MERCER RUBBER Co.

Manufacturers of Expansion Joints, Flexible Duct Connectors and Industrial Hose

The Mercer Rubber Company was started in 1865 as a small factory on Mercer Street in Hamilton Square, New Jersey. The company specialized in molded rubber mechanical products, rubber sheeting and conveyor belting, and began building rubber expansion joints in the early 1930's. Mercer was completely owned by one family from its inception through 1982, when it became a sister to Mason Industries, one of the world's largest producers of molded rubber expansion joints. Since that time, it has been managed by professional engineers, and we believe our engineering staff is proportionately larger than any other similar company in the United States.

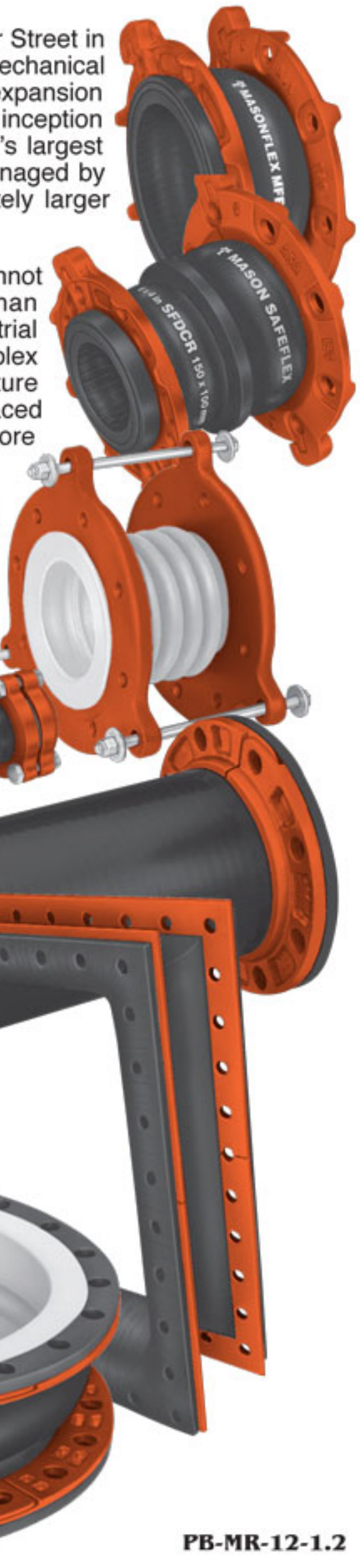
Handbuilt flexible connectors for piping and duct work solve problems that cannot be handled by other materials. Rubber is more compliant and resilient than metal, fiberglass or plastic. The technology behind building shapes for industrial applications has grown as well. The United States chemical and industrial complex is in the forefront of synthetic rubber for chemical resistance and temperature extremes. Modern reinforcement fabrics and tire cord have completely replaced early designs using cotton and rayon. The end result has been a lighter, more flexible, higher pressure and temperature resistant product.

In this brief presentation we can only tell you where the products are used and some of the things we do. We would be pleased to send you our complete catalog showing the wide range of standard products. However, even then, you would have to let us know about your application, so if need be, we could design and build to your exact requirements.

I am sure that if you need a rubber expansion joint, duct connector or industrial hose, we can help. Please let us hear from you.

THE MERCER RUBBER COMPANY

Norman J. Mason, Owner



What is a Handbuilt Rubber Expansion Joint?

We have a great publication called "Expansion Joint Production. A Step By Step Guide". Should you never need an expansion joint, you might want to write for it anyway because the process is so interesting, but let's do what we can here.

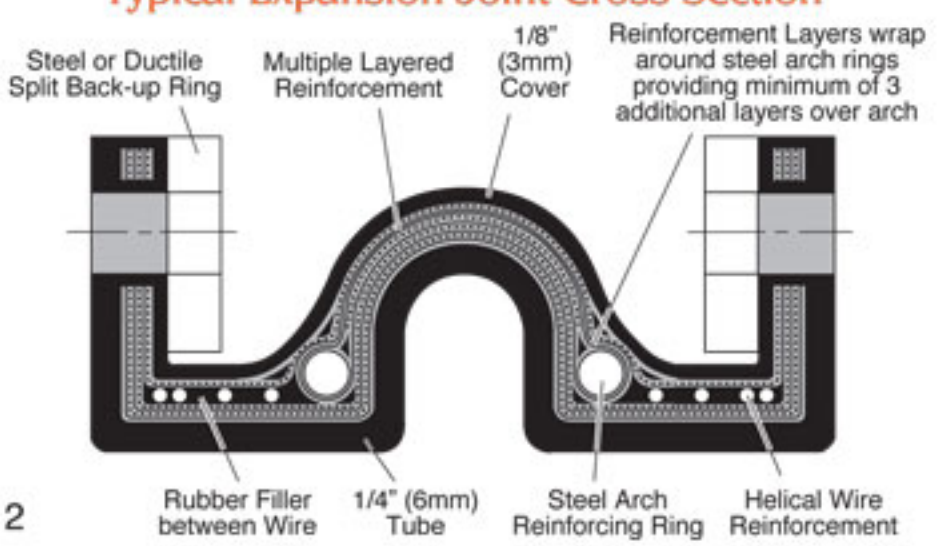
The illustration below is a typical cross section. The ends are normally rubber flanges that will mate with the piping system. The arch is the flexible element that allows for expansion, contraction transverse motion and misalignment. The sealing element is the rubber tube on the inside, and this is backed by multiple layers of fabric reinforcement. The straight portion is reinforced with steel wire and then fabric placed over that under the cover. While it is not absolutely mandatory, we find that the expansion joint holds up better if there are steel rings at the base of the arch to hold the arch shape. Since flange bolts would pull through the rubber flanges, we furnish steel back up rings. Ends can be built in weld nipples, slip on or any other mating arrangement.

