NEW YORK STATE BUILDING DEPARTMENT NOTES

ALL WORK SHALL COMPLY WITH APPLICABLE SECTIONS OF THE 2020 NEW YORK STATE ADOPTIONS OF THE INTERNATIONAL BUILDING, MECHANICAL, ENERGY CONSERVATION CONSTRUCTION CODE, ALL AMENDMENTS AND RULES AND REGULATIONS OF THE DEPARTMENT OF BUILDINGS TO DATE.

1. THESE PLANS ARE APPROVED ONLY FOR THE WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

2. TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 INTERNATIONAL ENERGY CONSERVATION CONSTRUCTION CODE WITH AMENDMENTS.

MECHANICAL NOTES

1. GENERAL

A. PRIOR TO PROPOSAL SUBMISSION. THIS CONTRACTOR SHALL VISIT THE SITE TO REVIEW THE EXISTING CONDITIONS ASSOCIATED WITH THE SCOPE OF WORK AND ADJACENT AREAS TO ASCERTAIN THE DIFFICULTIES WHICH WILL AFFECT THE EXECUTION OF THE WORK OF THIS CONTRACT.

B. SUBMISSION OF A PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT THE ABOVE SITE EXAMINATION HAS BEEN MADE AND LATER CLAIMS WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN HAD SUCH AN EXAMINATION BEEN MADE.

2. SCOPE OF WORK.

A. ALL EXISTING WORK REQUIRED TO REMAIN BUT INTERFERING WITH PROPOSED NEW MECHANICAL (AS WELL AS ELECTRICAL AND GENERAL CONSTRUCTION WORK) SHALL BE RELOCATED AND RECONNECTED USING MATERIALS CONFORMING TO STANDARDS OF THIS CONTRACT.

B. ALL MATERIALS AND EQUIPMENT SHALL BE DISPOSED OF IN ACCORDANCE WITH APPLICABLE LAWS AND ENVIRONMENTAL REGULATIONS.

C. COORDINATE WITH OWNER TO DETERMINE WHETHER EQUIPMENT IS TO BE TURNED OVER FOR FUTURE USE AND STORED IN THEIR ASSOCIATED STORAGE LOCATIONS.

ABBREVIATIONS

ACUR	AIR CURTAIN (UNHEATED)
AD	ACCESS DOOR
AI	ANALOG INPUT (CONTROL POINT)
AFF	ABOVE FINISH FLOOR
AO	ANALOG OUTPUT (CONTROL POINT)
AS	AIR SEPARATOR
ATC	AUTOMATIC TEMPERATURE CONTROL
AV	ANALOG VALUE (CONTROL SOFTWARE POINT)
B	BOILER
BI	BINARY INPUT (CONTROL POINT)
BO	BINARY OUTPUT (CONTROL POINT)
BV	BINARY VALUE (CONTROL SOFTWARE POINT)
CFM	CUBIC FEET PER MINUTE
CD	CONDENSATE DRAIN
DD	DUCT DETECTOR
DDC	DIRECT DIGITAL CONTROLLER
DN	DOWN
DPS	DIFFERENTIAL PRESSURE SWITCH
DPT	DIFFERENTIAL PRESSURE TRANSDUCER
DSF	DESTRATIFICATION FAN
EC	ELECTRICAL CONTRACTOR
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
F	FAN
FD	FIRE DAMPER
FSD	COMBINATION FIRE SMOKE DAMPER
FTR	FINNED TUBE RADIATOR (HOT WATER)
GC	GENERAL CONTRACTOR
GXF	GENERAL EXHAUST FAN
HWP	HOT WATER PUMP
HWMF	HOT WATER MANIFOLD (RADIANT FLOOR HEATING)
HWS&R	HOT WATER SUPPLY & RETURN
HWUH	HOT WATER UNIT HEATER
HV	HEATING & VENTILATING UNIT
LD	LEAK DETECTOR
MC	MECHANICAL CONTRACTOR
MD	MOTORIZED DAMPER
N.C.	NORMALLY CLOSED (FAIL STATE)
N.O.	NORMALLY OPEN (FAIL STATE)
OED	OPEN ENDED DUCT
PC	PUMPED CONDENSATE
RAG	RETURN AIR GRILLE
RAD	RETURN AIR DUCT
RF	RADIANT FLOOR HEATING
RTAC	ROOFTOP AIR CONDITIONING UNIT
SAG	SUPPLY AIR GRILLE
SD	SMOKE DAMPER
SHV	SMOKE HEAT VENT
TF	TRANSFER FAN
TXF	TOILET EXHAUST FAN
V	VENT
VAV	VARIABLE AIR VOLUME (BOX, AHU OR AC UNIT)
VAV-HW	VARIABLE AIR VOLUME BOX WITH HOT WATER COIL
VD	VOLUME DAMPER (OPPOSED BLADE DAMPER)
VFD	VARIABLE FREQUENCY DRIVE

MECHANICAL LEGEND & SYMBOLS

- A(250) — DIFFUSER TYPE AND CFM (CUBIC FEET PER MINUTE). REFER TO SCHEDULE.
- DOUBLE LINE DUCT
- VD — VOLUME DAMPER
- FD — FIRE DAMPER WITH DUCT ACCESS DOOR
- MOTORIZED DAMPER
- STRAINER WITH BLOW DOWN VALVE
- ELBOW TURNED UP
- ELBOW TURNED DOWN
- BOTTOM PIPE CONNECTION
- TOP PIPE CONNECTION
- GATE VALVE
- TWO-WAY CONTROL VALVE (ELECTRONIC)
- PRESSURE REDUCING VALVE
- COMBINATION BALANCING VALVE AND METER STATION
- CHECK VALVE
- BUTTERFLY VALVE
- BALL VALVE
- UNION
- A — AUTOMATIC AIR VENT
- M — MANUAL AIR VENT
- THERMOMETER WITH SHUTOFF VALVE
- PRESSURE GAUGE WITH SHUTOFF VALVE
- VACUUM BREAKER
- PIPE ANCHOR
- PIPE GUIDE

LINE REPRESENTATION

- EXISTING DUCTWORK/PIPING
- NEW DUCTWORK
- EXISTING MECHANICAL EQUIPMENT
- NEW MECHANICAL EQUIPMENT

DRAWING NOTATIONS

- # — KEYED NOTE
- A / B — SECTION DESIGNATION ON DRAWING WHERE SECTION IS CUT
  A-SECTION DESIGNATION
  B-DRAWING NO.
- POINT OF NEW CONNECTION TO EXISTING WORK
- POINT OF DEMOLITION
- REMOVE AND PATCH EXISTING WORK
- 1 — REVISION SYMBOL

MECHANICAL DRAWING LIST

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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KEY PLAN

REV	DESCRIPTION	DATE
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	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :

CHECKED BY :

APPROVED BY :

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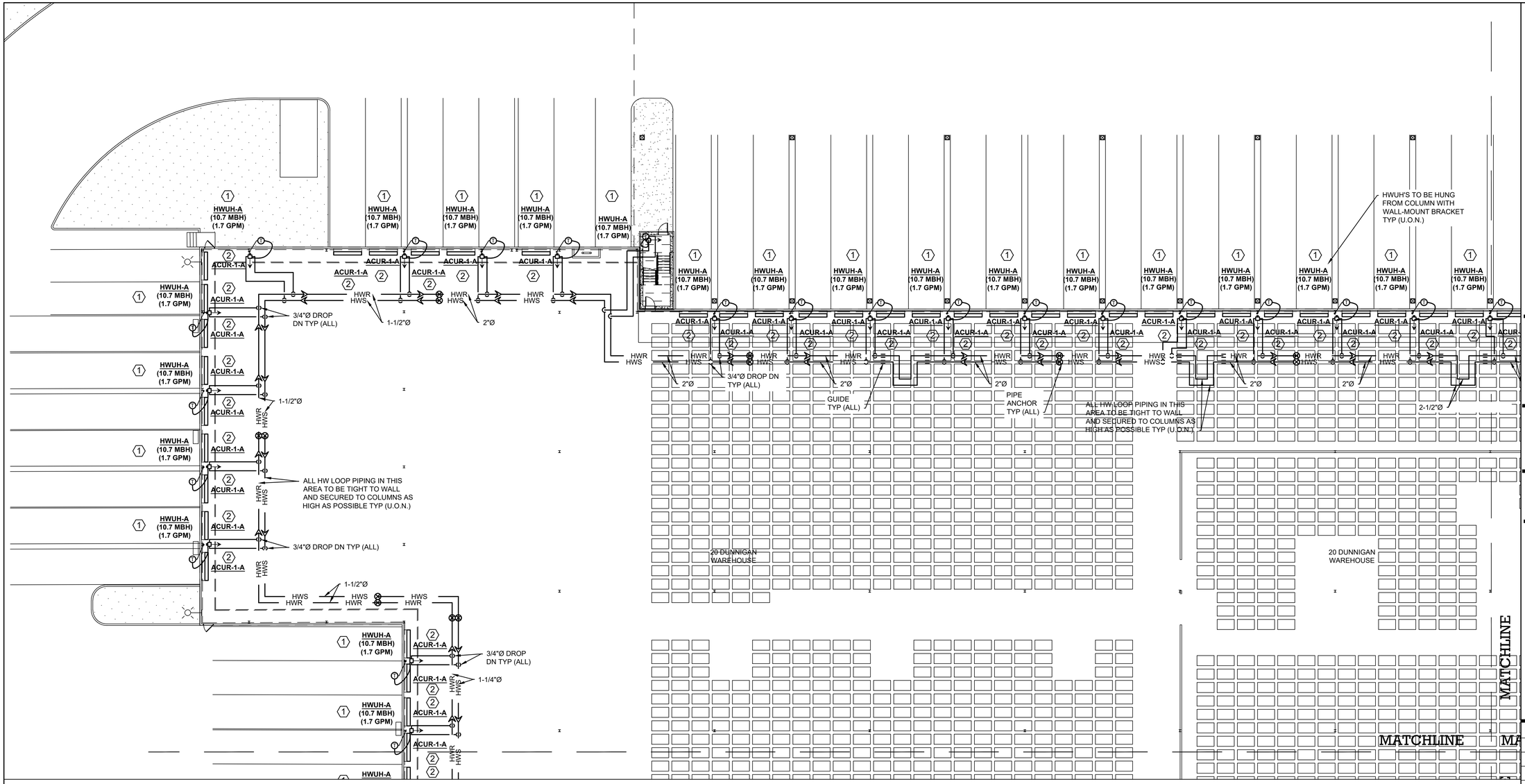
SCALE :

DRAWING TITLE :

MECHANICAL ABBREVIATIONS, LEGEND, NOTES & SYMBOLS

DWG NUMBER :

M-001



1 M-101 MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 1

SCALE: 1/16" = 1'-0"

N

GENERAL MECHANICAL NOTES:

1. ALL WORK SHALL CONFORM TO THE LATEST BUILDING STANDARDS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN A COPY OF THE BUILDING STANDARDS AND MEET WITH BUILDING MANAGEMENT IN ORDER TO BECOME TOTALLY FAMILIAR WITH THE BUILDING CONSTRUCTION RULES. THERE SHALL BE NO DEVIATION FROM THE BUILDING STANDARDS WITHOUT PRIOR WRITTEN APPROVAL FROM THE BUILDING MANAGEMENT.
2. WHEN MECHANICAL WORK IS SUBCONTRACTED IT SHALL BE THE MECHANICAL CONTRACTORS RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT. IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
3. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR AND COORDINATED WITH THE GENERAL CONTRACTOR FOR COORDINATION AMONG ALL TRADES.
4. FURNISH & INSTALL ALL MATERIALS, EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
5. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
6. FURNISH & INSTALL VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO AND WITHIN 50 FEET OR 50 PIPE DIAMETERS IF ISOLATED EQUIPMENT REFER TO SPECIFICATIONS FOR EXACT REQUIREMENTS OF ALL PIPING, DUCTWORK AND EQUIPMENT VIBRATION ISOLATION.
7. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
8. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
9. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATELY ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
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11. INSTALL PIPING SO THAT ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.

KEYED NOTES: (#)

1. CONTRACTOR SHALL FURNISH & INSTALL HYDRONIC UNIT HEATER AS SCHEDULED & SHOWN ON PLAN. FINAL UNIT HEATER LOCATION TO BE WALL/COLUMN MOUNTED WITH BRACKET OR HUNG FROM STRUCTURAL BEAM.

2. CONTRACTOR SHALL FURNISH & INSTALL ELECTRONIC AIR CURTAIN AS SCHEDULED & SHOWN ON PLAN. FINAL AIR CURTAIN LOCATION TO BE COORDINATED WITH AUTOMATIC DOOR ASSEMBLY.

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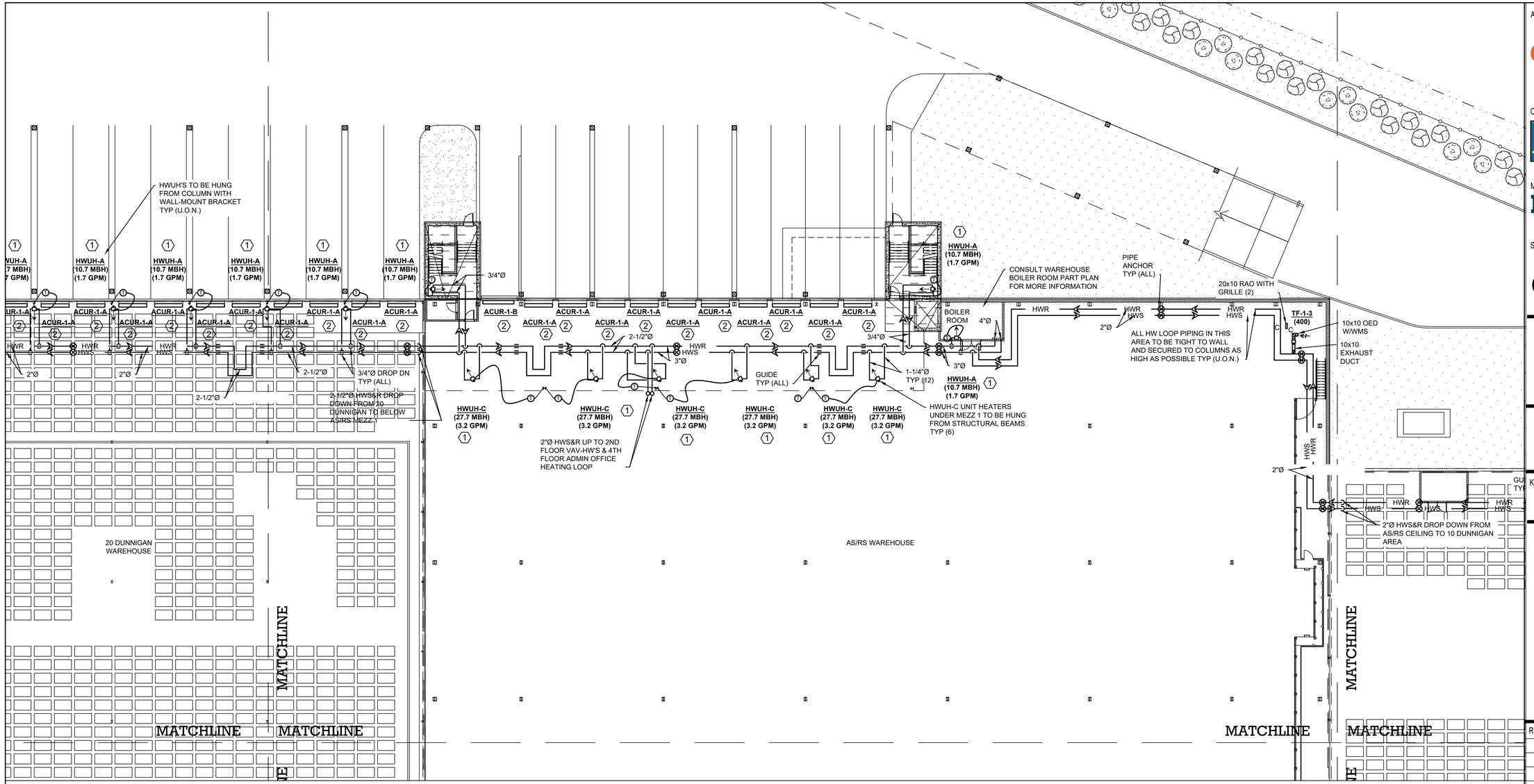
SCALE :

DRAWING TITLE :

MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 1

DWG NUMBER :

M-101



1 M-102 MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 2

SCALE: 1/16" = 1'-0"

N

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APPROVED BY :

DATE :

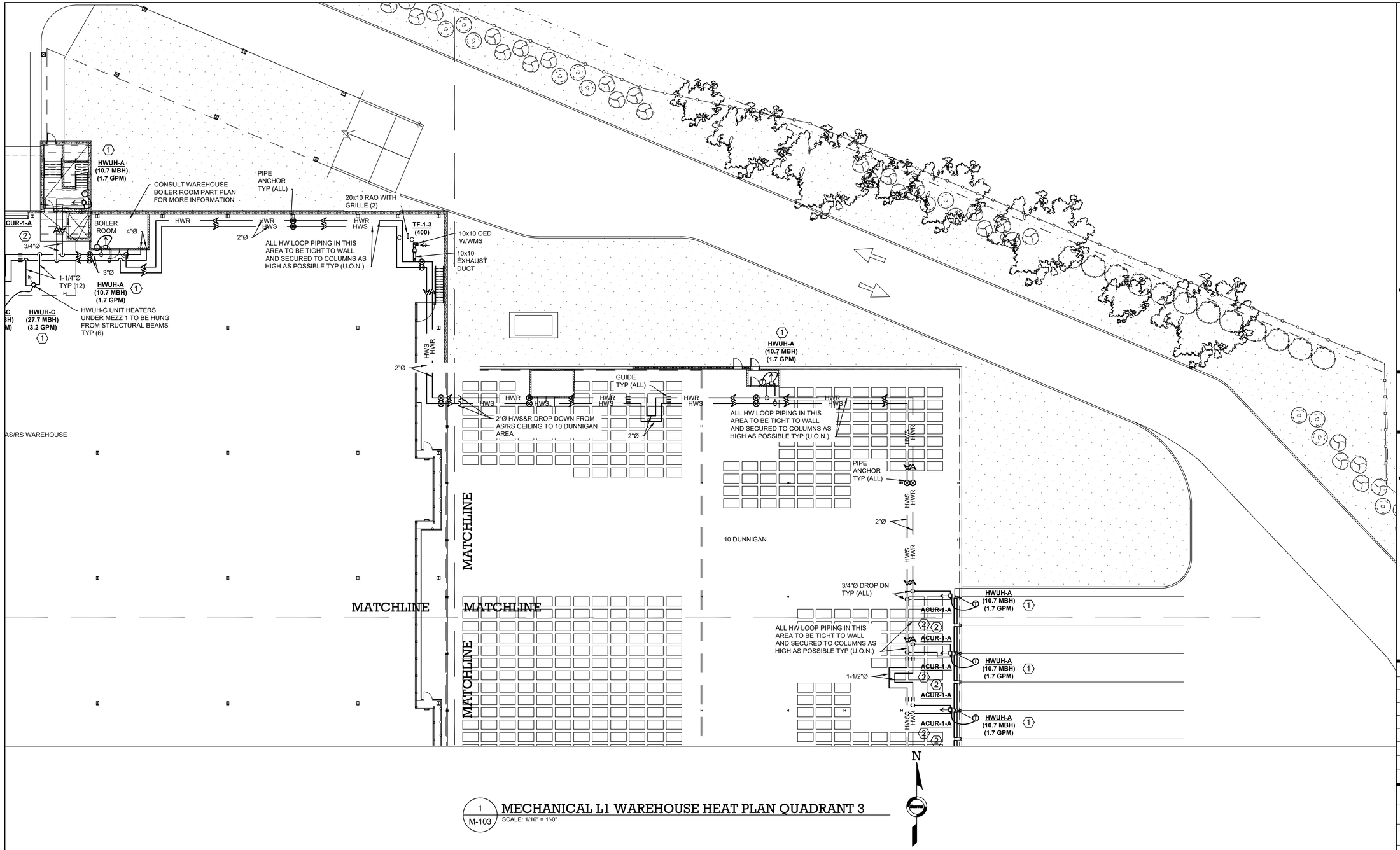
SCALE :

DRAWING TITLE :

MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 2

DWG NUMBER :

M-102



1 M-103

MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 3

SCALE: 1/16" = 1'-0"

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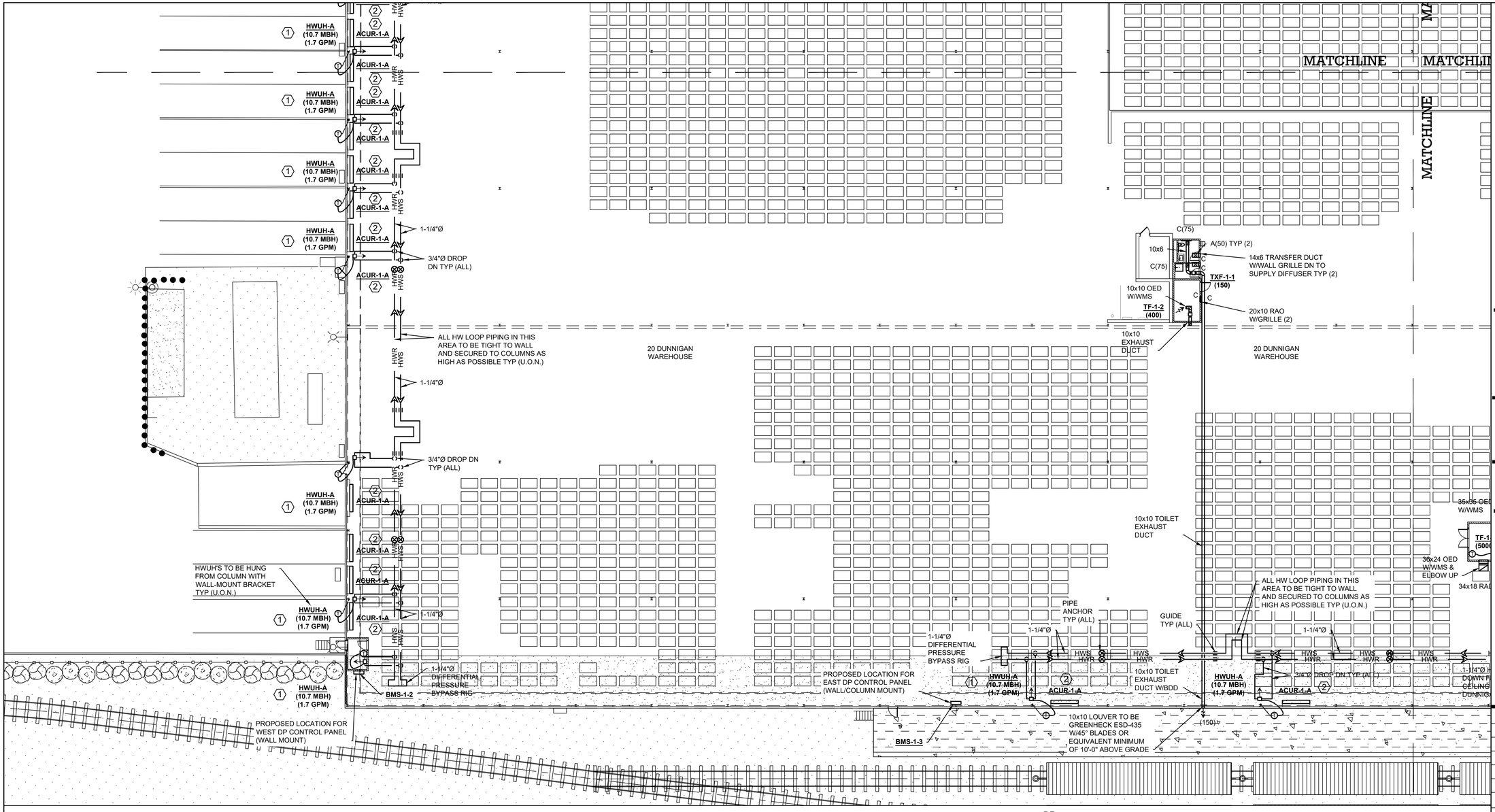
SCALE :

DRAWING TITLE :

MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 3

DWG NUMBER :

M-103



1 M-104 **MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 4**

SCALE: 1/16" = 1'-0"

GENERAL MECHANICAL NOTES:

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6. FURNISH & INSTALL VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO AND WITHIN 50 FEET OR 50 PIPE DIAMETERS IF ISOLATED EQUIPMENT REFER TO SPECIFICATIONS FOR EXACT REQUIREMENTS OF ALL PIPING, DUCTWORK AND EQUIPMENT VIBRATION ISOLATION.
7. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
8. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
9. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATELY ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
10. CERTAIN ITEMS SUCH AS RISERS AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS. LOCATIONS OF ALL SUCH ITEMS SHALL BE INDICATED ON SHOP DRAWINGS BY THE INSTALLING CONTRACTOR FOR REVIEW AND APPROVAL DURING THE SHOP DRAWING PROCESS.
11. INSTALL PIPING SO THAT ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.

KEYED NOTES: ⟨#⟩

1. CONTRACTOR SHALL FURNISH & INSTALL HYDRONIC UNIT HEATER AS SCHEDULED & SHOWN ON PLAN. FINAL UNIT HEATER LOCATION TO BE WALL/COLUMN MOUNTED WITH BRACKET OR HUNG FROM STRUCTURAL BEAM.
2. CONTRACTOR SHALL FURNISH & INSTALL ELECTRONIC AIR CURTAIN AS SCHEDULED & SHOWN ON PLAN. FINAL AIR CURTAIN LOCATION TO BE COORDINATED WITH AUTOMATIC DOOR ASSEMBLY.

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SUFFERN, NEW YORK

KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :

CHECKED BY :

APPROVED BY :

DATE :

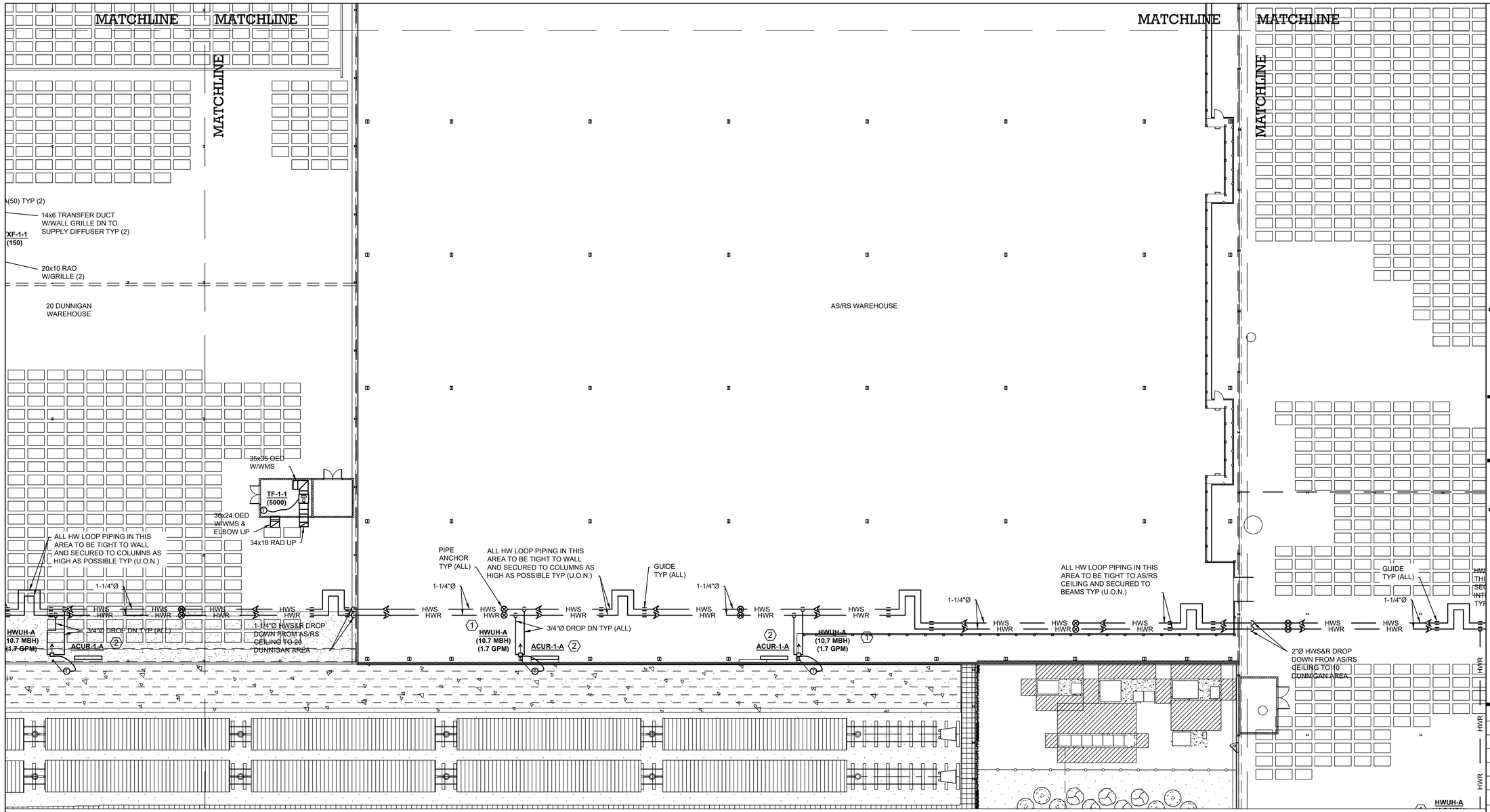
SCALE :

DRAWING TITLE :

MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 4

DWG NUMBER :

M-104



1 M-105 MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 5

SCALE: 1/16" = 1'-0"

N

GENERAL MECHANICAL NOTES:

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DRAWN BY :

CHECKED BY :

APPROVED BY :

DATE :

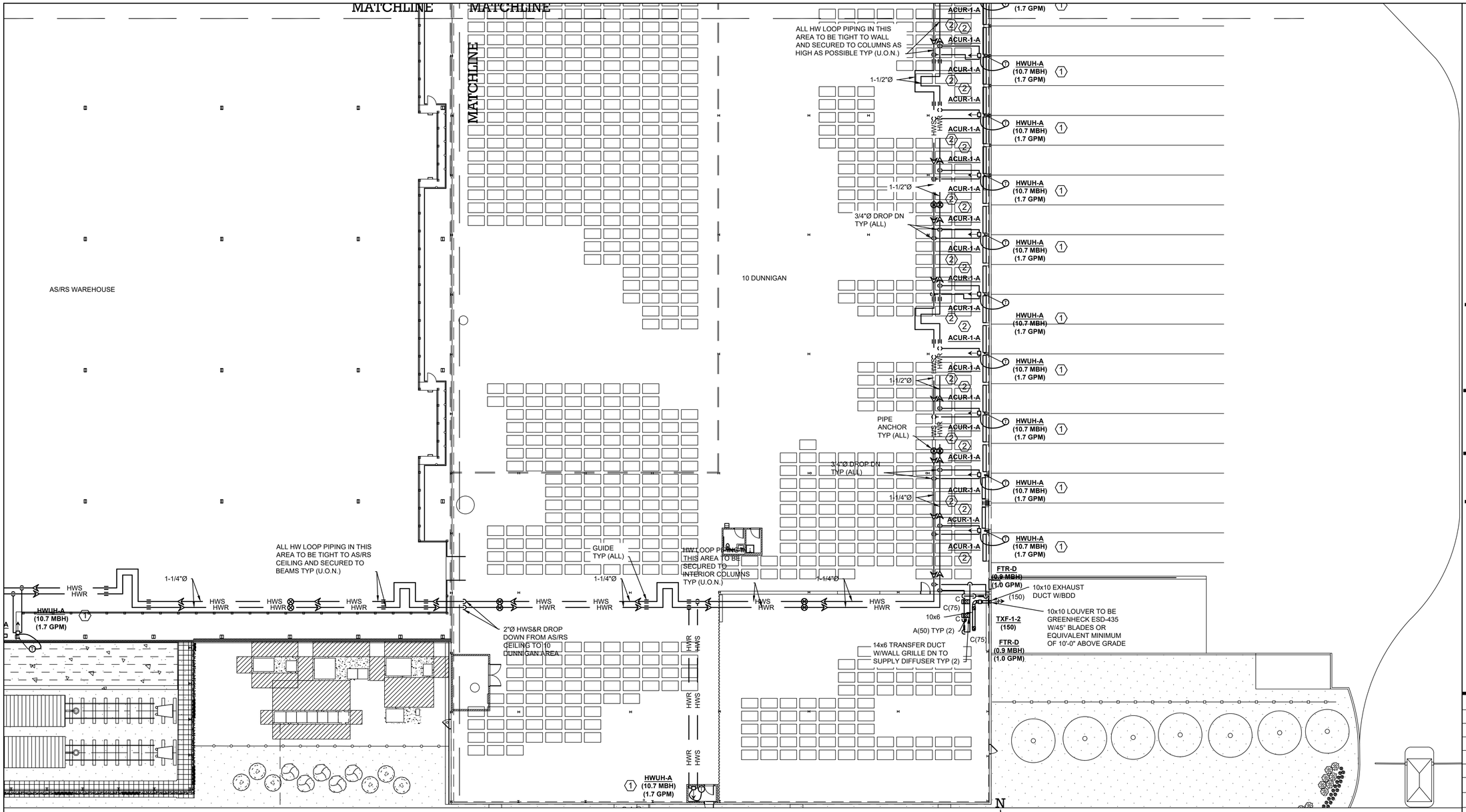
SCALE :

DRAWING TITLE :

MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 5

DWG NUMBER :

M-105



1 M-106 MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 6

SCALE: 1/16" = 1'-0"

GENERAL MECHANICAL NOTES:

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DRAWN BY :
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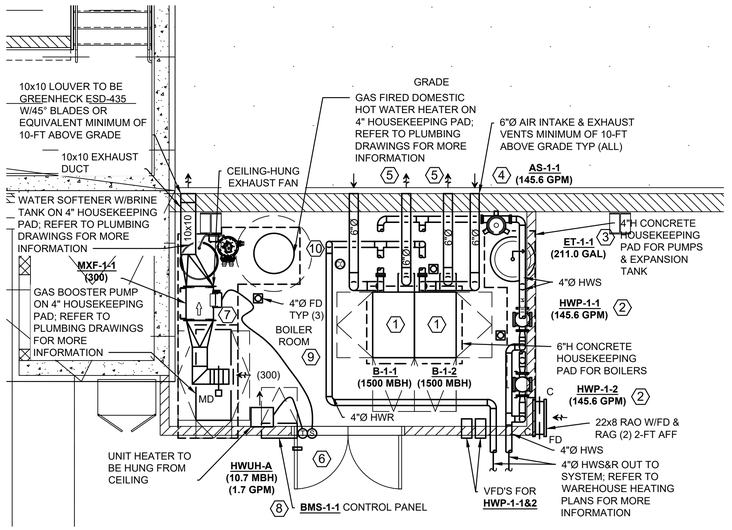
DATE :
SCALE :

DRAWING TITLE :
MECHANICAL L1 WAREHOUSE HEAT PLAN QUADRANT 6

DWG NUMBER :
M-106



1 M-107

MECHANICAL L1 WAREHOUSE BOILER ROOM PART PLAN

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

N

GENERAL MECHANICAL NOTES:

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KEYED NOTES: (#)

1. CONTRACTOR SHALL FURNISH & INSTALL LOW PRESSURE CONDENSING BOILER AS SHOWN ON PLAN & SCHEDULED. FURNISH & INSTALL 6"H CONCRETE HOUSEKEEPING PAD FOR BOILER; COORDINATE FINAL LOCATION WITH FLOOR DRAINS, PIPING & OTHER EQUIPMENT.
2. CONTRACTOR SHALL FURNISH & INSTALL FLOOR-MOUNTED MULTI-STAGE VERTICAL INLINE PUMP AS SHOWN ON PLAN & SCHEDULE. FURNISH & INSTALL 4"H CONCRETE HOUSEKEEPING PAD WITH INTERIA BASE; COORDINATE FINAL LOCATION WITH FLOOR DRAINS, PIPING & OTHER EQUIPMENT.
3. CONTRACTOR SHALL FURNISH & INSTALL FLOOR-MOUNTED HOT WATER EXPANSION TANK AS SHOWN ON PLAN & SCHEDULE. FURNISH & INSTALL 4"H CONCRETE HOUSEKEEPING PAD; COORDINATE FINAL LOCATION WITH FLOOR DRAINS, PIPING & OTHER EQUIPMENT.
4. CONTRACTOR SHALL FURNISH & INSTALL CEILING-HUNG AIR SEPARATOR AS SHOWN ON PLAN & SCHEDULE. AIR SEPARATOR SHALL BE HUNG BELOW CONDENSING BOILER INTAKE & EXHAUST VENTS TO ALLOW FOR EASY MAINTENANCE. FINAL AIR SEPARATOR LOCATION TO BE COORDINATED WITH PIPING & OTHER EQUIPMENT..
5. CONTRACTOR SHALL FURNISH & INSTALL DOUBLE WALL VENT PIPING FOR CONDENSING BOILER; ALL EXHAUST VENT PIPING TO BE AL29-4C OR EQUIVALENT.
6. CONTRACTOR SHALL FURNISH & INSTALL MSA TAMPER-PROOF PULL STATION FOR BOILER ROOM EMERGENCY SHUTDOWN. CONSULT MECHANICAL CONTROL DIAGRAMS FOR MORE INFORMATION.
7. CONTRACTOR SHALL FURNISH & INSTALL CEILING-HUNG MECHANICAL ROOM EXHAUST FAN AS SHOWN ON PLAN & SCHEDULED. EXHAUST FAN SHALL BE AS HIGH AS POSSIBLE WHILE STILL REMAINING ACCESSIBLE FOR MAINTENANCE.
8. CONTRACTOR SHALL FURNISH & INSTALL WALL-MOUNTED BMS CONTROL PANEL. COORDINATE FINAL PANEL LOCATION WITH ALL EQUIPMENT & REFER TO MECHANICAL CONTROL DIAGRAMS FOR MORE INFORMATION.
9. CONTRACTOR SHALL COORDINATE INSTALLATION OF ALL MECHANICAL EQUIPMENT WITH ADJACENT PLUMBING EQUIPMENT; MAINTAIN ADEQUATE CLEARANCES FOR MAINTENANCE OF ALL EQUIPMENT.
10. CONTRACTOR SHALL FURNISH & INSTALL CEILING-MOUNTED CARBON MONOXIDE DETECTOR. COORDINATE INSTALLATION WITH FIRE ALARM CONTRACTOR.

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SCALE :

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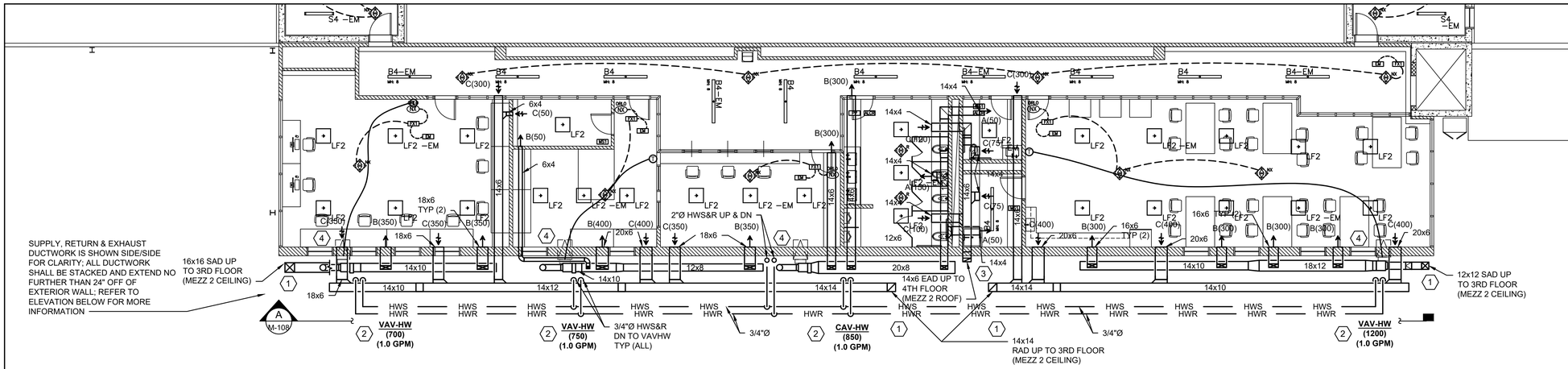
MECHANICAL L1 WAREHOUSE BOILER ROOM PART PLAN

DWG NUMBER :

M-107



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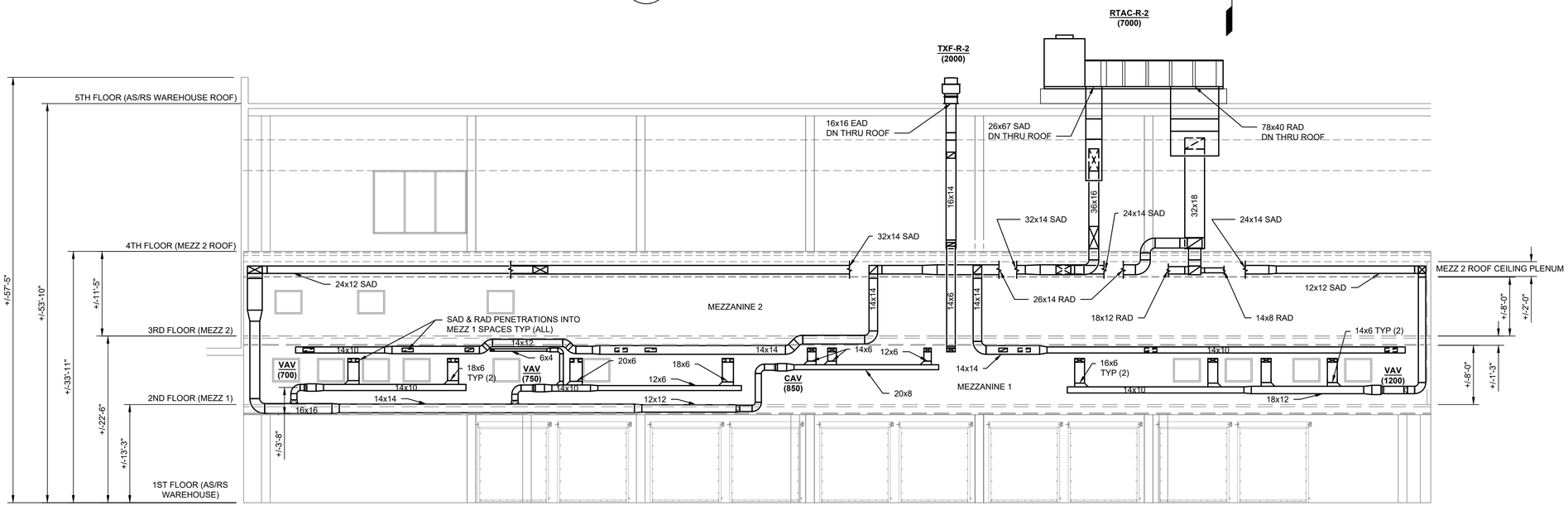
10. CERTAIN ITEMS SUCH AS RISERS AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS. LOCATIONS OF ALL SUCH ITEMS SHALL BE INDICATED ON SHOP DRAWINGS BY THE INSTALLING CONTRACTOR FOR REVIEW AND APPROVAL DURING THE SHOP DRAWING PROCESS.
11. INSTALL PIPING SO THAT ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.

KEYED NOTES: (#)

1. CONTRACTOR TO FURNISH & INSTALL SUPPLY & RETURN DUCTWORK AS SHOWN ON PLAN. ALL DUCTWORK TO BE INTERNALLY LINED AND COORDINATED WITH PIPING AND VAV BOXES. ALL DUCTWORK EXTERNAL TO MEZZANINE 1 TO BE STACKED AND SHALL EXTEND NO FURTHER THAN 24" OFF OF MEZZANINE EXTERNAL WALL. CONSULT MECHANICAL ELEVATION BELOW FOR MORE INFORMATION.
2. CONTRACTOR SHALL FURNISH & INSTALL VARIABLE AIR VOLUME BOX WITH HOT WATER REHEAT COILS (VAV-HW & CAV-HW) SUPPLY DUCTWORK, PIPING & DIFFUSERS AS SHOWN ON PLAN & SCHEDULED. FURNISH & INSTALL DDC CONTROLLER WITH ROOM SENSOR FOR BOX. REFER TO MECHANICAL CONTROL DIAGRAM FOR MORE INFORMATION.
3. CONTRACTOR SHALL FURNISH & INSTALL EXHAUST DUCTWORK UP TO WAREHOUSE 3RD FLOOR (MEZZ 2). REFER TO L3 WAREHOUSE NEW DUCT & HEAT PLAN FOR MORE INFORMATION.
4. CONTRACTOR SHALL FURNISH & INSTALL 24x24 WALL-MOUNTED ACCESS DOOR IN MEZZANINE EXTERIOR WALL TO ACCESS VAV BOX CONTROLS & PIPING; COORDINATE FINAL ACCESS DOOR LOCATION WITH VAVHW BOX LOCATION.

1 M-108 MECHANICAL L2 WAREHOUSE MEZZ 1 DUCT & HEAT PLAN
SCALE: 1/8" = 1'-0"



2 M-108 ELEVATON A - MECHANICAL L2 THRU L5 DUCTWORK ROUTING
SCALE: 1/8" = 1'-0"

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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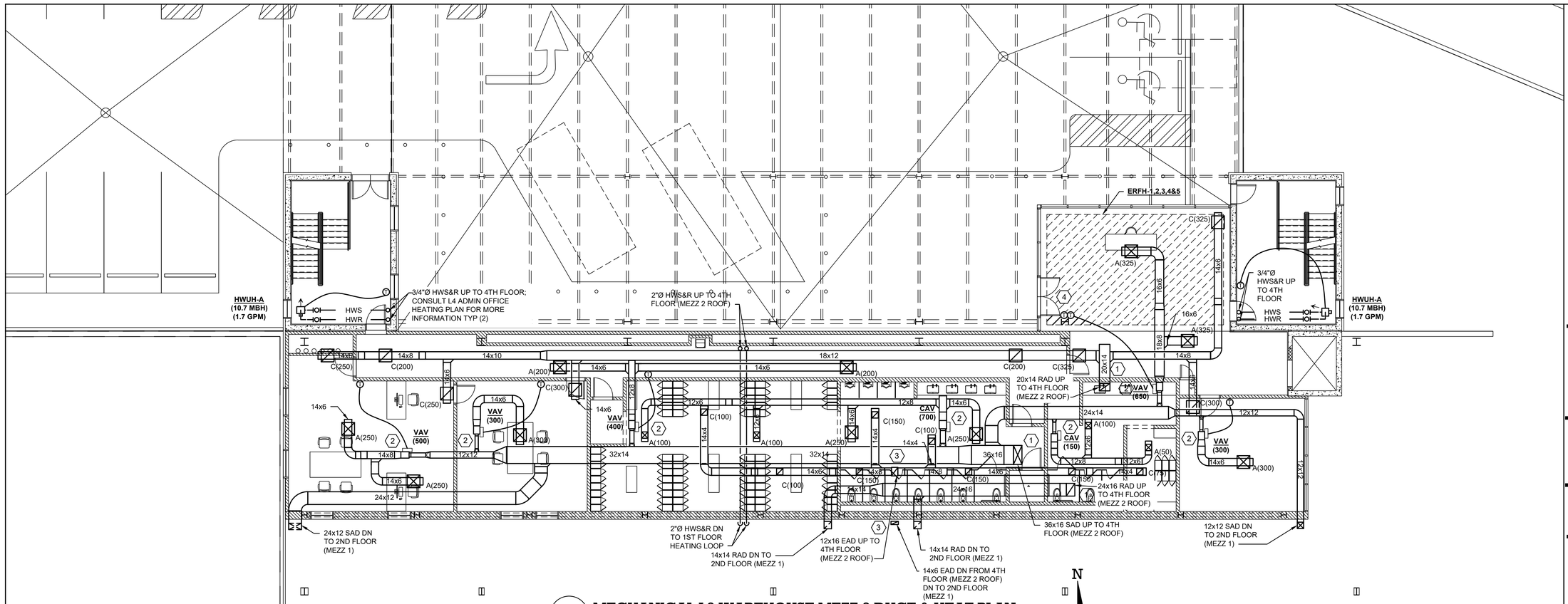
SCALE :

DRAWING TITLE :
MECHANICAL L2 WAREHOUSE MEZZ 1 DUCT & HEAT PLAN

DWG NUMBER :
M-108



1 M-109

MECHANICAL L3 WAREHOUSE MEZZ 2 DUCT & HEAT PLAN

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

GENERAL MECHANICAL NOTES:

1. ALL WORK SHALL CONFORM TO THE LATEST BUILDING STANDARDS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN A COPY OF THE BUILDING STANDARDS AND MEET WITH BUILDING MANAGEMENT IN ORDER TO BECOME TOTALLY FAMILIAR WITH THE BUILDING CONSTRUCTION RULES. THERE SHALL BE NO DEVIATION FROM THE BUILDING STANDARDS WITHOUT PRIOR WRITTEN APPROVAL FROM THE BUILDING MANAGEMENT.
2. WHEN MECHANICAL WORK IS SUBCONTRACTED IT SHALL BE THE MECHANICAL CONTRACTORS RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT. IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
3. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR AND COORDINATED WITH THE GENERAL CONTRACTOR FOR COORDINATION AMONG ALL TRADES.
4. FURNISH & INSTALL ALL MATERIALS, EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
5. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
6. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
7. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
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KEYED NOTES: (#)

1. CONTRACTOR TO FURNISH & INSTALL SUPPLY & RETURN DUCTWORK AS SHOWN ON PLAN. ALL DUCTWORK TO BE INTERNALLY LINED AND COORDINATED WITH PIPING AND VAV BOXES.
2. CONTRACTOR SHALL FURNISH & INSTALL VARIABLE AIR VOLUME (VAV) BOX WITH SUPPLY DUCTWORK & DIFFUSERS AS SHOWN ON PLAN & SCHEDULED. FURNISH & INSTALL DDC CONTROLLER WITH ROOM SENSOR FOR BOX; REFER TO MECHANICAL CONTROL DIAGRAM FOR MORE INFORMATION.
3. CONTRACTOR SHALL FURNISH & INSTALL EXHAUST DUCTWORK UP TO WAREHOUSE 4TH FLOOR. REFER TO L4 WAREHOUSE NEW DUCT & HEAT PLAN FOR MORE INFORMATION.
4. CONTRACTOR SHALL FURNISH & INSTALL ELECTRIC RADIANT FLOOR HEATING CABLE IN RECEPTION LOBBY CONCRETE SLAB. INSTALL PER MANUFACTURER'S RECOMMENDATIONS AND COORDINATE WITH ELECTRICAL CONTRACTOR.

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SCALE :

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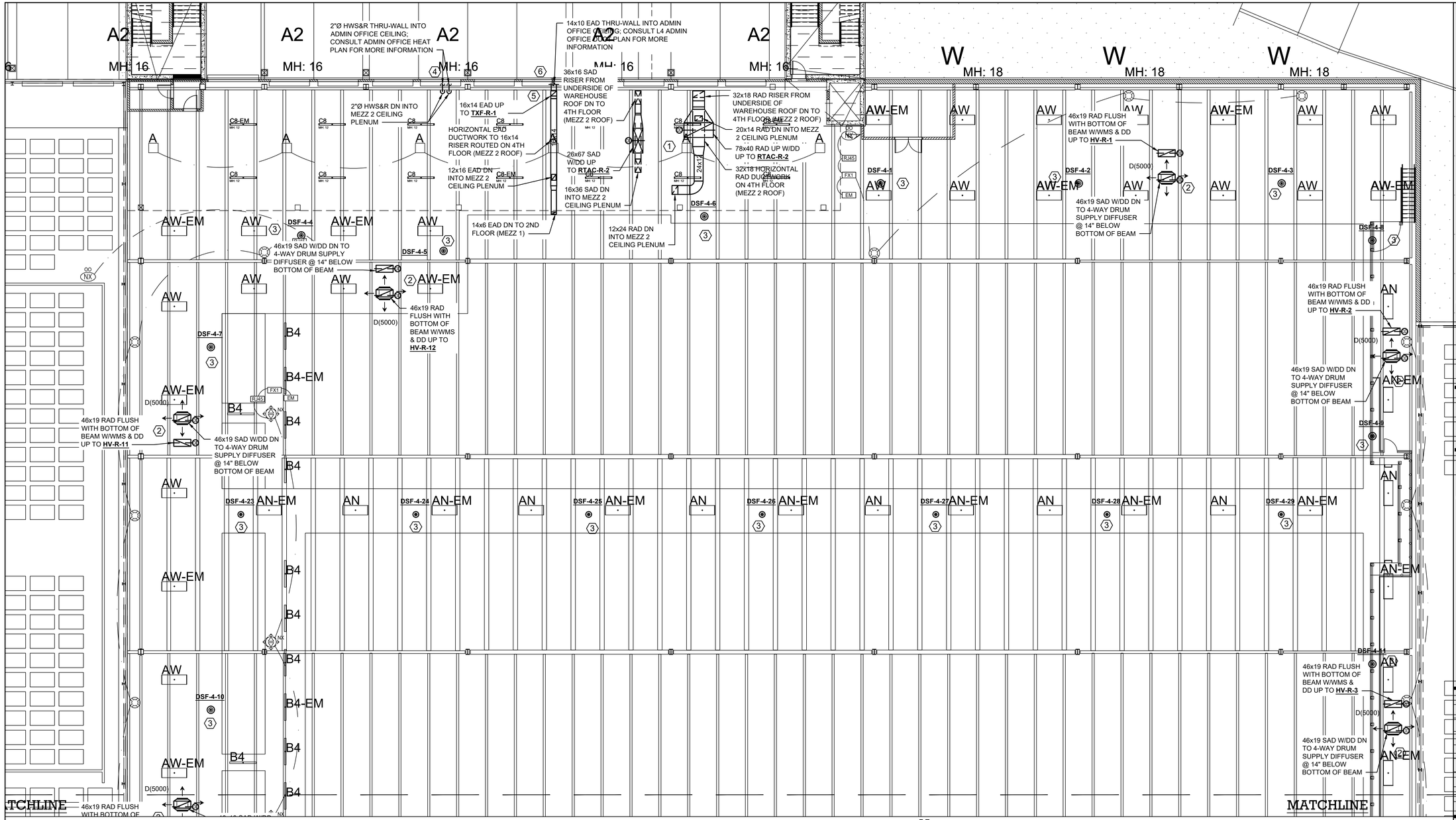
MECHANICAL L3 WAREHOUSE MEZZ 2 DUCT & HEAT PLAN

DWG NUMBER :

M-109



GENERAL MECHANICAL NOTES:

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4. FURNISH & INSTALL ALL MATERIALS, EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
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6. FURNISH & INSTALL VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO AND WITHIN 50 FEET OR 50 PIPE DIAMETERS IF ISOLATED EQUIPMENT REFER TO SPECIFICATIONS FOR EXACT REQUIREMENTS OF ALL PIPING, DUCTWORK AND EQUIPMENT VIBRATION ISOLATION.
7. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
8. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
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11. INSTALL PIPING SO THAT ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.

