Barbco INC.

STEERING HEAD AND WATER GRADE INDICATOR

OPERATION AND PARTS MANUAL

TABLE OF CONTENTS

Corporate Philosophy and Mission

Barbco Inc. and its president, Jim Barbera are dedicated to not only the success of the organization but also to the growth and fulfillment of its employees and the surrounding community. To do both requires the company to be the "best that it can possibly be". To achieve this end, Barbco recognizes that all members of the company must be focused on a common mission and set of shared goals. Thus in September 1990 the company established the following Mission Statement and Goals

Mission Statement

Barbco Inc. is dedicated to instilling in all segments of its organization a commitment to the production of high quality earth boring equipment and accessories. We seek to be recognized as the leader in our industry in terms of quality products, customer service, innovation, and serving the needs of earth boring contractors throughout the world supported by a management philosophy which seeks employee satisfaction and involvement, customer loyalty, and maximization of productivity and profitability.

Goal 1 **A Commitment to Quality which**
Develops a quality focus to consistently provide our customers with products and services which meet or exceed their expectations as to reliability, construction, precision and aesthetics.

Goal 2 **A Commitment to Service which**
Develops an organizational philosophy which is based on the concept that "We will Do whatever it takes" to provide quality service to our customers in the most efficient and effective manner.

Goal 3 **A Commitment to Innovation which**
Provides an organizational focus on creativity, encouraging the development of procedures and process which add value to our products and services.

Goal 4 **A Commitment to Related Activities which**
Expands into areas which complement our basic operations and strengthen our communities.

Goal 5 **A Commitment to Employee Development which**
Creates an organizational culture that recognizes the value of the individual employee, regardless of function, in the overall success of the company, and to provide all employees with opportunities for career development and education.

Goal 6 **A Commitment to Profitability and Growth which**
Expands the company in a controlled manner, enabling it to build earnings and a strong capital base so as to maximize its value to shareholders.

LIST OF MATERIALS FOR LEAD PIECE OF CASING

1 pc. Casing 19'-10" long (**see step 1)**

1 Barbco Steering Head Kit

1 Set Steering Rod Ends

1 pc. 3/4" SCH 80 Black Pipe (Steering Rod Pipe)

1 pc. 1 1/2" SCH 40 Black Pipe

2 pc. 1/2" SCH 40 Black Pipe

1 - 1 1/2" Pipe Nipple 8" long

1 - 1 1/2" x 1 1/2" x 3/4" Pipe Tee

1 - 1 1/2" Pipe Cap

1 - 3/8" x 3" Over Cut Ring (Cut off of your first piece of casing.)

HAND TOOLS NEEDED TO BUILD STEERING HEAD

1 - 24" Carpenter Square

1 - 25' Rule

1 - 4' Level

1 - Pipe Wrap Around

2 - Pieces Soap Stone

2 - 8" C-Clamps

2 - Pipe Wrenches

1 - String Chalk Line

1 - Can Pipe Dope

1 - Welding Machine with Accessories

1 - Set Torches with Accessories

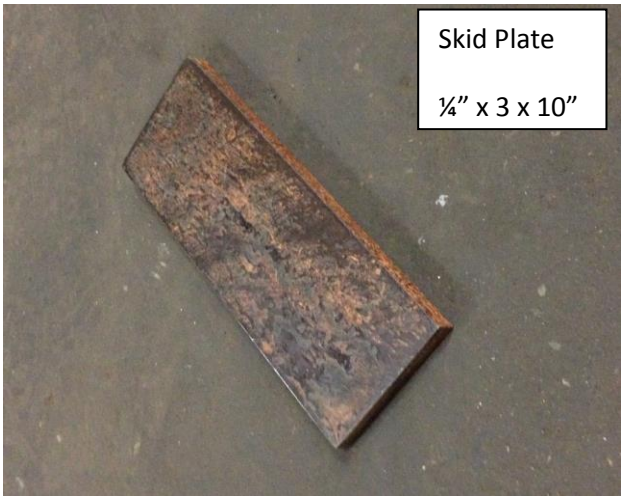
1 - Electric Hand Grinder

1 - Pipe Cutter

1 - Pipe Threader 1/2" & 1-1/2" die

1 - 2 lb. Hammer

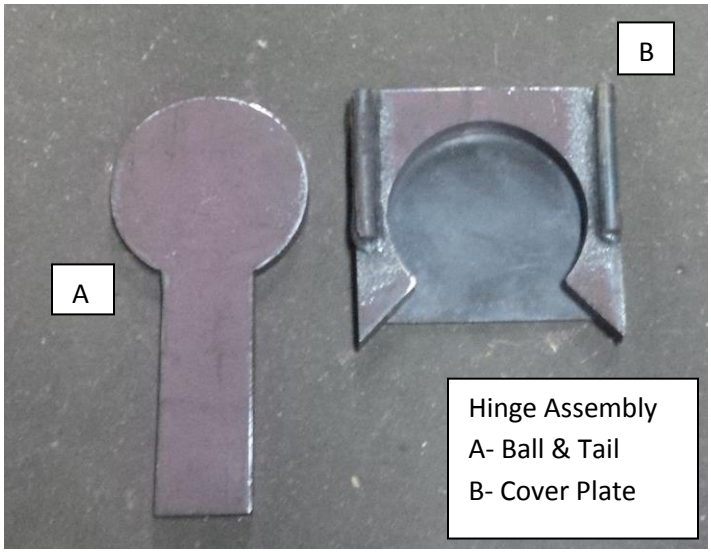
COMPONENT IDENTIFICATION



Water Level Sensing Head

Steering Rod Ends

Torque Master and Mounting Band



Hinge Assembly
A- Ball & Tail
B- Cover Plate

Ball Size Diameter:

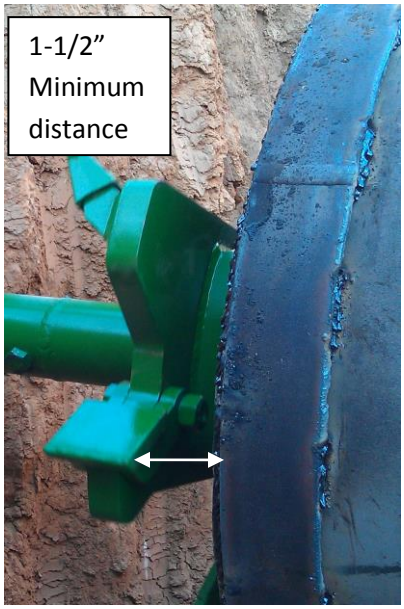
3”diameter for casing 12”-14”

5”diameter for casing 16”-30”

7”diameter for casing 36”-48”

9”diameter for casing 54”-60”

CONSIDERATIONS PRIOR TO FABRICATION



When preparing to fabricate your lead steering casing, it is important to control the gap between the back of wiper (on the cutting head) to the front edge of the over cut band (on the lead casing). This manual shows step by step instructions to produce a minimum distance of 1-1/2” as shown.

ATTENTION! To avoid contact between the wiper and the over cut band, every additional casing added must be 20 foot.

EXAMPLE: If the distance between the back of wiper and over cut band is 1-1/2” and the second casing measuring 20’- ½” long is added, the gap will close by ½”. If not monitored the wiper can contact the casing causing damage to the drill string and/or machine upset.

There are several manufactures of auger boring machines. Each have their own unique master pusher. It is important to know where the face of the front drive adapter lands in proportion to the end of the master pusher can. This dimension can change when using casing attachments.

The end of the master pusher (where it pushes casing) and the end of the front drive adapter are flush on all Barbco boring machines.

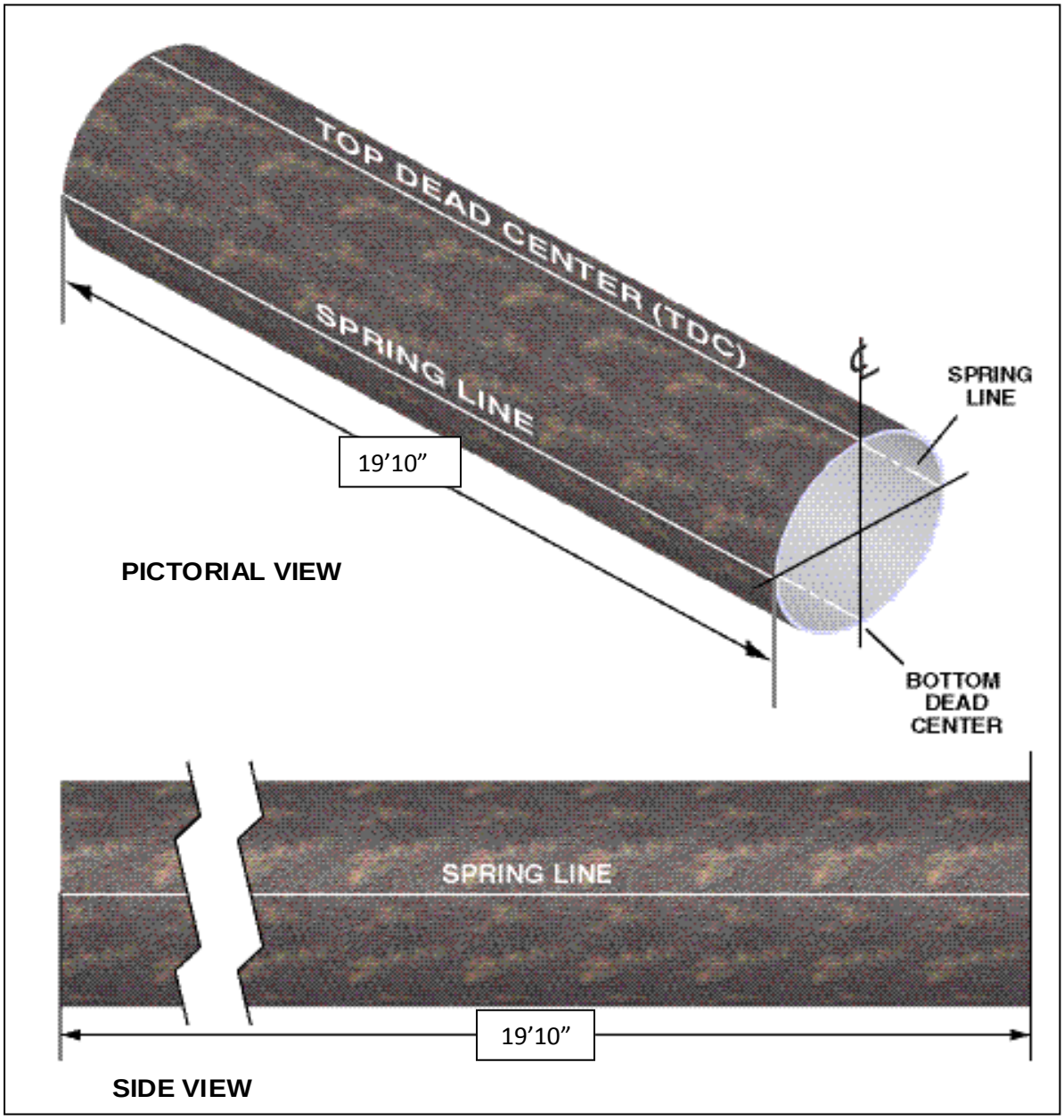
All casing attachments must be measured and considered during step 1 of this manual. As the casing is pushed off the face of the attachment instead of the master pusher.

Fabrication Steps

This step by step instruction is for a steering assembly using a 30/36-200 boring machine pushing 30” casing.

