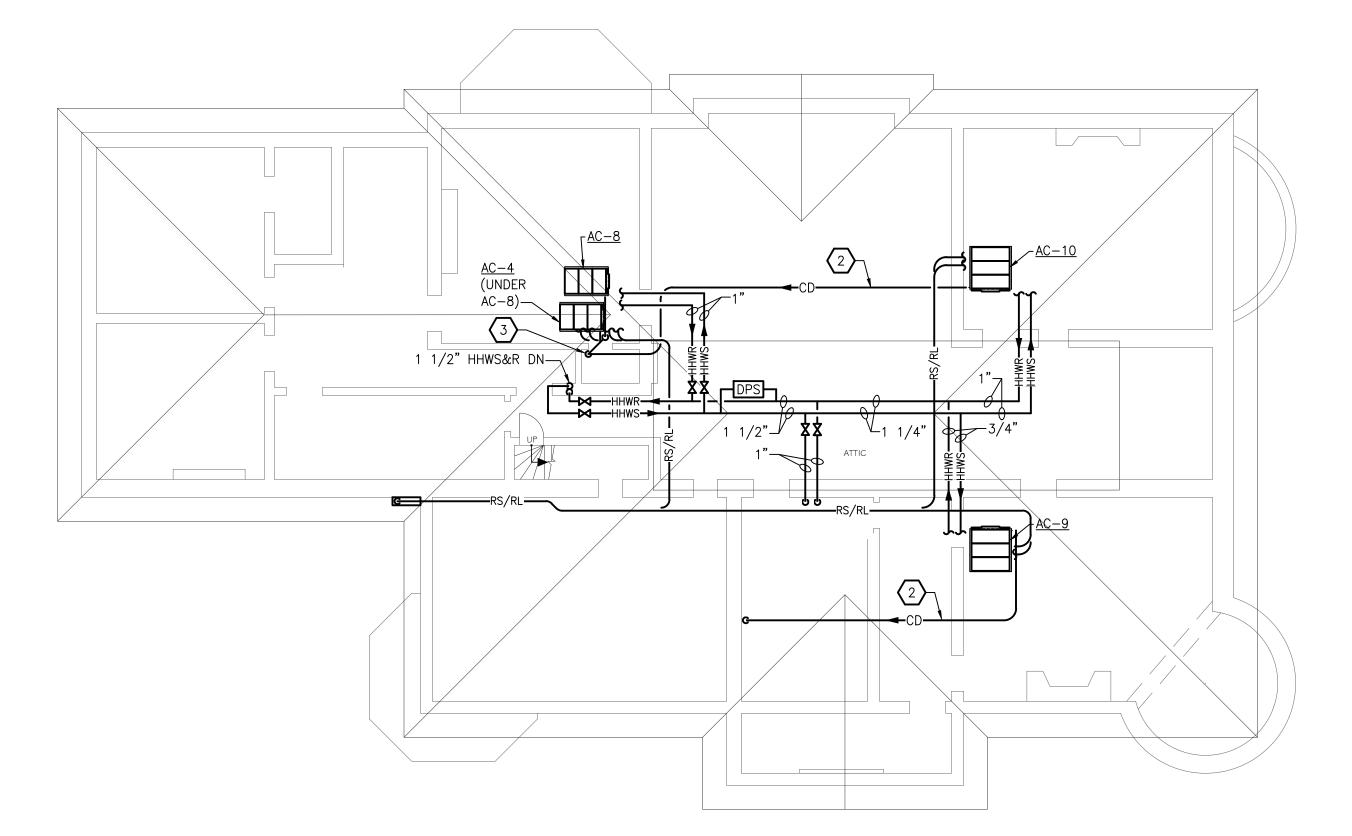
BASEMENT AND FIRST FLOOR HVAC PIPING PLAN

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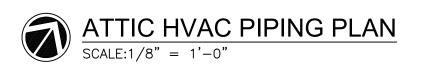
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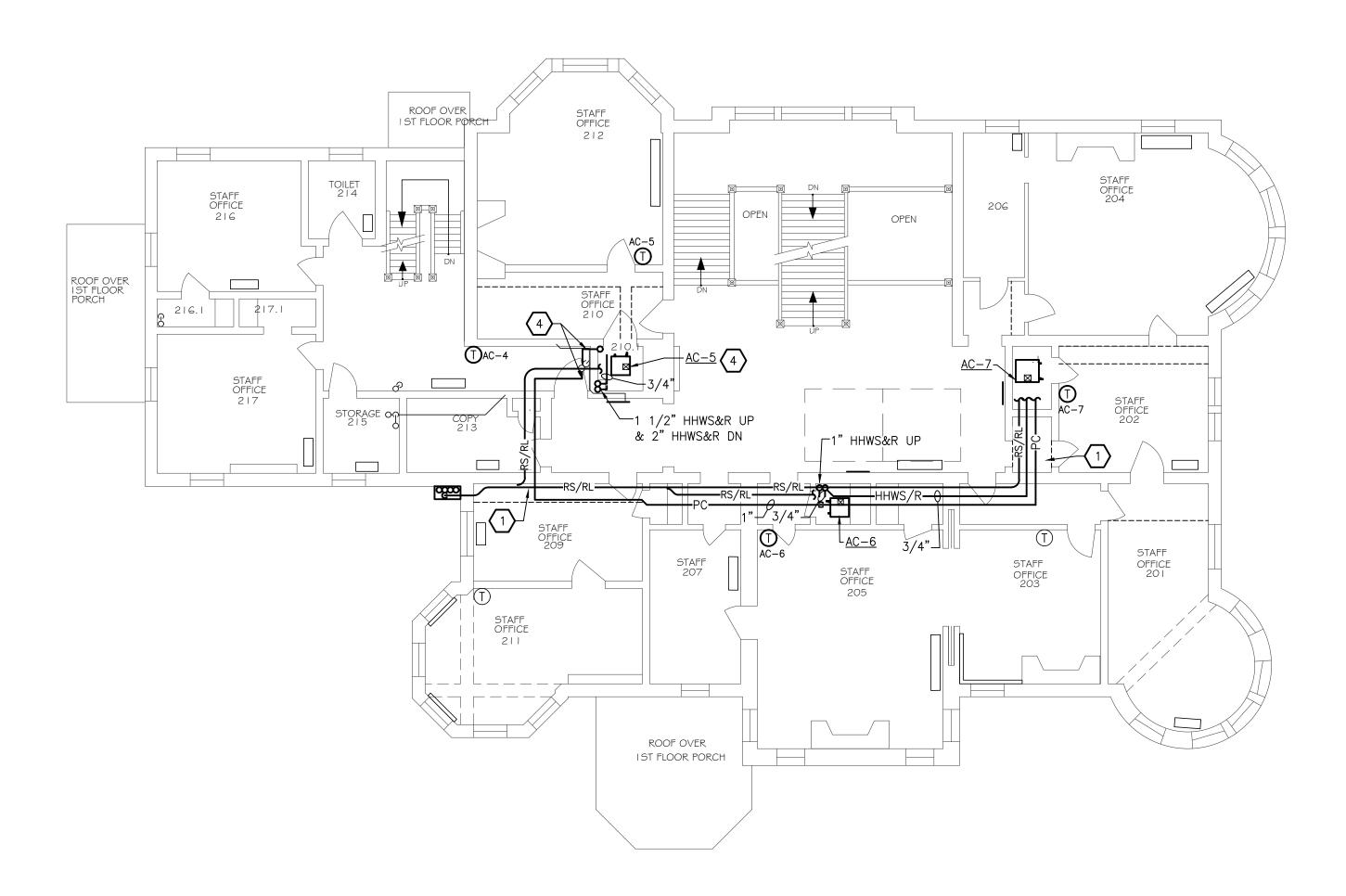












SECOND FLOOR HVAC PIPING PLAN SCALE:1/8" = 1'-0"

HVAC PIPING GENERAL NOTES

- 1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF THE WORK. PROVIDE HVAC SYSTEMS COMPLETE PER SPECIFICATION, SMACNA STANDARDS, AND PER APPLICABLE CODES INCLUDING ALL NECESSARY OFFSETS, FITTINGS, SPECIAL RADIUS OR MITERED ELBOWS WHICH ARE REQUIRED DUE TO SPACE CONSTRAINTS OR STRUCTURAL CONDITIONS OR OTHER CONDITIONS.
- 2. CONTRACTOR SHALL COORDINATE THEIR WORK WITH THE WORK OF ALL OTHER TRADES. ALL DUCTWORK IS TO BE ROUTED AS HIGH A POSSIBLE. PROVIDE ACCESS AROUND ALL NEW EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. VERIFY ALL CLEARANCES PRIOR TO THE FABRICATION OF ANY WORK.
- 3. PIPING SHALL BE ROUTED AS HIGH AS POSSIBLE AND SHALL NOT BE LOCATED OVER ELECTRICAL EQUIPMENT/PANELS. PROVIDE REQUIRED CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT. PIPING SHALL NOT INTERFERE WITH ELECTRICAL EQUIPMENT CLEARANCE.
- 4. PIPING SHALL NOT BE INSTALLED IN A LOCATION THAT RESTRICTS THE ACCESS TO MECHANICAL DEVICES REQUIRING ACCESS.
- 5. THE CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL, ETC. FOR THE PROPER INSTALLATION OF ALL MECHANICAL SYSTEMS.
- 6. COORDINATE FLOOR, WALL, ROOF PENETRATIONS, LOUVER SIZES, PAD LOCATIONS ETC. WITH ARCHITECTURAL TRADES. SEAL ALL PIPING AND DUCT PENETRATIONS.
- COORDINATE AND PROVIDE ACCESS DOORS IN HARD CEILING AREAS FOR ACCESS TO BALANCING DAMPERS, ETC.
- 8. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
- 9. PROVIDE CODE REQUIRED CLEARANCE/ACCESS DOORS FOR DAMPERS, VALVES, AND CLEANOUTS LOCATED IN WALLS OR ABOVE HARD CEILINGS. COORDINATE LOCATIONS WITH ARCHITECT.
- 10. CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS. TRANSITIONS TO ALL EQUIPMENT SHALL BE VERIFIED AND PROVIDED FOR EQUIPMENT FURNISHED.

⟨#⟩ KEYED NOTES

- ROUTE PIPING IN NEW 12" DEEP DRYWALL SOFFIT. COORDINATE PIPING INSTALLATION WITH DUCTWORK.
- 2. CONDENSATE DRAIN TO BE SAME SIZE AS A/C UNIT DRAIN CONNECTION WITH MINIMUM PIPE SIZE TO BE 3/4"
- 3. 1" CONDENSATE DRAIN DOWN.
- 4. EXTEND CONDENSATE DRAIN TO EXISTING HUB OUTLET.
- 5. EXTEND CONDENSATE DRAIN TO DISCHARGE ABOVE NEAREST FLOOR DRAIN.



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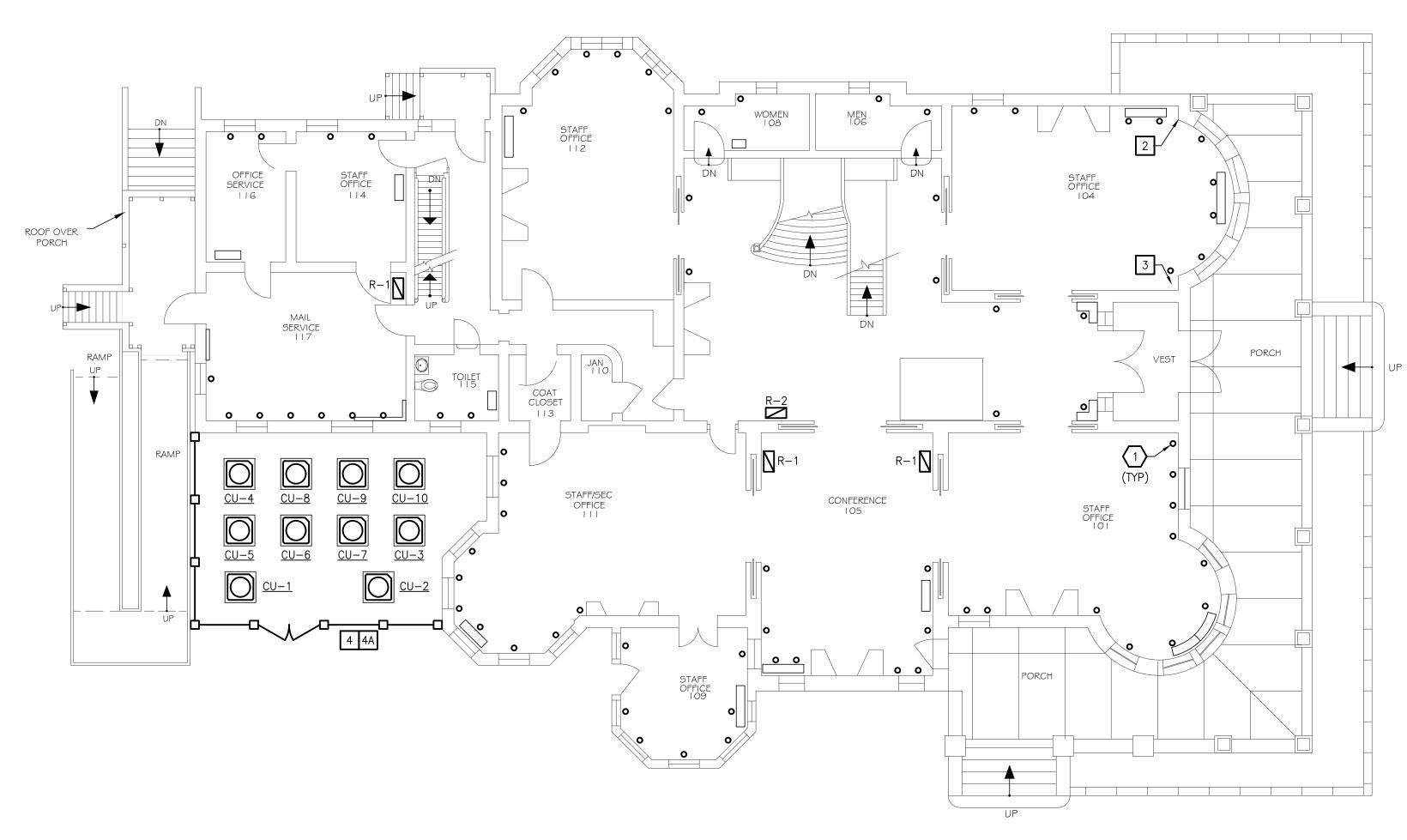
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SECOND, THIRD AND ATTIC
HVAC PIPING PLAN

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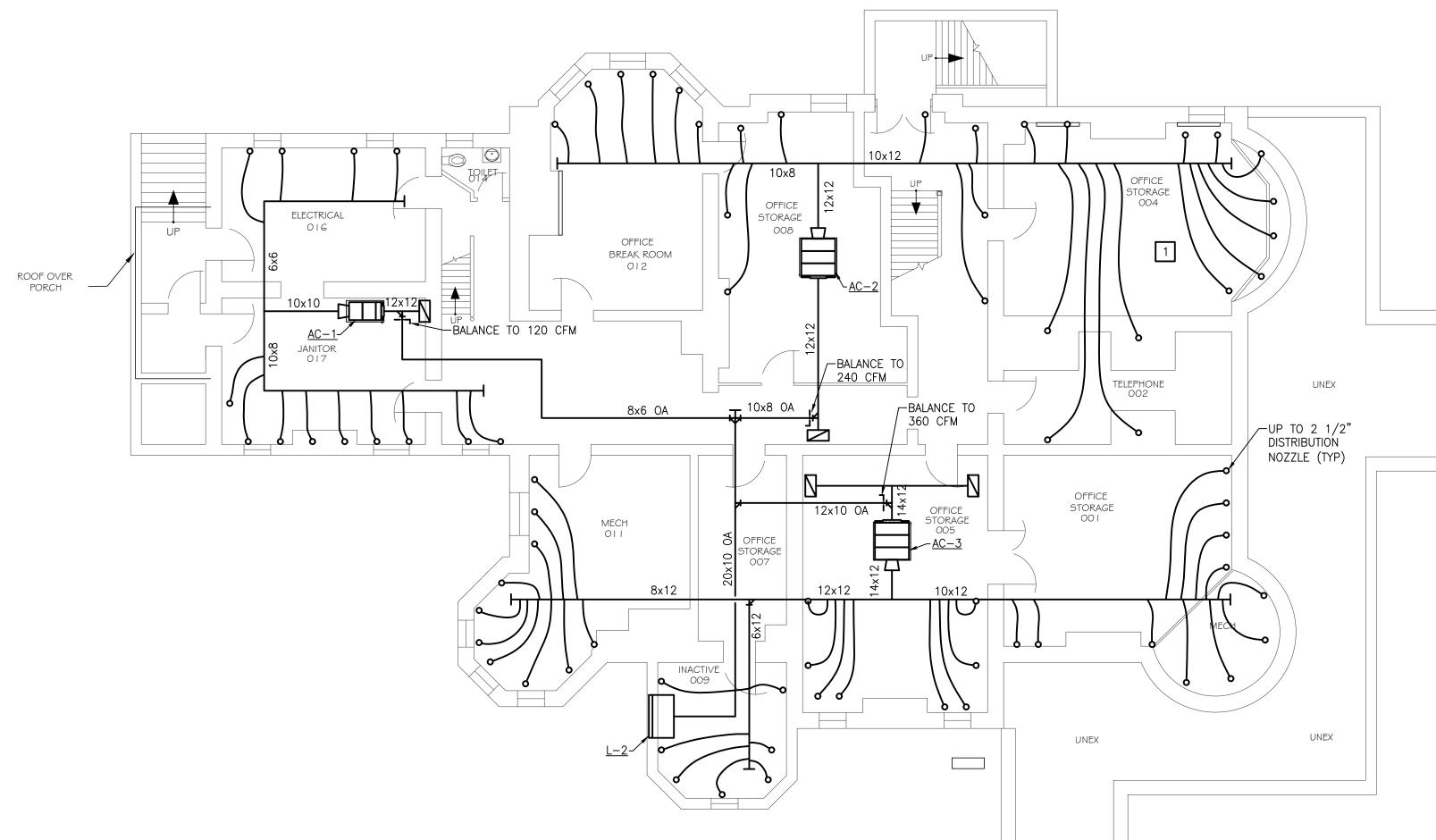
MP1.2





FIRST FLOOR ARCHITECTURAL AND SHEET METAL PLAN SCALE: 1/8" = 1'-0"

BASEMENT ARCHITECTURAL AND SHEET METAL PLAN



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

ARCHITECTURAL GENERAL NOTES

- 1. DO NOT CUT INTO ANY DECORATIVE CEILING CORNICES, MEDALLIONS (INDICATED BY DASHED CIRCLES), ETC.
- 2. INSTALL NEW AIR DIFFUSERS A MINIMUM OF 4" FROM EDGE OF DIFFUSER TO ANY ADJACENT CEILING CORNICE, MEDALLION, ETC.
- 3. AIR DIFFUSER SHOULD BE CUT WITH A HOLE SAW TO AVOID PLASTER PATCHING, AND ALL PLASTER SLOTS OPENED FOR DUCTWORK/PIPING INSTALLATION SHOULD BE SAWCUT, NOT BROKEN OUT.

ARCHITECTURAL KEYED NOTES

- 1. INSTALL DUCTWORK/PIPING ABOVE EXISTING SUSPENDED ACOUSTICAL CEILING.
- 2. REMOVE DAMAGED PLASTER IN FLAT WALL AREAS (APPROXIMATELY 50 SQUARE FEET) TO SOLID SUBSTRATE AND INSTALL NEW PLASTER (GROUND/ROUGH/FINISH COATS). CLEAN LOOSE MATERIAL FROM EDGES OF DECORATIVE CEILING CORNICE ELEMENTS (DENTILS, EGGS/DARTS, ETC) TO SOLID MATERIAL. PAINT ENTIRE NORTH WALL AFTER PLASTER WORK IS COMPLETE.
- 3. AFTER REMOVAL OF HEATING WATER PIPING, PATCH PLASTER HOLE IN CEILING CORNICE AND HOLE IN WOOD FLOORING WITH MATCHING MATERIAL. PAINT CEILING CORNICE TO NEAREST CORNERS.
- 4. INSTALL 8FT HIGH STEEL FENCING (SATIN BLACK FINISH) WITH VERTICAL SPINDLES 4" O.C. AND DECORATIVE ARROW TIP CAPS. FENCE POSTS TO BE SET IN 8" DIAMETER BY 3'-6" DEEP CONCRETE FOUNDATIONS. DOUBLE GATES TO HAVE CYLINDER LOCK INSTALLED FOR MASTER KEYING TO WSU SYSTEM.
- 4A. EXTERIOR CONDENSER FARM AREA TO HAVE GRASS REMOVED, NON WOVEN GEOTEXTILE WEED BARRIER PLACED OVER ENTIRE AREA WITH SEAMS OVERLAPPED MINIMUM ONE FOOT IN ALL DIRECTIONS, AND INSTALL 4" PEA GRAVEL ON TOP OF PLASTIC OVER ENTIRE AREA.
- 5. INSTALL 1/4" DRYWALL OVER ENTIRE CEILING AFTER REMOVAL OF PLASTER SLOTS FOR DUCTWORK/PIPING INSTALLATION. PAINT CEILING.
- 6. CUT PLASTER SLOTS ANGLED AWAY FROM OPENING (BACKCUT) IN MINIMAL SIZE NECESSARY FOR INSTALLATION/THREADING OF DUCTWORK/PIPING IN JOIST SPACES (SEE DOTTED BOXES INDICATING RELATIVE SIZE OF SLOTS.) PROVIDE PLASTER PATCH AFTER INSTALLATION. REPAINT ENTIRE CEILING.
- 7. ALIGN NEW 12" DEEP DRYWALL SOFFIT WITH WEST LEADING EDGE OF ADJACENT CEILING CORNICE CORNER. SOFFIT TO ENCLOSE EAST/WEST DUCTWORK/PIPING AND CONNECTIONS. PAINT SOFFIT AND CEILING.
- 8. 12" DEEP DRYWALL SOFFIT IN WIDTHS REQUIRED TO ENCLOSE ALL INSTALLED DUCTWORK/PIPING, ETC. PAINT SOFFIT, CEILING AND CORNICE.

9. REMOVE BASE AND DAMAGED PLASTER (APPROXIMATELY 4 SQUARE FEET).

- PATCH PLASTER, REINSTALL BASE AND PAINT WALLS FULL HEIGHT TO NÉAREST VERTICAL CORNER.
- 10. REMOVE ANY WALL TRIM, REMOVE 3" DEEP NICHE IN BRICK WALL FULL HEIGHT FOR INSTALLATION OF DUCTWORK/PIPING. INSTALL 5/8" DRYWALL OVER ENTIRE WALL AND THEN REINSTALL WOOD TRIM. PAINT WALL.
- 11. CONSTRUCT A/C UNIT PLATFORMS ABOVE EXISTING CEILING JOISTS, SPANNING BETWEEN BEARING WALLS AS SHOWN. PLATFORM FRAMING TO BE 2X10'S 16" O.C. WITH 2X4 BLOCKING BETWEEN JOISTS 4'-0" O.C. AND ABOVE BEARING WALL SUPPORTS. PROVIDE 3/4" PLYWOOD PLATFORM SURFACE BENEATH A/C UNITS EXTENDING MINIMUM 2'-0" FROM ALL SIDES OF UNITS.
- 12. ELEVATED PLATFORM FOR A/C UNIT #8 (ABOVE #4) TO BE CONSTRUCTED OF SIMILAR FRAMING AND SIZE OF BASE PLATFORM AND BE SUPPORTED AT EACH END, ABOVE THE RESPECTIVE BEARING WALL, WITH A 2x4 STUD PARTITION IN HEIGHT AS REQUIRED FOR A/C UNIT CLEARANCES. PROVIDE DIAGONAL BRACING BETWEEN 2x4 STUD WALLS AND PLATFORM FOR RIGIDITY.
- 13. INSTALL AN ADDITIONAL 4" OF CELLULOSE INSULATION OVER THE EXISTING MATERIAL THROUGHOUT THE ENTIRE ATTIC SURFACE, AND REMOVE/REPLACE WOOD WALKWAY BOARDS AS NECESSARY TO PROVIDE CONTINUOUS COVERAGE OF ALL ATTIC FLOOR SURFACE AREAS.
- 14. INSTALL REPRODUCTION WOOD PANEL DOOR TO MATCH EDISTING HISTORIC DOORS IN SPECIES, FINISH, PROFILES, DETAILS, CONSTRUCTION, DIMENSIONS AND WITH HARDWARE TO ALSO MATCH.
- 15. INSTALL SUSPENDED "FINELINE" 2'X2' ACOUSTICAL CEILING GRID WITH MINIMUM GRID LINES CENTERED IN SPACE AND WITH NON-FISSURED CEILING PADS

SHEET METAL GENERAL NOTES

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- 4. DUCTWORK/PIPING SHALL NOT BE INSTALLED IN A LOCATION THAT RESTRICTS THE ACCESS TO MECHANICAL DEVICES REQUIRING ACCESS.
- 5. THE CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL, ETC. FOR THE PROPER INSTALLATION OF ALL MECHANICAL SYSTEMS.
- 6. COORDINATE FLOOR, WALL, ROOF PENETRATIONS, LOUVER SIZES, PAD LOCATIONS ETC. WITH ARCHITECTURAL TRADES. SEAL ALL PIPING AND DUCT PENETRATIONS.
- 7. COORDINATE AND PROVIDE ACCESS DOORS IN HARD CEILING AREAS FOR ACCESS TO BALANCING DAMPERS. ETC.
- 8. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
- 9. PAINT ALL VISIBLE INTERIOR SURFACES OF EXHAUST/RETURN GRILLES, REGISTERS AND VISIBLE ASSOCIATED DUCTWORK FLAT BLACK.
- 10. PROVIDE CODE REQUIRED CLEARANCE/ACCESS DOORS FOR DAMPERS, VALVES, AND CLEANOUTS LOCATED IN WALLS OR ABOVE HARD CEILINGS.
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(#) SHEET METAL KEYED NOTES

- 1. 2 1/2" FLOOR MOUNTED AIR DISTRIBUTION NOZZLE. COORDINATE NOZZLE FINISH WITH OWNER.
- 2. RETURN AIR IS LOCATED ON THE BOTTOM OF THE VERTICAL A/C UNIT.
 MOUNT EQUIPMENT STAND TO ALLOW ACCESS TO FILTER AND NOT OBSTRUCT
 AIRFLOW INTO THE UNIT.
- 3. 2 1/2" CEILING MOUNTED AIR DISTRIBUTION NOZZLE. COORDINATE NOZZLE FINISH WITH OWNER.
- 4. INSTALL RETURN GRIILLE ABOVE WOOD BASE TRIM. ROUTE 12X10 RETURN DUCT UP TO CEILING SPACE FOR CONNECTION OF OUTSIDE AIR DUCT.
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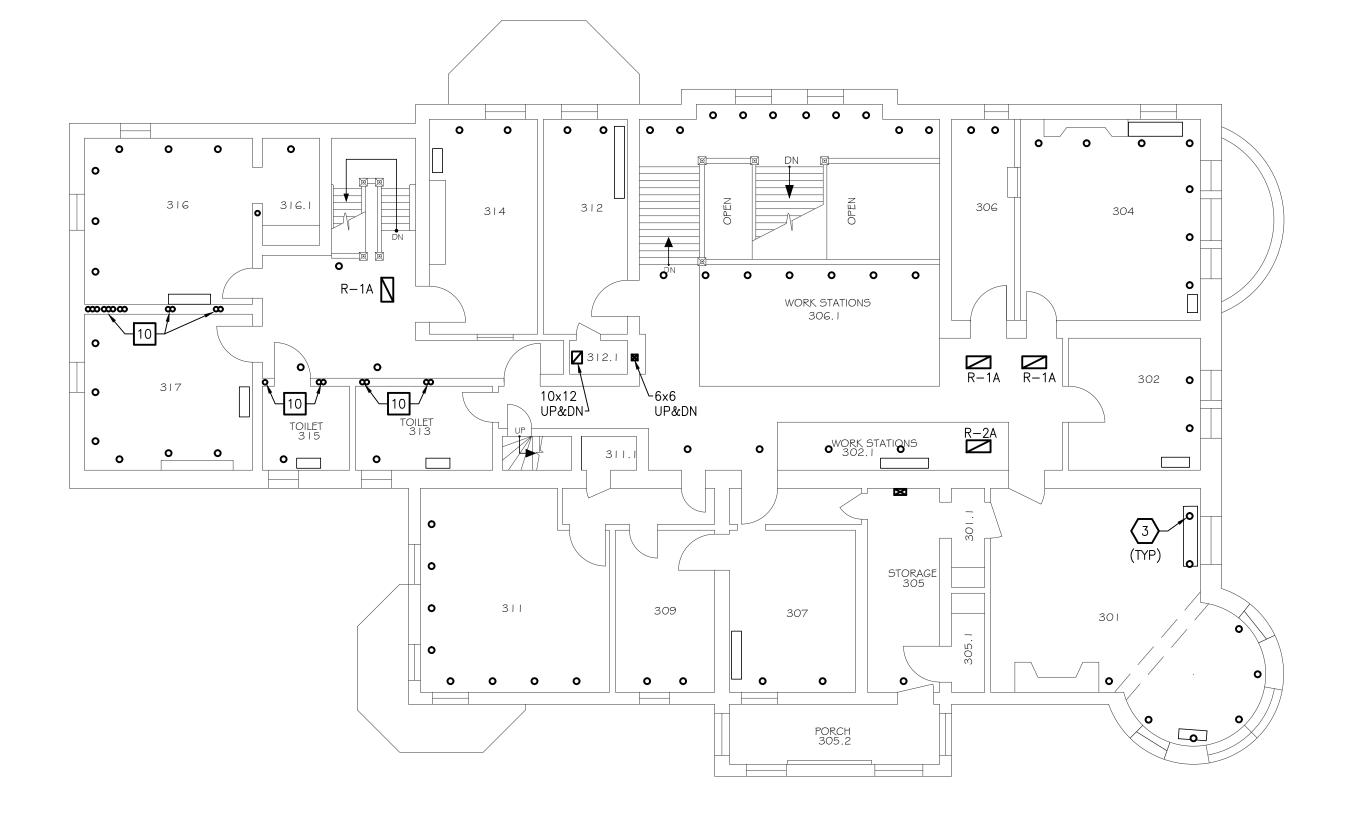
BASEMENT AND FIRST FLOOR ARCHITACTURAL AND SHEET METAL PLAN

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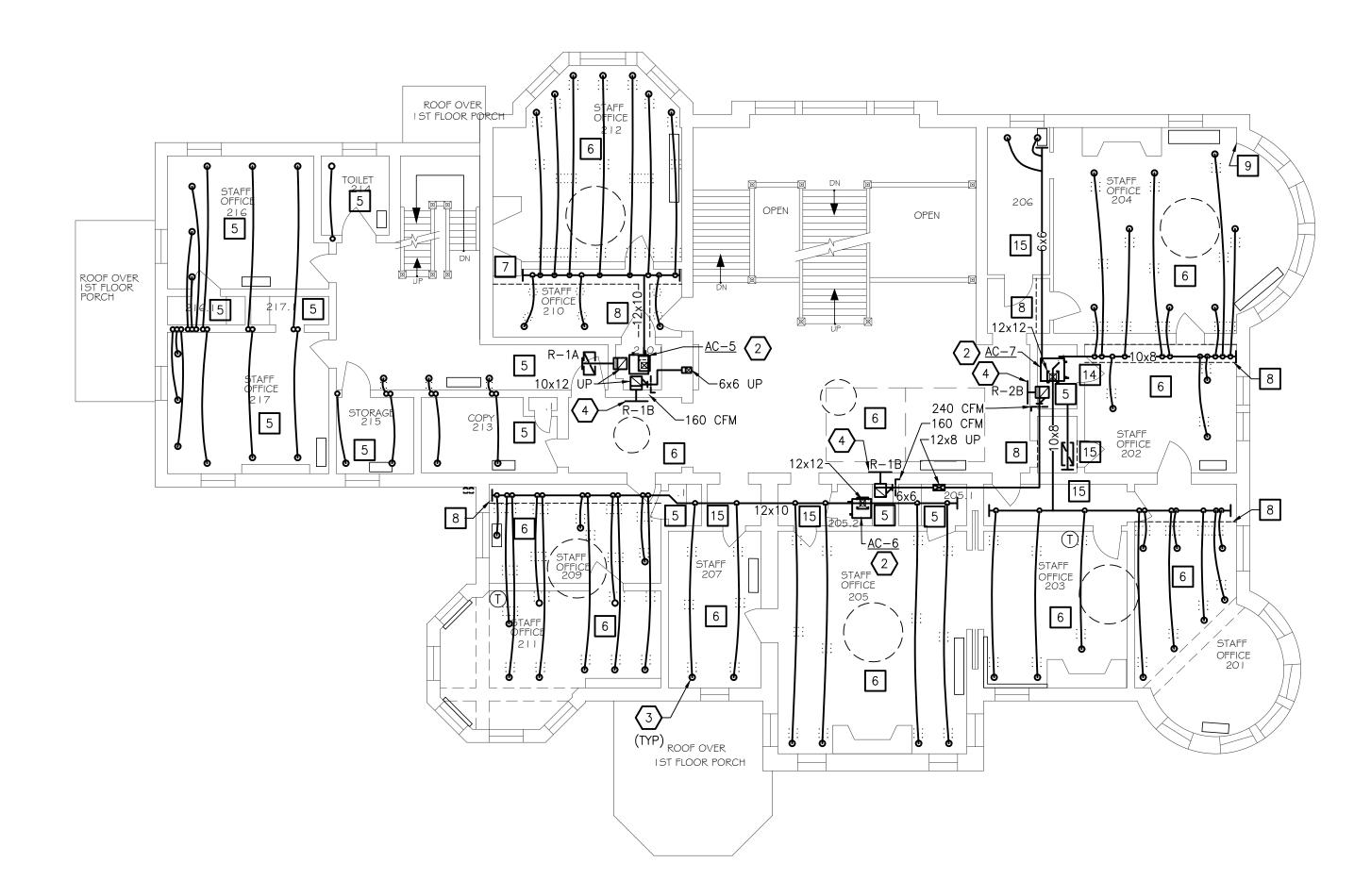
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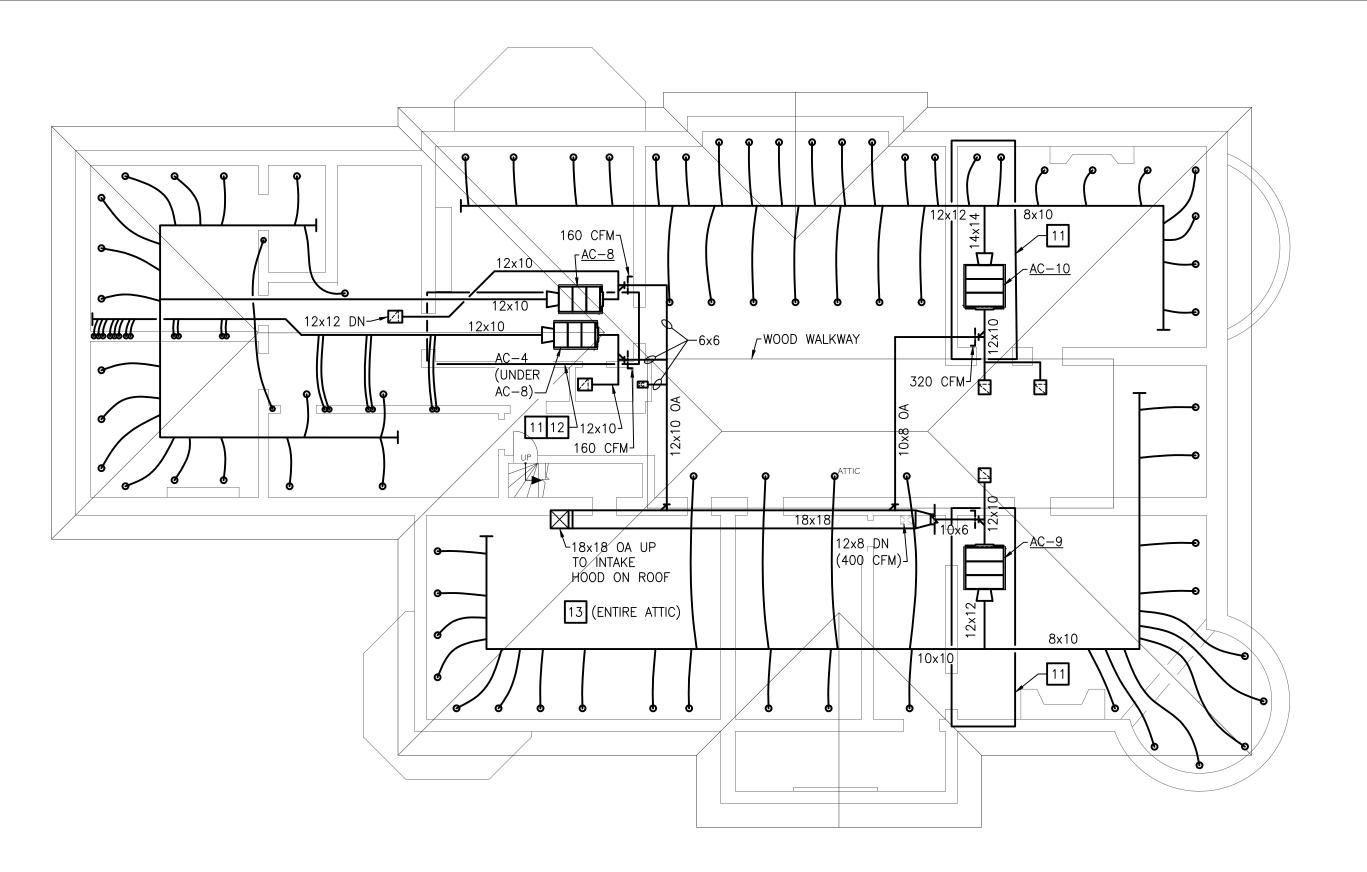






SECOND FLOOR ARCHITECTURAL AND SHEET METAL PLAN

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





ARCHITECTURAL KEYED NOTES

- 1. INSTALL DUCTWORK/PIPING ABOVE EXISTING SUSPENDED ACOUSTICAL CEILING.
- 2. REMOVE DAMAGED PLASTER IN FLAT WALL AREAS (APPROXIMATELY 50 SQUARE FEET) TO SOLID SUBSTRATE AND INSTALL NEW PLASTER (GROUND/ROUGH/FINISH COATS). CLEAN LOOSE MATERIAL FROM EDGES OF DECORATIVE CEILING CORNICE ELEMENTS (DENTILS, EGGS/DARTS, ETC) TO SOLID MATERIAL. PAINT ENTIRE NORTH WALL AFTER PLASTER WORK IS COMPLETE.
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- 4. INSTALL 8FT HIGH STEEL FENCING (SATIN BLACK FINISH) WITH VERTICAL SPINDLES 4" O.C. AND DECORATIVE ARROW TIP CAPS. FENCE POSTS TO BE SET IN 8" DIAMETER BY 3'-6" DEEP CONCRETE FOUNDATIONS. DOUBLE GATES TO HAVE CYLINDER LOCK INSTALLED FOR MASTER KEYING TO WSU SYSTEM.
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- 5. INSTALL 1/4" DRYWALL OVER ENTIRE CEILING AFTER REMOVAL OF PLASTER SLOTS FOR DUCTWORK/PIPING INSTALLATION. PAINT CEILING.
- 6. CUT PLASTER SLOTS ANGLED AWAY FROM OPENING (BACKCUT) IN MINIMAL SIZE NECESSARY FOR INSTALLATION/THREADING OF DUCTWORK/PIPING IN JOIST SPACES (SEE DOTTED BOXES INDICATING RELATIVE SIZE OF SLOTS.) PROVIDE PLASTER PATCH AFTER INSTALLATION. REPAINT ENTIRE CEILING.
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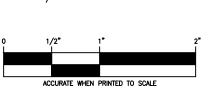
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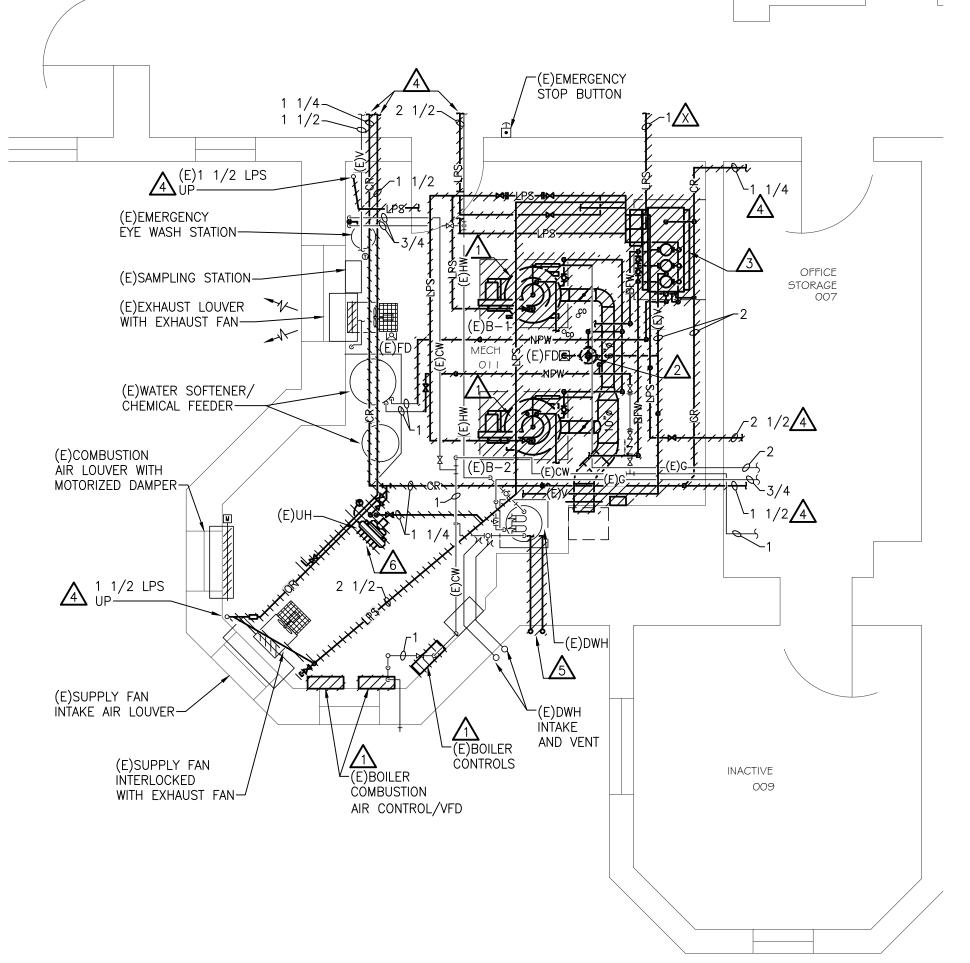
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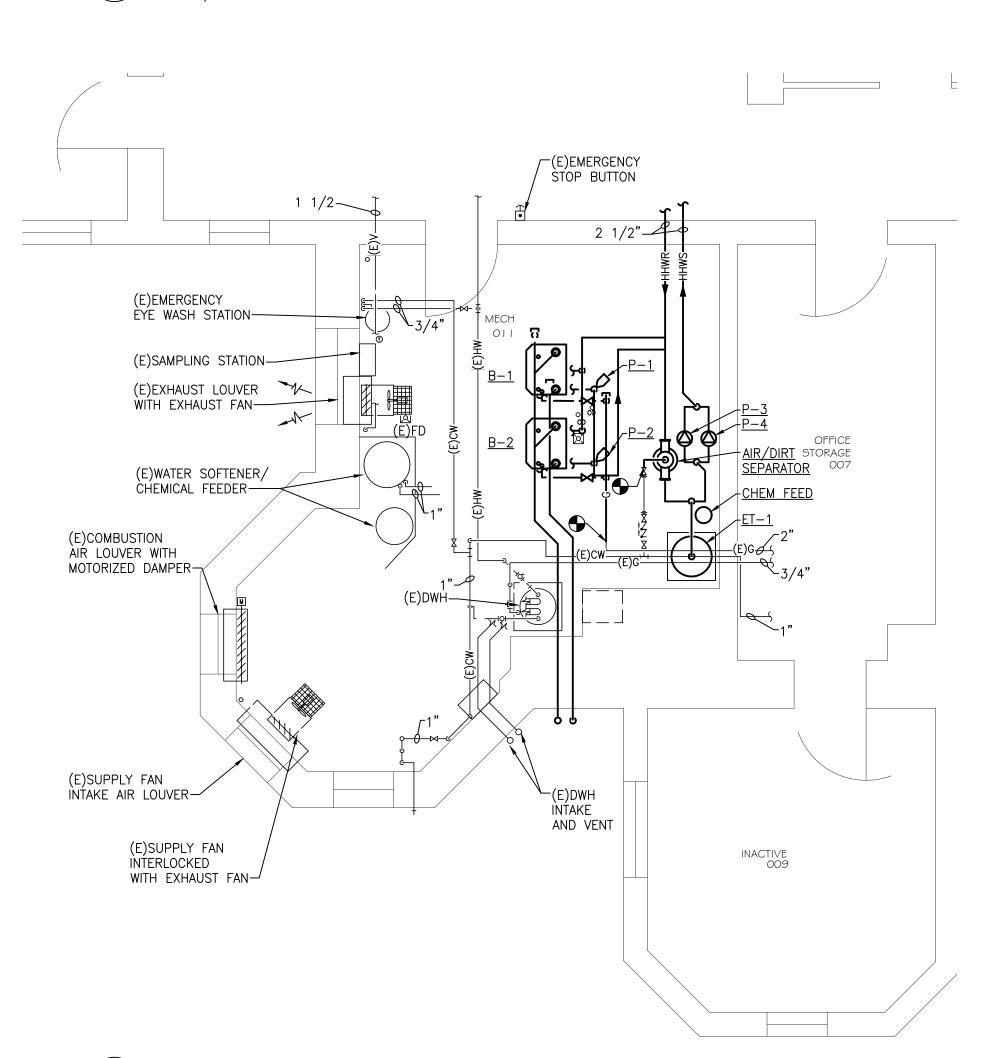
SECOND, THIRD, AND ATTIC ARCHITECTURAL AND SHEET METAL PLAN

SHEET NUMBER:

MH1.2



ENLARGED BASEMENT MECHANICAL ROOM DEMOLITION PLAN SCALE:1/4" = 1'-0"







- 1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.
- 2. PRIOR TO COMMENCEMENT OF WORK, CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH EXISTING SITE CONDITIONS, SYSTEMS, AND UTILITIES. NOTIFY ARCHITECT OF ANY INTERFERENCES OR DISCREPANCIES.
- 3. VERIFY DEPTH, SIZE, LOCATIONS AND CONDITION OF EXISTING UTILITIES IN THE FIELD, INCLUDING POINTS OF CONNECTION PRIOR TO STARTING ANY WORK.
- 4. ANY INTERRUPTIONS OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE PRESENT BUILDING'S OPERATION.
- 5. ALL ITEMS ON DEMOLITION PLAN SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED. ALL WORK INDICATED ON PLANS HAS BEEN LOCATED PER EXISTING DRAWINGS AND/OR FIELD OBSERVATION AND REQUIRES FIELD VERIFICATION.
- 6. ALL ITEMS INDICATED WITH CROSS—HATCHING SHALL BE REMOVED COMPLETE, WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, INSULATION, CONTROLS, ETC. CAP ALL OPEN ENDED PIPES AND DUCTS.
- 7. ALL EXISTING WORK TO REMAIN SHALL BE PROTECTED FROM DAMAGE. WHERE DUCT OR PIPE INSULATION HAS BEEN DAMAGED DURING DEMOLITION, THE CONTRACTOR SHALL REPAIR INSULATION AS REQUIRED TO MATCH EXISTING.
- 8. THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL EQUIPMENT BEING REMOVED. ALL ITEMS REMOVED SHALL BE LEGALLY DISPOSED OF. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXISTING RELOCATED AND OWNER PROVIDED EQUIPMENT.

- 1. REMOVE STEAM BOILERS COMPLETE, INCLUDING ALL ASSOCIATED STEAM AND CONDENSATE PIPING, VENTING, FLUE DUCTWORK, CONTROLS, ACCESSORIES AND CONCRETE HOUSEKEEPING
- 2. REMOVE BLOW-DOWN SEPARATOR COMPLETE, INCLUDING ALL ASSOCIATED PIPING, VENTING, CONTROLS AND ACCESSORIES.
- 3. REMOVE CONDENSATE RECEIVER AND PUMP SKID COMPLETE, INCLUDING ALL ASSOCIATE PIPING, VENTING CONTROLS, ACCESSORIES AND CONCRETE HOUSEKEEPING PAD.
- 4. REMOVE ALL CONDENSATE RETURN, STEAM OR HEATING HOT WATER PIPING IN AND LEAVING MECHANICAL ROOM. IF LINES RUN UP THROUGH FLOOR, DISCONNECT PIPING BELOW FLOOR/CEILING LINE AND CAP. REMOVE ALL ASSOCIATED HANGERS AND SUPPORTS FROM PIPING TO BE REMOVED.
- 5. REMOVE BOILER SYSTEM VENT PIPING THROUGH WALL AND FROM EXTERIOR OF BUILDING.
- 6. REMOVE UNIT HEATER COMPLETE, INCLUDING ALL ASSOCIATED PIPING, CONTROLS AND ACCESSORIES.

HVAC GENERAL NOTES

- 1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF THE WORK. PROVIDE HVAC SYSTEMS COMPLETE PER SPECIFICATION, SMACNA STANDARDS, AND PER APPLICABLE CODES INCLUDING ALL NECESSARY OFFSETS, FITTINGS, SPECIAL RADIUS OR MITERED ELBOWS WHICH ARE REQUIRED DUE TO SPACE CONSTRAINTS OR STRUCTURAL CONDITIONS OR OTHER CONDITIONS.
- 2. CONTRACTOR SHALL COORDINATE THEIR WORK WITH THE WORK OF ALL OTHER TRADES. ALL DUCTWORK IS TO BE ROUTED AS HIGH A POSSIBLE. PROVIDE ACCESS AROUND ALL NEW EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. VERIFY ALL CLEARANCES PRIOR TO THE FABRICATION OF ANY WORK
- 3. DUCTWORK/PIPING SHALL BE ROUTED AS HIGH AS POSSIBLE AND SHALL NOT BE LOCATED OVER ELECTRICAL EQUIPMENT/PANELS. PROVIDE REQUIRED CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT. DUCTWORK/PIPING SHALL NOT INTERFERE WITH ELECTRICAL EQUIPMENT CLEARANCE.
- 4. DUCTWORK/PIPING SHALL NOT BE INSTALLED IN A LOCATION THAT RESTRICTS THE ACCESS TO MECHANICAL DEVICES REQUIRING ACCESS.
- 5. THE CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL, ETC. FOR THE PROPER INSTALLATION OF ALL MECHANICAL SYSTEMS.
- 6. COORDINATE FLOOR, WALL, ROOF PENETRATIONS, LOUVER SIZES, PAD LOCATIONS ETC. WITH ARCHITECTURAL TRADES. SEAL ALL PIPING AND DUCT PENETRATIONS
- 7. THE CONTRACTOR SHALL REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATION OF GRILLES, REGISTERS, AND DIFFUSERS.
- 8. COORDINATE AND PROVIDE ACCESS DOORS IN HARD CEILING AREAS FOR ACCESS TO BALANCING DAMPERS, ETC. REFER TO ARCHITECTURAL DRAWINGS FOR CEILING TYPES.
- 9. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
- 10. PROVIDE CODE REQUIRED CLEARANCE/ACCESS DOORS FOR DAMPERS, VALVES, AND CLEANOUTS LOCATED IN WALLS OR ABOVE HARD CEILINGS. COORDINATE LOCATIONS WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPES.
- 11. CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS. TRANSITIONS TO ALL EQUIPMENT SHALL BE VERIFIED AND PROVIDED FOR EQUIPMENT FURNISHED.



