

DISPERSAL BARRIER EQUIPMENT COOLING

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US Army Corps of Engineers
BUILDING STRONG

Barrier Cooling Systems

Unique Cooling Requirements

- **Higher Cooling Water Temperatures**
 - ▶ Entering and Leaving Water Temperatures that prevent condensation near electrical equipment (approx. 65-90F)
- **Pulser DI Water Cooling**
 - ▶ Requires cooling water with a low conductivity
 - ▷ Therefore, Cooling conductivity must be monitored
 - ▷ Piping and fittings must be suitable for De-ionized water
- **Varying Heat Capacities**
 - Canal conductivity may increase power demand
 - Maintenance shutdowns
 - Pulse Parameter changes



DEMONSTRATION BARRIER COOLING SYSTEM



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DEMONSTRATION BARRIER

Cooling System

- **Heat Loads:**
 - ▶ 4 Rectifiers
 - ▶ 4 Pulsers
- **Cooling Process:**
 - ▶ Air-Cooled inside the equipment
- **Heat Exchange Equipment**
 - ▶ No external cooling system. All units are internally air-cooled.



BARRIER IIA

Cooling System



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BARRIER IIA

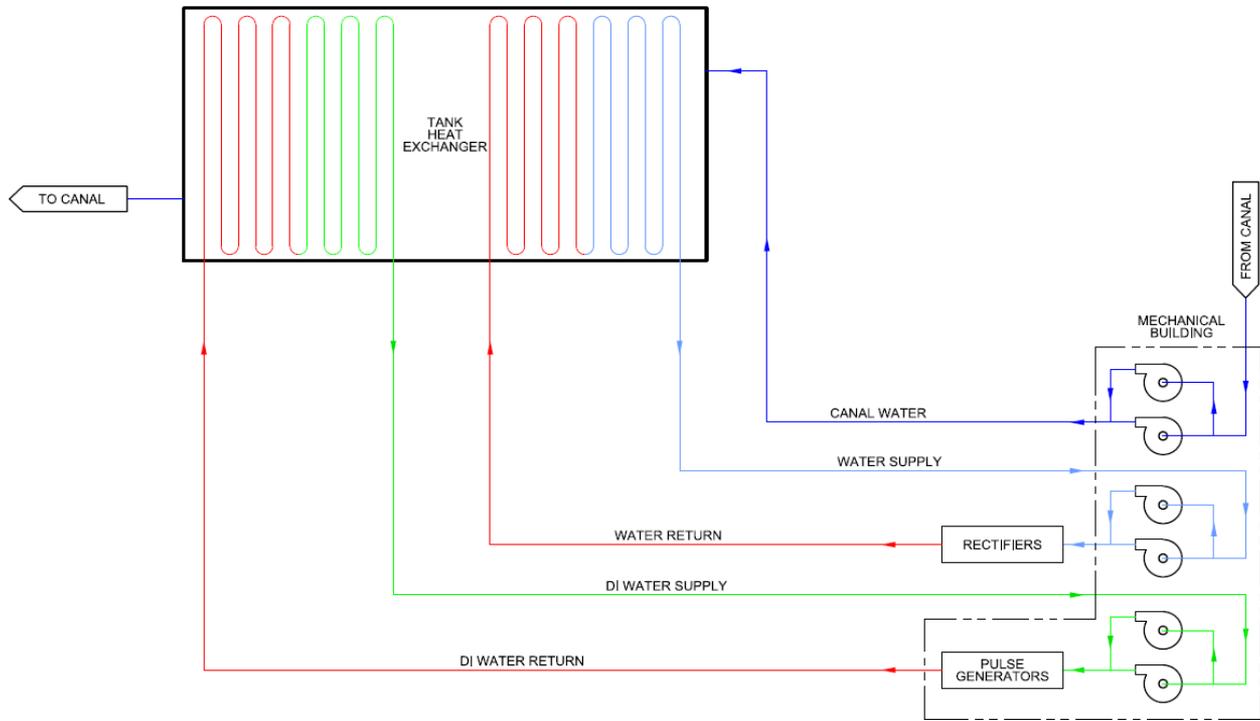
Liquid Cooling System

- **Heat Loads:**
 - ▶ 3 Rectifiers (Spangs)
 - ▶ 3 Pulsers
- **Cooling Process:**
 - ▶ Rectifiers: Closed Loop Water System
 - ▶ Pulsers: Closed Loop De-Ionized Water
- **Heat Exchange Equipment**
 - ▶ Cooling Tank
 - Chiller Rental for Summer Months



BARRIER IIA

Cooling System Diagram



BARRIER 2A LIQUID COOLING DIAGRAM (EXISTING)
INDUSTRY DAY 2016

COOLING SYSTEM CONTROLLED BY SCADA.



