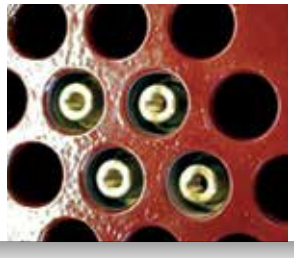
CURTISS-WRIGHT

EST Group



Product Guide

Heat Exchanger Testing & Plugging

Hydrostatic Testing & Isolation Plugs

Field Services

CURTISS-WRIGHT

With a proud legacy spanning more than 85 years, Curtiss-Wright is a global innovative company that delivers highly engineered, critical function products and services to the commercial, industrial, defense and energy markets. Building on the heritage of Glenn Curtiss and the Wright brothers, we have a long tradition of providing reliable solutions through trusted customer relationships.

Curtiss-Wright EST Group

Since 1968, Curtiss-Wright EST Group has specialized in the development, and manufacture of tools and systems that greatly simplify maintenance of shell & tube and air-cooled heat exchangers, as well as test plug systems that expedite in-service inspection of open end pipe, piping systems, tubing and pressure vessels. Our plugging and testing systems have saved customers millions of dollars in maintenance and downtime.

EST Group serves the power generation, upstream oil and gas, refining, petrochemical, fine chemical, pharmaceutical and shipbuilding industries worldwide.

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ISO 9001:2015
registered facility

Pop-A-Plug® Heat Exchanger Tube Plugging System Overview & Qualifications

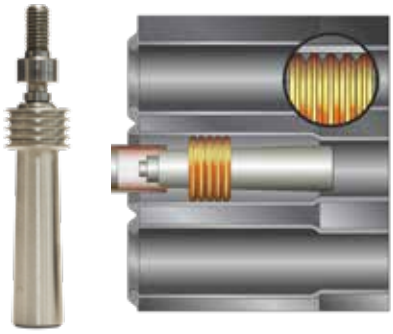
Our flagship product, Pop-A-Plug® Tube Plugs are the industry's leading technology for plugging leaking and/or degraded heat exchanger tubes.

- Eliminates the need for welding in tube plugs
- Identified as a recommended tube plugging method in ASME PCC-2 (Article 3.12)
- Offers lowest life cycle cost when compared to alternative tube plugging methods
- Engineered solution that will not degrade and leak like rubber/elastomer plugs
- Global industry acceptance as a safe, reliable and easy to install heat exchanger tube plugging method
- Recognized as a best practice repair method by many power, refining, chemical and petrochemical companies worldwide
- Approved by Canada's Technical Standards and Safety Authority (TSSA) and Alberta Boilers Safety Association (ABSA) as a qualified heat exchanger tube plug for Nuclear and non-Nuclear applications. CRN numbers available upon request.
- Used in more than 97% of North American Nuclear Power Plants
- Used in 100% of French Nuclear Power Plants
- Widely used by US Navy on nuclear class surface ships and submarines
- Available in more than 35 different alloys to match your heat exchanger tube material and mitigate corrosion and thermal expansion issues
- Large inventory and 24/7 emergency manufacturing available
- Manufactured to quality assurance programs including: ASME NQA-1, 10 CFR 50 Appx. B and ANSI N45.2
- Nuclear Procurement Issues Committee (NUPIC) audited and approved company serving the global Nuclear Industry
- Independently reviewed and certified by TUV Rheinland
- ISO 9001:2015 Registered Facility

Heat Exchanger Tube Plugs & Stabilizers

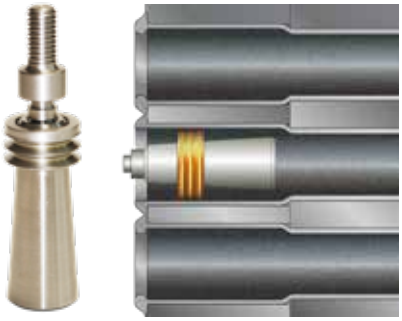
Pop-A-Plug® P2

A proven long-term performer in thermal and nuclear power generating stations, the Pop-A-Plug P2 tube plug features patented internally serrated rings designed to maintain a leak tight seal under extreme thermal and pressure cycling. The Pop-A-Plug P2 tube plugging system reduces downtime, eliminates welding and explosives, and will not damage your tubes, tubejoints or tubesheet. Working pressures to 7,000 PsiG (480 BarG). Sizes to fit 0.400" to 1.460" (10.16mm to 37.08mm) tube I.D. Proven helium leak tight to 1 x 10^{-10} cc/sec. Breakaway ensures quick, easy and tightly controlled installation force eliminating damage to tube joints and epoxy coated tube sheets. Larger and smaller sizes available. Pop-A-Plug P2 tube plug sizing lower limit is 0.215" (5.46mm). Removable for retubing. Compliant with quality assurance systems including; ANSI N45.2, 10 CFR 50 Appx. B, 10 CFR 21.



Pop-A-Plug® CPI/Perma

Designed as a fast and safe way to seal leaking heat exchanger and condenser tubes. Pop-A-Plug CPI/Perma tube plugs are resistant to thermal cycling and are able to provide a seal that is helium leak tight. Pop-A-Plug CPI/Perma tube plugs install using a controlled force. This protects against damage to tubesheet ligaments and adjacent tubesheet joints, extending the life of your heat exchanger and reducing total operating cost. Operating pressures to 1000 PsiG (68.9 BarG). Tube sizes for 0.472" to 2.067" (11.99mm to 52.50mm) I.D. tubes. Helium leak tight to 1 x 10^{-6} cc/sec. Larger sizes available. Removable for retubing. Compliant with quality assurance systems including; ANSI N45.2, 10 CFR 50 Appx. B, 10 CFR 21.



Vibra Proof Condenser Plugs

A metal, expandable elastomer condenser plug, ideal for temporary tube plugging applications. Available for tube I.D. ranges from 0.280" to 1.309" (7.11-33.25mm). Maximum pressure rating is 150 PsiG (10.3 BarG). Brass or stainless steel with elastomers of neoprene, silicone, or fluoroelastomer seal materials.

Pop-A-Plug® Tube Stabilizers

Effectively stabilize weakened or fractured heat exchanger and condenser tubes. Unique Pop-A-Plug Anchoring System eliminates cable or rod migration, ensuring fractured/deteriorated tubes are securely supported until retubing or sleeving can be performed. Ideal for any type of shell and tube heat exchanger from high pressure feedwater heaters to surface condensers. Sizes to fit tubes ranging from 0.501" to 0.960" I.D. (12.73-24.38mm). Available in either rod or cable type configuration. Available in any length.