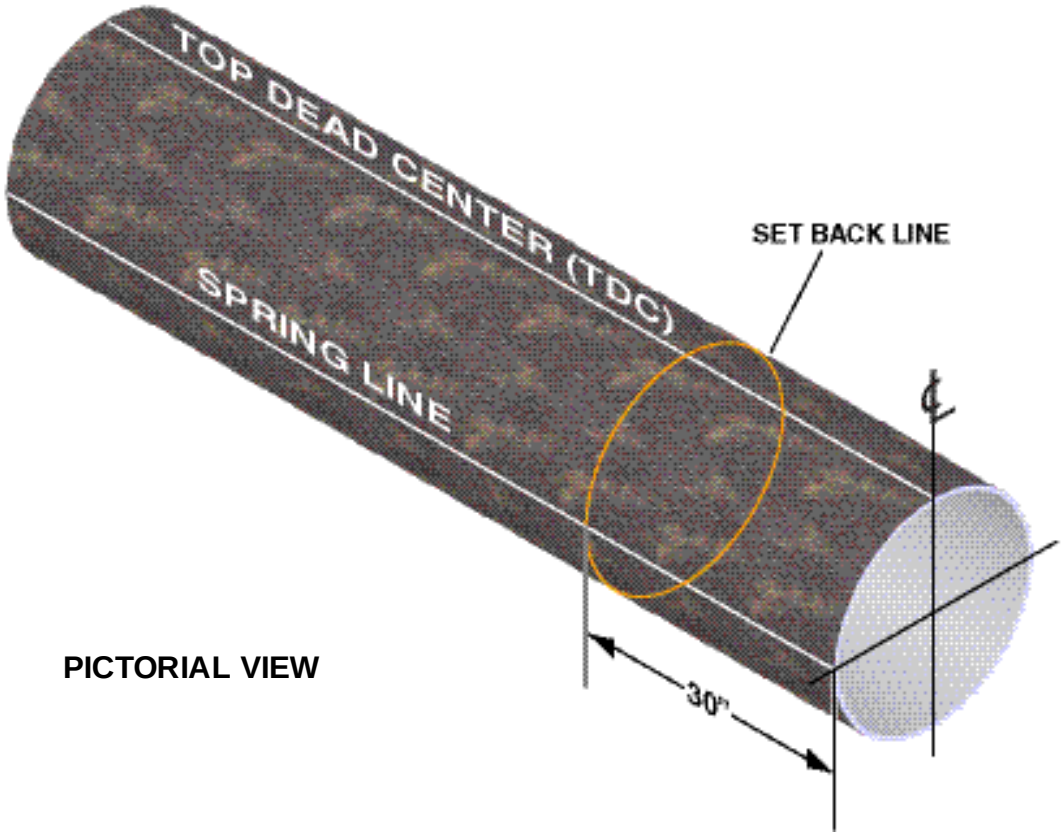
Step 1. Cut down the 20’ long casing to 19’ 10”. Save drop for step 8 of this manual
(*See considerations prior to Fab*)

Step 2. Use a 24” carpenter square to locate center lines for top-bottom-sides. Then quarter the casing by snapping a chalk line down the length of the casing.

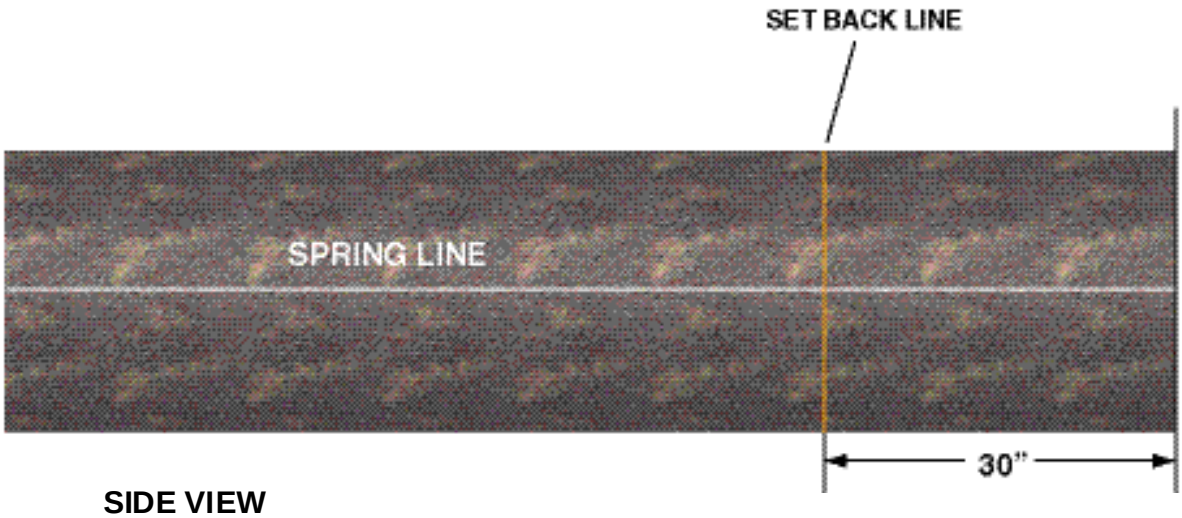


Step 3. Mark a setback line around the circumference of the casing, determined by the O.D. size of the casing.

Example Chart
12-24” OD Casing - Set Back Line to be 24”
30” OD Casing & above. Set Back Line to be 30”

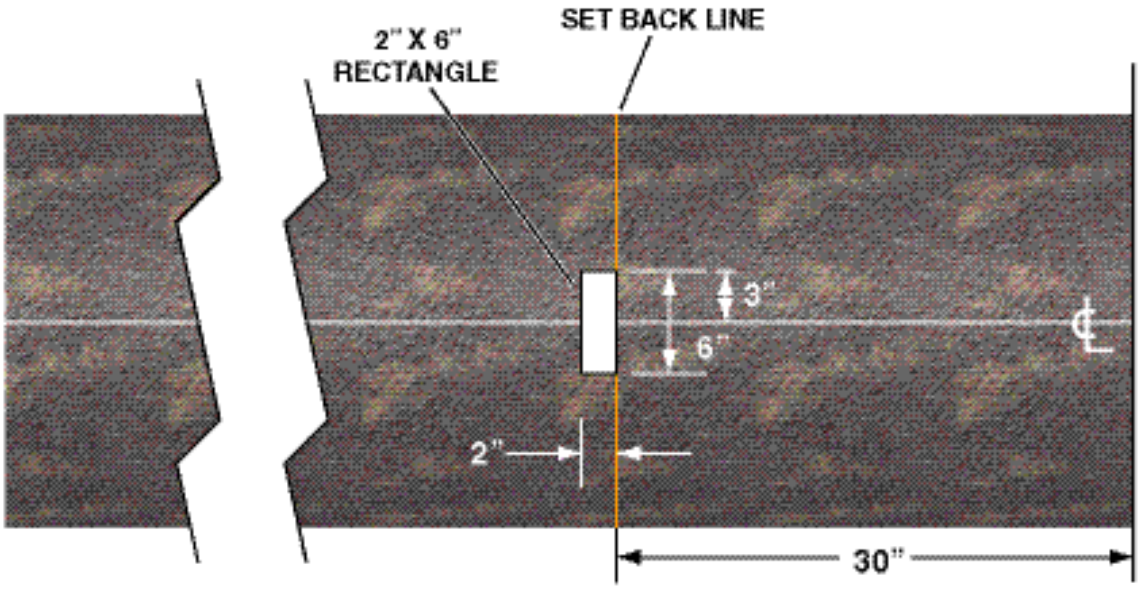


PICTORIAL VIEW



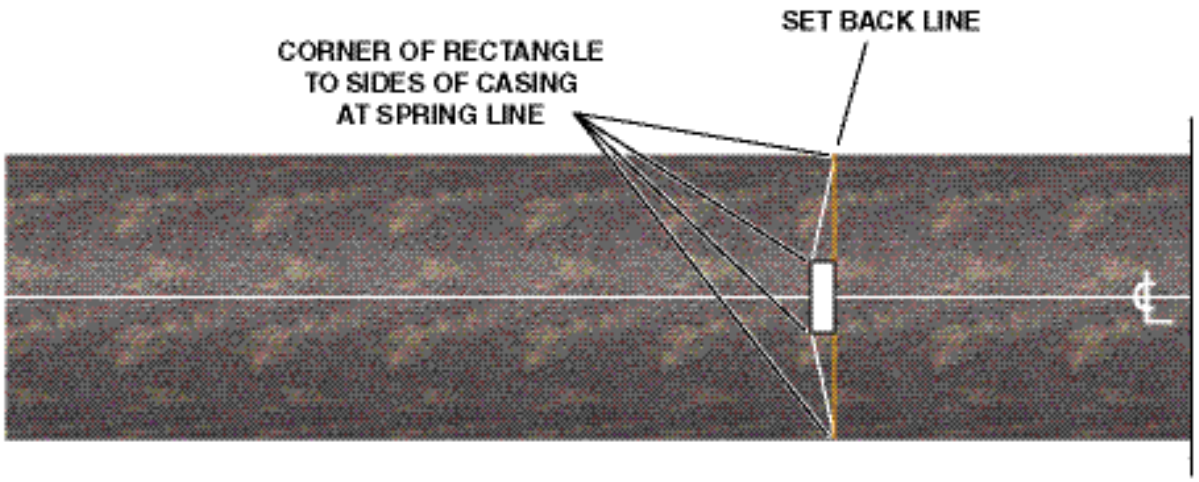
SIDE VIEW

Step 4. Mark a 2” x 6” rectangle on the top and bottom dead center of the casing, using center lines and set back line.

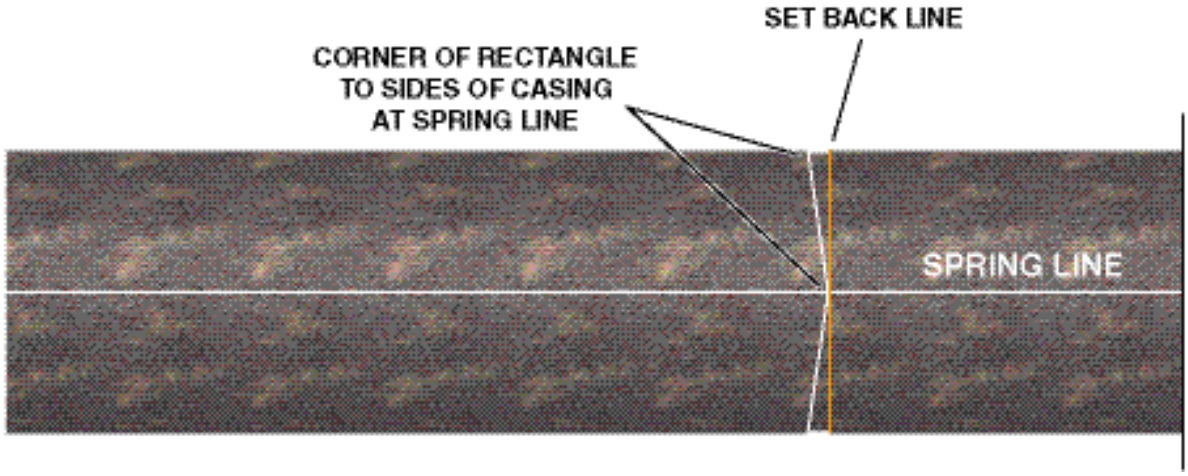


TOP AND BOTTOM VIEW

Step 5. Mark a line from the corners of the rectangle to where the spring line and the set back line intersect, on both sides. Mark both top and bottom section of casing.

