

## Operating Procedures for 5” through 24” GripTight® Elbow Test Plug

Thank you for choosing to use a GripTight® Elbow Test Plug. Please note that the following procedures apply to testing metallic pipes or tubes. If you are testing non-metallic pipes or tubes, please contact EST Group Customer Service prior to usage. Failure to follow the correct procedures for testing non-metallic pipes or tubes may result in injury to personnel and damage to equipment.

In order to carry out safe testing with your GripTight Elbow Test Plug, the following equipment is required:

1. A calibrated torque wrench that is capable of producing the required torque
2. A deep socket or crowfoot wrench
3. Pipe cap(s) or couplings with working pressure greater than or equal to the test pressure being used (see Tables 1, 2 & 3 for size).

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

### WARNING

- ⚠ **GTLBO plugs are for use in all Carbon Steel, Stainless Steel and Alloy pipes with a hardness up to HRC 32. Contact EST Customer Service if pipes to be tested have a hardness greater than HRC 32.**
- ⚠ **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 pipe, tube, or equipment.**
- ⚠ **Pressure testing is inherently dangerous. Strict adherence to the operating procedures and industry standard safety practices could prevent injury to personnel and damage to equipment.**
- ⚠ **All personnel must be clear of the GripTight Elbow 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 GripTight Elbow Test Plug being used.**
- ⚠ **For improved safety, EST Group always recommends testing with an incompressible liquid such as water. Residual air or gas must be displaced or vented from the system 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.**

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

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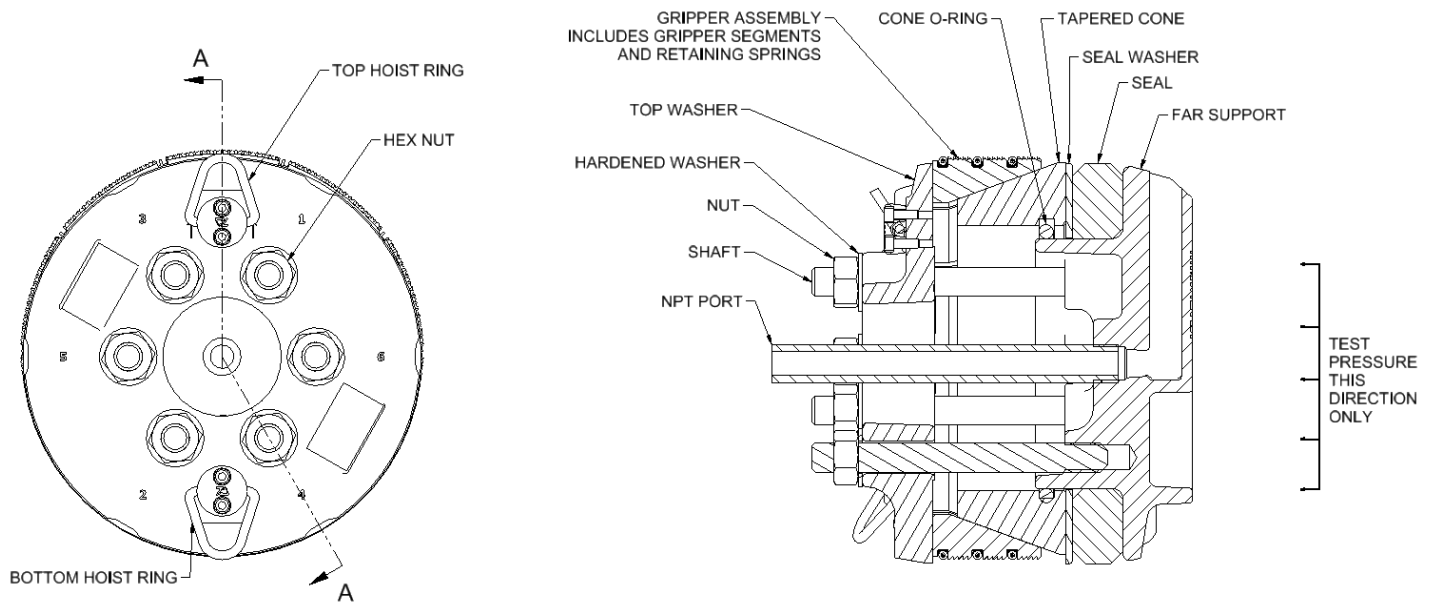
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**GripTight Elbow High Pressure Test Plug**

