

TABLE OF CONTENTS – COMMERCIAL UNDERSLAB DUCT

Underslab Capabilities and Variations

1

Underslab Air Duct Specification

4

Dimensional Data Tables

20

Fitting Dimensional Details

24

UNDERSLAB CAPABILITIES AND VARIATIONS

Spunstrand® Inc. has been manufacturing underslab HVAC ductwork for over fifty years in both insulated and non-insulated forms. Insulated and non-insulated ductwork is available in, but not limited to, standard sizes 2"Ø through 168"Ø. Custom sizes, larger and smaller, round or rectangular are available. Rectangular or square duct systems are not usually designed and laid out for underground use except for vertical boot risers. Boot risers are often sheet metal but can be made out of fiberglass for a complete water tight system if high water table conditions exist. Fiberglass boots are also recommended if corrosive soil conditions exist.

Insulation values are available in standard; R-4, R-6, R-8, R-10 and R-12. Greater values required can be easily accommodated. Wall thickness may also be varied to attain greater depths of burial or to provide better structure for pipe brackets and other equipment used as conveyances through the duct system.

Spunstrand® Inc. does offer a complete line of pre-insulated or non-insulated fittings. If fittings other than standard or variations from standard are required, these can be handled upon request and normally at no additional cost. Pre-manifolded or factory-attached fittings are also available.

CAPABILITIES LIST

- Watertight Joints
- Special Shapes and Sizes
- Heavier Wall Thickness
- Custom Insulating Values
- Custom Lengths
- Custom Fittings: Round, Rectangular
- Consulting
- Direct burial
- Complete Line of Pre-insulated or Non-insulated Fittings
- Factory Manifolding
- Alternate Joint Systems
- Deep Burial Engineering
- FRP Boots

Spunstrand® Inc. fiberglass reinforced plastic duct (FRP) is rated Class 1 and code approved for direct underground burial serving any commercial application which has the supply and / or return air system under the building slab. Typical applications include the following:

UNDERSLAB HVAC / SLAB ON GRADE CONSTRUCTION

- Banks
- Churches
- Hospitals
- Libraries
- Schools / Gymnasiums
- Swimming Pools
- Theaters / Auditoriums
- Hotels
- Carbon Monoxide Exhaust
- High Rise Construction (HVAC & Garage Exhaust)
- Housing Projects
- Restaurants
- Super Markets (HVAC & Heat Recovery Systems)

Spunstrand® Inc. duct for these applications is manufactured using the filament wound method, where continuous fiberglass strands are impregnated with resin and machine wound on a mandrel which has first received a foil scrim kraft surface liner. Winding continues until the desired wall thickness is reached, then the mandrel with the duct laminate is moved to a heated curing station where it is rotated until the resin is set. The approximate glass content of the filament wound duct is 70%.

The internal surface liner provides the Class 1 rating for this product while the fiberglass furnishes strength, dimensional stability, and temperature resistance. The type of resin is chosen to provide chemical and electrical resistance, color, finish hardness and thermal properties.

Factory fabricated standard fittings include elbows, wye branches, laterals, tees, crosses, concentric and eccentric reducers and end caps. The fittings are fabricated from standard duct material with the fiberglass reinforced joints built up by hand. Centerline or tangent takeouts are available.

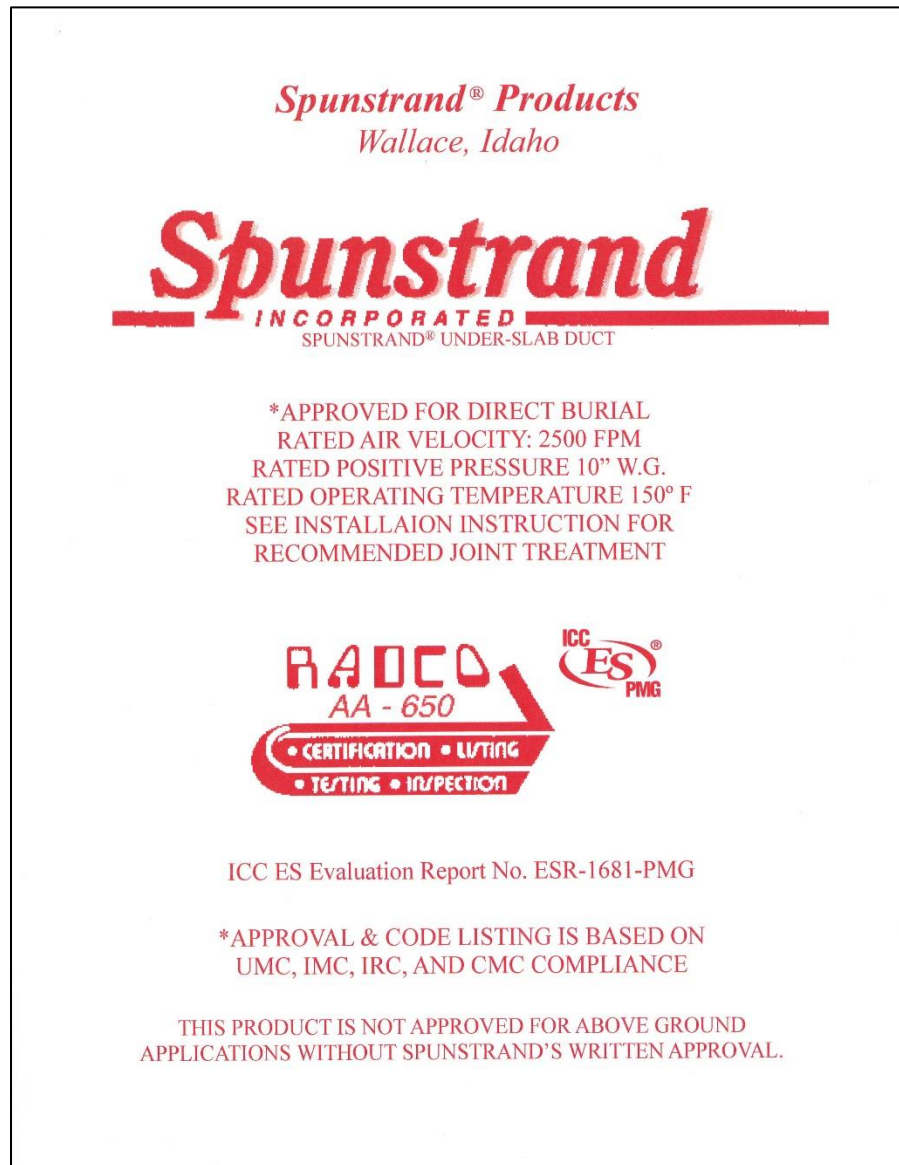
Custom supply and / or return air plenums are available and made of the same material as for underground applications. These come complete with stub-outs for connecting to the underslab duct system with end caps which can be field cut to accept the above ground supply and / or return air system.

Accessories include as a standard, wet joint material to provide water tight field joints.

The end result is a duct system which is easily and quickly installed, eliminating concrete encasement and the corresponding duct tie downs while allowing for immediate backfill. It is watertight, corrosion resistant, provides a superior strength to weight ratio and extreme care is not required to protect the external finish. Openings for field furnished sheet metal or the preferred fiberglass boots and saddle taps are easily cut in the field using conventional tools.

CODE LISTINGS

- 2012, 2009 and 2006 *International Residential Code*® (IRC)
- 2012, 2009 and 2006 *International Mechanical Code*® (IMC)
- 2012, 2009 and 2006 *Uniform Mechanical Code*® (UMC)
- 2012, 2009 and 2006 *California Mechanical Code*® (IMC)
- LC 1014-2011 Listing Criteria for Underground Plastic Air Ducts
- UL 181-2008 Standard for Safety for Factory-Made Air Ducts and Connectors



LIMITATIONS

Spunstrand® Inc. Underslab Air Duct is rated and code approved at the following:

Temperature = 150° Continuous
Pressure = 10" W.G. positive, 4.8" W.G. negative
Air Velocity = 2500 FPM

Installation must be in accordance with the published installation instructions. For any deviations, please contact Spunstrand® Inc. and we will provide recommendations or applicable variation options. We are here to make your every project a complete success.

STANDARD SPECIFICATIONS FOR SPUNSTRAND® INC. UNDERSLAB AIR DUCT

Part 2 - Products

2.01 GENERAL

- A. Underground ductwork, including fittings, shall be constructed of fiberglass reinforced plastic manufactured by Spunstrand® Inc., 620 North Post Street, Post Falls, ID 83854. 208.777.7444 ph, 208.777.7445 fax. All duct and fittings shall be designed and constructed to meet the applicable requirements of Uniform Mechanical Code, Chapter 6 and be listed with ICC-ES for direct burial application. All ductwork and fittings shall include labels certifying the actual code listings and report number, and shall be installed in strict accordance with the manufacturer's instructions.

2.02 MATERIALS

- A. Resin - The resin used shall be high grade polyester, tested to meet the requirements of Uniform Mechanical Code, Chapter 6 and suitable for corrosion against all normal soil and moisture conditions. Resin systems with fillers exceeding 5% shall not be approved.
- B. Inner Lining - All duct and fittings shall have a UL listed Class 1 inner liner for both flame spread and smoke developed ratings.
- C. Structural Layer - The structural layer shall be filament wound of resin and glass to meet the specified working pressures and depth of burial requirements.

2.03 INSULATION

- A. Underground ductwork shall be factory pre-insulated including all fittings. The duct shall be ICC-ES listed and installed in strict accordance with the manufacturer's instructions. The insulation value of the duct shall be R-4, R-6, R-8, R-10 or R-12 as selected. Insulation values shall be tested per ASTM C-518 in an independent lab with a minimum of five years experience performing testing to this standard.

2.04 ACCESSORIES

- A. Fittings - Fittings shall be fabricated from straight duct and have the same working pressure and shall also be corrosion and moisture resistant. Reducers shall be filament wound as specified for the duct.
- B. Joints - Field joints are to be watertight by using an internal galvanized sheet metal sleeve secured with sheet metal screws. The joints shall then be of the wet lay-up type in strict accordance with the manufacturer's instructions. This includes thoroughly cleaning and sanding areas to be joined and using manufacturer supplied polyester resin and fiberglass mat.
See Field Wet Joint Installation Instructions for Underslab Air Duct on page 12.
- C. Register Boots - Register boots, if constructed of galvanized sheet metal with a flange secured to the duct with sheet metal screws, must be encased in concrete covering well around the joint.
Preferred Option: Underground supply and / or return air plenums shall be made of the same material as the duct. They shall be of one-piece construction including the stub outs for connecting to the ductwork.

2.05 SILENCERS

1. Fiberglass Reinforced Plastic Silencers shall be manufactured by **Spunstrand® Inc. and David P. Wilson, FiberSonic Model FS-00-00-00**, or pre-approved equal. Silencer shall be tested for insertion loss, self-noise, and pressure drop in an independent NVLAP accredited laboratory in full accordance with ASTM E477. Testing shall be completed and data available for review, 72 hours prior to bid date. Test data for insertion losses to meet or exceed the acoustical data published in the specification tables.
2. Silencers above ground to installed per manufacturer's recommendations.
3. Silencers installed below ground should either be accessible inside a watertight concrete vault, or fitted with a schedule 80 PVC drain at the lowest point for piping back to plenum. Water entering the duct by any means will find a low point in the silencer, and must have a provision for draining. See Fibersonic Silencer™.
4. Construction Specification and details available in the Industrial Section of this catalog.

INSTALLATION INSTRUCTIONS FOR SPUNSTRAND® INC. UNDERSLAB AIR DUCT

Part 3 - INSTALLATION

3.01 GENERAL

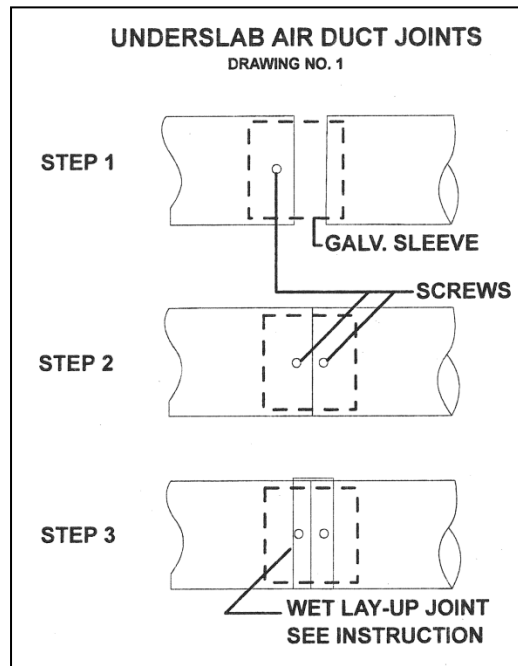
- A. Spunstrand® Inc. duct is a semi-rigid reinforced thermosetting resin product designed to deflect approximately 5% under external load without structural damage. The performance of the duct is affected by the amount of strain introduced into the duct wall from internal pressure, external loads and the resulting deflection of the duct with respect to its wall thickness.
- B. It is important to recognize the need for care in handling the duct during the installation process and to properly provide uniform support for the duct by carefully placing the backfill material under and around the duct. Large diameter duct will usually require internal support during the backfilling process and until all external soil loads have stabilized. When installed underground, the load of the soil above the duct tends to flatten the duct and make it wider. As the duct tries to widen, the walls push into the soil at the sides developing a resistance that helps support the vertical load. The higher the soil resistance the less the duct will deflect. Proper installation techniques are necessary to prevent excessive deflections and potential duct buckling.

3.02 TRENCH CONSTRUCTION

- A. The surface at the bottom of the trench should be continuous, smooth, and free of rocks to avoid point loading on the duct. Where this cannot be accomplished the trench bottom should be over excavated to allow a minimum of 4 inches of bedding material under the duct.
- B. Trench width should not be greater than necessary to provide adequate room for joining the duct in the trench and for compacting the backfill in the bedding zone and at the sides of the duct. The minimum distance between the duct and the trench is four (4) inches; maximum recommended trench width is twice the diameter of the duct.
- C. Dewatering should be provided when there is a risk of flooding the trench during installation. Dewatering shall continue from the time the duct is first placed in the trench, until backfill or encasement is completed. Damage can occur when the duct is floated during a water uplift event.

