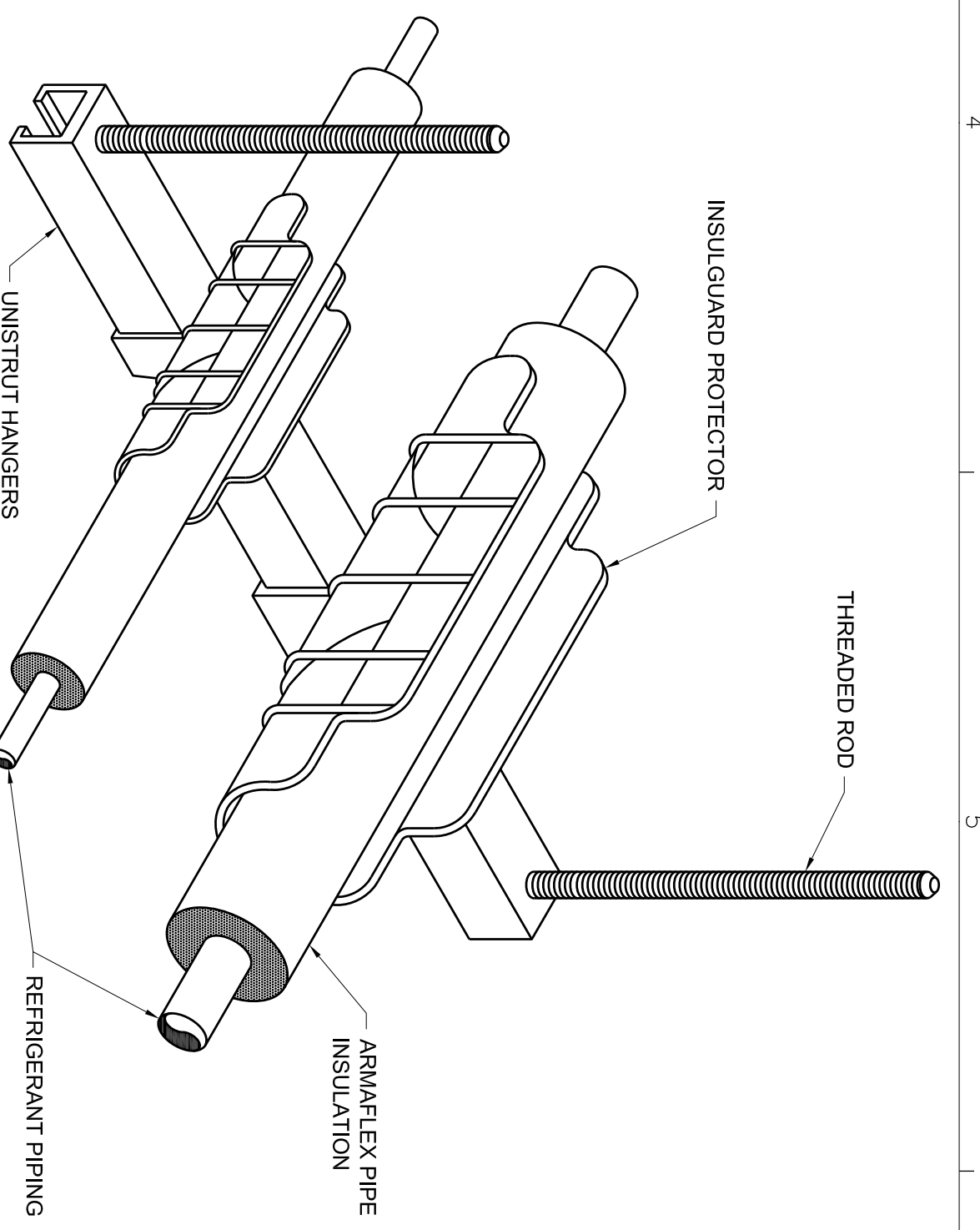


NOTES:  
 1. HANNAFORD SHALL PROVIDE EVAPORATOR AND TYP.  
 2. ALL OTHER PARTS TO BE SUPPLIED BY CONTRACTOR, AS FOLLOWS:  
 3. LIQUID AND SUCTON VALVES (MATCH LINE SIZE) AND 1/4\"/>