Installation and Removal Tools

Pop-A-Plug® System Ram Packages

There is no better way to install Pop-A-Plug Tube Plugs than with our hydraulic installation equipment. Our Small and Large Ram Packages are designed to hydraulically install Pop-A-Plug Tube Plugs quickly and safely in seconds.

Rams are compact, lightweight and easy to use. Ram packages include a hydraulic ram, pump, pressure gauge, high pressure hose and a metal storage case.

Pop-A-Plug® Close Quarters Ram (CQR)

The Close Quarters Ram lets you install Pop-A-Plug Tube Plugs even when there's minimal clearance around the tube end.

Ideal for tubes in the outermost row of closed head feedwater heaters or for tubes adjacent to a pass partition or divider plate.

Pop-A-Plug® Manual Installation Tool (MIT)

Provides fast, reliable installation in situations where air or electricity are not available. Each MIT comes complete with a Pull Rod and Positioner to install the size and style Pop-A-Plug Tube Plug identified in the tool's model number. By interchanging pull rods and plug positioners, the MIT body can be used to install P2 plugs up to 1.160" (29.46mm) and CPI/Perma plugs up to 1.149" (29.18mm). The MIT can be used with manual wrenches or sockets, as well as with electric or pneumatic impact wrenches.

Brush Kits

Tube preparation is vital to successful tube plugging. Our brushes deliver fast, and consistent tube preparation. Tube preparation brushes size and round the tube end, quickly remove surface defects that can cause leaks and provide a roughened surface. This improves the Pop-A-Plug Tube Plug's pressure holding capability and leak tight integrity.

Tapered Reamers

Needed when weld droop obstructs a tube opening and prevents proper measurement of tube I.D. Tapered design allows for precise removal of weld droop or other obstructions when fitted into a hand-held power drill. Offered in various sizes for use with both Pop-A-Plug CPI/Perma and Pop-A-Plug P2 tube plugs.

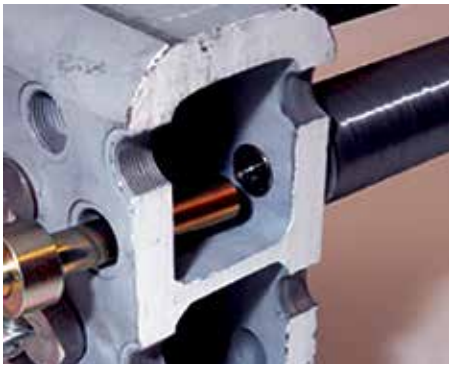
Installation and Removal Tools

Pull Rod Assemblies

EST Group maintains a significant inventory of Pull Rod Assemblies, Channel Head assemblies and extensions for both near end and Through-The-Tube Plugging™ in Shell and Tube Heat Exchangers and Air Cooled Heat Exchangers.

Pull Rod Assemblies for Air Cooled Heat Exchangers (ACHE)

EST Group offers a line of Pull Rod assemblies, Channel Head assemblies and extensions for the preparation and plugging of all types of Air Cooled Heat Exchangers. These tools eliminate the need for hammer in or welded plugs that can damage the tube and/or tubesheet and cause unexpected ejections. Pull Rods, Go/No-Go Gages, Reamers and Brushes are all available with extension rods to easily reach the tube sheet through the plug header to do the repairs in minutes instead of hours.



One Rev Tube Cutter

Ideal for piercing tubes prior to tube plugging. Capable of cutting ferrous & non-ferrous tubes commonly found in heat exchangers, boilers, & condensers. No special drives required, for use with hand wrench or ratchet. Adjustable for tube sheet thickness from 1" to 6" (25.4mm - 152.4 mm), longer tools available in 10" increments.

Pop-A-Plug® Removal Tool (PRT)

Quickly and easily remove installed Pop-A-Plug Tube Plugs with the dual functioning Removal Tool. The PRT features a nose piece that threads into the pin of an installed plug, enabling you to drive the pin from the ring. The tool retains the pin while a serrated spear grabs the ring's I.D. An integral slide hammer pulls out the ring and pin in one operation. Also available in extended models for Pop-A-Plug Air Cooled Heat Exchanger tube plugging systems.

Heat Exchanger Tube Testing Equipment

G-160 Tube Testing Tool

Rapidly detect tube leaks while providing a safer working environment for plant personnel. Innovative patent-pending gripper design provides increased operator safety. Uses standard compressed air supply - 40 to 125 PsiG (2.7 to 8.5 BarG).

Test tube I.D. sizes from 0.49" to 1.11" (12.4mm to 28.2mm). *Optional Support Tube Assemblies allow testing of tubes with I.D. sizes from 0.28" to 1.81" (7.1mm to 46.0mm).*

Features

- Ergonomic design with push button activated air injection valve
- Patent-pending gripper design requires less operator force
- Corrosion resistant powder coated finish
- Lightweight aluminum construction
- Fully protected gauges
- Impact-resistant case

Patent-pending gripper design

Analog & Digital gauges available

G-250 Vacuum Tube Testing Tool

Designed to quickly seal off and evacuate individual heat exchanger tubes to test for leakage. Test heat exchanger tubes ranging from 0.28" to 1.45" (7.1 to 36.8mm). High strength aluminum alloy construction reduces fatigue associated with heavier testing equipment. Each G-250 set weighs less than 2.5 lbs. (1.1kg).

Optional Seal sets available to test tubes to 2.50" (63.5mm). Replacement Seal & Washer sets, Channel Head Extensions and Digital Pressure Gauges also available. Uses standard compressed air supply - 40 to 125 PsiG (2.7 to 8.5 BarG).

G-650 Vacuum Joint Testing Tool

Quickly test expanded tube-to-tubesheet joints for leakage. Ideal for heat exchanger manufacturers or companies performing retubing operations. The G-650 Tool seals the tube I.D. and the tubesheet face, then evacuates the tube end at the joint. A loss of vacuum indicates a leaky tube joint. Interchangeable manifolds and Seal & Washer sets allow the G-650 Tool to test tube-to-tubesheet joints on 3/8" to 1¼" (9.5mm to 31.8mm) O.D. tubes.

The larger G-650A Vacuum Joint Testing Tool will accommodate tube O.D. sizes from 1½" to 2½" (38.1- 63.5mm). G-650 Tools are not suitable for testing excessively belled/flared tube ends, or tubes with welded tube-to-tubesheet joints. Digital Pressure Gauges are also available. Uses standard compressed air supply - 40 to 125 PsiG (2.7 to 8.5 BarG).