1 / M-110 — MECHANICAL L4 WAREHOUSE DUCT & HEAT PLAN NORTH
SCALE: 3/32" = 1'-0"

N

KEYED NOTES: (#)

1. CONTRACTOR SHALL FURNISH & INSTALL SUPPLY & RETURN DUCTWORK FROM ROOFTOP AIR CONDITIONING UNIT (RTAC-R-2) WITH DUCT DETECTORS DOWN TO 4TH FLOOR (MEZZ 2 ROOF). DUCTWORK TO BE ROUTED FROM ROOF PENETRATION TO AS/RS WAREHOUSE EXTERIOR WALL AND OFFSET ONTO 4TH FLOOR (MEZZ 2 ROOF).
2. CONTRACTOR SHALL FURNISH AND INSTALL SUPPLY & RETURN DUCTWORK WITH DUCT DETECTORS FROM ROOFTOP HEATING & VENTILATING UNIT (HV). COORDINATE FINAL DUCTWORK LOCATION WITH SUPPLY DRUM DIFFUSER, FIRE PROTECTION LINES, LIGHTS & ROOFTOP UNIT.
3. CONTRACTOR SHALL FURNISH & INSTALL DESTRATIFICATION FAN AS SHOWN ON PLAN & SCHEDULED. FAN TO BE CEILING-HUNG 4" BELOW ROOF AND CENTERED BETWEEN BEAM HAUNCHES; COORDINATE FINAL INSTALLATION WITH AS/RS RACK SYSTEM.
4. CONTRACTOR SHALL FURNISH & INSTALL HOT WATER SUPPLY & RETURN (HWS&R) PIPING FROM 4TH FLOOR ADMIN CEILING. FINAL LOCATION TO BE COORDINATED WITH ALL OTHER TRADES. REFER TO L4 ADMIN OFFICE NEW HEATING PLAN FOR MORE INFORMATION.
5. CONTRACTOR SHALL FURNISH & INSTALL EXHAUST DUCTWORK RISER UP TO ROOFTOP TOILET EXHAUST FAN (TXF-R-1). EXHAUST DUCTWORK TO BE ROUTED TIGHT TO AS/RS WAREHOUSE EXTERIOR WALL.
6. CONTRACTOR SHALL FURNISH & INSTALL EXHAUST DUCTWORK FROM 4TH FLOOR ADMIN CEILING. FINAL LOCATION TO BE COORDINATED WITH ALL OTHER TRADES. REFER TO L4 ADMIN OFFICE NEW DUCTWORK PLAN FOR MORE INFORMATION.

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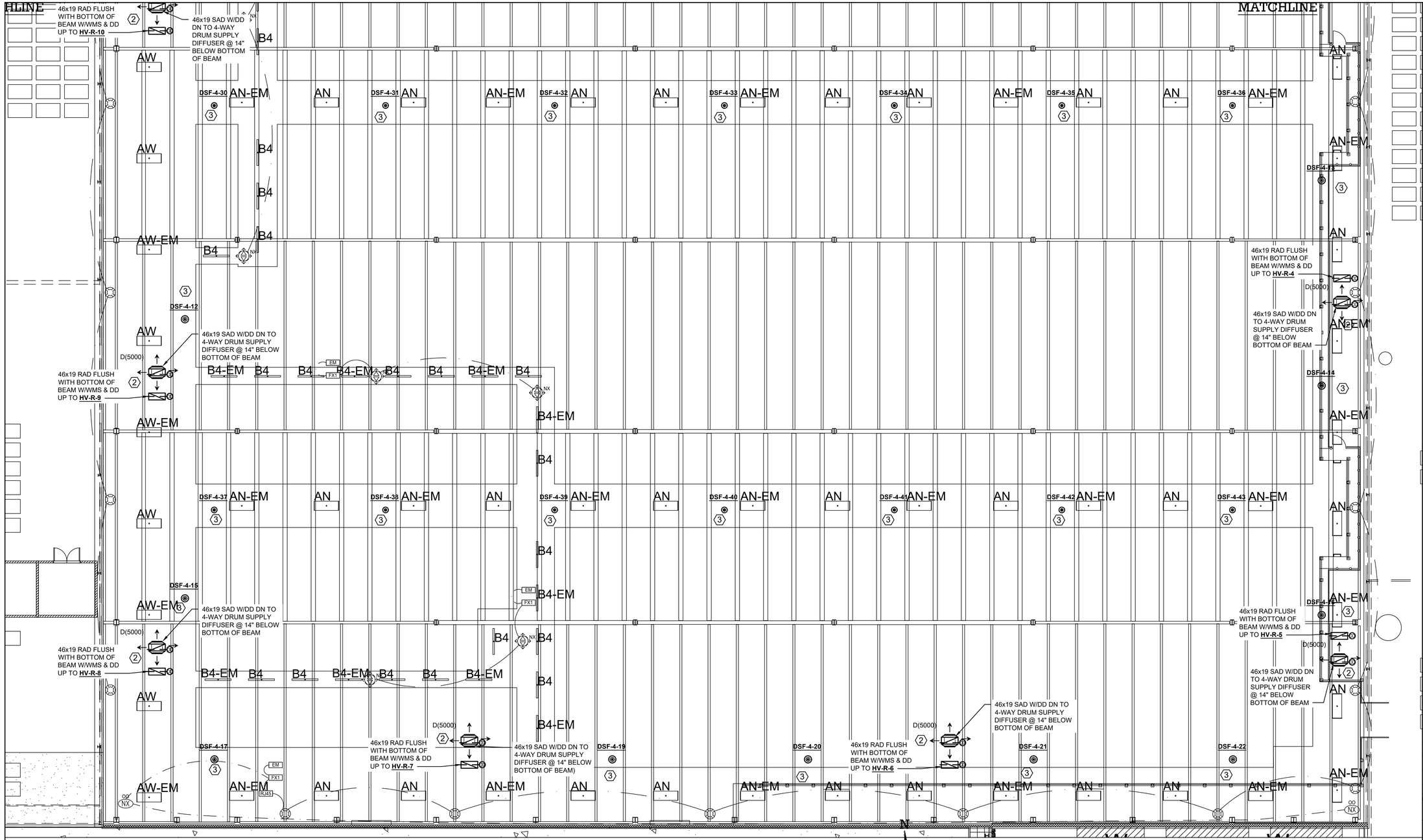
MECHANICAL L4 WAREHOUSE DUCT & HEAT PLAN NORTH

DWG NUMBER :
M-110



1 / M-111 MECHANICAL L4 WAREHOUSE DUCT & HEAT PLAN SOUTH

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KEYED NOTES: ⟨#⟩

1. CONTRACTOR SHALL FURNISH & INSTALL SUPPLY & RETURN DUCTWORK FROM ROOFTOP AIR CONDITIONING UNIT (RTAC-R-2) WITH DUCT DETECTORS DOWN TO 4TH FLOOR (MEZZ 2 ROOF). DUCTWORK TO BE ROUTED FROM ROOF PENETRATION TO AS/RS WAREHOUSE EXTERIOR WALL AND OFFSET ONTO 4TH FLOOR (MEZZ 2 ROOF).
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6. CONTRACTOR SHALL FURNISH & INSTALL EXHAUST DUCTWORK FROM 4TH FLOOR ADMIN CEILING. FINAL LOCATION TO BE COORDINATED WITH ALL OTHER TRADES. REFER TO L4 ADMIN OFFICE NEW DUCTWORK PLAN FOR MORE INFORMATION.

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MECHANICAL L4 WAREHOUSE DUCT & HEAT PLAN SOUTH

DWG NUMBER :

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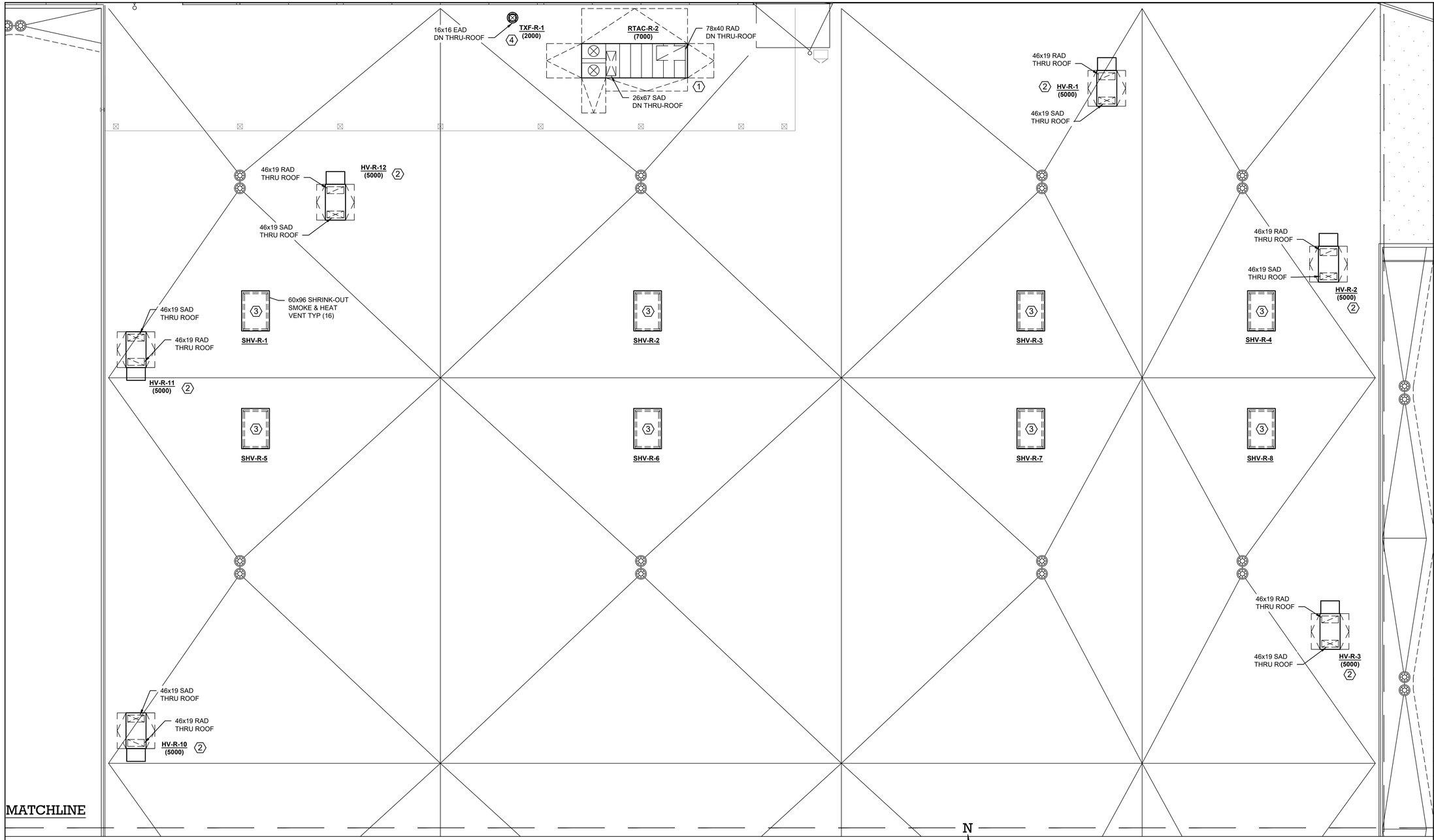

1 / M-112 MECHANICAL L5 WAREHOUSE ROOF DUCT PLAN NORTH

SCALE: 3/32" = 1'-0"

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3. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR AND COORDINATED WITH THE GENERAL CONTRACTOR FOR COORDINATION AMONG ALL TRADES.
4. FURNISH & INSTALL ALL MATERIALS, EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
5. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
6. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
7. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
8. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATELY ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
9. CERTAIN ITEMS SUCH AS RISERS AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS. LOCATIONS OF ALL SUCH ITEMS SHALL BE INDICATED ON SHOP DRAWINGS BY THE INSTALLING CONTRACTOR FOR REVIEW AND APPROVAL DURING THE SHOP DRAWING PROCESS.

KEYED NOTES: (#)

1. CONTRACTOR SHALL FURNISH & INSTALL PACKAGED ROOFTOP AC UNIT WITH GAS FIRED FURNACE AS SHOWN ON PLAN & SCHEDULED. RTAC TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.
2. CONTRACTOR SHALL FURNISH & INSTALL PACKAGED ROOFTOP HEATING & VENTILATING WITH GAS FIRED FURNANCE AS SHOWN ON PLAN & SCHEDULED. HV TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.
3. CONTRACTOR SHALL FURNISH & INSTALL CURB-MOUNTED SMOKE & HEAT VENT AS SHOWN ON PLAN & SCHEDULED. SMOKE & HEAT VENT TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.
4. CONTRACTOR SHALL FURNISH & INSTALL EXHAUST FAN AS SHOWN ON PLAN & SCHEDULED. EXHAUST FAN TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :

CHECKED BY :

APPROVED BY :

DATE :

SCALE :

DRAWING TITLE :

MECHANICAL L5 WAREHOUSE ROOF DUCT PLAN NORTH

DWG NUMBER :

M-112

CHLINE

MATCHLINE

46x19 SAD THRU ROOF
46x19 RAD THRU ROOF
HV-R-9 (5000) 2

60x96 SHRINK-OUT SMOKE & HEAT VENT TYP (16)
SHV-R-9

SHV-R-10

SHV-R-11

SHV-R-12

46x19 RAD THRU ROOF
46x19 SAD THRU ROOF
HV-R-4 (5000) 2

SHV-R-13

SHV-R-14

SHV-R-15

SHV-R-16

46x19 SAD THRU ROOF
46x19 RAD THRU ROOF
HV-R-8 (5000) 2

46x19 SAD THRU ROOF
46x19 RAD THRU ROOF
HV-R-7 (5000) 2

46x19 SAD THRU ROOF
46x19 RAD THRU ROOF
HV-R-6 (5000) 2

46x19 RAD THRU ROOF
46x19 SAD THRU ROOF
HV-R-5 (5000) 2

1 M-113
MECHANICAL L5 WAREHOUSE ROOF DUCT PLAN SOUTH
SCALE: 3/32" = 1'-0"

N

GENERAL MECHANICAL NOTES:

1. ALL WORK SHALL CONFORM TO THE LATEST BUILDING STANDARDS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN A COPY OF THE BUILDING STANDARDS AND MEET WITH BUILDING MANAGEMENT IN ORDER TO BECOME TOTALLY FAMILIAR WITH THE BUILDING CONSTRUCTION RULES. THERE SHALL BE NO DEVIATION FROM THE BUILDING STANDARDS WITHOUT PRIOR WRITTEN APPROVAL FROM THE BUILDING MANAGEMENT.
2. WHEN MECHANICAL WORK IS SUBCONTRACTED IT SHALL BE THE MECHANICAL CONTRACTORS RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT. IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
3. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR AND COORDINATED WITH THE GENERAL CONTRACTOR FOR COORDINATION AMONG ALL TRADES.
4. FURNISH & INSTALL ALL MATERIALS, EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
5. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
6. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
7. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
8. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATELY ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
9. CERTAIN ITEMS SUCH AS RISERS AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS. LOCATIONS OF ALL SUCH ITEMS SHALL BE INDICATED ON SHOP DRAWINGS BY THE INSTALLING CONTRACTOR FOR REVIEW AND APPROVAL DURING THE SHOP DRAWING PROCESS.

KEYED NOTES: (#)

1. CONTRACTOR SHALL FURNISH & INSTALL PACKAGED ROOFTOP AC UNIT WITH GAS FIRED FURNACE AS SHOWN ON PLAN & SCHEDULED. RTAC TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.
2. CONTRACTOR SHALL FURNISH & INSTALL PACKAGED ROOFTOP HEATING & VENTILATING WITH GAS FIRED FURNANCE AS SHOWN ON PLAN & SCHEDULED. HV TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.
3. CONTRACTOR SHALL FURNISH & INSTALL CURB-MOUNTED SMOKE & HEAT VENT AS SHOWN ON PLAN & SCHEDULED. SMOKE & HEAT VENT TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.
4. CONTRACTOR SHALL FURNISH & INSTALL EXHAUST FAN AS SHOWN ON PLAN & SCHEDULED. EXHAUST FAN TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.

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KEY PLAN

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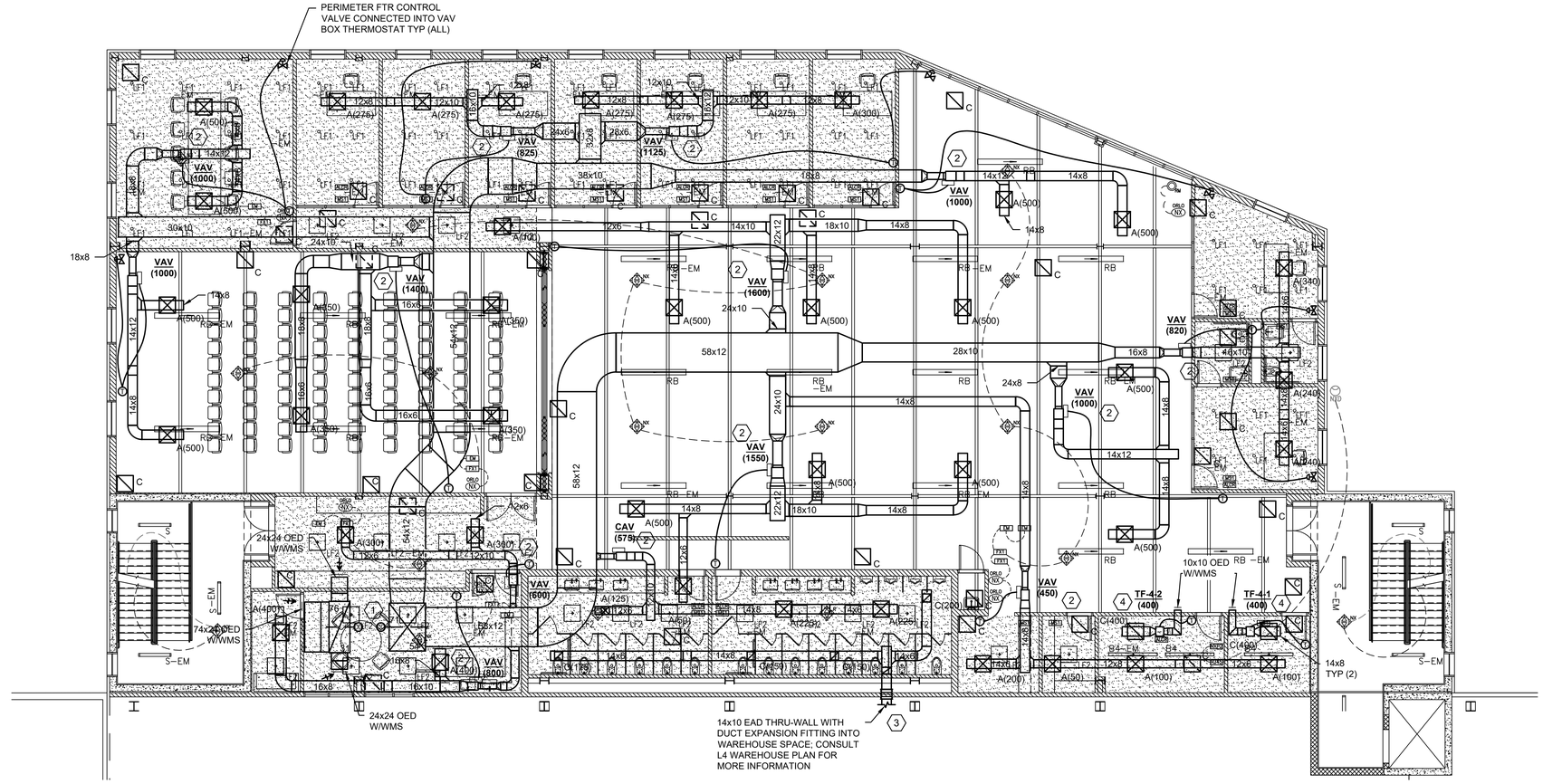
DATE :
SCALE :

DRAWING TITLE :
MECHANICAL L5 WAREHOUSE ROOF DUCT PLAN SOUTH

DWG NUMBER :
M-113



1 M-114 MECHANICAL L4 ADMIN OFFICE DUCT PLAN

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

GENERAL MECHANICAL NOTES:

1. ALL WORK SHALL CONFORM TO THE LATEST BUILDING STANDARDS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN A COPY OF THE BUILDING STANDARDS AND MEET WITH BUILDING MANAGEMENT IN ORDER TO BECOME TOTALLY FAMILIAR WITH THE BUILDING CONSTRUCTION RULES. THERE SHALL BE NO DEVIATION FROM THE BUILDING STANDARDS WITHOUT PRIOR WRITTEN APPROVAL FROM THE BUILDING MANAGEMENT.
2. WHEN MECHANICAL WORK IS SUBCONTRACTED IT SHALL BE THE MECHANICAL CONTRACTORS RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT. IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
3. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR AND COORDINATED WITH THE GENERAL CONTRACTOR FOR COORDINATION AMONG ALL TRADES.
4. FURNISH & INSTALL ALL MATERIALS, EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
5. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
6. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
7. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
8. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATELY ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
9. CERTAIN ITEMS SUCH AS RISERS AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS. LOCATIONS OF ALL SUCH ITEMS SHALL BE INDICATED ON SHOP DRAWINGS BY THE INSTALLING CONTRACTOR FOR REVIEW AND APPROVAL DURING THE SHOP DRAWING PROCESS.

KEYED NOTES: (#)

1. CONTRACTOR TO FURNISH & INSTALL SUPPLY & RETURN DUCTWORK FROM ROOFTOP AC UNIT (RTAC-R-1) AS SHOWN ON PLAN. ALL DUCTWORK TO BE INTERNALLY LINED AND COORDINATED WITH PIPING AND HOT WATER UNIT HEATERS IN CEILING PLENUM.
2. CONTRACTOR SHALL FURNISH & INSTALL VARIABLE AIR VOLUME (VAV) BOX WITH SUPPLY DUCTWORK & DIFFUSERS AS SHOWN ON PLAN & SCHEDULED. FURNISH & INSTALL DDC CONTROLLER WITH ROOM SENSOR; REFER TO MECHANICAL CONTROL DIAGRAM FOR MORE INFORMATION.
3. CONTRACTOR SHALL FURNISH & INSTALL EXHAUST DUCTWORK FROM 4TH FLOOR ADMIN CEILING THRU WALL INTO AS/RS WAREHOUSE CEILING. FURNISH & INSTALL DUCT EXPANSION FITTING AT WALL PENETRATION AS SHOWN ON PLAN & SCHEDULED.
4. CONTRACTOR SHALL FURNISH & INSTALL CEILING HUNG TRANSFER FAN WITH DUCTWORK SHOWN ON PLAN & SCHEDULED.

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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KEY PLAN

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DATE :

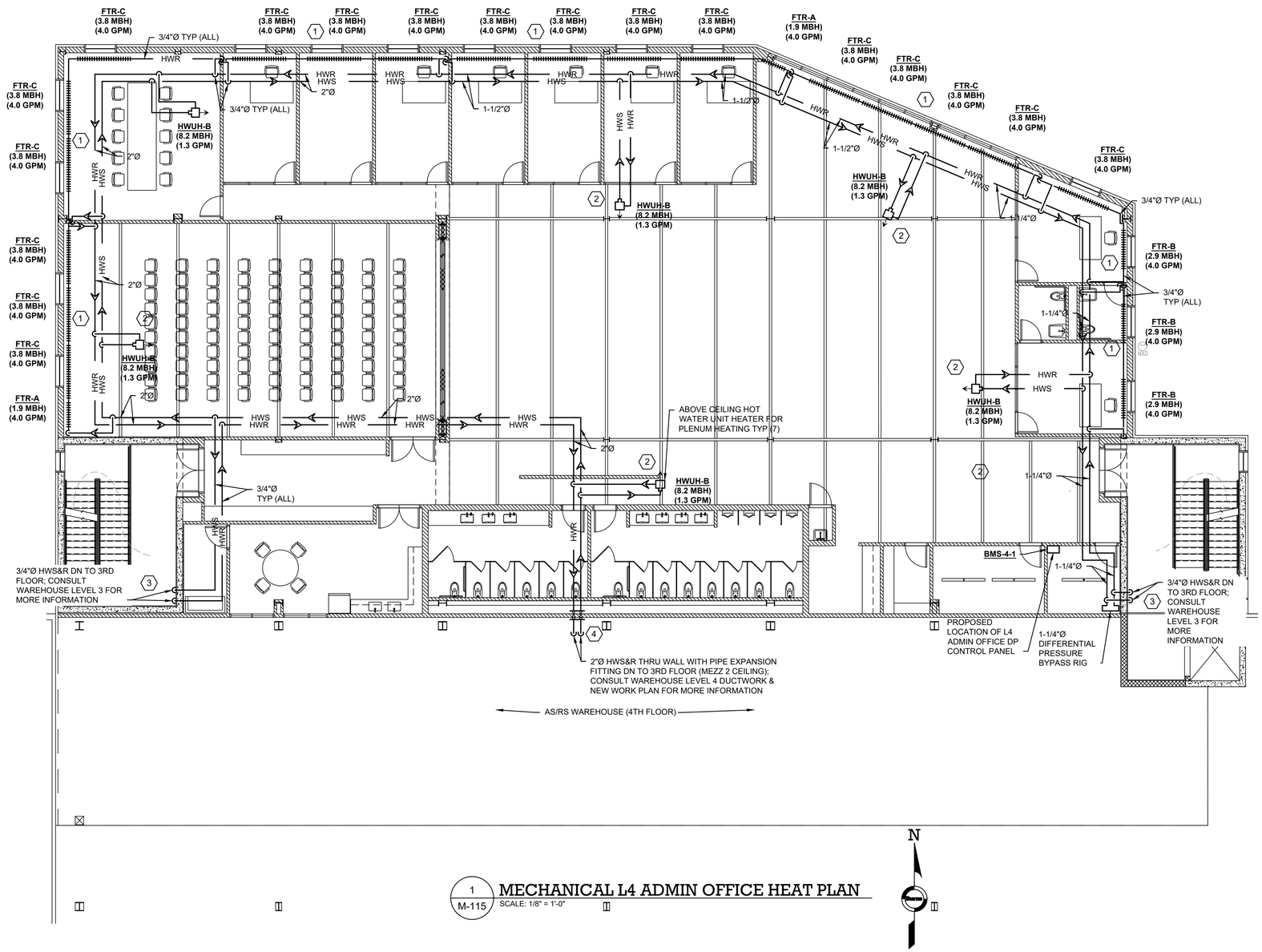
SCALE :

DRAWING TITLE :

MECHANICAL L4 ADMIN OFFICE DUCT PLAN

DWG NUMBER :

M-114



1 M-115 MECHANICAL L4 ADMIN OFFICE HEAT PLAN

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

GENERAL MECHANICAL NOTES:

1. ALL WORK SHALL CONFORM TO THE LATEST BUILDING STANDARDS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN A COPY OF THE BUILDING STANDARDS AND MEET WITH BUILDING MANAGEMENT IN ORDER TO BECOME TOTALLY FAMILIAR WITH THE BUILDING CONSTRUCTION RULES. THERE SHALL BE NO DEVIATION FROM THE BUILDING STANDARDS WITHOUT PRIOR WRITTEN APPROVAL FROM THE BUILDING MANAGEMENT.
2. WHEN MECHANICAL WORK IS SUBCONTRACTED IT SHALL BE THE MECHANICAL CONTRACTORS RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT. IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
3. FURNISH & INSTALL ALL MATERIALS, EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
4. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
5. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
6. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
7. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATELY ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
8. CERTAIN ITEMS SUCH AS RISERS AND DROPS IN PIPING, VALVES, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS. LOCATIONS OF ALL SUCH ITEMS SHALL BE INDICATED ON SHOP DRAWINGS BY THE INSTALLING CONTRACTOR FOR REVIEW AND APPROVAL DURING THE SHOP DRAWING PROCESS.
9. INSTALL PIPING SO THAT ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.

KEYED NOTES: (#)

1. CONTRACTOR SHALL FURNISH & INSTALL PERIMETER FINNED TUBE RADIATORS AS SHOW ON PLAN & SCHEDULED. ALL FINNED TUBE ENCLOSURES TO EXTEND WALL TO WALL WITH ENCLOSURE ACCESS DOORS FOR PIPING TRIM. COORDINATE FINAL HWS&R DROPS TO FINNED TUBE RADIATOR (FTR) FROM CEILING PLENUM WITH PARTITIONS. CONSULT MECHANICAL DETAILS & FLOW DIAGRAMS FOR INFORMATION.
2. CONTRACTOR SHALL FURNISH & INSTALL CEILING-PLENUM HOT WATER UNIT HEATERS AS SHOWN ON PLAN & SCHEDULED. UNIT HEATER INSTALLATION & PIPING TO BE COORDINATED WITH ALL NEW DUCTWORK AND FULLY ACCESSIBLE.
3. CONTRACTOR SHALL FURNISH & INSTALL HWS&R DROP DOWN TO 3RD FLOOR STAIRWELL UNIT HEATER. COORDINATE FINAL DROP DOWN LOCATION WITH WALL-HUNG UNIT HEATER ON 3RD FLOOR AND REFER TO 3RD FLOOR WAREHOUSE PLANS FOR MORE INFORMATION.
4. CONTRACTOR SHALL FURNISH & INSTALL HOT WATER SUPPLY & RETURN (HWS&R) PIPING FROM 4TH FLOOR ADMIN CEILING. PIPING TO BE ROUTED DOWN AS/RS WAREHOUSE EXTERIOR WALL AND DOWN TO 3RD FLOOR (MEZZ 2 ROOF). FURNISH & INSTALL STAINLESS STEEL BELLOWS METAL EXPANSION JOINT AT PIPE WALL PENETRATION FROM OFFICE ADMIN BUILDING TO AS/RS WAREHOUSE AS SHOWN ON PLAN & SCHEDULED

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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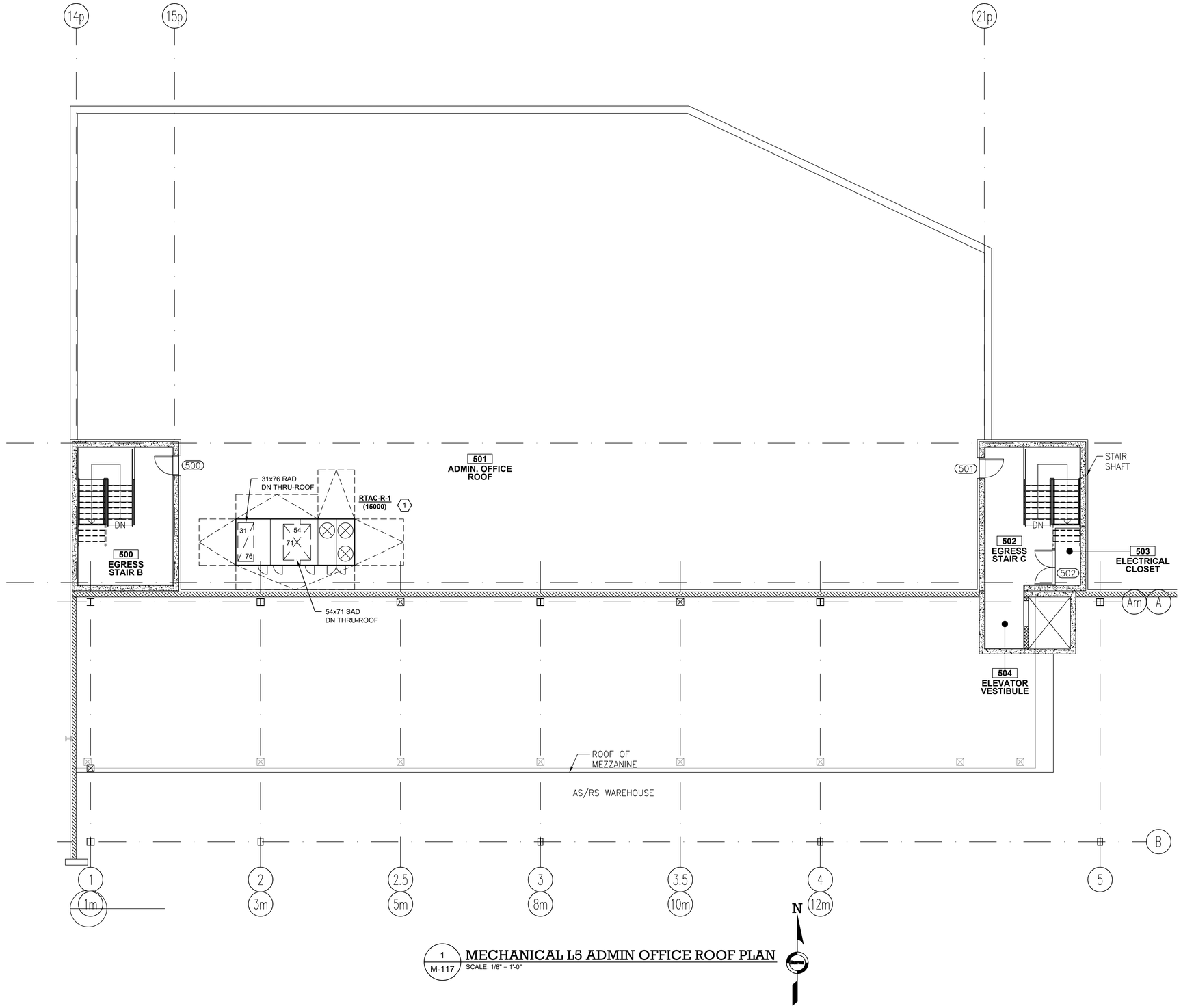
DRAWING TITLE :

MECHANICAL L4 ADMIN OFFICE HEAT PLAN

DWG NUMBER :

M-115



1 M-117 MECHANICAL L5 ADMIN OFFICE ROOF PLAN
SCALE: 1/8" = 1'-0"

GENERAL MECHANICAL NOTES:

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2. WHEN MECHANICAL WORK IS SUBCONTRACTED IT SHALL BE THE MECHANICAL CONTRACTORS RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT. IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
3. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR AND COORDINATED WITH THE GENERAL CONTRACTOR FOR COORDINATION AMONG ALL TRADES.
4. FURNISH & INSTALL ALL MATERIALS, EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
5. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
6. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER.
7. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR THE FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATIONS.
8. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATELY ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
9. CERTAIN ITEMS SUCH AS RISERS AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS. LOCATIONS OF ALL SUCH ITEMS SHALL BE INDICATED ON SHOP DRAWINGS BY THE INSTALLING CONTRACTOR FOR REVIEW AND APPROVAL DURING THE SHOP DRAWING PROCESS.

KEYED NOTES: (#)

1. CONTRACTOR SHALL FURNISH & INSTALL PACKAGED ROOFTOP AC UNIT WITH GAS FIRED FURNACE AS SHOWN ON PLAN & SCHEDULED. RTAC TO BE PLACED ON 24"H INSULATED ROOF CURB. FINAL LOCATION TO BE COORDINATED WITH STRUCTURAL.

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

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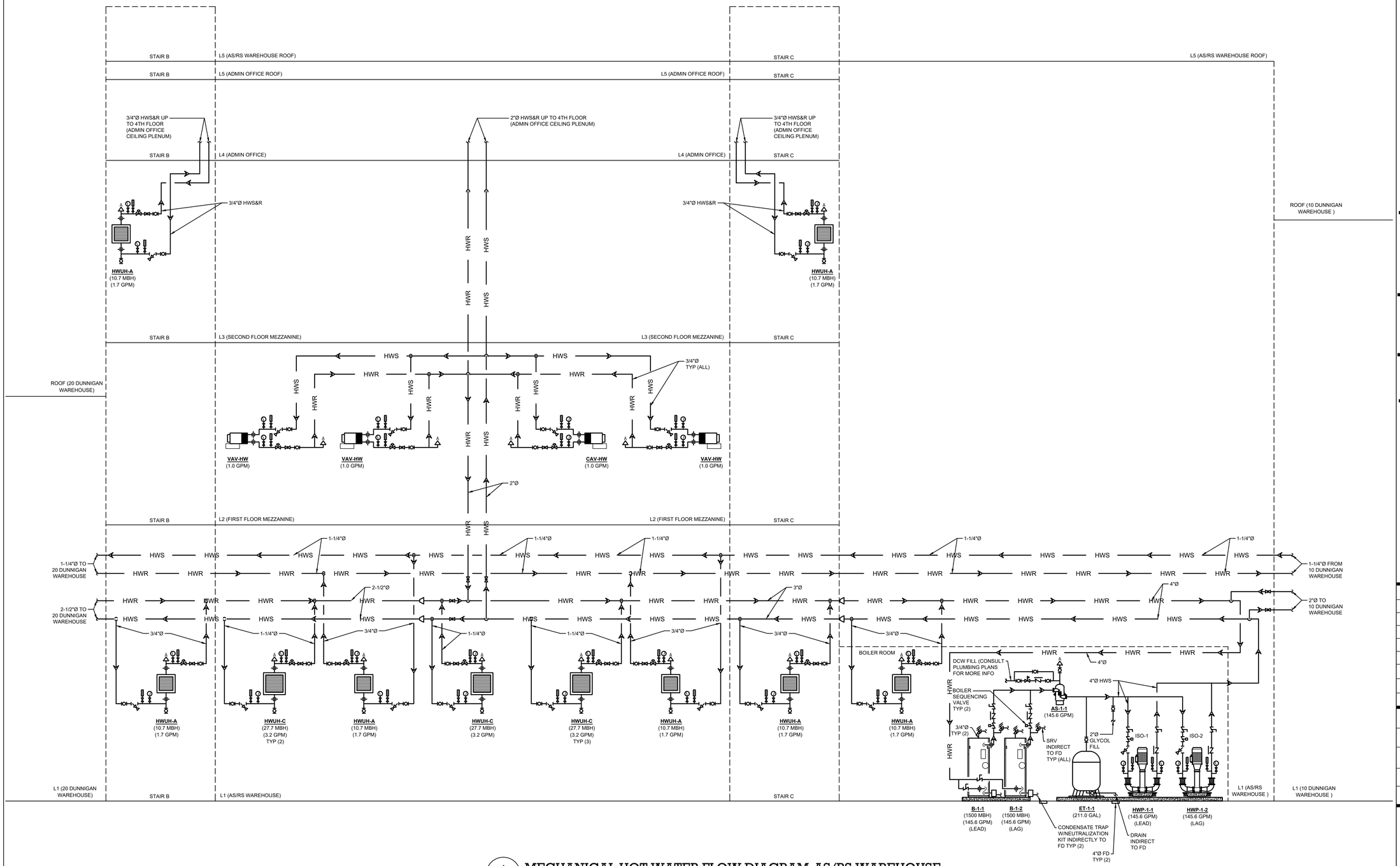
SCALE :

DRAWING TITLE :
MECHANICAL L5 ADMIN OFFICE ROOF PLAN

DWG NUMBER :
M-116



1 / M-301 MECHANICAL HOT WATER FLOW DIAGRAM-AS/RS WAREHOUSE

SCALE: NTS

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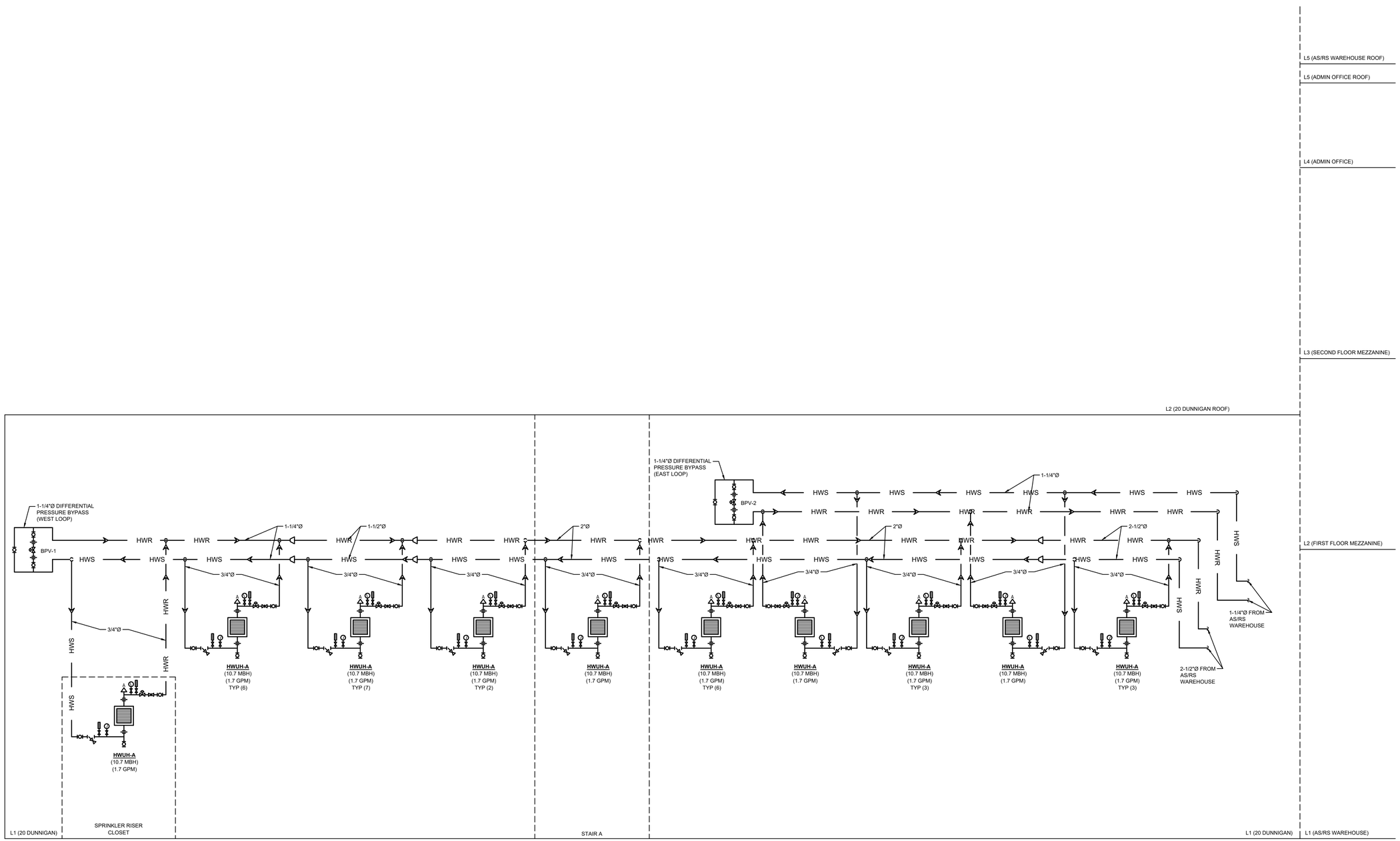
MECHANICAL HOT WATER FLOW DIAGRAM SHEET #1

DWG NUMBER :

M-301



1 / M-302 MECHANICAL HOT WATER FLOW DIAGRAM-20 DUNNIGAN WAREHOUSE

SCALE: NTS

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SCALE :

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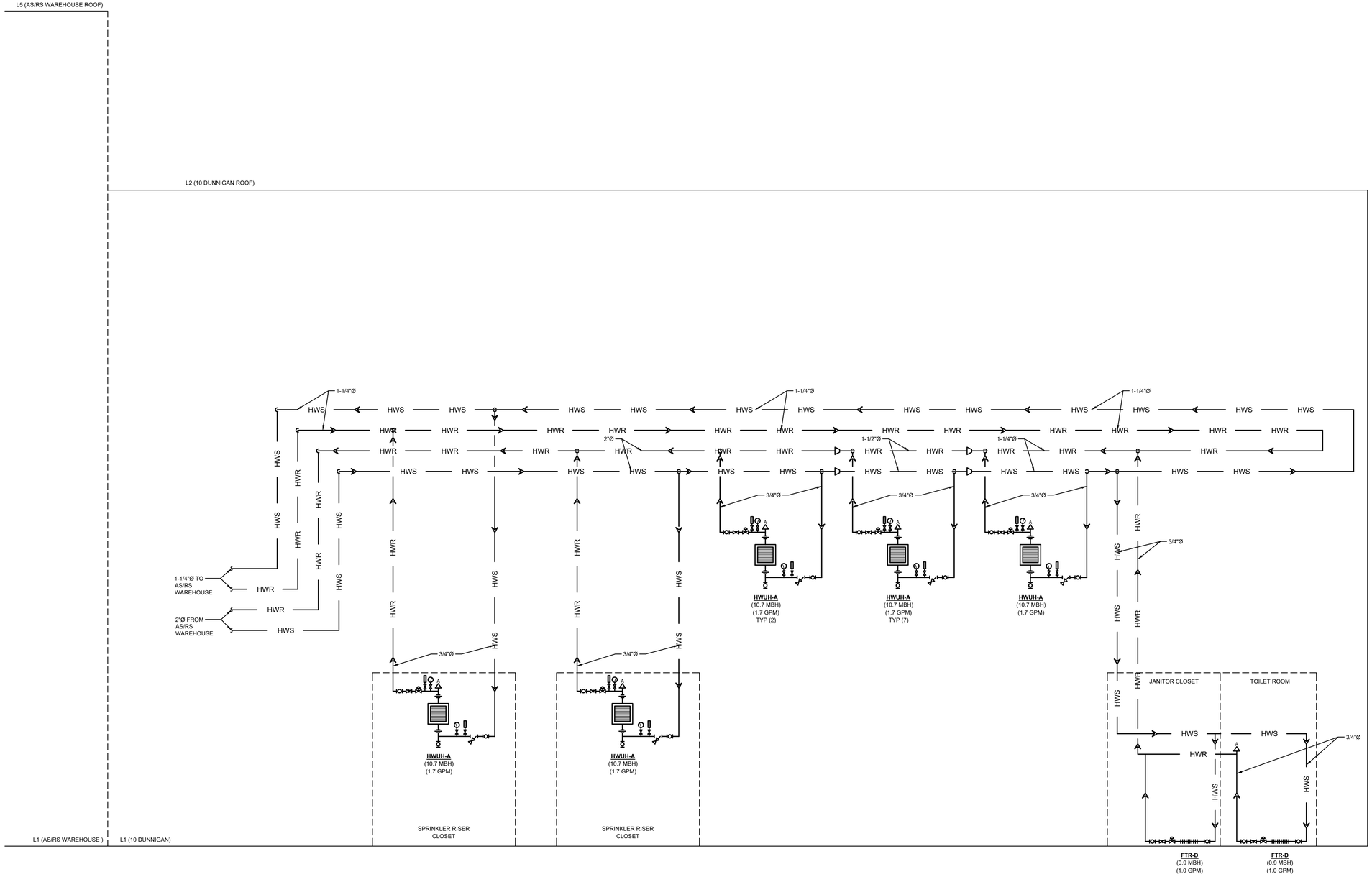
MECHANICAL HOT WATER FLOW DIAGRAM SHEET #2

DWG NUMBER :

M-302



1 / M-303 MECHANICAL HOT WATER FLOW DIAGRAM-10 DUNNIGAN WAREHOUSE

SCALE: NTS

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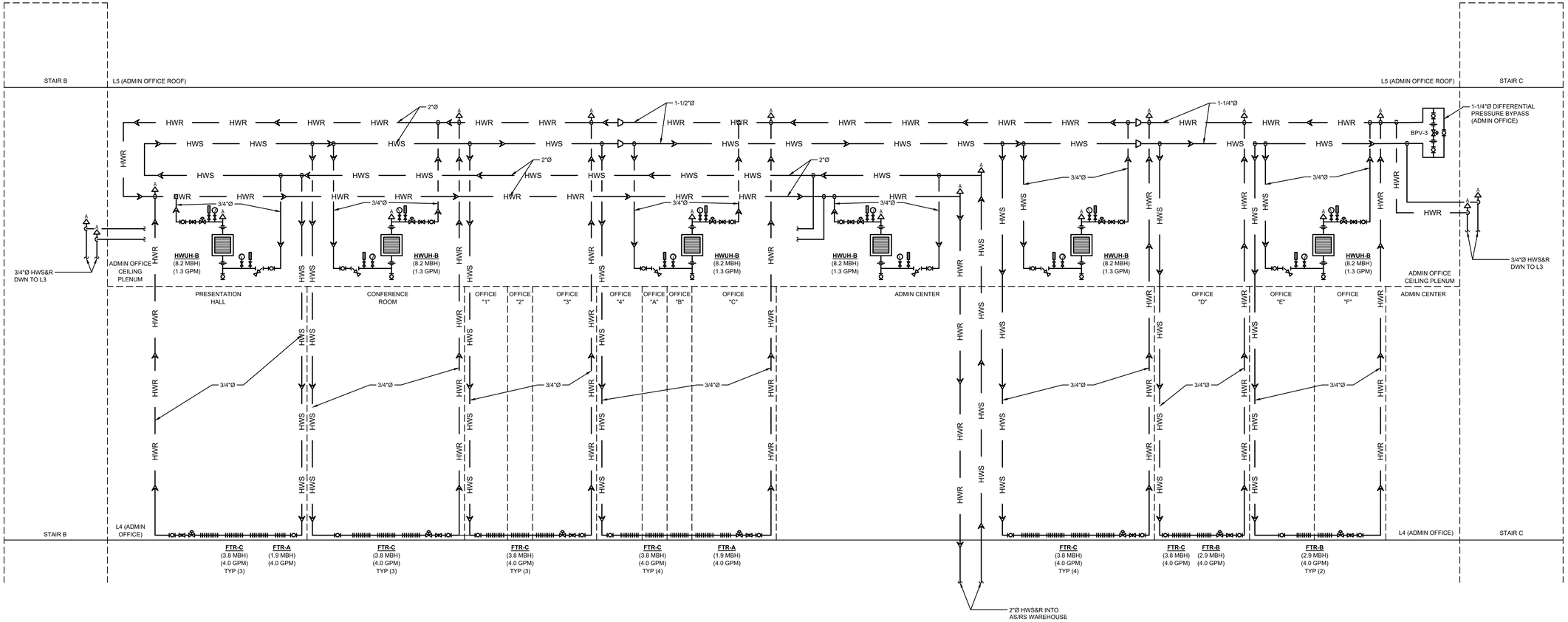
MECHANICAL HOT WATER FLOW DIAGRAM SHEET #3

DWG NUMBER :

M-303



1 / M-304 MECHANICAL HOT WATER FLOW DIAGRAM-ADMIN OFFICE

SCALE: NTS

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SCALE :

DRAWING TITLE :

MECHANICAL HOT WATER FLOW DIAGRAM SHEET #4

DWG NUMBER :

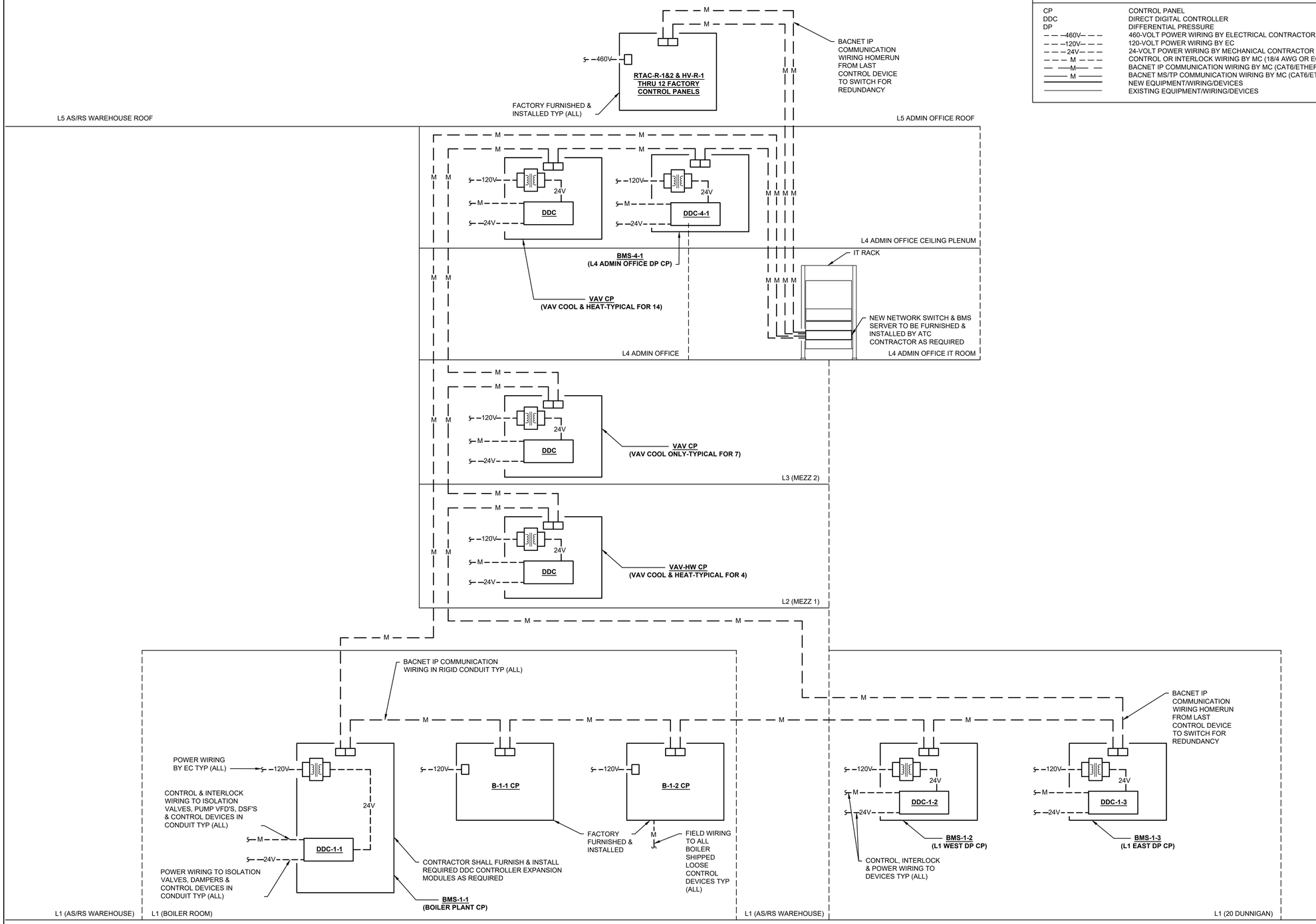
M-304

CONTROL NOTES

1. ALL POWER, CONTROL & INTERLOCK WIRING TO BE IN CONDUIT.
2. ATC SHALL FURNISH & INSTALL 120V-TO-24V STEP-DOWN TRANSFORMERS IN CONTROL PANELS AS REQUIRED FOR CONTROL DEVICE POWER; COORDINATE 120V POWER WITH ELECTRICAL CONTRACTOR.
3. ALL CONTROL DEVICES ARE 24-VOLT POWER UNLESS OTHERWISE NOTED.

CONTROL LEGEND

CP	CONTROL PANEL
DDC	DIRECT DIGITAL CONTROLLER
DP	DIFFERENTIAL PRESSURE
– – –460V– – –	460-VOLT POWER WIRING BY ELECTRICAL CONTRACTOR (EC)
– – –120V– – –	120-VOLT POWER WIRING BY EC
– – –24V– – –	24-VOLT POWER WIRING BY MECHANICAL CONTRACTOR (MC)
– – – M – – –	CONTROL OR INTERLOCK WIRING BY MC (18/4 AWG OR EQUIVALENT)
– – –M– – –	BACNET IP COMMUNICATION WIRING BY MC (CAT6/ETHERNET OR EQUAL)
——— M ———	BACNET MS/TP COMMUNICATION WIRING BY MC (CAT6/ETHERNET OR EQUAL)
———	NEW EQUIPMENT/WIRING/DEVICES
———	EXISTING EQUIPMENT/WIRING/DEVICES



1 M-305 **MECHANICAL MBD BMS SYSTEM ARCHITECTURE**
SCALE: NTS

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MECHANICAL CONTROLS SHEET #1

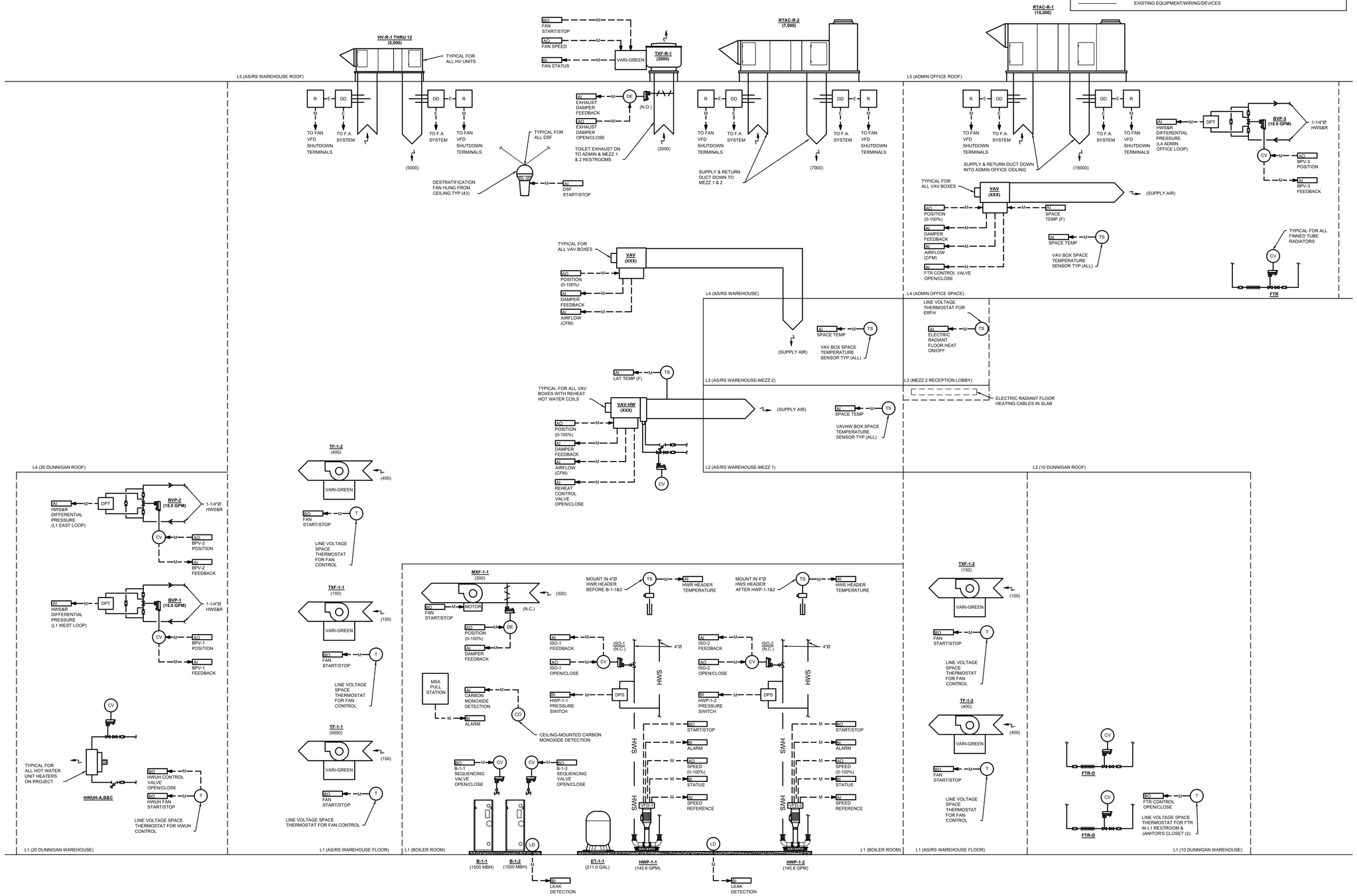
DWG NUMBER :
M-305

CONTROL NOTES

1. ALL POWER, CONTROL & INTERLOCK WIRING TO BE IN CONDUIT.
2. ATC SHALL FURNISH & INSTALL 120V-TO-24V STEP-DOWN TRANSFORMERS IN CONTROL PANELS AS REQUIRED FOR CONTROL DEVICE POWER; COORDINATE 120V POWER WITH ELECTRICAL CONTRACTOR.
3. ALL CONTROL DEVICES ARE 24-VOLT POWER UNLESS OTHERWISE NOTED.

