Operating Procedures for 2” SCH 160 through 5” SCH 80 GripTight® Long Radius Elbow Test Plug

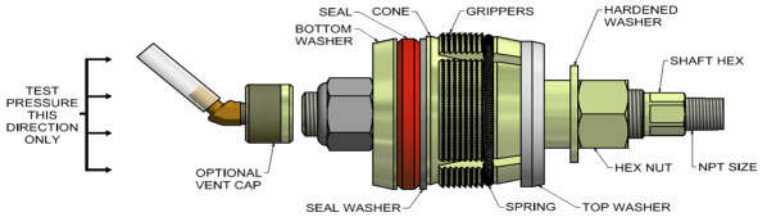
Thank you for choosing to use a GripTight Long Radius Elbow Test Plug. In order to carry out safe testing with your GripTight Elbow Test Plug, the following equipment is required:

1. A calibrated torque wrench capable of producing the required torque
2. A crowfoot wrench or deep well socket (see Table 1 for sizing information)
3. A wrench to interface with the Shaft Hex (see Table 1)
4. Pipe cap(s) with working pressure greater than or equal to the test pressure being used (see Table 1 for size).

All required equipment is available for purchase through EST Group. All equipment and components required to maintain and refurbish Test Plugs is also available through EST Group. Contact EST Group Customer Service for information.

WARNING

- ⚠ Pressure testing is inherently dangerous. Strict adherence to these operating procedures and industry standard safety practices could prevent injury to personnel and damage to equipment.
- ⚠ All personnel must be clear of the Test Plug during pressure testing. Never stand in the potential path of a GripTight Elbow Test Plug during testing. Always understand and observe industry standard safe practices for distance between personnel and equipment being tested.
- ⚠ Pressures must never exceed the maximum pressure rating of any component in a system or the maximum pressure rating of the Test Plug being used.
- ⚠ For safety, an incompressible liquid such as water should be used as the test medium. Residual air or gas must be displaced from the pipe prior to testing. For horizontal testing applications, an optional GripTight Vent Cap (GTVC) will allow for venting of most air or gas. The GTVC is available for most Test Plugs – see Table 3: GripTight Vent Cap Selection Guide.
- ⚠ If testing pneumatically, every attempt to limit potential damage to equipment or injury to personnel must be made. Testing procedures and protocol should adhere to the provisions for pneumatic testing set forth in the current ASME PCC-2 Repair of Pressure Equipment and Piping.
- ⚠ The Test Plugs are designed to withstand test pressure in the direction shown below. Do not use these plugs in applications that would subject the plugs to pressure in a manner that differs from the images below.
- ⚠ The maximum temperature exposure for urethane seals is 180°F (82°C). Contact EST Group Customer Service if high temperature seal materials are needed.



Single-Shaft GripTight Elbow Test Plugs

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1. Test Preparation

1. Fully read and understand these operating procedures. Pressure testing is inherently dangerous and must be performed as safely as possible. If any instruction contained in this document is unclear, STOP and contact EST Group Customer Service.
2. Following these procedures and industry standard safe practices may prevent injury to personnel and damage to property.
3. Read these instructions prior to every test. Be familiar with and use applicable Human Performance Tools before, during, and after every test.
4. Hydrostatic testing is preferred over pneumatic testing due to safety concerns. Displace as much air or gas as possible prior to conducting a hydrostatic test.
5. If any instruction contained in these operating procedures contradicts a site specific guideline or procedure: STOP and contact EST Group Customer Service for guidance.

- Test pressure MUST NOT exceed the maximum pressure rating of the lowest rated component under test.
- The test pressure MUST NOT exceed the rated pressure of the plug.
- Test pressure MUST NOT exceed 80% of specified minimum yield stress for host pipe, tube, or equipment.

Examples of Human Performance Tools

- Pre-Job Briefing
- Two-Minute Drill
- Three-Way Communication
- Phonetic Alphabet
- S.T.A.R. (Stop-Think-Act-Review)
- Procedure Use and Adherence
- Place Keeping (Circle Slash)
- Flagging / Operational Barriers
- Self-Checking
- Independent Verification
- Concurrent Verification
- First Check
- STOP When Unsure
- Peer Checking
- Post-Job Review

WARNING

⚠ Contact EST Group Customer Service if the test pressure required exceeds the maximum plug rating or is in excess of 80% of specified minimum yield stress for host elbow, pipe, tube, or equipment.

2. Equipment Inspection and Preparation

Perform the following steps prior to performing your pressure test.