GripTight® Test & Isolation Plug Product Line

Safe, Effective Solutions for Rapid Pipe Testing and Repairs

EST Group offers a complete line of Hydrostatic Pressure Test and Pipeline Isolation Plugs for pressure testing pipework, pipelines and pressure vessels. GripTight® Test Plugs - for high pressure hydrostatic testing of open end pipe, piping systems, tubing and pressure vessels. Safe and effective at working pressures to 15000 PsiG (1034 BarG). Pipe OD and ID sealing solutions available. GripTight® Isolation Plugs – positively isolate pipe end hot work from potentially explosive upstream vapors; then weld and test the flange to pipe connection all with one tool.

- Test Open End Pipes, Pipelines, Tubes and Pressure Vessels
- Perform Flange-To-Pipe Weld Testing
- Isolate and Test Pipe Connections

GripTight® Test Plug

GripTight MAX® Test Plug

GripTight® Elbow Plug

GripTight® Isolation Plug

O.D. GripTight® Test Plug

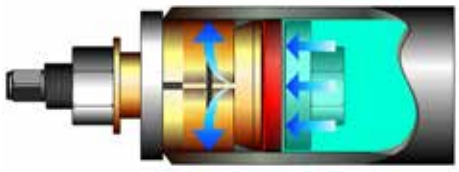
GripTight® PE Test Plug

GripTight® Reverse Pressure Test Plug

Pressure Test & Isolation Plugs

GripTight®

A standard in the industry, the GripTight High Pressure Test Plug uses test pressure to grip and seal more securely against the pipe's inner diameter. The greater the pressure, the greater the grip! The result is quicker installation, improved sealing, and all around safer testing. GripTight Test Plugs eliminate the time consuming practice of welding on/cutting off end caps/pups. GripTight Test Plugs are reusable and compatible with hydrostatic testing. Operating pressures up to 14000 PsiG (960 BarG), depending on plug size. Sizes from 1" to 48" (DN25 -DN1200), for smaller sizes, see GripTight MAX Test Plugs. *Larger sizes available.*



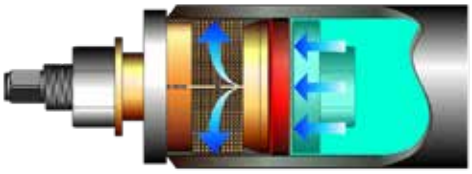
GripTight MAX®

Significantly increase the range of pipe materials that can be tested at higher pressures.

Highly effective for testing high pressure steam systems, high alloy hardened pipe materials, and down hole/well-head piping. Also effective for testing non-metallic materials including Fiberglass Reinforced Plastic (FRP) and Glass Reinforced Epoxy (GRP).

Features & Benefits

- Safe and reliable testing at higher pressures
- Saves up to 80% in testing time vs. welded-on end cap testing procedures
- Patented dual-serrated gripper design provides more gripping points on inside pipe surfaces
- Test pressures to 15000 PsiG (1034 BarG)
- Sizes from 3/8" to 48" (DN10 - DN1200). *Larger sizes available*
- Facilitates testing in accordance with ASME PCC-2 and ASME Boiler and Pressure Vessel Codes

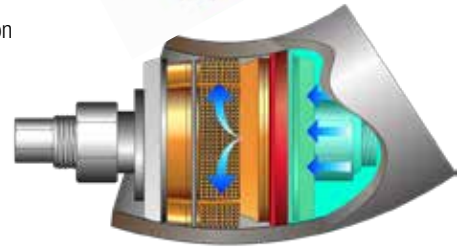


GripTight® Elbow

Designed for testing long radius elbows. Our patented dual-serrated GripTight MAX grippers give this unique plug design pressure holding capabilities to 3350 PsiG (231 BarG) - providing a safe and effective solution for pipe spools and piping systems terminating in long radius elbows.

Features & Benefits

- Orientation Free Installation - no need to align with elbow - easier operation
- Patented dual-serrated gripper design
- Test pressures to 3350 PsiG (231 BarG)
- Sizes for NPS ranging from 2" to 24" (DN50-DN600). *Larger sizes available*
- Fits any long radius elbow
- Saves up to 80% in testing time vs. welded-on end cap/pup testing procedures

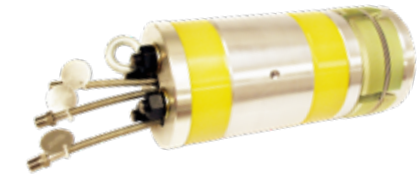


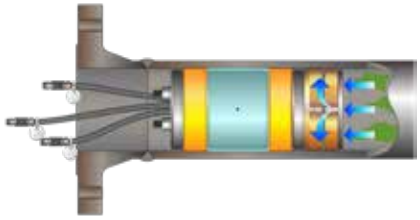
Pressure Test & Isolation Plugs

GripTight® Isolation Plug

GripTight Isolation Plugs integrate a Double Block and Bleed Test Plug with GripTight grippers. The upstream port allows operators to positively isolate and monitor potentially explosive vapors during hot work. The dual port design allows water to be introduced to the section between the seals through the fill port while air is simultaneously evacuated through the vent port - creating a positive pressure barrier between the hotwork and residual upstream gases. After hotwork is complete, the plug can be repositioned to hydrotest the new weld connection.

GripTight grippers improve the operational safety minimizing the risk of accidental plug blowout/ expulsion due to improper use or unexpected upstream pressure in the line. GripTight Isolation Plugs are capable of withstanding test pressures to 2250 PsiG (155.1BarG) between the seals, and upstream pressures up to 1500 PsiG (103 BarG). As upstream pressure increases, GripTight grippers use the pressure to grip and seal more securely against the pipe's I.D. Sizes from 3/4" to 48" NPS (DN20 - DN1200). *Larger sizes available.*

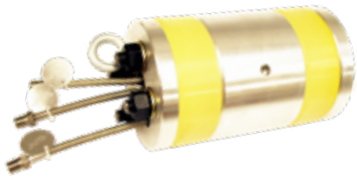


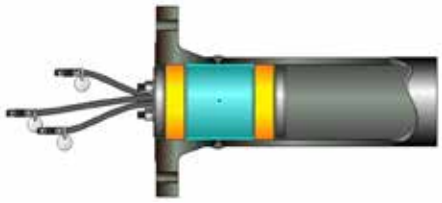


Double Block and Bleed Plug

Double Block and Bleed Isolation Plug utilizes a safe and effective three port design. The upstream port allows operators to positively isolate and monitor potentially explosive vapors during hot work. The dual port design allows water to be introduced to the section between the seals through the fill port while air is simultaneously evacuated through the vent port - creating a positive pressure barrier between the hotwork and residual upstream gases. After hotwork is complete, plug can be repositioned to hydrotest new weld connections.

