Boring Machine Tunneling Attachment

BMTA

Operation Manual

Final 4-3-17

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.

Barbco

Operation and Parts Manual

Boring Machine Tunnel Attachment (BMTA) Table of Contents

Introduction

Safety Rules

Component Description

Set Up

BMTA Set Up

Operation

Maintenance

Manufacturer's Statement

The information contained in this operation manual is necessary for the safe and proper setup, and operation of your Barbco boring machine tunnel attachment (BMTA). Barbco Inc. has a long tradition of offering the best quality and most efficient to operate underground installation equipment in the world. Read and understand this manual completely before you use the Barbco boring machine tunnel attachment and keep it with the unit at all times for quick reference.

The equipment described in this manual is subject to change. Barbco Inc. reserves the right to change equipment at any time as part of normal product improvement. Some improvements may have been made after this manual was printed. For the latest information on your equipment, contact Barbco Inc.

The illustrations contained in this manual are intended to clarify explanations in the text. The illustrations may look slightly different from your unit, but this has been allowed only if it does not fundamentally change the factual information. Some optional equipment may be illustrated that your machine is not equipped with.

The Barbco boring machine tunnel attachment is capable of boring in various soils for long distance depending upon local conditions.

How to Reach Us

If you encounter a circumstance that is not covered in this manual, Barbco's service department will be happy to assist you. Barbco's office hours are 8:00 AM–5:00 PM, Monday through Friday. Barbco's office is located in East Canton, Ohio.

Barbco Corporate Headquarters, East Canton, Ohio

- Main Office..... (330) 488 - 9400
- Toll Free..... (800) 448 - 8934

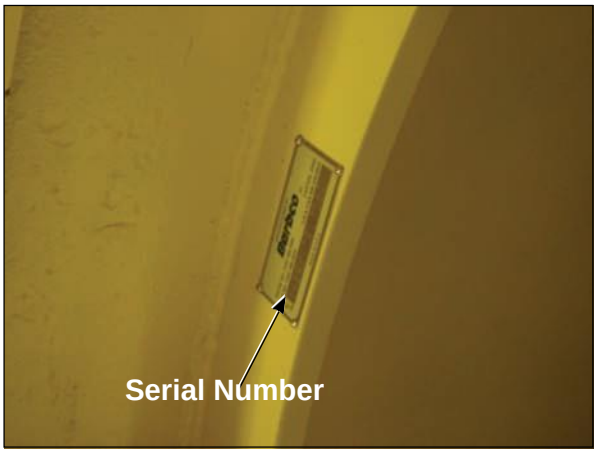
How to Order Parts

To place an order for spare parts, you can call either of the above numbers. Parts department hours are Monday through Friday, 8:00 AM–5:00 PM (Eastern Time). Orders can also be accepted via fax, 24 hours a day. Next day service must be called in by 3:00 PM.

- Spare Parts (fax) ..... (330) 488 - 2022

When you call the factory for spare parts or service, have the model number and serial number of the machine. See ID tag located to the left of the operators seat on the stiffener ring. Write the serial number of your machine in the space provided below.

Your Machine Serial Number



Barbco

Safety Awareness Program

Understanding Operation Safety

All references throughout this manual are to current models of Barbco Equipment. Operating guidelines will generally apply to most models in each group.

BE AWARE OF SAFETY INFORMATION.

This is the safety alert symbol. This symbol is placed in the manual to alert you to the potential for bodily injury or death.

UNDERSTAND SIGNAL WORDS

Signal words are used to identify safety information within the text of this manual, and are used on the hazard alert signs used on the machine.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING

Indicates a potential hazard or unsafe situation which, if not avoided, could result in death or serious personal injury.

CAUTION

Indicates a potential hazard or unsafe practice, which if not avoided may result in minor personal injury or product or property damage.

If you are the owner, operator, or the helper using Barbco equipment, it is important that you recognize that the equipment is a powerful piece of construction equipment.

IT MUST BE OPERATED WITH RESPECT AND CAUTION.

All operators or trainees must carefully read and thoroughly understand this Operation Manual before starting or using this machine.

Thorough training of both operators and helpers is essential for the safe operation of this equipment.

Never allow inexperienced personnel to operate or work near the machine unless they are carefully supervised during training. In the United States, workplace safety is regulated by the Occupational Health and Safety Administration (OSHA). OSHA regulations are found in the *Code of Federal Regulations.*, Chapter 29. This is known as 29CFR1910.

Information can be obtained from your Regional U.S. Department of Labor Office.

Basic Safety Guidelines

The following is only an outline of good safety practices. It is the responsibility of each person working with boring machines to learn and follow all local, state and federal safety regulations. All operators must read and understand the Operation & Safety Instruction Manual before starting the machine. The meaning of the hazard alert signs is explained in the Operation & Safety Instruction Manual.

Good safety practice dictates the following rules for each job:

1. Post the location and phone number of the nearest aid station or hospital.
2. Have at least one of your workers trained in first aid.
3. Have a complete first aid kit on site.
4. Keep a fire extinguisher on site.
5. Always wear proper personal safety equipment including hard hat, steel toe boots or shoes, and eye protection.
6. Thorough training of the operator is essential for the safe operation of any boring machine or attachment.

Safety Recommendations for Earth Boring Equipment

1. Each employer shall protect employees from falling into the entrance or exit pit by the placement of a guardrail or fence at ground level around the pits.
2. No crew shall consist of less than two persons.
3. All engine exhaust must be vented to the open atmosphere.
4. Always turn the engine off before leaving the operator's station for any reason.
5. It is recommended that the exit pit be excavated at the beginning of the boring process. If this is not possible then the boring procedure should be stopped short of the exit pit location to allow the exit pit to be excavated and then the boring completed. This will minimize the risk to personnel and equipment.
6. Refer to Barbco auger boring operation manual for safe operation of the Barbco ABM.
7. Before doing any service on the machine, push the Emergency Stop button and remove the ignition key.

SAE Recommended Practice AA2305 AUG06
Operating Precautions for Horizontal Earth Boring Machines and Attachments

1. Scope

These general operator precautions apply to horizontal earth boring machines and there attachments as defined in SAE J2022. These should not be considered as all-inclusive for all specific uses and unique features of each machine. Other more specific operator precautions not mentioned herein should be covered by users of this SAE Recommended Practice for each machine application.

1.1 Purpose—This SAE Recommended Practice is intended to be used as a guide for manufacturers and users of Horizontal Earth Boring Machines and attachments to improve the degree of personal safety for operators and others during normal operation and servicing. Avoidance of accidents also depends upon the care exercised by such persons. Inclusion of this practice in state, federal, or any laws or regulations where flexibility of revision is lacking is discouraged.

2. Personnel Precautions

2.1 Avoid loose fitting clothing, lose or uncovered jewelry.

2.2 Know and use the recommended protective equipment that is to be worn when operating this machine. Hard hats, protective glasses, protective shoes, gloves, reflector type vests, respirators and ear protection are examples of types of equipment that may be required.

2.3 Be sure all personnel know and follow safe operating procedures, including a complete understanding of all safety signs and avoidance procedures.

2.4 Know and use the hand signals required for particular jobs and know who has the responsibility for signaling.

3. Operator—General Precautions

4.1 It is the responsibility of the operator to read and understand the Operator's Manual and other information provided and use the correct operating procedure. Machines should be operated only by qualified operators and trained helpers.

4.2 Make sure that all protective guards, doors, etc. are in place and secure.

4.3 Remove all loose objects stored in or on the machine. Remove all objects which do not belong in or on the machine and its equipment.

4.4 It is the operator's responsibility to point out each of the safety signs on the machine and insure the crew understands the importance of adhering to each of the safety signs.

4.5 It is the operator's responsibility to know that all underground utilities have been located before the bore is started, and to avoid them by using proper boring techniques.

4.6 In some instances venting of exhaust may be required. It is the operator's responsibility to be sure that the exhaust fumes have been properly vented.

