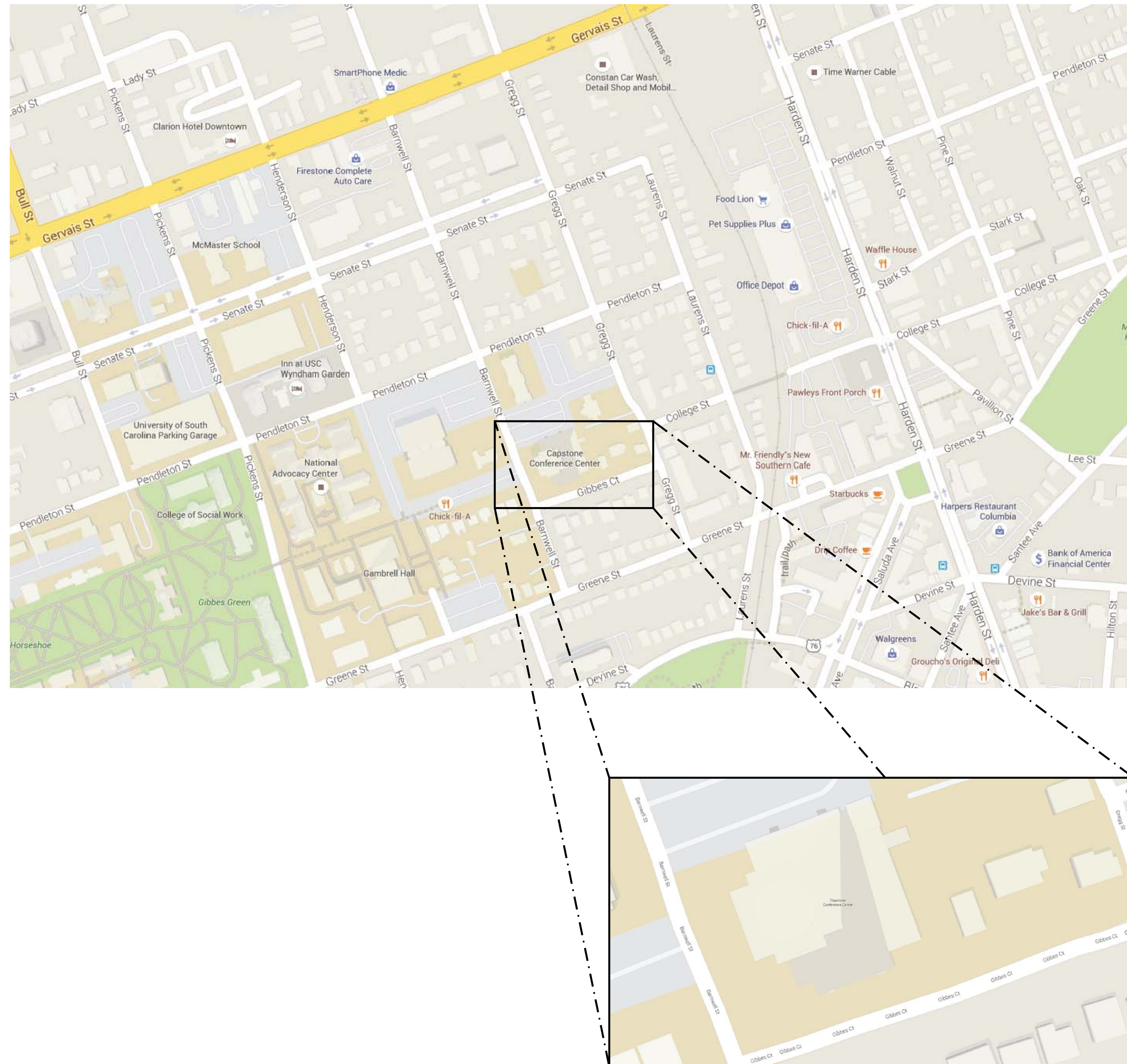


# DOMESTIC HOT WATER REPLACEMENT CAPSTONE 902 BARNWELL STREET, COLUMBIA, SC 29201 UNIVERSITY OF SOUTH CAROLINA



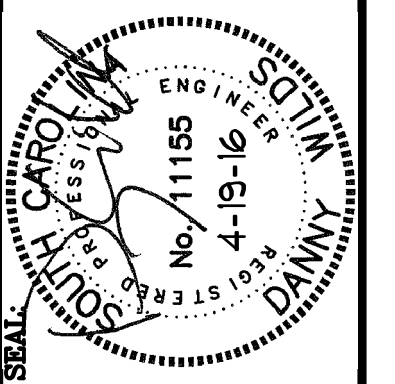
### DRAWING INDEX

- C1 COVER SHEET
- PLUMBING:**
- P1 PLUMBING DEMOLITION PLAN
- P2 PLUMBING FLOOR PLAN - WASTE PIPING, SCHEDS AND DETAILS
- P3 PLUMBING FLOOR PLANS
- P4 PLUMBING SCHEMATICS - WATER PIPING
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- ELECTRICAL:**
- E101 ELECTRICAL FLOOR PLAN

### PROJECT DATA

- PROJECT DESIGNED IN ACCORDANCE WITH:
1. INTERNATIONAL PLUMBING CODE - 2012 EDITION
  2. INTERNATIONAL ENERGY CONSERVATION CODE - 2009 EDITION
  3. INTERNATIONAL MECHANICAL CODE - 2012 EDITION
  4. INTERNATIONAL ELECTRICAL CODE - 2012 EDITION
  5. NATIONAL ELECTRICAL CODE - 2011

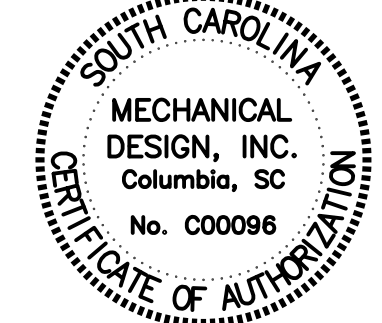
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COLUMBIA, SC 29208



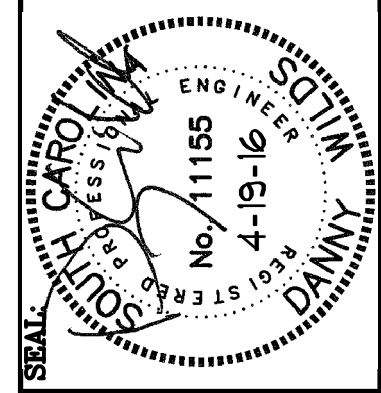
BUILDING:	DRAWING:	DATE:	DRAWN BY:	CHECKED BY:
039	CAPSTONE	19 APR 16	DLF	DLF

PROJECT TITLE: CAPSTONE - A/E WORK DETERMINE  
DOMESTIC HW REPLACEMENT  
CP00407409 / FM00514359  
H27-D199-FW  
University of South Carolina

SHEET: C1  
1 OF 1  
SHEET IN SET:  
OF



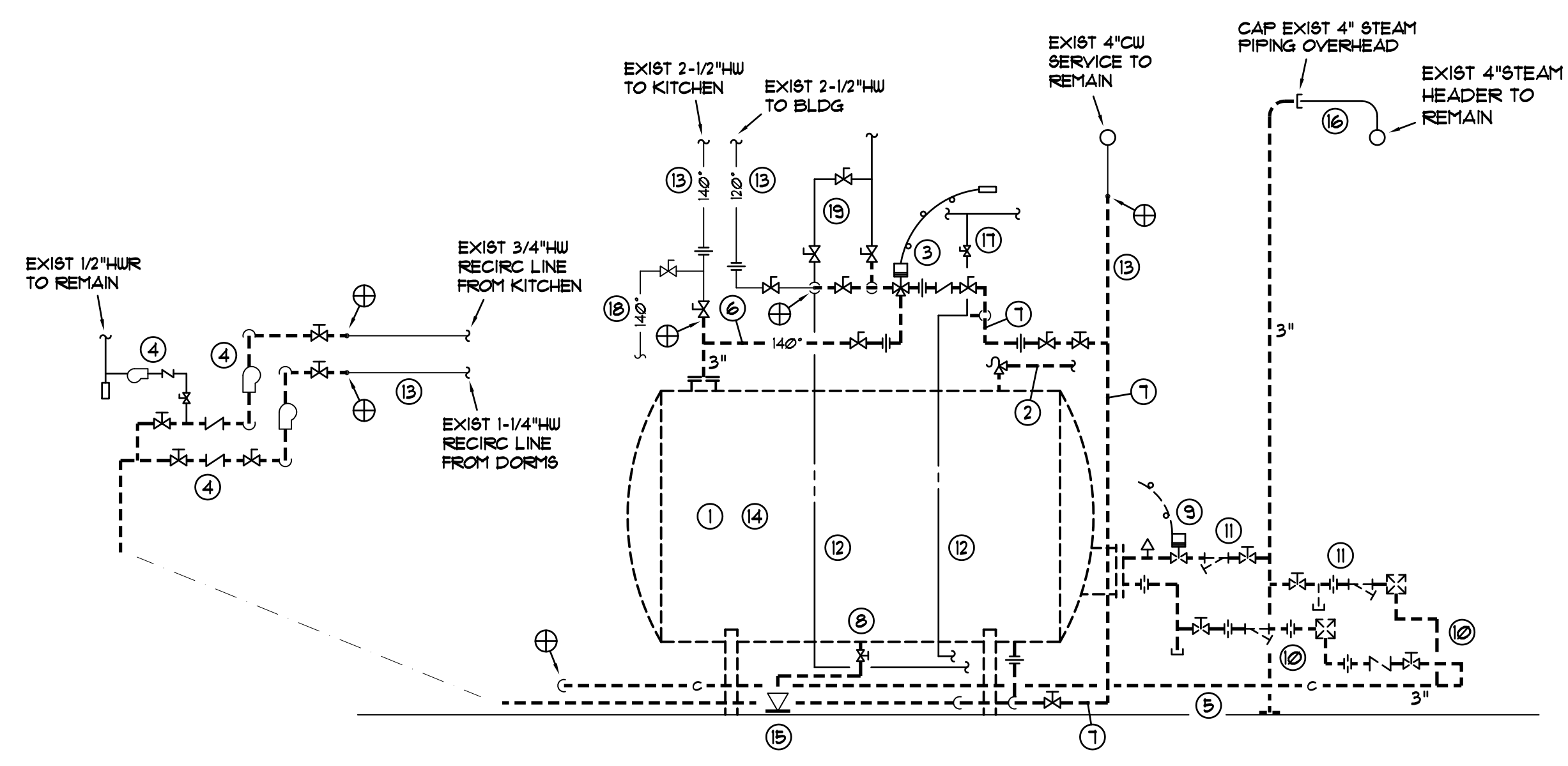
**MECHANICAL DESIGN, INC.**  
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CONTACT: D. FULMER  
DATE: 04/19/16  
COMM. NO. 163292



BUILDING:	039
DRAWING:	CAPSTONE
DATE:	19 APR 16
DRAWN BY:	DLF
CHECKED BY:	DLF

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SHEET: P1  
 1 OF 6  
 SHEET IN SET: OF



**DHW P I F I** EXISTING HW GENERATOR DETAIL - DEMOLITION  
 SCHEMATIC

DEMOLITION NOTE: DASHED PIPING INDICATES PIPING AND MATERIALS TO BE REMOVED.

- DEMOLITION NOTES**
- GENERAL: USC RESERVES THE RIGHT TO CLAIM ANY MATERIALS, PRODUCTS OR EQUIPMENT WHICH ARE REMOVED. ALL SALVAGED ITEMS SHALL BE IDENTIFIED BY USC PRIOR TO START OF DEMOLITION. DISPOSAL OF ALL OTHER ITEMS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. COORDINATE WITH USC AS REQUIRED.
- ① REMOVE EXIST HOT WATER GENERATOR AND ASSOCIATED PIPING AS INDICATED.
  - ② REMOVE EXISTING T&P PIPING COMPLETE.
  - ③ REMOVE EXISTING MIXING VALVE, THERMOMETER AND TEMP CONTROL BULB COMPLETE.
  - ④ REMOVE EXIST RECIRC PIPING TO POINT INDICATED. EXIST RECIRC PUMPS SHALL REMAIN.
  - ⑤ REMOVE EXISTING CONDENSATE PIPING COMPLETE.
  - ⑥ REMOVE EXIST HW PIPING TO POINT INDICATED.
  - ⑦ REMOVE EXIST CW PIPING TO POINT INDICATED.
  - ⑧ REMOVE EXISTING DRAIN PIPING COMPLETE.
  - ⑨ REMOVE EXIST STEAM CONTROL VALVE.
  - ⑩ REMOVE EXIST CONDENSATE DRAIN PIPING, VALVES, STRAINERS AND BUCKET TRAPS.
  - ⑪ REMOVE EXIST STRAINER AND STEAM PIPING TO HEATER.
  - ⑫ EXIST TEMPORARY HOT AND COLD WATER PIPING TO REMAIN.
  - ⑬ REMOVE INSULATION PRODUCTS FOR EXIST CW, HW, HUR, STEAM AND CONDENSATE PIPING TO POINT OF CONNECTION APPROX WHERE INDICATED ON FLOOR PLANS. (SEE ASBESTOS NOTES, THIS SHT)
  - ⑭ REMOVE ALL ASSOCIATED HANGERS, SUPPORTS, BRACKETS, ETC. FOR ALL PIPING, RECIRC PUMPS, COMPONENTS, ETC. BEING REMOVED FOR THIS PROJECT. (SEE ASBESTOS NOTES, THIS SHT)
  - ⑮ REMOVE EXISTING FLOOR DRAIN WITH FUNNEL.
  - ⑯ EXISTING 4" STEAM TO BE CAPPED OVERHEAD.
  - ⑰ EXISTING 1/2" CW PIPING TO REMAIN. RECONNECT AS REQUIRED.
  - ⑱ EXISTING TEMPORARY 140°F HW PIPING TO REMAIN.
  - ⑲ EXISTING 1/2" 120°F HW PIPING TO REMAIN.
  - ⑳ EXISTING 1/2" HW PIPING AND RECIRC PUMP TO REMAIN. RECONNECT AS REQUIRED.

