Underground Technology

GTI Keyhole Conference Fall 2012

Procedure Development and Tooling Design

By Frank Russo

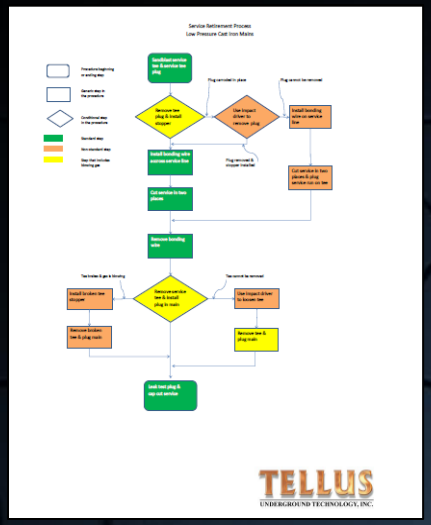
The Tellus Approach to Tool Design

A three step process

Determine the Process

- Leak location & Repair
- Service cut-off
- Corrosion control
- Service renewal
- Service installation
- Camera inspection
- Test station install
- Main tie-over

Develop a Procedure

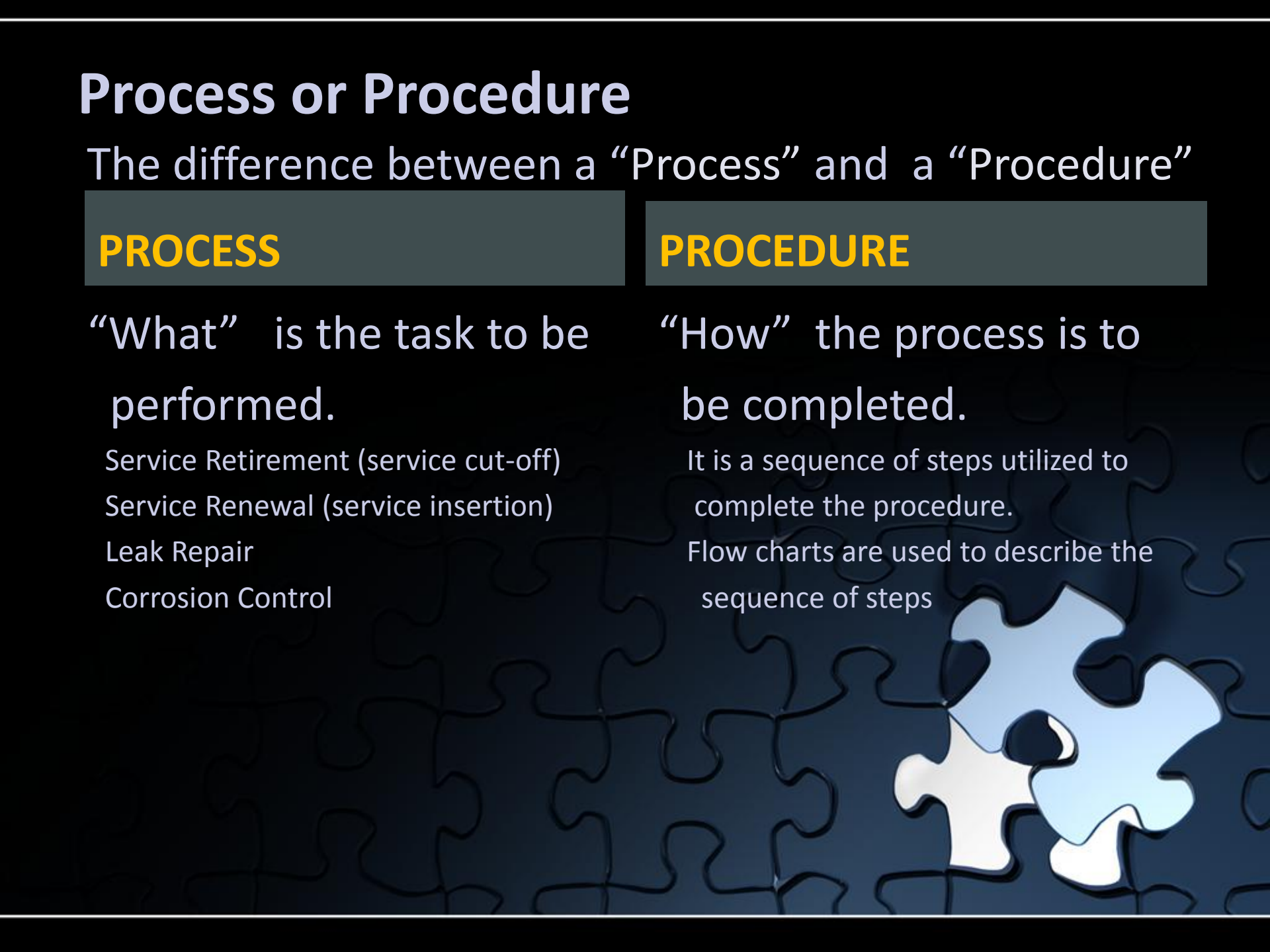


Design the Tooling to fulfill the requirements of the Procedure

Process or Procedure

The difference between a “Process” and a “Procedure”

