PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Motors.
2. Starters.
3. Variable Speed Drives.
5. Gages and Thermometers.
6. Temperature and Pressure Test Plugs.
7. Pipe Hangers, Supports and Guides.

B. Related Sections:

1. Section 15010 - Basic Mechanical Requirements.
2. Section 15190 - Mechanical Identification.
3. Section 15240 - Mechanical Sound and Vibration Control.
4. Section 01045 - Cutting and Patching.
5. Section 02200 - Earthwork.
7. Section 15950 - Temperature Controls
8. Section 09900 - Painting

1.02 REFERENCES
A. American National Standards Institute (ANSI).

B. American Society of Mechanical Engineers (ASME).


D. National Electrical Manufacturer's Association (NEMA).

E. ASHRAE

F. ASTM

G. NFPA

H. UL

1.03 SYSTEM DESCRIPTION

A. Design Requirements:

1. Motors:

   a. General:

      1. Size for the operating conditions of each specific item of equipment.

      2. Motors 1/2 hp and smaller single phase.

      3. For 1 HP and higher, specify that motors are to be Premium Efficient, complying with Xcel Energy requirements.

   b. Altitude Deration:

      1. Motors must be selected to operate within name plate horsepower at 5400 feet elevation and shall not operate on the service factor.

   c. Starting Capability:

      1. Select motors capable of making starts as frequently as indicated by the automatic control system requirements for energy conservation or other multiple starts.

   d. Energy Efficiency:
1. All motors rated greater than 1000 watts shall have a Power Factor of not less than 85 percent under rated load conditions.

e. Bearings:

1. Ball or roller bearings.

2. Regreasable except permanently sealed where motor is normally inaccessible for regular maintenance.

3. Sleeve-type acceptable for fractional horsepower light-duty motorized equipment.

f. Acoustical:

1. Motors shall not exceed 80 db rating when running their full speed and power range.

g. Specify that all belt-drive motors over 5 HP shall have dual push-pull adjustment screws for the motor mounts. For retrofits, require that the motor mounts be replaced if not of this type.

h. VFD Use:

1. Motors have insulation rated 1600 volts or greater.

i. Insulation:

1. Motors shall be NEMA Design B with Class F insulation.

j. Sealant:

1. Pipes penetrating through exterior walls are to be sealed and supported by Link Seal or approved equal. Size and type of Link Seal to be selected based on type of pipe and application.

2. Starters:

a. General:

1. Specify starters necessary to operate Division 15 Motors.

2. Consult with Electrical Engineer and determine which motors, if any, require reduced-voltage or reduced inrush starters. Conditions of starting must be considered. For example, large vane axial fans have low starting torque requirements because they are controlled to start with fan blades unloaded.
which usually allow across-the-line starting to be accomplished within University requirements, with advantages of shorter manufacturer's delivery schedules, lowest cost, least complex and requiring the least maintenance.

3. Specify starters for chillers and packaged equipment in their respective Sections.

b. Motor Control Centers:

1. Where a large group of starters can be centrally located, it will be beneficial to have these assembled in a motor control center (MCC) and specified in Division 16.

2. Where starters are to be specified in a MCC in Division 16, close coordination is required with the Electrical Consultant to make sure starters match specific motor requirements for part winding start, auto transformer type starting, wye/star-delta closed transition type or where two speed motors have been specified.

3. Provide adequate space in design for installation of field panels to contain relays and point cards for remote start-stop and status indication in conjunction with EMCS requirements.

c. Starter Configuration:

1. Comply with full NEMA Standards and NEC. Refer to 16480.

2. Specify Type 1 general purpose enclosures with/ padlock ears.

d. Manual Control:

1. Specify maintained-contact push buttons with pilot lights for single-speed or multi-speed operation.

e. Automatic Control:

1. Specify magnetic starters for motors 1/2 horsepower and larger and for smaller motors where interlock or automatic operation is required.

