

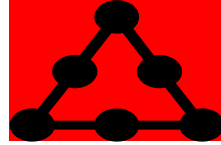
# **Process Chilled Water for HEERC**

**Adam Anderson  
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# Summary of HEERC Process Chilled Water

- HEERC process chilled water (PCW) is needed for running helium compressors used by pulse tube coolers (PTCs) for dilution refrigerators and other cryostats.
- PCW is critical infrastructure across multiple projects: current and planned experiments will use the equivalent of at least ~15 Cryomech PT-415s, across CMB-S4, SPT, quantum, and CCDs.
- Unclear when system was actually filled or with what water, and Andrew Lathrop reported that water looked dirty when he connected a compressor to the loop.
- We therefore obtained an analysis of the water, compared it with requirements for Cryomech compressors, and ISD has recommended installing a filtration system.

# Water Quality Analysis



Fehr Solutions, LLC

Water Treatment Services and Consulting

Cryomech cooling water specifications:

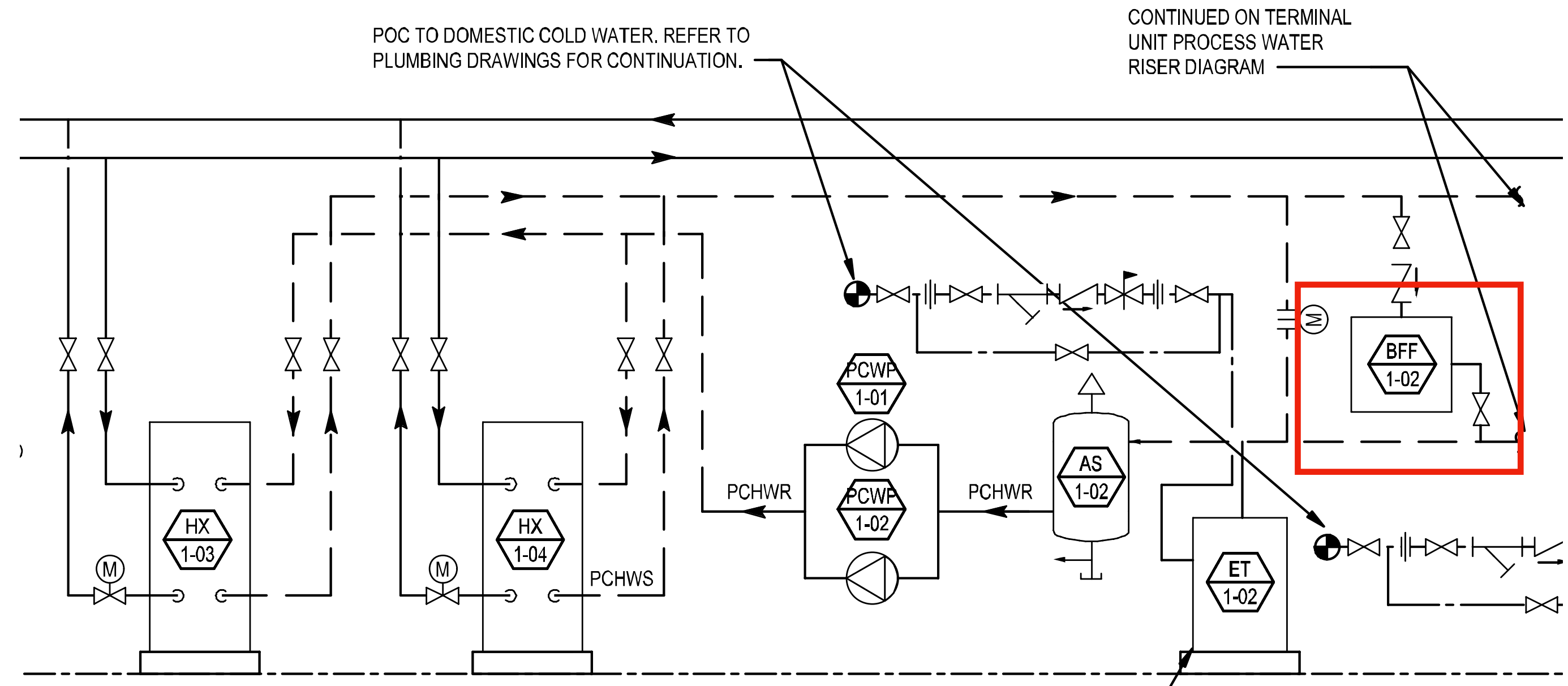
Glycol Sample	IERC PCW LOOP	Recommended Ranges
Number		
Date	11/1/23	
Conductivity (as micromhos)	1703	<3,000
pH	9.57	8.5 to 10.5
Magnesium (as ppm CaCO3)	154.37	
Calcium (as ppm CaCO3)	40.19	
Ca/Mg Ratio	0.26	loss of calcium
Iron (as ppm Fe)	1.35	<1
Copper (as ppm Cu)	0.45	<0.1
Total Phosphorus (as ppm PO4)	5.80	
Zinc (as ppm Zn)	0.70	
Sodium (as ppm Na)	405.70	
Molybdate (as ppm Mo)	0.17	
Silicate (as ppm SiO2)	1.89	
Boron (as ppm B)	60.76	
Aluminum (as ppm Al)	0.08	
Sulfur (as ppm SO4)	104.72	
Manganese (as ppm Mn)	0.04	
Total Hardness (as ppm CaCO3)	24.86	
Azole (as ppm TT)	4.61	>5
Nitrite (as ppm NO2)	120.00	250 to 1500
Propylene (%)	N/A	25 to 35 %
Freeze Protection (F)	N/A	

