MECHANICAL SPECIFICATIONS

SYSTEMS INSULATION DESCRIPTION:

A. IN GENERAL, THE WORK TO INCLUDE INSULATING ALL NEW PIPING SYSTEMS AS DESCRIBED HEREAFTER.

B. THE PIPING SYSTEMS TO BE INSULATED INCLUDE:
   1. HEATING HOT WATER PIPING.

C. MANUFACTURERS: PROVIDE PIPING INSULATION PRODUCTS PRODUCED BY ONE OF THE FOLLOWING FOR EACH TYPE AND TEMPERATURE RANGE OF INSULATION:
   1. CERTAINTEED CORP.
   2. JOHNS–MANVILLE CORP.
   3. OWENS–CORNING FIBERGLAS (OCF) CORP.
   4. PITTSBURG CORNING CORP.

D. FLAME/SMOKE RATINGS: PROVIDE COMPOSITE PIPING INSULATION (INSULATION, JACKETS, COVERINGS, SEALERS, MASTICS AND ADHESIVES) WITH FLAME–SPREAD RATING OF 25 OR LESS AND A SMOKE–DEVELOPED RATING OF 50 OR LESS, AS TESTED BY ASTM E84 (NFPA 255) METHOD.

E. HEATING HOT WATER PIPING: IN GENERAL, THE WORK SHALL INCLUDE INSULATING ALL NEW HEATING HOT WATER PIPING INCLUDING ANY EXISTING PIPE INSULATION THAT MAY BE DAMAGED DURING NEW BOILER INSTALLATION. PIPE SHALL BE INSULATED WITH 2" THICK ONE–PIECE MOLDED FIBROUS GLASS INSULATION EQUAL TO "OWENS CORNING FIBERGLAS" "ASJ–MAX" ALL SERVICE JACKET, MOLD AND PUNCTURE RESISTANT, AND WITH DOUBLE ADHESIVE LAP SEAL.

F. INSTALLATION OF INSULATION:
   1. GENERAL: INSTALL INSULATION PRODUCTS IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS, AND IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICES TO ENSURE THAT THE INSULATION SERVES ITS INTENDED PURPOSE.
   2. INSTALL INSULATION ON PIPE SYSTEMS SUBSEQUENT TO TESTING AND ACCEPTANCE OF TESTS.
   3. INSTALL INSULATION MATERIALS WITH SMOOTH AND EVEN SURFACES. INSULATE EACH CONTINUOUS RUN OF PIPING WITH FULL–LENGTH UNITS OF INSULATION, WITH A SINGLE CUT PIECE TO COMPLETE THE RUN. DO NOT USE CUT PIECES OR SCRAPS ABUTTING EACH OTHER.
   4. CLEAN AND DRY PIPE SURFACES PRIOR TO INSULATING. BUTT INSULATION JOINTS FIRMLY TOGETHER TO ENSURE A COMPLETE AND TIGHT FIT OVER SURFACES TO BE COVERED.
   5. MAINTAIN INTEGRITY OF VAPOR–BARRIER JACKETS ON PIPE INSULATION, AND PROTECT TO PREVENT PUNCTURE OR OTHER DAMAGE.
   6. COVER FITTINGS AND SIMILAR ITEMS IN EACH PIPING SYSTEM WITH EQUIVALENT THICKNESS AND COMPOSITION OF INSULATION AS APPLIED TO ADJOINING PIPE RUN. INSTALL FACTORY MOLDED, PRECUT OR JOB FABRICATED UNITS (AT INSTALLER'S OPTION) EXCEPT WHERE A SPECIFIC FORM OR TYPE IS INDICATED.
   7. EXTEND PIPING INSULATION WITHOUT INTERRUPTION THROUGH WALLS, FLOORS AND SIMILAR PIPING PENETRATIONS, EXCEPT WHERE OTHERWISE INDICATED. INSTALL PROTECTIVE METAL SHIELDS AND INSULATED INSERTS WHEREVER NEEDED TO PREVENT COMPRESSION OF INSULATION.
   8. ALL INSULATION WORK SHALL BE DONE BY MECHANICS SKILLED IN ITS APPLICATION AND REGULARLY EMPLOYED BY THE INSULATION CONTRACTOR WHO SHALL BE A SUB–CONTRACTOR TO THIS CONTRACTOR. SPECIAL CARE SHALL BE GIVEN TO THE COVERING OF IRREGULAR FITTINGS IN ORDER TO OBTAIN AN EVEN SURFACE RESULTING IN A NEAT AND WORKMANLIKE APPEARANCE.