Step/Action	*Additional Action/Information/Result*
1. Visually inspect the plug for worn or damaged components. Replace as needed. 2. Lubricate tapered surface of the cone and surfaces of the cone and seal washer which are in contact with each other	• The tapered surface between the Cone and Grippers and surface between the CONE and SEAL WASHER must be free of friction producing dirt or corrosion. • Apply a light lubricant such as SAE 10W motor oil to the tapered surface of the Cone and to the surfaces of the Cone and Seal Washer which are in contact with each other. Wipe away any excess lubricant from components making sure to leave an ample amount on cone and mating surface of gripper back and seal washer. Lubricant **must not** be on seal. • The Seal(s) must not have excessive deformations, cuts or scores.
3. Liberally spread antiseize over both sides of the Hardened Washer and on the threads of the Shaft.	**CAUTION** ⚠ Failure to properly lubricate Shaft thread, Cone and Washer surfaces may result in unsafe operating conditions or plug leakage.

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Step/Action	*Additional Action/Information/Result*

4. Tighten the Hex Nut(s) so the Grippers move freely to the end of the tapered Cone surface.

If	*then*
Grippers move freely to end of the tapered Cone surfaces,	Loosen the Hex Nut(s) back to its/their original position(s) and go to the next step.
Grippers do not fully retract,	If required, remove any light rust, residue or corrosion on the cone face, gripper backs and tops, seal washer and underside of positioning washer using a Scotch Brite Pad or pad of equivalent quality. Re-lubricate gripper backs and, tops, tapered cone surface and surfaces of Cone and Seal Washer which are in contact with each other using a light lubricant such as SAE 10W motor oil. Wipe away any excess lubricant from components making sure to leave an ample amount of tapered cone face and mating surface of gripper back as well as mating surfaces of cone and seal washer. If grippers still do not fully retract and nut cannot be easily advanced, do not use this plug for testing. Contact EST Group Customer Service for assistance.
The Hex Nut(s) cannot easily be tightened to allow full gripper expansion	Do not use this plug for testing. Contact EST Group Customer Service for assistance.

5. Clean and dry the inside of the pipe.

- All moisture, debris, and excessive scale must be removed from the pipe ID to ensure a proper seal is established during the pressure test.

6. Verify that the pipe size and schedule stamped on the GripTight Elbow Test Plug is equivalent to the size of the pipe you are testing, or that the inside diameter (ID) of the equipment being tested is within the ID operating range for the GripTight Elbow Test Plug being used.

- See Table 1 for the Functional ID Operating Range for GripTight Elbow Test Plugs.

7. Verify that the equipment to be tested is prepared before performing the test. Make sure all applicable safety procedures are observed and followed, e.g. Lock-Out Tag-Out, work permits, correct components is being tested, etc.

CAUTION

⚠ Special caution must be taken when applying lubricant and handling the GripTight Elbow Test Plug. The lubricant must not come in contact with the Seal, the Gripper Teeth, or the inside of the pipe or tube.

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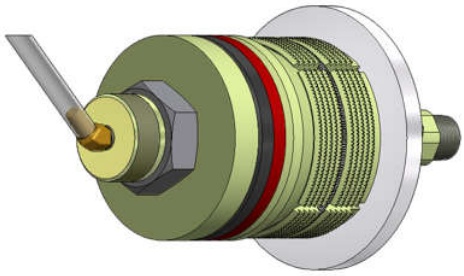
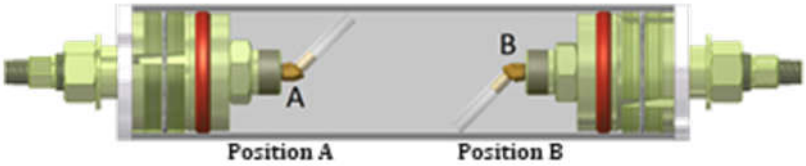
3. Installing and Using the GripTight Vent Cap

Perform these steps if you are using the optional GripTight Vent Cap (see Table 2: GripTight Vent Cap Selection Guide for sizing). Use of a GripTight Vent Cap to remove air from horizontal hydrotest applications is strongly recommended. Contact EST Group Customer Service for availability. If you are not using the GripTight Vent Cap during your pressure test, then proceed to Section 4: Installing and Using the Safety Gag.