**1.0 REFRIGERANTS AND OILS:**  
 1.1 CONTRACTOR SHALL SUPPLY OIL AND REFRIGERANT PER TABLE 1.1 LISTED BELOW.  
 1.2 Refrigerant and oil shall be new and delivered to the job site in original containers.  
 1.3 Lubricant or diluents shall be the same as those specified in the original containers.  
 1.4 Venting of refrigerant to the atmosphere is not allowed.  
 1.5 Only EPA certified technicians are allowed to handle refrigerant and work on any charged system.  
 1.6 Refrigerant recovery levels shall be at 20% average liquid level when turned over to the owner.  
 1.7 Record refrigerant charge amounts on rack start-up forms and return to owner.

**TABLE 1.1**

ROCK	REFRIGERANT	OIL SPECIFICATIONS		
		TYPE	WT	MANUFACTURER
ROCK A (1.58T287)	R407C	PCE	150	MOBIL ARCTIC 22
ROCK B (1.59T)	R407A	PCE	150	MOBIL ARCTIC 22
ROCK C (1.59T)	R407A	PCE	150	MOBIL ARCTIC 22

**2.0 PIPE & FITTINGS REQUIREMENTS:**

- 2.1 All pipe shall be 7/8" Type L copper, manufactured in accordance with ASTM B88, and drainage, proper grade and approval from Owner Engineering.
- 2.2 All fittings shall be refrigeration-grade copper or brass. No stamped fittings are allowed.
- 2.3 All elbows shall be long radius type. No turned elbows are permitted. Fittings must be used for all size and direction changes.
- 2.4 "T" connections may be field manufactured. "T" off tools must be approved by Owner Engineering Department.

**3.0 BRAZING REQUIREMENTS:**

- 3.1 During brazing operations, dry nitrogen must be lead through piping to prevent oxidation and scaling.
- 3.2 To prevent heated condensation of the piping, do not use an excessive amount of flux and apply flux to only male portion of joint.
- 3.3 All joints shall be brazed with silver solder alloy containing not less than 15% silver, except as noted below.
- 3.3.1 Soft solder may be used for case connections.
- 3.3.2 For copper-to-copper, brass-to-steel and steel-to-steel joints, use silver solder alloy containing no less than 50% silver.
- 3.3.3 For copper-to-brass joints, where damage could occur from excess heat such as hot wires, use 95/5 silver solder.

**4.0 PIPING INSTALLATION REQUIREMENTS:**

- 4.1 Piping alignments and plans shall be followed, except as otherwise instructed by "Owner Representative".
- 4.2 All piping to be installed to prevent dripping spillage on other pipes or objects. Cases piping to be made to allow access to valves, fans, condensers, TYP's and electrical services or controls.
- 4.3 Discharge lines shall slope in the direction of flow.
- 4.4 Horizontal suction lines shall slope to the compressors at a rate of 1 inch per 20 feet.
- 4.5 All suction lines shall be constructed per R2 detail drawing.
- 4.6 Sub-up connections for cases shall be per R2 detail drawing.
- 4.7 Any flammable liquid vapors shall be connected to the bottom of the liquid header. Flammable liquid branches can be made to any orientation, to stringly insulation. All suction branches shall connect to the top of the suction header.
- 4.8 All liquid and suction lines shall be insulated as follows:  
 4.8.1 Liquid insulation shall be 3/4" thick and suction line insulation shall be 1" thick. Use Armstrong Armaflex II or equivalent having a documented insulation value of R-7.0 or higher. Armaflex covered by 25/50 per ASTM B64, and a water vapor transmission rate of .10 or less.  
 4.8.2 All insulation joints shall be sealed with rubber cement to insure an airtight seal. Where possible, sealant shall be the standard of compressor manufacturer.  
 4.8.3 All refrigeration penetrations in refrigerated rooms and coolers shall be completely sealed with hot rubber sealant.  
 4.8.4 All refrigeration penetrations into compressor room shall be sealed to size for each line and sealed using Insul-Flex from Products From-Pak (non-combustible) or equivalent.  
 4.8.5 All insulation which is located outdoors must be protected with weather-resistant PVC jacket.  
 4.8.6 All insulation which is located in an exhaust must be UV and Fleum rated.
- 4.9 Approved piping shall be supported by proper hangers and struts, as follows:  
 4.9.1 Support lines with "Unistrut" or equivalent. Maximum support spacing shall be 6 feet in compressor room and 12 feet elsewhere.  
 4.9.2 Chimes with "Unistrut" or equivalent shall be used to support all refrigeration piping and equipment.  
 4.9.3 Where chimes are not used, independent coolers shall be placed between the pipe insulation and the supporting member to prevent damage to the insulation per manufacturer's recommendations shown by Details E1 & E3.
- 4.10 Below-slab piping shall be routed through sleeves fabricated from schedule 30S35 PVC pipe.  
 4.11 Temporary physical protection shall be applied to the piping system, as required. Cap ends of pipe not being worked.
- 4.12 Piping shall be routed to clear evaporator fans, motors and expansion valves.
- 4.13 All compressor room piping shall be located so that normal servicing of the refrigeration equipment is not hindered. Do not install piping which obstructs the view of the condenser coil sight-glasses or service with the removal of the compressor's cover panels, and check access panels, fans, fan motors, condenser coils, fans and other components in the room.
- 4.14 SECONDARY COOLANT PIPING: N/A

