1. This information provides guidelines for thermal insulation of piping, ductwork, and associated mechanical equipment. Duct liner, AHU insulation, and air terminal box lining are covered under “General Mechanical Requirements,” “Air Distribution, Ventilation and Exhaust Systems,” and “Basic Methods and Materials” standards, available from the Facilities Management (FM) project representative.

2. FM project representative, FM, and the Plumbing Shop shall approve selection of materials, means, and methods. Unless otherwise approved, the design intent requires means and methods that provide minimal disruption to adjacent building activities and operations.

3. FM project representative shall inform FM and other campus departments or groups affected by any insulation modification work.

4. Prior to work, require means and methods that protect occupants, general public, workers and assets from exposure to noise, dust, traffic, and other hazards.

5. Asbestos and hazardous material:
   a. Public works construction projects: During preliminary design, coordinate with FM project representative to define scope of asbestos or other hazardous material abatement required. Meet with campus Environmental Health and Safety representative to review hazardous material abatement and notification requirements.
   c. Include re-insulation of any remaining pipes that will be uncovered during asbestos abatement.

6. Insulation thickness shall conform to ASHRAE Standards and Washington State Energy Code - whichever is more stringent for the application. Where new piping ties into existing, adjust thickness if required, so any given length of pipe (whether new or existing) has a consistent insulation thickness. Intent for finished installation is to have workmanlike appearance without patched-in offsets and uneven insulation jacketing.

7. Duct liner and sound attenuators:
   a. During design development, submit a plan to define which portions of the ductwork system are to be sound lined or provided with sound attenuators for approval by the FM project representative, FM, and the Plumbing Shop. See the “WWU Design Guide Acoustical Standards.”

8. Require all insulation materials, jackets, adhesives, and other components of the insulation system to be fire-resistant, waterproof, and resistant to microbial growth in the presence of moisture.

9. Protect all exterior ductwork and piping insulation from damage and exposure to weather elements such as ultra-violet light, rain, wind, temperature drop, etc.

10. Duct insulation:
   a. Require duct insulation on the exterior of all metal supply ducts, return ducts, outside air intake ducts and plenums.
b. Flexible fiberglass blanket insulation with factory applied foil-scrim-kraft (FSK) facing jacket, ASTM C553. Require for interior concealed ductwork above ceiling and in chases.

c. Rigid fiberglass board with FSK jacket, ASTM C612. Require on ductwork exposed to view in finished areas including mechanical rooms and penthouses.

d. Rigid closed cell preformed board insulation for ducts exposed to weather. Coat all surfaces and edges with waterproofing. Slope insulation on horizontal duct to edges.

11. Domestic cold and hot water and heating hot water piping systems:
   b. Require pre-formed PVC insulation fitting covers over fiberglass insulation on all elbows and fittings. Insulating performance and vapor barrier requirements of the fitting insulation shall meet the requirements of the adjacent piping. Acceptable product: Johns Manville Zeston or Ceel-co.
   c. Prohibit ASTM C552 cellular glass "Foamglas" insulation on hot water, steam and steam condensate systems.

12. Chilled water piping systems:
   a. Direct burial applications require cellular glass preformed pipe insulation, ASTM C 552, with air tight vapor barrier jacket. Tape all circumferential joints and longitudinal joints. Non-burial chilled water piping is required to be insulated with flexible pre-formed elastomeric closed cell foam insulation in tubular form, resistant to moisture and conforming to ASTM C 534 or ASTM D 1056. Minimum 3/4 inch (19mm) thick. Acceptable products: Armaflex or Rubatex.

13. Steam and condensate piping systems in utility tunnels, manholes, and mechanical rooms:
   a. Require pre-formed high temperature mineral wool pipe insulation appropriate for temperature application.