2. Specify auxiliary contacts if needed. Specify space for future.


4. Interlocks, pneumatic switches and similar devices as required for coordination with the control requirements specified in Section 15950 - Controls and Section 15985-Control Sequence of Operation.
5. Built-in 120 volt control circuit transformer, fused from line side, where service exceeds 240 volts.

6. Trip-free thermal overload relays, each phase.

7. Externally operated manual reset.

3. Variable-Speed Controllers (VSC)
   
a. General:

   The characteristics listed below are the minimum requirements for UCB applications.

   1. The VSC shall be of sufficient capacity and provide a quality of output wave form so as to achieve full rated output of the motors. The VSC shall be capable of operating any standard NEMA Design B squirrel cage induction motor (3 phase, 60 Hz), with full-load amp rating between 10 percent and 110 percent of the drive full load current capability, without requiring any modifications to the motor or drive.

   2. Three (3) year warranty.

   b. Construction:
   1. Each VSC shall be of the pulse width modulation (PWM) design.

   c. Basic Features

   1. Control:

   a. With the "H-O-A" switch in the 'HAND' position, the drive shall be controlled by the manual mode on the drive door.

   b. With the "H-O-A" switch in 'AUTOMATIC', the drive shall start, and its speed shall be controlled by a 4 to 20 MA input speed signal.

   c. With the "H-O-A" switch in the "OFF" position, the run circuit will be open and the VSC will not operate.

   d. The VSC shall be arranged to provide automatic restart after a trip condition resulting from over-voltage or under-voltage. For safety, the drive shall shut down and require manual reset and restart if the automatic reset/restart function is not successful within a maximum of five attempts.

   2. Field Adjustments:
a. Independent acceleration/deceleration rates: 0.5 - 120 seconds. Regeneration or dynamic braking will not be required for deceleration.

3. Line Noise Protection:

a. VSCs shall be equipped with factory installed reactors or separate isolating transformer as called for on the plans to minimize the effects of harmonics and "line notching" on the building distribution system. Manufacturer shall optimize the impedance of reactors or transformer and provide calculations to the owner certifying that the installed system is within IEEE-519 standards. Care should be taken in specifying transformer impedance so the transformer can support across-the-line starting of the driven motor in a standby mode.

4. Factory Tests:

a. The VSC shall be tested with the system logic and given complete factory tests including simulated operation

4. Valves:

a. Specify valves which meet these standards as a minimum. They shall be pressure-rated type valves.

b. Specify that all valves shall comply with the applicable MSS (Manufacturer Standardization Society) standards, and shall state so in submittals.

c. Locate valves in accessible locations with adequate clearance around hand wheels or levers for easy operation.

d. Specify and clearly indicate service valves for all equipment, risers, branches and zones on Drawings.

e. Isolation valves shall be installed within 5 feet of the unit served. If the branch line serving the unit is greater than 10 feet long, an isolation valve shall be installed at the branch connection.

f. For domestic water systems:

   - 2” and smaller, ball valve with stainless-steel ball and stem.
   - 2 ½” to 4”, three-piece ball valve with stainless-steel ball and stem.
   - Above 4” gate valves with resilient seat.

5. Gages and Thermometers:
a. Review with University during design development where stationary gages and thermometers will be required, in addition to sensors and instrumentation specified in Section 15950-Controls, to avoid unnecessary redundancy. Gages with dual units (Standard and S.I.) are required.

b. Stationary locations to confirm, and clearly indicate, on primary pieces of equipment specified in other Sections of these Design Standards include the following:

   PRV Stations
   Heat Exchangers
   Domestic Water Heaters
   Condensate Coolers
   HVAC Pumps
   Chillers
   Condensers
   Boilers

6. Temperature and Pressure Test Plugs:

   a. Specify for all other locations of equipment or piping where periodic temperature and/or pressure indication is required to test performance of equipment or systems include the following:

      Water Coils
      Zone Loops
      Booster Pumps

   b. Determine and specify minimum number of portable thermometers and gages that will be required for test plugs to monitor any one set of conditions.