4.7 Know and obey all federal, state, and local codes and regulations.

4.8 Make sure all personnel know and stay in their prescribed areas to insure a safe operation.

5. Starting and Stopping Precautions

5.1 Do not start machine until all personnel are clearly away from any rotating or moving parts.

5.2 Check operation of all machine controls before using the machine.

5.3 Make sure all servicing as prescribed in the Operator's Manual has been completed.

5.4 Start and operate the machine only from the operator's station.

5.5 Make sure all fluid lines are securely connected before starting the machine.

5.6 When shutting down machine, follow manufacturer's recommended procedure.

5.7 Procedure for shut down. Shut power source down, relieve system pressure, and remove the starter key (if so equipped).

6. Operating Precautions

6.1 Make sure all operating personnel observe and use safe operating practices, including adhering to all safety signs.

6.2 Watch that all personnel and objects are clearly away from any rotating or moving parts.

6.3 Never leave operator station while machine is in operation.

6.4 Do not operate machine unless protective guards, doors, etc. are in place.

6.5 Shut down machine at first sign of malfunction or hazardous condition.

7. Maintenance Precautions

7.1 Shut down power source and relieve system pressures before doing any maintenance.

7.2 Observe manufacturer's recommended maintenance procedures.

7.3 Maintenance should be done by trained personnel.

7.4 Do not modify the machine in any way.

7.5 Repair or replace damaged or missing protective guards, doors, etc.

7.6 Replace all missing, illegible, or damaged safety signs. Keep all safety signs clean.

7.7 Use a piece of cardboard or wood to check for pressurized leaks to prevent fluid penetrating the skin. Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin and cause serious injury and possibly death if proper medical treatment by a physician familiar with this injury is not received immediately.

8. Fuel Handling Precautions

8.1 Do not smoke or permit open flames (which includes welding) while fueling or near fueling operations.

8.2 Do not refuel while engine is running, or while the engine is hot.

8.3 Do not refuel to tank capacity. Allow room for fuel expansion.

8.4 Tighten the fuel tank cap securely. If lost, replace it with only the original manufacturer's approved cap.

8.5 Always use the correct grade of fuel.

8.6 Prevent fuel spillage by maintaining control of the fuel filler nozzle when filling the tank.

8.7 Clean up spilled fuel immediately.

8.8 Never use fuel for cleaning purposes.

To Avoid Death or Serious Injury

As an employer, it is required that you follow the rules and regulations set forth by the Department of Labor OSHA office.

This piece of equipment requires the subsequent Regulations to be followed:

1926.21 (b) (2) regarding inspection of jobsites

1926(b) (4) regarding the training required to operate this equipment

1926.800 Which applies to the construction of underground tunnels, shafts, chambers, and passageway.

1926.32(f) – identifying a competent person. A ***competent person*** onsite is one who can identify existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

OSHA Training Requirements include:

All employees involved in underground construction must be trained to recognize and respond to hazards associated with Tunneling work. Training must be tailored to the specific requirements of the jobsite and include any unique issues or requirements.

The following topics must be part of the employee training program:

Illumination – 1926.56

Machine Guarding – 1910 Subpart O

Lockout/Tagout - 1926.417

Personal protective equipment – Subpart E

Personal Protective equipment It is essential that employees working in environments that present hazards that cannot be engineered out have the proper PPE for the tasks. This could include but not limited to: hard hats, hearing protection, respirators, safety glasses, gloves, fall protection, etc.
Conducting a PPE assessment prior to the task being performed will give the appropriate amount of protection to the employee.

Confined Spaces – 1926.1200 Subpart AA

The Confined Space for Construction standard sets forth the practices and procedures to protect employees in construction activities at a worksite with one or more confined spaces.
Confined spaces are spaces that: Are large enough to enter; has limited or restricted means for entry and exit; AND is not designed for continuous employee occupancy.

Examples of Confined Spaces in Construction include:

- Pits (i.e. elevator, escalator, pump, valve or other equipment)
- Manholes (i.e. electrical, communication, or other utility)
- Tanks (fuel, chemical, water, or other liquid, solid or gas)
- Sewers
- Storm drains
- Water mains
- Precast concrete and other pre-formed manhole units
- Drilled shafts

The requirements of the Confined Space regulation cover the following:

- Identifying and notifying employees, written confined space program, ventilation, air monitoring (oxygen, H_2S, LEL, CO and any additional atmospheric hazards)
- Sign-in/sign-out procedures
- emergency evacuation
- communications
- PPE
- Illumination
- Rescue and Emergency equipment, and any other equipment needed for the safe access and egress from the space.

It is required to conduct a job-site job hazard analysis (JHA) when non-routine work is conducted in a task that does not fit the above definition of a confined space.

Air monitoring and ventilation

Air monitoring is required when there are gassy conditions. A competent person must perform all air-monitoring required to determine the proper ventilation exchanges need to take place while in the underground operation.

Underground areas must be tested for:

- Carbon monoxide
- Nitrogen dioxide
- Hydrogen sulfide (H2S)
- Other atmospheric hazards as often as necessary to ensure that limits are not being exceeded.

Prescribed limits:

- Oxygen – 19.5%-22%; H2S – 5 ppm (beginning & midpoint of the shift until below); 10 and above ppm (Continuous monitoring shall be performed); 20+ ppm – additional measures must be taken (i.e. respirators, increased ventilation, evacuation, etc.) to maintain the exposure below the permissible exposure limit (PEL).
- Fresh air must be supplied to ALL underground work areas in sufficient amounts. A minimum of 5.7 cfm of fresh air per minute for each employee.
- Mechanical ventilation must have reversible airflow.
- Gassy operations require ventilation systems that have controls located aboveground for reversing airflow.
- Blasting or drilling requires the velocity of airflow to be at least 9.14 meters/minute

Emergency procedures, including evacuation plans:

When an employee is working underground at least one designated person must be on duty above ground. They are responsible for the accurate count of personnel and summoning emergency services if needed.
Each underground employee must have a portable hand lamp or cap lamp to provide illumination for escape.
The employer must provide at minimum two 5-person rescue teams. 1 team at the site or within 30 minutes travel time and the other within two hours travel time.
Less than 25 employees, the employer must provide one 5-person rescue team at the jobsite or within 30 minutes travel time.

Fire prevention and protection:

Open flames and fires are prohibited in underground construction areas unless permitted for hot work (welding, cutting, or other hot work operations)

Communications:

Employees working underground must have a means of communication with personnel working above ground (i.e. – sirens, horns, radios, close circuit television, etc.)
Communication equipment and systems must be tested upon initial entry of each shift.
Employees working alone should be required to check in with their supervisor periodically.

Flood Control:

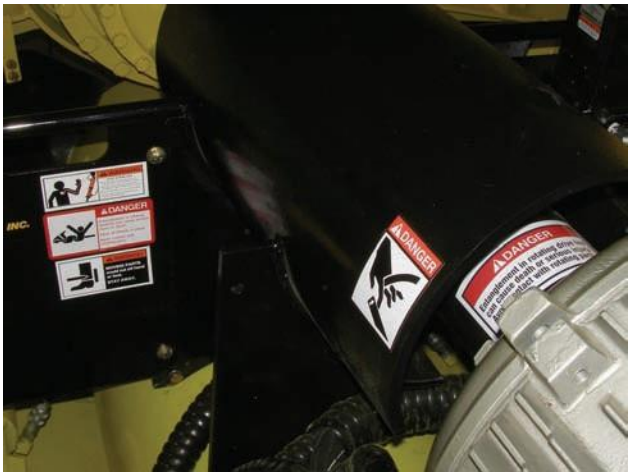
The appropriate flood protection along with a rescue plan is required when working underground. (caissons, etc.)