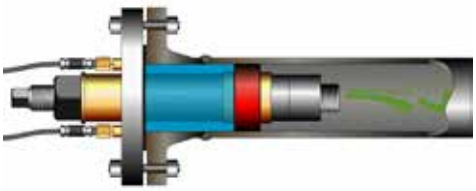
Durable aluminum/steel construction makes this tool lightweight and easy to maneuver. The volume of water required for testing is so small that testing can be accomplished using a simple hand pump, easily facilitating testing in remote areas of facilities. Pressure rated to 2250 PsiG (155.1 BarG) between the seals. Upstream pressure rated to 10 PsiG (0.7 BarG). Sizes from 3/4" to 48" NPS (DN20 - DN1200) in STD wall, schedule 40 and 80. *Larger sizes available.*





High Lift Flange Weld

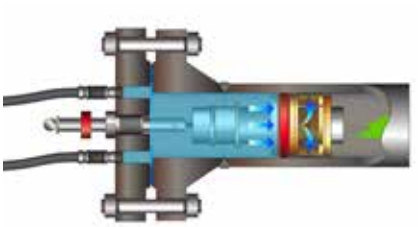
Monitor upstream conditions, isolate and purge weld area, perform hot work, and hydro test the weld joint with one easy-to-use tool. No blind flanging upstream, no vacuum truck for evacuating the line, and no X-raying. Each test requires a minimum amount of water, no need to fill the entire line. Use less water and minimize your environmental impact. High Lift seal design provides improved seal-to-pipe clearance. Operating pressures to ANSI B16.5 requirements. Flange classes 150 to 600 lb. Higher classes available. All flange types. Pipe sizes from 3/4" to 24" (DN20 - DN600). *Larger sizes available.*



Pressure Test & Isolation Plugs

GripTight® Reverse Pressure

Pressure test flange-to-pipe welds with full radial, hoop and axial stresses – equivalent to the stresses that would be produced when using a blind to pressurize the entire piping system. Pressure testing can effectively verify the weld integrity providing the user confidence the flange and weld will properly function when placed into service. Operating pressures to 2250 PsiG (155.1 BarG).



O.D. GripTight®

Uses patented self-gripping, self-sealing design and reliable dual seal mechanism to provide unparalleled speed and safety in hydro-testing. The GripTight design grips and seals along the pipe O.D. Since pipe O.D.'s are constant, one O.D. plug often replaces several different sizes of I.D. sealing plugs providing an economic advantage and lower inventory. Operating pressures to 5000 PsiG (343 BarG). 1/4" to 4" ANSI pipe sizes (DN8 - DN100) and 1/2" to 3½" (12.7 to 88.9 mm) O.D. tube sizes.

GripTight® PE

No more having to square and round pipe ends to fuse on end caps. Just slip a GripTight PE plug in the open ends of a section of pipe, tighten and begin testing. Testing can be performed on an installed pipe or while it is still on the spool. Patented dual seal design. Available in 2", 3", 4", 6" and 8" pipe sizes (DN50-DN200). Plug sizes to cover 9 to 17 SDR applications in either HDPE or MDPE pipe - other sizes available. Conservatively rated to 150% of maximum operating pressure required under 49 CFR 192.513.

Socket Weld (SQS)

SQS Test Plugs are designed to facilitate testing socket weld fittings and couplings. During installation, grippers expand within the socket holding the plug in position while the seal element expands and seals off the bore of the fitting. Designed for ASTM A105 3000 lb carbon steel socket weld fittings. Sizes to fit 1/2" through 2" fittings, operating pressures to 5000 PsiG (344 BarG), depending on plug size. *Larger sizes available.*

Pressure Test & Isolation Plugs

LW100 Series

Highly versatile, lightweight, and cost effective test and temporary sealing solution for low pressure applications. Lightweight aluminum construction substantially reduces manpower and heavy lifting equipment required for installation and removal, resulting in lower costs per test. Safely test applications from 4" to 36" (101.6 to 914.4mm), with a pressure rating up to 100 PsiG (6.9 BarG). *Larger sizes available.*

Bolt Type

Designed for simple and reliable testing of pipe and tubing. Bolt Type plugs feature a neoprene seal - the only part of the plug that comes in contact with the tube I.D. Simply install into the open end of the pipe or tube and tighten the large compression nut to expand the seal element; then begin testing.

Operating pressures to 250 PsiG (17.2 BarG), depending on the plug size. Sizes for 0.28" to 10½" (7.11 - 266.7mm). Shown with thread protector.

Economy

Simple and reliable testing of pipe and tubing. Economy plugs feature a neoprene seal - the only part of the plug that comes in contact with the tube I.D. Simply install the Economy test plug into the open end of a pipe and/or tube, and tighten to expand the seal.

Begin pressure testing. Operating pressures to 35 PsiG (2.4 BarG), depending on plug size. Sizes for 3/8" to 4" (9.525 - 101.6mm).

Pressure Test & Isolation Plug Accessories / Safety Devices

Auto GripTight® Testing System

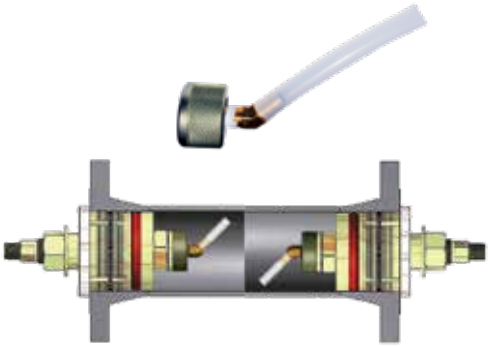
Speeds plug installation and testing process. System hydraulically energizes the test plug by simply activating a hydraulic pump, eliminating the need for manually tightening the plug. Ideal for testing applications in pipe or tubing I.D.'s ranging from 0.50" to 4.34" (12.7 - 110.2mm) and operating pressures to 13900 PsiG (958 BarG). Contact Customer Service and let us help you design a system.

Test Plug Lifting Arms

Designed to maneuver larger test plugs securely with cranes, forklifts, or other lifting mechanisms. Provides greater stability and operator safety during installations. Models available for use with plug sizes ranging from 10"- 48" (DN250 - DN1200), and 6500 lbs. (2950 kg) capacity.

GripTight® Vent Assembly

Safely fill and drain pipes during hydrostatic testing. Vents are installed with tubes at high and low points in the area being tested in order to fill with test medium and displace air/gases in the pipe being tested.



Plug Safety Gags

Designed to prevent damage which may occur due to incorrectly installed plugs ejecting from the pipe during pressurization. Gags are designed to quickly fasten to pipe OD and plug inlet.

