



CSI: DIVISION: 23 00 00—HEATING, VENTILATION AND AIR CONDITIONING (HVAC)  
Section: 23 31 00—HVAC Ducts and Casings

**Product certification system:**

The ICC-ES product certification system includes testing samples taken from the market or supplier's stock, or a combination of both, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the supplier's quality system.

Product: Underground Single Wall & Double Wall Insulated Duct for HVAC Direct Burial Applications  
Underground Single Wall Duct for Under Ground Vehicle Exhaust Direct Burial Applications

Listee: Monoxivent  
1306 Mill Street  
Rock Island, IL 61201  
[www.monoxivent.com](http://www.monoxivent.com)

**Additional Listee:**

Appalachian Plastics Inc.  
34001 Glove Road  
Glade Spring, VA 24340

**Compliance with the following codes:**

2024, 2021, 2018, 2015, 2012 and 2009 *International Mechanical Code*® (IMC)  
2024, 2021, 2018, 2015, 2012 and 2009 *International Residential Code*® (IRC)  
2024, 2021, 2018, 2015, 2012 and 2009 *Uniform Mechanical Code*® (UMC)\*  
2025, 2022, 2019, 2016, 2013, 2010 and 2007 *California Mechanical Code*® (CMC)  
2020, 2015, and 2010 National Building Code of Canada® (NBC)\*\*

*\*Uniform Mechanical Code is a copyrighted publication of the International Association of Plumbing and Mechanical Officials.*

*\*\* National Building Code of Canada is a copyrighted publication of the National Research Council Canada*

**Compliance with the following standards:**

ICC-ES LC1014-2016, PMG Listing Criteria for Underground Plastic Air Ducts  
ICC-ES EG290, Evaluation Guideline for Underground Plastic Air Ducts  
ASTM D2412-2021, Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading  
ASTM E84-2024, Standard Test Method for Surface Burning Characteristics of Building Materials  
UL 723 11<sup>th</sup> Edition, Test for Surface Burning Characteristics of Building Materials  
ASTM C518-2021, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus  
NSF Protocol P374-2010, Air Duct Thermal Efficiency Performance

**Identification:**

The Monoxivent underground duct and fittings described in this listing are identified by a permanent label bearing the manufacturer's name (Monoxivent) and/or trademark, the product name, model number and the ICC-ES PMG listing mark.

**Installation:**

Installation of Monoxivent underground HVAC Duct and fittings must comply with the manufacturer's published installation instructions and the applicable codes.

Flood Plain Elevation: Product was tested to withstand a pressure equivalent to 12 feet water column pressure for 7 days with no leakage. Product may be installed right on the sub-grade of excavation without any further sub material being required except when it is bedrock then a sub soil such as sand or construction grade fill or pea gravel may be used under the duct.

**Models:****Underground HVAC Duct and Fittings:**

The Monoxivent underground HVAC duct and fittings are an underground air duct and fitting system for use in forced-air heating and cooling systems in accordance with Section 603.8 of the IMC, Section M1601.1.2 of the IRC, or Section 602.0 of both the CMC and the UMC, as applicable. See Table 1, below.

Single wall ducts and fittings are made of fiberglass reinforced thermoset resin. Double wall ducts and fittings are made of fiberglass reinforced thermoset resin as inner and outer layers, with closed cell polyurethane foam inserted in-between as the insulation material. Both single wall and double wall straight ducts have a minimum pipe stiffness of 8 psi (55kPa) at 5 percent deflection when tested in accordance with ASTM D2412. See Table 2, below.

Surface Burning Characteristics: Fiberglass reinforced thermoset resin has a flame spread index of 25 or less and a smoke development index of 50 or less when tested in accordance with ASTM E84. Closed cell polyurethane foam complies with section 2603.3 of the *International Building Code*® and has a flame spread index of 25 or less and a smoke development index of 450 or less when tested in accordance with ASTM E84.

Thermal Resistance: When tested in accordance with ASTM C518, single wall with a total thickness of 0.125 inch has a thermal resistance value of R1; double wall with a total thickness of 1.25 inches (1 inch polyurethane foam enclosed by a 0.125 inch of fiberglass inner and a 0.125-inch fiberglass outer layer) has a thermal resistance value of R6.

Thermal Distribution Efficiency (TDE): When tested to NSF Protocol P374, the Monoxivent Underground HVAC single wall non-insulated duct, in 10 inches in diameter and greater, exhibited equivalent TDE to a spiral steel reference duct surrounded on all sides with R-10 rated insulation.

The Monoxivent underground HVAC duct and fittings are designed for use in systems with a maximum rated positive pressure equivalent to 10-inch water column and a maximum rated negative pressure of 5-inch water column in accordance with Section 603.3 of the IMC.