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CLIENT:

Wayne State University

Design and Construction Services 5454 Cass Avenue Detroit, MI 48202

PROJECT:

Beecher House 5475 Woodward Ave., Detroit, MI 48202



Seal:

ISSUED BIDS	FOR:		08/27/21
ISSUE	D		DATE

SHEET TITLE:

DESIGNER:

ENGINEER:

ENLARGED BASEMENT
MECHANICAL ROOM
DEMOLITION AND NEW
WORK PLANS

SHEET NUMBER:

M4.0

				CO	NDE	NSIN	IG U	NIT S	SCHE	EDU	LE			
	UNIT	NOMINAL	MINIMUM	DESIGN	NO. OF		ELEC	TRICAL		D	ISCONN	ECT	MANUFACTURER/	
UNIT ID	SERVED	TONNAGE	SEER	AMBIENT (°F)	FANS	МОСР	MCA	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	MODEL NO.	REMARKS
CU-1	AC-1	1.5	14	95	1	25	17	208	1	E	Е	SWITCH	LENNOX ML14XC1	
CU-2	AC-2	3	14	95	1	40	23.4	208	1	E	Е	SWITCH	LENNOX ML14XC1	
CU-3	AC-3	4.5	14	95	1	40	24.2	208	1	Е	Е	SWITCH	LENNOX ML14XC1	
CU-4	AC-4	2	14	95	1	25	17	208	1	E	E	SWITCH	LENNOX ML14XC1	
CU-5	AC-5	2	14	95	1	25	17	208	1	E	Е	SWITCH	LENNOX ML14XC1	
CU-6	AC-6	2	14	95	1	25	17	208	1	E	Е	SWITCH	LENNOX ML14XC1	
CU-7	AC-7	3	14	95	1	40	23.4	208	1	E	Е	SWITCH	LENNOX ML14XC1	
CU-8	AC-8	2	 									SWITCH	LENNOX ML14XC1	
CU-9	AC-9	3	14	95	1	40	23.4	208	1	E	Е	SWITCH	LENNOX ML14XC1	
CU-10	AC-10	4	14	95	1	40	24.2	208	1	Е	Е	SWITCH	LENNOX ML14XC1	

1. PROVIDE OUTDOOR UNITS WITH EQUIPMENT PADS. 2. PROVIDE UNITS ON BALCONY WITH ELEVATED EQUIPMENT SUPPORTS AND VIBRATION ISOLATION.

		GRILLE	, REGIS	TER ANI	D DIFF	USER	SCHEDUL	E							
UNIT ID	FACE SIZE	DAYLIGHT OPENING	MOUNTING	ACCESSORY	FINISH	MATERIAL	PRICE/ MODEL NO.	REMARKS							
R-1	24x12 22.25x10.25 FLOOR - WHITE STEEL LG250														
R-1A	24x12	22.25x10.25	CEILING	-	WHITE	STEEL	LG250								
R-1B	24x12	22.25x10.25	WALL	-	WHITE	STEEL	LG250								
R-2	29x14	26.75x12.5	FLOOR	-	WHITE	STEEL	LG250								
R-2A	29x14	26.75x12.5	CEILING	-	WHITE	STEEL	LG250								

										M	ODU	JLAR HI	GH ST	ATIC	CAIF	R HAI	NDLI	NG	UNI	T SCH	HEDUL	.E									
			SI	UPPLY FAN	l			DX C	COOLING	COIL						HE	ATING C	OIL					El	_ECTRIC/	AL		D	ISCONN	ECT		
UNIT ID	ASSOCIATED OUTDOOR	AIR FLOW (CFM)	MAX ESP	DRIVE		TOTAL	SENSIBLE		A)	IR.		REFRIGERANT	MIN. TOTAL		AIR				WAT	ER	_						ELIDN	INCT		MANUFACTURER/ MODEL	REMARKS
	UNIT	(3.1.)	(IN WG)	TYPE	HP	CAPACITY (MBH)	CAPACITY (MBH)	EDB (°F)	EWB (°F)	LDB (°F)	LWB (°F)	TYPE	CAPACITY (MBH)	EAT (°F)	LAT (°F)	APD (IN WG)		EWT (°F)	LWT (°F)	MAX WPD (FT HD)	CONTROL VALVE	МОСР	MCA	FLA	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	TIODEE	
AC-1	CU-1	450	1.3	ECM	1/3	18	15	80	67	55	54.8	R-410A	19.5	50	90	0.10	1.7	150	127	2.0	3-WAY	15	7.0	5.6	120	1	E	Е	SWITCH	M1218	
AC-2	CU-2	900	1.3	ECM	1/3	42	34	80	67	55	54.8	R-410A	39.1	50	90	0.11	3.4	150	127	2.0	2-WAY	20	12.8	10.2	120	1	E	Е	SWITCH	M3642	
AC-3	CU-3	1350	1.3	ECM	1/3	48	38	80	67	55	54.8	R-410A	58.6	50	90	0.20	5.1	150	127	2.0	3-WAY	20	12.8	10.2	120	1	E	Е	SWITCH	M4860	
AC-4	CU-4	600	1.3	ECM	1/3	30	24	80	67	55	54.8	R-410A	26.0	50	90	0.12	2.3	150	127	2.0	2-WAY	15	7.0	5.6	120	1	Е	Е	SWITCH	M2430	
AC-5	CU-5	600	1.3	ECM	1/3	30	24	80	67	55	54.8	R-410A	26.0	50	90	0.12	2.3	150	127	2.0	2-WAY	15	7.0	5.6	120	1	E	Е	SWITCH	V2430	VERTICAL CONFIGURATION
AC-6	CU-6	600	1.3	ECM	1/3	30	24	80	67	55	54.8	R-410A	26.0	50	90	0.12	2.3	150	127	2.0	2-WAY	15	7.0	5.6	120	1	E	Е	SWITCH	V2430	VERTICAL CONFIGURATION PROVIDE CONDENSATE DRAIN PUMP
AC-7	CU-7	900	1.3	ECM	1/3	42	34	80	67	55	54.8	R-410A	39.1	50	90	0.11	3.4	150	127	2.0	3-WAY	20	12.8	10.5	120	1	E	Е	SWITCH	V3642	VERTICAL CONFIGURATION PROVIDE CONDENSATE DRAIN PUMP
AC-8	CU-8	600	1.3	ECM	1/3	30	24	80	67	55	54.8	R-410A	26.0	50	90	0.12	2.3	150	127	2.0	2-WAY	15	7.0	5.6	120	1	E	E	SWITCH	M2430	
AC-9	CU-9	900	1.3	ECM	1/3	42	34	80	67	55	54.8	R-410A	39.1	50	90	0.11	3.4	150	127	2.0	2-WAY	20	12.8	10.2	120	1	Е	E	SWITCH	M3642	
AC-10	CU-10	1200	1.3	ECM	1/3	48	38	80	67	55	54.8	R-410A	52.1	50	90	0.18	4.5	150	127	2.0	3-WAY	20	12.8	10.2	120	1	E	Е	SWITCH	M4860	

- 1. COORDINATE EXACT MODEL NUMBERS FOR EACH UNICO MODULE WITH EQUIPMENT SUPPLIER. 2. PROVIDE EACH UNIT WITH SUPPLY AND RETURN TRANSITIONS/ADAPTERS.
- 3. PROVIDE EACH UNIT WITH PROPERLY SIZED DRAIN PAN TO MEET UNIT CONFIGURATIONS.

								В	OILE	R SC	CHE	DUL	=							
UNIT ID FUEL TYPE GAS PRESS MIN - MAX (IN WG) FUEL TYPE GAS PRESS MIN - MAX (IN WG) WBH) FUEL TYPE WBH) FUEL TY											ISCONNEC INST. BY	TYPE	MANUFACTURER/ MODEL NO.	REMARKS						
							(GFI4I)	(1)	(1)	(11110)						DI	DI			
B-1	NAT GAS	4-10.5	399	380	10:1	55	29	125	150	5.7	15	7	12	120	1	E	Е	SWITCH	NTI TRINITY Tft399	
B-2	NAT GAS	4-10.5	399	380	10:1	55	29	125	150	5.7	15	7	12	120	1	E	E	SWITCH	NTI TRINITY Tft399	

1. PROVIDE FLOOR STAND FOR EACH BOILER AND ATTACHMENT TWINING KIT. 2. PROVIDE EACH BOILER WITH CONDENSATE NEUTRALIZATION KIT.

				TERIA KNESS						JAC	KET			
INDOOR PIPE SYSTEM AND	FIBERGLASS	CELLULAR GLASS	MINERAL WOOL	PHENOLIC	POLYISOCYANURATE CELLULAR PLASTIC	CALCIUM SILICATE	FLEXIBLE ELASTOMERIC CELLULAR INSULATION (FECI)	PVC	ALUMINUM	TYPE 304 STAINLESS STEEL	SELF-ADHESIV (FOR OUTDOOR APPLICATIONS)	PVDC (INDOOR)	PVDC (OUTDOOR)	KEYED NOTES
HEATING HOT WATER (UP		-	:5)											
2 AND SMALLER	1							Х	Х					Α
2 1/2 AND LARGER	1.5							Х	Х					Α
			'RIGID	COPPE	ER)			•						!
REFRIGERANT SUCTION AN	ID HOT	GAS ((11012											1
REFRIGERANT SUCTION AN	ID HOT	GAS (1	Х	Х					
	1			COPPE	R)		1	Х	Х					
ALL SIZES	1			COPPE	R)		1	X	X					
ALL SIZES REFRIGERANT SUCTION AN	1 ND HOT	GAS ((SOFT			S)		l						
ALL SIZES REFRIGERANT SUCTION AN	1 ND HOT PIPE S	GAS ((SOFT	SIZE (INCHE	S)		l						
ALL SIZES REFRIGERANT SUCTION AN ALL SIZES OUTDOOR, ABOVEGROUND	1 ND HOT PIPE S	GAS ((SOFT	SIZE (INCHE	S)		l			X			В
ALL SIZES REFRIGERANT SUCTION AN ALL SIZES OUTDOOR, ABOVEGROUND REFRIGERANT SUCTION &	1 D PIPE S HOT G	GAS (SYSTEI AS (RI	(SOFT)	SIZE (INCHE	rs)	1	l	Х		X			В

STEEL JACKET.

- 1. 'X' OR THICKNESS IN INCHES INDICATES ACCEPTABLE SELECTION. IF MORE THAN ONE SELECTION IS INDICATED,
- CONTRACTOR MAY SELECT FROM THOSE INDICATED SELECTIONS.
 2. INSULATE PIPING WITHIN AIR HANDLING EQUIPMENT THE SAME AS INDOOR PIPING. PROVIDE ALUMINUM OR STAINLESS

A. PROVIDE FIELD APPLIED JACKET FOR PIPING EXPOSED IN EQUIPMENT ROOMS, STORAGE ROOMS, JANITORS CLOSETS, RECEIVING ROOMS, TEST AREAS, CIRCULATION AREAS AND SUCH AREAS SUBJECT TO DAMAGE WITHIN 10 FEET (3 METERS) OF FINISHED FLOOR.

B. PROVIDE MANUFACTURER'S RECOMMENDED PROTECTIVE COATING FOR FLEXIBLE ELASTOMERIC THERMAL INSULATION.

				LO	UVER	SCHE	DULE			
UNIT ID	EQUIPMENT SERVED	DUTY	CFM	OVERALL SIZE (W x H)	FREE AREA (SQ FT)	S.P. (IN. WG)	MAX S.P. (IN. WG)	FREE AREA MAX VELOCITY (FPM)	MANUFACTURER/ MODEL NO.	REMARKS
L-1	CU-8, 9, 10	RELIEF	2400	19.5x48	3.6	0.06	0.1	800	GREENHECK ESD-635	
L-2	AC-1, 2, 3	INTAKE	720	48x12	0.99	0.08	0.1	755	GREENHECK ESD-635	

1. PROVIDE INTERNAL BIRD SCREEN 2. CHANNEL FRAME. ANODIZE CLEAR FINISH.

A	ВО	VE	GR	OU	IND) H\	/AC	PI	PIN	IG	API	PLI(CA	TIO	N S	SCH	HED	UL	E.	
					MATE	ERIAL		ISO	LATIO	N VAL	.VES			C	CONNE	CTIO	N			
PIPE SIZE (INCHES)	TYPE "M" (HARD) COPPER	TYPE "L" (HARD) COPPER	TYPE "K" (SOFT) COPPER	CARBON STEEL (SCHEDULE 40)	CARBON STEEL (SCHEDULE 80)	CARBON STEEL (STANDARD)	COPPER TYPE DWV	BALL	GENERAL SERVICE BUTTERFLY	HI-PERFORMAANCE BUYTTERFLY	GATE (OS&Y)	GROOVED	THREADED	FLANGED	WELDED	SOLDERED	BRAZED	PRESSURE SEAL	MECHANICALLY FORMED TEE	KEYED NOTES
HEATING HOT WATER	R (UP T	O 200°	PF)																	
UP TO 2		Х						Х								Х	Х	Х	Х	
2 1/2 TO 4				Х					Х			Χ		Х	Х					А
GENERAL NOTES:																				

- 1. 'X' INDICATES ACCEPTABLE SELECTION. IF MORE THAN ONE MATERIAL IS INDICATED FOR A PIPING SYSTEM, CONTRACTOR MAY SELECT FROM THOSE INDICATED SELECTIONS.
- 2. GROOVED END VALVES MAY BE USED WITH GROOVED END PIPING. 3. HVAC EQUIPMENT DRAINS, VENTS, SAFETY VALVE PIPING, BLOWDOWN PIPING AND THE LIKE SHALL BE SAME PIPING MATERIAL AS ASSOCIATED PIPING SYSTEM.
- 4. USE UNIONS OR FLANGES AT VALVE AND EQUIPMENT CONNECTIONS. 5. DISSIMILAR-METAL PIPING JOINTS: CONSTRUCT JOINTS USING DIELECTRIC FITTINGS COMPATIBLE WITH BOTH PIPING MATERIALS.
- NPS 2 (DN 50) AND SMALLER: USE DIELECTRIC UNIONS, COUPLINGS, OR NIPPLES/WATERWAYS. NPS 2-1/2 TO NPS 4 (DN 65 TO DN 100): USE DIELECTRIC NIPPLES/WATERWAYS, DIELECTRIC FLANGES, OR DIELECTRIC FLANGE INSULATION KITS.

A. GROOVED FITTINGS, JOINTS AND COUPLINGS MAY BE USED IN MECHANICAL ROOMS ONLY.

				IN	TAKE/	RELII	EF HO	OOD :	SCHE	DULE					
UNIT ID	SYSTEM SERVED AIRFLOW (CFM) THROAT SIZE (IN) THROAT VELOCITY (FPM) THROAT VELOCITY (FPM) WIDTH LENGTH (IN) LENGTH (IN) CURB HOOD CONSTRUCTION MANUFACTURER/ MODEL NO. REMARKS														
IH-1	OUTSIDE AIR	1440	18x18	640	0.96	28	36	16	8	GALVANIZED	GREENHECK FGI	PROVIDE WITH INSECT AND BIRD SCREEN TYPICAL			

1. PROVIDE ROOF CURB FOR PITCHED ROOF. FIELD VERIFY PITCH ANGLE.

						F	PUMP	SCI	HED	ULE						
			FLOW	HEAD		ELEC	TRICAL		D	ISCONN	ECT	S	TARTER		MANUIEACTURED/	
UNIT ID	SYSTEM SERVED	TYPE	(GPM)	(FT)	ВНР	НР	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	TYPE	FURN. BY	INST. BY	MANUFACTURER/ MODEL NO.	REMARKS
P-1	BOILER (B-1)	IN-LINE	29	15	-	2/5	120	1	М	Е	H-C	D-A	М	E	BELL & GOSSETT PL-100	
P-2	BOILER (B-2)	IN-LINE	29	15	-	2/5	120	1	М	E	H-C	D-A	М	E	BELL & GOSSETT PL-100	
P-3	HEATING HOT WATER (SYSTEM)	IN-LINE	31	25	-	1.0	120	1	М	E	H-C	D-A	М	E	BELL & GOSSETT E-90 1.5 AAB	PROVIDE WITH ECM MOTOR
P-4	HEATING HOT WATER (SYSTEM)	IN-LINE	31	25	-	1.0	120	1	М	Е	H-C	D-A	М	E	BELL & GOSSETT E-90 1.5 AAB	PROVIDE WITH ECM MOTOR

1. PERFORMANCE BASED ON WATER, UNLESS OTHERWISE INDICATED. 2. PUMPS SHALL BE NON-OVERLOADING.

	EXPANSION TANK SCHEDULE											
UNIT ID	SYSTEM SERVED	TYPE	MIN PSIG	MAX PSIG	MIN (°F)	MAX (°F)	SYSTEM VOLUME (GAL)	TANK VOLUME (GAL)	DIA (IN)	HEIGHT (IN)	MANUFACTURER/ MODEL NO.	REMARKS
ET-1	HEATING HOT WATER	BLADDER	23	55	50	150	50	10	10	37.25	BELL&GOSSETT B-35LA	

1. PERFORMANCE BASED ON WATER.

				MATE	ERIAL	-			I		ATIOI VES	N	P	PRESS	SURE	CON	NECT	TION:	6		GRA\ CONI				
PIPE SIZE (INCHES)	TYPE "M" (HARD) COPPER	TYPE "L" (HARD) COPPER	TYPE "K" (SOFT) COPPER	CARBON STEEL (SCHEDULE 40)	CARBON STEEL (STANDARD)	NO HUB CISPI	COPPER DWV	CSST	ВАЦ	AGA BALL	GENERAL SERVICE BUTTERFLY	LUBRICATED PLUG	WELDED	THREADED	GROOVED	SOLDERED	BRAZED	FLANGED	INSERT & CRIMP	SOLVENT WELDED	SOLDERED	FUSION	CISPI HUBLESS	HEAVY DUTY HUBLESS	KEYED NOTES
ABOVE GROUND PIPIN	lG																								
COLD CONDENSATE D	RAIN																								
ALL SIZES	Х						Х									Х	Х				Х				
PUMPED COLD CONDE	NSAT	E DRA	AIN																						
UP TO 2	Х								Χ							Χ	Х								
NATURAL GAS																									
UP TO 2				Χ						Χ			Χ	Х											
2 1/2 TO 3				Χ						Χ			Χ					Χ							
4 TO 10				Х								Х	Х					Х							

- 1. 'X' INDICATES ACCEPTABLE SELECTION. IF MORE THAN ONE MATERIAL IS INDICATED FOR A PIPING SYSTEM, CONTRACTOR MAY SELECT FROM THOSE INDICATED
- 2. GROOVED END VALVES MAY BE USED WITH GROOVED END PIPING.
- 3. USE UNIONS OR FLANGES AT VALVE AND EQUIPMENT CONNECTIONS. 4. DISSIMILAR-METAL PIPING JOINTS: CONSTRUCT JOINTS USING DIELECTRIC FITTINGS COMPATIBLE WITH BOTH PIPING MATERIALS.
- NPS 2 (DN 50) AND SMALLER: USE DIELECTRIC UNIONS, COUPLINGS, OR NIPPLES/WATERWAYS. NPS 2-1/2 TO NPS 4 (DN 65 TO DN 100): USE DIELECTRIC NIPPLES/WATERWAYS, DIELECTRIC FLANGES, OR DIELECTRIC FLANGE INSULATION KITS. 5. PLUMBING EQUIPMENT DRAINS, VENTS, SAFETY VALVE PIPING, BLOWDOWN PIPING AND THE LIKE SHALL BE THE SAME PIPING MATERIAL AS ASSOCIATED PIPING SYSTEM.



SES Project # 21 0407 01

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Wayne State University Design and Construction Services 5454 Cass Avenue Detroit, MI 48202

PROJECT:

Beecher House 5475 Woodward Ave., Detroit, MI 48202



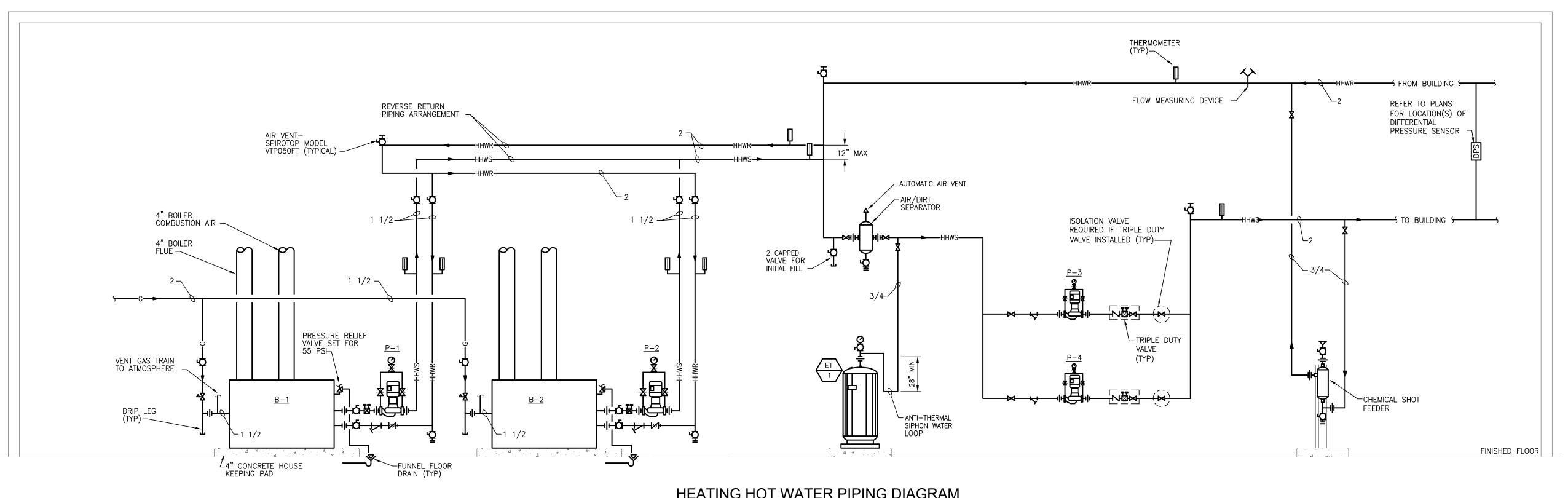
Seal:

ISSUED FOR: BIDS	08/27/2
ISSUED	DAT

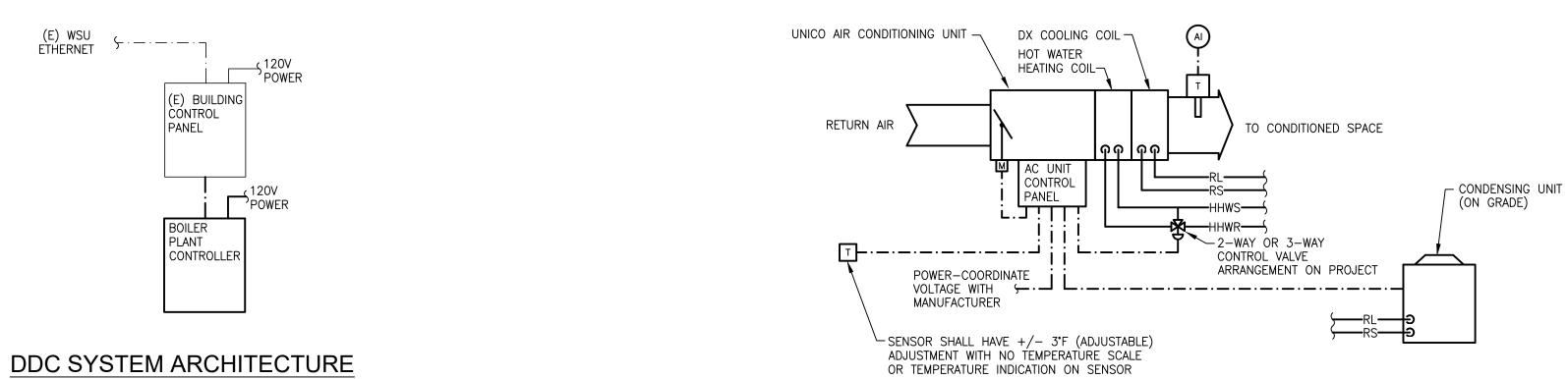
SHEET TITLE:

DESIGNER: **ENGINEER:**

MECHANICAL SCHEDULES



HEATING HOT WATER PIPING DIAGRAM



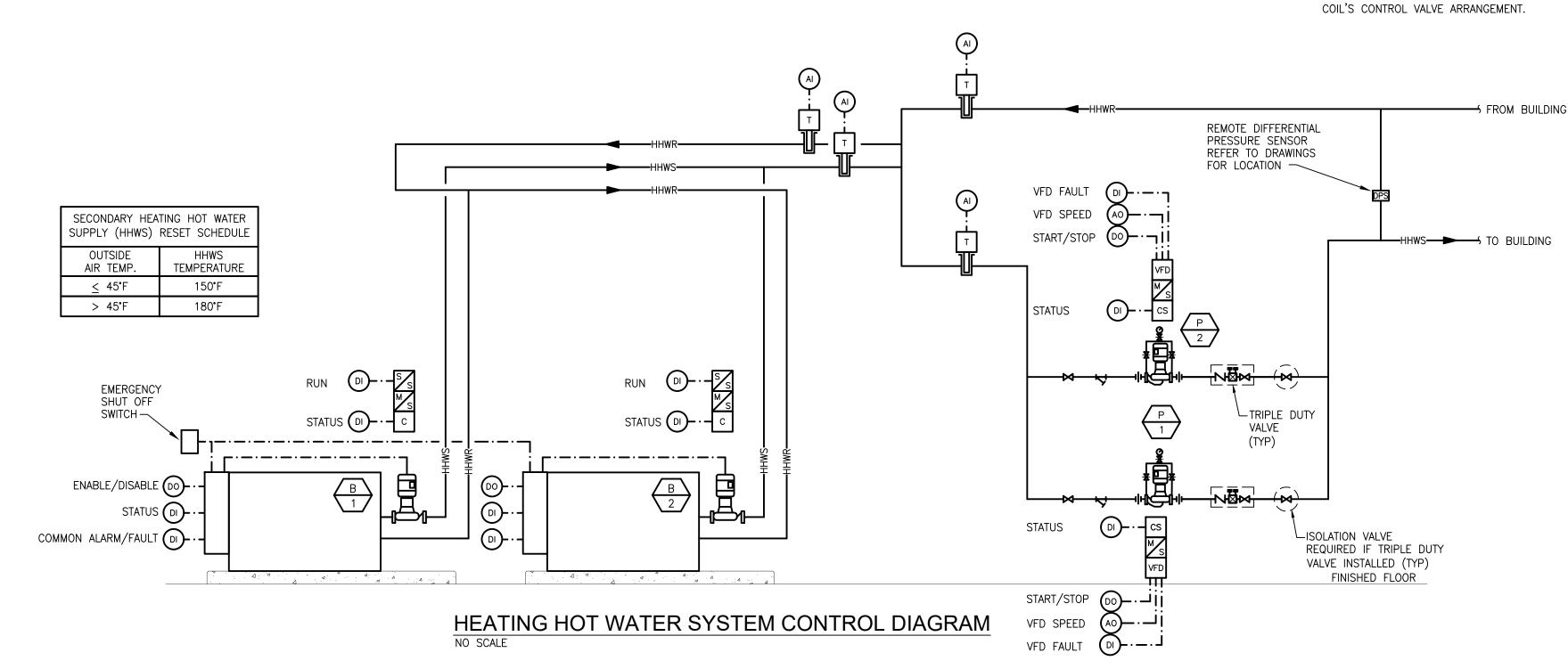
BUILDING AUTOMATION SYSTEM NOTES:

1. CONNECT NEW BOILERS TO EXISTING BUILDING CONTROL PANEL. COORDINATE WITH WSU REQUIREMENTS.

TYPICAL UNICO AIR CONDITIONING **UNIT CONTROL DIAGRAM**

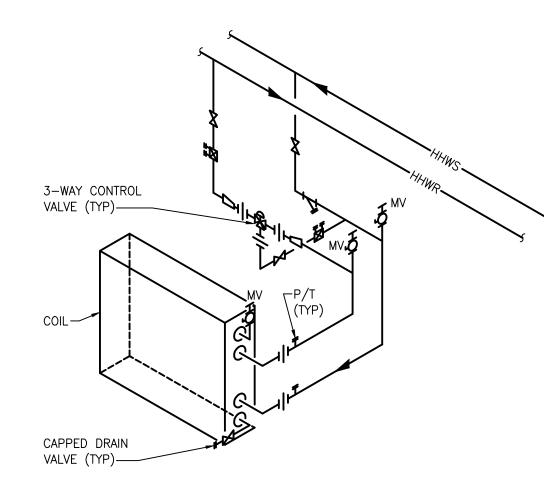
NOTE:

1. REFER TO SCHEDULE TO DETERMINE EACH

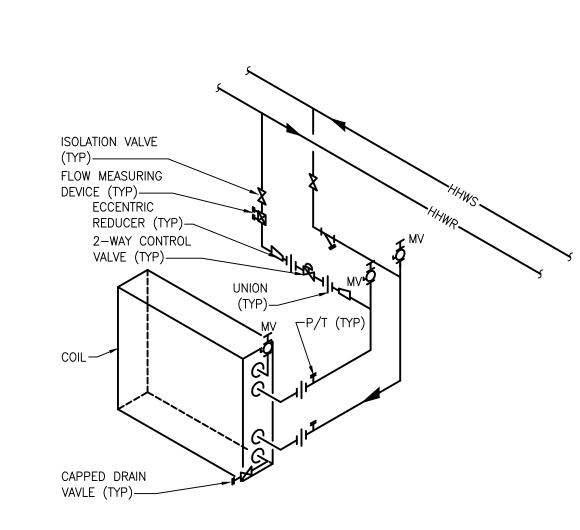


HEATING HOT WATER SYSTEM SEQUENCE OF OPERATIONS: NOTE: ALL SETPOINTS AND TIME INTERVALS SHALL BE ADJUSTABLE BY THE SYSTEM

- 1. WITH THE HYDRONIC HEATING SECONDARY PUMPS' HAND/AUTO/OFF SWITCH IN THE "AUTO" POSITION, THE DDC SYSTEM SHALL ENERGIZE THE LEAD PUMP. ONE OF THE TWO PUMPS SHALL BE DESIGNATED "LEAD PUMP" AND SHALL OPERATE CONTINUOUSLY. THE OTHER PUMPS SHALL SERVE AS THE "STANDBY PUMP".
- 2. THE DDC SYSTEM SHALL ALTERNATE PUMP OPERATION BASED ON RUN TIME HOURS OR AT THE BEGINNING OF EACH MONTH.
- 3. EACH PUMP WILL PROVE OPERATION TO THE DDC SYSTEM WITH ITS CURRENT SWITCH. IF A PUMP FAILS, AN ALARM WILL BE SENT TO THE DDC SYSTEM AND THE STANDBY PUMP WILL BE ACTIVATED.
- 4. THE BOILER CONTROL PANEL SHALL ALTERNATE BOILER OPERATION BASED ON RUN TIME HOURS. IF A BOILER FAILS, AN ALARM WILL BE SENT TO THE DDC SYSTEM AND THE STANDBY BOILER WILL BE ACTIVATED.
- 5. UPON A CALL FOR HEATING, THE BOILER PRIMARY PUMP SHALL BE ENERGIZED AND RUN WHENEVER THE BOILER IS FIRING. AFTER FLOW IS PROVEN BY THE PUMPS CURRENT SWITCH, THE BOILER SHALL MODULATE FIRING RATE TO MAINTAIN THE SYSTEM SUPPLY WATER TEMPERATURE.
- 6. IF THE PRIMARY BOILER CANNOT MAINTAIN SYSTEM SETPOINT, THE SECOND BOILER SHALL BE ENERGIZED.
- 7. WHEN THE EMERGENCY SHUT OFF SWITCH IS ACTIVATED, THE BOILERS AND PUMPS SHALL IMMEDIATELY BE DE-ENERGIZED.
- 8. THE BUILDING DDC SYSTEM SHALL MONITOR AND GRAPHICALLY SHOW THE FOLLOWING POINTS: ALL TEMPERATURE POINTS INDICATED, BOILER STATUS, BOILER ALARM, PUMP ALARM, AND OUTSIDE AIR TEMPERATURE.



HEATING COIL PIPING DIAGRAM (3-WAY VALVE) NO SCALE



HEATING COIL PIPING DIAGRAM (2-WAY VALVE) NO SCALE



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SES Project # 21 0407 01

Wayne State University

Design and Construction Services 5454 Cass Avenue Detroit, MI 48202

PROJECT:

Beecher House 5475 Woodward Ave., Detroit, MI 48202



Seal:

ISSUED FOR: BIDS 08/27/21

DATE ISSUED **DESIGNER: ENGINEER:**

SHEET TITLE:

MECHANICAL PIPING

DIAGRAMS AND CONTROLS

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for

B. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining

construction that might be misconstrued as damage caused by selective structure

selective structure demolition work to Owner's Representative for review prior to commencement of work. 1. Proposed dust-control and noise-control measures.

1.04 QUALITY ASSURANCE A. Contractor Qualifications: Engage only subcontractors who can demonstrate not less than five years successful experience in work of similar character. B. Standards: Comply with NFPA 241.

1.05 PROJECT CONDITIONS A. Occupancy: The Owner will be continuously occupying spaces immediately adjacent to areas of selective structure demolition. Conduct selective structure demolition work in such manner that will minimize need for disruption of normal operations.

B. Condition of Structures: Owner assumes no responsibility for actual condition of items to be demolished. C. Asbestos is NOT expected to be encountered in the course of this Contract. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Architect and the Owner.

D. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective structure demolition work. 1. Protect from damage existing finish work that is to remain in place and becomes

1. Asbestos will be removed by Owner before start of Work.

exposed during demolition operations. 2. Protect floors with suitable coverings when necessary. 3. Construct temporary dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof

E. Damages: Promptly repair damages caused to adjacent facilities by structure demolition work at no cost to Owner. 1.06 SCHEDULING

A. Arrange selective structure demolition operations so as not to interfere with Owner's existing on-site operations. PART 2 PRODUCTS

2.01 MATERIALS

A. General: Except as otherwise indicated or approved by Architect, provide materials for selective demolition which will result in equal-or-better work than the work being cut-and-patched in terms of performance characteristics, including visual effect where applicable. Comply with the requirements, and use materials identical to original materials where feasible and where recognized that satisfactory results can be produced PART 3 EXECUTION

3.01 EXAMINATION A. Prior to commencement of selective structure demolition work, inspect areas in which B. When unanticipated mechanical, electrical, and structural elements are encountered, and conflict with intended design, investigate and measure the nature and extent of conflict.

Promptly submit a report in writing to Architect C. Survey condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective structure demolition operations. 3.02 UTILITY SERVICES

A Maintain existing utilities indicated to remain in service and protect against damage during selective structure demolition operations. 1. Do not interrupt existing utilities serving occupied or operating facilities, except when

A. Conduct structure demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective structure demolition area. B. Erect and maintain dustproof partitions and closures as required to prevent spread of

authorized in writing by the Owner or authorities having jurisdiction

dust or fumes to occupied portions of the building. 3 04 DEMOLITION A. Demolish and remove existing construction only to extent required by new construction

B. Perform selective structure demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations. C. Employ only skilled tradesmen to perform selective structure demolition. D. Cut work by methods least likely to damage work to be retained and work adjoining.

Neatly cut openings and holes square, plumb, and true to size required. E. In general, where physical cutting action is required, cut work with sawing and grinding tools, not with hammering and chopping tools.

1. Maintain portable fire-suppression devices during flame-cutting operations. F. Remove decayed, vermin—infested, or otherwise dangerous or unsuitable materials and G. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power driven masonry saw or hand tools; do not use power driven impact tools

3.05 PATCHING AND REPAIRS A. Promptly patch and repair damaged surfaces caused to adjacent construction by selective structure demolition operations. B. Patch with seams which are durable and as invisible as possible. Comply with specified

tolerances for the work. C. Restore exposed finishes of patched area; and where necessary, extend finish restoration onto retained work adjoining in manner to eliminate evidence of patching. D. Closely match finish and texture of existing adjacent surfaces.

E. Where selective structure demolition terminates at a surface, finish, or substrate to remain, completely remove all traces of material selectively demolished, including mortar beds. Provide smooth, even substrate transition.

F. Where patching smooth painted surfaces, extend final coat of paint over entire unbroken surface, after patched and repaired area has received primer and second coat. .06 DISPOSAL OF DEMOLISHED MATERIALS A. Remove debris, rubbish and other materials resulting from demolition operations from

building site. Do not allow demolished materials to accumulate on-site. Transport and dispose of materials off-site in legal manner in an EPA-approved landfill. 1. If hazardous materials are encountered during demolition operations, immediately stop work in the area affected and report the condition to the Owner and Architect i writing. If Owner determines the hazardous materials are asbestos or PCB's, do no further work in the area until the materials are either removed or rendered harmless and the area has been certified safe by appropriate authorities.

3.07 CLEAN-UP AND REPAIR A. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean. B. Repair demolition performed in excess of that required. Return surfaces to remain to condition existing prior to commencement of selective structure demolition work. Repair adjacent construction or surfaces soiled or damaged by selective structure demolition

C. Clean adjacent portion of the structure and improvements of dust, dirt and debris caused by demolition operations, as directed by the Architect and Owner, or governing authorities. Return adjacent greas to conditions existing prior to start of work. FND OF SECTION

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 GENERAL 1.01 SUBMITTALS

A. Product Data: Provide material certificates for all lumber and plywood. B. Moisture Protection: Contractor must develop a moisture protection plan and moisture

control plan for wood materials. C. Avoid storing materials where they are exposed to rain, snow or standing water. Keep materials covered. PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS A. Lumber Standards: Comply with PS 20 and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee (ALSC) Board of Review. 2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S. B. Moisture Content: MC19. C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Gradel per WCLIB (GR) or WWPA G-5 rules. 2. Boards: Southern Pine No.2 Boards per SPIB rules, or any other graded construction board per WCLIB or WWPA rules.

3. Plywood: PS 2 type, rated Structural I Plywood Sheathing. a. Bond Classification for exterior applications: Exterior b. Bond Classification for interior applications: Exposure I

2.03 ACCESSORIES A. Fasteners and Anchors: Provide fasteners of size and type indicated to comply with requirements specified.

 Where rough carpentry is exposed to weather, in ground contact or in areas of high relative humidity, provide fasteners made of Hot-dipped galvanized steel per ASTM A 153/A 153MI or type 304 stainless steel.

2. Anchors: Toggle bolt type for anchorage to hollow masonry. PART 3 EXECUTION 3.01 INSTALLATION — GENERAL

surfaces, unless otherwise indicated.

A. Use common wire nails, unless otherwise indicated. Make tight connections between members. Install fasteners without splitting wood; predrill as required. 3.02 FRAMING INSTALLATION A. Set structural members level, plumb, and true to line. Discard pieces with defects that

would lower required strength or result in unacceptable appearance of exposed members. B. Install structural members full length without splices unless otherwise specifically detailed. C. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by lapplicable codes and AWC (WFCM) Wood Frame Construction Manuall.

3.0.3 BLOCKING NAILERS AND SUPPORTS A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim. Form shapes shown and cut as required for true line and level of attached work. B. Attach to substrates to support applied loading. Recess bolts and nuts flush with

END OF SECTION

SECTION 06 2013 - HISTORIC STILE & RAIL DOOR

PART 1 GENERAL 1.01 SECTION INCLUDES

A. Reconstruction of historic stile & rail paneled closet door in room #202. 1.02 SUBMITTALS A. Product Data: Submit manufacturer's wood door product data.

B. Shop Drawing: Submit shop drawings showing door elevation, all dimensions of panels, stiles, rails, door construction details, etc. Also, submit manufacturer's cuts on proposed matching historic hardware including hinges, passage set, strike etc. C. Samples: Submit two corner samples of mockup panel/stile/rail section of historic door design with finish/species/joinery to match existing doors, 12" square samples.

1.03 QUALITY ASSURANCE A. Restoration Specialist Qualifications: Company specializing in fabricating the products specified in this section with minimum 10 years of documented experience, with sufficient production capacity to produce required units without causing delay in the Work. B. Quality Standard: Unless otherwise indicated, comply with Architectural Woodwork Standards for grades of woodwork, construction, finishes and other requirements C. Assume undivided responsibility for architectural woodwork including fabrication, finishing

D. Single Source responsibility: Obtain primary repair materials from a single manufacturer. Provide secondary materials as recommended by the manufacturer of the primary 1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from weather and contact with damp or wet surfaces. B. Discard materials and remove from job ite materials damaged in handling or storage and any materials that have been subjected to conditions contrary to the manufacturer's recommendations or product which has exceeded it's shelf life C. Perform work only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish can be applied in accordance with

D. Do not install carpentry materials that are wet, moisture or mold damaged. 1.05 PROJECT CONDITIONS A. Field Measurements: Check actual dimensions of existing historic door frame by accurate field measurements before manufacturing door; show recorded measurements on final shop drawings. Coordinate manufacturer's schedule with construction progress to avoid

PART 2 PRODUCTS 2.01 MANUFACTURERS A. Blackberry Window and Door Systems, Inc.: Kalamazoo, MI (800) 732-9400

B. Century Restoration; South Haven, MI (616) 443-0169 C. Deppe Enterprises, LLC; Marshall, MI (269) 781-8020 D. Full Spectrum Stained Glass; Colon, MI (269) 432-2610 E. H & R Window Repair Company; Hazel Park, MI (248) 544-8282 F. Looking Glass Studio; Lansing, MI (517) 626-0006 G. Kelly Windows: Detroit, MI (313) 861-6910 H. Midtown Craftsmen, LLC; Grand Rapids, MI (616) 245-5970 I. R & J Raven Corporation; Grand Rapids, MI (616) 245-5684

finish manufacturer's recommendations.

sawed/sliced.

J. Sevonty Restoration; Detroit, MI (313) 622-5582 K. Wood Window Repair; Ann Arbor, MI (734) 604-4778 2.02 HISTORIC STILE AND RAIL DOOR RECONSTRUCTION A. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Construction, General: Comply with the following requirements: 1. Grade of Doors for Transparent Finish: Premium. 2. Wood Species and Cut for Transparent Finish: Match existing historic species, plain

3. Stile and Rail Construction for Transparent Finish: Clear lumber; may be edge glued r width. Select stock for similarity of grain and color, and arrange for optimum match between adjacent pieces. 4. Raised Panel Construction for Transparent Finish: Shaped, edge-glued, clear-lumber panel faces alued to both sides of a wood-based panel product. Select face stock for similarity of grain and color, and arrange for optimum match between adjacent

C. Interior Doors: Comply with the following requirements: 1. Stile and Rail Widths/Molding Profiles/Raised Panel Thickness/Panel Design: Match existing historic doors 2.03 FARRICATION A. Fabricate stile and rail wood doors in sizes indicated for Project site fitting.

B. Factory fit doors to meet existing historic wood frame dimensions, with the following uniform clearances and bevels, unless otherwise indicated: 1. Clearances: Provide 1/8 inch at heads, jambs. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering. C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI WDHS.3. Comply with, existing door frame dimeinsions, Shop Drawings,

BHMA A156.115W standards, and hardware templates. 2.04 SHOP PRIMING A. Transparent Finish: Shop seal faces and edges of doors for transparent finish with stain to match existing historic doors. 2.05 FACTORY FINISHING

A. Comply with AWI/AWMAC/WI (AWS) Section 5, unless otherwise indicated. B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling, and other similar preparations required for finishing. C. Transparent Finish: Comply with requirements indicated below for grade, finish system

staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D523. 1. Grade: Premium 2. AWS Finish System: Catalyzed polyurethane. 3. Staining: As approved by Architect to match existing historic door finish.

3.01 INSTALLATION A. Hardware: Match existing historic door hardware. B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as

indicated in 2.03 B 1. above; do not trim stiles and rails in excess of limits set by manufacturer. Machine doors for hardware. Seal cut surfaces after fitting and

D. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at Project site. 3.02 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

3.03 CLEANING AND PROTECTION A. Finished Doors: Refinish or replace doors damaged during installation. B. Protect doors as recommended by door manufacturer to ensure wood doors are without damage or deterioration at time of Substantial Completion. FND OF SECTION

SECTION 07 2126 - BLOWN INSULATION PART 1 GENERAL 1.01 SECTION INCLUDES A. Attic: Loose insulation pneumatically placed, and poured into joist spaces.

1.02 REFERENCES A. ASTM C 739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation; B. ASTM C 1015 - Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation: 2006.

1.03 SUBMITTALS A. Product Data: Provide data on product characteristics, performance criteria, limitations. 1. Recycled Content: Indicate percentage of pre-consumer and post-consumer recycled

B. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation. C. Certificates: Certify products of this section meet or exceed specified requirements. D. Provide certification that lists the following:

1. Type of insulation 2. Manufacturer 3. Initial installed thickness 4. Settled R-Value 5. Installed density

4. Sheen: Satin 30 gloss units.

PART 3 EXECUTION

6. Coverage area 7. Number of bags installed on the iob site.

E. Installer must sign, date and post a copy of the certification in a conspicuous location PART 2 PRODUCTS 2.01 MANUFACTURERS

A. Blown Insulation: 1. CertainTeed Corporation U.S. GreenFiber. 3. International Cellulose Corp.

4. Johns Manville Corporation. 2.02 MATERIALS

A. Loose Fill Insulation: ASTM C 739, cellulose fiber type, bulk for pneumatic placement. 1. Recycled Content: Minimum 75 percent post-consumer content. 2. Thermal Conductivity: 0.27 BTU in/(hr sq ft deg F).

3. Installed Thickness: As indicated on Drawings. PART 3 EXECUTION 3.01 EXAMINATION A. Verify substrate, adjacent materials, and insulation are dry and ready to receive B. Verify light fixtures have thermal cut-out device to restrict over-heating in soffit or

ceiling spaces. C. Verify spaces are unobstructed to allow placement of insulation. 3 02 INSTALLATION A. Install insulation per ASTM C 1015 and manufacturer's instructions.

B. Place insulation pneumatically to completely fill ceiling joist spaces in attic. C. Completely fill intended spaces. Leave no gaps or voids. 3.03 CLEANING

A. Remove loose insulation residue. END OF SECTION SECTION 08 8000 - GLAZING

PART 1 GENERAL 1.01 PERFORMANCE REQUIREMENTS A. Provide glass and glazing produced, fabricated and installed to withstand normal thermal movement, wind loading, impact loading (where applicable), without failure including loss

or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials, and other defects in the work.

1, Direct Hung unless otherwise indicated.

and suspension system indicated

PART 3 EXECUTION

3.01 FXAMINATION

3 02 PREPARATION

3.03 INSTALLATION

not less than 0.106 inch diameter (12 gage).

until unsatisfactory conditions have been corrected

borders, and comply with reflected ceiling plans.

below, manufacturer's instructions and CISCA (AC)

necessary to conceal edges of acoustical units.

system runners and edge moldings.

SECTION 09 9100 - PAINTING

3.04 CLEANING AND PROTECTION

PART 1 GENERAL

classification.

1. Samples submitted must be dry.

for review of in-place work.

finishes of prepared samples

to be painted.

PART 2 PRODUCTS

2. PPG Paints(PPG)

PART 3 EXECUTION

before paint is applied.

2.01 MANUFACTURERS

2.02 MATERIALS

3.01 EXAMINATION

3.02 PREPARATION

1.04 ENVIRONMENTAL REQUIREMENTS

products of one of the following:

The Sherwin-Williams Co.(SW)

1. Benjamin Moore and Co.(Moore)

product identification will not be acceptable.

coatings. Remove oil and grease prior to cleaning.

substrates primed by others.

subsequent surface deterioration.

substrate and type of material being applied.

detrimental to formulation of a durable paint film.

2. Provide finish coats compatible with primers used.

cause the undercoat to lift or lose adhesion

uniform finish, color, appearance and coverage.

imperfections will not be acceptable.

discarded paint materials from the site.

or defaced painted surfaces.

3.05 INTERIOR PAINT SCHEDULE

applicators per manufacturer's directions.

recommended by manufacturer.

due to insufficient sealing.

prime coated by others.

requirements.

3.04 ICLEANING AND PROTECTION

each separate coat.

3.03 APPLICATION

card stock.

1.03 FIELD SAMPLES

1.01 SECTION INCLUDES

1.02 SUBMITTALS

Remove and replace dented, bent, or kinked members.

and repaired to permanently eliminate evidence of damage.

C. Edge Moldings and Trim: Metal of types and profiles indicated, or if not indicated,

A. Examine substrates and structural framing to which ceiling system attaches or abuts with

that affect installation and anchorage of ceiling system. Do not proceed with installation

installer present for compliance with requirements specified in this and other sections

A. Measure each ceiling area and establish layout of acoustical units to balance border

1. Standard for Installation of Ceiling Suspension Systems: ASTM C636/C636M.

C. Install suspension system runners square and securely interlocked with one another.

D. Install acoustical panels with undamaged edges and fitted accurately into suspension

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings and

E. Install acoustical panels in coordination with suspension system, with edges concealed by

support of suspension members. Scribe and cut panels to fit accurately at border and

suspension members. Comply with manufacturer's instructions for cleaning and touch-up

of minor finish damage. Remove and replace work which cannot be successfully cleaned

END OF SECTION

A. Work includes surface preparation, painting and finishing of interior items and surfaces.

B. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers

and fillers, and other applied materials whether used as prime, intermediate or finish

C. Paint exposed surfaces of new ayosum board soffits, ceiling & wall plaster patching and

1. Provide manufacturer's technical information including label analysis and instructionsfor

2. List each material and cross-reference the specific coating, finish system and

material to be applied, with texture to simulate actual conditions, on 12 inch by 12 inch

1. Provide full-coat finish samples in each room on minimum 10 sq. ft. of surface until

3. Architect will select one surface in each room for each type of coating and substrate

A. Do not apply paint where conditions of airborne debris or contamination exist or could

A. Manufacturers: Subject to compliance with requirements including color selection, provide

A. Material Compatibility: Provide primers, finish coat materials and related materials

application as demonstrated by manufacturer based on testing and field experience

B. Material Quality: Provide manufacturer's best quality trade sale paint material of the

C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service

to match existing historic paint colors in each room as acceptable to the Architect.

A. Examine substrates and conditions under which painting will be performed for compliance

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting

fixtures and similar items already installed that are not to be painted. Where removal is

not practical, provide surface-applied protection prior to surface preparation and painting.

1. Protect adjacent surfaces with suitable covering or other method during work progress.

2. After completion of painting operations, reinstall items removed using workers skilled in

1. Provide barrier coats over incompatible primers or remove and reprime. Notify I

where multiple coats of the same material are applied. Tint undercoats to match color

of finish coat, but provide sufficient differences in shade of undercoats to distinguish

A. Apply paint per manufacturer's directions. Use applicators and techniques best suited for

1. Paint colors to be custom to match historic existing paint colors in each room as

3. The number of coats and film thickness required is the same regardless of application

a. Give special attention to ensure surfaces, including edges, corners, crevices, welds

and exposed fasteners receive a dry film thickness equivalent to flat surfaces.

