

Field Installation Services – Downhole

Services and equipment available for the installation of downhole tubing and casing include the following:

- Hands-on supervision and assistance in the unloading, storing, and handling of the tubing or casing at the well site.
- Expertise and recommendations relative to the rig equipment in use for the running of the string, the packer, wellhead, and other well equipment intended to be used in the installation.
- Active supervision and participation in the makeup and running of the fiberglass string.
- Expertise, recommendations, and active participation in the space out procedure of the installation.
- Expertise, recommendations, and active participation in the testing of the completed string.
- Expertise and recommendations relative to setting the fiberglass string.
- Cleaning and inspection of used fiberglass tubulars.
- On-site reinforced fiberglass overwrap of steel casing connections.
- For some sizes and in some locations, provision of a power tong, torque computer, slips, single joint compensator, and necessary hand tools.

Future Pipe Industries, Inc. field personnel have extensive and effective experience in the installation of fiberglass products in all forms of installations. Typically they can be of assistance in many aspects of a fiberglass project, only some of which are listed above. Their responsibilities, however, do not include the success or failure of a given project and their authority on a customer's work site is restricted to advice and recommendations given to the customer and his employees. Field installation services are not available for products not manufactured by Future Pipe Industries, Inc..

RED BOX DOWNHOLE TUBING AND CASING INSTALLATION INSTRUCTIONS

INTRODUCTION

Fiberglass tubing and casing differs from steel and requires different handling and running techniques. The method of manufacture results in dimensions that do not always correspond with steel tubular dimensions. Of particular concern are the variations in outside and upset diameters which do not, in general, correspond with the standard dimensions of steel tubulars.

HANDLING AND STORAGE

1. Care should be taken when unloading tubing and casing. Do not drop or throw. A minimum of two (2) men are required to move fiberglass tubulars of less than 4 inches in nominal diameter. On larger sizes a third man or handling equipment is recommended.
2. Fiberglass tubulars must be equipped with thread protectors during storage and movement. FUTURE PIPE INDUSTRIES, INC. suggests the thread protectors not be removed until just prior to makeup on the rig floor.
3. Fiberglass tubulars should be stacked with proper support and spacing, four (4) equally spaced wooden strips are recommended. Chock the ends of the stack to prevent rolling. Walking or placing objects on the stacked fiberglass tubing is not recommended.

INSTALLATION

Most fiberglass tubular failures are the result of improper makeup of the threaded connections. FUTURE PIPE INDUSTRIES, INC.'S tubing and casing utilize an integral joint or threaded and coupled 8Rd or 6Rd threaded connections. To achieve a structurally sound, leak tight connection, it must be properly made-up to a controlled torque level using the proper thread compound. The following procedures are recommended.

1. When picking up joints from the racks do not allow pin threads to be exposed. Replace any thread protectors that may be missing. Unprotected pin ends may drag and be damaged.
2. Standard elevators can, in most cases, be used to run fiberglass tubulars. It is always advisable to measure the upset diameter of the fiberglass tubing and to make sure that the slip dimensions are correct. In some cases, the slips must be dressed to fit the fiberglass tubing in order to avoid any single point contact that might damage the tubing

Square shoulder elevators can be used up to a maximum 3,000 lbs. string weight for any threaded and coupled strings.

Use: MYT elevators for 2-3/8" and 2-7/8" size tubing,
YT elevators for 3-1/2" and 4-1/2" size tubing, and
YC elevators for 5-1/2" and larger size tubing or casing.

Special considerations may be required when string weight exceeds 20,000 lbs. to assure trouble free running for fiberglass tubulars. (Note that the weights refer to immersed weights, which account for the weight reducing effect of buoyancy. Buoyancy Factor for fiberglass is about 0.5, much lower than for steel).

3. Do not set the slips while the fiberglass tubing is being raised or lowered.
4. If steel-to-fiberglass connections are required examine the steel threads carefully to insure that no burrs are present. In connecting any steel connections to fiberglass the fiberglass torque values must be used.
5. If a full joint of steel tubular is to be added to a fiberglass string, care must be taken to insure that the weight of the hanging steel joint be supported by a single joint compensator and that the fiberglass female connection at no time during the makeup be required to support the steel joint. If the weight of the steel joint is supported by the fiberglass threads during the makeup, damage to the fiberglass threads may occur.
6. When connecting into a steel female thread such as a submersible pump or packer, make sure that the steel thread is a 8Rd long thread up to 4-1/2" size, 8Rd casing long thread for sizes 5-1/2" through 9-5/8", and 8Rd casing short for 10-3/4". In sizes larger than 10-3/4" fiberglass crossover couplings or male threads may be required to cross from the 6 round thread to the conventional 8 round thread.

In the smaller sizes, if the steel thread is 8Rd short thread and cannot be changed out to long thread, a steel changeover to long thread is recommended. In case the fiberglass pin must be made up into a steel short thread, use the following guide in cutting off fiberglass long form 8Rd threads.

2-3/8" size - Cut off 5 threads (5/8" long)
 2-7/8" size - Cut off 6 threads (3/4" long)
 3-1/2" size - Cut off 6 threads (3/4" long)
 4-1/2" size - Cut off 7 threads (7/8" long)

There will be some loss of tensile strength from published values because of the shortened pin thread.

7. Thread compound must be a low shear type compound. Dependent on conditions, TFC#15, Enhanced TFC#15, or APT sealant are recommended. Consult with FUTURE PIPE INDUSTRIES, INC. for the appropriate recommendation for each application.