7. Pipe Hangers, Supports and Guides:

   a. Hangers in contact with steel, iron, cast or ductile iron shall be plated.

   b. Hangers in contact with copper piping shall be copper clad or have a suitable lining to prevent electrolysis.

   c. Hangers for cold insulated pipe shall be around the outside of the insulation.

   d. For hot and cold water lines ¾” and smaller, fiberglass insulation with 180-degree metal shield is acceptable. For piping 1 inch and larger, specify Snappitz brand inserts at these hangers and roller support points to prevent insulation damage.
e. Plastic piping shall be supported on continuous galvanized steel trough with clevis hanger spacing as indicated for metallic piping, or as recommended by manufacturer.

f. Pipes that run parallel and have similar grade or pitch may be supported on trapeze hangers with spacing determined by the smallest pipe.

g. Special pipe hanger and support provisions required for control of pipe expansion, vibration, and sound transmission shall be in accordance with Section 15240-Mechanical Sound and Vibration Control and good sound attenuation practice.

h. Pipe guides and anchors shall be detailed and locations shown on drawings.

i. Pipes on roofs shall be supported by roller supports of adjustable height. Wood blocks and straps are not acceptable for lengths greater than six feet.

j. Within walls, every vertical 6 feet where pipes supply fixtures.

k. Within 6 inches of both sides of a control valve.

8. Dielectric Pipe Fittings and Isolators:

a. Dielectric Waterways are no longer wanted. Provide brass couplings or valves at all connections between dissimilar metals in water systems to control corrosion potential caused by galvanic or electrolytic action. Dielectric unions are not acceptable.

b. Typical locations are:
   1. Water heaters.
   2. Storage and pressure tanks.
   3. Water conditioning equipment.
   5. Make-up connections to boilers.
   6. Make-up connections to chilled water systems.
   7. And the like where materials of different electrode potential are joined.

9. Unions:
a. Unions and isolation valves are required wherever major components need to be removed for repair or replacement. Flanges are required for 2” piping and larger.

10. Venturis:

a. Venturis or other flow-measuring devices are required wherever water balancing is required.

1.04 QUALITY ASSURANCE

A. Welder Qualifications: Welding shall be performed by ASME Certified Welders with current certificate in accordance with ANSI B31.1 for shop and project site welding of piping work.

PART 2 - PRODUCTS

2.01 MOTORS

A. Manufacturers:

ABB
AO Smith
Baldor
General Electric
Gould
Lincoln
Louis Allis
Reliance
Toshiba
Westinghouse

B. Motor performance and ratings certified in accordance with latest NEMA standards.

2.02 STARTERS

A. Manufacturers:

Allen Bradley
General Electric
Siemens
Sprecher & Schuh (NEMA approved only)
Westinghouse
SQ “B”, Cutler-Hammer

B. Starters certified in conformance with latest NEMA Standards and NEC requirements.
2.03 VARIABLE SPEED CONTROLLERS

A. Manufacturers:

   ABB
   Danfoss

2.04 VALVES (For any value used in steam service, refer to Section 15521)

A. Manufacturers:

1. General: Valves, manufacturers and catalog numbers are shown only to establish type and quality of valves required. Other equal valves may be selected from the following lists of acceptable manufacturers. All valves shall be pressure-rated type.

   a. Ball Valves (Bronze body, tunnel balls), (Comply with MSS-SP-110):

      Apollo
      Dynaquip
      Hammond
      Jamesbury
      Jomar
      Milwaukee
      Nibco (industrial duty)
      Watts
      Worcester

   b. Butterfly Valves (Comply with MSS-SP-67):

      Crane
      DeZurik
      Fisher
      Hammond
      Jamesbury
      Keystone
      Milwaukee
      Nibco (industrial duty)
      Posi-Seal
      Victaulic

   c. Non-Lubricated Eccentric Plug Valves:

      DeZurik
      Keystone
      Milliken

   d. Lubricated Plug Valves:
e. Gas Valves (AGA, CGA, UL):

- Crane
- Hammond
- Peter Healy
- Alternate: Milwaukee "Butterball" valves
- Jomar Ball valves

f. U.L., F.M. Approved or Listed Valves:

- Demco
- GEM
- Grinnell
- Jomar
- Kennedy
- Keystone
- Mission
- Mueller
- Nibco (industrial duty)
- Pratt
- Victaulic

g. Bronze Pressure-rated Valves (Comply with MSS-SP-80):

- Crane
- Hammond
- Milwaukee
- Nibco (industrial duty)
- Powell
- Stockham

h. Iron Body Pressure-rated Valves (Comply with MSS-SP-70):

- Crane
- Kennedy
- Lunkenheimer
- Milwaukee
- Mueller
- Powell
- Stockham
- Walworth

i. Gate Valves (Steam only. See Section 15521.)
j. Balancing Valves:

See Section 15511 (Hydronic Piping).

B. Valve Schedule:

1. Ball Valves:
   a. Pressure-rated
   b. Blowout-proof stem with packing nut
   c. Full ball port with Teflon seals and seat, as specified.
   d. Solid, bored-hole, stainless-steel ball and stem.
      NOTE: For all bronze valves, specify the following:
      Body = ASTM B61, B62 or B584 Bronze
   e. Example Schedule:
      
      Plan Code:    B.V.
      Service:      Balancing
      Pressure:     150 SWP/600 WOG
      Sizes/Inches: 1/4 through 4"
      Make:    Apollo 77-200
      Actuator:    Lever
      Port:        Full
   f. Three-piece ball valve if 2-1/2” or greater.

2. Butterfly Valves:
   a. Example Schedule: standard 150 psig with 150 psig ANSI companion flanges for
      use where system pressures cannot exceed 200 psig shut off (static) pressure.
      
      Plan Code:    BFV
      Style:        Fully-lugged body. Shall be capable of bi-directional
                     dead-end shut-off and full-rated pressure without the need
                     for downstream blind flange. Lay length shall conform to
                     current MSS SP 68 or API 609 Standards. Valve bodies
                     shall have minimum wall thickness requirements of ANSI
                     B16.34. Valve bodies shall have an internally cast travel
                     stops for the valve disc. Valve-body neck length shall
                     accommodate 2” insulation. Valve disk and shaft shall be
                     double-offset design. Valve disk shall be secured in a
                     concentric location relative to the seat by means of non-
wearing self-lubricating bushings. Blowout-resistant shaft shall be standard and shall meet API 609. Valve journals shall have press-fit upper and lower bushings located immediately adjacent to flattened body bore surface for shaft support.

Pressure Rating:
ANSI Class: 150 minimum
Body: Cast Steel ASTM A216 WCB
Disc: 316 Stainless Steel
Stem: 17-4 Stainless Steel
Seat: RTFE
Stem Packing: PTFE
Gasket: Graphite
Anti-Extrusion Ring: 316 Stainless Steel
Stem Bearing: RTFE Composite
Stem Retention Ring: 316 SS
Disc Locating Spacer: 316 SS
Actuator: 2" through 6" 10-position lever with memory stop. 8" through 20" Self-locking worm gear with adjustable limit stops, and position indicator. Provide chain wheel and chain where indicated by contract documents.
Make: Keystone KLOK
Size: 2"-36"
Model: 362

3. Balancing Cock

a. Example Schedule:

<table>
<thead>
<tr>
<th>Plan Code</th>
<th>Flow Indicating</th>
<th>Ecc. Plug Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure:</td>
<td>175 lb. WOG</td>
<td>175 lb. WOG</td>
</tr>
<tr>
<td>Size/Inches:</td>
<td>1/2 through 2 1/2</td>
<td>3 through 12</td>
</tr>
<tr>
<td>Make:</td>
<td>T &amp; A</td>
<td>DeZurik</td>
</tr>
<tr>
<td>Model:</td>
<td>Bal. Valve</td>
<td>100 w/gage tap</td>
</tr>
<tr>
<td>Actuator:</td>
<td>w/Memory Stop</td>
<td>159 w/Memory Stop</td>
</tr>
<tr>
<td>Ends:</td>
<td>Threaded or sweat</td>
<td>Flanged</td>
</tr>
<tr>
<td>Packing:</td>
<td>Gland</td>
<td>Gland</td>
</tr>
</tbody>
</table>

