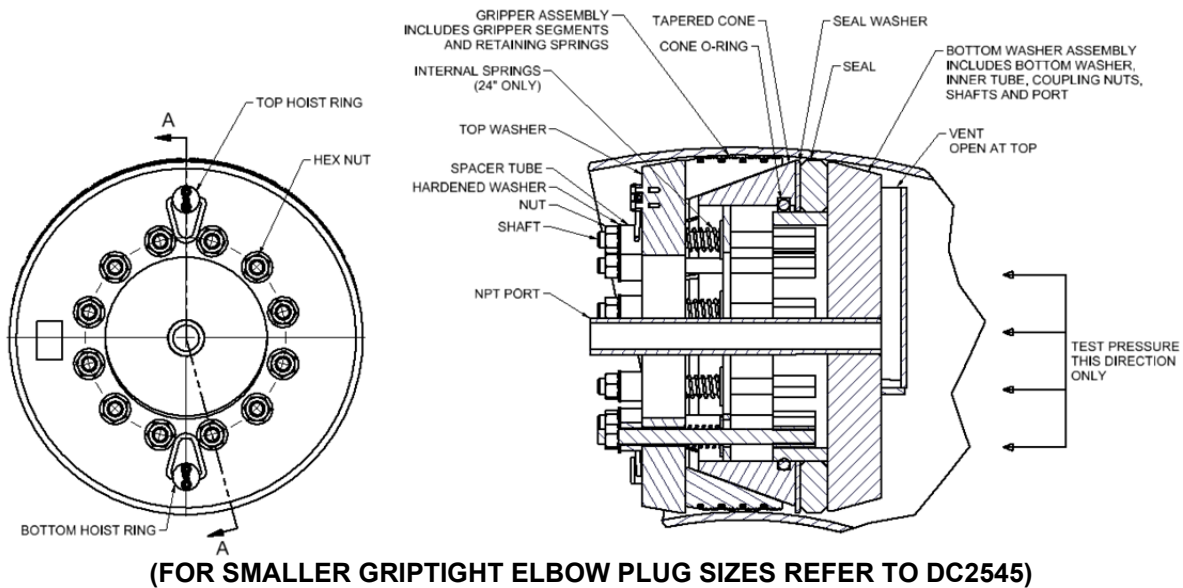


OPERATING PROCEDURES FOR 10"- 24" GRIPTIGHT® LONG RADIUS ELBOW HIGH PRESSURE TEST PLUGS



WARNING! FOR PROPER OPERATION, GRIPTIGHT PLUGS MUST BE ASSEMBLED AS SHOWN.

- ◆ **PRESSURE TESTING IS INHERENTLY DANGEROUS. STRICT ADHERENCE TO THESE OPERATION INSTRUCTIONS AND INDUSTRY SAFETY PRACTICES COULD PREVENT INJURY TO PERSONNEL.**
- ◆ **ALL PERSONNEL MUST BE CLEAR OF TEST PLUG WHEN PRESSURE TESTING.**
- ◆ **FOR SAFETY, AN INCOMPRESSIBLE LIQUID SUCH AS WATER SHOULD BE USED AS THE TEST MEDIUM. RESIDUAL AIR OR GAS IS TO BE EVACUATED FROM THE PIPE PRIOR TO TESTING. IN NON-VERTICAL APPLICATIONS THE VENT, SHOWN ABOVE, WILL ALLOW FOR VENTING MOST AIR OR GAS.**
- ◆ **GRIPTIGHT ELBOW TEST PLUGS ARE DESIGNED TO WITHSTAND PRESSURE IN THE DIRECTION SHOWN IN THE ABOVE DRAWING. DO NOT USE THESE PLUGS FOR REVERSE PRESSURE APPLICATIONS.**
- ◆ **REMOVE METAL SHIPPING BAND SECURING GRIPPER ASSEMBLY PRIOR TO PRESSURE TESTING.**
- ◆ **VERIFY THE PIPE ID RANGE AND PRESSURE RATING LOCATED ON THE TAG PROVIDED ON THE TEST PLUG.**
- ◆ **DO NOT USE GRIPTIGHT ELBOW PLUGS IN PIPES WITH ID COATINGS. CONTACT EST CUSTOMER SERVICE PRIOR TO USE OF GRIP TIGHT ELBOW PLUG ON ANY TYPE OF COATED PIPE / TUBE.**

