

**CLASSIFICATION, NOMENCLATURE, AND SPECIFICATION
DEFINITIONS FOR HORIZONTAL EARTHBORING MACHINES**

1. Scope—This SAE Standard applies to horizontal earthboring machines of the following types:

- a. Auger Machines
- b. Pipe Pushers
- c. Rotary Rod Machines
- d. Impact Machines

The illustrations used are for classification and are not intended to resemble a particular machine. Only basic working dimensions are given. They may be supplemented by the machine manufacturer. This document is based on existing commercial horizontal earthboring machines.

This document does not apply to specialized mining machinery in SAE J1116, conveyors, tunnel boring machines, pipe jacking systems, and microtunnelers.

1.1 Purpose—The purpose of this document is to encourage common terminology of machine types, component names, and definitions of working specifications for horizontal earthboring machines.

2. References

2.1 Applicable Documents—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J916—Rules for SAE Use of SI (Metric) Units

SAE J1116—Categories of Off-Road Self-Propelled Work Machines

SAE J1233—Commercial Literature Specifications—Off-Road Work Machines

SAE J1234—Specification Definitions—Off-Road Work Machines

3. Definitions

3.1 Horizontal Earthboring Machines—A machine used to bore horizontally through the earth by means of a rotating tool, or nonrotating pushing or piercing tool.

3.2 Bore—A generally horizontal hole produced underground primarily for the purpose of installing services.

3.3 Auger Machine—A machine used to drill earth horizontally by means of a cutting head and auger or other functionally similar device. The machine may be either cradle or track type.

3.4 Pipe Pusher—A machine that pushes or pulls a rod or pipe to produce a bore by means of compaction without rotation or impact.

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3.5 Rotary Rod Machines—A machine used to drill earth horizontally by means of a cutting head attached to a rotating rod (not an auger). Such drilling may include fluid injection to the cutting head through a hollow rod.

3.6 Impact Machines—A type of machine that pierces the earth (piercing tool) or rams an object to produce a bore (ramming machine).

4. Machine Classifications

4.1 Auger Boring Machine (Track and Cradle Types)

4.1.1 TRACK TYPE

4.1.1.1 Nomenclature—(Refer to Figures 1 to 3)

NOTE: Some items shown may not be standard equipment.

4.1.1.2 Dimensional Terms—Refer to SAE J1234 for general measurement conditions and description of basic dimensions. Units of measure are to be stated as prescribed in SAE J1233 and J916; e.g., millimeters (inches).

4.1.1.2.1 Overall Machine Length (L)—Distance between the back of the master track vertical plane and the front of the extension track vertical plane.

4.1.1.2.2 Overall Machine Height (H)—Distance between horizontal ground plane of track, to the highest horizontal line on the machine.

4.1.1.2.3 Overall Machine Width (W)—Distance between vertical planes parallel to the machine's longitudinal axis and passing through the farthest point on the sides of the machine.

4.1.1.2.4 Centerline (C)—Distance between the center of drive chuck and the bottom of the track.

4.1.1.2.5 Maximum Diameter (D): Largest outside casing diameter that can be thrust by the machine.

4.1.1.2.6 Pit Size—Minimum pit width and length for the machine.

4.1.1.2.6.1 Pit Width (A): Minimum measured width at bottom of pit to theoretical vertical ground planes for a given machine.

4.1.1.2.6.2 Pit Length (B)—Measured length of pit from rearmost section of master track to vertical plane of cutting head prior to starting the bore for a given machine, plus specified assembly clearance.

4.1.1.3 Performance Terms

4.1.1.3.1 Torque—Measure of the maximum forward rotary force available at drive chuck.

4.1.1.3.2 Thrust—Measure of maximum force available to push the casing into the ground.

4.1.1.3.3 Auger Speed—Maximum revolutions per minute available at the drive chuck based on recommended power source, i.e., governed engine rpm, hydraulic pressure/flow, or electric motor rpm.