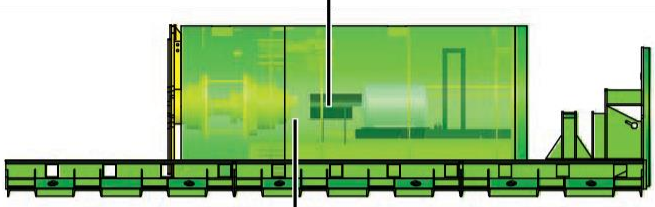
WARNING! HEARING LOSS HAZARD! Wear ear plugs while standing near a working machine. Sound pressure levels may exceed OSHA standards for constant exposure.

PERMISSIBLE NOISE EXPOSURES*

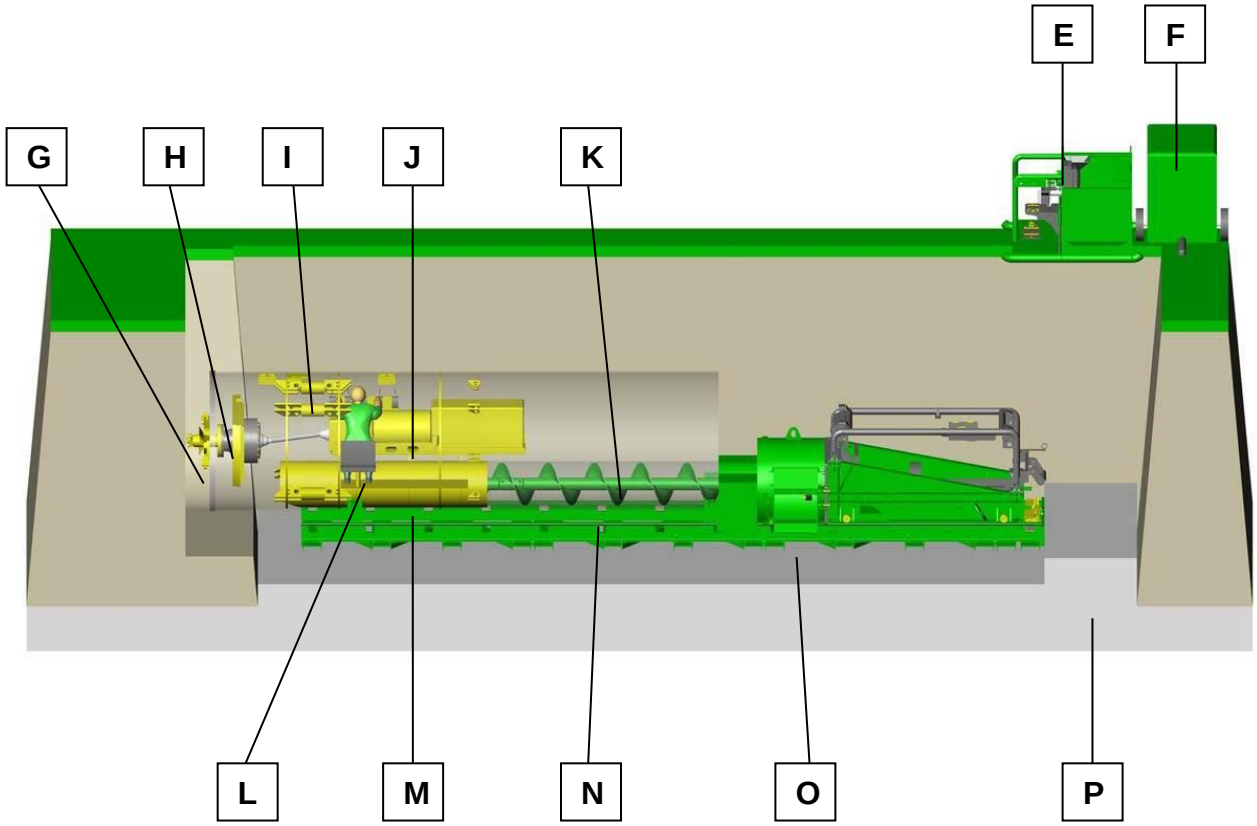
Duration per day in hours	Sound level in dB (A) Slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or LESS	115

Decals





Machine Components



DESCRIPTION OF MACHINE COMPONENTS.

A- Tunnel Attachment BMTA- Man entry tunneling accessory for the auger boring machine capable of controlling line and grade during the boring process.

B- Auger Boring Machine- Provides the forward thrusting force and spoil removal for the tunneling attachment.

C- Track- The rail that the auger bore rides on and can be extended as needed to push longer casing segments.

D- Master Saddles- Sets the tunneling attachment on the proper centerline to the auger boring machine.

E- Bentonite Pump- Major Accessory to tunneling attachments. Provides lubrication to the outside of the tunnel reducing skin friction.

F- Generator- Tunneling attachment main power source.

G- Cutting Head- Can be made with various cutters with or without adjustable doors determined by the soil condition.

H- Torque Multiplier- Provides increase rotation torque for the cutting head.

I- Steering Jacks- Hydraulically operated cylinders that articulate the head during steering corrections.

J- Power Skid- Main drivetrain for the tunneling attachment.

K- Spoil Casing- Provides protection for the operator from rotating auger.

L- Operator- Man's equipment down hole. Controls the steering for the project. Is in constant contact with the boring machine operator.

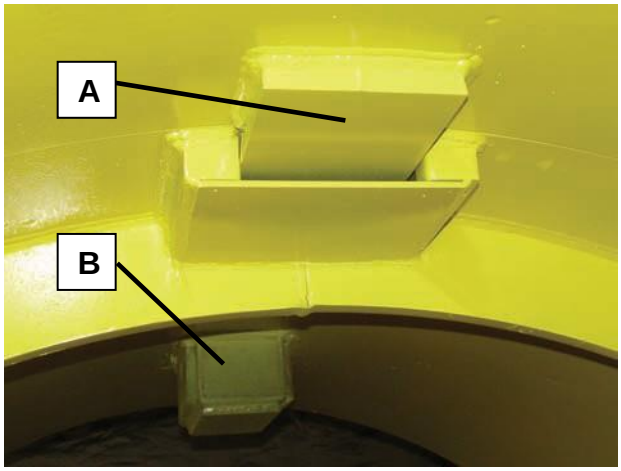
M- Operators Platform- Area where the operator can sit and run the tunneling machine.

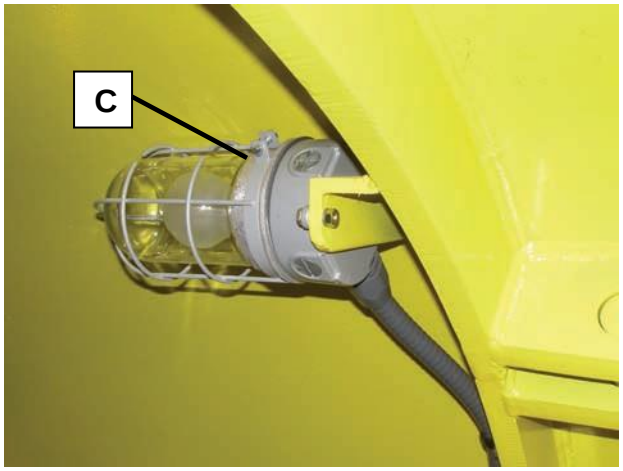
N- Auger- Removes the spoil from the bore hole.

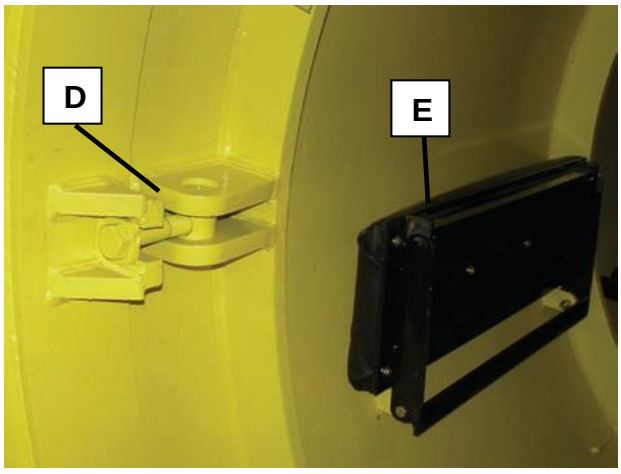
O- Spoil Chute- Location where the spoil exits the machinery.

