ExxonMobil BTCP/BTRF	**Hydrostatic Testing with Temporary Test Plugs** (***Owner: BTES FN/O&A Fixed Equipment and Inspection Section Supervisor***)	**Maintenance Work Practice No. 7020**

Introduction

Scope

To provide the minimum safety requirements for hydrostatic testing of lines and flanges with temporary, expandable test plugs (pipe stoppers, pipe plugs, and flange test plugs).

References

- MWP-7021, Hydrostatic Testing Pressure Vessels and Piping
- MWP-7050, Blinding Operations and Flange Spreading
- BTAES 3-7-6-2, Temporary Pipeline Plug Use

Table of Contents/ Attachments

Safety, Health and Environmental Precautions

- Due to the special nature and potential safety risks, special prior approval of the Mechanical and Process First Line Supervisor (FLS) is required for use of temporary test plugs.

Introduction, Continued

Safety, Health and Environmental Precautions, *Continued*

- Due to the added reactive forces created when a pressurized gas is released to the atmosphere, the air needs to be removed from the system being tested.
- Burrs and sharp edges can damage plug seals. A smooth surface is required for the test plug to grip.
- The following restrictions must be observed when using temporary test plugs. Test plugs:
  - Must have proper written approval of the Mechanical and Process First Line Supervisors. (See approval form for Hydrotesting with Temporary Test Plugs located in Attachment 1.)

➔ **NOTE:** *Attachment 1 is not required for flanged test plugs.*

  - Are limited to pressure rating stamped on plug.
  - Are limited to pipe schedule designated on plug.
  - Are limited to cases when all air can be vented from line.
  - Must be used with a safety chain. (Not required for flange test plugs.)
  - ➔ Are limited to 300 pound flange-rated system and lower (1125 psig) for Pipe Test Plugs.
  - ➔ Flange test plugs are limited to the manufacture's rating stamped on plug. Reverse Pressure Gripper Test Plug shown in Attachment 3, Figure 1 is limited to 600 pound flange rating (2225 psig).
  - ➔ Mechanical FLS to consider alternatives in the event a successful pressure test cannot be achieved utilizing temporary test plugs.
  - ➔ For welds to be tested with flange test plugs; MT or PT 2nd weld pass of butt welded connections.
- During pressurization restrict personnel from area at end of pipe/plug.

Work Procedure

WARNING:

DO NOT USE TEST PLUGS FOR PERMANENT CLOSURES, HOT WORK, ENTERING, OR ANY OTHER ISOLATION PURPOSE.

NOTE: *GP-03-19-01, Fabricated Piping Erection, requirements must be met.*

➔ ***NOTE:*** *Attachment 2, Figures 1 and 2 show a typical Pipe test plug and safety chain assembly and an exploded view of a test plug.*

	Step	Action
Pipe Test Plug	1	Locate all vent points required to vent all air from the line.
	2	Open all vents.
Clean Pipe	3	Clean all water, scale dirt, grease, etc. from the end of the line.
	4	Use a wire brush or sandblast, as required, to give the line a smooth, clean interior surface.
Inspect Plug	5	Inspect test plug seal for wear or damage.
	6	If required, replace seals.
	7	Inspect test plug gripping teeth for wear, damage, or teeth orientation.
	8	If required, replace gripping teeth.
Insert Plugs	9	Insert test plugs into line and tighten.
	10	Attach safety chain to plug and proper size retainer clamp.
	11	Ensure safety chain is tight.
	12	Open vent in plug.
	13	Complete Steps 1 through 10 of Attachment 1, Approval Form and Checklist, Hydrotesting with Temporary Test Plugs.
Fill Line with Water	14	Begin filling line with water.
	15	Check plugs for leaks.

Work Procedure, Continued

Pipe Test Plug, *Continued*

Step	Action
Fill Line with Water, Continued 16	If plug leaks: • Depressure the line • Retorque the plug
17	When vents are flowing water, close vents.
Pressurize Line 18	Raise water pressure to 10 to 20 psig.
19	Check valves and plugs for leaks.
20	Observe safety chains to check plugs for movement.
21	If plug leaks or moves: • Depressure line • Retorque plug ***NOTE:*** *Stand to one side of the end of the line while retightening under pressure.* ***NOTE:*** *At high pressure, it may be necessary to tighten plug nut several times to prevent plug movement.*
22	Raise water pressure to 25% of test pressure.
23	Check plugs for leaks or movement.
Complete Pressure Test 24	Raise water pressure to full test pressure.
25	Check plugs for leaks or movement.
26	Depressure line.
27	Open drains.
28	Remove plugs.
29	Complete Attachment 1, Approval Form and Checklist, Hydrotesting with Temporary Test Plugs.

