

Stennis Space Center  
Riverine Training Facility

### **Mechanical Design Basis**

#### **General:**

This section describes the general Basis of Design for the Mechanical systems serving the Riverine and Combatant Craft Operations Facility at Stennis Space Center. The mechanical systems described herein include the plumbing and HVAC systems only. The intent of this description is to adequately and accurately describe the design intent, and prove compliance with the system requirements outlined in the contract.

The project intent is to meet or exceed LEED® Certified requirements. As such, certain design approaches, system configurations, and equipment selections have been tailored to increase operating efficiencies while minimizing operational costs and system complexities.

#### **Mechanical HVAC**

The building is served by a central chilled water plant designed specifically for the Riverine Facility. The primary component is a single high-efficiency air-cooled chiller with multiple compressors. The system is designed for 100% of the anticipated, calculated load, but includes multiple compressors to enhance redundancy within the refrigeration system. The final system design is predicated on the following conditions:

##### *Outdoor Design Conditions*

Cooling Season:	92°F DB / 82°F WB
Heating Season:	31°F DB

##### *Indoor Design Conditions:*

Conditioned Spaces ~	
Cooling Season:	75°F DB / 50%RH
Heating Season:	68°F DB

Ventilated / Heated Spaces ~	
Cooling Season:	95°F DB
Heating Season:	55°F DB

The system includes a variable primary pumping scheme, which allows the chilled water flow to modulate in response to real-time fluctuations in HVAC cooling load. This capability will significantly enhance the energy consumption characteristics of the facility while increasing the useful life of the pumping equipment. Due to the anticipated small system volume, a buffer tank is included to minimize hard starts / stops by the chiller equipment. The chilled water system includes chemical treatment for rust, corrosion, and scale inhibition.

Air-side system design incorporates the use of central station modular air handlers with variable speed fans (controlled by variable frequency drives). Fan speed is adjusted in real time to deliver only the amount of air required to adequately condition the subject spaces. The building is divided into several zones, predicated on common use, exposure, or specific environmental control

requirements. Each zone is served by a dedicated VAV (variable air volume) terminal unit with electric reheat. The Communications Room is served by a dedicated DX split system sized specifically for the internal load requirements of the space, including equipment, lights, personnel, etc.

Based on the calculated loads for each zone, the electric heat option provides greater system flexibility, reduced operating and maintenance costs, and increased reliability versus a centralized heating hot water boiler system. The heating load for the proposed building is minimal, and the building will require simultaneous heating and cooling throughout portions of the year. Conditions would be common where a natural gas boiler system (comprised of pumps, boilers, controls, etc.) would require operation to satisfy an extremely small heat or reheat load within a small zone or office. In order to eliminate these gross inefficiencies, electric heaters are integrated into the VAV boxes to provide heat (and reheat, where required) to each individual zone without the need for operation of a central heating plant.

The central control system monitors all applicable conditions within the building, and provides system control to automatically maintain appropriate temperature conditions within each zone. User-level interface (thermostats) provides a range of setpoint adjustment; the range is controlled by the master central system. Each central station AHU utilizes a CO2 sensor to implement a Demand Control Ventilation (DCV) strategy, which allows the reduction of outside air delivery during times when the building is sensed to be partially occupied. The Armory zone includes active humidity control in order to preserve the contents of the space during high ambient humidity conditions. The central system interfaces seamlessly with the existing Stennis Siemens® APOGEE® system.

The Boat Maintenance wing of the facility is served by heating and ventilation systems only. Such systems are comprised of electric resistance unit heaters and roof-mounted centrifugal exhaust fans, thermostatically controlled with user-level override.

The Boat Storage Building is served by heating and ventilation systems only. These systems include electric resistance unit heaters and roof-mounted centrifugal exhaust fans on automatic thermostatic controls.

### **Plumbing Systems**

The plumbing systems consist of all necessary fixtures, valves, piping, connections, and trim to form complete and functioning systems. All fixtures are selected based on low-consumption performance characteristics that meet or exceed the LEED requirement for a minimum 20% reduction in water consumption. Water heating is accomplished by utilizing central electric water heaters which exceed the standby loss provisions of ASHRAE 90.1. A recirculating hot water return system is used to ensure prompt delivery of hot water at each fixture while minimizing energy consumption based on piping heat loss.

Fixtures are based on the following characteristics:

#### *Water closets:*

Low-Consumption flush valve vit china (Accessible where required)

#### *Urinals:*

Low-Consumption flush valve vit china (Accessible where required)

#### *Wall-Mounted Lavatories:*

White vit china with 4" centerset low-consumption faucet (Accessible where required).

*Showers:*

Pressure-balanced valves and trim, accessible personal handshower and support bars where required.

*Service Sinks:*

Floor-mounted cast terrazzo style mop sink with drop front, mop hanger, and bumper guard.

*Kitchen / Break Room Sinks:*

Self-rimming stainless steel sink with 8" centerset high arc gooseneck low-consumption faucet with wristblade handles.

*Shower / Eyewash Stations:*

Pedestal supported combination shower and eyewash per applicable safety standards, including tempered water supply.

*Drinking Fountains:*

Dual-height push-button wall-mounted water coolers for accessible applications, single station electric water coolers for non-ADA/UFAS applications.

All wall mounted fixtures are supported from the floor using adjustable floor-mounted fixture supports. Wall hangers are not used.

The incoming water service is protected using an approved reduced pressure principle (RPP) backflow preventer per AWWA guidelines. All connections between the potable supply and the mechanical HVAC water systems are through an approved RPP backflow preventer per AWWA.

All mechanical rooms have wall hydrants for cleaning operations. Wall hydrants are installed along the building exterior to permit access along every point of the perimeter with a 100' long hose.

Piping specifications are as follows:

Underground Sanitary Waste: Schedule 40 PVC with solvent weld joints.

Above Ground Waste and Vent: No-hub service weight cast iron pipe and fittings.

Internal Roof Drainage: None Required.

Compressed Air Systems (Non-Medical Use): Galvanized steel with screwed fittings OR Type L copper with soldered fittings.

Domestic Water Supply: Type L copper with soldered fittings.

Chilled Water Piping: Schedule 40 Steel (larger sizes) or Type L copper with soldered fittings. Connections between dissimilar metals shall be prohibited. Dielectric unions or flanges shall be used where applicable.

The Boat Maintenance Building is served by a continuous trench drain and area floor drains discharging into an oil-water separator prior to release to the sanitary sewer system.

In the Boat Maintenance wing of the main facility, the area is served by a rotary air compressor with refrigerated dryer, aftercooler, and filter. Piping is routed through the bay with a minimum of 4 drops, which include a filter pressure regulator and quick-disconnect for attachment of operator tools.

END OF MECHANICAL DESIGN BASIS SUMMARY