4. Gas Valves:

a. Gas Valve and lubricated plug or AGA-approved Ball or Butterball™ valves.

b. Example Schedule:

<table>
<thead>
<tr>
<th>Plan Code</th>
<th>G.C.</th>
<th>L.P.V.</th>
<th>L.P.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure:</td>
<td>100 PSIG Air</td>
<td>200 lb. WOG</td>
<td>200 lb. WOG</td>
</tr>
</tbody>
</table>
5. UL and FM Approved Valves:
   a. Gate, check and butterfly.
   b. Sizes all.
   c. Example Schedule:

<table>
<thead>
<tr>
<th>Plan Code</th>
<th>OS&amp;Y</th>
<th>C.V.</th>
<th>W.C.V.</th>
<th>BF.V</th>
<th>D.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve Type</td>
<td>Gate</td>
<td>Swing</td>
<td>Wafer</td>
<td>BTFY</td>
<td>Drain</td>
</tr>
<tr>
<td>Make:</td>
<td>Kennedy</td>
<td>GEM</td>
<td>GEM</td>
<td>Demco</td>
<td></td>
</tr>
<tr>
<td>Milwaukee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight Threaded:</td>
<td>67</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>Butterball</td>
</tr>
<tr>
<td>Straight Flanged:</td>
<td>68</td>
<td>F-250</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Wafer:</td>
<td>------</td>
<td>------</td>
<td>F-512</td>
<td>NE-H</td>
<td>-----</td>
</tr>
</tbody>
</table>

6. Specialty Valves:
   a. Petcock, drain, needle.
   b. Example Schedule:

<table>
<thead>
<tr>
<th>Plan Code:</th>
<th>PTK</th>
<th>S&amp;D V.</th>
<th>D.V.</th>
<th>N.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type: Petcock</td>
<td>Ball</td>
<td>Gate</td>
<td>Needle</td>
<td></td>
</tr>
<tr>
<td>Pressure: 250 SWP Water</td>
<td>150 LB.</td>
<td>Water 125 LB.</td>
<td>200 SWP/</td>
<td></td>
</tr>
<tr>
<td>Size/Inches: 1/8</td>
<td>1/2 and 3/4</td>
<td>3/4</td>
<td>1/8 through 3/4</td>
<td></td>
</tr>
<tr>
<td>Make: Powell</td>
<td>Apollo</td>
<td>Milwaukee</td>
<td>Hammond</td>
<td></td>
</tr>
<tr>
<td>Model: 922</td>
<td>Full-port</td>
<td>148</td>
<td>1B415</td>
<td></td>
</tr>
<tr>
<td>Ends: Threaded</td>
<td>Threaded or Threaded</td>
<td>Threaded</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solder, and Hose</td>
<td>End Adapter, Hose cap &amp; chain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Standard Bronze Valves - 150 SWP/300 WOG.
   a. Gate, globe and check.
   b. Sizes 1/8 through 2 inches.
c. Example Schedule:

<table>
<thead>
<tr>
<th>Plan Code:</th>
<th>G.V</th>
<th>GL.V.</th>
<th>C.V.</th>
<th>L.C.V.</th>
<th>B.C.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve Type:</td>
<td>Gate</td>
<td>Globe</td>
<td>Swing</td>
<td>Lift</td>
<td>BTFY</td>
</tr>
<tr>
<td>Make:</td>
<td>Hammond</td>
<td>Hammond</td>
<td>Hammond</td>
<td>Crane</td>
<td>----</td>
</tr>
<tr>
<td>Straight Threaded:</td>
<td>1B629</td>
<td>1B413T</td>
<td>1B446</td>
<td>366-1/2</td>
<td>----</td>
</tr>
<tr>
<td>Angle Threaded:</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>