CONTROL LEGEND

CP	CONTROL PANEL
DDC	DIRECT DIGITAL CONTROLLER
DP	DIFFERENTIAL PRESSURE
—460V—	460-VOLT POWER WIRING BY ELECTRICAL CONTRACTOR (EC)
—120V—	120-VOLT POWER WIRING BY EC
— 24V —	24-VOLT POWER WIRING BY MECHANICAL CONTRACTOR (MC)
— M —	CONTROL OR INTERLOCK WIRING BY MC (18/4 AWG OR EQUIVALENT)
—M—	BACNET IP COMMUNICATION WIRING BY MC (CAT6/ETHERNET OR EQUAL)
M	BACNET MS/TP COMMUNICATION WIRING BY MC (CAT6/ETHERNET OR EQUAL)
	NEW EQUIPMENT/WIRING/DEVICES
	EXISTING EQUIPMENT/WIRING/DEVICES



1 / M-306 MECHANICAL MBD BMS CONTROL DIAGRAMS
SCALE: NTS

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DRAWING TITLE :

MECHANICAL CONTROLS SHEET #2

DWG NUMBER :

M-306

LOCATED IN BMS-1-1 CP

DDC-1-1 (BOILER PLANT CONTROLLER)

	HARDWIRED POINTS				SOFTWARE POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**TREND**	**BMS GRAPHIC**
CARBON DIOXIDE DETECTION ALARM			X			X		X
BOILER ROOM EMERGENCY PULL STATION ALARM			X			X		X
MXF-1-1 START/STOP			X			X		X
MXF-1-1 DAMPER OPEN/CLOSE		X						
MXF-1-1 DAMPER FEEDBACK	X				X			X
B-1-1 START/STOP						X		X
B-1-1 HWS TEMPERATURE SETPOINT					X			X
B-1-2 START/STOP						X		X
B-1-2 HWS TEMPERATURE SETPOINT					X			X
HWP-1-1 ISO-1 VALVE OPEN/CLOSE		X						
HWP-1-1 ISO-1 VALVE FEEDBACK	X				X			X
HWP-1-1 DIFFERENTIAL PRESSURE SWITCH PROVE			X			X		X
HWP-1-1 VFD START/STOP				X				
HWP-1-1- VFD COMMON ALARM			X			X		X
HWP-1-1 VFD SPEED (0-100%)		X						X
HWP-1-1 VFD SPEED REFERENCE (0-100%)	X				X			X
HWP-1-1 VFD STATUS			X			X		X
HWP-1-2 ISO-2 VALVE OPEN/CLOSE		X						
HWP-1-2 ISO-2 VALVE FEEDBACK	X				X			X
HWP-1-2 DIFFERENTIAL PRESSURE SWITCH PROVE			X			X		X
HWP-1-2 VFD START/STOP				X				
HWP-1-2- VFD COMMON ALARM			X			X		X
HWP-1-2 VFD SPEED (0-100%)		X						X
HWP-1-2 VFD SPEED REFERENCE (0-100%)	X				X			X
HWP-1-2 VFD STATUS			X			X		X
HWR HEADER TEMPERATURE (F)	X				X			X
HWS HEADER TEMPERATURE (F)	X				X			X
BOILER ROOM LEAK DETECTION #1 ALARM			X			X		X
BOILER ROOM LEAK DETECTION #2 ALARM			X			X		X
L1 WEST LOOP HWS&R DIFFERENTIAL PRESSURE					X			X
L1 WEST LOOP BPV-1 POSITION					X			X
L1 WEST LOOP BPV-1 FEEDBACK					X			X
L1 EAST LOOP HWS&R DIFFERENTIAL PRESSURE					X			X
L1 EAST LOOP BPV-2 POSITION					X			X
L1 EAST LOOP BPV-2 FEEDBACK					X			X
Totals	**7**	**5**	**11**	**2**	**15**	**13**	**0**	**30**
Totals	**25**				**28**			

LOCATED IN BMS-1-2 CP

DDC-1-2 (L1 WEST LOOP DP CONTROL)

	HARDWIRED POINTS				SOFTWARE POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**TREND**	**BMS GRAPHIC**
L1 WEST LOOP HWS&R DIFFERENTIAL PRESSURE	X							
L1 WEST LOOP BPV-1 POSITON (0-100%)		X						
L1 WEST LOOP BPV-1 FEEDBACK (0-100%)	X							
Totals	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
Totals	**3**				**0**			

LOCATED IN BMS-1-3 CP

DDC-1-3 (L1 EAST LOOP DP CONTROL)

	HARDWIRED POINTS				SOFTWARE POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**TREND**	**BMS GRAPHIC**
L1 EAST LOOP HWS&R DIFFERENTIAL PRESSURE	X							
L1 EAST LOOP BPV-2 POSITON (0-100%)		X						
L1 EAST LOOP BPV-2 FEEDBACK (0-100%)	X							
Totals	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
Totals	**3**				**0**			

LOCATED IN BMS-4-1 CP

DDC-4-1 (L4 ADMIN LOOP DP & FAN CONTROL)

	HARDWIRED POINTS				SOFTWARE POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**TREND**	**BMS GRAPHIC**
L4 ADMIN LOOP HWS&R DIFFERENTIAL PRESSURE	X				X			X
L4 ADMIN LOOP BPV-3 POSITON (0-100%)		X						
L4 ADMIN LOOP BPV-3 FEEDBACK (0-100%)	X				X			X
TXF-R-1 FAN START/STOP				X				
TXF-R-1 FAN SPEED	X				X			X
TXF-R-1 FAN STATUS			X			X		X
DESTRATIFICATION FAN START/STOP		X						
Totals	**3**	**2**	**1**	**1**	**1**	**1**	**0**	**2**
Totals	**7**				**2**			

TYPICAL FOR ALL

VAV BOX DDC (COOLING ONLY)

	HARDWIRED POINTS				SOFTWARE POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**TREND**	**BMS GRAPHIC**
SPACE TEMPERATURE (F)	X				X			X
DAMPER POSITION (0-100%)		X						
DAMPER FEEDBACK (0-100%)	X				X			X
AIRFLOW (CFM)	X				X			X
SPACE TEMPERATURE OVERRIDE SETPOINT (F)					X			X
AIRFLOW OVERRIDE (CFM)					X			X
Totals	**3**	**1**	**0**	**0**	**5**	**0**	**0**	**5**
Totals	**4**				**5**			

TYPICAL FOR ALL

VAV-HW BOX DDC (COOL & HEAT)

	HARDWIRED POINTS				SOFTWARE POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**TREND**	**BMS GRAPHIC**
SPACE TEMPERATURE (F)	X				X			X
DAMPER POSITION (0-100%)		X						
DAMPER FEEDBACK (0-100%)	X				X			X
AIRFLOW (CFM)	X				X			X
SAT (F)	X				X			X
REHEAT HW VALVE POSITION (0-100%)		X						
REHEAT HW VALVE FEEDBACK (0-100%)	X				X			X
REHEAT HW VALVE POSITION OVERRIDE					X			X
SPACE TEMPERATURE OVERRIDE SETPOINT (F)					X			X
AIRFLOW OVERRIDE (CFM)					X			X
Totals	**5**	**2**	**0**	**0**	**8**	**0**	**0**	**8**
Totals	**7**				**8**			

TYPICAL FOR ALL

VAV BOX DDC (COOL & HEAT)

	HARDWIRED POINTS				SOFTWARE POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**TREND**	**BMS GRAPHIC**
SPACE TEMPERATURE (F)	X				X			X
DAMPER POSITION (0-100%)		X						
DAMPER FEEDBACK (0-100%)	X				X			X
AIRFLOW (CFM)	X				X			X
FTR HW VALVE OPEN/CLOSE				X				
FTR HW VALVE FEEDBACK			X			X		X
SPACE TEMPERATURE OVERRIDE SETPOINT (F)					X			X
AIRFLOW OVERRIDE (CFM)					X			X
Totals	**3**	**1**	**1**	**1**	**5**	**1**	**0**	**6**
Totals	**6**				**6**			

TYPICAL FOR ALL

HWUH THERMOSTAT

	HARDWIRED POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**
HWUH FAN START/STOP				X
HWUH HW VALVE OPEN/CLOSE				X
Totals	**0**	**0**	**0**	**2**
Totals	**2**			

TYPICAL FOR ALL

FTR THERMOSTAT

	HARDWIRED POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**
FTR HW VALVE OPEN/CLOSE				X
Totals	**0**	**0**	**0**	**1**
Totals	**1**			

TYPICAL FOR ALL

FAN THERMOSTAT

	HARDWIRED POINTS			
POINT NAME	**AI**	**AO**	**BI**	**BO**
FAN START/STOP				X
Totals	**0**	**0**	**0**	**1**
Totals	**1**			

1 / M-307 MECHANICAL MBD CONTROL POINTS LIST

SCALE: NTS

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	ISSUED FOR PROGRESS	01/18/2022

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MECHANICAL
CONTROLS SHEET #3

DWG NUMBER :

M-307

HOT WATER BOILER PLANT SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH & INSTALL ALL FIELD WIRING, CONTROLLERS, CONTROL PANELS, ETC. AS REQUIRED FOR OPERATION BELOW.
2. THE BUILDING MANAGEMENT SYSTEM (BMS) SHALL CONTROL, MONITOR, AND AUTOMATE THE OPERATION OF THE HEATING HOT WATER SYSTEM. THE SYSTEM CONSISTS OF TWO (2) LOW-PRESSURE CONDENSING HOT-WATER BOILERS & TWO (2) VARIABLE -SPEED HOT WATER PUMPS WITH VFD'S.
3. THE BOILERS SHALL OPERATE UNDER THE FACTORY MOUNTED CONTROLS. THE FACTORY CONTROLLER SHALL HANDLE EQUIPMENT LEVEL PARAMETERS SUCH AS FIRING RATE, DAMPER POSITION, BLOWER CONTROL, SAFETIES, ETC. THE CONTROLLER SHALL BE CAPABLE OF HANDLING MULTIPLE BOILERS IN THE ARRAY TO DETERMINE THE OPTIMAL MODE OF OPERATION FOR EFFICIENCY AND LONGEVITY.
4. THE BOILER CONTROLLER SHALL RECEIVE INPUTS FROM THE BMS FOR PARAMETERS INCLUDING, AT MINIMUM:
   a. BOILER CONTROL SYSTEM START/STOP
   b. HOT WATER SUPPLY TEMPERATURE SETPOINT
5. THE BOILER CONTROLLER SHALL SEND BACK TO THE BMS ALL AVAILABLE ONBOARD DATA POINTS FROM THE BOILERS.
6. SEQUENCE OF OPERATION:
   a. THE LEAD BOILER SHALL BE INDEXED ON WHEN OUTSIDE AIR TEMPERATURE FALLS BELOW 50°F (ADJ.) OR THROUGH BMS COMMAND.
   b. UPON A COMMAND TO ENABLE THE HOT WATER SYSTEM, THE LEAD BOILER SEQUENCING VALVE SHALL OPEN AND THE LEAD HOT WATER PUMP SHALL BE ENERGIZED.
   c. WHEN SEQUENCING VALVE STATUS IS PROVEN, THE BMS SHALL ENABLE THE LEAD BOILER PACKAGED CONTROLS.
   d. THE LEAD BOILER PACKAGED CONTROLS SHALL CONTROL TO MAINTAIN THE HOT WATER SUPPLY TEMPERATURE SETPOINT. THE BMS SHALL HAVE THE CAPABILITY OF ADJUSTING THE HOT WATER SUPPLY TEMPERATURE SETPOINT VIA INTERFACE TO THE PACKAGED BOILER CONTROL PANEL.
   e. THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL BE RESET LINEARLY FROM 100°F (ADJ.) TO 150°F (ADJ.) AS THE OUTSIDE AIR TEMPERATURE FALLS FROM 60°F (ADJ.) TO 0°F (ADJ.).
   f. IF THE HOT WATER SUPPLY TEMPERATURE FALLS BELOW SETPOINT FOR A PERIOD OF 30 MINUTES (ADJ.), THE LAG BOILER WILL BE ENABLED.
   g. UPON A COMMAND TO ENABLE THE LAG BOILER, THE ASSOCIATED LAG BOILER SEQUENCING VALVE SHALL OPEN LAG HOT WATER PUMP SHALL ENABLE.
   h. WHEN SEQUENCING VALVE POSITION AND PUMP FLOW IS PROVEN, THE BMS SHALL ENABLE THE LAG BOILER PACKAGED CONTROLS.
   i. THE BOILER PACKAGED CONTROLS SHALL CONTROL TO MAINTAIN THE HOT WATER SUPPLY TEMPERATURE SETPOINT.
   j. IF BOTH BOILERS (LEAD AND LAG) ARE ENABLED AND THE HOT WATER LOAD FALLS BELOW THE HEATING CAPABILITIES OF THE LEAD BOILER FOR A PERIOD OF 30 MINUTES (ADJ.), THE LAG BOILER SHALL BE DISABLED. ONCE THE LAG BOILER HAS BEEN DISABLED, THE ASSOCIATED LAG HOT WATER PUMP SHALL BE DE-ENERGIZED.
   k. THE BOILERS SHALL OPERATE WITH A LEAD/LAG PROGRAM. THE LEAD BOILER SHALL BE THE BOILER WITH THE LOWER RUNTIME HOURS. THE LAG BOILER SHALL BE THE BOILER WITH THE HIGHER RUNTIME HOURS. THE LEAD AND LAG BOILERS SHALL BE INDEXED ON A WEEKLY BASIS AT A MINIMUM (ADJ.). FACILITY PERSONNEL SHALL HAVE THE ABILITY TO OVERRIDE THE PRIORITY OF EACH BOILER.
   l. AT ANY TIME A BOILER COMMON ALARM IS INDICATED, AN ALARM SHALL BE GENERATED ON THE BMS THAT NOTIFIES THE BMS OPERATOR OF THE SPECIFIC BOILER THAT HAS FAILED AND THAT BOILER AND THE ASSOCIATED HOT WATER PUMP SHALL BE COMMANDED OFF. IF THE FAILED BOILER IS THE LEAD BOILER, THE LAG BOILER SHALL BECOME THE LEAD. IF THE FAILED BOILER IS THE LAG BOILER, THE LAG BOILER SHALL BE LOCKED OUT.
   m. EACH HOT WATER PUMP SHALL BE DEDICATED TO ONE (1) OF THE BOILERS. AT ANY TIME A PUMP COMMAND DOES NOT EQUAL A PUMP STATUS, EXCEPT IMMEDIATELY AFTER STARTUP, A PUMP FAILURE ALARM SHALL BE GENERATED ON THE BMS THAT NOTIFIES THE BMS OPERATOR OF THE SPECIFIC PUMP THAT HAS FAILED AND THAT PUMP AND THE ASSOCIATED BOILER SHALL BE COMMANDED OFF. THE BMS SHALL WAIT 30 SECONDS AFTER STARTUP TO SEE THE PUMP STATUS CHANGE BEFORE INDICATING A PUMP FAILURE ALARM. IF THE FAILED PUMP IS ASSOCIATED WITH THE LEAD BOILER, THE LAG BOILER SHALL BECOME THE LEAD. IF THE FAILED PUMP IS ASSOCIATED WITH THE LAG BOILER, THE LAG BOILER SHALL BE LOCKED OUT.
   n. HOT WATER PUMP CONTROL: THE LEAD HOT WATER PUMP SHALL BE ENERGIZED ANY TIME EITHER BOILER IS ENABLED.
   o. THE LEAD HOT WATER PUMP VFD SHALL MODULATE AS NECESSARY TO MAINTAIN THE SYSTEM DIFFERENTIAL PRESSURE SETPOINT (ADJ). UPON HOT WATER SYSTEM START UP, ALL HEATING LOOP BYPASS VALVES (3) SHALL BE CLOSED. THE VARIABLE FREQUENCY DRIVE SHALL START AT 0% AND SLOWLY RAMP UP TO SPEED AS REQUIRED BY THE DIFFERENTIAL PRESSURE SENSORS. DIFFERENTIAL PRESSURE SENSORS SHALL BE LOCATED AT THE END OF EACH HEATING LOOP AS SHOWN ON THE MECHANICAL PLANS. THE BMS SHALL MAINTAIN EACH SENSOR AT SETPOINT (I.E., THE SENSOR WITH THE LOWEST READING SHALL BE THE CONTROLLING SENSOR). EACH DIFFERENTIAL PRESSURE SENSOR SHALL BE WIRED TO THE DDC CONTROLLER IN THE AREA AND SHALL BE COMMUNICATED VIA BACNET BACK TO THE MAIN BOILER PLANT CONTROLLER. IF THE VFD IS CONTROLLING AT THE MINIMUM ALLOWED LEVEL, THE RESPECTIVE BYPASS VALVE (CONTROLLING DIFFERENTIAL PRESSURE SENSOR) SHALL BE MODULATED OPEN AS REQUIRED TO MAINTAIN THE SYSTEM DIFFERENTIAL PRESSURE SETPOINT. THE BYPASS VALVE SHALL ONLY BE MODULATED OPEN WHEN THE VFD IS CONTROLLING AT ITS MINIMUM LEVEL. THE BYPASS VALVE SHALL BE MODULATED CLOSED BEFORE THE SIGNAL TO THE VFD IS INCREASED ABOVE THE MINIMUM LEVEL.
   p. AT ANY TIME A PUMP COMMAND DOES NOT EQUAL A PUMP STATUS, EXCEPT IMMEDIATELY AFTER STARTUP, OR A VFD COMMON ALARM IS INDICATED; A PUMP FAILURE ALARM SHALL BE GENERATED ON THE BMS THAT NOTIFIES THE BMS OPERATOR OF THE SPECIFIC PUMP THAT HAS FAILED AND THAT PUMP SHALL BE COMMANDED OFF. THE BMS SHALL WAIT 30 SECONDS AFTER STARTUP TO SEE THE PUMP STATUS CHANGE BEFORE INDICATING A PUMP FAILURE ALARM. AN AUTOMATIC LEAD/LAG PROGRAM SHALL START THE LAG PUMP IN THE EVENT OF A LEAD PUMP FAILURE.
7. EMERGENCY SHUT DOWN:
   a. ACTIVATION OF THE MANUAL PULL STATION, AS SHOWN ON THE MECHANICAL DRAWINGS, FOR THE EMERGENCY SHUTDOWN OF THE BOILER PLANT SHALL OVERRIDE ALL CONTROL STRATEGIES TO SHUTDOWN THE BOILER PLANT (I.E., BOILERS & HOT WATER PUMPS).
8. LEAK DETECTION:
   a. A TAPE-TYPE LEAK DETECTOR SHALL BE PROVIDED ON THE HOUSEKEEPING PAD FOR EQUIPMENT AS SHOWN ON THE MECHANICAL PLANS.
   b. THE LEAK DETECTOR SHALL ALARM AT THE BMS AND SHUTDOWN THE BOILER PLANT EQUIPMENT (ADJ).

VARIABLE AIR VOLUME (VAV-HW) & CONSTANT VOLUME (CV-HW) BOX WITH HOT WATER REHEAT COIL SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH & INSTALL ALL FIELD WIRING, CONTROLLERS, CONTROL PANELS, ETC. AS REQUIRED FOR OPERATION BELOW.
2. COORDINATE FACTORY MOUNTING AND WIRING OF CONTROL PANEL, ACTUATOR, TRANSFORMER AND HOT WATER VALVE WITH THE VAV BOX MANUFACTURER. THE BMS CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING, INSTALLING AND WIRING OF CONTROLS NOT FURNISHED, INSTALLED, OR WIRED BY OTHERS THAT ARE REQUIRED FOR AN OPERATIONAL SYSTEM.
3. OCCUPIED MODE:
   a. UPON A FALL IN SPACE TEMPERATURE BELOW SETPOINT, 75F-COOLING, 70F-HEATING (ADJ), THE BOX DAMPER SHALL MODULATE CLOSED TO THE MINIMUM CFM SETPOINT. UPON A FURTHER FALL IN SPACE TEMPERATURE, THE BOX DAMPER SHALL MODULATE TO THE HEATING CFM SETPOINT AND THE HOT WATER REHEAT VALVE SHALL MODULATE AS NECESSARY TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. UPON A RISE IN SPACE TEMPERATURE, THE HOT WATER REHEAT VALVE SHALL CLOSE. UPON A FURTHER RISE IN SPACE TEMPERATURE, THE BOX DAMPER SHALL MODULATE FROM THE MINIMUM TO THE MAXIMUM CFM SETTING AS NECESSARY TO MAINTAIN THE CFM SETPOINT AS RESET BY THE SPACE TEMPERATURE. THE MINIMUM AND MAXIMUM CFM SETTINGS SHALL BE THOSE SCHEDULED ON THE MECHANICAL DRAWINGS.
   b. THE CAV BOX DAMPER SHALL MODULATE AS NECESSARY TO MAINTAIN THE CFM SETPOINT. THE CAV BOX HOT WATER REHEAT VALVE SHALL MODULATE AS NECESSARY TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. THE CFM SETPOINT SHALL BE AS SCHEDULED ON THE MECHANICAL DRAWINGS
4. UNOCCUPIED MODE:
   a. THE VAV BOX DAMPER SHALL CLOSE AND THE REHEAT VALVE SHALL REMAIN CLOSED.
   b. IF THE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED SETBACK TEMPERATURE SETPOINT OF 60F (ADJ.) OR RISES ABOVE THE UNOCCUPIED SETUP TEMPERATURE SETPOINT OF 80F (ADJ.), THE FAN SYSTEM SERVING THE VAV BOX SHALL BE ENABLED AND THE VAV BOX SHALL BE INDEXED TO THE MAXIMUM CFM SETTING. THE FAN SYSTEM SHALL RUN FOR A MINIMUM OF 1/2 HOUR (ADJ.).
5. THE VAV BOX SHALL NOT OPEN BEYOND THE MAXIMUM CFM SETTING.
6. FURNISH & INSTALL ONE (1) DDC CONTROLLER AND ONE (1) TEMPERATURE SENSOR FOR EACH VAV BOX.
7. CONSULT MECHANICAL CONTROL POINTS LIST FOR MORE INFORMATION.

VARIABLE AIR VOLUME (VAV) & CONSTANT VOLUME (CV) BOX (COOLING ONLY) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH & INSTALL ALL FIELD WIRING, CONTROLLERS, CONTROL PANELS, ETC. AS REQUIRED FOR OPERATION BELOW.
2. COORDINATE FACTORY MOUNTING AND WIRING OF CONTROL PANEL, ACTUATOR, TRANSFORMER AND HOT WATER VALVE WITH THE VAV BOX MANUFACTURER. THE BMS CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING, INSTALLING AND WIRING OF CONTROLS NOT FURNISHED, INSTALLED, OR WIRED BY OTHERS THAT ARE REQUIRED FOR AN OPERATIONAL SYSTEM.
3. OCCUPIED MODE:
   a. UPON A FALL IN SPACE TEMPERATURE BELOW SETPOINT, 75F (ADJ), THE BOX DAMPER SHALL MODULATE CLOSED TO THE MINIMUM CFM SETPOINT. UPON A RISE IN SPACE TEMPERATURE, THE BOX DAMPER SHALL MODULATE FROM THE MINIMUM TO THE MAXIMUM CFM SETTING AS NECESSARY TO MAINTAIN THE CFM SETPOINT AS RESET BY THE SPACE TEMPERATURE. THE MINIMUM AND MAXIMUM CFM SETTINGS SHALL BE THOSE SCHEDULED ON THE MECHANICAL DRAWINGS.
   b. THE CAV BOX DAMPER SHALL MODULATE AS NECESSARY TO MAINTAIN THE CFM SETPOINT. THE CFM SETPOINT SHALL BE AS SCHEDULED ON THE MECHANICAL DRAWINGS.
4. UNOCCUPIED MODE:
   a. WHEN THE PRIMARY FAN SYSTEM SERVING THE VAV BOX IS NOT RUNNING, THE VAV BOX DAMPER SHALL CLOSE.
   b. IF THE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED SETBACK TEMPERATURE SETPOINT OF 60F (ADJ.) OR RISES ABOVE THE UNOCCUPIED SETUP TEMPERATURE SETPOINT OF 80F (ADJ.), THE FAN SYSTEM SERVING THE VAV BOX SHALL BE ENABLED AND THE VAV BOX SHALL BE INDEXED TO THE MAXIMUM CFM SETTING. THE FAN SYSTEM SHALL RUN FOR A MINIMUM OF 1/2 HOUR (ADJ.).
5. THE VAV BOX SHALL NOT OPEN BEYOND THE MAXIMUM CFM SETTING.
6. FURNISH & INSTALL ONE (1) DDC CONTROLLER AND ONE (1) TEMPERATURE SENSOR FOR EACH VAV BOX.
7. CONSULT MECHANICAL CONTROL POINTS LIST FOR MORE INFORMATION.

HOT WATER UNIT HEATER (HWUH-A,B&C) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH, INSTALL AND WIRE A SPACE THERMOSTAT TO CONTROL THE HOT WATER UNIT HEATER.
2. OCCUPIED/UNOCCUPIED MODE:
   a. ON A FALL IN SPACE TEMPERATURE BELOW SETPOINT, 65F (ADJ), THE THERMOSTAT SHALL ENERGIZE THE UNIT FAN AND OPEN THE CONTROL VALVE TO MAINTAIN THE SPACE TEMPERATURE SETPOINT.
   b. ON A RISE IN SPACE TEMPERATURE, THE FAN SHALL BE DE ENERGIZED AND THE CONTROL VALVE SHALL REMAIN CLOSED.
   c. THE UNIT HEATER SHALL OPERATE INDEPENDENT OF THE BMS.

ELECTRIC UNHEATED AIR CURTAIN (ACUR-1-A&B) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH & INSTALL ALL FIELD WIRING & MOUNTING OF CONTROL PANELS, ETC. AS REQUIRED FOR OPERATION BELOW.
2. THE ELECTRIC AIR CURTAINS SHALL BE CONTROLLED VIA DOOR SWITCH.
3. UPON OPEN OF THE DOOR SWITCH, THE ELECTRIC AIR CURTAIN SHALL ENABLED AND MAINTAIN CONSTANT AIR VOLUME UNTIL THE DOOR SWITCH CLOSES.
4. THE AIR CURTAIN SHALL OPERATE INDEPENDENT OF THE BMS.

TOILET EXHAUST FAN (TXF ALL) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH & INSTALL ALL FIELD WIRING & MOUNTING OF CONTROL PANELS, ETC. AS REQUIRED FOR OPERATION BELOW.
2. THE FAN SHALL BE STARTED/STOPPED BASED UPON A TIME OF DAY SCHEDULE OR MANUAL COMMAND AND RUN CONTINUOUSLY.
3. UPON A COMMAND TO START THE FAN, THE FAN MOTORIZED DAMPER SHALL OPEN (IF APPLICABLE).
4. WHEN THE DAMPER IS OPEN, AS SENSED BY A DAMPER END SWITCH, THE FAN SHALL ENERGIZE.
5. UPON A COMMAND TO DE-ENERGIZE THE FAN, THE DISCHARGE DAMPER SHALL HAVE AN ADJUSTABLE TIME DELAY TO KEEP THE DAMPER OPEN UP TO 30 SECONDS AFTER THE FAN IS DE-ENERGIZED.

TRANSFER FANS (TF ALL) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH, INSTALL AND WIRE A SPACE THERMOSTAT TO CONTROL THE TRANSFER FAN.
2. OCCUPIED/UNOCCUPIED MODE:
   a. ON A FALL IN SPACE TEMPERATURE BELOW SETPOINT, 70F (ADJ), THE THERMOSTAT SHALL ENERGIZE THE UNIT FAN TO MAINTAIN THE SPACE TEMPERATURE SETPOINT.
   b. ON A RISE IN SPACE TEMPERATURE, THE FAN SHALL BE DE ENERGIZED.
   c. THE TRANSFER FAN SHALL OPERATE INDEPENDENT OF THE BMS.

HOT WATER FINNED TUBE RADIATORS (FTR) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH & INSTALL ALL FIELD WIRING & MOUNTING OF CONTROL VALVES, TEMPERATURE SENSORS, THERMOSTATS, PANELS, ETC. AS REQUIRED FOR OPERATION BELOW.
2. OCCUPIED MODE:
   a. DURING OCCUPIED MODE, THE RADIATOR CONTROL VALVE SHALL MODULATE AS REQUIRED TO MAINTAIN THE SPACE TEMPERATURE SETPOINT, 70F (ADJ).
3. UNOCCUPIED MODE:
   a. DURING UNOCCUPIED MODE, THE RADIATOR CONTROL VALVE SHALL MODULATE AS NECESSARY TO MAINTAIN THE NIGHT SETBACK SPACE TEMPERATURE SETPOINT, 60F (ADJ).
4. IF A SPACE IS SERVED BY RADIATOR AND A VAV BOX, THE RADIATOR CONTROL VALVE SHALL NOT BE OPENED TO MAINTAIN SPACE TEMPERATURE UNTIL THE VAV BOX DAMPER IS AT MINIMUM POSITION.
5. THE VAV BOX DAMPER SHALL NOT OPEN BEYOND MINIMUM POSITION UNTIL THE RADIATIOR CONTROL VALVE IS FULLY CLOSED.

ELECTRIC RADIANT FLOOR HEATING (ERFH) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL FURNISH, INSTALL AND WIRE A SPACE THERMOSTAT TO CONTROL THE ELECTRIC RADIANT FLOOR HEATING.
2. OCCUPIED/UNOCCUPIED MODE:
   a. ON A FALL IN SPACE TEMPERATURE BELOW SETPOINT, 70F (ADJ), THE THERMOSTAT SHALL ENERGIZE THE ELECTRIC RADIANT FLOOR HEATING AS REQUIRED TO MAINTAIN THE SPACE TEMPERATURE SETPOINT.
   b. ON A RISE IN SPACE TEMPERATURE, THE ELECTRIC RADIANT FLOOR HEATING SHALL BE DE-ENERGIZED.
   c. THE ELECTRIC RADIANT FLOOR HEATING SHALL OPERATE INDEPENDENT OF THE BMS.
3. THE BMS CONTROL CONTRACTOR SHALL COORDINATE REQUIRED RELAYS WITH THE ELECTRICAL CONTRACTOR AS REQUIRED FOR SINGLE THERMOSTAT OPERATION.

ROOFTOP AIR CONDITIONING UNIT WITH GAS-FIRED FURANCE (RTAC-R-1&2) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL COORDINATE WIRING OF ALL MANUFACTURER SHIPPED LOOSE CONTROL ACCESSORIES, ETC. AS REQUIRED FOR OPERATION BELOW.
2. EACH ROOFTOP AC UNIT SHALL HAVE A MICROPROCESSOR- BASED CONTROLLER WHICH SHALL MONITOR AND CONTROL THE ROOFTOP UNIT IN A STAND-ALONE MODE OR AS DIRECTED BY THE BUILDING MANAGEMENT SYSTEM.
3. THE ROOFTOP AC CONTROL PANEL SHALL HAVE A HUMAN INTERFACE PANEL WITH A CLEAR ENGLISH LCD DISPLAY AND KEYPAD FOR MONITORING, SETTING, EDITING AND CONTROLLING.
4. THE UNIT SHALL BE STARTED AND STOPPED BY THE PACKAGED CONTROLS BASED UPON A TIME OF DAY SCHEDULE OR BMS.
5. FACILITY PERSONNEL SHALL HAVE THE ABILITY TO MANUALLY OVERRIDE THE UNIT ON VIA THE UNIT'S PACKAGED CONTROLS LCD DISPLAY.
6. WHEN THE UNIT IS INDEXED "ON," THE SUPPLY, RETURN & EXHAUST DAMPERS SHALL MODULATE TO THE POSITION AS SET BY THE AIR BALANCER. THE UNIT SHALL START ONLY AFTER ALL DAMPERS ARE IN THE PROPER POSITION, AS PROVEN BY INDIVIDUAL DAMPER END SWITCHES. DAMPERS SHALL BE CONTROLLED VIA THE UNIT'S PACKAGED CONTROLS.
7. THE UNIT SHALL BE PROVIDED WITH AN OUTSIDE AIR TEMPERATURE SENSOR TO DETERMINE OPERATING MODE.
8. COOLING:
   a. GAS-FIRED HEATING SHALL BE LOCKED OUT, DUCT MOUNTED DISCHARGE AIR TEMPERATURE SENSOR SHALL CYCLE REFRIGERATION CIRCUIT TO MAINTAIN SETPOINT.
9. HEATING:
   a. COMPRESSORS SHALL BE LOCKED OUT, IF THE OUTSIDE AIR SENSOR INDICATES A WINTER CONDITION, DUCT MOUNTED DISCHARGE AIR TEMPERATURE SENSOR SHALL STAGE THE GAS-FIRED FURNANCE TO MAINTAIN SETPOINT.
   b. AN AIR FLOW SWITCH SHALL PREVENT OPERATION OF THE GAS-FIRED FURNACE WHEN THERE IS A LOSS OF AIR FLOW.
   c. ECONOMIZER MODE SHALL BE LOCKED OUT AND THE UNIT SHALL UTILIZE MINIMUM OUTSIDE AIR.
10. ECONOMIZER:
   a. OUTSIDE AIR TEMPERATURE SENSOR SHALL INDEX SYSTEM TO ECONOMIZER MODE WHENEVER OUTSIDE AIR CONDITIONS PERMIT.
   b. DISCHARGE AIR TEMPERATURE SENSOR SHALL MODULATE MAXIMUM OUTSIDE AIR AND RETURN AIR DAMPERS TO MAINTAIN SETPOINT.
   c. SPILL AIR DAMPER SHALL MODULATE OPEN AS REQUIRED.
   d. WHEN THE UNIT IS INDEXED "OFF," REFRIGERATION CIRCUIT SHALL BE LOCKED OUT AND GAS-FIRED FURNACE SHALL BE DE-ENERGIZED, FANS SHALL BE OFF, OUTSIDE AIR DAMPER SHALL CLOSE AND RETURN AIR DAMPER SHALL OPEN. ALL OTHER DAMPER SHALL BE CLOSED.
11. SMOKE DETECTORS:
   a. FURNISHED BY ELECTRICAL CONTRACTOR AND INSTALLED BY MECHANICAL CONTRACTOR.
   b. LOCATED IN THE SUPPLY & RETURN AIR DUCTWORK SHALL AUTOMATICALLY SHUTDOWN FANS UPON THE DETECTION OF SMOKE.
   c. ELECTRICAL CONTRACTOR SHALL INTERLOCK ALARM SIGNAL WITH BASE BUILDING FIRE ALARM SYSTEM.
12. THIS CONTRACTOR SHALL PROVIDE ALL FIELD WIRING BETWEEN THE UNIT'S PACKAGED CONTROLS AND THE FAN VFD.
13. ALL DAMPER POSITIONS SHALL BE PROVEN THROUGH END SWITCHES.
14. STATIC PRESSURE CONTROL:
   a. THE STATIC PRESSURE SENSOR SHALL BE INSTALLED IN THE SUPPLY AIR DUCT 2/3 DOWNSTREAM OF THE SUPPLY FAN.
   b. THE CONTROL CONTRACTOR SHALL WIRE THE SENSOR TO THE UNIT'S PACKAGED CONTROLS.
15. THE BUILDING MANAGEMENT SYSTEM (BMS) SHALL HAVE THE ABILITY TO PERFORM THE FOLLOWING ROOFTOP CONTROL STRATEGIES.
16. UNOCCUPIED MODE:
   a. WHEN THE BMS INITIATES THE UNOCCUPIED MODE, THE ROOFTOP SHALL ASSUME THE UNOCCUPIED HEATING AND COOLING SETPOINTS (65F AND 80F) ADJUSTABLE.
   b. IF THE UNOCCUPIED SETPOINTS ARE EXCEEDED, THE UNIT SHALL HEAT OR COOL UNTIL THE ZONE TEMPERATURE IS WITHIN THE UNOCCUPIED SETPOINTS.
17. NIGHT SETBACK TEMPERATURE CONTROL:
   a. DURING UNOCCUPIED HOURS, THE ROOFTOP UNIT SHALL BE CONTROLLED BY THE BMS TO MAINTAIN USER-DEFINED UNOCCUPIED HEATING AND COOLING SETPOINTS. THE OUTDOOR AIR DAMPER SHALL REMAIN CLOSED FOR NIGHT SETBACK OPERATION (UNLESS ECONOMIZING FOR ZONE COOLING). THE FAN SHALL OPERATE IN THE AUTOMATIC CONTROL MODE.
18. PURGE/NIGHT ECONOMIZER:
   a. THE PURGE MODE SHALL TURN ON THE FAN AND ENABLE THE ECONOMIZER DURING UNOCCUPIED HOURS TO COOL A ZONE USING COOL NIGHT OUTDOOR AIR. THROUGH THE BMS TIME OF DAY SCHEDULING, THE OPERATOR SHALL SPECIFY WHEN THE PURGE MODE OCCURS. DURING THE PURGE MODE, THE ECONOMIZER SHALL BE ENABLED WHILE MECHANICAL OUTDOOR COOLING AND HEATING ARE DISABLED.
19. TRANSITION FROM UNOCCUPIED TO OCCUPIED:
   a. WHEN THE UNIT TRANSITIONS FROM THE UNOCCUPIED OPERATION TO OCCUPIED OPERATION, START-UP OR MORNING WARM-UP MODE SHALL BE ACTIVATED.
20. STARTUP MODE:
   a. THE ROOFTOP UNIT CAN BE CONTROLLED TO THE STARTUP MODE BY THE BMS FOR OPTIMAL START PURPOSES.
   b. DURING THE STARTUP MODE, HEATING AND COOLING ARE ENABLED FOR THE ROOFTOP. ON VARIABLE AIR VOLUME UNITS, THE TRANSITION FROM THE UNOCCUPIED TO THE STARTUP MODE MAY INITIATE THE MORNING WARMUP MODE, IF THE SPACE TEMPERATURE IS BELOW THE MORNING WARMUP SETPOINT.
   c. ON BOTH CONSTANT VOLUME AND VARIABLE AIR VOLUME UNITS, THE OUTDOOR AIR DAMPER SHALL REMAIN CLOSED, UNLESS ECONOMIZING, UNTIL THE ZONE'S SCHEDULED OCCUPIED TIME.
21. MORNING WARMUP (CV AND VAV UNITS):
   a. WHEN THE ROOFTOP SHALL CHANGE FROM THE UNOCCUPIED TO THE OCCUPIED MODE, THE UNIT MAY ENTER THE MORNING WARMUP MODE.
   b. THE MORNING WARMUP MODE SHALL BE INITIATED IF THE MORNING WARMUP SENSOR VALUE IS LESS THAN THE MORNING WARMUP SETPOINT.
   c. THE ECONOMIZER SHALL BE KEPT CLOSED AND THE SELECTED ZONE IS HEATED.
   d. THE BMS SHALL SEND THE ROOFTOP UNIT A MORNING WARMUP TEMPERATURE AND SETPOINT.
   e. THE MORNING WARMUP SETPOINT SHALL BE BASED ON ONE SPECIFIC ZONE DESIGNATED BY THE OPERATOR OR BASED ON AN AVERAGE ZONE TEMPERATURE.
22. OCCUPIED OPERATION:
   a. WHEN THE ROOFTOP UNIT IS CONTROLLED TO THE OCCUPIED MODE, ALL ROOFTOP UNIT FUNCTIONS SHALL BE ENABLED.
   b. VARIABLE AIR VOLUME UNITS SHALL OPERATE IN SUPPLY AIR TEMPERATURE CONTROL MODE.
   c. THE ROOFTOP UNIT SHALL DEFAULT TO THIS MODE IN THE EVENT THAT COMMUNICATIONS WITH THE BMS ARE LOST.
23. SUPPLY AIR SETPOINT (VARIABLE AIR VOLUME UNITS):
   a. THE SUPPLY AIR SETPOINT FOR EACH ROOFTOP UNIT SHALL BE 55F FOR COOLING (ADJ) AND 80F FOR HEATING (ADJ).
   b. THE BMS OR RESET AUTOMATICALLY BASED ON AN OUTDOOR AIR OR ZONE TEMPERATURE.
24. DAYTIME WARMUP (VAV UNITS):
   a. WHEN THE ZONE TEMPERATURE DROPS BELOW AN OPERATOR-SPECIFIED DAYTIME WARMUP SETPOINT, THE ROOFTOP SHALL ENTER THE DAYTIME WARMUP MODE.
   b. IN THIS MODE, THE ROOFTOP SHALL SUPPLY HEAT TO THE VAV BOXES BY DRIVING THE VAV BOXES FULLY OPEN AND THE VARIABLE FREQUENCY DRIVE(S) ARE DRIVING TO 100 PERCENT.
   c. AFTER THE ZONE IS WARMED UP, THE UNIT SHALL RESUME NORMAL COOLING. THE BMS SHALL COMMUNICATE THE DAYTIME WARMUP TEMPERATURE VALUE FOR THE ROOFTOP TO USE TO INITIATE THE NECESSARY HEATING FOR THE ZONE.
25. ECONOMIZER CONTROL (CV AND VAV UNITS):
   a. THE BMS SHALL OVERRIDE THE ECONOMIZER CONTROLLER ON THE ROOFTOP UNIT TO PROVIDE FREE COOLING. IF POOR OUTDOOR AIR CONDITIONS EXIST, THE BMS SHALL LOCKOUT ALL ECONOMIZERS. ON CONSTANT VOLUME UNITS THE BMS SHALL ALSO SET THE MINIMUM ECONOMIZER POSITION TO MAINTAIN A MINIMUM OUTDOOR AIR FLOW (CFM). ON VAV UNITS, AS THE SUPPLY FAN MODULATES DOWN, THE MINIMUM ECONOMIZER POSITION SHALL ALSO BE RESET TO COMPENSATE FOR THE REDUCTION IN TOTAL AIRFLOW.
26. TIMED OVERRIDE:
   a. WHEN A TIMED OVERRIDE IS INITIATED BY THE USER, THE ROOFTOP UNIT SHALL RETURN TO ITS NORMAL OCCUPIED MODE FOR A PERIOD OF TIME AS SPECIFIED AT THE BMS. WHEN THE TIMED OVERRIDE PERIOD HAS ENDED, THE UNIT SHALL AUTOMATICALLY RETURN TO ITS UNOCCUPIED CYCLE. THE BMS SHALL MONITOR AND STORE THE OVERRIDE TIME FOR EACH TIMED OVERRIDE INPUT FOR DOCUMENTATION OF AFTER-HOURS OPERATION. THE BMS SHALL ALSO RECOGNIZE A TIMED OVERRIDE FUNCTION IF PROVIDED.

HEATING & VENTILATING UNIT (HV-R-1 THRU 12) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL COORDINATE WIRING OF ALL MANUFACTURER SHIPPED LOOSE CONTROL ACCESSORIES, ETC. AS REQUIRED FOR OPERATION BELOW.
2. EACH ROOFTOP HEATING & VENTILATING UNIT SHALL HAVE A MICROPROCESSOR- BASED CONTROLLER WHICH SHALL MONITOR AND CONTROL THE ROOFTOP UNIT IN A STAND-ALONE MODE OR AS DIRECTED BY THE BUILDING MANAGEMENT SYSTEM.
3. THE ROOFTOP HV CONTROL PANEL SHALL HAVE A HUMAN INTERFACE PANEL WITH CLEAR ENGLISH LCD DISPLAY AND KEYPAD FOR MONITORING, SETTING, EDITING AND CONTROLLING.
4. THE H&V UNIT SHALL BE STARTED AND STOPPED BY THE PACKAGED CONTROLS BASED UPON A TIME OF DAY SCHEDULE OR BMS.
5. FACILITY PERSONNEL SHALL HAVE THE ABILITY TO MANUALLY OVERRIDE THE UNIT ON VIA THE UNIT'S PACKAGED CONTROLS LCD DISPLAY.
6. WHEN THE UNIT IS INDEXED "ON," THE SUPPLY, RETURN & EXHAUST DAMPERS SHALL MODULATE TO THE POSITION AS SET BY THE AIR BALANCER. THE UNIT SHALL START ONLY AFTER ALL DAMPERS ARE IN THE PROPER POSITION, AS PROVEN BY INDIVIDUAL DAMPER END SWITCHES. DAMPERS SHALL BE CONTROLLED VIA THE UNIT'S PACKAGED CONTROLS.
7. OCCUPIED MODE:
   a. HEATING:
   i. IF THE OUTSIDE AIR SENSOR INDICATES A WINTER CONDITION, DUCT MOUNTED DISCHARGE AIR TEMPERATURE SENSOR SHALL STAGE THE GAS-FIRED FURNANCE TO MAINTAIN SETPOINT.
   ii. AN AIR FLOW SWITCH SHALL PREVENT OPERATION OF THE GAS-FIRED FURNACE WHEN THERE IS A LOSS OF AIR FLOW.
   iii. ECONOMIZER MODE SHALL BE LOCKED OUT AND THE UNIT SHALL UTILIZE MINIMUM OUTSIDE AIR.
   b. ECONOMIZER:
   i. OUTSIDE AIR TEMPERATURE SENSOR SHALL INDEX SYSTEM TO ECONOMIZER MODE WHENEVER OUTSIDE AIR CONDITIONS PERMIT.
   ii. DISCHARGE AIR TEMPERATURE SENSOR SHALL MODULATE MAXIMUM OUTSIDE AIR AND RETURN AIR DAMPERS TO MAINTAIN SETPOINT.
   iii. SPILL AIR DAMPER SHALL MODULATE OPEN AS REQUIRED.
   iv. WHEN THE UNIT IS INDEXED "OFF," THE GAS-FIRED FURNACE SHALL BE DE-ENERGIZED, FANS SHALL BE OFF, OUTSIDE, RETURN & EXHAUST AIR DAMPERS SHALL CLOSE.
8. UNOCCUPIED MODE:
   a. THE SUPPLY FAN SHALL REMAIN OFF.
   b. ALL DAMPERS SHALL CLOSE.
   c. THE GAS-FIRED FURNACE SHALL BE DISABLED.
9. SMOKE DETECTORS:
   a. FURNISHED BY ELECTRICAL CONTRACTOR AND INSTALLED BY MECHANICAL CONTRACTOR.
   b. LOCATED IN THE SUPPLY & RETURN AIR DUCTWORK SHALL AUTOMATICALLY SHUTDOWN FANS UPON THE DETECTION OF SMOKE.
   c. ELECTRICAL CONTRACTOR SHALL INTERLOCK ALARM SIGNAL WITH BASE BUILDING FIRE ALARM SYSTEM.

DESTRATIFICATION FANS DSF-4-1 THRU 43) SEQUENCE OF OPERATION:

1. THE BMS CONTRACTOR SHALL COORDINATE WIRING AS REQUIRED FOR OPERATION BELOW.
2. THE DESTRATIFICATIONS SHALL BE STARTED THROUGH THE BMS VIA START/STOP COMMAND OR PROGRAMMABLE SCHEDULED.
3. THE DESTRATIFICATION FANS SHALL MAINTAIN CONSTANT VOLUME.

2 / M-308 MECHANICAL MBD CONTROL SEQUENCES OF OPERATION
SCALE: NTS

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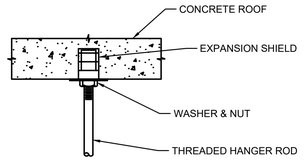
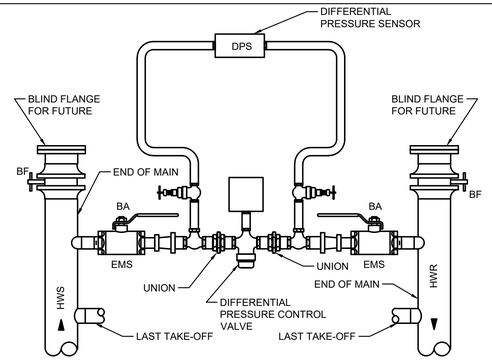
SCALE :

DRAWING TITLE :
MECHANICAL CONTROLS SHEET #3

DWG NUMBER :
M-308

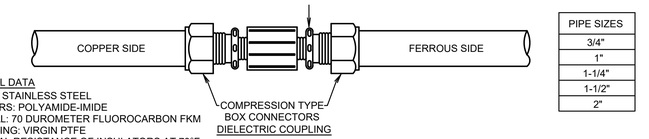


1 M-501 **TYPICAL HANGER EXPANSION SHIELD DETAIL**
SCALE: NTS



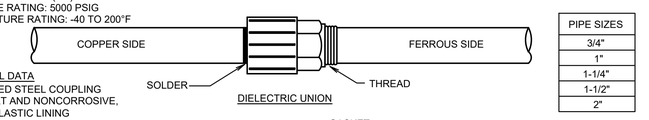
NOTES:
1. PROVIDE DIFFERENTIAL PRESSURE CONTROL ON HOT WATER SYSTEMS.
2. PROVIDE TEST PORTS TO ALLOW CALIBRATION FOR BALANCING CONTRACTOR.

4 M-501 **TYPICAL HYDRONIC DIFFERENTIAL PRESSURE ASSEMBLY**
SCALE: NTS



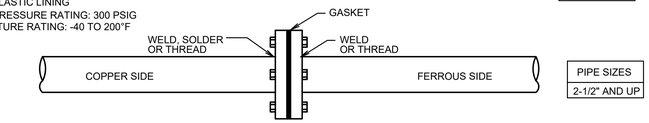
PIPE SIZES
3/4"
1"
1-1/4"
1-1/2"
2"

TECHNICAL DATA
BODY: 316 STAINLESS STEEL
INSULATORS: POLYAMIDE-IMIDE
QUAD SEAL: 70 DUROMETER FLUOROCARBON FKM
BACKUP RING: VIRGIN PTFE
ELECTRICAL RESISTANCE OF INSULATORS AT 70°F:
10 x 10 OHMPAT 10V (DC)
PRESSURE RATING: 5000 PSIG
TEMPERATURE RATING: -40 TO 200°F



PIPE SIZES
3/4"
1"
1-1/4"
1-1/2"
2"

TECHNICAL DATA
GALVANIZED STEEL COUPLING
WITH INERT AND NONCORROSIVE,
THERMOPLASTIC LINING
SYSTEM PRESSURE RATING: 300 PSIG
TEMPERATURE RATING: -40 TO 200°F

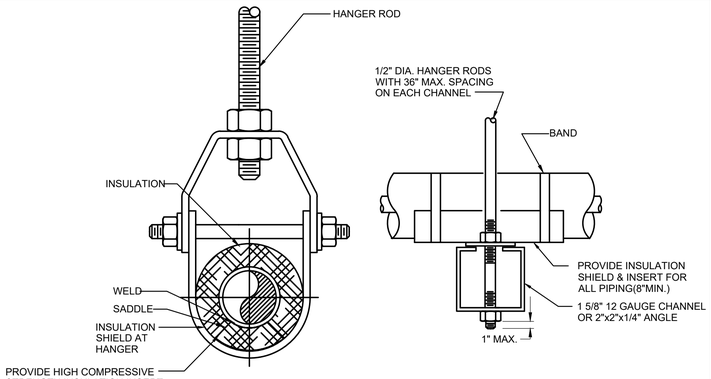


PIPE SIZES
2-1/2" AND UP

TECHNICAL DATA
PROVIDE FULL-FACE OR RING TYPE NEOPRENE

OR PHENOLIC GASKET
PROVIDE PHENOLIC OR POLYETHYLENE BOLT SLEEVES, PHENOLIC WASHERS, AND STEEL BACKING.
SYSTEM PRESSURE RATING: 300 PSIG
TEMPERATURE RATING: -40 TO 200°F

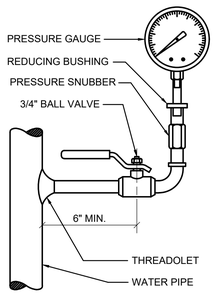
7 M-501 **DIELECTRIC PIPE FITTING**
SCALE: NTS



ADJUSTABLE CLEVIS HANGER

TRAPEZE HANGER FOR UP TO 1000 LB. UNIFORM LOAD

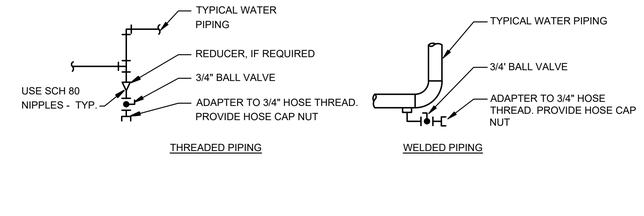
2 M-501 **TYPICAL PIPE CLEVIS HANGER DETAIL**
SCALE: NTS



WATER PIPING

NOTE:
1. FOR PIPES 2" AND SMALLER, USE FITTING INSTEAD OF THREADOLET OR WELDOLET.

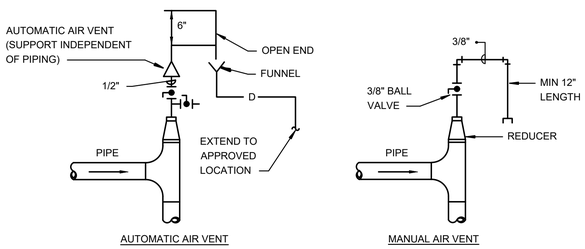
5 M-501 **PRESSURE GAUGE DETAIL**
SCALE: NTS



THREADED PIPING

WELDED PIPING

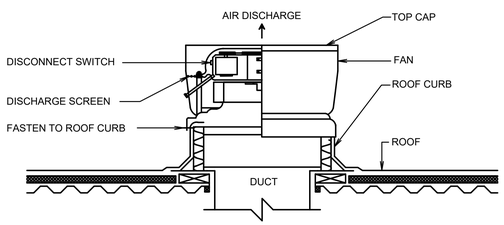
8 M-501 **DRAIN VALVE CONNECTION DETAIL**
SCALE: NTS



AUTOMATIC AIR VENT

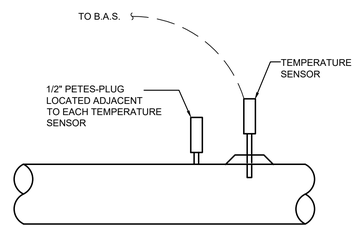
MANUAL AIR VENT

3 M-501 **TYPICAL AIR VENT DETAIL**
SCALE: NTS



NOTES:
1. EXHAUST FAN SHALL BE PROVIDED WITH FACTORY-MOUNTED CONTROLS.
2. ALL DISCONNECTS & CONTROL PANELS MOUNTED OUTDOORS SHALL BE PROVIDED WITH A NEMA 4X ENCLOSURE.