PROCESS	PROCEDURE
“What” is the task to be performed.	“How” the process is to be completed.
Service Retirement (service cut-off)	It is a sequence of steps utilized to complete the procedure.
Service Renewal (service insertion)	Flow charts are used to describe the sequence of steps
Leak Repair	
Corrosion Control	



Process Considerations

A meeting with the gas system operator to determine system parameters

"What" process

The process that is to be performed on the distribution system

Service retirement, Service renewal, Leak repair, Anode installation etc.

System material

What is material makeup of the mains, services & service tees

Cast iron, Steel, HDPE plastic, Malleable iron, Red thread etc.

System hardware

What hardware is on system or to be added to the system

Fitting manufacturer, Fitting size, Attachment to main, Service configuration

Location accuracy

What plant location information is available

Accuracy of drawings, location devices available, who will be responsible for locations

System pressure

What is the operating system pressure

Low pressure, Medium pressure, High pressure

Blowing gas

Will it be "No-blow" or a Blowing gas process

Does system operator expect a "No-blow" procedure

Each process is unique to the service connection configuration

A steel to plastic service

A saddle on a steel main

A “Procedure” consists of a step-by-step set of instructions, a flow chart and list of tools

Each procedure will vary based upon the system hardware

OPERATION INSTRUCTIONS

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Service Retirement Procedure; Medium Pressure Gas Systems (*Steel)*

(for services attached to the main with a “U” bolt saddle)

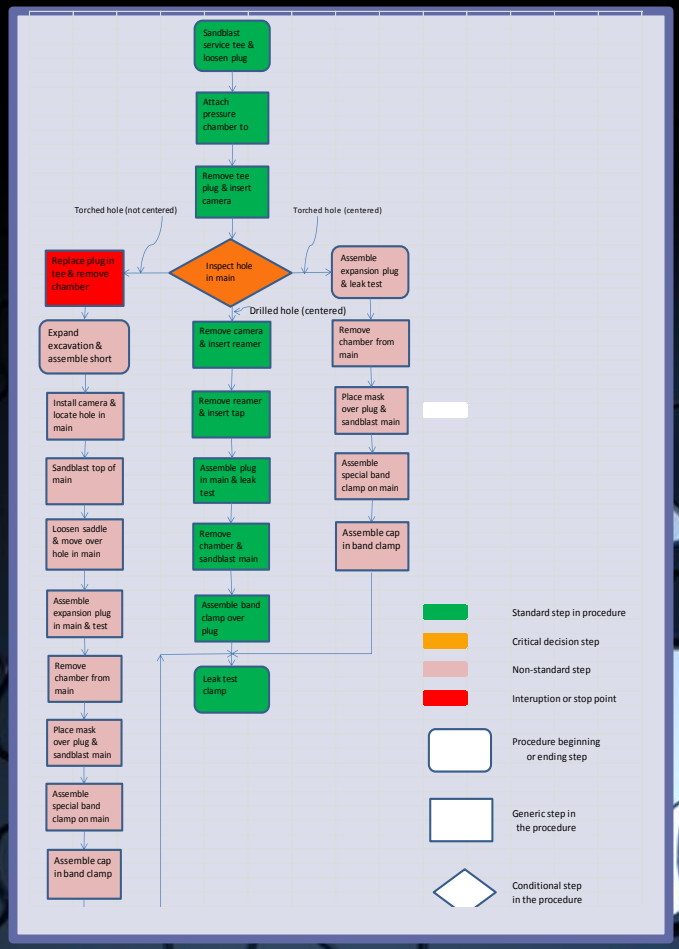
Preparation:

1. Core and excavate an 18” diameter hole to a depth that allows 3” to 4” of clearance below the gas main. Also be sure to expose enough of the service line to permit cutting of the service run with the pneumatic reciprocating saw.
2. Clean the service tee plug and top surface of service tee using an extension sandblasting nozzle. Remove all caked-on soil and rust scale to insure that the tee plug removal socket will fit onto the square pad of the plug and that the band on the top of the tee is sufficiently clean to seal on the pressure chamber.