PIPING MATERIALS:

A. HEATING HOT WATER PIPING: BLACK STEEL PIPE SCHEDULE 40: ASTM A53, A106, OR A120; EXCEPT COMPLY WITH ASTM A53 OR A106 WHERE CLOSE COILING OR BENDING IS REQUIRED. FITTINGS FOR BLACK STEEL PIPE SHALL BE:
   1. SCREWED FITTINGS – 150 LB. GRAY CAST IRON CONFORMING TO ANSI NO. B16.4.
   2. FLANGED FITTINGS – 150 LB. GRAY CAST IRON CONFORMING TO ASTM NO. A181.
   3. UNIONS – 300 LB. MALLEABLE IRON GROUND JOINTS WITH BRASS–TO–IRON SEATS CONFORMING TO ANSI NO. B16.3.
   4. FLANGES – 150 LB. STEEL WELDING NECK WITH RAISED FACE CONFORMING TO ASTM NO. A181, EXCEPT FOR MATCHING FLANGES REQUIRED AT EQUIPMENT AND VALVES.
   5. WELDING FITTINGS, INCLUDING ELBOWS, REDUCING ELLS, CAPS, STRAIGHT TEES, REDUCING TEES, STRAIGHT AND REDUCING LATERALS AND REDUCERS SHALL BE "STANDARD WEIGHT", GRADE B FITTINGS, MEETING ASTM A234, AS PRODUCED BY CRANE, TUBE–TURNS, OR TAYLOR FORGE. FURNISH LONG RADIUS 90 DEGREE ELBOWS. COMPLETE ASTM SPECIFICATION INFORMATION SHALL BE STAMPED ON EACH FITTING.
   6. STANDARD WEIGHT WELDOLETS OR THREADOLETS MAY BE USED IN LIEU OF WELDING TEES ONLY WHERE THE BRANCH LINE IS AT LEAST TWO PIPE SIZES SMALLER THAN MAIN. UNDER NO CIRCUMSTANCES WILL IT BE PERMISSIBLE FOR ONE PIPE LINE TO BE WELDED DIRECTLY INTO ANOTHER, REGARDLESS OF SIZE.
   7. MANUFACTURE – WELDING FITTINGS AND FLANGES WHICH HAVE BEEN MACHINED, REMARKED, PAINTED, OR OTHERWISE PRODUCED DOMESTICALLY. NON–DOMESTIC FORGINGS WILL NOT BE ACCEPTABLE. FITTINGS AND FLANGES SHALL HAVE THE MANUFACTURER'S TRADEMARK PERMANENTLY & IDENTIFIED IN ACCORDANCE WITH MSS SP–25. WELD PIPE JOINTS IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICE. BLACK STEEL PIPE AND FITTINGS 2–1/2" AND LARGER, EXCEPT CONNECTIONS TO EQUIPMENT, SHALL HAVE WELDED OR FLANGED JOINTS. WELDED FITTINGS SHALL BE USED IN ALL LINES 2–1/2" AND ABOVE.
   8. GAUGES AND THERMOMETERS: FURNISH AND INSTALL GAUGES WITH 4–1/2" DIALS. PRESSURE GAUGES SHALL SIMILAR TO "WEKSLER" MODEL BA14–2–PG. THERMOMETERS SHALL BE SIMILAR TO "WEKSLER" MODEL A935A ADJUSTABLE ANGLE THERMOMETER. 0–120° F RANGE.

B. FUEL GAS PIPING: COMPLY WITH APPLICABLE PROVISIONS OF "NATIONAL FUEL GAS CODE", ANSI Z 223.1 (NFPA STANDARD NO. 54). BLACK STEEL PIPE, SCHEDULE 40, SOCKET WELDED JOINTS AND FITTINGS. JOINTS AND FITTINGS DOWNSTREAM OF PRESSURE REGULATOR TO BE THREADED TYPE.

