



Standard Operating Procedures

GlassBore[®] API Tubular Goods

Focus on Safety and Quality



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Focal Points

- Focus on Safety
- Focus on Quality

Arrival on Production Rig Location

Inspection of Work Area

1. Arrive safely on client location.
 - Park vehicle in accordance with CLS/client policy (observe orientation of vehicle, position with respect to guy wires, wind direction etc.).
2. Meet with rig personnel and conduct appropriate safety and orientation activities in accordance with CLS and client policy.
 - Complete Safety Paperwork/Tailgate Safety Meetings and JSA documents.
3. When rig activity and personnel indicate that it is time to rig up CLS, gather equipment and proceed to rig floor.
 - Inspect the work area for hazards and proceed with installation of running and handling tools once it is secure.

Placement of Running and Handling Equipment on Rig Floor

1. Communicate your purpose and requirements with Rig Operator and rig site personnel.
2. Hang sheave in a safe location (see detailed installation guidelines below) - use provided wire rope slings and hooks/shackle assemblies.
 - Ask for help from the rig crew. Have the operator secure the sheave to a derrick leg or other rigid component of the structure where it will not interfere with block/elevators motion. Any winch line is an unsafe hanging point for the sheave.
3. Thread drift rope through sheave and insure that drift is secured to rope by application of steel wire and plastic tape.
4. Position yourself in a safe location and proceed with the installation in accordance with the quality guidelines in Section 2.
5. Upon completion of the installation, remove all material and equipment from the rig floor and safely return to your vehicle and then to the CLS facility.
 - Maintain your work area and keep it clean and free from trip hazards.

Drift Equipment Description

Proper Drift Equipment consists of the following:

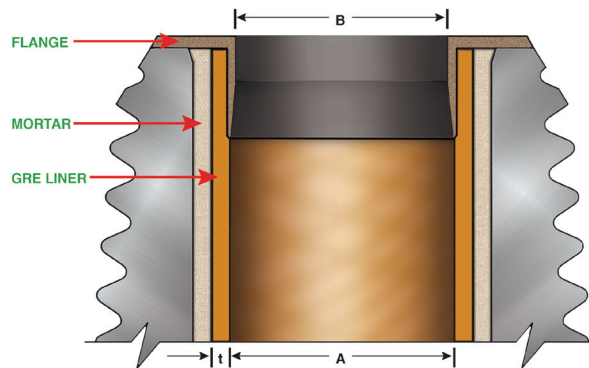
- Drift bar manufactured to accommodate an appropriate length of ½-inch sash cord. A steel loop welded to the drift bar is CLS minimum requirement. The drift bar should be carefully machined to the dimensions indicated in **Table 1**. Drifting with a known diameter is very important because the selected drift dimension will be kept in the well file to determine future profile diameters, blanking plug diameters, wireline tools etc.
- Sheave should be rated for 550 pounds at a minimum and be constructed with a bearing-supported pulley and accommodation for an equally-rated shackle.
- Sling should be constructed of wire rope by an approved vendor and capable of supporting at least 950 pounds. The D-Ring should be equally rated.

Drift Equipment Installation and Usage

CLS recommends drifting each connection to insure against over-compressed C-Rings of other restrictions in the *GlassBore*® tubing string. Please use the following guidelines to rig up, operate and rig down the drift equipment:

1. Secure sheave to derrick leg or other rigid location with wire rope sling/clevis hook. The derrick leg is the optimal choice but other secure locations may be approved including chain/wire rope assemblies secured in tension away from the rotary table.
 2. Place C-Ring in collared end of the joint in the rotary table and place stabbing guide on top of the coupling.
 3. Operator picks up and makes up the next joint or stand.
 4. Drift the connection.
 - a. Rig operator opens slips and lowers string into the wellbore to next connection.
 - b. Field Service Rep drifts the tubing by lowering the drift tool on the sash cord through the previous connection and then retrieving it.
 5. Once the drift has passed through the new connection and is retrieved without interference the tool is set aside away from the rig activity and the rotary table. Repeat until the string is installed.
- Remove the sheave and all surface running and handling equipment and return to company vehicle prior to departure from location.