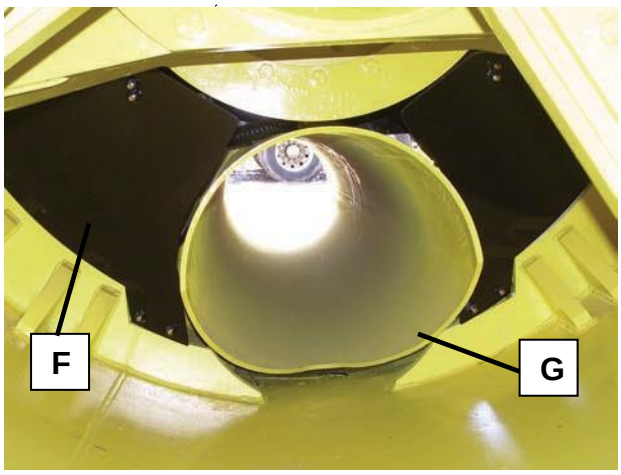
P- Back Stop- Must be capable of handling the maximum thrust of the auger boring machine.

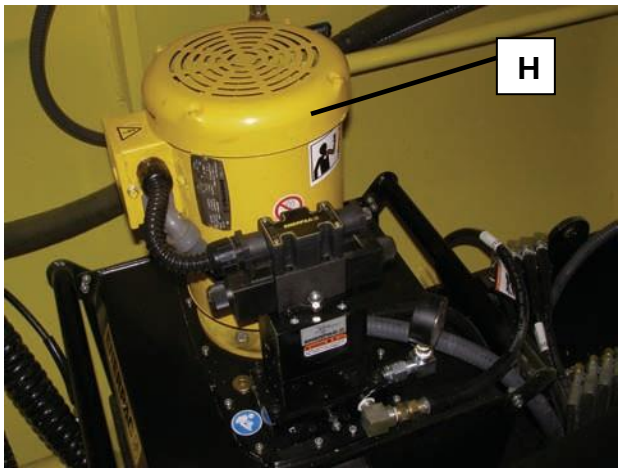
Machine Components Continued

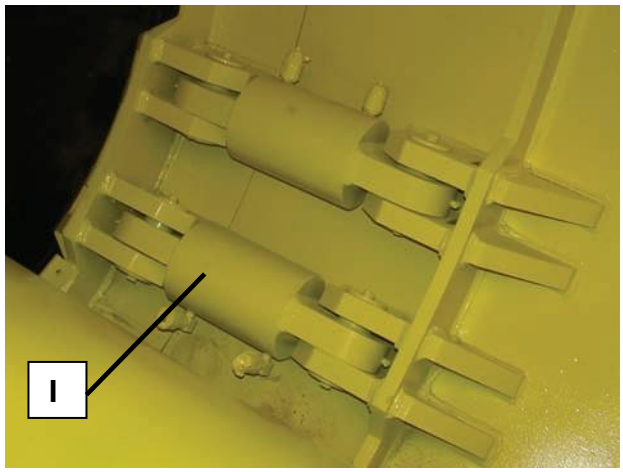












DESCRIPTION MACHINE COMPONENTS CONTINUED.

A- SOCKET- Keeps the head section in line with the tunnel section of the tunnel shield.

B- LIFT POINT- Accessible from the outside tunnel shield. Designed to pick up the BMTA

C- WORK LIGHT- Illuminates the tunnel when the main disconnect is in the on position only.

D- QUICK DISCONECT- Disconnect ring is designed for quick removal from the exit pit.

E- SEAT- Comfortable seating for operating.

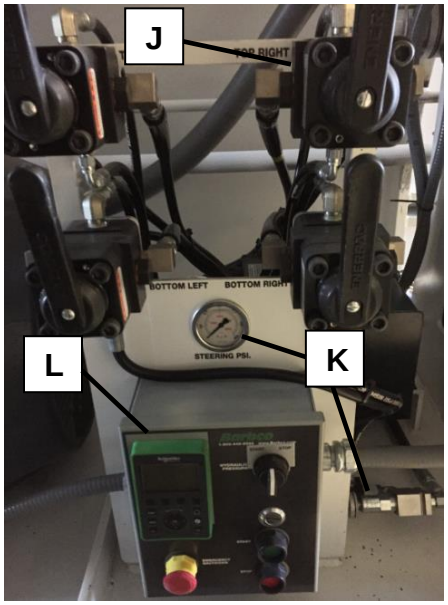
F- DAM- Helps keep the steering cylinders clear of spoil.

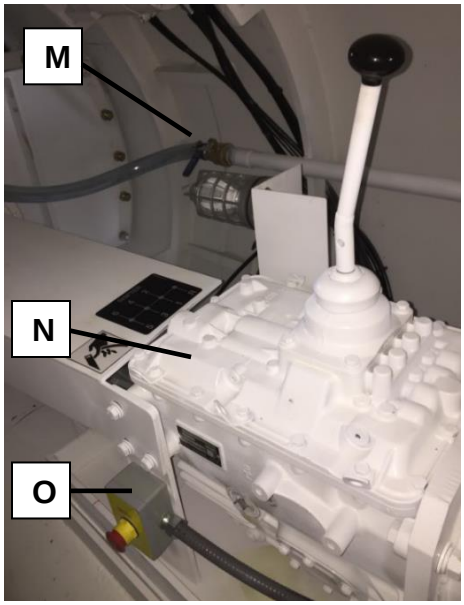
G- SPOIL TUBE- Keeps operator protected from rotating auger during spoil removal.

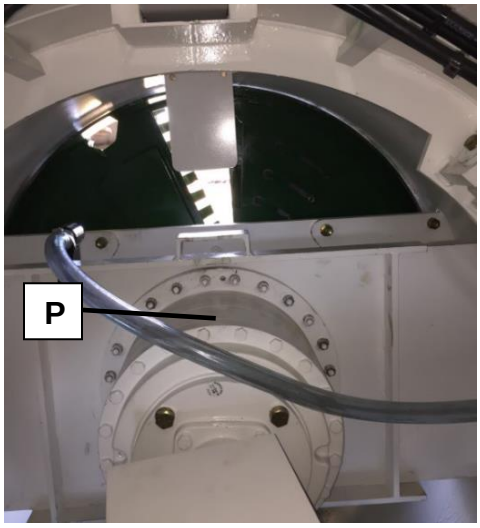
H- HYDRAULIC STEERING UNIT- Provides hydraulic power to the steering jacks.

I- STEERING CYLINDER- Provides articulation to the head section during steering corrections.

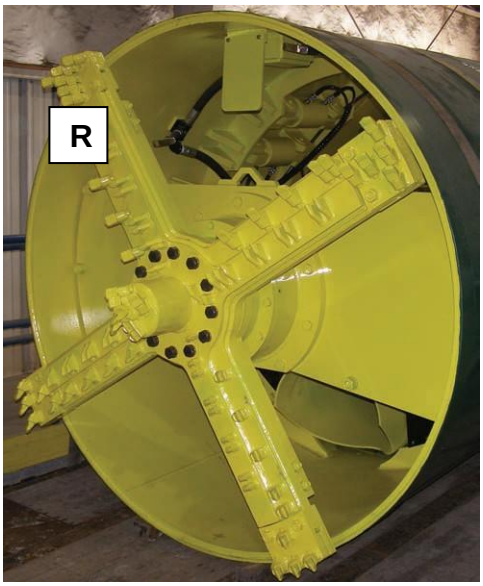
Barbco

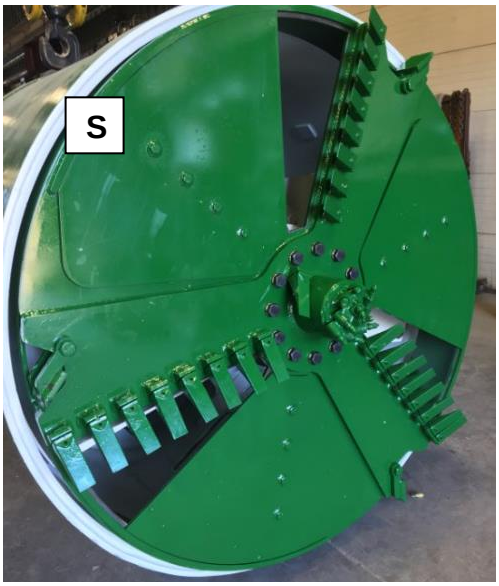

J
L
K
BOTTOM LEFT
BOTTOM RIGHT
STEERING PSI.