Step/Action	*Additional Action/Information/Result*
1. Thread the GripTight Vent Cap on to the shaft below the Bottom Washer.	• The GripTight Vent Cap is now installed on the plug. 
2. Cut or bend the Plastic Tube so the open end just fits within the elbow/pipe ID.	• The Plastic Tube should easily fit within the pipe.
3. Ensure GripTight Vent Cap is positioned correctly within the elbow/pipe prior to plug installation.	

If	*Then*
Venting air from the elbow/pipe prior to hydrostatic testing, Test Plug and Vent Cap (Position A),	Install the GripTight Elbow Test Plug in the elbow/pipe with the GripTight Vent Cap Plastic Tube OR Vent Channel pointing up – toward 12 o'clock position.
Removing test medium from the elbow/pipe following hydrostatic testing, Test Plug and Vent Cap (Position B),	Install the GripTight Elbow Test Plug in the elbow/pipe with the GripTight Vent Cap Plastic Tube or Vent Channel pointing down – toward 6 o'clock position.
Using GripTight Vent Caps in Position A and Position B,	Fill and drain the pipe from Position B and vent from Position A.



- To drain the test medium using low pressure air, introduce the compressed air through plug A. The hydrostatic test medium will be pushed out of the elbow/pipe through plug B. The pipe is drained of the test medium when air begins to come out of plug B. It may be helpful to attach a hose to plug B during this process to control the test medium.

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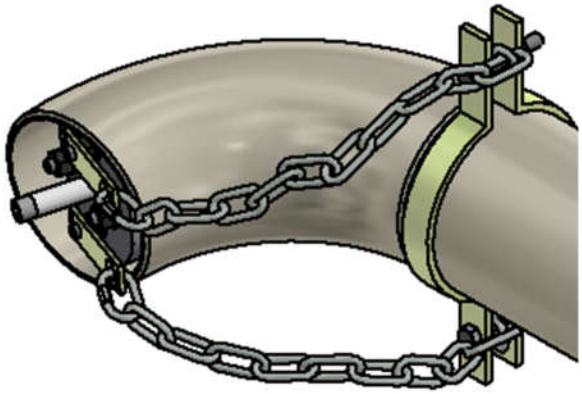
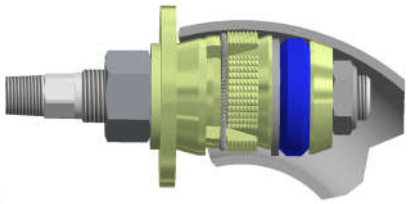
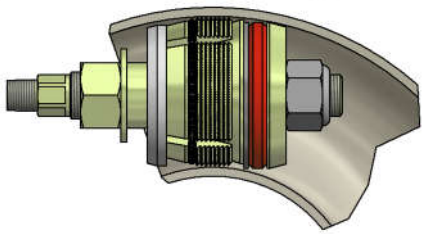
4. Installing and Using the Safety Gag

Perform the following steps if you are using the optional Safety Gag. Regardless of test pressure, Safety Gags are strongly recommended for every application as they enhance the safety of the test system configuration.. If a Safety Gag is not being used, skip to Section 5: Performing the Pressure Test.

Step/Action	*Additional Action/Information/Result*
1. Install Safety Gag Pipe Clamps onto elbow/pipe being tested. If required, the safety chains may be placed between the Pipe Clamps. This configuration is acceptable as long as the placement of the chains does not prevent the Safety Gag from tightening securely on to the outside of the elbow, pipe or tube.	**If** — Using a Safety Gag; **Then** — Install the Safety Gag pipe clamps onto the elbow/pipe. **CAUTION** ⚠ GripTight Elbow Test Plug Seals and Grippers are energized by test pressure. During pressurization, the Shaft(s) may move slightly. This is normal and expected. A small amount of slack in the Safety Chain(s) is required for this movement and energization to occur.
2. Tighten the bolts enough to prevent the Safety Gag from moving. The Safety Gag should not be able to slide or move when pushed or pulled. 3. Insert GripTight Elbow Test Plug into the equipment to be tested. 4. Follow remaining GripTight Elbow Test Plug installation procedure as per the steps in Section 5: Performing the Pressure Test. 5. Slip the Link(s) over the Shaft(s) before introducing test medium or test pressure. Do not place the Link(s) under the GripTight Elbow Test Plug Hex Nut(s).	

5. Performing the Pressure Test

Step/Action	*Additional Action/Information/Result*
1. Place the Test Plug inside the elbow. The Test Plug must be able to fit with the full length of the Grippers inside the elbow. Ideally, the plug should be inserted until the top washer inner surface completely inserted into the face of the equipment being tested.	 

