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# **STEAM GENERATION SYSTEMS DESIGN MANUAL (INCLUDING ENERGY CENTER)**

**Department of  
Veterans Affairs**



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## **STEAM GENERATION DESIGN MANUAL (INCLUDING ENERGY CENTER)**

### **1. CRITERIA UNIQUE TO VA:**

**1.1** Steam Generation (boiler plant) work shall only be indicated on "MP"-series drawings (see VA Design and Construction Procedure, Topic 2, Drawings).

**1.2** "MP"-series drawings shall include symbols and schedules, equipment lists, National Cad Standards, schematic piping diagrams, floor plans, upper level plan of boiler room, mezzanine and pit plans, sections, demolition plans, fuel tank plot plans, other work as necessary.

**1.3** Only steam generation symbols and abbreviations shown on VA National CAD Standards SD230511-03 thru SD230511-20 can be used on the drawings.

**1.4** Steam generation piping and equipment arrangement must conform to schematic diagrams in VA National Cad Standard Details (Steam). The schematic diagrams must be shown on the drawings.

**1.5** Pipe sizes shall be indicated on plan and section views and on the schematic diagrams.

**1.6** Gas fuel piping serving the boilers shall be shown on the "MP" drawings, not on the "PL" drawings.

**1.7** Equipment shown on the drawings shall be generic and not the configuration of a particular manufacturer.

**1.8** Major options and alternatives in selection of equipment must be evaluated utilizing the life cycle cost analysis methods of NIST Handbook 135 using discount factors from the current edition of the Annual Supplement to the Handbook.

### **2. GENERAL:**

**2.1** The boiler plant shall serve as the central steam generating facility.

**2.2** Locate the boiler plant in a separate building if practical. Any co-generation equipment should also be included in this building. The boiler plant and the air conditioning chiller plant may be combined into an energy center building. For chiller plant requirements, refer to [HVAC Design Manual](#).

**2.3** Reserve space on the site adjacent to the boiler plant or energy center building to allow future expansion of the building to add boilers, chillers or co-generation equipment.

**2.4** Provide an area for underground or aboveground tanks for liquid fuel.

**2.5** Investigate the possibility of purchasing steam from a neighboring facility if purchasing steam is feasible. Perform a life cycle cost analysis of purchased steam versus VA-generated steam including all expense factors such as boiler

plant investment, fuel cost, salaries of operating personnel, maintenance costs, electricity and water costs.

**2.6** Design the boiler plant systems to comply with this design manual, and the current editions of VA Program Guides, VA Handbooks, and VA Master Specifications. The design shall also meet the provisions of the current edition of the ASME B31.1 Code for Pressure Piping, Power Piping; ASME B31.9, Code for Pressure Piping, Building Services Piping (Plants which do not generate steam over 100 kPa, 15 psig); National Fire Protection Association NFPA-85, Boiler and Combustion Systems Hazard Code; and National Fire Protection Association NFPA 31, Standard for the Installation of Oil Burning Equipment, and The VA Safety Device Testing Manual, and the current VA Boiler Plant Operations Directive. If state or local codes are more stringent than the above requirements, discuss with the VA Contracting Officer.

**2.7** Show boiler plant work on drawings using a minimum scale of 1:50 (1/4" = 1'0").

**2.8** All floor-mounted equipment shall be placed on and anchored to housekeeping pads.

**2.9** Existing work which remains in service shall be identified in a way which easily distinguishes this work from the new work. Points of connection between new and existing work shall be identified.

### **3. EQUIPMENT LISTS AND SCHEDULES:**

**3.1** All boiler plant equipment shall be listed and scheduled in conformance with VA National CAD Standard Details <http://www.cfm.va.gov/til/sDetail.asp#23>

### **4. BOILER PLANT CAPACITY AND PRESSURE:**

**4.1** The following establishes VA policy on the quantity, capacity, arrangement, and standby capability of the boilers and auxiliary equipment. It applies to the design of new boiler plants, replacement boiler plants, and expansion of existing boiler plants, in all climates.