2. Apply additional coats if undercoats, stains, and other conditions show through final

3. Allow sufficient time between successive coats to permit proper drying. Do not recoat

until paint has dried to where it feels firm, does not deform or feel sticky or

moderate thumb pressure and where application of another coat of paint does not

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated or

otherwise prepared for painting as soon as practicable after preparation and before

coat of paint until paint film is of uniform finish, color, and appearance

D. Application Procedures: Apply paints and coating by brush, roller, spray or other

recommended spreading rate. Provide total dry film thickness of entire system as

recommended by manufacturer to material required to be painted or finished and not

G. Pigmented (Opaque) Finishes: Completely cover to provide a smooth opaque surface of

1. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface

1. After completion of painting, clean glass and paint—spattered surfaces. Remove

B. Protect work of other trades, whether to be painted or not, against damage by painting.

Correct damage by cleaning, repairing or replacing, and repainting as acceptable to l

C. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective

wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touchup and restore damaged

spattered paint by washing and scraping. Be careful not to scratch or damage

H. Completed Work: Match approved custom samples for color, sheen texture and coverage

in each room. Remove, refinish or repaint work not complying with specified

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish and other

1. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas

in first coat appears, to assure a finish coat with no burn through or other defects

E. Minimum Coating Thickness: Apply materials no thinner than manufacturer's

F. Prime Coats: Before applying finish coats, apply a prime coat of material as

1. At existing, previously painted surfaces, apply finish coats only.

Architect in writing about anticipated problems using specified finish—coat material with

B. Cleaning: Before applying paint or other surface treatments, clean new and previously

painted (existing) substrates of substances that could impair the bond of the various

C. Surface Preparation: Clean and prepare surfaces to be painted in conformance with

manufacturer's instructions for each particular substrate condition and specified.

D. Materials Preparation: Carefully mix and prepare paint materials per manufacturer's

E. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces or conditions

with paint application requirements. Surfaces receiving paint must be thoroughly dry

D. Colors: Acceptability of any manufacturer is contingent upon availabilit

compatible with one another and the substrates indicated under conditions of service and

various coating types specified. Paint material containers not displaying manufacturer's

required sheen, color, and texture are obtained; simulate finished lighting conditions

B. Samples for Initial Verification Purposes: Provide samples of each color, sheen and

A. Field Samples: On wall surfaces and other exterior and interior components, duplicate

application. Identify each material by the manufacturer's catalog number and general

adjacent surfaces to the patched area to the edges of surface corners or edge of

A. Product Data: Submit product data for each paint system specified.

2. Resubmit until required color, sheen and texture is achieved.

2. Final acceptance of colors will be from field samples.

handling, storage and application of each material proposed for use.

widths at opposite edges of each ceiling. Avoid use of less-than-half width units at

A. General: Install acoustical ceiling systems to comply with installation standard referenced

B. Install edge moldings of type indicated at perimeter of acoustical ceiling area and where

B. Glass Selection: Provide glass lites to match the thickness of existing glass lites in upper sash of the existing double hung windows. Glass thickness/strength should be 1.02 DEFINITIONS

A. Mismatch: Imperfect alignment 1.03 SUBMITTALS A. Samples: Submit 12" square sample of window glass

1.05 WARRANTY

1.04 QUALITY ASSURANCE A. Single Source Responsibility for Fabrication and Installation: Engage a fabricator/installer who shall assume undivided responsibility for all components of structural glazing work, including structural design and weatherproof integrity of the system in place. B. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

PART 2 PRODUCTS 2.01 SINGLE LITE FLOAT GLASS A. Manufacturing Process: Provide single lite float glass for installation in existing double hung aluminum windows PART 3 EXECUTION

1. Warranty Period: Five (5) years after date of Substantial Completion.

3.01 PREPARATION A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrat 3.02 GLAZING, GENERAL A. Comply with combined printed recommendations of glass manufacturers, manufacturers of

alazing caulk except where more stringent requirements are indicated, including those of referenced glazing publications B. Protect glass from edge damage during handling and installation as follows: 1. Remove damaged glass from Project site and legally dispose of off-site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken

glass and impair performance and appearance. C. Apply primers to joint surfaces where required for adhesion of glazing caulk. 3.03 GLAZING INSTALLATION A. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide

1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of B. Install glazing caulk to meet manufacturer's standards, remove all excess caulk from vision surface of alass, and match anale of existing historic glazing application. C. Set units of glass in each series with uniformity of pattern, draw, bow and similar

D. Provide compressible filler rods or equivalent back-up materials, as recommended by sealant and alass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to back surface of joints as well as to control dept of sealant for optimum performance, unless otherwise indicated E. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant,

tape or gasket on opposite side, provide adequate anchorage to ensure gasket will not "walk" out when installation is subjected to movement. F. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer. 3.04 CLEANING AND PROTECTION

A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove non-permanent labels and clean surfaces. B. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents, and vandalism C. Wash glass on both faces not more than four days prior to date scheduled for

inspections intended to establish date of Substantial Completion in each area of project. END OF SECTION SECTION 09 5113 - ACOUSTICAL PANEL CEILINGS PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustical panel ceilings and grid systems as shown on Drawings and in Schedules. 1.02 REFERENCES A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel

B. ASTM C635/C635M — Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay—in Panel Ceilings 2017 C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2013.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017 E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2019. F. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between

Rooms Sharing a Common Ceiling Plenum 2021a. G. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building

 CISCA (AC) - Acoustical Ceilings: Use and Practice 1999. J. UL (DIR) - Online Certifications Directory Current Edition. 1.03 SUBMITTALS A. Product Data: Provide manufacturer's product technical data and installation instructions for each acoustical ceiling panel, suspension system and trim products required.

required, of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected. 1. 6 inch by 6 inch samples of each acoustical panel pattern and color required. 2. Set of 12 inch long samples of exposed suspension system members, including moldings for each color and system type required.

B. Samples for Verification Purposes: Submit samples of each type of exposed finish

C. Ceiling Layouts— Submit reflected ceiling plan layouts of grid pattern for each area 1.04 QUALITY ASSURANCE A. Installer Qualifications: Not less than 3 years of successful experience in installation of acoustical ceilings similar to this project and is acceptable to the manufacturer of

acoustical units. B. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work. C. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent auglity in

appearance and physical properties without delaying progress of the Work. D. Fire Performance Characteristics: Provide acoustical ceilings identical to those tested for the following fire performance characteristics, per ASTM test method indicated, by UL (DIR) or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization. 1. Surface Burning Characteristics: As follows, tested per ASTM E84, and complying with

a. Flame Spread: 25 or less. b. Smoke Developed: 50 or less. 1.05 DELIVERY, STORAGE, AND PROTECTION A. Deliver acoustical ceiling units to project site in original, unopened packages and store in a fully enclosed space, protected against damage from moisture, direct sunlight, surface

ASTM E1264 for Class A products.

b. Color: White.

c. Noise Reduction Coefficient: NRC 0.60.

2. Structural Classification: Heavy—Duty System.

d. Ceiling Attenuation Class: CAC 35.

contamination or other causes. B. Before installing acoustical ceiling units, permit units to reach room temperature and a stabilized moisture content. C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any

1.06 PROJECT CONDITIONS A. Space Enclosure: Do not install interior acoustical ceilings until wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of emperature and humidity will be continuously maintained at values near those indicated B. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and

suspension system components with work of other trades that penetrate ceilings or is supported by them, including light fixtures, HVAC equipment and partition system. 1. Coordinate with cubicle systems track. PART 2 PRODUCTS

2.01 ACOUSTICAL CEILING UNITS, GENERAL A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated per ASTM E1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated. 2.02 MINERAL-BASE ACOUSTICAL PANELS

A. Mineral-Base Panels - Water Felted with Painted Finish: Type III, Form 2, Class A, units per ASTM E 1264 complying with the following: 1. Fine Textured Pattern: Units fitting ASTM E 1264 pattern designation CE, with other panel characteristics as follows: a. Color/Light Reflectance Coefficient: White/LR 0.85.

e. Edge Detail: Beveled tegular, sized to fit grid. f. Size: 24 inches by 24 inches by 3/4 inch. 2. Product: Subject to compliance with requirements, provide only the following: Armstrona World Industries: Mesa 2.03 METAL SUSPENSION SYSTEMS

A. Narrow-Faced Uncapped, Double-Web, Steel Suspension System: Main and cross members roll-formed from prepainted electrolytic zinc-coated cold-rolled steel sheet, with 9/16 inch wide face; other characteristics as follows: 1. Face Design: Box-shaped flanges forming 1/8 inch wide slotted reveal, designed to fit edge reveals in panels so that faces of flanges recess flush with exposed faces of

3. Finish: Painted; white face and reveal. 4. Product: Subject to compliance with requirements, provide one of the following: a. Fineline 1/8 DXFF; USG Interiors, Inc. 2.04 SUSPENSION SYSTEM ACCESSORIES A. Attachment Devices: Size for 4 times design load indicated in ASTM C635/C635M, Table

A. General: Provide the following paint systems for the various substrates indicated. B. Wire for Hangers and Ties: ASTM A641/A641M. Class 1 zinc coating, soft temper. B. Gypsum Wall Board:

2.02 METAL FRAMING MATERIALS

for project conditions.

1. Gaae: Provide wire sized so that stress at 3 times hanger design load (ASTM 1. Flat Acrylic Finish: 2 finish coats over a primer. C635/C635M. Table 1, Direct-Hung), will be less than yield stress of wire, but provide a. Primer (New gypsumboard): Latex-based, interior primer applied at spreading rate recommended by manufacturer to achieve a total dry film thickness not less than that recommended by the manufacture 1) Moore: Ultra Spec Prep Coat High Build Interior Primer 580 manufacturer's standard moldings for edges and penetrations that fit type of edge detail 2) PPG: Speedhide Primer 6-2

> 3) SW: ProMar 200 0 VOC Primer B28W2600 b. First and Second Coats: Flat acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer to achieve a total dry film thickness not less that that recommended by the manufacturer 1) Moore: Ultra Spec 500 Flat N536

2) PPG: Speedhide Zero VOC Latex Flat 6-4110XI Series 3) SW: ProMar 200 Zero VOC Interior Flat B30-2600 Series 4) PPG: Speedhide Primer 6-2

5) SW: ProMar 200 0 VOC Primer B28W2600 6) Moore: Ultra Spec Prep Coat High Build Interior Primer 580 7) PPG: Speedhide Primer 6-2 8) SW: ProMar 200 0 VOC Primer B28W2600 END OF SECTION

SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES PART 1 GENERAL 1.01 SUBMITTALS

finishing system. Provide manufacturer's specifications and installation instructions for each gypsum wallboard component, including other data as required to show compliance PART 2 PRODUCTS 2.01 GYPSUM BOARD ASSEMBLIES

A. Product Data: Provide data on metal framing, gypsum board, accessories, and joint

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel ASTM A653/A653M, G40 hot dip, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/360 at 5 psf (L/360 at 240 Pa). 1. Studs: "C" shaped with knurled or embossed faces.

a. Minimum thickness: 22 gage or 22 EQ, unless otherwise noted

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2. Ceiling Channels: C-shaped. a. Minimum Thickness: 22 gage or 22 EQ 2.03 BOARD MATERIALS A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Thickness: Provide gypsum board in thickness indicated, or if not otherwise indicated,

in 5/8 inch thickness. 2.04 GYPSUM WALLBOARD ACCESSORIES A. Sealant exposed to view: Provide paintable sealant at all locations exposed to view. B. Interior Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, or rigid plastic, unless otherwise indicated. Provide with either knurled or perforated expanded flanges for nailing or stapling, and beaded for concealment of flanges, in joint compound. Provide tear away bead in profiles required to provide finished edges where gypsumboard abuts

1. Shapes: As indicated below by reference to Figure 1 designations per ASTM C1047. a. Corner bead on outside corners, unless otherwise indicated. b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC beads for edge trim, unless otherwise indicated. c. L-bead with face flange only; face flange formed to receive joint compound.

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer

1. Joint Compound: Drying type, vinyl—based, ready—mixed. 2. Joint Compound: Setting-type D. Screws for Attachment to Steel Members From 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs; cadmium plated for exterior locations.

PART 3 EXECUTION 3.01 FRAMING INSTALLATION A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions. B. Studs: Space studs as indicated.

C. Blocking: Install blocking for support of: 1. Plaster lath covering niches for AC piping. 3.02 BOARD INSTALLATION A. Comply with ASTM C840, GA-216, and manufacturer's instructions.

3.03 METHODS OF GYPSUM BOARD APPLICATION A. Single—Layer Application: Install gypsum wallboard as follows: 1. On ceilings apply gypsum board prior to wall/partition board application to greatest 2. On partitions/walls apply gypsum board vertically (parallel to framing), and provide

3.04 INSTALLATION OF TRIM AND ACCESSORIES A. General: Where feasible, use same fasteners to anchor trim accessory flanges as required to fasten avosum board to supports. Otherwise, fasten flanges to comply with manufacturer's recommendations. B. Install corner beads at external corners.

3.05 JOINT TREATMENT A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration. B. Finish interior gypsum wallboard by applying the following joint compounds in three coats

(not including prefill of openings in base), sand between coats, and after last coat. 1. Embedding and First Coat: Setting—type joint compound. 2. Fill (Second) Coat: Setting-type joint compound. 3. Finish (Third) Coat: Ready-mix drying all-purpose or topping compound. C. Finish gypsum board in accordance with levels defined in Gypsum Association GA-214 "Recommended Levels of Gypsum Board Finish", as follows:

1 Level 4: Gypsum board surfaces except where another finish level is indicated a. Embed tape in joint compound and apply first, second, and finish coats of compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat to produce a surface free of visual defects.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes. 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

2. Taping, filling, and sanding are not required at base layer of double-layer applications. 3.06 TOLERANCES A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in

10 feet (3 mm in 3 m) in any direction. FND OF SECTION

SECTION 09 2300 - GYPSUM PLASTER PATCHING AND REPAIR PART 1 GENERAL 1.01 SECTION INCLUDES A. Gypsum plastering B. Gypsum lath.

(Reapproved 2021).

2.01 MANUFACTURERS

3.01 EXAMINATION

A. Gypsum Plaster:

1.02 REFERENCE STANDARDS A. ASTM C28/C28M - Standard Specification for Gypsum Plasters 2010 (Reapproved 2015). B. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring 2003 (Reapproved 2018).

D. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017. 1.03 SUBMITTALS A. Product Data: Provide data on plaster materials, characteristics, and limitations of products specified 1.04 QUALITY ASSURANCE

C. ASTM C842 - Standard Specification for Application of Interior Gypsum Plaster 2005

A. Installer Qualifications: Company specializing in performing historic plaster repairs with minimum 10 years of documented experience. 1.05 FIELD CONDITIONS A. Do not apply plaster when substrate or ambient air temperature is under 50 degrees F (10 degrees C) or over 80 degrees F (27 degrees C).

B. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) during and after installation of plaster. PART 2 PRODUCTS

1. National Gypsum Companyt: www.nationalgypsum.com/#sle. 2. USG: www.usg.com/#sle 2.02 PLASTER MATERIALS A. Ready-Mixed Gypsum Plaster: ASTM C28/C28M; mill-mixed type, requiring only the

B. Ready-Mixed Finishing Plaster: Gypsum/Lime putty type ASTM C28/C28M; mixture of

gauging plaster and lime. C. Water: Clean, fresh, potable and free of mineral or organic matter that could adversely D. Bonding Agent: ASTM C 631; type recommended for bonding plaster to plaster base 2.03 LATH AND ACCESSORIES

A. Gypsum Lath: ASTM C1396/C1396M, standard type. B. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, maximum possible lengths. 1. Material: Formed sheet steel with rust inhibitive primer, expanded metal flanges. Match profiles to existing. C. Fasteners: Nails. staples. or other approved metal supports, of type and size to suit

B. Lath and Accessories: Verify substrate is flat and surface is ready to receive work of

2.04 PLASTER MIXES A. Over Gypsum Lath: Three-coat application, gypsum neat plaster and sand mixed and proportioned per ASTM C 842. B. Ready-Mixed Plaster Materials: Mix per manufacturer's instructions. PART 3 EXECUTION

application, to rigidly secure accessories in place.

this section. Verify joint and surface perimeter accessories are in place. A. Locations involving the loss of brown and finish coats (base coat is intact and sound):

A. Verify existing conditions are satisfactory before starting work.

1. Small holes (less than 4 inches in diameter): Perform repair in two applications. Use bonding agent where necessary to facilitate bond between brown and scratch coat. a. Apply layer of basecoat plaster and scrape back to below the level of the existing

adjacent finish coat. After coating has set but not dried apply final coat to create a smooth level surface. B. Locations where all three coats of plaster are damaged:

between exposed lath to allow patch to key into lath.

1. Clean out old plaster and resecure wood lath. Remove chunks of existing plaster from

2. Thoroughly soak the wood lath to prevent warping and promote bonding. Apply bonding agent as required to improve bond between plaster and lath 3. Attach expanded metal lath to the wood lath with tie wires and nail over lath with

4. Apply three layers of plaster over the metal lath, lapping each layer of plaster over SES Project # 21 0407 01 the old plaster so that the old and new are evenly joined 5. If patch is in a surface that is wavy, contour the patch to conform to the irregularities of the existing work.

C. Finish coats of all patching work should be Lime putty with aguaing plaster. 3.03 INSTALLATION - GYPSUM LATH AND ACCESSORIES A. Install gypsum lath in accordance with ASTM C841.

B. Install gypsum lath perpendicular to framing members, with lath face exposed. Stagger end joint of alternate courses. Butt joints tight. Maximum gap allowed: 1/8 inch (3 C. Place corner reinforcement diagonally over gypsum lath and across corner immediately

above and below openings. Secure to gypsum lath only. D. Continuously reinforce internal angles with corner mesh, return 3 inches (75 mm) from corner to form the angle reinforcement; fasten at perimeter edges only. E. Place corner bead at external wall corners; fasten at outer edges of lath only. F. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

G. Place 4 inch (100 mm) wide strips of strip mesh centered over junctions of dissimilar

backing materials. Secure rigidly in place. 3.04 PLASTERING A. Apply gypsum plaster per ASTM C 842 and manufacturer's instructions.

END OF SECTION SECTION 32 3119 - DECORATIVE STEEL FENCES AND GATES PART 1 GENERAL 1.01 SECTION INCLUDES

A. Decorative steel fences. 1 02 REFERENCE STANDARDS

PART 2 PRODUCTS

2.03 WELDED STEEL FENCE

2.01 MANUFACTURERS

A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017. B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

D. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets 2016. E. ASTM F2656/F2656M - Standard Test Method for Crash Testing of Vehicle Security Barriers 2020.

C. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2021a.

F. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing 2018. G. NFPA 70 — National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements. 1.03 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be used, including 1. Preparation instructions and recommendations. 2. Storage and handling requirements and recommendations. 3. Installation methods.

this section with minimum five years documented experience.

B. Shop Drawings: 1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components. 2. Foundation details, concrete design mix and reinforcing schedule for anti-ram barrier

C. Samples: Submit two samples of fence panels, slat infill, 12 inch by 12 inch in size illustrating construction and colored finish. D. Manufacturer's Qualification Statement. 1.04 QUALITY ASSURANCE A. Manufacturer Qualifications: Company specializing in manufacturing products specified in

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer. 1.05 DELIVERY, STORAGE AND HANDLING A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

2.02 FENCES A. Fences: Complete factory—fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics: B. Steel: ASTM A653/A653M; tensile strength 45,000 psi (310 MPa), minimum.

1. Hot-dip galvanized; ASTM A653/A653M, G60. 2. 62 percent recycled steel, minimum. C. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence D. Hinges: Finished to match fence components.

A. Provide fence meeting requirements for Industrial class as defined by ASTM F2408. B. Fence Panels: Fusion welded: 8 feet high by 6 feet lon 1. Panel Style: Two rail. 2. Attach panels to posts with manufacturer's standard panel brackets.

C. Posts: Steel tube. D. Pickets: Steel tube. 1. Spacing: 3-3/4 inch (95.2 mm) clear. 2. Style: Pickets with finial extend above top rail.

3. Finial: Spear point. 2.04 CONCRETE A. Concrete: Transit-mixed from a ready-mix plant, per ASTM C 94 and having the

following characteristics 1. Compressive Strength- 3000 psi at 28 days. 2. Air-entrainment- 6 percent.

colors and gloss.

PART 3 EXECUTION

3.03 CLEANING

3. Aggregate- Size 67 (ASTM C 33). 4. Slump- 4 inches. 2.05 FABRICATION A. Fence components shall be assembled on site. B. Gates shall be preassembled and shipped with hardware.

1 Fabricate gate perimeter frame of steel tube shapes standard with the manufacturer Provide additional members to ensure proper gate operation and to attach gate 2. Assemble gate frames by welding for rigid connections. Attach hardware by welding or other means to ensure against removal or breakage. 3. Provide bracing for gate as required to ensure frame rigidity without sag or twist.

2.06 SHOP FINISHING A. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas. Apply a conversion coating of type suited to organic coating applied over it. 1. Repair galvanizing per ASTM A 780.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard powder coat, baked-enamel finish consisting of an epoxy prime coat and thermosetting polyester topcoat, with not less than 1.0-mil dry film thickness for topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils. 1. Color and Gloss: "Black" in "Matte" finish selected from manufacturer's full range of

3.01 EXAMINATION A. Do not begin installation until substrates have been properly prepared. 3.02 INSTALLATION A. Install in accordance with manufacturer's instructions B. Set fence posts in accordance with the manufacturer recommended spacing in minimum

8 inch diameter concrete footings 3'-6" deep. C. When cutting rails immediately seal the exposed surfaces by: Removing metal shavings from cut area. 2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry. 3. Apply two coats of custom finish spray paint matching fence color.

negate manufacturer's warranty. D. Space gate posts according to the manufacturers' drawings, dependent on standard out—to—out gate leaf dimensions and gate hardware selected. 1. Base type and quantity of gate hinges for the application; weight, height, and number

4. Failure to seal exposed surfaces in accordance with manufacturer's instructions wil

2. Identify the necessary hardware required for the application on the manufacturer's gate drawings. Gate lock to be surface mounted cylinder lock with replaceable core to meet WSU standards. 3. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations. Provide cane post on one gate leaf with locking device to prevent being raised without key.

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required. B. Clean fence with mild household detergent and clean water rinse well. C. Remove cement mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water D. Touch up scratched surfaces using materials recommended by manufacturer. Match

touched-up paint color to factory-applied finish. 3.04 PROTECTION A. Protect installed products until completion of project. B. Touch-up, repair, or replace damaged products before Date of Substantial Completion. END OF SECTION



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Wayne State University **Design and Construction Services** 5454 Cass Avenue Detroit, MI 48202

PROJECT:

Seal:

Beecher House 5475 Woodward Ave., Detroit. MI 48202



SSUED FOR: 08/27/21 BIDS

DATE

RRS

ARCHITECTURAL

ISSUED

DESIGNER:

ENGINEER:

MECHANICAL GENERAL REQUIREMENTS

- A. REFERENCES: MECHANICAL AND PHYSICAL PROPERTIES OF ALL MATERIALS, AND THE DESIGN PERFORMANCE CHARACTERISTICS. AND METHODS OF CONSTRUCTION OF ALL ITEMS O EQUIPMENT, SHALL BE IN ACCORDANCE WITH THE LATEST ISSUE OF THE VARIOUS APPLICABLE STANDARD SPECIFICATIONS.
- B. PERFORMANCE REQUIREMENTS: SYSTEMS COMPONENTS PRESSURE AND TEMPERATURE RATINGS: NOT LESS THAN INDICATED AND AS REQUIRED FOR SYSTEM PRESSURES AND TEMPERATURES. C. QUALITY ASSURANCE
- SCOPE OF WORK: FURNISH ALL LABOR, MATERIAL, EQUIPMENT, TECHNICAL SUPERVISION, AND INCIDENTAL SERVICES REQUIRED TO COMPLETE, TEST AND LEAVE READY FOR OPERATION THE MECHANICAL SYSTEMS AS SPECIFIED AND AS INDICATED ON DRAWINGS. 2. ORDINANCES AND CODES: PERFORM ALL WORK IN ACCORDANCE WITH APPLICABLE FFDFRAL. STATE AND LOCAL ORDINANCES AND REGULATIONS, THE RULES AND REGULATIONS OF ASHRAE, NFPA, SMACNA AND UL, UNLESS OTHERWISE INDICATED.
- 3. SOURCE LIMITATIONS: EQUIPMENT OF THE SAME OR SIMILAR SYSTEMS SHALL BE BY THE 4. TESTS AND INSPECTIONS: PERFORM ALL TESTS REQUIRED BY STATE, CITY, COUNTY
- AND/OR OTHER AGENCIES HAVING JURISDICTION. PROVIDE ALL MATERIALS, EQUIPMENT, ETC., AND LABOR REQUIRED FOR TESTS. 5. SEQUENCE AND SCHEDULE: WORK SO AS TO AVOID INTERFERENCE WITH THE WORK OF OTHER TRADES. BE RESPONSIBLE FOR REMOVING AND RELOCATING ANY WORK WHICH IN
- THE OPINION OF THE OWNER'S REPRESENTATIVES CAUSES INTERFERENCE. 6. LABELING REQUIREMENT FOR PACKAGED EQUIPMENT: ELECTRICAL PANELS ON PACKAGED MECHANICAL EQUIPMENT SHALL BEAR UL LABEL OR LABEL OF OTHER NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) (ITSNA, CSA, ETC.).
- 7. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED NFPA 70, ARTICLE 100, BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, AND MARKED FOR INTENDED USE D. CODES, PERMITS AND FEES:
- 1 UNITES OTHERWISE INDICATED ALL REQUIRED PERMITS LICENSES INSPECTIONS APPROVALS AND FEES FOR MECHANICAL WORK SHALL BE SECURED AND PAID FOR BY THE CONTRACTOR. ALL WORK SHALL CONFORM TO ALL APPLICABLE CODES, RULES AND
- 2. WORK SHALL BE EXECUTED IN ACCORDANCE WITH THE RULES AND REGULATIONS SET FORTH IN LOCAL AND STATE CODES. PREPARE ANY DETAILED DRAWINGS OR DIAGRAMS WHICH MAY BE REQUIRED BY THE GOVERNING AUTHORITIES. WHERE THE DRAWINGS AND REQUIREMENTS, THE DRAWINGS AND SPECIFICATIONS SHALL GOVERN.
- E. THE DRAWINGS SHOW LOCATION AND GENERAL ARRANGEMENT OF EQUIPMENT, PIPING AND RELATED ITEMS. FOLLOW DRAWINGS AS CLOSELY AS ELEMENTS OF THE CONSTRUCTION
- F. MATERIAL AND EQUIPMENT MANUFACTURERS: 1. EQUIPMENT: ALL ITEMS OF EQUIPMENT SHALL BE FURNISHED COMPLETE WITH ALL ACCESSORIES NORMALLY SUPPLIED WITH THE CATALOG ITEMS LISTED AND ALL OTHER ACCESSORIES NECESSARY FOR COMPLETE AND SATISFACTORY OPERATING SYSTEM EQUIPMENT AND MATERIALS SHALL BE NEW AND SHALL BE STANDARD PRODUCTS O MANUFACTURERS REGULARLY ENGAGED IN THE PRODUCTION OF FIRE PROTECTION PLUMBING; HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT; AND SHALL B
- 2. PACKAGE UNIT EQUIPMENT AND SKID MOUNTED MECHANICAL COMPONENTS THAT ARE FACTORY ASSEMBLED SHALL MEET, IN DETAIL, PRODUCTS NAMED AND SPECIFIED IN EACH SECTION OF MECHANICAL AND ELECTRICAL SPECIFICATIONS. 3. WHERE EQUIPMENT CHANGES ARE MADE THAT INVOLVE ADDITIONAL ELECTRICAL WORK

(LARGER SIZE MOTOR, ADDITIONAL WIRING OF EQUIPMENT, ETC.) THE MECHANICAL TRADES

- COMPENSATE THE ELECTRICAL TRADES FOR THE COST OF THE ADDITIONAL WORK REQUIRED. G. INSPECTION OF SITE: VISIT SITE, EXAMINE AND VERIFY CONDITIONS UNDER WHICH WOR MUST BE CONDUCTED BEFORE SUBMITTING PROPOSAL. SUBMITTING OF PROPOSAL IMPLIES AT CONTRACTOR HAS VISITED SITE AND UNDERSTANDS CONDITIONS UNDER WHICH WORK MUST BE CONDUCTED. NO ADDITIONAL CHARGES WILL BE ALLOWED BECAUSE OF FAILURE TO
- MAKE THIS EXAMINATION OR TO INCLUDE ALL MATERIALS AND LABOR TO COMPLETE WORK. H. SUBMITTALS: SUBMIT PROJECT SPECIFIC SUBMITTALS FOR REVIEW. I. DELIVERY, STORAGE, AND HANDLING: STORAGE AND PROTECTION: PROVIDE ADEQUATE WEATHER PROTECTED STORAGE SPACE FOR ALL MECHANICAL EQUIPMENT AND MATERIALS
- DELIVERIES TO THE JOB SITE. STORAGE LOCATIONS WILL BE DESIGNATED BY THE OWNER'S REPRESENTATIVE. EQUIPMENT STORED IN UNPROTECTED AREAS MUST BE PROVIDED WITH INSTRUCTION OF OWNER PERSONNEL: BEFORE FINAL INSPECTION, INSTRUCT OWNER'S DESIGNATED PERSONNEL IN OPERATION, ADJUSTMENT, AND MAINTENANCE OF MECHANICAL EQUIPMENT AND SYSTEMS AT AGREED UPON TIMES. A MINIMUM OF 24 HOURS OF FORMAL
- INSTRUCTION TO OWNER'S PERSONNEL SHALL BE PROVIDED FOR EACH BUILDING. ADDITIONAL HOURS ARE SPECIFIED IN INDIVIDUAL SPECIFICATION SECTIONS. K. WARRANTY: CONTRACTOR SHALL WARRANTY THAT MECHANICAL INSTALLATION IS FREE FROM DEFECTS AND AGREES TO REPLACE OR REPAIR. TO OWNER'S SATISFACTION. ANY PART OF THIS MECHANICAL INSTALLATION WHICH BECOMES DEFECTIVE WITHIN A PERIOD OF ONE YEAR (UNLESS SPECIFIED OTHERWISE) FROM THE DATE OF SUBSTANTIAL COMPLETION FOLLOWING
- FINAL ACCEPTANCE. PROVIDED THAT SUCH FAILURE IS DUE TO DEFECTS IN EQUIPMEN MATERIAL, WORKMANSHIP OR FAILURE TO FOLLOW CONTRACT DOCUMENTS. FILE WITH OWNER ANY AND ALL WARRANTIES FROM EQUIPMENT MANUFACTURERS INCLUDING OPERATING CONDITIONS AND PERFORMANCE CAPACITIES THEY ARE BASED ON. MECHANICAL DEMOLITION WORK: DEMOLITION OF EXISTING MECHANICAL EQUIPMENT AND MATERIALS SHALL BE DONE BY THE CONTRACTOR UNLESS OTHERWISE INDICATED. INCLUDE
- ALL ITEMS SUCH AS, BUT NOT LIMITED TO, EXISTING PIPING, PUMPS, DUCTWORK, SUPPORTS AND FOLLIPMENT WHERE SLICH ITEMS ARE NOT REQUIRED FOR PROPER OPERATION O MODIFIED SYSTEM. IN GENERAL, DEMOLITION WORK IS INDICATED ON DRAWINGS. HOWEVER E CONTRACTOR SHALL VISIT JOB SITE TO DETERMINE FULL EXTENT AND CHARACTER OF
- M. REFRIGERANT INSTALLATION AND DISPOSAL: PERFORM ALL WORK RELATED TO REFRIGERANT CONTAINED IN AIR CONDITIONERS, AND SIMILAR EQUIPMENT, INCLUDING RELATED PIPING, IN STRICT ACCORDANCE WITH THE FOLLOWING REQUIREMENTS: 1. ASHRAE STANDARD 15 AND RELATED REVISIONS: SAFETY CODE FOR MECHANICAL
- 2. ASHRAE STANDARD 34 AND RELATED REVISIONS: NUMBER DESIGNATION AND SAFETY CLASSIFICATION OF REFRIGERANTS. 3. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (US EPA) REQUIREMENTS OF
- SECTION 8 08 (PROHIBITION OF VENTING AND REGULATION OF CFC) AND APPLICABLE STATE AND LOCAL REGULATIONS OF AUTHORITIES HAVING JURISDICTION. N. RECOVERED REFRIGERANT IS THE PROPERTY OF THE CONTRACTOR. DISPOSE OF REFRIGERANT LEGALLY, IN ACCORDANCE WITH APPLICABLE RULES AND REGULATIONS. O. WORK IN EXISTING BUILDINGS:
- I. OWNER WILL PROVIDE ACCESS TO EXISTING BUILDINGS AS REQUIRED. ACCESS REQUIREMENTS TO OCCUPIED BUILDINGS SHALL BE IDENTIFIED ON THE PROJECT SCHEDULE. CONTRACTOR. ONCE WORK IS STARTED IN EXISTING BUILDING. SHALL COMPLETE SAME WITHOUT INTERRUPTION IN ORDER TO RETURN WORK AREAS AS SOON AS POSSIBLE TO OWNER. 2. ADEQUATELY PROTECT AND PRESERVE ALL EXISTING AND NEWLY INSTALLED WORK.
- PROMPTLY REPAIR ANY DAMAGE TO SAME AT CONTRACTOR'S EXPENSE. 3. CONSULT WITH OWNER'S REPRESENTATIVE AS TO METHODS OF CARRYING ON WORK SO AS NOT TO INTERFERE WITH OWNER'S OPERATION ANY MORE THAN ABSOLUTELY NECESSARY. ACCORDINGLY, ALL SERVICE LINES SHALL BE KEPT IN OPERATION AS LONG AS POSSIBLE AND THE SERVICES SHALL ONLY BE INTERRUPTED AT SUCH TIME AS WILL BE DESIGNATED BY THE OWNER'S REPRESENTATIVE
- 4. PRIOR TO STARTING WORK IN ANY AREA, OBTAIN APPROVAL FOR DOING SO FROM A QUALIFIED REPRESENTATIVE OF THE OWNER WHO IS DESIGNATED AND AUTHORIZED BY THE OWNER TO PERFORM TESTING AND ABATEMENT. IF NECESSARY, OF ALL HAZARDOUS MATERIALS INCLUDING BUT NOT LIMITED TO, ASBESTOS, CONTRACTOR SHALL NOT PERFORM ANY INSPECTION, TESTING, CONTAINMENT, REMOVAL OR OTHER WORK THAT IS RELATED IN ANY WAY WHATSOEVER TO HAZARDOUS MATERIALS UNDER THE CONTRACT.
- P. TFMPORARY SFRVICES: THE EXISTING BUILDING WILL BE OCCUPIED DURING CONSTRUCTION MAINTAIN MECHANICAL SERVICES AND PROVIDE NECESSARY TEMPORARY CONNECTIONS AND THEIR REMOVAL AT NO ADDITIONAL EXPENSE. WORK INVOLVING OTHER TRADES: CERTAIN ITEMS OF EQUIPMENT OR MATERIALS SPECIFIED IN
- THE MECHANICAL DIVISION MAY HAVE TO BE INSTALLED BY OTHER TRADES DUE TO CODE REQUIREMENTS OR UNION JURISDICTIONAL REQUIREMENTS. IN SUCH INSTANCES. CONTRACTOR SHALL COMPLETE WORK THROUGH AN APPROVED. QUALIFIED SUBCONTRACTOR AND SHALL INCLUDE FULL COST FOR SAME IN PROPOSAL. R. ACCEPTANCE PROCEDURE: UPON SUCCESSFUL COMPLETION OF START-UP AND
- RECALIBRATION, BUT PRIOR TO BUILDING ACCEPTANCE, SUBSTANTIAL COMPLETION AND COMMENCEMENT OF WARRANTIES, ARCHITECT/ENGINEER SHALL BE REQUESTED IN WRITING TO OBSERVE THE SATISFACTORY OPERATION OF ALL MECHANICAL SYSTEMS. 1. CONTRACTOR SHALL DEMONSTRATE OPERATION OF EQUIPMENT AND CONTROL SYSTEMS,
- INCLUDING EACH INDIVIDUAL COMPONENT, TO OWNER AND ARCHITECT/ENGINEER. 2. AFTER CORRECTING ALL ITEMS APPEARING ON THE PUNCH LIST, MAKE A SECOND WRITTEN REQUEST TO THE OWNER AND ARCHITECT/ENGINEER FOR OBSERVATION AND APPROVAL.
- 3. AFTER ALL ITEMS ON PUNCH LIST ARE CORRECTED AND FORMAL APPROVAL OF MECHANICAL SYSTEMS IS PROVIDED BY ARCHITECT/ENGINEER. CONTRACTOR SHALL INDICATE TO THE OWNER IN WRITING THE COMMENCEMENT OF THE WARRANTY PERIOD.

BASIC MECHANICAL MATERIALS AND METHODS

- A. PIPE, TUBE, AND FITTINGS: 1. REFER TO PIPING SECTIONS FOR PIPE, TUBE, AND FITTING MATERIALS AND JOINING 2. PIPE THREADS: ASME B1.20.1 FOR FACTORY-THREADED PIPE AND PIPE FITTINGS.
- B. JOINING MATERIALS: 1. REFER TO PIPING SPECIFICATIONS FOR SPECIAL JOINING MATERIALS NOT LISTED BELOW. 2. UNIONS: PIPE SIZE 2 INCHES AND SMALLER: FERROUS PIPE: MALLEABLE IRON GROUND OINT TYPE UNIONS. UNIONS IN GALVANIZED PIPING SYSTEM SHALL BE GALVANIZED. COPPER TUBE AND PIPE: BRONZE UNIONS WITH SOLDERED JOINTS.
- 3. FLANGES: PIPE SIZES 2-1/2 INCH AND LARGER: FERROUS PIPE: STANDARD WEIGHT FORGED STEEL WELD NECK FLANGES. COPPER TUBE AND PIPE: SLIP-ON BRONZE 4. PIPE-FLANGE GASKET MATERIALS: SUITABLE FOR CHEMICAL AND THERMAL CONDITIONS OF PIPING SYSTEM CONTENTS.
- 5. FLANGE BOLTS AND NUTS: ASME B18.2.1, CARBON STEEL, UNLESS OTHERWISE INDICATED. SQUARE HEAD BOLTS AND NUTS ARE NOT ACCEPTABLE. 6. SOLDER FILLER METALS: ASTM B 32. LEAD-FREE. ANTIMONY-FREE, SILVER-BEARING ALLOYS. INCLUDE WATER-FLUSHABLE FLUX ACCORDING TO ASTM B 813.
- 7. BRAZING FILLER METALS: AWS A5.8, BCUP SERIES, COPPER-PHOSPHORUS ALLOYS FOR GENERAL-DUTY BRAZING, UNLESS OTHERWISE INDICATED; AND AWS A5.8, BAG1, SILVER ALLOY FOR REFRIGERANT PIPING, UNLESS OTHERWISE INDICATED. C. PIPE THREAD COMPOUNDS:
- 1. PIPE THREAD COMPOUNDS FOR THE FLUID SERVICE COMPATIBLE WITH PIPING MATERIALS
- 2. COMPOUNDS FOR POTABLE WATER SERVICE AND SIMILAR APPLICATIONS ACCEPTABLE TO U.S. DEPARTMENT OF AGRICULTURE (USDA) OR FOOD AND DRUG ADMINISTRATION (FDA). COMPOUNDS CONTAINING LEAD ARE PROHIBITED.
- 3. INORGANIC ZINC-RICH COATINGS OR CORROSION INHIBITED PROPRIETARY COMPOUNDS FOR GALVANIZED CARBON STEEL SYSTEMS TO COAT RAW CARBON STEEL SURFACES, IN LIEU OF SUBSEQUENT PAINTING. MANUFACTURERS: CARBOLINE CARBO-ZINC 12 | 4 GRAPHITE AND OIL OR PROPRIETARY CORROSION INHIBITED COMPOUNDS SUITABLE FOR SYSTEM TEMPERATURES FOR STEAM OR CONDENSATE. MANUFACTURERS: WKM, DIVISION
- 5. USE TETRAFLUOROETHYLENE (TEFLON) TAPE 2 TO 3 MILS THICK FOR NATURAL GAS SYSTEM THREADED JOINTS. MANUFACTURERS: CADILLAC PLASTIC; PERMACEL | OTHER
- APPROVED. D. DIELECTRIC FITTINGS: PROVIDE DIELECTRIC FITTINGS AS SCHEDULED ON THE DRAWINGS.
- DIELECTRIC-FLANGE KITS: a. MANUFACTURERS: ADVANCE PRODUCTS & SYSTEMS, INC. | CALPICO, INC. | CENTRAL PLASTICS COMPANY | PIPELINE SEAL AND INSULATOR, INC. | WATTS WATER

OF COOPER INDUSTRIES, INC., KEY GRAPHITE PASTE | OTHER APPROVED.

- TECHNOLOGIES, INC.; WATTS REGULATOR CO. DIELECTRIC NIPPLE/WATERWAY FITTINGS: a. MANUFACTURERS: ANVIL INTERNATIONAL, INC.; GRUVLOK MANUFACTURING; DI-LOK NIPPLES | ELSTER GROUP; PERFECTION CORP.; CLEARFLOW | PRECISION PLUMBING PRODUCTS. INC.: CLEARFLOW | SIOUX CHIEF MANUFACTURING CO., INC. | TYCO FIRE
- & BUILDING PRODUCTS; GRINNELL MECHANICAL PRODUCTS; FIGURE 407 CLEARFLOW VICTAULIC CO. OF AMERICA: STYLE 47 CLEARFLOW. E. MECHANICAL SLEEVE SEALS:
- 1. DESCRIPTION: MODULAR SEALING ELEMENT UNIT, DESIGNED FOR FIELD ASSEMBLY, TO FILL ANNULAR SPACE BETWEEN PIPE AND SLEEVE. 2. MANUFACTURERS: ADVANCE PRODUCTS & SYSTEMS, INC. | CALPICO, INC. | METRAFLEX CO. | PIPELINE SEAL AND INSULATOR, INC., THUNDERLINE LINK SEAL.
- 1. STEEL PIPE: ASTM A53, TYPE E, GRADE B, SCHEDULE 40, AND 0.375 INCH WALL BLACK. 2. STEEL PIPE: ASTM A53, TYPE E, GRADE B, SCHEDULE 40, AND 0.375 INCH WALL GALVANIZED, PLAIN ENDS.
- 3. CAST IRON: CAST OR FABRICATED "WALL PIPE" EQUIVALENT TO DUCTILE-IRON PRESSURE PIPE, WITH PLAIN ENDS AND INTEGRAL WATERSTOP, UNLESS OTHERWISE INDICATED. 4. STACK SLEEVE FITTINGS: MANUFACTURED, CAST-IRON SLEEVE WITH INTEGRAL CLAMPING
- FLANGE. INCLUDE CLAMPING RING AND BOLTS AND NUTS FOR MEMBRANE FLASHING. G. ESCUTCHEONS: MANUFACTURED WALL AND CEILING ESCUTCHEONS, WITH AN ID TO CLOSELY FIT AROUND PIPE, TUBE, AND INSULATION OF INSULATED PIPING AND AN OD THAT COMPLETELY COVERS OPENING. H. EPOXY BONDING COMPOUND: TWO-COMPONENT SYSTEM SUITABLE FOR BONDING WET OR
- DRY CONCRETE TO EACH OTHER AND TO OTHER MATERIALS. 1. MANUFACTURERS: EUCO 452 #450, EUCLID CHEMICAL CO. | EPOBOND, L & M CONSTRUCTION CHEMICALS | SIKADUR 87, SIKA CORP.
- LEAK DETECTOR SOLUTION: COMMERCIAL LEAK DETECTOR SOLUTION FOR PIPE SYSTEM 1. MANUFACTURERS: AMERICAN GAS AND CHEMICALS INC., LEAK TEC | COLE-PARMER INST. CO., LEAK DETECTOR | GUY SPEAKER CO. INC., SQUIRT 'N BUBBLES
- PIPE ROOF PENETRATION ENCLOSURES: MINIMUM 18 GAGE WELDED GALVANIZED STEEL CONSTRUCTION. INTEGRAL BASE PLATE. BUILT—IN FULLY MITERED CANT. FACTOR INSTALLED INSECT AND DECAY RESISTANT WOOD NAILER. FACTORY INSTALLED 1-1/2 INCH 3 POUNDS PER CUBIC FOOT DENSITY RIGID INSULATION. EPDM COMPRESSION MOLDED RUBBER CAP FOR SINGLE OR MULTIPLE PIPES AS REQUIRED. STAINLESS STEE DRAW-BAND CLAMPS. 1. MANUFACTURERS: PATE COMPANY | PORTALS PLUS, INC. | THYBAR CORPORATION,

HANGERS AND SUPPORTS

A. PIPE HANGERS, SUPPORTS, AND ACCESSORIES SHALL COMPLY WITH THE FOLLOWING: 1. MSS SP-58, PIPE HANGERS AND SUPPORTS - MATERIALS, DESIGN AND MANUFACTURE.

THYCURB.

- 2. MSS SP-58, PIPE HANGERS AND SUPPORTS SELECTION AND APPLICATION. 3. MSS SP-89. PIPE HANGERS AND SUPPORTS - FABRICATION AND INSTALLATION PRACTICES.
- B. HANGER ROD MATERIAL: THREADED, HOT ROLLED, STEEL ROD CONFORMING TO ASTM A 36 OR ASTM A 575. C. STEEL PIPE HANGERS AND SUPPORTS: MSS SP-58, TYPES 1 THROUGH 58,
- FACTORY-FABRICATED COMPONENTS. 1. MANUFACTURERS: ANVIL INTERNATIONAL, INC. | B-LINE SYSTEMS, INC., DIVISION OF COOPER INDUSTRIES | CARPENTER & PATERSON, INC. | HILTI USA | ERICO INTERNATIONAL CORP. | PHD MANUFACTURING, INC. | TOLCO, DIVISION OF NIBCO.
- TRAPEZE PIPE HANGERS: MSS SP-58, TYPE 59, SHOP- OR FIELD-FABRICATED PIPE-SUPPORT ASSEMBLY MADE FROM STRUCTURAL-STEEL SHAPES WITH MSS SP-58 HANGER RODS. NUTS. SADDLES. AND U-BOLTS. E. METAL FRAMING SYSTEMS: DESCRIPTION: MFMA-3, SHOP- OR FIELD-FABRICATED
- PIPE-SUPPORT ASSEMBLY MADE OF STEEL CHANNELS AND OTHER COMPONENTS. 1. MANUFACTURERS: B-LINE SYSTEMS, INC., A DIVISION OF COOPER INDUSTRIES | HILTI USA | POWER-STRUT DIV., TYCO INTERNATIONAL, LTD. | UNISTRUT CORP., TYCO INTERNATIONAL, LTD.
- F. THERMAL-HANGER SHIELD INSERTS: DESCRIPTION: INSULATION INSERT ENCASED IN 360 DEGREE SHEET METAL SHIELD. 1. MANUFACTURERS: AMERICAN MECHANICAL INSULATION SALES INC. (AMIS) | B-LINE SYSTEMS, INC., DIVISION OF COOPER INDUSTRIES | ERICO INTERNATIONAL CORP. | PIPE SHIELDS, INC. | RILCO MANUFACTURING COMPANY, INC. | TOLCO, DIVISION OF NIBCO |
- VALUE ENGINEERED PRODUCTS. G. EQUIPMENT SUPPORTS: WELDED, SHOP- OR FIELD-FABRICATED EQUIPMENT SUPPORT MADE FROM STRUCTURAL-STEEL SHAPES.
- H. MISCELLANEOUS MATERIALS: ASTM A 36/A 36M, STEEL PLATES, SHAPES, AND BARS; BLACK AND GALVANIZED.

