Questar ThermWise Duct Technical Specifications

1. **Introduction and Scope**: This document sets forth the specifications for duct sealing and duct insulation in accordance to Questar ThermWise Weatherization Rebates program (PROGRAM).

    1.1. Additional requirements may be specified within the applicable Questar Gas Company Utah Natural Gas Tariff which defines qualifications for ThermWise Weatherization Rebates efficiency measures.

2. Work is to be completed by contractors qualified under PROGRAM. Work shall be subject to quality assurance inspections by PROGRAM.

3. Intent of work completed under PROGRAM is to realize energy savings by increasing duct system efficiency.

4. Work completed under PROGRAM is to be in conformance with requirements of Health and Safety and Combustion Safety and Carbon Monoxide Protection sections of BPI Technical Standards.[1]

5. **Duct Sealing and Duct Insulation Applicability**

    5.1. Heating ducts in unconditioned spaces within dwelling units.

        5.1.1. Clarification: Duct systems installed in insulated non-vented basements and crawl spaces shall be considered to be inside of conditioned space and not eligible under PROGRAM.

        5.1.2. Clarification: Duct systems installed in non-insulated non-vented basements with no insulation in floor structure separating basement from conditioned space above, shall be considered to be inside of conditioned space and not eligible under PROGRAM.

        5.1.3. Clarification: Duct systems installed in insulated non-vented attics (i.e., attic spaces that are inside the building's thermal insulation envelope) shall be considered to be inside of conditioned space and not eligible under PROGRAM.

        5.1.4. Clarification: Duct systems installed in non-heated garages, even if garage walls are insulated, shall be considered to be in unconditioned space. Garages provided with low energy heating systems (less than 3.4 Btu/h·ft^2) or portable space heaters are considered non-heated garages.

[1] Building Performance Institute Inc. *Technical Standards for Certified Building Analyst I*. Copy of standards available at www.bpi.org

5.1.5. Clarification: Duct systems installed in heated insulated garages shall be considered to be in conditioned space.

5.1.6. Clarification: Duct systems in fully enclosed insulated interior mechanical rooms of 250 square feet or less, and provided with combustion air directly communicating with the outdoors, with combustion air opening free area of 30 square inches or greater, shall be considered to be in unconditioned space.

5.1.7. Insulation of ductwork within conditioned space is not required and is not eligible under PROGRAM.

5.2. Return air heating ducts, operating in a negative pressure, within Combustion Air Zones (CAZ)

5.2.1. Clarification: Negative pressure return air duct systems within Combustion Air Zones (areas containing combustion appliances) are eligible under PROGRAM in regards to duct sealing. Such ducts shall be sealed as a Health and Safety measure.

5.3. Existing dwelling units heated with natural gas. In order to qualify as an existing dwelling unit, home must be occupied for at least one year.

6. **Duct Sealing Materials and Methods**

6.1. Non-flex duct joints and connections shall be sealed with UL-181 listed mastic.

6.1.1. The application of mastic shall be done properly, according to manufacturer specifications. Mastic shall be applied to a minimum thickness of 1/16".

6.1.2. Where gaps in ductwork exceed 1/8", mastic is to be reinforced with fiberglass mesh tape.

6.1.3. Where gaps in ductwork exceed ½", ductwork is to be repaired with rigid materials before sealing with mastic.

6.1.4. Take offs and slip joints shall be mechanically secured and sealed with mastic.

6.1.5. Where service access is necessary, only UL-181 listed foil tape shall be used. The furnace to plenum connection is also allowed to be sealed with UL-181 listed foil tape.

6.1.6. Cloth-backed duct tape shall not be used to seal, secure, or fasten ducts.

6.2. Flexible duct connections shall have both the interior and exterior liners separately secured with nylon straps (Panduit or equivalent) and tightened with a manufacturer-approved tensioning tool. Steel band clamps with worm drive tension adjusters also are acceptable.

6.2.1. Interior liners shall be air sealed to duct fittings using mastic or UP-181 listed foil tape wrapped at least 1.5 times around perimeter of connection.

7. **Duct System Leakage Test Procedure:** The Duct Leakage to Exterior Test shall be used to measure the duct leakage in a system, unless otherwise specified in this document. The following steps shall be performed during test:

   7.1. Install a duct pressure testing apparatus (such as "Duct Blaster" brand device, DUCT TESTER) to the ductwork system at air handler or large return air grille according to test apparatus instructions.

   7.2. Remove air filter(s) from the duct system.

   7.3. Seal all supply and return air registers/grilles with masking tape or other non-destructive sealant.

   7.4. Drill a static pressure test hole into the supply duct and insert static pressure probe connected to manometer with reference port open to conditioned space.

   7.5. Pressurize the home's interior conditioned space to a test pressure of 50 Pa by use of a Blower Door.

   7.6. Pressurize the ductwork system by means of the DUCT TESTER so that duct static pressure is 0 Pa with respect to the indoor reference pressure.

   7.7. The airflow measured by the DUCT TESTER in this configuration is the Duct Leakage to Exterior value.

8. Duct Sealing Requirements

   8.1. All accessible portions of the duct system shall be inspected for signs of leakage and soundness of materials. For new duct systems, the entire duct system is considered to be accessible.

