TRIC®

User Guide

X30

PIPEBURSTING SYSTEM

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Congratulations and thank you for purchasing a TRIC pipebursting system. This visual guide provides basic yet comprehensive instructions for safe, effective operation and care of your TRIC equipment. We want to familiarize you with the critical working elements of your TRIC pulling unit and bursting head assembly, and to illustrate the essential best practices with your system. Our goal is not to describe every possible bursting scenario, but rather to create a convenient reference to facilitate more trouble-free operation, and above all to encourage safety on the job.

To that intent, please note the warning symbols in this user guide, which indicate two levels of concern. The yellow symbol warns against mechanical failure or undue stress on equipment. The red warning indicates danger of physical injury or death. In some cases both warning symbols will be displayed at once. In any case, please pay close attention to all safety topics covered in this manual. SAFETY FIRST!

We are continually improving our products and actively testing them in the field. We also maintain working relationships with many of our customers, thus their experience is ours. We are happy to share this information, along with the latest updates and tips, at www.trictools.com. Or if you prefer, call us toll-free at 888-883-8742. Welcome to the TRIC Team!

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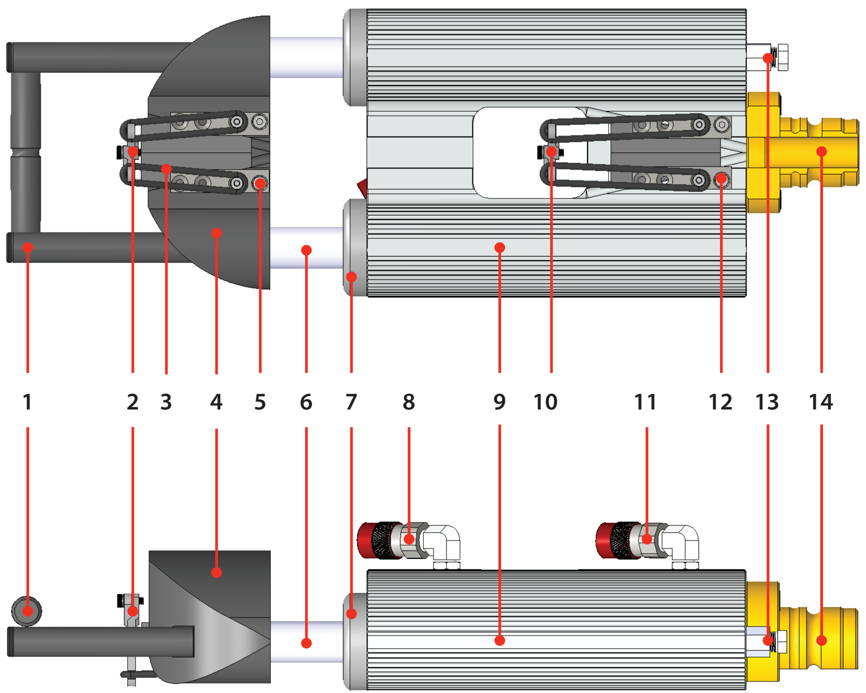
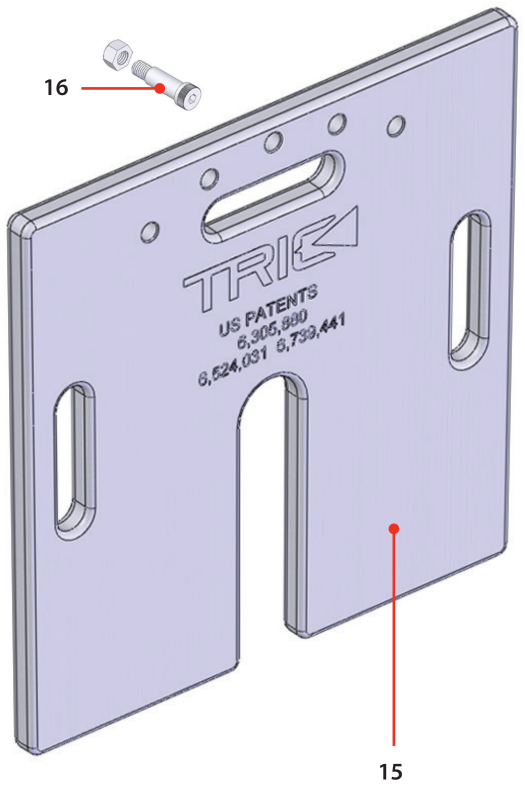
ILLUSTRATIONS

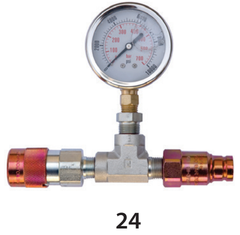


X-Series Puller Components*

1 Handle
2 Gripper Assembly (pulling)
3 Gripper Retainer O-Ring
4 Pulling Bridge
5 Cover Plate
6 Piston Shaft
7 Cylinder Gland
8 Hydraulic Fitting (retracting)
9 Cylinder Body & Retaining Bridge
10 Gripper Assembly (retaining)
11 Hydraulic Fitting (extending)
12 Cover Plate
13 Pressure Relief Plug/Valve
14 Nose

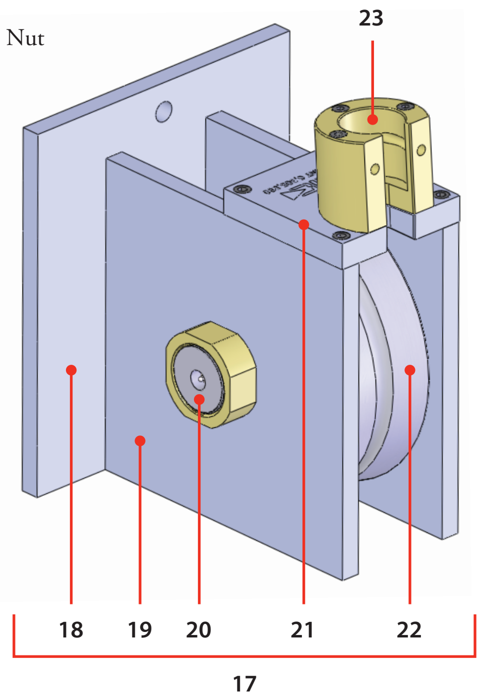
Materials and specifications subject to change without notice. Shown is the 2021 model with revised pulling bridge.





15 Resistance Plate
16 Resistance Plate Bolt & Nut
17 Pulley Base
- 18 front plate
- 19 side plate
- 20 axle
- 21 top plate
- 22 wheel
- 23 annulus/socket

24 Pressure Gauge



The heart of each TRIC pipe-bursting system is essentially a cable-pulling device. Cable, or wire rope, has been an integral part of the TRIC method since the company introduced trench-less sewer lateral replacement in 1997. Laterals, or residential sewers, are often constructed with bends (directional changes) between the building foundation and the property line or public sewer main (see Figure 1). A cable is the most efficient way to negotiate these bends. It is quite common to pull through one or two bends in a lateral job, sometimes three or more. It is also possible to be stuck at any given point on an unknown obstacle, or because the pull has not been set up advantageously. See the next section on *Bursting Preparation* for logistical advice on some of the more typical job scenarios.

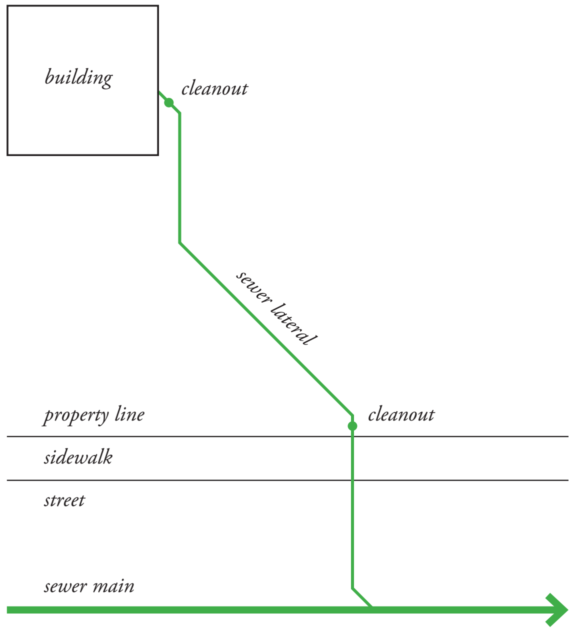


Figure 1
Sample sewer lateral path

INTRODUCTION

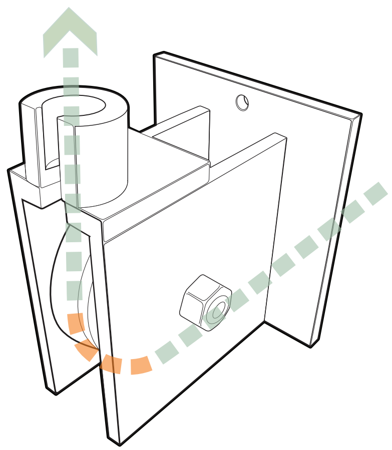


Figure 2
Pulley wheel radius & cable stress

Vertical pulling essentially defines the original TRIC method. Along with an open cable path and sideways cable insertion—i.e. allowing cable engagement at any point without threading cable through the puller—the vertical pulling unit has a compact footprint (20” wide by 18” long with narrow resistance plate). Cable stress is concentrated on the wheel radius, as illustrated in Figure 2 at left. This reduces the overall test strength rating of the cable by as much as 15%-20%. For this reason TRIC recommends having a working pressure gauge at all times to indicate how hard the unit is pulling. For further information on cable strength ratings see Figure 17 on page 31. Also note that wood or other cribbing adds extra length to the pulling setup (see Figure 11 on page 24).

BURSTING HEAD	PIPE MATERIAL
Standard/Static	1, 2, 3, 5, 6
Impact (Pneumatic)*	1, 2, 3, 4, 6, 7
Swaged Splitter*	2, 6, 7, 8, 9
Link-Blade Splitter*	2, 6, 7, 8, 9

1 Vitrified Clay (VCP)
2 Cast Iron (CI)
3 Asbestos Concrete (AC)
4 Reinforced Concrete
5 Fiber Conduit (Orangeburg)
6 Plastic
7 Ductile Iron
8 Steel
9 Copper

**Special accessories typically used in commercial or municipal applications.*

Figure 3
Bursting Head Selection Table

BURSTING PREPARATION

The TRIC X30 will replace most breakable types of pipe up to 6" (150mm) in diameter. TRIC also manufactures a variety of bursting or splitting heads, each specific to the type and size of pipe to be replaced. Please see Figure 3 on the facing page to select the correct head for the job.