Work Procedure, Continued

Flange Test Plugs

Step	Action
	NOTE: *Attachment 3. Figure 1 shows a typical flange test plug configuration. Using a flange test plug per Figure 2 requires Designated Approval Engineer (DAE) Approval.*
1	Locate all vent points required to vent all air from the line.
2	Open vents.
3	Clean all water, scale dirt, grease, etc. from the end of the line.
4	Use a wire brush or sandblast, as required, to give the line a smooth, clean interior surface.
5	Inspect test plug seal for wear or damage, and if required, replace seals.
6	Confirm test plug size and pipe schedule matches the pipe to be tested.
7	Inspect test plug gripping teeth for wear, damage, and teeth orientation.
8	If required, replace gripping teeth.
9	Insert test plug into pipe. If installing into vertical pipe, maintain plug position such that it does not fall before it can be securely tightened.
10	Quality Control (QC) shall witness proper fit up of test plug. To achieve a proper hydrotest, the plug must be inserted at least 4” past the weld to be tested and the retention chain must have slack in the installed position.
11	Tighten the large compression nut to manufacture’s specifications. **NOTE:** *Tightening the compression nut will expand the seal in the pipe.*
12	Bolt blind flange and test flange Assembly together.
13	Open vent and water inlet plug.

Clean Pipe

Inspect Plug

Install Plug

Quality Control Hold Point

Bolt Flanges

Work Procedure, Continued

Flange Test Plugs, *Continued*

	Step	Action
Fill Line with Water	14	Fill test chamber with water.
	15	Allow trapped air to escape.
	16	When all vents flow water, close vents.
Pressurize Line	17	Build water pressure to 10 to 20 psig.
	18	Check for leaks.
	19	If pressure cannot be maintained during the test, depressure the line and check the compression nut.
	20	Raise water pressure to 25% of test pressure.
	21	Check plug for leaks.
Complete Pressure Test	22	Raise water pressure to full test pressure.
	23	Depressure the line.
	24	Open vents.
➔	25	Verify line is vented upstream of test plug prior to removal of blind flange to access the test plug.
➔	26	Remove blind flange.
➔ *QC Hold Point*	27	QC shall witness the plug position after hydrotest. If the test plug has moved from its initial position and the retention chain is tight, then the plug shall be readjusted and the hydrotest shall be repeated.
	28	Loosen compression nut.
	29	Unbolt flanges.
	30	Remove test plug from the pipe. ***NOTE:*** *Purchase descriptions and potential suppliers are shown in Attachment 4.*

**** End of Maintenance Work Practice ****

Attachment 1

Approval Form and Checklist, Hydrotesting with Temporary Test Plugs

Unit: _____ Date: _____

Line: _____ Location: _____

Pipe Diameter: _____ nps Wall Thickness: _____ inches

Test Pressure: _____ psig

I confirm that these requirements and procedures are being used.

Mechanical First Line Supervisor: _____

Process First Line Supervisor: _____

Columns shall be initialed by Process and Mechanical representatives, as indicated, to certify that each item has been checked:

	Checked By	
	Process	Mechanical
1. Job drawing has been reviewed for any special requirements (such as CET), and these have been followed.		_____
2. Plugs are rated above test pressure.		_____
3. All air can be vented from line.	_____	_____
4. Safety chain and retainer clamp correct.		_____
5. All water, scale, dirt, burrs, grease, etc. has been removed from ends of line as necessary to give clean, smooth interior surface.		_____