Hydrostatic Test Pumps

P Series Hand Pump

A self-contained and portable hand pump for testing tubes, pipes and pressure vessels. It is integrated into a 5 gallon attached reservoir which is easily refilled. Pump is hand operated, eliminating the need for compressed air. Pressure output can be adjusted to either 1000 PsiG (68.9 BarG), 2000 PsiG (137.9 BarG) or 3000 PsiG (206.8 BarG) for the appropriate application. It has a silicone-filled gauge for all weather use and minimal moving parts for durability and longevity. High pressure bleed valve and hose with swivel fitting included.

P Series

Ideal for hydro testing heat exchanger tubes, pipe and pressure vessels in the field or in the shop. Available in two output pressures, 2,500 or 10000 PsiG (172.3 and 689.4 BarG). All wetted parts are stainless steel. Easy to read 4" (100 mm) diameter pressure gauge. Completely enclosed in a lockable aluminum tool box. Supplied with 10ft (3.1 m) high pressure hose with quick couplings for air and water inlet connections.

Blue Max 3

Suitable for all hydrostatic testing applications. Available in a number of output pressures ranging from 1000 to 10000 PsiG (68.6 to 686.3 BarG). Higher pressures available. All wetted parts are stainless steel. Blue Max 3 features an easy to read 4" diameter (100 mm) pressure gauge. Supplied with mating quick connect couplings for air inlet, water inlet and high pressure outlet connections. Enclosed cabinet provides safe & quiet operation, and protects components from damage.

Specialty Tools

D-Series Tapping Tools

Safely tap, sample, and drain piping and pressure vessels with the D-Series Tapping Tools from EST Group. D-Series Tools provide unmatched reliability for isolating and removing contaminants while keeping operators safe. Bolt-on design makes for quick and easy installation.

Available for pipe sizes from 1/4" through 3" at working pressures to 285 PsiG (19.7 BarG). Complies with ANSI N45.2, 10 CFR 50 Appx. B and 10 CFR 21.

Turnaround Job Boxes & Toolkits

Turnaround Job Box

Perfect for anyone who is planning a large test and repair project and needs to have all their Pop-A-Plug® Tube Plugs, GripTight® Test Plugs and Installation tools in one place. Turnaround Job Boxes are easily transported by fork truck or pallet jack and are all-steel construction. Can be securely locked to prevent theft of tools, plugs and other materials.

Pipe Test Toolkit

Combined with your choice of GripTight Test Plug, GripTight MAX Test Plug or other EST Group Test and Isolation Plugs, the Pipe Test Tool kit is all you need to hydrostatically test your flange welds and other joint connections. All that's needed is the water!

EST Group Field Services

Expert Field Services & Technical Support, 24/7, 365 days a year

With industry wide reduction in plant maintenance personnel, it is more important than ever to work with a skilled and experienced provider of heat exchanger and hydrostatic testing services. From inspection to repair services, when you work with EST Group, you know the job is done right.

EST Group Field Services provides a complete range of on-site services for your shell and tube heat exchangers, condensers, air cooled heat exchangers and oil coolers. We also provide hydrostatic testing services for pipe, piping systems, and flange connections. Our trained technicians have the experience and know-how to handle the most demanding jobs, safely, competently and on-time.

Our technicians quickly respond and meet the tightest repair schedules. Join our growing list of satisfied customers in the power generation, chemical, petrochemical, oil refining, pharmaceutical, industrial gas, shipbuilding, and boiler manufacturing industries.

Services

- Pop-A-Plug® Tube Plugging and Through-The-Tube™ Plugging
- Tube Testing & Tube Joint Testing
- Tube Sleeving & Lining
- Tube Cleaning
- Tube Sample Removal
- Visual Tube Inspection
- Hydrostatic Testing
    - GripTight® full line testing
    - GripTight® Elbow testing
    - GripTight® Reverse Pressure flange weld testing
    - Double Block and Bleed Isolation
    - GripTight® Isolation weld testing with back pressure isolation
- Field Supervision & Technical Support

EST Group Product Training

- Certified Training Program
- Pop-A-Plug® Installation Training
- Test Plug Operation and Plug Maintenance Training

Common Pipe Sizing Chart - English & Metric Sizing (inches / mm)