6 M-501 **TYPICAL ROOFTOP EXHAUST FAN**
SCALE: NTS



9 M-501 **TYPICAL TEMPERATURE SENSOR INSTALLATION**
SCALE: NTS

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MECHANICAL DETAILS SHEET #1

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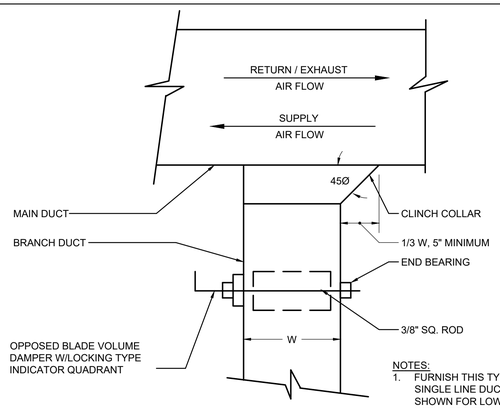
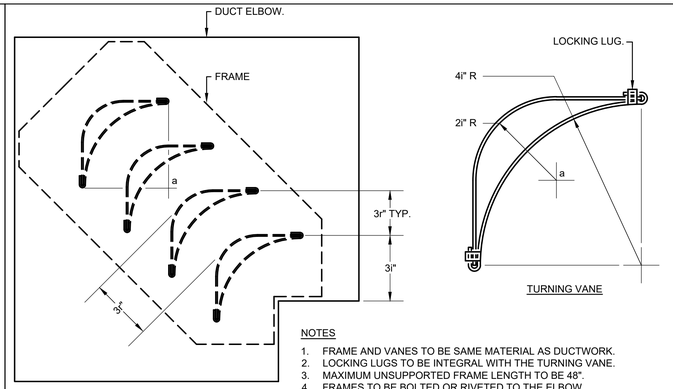
M-501



NOTES:
1. FURNISH THIS TYPE OF CONNECTION WHEN SINGLE LINE DUCTWORK IS INDICATED AS SHOWN FOR LOW PRESSURE BRANCHES WITH LESS THAN 33% CAPACITY OF MAIN DUCT.

1 M-502 DUCT BRANCH TAKEOFF FOR LOW PRESSURE DUCTWORK
SCALE: NTS

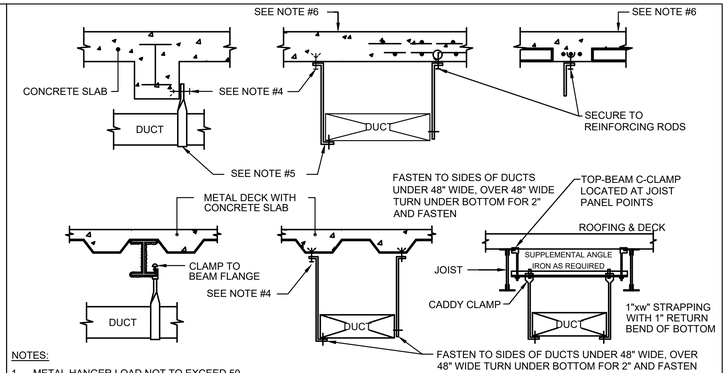


VANED ELBOW

TURNING VANE

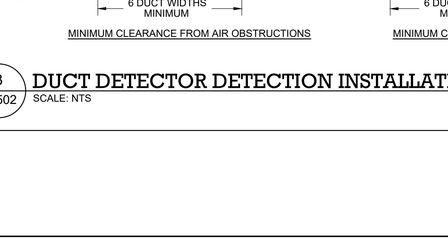
NOTES
1. FRAME AND VANES TO BE SAME MATERIAL AS DUCTWORK.
2. LOCKING LUGS TO BE INTEGRAL WITH THE TURNING VANE.
3. MAXIMUM UNSUPPORTED FRAME LENGTH TO BE 48".
4. FRAMES TO BE BOLTED OR RIVETED TO THE ELBOW.
5. VANES AND FRAMES TO BE SAME GAUGE AS THE ELBOW. (MINIMUM 20 GAUGE)
6. SQUARE ELBOWS ARE TO BE USED ONLY WHEN SPECIFICALLY INDICATED ON THE DESIGN DRAWINGS.

4 M-504 MITERED ELBOWS WITH DOUBLE THICKNESS TURNING VANES
SCALE: NTS



NOTES:
1. METAL HANGER LOAD NOT TO EXCEED 50
2. FOR NON-STEEL DUCTS HANGERS TO BE LBS. ISOLATED TO PREVENT GALVANIC ACTION.
3. HANGERS SHALL BE SAME MATERIALS AS DUCTWORK BEING SUPPORT.
4. EXPANSION BOLT MINIMUM SIZE r" (B.S.&A. FILE #390-58-SM OR #480-64-SM OR #481-64-SM) FOR STONE CONCRETE ONLY.
5. w" x 1" GALVANIZED IRON HANGERS 8'-0" ON CENTER FOR DUCTS 4 SQ. FT. AND UNDER, 4'-0" ON CENTER FOR DUCTS OVER 4 SQ. FT.
6. IN CINDER CONCRETE SLABS OR IN REPUBLIC IN AREA. ARCH. USE APPROVE SCISSOR TYPE HANGER HOOK (B.S.&A. FILE #A-61-63 SM).

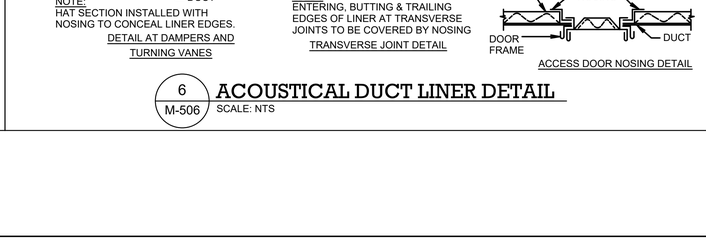
7 M-502 TYPICAL DUCT HANGING DETAILS
SCALE: NTS



INSULATED PIPE
WITH VAPOR BARRIER

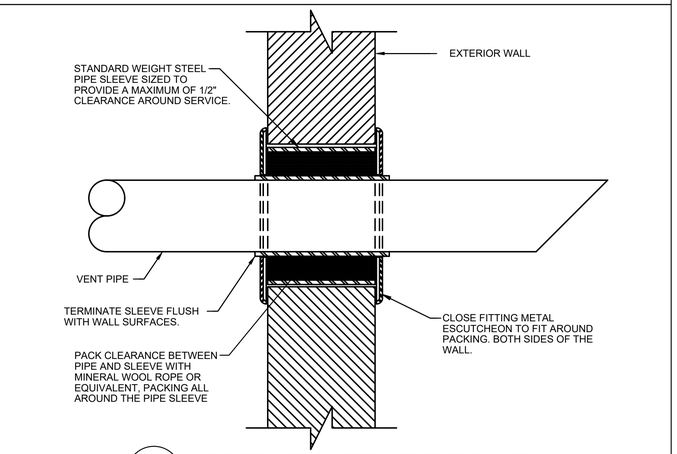
NOTES:
1. PROVIDE ROLLER HANGERS FOR ALL HWS&R PIPING.

2 M-502 TYPICAL ROLLER HANGER SUPPORTS
SCALE: NTS

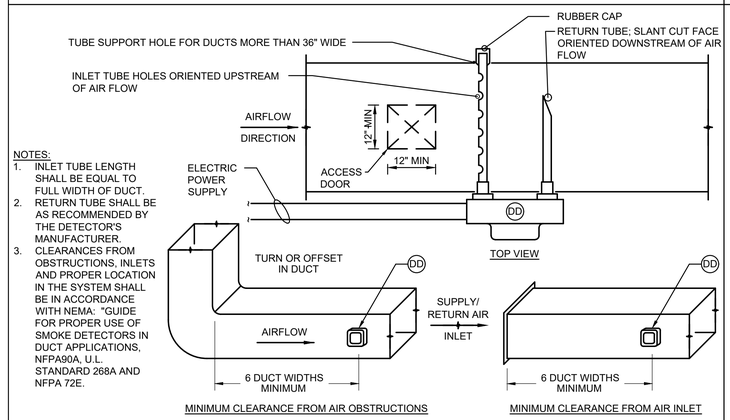


NOTES:
1. USE SINGLE BLADE FOR DUCTS UP TO 12" HIGH AND LESS THAN 29" WIDE.
2. USE MULTIPLE BLADES FOR DUCTS GREATER THAN OR EQUAL TO 29" AND/OR OVER 12" HIGH.
3. PROVIDE DAMPERS FOR ALL BRANCH DUCT SERVING AIR DEVICES.

5 M-502 VOLUME DAMPER DETAIL
SCALE: NTS



8 M-502 TYPICAL ROOFTOP UNIT DETAIL
SCALE: NTS

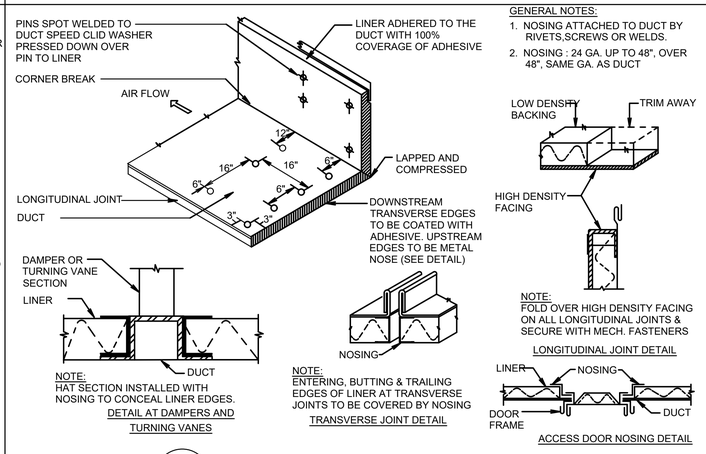


NOTES:
1. INLET TUBE LENGTH SHALL BE EQUAL TO FULL WIDTH OF DUCT.
2. RETURN TUBE SHALL BE AS RECOMMENDED BY THE DETECTOR'S MANUFACTURER.
3. CLEARANCES FROM OBSTRUCTIONS, INLETS AND PROPER LOCATION IN THE SYSTEM SHALL BE IN ACCORDANCE WITH NEMA: "GUIDE FOR PROPER USE OF SMOKE DETECTORS IN DUCT APPLICATIONS, NFPA90A, U.L. STANDARD 268A AND NFPA 72E.

MINIMUM CLEARANCE FROM AIR OBSTRUCTIONS

MINIMUM CLEARANCE FROM AIR INLET

3 M-502 DUCT DETECTOR DETECTION INSTALLATION DETAIL
SCALE: NTS



NOTE:
HAT SECTION INSTALLED WITH NOSING TO CONCEAL LINER EDGES.

DETAIL AT DAMPERS AND TURNING VANES

NOTE:
ENTERING, BUTTING & TRAILING EDGES OF LINER AT TRANSVERSE JOINTS TO BE COVERED BY NOSING

TRANSVERSE JOINT DETAIL

GENERAL NOTES:
1. NOSING ATTACHED TO DUCT BY RIVETS,SCREWS OR WELDS.
2. NOSING : 24 GA. UP TO 48", OVER 48", SAME GA. AS DUCT

NOTE:
FOLD OVER HIGH DENSITY FACING ON ALL LONGITUDINAL JOINTS & SECURE WITH MECH. FASTENERS

LONGITUDINAL JOINT DETAIL

ACCESS DOOR NOSING DETAIL

6 M-506 ACOUSTICAL DUCT LINER DETAIL
SCALE: NTS

9 M-502 INTAKE & EXHAUST VENT THRU-WALL
SCALE: NTS

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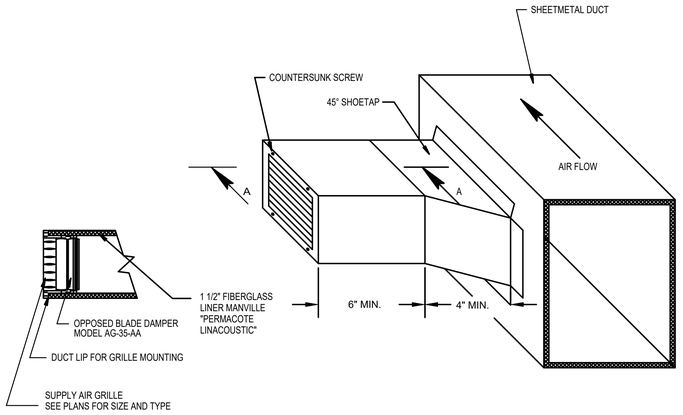
MECHANICAL
DETAILS SHEET #2

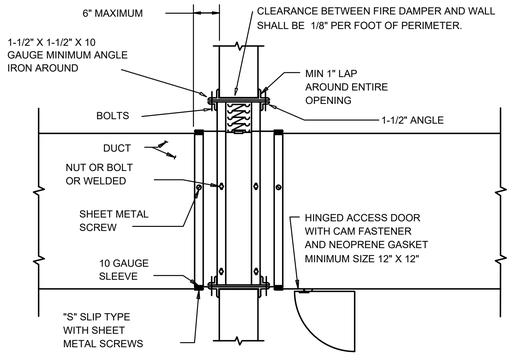
DWG NUMBER :

M-502



1 M-503 TYPICAL SIDEWALL SUPPLY REGISTER DETAIL

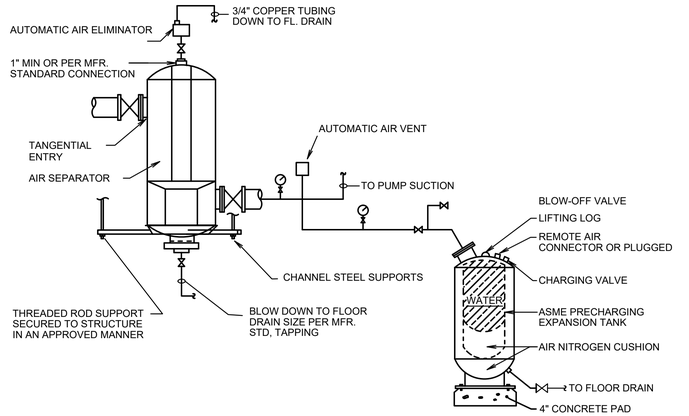
SCALE: NTS



NOTE:
1. PROVIDE FIRE DAMPER FOR ROUND DUCT OR USE TRANSITIONS FOR ROUND TO SQUARE DUCT.
2. PROVIDE DAMPER WITH FUSIBLE LINKS AND INTERNAL OPERATORS.

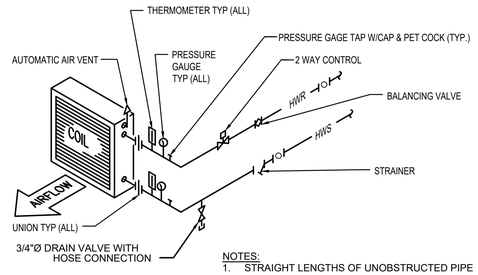
4 M-503 TYPICAL DUCT FIRE DAMPER DETAIL

SCALE: NTS



7 M-503 AIR SEPARATOR & EXPANSION TANK DETAIL

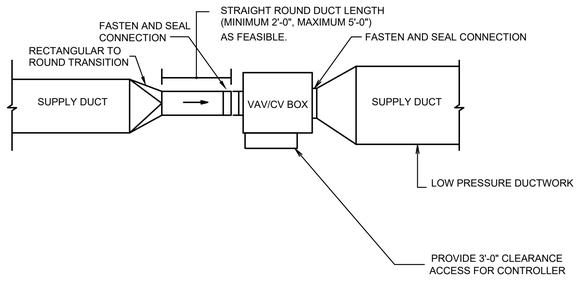
SCALE: NTS



NOTES:
1. STRAIGHT LENGTHS OF UNOBSTRUCTED PIPE WITHOUT IN-LINE APPURTENANCES SHALL BE INSTALLED UP AND DOWNSTREAM OF FLOW CONTROL BALANCING VALVES PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.

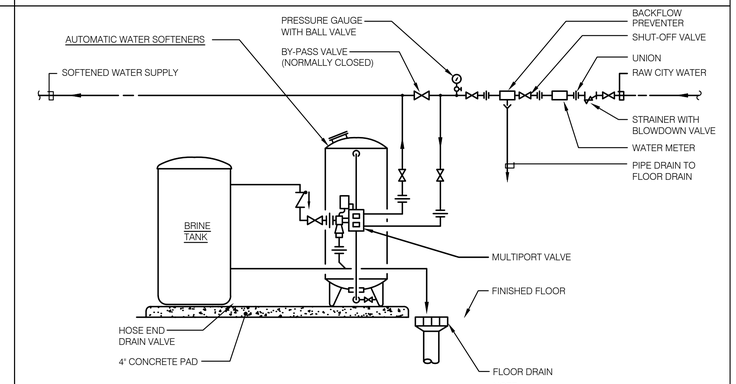
2 M-503 TYPICAL HOT WATER UNIT HEATER PIPING DETAIL

SCALE: NTS



5 M-503 TYPICAL VAV BOX DETAIL

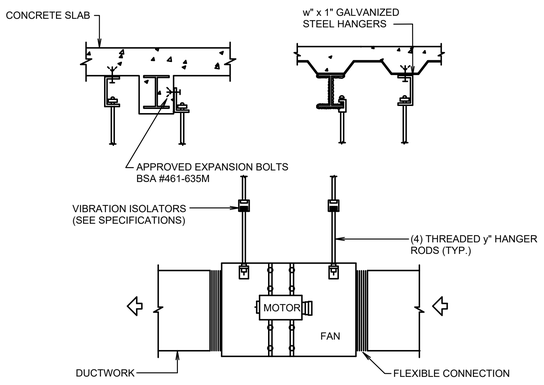
SCALE: NTS



NOTE:
REFER TO PLUMBING PLANS FOR MORE INFORMATION.

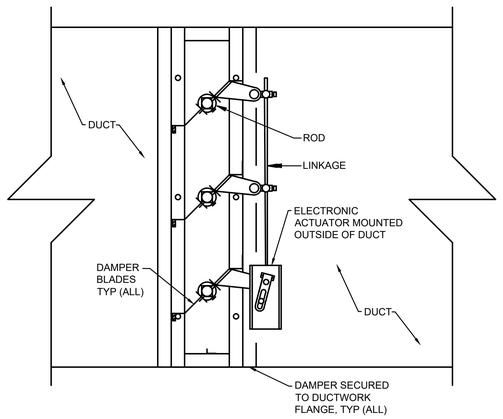
8 M-503 TYPICAL WATER SOFTENER DETAIL

SCALE: NTS



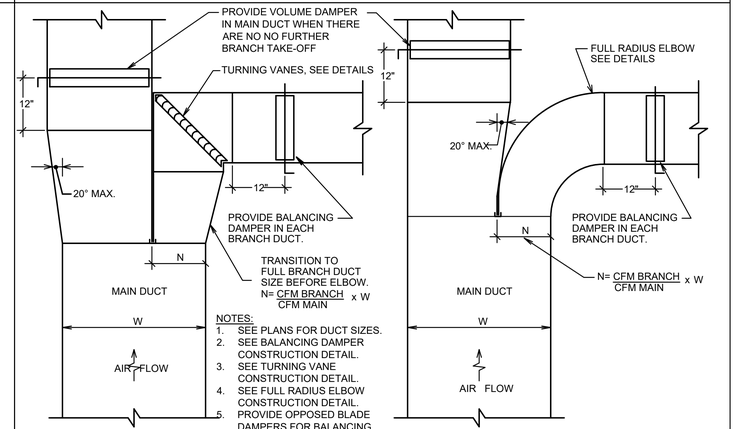
3 M-503 TYPICAL FAN HANGING DETAL

SCALE: NTS



6 M-503 MOTORIZED DAMPER DETAIL

SCALE: NTS



NOTES:
1. SEE PLANS FOR DUCT SIZES.
2. SEE BALANCING DAMPER CONSTRUCTION DETAIL.
3. SEE TURNING VANE CONSTRUCTION DETAIL.
4. SEE FULL RADIUS ELBOW CONSTRUCTION DETAIL.
5. PROVIDE OPPOSED BLADE DAMPERS FOR BALANCING.

9 M-503 TYPICAL SUPPLY AIR DUCT CONNECTIONS

SCALE: NTS

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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MANHATTAN BEER DISTRIBUTORS
20 DUNNIGAN DRIVE
SUFFERN, NEW YORK

KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :

CHECKED BY :

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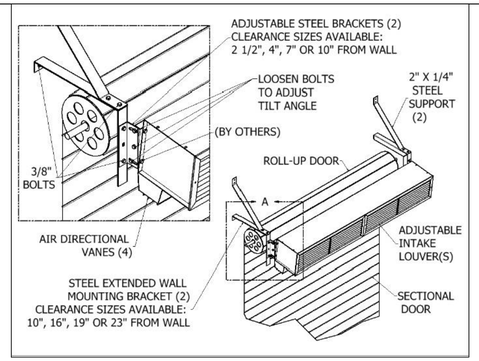
SCALE :

DRAWING TITLE :

MECHANICAL DETAILS SHEET #3

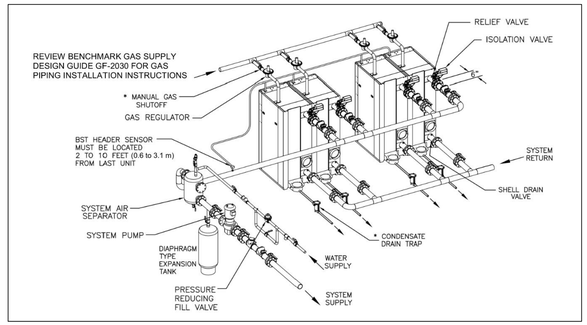
DWG NUMBER :

M-503

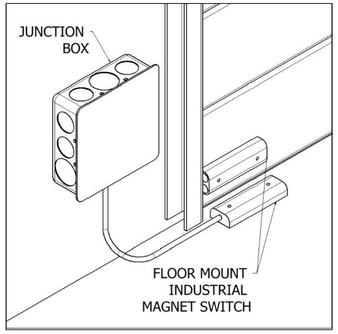


NOTES:
1. EXTENDED WALL MOUNTING: FOR TANDEM MOUNTING OF AIR CURTAIN OVER SECTIONAL STYLE DOOR, USE EITHER WALL MOUNTING ANGLE BRACKETS OR THREADED RODS.
2. TOP MOUNTING BRACKETS: FOR OVERHEAD INSTALLATION OF UNITS, USE IN CONJUNCTION WITH THE THREADED HOLES PROVIDED ON TOP OF UNIT. NOTE: ANGLE BRACKETS, THREADED RODS AND I BEAMS ARE PROVIDED BY OTHERS.

1 / M-504 **TYPICAL AIR CURTAIN MOUNTING DETAIL**
SCALE: NTS

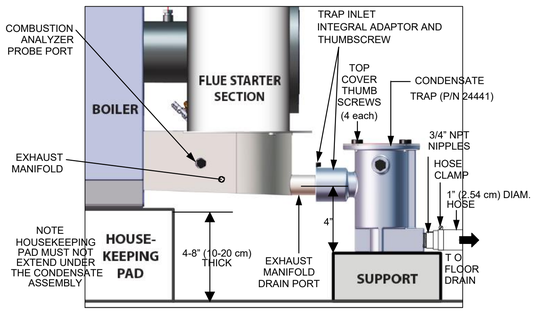


4 / M-504 **TYPICAL BOILER PIPING INSTALLATION DETAIL**
SCALE: NTS

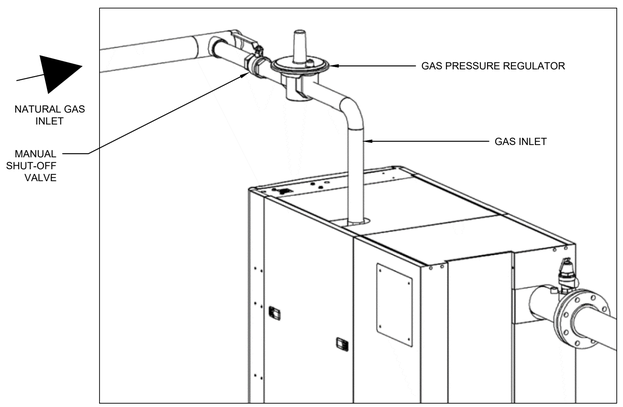


NOTES:
1. Mars door limit and magnetic reed switches are available with NEMA 1, 4X and 7 ratings. Contact the factory for additional ratings and details.
2. Use light gauge materials when field fabricating brackets to activate and deactivate the door limit switch(s).
3. All wiring must be per local and NEC (National Electric Code) codes.
4. Panels or controllers may be required. Refer to wiring diagram inside the control panel box.

2 / M-504 **TYPICAL MAGNETIC DOOR SWITCH INSTALLATION DETAIL**
SCALE: NTS



5 / M-504 **TYPICAL BOILER CONDENSATE TRAP INSTALLATION DETAIL**
SCALE: NTS



3 / M-504 **TYPICAL BOILER GAS CONNECTION DETAIL**
SCALE: NTS

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DRAWING TITLE :

MECHANICAL
DETAILS SHEET #4

DWG NUMBER :

M-504

AIR CURTAIN SCHEDULE

UNIT TAG	LOCATION	SERVICE	AIRFLOW (CFM)	MAX CORE VELOCITY AT NOZZLE (FPM)	AVERAGE VELOCITY (FPM)	DIMENSIONS (LxWxH)	NOZZLE LENGTH (IN)	MOTOR						SOUND (dBA)	WEIGHT (LBS)	MANUFACTURER	MODEL #	COMMENTS
								QTY	HP	RPM	V/PH/HZ	FLA	POWER RATING (WATTS)					
ACUR-1-A	WAREHOUSE	WAREHOUSE DOORS	4,137	5,960	2,206	108"x13"x11"	108	3	0.50	1,725	460/3/60	2.4	1,500	71	175	MARS	STD2108-3UH-OB	SEE BELOW
ACUR-1-B	WAREHOUSE	WAREHOUSE DOORS	4,341	4,660	2,084	120"x13"x11"	120	3	0.50	1,725	460/3/60	2.4	1,570	71	185	MARS	STD2120-3UH-OB	SEE BELOW

AIR CURTAIN SCHEDULE NOTES (TYPICAL U.O.N.):

1. FURNISH & INSTALL MOTOR CONTROL PANEL WITH NON-FUSED PANEL MOUNTED DOOR DISCONNECT SWITCH & DOOR LIMIT SWITCH MODEL #99-125 OR EQUIVALENT.
2. FURNISH & INSTALL AIR CURTAIN & DOOR LIMIT SWITCH MOUNTING BRACKETS AS REQUIRED.
3. FURNISH & INSTALL HEAVY GAUGE OBSIDIAN BLACK CORROSION PROOF PAINT.
4. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

AIR OUTLET SCHEDULE

DESIGNATION	DESCRIPTION	NECK SIZE (IN)	FRAME SIZE (IN)	CFM RANGE	MAX NC	MANUFACTURER	MODEL #	COMMENTS
A	PLAQUE TYPE SUPPLY DIFFUSER	8"	24"x24"	0-200	<20	TITUS	OMNI	LAY-IN
	PLAQUE TYPE SUPPLY DIFFUSER	10"	24"x24"	201-350	<20	TITUS	OMNI	LAY-IN
	PLAQUE TYPE SUPPLY DIFFUSER	12"	24"x24"	351-450	<20	TITUS	OMNI	LAY-IN
	PLAQUE TYPE SUPPLY DIFFUSER	14"	24"x24"	451-600	<20	TITUS	OMNI	LAY-IN
	PLAQUE TYPE SUPPLY DIFFUSER	15"	24"x24"	601-750	<20	TITUS	OMNI	LAY-IN
B	DOUBLE DEFLECTION SUPPLY REGISTER	A"xB"	(A+1.5)"x(B+1.5)"	0-750	<20	TITUS	300RS	SURFACE-MOUNT
C	RETURN & EXHAUST DIFFUSER/GRILLE	A"xB"	(A+1.5)"x(B+1.5)"	0-750	<20	TITUS	350RL	CUT-IN & LIGHT SHIELD
D	DRUM LOUVER DIFFUSER	27.5"x27.5"	30"x30"	4000-5000	<40	RUSKIN	DLD-2010	DUCT-MOUNT

AIR OUTLET SCHEDULE NOTES (TYPICAL U.O.N.):

1. INSTALL FOUR (4) WAY DIFFUSERS UNLESS OTHERWISE NOTED. FURNISH & INSTALL BLANK OFF PLATES FOR DIFFUSERS SHOWN TO HAVE 2-WAY OR 3-WAY PATTERNS.
2. INCREASE NECK SIZES AS REQUIRED TO ACCOMMODATE BLANK-OFF PLATES.
3. DIFFUSERS SHALL BE SUITABLE FOR THE TYPE OF CEILING CONSTRUCTION BEING INSTALLED IN.
4. DIFFUSERS THAT SERVE AREAS WITHOUT HUNG CEILINGS SHALL BE SUITABLE FOR DUCTWORK MOUNTING.
5. ALL ADJUSTABLE AIR OUTLET PATTERN DEFLECTORS SHALL BE FIELD ADJUSTED TO OPTIMIZE AIR DISTRIBTUION TO PREVENT DRAFT.
6. ARCHITECT TO CONFIRM FINAL AIR OUTLET COLOR & FINISHES.
7. FURNISH & INSTALL INSULATED DUCT CAP ACCESSORY FOR EACH DRUM LOUVER DIFFUSER.
8. REFER TO MECHANICAL SPECIFICATIONS FOR MORE INFORMATION.

EXPANSION TANK SCHEDULE

UNIT TAG	SERVICE	TYPE	MAXIMUM OPERATING TEMP (F)	MINIMUM OPERATING TEMP (F)	MAXIMUM OPERATING PRESSURE (PSIG)	SYSTEM VOLUME (GAL)	FLUID TYPE	TANK TOTAL VOLUME (GAL)	TANK ACCEPTANCE VOLUME (GAL)	DIMENSIONS (D"xH")	WEIGHT (LBS)	MANUFACTURER	MODEL #	COMMENTS
ET-1-1	BUILDING HW	DIAPHRAGM	240	40	125	1605	30 % PG	211	71	30x76	2461	BELL & GOSSETT	D-280	SEE BELOW

EXPANSION TANK SCHEDULE NOTES:

1. TANK TO BE DESIGNED & CONSTRUCTED PER ASME CODE SECTION VIII, DIV. 1. & ASME RATED.
2. FURNISH & INSTALL HEAVY DUTY BUTYL RUBBER DIAPHRAGM.
3. UNIT SHALL BE RATED FOR A MAXIMUM WORKING PRESSURE OF 125 PSIG.
4. TANK TO BE PRECHARGED AT A MINIMUM OF 12 PSIG FROM THE FACTORY.
5. FURNISH & INSTALL TANK SIGHT GLASS.
6. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

AIR SEPARATOR SCHEDULE

UNIT TAG	LOCATION	SERVICE	CONNECTION INLET/OUTLET (IN)	DESIGN FLOW (GPM)	WATER PD (FT)	UNIT CONSTRUCTION	DIMENSIONS (D"xH")	WEIGHT (LBS)	MAX TEMP RATING (F)	MANUFACTURER	MODEL #	COMMENTS
AS-1-1	MER	BUILDING HW	4/4	145.6	0.55	CARBON STEEL	16x32	278.0	350.0	BELL & GOSSETT	R-4F	SEE BELOW

AIR SEPARATOR SCHEDULE NOTES:

1. UNIT SHALL BE DESIGNED & CONSTRUCTED PER ASME CODE SECTION VIII, DIV. 1 STANDARDS & ASME RATED.
2. FURNISH & INSTALL FLANGED CONNECTIONS WITH CARBON STEEL CONSTRUCTION AND 304SS STRAINER.
3. FURNISH & INSTALL MANUAL BLOWDOWN VALVE; B&G MODEL MBV-1 OR EQUIVALENT.
4. FURNISH & INSTALL AUTOMATIC AIR VENT; B&G MODEL 107A OR EQUIVALENT.
5. UNIT TO BE RATED FOR A MAXIMUM WORKING PRESSURE OF 125 PSIG.
6. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

EXPANSION FITTING SCHEDULE

TYPE	DESCRIPTION	MATERIAL	DUCT/PIPE SIZE (IN)	LENGTH (IN)	MANUFACTURER	MODEL #	COMMENTS
DUCT	U-STYLE	EPDM	36x16	9.0	FLEXICRAFT	FTE-EPDM	SEE BELOW
PIPE	METAL BELLOWS	316 STAINLESS STEEL	2	8.5	FLEXICRAFT	MNLC50F	SEE BELOW

EXPANSION FITTING SCHEDULE NOTES:

1. FURNISH & INSTALL BOLTED FLANGE CONNECTION FOR PIPE EXPANSION FITTING.
2. FURNISH & INSTALL FLANGE TYPE RECTANGULAR CONFIGURATION FOR DUCT EXPANSION FITTING.
3. CONTRACTOR SHALL VERIFY FINAL EXPANSION FITTING LENGTH WITH FIELD CONDITIONS PRIOR TO RELEASE.
4. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

DESTRATIFICATION FAN SCHEDULE

UNIT TAG	LOCATION	SERVICE	TYPE	DRIVE	AIRFLOW (CFM)	TOTAL SP (IN W.C.)	TOTAL ESP (IN W.C.)	OUTLET VELOCITY (FPM)	INLET/OUTLET SIZE (IN)	MOTOR						VFD	SOUND (dBA)	WEIGHT (LBS)	MANUFACTURER	MODEL #	COMMENTS
										BHP	HP	RPM	V/PH/HZ	FLA	MCA						
DSF-4-1 THRU 22	AS/RS WAREHOUSE CEILING	WAREHOUSE	PROPELLER	DIRECT	-	-	-	-	19/12	0.22	0.25	1,630	277/1/60	1.3	15.0	NO	45	22	AIRIUS	A-60-EC-277-B	SEE BELOW
DSF-4-23 THRU 43	AS/RS WAREHOUSE CEILING	WAREHOUSE	PROPELLER	DIRECT	-	-	-	-	15/15	0.13	0.25	1,660	208/1/60	0.8	15.0	NO	44	13	AIRIUS	ONYX-EC-240-B	SEE BELOW

DESTRATIFICATION FAN SCHEDULE NOTES (TYPICAL U.O.N.):

1. FURNISH & INSTALL SINGLE POINT POWER CONNECTION WITH DISCONNECT SWITCH.
2. FAN SHALL BE CAPABLE OF ACCEPTING A 0-10VDC CONTROL SIGNAL.
3. FURNISH & INSTALL MANUFACTURER HANGING KIT.
4. REFER TO MECHANICAL SPECIFICATIONS FOR MORE INFORMATION.

EXHAUST FAN SCHEDULE

UNIT TAG	LOCATION	SERVICE	TYPE	DRIVE	AIRFLOW (CFM)	TOTAL SP (IN W.C.)	TOTAL ESP (IN W.C.)	OUTLET VELOCITY (FPM)	INLET/OUTLET SIZE (IN)	MOTOR						VFD	SOUND (dBA)	WEIGHT (LBS)	MANUFACTURER	MODEL #	COMMENTS
										BHP	HP	RPM	V/PH/HZ	FLA	MCA						
TXF-R-1	WAREHOUSE ROOF	RESTROOMS	CENTRIFUGAL BI	DIRECT	2,000	-	0.50	1,163	16x16/29	0.42	0.75	1,312	120/1/60	10.0	15.0	NO	64	70	GREENHECK	CUE-140-VG	SEE BELOW
TF-4-1	RM 417	IT CLOSET	CENTRIFUGAL FC	DIRECT	400	-	0.30	889	19x19/8x8	0.10	0.10	1,070	120/1/60	2.5	15.0	NO	51	31	GREENHECK	SP-A510-VG	SEE BELOW
TF-4-2	RM 418	ELECTRIC RM	CENTRIFUGAL FC	DIRECT	400	-	0.30	889	19x19/8x8	0.10	0.10	1,070	120/1/60	2.5	15.0	NO	51	31	GREENHECK	SP-A510-VG	SEE BELOW
MXF-1-1	MECH RM	BOILER RM	CENTRIFUGAL BI	BELT	300	-	0.50	163	18x18	0.10	0.25	1,361	120/1/60	5.8	15.0	YES	56	191	GREENHECK	TCB-2-09	SEE BELOW
TF-1-1	RM 116	AIR COMPRESSOR RM	CENTRIFUGAL BI	BELT	5,000	-	0.30	596	35x35/35x35	0.65	2.00	600	208/1/60	12.5	15.0	YES	65	134	GREENHECK	SQ-18-07-0700-VG	SEE BELOW
TF-1-2	RM 117	RESTROOMS	CENTRIFUGAL FC	DIRECT	400	-	0.30	889	19x19/8x8	0.10	0.10	1,070	120/1/60	2.5	15.0	NO	51	31	GREENHECK	SP-A510-VG	SEE BELOW
TXF-1-1	RM 121	RESTROOMS	CENTRIFUAL FC	DIRECT	150	-	0.50	139	8x8/8x8	0.04	0.10	1,226	120/1/60	1.5	15.0	NO	37	24	GREENHECK	CSP-A390-VG	SEE BELOW
TXF-1-2	RM 122	RESTROOMS	CENTRIFUAL FC	DIRECT	150	-	0.50	139	8x8/8x8	0.04	0.10	1,226	120/1/60	1.5	15.0	NO	37	24	GREENHECK	CSP-A390-VG	SEE BELOW
TF-1-3	RM 107	EMERG. SERV. RM	CENTRIFUGAL FC	DIRECT	400	-	0.30	889	19x19/8x8	0.10	0.10	1,070	120/1/60	2.5	15.0	NO	51	31	GREENHECK	SP-A510-VG	SEE BELOW

FAN SCHEDULE NOTES (TYPICAL U.O.N.):

1. FURNISH & INSTALL SINGLE POINT POWER CONNECTION WITH EC VARIGREEN MOTOR AND HOA CONTROLLER.
2. FURNISH & INSTALL INSULATED 24"H ROOFCURB FOR TXF-R-1.
3. FURNISH & INSTALL MANUFACTURER HANGING KIT WITH VIBRATION ISOLATORS FOR TF-1-1&2, TXF-1&2, TF-4-1&2 & MXF-1-1.
4. FURNISH SPARK RESISTANT B CERTIFICATION FOR MXF-1-1.
5. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

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MECHANICAL
SCHEDULES SHEET #1

DWG NUMBER :

M-601

LOW PRESSURE HOT WATER CONDENSING BOILER SCHEDULE

UNIT TAG	LOCATION	SERVICE	UNIT TYPE	RATED CAPACITY			WATER CONDITIONS					BOILER INPUT - FIRING RATE					ELECTRICAL				INTAKE/ EXHAUST VENT SIZE (IN)	EFFICIENCY (%)	WEIGHT (LBS)	DIMENSIONS (WxDxH)	MANUFACTURER	MODEL #	COMMENTS
												FUEL OIL		GAS													
				BOILER HORSEPOWER (BHP)	INPUT (MBH)	OUTPUT (MBH)	OPERATING PRESSURE (PSIG)	FLOW RATE (GPM)	PRESURE DROP (FT)	ENTERING WATER TEMP (F)	LEAVING WATER TEMP (F)	TYPE	FLOW RATE (GPH)	TYPE	MIN/MAX PRESSURE (IN W.C.)	FLOW RATE (CFH)	V/PH/HZ	FLA	MCA	MOCP						
B-1-1	BOILER ROOM	SPACE HEATING	FIRETUBE	45	1500	1395	45	250	6.47	130	150	N/A	N/A	NG	4/14	1500	120/1/60	-	16	20	6/6	87	1406	28"x44"x78"	AERCO	BMK 1500	SEE BELOW
B-1-2	BOILER ROOM	SPACE HEATING	FIRETUBE	45	1500	1395	45	250	6.47	130	150	N/A	N/A	NG	4/14	1500	120/1/60	-	16	20	6/6	87	1406	28"x44"x78"	AERCO	BMK 1500	SEE BELOW

LOW PRESSURE HOT WATER CONDENSING BOILER SCHEDULE NOTES TYP (U.O.N.):

1. FURNISH & INSTALL SINGLE POINT ELECTRICAL CONNECTION WITH CIRCUIT BREAKER DISCONNECT.
2. FURNISH & INSTALL C-MORE CONTROLLER WITH BST FOR BOILER LEAD/LAG CONTROL & BACNET IP & MS/TP COMMUNICATION.
3. FURNISH & INSTALL CONDENSATE PH TREATMENT KIT FOR EACH BOILER.
4. FURNISH & INSTALL ALL INTAKE & VENT PIPING AS SHOWN ON MECHANICAL PLANS.
5. UNIT SHALL BE FACTORY MUTUAL (FM GLOBAL) CERTIFIED AND UL APPROVED.
6. FURNISH & INSTALL WALL-MOUNTED MSA TAMPER-PROOF EMERGENCY BOILER PLANT SHUTDOWN SWITCH OR EQUIVALENT AS SHOWN ON MECHANICAL PLANS.
7. FURNISH & INSTALL ELECTRONIC PILOT.
8. UNIT SHALL BE IN ACCORDANCE WITH ASME SECTION IV & PRESSURE VESSEL CODE.
9. EXHAUST VENT PIPING TO BE DOUBLE-WALL AL29-4C OR EQUIVALENT..
10. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

HOT WATER FINNED TUBE RADIATOR SCHEDULE

UNIT TAG	LOCATION	SERVICE	HEATING CAPACITY (BTU/FT)	WATER-SIDE								RADIATOR									MANUFACTUER	MODEL #	COMMENTS
				FLUID TYPE	% GLYCOL	FLOW (GPM)	ROWS HIGH	WATER PD (FT)	HWS TEMP (F)	HWR TEMP (F)	CONNECTION INLET/OUTLET (IN)	TUBE MATERIAL	TUBE DIAMETER (IN)	FIN MATERIAL	FIN SIZE (IN)	FIN THICKNESS (IN)	FINS PER FT	ENCLSOURE HEIGHT (IN)	MOUNTING HEIGHT (IN)	LENGTH (FT)			
FTR-A	SEE PLAN	SPACE HEATING	484.0	WATER	30	4.0	1	0.17	150.0	130.0	3/4	COPPER	3/4	ALUMINUM	3x3-1/4	0.024	48	14	8	4'-0"	SLANT FIN	350-14	SEE BELOW
FTR-B	SEE PLAN	SPACE HEATING	484.0	WATER	30	4.0	1	0.26	150.0	130.0	3/4	COPPER	3/4	ALUMINUM	3x3-1/4	0.024	48	14	8	6'-0"	SLANT FIN	350-14	SEE BELOW
FTR-C	SEE PLAN	SPACE HEATING	484.0	WATER	30	4.0	1	0.35	150.0	130.0	3/4	COPPER	3/4	ALUMINUM	3x3-1/4	0.024	48	14	8	8'-0"	SLANT FIN	350-14	SEE BELOW
FTR-D	SEE PLAN	SPACE HEATING	455.0	WATER	30	1.0	1	0.35	150.0	130.0	3/4	COPPER	3/4	ALUMINUM	3x3-1/4	0.024	48	14	8	2'-0"	SLANT FIN	350-14	SEE BELOW

HOT WATER FINNED TUBE RADIATOR SCHEDULES NOTES TYP (U.O.N.):

1. FURNISH & INSTALL ALL PIPING TRIM AS DETAILED ON MECHANICAL FLOW DIAGRAM & DETAILS.
2. ALL FINNED TUBE RADIATOR ENCLOSURES TO EXTEND WALL-TO-WALL UNLESS OTHERWISE NOTED; CONTRACTOR TO FIELD VERIFY FINAL ENCLOSURE LENGTH PRIOR TO RELEASE.
3. MECHANICAL CONTRACTOR SHALL CONSULT MECHANICAL NEW WORK PLANS FOR QUANITY & LOCATION.
4. CONTRACTOR SHALL FURNISH & INSTALL RADIATOR VALVE COVER SECTIONS FOR ALL PIPING TRIM SECTIONS AS REQUIRED; COORDINATE QUANTITIES WITH MECHANICAL FLOW DIAGRAMS.
5. FURNISH NU-WHITE FINISH.
6. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

HOT WATER UNIT HEATER SCHEDULE

UNIT TAG	LOCATION	SERVICE	TOTAL HEATING (MBH)	WATERSIDE							AIRSIDE				ELECTRICAL			MOUNTING HEIGHT (FT)	ORIENTATION	THROW (FT)	WEIGHT (LBS)	DIMENSIONS (WxDxH)	MANUFACTUER	MODEL #	COMMENTS
				FLUID TYPE	% GLYCOL	FLOW (GPM)	WATER PD (IN FT)	HWS TEMP (F)	HWR TEMP (F)	CONNECTION INLET/OUTLET (IN)	FAN HP	RPM	AIRFLOW (CFM)	EAT/LAT (F)	V/PH/HZ	FLA	MCA								
HWUH-A	SEE PLAN	SPACE HEATING	10.7	WATER	30	1.7	0.01	150.0	130.0	3/4	0.1	1100	330	60/107	120/1/60	0.40	15	7'-0"	VERTICAL	16'-0"	44.0	17"x19"x17"	REZNOR	WS-22/33	SEE BELOW
HWUH-B	SEE PLAN	PLENUM HEATING	8.2	WATER	30	1.3	0.01	150.0	130.0	3/4	0.1	1100	270	60/104	120/1/60	0.30	15	9'-0"	VERTICAL	16'-0"	37.0	17"x19"x17"	REZNOR	WS-18/24	SEE BELOW
HWUH-C	SEE PLAN	SPACE HEATING	27.7	WATER	30	3.2	0.08	150.0	130.0	1-1/4	0.1	1100	560	60/113	120/1/60	0.60	15	10.0	VERTICAL	18'-0"	49.0	19"x19"x19"	REZNOR	WS-44/62	SEE BELOW

HOT WATER UNIT HEATER SCHEDULES NOTES (TYPICAL U.O.N.):

1. FURNISH & INSTALL ALL PIPING TRIM AS DETAILED ON MECHANICAL FLOW DIAGRAM & DETAILS.
2. FURNISH & INSTALL STEEL COILS WITH ALUMINUM FINS.
3. FURNISH & INSTALL HEAVY DUTY LINE VOLTAGE THERMOSTAT WITH GUARD COVER FOR EACH UNIT HEATER.
4. FURNISH & INSTALL 1" DEFLECTION SPRING HANGERS FOR EACH UNIT HEATER; MASON INDUSTRIES TYPE 30N OR EQUIVALENT.
5. FURNISH & INSTALL WALL-MOUNT BRACKET OR CEILING-HUNG HANGING KIT; REFER TO MECHANICAL PLANS FOR INFORMATION.
6. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

PUMP SCHEDULE

UNIT TAG	LOCATION	SERVICE	TYPE	FLOW (GPM)	FLUID TYPE	TOTAL HEAD (FT)	SUCTION CONNECTION (IN)	DISCHARGE CONNECTION (IN)	IMPELLER DIAMETER (IN)	EFFICIENCY (%)	RPM	MOTOR				WEIGHT (LBS)	MANUFACTURER	MODEL #	COMMENTS
												BHP	HP	ELECTRICAL (V/PH/HZ)	VFD				
HWP-1-1&2	1ST FLOOR	BUILDING HW	VERTICAL INLINE	145.6	30% PG	150.0	3.00	3.00	-	65.6	1,750	8.49	10	460/3/60	YES	418	BELL & GOSSETT	46SV9/2	SEE BELOW

PUMP SCHEDULES NOTES TYP (U.O.N.):

1. FURNISH & INSTALL VARIABLE FREQUENCY DRIVE WITH DOOR CIRCUIT BREAKER DISCONNECT; ABB ACH580-PCR-014A-4+E213+K465.
2. FURNISH & INSTALL INERTIA BASE CONCRETE PAD UNDER EACH PUMP.
3. FURNISH CLASS 125 PUMP FLANGE RATING.
4. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

PIPE MATERIAL SCHEDULE

SERVICE	PIPE SIZE	MATERIAL	WEIGHT	STANDARD	JOINT TYPE
COLD CONDENSATE DRAINS & MISCELLANEOUS DRAINS	2" & BELOW	HARD COPPER	TYPE 'L'	ASTM A88	SOLDER
HOT WATER WITH GLYCOL	4" & BELOW	HARD COPPER	TYPE 'K'	ASTM B88	BRAZED
COLD WATER MAKEUP & FILL	4" & BELOW	HARD COPPER	TYPE 'L'	ASTM B88	BRAZED
PIPING TO GAUGES	ALL	RED BRASS	STANDARD	ASTM B43	THREADED
GAS (FINAL EQUIPMENT CONNECTIONS)	ALL	BLACK STEEL	SCHEDULE 40	ASTM A53 OR A106 SEAMLESS GRADE B	THREADED

PIPE MATERIAL SCHEDULE NOTES:

1. REFER TO MECHANICAL SPECIFICATIONS FOR MORE INFORMATION

PIPE FITTING SCHEDULE

PIPE MATERIAL	PIPE SIZE	JOINT TYPE	FITTING MATERIAL	FITTING CLASS
BLACK STEEL	2" & SMALLER	THREADED FLANGE	CAST IRON	125 PSIG
COPPER TUBING (HARD DRAWN)	4" & SMALLER	BRAZED	WROUGHT COPPER OR CAST COPPER	300 PSIG @ 100F & 150 PSIG & 250F
RED BRASS	ALL SIZES	THREADED	CAST BRONZE	125 PSIG & 250 PSIG

PIPE FITTING SCHEDULE NOTES:

1. REFER TO MECHANICAL SPECIFICATIONS FOR MORE INFORMATION

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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MANHATTAN BEER DISTRIBUTORS
20 DUNNIGAN DRIVE
SUFFERN, NEW YORK

KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
	ISSUED FOR BID	10/15/2021
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M-602

PACKAGED ROOFTOP HEATING & VENTILATING UNIT SCHEDULE

UNIT TAG	LOCATION	SERVICE	TOTAL SUPPLY AIRFLOW (CFM)	TOTAL OUTSIDE AIRFLOW (CFM)	TOTAL SP (IN W.C.)	TOTAL ESP (IN W.C.)	GAS-FIRED FURNACE							SUPPLY FAN					UNIT ELECTRICAL				PREFILTER MERV# /EFFICIENCY	DIMENSIONS (LxWxH)	WEIGHT (LBS)	MANUFACTURER	MODEL #	COMMENTS
							TOTAL INPUT (MBH)	TOTAL OUTPUT (MBH)	EAT/LAT DB (F)	GAS FLOW (CFH)	NUMBER OF STAGES	GAS PRESSURE MIN/MAX (IN W.G.)	EFFICIENCY (%)	MOTOR					V/PH/HZ	FLA	MCA	MOCP						
														QTY	DRIVE TYPE	RPM	HP	VFD										
HV-R-1 THRU 12	AS/RS WAREHOUSE ROOF	AS/RS WAREHOUSE HEATING	5,000	670	0.97	0.50	300.0	240.0	50/75	300.0	10.0	5/10.5	80	1	DIRECT	1117	3	YES	460/3/60	-	7.49	11.5	8/85	8'-2"x4'-4"x3'-3"	1,540	TRANE	GRAA30PFJF0N2CY305N	SEE BELOW

PACKAGED ROOFTOP HEATING & VENTILATING UNIT SCHEDULE NOTES TYP (U.O.N.):

1. UNIT TO BE FURNISHED WITH SINGLE POINT POWER CONNECTION PRE-WIRED WITH CIRCUIT BREAKER DISCONNECT, VARIABLE FREQUENCY DRIVE, CONVENIENCE RECEPTACLE & SERVICE LIGHTS.
2. UNIT TO BE FURNISHED WITH ELECTRONIC MODULATING DUCT STAT, SPACE THERMOSTAT AND FACTORY MOUNTED & WIRED DDC CONTROLLER WITH BACNET IP & MS/TP COMMUNICATION PROTOCOL.
3. UNIT CASING TO BE ZINC COATED, HEAVY GAUGE GALVANIZED STEEL SUITABLE FOR OUTDOOR OPERATION.
4. UNIT TO BE FURNISHED WITH MODULATING GAS HEAT FURNANCE WITH STAINLESS STEEL HEAT EXCHANGER TUBES AND HEADERS WITH A TURNDOWN OF 10:1.
5. UNIT TO BE FURNISHED WITH AIRSIDE ECONOMIZING SECTION WITH ULTRA-LOW LEAKAGE DAMPERS AND 0-100 PERCENT MODULATING ECONOMIZING CONTROL VIA COMPARATIVE ENTHALPHY.
6. UNIT TO BE FURNISHED & INSTALLED WITH 24"H INSULATED ROOF CURB.
7. REFER TO MECHANICAL SPECIFICATIONS FOR MORE INFORMATION.

PACKAGED ROOFTOP AC UNIT WITH GAS FIRED FURNACE SCHEDULE

UNIT TAG	LOCATION	SERVICE	TONS	TOTAL SUPPLY AIRFLOW (CFM)	TOTAL OUTSIDE AIRFLOW (CFM)	TOTAL SP (IN W.C.)	TOTAL ESP (IN W.C.)	DX COOLING COIL				GAS-FIRED FURNACE						
								TOTAL CAPACITY (MBH)	TOTAL SENSIBLE (MBH)	EAT/LAT DB (F)	EAT/LAT WB (F)	TOTAL INPUT (MBH)	TOTAL OUTPUT (MBH)	EAT/LAT DB (F)	GAS FLOW (CFH)	NUMBER OF STAGES	GAS PRESSURE MIN/MAX (IN W.G.)	EFFICIENCY (%)
RTAC-R-1	ADMIN OFFICE ROOF	ADMIN OFFICE	45	15,000	1,230	2.93	1.50	544.5	412.23	76.7/54.6	64.0/52.6	350.0	280.0	60/77.7	350.0	5.0	7/14	80
RTAC-R-2	AS/RS ROOF	AS/RS MEZZANINES	22	7,000	800	2.12	1.50	267.9	196.46	77.3/54.0	64.5/52.2	235.0	188.0	60/84	235.0	2.0	7/14	80

PACKAGED ROOFTOP AC UNIT WITH GAS FIRED FURNACE SCHEDULE (CONT'D)

SUPPLY FAN						CONDENSING SECTION									UNIT ELECTRICAL				PREFILTER MERV# /EFFICIENCY	EER (@ AHRI)	IEER (@ AHRI)	DIMENSIONS (LxWxH)	WEIGHT (LBS)	MANUFACTURER	MODEL #	COMMENTS
MOTOR						COMPRESSORS					FAN MOTOR															
QTY	DRIVE TYPE	RPM	BHP	HP	VFD	QTY	TYPE	TONS/EACH	FLA/EACH	LRA/EACH	QTY	DRIVE TYPE	RPM	HP	VFD	V/PH/HZ	FLA	MCA	MOCP							
1	BELT	686	13.61	15	YES	3	SCROLL	10/15/15	18.6/27.5/27.5	142/197/197	4	DIRECT	1567	1.1	NO	460/3/60	-	112.5	125.0	14/90	10.4	14.5	19'-5"x7'-6"x6'-5"	5,932	TRANE	YCD600B4	SEE BELOW
1	BELT	1465	5	5	YES	2	SCROLL	-	19.1/19.1	142/197/198	2	DIRECT	1465	1.0	NO	460/3/60	-	55.97	70.0	14/90	11.0	14.0	24'-5"x7'-10"x3'-9"	5,716	TRANE	SFHLF20	SEE BELOW

PACKAGED ROOFTOP AC UNIT WITH GAS FIRED FURNACE SCHEDULE NOTES TYP (U.O.N.):

1. UNIT TO BE FURNISHED WITH SINGLE POINT POWER CONNECTION PRE-WIRED WITH CIRCUIT BREAKER DISCONNECT, VARIABLE FREQUENCY DRIVE, DDC CONTROLLER WITH BACNET IP & MS/TP COMMUNICATION PROTOCOL, CONVENIENCE RECEPTACLE & SERVICE LIGHTS.
2. UNIT TO BE FURNISHED WITH 5" COLOR TOUCHSCREEN.
3. UNIT CASING TO BE ZINC COATED, HEAVY GAUGE GALVANIZED STEEL WITH WEATHER RESISTANT PAINTED EXTERIOR.
4. UNIT TO BE FURNISHED WITH HIGH EFFICIENCY MULTI-STAGE MECHANICAL COOLING.
5. UNIT TO BE FURNISHED WITH R-410A REFRIGERANT.
6. UNIT TO BE FURNISHED WITH MODULATING GAS HEAT FURNANCE WITH STAINLESS STEEL DRUM & TUBE HEAT EXCHANGERS.
7. UNIT TO BE FURNISHED WITH AIRSIDE ECONOMIZING SECTION WITH ULTRA-LOW LEAKAGE DAMPERS AND 0-100 PERCENT MODULATING ECONOMIZING CONTROL VIA COMPARATIVE ENTHALPHY.
8. UNIT TO BE FURNISHED & INSTALLED WITH INSULATED 24"H ROOF CURB.
9. REFER TO MECHANICAL SPECIFICATIONS FOR MORE INFORMATION.

