

## 5. Fire Protection

### Overview

Fire sprinkler and mechanical fire/life safety site visits were performed from February 9 through February 12, 2009 on typical floors 10, 15, 21; restricted floors 2, 3, 5, 17, 19; floor 1, penthouse, floor 12 and the parking garage. The mechanical team visually assessed these floors for potential upgrades, repairs, building code issues and fire/life safety requirements per the 2007 California Fire Code (CFC) and the requirements of the City of Sacramento High Rise Code. The mechanical team also noted evidence of corrosion and service life issues.

Building engineering staff accompanied the mechanical team, provided access and also pointed out known deficiencies regarding the fire sprinkler and mechanical fire/life safety systems.

The BOE building is protected with an ordinary hazard wet pipe fire sprinkler system throughout the building. The fire sprinkler system is inspected by an outside fire protection contractor on an annual basis and also on a 5 year certification test basis. The fire pump requires a monthly flow test.

The following is a list of major concerns that should be addressed with the fire protection system:

1. The lack of a back-up fire pump is a concern.
2. Install a tamper switch on the bypass valve located in the Fire Pump Room.
3. Install an overflow drain system on the fire storage tank to prevent water damage from an overflow condition.
4. Add fire sprinkler coverage for dropped soffit areas at the first floor per NFPA 13 requirements.
5. Add fire sprinkler coverage for the skylight on the first floor per NFPA 13 requirements.
6. Upgrade “Ansul” systems with current code compliant extinguishing agent.

### A. Fire Pump Room

The main fire pump room is located on the west side of the building on the first floor along 4<sup>th</sup> Street. The fire pump room has a single “Patterson” size 6X3HW, 200hp, fire booster pump rated at 750 gpm and 295 psig pump pressure. The fire pump system has a bypass piping and valve arrangement to test the fire pump and direct fire flow into the 15,000 gallon above grade, concrete fire storage tank adjacent to the fire pump room. A jockey pump is located in the fire pump room. A fire pump controller with automatic transfer switch is also mounted in the fire pump room. The fire pump is backed up with emergency power from a diesel generator located north of the fire pump room. The fire pump configuration does not meet current City of Sacramento High Rise Code which requires two fire pumps, (one electric pump and one engine driven pump). It is a concern

that a single fire pump can be out of service for repair and there is not a back-up pump for the building fire sprinkler system.

The bypass valve arrangement appears to have been an addition to the original system to allow testing and it was noted that the bypass valve does not have a tamper switch to monitor valve operation as required by code. The following repair or retrofit items are recommended for the Fire Pump Room.

1. Install a back-up fire pump to comply with current City of Sacramento High Rise Code.
2. Install a tamper switch on the valve for bypass pumping test.

### Fire Sprinkler Risers

The main fire sprinkler risers are located in the fire pump room and are sectioned for the fire flow density and pressure zones within the building. The fire sprinkler risers have a flow switch to monitor flow, monitored outside screw and yoke isolation valve and a fire flow test connection. The fire sprinkler risers are braced horizontally and vertically for seismic protection.

The sprinkler risers are connected by fire supply piping that is interconnected to the fire booster pump and the City water supply. The City water supply is connected by a reduced pressure principle backflow assembly located inside the Fire Control Room. The fire water supply is monitored with a flow switch upstream of the fire sprinkler risers. The fire sprinkler risers are shown in Photo No. 4 above which also includes the fire jockey pump. No significant repairs are recommended for the fire sprinkler risers and water supply system.

### Fire Storage Tank

A 15,000 nominal capacity fire storage tank is located adjacent to the Fire Pump Room. The fire storage tank provides a secondary source of fire water supply in the event that the City water supply does not allow sufficient storage volume. The rectangular tank is constructed of cast-in-place concrete and has an open top. It was noted that an overflow system is not provided in the event that the tank float system does not function properly causing an overflow condition. It is recommended that a tank overflow drain be provided for the fire storage tank. It is also recommended that the tank be cleaned of sediment and organic debris which can accumulate from having a large open top. Periodic dosing with a sodium hypochlorite solution will minimize the organic growth in the tank. The following recommendations for repair and upgrade of the fire storage tank are listed below:

1. Install an overflow drain system on the tank to prevent water damage from an overflow condition.

2. Schedule periodic dosing of the tank with a sodium hypochlorite solution to minimize organic growth in the tank.

### Fire Department Connections

Fire Department Connections are located on the west side of the building adjacent to the Fire Pump Room. The fire department connections are connected to the standpipe systems located in the stairwells and extend to the roof for fire protection. The fire department connections appear adequate for fire code compliance.

