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HTGR

HVAC
SUBSYSTEM DESIGN DESCRIPTION

AUTHOR / CONTRACTOR

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HFD-49011

HVAC
SUBSYSTEM DESIGN DESCRIPTION

4 x 350 MW(t) MODULAR HTGR PLANT

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LIST OF ACRONYMS

ECA	Energy Conversion Area
H&V	Heating and Ventilation
HVAC	Heating, Ventilation, and Air Conditioning
MSG	Mechanical Services Group
NI	Nuclear Island
OPDS	Overall Plant Design Specification
PSB	Personnel Service Building
RB	Reactor Building
RSB	Reactor Service Building
SSDD	Subsystem Design Description
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.

The HVAC system is a subsystem within the Mechanical Services Group (MSG).

The HVAC system for the 4 x 350 MW(t) Modular HTGR Plant presently consists of ten, nonsafety-related subsystems located in the Nuclear Island (NI) and Energy Conversion Area (ECA) of the plant. The following is a brief description summarizing the scope of each respective HVAC subsystem.

A. REACTOR BUILDING HVAC SYSTEM

The reactor building HVAC system provides once-through conditioned supply air and monitored/filtered exhaust, supplemented by local cooling, for each reactor building (RB).

One air handling unit with redundant fans supplies conditioned ventilation air to two reactor buildings. A similar air handling unit services the other two reactor buildings. The reactor and steam generator cavities are isolated during normal operation and are cooled by local unit coolers during shutdown conditions. The ventilation air transfers from areas of low radioactivity to areas of high radioactivity before it is discharged from a monitored stack. If the stack radiation detectors indicate an unacceptable level of radioactive particles in the exhaust, the air is routed through a filter train with redundant fans before release to the atmosphere.

During shutdown, both supply fans and both filtration fans are operated, and the cavity isolation valves are opened to purge the reactor and steam generator cavities.

B. REACTOR SERVICE BUILDING HVAC SYSTEM

The reactor service building HVAC system provides conditioned supply air to the reactor service building (RSB) and monitor/filter that portion of the air that is exhausted from the potentially radioactive cells.

One air handling unit supplies conditioned air to the low radioactivity rooms in the reactor service building. Part of the air is recirculated (summer) or discharged to the maintenance enclosure (winter). Air transferred to potentially radioactive cells is monitored and discharged to the atmosphere. If the stack monitors detect unacceptable levels of radioactive particles in the exhaust, the air is routed through a filter train before release.

C. MAINTENANCE ENCLOSURE H&V SYSTEM

The maintenance enclosure H&V system provides ventilation and heating for the maintenance enclosure.

The maintenance enclosure is cooled by outdoor air supplied by wall louvers and exhausted by power roof ventilators. In the winter, supplemental heating is provided by unit heaters suppled with hot water, and

infiltration is reduced by closing the wall-mounted dampers and transferring clean air from the RSB. Capacity control is accomplished by cycling the fans and dampers with space thermostats.

D. PERSONNEL SERVICE BUILDING HVAC SYSTEM

The personnel service building HVAC system provides once-through conditioned supply air to the personnel services building (PSB), and monitor/filter the air exhausted from the potentially radioactive rooms.

The personnel service building is air conditioned by a supply air handling unit supplying the controlled area, laboratory and lockers. Air transferred to potentially radioactive rooms is monitored and, if necessary, filtered before release to the atmosphere.

E. NI COOLING WATER BUILDING, LIQUID NITROGEN ENCLOSURE, AND HELIUM STORAGE STRUCTURE H&V SYSTEM

The H&V systems associated with the NI cooling water building, the liquid nitrogen enclosures, and helum storage structure provides heating and ventilation for the areas within these respective structures.

Each of these structures is cooled by outdoor air supplied by wall louvers and exhausted by power roof ventilators. In the winter; supplemental heating is provided by unit heaters supplied with hot water, and infiltration is reduced by closing the wall mounted dampers. Capacity control is accomplished by cycling the fans and dampers with space thermostats.

F. CONTROL ROOM AREA HVAC SYSTEM

The control room area HVAC system supplies conditioned air to the control, computer, and mechanical equipment room areas of the operations center for the purpose of removing equipment heat, ventilation, and for maintaining personnel comfort. The system is designed to be operational during all normal plant modes to maintain space temperatures and humidity levels within acceptable limits.

The system consists of two nonsafety-related 100 percent capacity air-conditioning units, ductwork, dampers and controls, a return exhaust fan, a kitchen exhaust fan, and a toilet room exhaust fan. Each air-conditioning unit consists of a cooling coil, prefilter and roll filter, and a centrifugal supply fan. Control room and computer room area heating is provided by electric heating coils in the respective rooms air supply ductwork.

G. STANDBY POWER BUILDING H&V SYSTEM

The standby power building H&V system supplies ventilation to each of the standby generator rooms.

Each standby generator area is provided with normal and standby ventilation which is designed to maintain space temperatures and humidity levels within acceptable limits during normal and transient modes of plant operation.

A normal ventilation exhaust system is provided for each area when the standby generator is not operating and consists of a vaneaxial fan, ductwork, dampers, and controls. Electric unit heaters are provided in each area to maintain minimum design temperatures when the standby generators are not operating.

A standby ventilation supply system is provided for each area when the standby generator is operating and consists of two 50 percent capacity vaneaxial supply fans, ductwork and dampers, and controls. This ventilation system receives its emergency power from the electrical bus that is supplied by the corresponding standby generator; therefore, ensuring the removal of heat generated by standby generator operations.

H. RADIOACTIVE WASTE MANAGEMENT BUILDING HVAC SYSTEM

The radioactive waste management building HVAC system supplies conditioned air to the office, lab, compactor, and general areas of the radioactive waste management building. The system is designed to maintain suitable environmental conditions for personnel and equipment protection and to control and minimize the release of radioactive materials from the building to the outside environment and to the general areas of the building during normal modes of plant operation.

The air supply system is nonsafety-related and consists of an air preheat coil with roll filter, two 50 percent capacity air-conditioning units--each consisting of a prefilter, cooling coil, heating coil, and centrifugal fan--and associated ductwork, dampers, and controls.

The air exhaust system is also nonsafety-related and consists of one 100 percent capacity bypass centrifugal fan, one 100 percent capacity filter exhaust fan, a filter bank consisting of a prefilter and a high efficiency particulate air filter, a lavatory exhaust fan, and associated ductwork dampers, and controls.

I. TURBINE BUILDING HVAC SYSTEM

The turbine building HVAC system supplies conditioned air to all levels of the turbine building for the purpose of removing heat generated within the building by equipment and other sources in order to maintain space temperatures at acceptable limits during normal modes of plant operation.

This nonsafety-related system consists of four evaporative spray cooling units with each unit consisting of two vaneaxial supply fans, roll filter, evaporative cooler, spray pump, and distribution ductwork and dampers. The system delivers outdoor air, conditioned by the evaporative coolers, to the respective areas in the building and exhausts the inside air by power roof ventilators. These roof exhaust fans operate in sequence with

the supply fans and return air dampers to modulate the return and exhaust air to give a mixed air temperature above a minimum set point when the evaporative coolers are not required. Heating for the building is provided by hot water unit heaters, and separate exhaust fans are provided for the lube oil conditioning room and battery rooms.

J. MAKEUP WATER TREATMENT AND AUXILIARY BOILER BUILDING HVAC SYSTEM

The makeup water treatment and auxiliary boiler building HVAC system supplies ventilation to the general areas and to the auxiliary boiler area of the building, and conditioned air to the office and lab areas of the building. The system is designed to maintain suitable environmental conditions for equipment protection and for personnel habitability during normal modes of plant operation.

The general area of the makeup water treatment section of the building is ventilated by a nonsafety-related supply and exhaust system consisting of one 100 percent capacity vaneaxial supply fan, one 100 percent capacity vaneaxial exhaust fan, one evaporative cooler with roll filter, ductwork, dampers, and controls. Heating is provided to the general area by hot water unit heaters to maintain the area above minimum design temperature.

The auxiliary boiler area is ventilated by a nonsafety related system which operates primarily during auxiliary boiler operation during the startup mode of plant operation. The system consists of a motorized air intake louver, filters, ductwork, two roof exhaust fans, and controls. Heating is provided by hot water unit heaters to maintain the area above minimum design temperature.

The office and lab area is conditioned by one package air-conditioning unit, ductwork, dampers, and controls. Supplemental heating is provided by an electric heating coil in the rooms air supply ductwork.

SECTION 1

SUBSYSTEM FUNCTIONS AND DESIGN REQUIREMENTS

1.1 SUBSYSTEM FUNCTIONS

The function of the HVAC subsystem is to ensure that building environments are established and maintained during normal and transient plant operation to assure environmental requirements are met for operator occupancy, equipment, component and instrumentation operability and maintenance.

Specific functions and requirements of each of the HVAC subsystems have been provided in the following subsections.

1.1.1 Reactor Building HVAC System

The function of the Reactor Building HVAC system is to:

- Supply the building with sufficient ventilation air, supplemented by local cooling, to maintain appropriate environmental conditions for equipment and personnel.

1.1.2 Reactor Service Building HVAC System

The function of the Reactor Service Building HVAC system is to:

- Provide air for personnel habitability, cool mechanical and electrical equipment, and dispose of radioactive gases and particulates, if any.

1.1.3 Maintenance Bay Enclosure H&V System

The functions of the Maintenance Enclosure H&V system are to:

- Provide ventilation for personnel comfort during refueling and maintenance operations.

- Provide space heating during winter, and pressurization to prevent natural-draft-induced infiltration.

The Maintenance Enclosure H&V system does not accomplish any radionuclide control function identified under Goal 3.

1.1.4 Personnel Service Building HVAC System

The functions of the Personnel Service Building HVAC system are to:

- Provide a conditioned air supply to keep the building habitable for personnel.
- Dispose of radioactive contaminants, if any, through a filtered exhaust system.

1.1.5 NI Cooling Water Building, Liquid Nitrogen Enclosure, and Helium Storage Structure H&V System

The functions of these H&V Systems are to:

- Provide ventilation for equipment cooling and/or for personnel comfort.
- Provide space heating during winter.

1.1.6 Control Room Area HVAC System

The functions of the Control Room Area HVAC system are to:

- Condition the control, computer, and mechanical equipment rooms environment to maintain plant performance capability.
- Maintain ambient environmental conditions (air quality, temperature, humidity, pressure, and noise levels) to acceptable levels for component operation and protection and for personnel habitability during normal plant modes of operation.
- Provide for personnel protection from radiation, toxic gases, smoke/fumes, and dust.

1.1.7 Standby Power Building H&V System

The functions of the standby power building H&V system are to:

- Condition the Standby Power Building environment to maintain plant performance capability.
- Maintain ambient environmental conditions (air quality, temperature, and humidity) at acceptable levels for component operability during normal and transient modes of plant operation.

1.1.8 Radioactive Waste Management Building HVAC System

The functions of the Radioactive Waste Management Building HVAC System are to:

- Condition the Radioactive Waste Management Building environment to maintain plant performance capability.
- Maintain ambient environmental conditions (air quality, temperature, humidity, and pressure) at acceptable levels for component operation and protection and personnel habitability during normal modes of plant operation.
- Provide for personnel protection from radiation, smoke/fumes and dust.
- Transfer air from areas with lessor potential for radiation contamination into areas with greater potential for radiation contamination, and to exhaust from the latter areas.

1.1.9 Turbine Building HVAC System

The functions of the Turbine Building HVAC system are to:

- Condition the turbine building environment to maintain plant performance capability.
- Maintain ambient environmental conditions (air quality, temperature, and humidity) at acceptable levels for component operation and protection during normal modes of plant operation.

1.1.10 Makeup Water Treatment and Auxiliary Boiler Building HVAC System

The functions of the Makeup Water Treatment and Auxiliary Boiler Building HVAC system are to:

- Condition the Makeup Water Treatment and Auxiliary Boiler Building to maintain plant performance capability.
- Maintain ambient environmental conditions (air quality, temperature, and humidity) at acceptable levels for component operation and protection and personnel habitability during normal and startup modes of plant operation.
- Provide for personnel protection from toxic gases, smoke/fumes, and dust.

SECTION 4

SUBSYSTEM AND COMPONENT INTERFACES

4.1 SUBSYSTEM INTERFACE REQUIREMENTS

4.1.1 Interface Requirements Imposed on Other Systems by NI HVAC Systems

The Nuclear Island HVAC 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 descriptive statement of the nature of the interface, the interfacing component, and the requirements of the interface.

4.1.2 Interface Requirements Imposed on Other Systems by ECA HVAC Systems

The Energy Conversion Area HVAC interface requirements, at the system level, are presented in Table 4.1-2 showing the system on which the requirements are imposed, and a brief descriptive statement of the nature of the interface, the interfacing component, and the requirements of the interface.

4.1.3 Interface Requirements Imposed on Subsystems Within the NI HVAC Systems

The Nuclear Island HVAC interface requirements, at the subsystem level, are presented in Table 4.1-3 showing the subsystem within the system on which the requirements are imposed, and a brief descriptive statement of the nature of the interface, the interfacing component, and the requirements of the interface.

4.1.4 Interface Requirements Imposed on Subsystems Within the ECA HVAC Systems

The Energy Conversion Area HVAC interface requirements, at the subsystem level, are presented in Table 4.1-4 showing the subsystem within the system on which the requirements are imposed, and a brief descriptive statement of the nature of the interface, the interfacing component, and the requirements of the interface.

