

SECTION 700 -- MECHANICAL

A. GENERAL

1. Every Specification Section is required to include in Part 2 (as the first item), “SUBSTITUTIONS: Materials shall be as specified...” (refer to “SECTION 100 -- GENERAL” for the entire statement).
2. Make sure all specification sections are coordinated with the Bureau’s General Conditions, Document 000708.
3. Penetration Firestopping: Provide penetration firestopping in fire-resistance-rated walls, horizontal assemblies, and smoke barriers in accordance with building and fire code requirements. Firestop systems will be UL Classified to ASTM E814 (UL 1479). Submittals are required, including for product data, product schedule, qualification data, and product test reports (with locations).
 - a. Projects with Architect: Firestopping specifications are required in Division 7. Include requirement for firestopping in fire sprinkler, plumbing, hvac, electrical, and communications specification sections with reference to the firestopping specification located in Division 7.
 - b. Projects with Engineer (and no Architect): For fire sprinkler, plumbing, hvac, electrical, and communication projects where there is no Architect involved in the project, firestopping specifications are required and may be located in and are required to be coordinated with all corresponding specification sections.

B. APPLICABLE DESIGN CODES AND STANDARDS

1. New Hampshire Building Code as defined in RSA 155-A with amendments as adopted by the Building Code Review Board and may (can) be found at the following link: www.nh.gov/safety/boardsandcommissions/bldgcode.
2. Meet seismic restraint requirements for fire-protection, plumbing, and mechanical equipment and systems in accordance with the requirements of the New Hampshire State Building Code. Refer to *Design Guidelines* “Section 100 -- General” paragraph pertaining to seismic requirements.
3. State Fire Code, Saf-C-6000 in accordance with RSA 153:5. Copies may (can) be found at the following link: www.nh.gov/safety/divisions/firesafety.
4. State Fire Marshal’s Office - Department of Safety, Local city and town construction Standards, Rules and Ordinances.
5. The design and construction must comply with all required codes and laws, not just those listed herein.

C. DESIGN GUIDELINES

1. Ductwork construction shall at a minimum comply with most current editions of SMACNA *HVAC Systems-Duct Design* and SMACNA *HVAC Duct Construction Standards – Metal and Flexible*. Unless otherwise required to meet a higher pressure standard, all ductwork shall be 2”w.g., with all joints sealed to class “C.”
2. Mechanical system design temperatures shall be based on ASHRAE 99% heating and 1% cooling temperature and coincident humidity. Indoor design temperatures shall be based on the most

recent edition of ASHRAE standards unless otherwise indicated in the program. Coordinate with the Contract Administrator and Using Agency.

3. In general, ducted returns are to be used on all ventilation systems, use insulated double wall air handlers where possible to promote indoor air quality. Flexible duct runs should be restricted to less than 6 feet; round duct shall be spiral seam construction unless specified otherwise; take offs from duct main branches or trunks shall be with 45° take offs with volume dampers located here to reduce noise. Provide flex connections at all vibrating equipment and on VAV boxes with coils to allow maintenance; black paint inside of duct at all duct termination devices; reinforce ductwork as required for the design duct pressure. Minimum centerline duct radius of elbows shall be 1.0. Rooftop equipment closer than 10' to roof's edge shall have a railing. Consider lining ductwork where noise is a concern.
4. The Contractor shall employ the services of a Certified Industrial Hygienist using a laboratory accredited by the American Industrial Hygiene Association to comply with RSA 10-B, ENV-A 2200, Clean Air in State Buildings Rules (New Hampshire Air Program Rules). Certification of properly collected and analyzed data that demonstrates compliance with said standards will be made by the Department of Environmental Services, Bureau of Environmental and Occupational Health, Radon Indoor Air Quality Program, 29 Hazen Drive, Concord, NH 03302-0095, telephone 603/271-3911) upon receipt of data submitted by the Certified Industrial Hygienist.
5. In accordance with Env-A 2200 & Env-A 2205 Standards, the following must be addressed:
 - a. Ventilation.
 - b. Noise.
 - c. Radon.
 - d. Carbon Dioxide.
 - e. Asbestos.
 - f. Formaldehyde.
 - g. Carbon Monoxide
6. Where possible the HVAC systems shall be designed with an economizer. Automatic temperature and environmental control systems shall be digital, except for renovation projects where existing systems are electrical or pneumatic, no new pneumatic control shall be used unless specifically approved by the Bureau. In general for new digital control systems, a graphical representation of the equipment on a provided computer shall be required for complicated systems and systems controlling a building of over 25,000 square feet.
7. Careful consideration of temperature control zoning is critical. Temperatures shall be adjustable from the control computer and wall sensor/thermostat.
8. Require the Contractor to coordinate submittals and the purchase and installation of HVAC and electrical equipment with the Using Agency and Contract Administrator and with the mechanical and electrical subcontractors.
9. Controls: Careful coordination of the DDC controls with the Bureau's Contract Administrator and the Using Agency is required since each situation is unique.
 - a. Automatic temperature controls field monitoring and control system using field programmable microprocessor based units with communications to Building Automation and Control System.
 - b. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

