

FINAL

SYSTEM DESCRIPTION
(Index No. 55)

NUCLEAR PLANT HYDROGEN SUPPLY SYSTEM
(B&R Dwg. No. 2626, Rev. 3)

JERSEY CENTRAL POWER AND LIGHT COMPANY

THREE MILE ISLAND NUCLEAR STATION

UNIT NO. 2

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Prepared by: J. A. Cameron

Burns and Roe, Inc.
700 Kinderkamack Road
Oradell, N.J.
07649

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NUCLEAR PLANT HYDROGEN SUPPLY SYSTEM

1.0 INTRODUCTION

1.1 System Functions

The Nuclear Plant Hydrogen Supply System stores a nuclear grade hydrogen and supplies it at a reduced pressure to the Make-up tank (MU-T-1) in the Auxiliary Building. Hydrogen is used in the primary coolant to reduce the concentration of free oxygen.

The Reactor Coolant Make-up and Purification System (Dwg.No.2024) interfaces with this system.

1.2 Summary Description of System (Ref. B&R Dwg. 2626, Rev. 3)

The system is essentially a piping manifold which delivers hydrogen from high pressure storage bottles to the make-up tank. This system contains a pressure reducer, pressure switches and indicators, a relief valve and pressure alarms as well as piping and valves for control and monitoring of hydrogen gas supplied to the tank.

1.3 System Design Requirements

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All piping is of carbon steel and is classified as conventional piping (Symbol C), designed, fabricated, inspected and erected in accordance with ANSI B31.1.0, Power Piping. Piping seismic design classification is Class II. All piping from the hydrogen storage bottles to valves HY-V 30 and HY-V31 is designed for 2700 PSIG and 100 F. The remainder of the system is designed for 150 PSIG and 100 F.

2.0 DETAILED DESCRIPTION OF THE SYSTEM

2.1 Components

2.1.1 Tanks

There are four standard 7 cubic-foot hydrogen bottles (Type A) which comprise the hydrogen storage tanks. The tanks are supplied at a pressure of approximately 2000 psig, and are replaced when pressure in these tanks drops below a predetermined pressure. The hydrogen bottle rack is located in the yard area in the hydrogen storage area adjacent to the TMI Unit No. 1 Control Building. The 2200 psig to 15 psig reducing station is located adjacent to the bottle rack.

2.1.2 Major System Valves

Hydrogen to Make-Up Tank Pressure Control Valves HY-V144A, 44B

A 1/4 inch pressure control valve (HY-U44A), which is constructed of carbon steel and is designed for 2500 psig (ANSI), is used to reduce hydrogen pressure from approximately 2200 psig to 15 psig. Valve HY-V44B, identical to HY-V44A, is installed in a by-pass line around valve HY-V44A as a Back-up.

2.2 Instruments, Alarms, Controls, and Protective Devices

Pressures can be monitored by local pressure indicators and, in addition, pressure switches are provided to give remote high and low pressure alarms in the Control Room. All instruments and control devices are listed in Table 1 and all alarms are listed in Table 2. A 1" inch relief valve, HY-R1, which relieves at 90 psig, is provided on the 15 psig header and relieves to atmosphere via a 1½ inch Exhaust Line. This relief valve is provided to protect the piping supplying the make-up tank.

3.0 PRINCIPAL MODES OF OPERATION

3.1 Start-up

To start the nuclear plant hydrogen supply system, hydrogen bottles are connected to the header and pressure control valves HY-V44A is set for 15 psig. Hydrogen is then supplied to the make-up and purification system at 15 psig.

