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FITZEMEYER & TOCCI

Mechanical / Electrical Engineering Solutions

FOCUS ON TECHNOLOGY

INFRASTRUCTURE MASTER PLANNING

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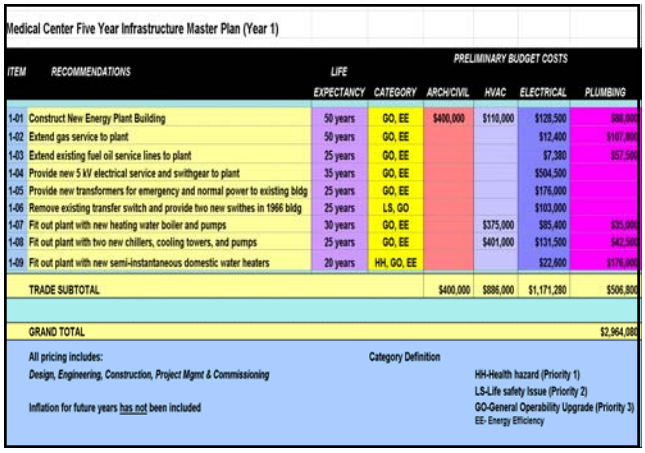
Current facility professionals are faced with dynamic and complex operational and capital planning environments. Facility requirements change so rapidly that maintaining an organization's ability to assess and solve multi-faceted infrastructure challenges is often overwhelming. Comprehensive infrastructure master plans are a vital tool for solving these challenges. Infrastructure master plans focus on the development of an organized and prioritized resource for budgeting and implementing facility repairs, renovations, and upgrades. Facility professionals use the plans to optimize allocation of their financial, material, and personnel assets as well as to determine feasibility of proposed facility modifications. For maximum success, the plans are developed through the combined efforts of facility managers, operators, maintainers, and our qualified engineering professionals.

The "HVAC" systems make up those infrastructure systems that are responsible for maintaining the overall environmental comfort and health within a facility. These systems are also the largest energy consumers in a typical facility. The primary functions of these systems are:

1. Add or remove heat from a space (heating or cooling)
2. Provide fresh air for ventilation
3. Add or remove moisture from the air in a space (humidification or dehumidification)
4. Control airborne space contaminants (filtration)



Medical Center Five Year Infrastructure Master Plan (Year 1)

ITEM	RECOMMENDATIONS	LIFE EXPECTANCY	CATEGORY	PRELIMINARY BUDGET COSTS ARCH/CIVIL	HVAC	ELECTRICAL	PLUMBING
1-01	Construct New Energy Plant Building	50 years	GO, EE	$400,000	$110,000	$128,500	$88,800
1-02	Extend gas service to plant	50 years	GO, EE			$12,400	$107,800
1-03	Extend existing fuel oil service lines to plant	25 years	GO, EE			$7,380	$57,500
1-04	Provide new 5 kV electrical service and swithgear to plant	35 years	GO, EE			$504,500	
1-05	Provide new transformers for emergency and normal power to existing bldg	25 years	GO, EE			$176,000	
1-06	Remove existing transfer switch and provide two new swithes in 1966 bldg	25 years	LS, GO			$103,000	
1-07	Fit out plant with new heating water boiler and pumps	30 years	GO, EE		$375,000	$85,400	$35,000
1-08	Fit out plant with two new chillers, cooling towers, and pumps	25 years	GO, EE		$401,000	$131,500	$42,500
1-09	Fit out plant with new semi-instantaneous domestic water heaters	20 years	HH, GO, EE			$22,600	$176,000
	TRADE SUBTOTAL			$400,000	$886,000	$1,171,280	$506,800
	GRAND TOTAL						$2,964,080

All pricing includes:
Design, Engineering, Construction, Project Mgmt & Commissioning

Inflation for future years has not been included

Category Definition
HH-Health hazard (Priority 1)
LS-Life safety Issue (Priority 2)
GO-General Operability Upgrade (Priority 3)
EE- Energy Efficiency

The typical sub-systems studied as part of the HVAC infrastructure, and some examples of each, include:

- Primary Heating - boilers, furnaces, and direct fired equipment
- Primary Cooling – chillers, direct expansion (DX) equipment
- Primary Cooling – chillers, direct expansion (DX) equipment
- Air Distribution Equipment – air handlers, fans, ductwork
- Steam Distribution Equipment – heat exchangers, piping, traps
- Hydronic Distribution Equipment – heat exchangers, pumps, piping
- Exhaust Systems – fans, ductwork
- Terminal Units – air control boxes, fan-coil units, baseboard radiators

Electrical systems are those responsible for supplying power, lighting, alarm, and signal to a facility for everyday normal operations and emergency operations.