4.1.2 CRADLE TYPE

4.1.2.1 Nomenclature—(Refer to Figures 4 and 5)

NOTE: Some items shown may not be standard equipment.

4.1.2.2 Dimensional Terms—Refer to SAE J1234 for general measurement conditions and description of basic dimensions. Preferred units of measure are in SAE J1233 and J916.

4.1.2.2.1 Overall Machine Length (L)—Distance between the back of the main frame vertical plane and the load cell vertical plane.

4.1.2.2.2 Overall Machine Height (H)—Distance between the horizontal plane of the leg and the highest horizontal line on the machine.

4.1.2.2.3 Overall Machine Width (W)—Distance between vertical planes parallel to the machine's longitudinal axis and passing through the farthest point on the sides of the machine.

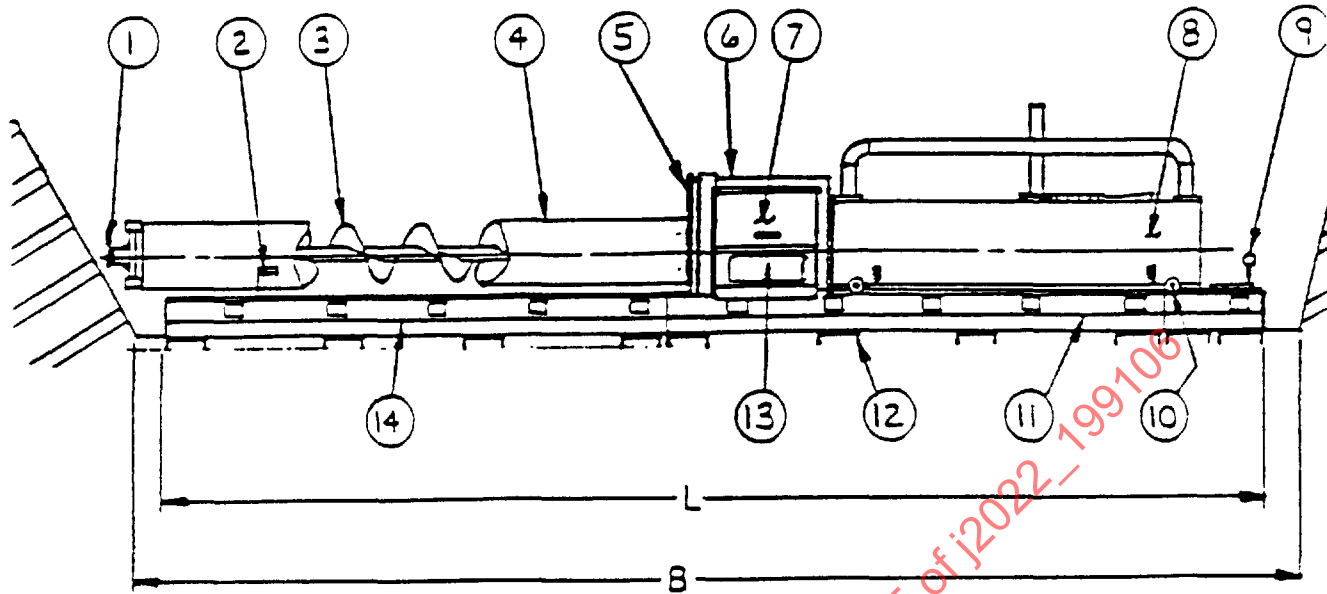


FIGURE 1—TRACK-TYPE AUGER BORING MACHINE

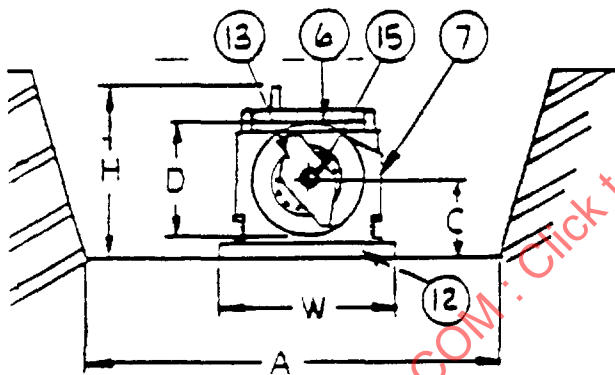


FIGURE 2—TRACK-TYPE AUGER BORING MACHINE

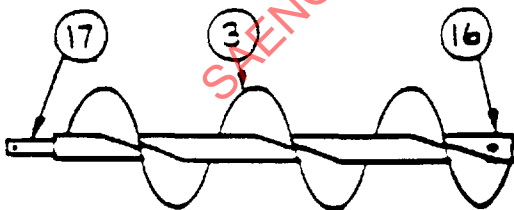


FIGURE 3—TRACK-TYPE AUGER BORING MACHINE

1. Cutting Head
2. Saddle
3. Auger
4. Casing
5. Casing Adapter
6. Master Pipe Pusher
7. Spoil Ejector Door
8. Carriage
9. Pushbar
10. Machine Roller
11. Master Track
12. Cross Member
13. Spoil Ejector
14. Extension Track
15. Drive Chuck
16. Female Hex Connector
17. Shank

- (L) Overall Machine Length
- (H) Overall Machine Height
- (W) Overall Machine Width
- (C) Centerline
- (D) Maximum Diameter
- (A) Pit Width
- (B) Pit Length

4.1.2.2.4 Maximum Diameter (D)—Largest outside casing diameter that can be thrust by the machine.

4.1.2.2.5 Centerline (C)—Distance between the center of drive chuck and the horizontal plane passing through the bottom leg of the machine.

4.1.2.2.6 Pit Width (A): Minimum measured width of pit to theoretical vertical ground planes for a given machine.

4.1.2.3 Performance Terms

4.1.2.3.1 Torque—Measure of the maximum forward rotary force available at the drive chuck.

4.1.2.3.2 Thrust—Measure of maximum force available to push the casing into the ground.

