

HTGR

STEAM VENTS AND DRAINS SUBSYSTEM DESIGN DESCRIPTION

~~Applied Technology~~

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AUTHOR / CONTRACTOR
STONE & WEBSTER ENGINEERING CORP.

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UNDER SUBCONTRACT TO GAS-COOLED REACTOR ASSOCIATES
FOR THE DEPARTMENT OF ENERGY
CONTRACT DE-AC03-78SFO2034**

JUNE 1986

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HFD-45008

STEAM VENTS AND DRAINS
SUBSYSTEM DESIGN DESCRIPTION

4 x 350 MW(t) MODULAR HTGR PLANT

APPLIED TECHNOLOGY

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Author/Contractor

Stone & Webster Engineering Corporation

Issued By:
Stone & Webster Engineering Corporation
Under Subcontract to Gas-Cooled Reactor Associates
For The Department of Energy
Contract DE-AC03-78SF02034

June 1986

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LIST OF ACRONYMS

OPDS	Overall Plant Design Specification
PCG	Power Conversion Group
SDD	System Design Description
SSDD	Subsystem Design Description
TB	Turbine Building
TBD	To be Determined

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PREFACE

The objectives of the HTGR plant project are to produce safe, economical power. Supporting these objectives are four major goals and their associated plant states identified as follows:

1. Maintain Safe Plant Operation
 - 1.1 Maintain Safe Energy Production
 - 1.2 Maintain Safe Plant Shutdown
 - 1.3 Maintain Safe Plant Refueling
 - 1.4 Maintain Safe Plant Startup/Shutdown
2. Maintain Plant Protection (in the event that plant operation cannot be maintained in the normal operating envelope)
 - 2.1 Protect the Capability to Maintain Safe Energy Production
 - 2.2 Protect the Capability to Maintain Safe Plant Shutdown
 - 2.3 Protect the Capability to Maintain Safe Plant Refueling
 - 2.4 Protect the Capability to Maintain Safe Plant Startup/Shutdown
3. Maintain Control of Radionuclide Release (in the low probability event of failure to maintain plant protection)
 - 3.1 Control Radiation
 - 3.2 Control Personnel Access
4. Maintain Emergency Preparedness (in the extremely low probability event of failure to maintain control of release of radionuclides)

The Overall Plant Design Specification (OPDS) is the top-level technical document for the HTGR plant. The OPDS (based on owner requirements and regulatory requirements) establishes the overall performance, functional, institutional, interface, operational, safety, maintenance, inspection and decommissioning requirements for design of the plant.

In response to the OPDS, a series of lower tier documents, System Design Descriptions (SDDs), Subsystem Design Descriptions (SSDDs), Component Design Specifications (CDSs) and Interface Control Documents (ICDs) describe and control the individual designs. Traceability from plant-level requirements to equipment-level requirements is maintained throughout this hierarchy of design documents.

SUMMARY

The Steam Vent and Drain system is a subsystem within the Power Conversion Group (PCG).

The Steam Vent system conveys steam and noncondensable gases to the atmosphere or appropriate terminal point at determined by the thermal cycle.

Typical steam vent systems are:

- Low pressure heater shell relief valve piping to the atmosphere.
- Low pressure heater shell vent piping which conducts noncondensable gases to the condenser.

The Drain system conveys high temperature water to the condenser to maintain the inventory of secondary fluid during startup.

SECTION 1

SUBSYSTEM FUNCTIONS AND DESIGN REQUIREMENTS

1.1 SUBSYSTEM FUNCTIONS

The functions of the Steam Vent and Drain subsystem are listed below:

- Convey steam and noncondensable gases to the atmosphere or appropriate terminal point as determined by the thermal cycle.
- Convey high temperature water to the condenser during plant startup.

SECTION 4
SUBSYSTEM AND COMPONENT INTERFACES

4.1 SUBSYSTEM INTERFACE REQUIREMENTS

4.1.1 Interface Requirements Imposed on Other Systems

Interface requirements, at the system level, are presented in Table 4.1-1 showing the system on which the requirements are imposed, and a brief description of the interface.

4.1.2 Interface Requirements Imposed on Subsystems Within the System

Interface requirements, at the subsystem level, are presented in Table 4.1-2 showing the subsystem within the system on which the requirements are imposed, and a brief description of the interface.