M
N
O


P


Q
Barbco
DANGER
480
VOLTS
PELIGRO
480
VOLTIOS


R


S

DESCRIPTION OF MACHINE COMPONENTS CONTINUED.

J- STEERING VALVE- Independent steering control locks position of steering cylinder when lever is in center position.

K- PRESSURE GAUGE AND ADJUSTMENT- Adjustment of pressure setting of the hydraulic steering system.

L- CONTROL BOX- Operators control station providing cutting head and steering system control.

M- BALL VALVE- On/Off control of water to help assist spoil removal and control dust. Second ball valve for bentonite On/Off not shown.

N- TRANSMISSION- Controls cutting head speed and direction.

O- E STOP- This is a red PUSH TO STOP control located at the operator's station. The control must be pulled up/out (PULL TO RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency. Two total in unit, one in front by steering cylinders, and one in back by the control station.

P- GEAR BOX- Torque increaser for cutting head.

Q- MAIN DISCONNECT/BREAKER BOX- Contains all wiring, breakers and motor starters for BMTA.

R- OPEN TYPE CUTTING HEAD- Standard cutting head for most ground conditions. Cutters subject to change.

S- CLOSED TYPE CUTTING HEAD- For soft, wet running conditions. Doors can be adjusted to open/close. Cutters subject to change.

Machine Set Up

DESIGNING THE JOB AND PREPARATION OF THE ENTRANCE PIT

When the job is in the planning stage, provide enough room for safe loading and unloading of equipment, and for spoil removal. Accidents are less likely to occur at sites that are open and kept clear of debris.

In most instances, an entrance pit will be required at the approach side of the bore. The dimensions of the pit floor required to install 20 feet (6.1 m) sections of casing, are found in the Entrance Pit Dimensions Chart. These dimensions will provide the most convenient and safest working conditions. They can be reduced but at the expense of efficiency and production.

It is the responsibility of the owner to make a safe pit that is in accordance with the rules set forth in the (OSHA) Code of Federal Regulations 29. There are specific requirements for pit construction, protection, barricades, traffic control, installation and type of ladders used in the pit and personal safety equipment. Barbco, Inc. recommends that the owner become familiar with the requirements of the (OSHA) Regulations CFR29. Information can be obtained from your Regional Department of Labor Office.

The floor of the pit must be aligned with the proposed casing grade. It must also be solid enough to sup- port the equipment being used without settling. A base of crushed stone should be used to prevent settling. The use of planking under the tracks is recommended and should be allowed for when bringing the floor up to grade. For long and/or critical bores the use of a concrete base is recommended.

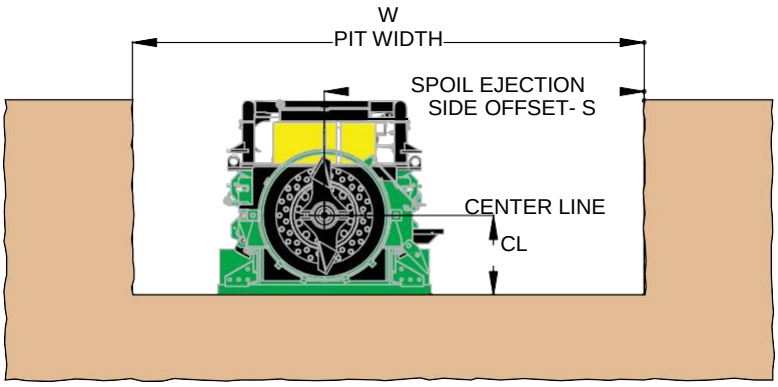
The boring operation requires that a square and secure backstop be provided for the track push plate. The thrust for the entire bore is transferred through the track to the backstop. Should the backstop fail during the bore campaign, valuable time will be lost in rebuilding. The backstop should be designed to with stand 1-1/2 to 2 times the maximum thrust of the boring machine being used. Barbco, Inc. strongly recommends using the services of a competent engineer to assist in the pit base/backstop design.

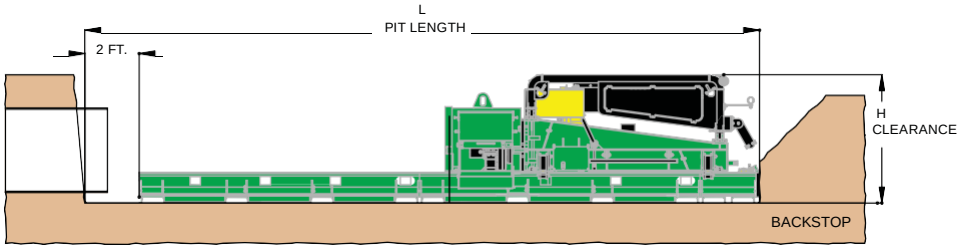
On all bores, it is recommended that a steel plate be used between the track push plate and the back- stop. For larger diameter and longer bores, driven sheeting, or a poured concrete pad should be considered. Experience and soil conditions will dictate the best method. A GOOD BASE AND A SECURE BACKSTOP ARE ESSENTIAL FOR ALL BORES. Refer to the Ground Conditions Chart in the Appendix section for base and backstop recommendations.

The possibility of flooding always exists during the tunneling operation. The location of a pit sump pump for dewatering should be considered during the design of the pit.

Entrance Pit Dimensions

The centerline of the Spoil Tube in the bottom of the Tunneling Attachment (BMTA) will be lined up with the elevation of the centerline of the Auger Boring Machine.