4.1.2.3.3 Auger Speed—Maximum revolutions per minute available at the drive chuck based on power source, i.e., governed engine rpm, hydraulic pressure/flow, or electric motor rpm.

4.2 Pipe Pushers

4.2.1 NOMENCLATURE—(Refer to Figures 6 to 8)

NOTE: Some items shown may not be standard equipment.

4.2.2 DIMENSIONAL TERMS—Refer to SAE J1234 for general measurement conditions and description of basic dimensions. Preferred units of measure are given in SAE J1233 and J916.

4.2.2.1 Overall Machine Length (L)—Distance between the back and the front of the pusher frame. For telescoping or adjustable frame units, maximum and minimum overall lengths should be given.

4.2.2.2 Overall Machine Height (H)—Distance between horizontal ground plane of the pusher frame and the horizontal plane passing through the highest point on the machine.

4.2.2.3 Overall Machine Width (W)—Distance between the vertical planes parallel to the machine's longitudinal axis and passing through the farthest point on the sides of the machine.

4.2.2.4 Centerline (C)—Distance from bottom of frame to center of push rod.

4.2.2.5 Diameter of Push Rod (A)—Largest diameter of push rod.

4.2.2.6 Length of Push Rod (B)—Nominal length of push rod.

4.2.2.7 Diameter of Expander (E)—Largest diameter of expander.

4.2.2.8 Cylinder Stroke (S)—Distance the cylinder rods moves from fully retracted to fully extended.

4.2.2.9 Pit Size—Minimum pit width and length.

4.2.3 PERFORMANCE TERMS

4.2.3.1 Thrust Pushing—Maximum force at manufacturer's recommended pressure.

4.2.3.2 Thrust Pulling—Maximum force at manufacturer's recommended pressure.

4.2.3.3 Cycle Time—Time in seconds to fully extend and retract cylinder rod at manufacturer's recommended pressure/flow.

4.2.3.4 Maximum Pressure—Relief valve pressure recommended by the manufacturer.

4.3 Rotary Rod Machines

4.3.1 NOMENCLATURE—(Refer to Figure 9)

NOTE: Some items shown may not be standard equipment.