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BARRIER IIA

ISSUES

- **Water Quality of the CSS Canal**
 - ▶ Canal water intake filter clogging. Frequent filter maintenance. Must be constantly monitored.
 - ▶ Cooling coil fouling and corrosion.
- **High canal water temperatures in summer months**
 - ▶ Canal Water can reach into the 90F range
 - Temporary using a mobile rental chiller to cool the tank water
- **Alternatives?**
 - ▶ Closed Loop Air Cooled Chilled Water System
 - ▶ Retrofit existing system.



BARRIER IIB

Cooling System



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BARRIER IIB

Cooling System Description

- **Heat Loads:**

- ▶ 3 Rectifiers
- ▶ 3 Pulsers

- **Cooling Process:**

- ▶ Spangs: Closed Loop Processed Water
- ▶ Pulsers: Closed Loop Processed De-Ionized Water

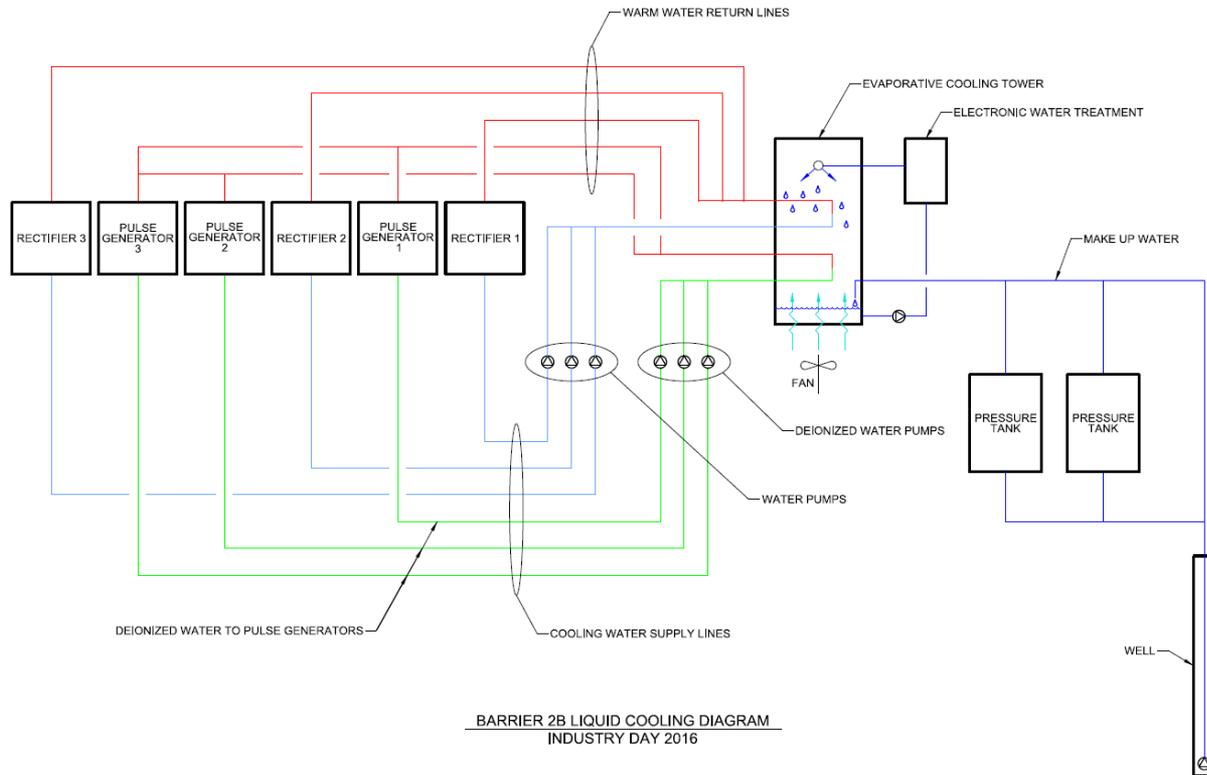
- **Heat Exchanger Equipment**

- ▶ 41Ton Closed Circuit Evaporative Cooling Tower
 - Tower Makeup Water Source: Well Water
 - Variable Frequency Drives used for Cooling Controls
 - Cleaning System: Electronic Water Treatment