**5.0 EVAPORATOR INSTALLATION FOR CASES, FREEZERS AND COOLERS:**

- Evaporators shall be installed per R2 detail drawing.

**6.0 ICE MACHINE INSTALLATION:**  
 N/A

**7.0 AIR COOLED CONDENSERS**  
 See Detail A1

**8.0 PRESSURE TESTING, EVACUATION AND CHARGING:**

- 8.1 Refrigeration piping shall be pressure tested as follows:  
 8.1.1 Pressure testing shall be accomplished with dry nitrogen using a pressure regulator.  
 8.1.2 All refrigeration piping shall be tested to 350 psig. Prior to pressure testing, isolate all components that may be damaged by 350 psig pressure, such as transducers, compressors, piping, regulators and valves.  
 8.1.3 Dry nitrogen shall be pressure tested to greater of either the manufacturer's pressure rating or 250 psig.  
 8.1.4 The lowest test pressure being tested shall be 24 hrs for condensate and 3 hrs for all other piping.  
 8.1.5 If required pressure cannot be maintained, then piping shall be re-inspected with nitrogen and nitrogen, per EPA guidelines. In order to locate leaks with an electronic leak detector, proper pressure test shall be used on systems.  
 8.1.6 Records must be maintained of pressure readings and time required for test for each tested pipe section.  
 8.1.7 Owner must witness the final testing of all installed piping sections. Contractor must provide Owner with 24 hour advance notice of all scheduled pressure tests.
- 8.2 After successful pressure testing, the piping system shall be evacuated as follows:  
 8.2.1 It is recommended that contractor use a mechanical vacuum pump with a minimum capacity of 10 CFM piping.  
 8.2.2 An electronic vacuum gauge, such as manufactured by Rotovac, must be used to measure the internal pipe pressure at the farthest point from the vacuum pump.  
 8.2.3 Refrigeration system shall be evacuated as follows:  
 Double evacuation to 1500 microns Hg, keeping the vacuum switch firm with the proper refrigerant to a positive pressure, per EPA guidelines.  
 Final evacuation to 500 microns Hg. Value of vacuum pump. The pressure must stay below 500 microns Hg for a four hour period for a successful evacuation.  
 If the pressure rises to 500 microns during the four hour test period, the system is to be re-evacuated per 8.1.5 above.  
 Repeat triple evacuation procedure after leak(s) have been repaired.
- 8.2.4 Records must be maintained of pressure readings and time required for test, for each tested pipe section. Records to be kept on file by inspection.
- 8.2.5 Owner must witness the final evacuation testing of all piping systems. Contractor must provide Owner with 24 hour advance notice of all scheduled testing.  
 8.2.6 Contractor must guarantee the integrity of all installed piping systems for a period of one year after start-up.  
 8.2.7 General Opening
- 8.3 After successful evacuation, the refrigeration system shall be charged with nitrogen and oil using the following guidelines:  
 8.3.1 All refrigerant and oil shall be delivered to the job site in original containers.  
 8.3.2 Record the amount of refrigerant charged on each system on the start-up report and the refrigerant log located in the compressor room.  
 8.3.3 Run initial charge on two callers set compressor. After starting, adjust to maintain correct oil levels in compressors and all separators. Record amount of charge in each tank.  
 8.4 Filter change requirements:  
 8.4.1 For removals. Change all liquid, suction and oil filter at end of project.  
 8.4.2 For new service. Change all liquid, suction and oil filter within 72 hours after rack start-up and change all liquid suction and oil filter at end of project.