## 1. Test Preparation

- 1.1. 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.
- 1.2. Following these procedures and industry standard safe practices may prevent injury to personnel and damage to property.
- 1.3. Read these instructions prior to every test. Be familiar with and use applicable Human Performance Tools before, during, and after every test.
- 1.4. 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.
- 1.5. 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

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## 2. Equipment Inspection and Preparation

Perform the following steps prior to performing your pressure test.

| Step/Action  | Additional Action/Information/Result  |    |      |   |  |                                |  |   |  |
|--|---|----|------|---|--|--------------------------------|--|---|--|
| 2.1. Visually inspect the plug for worn or damaged components. Replace as needed.                        | <ul style="list-style-type: none"> <li>The tapered surface between the Cone and Grippers must be free of friction producing dirt or corrosion.</li> <li>Apply a lubricant such as Molykote® DX or SAE 10W motor oil to the tapered surface of the Cone. 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 <u>must not</u> be on seal.</li> </ul>   |    |      |   |  |                                |  |   |  |
| 2.2. Lubricate surface of the Tapered Cone.  | <ul style="list-style-type: none"> <li>The Seal must not have excessive deformations, cuts or scores.</li> </ul>  |    |      |   |  |                                |  |   |  |
| 2.3. Inspect or lubricate the underside of the positioning washer where the grippers slide.              |   |    |      |   |  |                                |  |   |  |
| 2.4. Liberally spread antiseize over both sides of the Hardened Washers and on the threads of the Shaft. | <p style="text-align: center;"><b>CAUTION</b></p> <p>⚠ Failure to properly lubricate Shaft thread and Washer surfaces may result in unsafe operating conditions or plug leakage.</p>  |    |      |   |  |                                |  |   |  |
| 2.5. Verify there is no debris in the gripper teeth; clean as needed.                                    |   |    |      |   |  |                                |  |   |  |
| 2.6. Tighten the Hex Nuts so the Grippers move freely to the end of the Tapered Cone surface.            | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #4F81BD; color: white;">If</th> <th style="background-color: #4F81BD; color: white;">then</th> </tr> </thead> <tbody> <tr> <td>Grippers move freely to end of the tapered Cone surfaces,</td> <td>Loosen the Hex Nuts back to its/their original position and go to the next step.</td> </tr> <tr> <td>Grippers do not fully retract,</td> <td>If required, remove any light rust, residue or corrosion on the cone face, gripper backs and tops and underside of positioning washer using a Scotch Brite Pad or pad of equivalent quality. Re-lubricate gripper backs, tops and tapered cone surface using a lubricant such as Molykote® DX or SAE 10W motor oil. Wipe away any excess lubricant from components making sure to leave an ample amount on Tapered Cone face and mating surface of gripper back. If grippers still do not fully retract and nuts cannot be easily advanced, do not use this plug for testing. Contact EST Group Customer Service for assistance.</td> </tr> <tr> <td>The Hex Nuts cannot easily be tightened to allow full gripper expansion</td> <td>Do not use this plug for testing. Contact EST Group Customer Service for assistance.</td> </tr> </tbody> </table> | If | then | Grippers move freely to end of the tapered Cone surfaces, | Loosen the Hex Nuts back to its/their original position 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 and underside of positioning washer using a Scotch Brite Pad or pad of equivalent quality. Re-lubricate gripper backs, tops and tapered cone surface using a lubricant such as Molykote® DX or SAE 10W motor oil. Wipe away any excess lubricant from components making sure to leave an ample amount on Tapered Cone face and mating surface of gripper back. If grippers still do not fully retract and nuts cannot be easily advanced, do not use this plug for testing. Contact EST Group Customer Service for assistance. | The Hex Nuts cannot easily be tightened to allow full gripper expansion | Do not use this plug for testing. Contact EST Group Customer Service for assistance. |
| If   | then  |    |      |   |  |                                |  |   |  |
| Grippers move freely to end of the tapered Cone surfaces,  | Loosen the Hex Nuts back to its/their original position 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 and underside of positioning washer using a Scotch Brite Pad or pad of equivalent quality. Re-lubricate gripper backs, tops and tapered cone surface using a lubricant such as Molykote® DX or SAE 10W motor oil. Wipe away any excess lubricant from components making sure to leave an ample amount on Tapered Cone face and mating surface of gripper back. If grippers still do not fully retract and nuts cannot be easily advanced, do not use this plug for testing. Contact EST Group Customer Service for assistance.  |    |      |   |  |                                |  |   |  |
| The Hex Nuts cannot easily be tightened to allow full gripper expansion                                  | Do not use this plug for testing. Contact EST Group Customer Service for assistance.  |    |      |   |  |                                |  |   |  |
| 2.7. Clean and dry the inside of the elbow.  | <ul style="list-style-type: none"> <li>All moisture, debris, and excessive scale must be removed from the elbow ID to ensure a proper seal is established during the pressure test.</li> </ul>  |    |      |   |  |                                |  |   |  |