**Underground Vehicle Exhaust Duct and Fittings**

Single wall ducts and fittings made of fiberglass reinforced thermoset resin having a flame spread index of 25 or less and a smoke development index of 50 or less when tested in accordance with ASTM E84, and having a stiffness that exceeds the requirements in ICC-ES LC1014 when tested to ASTM D2412 at elevated temperatures (See Table 3 for test result.), are suitable for use to convey vehicle exhaust gases in accordance with section 510.8 of IMC. Material compatibility and suitability are subject to evaluation and approval by authority having jurisdiction.

The Monoxivent underground Vehicle Exhaust duct and fittings are designed for use in systems with a maximum rated negative pressure of 10-inch water column.

## Conditions of Listing:

1. Designs using Monoxivent underground HVAC duct and fittings must be limited to systems with a maximum air temperature of 150°F (66°C) at the discharge of the unit entering the duct system. Sizing must be in accordance with Section 603.2 of the IMC, Section M1601.1 of the IRC, or Section 601.2 of both the CMC and the UMC.
2. For the purposes of this evaluation, Monoxivent underground HVAC and Vehicle Exhaust duct and fittings must be installed underground or embedded. Above ground applications are outside scope of this report.
3. The design of concrete slabs with an embedded air duct is beyond the scope of this evaluation.
4. Underground air duct pipes located below the design flood elevation must be designed and installed to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation, in accordance with Section 603.13 of the IMC, Section M1601.3.8 of the IRC, or Section 604.6 of both the CMC and the UMC, as applicable.
5. The maximum depth below Base Flood Elevation (BFE) in which the duct can be installed flat on grade based on testing per LC1014 Section 4.3.2 is 6 feet (1829 mm). For installation beyond 6 feet below BFE, Monoxivent underground HVAC Duct shall have a minimum slope of 1/8 inch per foot (10.4mm/m) to allow drainage to a point provided with access.
6. The Monoxivent underground HVAC and Vehicle Exhaust duct and fittings are under a quality control program with annual surveillance inspections by ICC-ES.