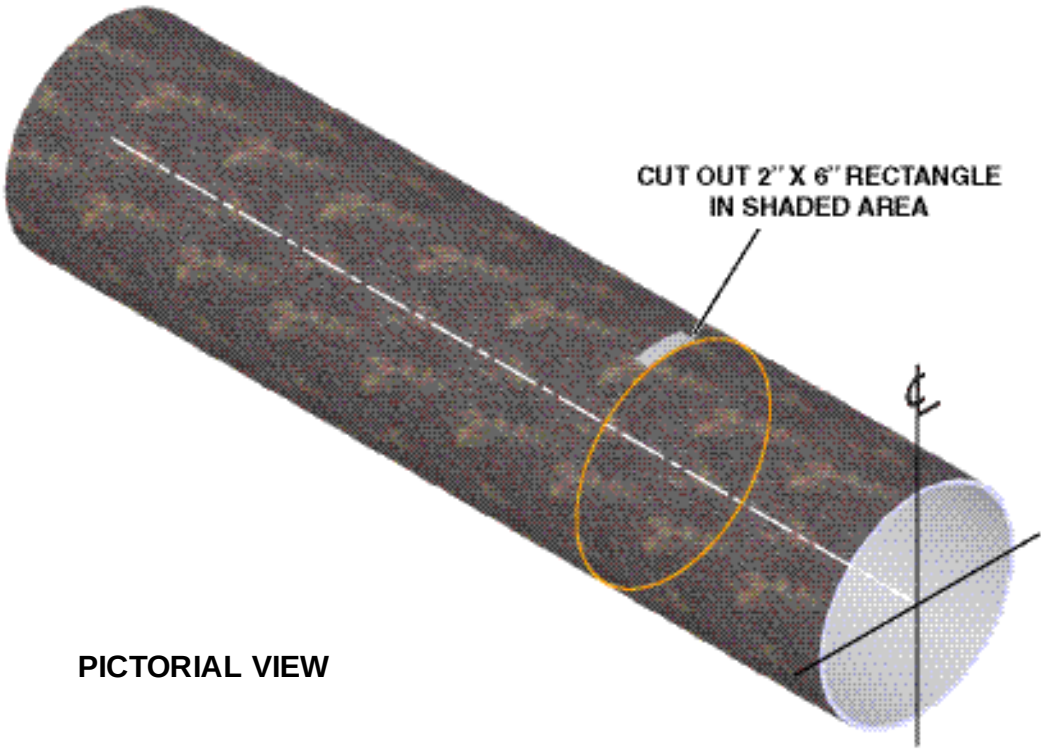


TOP AND BOTTOM VIEW

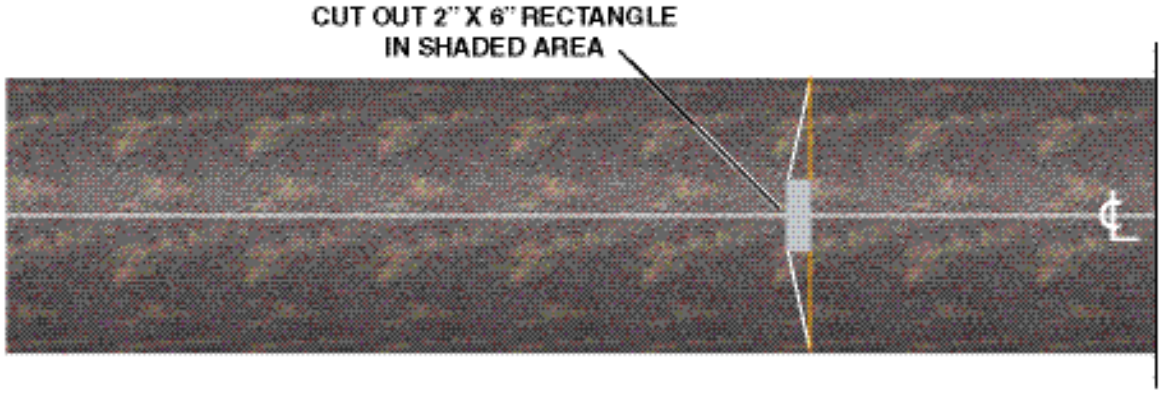


SIDE VIEW

Step 6. Cut out the 2” x 6” rectangles marked on top and bottom of casing.

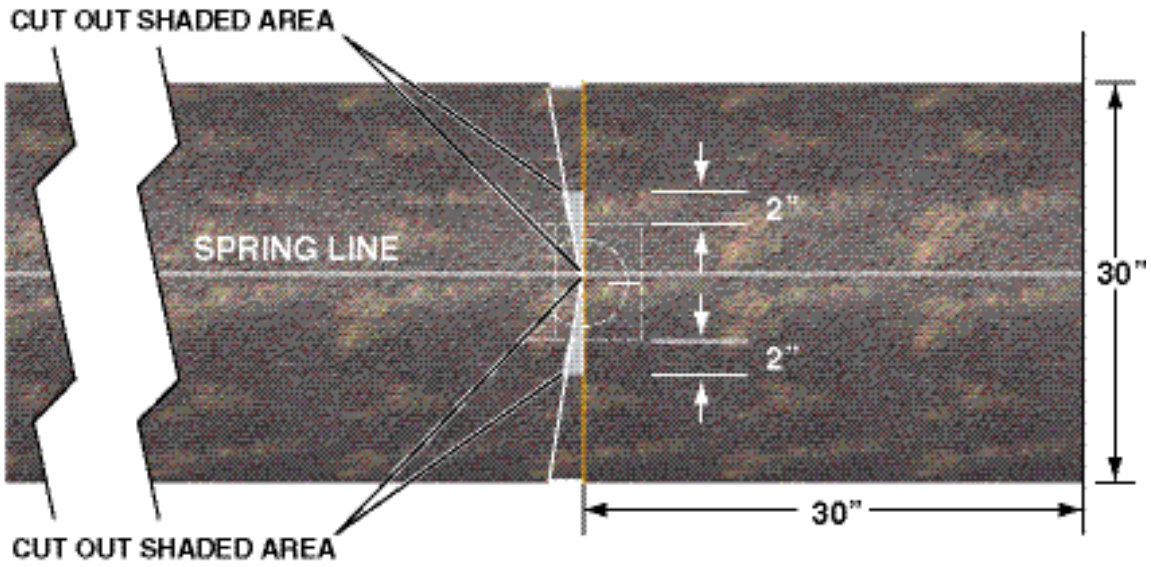


PICTORIAL VIEW



TOP AND BOTTOM VIEW

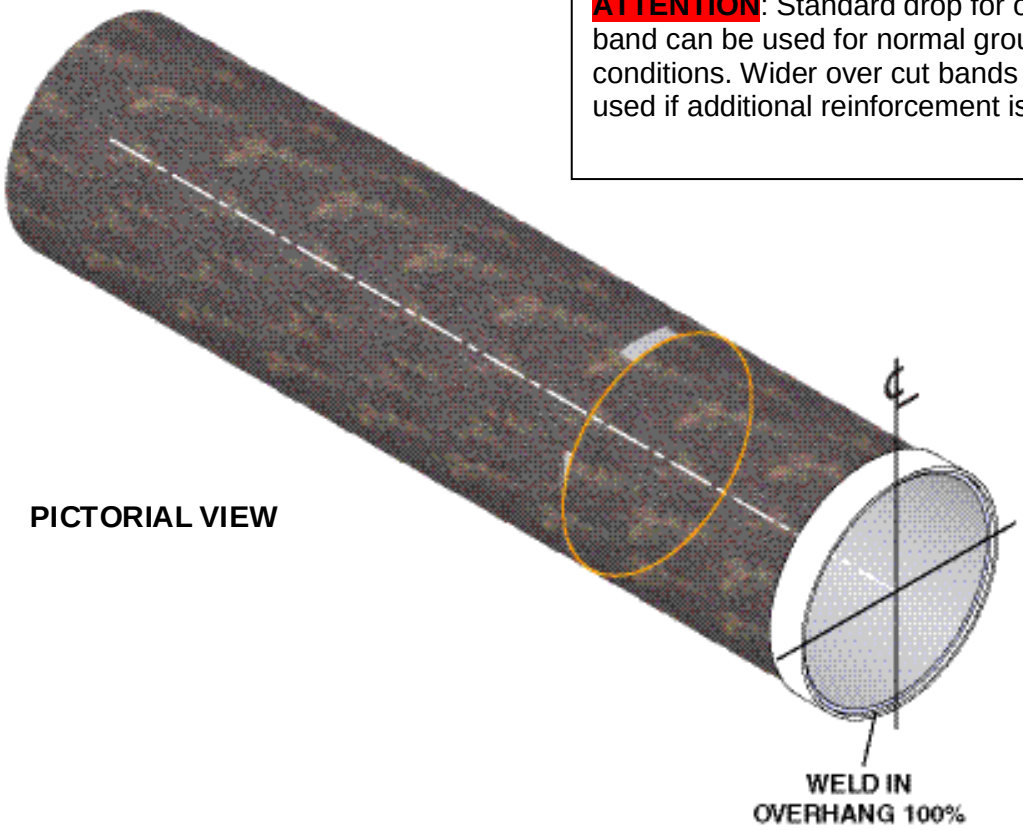
Step 7. Cut out from spring line 2” over diameter of the hinge assembly, within the lines drawn on both sides of casing.



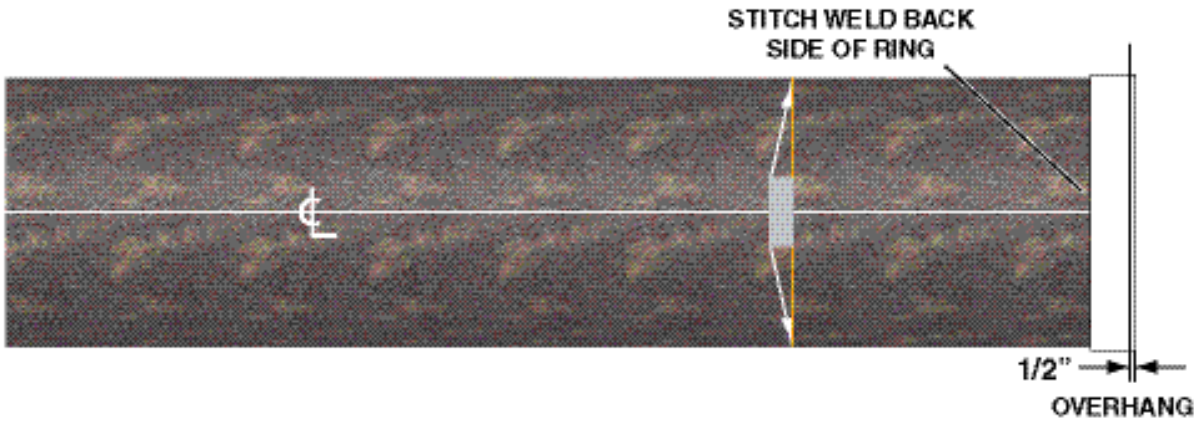
SIDE VIEW

Step 8. Weld the drop (over cut band) from step 1 to the front section of casing. Allow it to overhang by ½". Weld around the inside of the band 100%. Stitch welding the outside is acceptable. This step reinforces the leading edge of the steering head and provides a beveled edge on the ID which aides the spoil entering inside the casing.

ATTENTION: Standard drop for over cut band can be used for normal ground conditions. Wider over cut bands can be used if additional reinforcement is needed.