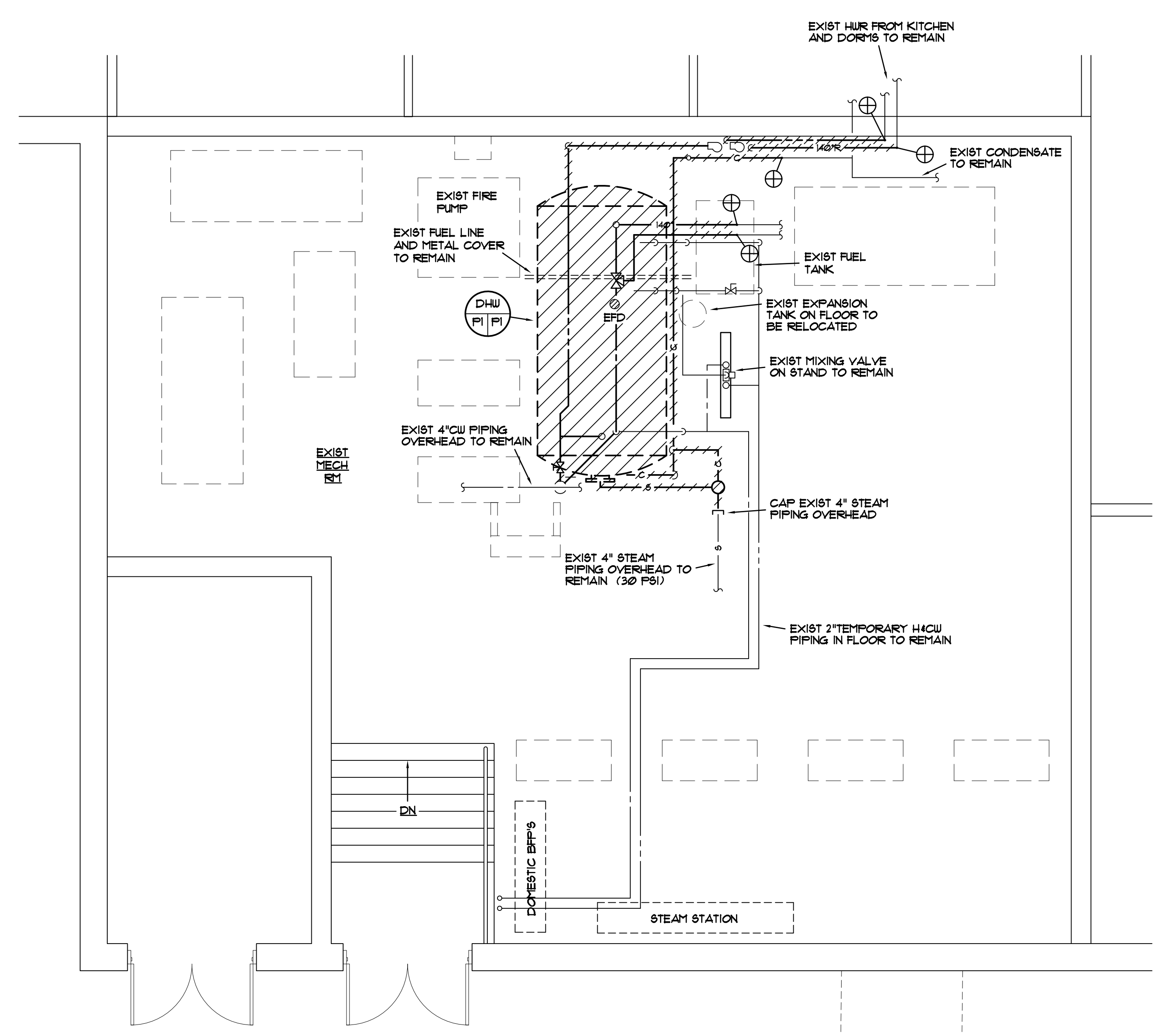
**EXISTING HOT WATER GENERATOR SCHEDULE**

STORAGE TANK (APPROX)			COIL CAP'Y		DELIVERY TEMP °F
DIA.	LENGTH	CAP'Y (GAL)	GPH	TEMP RISE °F	
72"	168"	2900	3000	100°	140°

NOTE: INFORMATION FURNISHED FROM EXIST DRGS DATED MAY 1966.

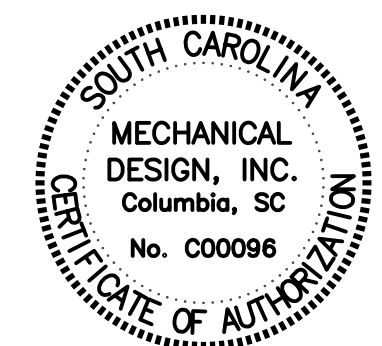
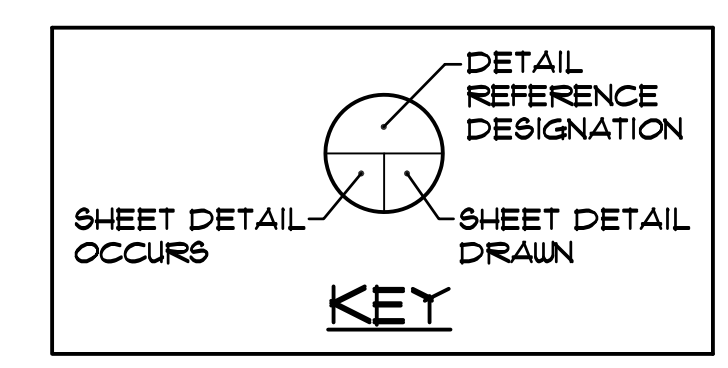
- DEMOLITION SCHEDULE**
- D1. COORDINATE DEMOLITION AND REMOVAL OF EXIST MATERIALS AND EQUIPMENT WITH USC PERSONNEL PRIOR TO START OF ANY DEMOLITION WORK.
  - D2. ALL WORK, INCLUDING ELECTRICAL SHALL BE IN PLACE TO MINIMIZE DOWN TIME FOR HOT WATER DELIVERY TO BUILDING. THIS IS CRITICAL.
  - D3. GENERALLY ALL PIPING SHALL BE REMOVED TO EXIST GATE VALVES AS REQUIRED TO FACILITATE DEMOLITION WITHOUT INTERRUPTING SERVICE TO OTHER AREAS OF THE BUILDING.
  - D4. COORDINATE DISRUPTION OF EXIST BLDG PLUMBING SYSTEMS OPERATION WITH UNIVERSITY PERSONNEL. SCHEDULE WORK AS DIRECTED BEFORE START OF CONSTRUCTION.

**PLUMBING DEMOLITION FLOOR PLAN**  
 SCALE: 1/4" = 1'-0"

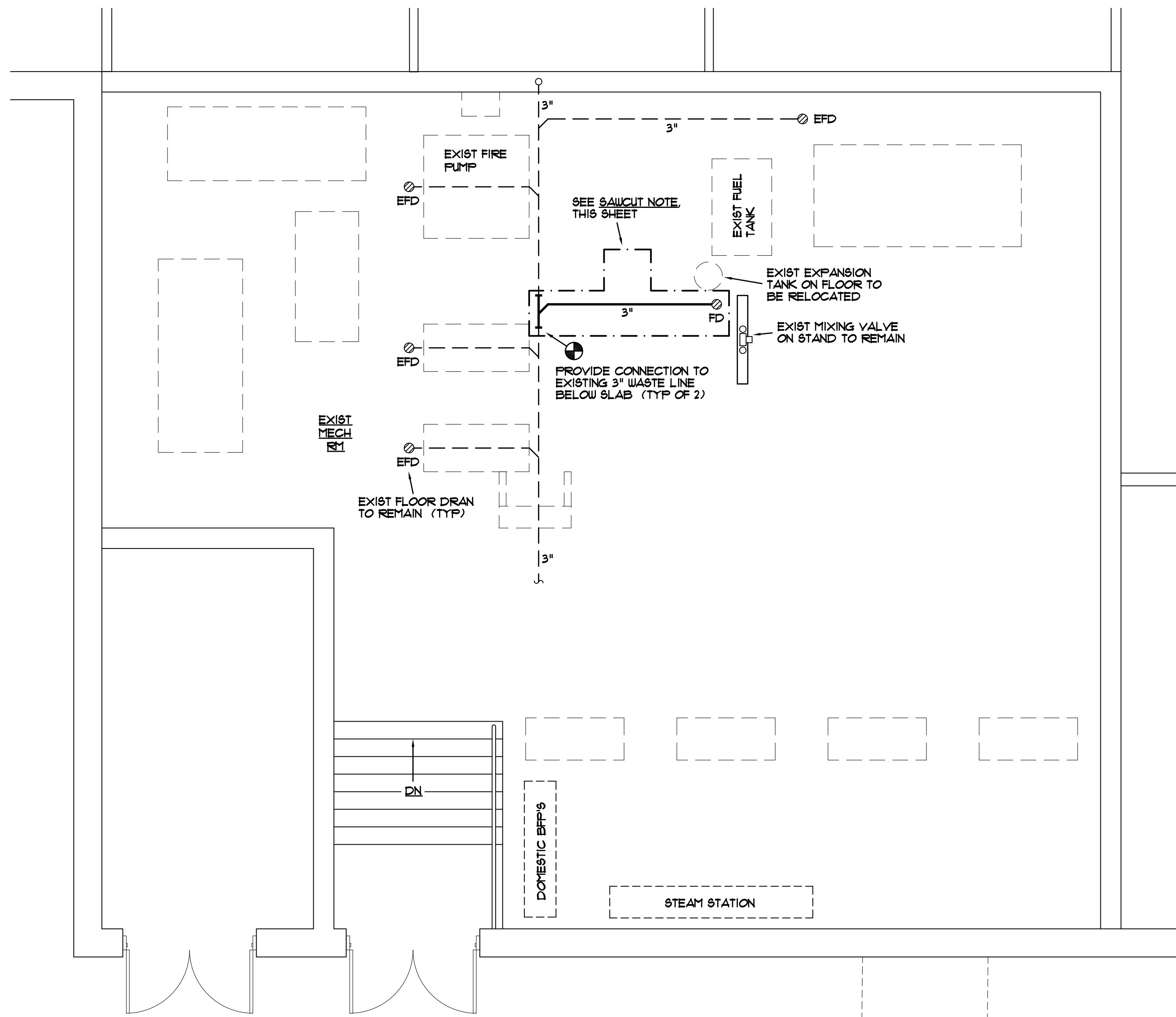


SEE ASBESTOS NOTES, THIS SHT  
 ⑬

- ASBESTOS NOTES**
- A1. REMOVAL OF INSULATION PRODUCTS ON STORAGE TANK AND PIPING WHICH CONTAIN ASBESTOS SHALL BE BY THE UNIVERSITY OF SC.
  - A2. INSULATION WILL BE REMOVED PRIOR TO SCHEDULED START OF WORK FOR THIS PROJECT.



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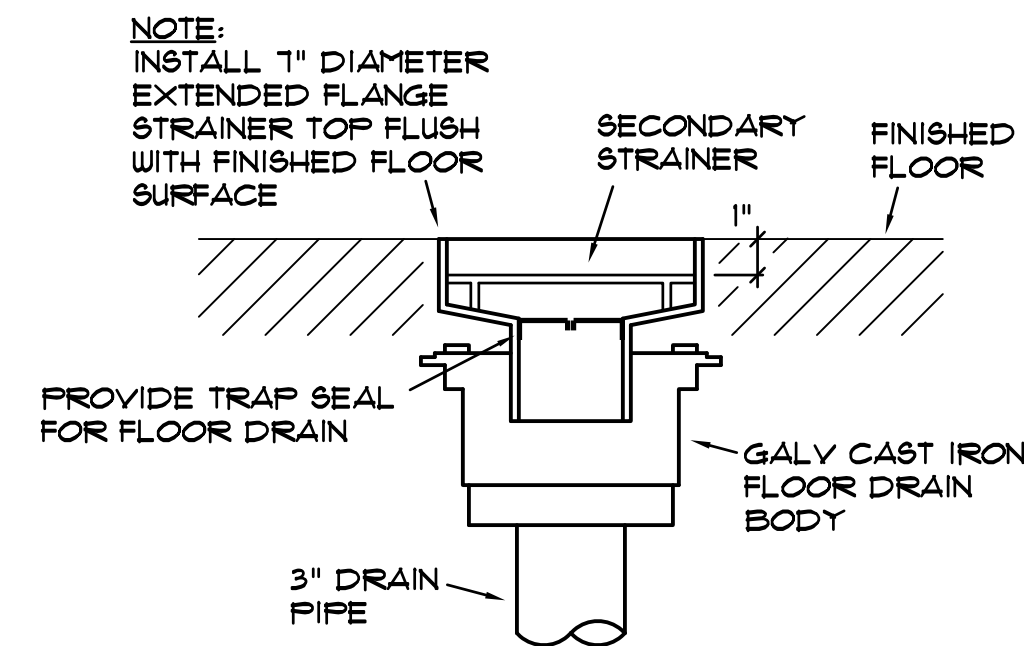


**PLUMBING FLOOR PLAN - WASTE PIPING**

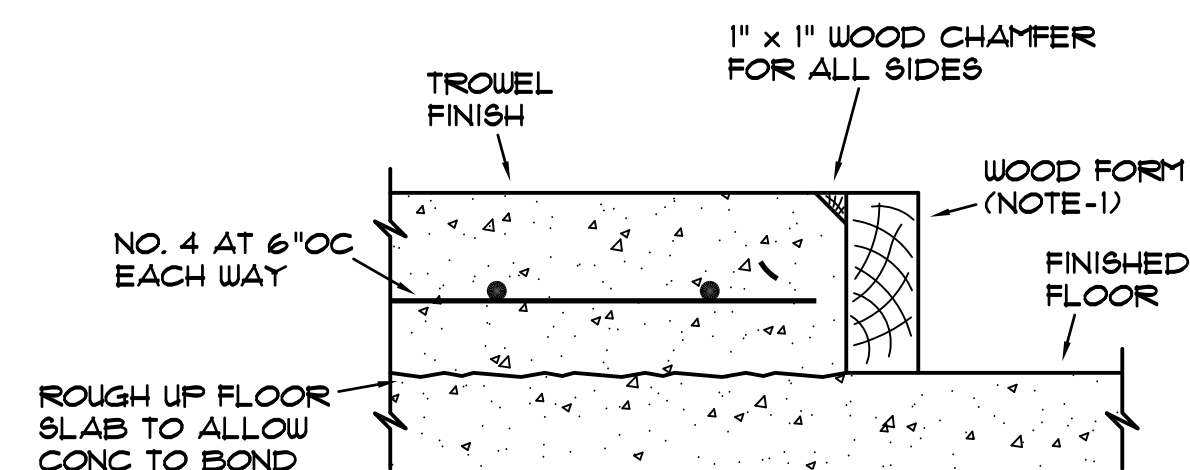
SCALE: 1/4" = 1'-0"

**DEMOLITION NOTE**

PROVIDE SAWCUTTING, REMOVAL AND PATCHING OF EXIST FLOOR SLAB AS REQUIRED FOR THE DEMOLITION AND INSTALLATION OF FLOOR DRAIN AS NOTED.



**RFD RECESSED FLOOR DRAIN DETAIL**  
NO SCALE



**CP CONCRETE PAD DETAIL**  
NO SCALE

- NOTES:**
- WOOD FORM SHALL BE MINIMUM 2"x8" STUD - CUT TO MAINTAIN FULL 6" PAD THICKNESS/DEPTH. VERIFY HEIGHT REQ'T WITH EQUIPMENT TO ALLOW ADEQUATE SLOPE FOR CONDENSATE DRAIN.
  - REMOVE WOOD FORM AND CHAMFER FRAMING BEFORE PROJECT COMPLETION.

**GENERAL PLUMBING NOTES**

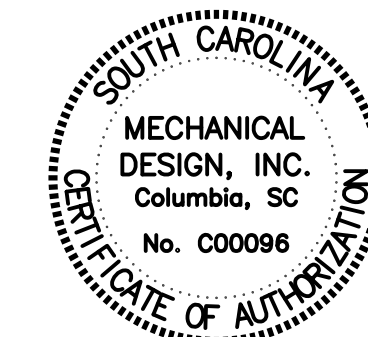
- DO NOT SCALE DRAWINGS. ROUGH FROM EXISTING CONDITIONS AND EQUIPMENT MFR'S DRAWINGS.
- COORDINATE PLUMBING SYSTEMS WITH EXIST CONDITIONS TO AVOID INTERFERENCE AND CONFLICTS PRIOR TO INSTALLATION OF PIPING, HEATERS AND EQUIPMENT.
- ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE (IBC) BUILDING AND (IPC) PLUMBING CODES, 2012 EDITIONS OF THE (ICC) INTERNATIONAL CODE COUNCIL AND ALL LOCAL CODES AND ORDINANCES.
- WHENEVER THE WORD "PROVIDE" IS USED, IT SHALL MEAN FURNISH AND INSTALL COMPLETE AND READY FOR USE.
- EXISTING HIGH PRESSURE STEAM IS 125 PSIG PER EXISTING DRGS. CONTRACTOR SHALL FIELD VERIFY EXISTING STEAM PRESSURE PRIOR TO START OF CONSTRUCTION AND NOTIFY ENGINEER IMMEDIATELY IF STEAM PRESSURE IS LESS THAN DESIGN PRESSURE.
- ROUTE ALL PIPING AND LOCATE VALVES, ETC. AS REQUIRED TO PERMIT EASY ACCESS. (TYPICAL)
- CONTRACTOR SHALL VERIFY EXACT SIZES OF EXIST WATER, STEAM AND CONDENSATE LINES PRIOR TO START OF CONSTRUCTION.
- ALL ELECTRICAL WORK FOR THIS PROJECT SHALL BE FURNISHED INCLUDING MATERIALS BY UNIVERSITY PERSONNEL. VERIFY ALL ELECTRICAL REQ'TS PRIOR TO ORDERING EQUIPMENT TO AVOID CONFLICTS.
- SEE DEMOLITION SCHEDULE, SHT P1 PRIOR TO START OF CONSTRUCTION.

