

7 MECHANICAL ENGINEERING - PLUMBING

7.1 Design Criteria

7.1.1 Codes and Standards

The latest edition of the codes, standards, orders, and guides referred to in this section will be followed, with a reference point of August 2008 being the anticipated design completion date. All work will be in accordance with BNL's Implementation Plan for DOE 413.3, "Program and Project Management for the Acquisition of Capital Assets."

7.1.2 DOE Orders

DOE O5480.4 – Environmental Protection, Safety and Health Protection Standards
DOE O413.3A – Program and Project Management for the Acquisition of Capital Assets
DOE O414.1C – Quality Assurance
DOE O420.1B – Facility Safety
DOE O420.2B – Safety of Accelerator Facilities

7.1.3 Codes, Standards, and Guides

Building Code of New York State (NYSBC) – 2002 Edition
American National Standards Institute
ANSI 117.1 Accessible and Useable Buildings and Facilities
American Society of Mechanical Engineers
American Society for Testing Materials Standards
American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Design Guidelines
ASHRAE Standard 90.1-2001 Energy Standards for Buildings Except Low-Rise Residential Buildings
American Water Works Association
ANSI/ASHRAE Standard 62-2001 Ventilation for Acceptable Indoor Air Quality
ANSI/AIHA Z9.5-2003 Standards for Laboratory Ventilation
ANSI/ASHRAE 110-1985 Method of Testing Performance of Laboratory Fume Hoods
Factory Mutual
Mechanical Code of New York State
National Institute of Standards and Technology
National Fire Protection Association (NFPA) Standards
Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Standards for Ductwork Design
Occupational Safety and Health Administration (OSHA)
Underwriters Laboratory
New York State Plumbing Code - 2002 Edition
New York State Fire Prevention Code - 2002 Edition
Energy Conservation Code of New York State - 2002 Edition
Americans with Disabilities Act Accessibility Guideline (ADAAG)
Leadership in Energy and Environmental Design (LEED) 2.2
LEED for Labs

7.2 Plumbing Systems

The NSLS-II facility will require the following plumbing systems:

- Domestic cold water
- Domestic hot water
- Sanitary sewer
- Tempered water (for emergency eye wash and shower)
- Storm (rain) water drainage

These services will be distributed within the Operations Center, the LOBs, the Experimental Hall, and the Booster / Linac and RF Buildings.

7.3 Preliminary Design

7.3.1 Plumbing Systems

7.3.1.1 Potable Water

Scope/Major elements	Water heaters Piping and accessories Safety showers/ eye washes
Redundancy	Two mains, with multiple connection points to the site system will connect to form a looped system feeding the building.
Cold water supply temperature	Ambient
Hot water supply temperature	See Narrative below
Coverage	Experimental Hall Operations Center LOB
Service buildings	
Materials of construction	
Piping	3 in. and over: Ductile iron, cement lined (buried) 3 in. and under: Copper (above ground)
Valves	Ball, globe or gate, bronze
Pumps	Stainless steel impeller, shaft Mechanical seals Ductile iron casing
Tanks	Galvanized steel (storage) Stainless steel or glass lined (water heaters)
Remarks	Disinfected to code requirements

Single 3 inch domestic water services with valves will be extended from the site water main to the Service Buildings as described below. The available pressure has not been verified at this time. Flow data will be obtained during Title II. Installation of a booster pump is not anticipated.

Supply for the domestic water systems shall originate from the water main loop on the interior (courtyard) side of the Ring Building. This interior loop shall be fed from an exterior (road side) loop water main in two locations. In turn, the exterior loop is also fed from two locations from the water mains on the site. (See Civil discussion for additional information on the water distribution plan.)

A domestic service shall enter each of the Service Buildings and supply the water system for the Service Building, adjacent LOB, and approximately 20-percent of the Ring Building. The service will be provided

with two (2) full size ASSE 1013 listed reduced pressure backflow prevention devices piped in parallel. Potable water serving the facility will be used for both the domestic and laboratory plumbing fixtures and equipment.

Laboratory faucets will incorporate integral vacuum breakers, and make-ups to mechanical and laboratory equipment will be provided with appropriate backflow prevention devices.

Domestic hot water will be provided at each laboratory building mechanical equipment room and include a circulated piping system. Hot water will be produced by a storage type electric water heater. The hot water will be stored at 140°F and distributed to lavatories and laboratory fixtures at 120°F through a thermostatic mixing valve.

A tempered (85°F) water distribution piping system will be provided through a thermostatic mixing valve and used as the source for the eyewash / safety showers located throughout each laboratory building. The system will be circulated.

Type "L" copper tubing with wrought copper or cast brass fittings and solder joints will be the pipe material. The pipe joints will be formed with 95-5 tin-antimony solder or code approved "lead free" solder and flux having a chemical composition equal to or less than 0.2-percent lead. Piping 2 in. and smaller may be joined with fittings utilizing a copper crimping system such as the Rigid/Viega ProPress System. 2½ in. piping and over may be schedule 40 galvanized steel with threaded or mechanical couplings (Victaulic style connections). The piping will be insulated with fiberglass pipe insulation having an all service jacket and self-sealing lap.

7.3.1.2 Sanitary

At a minimum, each LOB and Service Building will have a sanitary sewer connection to the site sanitary sewer. Due to the anticipated elevations of the site sanitary sewers, several of the LOB's will need to have sewage ejectors. The remainder will be gravity flow. (See Civil Discussion for additional description of the site sanitary sewers.)

The sanitary drainage system will provide drainage facilities for the toilet fixtures and mechanical room drains. The piping will typically be 4-inch where water closets are served, and 3-inch otherwise. The associated vent piping will be 2-inch and 1 1/2-inch respectively.

Horizontal collection into the building drain will occur below the slab of the First floor and generally exit by gravity to the site sanitary sewer.

To facilitate maintenance and reliability of service, cleanouts will be provided throughout the drainage system. Generally, these will be in accordance with Code requirements, however, consideration of placement will also address accessibility and disturbance to the ongoing functions of the facility. Cleanouts will be the same size as the pipe to which they are connected up to 4-inch, and for larger sizes the cleanout will not exceed 4-inch. Long sweep ells, or wye and 1/8th bends will be utilized to transition from the cleanout to the pipe to permit easy entry for maintenance.

Service weight cast iron soil pipe and fittings was selected as the piping material for this system. Cast iron piping has repeatedly proven its dependability of service. Two methods of joining the pipe and fittings are available. The gasketed bell and spigot joint using a neoprene gasket will be used for the portions of the system placed underground. The no-hub clamped joint using a one piece neoprene gasket, and stainless steel shield with retaining clamps will be used for the above ground portions where the possibility of modifications exist.

7.3.1.3 Storm (Rain) Water Drainage

Storm water will be collected utilizing commercially available drains of style, size, and quantity consistent with the area being drained. Sizing of the drains and collection piping will be based on using a rainfall rate of 3 inches per hour for a storm of 1 hour duration and 100 year return for the primary roof drainage system. Where required, emergency overflow drains and piping will be provided. The piping will generally be routed vertically from the drains to below the First floor slab where it will be collected horizontally and discharge by gravity to the site storm sewers.

Cleanouts will be provided and will follow the same parameters described for the sanitary drainage system.

The pipe materials will be the same as those selected for the sanitary drainage system.