- c. Provide computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
 - d. Provide controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, when directly connected to control units.
 - e. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories to operate mechanical systems, and to perform functions specified.
 - f. Provide installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.
 - g. Consideration shall be carefully given when integrating with the State's existing Building Management Systems and Universal Network Controllers, of which there are many.
10. The operating cost of the mechanical systems is a high concern. The designer shall evaluate and present to the Bureau, options with life cycle costs when selecting mechanical systems. The designer will be asked to economically justify the system selection. While other building and occupancy factors contribute to system selection, these need to be discussed with the Bureau during the design process. HVAC systems shall incorporate high-energy efficiency equipment and systems and energy recovery systems. Always use premium efficiency motors.
 11. Adequate space shall be provided to service mechanical equipment. Consideration shall be given for removing and replacing mechanical equipment.
 12. Mechanical systems shall be designed to comply with the appropriate structural requirements of the New Hampshire State Building Code, including snow, wind, and seismic loading.
 13. Approved smoke, fire, and combination dampers shall be provided in accordance with the requirements of NFPA 90A *Installation of Air-Conditioning and Ventilation Systems*, NFPA 90B *Installation of Warm Air Heating and Air-Condition Systems*, NFPA 101 *Life Safety Code*, *International Building Code*, and *International Mechanical Code*.
 14. Consideration of freeze protection and thermal shock shall be given in hydronic systems.
 15. An Order for State Government to Continue to Lead by Example in Energy Efficiency, Executive Order 2011-1 (supersedes EO 2005-4), shall apply to new buildings that are estimated to exceed \$1 million in construction cost; building additions that add 25 percent or greater gross floor area to the existing building and/or those that are estimated to exceed \$1 million in construction costs; and/or building renovations that exceed 25 percent of the gross floor area.
 16. New Hampshire High Performance Design Standard linked at <https://admin.state.nh.us/purchasing/publicworks/PWdocuments.asp> is to be implemented in the design and construction of State funded projects for State owned properties per the State Building Code, Section 155-A:13.
 17. Dry automatic sprinkler systems shall be designed to utilize internally galvanized pipe and fittings. Galvanized pipe shall be in accordance with ANSI/ASTM A53 *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*; ANSI/ASTM A 795 *Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use*.
 18. On wet pipe sprinkler systems, sprinkler pipes shall be permitted to be installed level. In dry pipe systems, branch lines shall be pitched at least ½ inch per 10 feet and mains shall be pitched at least ¼ inch per 10 feet. In preaction systems where a portion of the piping is subject to freezing,

branch lines shall be pitched at least 1/2 inch per 10 feet and mains shall be pitched at least 1/4 inch per 10 feet.

19. Provisions shall be made to properly drain all parts of the system.

20. Sprinkler pipe sizing shall be specified as follows. Review with Contract Administrator on a project-by-project basis. Contract Administrator must approve any deviation.

	Wet	Wet	Dry	Dry
Pipe Line	Mains	Branchlines	Mains	Branchlines
Sizes	2" and larger	2" and Smaller	2" and Larger	2" and Smaller
Type	Black Steel	Black Steel	Galvanized Steel	Galvanized Steel
Schedule	Schedule 10	Schedule 40	Schedule 10	Schedule 40
Joints	Grooved	Threaded	Grooved	Threaded
Fitting	Grv Weld and Hole Cut	Black Cast Iron	Grv Weld and Hole Cut	Galvanized Mall Iron