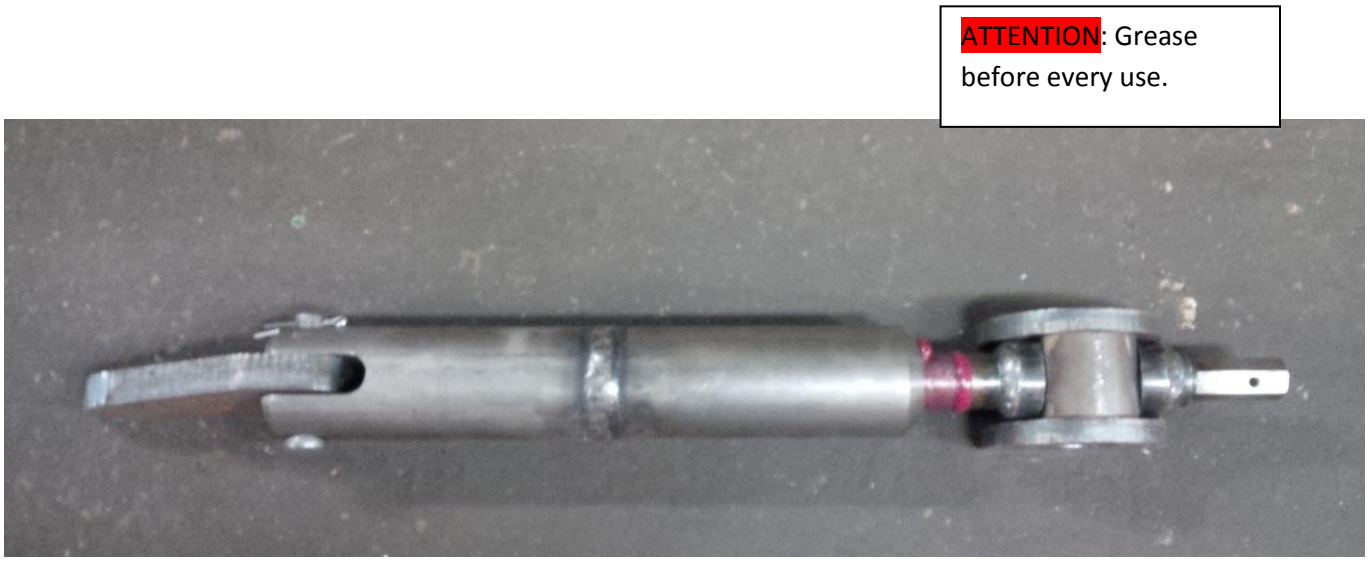
PICTORIAL VIEW



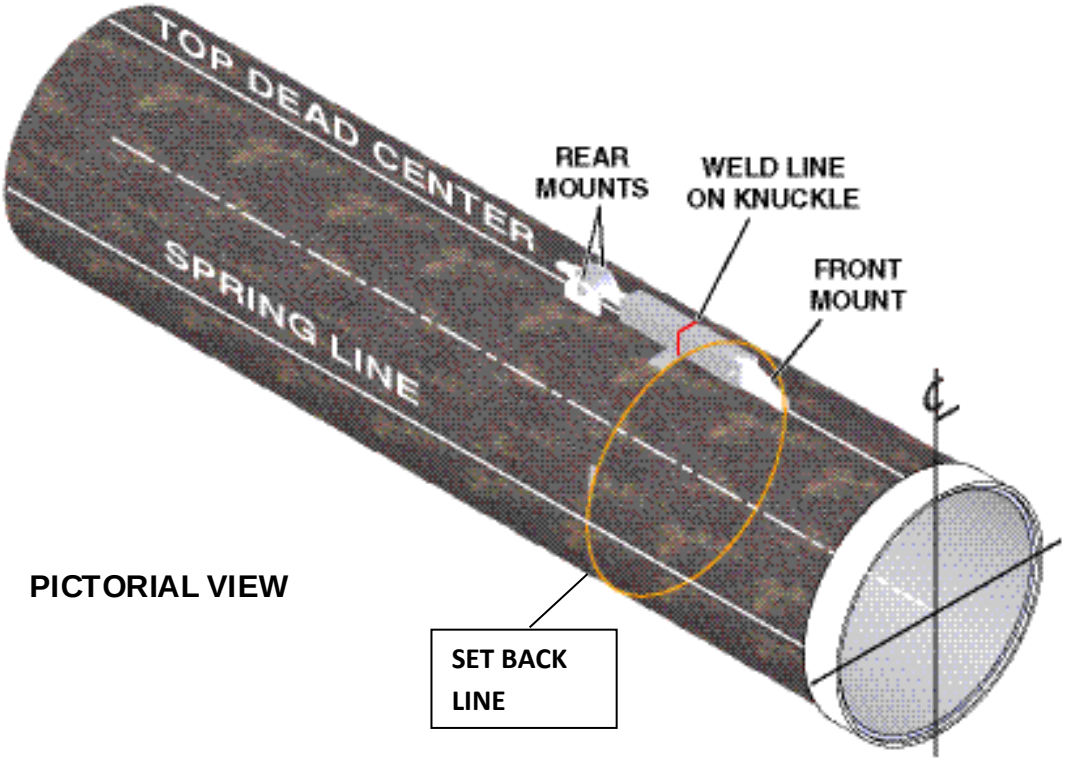
TOP AND BOTTOM VIEW

Step 9. Adjust the steering knuckle having an equal amount of turns in and out. This will allow the steering head when completed an equal amount of turns up and down

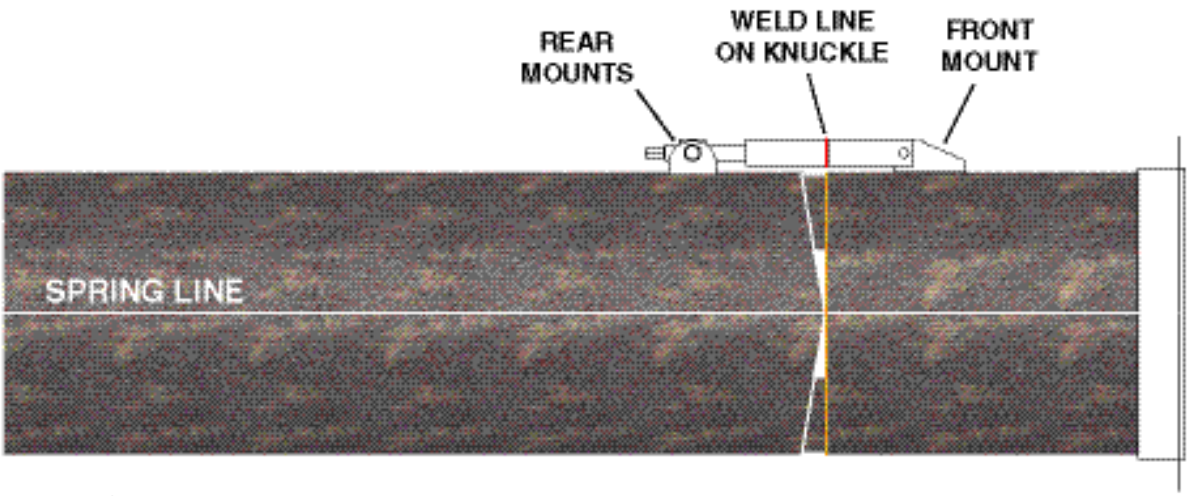
Knuckle below shown with equal amount of turns (11), in and out. Ready to be assembled onto the steering casing.



Step 10. Align the steering knuckle with the front and rear mounts in place on top of casing. Use the top dead center line on the drawing to line up the body of the knuckle assembly as shown. Use the set back line on the drawing to line up the weld on the knuckle as shown. Weld front and rear mounts to casing. Triple pass weld is recommended.

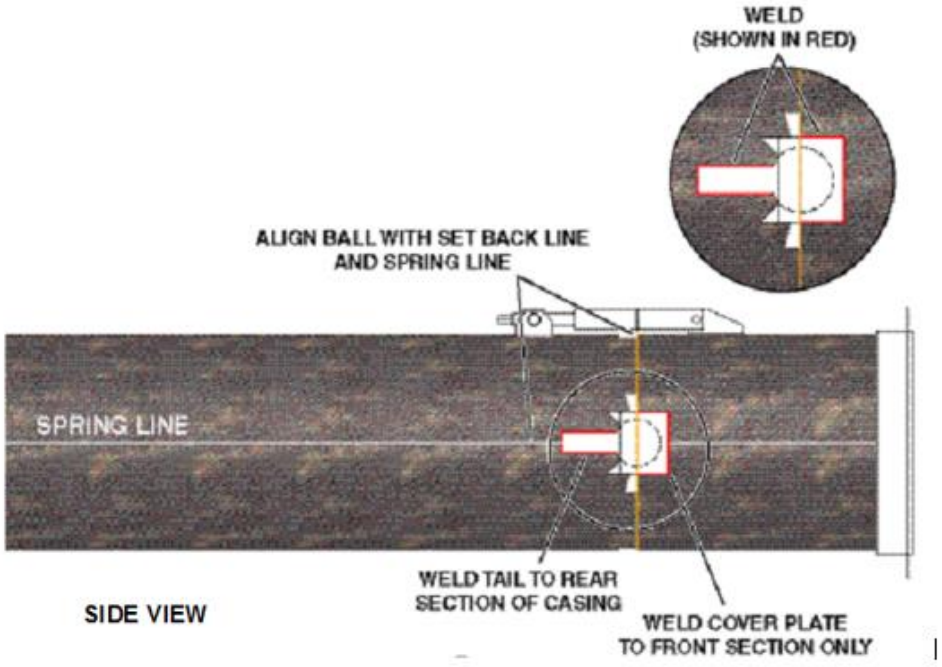


PICTORIAL VIEW



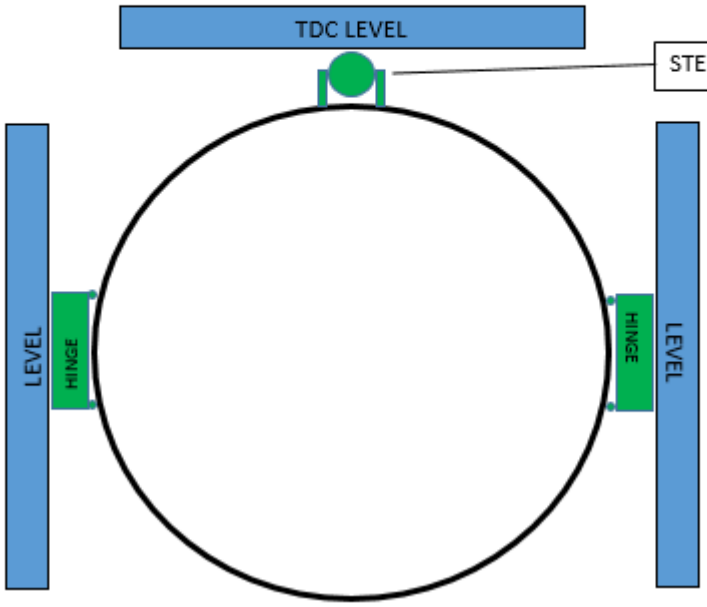
SIDE VIEW

Step 11. Align the center of the ball to where the set back line and the spring line intersect on side of casing. Once proper alignment is made, weld coverplate to front section of casing. Weld the tail of ball to rear of casing. Triple pass weld is recommended.

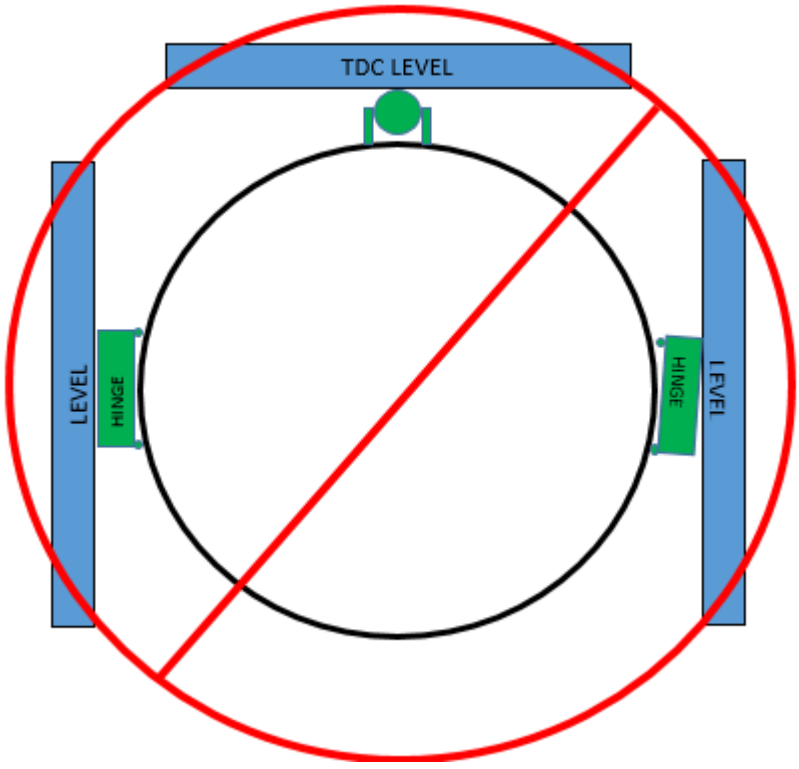


Gap tolerance 0 - 1/16th.
Grind round stock to fit.