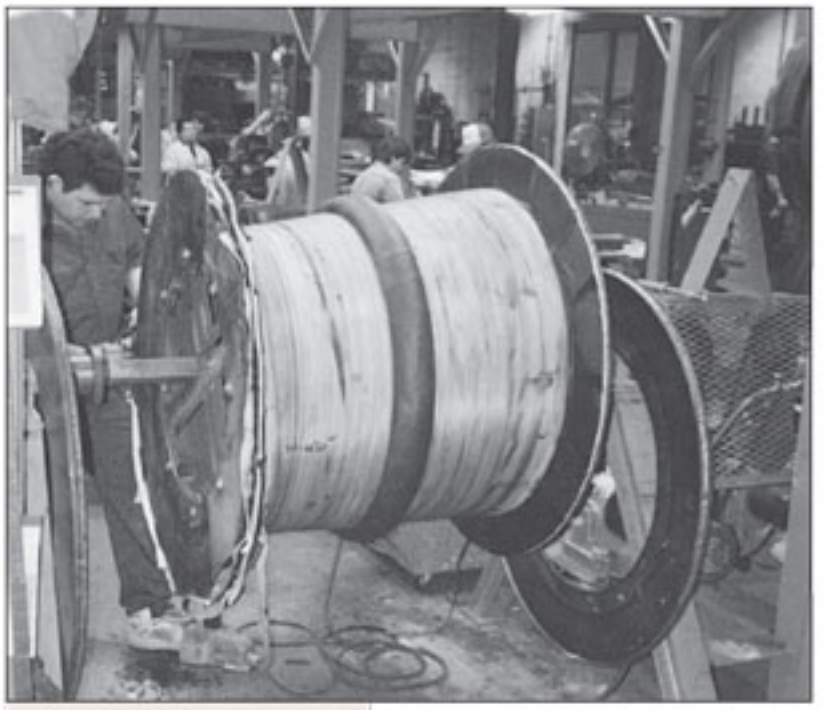
Regardless of whether the final shape is going to be, round with a single arch, a rectangular ducting transition piece, elbow, tee or cross, eccentric or concentric reducer or any other strange shape, we start with a steel form that matches the inside steel contours of the finished product. This form or mandrel is mounted in a slow turning foot controlled lathe, and the builder proceeds as follows:

1. Place a solid rubber arch form in the correct position on the mandrel. (After the joint is finished and cured, this rubber piece is pulled out to leave the arch opening.)
2. Cover the mandrel and the arch form with the rubber tube.
3. Add multiple plies of rubber impregnated tire cord, which forms the backing behind the tube.
4. Slide the arch reinforcing rings on from the ends and complete the wrapping of the reinforcement materials around these steel rings and up over the arch.
5. Add the helical wire reinforcement.
6. Add the rubber filler between the wire rings.
7. Add the fabric reinforcement over the wire.
8. Bring the end fabric and rubber construction up vertically at the ends, and clamp these flanges between steel mold plates.
9. Wrap the entirety securely with Nylon tape to force the many layers together and maintain the shape during the curing process.
10. Place the wrapped product in a steam pressure vessel (autoclave) and cure it for about 3 hours until completely vulcanized.
11. Remove the steel flange rings, nylon tape, etc. Drill the holes precisely, in the rubber flanges. Add the steel or ductile iron split back up rings. Pack properly and ship to the jobsite.

Handbuilt expansion joints are also referred to as handwrapped, because Nylon wrapping rather than a steel mold maintains the outer shape during the curing process.

Typical Expansion Joint Cross Section





An intermediate stage of building a single arch concentric reducer, 36" (914mm) and 24" (610mm) flanges and 48" (1220mm) face to face. A large difficult size.

Pulling the tire cord reinforcement from one steel arch reinforcing ring, across the arch to the other ring adds to arch strength and shape stability.

Forming the rubber flanges with steel flange rings after the Nylon tape has been wrapped over the expansion joint body to hold the shape during the curing process. Flanges must be built correctly to maintain seals and avoid pullout.

Pulling back cover, tire cord reinforcement and tube prior to building the flanges on an eccentric reducer.

Checking steel wire reinforcement spacing. This guarantees consistently high safety factors.

A range of products in the open autoclave before closing the door and steam curing for approximately 3 hours at 305° F (151°C).

Variations in Configurations

Mismatched and Overseas Flanges

Expansion joints can be used as flange transition pieces. For example, a pump may have an ASA 300 flange, but the system continues with ASA 150 piping. The expansion joint is built with an ASA 300 one end, ASA 150 the other, so there is no need for another transition fitting.

Sometimes it is a European to an American standard where there might be a DIN 10 on one end and ASA 150 the other. We build expansion joints to match any Overseas flange system such as the Japanese JIN, the British PIN, the European DN, etc.

Offset Joints & Unparallel Faces

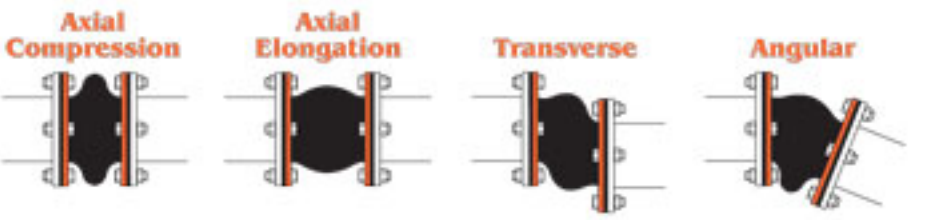
When retrofit work is in progress, we are often called on to provide expansion joints that match the piping system after years of settlement and shifting. When the expansion joints are built to fit conditions rather than forced into position, all normal movement capabilities are retained. The illustrations show offset expansion joints and joints with unparallel faces as manufactured to meet these conditions.

Longer & Shorter Joints

While we have a whole series of standard face to face dimensions, the rubber expansion joint industry is so old that we often replace joints that were never built to any standard. Thus we build joints that are longer or shorter to avoid repiping.

Movements

Rubber expansion joints are capable of axial compression, axial expansion, transverse and angular movements. In many cases, three movements are all taking place at one time. Standard expansion joints have movement limits, but they can be increased by changing to multiple arches or single piece construction with an arch at each end and a long intermediate hose body.



