

**220500 PLUMBING BASIC MATERIALS AND METHODS**

*Cornell’s Design and Construction Standards provide mandatory design constraints and acceptable or required products for all construction at Cornell University. These standards are provided to aid the design professional in the development of contract documents and are not intended to be used verbatim as a contract specification nor replace the work and best judgement of the design professional. Any deviation from the Design and Construction standards shall only be permitted with approval of the University Engineer.*

**PART 1: GENERAL**

**1.01 RELATED CORNELL DESIGN AND CONSTRUCTION STANDARDS**

- A. Section 013010 – Accessibility for People with Disabilities
- B. Section 018110 – Green Building Guidelines
- C. Section 221100 – Backflow Prevention
- D. Section 224500 – Safety Showers and Eyewashes
- E. Section 226700 – Laboratory Water Purification Systems
- F. Section 230500 – Basic HVAC Materials and Methods
- G. Section 230523 – Valves
- H. Section 230540 – Laboratories
- I. Section 230700 – HVAC Insulation

**1.02 RELATED CORNELL STANDARD DETAILS**

- A. Detail 3.4.2, Piping Legend
- B. Detail 3.4.4, Domestic Water Service Entrance and Meter Detail

**1.03 SCOPE**

- A. This section applies to plumbing materials installed within the perimeter of the structure from the meter or utility connection to points of utilization within the building. For service piping outside the building perimeter, please contact Cornell Utilities.

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1.04 SUMMARY COMMENTS

- A. For each project, the designer should prepare a Design Narrative/Intent and Basis of Design document for review with project stakeholders.
- B. System design and equipment selection should be determined by minimum life cycle cost including first, operating and maintenance costs. Design plumbing systems in conformance with the Energy Guidelines outlined in Cornell Design and Construction Standard Section 018110.
- C. The consultant will review acceptable systems types with Cornell during the Schematic Design Phase, at the latest.

1.05 POTABLE WATER SOURCES

- A. Three (3) different water sources are utilized on campus:
  - 1. The City of Ithaca - Municipal Water Service
  - 2. Cornell University – Fall Creek (Water Filtration Plant)
  - 3. The Town of Ithaca - Bolton Point Water Authority

1.06 STORM SEWER

- A. Title 6 New York Codes, Rules and Regulations Part 750-1 requires SPDES (State Pollutant Discharge Elimination System) permits for all discharges of water pollutants (including non-contact cooling water) with the following exceptions:
  - 1. Discharge to a municipal treatment plant.
  - 2. Groundwater discharges of less than 1,000 gallons per day of sewage effluent only, no admixture of other type wastes.
- B. No sewage or waste shall be discharged to storm sewer.
- C. Acceptable discharges to the storm sewer include uncontaminated storm water, groundwater, subsurface drainage and roof runoff. Storm water from construction activities is subject to state and/or local requirements.

1.07 SANITARY SEWER

- A. Design and construction of projects shall be in accordance with the laws, rules, regulations and specifications of the municipality having jurisdiction.

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- B. Sanitary sewers in the City of Ithaca, Town of Ithaca, and the Town of Dryden discharge to the Ithaca Area Waste Water Treatment Facility (IAWWTF); design and construction for projects at Cornell University within these localities shall comply with IAWWTF. Requirements are available from the respective City/Town Engineer and/or Chief Waste Water Treatment Plant Operator, telephone 607-273-8381.
- C. Sanitary sewers in the Town of Lansing, Village of Lansing, and Village of Cayuga Heights discharge to the Cayuga Heights Waste Treatment Plant; design and construction of projects at Cornell University in these localities shall comply with the Village of Cayuga Heights Sewer Law, which is available from the Village of Cayuga Heights Engineer, telephone 607-257-5536.
- D. No uncontaminated storm water, groundwater, roof runoff, or subsurface drainage shall be discharged to the sanitary sewer (this list is not comprehensive).
- E. Any new or modified wastewater pretreatment system required to meet discharge standards and sewer use laws shall be approved by the appropriate publicly owned treatment works (POTW) prior to installation. Approvals shall be coordinated with Cornell University Environmental Health and Safety (EH&S).