The Process:

3. Select the appropriate size main clamp fixture, service tee adapter and pressure chamber for the service to be retired. Assemble the service tee adapter to the pressure chamber and snug coupling tight enough to establish a gas tight seal using the two pressure chamber wrenches. Insert the service tee adapter into the sleeve of the main clamp platform while positioning the two clamping lugs on the threaded rods on the main clamp platform. Assemble the two hex nuts and washers onto the threaded rods and thread the nuts far enough to fully engage the two clamping lugs into the slots of the main clamp sleeve.
4. The assembled pressure chamber, service tee adapter and main clamp platform assembly can now be lowered into the excavated keyhole and positioned on the main over the service tee. The service tee adapter must slide freely in the two slots of the main clamp platform. After the service tee adapter is positioned on the service tee and the service tee adapter drops in place over the service tee, the main clamps can be tightened onto the main. With the pressure chamber and main clamp assembly firmly clamped in place the service tee adapter can be sealed on the service tee by advancing

PROCEDURE FLOW CHART



A well written “procedure” must address all events that can cause the procedure to fail

All operating procedures include the list of tooling that will be used to perform that procedure as it is written

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Installation Procedure

Keyhole procedure for installation of Elster/Perfection

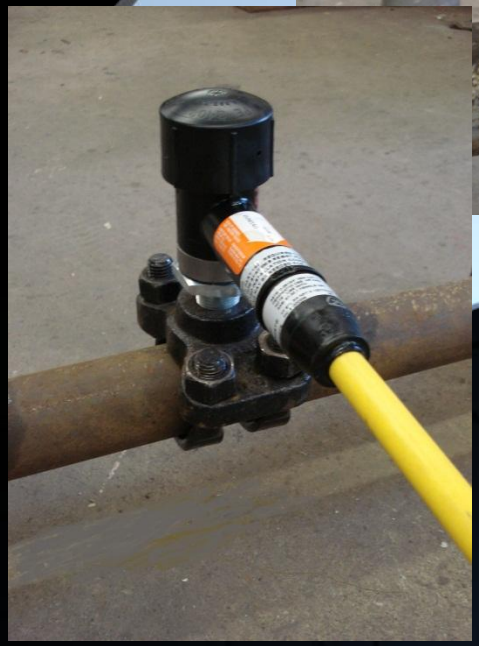
1. Install the service line between the main and the meter ri
crosses the main approximately 30 cm. above the top sur
1 degree to the attachment point on the riser.
2. Using the cloth holding tool assembled to the ¾" hex extc
point where service crosses the main using a solvent wet
the main for a distance that is wider than the width of the
3. Using the cloth holding tool and a lubricant wetted cloth
lubricate the top half of the main for a distance that is at
installed.
4. Lubricate the saddle O ring and remove the cap from the
holding tool and lower saddle half to the lower saddle ho
5. Using the tooling from step 4 (above) assemble the tee tc
only enough to hold the tee in place on the main but lose
around the main.
6. Using the extension plastic pipe cutting tool, cut the servi
engagement of the service line into the stab coupling. Ch
7. Set the stab depth dimension on the pipe marking tool ar
drive. Now mark the stab depth on the service line.
8. Assemble the appropriate size Elster/Perfection chamferi
and attach the chamfer tool to sidewinder extension wre
Using this combination tool chamfer the cut end of the se
9. Using the pipe handling tool to hold the service line and t
align the service line with the coupling and rotate the tee
deep enough into the coupling to achieve complete stab
connection move the service tee riser to a position that is
tapping tee can now be tightened to secure it to the mair
10. Attach the service riser to the service line using the same
11. Leak test the service by plugging the service riser at the n
test tool onto the riser of the tapping tee.
12. Upon successful completion of the leak test, assemble the riser to the meter connection. Then install the cutter assemble into the tapping tee and place the depth tube on top of the cutter assembly. Thread the cutter down, turning the cutter clockwise, until it bottoms in the riser (tower). The depth tube should be used as a visual guide and will be approximately flush with the top of the riser (tower). Use the mirror on the ¼" hex drive to confirm the height of the depth tube. The cutter has now pierced the main.
13. Thread the cutter upward (turning it counterclockwise) until it is flush with the top of the tower. The depth tube can now be removed. Gas will now flow into the service line.
14. Install the PMTT PermaTite cap on the tee using the cap assemble tool. Using a mirror attached to the ½" hex extension tool, visually watch the tightening of the cap to insure that the cap comes in contact with the stop on the tee riser (tower).