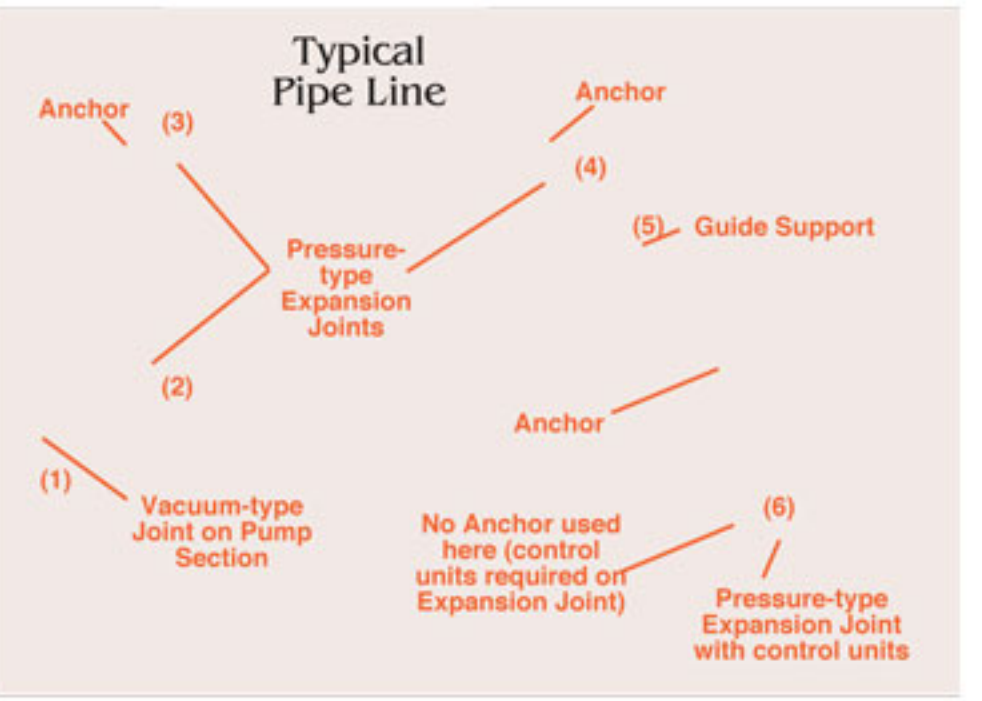
Typical Piping Layouts

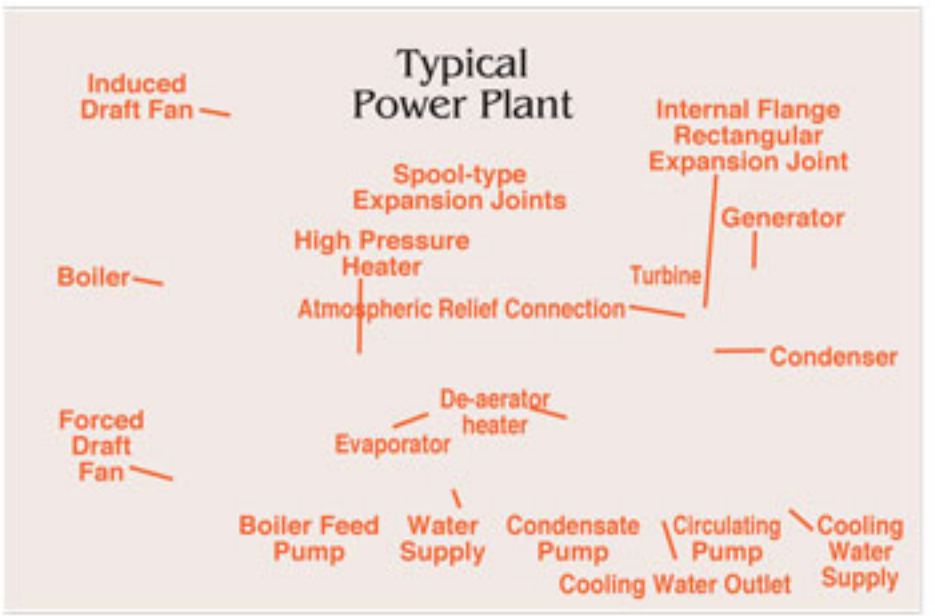
This simple illustration shows typical applications. While most pump inlets are under pressure, a pump used in lifting service must have a vacuum joint (1) on the pump suction. Once past the pump to the discharge, joints (2) are selected for pressure.

It is always best to install the expansion joint (2) on the equipment side of the valve, as it simplifies inspection or replacement. If the piping is anchored near the pump and by an anchor before the next expansion joint, there is no need for control rods.

Expansion joints (3) and (4) are designed to take the expansion or contraction between two anchors. Since all the thrust force will be taken by the anchors, no control rods are needed. If there is a long run between anchors, there will be movement at the intermediate points and the pipe should be supported by sliding guides.(5)

At location 6, the piping is not anchored on either side of the expansion joint. Control rods must be used to take the pressure thrust or the expansion joint will drive the piping and probably fail. When control rods are added, the expansion joint will always be in the full open position and will not accept axial motion. Expansion joints using control rods can still handle transverse and angular movement.