Apply the TFC#15 compounds to the pin and box using a "moustache" type brush. The compound is to be lightly and uniformly applied. The general thread form should be just visible after application of compound. Teflon tape may be recommended on some larger diameter casing applications and it is always recommended on fiberglass to steel connections. Apply two passes of tape, down and up the pin threads.

APT sealant is applied using a caulking gun and a comb to distribute the compound over the threads. See the written instructions with the compound for full details as to the application procedure.

NOTE: Field experience indicates that thread compounds formulated with silicon base grease or oils will significantly reduce makeup torque requirements.

Typical thread compound usage is:

| <u>Size</u> | <u>Per Gallon Pail</u> |
|-------------|-------------------------------------|
| 2-3/8" | 3,200 ft. (Approx. 107 connections) |
| 2-7/8" | 2,800 ft. (Approx. 93 connections) |
| 3-1/2" | 2,500 ft. (Approx. 83 connections) |
| 4-1/2" | 1,800 ft. (Approx. 60 connections) |
| 5-1/2" | 1,400 ft. (Approx. 47 connections) |
| 6-5/8" | 1,300 ft. (Approx. 43 connections) |
| 7" | 1,200 ft. (Approx. 40 connections) |
| 7-5/8" | 1,100 ft. (Approx. 37 connections) |
| 9-5/8" | 600 ft. (Approx. 20 connections) |
| 10-3/4" | 500 ft. (Approx. 17 connections) |
| 11-3/4" | 420 ft. (Approx. 14 connections) |
| 13-3/8" | 360 ft (Approx. 12 connections) |

It is advisable to order at least one extra gallon of thread compound over the calculated requirement.

8. Start the connections by hand and makeup to the hand tight position. Do not force threads. If hand makeup becomes a problem, back out the connection, clean, re-apply thread compound and try again.
9. Complete the makeup using a strap wrench or a power tong that has been demonstrated to be capable of makeup without damage to the pipe body. Position the strap or the tong jaws on the heavier upset area of the tubing. Controlled torque is required to ensure a leak tight connection. On larger sizes a chain wrench can be used to make up and to back up.

DO NOT OVER TIGHTEN CONNECTION.

It is recommended that torque control be established using an electronic strain gage/load cell type device. Hydraulic pressure gages that monitor the hydraulic pressure delivered to a hydraulic tong have proven unreliable for this application.

NOTE: Fiberglass-to-fiberglass tightening torque levels are significantly lower than those required for steel connections.

RECOMMENDED FIBERGLASS DOWNHOLE TUBING TORQUE TABLE USING TFC#15 THREAD COMPOUND

Integral Joint Tubing and Casing

| <u>SIZE</u> | <u>TUBING TORQUE</u> | <u>CASING TORQUE</u> |
|-------------|--------------------------|--------------------------|
| 2-3/8" | 110 - 140 ft. lbs. | 110 - 140 ft. lbs. |
| 2-7/8" | 150 - 175 ft. lbs. | 175 - 200 ft. lbs. |
| 3-1/2" | 250 - 280 ft. lbs. | 275 - 300 ft. lbs. |
| 4-1/2" | 340 - 380 ft. lbs. | 350 - 400 ft. lbs. |
| 5-1/2" | 430 - 470 ft. lbs. | 475 - 520 ft. lbs. |
| 6-5/8" | 680 - 730 ft. lbs. | 700 - 750 ft. lbs. |
| 7" | 780 - 830 ft. lbs. | 750 - 900 ft. lbs. |
| 7-5/8" | 880 - 930 ft. lbs. | 950 - 1,000 ft. lbs. |
| 9-5/8" | 1,100 - 1,200 ft. lbs. | 1,200 - 1,300 ft. lbs. |
| 10-3/4" | 1,400 - 1,500 ft. lbs. | 1,400 - 1,500 ft. lbs. |

Threaded and Coupled Tubing and Casing

| | |
|---------|------------------------|
| 9-5/8" | 1,400 - 1,600 ft. lbs. |
| 10-3/4" | 1,500 - 1,700 ft. lbs. |
| 11-3/4" | 1,600 - 2,000 ft. lbs. |
| 13-3/8" | 1,700 - 2,400 ft. lbs. |
| 16" | 2,200 - 3,000 ft. lbs. |
| 18" | 2,400 - 3,500 ft. lbs. |

10. When making-up steel-to-fiberglass connections, use the torque value for the fiberglass.
11. Red Box tubing may be set in compression only under particular circumstances which alleviate the possibility of buckling. If considering a compression set, contact Future Pipe Industries, Inc. personnel for information. When setting a packer or latching into a permanent packer, note the weight of the tubing string prior to pulling tension. Be certain not to exceed the tensile rating of the tubing when setting the string in tension. Packers should be equipped with soft, 50 durometer hardness rubber to insure a seal at the lesser tensile values of fiberglass tubing.
12. When pulling fiberglass tubing, do not rotate the connection after threads have disengaged. Do not allow the threads to jump out under tension or jump out and fall back on the stationary threads.
13. When pulling fiberglass tubulars, do not allow the slip dies to rub against the pipe body. Set the slips carefully to avoid impact damage. Make certain the blocks are completely stopped before setting the slips.
14. All threaded connections should be cleaned prior to use. Cleaning on the rack with a medium pressure water jet or steam cleaner is recommended. Do not use powered brushes or wire bristle brushes. Solvent cleaning with a fast drying non-residue solvent, such as methylene chloride is acceptable. Do not use diesel fuel as a final cleaning agent.

Following cleaning, thread protectors should be installed.

FOR QUESTIONS OR FURTHER INSTALLATION DETAILS, PLEASE CONTACT:

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