VAV BOX SCHEDULE

DESIGNATION	BOX SIZE (INLET)	AIRFLOW RANGE (CFM)		LOWEST AIRFLOW SETTING (CFM)	MINIMUM STATIC PRESSURE (IN W.C.)	DISCHARGE SOUND LEVEL AT MAX CFM & 2" W.C. (NC)	RADIATED SOUND LEVEL AT MAX CFM & 2" W.C. (NC)	HOT WATER COIL					MANUFACTURER	MODEL #	COMMENTS
		MIN	MAX					FLOW (GPM)	FLUID	HEATING CAPACITY (MBH)	ROWS	PRESSURE DROP (FT)			
VAV	6"	100	375	80	0.130	25	17	-	-	-	-	-	TRANE	VCCF-06	SEE BELOW
VAV	8"	376	675	145	0.021	24	21	-	-	-	-	-	TRANE	VCCF-08	SEE BELOW
VAV	10"	676	1050	230	0.002	24	21	-	-	-	-	-	TRANE	VCCF-10	SEE BELOW
VAV	12"	1051	1500	325	0.002	24	21	-	-	-	-	-	TRANE	VCCF-12	SEE BELOW
VAV-HW	10"	676	1050	230	0.002	24	21	1.0	30% PG	21.0	1	3.13	TRANE	VCWF-10	SEE BELOW
VAV-HW	12"	1051	1500	325	0.002	24	21	1.0	30% PG	27.0	1	0.65	TRANE	VCWF-12	SEE BELOW

VARIABLE AIR VOLUME BOX SCHEDULE NOTES TYP (U.O.N.):

1. FURNISH & INSTALL DDC CONTROLLER WITH BACNET MS/TP & IP COMMUNICATION PROTOCOL FOR EACH VAV BOX.
2. FURNISH & INSTALL SPACE SENSOR FOR EACH VAV BOX.
3. FURNISH & INSTALL ALL PIPING & TRIM AS SHOWN ON PLAN & FLOW DIAGRAMS FOR VAV BOXES WITH HOT WATER COILS (VAVHW).
4. CONTRACTOR SHALL COORDINATE CONTROL & POWER WIRING WITH CONTROL & ELECTRICAL CONTRACTOR.
5. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

AUTOMATICALLY OPERATED SMOKE & HEAT VENT SCHEDULE

DESIGNATION	DESCRIPTION	SHRINK-OUT MATERIAL	UL 793 OR FM 4430 COMPLIANCE	DIMENSIONS (WxLxH)	MOUNTING TYPE	MANUFACTURER	MODEL #	COMMENTS
SHW-R-1:16	SHRINK-OUT SMOKE & HEAT VENT	ACYRLIC DOUBLE DOME	UL 793	60"x96"x6"	CURB-MOUNT	WASCO-VELUX	66102	SEE BELOW

AUTOMATICALLY OPERATED SMOKE & HEAT VENT SCHEDULE NOTES TYP (U.O.N.):

1. FURNISH & INSTALL 1-1/2" INTEGRAL ROOF CURB.
2. FURNISH CLEAR OUTER ACRYLIC GLAZING.
3. CONTRACTOR SHALL COORDINATE ALL VENT INSTALLATIONS WITH STRUCTURAL CONTRACTOR; ALL FINAL LOCATIONS TO BE SUBMITTED TO ARCHITECT & ENGINEER FOR APPROVAL.
4. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

ELECTRIC RADIANT FLOOR HEATING SCHEDULE

UNIT TAG	LOCATION	SERVICE	TYPE	W/SQFT	COVERAGE (SQFT)	LENGTH (FT)	SPACING (IN)	ELECTRICAL (V/PH/HZ)	WATTS	AMPS	MANUFACTURER	MODEL #	COMMENTS
ERFH-3-1	CONCRETE SLAB	RECEPTION LOBBY 314	CABLE	18	97	290	4	120/1/60	1740	14.5	THERMOSOFT	TS290-120	SEE BELOW
ERFH-3-2	CONCRETE SLAB	RECEPTION LOBBY 314	CABLE	18	97	290	4	120/1/60	1740	14.5	THERMOSOFT	TS290-120	SEE BELOW
ERFH-3-3	CONCRETE SLAB	RECEPTION LOBBY 314	CABLE	18	97	290	4	120/1/60	1740	14.5	THERMOSOFT	TS290-120	SEE BELOW
ERFH-3-4	CONCRETE SLAB	RECEPTION LOBBY 314	CABLE	18	97	290	4	120/1/60	1740	14.5	THERMOSOFT	TS290-120	SEE BELOW
ERFH-3-5	CONCRETE SLAB	RECEPTION LOBBY 314	CABLE	18	97	290	4	120/1/60	1740	14.5	THERMOSOFT	TS290-120	SEE BELOW

ELECTRIC RADIANT FLOOR HEATING SCHEDULE NOTES (TYPICAL U.O.N.):

1. FURNISH & INSTALL STANDARD PROGRAMMABLE THERMOSTAT; THERMOSOFT TH115-AF-GA/U OR EQUIVALENT.
2. FURNISH & INSTALL REQUIRED RELAYS TO CONTROL ALL HEATING CABLES IN NEMA 1 ENCLOSURE; COORDINATE WITH ELECTRICAL CONTRACTOR.
3. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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M-603

MECHANICAL SPECIFICATIONS

PART 1- GENERAL

1.01 GENERAL

A. THE LATEST EDITION OF AIA DOCUMENTS A201 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, OR AS REQUIRED BY THE ARCHITECTURAL DOCUMENTS AND/OR THE STRUCTURAL ENGINEERS DOCUMENTS ARE PART OF THE CONTRACT.

B. BIDDERS SHALL VISIT AND CAREFULLY EXAMINE THE AREA AFFECTED BY THIS WORK TO FAMILIARIZE THEMSELVES WITH THE EXISTING CONDITIONS AND THE DIFFICULTIES THAT WILL AFFECT THE EXECUTION OF THIS WORK BEFORE SUBMITTING PROPOSALS. SUBMISSION OF A PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT SUCH AN EXAMINATION HAS BEEN MADE AND LATER CLAIMS WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT, OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN HAD SUCH AN EXAMINATION BEEN MADE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ENGINEERS ATTENTION PRIOR TO BID. IF DISCREPANCIES ARE NOT RESOLVED TO CONTRACTORS SATISFACTION THEY SHALL BE QUALIFIED IN THEIR BID SUBMISSION.

C. THIS CONTRACTOR SHALL REVIEW ALL CONSTRUCTION DOCUMENTS ASSOCIATED WITH THIS PROJECT INCLUDING GENERAL CONSTRUCTION, DEMOLITION, ARCHITECTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND SPRINKLER PLANS AND SPECIFICATIONS. ALL WORK REQUIRED IN THE BID WHICH IS INDICATED OR IMPLIED TO BE PERFORMED BY THIS TRADE IN OTHER SECTIONS OF THE WORK SHALL BE INCLUDED IN THEIR BID. IF A CONFLICT OCCURS IN THE BID SPECIFICATIONS AND/OR ON THE DRAWINGS, THE MORE STRINGENT SITUATION SHALL APPLY.

D. COORDINATE ALL WORK OF THE SECTION WITH EXISTING CONDITIONS AND THE WORK OF OTHER TRADES. THE CONTRACTOR SHALL THOROUGHLY ACQUAINT HIMSELF WITH THE WORK INVOLVED AND SHALL VERIFY AT THE BUILDING ALL MEASUREMENTS NECESSARY FOR THE PROPER INSTALLATION OF THE WORK, OBTAINING THE SAME WHEN NECESSARY FROM THE OTHER CONTRACTORS AND SECTIONS. CONTRACTOR SHALL ALSO BE PREPARED TO PROMPTLY FURNISH TO OTHER CONTRACTORS ANY INFORMATION RELATING TO THE WORK OF THIS SECTION NECESSARY FOR THE PROPER INSTALLATION OF OTHER CONTRACTS AND SHALL COOPERATE TO SECURE THE BEST PROGRESS OF, AND HARMONY BETWEEN, THE WORK OF THE DIFFERENT CONTRACTS AND SECTIONS IN THE INTERESTS OF THE INSTALLATION AS A WHOLE. CONFER WITH OTHER CONTRACTORS AND ENGINEER FOR ADJACENT WORK TO THIS SECTION AND ARRANGE TO HAVE VISIBLE PORTIONS OF WORK FIT AND HARMONIZE IN A MANNER SATISFACTORY TO THE OWNER'S REPRESENTATIVE.

E. THE SPECIFICATIONS ARE ACCOMPANIED BY DRAWINGS INDICATING THE GENERAL LOCATION OF EQUIPMENT AND CONNECTIONS THERETO. UNLESS SPECIFICALLY DIMENSIONED, LOCATIONS OF EQUIPMENT AND ROUTINGS ARE APPROXIMATE. SCALES ON DRAWINGS ARE INDICATED FOR BIDDING PURPOSES ONLY. DRAWINGS SHALL NOT BE SCALED FOR CONSTRUCTION AND MANUFACTURING DETAILS. CERTAIN SYSTEMS ARE DIAGRAMMATIC AND GIVE THE GENERAL ARRANGEMENT ONLY. NO ADDED COMPENSATION WILL BE PERMITTED FOR VARIATIONS DUE TO FIELD CONDITIONS. EXACT LOCATIONS AND ARRANGEMENTS SHALL BE DETERMINED IN THE FIELD ON THE BASIS OF DETAILS INDICATED ON APPROVED SHOP DRAWINGS, AND SUPPLEMENTARY INFORMATION ISSUED BY THE ENGINEER, AND SHALL PROVIDE FOR OPERATING EFFICIENCY, NEATNESS OF APPEARANCE, AND EASE OF MAINTENANCE.

F. GUARANTEE: THE CONTRACTOR SHALL GUARANTEE AND SERVICE THE ENTIRE INSTALLATION FOR A PERIOD OF ONE YEAR FROM THE DATE OF THE FINAL ACCEPTANCE OF THE INSTALLATION. THE CONTRACTOR SHALL, DURING THE PERIOD OF THE GUARANTEE, REPLACE OR REPAIR AT HIS OWN EXPENSE ANY PIECE OF EQUIPMENT AND/OR MATERIAL WHICH IS FOUND TO BE DEFECTIVE. THE REPLACEMENT OR REPAIR SHALL BE PERFORMED THE SAME DAY OF NOTIFICATION IN AN EMERGENCY FASHION WHEN NOTIFIED BY THE OWNER OR AUTHORIZED REPRESENTATIVE. THE CONTRACTOR SHALL ALSO REPAIR ALL DAMAGE TO SURROUNDING WORK CAUSED BY THE FAILURE, REPAIR OR REPLACEMENT OF DEFECTIVE EQUIPMENT. ALL REFRIGERATION COMPRESSORS SHALL HAVE A FACTORY GUARANTEE INCLUDING PARTS AND LABOR FOR FIVE YEARS TOTAL. THE FINAL ACCEPTANCE WILL BE MADE AFTER THE CONTRACTOR HAS ADJUSTED HIS EQUIPMENT, BALANCED THE VARIOUS SYSTEMS, DEMONSTRATED THAT IT FULFILLS THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATION, AND HAS FURNISHED ALL THE REQUIRED CERTIFICATES OF INSPECTION AND APPROVALS.

G. EQUIPMENT AND MATERIALS: MOST ITEMS OF MECHANICAL AND ELECTRICAL EQUIPMENT AND MATERIAL ARE NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS WITH A MANUFACTURER'S NAME AND CATALOG NUMBER. THIS DESIGNATION IS USED TO SET THE STANDARD FOR CONSTRUCTION, PERFORMANCE, OPERATION AND APPEARANCE. PRODUCTS OF OTHER MANUFACTURERS WILL BE CONSIDERED AND RULED UPON BY THE ENGINEER. THE SUBMISSION OF A SUBSTITUTION IMPLIES THAT THE ITEM HAS ALL NECESSARY UNDERWRITERS' LABORATORIES, BOARD OF STANDARDS AND APPEALS, NEW YORK CITY MEA, NATIONAL ELECTRICAL CODE, NEW YORK CITY ELECTRICAL CODE AND NEW YORK CITY ELECTRICAL ADVISORY BOARD, ETC. APPROVALS. SHOULD THE ITEM BE FOUND NOT TO HAVE SUCH APPROVAL, IT SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER

H. SUBSTITUTIONS: DEVIATIONS FROM CONTRACT DOCUMENTS AND SUBSTITUTION OF MATERIALS OR EQUIPMENT FOR THOSE SPECIFIED SHALL BE REQUESTED INDIVIDUALLY IN WRITING. FURNISH INFORMATION AS REQUIRED TO DEMONSTRATE THAT THE ARTICLE, MATERIAL, APPARATUS, PRODUCT OR PROCESS TO BE USED IS ADEQUATELY COMPARABLE TO THAT SPECIFIED IN QUALITY, FINISH, DESIGN, EFFICIENCY, DURABILITY AND GENERAL APPEARANCE, AND HAS BEEN ELSEWHERE DEMONSTRATED TO BE SERVICEABLE FOR THE PURPOSES FOR WHICH IT IS INTENDED. IF TESTS OR DEMONSTRATIONS ARE REQUIRED BY THE OWNER'S REPRESENTATIVES, THE COST OF SUCH TESTS OR DEMONSTRATIONS SHALL BE BORNE BY THE CONTRACTOR. DESCRIBE REASON FOR CHANGE, CONNECTIONS TO ADJACENT MATERIALS, ELECTRICAL SERVICES, SERVICE ACCESS REQUIREMENTS, DIFFERENCES IN OPERATING CHARACTERISTICS OR CYCLES AND ALL OTHER POINTS OF DEVIATION. CONTRACTOR TO ASSUME FULL RESPONSIBILITY FOR SAFETY, COORDINATION WITH OTHER TRADES, OPERATION AND PERFORMANCE OF ALTERED SYSTEM.

I. THIS CONTRACTOR IS TO OBTAIN A COPY OF THE BUILDING RULES AND REGULATIONS PRIOR TO BID SUBMISSION. ALL WORK MUST BE INSTALLED IN ACCORDANCE WITH THE BUILDING RULES AND REGULATIONS. DETERMINE REQUIREMENTS AND THE EXTENT OF PREMIUM TIME WORK REQUIRED BY BUILDING, FOR THE PURPOSE OF THE BID ASSUME ANY NOISY WORK (E.G., CHOPPING, CORE DRILLING, WELDING, BRAISING, SOLDERING, ETC.) AND BASE BUILDING SYSTEMS INTERRUPTIONS ARE TO BE PERFORMED OUTSIDE NORMAL BUSINESS HOURS.

J. REMOVAL, TEMPORARY CONNECTIONS AND RELOCATION OF CERTAIN EXISTING WORK WILL BE NECESSARY FOR THE INSTALLATION OF THE NEW SYSTEMS. ALL EXISTING CONDITIONS ARE NOT COMPLETELY DETAILED ON THE DRAWINGS. THE CONTRACTOR SHALL SURVEY THE SITE AND MAKE ALL NECESSARY CHANGES REQUIRED BASED ON EXISTING CONDITIONS FOR PROPER INSTALLATION OF NEW WORK.

K. ALL NECESSARY CUTTING AND PATCHING IN FLOOR SLABS, ROOF SLABS, WALLS, AND CEILINGS FOR THE HVAC WORK SHALL BE PERFORMED BY THIS CONTRACTOR. RESTORE TO MATCH EXISTING CONDITIONS.

L. WHERE PIPE AND/OR DUCTWORK PENETRATE RATED WALLS, THE SPACE BETWEEN THE INSULATION AND THE WALL SHALL BE CAULKED WITH NON-COMBUSTIBLE MATERIAL IN AN APPROVED MANNER. ALL PIPING AND/OR DUCTWORK TO BE INSTALLED ABOVE HUNG CEILING UNLESS OTHERWISE NOTED ON DRAWINGS. THE CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS FOR ALL CEILING ELEVATIONS.

M. ACCESS DOORS IN FINISHED CONSTRUCTION: THE CONTRACTOR SHALL PREPARE A LIST OF ALL ACCESS DOORS (MINIMUM 18"X18") REQUIRED FOR OPERATION AND MAINTENANCE OF ALL CONCEALED EQUIPMENT AND OTHER DEVICES, WHICH SHALL BE SUPPLIED TO THE GENERAL CONTRACTOR FOR INSTALLATION. THE COST TO FURNISH AND INSTALL ACCESS DOORS SHALL BE INCLUDED IN THIS CONTRACTORS BID. THIS CONTRACTOR IN ADVANCE OF CEILING INSTALLATIONS SHALL SUITABLY FIELD TAG AND IDENTIFY ALL CONCEALED EQUIPMENT, VALVES, DAMPERS, ETC., WHICH REQUIRE ACCESS DOOR PROVISIONS.

N. NEW DUCTWORK SHALL ARRIVE ON THE CONSTRUCTION SITE SEALED AND REMAIN PROTECTED FROM DEBRIS THROUGHOUT CONSTRUCTION PRIOR TO FINAL INSTALLATION. AIR DISTRIBUTION ACCESSORIES AND INTERNAL COMPONENTS OF ALL HVAC EQUIPMENT SHALL BE SEALED AND PROTECTED FROM DEBRIS WHILE ON THE CONSTRUCTION SITE PRIOR TO FINAL CONNECTION AND START-UP.

O. ALL VOLATILE ORGANIC COMPOUND (VOC) LIMITS OF ADHESIVES, SEALANTS AND SEALANT PRIMERS MUST COMPLY WITH SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) RULE #1168, AMENDMENT DATE OF JANUARY 7, 2005.

1.02 SCOPE OF WORK

A. THE CONTRACTOR SHALL FURNISH AND INSTALL AN HVAC SYSTEM COMPLETE WITH ALL EQUIPMENT, DUCTWORK, PIPING, INSULATION, CONTROLS, ACCESSORIES AND ASSOCIATED WORK IN ACCORDANCE WITH THE NEW YORK STATE BUILDING CODE, ALL NATIONAL, STATE AND LOCAL AUTHORITIES HAVING JURISDICTION, BUILDING MANAGEMENT, DESIGN DRAWINGS AND THIS SPECIFICATION.

B. THE WORK SHALL INCLUDE ALL LABOR, MATERIALS, EQUIPMENT, HOISTING AND RIGGING, BREAKDOWN AND SETUP OF EQUIPMENT FOR INSTALLATION, SCAFFOLDING, AND SERVICES TO COMPLETE THE SYSTEM AND PROVIDE THE OWNER WITH A FULLY OPERATIONAL SYSTEM. ANY EQUIPMENT, PARTS, MATERIALS, ACCESSORIES, OR LABOR THAT IS NECESSARY FOR PROPER PERFORMANCE OF THE MECHANICAL WORK ALTHOUGH NOT SPECIFICALLY MENTIONED HEREIN OR SHOWN ON THE DRAWINGS, SHALL BE FURNISHED AND INSTALLED WITHOUT ADDITIONAL COSTS. WHEN INSTALLATION OF A PART OF ANY SYSTEM (PLUMBING, HEATING, AIR CONDITIONING, ELECTRICAL OR OTHERWISE) REQUIRES A SHUTDOWN OF ANY OPERATING SYSTEM, CONNECT THE PARTIAL SYSTEM ONLY AFTER NOTIFICATION TO AND WITH APPROVAL OF THE OWNER. COORDINATE ACTIVITIES CLOSELY WITH THOSE OF SUBCONTRACTOR'S SO THE OPERATION IS RESTRICTED TO AS SHORT AN INTERVAL AS POSSIBLE AND "OUT OF SERVICE" TIME OF THESE FACILITIES IS KEPT TO A MINIMUM. ANY SHUTDOWN OF THE ELECTRICAL SYSTEM WILL BE DONE OUT OF HOURS AS APPROVED BY OWNER.

C. IT IS IMPERATIVE THAT EXISTING SYSTEMS BE MAINTAINED IN CONTINUOUS OPERATION DURING THE COURSE OF CONSTRUCTION; IF SHUTDOWNS ARE REQUIRED TO PERMIT THE DISCONNECTION AND REMOVAL OR RECONNECTION OF EXISTING WORK, OR FINAL CONNECTION TO BE MADE TO AN EXISTING SYSTEM, THEY SHALL OCCUR ONLY DURING OFF-HOURS AND ONLY AFTER PROPER PERMISSION HAS BEEN OBTAINED FROM BUILDING MANAGEMENT.

D. THE BUILDING MANAGEMENT REQUIRES NOT LESS THAN SEVEN DAYS NOTICE FOR SHUTDOWN OF ANY BUILDING SYSTEM.

E. MAKE AN ACCURATE TAKE-OFF ALL EXISTING EQUIPMENT, DUCTWORK, PIPING, CONDUIT, PANELBOARDS, WIRING DEVICES, AND OTHER ACCESSORIES BEING REMOVED DURING DEMOLITION AND INCLUDE THE COST FOR DISCONNECTING AND REMOVAL OF STATED EQUIPMENT, ETC. INTO THE BASE BID. REMOVALS SHALL BE AS SPECIFIED AND/OR AS INDICATED ON THE DRAWINGS. IN CERTAIN CASES, EQUIPMENT OR MATERIALS DESIGNATED FOR REMOVAL SHALL REMAIN THE PROPERTY OF THE OWNER AND SHALL BE TURNED OVER AT LOCATIONS IN THE BUILDING AS DIRECTED BY THE OWNER.

F. PLAN INSTALLATION OF NEW WORK AND CONNECTIONS TO EXISTING WORK TO INSURE MINIMUM INTERFERENCE WITH REGULAR OPERATION OF EXISTING FACILITIES. ALL SYSTEM SHUTDOWNS AFFECTING OTHER AREAS SHALL BE COORDINATED WITH BUILDING MANAGEMENT.

G. THIS OWNER SHALL PROCURE THE SERVICES OF A THIRD PARTY INSPECTION COMPANY TO PERFORM ALL SPECIAL INSPECTIONS IN ACCORDANCE WITH THE NEW YORK CITY BUILDING CODE. SECURE ALL REQUIRED PERMITS AND APPROVALS AND TRANSMIT SAME TO THE OWNER. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL FEES.

1.03 SHOP DRAWINGS, EQUIPMENT SUBMISSION, MAINTENANCE MANUALS

A. SUBMIT ONE (1) REPRODUCIBLE AND ONE (1) PRINT OF THE SHEET METAL AND PIPING SHOP DRAWINGS, 3/8" SCALE, CERTIFIED BY ALL TRADES THAT COORDINATION HAS BEEN ESTABLISHED.

B. SUBMIT THREE (3) COPIES OF ALL SHEET METAL AND PIPING SHOP STANDARDS LEAKAGE TEST CERTIFICATION, AIR AND WATER BALANCING REPORTS, AND CERTIFIED EQUIPMENT CUTS WITH CONSTRUCTION WIRING DIAGRAMS, AND AUTOMATIC TEMPERATURE CONTROL SHOP DRAWINGS INCLUDING CONTROL AND POWER WIRING DIAGRAMS, SEQUENCE OF OPERATIONS AND ALL CUTS OF EQUIPMENT AND DEVICES.

C. SUBMIT FOUR (4) BOOK BOUND OPERATING AND SERVICE MANUALS WHICH SHALL INCLUDE COPIES OF ALL AS-BUILT SHOP DRAWINGS FOLDED AND PLACED INTO BINDER POCKETS, AS-BUILT DRAWINGS IN ELECTRONIC FORMAT, COPIES OF REVIEWED EQUIPMENT CUTS FOR INSTALLED EQUIPMENT, COPIES OF EQUIPMENT START UP CHECKLISTS, AIR AND WATER BALANCING REPORTS, LEAK TESTS, HYDROSTATIC TESTS, WATER TREATMENT AND CHEMICAL CLEANING CERTIFICATION. CONTRACTOR SHALL INSTRUCT OWNERS PERSONNEL ON THE OPERATION OF ALL HVAC SYSTEMS.

D. AS WORK PROGRESSES AND FOR DURATION OF CONTRACTOR, MAINTAIN COMPLETE AND SEPARATE SET OF PRINTS OF CONTRACT DRAWINGS AT THE JOB SITE. RECORD WORK COMPLETED AND ALL CHANGES FROM ORIGINAL CONTRACT DRAWINGS CLEARLY AND ACCURATELY INCLUDING WORK INSTALLED AS A MODIFICATION OR ADDITION TO THE ORIGINAL DESIGN. RECORD VALVE TAGS AS THEY ARE INSTALLED. FINAL SUBMISSION OF REPRODUCIBLE AS-BUILT DRAWINGS ARE TO BE SIGNED AND CERTIFIED BY INSTALLING CONTRACTOR THAT THIS IS THE AS-BUILT CONDITION OF THE WORK. AS-BUILT SHOP DRAWINGS SHALL BE SUBMITTED IN DRAWING AND ELECTRONIC FORMAT (AUTOCAD 2007 MINIMUM).

PART 2- PRODUCT/APPLICATION

2.01 DUCTWORK

A. PROVIDE ALL SUPPLY, RETURN, EXHAUST, AND OUTSIDE AIR SHEET METAL DUCTWORK, FITTINGS, DAMPERS, TURNING VANES, ACCESS DOORS, PLENUMS, FLEXIBLE CONNECTIONS, AND SUPPORTS AND PERFORM LEAK TEST PER LATEST SMACNA STANDARDS AND NFPA90A AS MODIFIED BY NEW YORK STATE BUILDING CODE. ALL DUCTWORK JOINTS SHALL BE SEALED AIR TIGHT WITH APPROVED DUCT SEALANT, SIMILAR TO 3M-900.

B. ALL LOW PRESSURE DUCTS EXPOSED IN OCCUPIED AREAS, OTHER THAN MECHANICAL AND FAN ROOMS FABRICATED WITH HEMMED "S" SLIPS. REINFORCE JOINTS OF DUCTS OVER 30" WIDE WITH FLAT BARS OR FLAT BARS AND 3/8" RODS FOR DUCTS OVER 54" WIDE. TOP JOINT WITH BAR SKIP UNDER 31" WIDTH AND REINFORCED BAR SKIP FOR 31" AND LARGER IN WIDTH.

C. ROUND DUCTS SPIRAL LOCK. G.I. COMPANY, SHEET METAL PRODUCTS, UNITED SHEET METAL, PACIFIC AIR PRODUCTS, OR AS APPROVED. ROUND DUCTS OVER 60" WITH BUTT WELDED, LONGITUDINAL SEAMS, AND FLANGE JOINTS.

D. FITTINGS IN ROUND DUCTS SHALL BE NO LIGHTER THAN 20 GAUGE, AND WELDED. G. 1. COMPANY, SHEET METAL PRODUCTS, UNITS SHEET METAL, PACIFIC AIR PRODUCTS, OR AS APPROVED. BRANCH TEE TAKE-OFFS MADE WITH "CON-T" TYPE CONICAL TEE FITTINGS. WHERE MAIN DUCT REDUCES IN SIZE AFTER TAKE-OFF, USE "CON-T" OR TURNS, AND 3-PIECE FOR 45 DEGREE TURNS.

E. CONTRACTOR SHALL ADHERE TO THE FULL INSIDE CROSS SECTIONAL DUCTWORK AREAS SHOWN ON THE DRAWINGS AND PROVIDE ALL TRANSITIONS AND OFFSETS AS REQUIRED TO MEET FIELD CONDITIONS, ACCOMMODATE EQUIPMENT MAINTENANCE REQUIREMENTS AND COORDINATE WITH ALL TRADES. ALL FIELD CONDITIONS WHICH REQUIRE MODIFIED TRANSITIONS WILL NOT BE APPROVED WITHOUT PRIOR ENGINEER APPROVAL THROUGH SHOP DRAWING OR RFI.

F. FOR DUCTS WITH ACOUSTICAL LINING THE SIZES SHOWN ON THE PLAN SHALL BE THE CLEAR INSIDE DIMENSIONS.

G. ALL OPEN-ENDED RETURN, TRANSFER OR EXHAUST DUCTS SHALL BE PROVIDED WITH WIRE MESH SCREENS.

H. NEW DUCTWORK SHALL HAVE PRESSURE CLASSIFICATION, SEALING REQUIREMENTS AND LEAKAGE TESTING AS LISTED BELOW UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS:

1. 4" CLASS: ALL SUPPLY DUCTWORK FROM DISCHARGE OF AIR UNITS TO INLETS OR TERMINAL BOXES. SEAL CLASS A, LEAKAGE CLASS 6 (RECTANGULAR) OR CLASS 3 (ROUND). PROVIDE TDF FLANGE CONNECTIONS FOR ALL SYSTEM 4" PRESSURE CLASS AND ABOVE.
2. 2" CLASS: ALL OTHER LOW PRESSURE DUCTWORK. SEAL CLASS B, LEAKAGE CLASS 24 (RECTANGULAR) OR CLASS 12 (ROUND).
3. LEAKAGE TESTING:
   A) ALL NEW LOW PRESSURE DUCTWORK (2" CLASS) SHALL BE TESTED ON AN AS-NEEDED BASIS AT THE ENGINEERS DISCRETION OR IF BALANCING AIR QUANTITIES CAN NOT BE MET. IF SPECIMEN FAILS TO MEET ALLOTTED LEAKAGE LEVEL, THE CONTRACTOR SHALL MODIFY TO BRING IT INTO COMPLIANCE AND SHALL RETEST IT UNTIL ACCEPTABLE LEAKAGE IS DEMONSTRATED. TESTS AND NECESSARY REPAIRS SHALL BE COMPLETED PRIOR TO CONCEALMENT OF DUCTS.

F. MATERIALS:

1. SHEETMETAL: HOT-DIPPED GALVANIZED SHEETMETAL WITH G60 COMMERCIAL COATING ACCORDING TO ASTM A653 & A924 FOR ALL DUCTWORK UNLESS OTHERWISE SPECIFIED.
2. ALUMINUM: ALLOY 3003-H14, OF THICKNESS REQUIRED BY THE SMACNA DUCT CONSTRUCTION STANDARDS. PROVIDE FOR ALL DUCTWORK EXPOSED TO WEATHER AND MOISTURE INCLUDING OUTSIDE AIR DUCTS WITHIN 10 FEET OF LOUVERS AND TOILET ROOMS EQUIPPED WITH BATHS OR SHOWERS.

G. PROVIDE MANUAL BALANCING DAMPERS AS REQUIRED TO PROPERLY BALANCE THE AIR DISTRIBUTION SYSTEM AS SHOWN ON DRAWINGS AND AS LISTED BELOW:

1. ALL SUPPLY AIR MAIN BRANCHES FROM TRUNK, EACH SPLIT, AND ALL SUB-BRANCHES FROM MAINS SHALL HAVE BALANCING DAMPERS.
2. EXHAUST AND RETURN MAIN BRANCHES FROM TRUNK, EACH SPLIT AND ALL SUB-BRANCHES FROM MAINS SHALL HAVE BALANCING DAMPERS.
3. IF DAMPER IS NOT ACCESSIBLE, OR IS LOCATED ABOVE A PLASTER OR DRYWALL CEILING, PROVIDE A REMOTE DAMPER ACTUATOR AND DAMPER AS MANUFACTURED BY YOUNG REGULATOR MODEL 896-C WITH NO. 1200A RIGHT ANGLE WORM GEAR AND DAMPER MODEL 820 OR APPROVED EQUAL.

H. FIRE DAMPERS:

1. PROVIDE ALL FIRE DAMPERS, SMOKE DETECTORS, AND ASSOCIATED CONTROLS AND ALARMS AS REQUIRED BY CODE.
2. DAMPERS SHALL BE DYNAMIC TYPE, U.L. LISTED AND LABELED, AND IN CONFORMANCE WITH NFPA.
3. FIRE DAMPER SHALL BE FUSIBLE LINK TYPE (165 DEGREE F.), TYPE B SHUTTER OUT OF THE AIR STREAM AS MANUFACTURED BY POTTORFF MODEL VFD-10 (1-1/2 HR RATED) AS REQUIRED OR APPROVED EQUAL.

I. SLOPE AND DRAIN ALL DUCTS EXPOSED TO MOISTURE, CONSTRUCT OF ALUMINUM AND DO NOT INTERNALLY LINE

J. AUTOMATIC CONTROL DAMPERS: PROVIDE DAMPERS WITH PARALLEL BLADES FOR 2-POSITION. AUTOMATIC DAMPERS ARE TO BE VERY LOW LEAKING TYPE WITH A MAXIMUM LEAKAGE RATE OF 6 CFM PER SQUARE FOOT AT 4" W.G. DAMPER MATERIAL SHALL BE THE SAME AS DUCT. PROVIDE WEATHERPROOF COMPONENTS FOR DAMPERS IN A MOISTURE ENVIRONMENT.

K. LOUVERS SHALL MATCH THE BUILDING EXTERIOR. SUBMIT THE SELECTED LOUVERS PRESSURE DROP AND WATER PENETRATION CHARACTERISTICS FOR REVIEW. LOUVERS SHALL BE GREENEHCK ESD-435 OR EQUIVALENT. LOUVERS SHALL HAVE AN EXTRUDED ALUMINUM STRUCTURE WITH AN ANODIZED ALUMINUM MILL FINISH OR FINISH AS SPECIFIED BY THE BUILDING MANAGEMENT. LOUVERS ARE ALSO TO BE PROVIDED WITH 1/2" WIRE MESH ALUMINUM BIRD SCREENS. ALL LOUVER SECTIONS NOT IN USE SHALL BE BLANKED-OFF WITH AN INSULATED SHEET METAL PANEL.

2.02 GRILLES, REGISTERS AND DIFFUSERS

A. PROVIDE ALL AIR OUTLETS AND RETURNS OF THE TYPE AND SIZES, AS SELECTED AND INDICATED ON DRAWING. ALL DUCTED RETURN AND EXHAUST OUTLETS SHALL HAVE OPPOSED BLADE DAMPERS (ADJUSTABLE THROUGH THE FACE). PROVIDE FRAMES AND MOUNTING TYPES AS REQUIRED TO MATCH SURROUNDING CEILING CONSTRUCTION. FINISHES TO BE SELECTED BY THE ARCHITECT.

B. ALL CEILING TYPE AIR DIFFUSERS SHALL BE PROVIDED WITH EQUALIZING DEFLECTOR.

C. A SCHEDULE OF DIFFUSERS, GRILLES AND REGISTERS WITH MANUFACTURERS MODELS, SIZES, ACCESSORIES, FINISHES, ETC., SHALL BE SUBMITTED FOR APPROVAL PRIOR TO RELEASE FOR FABRICATION AND DELIVERY

D. DIFFUSERS SHOWN ON DIFFUSER SCHEDULE SHALL BE CHANGED TO MATCH EXISTING DIFFUSER TYPE WHERE EXISTING DIFFUSERS ARE REMAINING.

E. ALL NON-DUCTED RETURN DIFFUSERS SHALL BE PROVIDED WITH LIGHT SHIELDS.

2.03 PIPING

A. PROVIDE PIPING WHICH IS SCHEMATICALLY INDICATED AND SIZED ON DRAWINGS. PIPING TO BE INSTALLED TO MEET SPECIFIED HEADROOM OR FIELD CONDITIONS AND SHALL CONFORM TO LATEST ASME CODES FOR PRESSURE PIPING. PIPE MATERIALS AND FITTING MATERIALS SHALL BE AS PER THE PIPE AND FITTING SCHEDULES SHOWN ON DRAWINGS.

B. PIPING, FITTINGS, AND ALL PIPE APPURTENANCES SHALL BE SUITABLE FOR THE PRESSURE AND TEMPERATURE OF SERVICE.

C. PROVIDE DIELECTRIC FITTINGS TO CONNECT DIFFERENT PIPING MATERIALS.

D. PROVIDE AIR VENTS AT EACH HIGH POINT AND DRAIN VALVES WITH HOSE BIB AT EACH LOW POINT.

E. PIPING SHALL BE INSTALLED WITH PROPER ANCHORS AND EXPANSION/CONTRACTION DEVICES SUCH AS LOOPS OR APPROVED EXPANSION JOINTS TO PREVENT UNDUE STRAINS ON PIPING OR APPARATUS CONNECTED TO THE PIPING, AS REQUIRED.

F. SUPPORT PIPING WITH HANGERS EQUIPPED WITH INSULATION SADDLES FROM APPROVED CONCRETE INSERTS, EXPANSION SHIELDS, BEAM CLAMPS, AND/OR SUPPLEMENTARY STEEL ANGLES, PLATES, AND CHANNELS. CONTRACTOR SHALL SUBMIT METHOD OF PIPING SUPPORT SIGNED AND SEALED BY A LICENSED PROFESSIONAL ENGINEER FOR REVIEW.

G. UNIONS WITH REMOVABLE SECTIONS OF PIPING SHALL BE INSTALLED AT ALL EQUIPMENT TO PERMIT EASE OF DISCONNECTION FOR EQUIPMENT SERVICE/REMOVALS WITHOUT DISMANTLING OF MAJOR PORTIONS OF CONNECTED PIPING.

H. PROVIDE TEES IN PIPING SYSTEM FOR TESTING AND BALANCING, AND INSTALLATIONS OF FLOW OR FLOAT SWITCHES, GAUGED, THERMOMETERS AND OTHER BALANCING AND CONTROL DEVICES, COORDINATE WITH THE CONTROL CONTRACTOR AND BALANCER.

I. PROVIDE AUTOMATIC PRESSURE RELIEF VALVES AND VACUUM BREAKERS TO PREVENT AGAINST PIPE RUPTURE OR SYPHONING ACTIONS. EXTEND DRAINS FROM RELIEF VALVES TO SPILL OVER FLOOR DRAINS.

J. ALL PIPE SLEEVES SHALL BE SCHEDULE 40 GALVANIZED STEEL. ANNULUS BETWEEN PIPE OR PIPE INSULATION AND SLEEVE SHALL BE CAULKED WITH A NON-COMBUSTIBLE MATERIAL TO WITHIN 1/4" OF WALL FACES AND FILLED WITH CAULKING COMPOUND FOR INTERIOR SLEEVES. EXTERIOR SLEEVES OR WATERPROOF SLEEVES SHALL UTILIZE LINK SEAL (LS) TYPE TO FILL THE ANNULUS. PROVIDE ESCUTCHEONS ON ALL EXPOSED PIPING THROUGH WALLS OR FLOORS HELD IN PLACE WITH SCREWS.

K. PROVIDE SECURELY FASTENED LABELING OF ALL PIPING (BOTH EXPOSED AND CONCEALED) IN ACCORDANCE WITH ANSI STANDARDS AND COLOR CODED AS PER BUILDING MANAGEMENT STANDARDS. LABELING SHOULD BE PROVIDED 20 FEET ON CENTERS AND/OR AT LEAST ONCE IN EACH ENCLOSED SPACE OR ROOM WHERE THE WALLS EXTEND ABOVE THE CEILING.

L. PROVIDE VALVE TAGS AND CHARTS:

1. EACH VALVE SHALL HAVE A 2 INCH DIAMETER BRASS TAG WITH 1 INCH HIGH NUMERAL STAMPED THEREON, SECURED TO THE VALVE BY MEANS OF BRASS S HOOK OR BRASS CHAIN. EACH SYSTEM TO HAVE A LETTER DESIGNATION INDICATING SERVICE.
2. THE CONTRACTOR SHALL FURNISH AN APPROVED NEATLY DRAWN VALVE CHART, PROPERLY FRAMED, SHOWING THE USE AND LOCATION OF EACH VALVE THAT IS TAGGED.

M. VALVES AND STRAINERS:

1. VALVES, STRAINERS, ETC., SHALL NOT CONTAIN ASBESTOS AND HAVE THE NAME OF THE MANUFACTURER AND GUARANTEED WORKING PRESSURE CAST OR STAMPED ON BODIES. VALVES OF SIMILAR TYPE SHALL BE BY A SINGLE MANUFACTURER.
2. VALVES USED FOR THROTTLING OR CONTROLLING FLOW SHALL BE BALL (3" OR SMALLER) OR PLUG TYPE VALVES (ALL SIZES). VALVES FOR ISOLATION SHALL BE BALL FOR LIQUID SYSTEMS UNLESS OTHERWISE SPECIFIED. BUTTERFLY VALVE SHALL BE LUG TYPE AND MAY BE SUBSTITUTED FOR BALL VALVES FOR SIZES 4" AND LARGER. REFER TO AUTOMATIC TEMPERATURE CONTROL SECTION FOR CONTROL VALVES.
3. VALVES SHALL HAVE WORKING PRESSURE AND TEMPERATURE RATINGS SAME AS PIPE FITTINGS SPECIFIED FOR THE SERVICE. REGARDLESS OF SERVICE, VALVES SHALL NOT BE DESIGNED FOR LESS THAN 125 PSI WORKING PRESSURE.
4. LUBRICATED, TAPERED PLUG VALVES WITH LOCKING FLOW PLATE SHALL BE PROVIDED IN THE DISCHARGE PIPING FROM WATER CIRCULATING PUMPS, IN THE LEAVING WATER PIPING BRANCHES FROM ALL COILS, HEAT EXCHANGER TYPES OF EQUIPMENT, AND ALL RETURN WATER RISERS OF SUB-MAINS THAT CONNECT TO HYDRONIC MAINS FOR BOTH BALANCING AND ISOLATION PURPOSES.
5. CHECK VALVES SIZED 2-1/2" AND LARGER SHALL BE IRON BODY, FLANGED ENDS, BRONZE MOUNTED, SWING PATTERN, WITH REMOVABLE CAP, RE-GRINDABLE DISC AND SEAT RING. CHECK VALVES SIZED 2" AND SMALLER SHALL BE BRONZE BODY, SCREWED ENDS, SWING PATTERN. PROVIDE SPRING LOADED, SILENT ACTION, NON-SLAM TYPE CHECK VALVE WITH REMOVABLE CAP, RE-GRINDING DISC AND SEAT RING IN ALL VERTICAL INSTALLATIONS AND DISCHARGE PIPING FROM PUMPS AS MANUFACTURED BY SMOLENKSY, MEULLER, WILLIAMS-HAGER OR MILLER.
6. BALL VALVES SHALL BE PROVIDED WITH STAINLESS STEEL BALL, STEM AND SEAT RING, TFE BUSHING AND SEAT RING GASKET. BALL VALVES INSTALLED IN COPPER SYSTEMS SHALL HAVE BRONZE BODIES. BALL VALVES SHALL BE RATED FOR A MINIMUM OF 275 PSI @ 100 DEGREE F. BALL VALVES USED FOR THROTTLING (3" AND SMALLER) SHALL BE PROVIDED WITH A LOCKING BALANCING STOP.
7. STRAINERS OF SARCO OR MEULLER MANUFACTURER SHALL BE PROVIDED IN THE INLET PIPING TO EACH STEAM TRAP, MAKE UP CONNECTION, PUMP, AND AUTOMATIC CONTROL VALVE OF STEAM AND HYDRONIC SYSTEM. STRAINER SHALL BE Y-PATTERN UNLESS OTHERWISE SPECIFIED ON DRAWINGS. STRAINERS SHALL BE OF DESIGN TO ALLOW BLOW-DOWN OF ACCUMULATED DEBRIS AND TO FACILITATE REMOVAL AND REPLACEMENT OF THE STRAINER SCREEN WITHOUT DISCONNECTION FROM THE MAIN PIPING. STRAINERS INSTALLED IN COPPER SYSTEMS SHALL HAVE BRONZE BODIES. STRAINER BASKET SHALL BE NICKEL, COPPER, BRASS OR STAINLESS STEEL OF AMPLE STRENGTH TO PREVENT COLLAPSING UNDER SHOCK LOADING. PERFORATIONS SHALL BE AS FOLLOWS: STEAM=1/32", WATER UP TO 3" SIZE-1/16", WATER 4" AND OVER -1/8". FOR STRAINERS 2-1/2" AND LARGER, PROVIDE A VALVE DIRT BLOW-OUT PIPING CONNECTION TERMINATED WITH A PIPE NIPPLE AND CAP. STRAINERS 2" AND SMALLER SHALL HAVE 6" LONG BLOW-OFF NIPPLE WITH CAPPED END.

N. THERMOMETERS AND PRESSURE GAUGES:

1. PROVIDE PIPE THERMOMETERS WITH SEPARABLE SOCKETS IN THE ENTERING AND LEAVING WATER PIPING CONNECTIONS TO COOLING TOWERS, CHILLERS, HEAT EXCHANGES, HEATING, COOLING AND CONDENSER COILS. THERMOMETERS SHALL BE WEISS, WEKSLER, THERICE OR OTHER APPROVED MANUFACTURER AND SHALL BE MINIMUM OF 4-1/2" DIAL TYPE, ALUMINUM FLANGELESS CASE FURNISHED WITH MICROMETER ADJUSTABLE POINTER. THERMOMETER SHALL HAVE A 1% ACCURACY AND MIDPOINT AS SYSTEM OPERATING TEMPERATURE.
2. PROVIDE LIQUID FILLED PRESSURE GAUGES ON INLET AND OUTLET WATER PIPING CONNECTIONS TO ALL PUMPS AND OTHER WATER HEAT EXCHANGE APPARATUS INCLUDING WATER COILS, HEAT EXCHANGERS, CHILLERS. EACH PRESSURE GAUGE INSTALLATION SHALL INCLUDE A 1/4" BALL VALVE FOR ITS CONNECTION TO PIPING. PRESSURE GAUGES SHALL BE WEISS, WEKSLER, THERICE OR OTHER APPROVED MANUFACTURER AND SHALL BE MINIMUM OF 4-1/2" DIAL TYPE, CAST ALUMINUM CASE, STEEL MOVEMENT, MICROMETER ADJUSTABLE POINTER, 1% ACCURACY AND MIDPOINT AT SYSTEM OPERATING PRESSURE.

O. PIPE TESTING:

1. NO TESTING SHALL BE CONDUCTED UNTIL PIPE CLEANING AND PRETREATMENT HAS BEEN COMPLETED AND RECORDED.
2. ALL TESTING SHALL BE COORDINATED BY THE CONTRACTOR AND SHALL BE WITNESSED BY A BUILDING OWNERS REPRESENTATIVE. ALL SYSTEMS WHICH FAIL THE PRESSURE TESTS SHALL BE FIXED AND RETESTED AT NO EXPENSE TO THE OWNER.
3. ISOLATE ALL EQUIPMENT WHICH IS TO BE EXCLUDED FROM THE PRESSURE TEST AND PROVIDE ALL TEMPORARY PIPING CONNECTIONS, FITTINGS, VALVES, EQUIPMENT, LABOR, ETC., TO PRESSURE TEST ALL SYSTEMS.
4. GLYCOL HOT WATER SYSTEMS WILL BE HYDROSTATICALLY TESTED WITH WATER AT 1-1/2 TIMES THE WORKING PRESSURE, FOR A MINIMUM PERIOD OF TWO HOURS, WITH NO LEAKS.

2.04 INSULATION REQUIREMENTS

A. INSULATION SHALL BE APPLIED TO PIPING AND MATERIALS AS SPECIFIED HEREIN AND FOR APPLICABLE SYSTEMS OF THIS PROJECT. INSULATION SHALL HAVE A FLAME SPREAD RATING NOT EXCEEDING 25 AND A SMOKE DEVELOPED INDEX OF 50 OR LESS AND SHALL MEET THE REQUIREMENTS OF ASTM, NFPA.

B. INSULATION SHALL BE CONTINUOUS THROUGH WALL AND SLAB SLEEVE OPENINGS EXCEPT FOR RATED WALLS OR SLABS WHERE AN APPROVED FIRESTOP IS REQUIRED AS PER NFPA.

C. INSULATION OF COLD SURFACES WHERE VAPOR BARRIER JACKETS ARE SPECIFIED SHALL BE APPLIED WITH AN UNBROKEN VAPOR SEAL. HANGERS AND SUPPORTS THAT ARE SECURED TO COLD SURFACES SHALL BE ADEQUATELY INSULATED TO PREVENT CONDENSATION.

D. WHERE INSULATION IS SPECIFIED FOR PIPING, INSULATE SIMILARLY ALL CONNECTIONS, VENTS, DRAINS, FLANGES, FITTINGS, VALVES, TANKS, PUMP CASINGS AND OTHER PARTS OF THE SYSTEM SUBJECT TO HEAT GAIN OR LOSS AND TO PREVENT CONDENSATION.

E. ALL EQUIPMENT, FITTINGS, DEVICES, ETC REQUIRING SERVICING OR INSPECTION SHALL HAVE REMOVABLE INSULATION WHICH CAN BE REPLACED WITHOUT DAMAGE.

F. ALL LEAK AND PRESSURE TESTS SHALL BE COMPLETED PRIOR TO THE INSTALLATION OF ANY INSULATION.

G. PIPING INSULATION:

1. CONDENSATE DRAIN AND DOMESTIC WATER MAKE-UP PIPING SHALL BE INSULATED WITH 1" THICK MOLDED GLASS FIBER WITH A MAXIMUM K FACTOR OF 0.27 AT 75 DECREE F MEAN TEMPERATURE AND FACTORY APPLIED VAPOR BARRIER JACKET.
2. GLYCOL HOT WATER PIPING UP TO 220 DEGREES F SHALL BE INSULATED WITH 1-1/2" THICK MOLDED GLASS FIBER FOR PIPE SIZES UP TO 1-1/2" INCHES IN DIAMETER AND 2" THICK FOR PIPE SIZES LARGER THAN 1-1/2" INCHES IN DIAMETER. INSULATION SHALL HAVE A MAXIMUM K FACTOR OF 0.27AT 75 DEGREE F MEAN TEMPERATURE AND FACTORY APPLIED VAPOR BARRIER JACKET.
3. ALL PIPING INSULATION TO BE INSTALLED WITH LONGITUDINAL LAP AND VAPOR BARRIER JOINT SEAL STRIPS WITH ADHESIVE OR SELF-SEALING LAPS. FITTINGS, FLANGES, AND VALVES SHALL BE INSULATED WITH PRE-MOLDED AND PRE-CUT FITTINGS WITH METERED SEGMENTS.

2.05 ACOUSTICAL TREATMENT

A. ACOUSTICAL LINING SHALL MEET THE MINIMUM THERMAL INSULATION VALUE OF R-6 OR A MAXIMUM K FACTOR OF 0.24 AT 1.5" THICKNESS WITH A MEAN TEMPERATURE OF 75 DEGREE F.

B. INSTALL LINER IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. COMPLETELY COVER ALL PORTIONS OF DUCTWORK PLENUMS AND CASINGS WITH APPROVED ADHESIVE. INSTALL LINER WITH ALL TRAVERSE JOINTS NEATLY BUTTED WITH NO INTERRUPTIONS OR GAPS. COVER ALL EXPOSED EDGES, JOINTS, MECHANICAL FASTENERS AND ANY DAMAGED AREAS WITH ADHESIVE. PROVIDE METAL NOSING AT EQUIPMENT DISCHARGES AND AT END EDGES OF LINING. SECURE LINER WITH APPROVED MECHANICAL FASTENERS INSTALLED IN ACCORDANCE WITH SMACNA DUCT LINER APPLICATION STANDARD.

C. DO NOT EXTERNALLY INSULATE ACOUSTICALLY LINED DUCTS.

D. DO NOT INTERNALLY LINE DUCTWORK WHICH IS A PART OF AN OUTSIDE AIR SYSTEM WHICH DISTRIBUTES UNCONDITIONED AIR.

E. FURNISH AND INSTALL ACOUSTICAL LINING IN DUCTWORK, PLENUMS AND CASINGS AS SHOWN ON THE DRAWINGS AND AS SPECIFIED BELOW:

1. ALL SUPPLY & RETURN DUCTWORK SHALL BE INTERNALLY LINED.

2.06 VIBRATION ISOLATION SYSTEMS

A. ALL ROTATING, REVOLVING OR RECIPROCATING EQUIPMENT, INCLUDING PIPING CONNECTIONS TO THIS EQUIPMENT SHALL BE ACOUSTICALLY ISOLATED TO PREVENT THE TRANSMISSION OF OBJECTIONABLE NOISES, SOUND OR VIBRATIONS TO THE OCCUPIED SPACES AND TO THE BUILDING STRUCTURES. ALL VIBRATION ISOLATION PRODUCTS SHALL BE SPECIFICALLY DESIGNED FOR THEIR INTENDED USE.

B. STATIC DEFLECTION OF ISOLATORS SHALL BE A MINIMUM OF 90% EFFICIENT.

C. MANUFACTURER OF VIBRATION ISOLATION EQUIPMENT SHALL DETERMINE VIBRATION ISOLATOR SIZES AND LOCATIONS, PROVIDE SUITABLE PIPING AND EQUIPMENT VIBRATION ISOLATION SYSTEMS, GUARANTEE SPECIFIED ISOLATION SYSTEM ATTENUATION AND DEFLECTION, AND PROVIDE INSTALLATION INSTRUCTIONS, DRAWINGS AND FIELD SUPERVISION TO ASSURE PROPER INSTALLATION AND PERFORMANCE.

D. MOUNTING TYPES:

1. PROVIDE TYPE KSL SPRING ISOLATOR WITH INERTIA BASE FOR FLOOR MOUNTED PUMPS 5 HP AND ABOVE HAVING THE FOLLOWING MINIMUM DEFLECTIONS:

DEFLECTION	MOTOR HP	INERTIA BASE
○ 1"	UP TO 30 HP	6"

2. PROVIDE SPRING ISOLATORS TYPE 30N FOR CEILING-SUPPORTED FANS. PROVIDE 1" MINIMUM STATIC DEFLECTION.
3. PROVIDE SPRING ROOF CURB TYPE RSC FOR ROOFTOP AC & HV UNITS. ROOF CURBS SHALL BE PRE-MANUFACTURERED OF NON-COMBUSTABLE CONSTRUCTION AND APPROVED BY LOCAL AUTHORITIES. PROVIDE 1" MINIMUM STATIC DEFLECTION FOR LESS THAN 7,500CFM AND 2" FOR GREATER THAN 7,500CFM.
4. SUPPORT OF PIPING EXPOSED ON ROOF AND IN EQUIPMENT ROOMS:
   A) FLOOR SUPPORTED PIPING ISOLATORS (TYPE SLR).
   B) VERTICAL RISER PIPING ANCHOR AND GUIDES (TYPE ADA).
   C) CEILING SUPPORTED PIPING ISOLATORS (TYPE 30N).
5. PROVIDE FLEXIBLE CONNECTIONS BETWEEN ALL FANS, AC & HV UNITS AND DUCTWORK AS PER DUCTWORK SPECIFICATION SECTION.

E. FLEXIBLE HOSE CONNECTORS SHALL BE INSTALLED AT INLET AND DISCHARGE CONNECTIONS TO ALL PUMPS.

F. SPRING TYPE 30N HANGERS SHALL BE PROVIDED FOR PIPING FOR A DISTANCE OF 50 FEET OR 50 PIPE DIAMETERS, WHICHEVER IS GREATER, UP AND DOWNSTREAM OF ALL POWER DRIVEN EQUIPMENT. THE HANGER SHALL PROVIDE 1" OF STATIC DEFLECTION FOR PIPES 4" OF OUTSIDE DIAMETER AND LARGER AND 1/2" STATIC DEFLECTION FOR PIPES SMALLER THEN 4" OUTSIDE DIAMETER.

G. VIBRATION ISOLATORS FOR FLOOR OR CEILING SUPPORTED EQUIPMENT SHALL HAVE A MAXIMUM LATERAL MOTION UNDER EQUIPMENT START-UP OR SHUT-DOWN CONDITIONS OF 1/4" AND MOTIONS IN EXCESS SHALL BE RESTRAINED BY SPRING TYPE MOUNTINGS.