8. Standard Iron Body Valves - 250 SWP/500 WOG

a. Gate, globe and check.

b. Sizes 2 through 12 inches.

c. Example Schedule:

<table>
<thead>
<tr>
<th>Plan Code:</th>
<th>G.V</th>
<th>OS&amp;Y.</th>
<th>GL.VC.</th>
<th>C.V.</th>
<th>N.S.C.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve Type:</td>
<td>Gate</td>
<td>Gate</td>
<td>Globe</td>
<td>Swing</td>
<td>Non Slam</td>
</tr>
<tr>
<td>Make:</td>
<td>Milwaukee</td>
<td>Milwaukee</td>
<td>Milwaukee</td>
<td>Mueller</td>
<td>Crane (Chapman)</td>
</tr>
<tr>
<td>Straight Threaded:</td>
<td>T-2897</td>
<td>T-2894</td>
<td>----</td>
<td>----</td>
<td>--------</td>
</tr>
<tr>
<td>Straight Flanged:</td>
<td>F-2897</td>
<td>F-2894</td>
<td>F-2983</td>
<td>F-2600-6</td>
<td>223</td>
</tr>
</tbody>
</table>

2.05 STATIONARY PRESSURE GAGES

A. Manufacturers:

Crosby  
Dwyer  
Trerice  
U.S. Gauge  
Weksler

B. Example Schedule:

<table>
<thead>
<tr>
<th>Dial Service</th>
<th>Dia.</th>
<th>Range</th>
<th>Make</th>
<th>Model</th>
<th>Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>4&quot;</td>
<td>Appropriate for Application</td>
<td>Trerice</td>
<td>600C</td>
<td>#870-1-865-1</td>
</tr>
<tr>
<td>Air</td>
<td>4&quot;</td>
<td>0 to 300 psig</td>
<td>Trerice</td>
<td>600C</td>
<td>#870-1-865-1</td>
</tr>
<tr>
<td>Vacuum</td>
<td>4&quot;</td>
<td>30&quot;Hg to 30 psig</td>
<td>Trerice</td>
<td>600C</td>
<td>#870-1-735-2</td>
</tr>
</tbody>
</table>

2.06 STATIONARY THERMOMETERS

A. Manufacturers:

Weiss, Miljoco or pre-approved equal
B. Vari-angle Digital Thermometer with light-sensitive electric cells.

2.07 TEMPERATURE AND PRESSURE TEST PLUGS

A. Manufacturers:

Fairfax
Peterson Equipment (Pete's Plug)
Trerice

B. Plugs suitable for vacuum to 600 psig and temperatures of -20 F to 300 F with cap and extension for insulated pipe where required.

C. Pressure gages and thermometers in individual shock-proof cases.

D. Schedule:

<table>
<thead>
<tr>
<th>Item</th>
<th>Make</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Plug</td>
<td>Fairfax</td>
<td>N-78-02</td>
</tr>
<tr>
<td>Pressure Gage &amp; Adapter</td>
<td>Trerice</td>
<td>0-300 psig #600-3-1/2&quot; Gage 80-02</td>
</tr>
<tr>
<td>Thermometer</td>
<td>Trerice</td>
<td>B-81105 0-220 F</td>
</tr>
</tbody>
</table>

2.08 PIPE HANGERS, SUPPORTS AND GUIDES

A. Manufacturers:

B-Line
Grinnell
Michigan
P.H.D.
Tolco

2.09 DIELECTRIC PIPE FITTINGS AND ISOLATORS

A. Manufacturer:

Provide brass couplings or bronze valves, or dielectric flanges. Dielectric Waterways are no longer used at UCB.