3.03 JOINING THE DUCT

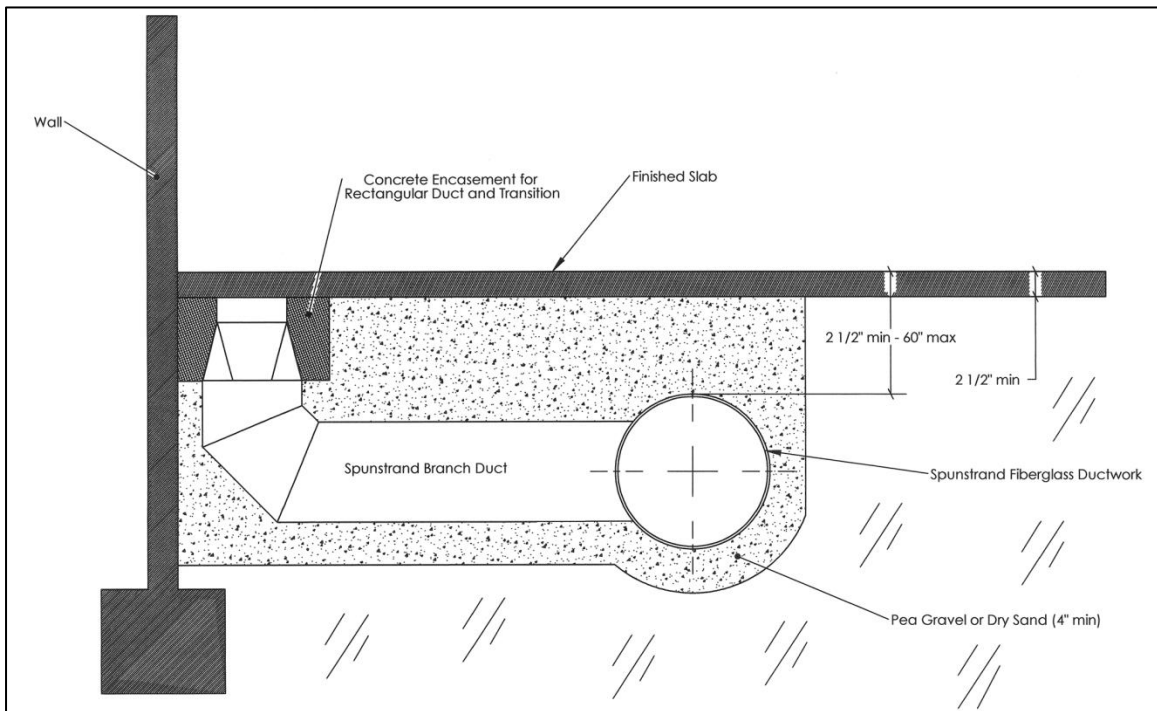
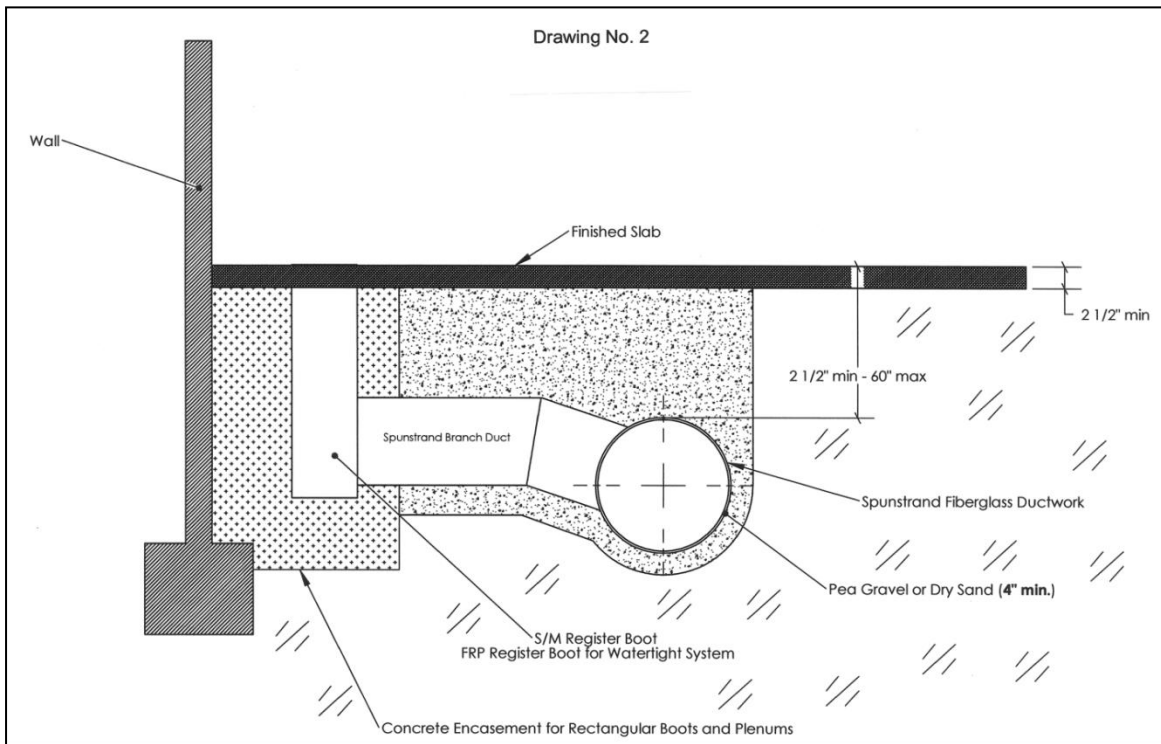
- A. Because of its relatively low weight per foot, Spunstrand® Inc. duct can be joined before lowering into the trench thus minimizing the number of in-trench joints required during installation. Field joints require an internal galvanized sheet metal sleeve furnished by installing contractor (See Physical Data chart on page 9). Field joints to be of the wet lay-up type in strict accordance with the manufacturer's instructions. This includes thoroughly cleaning and sanding areas to be joined. (See Drawing No. 1. on page 7.)



3.04 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer's instructions including but not limited to the following: duct to be installed in a trench with provision for good drainage and an allowance for a minimum of 4" pea gravel or *dry* silica sand to completely encase the duct. The top of the duct shall be at least 2 1/2" below the top of the concrete slab.

- B. Store and handle the duct so as to prevent damage. Carefully inspect each length before installation. If long sections are to be assembled alongside the trench then lowered into position, the duct run should be supported along its length to avoid strain and potential overstress or buckling of the duct or damage to the joints. Lay the duct in the trench so that it bears evenly on the bedding or bottom of the trench throughout its entire length. Arrows on the duct clearly mark the direction of airflow. A minimum thickness of 2 1/2" of concrete is recommended where duct protrudes through the concrete. The maximum depth of burial for standard Spunstrand® Inc. underslab air duct allows for 5 feet of backfill cover. Deeper burial is possible; however, your Spunstrand® Inc. representative must be contacted for special recommendations that may be required. If the duct is not underslab it should be below the frost line. If the duct must pass directly under a load / weight bearing wall or under a road, reinforcement over the duct may be required. Again, please contact your Spunstrand® Inc. representative for specific requirements if your application meets these referenced, or any other custom considerations. (See Drawing No. 2 on page 8.)



PHYSICAL DATA FOR WET JOINT SYSTEM

Sheetmetal sleeve to be furnished by installing contractor.

4"	26 / 4"	6" Stitch Mat / 2 Layers
5"	26 / 4"	6" Stitch Mat / 2 Layers
6"	26 / 4"	6" Stitch Mat / 2 Layers
7"	26 / 4"	6" Stitch Mat / 2 Layers
8"	26 / 4"	6" Stitch Mat / 2 Layers
9"	26 / 4"	6" Stitch Mat / 2 Layers
10"	26 / 4"	6" Stitch Mat / 2 Layers
12"	26 / 4"	6" Stitch Mat / 2 Layers
14"	24 / 4"	6" Stitch Mat / 2 Layers
16"	24 / 4"	6" Stitch Mat / 2 Layers
18"	24 / 4"	6" Stitch Mat / 2 Layers
20"	24 / 4"	6" Stitch Mat / 2 Layers
22"	24 / 4"	6" Stitch Mat / 2 Layers
24"	24 / 4"	6" Stitch Mat / 2 Layers
26"	22 / 6"	6" Stitch Mat / 2 Layers
28"	22 / 6"	6" Stitch Mat / 2 Layers
30"	22 / 6"	6" & 8" Stitch Mat / 1 Layer Ea.
32"	22 / 6"	6" & 8" Stitch Mat / 1 Layer Ea.
36"	22 / 6"	6" & 8" Stitch Mat / 1 Layer Ea.
42"	22 / 6"	6" & 8" Stitch Mat / 1 Layer Ea.
48"	22 / 6"	6", 8" & 10" Stitch Mat / 1 Layer Ea.
54"	22 / 6"	6", 8" & 10" Stitch Mat / 1 Layer Ea.
60"	22 / 6"	6", 8" & 10" Stitch Mat / 1 Layer Ea.
*72"	22 / 6"	6", 8" & 10" Stitch Mat / 1 Layer Ea.
<i>*72" and larger diameter ductwork is not included in the ICC-ES listing.</i>		

DIRECT BURIAL UNDERSLAB DUCT

Standard Installation Defined

Spunstrand® Inc. underslab duct products are versatile in many ways, and can accommodate a variety of field conditions with appropriate engineering and design. This document is intended to provide a snapshot of a standard installation, and jobsite conditions that require a factory or engineering review prior to installation. If Spunstrand® Inc. duct is installed with materials or methods outside of the parameters of a standard installation without factory approval, the factory warranty will be null and void. This document applies to both our insulated and non-insulated underslab round ductwork.

Spunstrand® Inc. is designed to be direct buried underneath a concrete slab. The duct is not considered structural, and the concrete slab must be designed to span the width of the duct trench if the slab is expected to bear significant loads, otherwise the slab may crack.

The standard depth of burial allows for up to 5 feet of cover over the top of the duct. As our installation instructions state, fill material should be carefully dispersed into the trench around the duct, and dumping full loads of sand or gravel directly onto the duct may result in damage or collapse.

A normal trench will accommodate one run of duct. If two runs of duct are going to occupy the same trench area, or if duct runs will cross over each other, the manufacturer must be notified, and special instructions will be provided if necessary. Trenches should have vertical sidewalls of engineered soil to provide support for the backfill material and stabilizing the duct. In some cases, this is not possible, and the manufacturer should be notified. Special instructions will be provided if necessary.

Approved Backfill Material

Approved backfill materials are pea gravel or dry silica sand. These materials will achieve 95% compaction without the use of mechanical compaction. Rodding and hand tamping are the only approved compaction methods over the top of the duct. A minimum of 4" of pea gravel or dry silica sand must completely encase the ductwork.

Spunstrand® Inc. duct is designed to handle hydrostatic loading if all of the above criteria are met. If ground water or high water table may occur in the area the duct is installed, wet joint material must be used as the joining system. Hydrostatic pressure could cause some movement of the duct and use of this joining method will help ensure a rigid system that can withstand these forces. Other non-rigid sealing systems may be water-tight, but could tear if the duct were to move. It is also recommended that the duct be anchored to the slab if the possibility of soil erosion exists. If soil erosion occurs and the duct or the slab is damaged, this is outside the scope of our warranty. Provisions should be made by the engineer or contractor to keep a water table from threatening the building, slab, and ductwork.

Concrete Encasement

Concrete encasement is not a standard method of installation, but can be accommodated with special provisions. If concrete encasement is being considered, it must be done in two to three lifts depending on diameter and trench conditions, with provisions to prevent floating. Please contact the manufacturer for specific instruction on how to do this without damaging the duct. Duct hold down system for encasement should be designed by a mechanical engineer and confirmed with Spunstrand® Inc. for potential pounds of float / uplift per lineal foot per diameter.

Rectangular Plenums, Register Boots and Transitions

Rectangular ducts, plenums, register boots and transitions are often provided as part of a system. These items are not approved for direct burial unless special design considerations have been made to withstand the loading. Spunstrand® Inc. assumes these items will all be concrete encased and properly braced during pouring to withstand the loads imposed. If clarification is needed, please consult Spunstrand® Inc.

No trucks or equipment may pass over the buried duct without steel plates to bridge the trench area. Equipment driving over the duct may cause cracks or potentially collapse the duct, and will result in a voided warranty. Any installation variations that are not approved by Spunstrand® Inc. will result in a voided warranty for the duct system. Not all installation considerations can be covered in this document, if there are any questions or concerns about the installation, please contact Spunstrand® Inc. for verification.

Foundation Wall Penetrations

Precautions need to be reviewed by the engineer on record or contact your Spunstrand® Inc. representative.

FIELD WET JOINT INSTALLATION INSTRUCTIONS FOR UNDERSLAB AIR DUCT

Tools and Supplies

The following items are required to be on hand before attempting the field assembly of duct joints: metal or plastic lamination roller, rubber gloves, paint brushes, measuring container and plastic pails for mixing resin and catalyst, goggles or other protective eyewear, utility knife or scissors, disc sander with 24-grit abrasive discs, heat gun, wax paper or mylar and acetone for use as a solvent for equipment clean up.

Precautions

Although polyester resins are quite stable, extended storage at elevated temperatures above 80 deg. F can decrease the reactivity of the resin. Be sure and read the MSDS sheets included in your starter kit. Temperature extremes must be avoided to ensure proper curing of the resin. See table 1 for mixing ratios at varying temperatures. Work must be done in a dry, well-ventilated area. A wide flat surface should be available to "wet-out" the glass mat strips. This surface should be covered with a disposable covering. Anyone coming into contact with resin or catalyst must wear rubber gloves and protective eyewear.

Joining Procedures

Cut the duct to the desired length using a circular saw with carbide grit, metal cutting or masonry blade, making sure that the cut ends are cut squarely to butt closely as per the tolerances specified in S.M.A.C.N.A. Std. 7.26.3.

Using a disc sander with 24-grit disc, abrade the ends of the duct to be joined removing the resin rich surface. The width of abraded surface for each duct end is 1 to 2 inches more than half the width of the mat that will be used to join the duct. The width & number of layers of stitch mat used shall be in accordance with Spunstrand® Inc. Standard Specifications, located in the Physical Data chart on page 9 of this underslab section.

Join the duct and / or fittings with a sheet metal sleeve as shown in drawing no. 1 on page 7 in the installation instructions. NOTE: the sleeve should not be pre-formed as the duct I.D. can vary slightly. Insert one half of the sleeve into one end of the duct and secure it with sheet metal screws. Slide the other end of the duct or fitting over the remaining part of the sleeve and attach it with sheet metal screws. The recommended sheet metal sleeve is:

Duct Diameter 4" - 12" = 26 Gauge, 4" Wide
Duct Diameter 14" - 24" = 24 Gauge, 4" Wide
Duct Diameter 26" - 72" = 22 Gauge, 6" Wide

Cut the composite glass mat to length using number of plies and widths as indicated. Each mat length should be 3.2 times the normal duct diameter plus 2". This will allow for a slight overlap.

Where two layers of mat are used, stagger the two layers so that the overall width of the joint is about 1/2" to 1" wider than the mat layers used. On larger diameters where the length of stitchmat is impractical to work with, it can be cut in half or thirds (adding extra for overlap) and then laid up in sequence, (Refer to Physical Data chart on page 9.)

Mix resin with catalyst in a disposable plastic container using only as much as you can work with in 15 to 20 minutes.

Lay-Up Procedures

On a flat surface covered with release film (such as wax paper, butcher paper or Mylar®), lay the first and widest section of fiberglass mat, chop strand side up and wet out with catalyzed resin mix (see fig's 1 & 2 on pages 13 and 14). Work the resin up through the dry fiberglass mat to minimize air entrapment. Once completed, place the second mat for the joint onto the coated mat with the woven side down and wet it out also.

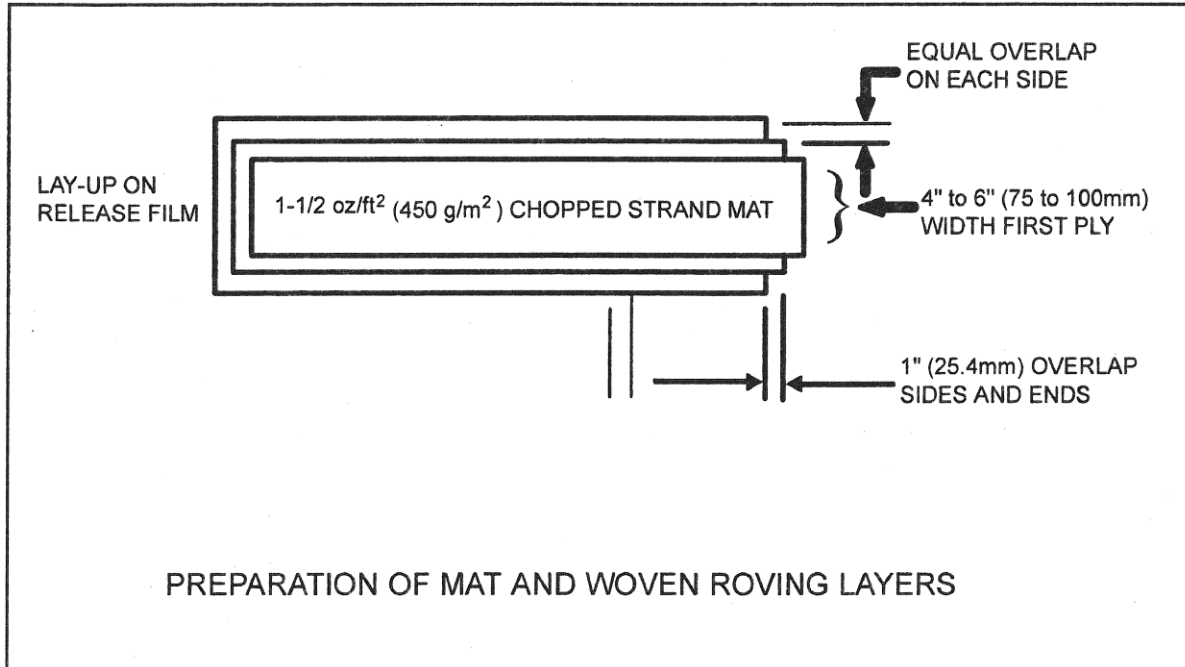


FIGURE 1

Begin the lay-up of the joint wrap by placing the chop strand side of the mat down against the duct. Use a 3" to 4" wide brush and laminating roller to work the resin in. Continue working the joint by rolling the resin from the center of the joint to the outer edges. Use moderate force with the roller to expel trapped air out of the laminate. Be careful not to remove too much resin. Each layer of fiberglass should overlap the ply beneath it (1/2 to 1in.) and bond directly to the duct in order to achieve secondary bonding. Note: if the joint looks dry, use additional mixed catalyzed resin during rolling. Place the rollers and paint brushes in acetone after each use, swirl them around to ensure the resin is dissolved.