TABLE 4.1-1

INTERFACE REQUIREMENTS IMPOSED ON OTHER SYSTEMS BY
NI HVAC SYSTEMS

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
REACTOR/AUXILIARY BUILDING HVAC SYSTEM			
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)			
(Liquid Radioactive Waste Subsystem)	Equipment drain piping	Unit coolers servicing cells subject to radioactive release	Provide drainage to radwaste system for unit coolers that trap halogens in the condensate. (11.0401.001)
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)	No Interface		
6. Plant Protection and Instrumentation System (32)	No Interface		
7. Fuel Handling, Storage and Shipping System (34)	No Interface		
8. Plant Control, Data and Instrumentation System (37)	No Interface		
9. Power Conversion System (50)	No Interface		

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(Reactor Building)	Provide housing	Building space	Provide housing and supports for the air handling units, exhaust units, unit coolers, roof ventilators, and ductwork. (11.0401.002)
(Reactor Auxiliary Building)	Provide housing	Building space	Provide housing and supports for air handling units and ductwork. (11.0401.003)
14. Mechanical Services System (90)	See Table 4.1-3 for interface requirements imposed by NI HVAC systems on subsystems within the Mechanical Services System.		
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Equipment terminals and control panels	Provide [60] Kw of 480 V electrical power for HVAC loads. (11.0401.004)

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
REACTOR SERVICE BUILDING HVAC SYSTEM			
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)	No Interface		
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)	No Interface		
6. Plant Protection and Instrumentation System (32)	No Interface		
7. Fuel Handling, Storage and Shipping System (34)	No Interface		
8. Plant Control, Data and Instrumentation System (37)	No Interface		
9. Power Conversion System (50)			
(Demineralized Water Makeup Subsystem)	Provide makeup water	At PPIS room(s)	Provide 0.1 gpm makeup water to the humidifiers of the evaporators of the PPIS unit coolers. (11.0401.005)
10. Heat Rejection Group (52)	No Interface		

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(Reactor Service Building)	Provide housing	Building space	Provide housing and supports for the air handling units, exhaust units, roof ventilators, packaged air conditioners, and ductwork. (11.0401.006)
14. Mechanical Services System (90)	See Table 4.1-3 for interface requirements imposed by NI HVAC systems on subsystems within the Mechanical Services System.		
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Equipment terminals and control panels	Provide [40] Kw of 480 V electrical power for HVAC loads. (11.0401.007)

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
MAINTENANCE ENCLOSURE H&V SYSTEM			
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)	No Interface		
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)	No Interface		
6. Plant Protection and Instrumentation System (32)	No Interface		
7. Fuel Handling, Storage and Shipping System (34)	No Interface		
8. Plant Control, Data and Instrumentation System (37)	No Interface		
9. Power Conversion System (50)	No Interface		
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
13. Buildings Structures, and Building Services System (70)			
(Maintenance Enclosure)	Provide housing	Building space	Provide housing and supports for roof ventilators and unit heaters. (11.0401.008)
14. Mechanical Services System (90)	See Table 4.1-3 for interface requirements imposed by NI HVAC systems on subsystems within the Mechanical Services System.		
15. Electrical Group (92) (Non-Class 1E AC Distribution Subsystem)	Provide electric power	Equipment terminals and control panels	Provide [10] Kw of 480 V electrical power for H&V loads. (11.0401.009)
PERSONNEL SERVICE BUILDING HVAC SYSTEM			
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)	No Interface		
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)	No Interface		

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
6. Plant Protection and Instrumentation System (32)	No Interface		
7. Fuel Handling, Storage and Shipping System (34)	No Interface		
8. Plant Control, Data and Instrumentation System (37)	No Interface		
9. Power Conversion System (50)	No Interface		
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(Personnel Service Building)	Provide housing	Building space	Provide housing and supports for the air handling units, exhaust units, roof ventilators, and ductwork. (11.0401.010)
14. Mechanical Services System (90)	See Table 4.1-3 for interface requirements imposed by NI HVAC systems on subsystems within the Mechanical Services System.		

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Equipment terminals and control panels	Provide [20] Kw of 480 V electrical powre for HVAC loads. (11.0401.011)

NI COOLING WATER BUILDING, LIQUID NITROGEN ENCLOSURE, AND HELIUM STORAGE STRUCTURE H&V SYSTEMS

1. Reactor System (10)	No Interface	
2. Reactor Vessel System (11)	No Interface	
3. Reactor Services Group (20)	No Interface	
4. Heat Transport System (21)	No Interface	
5. Miscellaneous Control and Instrumentation System (30)	No Interface	
6. Plant Protection and Instrumentation System (32)	No Interface	
7. Fuel Handling, Storage and Shipping System (34)	No Interface	
8. Plant Control, Data and Instrumentation System (37)	No Interface	
9. Power Conversion System (50)	No Interface	

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(NI Cooling Water Building)	Provide housing	Building space	Provide housing and supports for roof ventilators and unit heaters. (11.0401.012)
(Liquid Nitrogen Enclosure)	Provide housing	Building space	Provide housing and supports for roof ventilators and unit heaters. (11.0401.013)
(Helium Storage Structure)	Provide housing	Building space	Provide housing and supports for roof ventilators and unit heaters. (11.0401.014)

TABLE 4.1-1 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
14. Mechanical Services System (90)	See Table 4.1-3 for interface requirements imposed by NI HVAC systems on subsystems within the Mechanical Services System.		
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Equipment terminals and control panels	Provide [10] Kw of 480 V electrical power for HVAC loads. (11.0401.015)

TABLE 4.1-2

INTERFACE REQUIREMENTS IMPOSED ON OTHER SYSTEMS BY
ECA HVAC SYSTEMS

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
	CONTROL ROOM AREA HVAC SYSTEM		
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)	No Interface		
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)			
(Radiation Monitoring Subsystem)	Provisions required for monitoring fresh air intake	Ventilation intake duct	Radiation levels in fresh air intake should be $\leq$ [TBD] mrem (11.0401.016)
6. Plant Protection and Instrumentation System (32)			
(Investment Protection Subsystem)	Limits ambient temperature of control room area to protect control/computer rooms equipment	At local temperature sensors	Maintain ambient environment temperature below 104°F. (11.0401.017)

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
7. Fuel Handling, Storage and Shipping System (34)	No Interface		
8. Plant Control, Data and Instrumentation System (37)			
(Plant Supervisory Control Subsystem)	Measures system parameters for system control	At various sensors in the HVAC system	Four to 20 ma at 24V dc required. (11.0401.018)
9. Power Conversion System (50)	No Interface		
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(Operations Center)	Provide space for the control room area HVAC components	Building space	[12,000] ft^3 of space required for all HVAC subsystem components and ductwork. (11.0401.019)
14. Mechanical Services System (90)	See Table 4.1-4 for interface requirements imposed by the ECA HVAC subsystem on subsystems within the Mechanical Services System.		

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Control room area air-conditioning units return fan, exhaust fans, and electric duct heaters	[135] kW of 480 V ac power required for all HVAC components (11.0401.020)
(Non-Class 1E Uninterruptable Power Supply Subsystem)	Provide electric power	At control room area HVAC controls and instrumentation	[TBD] kW of electric power required for controls and instrumentation (11.0401.021)
STANDBY POWER BUILDING H&V SYSTEM			
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)	No Interface		
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)	No Interface		

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
6. Plant Protection and Instrumentation System (32)			
(Investment Protection Subsystem)	Limits ambient temperature of standby generator area to ensure standby generator operation	At local temperature sensors	Maintain ambient environment temperature below 120°F. (11.0401.022)
7. Fuel Handling, Storage and Shipping System (34)	No Interface		
8. Plant Control, Data and Instrumentation System (37)			
(Plant Supervisory Control Subsystem)	Measures system parameters for system control	At various sensors in the HVAC system	Four to 20 ma at 24 V dc required. (11.0401.023)

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
9. Power Conversion System (50)	No Interface		
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(Standby Power Building)	Provide space for the standby power building H&V components	Building space	[10,000] ft^3 of space required for all H&V subsystem components and ductwork. (11.0401.024)
14. Mechanical Services System (90)	See Table 4.1-4 for interface requirements imposed by the ECA HVAC subsystem on subsystems within the Mechanical Services System.		
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Standby power building vaneaxial supply fans, vaneaxial exhaust fan, electric unit heaters, and motor-operated dampers	[150] kW of 480 V ac power required for all H&V components (11.0401.025)

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Non-Class 1E Uninterruptable Power Supply Subsystem)	Provide electric power	At standby power building HVAC controls and instrumentation	[TBD] kW of electric power required for controls and instrumentation (11.0401.026)
	RADIOACTIVE WASTE MANAGEMENT BUILDING HVAC SYSTEM		
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)	No Interface		
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)			
(Radiation Monitoring Subsystem)	Provisions required for monitoring ventilation exhaust	Ventilation exhaust duct	Radiation levels on exhaust duct should be $\leq$ [TBD] mrem (11.0401.027)
6. Plant Protection and Instrumentation System (32)	No Interface		
7. Fuel Handling, Storage and Shipping System (34)	No Interface		

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
8. Plant Control, Data and Instrumentation System (37)			
(Plant Supervisory Control Subsystem)	Measures system parameters for system control	At various sensors in the HVAC system	Four to 20 ma at 24 V dc required. (11.0401.028)
9. Power Conversion System (50)	No Interface		
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(Radioactive Waste Management Building)	Provide space for the radioactive waste management building HVAC components	Building space	[20,000] ft^3 of space required for all HVAC subsystem components and ductwork. (11.0401.029)
14. Mechanical Services System (90)	See Table 4.1-4 for interface requirements imposed by the ECA HVAC subsystem on subsystems within the Mechanical Services System.		

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Radwaste management building air-conditioning units, exhaust fans, electric duct heaters, and motor-operated dampers	[100] kW of 480 V ac power required for all HVAC components (11.0401.030)
(Non-Class 1E Uninterruptable Power Supply Subsystem)	Provide electric power	At radwaste management building HVAC controls and instrumentation	[TBD] kW of electric power required for controls and instrumentation (11.0401.031)
TURBINE BUILDING HVAC SYSTEM			
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)	No Interface		
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)	No Interface		
6. Plant Protection and Instrumentation System (32)	No Interface		

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
7. Fuel Handling, Storage and Shipping System (34)	No Interface		
8. Plant Control, Data and Instrumentation System (37)			
(Plant Supervisory Control Subsystem)	Measures system parameters for system control	At various sensors in the HVAC system	Four to 20 ma at 24 V dc required. (11.0401.032)
9. Power Conversion System (50)	No Interface		
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(Turbine Building)	Provide space for the turbine building HVAC components	Building space	[40,000] ft^3 fo space required for all HVAC subsystem components and ductwork. (11.0401.033)
14. Mechanical Services System (90)	See Table 4.1-4 for interface requirements imposed by the ECA HVAC subsystem on subsystems within the Mechanical Services System.		

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Turbine building evaporative air cooling units, roof exhaust fans, unit heating and miscellaneous exhaust fans	[180] kW of 480 V ac power required for all HVAC components (11.0401.034)
(Non-Class 1E Uninterruptable Power Supply Subsystem)	Provide electric power	At turbine building HVAC controls and instrumentation	[TBD] kW of electric power required for controls and instrumentation (11.0401.035)
MAKEUP WATER TREATMENT AND AUXILIARY BOILER BUILDING HVAC SYSTEM			
1. Reactor System (10)	No Interface		
2. Reactor Vessel System (11)	No Interface		
3. Reactor Services Group (20)	No Interface		
4. Heat Transport System (21)	No Interface		
5. Miscellaneous Control and Instrumentation System (30)	No Interface		
6. Plant Protection and Instrumentation System (32)	No Interface		

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
7. Fuel Handling, Storage and Shipping System (34)	No Interface		
8. Plant Control, Data and Instrumentation System (37)			
(Plant Supervisory Control Subsystem)	Measures system parameters for system control	At various sensors in the HVAC system	Four to 20 ma at 24 V dc required. (11.0401.036)
9. Power Conversion System (50)	No Interface		
10. Heat Rejection Group (52)	No Interface		
11. Reactor Cavity Cooling System (56)	No Interface		
12. Shutdown Cooling System (57)	No Interface		
13. Buildings Structures, and Building Services System (70)			
(Makeup Water Treatment and Auxiliary Boiler Building)	Provide space for the building's HVAC components	Building space	[8000] ft^3 of space required for all HVAC subsystem components and ductwork. (11.0401.037)
14. Mechanical Services System (90)	See Table 4.1-4 for interface requirements imposed by the ECA HVAC subsystem on subsystems within the Mechanical Services System.		

TABLE 4.1-2 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
15. Electrical Group (92)			
(Non-Class 1E AC Distribution Subsystem)	Provide electric power	Evaporative air cooling unit, supply fan, roof exhaust fans, unit heaters, air-conditioning unit, and motorized louver	[150] kW of 480 V ac power required for all HVAC components (11.0401.038)
(Non-Class 1E Uninterruptable Power Supply Subsystem)	Provide electric power	At HVAC system controls and instrumentation and instrumentation	[TBD] kW of electric power required for controls and instrumentation (11.0401.039)

TABLE 4.1-3

INTERFACE REQUIREMENTS IMPOSED ON OTHER SUBSYSTEMS
WITHIN THE NI HVAC SYSTEMS

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
	REACTOR/AUXILIARY BUILDING HVAC SYSTEM		
Mechanical Services System (90)			
(Potable Water Subsystem)	No Interface		
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	No Interface		
(Waste Water Treatment Subsystem)	Equipment drain piping	HVAC equipment rooms and unit coolers serving nonradioactive areas	Remove condensate from cooling coils serving nonradioactive areas and pump to the wastewater disposal system (11.0401.040)
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide instrument air	HVAC Control panels in Reactor and Reactor Auxiliary Building	Supply 100 psig air to operate controls and actuators. (11.0401.041)

TABLE 4.1-3 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
	Provide damper actuation air	At power operated values	Provide 100 psig air (11.0401.042)
(Central HTW Heating Subsystem)	Provide hot water for heating capability	Reactor building air handling unit hot water coil	Provide hot water for [3 x 10^6] Btu/h heating load for the air handling units (11.0401.043)
(Plant Drains Subsystem)	No Interface		
(HVAC (Station Chilled Water Subsystem))	Provide chilled water for cooling capability	Reactor building air handling unit chilled water coils and unit coolers	Provide chilled water to remove [5 x 10^6] Btu/h from the air supply units and unit coolers (11.0401.044)
	REACTOR SERVICE BUILDING HVAC SYSTEM		
Mechanical Services System (90)			
(Potable Water Subsystem)	No Interface		
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	No Interface		

