NORTH AMERICAN ENERGY SERVICES	**OPERATIONS MANUAL** VOLUME I - SYSTEM DESCRIPTION	
Number: **SD-603**	Subject: **Circulating Water**	
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DRAWINGS	Rev.	Date
603-1, Circulating Water System	R0	-
603-2, Circulating Water Chemical Feed System	R0	-
603-3, Circulating Water Chemical Feed System	R0	-

REFERENCES		Rev.	Date
1.	Engineering Company, Dwg. No. 049531-1HRC-M2013A, Circulating Water System	5	26 Apr 02
2.	Engineering Company, Dwg. No. 049531-9HRE-M2014, Circulating Water Chemical Feed System	3	10 May 02
3.	Engineering Company, File No. 49531.93.2603, Circulating Water	1	5 Aug 01
4.	Engineering Company, File No. 49531.93.2605, Circulating Water Chemical Feed	1	5 Aug 01

1. GENERAL DESCRIPTION

The primary function of the Circulating Water System is to provide cooling water to the condenser for condensing steam turbine exhaust steam and to provide cooling water to the closed cycle cooling water heat exchangers. The Circulating Water System rejects heat to the atmosphere using a counterflow mechanical draft cooling tower.

The Circulating Water Chemical Feed System provides protection of the Circulating Water System and the cooling water side of the condenser and the plant equipment heat exchangers against scaling and corrosion. In addition, the Circulating Water Chemical Feed System provides control of bacterial slime and algae that could affect heat transfer, impair flow distribution at the cooling tower, and cause deterioration of materials. The common Circulating Water Chemical Feed System consists of chemical feeds for both units.

2. SYSTEM FUNCTIONS

A. CIRCULATING WATER SYSTEM

The Circulating Water System for each unit includes one concrete circulating water pump intake sump; two half-capacity, vertical, wet pit, single-stage, mixed flow type circulating water pumps with motors; one 100 percent capacity, single-stage vertical turbine auxiliary cooling water pump with motor; 10 cell, counterflow, induced mechanical draft type cooling tower and concrete basin; and all piping, valves, and instrumentation necessary to transport circulating water within the Circulating Water System.

Circulating water is pumped by the circulating water pumps from the circulating water pump intake sump through steel and concrete piping to the condenser. In the condenser, heat is transferred to the circulating water as it condenses steam exhausted from the steam turbine. The heated water exits the condenser and flows to the mechanical draft cooling tower through the steel and concrete circulating water piping. The circulating water is cooled in the cooling tower, collects in the cooling tower basin, and flows back to the circulating water pump intake sump.

Circulating water is also supplied to the closed cycle cooling water heat exchangers. Heat is rejected to the circulating water in the heat exchangers. The heated water exits the heat exchangers and flows to the cooling tower through the circulating water pipe.

The auxiliary cooling water pump for each unit is primarily used for filling of the Circulating Water System. The Auxiliary Cooling Water System can also supply cooling water to the Closed Cycle Cooling Water heat exchangers if necessary. Auxiliary cooling water is pumped from the auxiliary cooling water pump intake structure through the steel and concrete circulating water piping to the condenser

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OP603-2, System Instrument Verification

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603-2, Circulating Water Chemical Feed System	R0	-
603-3, Circulating Water Chemical Feed System	R0	-

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1.	Engineering Company, Dwg. No. 049531-1HRC-M2013A, Circulating Water System	5	26 Apr 02
2.	Engineering Company, Dwg. No. 049531-9HRE-M2014, Circulating Water Chemical Feed System	3	10 May 02
3.	Engineering Company, File No. 49531.93.2603, Circulating Water	1	5 Aug 01
4.	Engineering Company, File No. 49531.93.2605, Circulating Water Chemical Feed	1	5 Aug 01

1. INTRODUCTION

This Operating Procedure shall be followed by the Generating Station personnel to operate the Circulating Water System and the associated auxiliary equipment. Only the most recently approved revision of this document shall be used and previous versions shall be destroyed to prevent confusion.

2. OPERATING PRECAUTIONS AND LIMITATIONS

The following summary of operating precautions and limitations is generally applicable to all system operations.

A. Heat exchangers should never be isolated by shutting both the inlet and outlet isolation valves without draining and venting the respective heat exchanger. Each 1 °F increase in temperature in an isolated vessel can produce a 100 psig pressure increase within the heat exchanger.

B. The plant Distributed Control System (DCS) monitors and controls the circulating water pumps, the pump discharge valves, and the cooling tower fans so these components can be operated from the main control room operating stations. To ensure safe remote operation of the system, pump discharge valve controls include electronic "permissive" interlocks to ensure the valve is shut before the associated pump can be started. Other pump-start permissive interlocks require that the main condenser water boxes must be full of water, there must be a minimal water level in the cooling tower water basin, and there must be minimal cooling water flow to the pump bearings.

C. The circulating water chemical feed systems inject five chemicals at various points in the system flow cycle. The chemicals include sulfuric acid, sodium hypochlorite (bleach), sodium sulfite, a scaling inhibitor, and a bio-dispersant. Exercise care when working with or around the various chemical storage tanks, pumps, and injection points used by this system. Review all MSDS for the chemical used by this system.

D. Operators shall regularly monitor the conditions and parameters listed below in order to anticipate, recognize, and respond to any associated alarm or automatic "trip".

Table 1, System Setpoints

Parameter	Alarm	Trip
CW Pump High Discharge Pressure	___ psig	___ psig
CW Pump Motor High Bearing Temperature	___ °F	___ °F
CW Pump Motor High Winding Temperature	___ °F	___ °F