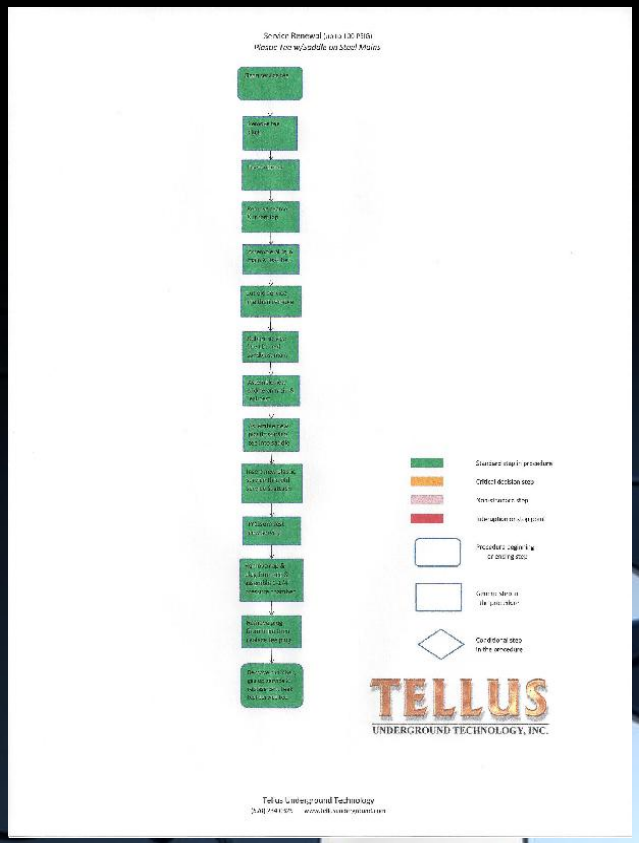
Tellus Underground Technology tooling required to perform the above process.

A. Plastic pipe handler
B. Plastic pipe cutter
C. Sidewinder wrench
D. Elster/Perfection chamfer tool holder
E. ¾" hex drive
F. Pipe marker tool
G. 3/8" drive locking extension
H. 3/8" drive tee handle
I. 3/8" drive Allen head wrench for tee saddle bolts
J. 3/8" drive Allen head wrench for tee cutter
K. ¼" hex drive 4" mirror
L. ¼" hex drive cloth holder
M. Tee riser holding tool
N. Leak test tool with pressure gauge
O. Lower saddle assembly tool (1/4" hex drive)
P. PMTT Permatite cap assembly tool

A standard service renewal flow chart

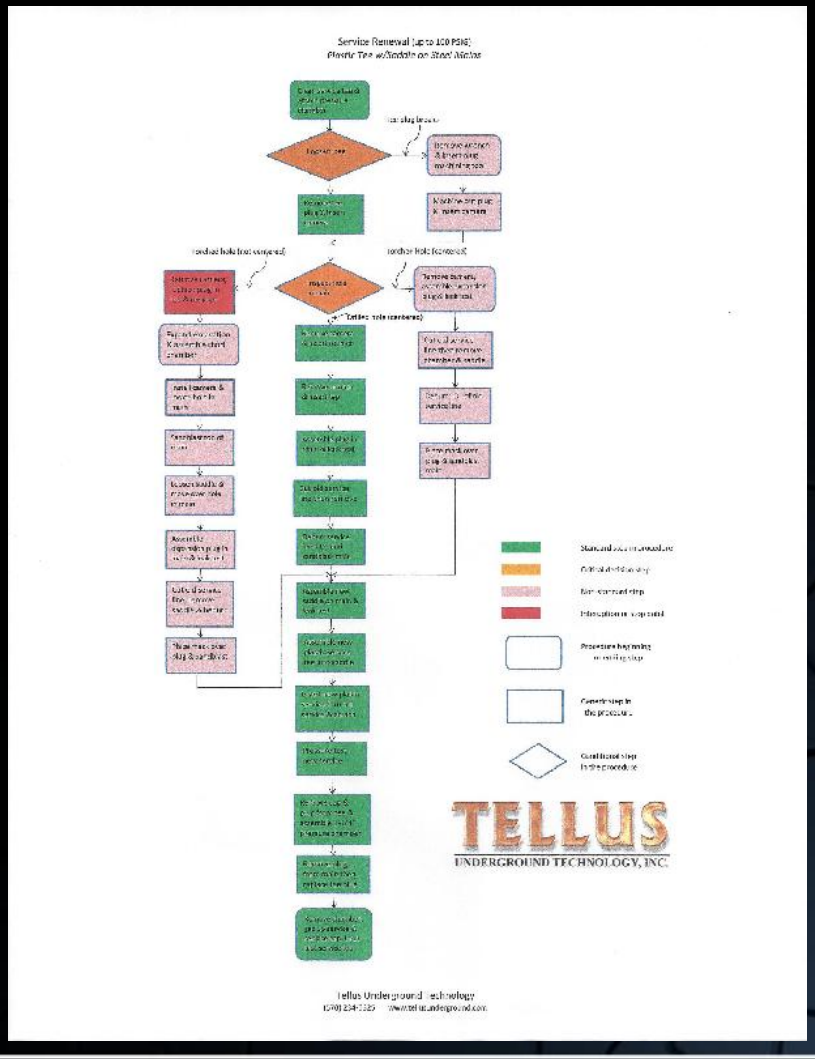
When the procedure progresses without any problems it would be a series of events with no deviations or decisions.