ATTENTION: The hinges must be plum to the TDC and parallel to each other to insure full movement of the head section.

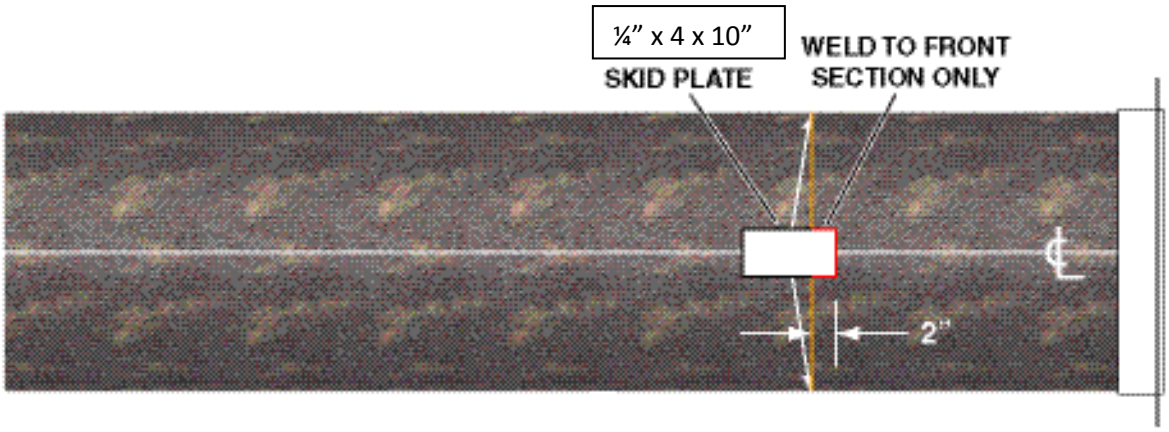


Correct Hinge position



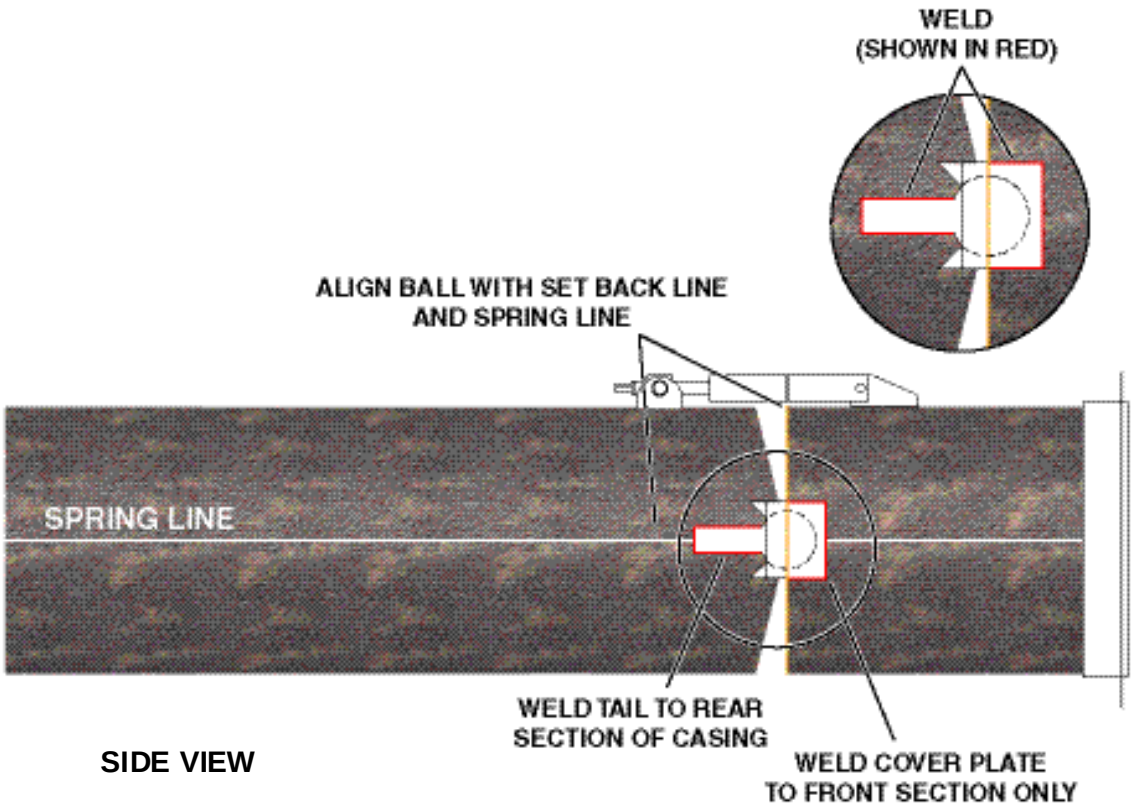
Incorrect Hinge position

Step 12. Align the ¼" x 4" x 10" skid plate to the bottom section of casing and weld to Front Steering Section only.



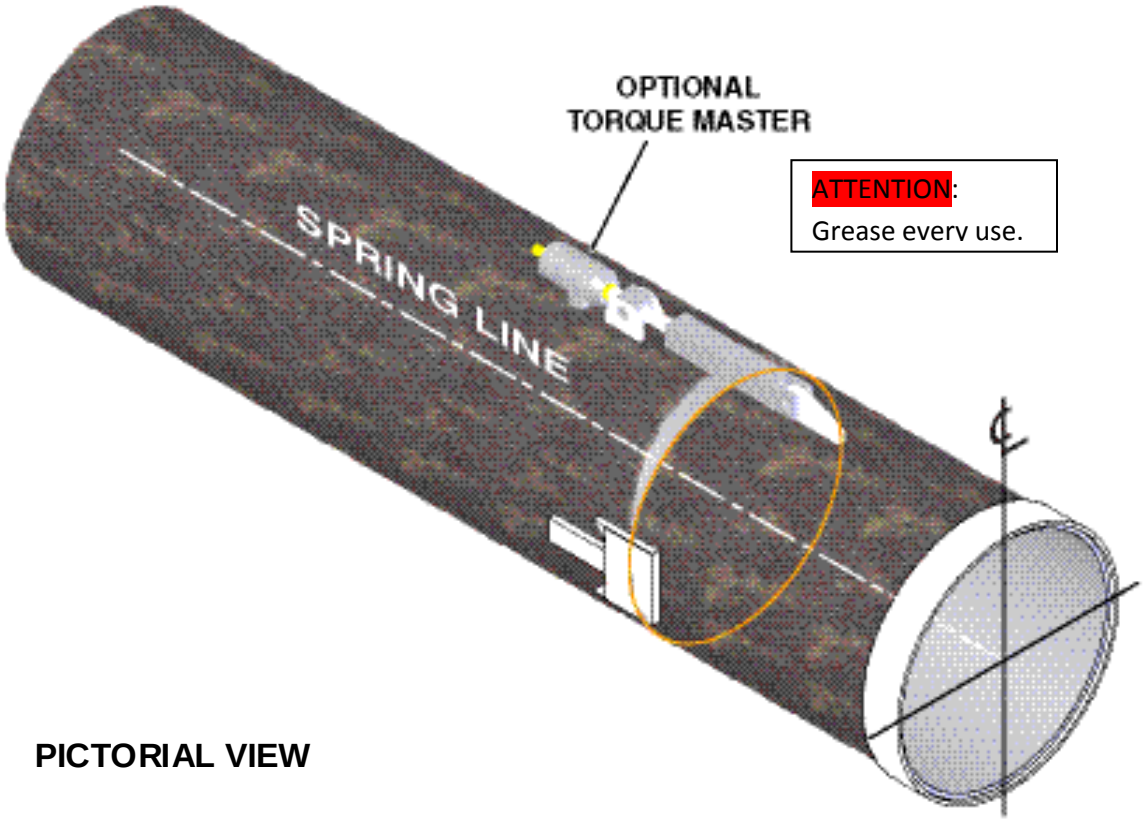
BOTTOM VIEW

Step 13. Once steering knuckle and side hinges are welded to casing, cut out remainder of marked lines from corners of rectangle to sides of casing, top and bottom.



SIDE VIEW

OPTIONAL BARBCO TORQUE MASTER



PICTORIAL VIEW

The Torque Master is a 4 to 1 internal gear reduction. 4 full turns on the input (Male 13/16" hex) equals 1 full turn on the output (Female 13/16" hex).

RECOMMENDED FOR:

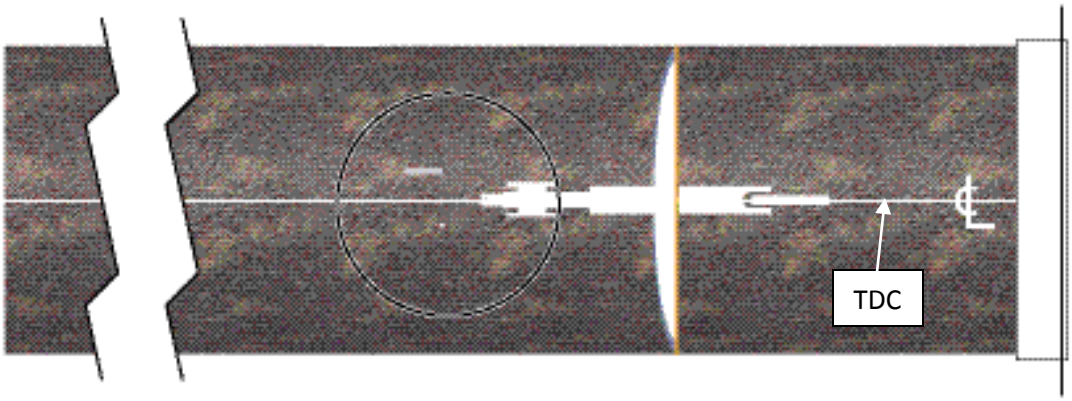
24" CASING AND UP.

200' CROSSINGS AND LONGER

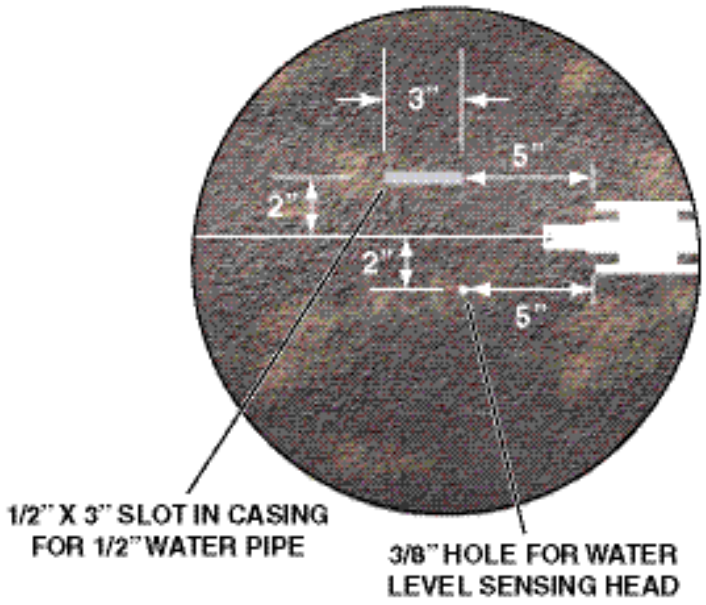
Step 14. Use dimensions below to install sensing head and waterline.