TEST AND BALANCE:

A. PROVIDE INDEPENDENT NEBB CERTIFIED TEST AND BALANCE AGENCY TO PERFORM HVAC WATER BALANCE OF THE FOLLOWING SYSTEMS:
   1. BOILERS B–1 AND B–2 AND ASSOCIATED BOILER PUMPS P–1, P–2, P–3, AND P–4

FLUE VENT SYSTEMS: BREECHING, CHIMNEY & STACK

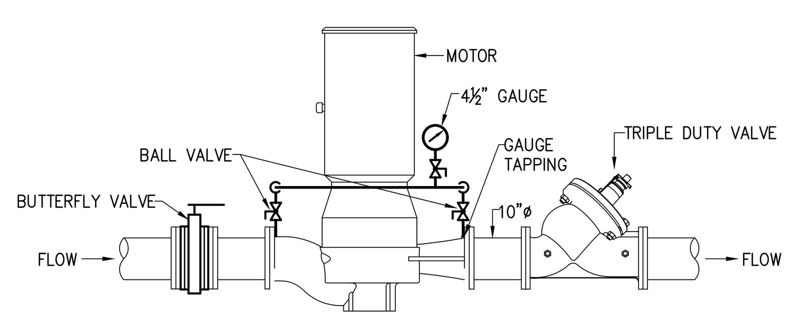
A. STAINLESS STEEL DOUBLE WALL ALL–IN–ONE FLANGED SYSTEM:
   1. MANUFACTURER SHALL PROVIDE FACTORY–BUILT STAINLESS STEEL MODULAR UNIVERSAL STACK/VENT SYSTEM TESTED AND LISTED BY UNDERWRITERS LABORATORIES INC. (UL) FOR USE WITH BUILDING HEATING APPLIANCES CHIMNEYS (PRESSURE STACKS) AND GAS VENTS FOR CONDENSING APPLIANCES.
   2. UL LISTINGS SHALL INCLUDE:
      a. UL 1738 STANDARD FOR VENTING SYSTEMS FOR GAS–BURNING APPLIANCES, CATEGORIES II, III, AND IV, WITH OPERATING FLUE GAS EXHAUST TEMPERATURES UP TO 550°F CONTINUOUS, AND/OR 480°F CONTINUOUS.

B. CONSTRUCTION:
   1. THE DOUBLE WALL AIR–SPACE INSULATED EXHAUST SYSTEM SHALL BE CONSTRUCTED OF ALL–STAINLESS STEEL. THE MATERIALS AND CONSTRUCTION OF MODULAR SECTIONS AND ACCESSORIES SHALL BE AS SPECIFIED BY THE TERMS OF THE PRODUCT'S UL LISTING.
      a. TYPE 444 STAINLESS STEEL INNER LINER.
      b. MINIMUM 1.25"INSULATING AIR SPACE.
      c. TYPE 304 BA STAINLESS STEEL OUTER JACKET.
      d. THE ENTIRE EXHAUST SYSTEM, INCLUDING ALL ACCESSORIES (CONNECTORS, HARDWARE, ANCHOR PLATE SUPPORTS, GUIDES, DRAINS, AND TERMINALS), SHALL BE TYPE 304 STAINLESS STEEL.

C. BREECHING, CHIMNEY & STACK
   1. INNER FLUE SHALL HAVE AN OVERLAPPING MALE/FEMALE SOCKET THAT PROTECTS THE ROLLED FLANGE WITH SEALANT AGAINST CONDENSATE AND HIGH–PRESSURE CLEANING. THE JOINTS SHALL BE SECURED WITH OVERLAPPING VEE BAND ON THE INNER AND OVERLAPPING LOCKING BAND ON THE OUTER JACKET.
   2. DOUBLE–WALL EXHAUST SYSTEM SHALL BE CONSTRUCTED SO THE OUTER JACKET IS FLOATING AND NOT WELDED TO THE INNER LINER.
   3. EXHAUST SYSTEM SHALL BE DESIGNED TO COMPENSATE FOR ALL TEMPERATURE INDUCED THERMAL EXPANSION, INSTALLED TO BE GASTIGHT, AND THUS PREVENT LEAKAGE OF COMBUSTION PRODUCTS INTO A BUILDING.
   4. EXHAUST SYSTEM IS BASED UPON "JEREMIAS" MODEL DWFL (OR EQUIVALENT) THAT IS ALSO AVAILABLE IN DIFFERENT INSULATION THICKNESSES. DETAILED MANUFACTURER'S SUBMITTAL DRAWINGS SHALL BE PROVIDED FOR APPROVAL PRIOR TO INSTALLATION OF THE EXHAUST SYSTEM.