H. ALL ISOLATORS INSTALLED OUTDOORS SHALL BE PROVIDED WITH CORROSION PROTECTION.

I. VIBRATION ISOLATOR SHALL BE PROVIDED BY MASON INDUSTRIES, VIBRATION ELIMINATOR CO., CONSOLIDATED KINETICS CO., OR APPROVED EQUAL.

2.07 EQUIPMENT

A. ROOFTOP HEATING & VENTILATING UNIT (HV-R-1 THRU 12):

I. MANUFACTURERS:

1. TRANE
2. RAPID ENGINEERING
3. REZNOR

II. GENERAL:

1. UNITS ARE COMPLETELY FACTORY ASSEMBLED, PIPED, WIRED AND TEST FIRED. ALL UNITS CONTAIN DUCT FURNACES THAT ARE ETL CERTIFIED AND CONFORM WITH THE LATEST ANSI STANDARDS FOR SAFE AND EFFICIENT PERFORMANCE. UNITS ARE MOUNTED ON METAL RAILS WITH LIFTING AND ANCHOR HOLES AND ARE SUITABLE FOR SLAB OR CURB MOUNTING. UNITS ARE AVAILABLE FOR OPERATION ON EITHER NATURAL OR LP (PROPANE) GAS. THE FIRING RATE OF EACH FURNACE WILL NOT EXCEED 400 MBH AND CONTAINS ITS OWN HEAT EXCHANGER, FLUE COLLECTOR, VENTING, BURNERS, SAFETY AND IGNITION CONTROLS. ALL UNITS ARE ETL CERTIFIED FOR ELECTRICAL SAFETY IN COMPLIANCE WITH UL 1995 AND CSA C22.2 NO. 236 SAFETY STANDARD FOR HEATING, VENTILATING AND COOLING EQUIPMENT. STANDARD CONTROL RELAYS SOCKET MOUNTED WITH TERMINAL BLOCK CONNECTIONS.

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :

CHECKED BY :

APPROVED BY :

DATE :

SCALE :

DRAWING TITLE :

MECHANICAL SPECIFICATIONS SHEET #1

DWG NUMBER :

M-801

2. ALL CONTROL WIRING TERMINATES AT TERMINAL STRIPS (SINGLE POINT CONNECTION) AND INCLUDE AN IDENTIFYING MARKER CORRESPONDING TO THE WIRING DIAGRAM. MOTOR AND CONTROL WIRING IS HARNESSED WITH TERMINAL BLOCK CONNECTIONS. CASINGS ARE DIE FORMED, 18 GAUGE [1.3 MM] GALVANIZED STEEL AND FINISHED IN AIR DRY ENAMEL. SERVICE AND ACCESS PANELS ARE PROVIDED THROUGH EASILY REMOVABLE SIDE ACCESS PANELS WITH CAPTIVE FASTENERS. FAN SECTIONS AND SUPPLY PLENUMS (WHEN PROVIDED) ARE INSULATED WITH FIRE RESISTANT, ODORLESS, MATTE FACED 1" [25 MM] GLASS FIBER MATERIAL. OUTSIDE AIR HOODS, WHEN PROVIDED, SHIP WITH A WIRE MESH INLET SCREEN. STANDARD HEAT EXCHANGER CONSTRUCTION CONSISTS OF 20 GAUGE [1.0 MM] ALUMINIZED STEEL TUBES AND 18 GAUGE [1.3 M] ALUMINIZED STEEL HEADERS. STANDARD DRIP PAN CONSTRUCTION IS CORROSION RESISTANT ALUMINIZED STEEL.

3. STANDARD FLUE COLLECTOR CONSTRUCTION IS CORROSION RESISTANT ALUMINIZED STEEL. BURNERS ARE DIE FORMED, CORROSION RESISTANT ALUMINIZED STEEL, WITH STAMPED PORTING AND STAINLESS STEEL PORT PROTECTORS. PORT PROTECTORS PREVENT FOREIGN MATTER FROM OBSTRUCTING THE BURNER PORTS. BURNERS ARE INDIVIDUALLY REMOVABLE FOR EASE OF INSPECTION AND SERVICING. THE ENTIRE BURNER ASSEMBLY IS EASILY REMOVED WITH ITS SLIDE OUT DRAWER DESIGN. THE PILOT IS ACCESSIBLE THROUGH AN ACCESS PLATE WITHOUT REMOVING THE BURNER DRAWER ASSEMBLY.

4. FILTER RACK IS CONSTRUCTED OF GALVANIZED STEEL WITH ACCESS THROUGH THE SIDE SERVICE PANEL. ELECTRICAL CABINET IS ISOLATED FROM THE AIR STREAM WITH A NON REMOVABLE ACCESS PANEL INTERIOR TO THE OUTER SERVICE PANEL. THERE IS PROVISION IN THIS CABINET FOR COMPONENT MOUNTING, WIRE ROUTING AND HIGH VOLTAGE ISOLATION. MOTOR AND CONTROL WIRING IS HARNESSED WITH TERMINAL BLOCK CONNECTIONS. STANDARD UNITS ARE PROVIDED WITH 24 VOLT COMBINATION SINGLE STAGE AUTOMATIC GAS VALVES, INCLUDING MAIN OPERATING VALVE AND PILOT SAFETY SHUTOFF, PRESSURE REGULATOR, MANUAL MAIN AND PILOT SHUTOFF VALVE, AND ADJUSTABLE PILOT VALVE. GAS VALVES ARE SUITABLE FOR NEC CLASS 2 USE FOR A MAXIMUM INLET GAS PRESSURE OF 0.5 PSI (14" W.C.) [3.4 KPA] ON NATURAL GAS. ALL ROOFTOP UNITS ARE PROVIDED WITH A LOW VOLTAGE CIRCUIT BREAKER RATED FOR 150% OF THE UNITS NORMAL 24 VOLT OPERATING LOAD.

5. EACH DUCT FURNACE IS PROVIDED WITH A 24 VOLT HIGH TEMPERATURE LIMIT SWITCH, A (REDUNDANT) COMBINATION GAS VALVE AND A FAN TIME DELAY RELAY. THE FAN TIME DELAY RELAY DELAYS THE FAN START UNTIL THE HEAT EXCHANGER REACHES A PREDETERMINED TEMPERATURE. IT ALSO ALLOWS THE FAN TO OPERATE AFTER BURNER SHUTDOWN, REMOVING RESIDUAL HEAT FROM THE HEAT EXCHANGER. DOUBLE AND TRIPLE FURNACE UNITS CONTAIN A REVERSE AIRFLOW INTERLOCK SWITCH. THE NORMALLY CLOSED SWITCH, WHEN ACTIVATED, CAUSES THE GAS VALVES TO CLOSE AND CONTINUE BLOWER OPERATION. ALL UNITS PROVIDED WITH A SOLID STATE IGNITION CONTROL SYSTEM WHICH IGNITES THE INTERMITTENT PILOT BY SPARK DURING EACH CYCLE OF OPERATION. WHEN PILOT FLAME IS PROVEN, MAIN BURNER VALVE OPENS TO ALLOW GAS FLOW TO THE BURNERS. PILOT AND BURNERS ARE EXTINGUISHED DURING THE OFF CYCLE.

III. STANDARD TEMPERATURE RISE FURNACE:

1. EACH DUCT FURNACE SHALL HAVE A LOWER PRESSURE DROP ACROSS THE HEAT EXCHANGER, ALLOWING HIGHER AIR FLOW CAPACITIES AND AN 80% EFF RATING WITH DELTA T OF 20-60F PER FURNACE.

IV. AIR HANDLING FAN(S):

1. CENTRIFUGAL FAN IS BELT DRIVEN, FORWARD CURVED WITH DOUBLE INLET, STATICALLY AND DYNAMICALLY BALANCED. THE BLOWER WHEEL IS FIXED ON A KEYED SHAFT, SUPPORTED WITH RUBBER GROMMET ON BEARING ONLY AND BALL BEARING SECURED. AN ACCESS INTERLOCK SWITCH IS INSTALLED IN THE BLOWER COMPARTMENT AND WILL DISENGAGE THE BLOWER UPON REMOVING THE SERVICE PANEL. AN OVERRIDE IS INCORPORATED INTO THE ACCESS INTERLOCK SWITCH FOR SERVICEABILITY.

V. POWER VENT:

1. POWER VENT UNITS ARE PROVIDED WITH A VENT FAN. OUTSIDE AIR FOR COMBUSTION AND PRODUCTS OF COMBUSTION HAVE INDIVIDUAL AIR INLET AND DISCHARGE GRILLES LOCATED IN THE UPPER SECTION OF THE FURNACE SERVICE PANEL. AN AIR PROVING SWITCH IS INSTALLED AND DISENGAGES GAS FLOW IF FOR ANY REASON THE DRAFTER HAS FAILED TO OPERATE. (POWER VENTING AND 100% SHUTOFF IGNITION SYSTEMS ARE REQUIRED FOR COMPLIANCE WITH IRI (INDUSTRIAL RISK INSURERS).

VI. ELECTRONIC MODULATING DUCT STAT WITH ROOM OVERRIDE GAS CONTROL:

1. PROVIDE MODULATED HEAT OUTPUT. AN AUTOMATIC VALVE IN SERIES WITH THE MODULATING VALVE SHALL BE PROVIDED TO CYCLE THE UNIT. IGNITION IS AT FULL FIRE (100% INPUT) AND MODULATES THE GAS INPUT FROM 100% TO 40% RATED INPUT. AVAILABLE FOR USE WITH A DUCT THERMOSTAT WITH REMOTE SET POINT ADJUSTMENT. OVERRIDE ROOM THERMOSTAT CAUSES THE UNIT TO GO TO FULL FIRE WHEN THE ROOM TEMPERATURE FALLS BELOW THE OVERRIDE ROOM THERMOSTAT'S SET POINT.

VII. TYPE 409 STAINLESS STEEL HEAT EXCHANGER:

1. HEAT EXCHANGER TUBES AND HEADERS SHALL BE 20 GAUGE [1.0 MM] TYPE 409 STAINLESS STEEL. BURNERS AND FLUE COLLECTOR SHALL BE 409 STAINLESS STEEL. 409 STAINLESS STEEL IS RECOMMENDED WHERE OUTSIDE AIR IS USED FOR MAKE UP AIR IN AREAS WHERE OUTSIDE TEMPERATURES ARE 40 F [4 C] OR BELOW.

VIII. DAMPERS-GENERAL:

1. DAMPERS ARE OF THE OPPOSED BLADE TYPE, CONSTRUCTED OF GALVANIZED STEEL WITH NEOPRENE NYLON BUSHINGS, BLADES TO BE MECHANICALLY INTERLOCKED.
2. TWO POSITION SPRING RETURN MOTOR WITH INTERLOCKED OUTSIDE AND RETURN AIR DAMPERS ARE PROVIDED. THE MOTOR POWERS EITHER THE OUTSIDE AIR DAMPER FULL OPEN AND THE RETURN AIR DAMPER FULL CLOSED OR THE OUTSIDE AIR DAMPER FULL CLOSED AND THE RETURN AIR DAMPER FULL OPEN IN RESPONSE TO AN OUTSIDE AIR TEMPERATURE SENSOR. WHEN THE UNIT IS OFF, THE MOTOR WILL DRIVE THE OUTSIDE AIR DAMPER FULL CLOSED AND THE RETURN AIR DAMPER FULL OPEN.

IX. ROOF CURB:

1. ROOF CURB IS SHIPPED UNASSEMBLED WITH HARDWARE PACKAGE AND GASKET ATTACHED. CURB AND RAIL SHALL TOTAL 24" HIGH AND SUPPLIED WITH A CROSS MEMBER WHICH ALLOWS THE ISOLATION OF THE RETURN AND SUPPLY AIR STREAMS (WHEN SUPPLIED).

X. FACTORY INSTALLED VFD:

1. A VARIABLE FREQUENCY DRIVE (VFD) SHALL BE PROVIDED WHEN VARIABLE AIR VOLUME CONTROL IS REQUIRED FOR FAN OPERATION. THE VFD SHALL BE PROPERLY SIZED, FACTORY MOUNTED AND WIRED TO THE FAN MOTOR. THE VFD SHALL PROVIDE OVERLOAD PROTECTION AND SOFT START OPERATION. THE VFD SHALL BE COVERED BY UL 1995 STANDARDS AND MANUFACTURED WITH A NEMA 1 PLENUM RATED ENCLOSURE. IF OPERATING CONDITIONS ARE BELOW 14.0 F A SEPARATE VFD ENCLOSURE SHOULD BE SELECTED.

XI. VFD ENCLOSURE:

1. THE VFD SHALL BE FACTORY INSTALLED IN A COLD WEATHER ENCLOSURE INSTALLED ON THE DOOR OF THE UNIT. ENCLOSURE SHALL BE NEMA 3R RATED AND SHALL PROTECT THE DRIVE IN AMBIENT TEMPERATURES FROM -30°F TO 115°F.

XJ. AIR CURTAIN (ACUR-A&B):

I. MANUFACTURER:

1. MARS AIR SYSTEMS
2. SIMILAR

II. AIR CURTAIN ASSEMBLIES:

1. MOTOR FAN ASSEMBLY: DESIGN FOR EASY REMOVAL, ASSEMBLY, REPAIR, AND MAINTENANCE.

III. MOTOR:

1. TOTALLY ENCLOSED AIR OVER (TEAO) COOLED MOTOR WITH SEALED LIFETIME PRE-LUBRICATED BALL BEARINGS, MOTOR STARTER AND THERMAL OVERLOAD PROTECTION.

IV. WIRED FOR SINGLE SPEED OPERATION.

V. ELECTRICAL CHARACTERISTICS:

1. 460V AC, THREE-PHASE; 0.8 AMP FULL LOAD PER MOTOR/FAN.
2. MEETS NEC. ETL LISTED TO CONFORM TO UL 507 (US) AND CSA22.2 (CANADA) STANDARDS. AMCA 211 CERTIFIED.

VI. FANS:

1. FORWARD CURVED CENTRIFUGAL TYPE, DOUBLE WIDTH, AND DOUBLE INLET DESIGN, DIRECTLY DRIVEN TO AN ELECTRIC MOTOR.

VII. PROVIDE RESILIENT ISOLATION DAMPENING MOUNTINGS BETWEEN MOTOR FRAME AND MOTOR MOUNTING PAN.

VIII. FACTORY BALANCED BLOWER WHEEL ASSEMBLY STATICALLY AND DYNAMICALLY.

IX. HOUSING:

1. SELF-CONTAINED ONE-PIECE TYPE WITH SUFFICIENT STRENGTH FOR MOUNTING FROM PRE-PUNCHED MOUNTING HOLES AT BOTH ENDS TO ADJACENT WALLS OR CEILING WITHOUT INTERMEDIATE SUPPORT.

X. SIZE:

1. UNHEATED: 12-3/4 INCHES DEEP BY 10-5/8 INCHES HIGH (INCLUDING DISCHARGE NOZZLE) BY WIDTH OF UNIT.

XI. MOUNTING:

1. UNHEATED INSIDE MOUNT.

XII. MATERIAL:

1. PROVIDE 18- AND 20-GAUGE ELECTRO OR HOT DIPPED GALVANIZED STEEL SHEET HOUSING CONFORMING TO ASTM A 879 AND/OR ASTM A 653.

XIII. AIR INLET GRILLE AND/OR FILTERS: PROVIDE AIR INLET GRILLE AND/OR FILTERS SPECIFIED.

XIV. DISCHARGE: PROVIDE INTEGRAL DISCHARGE NOZZLE SPECIFIED.

XV. FINISH AND COLOR:

1. PROVIDE WITH, NO VOC, CORROSION RESISTANT POLYURETHANE POWDER COATED FINISH FOR SHEET METAL HOUSINGS.
2. UNIT TO BE OBSIDIAN BLACK.

XVI. DISCHARGE NOZZLE:

1. WEDGE-SHAPED DISCHARGE OUTLET NOZZLE WITH ADJUSTABLE AIR FOIL VANES WITH A PLUS/MINUS 40-DEGREE SWEEP FRONT TO BACK.

XVII. AIR VELOCITY AT NOZZLE:

1. STD2108-3: 108 INCH (2743 MM) WIDE UNITS: 2206 FEET/MIN (11.2 M/S) TWO 1/2HP MOTOR/FAN ASSEMBLIES.
2. STD2120-3: 120 INCH (3050 MM) WIDE UNITS: 2084 FEET/MIN (10.6 M/S) THREE 1/2HP MOTOR/FAN ASSEMBLIES.

XVIII. AIR SPEED AT FLOOR: MINIMUM OF 300 FPM (1.53 M/S) AT 3 FEET (914 MM) FROM THE FLOOR.

XIX. AIR INLET GRILLE AND FILTERS:

1. LOCATION: FRONT.
2. TYPE: FIXED AIR INTAKE GRILLE.
3. FILTER: ALUMINUM MESH, 1/4 INCH (6.4 MM), WASHABLE.

XX. MOTOR/FAN ASSEMBLY:

1. SOUND PRESSURE LEVEL AT 10 FEET (3 M) FROM NOZZLE:
2. THREE MOTOR/FAN UNITS: 71 DBA.

XXI. MOTOR CONTROL PANELS FOR UNHEATED UNITS:

1. RECOMMENDED FOR ALL THREE-PHASE UNITS AND SINGLE PHASE UNITS WITH COMBINED MOTOR CAPACITIES OF MORE THAN 1 HP WHENEVER A DOOR LIMIT SWITCH IS USED TO AUTOMATICALLY START AND STOP THE AIR CURTAIN.
2. PROVIDE MOTOR CONTROL PANELS AS FOLLOWS:
1. MOUNTING: SHIPPED LOOSE TO BE FIELD MOUNTED.
3. ELECTRICAL COMPONENTS UL/CUL LISTED.
4. PANELS UL 508A LISTED.

C. VERTICAL INLINE MULTISTAGE PUMP (HWP-1-1&2):

I. MANUFACTURER:

1. BELL & GOSSETT
2. ARMSTRONG
3. GRUNDFOS

II. PUMP:

1. THE PUMP SHALL BE A NON-SELF PRIMING VERTICAL MULTISTAGE PUMP COUPLED TO A MOTOR.
2. THE LIQUID END, LOCATED BETWEEN THE UPPER COVER AND THE PUMP CASING, IS HELD IN PLACE BY TIE RODS.
3. THE PUMP CASING IS AVAILABLE WITH DIFFERENT CONFIGURATIONS AND CONNECTION TYPES.
4. DIRECTION OF ROTATION: CLOCKWISE LOOKING AT THE PUMP FROM THE TOP DOWN (MARKED WITH AN ARROW ON THE ADAPTER AND ON THE COUPLING).

III. MOTOR:

1. STANDARD NEMA PREMIUM TC FRAME MOTORS IN TOTALLY ENCLOSED FAN COOLED (TEFC).
2. 1750 RPM NOMINAL

IV. STANDARD VOLTAGE:

1. THREE-PHASE VERSION, 2 POLE: 208-230/460 V, 60 HZ

V. GENERAL:

1. VERTICAL MULTISTAGE CENTRIFUGAL PUMP WITH IMPELLERS, DIFFUSERS AND OUTER SLEEVE MADE ENTIRELY OF STAINLESS STEEL, AND WITH PUMP CASING AND MOTOR ADAPTER MADE OF CAST IRON IN THE STANDARD VERSION
2. ROTATING COMPONENTS MADE ENTIRELY OF AISI 316 STAINLESS STEEL
3. INNOVATIVE AXIAL LOAD COMPENSATION SYSTEM TO ENSURE REDUCED AXIAL THRUSTS
4. BALANCED MECHANICAL SEAL ACCORDING TO EN 12756 (EX DIN 24960) AND ISO 3069, WHICH CAN BE REPLACED WITHOUT REMOVING THE MOTOR FROM THE PUMP
5. SEAL HOUSING CHAMBER DESIGNED TO PREVENT THE ACCUMULATION OF AIR IN THE CRITICAL AREA NEXT TO THE MECHANICAL SEAL
6. ALLOWABLE TEMPERATURE RANGE: -20ºF TO 250ºF
7. PUMP BODY FITTED WITH TAPS FOR INSTALLING PRESSURE GAUGES ON BOTH SUCTION AND DELIVERY FLANGES

D. VARIABLE AIR VOLUME BOXES (VAV, CAV & VAV-HW):

I. CASING:

1. 22 GAUGE GALVANIZED STEEL.

II. AGENCY LISTING:

1. UNIT IS UL AND CANADIAN UL LISTED AS A ROOM AIR TERMINAL UNIT. CONTROL # 9N65. AHRI 880 CERTIFIED.

III. INSULATION:

1. 1-INCH (25.4 MM) MATTE-FACED INSULATION--INTERIOR SURFACE OF UNIT CASING IS ACOUSTICALLY AND THERMALLY LINED WITH 1-INCH, 1.0 LB/FT3 (25.4 MM, 16.0 KG/M3) COMPOSITE DENSITY GLASS FIBER WITH A HIGH-DENSITY FACING. INSULATION R-VALUE IS 3.85. INSULATION IS UL LISTED AND MEETS NFPA-90A AND UL 181 STANDARDS. THERE ARE NO EXPOSED EDGES OF INSULATION (COMPLETE METAL ENCAPSULATION).
2. WIRE PENETRATIONS ARE COVERED BY GROMMETS. THERE ARE NO EXPOSED EDGES OF INSULATION (COMPLETE METAL ENCAPSULATION).

IV. PRIMARY AIR VALVE:

1. AIR VALVE ROUND--THE PRIMARY (VENTILATION) AIR INLET CONNECTION IS AN 18-GAUGE GALVANIZED STEEL CYLINDER SIZED TO FIT STANDARD ROUND DUCT. A MULTIPLE-POINT, AVERAGING FLOW SENSING RING IS PROVIDED WITH BALANCING TAPS FOR MEASURING +/-5% OF UNIT CATALOGED AIRFLOW.
2. AN AIRFLOW VERSUS PRESSURE DIFFERENTIAL CALIBRATION CHART IS PROVIDED.
3. THE DAMPER BLADE IS CONSTRUCTED OF A CLOSED- CELL FOAM SEAL THAT IS MECHANICALLY LOCKED BETWEEN TWO 22-GAUGE GALVANIZED STEEL DISKS.
4. THE DAMPER BLADE ASSEMBLY IS CONNECTED TO A CAST ZINC SHAFT SUPPORTED BY SELF-LUBRICATING BEARINGS.
5. THE SHAFT IS CAST WITH A DAMPER POSITION INDICATOR. THE VALVE ASSEMBLY INCLUDES A MECHANICAL STOP TO PREVENT OVER-STROKING. SEE , P. 16 FOR AIR LEAKAGE PERFORMANCE DATA.

V. OUTLET CONNECTION:

1. SLIP AND DRIVE CONNECTION--TERMINAL UNITS COME STANDARD WITH SLIP AND DRIVE CONNECTION.

VI. HOT WATER COILS (IF APPLICABLE):

1. ALL HOT WATER COILS ARE FACTORY-INSTALLED ON THE DISCHARGE OUTLET.
2. FULL FIN COLLARS PROVIDED FOR ACCURATE FIN SPACING AND MAXIMUM FIN-TUBE CONTACT.
3. THE 3/8" (9.5 MM) OD SEAMLESS COPPER TUBES ARE MECHANICALLY EXPANDED INTO THE FIN COLLARS. COILS SHALL BE SUBJECTED TO A PRESSURE DECAY TEST AT 450 PSIG FOR A MINIMUM OF 45 SECONDS.
4. COILS SHALL THEN BE EVACUATED AND CHARGED WITH A HELIUM GAS MIXTURE AND PRESSURIZED TO 150 PSIG. WHILE PRESSURIZED WITH THE HELIUM GAS MIXTURE, THE COIL SHALL BE CHECKED WITH A GAS ANALYZER TO DETECT HELIUM LEAKS.
5. ALTERNATIVELY, THE COIL SHALL BE SUBJECTED TO A FINAL AIR-UNDER-WATER LEAK TEST AT 300 PSIG.
6. THE 1-ROW COIL HAS 144 ALUMINUM FINS PER FOOT.
7. FULL FIN COLLARS PROVIDED FOR ACCURATE FIN SPACING AND MAXIMUM FIN-TUBE CONTACT.
8. COIL CONNECTIONS ARE LEFT-HAND. RIGHT-HAND CONNECTIONS ARE OPTIONAL.
9. COILS ARE ASSEMBLED WITH EITHER 3/8" OR 7/8" (22.2 MM) OD BRAZE CONNECTIONS.

E. PIPE EXPANSION FITTING (PIPE):

I. MANUFACTURERS:

1. FLEXICRAFT
2. SIMILAR

II. CONSTRUCTION:

1. METAL EXPANSION JOINTS SHALL CONSIST OF A SINGLE HYDRAULICALLY FORMED METAL BELLOWS WITH FLANGE END FITTINGS.
2. FLANGES SHALL BE CARBON STEEL AND ANSI B16.5 150#.
3. THE BELLOWS SHALL BE 316 STAINLESS STEEL.

III. JOINTS:

1. JOINTS SHALL BE DESIGNED TO MEET THE DESIGN PRESSURES AND TEMPERATURE FOR THE SYSTEM AND SHALL BE CAPABLE OF ACCOMMODATING PIPING SYSTEM AND EQUIPMENT MOVEMENTS AS NEEDED.

F. DUCT EXPANSION FITTING:

I. MANUFACTURERS:

1. FLEXICRAFT
2. SIMILAR

II. CONSTRUCTION:

1. EPDM ELASTOMER FLEXIBLE ELEMENT MATERIAL FOR FABRIC EXPANSION JOINTS.
2. REINFORCED WITH FIBERGLASS.
3. FABRIC TO BE 1/4" THICKNESS AND RATED FOR 300F.
4. FABRIC DUCT EXPANSION FITTING TO HAVE FLANGE CONNECTION FOR DUCTWORK CONNECTION.

G. AIR SEPARATOR (AS-1-1):

I. MANUFACTURER:

1. BELL & GOSSETT
2. AMTROL

II. COMPONENTS:

1. THE AIR SEPARATOR SHALL BE DESIGNED, CONSTRUCTED, AND STAMPED IN ACCORDANCE WITH SECTION VIII, DIVISION I OF THE ASME BOILER AND PRESSURE VESSEL CODE, AND REGISTERED WITH THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS.
2. THE AIR SEPARATOR SHALL HAVE A MAXIMUM TEMPERATURE RATING OF 350°F (177°C).
3. THE AIR SEPARATOR BODY SHALL BE MADE OF CAST IRON OR CARBON STEEL.
4. THE AIR SEPARATOR BODY SHALL BE THREE TIMES THE NOMINAL INLET/OUTLET PIPE DIAMETER.
5. THE AIR SEPARATOR SHALL INCLUDE THREADED BLOW DOWN CONNECTION TO ALLOW FOR SEDIMENT TO BE REGULARLY CLEANED OUT OF THE UNIT.
6. THE AIR SEPARATOR SHALL INCLUDE A THREADED AIR REMOVAL CONNECTION ON TOP OF THE UNIT SO AN AIR VENT OR EXPANSION/COMPRESSION TANK CAN BE CONNECTED, ALLOWING COLLECTED AIR TO BE REMOVED FROM THE UNIT.
7. THE AIR SEPARATOR SHALL INCLUDE A PERFORATED BAFFLE WITH 3/16" PERFORATIONS AND 51% OPEN AREA (R-MODELS ONLY). THE BAFFLE SHALL BE MADE OF CARBON STEEL (R-MODELS ONLY).
8. THE AIR SEPARATOR SHALL INCLUDE A REMOVABLE PERFORATED STRAINER WITH 3/16" PERFORATIONS AND 51% OPEN AREA (R- MODELS ONLY).
9. THE REMOVABLE STRAINER SHALL BE MADE OF 304 STAINLESS STEEL (R- MODELS ONLY).
10. THE AIR SEPARATOR SHALL BE AVAILABLE WITH FLANGED END CONNECTIONS.
11. FLANGE END CONNECTIONS SHOULD BE DESIGNED ACCORDING TO ANSI STANDARDS.

III. ACCESSORIES:

1. BLOWDOWN VALVE.
2. AIR VENT

H. FLOOR-MOUNTED EXPANSION TANK (ET-1-1):

I. MANUFACTURER:

1. BELL & GOSSETT
2. AMTROL

II. GENERAL:

1. PRE-CHARGED VERTICAL STEEL EXPANSION TANK WITH INTEGRAL HEAVY DUTY BUTYL RUBBER DIAPHRAGM
2. TANK SHALL HAVE 0.302"-0.32" CHARGING VALVE CONNECTION (STANDARD TIRE VALVE) TO FACILITE THE ONSITE CHARGING OF THE TANK TO MEET SYSTEM REQUREMENTS.
3. THE TANK SHALL HAVE A MAX DESIGN TEMPERATURE OF 240F AND A MAX WORKING PRESSURE OF 125 PSIG.

III. TANK:

1. THE TANK SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION VIII OF THE ASME BOILER AND PRESSURE VESSEL CODE AND STAMPED 125 PSI (862 KPA) WORKING PRESSURE.

I. CEILING-MOUNTED INLINE EXHAUST FAN (TF-1-1,2&3, TXF-1-1&2, TF-4-1&2):

I. MANUFACTURER:

1. GREENHECK
2. PENN BARRY
3. COOK

II. GENERAL DESCRIPTION:

1. BASE FAN PERFORMANCE AT STANDARD CONDITIONS (DENSITY 0.075 LB/FT3)
2. EACH FAN SHALL BEAR A PERMANENTLY AFFIXED MANUFACTURE'S NAMEPLATE CONTAINING THE MODEL NUMBER AND INDIVIDUAL SERIAL NUMBER

III. WHEEL:

1. FORWARD CURVED OR BACKWARD INCLINED CENTRIFUGAL WHEEL
2. CONSTRUCTED OF GALVANIZED STEEL.
3. STATICALLY AND DYNAMICALLY BALANCED IN ACCORDANCE TO AMCA STANDARD 204-05

IV. MOTOR:

1. ELECTRONICALLY COMMUTATED MOTOR
2. MOTOR ENCLOSURES: TOTALLY ENCLOSED FAN COOLED.
3. ELECTRONIC COMMUTATION TYPE MOTOR (ECM) SPECIFICALLY DESIGNED FOR FAN APPLICATIONS. AC INDUCTION TYPE MOTORS ARE NOT ACCEPTABLE. EXAMPLES OF UNACCEPTABLE MOTORS ARE: SHADED POLE, PERMANENT SPLIT CAPACITOR (PSC), SPLIT PHASE, CAPACITOR START AND 3 PHASE INDUCTION TYPE MOTORS.
4. MOTORS ARE PERMANENTLY LUBRICATED, HEAVY DUTY BALL BEARING TYPE TO MATCH WITH THE FAN LOAD AND PRE-WIRED TO THE SPECIFIC VOLTAGE AND PHASE.
5. INTERNAL MOTOR CIRCUITRY TO CONVERT AC POWER SUPPLIED TO THE FAN TO DC POWER TO OPERATE THE MOTOR OR INTEGRATED VARIABLE FREQUENCY DRIVE.
6. MOTOR SHALL BE SPEED CONTROLLABLE DOWN TO 20% OF FULL SPEED (80% TURNDOWN). SPEED SHALL BE CONTROLLED BY EITHER A POTENTIOMETER DIAL MOUNTED AT THE MOTOR OR BY A 0-10 VDC SIGNAL.
7. MOTORS CAN ACHIEVE UP TO 95% EFFICIENCY, MODEL AND HORSEPOWER DEPENDENT.

V. HOUSING:

1. CONSTRUCTED OF HEAVY GAUGE GALVANIZED STEEL
2. INTERIOR SHALL BE LINED WITH 0.5 INCHES OF ACOUSTICAL INSULATION

VI. SPRING LOADED ALUMINUM BACKDRAFT DAMPER:

1. PREVENTS AIR FROM ENTERING BACK INTO THE BUILDING WHEN FAN IS OFF.
2. ELIMINATES RATTLING OR UNWANTED BACKDRAFTS.

VII. MOUNTING BRACKETS:

1. FULLY ADJUSTABLE FOR MULTIPLE INSTALLATION CONDITIONS

VIII. ACCESS PANEL:

1. ONCE INSTALLED SHALL HAVE EASY ACCESS TO INTERNAL COMPONENTS

IX. DISCONNECT SWITCHES:

1. FACTORY MOUNTED AND SHIPPED LOOSE FOR FIELD MOUNTING
2. NEMA 1: INDOOR APPLICATION NO WATER. (SINGLE POLE ROCKER SWITCH ASSEMBLY)(TWO POLE ROCKER SWITCH ASSEMBLY)
3. WIRED FROM FAN MOTOR TO JUNCTION BOX INSTALLED WITHIN MOTOR COMPARTMENT
4. ACCESS FOR WIRING SHALL BE EXTERNAL

X. VIBRATION KIT:

1. AVAILABLE FOR SUSPENDED INSTALLATIONS
2. INCLUDES PREPUNCHED HOLE FOR EASE OF INSTALLATION AND SHALL HAVE ALL HARDWARE TO MOUNT ONE UNIT.

J. INLINE TUBULAR EXHAUST FAN (MXF-1-1):

I. MANUFACTURER:

1. GREENHECK
2. PENN BARRY
3. COOK

II. GENERAL

1. BASE FAN PERFORMANCE AT STANDARD CONDITIONS (DENSITY 0.075 LB. /FT3).
2. FANS SELECTED SHALL BE CAPABLE OF ACCOMMODATING STATIC PRESSURE AND FLOW VARIATIONS OF +/-15% OF SCHEDULED VALUES.
3. EACH FAN SHALL BE BELT DRIVEN IN AMCA ARRANGEMENT 9 ONLY WITH WHEEL SECURED TO THE FAN SHAFT.
4. FANS ARE TO BE EQUIPPED WITH LIFTING LUGS.
5. AFTER FABRICATION ALL CARBON STEEL COMPONENTS SHALL BE CLEANED AND CHEMICALLY TREATED BY A PHOSPHATIZING PROCESS TO INSURE PROPER REMOVAL OF GREASE, OIL, SCALE, ETC. FAN SHALL THEN BE COATED WITH A MINIMUM OF 2-4 MILS OF PERMATECTOR (POLYESTER URETHANE), ELECTROSTATICALLY APPLIED AND BAKED. FINISH COLOR SHALL BE RAL 7023, CONCRETE GREY. COATING MUST EXCEED 1,000-HOUR SALT SPRAY UNDER ASTM B117 TEST METHOD.

III. FAN HOUSING AND OUTLET:

1. FAN HOUSING TO BE AERODYNAMICALLY DESIGNED WITH PUNCHED INLET AND OUTLET FLANGES FOR DUCTWORK CONNECTION ON INLINE FANS.
2. FAN HOUSING SHALL BE CONSTRUCTED OF ROLLED STEEL WITH A CONTINUOUS SEAM WELD.
3. HOUSING AND BEARING SUPPORT SHALL BE CONSTRUCTED OF WELDED STRUCTURAL STEEL MEMBERS TO PREVENT VIBRATION AND RIGIDLY SUPPORT THE SHAFT AND BEARINGS.
4. EITHER AN OSHA COMPLIANT WEATHERHOOD, OR AN OSHA COMPLIANT BELT GUARD SHALL BE INCLUDED TO COMPLETELY COVER THE MOTOR PULLEY AND BELT(S).

IV. FAN WHEEL

1. THE FAN WHEEL SHALL BE OF THE NON-OVERLOADING BACKWARD INCLINED CENTRIFUGAL TYPE. WHEELS SHALL BE STATICALLY AND DYNAMICALLY BALANCED TO BALANCE GRADE G6.3 PER ANSI S2.19.
2. LEVEL I: WHEEL SHALL BE CONSTRUCTED WITH HALF-WELDED AND HALF-RIVETED ALUMINUM. THE MAXIMUM PRESSURE CAPABILITIES SHALL BE 2 INCHES W.G.
3. ALUMINUM PARTS SHALL NOT REQUIRE PROTECTIVE COATING.
4. THE WHEEL AND FAN INLET SHALL BE CAREFULLY MATCHED AND SHALL HAVE PRECISE RUNNING TOLERANCES FOR MAXIMUM PERFORMANCE AND OPERATING EFFICIENCY.

V. FAN MOTORS AND DRIVE.

1. MOTORS TO BE NEMA T-FRAME, 1800 RPM, OPEN EXPLOSION PROOF-SPARK RESISTANT B CERTIFIED WITH A 1.15 SERVICE FACTOR.
2. DRIVE BELTS AND SHEAVES SHALL BE SIZED FOR 150% OF THE FAN OPERATING BRAKE HORSEPOWER, AND SHALL BE READILY AND EASILY ACCESSIBLE FOR SERVICE, IF REQUIRED.
3. FAN SHAFT TO BE TURNED AND POLISHED STEEL THAT IS SIZED SO THE FIRST CRITICAL SPEED IS AT LEAST 25% OVER THE MAXIMUM OPERATING SPEED FOR EACH PRESSURE CLASS.
4. FAN SHAFT BEARINGS SHALL BE AIR HANDLING QUALITY, BEARINGS SHALL BE HEAVY-DUTY GREASE LUBRICATED, SELF-ALIGNING OR ROLLER PILLOW BLOCK TYPE.
5. BEARINGS SHALL BE SELECTED FOR A BASIC RATING FATIGUE LIFE (L-10) OF 80,000 HOURS AT MAXIMUM OPERATING SPEED FOR EACH PRESSURE CLASS {AVERAGE LIFE OR (L-50) OF 400,000 HOURS}.
6. BEARINGS SHALL BE FIXED TO THE FAN SHAFT USING CONCENTRIC MOUNTING LOCKING COLLARS, WHICH REDUCE VIBRATION, INCREASE SERVICE LIFE, AND IMPROVE SERVICEABILITY. BEARINGS THAT USE SET SCREWS SHALL NOT BE ALLOWED.
7. BEARINGS SHALL HAVE EXTENDED LUBE LINES WITH ZERK FITTINGS TO ALLOW FOR LUBRICATION.

VI. DISCONNECT SWITCHES:

1. FACTORY MOUNTED AND SHIPPED LOOSE FOR FIELD MOUNTING
2. NEMA 1: INDOOR APPLICATION NO WATER. (SINGLE POLE ROCKER SWITCH ASSEMBLY)(TWO POLE ROCKER SWITCH ASSEMBLY)
3. WIRED FROM FAN MOTOR TO JUNCTION BOX INSTALLED WITHIN MOTOR COMPARTMENT
4. ACCESS FOR WIRING SHALL BE EXTERNAL

K. CEILING-HUNG INLINE EXHAUST FAN (TF-1-1):

I. MANUFACTURER:

1. GREENHECK
2. PENN BARRY
3. COOK

II. GENERAL:

1. BASE FAN PERFORMANCE AT STANDARD CONDITIONS (DENSITY 0.075 LB/FT3)
2. EACH FAN SHALL BEAR A PERMANENTLY AFFIXED MANUFACTURE'S ENGRAVED METAL NAMEPLATE CONTAINING THE MODEL NUMBER AND INDIVIDUAL SERIAL NUMBER

III. WHEEL:

1. NON-OVERLOADING, BACKWARD INCLINED CENTRIFUGAL WHEEL
2. CONSTRUCTED OF ALUMINUM.
3. STATICALLY AND DYNAMICALLY BALANCED IN ACCORDANCE TO AMCA STANDARD 204-05
4. THE WHEEL CONE AND FAN INLET WILL BE MATCHED AND SHALL HAVE PRECISE RUNNING TOLERANCES FOR MAXIMUM PERFORMANCE AND OPERATING EFFICIENCY.
5. SINGLE THICKNESS BLADES ARE SECURELY RIVETED OR WELDED TO A HEAVY GAUGE BACK PLATE AND WHEEL CONE.

IV. MOTOR:

1. ELECTRONICALLY COMMUTATED MOTOR
2. MOTOR ENCLOSURES: TOTALLY ENCLOSED FAN COOLED.
3. ELECTRONIC COMMUTATION TYPE MOTOR (ECM) SPECIFICALLY DESIGNED FOR FAN APPLICATIONS. AC INDUCTION TYPE MOTORS ARE NOT ACCEPTABLE. EXAMPLES OF UNACCEPTABLE MOTORS ARE: SHADED POLE, PERMANENT SPLIT CAPACITOR (PSC), SPLIT PHASE, CAPACITOR START AND 3 PHASE INDUCTION TYPE MOTORS.
4. MOTORS ARE PERMANENTLY LUBRICATED, HEAVY DUTY BALL BEARING TYPE TO MATCH WITH THE FAN LOAD AND PRE-WIRED TO THE SPECIFIC VOLTAGE AND PHASE.
5. INTERNAL MOTOR CIRCUITRY TO CONVERT AC POWER SUPPLIED TO THE FAN TO DC POWER TO OPERATE THE MOTOR OR INTEGRATED VARIABLE FREQUENCY DRIVE.
6. MOTOR SHALL BE SPEED CONTROLLABLE DOWN TO 20% OF FULL SPEED (80% TURNDOWN). SPEED SHALL BE CONTROLLED BY EITHER A POTENTIOMETER DIAL MOUNTED AT THE MOTOR OR BY A 0-10 VDC SIGNAL.
7. MOTORS CAN ACHIEVE UP TO 95% EFFICIENCY, MODEL AND HORSEPOWER DEPENDENT.

V. HOUSING/CABINET CONSTRUCTION:

1. CONSTRUCTION MATERIAL: GALVANIZED
2. SQUARE DESIGN CONSTRUCTED OF HEAVY GAUGE GALVANIZED STEEL

VI. HOUSING SUPPORT & DRIVE FRAME:

1. DRIVE FRAME IS CONSTRUCTED OF STRUCTURAL STEEL WITH FORMED FLANGES.

VII. DISCONNECT SWITCH:

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :

CHECKED BY :

APPROVED BY :

DATE :

SCALE :

DRAWING TITLE :

MECHANICAL
SPECIFICATIONS SHEET #2

DWG NUMBER :

M-802

1. NEMA 1: INDOOR APPLICATION NO WATER. FACTORY STANDARD.
2. POSITIVE ELECTRICAL SHUT-OFF
3. WIRED FROM FAN MOTOR TO JUNCTION BOX INSTALLED WITHIN MOTOR COMPARTMENT

VIII. DUCT COLLARS:
1. SQUARE DUCT MOUNTING COLLAR
2. INLET AND DISCHARGE COLLARS PROVIDE EASY SLIP FIT DUCT CONNECTION
3. SQUARE DESIGN TO PROVIDE A LARGE DISCHARGE AREA

IX. ACCESS PANEL:
1. TWO SIDED ACCESS PANELS, PERMIT EASY ACCESS TO ALL INTERNAL COMPONENTS

X. LOCATED PERPENDICULAR TO THE MOTOR MOUNTING PANEL

XI. DAMPER:
1. TYPE: GRAVITY
2. GALVANIZED FRAMES WITH PREPUNCHED MOUNTING HOLES
3. BALANCED FOR MINIMAL RESISTANCE TO FLOW

L. HOT WATER FINNED TUBE RADIATORS (FTR):

I. MANUFACTURER:
1. SLANT FIN
2. VULCAN
3. STERLING HEAT

II. COVER ASSEMBLY:
1. ONE-PIECE BOTTOM, BACK AND TOP PANEL, AND ONE-PIECE FRONT PANEL, FORMED OF COLD ROLLED STEEL.
2. BOTTOM AND TOP EDGES OF BACK PANEL SHALL BE FORMED TO PROVIDE CHANNELS ALONG ENTIRE LENGTH, TO RECEIVE FULL-HEIGHT SUPPORT BRACKETS.
3. BRACKETS SHALL BE DIE-FORMED OF ELECTRO GALVANIZED COLD ROLLED STEEL, FOR RIGID BRACING AND SPRING LOCKING.
4. SLIDE-ACTION EXPANSION CRADLES, FORMED OF POLYPROPYLENE, SHALL BE INSERTED BETWEEN HEATING ELEMENT AND SUPPORT BRACKET.
5. CRADLES SHALL PROTECT ELEMENT BOTTOM AND SIDES FROM CONTACT WITH BRACKETS OR COVER, CONFINING ELEMENT TO FREE LATERAL EXPANSION FOR NOISELESS OPERATION.
6. ALL COVER COMPONENTS WITH A 19-GAUGE FRONT COVER SHALL BE PAINTED IN NU-WHITE THERMOSETTING POLYESTER ENAMEL AND ALL COVER COMPONENTS WITH A 16-GAUGE FRONT COVER SHALL HAVE AN ELECTROGALVANIZED FINISH.

III. OPTIONS:
1. FINNED TUBE ENCLOSURE ACCESS DOORS FOR PIPING TRIM.
2. CONTRACTOR SHALL COORDINATE QUANTITES WITH MECHANICAL PLANS & FLOW DIAGRAMS.
3. ALL FINNED TUBE ENCLOSURES SHALL EXTEND WALL TO WALL UNLESS OTHERWISE NOTED.

M. ELECTRONIC RADIANT FLOOR HEATING:

I. MANUFACTURER:
1. THERMOSOFT
2. SIMILAR

II. GENERAL:
1. THE ELECTRONIC HEATING CABLE SHALL BE A TWIN CONDUCTOR CABLE AND SHALL EMIT ZERO EMF.
2. CABLE SHALL BE RATED FOR A MAXIMIM OF 220F AND A MINIMUM OF 40F.
3. CABLE DIAMETER SHALL BE 1/4" IN THICKNESS

III. INSULATION:
1. CABLE SHALL BE INSULATED WITH FLUOROPOLYMER AND XLPE.

IV. CONTROLS:
1. FURNISH WALL-MOUNTED LINE VOLTAGE THERMOSTAT
2. FURNISH NECESSARY RELAYS AS REQUIRED TO SUPPORT SINGLE THERMOSTAT OPERATION.

N. HOT WATER UNIT HEATER (HWUH-A,B&C):

I. MANUFACTURER:
1. REZNOR
2. MODINE
3. TRANE

II. GENERAL:
1. THE HEAT EXCHANGER SHALL BE MADE OF ONE OR TWO ROW STEEL COILS WITH ALUMINUM FINS WITH APPROXIMATELY 10-1/2 FINS PER INCH.
2. THE SPACING BETWEEN THE FINS SHALL ALLOW FOR EASY CLEANING AND MAINTENANCE.
3. THE COPPER TUBING USED FOR THE HEATING COIL SHALL BE A MINIMUM OF (0.03", 0.75 MM) THICK.
4. THE COPPER TUBE DIAMETER SHALL BE 0.867" (22 MM) O.D. OR LARGER.
5. THE HEAT EXCHANGER ASSEMBLY SHALL HAVE AN EPOXY-POLYESTER POWDER COATING.

III. FAN MOTOR ASSEMBLY:
1. THE FAN/MOTOR ASSEMBLY SHALL BE MADE UP OF THREE COMPONENTS: THE FAN, THE MOTOR AND THE FAN GUARD, WHICH ALSO ACT AS THE MAIN SUPPORT FOR THE FAN.
2. THIS FAN GUARD SHALL BE GALVANIZED FOR PROTECTION AGAINST CORROSION, AND SHALL BE MOUNTED ONTO THE MAIN CASING WITH ANTI-VIBRATION RUBBER MOUNTINGS.
3. THE FAN GUARD MEETS OSHA REQUIREMENTS.

IV. MOTOR:
1. THE STANDARD 2-SPEED MOTOR SHALL BE HERMETICALLY SEALED.
2. THE MOTOR SHALL BE WIRED FOR 120/1/60 VOLTS.
3. THE MOTOR SPEED SHALL BE FIELD ADJUSTABLE FOR HIGH OR LOW SPPED.
4. MOTOR WHICH IS MAINTENANCE FREE. THE MOTOR IS WIRED FOR

V. UNIT CABINET:
1. THE UNIT CABINET SHALL BE 0.032" THICK GALVANIZED PRE-PAINTED STEEL IN DOVE GRAY.
2. HELPS PROTECT THE CABINET AGAINST OXIDATION.
3. THE CABINET SHALL BE HELD TOGETHER BY SHAKE-PROOF SCREWS AND MOLDED CORNER SECTIONS TO ADD ADDITIONAL STRENGTH AND DURABILITY.

VI. CONTROLS:
1. FURNISH LINE-VOLTAGE WALL-MOUNT THERMOSTAT CAPABLE OF FAN AND HOT WATER CONTROL VALVE OPERATION.

O. ROOF-MOUNTED EXHAUST FAN (TXF-1-1):

I. MANUFACTURER:
1. GREENHECK
2. PENN BARRY
3. COOK

II. GENERAL:
1. DISCHARGE AIR DIRECTLY AWAY FROM THE MOUNTING SURFACE

III. WHEEL:
1. MATERIAL TYPE: ALUMINUM
2. NON-OVERLOADING, BACKWARD INCLINED CENTRIFUGAL
3. STATICALLY AND DYNAMICALLY BALANCED IN ACCORDANCE TO AMCA STANDARD 204-05
4. THE WHEEL CONE AND FAN INLET WILL BE MATCHED AND SHALL HAVE PRECISE RUNNING TOLERANCES FOR MAXIMUM PERFORMANCE AND OPERATING EFFICIENCY.

IV. MOTORS:
1. ELECTRONICALLY COMMUTATED MOTOR
2. MOTOR ENCLOSURES: OPEN TYPE
3. MOTOR TO BE A DC ELECTRONIC COMMUTATION TYPE DESIGNED FOR FAN APPLICATIONS. AC INDUCTION TYPE MOTORS ARE NOT ACCEPTABLE. EXAMPLES OF UNACCEPTABLE MOTORS ARE: SHADED POLE, PERMANENT SPLIT CAPACITOR (PSC), SPLIT PHASE, CAPACITOR START AND 3 PHASE INDUCTION TYPE MOTORS.
4. MOTORS ARE PERMANENTLY LUBRICATED, HEAVY DUTY BALL BEARING TYPE TO MATCH WITH THE FAN LOAD AND PRE-WIRED TO THE SPECIFIC VOLTAGE AND PHASE.
5. INTERNAL MOTOR CIRCUITRY TO CONVERT AC POWER SUPPLIED TO THE FAN TO DC POWER TO OPERATE THE MOTOR
6. MOTOR SHALL BE SPEED CONTROLLABLE DOWN TO 20% OF FULL SPEED (80% TURNDOWN). SPEED SHALL BE CONTROLLED BY EITHER A POTENTIOMETER DIAL MOUNTED AT THE MOTOR OR BY A 0-10 VDC SIGNAL.
7. MOTOR SHALL BE A MINIMUM OF 85% EFFICIENT AT ALL SPEEDS.

V. HOUSING:
1. CONSTRUCTED OF HEAVY GAUGE ALUMINUM INCLUDES EXTERIOR HOUSING, CURB CAP, WINDBAND, AND MOTOR COMPARTMENT HOUSING. GALVANIZED MATERIAL IS NOT ACCEPTABLE.
2. HOUSING SHALL HAVE A RIGID INTERNAL SUPPORT STRUCTURE. WINDBAND TO BE ONE PIECE UNIQUELY SPUN ALUMINUM CONSTRUCTION AND MAINTAIN ORIGINAL MATERIAL THICKNESS THROUGHOUT THE HOUSING WINDBAND TO INCLUDE AN INTEGRAL ROLLED BEAD FOR STRENGTH.
3. CURB CAP BASE TO BE FULLY WELDED TO WINDBAND TO ENSURE A LEAK PROOF CONSTRUCTION. TACK WELDING, BOLTING, AND CAULKING ARE NOT ACCEPTABLE.
4. CURB CAP TO HAVE INTEGRAL DEEP SPUN INLET VENTURI AND PRE-PUNCHED MOUNTING HOLES TO ENSURE CORRECT ATTACHMENT TO CURB.
5. DRIVE FRAME ASSEMBLIES SHALL BE CONSTRUCTED OF HEAVY GAUGE STEEL AND MOUNTED ON VIBRATION ISOLATORS.
6. BREATHER TUBE SHALL BE 10 SQUARE INCHES IN SIZE FOR FRESH AIR MOTOR COOLING, AND DESIGNED TO ALLOW WIRING TO BE RUN THROUGH IT.

VI. MOTOR COVER:
1. CONSTRUCTED OF ALUMINUM

VII. VIBRATION ISOLATION:
1. DOUBLE STUDDED TRUE ISOLATORS
2. NO METAL TO METAL CONTACT
3. SIZED TO MATCH THE WEIGHT OF EACH FAN

VIII. DISCONNECT SWITCHES:
1. NEMA RATED: 3R
2. POSITIVE ELECTRICAL SHUT-OFF
3. WIRED FROM FAN MOTOR TO JUNCTION BOX INSTALLED WITHIN MOTOR COMPARTMENT

IX. DRAIN TROUGH:
1. ALLOWS FOR ONE-POINT DRAINAGE OF WATER, GREASE, AND OTHER RESIDUES

X. OPTIONS/ACCESSORIES:
1. BIRDSCREEN:
2. CONSTRUCTION OF GALVANIZED STEEL
3. PROTECTS FAN DISCHARGE

XI. CLEAN OUT PORT:
1. REMOVABLE GREASE REPELLENT COMPRESSION RUBBER PLUG ALLOWS ACCESS FOR CLEANING WHEEL THROUGH WINDBAND.

XII. ROOF CURBS:
1. MOUNTED ONTO ROOF WITH FAN
2. MATERIAL: ALUMINUM
3. INSULATION THICKNESS: 1 INCH
4. COATING TYPE: MACROPOXY WITH UV TOP COAT

XIII. DAMPERS:
1. TYPE: MOTORIZED
2. PREVENTS OUTSIDE AIR FROM ENTERING BACK INTO THE BUILDING WHEN FAN IS OFF
3. BALANCED FOR MINIMAL RESISTANCE TO FLOW
4. GALVANIZED FRAMES WITH PRE-PUNCHED MOUNTING HOLES

XIV. HINGE KIT:
1. ALUMINUM HINGES
2. ALLOWS THE FAN TO TILT AWAY FOR ACCESS TO WHEEL AND DUCTWORK FOR INSPECTION AND CLEANING

P. ROOFTOP AIR CONDITIONING UNIT (RTAC-R-1&2):

I. MANUFACTURERS:
1. TRANE
2. RAPID ENGINEERING
3. YORK

II. SUBMITTALS:
1. SUBMIT DRAWINGS INDICATING COMPONENTS, DIMENSIONS, WEIGHTS AND LOADINGS, REQUIRED CLEARANCES, AND LOCATION AND SIZE OF FIELD CONNECTIONS.
2. SUBMIT PRODUCT DATA INDICATING RATED CAPACITIES, WEIGHTS, ACCESSORIES, SERVICE CLEARANCES AND ELECTRICAL REQUIREMENTS.
3. SUBMIT MANUFACTURER'S INSTALLATION INSTRUCTIONS.

III. OPERATION AND MAINTENANCE DATA:
1. SUBMIT OPERATION AND MAINTENANCE DATA.
2. INCLUDE MANUFACTURER'S DESCRIPTIVE LITERATURE, START-UP AND OPERATING INSTRUCTIONS, INSTALLATION INSTRUCTIONS, AND MAINTENANCE PROCEDURES.

IV. HANDLING:
1. COMPLY WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR RIGGING, UNLOADING, AND TRANSPORTING UNITS.
2. PROTECT UNITS FROM PHYSICAL DAMAGE. LEAVE FACTORY SHIPPING COVERS IN PLACE UNTIL INSTALLATION.

V. WARRANTY:
1. PROVIDE A FULL PARTS WARRANTY FOR ONE YEAR FROM START-UP OR 18 MONTHS FROM SHIPMENT, WHICHEVER OCCURS FIRST.
2. PROVIDE FIVE YEAR EXTENDED PARTS WARRANTY FOR COMPRESSORS.
3. PROVIDE FIVE YEAR LIMITED PARTS WARRANTY FOR HEAT EXCHANGER.