Note

All acetone must be collected in a DOT Approved metal container at the end of each day and properly stored. After the job is completed, the collected solvent should be disposed of through a licensed hazardous waste treatment storage and disposal facility.

Saddle Taps

FRP saddle taps are attached using the same wet joint procedure as described above. First cut a hole in the duct where the saddle tap is to be attached. The hole should be slightly smaller than the saddle tap opening. Use a carbide chip or a metal cutting blade on a jigsaw, taking care to remove the piece that is being cut out. Center the saddle tap as required and pop rivet or screw attach each corner. Abrade the tap flange and 2" of the duct around the hole. Place a 6" wide section of mat that has been saturated with resin so it is centered half way on the flange and the duct. Use brushes and laminating rollers to work out any air bubbles until mat is in total contact with the flange and duct surfaces.

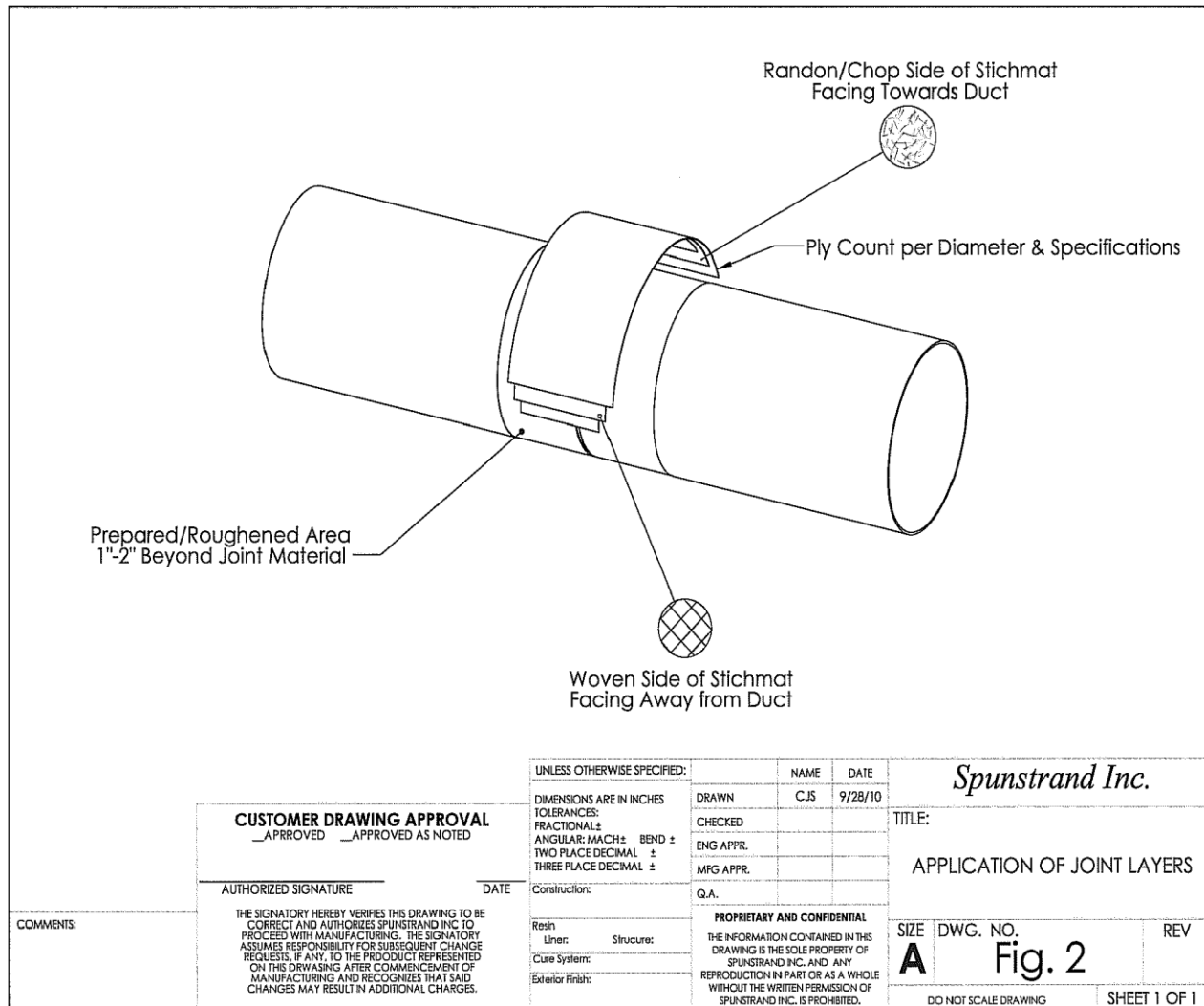


TABLE 1: GUIDE TO MIXING RATIOS

NOT RECOMMENDED BELOW 50° F (10° C) WITHOUT AN EXTERNAL HEAT SOURCE		
1 Pint (472 cc)	0.41 oz (12 cc)	*50-60° F (10-16° C)
1 Pint (472 cc)	0.32 oz (9.5 cc)	60-70° F (16-21° C)
1 Pint (472 cc)	0.20 oz (6 cc)	70-80° F (21-27° C)
1 Pint (472 cc)	0.19 oz (5.5 cc)	80-90° F (27-32° C)
1 Pint (472 cc)	0.17 oz (5 cc)	90+° F (32 +° C)

Mix resin thoroughly before adding catalyst into the mixing container.
The above catalyzation table will allow for a pot life of about 20 minutes.

****Call Spunstrand® Inc. for special recommendations - a heat gun or external heat source may be necessary.***

WET JOINT MATERIAL

Jobsite Hazards and Precautions

While the materials provided to complete this project are all very stable and simple to use, there are some precautions that must be taken to assure that hazardous conditions do not develop on the jobsite. This information is all in the MSDS information provided, but this is for clarifications of crucial parts of these data sheets. Always follow OSHA and jobsite regulations with joint lay-up materials.

Please be sure to read all MSDS information for the chemicals being used and adhere to all personal protective equipment recommendations and storage information.

Storage

Temperature: Resin should be stored in a cool to warm environment with a recommended maximum temperature of 77 degrees. Excessive temperatures can cause the resin to harden even without the addition of the catalyst. Catalyst must also be kept at a recommended temperature below 77 degrees. Excessive temperature can cause hazardous conditions with the catalyst including hazardous polymerization and combustion. When storing resin, MEKP (catalyst), acetone or any chemicals indoors, make certain the lids or caps are on tight and no spills or fumes can be detected. Make certain that adequate ventilation is provided in occupied space or any space that product is stored and could allow for a buildup of fumes due to leaks or spills.

Material Usage and Cleanup

When the resin and catalyst are mixed together, the reaction is exothermic, meaning it will create heat to help the curing process. When the material is mixed, the proper mixing ratios should be followed. While the ratios must be considerably out of compliance in order to cause a hazardous condition, it is a possibility. The more mass of mixed resin that is left in a container, the more heat will be generated. An improper mixing ratio and a large mass of mixed resin left in a container could create enough heat to cause a fire. Any amount of unused mixed resin must be moved out of any enclosed structure and should be placed in an area where high temperature cannot cause any other hazardous conditions. It must also be isolated from any electrical exposure or other flammable materials or rags. Mark your buckets and measuring devices to maintain consistent performance and a record of your mixing history.

Acetone is the only acceptable solvent for cleanup of resin-saturated brushes, rollers or other necessary cleanup. Once the acetone has been used, it is classified as a hazardous material and must be disposed of in accordance with the law. Acetone is extremely flammable, and should always be stored in accordance with local and state regulations and used away from any potential source of ignition. Note that fiberglass is a very hard plastic and while grinding fiberglass does not produce a visible spark, sparks do occur. Make sure that all resin in buckets, brushes, wax paper (release films) or rollers is completely cured prior to dumping into jobsite waste dumpsters.

Moisture and water must be kept away from all materials during storage. If the fiberglass cloth material becomes wet or moist, it will inhibit that material from absorbing resin. It will also inhibit the cure of the resin, resulting in a potentially leaky joint. These materials must be kept completely dry. If they do get wet, the time for this material to dry out enough to use is extremely long. The material should be replaced if this occurs.

Boot Takeouts (Boot Registers)

Detail drawing on page 8 indicates the use of a sheet metal rectangular to round transition mounted vertically in the slab floor. A connection is made by inserting the round portion of the sheet metal register into the fiberglass elbow (45 or 90 depending on situation). Use duct sealer with a scrim reinforcement on the outside of the round portion of the transition where it inserts into the mating Spunstrand® Inc. fiberglass fitting. Encase the sheet metal transition completely in concrete, covering well around and below the joint to the fiberglass elbow. This is normally done at the same time the slab is poured.

Field Duct Cutting

Spunstrand® Inc. underslab air duct is readily cut in the field with conventional tools, such as a saber saw, band saw or circular saw. A metal cutting blade or reinforced abrasive wheel is preferable. It is recommended that O.S.H.A. approved fine particle dust masks and / or other protective gear is worn when cutting the duct.

Backfilling

When backfilling and pouring the concrete slab, care shall be exercised to avoid shock loads. Uniform backfilling is required to maintain the duct in a round configuration at all times. A minimum of 4" pea gravel or dry silica sand should be used as backfill under, around, and over the duct. The backfill around the duct should be placed in layers on each side of the duct. Take care to compact the material under the haunches of the duct and bring the backfill up in roughly even lifts to avoid uneven loading on the duct walls.

Mechanical compaction is not recommended due to the extreme care required to avoid damage to the duct. Water settling of the backfill is unsatisfactory because floatation of the duct is the usual result. Hand tamping is the recommended method. Pea gravel as dumped from a wheelbarrow is approximately 85% compacted, with the addition of hand tamping or rodding, pea gravel backfill compaction will approach 95%.

Space parallel ducting systems sufficiently far apart to allow compaction equipment to compact the soil between the ducts. Compact the soil between the ducts in the same manner as recommended for a single duct with particular attention to the compaction around and under the haunches of the ductwork.

Stake / mark underground ductwork as backfilling is being completed. Note: It is not recommended that an engineered fill be brought up around the duct due to the potential for damage from the compaction equipment and potential for uneven loading which could result in collapse. Rather, the engineered fill should be completed to the designed elevation and then the desired trench dug and the duct installed per manufacturer's recommendation.

Water Table Procedure

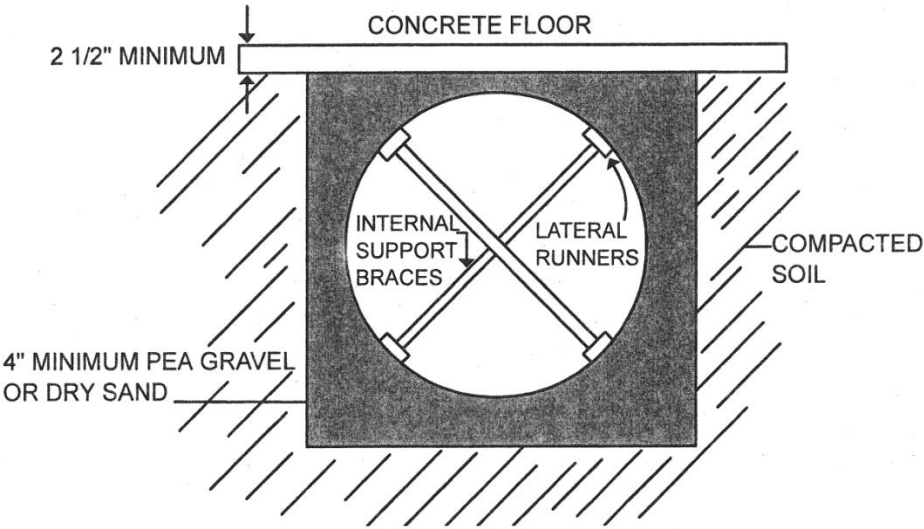
Where water is encountered within the trench zone it should be removed by suitable means and the trench maintained in a reasonable dry condition until the duct has been installed and enough backfill placed to prevent any floatation. The gradation of the backfill in the duct trench shall be such that the fines from the surrounding soils will not migrate into the backfill and cause lack of sidewall or foundation support. As an alternative the use of filtration fabric can be considered for this purpose. In either case, the assistance of a soils engineer should be sought.

Heavy Equipment Procedure

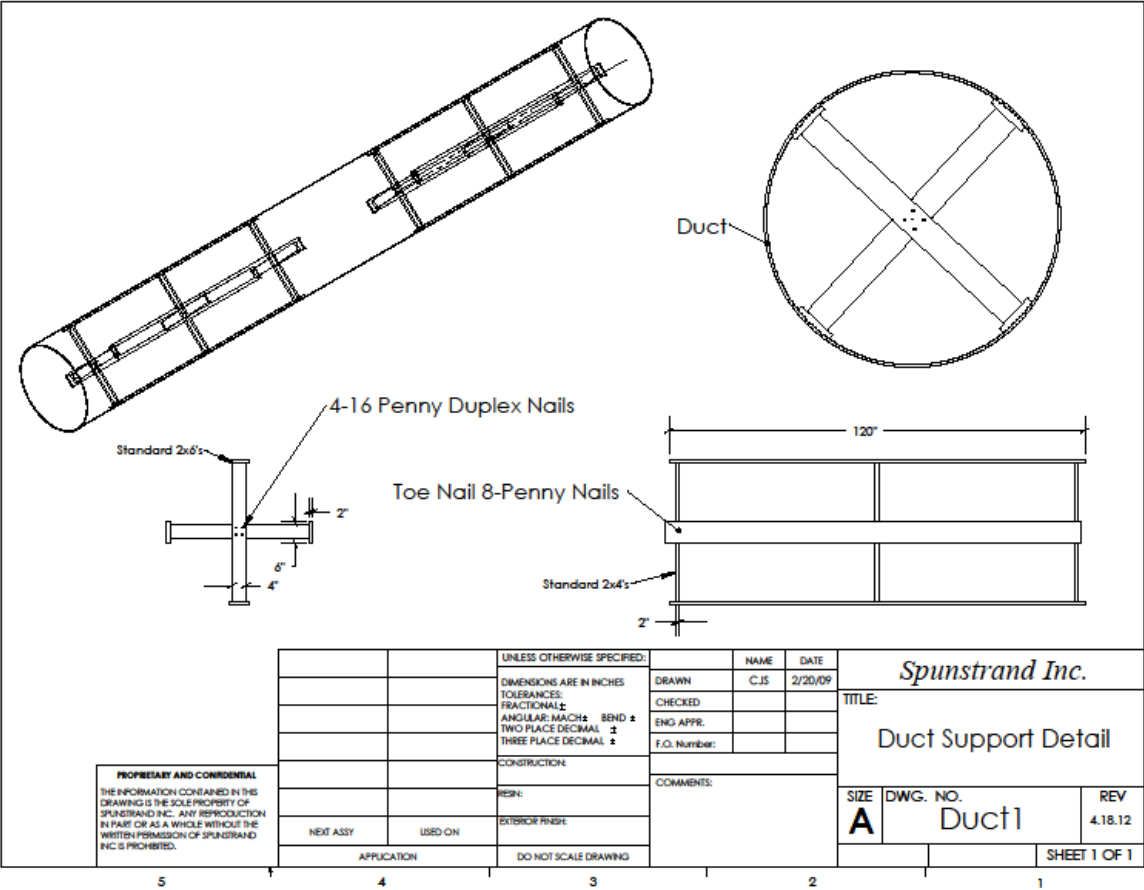
Heavy equipment shall not be allowed to pass over the duct without proper bridging. Where heavy floor loads are anticipated, the floor slab should be reinforced over the duct area or a crown of concrete poured over the duct in lieu of the backfill material. Where ducts are parallel to a wall or foundation, it should be spaced to provide a minimum of 4" for the backfill material. Where the duct must pass directly under a load bearing wall, reinforcement over the duct may be required.