When events do not progress as planned

The reality is that tee plugs break, saddles are not positioned directly over the hole in the main and holes in the main have been torched.



What do you need to know to buy tools

Keyhole & No-blow tools are unique and specialized devices

- The gas mechanic usually has a good understanding of the process at hand but it is unfair to expect him to have the ability to identify the keyhole or no-blow tools necessary to preform any specific procedure. Tellus procedure descriptions clearly explain each procedure and provides a tooling list and description.

A description of the procedure & tooling

The complete procedure and hardware are described

- A general description of the tooling with tool names and part numbers

Keyhole Technology

Service Retirement (up to 100PSIG)

For mechanical saddles on a steel main

PROCESS DESIGN

All Tellus procedures and tooling have been designed and developed to employ innovative methods and specialized equipment for the performance of standard maintenance processes through core cut openings (18" diameter) in the road surface or pavement.

PROCESS INTEGRITY

A high level of process integrity can only be achieved through analysis and understanding the failure modes and hazards that may exist. Tellus Underground Technology works closely with the LDC's and their contractors to develop standard operating procedures and tool sets that are designed to address and resolve those unexpected situations in which events do not progress as expected.

OPERATING COST SAVINGS

When the costs of "Keyhole" procedures are compared to conventional methods operating costs are significantly reduced. The elimination of street restoration costs along with labor cost savings have resulted in operating cost reductions of as much as 50%.

This procedure is designed for the retirement or abandonment of saddle mounted steel services that have been attached to steel gas mains operating at pressures ranging from 10 to 100 PSIG. In most installations the service tee is mounted using a mechanical "U bolt" saddle similar to those manufactured by Mueller Co. and Dresser Industries. It should be noted that this is a "No-Blow" procedure that is designed to be performed in an 18" diameter cored "Keyhole" excavation.

At the time most of these services were installed there were two commonly used methods to pierce a hole in the steel gas main. The most frequently utilized method was to drill a hole in the main using a drilling fixture that cut a hole with a shell cutter, resulting in a perfectly round hole that is always a uniform size and centered squarely under the threaded hole in the saddle. The second commonly used method was to pierce the main with a welding torch. When this method was utilized it was virtually impossible to make a perfectly round hole in the main or to accurately locate the hole under the threaded opening in the saddle.

This Tellus procedure has been designed to address either of these types of installations by providing a gas camera inside the operating pressure chamber thus allowing the operator the ability to inspect the opening in the main then carry out the procedure that is appropriate for the existing installation. Either procedure is always completed by plugging the main and then assembling a stainless steel band clamp to permanently seal the area where the saddle was removed from the main.

TELLUS
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Service Retirement (up to 100 PSIG)
For mechanical saddles on steel mains

Tooling Description and Features

TECHNICAL SUPPORT

We work with your operating crews and contractors to insure that they fully understand every detail of the keyhole process. We also work with your technicians and procurement staff to insure that all of your operating standards are fully satisfied.

SUPERIOR QUALITY

Tellus tools are professional quality tools designed for use by utility professionals. These tools are designed to exceed all of the demands of the underground gas distribution industry.

STATE OF THE ART TECHNOLOGY

The Tellus organization is constantly and consistently engaged in R&D and product development efforts. We are also in constant contact with gas utility industry equipment and hardware suppliers to insure that the latest developments will be applied to all new procedures and keyhole devices.

For more information on any of our products or services please visit us on the Web at: www.tellsunderground.com

The keyhole tooling utilized to remove a gas service from a pressurized steel main is based upon the use of a pressure chamber to perform many of the steps in this "no-blow" procedure. The procedure begins with launching of an inspection camera to view the pierced hole in the main. The gas mechanic can bypass this step if he already knows the method that was utilized to pierce the main. Once the main configuration is clearly defined, the hole in the main is either sized and tapped for the installation of a special steel plug or plugged with an expansion plug for those mains with a torched hole. After the main has been plugged the pressure chamber is removed and the main is sandblasted to prepare it for final sealing with a stainless steel band clamp.

In those cases where the torched hole in the main is so far off center that it is impossible for the gas mechanic to install the plug into the main, we have established a conventional excavation method to move the saddle over the pierced hole using the inspection camera.

If for any reason the gas mechanic determines that he would prefer to abort the "Keyhole" procedure and perform the procedure using conventional open excavation methods, he can replace the tee plug for completion at a later date.

All Tellus processes are supported by a flow chart and a step by step operating procedure. Just as in any scientific or medical procedure each step must be performed exactly as designed and in the prescribed sequence to achieve repeatable and successful results. When well-designed tools are utilized in a thoughtfully-designed procedure the operating gas mechanic can always expect professional results.