The first step in any pipe-bursting project is to locate and expose the existing pipe at each end of the service line to be replaced. Drain lines should be recently inspected and located by video, with all depths, bends, transitions, connections, and service points (cleanouts) marked on the ground surface. Launching and receiving pits are configured differently from one another, and can have vastly different excavation requirements. Please review the illustrations on the following pages.

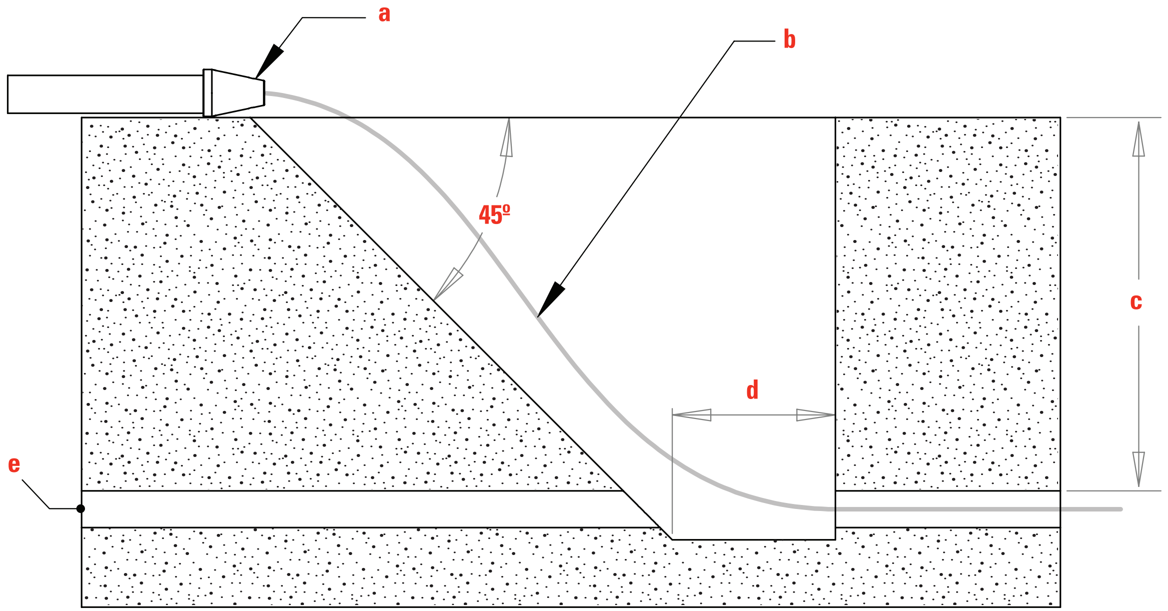


Figure 4
Launching pit (Scenario A)

a 4"– 6" (100–150 mm)
HDPE pipe & bursting head

b Cable

c Variable

d 1'– 2' (30–60 cm)

e Existing (old) pipe line

HDPE pipe is flexible, which is indispensable for pipe-bursting applications. The relationship between pipe diameter and wall thickness (known as SDR or Standard Dimension Ratio) determines the level of flexibility for each pipe size. A safe formula for the excavation of launching pits for all sizes of HDPE pipe is a 30º access angle, or ramp-down to pipe level. This translates to a surface cut that is roughly twice as long as the pipe is deep. However, smaller pipe sizes have smaller bending radii. Figure 4 on the facing page shows a typical launch scenario for sewer lateral bursting. Due to the smaller bending radius of 4" pipe—standard for sewer laterals—a steeper ramp-down can be used (here shown at 45º). Allow enough room under the old pipe at the point of entry (**d**) to allow flexing back to grade and to facilitate reconnecting the line after the burst.

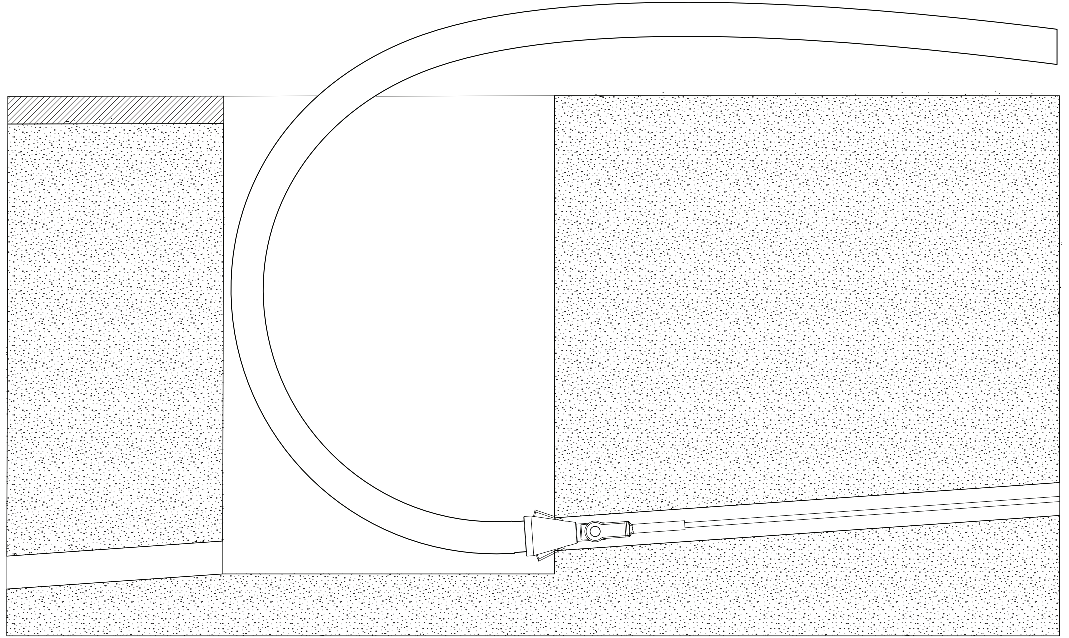


Figure 5
Launching pit (Scenario B)

Figure 6
Clevis & pulling-eye head connection

Tight launching pits that are deeper than they are long are often best negotiated by creating a "C" curve with the HDPE pipe, as illustrated in Figure 5 (Scenario B) on the facing page. This works best with smaller pipe diameters such as 4 inch (100mm) and under. The standard cable for lateral bursting systems is 3/4" diameter with an open socket or clevis termination. The large socket pin that connects the bursting head to the cable also acts as a hinge to facilitate pipe entry (see Figure 6). After attaching the bursting head to the cable, position the head assembly in the launch pit with the clevis termination inside the old pipe, and the bursting head with new pipe diving straight down. As the pull begins, assist the pipe as it flexes into the "C" shape. Then as the pull progresses, maintain a large curve in the new pipe as it enters the pit.

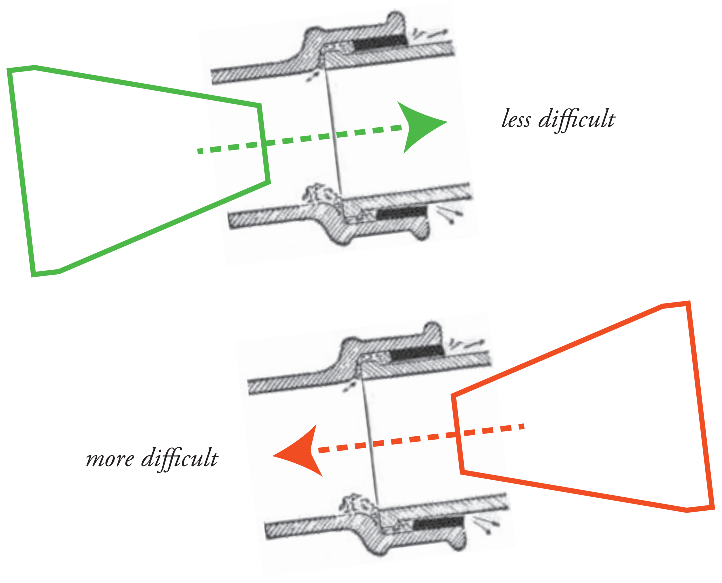


Figure 7
Up-grade bursting (green) versus down-grade bursting (red) in bell-and-spigot cast iron pipe

BURSTING PREPARATION

Since every job is different, there are no set rules for pit preparation and pulling direction. However, when feasible, bursting up-grade can be helpful in certain situations. Pulling up-grade allows the introduction of water to the host pipe from the upper pulling pit (receiving pit), so that the bursting head is immersed in water as it breaks through the old pipe. This lubricates the host pipe and softens dry surrounding soil as the bursting head breaks the old pipe and expands the broken pieces outward. When working in particularly hard ground conditions, hydraulic pulling pressures can be reduced by as much as 50% simply by adding water to the host pipe during a burst. Lower operating pressures generally result in faster bursting, depending on the hydraulic power source used. It is not always necessary or advantageous to add water during a pull. However, it is important to monitor pulling pressures at all times.

In addition, cast iron bell joints are more easily broken from behind, that is, pulling up-grade rather than pulling down-grade into the bell joint (see Figure 7). This is true whether the host pipe is wet or dry, and especially true for cast iron pipe in good condition (i.e., not rusted through or corroded). In any case, adding water can be helpful when bursting pressures are consistently high due to dry compact soil. When high pressures persist, release excess cable tension (see instructions on page 42), leaving only enough tension to keep cribbing and puller in place. Then insert a garden hose a few feet down the line and turn water on fully. Reduce or stop flow if your pulling pit becomes flooded.