For large diameter duct (36" and over) movable internal support braces including lateral runners are recommended during backfill. They are to be relocated as backfilling is continued and removed upon completion. (See Drawing No. 5 on page 18.)

MOVABLE INTERNAL SUPPORTS FOR
LARGE DIAMETER (36" and over) UNDERSLAB AIR DUCT
Drawing No. 5



CAUTION: Installations requiring variation from these instructions should be approved by Spunstrand® Inc.



PRODUCT INFORMATION CONCERNING SHIPPING AND HANDLING

RECEIVING:

Regardless the mode of transportation, upon receiving, each piece should be inspected and checked against the Packing Slip / Bill of Lading.

INSPECTION:

Note damaged or missing items on the Bill of Lading and notify the carrier's agent (*truck driver*). Obtain a signed acknowledgement of the damage or shortage at the time of unloading. **DO NOT** dispose of or return damaged items. Replacement materials must be re-ordered on a separate Purchase Order. Shipments are FOB factory – *Wallace, Idaho*. Once materials are loaded and leave the Spunstrand® Inc. factory, title of materials pass to the consignee – *customer*. If you do not note the damage and assist in filing a freight claim, any warranty work or replacement parts will be charged to the customer.

UNLOADING:

Small parts may be unloaded by hand but not thrown off the truck. Handle parts carefully, being sure not to scratch the interior surface or damage the ends.

- **DO NOT** push or roll duct off the truck with a fork lift.
- **DO NOT** use hooks to lift duct.
- **DO NOT** use wire rope or chains as a sling to lift large duct.

If slings are to be used, they must be a minimum of 4" wide webbed nylon or canvas. On 20 foot lengths of large duct, two slings should be placed approximately 7 feet in from each end, and the load lifted evenly. On 40 foot lengths, three slings placed at 10 foot intervals should be used.

STORAGE:

It is important that the resin and glass materials be stored out of the weather in a clean, dry location within a maximum temperature of 77°F. Cover all product (glass, duct) with a protective tarp. The glass materials and product should be covered to protect them from rain and snow. Keep resin out of the sun and store in an area where the temperature will not fall below 60°F. Read the labels on all containers, the labels contain information about health and safety considerations as well as storage.

FSK (Non-Insulated) Duct and Fittings – Shipping Weights

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
NOMINAL DIAM. (IN)	STRAIGHT DUCT / FT (lbs)	45 ° ELBOW (lbs)	90 ° ELBOW (lbs)	CON. RED. (lbs)	ECC. RED. (lbs)	END CAP (lbs)	TEE (lbs)	SINGLE 45 ° Y (lbs)	SINGLE 90 ° Y (lbs)	CROSS (lbs)	DOUBLE 45 ° Y (lbs)	DOUBLE 90 ° Y (lbs)	TRUE Y (lbs)	SADDLE TAP (lbs)	TRANSITO N (lbs)	FLANGE (lbs)
4	0.9	1	2	-	-	1	1	1	2	1	2	4	1	1	3	2
5	1.1	1	2	1	1	1	2	2	3	3	3	5	2	1	4	2
6	1.2	2	3	2	3	2	2	3	4	3	4	6	2	1	4	3
7	1.4	2	3	2	3	2	2	3	4	3	4	6	2	1	5	3
8	1.6	2	4	2	3	2	3	4	5	4	5	7	3	1	6	4
9	1.7	3	5	3	4	3	4	5	7	5	7	11	4	2	6	4
10	1.9	3	5	3	4	3	4	6	8	5	8	12	4	2	7	5
12	2.2	4	7	3	4	4	6	8	10	7	10	16	7	3	9	6
14	2.5	5	9	4	5	5	7	10	13	8	13	19	8	4	10	6
16	3.8	8	14	5	7	6	10	14	18	12	18	28	11	4	12	7
18	4.2	9	16	5	7	8	12	18	23	14	23	35	14	6	16	8
20	4.6	11	18	6	8	9	14	21	27	16	27	41	16	6	18	9
22	6.2	13	23	8	10	11	19	29	37	22	37	53	21	8	30	15
24	6.7	15	26	8	10	12	22	33	42	25	42	60	24	8	34	16
26	7.2	18	32	10	13	15	27	42	53	30	54	76	31	11	40	18
28	9.2	21	37	11	14	17	33	52	65	37	66	92	37	12	45	19
30	9.8	23	40	12	16	19	36	58	72	41	74	102	41	13	52	21
32	10.4	25	45	13	17	21	41	65	80	46	83	113	47	15	58	22
34	12.5	29	52	15	20	25	50	81	96	56	103	142	57	17	62	24
36	13.6	32	58	16	21	27	55	89	108	61	113	151	63	19	65	25
38	15.3	40	72	19	25	33	69	113	136	76	143	191	79	23	71	28
40	18.7	56	101	26	34	44	96	160	193	106	203	270	111	31	82	35
42	20.3	64	115	29	38	50	110	183	221	121	233	309	127	35	88	38
44	21.7	67	121	31	40	51	118	197	237	130	250	330	136	36	94	40
46	24.3	73	133	33	43	54	134	225	268	146	285	371	154	38	105	42
48	25.6	76	139	34	44	55	141	239	283	154	302	391	162	39	110	43
54	31.7	101	184	42	55	74	190	327	386	206	414	531	222	52	125	49
60	37.8	131	240	50	65	95	246	426	504	265	542	693	287	67	141	54
66	32.9	176	327	65	85	108	382	614	716	374	777	978	408	75	177	69
70	29.6	207	386	76	99	116	454	742	861	448	938	1173	490	81	201	79
*72	58.9	213	398	78	102	118	493	768	890	463	970	1212	507	82	206	81

**72" and larger diameter ductwork is not included in the ICC-ES listing.*

R-4 (Insulated) Duct and Fittings – Shipping Weights

NOMINAL DIAM. (IN)	1 STRAIGHT DUCT / FT (lbs)	2 45 ° ELBOW (lbs)	3 90 ° ELBOW (lbs)	4 CON. RED. (lbs)	5 ECC. RED. (lbs)	6 END CAP (lbs)	7 TEE (lbs)	8 SINGLE 45 ° Y (lbs)	9 SINGLE 90 ° Y (lbs)	10 CROSS (lbs)	11 DOUBLE 45 ° Y (lbs)	12 DOUBLE 90 ° Y (lbs)	13 TRUE Y (lbs)	14 SADDLE TAP (lbs)	15 TRANSITO N (lbs)	16 FLANGE (lbs)
4	2	2	4	2	3	2	2	2	4	2	4	8	2	1	6	2
5	2	2	4	2	3	2	4	4	6	6	6	10	2	1	7	2
6	2	2	4	3	4	2	4	6	8	6	8	12	4	1	8	3
7	3	3	5	4	5	3	4	7	9	7	9	13	4	2	10	3
8	3	4	7	4	5	3	6	8	11	8	11	15	5	2	11	4
9	3	4	8	5	7	3	8	10	15	10	15	23	5	2	12	4
10	4	5	9	5	7	5	9	12	17	11	17	25	7	4	14	5
12	4	7	12	5	7	5	13	16	21	16	21	33	7	4	16	6
14	5	9	16	7	9	6	17	23	28	20	29	39	11	4	19	6
16	6	10	17	8	10	7	18	24	29	22	30	40	12	5	19	6
18	6	12	22	8	11	8	22	31	34	26	37	44	16	5	21	7
20	7	16	28	10	13	11	27	38	47	31	49	56	23	8	26	9
22	8	19	32	13	17	12	31	42	52	36	57	71	25	8	42	14
24	11	23	42	15	20	15	45	65	75	55	80	100	35	11	49	16
26	12	27	48	18	23	15	48	75	90	60	95	115	40	11	53	18
28	13	28	52	20	26	16	52	95	110	65	125	135	48	11	57	19
30	14	32	55	21	27	17	60	105	130	70	130	170	54	12	61	21
32	15	35	79	22	29	18	66	112	142	76	142	183	61	13	66	22
34	17	42	80	24	31	20	81	245	152	94	167	208	71	14	70	24
36	19	49	81	25	33	21	96	152	162	111	192	233	81	15	74	25
38	20	52	89	27	37	24	100	159	173	116	199	251	94	15	77	26
40	22	54	87	29	41	26	104	166	184	121	207	269	107	16	80	27
42	22	59	105	32	41	24	113	180	213	134	222	305	134	16	85	28
44	25	62	111	34	43	25	117	184	217	138	228	310	143	17	88	29
46	27	66	117	35	45	26	121	187	221	141	234	315	151	18	91	30
48	27	72	125	36	47	27	128	194	226	148	246	325	164	18	94	32
54	31	94	170	45	59	31	194	288	329	222	364	461	218	22	100	34
60	39	113	210	50	65	40	246	380	450	280	480	609	240	28	107	36
66	52	175	327	74	96	47	378	603	702	425	759	953	459	34	152	51
70	61	216	406	90	116	52	466	751	870	522	945	1182	605	38	82	61
*72	65	237	445	98	127	55	509	826	954	572	1039	1297	678	39	199	67

**72" and larger diameter ductwork is not included in the ICC-ES listing.*



R-6 (Insulated) Duct and Fittings – Shipping Weights

NOMINAL DIAM. (IN)	1 STRAIGHT DUCT / FT (lbs)	2 45 ° ELBOW (lbs)	3 90 ° ELBOW (lbs)	4 CON. RED. (lbs)	5 ECC. RED. (lbs)	6 END CAP (lbs)	7 TEE (lbs)	8 SINGLE 45 ° Y (lbs)	9 SINGLE 90 ° Y (lbs)	10 CROSS (lbs)	11 DOUBLE 45 ° Y (lbs)	12 DOUBLE 90 ° Y (lbs)	13 TRUE Y (lbs)	14 SADDLE TAP (lbs)	15 TRANSITO N (lbs)	16 FLANGE (lbs)
4	2	2	5	2	3	2	2	2	5	2	5	10	2	1	7	2
5	2	2	5	2	4	2	5	5	7	7	7	12	2	1	8	2
6	3	2	5	4	5	2	5	7	10	7	10	14	5	1	10	4
7	3	4	6	5	6	4	5	8	11	8	11	15	5	2	12	4
8	3	5	8	5	6	4	7	10	13	10	13	18	6	2	13	5
9	4	5	10	6	8	4	10	12	18	12	18	27	6	2	14	5
10	4	6	11	6	8	6	11	14	20	13	20	30	8	5	17	6
12	5	8	14	6	8	6	15	19	25	19	25	39	8	5	19	7
14	6	11	19	8	11	7	20	27	33	24	34	46	13	5	23	7
16	7	12	20	10	12	8	21	29	34	26	36	48	14	6	23	7
18	7	14	26	10	13	10	26	37	40	31	44	52	19	6	25	8
20	8	19	33	12	15	13	32	45	56	37	58	67	27	10	31	11
22	9	23	38	15	20	14	37	50	62	43	68	84	30	10	50	17
24	13	27	50	18	24	18	53	77	89	65	95	119	42	13	58	19
26	14	32	57	21	27	18	57	89	107	71	113	137	48	13	63	21
28	15	33	62	24	31	19	62	113	131	77	148	160	57	13	68	23
30	17	38	65	25	32	20	71	125	154	83	154	202	64	14	72	25
32	18	42	94	26	34	21	78	133	169	90	169	217	72	15	78	26
34	20	50	95	28	37	23	96	291	181	111	198	247	84	17	83	28
36	22	58	96	30	39	25	114	181	192	132	228	277	96	18	88	30
38	24	61	106	32	44	29	119	189	205	138	236	298	112	18	91	31
40	26	64	103	34	49	31	124	197	219	144	246	319	127	19	95	32
42	26	70	125	38	49	32	134	214	253	159	264	362	159	19	101	33
44	30	74	132	40	51	30	139	218	258	163	271	368	170	20	105	34
46	32	78	139	42	53	31	144	222	262	167	278	374	179	21	108	36
48	30	86	148	43	56	29	152	230	268	176	292	386	195	21	112	38
54	37	112	202	53	70	37	230	342	391	264	432	547	259	26	119	40
60	46	134	249	59	77	48	292	451	534	333	570	723	285	33	127	43
66	62	208	389	88	114	56	448	716	834	505	901	1132	545	40	181	61
70	72	257	482	107	138	61	553	892	1033	620	1122	1404	718	45	97	72
*72	77	281	528	116	151	65	604	981	1133	679	1234	1540	805	46	236	80

**72" and larger diameter ductwork is not included in the ICC-ES listing.*



R-8 (Insulated) Duct and Fittings – Shipping Weights

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
NOMINAL DIAM. (IN)	STRAIGHT DUCT / FT (lbs)	45° ELBOW (lbs)	90° ELBOW (lbs)	CON. RED. (lbs)	ECC. RED. (lbs)	END CAP (lbs)	TEE (lbs)	SINGLE 45° Y (lbs)	SINGLE 90° Y (lbs)	CROSS (lbs)	DOUBLE 45° Y (lbs)	DOUBLE 90° Y (lbs)	TRUE Y (lbs)	SADDLE TAP (lbs)	TRANSITIO N (lbs)	FLANGE (lbs)
4	2	3	6	2	4	3	3	3	6	3	6	11	3	1	8	3
5	3	3	6	3	4	3	6	6	8	8	8	14	3	1	10	3
6	3	3	6	4	6	3	6	8	11	8	11	17	6	1	11	4
7	4	4	7	6	7	4	6	10	13	10	13	18	6	3	14	4
8	4	6	10	6	7	4	8	11	15	11	15	21	7	3	15	6
9	5	6	11	7	10	4	11	14	21	14	21	32	7	3	17	6
10	5	7	13	7	10	7	13	17	24	15	24	35	10	6	20	7
12	6	10	17	7	10	7	18	23	30	23	30	46	10	6	23	8
14	7	13	23	10	13	8	24	32	39	28	41	55	15	6	27	8
16	8	14	24	11	14	10	25	34	41	31	42	56	17	7	27	8
18	9	17	31	11	15	11	31	44	48	37	52	62	23	7	30	10
20	10	23	39	14	18	15	38	53	66	44	69	79	32	11	37	13
22	11	27	45	18	24	17	44	59	73	51	80	100	35	11	59	20
24	16	32	59	21	28	21	63	91	105	77	113	141	49	15	69	23
26	17	38	68	25	32	21	68	105	127	84	134	162	56	15	75	25
28	18	39	73	28	37	23	73	134	155	91	176	190	68	15	80	27
30	20	45	77	30	38	24	84	148	183	98	183	239	76	17	86	30
32	21	49	111	31	41	25	93	158	200	107	200	257	86	18	93	31
34	24	59	113	33	44	27	114	345	214	131	235	293	100	20	98	33
36	26	69	114	35	46	30	135	214	228	156	270	328	114	21	104	35
38	29	72	125	38	52	34	141	224	243	163	280	353	132	21	108	37
40	31	76	122	41	58	37	147	233	259	170	291	378	150	23	113	38
42	31	83	148	45	58	38	159	253	300	188	312	429	188	23	120	39
44	35	88	156	47	60	35	165	258	305	193	321	436	201	24	124	41
46	37	92	165	49	63	37	170	263	311	198	329	443	212	25	128	42
48	35	101	176	51	66	34	180	273	318	208	346	457	231	25	132	45
54	44	132	239	63	83	44	273	405	463	312	512	648	307	31	141	48
60	54	159	295	70	91	56	346	534	633	394	675	856	338	39	150	51
66	73	246	461	104	135	66	531	848	987	598	1067	1340	645	48	214	72
70	85	304	571	127	163	73	655	1056	1223	734	1329	1662	851	53	115	86
*72	91	333	626	138	179	77	716	1162	1342	804	1461	1824	953	55	280	94