DN	PIPE SIZE	PIPE OD	SCH 5S	SCH 10S	SCH 10	SCH 20	SCH 30	STD	SCH 40	SCH 60	XS	SCH 80	SCH 100	SCH 120	SCH 140	SCH 160	XXS
6	1/8	0.405 (10.29)		0.307 (7.80)				0.269 (6.83)	0.269 (6.83)		0.215 (5.46)	0.215 (5.46)					
8	1/4	0.540 (13.72)		0.410 (10.41)				0.364 (9.25)	0.364 (9.25)		0.302 (7.67)	0.302 (7.67)					
10	3/8	0.675 (17.15)		0.545 (13.84)				0.493 (12.52)	0.493 (12.52)		0.423 (10.74)	0.423 (10.74)					
15	1/2	0.840 (21.34)	0.710 (18.03)	0.674 (17.12)				0.622 (15.80)	0.622 (15.80)		0.546 (13.87)	0.546 (13.87)				0.464 (11.79)	0.252 (6.40)
20	3/4	1.050 (26.67)	0.920 (23.37)	0.884 (22.45)				0.824 (20.93)	0.824 (20.93)		0.742 (18.85)	0.742 (18.85)				0.612 (15.54)	0.434 (11.02)
25	1	1.315 (33.40)	1.185 (30.10)	1.097 (27.86)				1.049 (26.64)	1.049 (26.64)		0.957 (24.31)	0.957 (24.31)				0.815 (20.70)	0.599 (15.21)
32	1-1/4	1.660 (42.16)	1.530 (38.86)	1.442 (36.63)				1.380 (35.05)	1.380 (35.05)		1.278 (32.46)	1.278 (32.46)				1.160 (29.46)	0.896 (22.76)
40	1-1/2	1.900 (48.26)	1.770 (44.96)	1.682 (42.72)				1.610 (40.89)	1.610 (40.89)		1.500 (38.10)	1.500 (38.10)				1.338 (33.99)	1.100 (27.94)
50	2	2.375 (60.33)	2.245 (57.02)	2.157 (54.79)				2.067 (52.50)	2.067 (52.50)		1.939 (49.25)	1.939 (49.25)				1.689 (42.90)	1.503 (38.18)
65	2-1/2	2.875 (73.03)	2.709 (68.81)	2.635 (66.93)				2.469 (62.71)	2.469 (62.71)		2.323 (59.00)	2.323 (59.00)				2.125 (53.98)	1.771 (44.98)
80	3	3.500 (88.90)	3.334 (84.68)	3.260 (82.80)				3.068 (77.93)	3.068 (77.93)		2.900 (73.66)	2.900 (73.66)				2.626 (66.70)	2.300 (58.42)
90	3-1/2	4.000 (101.60)	3.834 (97.38)	3.760 (95.50)				3.548 (90.12)	3.548 (90.12)		3.364 (85.45)	3.364 (85.45)					
100	4	4.500 (114.30)	4.334 (110.08)	4.260 (108.20)				4.026 (102.26)	4.026 (102.26)		3.826 (97.18)	3.826(97.18)		3.626 (92.10)		3.438 (87.33)	3.152 (80.06)
125	5	5.563 (141.30)	5.345 (135.76)	5.295 (134.49)				5.047 (128.19)	5.047 (128.19)		4.813 (122.25)	4.813 (122.25)		4.563 (115.90)		4.313 (109.55)	4.063 (103.20)
150	6	6.625 (168.28)	6.407 (162.74)	6.357 (161.47)				6.065 (154.05)	6.065 (154.05)		5.761 (146.33)	5.761 (146.33)		5.501 (139.73)		5.189 (131.80)	4.897 (124.38)
200	8	8.625 (219.08)	8.407 (213.54)	8.329 (211.56)		8.125 (206.38)	8.071 (205.00)	7.981 (202.72)	7.981 (202.72)	7.813 (198.45)	7.625 (193.68)	7.625 (193.68)	7.437 (188.90)	7.189 (182.60)	7.001 (177.83)	6.813 (173.05)	6.875 (174.63)
250	10	10.750 (273.05)	10.482 (266.24)	10.420 (264.67)		10.250 (260.35)	10.136 (257.45)	10.020 (254.51)	10.020 (254.51)	9.750 (247.65)	9.750 (247.65)	9.564 (242.93)	9.312 (236.52)	9.064 (230.23)	8.750 (222.25)	8.500 (215.90)	8.750 (222.25
300	12	12.750 (323.85)	12.438 (315.93)	12.390 (314.71)		12.250 (311.15)	12.090 (307.09)	12.000 (304.80)	11.938 (303.23)	11.626 (295.30)	11.750 (298.45)	11.376 (288.95)	11.062 (280.97)	10.750 (273.05)	10.500 (266.70)	10.126 (257.20)	10.750 (273.05)
350	14	14.000 (355.60)	13.688 (347.68)	13.624 (346.05)	13.500 (342.90)	13.376 (339.75)	13.250 (336.55)	13.250 (336.55)	13.124 (333.35)	12.812 (325.42)	13.000 (330.20)	12.500 (317.50)	12.124 (307.95)	11.812 (300.02)	11.500 (292.10)	11.188 (284.18)	
400	16	16.000 (406.40)	15.670 (398.02)	15.624 (396.85)	15.500 (393.70)	15.376 (390.55)	15.250 (387.35)	15.250 (387.35)	15.000 (381.00)	14.688 (373.08)	15.000 (381.00)	14.312 (363.52)	13.938 (354.03)	13.562 (344.47)	13.124 (333.35)	12.812 (325.42)	
450	18	18.000 (457.20)	17.670 (448.82)	17.624 (447.65)	17.500 (444.50)	17.376 (441.35)	17.124 (434.95)	17.250 (438.15)	16.876 (428.65)	16.500 (419.10)	17.000 (431.80)	16.124 (409.55)	15.688 (398.48)	15.250 (387.35)	14.876 (377.85)	14.438 (366.73)	
500	20	20.000 (508.00)	19.625 (498.48)	19.564 (496.93)	19.500 (495.30)	19.250 (488.95)	19.000 (482.60)	19.250 (488.95)	18.812 (477.82)	18.376 (466.75)	19.000 (482.60)	17.938 (455.63)	17.438 (442.93)	17.000 (431.80)	16.500 (419.10)	16.062 (407.97)	
550	22	22.000 (558.80)	21.625 (549.28)	21.564 (547.73)	21.500 (546.10)	21.250 (539.75)	21.000 (533.40)	21.250 (539.75)		20.250 (514.35)	21.000 (533.40)	19.750 (501.65)	19.250 (488.95)	18.750 (476.25)	18.250 (463.55)	17.750 (450.85)	
600	24	24.000 (609.60)	23.564 (598.53)	23.500 (596.90	23.500 (596.90)	23.250 (590.55)	22.876 (581.05)	23.250 (590.55)	22.624 (574.65)	22.062 (560.37)	23.000 (584.20)	21.564 (547.73)	20.938 (531.83)	20.376 (517.55)	19.876 (504.85)	19.312 (490.52)	
650	26	26.000 (660.40)			25.376 (644.55)	25.000 (635.00)		25.250 (641.35)			25.000 (635.00)						
700	28	28.000 (711.20)			27.376 (695.35)	27.000 (685.80)	26.750 (679.45)	27.250 (692.15)			27.000 (685.80)						
750	30	30.000 (762.00)	29.500 (749.30)	29.376 (746.15)	29.376 (746.15)	29.000 (736.60)	28.750 (730.25)	29.250 (742.95)			29.000 (736.60)						
800	32	32.000 (812.80)			31.376 (796.95)	31.000 (787.40)	30.750 (781.05)	31.250 (793.75)	30.624 (777.85)		31.000 (787.40)						
850	34	34.000 (863.60)			33.376 (847.75)	33.000 (838.20)	32.750 (831.85)	33.250 (844.55)	32.624 (828.65)		33.000 (838.20)						
900	36	36.000 (914.40)			35.376 (898.55)	35.000 (889.00)	34.750 (882.65)	35.250 (895.35)	34.500 (876.30)		35.000 (889.00)						
1000	42	42.000 (1066.8)						41.250 (1047.75)			41.000 (1041.40)						
1200	48	48.000 (1219.2)						47.250 (1200.15)			47.000 (1193.8)						

Approximate Tube Inside Diameters Before & After Roller Expansion (Inches)