GlassBore® Thread Profile and Dimension for API Connection



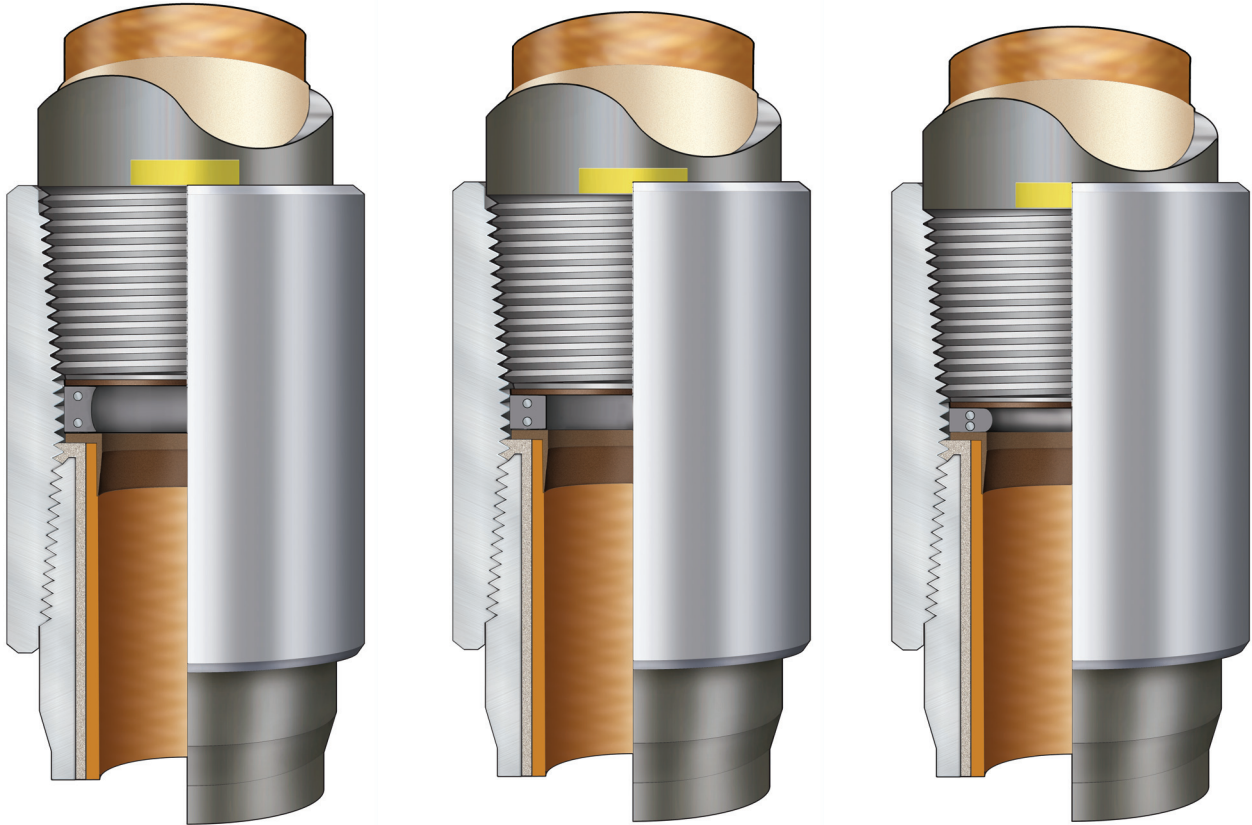
Pipe Dia. (inches)	Weight ppf	A Liner ID	B Flange ID	t Wall Thickness	Drift (API)
2-1/16	3.25	1.500	1.420	0.040	1.250
2-3/8	4.70	1.810	1.750	0.040	1.600
2-7/8	6.50	2.250	2.200	0.040	1.950
3-1/2	9.30	2.750	2.690	0.045	2.440
4-1/2	11.60	3.690	3.600	0.060	3.350
4-1/2	12.75	3.690	3.600	0.060	3.350
4-1/2	13.50	3.600	3.510	0.060	3.260
5	15.00	4.010	3.900	0.065	3.650
5	18.00	4.010	3.900	0.065	3.650
5-1/2	15.50	4.520	4.400	0.075	4.150
5-1/2	17.00	4.520	4.400	0.075	4.150
5-1/2	20.00	4.520	4.400	0.075	4.150
5-1/2	23.00	4.395	4.280	0.075	4.030
7	23.00	5.900	5.780	0.095	5.530
7	26.00	5.900	5.780	0.095	5.530
7	29.00	5.800	5.690	0.095	5.440
7	32.00	5.800	5.690	0.095	5.440