14. Metal pipe insulation jackets:
   a. Metal shall be uniformly corrugated or embossed aluminum, minimum 0.016" (0.41mm) thick, with factory bonded moisture barrier lining.
   b. Provide caps on all ends.
   d. Metal fitting insulation and covers: Factory prefabricated aluminum insulation covers. Insulating performance and moisture barrier requirements of the fitting insulation shall meet the requirements of the adjacent piping. Seams shall overlap 3”.
   e. Metal jacketing bands: Require stainless steel blue banding (designates non-asbestos). Protect all raw edges and tag ends of banding clips to prevent danger to personnel coming in contact. Rotate band ends away from traffic areas, including same technique for metal jacketing seams.
   f. Require metal pipe insulation jackets on steam and condensate piping installed less than 8 feet above the finished floor. All steam line elbows shall be metal jacketed.

15. Refrigerant piping systems:
   a. Insulate refrigerant suction line with flexible pre-formed elastomeric closed cell foam insulation in tubular form, resistant to moisture and conforming to ASTM C 534 or ASTM D 1056. Minimum ¾” (19mm) thick. Acceptable products: Armaflex or Rubatex.
   b. Insulate refrigerant discharge line (hot gas discharge) when there is a danger of personnel
coming in contact with piping or when the line is passing through a conditioned space.

c. Insulate refrigerant liquid line when it passes through spaces having temperatures greater than the refrigerant condensing temperatures.
d. All joints and fittings to be glued and sealed air tight.

16. Require insulation with an air tight vapor barrier jacket to the following:
   a. All exterior piping.
   b. Any piping within outside air ductwork.
   c. Refrigerant suction piping.
   d. All potable and non-potable water pipes less than 55°F (12°C).
   e. Chilled water distribution systems.
   f. Rainwater leaders inside the building.
   g. Domestic and lab cold water pipes.
   h. Chilled water coil condensate piping.
   i. P-traps that are exposed to dew-point temperatures and under all ADA sinks.
   j. Supply tubes under ADA sinks.

17. Removable insulation – construction:
   c. Stainless steel wire and lacing hooks.

18. Removable insulation – application:
   a. Require removable insulation on all equipment and components requiring periodic maintenance and operation.
   b. In mechanical rooms, require insulation blankets on all valves and components on systems with insulated piping.
   c. Require removable insulation on any hot surfaces under 6' for personnel burn protection.
   d. Require removable insulation on pipe flanges.
   e. Require removable insulation on control valves. Do not insulate actuators.

19. Do not provide insulation on: (unless personnel burn protection is needed under 6'):
   a. Valve handles.
   b. Test ports.
   c. Balancing valves on heating hot water systems.
   d. Control valve actuators.
   e. Unions and valves less than 1"(25mm) in diameter in potable or non-potable piping systems, except chilled water.
   f. Steam pressure relief valves in mechanical rooms.
   g. Steam traps or adjacent trap piping.
   h. Nameplates on pressure vessels.
   i. Heating water pumps.

20. In mechanical rooms and utility tunnels, pipe insulation surfaces shall be suitable for painting and identification after installation. See “DIVISION 20 GENERAL MECHANICAL.”
21. Installation, fabrication and construction:
   a. Do not insulate ducts and pipes until the system has passed static pressure tests.
   b. Apply duct insulation tightly and smoothly. Use metal anchors and pins welded to duct with self-locking washers to fasten insulation in place. Prohibit sagging. Clip off or bend pins flush.
   c. Require continuous insulation through pipe hangers or supports. Do not notch insulation. Provide shields or saddles to prevent crushing insulation. Shields shall be minimum 6" long and centered under hanger.
   d. Apply jackets and coatings over clean and dry insulation.
   e. Fill joints, breaks, punctures and voids in vapor barrier jacket watertight.
   f. Replace ripped, damaged, wet, dirty or moldy mechanical insulation before system is turned over to the owner.
   g. Repair or replace dented jackets.
   h. Do not leave any raw fiberglass fibers exposed. Seal all joints.
   i. Do not compress or reduce insulation without prior approval for exception from WWU.
   j. When patching existing systems, match insulation thickness of adjacent insulation and use seam tape to seal. Approved sealing tape is 3" width.
   k. Temperature Cloth for more than 500 degree direct application.
   l. Tempmat for less than 500 degree direct application.
   m. Use Stainless steel staples, Bostitch #5019, or equal.
   n. Use 12 gauge washers
   o. Fasten washer on support bracket with aluminum mushroom cap.
   p. All staples inside of pad.
   q. No spun fiberglass permitted.

End