Tool Requirements

Tool Description	Tellus P/N
½" locking square drive extension (6 ft. length)	GTN-1006
Tee handle, ½" drive	GTN-1005
Pneumatic extension saw, ½" to 2" (6 ft. length)	GTN-1010
½" hex drive w/remote release, (6 ft. length)	HEX-1011
2" pressure chamber w/¾" service tee adapter	GTN-1030
Main clamping fixture for 2" or 3" to 6" mains	SAS-1336
Band clamp assembly tools for 2" to 6" mains	SAS-1352
Sandblasting extension tool	GTN-1013
Pneumatic ratchet, 3/8" drive X 6 ft. length	SJE-1240
Band clamp closing tool	SAS-1351

Additional optional tooling:

Gas camera w/ 6 ft. rigid cable

Stuffing box for 2" pressure chamber

SERVICES AVAILABLE

- Technical Support
- Setup and Training
- Tool Maintenance Support
- Procedure Mapping
- Special Application Design

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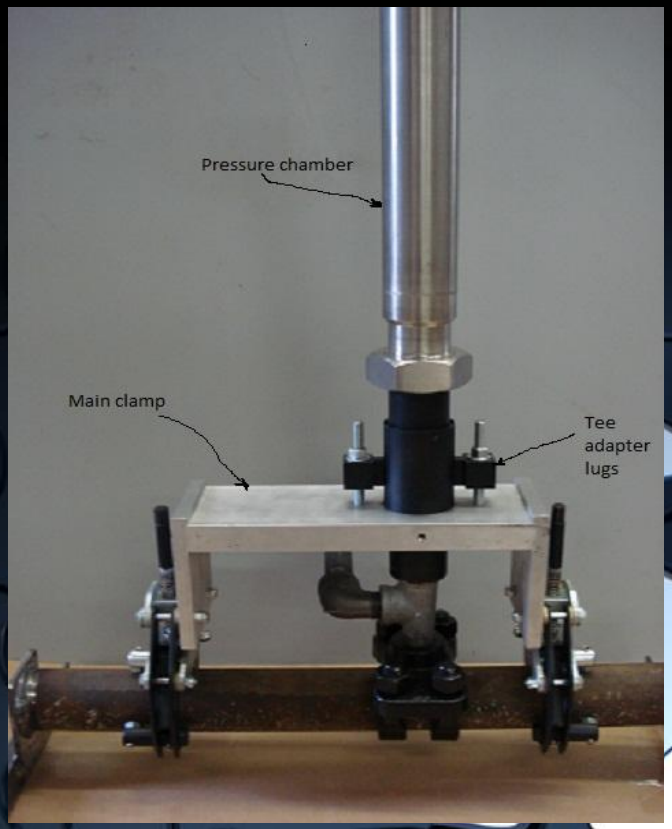
Professional grade keyhole & no-blow tools for gas operations professionals

Durable pneumatic tools designed specifically for keyhole operations & no-blow pressure chambers that are safe and functional



Standard drives give the user the ability to utilize “off the shelf” tools

Standard locking square drives from 1/8” to ¾”

- Standard ¼” hex drives for tools that must be positioned or attached to the main or service and released in the excavation.

Specialty tools

Tooling specifically designed for keyhole work

- Keyhole ratchet
  - A long handle wrench that locks in one direction & releases in the opposite direction

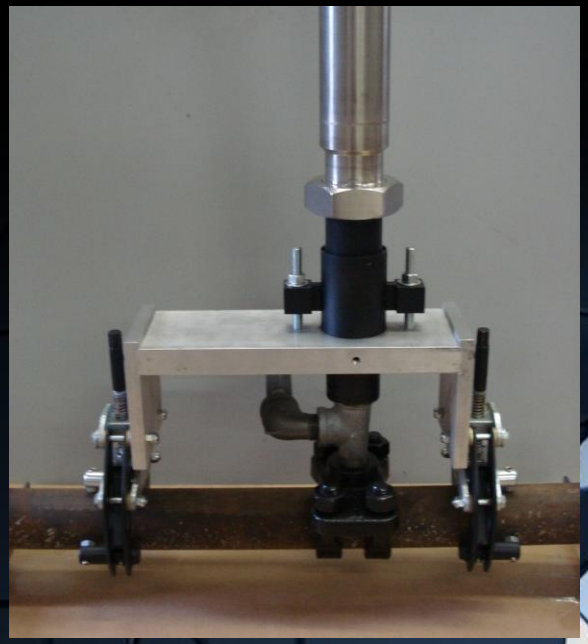
- Pressure chambers
  - Designed to precisely machine gas fittings while under full operating pressure

- Pneumatic scaler tool
  - Can be positioned at any angle around a bell joint to remove pipe scale

Specialty processes (service retirement and service renewal of saddle mounted cast steel service tees on medium pressure steel mains)

A No-blow keyhole procedure

- A special threaded plug is installed into the steel main.