TABLE 4.1-3 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Waste Water Treatment Subsystem)	Equipment drain piping	HVAC equipment rooms	Remove condensate from cooling coils serving nonradioactive areas and pump to the wastewater disposal system. (11.0401.045)
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide instrument air	HVAC control panels in Reactor Service Building	Supply 100 psig air to operate contols and actuators (11.0401.046)
	Provide damper actuation air	At power operated valves	Provide 100 psig air (11.0401.047)
(Central HTW Heating Subsystem)	Provide hot water for heating capability	Reactor Service Building air handling unit hot water coil	Provide hot water for [2 x 10^6] Btu/h heating load for the air handling units (11.0401.048)
(Plant Drains Subsystem)	No Interface		

TABLE 4.1-3 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(HVAC (Station Chilled Water Subsystem))	Provide chilled water for cooling capability	Reactor Service Building air handling unit chilled water coil	Provide chilled water to remove [2 x 10^6] Btu/h from the air supply units and unit coolers (11.0401.049)
MAINTENANCE ENCLOSURE H&V SYSTEM			
Mechanical Services System (90)			
(Potable Water Subsystem)	No Interface		
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	No Interface		
(Waste Water Treatment Subsystem)	No Interface		
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide instrument air	H&V control panels in the Maintenance Enclosure	Supply 100 psig air to operate controls and actuators. (11.0401.050)

TABLE 4.1-3 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
	Provide damper actuation air	At power operated valves	Provide 100 psig air. (11.0401.051)
(Central HTW Heating Subsystem)	Provide hot water for heating capability	Area unit heaters	Provide hot water for [0.5 x 10^6] Btu/h heating load for the unit heaters. (11.0401.052)
(Plant Drains Subsystem)	No Interface		
	PERSONNEL SERVICE BUILDING HVAC SYSTEM		
Mechanical Services System (90)			
(Potable Water Subsystem)	No Interface		
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	No Interface		
(Waste Water Treatment Subsystem)	Equipment drain piping	HVAC equipment room	Remove condensate from cooling coils serving nonradioactive areas and pump to the wastewater disposal system. (11.0401.053)

TABLE 4.1-3 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide instrument air	HVAC control panels in the Personnel Service Building	Supply 100 psig air to operate controls and actuators. (11.0401.054)
	Provide damper actuation air	At power operated valves	Provide 100 psig air (11.0401.055)
(Central HTW Heating Subsystem)	Provide hot water for heating capability	Personnel Service building air handling unit hot water coil	Provide hot water for [1.5 x 10^6] Btu/h heating load for the air handling unit (11.0401.056)
(Plant Drains Subsystem)	No Interface		
(HVAC (Station Chilled Water Subsystem))	Provide chilled water for cooling capability	Personnel service building air handling unit chilled water coil	Provide chilled water to remove [3 x 10^6] Btu/h from the air supply unit. (11.0401.057)

TABLE 4.1-3 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
	NI COOLING WATER BUILDING, LIQUID NITROGEN ENCLOSURE, AND HELIUM STORAGE STRUCTURE H&V SYSTEMS		
Mechanical Services System (90)			
(Potable Water Subsystem)	No Interface		
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	No Interface		
(Waste Water Treatment Subsystem)	No Interface		
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide instrument air	H&V control panels in the miscellaneous buildings	Supply 100 psig air to operate controls and actuators. (11.0401.058)
	Provide damper actuation air	At power operated valves	Provide 100 psig air (11.0401.059)

TABLE 4.1-3 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Central HTW Heating Subsystem)	Provide hot water for heating capability	Area unit heaters	Provide hotwater for [1 x 10^6] Btu/h heating load for the area unit heaters. (11.0401.060)

TABLE 4.1-4

INTERFACE REQUIREMTNS IMPOSED ON OTHER SUBSYSTEMS
WITHIN THE ECA HVAC SYSTEMS

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
	CONTROL ROOM AREA HVAC SYSTEM		
Mechanical Services System (90)			
(Potable Water Subsystem)	No Interface		
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	Provisions required to isolate control and computer room areas upon halon release	[TBD]	[TBD] (11.0401.061)
(Waste Water Treatment Subsystem)	No Interface		
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide air for system component operation	At all air-operated dampers and applicable control instruments	[TBD] scfm of instrument air required (11.0401.062)

TABLE 4.1-4 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Central HTW Heating Subsystem)			
(Plant Drains Subsystem)	Provisions required for draining of cooling and heating coils	Control room area air-conditioning unit, hot water coils	Drain maximum coil capacities of [TBD] gallons (11.0401.063)
(HVAC (Chilled Water Subsystem))	Provide chilled water for cooling capability	Control room area air conditioning units chilled water coils	Provide (100) gpm of chilled water to the air-conditioning units (11.0401.064)
	STANDBY POWER BUILDING H&V SYSTEM		
Mechanical Services System (90)			
(Potable Water Subsystem)	No Interface		
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	Provisions required to shutdown ventilation system upon fire suppression initiation	[TBD]	[TBD]
(Waste Water Treatment Subsystem)	No Interface		
(Auxiliary Boiler Subsystem)	No Interface		

TABLE 4.1-4 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide air for system component operation	At all air-operated control instruments	[TBD] scfm of instrument air required (11.0401.065)
(Central HTW Heating Subsystem)	No Interface		
(Plant Drains Subsystem)	No Interface		
	RADIOACTIVE WASTE MANAGEMENT BUILDING HVAC SYSTEM		
Mechanical Services System (90)			
(Potable Water Subsystem)	No Interface		
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	No Interface		
(Waste Water Treatment Subsystem)	No Interface		
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		

TABLE 4.1-4 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Instrument and Service Air Subsystem)	Provide air for system component operation	At all air-operated dampers and applicable control instruments	[TBD] scfm of instrument air required. (11.0401.066)
(Central HTW Heating Subsystem)	Provide hot water for heating capability	Radwaste management building air-conditioning units hot water coils	Provide [90] gpm of hot water to the air-conditioning units. (11.0401.067)
(Plant Drains Subsystem)	Provisions required for drainage of cooling and heating coils	Radwaste management building air-conditioning unit	Drain maximum coil capacities of [TBD] gallons (11.0401.068)
(HVAC (Chilled Water Subsystem))	Provide chilled water for cooling capability	Radwaste management building air-conditioning units, chilled water coils	Provide [260] gpm of chilled water to the air-conditioning units (11.0401.069)
	TURBINE BUILDING HVAC BUILDING		
Mechanical Services System (90)			
(Potable Water Subsystem)	Provisions required for makeup to the evaporative cooling units	Turbine building evaporative cooling units	Provide [40] gpm of potable water to each of the evaporative cooling units (11.0401.070)

TABLE 4.1-4 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	Provisions required for smoke venting of building area	Turbine building roof exhaust fans	[TBD] (11.0401.071)
(Waste Water Treatment Subsystem)	No Interface		
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide air for system component operation	At all air-operated dampers and applicable control instruments	[TBD] scfm of instrument air required (11.0401.072)
(Central HTW Heating Subsystem)	Provide hot water for heating capability	Turbine building hot water unit heaters	Provide [6] gpm of hot water to each of the hot water unit heaters (11.0401.073)
(Plant Drains Subsystem)	Provisions required for drainage of evaporative cooling unit	Turbine building evaporative cooling units	Drain maximum unit capacities of [TBD] gallons (11.0401.074)

TABLE 4.1-4 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
	MAKEUP WATER TREATMENT AND AUXILIARY BOILER BUILDING HVAC SYSTEM		
Mechanical Services System (90)			
(Potable Water Subsystem)	Provisions required for makeup to the evaporative cooling unit	Makeup water treatment area evaporative cooling unit	Provide [10] gpm of potable water (11.0401.075)
(Storm Drainage Subsystem)	No Interface		
(Sanitary Drainage & Treatment Subsystem)	No Interface		
(Plant Fire Protection Subsystem)	No Interface		
(Waste Water Treatment Subsystem)	No Interface		
(Auxiliary Boiler Subsystem)	No Interface		
(Raw Water Treatment Subsystem)	No Interface		
(Instrument and Service Air Subsystem)	Provide air for system component operation	At all air-operated dampers and applicable control instruments	[TBD] scfm of instrument air required (11.0401.076)
(Central HTW Heating Subsystem)	Provide hot water for heating capability	Area hot water unit heaters	Provide [10] gpm of hot water to each of the hot water unit heaters (11.0401.077)

TABLE 4.1-4 (cont)

Interfacing Systems (With Subsystem/Identification)	Nature of Interface	Interfacing Component	Interface Requirements
(Plant Drains Subsystem)	Provisions required for drainage of evaporative cooling unit	Makeup water treatment area evaporative cooling unit	Drain maximum unit capacity of [TBD] gpm. (11.0401.078)

SECTION 9

REFERENCES

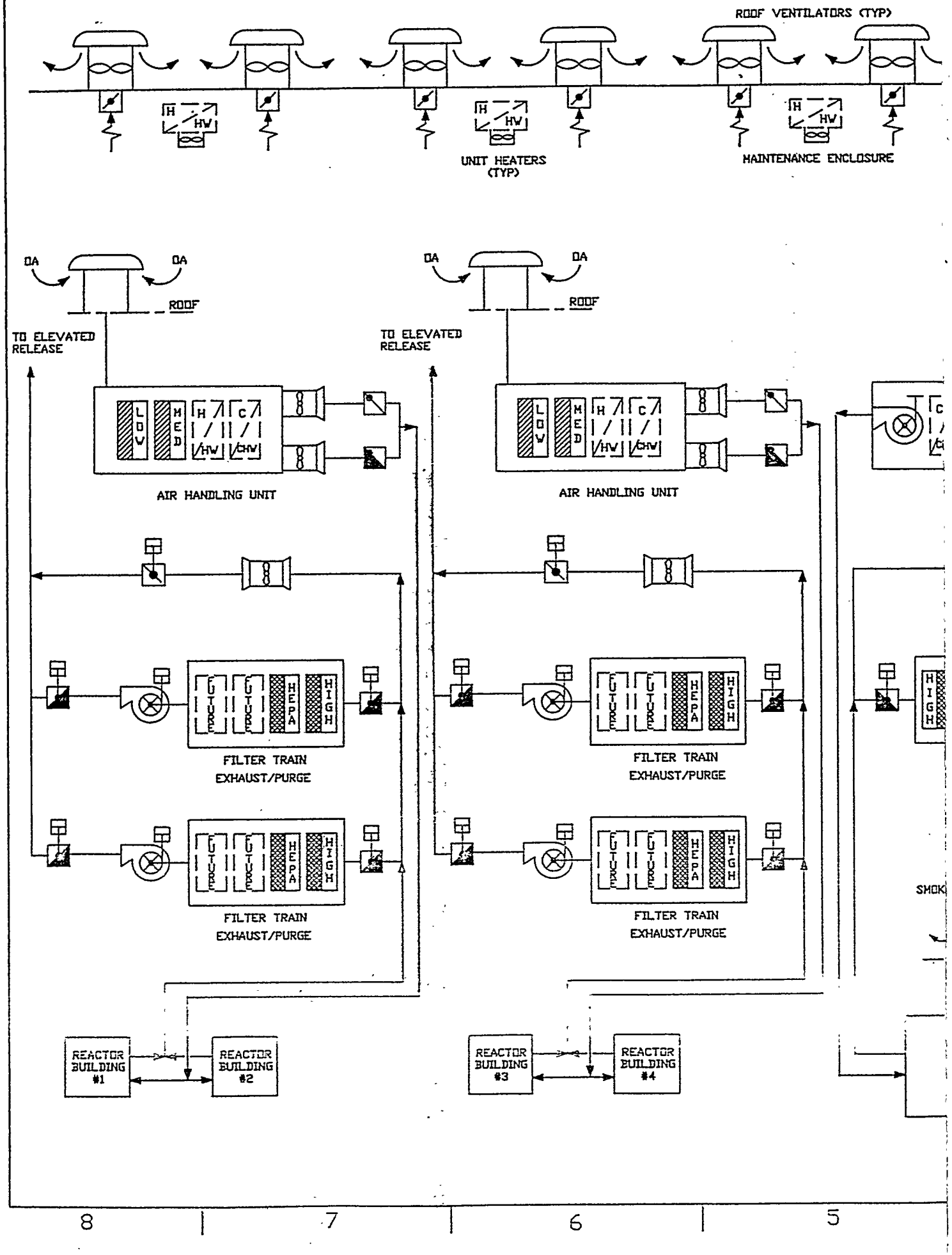
1. GA Technologies, Inc. (GA), et al. Overall Plant Design Specification 4 x 350 MW(t) Modular HTGR Plant, HTGR-86-004, Rev. 1, GA, San Diego, CA, February 1986.

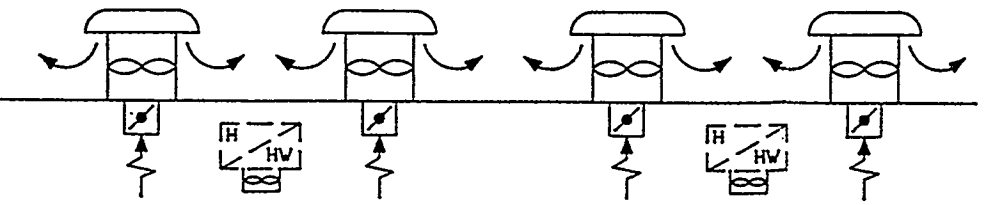
2. Bechtel Group, Inc. (BGI), et al. Preliminary Concept Description Report, 4 x 350 MW(t) HTGR Plant, Side-by-Side Steel Vessel, Prismatic Core Concept, HTGR-85-142, Rev. 0 BGI, San Francisco, CA October 1985.