**PLUMBING SYMBOLS**

SYMBOL	DESCRIPTION
---	COLD WATER PIPING
---140°---	HOT WATER PIPING (140°F)
---120°---	HOT WATER PIPING (120°F)
---R---	HOT WATER RECIRC PIPING
---140°R---	HOT WATER RECIRC PIPING (140°F)
---C---	CONDENSATE DRAIN PIPING
---S---	STEAM PIPING (15 PSIG)
---HP8---	HIGH PRESSURE STEAM PIPING (100 PSIG)
⊗	BALL VALVE
⊕	GATE VALVE
∨	CHECK VALVE
⊙	CONNECT TO EXISTING
⊕	POINT OF DEMOLITION
⊙ FD	FLOOR DRAIN
⊙ EPD	EXIST FLOOR DRAIN
□ WM	WATER METER

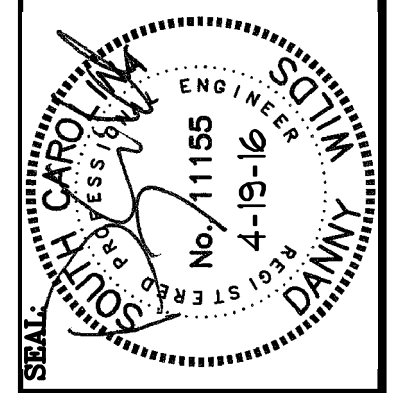
**SITE VISIT NOTE**

CONTRACTOR IS REQ'D TO VISIT PROJECT SITE PRIOR TO SUBMITTING BID AND THOROUGHLY FAMILIARIZE HIMSELF WITH ALL EXIST CONDITIONS RELATING TO THIS PROJECT. SUBMISSION OF A BID WILL BE CONSIDERED AS EVIDENCE THAT THE CONTRACTOR HAS VISITED THE SITE OF WORK.



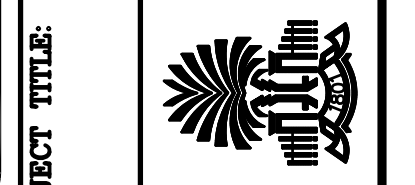
**MECHANICAL DESIGN INC.**  
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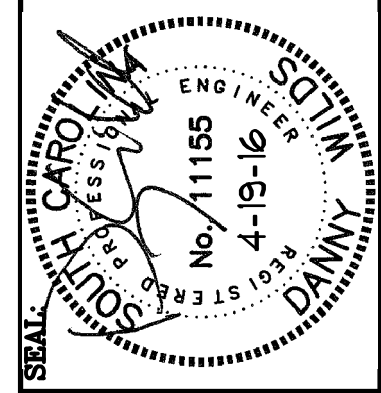
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COLUMBIA, SC 29208



BUILDING: 039	DRAWING: CAPSTONE	DATE: 19 APR 16	DRAWN BY: DLF	CHECKED BY: DLF
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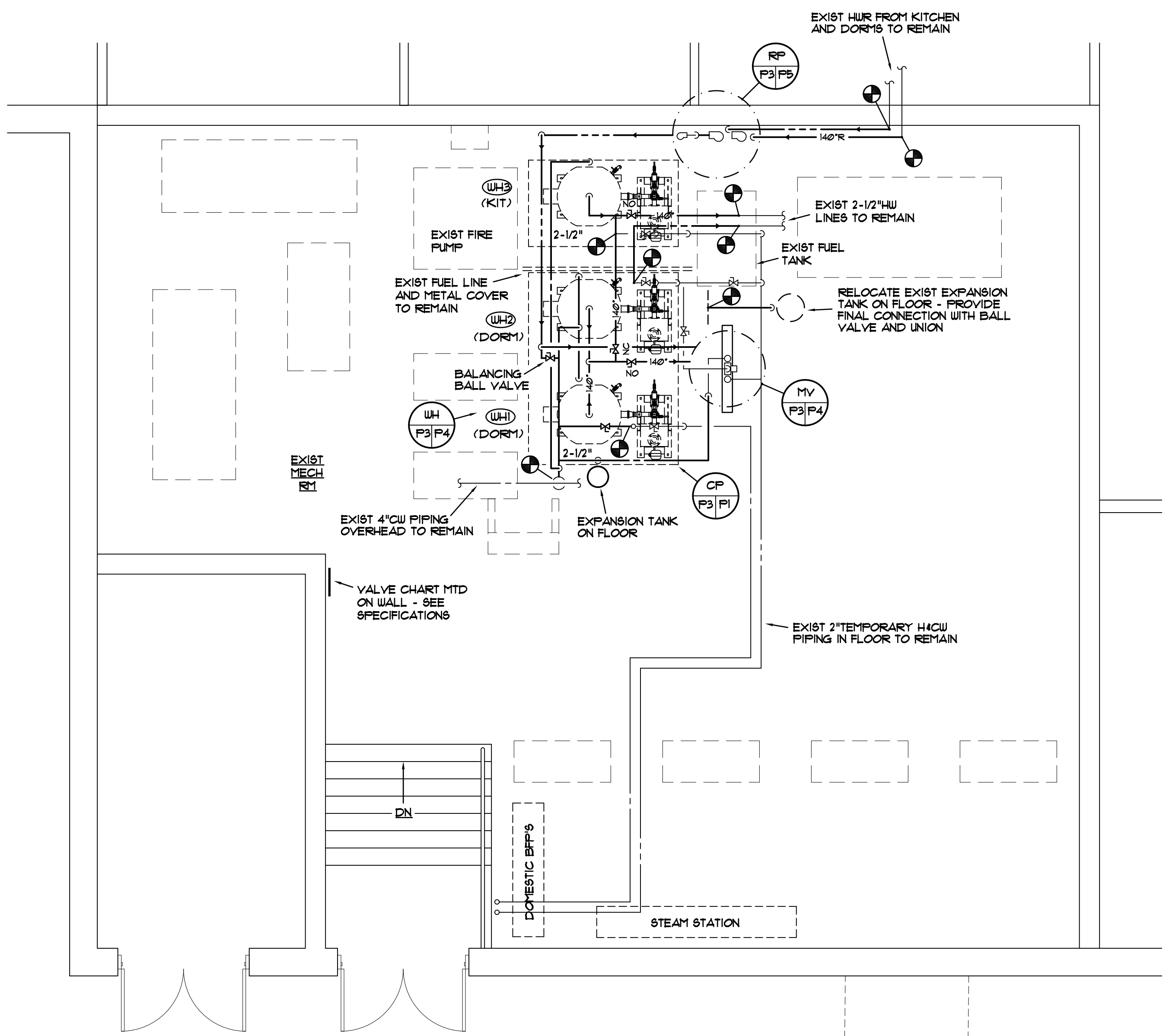
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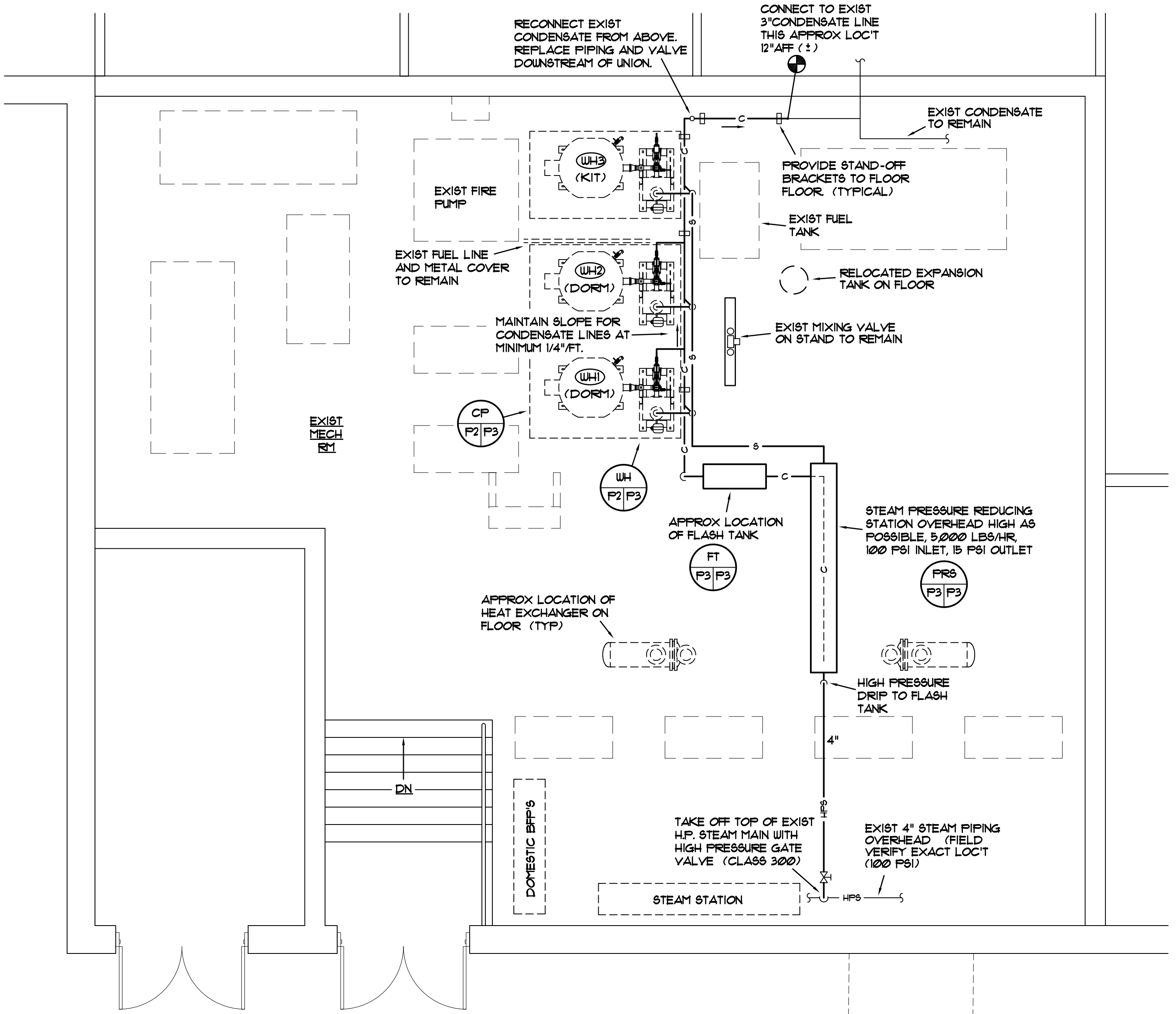


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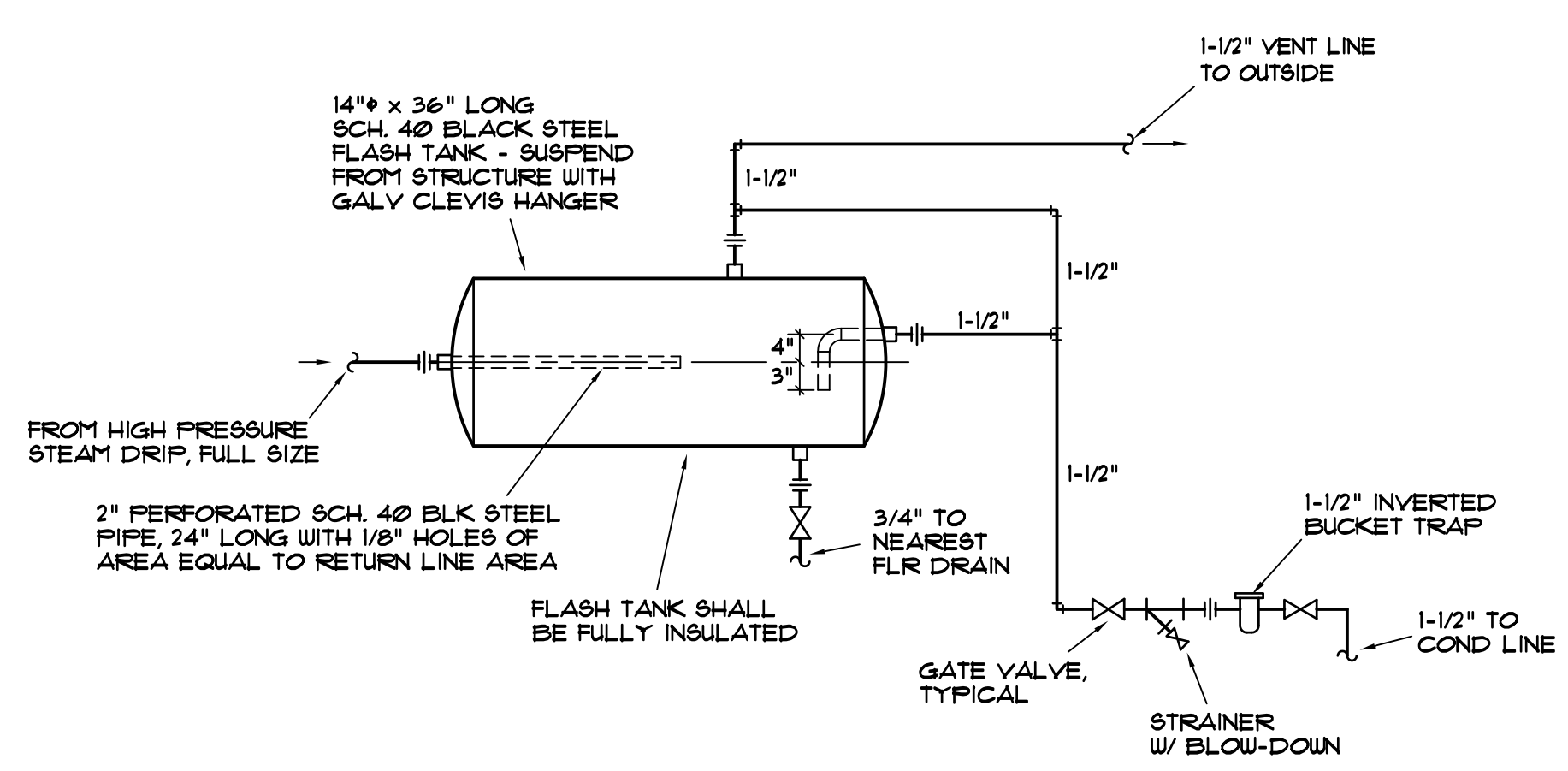
WATER PIPING



