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Penetrations of Shaft Enclosures

By Paul Ricci, Senior Mechanical Project Engineer, Fitzemeyer & Tocci (email pricci@f-t.com)

Is it possible to prevent smoke on one floor from spreading to another? Though complete prevention is not practical, it is reasonable to slow such transmission sufficiently to allow building occupants to safely exit the building. Among numerous methods in an evolving system of smoke control techniques deemed reasonable, the 7th edition of the Massachusetts state building code (MSBC) now requires the routine prevention of smoke transmission between floors in buildings.

In virtually all multi-story buildings, openings in the floors are needed to distribute fresh air flows through ductwork. Because smoke can just as easily travel these same paths between levels, the MSBC requires sealed shaft enclosures around such openings. MSBC Section 707.0, "Shaft Enclosures" intersects with section 716.0, "Ducts and Air Transfer Openings," at section 716.5.3.1, "Penetrations of shaft enclosures," Here, the MSBC states, "shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listings." Prior to the 7th edition, only fire dampers were required in these locations.

Since now smoke and fire dampers are systematically required at shaft enclosure penetrations, it is becoming standard practice to provide combination smoke and fire dampers instead of one of each damper type. The customary guillotine-type apron dampers with fusible links will not work in this combined application. The blade-type is required. Five basic considerations for the provision of such dampers have been gleaned from the Code by a respected manufacturer and are as follows: 1. Fire Resistance Rating (1 or 3 hours), 2. Leakage Rating (Classes 1-3), 3. Elevated Temperature Rating (250 or 350 ° F.), 4. Operational Ratings (various velocity and pressure ratings), and 5. Blade Design (Airfoil or triple V-Groove style). Operationally, the dampers must close when air in the duct exceeds the rated temperature – usually 165 ° F. In the smoke migration prevention capacity the damper must close when the included local smoke sensor senses smoke. Closing of the damper activates the building fire alarm and slows the migration of smoke and heat.

Speare Memorial Hospital - Boulder Point Medical Office Building Plymouth, New Hampshire

Architect: Lavallee Brensinger Architects

The **scope** of this project was to design HVAC, plumbing, fire protection and electrical systems for a new 33,500 s.f. medical office building constructed on two levels. The building program includes medical office, examination and treatment, pharmacy, rehabilitation, administrative, waiting, and support areas. The building is intended to operate on a six day per week schedule with unoccupied periods during the late evening and early morning.

The **design challenge** was to provide cost effective HVAC, plumbing, electrical and fire protection systems within an aggressive design and construction schedule.

Our **solution** included primary heating provided via hot water boiler equipment fed by propane gas. Electric heating water pumps provided hot water for space heating and ventilation air preheat. Primary cooling was provided by DX air cooled condensing units associated with each air handler. Air distribution included variable air volume with terminal reheat coils supplied by rooftop mounted air handlers; two serving roughly half of each floor. Exhaust systems were provided for toilet, general, and specialized exhausts. Automatic control systems were supported by a Direct Digital Control based building automation system.

Electrical design included a new normal power electrical service provided from a pad mount transformer which converted the available utility voltage to a three-phase 480V building service. Complete new power distribution was provided to support all power, lighting and equipment requirements. Low voltage systems included new fire alarm, security, nurse call systems, and telephone and data infrastructure systems.

Plumbing design included domestic hot and cold water, sanitary waste and storm drainage systems. Domestic hot water was provided by two propane-fired hot water heaters located within the mechanical room. The new water service was sized to support the current construction and expected subsequent building expansion. The building was provided with underground, liquefied propane tanks for fuel services.

The fire suppression design included a wet-type automatic fire sprinkler system designed for Light Hazard Occupancy throughout the building.

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2 Montvale Avenue, Suite 4100, Stoneham, MA, 02180
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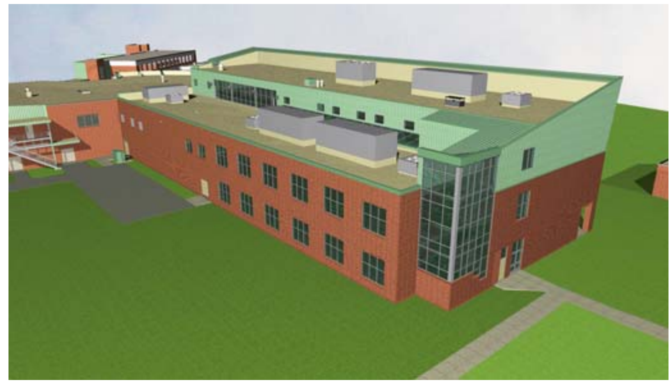


Great Bay Community College
Nashua, New Hampshire

Architect: Dennis Mires, The Architect

The **scope** of this project was to design HVAC, plumbing, fire protection and electrical systems for a new 50,000 s.f. health science and humanities building. The building program included classrooms, offices, an auditorium and support services.