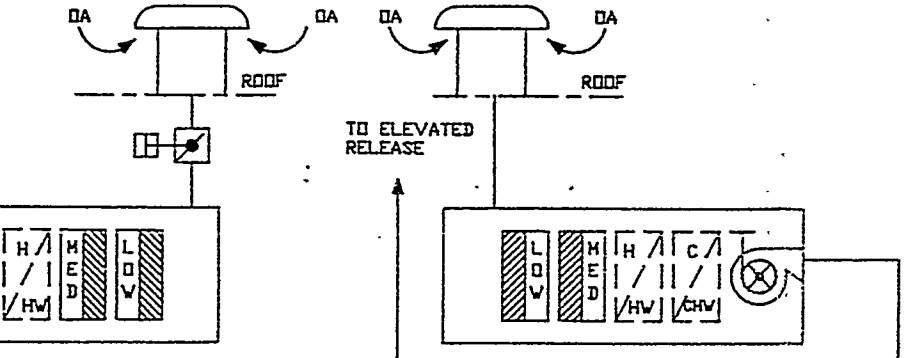
APPENDIX B

DRAWINGS

	Title
14884-PSK-90.11A	Nuclear Island HVAC Composite Flow Diagram
14884-PSK-90.11B	Reactor Building/Auxiliary Building HVAC System
14884-PSK-90.11C	Reactor Service Building HVAC System
14884-PSK-90.11D	Miscellaneous Buildings H&V Systems
14884-PSK-90.11E	Personnel Service Building HVAC System
14884-PSK-90.11F	Control Room Area HVAC System
14884-PSK-90.11G	Standby Power Building H&V System
14884-PSK-90.11H	Radwaste Management Building HVAC System
14884-PSK-90.11J	Turbine Building HVAC System
14884-PSK-90.11K	Makeup Water Treatment and Auxiliary Boiler Building HVAC System



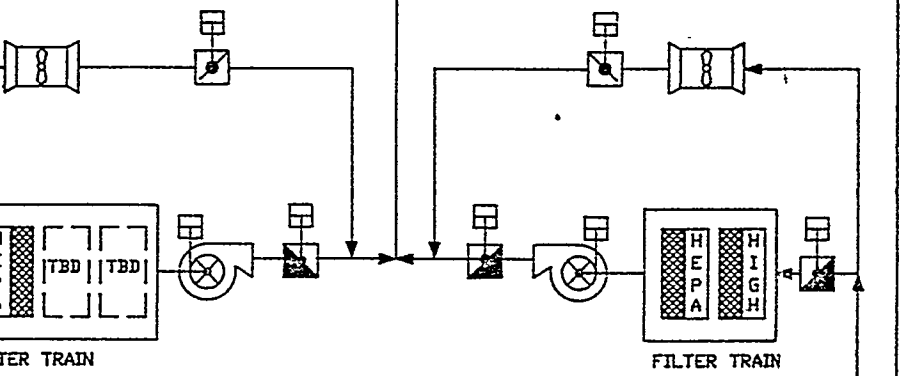




AIR HANDLING UNIT

AIR HANDLING UNIT

TO ELEVATED RELEASE



TER TRAIN

FILTER TRAIN

XHAUST FAN

ACTOR RVICE LDG.

PERSONNEL SERVICE BLDG.

NOTES:

1. ALL ELEVATED RELEASES WILL BE MONITORED FOR RADIOACTIVITY.
2. ADDITIONAL SPACES ARE PROVIDED FOR FUTURE CARBON ABSORBERS AND HEPA FILTERS IN THE RB & RSB EXHAUST FILTER HOUSINGS.

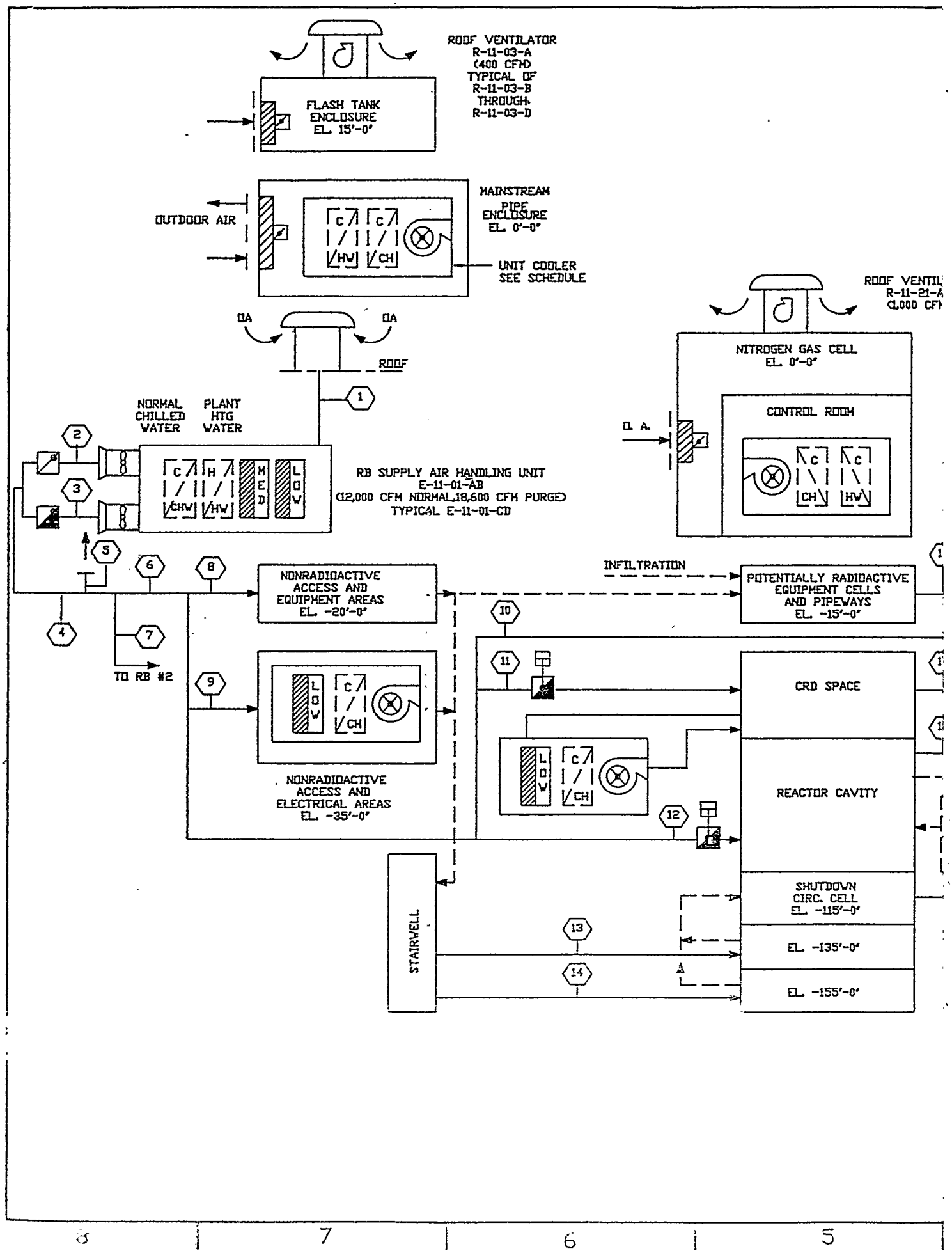
[illegible] NATIONAL, INC.
SAN FRANCISCO

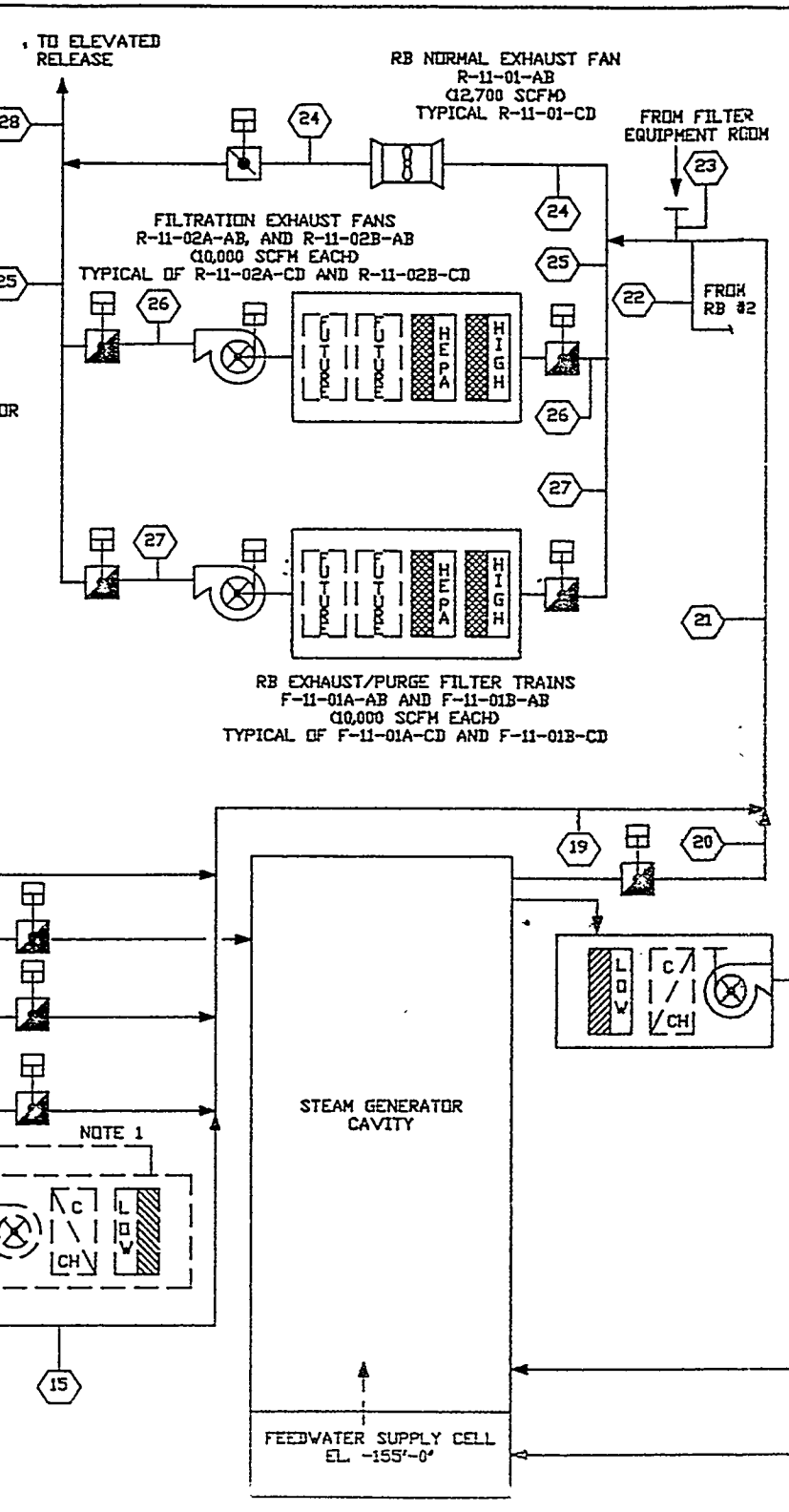
GAS-COOLED REACTOR ASSOCIATES
4x350 MW(t) MHTGR

NI HVAC SUBSYSTEM
COMPOSITE FLOW DIAGRAM

JOB NO.	DRAWING NO.	REV.
M-36100 14508	14884-PSK-90.11A	6/21/126

4 | 3 | 2 | 1





UNIT COOLER SCHEDULE		
EQUIPMENT NUMBER	SPACE COOLED	AIR FLOW (CFM)
E-11-04A-A	CRD ACCESS CELL @ EL. -8'-0"	3,000
B-A		3,000
E-11-05A-A	ELEC. EQPT. RM(s) @ EL.-35'-0"	13,500
B-A		13,500
E-11-06A-A	REACTOR CAVITY	6,500
B-A		6,500
C-A		6,500
D-A		6,500
E-11-07A-A	STEAM GENERATOR CAVITY	1,500
B-A		1,500
E-11-08-A	MAINSTREAM PIPE ENCLOSURE @ EL. 0'-0"	1,000*
E-11-09A/B	NITROGEN ENCL. CONTROL RM @ EL. 0'-0"	200*

* THE UNIT COOLERS IN THESE ENCLOSURES EACH CONTAIN A HEATING COIL AS WELL AS A CHILLED WATER COOLING COIL.

NOTE:

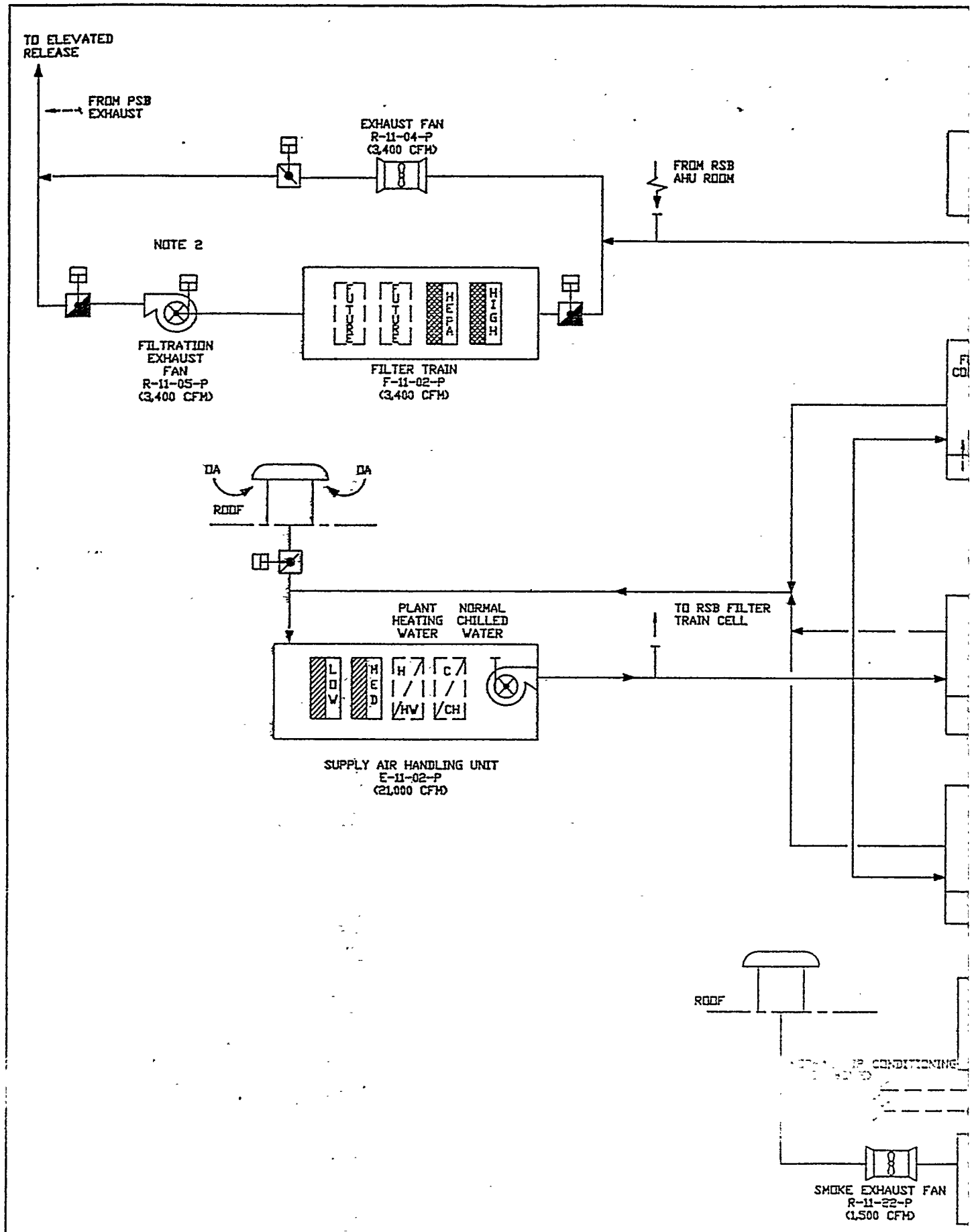
1. IF SUFFICIENT TIME IS ALLOWED FOR REACTOR COOL DOWN BEFORE ISI INSPECTIONS, THE REACTOR CAVITY CAN BE COOLED BY PURGE AIR AND THE UNIT COOLERS CAN BE ELIMINATED.