Table 1

Section 2

Installing Compression Rings in *GlassBore*® Tubing

1. Install C-Ring into clean coupling. Do not dope coupling before installing ring!
Apply a small amount of dope or lubricant to top and bottom surface of ring prior to inserting.
 2. Insert ring into coupling by hand. The ring should slip easily and should be firmly seated on the shoulder of the liner in the coupling. Use stabbing guide to stab all lined joints. Make up to normal torque value, then observe painted Reference Band. C-Ring compression is illustrated below. Use low tong speed when approaching Reference Band to avoid liner or C-Ring damage.
- The Reference Band indicates C-Ring compression only – it does not indicate joint makeup or tightness.
4. The C-Ring must be in compression AND the thread must be tightened to normal torque level for the system to protect the coupling.



MINIMUM COMPRESSION

When coupling contacts bottom of painted reference band, end of pipe also contacts corrosion barrier ring. No C-RING compression at this point.

Further engagement is required to compress the C-RING

IDEAL COMPRESSION

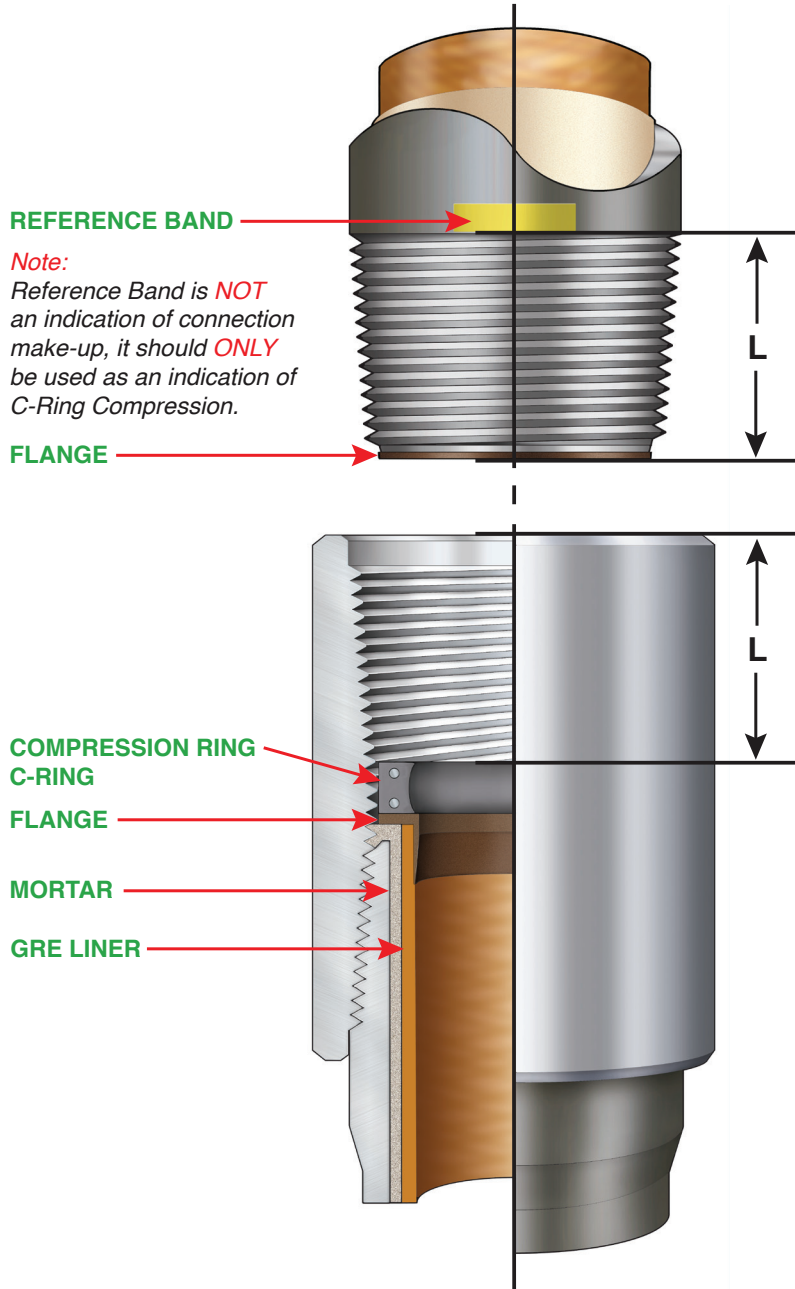
The C-RING is compressed, the reference band is partially buried under the coupling and is partially visible above the face of coupling.