4.3.2 DIMENSIONAL TERMS—Refer to SAE J1234 for general measurement conditions and description of basic dimensions. Preferred units of measure are given in SAE J1233 and J916.

4.3.2.1 Diameter of Drill Rod (D3)—Minimum diameter of drill rod.

4.3.2.2 Diameter of Drill Rod Coupler (D4)—Maximum outside diameter of drill rod coupler.

4.3.2.3 *Diameter of Standard Bit (D1)*—Maximum outside diameter of standard bit.

4.3.2.4 *Length of Drill Rod*—Nominal length of drill rod.

4.3.2.5 *Diameter of Reamer (D2)*—Largest diameter of reamer.

4.3.3 PERFORMANCE TERMS

4.3.3.1 *Torque*—Output torque from the drive unit at rated input parameters.

4.3.3.1.1 Input Parameter for Hydraulic or Pneumatic Drive—Maximum continuous rated flow and pressure.

4.3.3.1.2 Input Parameter for Electrical Drive—Maximum continuous rated voltage and amperage.

4.3.3.1.3 Input Parameter for Mechanical Drive—Maximum continuous rated torque and shaft speed.

4.3.3.2 *Shaft Speed*—Output speed at the input parameters defined in 4.3.3.1.

4.4 Impact Machines

4.4.1 NOMENCLATURE—(Refer to Figure 10 for Piercing Tool and refer to Figure 11 for Ramming Machine)
NOTE: Some items shown may not be standard equipment.

4.4.2 DIMENSIONAL TERMS—Refer to SAE J1234 for general measurement conditions and description of basic dimensions. Preferred units of measure are given in SAE J1233 and J916.

4.4.2.1 *Tool Diameter (D)*—Maximum diameter of tool body.

4.4.2.2 *Tool Length (L)*—Distance between tip and end of tool, not including whip hose.

4.4.3 PERFORMANCE TERMS

4.4.3.1 *Power Requirements*—Manufacturer's recommended maximum flow and pressure.

4.4.3.2 *Cycles Per Minute*—Measured at maximum flow and pressure recommended by manufacturer with tool fully engaged.

4.4.3.3 *Reversing Procedure*—Procedure for reversing, if applicable.