***72" and larger diameter ductwork is not included in the ICC-ES listing.**



R-10 (Insulated) Duct and Fittings – Shipping Weights

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
NOMINAL DIAM. (IN)	STRAIGHT DUCT / FT (lbs)	45 ° ELBOW (lbs)	90 ° ELBOW (lbs)	CON. RED. (lbs)	ECC. RED. (lbs)	END CAP (lbs)	TEE (lbs)	SINGLE 45 ° Y (lbs)	SINGLE 90 ° Y (lbs)	CROSS (lbs)	DOUBLE 45 ° Y (lbs)	DOUBLE 90 ° Y (lbs)	TRUE Y (lbs)	SADDLE TAP (lbs)	TRANSITO N (lbs)	FLANGE (lbs)
4	3	3	7	2	4	3	3	3	7	3	7	13	3	2	10	3
5	3	3	7	3	5	3	7	7	10	10	10	16	3	2	11	3
6	4	3	7	5	7	3	7	10	13	10	13	20	7	2	13	5
7	4	5	8	7	8	5	7	11	15	11	15	21	7	3	16	5
8	5	7	11	7	8	5	10	13	18	13	18	24	8	3	18	7
9	5	7	13	8	11	5	13	16	24	16	24	37	8	3	20	7
10	6	8	15	8	11	8	15	20	28	18	28	41	11	7	23	8
12	7	11	20	8	11	8	21	26	34	26	34	54	11	7	26	10
14	8	15	26	11	15	10	28	37	46	33	47	63	18	7	31	10
16	9	16	28	13	16	11	29	39	47	36	49	65	20	8	31	10
18	10	20	36	13	18	13	36	50	55	42	60	72	26	8	34	11
20	11	26	46	16	21	18	44	62	76	50	80	91	37	13	42	15
22	12	31	52	21	28	20	50	68	85	59	93	115	41	13	68	23
24	18	37	68	24	33	24	73	106	122	89	130	163	57	18	80	26
26	20	44	78	29	37	24	78	122	146	98	154	187	65	18	86	29
28	21	46	85	33	42	26	85	154	179	106	203	219	78	18	93	31
30	23	52	89	34	44	28	98	171	211	114	211	276	88	20	99	34
32	24	57	128	36	47	29	107	182	231	124	231	297	99	21	107	36
34	27	68	130	38	50	32	132	398	247	152	271	338	115	23	114	38
36	31	80	132	41	54	34	156	247	263	180	312	379	132	24	120	41
38	33	84	145	44	60	39	163	258	281	189	323	408	153	24	125	42
40	35	88	141	47	67	42	169	270	299	197	336	437	174	26	130	44
42	36	96	171	52	67	44	184	293	346	218	361	496	218	26	138	46
44	41	101	180	54	70	41	190	298	353	223	371	504	232	28	143	47
46	43	106	190	57	73	42	197	304	359	229	380	512	245	29	148	49
48	41	117	203	59	76	39	208	315	367	241	400	528	267	29	153	52
54	51	153	276	73	96	50	315	468	535	361	592	749	354	36	163	55
60	63	184	341	81	106	65	400	618	731	455	780	990	390	46	174	59
66	84	284	532	120	156	76	613	980	1141	691	1233	1549	746	55	247	83
70	98	351	659	146	189	84	756	1220	1414	848	1536	1921	983	62	133	99
*72	106	385	723	159	206	89	827	1342	1550	930	1688	2108	1102	63	323	109
*72" and larger diameter ductwork is not included in the ICC-ES listing.																

R-12 (Insulated) Duct and Fittings – Shipping Weights

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
NOMINAL DIAM. (IN)	STRAIGHT DUCT / FT (lbs)	45 ° ELBOW (lbs)	90 ° ELBOW (lbs)	CON. RED. (lbs)	ECC. RED. (lbs)	END CAP (lbs)	TEE (lbs)	SINGLE 45 ° Y (lbs)	SINGLE 90 ° Y (lbs)	CROSS (lbs)	DOUBLE 45 ° Y (lbs)	DOUBLE 90 ° Y (lbs)	TRUE Y (lbs)	SADDLE TAP (lbs)	TRANSITIO N (lbs)	FLANGE (lbs)
4	3	4	7	3	5	4	4	4	7	4	7	15	4	2	11	4
5	4	4	7	4	6	4	7	7	11	11	11	18	4	2	13	4
6	4	4	7	6	7	4	7	11	15	11	15	22	7	2	15	6
7	5	6	9	7	9	6	7	13	17	13	17	24	7	4	18	6
8	5	7	13	7	9	6	11	15	20	15	20	28	9	4	20	7
9	6	7	15	9	13	6	15	18	28	18	28	42	9	4	22	7
10	7	9	17	9	13	9	17	22	31	20	31	46	13	7	26	9
12	8	13	22	9	13	9	24	29	39	29	39	61	13	7	29	11
14	9	17	29	13	17	11	31	42	52	37	53	72	20	7	35	11
16	10	18	31	15	18	13	33	44	53	41	55	74	22	9	35	11
18	11	22	41	15	20	15	41	57	63	48	68	81	29	9	39	13
20	13	29	52	18	24	20	50	70	87	57	90	103	42	15	48	17
22	14	35	59	24	31	22	57	77	96	66	105	131	46	15	77	26
24	21	42	77	28	37	28	83	120	138	101	147	184	65	20	90	29
26	22	50	88	33	42	28	88	138	166	111	175	212	74	20	98	33
28	24	52	96	37	48	29	96	175	203	120	230	249	88	20	105	35
30	26	59	101	39	50	31	111	194	240	129	240	313	100	22	112	39
32	27	65	146	41	53	33	122	206	262	140	262	337	112	24	122	41
34	31	77	147	43	57	36	149	452	280	172	308	383	131	26	129	43
36	35	90	149	46	61	39	177	280	299	205	354	429	149	28	136	46
38	37	95	164	50	68	44	185	293	319	214	367	463	173	28	142	48
40	40	100	160	53	76	48	192	306	339	223	382	496	197	29	147	50
42	40	109	194	59	76	50	208	332	393	247	409	562	247	29	157	52
44	46	115	205	62	79	46	216	338	400	253	420	571	264	31	162	53
46	49	121	216	65	83	48	223	345	407	260	431	581	278	33	168	55
48	46	133	230	66	87	44	236	358	417	273	453	599	302	33	173	59
54	58	173	313	83	109	57	358	531	606	409	671	850	402	41	184	63
60	71	208	387	92	120	74	453	700	829	516	885	1122	442	52	197	66
66	95	322	604	136	177	87	696	1111	1294	783	1399	1756	846	63	280	94
70	112	399	748	166	214	95	858	1384	1603	962	1742	2178	1115	70	151	112
*72	120	437	820	181	234	101	938	1522	1758	1054	1915	2390	1250	72	367	123

***72" and larger diameter ductwork is not included in the ICC-ES listing.**



OUTSIDE DIAMETER FOR FSK DUCT**Tolerance +/- 1/4"**

NOMINAL INSIDE DIAMETER (Inches)	INNER WALL		FSK OUTSIDE DIAMETER
	# of PLIES	NOM. WALL THICKNESS	
4	3	0.0675	4.1
5	3	0.0675	5.1
6	3	0.0675	6.1
7	3	0.0675	7.1
8	3	0.0675	8.1
9	3	0.0675	9.1
10	3	0.0675	10.1
12	3	0.0675	12.1
14	3	0.0675	14.1
16	4	0.09	16.2
18	4	0.09	18.2
20	4	0.09	20.2
22	5	0.1125	22.2
24	5	0.1125	24.2
26	5	0.1125	26.2
28	6	0.135	28.3
30	6	0.135	30.3
32	6	0.135	32.3
34	6	0.135	34.3
36	8	0.18	36.4
38	8	0.18	38.4
40	8	0.2025	40.4
42	9	0.2025	42.4
44	9	0.2025	44.4
46	9	0.225	46.4
48	10	0.225	48.5
54	12	0.27	54.5
60	13	0.2925	60.6
66	14	0.315	66.6
70	15	0.3375	70.7
*72	15	0.3375	72.7
<i>*72" and larger diameter ductwork is not included in the ICC-ES listing.</i>			



OUTSIDE DIAMETER FOR R-4¹ DUCT**Tolerance +/- 1/4"**

NOMINAL INSIDE DIAMETER (Inches)	INNER WALL		OUTER WALL		OUTSIDE DIAMETER
	# of PLIES	NOM. WALL THICKNESS (Inch)	# of PLIES	NOM. WALL THICKNESS (Inch)	
4	2	0.045	3	0.0675	5.5
5	2	0.045	3	0.0675	6.5
6	2	0.045	3	0.0675	7.5
7	2	0.045	3	0.0675	8.5
8	2	0.045	3	0.0675	9.5
9	2	0.045	3	0.0675	10.5
10	2	0.045	3	0.0675	11.5
12	2	0.045	3	0.0675	13.5
14	2	0.045	3	0.0675	15.5
16	2	0.045	3	0.0675	17.5
18	2	0.045	3	0.0675	19.5
20	2	0.045	3	0.0675	21.5
22	2	0.045	3	0.0675	23.5
24	3	0.0675	4	0.09	25.6
26	3	0.0675	4	0.09	27.6
28	3	0.0675	4	0.09	29.6
30	3	0.0675	4	0.09	31.6
32	3	0.0675	4	0.09	33.6
34	3	0.09	4	0.09	35.6
36	4	0.09	4	0.09	37.6
38	4	0.09	4	0.09	39.6
40	4	0.09	4	0.09	41.6
42	4	0.09	4	0.09	43.6
44	4	0.09	4	0.09	45.6
46	4	0.09	4	0.09	47.6
48	4	0.09	4	0.09	49.6
54	4	0.09	5	0.1125	55.7
60	4	0.90	6	0.135	61.7
66	4	0.09	8	0.18	67.8
70	5	0.1125	9	0.2025	71.9
*72" and larger diameter ductwork is not included in the ICC-ES listing.					



OUTSIDE DIAMETER FOR R-6² DUCT**Tolerance +/- 1/4"**

NOMINAL INSIDE DIAMETER (Inches)	INNER WALL		OUTER WALL		OUTSIDE DIAMETER
	# of PLIES	NOM. WALL THICKNESS (Inch)	# of PLIES	NOM. WALL THICKNESS (Inch)	
4	2	0.045	3	0.0675	6.4
5	2	0.045	3	0.0675	7.4
6	2	0.045	3	0.0675	8.4
7	2	0.045	3	0.0675	9.4
8	2	0.045	3	0.0675	10.4
9	2	0.045	3	0.0675	11.4
10	2	0.045	3	0.0675	12.4
12	2	0.045	3	0.0675	14.4
14	2	0.045	3	0.0675	16.4
16	2	0.045	3	0.0675	18.4
18	2	0.045	3	0.0675	20.4
20	2	0.045	3	0.0675	22.4
22	2	0.045	3	0.0675	24.4
24	3	0.0675	4	0.09	26.5
26	3	0.0675	4	0.09	28.5
28	3	0.0675	4	0.09	30.5
30	3	0.0675	4	0.09	32.5
32	3	0.0675	4	0.09	34.5
34	4	0.09	4	0.09	36.6
36	4	0.09	4	0.09	38.6
38	4	0.09	4	0.09	40.6
40	4	0.09	4	0.09	42.6
42	4	0.09	4	0.09	44.6
44	4	0.09	4	0.09	46.6
46	4	0.09	4	0.09	48.6
48	4	0.09	4	0.09	50.6
54	4	0.09	5	0.1125	56.6
60	4	0.09	6	0.135	62.7
66	4	0.09	8	0.18	68.7
70	5	0.1125	9	0.2025	72.8
*72" and larger diameter ductwork is not included in the ICC-ES listing.					



OUTSIDE DIAMETER FOR R-8² DUCT**Tolerance +/- 1/4"**

NOMINAL INSIDE DIAMETER (Inches)	INNER WALL		OUTER WALL		OUTSIDE DIAMETER
	# of PLIES	NOM. WALL THICKNESS (Inch)	# of PLIES	NOM. WALL THICKNESS (Inch)	
4	2	0.045	3	0.0675	6.8
5	2	0.045	3	0.0675	7.8
6	2	0.045	3	0.0675	8.8
7	2	0.045	3	0.0675	9.8
8	2	0.045	3	0.0675	10.8
9	2	0.045	3	0.0675	11.8
10	2	0.045	3	0.0675	12.8
12	2	0.045	3	0.0675	14.8
14	2	0.045	3	0.0675	16.8
16	2	0.045	3	0.0675	18.8
18	2	0.045	3	0.0675	20.8
20	2	0.045	3	0.0675	22.8
22	2	0.045	3	0.0675	24.8
24	3	0.0675	4	0.09	27.0
26	3	0.0675	4	0.09	29.0
28	3	0.0675	4	0.09	31.0
30	3	0.0675	4	0.09	33.0
32	3	0.0675	4	0.09	35.0
34	3	0.09	4	0.09	37.0
36	4	0.09	4	0.09	39.0
38	4	0.09	4	0.09	41.0
40	4	0.09	4	0.09	43.0
42	4	0.09	4	0.09	45.0
44	4	0.09	4	0.09	47.0
46	4	0.09	4	0.09	49.0
48	4	0.09	4	0.09	51.0
54	4	0.09	5	0.1125	57.1
60	4	0.90	6	0.135	63.1
66	4	0.09	8	0.18	69.2
70	5	0.1125	9	0.2025	73.4
*72" and larger diameter ductwork is not included in the ICC-ES listing.					



OUTSIDE DIAMETER FOR R-10² DUCT**Tolerance +/- 1/4"**

NOMINAL INSIDE DIAMETER (Inches)	INNER WALL		OUTER WALL		OUTSIDE DIAMETER
	# of PLIES	NOM. WALL THICKNESS (Inch)	# of PLIES	NOM. WALL THICKNESS (Inch)	
4	2	0.045	3	0.0675	7.8
5	2	0.045	3	0.0675	8.8
6	2	0.045	3	0.0675	9.8
7	2	0.045	3	0.0675	10.8
8	2	0.045	3	0.0675	11.8
9	2	0.045	3	0.0675	12.8
10	2	0.045	3	0.0675	13.8
12	2	0.045	3	0.0675	15.8
14	2	0.045	3	0.0675	17.8
16	2	0.045	3	0.0675	19.8
18	2	0.045	3	0.0675	21.8
20	2	0.045	3	0.0675	23.8
22	2	0.045	3	0.0675	25.8
24	3	0.0675	4	0.09	27.9
26	3	0.0675	4	0.09	29.9
28	3	0.0675	4	0.09	31.9
30	3	0.0675	4	0.09	33.9
32	3	0.0675	4	0.09	35.9
34	3	0.09	4	0.09	38.0
36	4	0.09	4	0.09	40.0
38	4	0.09	4	0.09	42.0
40	4	0.09	4	0.09	44.0
42	4	0.09	4	0.09	46.0
44	4	0.09	4	0.09	48.0
46	4	0.09	4	0.09	50.0
48	4	0.09	4	0.09	52.0
54	4	0.09	5	0.1125	58.0
60	4	0.09	6	0.135	64.1
66	4	0.09	8	0.18	70.2
70	5	0.1125	9	0.2025	74.3
*72" and larger diameter ductwork is not included in the ICC-ES listing.					