COMMON WORK RESULTS FOR HVAC

A. FNVIRONMENTAL REQUIREMENTS: DO NOT OPERATE EQUIPMENT FOR ANY PURPOSE TEMPORARY OR PERMANENT, UNTIL DUCTWORK IS CLEAN, FILTERS ARE IN PLACE, BEARINGS

B. FAN POWER TRANSMISSION: V-BELT TYPE FAN DRIVES: IN ACCORDANCE WITH ENGINEERING

- STANDARD SPECIFICATION FOR DRIVES USING MULTIPLE V-BELTS, SPONSORED BY THE MECHANICAL POWER TRANSMISSION ASSOCIATION AND THE RUBBER MANUFACTURER'S 1. MANUFACTURERS: EMERSON POWER TRANSMISSION; BROWNING | ROCKWELL AUTOMATION; DODGE | T.B. WOOD'S INCORPORATED.
- NOTCHED OR COGGED STYLE, ENDLESS TYPE, OF DACRON REINFORCED ELASTOMER CONSTRUCTION, WITH CROSS-SECTION TO SUIT SHEAVE GROOVES. . MANUFACTURERS: EMERSON POWER TRANSMISSION; BROWNING; AX, BX, AND CX SERIES AND 3VX AND 5VX SERIES | ROCKWELL AUTOMATION: DODGE: CLASSIC COG AND NARROW COG V-BELTS | T.B. WOOD'S INCORPORATED; CLASSICAL COG AND NARROW COG
- D. V-BELT DRIVE MOTOR BASES: PROVIDE FOR ADJUSTMENT OF BOTH BELT TENSION AND
- F. BELT DRIVE GUARDS: ANSI AND OSHA COMPLIANT WITH PROVISION FOR READILY VIEWING BELT TENSION AND MEASURING SHAFT SPEEDS. GUARDS SHALL BE INSTALLED WITH QUICK
- F. SHEAVES: FURNISH SHEAVES OF MACHINED CAST IRON OR CARBON STEEL, BUSHING TYPE OF FIXED BORE, SECURED TO THE SHAFT BY KEY AND KEYWAY
- G. AIR HANDLING SYSTEM BALANCING PROVISIONS: 1. PROVIDE EXTRA SHEAVES, SIZED AS RECOMMENDED BY THE BALANCING AGENT, FOR THE ADJUSTMENT OF FAN SPEED FOR EACH AIR HANDLING SYSTEM DURING AIR QUANTITY BALANCING OPERATIONS. FURNISH SHEAVES AS SPECIFIED.
- 2 PROVIDE SHEAVES SIZED AS RECOMMENDED BY THE BALANCING AGENT FOR THE ADJUSTMENT OF FAN SPEED FOR EACH EXISTING AIR HANDLING SYSTEM REQUIRING REBALANCING DURING AIR QUANTITY BALANCING OPERATIONS. FURNISH SHEAVES AS H. FAN BEARINGS: ANTI-FRICTION BALL OR ROLLER TYPE WITH PROVISION F SELF-ALIGNMENT AND THRUST LOAD. MADE IN USA. WITH ABMA L10 MINIMUM LIFE
- 200,000 HOURS. USE CAST IRON HOUSINGS AND DUST-TIGHT SEALS SUITABLE FOR LUBRICANT PRESSURES. LUBRICATION PROVISIONS: USE SURFACE BALL CHECK TYPE SUPPLY FITTINGS. PROVIDE EXTENSION TUBES TO ALLOW SAFE MAINTENANCE WHILE EQUIPMENT IS OPERATING PROVIDE MANUAL OR AUTOMATIC PRESSURE RELIEF FITTINGS TO PREVENT OVERHEATING OR SFAI BLOW-OUT DUE TO EXCESS LUBRICANT OR PRESSURE. ARRANGE RELIEI FITTINGS OPPOSITE SUPPLY BUT VISIBLE FOR NORMAL MAINTENANCE OBSERVATION.
- 2. BEARINGS ON EQUIPMENT WITH LESS THAN 1/2 HORSEPOWER RATING OR ON SHAFTS SMALLER THAN 1-3/4 INCH IN DIAMETER: PERMANENTLY SEALED, PRE-LUBRICATED ANTI-FRICTION BEARINGS PER SPECIFIED MATERIALS AND ABMA L10 LIFE REQUIREMENTS. 3. INSTALL SHEAVES WHERE RECOMMENDED BY TESTING, ADJUSTING, AND BALANCING

IDENTIFICATION

1. LOCATION: ACCESSIBLE AND VISIBLE

- A. MANUFACTURERS: SETON | BRADY | EMED | CRAFTMARK | BRIMAR INDUSTRIES, INC. | MARKING SERVICES INC. (MSI) | KOLBI PIPE MARKER CO. B. EQUIPMENT NAMEPLATES: METAL, WITH DATA ENGRAVED OR STAMPED, FOR PERMANENT ATTACHMENT ON EQUIPMENT.
- 2. FASTENERS: AS REQUIRED TO MOUNT ON EQUIPMENT. C. EQUIPMENT MARKERS: ENGRAVED, COLOR-CODED LAMINATED PLASTIC. INCLUDE CONTACT-TYPE, PERMANENT ADHESIVE.
- 1. SIZE: 2-1/2 BY 4 INCHES FOR CONTROL DEVICES, DAMPERS, AND VALVES; 4-1/2 BY 6 INCHES FOR EQUIPMENT. D. PIPE MARKERS:
- 1. GENERAL REQUIREMENTS FOR MANUFACTURED PIPE LABELS: COLOR-CODED, WITH LETTERING INDICATING SERVICE, AND SHOWING FLOW DIRECTION. 2. PRETENSIONED PIPE LABELS: PRECOILED, SEMIRIGID PLASTIC FORMED TO COVER FULL CIRCUMFERENCE OF PIPE AND TO ATTACH TO PIPE WITHOUT FASTENERS OR ADHESIVE. 3. SELF-ADHESIVE PIPE LABELS: PRINTED PLASTIC WITH CONTACT-TYPE, PERMANENT-ADHESIVE BACKING.
- 4. PIPE LABEL CONTENTS: INCLUDE IDENTIFICATION OF PIPING SERVICE USING SAME DESIGNATIONS OR ABBREVIATIONS AS USED ON DRAWINGS, PIPE SIZE, AND AN ARROW INDICATING FLOW DIRECTION. a. FLOW-DIRECTION ARROWS: INTEGRAL WITH PIPING SYSTEM SERVICE LETTERING T
- ACCOMMODATE BOTH DIRECTIONS, OR AS SEPARATE UNIT ON EACH PIPE LABEL TO INDICATE FLOW DIRECTION.
- b. LETTERING SIZE: AT LEAST 1-1/2 INCHES HIGH. E. DUCT LABELS
- DUCT MARKERS: VINYL, 2-INCH MINIMUM CHARACTER HEIGHT, WITH PERMANENT PRESSURE SENSITIVE ADHESIVE. INCLUDE DIRECTION AND QUANTITY OF AIRFLOW, AIR HANDLING UNIT OR FAN NUMBER. AND DUCT SERVICE (SUCH AS SUPPLY, RETURN, AND a. ADHESIVE: CONTACT-TYPE PERMANENT ADHESIVE, COMPATIBLE WITH LABEL AND WITH
- 2. DUCT MARKERS: ENGRAVED, COLOR-CODED LAMINATED PLASTIC. INCLUDE DIRECTION ANI QUANTITY OF AIRFLOW, AIR HANDLING UNIT OR FAN NUMBER, AND DUCT SERVICE (SUCH AS SUPPLY, RETURN, AND EXHAUST). INCLUDE CONTACT-TYPE, PERMANENT ADHESIVE. a. FASTENERS: STAINLESS-STEEL RIVETS OR SELF-TAPPING SCREWS.

D. DUCTWORK INSULATION MATERIALS:

- <u>INSULATION</u> A. ACCEPTABLE PIPE, DUCT, AND EQUIPMENT INSULATION MATERIALS AND THICKNESSES ARE SCHEDULED ON THE DRAWINGS. WHERE NOT SCHEDULED, THE FOLLOWING APPLY:
- a. HOT SERVICE DRAINS, ALL PIPE SIZES: GLASS-FIBER OR MINERAL WOOL, PREFORMED PIPE INSULATION, TYPE I OR II: 1 INCH THICK. b. HOT SERVICE VENTS, ALL PIPE SIZES: GLASS-FIBER OR MINERAL WOOL, PREFORMED PIPE INSULATION. TYPE I OR II: 1 INCH THICK. c. EXISTING PLASTIC WATER PIPING WITHIN RETURN AIR PLENUM SPACE: ALL PIPE
- SIZES: INSULATION SHALL BE: 1) FIRE-RATED PLENUM WRAP: 1/2 INCH THICK. B. FIELD-APPLIED JACKETING SYSTEMS DESCRIPTION: 1. ACCEPTABLE JACKETING MATERIALS ARE SCHEDULED ON THE DRAWINGS. WHERE NO
- SCHEDULED, THE FOLLOWING APPLY: a. STEAM CONDENSATE PIPING WITHIN AIR HANDLING UNITS: ALUMINUM, STUCCO EMBOSSED: 0.016 INCH THICK. b. PIPING WITHIN ENERGY RECOVERY UNITS: TYPE 304 STAINLESS STEEL, SMOOTH 0.010 INCH THICK. SEAMS AND JOINTS CALKED WITH CHEMICALLY RESISTANT
- SEALER. C. PIPE INSULATION MATERIALS: 1. FLEXIBLE ELASTOMERIC: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS.
- INSUL-TUBE AND INSUL-SHEET 2. GLASS-FIBER, PREFORMED PIPE INSULATION: TYPE I, 850 DEG F MATERIALS: GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 547, TYPE I, GRADE A, WITH FACTORY-APPLIED ASJ OR ASJ-SSL

a. PRODUCTS: ARMACELL LLC; AP ARMAFLEX | IK INSULATION GROUP; K-FLEX;

- a. PRODUCTS: JOHNS MANVILLE; MICRO-LOK | KNAUF INSULATION; 1000 PIPE INSULATION | MANSON INSULATION INC.; ALLEY-K | OWENS CORNING; FIBERGLAS PIPE
- 1. BLANKET INSULATION: GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 553, TYPE II AND ASTM C 1290, TYPE III WITH FACTORY-APPLIED FSK a. PRODUCTS: CERTAINTEED CORP.; DUCT WRAP | JOHNS MANVILLE; MICROLITE | KNAUF
- INSULATION; DUCT WRAP | MANSON INSULATION INC.; ALLEY WRAP FSK | OWENS CORNING, ALL-SERVICE DUCT WRAP. 2. BOARD INSULATION: GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 612, TYPE IA OR TYPE IB. FOR DUCT AND PLENUM APPLICATIONS, PROVIDE INSULATION WITH FACTORY-APPLIED FSK JACKET. FOR EQUIPMENT APPLICATIONS, PROVIDE
- INSULATION WITH FACTORY-APPLIED ASJ a. PRODUCTS: CERTAINTEED CORP.; COMMERCIAL BOARD | FIBREX INSULATIONS INC.; FBX | JOHNS MANVILLE; 800 SERIES SPIN-GLAS | KNAUF INSULATION; INSULATION BOARD | MANSON INSULATION INC.; AK BOARD | OWENS CORNING; FIBERGLAS 700
- E. INSULATING CEMENTS, ADHESIVES, TAPES, AND SEALANTS: USE MANUFACTURER RECOMMENDED PRODUCTS. F. MASTICS: MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES; COMPLY WITH MIL-C-19565C, TYPE II.
- G. FIELD-APPLIED JACKETS: FIELD-APPLIED JACKETS SHALL COMPLY WITH ASTM C 921, TYPE I, UNLESS OTHERWISE INDICATED. 1. PVC JACKET: HIGH-IMPACT-RESISTANT, UV-RESISTANT PVC COMPLYING WITH ASTM D 1784, CLASS 16354-C; THICKNESS AS SPECIFIED; ROLL STOCK READY FOR

SHOP OR FIELD CUTTING AND FORMING.

- a. PRODUCTS: JOHNS MANVILLE; ZESTON AND CEEL-CO | P.I.C. PLASTICS, INC.; FG SERIES | PROTO PVC CORPORATION; LOSMOKE | SPEEDLINE CORPORATION; 2. PVC FITTING COVERS: HIGH-IMPACT-RESISTANT, UV-RESISTANT PVC COMPLYING WITH
- a. PRODUCTS: JOHNS MANVILLE: ZESTON AND CEFL-CO | P.I.C. PLASTICS, INC.: FG SERIES | PROTO PVC CORPORATION; LOSMOKE | SPEEDLINE CORPORATION; SMOKESAFE.

ASTM D 1784, CLASS 16354-C, AND INCLUDING FLEXIBLE GLASS FIBER INSULATION

3. ALUMINUM JACKET: COMPLY WITH ASTM B 209, ALLOY 3003, 3005, 3105 OR 5005 AND ROLL STOCK READY FOR SHOP OR FIELD SIZING OR FACTORY CUT AND ROLLED TO SIZE. a. PRODUCTS: PABCO-CHILDERS METALS; ITW INSULATION SYSTEMS; METAL JACKETING SYSTEMS | RPR PRODUCTS, INC.; INSUL-MATE.

- <u>METERS AND GAGES</u>
- A. METAL-CASE, LIQUID-IN-GLASS THERMOMETERS: 1. MANUFACTURERS: AMETEK, INC.; U.S. GAUGE DIV. | MILJOCO CORPORATION | REOTEMP INSTRUMENT CORPORATION | TRERICE, H. O. CO. | WEISS INSTRUMENTS, INC. | WEKSLER INSTRUMENTS OPERATING UNIT; DRESSER INDUSTRIES; INSTRUMENT DIV.
- 2. CASE: DIE-CAST ALUMINUM OR CHROME-PLATED BRASS, 9 INCHES LONG
- 3. TUBE: RED OR BLUE READING, ORGANIC-LIQUID FILLED, WITH MAGNIFYING LENS. 4. CONNECTOR: ADJUSTABLE TYPE, 180 DEGREES IN VERTICAL PLANE, 360 DEGREES IN
- HORIZONTAL PLANE, WITH LOCKING DEVICE. 5. STEM: COPPER-PLATED STEEL, ALUMINUM, OR BRASS FOR THERMOWELL INSTALLATION
- AND OF LENGTH TO SUIT INSTALLATION. 6. ACCURACY: PLUS OR MINUS 1 PERCENT OF RANGE OR PLUS OR MINUS 1 SCALE DIVISION TO MAXIMUM OF 1.5 PERCENT OF RANGE
- B. THERMOWELLS: SAME AS MANUFACTURER OF THERMOMETER BEING USED. PRESSURE—TIGHT. SOCKET-TYPE METAL FITTING MADE FOR INSERTION INTO PIPING AND OF TYPE. DIAMETER. AND LENGTH REQUIRED TO HOLD THERMOMETER. BRASS FOR COMPATIBLE SERVICES LESS THAN 353 DEG F; ANSI 18-8 STAINLESS STEEL FOR ALL OTHERS TO SUIT SERVICE. FURNISH
- EXTENSION NECK TO ACCOMMODATE INSULATION WHERE APPLICABLE. C. PROVIDE THE FOLLOWING TEMPERATURE RANGES FOR THERMOMETERS
- 1. DOMESTIC COLD WATER: 30 TO 130 DEG F OR 0 TO 120 DEG F. 2. DOMESTIC HOT WATER: 30 TO 180 DEG F.
- 3. CHILLED WATER/CONDENSER WATER: 30 TO 130 DEG F OR 0 TO 120 DEG F.
- HEATING WATER: 30 TO 240 DEG F. 5. ALL OTHER LOCATIONS: AS INDICATED ON DRAWINGS.

D. PRESSURE GAGES:

- 1. MANUFACTURERS: AMETEK, INC.; U.S. GAUGE DIV. | CAMBRIDGE | DWYER INSTRUMENTS, INC. | MARSH BELLOFRAM | MILJOCO CORPORATION | TRERICE, H. O. CO. | WEISS INSTRUMENTS, INC. | WEKSLER INSTRUMENTS OPERATING UNIT; DRESSER INDUSTRIES;
- INSTRUMENT DIV 2. DIRECT-MOUNTING, DIAL-TYPE PRESSURE GAGES: INDICATING-DIAL TYPE COMPLYING WITH
- 3. CASE: STAINLESS STEEL, ALUMINUM, OR FRP, 4-1/2-INCH DIAMETER. 4. PRESSURE-ELEMENT ASSEMBLY: BOURDON TUBE, UNLESS OTHERWISE INDICATED.
- 5. PRESSURE CONNECTION: BRASS, NPS 1/4, BOTTOM-OUTLET TYPE UNLESS BACK-OUTLET
- 6. ACCURACY: GRADE A, PLUS OR MINUS 1 PERCENT OF MIDDLE HALF SCALE.
- 7. VACUUM-PRESSURE RANGE: 30-IN. HG OF VACUUM TO 15 PSIG OF PRESSURE. 8. WATER: 0-100 PSIG (1 PSI DIVISIONS TO 50 PSI; 5 PSI DIVISIONS ABOVE 50 PSI),
- 9. STEAM (15 PSIG AND LESS): 30 INCHES HG VACUUM-30 PSIG (1 INCH DIVISIONS
- BELOW 0 PSI; 1 PSI DIVISIONS ABOVE 0 PSI), SILICONE DAMPENED. 10. STEAM (16 TO 60 PSIG): 30 INCHES HG VACUUM-100 PSIG, SILICONE DAMPENED. 11. RANGE FOR FLUIDS UNDER PRESSURE: 1-1/2 TIMES EXPECTED WORKING PRESSURE. IF
- 12. PRESSURE-GAGE FITTINGS: a. VALVES: NPS 1/4 BRASS BALL TYPE.
- b. SYPHONS: NPS 1/4 COIL OF BRASS TUBING WITH THREADED ENDS. c. SNUBBERS: ASME B40.5. NPS 1/4 BRASS BUSHING WITH CORROSION-RESISTANT.
- POROUS-METAL DISC OF MATERIAL SUITABLE FOR SYSTEM FLUID AND WORKING PRESSURE. E. INSTALL DRY-CASE-TYPE PRESSURE GAGES ON INLET AND OUTLET OF EACH
- PRESSURE-REDUCING VALVE. F. INSTALL LIQUID-FILLED-CASE-TYPE PRESSURE GAGES AT SUCTION AND DISCHARGE OF EACH PLIMP

TESTING, ADJUSTING, AND BALANCING

NOT A STANDARD SCALE, SELECT NEXT LARGEST SCALE.

- A. GENERAL PROCEDURES FOR TESTING AND BALANCING: 1. 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. 2. 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. B. GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS: 1. PREPARE TEST REPORTS FOR BOTH FANS AND OUTLETS. OBTAIN MANUFACTURER'S OUTLET
- FACTORS AND RECOMMENDED TESTING PROCEDURES. CROSSCHECK THE SUMMATION OF REQUIRED OUTLET VOLUMES WITH REQUIRED FAN VOLUMES. PREPARE SCHEMATIC DIAGRAMS OF SYSTEMS' "AS-BUILT" DUCT LAYOUTS. OR USE
- REDUCED SCALE CONTRACT DOCUMENTS WITH NOTATIONS. 3. FOR VARIABLE-AIR-VOLUME SYSTEMS, DEVELOP A PLAN TO SIMULATE DIVERSITY.
- 4. DETERMINE THE BEST LOCATIONS IN MAIN AND BRANCH DUCTS FOR ACCURATE DUCT AIRFLOW MEASUREMENTS 5 CLIT INSULATION AND DRILL DUCTS FOR INSTALLATION OF TEST PROBES TO THE MINIMUM EXTENT NECESSARY TO ALLOW ADEQUATE PERFORMANCE OF PROCEDURES. AFTER TESTING AND BALANCING, CLOSE PROBE HOLES WITH NEAT PATCHES, NEOPRENE PLUGS, THREADED PLUGS, OR THREADED TWIST-ON METAL CAPS, AND PATCH INSULATION WITH NEW
- MATERIALS IDENTICAL TO THOSE REMOVED. RESTORE VAPOR BARRIER AND FINISH ACCORDING TO INSULATION SPECIFICATIONS FOR THIS PROJECT. 6. CHECK AIR FLOW WITHIN INTAKE PLENUMS AND MIXING BOXES OF AIR HANDLING UNITS FOR UNEVEN FLOW AND TEMPERATURE STRATIFICATION AND PREPARE A REPORT WITH PROFILE ELEVATIONS (TEMPERATURE AND VELOCITY) ON EACH COIL OR FILTER FACE FOR
- 7. LOCATE START-STOP AND DISCONNECT SWITCHES, ELECTRICAL INTERLOCKS, AND MOTOR 8. VERIFY THAT MOTOR STARTERS ARE EQUIPPED WITH PROPERLY SIZED THERMAL
- 9. CHECK DAMPERS FOR PROPER POSITION TO ACHIEVE DESIRED AIRFLOW PATH. 10. CHECK FOR AIRFLOW BLOCKAGES. 11. CHECK CONDENSATE DRAINS FOR PROPER CONNECTIONS AND FUNCTIONING. 12. CHECK FOR PROPER SEALING OF AIR-HANDLING UNIT COMPONENTS.

PROTECTION.

13. CHECK FOR PROPER SEALING OF AIR DUCT SYSTEM. C. GENERAL PROCEDURES FOR HYDRONIC SYSTEMS: 1. PREPARE TEST REPORTS WITH PERTINENT DESIGN DATA AND NUMBER IN SEQUENCE

- STARTING AT PUMP TO END OF SYSTEM. CHECK THE SUM OF BRANCH-CIRCUIT FLOWS AGAINST APPROVED PUMP FLOW RATE. PREPARE SCHEMATIC DIAGRAMS OF SYSTEMS' "AS-BUILT" PIPING LAYOUTS. OR USE REDUCED SCALE CONTRACT DOCUMENTS WITH NOTATIONS.
- 3. PREPARE HYDRONIC SYSTEMS FOR TESTING AND BALANCING ACCORDING TO THE FOLLOWING, IN ADDITION TO THE GENERAL PREPARATION PROCEDURES SPECIFIED ABOVE: a. OPEN ALL MANUAL VALVES FOR MAXIMUM FLOW.
- b. CHECK EXPANSION TANK LIQUID LEVEL. c. CHECK MAKEUP-WATER-STATION PRESSURE GAGE FOR ADEQUATE PRESSURE FOR HIGHEST VENT.
- d. CHECK FLOW-CONTROL VALVES FOR SPECIFIED SEQUENCE OF OPERATION AND SET AT INDICATED FLOW. e. SET SYSTEM CONTROLS SO AUTOMATIC VALVES ARE WIDE OPEN TO HEAT EXCHANGERS. f. SET DIFFERENTIAL-PRESSURE CONTROL VALVES AT THE SPECIFIED DIFFERENTIAL PRESSURE. DO NOT SET AT FULLY CLOSED POSITION WHEN PUMP IS

POSITIVE-DISPLACEMENT TYPE UNLESS SEVERAL TERMINAL VALVES ARE KEPT OPEN.

g. CHECK PUMP-MOTOR LOAD. IF MOTOR IS OVERLOADED, THROTTLE MAIN

D. TOLERANCES: 1. SET HVAC SYSTEM AIRFLOW AND WATER FLOW RATES WITHIN THE FOLLOWING TOLERANCES: a. AIR HANDLING EQUIPMENT AND OUTLETS: PLUS OR MINUS 5 PERCENT. WHERE TERMINAL UNITS SERVE 6 OR MORE OUTLETS WITHIN A COMMON ROOM, INDIVIDUAL OUTLETS MAY VARY UP TO PLUS OR MINUS 10 PERCENT OF DESIGN FLOW RATES IF

FLOW-BALANCING DEVICE SO MOTOR NAMEPLATE RATING IS NOT EXCEEDED.

OVERALL ROOM SUPPLY IS WITHIN PLUS OR MINUS 5 PERCENT. b. HEATING-WATER FLOW RATE: 0 TO MINUS 10 PERCENT.

DUCT ACCESSORIES

- A. QUALITY ASSURANCE: COMPLY WITH NFPA 90A, "INSTALLATION OF AIR CONDITIONING AND VENTILATING SYSTEMS," AND NFPA 90B, "INSTALLATION OF WARM AIR HEATING AND AIR
- B. BIRD SCREENS: NO. 2 MESH, 0.063 INCH DIAMETER GALVANIZED WIRE SCREEN WITH OPEN AREA OF NOT LESS THAN 72 PERCENT. CONCEAL SHARP EDGES BY ADDING METAL EDGING CONSISTING OF ROD, FLAT OR ANGLE IRON, OR 16 GAGE GALVANIZED SHEET STEEL TURNED OVER AT LEAST 3/4 INCH ON BOTH SIDES.
- MANUAL VOLUME DAMPERS (LOW PRESSURE): 1. FACTORY FABRICATED, WITH REQUIRED HARDWARE AND ACCESSORIES, STIFFEN DAMPER BLADES FOR STABILITY. INCLUDE LOCKING DEVICE TO HOLD SINGLE—BLADE DAMPERS IN A FIXED POSITION WITHOUT VIBRATION. CLOSE DUCT PENETRATIONS FOR DAMPER
- COMPONENTS TO SEAL DUCT CONSISTENT WITH PRESSURE CLASS. 2. DAMPER HARDWARE: ZINC-PLATED, DIE-CAST CORE WITH DIAL AND HANDLE MADE OF 3/32-INCH- THICK ZINC-PLATED STEEL, AND A 3/4-INCH HEXAGON LOCKING NUT. INCLUDE CENTER HOLE TO SUIT DAMPER OPERATING-ROD SIZE. INCLUDE ELEVATED
- PLATFORM FOR INSULATED DUCT MOUNTING. 3. MANUFACTURERS: AMERICAN WARMING AND VENTILATING | ARROW UNITED INDUSTRIES GREENHECK | KRUEGER | LOUVERS AND DAMPERS | NAILOR INDUSTRIES INC. | RUSKIN COMPANY | VENT PRODUCTS COMPANY, INC. | YOUNG REGULATOR COMPANY.
- D. MANUAL VOLUME DAMPERS (MEDIUM OR HIGH PRESSURE): 1. FACTORY FABRICATED, WITH REQUIRED HARDWARE AND ACCESSORIES, STIFFEN DAMPER BLADES FOR STABILITY. INCLUDE LOCKING DEVICE TO HOLD SINGLE-BLADE DAMPERS IN A POSITION WITHOUT VIBRATION. CLOSE DUCT PENETRATIONS FOR DAMPER COMPONENTS TO SEAL DUCT CONSISTENT WITH PRESSURE CLASS 2. DAMPER HARDWARE: ZINC-PLATED, DIE-CAST CORE WITH DIAL AND HANDLE MADE OF 3/32-INCH- THICK ZINC-PLATED STEEL, AND A 3/4-INCH HEXAGON LOCKING NUT. INCLUDE CENTER HOLE TO SUIT DAMPER OPERATING-ROD SIZE. INCLUDE ELEVATED
- 3. MANUFACTURERS: AMERICAN WARMING AND VENTILATING | GREENHECK | LOUVERS AND DAMPERS | NAILOR INDUSTRIES INC. | RUSKIN COMPANY | VENT PRODUCTS COMPANY, INC. E. FIRE DAMPERS (CURTAIN STYLE): 1. DYNAMIC FIRE DAMPERS WITH CURTAIN STYLE BLADES, AND LABELED ACCORDING TO
- 2. FIRE RATING: AS REQUIRED BY WALL CONSTRUCTION. FUSIBLE LINKS: REPLACEABLE, 165 DEG F RATED. 4. MANUFACTURERS: AIR BALANCE, INC. | GREENHECK | NCA MANUFACTURING, INC. | NAILOR

UL 555, MAXIMUM VELOCITY 2000 FPM, MAXIMUM STATIC PRESSURE 4 INCHES W.G.

- INDUSTRIES INC. | RUSKIN COMPANY. FABRICATE TO COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS——META
- GALVANIZED SHEET STEEL SET INTO VANE RUNNERS SUITABLE FOR DUCT MOUNTING. a. MANUFACTURERS: AERO/DYNE COMPANY | DUCTMATE INDUSTRIES, INC. | DURO DYNE CORP. I WARD INDUSTRIES, INC. 3. ACOUSTIC TURNING VANES: DOUBLE-VANE CURVED BLADES OF GALVANIZED SHEET STEEL

2. MANUFACTURED TURNING VANES: DOUBLE-VANE OR AIRFOIL-SHAPED, CURVED BLADES OF

AND FLEXIBLE" FOR VANES AND VANE RUNNERS. VANE RUNNERS SHALL AUTOMATICALLY

- WITH PERFORATED FACES AND FIBROUS-GLASS FILL SET INTO VANE RUNNERS SUITABLE FOR DUCT MOUNTING. a. MANUFACTURERS: DUCTMATE INDUSTRIES, INC. | WARD INDUSTRIES, INC.
- 1. FABRICATE DOORS AIRTIGHT AND SUITABLE FOR DUCT PRESSURE CLASS. DOORS MAY BE FIELD FABRICATED IN ACCORDANCE WITH SMACNA STANDARDS, OR COMMERCIALLY 2. DOOR: DOUBLE WALL, DUCT MOUNTING, AND RECTANGULAR; FABRICATED OF GALVANIZED

G. DUCT-MOUNTING ACCESS DOORS:

RUSKIN COMPANY.

CHEMICAL-RESISTANT COATING.

INDICATED.

HART & COOLEY, INC.

- SHEET METAL WITH INSULATION FILL AND THICKNESS AS INDICATED FOR DUCT PRESSURE CLASS. INCLUDE VISION PANEL WHERE INDICATED. INCLUDE BUTT OR PIANO HINGE AND CAM LATCHES. a. MANUFACTURERS: AIR BALANCE, INC. | GREENHECK | NAILOR INDUSTRIES INC.
- 3. DOOR: DOUBLE WALL, DUCT MOUNTING, AND ROUND; FABRICATED OF GALVANIZED SHEET METAL WITH INSULATION FILL AND 1-INCH THICKNESS. INCLUDE CAM LATCHES. a. MANUFACTURERS: DUCTMATE INDUSTRIES, INC. | FLEXMASTER U.S.A., INC. 4. INSTALL DUCT-MOUNTING, RECTANGULAR ACCESS DOORS WITH LONG DIMENSION AT RIGHT ANGLES TO DIRECTION OF AIRFLOW AND OF LARGEST STANDARD SIZE WHICH CAN BE
- ACCOMMODATED IN DUCT. MAXIMUM SIZE: 21 BY 14 INCHES.
- 1. FLAME-RETARDANT OR NONCOMBUSTIBLE FABRICS, COATINGS, AND ADHESIVES COMPLYING WITH UL 181, CLASS 1 2. METAL-EDGED CONNECTORS: FACTORY FABRICATED WITH A FABRIC STRIP ATTACHED TO STRIPS OF GALVANIZED SHEET STEEL, STAINLESS STEEL OR ALUMINUM SHEETS.
- SELECT METAL COMPATIBLE WITH DUCTS. 3. INDOOR SYSTEM, FLEXIBLE CONNECTOR FABRIC: GLASS FABRIC DOUBLE COATED WITH 4. OUTDOOR SYSTEM, FLEXIBLE CONNECTOR FABRIC: GLASS FABRIC DOUBLE COATED WITH
- WEATHERPROOF, SYNTHETIC RUBBER RESISTANT TO UV RAYS AND OZONE. 5. HIGH-TEMPERATURE SYSTEM, FLEXIBLE CONNECTORS: GLASS FABRIC COATED WITH SILICONE RUBBER. 6. HIGH-CORROSIVE-ENVIRONMENT SYSTEM, FLEXIBLE CONNECTORS: GLASS FABRIC WITH
- 7. MANUFACTURERS: ADSCO MANUFACTURING LLC. | DURO DYNE CORP. | SENIOR FLEXONICS PATHWAY. | VENTFABRICS, INC. I. FLEXIBLE DUCTS, LOW AND MEDIUM PRESSURE: 1. FLEXIBLE DUCTS: INTERLOCKING SPIRAL OF GALVANIZED STEEL OR ALUMINUM
- FLAT STEEL BANDS; RATED TO 6 INCHES WG POSITIVE AND 4 INCHES WG NEGATIVE FOR LOW AND MEDIUM PRESSURE DUCTS. 2. INSULATED FLEXIBLE DUCTS: FLEXIBLE DUCT WRAPPED WITH FLEXIBLE GLASS FIBER INSULATION, ENCLOSED BY A FIRE RETARDANT POLYETHYLENE VAPOR BARRIER JACKET;

CONSTRUCTION OR FABRIC SUPPORTED BY HELICALLY WOUND SPRING STEEL WIRE OF

4. FLEXIBLE DUCT FITTINGS: GALVANIZED STEEL, TWIST-IN DESIGN WITH DAMPER. SIZE AS

- MAXIMUM 0.23 K VALUE AT 75 DEG F. 3. ACOUSTICAL PERFORMANCE SHALL BE TESTED IN ACCORDANCE WITH THE AIR DIFFUSION COUNCIL'S "FLEXIBLE AIR DUCT TEST CODE FD 72-R1, SECTION 3.0, SOUND
- 5. FLEXIBLE DUCT CLAMPS: STAINLESS-STEEL BAND WITH CADMIUM-PLATED HEX SCREW TO TIGHTEN BAND WITH A WORM-GEAR ACTION, IN SIZES 3 THROUGH 18 INCHES TO SUIT DUCT SIZE. 6. MANUFACTURERS: FLEXMASTER U.S.A., INC. | AUTOMATION INDUSTRIES THERMAFLEX
- J. FLEXIBLE DUCT FLBOW SUPPORTS: 1. ELBOW SUPPORTS SHALL BE CONSTRUCTED OF DURABLE COMPOSITE MATERIAL AND BE FULLY ADJUSTABLE TO SUPPORT FLEXIBLE DUCT DIAMETERS 6 INCHES THROUGH 16

BASED, WATERPROOF, AND RESISTANT TO GASOLINE AND GREASE.

3. MANUFACTURERS: AUTOMATION INDUSTRIES THERMAFLEX; FLEXFLOW ELBOW | SMART AIR & ENERGY SOLUTIONS; SMART FLOW ELBOW. K. DUCT ACCESSORY HARDWARE: ADHESIVES: HIGH STRENGTH, QUICK SETTING, NEOPRENE

2. FLBOW SUPPORTS SHALL BE ULLISTED FOR USE IN RETURN AIR PLENUM SPACES.

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SSUED FOR: BIDS 08/27/21

DATE

SHEET TITLE:

MECHANICAL

ISSUED

DESIGNER

ENGINEER:

SPECIFICATIONS

PIPING MATERIALS

- A. PIPING SYSTEM AND MATERIALS ARE SCHEDULED ON THE DRAWINGS.
- B. REGULATORY REQUIREMENTS: COMPLY WITH REQUIREMENTS IN PUBLIC LAW 111-380 "REDUCTION OF LEAD IN DRINKING WATER ACT," ABOUT LEAD CONTENT IN MATERIALS THAT WILL BE IN CONTACT WITH POTABLE WATER FOR HUMAN CONSUMPTION.

B. PIPING MATERIALS SHALL BEAR LABEL, STAMP, OR OTHER MARKINGS OF SPECIFIED TESTING

- D. TRANSITION AND SPECIAL FITTINGS WITH PRESSURE RATINGS AT LEAST EQUAL TO PIPING
- RATING MAY BE USED IN APPLICATIONS BELOW, UNLESS OTHERWISE INDICATED.
- E. FLANGES MAY BE USED ON ABOVEGROUND PIPING, UNLESS OTHERWISE INDICATED. F. COPPER TUBE AND FITTINGS:

THE FOLLOWING:

- 1. HARD COPPER TUBE: ASTM B 88, TYPE L, WATER TUBE, DRAWN TEMPER. a. COPPER PRESSURE FITTINGS: ASME B16.18, CAST-COPPER-ALLOY OR ASME B16.22,
- WROUGHT- COPPER, SOLDER-JOINT FITTINGS. FURNISH WROUGHT-COPPER FITTINGS IF b. BRONZE FLANGES: ASME B16.24. CLASS 150. WITH SOLDER-JOINT ENDS. FURNISH
- CLASS 300 FLANGES IF REQUIRED TO MATCH PIPING. c. COPPER UNIONS: MSS SP-123. CAST-COPPER-ALLOY. HEXAGONAL-STOCK BODY WITH BALL-AND-SOCKET, METAL-TO-METAL SEATING SURFACES, AND SOLDER-JOINT
- B. GENERAL-DUTY VALVES; AND DRAIN VALVES ARE SPECIFIED IN "VALVES."
- PIPE HANGER AND SUPPORT DEVICES ARE SPECIFIED IN "HANGERS AND SUPPORTS." INSTALL
- 1. VERTICAL PIPING: MSS TYPE 8 OR TYPE 42, CLAMPS. 2. INDIVIDUAL, STRAIGHT, HORIZONTAL PIPING RUNS: ACCORDING TO THE FOLLOWING:
- a. 100 FEET AND LESS: MSS TYPE 1, ADJUSTABLE, STEEL CLEVIS HANGERS. b. LONGER THAN 100 FEET: MSS TYPE 43, ADJUSTABLE ROLLER HANGERS
- c. LONGER THAN 100 FEET: MSS TYPE 49, SPRING CUSHION ROLLS, IF INDICATED. 3. MULTIPLE, STRAIGHT, HORIZONTAL PIPING RUNS 100 FEET OR LONGER: MSS TYPE 44,
- PIPE ROLLS. SUPPORT PIPE ROLLS ON TRAPEZE. 4. BASE OF VERTICAL PIPING: MSS TYPE 52. SPRING HANGERS
- D. INSTALL SUPPORTS ACCORDING TO "HANGERS AND SUPPORTS.
- SUPPORT VERTICAL PIPING AND TUBING AT BASE AND AT EACH FLOOR. F. ROD DIAMETER MAY BE REDUCED 1 SIZE FOR DOUBLE-ROD HANGERS, TO A MINIMUM OF
- G. 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
- H. INSTALL SUPPORTS FOR VERTICAL COPPER TUBING EVERY 10 FEET.
- I. SUPPORT PIPING AND TUBING NOT LISTED ABOVE ACCORDING TO MSS SP-69 AND MANUFACTURER'S WRITTEN INSTRUCTIONS.
- 1. STEEL PIPE ASTM A53/A53M, SCHEDULE 40 BLACK. FITTINGS TO BE ASME B16.3, MALLEABLE IRON, OR ASTM A234/A234M, WROUGHT STEEL WELDING TYPE. JOINTS TO BE
- WELDED OR THREADED TO ASME B31.1. 2. COPPER TUBE: ASTM B88 (ASTM B88M), TYPE K (A) OR L (B) ANNEALED. FITTINGS TO BE ASME B16.26, CAST BRONZE WITH FLARED JOINTS.
- 3. COPPER TUBE: ASTM B68/B68M, O50 OR O60 TEMPER; OR ASTM B75/B75M, H58 (GENERAL PURPOSE) DRAWN TEMPER. FITTINGS TO BE ASME B16.26 CAST BRONZE WITH
- 4. COPPER TUBE: ASTM B280, 060 SOFT ANNEALED. FITTINGS TO BE ASME B16.26 CAST BRONZE WITH FLARED JOINTS. K. UNIONS FOR PIPE SIZES 3 INCHES AND UNDER ARE TO BE FERROUS PIPE: CLASS 150
- MALLEABLE IRON THREADED UNIONS OR COPPER TUBE AND PIPE: CLASS 150 BRONZE UNIONS WITH SOLDERED JOINTS. L. FLANGES FOR PIPE SIZE OVER 1 INCH TO BE FERROUS PIPE: CLASS 150 MALLEABLE IRON THREADED OR FORGED STEEL SLIP-ON FLANGES: PREFORMED NEOPRENE GASKETS OF COPPER TUBE AND PIPE: CLASS 150 SLIP-ON BRONZE FLANGES; PREFORMED NEOPRENE
- M. MECHANICAL COUPLINGS FOR GROOVED AND SHOULDERED JOINTS: TWO OR MORE CURVED HOUSING SEGMENTS WITH CONTINUOUS KEY TO ENGAGE PIPE GROOVE. CIRCULAR C-PROFILE GASKET, AND BOLTS TO SECURE AND COMPRESS GASKET, DIMENSIONS AND TESTING TO BE IN ACCORDANCE WITH AWWA C606. HOUSING MATERIAL TO BE ASTM A47/A47M MALLEABLE IRON, DUCTILE IRON, OR GALVANIZED. GASKET MATERIAL TO BE EPDM SUITABLE FO OPERATING TEMPERATURE RANGE FROM MINUS 30 DEGREES F TO 230 DEGREES
- 180 DEGREES F. BOLTS AND NUTS TO BE HOT DIPPED GALVANIZED OF ZINC-ELECTROPLATED STEEL. N. DIELECTRIC CONNECTIONS: UNION WITH GALVANIZED OR PLATED STEEL THREADED END,

NITRILE RUBBER SUITABLE FOR OPERATING TEMPERATURE RANGE FROM MINUS 20 DEGREES F

- COPPER SOLDER END, WATER IMPERVIOUS ISOLATION BARRIER. O. PROVIDE HANGERS AND SUPPORTS THAT COMPLY WITH MSS SP-58. IF TYPE OF HANGER OR SUPPORT FOR PARTICULAR SITUATION IS NOT INDICATED, SELECT APPROPRIATE TYPE USING
- P. OVERHEAD SUPPORTS TO BE INDIVIDUAL STEEL ROD HANGERS ATTACHED TO THE STRUCTURE
- Q. JOINING MATERIALS: REFER TO "BASIC MECHANICAL MATERIALS AND METHODS." R. COMBINATION, BALANCING VALVES NPS 2 AND SMALLER:
- 1. BODY: BRASS OR BRONZE, BALL OR PLUG TYPE WITH CALIBRATED ORIFICE OR VENTURI.
- 2. BALL: BRASS OR STAINLESS STEEL. PLUG: RESIN.

MSS SP-58 RECOMMENDATIONS.

- 4. SEAT: PTFE. 5. END CONNECTIONS: THREADED OR SOCKET.
- 6. PRESSURE GAGE CONNECTIONS: INTEGRAL SEALS FOR PORTABLE DIFFERENTIAL PRESSURE
- 7. HANDLE STYLE: LEVER, WITH MEMORY STOP TO RETAIN SET POSITION.
- 8. CWP RATING: MINIMUM 125 PSIG.
- 9. MAXIMUM OPERATING TEMPERATURE: 250 DEG F
- 10. MANUFACTURERS: FLOW DESIGN INC. | GRISWOLD CONTROLS | HYDRONIC COMPONENTS, INC. (HCI) | NEXUS VALVE.
- S. COMBINATION, BALANCING VALVES NPS 2-1/2 THROUGH NPS 4:
- 1. BODY: CAST-IRON OR STEEL BODY, BALL, PLUG, BUTTERFLY, OR GLOBE PATTERN WITH CALIBRATED ORIFICE OR VENTURI.
- 2. BALL: BRASS OR STAINLESS STFFI. STEM SEALS: EPDM O-RINGS.
- 4. DISC: GLASS AND CARBON-FILLED PTFE.
- SEAT: PTFE.
- 6. END CONNECTIONS: FLANGED OR GROOVED.
- 7. PRESSURE GAGE CONNECTIONS: INTEGRAL SEALS FOR PORTABLE DIFFERENTIAL PRESSURE
- 8. HANDLE STYLE: LEVER, WITH MEMORY STOP TO RETAIN SET POSITION. 9. CWP RATING: MINIMUM 125 PSIG. 10. MAXIMUM OPERATING TEMPERATURE: 250 DEG F.
- 11. MANUFACTURERS: FLOW DESIGN INC. | GRISWOLD CONTROLS | HYDRONIC COMPONENTS, INC. (HCI) | NEXUS VALVE.
- MANUAL AIR VENTS: USE BALL-VALVE-TYPE HOSE-END DRAIN VALVES, REFER TO "VALVES." U. AUTOMATIC AIR VENTS:
- 1. BODY: BRONZE OR CAST IRON. 2. INTERNAL PARTS: NONFERROUS
- 3. OPERATOR: NONCORROSIVE METAL FLOAT
- 4. INLET CONNECTION: NPS 1/2. DISCHARGE CONNECTION: NPS 1/4
- 6. CWP RATING: 150 PSIG.

AND DRAIN CONNECTION.

20 FEET OR LONGER.

- 7. MAXIMUM OPERATING TEMPERATURE: 240 DEG F. 8. MANUFACTURERS: AMTROL, INC. | ARMSTRONG PUMPS, INC. | BELL & GOSSETT; XYLEM
- INC. | TACO. V. Y-PATTERN STRAINERS: 1. BODY: ASTM A 126, CLASS B, CAST IRON WITH BOLTED COVER AND BOTTOM DRAIN
- 2. BODY, GROOVED: ASTM A 536, GRADE 65-45-12, DUCTILE-IRON WITH COUPLED COVER
- 3. END CONNECTIONS: THREADED ENDS FOR NPS 2 AND SMALLER: FLANGED ENDS FOR NPS 2-1/2 AND LARGER; GROOVED ENDS MAY BE USED ON GROOVED PIPING.
- 4. STRAINER SCREEN: 40-MESH STARTUP STRAINER, AND PERFORATED STAINLESS-STEEL BASKET WITH 50 PERCENT FREE AREA.
- 5. CWP RATING: MINIMUM 125 PSIG.
- a. PIPE PLUG FOR SIZES NPS 2 AND SMALLER.
- b. FACTORY-INSTALLED, HOSE-END DRAIN VALVE FOR SIZES NPS 2-1/2 AND LARGER. 7. MANUFACTURERS: KECKLEY | METRAFLEX | MUELLER STEAM SPECIALTY | SPENCE | SSI EQUIPMENT, INC. | WATTS WATER TECHNOLOGIES, INC. | YARWAY | ANVIL INTERNATIONAL,
- INC.; (FOR GROOVED PIPING) | VICTAULIC COMPANY; (FOR GROOVED PIPING). W. HANGER, SUPPORT, AND ANCHOR DEVICES ARE SPECIFIED IN "HANGERS AND SUPPORTS." COMPLY WITH THE FOLLOWING REQUIREMENTS FOR MAXIMUM SPACING OF SUPPORTS.
- X. INSTALL THE FOLLOWING PIPE ATTACHMENTS: 1. ADJUSTABLE STEEL CLEVIS HANGERS FOR INDIVIDUAL HORIZONTAL PIPING LESS THAN 20

2. ADJUSTABLE ROLLER HANGERS AND SPRING HANGERS FOR INDIVIDUAL HORIZONTAL PIPING

- 3. PIPE ROLLER: MSS SP-58, TYPE 44 FOR MULTIPLE HORIZONTAL PIPING 20 FEET OR LONGER, SUPPORTED ON A TRAPEZE.
- 4. SPRING HANGERS TO SUPPORT VERTICAL RUNS. 5. PROVIDE COPPER-CLAD HANGERS AND SUPPORTS FOR HANGERS AND SUPPORTS IN
- DIRECT CONTACT WITH COPPER PIPE. Y. INSTALL HANGERS FOR DRAWN-TEMPER COPPER PIPING WITH THE FOLLOWING MAXIMUM
- SPACING AND MINIMUM ROD SIZES:
- 1. NPS 3/4: MAXIMUM SPAN, 5 FEET; MINIMUM ROD SIZE, 1/4 INCH. 2. NPS 1: MAXIMUM SPAN, 6 FEET; MINIMUM ROD SIZE, 1/4 INCH.
- 3. NPS 1-1/2: MAXIMUM SPAN, 8 FEET; MINIMUM ROD SIZE, 3/8 INCH. 4. NPS 2: MAXIMUM SPAN, 8 FEET; MINIMUM ROD SIZE, 3/8 INCH.
- 5. NPS 2-1/2: MAXIMUM SPAN, 9 FEET; MINIMUM ROD SIZE, 3/8 INCH. 6. NPS 3: MAXIMUM SPAN, 10 FEET; MINIMUM ROD SIZE, 3/8 INCH.
- 7. NPS 4 TO NPS 5: MAXIMUM SPAN, 10 FEET MINIMUM ROD SIZE, 1/2-INCH.
- Z. SUPPORT VERTICAL RUNS AT ROOF, AT EACH FLOOR, AND AT 10-FOOT INTERVALS BETWEEN AA. PERFORM THE FOLLOWING TESTS ON HYDRONIC PIPING:
- 1. USE AMBIENT TEMPERATURE WATER AS A TESTING MEDIUM UNLESS THERE IS RISK OF DAMAGE DUE TO FREEZING. ANOTHER LIQUID THAT IS SAFE FOR WORKERS AND COMPATIBLE WITH PIPING MAY BE USED.
- 2. WHILE FILLING SYSTEM, USE VENTS INSTALLED AT HIGH POINTS OF SYSTEM TO RELEASE AIR. USE DRAINS INSTALLED AT LOW POINTS FOR COMPLETE DRAINING OF TEST LIQUID. 3. ISOLATE EXPANSION TANKS AND DETERMINE THAT HYDRONIC SYSTEM IS FULL OF WATER. 4. SUBJECT PIPING SYSTEM TO HYDROSTATIC TEST PRESSURE THAT IS NOT LESS THAN 1.5 TIMES THE SYSTEM'S WORKING PRESSURE. TEST PRESSURE SHALL NOT EXCEED MAXIMUM PRESSURE FOR ANY VESSEL, PUMP, VALVE, OR OTHER COMPONENT IN SYSTEM UNDER TEST. VERIFY THAT STRESS DUE TO PRESSURE AT BOTTOM OF VERTICAL RUNS DOES NOT EXCEED 90 PERCENT OF SPECIFIED MINIMUM YIELD STRENGTH OR 1.7 TIMES "SE"
- VALUE IN APPENDIX A IN ASME B31.9, "BUILDING SERVICES PIPING." 5. AFTER HYDROSTATIC TEST PRESSURE HAS BEEN APPLIED FOR AT LEAST 10 MINUTES, EXAMINE PIPING, JOINTS, AND CONNECTIONS FOR LEAKAGE. ELIMINATE LEAKS TIGHTENING, REPAIRING, OR REPLACING COMPONENTS, AND REPEAT HYDROSTATIC TEST UNTIL THERE ARE NO LEAKS.
- 6. PREPARE WRITTEN REPORT OF TESTING. AB. PERFORM THE FOLLOWING BEFORE OPERATING THE SYSTEM:
- OPEN MANUAL VALVES FULLY 2. INSPECT PUMPS FOR PROPER ROTATION.
- 3. REMOVE DISPOSAL FINE-MESH STRAINERS IN PUMP SUCTION DIFFUSERS. 4. SET MAKEUP PRESSURE-REDUCING VALVES FOR REQUIRED SYSTEM PRESSURE.
- 5. INSPECT AIR VENTS AT HIGH POINTS OF SYSTEM AND DETERMINE IF ALL ARE INSTALLED AND OPERATING FREELY (AUTOMATIC TYPE), OR BLEED AIR COMPLETELY (MANUAL TYPE).
- 6. SET TEMPERATURE CONTROLS SO ALL COILS ARE CALLING FOR FULL FLOW 7. INSPECT AND SET OPERATING TEMPERATURES OF HYDRONIC EQUIPMENT, SUCH AS

BOILERS, CHILLERS, COOLING TOWERS, TO SPECIFIED VALUES. AC. VERIFY LUBRICATION OF MOTORS AND BEARINGS.

PIPE FLEXIBLE CONNECTORS, EXPANSION TTINGS AND LOOPS

- A. MATERIALS FOR ANCHORS:
- 1. STEEL SHAPES AND PLATES: ASTM A 36/A 36M.
- 2. BOLTS AND NUTS: ASME B18.10 OR ASTM A 183, STEEL, HEX HEAD.
- 3. WASHERS: ASTM F 844, STEEL, PLAIN, FLAT WASHERS. 4. MECHANICAL FASTENERS: INSERT-WEDGE-TYPE STUD WITH EXPANSION PLUG ANCHOR FOR USE IN HARDENED PORTLAND CEMENT CONCRETE, AND TENSION AND SHEAR CAPACITIES
- APPROPRIATE FOR APPLICATION. 5. CHEMICAL FASTENERS: INSERT-TYPE-STUD BONDING SYSTEM ANCHOR FOR USE WITH
- HARDENED PORTLAND CEMENT CONCRETE, AND TENSION AND SHEAR CAPACITIES APPROPRIATE FOR APPLICATION. 6. CONCRETE: PORTLAND CEMENT MIX, 3000 PSI MINIMUM. REFER TO DIVISION 3 SECTION
- "CAST-IN-PLACE CONCRETE" FOR FORMWORK, REINFORCEMENT, AND CONCRETE. 7. GROUT: ASTM C 1107. FACTORY-MIXED AND -PACKAGED. DRY. HYDRAULIC-CEMENT.
- NONSHRINK, NONMETALLIC GROUT; SUITABLE FOR INTERIOR AND EXTERIOR APPLICATIONS. B. RUBBER FLEXIBLE CONNECTORS/EXPANSION JOINTS:
- 1. ASTM F 1123, FABRIC-REINFORCED RUBBER WITH EXTERNAL CONTROL RODS OR CABLES, AND COMPLYING WITH FSA'S "TECHNICAL HANDBOOK: NON-METALLIC EXPANSION JOINTS AND FLEXIBLE PIPE CONNECTORS. a. MANUFACTURERS: FLEX-WELD. INC./KEFLEX | MASON INDUSTRIES. INC.: MERCER
- CITY HOSE, INC. | VIBRATION MOUNTINGS & CONTROLS, INC. 2. MATERIAL: EPDM.