1.08 CHEMICALS

- A. Various chemicals are used in the research and teaching functions of the University. The Cornell University Chemical Hygiene Plan gives specific guidance for chemical disposal procedures; which can be found at <http://sp.ehs.cornell.edu/lab-research-safety/laboratory-safety-manual/Pages/index.aspx>

1.09 ACCIDENTAL DISCHARGE PREVENTION

- A. Systems shall be designed so as to prevent accidental discharges of prohibited or deleterious substances to the sanitary or storm sewer. Where appropriate, curbs around sumps or floor drains shall be installed. Curbs shall be provided in all emergency generator oil storage rooms.

1.10 FLOOR DRAINS

- A. Floor drains are required in mechanical equipment rooms, kitchen and dishwashing areas, garages, elevator pits, public toilet rooms, and similar areas.
- B. Floor drains shall be connected to the sanitary sewer.
- C. No floor drains in buildings and plants shall be tied to the storm sewer system.

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- D. Floor drains are generally not required to support emergency showers.

**1.11 ON-SITE WASTEWATER TREATMENT SYSTEMS**

- A. Septic systems and lagoons shall only be used as a last resort when a municipal sanitary sewer is not available.
- B. Design shall be approved by the authority having jurisdiction.
- C. Permits shall be obtained as required from local, state, and federal agencies. County Health Departments must be consulted for all septic system construction and modifications. The NYSDEC permitting requirements under 6NYCRR, Part 750-1 must be met if applicable.
- D. Permitting shall be coordinated with Cornell University Environmental Health & Safety.

**1.12 PIPE ROUTING VERIFICATION**

- A. All drainable fixtures must have verification of proper routing and pipe slope.
- B. Verification must be performed on all new construction and when existing systems are modified.
- C. Verification must include positive identification using tracer dyes. Cornell University Customer Service must be notified prior to using dyes.
- D. Cornell University personnel or a designated representative must witness verification testing.
- E. Documentation of the dye test verification must be presented to Cornell University Environmental Compliance Office (ECO). Forms are available from ECO upon request.
- F. CU EH&S and local municipal storm water officials must be notified prior to dye testing storm sewers.

**1.13 ACCESSIBLE PLUMBING FIXTURES FOR LABORATORIES**

- A. Each laboratory, including research and teaching, shall have sinks, workstations, and fume hoods that are accessible to people with disabilities in accordance with Chapters 3 of the ICC/ANSI A117.1-2003 and 2010 ADA Standards for Accessible Design.

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- B. If there is only one sink provided in a laboratory, a deep sink with side approach is generally preferred over using a shallow sink with front approach. This typically means that a bench top emergency eyewash is not suitable. See Cornell Design and Construction Standard Section 224500 for additional information.

1.14 REMOTE FUEL TANK FILLING STATIONS

- A. Cornell University has standardized the type and size of fuel filler connections and stations on campus. The type/size of the filler connection should be a 2-inch camlock female connector. The remote station employed on campus is the Simplex FuelPort filling system.
- B. Piping materials – A-53 Steel piping with threaded joints. Steel piping shall be factory coated with corrosion resistant paint or coating.

PART 2: PRODUCTS

2.01 GENERAL

- A. Grooved-Joint fittings shall be allowed on copper domestic water piping 2 ½" or larger.
- B. The only type of copper pressure seal fitting system that is allowed to be used on campus are those that use a mechanical joint that crimps on both sides of the O-ring, and shall be limited to use on domestic water systems. The only acceptable manufacturer is Viega.
- C. All equipment, devices and accessories installed in potable water applications shall comply with NSF 61.
- D. Piping shall be fully labeled throughout (mechanical rooms, chases and throughout buildings). Labels should include name of system, flow arrow, color code and size of pipe. Stencils are acceptable. Label every 25 feet, and at all penetrations and branches.
- E. Due to Cornell’s experience with increased frequency of maintenance, the following piping specialties are not allowed on campus:
  - 1. Dielectric Unions
  - 2. Combination balancing and shutoff valves
  - 3. Triple Duty Valves

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F. Please consult with Facilities Engineering for deviations from these standards.

