Ceram Core™ Piping

Installation Data

CHEMICAL INDUSTRIAL

Handling

The abrasion resistant liner may be damaged by severe impact or pipe deformation. Abusive handling can cause fracture and loss of some of the liner. Fine cracks in the liner will cause no problems, but if the liner is so severely damaged as to flake away chips and pieces, the overwrap will be exposed to abrasion and pipe will fail prematurely.

Caution:

1. Do not throw pipe from trucks onto rocks, into ditches or subject it to similar rough treatment.
2. Avoid striking the pipe. Any blow which causes a delamination of the overwrap will damage the liner.
3. A NOV Fiber Glass Systems representative should inspect the pipe before installation if there is any suspected damage.
4. Avoid striking end of pipe against objects which may damage liner, and keep flange protectors in place until ready to install.

Installation

Joining Methods

Ceram Core pipe is joined by a self-aligning flange joint. The pipe is fabricated with flanges on both ends. An O-ring and an alignment ring, which are supplied by NOV Fiber Glass Systems, are required for matching the flange. When properly installed and compressed there will be a very minimal gap between the ends of the liner of adjacent pipe. See Table II for recommended bolt torque. Particular attention must be given to accurately align pipe bores at all joints. The rate of wear of the reinforcing overwrap vs. that of the ceramic bead liner is on the magnitude of 1000:1. Severe misalignment which will expose the overwrap to the abrasive material will cause an undercutting of the liner and early pipe failure. Misalignment should not exceed ½" bead diameter for optimum service (approximately 1/32"). Transition fittings are necessary to join the pipe to systems with different inside diameters. (See the following section for details). If it is not possible to perfectly align pipe, such as when adapting to existing lines, it is preferable that the downstream side of the joint be oversized to avoid impact on a cut edge of the liner. In no case should the overwrap be exposed.

Fittings

Ceram Core fittings are flanged with a radius sweep of three times diameter. Standard fittings available are 45° and 90° elbows, except on 14" and 16" diameters where 45° elbows only are available as standard.

Connecting to Other Systems

Ceram Core pipe can be installed to new or existing systems by two methods:.

Transition Fittings

When joining to materials other than CERAM CORE pipe or fittings, it is extremely important that the inside diameter of pipe-to-pipe and pipe-to-fitting match. Mismatched I.D.'s can cause the liner to be undercut and "scooped" away, causing premature failure. If the I.D. of the existing line or fitting at the point of entry into CERAM CORE is ±.050" (or more) larger or smaller than the I.D. of the pipe, a special adapter must be used to assure a smooth transition. Transition fittings for adapting to new or existing lines or other openings are considered essential and will be designed as needed for each installation upon receipt of the necessary dimensional information from the customer. A minimum of two transition fittings generally will be required on each installation.

When installing transition fittings it is recommended that the inside diameter of the transition fittings be aligned to the inside diameter of the existing system before the spool is connected to the transition fitting. Since transition fittings are usually one foot long, this procedure can be accomplished by sight. Also, make sure that there are no gaps between the existing system and the transition fittings which could cause undercutting.

Flanges

Flanges have standard ANSI B16.5 150 lb. flange bolt hole dimensions. Flange seals should be 60-70 durometer O-rings when joining pipe to pipe. Use a stiff grease to hold the O-ring in the groove when assembling the flanged joints. 1/8" thick full face gaskets or half size O-rings should be used when joining pipe to other equipment. (See Table II.) When the piping system is being connected to another type of system (flange is flush), the inside diameter of the gasket should be such as to match the inside diameter of the pipe when the flange bolts are tightened. The bore of the pipe piece MUST be aligned as concentric as possible with the bore of the system to which it is being connected. If there are irregularities or "scooped away" places due to previous wear, these should be grouted with CeramSurf™ surfacing material (available from NOV Fiber Glass Systems).

Field Preparation

Special Equipment

Under normal circumstances, field preparations consist of having the proper torque wrenches, bolts, nuts, and washers. NOV Fiber Glass Systems normally manufactures all pipe sections to the desired length so the installer need only assemble flanged joints. The close tolerances necessary to maintain proper joint alignment are difficult to reproduce in field cut joints. For this reason field bonded joints should be eliminated or kept to a minimum. Special diamond blades and a large

lathe or special NOV Fiber Glass Systems tools are required for the field installation of flanges. The following sections give a brief description of procedures necessary to make field joints. Additional tool instructions and matching tolerances are available upon request.

Cutting

The end of the pipe must be cut squarely and smoothly. Due to extreme hardness of the liner, standard cutting tools will not cut the liner without chipping. Therefore, when the pipe is cut anywhere except within two inches or less of the end (dressing cut), it is necessary to make two cuts (rough and dress) to produce the desired smoothness. If only a dressing cut is needed, then a single cut can be used.

Rough Cutting

Scribe or draw a line around the pipe at the desired rough cut dimension. Allow approximately one inch for dressing cut.