TABLE 4.1-1
 (STEAM VENTS AND DRAINS)
 INTERFACE REQUIREMENTS IMPOSED ON OTHER SYSTEMS

<u>Interfacing Systems (with Subsystem/Identification)</u>	<u>Nature of Interface</u>	<u>Interfacing Component</u>	<u>Interface Requirements</u>
1. <u>Reactor System</u> (10)	No Interface		
2. <u>Vessel System</u> (11)	No Interface		
3. <u>Reactor Services Group</u> (20)	No Interface		
4. <u>Heat Transport System</u> (21)	No Interface		
5. <u>Miscellaneous Control and Instrumentation Group</u> (30) (Radiation Monitoring)	TBD		
6. <u>Plant Protection and Instrumentation System</u> (32) (Investment Protection)	TBD		
7. <u>Fuel Handling, Storage and Shipping System</u> (34)	No Interface		

TABLE 4.1-1 (cont)
(STEAM VENTS AND DRAINS)

Interfacing Systems (with Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
8. <u>Plant Control, Data and Instrumentation System</u> (37)			
(Plant Supervisory Control)	TBD		
(BOP Control)	TBD		
9. <u>Power Conversion Group</u> (50)	See Table 4.1-2 for interface requirements imposed on subsystems within the Power Conversion Group		
10. <u>Heat Rejection Group</u> (52)	No Interface		
11. <u>Reactor Cavity Cooling System</u> (56)	No Interface		
12. <u>Shutdown Cooling System</u> (57)	No Interface		
13. <u>Buildings Structures, and Building Service Group</u> (70)			
(Turbine Building)	Provide Space	Inside the TB	Provide [1 ft peripheral] space for maintenance, separation, support, and placement of piping and equipment. (08.0401.130)

TABLE 4.1-1 (cont)

(STEAM VENTS AND DRAINS)

Interfacing Systems (with Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
14. <u>Mechanical Service Group</u> (90) (Auxiliary Boiler)	TBD		
15. <u>Electrical Group</u> (92)	No Interface		

TABLE 4.1-2
 (STEAM VENTS AND DRAINS))
 INTERFACE REQUIREMENTS IMPOSED ON SUBSYSTEMS
 WITHIN THE SYSTEM

<u>Interfacing Systems (with Subsystem/Identification)</u>	<u>Nature of Interface</u>	<u>Interfacing Component</u>	<u>Interface Requirements</u>
<u>Power Conversion Systems (50)</u>			
(Feedwater and Condensate)	TBD		
(Demineralized Water Makeup)	No Interface		
(Condensate Polishing)	No Interface		
(Chemical Feed)	No Interface		
(Turbine Plant Sampling)	No Interface		
(Turbine Building Closed Cooling Water)	No Interface		
(Turbine Generator and Auxiliaries)	TBD		
(Main and Bypass Steam)	TBD		
(Extraction and Auxiliary Steam)	No Interface		

TABLE 4.1-2 (cont)
(STEAM VENTS AND DRAINS)

Interfacing Systems (with Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Heater Drains and Condensate Returns)	Provide Overpressure Protection	Feedwater heater shell to Atmosphere	Provide [one] relief valves at [TBD] psig (08.0401.550)
	Remove Noncondensable Gases	Feedwater heater shell to Condenser Shell Deaerating heater shell to Atmosphere	Provide vent piping with [$\frac{1}{4}$ in] orifice plates (08.0401.560)
(Start-up and Shutdown)	TBD		
(Steam and Water Dump)	No Interface		

SECTION 9

REFERENCES

1. GA Technologies, Inc. (GA), et al Overall Plant Design Specification 4 x 350 MW(t) Modular HTGR Plant, HTGR - 86-004, Rev. 1. GA, San Diego, CA, February 1986.
2. Bechtel Group, Inc. (BGI) et al Preliminary Concept Description Report 4 x 350 MW(t) HTGR Plant Side-By-Side Steel Vessel Prismatic Core Concept, HTGR-85-142. BGI, San Francisco, CA, October 1985.