PREPARED BY THE SAE OFF-ROAD MACHINERY TECHNICAL COMMITTEE
SC-35—HORIZONTAL EARTHBORING MACHINERY

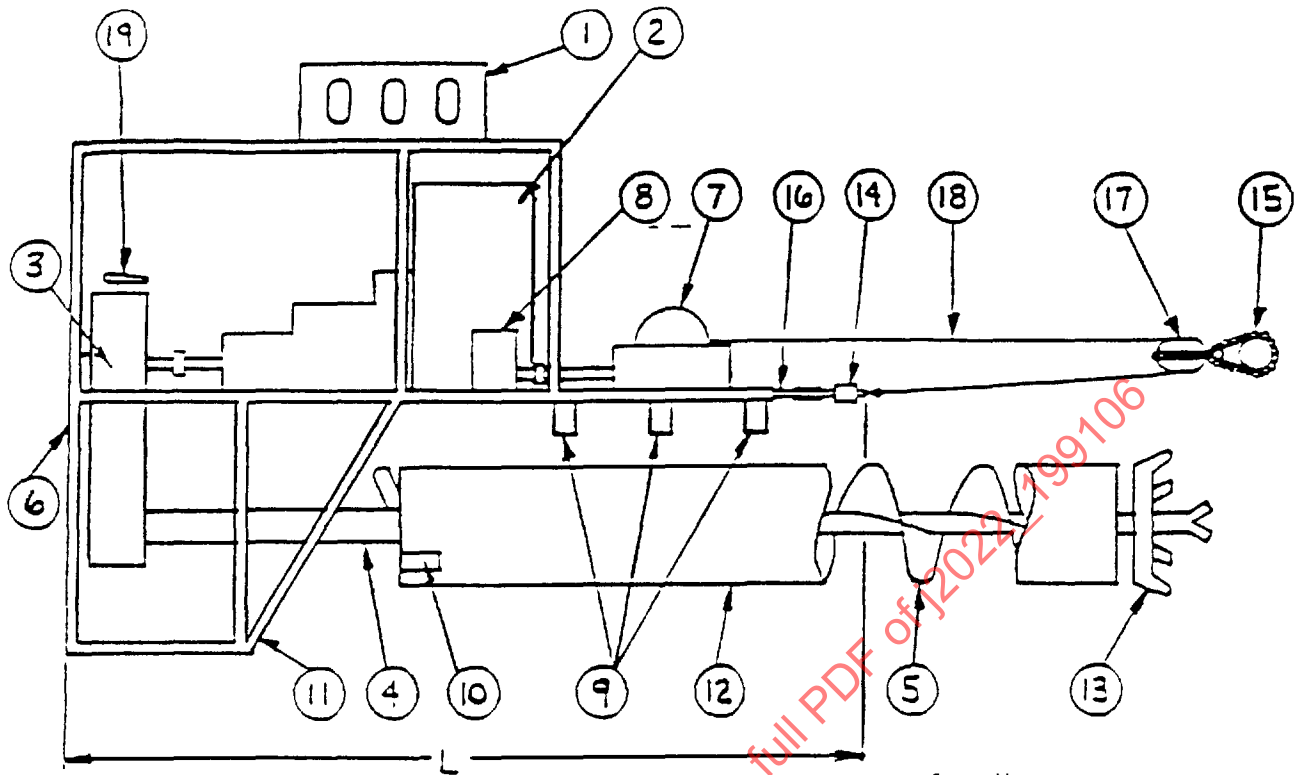


FIGURE 4—CRADLE-TYPE AUGER BORING MACHINE

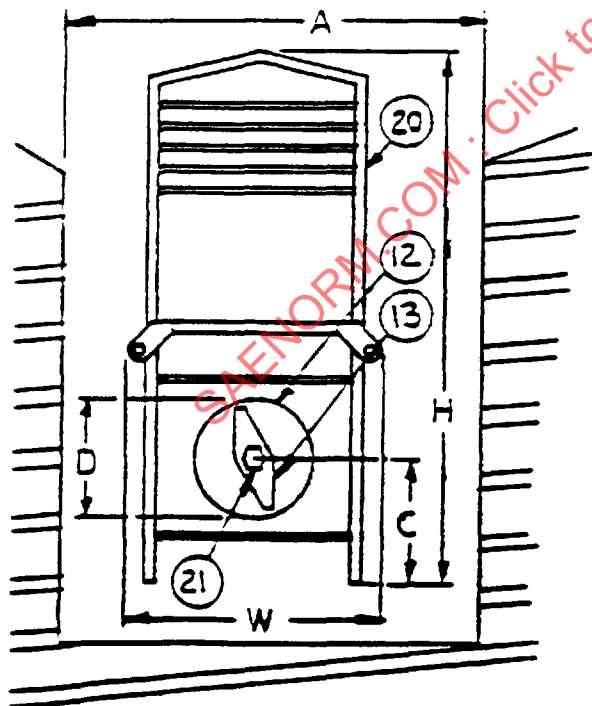


FIGURE 5—CRADLE-TYPE AUGER BORING MACHINE

1. Hanger
2. Power Train
3. Auger Gear Box
4. Auger Drive
5. Auger
6. Main Frame
7. Winch
8. Winch Drive
9. Casing Clamps
10. Thrust Hook
11. Legs
12. Casing
13. Cutting Head
14. Load Cell
15. Dead Man
16. Machine Dead Man
17. Sheave Block
18. Cable
19. Seat
20. Safety Grill
21. Drive Chuck