**9.0 SELF-CONTAINED REFRIGERATION EQUIPMENT**

The refrigeration contractor shall be responsible for the start-up of all self-contained units.

**10.0 LOCK OUT / TAG OUT REQUIREMENTS:**

All contractors performing work at a hazardous or lock-out shall follow, at a minimum, the Hazardous document titled "Lock Out / Tag Out" for Hazardous Field Control. All contractor equipment performing a lock-out procedure shall be tagged with a lock-out tag. The tag shall be signed by the contractor employee, and their adherence to safe work practices as defined by OSHA and WPA/VOLC, Inc. with their employer.

**11.0 COMMISSIONING:**

The refrigeration contractor will be part of the Commissioning Team. The contractor must therefore participate in commissioning site inspections, and upon request, provide installation documentation to the commissioning leaders.

**12.0 FILTER CHANGES:**

- 12.1 For removals:  
 12.1.1 Maintain clean suction, liquid and oil filter through duration of project.  
 12.1.2 At completion of project, change all suction, liquid and oil filter.  
 12.2 For new construction:  
 12.2.1 After 72hrs from start-up, change all suction, liquid and oil filter.  
 12.2.2 At end of project, change all suction, liquid and oil filter.

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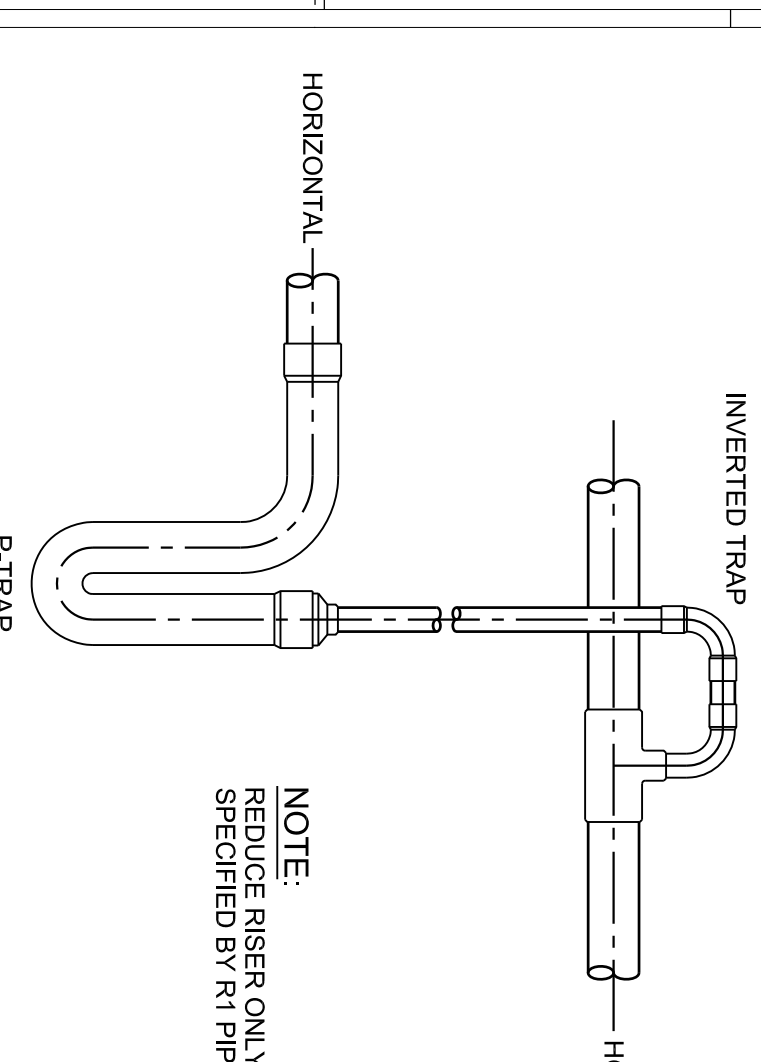
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 12.1.2 At completion of project, change all suction, liquid and oil filter.  
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 12.2.2 At end of project, change all suction, liquid and oil filter.