      8.1.1. Accessible plenum connections and take-offs shall be exposed, properly connected and sealed.

      8.1.2. Accessible wyes, elbows and other duct connections shall be exposed, properly connected and sealed.

         8.1.2.1. Exception: new duct installations shall have all connections between duct components properly connected and sealed.

      8.1.3. Flexible duct connections that have properly secured exterior liners may be considered to have interior liners that are not accessible.

   8.2. Where a large section of duct insulation is removed, the insulation shall be re-installed and securely attached to the duct system.

   8.3. Building cavities used as ducts shall be considered duct systems and shall be sealed to these standards.

8.4. The air leakage of the duct system shall be measured before sealing the system, using the protocol identified in 5: Duct System Leakage Test Procedure.

8.5. In order to qualify, the measured leakage of the system after sealing, using the same test method as above, shall show a reduction of at least 50%.

8.6. In order to qualify, the measured leakage of the system after sealing, using the same test method as above, shall show a reduction of at least 100 CFM50.

8.7. In cases where return ducts are inaccessible, compliance with 8.5 may be accomplished by performing the Duct System Leakage Test Procedure on the supply side only.

8.8. If a new air handler is being installed, the total external static pressure acting on the system air handler should be tested with approved instruments and recorded at time of startup. A measured external static pressure of more than 0.8" (200 Pa) should cause installer to consider taking corrective measures with system ductwork.

9. Duct systems insulation

9.1. All duct systems having insulation added shall first be exposed and sealed against leakage. Duct insulation shall not be considered a duct sealing method.

9.1.1. Exception: Spray-foam insulation, when approved for use on duct systems by the insulation manufacturer and by jurisdiction having authority, shall be considered a method of both sealing and insulating ducts.

9.2. Duct insulation materials shall be UL 181 listed, and shall be used in accordance with NRPA Standards 90A and 90B and the ICC International Mechanical Code.

9.3. Duct insulation materials shall be installed in accordance with manufacturers' instructions.

9.4. Duct wrap insulation materials shall be certified to comply with ASTM C 1290 and shall be installed in such a fashion so as to compress to less than 75% of nominal thickness.

9.5. Duct wrap insulation shall be factory laminated to a vapor retarder facing. Insulation shall be installed with facing away from duct surface.

9.5.1. Joints (both lateral and longitudinal) of the vapor retarder facing are to be closed with pressure-sensitive tape (matching the insulation facing) or glass fabric and mastic.

9.5.2. All tears, punctures, and other penetrations of the duct warp facing shall be sealed with tape or mastic.

9.6. Supply and return air ducts shall be insulated to a minimum of R-8.

9.6.1. Exception: Ducts in floor trusses shall be insulated to a minimum of R-6.

9.6.2. Exception: Ducts or portions thereof located completely inside conditioned space do not require insulation.

9.7. Supply and return air ducts shall be fully insulated around complete perimeter of duct and along total length of the duct.

9.7.1. Exception: For ducts in attics installed with bottom side of duct 8" or less above ceiling level, the bottom side only of the duct may be left uninsulated if attic insulation is installed to a depth of 16" or greater above ceiling level and fully conceals the uninsulated bottom side of the duct.

9.7.2. Exception: For ducts installed tight against walls or ceilings adjoining conditioned spaces, the side(s) of the duct against such surfaces do not require insulation.

9.7.3. Exception: For ducts installed tight against the bottom of insulated frame floors adjoining conditioned spaces, and the floor joist space cavities are fully filled with insulation, the top side of the duct does not require insulation. In cases where the floor joist space insulation is installed with significant voids above the insulation, the floor joist insulation shall be pressed upwards into such voids, and duct insulation shall be applied to the top side of duct.

10. Safety Inspection of Combustion Appliances

10.1. A preliminary and post-work (i.e., before and after sealing and insulating of ductwork) safety inspection of all combustion appliances shall be completed as part of work under PROGRAM.

10.2. The inspection shall be in conformance with BPI Technical Standards, and shall include at a minimum the following tests and inspections:

10.2.1. Carbon monoxide tests of undiluted flue gases of combustion appliances.

10.2.2. Ambient carbon monoxide monitoring in breathing zone.

10.2.3. Spillage and draft tests for all natural and induced draft space heating systems and water heaters.

10.2.4. Worst-Case CAZ Depressurization test

10.2.5. Gas Supply Safety inspection, including identifying leaks using a gas leak detector.

10.2.6. Check for unvented combustion appliances.

10.2.7. Testing of gas oven(s).

10.2.8. Check for CO detectors.

10.2.9. Furnace inspection for flame interference.

10.3. Inspections are to be performed by a BPI Certified Building Analyst.

10.4. Homeowner shall be notified in writing of the results of all combustion safety tests.

10.5. Homeowner shall be notified in writing of any recommended corrective actions resulting from the combustion safety tests.

10.6. Homeowner shall be notified in writing, and by voice communications, of any required corrective actions resulting from the combustion safety tests. A homeowner signed acknowledgement of receipt and understanding of notification shall be received and kept on record by contractor.

10.7. In case of an “Emergency” Combustion Safety Test Action Level (per BPI Technical Standards) contractor shall shut off fuel to the appliance, shall notify homeowner of need for immediate appliance service, and shall notify Questar Gas service representative.