ENTRANCE PIT DIMENSIONS CHART
TO INSTALL 20 FT. (6.1 m) CASING LENGTHS

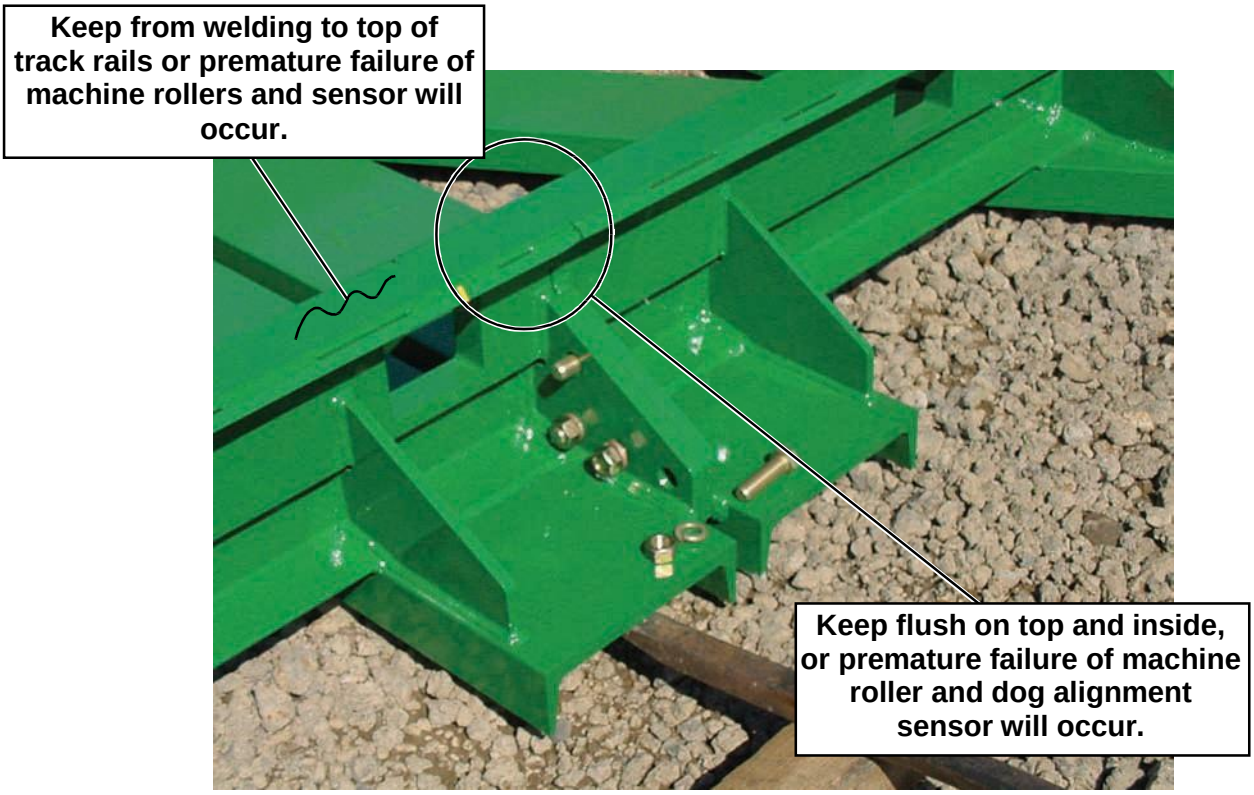
MODEL	CL	S	W	L	H
36	22.5 [57.2]	7.5 [2.29]	12 [3.66]	34 [10.36]	59 [149.9]
48	28 [71.1]	8 [2.44]	12.5 [3.81]	34 [10.36]	65 [165.1]
60	34.75 [88.3]	9 [2.74]	14 [4.27]	36 [10.97]	72 [182.9]

Setting and Aligning the Track

One of the most critical part of the bore is the setting of the boring machine track on line and grade. If the alignment is not right when you start, it is not likely to improve. This is essential when using a tunneling attachment as it keeps even loads thru the boring machine and the master saddle in contact with the tunnel casing.

THE MACHINE AND THE TRACK SECTIONS ARE DESIGNED TO BE PLACED SEPARATELY. ALWAYS USE BALANCED LIFT POINTS.

WARNING! Always use correct lifting devices and NEVER hoist or transfer loads over personnel!



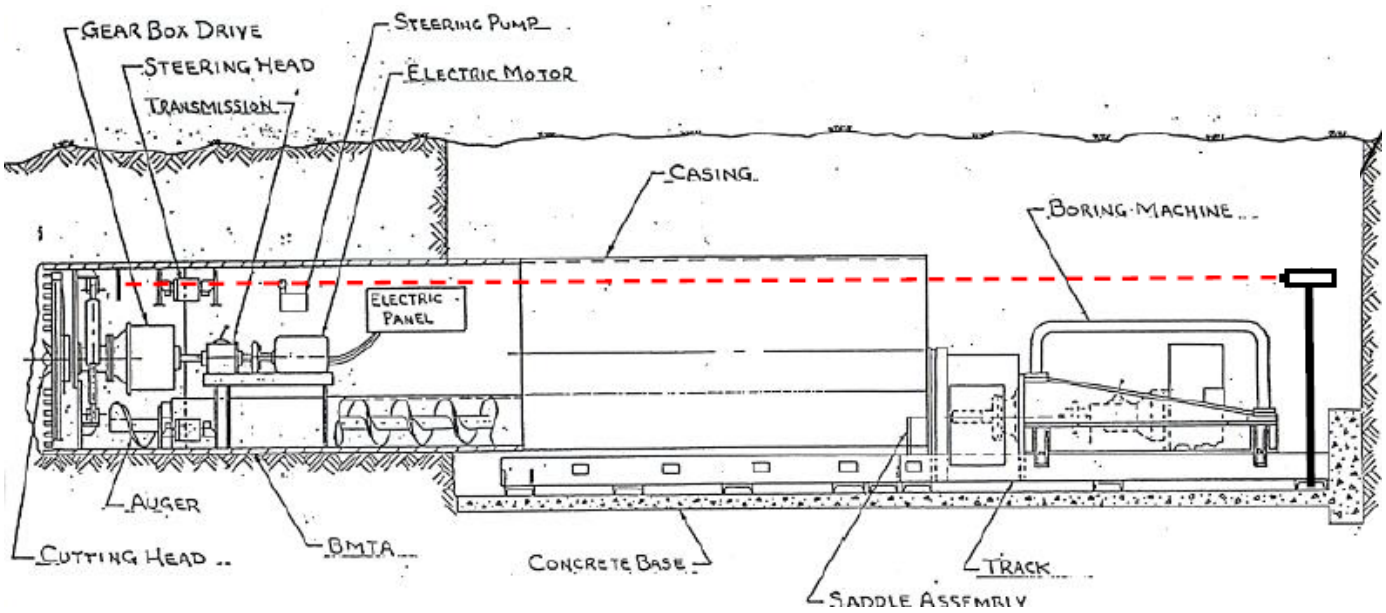
Lift and place the master track in the pit with the push plate against the backstop. Use a string and plumb bob to align the master track with the line of the proposed bore. Note that the track sections are numbered at each end. Extension tracks are installed so that adjoining ends have the same number. Install the extension tracks, aligning the top of the joints and bolting them together using bolts in ALL holes.
Before setting the machine, make a final check of the line and grade.

Refer to your Auger Boring Machine manual for complete set up instructions.

BMTA Set Up

Laser set up

Must be on line and grade of the bore path and independent of the boring machine. Best when the laser mount startles the concrete pad the machine is set on, reducing vibration and forces from the auger boring machine during operation.



DANGER HIGH VOLTAGE

480 Volts

A properly grounded disconnect must be used between the Tunnel Machine and the Generator to provide a safety net should a main power feed cable get cut.

Quick Disconnect Band

Weld a section of casing to the QD band to achieve a full 20’ section to start the bore. This will allow a good secure start as the BMTA can be deep into the bore before stopping to weld the next joint.

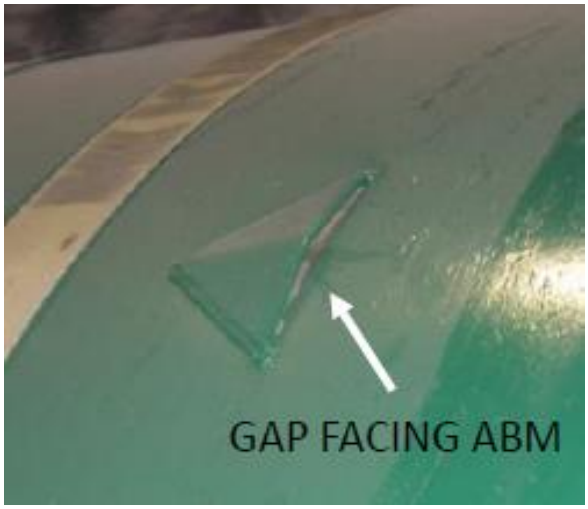
QD Band will allow quick removal of the BMTA from the exit pit after the bore is complete.

Prepping the Casing.