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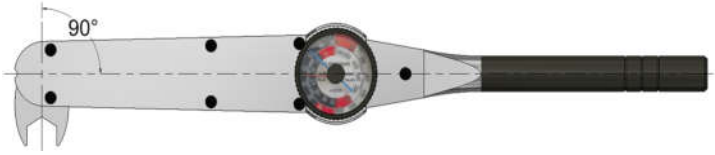
Step/Action	*Additional Action/Information/Result*
2. If testing in seam-welded pipes or elbows, position the Grippers so that the weld seam is between Gripper segments. See Step/Action 9 for more information.	**Warning** ⚠ It is sometimes necessary to remove the weld seam in the area where the GripTight Elbow Test Plug is being installed. Carefully machine the weld bead. ***Note:*** The inside of the elbow, tube or pipe must be clean, dry, and free of rust, scale or debris.
3. Center the GripTight Elbow Test Plug within the elbow/pipe and hand tighten the Hex Nut(s) until the test plug has gripped the pipe ID. ***Note:*** Slight wiggling of the plug may allow for further hand tightening of the Hex Nut(s).	
4. Tighten the Hex Nut with a calibrated torque wrench and an appropriately sized crowfoot wrench. See Table 1: GripTight Elbow Single-Shaft Test Plug Specifications for nominal and maximum installation torques.	**CAUTION** ⚠ Using a wrench on the Shaft Hex will prevent the Shaft on Single-Shaft GripTight Elbow Test Plugs from spinning during installation. ⚠ The torque wrench being used must be calibrated to ensure that the correct amount of torque is being applied. An un-calibrated torque wrench may cause the operator to tighten the Hex Nut either too much or too little. This may result in unsafe operating conditions or prevent testing from being carried out successfully. ⚠ Some crowfoot wrenches may not be able to apply the required amount of torque for some GripTight Elbow Test Plugs. Before attempting to install, make sure the equipment being used is of adequate strength for the application. Using an insufficiently strong crowfoot wrench may cause injury to personnel or damage to the GripTight Elbow Test Plug. ⚠ Failure to apply at least the nominal installation torque from Table 1 or Table 2 may result in unsafe operation of the plug. ⚠ If a crowfoot wrench is used, ensure wrench is used at a 90° angle relative to the handle of the torque wrench. Failure to do so can result in significant and dangerous over-torque.
5. If a Safety Gag is being used, slip the Link(s) over the Shaft before proceeding. The Link(s) should not be placed under the Hex Nut.	
6. Install the pressure source leak tight. Use of a hose whip restraint is very strongly recommended. Inspect all connections to ensure they are leak tight.	• For GripTight Elbow Test Plugs not being used to pressurize or vent the system, install a pipe cap with a pressure rating that is greater than or equal to the maximum test pressure being used. **CAUTION** ⚠ Before proceeding, inspect the unit / component under test to ensure every component is in the correct configuration. This includes checking to make sure all GripTight Elbow Test Plugs being used have been properly installed.