TABLE 1—SYSTEM COMPONENTS

| Item Description      | Model Number | I.D. (inches) | Thickness (inches) | Item Description      | Model Number | I.D. (inches) | Overall Thickness (inches) |
|-----------------------|--------------|---------------|--------------------|-----------------------|--------------|---------------|----------------------------|
| Single-Wall 45° Elbow | S064         | 6             | 0.125              | Double-Wall 45° Elbow | D064         | 6             | 1.25                       |
| Single-Wall 45° Elbow | S084         | 8             | 0.125              | Double-Wall 45° Elbow | D084         | 8             | 1.25                       |
| Single-Wall 45° Elbow | S104         | 10            | 0.125              | Double-Wall 45° Elbow | D104         | 10            | 1.25                       |
| Single-Wall 45° Elbow | S124         | 12            | 0.125              | Double-Wall 45° Elbow | D124         | 12            | 1.25                       |
| Single-Wall 45° Elbow | S144         | 14            | 0.125              | Double-Wall 45° Elbow | D144         | 14            | 1.25                       |
| Single-Wall 45° Elbow | S164         | 16            | 0.125              | Double-Wall 45° Elbow | D164         | 16            | 1.25                       |
| Single-Wall 45° Elbow | S184         | 18            | 0.125              | Double-Wall 45° Elbow | D184         | 18            | 1.25                       |
| Single-Wall 45° Elbow | S204         | 20            | 0.1875             | Double-Wall 45° Elbow | D204         | 20            | 1.25                       |
| Single-Wall 45° Elbow | S224         | 22            | 0.1875             | Double-Wall 45° Elbow | D224         | 22            | 1.375                      |
| Single-Wall 45° Elbow | S244         | 24            | 0.1875             | Double-Wall 45° Elbow | D244         | 24            | 1.375                      |
| Single-Wall 45° Elbow | S264         | 26            | 0.1875             | Double-Wall 45° Elbow | D264         | 26            | 1.375                      |
| Single-Wall 45° Elbow | S284         | 28            | 0.1875             | Double-Wall 45° Elbow | D284         | 28            | 1.375                      |
| Single-Wall 45° Elbow | S304         | 30            | 0.1875             | Double-Wall 45° Elbow | D304         | 30            | 1.375                      |
| Single-Wall 45° Elbow | S324         | 32            | 0.1875             | Double-Wall 45° Elbow | D324         | 32            | 1.375                      |
| Single-Wall 45° Elbow | S344         | 34            | 0.1875             | Double-Wall 45° Elbow | D344         | 34            | 1.375                      |
| Single-Wall 45° Elbow | S364         | 36            | 0.1875             | Double-Wall 45° Elbow | D364         | 36            | 1.375                      |
| Single-Wall 45° Elbow | S384         | 38            | 0.25               | Double-Wall 45° Elbow | D384         | 38            | 1.5                        |
| Single-Wall 45° Elbow | S404         | 40            | 0.25               | Double-Wall 45° Elbow | D404         | 40            | 1.5                        |
| Single-Wall 45° Elbow | S424         | 42            | 0.25               | Double-Wall 45° Elbow | D424         | 42            | 1.5                        |
| Single-Wall 45° Elbow | S444         | 44            | 0.25               | Double-Wall 45° Elbow | D444         | 44            | 1.5                        |
| Single-Wall 45° Elbow | S464         | 46            | 0.25               | Double-Wall 45° Elbow | D464         | 46            | 1.5                        |
| Single-Wall 45° Elbow | S484         | 48            | 0.25               | Double-Wall 45° Elbow | D484         | 48            | 1.5                        |
| Single-Wall 45° Elbow | S504         | 50            | 0.25               | Double-Wall 45° Elbow | D504         | 50            | 1.5                        |
| Single-Wall 45° Elbow | S524         | 52            | 0.25               | Double-Wall 45° Elbow | D524         | 52            | 1.5                        |
| Single-Wall 45° Elbow | S544         | 54            | 0.25               | Double-Wall 45° Elbow | D544         | 54            | 1.5                        |
| Single-Wall 45° Elbow | S564         | 56            | 0.25               | Double-Wall 45° Elbow | D564         | 56            | 1.5                        |
| Single-Wall 45° Elbow | S584         | 58            | 0.25               | Double-Wall 45° Elbow | D584         | 58            | 1.5                        |
| Single-Wall 45° Elbow | S604         | 60            | 0.25               | Double-Wall 45° Elbow | D604         | 60            | 1.5                        |
| Single-Wall 90° Elbow | S069         | 6             | 0.125              | Double-Wall 90° Elbow | D069         | 6             | 1.25                       |
| Single-Wall 90° Elbow | S089         | 8             | 0.125              | Double-Wall 90° Elbow | D089         | 8             | 1.25                       |
| Single-Wall 90° Elbow | S109         | 10            | 0.125              | Double-Wall 90° Elbow | D109         | 10            | 1.25                       |
| Single-Wall 90° Elbow | S129         | 12            | 0.125              | Double-Wall 90° Elbow | D129         | 12            | 1.25                       |