Attachment 1, Continued

Approval Form and Checklist, Hydrotesting with Temporary Test Plugs

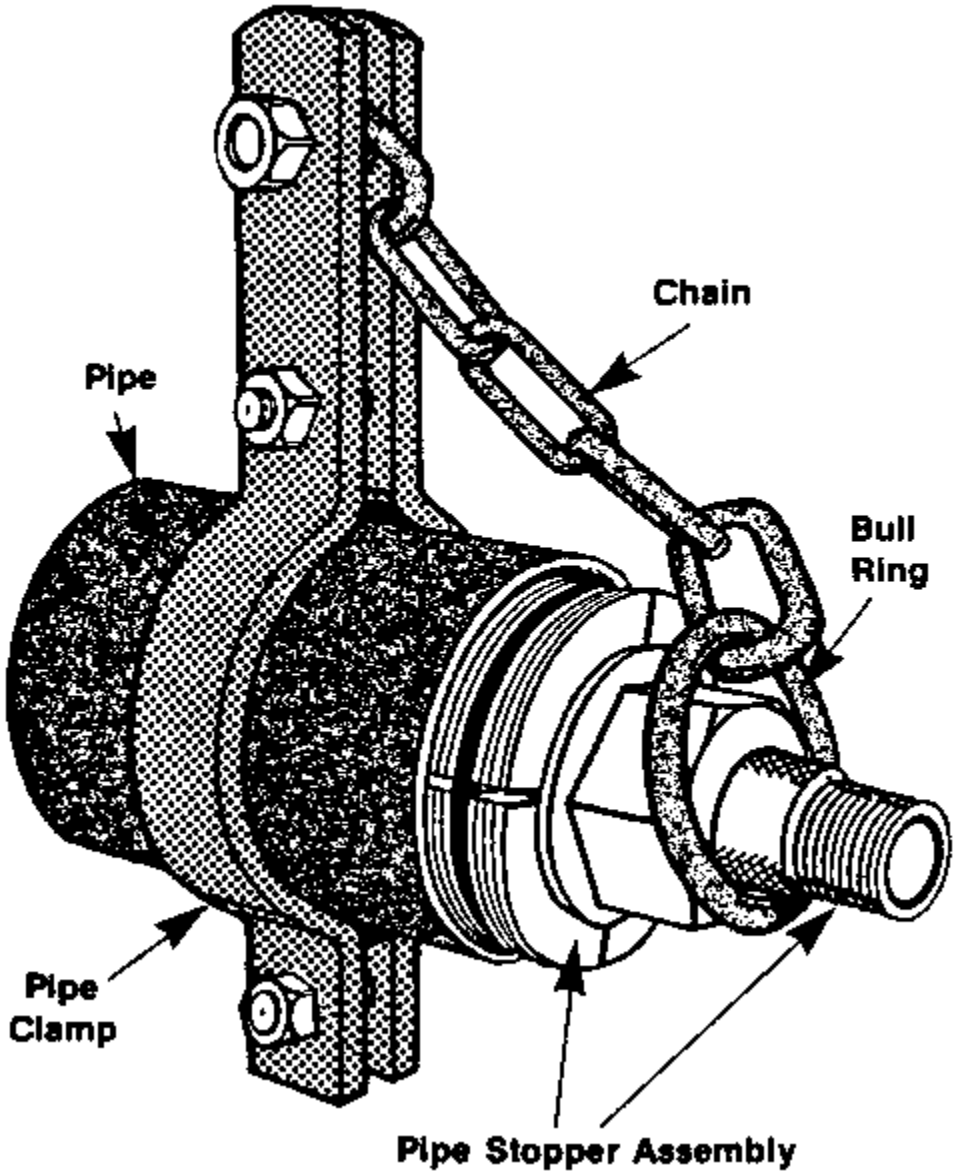
Columns shall be initialed by Process and Mechanical representatives, as indicated, to certify that each item has been checked: Continued

		Checked By	
		Process	Mechanical
6.	Seals have been inspected for wear or damage and replaced as required.		_____
➔ 7.	Gripping teeth have been inspected for condition and replaced if required. Verify teeth directions are intended for use as a pipe test plug.		_____
➔ 8.	Confirm test plug size and pipe schedule matches the pipe to be tested.		_____
9.	Personnel access has been restricted from area at end of pipe/plug.	_____	_____
10.	Safety chain has been attached to plug and properly sized retainer clamp. Chain is tight.	_____	_____
11.	Testing Steps 14 through 25 have been reviewed with personnel performing the work.	_____	_____
12.	Plugs have been removed.	_____	_____