BECHTEL NATIONAL, INC.
SAN FRANCISCO

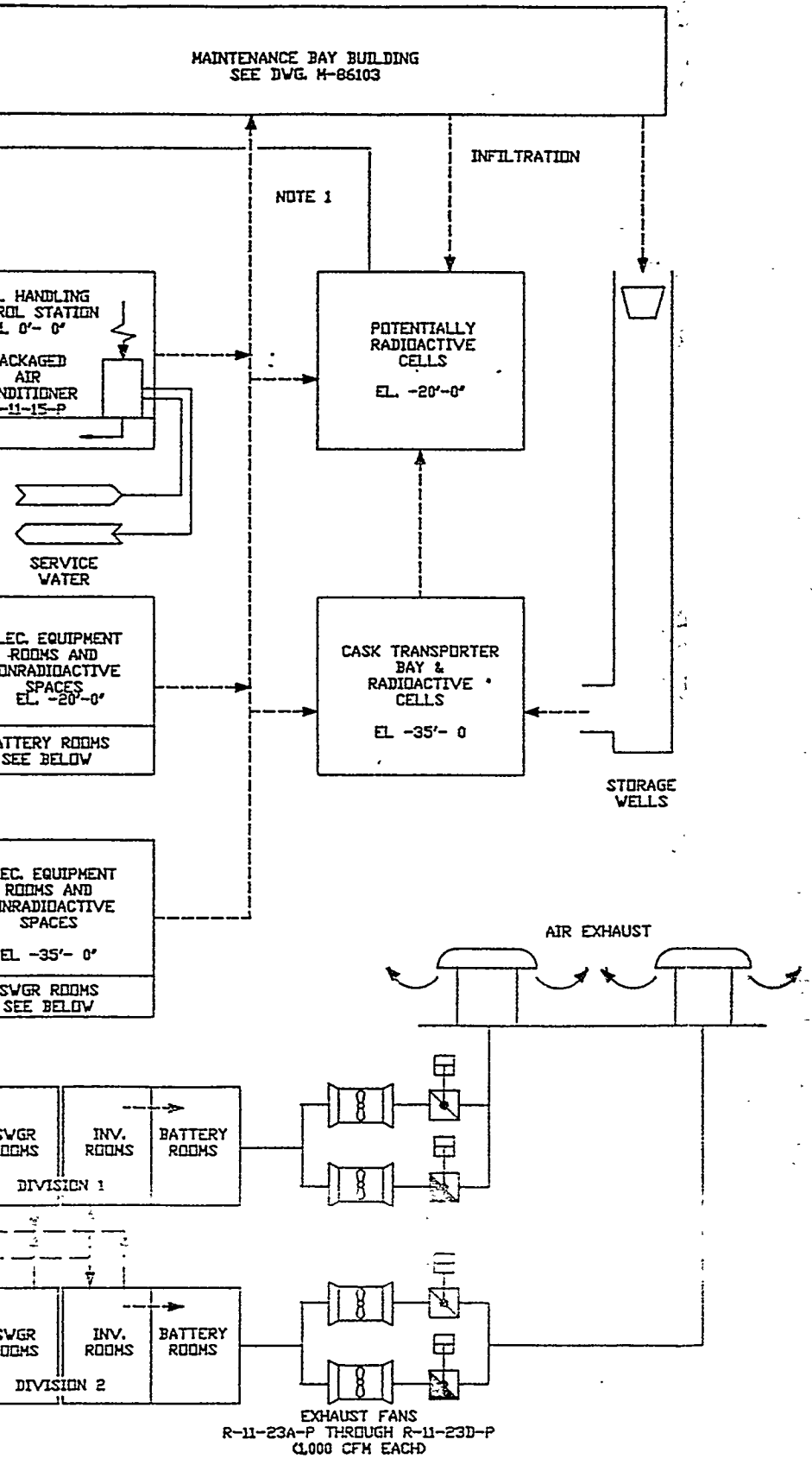
GAS-COOLED REACTOR ASSOCIATES
4x350 MW(t) MHTGR

FLOW DIAGRAM
REACTOR BLDG./AUXILIARY BLDG.
HVAC SUBSYSTEM

JOB NO.	DRAWING NO.	REV.
M-86101	14508	14884-PSK-90-115 5/12/1



8 | 7 | 6 | 5



NOTES:

1. THE MAKE-UP (O.A.) DAMPER GOES TO FULL OPEN WHEN THE OUTDOOR AIR TEMPERATURE IS 50°F OR LESS, TO PRESSURIZE THE MAINTENANCE BAY BUILDING.
2. AIR FLOW THROUGH THE EXHAUST FILTERS IS HELD CONSTANT BY A DUCT VELOCITY SENSOR WHICH MODULATES THE FAN'S INLET GUIDE VANES.
3. ALL COMPONENTS ARE NONSAFETY-RELATED.

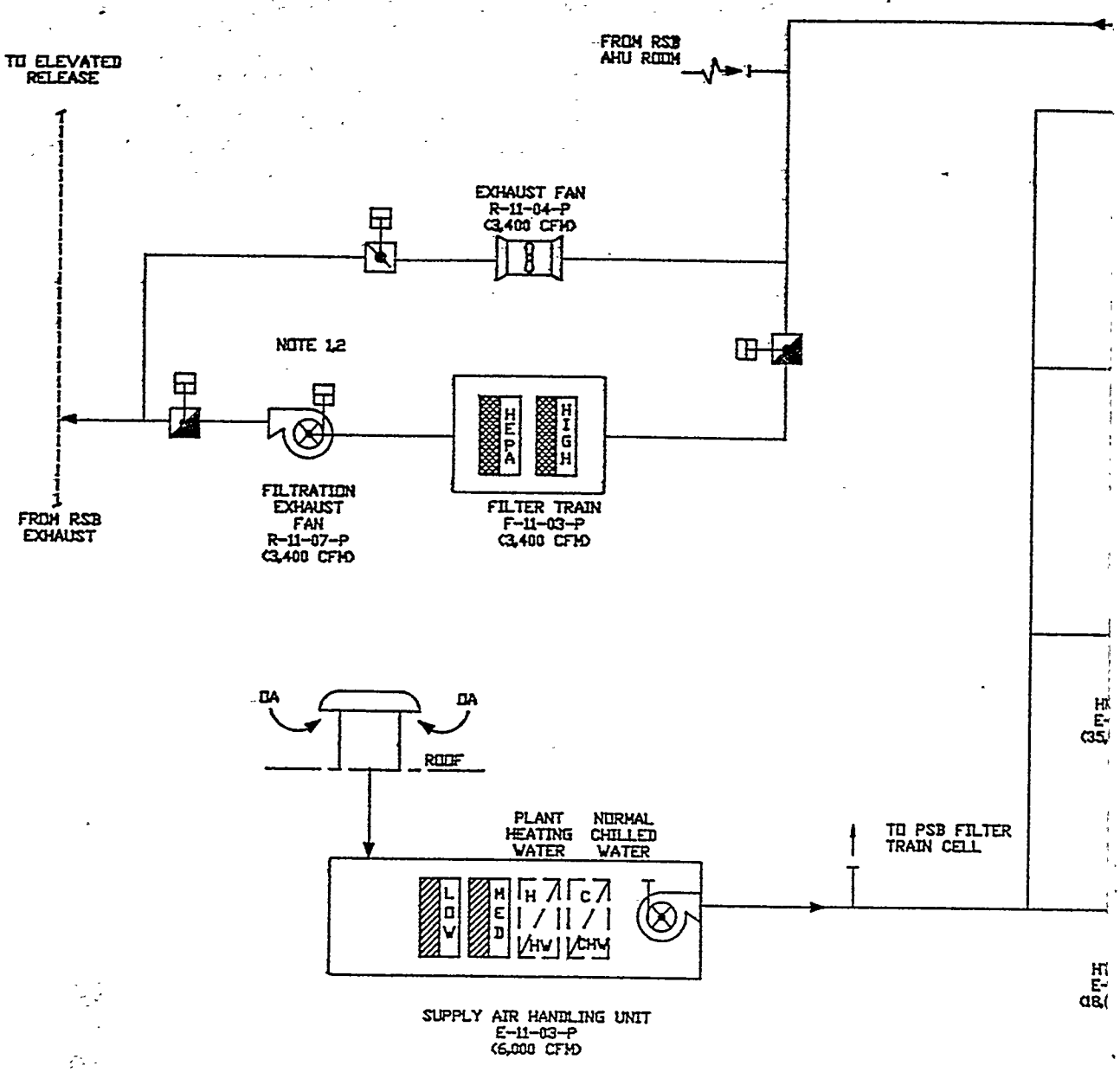
BECHTEL NATIONAL INC.
SAN FRANCISCO

GAS-COOLED REACTOR ASSOCIATES
4x350 MW(t) MHTGR

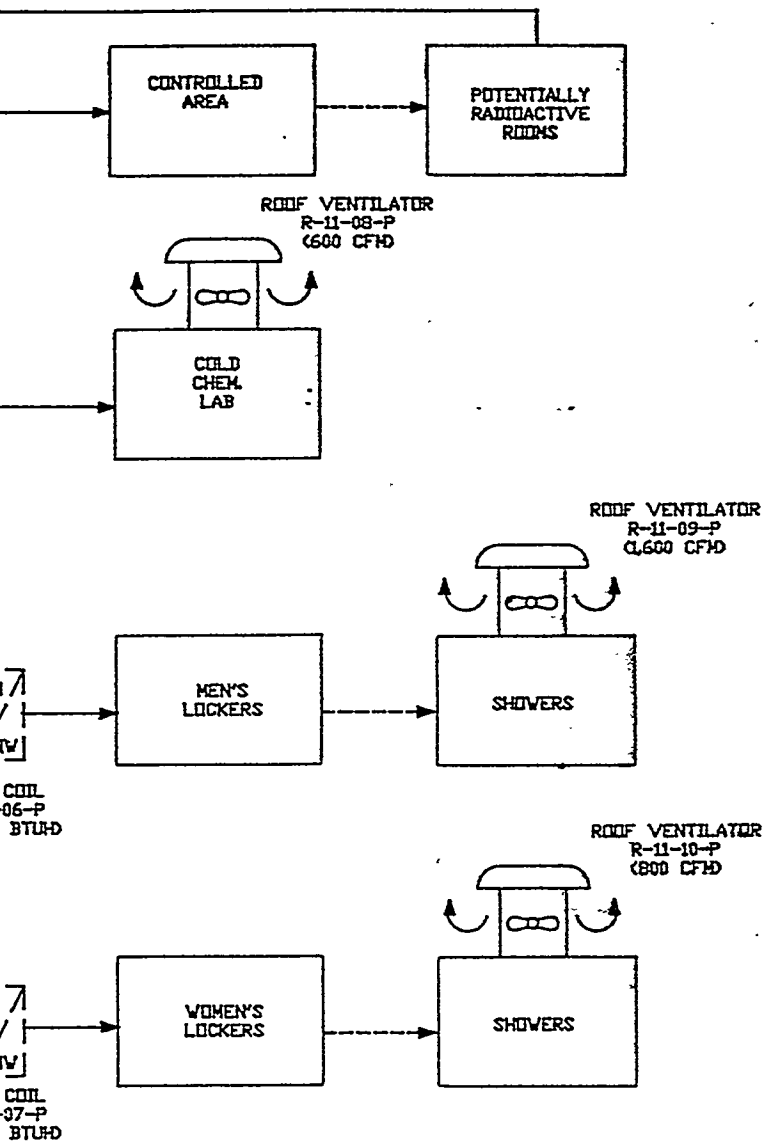
FLOW DIAGRAM
REACTOR SERVICE BUILDING
HVAC SUBSYSTEM

	JOB NO.	DRAWING NO.	REV
M-86102	14508	14884-PSK-90.11C	5

4 3 2 1



8 7 6 5



NOTES:

1. POTENTIALLY RADIOACTIVE SPACES ARE MAINTAINED AT A NEGATIVE PRESSURE.

2. AIRFLOW THROUGH FILTERS IS HELD CONSTANT BY A DUCT VELOCITY CONTROLLER MODULATING THE FAN'S INLET GUIDE VANES.

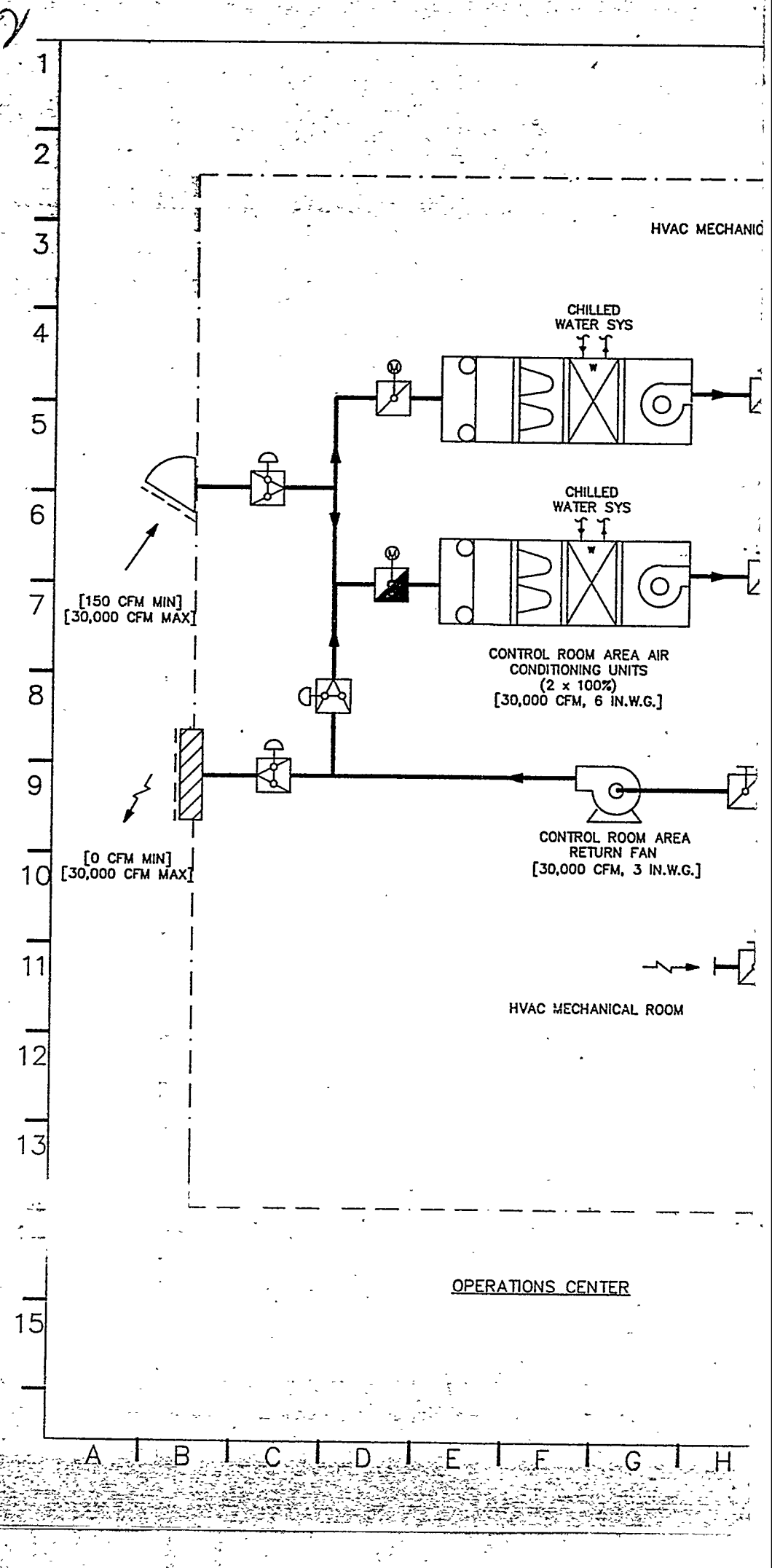
BECHTEL [illegible]
SAN FRANCISCO

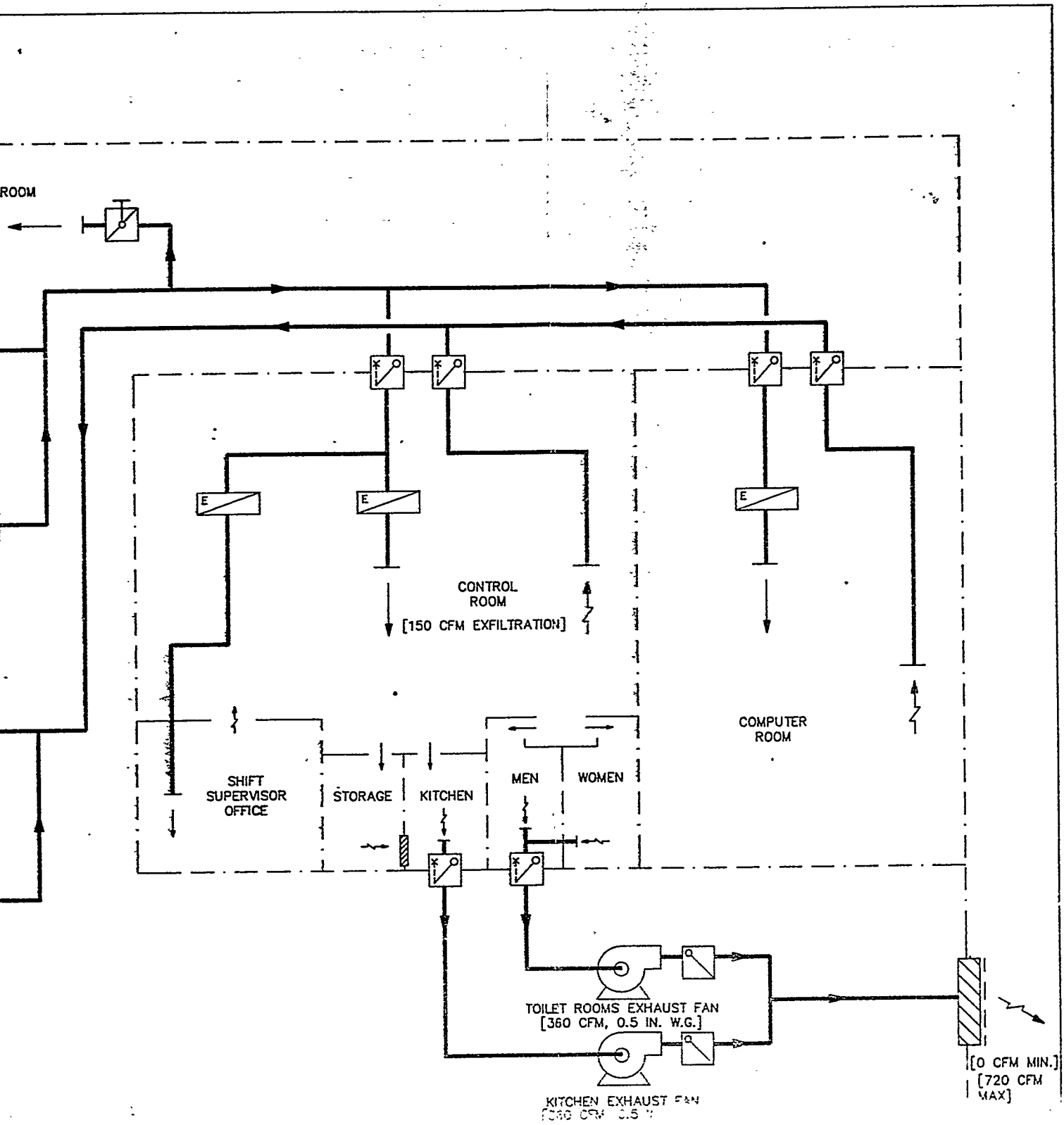
GAS-COOLED REACTOR ASSOCIATES
4x350 MW(t) MHTGR

FLOW DIAGRAM
PERSONNEL SERVICE BUILDING
HVAC SUBSYSTEM

JOB NO.	DRAWING NO.	REV.
M-86104	14508	14884-PSK-90.11E	6/3

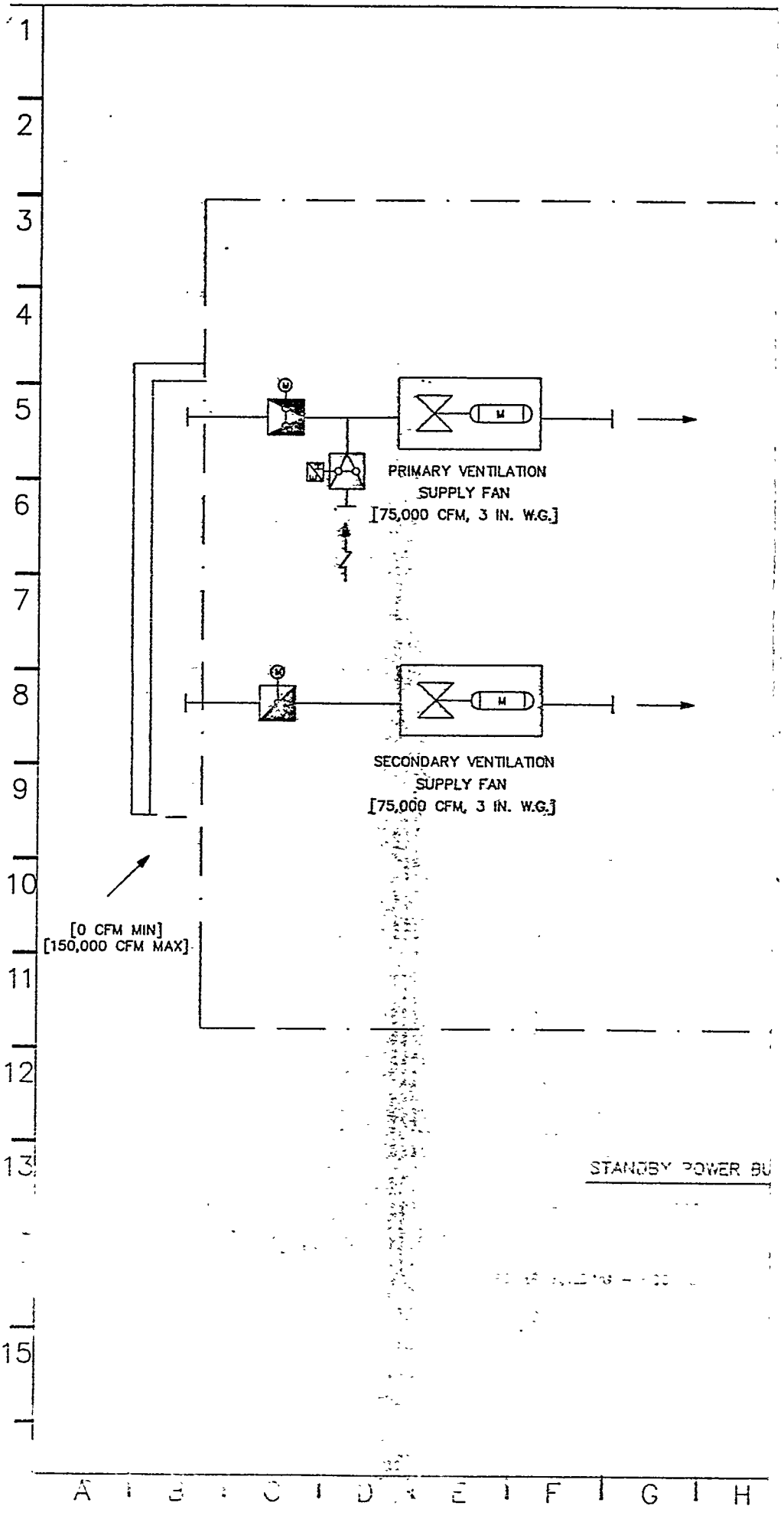
4 3 2 1

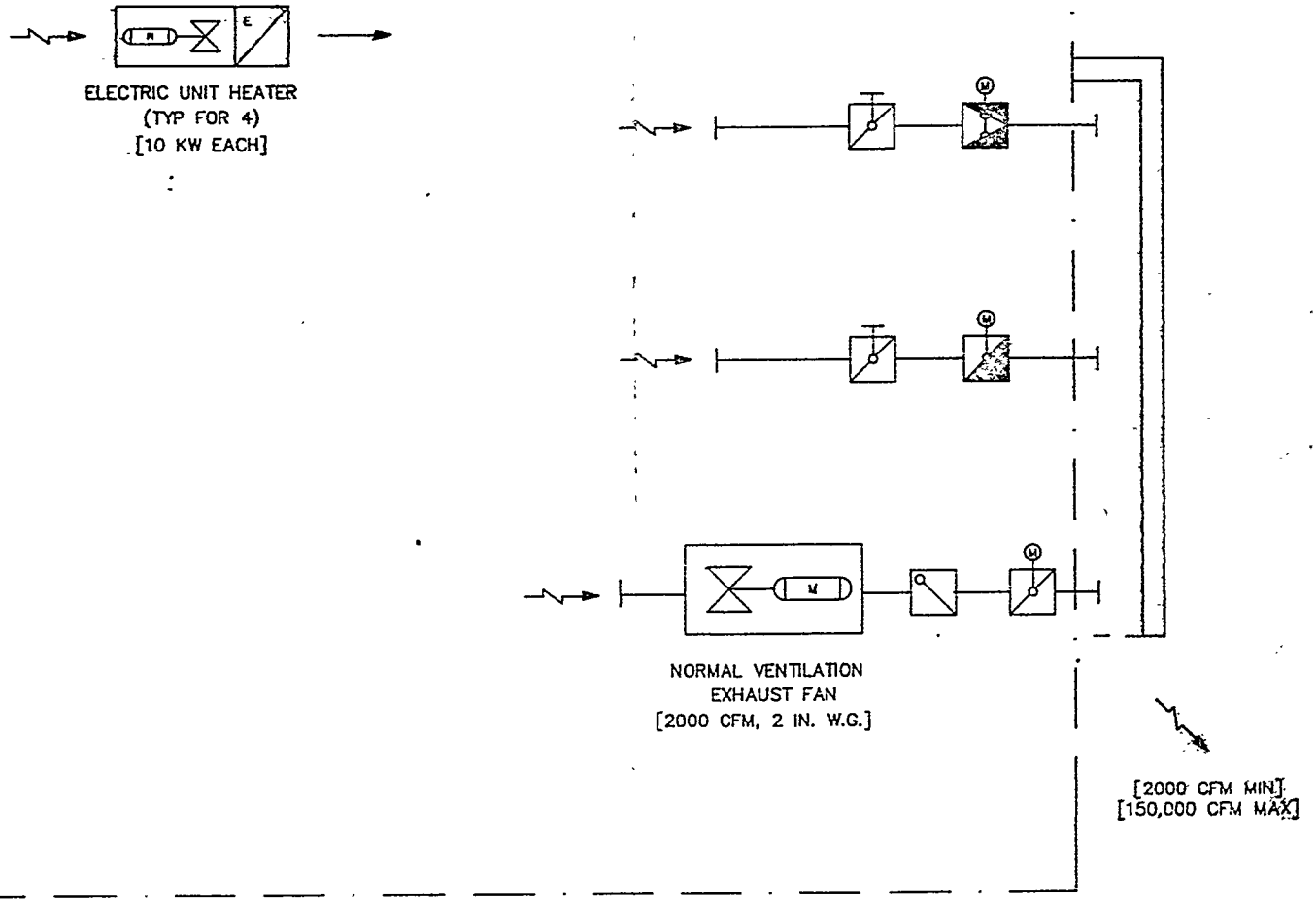

HVAC MECHANIC
CHILLED WATER SYS
CHILLED WATER SYS
[150 CFM MIN]
[30,000 CFM MAX]
CONTROL ROOM AREA AIR CONDITIONING UNITS
(2 x 100%)
[30,000 CFM, 6 IN.W.G.]
[0 CFM MIN]
[30,000 CFM MAX]
CONTROL ROOM AREA RETURN FAN
[30,000 CFM, 3 IN.W.G.]
HVAC MECHANICAL ROOM
OPERATIONS CENTER
1
2
3
4
5
6
7
8
9
10
11
12
13
15
A
B
C
D
E
F
G
H