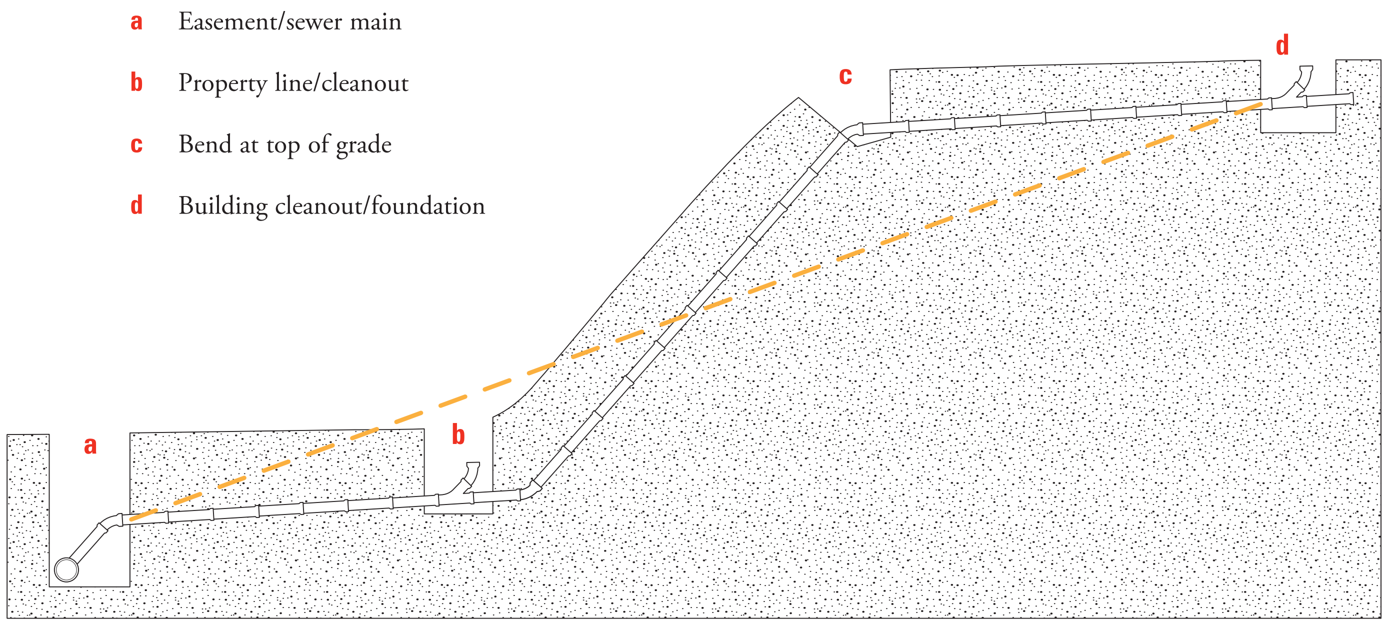


Figure 8
Stitching up a steep grade

Figure 8 at left illustrates a common situation, in which the sewer lateral runs down a steep hill or embankment, and has bends at both top and bottom of the slope. If the burst is attempted from the main **a** to the building **d** or vice versa, depending on ground conditions, the cable will tend to follow the path indicated by the dotted orange line, and in many cases will slice out of the old sewer at street level (**a–b**), and/or cut into the earth excessively at the top of the grade **c**. This can be avoided by a process called "stitching." First, excavate at points **a**, **b**, **c**, and **d** as shown. Remove old pipe, couplings, and connections from all pits. Fuse enough HDPE pipe to replace the entire line from main **a** to building **d**, plus an extra 10 or 12 feet (3 or 4 meters). Attach the bursting head to the new pipe. Thread the cable from pit **a** to pit **b**. Position the HDPE pipe and bursting head at launch pit **a** and connect it to the cable. Then insert the puller in pit **b** and burst from **a** to **b** first. Thread the cable from **b** up to **c**, during or after the first pull. When the bursting head arrives at pit **b**, move the puller up to pit **c** and continue. When the bursting head arrives at pit **c**, move the puller up to pit **d** and finish the pull. Stitching maintains continuity of flow path by avoiding three separate launches. There is only one launch, with one entire length of pipe, pulled in three stages. Note also the resistance wall in pit **c**, which faces downhill *because it must be perpendicular to the host pipe path*. This is critical for stable, effective, and safe bursting. Do not use the ground surface to gauge the angle of the resistance wall. Use the pipe path instead, and cut a flat wall 90º opposed to the pipe.

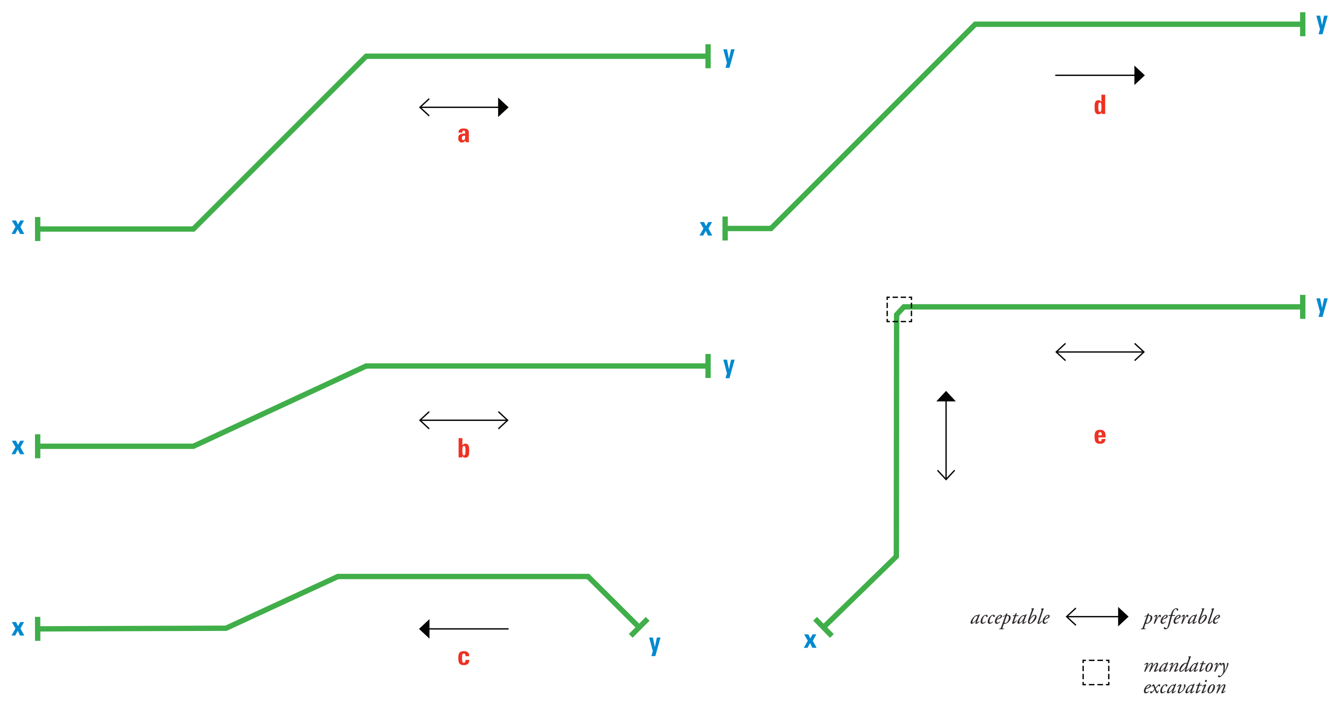


Figure 9
Basic lateral bursting scenarios (overhead view)

BURSTING PREPARATION

Figure 9 opposite shows common examples of laterals with two or more bends. *These schematics are all overhead views, as in a road map*. Arrows indicate pull direction, or which way the bursting head is going. A number of factors influence which direction to pull, including accessibility of the pipe at either end, adjacent utilities, slope, ground conditions, pipe path and material, and of course physical bends or elbows in the line. The most common of these are the 1/16 bend (22.5º) and the 1/8 bend (45º). It's best to know the type and number of bends in the line, and especially where they are positioned in the lateral path. For example, scenario **a** could go either way, with preference to pull from end **y** because it has the longer section of straight pipe. The more straight pipe there is in front of the puller, the less likelihood there is for the cable to cut out of the pipe path at the receiving pit, and come out of alignment with the puller. Excessive cutting into the earth with the cable can stop a pull, break equipment, or both. Scenario **b** presents no challenge in either direction. Scenarios **c** and **d** have clear directional preference due to the very short distance before a major bend at one end. However, sometimes it is impractical to place a pulling pit at the desirable end of the lateral. In scenario **c**, end **x** is where you want the puller, but if end **y** is where the pulling pit has to be, it may be best to dig the 45º bend near end **y**. Scenario **e** depicts a lateral with a combo 90º bend, possibly found at the corner of a building. This scenario requires two pulls, with a third excavation at the 90º bend. In all cases, it is best to remember that the puller and cable want to straighten out the line between ends **x** and **y**.

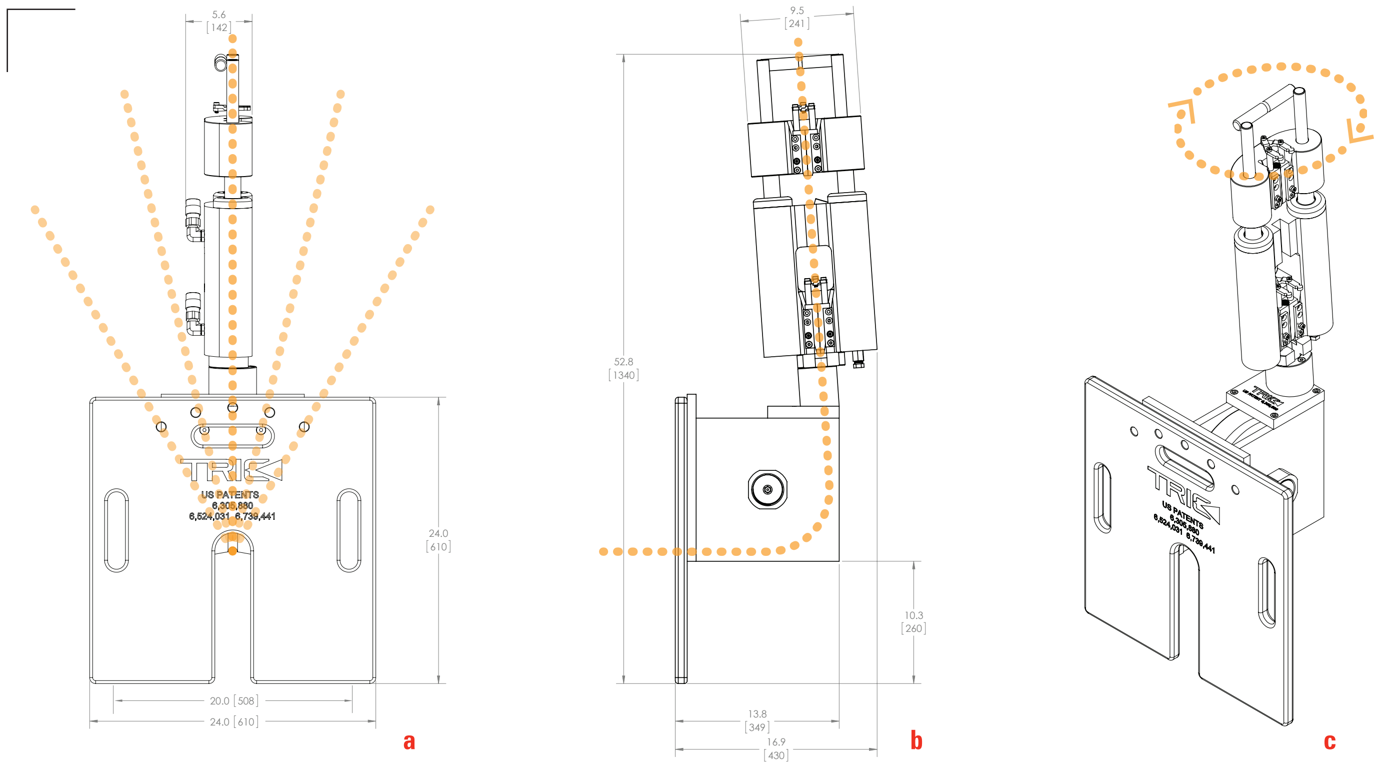
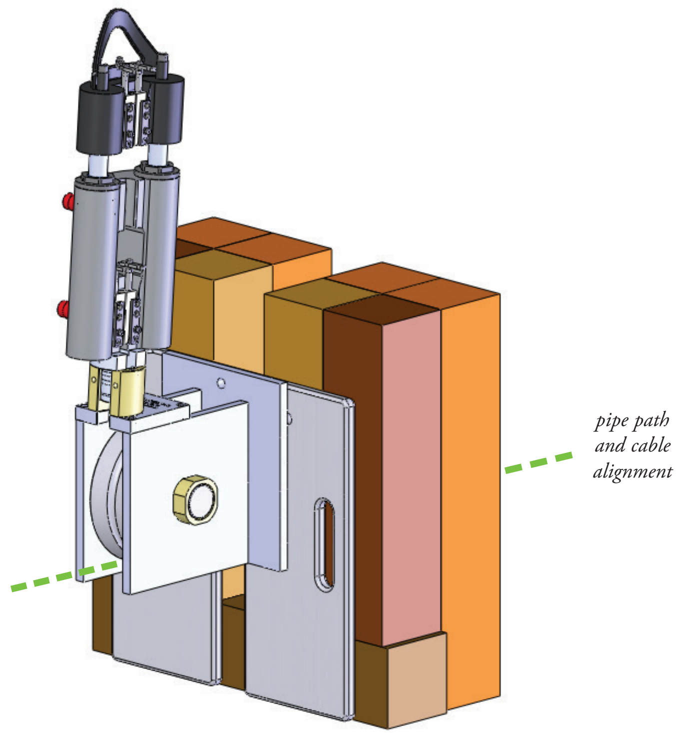