PART 3 - EXECUTION

3.01 ERECTION, INSTALLATION, APPLICATION

A. Variable Speed Controllers
1. Field Tests

The VSC shall be tested and started under actual conditions by factory trained personnel. One day of technician's time shall be included in the base bid for checkout/startup.

2. Once operational, the unit being controlled by the VSC shall be operated through its full range to determine resonant speeds, and the VSC shall be programmed to skip those speeds.

3. Provide one complete spare set of all fuses used in each VSC supplied.

B. Quiet Operation and Vibration:

1. Specify that all work shall operate in accordance with Section 15240-Mechanical Sound and Vibration Control under all conditions of load.

2. Sound or vibration conditions not in accordance with Section 15240 and considered objectionable by the University shall be corrected in a manner approved by the Project Architect under the Work of Division 15.

C. Access Doors:

1. Coordinate location, installation, furnishing and specification for both standard and fire rated access doors with the Architect.

2. Specify 20" by 20" minimum size or larger as required for service use on mechanical equipment.

3. Locate where required for access to valves, shock absorbers, dampers, controls, mechanical equipment or appurtenances.

D. Sleeves, Plates and Closures:

1. Protection for Insulated Pipes:
   a. When insulated pipes penetrate floors which will be covered with finish flooring, specify that a sheet metal protective covering be installed around the insulation jacket.
   
   b. Sheet metal shall extend above the pipe sleeve far enough to protect the insulation from bumping by polishing machines and vacuum sweepers.

   c. Space between the pipe sleeve and the sheet metal must be sealed.
2. Floor Sleeves:
   a. Install sleeves 2” above finished floor for all penetrations in rooms with floor drains and for all penetrations in “wet wall” surrounding the rooms (kitchens, mechanical, baths, breakrooms, etc.).
   b. All existing floors that are core drilled in “wet walls” shall comply with Section a.
   c. All other penetration sleeves shall extend ¼” minimum above finished floor.

3. Seals:
   a. Where fire rated separations are penetrated by pipes or ductwork, the annular space around the pipe or ductwork shall be installed to an approved fire rated assembly with appropriate fire rated materials.

E. Excavating and Backfilling:
   1. Specify excavation and backfilling for mechanical equipment requirements to be in accordance with Section 02200-Earthwork of these Design Guidelines.

F. Cutting and Patching:
   1. Specify cutting and patching requirements for mechanical equipment to be in accordance with Section 01045-Cutting and Patching of these Design Guidelines.

G. Other Installation Requirements:
   1. In general, for project specifications, remove "Design Requirements" in Part 1, paragraph 1.03, sub-paragraph A, and expand here on specific requirements of installation for motors, starters, valves, gages, thermometers, test plugs and any other products specified in Part 2 or required for Division 15 work in general.

H. Construction and pre-occupancy Indoor-Air-Quality (IAQ) Management
   1. Include in the specifications the items listed. Also require that all on-site equipment and components shall be protected from dust.
      a. During Construction, meet or exceed the recommended design Approaches of the SMACNA IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3.
      b. Protect stored on-site or installed absorptive materials from moisture damage.
c. If AHUs must be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE 52.2-1999.

**LEED EQc3.1: Construction IAQ Management Plan:**
Replace all filtration media immediately prior to occupancy. Filtration media shall have a MERV of 13, as determined by ASHRAE 52.2-1999 for media installed at the end of construction.

**LEED EQc3.2: Construction IAQ Management Plan:**
Include in the specifications the items listed below regarding to pre-occupancy IAQ.

a. After construction and prior to occupancy, conduct a minimum 2-week flush-out with new MERV 13 filtration media at 100% outside air. After the flush-out, replace the filtration media with new MERV 13 filters, except for the filters solely processing outside air.

-OR-

b. Conduct a baseline indoor air quality testing procedure consistent with the U.S. EPA's current Protocol for Environmental Requirements, Baseline IAQ and Materials for the Research Triangle Park campus, Section 01445.

END OF SECTION 15050