**4.2** Maximum steam loads shall be determined by adding existing steam demands and new connected loads with diversity factors, and allowing credit for heat recovery devices. Include future loads for projects that are programmed. Boiler plant auxiliary equipment loads and distribution line losses shall be included in load calculations. Existing loads should be determined by reviewing boiler steam flow data for winter periods when the outside temperature approaches ASHRAE design conditions, and for summer periods. The accuracy of the data must be verified. In the review of the data, judgment must be utilized in determining realistic peak loads (loads which are sustained for at least ten minutes).

**4.3** The plant shall be capable of supplying the maximum steam demand with the largest boiler not operating, and with the largest pump of each service not operating.

**4.4** The plant shall be capable of supplying the minimum steam demand with the smallest boiler in a normal mode of operation and with all auxiliary equipment operating within recommended turn-down ranges. The capacity of the smallest boiler shall be sufficient for peak demand in the non-heating season.

**4.5** A minimum of three boilers is required for plants which serve medical centers.

**4.6** Boiler steam output capacity shall be based on boiler heating surface requirements as follows:

**4.6.1** Fire Tube Packaged Gas and/or Oil Boilers: Provide 0.047 square meter per kilowatt output (5 square feet per boiler horsepower).

**4.6.2** Water Tube D- Type Packaged Gas and/or Oil Boilers:

Heating Surface (sq. meters) = (Output (Kg/Sec) x 60.6) + 60

Heating Surface (sq. ft.) =  $\frac{\text{Output (BTU/Hr.)} + 700}{12,500}$

Heating surface is defined as the flat projected area in the furnace and full circumferential area in the convection section of the boiler. Furnace heat release shall not exceed 520,000 W/cu. meter (50,000 BTU/Hr. cu. ft).

**4.6.3** Other Types of Boilers: Apply conservative ratings. Utilize other types, such as flex-tube boilers, only on non-critical loads.

**4.7** Heat recovery boilers shall not be included in the boiler plant capacity calculation unless they can operate with their own burners independent of the device from which heat is being recovered.

**4.8** Steam header pressure shall be sufficient to serve the pressure requirements of the steam loads in an economical manner. If a laundry must be served, typical header pressure requirements range 760 – 860 kPa (110 – 125 psi). If sterilizing equipment must be served, typical header pressure requirements range 410 – 620 kPa (60 – 90 psi). When replacing an existing boiler plant, header pressures shall not be increased above the existing unless a complete engineering analysis is performed on affected portions of the steam system of the facility to determine the effect of higher pressures and temperatures on pipe expansion devices, steam traps, and other devices.

## **5. BOILER PLANT FUEL SELECTION:**

**5.1** Perform an engineering economic analysis to determine the lowest life cycle cost of various fuel options.

**5.2** When considering fuel options, determine the reliability of the supply and the feasibility of using each fuel. Where natural gas is utilized, provide a second fuel (such as fuel oil or propane), stored on the site, as a standby.

**5.3** Conform to local, federal and state emissions regulations.

## **6. STANDBY FUEL STORAGE QUANTITY:**

**6.1** Provide fuel oil or propane storage volume equivalent to ten January days of normal operation on plants which have capability for natural gas operation, and provide oil or propane storage for 15 January days of normal operation when plant has capability for oil or propane only. Where unusual local conditions exist, the design engineer may recommend deviations from these requirements.

## **7. STEAM PRESSURE CLASSES:**

Low Pressure (LPS) .....	0 thru 103 kPa	(0 thru 15 psi)
Medium Pressure (MPS) ...	110 kPa thru 407 kPa	(16 thru 59 psi)
High Pressure (HPS) .....	414 kPa and above	(60 psi and above)

## **8. BOILER PLANT EQUIPMENT TYPES AND SELECTIONS:**

**8.1** Boilers - Gas and/or Oil Fired:

**8.1.1** Boiler Types: Packaged fire tube units up thru 6900 kW (700 boiler horsepower) are acceptable. Packaged water tube units are acceptable for any capacity requirement. The choice between water tube and fire tube units must be based on life cycle costs, and available space in the boiler room.

**8.1.2** Quantity of Boilers: Normally, three units of equal size are the most cost effective and operationally practical. In some cases, a smaller boiler for use in the summer load period is necessary. The selection should be based on the load profile developed by the design engineer.