BARRIER IIB

Cooling System Diagram



BARRIER IIB

ISSUES

- **Water Quality**
 - ▶ Frequent Cooling Tower Shutdowns
 - Calcium buildup
 - Corrosion
 - Frequent replacement of parts
- **Air Quality**
 - ▶ Coal Dust and other Contaminants
- **Water Treatment System**
 - ▶ Fails to treat the water to prevent system malfunctions
 - Well testing indicated btw 250 and 660 mg/L CaCO₃
- **Alternatives?**
 - ▶ Alternative Water Treatment Systems



PERMANENT BARRIER I

Cooling System



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PERMANENT BARRIER I

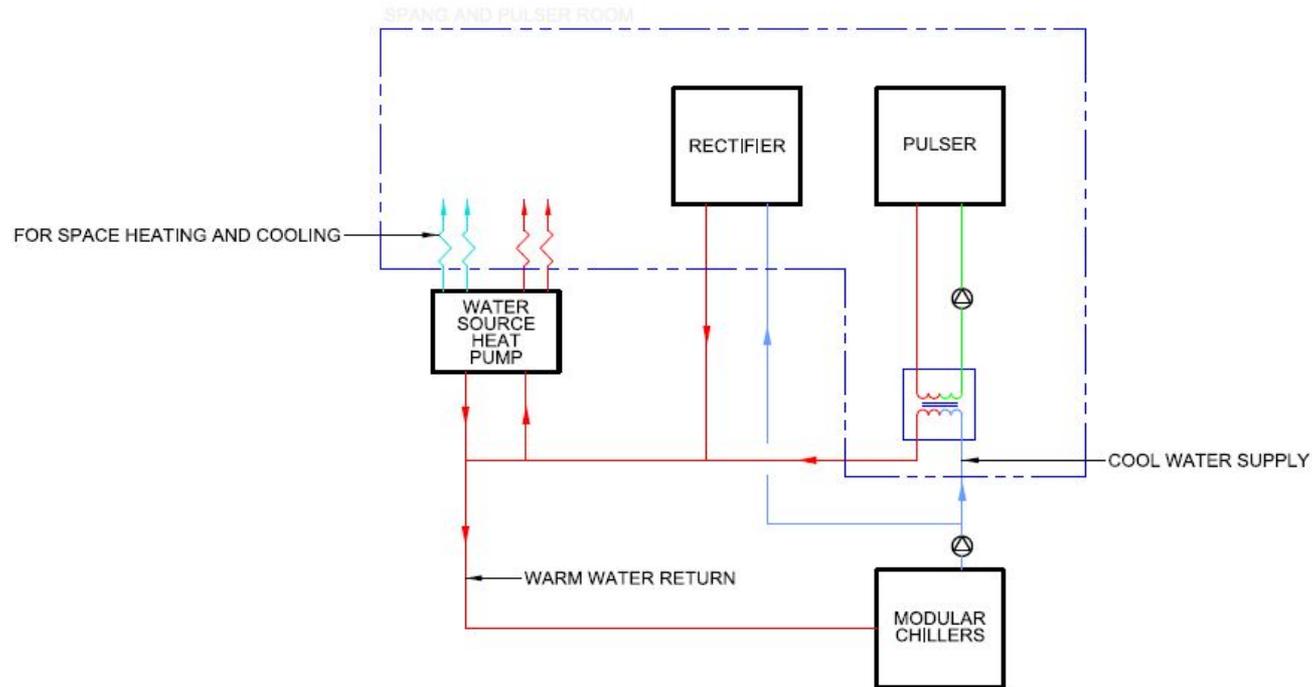
Cooling System Design

- **Heat Loads**
 - ▶ 2 Rectifiers
 - ▶ 2 Pulsers
- **Cooling Process**
 - ▶ Spangs: Closed Loop Chilled Water System
 - ▶ Pulsers: Closed Loop De-Ionized Water System
- **Heat Exchange Equipment**
 - ▶ 4 Modular Split System Chillers (89 Tons Total)
 - ▶ Plate and Frame Heat Exchanger
 - ▶ Water Source Heat Pump for space Cooling/Heating



PERMANENT BARRIER I

Cooling System Diagram



PERMANENT BARRIER I LIQUID COOLING DIAGRAM
INDUSTRY DAY 2016



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