220500  PLUMBING BASIC MATERIALS AND METHODS

PART 1  GENERAL

1.01  RELATED CORNELL DESIGN AND CONSTRUCTION STANDARDS

A. Section 013010 – Accessibility for People with Disabilities
B. Section 230540 – Laboratories
C. Section 230500 – Basic HVAC Materials and Methods
D. Section 230523 – Valves
E. Section 224500 – Safety Showers and Eyewashes
F. Section 226700 – Laboratory Water Purification Systems
G. 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 with the building. For service piping outside the building perimeter, please contact Cornell Utilities.

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 018120.
C. The consultant will review acceptable systems types with Cornell during the Schematic Design Phase, at the latest.

1.05 POTABLE WATER SOURCE

A. All water is supplied by the Cornell University Water Filter Plant except in emergencies. There are three main water distribution zones on campus, as follows:

1. Campus Zone 1 – Supplied by a 1 million gallon Ground Tank.
2. Campus Zone 2 – Supplied by Hungerford Hill Tank. This systems pressure is reduced using PRV 1065.
3. Campus Zone 3 – Supplied by the Hungerford Hill Tank.

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.

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.

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

2.02 VALVES


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 POTABLE WATER SERVICE ENTRANCE BACKFLOW PREVENTER

A. All university domestic water systems are considered hazardous and therefore shall require reduced pressure (RPZ) backflow prevention devices. Prior to developing the schematic design, the consultant shall refer to Cornell Utilities Water Treatments Department’s Cornell University Cross Connection Control Program documents for information on the proper application of the backflow prevention devices on University domestic water systems.

B. For buildings where uninterruptable service is required, Cornell requires the potable water supply to the building be protected with two reduced pressure zone (RPZ) backflow devices with integral strainers and piped in parallel. For non-critical potable water supplies, a single RPZ is acceptable. Pressure gauges shall be provided on both sides of the RPZ.
C. All RPZ relief drains shall be piped with full sized drain lines to the nearest sanitary drain. The sanitary drain shall be capable of handling a full discharge flow from the RPZ.

D. Cornell acceptable RPZ devices are as follows:

1. Watts Regulator, Model LF909-S-FDA
2. Watts Regulator, Model 994-S

E. In certain cases, deviation from this requirement will be considered on a case by case basis. Please consult with Facilities Engineering for further information.

F. Backflow preventer assemblies shall be installed to prevent freezing, flooding and mechanical damage with the following clearances:

1. 30 to 60-inches above floor from the centerline of the assembly.
2. 18 inches minimum from the bottom of RPZ relief valves.
3. 12 inches above the assembly.
4. 30 inches in front of the assembly.
5. 8 inches from the back side of the device.

G. Provide strainer upstream of backflow prevention device.

H. RPZ discharge shall be sized for catastrophic failure of the relief valve. Discharge flow shall be determined by the manufacturer’s listed maximum discharge rate based on supply pressure or on-site pressure; whichever is greater.

I. RPZ drainage shall be via gravity drain. If sump pumps are used they must accommodate the maximum discharge rate and be connected to an emergency power supply.

J. Acceptable RPZ discharges are as follows:

1. Storm Sewer – Connection shall include a backwater check valve.
2. Sanitary Sewer – Connection shall be trapped and include a backwater check valve.
3. Grade – Discharge shall be terminated above grade in a location not subject to flooding. Piping termination shall include a rodent screen.

2.07 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.

2.08 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 and deep seal traps are not an acceptable means of odor prevention.

2.09 GREASE INTERCEPTORS

A. Grease interceptors 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 applicable code. Requirements shall be verified with the local municipality.

C. Except for residential construction, kitchen fixtures and floor drains shall have 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. Install interceptors on grease lines prior to admixture with the sanitary sewer.

2.10 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.
2.11 DOMESTIC HOT WATER SYSTEMS

A. Steam to water heat exchanger type hot water heaters shall be double-wall heat exchangers due to the campus steam supply containing an essentially toxic transfer fluid.

2.12 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.