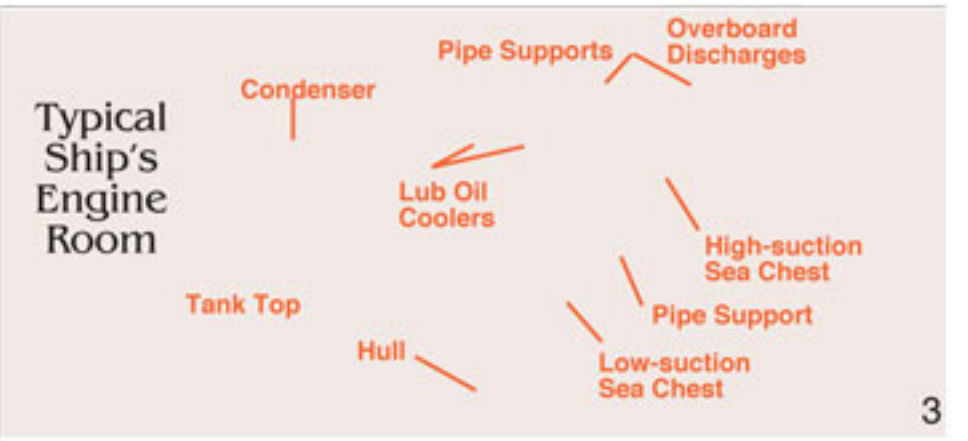


This small diagram is typical of a power plant. The steam lines going to the turbine are normally too hot for rubber joints and stainless steel or offsets handle the problem. By the time the steam has gone through the turbine it has cooled down before entering the condenser, and a U type internally flanged rubber expansion joint is commonly used underneath the turbine and before the condenser. If there is an atmospheric relief connection, it may also have a rubber expansion joint. The condensate coming out of the condenser is quite cool and rubber expansion joints should be used as needed leading to the condensate pump and in various parts of the circuit back to the boiler, whether through the boiler feed pump or directly from the condensate pump, but before the boiler preheater.

Shifting over to the cooling water supply, there are huge connections to river water or sea water, all of which are commonly fitted with rubber connections as are the cooling water outlets.

A ship's engine room is a miniature power plant. Rubber expansion joints to a sea chest are in the same locations as the condenser cooling water suction and discharge in a shore based plant. We also supply connections like bilge pump suction, etc., that may not have their land counterparts.

Unfortunately, this bulletin does not contain illustrations of a waste water sewage treatment plant. Mercer heavy duty duct connectors (See page 7) are located in the ducts from the forced draft fans leading to the boilers and particularly in the high pressure, high temperature pressurized air ducts from the positive blowers that provide aeration to the sewage tanks. The hot air leads to unusually large duct expansion.



Series 500 Expansion Joints

The cross section on page 2 is typical of series 500 construction. The vast majority of expansion joints have one arch, but if the movements cannot be accommodated, we build them with two, three or four arches, so the sum of the movements of each individual arch add up to the specifications. Multiple arches are a great help in misalignment and unparallel face situations as well.

Materials

A high grade of Natural Rubber is still an excellent choice for most water applications below 180°F (82°C). DuPont Neoprene has the broadest range of chemical resistant capabilities and higher temperature resistance than Natural Rubber. Butyl and Sulfur cured EPDM are generally used for temperatures up to 250°F (121°C). Peroxide cured EPDM will handle 350°F (176°C) and has outstanding aging characteristics. Nitrile is superior for general oil resistance. Both Natural Rubber and Hypalon are excellent for abrasion resistance, and DuPont Viton has outstanding chemical properties as well as temperature tolerance to 400°F (204°C).

Reinforcement fabrics may be Nylon, Polyester or DuPont Kevlar® for much greater strength and stability, particularly at the higher temperatures.

Since we cut all of our own tire cord, the ply angle can be changed to provide either larger movements, greater pressure resistance or shape stability.

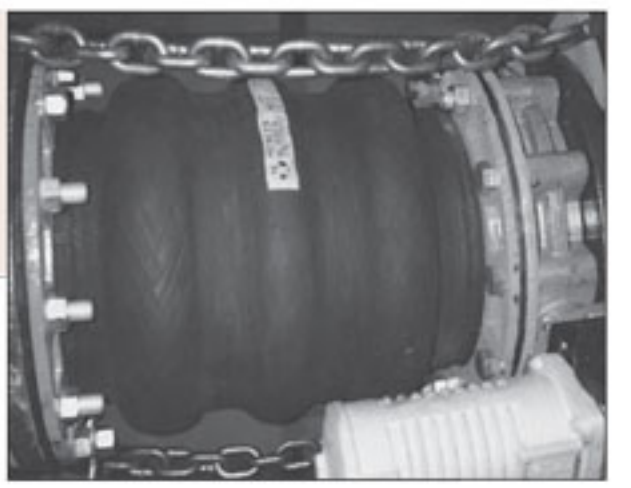
This bulletin is not meant to be specific. We have provided this outline just to give you a rough idea of the range of materials we use and the choices available to our engineers.

Series 500 expansion joints find themselves in virtually every application and they are manufactured in sizes ranging from 11/2" to 144" (38mm to 3658mm) in diameter. They are recommended for expansion and contraction in long pipe lines or in misalignment and displacement situations at equipment connections. These functions are in addition to high frequency vibration isolation.

501
1 Arch

502
2 Arch

A very unusual application showing a triple arch expansion joint used to maximize transverse movement. Rather than the conventional control rods, chains connect flange to flange to allow for very much improved transverse flexibility and movement.

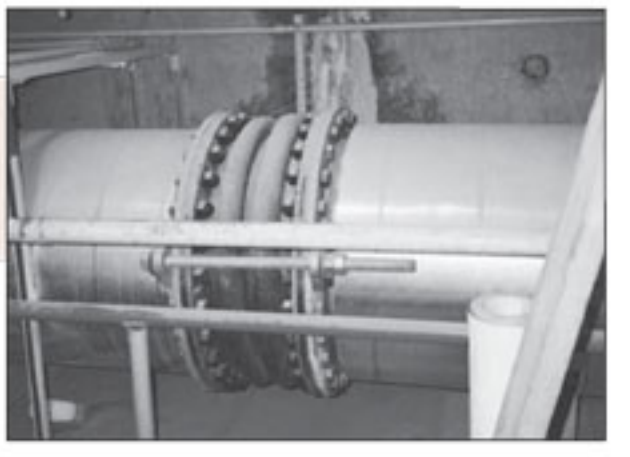


503
3 Arch

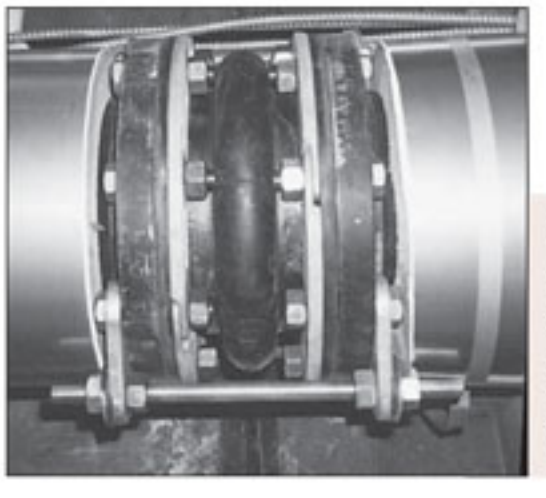
504
4 Arch

A huge 132" (3353mm) diameter single arch 501 under construction. Very few manufacturers have the equipment or the engineering staff to work to these diameters.