4	3	2	1	ISSUE	P & I SKETCH
			RLK	PREP	CONTROL ROOM AREA HVAC SYSTEM
			[illegible]	REVIEW	4x350 MW(t) MOD HTGR PLANT
			WCC	APP	GAS COOLED REACTOR ASSOC.
			6/23/86	DATE	STONE & WEBSTER ENGINEERING CORP.
					DWG. 14884-PSK-90.11F

J K L M N P Q R S T U V


PRIMARY VENTILATION
SUPPLY FAN
[75,000 CFM, 3 IN. W.G.]
SECONDARY VENTILATION
SUPPLY FAN
[75,000 CFM, 3 IN. W.G.]
[0 CFM MIN]
[150,000 CFM MAX]
STANDBY POWER BU

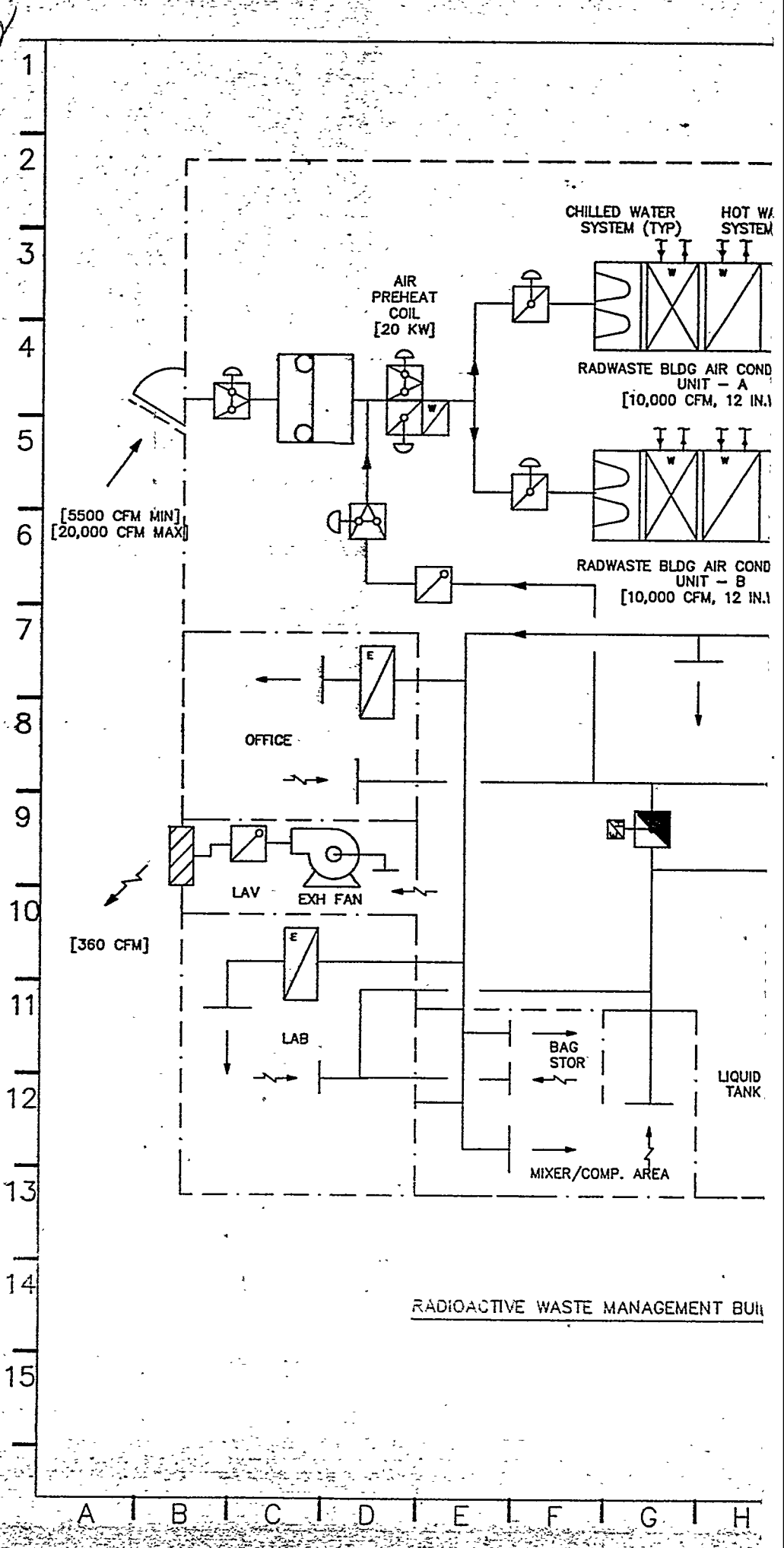


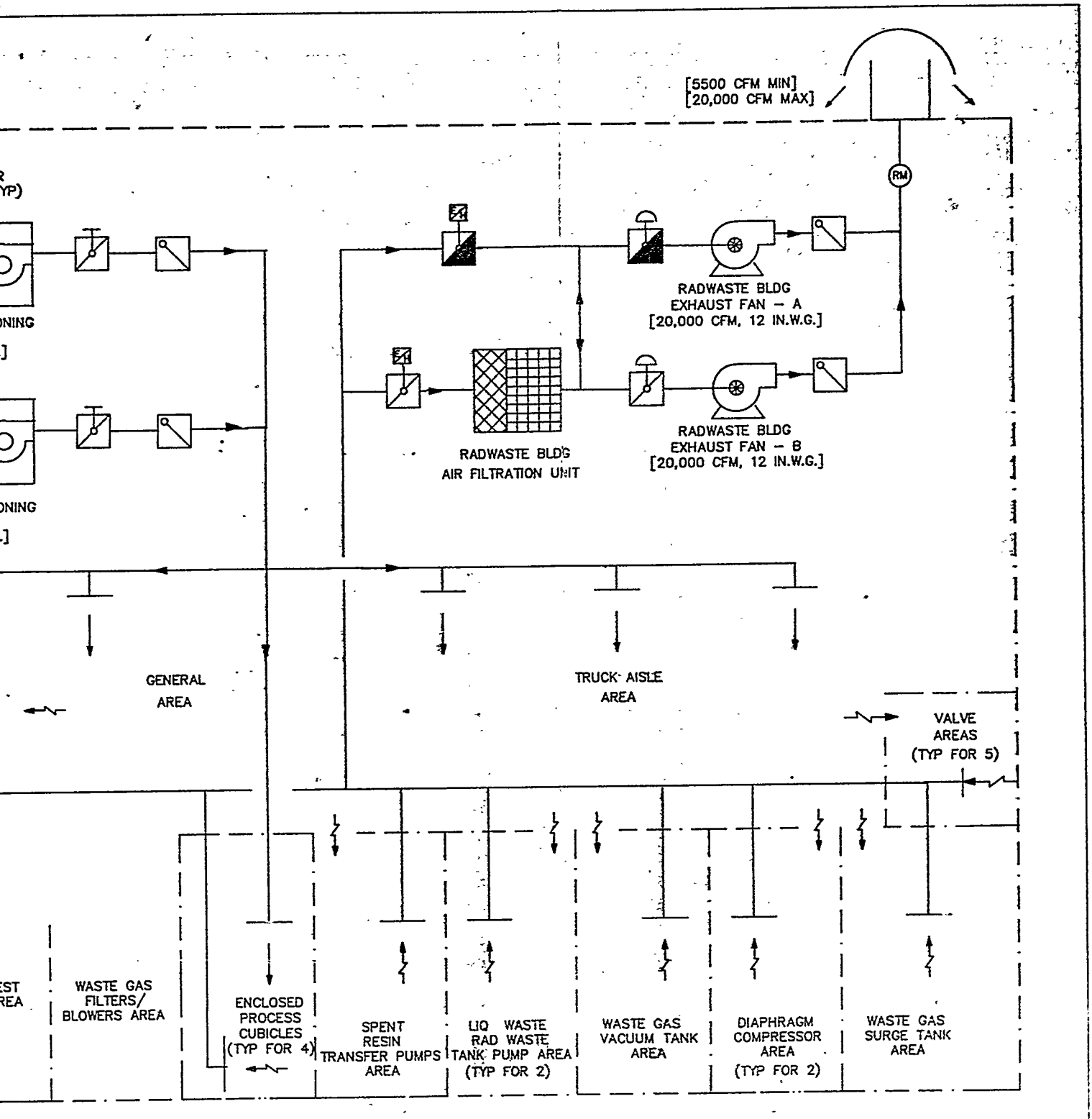
CING

			RLK	PREP
				REVIEW
			WCC	APP

P & I DIAGRAM
STANDBY POWER [illegible]
4x350 MW(t) MOD HTGR PLANT
GAS COOLED REACTOR (SSQC)
STONE & WEBSTER ENGINEERING CORP.

J K L M N P Q R S T U


CHILLED WATER SYSTEM (TYP)
HOT WA SYSTEM
AIR PREHEAT COIL [20 KW]
RADWASTE BLDG AIR COND UNIT – A [10,000 CFM, 12 IN.
RADWASTE BLDG AIR COND UNIT – B [10,000 CFM, 12 IN.
[5500 CFM MIN] [20,000 CFM MAX]
OFFICE
LAV
EXH FAN
[360 CFM]
LAB
BAG STOR
LIQUID TANK
MIXER/COMP. AREA
RADIOACTIVE WASTE MANAGEMENT BUI
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
A
B
C
D
E
F
G
H



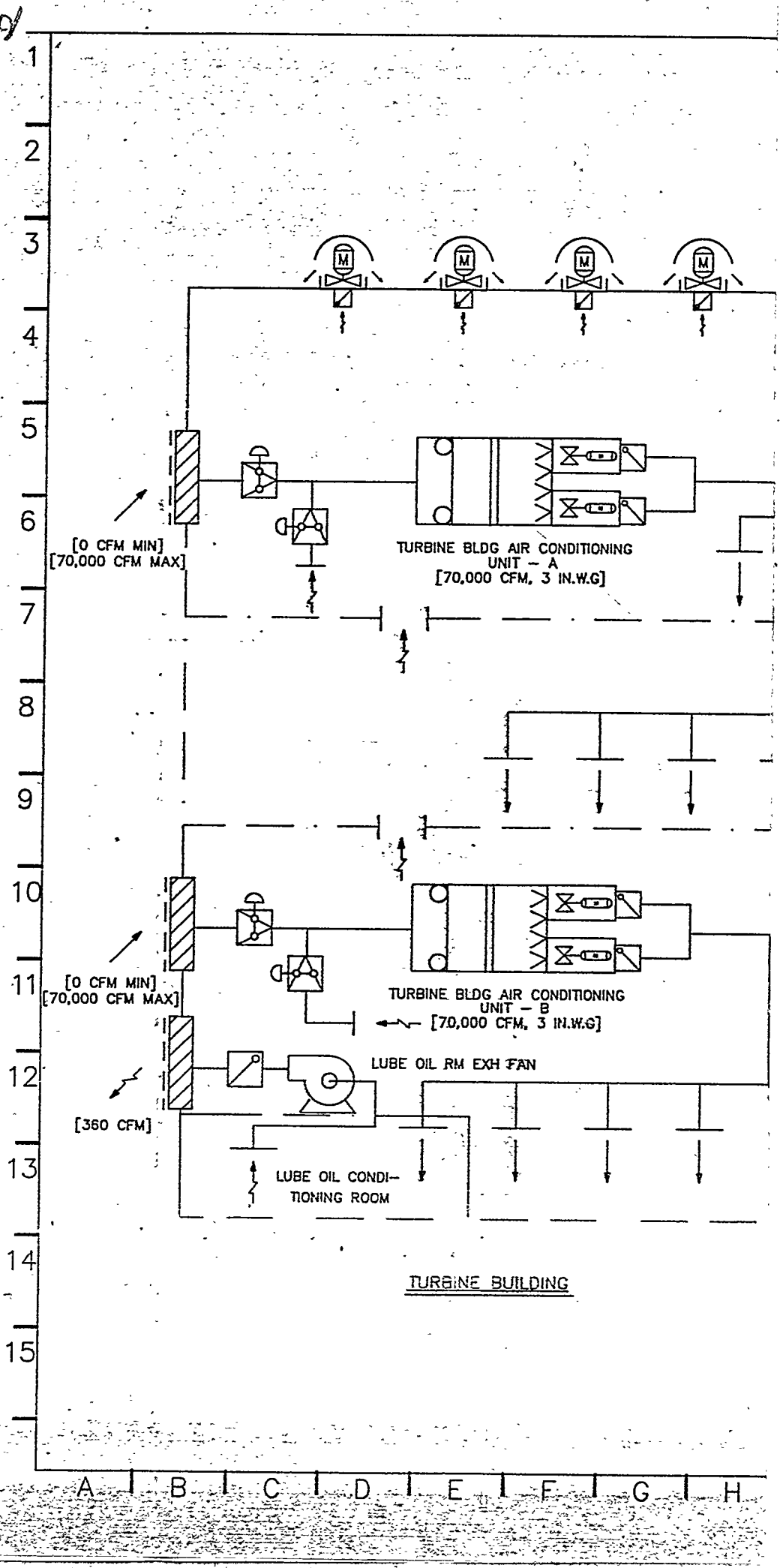
4	3	2	1	ISSUE
			RLK	PREP
			mrs AKR	REVIEW
			WCC	APP
			6/23/86	DATE