THREADS MUST BE TIGHT!

MAXIMUM COMPRESSION

The ring is fully compressed. Do not make-up past the top of the painted reference band as liner damage may result. If threads are not tight, back out joint, remove ring and replace with 3/4 or 1/2 ring.

GlassBore® Tubing with CLS Compression Ring



	Pipe Size	Pin Thread Length	Coupling Length	DIMENSION "L"	
				New	3/4
IJ	2 1/16	1.438	1.938	1.410	-
EUE	2 3/8	1.938	4.875	1.883	2.038
	2 7/8	2.125	5.250	2.070	2.225
	3 1/2	2.375	5.750	2.375	2.530
	4 1/2	2.625	6.250	2.725	2.880
BTC	4 1/2	3.9375	8.875	3.875	4.030
	5	4.0625	9.125	4.062	4.217
	5 1/2	4.125	9.250	4.125	4.280
	7	4.500	10.000	4.500	4.655
LTC	4 1/2	3.000	7.000	3.100	3.255
	5 1/2	3.500	8.000	3.475	3.630
	7	4.000	9.000	3.975	-

* All dimensions are in inches.

Drawing 2

Section 3

Running Procedures for *GlassBore*[®] GRE-Lined API Tubular Goods

Composite Lining Systems recommends the representation of a CLS Service Technician whenever *GlassBore*[®] internally lined tubing is to be run, pulled or repaired on location. The purpose of a CLS Technician is to advise proper handling procedures and to insure proper installation and compression of the CLS C-Rings. Proper makeup and C-Ring compression will significantly enhance the useful life of the lined tubing string. It is not Composite Lining Systems' position to recommend makeup torque; however, CLS advises that sufficient torque (recommended by mfr.) must be applied or the system may fail because the C-Ring does not provide pressure integrity to the coupling system. CLS would advise a customer to use company torque specifications or refer to API torque tables when running lined tubulars.

1. Leave thread protectors in place until the moment pipe is to be made up.
 - Always use a stabbing guide to protect the lining when running *GlassBore*[®] lined tubulars.
2. Always place a backup tong on coupling. If the coupling turns on the mill side, the connection should be taken apart to inspect for liner damage.
3. Measure several flange depths and painted reference band dimensions to verify the correct C-Ring is being used with the correct painted reference band. With the C-Ring installed in the coupling and seated on the flange shoulder, the depth measured from the top of the coupling to the top of the C-Ring should equal the distance on the mating pin end from the end of the pipe to the bottom of the paint reference band. If re-running un-banded tubing and a banding template is not available, install a C-Ring by hand and firmly seat on coupling flange, make sure depth in coupling to top of installed C-Ring. This distance when marked on pin with paint marker indicates initial C-Ring contact. Refer to **Drawing 2** page 6.
4. Do not apply thread sealant to coupling before installing C-Ring. Generally CLS recommends doping the pin only, if the coupling is to be doped, do so only after the C-Ring has been installed. Apply a thin film of a lubricant or thread compound to the bottom surfaces of the C-Ring or to the mating flange to reduce friction during make-up.
 - When using power tongs, make up in low speed when approaching the top of the coupling with the painted reference band. High-speed makeup can damage the C-Ring and/or the GRE liner.
5. Use company specified torque values or reference published torque guides for determination of makeup torque. Make-up each joint to the same torque level and monitor the C-Ring compression by observing the paint reference band. CLS recommends checking a number of made-up joints with pipe wrenches to verify joint tightness.
 - CLS Service Technicians do not recommend torque for lined tubulars.
6. Observe the painted reference band as a guide for C-Ring compression only. Refer to **Drawing 1** page 4.

- The reference band is intended only to indicate the C-Ring compression and should in no case be used as an indication of joint tightness; rather it is an indication of initial contact of the C-Ring by the lining.

Compression of the C-Ring is required to achieve a corrosion barrier across the connection. CLS recommends some compression beyond initial contact. Optimum compression on the CLS C-Ring is 1/8-inch.