**8.1.3** Low Load Operations: Water tube boilers should not be required to cycle on and off. Cycling of fire tube boilers should be minimized.

**8.1.4** Burners: Provide low excess air design, with oxygen trim, on larger water tube boilers when justified by life cycle cost analysis. Provide low NOx burners where required by emissions authorities. Variable frequency drives may be applied on larger motors.

**8.2** Feedwater Deaerators: Because of enhanced turndown capabilities, tray and packed column types shall be used if there is sufficient building height available for the deaerating section which is mounted on the deaerated water storage tank. Where height is limited, spray-type units may be used. The deaerated water storage tank shall be sized for 20 minutes storage from overflow level at peak plant output requirements. Consideration should be given to sizing the feedwater

deaerator for future loads. Packaged boiler feed pump/deaerator units should not be applied except where there are space limitations. This is because packaged units often have pumps and piping packed into a small space resulting in difficult access.

**8.3 Boiler Feed Pump System:** For most plants, the preferred arrangement is one pump dedicated to each boiler, with cross connections allowing each pump to provide emergency service to one other boiler. In the largest plants it may be advantageous to provide a boiler feed header system with all pumps supplying the common header. High efficiency multi-stage centrifugal ring section diffuser pumps are preferred. Two-stage horizontal split case centrifugal pumps may be applied on larger plants if the life cycle cost is less than for multi-stage.

**8.4 Pumps-General:** Provide one standby pump for each service except boiler feed systems where one pump is dedicated to each boiler. On boiler feed service allow space for a future pump. Pumps shall operate continuously rather than on-off. Motor kw (hp) shall be selected to be non-overloading at any point on the pump performance (head - capacity) curve. Variable frequency drives controlling discharge pressure may be applied on larger pumps, such as over 7.5 hp.

**8.5 Condensate Storage Tank:** Shall be sized to accommodate surges without overflow. Normally, a tank sized for 20 minutes minimum storage to overflow at peak plant output requirements is satisfactory. The A/E must review the condensate handling systems in all buildings to determine if any unusual situations will require a larger condensate storage tank in the boiler plant. Consideration should be given to sizing the tank for future loads.

**8.6 Boiler Blow-off Tank:**

**8.6.1** The boiler blowoff tank shall be located within the boiler plant building. Where possible, the blowoff inlet in the tank shall be at an elevation below the elevation of the blowoff header to prevent sludge from accumulating in the blowoff header. Where blowoff tanks cannot be installed below the header, provide water flushing system to clean trapped horizontal blowdown lines and provide a valved drain on the blowdown line to allow draining the boilers.

**8.6.2** The boiler blowoff tank size, connections, design and construction requirements shall be in accordance with the recommendations contained in the Rules and Recommendations for the Design and Construction of Boiler Blowoff Systems, published by the National Board of Boiler and Pressure Vessel Inspectors, Columbus, Ohio.

**8.6.3** Blowoff tank volume shall be twice the volume of water contained in a four inch blowdown of the largest boiler.

**8.6.4** Provide automatic temperature control system which mixes city water with the blowoff tank discharge water to limit the temperature of the water going to the sewer to 60 degrees C (140 degrees F).

**8.7 Pipe, Breeching and Stack Supports and Anchors:** Show the locations of all roller and spring-type hangers, anchors, trapezes, seismic bracing and special supports. Detail the anchor designs and seismic bracing designs. Detail the

connections to the building structure when standard pipe hanger components cannot be used as building attachments. The structural drawings must show sufficient structural members for each hanger and support location.

**8.8 Fuel Tanks:** May be located underground or aboveground. Provide secondary containment systems on tanks and piping. All steel buried tanks, piping, and secondary containment shall be coated and cathodically protected. Provide leak detectors located in the interstitial spaces of the tanks and in piping systems between the carrier pipes and outer casings. Provide spill and overfill prevention measures as required by pollution control authorities.