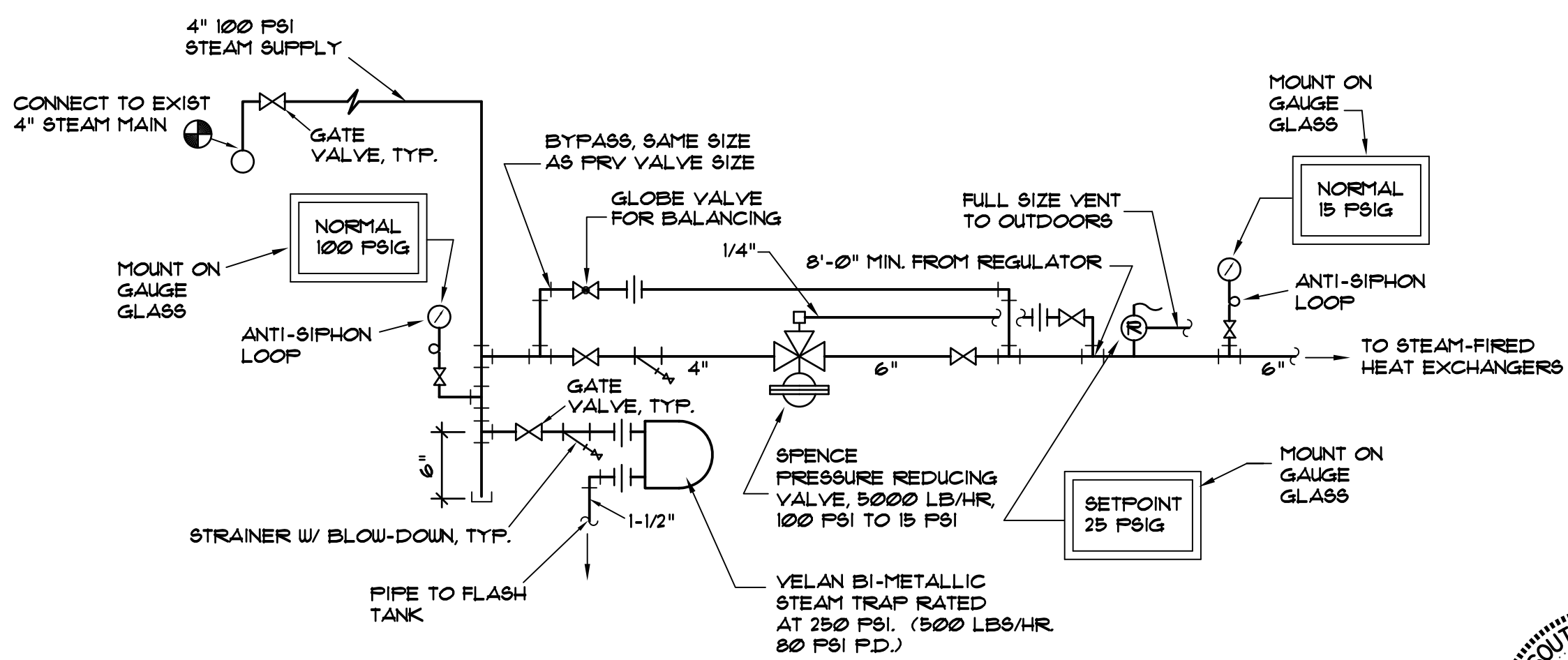
STEAM AND CONDENSATE PIPING

PLUMBING FLOOR PLANS

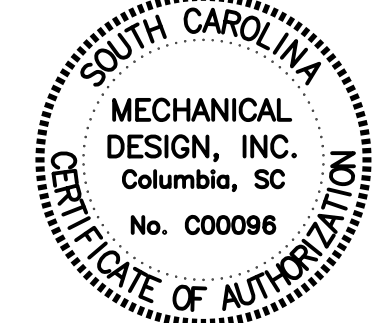
SCALE: 1/4" = 1'-0"



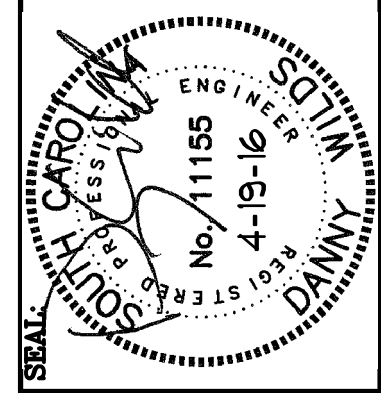
FT P3/P3 FLASH TANK DETAIL SCHEMATIC



PRS P3/P3 STEAM PRESSURE REDUCING STATION NOT TO SCALE

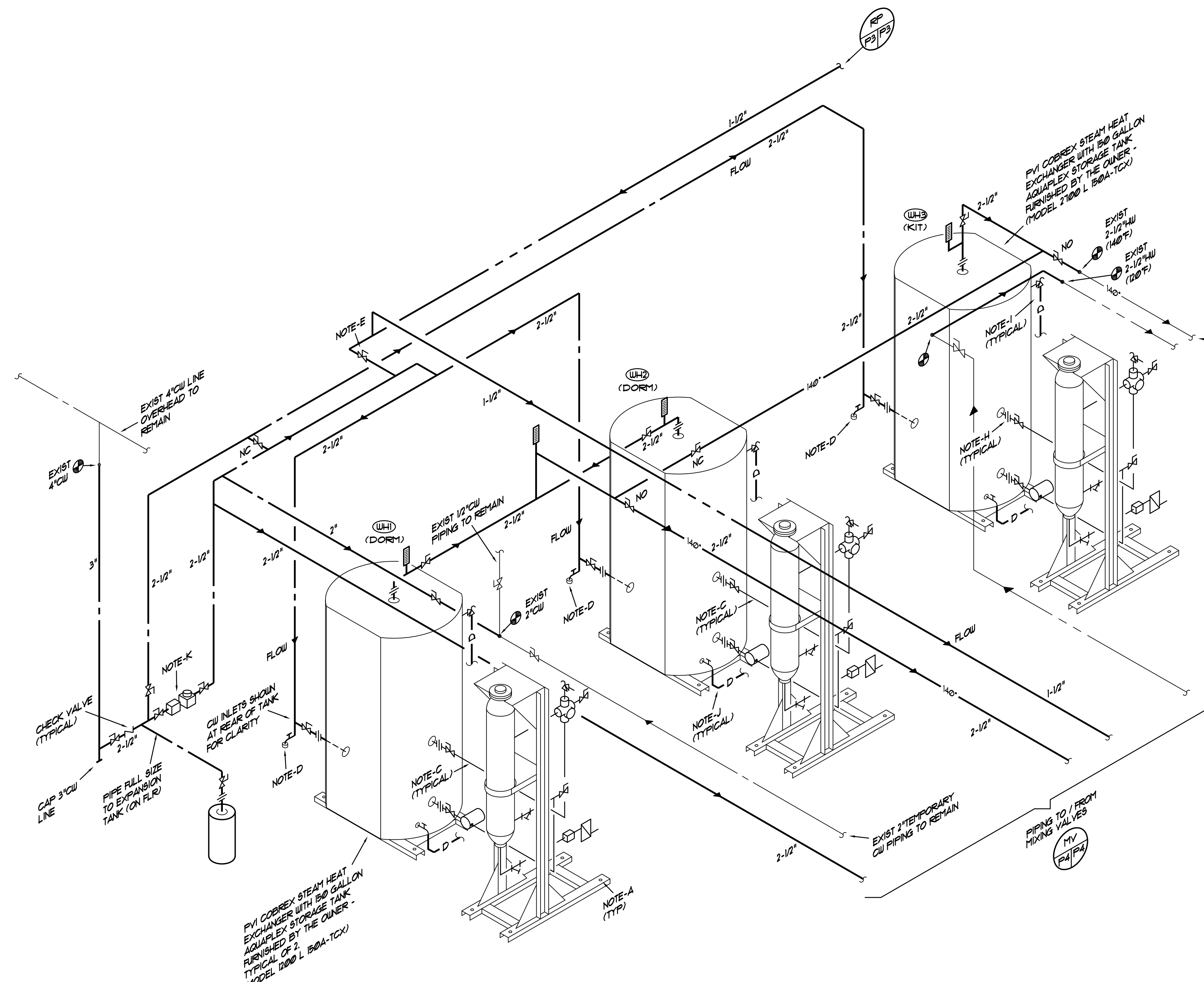


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STEAM-FIRED WATER HEATER SCHEDULE							
MARK	PVI MODEL	GPH	INLET PRESSURE	STEAM (LB/HR)	ΔTF	SERVICE	DELIVERY TEMP
UH1	1200 L 150A-TCX	1010 @	15 PSI	884	100°	DORM	120°
UH2	1200 L 150A-TCX	1010 @	15 PSI	884	100°	DORM	120°
UH3	2100 L 150A-TCX	3600 @	15 PSI	3151	100°	KITCHEN	140°

@ 16.8 GPM  
 @@ 60 GPM

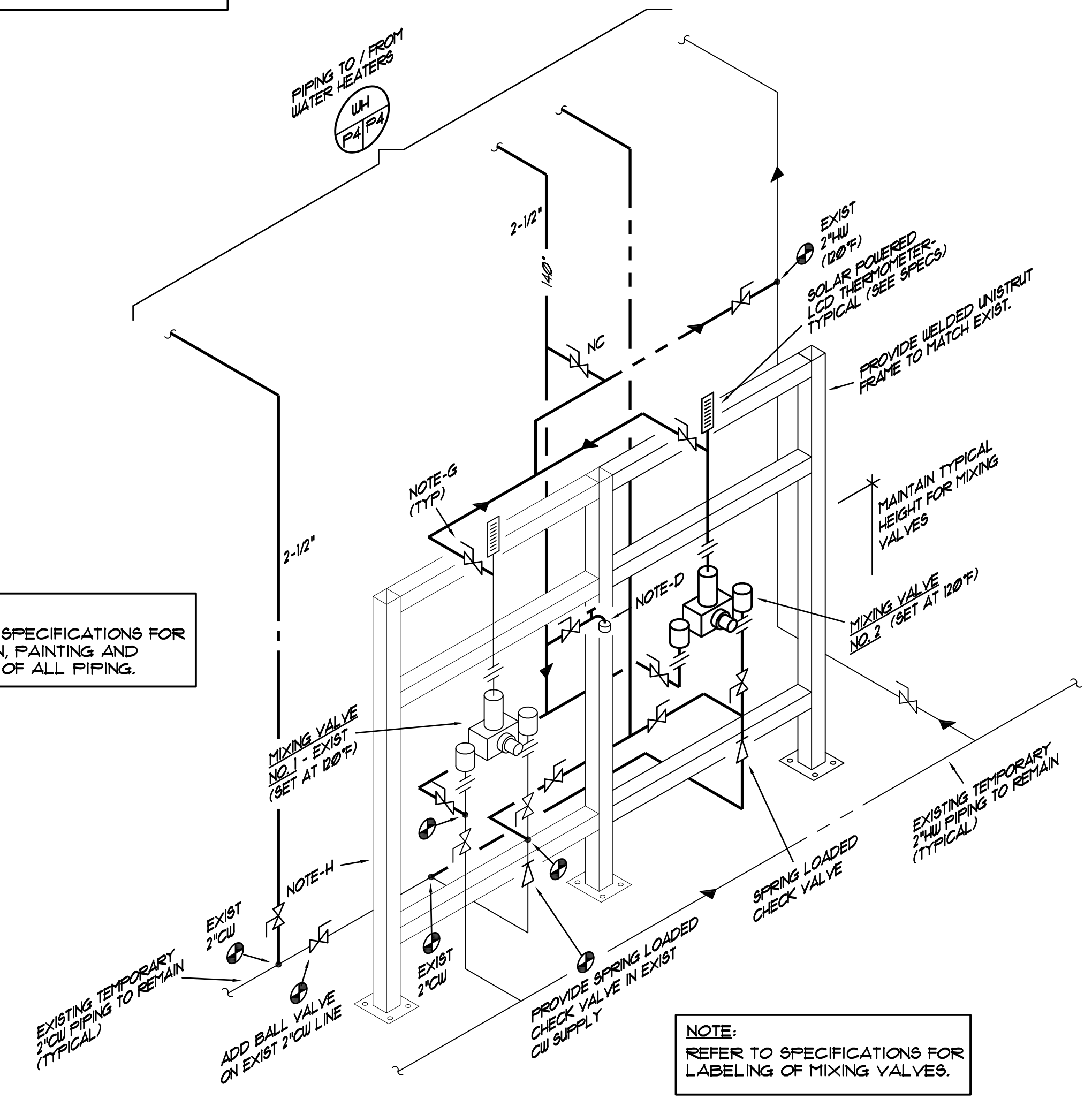


**UW**  
**P3 P4**  
**WATER HEATER PIPING INSTALLATION DIAGRAM - WATER PIPING**  
SCHEMATIC

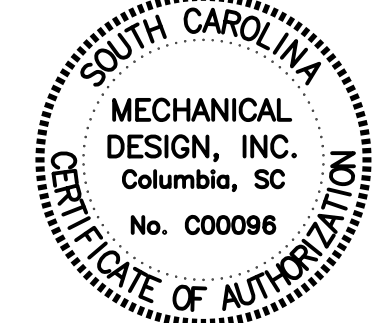
- WATER HEATER / MIXING VALVE NOTES:**
- SECURE SKIDS TO CONCRETE PAD USING 1/2" STAINLESS STEEL ANCHORS.
  - FIELD VERIFY EXACT LOCATIONS AND SIZES OF EXIST WATER, STEAM AND CONDENSATE LINES AND POINTS OF CONNECTION PRIOR TO START OF CONSTRUCTION.
  - PROVIDE COMPLETE INSULATION OF MANIFOLD PIPING ON WATER HEATERS AS DIRECTED BY ENGINEER TO PREVENT CONDENSATION AFTER START OF WATER HEATER.
  - PROVIDE HAMMOND 2002 3/4" HOSEBIBS WITH WATTS 8A VACUUM BREAKER FOR SYSTEM DRAIN AND TEST.
  - BALL VALVE FOR BALANCING RECIRC SYSTEM.
  - PROVIDE REDUCING FITTINGS FOR FINAL CONNECTIONS TO MIXING VALVE AS REQUIRED.
  - PROVIDE ALL VALVES AS NOTED AT MIXING VALVES TO ALLOW FOR BY-PASS DURING MAINTENANCE.
  - PIPING ASSEMBLY IS FACTORY FIT BETWEEN THE HEAT EXCHANGER AND STORAGE TANK AND IS SEPARATED AT UNIONS FOR SHIPPING. FIELD CONNECTION AT UNIONS IS REQUIRED.
  - PIPE T&P RELIEF VALVE TO FLOOR DRAIN (FD) AND ELBOW DOWN WITH AIR GAP. (TYPE L COPPER)
  - PIPE DRAIN VALVE TO FLOOR DRAIN (FD) AND ELBOW DOWN WITH AIR GAP. (TYPE L COPPER)
  - WATER METER - SEE SPECIFICATIONS.

NOTE:  
REFER TO SPECIFICATIONS FOR INSULATION, PAINTING AND LABELING OF ALL PIPING.

NOTE:  
REFER TO SPECIFICATIONS FOR INSULATION, PAINTING AND LABELING OF ALL PIPING.