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**Step/Action****Additional Action/Information/Result**

2.8. Verify that the elbow size and schedule stamped on the GripTight Elbow Test Plug is equivalent to the size of the elbow 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 Tables 1 through 3 for the Functional ID Operating Range for GripTight Elbow Test Plugs.

2.9. 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 elbow.

2.10. Insert GripTight Elbow Test Plug into the equipment to be tested.

2.11. Follow remaining GripTight Elbow Test Plug installation procedure as per the steps in Section 3: Performing the Pressure Test.

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### 3. Performing the Pressure Test

Perform the following steps to perform a pressure test with the GripTight Elbow Test Plug.

| Step/Action  | Additional Action/Information/Result  |
|--|---|
| <p>3.1. Place the GripTight Elbow Test Plug inside the elbow. The GripTight Elbow Test Plug must be able to fit with the full length of the Grippers inside the elbow.</p> <p>3.2. Center the GripTight Elbow Test Plug within the elbow and hand tighten the Hex Nuts until the test plug has gripped the elbow ID.</p> |   |
| <p><b>Note:</b> Slight wiggling of the plug may allow for further hand tightening of the Hex Nut(s).</p>   |   |
| <p>3.3. Use a star pattern to incrementally tighten the Hex Nuts. Numbers on the positioning washer provide a suggested tightening sequence. Repeat torque sequence until desired torque has been applied.</p>   |   |
| <p>3.4. Tighten the Hex Nut(s) with a calibrated torque wrench and an appropriately sized crowfoot wrench or deep socket. Deep Sockets are recommended for Multi-Shaft GripTight Elbow Test Plugs. See Tables for minimum and maximum installation torques.</p>  | <p style="text-align: center;"><b>CAUTION</b></p> <ul style="list-style-type: none"> <li>⚠ 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(s) either too much or too little. This may result in unsafe operating conditions or damage to the test plug.</li> <li>⚠ 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.</li> <li>⚠ Failure to apply at least the minimum installation torque from Table 1-3 may result in unsafe operation of the plug.</li> <li>⚠ 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.</li> </ul> |

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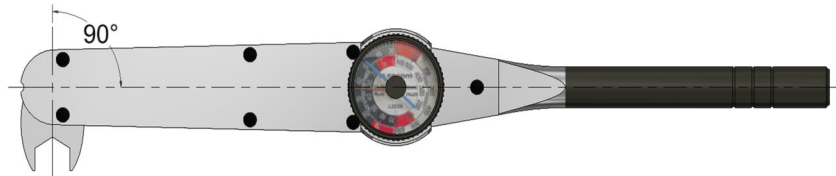
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| Step/Action | Additional Action/Information/Result |
|-------------|--------------------------------------|
|-------------|--------------------------------------|

3.5. If a Safety Gag is being used, slip the Link(s) over the Shaft(s) before proceeding. The Link(s) should not be placed under the Hex Nut(s) or over the center port.



3.6. 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.

3.7. Fill the pipe with test medium while displacing any residual air or gas.

**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 pipe, tube, or equipment.**

3.8. Perform the pressure test.

3.9. 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 elbow being tested may cause small leaks.
- If leaks persist, additional tightening of the Hex Nuts may be required. RELEASE ALL TEST PRESSURE before making adjustments to the GT Elbow Test Plug.
- Do not exceed the maximum torque for the GripTight Elbow Test Plug. See Tables for torque values.