Parameter	Value	
Cooling Water: minimum flow @ maximum temperature See Chart 1 for details.	3.0 GPM @ 80 F	11.5 LPM @ 27 C
Maximum Inlet Pressure	110 PSIG	7.6 bar
Alkalinity	5.8 < pH < 8.0	5.8 < pH < 8.0
Calcium Carbonate	Concentration < 80 PPM	Concentration < 80 PPM

- Water analysis is in range for Cryomech specs except pH. We contacted Cryomech and they did not seem concerned about a slightly elevated pH. The main concern for the compressors is scaling inside heat exchangers, due to hard water, which can degrade efficiency. No concern about the Ca/Mg ratio.
- Water consultant Mike Fehr recommended installing a sidestream filter for the entire loop, near the heat exchanger. He also claimed that the pH can be reduced and the water treated with a corrosion inhibitor.

# Filtration Plan

- Larry Hammond noticed that the existing bypass feeder for the heat exchanger has an optional filter conversion kit; thus, we simply need to perform this conversion to add filtration to the loop. See [datasheet](#) for filter kit.
- Points from Larry:
  - The BFF has isolation valves but doesn't have a balancing flow control valve. To be able to meter the flow through the filter to say 5-10% of the total flow a circuit setter type balancing valve should be added. Installing a pressure gauge on both sides of the filter is also recommending.
  - With a task code from the users, the addition of the flow control valve and gauges could be done by ISD/FM.
- Still waiting on a more expert cost/labor estimate, but my rough guess is that the filter kit, valves, and gauges seem like maybe a few \$k + less than 1 day of labor to install.
- ***What task code should we use for this? Projects or building task code?***



BYPASS FILTER FEEDER SCHEDULE								
ITEM		MANUFACTURER	MODEL NO.	LOCATION	SERVICE	TANK CAPACITY [GAL]	WEIGHT	NOTES
TYPE	NO.							
BFF	1-01	VECTOR INDUSTRIES	FA-1000AL	MECHANICAL RM 1605	HHW	5	50	1-2
BFF	1-02	VECTOR INDUSTRIES	FA-1000AL	MECHANICAL RM 1605	PCHW	5	50	1-2
BFF	1-03	VECTOR INDUSTRIES	FA-1000AL	MECHANICAL RM 1705	40% PG HHW	5	50	1-2

- NOTES:
1. PROVIDE FILTER CONVERSION KIT.
  2. PROVIDE ADJUSTABLE LEG SET.

# Bonus: Electrical Plugs in Chase

- Good news! 4x 208VAC 3ph plugs were installed in the extreme south chase.
- But! During inspection, I noticed that two of these plugs seem to be missing fuses.
- Need to contact Dave to confirm that he knows that these are missing.