**8.9 Natural Gas Systems:** Header pressure in the boiler plant shall be as low as practical which, for water tube boilers is 70 - 100 kPa (10 - 15 psi) and, for fire tube boilers is 35 - 70 kPa (5 - 10 psi). Higher gas pressures may be required for low-NOx burners or high turndown burners. Coordinate system design with requirements of local gas supplier. Provide separate gas meter for the boiler plant.

**8.10 Liquid Petroleum (LP) Gas System:** Provide system for operation of igniters (pilots) when natural gas is not available or is interrupted and the burners will be fired on oil. If natural gas is normally utilized, the LP gas igniter system is for emergency use only. The LP gas igniter system shall operate at 35 kPa (5 psi) or less. The VAMC will supply replaceable propane cylinder tanks. The A/E must design the tank piping, valve system, and provide concrete pad and chains for supporting the tanks. Locate the tanks outside.

**8.11 Boiler Plant Building Hazardous Gas Detection System:** Industrial-type system with central alarm panel and multiple sensors is required. Provide carbon monoxide sensors at breathing level near the front of each boiler and in personnel spaces where there is exhaust ventilation. If natural gas is a main fuel, provide combustible gas detectors at the ceiling of the boiler room. If propane is utilized as a main fuel, provide combustible gas sensors at the low points in the boiler plant.

**8.12 Steam Pressure Reducing Stations:** Use single-stage reducing stations to obtain required pressure. Parallel pressure reducing valves in which two pressure reducing valves share the load are preferred on the services to the feedwater deaerator and the steam distribution systems. Safety valve capacity selections for PRV stations must conform to recommendations in an Appendix to the National Board Inspection Code, published by the National Board of Boiler and Pressure Vessel Inspectors. Manual bypass globe valves should be sized to limit the maximum flow through the bypass to the flow capacity of the largest PRV in the PRV station. Safety valves must have sufficient capacity to handle the wide open flow of the largest pressure reducing valve or the wide open bypass, whichever is greater.

**8.13 Heat Recovery Boilers:** Heat recovery boilers generating high pressure steam shall be located in the boiler plant where they can be monitored by boiler plant operating personnel.



**8.14 Engine-Generators and Incinerators:** Locate in rooms separate from the boiler room.

## **9. STACKS AND EMISSIONS:**

**9.1** Boiler stack location, height, and diameter shall be determined by an engineering study which considers boiler/burner operational requirements, air flow around the stacks and the boiler plant and adjacent buildings, and emissions regulations. Avoid impingement of stack gases on fresh air intakes of building ventilating or air conditioning systems. Comply with federal, state and local emissions regulations.

**9.2** Generally, individual stacks on each boiler are preferred. A common breeching and single stack system for all boilers is acceptable if warranted by project conditions.

**9.3** Locate diesel engine exhaust outlets to avoid mixing the gases with building intake air.

## **10 BOILER PLANT HEAT RECOVERY:**

**10.1** Provide heat recovery devices when they can be justified by a life cycle cost analysis. Systems include (1) flue gas economizers for each boiler and (2) continuous blowoff heat recovery and (3) co-generation.

## **11. BOILER PLANT MAKE-UP WATER TREATMENT:**

**11.1** "Zero hardness" water must be supplied. Dealkalizing is required if alkalinity in the make-up water exceeds 50 ppm. The design engineer must obtain a current analysis of the water supply and determine the type of treatment which is necessary. The design engineer must determine if the treated water will cause any substantial corrosion problems and recommend preventative methods. Life cycle cost studies must be performed to evaluate which type of water treatment equipment will be applied (ion-exchange softener, dealkalizer, reverse osmosis, other systems which have proven successful with local water conditions).

**11.2** Water treatment systems are shown on "PL" drawings.

## **12. BOILER PLANT CHEMICAL FEED SYSTEMS:**

**12.1** Provide a separate continuous feed system (proportioning pump and tank) for each boiler, for the deaerator, and for the main steam header.

### **13. BOILER PLANT LOADS ON EMERGENCY GENERATOR:**

**13.1** All equipment, controls, instruments, and plant lighting must be served by an emergency generator.

**13.2** Ventilation and heating of generator room shall conform to [HVAC Design Manual](#).

### **14. CONTROLS AND INSTRUMENTATION:**

**14.1** Multi-loop industrial process type programmable digital controllers are required for all control functions except burner management where specialized digital controllers are required.