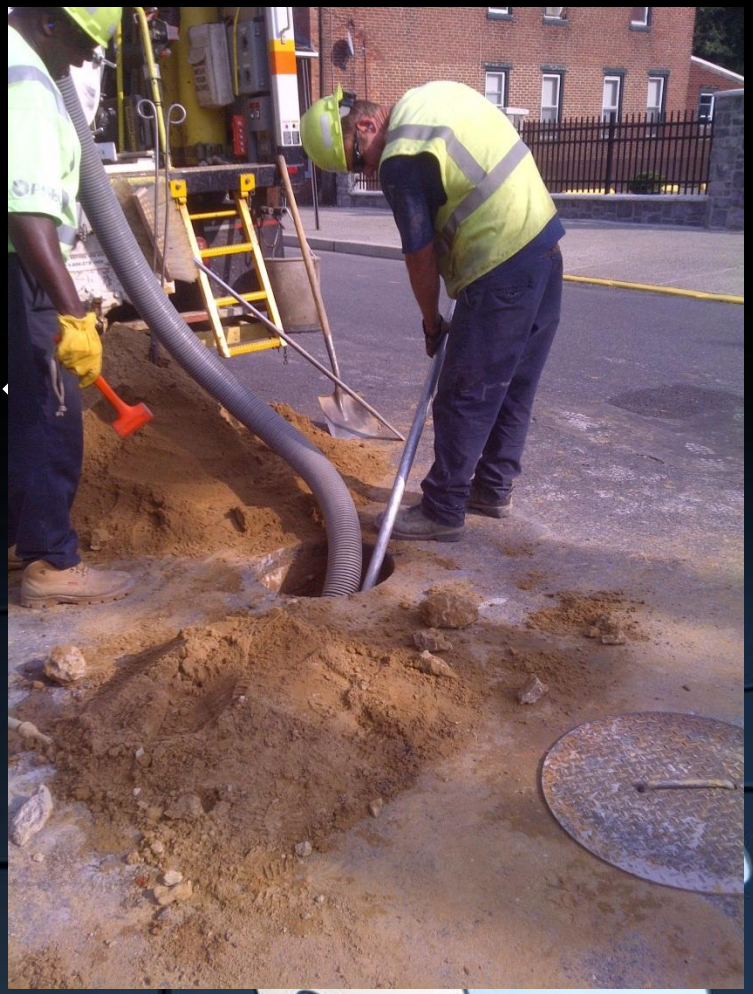
Tellus also manufactures technologically advanced vacuum excavation systems

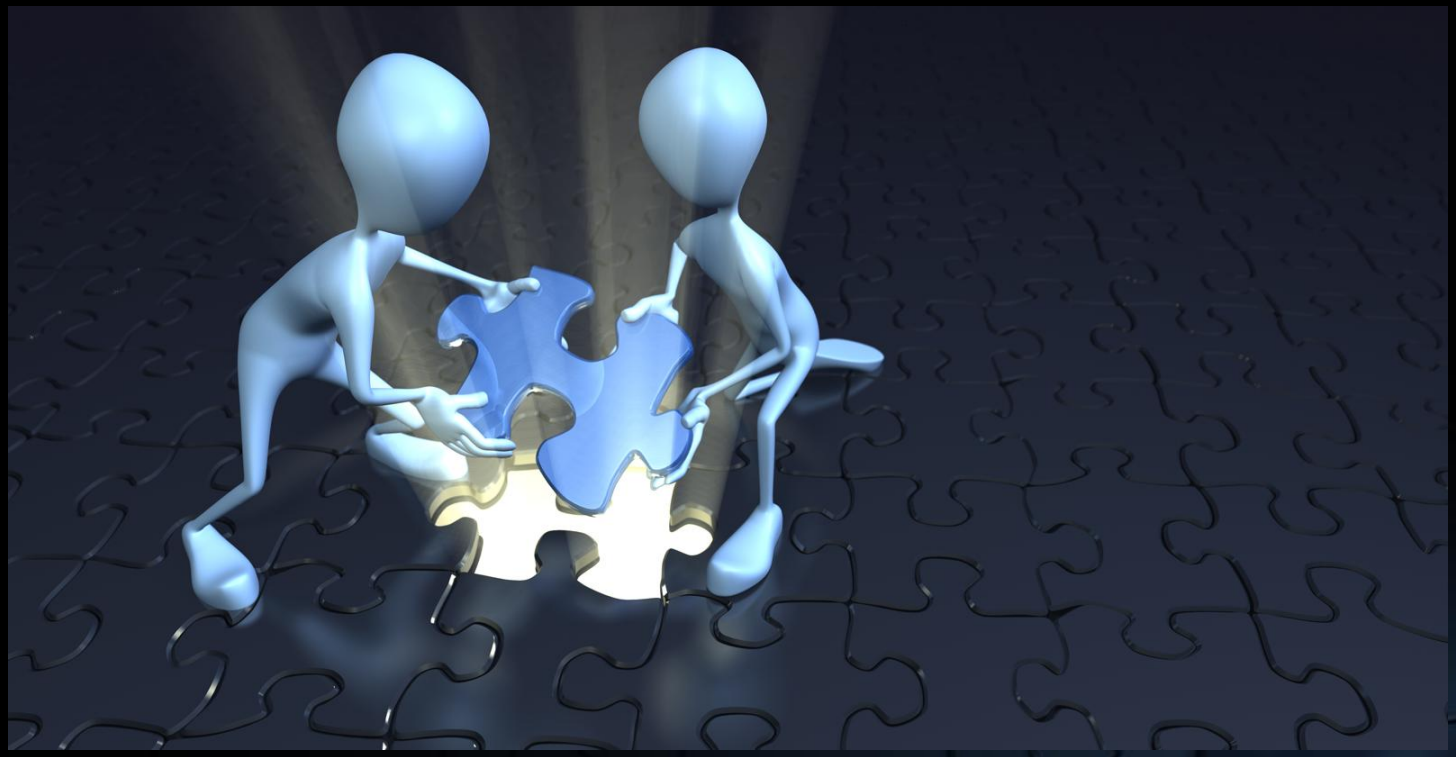
Equipped with a filtration system that never requires cleaning