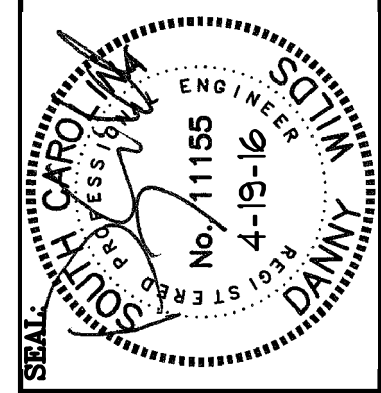
**MV**  
**P2 P3**  
**MIXING VALVE INSTALLATION**  
SCHEMATIC



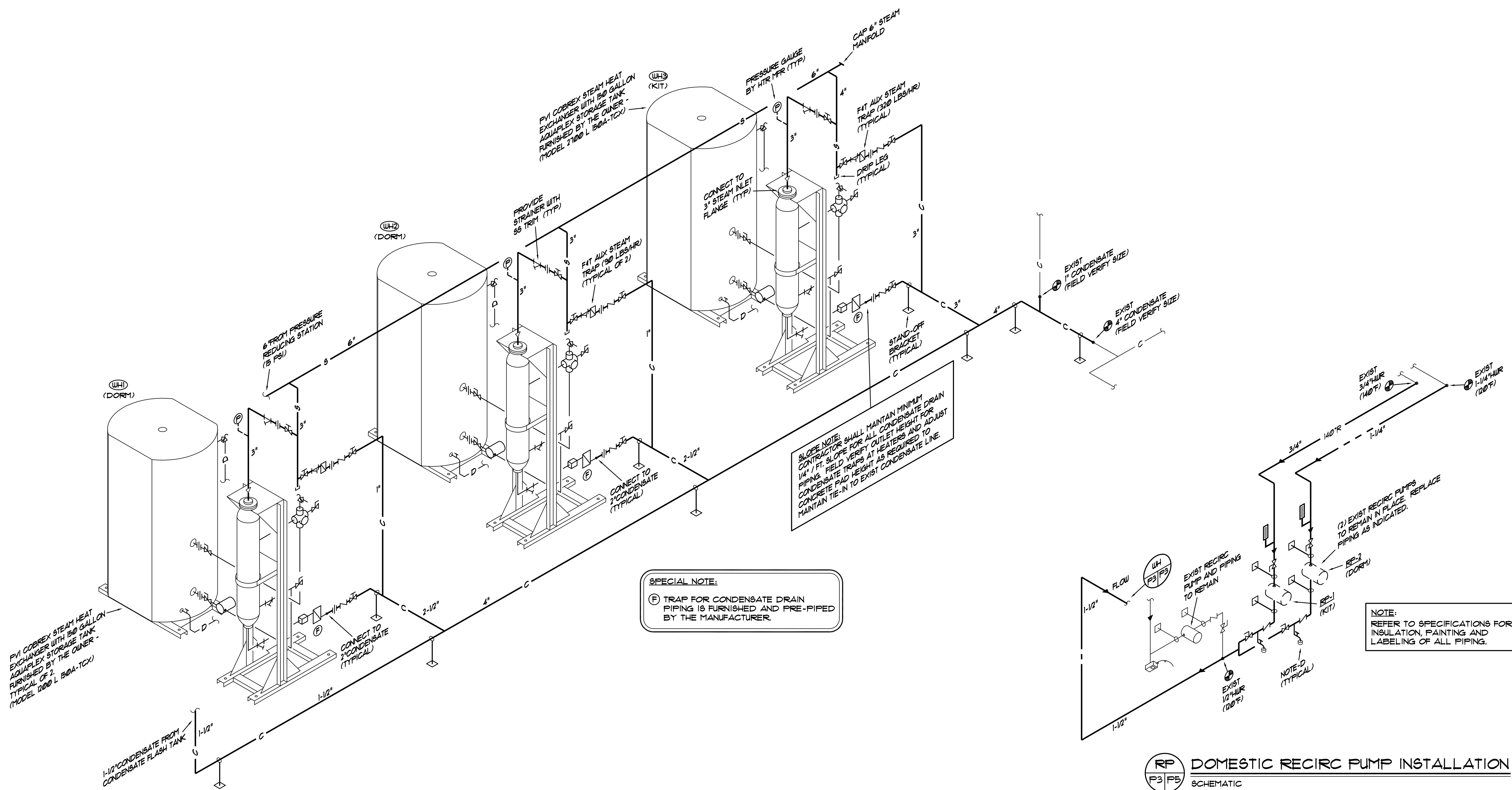
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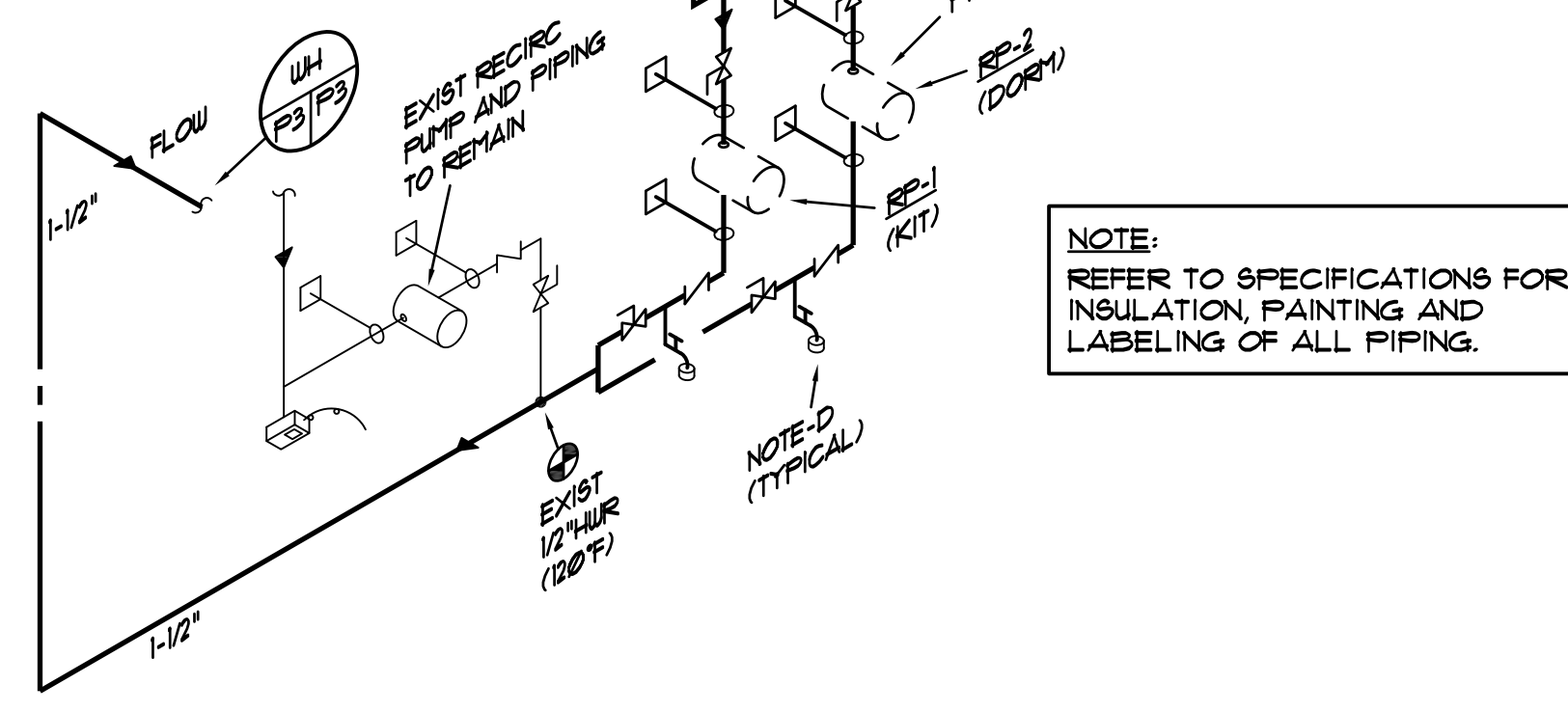


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DRAWN BY:	DLF
CHECKED BY:	DLF



**SLOPE NOTE:**  
CONTRACTOR SHALL MAINTAIN MINIMUM  
1/4\"/>

**SPECIAL NOTE:**  
Ⓣ TRAP FOR CONDENSATE DRAIN  
PIPING IS FURNISHED AND PRE-PIPED  
BY THE MANUFACTURER.

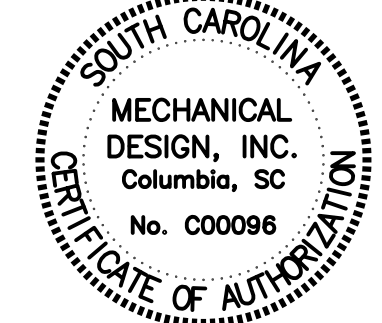


**RF P3/P5 DOMESTIC RECIRC PUMP INSTALLATION SCHEMATIC**

**UH P3/P5 WATER HEATER PIPING INSTALLATION DIAGRAM - STEAM AND CONDENSATE PIPING SCHEMATIC**

RECIRC PUMP SCHEDULE			
MARK	MODEL	SERVICE	DELIVERY TEMP °F
RP-1	EXIST	KITCHEN	140°
RP-2	EXIST	DORMITORIES	120°
RP-3	EXIST	NOT KNOWN	120° (ASSUMED)

**NOTE:**  
REFER TO SPECIFICATIONS FOR  
LABELING OF RECIRC PUMPS.



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University of South Carolina

PLUMBING SPECIFICATIONS

1.0 QUALITY ASSURANCE:

A. Instantaneous steam fired water heaters: Size and performance shall be as indicated in the unit schedule. Units shall be complete with factory furnished components as shown on the drawings. Equipment shall be completely assembled and tested at the factory. Units are factory disassembled at unions for reassembly in the field.

2.0 STEAM-FIRED WATER HEATERS:

A. Commercial steam-fired water heaters shall be furnished by the Owner. Heaters shall be as follows:

WH1: PVI 1200 L 150A-TCX with 150 gallon storage tank. Capacities shall be as indicated on drgs.

WH2: PVI 1200 L 150A-TCX with 150 gallon storage tank. Capacities shall be as indicated on drgs.

WH3: PVI 2700 L 150A-TCX with 150 gallon storage tank. Capacities shall be as indicated on drgs.

B. Each heater shall be furnished with the following:

- 150 gallon vertical ASME storage tank, stamped for 150 psi test
- Copper and brass, double-wall, shall-and-tube heat exchanger
- National Board registered for 150 MAWP
- Float and thermostatic steam trap
- Bronze circulating pump
- Copper, bronze and brass waterside piping, valves and fittings
- Bronze tank fittings with bronze pipe nipples
- Heavy duty steel powder-coated stand
- ASHRAE 90.1 compliance
- Low-lead compliant
- Clean-lead valves for heat exchanger
- ASME T&P relief valve on tank, ASME pressure relief valve on heat exchanger
- Drain Valve
- Steel skid mounted
- Segmented steel insulation jacket
- Optional steam pressure gauge (See plan for location)

C. Provide heaters complete with temperature and pressure gauges mounted on tank outlet piping.

D. Water heater tanks shall be an engineered duplex alloy stainless steel tank. These tanks shall be furnished for superior corrosion protection and extended tank life in accordance with these specifications.

E. Water heaters shall have all standard factory operating controls and safety features including programmable electronic operating control, immersion temp limiting device and terminals for remote on-off control.

F. Water heaters shall be furnished complete with factory authorized equipment start-up by a factory trained start-up technician before placing units in operation. Start-up includes all balance and adjustments to each heater as necessary and a written start-up report for each heater. Manufacturer/contractor shall notify Engineer minimum (3) day before scheduling factory start-up and schedule accordingly.

G. Water heaters shall be furnished with threaded dielectric insulator flanges installed at the factory to protect from corrosion. Final connections to each heater shall be made with brass unions connected to threaded brass nipples furnished by the manufacturer.

H. Equipment warranty shall include the following:

1. Manufacturer's standard 25-year tank warranty. Warranty shall not have any requirements for annual inspections or Owner maintenance. Anode rods for protection of tank linings will not be acceptable for corrosion protection.
2. Manufacturer's standard 3-year heat exchanger warranty
3. 1-year cost-free service policy

I. Contractor shall obtain equipment data for water heaters prior to start of demolition and coordinate all work accordingly.

1. Provide concrete pad below each heater as detailed on drgs. Final height of concrete pad shall be as required to maintain adequate slope for connection to existing condensate piping.

3.0 PIPING:

A. Domestic hot and cold water piping shall be hard drawn type L copper pipe with soldered wrought copper fittings. Use lead-free hard solder (95/5) for all joints located above slab. Use soldering nipples of couplings between screwed and soldered pipe and fittings.

1. Provide dielectric unions between dissimilar metals.

2. Option:  
Viega ProPress fittings may be used for this project for the domestic hot and cold water piping only as an alternative to sweat fittings. Provide ProPress adaptors as required for the installation of valves as specified.

B. Steam supply piping shall be schedule 40 black steel pipe with welded malleable iron fittings, rated at 150 PSI.

C. Condensate return piping shall be schedule 80 black steel pipe with welded malleable iron fittings, rated at 150 PSI.

D. Waste piping shall be cast iron pipe with bell and spigot fittings. Pipe and fittings shall be in accordance with ASTM A-74 and WW-P-401d as mfr'd by Charlotte Pipe and Foundry or Tyler Pipe.

E. Pipe locations shown are approximate. Exact location of equipment and pipes to be as approved by USC maintenance personnel and determined in the field, to avoid other pipes and to maintain clearances.

F. Equipment locations shown are approximate. Exact location of steam equipment to be as approved by USC maintenance personnel and determined in the field, to avoid interferences and to maintain clearances.

G. Piping to comply with best trade practice. Provide clearances between pipe and building structure so pipes can expand without damage to building structure.

4.0 VALVES:

A. Provide cast steel API 600 gate valves (indicating type) for steam and condensate lines. Valves shall be furnished with 410 stainless steel trim and flexible round wedge in lieu of solid wedge design. Valves shall be sized according to line sizes indicated. Valves shall be as manufactured by Velan or accepted equal.

B. Provide Class 150 swing check valves (wafer type) for condensate lines. Check valves shall be cast steel body and disc, stainless steel trim, metal to metal seat, NAF Fig. 526440 or accepted equal.

C. Provide lead-free full-port ball valves rated at 600 WOG for domestic hot and cold water piping systems where noted. Valves shall be sized according to line sizes shown.

D. Domestic ball valves shall be Class 125 designed for a minimum of 125 PSI steam working pressure. The manufacturer name and the working pressure to be cast on valve body.

E. Install valves with stems upright within 15 degrees of the vertical plane.

F. Gate valve handles shall be malleable iron. Die-cast aluminum handwheels will not be accepted.

G. Valves for plumbing systems to be the product of one of the manufacturers and model numbers shown in the following table:

Dom Gate Valves 3" and smaller (Bronze, sweat)	MSS Spec. No.	Hammond	Apollo	Nibco	Milwaukee
	MSS-SP-80	UP635	101-SLF	S-111-LF	UP149
Dom Ball Valves 3" and smaller (Bronze, Sweat)	Fed Spec. No.	Hammond	Apollo	Nibco	Milwaukee
	WW-V-35, class A, Type II, Style 3	UP8311A	77FLF-200	S-585-80-LF	UPBA450
Dom Check Valves 3" and smaller (Bronze, Sweat)	MSS Spec. No.	Hammond	Apollo	Nibco	Milwaukee
	MSS-SP-80	UP912	161S-LF	S-413-B-LF	UP1509

H. Equal valves by Stockham or Kitz will be accepted.

Option:  
Valves for use in domestic water systems that are compatible with Viega ProPress piping systems may be used provided that valves are mfr'd in accordance with the above standards as applicable.

5.0 PIPE HANGERS:

A. Pipe hangers to be the product of one of the manufacturers and model numbers shown in the following table:

Manufacturer	1/2" thru 2"	2-1/2" and larger	Wall Plate Hangers
Grinnell	104C	260	139
Fee & Mason	199	239	302
Elgen	92	12	---

B. Provide oversized pipe hangers over insulated piping. Install 18 gauge galvanized, shield between hanger and insulation. 10" long shield to extend 180 degrees around the bottom of the insulated pipe.

C. Location and method of support subject to Engineer's approval. Threaded rods and supplementary steel to span structural supports to accommodate hangers shall be included.

D. Support pipes 2" size and under by hangers not over 8'-0" apart. Support pipes over 2" size by hangers not more than 10'-0" apart.

E. Support vertical pipes by clamps not over 12'-0" apart. Protect copper pipes by lead sleeves between pipes and clamps.

F. Provide stand-off brackets where required and as noted on drgs.

G. Equal pipe support system as manufactured by Michigan Pipe Hangers will be accepted.

H. Provide supplementary steel required for support of suspended piping and installation of pipe hangers. All supplementary steel support bracing shall meet seismic design requirements of the 2012 International Bldg Code.

1. Seismic systems as manufactured by Amber/Booth or Mason Industries will be accepted.

2. Provide acceptance letter from the manufacturer's agent prior to project closeout indicating manufacturer review of installed seismic piping restraint systems throughout project.

3. Provide approved safety restraining devices and products for water heaters. Attach products and devices to the adjoining structures in accordance with specific manufacturer installation instructions.

Shop Drawings: Design of supports will require installation shop drawings furnished by the manufacturer which shall include installation methods, sizes and materials signed and sealed by a registered professional Engineer in the State of South Carolina. Contractor shall furnish shop drawings for review at start of project.