Typical 36 inch single arch expansion joint with ASA 150 flanges. Operating temperature about 180° F (82°C) at a pressure of 165psi (11.6 Kg/cm²)



Typical two arch series 502 expansion joint in a hot water line. In this application two arches are used to meet the specified movements.



Single arch molded expansion joint in a hot water line. Temperature 215° F (101°C), pressure 165psi (11.6kg/cm²). This is an unanchored application requiring the use of control rods. In this application nuts were used inside of the control rod plates as well to prevent inward movement. The primary function would be transverse motion and in many applications spherical washers are used under the nuts.

Series 700

Teflon® Lined Expansion Joints

Series 700 Teflon® lined expansion joints are the series 500 built over a preformed Teflon® tube. Since the series 500 body provides the backing, we can withstand very high pressures and high temperatures. Teflon® lined expansion joints are used wherever the chemical content of the fluid is so corrosive as to be beyond the physical tolerance of a rubber material. They are also used in systems where conventional rubber might stand up quite well, but contamination must be avoided. We have built series 700 as large as 60" (1524mm) in diameter.

Built In Preformed Teflon® Liner

Teflon® is a registered trademark of DuPont.

Series FCR500 and FER500

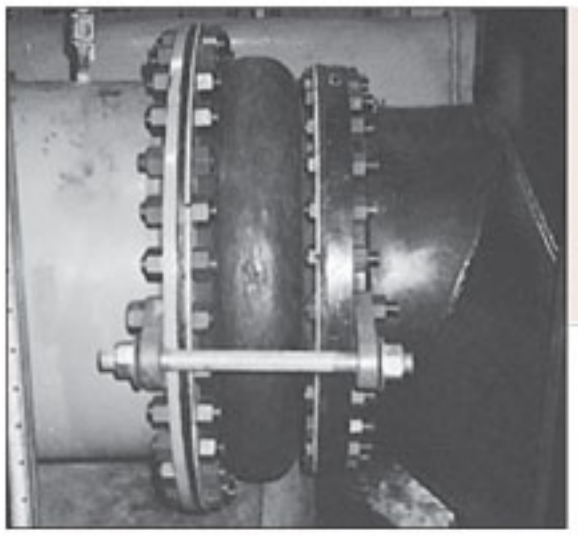
Concentric and Eccentric Reducer

Virtually all piping systems go through changes in diameter either in the run or at the equipment connections. Since an expansion joint or flexible connector is needed anyway, it makes good sense to have the expansion joint serve the dual purpose of changing the piping diameter and handling the expansion, misalignment or vibration problem all at one time. Should you work with a straight connector, it means that in addition to the expansion joint, an expensive cast iron or steel reducer must be used for the piping transition. This would result in a need for additional space and add to the cost as well.

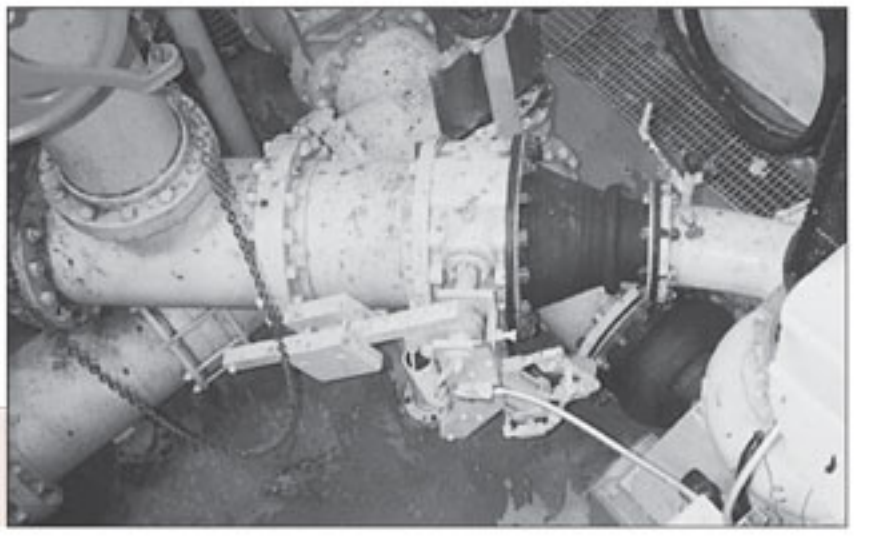
While we have published transition sizes, and face to face dimensions, it is seldom that the cataloged sizes are what is needed on the jobsite. We vary the face to face dimensions as well as the two flange sizes to fit the application.

Concentric reducers are more common. The eccentric design is used primarily at pump inlets and outlets to provide smoother flow both in and out of the pump.

Since most of our competitors do not want to be involved with these difficult products, Mercer is very active in this market.

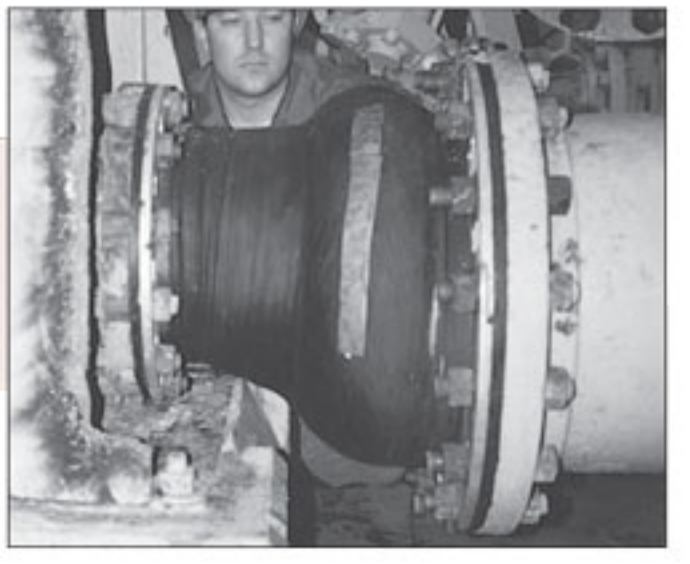


Typical installation of a 24"x18" (610 x 457mm) concentric reducer built with a continuous rather than a shaped arch. Location is unanchored and there was the need for control rods. Continuous spherical arches eliminate the need for filled arches in slurry applications and encourage smoother flow.