RUBBER CO. | METRAFLEX, INC. | SENIOR FLEXONICS, INC.; PATHWAY DIVISION | TWIN

- 3. END CONNECTIONS: FULL-FACED, INTEGRAL, STEEL FLANGES WITH STEEL RETAINING
- 4. COATING: FACTORY APPLIED HYPALON PAINT FOR OUTDOOR APPLICATIONS. C. HOSE AND BRAID FLEXIBLE CONNECTORS: 1. MANUFACTURERS: ADSCO MANUFACTURING, LLC. | FLEX-WELD, INC. | HYSPAN PRECISION
- PRODUCTS, INC. | METRAFLEX, INC. | SENIOR FLEXONICS, INC.; PATHWAY DIVISION | TWIN 2. FLEXIBLE CONNECTORS FOR COPPER PIPING: MULTIPLE-PLY PHOSPHOR-BRONZE CORRUGATED HOSE WITH BRONZE OUTER BRAID, COPPER FERRULE, AND COPPER PIPE
- END CONNECTIONS. 3. FLEXIBLE CONNECTORS FOR STEEL PIPING: MULTIPLE—PLY STAINLESS—STEEL CORRUGATED HOSE WITH STAINLESS STEEL OUTER BRAID, AND STEEL PIPE END CONNECTIONS.
- 4. MINIMUM PRESSURE RATING: 150 PSIG. UNLESS OTHERWISE INDICATED. 5. MAXIMUM TEMPERATURE RATING: 450 DEG F FOR COPPER PIPING CONNECTORS, 800 DEG F FOR STEEL PIPING CONNECTORS. D. EXPANSION COMPENSATORS:
- 1. DOUBLE-PLY CORRUGATED STEEL, STAINLESS-STEEL, OR COPPER-ALLOY BELLOWS IN HOUSING WITH INTERNAL GUIDES, ANTITORQUE DEVICE, AND REMOVABLE END CLIP FOR
- a. MANUFACTURERS: ADSCO MANUFACTURING, LLC. | FLEX-WELD, INC./KEFLEX | HYSPAN PRECISION PRODUCTS, INC. | METRAFLEX, INC. | SENIOR FLEXONICS, INC.; PATHWAY DIVISION | TWIN CITY HOSE, INC. 2. MINIMUM PRESSURE RATING: 200 PSIG, UNLESS OTHERWISE INDICATED.
- 3. CONFIGURATION FOR COPPER PIPING: TWO-PLY STAINLESS-STEEL BELLOWS AND BRONZE OR STAINLESS-STEEL SHROUD. 4. END CONNECTIONS FOR COPPER TUBING: SOLDER JOINT.
- 5. CONFIGURATION FOR STEEL PIPING: TWO-PLY STAINLESS-STEEL BELLOWS AND CARBON-STEEL SHROUD. 6. END CONNECTIONS FOR STEEL PIPE: NPS 2 AND SMALLER: THREADED. NPS 2-1/2
- TO NPS 4: FLANGED OR WELD. E. FLEXIBLE-HOSE EXPANSION JOINTS: 1. MANUFACTURED ASSEMBLY WITH TWO FLEXIBLE-METAL-HOSE LEGS JOINED BY LONG-RADIUS, 180-DEGREE RETURN BEND OR CENTER SECTION OF FLEXIBLE HOSE;
- WITH INLET AND OUTLET ELBOW FITTINGS, CORRUGATED-METAL INNER HOSES, AND BRAIDED OUTER SHEATHS. a. MANUFACTURERS: FLEX-HOSE CO., INC. | METRAFLEX, INC.; METRALOOP | TWIN CITY
- 2. FLEXIBLE-HOSE EXPANSION JOINTS FOR COPPER PIPING: COPPER-ALLOY FITTINGS WITH SOLDER-JOINT END CONNECTIONS.
- 3. FLEXIBLE-HOSE EXPANSION JOINTS FOR STEEL PIPING: CARBON-STEEL FITTINGS WITH THREADED END CONNECTIONS FOR NPS 2 AND SMALLER AND FLANGED OR WELD END CONNECTIONS TO MATCH PIPING SYSTEM FOR NPS 2-1/2 AND LARGER.
- 1. STEEL, FACTORY FABRICATED, WITH BOLTED TWO-SECTION OUTER CYLINDER AND BASE FOR ALIGNMENT OF PIPING AND TWO-SECTION GUIDING SPIDER FOR BOLTING TO PIPE. a. MANUFACTURERS: ADSCO MANUFACTURING, LLC. | FLEX-WELD, INC. | HYSPAN PRECISION PRODUCTS, INC. | METRAFLEX, INC. | SENIOR FLEXONICS, INC., PATHWAY
- G. SLIDING/GUIDING DEVICES: 1. FOR PIPE SIZE NPS 4 AND SMALLER ON ALL HOT PIPING, PROVIDE GUIDES EQUAL TO FLEXONICS SEMI-STEEL SPIDER AND GUIDING CYLINDER PIPE ALIGNMENT GUIDES FOR ALL EXPANSION JOINTS AND LOOPS. PROVIDE PIPE ALIGNMENT GUIDES IN QUANTITIES AT ALL LOCATIONS AS REQUIRED ACCORDING TO THE MANUFACTURER'S DESIGN CRITERIA RECOMMENDATIONS. PIPE ALIGNMENT GUIDES SHALL SERVE TO GUIDE THE EXPANSION JOINTS, LOOPS OR BENDS.
- a. MANUFACTURERS: B-LINE SYSTEMS, INC.; A DIVISION OF COOPER INDUSTRIES; FIGURE 3281 SERIES | SENIOR FLEXONICS | SYPRIS TECHNOLOGIES; TUBE TURNS DIVISION | U.S. FLEXIBLE METALLIC TUBING CO., KELFLEX TYPE M | METRAFLEX, INC.
- 2. FOR PIPE SIZES NPS 6 AND LARGER AND ALL GUIDES ON COLD PIPING. FURNISH PRE-ENGINEERED PRE-INSULATED GUIDES WITH PUBLISHED VERTICAL AND LATERAL LOAD RATINGS. CONSTRUCTION SHALL CONSIST OF AN INSULTED SHIELD CONTAINING STRUCTURAL CALCIUM SILICATE (100 PSI NON-LOAD BEARING AND 600 PSI LOAD BEARING) ENCASED IN 360 DEGREES OF OVERLAPPING SHEET METAL. A 36 STEEL CLAMPS TORQUED ONTO INSULATED SHIELD WITH RECOMMENDED CATALOG TORQUE VALVES. SLIDE SERVICE SHALL BE STAINLESS STEEL TO POLYETHYLENE OR TEFLON WITH
- A MAXIMUM COEFFICIENT OF FRICTION OF 0.15. a. MANUFACTURERS: PIPE SHIELDS, INC. B3000, B4000, B7000 AND B8000 SERIES | CARPENTER AND PATERSON, INC. | RILCO MFG. HG 3000, HG 4000, HG 7000, AND

HYDRONIC PUMPS

MOTORS AS A SUPPORT POINT.

- A. DESIGN REQUIREMENTS: REFER TO SCHEDULES FOR BASIS OF DESIGN AND PUMP CAPACITIES. B. IN-LINE CENTRIFUGAL PUMPS
- . MANUFACTURERS: ARMSTRONG PUMPS INC. | BELL & GOSSETT; XYLEM INC. | TACO, INC. C. EXAMINATION: EXAMINE ROUGHING-IN OF DOMESTIC-WATER-PIPING SYSTEM TO VERIFY ACTUAL LOCATIONS OF CONNECTIONS BEFORE PUMP INSTALLATION.
- D. PUMP INSTALLATION:
- COMPLY WITH HI 1.4. 2. INSTALL PUMPS WITH ACCESS FOR PERIODIC MAINTENANCE INCLUDING REMOVAL OF MOTORS, IMPELLERS, COUPLINGS, AND ACCESSORIES. 3. INDEPENDENTLY SUPPORT PUMPS AND PIPING SO WEIGHT OF PIPING IS NOT SUPPORTED BY PUMPS AND WEIGHT OF PUMPS IS NOT SUPPORTED BY PIPING. DO NOT USE PUMP

GENERAL-DUTY VALVES FOR HVAC

- A. ASME COMPLIANCE: ASME B31.9 FOR BUILDING SERVICES PIPING VALVES.
- B. ASME COMPLIANCE FOR FERROUS VALVES: ASME B16.10 AND ASME B16.34 FOR DIMENSION AND DESIGN CRITERIA.
- APPLICATIONS, USE THE FOLLOWING: 1. THROTTLING SERVICE: BALL, BUTTERFLY, OR GLOBE VALVES. 2. PUMP DISCHARGE: SPRING-LOADED, LIFT-DISC CHECK VALVES; AND BRONZE LIFT CHECK

C. ISOLATION VALVES ARE SCHEDULED ON THE DRAWINGS. FOR OTHER GENERAL HVAC VALVE

- D. TWO-PIECE, FULL-PORT, BRONZE BALL VALVES WITH STAINLESS-STEEL TRIM: TYPE 316 STAINLESS-STEEL BALL AND STEM, REINFORCED TFE SEATS, BLOW-OUT-PROOF STEM, WITH
- ADJUSTABLE STEM PACKING, SOLDERED OR THREADED ENDS; 150 PSIG SWP AND 600-PSIG 1. MANUFACTURERS: APOLLO VALVES; BY CONBRACO INDUSTRIES, INC.; SERIES 77C-140 CRANE CO.: CRANE VALVES | HAMMOND VALVE | MILWAUKEE VALVE COMPANY | NIBCO INC.: MODELS S-585-70-66 OR T-585-70-66 | WATTS WATER TECHNOLOGIES, INC.
- F. GENERAL SERVICE BUTTERFLY VALVES: MSS SP-67, FOR BUBBLE-TIGHT SHUTOFF, EXTENDED-NECK FOR INSULATION, DISC AND LINING SUITABLE FOR POTABLE WATER, UNLESS OTHERWISE INDICATED, AND WITH THE FOLLOWING FEATURES: FULL LUG, AND GROOVED VALVES SHALL BE SUITABLE FOR BI-DIRECTIONAL DEAD ENI SERVICE AT FULL RATED PRESSURE WITHOUT THE USE OR NEED OF A DOWNSTREAM
- GROOVED-END BUTTERFLY VALVES WITH EPDM-ENCAPSULATED DUCTILE-IRON DISC DUCTILE-IRON BODY WITH GROOVED OR SHOULDERED ENDS AND POLYAMIDE COATING INSIDE AND OUTSIDE; TYPE 416 STAINLESS-STEEL STEM, PTFE BRONZE SINTERED ON STEE BUSHING, AND 300-PSIG CWP RATING FOR VALVES NPS 2 THROUGH NPS 8, 200 PSIG CWP
- RATING FOR VALVES NPS 10 THROUGH NPS 12. 1. MANUFACTURERS: ANVIL INTERNATIONAL, INC. | NIBCO INC.; MODEL GD-4765-3/5 | TYCO FIRE & BUILDING PRODUCTS; GRINNELL MECHANICAL PRODUCTS | VICTAULIC CO. OF

BRONZE CHECK VALVES: MSS SP-80. CLASS 150. BRONZE. SWING CHECK VALVES WITH

2. VALVE SIZES NPS 2 THROUGH NPS 6 SHALL HAVE LEVER LOCK OPERATOR; VALVE SIZES

- BRONZE DISC: ASTM B-62 BRONZE BODY AND SEAT WITH REGRINDING-TYPE BRONZE DISC Y-PATTERN DESIGN, SOLDERED OR THREADED END CONNECTIONS, AND HAVING 300 PSIG MANUFACTURERS: APOLLO VALVES; BY CONBRACO INDUSTRIES, INC. | CRANE CO.; CRANE VALVES | CRANE CO.; STOCKHAM DIV. | HAMMOND VALVE | MILWAUKEE VALVE COMPANY; MODEL 515 | NIBCO INC.; MODELS S-433-B OR T-433-B | WATTS WATER
- K. IRON SWING CHECK VALVES: MSS SP-71, CLASS 125, GRAY-IRON, STANDARD SWING CHECK VALVES: ASTM A-126, CLASS B CAST-IRON BODY AND BOLTED BONNET WITH FLANGED END CONNECTIONS; NON-ASBESTOS SYNTHETIC-FIBER GASKETS; BRONZE DISC AND SEAT; AND HAVING 200 PSIG CWP RATING. 1. MANUFACTURERS: APOLLO VALVES: BY CONBRACO INDUSTRIES, INC. I CRANE CO.: CRANE
- VALVES | CRANE CO.; STOCKHAM DIV. | HAMMOND VALVE | MILWAUKEE VALVE COMPANY; MODEL F-2974 | NIBCO INC.; MODEL F-918-B | WATTS WATER TECHNOLOGIES. M. GROOVED-END, SWING CHECK VALVES: DUCTILE-IRON BODY WITH GROOVED OR SHOULDERED ENDS; NONASBESTOS, SYNTHETIC-FIBER GASKETS; RUBBER SEATS; AND HAVING 250-PSIG
- 1. MANUFACTURERS: MUELLER CO. | NIBCO, INC.; MODEL G-917-W | TYCO FIRE & BUILDING PRODUCTS; GRINNELL MECHANICAL PRODUCTS | VICTAULIC CO. OF AMERICA.
- N. BRONZE LIFT CHECK VALVES: CLASS 125, LIFT CHECK VALVES WITH NONMETALLIC TFE DISC: DESCRIPTION: a. STANDARD: MSS SP-80, TYPE :
- b. CWP RATING: 250 PSIG. c. BODY DESIGN: VERTICAL FLOW.
- d. BODY MATERIAL: ASTM B 584 ALLOY C844, BRONZE. e. ENDS: THREADED OR SOLDER.

TECHNOLOGIES.

- f. DISC: PTFE, OR TFE. 2. MANUFACTURERS: HAMMOND VALVE | MILWAUKEE VALVE COMPANY | NIBCO INC.; MODEL
- S-480-Y OR T-480-Y | THE WM. POWELL COMPANY. SPRING-LOADED, CENTER-GUIDED LIFT-DISC (SILENT) CHECK VALVES, GENERAL: FCI 74-AND MIL-V-18436F, WITH SPRING-LOADED, CENTER-GUIDED BRONZE DISC AND SEAT. 1. CLASS 125 WAFER LIFT-DISC CHECK VALVES: WAFER STYLE WITH CAST-IRON BODY WITH DIAMETER MADE TO FIT WITHIN BOLT CIRCLE, AND HAVING 200 PSIG CWP RATING. a. MANUFACTURERS: NIBCO INC.; MODEL W-910-B | MUELLER STEAM SPECIALTY
- MILWAUKEE VALVE COMPANY | HAMMOND VALVE. 3. CLASS 125, GLOBE, FLANGED LIFT-DISC CHECK VALVES: GLOBE STYLE WITH CAST-IRON BODY AND FLANGED ENDS, AND HAVING 200 PSIG CWP RATING. a. MANUFACTURERS: NIBCO INC.; MODEL F-910-B | MUELLER STEAM SPECIALTY |
- BRONZE GLOBE VALVES: MSS SP-80, WITH MALLEABLE-IRON HANDWHEEL, CLASS 150, TFE DISC, BRONZE GLOBE VALVES: ASTM B-62 BRONZE BODY, BONNET, AND SEAT, TFE DISC COPPER-SILICONE BRONZE STEM, UNION-RING BONNET, SOLDERED OR THREADED END CONNECTIONS: AND HAVING 300 PSIG CWP RATING. 1. MANUFACTURERS: APOLLO VALVES; BY CONBRACO INDUSTRIES, INC. | CRANE CO.; CRANE VALVES | HAMMOND VALVE | MILWAUKEE VALVE COMPANY; MODEL 590 | NIBCO INC.;
- R. DRAIN VALVES: BALL-VALVE-TYPE, HOSE-END DRAIN VALVES: BRONZE BALL VALVE AS SPECIFIED IN THIS SECTION.

MODELS S-235-Y OR T-235-Y | WATTS WATER TECHNOLOGIES, INC.

- 2. OUTLET: THREADED, SHORT NIPPLE WITH GARDEN-HOSE THREAD COMPLYING WITH ASME B1.20.7 AND CAP WITH BRASS CHAIN. S. INSTALL VALVES WITH UNIONS OR FLANGES AT EACH PIECE OF EQUIPMENT ARRANGED TO
- ALLOW SERVICE, MAINTENANCE, AND EQUIPMENT REMOVAL WITHOUT SYSTEM SHUTDOWN. T. LOCATE VALVES FOR EASY ACCESS AND PROVIDE SEPARATE SUPPORT WHERE NECESSARY. U. INSTALL VALVES IN HORIZONTAL PIPING WITH STEM AT OR ABOVE CENTER OF PIPE. BUTTERFLY VALVES SHALL BE INSTALLED WITH STEM HORIZONTAL TO ALLOW SUPPORT FOR
- THE DISC AND THE CLEANING ACTION OF THE DISC. V. INSTALL VALVES IN POSITION TO ALLOW FULL STEM MOVEMENT.

W. INSTALL CHECK VALVES FOR PROPER DIRECTION OF FLOW.

MILWAUKEE VALVE COMPANY | HAMMOND VALVE.

- TEMPERATURE CONTROLS
- A. TEMPERATURE CONTROL BUILDING AUTOMATION SYSTEM CONSISTING OF DIRECT DIGITAL CONTROL (DDC) CONTROLLERS, CONTROL VALVES, CONTROL DAMPERS, SENSORS, TRANSDUCERS, RELAYS, SWITCHES, DATA COMMUNICATION NETWORK, ALL ASSOCIATED CONTROL WIRING AND RACEWAY SYSTEMS, BAS/DDC SYSTEM PROGRAMMING, DATABASE AND
- GRAPHIC DISPLAY GENERATION AT THE NEW/EXISTING REMOTE OPERATOR INTERFACE. B. THERMOSTAT CONTROL WHERE INDICATED.
- C. CONTROL SEQUENCES FOR HVAC SYSTEMS, SUBSYSTEMS, AND EQUIPMENT ARE INDICATED ON PROJECT DRAWINGS.
- D. INSTALLER QUALIFICATIONS: AN EXPERIENCED INSTALLER WHO IS AN APPROVED INSTALLER OF THE AUTOMATIC CONTROL SYSTEM MANUFACTURER FOR BOTH INSTALLATION AND MAINTENANCE OF UNITS REQUIRED FOR THIS PROJECT.
- E. 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
- F. COMPLY WITH NFPA 90A, "INSTALLATION OF AIR CONDITIONING AND VENTILATION SYSTEMS. G. THE BUILDING AUTOMATION SYSTEM (BAS) SHALL BE FULLY INTEGRATED, DISTRIBUTED DATA PROCESSING SYSTEM INCORPORATING DIRECT DIGITAL CONTROL (DDC) FOR THE CONTROL AND MONITORING OF HEATING, VENTILATING AND AIR CONDITIONING (HVAC) EQUIPMENT AND OTHER
- RELATED SYSTEMS. MICROPROCESSOR BASED DDC CONTROLLERS SHALL BE DIRECTLY CONNECTED TO HVAC EQUIPMENT SENSORS AND ACTUATORS. A DATA COMMUNICATION NETWORK SHALL ALLOW DATA EXCHANGE BETWEEN THE DDC CONTROLLERS AND THE EXISTING H. DIRECT DIGITAL CONTROL (DDC) CONTROLLERS: MODULAR IN DESIGN AND CONSISTING OF STAND-ALONE MICROPROCESSOR BOARD WITH ROM AND FULLY CUSTOM PROGRAMMABLE RAM. EPROM, AND/OR EEPROM MEMORY, INTEGRAL INTERFACE EQUIPMENT AND POWER SURGE
- PROTECTION. CONTROLLERS SHALL BE CONNECTED DIRECTLY TO SENSORS, CONTROLLED DEVICES AND THE COMMUNICATION NETWORK. DATA COMMUNICATION NETWORK SHALL BE PROVIDED TO ALLOW DATA TRANSMISSION BETWEEN ALL DDC CONTROLLERS AND BETWEEN THE DDC CONTROLLERS AND THE EXISTING WSU
- J. PRESSURE INDEPENDENT CONTROL VALVES (2-WAY): UP TO 2 INCHES CHARACTERIZED BALL VALVE WITH INTEGRAL PRESSURE CÒMPENŚATING CARTRIDGE WHICH MAINTAINS CONSTANT PRESSURE DROP ACROSS VALVE SEAT, BRONZE BODY WITH SCREWED ENDS STAINLESS STEEL OR CHROME PLATED BRASS BALL, CHARACTERIZING DISC. STAINLESS STEI OR BRASS STEM, AND RESILIENT REINFORCED TEFLON SEATS. OVER 2 INCHES - CONTROL VALVE WITH INTEGRAL PRESSURE COMPENSATING SPRING AND DIAPHRAGM WHICH MAINTAINS A CONSTANT PRESSURE DROP ACROSS THE VALVE SEAT, IRON BODY WITH FLANGED END: STAINLESS STEEL TRIM. CONTROL VALVES SHALL ACCURATELY CONTROL FLOW FROM 0 TO 100% OF THE FULL RATED FLOW. FLOW THROUGH THE CONTROL VALVE SHALL NOT VARY MORE THAN +/- 5% DUE TO SYSTEM PRESSURE FLUCTUATIONS WHEN THE PRESSURE DROP ACROSS THE VALVE IS WITHIN THE RANGE OF 5 PSID TO 35 PSID. ASSEMBLY BODY SHALL BE EQUIPPED WITH UPSTREAM AND DOWNSTREAM P/T PORTS. MANUFACTURERS: BELIMO. BRAY/DELTA CONTROL PRODUCTS, DANFOSS NEXUS VALVE, FLOWCON INTERNATIONAL,
- GRISWOLD, HONEYWELL, JOHNSON CONTROLS. K. PRESSURE DEPENDENT CHARACTERIZED BALL VALVES (2-WAY & 3-WAY): UP TO 2 INCHES - BRONZE BODY WITH SCREWED ENDS. STAINLESS STEEL OR CHROME PLATED BRASS BALL. CHARACTERIZING DISC. STAINLESS STEEL OR BRASS STEM. AND RESILIENT REINFORCED TEFLON SEATS. MANUFACTURERS: BELIMO, BRAY/DELTA CONTROL PRODUCTS, HONEYWELL,
- GLOBE VALVES (2-WAY & 3-WAY): UP TO 2 INCHES: BRONZE BODY, BRONZE TRIM, RISING STEM, RENEWABLE COMPOSITION DISC, SINGLE SEATED, SCREWED ENDS WITH BACKSEATING CAPABILITY, REPACKABLE UNDER PRESSURE. OVER 2 INCHES: IRON BODY, BRONZE TRIM RISING STEM. PLUG_TYPE DISC. FLANGED ENDS. RENEWABLE SEAT AND DISC. REPACKABLE UNDER PRESSURE. VALVE STEM PACKING SHALL BE TETRAFLUORETHYLENE, SPRING LOADEI AND SELF-ADJUSTING. PACKLESS CONSTRUCTION IS ACCEPTABLE. MANUFACTURERS: BELIMO, BRAY/DELTA CONTROL PRODUCTS, HONEYWELL, JOHNSON CONTROLS, SIEMENS:
- M. CONTROLS DAMPERS: PERFORMANCE TEST IN ACCORDANCE WITH AMCA 500. FRAMES GALVANIZED STEEL, MINIMUM 16 GAUGE, MINIMUM 2 INCHES IN WIDTH, WELDED OR RIVETED WITH CORNER REINFORCEMENT FOR 12 GAGE STRUCTURAL EQUIVALENCE. BLADES GALVANIZED STEEL, MINIMUM 14 GAUGE, MAXIMUM BLADE SIZE 8 INCHES WIDE, 60 INCHES LONG, ATTACHED TO MINIMUM 1/2 INCH SHAFTS. DAMPERS WHICH ARE REQUIRED TO HAVE A STATIC PRESSURE RATING OVER 4 INCH W.G. SHALL HAVE MINIMUM 3/4 INCH SOLID SHAFTS. BLADE SEALS — SYNTHETIC ELASTOMERIC OR NEOPRENE. MECHANICALLY ATTACHED. FIELD REPLACEABLE. JACKSHAFTS (WHERE REQUIRED) — MINIMUM 1/2 INCH GALVANIZED STEEL. JAMB SEALS — STAINLESS STEEL. BEARINGS — OIL IMPREGNATED SINTERED BRONZE OR LUBRICANT FREE, SOLID STAINLESS STEEL. PROVIDE THRUST WASHERS AT BEARINGS FOR ALL DAMPERS WHICH ARE TO BE MOUNTED WITH BLADES IN THE VERTICAL POSITION. LINKAGES - ACCESSIBLE FOR MAINTENANCE LOCATED IN AIRSTREAM (ZINC PLATED) OR IN DAMPER FRAME EXTERNAL TO THE DUCT. LEAKAGE — LESS THAN 8 CFM PER SQUARE FOOT BASED ON 4 INCHES W.G. PRESSURE DIFFERENTIAL. STATIC PRESSURE RATING - AS SCHEDULED ON THE DRAWINGS. OR IF NOT SCHEDULED. MINIMUM 4" W.G. MAXIMUM VELOCITY — AS SCHEDULED ON THE DRAWINGS. OR DESIGN FOR MAXIMUM VELOCITY TO BE ENCOUNTERED IN LOCATION WHERE INSTALLED. TEMPERATURE LIMITS - NEG 40 TO 200°F. MANUFACTURERS: AMERICAN WARMING & VENTILATING, ARROW UNITED INDUSTRIES, GREENHECK, HONEYWELL,
- JOHNSON CONTROLS, LOUVERS & DAMPERS, INC, RUSKIN, TAMCO, VENT PRODUCTS.

N. ELECTRICAL REQUIREMENTS FOR CONTROLS WORK

- 1. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. 2. ELECTRICAL ACCESSORIES SUCH AS RELAYS. SWITCHES. CONTACTORS AND CONTROL
- TRANSFORMERS SHALL MEET THE REQUIREMENTS OF THE DIVISION 26 SPECIFICATIONS OF 3. ELECTRICAL WIRING AND CONDUIT SHALL MEET THE REQUIREMENTS OF THE DIVISION 26 SPECIFICATIONS. ALL CONTROL WIRING IN MECHANICAL ROOMS AND ANY OTHER EXPOSED AREAS SHALL BE RUN IN CONDUIT. LOW VOLTAGE TEMPERATURE CONTROL WIRING IN CONCEALED ACCESSIBLE LOCATIONS (I.E. ABOVE LAY-IN CEILINGS), AS WELL AS LOW VOLTAGE TEMPERATURE CONTROL WIRING WITHIN PARTITIONS. MAY BE RUN USING PLENUM RATED CABLE, NEATLY TIE-WRAPPED AND FASTENED TO THE BUILDING STRUCTURE (NOT TO
- CEILING OR CEILING SUPPORT WIRES). 4. CONDUITS CARRYING CONTROL WIRING SHALL BE SIZED FOR A MAXIMUM FILL OF 40% OF
- 5. WHERE RACEWAY IS REQUIRED, TWO SEPARATE RACEWAY SYSTEMS SHALL BE PROVIDED; ONE FOR A.C. WIRING AND THE OTHER FOR D.C. WIRING 6. DATA TRANSMISSION CABLING AND EQUIPMENT GROUNDING PROCEDURES SHALL MEET THE LATEST FCC GUIDELINES FOR ELECTROMAGNETIC FIELD GENERATION. 7. ALL CONTROL WIRING SIZES AND TYPES SHALL MEET OR EXCEED THE EQUIPMENT
- MANUFACTURER'S RECOMMENDATIONS. P. INSTALLATION - CONTROL SYSTEMS:

UNLESS NOTED OTHERWISE.

- 1. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. 2. CHECK AND VERIFY LOCATION OF TEMPERATURE SENSORS, THERMOSTATS AND OTHER EXPOSED CONTROL SENSORS WITH PLANS AND ROOM DETAILS BEFORE INSTALLATION. LOCATE ROOM TEMPERATURE SENSORS AND THERMOSTATS 48 INCHES ABOVE FLOOR
- 3.LOCATE ALL CONTROL COMPONENTS AND ACCESSORIES SUCH THAT THEY ARE EASILY ACCESSIBLE FOR ADJUSTMENT, SERVICE AND REPLACEMENT 4.LOCATE, SUPPORT AND INSTALL ALL CONTROL COMPONENTS AND ACCESSORIES SO THAT THEY WILL NOT BE SUBJECT TO VIBRATION, EXCESSIVE TEMPERATURES, DIRT, MOISTURE OR
- OTHER HARMFUL CONDITIONS BEYOND THEIR RATED LIMITATIONS. 5. PROVIDE ALL NECESSARY RELAYS, SWITCHES, LINKAGES, CONTROL DEVICES, ACCESSORIES AND CONNECTIONS AS REQUIRED FOR A COMPLETE AND OPERATIONAL CONTROL SYSTEM AS SPECIFIED HEREIN AND SHOWN. 6.IDENTIFICATION AND MARKING: ALL SENSORS, RELAYS, SWITCHES, ETC. SHALL BE MARKED WITH THE SAME IDENTIFICATION NUMBER AS USED ON THE AS-BUILT SHOP DRAWINGS. USE

BROTHER P-TOUCH LABEL MAKER OR SIMILAR WITH BLACK TEXT ON CLEAR OR WHITE

SUPER ADHESIVE TAPE. IF LABEL APPLIED IN WET ENVIRONMENT. SPRAY LABEL WITH

CLEAR ENAMEL FOR WATERPROOFING. ALL CONTROL PANELS AND AUXILIARY ENCLOSURES BE SUPPLIED WITH ENGRAVED PLASTIC NAMEPLATE PERMANENTLY ATTACHED IDENTIFYING IT AS CONTROL PANEL NUMBER, SYSTEM SERVED, AREA SERVED, FED FROM LIGHTING PANEL NUMBER, CIRCUIT NUMBER, ET Q. GRAPHIC DISPLAY GENERATION. PROVIDE THE FOLLOWING GRAPHIC DISPLAYS AS A MINIMUM AT THE OPERATOR WORKSTATIONS, ARRANGED IN LOGICAL PENETRATION PATHS. 1. FLOOR PLANS FOR EACH FLOOR WITHIN BUILDING, WITH DISPLAY OF PRESENT VALUES OF SPACE CONDITIONS SENSED BY CONNECTED SPACE SENSORS, DISPLAY OF THE NAME OF THE AIR HANDLER ASSOCIATED WITH EACH SPACE SENSOR. DISPLAY OF THE ROOM NUMBER

IN WHICH THE SENSOR IS LOCATED AND COLOR CODING TO INDICATE WHETHER THE SENSED SPACE CONDITION IS WITHIN THE ACCEPTABLE RANGE, IS TOO HIGH, OR IS

- CONTRACTOR SHALL CONFIRM OWNER DESIRED ROOM NAMES PRIOR GRAPHICS GENERATION WHICH MAY DIFFER FROM THE ROOM NAMES INDICATED ON 2. SCHEMATIC DIAGRAM FOR EACH HVAC SYSTEM. EACH SYSTEM SCHEMATIC DISPLAY SHALL
- PUMPS, EQUIPMENT ETC. b.SYSTEM NAME.
- c.AREA SERVED. d.PRESENT VALUE OR STATUS OF ALL INPUTS, ALONG WITH PRESENT SETPOINT. e.PRESENT PERCENT OPEN FOR EACH DAMPER, VALVE, ETC. BASED ON COMMANDED

a.SCHEMATIC ARRANGEMENT OF DUCTWORK, FANS, DAMPERS, COILS, VALVES, PIPING,

- a.PRESENT OCCUPANCY MODE. h.PRESENT ECONOMIZER MODE, WHERE APPLICABLE.
- i.PRESENT OUTSIDE AIR TEMPERATURE. j. ASSOCIATED SPACE CONDITIONS AND SETPOINTS, WHERE APPLICABLE.

f.RESET SCHEDULE PARAMETERS FOR ALL POINTS, WHERE APPLICABLE.

MODE. STANDBY MODE. ETC.). I.COLOR CODING TO INDICATE NORMAL AND ABNORMAL VALUES, ALARMS, ETC.

k.STATUS OF APPLICATION PROGRAMS (E.G., WARM-UP, OCCUPIED MODE, UNOCCUPIED

3. MANUAL OVERRIDE CAPABILITY FOR EACH ON/OFF OR OPEN/CLOSED CONTROLLED DIGITAL OUTPUT (FOR FANS. PUMPS. 2-POSITION DAMPERS AND VALVES. ETC.) AND EACH MODULATING ANALOG OUTPUT (FOR DAMPERS, VALVES, VFD SPEED MODULATION TYPE POINTS, ETC) SHALL BE PROVIDED. GRAPHIC DISPLAY OF OUTPUT POINT AUTO OR MANUAL OVERRIDE STATUS SHALL BE PROVIDED.

- 4. SEQUENCE OF OPERATION IN WRITTEN (TEXT) FORMAT FOR EACH HVAC SYSTEM. 5. OVERALL BAS SYSTEM SCHEMATIC.
- 6. SYSTEM MANAGEMENT GRAPHIC FOR EACH NETWORK DEVICE AND/OR DDC CONTROLLER. R. OWNER INSTRUCTION AND TRAINING: PROVIDE A MINIMUM OF [FORTY (40) HOURS] OF ON-SITE INSTRUCTION AND TRAINING TO THE OWNER ON THE OPERATION OF THE CONTROL SYSTEMS FOR THE INITIAL INSTALLATION. INSTRUCTION AND TRAINING SHALL BE PERFORMED BY A COMPETENT CONTRACTOR REPRESENTATIVE FAMILIAR WITH THE CONTROL SYSTEMS
- OPERATION. MAINTENANCE AND CALIBRATION CALIBRATION AND START-UP: AFTER INSTALLATION AND CONNECTION OF CONTRO COMPONENTS, TEST, ADJUST AND RE-ADJUST AS REQUIRED ALL CONTROL COMPONENTS IN TERMS OF FUNCTION, DESIGN, SYSTEMS BALANCE AND PERFORMANCE. MAKE SYSTEMS READY FOR ENVIRONMENTAL EQUIPMENT ACCEPTANCE TESTS
- ACCEPTANCE PROCEDURE: UPON SUCCESSFUL COMPLETION OF START-UP AND RECALIBRATION AS INDICATED IN THIS SECTION, THE ARCHITECT SHALL BE REQUESTED IN WRITING TO INSPECT THE SATISFACTORY OPERATION OF THE CONTROL SYSTEMS. AFTER CORRECTING ALL ITEMS APPEARING ON THE PUNCH LIST, MAKE A SECOND WRITTEN REQUEST TO THE OWNER AND ARCHITECT FOR INSPECTION AND APPROVAL. AFTER ALL ITEMS ON THE PUNCH LIST ARE CORRECTED AND FORMAL APPROVAL OF THE CONTROL SYSTEMS IS PROVIDED BY THE ARCHITECT, THE CONTRACTOR SHALL INDICATE TO THE OWNER IN WRITING THE COMMENCEMENT OF THE WARRANTY PERIOD.



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SES Project # 21 0407 01

Strategic Energy Solutions 4000 W. Eleven Mile Road Berkley, MI 48072

Detroit, MI 48202

Wayne State University Design and Construction Services 5454 Cass Avenue

PROJECT:

Beecher House 5475 Woodward Ave., Detroit, MI 48202



Seal:

ISSUED FOR: BIDS	08/27/

DATE

SHEET TITLE: **MECHANICAL**

SPECIFICATIONS

SHEET NUMBER:

ISSUED

DESIGNER

ENGINEER:

				COP	PER FEEDER SCHEDULE			
FEEDER (AMPS)	COND. SIZE	2 WIRE WITH GROUND	FEEDER (AMPS)	COND. SIZE	3 WIRE WITH GROUND	FEEDER (AMPS)	COND. SIZE	4 WIRE WITH GROUND
15S	12	2#12, 1#12 GND IN 3/4"C	15	12	3#12, 1#12 GND IN 3/4"C	(15N)	12	4#12, 1#12 GND IN 3/4"C
20\$	12	2#12, 1#12 GND IN 3/4"C	20	12	3#12, 1#12 GND IN 3/4"C	20N	12	4#12, 1#12 GND IN 3/4"C
25S	10	2#10, 1#10 GND IN 3/4"C	25	10	3#10, 1#10 GND IN 3/4"C	(25N)	10	4#10, 1#10 GND IN 3/4"C
30S	10	2#10, 1#10 GND IN 3/4"C	30	10	3#10, 1#10 GND IN 3/4"C	(30N)	10	4#10, 1#10 GND IN 3/4"C
35S	8	2#8, 1#10 GND IN 3/4"C	35	8	3#8, 1#10 GND IN 3/4"C	(35N)	8	4#8, 1#10 GND IN 3/4"C
40S	8	2#8, 1#10 GND IN 3/4"C	40	8	3#8, 1#10 GND IN 3/4"C	40N	8	4#8, 1#10 GND IN 3/4"C
45S	6	2#6, 1#10 GND IN 3/4"C	45	6	3#6, 1#10 GND IN 3/4"C	45N	6	4#6, 1#10 GND IN 1"C
(50S)	6	2#6, 1#10 GND IN 3/4"C	50	6	3#6, 1#10 GND IN 3/4"C	(50N)	6	4#6, 1#10 GND IN 1"C
60S	4	2#4, 1#10 GND IN 1"C	60	4	3#4, 1#10 GND IN 1"C	(60N)	4	4#4, 1#10 GND IN 1 1/4"C
70S	4	2#4, 1#8 GND IN 1"C	70	4	3#4, 1#8 GND IN 1"C	(70N)	4	4#4, 1#8 GND IN 1 1/4"C
80S	3	2#3, 1#8 GND IN 1"C	80	3	3#3, 1#8 GND IN 1"C	(80N)	3	4#3, 1#8 GND IN 1 1/4"C
905	2	2#2, 1#8 GND IN 1"C	90	2	3#2, 1#8 GND IN 1 1/4"C	90N	2	4#2, 1#8 GND IN 1 1/2"C
(100S)	1	2#1, 1#8 GND IN 1 1/4"C	(100)	1	3#1, 1#8 GND IN 1 1/4"C	(100N)	1	4#1, 1#8 GND IN 1 1/2"C
			110	2	3#2, 1#6 IN 1 1/4"C	(110N)	2	4#2, 1#6 GND IN 1 1/4"C
			125	1	3#1, 1#6 GND IN 1 1/4"C	(125N)	1	4#1, 1#6 GND IN 1 1/2"C
			150	1/0	3#1/0, 1#6 GND IN 1 1/2"C	(150N)	1/0	4#1/0, 1#6 GND IN 2"C
			175	2/0	3#2/0, 1#6 GND IN 1 1/2"C	(175N)	2/0	4#2/0, 1#6 GND IN 2"C
			200	3/0	3#3/0, 1#6 GND IN 2"C	(200N)	3/0	4#3/0, 1#6 GND IN 2"C
			225	4/0	3#4/0, 1#4 GND IN 2"C	(225N)	4/0	4#4/0, 1#4 GND IN 2 1/2"C
			250	250	3-250 KCMIL, 1#4 GND IN 2"C	(250N)	250	4-250 KCMIL, 1#4 GND IN 2 1/2"C
			300	350	3-350 KCMIL, 1#4 GND IN 2"C	300N	350	4-350 KCMIL, 1#4 GND IN 3"C
			350	500	3-500 KCMIL, 1#3 GND IN 3"C	350N	500	4-500 KCMIL, 1#3 GND IN 3 1/2"C
			400	600	3-600 KCMIL, 1#3 GND IN 3 1/2"C	400N	600	4-600 KCMIL, 1#3 GND IN 4"C
			450	2-4/0	(2) 3#4/0, 1#2 GND IN 2"C	450N	2-4/0	(2) 4#4/0, 1#2 GND IN 2 1/2"C
			500	2-250	(2) 3-250 KCMIL, 1#2 GND IN 2 1/2"C	(500N)	2-250	(2) 4-250 KCMIL, 1#1 GND IN 3"C
			600	2-350	(2) 3-350 KCMIL, 1#1 GND IN 2 1/2"C	(600N)	2-350	(2) 4-350 KCMIL, 1#1 GND IN 3"C
			700	2-500	(2) 3-500 KCMIL, 1#1/0 GND IN 3"C	(700N)	2-500	(2) 4-500 KCMIL, 1#1/0 GND IN 3 1/2"C
			800	2-600	(2) 3-600 KCMIL, 1#1/0 GND IN 3 1/2"C	(800N)	2-600	(2) 4-600 KCMIL, 1#1/0 GND IN 4"C
			(1000)	3-500	(3) 3-500 KCMIL, 1#2/0 GND IN 3"C	(1000N)	3-500	(3) 4-500 KCMIL, 1#2/0 GND IN 3 1/2"C
			(1200)	3-600	(3) 3-600 KCMIL, 1#3/0 GND IN 4"C	(1200N)	3-600	(3) 4-600 KCMIL, 1#3/0 GND IN 4"C
			(1600)	4-600	(4) 3-600 KCMIL, 1#4/0 GND IN 4"C	(1600N)	4-600	(4) 4-600 KCMIL, 1#4/0 GND IN 4"C
			2000	5-600	(5) 3-600 KCMIL, 1-250 KCMIL GND IN 4"C	2000N	5-600	(5) 4-600 KCMIL, 1-250 KCMIL GND IN 4"C
			2500	7-500	(7) 3-500 KCMIL, 1-350 KCMIL GND IN 3 1/2°C	2500N	7-500	(7) 4-500 KCMIL, 1-350 KCMIL GND IN 3 1/2"C
			3000	8-500	(8) 3-500 KCMIL, 1-400 KCMIL GND IN 3 1/2"C	3000N	8-500	(8) 4-500 KCMIL, 1-400 KCMIL GND IN 3 1/2"C
				10-600	(10) 3-600 KCMIL, 1-500 KCMIL GND IN 4"C	4000N	10-600	(10) 4-600 KCMIL, 1-500 KCMIL GND IN 4"C
			(5000)	12-600	(12) 3-600 KCMIL, 1-700 KCMIL GND IN 4"C	(5000N)	12-600	(12) 4-600 KCMIL, 1-700 KCMIL GND IN 4"C
			6000	15-600	(15) 3-600 KCMIL, 1-500 KCMIL GND IN 4"C	6 000N	15-600	(15) 4-600 KCMIL, 1-800 KCMIL GND IN 4"C

1. AMPACITIES FOR FEEDER SIZES ARE BASED ON N.E.C. CODE 110-14. (TERMINATION PROVISIONS FOR EQUIPMENT RATED 100A OR LESS ARE RATED FOR USE WITH CONDUCTORS RATED 60°C. TERMINATION PROVISIONS FOR EQUIPMENT RATED GREATER THAN 100A ARE RATED FOR USE WITH CONDUCTORS RATED 75°C.)

2. CONTRACTOR MAY OPTIONALLY USE 1/2" CONDUIT IN LIEU OF 3/4" CONDUIT FOR #10 AND #12 CONDUCTORS.

3. CONDUIT FILL IS BASED ON 40% FILL USING SINGLE CONDUCTOR BUILDING WIRE OF INSULATION TYPES THHN, THWN-2, XHH, XHHW, AND XHHW-2 IN RMC. FOR OTHER RACEWAY TYPES REFER TO APPROPRIATE N.E.C. APPENDIX C TABLES.

4. EQUIPMENT GROUND SIZING BASED ON N.E.C. TABLE 250.122.

TECHNOLOGY SYMBOL LIST						
SYMBOL	DESCRIPTION					
	CAMERA					
CR	CARD READER					
₩	TECHNOLOGY OUTLET — 6" ABOVE COUNTER					
▼	TECHNOLOGY OUTLET — FLOOR					
▼	TECHNOLOGY OUTLET — WALL					
DH	MAGNETIC DOOR HOLDER					
•	PUSH BUTTON					
(S)	SPEAKER					
$\vdash \bigcirc$	WALL CLOCK — SINGLE FACE					
\Box	WALL CLOCK — DOUBLE FACE					
	WALL CLOCK AND SPEAKER UNIT					
WAP	WIRELESS ACCESS POINT					
NOTES:						

NOTES:

1. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR BOX AND CONDUIT FOR ALL DEVICES INDICATED.

2. LOW VOLTAGE CONTRACTOR SHALL PROVIDE EXACT SPECIFICATIONS AND LOCATIONS OF ALL DEVICES.

	SYMI
	\$
	\$
JNTER	\$
	\$
	C

LIGH	LIGHTING CONTROLS LEGEND						
SYMBOL	DESCRIPTION						
\$	SINGLE POLE SWITCH						
\$3	THREE WAY SWITCH						
\$4	FOUR WAY SWITCH						
\$L	LIGHT CONTROL LOCATION						
G	GENERATOR TRANSFER DEVICE						

LIGHTING CONTROLS LEGEND							
SYMBOL	DESCRIPTION						
\$	SINGLE POLE SWITCH						
\$3	THREE WAY SWITCH						
\$4	FOUR WAY SWITCH						
\$L	LIGHT CONTROL LOCATION						
G	GENERATOR TRANSFER DEVICE						

SYMBOL	DESCRIPTION
•	CONDUIT DOWN
0	CONDUIT UP
4	DISCONNECT SWITCH - NON FUSED
4	DISCONNECT SWITCH - FUSED
	DISCONNECT SWITCH - COMB. MOTOR STARTER
	ELECTRICAL PANEL
•	GROUNDING ROD
=	GROUND
	GROUNDING BAR
<u>(</u>)	JUNCTION BOX
М	METER
<i>\O</i>	MOTOR - SINGLE PHASE
\	MOTOR — THREE PHASE
\$м	MOTOR RATED SWITCH
φ	POWER RECEPTACLE - SIMPLEX TYPE
	POWER RECEPTACLE — DUPLEX TYPE
 	POWER RECEPTACLE - DUPLEX 6" ABOVE COUNTER
Pusa	POWER RECEPTACLE - USB/DUPLEX COMBO. DEVICE
#	POWER RECEPTACLE - QUADRUPLEX TYPE
\Box	POWER RECEPTACLE - RECESSED FLOOR TYPE
Θ	POWER RECEPTACLE - SPECIALTY TYPE
TC	TIME CLOCK
Т	TRANSFORMER

POWER SYMBOL LIST

FIF	RE ALARM SYMBOL LIST						
SYMBOL	DESCRIPTION						
F⋈	AUDIBLE DEVICE/WALL MOUNTED						
F	VISUAL DEVICE/WALL MOUNTED						
Ē⊲	COMBO AUDIBLE/VISUAL DEVICE/WALL MOUNTED						
F	AUDIBLE DEVICE/CEILING MOUNTED						
F	VISUAL DEVICE/CEILING MOUNTED						
F	COMBO AUDIBLE/VISUAL DEVICE/CEILING MOUNTED						
Ć\$	CO ALARM/SMOKE DETECTOR						
Ś	SMOKE DETECTOR						
\Diamond	CO ALARM						
\$	DUCT MOUNTED SMOKE DETECTOR						
H	HEAT DETECTOR						
▽FD	FIRE DEPARTMENT COMMUNICATION OUTLET						
- P	EXISTING COMBINATION FIRE/SMOKE DAMPER (HORIZONTAL)						
	EXISTING COMBINATION FIRE/SMOKE DAMPER (VERTICAL)						
F	MANUAL PULL STATION						
FS	FLOW SWITCH						
TS	TAMPER SWITCH						
FAA	FIRE ALARM ANNUNCIATOR PANEL						
FACP	FIRE ALARM CONTROL PANEL						
1/0	INPUT/OUTPUT CONTROL MODULE						
NOTES:							

NOTES:

1. DRAWINGS INDICATE DESIGN INTENT ONLY, FINAL LOCATIONS AND DEVICE SPECIFICATIONS SHALL BE PROVIDED BY FIRE ALARM MANUFACTURER. REFER TO PROJECT SPECIFICATIONS FOR APPROVED MANUFACTURERS.

AFF	ABOVE FINISHED FLOOR
A	AMPERE
AF	AMPERE FUSE/AMPERE FRAME
AWG	AMERICAN WIRE GAUGE
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AIC	AVAILABLE INTERRUPTING CURRENT (AMPS)
C	CONDUIT OR CEILING MOUNTED
CB	CIRCUIT BREAKER
CU	COPPER
CT	
	CURRENT TRANSFORMER
DIA	DIAMETER
DISC	DISCONNECT
EMT	ELECTRICAL METALLIC TUBING
EWC	ELECTRIC WATER COOLER
EPO (5)	EMERGENCY POWER OFF
(E)	EXISTING ELECTRICAL EQUIPMENT OR WORK
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FLA	FULL LOAD AMPS
F	FUSE
G/GRD	GROUND
GFCI/GFI	GROUND FAULT CIRCUIT INTERRUPTER
НОА	HAND-OFF-AUTO
HP	HORSEPOWER
IG	ISOLATED GROUND
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KW	KILOWATT
KWH	KILOWATT HOUR
LP	LIGHTING PANEL
MCB	MAIN CIRCUIT BREAKER
MDP	MAIN DISTRIBUTION PANEL
MLO	MAIN LUG ONLY
MAX	MAXIMUM
MIN	MINIMUM
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOC.
N/NEU	NEUTRAL
NF	NON-FUSIBLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NIC	NOT IN CONTRACT
PH. OR Ø	PHASE
Р	POLE
PF	POWER FACTOR
PVC	POLYVINYL CHLORIDE (PLASTIC)
(R)	RELOCATED EXISTING ELECTRICAL EQUIPMENT
(RR)	REMOVE AND REINSTALL
RMC	RIGID METALLIC CONDUIT
RP	RECEPTACLE PANEL
TBB	TELEPHONE BACKBOARD
TYP.	TYPICAL
UC	UNDER COUNTER
UL	UNDERWRITERS LABORATORIES
UPS	UNINTERRUPTIBLE POWER SUPPLY
USB	UNIVERSAL SERIAL BUS
V	VOLT
VA VA	VOLT AMPERE
WC	WATT
WD	WIRE GUARD
WP	WEATHERPROOF
XFMR	TRANSFORMER

ELECTRICAL ABBREVIATIONS

DESCRIPTION

ABBREV.