D. INSTALLATION
   1. ROOF AND WALL PENETRATIONS SHALL BE FACTORY INSULATED AND UL LISTED AS NOT TO REQUIRE AIR VENTILATION FOR SAFE INSTALLATION AROUND COMBUSTIBLE MATERIALS.
   2. ENTIRE EXHAUST SYSTEM FROM THE APPLIANCE OUTLET TO THE TERMINATION POINT, INCLUDING ACCESSORIES SHALL BE FROM ONE MANUFACTURER, EXCEPT WHERE NOTED.

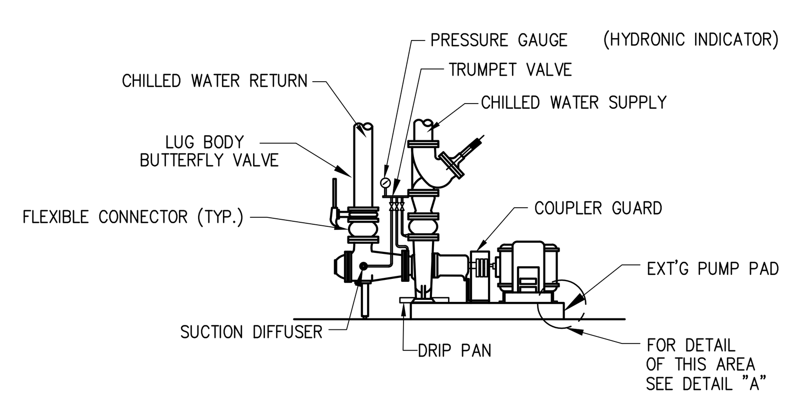
E. WARRANTY
   1. THE FACTORY–BUILT MODULAR EXHAUST SYSTEM SHALL BE WARRANTED AGAINST FUNCTIONAL FAILURE FOR TWENTY–FIVE (25) YEARS.
   2. MANUFACTURER SHALL PROVIDE ASHRAE FLUE SIZING CALCULATIONS, OR CERTIFICATE OF VENT EQUIVALENT FEET, CONFIRMING THE INNER DIAMETER IS IN COMPLETE COMPLIANCE WITH APPLIANCE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
   3. MANUFACTURER SHALL PROVIDE CERTIFICATE OF CODE COMPLIANCE FOR ALL REQUIRED LOCAL AND NATIONAL CODES FOR THE INSTALLATION WITH THE SCHEDULED APPLIANCES.



IN–LINE PUMP DETAIL

NO SCALE

TYP. FOR PUMPS P–1 & P–2

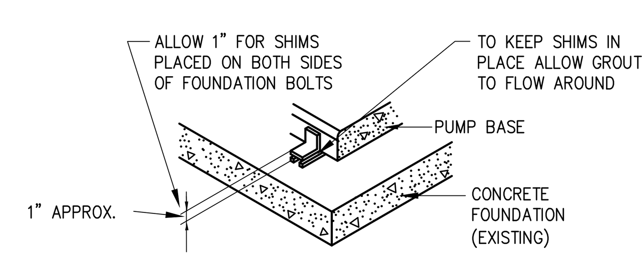


BASE MOUNTED PUMP DETAIL

NO SCALE

NOTES:

1. TYP. FOR PUMPS P–3 & P–4
2. EXT'G PUMP PAD TO BE UTILIZED FOR NEW PUMP INSTALLATION



DETAIL "A"

NO SCALE

CONDENSING FIRETUBE HEATING HOT WATER BOILER SCHEDULE

SYMBOL	LOCHINVAR MODEL No.	NET AHRI M.B.H. RATING	MIN. FLOW RATE (G.P.M.)	MAX FLOW RATE (G.P.M.)	GAS FIRING RATE–MBH INPUT (MIN.)	GAS FIRING RATE–MBH INPUT (MAX.)	GAS FIRING RATE–MBH OUTPUT (MIN.)	GAS FIRING RATE–MBH OUTPUT (MAX.)	AHRI THERMAL %	TURN DOWN RATIO	FLOWRATE AT 30°F ΔT (GPM)	PRESSURE DROP (FT. OF H_2O)	FLUE VENT DIA. INCHES	COMBUSTION AIR CONN. DIA. INCHES	VOLTAGE	BOILER AMPS	M.C.A.	NOTES
B–1	CREST FB 1501	1,255	25	350	60	1,500	57.72	1,443	96.2	25:1	108	10	8	8	115/1/60	10.0	13	1–10
B–2	CREST FB 1501	1,255	25	350	60	1,500	57.72	1,443	96.2	25:1	108	10	8	8	115/1/60	10.0	13	1–10

PROVIDE WITH INTEGRAL "BACNET" MSTP COMMUNICATIONS INTERFACE.