**14.2** Parallel-positioning combustion controls are required except on smaller fire tube boilers where single-point positioning controls are practical.

**14.3** Controls added to existing systems shall be the same manufacture and type, if available.

**14.4** Monitoring and data management shall be by means of a SCADA program on a computer work station reserved for only boiler plant monitoring. There shall also be annunciation of alarms, pressure gages, and other operating displays on instrument panels within easy view of the firing aisle.

### **15. ARRANGEMENT OF EQUIPMENT AND PIPING:**

**15.1** Arrange boilers, co-generation equipment, emergency generator room, control panels, instrumentation panel, motor control center, and control room/Engineering Control Center along an aisle on the main floor. Boiler and chiller spaces must be observable from the control room/Engineering Control Center. Locate boiler feed pumps, water treatment area and main steam header on the main floor.

**15.2** All equipment and piping devices must be accessible from the floor or from permanent platforms for operation, repair, maintenance and replacement. Repair, maintenance and replacement must be possible without requiring the removal of other major items of equipment, the removal of major portions of piping, or the removal of portions of the building. Generally, there should be at least three feet of clear floor space around all items of equipment. Boilers and chillers require a greater amount of clearance. Drawings must show plan and elevation views of all valves and equipment which require access.

**15.3** Boilers: Allow space for tube cleaning and tube removal, door swing, and soot blower removal. Provide access platforms for valves and manways which are located on top of boilers, for access to steam drum manways located at rear of water tube boilers, for access to economizer valves and inspection openings, and control devices and valves on air pollution control equipment. Provide unobstructed view from aisle of all boiler-mounted and burner-mounted gages and indicators.

**15.4** Control and instrument panels shall be visible from the aisle, and to the maximum extent possible, visible from the control room/Engineering Control Center. Instrument panels may be located in the control room/Engineering Control Center.

**15.5** The electrical switchgear and engine-generator(s) shall be located in a separate room adjacent to an outside wall. The engine-generator(s) shall be visible via view windows from the room that contains their paralleling and distribution equipment.

**15.6** All valves shall be located not more than seven feet above a floor, mezzanine, or platform. Limited exceptions are permitted for valves that are rarely used, would not need to be operated in an emergency situation, and can be reached with portable ladders or chain-wheels.

**15.7** Water Treatment Area: Provide an area which includes the chemical feed units and space for chemical storage and mixing. Cold water and drains must be available in the area and there must be an emergency eyewash and shower. Approximate floor space requirement for chemical storage is 10 square meters (100 square feet). The chemical storage area must accommodate chemicals in bags or barrels or bulk tanks that will be furnished by the chemical supplier. The storage area must be reachable by hose from a tank truck parked outside the building.

**15.8** Water Test Area: Provide laboratory type sinks in a stainless steel countertop unit which includes cabinets below and above for storage of boiler water testing equipment. Locate boiler water sample coolers adjacent to the sink unit. The test area should be adjacent to the firing aisle. The feed water sample cooler should be located adjacent to the deaerator.

**15.9** Provide salt storage space adjacent to water softener and dealkalizer (if provided).

**15.10** Oil Piping: Locate in trenches to reduce leak hazard and air binding.

## **16. COMBINED BOILER AND CHILLER PLANT (ENERGY CENTER):**

**16.1** Combining the boiler and chiller plant in one building is preferred when it can be economically justified. Each proposed energy center must be reviewed by VA Central Office.

**16.2** The energy center shall house the boiler plant, chiller plant, Engineering Control Center, pumps, plumbing equipment, associated electrical switchgear and boiler plant emergency generator and co-generation equipment for the VA medical center. To the extent feasible other emergency generators and electrical substations and domestic hot water generators may be placed in the energy center.

**16.3** The air conditioning chiller area and the Engineering Control Center shall be designed in accordance with the [HVAC Design Manual](#). The electrical equipment area shall be designed in accordance with Design and Construction Procedure,

“Electrical, Signal, and Telephone Closets and Computer Rooms”, the [Electrical Design Manual](#), and [VA Design Manual for Engine-Generators and Distribution](#).