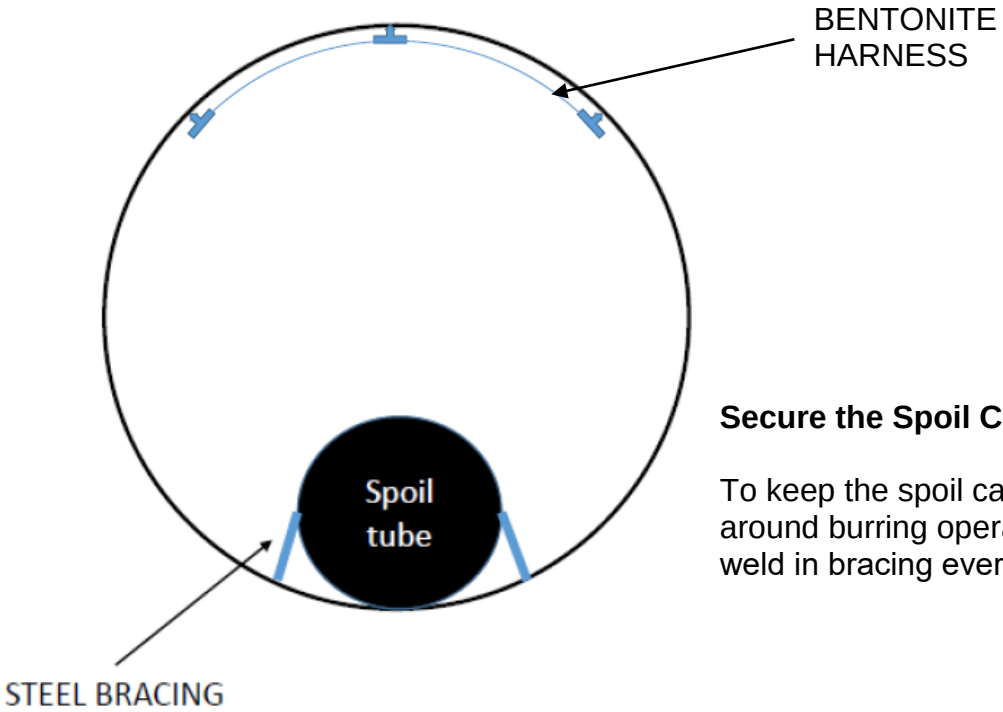
Hangers
Welded to the inner right side of the casing at the spring line to support the main electrical cable, water line and bentonite line

DANGER HIGH VOLTAGE.
Electrical lines must be kept off the bottom of the casing

Bentonite Ports
Are recommended to be installed down the tunnel every 15'-20'. Proper lubrication is essential when tunneling.
Barbco can supply extra Bentonite Harness allowing the casing sections to be prepared While the boring process is being done.



Bentonite supply line is typical ¾" pipe held up in the hangers mentrioned above.
The center port of the harness is located on the inside at the top of the casing. Tourch holes in the casing at the port locations and weld the harness in place. Weld covers over the port locations on the outside of the casing as shown. Be sure to leave the side facing the ABM unwelded.



Secure the Spoil Casing

To keep the spoil casing from walking around burring operation its best to weld in bracing every 20'

Secure the BMTA.

Each joint of casing must be secured to the Master Saddle during the boring process. This will keep the tunnel from rotating.
Weld it as needed. A chain can be added as shown

Suggestive Job Site Check List

Barbco Inc. recommends that the following items be checked before starting the bore.

1) **JOB SETUP**

- ✔ Pit walls adequately sloped or sheeted for safety in accordance with (OSHA) CFR29.
- ✔ Machine & BMTA on Line.
- ✔ Machine & BMTA on Grade.
- ✔ Laser securely in place and properly surveyed in.
- ✔ Pit Sump Pump installed and operating properly.
- ✔ Pit Area cleaned up

2) **CUTTING HEAD & CASING**

- ✔ Cutting head teeth in condition for job
- ✔ Start Bentonite Pump. Flow test
- ✔ Mark casing in one foot increments starting at leading end

3) **BORING MACHINE & TUNNEL MACHINE - Refer to Maintenance Section**

- ✔ Fuel levels in Boring Machine.
- ✔ Engine crankcase Oil
- ✔ Transmission Gear Lube in Boring Machine & Tunnel Power skid.
- ✔ Gearbox Gear Lube in Boring Machine & Tunnel Power skid.
- ✔ Winch Gear Oil
- ✔ Hydraulic Oil in Boring Machine & Tunnel Power skid.
- ✔ Winch locked out and cable wound
- ✔ Hook Rollers Down & Locked
- ✔ Spoil Door Closed

4) **JOB SAFETY**

- ✔ CREW HAVE ANY QUESTIONS REGARDING SAFETY OR PROCEDURES WITH EQUIPMENT BEING USED
- ✔ Refer to Safety Section of this Manual and Read and Understand it Completely

BMTA Operating Instructions

(Machine and casing are already set up. Ready to bore.)

Operating Steering Components

MANUAL HYDRAULIC STEERING

Layout configuration subject to the size of the tunnel shield**.**

Top Left

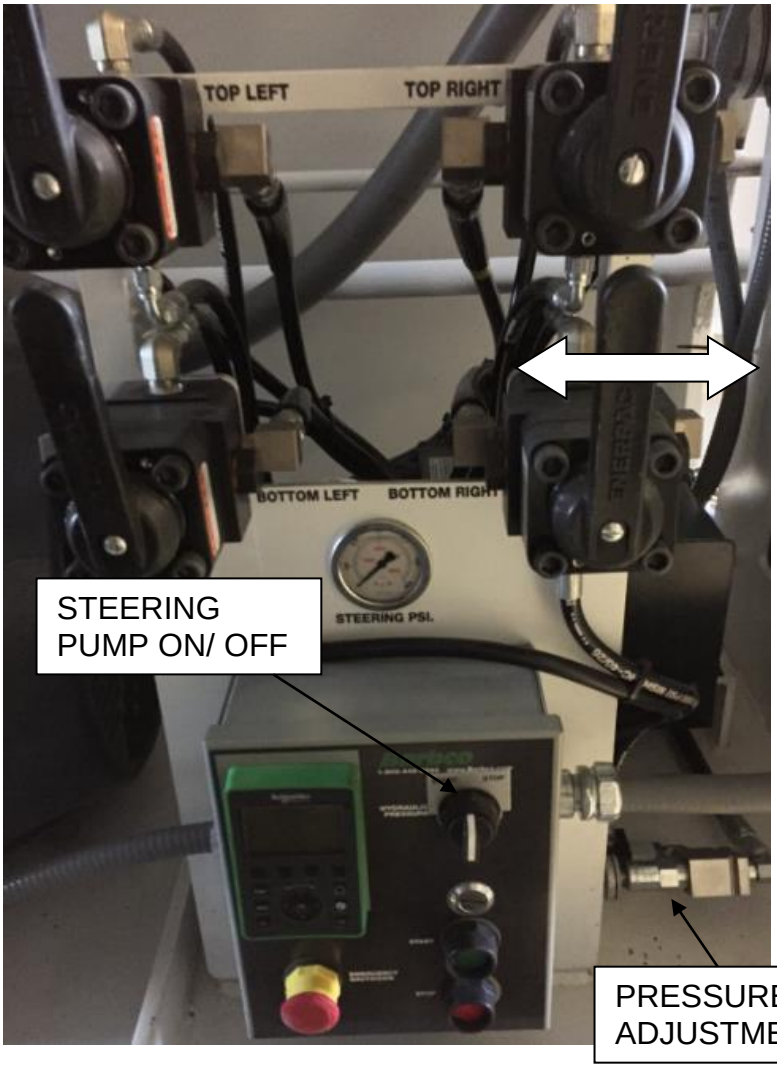
Top Right

Bottom Left

Bottom Right

1- Position the lever(s) to the left to extend the cylinder. Position lever to the right to retract the cylinder

2- Turn steering pump to the ON position to move the head section. Keep pump OFF and levers in the center position when not in use



3- Pressure can be adjusted by turning the relief knob. Turn CW to increase, CCW to decrease the pressure.

