

## Maintenance and Repair of the CDF Electronics Cooling Water System

This procedure outlines the steps needed to perform several maintenance jobs on the CDF electronics cooling water (ECW) system.

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Editorial Hand-Processed Changes Other Than Spelling  
Require Department Head Approval

HPC Number	Date	Section Number	Initials
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### Approvals

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(CDF Department Head)

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(Date)

**1.0 Controlled Copies of this procedure.**

Three controlled copy of this procedure will exist.

One will be held in the CDF Department Office Library.

The others will be on the CDF web page at

<http://www-cdf.fnal.gov/cdfsafe/cdfproclist.html>

and at

ADMIN.CDF / ES&H / PROCEDURES

All other copies will be marked, " INFORMATIONAL COPY ONLY "

## **2.0 The Procedure**

The proper execution of this procedure will consist of following one of the checklists below, as appropriate for the maintenance needed. Special equipment may be needed to complete each checklist. Read each section before work is done. Completion of any procedure including unusual occurrences must be recorded.

- 2.1 Maintenance of the pumps on the west alcove.
  - (a) Quarterly check the pumps for high temperature, unusual vibration, shaft seal leaks, oil level etc. See the Pump manual for details.
  - (b) Quarterly switch the lead pump for a few minutes to make sure the backup is still operable.
- 2.2 Maintenance of the UV stabilizer on the west alcove
  - (a) Quarterly check the indicating lights on the stabilizer panel for proper operation. See the stabilizer manual for details.
- 2.3 Maintenance of the water chemistry.
  - (a) **Warning:** See the MSDS before handling chemicals and wear proper protective gloves and goggles as recommended in section 8.
  - (b) Fill with distilled water. Volume of the complete ECW system is about 1000 US gallons.
  - (c) Initially add 2.0 oz. of Nalco 39M corrosion inhibitor per gallon of system water.
  - (d) Initially add 0.025 oz. of Nalco 7338 microbiocide per gallon of system water.
  - (e) Check the water chemistry monthly and add chemicals as needed.
  - (f) Nitrate concentration should be between 600 and 650 PPM. Measure with Nalco CO318 Nitrite Test Kit. Add Nalco 39M if necessary.
  - (g) Check bacterial growth with Nalco dip slide P1673. If growth is present, add 0.01oz of Nalco 7338 per gallon of system water.
  - (h) Keep a record of all tests and additions.
- 2.4 Maintenance of the filter on the west alcove
  - (a) Quarterly check the pressure drop. It should be less than 10 psi.
  - (b) If high, close the UV stabilizer inlet block valve then the filter inlet and outlet block valves.
  - (c) Replace the filter elements.
  - (d) Open the filter block valves and slowly open the stabilizer inlet valve. Stabilizer pressure should not exceed 50 psig.
- 2.5 Maintenance of the pump and main heat exchanger strainers.
  - (a) Quarterly check the strainer pressure drop. It should be less than 5 psi.
  - (b) If high, blow down the strainer into a bucket to clean it.
  - (c) If that is ineffective, shut down the system, close adjacent block valves and remove the strainer element.
  - (d) **Warning:** Use safety goggles and safety nozzles when using compressed air.
  - (e) Rinse the screen with clean water or blow off with compressed air.

- 2.6 Maintenance of the individual rack water strainers.
  - (a) Annually or after commissioning major subsystems, spot-check the strainers for cleanliness. Based on this check the remainder may need to be cleaned.
  - (b) Only clean these strainers when the rack power is off to avoid overheating.
  - (c) Close the supply and return block valves and unscrew the strainer plug.
  - (d) **Warning:** Use safety goggles and safety nozzles when using compressed air.
  - (e) Rinse the screen with clean water or blow off with compressed air.
- 2.7 Maintenance of the individual rack solenoid valves.
  - (a) These valves are normally open.
  - (b) On a three-day basis they will be automatically cycled. Rack power will not be interrupted.
  - (c) They should be checked for proper operation monthly. This test may be done with racks powered. Any valves failing to close must be cleaned or replaced.
  - (d) To check the first floor valves, get a clipboard and open picture CDF/RACKS/FIRST FLOOR. Press the 'Pulse Valves' button.
  - (e) Immediately walk into the counting room and watch the flow indicator for rack 1RR27C. The flow should completely shut off for a few seconds when the valve cycles. The rest of the valves in the room will cycle subsequently.
  - (f) To check the second floor valves, get a clipboard and open picture CDF/RACKS/SECOND FLOOR. Press the 'Pulse Valves' button.
  - (g) Immediately walk into the counting room and watch the flow indicator for rack 2RR22I. The flow should completely shut off for a few seconds when the valve cycles. The rest of the valves in the room will cycle subsequently.
- 2.8 Maintenance of instrumentation.
  - (a) The temperature sensors do not require maintenance. For replacement, after connecting the new sensor to wiring, immerse it in clean ice water and log the reading. The bias will be adjusted on APACS if necessary.
  - (b) Biannually or before major running period's recalibrate all pressure and differential pressure instruments. When replacing instruments check for leakage.
  - (c) If any instrument appear to be damaged it should be replaced.
- 2.9 Maintenance of heat exchangers.
  - (a) When accessible inspect all air heat exchangers for dirt and damage.
  - (b) Remove dirt with a vacuum cleaner being careful not to damage fins.
  - (c) If fins are damaged, straighten with a straightening tool.
  - (d) Where buna N hoses are installed, they should be checked every two years for cracks and signs of degeneration. If any hoses are suspect they should be replaced.