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| Step/Action  | Additional Action/Information/Result   |
|--|--|
| <p>3.10. Verify that GripTight Elbow Test Plug movement is within specified limits.</p> <div data-bbox="107 260 672 485" style="border: 1px solid red; padding: 5px;"> <p style="text-align: center;"><b>Warning</b></p> <ul style="list-style-type: none"> <li>⚠ Never re-torque the hex nut(s) while the plug is pressurized. This is unsafe and can cause damage to the GripTight Elbow Test Plug.</li> <li>⚠ Release all pressure prior to adjusting GripTight Elbow Test Plug torque.</li> </ul> </div> | <ul style="list-style-type: none"> <li>• For Multi-Shaft GripTight Elbow Test Plugs, movement up to 0.50” (13 mm) is acceptable. If plug movement exceeds the acceptable amount, immediately release all pressure and remove the GripTight Elbow Test Plug.</li> <li>• Examine the GripTight Elbow Test Plug components for wear. Pay particular attention to the condition of the Grippers. Replace parts as necessary.</li> <li>• 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.</li> </ul>  |
| <p>3.11. Gradually release all pressure from the system once the test is completed.</p> <div data-bbox="107 661 672 863" style="border: 1px solid red; padding: 5px;"> <p style="text-align: center;"><b>Warning</b></p> <ul style="list-style-type: none"> <li>⚠ Incrementally loosen Hex Nuts on multi-shaft plugs using the same star pattern as installation. Failure to do so may overstress the shafts and nuts and cause deformation or damage.</li> </ul> </div>                                     | <div data-bbox="701 499 1523 583" style="border: 1px solid black; padding: 5px;"> <p><b>Note:</b> If excessive Shaft movement persists after using the maximum GripTight Elbow installation torque, <b>stop the test, release all test pressure, and contact EST Group customer Service for technical assistance.</b></p> </div> <ul style="list-style-type: none"> <li>• If using a GripTight Elbow plugs in the Vent/Fill positions, to recover test medium, apply low pressure air to plug in Vent position.</li> <li>• Loosen the Hex Nut(s), remove the GripTight Elbow Test Plug from the pipe and then inspect the GripTight Elbow Test Plug for any deformation or damage.</li> <li>• If the plug is difficult to remove, wait for the seal to relax (up to 2-3 minutes) and a gentle wiggle of the shafts or tap on the positioning washer, will help.</li> </ul> |
| <div data-bbox="107 915 1523 1035" style="border: 1px solid red; padding: 5px;"> <p style="text-align: center;"><b>Warning</b></p> <ul style="list-style-type: none"> <li>⚠ Some test medium may remain inside the pipe after a hydrostatic test has been conducted. Caution must be taken when loosening Hex Nuts and removing GripTight Elbow Test Plugs to prevent unsafe conditions from occurring during removal, e.g. water spills onto a catwalk creating slippery conditions.</li> </ul> </div>      |  |

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## 4. Storage

- Prior to storing, clean and dry the GripTight Elbow Test Plug. Do not allow the Seal to come in contact with any cleaning chemicals or solvents. Exposure to these chemicals may damage the Seal.
- Ensure the gripper teeth are free of dirt and debris. Clean as needed.
- Re-lubricate the Shaft threads and between the Hex Nuts and mating surface as previously described in Section 2: Equipment Inspection and Preparation.
- 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).
- For additional protection, the GTLBO should be stored in a plastic bag or wrap.
- Store these instructions with each GripTight Elbow Test Plug.

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**IF TESTING PNEUMATICALLY, IN STAINLESS STEEL, OR HIGH ALLOY PIPE/TUBE, USE MAXIMUM TORQUE.**