Figure 10
X30 unit dimensions and pulling configuration

The X30 pulling assembly is extremely adaptable to a variety of setup situations. Figure 10 on the facing page displays the overall dimensions of the pulling unit. See cribbing examples on the following pages. Figure 10**a** shows frontal dimensions plus the five different options to attach the wheelbase to the resistance plate. This offers extreme flexibility of operation when there are adjacent utilities, uneven surfaces, or other obstacles in the pulling pit. Figure 10**b** shows overall height plus minimum setback, as well as cable path (alignment with host pipe) when the unit is under load. *Note that the resistance plate must be perpendicular to the host pipe during the pull, and that the bottom of the wheel should align with the host pipe.* In other words, the bottom of the wheel is the center of the pull, which is also the center of the resistance plate. Therefore the plate needs to extend below the host pipe to center the pulling load. See cribbing examples on page 24 showing wood blocking underneath the host pipe line, as well as side and top support, to build a "resistance wall" constructed to distribute the load as evenly as possible in the pulling pit. Blocks of wood can also be placed under the pulley base to provide added stability during setup and operation. Figure 10**c** demonstrates the ability of the puller to spin 360º on the pulley base. This allows further flexibility in setup, cable handling, and routing of hydraulic hoses and pulling cable during operation. The ability to spin the puller also allows for correction of cable misalignment resulting from wear on the wheel, axle, or socket of the pulley base.



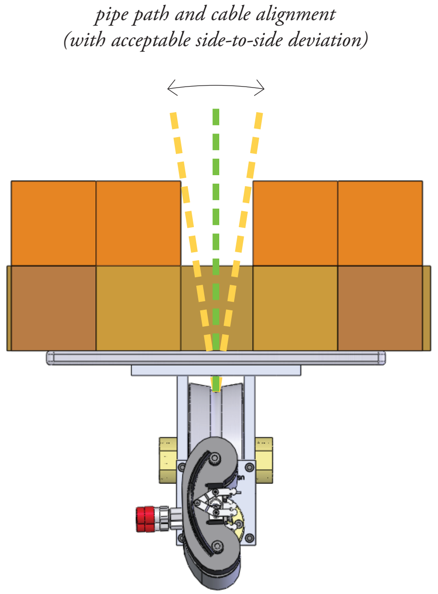


Figure 11
X30 cribbing with lumber
(Shown here are 6" X 6" timbers in 24" and 30" lengths)

BURSTING PREPARATION

The better the setup, the faster, easier, and safer the job will go. The point is to *make the pulling unit as stable as possible, maintain proper alignment with the cable when under load, and monitor hydraulic pressure at all times*. The objective is to create a "wall of integrity" to spread the load evenly over as large a surface area as possible in the pulling pit. Every pit is different, so the best material to accommodate most scenarios is wood timbers. Keep in mind the "center of the pull," as indicated by the green dotted lines in Figure 11 at left. Shown are 6" X 6" timbers in 24" and 30" lengths. Other useful wood sizes are 4" X 6" and 2" X 6". When possible, a good way to start is by setting a horizontal timber *under* the cable path, to create a low anchor of support. Then build on that by adding vertical timbers as shown.

Depending on the dimensions of the pit, cribbing can be stacked horizontally as well as vertically. In uneven pits with wet or unstable soil, galvanized steel pipe or fence pole material can be driven into the ground with a sledge hammer to create a vertical wall of support (see Figure 12 below).

Figure 12
(Cribbing With Poles)

a b c

Figure 13
Loading Cable into Puller

To get the pulling cable through the old sewer, first use a duct-rodder or similar device to navigate the line. If the pipe is clogged or in serious disrepair, use a sewer snake or hydro-jetter to get through the line. Then pull back a stout nylon rope or similar strong webbing to pull in the cable. Attach the new PE pipe to the bursting head. See instructions on following pages for TRIC self-gripping head assemblies, and for fuse-on (PE cap) head assemblies refer to butt-fusion standards provided by fusion equipment manufacturers. Position the head and new pipe at the launch pit, and attach the cable to the head. Take up cable slack at the pulling pit. Position cribbing, making any small adjustments to the pit with hand tools. See pages 24-25 for cribbing examples. Wood can also be used to support the pulley base as shown in Figure 13**a** at left. This keeps the pulling assembly upright when no tension is on the cable, and it also helps stabilize the unit under load. Apply anti-seize grease or equivalent to the gripper pockets, and make sure grippers are clean and move freely up and down before each job. Once cribbing is set in the pulling pit, position the resistance plate and attach the pulley base to the plate. Pull the cable around the wheel and into the annulus or wheel socket (see Figure 13**a**). Then drop the puller onto the wheel socket with grippers facing the cable (see Figure 13**b**). This "captures" the cable and makes it easier to load into the puller, especially when space is limited in the pulling pit. Open the grippers and roll the cable into pulling position, then close the grippers around the cable and attach the retaining O-rings to each gripper assembly as shown in Figure 13**c**.

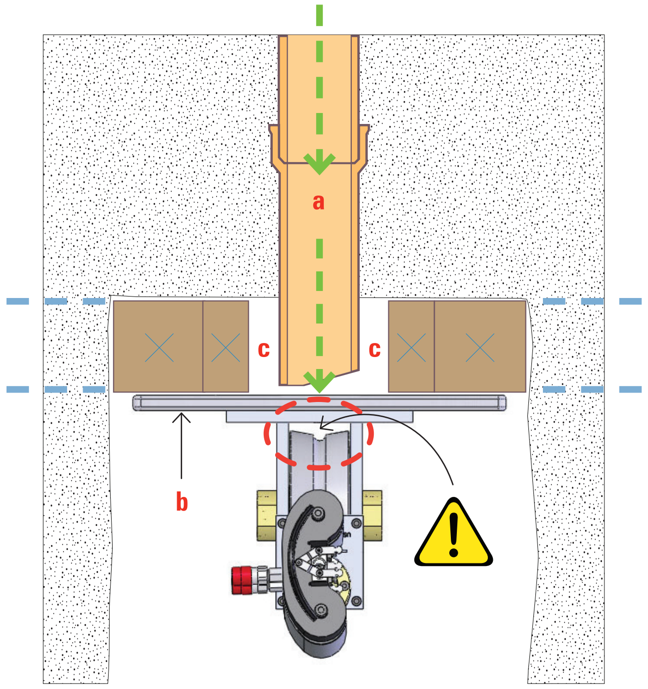


Figure 14
Pipe intrusion

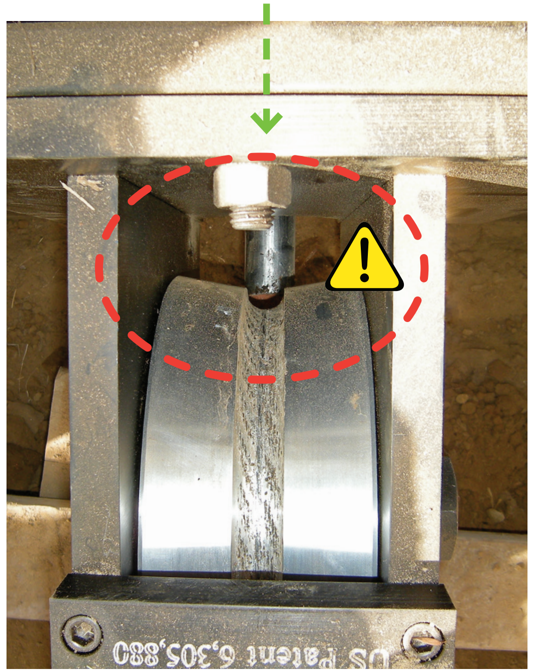


Figure 15
Cable termination and stopping point

Pipe intrusion is a common occurrence in the receiving pit (see Figure 14 at left). *This is when the old pipe* (**a**) *is forced out of the ground towards the pulling assembly.* It happens near the end of the burst, when the bursting head is close to the receiving pit. Pipe intrusion is relatively common when bursting bell-and-spigot cast iron, particularly when pulling downstream—i.e., into the bell or hub—as shown. The resistance plate (**b**) has a narrow cable slot (3” or 75 mm) that will prevent pipe and fragments 3” or larger in diameter from getting past the resistance plate and encroaching upon the pulling unit. If pipe is driven into the receiving pit, it is stopped by the resistance plate and the pull continues without interruption. When using wood cribbing, be sure to allow room for the bursting head to pass the timbers to allow maximum extraction at the end of the pull. Figure 14 shows 6” x 6” and 4” x 6” timbers in front of the resistance plate (**b**). In this example, the timbers flanking the cable/pipe path (dashed green line) create a gap of about 6” (150 mm) to allow the bursting head to pass through. For maximum stability and extra extraction space (**c**), add more timbers whenever possible. For example Figure 14 shows one layer of timbers between soil and resistance plate, whereas two or three layers (depending on lumber dimensions) are needed to provide full extraction space for the bursting head. This is because *the pull must stop when the cable termination is visible inside the pulley base* (see Figure 15). Keep extraction space (Figure 14**c**) free of debris and soil as the bursting head nears the resistance plate. Stop before the clevis makes contact with the resistance plate.

