TECHNICAL SPECIFICATIONS

Basic Compounds Used in Green Line Hoses...

The following table gives general properties for most common elastomers used in hose today. It is provided as a guide only, and qualities may vary since adjustments and additions to rubber or plastic compounds are often made to suit various applications. For example, an EPDM acid delivery hose may have a different blend of tube compound than an EPDM heater hose.

Common Name	Composition	General Characteristics
EPDM rubber	ethylene propylenediene-terpolymer	excellent ozone, chemical and aging characteristics, poor resistance to petroleum based fluids, very good heat and steam resistance
Hypalon	chloro-sulphonated-polyethylene	good heat and abrasion resistance fair resistance to petroleum based fluids excellent weathering, ozone, and acid resistance
Natural rubber	isoprene natural	excellent physical properties and abrasion resistance, acid-resistant but not oil-resistant
Neoprene rubber	chloroprene	flame retarding, excellent weathering resistance, good oil resistance, good physical properties
Nitrile rubber (Buna-n)	nitrile-butadiene	excellent oil resistance and good physical properties, moderate resistance to aromatics
Nitrile/pvc	nitrile-polyvinyl chloride	excellent oil and weather resistance good abrasion resistance
SBR rubber	styrene-butadiene	good physical properties, good abrasion resistance, poor resistance to petroleum based fluids
Viton rubber	hexafluoro-propylene vinilydene fluoride	excellent high temperature resistance very good chemical resistance very expensive
Cross-linked polyethylene (XLPE)	cross-linked polyethylene	excellent resistance to a very wide range of solvents, chemicals, acids and oils(including aromatics)
PVC	plasticized poly-vinyl chloride	excellent weathering and ozone resistance good chemical and abrasion resistance affected by temperature extremes
Urethane	polyurethane	extremely abrasion resistant, excellent chemical, weathering, petroleum and temperature resistance

Rubber versus Plastic...

With modern compounding technology the line between rubbers and plastics is becoming indistinct. In general, raw rubbers are transformed into finished goods by an irreversible chemical reaction during a heating process called vulcanization. For this reason they are referred to as thermoset elastomers. Plastics must be heated to a soft or liquid state to be formed into tubing or hose, but generally no chemical reaction takes place. If reheated, they will become soft and can be reformed. They are referred to as thermoplastic elastomers. Today many new plastics exhibit rubber-like features, and vice-versa.

Hose selection will depend on the characteristics of the particular elastomer formula that best fit the application.

Temperature Conversion

- **Fahrenheit to Celsius:** subtract 32 and multiply by 0.556.
- **Celsius to Fahrenheit:** multiply by 1.8 and add 32.

Useful information and rules of thumb...

- Each 10 ft of vertical height of water column produces 4.33 psi of pressure.
- 1 Cubic foot of water weighs 62.4 lb.
- 1 Imp Gallon of water weighs 10 lb.
- Each 1 HP on an electric air compressor produces 3.5 to 4 SCFM (standard cubic feet per minute) of air at 100 psi.
- Each 1 HP of drive in a hydraulic system will produce the equivalent of 1 GPM(gallon per minute) at 1500 psi.

Pressure:

1 psi	= 2.307 ft of head (ft of water column)
	= 2.036Hg
	= 0.06895 Bar
	= 0.006895 MPa (MegaPascals)
	= 0.07031 Kg/sq cm
	= 0.06805 Atmospheres
1 Bar	= 14.5 psi
1 Atmosphere	= 14.7 psi
	= 29.92 Hg (inches of Mercury)
	= 33.9 feet of water
1MegaPascal (Mpa)	= 145 psi
1 Kg/sq cm	= 14.2 psi

Weight :

1 lb	= 453.59 grams
	= 0.45359 Kg
1 Kg	= 2.2046 lb

Volume:

1 Cubic foot	= 7.48 US Gallons
	= 28.317 liters
1 Imp Gallon	= 1.201 US Gallons
	= 160 Imperial ounces
	= 4.546 liters
	= 4546 milliliters (c.c.'s)
1 US Gallon	= 128 US oz
	= 3.785 liters
1 Barrel oil	= 42 US Gallons