Tube Inside Diameters As Manufactured

Wall Thickness		Tube OD												
BWG	Decimal	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	2
8	0.165	0.045	0.170	0.295	0.420	0.545	0.670	0.795	0.920	1.045	1.170	1.295	1.420	1.670
9	0.148	0.079	0.204	0.329	0.454	0.579	0.704	0.829	0.954	1.079	1.204	1.329	1.454	1.704
10	0.134	0.107	0.232	0.357	0.482	0.607	0.732	0.857	0.982	1.107	1.232	1.357	1.482	1.732
11	0.120	0.135	0.260	0.385	0.510	0.635	0.760	0.885	1.010	1.135	1.260	1.385	1.510	1.760
12	0.109	0.157	0.282	0.407	0.532	0.657	0.782	0.907	1.032	1.157	1.282	1.407	1.532	1.782
13	0.095	0.185	0.310	0.435	0.560	0.685	0.810	0.935	1.060	1.185	1.310	1.435	1.560	1.810
14	0.083	0.209	0.334	0.459	0.584	0.709	0.834	0.959	1.084	1.209	1.334	1.459	1.584	1.834
15	0.072	0.231	0.356	0.481	0.606	0.731	0.856	0.981	1.106	1.231	1.356	1.481	1.606	1.856
16	0.065	0.245	0.370	0.495	0.620	0.745	0.870	0.995	1.120	1.245	1.370	1.495	1.620	1.870
17	0.058	0.259	0.384	0.509	0.634	0.759	0.884	1.009	1.134	1.259	1.384	1.509	1.634	1.884
18	0.049	0.277	0.402	0.527	0.652	0.777	0.902	1.027	1.152	1.277	1.402	1.527	1.652	1.902
19	0.042	0.291	0.416	0.541	0.666	0.791	0.916	1.041	1.166	1.291	1.416	1.541	1.666	1.916
20	0.035	0.305	0.430	0.555	0.680	0.805	0.930	1.055	1.180	1.305	1.430	1.555	1.680	1.930
21	0.032	0.311	0.436	0.561	0.686	0.811	0.936	1.061	1.186	1.311	1.436	1.561	1.686	1.936
22	0.028	0.319	0.444	0.569	0.694	0.819	0.944	1.069	1.194	1.319	1.444	1.569	1.694	1.944
23	0.025	0.325	0.450	0.575	0.700	0.825	0.950	1.075	1.200	1.325	1.450	1.575	1.700	1.950
24	0.022	0.331	0.456	0.581	0.706	0.831	0.956	1.081	1.206	1.331	1.456	1.581	1.706	1.956

Tube Inside Diameters After Roller Expansion

Wall Thickness		Tube OD												
BWG	Decimal	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	2
8	0.165	0.078	0.203	0.328	0.453	0.578	0.703	0.828	0.953	1.078	1.203	1.328	1.453	1.703
9	0.148	0.109	0.234	0.359	0.484	0.609	0.734	0.859	0.984	1.109	1.234	1.359	1.484	1.734
10	0.134	0.134	0.259	0.384	0.509	0.634	0.759	0.884	1.009	1.134	1.259	1.384	1.509	1.759
11	0.120	0.159	0.284	0.409	0.534	0.659	0.784	0.909	1.034	1.159	1.284	1.409	1.534	1.784
12	0.109	0.179	0.304	0.429	0.554	0.679	0.804	0.929	1.054	1.179	1.304	1.429	1.554	1.804
13	0.095	0.204	0.329	0.454	0.579	0.704	0.829	0.954	1.079	1.204	1.329	1.454	1.579	1.829
14	0.083	0.226	0.351	0.476	0.601	0.726	0.851	0.976	1.101	1.226	1.351	1.476	1.601	1.851
15	0.072	0.245	0.370	0.495	0.620	0.745	0.870	0.995	1.120	1.245	1.370	1.495	1.620	1.870
16	0.065	0.258	0.383	0.508	0.633	0.758	0.883	1.008	1.133	1.258	1.383	1.508	1.633	1.883
17	0.058	0.271	0.396	0.521	0.646	0.771	0.896	1.021	1.146	1.271	1.396	1.521	1.646	1.896
18	0.049	0.287	0.412	0.537	0.662	0.787	0.912	1.037	1.162	1.287	1.412	1.537	1.662	1.912
19	0.042	0.299	0.424	0.549	0.674	0.799	0.924	1.049	1.174	1.299	1.424	1.549	1.674	1.924
20	0.035	0.312	0.437	0.562	0.687	0.812	0.937	1.062	1.187	1.312	1.437	1.562	1.687	1.937
21	0.032	0.317	0.442	0.567	0.692	0.817	0.942	1.067	1.192	1.317	1.442	1.567	1.692	1.942
22	0.028	0.325	0.450	0.575	0.700	0.825	0.950	1.075	1.200	1.325	1.450	1.575	1.700	1.950
23	0.025	0.330	0.455	0.580	0.705	0.830	0.955	1.080	1.205	1.330	1.455	1.580	1.705	1.955
24	0.022	0.335	0.460	0.585	0.710	0.835	0.960	1.085	1.210	1.335	1.460	1.585	1.710	1.960

NOTE: TUBE INSIDE DIAMETERS AFTER ROLLER EXPANSION ARE ESTIMATED ASSUMING A 10% WALL THICKNESS LOSS, FORMULA = [(OD - 2 * (WT * 0.9)]

Approximate Tube Inside Diameters Before & After Roller Expansion (mm)

Tube Inside Diameters As Manufactured

Wall Thickness		Tube OD														
BWG	Decimal	9.53	12.70	15.88	19.05	22.23	25.40	28.58	31.75	34.93	38.10	41.28	44.45	50.80	57.15	63.50
8	4.19	1.14	4.32	7.49	10.67	13.84	17.02	20.19	23.37	26.54	29.72	32.89	36.07	42.42	48.77	55.12
9	3.76	2.01	5.18	8.36	11.53	14.71	17.88	21.06	24.23	27.41	30.58	33.76	36.93	43.28	49.63	55.98
10	3.40	2.72	5.89	9.07	12.24	15.42	18.59	21.77	24.94	28.12	31.29	34.47	37.64	43.99	50.34	56.69
11	3.05	3.43	6.60	9.78	12.95	16.13	19.30	22.48	25.65	28.83	32.00	35.18	38.35	44.70	51.05	57.40
12	2.77	3.99	7.16	10.34	13.51	16.69	19.86	23.04	26.21	29.39	32.56	35.74	38.91	45.26	51.61	57.96
13	2.41	4.70	7.87	11.05	14.22	17.40	20.57	23.75	26.92	30.10	33.27	36.45	39.62	45.97	52.32	58.67
14	2.11	5.31	8.48	11.66	14.83	18.01	21.18	24.36	27.53	30.71	33.88	37.06	40.23	46.58	52.93	59.28
15	1.83	5.87	9.04	12.22	15.39	18.57	21.74	24.92	28.09	31.27	34.44	37.62	40.79	47.14	53.49	59.84
16	1.65	6.22	9.40	12.57	15.75	18.92	22.10	25.27	28.45	31.62	34.80	37.97	41.15	47.50	53.85	60.20
17	1.47	6.58	9.75	12.93	16.10	19.28	22.45	25.63	28.80	31.98	35.15	38.33	41.50	47.85	54.20	60.55
18	1.25	7.04	10.21	13.39	16.56	19.74	22.91	26.09	29.26	32.44	35.61	38.79	41.96	48.31	54.66	61.01
19	1.07	7.39	10.57	13.74	16.92	20.09	23.27	26.44	29.62	32.79	35.97	39.14	42.32	48.67	55.02	61.37
20	0.89	7.75	10.92	14.10	17.27	20.45	23.62	26.80	29.97	33.15	36.32	39.50	42.67	49.02	55.37	61.72
21	0.81	7.90	11.07	14.25	17.42	20.60	23.77	26.95	30.12	33.30	36.47	39.65	42.82	49.17	55.52	61.87
22	0.71	8.10	11.28	14.45	17.63	20.80	23.98	27.15	30.33	33.50	36.68	39.85	43.03	49.38	55.73	62.08
23	0.64	8.26	11.43	14.61	17.78	20.96	24.13	27.31	30.48	33.66	36.83	40.01	43.18	49.53	55.88	62.23
24	0.56	8.41	11.58	14.76	17.93	21.11	24.28	27.46	30.63	33.81	36.98	40.16	43.33	49.68	56.03	62.38