PISTON DIAMETER AND TOTAL SURFACE AREA

Area x PSI	1000	2000	3000	4000	5000	6000	7000	8000
1.625" pair 4.15 sq. in.	2.07	4.15	6.22	8.3	10.37	12.44	14.52	16.6
1.75" pair 4.81 sq. in.	2.4	4.81	7.21	9.62	12.03	14.43	16.84	19.24
2.0" pair 6.28 sq. in.	3.14	6.28	9.42	12.56	15.7	18.84	21.98	25.12
2.5" pair 9.82 sq. in.	4.91	9.82	14.73	19.64	24.55	29.46	34.37	39.28
2.75" pair 11.88 sq. in.	5.94	11.88	17.82	23.76	29.7	35.64	41.58	47.52
3.0" pair 14.14 sq. in.	7.07	14.14	21.21	28.28	35.35	42.42	49.49	56.56
3.5" pair 19.24 sq. in.	9.62	19.24	28.86	38.48	48.1	57.72	67.34	76.96
4.0" pair 25.13 sq. in.	12.57	25.13	37.7	50.26	62.83	75.39	87.96	100.56
4.5" pair 31.81 sq. in.	15.91	31.81	47.72	63.62	79.53	95.43	113.34	127.28
5.0" pair 39.27 sq. in.	19.64	39.27	58.91	78.54	98.2	117.81	137.45	157.12

PULLING FORCE (US TONS)

MODEL (CYLINDER): X20 (1.625"/41mm), C20 (1.75"/45mm), C25 (2.0"/50mm), X30 (2.5"/64mm), X50 (2.75"/70mm), M50/V24 (3.5"/89mm), M100 (5.0"/127mm)

Figure 16
Hydraulic Pulling Force Table

SAFE OPERATION

STANDARD SWAGED WIRE ROPE (6 x 26 RRL IWRC)

DIAMETER		WEIGHT		TEST STRENGTH (TONS)*	
inches	mm	lbs/ft	kg/M	US	metric
1/2	**12**	N/A	**N/A**	N/A	**N/A**
9/16	**14**	0.68	**1.01**	19.3	**17.5**
5/8	**16**	0.85	**1.27**	23.9	**21.7**
3/4	**19**	1.25	**1.87**	34.5	**31.3**
7/8	**22**	1.66	**2.47**	47.0	**42.6**
1	**25**	2.15	**3.21**	61.5	**55.8**
1 1/8	**28**	2.80	**4.17**	75.0	**68.0**
1 1/4	**32**	3.46	**5.15**	90.0	**81.6**
1 3/8	**35**	4.20	**6.23**	110	**99.8**

COMPACT SWAGED WIRE ROPE (6 x 25 RRL IWRC)

DIAMETER		WEIGHT		TEST STRENGTH (TONS)*	
inches	mm	lbs/ft	kg/M	US	metric
1/2	**12**	0.63	**0.94**	18.6	**16.9**
9/16	**14**	0.78	**1.15**	23.7	**21.5**
5/8	**16**	1.01	**1.50**	28.5	**25.8**
3/4	**19**	1.41	**2.10**	42.2	**38.3**
7/8	**22**	1.91	**2.85**	56.0	**50.8**
1	**25**	2.53	**3.77**	73.7	**66.9**
1 1/8	**28**	2.89	**3.93**	92.9	**84.3**
1 1/4	**32**	3.43	**4.67**	103	**93.4**
1 3/8	**35**	4.20	**5.72**	120	**108.9**

**Listed for comparison only. Field applications vary. Putting a wire rope under load around a radius (wheel or pulley) degrades factory strength ratings. Actual breaking point may be reduced by 20% or more when pipe-bursting. Use extreme caution and always have a working pressure gauge on pulling equipment.*

Figure 17
Swaged Wire Rope Specifications

*Major components of the TRIC standard bursting head assembly: (**a**) mole, (**b**) removable blade, (**c**) pulling core, (**d**) PE cap, (**e**) core washer, (**f**) core bolt.*

*Ancillary components include (**g**) 3/4" swaged cable with open socket (clevis) termination, (**h**) socket pin, (**k**) cotter pin, (**m**) pre-burster*

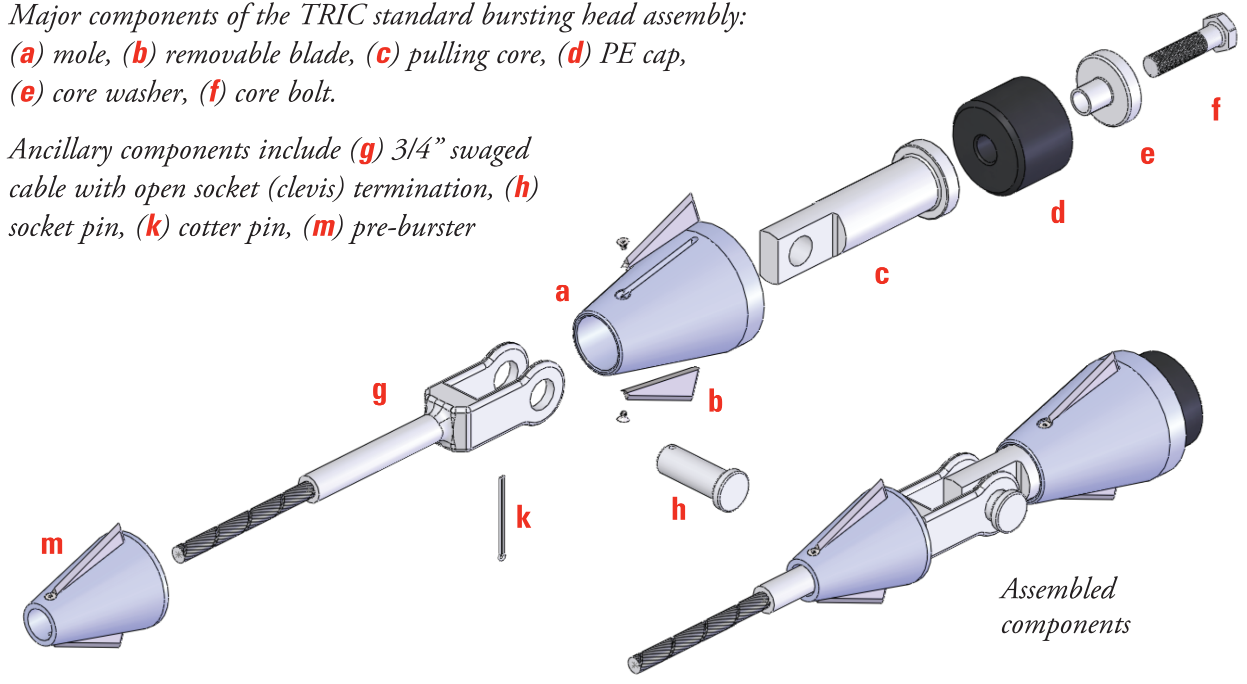


Figure 18

TRIC standard bursting heads are lighter than their TRIC-Lock counterparts, and are better configured to negotiate difficult entry angles and bends in the pipe path.

TRIC-Lock heads, on the other hand, do not require fusing to the pipe, which eliminates the need for PE caps. This is a significant savings, as well as a great convenience on the job.

TRIC 4" and 6" bursting head assemblies—both standard and TRIC-Lock models—employ the open socket or clevis type cable termination (***g***) in Figure 18 opposite, and Figure 6 on page 15).

Custom threaded-core 4" and 6" heads (configured like the 8" and 10" heads shown on page 38) are available on special order.

The pre-burster (***m***) shown in Figure 18 is used primarily when upsizing 3" pipe to 4" HDPE. Its function is to enter and break or split the smaller diameter pipe before the clevis connection makes contact. This is particularly important when replacing cast iron and plastic, even when bursting size-to-size. The socket pin itself (***h***) measures 4" in length, while the ID of standard 4" cast iron sewer pipe is slightly less than that. PVC drain pipe is nominal ID or less, depending on size and ASTM rating.

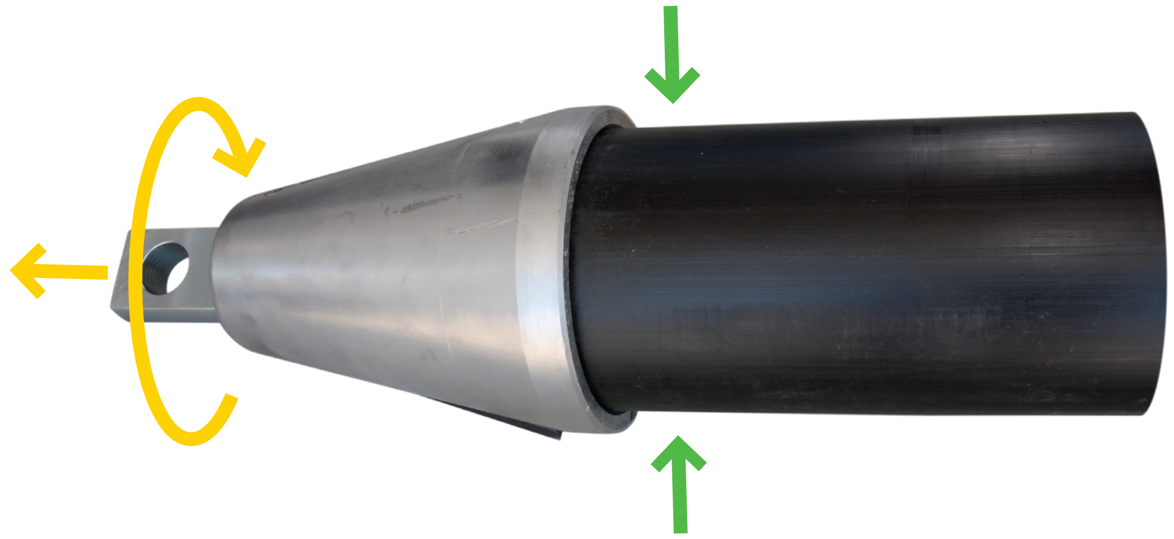
Both the pre-burster and 4" mole use the same removable blades (***b***). Blades are necessary when replacing plastic pipe. They are recommended with cast iron and clay pipe (VCP). For plastic, generally two opposing blades are best.