- (L) Overall Machine Length
 (H) Overall Machine Height
 (W) Overall Machine Width
 (D) Maximum Diameter
 (C) Centerline
 (A) Pit Width

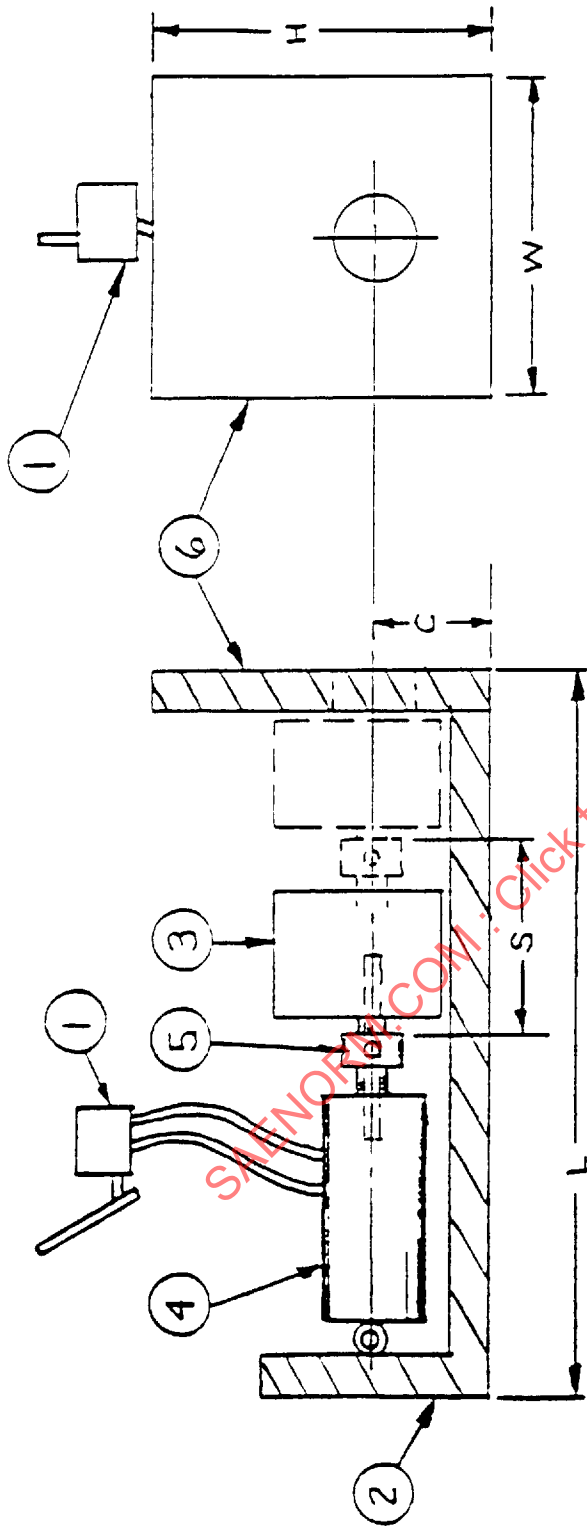


FIGURE 6—PIPE PUSHER—SIDE VIEW

FIGURE 7—PIPE PUSHER—END VIEW

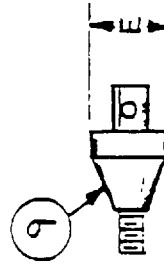
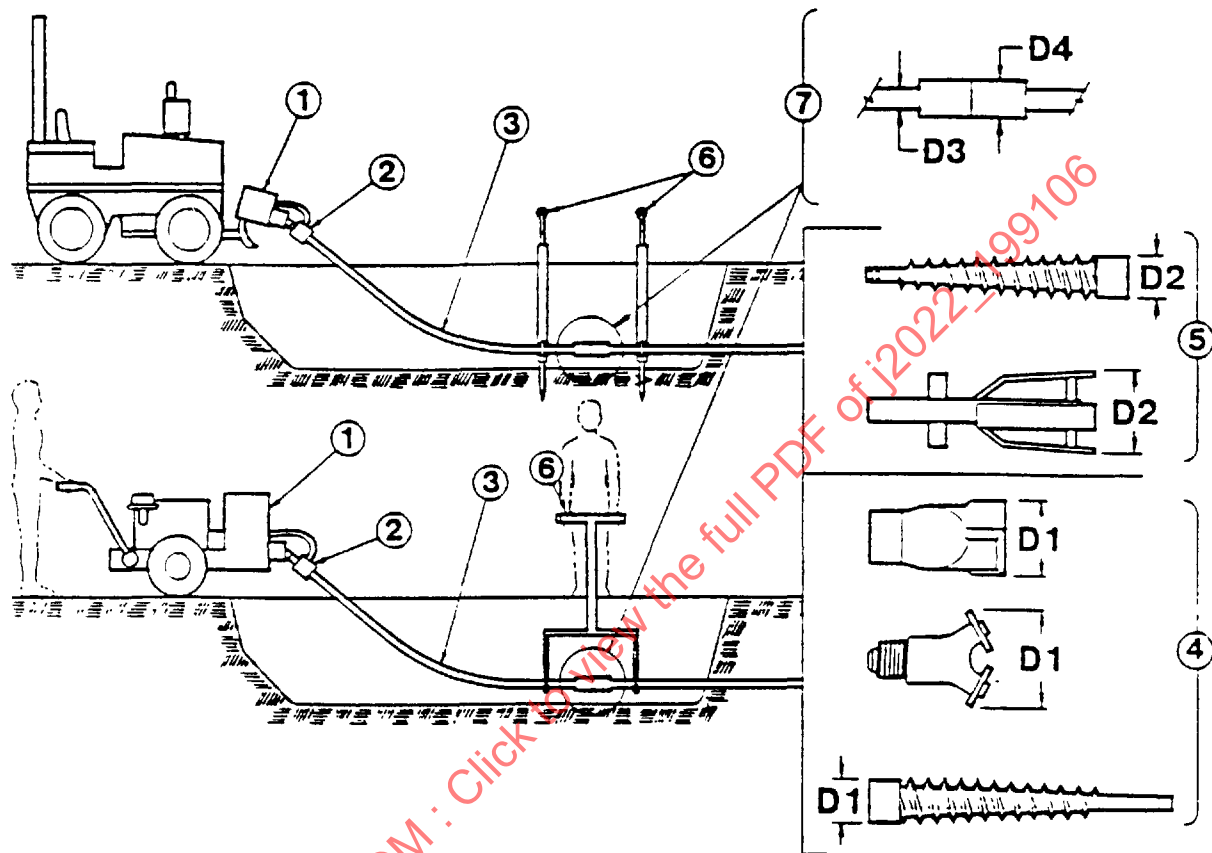


FIGURE 8—PIPE PUSHER

1. Valve Body
2. Body (Box)
3. Jaw Assembly
4. Cylinder
5. Cylinder Rod
6. Front Frame
7. Push Rod
8. Coupler
9. Expander

- (L) Overall Machine Length
- (H) Overall Machine Height
- (W) Overall Machine Width
- (C) Centerline
- (A) Diameter of Push Rod
- (B) Length of Push Rod
- (E) Diameter of Expander
- (S) Cylinder Stroke



1. Drill Rod Drive
2. Water Swivel
3. Drill Rod
4. Boring Bits
5. Reamers
6. Rod Guide
7. Drill Rod Coupler

- D1. Diameter of Standard Bit
- D2. Diameter of Reamer
- D3. Diameter of Drill Rod
- D4. Diameter of Drill Rod Coupler

FIGURE 9—ROTARY ROD MACHINE