| Single-Wall 90° Elbow | S149         | 14            | 0.125              | Double-Wall 90° Elbow | D149         | 14            | 1.25                       |
| Single-Wall 90° Elbow | S169         | 16            | 0.125              | Double-Wall 90° Elbow | D169         | 16            | 1.25                       |
| Single-Wall 90° Elbow | S189         | 18            | 0.125              | Double-Wall 90° Elbow | D189         | 18            | 1.25                       |
| Single-Wall 90° Elbow | S209         | 20            | 0.125              | Double-Wall 90° Elbow | D209         | 20            | 1.25                       |
| Single-Wall 90° Elbow | S229         | 22            | 0.1875             | Double-Wall 90° Elbow | D229         | 22            | 1.375                      |
| Single-Wall 90° Elbow | S249         | 24            | 0.1875             | Double-Wall 90° Elbow | D249         | 24            | 1.375                      |
| Single-Wall 90° Elbow | S269         | 26            | 0.1875             | Double-Wall 90° Elbow | D269         | 26            | 1.375                      |
| Single-Wall 90° Elbow | S289         | 28            | 0.1875             | Double-Wall 90° Elbow | D289         | 28            | 1.375                      |
| Single-Wall 90° Elbow | S309         | 30            | 0.1875             | Double-Wall 90° Elbow | D309         | 30            | 1.375                      |
| Single-Wall 90° Elbow | S329         | 32            | 0.1875             | Double-Wall 90° Elbow | D329         | 32            | 1.375                      |
| Single-Wall 90° Elbow | S349         | 34            | 0.1875             | Double-Wall 90° Elbow | D349         | 34            | 1.375                      |
| Single-Wall 90° Elbow | S369         | 36            | 0.1875             | Double-Wall 90° Elbow | D369         | 36            | 1.375                      |
| Single-Wall 90° Elbow | S389         | 38            | 0.25               | Double-Wall 90° Elbow | D389         | 38            | 1.5                        |
| Single-Wall 90° Elbow | S409         | 40            | 0.25               | Double-Wall 90° Elbow | D409         | 40            | 1.5                        |
| Single-Wall 90° Elbow | S429         | 42            | 0.25               | Double-Wall 90° Elbow | D429         | 42            | 1.5                        |
| Single-Wall 90° Elbow | S449         | 44            | 0.25               | Double-Wall 90° Elbow | D449         | 44            | 1.5                        |
| Single-Wall 90° Elbow | S469         | 46            | 0.25               | Double-Wall 90° Elbow | D469         | 46            | 1.5                        |
| Single-Wall 90° Elbow | S489         | 48            | 0.25               | Double-Wall 90° Elbow | D489         | 48            | 1.5                        |
| Single-Wall 90° Elbow | S509         | 50            | 0.25               | Double-Wall 90° Elbow | D509         | 50            | 1.5                        |
| Single-Wall 90° Elbow | S529         | 52            | 0.25               | Double-Wall 90° Elbow | D529         | 52            | 1.5                        |
| Single-Wall 90° Elbow | S549         | 54            | 0.25               | Double-Wall 90° Elbow | D549         | 54            | 1.5                        |
| Single-Wall 90° Elbow | S569         | 56            | 0.25               | Double-Wall 90° Elbow | D569         | 56            | 1.5                        |
| Single-Wall 90° Elbow | S589         | 58            | 0.25               | Double-Wall 90° Elbow | D589         | 58            | 1.5                        |
| Single-Wall 90° Elbow | S609         | 60            | 0.25               | Double-Wall 90° Elbow | D609         | 60            | 1.5                        |
| Single-Wall Endcap    | S06E         | 6             | 0.125              | Double-Wall Endcap    | D06E         | 6             | 1.25                       |
| Single-Wall Endcap    | S08E         | 8             | 0.125              | Double-Wall Endcap    | D08E         | 8             | 1.25                       |
| Single-Wall Endcap    | S10E         | 10            | 0.125              | Double-Wall Endcap    | D10E         | 10            | 1.25                       |
| Single-Wall Endcap    | S12E         | 12            | 0.125              | Double-Wall Endcap    | D12E         | 12            | 1.25                       |
| Single-Wall Endcap    | S14E         | 14            | 0.125              | Double-Wall Endcap    | D14E         | 14            | 1.25                       |
| Single-Wall Endcap    | S16E         | 16            | 0.125              | Double-Wall Endcap    | D16E         | 16            | 1.25                       |
| Single-Wall Endcap    | S18E         | 18            | 0.125              | Double-Wall Endcap    | D18E         | 18            | 1.25                       |
| Single-Wall Endcap    | S20E         | 20            | 0.125              | Double-Wall Endcap    | D20E         | 20            | 1.25                       |
| Single-Wall Endcap    | S22E         | 22            | 0.1875             | Double-Wall Endcap    | D22E         | 22            | 1.375                      |
| Single-Wall Endcap    | S24E         | 24            | 0.1875             | Double-Wall Endcap    | D24E         | 24            | 1.375                      |