INSTALLATION PROCEDURES

1. **PRIOR TO USE**, replace damaged or worn grippers and seal if applicable. (See DC2588 and DC2512) The surface between the cone and grippers must be free of friction producing dirt or corrosion. Verify proper operation of the test plug by tightening with a wrench the hex nuts so that the grippers move freely to the end of the tapered cone surface. Fully loosen the hex nuts. Prior to testing, ensure the hex nuts have been advanced down so that the gripper OD is

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approximately the same as the top washer OD. Should the grippers not fully retract, apply a light lubricant such as a Molykote® DX or SAE 10W motor oil to the tapered surface of the cone and cone surface contacting seal washer. Wipe away any excess lubricant from components making sure to leave an ample amount on tapered cone face and mating surface of gripper back. **Lubricant must not be on seal.** Threads should be kept well lubricated with antisieze. Inspect threads and apply antisieze if necessary before testing. If the nut cannot be easily advanced to allow full gripper expansion, **DO NOT USE THIS PLUG FOR TESTING** and contact EST Customer Service.

2. For welded elbows, if the weld seam protrudes into the elbow ID, it is to be ground flush with the elbow ID to prevent interference with the grippers. The elbow ID is to be clean, dry and free of scale, dirt or debris.

WARNING! ACCEPTED INDUSTRY SAFETY PRACTICES MUST BE FOLLOWING WHEN LIFTING AND MOVING GT ELBOW TEST PLUGS AND DURING ALL STEPS RELATED TO INSTALLATION OR REMOVAL OF THE TEST PLUGS.

3. Two hoist rings have been provided for ease of installation and lifting the plug. Ensure that the top hoist ring is positioned as shown in relation to the vent for horizontal installation. The top hoist ring and vent must be located as shown to ensure that most air or gas is properly vented when used in a horizontal application. Position the test plug in a clean, lubricant free pipe end so that all the gripper teeth are within the pipe. The plug is to be centered within the pipe end regardless of the cut on the end of the pipe. Orient the plug so that the open end of the vent is at the highest point.

For Horizontal Installations use of a Test Plug Lifting Fixture (TP-LIFT-1024) will aid horizontal installation of the plug. See Operating Procedures for Test Plug Lifting Fixture (DC2590).

4. Incrementally tighten the hex nuts in standard cross or star pattern to the normal installation torque of **180 Ft-Lbs (244 N·m)**. Torque increments of 25%, 50%, 75% and 100% of the final installation torque are recommended. On plugs used horizontally, tightening the bottom hex nuts first will aid in centering the plug. There may exist cases (pipe defects, out-of-roundness, pipe seams, etc.) where a higher installation torque is necessary to seal the pipe. If a higher installation torque is necessary it is recommended that the installation torque be increased in increments only enough to seal the pipe. The maximum installation torque limit is **325 Ft-Lbs (441 N·m)**. Do not exceed the maximum installation torque of **325 Ft-Lbs (441 N·m)**. Use of a calibrated torque wrench is recommended.

WARNING! FAILURE TO APPLY THE INSTALLATION TORQUE SPECIFIED COULD RESULT IN UNSAFE OPERATION OR LEAKAGE.