- 2.10 Adding water to the whole system.
  - (a) Use only distilled water.
  - (b) Using the clean drum pump, connect a hose to the connection on the West Side of the assembly hall pit above the alcove.
  - (c) Make sure the expansion tank vent valve on the third floor is open. It should normally be open.
  - (d) Run the pump.
- 2.11 Repair to a portion of the system. This procedure would typically be used for replacement of a heat exchanger or hose anywhere in the system. This is not meant to cover new or major subsystem installations.
  - (a) Isolate the portion in question with supply and return block valves
  - (b) Find the volume of the isolated portion.
  - (c) **Caution:** Put rags under the drain point to catch small spills and protect sensitive equipment.
  - (d) **Caution:** The line may be under pressure. Open the drain valve or crack the drain fitting.
  - (e) Attach a hose to a low point drain or if the volume is small enough put a bucket under the drain point.
  - (f) Open a vent valve or crack a high point fitting to allow air into the portion. If necessary apply air pressure to blow water out.
  - (g) Perform the needed repairs
  - (h) **Warning:** Wear safety glasses during testing. Pressurize to 150 psig with air if suitable vent or drain valves are available and bubble leak check all relevant joints.
  - (i) After successful leak checking, vent the air and open the return valve to fill the portion with water.
  - (j) If pneumatic pressurization is not possible, visually double check all relevant connections then close the return valve and open the supply valve with the ECW pump running. Visually inspect relevant joints for leaks.
  - (k) When leak checking is done, close all vent and drain valves, open both supply and return valves.
  - (l) Depending on the amount of air introduced into the ECW air may need to be vented from the air separator. See CDF-II procedure 416.

- 2.12 Connecting the central detector to the building piping.
- (a) Check alignment. Maximum offset should be one inch in any direction. If greater than this contact someone listed in section 4.0.
  - (b) Gather a bucket and rags to collect water
  - (c) Close the supply and return block valves on the building side of the connection.
  - (d) Loosen the flange bolts and drain the section into buckets.
  - (e) Removed the blind flanges and store.
  - (f) One end of each hose is to be connected with a flange insulating kit. The kit includes plastic washers and stud sleeves.
  - (g) Loosely connect the offset hoses using new ring gaskets. One end is equipped with a rotatable flange. Do not impose any torsion on the hoses. The building piping supports may be adjusted vertically if necessary.
  - (h) Tighten flanges following the proper pattern. See Tube Turns Pipe Fitters Manual.
  - (i) **Warning:** Wear safety glasses during testing . Pressurize to 150 psig with air and check for leaks. One week later return and retighten flange studs if necessary.
- 2.13 Disconnecting the central detector from the building piping.
- (a) Connect a drain hose to any low point on the central detector and run it to a floor drain or drums. Make sure it can drain both supply and return sides or use two hoses if necessary. If the water is saved in drums it may be reused.
  - (b) Close the supply and return valves on the building side of the connection.
  - (c) Open vent valves on the supply and return above the connection. Be prepared to catch small amounts of water from these vents.
  - (d) Open the drain valves
  - (e) Gather rags below the flanges to catch small amounts of water that may drip out. Remove the supply and return hoses.
  - (f) Install the blind flanges with new gaskets and tighten with the proper pattern.
- 2.14 Drip sensor maintenance
- (a) If drip sensors is installed this section will be completed.
- 2.15 Maintenance on a section powered by the portable chiller
- (a) Turn off the chiller
  - (b) Attach a drain hose to the return side valve, and direct it into a floor drain.
  - (c) Open the drain valve
  - (d) Open a vent valve to allow air into the chiller. If necessary apply air pressure to blow water out.
  - (e) After repairs, fill with water and visually check for leaks.
  - (f) If necessary to fill the whole chiller system, connect the clean drum pump to a low point in the system and open appropriate high points. Fill the system with distilled water until all air is removed.
  - (g) Open both supply and return valves to the chiller, and start the chiller

### **3.0 Checklist**

No additional "Procedure Execution Forms" are required. Any unusual events should be recorded in the control room logbook.

### **4.0 Deviations from the Procedure**

All deviations from the above procedure must be approved by the Department Head, after consultation with; ECW system manager, the ECW system engineer, the head of the I&I group or their deputies.

### **5.0 Required Training and Authorized Training Personnel.**

There is no prerequisite training for this procedure.

Authorized training personnel are listed below:

Mike Starr, ID# 6919

Either a procedure practice run led by an authorized trainer or a verbal discussion with an authorized trainer is the only required training. This choice depends on the specific procedure being performed and experience of the trainee.

### **6.0 Training Materials.**

A copy of this procedure

**7.0 List of Trained People for this procedure.**

The list of trained people for this procedure will exist in written form in the CDF Department copy of this procedure. Only CDF technicians will be trained in the procedure.

The list may eventually reside in a Lab-wide database as well.

Name	Date	ECW Systems Engineer or Manager Signature	Comments
Bruce Vollmer			
Dean Beckner			
Dave Haynie			
Cutchlow Cahill			
Craig Olson			
John Voirin			

## **8.0 References and Supporting Documentation**

Fermilab ES&H Manual

Equipment Manuals ( Pump, UV Stabilizer, ) available from Water Systems Engineer

MSDS available at Right to Know Center and in the Department copy of this procedure.

Nalco CO318 Nitrite Test Kit

Nalco dip slide P1673