## **17. BOILER PLANT OR ENERGY CENTER BUILDING:**

### **17.1 Building arrangement:**

**17.1.1** Provide a structural system which permits access to overhead members for pipe and duct support and allows for future expansion.

**17.1.2** The building design shall permit all equipment to be installed (and removed in the future) without removal of any building structural element, walls or the roof.

**17.1.3** Locate the main boiler room or energy center floor above finished grade to preclude flooding and to permit horizontal rigging of equipment in and out of the building.

**17.1.4** Establish roof height to provide adequate clearance above all equipment and piping. Provide for present or future installation of economizers above the boilers.

**17.1.5** Provide basement area or pit areas for underground steam distribution pipe entrance and blow-off tank.

**17.1.6** Provide basement area, if necessary for proper operation, for condensate storage tank, condensate transfer pumps, and fuel oil pumps.

**17.1.7** Locate a mezzanine above the boiler feed pump area to support and provide access to the deaerating feedwater heater. Normal mezzanine floor height above the boiler room floor is 3.7 meters (12 feet). Design the mezzanine floor to contain water spillage.

**17.1.8** Provide overhead roll-up doors through which all equipment can be rigged. Locate a roll-up security grill inside each door so that the doors can be open for summer ventilation.

**17.1.9** The building and site adjacent to the building shall be arranged to allow for future expansion if additional boilers, chillers, or other equipment are needed.

**17.1.10** Provide a block wall partition between the chiller portion of the building and other areas for noise control. Also provide the same for the co-generation engine unless other noise reduction measures are taken.

### **17.2 Provide the following personnel facilities:**

**17.2.1** An air conditioned control room of at least 14 square meters (150 square feet) floor area with view windows located to allow observation of firing aisle and chillers. Where an Engineering Control Center is provided additional floor area is required (see Chapter 230 of VA Handbook 7610 for required floor area).

**17.2.2** A supervisors' office of approximately 10 square meters (100 square feet) floor area.

**17.2.3** Locker facilities on the main floor of boiler plants and energy centers for employees, one or more of whom may be female. Facilities shall include separate showers and locker rooms for male and female employees. Twelve lockers shall be provided including a minimum of two lockers in the female locker area.

**17.2.4** Two separate toilet rooms adjacent to the locker rooms each having a water closet and lavatory plus a urinal in male toilet.

**17.2.5** Water cooler.

**17.2.6** Break room with sink, storage cabinets, and electric service for microwave oven and refrigerator.

**17.2.7** Housekeeping closet.

**17.3** Provide access platforms as follows:

**17.3.1** A platform above each boiler to provide access to valves and manways which are located on top of the boiler. Minimum width shall be 760 millimeters (2.5 feet), with length to suit boilers furnished.

**17.3.2** A 920 millimeter x 1220 millimeter (3 feet x 4 feet) steam drum manway access platform at the rear of each water tube boiler. Locate below the steam drum.

**17.3.3** Platform for access to economizer valves and service panels.

**17.3.4** Other platforms as necessary to allow access to equipment requiring maintenance which is located more than 4.5 meters (15 feet) above the floor.

**17.3.5** Permanent ladders for access to all platforms. The design of ladders and platforms shall conform to OSHA requirements.

**17.3.6** Permanent ladders and stairs:

**17.4.1** Provide stairways to mezzanine, platform or pit levels which require frequent access, such as deaerator level.

**17.4.2** Other areas, such as boiler platforms, may have ladders. Ladders higher than 2130 millimeters (7 feet) should be sloped 25%.

**17.5** Boiler plant and energy center heating, ventilating, and air conditioning shall be provided as follows:

**17.5.1** Combustion and ventilation air intakes through the building walls and roof. Provide combustion air make-up heating and ventilating units in colder climates.

**17.5.2** Roof-mounted exhaust fans totaling approximately 12 air changes per hour.

**17.5.3** Heat in personnel rooms to maintain 21 degrees C (70 degrees F).

**17.5.4** Heat as necessary in the boiler room, chiller room and other equipment spaces to maintain 18 degrees C (65 degrees F).