### Fire Sprinklers Piping and Sprinkler Heads

Fire sprinkler piping and sprinkler heads are located throughout the building and the fire sprinkler piping is sized in accordance with the NFPA 13 standard adopted at the time of building and fire marshal approval. The fire sprinklers are generally spaced symmetrical and provide adequate sprinkler coverage with the exception of a few limited areas within the building. The open office areas have symmetrical coverage and no issues were noted during our site visit. The areas of the building that do not have adequate coverage are located on the first floor in the ceilings with changes in ceiling heights due to soffit conditions and the areas that have skylights. The soffit areas in the first floor dining area appear to have been modified without modifying the fire sprinkler layout with adequate coverage. The following recommendations for repair and upgrade of the fire sprinkler piping and sprinkler head layouts are listed below:

1. Add fire sprinkler for coverage of dropped soffits on the first floor per NFPA 13 requirements.
2. Add fire sprinkler coverage for the skylights on the first floor per NFPA 13 requirements.

### Fire Suppression Systems

There are halon fire suppression systems for the Main Computer Room, Telecommunication Rooms stacked on various floors, and the Printing Room located on the first floor. There is also a kitchen grease hood fire suppression system for the first floor kitchen area. The halon fire suppression extinguishing agent has been superseded by code to a less ozone depleting extinguishing agent such as "Energon." Fire suppression systems designed for current code compliance no longer use halon fire suppression systems. The following recommendations for repair and upgrade of the fire suppression system are listed below:

1. Upgrade "Ansul" systems with current code compliant extinguishing agent.

## Halogen Gas Monitoring

A halogen gas monitoring system is installed in the chiller mechanical room to detect a release of refrigerant or halogen gas inside the mechanical room. Halogen gas is a colorless and odorless gas and is heavier than standard air. The potential inhalation danger to building occupants needs to be alarmed and the refrigerant gas exhausted to prevent injury. The draft retro-commissioning report dated July 21, 2007 identified the refrigerant detection system required calibration of setpoints and relocation of the gas sensor. The following upgrades and repair items are recommended:

1. Restore proper refrigerant leak detection system function. The sensor should be within 12" of the floor.

## Fire Control Room

The Fire Control Room is located on the first floor near the main entrance and Stairwell 2. The Fire Control Room is equipped with a main fire safety system panel to monitor the status and control of the smoke removal system and isolate various floors by positive or negative pressure relationships inside the building. The main alarm panel allows fire fighters the ability to isolate the various floors with automatic damper control of the supply, return and exhaust systems in smoke removal mode. Concerns regarding this system are addressed in the fire alarm section of the report.

## Breathing Air Systems.

Portable Breathing Air Systems are located inside the Fire Control Room on the first floor. The portable breathing cylinders aid fire fighters in performing rescue and fire fighting duty. The breathing air main fill tanks are located in Stairwell 2. See the Architectural section of this report for more information.

## Stairwell Pressurization System

Stairwell pressurization fans are located at the penthouse floor level and provide positive stairwell pressurization of the stairwells. The positive pressure keeps smoke from migrating into the stairwells to allow the safe evacuation of building occupants in the event of an emergency. The stairwell fans were observed to be operational however the pressure required for opening the doors into the stairwells was excessive. The following upgrades and repair items are recommended:

1. Test and calibrate the operation of the stairwell pressurization fans.
2. Investigate and adjust door operating pressure into the stairwells.

## Emergency Power Fuel Storage Systems

A brief mechanical review of the emergency power fuel storage systems was performed during our survey. The emergency power back-up fuel supply system appears to be operational however it was noted that a ventilation system was not installed in the main diesel fuel storage room and also that the diesel fuel containment wall has areas that show blistering of the containment wall coating. The following upgrades and repair items are recommended:

1. Install an exhaust ventilation system in the main diesel fuel storage room per code.
2. Repair coating at containment walls.

## Fire Dampers and Fire Smoke Dampers

Fire Dampers are indicated at fire rated shaft penetrations and at fire rated construction penetrations of exit corridors and occupancy separations. The BOE Building was constructed prior to the code requirement for combination fire/smoke dampers at all exit corridor duct penetrations. Combination fire/smoke dampers in exit corridors provide an important measure of fire/life safety for the building occupants in the event of an emergency. The following upgrades and repair items are recommended:

1. Test the operation of existing fire/smoke dampers in the building
2. Install combination fire/smoke dampers at exit corridors per current code.

## Helistop

A brief mechanical review of the Helistop located at the uppermost roof level was performed during our survey. It was noted that the Helistop does not have a fuel containment system to contain fuel and isolate the building storm drain system per the City of Sacramento High Rise Code. The following upgrades and repair items are recommended:

1. Install a containment system for the Helistop.