ATTENTION: This step is for a Steering Head without the optional Torque Master

Option A

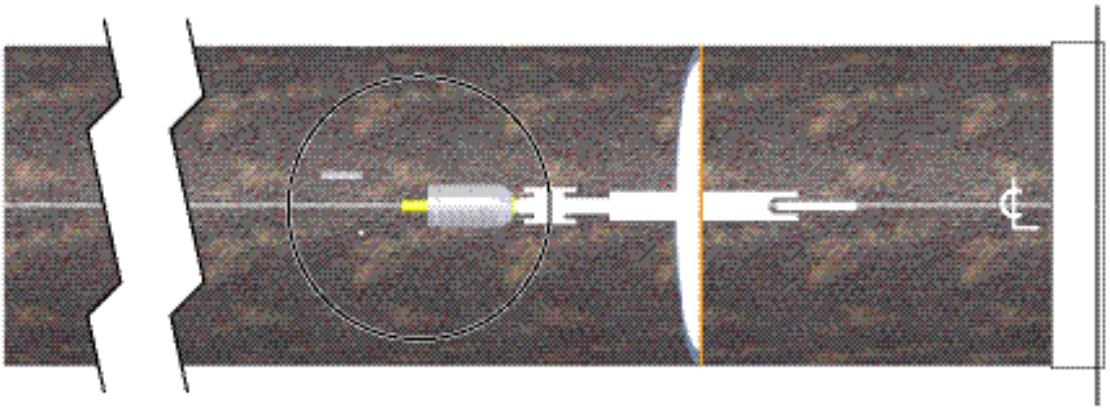


TOP VIEW

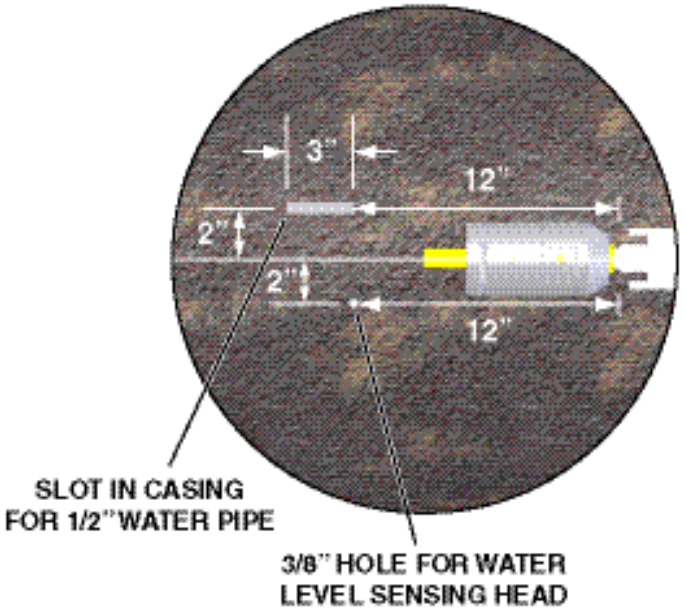


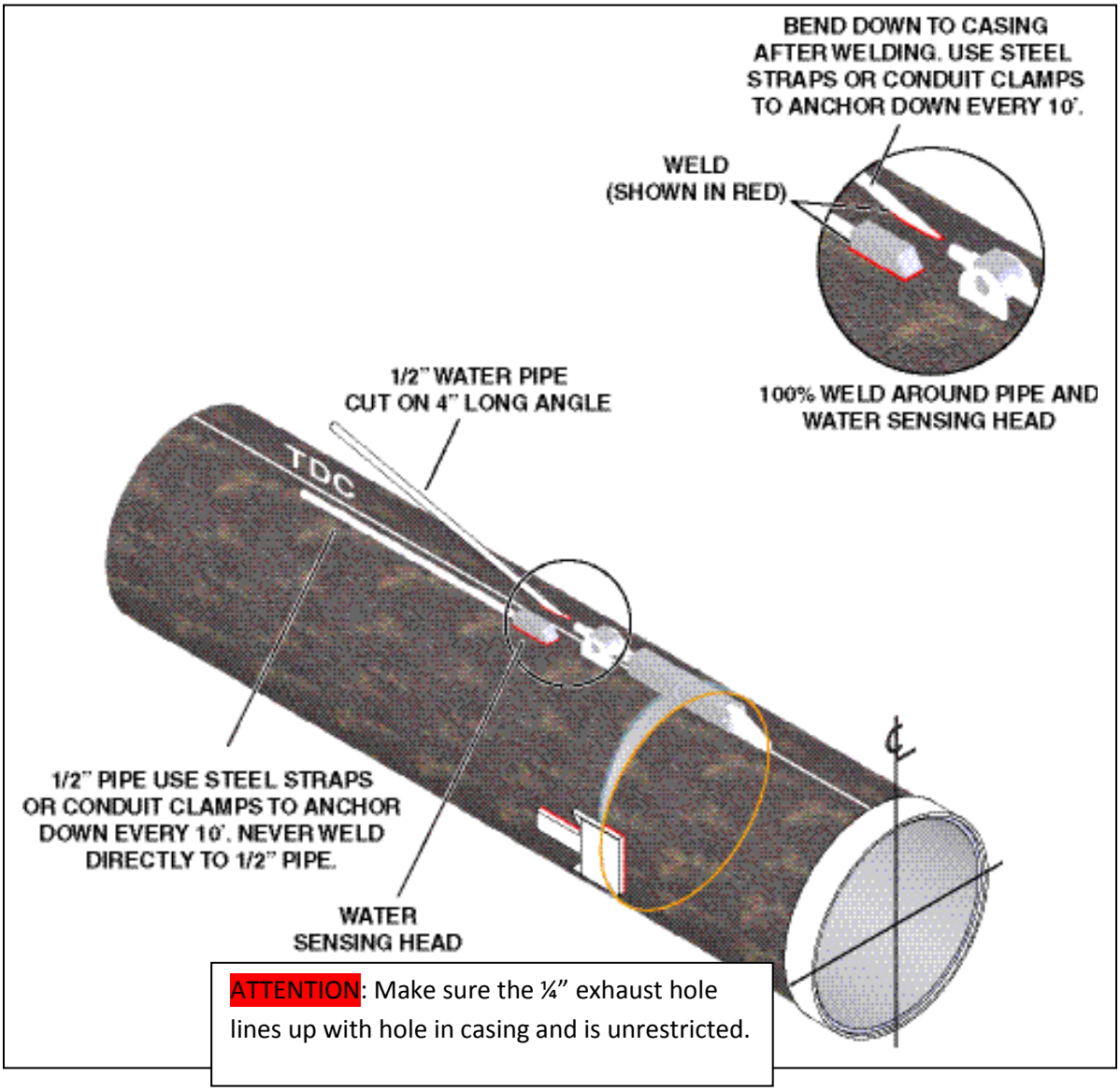
ATTENTION: This step is for Steering Head with the option of Torque Master

Option B

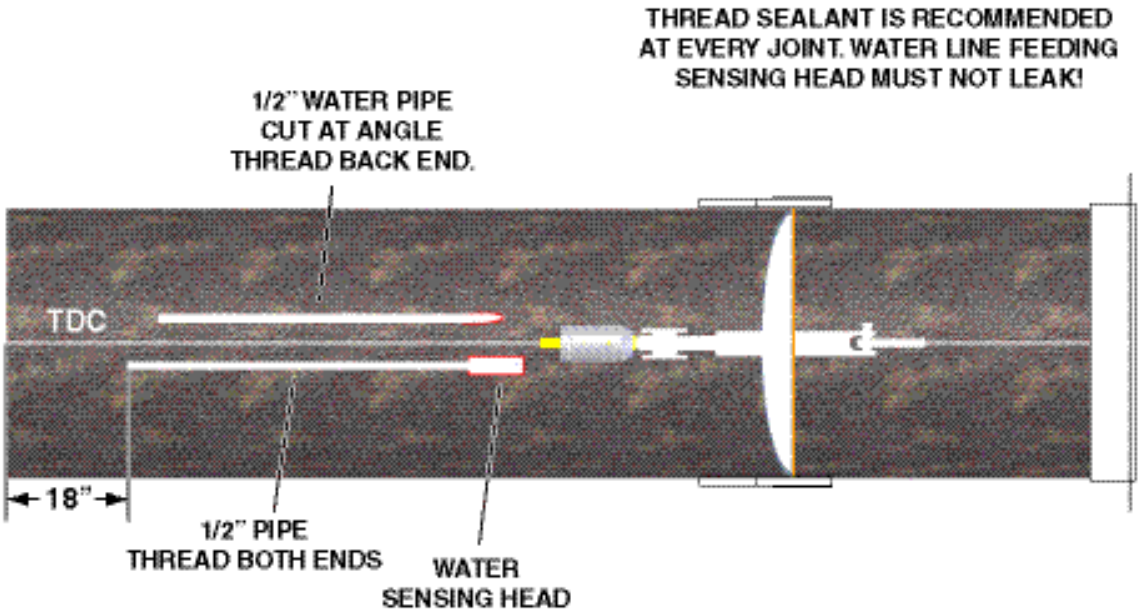


TOP VIEW WITH TORQUE MASTER





ATTENTION: Make sure the ¼" exhaust hole lines up with hole in casing and is unrestricted.



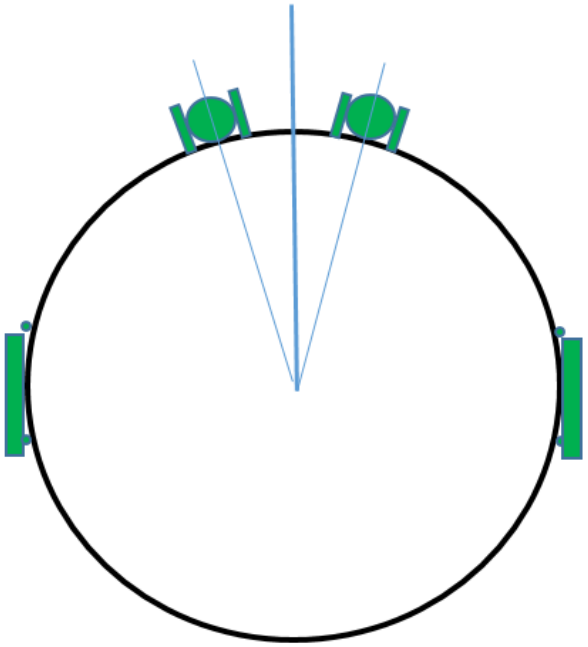
TOP VIEW WITH TORQUE MASTER

Option C

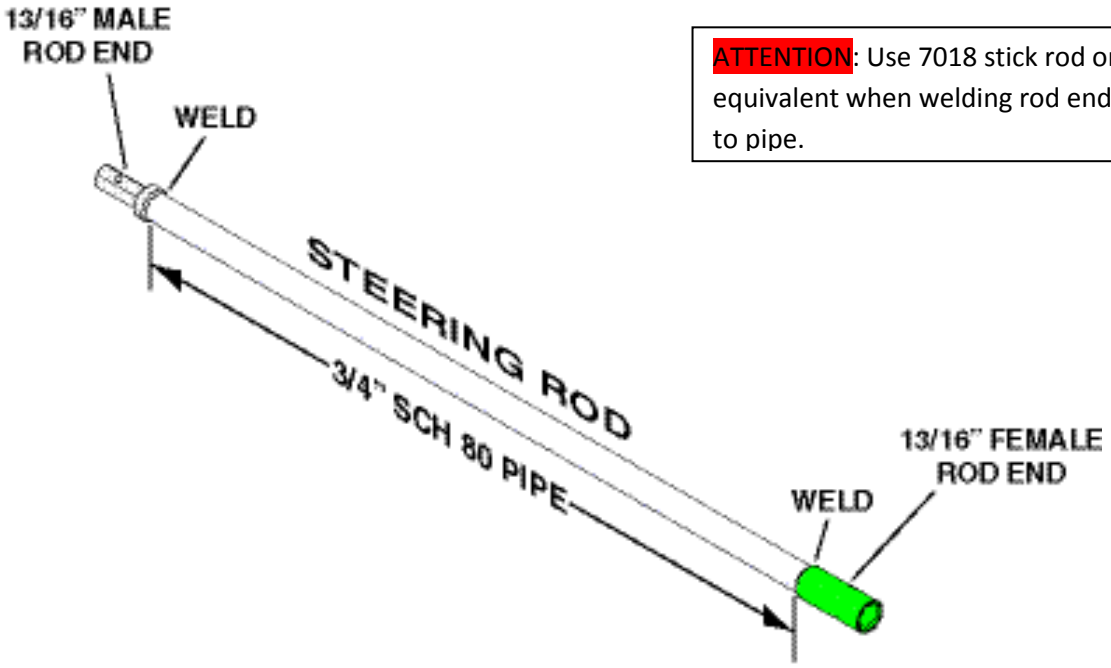
ATTENTION: This step is for a Steering Head using a double knuckle assembly. Recommended for 36” casing and bigger, 300’ shots or longer

DOWN HOLE END VIEW.