*Major components of the TRIC-Lock bursting head: Pulling Core (**a**), Core Bushing (**b**), Grip Assembly (**c**), Expander Cone (**d**), and Bursting Head Shell or Mole (**e**). Small parts include blade(s) and grip assembly O-rings. Shown here is the 6-inch model.*

Figure 19

Unit loosely assembled, ready to attach to pipe. TRIC-Lock heads are designed to fit IPS SDR17 and SDR11 HDPE pipe, but may also fit slight dimensional variations (such as metric equivalents). If you must pull a gauge of pipe that won't quite fit the grip assembly, we recommend that you fuse a short piece of SDR17 onto the end of the other pipe.

Figure 20



Attaching the TRIC-Lock head to SDR17 or SDR11 HDPE pipe (see facing page)

Figure 21

TRIC-LOCK BURSTING HEAD

TRIC-LOCK ATTACHMENT

Cut a clean, straight edge on the end of the pipe to be attached. It's best to trim the pipe end in a fusion machine, and then use the fusion jig to hold the pipe while attaching the TRIC-Lock head assembly. After trimming the pipe end, open the jig and slide it back on the pipe so that the pipe end extends about 6" to 8" outside the jig. Secure the pipe in the jig. Insert the pulling core assembly (**a** through **d** in Figure 19) into the pipe until the grip assembly (**c**) is just inside the pipe. The core bushing (**b**) will be just outside the pipe. Spin the pulling core counterclockwise until the grip pack is barely snug inside the pipe. Then slide the bursting head over the core assembly and onto the pipe. The head skirt will overlap the pipe about 1-1/4" to 1-1/2" before docking against the core bushing and pipe end. The pulling eye should still extend completely outside the nose of the bursting head. Hold the head firmly against the pipe while pulling on the core (this is easier with two people). Turn the pulling core COUNTERCLOCKWISE with a crowbar or similar device (yellow arrows) until the grip pack pinches the pipe inside the skirt of the bursting head. Tighten until the head cannot rotate or slide off the pipe. The pipe will visibly swell immediately behind the head (green arrows). Do not overtighten. As the head assembly is pulled during the burst, it will further tighten against the pipe.

Figure 22

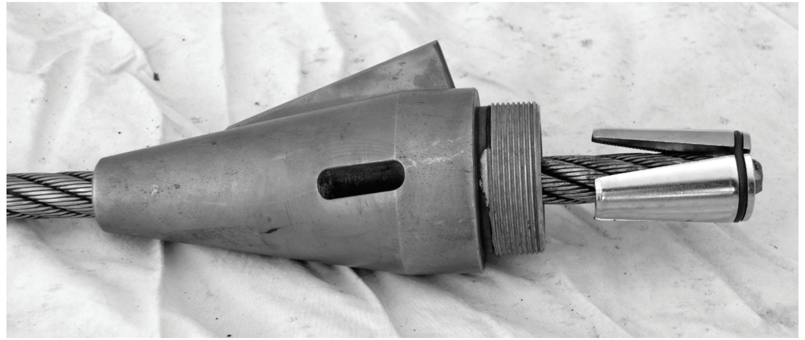


Figure 23

SELF-GRIPPING BURSTING HEAD ATTACHMENT

Clean and inspect chuck chamber after each use. Spray the chamber with PSI Teflon lubricant (www.prestresssupply.com) or similar lubricant before each job (see Fig. 24). Allow the Teflon spray to dry completely before use. Insert the clean finished end of the pulling cable through the bursting head from front to back, leaving a few inches extending behind (see Fig. 22). Place the clean chuck pack on the end of the cable as shown (see Fig. 23), allowing a very small portion of cable to protrude from rear of chuck assembly. Keep the chucks even and aligned, and hold the chuck assembly on the cable while pulling the cable forward to lock the chuck assembly inside the bursting head. Ensure that chucks are gripping the cable and are fully and evenly engaged inside the chuck chamber.

Figure 24

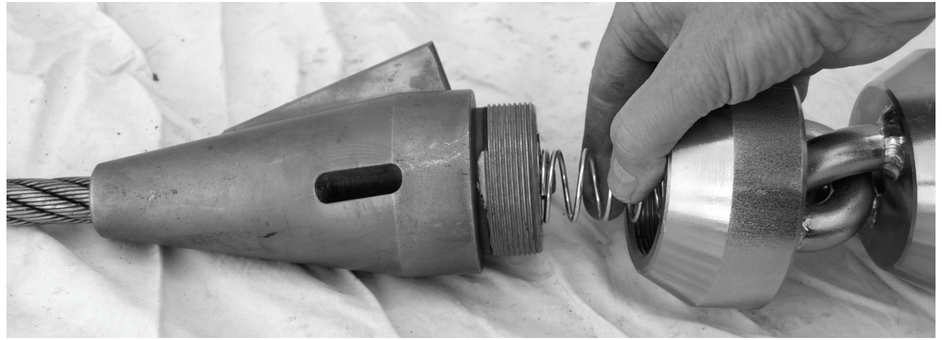


Figure 25

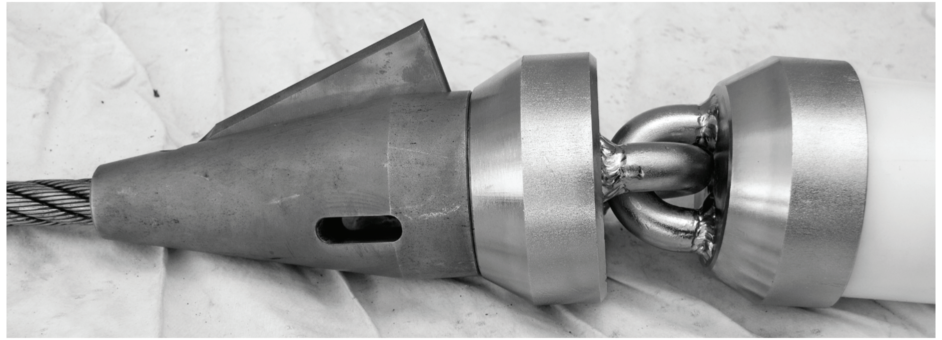


Figure 26

SELF-GRIPPING BURSTING HEAD (2" & 3")

Clean and lubricate threads on the bursting head with anti seize grease. Also make sure that tail assembly threads are clean and free of old grease and dirt build-up. Center the spring over the cable end against the chuck assembly, and center the other end of the spring inside the tail assembly (Figure 25). Thread the tail assembly completely onto the head (Figure 26). This is easier if done before fusing the full length of HDPE pipe onto the tail assembly.

To release cable from the head assembly, first remove the tail assembly, then place the TRIC extractor wedge into the extraction slot (Figure 27), and hit wedge with a mallet to release the chuck assembly. Clean and inspect all parts before the next use.

Figure 27

An essential technique in the use of all TRIC pipebursting equipment is detensioning, or releasing cable tension to free the pulling unit. Each TRIC cable puller has two gripper assemblies. Pulling grippers engage the cable and pull it as the cylinders extend. Retaining grippers hold cable tension as the cylinders retract, allowing the pulling grippers to release the cable and reposition for another cycle. It is important to monitor pulling force at all times (a pressure gauge is essential), and to anticipate the effects of hydraulic pressures and cable tension, so as to allow an "escape" from dangerously high tension or adverse movement of the pulling assembly. In precarious situations under high load, use a gaff to manipulate grippers remotely (see page 49).

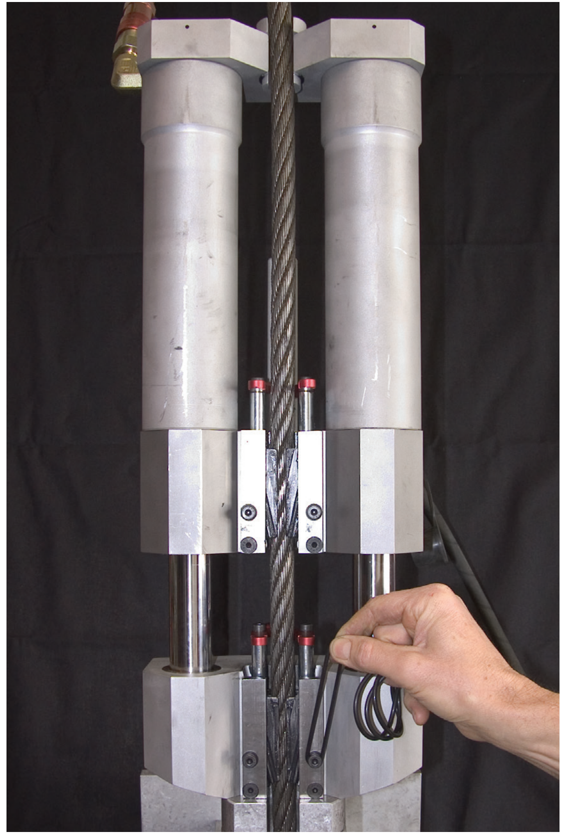
DO NOT enter a pit with a TRIC puller that is unstable and under load. Stop and release tension, then investigate. Adjust the pulling assembly as necessary before proceeding further. Read sections regarding proper setup and cable load capacities.

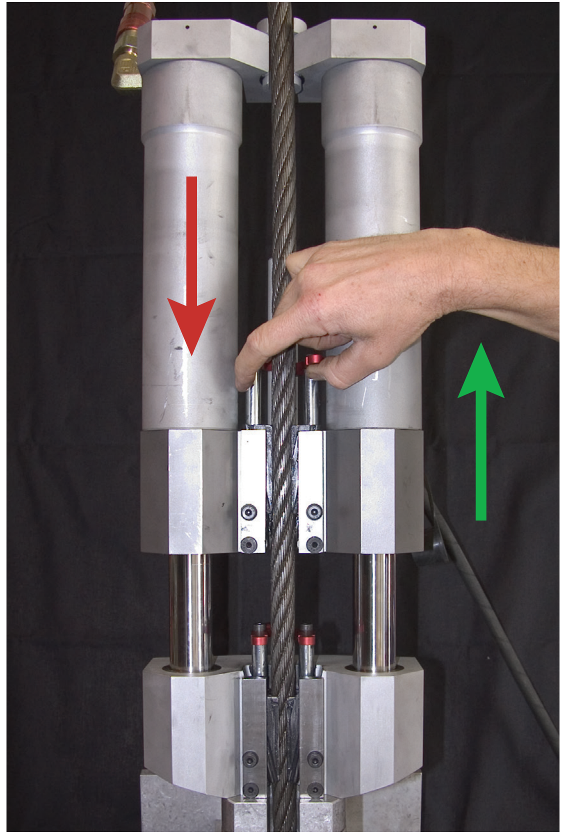
In the following illustrations, **red arrows** (on cylinders) indicate cylinder direction, and **green arrows** (by hands) indicate gripper action or hand movement.