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Step/Action	*Additional Action/Information/Result*
7. Fill the pipe with test medium.	 Position A Position B • Check for any leaks while filling. • If using a GripTight Vent Cap or plug is equipped with a Vent Channel, fill the elbow, pipe or tube being tested until test medium flows steadily out of GripTight Elbow Test Plug in position A (the Vent position). • If not using a GripTight Vent Cap or plug equipped with a Vent Channel, displace residual gases from the test system by opening the system at its highest point.
8. Perform the pressure test. 9. Check for leaks. A drop in pressure may not necessarily indicate a leak, as the GripTight Elbow Test Plugs require some time to "settle" while pressure is applied and the testing is being performed.	• Slowly introduce the test pressure. TEST PRESSURE MUST NEVER EXCEED THE MAXIMUM PRESSURE RATING OF ANY COMPONENT IN THE SYSTEM UNDER TEST. TEST PRESSURE MUST NEVER EXCEED THE MAXIMUM PRESSURE RATING OF THE GRIPTIGHT ELBOW TEST PLUG BEING USED. • Imperfections within the pipe being tested may cause small leaks. • Seam welded pipes occasionally require some weld bead to be removed. If the pipe is seam-welded and leaking persists after additional tightening, remove the weld bead in the area where the GripTight Elbow Test Plug is installed. • If leaks persist, additional tightening of the Hex Nut may be required. **RELEASE ALL TEST PRESSURE** before making adjustments to the GripTight Elbow Test Plug. • Do not exceed the maximum torque for the GripTight Elbow Test Plug. See Table 1 for torque values.
10. Verify that GripTight Elbow Test Plug movement is within specified limits. **Warning** ⚠ Never re-torque the hex nut while the plug is pressurized. This is unsafe and can cause damage to the GripTight Elbow Test Plug. Release all pressure prior to adjusting GripTight Elbow Test Plug torque.	• Movement of the Shaft(s) during testing is expected and acceptable. For Single-Shaft GripTight Elbow Test plugs, movement up to 0.25" (6.4 mm) is acceptable. If Shaft movement exceeds the acceptable amount, immediately release all pressure and remove the GripTight Elbow Test Plug. • Examine the GripTight Elbow Test Plug components for wear. Pay particular attention to the condition of the Grippers. Replace parts as necessary. • Reinstall the GripTight Elbow Test Plug, following all instructions provided. Increase the installation torque used. Do not exceed the maximum torque rating for the plug. ***Note:*** If excessive Shaft movement persists after using the maximum GripTight Elbow installation torque, **stop the test, release all test pressure, and contact EST Group customer Service for technical assistance.**
11. Release all pressure from the system once the test is completed.	• If using a GripTight Vent Cap to recover test medium, apply low pressure air to plug in Position A (see Section 3 - Installing and Using the GripTight Vent Cap as a reference). • Loosen the Hex Nut, remove the GripTight Elbow Test Plug from the pipe and then inspect the GripTight Elbow Test Plug for any deformation or damage.

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Step/Action	*Additional Action/Information/Result*

Warning

⚠ Some test medium may remain inside the pipe after a hydrostatic test has been conducted. Caution must be taken when loosening Hex Nut(s) and removing GripTight Elbow Test Plugs to prevent unsafe conditions from occurring during removal, e.g. water spills onto a catwalk creating slippery conditions.

6. Storage

- Prior to storing, clean and dry the GripTight Elbow Test Plug. Do not allow the Seal(s) to come in contact with any cleaning chemicals or solvents. Exposure to these chemicals may damage the Seal(s).
- Re-lubricate the Shaft threads and between the Hex Nut and mating surface(s) as previously described in Section 2: Equipment Inspection and Preparation. Store these instructions with each GripTight Elbow Test Plug.
- Store the GripTight Elbow Test Plug in an area out of direct exposure to sun or ultraviolet (UV) light. Do not store in an area where it will be subjected to heat in excess of 180°F (82°C). Excessive heat or UV light exposure will damage and prematurely degrade the Seal(s).

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Table 1: GripTight Elbow Single-Shaft Test Plug Specifications