MAIN POWER DISCONNECT

CUTTING HEAD OPERATION

Main power disconnect must be in the ON position. (BMTA lights will be illuminated)

DANGER HIGH VOLTAGE

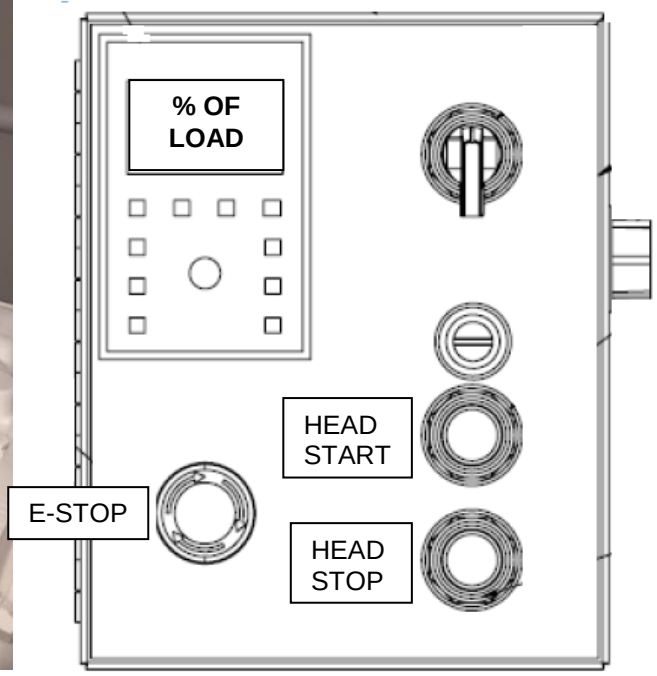
DANGER ROTATING CUTTING HEAD. CLEAR ALL PERSONAL

1- Put the transmission in the desired gear position.

2- Push the HEAD START button. Allow the head to get up to speed before advancing the tunnel.

3- Push the HEAD STOP button to turn off the rotation of the cutting head.

HEAD SPEED GEAR SHIFT



Staring the Tunnel

With all equipment in place and all connections made, proceed with the following steps:

1- Make sure both Operators can communicate with headsets.
2- Auger boring operator announces “all clear” and starts boring machine and spoil auger (speed of auger based on soil conditions and penetration rate of tunnel machine).

DANGER

Clear all unnecessary personal

3- BMTA Operator starts cutting head in first gear to make sure there is no restrictions on head then shuts down and picks desired cutter head speed then starts back up.
4- Without pushing the BMTA operator extends all four steering jacks about ½” then an additional ½” on the bottom 2 steering jacks to create an upward angle to start the bore.
5- BMTA operator instructs the auger boring operator to start pushing the tunnel forward as the pressure on the ABM is monitored.
6- Once the stroke of the ABM is ended the BMTA operator must stop the cutting head until the ABM has reset the dogs.

CAUTION

Leaving the cutter head spin could create a void above the cutting head in certain ground conditions and could allow for unexpected tilt of the ABM

7- Restart the head on the BMTA and instruct the auger boring operator to start pushing the tunnel forward as the pressure on the ABM is monitored
8- Continue this process for the complete length of the BMTA and try to keep the BMTA in the front saddle.
9- Remove the front saddle
10- Add the first joint of casing. *See set up.*
11- Restart the head on the BMTA and instruct the auger boring operator to start pushing the tunnel forward as the pressure on the ABM is monitored
12- Once the stroke of the ABM is ended the BMTA operator must stop the cutting head until the ABM has reset the dogs.
13- This is when the line and grade should be checked. The BMTA operator should retract the steering head completely. This should be done with the auger and head turning. **ABM must be dogged in and auger turning when making corrections!**
14- Take a laser reading. Document all readings and corrections made.
15- Adjust steering head back to desired position.
16- **Repeat steps 11 thru 15 on every stroke of the Auger Boring machine until the tunnels complete!**

Laser Operation

Monitoring Grade is performed by the tunnel Laser that is set in the entrance pit. This laser should be mounted in such a manner to be completely independent of the thrust block and the pit shoring.

The laser is set to the same line and grade as the ABM set up, but set to hit the target mounted in the BMTA.

Bentonite Operation-

Bentonite Harnesses are provided for customer to install on casing as needed. Each one should have its own independent valve to control Bentonite flow.

Provide bentonite to individual ports as to assure proper lubrication to all sections of casing installed. Do not have all ports open at the same time as the closest ports will see Bentonite and the farthest will not.

Do not allow Bentonite to penetrate into the head chamber and also back at the entrance pit. If you see Bentonite, close valves nearest to those area’s until it stop’s.

Bentonite is used for the reduction of thrust on the ABM, so if the thrust increase’s, so should the Bentonite.

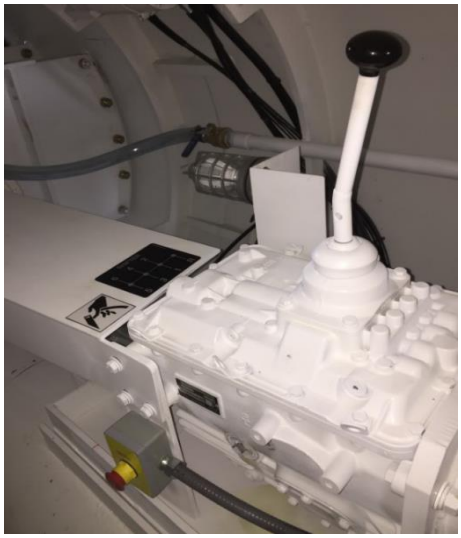
MAINTENANCE INSTRUCTIONS

Check fluid levels and fill as follows:

TRANSMISSION:

Check oil level monthly. Fill to checkpoint with Mobil Synthetic Trans 50. Change every 300 hours or six (6) months.

Oil Level



GEARBOX:

Check oil level monthly. Fill to checkpoint with Shell S4AX 85W/140 gear oil. Change every 300 hours or six (6) months.

AUGER COUPLINGS:

Clean and coat with light grease after each use. Check shanks for twisting and replace if there is evidence of failure.

AUGER:

Examine after use for bent or broken flighting. Straighten and re-weld as necessary.

CUTTING HEADS:

Examine all teeth and replace as necessary before each use. Check all bullet bits on rock heads to ensure they are firmly seated and rotate in their sockets. Check condition of wing cutters, check for cutting diameter and freedom of movement as well.

Barbco

MAINTENANCE SPECIFICATONS

Transmission	Eaton
Oil Capacity	12.5 Pints Mobil Synthetic Trans 50
Flexible Drive Coupling	Dodge
Gearbox	Fairfield
Oil Capacity	8 Quarts Shell S4AX 85W/140
Input Adapter	Rockford
Hydraulic Oil	ISO AW46
Reservoir Capacity	4 U.S. Gallons
Hydraulic Pump	Gear pump
Pump Coupling	Guardian

MAINTENANCE SCHEDULE CHART

Service Item	Daily	Weekly	Monthly	First 100 HR	Every 300 HR	Every
Drive Train	V					
• Transmission Oil Level	V, L		C	Change	Change	
• Dodge Coupling	V					
• Gearbox Input Shaft	V, L					
• Gearbox Oil Level	V, L		C	Change	Change	
Electrical System						
• Harnesses	V					
• Cable Connections	V		V			
• Work Lights	V					
• Gauges	V					
• Sensors			Test			
Hydraulic System						
• Change Hydraulic Oil					Change	
• Pump Auxiliary	P, L					
• Fittings & Hoses	V, L					
• Valves	V, L					
• Hydraulic Cylinders	V, L					

* Refer to engine manual for operation and maintenance guide lines.

V - Visual Inspection: Structure Failure, Loose Hardware, Any Defects, Wear, Fatigue. L - Leaks: Oil or Hydraulic.
G - Grease: Refer to Lubrication Chart
P - Check Pressure
C - Check Fluid Levels

Barbco INC.

Manufacturing Horizontal Earth Boring Machines
Tunnel Equipment • Directional Drills • Tooling

315 Pekin Road, S.E. • East Canton, Ohio 44730-9462
Phone: 330-488-9400 • Toll Free 1-800-448-8934 • Fax 330-488-2022
email: info@barbco.com • Web Site: www.barbco.com