***PLEASE NOTE:* The puller shown in this sequence is Model C25. However, the process of releasing cable tension is the same for all TRIC pullers. Please see pages 6–7 for an illustration of parts for the X30.**

STEP 1:
Remove gripper O-rings

Remove gripper tension O-rings before inserting or removing the cable from the puller. This allows for easy manipulation of the grippers. If the puller is near full extension when your pipe bursting is finished, proceed to Step 4. If the puller is more retracted (as shown here), proceed to Step 2.





STEP 2:
Free pulling grippers

Pull back/up on pulling grippers while retracting cylinders until the pulling grippers are free. Retaining grippers will hold cable tension and allow pulling grippers to release cable.

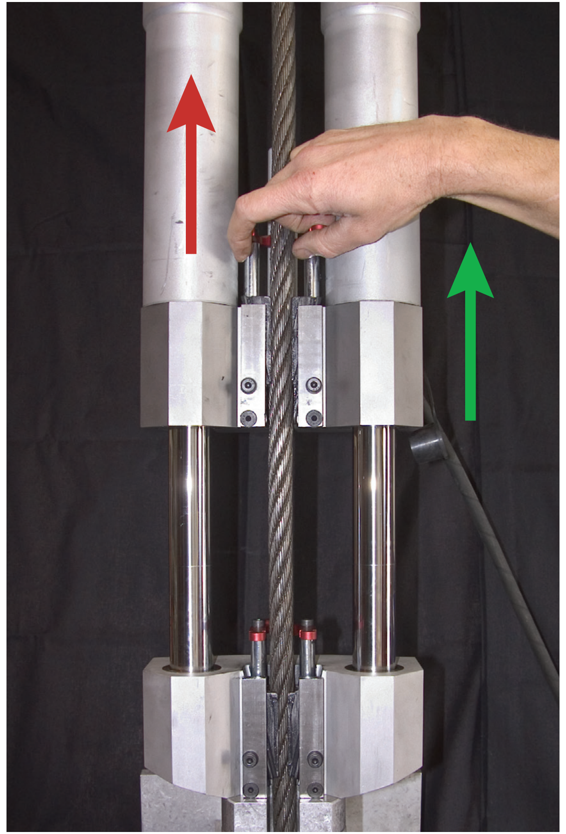
WARNING: Avoid hitting or prying yoke assemblies to move or free grippers.

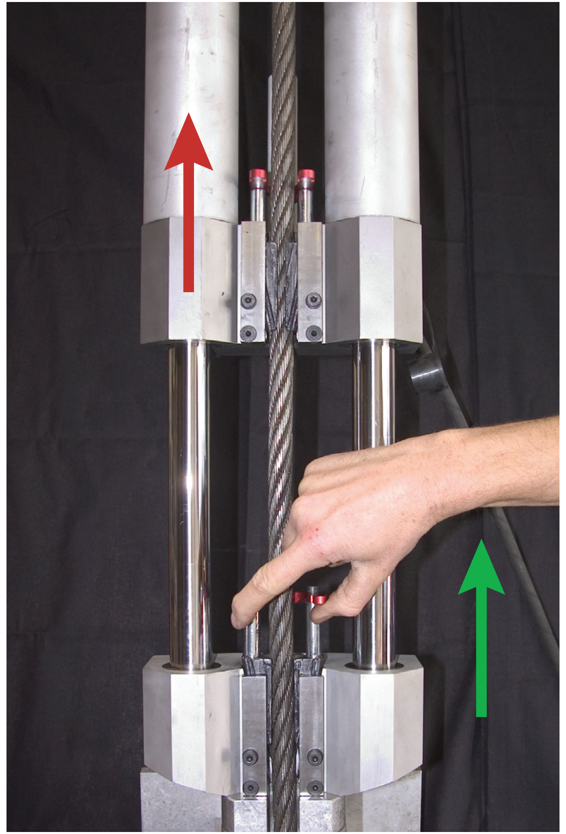
WARNING: If puller is under load and is unstable or in a confined area, use a gaff to release tension remotely before entering pit with equipment (see page 49 for illustration).

DETENSIONING

STEP 3:
Extend puller without engaging cable

Hold pulling grippers away from the cable, then extend the cylinders to near the end of the stroke (leaving some piston travel remaining). Then, slide pulling grippers onto the cable.



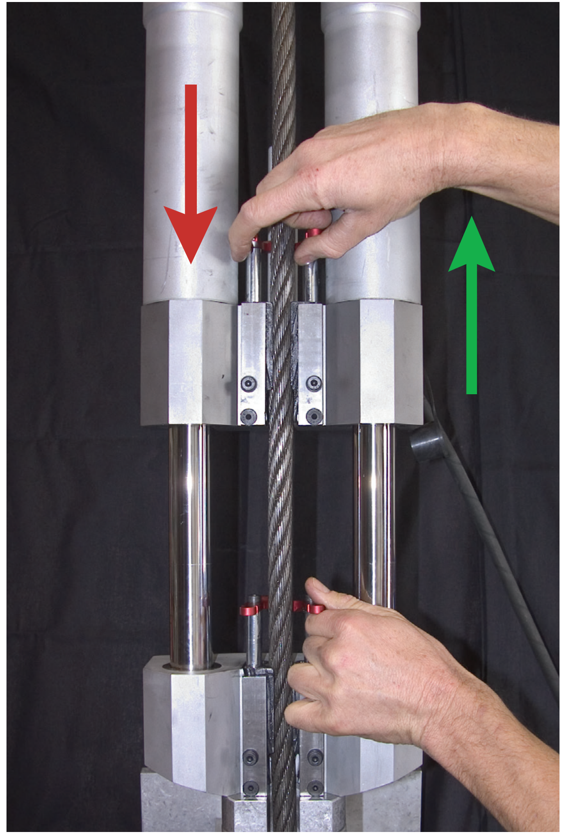


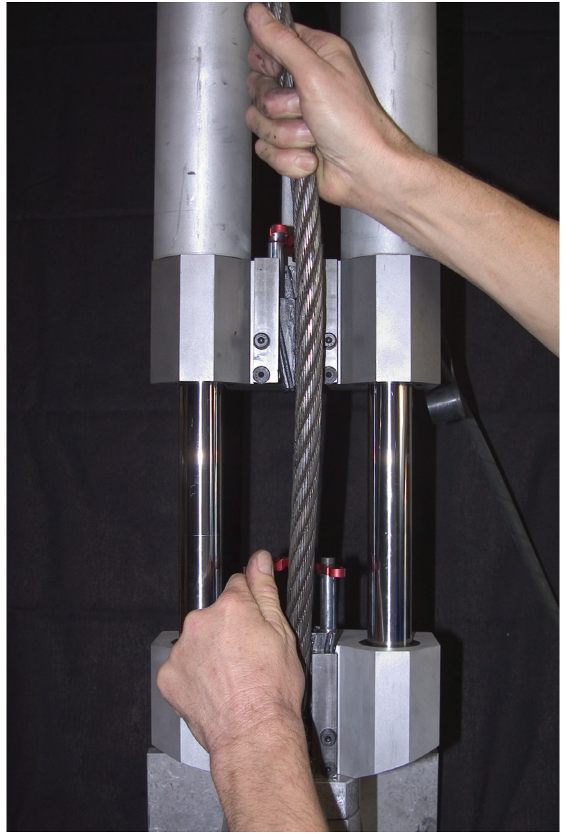
STEP 4:
Free retaining grippers

Using remaining piston travel, extend ram while pulling retaining grippers back away from cable. If retaining grippers do not release, repeat steps 2 and 3, and allow more upward piston travel to free retaining grippers.

STEP 5:
Free pulling and retaining grippers

Keeping retaining grippers away from the cable, pull back on pulling grippers while retracting the cylinders. With the retaining grippers loose, the puller will "feed back" cable tension. (On some occasions, cable stretch is such that Steps 2 through 5 must be repeated.)





STEP 6: Remove cable, clean and inspect puller and gripper assemblies

Remove cable from puller. Before detaching hydraulic hoses, retract puller to protect chrome piston rods during storage and transport. (Serious scuffing or denting of chrome rods will cause hydraulic seals to leak.) Hose off pulling unit to remove dirt and debris, then remove gripper assemblies. Thoroughly clean grippers with a stiff wire brush. Inspect yokes and towers for damage, and repair or replace as necessary. Apply grease to grippers and gripper housings, then reassemble to puller. Keep extra yokes and towers on hand.

Remote Detensioning

To release cable tension remotely, use a gaff, or even a crowbar if nothing else is available on the job site. The gaff shown on this page is assembled from elements easily found around the home or at the local hardware store: an old broom-stick, 60cm of insulated 2–3mm cable, two 30mm hose-clamps, and a ceiling hook. Use the hook-end to remove tension O-rings, and use the loop-end to manipulate gripper yoke assemblies.

The TRIC pipebursting system consists of a few basic elements identified in this section, along with notes on general care and problem-solving.

The Pulling Assembly: Also known as the down-hole unit (DHU), the TRIC pulling assembly includes *the resistance plate, the pulley base, and the puller*. See pages 6 and 7 for DHU parts descriptions. Grease the pulley wheel regularly (there is a Zerk fitting on the axle) and make sure the wheel rotates freely with minimal play. The cable channel on the wheel may become noticeably wider under normal use, given that the DHU can accommodate some divergence in the cable pulling path (see Figure 11 on page 24). Extreme wear will deepen the cable channel—effectively reducing the radius of the wheel—and may include axle wear that results in misalignment of the wheel and cable during use, which causes problems with the retaining grippers. If the retaining grippers are not engaging the cable properly as the puller retracts, release tension on the cable completely and spin the puller 30º–40º in either direction in the wheel socket (see Figure 10**c** on page 22). This may alleviate the problem temporarily. In any case, worn parts should be replaced. The X30 puller should be cleaned and checked after each job. Hose off excess dirt and debris, and remove gripper assemblies to thoroughly clean and re-grease the grippers and gripper pockets. Periodically check 3/8" Allen-bolts in the puller's nose and handle shafts. (Handle bolts also secure the pulling bridge to the piston shafts.) Please see pages 6–7 for X30 parts reference.