- Above deck designs that can be fitted to a Non CDL chassis (under 26,000 lbs.)
- Four wheel drive configurations that are mounted on a 19,500 lbs. chassis
- Under-deck designs with short wheel bases that can maneuver in tight spaces

Available processes

- Leak location & repair
- Service retirement (service cut-offs)
- Corrosion control
- Service renewals
- Anode installation
- Service installation
- Camera launch & inspection
- Underground plant location
- Meter replacement &relocation
- Tracer wire repair
- Test station installation
- Gas evacuation: emergency leaks
- Tie-overs on main replacements





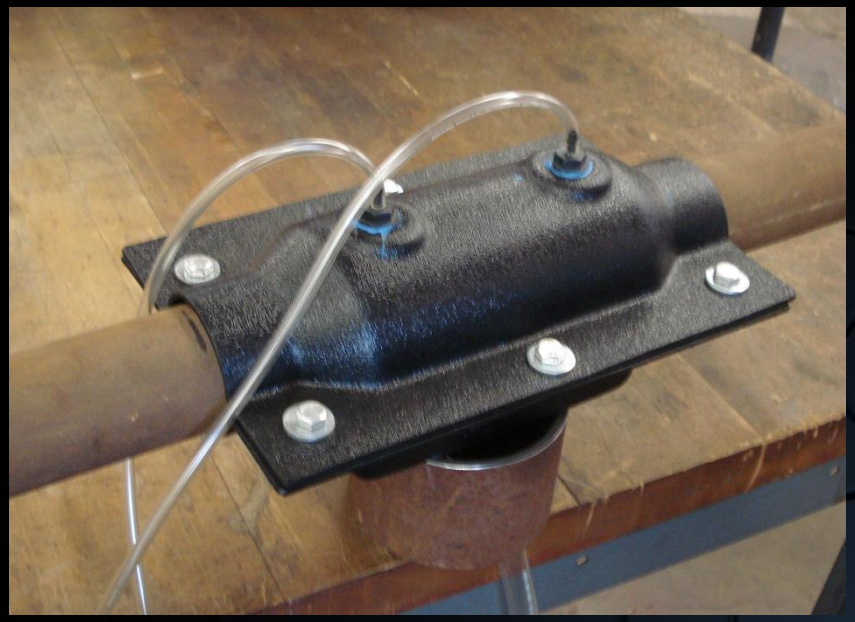
Partner with Tellus professionals to bring the latest keyhole & no-blow technology to your organization

Tellus Underground Technology, Inc. offers comprehensive keyhole training and implementation programs to gas LDC's and their contractors. Contact us at 570-234-0325 or on the web at: www.tellusunderground.com

Corrosion protection for keyhole procedures

Corrosion primer is heated to 120 degrees F then pumped into the bottom of the mold until both vent tubes begin to fill. The inlet and vent tubes are then capped and dropped into the excavation.

TWO PIECE MOLD (THREE PIECE MOLDS WILL BE NECESSARY FOR SERVICE TEES



PROTOTYPE ENCLOSURE TO ACCOMMODATE A TWO BOLT BAND CLAMP