Using a power circular hand saw and abrasive blade, or hack saw, cut through the laminate to the liner completely around the pipe. Note: All glass fiber filaments should be cut.

Snap the pipe in two by placing pipe on support with cut slightly overhanging support. Apply a downward impact load to end of pipe with a 2x4 or rubber mallet while pipe is rotated such that one full rotation is made before separation. The pipe is now ready for the finish cut to dress up the edge.

Dress Cutting

The method to obtain a square cut requires a lathe large enough to turn the pipe and a tool post grinder equipped with a diamond blade. Only a diamond blade is hard enough to cut the ceramic liner. Water must be used at all times to keep the blade cool. The pipe must be rotated by hand unless the lathe is capable of extremely slow speed (1-2 RPM). Cut through the overwrap down to the liner, then advance the blade through the liner far enough to cut off in one revolution. Rotate the pipe into the blade. Do not overload the blade. With a little practice, the proper feed rate can be determined by listening to the motor pitch. Support the ring being cut off to prevent the liner from breaking as the saw approaches a complete cut.

Caution: Be sure the final dress cut removes all chipped or broken liner.

Bonding

Pipe Preparation

Scarfing the O.D. is necessary to remove the gloss and true the O.D. of the pipe to receive the flange. Scarf until a snug, dry fit is achieved between the pipe and the flange. This can be done on a lathe or with the NOV Fiber Glass Systems dressing tool. Eccentricity should not exceed ±.015".

Use 8000 Series adhesive kits.

Clean the machined surfaces of both the pipe and flanges. Use solvent and the paper towels provided in the kit, carefully following the instructions provided in the kit.

Apply adhesive to both pipe and flange bonding surfaces being sure to cover all machined surfaces.

Lightly drive the flange onto the pipe. The flange face must be flush and square with the end of the pipe.

Buried Installations

Preparing the Trench

The final bedding of the trench should be done as uniform and smooth as possible. Rocks or high spots in the trench bottom cause uneven bearing on the pipe and may damage the liner due to stress during backfill and cause unnecessary wear at these points. This is particularly significant if pulsation is present in the lines due to pumps. Sharp bends and changes in elevation or lateral direction in the line must be accomplished through the use of appropriate elbows. A bell hole should be dug for each set of flanges so the pipe rests on the bottom of the ditch.

Rocky Areas

If the trench is excavated through rock or shale ledges, the trench should be slightly deeper and a layer of sand used in the bottom of the trench and over the pipe to assure protection of the pipe from the rocks.

Road Crossings

In laying pipe under road crossing, it is recommended that the pipe be laid through a conduit. Firm, well compacted bedding under the pipe at the entrance and exit is essential to prevent shear loads due to backfill and settling. Check Table I for burial depths when pipe will experience surface loads. If a flange joint occurs within the casing, centering devices must be installed at the recommended support spacing.

Wipe off all adhesive on the flange face. An uneven surface or filled grooves due to cured residual adhesive will cause gasket sealing problems. A rag slightly dampened with solvent may be used. DO NOT flood with solvent as this may wash adhesive out of the bond area and weaken the bond.

Backfilling

The installation should be backfilled with sufficient fill to hold in place with all of the fittings and joints left open for inspection during the testing period. Once the testing is completed, then the backfilling may be finished.

1. Timing

The pipe should be covered as soon as possible to eliminate the chance of damage to the pipe; floating of the pipe due to flooding and shifting of the line due to cave-ins.

2. Material

The material used for the backfill should be free of sharp rocks, heavy boulders, large clods of dirt and frozen lumps of dirt. Pipe should be completely supported underneath before overburden is applied. Frozen earth will eventually thaw leaving the pipe with insufficient support and voids around the pipe. Vibratory or similar tamping equipment can drive small stones into the pipe wall. Clean backfill should be used with this type equipment. Multiple lines in the same ditch should be separated with clean backfill or sand.

Above Ground Installations

Above ground installations can be broadly divided into two categories—lines which are laid directly on the surface of the ground and those which are hung or supported as in a typical plant. In either case, there are certain basic guidelines to be followed.

On any lines laid directly on the surface, care should be taken to insure that there are no severe bends and that adequate protection is provided in areas where possible mechanical damage could occur. If the line is connected into a system which could impart a vibration or pulsing action to the pipe, areas of point loading should be protected to prevent the pipe from abrading. Since pipe is flanged, wooden bolsters or similar supports should be provided at support spacing intervals so pipe will not rest on flanges. Pipe resting only on flanges may warp and make future rotation for best wear difficult.

Anchors

Pipe anchors divide a pipeline into sections. In most cases pumps, tanks, and other similar equipment function as anchors. Additional anchors are required at all changes in direction and at all changes in elevation. Anchors are required on both ends of elbows, either at the elbow or within 5 feet of the elbow ends. On long straight runs only, anchors should be installed at approximately 300 foot intervals. Do not use anchors which apply point loads directly to the bare pipe. Anchors that apply point loads can be used only if a protective sleeve is used between the pipe and the anchor. Guides must be used in conjunction with anchors. See Guide Spacing in Manual CI1500 Ceram Core. When joining Ceram Core product to other piping systems, the adjoining system must be securely anchored to prevent the transfer of thermal end load.