5. Install the pressure source or vent to the plug, leak tight. For plugs not being used to pressurize or vent the system, install a pipe cap rated at or above the Grip Tight Elbow Test Plug test pressure, leak tight.
6. Fill the pipe with test medium while displacing any residual air or gas. Slowly introduce the test pressure. The test pressure must never exceed the maximum pressure listed in Tables 1 and 2.
7. As pressure increases, movement of the shaft as large as .60" (15.24mm) may be detected. This movement indicates additional squeeze of the seal and expansion of the grippers and is normal for this plug design. Should movement of the shaft or plug exceed 0.60" (15.24mm), release **ALL** pressure immediately, remove plug, examine, reinstall and begin testing in accordance with this operating procedure. Should movement of the shaft or plug during the test still exceed 0.60" (15.24mm), contact EST Customer Service for technical assistance.
8. Imperfections within the elbow being tested may cause small plug leaks as the test pressure is being increased. Should small leaks develop, additional tightening of the plug may be required. Prior to any plug adjustments release all pressure from the system. Make necessary adjustments and re-tighten hex nuts and re-pressurize the system. If leakage continues, the imperfections within the pipe must be removed.

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WARNING! NEVER STAND IN THE POSSIBLE PATH OF THE TEST PLUG.

WARNING! NEVER EXCEED THE MAXIMUM TORQUE SPECIFIED IN TABLES 1 & 2. DAMAGE TO THE PLUG MAY OCCUR.

9. At the conclusion of the test, release ALL pressure, loosen the hex nuts, remove and inspect plug. Any plug component, which is worn or damaged, must be replaced before attempting further testing. Contact EST Customer Service for replacement part information.
10. Prior to storing, dry all parts of the plug and lubricate the shaft threads and hardened washers with anti-seize. Also apply a light lubricant such as a Molykote® DX or SAE 10W motor oil to the tapered surface of the cone and cone surface contacting seal washer. Wipe away any excess lubricant from components making sure to leave an ample amount on tapered cone face and mating surface of gripper. **Lubricant must not be on seal.** Store these instructions with the plug.

SEAL AND GRIPPER REPLACEMENT (See DC2512)

1. Remove hex nuts and the hardened washers. Remove the spacer tubes if present.
2. Remove top washer.
3. Carefully remove gripper assembly, tapered cone, seal washer and seal. If care is taken the gripper assembly can be handled in its assembled configuration.
4. Install new seal.
5. Install seal washer so that the fillet (round) of the seal washer faced the seal.
6. Install tapered cone so that the large end of the cone is against the seal washer. Apply a light lubricant such as a Molykote® DX or SAE 10W motor oil to the tapered surface of the cone and cone surface contacting seal washer. Wipe away any excess lubricant from components making sure to leave an ample amount on tapered cone face. **Lubricant must not be on seal.** For 22" SCH5 and all 24" plug sizes, install the internal springs and washers, (1) every other shaft.
7. If gripper assembly has collapsed or if new a new gripper assembly is being installed it may be reassembled by placing the thick end of each gripper segment on a flat surface. Form a circle with all but (2) gripper segments, Install the garter spring around the gripper segments and into the groove on each gripper. Holding (2) adjacent segments stretch the spring and install an additional gripper section. Repeat for the remaining section. Carefully handle gripper assembly and install onto the plug so that tapered gripper surface mates with tapered cone surface.
8. Install top washer.
9. Lubricate shafts with anti-seize, if necessary. Install spacer tubes if present, hardened washers and hex nuts.

EST Group provides a complete range of repair products, services, and replacement parts covering the life cycle of heat exchangers and condensers; additionally EST Group provides products and services to facilitate pressure testing pipe, piping systems, pressure vessels, and their components. Visit EST Group on the Internet at <http://estgroup.cwfc.com>.

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TABLE 1. Technical Data And Installation Torque For GripTight Elbow Test Plugs In 10" Through 12" Elbow Sizes.

* NEVER use a test pressure greater than the weakest component in the system that can safely handle. The maximum test pressure for higher strength pipe/elbow must never exceed the highest test pressure listed for that pipe/elbow size. Do not use in coated pipe at any pressure. Contact EST Customer Service to determine use.