Locate knuckles at the 11 & 1 o-clock positions. Use dimensions on step 14A for Sensing Head and Waterline

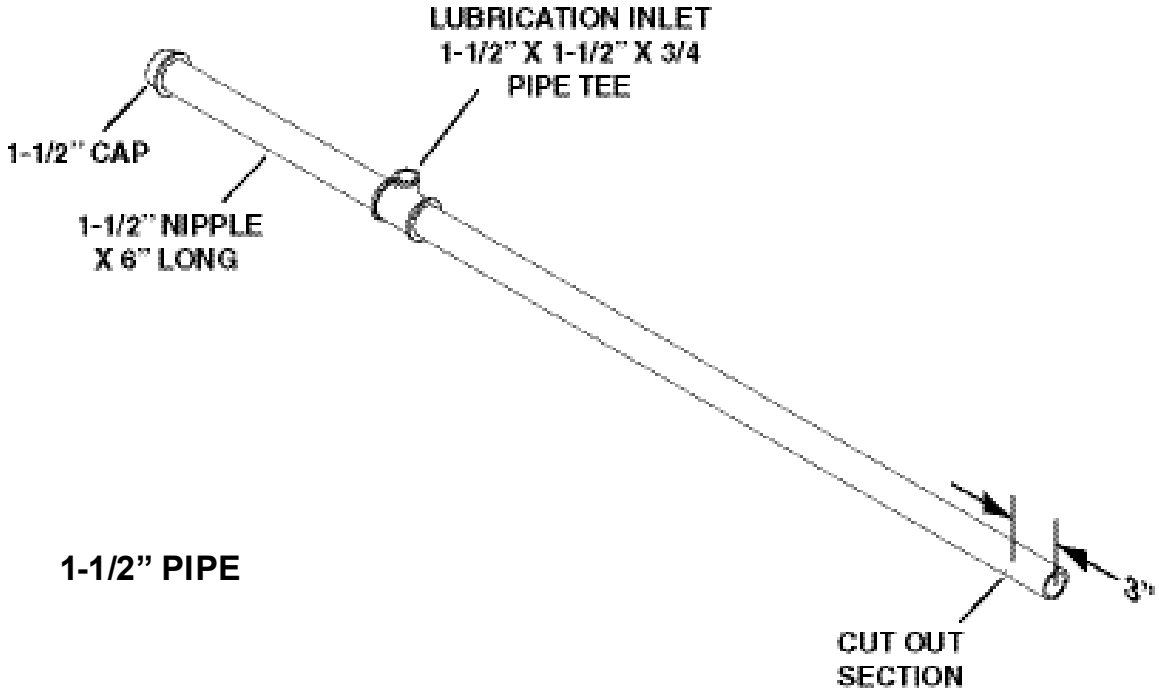


Step 15. Make a steering rod using male and female steering rod ends with 3/4” SCH 80 pipe. The length of the steering rod will be from connected end of steering knuckle to the halfway point of the 1-1/2” pipe nipple in Step 16**. Note**: Welding procedure 7-18th or equal

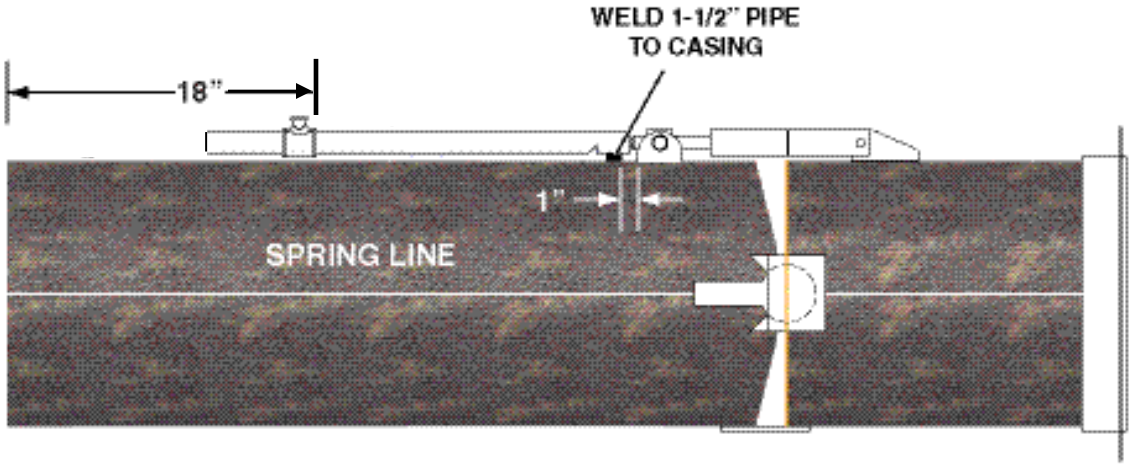


ATTENTION: Use 7018 stick rod or equivalent when welding rod ends to pipe.

Step 16. Cut a 1/2” slot, 3 inches back from the front end of 1-1/2” pipe. Place the steering Rod into the 1-1/2” pipe. Connect the steering rod to the steering knuckle secure with a roll pin. Slide the 1-1/2” pipe to the back of the steering knuckle or torque master (if supplied). (Be sure the 1/2” slot is on the bottom). Secure the 1-1/2” pipe to the casing with a weld, approximately 1inch from the back end.

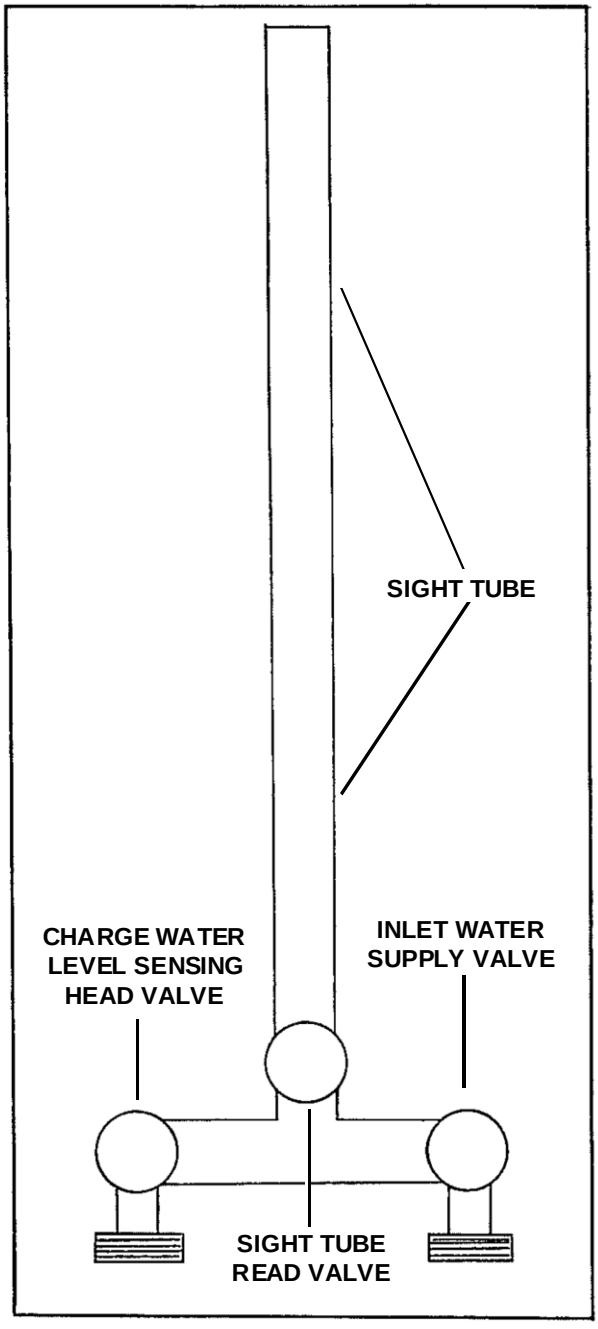


1-1/2” PIPE



SIDE VIEW

BARBCO GRADE INDICATOR



MEASUREMENTS IN HUNDREDS

Welcome to the growing family of contractors who are using Barbco's Water Grade Indicator. This simple to use instrument gives you a time tested method of monitoring the grade of casing as it is being pushed into the ground.

Your new Barbco Water Grade Indicator is as uncomplicated as we could make it, and its simple construction passes on to you lower cost while maintaining the high level of performance of more expensive instruments.

HOW IT WORKS

The Barbco Water Grade Indicator operates in the same way as the sight tube on a boiler. The small tube on the outside of the tank indicates the level of the water on the inside of the tank, as long as the indicator tube is connected to the same pressure as the inside tank. With the Barbco Water Grade Indicator, both ends of the system are vented to air pressure.

A pit mounted control and indicator board is located at some convenient point in the pit, opposite of the spoil removal side of the pit. A clear plastic hose connects the pit mounted water grade indicator to the 1/2" water pipe running along the top centerline of the casing.

Water is used to fill the system. The level of the water at the pit grade indicator will then show the level of the sensing head mounted on the end of the casing as it is pushed into the ground.

A simple "topping off" procedure is used before each reading to assure that the system is full of water and reading properly.

Careful attention to the following instructions and checking the instrument before readings will help assure good results.

SET UP PROCEDURE

1. Locating the Pit Grade Indicator

   Secure a 2 x 6 or other reasonably flat piece of lumber to the wall of the pit at some convenient location, opposite the spoil removal side of the pit. Hang the pit grade indicator so that the middle of the indicator sight tube is about at a level with the top of the casing. Exact alignment of the pit grade indicator scale will be done during the filling and charging of the system.

2. Connecting the System

   Run a garden hose from the inlet water supply valve (bottom right) to the water supply. If a 55 gallon drum is being used for the water supply at ground level, (be sure to use clean water only), and keep the drum reasonably full of water throughout the bore. Connect the 30' clear plastic hose from the charge water level sensing head valve (bottom left) to the 1/2" water line pipe on the casing. Keep this line off the boring machine track, below the top of the casing, and long enough to reach when the push is finished.

3. Charging the System

   Step #1 - Open the charge water level sensing valve (bottom left). Close the sight tube read valve (center valve) open the inlet water supply valve (bottom right) and let water flow until it comes out of the water level sensing head, and no air bubbles exist in the clear plastic hose.

Step #2 - Close charge water level sensing head valve (bottom left). Open sight tube read valve (center valve) and let water flow out of top of sight tube until no air bubbles exist. Close sight tube read valve (center valve) and inlet water supply valve (bottom right). All valves are now closed.

Step #3 - Open charge water level sensing head valve (bottom left) and open sight tube read valve slowly (center valve) and allow water to level off for grade reading. Repeat steps #1, 2, and 3 for each grade reading.

4. Set grade indicator on pit mounting board so that zero on the scale is same as water level in the sight tube. The system is now ready for use. It is important that Steps #1, 2, and 3 be re-done before each reading and as new casing and 1/2” water pipe is added.
5. Adding New Casing and 1/2” Water Pipe

   As each push is completed, new casing and 1/2” water pipe are added. Check the casing center line mark for rotation. If the casing has rotated, grade readings will be in error by the amount of rotation. When new 1/2” pipe is added (use pipe cement only on all joints) and reconnect the clear plastic hose. Repeat charging the system (steps #1 thru #3).