NOTE: *Approval form and checklist not required for flanged test plugs.*

Attachment 2
Pipe Test Plug Details

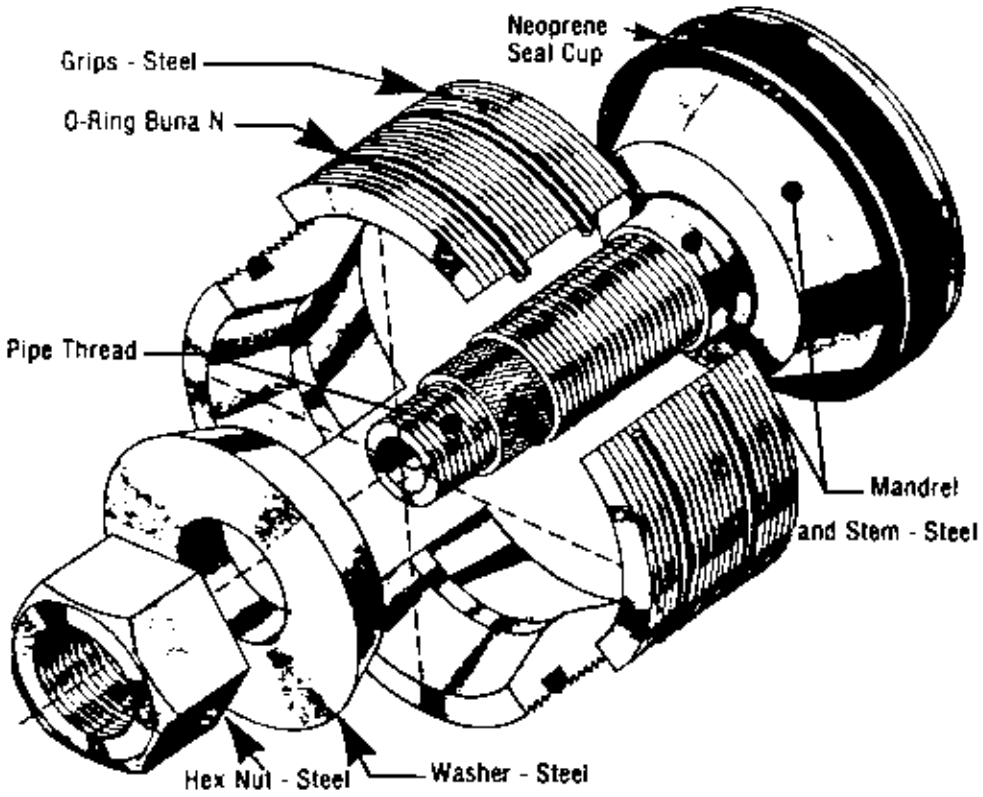
Figure 1, Pipe Test Plug and Safety Chain Assembly