**5.0 EVAPORATOR INSTALLATION FOR CASES, FREEZERS AND COOLERS:**

Evaporators shall be installed per R2 detail drawing.

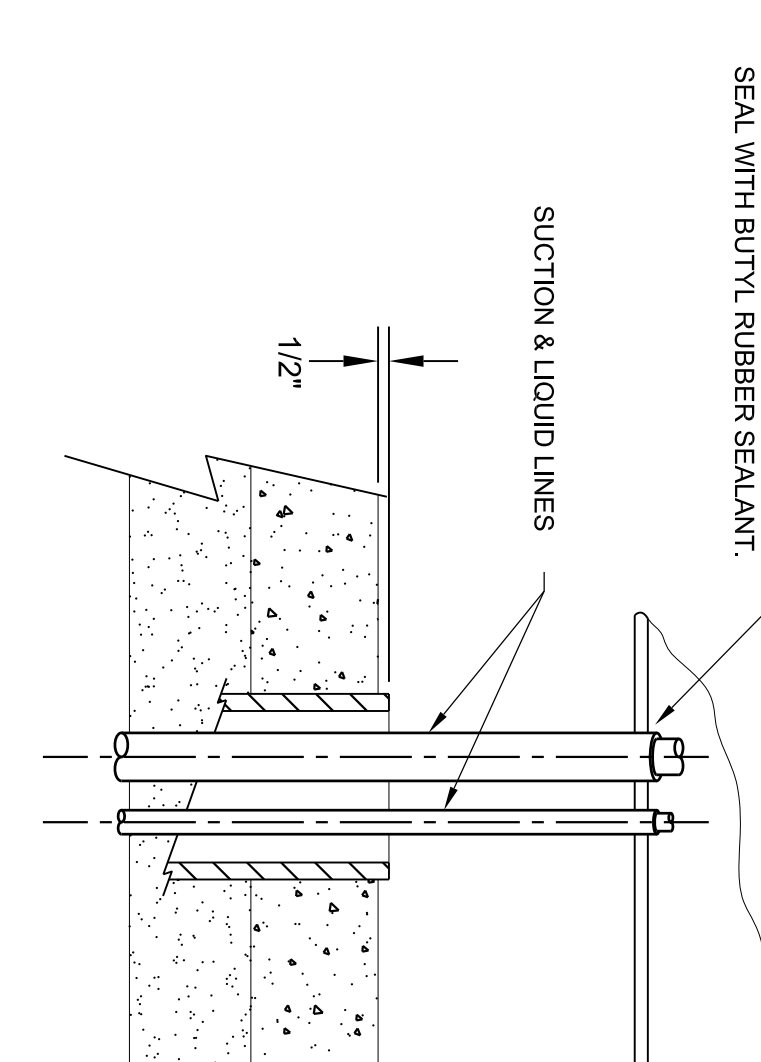