Sales Number	Elbow		Minimum Elbow ID Inches	Maximum Elbow ID Inches	Minimum Elbow ID mm	Maximum Elbow ID mm	* Maximum Pressure PsiG	* Maximum Pressure BarG	Normal Installation Torque Ft-Lbs	Maximum Installation Torque Ft-Lbs	Normal Installation Torque N*m	Maximum Installation Torque N*m
	Size	Schedule										
GTLBO-10P100	10	100	9.28	9.59	235.7	243.6	3350	231	180	325	244	440.6
GTLBO-10P80		80	9.53	9.80	242.1	248.9	3350	231	180	325	244	440.6
GTLBO-10PXS		XS	9.72	9.97	246.9	253.2	3350	231	180	325	244	440.6
GTLBO-10P40		40	9.99	10.21	253.7	259.3	3350	231	180	325	244	440.6
GTLBO-10P30		30	10.10	10.31	256.5	261.9	3350	231	180	325	244	440.6
GTLBO-10P20		20	10.22	10.41	259.6	264.4	3350	231	180	325	244	440.6
GTLBO-10P10		10S	10.39	10.56	263.9	268.2	3350	231	180	325	244	440.6
GTLBO-10P5		5	10.45	10.61	265.4	269.5	3350	231	180	325	244	440.6
GTLBO-12P160	12	160	10.10	10.41	256.5	264.4	3350	231	180	325	244	440.6
GTLBO-12P140		140	10.47	10.88	265.9	276.4	3350	231	180	325	244	440.6
GTLBO-12P120		120/XXS	10.72	11.09	272.3	281.7	3350	231	180	325	244	440.6
GTLBO-12P100		100	11.03	11.37	280.2	288.8	3350	231	180	325	244	440.6
GTLBO-12P80		80	11.34	11.64	288	295.7	3350	231	180	325	244	440.6
GTLBO-12P60		60	11.59	11.86	294.4	301.2	3350	231	180	325	244	440.6
GTLBO-12PXS		XS	11.72	11.97	297.7	304	3350	231	180	325	244	440.6
GTLBO-12P40		40	11.91	12.19	302.5	309.6	3350	231	180	325	244	440.6
GTLBO-12P30		30	12.03	12.27	305.6	311.7	3350	231	180	325	244	440.6
GTLBO-12P20		20	12.22	12.41	310.4	315.2	3350	231	180	325	244	440.6
GTLBO-12P10		10S/5	12.36	12.57	313.9	319.3	3350	231	180	325	244	440.6

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TABLE 2. Technical Data And Installation Torque For GripTight Elbow Test Plugs In 14” Through 16” Elbow Sizes.

* NEVER use a test pressure greater than the weakest component in the system that can safely handle. The maximum test pressure for higher strength pipe/elbow must never exceed the highest test pressure listed for that pipe/elbow size. Do not use in coated pipe at any pressure. Contact EST Customer Service to determine use.