NOTES:

1. MICROPROCESSOR CONTROLS W/ LCD DISPLAY GOVERNING TEMPERATURE, SAFETY, AND IGNITION CONTROL DEVICES.
2. CAT IV VENT CAPABILITY FOR USE WITH U.L. LISTED POLYPROPYLENE VENTING SYSTEM.
3. 316L STAINLESS STEEL FIRE TUBES.
4. OUTDOOR AIR SENSOR ACCESSORY.
5. CONDENSATE NEUTRALIZATION KIT.
6. AUTOMATIC RESET HIGH LIMIT CUTOUT.
7. ASME STAINLESS STEEL HEAT EXCHANGER.
8. FACTORY START–UP SERVICE & FIRST YEAR LABOR WARRANTY.
9. 0–10 VDC INPUT CAPACITY FROM REMOTE BMS SYSTEM
10. ROOM COMBUSTION AIR KIT.

PUMP SCHEDULE

PUMP No.	B & G MODEL No.	G.P.M. EA.	HEAD FT.	H.P. EA.	VOLTAGE	TRIPLE DUTY VALVE		SUCTION DIFFUSER		REMARKS
						MODEL	PRESS. DRP.	MODEL	PRESS. DRP.	
P–1	E–80 3" x 3" x 6⅛"	108	30	2	208/3/60	3DS–3B	3.1 FT.	–––––	–––––	NOTE 1, BOILER B–1
P–2	E–80 3" x 3" x 6⅛"	108	30	2	208/3/60	3DS–3B	3.1 FT.	–––––	–––––	NOTE 1, BOILER B–2
P–3	E–1510 2BD 2" x 2½" x 8⅝"	141	70	5	208/3/60	3DS–2½S	3.3 FT.	EC–3X 4" x 2.5"	1.9 FT.	NOTE 2, PRIMARY
P–4	E–1510 2BD 2" x 2½" x 8⅝"	141	70	5	208/3/60	3DS–2½S	3.3 FT.	EC–3X 4" x 2.5"	1.9 FT.	NOTE 2, STANDBY

NOTE:

1. CLOSE COUPLED INLINE PUMP, CAST IRON VOLUTE CONSTRUCTION, AND PREMIUM EFFICIENCY VFD COMPATIBLE ODP MOTOR, AND SHAFT GROUNDING RINGS.
2. BASE MOUNTED, FLEXIBLE COUPLED, END SUCTION PUMP WITH PREMIUM EFFICIENCY VFD COMPATIBLE ODP MOTOR, AND SHAFT GROUNDING RINGS.

VARIABLE FREQUENCY DRIVE SCHEDULE

TAG	SERVICE	"DANFOSS" MODEL No.	H.P.	OUTPUT AMPS	VOLTAGE	REMARKS
VFD–1	P–1	FC–102	2	7.5	208/3/60	NOTES 1–5
VFD–2	P–2	FC–102	2	7.5	208/3/60	NOTES 1–5
VFD–3	P–3	FC–102	5	16.7	208/3/60	NOTES 1–5
VFD–4	P–4	FC–102	5	16.7	208/3/60	NOTES 1–5

NOTES:

1. PROVIDE "BACNET" COMMUNICATION INTERFACE.
2. NEMA 1 ENCLOSURE.
3. UL LISTED.
4. VERTICAL FUSED MAIN DISCONNECT SWITCH.
5. 100kA SCCR

MANUAL CIRCUIT BALANCER SCHEDULE

SYMBOL	B&G MODEL No.	G.P.M.	dp FEET	APPROX. SETTING	No. REQ'D	REMARKS
CB–1	2½" CB	101	*	*	1	
CB–2	2" CB	40	*	*	1	

* TO BE COMPLETED AT TEST & BALANCE PHASE OF WORK.