Attachment 2, Continued

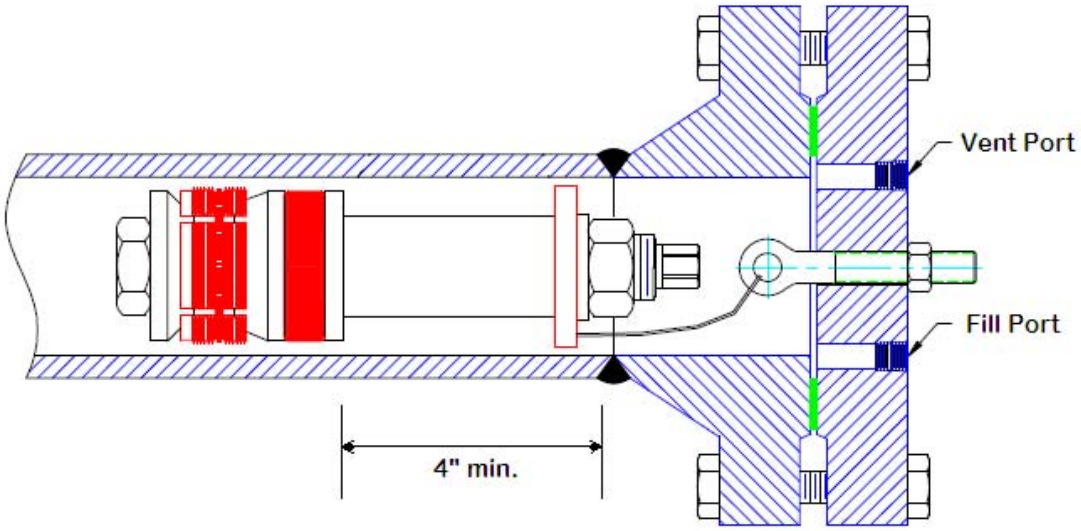
Pipe Test Plug Details

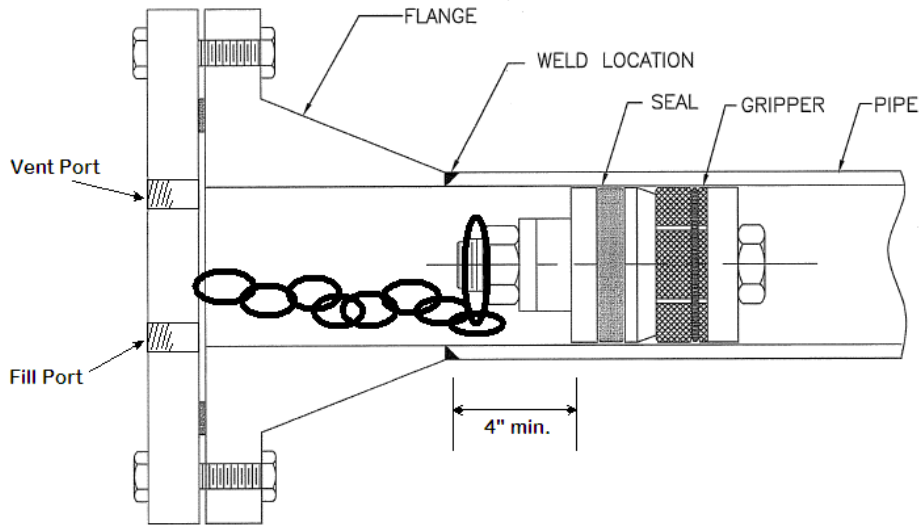
Figure 2, Exploded View of Typical Pipe Plug Pipe



Attachment 3
Typical Flange Test Plug

Figure 1: Reverse Pressure Gripper Test Plug





Standard sizes 1 ¼" thru 12" NPS, Schd 40 or Schd 80. Custom sizes and schedules available up to 24" NPS.

Use with a Retention cable or chain to avoid losing the plug in the downstream piping.

Attachment 3, Continued

Typical Flange Test Plug

Figure 2: Standard Flange Test Plug

(DAE Approval Required)