3.2 Normal Operation

Nuclear grade hydrogen, stored at approximately 2000 psig, enters the $\frac{1}{2}$ inch hydrogen manifold through bottle isolation valves HY-V1A, HY-V1B, HY-V1C, and HY-V1D and manifold isolation valves HY-V27A, HY-V27B, HY-V27C and HY-V27D. A full pressure $\frac{1}{2}$ inch hose connection is provided from the header with isolation valves HY-V22 and HY-V28. A pressure switch HY-PS-1471 and Low pressure alarm HY-PAL-1471, set at 150 psig, are provided to monitor the header pressure ahead of the reducer station. The reducing station is comprised of two parallel reducers and isolation valves for redundancy; HY-V44A reducing valve with valves HY-V29 & HY-V30 as isolation valves, and HY-V44B reducing valve with valves HY-V31 & HY-V43 for isolation. Pressure relief valve HY-R1, which relieves at 90 psig, is located on a 1 inch branch line downstream from the reducing station and has a $1\frac{1}{2}$ inch vent line to the atmosphere through the corridor roof. Downstream from the vent line the hydrogen line reduces to $\frac{1}{2}$ inch diameter. High and Low pressure switches HY-PS-1474 and HY-PS-1473 respectively actuate High/Low Pressure Alarm HY-PAH-1473. A $\frac{1}{2}$ inch Globe valve HY-V46 is provided in the line as it passes through the connecting corridor between Unit 1 and Unit 2. Valve HY-V8 is the root valve to the local pressure indicator (B&W) MU-20-PI in the Auxiliary Building. A hose connection HY-U11 is provided with block valves HY-V9 and HY-V26. The piping continues through Filter HY-U9 to the Make Up and Purification System at valve MU-V28.

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3.3 Shutdown

The nuclear hydrogen supply system is not shut down under normal circumstances. If maintenance must be performed, then all or a section of this system can be isolated by shutting the appropriate isolation valves.

3.4 Special or Infrequent Operation

None.

3.5 Emergency

4.0 HAZARDS AND PRECAUTIONS

Hydrogen in an oxygen atmosphere can be highly flammable or explosive, depending on the percentage of concentration. Therefore, smoking or other open flame must be prohibited in the hydrogen bottle storage area. In addition, a "soap test" or other non-flammable leak check test should be performed on all hydrogen bottle fittings following installation of new bottles. When placing the pressure reducing station in service, care must be exercised to increase pressure slowly in order to prevent damage to the pressure control valve.

REV. _____ DATE _____ SUBJECT _____ SHEET NO. 1 OF 1
 CHRD. BY _____ DATE _____ / _____ JOB NO. _____

TABLE 1

INSTRUMENTATION AND CONTROLS

NOTE: For reference to I and C Logic System refer to I&C Schematic Dwg. 3090

IDENTIFICATION	DESCRIPTION	FUNCTION	LOCATION	TYPE	INPUT RANGE	OUTPUT RANGE	SETPOINT
HY-PS-1471	Pressure Switch	Sends signal to HY-PA-1471 for Hydrogen Manifold low pressure	Rack 460	Diaphragm	100-500 PSIG	N/A	150 PSIG
HY-PS-1473	Pressure Switch	Sends signal to HI/Low Alarm HY-PA-1473 for make-up tank hydrogen low pressure	Rack 460	Diaphragm	10-60 PSIG	N/A	13 PSIG
HY-PS-1474	Pressure Switch	Sends signal to HI/Low Alarm HY-PA-1473 for make-up tank hydrogen hi pressure	Rack 460	Diaphragm	10-60 PSIG	N/A	55 PSIG

TABLE 2

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

PANEL MOUNTED ANNUNCIATORS

IDENTIFICATION	MEASURED VARIABLE, PSIG	ALARM SETPOINT		INPUT SOURCES	VARIABLE RANGE	PANEL NAME
		HI	LOW			
HY-PAL-1471	Hydrogen Manifold Low Pressure	N/A	150 PSIG	HY-PS-1471	100-500 PSIG	WIG Panel
HY-PA-1473	Make-up Tank Hydrogen Header	55 PSIG	13 PSIG	HY-PS-1473 HY-PS-1474	10-60 PSIG	WIG Panel

COMPUTER INPUTS

None

POOR ORIGINAL

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TMI DOCUMENTS

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Wilda R. Mullinix, NRC

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