7. If the top of the coupling at final make-up torque has not contacted the pin end reference band, a gap exists between the flange and the C-Ring leaving the coupling threads exposed. It will be necessary to break the connection apart and install a taller C-Ring or stack a ½ C-Ring on top of existing C-Ring. Always re-mark the pin end reference band after installing alternate or additional C-Rings.
8. Do not make up past the top edge of the reference band as this may damage the C-Ring and/or the liner. The reference band is typically ¼ inch in height, which is the maximum compression that can be exerted on the C-Ring. If the top of the coupling will make up past the top edge of the reference band before the threads are tight, break the connection apart and install a shorter C-Ring. Remember to always re-mark the pin end reference band after installing an alternate C-Ring.
9. An Adaptor-Ring and/or multiple C-Rings may be required when mating an unlined packer or tool joint to a joint of *GlassBore*[®] tubing. The narrow side of the hard plastic Adaptor-Ring can be seated in the coupling on the unlined nipple or shoulder, and the thicker side of the Adaptor-Ring should be used to mate with the C-Ring. Either Adaptor-Ring can be used, depending upon the orientation inside the unlined coupling being mated to the *GlassBore*[®] pin thread. CLS Service Technicians are trained to accommodate such situations.
10. CLS recommends drifting each connection when running downhole tubulars. After the connection is made up, lower the joint and set slips to access the top coupling. Lower the drift into the top joint on a rope until it reaches the connection that was just made up. If the drift does not pass through the connection, the C-Ring has protruded into the ID and should be replaced.
11. Always insure the drift rope length is sufficient to pass through the longest joint. The recommended drift diameter is determined by the flange diameter in the coupling. **Table 1** page 4 indicates the appropriate drift diameters. The listed Nominal Drift Diameter is the standard drift tool carried by the CLS Service Technicians. Customers should request an alternate size drift tool if so desired.

Section 4

Removing *GlassBore*[®] GRE-Lined API Tubular Goods from the wellbore

1. Always place tong backups on the coupling while breaking apart connections. The backup tong must grip sufficiently to prevent the coupling from turning on the mill side.
- Install pin thread protectors on all pins prior to racking or standing back.
2. When standing back in the derrick, avoid bouncing the pin off the rig floor.
3. Lay joints down on racks for inspection of threads and lining.
4. Remove all compression rings. Inspect pin and box threads for damage and corrosion. Inspect all liners and flanges for damage or obstruction.
5. Cleaning of lining and threads may be necessary for full visual inspection.
6. Re-dope all threads if the pipe is not to be re-run immediately to prevent corrosion.
7. Repair joints with damaged flanges or threads.
8. Consult CLS facility prior to removing couplings because lining damage may occur. Removing the flange from the liner inside the coupling significantly reduces the risk of liner damage when removing the coupling, because the liner and flange extend to the midpoint of the coupling.
9. Inspect reference bands, re-apply correct marks if they are missing or if changing from New to $\frac{3}{4}$ sized C-Rings.

Section 5

Re-running *GlassBore*[®] GRE-Lined API Tubular Goods

1. Check to see that the correct C-Ring size and corresponding reference bands (New or $\frac{3}{4}$) are in place. (See ***Drawing 2*** page 6)
2. Install new C-Rings at the discretion of the customer.
3. ALWAYS use a stabbing guide.
4. ALWAYS place tong backups on the couplings while tightening pipe.
5. Drift each joint after make-up with proper drift size; insure drift will extend through the connection. (See ***Table 1*** page 4 for Drift Diameters)
6. Use low tong speed when the banding mark is approaching the top of the coupling to avoid damage to the C-Ring and lining when the C-Ring is compressed.
7. A CLS Service Technician on location is recommended.

HSE and Quality Issue Chain of Communication

In the event that a safety or quality issue is not being addressed on a Client location, *DO NOT HESITATE* to call the first person or people in the following chain of communication.

● Safety

If a medical emergency, contact 911 then proceed with the following:

All medical incidents call CLS Supervisor

CLS Supervisor to notify HSE Manager

CLS Supervisor to notify Client Operations Supervisor

HSE Manager to notify Client HSE Manager for Client reporting procedure

● Quality

Call CLS Supervisor

Call Client Operations Supervisor at request of CLS Supervisor only

CLS Supervisor to notify Client Operations Supervisor in all cases

YOU HAVE THE RIGHT TO SHUT DOWN THE WELLSITE OPERATION FOR ALL SAFETY AND QUALITY CONSIDERATIONS. NOTIFY YOUR SUPERVISOR IMMEDIATELY.



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COMPOSITE LINING SYSTEMS

GlassBore® GlassLine® GlassWrap®