**G3 DETAIL - REDUCING RISER**

NOT TO SCALE



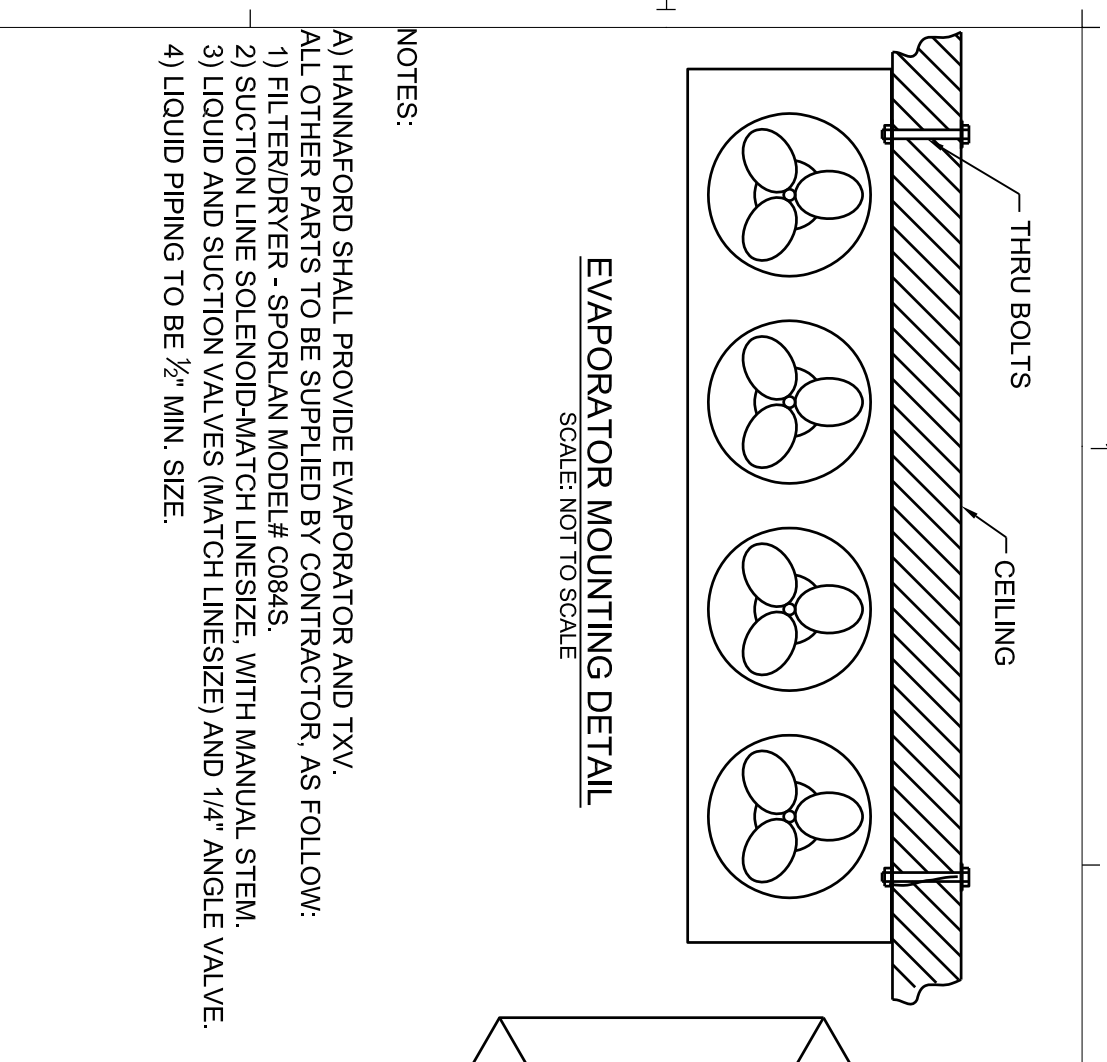
**G5 DETAIL - TYPICAL REFRIGERATION PIT**