6.0 WATER METER:

A. Provide Badger Meter Recordall, Model M120-LL, lead-free 1-1/2" mechanical water meter with integral strainer and local register on domestic CW service line to WH1/WH2 where indicated on drgs. Locate meter to be easily read from the floor.

B. Verify units for register (GPM or cubic feet) with Owner prior to ordering to prevent conflicts.

7.0 RECIRCULATION PUMPS:

A. Recirc pumps are existing to remain. Contractor shall provide stand-off brackets on the piping on both sides of pumps for support as detailed on drgs.

B. Provide Hammond 2002, 3/4" diameter, wheel handle operator, bronze body hosebib with 3/4" hose thread end and Watts 8A vacuum breaker and locate downstream of recirc pump as detailed on drawings.

8.0 THERMOSTATIC MIXING VALVES:

A. Provide Symmons 7-1000A thermostatic mixing valve complete with bronze construction and swivel action check stops for hot and cold water inlets to match existing unit installed.

B. Modify existing rack as detailed on drgs for support of additional mixing valve.

C. Contractor shall refer to specific manufacturer instructions and requirements for the installation of balancing by-pass line recirculation system installation and provide as detailed on drgs. Failure to comply with this requirement for will require repiping in the field as directed.

9.0 FLOOR DRAIN:

A. Floor drain shall be as manufactured by JR Smith or equal by Josam or Zurn will be accepted.

(FD): 2005-G-F38-NB galvanized ci body with 9" diameter nickle bronze extended rim strainer, 3" outlet. See detail on drgs and install with top of flange flush with finished floor surface. (Flat strainer shall be depressed 1" below finished floor surface)

10.0 PIPE INSULATION:

A. All insulation material shall have a fire hazard classification not to exceed flame spread of 25 and smoke development rating of 50, as listed by Underwriters Laboratories and acceptable under NFPA standards. This is to apply to the complete system and to the composite insulation with jacket or facings, vapor barrier, joint sealing tapes, mastic and fittings.

B. Insulate steam pipe with 3" rigid pipe insulation. Insulate condensate drain pipes with 2" thick rigid pipe insulation. Insulation shall be Foaming glass pipe covering. Pipe insulation sealer shall be Foster 60-25 or equal.

C. Domestic hot and cold water piping shall be insulated with 1" thick one-piece fiberglass insulation with ASJ embossed vapor barrier laminated jacket.

1. Pipe fittings shall be insulated with same material and thickness as pipe. Install PVC jacket for all pipe insulation fittings. Insulation shall conform to HH-1-558B, Form D, Type III, Class 12; NFPA 90A and MIL-1-223.

D. All insulation work shall be performed by a franchised insulation firm. All insulation shall be installed in a workmanlike manner by qualified workers whose sole source of income is from installing pipe insulation for mechanical systems.

E. All seams for rigid pipe insulation shall be sealed with pipe insulation sealer. A light coat of sealer shall be applied over the entire surface of the insulation and embedded with Fab-Cloth in the sealer. This operation shall be applied twice over the insulation. Surface to be smooth when complete. Provisions shall be provided for expansion, as recommended by the insulation manufacturer.

F. All pipe insulation shall be covered with a U.L. labeled, 8 ounce cotton canvas and two coats of Childers CP-52 lagging adhesive. Adhesive shall completely seal cloth ready for painting.

11.0 PIPING TESTS:

A. All piping installed shall be hydraulically tested as specified herein. Provide all equipment required to make the tests specified.

B. Piping may be tested a section at a time in order to facilitate the construction.

C. Fill the section of pipe to be tested with water and bring the section up to pressure with a test pump. These tests shall be conducted before any insulation is installed. Remove and insulation installed prior to these tests. Gauges used in the tests shall have been recently calibrated with a dead weight tester.

D. All tests shall apply full test pressure to the piping for a minimum of 2 hours.

E. All tests shall be conducted at the water working pressure of the pipe installed. When schedule 40 or standard weight pipe is used, the test pressure shall be 150 PSI.

F. When the test pressure has fallen over 5% during the 2 hour test period, the point of leakage shall be found, repaired and the test repeated. This procedure shall be followed until the piping system has met requirements above.

12.0 EXPANSION TANK:

A. Provide Amtrol ST-30V-C ASME expansion tank where indicated on drawings, 11.3 gallon acceptance capacity at 40 PSI pre-charge.

B. Equal expansion tank as manufactured by Wessels or Bell and Gosset will be accepted.

13.0 PAINTING

A. Provide painting of all insulated piping serving water heaters including exist modified piping. Paint shall be Rose Tolbert applied with minimum (1) coat primer/sealer and (2) coats semi-gloss latex. Pipes shall be color coded in accordance with USC to match existing and as follows:

Service	Color
Domestic Cold Water	5085A "Americana"
Steam	4565Y "Zinnia"
Condensate	4514D "Quince"
Domestic Hot Water	4674A "Festive"

B. Contractor shall prime coat and paint all exposed steel components required for the installation of water heaters and accessories. Paint shall be minimum (1) coat primer and (2) coats gloss black enamel.

C. Contractor shall prime coat and paint rack for thermostatic mixing valves including existing rack with minimum (1) coat primer and (2) coats gloss black enamel.

14.0 STEAM ACCESSORIES:

A. Strainers shall be y-type with semi-steel body, .045" type 304 stainless steel screens, 125 PSIG working pressure with blow-down and removable strainer cover. Strainers shall be as manufactured by Hoffman, Sarco, Jenkins, Grinnell or approved equal.

B. F&T traps shall be constructed of cast iron with cap and mechanism that can be removed without disturbing the pipe connections. F&T traps shall be as manufactured by Hoffman, Sarco, Watson McDaniel or approved equal.

C. Steam pressure regulating valve shall be as manufactured by Spence or accepted equal.

D. Steam pressure gauges shall be stainless steel, high quality liquid filled type.

15.0 THERMOMETERS:

A. Thermometers shall be OMEGA type SPT12 Series Solar Powered LCD thermometers with hi-impact ABS case, brass thermowell, 3/8" LCD digit display, 1% accuracy, 10 Lux rating and glass passivated thermistor type sensor. Industrial glass shall have full conformance with Fed Spec GG-T-321D. Bimetallic shall be in full conformance with ASME B40.3 - 1990. "S" dimension shall be 6". Range shall be 20-240F.

16.0 IDENTIFICATION OF PIPING SYSTEMS:

A. Identify each piece of equipment and control device, etc. with nameplates indicating correct identification as shown on drawings. Nameplates shall be minimum 1/16" thick plates with 1/2" high white letters on black background. Nameplates shall be attached securely to equipment, mixing valve rack or wall adjacent to equipment as applicable.

B. All domestic cold water, domestic hot water, domestic hot water recirc, condensate and steam piping for this project shall be labeled by pipe markers as manufactured by Brady Corp. Pipe markers shall be B-689 high performance pipe markers, pre-coiled with self-adhesive ends. Markers shall include flow arrows and comply with ANSI/OSHA specs. All wording shall be in capital letters. All wordings, colors, text size and number of occurrences shall comply with standard ANSI/OSHA specifications. Markers shall meet 25/50 flame and smoke spread ratings. Markers shall be designed for applicable pipe wall temperatures.

1. Pipe identification shall be as follows and as directed by USC personnel:

Dom CW Dom HW Dom HWR Steam (HPS) Steam (LPS) Condensate (CR)

C. Provide standard bronze identification tags as manufactured by Brady Corp. for all valves under this project. Provide valve identification chart (See flow plan for approximate location of chart). Bronze tags shall be attached to the valve by use of brass S-hooks. Tag identification shall be by service and each valve shall be numbered.

17.0 SUBMITTALS

A. Contractor shall submit detailed shop drgs, equipment materials cutsheets and product data clearly marked for all items listed below. All product data shall be submitted at one time in detail. Partial submission will not be accepted.

1. Pipe Materials including Jointing Materials
2. Pipe Insulation Materials
3. Steam-Fired Water Heaters
4. Identification of Plumbing Systems
5. Steam Accessories
6. Expansion Tank
7. Floor Drain
8. Thermostatic Mixing Valves
9. Thermometers
10. Valves
11. Seismic Products including Shop Drgs

18.0 ENGINEER SITE VISIT REPORTS

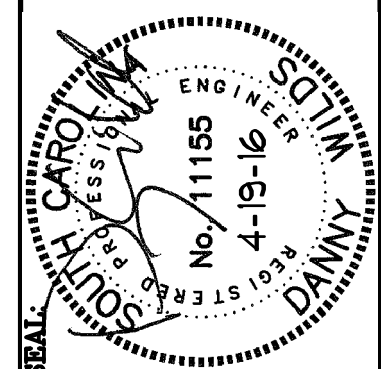
A. Engineer site visit reports will be furnished during construction as requested by Troy Greene, USC Project Manager.

B. Contractor is responsible for correcting all construction items and to respond in writing to all deficiencies as directed. Contractor shall contact Engineer immediately if there are any questions or conflicts after receipt of written site visit reports.

C. Furnish response to all punchlist items within 10 days of receipt of report including completion status to maintain timely, planned construction progress without delays or problems.

END OF PLUMBING SPECIFICATIONS

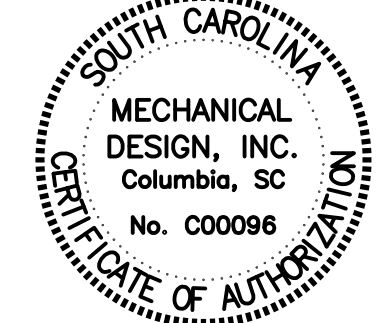
CAMPUS PLANNING  
AND CONSTRUCTION  
COLUMBIA, SC 29208



BUILDING:	DRAWING:	DATE:	CHECKED BY:
039	CAPSTONE	19 APR 16	DLF

PROJECT TITLE: CAPSTONE - A/E WORK DETERMINE DOMESTIC HW REPLACEMENT  
 CP00407409 / FM00514359  
 H27-D199-FW  
 University of South Carolina

SHEET: P6  
 6 OF 6  
 SHEET IN SET:  
 OF



**MECHANICAL DESIGN INC.**  
 4403 Broad River Road  
 Columbia, S.C. 29210  
 (803) 731-9834  
 (803) 731-9837 FAX  
 CONTACT: D. FULMER  
 DATE: 04/19/16 COMM. NO. 163292

ELECTRICAL DEMOLITION NOTES

- A. THE ELECTRICAL CONTRACTOR SHALL ASSIST THE PLUMBING/MECHANICAL SUBS IN REMOVAL OF EQUIPMENT WITH ELECTRICAL CONNECTIONS AS REQUIRED.
B. PRIOR TO SUBMITTING BID, THE CONTRACTOR SHALL SURVEY THE EXISTING BUILDING AND MAKE NOTE OF ANY ADDITIONAL DEMOLITION AND/OR ANY ADDITIONAL REMOVAL AND RELOCATION WHICH MAY BE REQUIRED IN ORDER TO ACCOMPLISH RENOVATIONS INDICATED IN CONTRACT DOCUMENTS.
C. NO EXISTING ELECTRICAL MATERIALS, EQUIPMENT, WIRING, OR CONDUIT BEING REMOVED MAY BE REUSED ON THIS PROJECT UNLESS SPECIFICALLY NOTED OTHERWISE ON THESE DRAWINGS.

SCOPE OF WORK

THE WORK OF THIS SECTION SHALL PROVIDE COMPLETE ELECTRICAL SYSTEMS WHICH SHALL INCLUDE THE PROVIDING OF ALL CONDUCTORS, RACEWAYS, FITTINGS, CIRCUIT PROTECTIVE DEVICES, BOXES, SUPPORTS, AND ALL ASSOCIATED APPURTENANCES AND MISCELLANEOUS EQUIPMENT NECESSARY, ALL OF WHICH SHALL BE COMPLETELY CONNECTED, TESTED, ADJUSTED AND LEFT IN PROPER OPERATING CONDITION.

GENERAL NOTES:

- 1. ALL ELECTRICAL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH THE 2011 NATIONAL ELECTRICAL CODE (NEC), THE 2012 INTERNATIONAL BUILDING CODE (IBC), AND ANY LOCAL CODES, LAWS AND ORDINANCES WHICH MAY APPLY.
2. ALL CONDUITS SHALL CONTAIN A GROUNDING CONDUCTOR REGARDLESS OF USE.
3. THE CONTRACTOR FOR THE WORK UNDER THIS SECTION SHALL SECURE AND PAY FOR ALL PERMITS, FEES, AND LICENSES REQUIRED FOR THE EXECUTION OF THIS WORK.
4. TYPE MC CABLE MAY NOT BE USED ON THIS PROJECT, EXCEPT THAT METAL CLAD CABLE SHALL BE PERMITTED FOR LIGHT FIXTURE WHIPS PROVIDED THEY DO NOT EXCEED 6-FEET IN LENGTH AND ARE PROVIDED BY THE LIGHT FIXTURE MANUFACTURER.
5. UNLESS OTHERWISE NOTED FOR 120-VOLT, 20-AMP CKTS: #10 AWG SHALL BE USED FOR HOMERUNS LONGER THAN 75 FEET #12 AWG SHALL BE USED FOR HOMERUNS 75 FEET OR SHORTER.
6. MULTIWIRE BRANCH CIRCUITS USING A SHARED OR COMMON NEUTRAL ARE NOT PERMITTED ON THIS PROJECT.
7. ELECTRICAL METALLIC TUBING AND RIGID GALVANIZED STEEL CONDUIT SHALL BE THE ONLY TYPES OF CONDUIT INSTALLED WITHIN THE BUILDING.
8. BRANCH CIRCUITS RUN EXPOSED IN DAMP LOCATIONS AND EQUIPMENT ROOMS, SHALL BE RUN IN EMT.
9. CONDUIT HOMERUNS TO PANELBOARDS AND CONDUITS SHOWN WITH MULTIPLE CIRCUITS SHALL BE 3/4" MINIMUM, OTHERWISE RACEWAYS SHALL BE 1/2" MINIMUM, EXCEPT THAT FLEXIBLE CONDUIT SHALL BE 3/8" MINIMUM.
10. INTERIOR CONDUIT HOMERUNS TO PANELBOARDS SHALL BE RUN OVERHEAD IN EMT OR GRC UNLESS NOTED OTHERWISE ON THE DRAWINGS.
11. INSTALL ALL MATERIALS PER MANUFACTURER'S INSTRUCTIONS.
12. IDENTIFY MAJOR EQUIPMENT INSTALLED WITH LAMCOR LABELS.
13. VISIT SITE TO DETERMINE EXISTING CONDITIONS PRIOR TO SUBMITTING BID.
14. ALL RACEWAYS, FIXTURES, WIRING, DEVICES, AND EQUIPMENT RENDERED USELESS BY THIS WORK SHALL BE REMOVED AND DELIVERED TO THE OWNER'S STORAGE FACILITY AS DIRECTED. ANY MATERIAL NOT WANTED BY THE OWNER SHALL BE DISPOSED OF BY THE CONTRACTOR.
15. WHERE DISAGREEMENTS EXISTS ON THE DESIGN DOCUMENTS, THE ITEM OR ARRANGEMENTS OF BETTER QUALITY, GREATER QUANTITY, OR HIGHER COST SHALL BE INCLUDED IN THE BASE BID. ANY DISCREPANCIES BETWEEN THE DRAWINGS, SPECIFICATIONS, AND FIELD CONDITIONS SHALL BE RESOLVED WITH THE ENGINEER PRIOR TO COMMENCING WORK. ALL AGREEMENTS SHALL BE VERIFIED IN WRITING.
16. ALL WORK UNDER THIS SECTION SHALL BE COORDINATED WITH OTHER TRADES TO INSURE PROPER LOCATION OF OUTLETS AND EQUIPMENT CONNECTIONS, AND TO MINIMIZE CONFLICTS WITH STRUCTURAL MEMBERS, DUCT WORK, PIPING, ETC. CONFLICTS BETWEEN EQUIPMENT AND/OR MATERIAL LOCATIONS SHALL BE CORRECTED AS DIRECTED BY THE ARCHITECT-ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
17. PROVIDE NEW TYPED WRITTEN PANEL DIRECTORIES. TURN OFF SPARE BREAKERS.