Tube Inside Diameters After Roller Expansion

Wall Thickness		Tube OD														
BWG	Decimal	9.53	12.70	15.88	19.05	22.23	25.40	28.58	31.75	34.93	38.10	41.28	44.45	50.80	57.15	63.50
8	4.19	1.98	5.16	8.33	11.51	14.68	17.86	21.03	24.21	27.38	30.56	33.73	36.91	43.26	49.61	55.96
9	3.76	2.76	5.93	9.11	12.28	15.46	18.63	21.81	24.98	28.16	31.33	34.51	37.68	44.03	50.38	56.73
10	3.40	3.40	6.57	9.75	12.92	16.10	19.27	22.45	25.62	28.80	31.97	35.15	38.32	44.67	51.02	57.37
11	3.05	4.04	7.21	10.39	13.56	16.74	19.91	23.09	26.26	29.44	32.61	35.79	38.96	45.31	51.66	58.01
12	2.77	4.54	7.72	10.89	14.07	17.24	20.42	23.59	26.77	29.94	33.12	36.29	39.47	45.82	52.17	58.52
13	2.41	5.18	8.36	11.53	14.71	17.88	21.06	24.23	27.41	30.58	33.76	36.93	40.11	46.46	52.81	59.16
14	2.11	5.73	8.91	12.08	15.26	18.43	21.61	24.78	27.96	31.13	34.31	37.48	40.66	47.01	53.36	59.71
15	1.83	6.23	9.41	12.58	15.76	18.93	22.11	25.28	28.46	31.63	34.81	37.98	41.16	47.51	53.86	60.21
16	1.65	6.55	9.73	12.90	16.08	19.25	22.43	25.60	28.78	31.95	35.13	38.30	41.48	47.83	54.18	60.53
17	1.47	6.87	10.05	13.22	16.40	19.57	22.75	25.92	29.10	32.27	35.45	38.62	41.80	48.15	54.50	60.85
18	1.25	7.28	10.46	13.63	16.81	19.98	23.16	26.33	29.51	32.68	35.86	39.03	42.21	48.56	54.91	61.26
19	1.07	7.60	10.78	13.95	17.13	20.30	23.48	26.65	29.83	33.00	36.18	39.35	42.53	48.88	55.23	61.58
20	0.89	7.92	11.10	14.27	17.45	20.62	23.80	26.97	30.15	33.32	36.50	39.67	42.85	49.20	55.55	61.90
21	0.81	8.06	11.24	14.41	17.59	20.76	23.94	27.11	30.29	33.46	36.64	39.81	42.99	49.34	55.69	62.04
22	0.71	8.25	11.42	14.60	17.77	20.95	24.12	27.30	30.47	33.65	36.82	40.00	43.17	49.52	55.87	62.22
23	0.64	8.38	11.56	14.73	17.91	21.08	24.26	27.43	30.61	33.78	36.96	40.13	43.31	49.66	56.01	62.36
24	0.56	8.52	11.69	14.87	18.04	21.22	24.39	27.57	30.74	33.92	37.09	40.27	43.44	49.79	56.14	62.49

NOTE: TUBE INSIDE DIAMETERS AFTER ROLLER EXPANSION ARE ESTIMATED ASSUMING A 10% WALL THICKNESS LOSS, FORMULA = [(OD - 2 * (WT * 0.9)]

Field Notes

Pop-A-Plug® Tube Plugging System for Air-Cooled Heat Exchangers

Curtiss Wright EST Group offers a solution to simplify testing, maintenance and repair of Air-Cooled Heat Exchangers. Pop-A-Plug Tube Plugging System and G-Series Tube Testing equipment provide easy-to-use tools for leak-testing and installing permanent but removable plugs into leaking tubes. These tools are designed to test and plug tubes through the plug sheet, directly accessing the tube sheet. Testing and installation can be done in minutes, not the hours previously needed to perform repairs. Pop-A-Plug Tube Plugs are rated up to 7000 PsiG (480 BarG), and are available in a variety of materials to match your tube material, I.D. and pressure.

Customer reported results using the Pop-A-Plug Tube Plugging System:

20 tubes were plugged and exchanger was back in operation in 1 hour using the Pop-A-Plug System vs 18-26 hours of downtime using hammer and welded plugs

- Average installation time: 2 minutes per plug
- No weld permits required
- No expert welders required
- No damage to plug sheet threads
- Tube plugs can be easily removed with one tool when re-tubing is required

Change Out Old Elastomeric Plugs, Minimize Plant Downtime

In power generating stations, any forced outage is costly, especially at the peak of the generating season. All plants that support the base load of energy need to do everything possible to maximize uptime. As an example of costs associated with unplanned outages, a coal-fired generation plant incurred almost $10.9 million in losses due to almost 1369 hours (over 8 weeks) of downtime due to process water contamination. Causes for the failures were varied but one of the single largest (34%), was due to the failure of previously installed rubber condenser plugs!

These outages call for the proactive change out of old rubber/elastomer tube plugs to Pop-A-Plug Tube Plugs for reliable, and permanent sealing of leaking and degraded tube plugs. Pop-A-Plug Tube Plugs are proven to provide the lowest lifecycle cost for all types of plug systems used in heat exchanger maintenance. Pop-A-Plug Tube Plug kits are readily from a large inventory with 24/7 emergency service available for any unplanned outage that may arise – anywhere. EST Group also offers outage job box kits for large plants needing a variety of plugs for their condenser systems.

REPLACE THIS:
Old elastomeric plugs which break down and become unreliable

WITH THIS:
Pop-A-Plug® Tube Plug: the most reliable solution with the lowest lifecycle cost available for any plugging system

Notes

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CURTISS-WRIGHT

Product animations, instructions, and detailed technical information are available on our website: **www.cw-estgroup.com**

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