The typical sub-systems studied as part of the electrical infrastructure, and some examples of each, include:

- Primary Electrical Service – high, medium, and low voltage services, metering, transformers, feeder wiring
- Normal Power Electrical Distribution – switchgear, distribution boards, panel boards, feeder wiring
- Emergency Electrical Service – generators, uninterruptible power systems, fuel cells
- Emergency Electrical Distribution – transfer switches, distribution boards, paralleling gear, panel boards, wiring
- Lighting – fixtures, emergency battery units, occupancy sensors, lighting control systems
- Fire Alarm – master box, transmitters, control panel, pull stations, smoke/heat detectors, horn/strobes

Plumbing systems include the systems that are responsible for bringing water to, waste from, and various gasses to a facility; as well as those piping systems required to distribute throughout the buildings. Fuel supply systems are also traditionally included in the plumbing infrastructure.

The typical sub-systems studied as part of the plumbing infrastructure, and some examples of each, include:

- Domestic Water Service – piping, meters, booster pumps
- Domestic Water Distribution – piping, valves, water heaters
- Sanitary Drainage and Venting – piping, fixtures
- Storm Water Drainage – piping, drains
- Fuel Supply – natural gas piping, oil tanks, fuel pumps

Fire suppression systems are responsible for suppressing fires within buildings for the protection of personnel and property. These are life-safety systems that must be kept in proper working order to protect as designed, and maintain code compliancy.

The typical sub-systems studied as part of the fire suppression infrastructure, and some examples of each, include:

- Fire Water Service – piping, backflow prevention devices, entrance risers
- Pressure pumps – fire pumps, jockey pumps
- Sprinklers and Standpipes – piping, sprinkler heads, hose valve

Today, organizations are constantly expanding and contracting their infrastructure base to remain efficient and profitable in their core service and markets. Accurate knowledge of the available capacity (or deficiencies) in infrastructure systems facilitates decision making and planning for inevitable organizational change. With effective knowledge of repair and maintenance needs, appropriate planning and budget exercises can be accomplished.

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Bergen Regional Medical Center
Facility Infrastructure Assessment
Paramus, New Jersey

Architect: MorrisSwitzer Environments for Health

The **scope** of this project was to evaluate the HVAC, plumbing, fire protection and electrical systems infrastructure for a 1.1 million sf medical center that provides medical, psychiatric and long term care services to the community.

Our **solution** included reviewing all engineering systems; mechanical, electrical, plumbing, and fire protection. The work began with an identification of primary systems to be evaluated. This effort included gathering of all available system drawings, schematics, and reports, interviews with facility staff and personnel, and thorough site visits and walkthroughs. This large volume of information was compiled into several abbreviated drawings, schematics and charts to summarize the systems to be evaluated. The report included an executive summary with recommended projects. The recommendations were organized by building for prioritization as the Facility Master Plan is further developed.

A five year master plan is typically incorporated into the Infrastructure Assessment results as an aid to planning and budgeting. Knowing that certain system deficiencies will exist for a year or two, but will be eliminated with a project in year three, helps the staff plan and efficiently utilize facility resources.

A full evaluation of a hospital's infrastructure systems gives a facility an unmatched understanding of current operations. This understanding can be used by the health care system to more efficiently plan, train, and budget. This improved efficiency equates directly into dollar savings and lower operating costs.

Boston College
St. Williams Hall
Brighton, Massachusetts

Architect: DiMella Shaffer Associates

The **scope** of this project was to design HVAC, plumbing, fire protection and electrical systems for a 45,000 sf renovation of St. Williams Hall for Boston College in Boston, Massachusetts. The new program for St. Williams Hall includes classroom and administrative space.

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

Our **solution** involved converting two dual fired (gas/No. 2 oil) Weil McClain steam boilers to hot water. The existing steam piping and steam heating terminals throughout the building will be completely removed throughout the building. The existing steam to hot water heat exchanger, pump and ancillary equipment serving the lower level will be removed. New primary hot water piping system will be provided within the boiler room. Two new primary boiler pumps are designed to provide constant water flow through the boilers. One pump will be stand-by and the pumps will be alternated to equalize run time. The building will be served by a new 150 ton chiller. The chilled water primary loop will be tied to the dual temperature piping system described below via a plate and frame heat exchanger . The building will be served by a 5" dual temperature (2-pipe) piping system. The piping will serve fan coil units throughout the building. The system will be in either heating or cooling mode. The new dual temperature system will be tied to the primary heating and the primary cooling piping systems. The system will automatically changeover from heating to cooling (and vice versa) based on outside air temperatures. The entire system will be controlled by a Direct Digital Control Facilities Management system

The renovation will include a new 3000 Amp., 120/208 Volt, 3 Phase, 4 Wire electrical service. The service will originate at an NStar utility pole or manhole on Commonwealth Avenue. The medium-voltage service will run underground to a new pad-mounted utility transformer located on the South side of the building. A new exterior mounted 175 KW/218.75 KVA, 120/208 Volt, 3 Phase, 4 Wire, 0.8 PF diesel-fired emergency generator with a 24-hour base tank and a sound-attenuated weatherproof enclosure will be provided as part of the renovation. A new fully-addressable, non-coded, microprocessor based fire alarm system will be provided to support new fire alarm devices throughout the building.

The plumbing design included new sanitary waste, natural gas and hot and cold domestic water systems.

The fire protection design included new wet pipe sprinkler and standpipe systems with a new 60 hp fire pump located in the Library.

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.

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