SECTION 260500 - ELECTRICAL BASIC MATERIALS AND METHODS

PART 1 - GENERAL REQUIREMENTS

1-01 SCOPE OF WORK

WORK INCLUDED: Furnish all necessary labor, material, plant and equipment, including materials and equipment not specifically mentioned but necessary to complete the work in a neat, correct, and workmanlike manner, to include:
1) Complete branch circuit wiring system for equipment, and outlets as shown on the electrical drawings.
2) Line voltage connections to equipment furnished under other Sections of these specifications, including disconnects, where indicated.

1-02 EQUIPMENT WIRING

Furnish and install power circuits to and line voltage connections to all equipment furnished and installed by other trades, including disconnects, where indicated.
Furnish and install receptacles for equipment furnished with cord and plug.

CONTROL WIRING

Raceways, wiring, and control devices (thermostats, pressure switches, program clocks, etc) for low voltage HVAC control systems and other mechanical and plumbing systems shall be furnished and installed under Division 23, unless otherwise indicated on the drawings or specified in this Division.

VOLTAGE: The Electrical Contractor shall supply power to equipment at the voltage indicated on the electrical drawings. The Electrical Contractor and the other applicable trades will be held responsible for coordinating the equipment voltages, the control equipment wiring, and the location and type of disconnect required to comply with the equipment manufacturer's requirements, the National Electric Code, and applicable local building codes. IF EQUIPMENT IS SUPPLIED AT A VOLTAGE OTHER THAN THAT PROVIDED, THE GENERAL CONTRACTOR AND SUBCONTRACTORS WILL BE HELD RESPONSIBLE FOR MAKING ANY NECESSARY ADJUSTMENTS TO CORRECT THE CONFLICT, AT NO COST TO THE OWNER, TO THE SATISFACTION OF THE ELECTRICAL ENGINEER.

1-03 EXISTING CONDITIONS

The Contractor will be held responsible for having visited the site and having familiarized himself with the existing conditions prior to submitting his bid.

1-04 COORDINATION

OTHER TRADES: All work under this Section shall be coordinated with other trades to insure proper location of outlets and equipment connections, and to minimize conflicts with structural members, duct work, piping, etc. Conflicts between equipment and/or material locations shall be corrected as directed by the Architect-Engineer at no additional cost to the Owner.

UTILITIES: The service locations, arrangement and metering for electrical and telephone service entrances shall be coordinated in detail with those utilities. All provisions necessary for these services shall be provided in the Electrical Contractor's bid, unless otherwise indicated.

1-05 CODES AND PERMITS

Installation and materials shall be in accordance with the applicable versions of the National Electrical Code, the International Building Code, and all local codes. Apply and pay for all permits and fees required for this construction.

1-06 DRAWINGS

The drawings and specifications shall be considered as complementary, one to the other, so that materials and labor indicated, called for, or implied by either shall be furnished and installed as if required by both. Where a disagreement exists between the plans and specifications, the item or arrangements of better quality, greater quantity, or higher cost shall be included in the base bid. Any discrepancies between the drawings, specifications, and field conditions shall be resolved with the Engineer prior to commencing work. All agreements shall be verified in writing.

RECORD DRAWINGS: The Contractor shall maintain one set of clean blueprints for "RECORD" drawings. All changes, revisions, or modifications to the project shall be recorded daily on these drawings with redline pencil. Upon completion of the project, these redline drawings shall be turned over to the Engineer for preparation of final Record Drawings.

1-07 GUARANTEE

All materials and labor furnished under this Section of the specifications shall be guaranteed by the Contractor to be free from defects for a period of one year from the date of acceptance. The Contractor shall repair or replace any deficiencies reported in the guarantee period promptly after notification, without any additional compensation from the Owner. Lamps are excluded from this warranty, except that all lamps shall be operational on the date of acceptance.

1-08 MATERIALS

UL LISTING: All materials shall be listed by Underwriter's Laboratories, or an approved equal testing laboratory, and shall bear the "UL" Label, where applicable.

SUBSTITUTIONS: Specific reference in the specifications to any article, device, product, material, fixture, form or type of construction, etc., by name, make or catalog number, with or without the words "or equal" shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition and the Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction, which, in the judgment of the Architect-Engineer, expressed in writing prior to bidding as specified below, is equal to that herein named.

Requests to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for review to the Architect-Engineer ten (10) days before bids are taken. Requests shall be accompanied by samples, descriptive literature, and engineering information, as necessary to fully identify and appraise the product. No increase in the contract sum will be considered when requests are not accepted. If the item is found to be equal, the Architect-Engineer will issue an Addendum making it a part of the Contract Documents prior to bidding.

1-09 SUBMITTALS

Electrical shop drawings shall be submitted in one complete package containing all items required by this specification. Partial shop drawing submittals may be rejected by the Architect-Engineer.

Within 30 days after award of contract and before any materials are delivered to the site, submit one (1) digital set in pdf format to the Architect-Engineer on the following materials:

- 1) Section 260500 - Raceways, Fittings, and Surface Wiring Systems.
2) Section 260500 - Wire and Cable.
3) Section 260500 - Boxes and Wireways.
4) Section 260500 - Existing Panelboard, new circuit breakers for new circuits.
5) Section 260500 - Fire Wall Penetration Assembly where applicable.

No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

Digital submittal to be pdf documents and to include a separate transmittal letter indicating project name and address, date, Electrical Contractor name and address, General Contractor name and address, Construction Manager name and address (if applicable), list of submittals, and remarks, and signature of transmitter.

The digital submittal shall be divided into submittal categories as indicated above, with each category tabbed separately with a cover sheet indicating project name and name and address of firm or entity that prepared submittal.

Failure to comply with the above criteria may result in rejection of the submittal by the Architect-Engineer. Refer to Division 1 for additional Submittal requirements.

PART 2 - MATERIALS

2-01 RACEWAYS AND FITTINGS

GALVANIZED RIGID CONDUIT (GRC): UL 6 and ASA C80.1 with full weight screwed fittings. Bushings shall be malleable iron. Bushings 1 1/4" and larger shall have insulated throat and grounding lug.

ELECTRICAL METALLIC TUBING (EMT): UL 797 and ASA C80.3 with steel compression or set-screw type fittings. Die-cast fittings are not acceptable. Fittings 1 1/4" and larger shall have nylon insulated throat. Indented or drive-on fittings are not acceptable. Conduit used for Fire Alarm System wiring shall be red, similar to Allied Fire Alarm EMT.

FLEXIBLE STEEL CONDUIT (GREENFIELD): UL 1. Fittings shall be steel.

LIQUIDTIGHT FLEXIBLE STEEL CONDUIT (SEALITE): UL 360. Fittings shall be steel compression type.

2-02 WIRE AND CABLE

UL STANDARDS: UL 44 and UL 83.
CONDUCTOR: Copper, soft drawn, per ASTM B3. Sizes No. 12 and 10 shall be solid conductor. Sizes No. 8 and larger shall have Class B concentric stranding per ASTM B8. Stranded conductors may not be used on No. 12 and No. 10 circuits.

INSULATION: 600 Volt, 75 Deg C rated. Type THHN, THWN, MTW, unless noted otherwise.

SPlicing MATERIALS:
No. 10 and smaller: Acceptable wire nuts or insulated crimped splice caps.
No. 8 and larger: Bronze or copper split bolts, or lined compression connectors. (Polaris insulated splice blocks may not be used on this project).

Insulation shall be Scotch No. 23 rubber tape and Scotch No. 33 plastic tape, or approved equivalent method.

2-03 BOXES AND WIRWAYS

OUTLET BOXES: Galvanized sheet steel per UL 514. "Through-wall" boxes SHALL NOT BE USED. Back-to-back mounting of boxes is not permitted. All outlet boxes 4"x4" or smaller located on opposite sides of a rated wall shall have a minimum of 24" horizontal spacing or shall be protected with listed putty pads. All outlet boxes larger than 4"x4" (communications outlets, etc.) located in rated walls shall be protected with listed putty pads.

Box sizes shall be as follows:

- 1) Wall Receptacle Outlets: 4" square by 2 1/8" deep with plaster ring as required.
2) Ceiling outlets: 4" square or octagonal by 1 1/2" or 2 1/8" deep with stud or ears where required for fixture support.
3) Exposed Outlets: Malleable iron or heavy duty cast aluminum with threaded hubs, Type FS, FD, or GS. Manufactured by Crouse-Hinds, Appleton, Kilark, or approved equal. Die cast boxes are not acceptable.

WIRWAYS, PULL BOXES AND JUNCTION BOXES: UL 50. Code grade galvanized sheet steel, aluminum, or steel primed and painted after fabrication. Manufactured by Square D, Austin Berrylhill, Hoffman Engineering, B\_Line Systems, or approved equal. Wireways shall have hinged covers.

2-04 WIRING DEVICES

MANUFACTURERS: All wiring devices shall be Hubbell Extra Heavy-Duty Specification Grade Series or equivalent of Arrow Hart Premium Industrial Spec Grade, Pass and Seymour Heavy-Duty Spec Grade, or Leviton Industrial Spec Grade, unless specifically noted otherwise. IL devices not meeting the specifications are supplied, they shall be removed, discarded, and new devices meeting the specification shall be furnished & installed by the Electrical Contractor at no cost to the Owner or the Engineer.

SPECIAL RECEPTACLES: Specification grade, rating as specified on the drawings.

COVER PLATES: Provide plates to suit the devices.

- 1) Finished interior walls: Jumbo Stainless Steel.
2) Exposed outlets: Galvanized steel.
3) Wet locations: Weatherproof 'N' Use type for wet location areas, hinged weatherproof type for damp location covered areas.

2-09 PANELBOARDS

MANUFACTURERS: Match existing type and AIC ratings.

CIRCUIT BREAKERS: Match existing type. Breakers shall be rated for the specified panelboard interrupting capacity rating in RMS symmetrical amperes. Two and three pole breakers shall have common internal trip. Branch mounted main breakers are not permitted unless specifically noted on the drawings.

PART 3 - EXECUTION

3-01 GENERAL REQUIREMENTS

WORKMANSHIP: All work shall be installed in a neat and orderly manner. Devices, cabinets, covers, fixtures, exposed raceways, etc., shall be aligned parallel or perpendicular to the building walls, ceiling, and floor. Wiring in panelboards and cabinets shall be neatly looped and laced, and not wedged. The Owner reserves the right to require repair or replacement of defective workmanship and material without additional compensation to the Contractor.

SUPPORTS: Conduits, boxes, cabinets, enclosures, lighting fixtures, etc., shall be securely supported by structural members or structural walls of intervals required by the NEC or as recommended by the manufacturer. Plaster, gypsum board, acoustical tile, and other ceiling and wall finish materials shall not be used for support.

CUTTING, PATCHING, AND PAINTING: The Electrical Contractor shall perform all boring, drilling, and cutting of walls, ceilings, and floors as required to install and support this raceways and equipment. Provide rough patching to seal penetrations through walls, ceilings, and floors. Finish patching and painting will be performed by the General Contractor.

3-02 GROUNDING

CODE: Entire system shall be grounded and bonded in accordance with the requirements of Article 250 of the National Electrical Code.

FEEDERS AND BRANCH CIRCUITS: Each feeder raceway shall be bonded to every cabinet, pull box, etc., to which it is connected by grounding bushings and bonding jumpers sized per NEC Table 250.122. Each branch circuit raceway must be connected to every cabinet, pull box, outlet box, etc., with double locknuts. Separate grounding conductors shall be installed on all feeders and on all lighting, receptacle and equipment branch circuits, whether indicated on the drawings or not. Size per NEC 250.122.

3-03 RACEWAYS

WIRING: All wiring shall be installed in raceways, unless noted. Raceways shall be run concealed, unless noted.

BRANCH CIRCUITS:

- 1) Branch circuits shall be run concealed where practical.
2) Branch circuits run concealed in walls or ceilings shall be run in EMT or GRC.
3) Branch circuits run exposed to weather on exterior walls or on roofs shall be run in GRC with screwed fittings.
4) Branch circuits run exposed in damp locations, unfinished spaces (attics), and unoccupied spaces (storage room, equipment rooms, janitor's closets) may be run in EMT in lieu of Wiremold.
5) All interior conduit homeruns to panelboards shall be run overhead in EMT or GRC unless noted otherwise on the drawings.
6) Metal conduits installed in contact with earth shall be painted with 2 coats Rustoleum paint or other acceptable preservative.

Final connections to motors, motor driven equipment, transformers, and vibrating equipment shall be made thru flexible conduit, 36" maximum length. "Sealtite" flexible metal conduit shall be installed outdoors, in equipment rooms, and in wet locations.

PULL WIRES: Raceways for wiring by others or for future shall contain a No. 14 galvanized steel pull wire or equivalent plastic cord with 200 lb. tensile strength.

INSTALLATION: Ream raceways, butt ends into couplings, 3 quarter bends per run maximum, plug raceways until wiring is pulled in place. Exposed conduits shall be run parallel and perpendicular to walls, floor, and ceiling. Multiple conduit runs shall be racked using Unistrut or Kindorf channels and pipe clamps. Install conduits in concrete slabs between the top and bottom layers of reinforcing steel. Maximum size of conduits in slabs is 1 inch. Crossing of conduits in slabs shall be avoided, if possible.

PULL BOXES: Maximum length between pull points shall be 200 ft. for pulls with two 90 degree bends, and 100 ft. for pulls with three 90 degree bends. Furnish and install pullboxes, junction boxes, handholes, or conduit bodies where bends or pulling lengths exceed these specifications.

EXPANSION JOINTS: Furnish and install expansion joints where conduit crosses building expansion joints and for straight runs exceeding 100 ft. in length.

MINIMUM SIZE: Home runs to panelboards shall be 3/4" minimum, otherwise raceways shall be 1/2" minimum, except that flexible conduit shall be 3/8" minimum.

3-04 WIRE AND CABLE

MINIMUM SIZE: No. 12 for power circuits, No. 14 for control circuits, unless noted. Where home run exceeds 75 ft. length on 120 volt circuits, use No. 10 minimum.

COLOR CODE: No. 12 and No. 10 shall have color-coded insulation. No. 8 and larger shall be marked at all terminals and joints with color-coded tape. Color code as follows:

Table with columns: Voltage, Phase A, Phase B, Phase C, Neutral, Grounding. Rows: 240/120 (Black, Orange, Blue, White, Green), 208/120 (Black, Red, Blue, White, Green), 480/277 (Brown, Orange, Yellow, Gray, Green).

INSTALLATION: Insure that raceway system is complete and that conductors will be free from moisture or physical damage prior to installing conductors. Install all conductors at the same time. Do not exceed cable manufacturer's recommended pulling tension for conductors. Where required, lubricate cables with Steel Yellow 77, Burny Silicon, or other acceptable cable lubricant. Do not use lubricants that are not acceptable to the Architect-Engineer.

SPlicing: Splices on Sizes No. 10 and smaller shall be made with wire nuts. Splices on Sizes No. 8 and larger shall be made with split bolt connectors, compression connectors, or solderless lugs. Splices shall be insulated with two or more layers of Scotch 23 rubber tape covered with two or more layers of Scotch 33 plastic tape, or acceptable equivalent method.

MULTIWIRE BRANCH CIRCUITS: Shared or common neutrals are not permitted on this project for multiwire branch circuits. The Contractor shall pull a separate neutral for all 120V & 277V circuits.