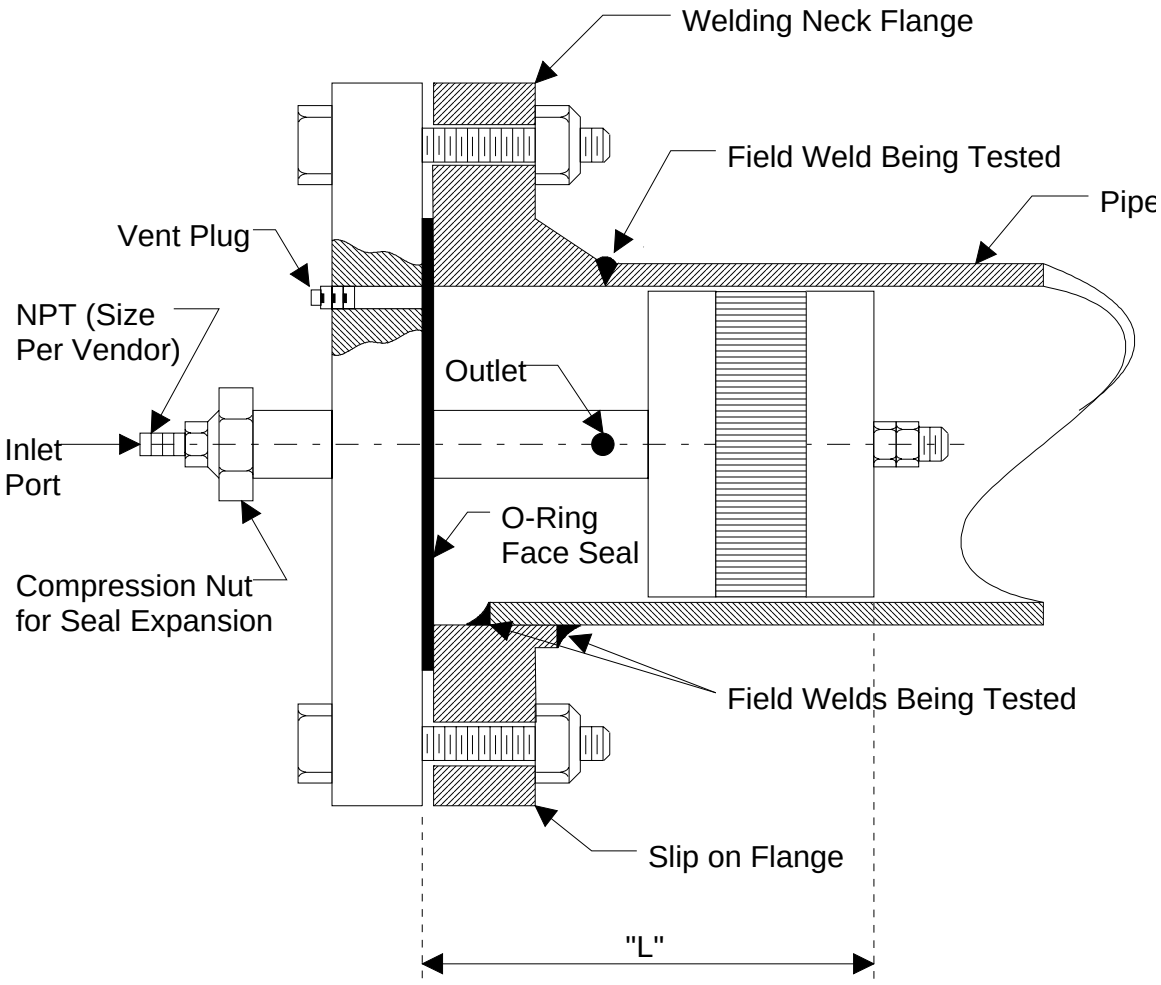


Table 1, Insertion Lengths, "L"

NPS	3/4	1	1-1/2	2	3	4	6	8
Length (inches)	4 -/4	4-1/4	5	5-5/8	7-3/8	7-3/8	9-1/4	9-3/4

NPS	10	12	14	16	18	20	24	
Length (inches)	12-7/8	12-7/8	12-3/4	12-1/2	12-7/8	12-3/4	13-1/4	

Longer or shorter insertion lengths require special order flange test plugs.

Attachment 4

Temporary Pipe Test Plugs and Flange Test Plug Purchase Descriptions

	Item	Description
Pipe Test Plug	1	For pipe test plugs specify: • Size (NPS) • Pipe Schedule
	2	Minimum requirements: • 1125 psig rated pressure • Safety chain and holder to retain plug if slippage occurs • Safety chain and retainer designed to prevent plug from slipping out of the line • A plug of identical design and construction must have passed a hydrostatic test at 1.5 times the rated pressure • Nominal pipe size, usable schedule range, and rated pressure stamped on plug or attached on a stainless steel tag to the plug • Operating instructions supplied with each plug
Flange Test Plug	3	For flange test plug specify: • Size (NPS) • Pipe Schedule • Neoprene seal and Buna-N O-ring, unless otherwise specified
	4	Minimum requirements: • 1125 psig rated pressure • A plug of identical design and construction must have passed a hydrostatic test at 1.5 times the rated pressure • Nominal pipe size, usable schedule range, and rated pressure stamped on plug or attached on a stainless steel tag to the plug • Operating instruction supplied with each plug

Attachment 4, Continued

Temporary Pipe Test Plugs and Flange Test Plug Purchase Descriptions

Potential Pipe Test Plug Suppliers (Attachment 2)	**Houston Representatives**
EST Group, Inc.	EADS Company 713-781-3000 EST Group 800-355-7044 EST Group 215-721-1100
Thaxton, Inc.	800-355-7044
USA Industries	713-941-3797
T.D. Williamson, Inc.	281-470-0791

Potential Flange Test Plug Suppliers (Attachment 3, Figure 1)	**Houston Representatives**
EST Group, Inc.	EADS Company 713-781-3000 EST Group 800-355-7044 EST Group 215-721-1100
Thaxton, Inc.	800-355-7044