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
B.O.P.	BOTTOM OF PIPE (BEFORE INSULATION)
B.O.S.	BOTTOM OF STRUCTURAL STEEL
C.T.E.	CONNECT TO EXISTING
EXT'G	EXISTING
O.C.	ON CENTER
—HWS—●—	HEATING WATER SUPPLY PIPING (HWS)
—HWR— ●—	HEATING WATER RETURN PIPING (HWR)
——D——	DRAINAGE PIPING
——G——	NATURAL GAS
EFD	EXISTING FLOOR DRAIN
	EXISTING CHILLED WATER SUPPLY PIPING – CWS
	EXISTING CHILLED WATER RETURN PIPING – CWR
	EXISTING HEATING HOT WATER SUPPLY PIPING – HWS
	EXISTING HEATING HOT WATER RETURN PIPING – HWR
	EXISTING WATER SUPPLY PIPING – CW
——D——	EXISTING DRAINAGE PIPING – D
——G——	EXISTING GAS PIPING
	GATE VALVE
	BUTTERFLY VALVE (LUG BODY)
	ANGLE VALVE
	BALL VALVE
	CHECK VALVE
	MANUAL CIRCUIT BALANCER
	STRAINER ASSEMBLY
	REDUCER
	GAS VALVE
	GLOBE VALVE
	PRESSURE REDUCING VALVE (PRV)
	TRIPLE DUTY VALVE – TDV
	UNION
	PRESSURE GAUGE
	DIGITAL THERMOMETER W/WELL
	TEMPERATURE SENSOR W/WELL
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
Ⓔ	BOILER EMERGENCY STOP SWITCH (E–STOP)
ΔP	DIFFERENTIAL PRESSURE GAUGE
ΔP	DIFFERENTIAL PRESSURE TRANSMITTER

MECHANICAL GENERAL NOTES

1. ALL SCHEDULES SHOWN ARE THE PURPOSE OF AIDING THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CORRECT TOTALS.
2. CO–ORDINATE HVAC INSTALLATION WITH ALL OTHER TRADES, INCLUDING ELECTRICAL.
3. REFER TO ELECTRICAL DRAWINGS FOR POWER CONNECTION POINTS.
4. ALL PIPING INSULATION SHALL COMPLY WITH SECTION 503 OF THE INTERNATIONAL ENERGY CONSERVATION CODE. 2009 EDITION.
5. ALL ELECTRICALLY POWERED EQUIPMENT SHALL BE LISTED AND LABELED PER NATIONAL ELECTRICAL CODE, AND INTERNATIONAL MECHANICAL CODE, 2018 EDITION, CHAPTER 3.
6. ALL EQUIPMENT SHALL BE ACCESSIBLE PER INTERNATIONAL MECHANICAL CODE 2018 EDITION, CHAPTER 3.
7. ALL PIPING ARRANGEMENT AND ROUTING AS SHOWN IS DIAGRAMMATIC AND MAY REQUIRE ALTERATIONS DIFFERENT FROM THAT SHOWN IN ORDER TO ACCOMMODATE STRUCTURE/ARCHITECTURAL FEATURES. CONTRACTOR SHALL FIELD VERIFY AND MAKE ALTERATIONS OR REVISIONS AS REQUIRED.
8. THE HORSEPOWERS SHOWN ARE MIN. REQUIRED FOR PRESENT AND/OR FUTURE GROWTH/OPERATION. IN NO CASE WILL ANY MOTOR H.P. REDUCTION FROM THAT SPECIFIED BE ACCEPTED.
9. BOILER INSTALLATION, PERMITTING AND REGISTRATION IS SUBJECT TO THE REQUIREMENTS OF THE S.C. BOILER SAFETY ACT, TITLE 41, CHAPTER 14.

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	10/13/2022	JCP	ISSUE FOR REVIEW

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BOILER REPLACEMENT FOR
GREENBRIER ELEMENTARY SCHOOL
GREENVILLE, SOUTH CAROLINA

MECHANICAL SCHEDULES, DETAILS, & SPECIFICATIONS

DESIGN / DRAWN: JCP / TMI
CHECKED: JCP
DATE: 10–13–2022
PERITUS JOB NO.: 220506
SHEET: M–100

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