Another type of concentric reducer using a spool type single arch at the small diameter.

Measurements being taken for a retrofit. The eccentric reducer was manufactured to the exact length with non-parallel flanges. The photo at right shows the reducer after installation.



Molded Rubber Expansion Joints

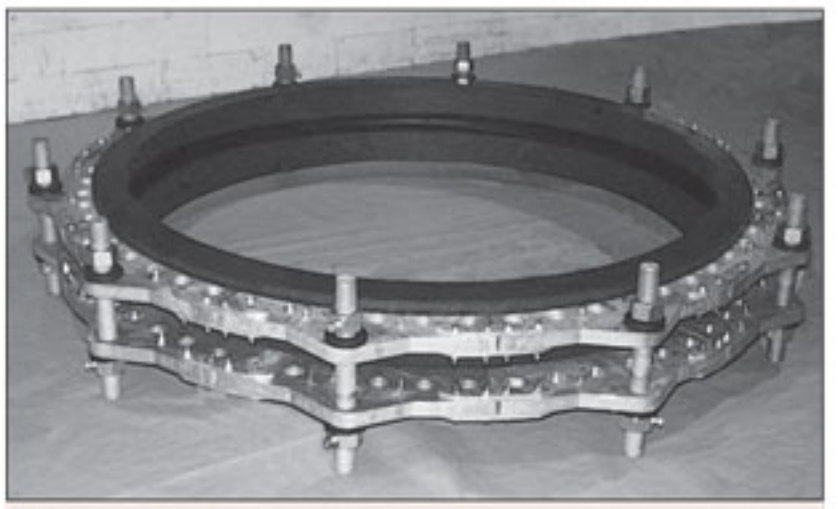
Single Arch
Threaded Ends
Safeflex SFU

Spherical molded rubber expansion joints are entirely different. There is no wire reinforcement in the body, and the pressure is retained by the tire cord spanning across the body from anchors in each flange. They are very similar to truck tires without the tread.

Spherical expansion joints are built straight. The curing process takes place in a steel mold clamped shut in a hydraulic press. Heat is introduced from plates on either side of the mold rather than by steam. An air bag is introduced in the center and pressurized to expand the body against the contours of the steel mold where it is vulcanized.

We manufacture these expansion joints using Nylon, Polyester or DuPont Kevlar® tire core. Our exclusive solid flange ring is clamped in place by the steel back up flanges. The built in ring prevents the rubber end pulling out of the retention flange.

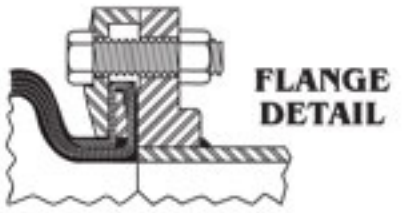
We manufacture this series in single and double spheres, as well as concentric reducers. In the sizes through 2" (51mm) they are built with screw on flanges.



60" (1524mm) diameter handbuilt SFEJ high pressure expansion joint.

Since these connectors are molded, there is a limitation on size, and face to face dimensions are fixed. The sealing principle is so effective, however, that we have handbuilt this construction to very large diameters, as shown in the photograph below.

Molded expansion joints are kept in stock in Neoprene and EPDM. They can be furnished in Nitrile, Hypalon or other materials as well.



Single Arch
Masonflex MFEJ

Concentric Reducer
Safeflex SFDCR

Double Arch
Masonflex MFDEJ

Series 800
Teflon® Expansion Joint

Teflon® expansion joints are always fixed dimension. They are molded in two, three and five arch configurations. Series 800 is particularly popular in the chemical industry where they provide excellent service in relatively low temperature, low pressure systems. Standard construction includes control rods as illustrated, and all sizes through 12 inch (305mm) diameter are kept in stock.

3 Arch
803

2 Arch
802

5 Arch
805

Duct Connectors

Mercer duct connectors are not to be confused with wrap around Fiberglass or other light-weight materials used in heating and ventilating systems. Our handbuilt duct connectors are another heavy duty industrial product. They are only used in high pressure, high temperature air applications or where the gas is some industrial by product that is highly corrosive and the duct connector must be leak proof.