T	
SYMBOL	DESCRIPTION
L1	LIGHTING FIXTURE TAG
1	CONSTRUCTION KEY NOTE NUMBER 1
\triangle	DEMOLITION KEY NOTE NUMBER 1
20	COPPER FEEDER SIZE TAG (REFER TO FEEDER SCHEDULE)
20	ALUMINUM FEEDER SIZE TAG (REFER TO FEEDER SCHEDULE)
<u>EQUIPMENT</u>	EQUIPMENT TAG
	EXISTING DEVICES OR EQUIPMENT
	NEW OR MODIFIED DEVICES OR EQUIPMENT
	NEW OR MODIFIED UNDERGROUND WIRING
S//////	EXISTING SYSTEM COMPONENT TO BE REMOVED
•	POINT OF NEW CONNECTION
_	SECTION NUMBER 4 E5.2 SHEET E5.2 ON WHICH SECTION IS DRAWN
,	SECTION NO. 6
6 E5.2	SECTION SCALE: 1/4" = 1' - 0" SHEET E5.2 ON WHICH SECTION IS CUT (ENLARGED PARTIAL PLAN SIMILAR)
LIGHTING CON SPACE TYPE	

NOTE: THE TAG DOES NOT REFLECT THE QUANTITY OF CONTROL DEVICES REQUIRED IN THE AREA.											
APPLICABLE CODES											
AND REGULATIONS											
YEAR	CODE										
2015	MICHIGAN BUILDING CODE										
2015	MICHIGAN ENERGY CODE										
2015	MICHIGAN RESIDENTIAL CODE										
2015	MICHIGAN REHABILITATION CODE										
2017	MICHIGAN ELECTRICAL CODE RULES, PART 8										
2017	NATIONAL ELECTRICAL CODE (NFPA 70)										
2013	NFPA 20										
2013	NFPA 72										
2013	NFPA 101										
2013	NFPA 110										
2009	ICC A117.1 ACCESSIBLE AND USABLE BUILDINGS & FACILITIES										
1985	DETROIT ELEVATOR CODE										



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Seal:

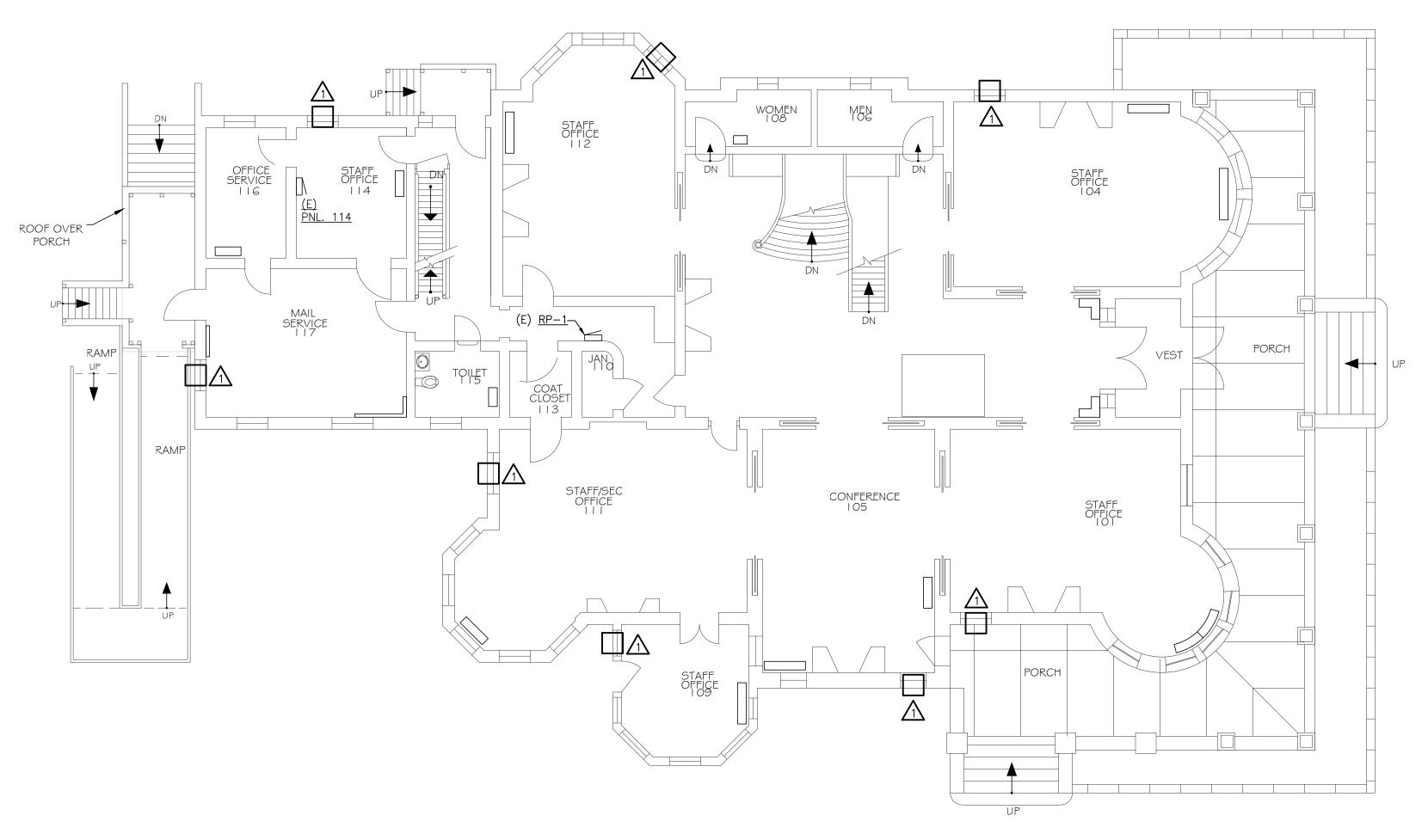
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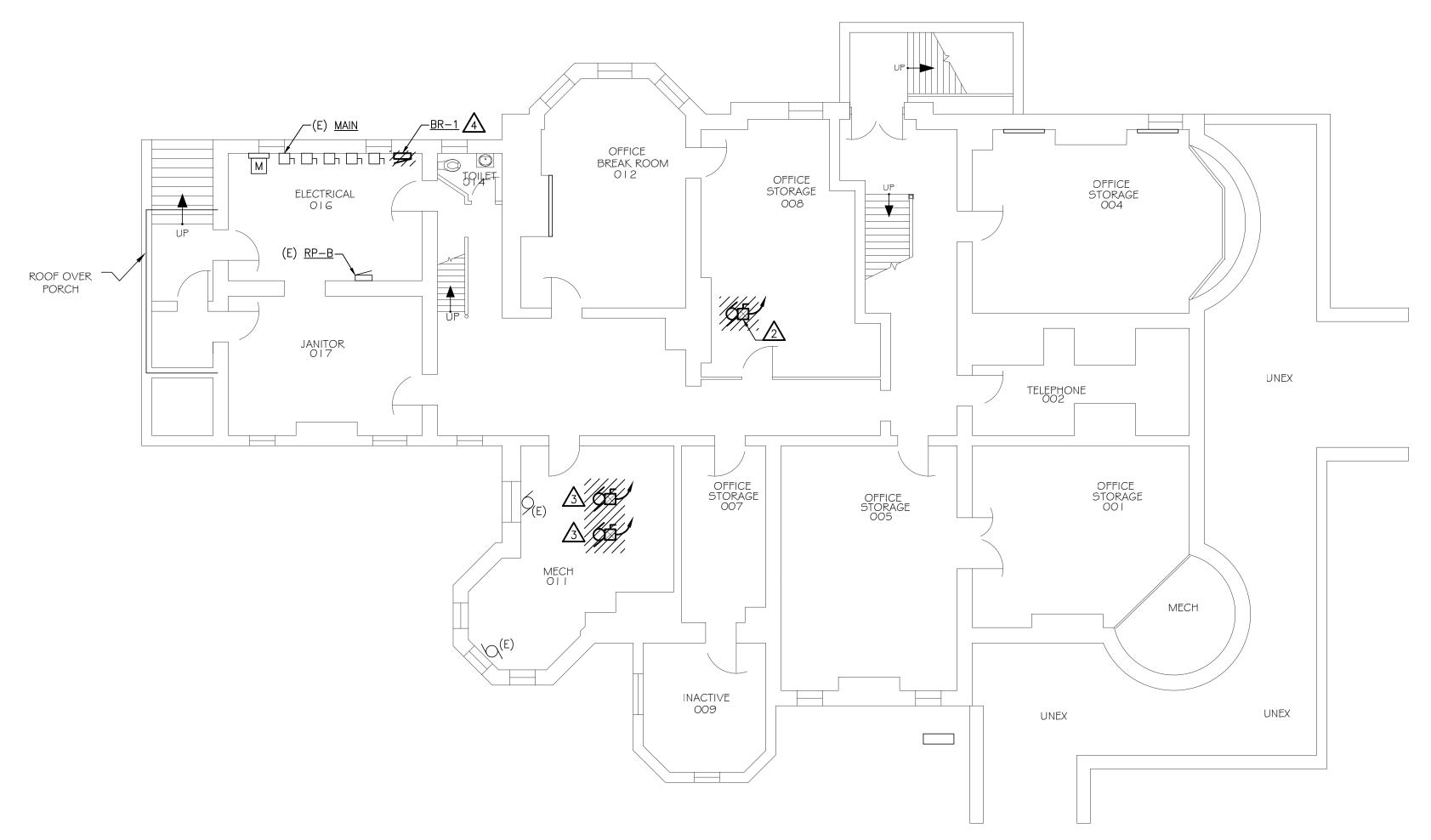
DESIGNER: ENGINEER:

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ELECTRICAL GENERAL INFORMATION



FIRST FLOOR ELECTRICAL DEMOLITION PLAN SCALE:1/8" = 1'-0"



BASEMENT ELECTRICAL DEMOLITION PLAN

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

ELECTRICAL DEMOLITION NOTES

- VISIT THE SITE PRIOR TO SUBMISSION OF BID TO EXAMINE THE EXISTING CONDITIONS AND THE EXTENT OF DEMOLITION WORK.
- 2. EXAMINE THE DRAWINGS OF OTHER TRADES, BE FAMILIAR WITH THE DEMOLITION
- REQUIRED BY OTHER TRADES.

 3. PERFORM ALL INCIDENTAL ELECTRICAL DEMOLITION AND/OR RELOCATION OF DEVICES AND EQUIPMENT REQUIRED TO FACILITATE THE DEMOLITION WORK OF
- OTHER TRADES.

 4. COORDINATE WITH NEW WORK PLANS, ONE LINE, AND RISER DIAGRAMS FOR EXTENT OF DEMOLITION WORK.
- 5. COORDINATE ANY SHUTDOWN OF EXISTING SERVICES AND EQUIPMENT REMAINING IN USE WITH OWNERS' REPRESENTATIVE. WHERE EXISTING BUILDING SERVICE IS REQUIRED TO BE SHUT DOWN, INCLUDE ALL ASSOCIATED OVERTIME COST TO PERFORM THIS WORK DURING EVENING AND WEEKENDS. INCLUDE ALL COSTS FOR PROVIDING TEMPORARY POWER.
- 6. REMOVE ALL CONDUIT AND WIRE BACK TO NEAREST UPSTREAM DEVICE REMAINING IN SERVICE.
- 7. WHERE DEMOLITION WORK AFFECTS ELECTRICAL SERVICE TO DOWNSTREAM DEVICES TO REMAIN; EXTEND CONDUIT AND WIRE AS REQUIRED TO MAINTAIN ELECTRICAL SERVICE.
- 8. PROVIDE BLANK COVER PLATES WHERE SWITCHES AND DEVICES ARE REMOVED AND WALL REMAINS INTACT. MARK ALL UNUSED CIRCUIT BREAKERS AS "SPARE".
- 9. CONTRACTOR TO TAG ALL CIRCUITS AT BOTH ENDS AFFECTED BY THIS SCOPE OF WORK.
- 10. CONTRACTOR SHALL PROVIDE UPDATED, TYPED—IN DIRECTORIES FOR ALL PANELS AFFECTED BY THIS SCOPE OF WORK.
- 11. CONTRACTOR SHALL VERIFY ALL UNDERGROUND AND IN—SLAB UTILITIES LOCATIONS PRIOR TO SAW CUTTING OR PENETRATING ANY FLOOR SLABS. CONTRACTOR SHALL REPAIR ALL UTILITIES DAMAGED BY SAW CUTTING.
- 12. REMOVE AND RE-INSTALL LIGHT FIXTURES AS REQUIRED BY PLASTER DEMOLITION CONTRACTOR.

♠ DEMOLITION KEYED NOTES

COMPLETE AND BACK TO SOURCE.

- EXISTING WINDOW A/C UNIT TO BE REMOVED. ELECTRICAL OUTLET PREVIOUSLY USED FOR THIS UNIT SHALL REMAIN IN PLACE AND UNDISTURBED.
- 2. REMOVE EXISTING MECHANICAL PUMP COMPLETE AND BACK TO SOURCE.
- 3. REMOVE MECHANICAL BOILER AND ASSOCIATED ELECTRICAL COMPONENTS
- 4. REPLACE PANELBOARD IN PLACE WITH NEW AS INDICATED IN ELECTRICAL SCHEDULES AND ONE—LINE DIAGRAM.



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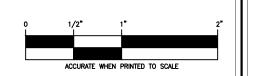
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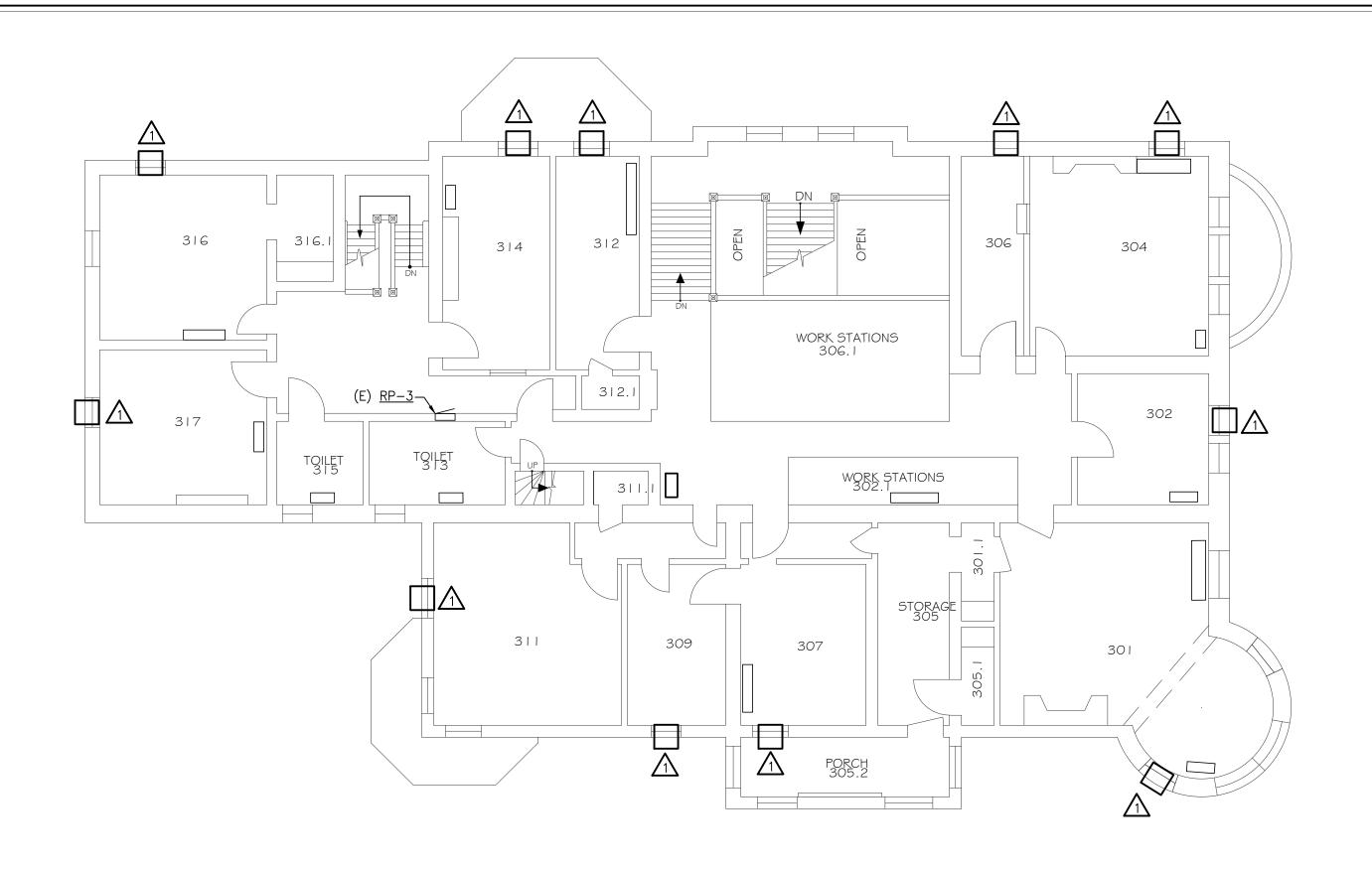
DESIGNER: ENGINEER:

BASEMENT AND FIRST FLOOR ELECTRICAL DEMOLITION PLAN

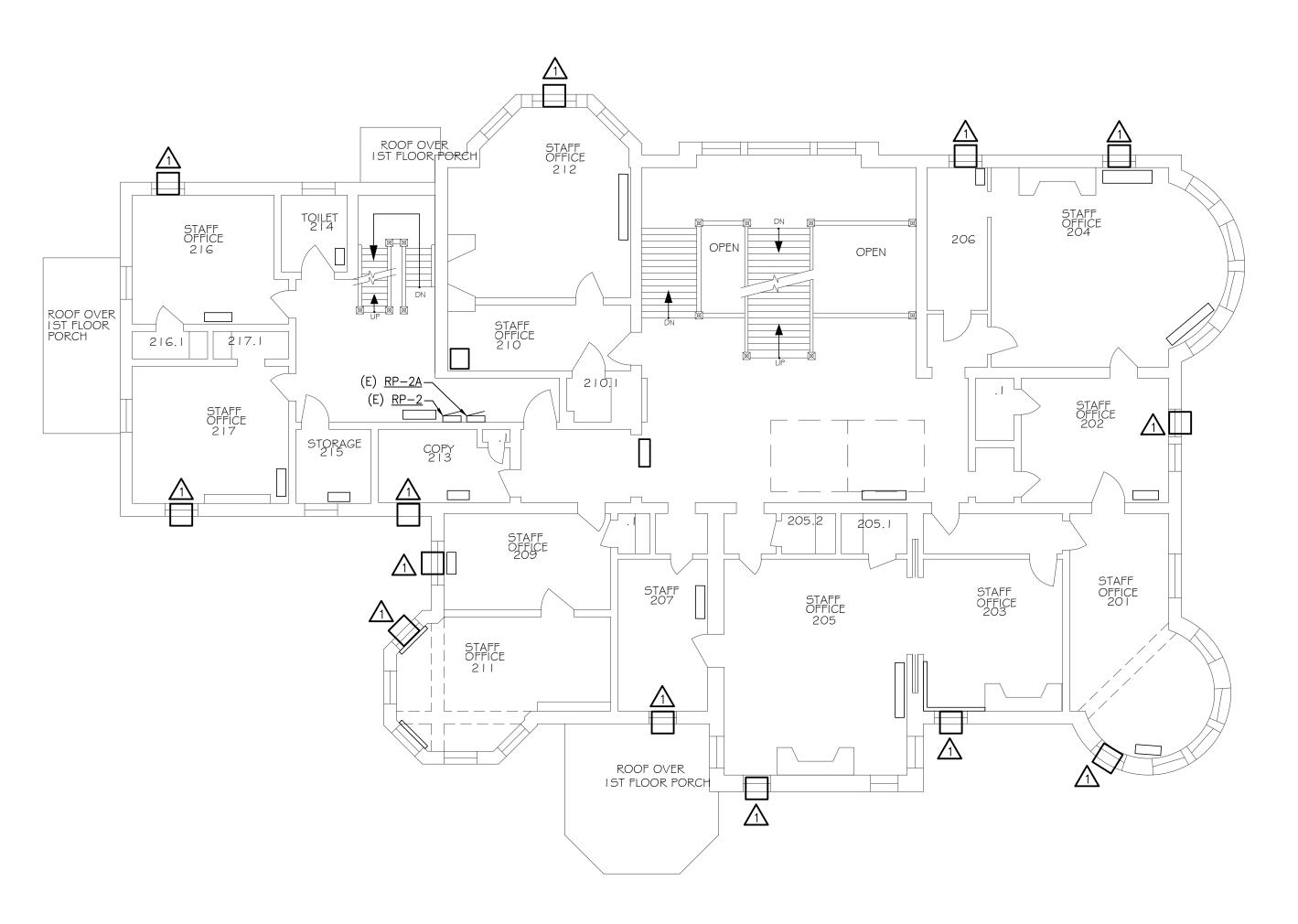
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THIRD FLOOR ELECTRICAL DEMOLITION PLAN SCALE:1/8" = 1'-0"



SECOND FLOOR ELECTRICAL DEMOLITION PLAN SCALE: 1/8" = 1'-0"

ELECTRICAL DEMOLITION NOTES

- VISIT THE SITE PRIOR TO SUBMISSION OF BID TO EXAMINE THE EXISTING CONDITIONS AND THE EXTENT OF DEMOLITION WORK.
- 2. EXAMINE THE DRAWINGS OF OTHER TRADES, BE FAMILIAR WITH THE DEMOLITION
- REQUIRED BY OTHER TRADES.

 3. PERFORM ALL INCIDENTAL ELECTRICAL DEMOLITION AND/OR RELOCATION OF DEVICES AND EQUIPMENT REQUIRED TO FACILITATE THE DEMOLITION WORK OF
- OTHER TRADES.

 4. COORDINATE WITH NEW WORK PLANS, ONE LINE, AND RISER DIAGRAMS FOR EXTENT OF DEMOLITION WORK.
- 5. COORDINATE ANY SHUTDOWN OF EXISTING SERVICES AND EQUIPMENT REMAINING IN USE WITH OWNERS' REPRESENTATIVE. WHERE EXISTING BUILDING SERVICE IS REQUIRED TO BE SHUT DOWN, INCLUDE ALL ASSOCIATED OVERTIME COST TO PERFORM THIS WORK DURING EVENING AND WEEKENDS. INCLUDE ALL COSTS FOR PROVIDING TEMPORARY POWER.
- 6. REMOVE ALL CONDUIT AND WIRE BACK TO NEAREST UPSTREAM DEVICE REMAINING IN SERVICE.
- 7. WHERE DEMOLITION WORK AFFECTS ELECTRICAL SERVICE TO DOWNSTREAM DEVICES TO REMAIN; EXTEND CONDUIT AND WIRE AS REQUIRED TO MAINTAIN ELECTRICAL SERVICE.
- 8. PROVIDE BLANK COVER PLATES WHERE SWITCHES AND DEVICES ARE REMOVED AND WALL REMAINS INTACT. MARK ALL UNUSED CIRCUIT BREAKERS AS "SPARE".
- 9. CONTRACTOR TO TAG ALL CIRCUITS AT BOTH ENDS AFFECTED BY THIS SCOPE OF WORK.
- 10. CONTRACTOR SHALL PROVIDE UPDATED, TYPED-IN DIRECTORIES FOR ALL PANELS AFFECTED BY THIS SCOPE OF WORK.
- 11. CONTRACTOR SHALL VERIFY ALL UNDERGROUND AND IN—SLAB UTILITIES LOCATIONS PRIOR TO SAW CUTTING OR PENETRATING ANY FLOOR SLABS. CONTRACTOR SHALL REPAIR ALL UTILITIES DAMAGED BY SAW CUTTING.
- 12. REMOVE AND RE-INSTALL LIGHT FIXTURES AS REQUIRED BY PLASTER DEMOLITION CONTRACTOR.

DEMOLITION KEYED NOTES

- EXISTING WINDOW A/C UNIT TO BE REMOVED. ELECTRICAL OUTLET PREVIOUSLY USED FOR THIS UNIT SHALL REMAIN IN PLACE AND UNDISTURBED.
- 2. REMOVE EXISTING MECHANICAL PUMP COMPLETE AND BACK TO SOURCE.
- 3. REMOVE MECHANICAL BOILER AND ASSOCIATED ELECTRICAL COMPONENTS COMPLETE AND BACK TO SOURCE.
- 4. REPLACE PANELBOARD IN PLACE WITH NEW AS INDICATED IN ELECTRICAL SCHEDULES AND ONE-LINE DIAGRAM.



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Seal:

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ISSUED	DATE

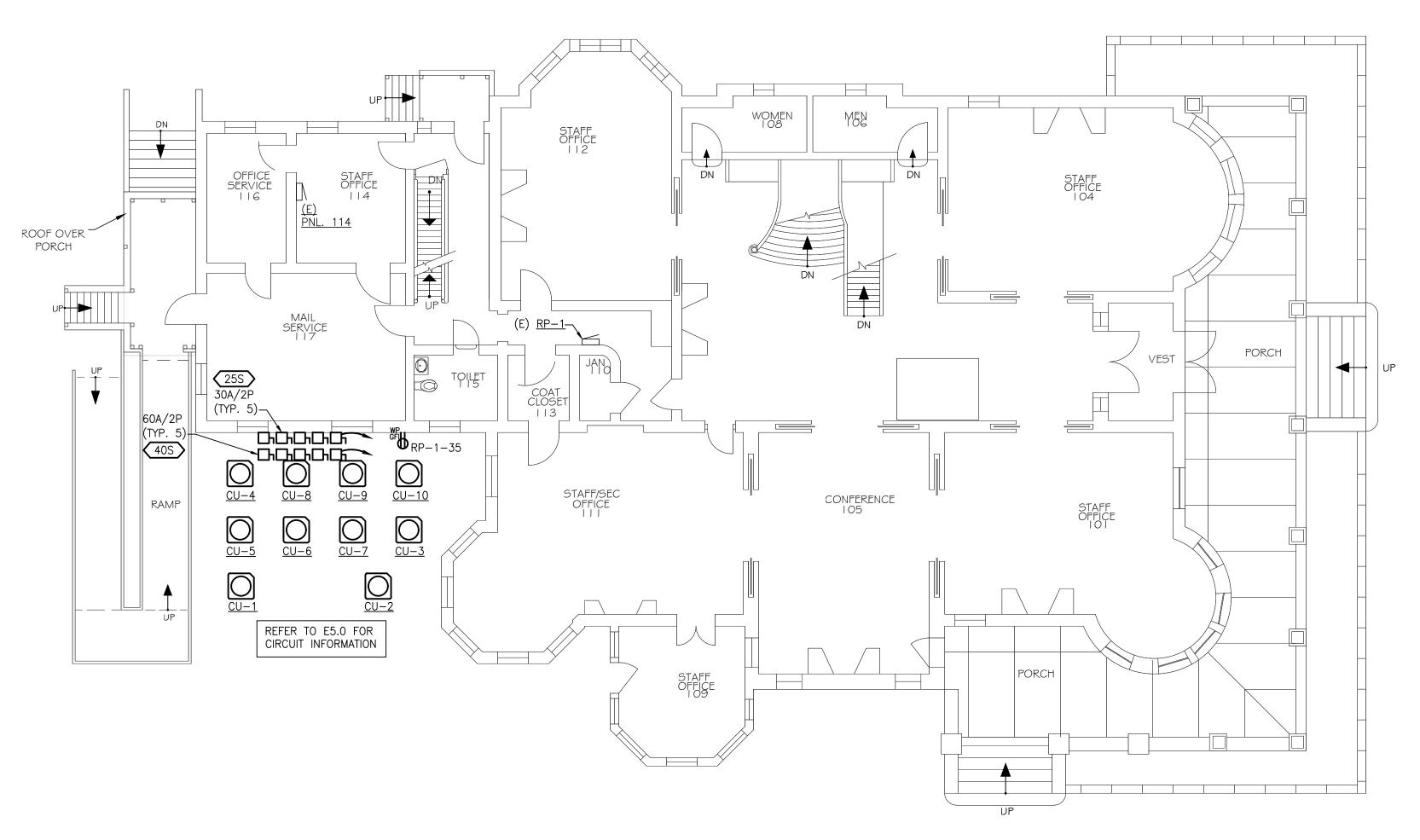
SHEET TITLE:

DESIGNER: ENGINEER:

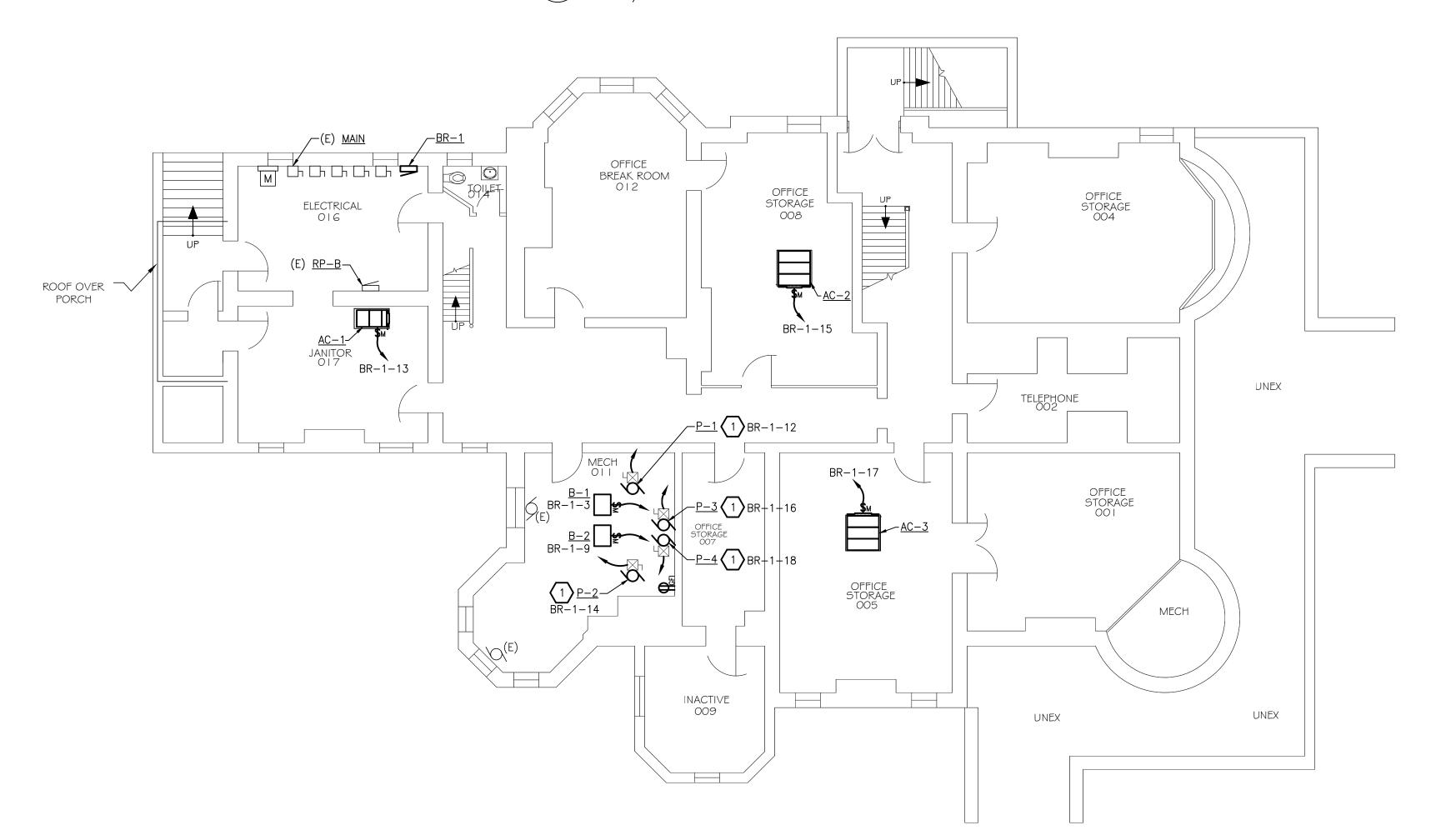
SECOND AND THIRD FLOOR ELECTRICAL DEMOLITION PLAN

SHEET NUMBER:

ED1.2



FIRST FLOOR ELECTRICAL POWER PLAN SCALE:1/8" = 1'-0"





POWER GENERAL NOTES

- ALL RECEPTACLES ON EXTERIOR, IN KITCHEN, IN CONCESSION, IN LABORATORY, AND WITHIN 6'-0" OF SINK OR OTHER WATER SUPPLY SHALL BE READILY ACCESSIBLE GFCI TYPE RECEPTACLE.
- 2. ALL CONDUITS SERVING 120 VOLTS OR GREATER SHALL INCLUDE A GROUND
- 3. ALL CONDUITS SHALL BE ROUTED CONCEALED UNLESS NOTED OTHERWISE.
- 4. ALL 120 VOLT CIRCUITS SHALL UTILIZE A SEPARATE NEUTRAL.
- 5. ALL BRANCH CIRCUITS THAT SUPPLY 125-V SINGLE PHASE, 15 AND 20 AMP OUTLETS TO BE INSTALLED IN DWELLING UNIT FAMILY ROOMS, DINING ROOMS, LIVING ROOMS, PARLORS, LIBRARIES, RECREATION ROOMS, CLOSETS, HALLWAYS OR SIMILAR ROOMS OR AREAS SHALL BE PROTECTED BY A LISTED ARC-FAULT CIRCUIT INTERRUPTER; COMBINATION-TYPE, INSTALLED TO PROVIDE PROTECTION OF THE BRANCH CIRCUIT.
- 6. REMOVE AND RE-INSTALL LIGHT FIXTURES AS REQUIRED BY PLASTER DEMOLITION CONTRACTOR.

KEYED NOTES

 H/O/A DISCONNECT COMBINATION UNITS SHALL BE PROVIDED BY UNIT MANUFACTURER, INSTALLED BY ELECTRICAL CONTRACTOR.

 120V CIRCUIT FEEDS BOTH AC UNIT AND CONDENSATE PUMP LOCATED ADJACENT TO UNIT. PROVIDE DISCONNECTING MEANS FOR BOTH UNIT AND PUMP.



Strategic Energy Solutions®
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SES Project # 21 0407 01

www.sesnet.com

CLIENT:

Wayne State University

Design and Construction Services 5454 Cass Avenue

PROJECT:

Beecher House 5475 Woodward Ave., Detroit, MI 48202

Detroit, MI 48202



Seal:

SSUED FOR: BIDS	08/27/2

DATE

SHEET TITLE:

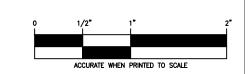
DESIGNER: ENGINEER:

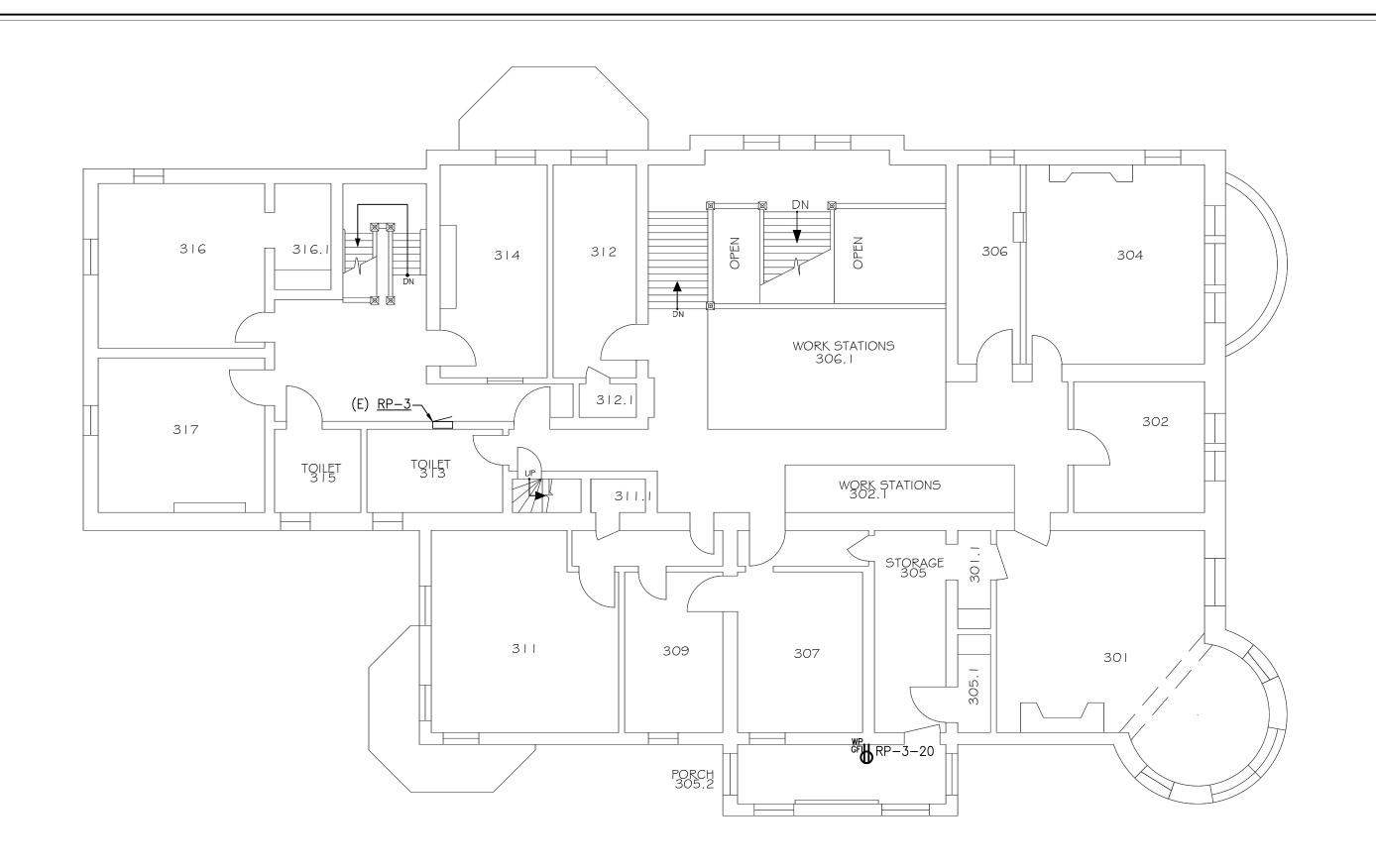
ISSUED

BASEMENT AND FIRST FLOOR ELECTRICAL POWER PLAN

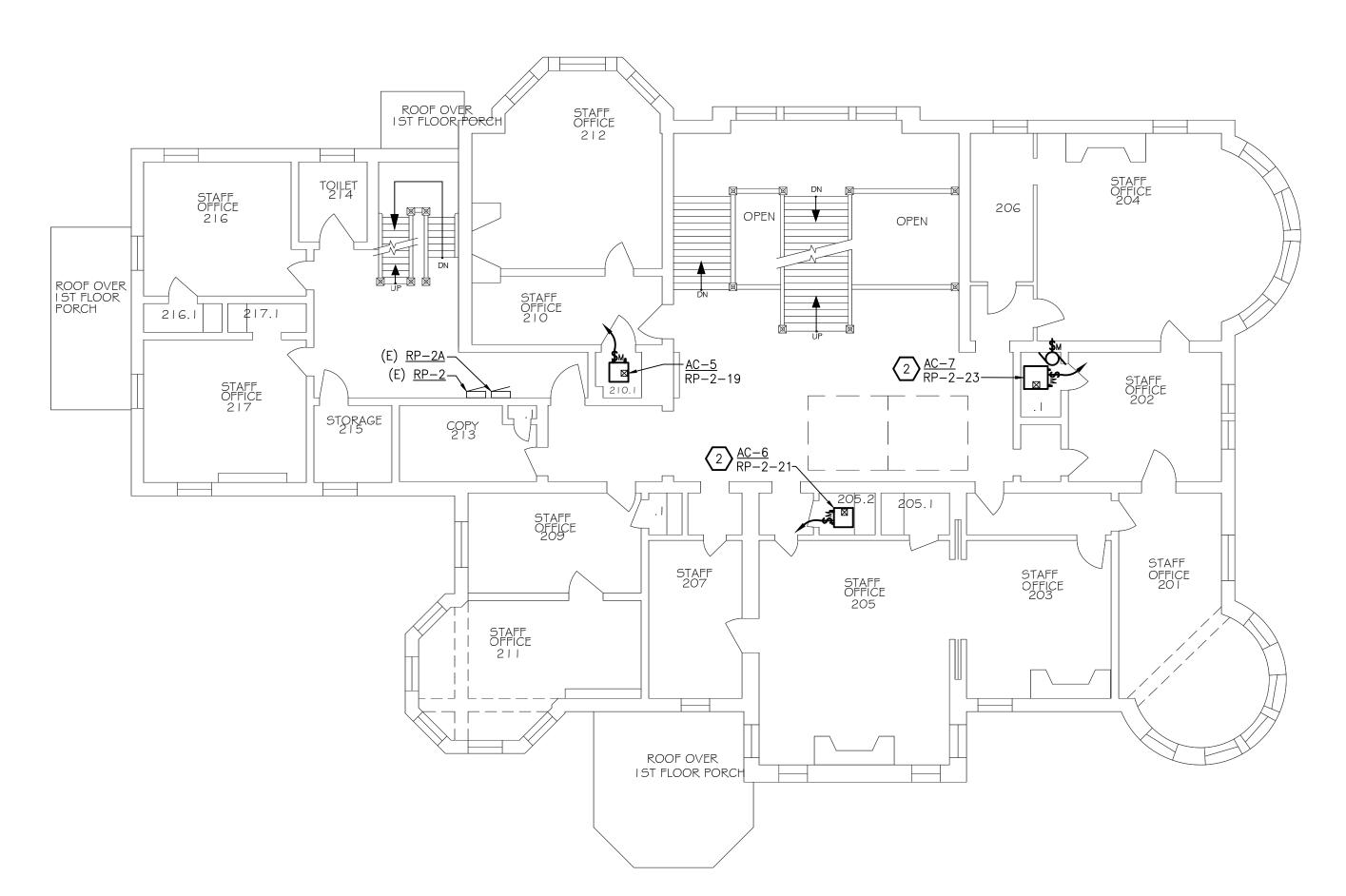
SHEET NUMBER:

EP1.1

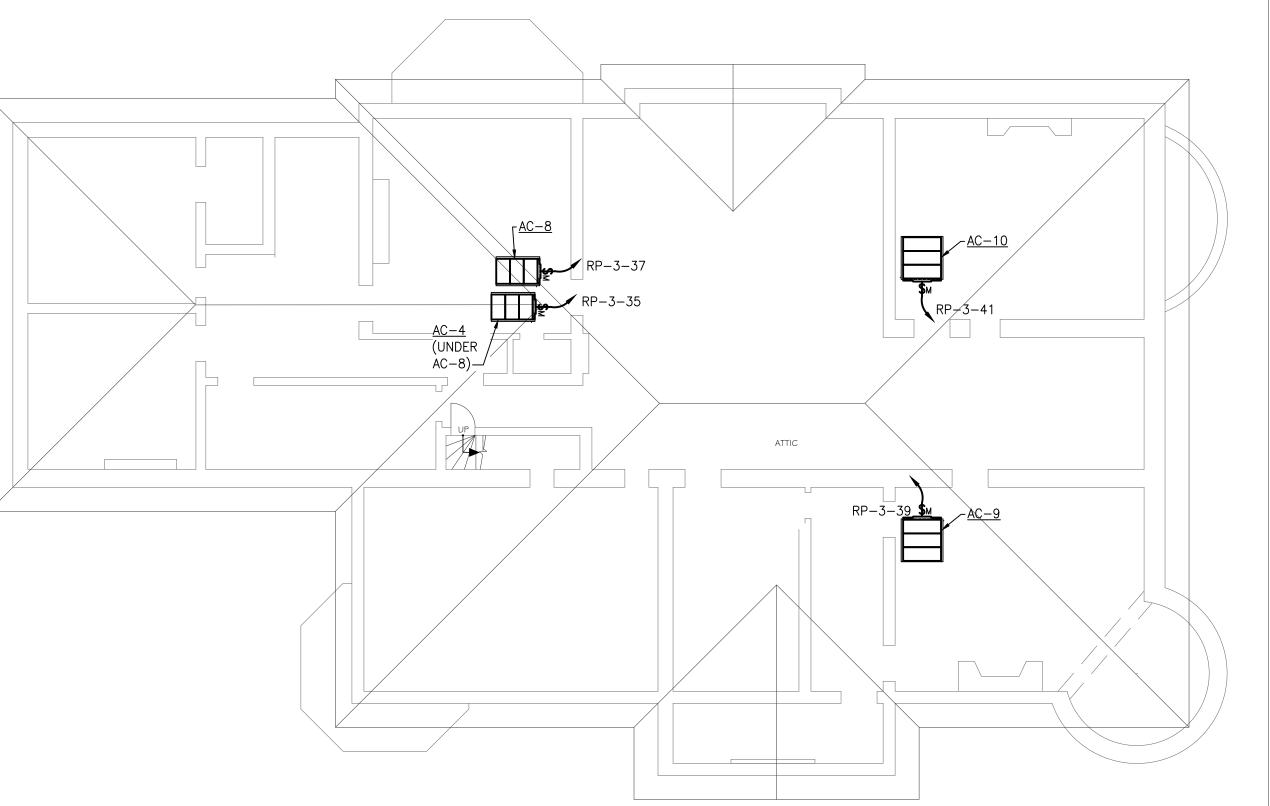




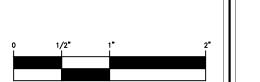
THIRD FLOOR ELECTRICAL POWER PLAN SCALE: 1/8" = 1'-0"











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- 120V CIRCUIT FEEDS BOTH AC UNIT AND CONDENSATE PUMP LOCATED ADJACENT TO UNIT. PROVIDE DISCONNECTING MEANS FOR BOTH UNIT AND PUMP.

SES

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CLIENT:

Detroit, MI 48202

Wayne State University
Design and Construction Services
5454 Cass Avenue

PROJECT:

Beecher House 5475 Woodward Ave., Detroit, MI 48202



Seal

ISSUED FOR: BIDS	08/27/21
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DESIGNER:	DAD

SHEET TITLE:

ENGINEER:

SECOND, THIRD AND ATTIC FLOOR ELECTRICAL POWER PLAN

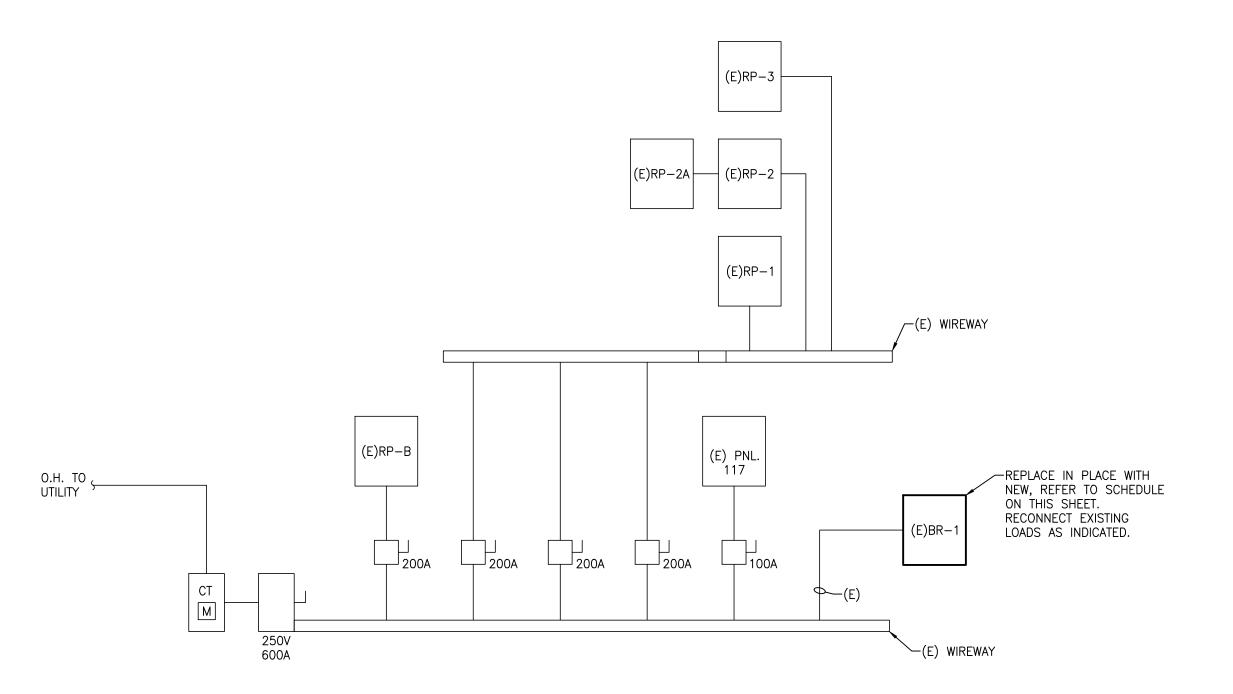
SHFFT NUMBER

EP1.2

Panel Designation: BR-1 Panel Location: ELECTRICAL ROOM						i	Main	: MI	LO		P-P Voltage: 208				
						Βu	ssing	: 10	00A			: 120			
Fed From	: MAIN				G	round	d Bus	ST.	ANDA	\RD				Phase:	: 3
Feeder Size	: EXISTING	G TO REM	1AIN			Μου	nting	: SU	JRFAC	Œ				Wire:	: 4
REPLACE PANELBOARD IN PLACE W/ NEW							utral				м	in SC In	terrupting	Ratina:	: 10kA
	Light	Recept	Cont	nonC	ОС	1	ØØ	la		OC	nonC	Cont	Recept	Light	
Remarks	Load	Load	Load	Load	Prot	СКТ	АВ		I (K I I	Prot	Load	Load	Load	Load	Remarks
XISTING LOAD	i			1000	20	1	X	T	2	20	1000				existing load
IEW B-1				840	20	3	Х		4	20	1000				existing load
SHUNT TRIP					20	5		Х	6	20	1000				EXISTING LOAD
existing load				1000	20	7	Х		8	20	250				NEW CHEMICAL FEED
NEW B-2				840	20	9	Х		10	20					existing load
SHUNT TRIP	1				20	11		Х	12	20	1176				NEW P-1
4C-1				672	20	13	Х		14	20	1176				NEW P-2
4C-2				1224	20	15	Х		16	25	1656				NEW P-3
AC-3				1224	20	17		Х	18	25	1656				NEW P-4
	1	Connect	ed Load		Ι		Dem	and			<u> </u>	Demana	d Load		7
Load Description	ØA	ØB	ØС	Total	1		Fac	tor			ØA	ØB	ØС	Total	1
ighting or Continous Load (Volt-Amps)	0	0	0	0			1.0	0			0	0	0	0	1
80VA Receptacle Load (Volt-Amps)	0	0	0	0		1.00) (First	10k	(VA)		0	0	0	0	Receptacle Demand Factor per Article
	Am	nount ove	r 10kVA	0		0.5	50 (>	10kV	/A)		0	0	0	0	220.44 of the National Electrical Code.
Continuous Load (Volt-Amps)	0	0	0	0			1.0	0			0	0	0	0	1
Non-Continuous Load (Volt-Amps)	5098	5560	5056	15714			1.0	0			5098	5560	5056	15714	1
otal Load (kVA)	5.10	5.56	5.06	15.71	125%	of Lig	ht/Co	ont c	and Re	ecept	5.10	5.56	5.06	15.71	1
otal Ampacity (Amps)	42.5	46.3	42.1	43.6	(<101	kVA) l	oad p	olus	other	load	42.5	46.3	42.1	43.6	1
Minimum Feeder Sizing (Amps)	42.5	46.3	42.1	43.6	 	oer N	FC Ar	licle	215.2	>	42.5	46.3	42.1	43.6	1

Panel Designati	on: (E)R	P-1					Maiı	n: /\	ЛLO				P-P \	/oltage:	208
Panel Location: FIRST FLOOR					Bussing: 225A								P-N \	/oltage:	120
Fed Fro	m: MAIN			Ground Bus: STANDARD										Phase:	
	ze: EXISTINO	TO PEN	1 1 1 1 1					_	URFA					Wire:	
	26. LAISTIIN	3 IO KLIV	IAIIN					_		JL.		60 11	19		
ITE LOAD CENTER						NE	€Uπα	31: 	00%				errupting		TUKA
Remarks	Light Load	Recept Load	Cont Load	nonC Load	OC Prot	СКТ	φ A	Ø Ø B Ø	ў скт С	1101	nonC Load	Cont Load	Recept Load	Light Load	Remarks
existing load				1000	20	1	X		2	20	1000				existing load
EXISTING LOAD				1000	20	3]	X	4	20	1000				existing load
existing load				1000	20	5)	(6	20	1000				existing load
existing load				1000	20	7	X		8	20	1000				existing load
existing load				1000	20	9		X	10	20	1000				existing load
existing load				1000	20	11		7	K 12	20	1000				existing load
existing load				1000	20	13	Х		14	20	1000				existing load
existing load				1000	20	15		X	16	20	1000				existing load
existing load				1000	20	17)	K 18	20	1000				existing load
CII 1				1768	25	19	X		20	20	1000				existing load
CU-1				1768	1 23	21		Х	22	20	1000				existing load
CILA				1768	0.5	23		7	(24	20	1000				existing load
CU-4				1768	25 25	25	Х		26	40	2433				CILO
OU 5				1768	0.5	27		x	28	40	2433				CU-2
CU-5				1768	25	29)	K 30	- 40	2517				
				1768		31	x		32	40	2517				CU-3
CU-6				1768	25	33		x	34		2433				
OUTDOOR OUTLET					20	35	tt	+	K 36	40	2433				CU-7
NEW SPACE					20	37	x	+	38	20					NEW SPACE
NEW SPACE					20	39	\perp	x	40	20					NEW SPACE
NEW SPACE					20	41	H		K 42	20					NEW SPACE
	Ш		<u> </u>			<u> </u>									· · · · · · · · · · · · · · · · · ·
		Connect	ed Load				Den	nan	d			Demand	Load		1
Load Description	ØA	ØB	ØС	Total			Fa	ctor			ØA	ØB	ØС	Total	1
Lighting or Continous Load (Volt-Amps)	0	0	0	0			1.	.00			0	0	0	0	1
180VA Receptacle Load (Volt-Amps)	0	0	0	0		1.0	0 (Fir:	st 10	OkVA)		0	0	0	0	Receptacle Demand Factor per Articl
, ,	Am	ount ove	r 10kVA	0		0	50 (>	· 10k	·(VA)		0	0	0	0	220.44 of the National Electrical Code
Continuous Load (Volt-Amps)	0	0	0	0				.00			0	0	0	0	
Non-Continuous Load (Volt-Amps)	17254	17170	15486	49910				.00			17254	17170	15486	49910	
Total Load (kVA)	17.25	17.17	15.49	49.91	125%	of Lig	jht/C	Cont	and R	ecept	17.25	17.17	15.49	49.91	
Total Ampacity (Amps)	143.7	143.0	129.0	138.5		_	-		s othe	-	143.7	143.0	129.0	138.5	1
Minimum Feeder Sizing (Amps)	143.7	143.0	129.0	138.5	< r	-					143.7	143.0	129.0	138.5	1