|                     |      |    |        |                     |      |    |       |
|---------------------|------|----|--------|---------------------|------|----|-------|
| Single-Wall Endcap  | S26E | 26 | 0.1875 | Double-Wall Endcap  | D26E | 26 | 1.375 |
| Single-Wall Endcap  | S28E | 28 | 0.1875 | Double-Wall Endcap  | D28E | 28 | 1.375 |
| Single-Wall Endcap  | S30E | 30 | 0.1875 | Double-Wall Endcap  | D30E | 30 | 1.375 |
| Single-Wall Endcap  | S32E | 32 | 0.1875 | Double-Wall Endcap  | D32E | 32 | 1.375 |
| Single-Wall Endcap  | S34E | 34 | 0.1875 | Double-Wall Endcap  | D34E | 34 | 1.375 |
| Single-Wall Endcap  | S36E | 36 | 0.1875 | Double-Wall Endcap  | D36E | 36 | 1.375 |
| Single-Wall Endcap  | S38E | 38 | 0.25   | Double-Wall Endcap  | D38E | 38 | 1.5   |
| Single-Wall Endcap  | S40E | 40 | 0.25   | Double-Wall Endcap  | D40E | 40 | 1.5   |
| Single-Wall Endcap  | S42E | 42 | 0.25   | Double-Wall Endcap  | D42E | 42 | 1.5   |
| Single-Wall Endcap  | S44E | 44 | 0.25   | Double-Wall Endcap  | D44E | 44 | 1.5   |
| Single-Wall Endcap  | S46E | 46 | 0.25   | Double-Wall Endcap  | D46E | 46 | 1.5   |
| Single-Wall Endcap  | S48E | 48 | 0.25   | Double-Wall Endcap  | D48E | 48 | 1.5   |
| Single-Wall Endcap  | S50E | 50 | 0.25   | Double-Wall Endcap  | D50E | 50 | 1.5   |
| Single-Wall Endcap  | S52E | 52 | 0.25   | Double-Wall Endcap  | D52E | 52 | 1.5   |
| Single-Wall Endcap  | S54E | 54 | 0.25   | Double-Wall Endcap  | D54E | 54 | 1.5   |
| Single-Wall Endcap  | S56E | 56 | 0.25   | Double-Wall Endcap  | D56E | 56 | 1.5   |
| Single-Wall Endcap  | S58E | 58 | 0.25   | Double-Wall Endcap  | D58E | 58 | 1.5   |
| Single-Wall Endcap  | S60E | 60 | 0.25   | Double-Wall Endcap  | D60E | 60 | 1.5   |
| Single-Wall Lateral | S06L | 6  | 0.125  | Double-Wall Lateral | D06L | 6  | 1.25  |
| Single-Wall Lateral | S08L | 8  | 0.125  | Double-Wall Lateral | D08L | 8  | 1.25  |
| Single-Wall Lateral | S10L | 10 | 0.125  | Double-Wall Lateral | D10L | 10 | 1.25  |
| Single-Wall Lateral | S12L | 12 | 0.125  | Double-Wall Lateral | D12L | 12 | 1.25  |
| Single-Wall Lateral | S14L | 14 | 0.125  | Double-Wall Lateral | D14L | 14 | 1.25  |
| Single-Wall Lateral | S16L | 16 | 0.125  | Double-Wall Lateral | D16L | 16 | 1.25  |
| Single-Wall Lateral | S18L | 18 | 0.125  | Double-Wall Lateral | D18L | 18 | 1.25  |
| Single-Wall Lateral | S20L | 20 | 0.125  | Double-Wall Lateral | D20L | 20 | 1.25  |
| Single-Wall Lateral | S22L | 22 | 0.1875 | Double-Wall Lateral | D22L | 22 | 1.375 |
| Single-Wall Lateral | S24L | 24 | 0.1875 | Double-Wall Lateral | D24L | 24 | 1.375 |
| Single-Wall Lateral | S26L | 26 | 0.1875 | Double-Wall Lateral | D26L | 26 | 1.375 |
| Single-Wall Lateral | S28L | 28 | 0.1875 | Double-Wall Lateral | D28L | 28 | 1.375 |
| Single-Wall Lateral | S30L | 30 | 0.1875 | Double-Wall Lateral | D30L | 30 | 1.375 |
| Single-Wall Lateral | S32L | 32 | 0.1875 | Double-Wall Lateral | D32L | 32 | 1.375 |
| Single-Wall Lateral | S34L | 34 | 0.1875 | Double-Wall Lateral | D34L | 34 | 1.375 |
| Single-Wall Lateral | S36L | 36 | 0.1875 | Double-Wall Lateral | D36L | 36 | 1.375 |
| Single-Wall Lateral | S38L | 38 | 0.25   | Double-Wall Lateral | D38L | 38 | 1.5   |
| Single-Wall Lateral | S40L | 40 | 0.25   | Double-Wall Lateral | D40L | 40 | 1.5   |
| Single-Wall Lateral | S42L | 42 | 0.25   | Double-Wall Lateral | D42L | 42 | 1.5   |