2.02 VALVES

A. See Cornell Design and Construction Standard Section 230523.

2.03 PRESSURE GAUGES AND THERMOMETERS

A. See Cornell Design and Construction Standard Section 230500.

2.04 HOSE BIBBS AND HOSES

A. All hose bibbs and other fittings with hose connections shall be provided with vacuum breakers.

B. Hose bibbs on building exteriors shall be frost-free type.

2.05 POTABLE WATER SERVICE METER

A. Water meters are required on the building service entrance. Meter shall be Metron-Farnier or Neptune, and shall have a local display readable in cubic feet sized per manufacturer’s specifications. Meters shall be complete with plate or basket strainers, a three valve bypass with a pressure gauge on the bypass. Consult Cornell for remote readout requirements. Meters shall be mounted between 36 to 60-inches above finished floor in an accessible location.

2.06 HOT WATER STORAGE TANKS

A. Hot water storage tanks above 150 gallon capacity shall be Pre-Krete lined in the field after setting. Below 150 gallon, tanks shall be glass lined.

B. Hot water storage tanks shall be factory insulated unless otherwise directed.

C. Tanks shall be ASME rated.

2.07 SANITARY PIPING SYSTEMS

A. Do not use stainless steel clamps below grade.

B. All cleanouts shall be full line size.

C. Odors from the sanitary system shall be minimized through the use of trap primers. Drain stoppers are not an acceptable means of odor prevention.

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- D. Kitchen Waste Drain System – Grease laden waste from kitchen fixtures including floor drains shall be piped separate from the building sanitary system and terminate at a grease interceptor.

**2.08 GREASE INTERCEPTORS**

- A. Shall be installed on kitchen waste drain systems. Grease interceptor outlet shall be connected to sanitary sewer. If a septic system is used, the grease interceptor shall be permitted and monitored.
- B. Grease interceptors shall be selected and sized to meet the facility grease load demand and applicable codes. Coordinate with Cornell Dining or kitchen operator for meal type, meal quantities, and preferred pump out schedule. Requirements shall be verified with the local municipality.
- C. Except for residential construction, kitchen fixtures and floor drains shall be connected to the kitchen waste system and routed to a grease interceptors.
- D. The use of interceptors on effluent to any leach field or sand filter shall be addressed on a case by case basis.
- E. Centralized grease interceptors located outside, below grade, are preferred for ease of maintenance and pumping.
- F. Construction – Molded, seamless high-density polyethylene construction. Metal construction is not acceptable. Unit shall meet PDI G101, ASME A112.14.3, and CSA B481 standards. Access covers shall be pickable cast iron construction. Access covers shall be labeled “Grease Trap” or similar.

**2.09 OIL AND WATER SEPARATORS**

- A. Provide oil and water separators for working garages. Oil and water separators shall be connected to sanitary sewer.
- B. Oil and water separator discharges to septic systems, storm sewers or groundwater shall be avoided. If unavoidable, an industrial discharge permit will be required *from the NYS DEC*. Permitting shall be coordinated with Cornell University Environmental Health and Safety.

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2.10 SUMP PUMPS

- A. Pump on, off, lead, lag, and maximum effluent level shall be specified as calculated based on basin size to allow for efficient pump run times. These values shall be pre-determined and not field verified set points. Level control shall maintain the effluent level to 2 inches below the invert of the gravity drain.
- B. Where duplex sump pump details are specified a detail shall be provided.
- C. Submersible type pumps shall be utilized in lieu of pedestal pumps.
- D. The check valve on sump pump discharge piping shall be located upstream of the shutoff valve to allow for check valve maintenance.

2.11 PLUMBING PIPING INSULATION

- A. See Cornell Design and Construction Standard Section 230700.