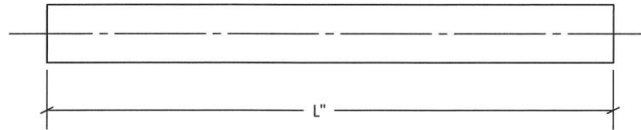
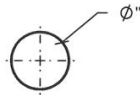
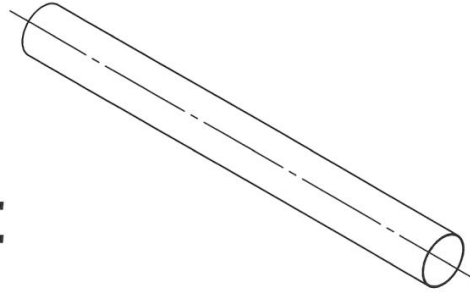
OUTSIDE DIAMETER FOR R-12² DUCT**Tolerance +/- 1/4"**

NOMINAL INSIDE DIAMETER (Inches)	INNER WALL		OUTER WALL		OUTSIDE DIAMETER
	# of PLIES	NOM. WALL THICKNESS (Inch)	# of PLIES	NOM. WALL THICKNESS (Inch)	
4	2	0.045	3	0.0675	8.7
5	2	0.045	3	0.0675	9.7
6	2	0.045	3	0.0675	10.7
7	2	0.045	3	0.0675	11.7
8	2	0.045	3	0.0675	12.7
9	2	0.045	3	0.0675	13.7
10	2	0.045	3	0.0675	14.7
12	2	0.045	3	0.0675	16.7
14	2	0.045	3	0.0675	18.7
16	2	0.045	3	0.0675	20.7
18	2	0.045	3	0.0675	22.7
20	2	0.045	3	0.0675	24.7
22	2	0.045	3	0.0675	26.7
24	3	0.0675	4	0.09	28.9
26	3	0.0675	4	0.09	30.9
28	3	0.0675	4	0.09	32.9
30	3	0.0675	4	0.09	34.9
32	3	0.0675	4	0.09	36.9
34	3	0.09	4	0.09	38.9
36	4	0.09	4	0.09	40.9
38	4	0.09	4	0.09	42.9
40	4	0.09	4	0.09	44.9
42	4	0.09	4	0.09	46.9
44	4	0.09	4	0.09	48.9
46	4	0.09	4	0.09	50.9
48	4	0.09	4	0.09	52.9
54	4	0.09	5	0.1125	59.0
60	4	0.09	6	0.135	65.0
66	4	0.09	8	0.18	71.1
70	5	0.1125	9	0.2025	75.3
*72" and larger diameter ductwork is not included in the ICC-ES listing.					

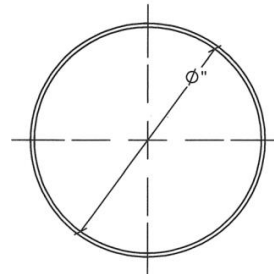
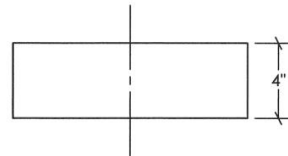
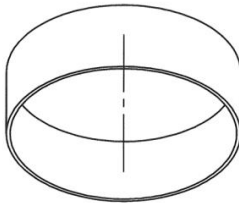


Straight Duct

4" ϕ - 48" ϕ L = 20'-0"
 52" ϕ - 72" ϕ L = 10'-0"



End Cap



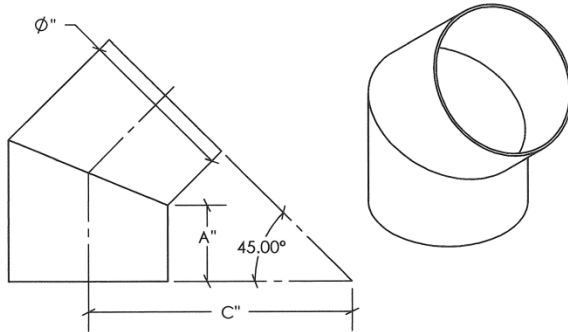
PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.				DIMENSIONS ARE IN INCHES		NAME		DATE		<i>Spunstrand Inc.</i>	
				TOLERANCES:		DRAWN		CJS			
				FRACTIONAL \pm		CHECKED					
				ANGULAR: MACH \pm BEND \pm		ENG APPR.					
				TWO PLACE DECIMAL \pm		MFG APPR.					
				THREE PLACE DECIMAL \pm		Q.A.					
				MATERIAL		COMMENTS:				Duct SIZE A DWG. NO. Underslab FRP REV.	
NEXT ASSY		USED ON		FINISH							
APPLICATION		DO NOT SCALE DRAWING									

*72" and larger diameter ductwork is not included in ICC-ES listing.

Spunstrand[®]
 Green duct that works

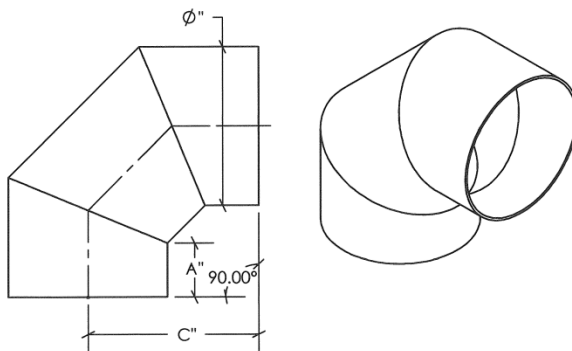
208.777.7444 ph www.spunstrand.com

45° Elbows



Diameter (in)	90° Elbows		45° Elbows
	A (in)	C (in)	C (in)
4	6	12 3/8	16 5/8
5	6	12 7/8	17 1/8
6	6	13 3/8	17 5/8
7	6	13 7/8	18 1/8
8	6	14 3/8	18 5/8
9	6	14 7/8	19 1/8
10	6	15 3/8	19 5/8
12	6	16 3/8	20 5/8
14	6	17 3/8	21 5/8
16	6	18 3/8	22 5/8
18	6	19 3/8	23 5/8
20	6	20 3/8	24 5/8
22	6	21 3/8	25 5/8
24	6	22 3/8	26 5/8
26	6	23 3/8	27 5/8
28	6	24 3/8	28 5/8
30	6	25 3/8	29 5/8
32	6	26 3/8	30 5/8
34	6	27 3/8	31 5/8
36	6	28 3/8	32 5/8
38	6	29 3/8	33 5/8
40	6	30 3/8	34 5/8
42	6	31 3/8	35 5/8
44	6	32 3/8	36 5/8
48	6	34 3/8	38 5/8
52	6	36 3/8	40 5/8
54	6	37 3/8	41 5/8
60	6	40 3/8	44 5/8
72	6	46 3/8	50 5/8

90° Elbows



PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.

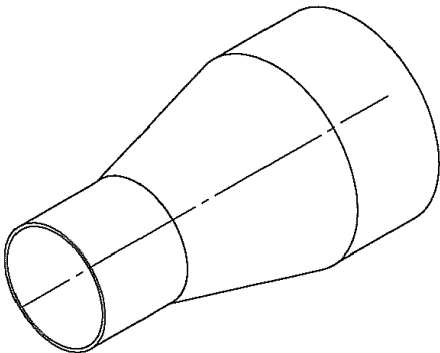
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±		NAME CJS	DATE 2009	Spunstrand Inc. Elbows
		MATERIAL		CHECKED		
		FINISH		ENG APPR.		
				MFG APPR.		
				Q.A.		
NEXT ASSY	USED ON	COMMENTS:		SIZE A DWG. NO. Underslab FRP REV.		
APPLICATION		DO NOT SCALE DRAWING				

*72" and larger diameter ductwork is not included in ICC-ES listing.

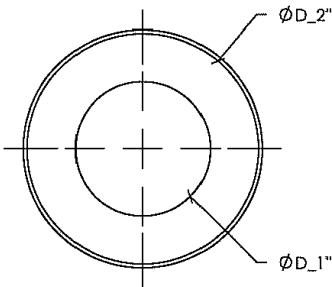
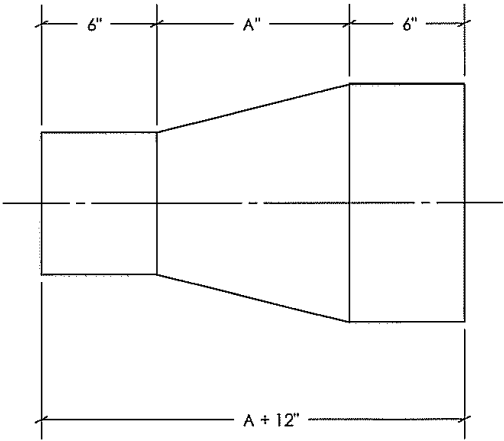
Spunstrand®
Green duct that works

208.777.7444 ph www.spunstrand.com

Inches of Reduction	A
1"	2 1/8"
2"	4
3"	5 7/8"
4"	7 3/4"
5"	9 5/8"
6"	11 1/2"
7"	13 3/8"
8"	15 1/8"
9"	17"
10"	18 7/8"
11"	20 3/4"
12"	22 5/8"
13"	24 1/2"
14"	26 3/8"
15"	28 5/8"
16"	32"
17"	33 7/8"
18"	35 3/4"
19"	36 5/8"
20"	37 5/8"



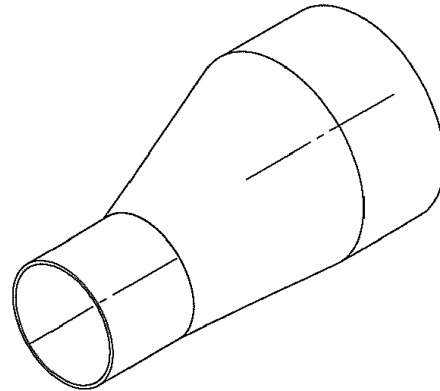
Inches of Reduction = D₂ - D₁



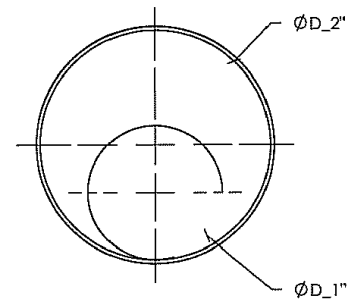
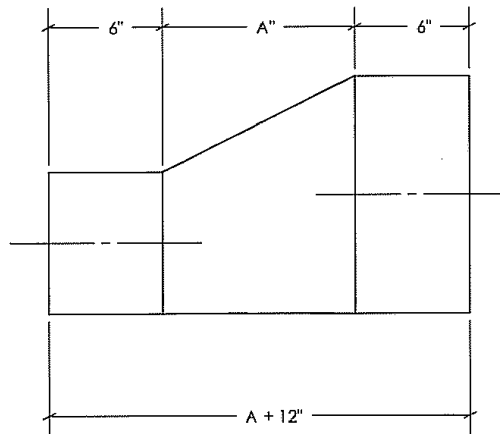
<p>PROPRIETARY AND CONFIDENTIAL</p> <p>THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.</p>		DIMENSIONS ARE IN INCHES		NAME		DATE		<i>Spunstrand Inc.</i>			
		TOLERANCES:		DRAWN		CJS				2009	
		FRACTIONAL ±		CHECKED						Concentric Reducer	
		ANGULAR: MACH ± BEND ±		ENG APPR.							
		TWO PLACE DECIMAL ±		MFG APPR.							
THREE PLACE DECIMAL ±		Q.A.									
		MATERIAL		COMMENTS:							
NEXT ASSY		USED ON									
FINISH											
APPLICATION		DO NOT SCALE DRAWING									

SIZE	DWG. NO.	REV.
A	Underslab FRP	

Inches of Reduction	A
1"	4 1/4"
2"	8"
3"	11 3/4"
4"	15 1/2"
5"	19 1/4"
6"	23"
7"	26 3/4"
8"	30 1/4"
9"	34"
10"	37 3/4"
11"	41 1/2"
12"	45 1/4"
13"	49"
14"	52 3/4"
15"	57 1/4"
16"	64"
17"	67 3/4"
18"	69 1/4"
19"	71 1/2"
20"	75 1/4"



$$\text{Inches of Reduction} = D_2 - D_1$$

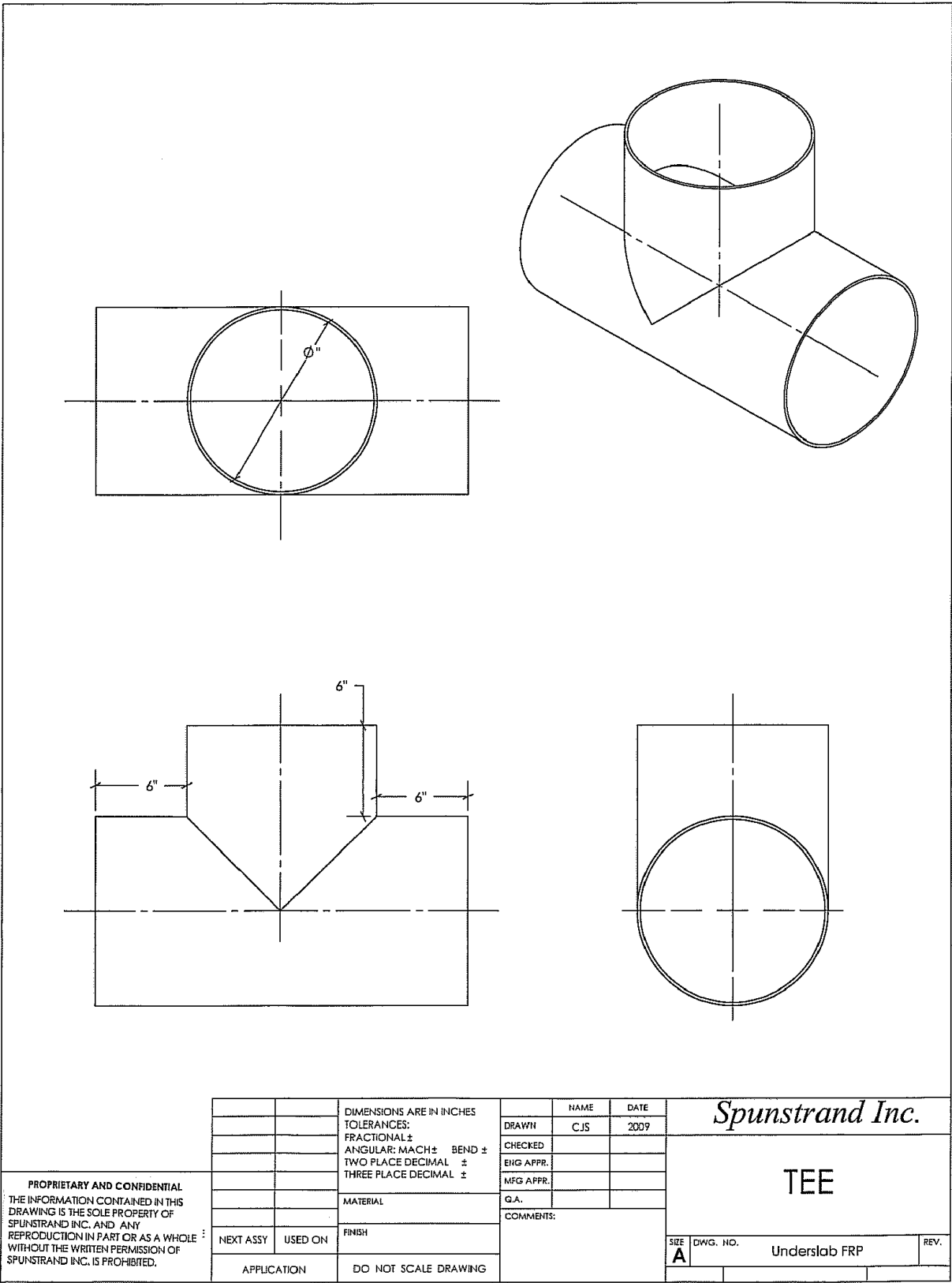


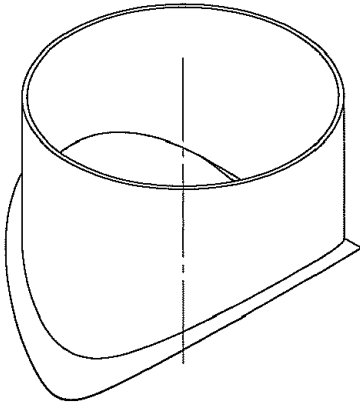
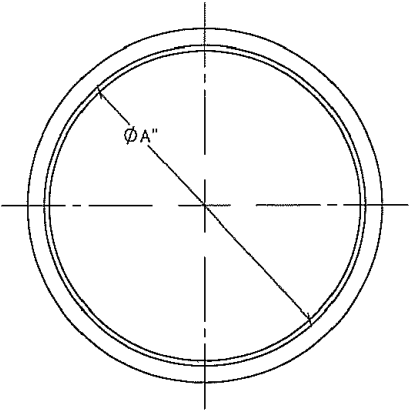
PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS
DRAWING IS THE SOLE PROPERTY OF
SPUNSTRAND INC. AND ANY
REPRODUCTION IN PART OR AS A WHOLE
WITHOUT THE WRITTEN PERMISSION OF
SPUNSTRAND INC. IS PROHIBITED.