Panel Designa	ion: (F)R	P-2					Main	· \ \	10				P_P \	/oltage:	208	
Panel Designation: (E)RP-2 Panel Location: SECOND FLOOR					Main: MLO							P-P Voltage: 208 P-N Voltage: 120				
		J FLOOR		Bussing: 225A Ground Bus: Standard									F-IN	-		
	om: MAIN													Phase:		
Feeder S	size: EXISTING	S TO REM	1AIN				_		JRFA(CE				Wire:	•	
ITE LOAD CENTER						Ne	utral				Μ	in SC Int	errupting		10kA	
Remarks	Light Load	Recept Load	Cont Load	nonC Load	OC Prot	СКТ	Ø Ø A B		СКТ	OC Prot	nonC Load	Cont Load	Recept Load	Light Load	Remarks	
				2500		1	X		2	20	1000				EXISTING LOAD	
SUBFEED TO PANEL RP-2A				2500	60	3	X		4	20	1000				existing load	
				2500		5		Х		20	1000				existing load	
existing load				1000	20	7	Х		8	20	1000				existing load	
existing load				1000	20	9	Х		10	20	1000				existing load	
existing load				1000	20	11		Х	12	20	1000				existing load	
existing load				1000	20	13			14		1000					
existing load				1000	20	15	X		16	20	1000				existing load	
				1000		17		Х	18	20	1000				existing load	
AC-5				672	20	19	Х		20	20	1000				existing load	
AC-6				672	20	21	X	(22	20	1000				existing load	
AC-7				1260	20	23		Х	24						SPACE	
SPACE						25	X		26						SPACE	
SPACE						27	X		28						SPACE	
SPACE						29		Х	30						SPACE	
SPACE						31	X		32						SPACE	
SPACE						33	X		34						SPACE	
SPACE						35		X	36						SPACE	
SPACE						37	Х		38						SPACE	
SPACE						39	X		40						SPACE	
SPACE						41		Х	42						SPACE	
															_	
		Connect					Dem					Demana				
Load Description	ØA	ØB	ØС	Total			Fac				ØA	ØB	ØС	Total		
Lighting or Continous Load (Volt-Amps)	0	0	0	0			1.0	-			0	0	0	0		
180VA Receptacle Load (Volt-Amps)	0	0	0	0) (Firs				0	0	0	0	Receptacle Demand Factor per Article	
		ount ove		0		0.50 (> 10kVA)				0	0	0	0	220.44 of the National Electrical Code.		
Continuous Load (Volt-Amps)	0	0	0	0			1.0				0	0	0	0		
Non-Continuous Load (Volt-Amps)	9172	9172	8760	27104		1.00 125% of Light/Cont and Recept					9172	9172	8760	27104		
Total Load (kVA)	9.17	9.17	8.76	27.10	1					_	9.17	9.17	8.76	27.10		
Total Ampacity (Amps)	76.4	76.4	72.9	75.2		_	-			load	76.4	76.4	72.9	75.2		
Minimum Feeder Sizing (Amps)	76.4	76.4	72.9	75.2	<	per N	EC Ar	ticle	215 .:	2>	76.4	76.4	72.9	75.2		



ELECTRICAL ONE-LINE DIAGRAM

REMOVED MECHANICAL LOADS: 11 UNITS @ 540W (120V) = 5,940W 23 UNITS @ 936W (208V) = 21,528W 27,468W

ADDED MECHANICAL LOADS: 55,660W

NET ADD TO BUILDING LOAD: 28,192W (78A @ 208V-3P)

COPPER FEEDER SCHEDULE								
FEEDER (AMPS)	COND. SIZE	2 WIRE WITH GROUND	FEEDER (AMPS)	COND. SIZE	3 WIRE WITH GROUND	FEEDER (AMPS)	COND. SIZE	4 WIRE WITH GROUND
15S	12	2#12, 1#12 GND IN 3/4°C	15	12	3#12, 1#12 GND IN 3/4°C	(15N)	12	4#12, 1#12 GND IN 3/4°C
205	12	2#12, 1#12 GND IN 3/4°C	20	12	3#12, 1#12 GND IN 3/4"C	20N	12	4#12, 1#12 GND IN 3/4"C
25S >	10	2#10, 1#10 GND IN 3/4"C	25	10	3#10, 1#10 GND IN 3/4"C	25N	10	4#10, 1#10 GND IN 3/4"C
305	10	2#10, 1#10 GND IN 3/4"C	30	10	3#10, 1#10 GND IN 3/4°C	30N	10	4#10, 1#10 GND IN 3/4"C
35S >	8	2#8, 1#10 GND IN 3/4"C	35	8	3#8, 1#10 GND IN 3/4"C	35N	8	4#8, 1#10 GND IN 3/4"C
40S >	8	2#8, 1#10 GND IN 3/4"C	40	8	3#8, 1#10 GND IN 3/4"C	40N	8	4#8, 1#10 GND IN 3/4"C
45S >	6	2#6, 1#10 GND IN 3/4"C	45	6	3#6, 1#10 GND IN 3/4"C	45N	6	4#6, 1#10 GND IN 1"C
50S >	6	2#6, 1#10 GND IN 3/4"C	50	6	3#6, 1#10 GND IN 3/4"C	(50N)	6	4#6, 1#10 GND IN 1"C
60S >	4	2#4, 1#10 GND IN 1"C	60	4	3#4, 1#10 GND IN 1"C	(60N)	4	4#4, 1#10 GND IN 1 1/4"C
70S >	4	2#4, 1#8 GND IN 1"C	70	4	3#4, 1#8 GND IN 1"C	(70N)	4	4#4, 1#8 GND IN 1 1/4"C
805	3	2#3, 1#8 GND IN 1"C	80	3	3#3, 1#8 GND IN 1"C	(80N)	3	4#3, 1#8 GND IN 1 1/4"C
905	2	2#2, 1#8 GND IN 1"C	90	2	3#2, 1#8 GND IN 1 1/4"C	90N	2	4#2, 1#8 GND IN 1 1/2"C
100S	1	2#1, 1#8 GND IN 1 1/4"C	(100)	1	3#1, 1#8 GND IN 1 1/4"C	(100N)	1	4#1, 1#8 GND IN 1 1/2"C

- 1. AMPACITIES FOR FEEDER SIZES ARE BASED ON N.E.C. CODE 110-14. (TERMINATION PROVISIONS FOR EQUIPMENT RATED 100A OR LESS ARE RATED FOR USE WITH CONDUCTORS RATED 60°C. TERMINATION PROVISIONS FOR EQUIPMENT RATED GREATER THAN 100A ARE RATED FOR USE WITH CONDUCTORS RATED 75°C.)
- 2. CONTRACTOR MAY OPTIONALLY USE 1/2" CONDUIT IN LIEU OF 3/4" CONDUIT FOR #10 AND #12 CONDUCTORS.
- 3. CONDUIT FILL IS BASED ON 40% FILL USING SINGLE CONDUCTOR BUILDING WIRE OF INSULATION TYPES THHN, THWN, THWN-2, XHH, XHHW, AND XHHW-2 IN RMC. FOR OTHER RACEWAY TYPES REFER TO APPROPRIATE N.E.C. APPENDIX C TABLES.

4. EQUIPMENT GROUND SIZING BASED ON N.E.C. TABLE 250.122.



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ISSUED	DATE
DESIGNER:	DAD

SHEET TITLE:

ENGINEER:

ELECTRICAL ONE-LINE DIAGRAM AND DETAILS

SHEET NUMBER:

E5.0

BASIC ELECTRICAL REQUIREMENTS

- 1.01 RELATED DOCUMENTS A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY ONDITIONS, SPECIAL CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO WORK OF THIS B. PROVIDE ALL ITEMS, ARTICLES, MATERIALS, OPERATIONS OR METHODS LISTED, MENTIONED OR
- SCHEDULED ON DRAWINGS AND/OR HEREIN, INCLUDING ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY AND REQUIRED FOR THEIR COMPLETION.

AND ACCESSORIES AS MAY BE REQUIRED TO MEET SUCH CONDITIONS.

- A. THE DRAWINGS SHOW THE LOCATION AND GENERAL ARRANGEMENT OF EQUIPMENT, ELECTRICAL SYSTEMS AND RELATED ITEMS. THEY SHALL BE FOLLOWED AS CLOSELY AS ELEMENTS OF THE CONSTRUCTION B. EXAMINE THE DRAWINGS OF OTHER TRADES AND VERIFY THE CONDITIONS GOVERNING THE WORK ON
- C. DEVIATIONS FROM THE DRAWINGS. WITH THE EXCEPTION OF MINOR CHANGES IN ROUTING AND OTHER SUCH INCIDENTAL CHANGES THAT DO NOT AFFECT THE FUNCTIONING OR SERVICEABILITY OF THE SYSTEMS, SHALL NOT BE MADE WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECT/ENGINEER. D. THE ARCHITECTURAL AND STRUCTURAL DRAWINGS TAKE PRECEDENCE IN ALL MATTERS PERTAINING TO THE BUILDING STRUCTURE, MECHANICAL DRAWINGS IN ALL MATTERS PERTAINING TO MECHANICAL TRADES ND ELECTRICAL DRAWINGS IN ALL MATTERS PERTAINING TO ELECTRICAL TRADES. WHERE THERE ARE

THE JOB SITE. ARRANGE WORK ACCORDINGLY, PROVIDING SUCH FITTINGS, CONDUIT, JUNCTION BOXES

- CONFLICTS OR DIFFERENCES BETWEEN THE DRAWINGS FOR THE VARIOUS TRADES, REPORT SUCH CONFLICTS OR DIFFERENCES TO THE ARCHITECT/ENGINEER FOR RESOLUTION. 1.03 CODES, PERMITS AND FEES
- A. UNLESS OTHERWISE INDICATED, ALL REQUIRED PERMITS, LICENSES, INSPECTIONS, APPROVALS AND FEES FOR ELECTRICAL WORK SHALL BE SECURED AND PAID FOR BY THE CONTRACTOR. ALL WORK SHALL CONFORM TO ALL APPLICABLE CODES, RULES AND REGULATIONS. B. RULES OF LOCAL UTILITY COMPANIES SHALL BE COMPLIED WITH. CHECK WITH THE UTILITY COMPANY
- SUPPLYING SERVICE TO THE INSTALLATION AND DETERMINE ALL DEVICES INCLUDING, BUT NOT LIMITED O, ALL CURRENT AND POTENTIAL TRANSFORMERS, METER BOXES, C.T. CABINETS AND METERS WHICH WILL BE REQUIRED AND INCLUDE THE COST OF ALL SUCH ITEMS IN PROPOSAL. C. ALL WORK SHALL BE EXECUTED IN ACCORDANCE WITH THE RULES AND REGULATIONS SET FORTH IN LOCAL AND STATE CODES. PREPARE ANY DETAILED DRAWINGS OR DIAGRAMS WHICH MAY BE REQUIRED
- BY THE GOVERNING AUTHORITIES. WHERE THE DRAWINGS AND/OR SPECIFICATIONS INDICATE MATERIALS OR CONSTRUCTION IN EXCESS OF CODE REQUIREMENTS, THE DRAWINGS AND/OR SPECIFICATIONS SHALL 1.04 STANDARDS OF MATERIAL AND WORKMANSHIP:
- A. ALL MATERIALS SHALL BE NEW. THE ELECTRICAL AND PHYSICAL PROPERTIES OF ALL MATERIALS. AND THE DESIGN, PERFORMANCE CHARACTERISTICS, AND METHODS OF CONSTRUCTION OF ALL ITEMS OF QUIPMENT, SHALL BE IN ACCORDANCE WITH THE LATEST ISSUE OF THE VARIOUS, APPLICABLE
- STANDARD SPECIFICATIONS OF THE FOLLOWING RECOGNIZED AUTHORITIES: 1. A.N.S.I.AMERICAN NATIONAL STANDARDS INSTITUTE
- 2. A.S.T.M.AMERICAN SOCIETY FOR TESTING MATERIALS 3. I.C.E.A.INSULATED CABLE ENGINEERS ASSOCIATION
- 4. I.E.E.E.INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS 5. N.E.C.NATIONAL ELECTRICAL CODE
- 6. N.E.M.A.NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION 7. U.L.UNDERWRITERS LABORATORIES. INC.
- B. ALL EQUIPMENT OF THE SAME OR SIMILAR SYSTEMS SHALL BE BY THE SAME MANUFACTURER.
- A. PROVIDE COMPLETE OPERATING AND MAINTENANCE INSTRUCTION MANUALS COVERING ALL ELECTRICAL EQUIPMENT HEREIN SPECIFIED, TOGETHER WITH PARTS LISTS. ALL LITERATURE SHALL BE SUBMITTED TO THE ARCHITECT IN AN ELECTRONIC FORMAT.
- B. THE OPERATING AND MAINTENANCE INSTRUCTIONS SHALL INCLUDE A BRIEF, GENERAL DESCRIPTION FOR ALL ELECTRICAL SYSTEMS INCLUDING, BUT NOT LIMITED TO; ROUTINE MAINTENANCE PROCEDURES, TROUBLE-SHOOTING PROCEDURES AND SHOP DRAWINGS. C. ANY EQUIPMENT OFFERED AS A SUBSTITUTION SHALL BE EQUAL IN QUALITY, DURABILITY, APPEARANCE,
- AMPACITY, AND EFFICIENCY THROUGH ALL RANGES OF OPERATION, SHALL CONFORM WITH ARRANGEMENTS AND SPACE LIMITATIONS OF THE EQUIPMENT SHOWN ON THE PLANS AND/OR SPECIFIED, SHALL BE COMPATIBLE WITH THE OTHER COMPONENTS OF THE SYSTEM. ALL COSTS TO MAKE THESE ITEMS OF EQUIPMENT COMPLY WITH THESE REQUIREMENTS INCLUDING. BUT NOT LIMITED TO. CONDUIT WIRING, BUS WORK, ENCLOSURES AND BUILDING ALTERATIONS SHALL BE INCLUDED IN THE ORIGINAL BID. SIMILAR EQUIPMENT SHALL BE BY ONE MANUFACTURER. 1.06 SHOP DRAWINGS/SUBMITTALS
- A. ALL SHOP DRAWINGS SHALL BE SUBMITTED IN GROUPINGS OF SIMILAR AND/OR RELATED ITEMS (LIGHTING FIXTURES, SWITCHGEAR, ETC.). INCOMPLETE SUBMITTAL GROUPINGS WILL BE RETURNED
- B. SUBMIT FOR APPROVAL SHOP DRAWINGS FOR ALL ELECTRICAL SYSTEMS OR EQUIPMENT BUT NOT LIMITED TO THE SECTIONS OF SPECIFICATIONS. WHERE ITEMS ARE REFERRED TO BY SYMBOLIC DESIGNATION ON THE DRAWINGS AND SPECIFICATIONS, ALL SUBMITTALS SHALL BEAR THE SAME DESIGNATION (LIGHT FIXTURES). REFER TO OTHER SECTIONS OF THE ELECTRICAL SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS:
- 1.07 MANUFACTURERS LISTED A. THE LISTING OF SPECIFIC MANUFACTURERS DOES NOT IMPLY ACCEPTANCE OF THEIR PRODUCTS THAT DO NOT MEET THE SPECIFIED RATINGS, FEATURES AND FUNCTIONS. MANUFACTURERS LISTED ARE NOT RELIEVED FROM MEETING THESE SPECIFICATIONS IN THEIR ENTIRETY.
- B. PRODUCTS IN COMPLIANCE WITH THE SPECIFICATION AND MANUFACTURED BY OTHERS NOT NAMED WILL BE CONSIDERED ONLY IF PRE-APPROVED BY THE ENGINEER TEN (10) DAYS PRIOR TO BID DATE. 1.08 USE OF EQUIPMENT
- A. THE USE OF ANY EQUIPMENT, OR ANY PART THEREOF FOR PURPOSES OTHER THAN TESTING EVEN WITH THE OWNER'S CONSENT, SHALL NOT BE CONSTRUED TO BE AN ACCEPTANCE OF THE WORK ON THE PART OF THE OWNER, NOR BE CONSTRUED TO OBLIGATE THE OWNER IN ANY WAY TO ACCEPT IMPROPER WORK OR DEFECTIVE MATERIALS.
- B. DO NOT USE OWNER'S LAMPS FOR TEMPORARY LIGHTING EXCEPT AS ALLOWED AND DIRECTED BY THE OWNER. EQUIP LIGHTING FIXTURES WITH NEW LAMPS WHEN THE PROJECT IS TURNED OVER TO THE PART 2 EXECUTION 2.01 INSTALLATION OF EQUIPMENT
- A. INSTALL ALL EQUIPMENT IN STRICT ACCORDANCE WITH ALL DIRECTIONS AND RECOMMENDATIONS FURNISHED BY THE MANUFACTURER. WHERE SUCH DIRECTIONS ARE IN CONFLICT WITH THE DRAWINGS AND SPECIFICATIONS. REPORT SUCH CONFLICTS TO THE ARCHITECT/ENGINEER FOR RESOLUTION. B. DO NOT PENETRATE OR OTHERWISE NOTCH OR CUT STRUCTURAL MEMBERS, INCLUDING FOOTINGS AND
- GRADE BEAMS, WITHOUT APPROVAL OF STRUCTURAL ENGINEER. C. MAKE PENETRATIONS PERPENDICULAR TO SURFACES UNLESS OTHERWISE INDICATED.
- D. PROVIDE SLEEVES FOR PENETRATIONS AS INDICATED OR AS REQUIRED TO FACILITATE INSTALLATION. SET SLEEVES FLUSH WITH EXPOSED SURFACES UNLESS OTHERWISE INDICATED OR REQUIRED. E. CONCEAL BENDS FOR CONDUIT RISERS EMERGING ABOVE GROUND
- F. SEAL INTERIOR OF CONDUITS ENTERING THE BUILDING FROM UNDERGROUND AT FIRST ACCESSIBLE POINT TO PREVENT ENTRY OF MOISTURE AND GASES. G. WHERE CONDUITS PENETRATE WATERPROOF MEMBRANE, SEAL AS REQUIRED TO MAINTAIN INTEGRITY OF
- H. MAKE PENETRATIONS FOR ROOF-MOUNTED EQUIPMENT WITHIN ASSOCIATED EQUIPMENT OPENINGS AND CURBS WHERE POSSIBLE TO MINIMIZE ROOFING SYSTEM PENETRATIONS. WHERE PENETRATIONS ARE NECESSARY, SEAL AS INDICATED OR AS REQUIRED TO PRESERVE INTEGRITY OF ROOFING SYSTEM AND MAINTAIN ROOF WARRANTY. INCLUDE PROPOSED LOCATIONS OF PENETRATIONS AND METHODS FOR SEALING WITH SUBMITTALS.
- 2.02 COORDINATION A. INSTALL WORK TO AVOID INTERFERENCE WITH WORK OF OTHER TRADES. REMOVE AND RELOCATE ANY WORK THAT CAUSES AN INTERFERENCE AT CONTRACTOR'S EXPENSE. DISPUTES REGARDING THE CAUSE OF AN INTERFERENCE WILL BE RESOLVED BY THE CONSTRUCTION MANAGER OR ARCHITECT/ENGINEER.
- 2.03 CHASES AND RECESSES A. PROVIDED BY THE ARCHITECTURAL TRADES, BUT THE CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR ACCURATE LOCATION AND SIZE. 2.04 CUTTING, PATCHING AND DAMAGE TO OTHER WORK
- A. REFER TO GENERAL CONDITIONS FOR REQUIREMENTS. B. ALL CUTTING, PATCHING AND REPAIR WORK SHALL BE PERFORMED BY THE CONTRACTOR THROUGH
- APPROVED, QUALIFIED SUBCONTRACTORS. CONTRACTOR SHALL INCLUDE FULL COST OF SAME IN BID. 2.05 EXCAVATION AND BACKFILLING
- A. PROVIDE ALL EXCAVATION, TRENCHING, TUNNELING, DEWATERING AND BACKFILLING REQUIRED FOR THE ELECTRICAL WORK. COORDINATE THE WORK WITH OTHER EXCAVATING AND BACKFILLING IN THE SAME
- B. WHERE CONDUIT IS INSTALLED LESS THAN 2"6" BELOW THE SURFACE OF PAVEMENT, PROVIDE CONCRETE ENCASEMENT, 4" MINIMUM COVERAGE, ALL AROUND OR AS SHOWN ON THE ELECTRICAL
- C. BACKFILL ALL EXCAVATIONS INSIDE BUILDING, UNDER DRIVES AND PARKING AREAS WITH WELL-TAMPED GRANULAR MATERIAL. BACKFILL ALL EXCAVATIONS UNDER WALL FOOTINGS WITH LEAN MIX CONCRETE UP TO UNDERSIDE OF FOOTINGS AND EXTEND CONCRETE WITHIN EXCAVATION A MINIMUM OF FOUR (FEET EACH SIDE OF FOOTING. GRANULAR BACKFILL SHALL BE PLACED IN LAYERS NOT MORE THAN 8 INCHES IN THICKNESS. 95 PERCENT COMPACTION THROUGHOUT WITH APPROVED COMPACTION
- EQUIPMENT. TAMP, ROLL AS REQUIRED. EXCAVATED MATERIAL SHALL NOT BE USED. D. BACKFILL OUTSIDE BUILDING WITH GRANULAR MATERIAL TO A HEIGHT 12 INCHES OVER TOP OF PIPE COMPACTED TO 95 PERCENT COMPACTION AS SPECIFIED ABOVE. BACKFILL REMAINDER OF EXCAVATION WITH UNFROZEN, EXCAVATED MATERIAL IN SUCH A WAY TO PREVENT SETTLING. TAMP, ROLL AS
- 2.06 EQUIPMENT FOUNDATION AND SUPPORTS
- A. SHALL BE AS REQUIRED OR AS SHOWN ON PLANS OR SPECIFIED. B. PROVIDE CONCRETE BASES AND SUPPORTS FOR FLOOR MOUNTED ELECTRICAL EQUIPMENT.
- C. PROVIDE CONCRETE HOUSE KEEPING BASES 4" ABOVE FINISHED FLOOR, WITH LEVELING CHANNELS, WHERE NOTED, FOR FLOOR-MOUNTED EQUIPMENT. D. FOR EQUIPMENT SUSPENDED FROM CEILINGS OR WALLS, FURNISH AND INSTALL ALL INSERTS, RODS, STRUCTURAL STEEL FRAMES, BRACKETS AND PLATFORMS REQUIRED.
- 2.07 EQUIPMENT CONNECTIONS A. MAKE CONNECTIONS TO EQUIPMENT, MOTORS, LIGHTING FIXTURES, AND OTHER ITEMS INCLUDED IN THE WORK IN ACCORDANCE WITH THE APPROVED SHOP DRAWINGS AND ROUGH-IN MEASUREMENTS FURNISHED BY THE MANUFACTURERS OF THE PARTICULAR EQUIPMENT FURNISHED. ALL ADDITIONAL CONNECTIONS NOT SHOWN ON THE DRAWINGS, BUT CALLED OUT BY THE EQUIPMENT MANUFACTURER'S SHOP DRAWINGS SHALL BE PROVIDED.
- 2.08 ACCESS DOORS

TEMPORARY PROTECTION.

- A. COORDINATE REQUIREMENTS FOR ACCESS DOORS WITH ARCHITECT. 2.09 CLEANING
- A. ALL DEBRIS SHALL BE REMOVED DAILY AS REQUIRED TO MAINTAIN THE WORK AREA IN A NEAT,
- B. FINAL CLEANUP SHALL INCLUDE, BUT NOT BE LIMITED TO, WASHING OF FIXTURE LENSES OR LOUVERS SWITCHBOARDS, SUBSTATIONS, MOTOR CONTROL CENTERS, PANELS, ETC. FIXTURE REFLECTORS AND LENSES OR LOUVERS SHALL BE LEFT WITH NO WATER MARKS OR CLEANING STREAKS. 2.10 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS
- A. EQUIPMENT AND MATERIALS SHALL BE PROTECTED FROM THEFT, INJURY OR DAMAGE.
- B. PROTECT CONDUIT OPENINGS WITH TEMPORARY PLUGS OR CAPS. C. PROVIDE ADEQUATE STORAGE FOR ALL EQUIPMENT AND MATERIALS DELIVERED TO THE JOB SITE. LOCATION OF THE SPACE WILL BE DESIGNATED BY THE CONSTRUCTION MANAGER OR ARCHITECT/ENGINEER. EQUIPMENT SET IN PLACE IN UNPROTECTED AREAS MUST BE PROVIDED WITH

- A. FOR ANY EXTRA ELECTRICAL WORK WHICH MAY BE PROPOSED. THIS CONTRACTOR SHALL FURNISH TO THE CONSTRUCTION MANAGER, AN ITEMIZED BREAKDOWN OF THE ESTIMATED COST OF THE MATERIALS AND LABOR REQUIRED TO COMPLETE THIS WORK. THE CONTRACTOR SHALL PROCEED ONLY AFTER RECEIVING A WRITTEN ORDER FROM THE CONSTRUCTION MANAGER ESTABLISHING THE AGREED PRICE AND DESCRIBING THE WORK TO BE DONE.
- 2.12 DRAWINGS AND MEASUREMENTS A. THESE SPECIFICATIONS AND ACCOMPANYING DRAWINGS ARE INTENDED TO DESCRIBE AND PROVIDE FOR FINISHED WORK. THEY ARE INTENDED TO BE COOPERATIVE, AND WHAT IS CALLED FOR BY EITHER SHALL BE AS BINDING AS IF CALL FOR BY BOTH. THE CONTRACTOR WILL UNDERSTAND THAT THE WORK HEREIN DESCRIBED SHALL BE COMPLETE IN EVERY DETAIL. B. THE DRAWINGS ARE NOT INTENDED TO BE SCALED FOR ROUGH-IN MEASUREMENTS NOR TO SERVE AS
- SHOP DRAWINGS. FIFLD MFASURFMENTS NECESSARY FOR ORDERING MATERIALS AND FITTING THE INSTALLATION TO THE BUILDING CONSTRUCTION AND ARRANGEMENT SHALL BE TAKEN BY THE CONTRACTOR. THE CONTRACTOR SHALL CHECK LATEST ARCHITECTURAL DRAWINGS AND LOCATE LIGHT SWITCHES FROM SAME WHERE DOOR SWINGS ARE DIFFERENT FROM ELECTRICAL DRAWINGS.
- *MINOR ELECTRICAL DEMOLITION*

- 1.01 SUMMARY A. THE WORK COVERED UNDER THIS SECTION CONSISTS OF THE FURNISHING OF ALL NECESSARY LABOR SUPERVISION, MATERIALS, EQUIPMENT, AND SERVICES TO COMPLETELY EXECUTE THE SYSTEM OF MINOR ELECTRICAL DEMOLITION AS DESCRIBED IN THIS SPECIFICATION. B. IT IS THE CONTRACTORS OBLIGATION TO BECOME FAMILIAR WITH THE EXTENT OF DEMOLITION AND THE EXISTING CONDITION BEFORE SUBMITTING THEIR BID.
- C. DURING DEMOLITION IF THE CONTRACTOR DISCOVERS UNFORSEEN SIGNIFICANT NON CODE COMPLIANCE CONDITIONS OF THE EXISTING INSTALLATION THEY SHALL NOTIFY THE ARCHITECT AND ENGINEER D. DURING DEMOLITION THE CONTRACTOR SHALL RECORD ON THE AS-BUILTS ALL DEMOLISHED CIRCUITS NUMBERS THAT CAN BE USED FOR NEW CIRCUITING.
- PART 2 EXECUTION 2.01 EXAMINATION
- A. VERIFY THAT ABANDONED WIRING AND EQUIPMENT SERVE ONLY ABANDONED FACILITIES. B. DEMOLITION DRAWINGS ARE BASED ON CASUAL FIFLD OBSERVATION AND EXISTING RECORD DOCUMENTS. C. REPORT DISCREPANCIES TO OWNER BEFORE DISTURBING EXISTING INSTALLATION. D. BEGINNING OF DEMOLITION MEANS INSTALLER ACCEPTS EXISTING CONDITIONS.
- 2.02 PRFPARATION A. DISCONNECT ELECTRICAL SYSTEMS IN WALLS, FLOORS, AND CEILINGS TO BE REMOVED.
- B. COORDINATE UTILITY SERVICE OUTAGES WITH UTILITY COMPANY. C. PROVIDE TEMPORARY WIRING AND CONNECTIONS TO MAINTAIN EXISTING SYSTEMS IN SERVICE DURING CONSTRUCTION. WHEN WORK MUST BE PERFORMED ON ENERGIZED EQUIPMENT OR CIRCUITS, USE PERSONNEL EXPERIENCED IN SUCH OPERATIONS.
- D. EXISTING ELECTRICAL SERVICE: MAINTAIN EXISTING SYSTEM IN SERVICE UNTIL NEW SYSTEM IS COMPLETE AND READY FOR SERVICE. DISABLE SYSTEM ONLY TO MAKE SWITCHOVERS AND CONNECTIONS. MINIMIZE OUTAGE DURATION. 2.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK
- A. REMOVE, RELOCATE, AND EXTEND EXISTING INSTALLATIONS TO ACCOMMODATE NEW CONSTRUCTION. B. REMOVE ABANDONED WIRING TO SOURCE OF SUPPLY. C. REMOVE EXPOSED ABANDONED CONDUIT, INCLUDING ABANDONED CONDUIT ABOVE ACCESSIBLE CEILING FINISHES. CUT CONDUIT FLUSH WITH WALLS AND FLOORS, AND PATCH SURFACES. D. DISCONNECT ABANDONED OUTLETS AND REMOVE DEVICES. REMOVE ABANDONED OUTLETS IF CONDUIT
- SERVICING THEM IS ABANDONED AND REMOVED. PROVIDE BLANK COVER FOR ABANDONED OUTLETS E. DISCONNECT AND REMOVE ABANDONED PANELBOARDS AND DISTRIBUTION EQUIPMENT. F. DISCONNECT AND REMOVE ABANDONED LUMINAIRES. REMOVE BRACKETS, STEMS, HANGERS, AND OTHER
- G. REPAIR ADJACENT CONSTRUCTION AND FINISHES DAMAGED DURING DEMOLITION AND EXTENSION WORK. H. MAINTAIN ACCESS TO EXISTING ELECTRICAL INSTALLATIONS THAT REMAIN ACTIVE. MODIFY INSTALLATION OR PROVIDE ACCESS PANEL AS APPROPRIATE. I. EXTEND EXISTING INSTALLATIONS USING MATERIALS AND METHODS COMPATIBLE WITH EXISTING ELECTRICAL INSTALLATIONS, OR AS SPECIFIED.
- 2.04 CLEANING AND REPAIR A. CLEAN AND REPAIR EXISTING MATERIALS AND EQUIPMENT THAT REMAIN OR THAT ARE TO BE REUSED. B. PANELBOARDS: CLEAN EXPOSED SURFACES AND CHECK TIGHTNESS OF ELECTRICAL CONNECTIONS. REPLACE DAMAGED CIRCUIT BREAKERS AND PROVIDE CLOSURE PLATES FOR VACANT POSITIONS.

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND

PROVIDE TYPED CIRCUIT DIRECTORY SHOWING REVISED CIRCUITING ARRANGEMENT.

- PART 1 PRODUCTS 1.01 CONDUCTOR AND CABLE APPLICATIONS A. DO NOT USE CONDUCTORS AND CABLES FOR APPLICATIONS OTHER THAN AS PERMITTED BY NFPA 70
- B. PROVIDE SINGLE CONDUCTOR BUILDING WIRE INSTALLED IN SUITABLE RACEWAY UNLESS OTHERWISE INDICATED, PERMITTED, OR REQUIRED
- C. NONMETALLIC-SHEATHED CABLE IS NOT PERMITTED. D. UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE IS NOT PERMITTED.
- E. SERVICE ENTRANCE CABLE IS NOT PERMITTED. F. ARMORED CABLE IS NOT PERMITTED.
- G. METAL-CLAD CABLE IS PERMITTED ONLY AS FOLLOWS: 1. WHERE NOT OTHERWISE RESTRICTED, MAY BE USED:
- a. WHERE CONCEALED ABOVE ACCESSIBLE CEILINGS FOR FINAL CONNECTIONS FROM JUNCTION BOXES) MAXIMUM LENGTH: 6 FFF b. WHERE CONCEALED IN HOLLOW STUD WALLS, ABOVE ACCESSIBLE CEILINGS, AND UNDER RAISED
- FLOORS FOR BRANCH CIRCUITS UP TO 20 A. 1) EXCEPTION: PROVIDE SINGLE CONDUCTOR BUILDING WIRE IN RACEWAY FOR CIRCUIT HOMERUN FROM FIRST OUTLET TO PANELBOARD. 2. IN ADDITION TO OTHER APPLICABLE RESTRICTIONS, MAY NOT BE USED:
- a. WHERE EXPOSED TO DAMAGE. b. FOR DAMP, WET, OR CORROSIVE LOCATIONS, UNLESS PROVIDED WITH A PVC JACKET LISTED AS SUITABLE FOR THOSE LOCATIONS.
- H. MANUFACTURED WIRING SYSTEMS ARE NOT PERMITTED. 1.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS A. PROVIDE PRODUCTS THAT COMPLY WITH REQUIREMENTS OF NFPA 70. B. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED. C. UNLESS SPECIFICALLY INDICATED TO BE EXCLUDED, PROVIDE ALL REQUIRED CONDUIT, BOXES, WIRING,
- CONNECTORS, ETC. AS REQUIRED FOR A COMPLETE OPERATING SYSTEM. D. COMPLY WITH NEMA WC 70. E. THERMOPLASTIC-INSULATED CONDUCTORS AND CABLES: LISTED AND LABELED AS COMPLYING WITH UL
- F. THERMOSET-INSULATED CONDUCTORS AND CABLES: LISTED AND LABELED AS COMPLYING WITH UL 44. G. CONDUCTOR MATERIAL: 1. PROVIDE COPPER CONDUCTORS EXCEPT WHERE ALUMINUM CONDUCTORS ARE SPECIFICALLY INDICATED. SUBSTITUTION OF ALUMINUM CONDUCTORS FOR COPPER IS NOT PERMITTED. CONDUCTOR SIZES INDICATED ARE BASED ON COPPER UNLESS SPECIFICALLY INDICATED AS ALUMINUM.
- CONDUCTORS DESIGNATED WITH THE ABBREVIATION "AL" INDICATE ALUMINUM. 2. COPPER CONDUCTORS: SOFT DRAWN ANNEALED, 98 PERCENT CONDUCTIVITY, UNCOATED COPPER CONDUCTORS COMPLYING WITH ASTM B3, ASTM B8, OR ASTM B787/B787M UNLESS OTHERWISE 3. TINNED COPPER CONDUCTORS: COMPLY WITH ASTM B33.
- 4. ALUMINUM CONDUCTORS (ONLY WHERE SPECIFICALLY INDICATED OR PERMITTED FOR SUBSTITUTION): AA-8000 SERIES ALUMINUM ALLOY CONDUCTORS RECOGNIZED BY ASTM B800 AND COMPACT STRANDED IN ACCORDANCE WITH ASTM B801 UNLESS OTHERWISE INDICATED.
- H. CONDUCTOR COLOR CODING: 1. COLOR CODE CONDUCTORS AS INDICATED UNLESS OTHERWISE REQUIRED BY THE AUTHORITY HAVING JURISDICTION, MAINTAIN CONSISTENT COLOR CODING THROUGHOUT PROJECT 2. COLOR CODING METHOD: INTEGRALLY COLORED INSULATION. 3. COLOR CODE:
- a. 480Y/277 V, 3 PHASE, 4 WIRE SYSTEM: 1) PHASE A: BROWN.
- 2) PHASE B: ORANGE. 3) PHASE C: YELLOW.
- 4) NEUTRAL/GROUNDED: GRAY. b. 208Y/120 V, 3 PHASE, 4 WIRE SYSTEM: 1) PHASE A: BLACK.
- 2) PHASE B: RED. 3) PHASE C: BLUE. 4) NEUTRAL/GROUNDED: WHITE. c. EQUIPMENT GROUND, ALL SYSTEMS: GREEN.
- 1.03 SINGLE CONDUCTOR BUILDING WIRE A. DESCRIPTION: SINGLE CONDUCTOR INSULATED WIRE. B. CONDUCTOR STRANDING: 1. FEEDERS AND BRANCH CIRCUITS:
- a. SIZE 12 AWG AND SMALLER: STRANDED. b. SIZE 10 AWG AND LARGER: STRANDED.

OF INSTALLED LOCATION.

2.01 INSTALLATION

- C. INSULATION VOLTAGE RATING: 600 V. D. INSULATION:
- 1. COPPER BUILDING WIRE: TYPE THHN/THWN OR THHN/THWN-2, EXCEPT AS INDICATED BELOW. 1.04 METAL-CLAD CABLE
- A. DESCRIPTION: NFPA 70, TYPE MC CABLE LISTED AND LABELED AS COMPLYING WITH UL 1569, AND LISTED FOR USE IN CLASSIFIED FIRESTOP SYSTEMS TO BE USED. B. CONDUCTOR STRANDING:
- 1. SIZE 12 AWG AND SMALLER: STRANDED. 2. SIZE 10 AWG AND LARGER: STRANDED. C. INSULATION VOLTAGE RATING: 600 V.
- D. INSULATION: TYPE THHN, THHN/THWN, OR THHN/THWN-2. E. GROUNDING: FULL-SIZE INTEGRAL EQUIPMENT GROUNDING CONDUCTOR. F. ARMOR: STEEL, INTERLOCKED TAPE. G. PROVIDE PVC JACKET APPLIED OVER CABLE ARMOR WHERE INDICATED OR REQUIRED FOR ENVIRONMENT
- 1.05 WIRING CONNECTORS A. DESCRIPTION: WIRING CONNECTORS APPROPRIATE FOR THE APPLICATION, SUITABLE FOR USE WITH THE CONDUCTORS TO BE CONNECTED, AND LISTED AS COMPLYING WITH UL 486A-486B OR UL 486C AS PART 2 EXECUTION

- A. CIRCUITING REQUIREMENTS: 1. UNLESS DIMENSIONED, CIRCUIT ROUTING INDICATED IS DIAGRAMMATIC.
- 2. WHEN CIRCUIT DESTINATION IS INDICATED WITHOUT SPECIFIC ROUTING, DETERMINE EXACT ROUTING
- 3. ARRANGE CIRCUITING TO MINIMIZE SPLICES. 4. INCLUDE CIRCUIT LENGTHS REQUIRED TO INSTALL CONNECTED DEVICES WITHIN 10 FT OF LOCATION
- 5. MAINTAIN SEPARATION OF CLASS 1, CLASS 2, AND CLASS 3 REMOTE—CONTROL, SIGNALING, AND POWER—LIMITED CIRCUITS IN ACCORDANCE WITH NFPA 70. 6. MAINTAIN SEPARATION OF WIRING FOR EMERGENCY SYSTEMS IN ACCORDANCE WITH NFPA 70.
- B. PERFORM WORK IN ACCORDANCE WITH NECA 1 (GENERAL WORKMANSHIP). C. INSTALL ALUMINUM CONDUCTORS IN ACCORDANCE WITH NECA 104. D. INSTALL METAL-CLAD CABLE (TYPE MC) IN ACCORDANCE WITH NECA 120.
- E. INSTALLATION IN RACEWAY: 1. TAPE ENDS OF CONDUCTORS AND CABLES TO PREVENT INFILTRATION OF MOISTURE AND OTHER
- 2. PULL ALL CONDUCTORS AND CABLES TOGETHER INTO RACEWAY AT SAME TIME. 3. DO NOT DAMAGE CONDUCTORS AND CABLES OR EXCEED MANUFACTURER'S RECOMMENDED MAXIMUM PULLING TENSION AND SIDEWALL PRESSURE.
- 4. USE SUITABLE WIRE PULLING LUBRICANT WHERE NECESSARY, EXCEPT WHEN LUBRICANT IS NOT RECOMMENDED BY THE MANUFACTURER. F. PARALLELED CONDUCTORS: INSTALL CONDUCTORS OF THE SAME LENGTH AND TERMINATE IN THE SAME
- G. SECURE AND SUPPORT CONDUCTORS AND CABLES IN ACCORDANCE WITH NFPA 70 USING SUITABLE SUPPORTS AND METHODS APPROVED BY THE AUTHORITY HAVING JURISDICTION. PROVIDE INDEPENDEN SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM RACEWAYS, PIPING, DUCTWORK, OR OTHER SYSTEMS.
- 1. METAL-CLAD CABLE (TYPE MC): a. USE LISTED FITTINGS. b. CUT CABLE ARMOR ONLY USING SPECIALIZED TOOLS TO PREVENT DAMAGING CONDUCTORS OR

H. TERMINATE CABLES USING SUITABLE FITTINGS.

- INSULATION. DO NOT USE HACKSAW OR WIRE CUTTERS TO CUT ARMOR. . INSTALL CONDUCTORS WITH A MINIMUM OF 12 INCHES OF SLACK AT EACH OUTLET. J. NEATLY TRAIN AND BUNDLE CONDUCTORS INSIDE BOXES, WIREWAYS, PANELBOARDS AND OTHER
- K. GROUP OR OTHERWISE IDENTIFY NEUTRAL/GROUNDED CONDUCTORS WITH ASSOCIATED UNGROUNDED
- CONDUCTORS INSIDE ENCLOSURES IN ACCORDANCE WITH NEPA 70. L. MAKE WIRING CONNECTIONS USING SPECIFIED WIRING CONNECTORS 1. MAKE SPLICES AND TAPS ONLY IN ACCESSIBLE BOXES. DO NOT PULL SPLICES INTO RACEWAYS OR MAKE SPLICES IN CONDUIT BODIES OR WIRING GUTTERS.
- 2. REMOVE APPROPRIATE AMOUNT OF CONDUCTOR INSULATION FOR MAKING CONNECTIONS WITHOUT CUTTING, NICKING OR DAMAGING CONDUCTORS. 3. DO NOT REMOVE CONDUCTOR STRANDS TO FACILITATE INSERTION INTO CONNECTOR. 4. CLEAN CONTACT SURFACES ON CONDUCTORS AND CONNECTORS TO SUITABLE REMOVE CORROSION
- OXIDES, AND OTHER CONTAMINATES. DO NOT USE WIRE BRUSH ON PLATED CONNECTOR SURFACES. 5. CONNECTIONS FOR ALUMINUM CONDUCTORS: FILL CONNECTORS WITH OXIDE INHIBITING COMPOUND WHERE NOT PRE-FILLED BY MANUFACTURER. M. INSULATE SPLICES AND TAPS THAT ARE MADE WITH UNINSULATED CONNECTORS USING METHODS
- SUITABLE FOR THE APPLICATION, WITH INSULATION AND MECHANICAL STRENGTH AT LEAST EQUIVALENT TO UNSPLICED CONDUCTORS. N. INSULATE ENDS OF SPARE CONDUCTORS USING VINYL INSULATING ELECTRICAL TAPE. O. INSTALL FIRESTOPPING TO PRESERVE FIRE RESISTANCE RATING OF PARTITIONS AND OTHER ELEMENTS. P. UNLESS SPECIFICALLY INDICATED TO BE EXCLUDED. PROVIDE FINAL CONNECTIONS TO ALL FOUIPMENT AND DEVICES, INCLUDING THOSE FURNISHED BY OTHERS, AS REQUIRED FOR A COMPLETE OPERATING

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- PART 1 PRODUCTS 1.01 GROUNDING AND BONDING REQUIREMENTS A. EXISTING WORK: WHERE EXISTING GROUNDING AND BONDING SYSTEM COMPONENTS ARE INDICATED TO BE REUSED, THEY MAY BE REUSED ONLY WHERE THEY ARE FREE FROM CORROSION, INTEGRITY AND CONTINUITY ARE VERIFIED, AND WHERE ACCEPTABLE TO THE AUTHORITY HAVING JURISDICTION.
- B. DO NOT USE PRODUCTS FOR APPLICATIONS OTHER THAN AS PERMITTED BY NFPA 70 AND PRODUCT C. UNLESS SPECIFICALLY INDICATED TO BE EXCLUDED, PROVIDE ALL REQUIRED COMPONENTS, CONDUCTORS, CONNECTORS, CONDUIT, BOXES, FITTINGS, SUPPORTS, ACCESSORIES, ETC. AS NECESSARY
- FOR A COMPLETE GROUNDING AND BONDING SYSTEM. D. WHERE CONDUCTOR SIZE IS NOT INDICATED, SIZE TO COMPLY WITH NFPA 70 BUT NOT LESS THAN APPLICABLE MINIMUM SIZE REQUIREMENTS SPECIFIED. E. GROUNDING SYSTEM RESISTANCE:
- 1. GROUNDING ELECTRODE SYSTEM: NOT GREATER THAN 5 OHMS TO GROUND, WHEN TESTED ACCORDING TO IEEE 81 USING "FALL-OF-POTENTIAL" METHOD. F. GROUNDING ELECTRODE SYSTEM: 1. PROVIDE CONNECTION TO REQUIRED AND SUPPLEMENTAL GROUNDING ELECTRODES INDICATED TO
- FORM GROUNDING ELECTRODE SYSTEM. a. PROVIDE CONTINUOUS GROUNDING ELECTRODE CONDUCTORS WITHOUT SPLICE OR JOINT. b. INSTALL GROUNDING ELECTRODE CONDUCTORS IN RACEWAY WHERE EXPOSED TO PHYSICAL DAMAGE. BOND GROUNDING ELECTRODE CONDUCTOR TO METALLIC RACEWAYS AT EACH END WITH
- BONDING JUMPER. 2. PROVIDE ADDITIONAL GROUND ELECTRODE(S) AS REQUIRED TO ACHIEVE SPECIFIED GROUNDING ELECTRODE SYSTEM RESISTANCE. 1.02 GROUNDING AND BONDING COMPONENTS A GENERAL REQUIREMENTS:
- 2. PROVIDE PRODUCTS LISTED AND LABELED AS COMPLYING WITH UL 467 WHERE APPLICABLE. B. CONDUCTORS FOR GROUNDING AND BONDING, IN ADDITION TO REQUIREMENTS OF SECTION 26 0526: 1. USE INSULATED COPPER CONDUCTORS UNLESS OTHERWISE INDICATED. a. EXCEPTIONS: 1) USE BARE COPPER CONDUCTORS WHERE INSTALLED UNDERGROUND IN DIRECT CONTACT WITH

1. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED.

- 2) USE BARE COPPER CONDUCTORS WHERE DIRECTLY ENCASED IN CONCRETE (NOT IN RACEWAY). C. CONNECTORS FOR GROUNDING AND BONDING. 1. DESCRIPTION: CONNECTORS APPROPRIATE FOR THE APPLICATION AND SUITABLE FOR THE
- CONDUCTORS AND ITEMS TO BE CONNECTED: LISTED AND LABELED AS COMPLYING WITH UL 467. 2. UNLESS OTHERWISE INDICATED, USE EXOTHERMIC WELDED CONNECTIONS FOR UNDERGROUND. CONCEALED AND OTHER INACCESSIBLE CONNECTIONS. 3. UNLESS OTHERWISE INDICATED, USE MECHANICAL CONNECTORS, COMPRESSION CONNECTORS, OR
- PART 2 EXECUTION 2.01 EXAMINATION A. VERIFY THAT WORK LIKELY TO DAMAGE GROUNDING AND BONDING SYSTEM COMPONENTS HAS BEEN

EXOTHERMIC WELDED CONNECTIONS FOR ACCESSIBLE CONNECTIONS.

- B. VERIFY THAT CONDITIONS ARE SATISFACTORY FOR INSTALLATION PRIOR TO STARTING WORK. 2.02 INSTALLATION A. PERFORM WORK IN ACCORDANCE WITH NECA 1 (GENERAL WORKMANSHIP).
- B. GROUND ROD ELECTRODES: UNLESS OTHERWISE INDICATED, INSTALL GROUND ROD ELECTRODES VERTICALLY. WHERE ENCOUNTERED ROCK PROHIBITS VERTICAL INSTALLATION, INSTALL AT 45 DEGREE ANGLE OR BURY HORIZONTALLY IN TRENCH AT LEAST 30 INCHES (750 MM) DEEP IN ACCORDANCE WITH NFPA 70 OR PROVIDE GROUND PLATES. C. MAKE GROUNDING AND BONDING CONNECTIONS USING SPECIFIED CONNECTORS.
- 1. REMOVE APPROPRIATE AMOUNT OF CONDUCTOR INSULATION FOR MAKING CONNECTIONS WITHOUT CUTTING, NICKING OR DAMAGING CONDUCTORS. DO NOT REMOVE CONDUCTOR STRANDS TO FACILITATE INSERTION INTO CONNECTOR. 2. REMOVE NONCONDUCTIVE PAINT, ENAMEL, OR SIMILAR COATING AT THREADS, CONTACT POINTS, AND
- CONTACT SURFACES. 3. EXOTHERMIC WELDS: MAKE CONNECTIONS USING MOLDS AND WELD MATERIAL SUITABLE FOR THE ITEMS TO BE CONNECTED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. 4. MECHANICAL CONNECTORS: SECURE CONNECTIONS ACCORDING TO MANUFACTURER'S RECOMMENDED TORQUE SETTINGS.
- 5. COMPRESSION CONNECTORS: SECURE CONNECTIONS USING MANUFACTURER'S RECOMMENDED TOOLS 2.03 FIELD QUALITY CONTROL
- A. INSPECT AND TEST IN ACCORDANCE WITH NETA ATS EXCEPT SECTION 4. B. PERFORM INSPECTIONS AND TESTS LISTED IN NETA ATS, SECTION 7.13.
- C. PERFORM GROUND ELECTRODE RESISTANCE TESTS UNDER NORMALLY DRY CONDITIONS. PRECIPITATION WITHIN THE PREVIOUS 48 HOURS DOES NOT CONSTITUTE NORMALLY DRY CONDITIONS. D. INVESTIGATE AND CORRECT DEFICIENCIES WHERE MEASURED GROUND RESISTANCES DO NOT COMPLY

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS PART 1 GENERAL

- 1.01 SUMMARY A. THE WORK COVERED UNDER THIS SECTION CONSISTS OF THE FURNISHING OF ALL NECESSARY LABOR, SUPERVISION, MATERIALS, EQUIPMENT, AND SERVICES TO COMPLETELY EXECUTE THE SYSTEM OF CONDUIT HANGERS AND SUPPORTS AS DESCRIBED IN THIS SPECIFICATION. B. RATED STRENGTH: ADEQUATE IN TENSION, SHEAR, AND PULLOUT FORCE TO RESIST MAXIMUM LOADS CALCULATED OR IMPOSED FOR THIS PROJECT, WITH A MINIMUM STRUCTURAL SAFETY FACTOR OF FIVE TIMES THE APPLIED FORCE.
- 1.02 COORDINATION A. COORDINATE INSTALLATION OF ROOF CURBS, EQUIPMENT SUPPORTS, AND ROOF PENETRATIONS. PART 2 PRODUCTS
- 2.01 SUPPORT AND ATTACHMENT COMPONENTS A. GENERAL REQUIREMENTS: 1. PROVIDE ALL REQUIRED HANGERS, SUPPORTS, ANCHORS, FASTENERS, FITTINGS, ACCESSORIES, AND HARDWARE AS NECESSARY FOR THE COMPLETE INSTALLATION OF ELECTRICAL WORK. 2. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED,
- 3. WHERE SUPPORT AND ATTACHMENT COMPONENT TYPES AND SIZES ARE NOT INDICATED, SELECT IN ACCORDANCE WITH MANUFACTURER'S APPLICATION CRITERIA AS REQUIRED FOR THE LOAD TO BE SUPPORTED. INCLUDE CONSIDERATION FOR VIBRATION, EQUIPMENT OPERATION, AND SHOCK LOADS WHERE APPLICABLE
- 5. STEEL COMPONENTS: USE CORROSION RESISTANT MATERIALS SUITABLE FOR THE ENVIRONMENT WHERE INSTALLED a. ZINC-PLATED STEEL: ELECTROPLATED IN ACCORDANCE WITH ASTM B633. b. GALVANIZED STEEL: HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM

B. CONDUIT AND CABLE SUPPORTS: STRAPS, CLAMPS, ETC. SUITABLE FOR THE CONDUIT OR CABLE TO

A123/A123M OR ASTM A153/A153M.