**Table 1: GripTight Elbow Test Plug Information**

| Sales Number | Elbow   |          | Plug OD |       | Functional I.D. Range |       |        |        | Maximum Test Pressure |      | Installation Torque |     |     |     | NPT Size |       |
|--------------|---------|----------|---------|-------|-----------------------|-------|--------|--------|-----------------------|------|---------------------|-----|-----|-----|----------|-------|
|              | Size    | Schedule |         |       | (in)                  |       | (mm)   |        |                       |      | FT-LBS              |     | N-m |     |          |       |
|              |         |          | (in)    | (mm)  | Min                   | Max   | Min    | Max    | Min                   | Max  | Min                 | Max |     |     |          |       |
|              | (in)    | (mm)     | Min     | Max   | Min                   | Max   | (PsiG) | (BarG) | Min                   | Max  | Min                 | Max |     |     |          |       |
| GTLBO-5P40   | 5       | 40       | 4.80    | 121.9 | 4.91                  | 5.12  | 124.7  | 130.0  | 3350                  | 231  | 45                  | 55  | 61  | 75  | 1/2"M    |       |
| GTLBO-5P10   |         | 10       | 5.10    | 129.5 | 5.21                  | 5.33  | 132.3  | 135.4  | 3350                  | 231  | 45                  | 55  | 61  | 75  | 1/2"M    |       |
| GTLBO-5P5    |         | 5        | 5.16    | 131.1 | 5.27                  | 5.44  | 133.9  | 138.2  | 3350                  | 231  | 45                  | 55  | 61  | 75  | 1/2"M    |       |
| GTLBO-6P160  | 6       | 160      | 4.80    | 121.9 | 4.91                  | 5.12  | 124.7  | 130.0  | 3350                  | 231  | 45                  | 55  | 61  | 75  | 1/2"M    |       |
| GTLBO-6P120  |         | 120      | 5.16    | 131.1 | 5.27                  | 5.44  | 133.9  | 138.2  | 3350                  | 231  | 45                  | 55  | 61  | 75  | 1/2"M    |       |
| GTLBO-6P80   |         | 80/XS    | 5.46    | 138.7 | 5.57                  | 5.71  | 141.5  | 145.0  | 3350                  | 231  | 45                  | 55  | 61  | 75  | 1/2"M    |       |
| GTLBO-6P40   |         | 40       | 5.81    | 147.6 | 5.93                  | 6.06  | 150.6  | 153.9  | 3350                  | 231  | 45                  | 55  | 61  | 75  | 1/2"M    |       |
| GTLBO-6P10   |         | 10       | 6.15    | 156.2 | 6.27                  | 6.41  | 159.3  | 162.8  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 1/2"M    |       |
| GTLBO-6P5    |         | 5        | 6.21    | 157.7 | 6.33                  | 6.47  | 160.8  | 164.3  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 1/2"M    |       |
| GTLBO-8P160  |         | 8        | 160     | 6.37  | 161.8                 | 6.49  | 6.75   | 164.8  | 171.5                 | 3350 | 231                 | 85  | 100 | 115 | 136      | 3/4"M |
| GTLBO-8PXXS  | XXS     |          | 6.45    | 163.8 | 6.57                  | 6.81  | 166.9  | 173.0  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P140  | 140     |          | 6.58    | 167.1 | 6.70                  | 6.93  | 170.2  | 176.0  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P120  | 120     |          | 6.79    | 172.5 | 6.91                  | 7.12  | 175.5  | 180.8  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P100  | 100     |          | 7.08    | 179.8 | 7.20                  | 7.38  | 182.9  | 187.5  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P80   | 80      |          | 7.30    | 185.4 | 7.42                  | 7.57  | 188.5  | 192.3  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P60   | 60      |          | 7.51    | 190.8 | 7.63                  | 7.78  | 193.8  | 197.6  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P40   | 40      |          | 7.70    | 195.6 | 7.82                  | 7.97  | 198.6  | 202.4  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P30   | 30      |          | 7.81    | 198.4 | 7.93                  | 8.08  | 201.4  | 205.2  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P20   | 20      |          | 7.88    | 200.2 | 8.00                  | 8.15  | 203.2  | 207.0  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P10   | 10      |          | 8.12    | 206.2 | 8.24                  | 8.39  | 209.3  | 213.1  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-8P5    | 5       |          | 8.21    | 208.5 | 8.33                  | 8.48  | 211.6  | 215.4  | 3350                  | 231  | 85                  | 100 | 115 | 136 | 3/4"M    |       |