3-05 BOXES

WALL OUTLETS: Flush mounted, unless noted. Boxes shall be securely mounted to wall studs or be grouted in masonry. Boxes shall have single or multi-gang plaster rings, as required. "Through-wall" boxes SHALL NOT BE USED. Back-to-back mounting of boxes is not permitted. Boxes on opposite sides of a rated wall shall have a minimum of 24" horizontal spacing or shall be protected with listed putty pads.

CEILING OUTLETS: Flush mounted or concealed above ceiling. Boxes for fixture support shall have studs or ears as required and shall be securely supported by adjustable bar hangers or steel angle.

JUNCTION BOXES, PULL BOXES, AND WIREWAYS: Shall be sized and installed as indicated on the drawings or where required by NEC for pulling or splicing wiring. All junction boxes and pull boxes shall be accessible. Junction boxes and pull boxes shall not be located above inaccessible ceilings.

LOCATIONS: Verify door swings and mount switches on strike side, 6" from jamb. Verify counter heights and arrangement prior to setting boxes. The Owner reserves the right to move any outlet by as much as 10 ft. from its indicated location at no additional cost, provided the Contractor is notified prior to roughing in.

3-06 WIRING DEVICES

INSTALLATION: Devices shall be installed as indicated on the drawings and wired in accordance with the manufacturer's instructions.

COVER PLATES: Cover plates shall be installed on all wiring devices, telephone and computer outlets, junction boxes, and outlet connections.

3-07 PANELBOARDS

DIRECTORY: Provide typewritten circuit directory for each panel identifying load served and room location. Identify all spare breakers and turn off. Panelboard schedules must comply with NEC 408.4, including listing room description and room number for each load.

3-15 COMPLETION OF WORK

TESTS AND FINAL REVIEW: Upon completion of work, the entire system shall be completely operational and tested to conform with these specifications and drawings, and shall be reviewed by the Architect-Engineer. All defects in workmanship and material shall be immediately corrected without additional compensation to the Contractor.

The final review of the electrical installation by the Engineer cannot be provided until the following items have been submitted to the Engineer for review:

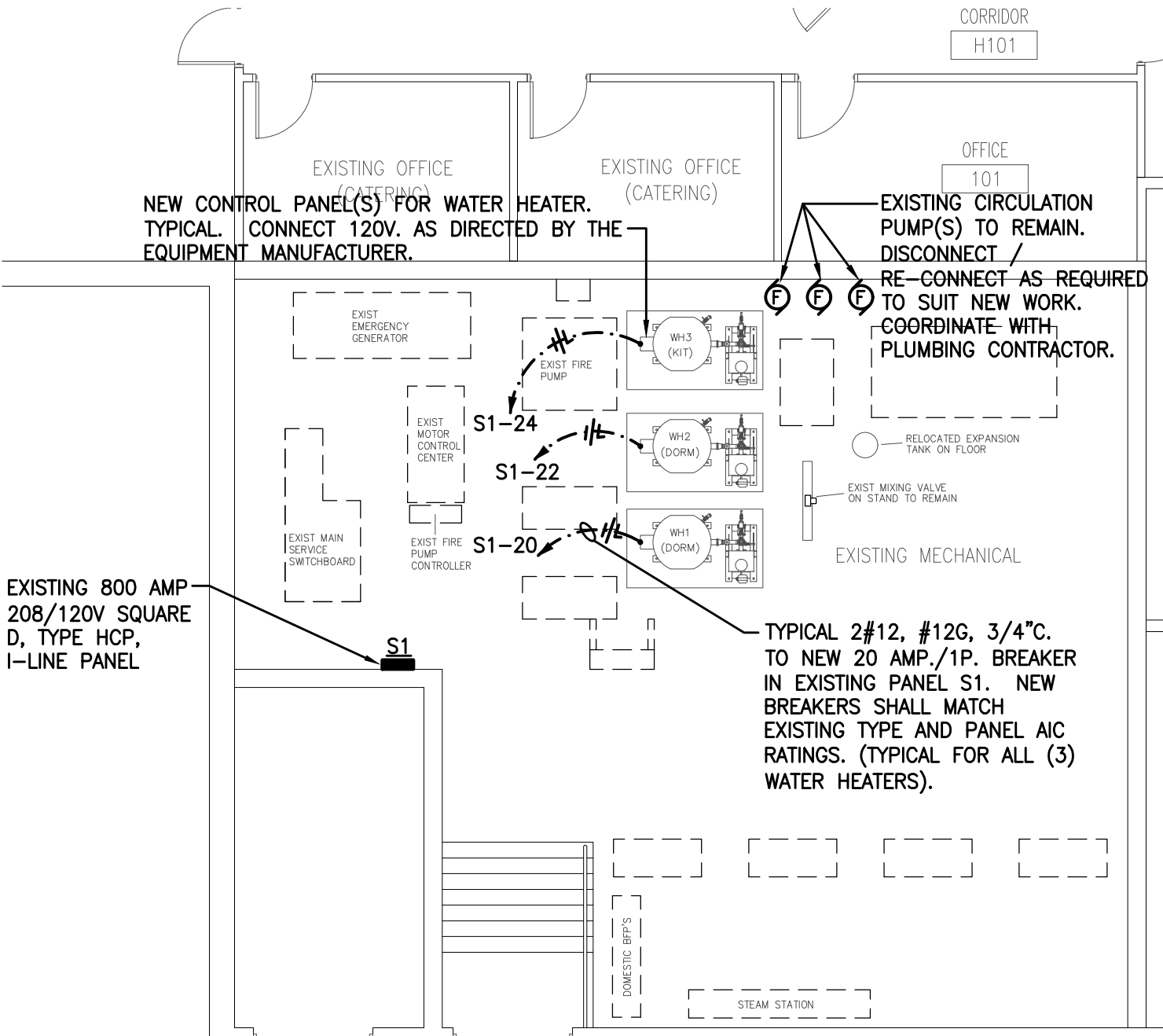
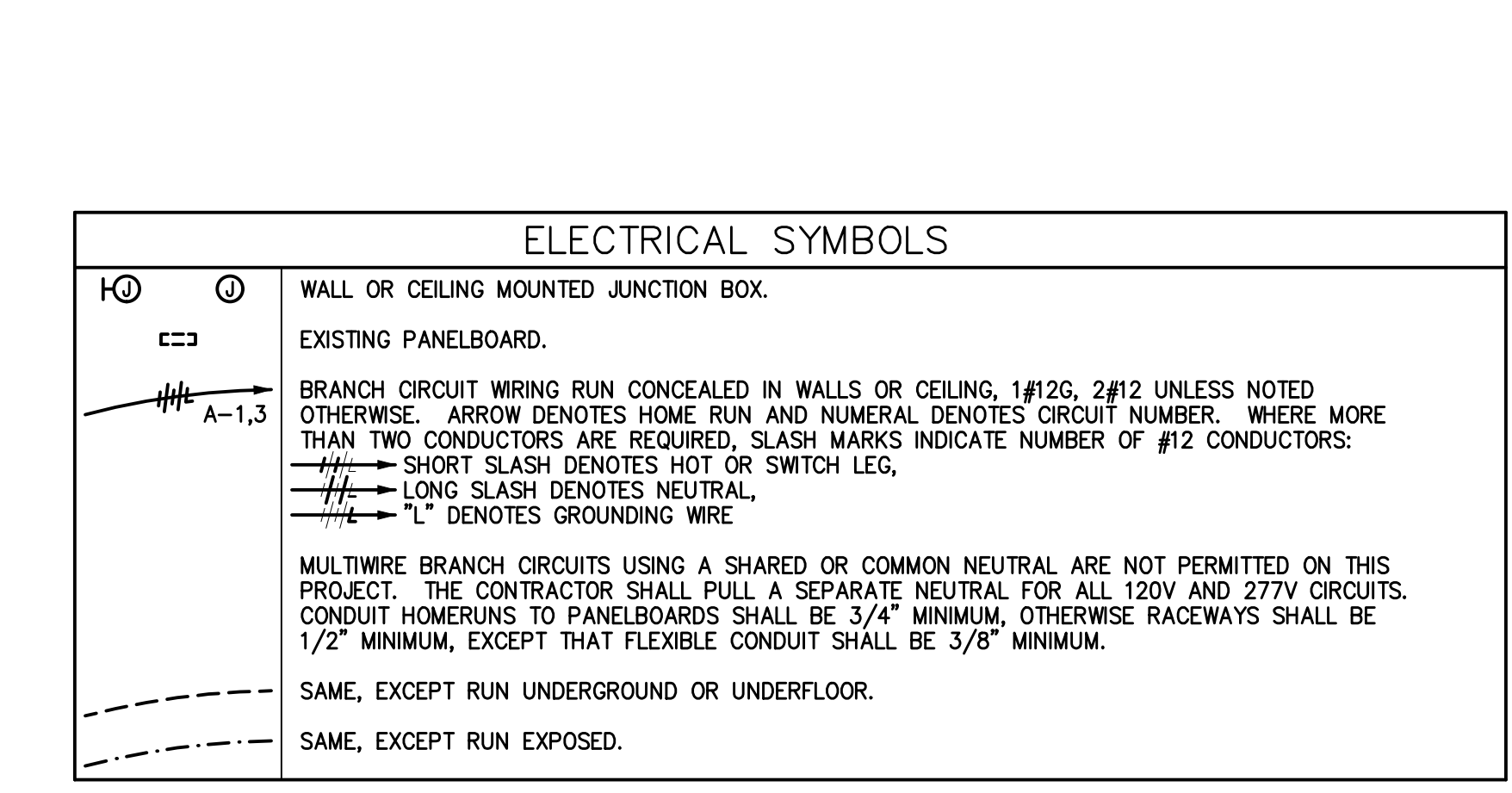
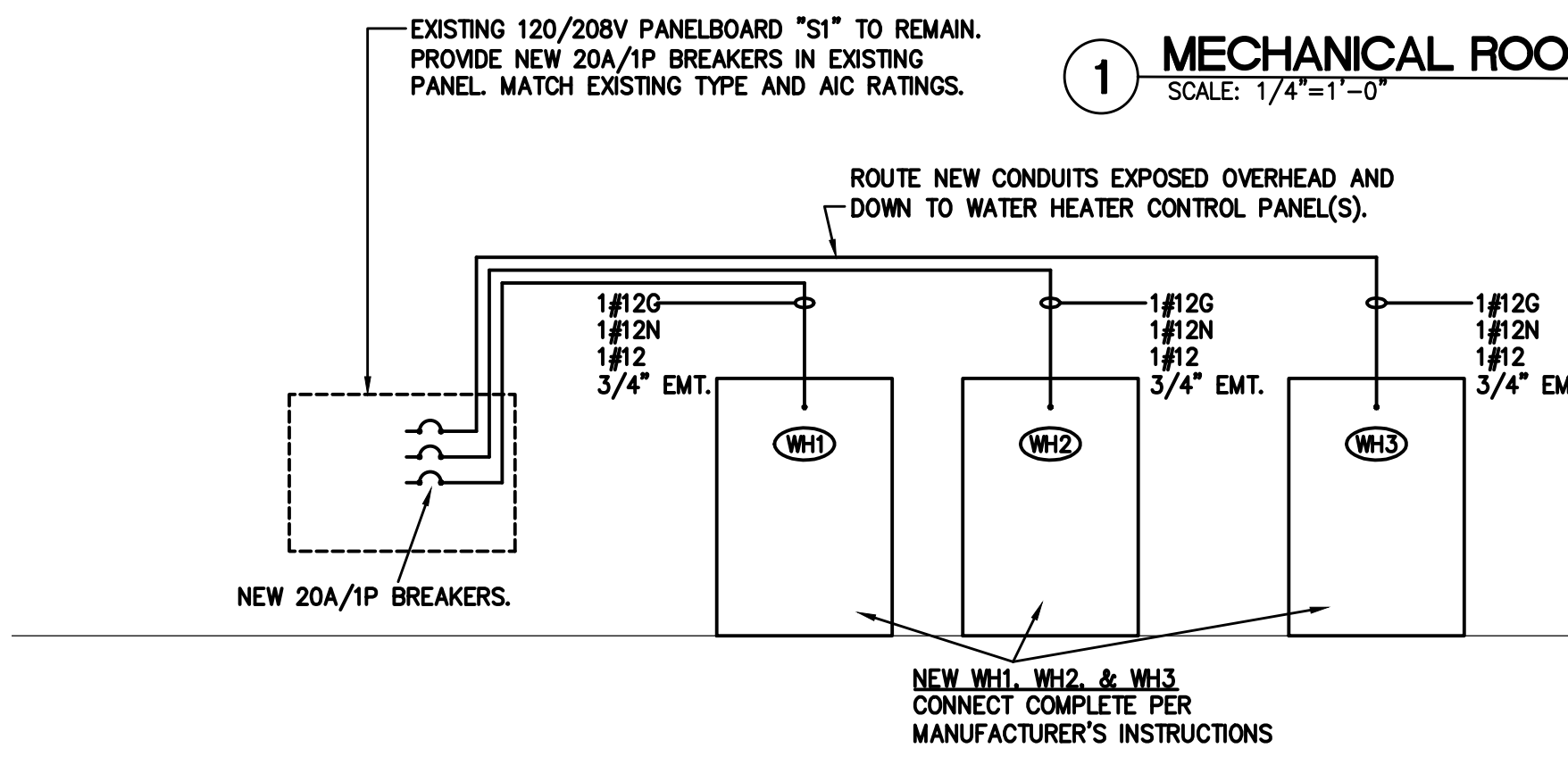
- 1) Letter from the Electrical Contractor on company letterhead indicating that the installation is complete and ready for a final review.

Failure to submit the above documentation prior to requesting the Engineer's Final Review of the project may result in delays in providing the final review. The Engineer assumes no liability for delays in the project resulting from failure to provide the proper documentation.

The system will not be considered complete until Record Documents are provided and training of facility personnel on the system operation is complete. This facet of the services to be provided by the Contractor is deemed very important to the satisfactory completion of the contract and the installation cannot be deemed complete until these services have been provided in accordance with the Contract Documents.

CLEAN UP: Upon completion of all installations and prior to final acceptance by the Owner, remove all debris from the site. Clean and touch up point on fixture lenses and trims, cabinets, enclosures, cover plates, etc.

END OF SECTION 260500



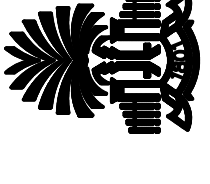
NOTE E1. CONNECT WH-1,2,3 TO 20 AMP, 120V. SPACES IN PANEL S1. PROVIDE NEW TYPED WRITTEN PANEL DIRECTORY INDICATING EXISTING AND NEW LOADS IN PANEL S1. ELECTRICAL CONTRACTOR SHALL PROVIDE APPROBE ON EXISTING PANEL S1 FEEDER AND DETERMINE MAX. LOADING ON PANEL PRIOR TO ADDING NEW LOADS. CONTACT ELECTRICAL ENGINEER WHERE CONFLICTS OCCUR.
NOTE E2. REFER TO PLUMBING DRAWINGS FOR EXACT SCOPE OF DEMOLITION REQUIRED FOR NEW WATER HEATERS. REMOVE ELECTRICAL WORK AS REQUIRED. LABEL EXISTING CIRCUITS AS SPARE.
NOTE E3. EXISTING LIGHTING TO REMAIN. ADJUST LOCATION AS REQUIRED TO SUIT NEW WORK.

Project information including drawing title (CAPSTONE - A/E WORK DETERMINE DOMESTIC HW REPLACEMENT), drawing number (E101), date (19 APR 16), and sheet number (1 OF 1).

Professional stamps for South Carolina State Engineer and Sims Group Engineers, Inc., along with contact information for the engineering firm.

CAMPUS PLANNING AND CONSTRUCTION COLUMBIA, SC 29208

CAPSTONE - A/E WORK DETERMINE DOMESTIC HW REPLACEMENT CP00407409 / FM00514359 H27-D199-FW University of South Carolina



Project title: CAPSTONE - A/E WORK DETERMINE DOMESTIC HW REPLACEMENT, Drawing: E101, Sheet: 1 OF 1.