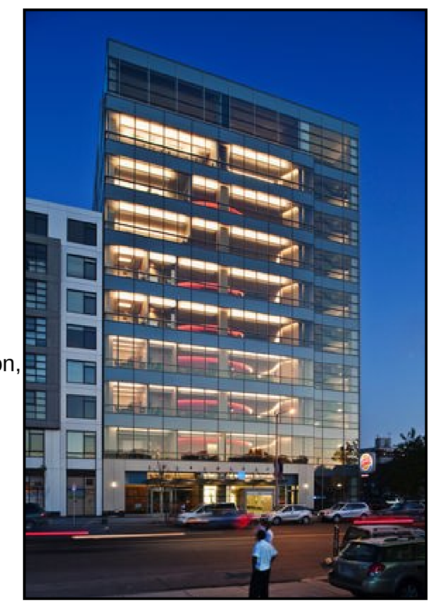
The **design challenge** was to provide cost effective HVAC, plumbing, electrical and fire protection systems.

Our **solution** included primary heating via hot water natural gas-fired boiler equipment consisting of multiple, condensing, high-efficiency, gas-fired boilers. The boilers were vertical, packaged configuration with forced draft burners. Heating hot water for air system reheat coils, perimeter radiation, and ventilation air pre-heat coils within the rooftop air handlers were generated by the boilers with heating water flow supported by two variable speed secondary pumps. Cooling, ventilation, and ventilation air pre-heating were provided by rooftop air handlers. Each AHU was served by a dedicated remote air-cooled condensing unit (ACCU). The entire system was controlled by a Direct Digital Control building automation system.

A new electrical service was provided for the building via a utility company pad-mounted transformer located on the exterior of the building. Emergency electrical power for the building was provided through local battery units provided for all life safety and egress systems. A complete lightning protection system was provided in full compliance with NFPA 780. A fully addressable, non-coded, microprocessor-based fire alarm system was provided throughout the building. Other systems included lighting and power distribution.

Plumbing systems consisted of new cold, hot, and re-circulated hot water supply systems, along with sanitary drainage and storm water drainage.

The fire suppression design included a wet-type automatic fire sprinkler system designed for Light Hazard Occupancy throughout the building.



Fenway Community Health Center
Boston, Massachusetts

Architect: Anshen + Allen

The **scope** of this project was to design the HVAC, plumbing, fire protection and electrical systems for a 70,000 fit-out of an approximately 100,000 s.f. developer spec office building.

The **design challenge** was to work in parallel with the developer design team to provide cost effective HVAC, plumbing, electrical and fire protection systems that offered maximum flexibility for Fenway Community Health Center.

Our **solution** involved providing three large packaged gas fired roof top units to provide cooling, ventilation, night heating, and morning warm up. The units served all levels of the FCHC space including the lecture hall and 1st floor. Pressure independent Variable Air Volume (VAV) terminal boxes with hot water reheat coils were provided for air flow and temperature control.

The electrical design included an extension of the existing base building normal and emergency power distribution and fire alarm systems. Lighting consisted of high efficiency fluorescent and LED based fixtures. The building utilized energy-efficient lighting coupled to a lighting control system to meet energy code requirements. Local occupancy sensing was also provided to minimize lighting energy.

The plumbing design included domestic hot and cold water, natural gas and sanitary distribution from parent building risers located at several locations throughout the horizontal floor plan. The hot water system began at two new gas-fired water heaters supplied for the tenant spaces. Hot water demand was based on approximately 150 fixtures of various types requiring hot water, with a total demand of 300 gallons per hour.

The fire suppression design included a wet-type automatic fire sprinkler system designed for Light Hazard Occupancy throughout the tenant space. The lab and medical records storage areas were treated as Ordinary Hazard, Group 1 in accordance with the requirements of NFPA 13. Sprinkler heads were ordinary temperature throughout except in mechanical spaces where sprinkler heads were intermediate temperature. A dry-pipe double pre-action system protected the Server Room.

As always, we welcome your questions and comments. If you would like further information, please feel free to contact Stephen J. Montibello, PE. a Principal with F&T, who can be reached at 781-481-0210, ext. 175.