| GTLBO-10P160 | 10      |          | 160     | 7.99  | 202.9                 | 8.13  | 8.54   | 206.5  | 216.9                 | 3350 | 231                 | 150 | 250 | 202 | 340      | 3/4"M |
| GTLBO-10P140 |         |          | 140     | 8.29  | 210.6                 | 8.36  | 8.64   | 212.3  | 219.5                 | 3350 | 231                 | 150 | 250 | 202 | 340      | 3/4"M |
| GTLBO-10P120 |         | 120      | 8.63    | 219.2 | 8.76                  | 9.09  | 222.5  | 230.9  | 3350                  | 231  | 150                 | 250 | 202 | 340 | 3/4"M    |       |
| GTLBO-10P100 |         | 100      | 8.88    | 225.6 | 9.03                  | 9.34  | 229.4  | 237.2  | 3350                  | 231  | 150                 | 250 | 202 | 340 | 3/4"M    |       |
| GTLBO-10P80  |         | 80       | 9.17    | 232.9 | 9.32                  | 9.59  | 236.7  | 243.6  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-10PXS  |         | 60/XS    | 9.39    | 238.5 | 9.54                  | 9.79  | 242.3  | 248.7  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-10P40  |         | 40/STD   | 9.70    | 246.4 | 9.85                  | 10.07 | 250.2  | 255.8  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-10P30  |         | 30       | 9.84    | 249.9 | 9.98                  | 10.19 | 253.5  | 258.8  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-10P20  |         | 20       | 9.97    | 253.2 | 10.12                 | 10.31 | 257.0  | 261.9  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-10P10  |         | 10S      | 10.17   | 258.3 | 10.32                 | 10.49 | 262.1  | 266.4  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-10P5   |         | 5        | 10.25   | 260.4 | 10.39                 | 10.55 | 263.9  | 268.0  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12P160 |         | 12       | 160     | 9.60  | 243.8                 | 9.74  | 10.05  | 247.4  | 255.3                 | 3350 | 231                 | 180 | 325 | 244 | 441      | 1"M   |
| GTLBO-12P140 |         |          | 140     | 9.99  | 253.7                 | 10.14 | 10.55  | 257.6  | 268.0                 | 3350 | 231                 | 180 | 325 | 244 | 441      | 1"M   |
| GTLBO-12P120 | 120/XXS |          | 10.26   | 260.6 | 10.41                 | 10.78 | 264.4  | 273.8  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12P100 | 100     |          | 10.60   | 269.2 | 10.75                 | 11.09 | 273.1  | 281.7  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12P80  | 80      |          | 10.95   | 278.1 | 11.10                 | 11.40 | 281.9  | 289.6  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12P60  | 60      |          | 11.25   | 285.8 | 11.39                 | 11.66 | 289.3  | 296.2  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12PXS  | XS      |          | 11.39   | 289.3 | 11.54                 | 11.79 | 293.1  | 299.5  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12P40  | 40      |          | 11.67   | 296.4 | 11.76                 | 12.04 | 298.7  | 305.8  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12P30  | 30      |          | 11.78   | 299.2 | 11.90                 | 12.14 | 302.3  | 308.4  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12P20  | 20      |          | 11.97   | 304.0 | 12.12                 | 12.31 | 307.8  | 312.7  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |
| GTLBO-12P10  | 10S/5   |          | 12.13   | 308.1 | 12.29                 | 12.50 | 312.2  | 317.5  | 3350                  | 231  | 180                 | 325 | 244 | 441 | 1"M      |       |