| Single-Wall Lateral | S44L | 44 | 0.25   | Double-Wall Lateral | D44L | 44 | 1.5   |
| Single-Wall Lateral | S46L | 46 | 0.25   | Double-Wall Lateral | D46L | 46 | 1.5   |
| Single-Wall Lateral | S48L | 48 | 0.25   | Double-Wall Lateral | D48L | 48 | 1.5   |
| Single-Wall Lateral | S50L | 50 | 0.25   | Double-Wall Lateral | D50L | 50 | 1.5   |
| Single-Wall Lateral | S52L | 52 | 0.25   | Double-Wall Lateral | D52L | 52 | 1.5   |
| Single-Wall Lateral | S54L | 54 | 0.25   | Double-Wall Lateral | D54L | 54 | 1.5   |
| Single-Wall Lateral | S56L | 56 | 0.25   | Double-Wall Lateral | D56L | 56 | 1.5   |
| Single-Wall Lateral | S58L | 58 | 0.25   | Double-Wall Lateral | D58L | 58 | 1.5   |
| Single-Wall Lateral | S60L | 60 | 0.25   | Double-Wall Lateral | D60L | 60 | 1.5   |
| Single-Wall Reducer | S06R | 6  | 0.125  | Double-Wall Reducer | D06R | 6  | 1.25  |
| Single-Wall Reducer | S08R | 8  | 0.125  | Double-Wall Reducer | D08R | 8  | 1.25  |
| Single-Wall Reducer | S10R | 10 | 0.125  | Double-Wall Reducer | D10R | 10 | 1.25  |
| Single-Wall Reducer | S12R | 12 | 0.125  | Double-Wall Reducer | D12R | 12 | 1.25  |
| Single-Wall Reducer | S14R | 14 | 0.125  | Double-Wall Reducer | D14R | 14 | 1.25  |
| Single-Wall Reducer | S16R | 16 | 0.125  | Double-Wall Reducer | D16R | 16 | 1.25  |
| Single-Wall Reducer | S18R | 18 | 0.125  | Double-Wall Reducer | D18R | 18 | 1.25  |
| Single-Wall Reducer | S20R | 20 | 0.125  | Double-Wall Reducer | D20R | 20 | 1.25  |
| Single-Wall Reducer | S22R | 22 | 0.1875 | Double-Wall Reducer | D22R | 22 | 1.375 |
| Single-Wall Reducer | S24R | 24 | 0.1875 | Double-Wall Reducer | D24R | 24 | 1.375 |
| Single-Wall Reducer | S26R | 26 | 0.1875 | Double-Wall Reducer | D26R | 26 | 1.375 |
| Single-Wall Reducer | S28R | 28 | 0.1875 | Double-Wall Reducer | D28R | 28 | 1.375 |
| Single-Wall Reducer | S30R | 30 | 0.1875 | Double-Wall Reducer | D30R | 30 | 1.375 |
| Single-Wall Reducer | S32R | 32 | 0.1875 | Double-Wall Reducer | D32R | 32 | 1.375 |
| Single-Wall Reducer | S34R | 34 | 0.1875 | Double-Wall Reducer | D34R | 34 | 1.375 |
| Single-Wall Reducer | S36R | 36 | 0.1875 | Double-Wall Reducer | D36R | 36 | 1.375 |
| Single-Wall Reducer | S38R | 38 | 0.25   | Double-Wall Reducer | D38R | 38 | 1.5   |
| Single-Wall Reducer | S40R | 40 | 0.25   | Double-Wall Reducer | D40R | 40 | 1.5   |
| Single-Wall Reducer | S42R | 42 | 0.25   | Double-Wall Reducer | D42R | 42 | 1.5   |
| Single-Wall Reducer | S44R | 44 | 0.25   | Double-Wall Reducer | D44R | 44 | 1.5   |
| Single-Wall Reducer | S46R | 46 | 0.25   | Double-Wall Reducer | D46R | 46 | 1.5   |
| Single-Wall Reducer | S48R | 48 | 0.25   | Double-Wall Reducer | D48R | 48 | 1.5   |
| Single-Wall Reducer | S50R | 50 | 0.25   | Double-Wall Reducer | D50R | 50 | 1.5   |
| Single-Wall Reducer | S52R | 52 | 0.25   | Double-Wall Reducer | D52R | 52 | 1.5   |
| Single-Wall Reducer | S54R | 54 | 0.25   | Double-Wall Reducer | D54R | 54 | 1.5   |
| Single-Wall Reducer | S56R | 56 | 0.25   | Double-Wall Reducer | D56R | 56 | 1.5   |
| Single-Wall Reducer | S58R | 58 | 0.25   | Double-Wall Reducer | D58R | 58 | 1.5   |
| Single-Wall Reducer | S60R | 60 | 0.25   | Double-Wall Reducer | D60R | 60 | 1.5   |
| Single-Wall Tee     | S06T | 6  | 0.125  | Double-Wall Tee     | D06T | 6  | 1.25  |