4. DO NOT USE PRODUCTS FOR APPLICATIONS OTHER THAN AS PERMITTED BY NFPA 70 AND PRODUCT

- 1. CONDUIT STRAPS: ONE-HOLE OR TWO-HOLE TYPE; STEEL OR MALLEABLE IRON.
- 2. CONDUIT CLAMPS: BOLTED TYPE UNLESS OTHERWISE INDICATED. C. OUTLET BOX SUPPORTS: HANGERS, BRACKETS, ETC. SUITABLE FOR THE BOXES TO BE SUPPORTED. D. METAL CHANNEL (STRUT) FRAMING SYSTEMS: FACTORY-FABRICATED CONTINUOUS-SLOT METAL CHANNEL (STRUT) AND ASSOCIATED FITTINGS, ACCESSORIES, AND HARDWARE REQUIRED FOR FIELD-ASSEMBLY OF
- 1. COMPLY WITH MFMA-4. 2. CHANNEL (STRUT) USED AS RACEWAY (ONLY WHERE SPECIFICALLY INDICATED): LISTED AND LABELED AS COMPLYING WITH UL 5B.
- E. HANGER RODS: THREADED ZINC-PLATED STEEL UNLESS OTHERWISE INDICATED. 1. MINIMUM SIZE, UNLESS OTHERWISE INDICATED OR REQUIRED:
- a. EQUIPMENT SUPPORTS: 1/2 INCH DIAMETER. b. SINGLE CONDUIT UP TO 1 INCH (27 MM) TRADE SIZE: 1/4 INCH DIAMETER.

G. HANGERS, SUPPORTS, ANCHORS, AND FASTENERS — GENERAL:

- F. ANCHORS AND FASTENERS: 1. UNLESS OTHERWISE INDICATED AND WHERE NOT OTHERWISE RESTRICTED, USE THE ANCHOR AND FASTENER TYPES INDICATED FOR THE SPECIFIED APPLICATIONS.
- 1. PROTECTIVE ZINC COATING EITHER ELECTRO-PLATED (ASTM B633 SCI OR SC3), PRE-GALVANIZED (ASTM A525 COATING DESIGNATION G90) OR HOT-DIP GALVANIZED AFTER FABRICATION (ASTM A123). THE MINIMUM THICKNESS OF ZINC COATING SHALL BE 0.2 MILL (5 MICROMETERS).. H. PROVIDE MATERIALS OF SIZE AND TYPE ADEQUATE TO CARRY THE LOADS OF EQUIPMENT AND CONDUIT, INCLUDING WEIGHT OF WIRE IN CONDUIT.
- I. CONDUIT HANGERS: 1. SHALL HAVE A VERTICAL LOAD LIMIT OF 100 LBS, AND A HORIZONTAL LOAD LIMIT OF 25 LBS..
- 2. SHALL BE AVAILABLE WITH EITHER A PLAIN HOLE FOR 1/4" BOLT OR A 1/4-20 THREAD 3. SHALL BE AVAILABLE FOR 3/8" THROUGH 2" EMT, RIGID, AND ALUMINUM CONDUIT. 4. SHALL BE AVAILABLE PRE-ASSEMBLED WITH MANUFACTURER'S SPECIALTY FASTENERS FOR
- CONNECTION TO BUILDING STRUCTURES LIKE BEAM, FLANGE, DROP WIRE/ROD, WOOD STRUCTURE, CONCRETE AND ACOUSTICAL TEE GRID. J. WIRE ROPE HANGERS: 1. WIRE ROPE HANGER ASSEMBLIES SHALL BE MADE OF GALVANIZED STEEL.
- 2. HANGER SHALL MEET THE FIRE RATING REQUIREMENTS FOR DIN 4102-2 FOR 30 MINUTES AT 30 PERCENT OF RATED LOAD. 3. ROPE HANGERS SHALL HAVE A MINIMUM SAFETY FACTOR OF 5:1.
- 4. ROPE HANGERS ARE NOT PERMITTED TO SUPPORT CONDUITS. 5. ROPE HANGERS ARE PERMITTED TO HANG LIGHT FIXTURES, WERE APPLICABLE. 6. HANGERS SHALL BE FULLY ADJUSTABLE. PART 3 EXECUTION
- 3.01 INSTALIATION A. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM PIPING, DUCTWORK, OR OTHER SYSTEMS B. UNLESS SPECIFICALLY INDICATED OR APPROVED BY STRATEGIC ENERGY SOLUTIONS, INC., DO NOT PROVIDE SUPPORT FROM SUSPENDED CEILING SUPPORT SYSTEM OR CEILING GRID.
- C. UNLESS SPECIFICALLY INDICATED OR APPROVED BY STRATEGIC ENERGY SOLUTIONS, INC., DO NOT ROVIDE SUPPORT FROM ROOF DECK D. EQUIPMENT SUPPORT AND ATTACHMENT:
- 1. USE METAL FABRICATED SUPPORTS OR SUPPORTS ASSEMBLED FROM METAL CHANNEL (STRUT) TO SUPPORT EQUIPMENT AS REQUIRED. 2. USE METAL CHANNEL (STRUT) SECURED TO STUDS TO SUPPORT EQUIPMENT SURFACE-MOUNTED ON HOLLOW STUD WALLS WHEN WALL STRENGTH IS NOT SUFFICIENT TO RESIST PULL-OUT 3. USE METAL CHANNEL (STRUT) TO SUPPORT SURFACE-MOUNTED EQUIPMENT IN WET OR DAMP LOCATIONS TO PROVIDÈ SPACE BETWEEN EQUIPMENT AND MOUNTING SURFACE.
- 4. SECURELY FASTEN FLOOR-MOUNTED EQUIPMENT. DO NOT INSTALL EQUIPMENT SUCH THAT IT RELIES ON ITS OWN WEIGHT FOR SUPPORT. E. SECURE FASTENERS ACCORDING TO MANUFACTURER'S RECOMMENDED TORQUE SETTINGS.

<u>CONDUIT</u>

PART 1 GENERAL 1.01 DELIVERY, STORAGE, AND HANDLING

F. REMOVE TEMPORARY SUPPORTS.

A. RECEIVE, INSPECT, HANDLE, AND STORE CONDUIT AND FITTINGS IN ACCORDANCE WITH MANUFACTURER'S B. PROTECT CONDUIT FROM CORROSION AND ENTRANCE OF DEBRIS BY STORING ABOVE GRADE. PROVIDE APPROPRIATE COVERING.

C. PROTECT PVC CONDUIT FROM SUNLIGHT. PART 2 PRODUCTS 2.01 CONDUIT APPLICATIONS A. DO NOT USE CONDUIT AND ASSOCIATED FITTINGS FOR APPLICATIONS OTHER THAN AS PERMITTED BY

C80.1 AND LISTED AND LABELED AS COMPLYING WITH UL 6.

- NFPA 70 AND PRODUCT LISTING. B. UNLESS OTHERWISE INDICATED AND WHERE NOT OTHERWISE RESTRICTED, USE THE CONDUIT TYPES INDICATED FOR THE SPECIFIED APPLICATIONS, WHERE MORE THAN ONE LISTED APPLICATION APPLIES. COMPLY WITH THE MOST RESTRICTIVE REQUIREMENTS. WHERE CONDUIT TYPE FOR A PARTICULAR APPLICATION IS NOT SPECIFIED, USE GALVANIZED STEEL RIGID METAL CONDUIT. 2.02 CONDUIT REQUIREMENTS
- B. WHERE CONDUIT SIZE IS NOT INDICATED, SIZE TO COMPLY WITH NFPA 70 BUT NOT LESS THAN APPLICABLE MINIMUM SIZE REQUIREMENTS SPECIFIED 2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC) A. DESCRIPTION: NFPA 70, TYPE RMC GALVANIZED STEEL RIGID METAL CONDUIT COMPLYING WITH ANSI

A. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED.

- B. FITTINGS: 1. NON-HAZARDOUS LOCATIONS: USE FITTINGS COMPLYING WITH NEMA FB 1 AND LISTED AND LABELED AS COMPLYING WITH UL 514B.
- 2. MATERIAL: USE STEEL OR MALLEABLE IRON. 3. CONNECTORS AND COUPLINGS: USE THREADED TYPE FITTINGS ONLY. THREADLESS SET SCREW AND COMPRESSION (GLAND) TYPE FITTINGS ARE NOT PERMITTED. 2.04 FLEXIBLE METAL CONDUIT (FMC)
- A. DESCRIPTION: NFPA 70, TYPE FMC STANDARD WALL STEEL FLEXIBLE METAL CONDUIT LISTED AND LABELED AS COMPLYING WITH UL 1, AND LISTED FOR USE IN CLASSIFIED FIRESTOP SYSTEMS TO BE B. FITTINGS: 1. DESCRIPTION: FITTINGS COMPLYING WITH NEMA FB 1 AND LISTED AND LABELED AS COMPLYING WITH
- 2. MATERIAL: USE STEEL OR MALLEABLE IRON. C. DESCRIPTION: INTERLOCKED STEEL CONSTRUCTION D. FITTINGS: NEMA FB 1 2.05 FLECTRICAL METALLIC TURING (FMT)
- AND LISTED AND LABELED AS COMPLYING WITH UL 797. B. FITTINGS: 1. DESCRIPTION: FITTINGS COMPLYING WITH NEMA FB 1 AND LISTED AND LABELED AS COMPLYING WITH
- 2. MATERIAL: USE STEEL OR MALLEABLE IRON. 3. CONNECTORS AND COUPLINGS: USE COMPRESSION (GLAND) OR SET-SCREW TYPE. a do not use indenter type connectors and couplings. C. DESCRIPTION: ANSI C80.3; GALVANIZED TUBIN D. FITTINGS AND CONDUIT BODIES: NEMA FB 1; STEEL OR MALLEABLE IRON COMPRESSION TYPE.

A. DESCRIPTION: NFPA 70, TYPE EMT STEEL ELECTRICAL METALLIC TUBING COMPLYING WITH ANSI C80.3

- 2.06 ELECTRICAL NONMETALLIC TUBING (ENT) A. DESCRIPTION: NFPA 70, TYPE ENT ELECTRICAL NONMETALLIC TUBING COMPLYING WITH NEMA TC 13 AND LISTED AND LABELED AS COMPLYING WITH UL 1653. B. FITTINGS:
- 1. MANUFACTURER: SAME AS MANUFACTURER OF ENT TO BE CONNECTED. 2. USE SOLVENT-WELDED TYPE FITTINGS. 3. SOLVENT-WELDED FITTINGS: RIGID PVC FITTINGS COMPLYING WITH NEMA TC 3 AND LISTED AND LABELED AS COMPLYING WITH UL 651; SUITABLE FOR USE WITH ENT.
- PART 3 EXECUTION 3.01 EXAMINATION A. VERIFY THAT MOUNTING SURFACES ARE READY TO RECEIVE CONDUITS. B. VERIFY THAT CONDITIONS ARE SATISFACTORY FOR INSTALLATION PRIOR TO STARTING WORK.
- C. VERIFY ROUTING AND TERMINATION LOCATIONS OF CONDUIT PRIOR TO ROUGH-IN. D. CONDUIT ROUTING IS SHOWN ON DRAWINGS IN APPROXIMATE LOCATIONS UNLESS DIMENSIONED. ROUTE AS REQUIRED TO COMPLETE WIRING SYSTEM. 3.02 INSTALLATION
- A. INSTALL GALVANIZED STEEL RIGID METAL CONDUIT (RMC) IN ACCORDANCE WITH NECA 101. B. INSTALL ELECTRICAL NONMETALLIC TUBING (ENT) IN ACCORDANCE WITH NECA 111. C. CONDUIT SUPPORT: 1. SECURE AND SUPPORT CONDUITS IN ACCORDANCE WITH NFPA 70 AND SECTION 26 0529 USING

SUITABLE SUPPORTS AND METHODS APPROVED BY THE AUTHORITY HAVING JURISDICTION.

2. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM PIPING, DUCTWORK, OR OTHER SYSTEMS. D. CONNECTIONS AND TERMINATIONS: 1. USE APPROVED ZINC-RICH PAINT OR CONDUIT JOINT COMPOUND ON FIELD-CUT THREADS OF

GALVANIZED STEEL CONDUITS PRIOR TO MAKING CONNECTIONS.

NOT LIMITED TO:

THREE-PIECE COUPLINGS OR SPLIT COUPLINGS. DO NOT USE RUNNING THREADS 3. USE SUITABLE ADAPTERS WHERE REQUIRED TO TRANSITION FROM ONE TYPE OF CONDUIT TO 4. TERMINATE THREADED CONDUITS IN BOXES AND ENCLOSURES USING THREADED HUBS OR DOUBLE LOCK NUTS FOR DRY LOCATIONS AND RAINTIGHT HUBS FOR WET LOCATIONS.

2. WHERE TWO THREADED CONDUITS MUST BE JOINED AND NEITHER CAN BE ROTATED. USE

CONDUCTORS. 6. SECURE JOINTS AND CONNECTIONS TO PROVIDE MAXIMUM MECHANICAL STRENGTH AND ELECTRICAL E. CONDUIT MOVEMENT PROVISIONS: WHERE CONDUITS ARE SUBJECT TO MOVEMENT, PROVIDE EXPANSION AND EXPANSION/DEFLECTION FITTINGS TO PREVENT DAMAGE TO ENCLOSED CONDUCTORS OR CONNECTED FOUIPMENT, THIS INCLUDES, BUT IS NOT LIMITED TO:

5. PROVIDE INSULATING BUSHINGS OR INSULATED THROATS AT ALL CONDUIT TERMINATIONS TO PROTECT

1. WHERE CONDUITS CROSS STRUCTURAL JOINTS INTENDED FOR EXPANSION, CONTRACTION, OR DEFLECTION. 2. WHERE CONDUITS ARE SUBJECT TO EARTH MOVEMENT BY SETTLEMENT OR FROST. F. CONDENSATION PREVENTION: WHERE CONDUITS CROSS BARRIERS BETWEEN AREAS OF POTENTIAL SUBSTANTIAL TEMPERATURE DIFFERENTIAL, PROVIDE SEALING FITTING OR APPROVED SEALING COMPOUND AT AN ACCESSIBLE POINT NEAR THE PENETRATION TO PREVENT CONDENSATION. THIS INCLUDES, BUT IS

2. WHERE CONDUITS PASS FROM UNCONDITIONED INTERIOR SPACES INTO CONDITIONED INTERIOR

1. WHERE CONDUITS PASS FROM OUTDOORS INTO CONDITIONED INTERIOR SPACES.

PART 1 PRODUCTS

- A. GENERAL REQUIREMENTS: 1. DO NOT USE BOXES AND ASSOCIATED ACCESSORIES FOR APPLICATIONS OTHER THAN AS PERMITTED BY NFPA 70 AND PRODUCT LISTING.
- 2. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED. 3. WHERE BOX SIZE IS NOT INDICATED, SIZE TO COMPLY WITH NFPA 70 BUT NOT LESS THAN
- APPLICABLE MINIMUM SIZE REQUIREMENTS SPECIFIED. 4. PROVIDE GROUNDING TERMINALS WITHIN BOXES WHERE EQUIPMENT GROUNDING CONDUCTORS
- B. OUTLET AND DEVICE BOXES UP TO 100 CUBIC INCHES, INCLUDING THOSE USED AS JUNCTION AND 1. USE SHEET-STEEL BOXES FOR DRY LOCATIONS UNLESS OTHERWISE INDICATED OR REQUIRED 2. USE CAST IRON BOXES OR CAST ALUMINUM BOXES FOR DAMP OR WET LOCATIONS UNLESS
- OTHERWISE INDICATED OR REQUIRED; FURNISH WITH COMPATIBLE WEATHERPROOF GASKETED COVERS. 3. USE SUITABLE CONCRETE TYPE BOXES WHERE FLUSH-MOUNTED IN CONCRETE. 4. USE SUITABLE MASONRY TYPE BOXES WHERE FLUSH-MOUNTED IN MASONRY WALLS.
- 5. USE RAISED COVERS SUITABLE FOR THE TYPE OF WALL CONSTRUCTION AND DEVICE CONFIGURATION
- WHERE REQUIRED. 6. USE SHALLOW BOXES WHERE REQUIRED BY THE TYPE OF WALL CONSTRUCTION.
- 7. DO NOT USE "THROUGH-WALL" BOXES DESIGNED FOR ACCESS FROM BOTH SIDES OF WALL. 8. SHEET-STEEL BOXES: COMPLY WITH NEMA OS 1, AND LIST AND LABEL AS COMPLYING WITH UL 9. CAST METAL BOXES: COMPLY WITH NEMA FB 1, AND LIST AND LABEL AS COMPLYING WITH UL
- 514A; FURNISH WITH THREADED HUBS. 10.BOXES FOR SUPPORTING LUMINAIRES AND CEILING FANS: LISTED AS SUITABLE FOR THE TYPE AND WEIGHT OF LOAD TO BE SUPPORTED; FURNISHED WITH FIXTURE STUD TO ACCOMMODATE MOUNTING OF LUMINAIRE WHERE REQUIRED.
- 11.BOXES FOR GANGED DEVICES: USE MULTIGANG BOXES OF SINGLE-PIECE CONSTRUCTION. DO NOT USE FIELD-CONNECTED GANGABLE BOXES. C. CABINETS AND ENCLOSURES, INCLUDING JUNCTION AND PULL BOXES LARGER THAN 100 CUBIC INCHES:
- 1. COMPLY WITH NEMA 250, AND LIST AND LABEL AS COMPLYING WITH UL 50 AND UL 50E, OR UL 2. NEMA 250 ENVIRONMENT TYPE, UNLESS OTHERWISE INDICATED:
- 3. JUNCTION AND PULL BOXES LARGER THAN 100 CUBIC INCHES: a. PROVIDE SCREW-COVER OR HINGED-COVER ENCLOSURES UNLESS OTHERWISE INDICATED. PART 2 EXECUTION
- 2.01 EXAMINATION A. VERIFY THAT FIELD MEASUREMENTS ARE AS INDICATED. B. VERIFY THAT MOUNTING SURFACES ARE READY TO RECEIVE BOXES. C. VERIFY THAT CONDITIONS ARE SATISFACTORY FOR INSTALLATION PRIOR TO STARTING WORK.
- A. INSTALL BOXES IN ACCORDANCE WITH NECA 1 (GENERAL WORKMANSHIP) AND. WHERE APPLICABLE. NECA 130, INCLUDING MOUNTING HEIGHTS SPECIFIED IN THOSE STANDARDS WHERE MOUNTING HEIGHTS
- B. ARRANGE EQUIPMENT TO PROVIDE MINIMUM CLEARANCES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND NFPA 70. C. PROVIDE SEPARATE BOXES FOR EMERGENCY POWER AND NORMAL POWER SYSTEMS. D. UNLESS OTHERWISE INDICATED, PROVIDE SEPARATE BOXES FOR LINE VOLTAGE AND LOW VOLTAGE
- E. FLUSH-MOUNT BOXES IN FINISHED AREAS UNLESS SPECIFICALLY INDICATED TO BE SURFACE-MOUNTED. F. UNLESS OTHERWISE INDICATED, BOXES MAY BE SURFACE-MOUNTED WHERE EXPOSED CONDUITS ARE INDICATED OR PERMITTED.
- G. BOX LOCATIONS: 1. LOCATE BOXES TO BE ACCESSIBLE.

RESISTANCE WILL NOT BE REDUCED.

2. UNLESS DIMENSIONED, BOX LOCATIONS INDICATED ARE APPROXIMATE. 3. LOCATE BOXES SO THAT WALL PLATES DO NOT SPAN DIFFERENT BUILDING FINISHES. 4. LOCATE BOXES SO THAT WALL PLATES DO NOT CROSS MASONRY JOINTS. 5. UNLESS OTHERWISE INDICATED. WHERE MULTIPLE OUTLET BOXES ARE INSTALLED AT THE SAME

LOCATION AT DIFFERENT MOUNTING HEIGHTS, INSTALL ALONG A COMMON VERTICAL CENTER LINE

6. FIRE RESISTANCE RATED WALLS: INSTALL FLUSH-MOUNTED BOXES SUCH THAT THE REQUIRED FIRE

- H. BOX SUPPORTS: 1. SECURE AND SUPPORT BOXES IN ACCORDANCE WITH NFPA 70 AND SECTION 26 0529 USING SUITABLE SUPPORTS AND METHODS APPROVED BY THE AUTHORITY HAVING JURISDICTION. 2. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE EXCEPT FOR CAST METAL BOXES
- (OTHER THAN BOXES USED FOR FIXTURE SUPPORT) SUPPORTED BY THREADED CONDUIT CONNECTIONS IN ACCORDANCE WITH NFPA 70. DO NOT PROVIDE SUPPORT FROM PIPING, DUCTWORK, OR OTHER SYSTEMS. . INSTALL BOXES PLUMB AND LEVEL.
- 1. INSTALL BOXES IN NONCOMBUSTIBLE MATERIALS SUCH AS CONCRETE, TILE, GYPSUM, PLASTER, ETC. SO THAT FRONT EDGE OF BOX OR ASSOCIATED RAISED COVER IS NOT SET BACK FROM FINISHED SURFACE MORE THAN 1/4 INCH OR DOES NOT PROJECT BEYOND FINISHED SURFACE. 2. INSTALL BOXES IN COMBUSTIBLE MATERIALS SUCH AS WOOD SO THAT FRONT EDGE OF BOX OR
- ASSOCIATED RAISED COVER IS FLUSH WITH FINISHED SURFACE. 3. REPAIR ROUGH OPENINGS AROUND BOXES IN NONCOMBUSTIBLE MATERIALS SUCH AS CONCRETE. TILE, GYPSUM, PLASTER, ETC. SO THAT THERE ARE NO GAPS OR OPEN SPACES GREATER THAN 1/8 INCH AT THE EDGE OF THE BOX K. INSTALL BOXES AS REQUIRED TO PRESERVE INSULATION INTEGRITY. L. INSTALL PERMANENT BARRIER BETWEEN GANGED WIRING DEVICES WHEN VOLTAGE BETWEEN ADJACENT

M. INSTALL FIRESTOPPING TO PRESERVE FIRE RESISTANCE RATING OF PARTITIONS AND OTHER ELEMENTS.

O. INSTALL BLANK WALL PLATES ON JUNCTION BOXES AND ON OUTLET BOXES WITH NO DEVICES OR EQUIPMENT INSTALLED OR DESIGNATED FOR FUTURE USE.

IDENTIFICATION FOR ELECTRICAL SYSTEMS

DEVICES EXCEEDS 300 V.

N. CLOSE UNUSED BOX OPENINGS.

J. FLUSH-MOUNTED BOXES:

- PART 1 PRODUCTS 1.01 IDENTIFICATION REQUIREMENTS
- A. IDENTIFICATION FOR EQUIPMENT: 1. USE IDENTIFICATION NAMEPLATE TO IDENTIFY EACH PIECE OF ELECTRICAL DISTRIBUTION AND CONTROL EQUIPMENT AND ASSOCIATED SECTIONS, COMPARTMENTS, AND COMPONENTS. a. PANELBOARDS:
- 1) IDENTIFY POWER SOURCE AND CIRCUIT NUMBER. INCLUDE LOCATION WHEN NOT WITHIN SIGHT OF FOUIPMENT 2) USE TYPEWRITTEN CIRCUIT DIRECTORY TO IDENTIFY LOAD(S) SERVED FOR PANELBOARDS WITH A DOOR. IDENTIFY SPARES AND SPACES USING PENCIL.

AVAILABLE FAULT CURRENT AND THE DATE CALCULATIONS WERE PERFORMED.

- 3) FOR POWER PANELBOARDS WITHOUT A DOOR. USE IDENTIFICATION NAMEPLATE TO IDENTIFY LOAD(S) SERVED FOR EACH BRANCH DEVICE, DO NOT IDENTIFY SPARES AND SPACES. 2. SERVICE EQUIPMENT: a. USE IDENTIFICATION NAMEPLATE TO IDENTIFY EACH SERVICE DISCONNECTING MEANS. b. USE IDENTIFICATION NAMEPLATE AT EACH PIECE OF SERVICE EQUIPMENT TO IDENTIFY THE
- 3. USE IDENTIFICATION LABEL TO IDENTIFY OVERCURRENT PROTECTIVE DEVICES FOR BRANCH CIRCUITS SERVING FIRE ALARM CIRCUITS. IDENTIFY WITH TEXT "FIRE ALARM CIRCUIT". 4. AVAILABLE FAULT CURRENT DOCUMENTATION: USE IDENTIFICATION LABEL TO IDENTIFY THE AVAILABLE
- AULT CURRENT AND DATE CALCULATIONS WERE PERFORMED AT LOCATIONS REQUIRING DOCUMENTATION BY NFPA 70, INCLUDING BUT NOT LIMITED TO THE FOLLOWING.
- a. SERVICE EQUIPMENT. b. INDUSTRIAL CONTROL PANELS. c. MOTOR CONTROL CENTERS d. FLEVATOR CONTROL PANELS e. INDUSTRIAL MACHINERY.
- 5. ARC FLASH HAZARD WARNING LABELS: USE WARNING LABELS TO IDENTIFY ARC FLASH HAZARDS FOR ELECTRICAL EQUIPMENT, SUCH AS SWITCHBOARDS, PANELBOARDS, INDUSTRIAL CONTROL PANELS, METER SOCKET ENCLOSURES. AND MOTOR CONTROL CENTERS THAT ARE LIKELY TO REQUIRE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE WHILE ENERGIZED. B. IDENTIFICATION FOR CONDUCTORS AND CABLES:
- 1. USE IDENTIFICATION NAMEPLATE OR IDENTIFICATION LABEL TO IDENTIFY COLOR CODE FOR UNGROUNDED AND GROUNDED POWER CONDUCTORS INSIDE DOOR OR ENCLOSURE AT EACH PIECE OF FEEDER OR BRANCH-CIRCUIT DISTRIBUTION EQUIPMENT WHEN PREMISES HAS FEEDERS OR

UNLESS OTHERWISE INDICATED.

VRINKLES AND EDGES PROPERLY SEALED

- BRANCH CIRCUITS SERVED BY MORE THAN ONE NOMINAL VOLTAGE SYSTEM. C. IDENTIFICATION FOR DEVICES:
- 1.02 IDENTIFICATION NAMEPLATES AND LABELS A. IDENTIFICATION NAMEPLATES: a. INDOOR CLEAN, DRY LOCATIONS: USE PLASTIC NAMEPLATES.
- b. OUTDOOR LOCATIONS: USE PLASTIC, STAINLESS STEEL, OR ALUMINUM NAMEPLATES SUITABLE FOR EXTERIOR USE. B. IDENTIFICATION LABELS: 1. MATERIALS: USE SELF-ADHESIVE LAMINATED PLASTIC LABELS; UV, CHEMICAL, WATER, HEAT, AND ABRASION RESISTANT.

2. TEXT: USE FACTORY PRE-PRINTED OR MACHINE-PRINTED TEXT. DO NOT USE HANDWRITTEN TEXT

- C. NAMEPLATES: ENGRAVED THREE-LAYER LAMINATED PLASTIC, BLACK LETTERS ON WHITE BACKGROUND. D. LABELS: EMBOSSED ADHESIVE TAPE, WITH 3/16 INCH WHITE LETTERS ON BLACK BACKGROUND. USE ONLY FOR IDENTIFICATION OF INDIVIDUAL WALL SWITCHES AND RECEPTACLES, CONTROL DEVICE
- PART 2 EXECUTION 2.01 PREPARATION A. CLEAN SURFACES TO RECEIVE ADHESIVE PRODUCTS ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
- B. DEGREASE AND CLEAN SURFACES TO RECEIVE NAMEPLATES AND LABELS. 2.02 INSTALLATION A. INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS B. INSTALL IDENTIFICATION PRODUCTS TO BE PLAINLY VISIBLE FOR EXAMINATION, ADJUSTMENT, SERVICING,
- D. SECURE NAMEPLATES TO EXTERIOR SURFACES OF ENCLOSURES USING STAINLESS STEEL SCREWS AND TO INTERIOR SURFACES USING SELF-ADHESIVE BACKING OR EPOXY CEMENT. E. INSTALL SELF-ADHESIVE LABELS AND MARKERS TO ACHIEVE MAXIMUM ADHESION, WITH NO BUBBLES OR

F. MARK ALL HANDWRITTEN TEXT, WHERE PERMITTED, TO BE NEAT AND LEGIBLE.

C. INSTALL IDENTIFICATION PRODUCTS CENTERED, LEVEL, AND PARALLEL WITH LINES OF ITEM BEING



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ISSUED FOR: 08/27/21

DATE

SHEET TITLE: **ELECTRICAL**

SPECIFICATIONS

ISSUED

DESIGNER:

ENGINEER:

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5-20R; SINGLE OR DUPLEX AS INDICATED ON THE DRAWINGS.
*PANELBOARDS*
                                                                                                           C. GFCI RECEPTACLES:
*PART 1 PRODUCTS*
                                                                                                             1. GFCI RECEPTACLES - GENERAL REQUIREMENTS: SELF-TESTING, WITH FEED-THROUGH PROTECTION
1.01 MANUFACTURERS
                                                                                                                AND LIGHT TO INDICATE GROUND FAULT TRIPPED CONDITION AND LOSS OF PROTECTION; LISTED AS
  A. SIEMENS INDUSTRY, INC: WWW.USA.SIEMENS.COM.
  B. EATON CORPORATION: WWW.EATON.COM.
  C. GENERAL ELECTRIC COMPANY: WWW.GEINDUSTRIAL.COM.
  D. SCHNEIDER ELECTRIC; SQUARE D PRODUCTS: WWW.SCHNEIDER-ELECTRIC.US.
                                                                                                          D. USB CHARGING DEVICES:
1.02 PANELBOARDS — GENERAL REQUIREMENTS
  A. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED.
                                                                                                               a. CHARGING CAPACITY — TWO—PORT DEVICES: 2.1 A, MINIMUM.
  B. UNLESS OTHERWISE INDICATED, PROVIDE PRODUCTS SUITABLE FOR CONTINUOUS OPERATION UNDER THE
     FOLLOWING SERVICE CONDITIONS:
                                                                                                          A. WALL PLATES: COMPLY WITH UL 514D.
     1. ALTITUDE: LESS THAN 6,600 FEET.
     2. AMBIENT TEMPERATURE:
                                                                                                               WIRING DEVICES.
       a. PANELBOARDS CONTAINING CIRCUIT BREAKERS: BETWEEN 23 DEGREES F AND 104 DEGREES F.
  C. SHORT CIRCUIT CURRENT RATING:
                                                                                                           B. NYLON WALL PLATES: SMOOTH FINISH, HIGH-IMPACT THERMOPLASTIC.
     1. PROVIDE PANELBOARDS WITH LISTED SHORT CIRCUIT CURRENT RATING NOT LESS THAN THE
       AVAILABLE FAULT CURRENT AT THE INSTALLED LOCATION AS INDICATED ON THE DRAWINGS.
                                                                                                        PART 2 EXECUTION
  D. MAINS: CONFIGURE FOR TOP OR BOTTOM INCOMING FEED AS INDICATED OR AS REQUIRED FOR THE
                                                                                                        2.01 EXAMINATION
                                                                                                          A. VERIFY THAT FIELD MEASUREMENTS ARE AS INDICATED.
   E. BRANCH OVERCURRENT PROTECTIVE DEVICES: REPLACEABLE WITHOUT DISTURBING ADJACENT DEVICES.
  F. BUSSING: SIZED IN ACCORDANCE WITH UL 67 TEMPERATURE RISE REQUIREMENTS.
     1. PROVIDE SOLIDLY BONDED EQUIPMENT GROUND BUS IN EACH PANELBOARD, WITH A SUITABLE LUG
       FOR EACH FEEDER AND BRANCH CIRCUIT EQUIPMENT GROUNDING CONDUCTOR.
  G. CONDUCTOR TERMINATIONS: SUITABLE FOR USE WITH THE CONDUCTORS TO BE INSTALLED.
  H. ENCLOSURES: COMPLY WITH NEMA 250, AND LIST AND LABEL AS COMPLYING WITH UL 50 AND UL
     1. ENVIRONMENT TYPE PER NEMA 250: UNLESS OTHERWISE INDICATED, AS SPECIFIED FOR THE
                                                                                                              CONNECTION TO WIRING DEVICES.
       FOLLOWING INSTALLATION LOCATIONS:
     2. BOXES: GALVANIZED STEEL UNLESS OTHERWISE INDICATED.
                                                                                                        2.02 PREPARATION
       a. PROVIDE WIRING GUTTERS SIZED TO ACCOMMODATE THE CONDUCTORS TO BE INSTALLED.
     FRONTS:
       a. Fronts for surface—mounted enclosures: same dimensions as boxes.
                                                                                                        2.03 INSTALLATION
       b. Fronts for flush-mounted enclosures: Overlap boxes on all sides to conceal
     4. LOCKABLE DOORS: ALL LOCKS KEYED ALIKE UNLESS OTHERWISE INDICATED.
   I. FUTURE PROVISIONS: PREPARE ALL UNUSED SPACES FOR FUTURE INSTALLATION OF DEVICES
     INCLUDING BUSSING, CONNECTORS, MOUNTING HARDWARE AND ALL OTHER REQUIRED PROVISIONS.
                                                                                                             INSTALLATION OF WIRING DEVICES PROVIDED UNDER THIS SECTION.
   J. SURGE PROTECTIVE DEVICES: WHERE FACTORY-INSTALLED, INTERNALLY MOUNTED SURGE PROTECTIVE
                                                                                                             1. MOUNTING HEIGHTS: UNLESS OTHERWISE INDICATED, AS FOLLOWS:
     DEVICES ARE PROVIDED IN ACCORDANCE WITH SECTION 26 4300, LIST AND LABEL PANELBOARDS AS A
                                                                                                               a. WALL SWITCHES: 48 INCHES ABOVE FINISHED FLOOR.
     COMPLETE ASSEMBLY INCLUDING SURGE PROTECTIVE DEVICE.
  K. LOAD CENTERS ARE NOT ACCEPTABLE.
1.03 POWER DISTRIBUTION PANELBOARDS
  A. DESCRIPTION: PANELBOARDS COMPLYING WITH NEMA PB 1, POWER AND FEEDER DISTRIBUTION TYPE,
     CIRCUIT BREAKER TYPE, AND LISTED AND LABELED AS COMPLYING WITH UL 67; RATINGS,
                                                                                                             DEVICES EXCEEDS 300 V.
     CONFIGURATIONS AND FEATURES AS INDICATED ON THE DRAWINGS.
  B. CONDUCTOR TERMINATIONS:
                                                                                                             CONNECT MORE THAN ONE CONDUCTOR TO WIRING DEVICE TERMINALS.
      1. MAIN AND NEUTRAL LUG MATERIAL: ALUMINUM, SUITABLE FOR TERMINATING ALUMINUM OR COPPER
     2. MAIN AND NEUTRAL LUG TYPE: MECHANICAL.
  C. BUSSING:
     1. PHASE AND NEUTRAL BUS MATERIAL: ALUMINUM OR COPPER.
     2. GROUND BUS MATERIAL: ALUMINUM OR COPPER.
  D. CIRCUIT BREAKERS:
     1. PROVIDE BOLT-ON TYPE.
                                                                                                           I. INSTALL WALL SWITCHES WITH OFF POSITION DOWN.
  E. ENCLOSURES:
     1. PROVIDE SURFACE-MOUNTED ENCLOSURES UNLESS OTHERWISE INDICATED.
                                                                                                             MOUNTED RECEPTACLES WITH GROUNDING POLE ON LEFT.
1.04 LIGHTING AND APPLIANCE PANELBOARDS
  A. DESCRIPTION: PANELBOARDS COMPLYING WITH NEMA PB 1, LIGHTING AND APPLIANCE BRANCH CIRCUIT TYPE, CIRCUIT BREAKER TYPE, AND LISTED AND LABELED AS COMPLYING WITH UL 67; RATINGS,
     CONFIGURATIONS AND FEATURES AS INDICATED ON THE DRAWINGS.
                                                                                                              LIEU OF MEETING THIS REQUIREMENT.
  B. CONDUCTOR TERMINATIONS:
                                                                                                             INSTALLED OR DESIGNATED FOR FUTURE USE.
     1. MAIN AND NEUTRAL LUG MATERIAL: ALUMINUM, SUITABLE FOR TERMINATING ALUMINUM OR COPPER
        CONDUCTORS.
     2. MAIN AND NEUTRAL LUG TYPE: MECHANICAL.
     1. PHASE BUS CONNECTIONS: ARRANGED FOR SEQUENTIAL PHASING OF OVERCURRENT PROTECTIVE
     2. PHASE AND NEUTRAL BUS MATERIAL: ALUMINUM OR COPPER.
     3. GROUND BUS MATERIAL: ALUMINUM OR COPPER.
  D. CIRCUIT BREAKERS: THERMAL MAGNETIC BOLT-ON TYPE UNLESS OTHERWISE INDICATED.
     1. PROVIDE SURFACE-MOUNTED OR FLUSH-MOUNTED ENCLOSURES AS INDICATED.
     2. PROVIDE CLEAR PLASTIC CIRCUIT DIRECTORY HOLDER MOUNTED ON INSIDE OF DOOR.
1.05 OVERCURRENT PROTECTIVE DEVICES
  A. MOLDED CASE CIRCUIT BREAKERS:
      1. DESCRIPTION: QUICK-MAKE, QUICK-BREAK, OVER CENTER TOGGLE, TRIP-FREE, TRIP-INDICATING
        CIRCUIT BREAKERS LISTED AND LABELED AS COMPLYING WITH UL 489, AND COMPLYING WITH FS
        W-C-375 WHERE APPLICABLE; RATINGS, CONFIGURATIONS, AND FEATURES AS INDICATED ON THE
     2. INTERRUPTING CAPACITY:
       a. PROVIDE CIRCUIT BREAKERS WITH INTERRUPTING CAPACITY AS REQUIRED TO PROVIDE THE SHORT
         CIRCUIT CURRENT RATING INDICATED.
       b. FULLY RATED SYSTEMS: PROVIDE CIRCUIT BREAKERS WITH INTERRUPTING CAPACITY NOT LESS
     3. CONDUCTOR TERMINATIONS:
        a. LUG MATERIAL: ALUMINUM, SUITABLE FOR TERMINATING ALUMINUM OR COPPER CONDUCTORS.
     4. THERMAL MAGNETIC CIRCUIT BREAKERS: FOR EACH POLE, FURNISH THERMAL INVERSE TIME
         TRIPPING ELEMENT FOR OVERLOAD PROTECTION AND MAGNETIC INSTANTANEOUS TRIPPING ELEMENT
        FOR SHORT CIRCUIT PROTECTION.
     5. MULTI-POLE CIRCUIT BREAKERS: FURNISH WITH COMMON TRIP FOR ALL POLES.
     6. PROVIDE THE FOLLOWING CIRCUIT BREAKER TYPES WHERE INDICATED:
       a. Ground fault circuit interrupter (GFCI) circuit breakers: Listed as complying with ul
         943, CLASS A FOR PROTECTION OF PERSONNEL.
       b. ARC-FAULT CIRCUIT INTERRUPTER (AFCI) CIRCUIT BREAKERS: COMBINATION TYPE LISTED AS
         COMPLYING WITH UL 1699.
        c. 100 PERCENT RATED CIRCUIT BREAKERS: LISTED FOR APPLICATION WITHIN THE PANELBOARD
          WHERE INSTALLED AT 100 PERCENT OF THE CONTINUOUS CURRENT RATING.
     7. DO NOT USE TANDEM CIRCUIT BREAKERS.
     8. DO NOT USE HANDLE TIES IN LIEU OF MULTI-POLE CIRCUIT BREAKERS.
     9. PROVIDE MULTI-POLE CIRCUIT BREAKERS FOR MULTI-WIRE BRANCH CIRCUITS AS REQUIRED BY NFPA
PART 2 EXECUTION
2.01 INSTALLATION
  A. INSTALL PANELBOARDS IN ACCORDANCE WITH NECA 407 AND NEMA PB 1.1.
  B. ARRANGE EQUIPMENT TO PROVIDE MINIMUM CLEARANCES IN ACCORDANCE WITH MANUFACTURER'S
  C. INSTALL PANELBOARDS PLUMB.
   D. INSTALL FLUSH-MOUNTED PANELBOARDS SO THAT TRIMS FIT COMPLETELY FLUSH TO WALL WITH NO
     GAPS AND ROUGH OPENING COMPLETELY COVERED.
  E. MOUNT PANELBOARDS SUCH THAT THE HIGHEST POSITION OF ANY OPERATING HANDLE FOR CIRCUIT
     BREAKERS OR SWITCHES DOES NOT EXCEED 79 INCHES ABOVE THE FLOOR OR WORKING PLATFORM.
   F. MOUNT FLOOR-MOUNTED POWER DISTRIBUTION PANELBOARDS ON PROPERLY SIZED 3 INCH HIGH
     CONCRETE PAD CONSTRUCTED IN ACCORDANCE WITH ARCHITECTURAL AND GENERAL TRADES.
   G. PROVIDE MINIMUM OF SIX SPARE 1 INCH TRADE SIZE CONDUITS OUT OF EACH FLUSH-MOUNTED
     PANELBOARD STUBBED INTO ACCESSIBLE SPACE ABOVE CEILING AND BELOW FLOOR.
  H. INSTALL ALL FIELD-INSTALLED BRANCH DEVICES, COMPONENTS, AND ACCESSORIES.
   I. MULTI-WIRE BRANCH CIRCUITS: GROUP GROUNDED AND UNGROUNDED CONDUCTORS TOGETHER IN THE
     PANELBOARD AS REQUIRED BY NFPA 70.
   J. SET FIELD-ADJUSTABLE CIRCUIT BREAKER TRIPPING FUNCTION SETTINGS AS DIRECTED.
   K. PROVIDE FILLER PLATES TO COVER UNUSED SPACES IN PANELBOARDS.
PART 1 PRODUCTS
1.01 MANUFACTURERS
  A. HUBBELL INCORPORATED: WWW.HUBBELL-WIRING.COM.
  B. LEVITON MANUFACTURING COMPANY, INC: WWW.LEVITON.COM.
  C. PASS & SEYMOUR, A BRAND OF LEGRAND NORTH AMERICA, INC: WWW.LEGRAND.US
1.02 WIRING DEVICE APPLICATIONS
  A. PROVIDE WIRING DEVICES SUITABLE FOR INTENDED USE AND WITH RATINGS ADEQUATE FOR LOAD
  B. FOR SINGLE RECEPTACLES INSTALLED ON AN INDIVIDUAL BRANCH CIRCUIT, PROVIDE RECEPTACLE WITH
     AMPERE RATING NOT LESS THAN THAT OF THE BRANCH CIRCUIT.
   C. PROVIDE WEATHER RESISTANT GFCI RECEPTACLES WITH SPECIFIED WEATHERPROOF COVERS FOR
     RECEPTACLES INSTALLED OUTDOORS OR IN DAMP OR WET LOCATIONS.
  D. PROVIDE TAMPER RESISTANT RECEPTACLES FOR RECEPTACLES INSTALLED IN DWELLING UNITS.
  E. PROVIDE GFCI PROTECTION FOR RECEPTACLES INSTALLED WITHIN 6 FEET OF SINKS.
   F. PROVIDE GFCI PROTECTION FOR RECEPTACLES INSTALLED IN KITCHENS.
  G. PROVIDE GFCI PROTECTION FOR RECEPTACLES SERVING ELECTRIC DRINKING FOUNTAINS.
  H. UNLESS NOTED OTHERWISE, DO NOT USE COMBINATION SWITCH/RECEPTACLE DEVICES.
1.03 WIRING DEVICE FINISHES
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A. PROVIDE WIRING DEVICE FINISHES AS DESCRIBED BELOW UNLESS OTHERWISE INDICATED. B. WIRING DEVICES INSTALLED IN FINISHED SPACES: WHITE WITH WHITE NYLON WALL PLATE.

E. WIRING DEVICES CONNECTED TO EMERGENCY POWER: RED WITH RED NYLON WALL PLATE.

THE PURPOSE SPECIFIED AND INDICATED.

BACK WIRING WITH SEPARATE GROUND TERMINAL SCREW. 2. NEMA CONFIGURATIONS SPECIFIED ARE ACCORDING TO NEMA WD 6.

INDICATED ON THE DRAWINGS.

B. CONVENIENCE RECEPTACLES:

1.05 RECEPTACLES

C. WIRING DEVICES INSTALLED IN UNFINISHED SPACES: GRAY WITH GALVANIZED STEEL WALL PLATE. D. WIRING DEVICES INSTALLED IN WET OR DAMP LOCATIONS: WHITE WITH SPECIFIED WEATHERPROOF

A. PROVIDE PRODUCTS LISTED AND CLASSIFIED BY UNDERWRITERS LABORATORIES INC. AS SUITABLE FOR

A. RECEPTACLES - GENERAL REQUIREMENTS: SELF-GROUNDING, COMPLYING WITH NEMA WD 1 AND NEMA WD 6, AND LISTED AS COMPLYING WITH UL 498, AND WHERE APPLICABLE, FS W-C-596; TYPES AS

1. STANDARD CONVENIENCE RECEPTACLES: INDUSTRIAL SPECIFICATION GRADE, 20A, 125V, NEMA

1. WIRING PROVISIONS: TERMINAL SCREWS FOR SIDE WIRING OR SCREW ACTUATED BINDING CLAMP FOR

a. PROVIDE TEST AND RESET BUTTONS OF SAME COLOR AS DEVICE. 2. STANDARD GFCI RECEPTACLES: INDUSTRIAL SPECIFICATION GRADE, DUPLEX, 20A, 125V, NEMA 1. USB CHARGING DEVICES - GENERAL REQUIREMENTS: LISTED AS COMPLYING WITH UL 1310. 1. CONFIGURATION: ONE PIECE COVER AS REQUIRED FOR QUANTITY AND TYPES OF CORRESPONDING 2. SCREWS: METAL WITH SLOTTED HEADS FINISHED TO MATCH WALL PLATE FINISH. C. STAINLESS STEEL WALL PLATES: BRUSHED SATIN FINISH, TYPE 302 STAINLESS STEEL. B. VERIFY THAT OUTLET BOXES ARE INSTALLED IN PROPER LOCATIONS AND AT PROPER MOUNTING HEIGHTS AND ARE PROPERLY SIZED TO ACCOMMODATE DEVICES AND CONDUCTORS IN ACCORDANCE WITH NFPA C. VERIFY THAT WALL OPENINGS ARE NEATLY CUT AND WILL BE COMPLETELY COVERED BY WALL PLATES. D. VERIFY THAT FINAL SURFACE FINISHES ARE COMPLETE, INCLUDING PAINTING. E. VERIFY THAT BRANCH CIRCUIT WIRING INSTALLATION IS COMPLETED, TESTED, AND READY FOR F. VERIFY THAT CONDITIONS ARE SATISFACTORY FOR INSTALLATION PRIOR TO STARTING WORK. A. PROVIDE EXTENSION RINGS TO BRING OUTLET BOXES FLUSH WITH FINISHED SURFACE. B. CLEAN DIRT, DEBRIS, PLASTER, AND OTHER FOREIGN MATERIALS FROM OUTLET BOXES. A. PERFORM WORK IN ACCORDANCE WITH NECA 1 (GENERAL WORKMANSHIP) AND, WHERE APPLICABLE, NECA 130, INCLUDING MOUNTING HEIGHTS SPECIFIED IN THOSE STANDARDS UNLESS OTHERWISE B. COORDINATE LOCATIONS OF OUTLET BOXES PROVIDED UNDER SECTION 26 0537 AS REQUIRED FOR b. RECEPTACLES: 18 INCHES ABOVE FINISHED FLOOR OR 6 INCHES ABOVE COUNTER. 2. WHERE MULTIPLE RECEPTACLES OR WALL SWITCHES ARE INSTALLED AT THE SAME LOCATION AND AT THE SAME MOUNTING HEIGHT. GANG DEVICES TOGETHER UNDER A COMMON WALL PLATE. C. INSTALL PERMANENT BARRIER BETWEEN GANGED WIRING DEVICES WHEN VOLTAGE BETWEEN ADJACENT D. WHERE REQUIRED, CONNECT WIRING DEVICES USING PIGTAILS NOT LESS THAN 6 INCHES LONG. DO NOT E. CONNECT WIRING DEVICES BY WRAPPING CONDUCTOR CLOCKWISE 3/4 TURN AROUND SCREW TERMINAL AND TIGHTENING TO PROPER TORQUE SPECIFIED BY THE MANUFACTURER. WHERE PRESENT, DO NOT USE PUSH-IN PRESSURE TERMINALS THAT DO NOT RELY ON SCREW-ACTUATED BINDING. F. UNLESS OTHERWISE INDICATED, CONNECT WIRING DEVICE GROUNDING TERMINAL TO BRANCH CIRCUIT EQUIPMENT GROUNDING CONDUCTOR AND TO OUTLET BOX WITH BONDING JUMPER. G. PROVIDE GFCI RECEPTACLES WITH INTEGRAL GFCI PROTECTION AT EACH LOCATION INDICATED. H. INSTALL WIRING DEVICES PLUMB AND LEVEL WITH MOUNTING YOKE HELD RIGIDLY IN PLACE. J. INSTALL VERTICALLY MOUNTED RECEPTACLES WITH GROUNDING POLE ON TOP AND HORIZONTALLY K. INSTALL WALL PLATES TO FIT COMPLETELY FLUSH TO WALL WITH NO GAPS AND ROUGH OPENING COMPLETELY COVERED WITHOUT STRAIN ON WALL PLATE. REPAIR OR REINSTALL IMPROPERLY INSTALLED OUTLET BOXES OR IMPROPERLY SIZED ROUGH OPENINGS. DO NOT USE OVERSIZED WALL PLATES IN L. INSTALL BLANK WALL PLATES ON JUNCTION BOXES AND ON OUTLET BOXES WITH NO WIRING DEVICES



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ISSUED FOR: 08/27/21

ISSUED

DESIGNER: ENGINEER:

SHEET TITLE:

Seal:

ELECTRICAL SPECIFICATIONS