Sales Number	Elbow		Minimum Elbow ID Inches	Maximum Elbow ID Inches	Minimum Elbow ID mm	Maximum Elbow ID mm	* Maximum Pressure PsiG	* Maximum Pressure BarG	Normal Installation Torque Ft-Lbs	Maximum Installation Torque Ft-Lbs	Normal Installation Torque N*m	Maximum Installation Torque N*m
	Size	Schedule										
GTLBO-14P160	14	160	11.16	11.63	283.5	295.4	3350	231	180	325	244	440.6
GTLBO-14P140		140	11.47	11.91	291.3	302.5	3350	231	180	325	244	440.6
GTLBO-14P120		120	11.78	12.18	299.2	309.4	3350	231	180	325	244	440.6
GTLBO-14P100		100	12.09	12.45	307.1	316.2	3350	231	180	325	244	440.6
GTLBO-14P80		80	12.47	12.78	316.7	324.6	3350	231	180	325	244	440.6
GTLBO-14P60		60	12.78	13.05	324.6	331.5	3350	231	180	325	244	440.6
GTLBO-14PXS		XS	12.97	13.22	329.4	335.8	3350	231	180	325	244	440.6
GTLBO-14P40		40	13.09	13.33	332.5	338.6	3350	231	180	325	244	440.6
GTLBO-14PSTD		30/STD	13.22	13.44	335.8	341.4	3350	231	180	325	244	440.6
GTLBO-14P20		20	13.34	13.55	338.8	344.2	3350	231	180	325	244	440.6
GTLBO-14P10		10	13.42	13.66	342.1	347	3350	231	180	325	244	440.6
GTLBO-14P10S		10S	13.55	13.77	342.1	347	3350	231	180	325	244	440.6
GTLBO-14P5		5	13.66	13.87	347	352.3	3350	231	180	325	244	440.6
GTLBO-16P160		16	160	12.78	13.05	324.6	331.5	3350	231	180	325	244
GTLBO-16P140	140		13.09	13.33	332.5	338.6	3350	231	180	325	244	440.6
GTLBO-16P120	120		13.53	13.96	343.7	354.6	3350	231	180	325	244	440.6
GTLBO-16P100	100		13.91	14.29	353.3	363	3350	231	180	325	244	440.6
GTLBO-16P80	80		14.28	14.62	362.7	371.3	3350	231	180	325	244	440.6
GTLBO-16P60	60		14.61	14.95	371.1	379.6	3350	231	180	325	244	440.6
GTLBO-16P40	40/XS		14.92	15.22	379	386.6	3350	231	180	325	244	440.6
GTLBO-16PSTD	30/STD		15.22	15.44	386.6	392.1	3350	231	180	325	244	440.6
GTLBO-16P20	20		15.34	15.55	389.6	394.9	3350	231	180	325	244	440.6
GTLBO-16P10	10		15.42	15.66	391.6	397.7	3350	231	180	325	244	440.6
GTLBO-16P10S	10S/5		15.55	15.81	395.1	401.6	3350	231	180	325	244	440.6

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TABLE 3. Technical Data And Installation Torque For GripTight Elbow Test Plugs In 18” Through 20” Elbow Sizes.

* NEVER use a test pressure greater than the weakest component in the system that can safely handle. The maximum test pressure for higher strength pipe/elbow must never exceed the highest test pressure listed for that pipe/elbow size. Do not use in coated pipe at any pressure. Contact EST Customer Service to determine use.

Sales Number	Elbow		Minimum Elbow ID Inches	Maximum Elbow ID Inches	Minimum Elbow ID mm	Maximum Elbow ID mm	* Maximum Pressure PsiG	* Maximum Pressure BarG	Normal Installation Torque Ft-Lbs	Maximum Installation Torque Ft-Lbs	Normal Installation Torque N*m	Maximum Installation Torque N*m
	Size	Schedule										
GTLBO-18P160	18	160	14.35	14.98	364.5	380.4	3350	231	180	325	244	440.6
GTLBO-18P140		140	14.79	15.36	375.7	390.2	3350	231	180	325	244	440.6
GTLBO-18P120		120	15.22	15.69	386.6	398.5	3350	231	180	325	244	440.6
GTLBO-18P100		100	15.66	16.07	397.8	408.2	3350	231	180	325	244	440.6
GTLBO-18P80		80	16.09	16.45	408.7	417.9	3350	231	180	325	244	440.6
GTLBO-18P60		60	16.47	16.78	418.3	426.2	3350	231	180	325	244	440.6
GTLBO-18P40		40	16.84	17.11	427.7	434.6	3350	231	180	325	244	440.6
GTLBO-18PXS		XS	16.97	17.22	431.0	437.4	3350	231	180	325	244	440.6
GTLBO-18P30		30	17.09	17.33	434.1	440.1	3350	231	180	325	244	440.6
GTLBO-18PSTD		STD	17.22	17.44	437.4	442.9	3350	231	180	325	244	440.6
GTLBO-18P20		20	17.34	17.55	440.4	445.7	3350	231	180	325	244	440.6
GTLBO-18P10		10	17.47	17.66	443.7	448.5	3350	231	180	325	244	440.6
GTLBO-18P10S		10S/5	17.64	17.81	448.1	452.2	3350	231	180	325	244	440.6
GTLBO-20P160	20	160	15.97	16.68	405.6	423.7	3350	231	180	325	244	440.6
GTLBO-20P140		140	16.42	17.06	417.1	433.4	3350	231	180	325	244	440.6
GTLBO-20P120		120	16.92	17.50	429.8	444.5	3350	231	180	325	244	440.6
GTLBO-20P100		100	17.41	17.88	442.2	454.2	3350	231	180	325	244	440.6
GTLBO-20P80		80	17.91	18.32	454.9	465.3	3350	231	180	325	244	440.6
GTLBO-20P60		60	18.34	18.70	465.8	475.1	3350	231	180	325	244	440.6
GTLBO-20P40		40	18.78	19.09	477.0	484.8	3350	231	180	325	244	440.6
GTLBO-20P30		30/XS	18.97	19.25	481.8	489.0	3350	231	180	325	244	440.6
GTLBO-20PSTD		20/STD	19.22	19.47	488.2	494.5	3350	231	180	325	244	440.6
GTLBO-20P10		10/10S/5	19.48	19.80	494.8	502.8	3350	231	180	325	244	440.6