		DIMENSIONS ARE IN INCHES		NAME		DATE		<i>Spunstrand Inc.</i>	
		TOLERANCES:		DRAWN		CJS			
		FRACTIONAL ±		CHECKED				Eccentric Reducer	
		ANGULAR: MACH ± BEND ±		ENG APPR.					
		TWO PLACE DECIMAL ±		MFG APPR.					
		THREE PLACE DECIMAL ±		Q.A.					
		MATERIAL		COMMENTS:					
		FINISH							
NEXT ASSY		USED ON							
APPLICATION		DO NOT SCALE DRAWING				SIZE A		DWG. NO. Underlab FRP	
								REV.	

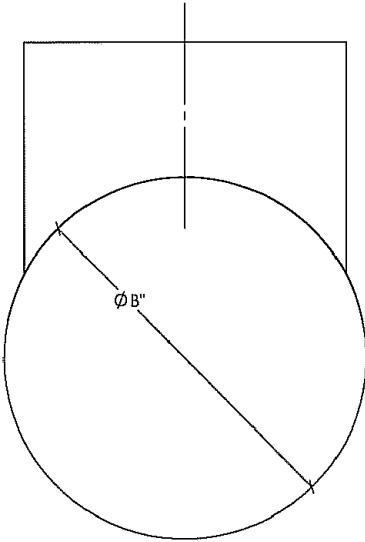
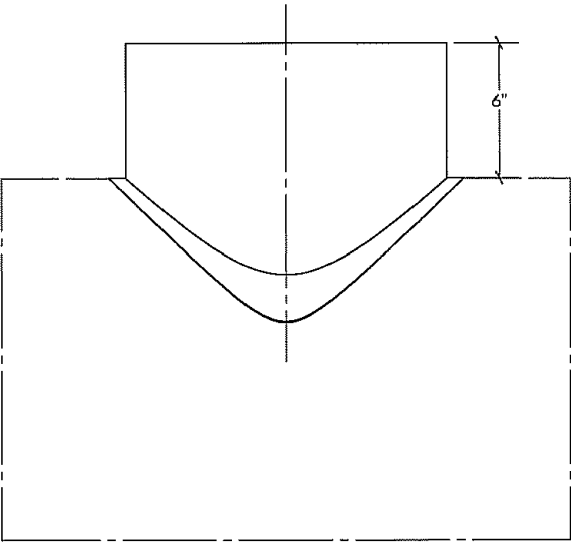
Spunstrand®
Green duct that works

208.777.7444 ph www.spunstrand.com



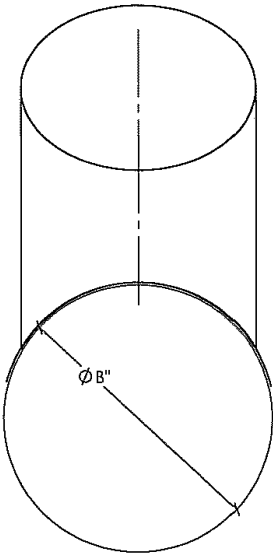
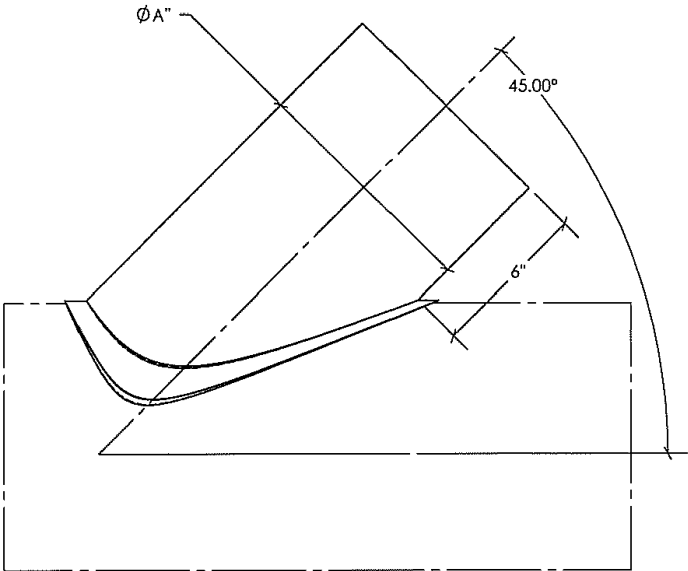
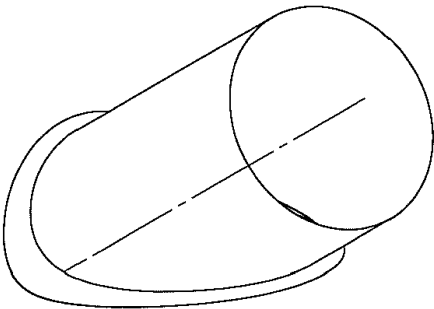


A onto B

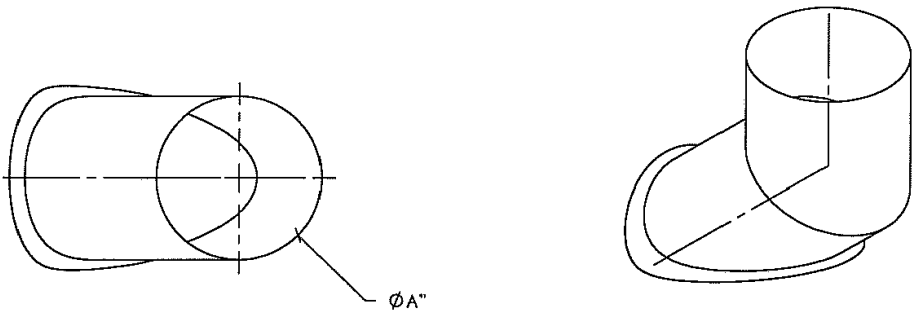


PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.			DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	NAME	DATE	<i>Spunstrand Inc.</i> 90deg Saddle Tap	
				DRAWN	CJS		2009
				CHECKED			
				ENG APPR.			
				MFG APPR.			
				Q.A.			
			COMMENTS:				
	NEXT ASSY	USED ON	MATERIAL				
			FINISH				
	APPLICATION		DO NOT SCALE DRAWING				
	SIZE A	DWG. NO.	Underslab FRP		REV.		

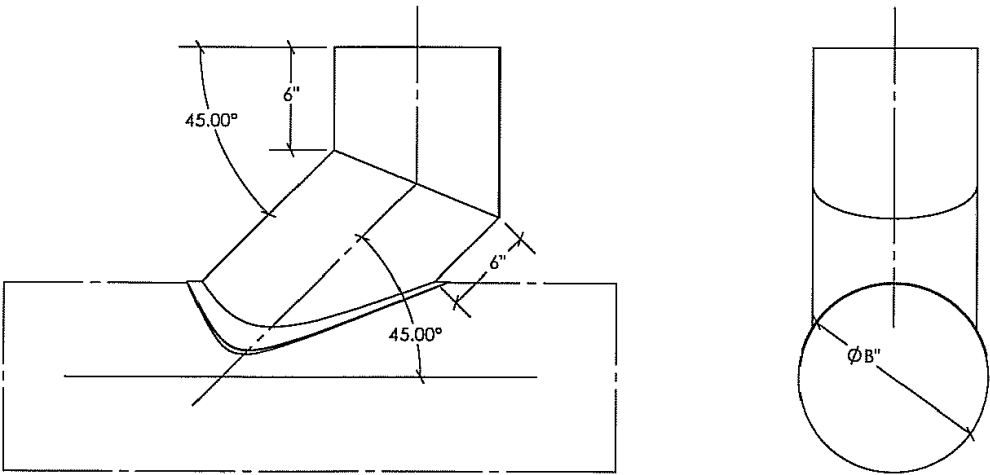
A onto B



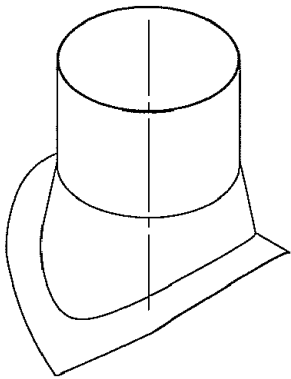
PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.			DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	NAME	DATE	<i>Spunstrand Inc.</i>				
				DRAWN	CJS		2009			
					CHECKED			45deg Saddle Tap		
					ENG APPR.					
					MFG APPR.					
					Q.A.					
			COMMENTS:							
	NEXT ASSY	USED ON	FINISH				SIZE A	DWG. NO.	Underslab FRP	REV.
	APPLICATION		DO NOT SCALE DRAWING							



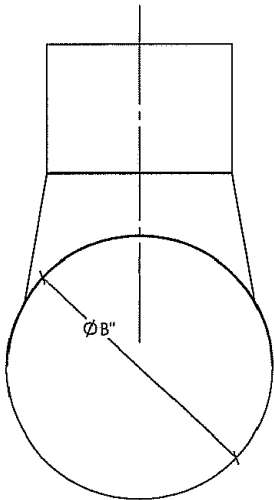
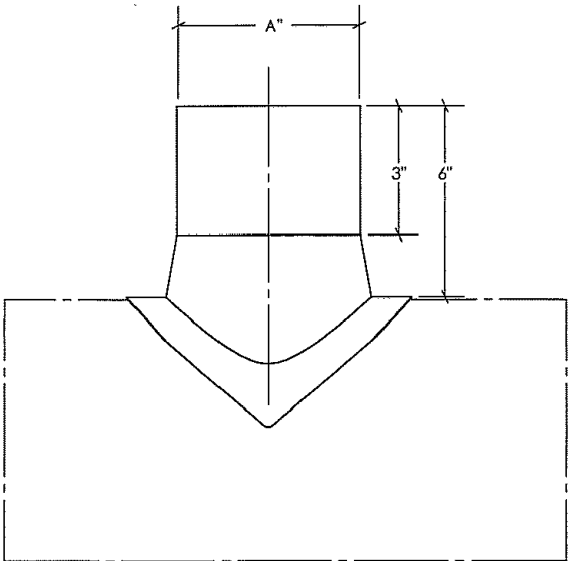
A onto B



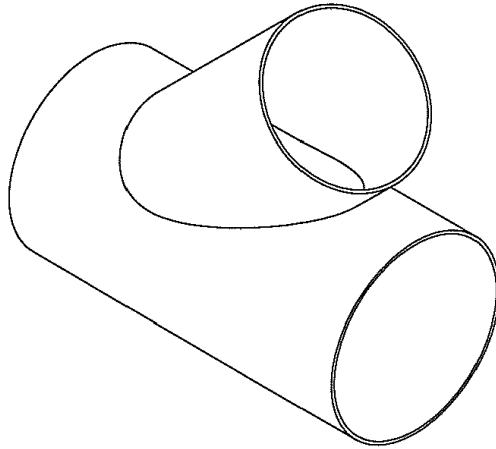
PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF <INSERT COMPANY NAME HERE>. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF <INSERT COMPANY NAME HERE> IS PROHIBITED.			DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±		NAME	DATE	Spunstrand Inc.	
					DRAWN	CJS	2009	90deg Lateral Saddle Tap
					CHECKED			
					ENG APPR.			
					MFG APPR.			
					Q.A.			
					COMMENTS:			
	NEXT ASSY	USED ON	FINISH					SIZE A DWG. NO. Underslab FRP
APPLICATION		DO NOT SCALE DRAWING					REV.	



A onto B

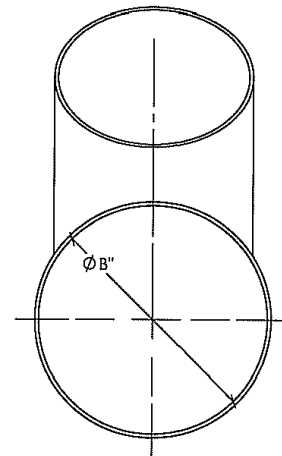
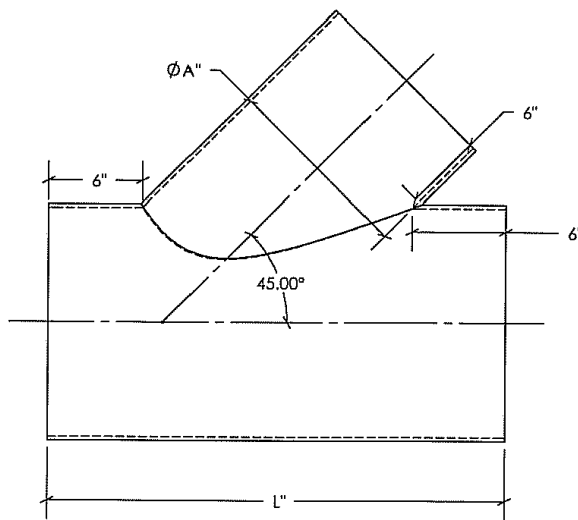


PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.			DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±		NAME	DATE	<i>Spunstrand Inc.</i>	
				DRAWN	CJS	2009		Conical Tap
				CHECKED				
				ENG APPR.				
				MFG APPR.				
				MATERIAL		Q.A.	COMMENTS:	SIZE A DWG. NO. Underslab FRP REV.
				FINISH				
	NEXT ASSY	USED ON						
	APPLICATION		DO NOT SCALE DRAWING					



A x B

45 DEGREE LATERAL	
"A" DIAMETER	L
4	17 2/3
5	19
6	20 1/2
7	21 8/9
8	23 1/3
9	24 3/4
10	26 1/7
12	29
14	31 7/8
16	34 5/8
18	37 1/2
20	40 1/4
22	43 1/8
24	46
26	48 3/4
28	51 5/8
30	54 1/2
32	57 1/4
34	60
36	63
38	65 3/4
40	68 5/8
42	71 1/4
44	74 1/4
48	79.872
52	85 1/2
54	88 3/8
60	96 7/8
72	113 7/8

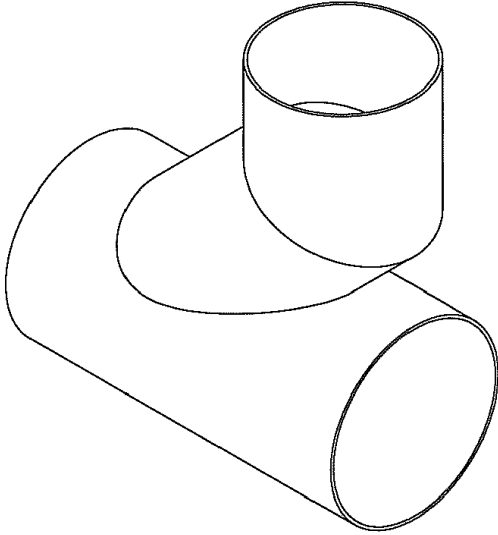


PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.			DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	NAME	DATE	Spunstrand Inc. 45deg Lateral	
				DRAWN	CJS		2009
				CHECKED			
				ENG APPR.			
				MFG APPR.			
			MATERIAL	Q.A.			
			FINISH	COMMENTS:			
	NEXT ASSY	USED ON				SIZE A	
	APPLICATION		DO NOT SCALE DRAWING			DWG. NO. Underslab FRP	
						REV.	

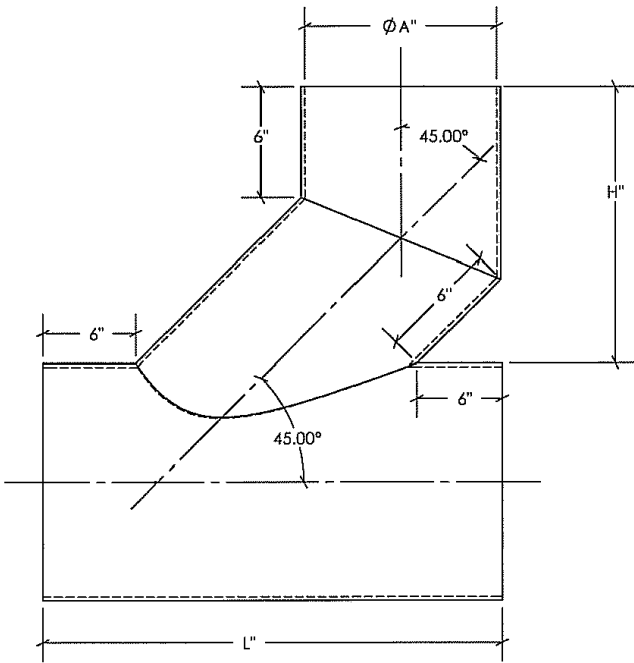
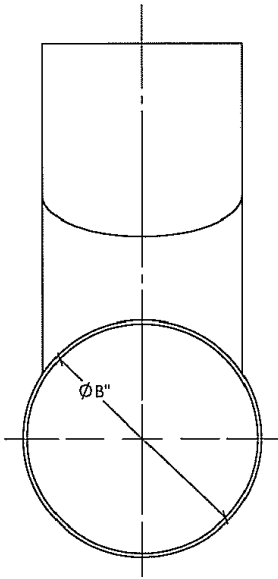
*72" and larger diameter ductwork is not included in ICC-ES listing.