2.13 PLUMBING PIPING INSULATION

A. See Cornell Design and Construction Standard Section 230700.

2.14 PIPE, FITTINGS AND JOINING MATERIALS

A. Domestic Water, Above Grade

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sizes</td>
<td>ASTM B88 Type L Hard Copper</td>
<td>ASME B16.22 Wrought Copper</td>
<td>ASTM B32 Solder 95 Sn / 5 Sb 95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
<tr>
<td>2-inch &amp; below</td>
<td>ASTM B88 Type L Hard Copper</td>
<td>ASME B16.22 Wrought Copper</td>
<td>ASME B16.22 Copper Pressure Seal EPDM Sealing Element</td>
</tr>
</tbody>
</table>
### B. Sanitary Waste & Vent, Above Grade

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sizes</td>
<td>ASTM A888, CISPI 301</td>
<td>ASTM A888, CISPI 301</td>
<td>ASTM C564</td>
</tr>
<tr>
<td></td>
<td>Service Weight Cast Iron</td>
<td>Service Weight Cast Iron</td>
<td>Elastomeric Sealing Sleeve</td>
</tr>
<tr>
<td></td>
<td>Hubless</td>
<td>Hubless</td>
<td>Stainless Steel Band</td>
</tr>
<tr>
<td>4-inch &amp; below</td>
<td>ASTM B306, Type DWV</td>
<td>ASME B16.29, Wrought Copper, DWV</td>
<td>ASTM B32, Solder, 95 Sn / 5 Sb, 95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sizes</td>
<td>ASTM A74, Service Weight Cast Iron, Hub and Spigot</td>
<td>ASTM A74, Service Weight Cast Iron, Hub and Spigot</td>
<td>ASTM C564, Elastomeric Compression Gasket</td>
</tr>
</tbody>
</table>

### D. Laboratory Waste & Vent

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sizes</td>
<td>ASTM D4101, ASTM F1412, Sch 40 Polypropylene, Fire Retardant</td>
<td>ASTM D4101, ASTM F1412, Polypropylene, Fire Retardant</td>
<td>ASTM D4101, ASTM F1412, Mechanical Joint</td>
</tr>
</tbody>
</table>

### E. Cooling Coil Condensate Drain

<table>
<thead>
<tr>
<th>Sizes</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sizes</td>
<td>ASTM B88, Type M Hard Copper</td>
<td>ASME B16.22, Wrought Copper</td>
<td>ASTM B32, Solder, 95 Sn / 5 Sb, 95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
<tr>
<td>1.25-inch &amp; above</td>
<td>ASTM B306, Type DWV</td>
<td>ASME B16.29, Wrought Copper, DWV</td>
<td>ASTM B32, Solder, 95 Sn / 5 Sb, 95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
</tbody>
</table>
F. Low Pressure Compressed Air, 100 psig and below

<table>
<thead>
<tr>
<th>Sizes</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2-inch &amp; below</td>
<td>Flame Retardant</td>
<td>Brass</td>
<td>Barb</td>
</tr>
<tr>
<td></td>
<td>Polyethylene Tubing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM B88</td>
<td>Brass</td>
<td>Compression</td>
</tr>
<tr>
<td></td>
<td>Type L Hard Copper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/4-inch &amp; above</td>
<td>ASTM B88</td>
<td>ASME B16.22</td>
<td>ASTM B32</td>
</tr>
<tr>
<td></td>
<td>Type L Hard Copper</td>
<td>Wrought Copper</td>
<td>Solder</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>95 Sn / 5 Sb</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
<tr>
<td></td>
<td>ASTM A53</td>
<td>ASME B16.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sch 40 Black Steel</td>
<td>Malleable Iron</td>
<td>Threaded</td>
</tr>
</tbody>
</table>

G. High Pressure Compressed Air, Above 100 psig

<table>
<thead>
<tr>
<th>Sizes</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2-inch &amp; below</td>
<td>Flame Retardant</td>
<td>Brass</td>
<td>Compression</td>
</tr>
<tr>
<td></td>
<td>Polyethylene Tubing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM B88</td>
<td>Brass</td>
<td>Compression</td>
</tr>
<tr>
<td></td>
<td>Type L Hard Copper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/4-inch &amp; above</td>
<td>ASTM B88</td>
<td>ASME B16.22</td>
<td>ASTM B32</td>
</tr>
<tr>
<td></td>
<td>Type L Hard Copper</td>
<td>Wrought Copper</td>
<td>Solder</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>95 Sn / 5 Sb</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
<tr>
<td></td>
<td>ASTM A53</td>
<td>ASME B16.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sch 40 Black Steel</td>
<td>Malleable Iron</td>
<td>Threaded</td>
</tr>
</tbody>
</table>