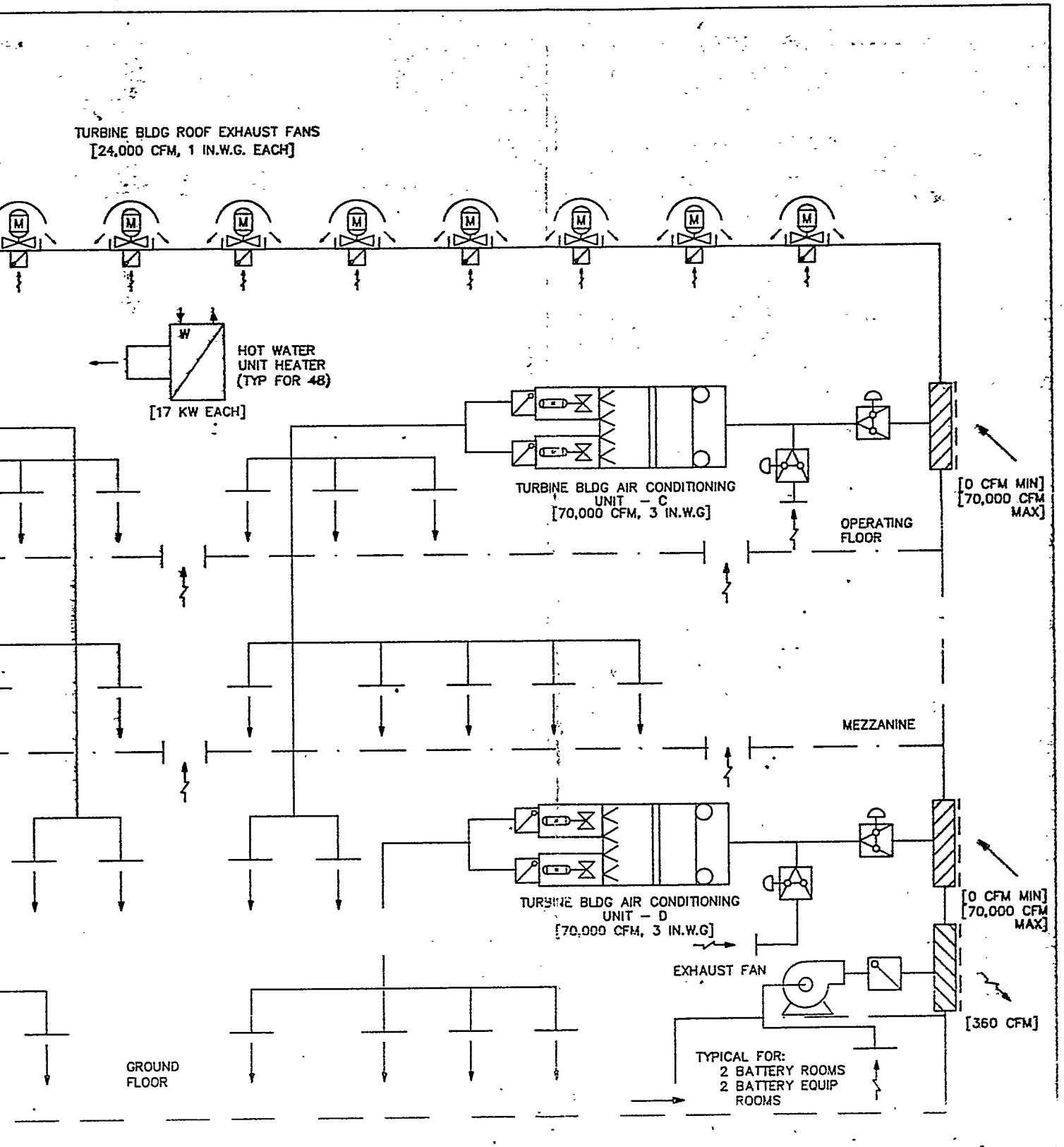
P & I SKETCH
RADWASTE MANAGEMENT BLDG
HVAC SYSTEM
4x350 Mw(t) MOD HTGR PLANT
GAS COOLED REACTOR ASSOC.

STONE & WEBSTER ENGINEERING CORP.

DWG. 14884–PSK–90.11H

J K L M N P Q R S T U V

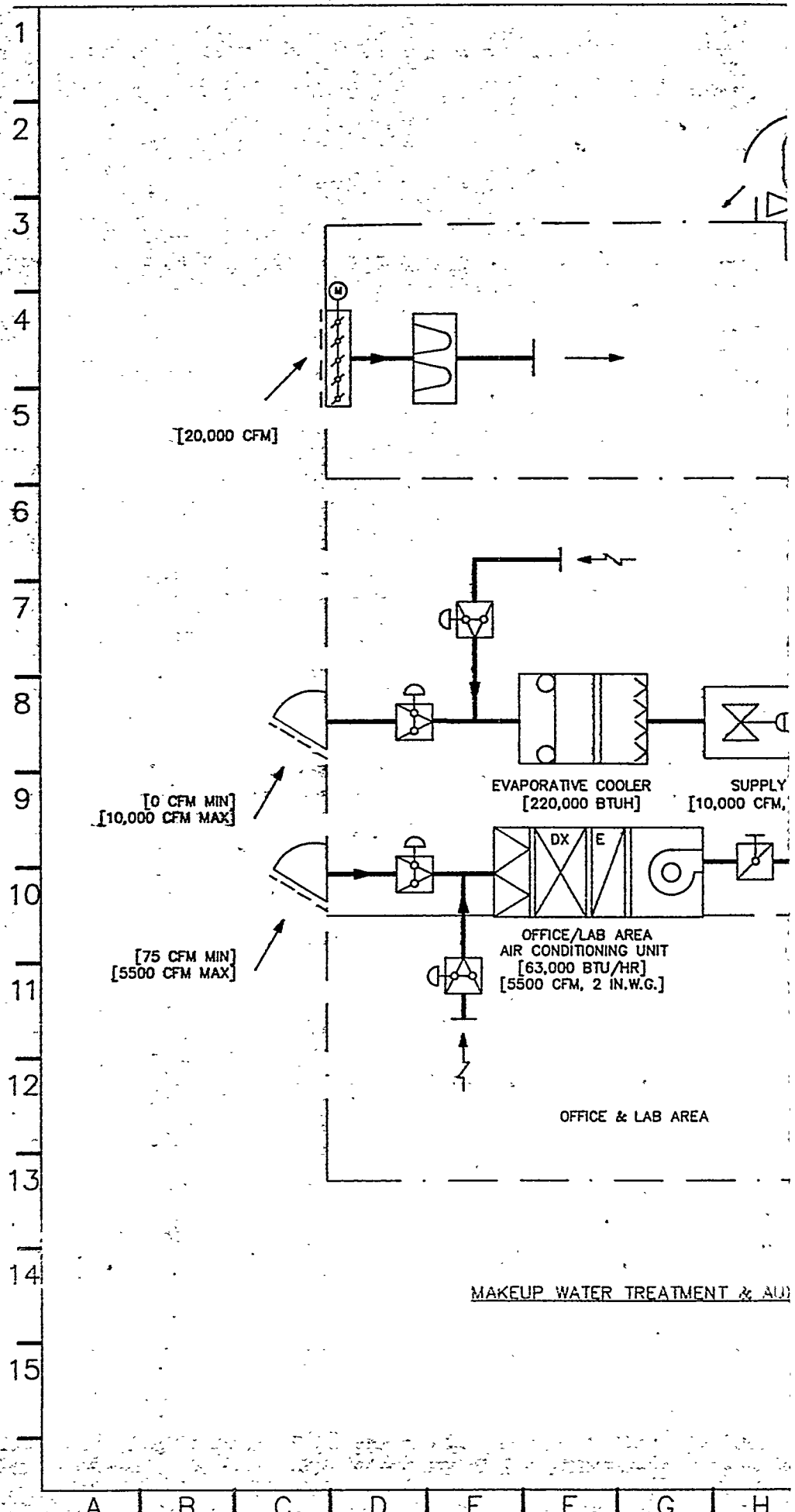

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
A
B
C
D
E
F
G
H
M
M
M
M
[0 CFM MIN]
[70,000 CFM MAX]
TURBINE BLDG AIR CONDITIONING
UNIT – A
[70,000 CFM, 3 IN.W.G]
[0 CFM MIN]
[70,000 CFM MAX]
TURBINE BLDG AIR CONDITIONING
UNIT – B
[70,000 CFM, 3 IN.W.G]
LUBE OIL RM EXH FAN
[360 CFM]
LUBE OIL CONDI–
TIONING ROOM
TURBINE BUILDING

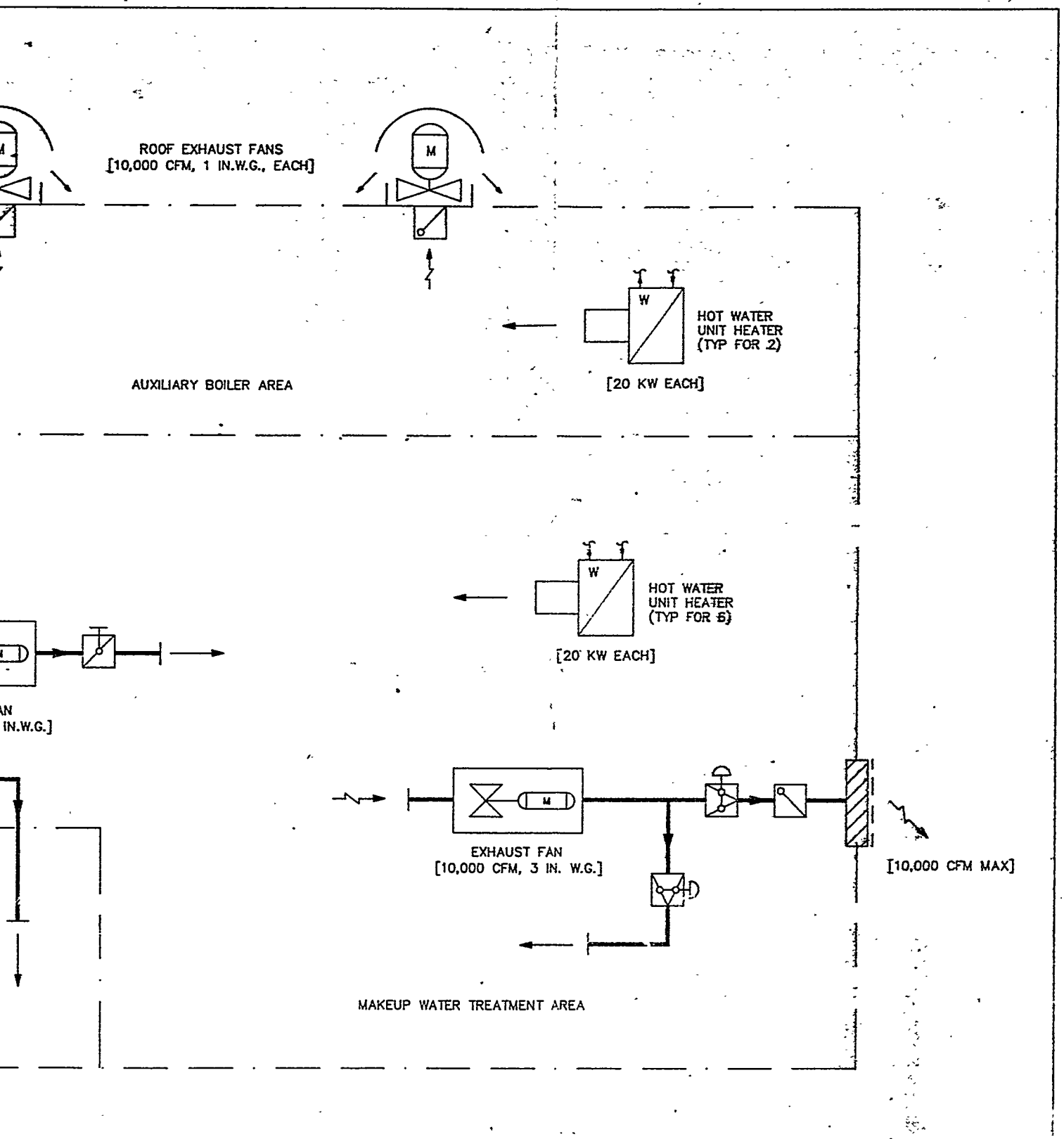


4	3	2	1	ISSUE
			RLK	PREP
			mrs	REVIEW
			WCC	APP
			6/23/86	DATE

P & I SKETCH
TURBINE BUILDING HVAC
SYSTEM
4x350 Mw(t) MOD HTGR PLANT
GAS COOLED REACTOR ASSOC.
STONE & WEBSTER ENGINEERING CORP.
DWG. 14884–PSK–90.11J

J K L M N P Q R S T U V


[20,000 CFM]
EVAPORATIVE COOLER
[220,000 BTUH]
SUPPLY
[10,000 CFM,
[0 CFM MIN]
[10,000 CFM MAX]
DX
E
OFFICE/LAB AREA
AIR CONDITIONING UNIT
[63,000 BTU/HR]
[5500 CFM, 2 IN.W.G.]
[75 CFM MIN]
[5500 CFM MAX]
OFFICE & LAB AREA
MAKEUP WATER TREATMENT & AU



IARY BOILER BUILDING

4	3	2	1	ISSUE
			RLK	PREP
			ms	REVIEW
			WCC	APP
			6/23/86	DATE

P & I SKETCH
MAKEUP WTR TREATMENT &
AUX. BOILER BLDG HVAC SYS
4x350 MW(t) MOD HTGR PLANT
GAS COOLED REACTOR ASSOC.

STONE & WEBSTER ENGINEERING CORP.

DWG. 14884-PSK-90.11K

J K L M N P Q R S T U V