Spunstrand®
 Green duct that works

208.777.7444 ph www.spunstrand.com



"A" DIAMETER	L	H
4	17 2/3	12
5	19	12 1/3
6	20 1/2	12 3/4
7	21 8/9	13 1/7
8	23 1/3	13 4/7
9	24 3/4	14
10	26 1/7	14 2/5
12	29	15 2/9
14	31 7/8	16
16	34 5/8	16 7/8
18	37 1/2	17 5/7
20	40 1/4	18 1/2
22	43 1/8	19 1/3
24	46	20 1/5
26	48 3/4	21
28	51 5/8	21 6/7
30	54 1/2	22 2/3
32	57 1/4	23 1/2
34	60	24 1/3
36	63	25 1/6
38	65 3/4	26
40	68 5/8	26 5/6
42	71 1/4	27 2/3
44	74 1/4	28 1/2
48	79.872	30 1/8
52	85 1/2	31 4/5
54	88 3/8	32 5/8
60	96 7/8	35 1/9
72	113 7/8	40

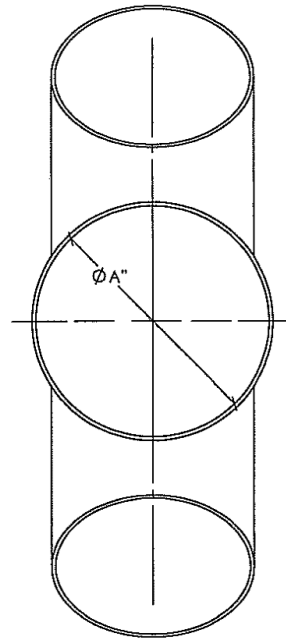
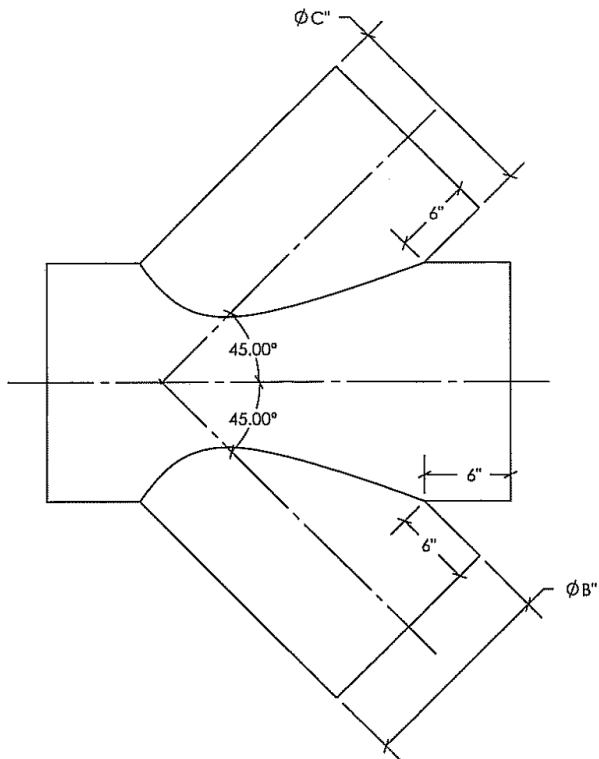
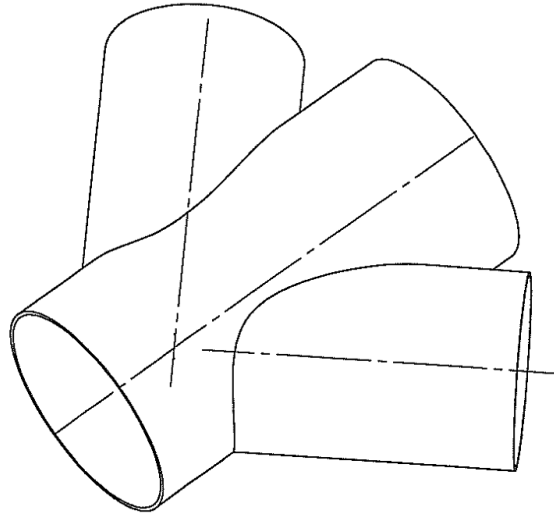



PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF <INSERT COMPANY NAME HERE>. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF <INSERT COMPANY NAME HERE> IS PROHIBITED.				DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±		NAME	DATE	Spunstrand Inc. 90deg Lateral	
				MATERIAL		DRAWN	CJS		2009
				FINISH		CHECKED			
						ENG APPR.			
						MFG APPR.			
		NEXT ASSY	USED ON		COMMENTS:				
		APPLICATION		DO NOT SCALE DRAWING					
							SIZE A	DWG. NO. Underslab FRP	
								REV.	

*72" and larger diameter ductwork is not included in ICC-ES listing.

Spunstrand®
Green duct that works

208.777.7444 ph www.spunstrand.com

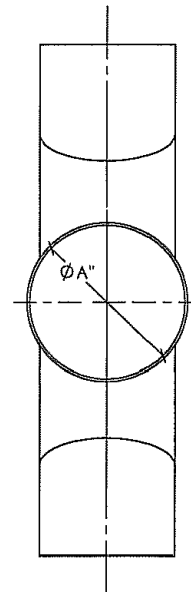
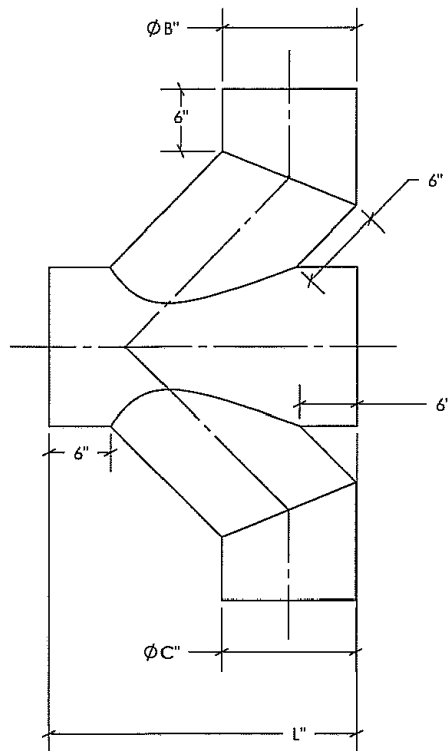
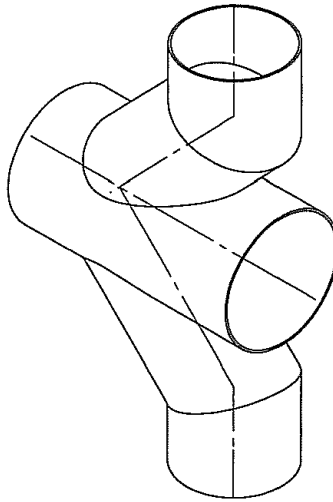
A x B x C

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS
DRAWING IS THE SOLE PROPERTY OF
SPUNSTRAND INC. AND ANY
REPRODUCTION IN PART OR AS A WHOLE
WITHOUT THE WRITTEN PERMISSION OF
SPUNSTRAND INC. IS PROHIBITED.

		DIMENSIONS ARE IN INCHES		NAME	DATE	Spunstrand Inc.
		TOLERANCES:		CJS	2009	
		FRACTIONAL \pm		CHECKED		
		ANGULAR: MACH \pm BEND \pm		ENG APPR.		
		TWO PLACE DECIMAL \pm		MFG APPR.		
		THREE PLACE DECIMAL \pm		G.A.		Double 45deg Lateral
		MATERIAL		COMMENTS:		
		FINISH				
NEXT ASSY	USED ON			SIZE A		DWG. NO. Underslab FRP
APPLICATION		DO NOT SCALE DRAWING				REV.

Spunstrand[®]
Green duct that works

208.777.7444 ph www.spunstrand.com



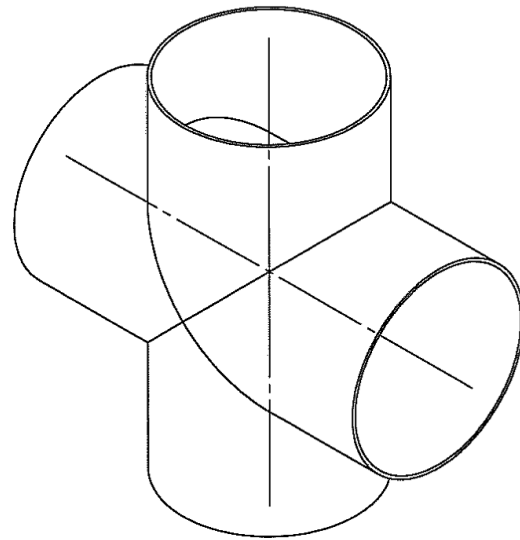
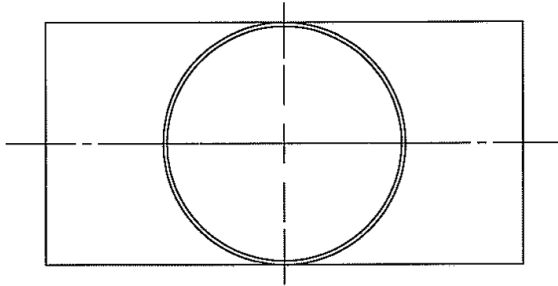
PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS
DRAWING IS THE SOLE PROPERTY OF
SPUNSTRAND INC. AND ANY
REPRODUCTION IN PART OR AS A WHOLE
WITHOUT THE WRITTEN PERMISSION OF
SPUNSTRAND INC. IS PROHIBITED.

		DIMENSIONS ARE IN INCHES		NAME	DATE	Spunstrand Inc. Double 90deg Lateral	
		TOLERANCES:		DRAWN	CJS		2009
		FRACTIONAL: \pm		CHECKED			
		ANGULAR: MACH: \pm BEND: \pm		ENG APPR.			
		TWO PLACE DECIMAL: \pm		MFG APPR.			
		THREE PLACE DECIMAL: \pm		Q.A.			
		MATERIAL		COMMENTS:			
NEXT ASSY	USED ON	FINISH					
APPLICATION		DO NOT SCALE DRAWING					

SIZE **A** DWG. NO. Underslab FRP REV.

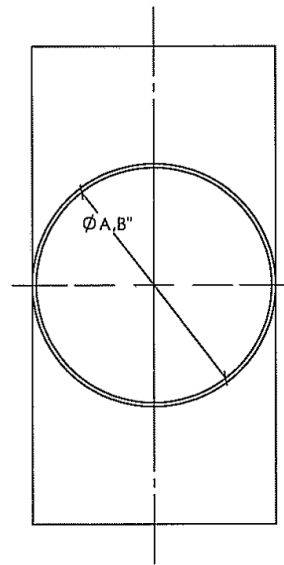
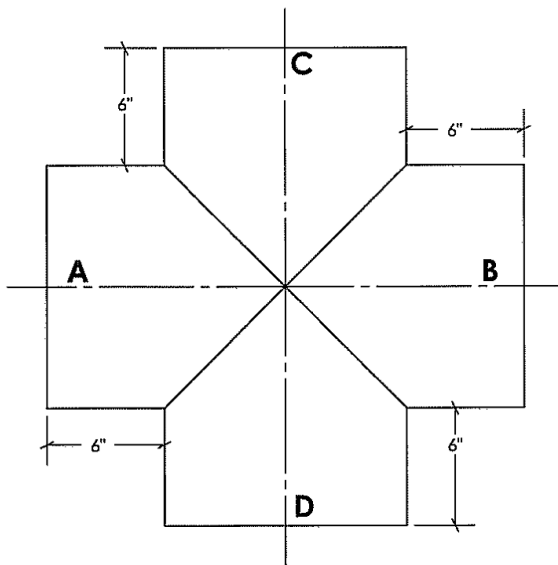
Spunstrand
Green duct that works

208.777.7444 ph www.spunstrand.com



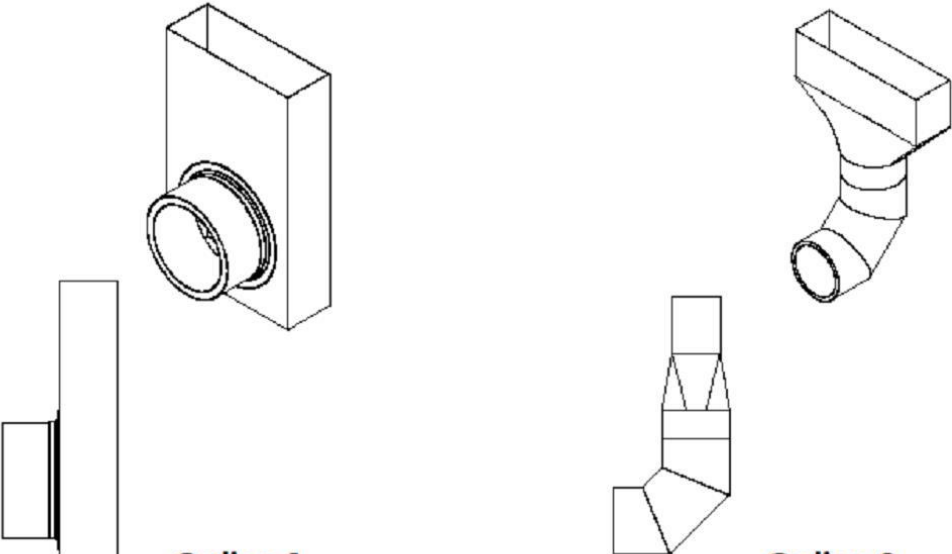
A x B x C x D

A & B must be equal diameter (Primary Air Flow)
C diameter must be equal to or less than A,B
D diameter must be equal to or less than A,B



Reducing Crosses Available by Request

PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.			DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL \pm ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm	DRAWN	NAME	DATE	Spunstrand Inc. Cross
				CJS		2009	
				CHECKED			
				ENG APPR.			
				MFG APPR.			
				Q.A.			
				COMMENTS:			
	NEXT ASSY	USED ON	FINISH				SIZE A DWG. NO. Underslab FRP REV.
	APPLICATION		DO NOT SCALE DRAWING				



Option 1

Option 2

CUSTOMER DRAWING APPROVAL _____ APPROVED _____ APPROVED AS NOTED AUTHORIZED SIGNATURE _____ DATE _____		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	<i>Spunstrand Inc.</i>	
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: \pm ANGULAR: MACH: \pm BEND \pm TWO PLACE DECIMAL: \pm THREE PLACE DECIMAL: \pm		DRAWN	CJS	8/25/10	TITLE:
COMMENTS:	THE SIGNATORY HEREBY VERIFIES THIS DRAWING TO BE CORRECT AND AUTHORIZES SPUNSTRAND INC. TO PROCEED WITH MANUFACTURING. THE SIGNATORY ASSUMES RESPONSIBILITY FOR SUBSEQUENT CHANGE REQUESTS, IF ANY, TO THE PRODUCT REPRESENTED ON THIS DRAWING AFTER COMMENCEMENT OF MANUFACTURING AND RECOGNIZES THAT SAID CHANGES MAY RESULT IN ADDITIONAL CHARGES.	CHECKED _____ ENG. APPR. _____ MFG. APPR. _____ Q.A. _____		PROPERTIES AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPUNSTRAND INC. AND ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPUNSTRAND INC. IS PROHIBITED.		Spunstrand FRP Register Boot Options	
		SIZE A DWG. NO. Reg Boot Options		REV			
		DO NOT SCALE DRAWING		SHEET 1 OF 1			