|                      |      |    |        |                      |      |    |       |
|----------------------|------|----|--------|----------------------|------|----|-------|
| Single-Wall Tee      | S08T | 8  | 0.125  | Double-Wall Tee      | D08T | 8  | 1.25  |
| Single-Wall Tee      | S10T | 10 | 0.125  | Double-Wall Tee      | D10T | 10 | 1.25  |
| Single-Wall Tee      | S12T | 12 | 0.125  | Double-Wall Tee      | D12T | 12 | 1.25  |
| Single-Wall Tee      | S14T | 14 | 0.125  | Double-Wall Tee      | D14T | 14 | 1.25  |
| Single-Wall Tee      | S16T | 16 | 0.125  | Double-Wall Tee      | D16T | 16 | 1.25  |
| Single-Wall Tee      | S18T | 18 | 0.125  | Double-Wall Tee      | D18T | 18 | 1.25  |
| Single-Wall Tee      | S20T | 20 | 0.125  | Double-Wall Tee      | D20T | 20 | 1.25  |
| Single-Wall Tee      | S22T | 22 | 0.1875 | Double-Wall Tee      | D22T | 22 | 1.375 |
| Single-Wall Tee      | S24T | 24 | 0.1875 | Double-Wall Tee      | D24T | 24 | 1.375 |
| Single-Wall Tee      | S26T | 26 | 0.1875 | Double-Wall Tee      | D26T | 26 | 1.375 |
| Single-Wall Tee      | S28T | 28 | 0.1875 | Double-Wall Tee      | D28T | 28 | 1.375 |
| Single-Wall Tee      | S30T | 30 | 0.1875 | Double-Wall Tee      | D30T | 30 | 1.375 |
| Single-Wall Tee      | S32T | 32 | 0.1875 | Double-Wall Tee      | D32T | 32 | 1.375 |
| Single-Wall Tee      | S34T | 34 | 0.1875 | Double-Wall Tee      | D34T | 34 | 1.375 |
| Single-Wall Tee      | S36T | 36 | 0.1875 | Double-Wall Tee      | D36T | 36 | 1.375 |
| Single-Wall Tee      | S38T | 38 | 0.25   | Double-Wall Tee      | D38T | 38 | 1.5   |
| Single-Wall Tee      | S40T | 40 | 0.25   | Double-Wall Tee      | D40T | 40 | 1.5   |
| Single-Wall Tee      | S42T | 42 | 0.25   | Double-Wall Tee      | D42T | 42 | 1.5   |
| Single-Wall Tee      | S44T | 44 | 0.25   | Double-Wall Tee      | D44T | 44 | 1.5   |
| Single-Wall Tee      | S46T | 46 | 0.25   | Double-Wall Tee      | D46T | 46 | 1.5   |
| Single-Wall Tee      | S48T | 48 | 0.25   | Double-Wall Tee      | D48T | 48 | 1.5   |
| Single-Wall Tee      | S50T | 50 | 0.25   | Double-Wall Tee      | D50T | 50 | 1.5   |
| Single-Wall Tee      | S52T | 52 | 0.25   | Double-Wall Tee      | D52T | 52 | 1.5   |
| Single-Wall Tee      | S54T | 54 | 0.25   | Double-Wall Tee      | D54T | 54 | 1.5   |
| Single-Wall Tee      | S56T | 56 | 0.25   | Double-Wall Tee      | D56T | 56 | 1.5   |
| Single-Wall Tee      | S58T | 58 | 0.25   | Double-Wall Tee      | D58T | 58 | 1.5   |
| Single-Wall Tee      | S60T | 60 | 0.25   | Double-Wall Tee      | D60T | 60 | 1.5   |
| Single-Wall Wye      | S06W | 6  | 0.125  | Double-Wall Wye      | D06W | 6  | 1.25  |
| Single-Wall Wye      | S08W | 8  | 0.125  | Double-Wall Wye      | D08W | 8  | 1.25  |
| Single-Wall Wye      | S10W | 10 | 0.125  | Double-Wall Wye      | D10W | 10 | 1.25  |
| Single-Wall Wye      | S12W | 12 | 0.125  | Double-Wall Wye      | D12W | 12 | 1.25  |
| Single-Wall Wye      | S14W | 14 | 0.125  | Double-Wall Wye      | D14W | 14 | 1.25  |
| Single-Wall Wye      | S16W | 16 | 0.125  | Double-Wall Wye      | D16W | 16 | 1.25  |
| Single-Wall Wye      | S18W | 18 | 0.125  | Double-Wall Wye      | D18W | 18 | 1.25  |
| Single-Wall Wye      | S20W | 20 | 0.125  | Double-Wall Wye      | D20W | 20 | 1.25  |
| Single-Wall Wye      | S22W | 22 | 0.1875 | Double-Wall Wye      | D22W | 22 | 1.375 |
| Single-Wall Wye      | S24W | 24 | 0.1875 | Double-Wall Wye      | D24W | 24 | 1.375 |
| Single-Wall Wye      | S26W | 26 | 0.1875 | Double-Wall Wye      | D26W | 26 | 1.375 |
| Single-Wall Wye      | S28W | 28 | 0.1875 | Double-Wall Wye      | D28W | 28 | 1.375 |
| Single-Wall Wye      | S30W | 30 | 0.1875 | Double-Wall Wye      | D30W | 30 | 1.375 |
| Single-Wall Wye      | S32W | 32 | 0.1875 | Double-Wall Wye      | D32W | 32 | 1.375 |
| Single-Wall Wye      | S34W | 34 | 0.1875 | Double-Wall Wye      | D34W | 34 | 1.375 |
| Single-Wall Wye      | S36W | 36 | 0.1875 | Double-Wall Wye      | D36W | 36 | 1.375 |
| Single-Wall Wye      | S38W | 38 | 0.25   | Double-Wall Wye      | D38W | 38 | 1.5   |
| Single-Wall Wye      | S40W | 40 | 0.25   | Double-Wall Wye      | D40W | 40 | 1.5   |
| Single-Wall Wye      | S42W | 42 | 0.25   | Double-Wall Wye      | D42W | 42 | 1.5   |
| Single-Wall Wye      | S44W | 44 | 0.25   | Double-Wall Wye      | D44W | 44 | 1.5   |
| Single-Wall Wye      | S46W | 46 | 0.25   | Double-Wall Wye      | D46W | 46 | 1.5   |
| Single-Wall Wye      | S48W | 48 | 0.25   | Double-Wall Wye      | D48W | 48 | 1.5   |
| Single-Wall Wye      | S50W | 50 | 0.25   | Double-Wall Wye      | D50W | 50 | 1.5   |
| Single-Wall Wye      | S52W | 52 | 0.25   | Double-Wall Wye      | D52W | 52 | 1.5   |
| Single-Wall Wye      | S54W | 54 | 0.25   | Double-Wall Wye      | D54W | 54 | 1.5   |
| Single-Wall Wye      | S56W | 56 | 0.25   | Double-Wall Wye      | D56W | 56 | 1.5   |
| Single-Wall Wye      | S58W | 58 | 0.25   | Double-Wall Wye      | D58W | 58 | 1.5   |
| Single-Wall Wye      | S60W | 60 | 0.25   | Double-Wall Wye      | D60W | 60 | 1.5   |
| Single-Wall Straight | S06S | 6  | 0.125  | Double-Wall Straight | D06S | 6  | 1.25  |
| Single-Wall Straight | S08S | 8  | 0.125  | Double-Wall Straight | D08S | 8  | 1.25  |
| Single-Wall Straight | S10S | 10 | 0.125  | Double-Wall Straight | D10S | 10 | 1.25  |
| Single-Wall Straight | S12S | 12 | 0.125  | Double-Wall Straight | D12S | 12 | 1.25  |
| Single-Wall Straight | S14S | 14 | 0.125  | Double-Wall Straight | D14S | 14 | 1.25  |
| Single-Wall Straight | S16S | 16 | 0.125  | Double-Wall Straight | D16S | 16 | 1.25  |
| Single-Wall Straight | S18S | 18 | 0.125  | Double-Wall Straight | D18S | 18 | 1.25  |
| Single-Wall Straight | S20S | 20 | 0.125  | Double-Wall Straight | D20S | 20 | 1.25  |
| Single-Wall Straight | S22S | 22 | 0.1875 | Double-Wall Straight | D22S | 22 | 1.375 |
| Single-Wall Straight | S24S | 24 | 0.1875 | Double-Wall Straight | D24S | 24 | 1.375 |
| Single-Wall Straight | S26S | 26 | 0.1875 | Double-Wall Straight | D26S | 26 | 1.375 |
| Single-Wall Straight | S28S | 28 | 0.1875 | Double-Wall Straight | D28S | 28 | 1.375 |
| Single-Wall Straight | S30S | 30 | 0.1875 | Double-Wall Straight | D30S | 30 | 1.375 |
| Single-Wall Straight | S32S | 32 | 0.1875 | Double-Wall Straight | D32S | 32 | 1.375 |
| Single-Wall Straight | S34S | 34 | 0.1875 | Double-Wall Straight | D34S | 34 | 1.375 |
| Single-Wall Straight | S36S | 36 | 0.1875 | Double-Wall Straight | D36S | 36 | 1.375 |
| Single-Wall Straight | S38S | 38 | 0.25   | Double-Wall Straight | D38S | 38 | 1.5   |
| Single-Wall Straight | S40S | 40 | 0.25   | Double-Wall Straight | D40S | 40 | 1.5   |
| Single-Wall Straight | S42S | 42 | 0.25   | Double-Wall Straight | D42S | 42 | 1.5   |
| Single-Wall Straight | S44S | 44 | 0.25   | Double-Wall Straight | D44S | 44 | 1.5   |