VI. REGULATORY REQUIREMENTS:
1. UNIT SHALL CONFORM TO CULUS FOR CONSTRUCTION OF PACKAGED AIR CONDITIONER AND SHALL HAVE CULUS LABEL AFFIXED TO ROOFTOP PACKAGE.
2. IN THE EVENT THE UNIT IS NOT CULUS APPROVED, THE MANUFACTURER SHALL, AT HIS EXPENSE, PROVIDE FOR A FIELD INSPECTION BY A CULUS REPRESENTATIVE TO VERIFY CONFORMANCE TO CULUS STANDARDS. IF NECESSARY, CONTRACTOR SHALL PERFORM REQUIRED MODIFICATIONS TO THE UNIT TO COMPLY WITH CULUS, AS DIRECTED BY THE CULUS REPRESENTATIVE, AT NO ADDITIONAL EXPENSE TO THE OWNER.
3. GAS-FIRED HEATING ROOFTOP UNITS WITH LESS THAN 400,000 BTU HEATING INPUT SHALL CONFORM TO ANSI Z21.47/CANADIAN STANDARDS ASSOCIATION (CAN/CSA-2.3) FOR CONSTRUCTION OF PACKAGED AIR CONDITIONER. GAS-FIRED HEATING ROOFTOP UNITS WITH MORE THAN 400,000 BTU HEATING INPUT SHALL CONFORM TO UL 795/CANADIAN STANDARDS ASSOCIATION (CAN/CSA-3.2) FOR CONSTRUCTION OF PACKAGED AIR CONDITIONER.
4. IN THE EVENT THE UNIT IS NOT CSA APPROVED, THE MANUFACTURER MUST, AT HIS EXPENSE, PROVIDE FOR A FIELD INSPECTION BY A CSA REPRESENTATIVE TO VERIFY CONFORMANCE TO CSA STANDARDS. IF NECESSARY, CONTRACTOR SHALL PERFORM MODIFICATIONS TO THE UNIT TO COMPLY WITH CSA, AS DIRECTED BY THE CSA REPRESENTATIVE, AT NO ADDITIONAL EXPENSE TO THE OWNER.

VII. EXTRA MATERIALS
1. PROVIDE ONE SPARE SET OF FILTERS.
2. FURNISH ONE SPARE SET OF FAN BELTS.

VIII. SUMMARY:
1. THE CONTRACTOR SHALL FURNISH AND INSTALL PACKAGED ROOFTOP AIR CONDITIONING UNIT(S) AS SHOWN AND AS SCHEDULED ON THE CONTRACT DOCUMENTS. THE UNIT(S) SHALL BE INSTALLED IN ACCORDANCE WITH THIS SPECIFICATION AND PERFORM AT THE CONDITIONS SPECIFIED, SCHEDULED OR AS SHOWN ON THE CONTRACT DRAWINGS.

IX. GENERAL:
1. MANUFACTURER OF PACKAGED UNITARY ROOFTOP PRODUCTS SHALL HAVE HAD A MINIMUM OF FIVE YEARS SUCCESSFUL EXPERIENCE IN THE MANUFACTURE AND SERVICE SUPPORT OF THE ROOFTOP PACKAGES SPECIFIED HEREIN. MANUFACTURERS WITH LESS THAN FIVE YEARS EXPERIENCE IN THE PRODUCTION OF ROOFTOP UNITS OF THE SIZES AND TYPES SPECIFIED SHALL NOT BE ACCEPTABLE.

X. SUBSTITUTIONS:
1. PRIOR APPROVAL REQUIRED AS INDICATED UNDER THE GENERAL AND/OR SUPPLEMENTAL CONDITIONS OF THESE SPECIFICATIONS. SUBSTITUTIONS MUST STILL COMPLY WITH THE PERFORMANCE AND FEATURES AS SPECIFIED HEREIN AND AS INDICATED ON THE DESIGN DOCUMENTS. JOB WILL BE AWARDED ON BASIS OF SPECIFIED PRODUCT. SUBSTITUTIONS MUST BE SELECTED AND APPROVED WITHIN 14 CALENDAR DAYS AFTER AWARD OF CONTRACT.

XI. GENERAL UNIT DESCRIPTION:
1. UNIT(S) FURNISHED AND INSTALLED SHALL BE PACKAGED ROOFTOPS AS SPECIFIED ON THE CONTRACT DOCUMENTS AND WITHIN THESE SPECIFICATIONS. COOLING CAPACITY RATINGS SHALL BE BASED UPON AHRI STANDARD 360. UNIT(S) SHALL CONSIST OF INSULATED WEATHERTIGHT CASING WITH COMPRESSORS, AIR COOLED CONDENSER COIL, CONDENSER FANS, EVAPORATOR COIL, FILTERS, SUPPLY AND/OR EXHAUST FAN MOTORS AND DRIVES, AND UNIT CONTROLS.
2. UNIT(S) SHALL BE SINGLE PIECE CONSTRUCTION AS MANUFACTURED AT THE FACTORY. [SITE ASSEMBLED SUB- ASSEMBLIES WILL NOT BE ALLOWED.] PACKAGE UNITS SHALL BE CONSTRUCTED FOR INSTALLATION ON A ROOF CURB PROVIDING FULL PERIMETER SUPPORT UNDER AIR HANDLER SECTION AND PEDESTAL SUPPORT UNDER CONDENSER SECTION.
3. UNIT(S) SHALL BE FACTORY RUN TESTED TO INCLUDE THE OPERATION OF ALL FANS, COMPRESSORS, HEAT EXCHANGERS, AND CONTROL SEQUENCES.
4. UNIT(S) SHALL HAVE LABELS, DECALS, AND/OR TAGS TO AID IN THE SERVICE OF THE UNIT AND INDICATE CAUTION AREAS.

XII. UNIT CASING:
1. CABINET: GALVANIZED STEEL, PHOSPHATIZED, AND FINISHED WITH AN AIR-DRY PAINT COATING DURABLE ENOUGH TO WITHSTAND A MINIMUM OF 500 CONSECUTIVE-HOUR SALT SPRAY APPLICATION IN ACCORDANCE WITH STANDARD ASTM B 117. STRUCTURAL MEMBERS SHALL BE HEAVY GAUGE WITH ACCESS DOORS AND REMOVABLE PANELS OF HEAVY GAUGE STEEL. ROOF PANELS SHALL BE SLOPED TO PROVIDE POSITIVE DRAINAGE OF RAIN WATER / MELTING SNOW AWAY FROM THE CABINET.
2. PROVIDE CUSTOM EXTERIOR PAINT COLORS TO MEET ARCHITECT/OWNERS SPECIFICATION.
3. ACCESS DOORS: FULLY GASKETED HINGED DOORS WITH FLUTED KNOB FASTENERS AND CHAINED "TIE-BACKS" TO PROVIDE ACCESS TO FILTERS, HEATING SECTION, RETURN/EXHAUST AIR FAN SECTION, SUPPLY AIR FAN SECTION AND EVAPORATOR COIL SECTION.
4. CONTROL PANEL: THE UNIT CONTROL PANEL SECTION SHALL BE COMPARTMENTED TO SEPARATE HIGH AND LOW VOLTAGE COMPONENTS. THE CONTROL PANELS SHALL ALSO BE FULLY GASKETED, HINGED AND PROVIDED WITH QUICK RELEASE LATCHES FOR EASY ACCESS.
1. THE HIGH VOLTAGE CONTROL PANEL SHALL BE PROVIDED WITH A DOOR HANDLE DISCONNECT SWITCH TO FACILITATE CONVENIENT, SAFE DISCONNECTION OF MAIN THREE PHASE POWER.
5. INSULATION: PROVIDE 1/2 INCH THICK COATED FIBERGLASS INTERNAL LINER ON ALL EXTERIOR PANELS IN CONTACT WITH THE CONDITIONED AIR STREAM.

XIII. SUPPLY FAN:

XIV. SUPPLY FAN SHALL BE ONE OR TWO SINGLE WIDTH, SINGLE INLET 9-BLADE PLENUM FAN(S). FAN BLADES SHALL BE ALUMINUM BACKWARD-INCLINED AIRFOIL. PLENUM FANS SHALL BE DIRECT-DRIVEN. ENTIRE ASSEMBLY SHALL BE COMPLETELY ISOLATED FROM UNIT AND FAN BOARD BY 2" DEFLECTION SPRING ISOLATION. MULTIPLE FAN WIDTHS SHALL BE AVAILABLE TO OPTIMIZE EFFICIENCY. FAN SHALL NOT REQUIRE ROUTINE MAINTENANCE SUCH AS FAN BEARING LUBRICATION, BELT TENSIONING AND REPLACEMENT, SHEAVE ALIGNMENT, AND SETSCREW TORQUE CHECKS.
1. MOUNT FAN MOTOR(S) AND FAN ON A COMMON BASE ASSEMBLY AND ISOLATED FROM UNIT. PROVIDE THRUST RESTRAINT ISOLATION ON THE FAN HOUSING/FAN BOARD TO ASSURE SMOOTH FAN STARTUP TRANSITION AND OPERATION.
2. FAN SHAFT SHALL BE MOUNTED ON GREASE LUBRICATED BALL BEARINGS.
3. MOTOR SHALL BE HIGH EFFICIENCY OPEN DRIP-PROOF. MOTOR SHALL HAVE A STANDARD T-FRAME AND A MINIMUM SERVICE FACTOR OF 1.15. ALL DRIVE COMPONENTS SHALL BE ACCESSIBLE WITHOUT THE USE OF SCAFFOLDS OR LADDERS, TO FACILITATE PERIODIC MAINTENANCE CHECKS AND FOR OPERATOR SAFETY.
4. INTERNAL SHAFT GROUNDING RING, OPTION--MOTORS HAVE INTERNAL BEARING PROTECTION FOR USE WITH VFDS TO PROVIDE A CONDUCTIVE DISCHARGE PATH AWAY FROM THE MOTOR BEARINGS TO GROUND. BEARING PROTECTION RINGS ARE CIRCUMFERENTIAL RINGS WITH CONDUCTIVE MICRO FIBERS WHICH PROVIDE THE PATH OF LEAST RESISTANCE AND DRAMATICALLY EXTEND MOTOR LIFE.

XV. GAS FIRED HEATING SECTION:
1. PROVIDE GAS-FIRED HEATING SECTION AS A COMPLETELY ASSEMBLED AND FACTORY-INSTALLED HEATING SYSTEM INTEGRAL TO UNIT, CULUS APPROVED SPECIFICALLY FOR OUTDOOR APPLICATIONS FOR USE DOWNSTREAM FROM REFRIGERANT COOLING COILS. PROVIDE CAPABILITY FOR THREADED GAS PIPING CONNECTION THROUGH SIDE OR BOTTOM OF UNIT.
2. HEATING SECTION SHALL BE FACTORY FIRE-TESTED PRIOR TO SHIPMENT.
3. GAS BURNER: FORCED-DRAFT TYPE BURNER WITH ADJUSTABLE COMBUSTION AIR SUPPLY, GAS VALVE, MANUAL SHUT-OFF, DIRECT SPARK OR PILOT IGNITION, AND FLAME SENSING MONITORING ELECTRODE. PROVIDE AIR PROVING SWITCH TO PREVENT BURNER OPERATION WHEN BURNER IS OPEN FOR MAINTENANCE OR INSPECTION.
4. GAS BURNER SAFETY CONTROLS: PROVIDE ELECTRONIC FLAME SAFETY CONTROLS FOR THE PROVING OF COMBUSTION AIR PRIOR TO IGNITION SEQUENCE WITH PRE-PURGE CYCLE, CONTINUOUS ELECTRONIC FLAME SUPERVISION, AND SIXTY SECOND DELAY BETWEEN FIRST AND SECOND STAGE GAS VALVE OPERATION ON TWO-STAGE HEATERS.
5. COMBUSTION BLOWER: PROVIDE CENTRIFUGAL TYPE FAN WITH BUILT-IN THERMAL OVERLOAD PROTECTION ON FAN MOTOR.
6. HEAT EXCHANGER: PROVIDE FACTORY PRESSURE- AND LEAK-TESTED TUBULAR TWO PASS HEAT EXCHANGER OF FREE-FLOATING DESIGN MANUFACTURED OF 16-GAUGE STAINLESS STEEL PRIMARY SURFACE AND 18-GAUGE STAINLESS STEEL SECONDARY SURFACE.
7. GAS HEATERS SHALL BE CONSTRUCTED OF GRADES OF STAINLESS STEEL SUITABLE FOR CONDENSING ENVIRONMENTS. THE HEATER SHALL PROVIDE 2 STAGES OR MODULATING CONTROL OF AND CONTAIN A MODULATING GAS VALVE THAT RESPONDS TO USER SELECTABLE SETPOINTS.
8. PROVIDE FACTORY-MOUNTED NON-FUSED DISCONNECT SWITCH.

XVI. EVAPORATOR COIL SECTION:
1. PROVIDE HEAVY DUTY ALUMINUM FINS MECHANICALLY BONDED TO COPPER TUBES. EVAPORATOR COIL SHALL BE INTER- CIRCUITED TO MAINTAIN ACTIVE COIL FACE AREA AT PART LOAD CONDITIONS. COIL SHALL ALSO UTILIZE INTERNALLY ENHANCED TUBING FOR MAXIMUM EFFICIENCY.
2. PROVIDE A THERMOSTATIC EXPANSION VALVE (TXV) FOR EACH REFRIGERANT CIRCUIT. FACTORY PRESSURE AND LEAK TEST COIL.
3. PROVIDE PITCHED STAINLESS STEEL DRAIN PAN TO ASSURE POSITIVE DRAINAGE OF CONDENSATE FROM THE UNIT CASING.

XVII. AIR-COOLED CONDENSER SECTION:
1. CONDENSER COILS SHALL HAVE ALL ALUMINUM MICROCHANNEL COILS. ALL COILS SHALL BE LEAK TESTED AT THE FACTORY TO ENSURE PRESSURE INTEGRITY. THE CONDENSER COIL IS PRESSURE TESTED TO 650 PSIG. SUBCOOLING CIRCUIT(S) SHALL BE PROVIDED AS STANDARD.
2. PROVIDE SUBCOOLING CIRCUIT(S) INTEGRAL WITH CONDENSER COILS TO MAXIMIZE EFFICIENCY AND PREVENT PREMATURE FLASHING OF LIQUID REFRIGERANT, TO A GASEOUS STATE, AHEAD OF THE EXPANSION VALVE.
3. PROVIDE VERTICAL DISCHARGE, DIRECT DRIVE FANS WITH STEEL BLADES, AND THREE PHASE MOTORS. FANS SHALL BE STATICALLY AND DYNAMICALLY BALANCED. MOTORS SHALL BE PERMANENTLY LUBRICATED, WITH BUILT-IN CURRENT AND THERMAL OVERLOAD PROTECTION AND WEATHERTIGHT SLINGER OVER MOTOR BEARINGS.
4. FURNISH UNIT WITH FACTORY-INSTALLED ELECTRONIC LOW AMBIENT OPTION TO ALLOW FOR OPERATION DOWN TO 0 DEGREES F.
5. PROVIDE FACTORY-INSTALLED LOUVERED STEEL COIL GUARDS AROUND PERIMETER OF CONDENSING SECTION TO PROTECT THE CONDENSER COILS, REFRIGERANT PIPING AND CONTROL COMPONENTS. LOUVERED PANELS SHALL BE FABRICATED FROM HEAVY GAUGE GALVANIZED STEEL AND BE RIGID ENOUGH TO PROVIDE PERMANENT PROTECTION FOR SHIPPING AND PRE-/POST- INSTALLATION. COURSE WIRE MESH IS NOT AN ACCEPTABLE MATERIAL FOR COIL GUARDS.

XVIII. REFRIGERATION SYSTEM:
1. COMPRESSOR: SHALL BE INDUSTRIAL GRADE, ENERGY EFFICIENT DIRECT DRIVE 3600 RPM MAXIMUM SPEED RECIPROCATING OR SCROLL TYPE. THE MOTOR SHALL OF A SUCTION GAS COOLED HERMETIC DESIGN. COMPRESSOR SHALL HAVE CENTRIFUGAL OIL PUMP WITH DIRT SEPARATOR, OIL SIGHT GLASS, AND OIL CHARGING VALVE.
2. PROVIDE WITH THERMOSTATIC MOTOR WINDING TEMPERATURE CONTROL TO PROTECT AGAINST EXCESSIVE MOTOR TEMPERATURES RESULTING FROM OVER-/UNDER-VOLTAGE OR LOSS OF CHARGE. PROVIDE HIGH AND LOW PRESSURE CUTOUTS, AND RESET RELAY.
3. PROVIDE FACTORY-INSTALLED COMPRESSOR LOCKOUT THERMOSTAT TO PREVENT COMPRESSOR OPERATION AT LOW AMBIENT CONDITIONS.
4. PROVIDE COIL FROST PROTECTION COMPRESSOR UNLOADING BASED ON REFRIGERANT CIRCUIT SUCTION TEMPERATURE TO PREVENT COIL FROSTING WITH MINIMUM ENERGY USAGE.
5. PHASE AND VOLTAGE MONITOR - STANDARD ON 20-75 TON AIR-COOLED UNITS. PROTECTS 3-PHASE EQUIPMENT FROM PHASE LOSS, PHASE REVERSAL AND LOW VOLTAGE.ANY FAULT CONDITION WILL PRODUCE A FAILURE INDICATOR LED AND SEND THE UNIT INTO AN AUTO STOP CONDITION. CULUS APPROVED.

XIX. OUTDOOR AIR SECTION:
1. PROVIDE 100% MODULATING ENTHALPY-BASED ECONOMIZER SYSTEM FULLY INTEGRATED WITH UNIT RETURN AND EXHAUST AIR DAMPERS. UNIT OPERATION IS THROUGH PRIMARY TEMPERATURE CONTROLS THAT AUTOMATICALLY MODULATE DAMPERS TO MAINTAIN DESIRED SPACE TEMPERATURE CONDITIONS.
2. PROVIDE AUTOMATIC OUTDOOR ENTHALPY LOCKOUT SENSOR.
3. PROVIDE ADJUSTABLE MINIMUM POSITION CONTROL.
4. PROVIDE SPRING-RETURN MOTOR FOR OUTSIDE AIR DAMPER CLOSURE DURING UNIT SHUTDOWN OR POWER INTERRUPTION.
5. ECONOMIZER CONTROL WITH COMPARATIVE ENTHALPY - USED WITH THE OUTSIDE AIR ECONOMIZER, TWO ENTHALPY SENSORS ARE PROVIDED TO COMPARE TOTAL HEAT CONTENT OF THE INDOOR AIR AND OUTDOOR AIR TO DETERMINE THE MOST EFFICIENT AIR SOURCE WHEN ECONOMIZING.
6. OUTSIDE AIR MEASUREMENT (TRAQ™) - A FACTORY MOUNTED AIRFLOW MEASUREMENT STATION (TRAQ™) SHALL BE PROVIDED IN THE OUTSIDE AIR OPENING TO MEASURE AIRFLOW. THE AIRFLOW MEASUREMENT STATION SHALL MEASURE FROM 40 CFM/TON TO MAXIMUM AIRFLOW. THE AIRFLOW MEASUREMENT STATION SHALL ADJUST FOR TEMPERATURE VARIATIONS. MEASUREMENT ACCURACY SHALL MEET REQUIREMENTS OF LEED IE Q CREDIT 1 AS DEFINED BY ASHRAE 62.1- 2007.

XX. DAMPERS:
1. LEAKAGE RATE SHALL BE DETERMINED IN ACCORDANCE WITH AMCA STANDARD 575.

XXI. FILTERS:
1. DIFFERENTIAL PRESSURE GAUGE - A FACTORY-INSTALLED, DIAL-TYPE, DIFFERENTIAL PRESSURE GAUGE SHALL BE PIPED TO BOTH SIDES OF THE FILTER TO INDICATE STATUS. GAUGE SHALL MAINTAIN A +/- 5 PERCENT ACCURACY WITHIN OPERATING TEMPERATURE LIMITS OF -20°F TO 120°F. GAUGE SHALL BE FLUSH-MOUNTED WITH CASING OUTER WALL. FILTER SECTIONS CONSISTING OF PRE- AND POST-FILTERS SHALL HAVE A GAUGE FOR EACH.

XXII. PRE-EVAP FILTER
1. HIGH EFFICIENCYTHROWAWAY OPTION, MERV 8 -- SHALL BE TWO-INCH HIGH EFFICIENCY MEDIA FILTERS WITH AVERAGE DUST SPOT EFFICIENCY OF 25-35 PERCENT AND AN AVERAGE ARRESTANCE IN EXCESS OF 90 PERCENT WHEN TESTED IN ACCORDANCE WITH ASHRAE 52-76.
2. 90-95% BAG FILTER OPTION, MERV 14 -- SHALL HAVE GLASS FIBER MEDIA MOUNTED IN A GALVANIZED STEEL FRAME.THESE CLASS 1 SINGLE PIECE DISPOSABLE BAG FILTERS SHALL HAVE A 90-95% DUST SPOT EFFICIENCY RATING PER ASHRAE 52-76.TO ENSURE MAXIMUM BAG FILTER LIFE TWO-INCH MERV8 PREFILTERS SHALL BE INCLUDED WITH THE BAG FILTERS.

XXIII. DDC MICROPROCESSOR CONTROLS:
1. GENERAL - EACH UNIT SHALL BE PROVIDED WITH A FACTORY-INSTALLED, PROGRAMMED AND RUN-TESTED, STAND-ALONE, MICROPROCESSOR CONTROL SYSTEM SUITABLE FOR CV OR VAV CONTROL AS REQUIRED. THIS SYSTEM SHALL CONSIST OF TEMPERATURE AND PRESSURE (THERMISTOR AND TRANSDUCER) SENSORS, PRINTED CIRCUIT BOARDS, AND A UNIT-MOUNTED HUMAN INTERFACE PANEL. THE MICROPROCESSOR SHALL BE EQUIPPED WITH ON-BOARD DIAGNOSTICS TO INDICATE THAT ALL HARDWARE, SOFTWARE, AND ALL INTERCONNECTED WIRING AND SENSORS ARE IN PROPER OPERATING CONDITION. THE MICROPROCESSOR'S MEMORY SHALL BE NON-VOLATILE EEPROM TYPE, THUS REQUIRING NO BATTERY OR CAPACITIVE BACKUP TO MAINTAIN ALL DATA DURING A POWER LOSS.
2. THE UNIT SHALL BE EQUIPPED WITH A BACNET IP & MS/TP COMMUNICATION PROTOCOL GATEWAY.
3. VENTILATION OVERRIDE MODULE (VOM) - SHALL BE PROVIDED WHICH WILL ALLOW THE USER TO FIELD RECONFIGURE AND ESTABLISH UP TO FIVE DIFFERENT PURGE, EXHAUST AND BUILDING PRESSURIZATION SEQUENCES. THESE SEQUENCES, FACTORY PRIORITIZED, SHALL BE RECONFIGURABLE THROUGH THE HUMAN INTERFACE PANEL AT THE ROOFTOP UNIT, THE REMOTE HUMAN INTERFACE OR THE TRACER BUILDING AUTOMATION SYSTEM.
4. ANTI-RECYCLE PROTECTION - SHALL BE PROVIDED TO PREVENT EXCESSIVE CYCLING, AND PREMATURE WEAR, OF THE COMPRESSORS, CONTACTORS AND RELATED COMPONENTS.
5. AIRFLOW MODULATION SHALL BE PROVIDED BY A VARIABLE FREQUENCY DRIVE WITH BYPASS THAT IS FACTORY-MOUNTED, COMPLETELY WIRED, AND FUNCTIONALLY TESTED. ADJUSTABLE FREQUENCY INVERTER DRIVE SHALL SAFELY VARY THE SPEED OF THE FAN MOTOR ALLOWING THE MOTOR TO MEET THE DYNAMIC REQUIREMENTS AT THE SHAFT OF THE MOTOR AND MEET THE SYSTEM STATIC. PROPERLY SIZED MOTOR PROTECTION SHALL BE PROVIDED IN BOTH DRIVE AND BYPASS MODES BY A MOTOR OVERLOAD RELAY AND FUSES. INVERTER CONTROLLER SHALL HAVE A DISPLAY THAT PROVIDES READOUT FUNCTIONS THAT INCLUDE: OUTPUT FREQUENCY, OUTPUT VOLTAGE, OUTPUT CURRENT, OUTPUT POWER, DC BUS VOLTAGE, INTERFACE TERMINAL STATUS, AND FAULT STATUS. IN THE BYPASS MODE, AN OUTPUT SIGNAL SHALL BE AVAILABLE FOR A BUILDING AUTOMATION SYSTEM TO MAKE SYSTEM ADJUSTMENTS TO PREPARE FOR AN ACROSS THE LINE START OF A FULLY LOADED FAN. A RUN COMMAND SIGNAL TO THE BYPASS MOTOR STARTER SHALL BE PROVIDED BY THE UNIT CONTROLLER.
6. INTERNAL SHAFT GROUNDING RING - MOTORS HAVE INTERNAL BEARING PROTECTION FOR USE WITH VFDS.

XXIV. MISCELLANEOUS FEATURES:
1. PROVIDE UNIT MOUNTED 115 VOLT CONVENIENCE OUTLET
2. PROVIDE UNIT MOUNTED & WIRED SERVICE LIGHTS.
3. PHASE AND VOLTAGE MONITOR - STANDARD ON 20-75T UNITS. PROTECTS 3-PHASE EQUIPMENT FROM PHASE LOSS, PHASE REVERSAL, AND LOW VOLTAGE. ANY FAULT CONDITION WILL PRODUCE A FAILURE INDICATOR LED, AND SEND THE UNIT INTO AN EMERGENCY STOP CONDITION. CULUS APPROVED.

Q. DESTRATIFICATION FANS (DSF-4-1 THRU 43):

I. MANUFACTURERS:
1. AIRIUS
2. EQUIVALENT

II. PERFORMANCE:
1. COORDINATED DESIGN OF HOUSING, STATOR AND MOTOR SHALL PROVIDE COLUMNAR LAMINAR AIRFLOW TO PRODUCE A MINIMUM OF 100 FPM AT CENTER OF COLUMN AT GRADE LEVEL WHEN INSTALLED WITHIN 2'-0" OF CEILING.

III. HOUSING:
1. THE FAN HOUSING SHALL BE MADE OF PC/ABS RESIN, RATED 5VA FOR FLAME RESISTANCE.

IV. HOUSING COLOR:
1. BLACK

V. SAFETY CABLE:
1. MODELS 10 THROUGH 60 ARE SUPPLIED WITH 6'-0" STEEL CABLE FASTENED TO SEISMIC RESTRAINT POINT INTEGRATED INTO HOUSING.

VI. MOTOR MOUNTING:
1. ENCLOSED IN HOUSING, ABOVE STATOR.

VII. STATOR:
1. THE FAN SHALL BE EQUIPPED WITH A PATENTED MULTIPLE-VANE STATOR COORDINATED WITH FAN DESIGN FOR MAXIMIZING COLUMNAR LAMINAR FLOW.

VIII. CERTIFICATION:
1. UL STANDARD 507 FOR SAFETY ELECTRIC FANS, CAN/CSA C22.2#60335-1AND UL 94 5VA AS CERTIFIED BY NATIONALLY RECOGNIZED TESTING LABORATORY. ACCEPTABLE LABORATORIES INCLUDE ETL, UL OR OTHER NATIONALLY RECOGNIZED TESTING LABORATORIES.

IX. IDENTIFICATION:
1. PERMANENTLY AFFIXED MANUFACTURER'S NAMEPLATE INCLUDING THE FOLLOWING: MODEL NUMBER, SERIAL NUMBER, MOTOR POWER SPECIFICATIONS, COUNTRY OF MANUFACTURE AND SAFETY MARKS: ETL (US & CA) & CE (EU).

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
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	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :

CHECKED BY :

APPROVED BY :

DATE :

SCALE :

DRAWING TITLE :

MECHANICAL SPECIFICATIONS SHEET #3

DWG NUMBER :

M-803

X. DESTRATIFICATION FAN SHALL BE AN AIR PEAR THERMAL EQUALIZER MODEL 60 OR ONYX PER SCHEDULE.

1. SIZE AND WEIGHT:
1. STANDARD 32 INCH HEIGHT TO BAIL; 24 INCH HEIGHT TO RIM. 20 INCH DIAMETER, 22LB (10KG)
2. MOTOR (EC):
1. ELECTRONICALLY COMMUTATED MOTOR, UP TO 92% EFFICIENT. STEEL BLADES WELDED TO STEEL HUB. BALL BEARINGS SHALL BE PERMANENTLY LUBRICATED AND SHIELDED. UP TO 1825 CFM, 1660 RPM, 68 DBA. THERMALLY PROTECTED MOTOR WITH AN OPERATING RANGE OF -13° F (-25° C) TO +140° F (+60° C).
2. RECOMMENDED CEILING HEIGHT UP TO 60 FEET (18.3 M) AND AREA COVERAGE UP TO 2000 SQ. FT. (186 SQ. M); 25 FEET (7.6 M) FROM THE FAN'S CENTER IN ALL DIRECTIONS.
3. ELECTRICAL REQUIREMENTS:
1. 277V AC, SINGLE PHASE, 50/60 HZ.; 0 - 1.3 AMPS; 0 - 170 WATTS FOR A-60.
2. 208V AC, SINGLE PHASE, 50/60 HZ.; 0 - 0.8 AMPS; 0 - 98 WATTS FOR ONYX.
4. CONTROLS SHALL BE COORDINATED WITH MOTOR SELECTION (EC).
1. EC MOTOR SHALL BE CONTROLLED BY 0-10VDC CONTROL SIGNAL VIA BAS.

R. LOW PRESSURE HOT WATER CONDENSING BOILER B-1-1 & 2):

I. MANUFACTURERS:
1. AERCO
2. CLEAVERBROOKS
3. LOCHINVAR

II. DESCRIPTION:
1. BOILER SHALL BE EITHER NATURAL GAS FIRED FULLY CONDENSING FIRE TUBE DESIGN. IT SHALL BE DESIGN TO OPERATE IN VARIABLE PRIMARY OR PRIMARY SECONDARY PIPING CONFIGURATION. POWER BURNER SHALL HAVE FULL MODULATION, DISCHARGE INTO A POSITIVE OR NEGATIVE PRESSURE VENT AND THE MINIMUM FIRING RATE SHALL NOT EXCEED THE FOLLOWING PER MODEL:

III. BOILERS THAT HAVE AN INPUT GREATER THAN WHAT IS SPECIFIED ABOVE AT MINIMUM FIRE WILL NOT BE CONSIDERED. BOILER EFFICIENCY SHALL INCREASE WITH DECREASING LOAD (OUTPUT), WHILE MAINTAINING SETPOINT. BOILER SHALL BE FACTORY-FABRICATED, FACTORY-ASSEMBLED AND FACTORY-TESTED, FIRE-TUBE CONDENSING BOILER WITH HEAT EXCHANGER SEALED PRESSURE-TIGHT, BUILT ON A STEEL BASE, INCLUDING INSULATED JACKET, FLUE-GAS VENT CONNECTIONS, COMBUSTION-AIR INTAKE CONNECTIONS, WATER SUPPLY, DUAL INLET RETURNS CONDENSATE DRAIN CONNECTIONS, AND CONTROLS.

IV. HEAT EXCHANGER:
1. THE HEAT EXCHANGER SHALL BE CONSTRUCTED OF 439 STAINLESS STEEL FIRE TUBES AND TUBESHEETS, WITH A ONE-PASS COMBUSTION GAS FLOW DESIGN. THE FIRE TUBES SHALL BE 1/2" OR 5/8" OD, WITH NO LESS THAN 0.049" WALL THICKNESS. THE UPPER AND LOWER STAINLESS STEEL TUBESHEET SHALL BE NO LESS THAN 0.25" THICK. THE PRESSURE VESSEL/HEAT EXCHANGER SHALL BE WELDED CONSTRUCTION. THE HEAT EXCHANGER SHALL BE ASME STAMPED FOR A WORKING PRESSURE NOT LESS THAN 150 PSIG. ACCESS TO THE TUBESHEETS AND HEAT EXCHANGER SHALL BE AVAILABLE BY BURNER AND EXHAUST MANIFOLD REMOVAL. MINIMUM ACCESS OPENING SHALL BE NO LESS THAN 8 INCH DIAMETER.

V. PRESSURE VESSEL: THE PRESSURE VESSEL SHALL HAVE A MAXIMUM WATER VOLUME PER EACH MODEL AS LISTED BELOW:
1. BMK1500: 44 GALLONS (166.6 LITERS)

VI. THE BOILER WATER PRESSURE DROP SHALL NOT EXCEED THE FOLLOWING PER MODEL SIZE:
1. BMK1500 AND 2000: 3 PSIG @ 170 GPM

VII. THE BOILER WATER CONNECTIONS SHALL BE FLANGED 150 POUND, ANSI RATED.
1. BMK1500 - 3000: 4 INCH FLANGE

VIII. THE PRESSURE VESSEL SHALL BE CONSTRUCTED OF ASME SA53 CARBON STEEL, WITH A 0.25 INCH THICK WALL AND 0.50 INCH THICK UPPER HEAD. INSPECTION OPENINGS IN THE PRESSURE VESSEL SHALL BE IN ACCORDANCE WITH ASME SECTION IV PRESSURE VESSEL CODE. THE BOILER SHALL BE DESIGNED SO THAT THE THERMAL EFFICIENCY INCREASES AS THE BOILER FIRING RATE DECREASES.

IX. MODULATING AIR/FUEL VALVE AND BURNER: THE BOILER BURNER SHALL BE CAPABLE OF THE FOLLOWING FIRING TURNDOWN RATIOS WITHOUT LOSS OF COMBUSTION EFFICIENCY OR STAGING OF GAS VALVES. THE TURNDOWN RATIOS SHALL BE AS FOLLOWS AND ARE BASED ON BTU SIZE:
1. BMK1500: 20:1

X. THE BURNER SHALL NOT OPERATE ABOVE 7.5% OXYGEN LEVEL OR 55% EXCESS AIR. THE BURNER SHALL PRODUCE LESS THAN 13 PPM OF NOX, UNDER STANDARD CALIBRATION, CORRECTED TO 3% EXCESS OXYGEN WHEN FIRING ON NATURAL GAS. THE BURNER SHALL BE METAL FIBER MESH COVERING A STAINLESS STEEL BODY WITH SPARK OR PROVEN PILOT IGNITION AND FLAME RECTIFICATION. ALL BURNER MATERIAL EXPOSED TO THE COMBUSTION ZONE SHALL BE OF STAINLESS STEEL CONSTRUCTION. THERE SHALL BE NO MOVING PARTS WITHIN THE BURNER ITSELF. A MODULATING AIR/FUEL VALVE SHALL METER THE AIR AND FUEL INPUT. THE MODULATING MOTOR MUST BE LINKED TO BOTH THE GAS VALVE BODY AND AIR VALVE BODY WITH A SINGLE LINKAGE. THE LINKAGE SHALL NOT REQUIRE ANY FIELD ADJUSTMENT. A VARIABLE SPEED CAST ALUMINUM PRE-MIX BLOWER SHALL BE USED TO ENSURE THE OPTIMUM MIXING OF AIR AND FUEL BETWEEN THE AIR/FUEL VALVE AND THE BURNER.

XI. FUEL:
1. THE BOILER SHALL USE ONE OF THE FOLLOWING GAS TRAIN OPTIONS:

XII. NATURAL GAS:
1. THE UNIT GAS TRAIN SHALL BE SPECIFICALLY DESIGNED AND CALIBRATED FOR A SINGLE PREDETERMINED FUEL. THE GAS TRAIN SHALL BE A VENTLESS GAS TRAIN.

XIII. EXHAUST MANIFOLD:
1. THE EXHAUST MANIFOLD SHALL BE OF CORROSION RESISTANT CAST ALUMINUM OR 316 STAINLESS STEEL WITH THE FOLLOWING DIAMETER FLUE CONNECTIONS:
1. BMK750 - 1500: 6 INCH

XIV. THE EXHAUST MANIFOLD SHALL HAVE A COLLECTING RESERVOIR AND A GRAVITY DRAIN FOR THE ELIMINATION OF CONDENSATION.

XV. BLOWER:
1. THE BOILER SHALL INCLUDE A VARIABLE-SPEED, DC CENTRIFUGAL FAN TO OPERATE DURING THE BURNER FIRING SEQUENCE AND PRE-PURGE THE COMBUSTION CHAMBER.

XVI. MOTORS:
1. BLOWER MOTORS SHALL COMPLY WITH REQUIREMENTS SPECIFIED IN DIVISION 23 SECTION "COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT."

XVII. MOTOR SIZES:

XVIII. MINIMUM SIZE AS INDICATED. IF NOT INDICATED, LARGE ENOUGH SO DRIVEN LOAD WILL NOT REQUIRE A MOTOR TO OPERATE IN THE SERVICE FACTOR RANGE ABOVE 1.0.

XIX. IGNITION:
1. IGNITION SHALL BE VIA SPARK OR PROVEN PILOT IGNITION WITH 100 PERCENT MAIN-VALVE SHUTOFF AND ELECTRONIC FLAME SUPERVISION.

XX. COMBUSTION AIR:
1. THE BOILER SHALL BE DESIGNED SUCH THAT THE COMBUSTION AIR IS DRAWN FROM THE INSIDE OF THE BOILER ENCLOSURE, DECOUPLING IT FROM THE COMBUSTION AIR SUPPLY AND PREHEATING THE AIR TO INCREASE EFFICIENCY.

XXI. COMBUSTION AIR FILTER:
1. THE BOILER SHALL BE EQUIPPED WITH AN AUTOMOTIVE HIGH FLOW AIR FILTER TO ENSURE EFFICIENT COMBUSTION AND UNHINDERED BURNER COMPONENTS OPERATION.

XXII. ENCLOSURE:
1. THE PLASTIC AND SHEET METAL ENCLOSURE SHALL BE FULLY REMOVABLE, ALLOWING FOR EASY ACCESS DURING SERVICING.

XXIII. O2 SENSOR LOCATED IN THE COMBUSTION CHAMBER:
1. THE BOILER SHALL BE EQUIPPED WITH AN OXYGEN SENSOR. THE SENSOR SHALL BE LOCATED IN THE BOILER COMBUSTION CHAMBER. BOILERS WITHOUT OXYGEN SENSOR OR BOILERS WITH AN OXYGEN SENSOR IN THE EXHAUST SHALL NOT BE ACCEPTABLE DUE TO MEASUREMENT ESTIMATION AND PERFORMANCE ACCURACY.

XXIV. CONTROLS:
1. THE BOILER SHALL HAVE AN INTEGRATED BOILER CONTROL THAT IS CAPABLE OF OPERATING THE BOILER AND ASSOCIATED ACCESSORIES INCLUDING BUT NOT LIMITED TO: ITS PUMPS, VALVES AND DAMPERS.
2. THE CONTROL SHALL HAVE A 5 INCH COLOR TOUCH SCREEN DISPLAY AS WELL AS SIX FUNCTION BUTTONS THAT ARE SEPARATE FROM THE DISPLAY. USER SHALL HAVE THE ABILITY TO NAVIGATE THE MENUS VIA TOUCHSCREEN OR NAVIGATION BUTTONS. CONTROLS NOT EQUIPPED WITH NAVIGATION BUTTON OPTIONS SHALL NOT BE PERMITTED.
3. THE CONTROL SHALL BE EQUIPPED WITH A MULTI-COLOR LINEAR LED LIGHT TO INDICATE THE LEVEL OF FIRING AND/OR AIR/FUEL VALVE POSITION.
4. THE CONTROL SHALL DISPLAY TWO TEMPERATURES USING TWO DEDICATED THREE-DIGIT SEVEN-SEGMENT DISPLAYS.
5. THE CONTROL SHALL OFFER AN ENABLE/DISABLE TOGGLE SWITCH AS WELL AS TWO BUTTONS FOR TESTING AND RESETTING THE LOW WATER CUTOFF.
6. THE MANAGER DESIGNATED BOILER CONTROL SHALL BE CAPABLE OF THE FOLLOWING FUNCTIONS WITHOUT THE NEED FOR ADDITIONAL EXTERNAL CONTROLS:
7. SEQUENCE UP TO 16 BOILERS,
8. CONTROL BOILER VARIABLE SPEED OR SINGLE SPEED PUMPS AND/OR MODULATING MOTORIZED VALVES,
9. OPERATE OR MODULATE A VARIABLE OR SINGLE SPEED SYSTEM PUMP OR ROTATE TWO SYSTEM PUMPS,
10. CONTROL AND COMMUNICATE WITH UP TO 6 SMARTPLATE DOMESTIC WATER HEATERS AND THEIR DOMESTIC HOT WATER PUMP,
11. THE CONTROL SHALL CONNECT TO OTHER PLANT BOILER CONTROLS USING RS485 AND COMMUNICATE USING MODBUS PROTOCOL.
12. THE CONTROL SYSTEM SHALL BE SEGREGATED INTO THREE COMPONENTS: "EDGE [II]" CONTROL PANEL, POWER PANEL AND INPUT/OUTPUT CONNECTION BOX. THE ENTIRE SYSTEM SHALL BE UNDERWRITERS LABORATORIES RECOGNIZED.
13. THE CONTROL PANEL SHALL CONSIST OF SEVEN INDIVIDUAL CIRCUIT BOARDS USING SURFACE-MOUNT TECHNOLOGY IN A SINGLE ENCLOSURE. EACH BOARD SHALL BE INDIVIDUALLY FIELD REPLACEABLE. THESE CIRCUIT BOARDS SHALL INCLUDE:
14. A MICROCONTROLLER BOARD WITH INTEGRATED 5 INCH TOUCHSCREEN COLOR DISPLAY PROVIDING THE USER INTERFACE.
15. A 7-SEGMENT DISPLAY BOARD. THIS BOARD INCLUDES TWO 3-DIGIT 7-SEGMENT DISPLAYS. THESE DISPLAYS SHALL BE USED TO VIEW A VARIETY OF TEMPERATURE SENSOR VALUES AND OPERATING AND STARTUP FUNCTION STATUS.
16. AN INTERFACE BOARD CONNECTS THE MICROCONTROLLER BOARD TO INTERNAL COMPONENTS USING RIBBON CABLES.
17. AN ELECTRIC LOW-WATER CUTOFF BOARD CONNECTS TO THE TEST AND MANUAL RESET FUNCTIONS ON THE MICROCONTROLLER BOARD.
18. A POWER SUPPLY BOARD IS DESIGNED TO PROVIDE THE DIFFERENT DC VOLTAGES TO THE REST OF THE BOARDS. IT ALSO ACTS AS VOLTAGE REGULATOR AND REDUCE POWER NOISE.
19. AN IGNITION AND COMBUSTION BOARD. THIS BOARD CONTROLS THE AIR/FUEL VALVE AND SAFETY SHUTOFF VALVE, FLAME STATUS AND IGNITION TRANSFORMER
20. A CONNECTOR BOARD USED TO CONNECT ALL EXTERNAL ELECTRICAL CONNECTION.

XXV. SYSTEM PUMP LEAD/LAG ROTATION:
1. THE CONTROL SHALL BE CAPABLE OF OPERATING TWO SYSTEM PUMPS. IT SHALL ROTATE THE LEAD PUMP BASED ON USER TIME SETTING. THE USE OF AN EXTERNAL PUMP LEAD-LAG CONTROL SHALL NOT BE PERMITTED UNLESS FUNCTION IS PERFORMED BY BUILDING MANAGEMENT SYSTEM.

XXVI. VARIABLE SPEED PUMP:
1. THE CONTROL SHALL BE CAPABLE OF MODULATING A VARIABLE SPEED PUMP. IT SHALL MODULATE THE PUMP BASED ON THE BOILER FIRING RATE, THE BOILER PLANT FIRING RATE, OR BASED ON THE RETURN HEADER TEMPERATURE DIFFERENTIAL FROM SUPPLY WATER TEMPERATURE ON A PRIMARY SECONDARY PIPING APPLICATION.

XXVII. MINIMUM NUMBER OF BOILER PLANT OPEN VALVES:
1. THE CONTROL SHALL MANAGE THE MINIMUM NUMBER OF BOILER MOTORIZED VALVES TO REDUCE VARIABLE SPEED PUMP FLOW AND ENERGY USED. THE CONTROL SHALL OFFER A SETTING TO CONTROL THE NUMBER OF VALVES OPEN DURING LOW LOAD AND STANDBY OPERATION. MANUFACTURERS WITHOUT THIS FEATURE SHALL OFFER ADDITIONAL PUMP CONTROLLER AND A SMALLER SINGLE SPEED PUMP TO RUN DURING THE LOW LOAD AND STANDBY PERIODS.

XXVIII. CONTROL SETTINGS TRANSFER USING USB:
1. THE CONTROL SHALL SIMPLIFY AND SIGNIFICANTLY LESSEN STARTUP AND BOILER SETTING TIME BY BEING ABLE TO USE A USB FLASH DRIVE TO COPY SETTINGS FROM ONE BOILER TO ANOTHER BOILER. INSTALLERS SHALL USE SUCCESSFULLY PRECONFIGURED BOILER SETTINGS IN THEIR PORTFOLIO TO NEWLY INSTALLED BOILERS.

XXIX. COMBUSTION CALIBRATION:
1. THE CONTROL SHALL OFFER AT LEAST 5 CALIBRATION POINTS. THE USE OF LESS THAN 5 CALIBRATION POINTS IS NOT PERMITTED TO IMPROVE OVERALL SYSTEM EFFICIENCY UNDER ALL FIRING RATES. EACH COMBUSTION CALIBRATION POINT SHALL OPERATE WITH 5 TO 7% O2 LEVELS TO IMPROVE OPERATING EFFICIENCY. DEVIATING AWAY FROM THESE VALUES SHALL NOT BE ACCEPTABLE.

XXX. ASSISTED COMBUSTION CALIBRATION:
1. THE CONTROL SHALL OFFER AN ASSISTED COMBUSTION CALIBRATION FEATURE TO HELP REDUCE SETUP TIME AND IMPROVE SETUP ACCURACY. THE ASSISTED COMBUSTION CALIBRATION SHALL ADJUST THE O2 LEVEL AT EACH CALIBRATION POINT TO HELP KEEP O2 LEVEL WITHIN ALLOWABLE EFFICIENCY. THE CONTROL SHALL LOG, DATE AND TIME STAMP THE CALIBRATED POINT COMBUSTION VALUES OF O2 AND ALLOW THE USER TO LOG NOX, CO AND FLAME STRENGTH. THE CONTROL SHALL CHECK THESE VALUES AGAINST MANUFACTURER ALLOWABLE COMBUSTION VALUES AND COLOR IDENTIFY VALUES OUT OF MANUFACTURER ACCEPTABLE RANGES. AS AN ADDITIONAL CAPABILITY, THE CONTROL SHALL ALSO HAVE THE ABILITY TO PERFORM MANUAL COMBUSTION CALIBRATION. NOT HAVING ASSISTED COMBUSTION CALIBRATION FUNCTION SHALL BE PROHIBITED.

XXXI. VALVE BALANCING:
1. TO HELP SIMPLIFY INSTALLATION AND AS PART OF A BOILER PLANT, THE CONTROL SHALL BE CAPABLE OF CONTROLLING AN ELECTRONIC MODULATING MOTORIZED VALVE FOR EACH OF THE BOILERS USING THE MANAGER BOILER CONTROL. IT SHALL HAVE A BUILT-IN LOGIC TO PROVIDE A MAXIMUM FLOW USING AN ADJUSTABLE VALVE OPENING PERCENTAGE POINT FOR EACH BOILER. THE CONTROL SHALL BE CAPABLE OF CLOSING ANY VALVE THAT HAS AN OFF BOILER. IF ALL BOILERS ARE OFF, THE CONTROL SHALL KEEP AT MINIMUM ONE VALVE OPEN TO PROTECT PUMPS.

XXXII. BUILDING AUTOMATION:
1. THE CONTROL SHALL BE ABLE TO COMMUNICATE TO BUILDING MANAGEMENT SYSTEMS USING BACNET AND MODBUS WITHOUT THE USE OF EXTERNAL GATEWAYS. THE CONTROL SHALL BE ABLE TO COMMUNICATE OVER EACH OF THE TWO PROTOCOLS USING IP AS WELL AS RS485. THE USE OF EXTERNAL GATEWAYS IS NOT ACCEPTABLE. THE CONTROL SHALL BE ABLE TO COMMUNICATE TO THE BUILDING MANAGEMENT SYSTEM USING:
1. BACNET MS/TP AND BACNET IP/ETHERNET. WHEN COMMUNICATING OVER BACNET IP, THE CONTROL SHALL OFFER AN ADDITIONAL LAYER OF IP SECURITY BY MAPPING ALL CONTROL BACNET IP COMMUNICATION TO THE BACNET SERVER'S IP AND MAC ADDRESSES. NOT HAVING THIS LEVEL OF SECURITY SHALL DEEM THE IP COMMUNICATION INSECURE AND SHALL NOT BE ACCEPTABLE.

XXXIII. SOFTWARE UPDATE:
1. THE CONTROL SHALL BE CAPABLE OF FIELD SOFTWARE UPDATES WITHOUT A NEED FOR HARDWARE COMPONENT(S) REPLACEMENT. THIS SHALL BE PERFORMED EITHER USING SOFTWARE ON A USB FLASH DRIVE OR VIA INTERNET CONNECTION. THE SOFTWARE UPDATE MECHANISM SHALL BE PERFORMED BY A TRAINED TECHNICIAN. THE SOFTWARE UPDATE MENUS SHALL BE SECURED USING A PASSWORD LEVEL. AFTER THE SOFTWARE UPDATE, THE CONTROL SHALL RETAIN ALL OF ITS PRIOR FIELD SETTINGS.

XXXIV. COPY SETTINGS FROM ONE BOILER TO THE OTHER:
1. TO SIGNIFICANTLY REDUCE INSTALLATION TIME BY REDUCING LONG REPETITIVE WORK, THE CONTROL SHALL HAVE THE CAPABILITY OF SAVING ITS SETTINGS TO A USB FLASH DRIVE. IN ADDITION, THE CONTROL SHALL HAVE THE ABILITY OF COPYING NEW SETTINGS FROM A FLASH DRIVE.

XXXV. BACKUP BOILER:
1. THE CONTROL SHALL BE ABLE TO OPERATE A LOWER EFFICIENCY BACK UP BOILER DURING PEAK PERIODS WHEN MAIN PLANT BOILERS ARE AT OR CLOSE TO PEAK LOAD.

XXXVI. THE CONTROLS SHALL ANNUNCIATE BOILER AND SENSOR STATUS AND INCLUDE EXTENSIVE SELF-DIAGNOSTIC CAPABILITIES.

XXXVII. THE CONTROL PANEL SHALL INCORPORATE:
1. SETPOINT HIGH LIMIT: SETPOINT HIGH LIMIT ALLOWS FOR A SELECTABLE MAXIMUM BOILER OUTLET TEMPERATURE AND ACTS AS TEMPERATURE LIMITING GOVERNOR. SETPOINT LIMIT IS BASED ON A PID FUNCTION THAT AUTOMATICALLY LIMITS FIRING RATE TO MAINTAIN OUTLET TEMPERATURE WITHIN A 0 TO 10 DEGREE SELECTABLE BAND FROM THE DESIRED MAXIMUM BOILER OUTLET TEMPERATURE.
2. SETPOINT LOW LIMIT: ALLOW FOR A SELECTABLE MINIMUM OPERATING TEMPERATURE.
3. FAILSAFE MODE: FAILSAFE MODE ALLOWS THE BOILER TO SWITCH ITS MODE TO OPERATE FROM AN INTERNAL SETPOINT IF ITS EXTERNAL CONTROL SIGNAL IS LOST, RATHER THAN SHUT OFF. THIS IS A SELECTABLE MODE, ENABLING THE CONTROL CAN TO SHUT OFF THE UNIT UPON LOSS OF EXTERNAL SIGNAL, IF SO DESIRED.

XXXVIII. EACH BOILER SHALL INCLUDE AN ELECTRIC, SINGLE-SEATED COMBINATION SAFETY SHUTOFF VALVE/REGULATOR WITH PROOF OF CLOSURE SWITCH IN ITS GAS TRAIN. EACH BOILER SHALL INCORPORATE DUAL OVER-TEMPERATURE PROTECTION WITH MANUAL RESET, IN ACCORDANCE WITH ASME SECTION IV AND CSD 1.

XXXIX. O2-TRIM OR AERTRIM: EACH BOILER SHALL BE EQUIPPED WITH THE PATENTED AERTRIM SYSTEM, AN ADVANCED O_2-TRIM SYSTEM FOR CONDENSING BOILER APPLICATIONS. THE SYSTEM SHALL UTILIZE A LOW COST RELIABLE AUTOMOTIVE O_2 SENSOR THAT MEASURES AND MONITORS THE OXYGEN CONTENT OF THE EXHAUST GASES. THE SYSTEM SHALL ADJUST THE BLOWER SPEED TO MAINTAIN OPTIMAL AIR-FUEL RATIOS IN THE EVENT OF ANY SITE CONDITION CHANGES (AIR DENSITY, GAS PRESSURE, BTU CONTENT, ETC.). THE SYSTEM SHALL HAVE THE FOLLOWING CAPABILITIES:
1. SELF-DIAGNOSTICS
2. SYSTEM STATUS AND ERROR MESSAGES
3. WHEN EXCESSIVE TRIMMING IS OCCURRING
4. WHEN O_2 SENSOR HAS FALLEN OUT OF CALIBRATION
5. ADJUSTABLE PARAMETER SETTINGS
6. O_2 TARGET AND RANGE TO MEET SITE REQUIREMENTS
7. SCHEDULE DAILY OR WEEKLY SELF-DIAGNOSTICS

XL. THE O_2 SENSOR SHALL BE INSTALLED THROUGH THE UNIT'S BURNER PLATE AND MEASURE THE OXYGEN CONTENT DIRECTLY WITHIN THE UNIT'S COMBUSTION CHAMBER.

XLI. BOILERS WITHOUT AN EQUIVALENT O_2 TRIM WILL BE DEEMED UNACCEPTABLE. DUE TO THE MOISTURE CONTENT OF FLUE GASES FROM CONDENSING BOILERS, PLACING THE O_2 SENSOR IN THE EXHAUST MANIFOLD OR STACK WILL BE DEEMED UNACCEPTABLE.

XLII. BOILERS WHICH REQUIRE THEIR O2 SENSOR BE CHANGED ANNUALLY WILL BE DEEMED UNACCEPTABLE.

XLIII. EACH BOILER SHALL HAVE INTEGRATED BOILER SEQUENCING TECHNOLOGY (BST), CAPABLE OF MULTI-UNIT SEQUENCING WITH LEAD-LAG FUNCTIONALITY AND PARALLEL OPERATION. THE SYSTEM WILL INCORPORATE THE FOLLOWING CAPABILITIES:
1. EFFICIENTLY SEQUENCE 2-TO-16 UNITS ON THE SAME SYSTEM TO MEET LOAD REQUIREMENT.
2. INTEGRATED CONTROL AND WIRING FOR SEAMLESS INSTALLATION OF OPTIONAL MODULATING MOTORIZED VALVE. WHEN VALVES ARE UTILIZED, THE SYSTEM SHALL OPERATE ONE MOTORIZED VALVE PER UNIT AS AN ELEMENT OF LOAD SEQUENCING. VALVES SHALL CLOSE WITH DECREASED LOAD AS UNITS TURN OFF, WITH ALL VALVES OPEN UNDER NO-LOAD CONDITIONS.
3. AUTOMATICALLY ROTATE LEAD/LAG AMONGST THE UNITS ON THE CHAIN AND MONITOR RUN HOURS PER UNIT AND BALANCE LOAD IN AN EFFORT TO EQUALIZE RUN HOURS AMONG ACTIVE UNITS.
4. OPTION TO MANUALLY DESIGNATE LEAD AND LAST BOILER
5. DESIGNATED MANAGER CONTROL, USED TO DISPLAY AND ADJUST KEY SYSTEM PARAMETERS.
6. AUTOMATIC BUMP-LESS TRANSFER OF MASTER FUNCTION TO NEXT UNIT ON THE CHAIN IN CASE OF DESIGNATED MASTER UNIT FAILURE; MASTER/SLAVE STATUS SHALL BE SHOWN ON THE INDIVIDUAL UNIT DISPLAYS.

XLIV. ELECTRICAL POWER:
1. SINGLE-POINT FIELD POWER CONNECTION: FACTORY-INSTALLED AND FACTORY-WIRED SWITCHES, MOTOR CONTROLLERS, TRANSFORMERS AND OTHER ELECTRICAL DEVICES SHALL PROVIDE A SINGLE-POINT FIELD POWER CONNECTION TO THE BOILER.

XLV. VENTING:
1. THE BOILER SHALL BE CAPABLE OF VENTING IN POLYPROPYLENE VENTING MATERIAL. THE EXHAUST VENT MUST BE UL LISTED FOR USE WITH CATEGORY II, III AND IV APPLIANCES AND COMPATIBLE WITH CONDENSING FLUE GAS SERVICE. UL LISTED VENTS OF POLYPROPYLENE OR AL 29-4C STAINLESS STEEL MUST BE USED WITH BOILERS.
2. PVC/CPVC IS APPROVED FOR USE WITH BMK750 AND 1000 MODELS
3. THE MINIMUM EXHAUST VENT DUCT SIZE FOR EACH BOILER IS SIX INCH (BMK750 - 1500) DIAMETER.