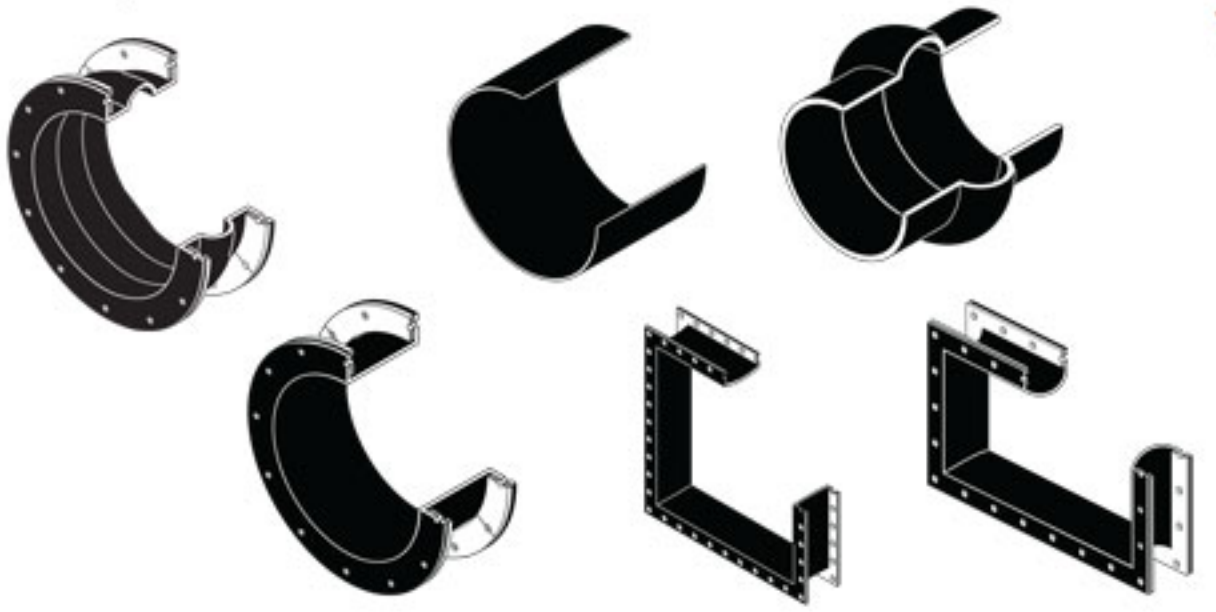
Duct connectors can be round or conical rectangular or square, fabricated as reducers or in some cases the transition piece from rectangular or square to round ducts. Flanged connectors are furnished with steel back up rings or plates, and where the outside exposure demands it, steel may be hot dipped galvanized or fabricated from stainless steel. Since there are no standard duct flanges, they are usually drilled to specific drawings. In some cases because the mating flanges cannot be properly measured or the existing holes follow no particular pattern, we furnish the assemblies with both the rubber and steel flanges undrilled for drilling in the field.

Rather than flanged ends, we often supply slip on designs that are clamped or banded. Depending on the specified movements, the body of the expansion joint may have an arch or arches similar to piping expansion joints or they may be straight or ballooned.

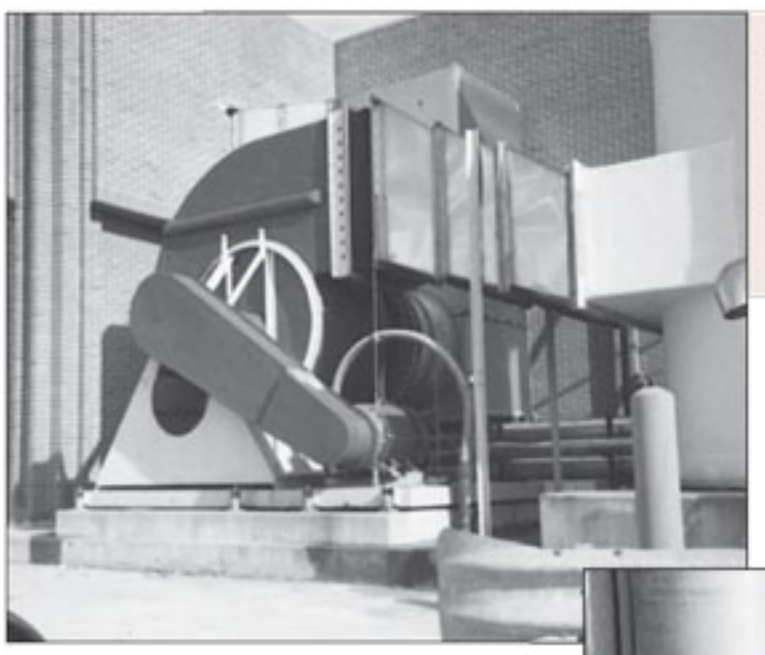
Mercer Rubber joints do not get up to high enough temperatures for applications in boiler breaching, but they are used in a temperature range as high as 400°F (204°C) and commonly located in the hot high pressure duct work in waste water and sewage treatment plants. They are used throughout the chemical industry, and we have supplied diameters as large as 132" (3353mm) for wind tunnels at both military and civilian research centers.

If you need an unusual duct connector, send the inquiry on to us. It is most likely we can build to your exact specifications and provide just what is needed.

Round Duct Connector

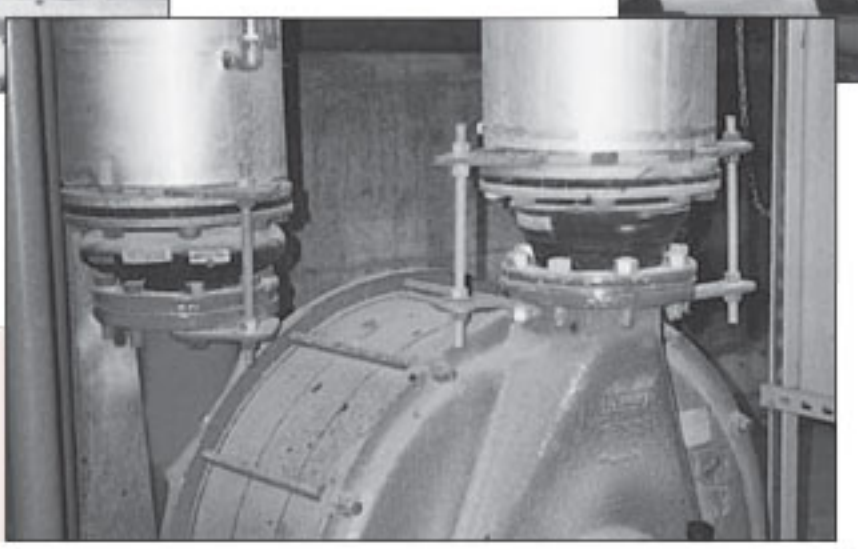


Rectangular Duct Connector



A rectangular heavy duty flexible duct connector installed in the top horizontal discharge of a boiler forced draft blower. Pressure 12psi (0.84kg/cm²).

Round duct connectors installed in the duct work of a sewage treatment plant allow for major hot duct expansion.



Concentric reducers installed in the suction and discharge air connections of a positive displacement high pressure blower, reduce stress to the flanges and facilitate hook-ups.