NOT TO SCALE



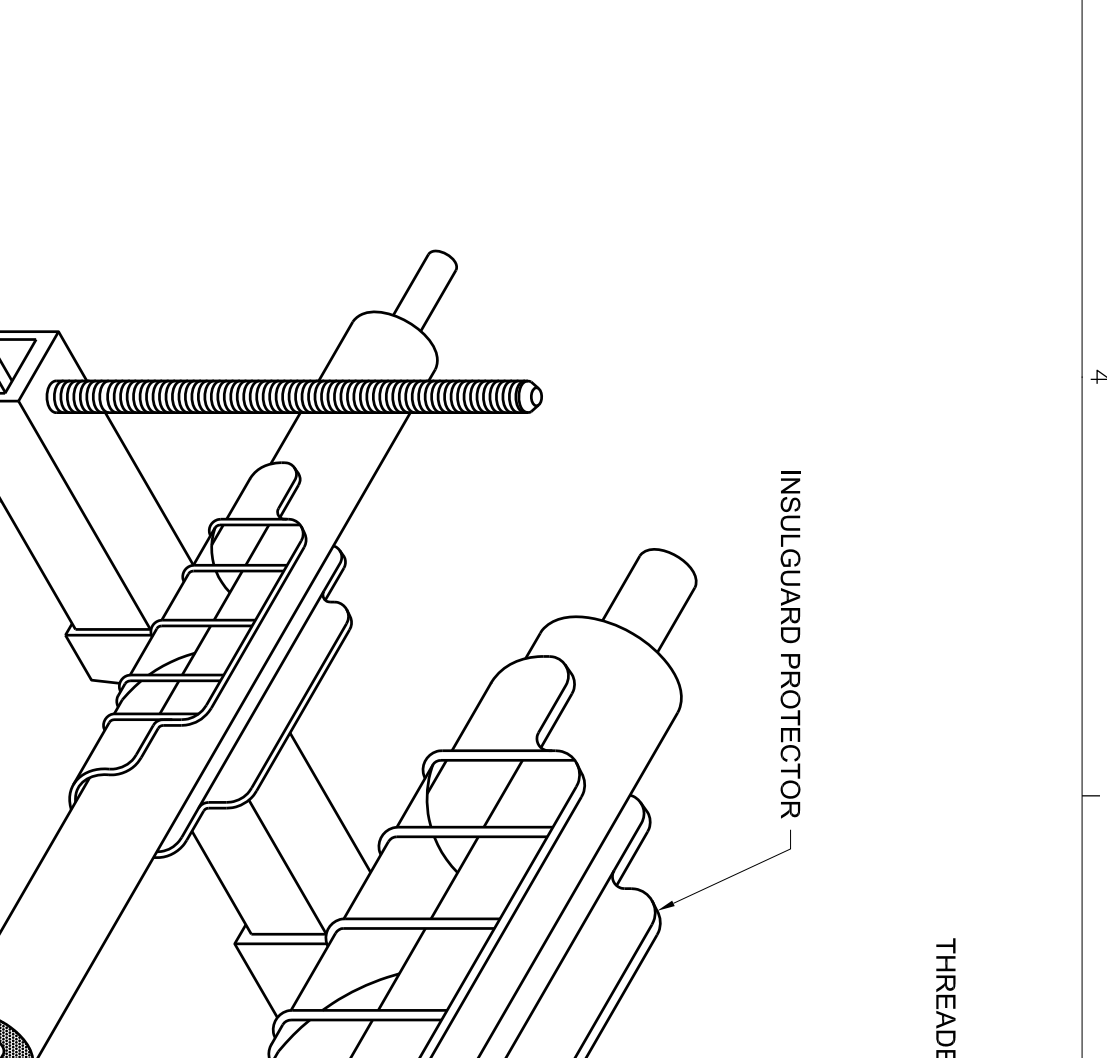
**G1 DETAIL - REFRIGERATION PIPING FOR FREEZERS/COOLERS**

NOT TO SCALE



**G4 DETAIL - REFRIGERATION PIPING PROTECTOR**

NOT TO SCALE



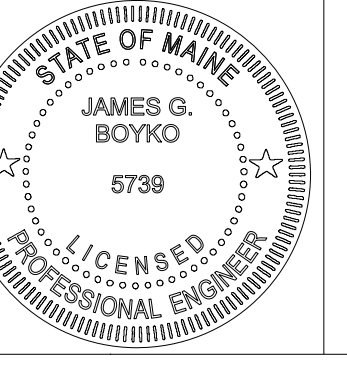
**C3 DETAIL - REDUCING RISER**

NOT TO SCALE



**C5 DETAIL - TYPICAL REFRIGERATION PIT**

NOT TO SCALE



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NUMBER	DATE	BY	DESCRIPTION
0	08/19/15		Issued for construction

Date: MAY, 2015  
 Drawn By: PDS  
 Checked By: BEI  
 Project Mgr: BEI  
 Project No:  
 Cod File: Portland Refrigeration.dwg  
 Graphic Scale: 0 1"

**R2-0**

**REFRIGERATION NOTES, LEGENDS AND ABBREVIATIONS**  
 HANNAFORD SUPERMARKET & PHARMACY  
 295 FOREST AVENUE  
 PORTLAND, MAINE