|                      |      |    |      |                      |      |    |     |
|----------------------|------|----|------|----------------------|------|----|-----|
| Single-Wall Straight | S46S | 46 | 0.25 | Double-Wall Straight | D46S | 46 | 1.5 |
| Single-Wall Straight | S48S | 48 | 0.25 | Double-Wall Straight | D48S | 48 | 1.5 |
| Single-Wall Straight | S50S | 50 | 0.25 | Double-Wall Straight | D50S | 50 | 1.5 |
| Single-Wall Straight | S52S | 52 | 0.25 | Double-Wall Straight | D52S | 52 | 1.5 |
| Single-Wall Straight | S54S | 54 | 0.25 | Double-Wall Straight | D54S | 54 | 1.5 |
| Single-Wall Straight | S56S | 56 | 0.25 | Double-Wall Straight | D56S | 56 | 1.5 |
| Single-Wall Straight | S58S | 58 | 0.25 | Double-Wall Straight | D58S | 58 | 1.5 |
| Single-Wall Straight | S60S | 60 | 0.25 | Double-Wall Straight | D60S | 60 | 1.5 |

TABLE 2—LOADING<sup>1</sup>

| DUCT DIAMETER<br>(inches) | DUCT CONSTRUCTION | LOAD at 5%<br>DEFLECTION<br>(lbs.) | Stiffness at 5%<br>Deflection (psi) |
|---------------------------|-------------------|------------------------------------|-------------------------------------|
| 6                         | Single Wall       | 986                                | 274                                 |
| 6                         | Double Wall       | 828                                | 230                                 |
| 20                        | Single Wall       | 148                                | 12.3                                |
| 20                        | Double Wall       | 434                                | 36.2                                |

TABLE 3—LOADING AT ELEVATED TEMPERATURE OF 6 INCH SINGLE WALL DUCT<sup>1</sup>

| DUCT TEMPERATURE | LOAD at 5% DEFLECTION<br>(lbs.) | Stiffness at 5% Deflection (psi) |
|------------------|---------------------------------|----------------------------------|
| 73 °F            | 1003                            | 278                              |
| 250 °F           | 892                             | 227                              |
| 500 °F           | 705                             | 165                              |

For SI: 1 inch = 25.4 mm, 1 lb. = 14.59 N/m.

<sup>1</sup> Loads are the results of ASTM 2412 testing without safety factors yielding a 5% deflection based on inside diameter.

Duct specimen tested were non-ribbed or none-reinforced sections of straight duct.