Hydraulic Power-Pack (Pump): The most common pump related issues are *(a) weak or dead battery, (b) faulty solenoid valve, (c) pendant control wire connectivity, (d) low or contaminated hydraulic oil, (e) pump-to-engine drive coupling failure (on certain models).* Power-packs for the X30 system employ a voltage regulator/rectifier to charge the battery during operation. Intermittent short-term use and/or a faulty rectifier can result in a weak battery on the job, which in turn causes the puller to behave erratically or stop altogether because the solenoid valve is not receiving enough voltage to shift properly. If this happens, test the valve manually. If there is a lever on the valve, shift it back and forth to test flow. If there is no lever, test the valve by pushing in either end of the shuttle with an Allen wrench or Phillips screwdriver (see Figure 28 opposite). Some valves have push-button ends that can be tested by hand. If the X30 responds when the valve is tested manually, then the problem is electrical. Check the battery, pendant control, and solenoid terminals. Some pumps are equipped with a wireless remote control, which also uses batteries. If the X30 does not respond to manual operation of the solenoid valve, then the problem is mechanical. The valve and/or the pump mechanism may need service. Keep the power-pack level during operation, and make sure that hydraulic fluid is clear and visible in the sight-window on the reservoir. Low or contaminated hydraulic oil can damage valve and pump mechanisms. TRIC pumps with Honda engines have a drive-coupling connection. If the engine is running and there is no discernible fluid transfer (i.e., no pressure or movement detected in the hoses or puller), and if other tests described above have been performed, then the drive coupling is most likely the problem. Remove the plastic service cover on the drive housing (most covers are orange plastic) and check for a slipped connector and/or damaged insert, which is a plastic insulator between the drive couplers (see figure 29 below). The couplers are fixed to their respective drive shafts with a shaft key, held in place with an Allen screw tightened to a specific torque. The Allen screw may also require a thread-locking compound. Refer to the manufacturer or contact TRIC for more information, or if you need replacement inserts.

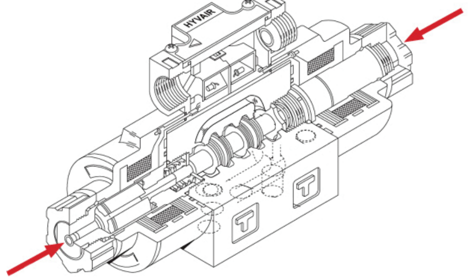


Figure 28 (Solenoid Valve)

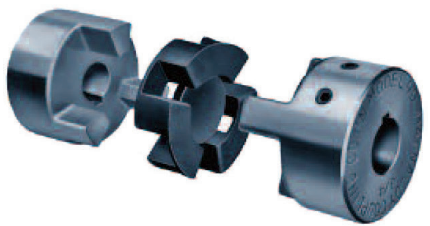


Figure 29 (Drive Coupling)

TROUBLESHOOTING & MAINTENANCE

ANSI: American National Standards Institute (www.ansi.org)

ASTM: (ASTM International) American Society for Testing and Materials (www.astm.org)

Bending Radius: Regarding HDPE pipe, the smallest radius bend that the pipe can sustain before folding or deforming.

Bridge, Pulling: The part of a cable puller that spans the center point between hydraulic cylinders, and which houses the pulling grippers.

Bridge, Retaining: The part of a cable puller that spans the center point between hydraulic cylinders, and which houses the retaining grippers.

Burst: (Noun) Pipebursting job.

Cage, Extraction: Metal frame built to extend the puller away from the resistance wall in the receiving pit.

Chuck: See Gripper.

Cleanout: Point of access on a sewer line, to facilitate inspection and cleaning.

Collet: Segmented band or sleeve with flanged or conical exterior designed to tighten against a cable or shaft.

Cover Plate: Removable steel plate that retains the gripper assembly in the pulling/retaining bridge.

Cribbing: Blocking and other support materials, including wood timbers, I-beams, and other structural steel, used to position and stabilize the pulling unit in the receiving pit.

D to d Ratio: The relationship between the diameter of a wire rope (d) as it is bent around the diameter of a drum or wheel (D) is expressed as a (D/d) ratio.

GPM: Gallons Per Minute, in reference to hydraulic fluid transfer systems.

Gripper: Metal wedge with concave, ribbed mating surface sized for a specific cable diameter. TRIC grippers come in matched pairs.

Gripper Assembly: Grippers (left and right), yoke towers, and yoke arms with connecting hardware.

Gripper Pair: Two matching grippers (one left and one right), also one complete gripper assembly.

Gripper Set: Two complete gripper pairs (one pulling and one retaining) for a specific cable size and pulling unit.

Head Assembly, Bursting: Complete pipe-bursting unit to connect with cable and replacement pipe, designed to replace breakable pipe materials.

Head Assembly, Splitting: Complete pipe-splitting unit to connect with cable and replacement pipe, designed to replace malleable pipe materials.

Hydraulic Flow Rate: The rate of fluid movement through a hydraulic fluid transfer system.

Hydraulic Pressure: A measurement of the force that is applied to a contained liquid, transmitting equally in every direction to all parts of the containment system (i.e., pump, hoses, cylinders, pistons).

Jaw(s): See Gripper.

LPM: Liters Per Minute, in reference to hydraulic fluid transfer systems.

Mole: The steel cone portion of the bursting head assembly.

Pipe Path: The exact underground route taken by a pipe system from point A to point B, including grade and physical bends.

Pipe, ABS: Acrylonitrile Butadiene Styrene pipe, used in most plumbing applications, both inside and outside building foundations. Pre-formed ABS joints and couplings can be solvent-welded (glued) together.

Pipe, AC: Asbestos Cement pipe, used extensively in America since the 1950s for water supply lines as well as sewers. Controlled as a hazardous substance. Manufactured in straight (no-hub) segments as well as bell-and-spigot segments.

Pipe, CI: Cast Iron pipe, used for water, gas, and sewer applications. Available in straight (no-hub) segments as well as bell-and-spigot segments.

Pipe, Concrete: Precast segments used for both storm and sanitary sewer systems. Smaller diameters (4” to 36” or 100mm to 900mm) available non-reinforced, and larger diameters (12” to 144” or 300mm to 3600mm) available steel reinforced.

Pipe, DI: Ductile Iron pipe, used for water, gas, and sewer applications. Available in straight (no-hub) segments as well as bell-and-spigot segments. Extra durable for use in areas where pipeline is exposed or under heavily traveled roads and railways, etc.

GLOSSARY OF TERMS

Pipe, Fiber Conduit: Also known as Orangeburg, after the Fiber Conduit Company in Orangeburg, New York, which produced the pipe for most of the 20th century. Used for electrical conduit, and subsequently sewers and drains. Made of wood pulp sealed with hot pitch. Relatively short service life, although some fiber conduit sewer lines are still in use after four or five decades.

Pipe, HDPE: High Density Polyethylene pipe is used for all major underground utilities. Extremely durable and flexible, HDPE pipe is supplied in 40-foot lengths for most sizes, and also on rolls for sizes up to 4” (100 mm) diameter. HDPE pipe segments are heat-welded together with a process called “butt-fusion,” which when properly executed produces a joint at least as strong as the pipe itself. Pre-fabricated HDPE fittings can be fused to the pipe, producing a homogenous, pressure-rated piping system. Special HDPE couplings with internal heating elements, called “electrofusion couplings,” are also used to join sections of HDPE pipe. Other fusible connection methods are saddle fusion and socket fusion, by which smaller diameter pipe segments are heat-welded to larger diameter pipe.

Pipe, Host: Refers to the existing (old) pipe to be replaced or rehabilitated via pipebursting, slip-lining, or CIP lining. The “host” pipe provides a conduit for the pipe replacement method.

Pipe, Orangeburg: See Pipe, Fiber Conduit.

Pipe, PVC: Polyvinyl Chloride pipe is used in multiple utility applications, including sewer, water, gas, and electrical conduit. PVC bell joints and couplings can be solvent-welded (glued) together. PVC pressure bell joints and couplings (employing O-ring seals) require no glue or bands. Fusible PVC (C-900, C-905, FPVC) is available for various underground utilities.

Pipe, Soil: Waste disposal drain pipe (sanitary sewer, as opposed to storm sewer).

Pipe, VCP: Vitrified Clay Pipe, or “terra cotta” is the most widely used material for sanitary sewer drains of all sizes, from 42-inch mains to 4-inch home laterals. Available in straight no-hub segments (requiring band couplings) and bell-and-spigot segments, including “Y” and “T” connections, bends, and reducers. Newer VCP bell & spigot connections employ polyurethane compression joints.

Piston Area: Surface area of the top of one or more pistons in a hydraulically powered machine. Hydraulic power is a function of the fluid pressure applied to a machine’s total piston surface area.

Pit, Launching: Excavation where bursting/splitting head (with new pipe attached) enters pipe to be replaced. Also called Entry Pit.

Pit, Receiving: Excavation where pulling unit is assembled, and where bursting head arrives at the end of the pull. Also called Pulling Pit or Exit Pit.

Plate, Resistance (Standard): 24” (61cm) square plate of 1-inch thick (25mm) hard aluminum, designed to distribute the compressive load of the pulling unit against the resistance wall (or cribbing) in the receiving pit.

Plate, Sub: Flat surface of various materials and construction, used to support and align the V24 (or other puller) in the receiving pit.

Pull: (Noun) Pipebursting job.

SDR (Standard Dimension Ratio): The ratio of pipe diameter to wall thickness. The formula is ($SDR = D/s$) where D = outside diameter and s = pipe wall thickness.

Service Line (Underground): Municipal utilities including sewer, electrical, gas, water, and communications.

Service Point: Point of access to utility line. For sewer systems, the examples are cleanouts and manholes.

Sewer Lateral: Also called a side sewer, a lateral is the pipeline that carries plumbing wastewater from a building to the municipal sanitary sewer.

Slip Line: Pipeline rehabilitation using new material of slightly smaller diameter, typically fused HDPE, pulled through the existing pipe.

Tower(s): Steel extender posts that connect the grippers to the yoke arms.

Underground Service Alert (USA): A non-profit organization providing free on-site location and marking of underground utilities, as a precaution for contractors and homeowners prior to excavation (Dial 811).

Upsize: Replace a pipe with one of larger diameter, via pipebursting.

Yoke(s): Steel arms that hinge on a pivot screw and hold gripper pair together.

Wall, Resistance: In the receiving or pulling pit, the wall of the excavation that supports the puller and cribbing during a burst.