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**Table 2: GripTight Elbow Test Plug Information**

| Sales Number | Elbow    |          | Plug OD |       | Functional I.D. Range |       |       |       | Maximum Test Pressure |        | Installation Torque |     |     |     | NPT Size |      |
|--------------|----------|----------|---------|-------|-----------------------|-------|-------|-------|-----------------------|--------|---------------------|-----|-----|-----|----------|------|
|              | Size     | Schedule |         |       | (in)                  |       | (mm)  |       |                       |        | FT-LBS              |     | N-m |     |          |      |
|              |          |          | (in)    | (mm)  | Min                   | Max   | Min   | Max   | (PsiG)                | (BarG) | Min                 | Max | Min | Max |          |      |
| GTLBO-14P160 | 14       | 160      | 10.64   | 270.3 | 10.80                 | 11.27 | 274.3 | 286.3 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P140 |          | 140      | 10.98   | 278.9 | 11.12                 | 11.56 | 282.4 | 293.6 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P120 |          | 120      | 11.30   | 287.0 | 11.45                 | 11.85 | 290.8 | 301.0 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P100 |          | 100      | 11.64   | 295.7 | 11.79                 | 12.15 | 299.5 | 308.6 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P80  |          | 80       | 12.07   | 306.6 | 12.22                 | 12.53 | 310.4 | 318.3 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P60  |          | 60       | 12.42   | 315.5 | 12.57                 | 12.84 | 319.3 | 326.1 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14PXS  |          | XS       | 12.64   | 321.1 | 12.79                 | 13.04 | 324.9 | 331.2 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P40  |          | 40       | 12.77   | 324.4 | 12.92                 | 13.16 | 328.2 | 334.3 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14PSTD |          | 30/STD   | 12.93   | 328.4 | 13.08                 | 13.30 | 332.2 | 337.8 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P20  |          | 20       | 13.08   | 332.2 | 13.22                 | 13.43 | 335.8 | 341.1 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P10  |          | 10       | 13.21   | 335.5 | 13.32                 | 13.56 | 338.3 | 344.4 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P10S |          | 10S      | 13.36   | 339.3 | 13.47                 | 13.69 | 342.1 | 347.7 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-14P5   |          | 5        | 13.44   | 341.4 | 13.60                 | 13.81 | 345.4 | 350.8 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-16P160 |          | 16       | 160     | 12.25 | 311.2                 | 12.40 | 12.67 | 315.0 | 321.8                 | 3350   | 231                 | 180 | 325 | 244 | 441      | 1" M |
| GTLBO-16P140 | 140      |          | 12.57   | 319.3 | 12.72                 | 12.96 | 323.1 | 329.2 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-16P120 | 120      |          | 13.04   | 331.2 | 13.19                 | 13.62 | 335.0 | 345.9 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-16P100 | 100      |          | 13.45   | 341.6 | 13.60                 | 13.98 | 345.4 | 355.1 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-16P80  | 80       |          | 13.85   | 351.8 | 14.00                 | 14.34 | 355.6 | 364.2 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 1" M     |      |
| GTLBO-16P60  | 60       |          | 14.28   | 362.7 | 14.38                 | 14.72 | 365.3 | 373.9 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-16P40  | 40/XS    |          | 14.64   | 371.9 | 14.74                 | 15.03 | 374.4 | 381.8 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-16PSTD | 30/STD   |          | 14.93   | 379.2 | 15.08                 | 15.29 | 383.0 | 388.4 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-16P20  | 20       |          | 15.08   | 383.0 | 15.22                 | 15.43 | 386.6 | 391.9 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-16P10  | 10       |          | 15.22   | 386.6 | 15.32                 | 15.56 | 389.1 | 395.2 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-16P10S | 10S/5    |          | 15.36   | 390.1 | 15.48                 | 15.73 | 393.2 | 399.5 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18P160 | 18       |          | 160     | 13.87 | 352.3                 | 13.97 | 14.60 | 354.8 | 370.8                 | 3350   | 231                 | 180 | 325 | 244 | 441      | 1" M |
| GTLBO-18P140 |          |          | 140     | 14.31 | 363.5                 | 14.41 | 14.99 | 366.0 | 380.7                 | 3350   | 231                 | 180 | 325 | 244 | 441      | 2" M |
| GTLBO-18P120 |          |          | 120     | 14.71 | 373.6                 | 14.86 | 15.33 | 377.4 | 389.4                 | 3350   | 231                 | 180 | 325 | 244 | 441      | 2" M |
| GTLBO-18P100 |          | 100      | 15.18   | 385.6 | 15.33                 | 15.74 | 389.4 | 399.8 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18P80  |          | 80       | 15.64   | 397.3 | 15.79                 | 16.16 | 401.1 | 410.5 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18P60  |          | 60       | 16.07   | 408.2 | 16.22                 | 16.53 | 412.0 | 419.9 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18P40  |          | 40       | 16.50   | 419.1 | 16.64                 | 16.91 | 422.7 | 429.5 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18PXS  |          | XS       | 16.64   | 422.7 | 16.79                 | 17.03 | 426.5 | 432.6 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18P30  |          | 30       | 16.77   | 426.0 | 16.92                 | 17.16 | 429.8 | 435.9 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18PSTD |          | STD      | 16.93   | 430.0 | 17.08                 | 17.29 | 433.8 | 439.2 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18P20  |          | 20       | 17.08   | 433.8 | 17.22                 | 17.43 | 437.4 | 442.7 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18P10  |          | 10       | 17.22   | 437.4 | 17.37                 | 17.56 | 441.2 | 446.0 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-18P10S |          | 10S/5    | 17.37   | 441.2 | 17.56                 | 17.73 | 446.0 | 450.3 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20P160 |          | 20       | 160     | 15.50 | 393.7                 | 15.59 | 16.30 | 396.0 | 414.0                 | 3350   | 231                 | 180 | 325 | 244 | 441      | 2" M |
| GTLBO-20P140 | 140      |          | 15.94   | 404.9 | 16.04                 | 16.68 | 407.4 | 423.7 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20P120 | 120      |          | 16.45   | 417.8 | 16.55                 | 17.13 | 420.4 | 435.1 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20P100 | 100      |          | 16.91   | 429.5 | 17.06                 | 17.53 | 433.3 | 445.3 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20P80  | 80       |          | 17.45   | 443.2 | 17.60                 | 18.01 | 447.0 | 457.5 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20P60  | 60       |          | 17.93   | 455.4 | 18.07                 | 18.43 | 459.0 | 468.1 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20P40  | 40       |          | 18.42   | 467.9 | 18.57                 | 18.87 | 471.7 | 479.3 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20P30  | 30/XS    |          | 18.64   | 473.5 | 18.79                 | 19.07 | 477.3 | 484.4 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20PSTD | 20/STD   |          | 18.93   | 480.8 | 19.08                 | 19.32 | 484.6 | 490.7 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |
| GTLBO-20P10  | 10/10S/5 |          | 19.28   | 489.7 | 19.38                 | 19.70 | 492.3 | 500.4 | 3350                  | 231    | 180                 | 325 | 244 | 441 | 2" M     |      |