Supports

NOV Fiber Glass Systems pipe should be supported at intervals designated by the support spacing data in the literature. Supports that have point contact or narrow supporting areas should be avoided, and valves or other heavy equipment should be supported independently of the pipe. Standard sling, clamp, and clevis hangers and shoe supports designed for use with steel pipe can be used to support NOV Fiber Glass Systems pipe. Any other type of support that gives a wide band of contact with at least 120° of contact with the pipe can be used. Any support that does not provide 120° of contact should be at least 4" wide or have a width equal to 1/3"of the diameter of the pipe, whichever is larger. If it is not possible to achieve this, the pipe should be protected with a protective sleeve of rubber lined metal, or other means of increasing the supporting area. In all cases, the support must be wide enough so that the bearing stress does not exceed 85 psi.

Expansion

The forces created by the expansion of NOV Fiber Glass Systems systems are approximately only 1/25 that of Schedule 40 steel. In cases where the piping system has long runs or is subjected to large changes in temperature, the changes in length must be handled by anchors and guides. See Product Manual Ceram Core for the anchor and guide spacing information. Consult a NOV Fiber Glass Systems representative for specific recommendations.

Pipe Rotation

For the longest service life and best economics, the system should be designed and installed so that pipe can be periodically rotated on a regular basis to insure even wear. This is particularly important where there is sliding abrasion on the bottom by heavy particles that do not remain suspended in the fluid stream. This precaution, plus careful alignment of the joints, will give a system with optimum performance. Since the pipe is extremely light, rotation can usually be accomplished by unbolting only a minimal number of joints and rotating several lengths at a time.

Table 1

Ceram Core Pipe Burial Depths[1]

Nominal Pipe Size		With H-20 Loading[2]				Without Live Loading	
		Minimum Burial Depth		Maximum Burial Depth		Maximum Burial Depth	
in	mm	ft	m	ft	m	ft	m
6	150	2	0.6	27	8.2	27	8.2
8	200	2	0.6	17	5.2	17	5.2
10	250	2	0.6	15	4.6	15	4.6
12	300	2	0.6	12	3.7	12	3.7
14	350	2	0.6	9	2.7	10	3.0
16	400	2	0.6	9	2.7	10	3.0

Table 2

Ceram Core Flange Bolt Make-Up Torque, Bolt, Washer and O-Ring for Flanges and Flanged Fittings[3]

Nom Pipe Size	Max. Torque[3]	Bolt Size	Bolt Length	Washer Size[4]	No. of Bolts	O-Ring Sizes[5] ARP 268 N.	
						Full Size	Half Size
in	ft-lbs	in	in	in			
6	30	¾	4 ½	1 ½	8	442	264
8	100	¾	5	1 ½	8	448	273
10	100	⅞	5 ½	1 ¾	12	452	277
12	100	⅞	6	1 ¾	12	457	280
14	100	1	6	2	12	459	281
16	100	1	6	2	16	465	284

[1] Basis for calculations are: (a) 3% maximum allowable diametrical deflection of the pipe; (b) soil modulus is 1000 psi; (c) the pipe is not subjected to a vacuum; (d) the water table is not above the top of the pipe. Other variables such as bedding constant assume worst case (most conservative) values. Reference ASTM D3839 for details on these assumptions (including an explanation of "soil modulus"). If actual conditions are different, contact your NOV Fiber Glass Systems representative.

[2] H-20 wheel loading is 32,000 lbs. per tandem axle; however, the allowable truck loading is now 34,000 lbs. per axle. Calculations are based on 34,000 lbs. per axle.

[3] The torque required to seal the gasket is usually lower than the maximum torque. Torque is based on non-lubricated bolts; therefore, torque levels should be lowered for lubricated bolts.

[4] Use SAE light washers.

[5] These numbers are from the SAE uniform numbering system. Full size O-rings are used with SF flange to SF flange. Half size are used with SF flange to smooth (flat) face flange.

[6] NOV Fiber Glass Systems flanges should be joined only to flat-faced flanges. When mating to raised-face flanges or lug-type valves, spacers are necessary.

National Oilwell Varco has produced this brochure for general information only, and it is not intended for design purposes. Although every effort has been made to maintain the accuracy and reliability of its contents, National Oilwell Varco in no way assumes responsibility for liability for any loss, damage or injury resulting from the use of information and data herein nor is any warranty expressed or implied. Always cross-reference the bulletin date with the most current version listed at the web site noted in this literature.

INS1030ENG February 2009

Fiber Glass Systems
17115 San Pedro Avenue, Ste 200
San Antonio, Texas 78232 USA
Phone: 210 477 7500
Fax: 210 477 7560