The following diagrams show how an incorrect reading and correct reading can be obtained:

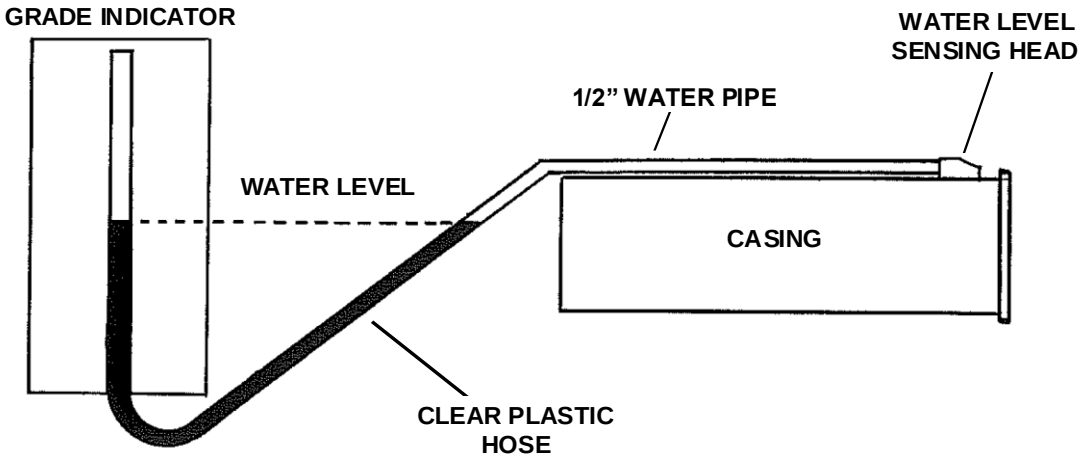


Figure 1. System partially full of water and indicating <u>INCORRECT READING</u>.

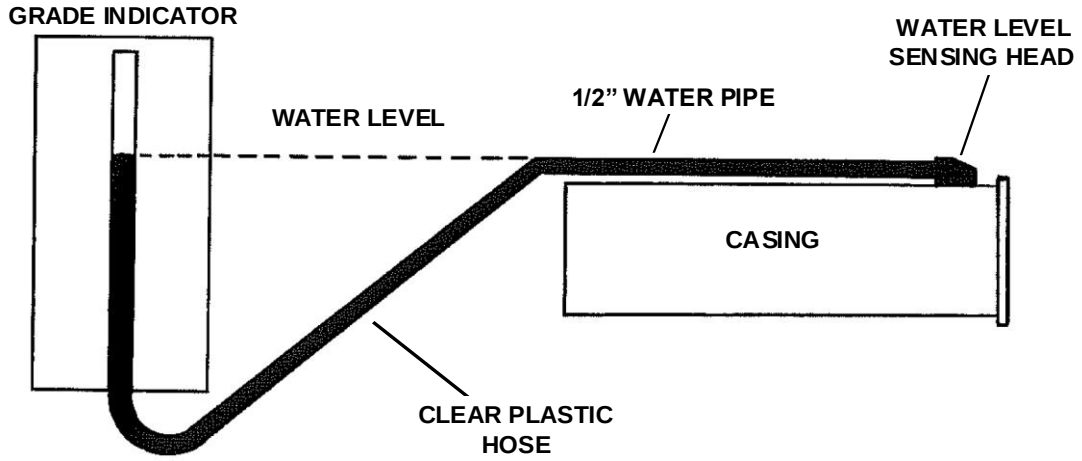
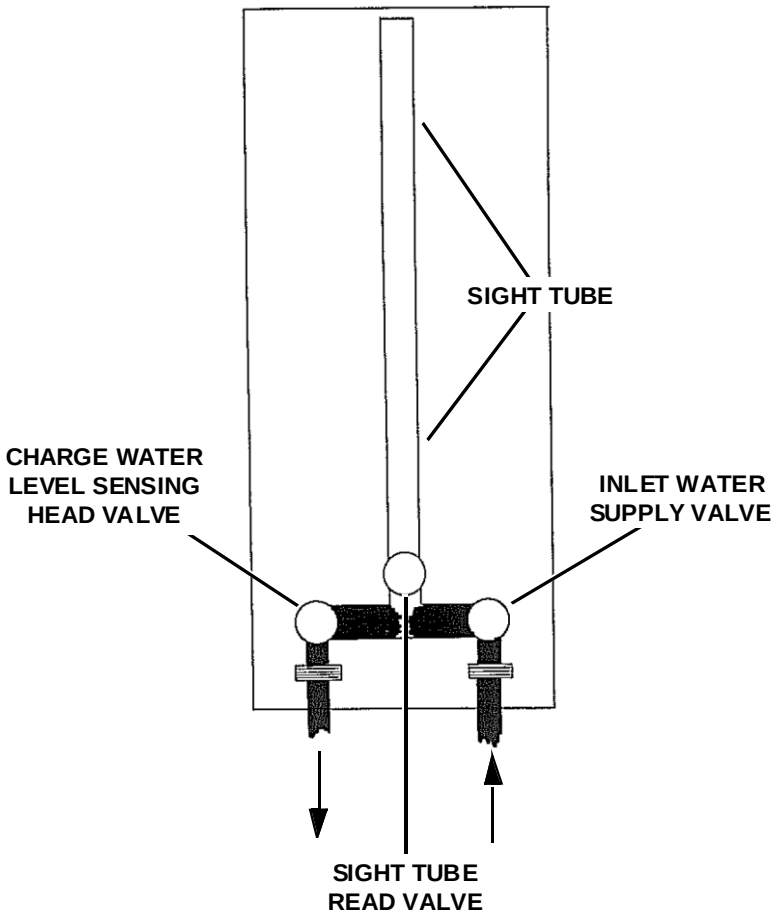


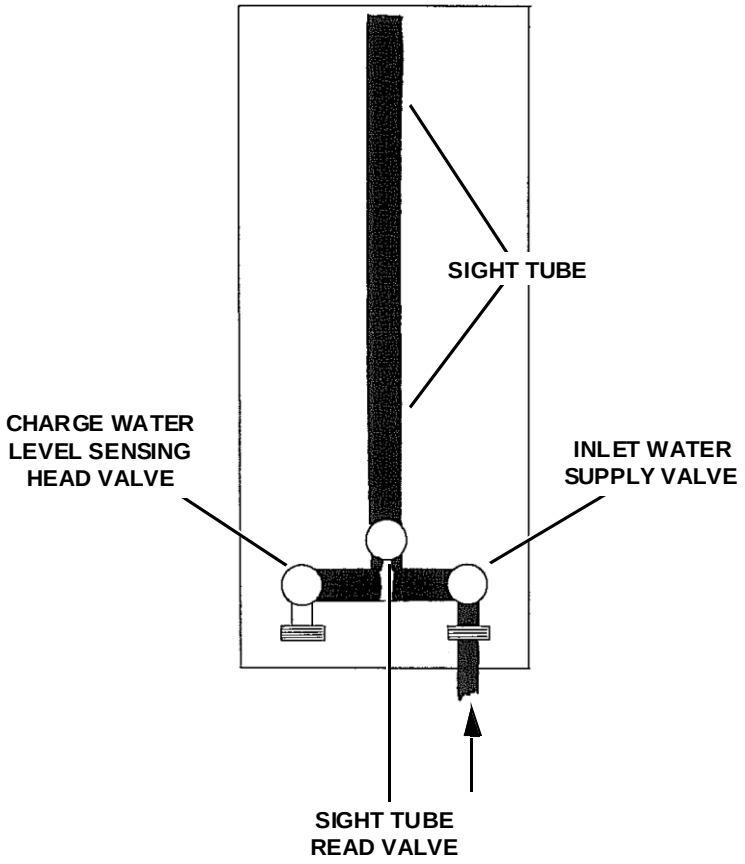
Figure 2. System full of water and indicating <u>CORRECT READING</u>.

Charging the System



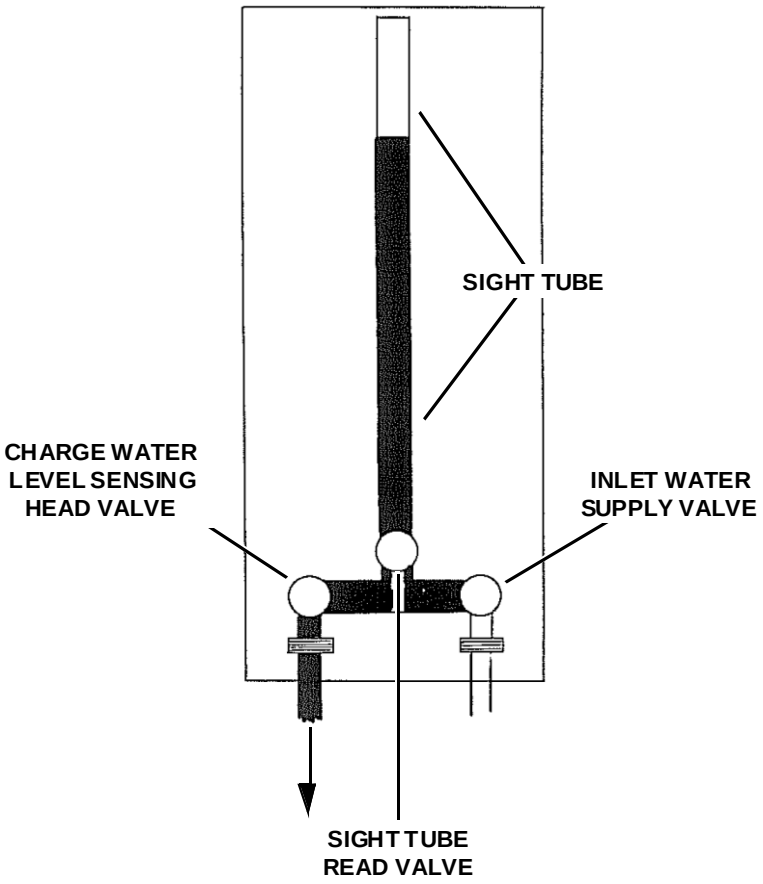
Step #1

Open the charge water level sensing valve (bottom left). Close the sight tube read valve (center valve) open the inlet water supply valve (bottom right) and let water flow until it comes out of the water level sensing head, and no air bubbles exist in the clear plastic hose.



Step #2

Close charge water level sensing head valve (bottom left). Open sight tube read valve (center valve) and let water flow out of top of sight tube until no air bubbles exist. Close sight tube read valve (center valve) and inlet water supply valve (bottom right). All valves are now closed.



Step #3

Open charge water level sensing head valve (bottom left) and open sight tube read valve slowly (center valve) and allow water to level off for grade reading. Repeat steps 1, 2, and 3 for each grade reading.

PROBLEMS TO LOOK FOR IN SYSTEM

a. Air bubbles in clear plastic line - Check all hose fittings for loose connections and bad washers. The system is taking in air.

b. Water level sensing head plugged - if the water rises in the sight tube and flows out the top, the water level sensing head is probably plugged. Re-charge the system with the sight tube read valve closed (center valve). Full water pressure should open the sensing head. In some cases, an air compressor may be needed to unplug the line. If plugging conditions exist, you may want to bore with water running through the water level sensing head, then re-charge the system for grade readings.

c. While taking readings be sure no one is stepping and/or standing on clear plastic hose. Be sure no one has moved pit grade indicator from its original setting.

d. Always check for casing rotation. If casing has rotated, grade readings will be in error by the amount of rotation.

e. If using a 55 gallon drum for water supply, be sure to keep it reasonably full with clean water.

f. Keep in mind, longer bores with greater grade percentage may cause the water level to exceed the height of the water level box. Please contact Barbco for instructions. It is best to determine the grade and distance prior to setup.

g. Negative grade bores greater than .5% may cause false readings. Always try to bore level or positive grade.

Barbco INC.

Manufacturing Horizontal Earth Boring Machines
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