**17.5.5** Air conditioning in the control room/Engineering Control Center, office, toilets, showers, break room.

**17.6** Acoustical Considerations: Provide acoustical treatment on building surfaces which are within 3 meters (10 feet) of burner fans or atomizing air compressors or co-generation engines. Provide noise control in the operations room/Engineering Control Center and in the office in accordance with [VA Design and Construction Procedure](#), Noise Transmission Control.

## **18. SEISMIC REQUIREMENTS:**

**18.1** Earthquake-resistive design shall comply with the requirements of [Master Specification](#) Section 13 05 41, Seismic Restraint Requirements for Nonstructural Components.

**18.2** Bracing for systems that experience thermal expansion shall be designed to allow the thermal expansion without overstressing any components.

## **19. MODIFICATIONS TO EXISTING PLANTS:**

**19.1** In addition to the equipment required for operation, the design shall provide a standby boiler and standby pumps during all phases of construction.

**19.2** Temporary boilers and other equipment may be employed if cost effective.

## **20. INDEX OF APPLICABLE VA DESIGN AND CONSTRUCTION PROCEDURES:**

**20.1** The following should be used as a checklist to assure that you have been furnished the current [VA Design and Construction Procedures](#) relating to steam generation:

**Topic 02 - Drawings**

**Topic 07 - Piping, Ducts, and Electrical Conduits**

**Topic 17 - Physical Security Strategies for New and Renovation VA Construction**

**Natural Disasters Non-Structural Resistive Design (CD-54)**

## **21. INDEX OF STEAM GENERATION CAD STANDARD DETAILS:**

<http://www.cfm.va.gov/til/sDetail.asp>

DIV 23	<a href="#">HVAC and STEAM</a>
-	HVAC and Steam Equipment Schedules
SD230511-01	Designer's Notes for Details and Schedules
SD230511-02	General Notes

SD230511-03	Abbreviations
SD230511-04	Abbreviations
SD230511-05	Abbreviations
SD230511-06	Abbreviations
SD230511-07	Abbreviations
SD230511-08	Drawing Symbols
SD230511-16	General Symbols
SD230511-17	Valve Symbols
SD230511-18	Controls Symbols
SD230511-19	Controls Symbols
SD230511-20	Controls Symbols
SD230511-21	Pipe Hangers
SD230511-22	Detail for Supporting Pipe on Roof
SD230511-23	Small pipe anchor 1-1/2"-4"
SD230511-24	Large pipe anchor 6"-18"
SD230511-25	Support/Anchor for Pipe Risers
SD230511-27	Pipe Trench in Building
SD230511-28	Anchor Installation - Steam/Condensate Piping in Trench
SD230511-29	Piping Crossing A Seismic Joint Detail "A"
SD230511-30	Piping Crossing A Seismic Joint Detail "B"
SD230511-31	Piping Crossing A Seismic Joint Detail "C"
SD230511-32	Piping Crossing A Seismic Joint Detail "D"
SD230511-33	Piping Crossing A Seismic Joint Detail "E"
SD230511-34	Forces and Moments on Boiler Steam Nozzles
SD230541-03	Concrete Equipment Bases
SD230541-04	Seismic Bracing for Equipment
SD230541-05	Securing Hanger Rods in Concrete
SD230911-01	Steam Flow Meter Primary Element and Flow Transmitter Installation
SD230911-02	Water Meter Installation
SD230911-03	Burner Control Panel For Water Tube Boiler
SD230911-04	Boiler Plant Instrumentation Panel
SD230923-07	Emergency Generator Room Controls
SD230923-10	Steam Meter Detail
SD231000-01	Underground Fuel Oil Storage Tank 8,000 Gallons and Larger
SD232111-01	Steam Trap Assembly and Steam Line Drip Pocket
SD232111-02	Safety Valve Steam
SD232111-03	Standard Steam Boiler Plant Piping Diagram

SD232111-04	Basic Flow Diagram - Condensate and Boiler Feedwater
SD232111-05	Condensate Storage and Transfer Flow Diagram
SD232111-06	Feedwater Deaerator Flow Diagram
SD232111-07	Boiler Feedwater Pumps Flow Diagram
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