Part Number	Long Radius Elbow Size & Schedule inches	Shaft Hex Size Across Flats inches	Hex Nut Size Across Flats inches	Functional ID Operating Range inches (mm)	Nominal Installation Torque ft*lbs (N*m)	Maximum Installation Torque ft*lbs (N*m)	NPT (M) Size	Maximum Test Pressure PsiG (BarG)
GTLBO-2P160	2" 160	1/2	15/16	1.66 - 1.77 (42.2 - 45.0)	20 (27)	40 (54)	1/4	3350 (231)
GTLBO-25PXXS	2-1/2" XXS	1/2	15/16	1.74 - 1.91 (44.2 - 48.5)	20 (27)	40 (54)	1/4	3350 (231)
GTLBO-2P80	2" 80 / XS	11/16	1 5/16	1.91 - 1.99 (48.5 - 50.5)	75 (102)	120 (163)	3/8	3350 (231)
GTLBO-2P40	2" 40 / STD	11/16	1 5/16	2.04 - 2.12 (51.8 - 53.8)	75 (102)	120 (163)	3/8	3350 (231)
GTLBO-25P160	2-1/2" 160	11/16	1 5/16	2.10 - 2.22 (53.3 - 56.4)	75 (102)	120 (163)	3/8	3350 (231)
GTLBO-2P10	2" 10	11/16	1 5/16	2.10 - 2.22 (53.3 - 56.4)	75 (102)	120 (163)	3/8	3350 (231)
GTLBO-2P5	2" 5	11/16	1 5/16	2.22 - 2.30 (56.4 - 58.4)	75 (102)	120 (163)	3/8	3350 (231)
GTLBO-25P80	2-1/2" 80 /XS	11/16	1 5/16	2.27 - 2.45 (57.7 - 62.2)	75 (102)	120 (163)	3/8	3350 (231)
GTLBO-3PXXS	3" XXS	11/16	1 5/16	2.27 - 2.45 (57.7 - 62.2)	75 (102)	120 (163)	3/8	3350 (231)
GTLBO-25P40	2-1/2" 40	1	17/8	2.44 - 2.54 (62.0 - 64.5)	150 (204)	250 (339)	1/2	3350 (231)
GTLBO-25P10	2-1/2" 10	1	17/8	2.60 - 2.74 (66.0 - 69.6)	150 (204)	250 (339)	1/2	3350 (231)
GTLBO-3P160	3" 160	1	17/8	2.60 - 2.74 (66.0 - 69.6)	150 (204)	250 (339)	1/2	3350 (231)
GTLBO-25P5	2-1/2" 5	1	17/8	2.68 - 2.78 (68.1 - 70.6)	150 (204)	251 (339)	1/2	3350 (231)
GTLBO-35PXXS	3-1/2" XXS	1	17/8	2.70 - 2.89 (68.6 - 73.4)	150 (204)	250 (339)	1/2	3350 (231)
GTLBO-3P80	3" 80 / XS	1	17/8	2.87 - 2.98 (72.9 - 75.7)	150 (204)	250 (339)	1/2	3350 (231)
GTLBO-3P40	3" 40 / STD	1	17/8	3.04 - 3.14 (77.2 - 79.8)	150 (204)	250 (339)	1/2	3350 (231)
GTLBO-4PXXS	4" XXS	1	17/8	3.12 - 3.32 (79.2 - 84.3)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-3P10	3" 10	1	17/8	3.23 - 3.34 (82.0 - 84.8)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-3P5	3" 5	1	17/8	3.30 - 3.41 (83.8 - 86.6)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-35P80	3-1/2" 80/XS	1	17/8	3.33 - 3.44 (84.6 - 87.4)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-4P160	4" 160	1	17/8	3.41 - 3.57 (86.6 - 90.7)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-35P40	3-1/2" 40/STD	1	17/8	3.52 - 3.63 (89.4 - 92.2)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-4P120	4" 120	1	17/8	3.60 - 3.74 (91.4 - 95.0)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-35P10	3-1/2" 10	1	17/8	3.73 - 3.84 (94.7 - 97.5)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-4P80	4" 80 / XS	1	17/8	3.80 - 3.91 (96.5 - 99.3)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-35P5	3-1/2" 5	1	17/8	3.80 - 3.91 (96.5 - 99.3)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-4P40	4" 40 / STD	1	17/8	4.00 - 4.11 (101.6 - 104.4)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-5PXXS	5" XXS	1	17/8	4.03 - 4.25 (102.4 - 108.0)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-4P10	4" 10	1	17/8	4.23 - 4.34 (107.4 - 110.2)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-4P5	4" 5	1	17/8	4.28 - 4.47 (108.7 - 113.5)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-5P160	5" 160	1	17/8	4.28 - 4.47 (108.7 - 113.5)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-5P120	5" 120	1	17/8	4.53 - 4.69 (115.1 - 119.1)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-6PXXS	6" XXS	1	17/8	4.59 - 4.82 (116.6 - 122.4)	150 (204)	300 (407)	1/2	3350 (231)
GTLBO-5P80	5" 80	1	17/8	4.78 - 4.91 (121.4 - 124.7)	150 (204)	300 (407)	1/2	3350 (231)

Questions? Contact EST Group Customer Service at any of the following locations.

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Table 2: GripTight Vent Cap Selection Guide

Elbow Size NPS (DN)	SCH 5	SCH 10	STD	SCH 40	XS	SCH 80	SCH 120	SCH 160	XXS
2 (50)	*	*	*	*	*	*	-	*	*
2-1/2 (65)	*	*	*	*	*	*	-	*	*
3 (80)	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	-	GTVC-0113	GTVC-0070
3-1/2 (90)	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	-	GTVC-0113	GTVC-0113
4 (100)	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113	GTVC-0113

*Note: GripTight Vent Caps not available due to small elbow ID's and space restrictions.

Table 3: Replacement Parts and Accessories for Standard NPS Size GripTight Elbow Test Plugs

GTLBO Plug Part Number	Replacement Gripper Assembly (Includes Spring)	Replacement Seal	Replacement Spring	Safety Gag	High Pressure Cap
Contact EST Group Customer Service for Replacement Parts and Accessories Part Number					

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