Industrial Hose

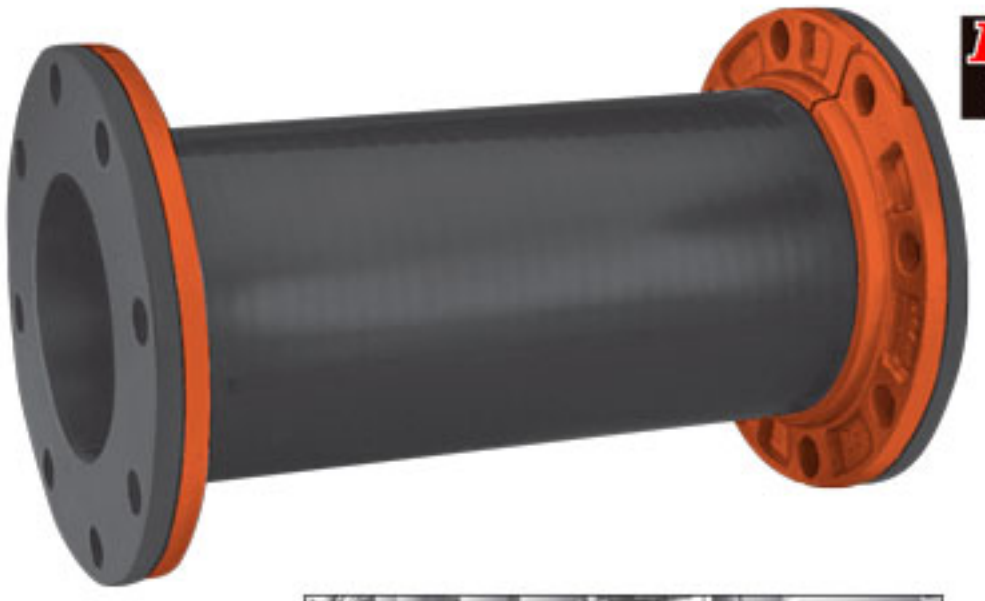
Series 100
Vibraflex Reinforced Rubber Pipe

Vibraflex reinforced rubber pipe is often described as rubber flanged hose. The cross section is very similar to that of the straight portion of an expansion joint starting with the tube multi-layers of tire cord, spiral wire reinforcement or individual steel rings for very high pressures and greater flexibility. Cover plies protect the construction and the outside surface is a tough resilient cover.

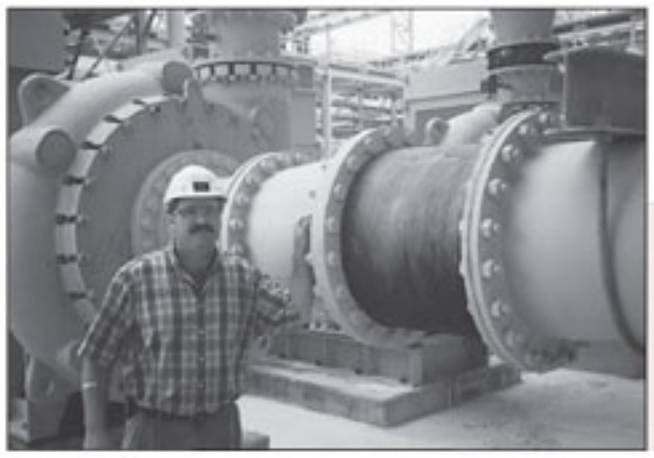
While hoses are not specifically designed for expansion and compression, in effect the rubber carcass can stand some expansion and compression since none of the steel reinforcement runs parallel to the axis. Transverse movements are dependent on the length and rubber pipe is commonly used for misalignment problems or continuous transverse motion. They can be built with major offsets as well.

Our Vibraflex pipe utilizes all of the materials mentioned earlier, and we specialize in hoses for abrasive service. They may have Hypalon liners, but more commonly pure gum rubber stock made to thicknesses of as much as 3/4" (19mm), particularly for the mining industry. We can match any flange or the hoses can be built with oversized cuff like slip on ends for clamping or banding in place. Another common variation is built in nipples for screw or welded connections. Some hoses are just simple slip ons.

We are very proud to have manufactured hoses with arches at each end and built in nipples as large as 72" (1829mm) in diameter and 8 foot (2.44m) long for transverse motion of plus or minus 8" (203mm). These hoses were buried deep under ground to supply water systems in cities as far removed as Bangkok.



Series 100 flexible hose installed in a cooling tower return line. Notice the major vertical displacement to compensate for the misaligned piping.



A 40" (1016mm) diameter series 100 hose installed in the suction line, drawing river water into condenser cooling service.

Metallic Hoses

There are times when because of temperature or some other reason a rubber hose will not handle the problem. Therefore, Mercer handles a complete line of braided flexible connectors as well as stainless steel expansion joints. We have filled many applications, both here and abroad, for unusual product.

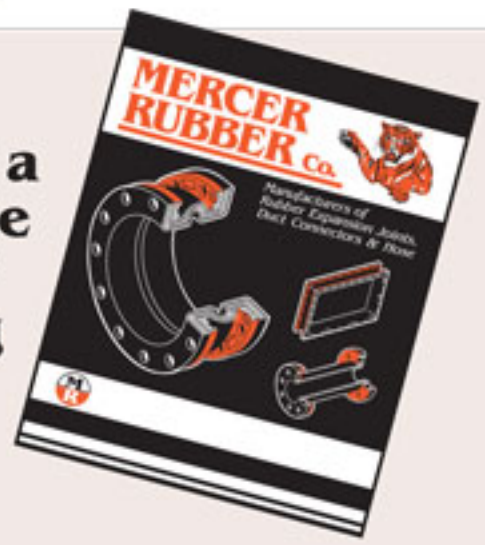
Braided Stainless Steel Hose with Male Nipples

Braided Stainless Steel Hose with Fixed and Floating Flanges

We hope we have given you some idea of the broad range of products that Mercer manufactures and how we can help you. We look forward to receiving your inquiries and by all means, let us know if you would like us to send you our complete catalog. We are sure you will find it most informative.

Once we have started to do business together, it will be the beginning of a long and pleasant partnership. We look forward to hearing from you.

Send for a Complete Mercer Catalog



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