XLVI. COMBUSTION-AIR INTAKE:
1. BOILERS SHALL BE CAPABLE OF DRAWING COMBUSTION AIR FROM THE OUTDOORS VIA A METAL OR PVC DUCT CONNECTED BETWEEN THE BOILER AND THE OUTDOORS.

XLVII. THE MINIMUM DUCTED COMBUSTION AIR DUCT SIZE FOR EACH BOILER IS SIX INCH (BMK750 - 1500) DIAMETER.

XLVIII. COMMON VENT AND COMMON COMBUSTION AIR MUST BE AN AVAILABLE OPTION FOR BOILER INSTALLATION. TO IMPROVE SYSTEM EFFICIENCY, MULTI-BOILER SYSTEM SHALL UTILIZE SEQUENCING LOGIC WITH COMMON VENTING AS WELL AS INDIVIDUAL BOILER VENTING CONFIGURATION. MANUFACTURERS NOT ALLOWING PARALLEL MODULATION FOR COMMON SHALL NOT BE ACCEPTABLE. CONSULT MANUFACTURER FOR COMMON VENT AND COMBUSTION AIR SIZING.

XLIX. FOLLOW GUIDELINES SPECIFIED IN MANUFACTURER'S VENTING GUIDE.

L. SOURCE QUALITY CONTROL:
1. BURNER AND HYDROSTATIC TEST: FACTORY ADJUST BURNER TO ELIMINATE EXCESS OXYGEN, CARBON DIOXIDE, OXIDES OF NITROGEN EMISSIONS AND CARBON MONOXIDE IN FLUE GAS, AND TO ACHIEVE COMBUSTION EFFICIENCY. PERFORM HYDROSTATIC TESTING.
2. TEST AND INSPECT FACTORY-ASSEMBLED BOILERS, BEFORE SHIPPING, ACCORDING TO ASME BOILER AND PRESSURE VESSEL CODE.
1. IF BOILERS ARE NOT FACTORY ASSEMBLED AND FIRE-TESTED, THE LOCAL VENDOR IS RESPONSIBLE FOR ALL FIELD ASSEMBLY AND TESTING.
2. ALLOW OWNER ACCESS TO SOURCE QUALITY-CONTROL TESTING OF BOILERS. NOTIFY ARCHITECT FOURTEEN DAYS IN ADVANCE OF TESTING.

LI. EXAMINATION:
1. BEFORE BOILER INSTALLATION EXAMINE ROUGHING-IN FOR CONCRETE EQUIPMENT BASES, ANCHOR-BOLT SIZES AND LOCATIONS AND PIPING AND ELECTRICAL CONNECTIONS TO VERIFY ACTUAL LOCATIONS, SIZES AND OTHER CONDITIONS AFFECTING BOILER PERFORMANCE, MAINTENANCE AND OPERATIONS.
2. BOILER LOCATIONS INDICATED ON DRAWINGS ARE APPROXIMATE. DETERMINE EXACT LOCATIONS BEFORE ROUGHING-IN FOR PIPING AND ELECTRICAL CONNECTIONS.
3. EXAMINE MECHANICAL SPACES FOR SUITABLE CONDITIONS WHERE BOILERS WILL BE INSTALLED.
4. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

LII. BOILER INSTALLATION:
1. INSTALL BOILERS LEVEL ON CONCRETE BASES.
2. INSTALL GAS-FIRED BOILERS ACCORDING TO NFPA 54.
3. ASSEMBLE AND INSTALL BOILER TRIM.
4. INSTALL ELECTRICAL DEVICES FURNISHED WITH BOILER BUT NOT SPECIFIED TO BE FACTORY MOUNTED.
5. INSTALL CONTROL WIRING TO FIELD-MOUNTED ELECTRICAL DEVICES.

LIII. CONNECTIONS:
1. PIPING INSTALLATION REQUIREMENTS ARE SPECIFIED IN OTHER DIVISION 23 SECTIONS. DRAWINGS INDICATE GENERAL ARRANGEMENT OF PIPING, FITTINGS AND SPECIALTIES.
2. INSTALL PIPING ADJACENT TO BOILER TO PERMIT SERVICE AND MAINTENANCE.
3. INSTALL PIPING FROM EQUIPMENT DRAIN CONNECTION TO NEAREST FLOOR DRAIN. PIPING SHALL BE AT LEAST FULL SIZE OF CONNECTION. PROVIDE AN ISOLATION VALVE IF REQUIRED.
4. CONNECT GAS PIPING TO BOILER GAS-TRAIN INLET WITH UNIONS. PIPING SHALL BE AT LEAST FULL SIZE OF GAS TRAIN CONNECTION. PROVIDE A REDUCER IF REQUIRED.
5. CONNECT HOT-WATER PIPING TO SUPPLY AND RETURN BOILER TAPINGS WITH SHUTOFF VALVE AND UNION OR FLANGE AT EACH CONNECTION.
6. INSTALL PIPING FROM SAFETY RELIEF VALVES TO NEAREST FLOOR DRAIN.

LIV. BOILER VENTING:
1. KIT: COMPLETE SYSTEM, ASTM A959, TYPE 29-4C STAINLESS STEEL OR POLYPROPYLENE (PPS), PIPE, VENT TERMINAL, THIMBLE, INDOOR PLATE, VENT ADAPTER, CONDENSATE TRAP AND DILUTION TANK, AND SEALANT. VENT SYSTEM SHALL MEET CATEGORY IV VENTING REQUIREMENTS.

LV. COMBUSTION-AIR INTAKE:
1. COMPLETE SYSTEM, STAINLESS STEEL, PIPE, VENT TERMINAL WITH SCREEN, INLET AIR COUPLING, AND SEALANT.
2. CONNECT VENTING FULL SIZE TO BOILER CONNECTIONS. [COMPLY WITH REQUIREMENTS IN DIVISION 23 SECTION "BREECHINGS, CHIMNEYS AND STACKS."]

LVI. FIELD QUALITY CONTROL:
1. PERFORM TESTS AND INSPECTIONS AND PREPARE TEST REPORTS.
2. MANUFACTURER'S FIELD SERVICE: ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO INSPECT COMPONENTS, ASSEMBLIES AND EQUIPMENT INSTALLATIONS, INCLUDING CONNECTIONS, AND TO ASSIST IN TESTING.

S. AUTOMATIC SHRINK OUT SMOKE & HEAT VENT (SHV-1 THRU 12):

I. MANUFACTURERS:
1. WASCO/VELUX
2. SIMILAR

II. MATERIALS
1. CURB FRAME: EXTRUDED ALUMINUM ALLOY 6063-T5 (MIN.) ASTM B 221 (ASTM B 221 M) WITH MINIMUM EFFECTIVE THICKNESS OF 0.060 INCH. PROVIDE INTEGRAL CONDENSATION GUTTER SYSTEM WITH CORNERS FULLY WELDED FOR WATERPROOF QUALITY.
2. RETAINER FRAME: EXTRUDED ALUMINUM ALLOY 6063-T5 (MIN). ASTM B 221 (ASTM B 221 M) WITH MINIMUM EFFECTIVE THICKNESS OF 0.060 INCH.
3. INTEGRAL CURBS: FABRICATE FROM DOUBLE SKIN OF 1100-H14 SHEET ALUMINUM, INSULATED WITH 1-1/2 INCH FIBERGLASS INSULATION. PROVIDE THERMAL BREAK AT BOTTOM.
4. PROVIDE MINIMUM THICKNESS REQUIRED TO MEET SPECIFIED LOADS FOR OUTER AND INNER SKIN.
5. PLASTIC SHEETS: MONOLITHIC, FORMABLE, TRANSPARENT (COLORLESS) OR TRANSLUCENT (WHITE) SHEETS WITH GOOD WEATHER AND IMPACT RESISTANT.
6. ACRYLIC: THERMOFORMABLE, ACRYLIC (METHACRYLATE), CATEGORY C-2 OR CC-2 TYPE UVA (FORMULATED WITH ULTRAVIOLET ABSORBER), WITH FINISH 1 (SMOOTH OR POLISHED), UNLESS OTHERWISE INDICATED.

III. SHAPE AND SIZE:
1. AS INDICATED BY MODEL NUMBER.

IV. GLAZING:
1. THERMOFORMED ACRYLIC: (CLEAR, #2447 WHITE). OUTER DOME WITH 25% RISE. CLEAR, #2247 WHITE TRANSLUCENT (52% TRANSMITTANCE), THERMOFORMED ACRYLIC INNER DOME (CLEAR, #2447 WHITE).

V. FASTENERS:
1. SAME METAL AS METALS BEING FASTENED, OR NONMAGNETIC STAINLESS STEEL OR OTHER NON-CORROSIVE METAL AS RECOMMENDED BY MANUFACTURER.

VI. BITUMINOUS COATING:
1. SSPC-PAINT 12, SOLVENT-TYPE, BITUMINOUS MASTIC, NOMINALLY FREE OF SULFUR AND CONTAINING NO ASBESTOS FIBERS, COMPOUNDED FOR 15-MIL (0.4 MM) DRY FILM THICKNESS PER COATING.

VII. PRODUCTS:
1. PROVIDE MODEL CSO MEETING THE REQUIREMENTS OF THIS SECTION.

VIII. INTEGRAL CURBS:
1. FABRICATE FROM DOUBLE SKIN OF 1100-H14 SHEET ALUMINUM, INSULATED WITH 1-1/2", R5.8, EPS INSULATION. PROVIDE THERMAL BREAK AT TOP AND BOTTOM.
2. HEIGHT 12 INCHES FROM BOTTOM OF ROOF FLANGE TO TOP OF RETAINER
3. PROVIDE .025-INCH MINIMUM THICKNESS OUTER SKIN, MILL FINISH. OUTER SKIN TO BE .032 INCH WHEN LENGTH EXCEED NOMINAL 48"
4. PROVIDE .032-INCH MINIMUM THICKNESS INNER SKIN, PREFINISHED WHITE.
5. CURB ASSEMBLY TO HAVE A MINIMUM U-VALUE OF 0.17.

IX. CONDENSATION CONTROL:
1. FABRICATE SKYLIGHT UNITS WITH INTEGRAL INTERNAL GUTTERS AND WEEPS TO COLLECT AND DISPOSE OF CONDENSATION.

X. SHAPE AND SIZE:
1. AS INDICATED BY MODEL NUMBER.

XI. GLAZING:
1. THERMOFORMED ACRYLIC. (CLEAR, # 2447 WHITE,).

XII. FABRICATION:
1. UNITS SHALL BE UNDERWRITERS LABORATORIES (UL) LISTED, FACTORY ASSEMBLED, AND CONSISTING OF A 100% ACRYLIC DOUBLE DOME DESIGNED TO DROP OUT IN IN THE EVENT OF A FIRE.
2. THE VENT SHALL OPERATE AT A MAXIMUM TEMPERATURE OF 286 DEGREES F PER UL STANDARD 793.
3. UNIT SHALL CONSIST OF AN ALL-ALUMINUM FULLY INSULATED CURB AND BODY ASSEMBLY WITH INTEGRAL CAP FLASHING AND 4" ROOF FLANGE.
4. UNIT HEIGHT SHALL BE 12" FROM BOTTOM OF ROOF FLANGE TO TOP OF RETAINER.
5. OUTER ACRYLIC DOME TO BE MINIMUM .177" THICK 100% ACRYLIC.
6. THE INNER DOME SHALL BE IMPACT MODIFIED ACRYLIC CONFIGURED FOR STIFFNESS TO SUPPORT THE OUTER DOME AND A 40 PSF LIVE LOAD.
7. DOME TO BE CONFIGURED AS NOT TO REQUIRE THE ADDITION OF SCREENS FOR FIRE BRAND PROTECTION.

XIII. FINISHES:
1. MILL FINISH: MANUFACTURER'S STANDARD MILL FINISH.

2.08 MOTOR STARTERS, CONTROL DEVICES AND MOTORS

A. MECHANICAL CONTRACTOR TO FURNISH AND INSTALL STARTERS FOR POWER WIRING BY THE ELECTRICAL CONTRACTOR.
B. MOTOR STARTERS SHALL BE CUTLER HAMMER, WESTINGHOUSE OR ALLEN-BRADLEY MANUFACTURER, SUITABLE FOR WALL OR ANGLE IRON FRAME MOUNTING.
C. ALL STARTERS FOR MOTORS LESS THAN 1/2 HP SHALL BE 120 VOLT, SINGLE PHASE, 60 CYCLE, A.C. SERVICE. MANUAL STARTERS WITH OVERLOAD PROTECTION AND LOCKOUT TYPE DISCONNECT SWITCH OR BREAKER MAY BE USED TO CONTROL SUCH MOTORS, EXCEPT WHERE INTERLOCKS OR AUTOMATIC CONTROLS ARE REQUIRED. IN SUCH CASES, MAGNETIC ACROSS-THE-LINE STARTERS SHALL BE FURNISHED.
D. ALL STARTERS FOR MOTORS 1/2 HP TO 75 HP SHALL BE COMBINATION FUSED DISCONNECT, MAGNETIC ACROSS-THE-LINE TYPE WITH FUSIBLE SWITCH. STARTERS 75 HP AND GREATER SHALL BE SOLID STATE ELECTRONIC SOFT START TYPE STARTERS.
E. ALL MAGNETIC STARTERS SUBJECT TO MANUAL START AND IN DIRECT VIEW OF THE MOTORS THEY CONTROL SHALL HAVE MOMENTARY CONTACT START AND STOP BUTTONS AND PILOT LIGHT BUILT IN TO COVER. ALL MAGNETIC STARTERS SUBJECT TO ELECTRICAL INTERLOCK OR AUTOMATIC CONTROL SHALL HAVE HAND-OFF-AUTOMATIC SWITCHES AND PILOT LIGHT BUILT INTO COVER.
F. WHERE STARTERS ARE NOT IN SIGHT OF MOTORS THEY CONTROL, A LOCAL DISCONNECT SWITCH WILL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.
G. PROVIDE ALL STARTERS WITH TRANSFORMERS BUILT INTO EACH STARTER CASING FOR CONTROL CIRCUIT. TRANSFORMERS SHALL SERVE ALL CONTROL CIRCUITS. EACH STARTER SUBJECT TO ELECTRICAL INTERLOCK AND/OR AUTOMATIC CONTROL SHALL HAVE THE NECESSARY AUXILIARY CONTACTS. ONE SET OF TERMINALS SHALL BE PROVIDED FOR EACH CONTROL CIRCUIT. CONTROL CENTERS SHALL BE PROVIDED WITH CONTROL TERMINAL BLOCKS. PROVIDE THREE SETS OF NORMALLY CLOSED OR NORMALLY OPEN CONTACTS.
H. ALL MAGNETIC STARTERS SHALL HAVE THERMAL OVERLOAD IN EACH PHASE LEG AND LOW VOLTAGE PROTECTION.
I. ALL PARTS SUBJECT TO WEAR, ARCING, ETC., SHALL BE REPLACEABLE.
J. ALL WIRING, STARTERS, SWITCHES, ETC., SHALL BE IN FULL ACCORDANCE WITH ALL LOCAL INSURANCE UNDERWRITERS CODE REQUIREMENTS.
K. FURNISH DETAILED COMPOSITE WIRING DIAGRAMS FOR THOSE INSTALLING ELECTRICAL WORK, AND FURNISH SUCH OTHER INFORMATION NECESSARY TO ASSURE THE PROPER CONNECTION, OPERATION AND CONTROL OF MOTORIZED EQUIPMENT, INCLUDING INTERLOCKS, AUTOMATIC OR SAFETY CONTROLS AND AUXILIARY CIRCUITS.
L. FURNISH THE PERTINENT INFORMATION SUCH AS STARTING TORQUE REQUIREMENTS OF HIGH INERTIA EQUIPMENT, SO THAT THE PROPER TYPE STARTER MAY BE PROVIDED BY THE STARTER MANUFACTURER. ALL INFORMATION IS SUBJECTED TO THE REVIEW OF THE ENGINEER.
M. PROVIDE LAMINATED NAME PLATE ATTACHED TO EACH STARTER AND VFD IDENTIFYING THE SYSTEM IT SERVES.

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :
CHECKED BY :
APPROVED BY :
DATE :
SCALE :

DRAWING TITLE :

MECHANICAL SPECIFICATIONS SHEET #4

DWG NUMBER :

M-804

N. STARTERS AND VFD'S SHALL BE PROVIDED WITH ENCLOSURES RATED NEMA 1 FOR INDOOR APPLICATIONS, NEMA 3R WITH ADDITIONAL GASKETING FOR WEATHERPROOF RAINTIGHT OUTDOOR ENCLOSURE OR INDOOR ENVIRONMENTS SUBJECT TO MOISTURE.

O. MOTORS SHALL BE HIGH EFFICIENCY, COMPLY WITH NEMA MG-1 STANDARD AND MEET THE 1992 EPA ENERGY EFFICIENCY ACT AND UTILITY COMPANY REBATE REQUIREMENTS.

P. PROVIDE VARIABLE FREQUENCY DRIVES (VFD) AS MANUFACTURED BY ABB OR EQUIVALENT FOR CONTROL OF PUMPS AS SHOWN ON THE PLANS AND AS SPECIFIED HEREIN. VFD DISTORTION FACTOR SHALL NOT EXCEED 3% THD (VOLTAGE) AT POINT OF COMMON COUPLING, AS DEFINED BY IEEE 519.1992 AND IN NO CASE SHALL THE CURRENT THD EXCEED 10%. VFDS SHALL INCLUDE THE FOLLOWING:

1. PWM TECHNOLOGY INCORPORATING IGBT.
2. 40 CHARACTER FULL ENGLISH DIGITAL DISPLAY. CODES ARE NOT ACCEPTABLE.
3. DC LINE CHOKE.
4. THREE SETS OF NORMALLY CLOSED OR NORMALLY OPEN CONTACTS.
5. CIRCUIT BREAKER DISCONNECT.
6. VFD DRIVE SERVICE SWITCH.
7. SPEED CONTROL DIAL.
8. THERMAL MOTOR OVERLOADS.
9. 3% AC LINE REACTOR PRE-WIRED AND INSTALLED WITHIN VFD ENCLOSURE.
10. FACTORY START-UP SERVICE INCLUDING COMPONENT TESTING, FIELD CHECK OF CONTROL CONNECTION, AND DOCUMENTS STATING THAT ALL WORK AND DRIVE FUNCTIONS ARE DEEMED ACCEPTABLE.
11. PROGRAMMING OF ALL DRIVE PARAMETERS PARTICULAR TO THIS INSTALLATION.
12. 2 YEAR SITE PARTS AND LABOR WARRANTY AFTER START-UP.

Q. VARIABLE FREQUENCY DRIVE MOTORS SHALL COMPLY WITH NEMA MG-1 PART 31.40.4.2 STANDARD SUITABLE FOR VFD OPERATION. CONTRACTOR TO COORDINATE VFD AND MOTOR MANUFACTURERS.

R. ALL VFD DRIVES FOR ALL EQUIPMENT SHALL BE OF THE SAME MANUFACTURER. MECHANICAL CONTRACTOR SHALL COORDINATE VFD DRIVE MANUFACTURER WITH EACH EQUIPMENT VENDOR.

2.09 AUTOMATIC TEMPERATURE CONTROL

A. GENERAL

1. PROVIDE ALL CONTROL, POWER, AND INTERLOCK WIRING INCLUDING CONDUITS AND INSTALL PER THE NEW YORK STATE AND NATIONAL ELECTRIC CODE. SUBMIT TERMINAL TO TERMINAL WIRING DIAGRAM, SEQUENCE OF OPERATION AND CUTS OF ALL COMPONENTS FOR APPROVAL. PROVIDE ALL RELAYS, SWITCHES, DAMPERS AND ACTUATORS, THERMOSTATS, PANELS, LIMIT SAFETIES, TRANSFORMERS, TIME CLOCKS, CONTROL VALVES AND OTHER DEVICES TO ACCOMPLISH THE DESIRED SEQUENCE OF OPERATION.
2. FURNISH AND INSTALL AS HEREIN SPECIFIED, A COMPLETE AUTOMATIC TEMPERATURE CONTROL SYSTEM OF THE DDC TYPE WITH BACNET COMMUNICATION PROTOCOL.
3. THE MANUFACTURER SHALL BE ALBIREO ENERGY, ABM, AUTOMATED LOGIC, SCHNEIDER ELECTRIC, HONEYWELL OR APPROVED EQUAL BY THE ENGINEER. MANUFACTURER SHALL BE APPROVED BY ENGINEER BEFORE BID AWARD. THE ATC CONTRACTOR SHALL BE AN INDEPENDENT CONTRACTOR NOT AFFILIATED WITH THE MECHANICAL CONTRACTOR.
4. ALL TEMPERATURE CONTROL SYSTEMS AND COMPONENTS ARE TO BE FULLY MODULATING TYPE, EXCEPT WHERE NOTED OTHERWISE.
5. THE NEW BMS SYSTEM SHALL BE A WEB-BASED SYSTEM.
6. BMS SOFTWARE & GRAPHICS:
   A) PROVIDE ENTERPRISE SERVER SOFTWARE TO ALLOW ALL NETWORK CONTROLLERS (INCLUDING GRAPHICS, ALARMS, SCHEDULES, ETC) TO BE ACCESSIBLE FROM THE WORKSTATION SIMULTANEOUSLY FOR OPERATIONS AND ENGINEERING TASKS.
   B) WEB-STATION SHALL REQUIRE SECURE USERNAME AND PASSWORD LOGIN.
   C) PROVIDE A SYSTEM GRAPHIC PAGE ON THE WORKSTATION & WEB GRAPHICS FOR EACH HVAC SYSTEM WITH ALL MONITORING AND CONTROL POINTS AS SPECIFIED.
   D) THE BMS CONTRACTOR SHALL PROVIDE A GRAPHIC REPRESENTATION OF EACH FLOOR PLAN AND EACH SYSTEM, SHOWING DEVICES AND ALARMS INDICATED ON THE INPUT/OUTPUT SUMMARY.
   E) PROVIDE A GRAPHICAL FLOOR PLAN SHOWING LEAK DETECTORS AND INDICATE STATUS.
   F) THE BMS SHALL PROVIDE GRAPHICAL SUMMARY PAGES FOR EQUIPMENT AND THEIR CRITICAL POINTS, AC UNIT LEAK DETECTION.
   G) ALL EQUIPMENT GRAPHICS SHALL BE DYNAMIC
   H) THE FLOOR GRAPHICS SHALL INCLUDE UNIQUE COLOR CODES FOR TEMPERATURE VARIATIONS FROM SETPOINT.
   I) THE GRAPHIC INTERFACE SHALL BE SIMPLE POINT AND CLICK NAVIGATION AND ALLOW SCHEDULE CHANGES, SETPOINT CHANGES, ALARM ACKNOWLEDGEMENT, TREND CONFIGURATION, ETC.
7. TRAINING
   A) THE BMS CONTRACTOR SHALL PROVIDE A MINIMUM OF (8) HOURS ON-SITE TRAINING FOR FACILITY STAFF ON-SITE. TRAINING CAN BE PERFORMED IN SEPARATE (4) HOUR INTERVALS AT THE DISCRETION OF THE OWNER.
   B) THE BMS CONTRACTOR SHALL PROVIDE HARDCOPY OF AS-BUILT DRAWINGS AND REVIEW ALL MAINTENANCE REQUIREMENTS AND PROCEDURES FOR ALL EQUIPMENT
8. ALL CONTROLS MUST BE THE PRODUCT OF ONE MANUFACTURER. ALL AUTOMATIC CONTROL VALVES AND DAMPER OPERATORS SHALL BE MANUFACTURED BY THE TEMPERATURE CONTROL MANUFACTURER.
9. THE MANUFACTURER OF THE AUTOMATIC CONTROL EQUIPMENT SHALL SUBMIT THE FOLLOWING FOR APPROVAL: A SCHEMATIC DIAGRAM OF EACH CONTROL SYSTEM WHICH SHALL INDICATE THE PROPER SEQUENCE OF OPERATION AND RANGE OF THE CONTROLS FOR ALL CYCLES, PROVIDE TERMINAL POINT TO TERMINAL POINT ELECTRICAL WIRING DIAGRAMS FOR APPROVAL, A COMPLETE DESCRIPTION OF THE AUTOMATIC OPERATION OF EACH SYSTEM WHERE THE DESCRIPTION INCLUDES THE DUTY OF EACH THERMOSTAT, VALVE, SWITCH, ETC., INCORPORATED IN THE CONTROL SYSTEM WITH A SCHEDULE AND ILLUSTRATION OF ALL CONTROL INSTRUMENTS AND EQUIPMENT INCLUDING CONTROL PANELS AND DEVICES FOR EACH SYSTEM.
10. INDIVIDUAL SMOKE DETECTORS SHALL BE INSTALLED (PROVIDED BY ELECTRICAL CONTRACTOR) IN THE RETURN DUCT OF ALL AIR HANDLING SYSTEMS SHARING A COMMON CEILING OR DUCT PLENUM AS REQUIRED BY CODE.
11. FOR AIR DISTRIBUTION SYSTEMS 2,000 CFM OR LARGER, INSTALL SMOKE DETECTORS (PROVIDED BY ELECTRICAL CONTRACTOR) IN MAIN SUPPLY DUCT (DOWNSTREAM OF AIR FILTERS AND AHEAD OF ANY BRANCH CONNECTIONS) AND MAIN RETURN DUCT (UPSTREAM OF ANY FILTERS AND BEFORE RETURN AIR IS DILUTED WITH OUTDOOR AIR).
12. ALL SMOKE DETECTORS SHALL BE TIED TO THE BUILDING FIRE ALARM SYSTEM. A SIGNAL FROM THE BUILDING FIRE ALARM SYSTEM SHALL AUTOMATICALLY SHUT DOWN SYSTEM FANS. SIGNAL, INTERLOCK WIRING, POWER WIRING AND FINAL CONNECTIONS WILL BE PROVIDED BY ELECTRICAL CONTRACTOR.

B. ELECTRIC WIRING:

1. ALL ELECTRIC WORK (EXCEPT FOR MOTOR FEEDERS, WIRING BETWEEN MOTORS, MOTOR CONTROLLERS, FEEDER PANELS, FUSES, CIRCUIT BREAKERS AND BUS BARS) REQUIRED FOR THE AUTOMATIC TEMPERATURE CONTROL SYSTEM SHALL BE PROVIDED BY THIS CONTRACTOR. WORK SHALL INCLUDE BUT NOT BE LIMITED TO TIME SWITCHES, DAMPER MOTORS, DAMPER SWITCHES, ELECTRIC THERMOSTAT, ELECTRIC RELAYS, E/P SWITCHES, INTERLOCKING WIRING, WIRE, CONDUIT, ETC.
1. ALL CONTROL POWER, WIRING AND TRANSFORMERS FOR DAMPERS, ACUATORS, VAV BOXES, CONTROL PANELS, ETC. TO BE PROVIDED BY THE CONTROLS CONTRACTOR FROM A SOURCE DESIGNATED BY THE ELECTRICAL CONTRACTOR. CIRCUITS FOR CONTROL DEVICES HAVE BEEN DESIGNATED IN THE ELECTRICAL PANEL SCHEDULES.
2. THE CONTROL MANUFACTURER SHALL INCLUDE WIRING DIAGRAMS IN HIS SHOP DRAWINGS SUBMITTALS FULLY COORDINATED WITH THE ELECTRICAL CONTRACTORS WORK. IT SHALL BE THE AUTOMATIC TEMPERATURE CONTROL CONTRACTORS RESPONSIBILITY TO PROVIDE ALL WIRING AND CONDUIT AS REQUIRED TO ACHIEVE THE FUNCTION CALLED FOR IN THESE SPECIFICATIONS, CONFORMING WITH LOCAL CODES FOR MATERIAL AND INSTALLATION. THE ELECTRICAL SPECIFICATION FOR THE PROJECT ELECTRICAL WORK IS TO BE FOLLOWED.

T. CONTROL PANELS SHALL BE NEMA 1 FOR INDOOR APPLICATIONS, NEMA 3R WITH ADDITIONAL GASKETING FOR WEATHERPROOF RAINTIGHT OUTDOOR ENCLOSURE OR INDOOR ENVIRONMENTS SUBJECT TO MOISTURE. THEY SHALL BE PROVIDED WITH WELDED ANGLE BRACKETS AND A BAKED PRIME COAT ENAMEL FINISH. THE PANEL DOORS SHALL BE HINGED LOCKING TYPE. CONTROL PANELS SHALL CONTAIN ALL CENTRAL CONTROL DEVICES, SUCH AS CONTROLLERS, RELAYS, SWITCHES, PILOT LIGHTS, TERMINAL BLOCKS, AND ALL OTHER ACCESSORIES AS REQUIRED FOR A WORKABLE ENVIRONMENTAL CONTROL SYSTEM. ALL COMPONENTS WITHIN THE CONTROL PANELS SHALL BE PRE-WIRED TO NUMBERED TERMINAL TRIPS, READY FOR FIELD CONNECTION FOR FIELD MOUNTED CONTROL COMPONENTS. PROVIDE ENGRAVED NAMEPLATES TO LABEL THE CONTROLLED EQUIPMENT. PROVIDE A PLASTIC LAMINATED CONTROL SCHEMATIC DRAWING HUNG NEXT TO EACH CONTROL PANEL.

U. THE SYSTEM INSTALLATIONS SHALL BE SUPERVISED BY THE AUTOMATIC CONTROL MANUFACTURER, WHO SHALL COORDINATE WITH AND INSTRUCT PIPING OR SHEET METAL TRADES AS TO TEES OR TAPPINGS TO BE INSTALLED IN PIPING OR EQUIPMENT AND OPENINGS THAT ARE REQUIRED IN SHEET METAL FOR THE SETTING AND INSTALLATIONS OF CONTROL DEVICES THEREIN BY THESE TRADES.

V. ALL ROOM THERMOSTATS/SENSORS AND SWITCH LOCATIONS SHALL BE SUBMITTED FOR REVIEW BY THE ARCHITECT AND ENGINEER PRIOR TO INSTALLATION WHETHER THE DEVICES ARE SHOWN ON PLANS OR NOT.

W. ALL ROOM THERMOSTATS/SENSORS SHALL HAVE OVERRIDE SWITCH, LOCAL READOUT AND LOCAL ADJUSTMENT. READOUT AND ADJUSTMENT SHALL BE CAPABLE OF BEING LOCKED OUT AT THE BMS.

X. AUTOMATIC VALVES:

1. ALL AUTOMATIC CONTROL AND ISOLATION VALVES SHALL BE OF THE ELECTRONIC TYPE, UNLESS OTHERWISE SPECIFIED, QUIET IN OPERATION, AND SHALL BE ARRANGED TO SPRING RETURN FAIL SAFE, IN A NORMALLY CLOSED POSITION. CONTROL VALVES SHALL BE FULLY PROPORTIONING AND ISOLATION VALVES SHALL BE 2-POSITION. VALVES TO HAVE ADJUSTABLE OPERATING RANGES AND STARTING POINTS TO PROVIDE FLEXIBILITY OF ADJUSTMENT IN SEQUENCING AND THROTTLING. MODULATING VALVES SHALL BE PROVIDED WITH PILOT POSITIONERS.
2. VALVES SHALL BE SIZED BY THE TEMPERATURE CONTROL MANUFACTURER AND GUARANTEED TO MEET THE HEATING OR COOLING REQUIREMENTS AS SPECIFIED. CONTROL VALVES SHALL BE SUITABLE FOR PRESSURE CONDITIONS AND CLOSE AGAINST 110% OF PUMP DIFFERENTIAL PRESSURE.
3. ALL VALVE BODIES SHALL HAVE THE SAME PRESSURE CHARACTERISTICS AS THE PIPE IN WHICH IT IS INSTALLED.
4. VALVES 2 INCHES AND SMALLER UNLESS OTHERWISE SPECIFIED SHALL HAVE BRONZE BODIES WITH SCREWED CONNECTIONS. VALVES SHALL BE FISHER TYPE ED, WARREN TYPE 20/70, K&M SERIES GCG, OR AS APPROVED.
5. VALVES BETWEEN 2-1/2" AND 4 INCH UNLESS OTHERWISE SPECIFIED, SHALL HAVE CAST IRON OR CARBON STEEL BODIES WITH FLANGED CONNECTIONS IN ACCORDANCE WITH THE PIPING SPECIFICATIONS. VALVES SHALL BE FISHER STYLE ED, WARREN TYPE 20/70 OR 1800 SERIES GCG, K&M SERIES GCG OR AS APPROVED.

I. AUTOMATIC DAMPERS:

1. PROVIDE CONTROLS FOR ALL THE AUTOMATIC DAMPERS, AS SPECIFIED IN THE DUCTWORK SECTION, AND SHOWN ON THE DRAWINGS.
2. CONTROL MOTORS OR ACTUATORS SHALL BE OF THE ELECTRONIC TYPE, UNLESS OTHERWISE NOTED, OF APPROPRIATE SIZE AND QUANTITIES TO PROVIDE TWO-POSITION.

J. SEQUENCES OF OPERATION - FURNISH AND MOUNT ALL DEVICES AS REQUIRED TO PERFORM THE FOLLOWING SEQUENCES OF OPERATION:

1. CONSULT MECHANICAL CONTROL DIAGRAMS.

PART 3- EXECUTION

3.01 A. PROVIDE AND INSTALL ALL EQUIPMENT AND ACCESSORIES OF THE SIZES AND CAPACITIES AS SCHEDULED AND AS INDICATED ON THE DRAWINGS AND IN ACCORDANCE WITH APPROVED SHOP DRAWINGS AND MANUFACTURERS RECOMMENDATIONS. PROVIDE ALL MOTOR STARTERS AS REQUIRED; MOTOR STARTERS WILL BE INSTALLED BY THIS CONTRACTOR AND WIRED BY ELECTRICAL TRADE.

K. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL REQUIRED CLEARANCES FOR SERVICING AND MAINTENANCE. COORDINATE REQUIREMENTS WITH ALL TRADES.

L. IDENTIFICATION OF EQUIPMENT AND CONTROLS:

1. ALL EQUIPMENT SHALL BE STENCILED OR LABELED WITH LAMACOID PLATES SCREWED THEREON WHICH SHALL INDICATE SYSTEMS SERVICE.
2. MOTOR STARTERS SHALL BE PROVIDED WITH LAMACOID PLATES WHICH INDICATE SYSTEM SERVED.
3. CONTRACTOR TO SUBMIT LIST OF EQUIPMENT TO RECEIVE LABELS AND THE COORDINATED DESIGNATIONS, SIZE OF LABEL LETTERING, PLATE SIZE AND COLOR FOR REVIEW PRIOR TO INSTALLATION.

M. FOR ALL FLOOR MOUNTED EQUIPMENT PROVIDE A 4" OR 6” HIGH CONCRETE HOUSE-KEEPING PAD; WHERE FLOOR STANDS ARE INDICATED PROVIDE FLOOR STAND OF STRUCTURAL STEEL OR STEEL PIPES AND FITTINGS AND BOLT TO PAD; FOR ROOF MOUNTED EQUIPMENT PROVIDE SUPPORTS WITH APPROVED ANCHORS DIRECTLY FROM BUILDING STEEL STRUCTURE. PROVIDE SUPPLEMENTARY STEEL AS REQUIRED TO ADEQUATELY SUPPORT THE LOAD.

3.02 CHEMICAL CLEANING AND PRETREATMENT

A. CLEANING OF PIPING SHALL BE PERFORMED IN THE PRESENCE OF A BUILDING REPRESENTATIVE.

B. PROVIDE ALL DISPERSANTS, SCALE INHIBITORS AND CORROSION INHIBITORS AS REQUIRED FOR CLEANING AND TREATING ALL PIPING SYSTEMS. CHROMATES SHALL NOT BE USED.

C. ALL CHEMICALS TO BE USED FOR PIPE CLEANING SHALL BE APPROVED BY THE BASE BUILDING CHEMICAL TREATMENT COMPANY.

D. FLUSH PIPING SYSTEMS WITH THE APPROVED CLEANING CHEMICAL TO REMOVE PIPE DOPE, SLUSHING COMPOUNDS, CUTTING OILS AND OTHER LOOSE EXTRANEOUS MATERIALS. SEAL ENDS AFTER CLEANING.

E. THE CONTRACTOR SHALL:

1. SATISFY EACH CHEMICAL HAS THE PROPER FEED RATES FOR CLEANING AND PRETREATMENT OF EACH SYSTEM AND RECORD.
2. CHECK THAT THE CLEANING SOLUTION IS ACTUALLY IN EACH SYSTEM.
3. SATISFY WHEN TO FLUSH THE SYSTEM.
4. CHECK EACH SYSTEM FOLLOWING FLUSHING TO ENSURE CLEANING CHEMICALS HAVE BEEN REMOVED FROM EACH SYSTEM AND TEST TO ENSURE PH OF NEW SYSTEM IS WITHIN 0.5 OF FRESH INCOMING WATER.

F. BLOCK MODULATING VALVES, ZONE VALVES AND OTHER SYSTEM RESTRICTIONS. PROVIDE BY PASS PIPING AND VALVING TO ISOLATE NEW AND EXISTING TO BE RE-USED EQUIPMENT SUCH AS CHILLERS, COILS, HEAT EXCHANGERS, ETC. FROM THE CLEANING PROCESS.

G. PROVIDE PORTABLE PUMPS TO CIRCULATE WATER FOR CLEANING PURPOSES AT RESPECTIVE FLOWS FOR FOUR (4) HOURS. REMOVE AND CLEAN STRAINERS. BLOW OFF LOW POINTS WITH STEAM AFTER CLEANING AND BEFORE TRAPS ARE INSTALLED. DRAIN ENTIRE SYSTEM.

H. CHEMICAL USED FOR CLEANING OF SYSTEMS SHALL COMPLY WITH THE RECOMMENDATIONS OF THE MANUFACTURERS OF THE MAJOR COMPONENTS IN THE SYSTEM AND SHALL BE APPROVED FOR USE.

I. UPON INITIAL FILL (FOLLOWING SYSTEM FLUSHING) THE APPROVED CHEMICALS WHICH PROVIDE A PROTECTIVE COATING TO PREVENT OXIDATION OF THE CLEANED SYSTEM SHALL BE ADDED.

3.03 WATER TREATMENT

C. PROVIDE ALL BIOCIDES AND BIODISPERSANTS AS REQUIRED TO TREAT WATER SYSTEMS FOR THE PREVENTION OF MICROBIOLOGICAL GROWTH. CHROMATES SHALL NOT BE USED.

D. PROVIDE A VENTURI CHEMICAL FEED FITTING AND SYSTEM OR EACH SYSTEM TO BE TREATED. FITTINGS SHALL BE NALCO BIODUCTOR OR APPROVED EQUAL.

E. PROVIDE ALL CONTROLS AND EQUIPMENT REQUIRED FOR AN AUTOMATIC BLEED AND CHEMICAL FEET SYSTEM.

F. AFTER CHEMICAL CLEANING AND PRETREATMENT OF PIPING SYSTEMS ANALYZE WATER SYSTEMS TO DETERMINE SPECIFIC BIOCIDES AND INHIBITORS TO BE USED.

G. ADD THE NECESSARY BLEND OF INHIBITORS, BIOCIDES AND DISPERSANTS FOR PROPER CONTROL OF CORROSION, SCALING AND MICROBIOLOGICAL GROWTH. SUBMIT IN WRITING THE RECOMMENDED FEED RATE OF ALL CHEMICALS AND BLEED RATE OF ALL SYSTEMS. USE PROPER CHEMISTRY TO PROVIDE THE FOLLOWING MINIMUM LEVELS:

1. CLOSED SYSTEM BACTERIA COUNTS BELOW 10^3 COLONIES PER MILLILITER (AEROBIC & NON AEROBIC). PH LEVELS TO BE BETWEEN 7.0 AND 9.0 CORROSION RATE TO BE LESS THAN 1/2 MILS/YEAR STEEL, 1/10 MIL/YEAR COPPER.
2. OPEN SYSTEM TREATMENT (CONDENSER WATER) PROVIDE AGENTS TO REDUCE SCALE DEPOSITS, TO ADJUST PH AND TO INHIBIT CORROSION. TREATMENT SHALL NOT CONTAIN ANY CHROMATES OR OTHER TOXIC SUBSTANCES. USE PROPER CHEMISTRY TO PROVIDE BACTERIA COUNTS BELOW 10^5 COLONIES PER MILLIMETER (AEROBIC AND NON-AEROBIC). PH TO BE BETWEEN 7.5 AND 8.5. CORROSION RATES TO BE LESS THAN 1 MILS/YEAR - STEEL AND 1/10 MILS/YEAR COPPER.

3.04 EQUIPMENT START-UP AND TESTING

A. UPON COMPLETION OF THE INSTALLATION, THIS CONTRACTOR SHALL ENSURE THAT ALL EQUIPMENT AND SYSTEMS ARE TESTED AND BALANCED UNDER FIELD OPERATING CONDITIONS TO DEMONSTRATE ITS COMPLIANCE WITH SPECIFICATION REQUIREMENTS.

B. SHOULD ANY PART OF THE EQUIPMENT OR SYSTEM FAIL TO MEET THE CONTRACT REQUIREMENTS, THIS CONTRACTOR SHALL ADJUST, REPAIR OR REPLACE ALL DEFECTIVE OR INOPERATIVE PARTS AND AGAIN CONDUCT THE COMPLETE START-UP TEST.

C. SUBMIT SYSTEM START UP SHEETS AND TEST RESULTS TO THE OWNER AND ENGINEER.

3.05 PERFORMANCE TESTS AND COMMISSIONING

A. COMMISSIONING IS MORE DETAILED THAN EQUIPMENT START-UP TESTING AND SHALL BE PERFORMED ON THIS PROJECT TO DEMONSTRATE TO THE COMMISSIONING AUTHORITY (CXA) A COMPLETE AND SUCCESSFUL WORKING INSTALLATION IN ALL OPERATIONAL MODES AS OUTLINED IN THE SEQUENCE OF OPERATIONS. THIS CONTRACTOR SHALL:

1. ATTEND ALL PRE-COMMISSIONING AND ANY SUBSEQUENT COMMISSIONING MEETINGS WITH ASSOCIATED SUB-CONTRACTORS AND MANUFACTURERS REPRESENTATIVES THAT ARE REQUIRED TO COMPLETE THE COMMISSIONING OF THE EQUIPMENT AND SYSTEMS PROVIDED.
2. REVIEW THE COMMISSIONING PLAN TYPICALLY PREPARED AND ISSUED BY THE CXA.
3. COMPLETE PRE-STARTUP AND STARTUP ON ALL INSTALLED EQUIPMENT PRIOR TO ALL COMMISSIONING ACTIVITIES.
4. COMPLETE AND SUBMIT A PRE-FUNCTIONAL CHECKLIST DISTRIBUTED BY THE CXA FOR EACH PIECE OF EQUIPMENT AND SYSTEM TO BE COMMISSIONED. ANY ISSUES ENCOUNTERED DURING START-UP SHOULD BE LISTED IN THE COMMENT SECTION.
5. PERFORM FUNCTIONAL PERFORMANCE TESTING OUTLINED IN THE COMMISSIONING PLAN.
6. WORK CLOSELY WITH THE CXA IN IDENTIFYING ALL OPERATING, MAINTENANCE, FAILURE MODES THAT MUST BE DEMONSTRATED AS PART OF THE COMMISSIONING PROCESS.
7. COORDINATE, SCHEDULE AND COMPLETE COMMISSIONING TASKS WITH THE CXA.
8. BE RESPONSIBLE FOR ALL COSTS FOR TESTING, INCLUDING RE-TESTING DUE TO DEFICIENCIES/NON-COMPLIANCE WITH THE SPECIFICATIONS. RE-TESTING COSTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL NOT CONSTITUTE JUSTIFICATION FOR ADDITIONAL COSTS TO THE OWNER.
9. INCLUDE OVERTIME LABOR AS NEEDED FOR TESTING.
10. RESPONSIBLE TO SUPPLY AND CONNECT ALL TESTING EQUIPMENT REQUIRED FOR ANY PART OF THE COMMISSIONING PROCESS (I.E. LOAD BANKS, CABLES, INFRARED SCANNING, TEMPORARY COOLING MEANS, TESTING MATERIALS AND CHEMICALS, ETC.)
11. SUBMIT MANUFACTURER ACCEPTANCE TESTING DOCUMENTATIONS (STARTUP AND MANUAL DOCUMENTS) TO THE COMMISSIONING AUTHORITY.

B. FUNCTIONAL PERFORMANCE TESTING:

1. START UP OF SYSTEMS AND COMPONENTS SHALL BE PERFORMED BY CONTRACTORS AND MANUFACTURER TECHNICIANS AS APPLICABLE PRIOR TO FUNCTIONAL PERFORMANCE TESTING (FPT) IN THE PRESENCE OF THE CXA. ALL POWER, SAFETIES AND CONTROL INTERLOCKS SHALL BE MADE OPERATIONAL. PRE-TEST VERIFICATION BY THE CONTRACTOR OF COMPONENTS AND SYSTEMS IS MANDATORY TO VERIFY OPERATION BEFOREHAND AND AVOID LAST MINUTE CORRECTIVE WORK OR REPEAT TESTING. SUBMISSION OF PRE-FUNCTION CHECKLISTS SHALL COMMUNICATE THAT SUCH PROCESS HAS OCCURRED.
2. ONCE PRE-FUNCTION CHECKLISTS HAVE BEEN SUBMITTED TO AND REVIEWED BY THE CXA, FUNCTIONAL TESTING CAN BE SCHEDULED BY THE CXA.
3. THE CXA MUST BE KEPT INFORMED OF THE CONSTRUCTION SCHEDULE AND GIVEN TWO (2) WEEKS NOTICE OF THE ANTICIPATED FUNCTIONAL TESTING TIMEFRAME WINDOW.
4. FUNCTIONAL TESTING SHOULD FOLLOW THE SYSTEMS TESTING AND BALANCING PROCESS.
5. PERFORMANCE TEST PROCEDURES ARE INTENDED TO DEMONSTRATE AND RECORD THE PERFORMANCE OF EQUIPMENT AND SYSTEMS UNDER SAFETY AND OPERATIONAL SCENARIOS AS APPLICABLE INCLUDING:
   A) RESPONSE TO SAFETIES IN MANUAL AND AUTOMATIC MODE
   B) SIGNALS TO FIRE ALARM, SECURITY AND TENANT ALARM PANELS
   C) SEQUENCE OF OPERATION, STEP BY STEP
   D) INTERLOCK WITH OTHER PIECES OF EQUIPMENT (E.G., VALVES, LEAK DETECTORS, ETC.)
   E) CONTROL SYSTEM RESPONSE AND ANNUNCIATION OF SENSOR/MONITOR POINTS
6. THE FUNCTIONAL TESTING PROCEDURES ARE EXECUTED BY THE CONTRACTORS, UNDER THE DIRECTION OF, AND RECORDED BY THE CXA. THE CONTRACTOR SHALL PROVIDE A FIELD TECHNICIAN AND A REPRESENTATIVE FROM THE AUTOMATIC TEMPERATURE CONTROLS CONTRACTOR TO OPERATE EQUIPMENT AND CONFIRM RESPONSES IN THE PRESENCE OF THE CXA AND OWNER'S APPOINTED REPRESENTATIVE.
7. ANY NON-COMPLIANCE ITEMS FOUND SHALL BE LISTED IN A COMMISSIONING ISSUES LOG PREPARED BY THE CXA. CONTRACTORS SHALL ENSURE THAT CORRECTIVE ACTION OF LISTED DEFICIENCIES IS IMPLEMENTED AND SHALL RESPOND UPON COMPLETION OF SUCH TO THE CXA VIA THE PROVIDED AREAS IN THE COMMISSIONING ISSUES LOG.
8. ITEMS OF NON-COMPLIANCE IN MATERIAL, INSTALLATION OR SETUP ARE CORRECTED AT THE CONTRACTOR'S EXPENSE.
9. ONCE THE CONTRACTOR INDICATES THAT ALL DEFICIENCIES HAVE BEEN ADDRESSED, THE SYSTEMS SHALL BE RETESTED.

C. SYSTEMS TO BE COMMISSIONED:

1. ROOFTOP AIR CONDITIONING UNITS WITH GAS-FIRED FURANCE (RTAC-R-1&2)
2. ROOFTOP HEATING & VENTILATING UNITS (HV-R-1 THRU 12)
3. DESTRATIFICATION FANS (DSF-4-1 THRU 43)
4. CONDENSING BOILERS (B-1-1&2)
5. HOT WATER CIRCULATING PUMPS (HWP-1-1&2)
6. HOT WATER UNIT HEATERS (HWUH-A,B&C)
7. ELECTRIC RADIANT FLOOR HEATING (ERFH-1,2,3,4&5)
8. HOT WATER FINNED TUBE RADIATORS (FTR)
9. VARIABLE AIR VOLUME BOXES WITH AND WITHOUT HEATING COILS
10. ALL TRANSFER & EXHAUST FANS) (TXF-X-X & TF-X-X)
11. HEATING CONTROL VALVES
12. BMS / CONTROLS

3.06 AIR AND WATER BALANCING

A. AIR AND WATER SYSTEM BALANCING SHALL BE PERFORMED BY AN APPROVED INDEPENDENT CERTIFIED TESTING AND BALANCING FIRM. THE TESTING AND BALANCING FIRM SHALL BE AABC, NEBB, TABB CERTIFIED OR DIRECTLY SUPERVISED BY A STAFFED LICENCED PROFESSIONAL ENGINEER WITH A MINIMUM OF FIVE YEARS EXPERIENCE. AIR AND WATER SYSTEM BALANCING SHALL BE PERFORMED IN THE PRESENCE OF A BUILDING REPRESENTATIVE.

B. MAKE ALL REQUIRED ADJUSTMENTS OF ALL NEW AIR AND WATER SYSTEM DEVICES UNTIL ALL SPECIFIED PERFORMANCES ARE MET. PROVIDE NECESSARY PIPING AND CONNECTIONS FOR BALANCING ALL WATER SYSTEMS. PROVIDE VOLUME DAMPERS AS REQUIRED FOR FINAL BALANCING OF AIR SYSTEMS. PROVIDE A CLEAN SET OF AIR FILTERS AT ALL AIR CONDITIONING UNITS AND CLEAN ALL STRAINERS PRIOR TO ANY BALANCING.

C. SUBMIT THREE (3) AIR AND WATER BALANCING REPORTS FOR REVIEW CONSISTING OF DESIGN AND ACTUAL READINGS OF ALL EQUIPMENT/DEVICES, LOCATION PLANS OF ALL EQUIPMENT/DEVICES BALANCED, BALANCING EQUIPMENT USED AND METHODS OF BALANCING.

D. ALL REPORTS SHALL INDICATE PRELIMINARY READINGS PRIOR TO BALANCING AND FINAL READINGS AFTER BALANCING HAS BEEN COMPLETED. IF IT IS DETERMINED THAT DRIVE CHANGES ARE REQUIRED, CONTRACTOR SHALL PROVIDE ALL NECESSARY NEW COMPONENTS.

E. CONTRACTOR SHALL INCLUDE IN THEIR BID TWO (2) JOB SITE COMFORT BALANCES UPON ACCEPTANCE OF THE FINAL BALANCING REPORT.

F. CONTRACTOR SHALL SUBMIT WATER BALANCE DATA SHEETS AND REPORTS WHICH TABULATE TEST DATA FOR FINAL ADJUSTED SYSTEM CONDITIONS WITHIN 2% OF DESIGN QUANTITIES FOR SYSTEM COMPONENTS INDICATING GPM AND PRESSURE DROP AT PIPE RISERS AND MAINS; PERFORMANCE CHARACTERISTICS FOR ALL PUMPS INDICATING RPM, GPM, TDH, AMPS, SUCTION AND DISCHARGE HEAD PRESSURE, BHP AND HP AT DESIGN AND NO FLOW CONDITIONS; PRESSURE DROP ACROSS COILS, EQUIPMENT, EACH RISER AND MAIN. MARK BALANCING VALVE TAG OF BALANCED POSITION.

G. CONTRACTOR SHALL SUBMIT AIR BALANCE DATA SHEETS AND REPORTS WHICH TABULATE TEST DATA FROM FINAL ADJUSTED SYSTEM CONDITIONS WITHIN 10% OF DESIGN QUANTITIES FOR SYSTEM COMPONENTS AIR OUTLETS, RETURNS AND TERMINAL UNITS INDICATING CFM AND PRESSURE DROP AT DUCT RISERS AND MAINS; PERFORMANCE CHARACTERISTICS FOR ALL FANS AND AIR CONDITIONING EQUIPMENT INDICATING RPM, CFM, PRESSURE DROP ACROSS EACH COMPONENT (FILTERS, COILS, DAMPERS, ETC), AMPS, SUCTION AND DISCHARGE STATIC PRESSURE, OUTSIDE AIR CFM, BHP AND HP AT DESIGN CONDITIONS; AIR OUTLET DISCHARGE TEMPERATURE AND CFM; TERMINAL BOX INLET SP, MINIMUM AND MAXIMUM AIR SETTINGS.

H. CONTRACTOR TO PROVIDE TRAVERSE READING AT BASE BUILDING MAIN SUPPLY AND RETURN SHAFTS AND PROVIDE STATIC PRESSURE READINGS DOWNSTREAM AND UPSTREAM OF ALL REHEAT/HEAT COILS AND PRV.

I. THE FINAL REPORT AFTER COMFORT BALANCE IS PERFORMED SHALL BE PROVIDED TO THE BUILDING MANAGER.

J. PRE-CONSTRUCTION AIR TESTING:

1. MEASURE PRESSURE, TEMPERATURE, AND VOLUME OF AIR FROM EXISTING BASE BUILDING RETURN AND SUPPLY AIR SYSTEMS SERVING THE SCOPE OF WORK AREA BEFORE STARTING WORK. SUBMIT REPORT TO ENGINEER IMMEDIATELY AFTER COMPLETION OF TEST.

3.07 ELECTRICAL WORK

A. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR POWER WIRING UNDER A SEPARATE DIVISION OF CONTRACT WORK. AUTOMATIC TEMPERATURE, SAFETY AND INTERLOCKING CONTROLS FOR MOTORS, MOTOR STARTERS AND OTHER ELECTRICAL APPARATUS AND DEVICES SHALL BE PROVIDED BY THE HVAC CONTRACTOR. CONTROL WIRING SHALL INCLUDE BUT NOT LIMITED TO ALL 12, 24, AND 120 VOLT WIRING.

B. THE MECHANICAL CONTRACTOR SHALL PREPARE AND SUBMIT FOR APPROVAL TERMINAL POINT TO TERMINAL POINT, COMPLETELY COORDINATED AND INTEGRATED WIRING DIAGRAMS FOR ALL WIRING REQUIRING FIELD INSTALLATION BY THE ELECTRICAL CONTRACTOR.

C. SPECIFIC WIRING DIAGRAMS OF FACTORY INSTALLED EQUIPMENT WIRING SHALL ALSO BE SUBMITTED FOR APPROVAL AND FURNISHED TO THE ELECTRICAL CONTRACTOR FOR HIS INSTALLATION REQUIREMENTS AND OTHER USES.

D. HVAC CONTRACTOR SHALL MAINTAIN ALL EXISTING CONTROL CONNECTIONS FOR STARTERS TO BE REUSED. CONTRACTOR SHALL COORDINATE EXISTING CONDITIONS AND PROVIDE ALL CONTACTS AND RELAYS REQUIRED FOR EXISTING STARTERS TO BE REPLACED WITH NEW.

E. HVAC CONTRACTOR SHALL COORDINATE WITH THE ELECTRICAL CONTRACTOR FOR THE INSTALLATION OF DUCT DETECTORS. DUCT DETECTOR SHALL BE FURNISHED AND WIRED BY THE ELECTRICAL CONTRACTOR AND MOUNTED BY THE HVAC CONTRACTOR.

TO THE BEST KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

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KEY PLAN

REV	DESCRIPTION	DATE
	ISSUED FOR DOB SUBMISSION	09/10/2021
	ISSUED FOR BID	10/15/2021
	ISSUED FOR PROGRESS	01/18/2022

DRAWN BY :

CHECKED BY :

APPROVED BY :

DATE :

SCALE :

DRAWING TITLE :

MECHANICAL SPECIFICATIONS SHEET #5

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