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**Table 3: GripTight Elbow Test Plug Information**

| Sales Number | Elbow |          | Plug OD |       | Functional I.D. Range |       |       |       | Maximum Test Pressure |     | Installation Torque |     |     |     | NPT Size |
|--------------|-------|----------|---------|-------|-----------------------|-------|-------|-------|-----------------------|-----|---------------------|-----|-----|-----|----------|
|              | Size  | Schedule |         |       | (in)                  |       | (mm)  |       |                       |     | FT-LBS              |     | N-m |     |          |
|              |       |          | (in)    | (mm)  | Min                   | Max   | Min   | Max   | Min                   | Max | Min                 | Max |     |     |          |
| GTLBO-22P160 | 22    | 160      | 17.19   | 436.6 | 17.29                 | 17.75 | 439.2 | 450.9 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-22P140 |       | 140      | 17.68   | 449.1 | 17.78                 | 18.24 | 451.6 | 463.3 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-22P120 |       | 120      | 18.20   | 462.3 | 18.30                 | 18.90 | 464.8 | 480.1 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-22P100 |       | 100      | 18.71   | 475.2 | 18.86                 | 19.36 | 479.0 | 491.7 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-22P80  |       | 80       | 19.20   | 487.7 | 19.39                 | 19.83 | 492.5 | 503.7 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-22P60  |       | 60       | 19.75   | 501.7 | 19.94                 | 20.31 | 506.5 | 515.9 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-22PXS  |       | XS       | 20.57   | 522.5 | 20.79                 | 21.07 | 528.1 | 535.2 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-22PSTD |       | 20/STD   | 20.86   | 529.8 | 21.08                 | 21.33 | 535.4 | 541.8 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-22P10  |       | 10/10S   | 21.16   | 537.5 | 21.38                 | 21.60 | 543.1 | 548.6 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-24P160 | 24    | 160      | 18.79   | 477.3 | 18.89                 | 19.35 | 479.8 | 491.5 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-24P140 |       | 140      | 19.29   | 490.0 | 19.39                 | 19.85 | 492.5 | 504.2 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-24P120 |       | 120      | 19.78   | 502.4 | 19.96                 | 20.57 | 507.0 | 522.5 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-24P100 |       | 100      | 20.35   | 516.9 | 20.54                 | 21.07 | 521.7 | 535.2 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |
| GTLBO-24P80  |       | 80       | 20.97   | 532.6 | 21.19                 | 21.65 | 538.2 | 549.9 | 3350                  | 231 | 180                 | 325 | 244 | 441 | 2"M      |

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

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