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TABLE 4. Technical Data And Installation Torque For GripTight Elbow Test Plugs In 22” Through 24” Elbow Sizes.

* NEVER use a test pressure greater than the weakest component in the system that can safely handle. The maximum test pressure for higher strength pipe/elbow must never exceed the highest test pressure listed for that pipe/elbow size. Do not use in coated pipe at any pressure. Contact EST Customer Service to determine use.

Sales Number	Elbow		Minimum Elbow ID Inches	Maximum Elbow ID Inches	Minimum Elbow ID mm	Maximum Elbow ID mm	* Maximum Pressure PsiG	* Maximum Pressure BarG	Normal Installation Torque Ft-Lbs	Maximum Installation Torque Ft-Lbs	Normal Installation Torque N*m	Maximum Installation Torque N*m
	Size	Schedule										
GTLBO-22P160	22	160	17.65	18.11	448.3	460.0	3350	231	180	325	244	440.6
GTLBO-22P140		140	18.16	18.62	461.3	472.9	3350	231	180	325	244	440.6
GTLBO-22P120		120	18.68	19.28	474.5	489.7	3350	231	180	325	244	440.6
GTLBO-22P100		100	19.22	19.72	488.2	500.9	3350	231	180	325	244	440.6
GTLBO-22P80		80	19.72	20.16	500.9	512.0	3350	231	180	325	244	440.6
GTLBO-22P60		60	20.22	20.59	513.6	523.1	3350	231	180	325	244	440.6
GTLBO-22PX5		XS	20.97	21.25	532.6	539.8	3350	231	180	325	244	440.6
GTLBO-22PSTD		20/STD	21.22	21.47	539.0	545.3	3350	231	180	325	244	440.6
GTLBO-22P10		10/10S	21.47	21.69	545.3	550.9	3350	231	180	325	244	440.6
GTLBO-22P5		5	21.59	21.80	548.4	553.7	3350	231	180	325	244	440.6
GTLBO-24P160		24	160	19.23	19.69	488.4	500.1	3350	231	180	325	244
GTLBO-24P140	140		19.76	20.22	501.9	513.6	3350	231	180	325	244	440.6
GTLBO-24P120	120		20.34	20.95	516.6	532.2	3350	231	180	325	244	440.6
GTLBO-24P100	100		20.91	21.45	531.1	544.7	3350	231	180	325	244	440.6
GTLBO-24P80	80		21.53	21.99	546.9	558.6	3350	231	180	325	244	440.6
GTLBO-24P60	60		22.03	22.43	559.6	569.7	3350	231	180	325	244	440.6
GTLBO-24P40	40		22.59	22.92	573.8	582.2	3350	231	180	325	244	440.6
GTLBO-24P30	30		22.84	23.14	580.1	587.8	3350	231	180	325	244	440.6
GTLBO-24PX5	XS		22.97	23.25	583.4	590.6	3350	231	180	325	244	440.6
GTLBO-24PSTD	20/STD		23.22	23.47	589.8	596.1	3350	231	180	325	244	440.6
GTLBO-24P10	10/5		23.47	23.69	596.1	601.7	3350	231	180	325	244	440.6

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