Length:

1 inch	= 2.54cm
1 meter	= 3.28084 feet
1 Kilometer	= 0.62137 Miles
1 Mile	= 5280 feet

Power:

1 HP	= 745.7 Watts

Temperature of Saturated Steam:

Gauge Pressure (psi)	Temperature °C	°F
25	130	267
30	134	274
40	141	287
50	148	298
60	153	307
80	162	324
100	170	338
120	177	350
140	182	361
160	188	371
180	193	379
200	198	388
225	203	397
250	208	406
275	212	414
300	216	422
325	221	429
350	225	437

Velocity of fluid flow in hose: **$V = 0.408 \times GPM / d^2$**

V …is fluid velocity in feet per second

GPM …is flow in U.S. gallons per minute

d …is the hose inside diameter in inches

What size hose should I use?

There are several considerations for determining hose size. Obviously, for a given flow rate, the smaller the hose, the higher the fluid velocity. As velocity increases, friction increases dramatically and much of the energy of the fluid is converted into heat, causing a pressure loss. For example, changing from a 5/8 hose to a 1/2 hose will more than double the pressure drop. For hydraulic systems, rules of thumb for fluid velocity have been developed that provide upper limits of acceptable friction and heat build-up. For industrial hoses, particularly pressure wash hoses, heat build-up is not a concern, rather excessive pressure drop over the length of the hose will make the pressure washer ineffective.

The calculation of actual pressure drop is quite complicated and dependent on many factors including fluid velocity, temperature, and viscosity, as well as tube smoothness. We can only calculate the fluid velocity and use the following guidelines to estimate an acceptable hose size.

Recommended flow velocity:

Hydraulic suction lines.........2 - 4 ft/sec.
Hydraulic pressure lines to 500 psi.........10 - 15 ft/sec.
Hydraulic pressure lines (500-3000 psi).........15 - 20 ft/sec.
Hydraulic pressure lines over 3000 psi.........20 - 25 ft/sec.
Water suction lines & discharge hoses.........4 - 7 ft/sec.
General water service.........4 - 10 ft/sec.

A few notes on making hose assemblies:

Permanent Installations: As much as we would like to see hose used everywhere, there are some installations where hose assemblies are not suitable. In general, these are permanent installations where visible inspection of the hose is impossible and where periodic testing is not conducted. The desirable feature of hose – its flexibility – is produced by specialized elastomers which will age and may be adversely affected by temperature, chemicals, ozone and extreme flexing. In general, hose assemblies should not be used as part of permanent piping systems, particularly where routine testing and inspection are not carried out, or where failure will result in property damage.

Electrical Grounding: Hoses being used to convey fuels or other flammable chemicals should have the hose electrically grounded to the couplings using the static or helix wire, to allow for dissipation of static electricity that may be built up by the fast flow of the product being carried.

Hydrostatic Testing: Where hose failure may result in environmental damage in the form of a chemical or fuel spill, new hose assemblies should be hydrostatically tested prior to use and periodically for the life of the hose. Typically hoses are tested to U.S. Coast Guard standards published by the Rubber Manufacturers Association. At our Delta location we offer hose testing services complete with test certificates and hose identification tags for your new or used assemblies.

Minimum Bend Radius: The bend radius of a hose is measured from the inside edge of the hose, not from the centerline. Minimum bend radii are typically given at room temperature. Higher temperatures may cause kinking, while low temperatures may make the hose difficult to bend tightly.

Very short rubber or plastic hose assemblies should not be used as flexible joints or expansion joints.

One of the most common hose failures we see is where a very short hose assembly is used between fixed pipes to allow for misalignment or vibration. Failures occur when the free length of the hose (the length of hose between the two fitting stems) is so short that it cannot absorb the flexing and vibration that occurs in the application. Also, when hoses are pressurized, they generally contract in length. If the assembly is in a straight line between two fixed points, something has to give to allow for the contraction. Generally it is the connection to the fittings, causing the fitting to weep.