2.12 PIPE, FITTINGS AND JOINING MATERIALS

- A. Domestic Water, Above Grade

Pipe Size	Pipe	Fittings	Joint
All sizes	ASTM B88 Type L Hard Copper	ASME B16.22 Wrought Copper	ASTM B32 Solder 95 Sn / 5 Sb 95.5 Sn / 4 Cu / 0.5 Ag
2-inch & below	ASTM B88 Type L Hard Copper	ASME B16.22 Wrought Copper	ASME B16.22 Copper Pressure Seal EPDM Sealing Element
2-inch & above	ASTM B88 Type L Hard Copper	ASME B16.22 Wrought Copper	Grooved Joint Fittings Grade EHP EPDM



**B. Sanitary Waste & Vent, Above Grade**

Pipe Size	Pipe	Fittings	Joint
All sizes	ASTM A888, CISPI 301 Service Weight Cast Iron Hubless	ASTM A888, CISPI 301 Service Weight Cast Iron Hubless	ASTM C564 Elastomeric Sealing Sleeve Stainless Steel Band
	ASTM D 1784, 1785 & 2665 PVC Schedule 40 Solid Wall Pipe	ASTM D 1784 & 2665, ASTM F 1866 Schedule 40 DWV Fitting System	ASTM D 2564 Solvent Cement, ASTM F 6, ASTM F 656 Primer
2-inch & below	ASTM B306 Type DWV	ASME B16.29 Wrought Copper, DWV	ASTM B32 Solder 95 Sn / 5 Sb 95.5 Sn / 4 Cu / 0.5 Ag

**C. Sanitary Waste & Vent, Below Grade**

Pipe Size	Pipe	Fittings	Joint
All sizes	ASTM A74 Service Weight Cast Iron Hub and Spigot	ASTM A74 Service Weight Cast Iron Hub and Spigot	ASTM C564 Elastomeric Compression Gasket
	ASTM D 1784, 1785 & 2665 PVC Schedule 40 Solid Wall Pipe	ASTM D 1784 & 2665, ASTM F 1866 Schedule 40 DWV Fitting System	ASTM D 2564 Solvent Cement, ASTM F 6, ASTM F 656 Primer

**D. Laboratory Waste & Vent**

Pipe Size	Pipe	Fittings	Joint
All sizes	ASTM D4101 ASTM F1412	ASTM D4101 ASTM F1412	ASTM D4101 ASTM F1412
	Sch 40 Polypropylene Fire Retardant	Polypropylene Fire Retardant	Mechanical Joint

E. Cooling Coil Condensate Drain

Sizes	Pipe	Fittings	Joint
All sizes	ASTM B88 Type M Hard Copper	ASME B16.22 Wrought Copper	ASTM B32 Solder 95 Sn / 5 Sb 95.5 Sn / 4 Cu / 0.5 Ag
1.25-inch & above	ASTM B306 Type DWV	ASME B16.29 Wrought Copper, DWV	ASTM B32 Solder 95 Sn / 5 Sb 95.5 Sn / 4 Cu / 0.5 Ag

F. Low Pressure Compressed Air, 100 psig and below

Sizes	Pipe	Fittings	Joint
1/2-inch & below	ASTM B88 Type L Hard Copper	Brass	Compression
3/4-inch & above	ASTM B88 Type L Hard Copper	ASME B16.22 Wrought Copper	ASTM B32 Solder 95 Sn / 5 Sb 95.5 Sn / 4 Cu / 0.5 Ag

G. High Pressure Compressed Air, Above 100 psig

Sizes	Pipe	Fittings	Joint
1/2-inch & below			
	ASTM B88 Type L Hard Copper	Brass	Compression
3/4-inch & above	ASTM B88 Type L Hard Copper	ASME B16.22 Wrought Copper	ASTM B32 Brazed 95 Sn / 5 Sb 95.5 Sn / 4 Cu / 0.5 Ag

H. Natural Gas Piping, Above Grade

Sizes	Pipe	Fittings	Joint
3-inch & Below	ASME B36.10, ASTM A53/A53M Schedule 40 Black Steel	ASME B16.3 Malleable Iron	Threaded
4-inch & Above	ASME B36.10, ASTM A53/A53M & Schedule 40 Black Steel	ASME B16.9 Carbon Steel	ASTM A 234 Welded

I. Pure Water: See Cornell Design and Construction Standard Section 226700.