APPENDIX B

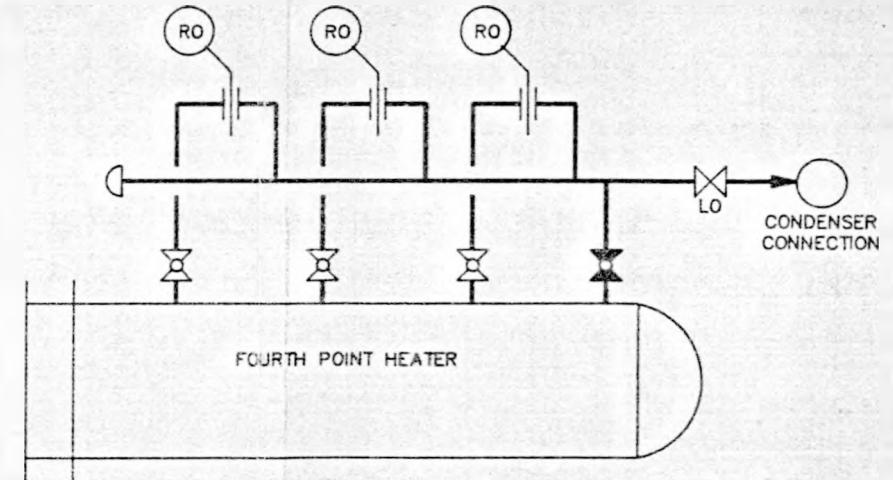
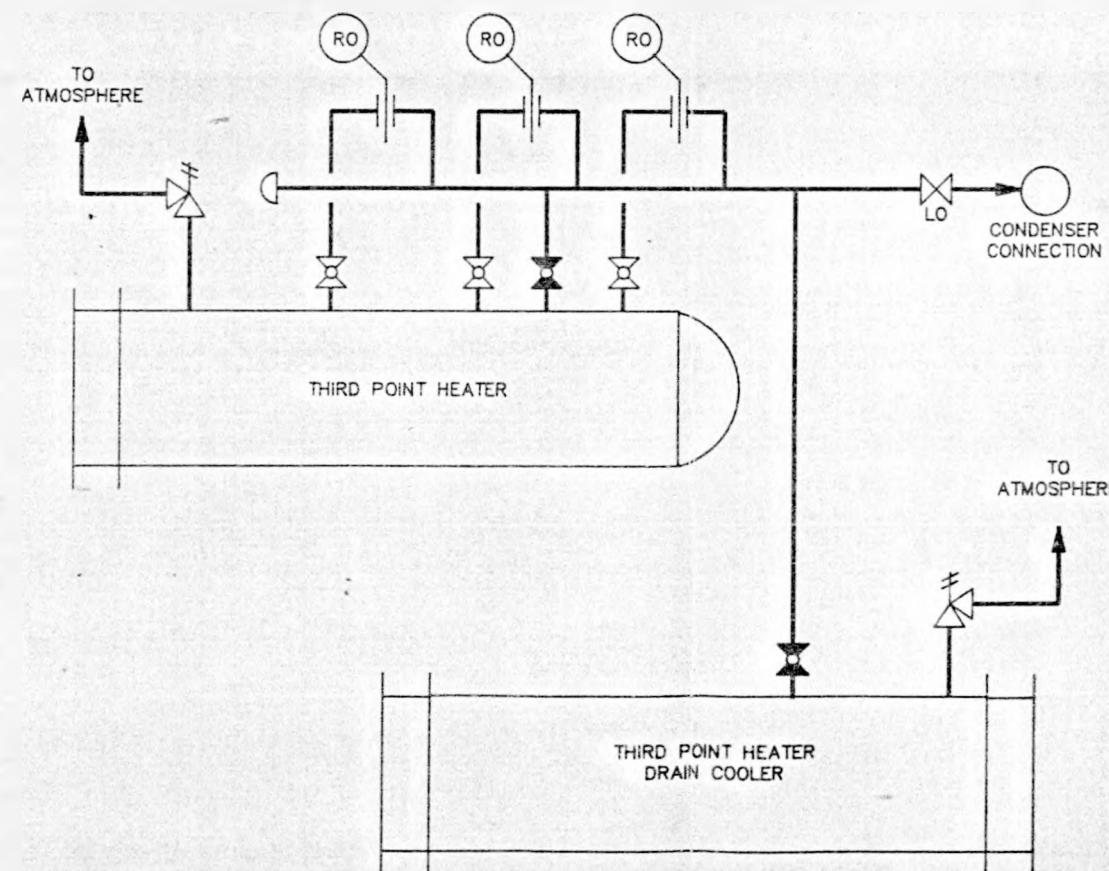
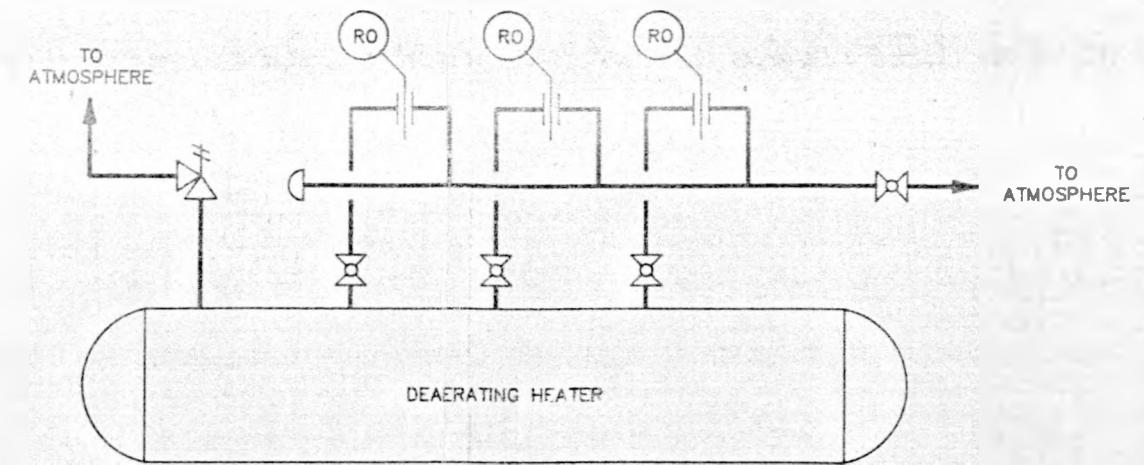
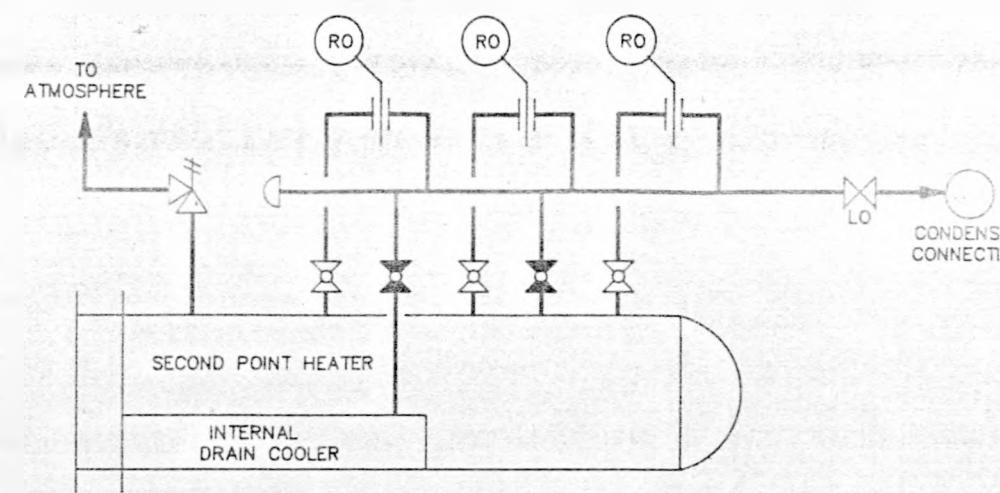
DRAWINGS

Drawing No.

14884-PSK-5054A

Title

Steam Vents and Drains



NOTES
1. THE HEATER VENT SYSTEM IS SHOWN FOR UNIT 1, THE HEATER VENT SYSTEM FOR UNIT 2 IS SIMILAR.

4	3	2	1	ISSUE	P & I SKETCH 2 X 300 MW(e)
			<i>TOW</i>	PREP	STEAM VENTS AND DRAINS
			<i>me-AP</i>	REVIEW	SHEET 1 OF 1
			<i>ACC</i>	APP	4 X 350 MW(t) HTGR PLANT
			<i>6/23/86</i>	DATE	GAS COOLED REACTOR ASSOCIATES
					STONE & WEBSTER ENGINEERING CORP.
					DWG. 14884 -PSK - 5054A

A | B | C | D | E | F | G | H | I | J | K | L | M | N | P | Q | R | S | T | U | V |