



SPECIFICATIONS FOR BORING AND SUBSURFACE

EXPLORATION DRILL MACHINE

ITEM: One relatively lightweight combination auger, core, and rotary type boring machine having low overall height and a low center of gravity shall be required. The drill shall be mounted on a 4 x 4 truck.

INTENT: These specifications describe salient features that shall be required in a combination auger, core, rotary type drill unit on a truck. The unit shall be completely assembled and ready for operation when delivered.

PURPOSE: This equipment shall be used for soil sampling, foundation testing, monitoring well installation and subsurface exploration work. The drill machine shall be capable of performing auger borings in unconsolidated formations with hollow-stem augers. The drill shall have the capability of productively using currently popular geoexploration methods and techniques that include Shelby tube or continuous tube sampling and standard penetration testing. The drill shall be capable of coring or rotary drilling applications.

GENERAL SPECIFICATIONS: The drill shall be a self-contained unit having a single engine power source. The power shall be appropriately directed to the hydraulic system and mechanically-driven drill head. A hydraulically actuated folding upright drill frame with twin hydraulic feed cylinders shall be supplied. The assembled drill with its complement of auxiliary equipment shall be so arranged that work may be carried on with optimum efficiency and a minimum of manual labor. All parts, materials and workmanship shall be of the highest quality recognized by the trade. The drill unit shall be thoroughly field tested and ready for immediate and continuous operation at time of delivery. The equipment proposed must be a current model under standard production, being produced in quantity for national distribution. The manufacturer must have a minimum of three years production experience designing and manufacturing this type of equipment. The drill shall have been in production for at least two years. Dealer or vendor modifications to a non-conforming model for the express purpose of meeting minimum specification requirements will not be acceptable. Parts and accessories shall be stocked and readily available from the successful vendor. The drill unit shall be furnished with all standard equipment advertised whether or not specifically called for here, except where optional or conflicting equipment is specified. The drill shall meet the following specifications.



ROTARY DRIVE: The drill transmission shall have at least four speeds forward and one speed reverse. The transmission shall be mounted stationary on the drill main base frame with a heavy-duty clutch immediately adjacent to the transmission power input. The maximum drill spindle torque shall exceed 3,380 foot-pounds in first gear. Rotational speeds of the drill spindle shall range from at least 110 RPM in first gear to more than 698 RPM in fourth gear at 2,500 engine RPM. The output of the transmission shall power a single speed right angle drive. The right angle drive output shall turn a drive shaft connected to the rotary box. The rotary box shall be stationary with respect to the drive head travel. The rotary box shall be grease packed. The minimum rotary box chain size shall be double 80 series. The rotary box shall turn a rotary drive bar that has a square cross section of at least 1.75 inches a side and shall be made of heat-treated alloy steel. The drill shall be equipped with a heavy-duty auger drive universal joint and 1-5/8 inch hexagon drive socket. Provision against shock overload to the rotary drive shall be accomplished through an easily adjustable torque-limiting clutch.

VERTICAL DRIVE: The vertical drive shall consist of two double-acting hydraulic feed cylinders with an overall stroke or travel of at least 68 inches. The feed cylinders shall have a point of thrust centered upon the axis of the drill spindle. The feed slide bushings shall be split for ease of removal and replacement. The vertical drive shall have a maximum downward thrust of not less than 13,650 pounds and an upward or retract force of not less than 19,600 pounds. The feed cylinders shall have a minimum piston rod diameter of 1.375 inches to withstand compressive forces when retracting augers from the ground without rotation. Hydraulic gauges shall be provided on the control panel at the left rear of the drill to indicate in pounds per square inch the hydraulic feed pressure and system pressure. Hydraulic controls shall be furnished for varying the feed rate and down pressure. The maximum rate of feed shall not be less than 79 feet per minute down and 55 feet per minute up.

Two feed levers shall be provided. One feed lever shall be of the spring return type permitting standard rates of feed and retract. The first feed lever shall not be affected by the dial control settings used with the second feed lever. The second feed lever shall have a detent position and be used for drilling when a controlled rate of feed is required. Feed rate, once set, shall not be affected by changes in engine RPM nor by changes in formation resistance unless the adjusted down pressure setting is reached. A feed rate control shall be furnished for changing the rate of feed. A pressure control shall be furnished for changing the maximum bit pressure. The feed rate and pressure controls shall be operated by rotary type valves located on the front of the control panel within easy reach of the operator.



DRILL POWER UNIT: The power unit shall be a self-contained electric starting, air-cooled, heavy-duty 3-cylinder industrial type diesel engine, having not less than 197 cubic inch displacement and a minimum 61 gross horsepower. The engine shall meet U.S. EPA Tier 2 emission certification. The unit shall be equipped with a heavy-duty air cleaner, a governor and a replaceable full flow oil filter. The unit shall have a 12-volt electric starting system consisting of a starter, alternator and regulator. The unit shall have a keyed ignition switch on the drill control panel and an electrically controlled engine throttle.

The power unit shall be equipped with a dry disc clutch not less than 13 inches in diameter and a transmission having not less than four speeds forward and one reverse. When coupled with the drill unit, the engine shall have sufficient power to meet all requirements listed elsewhere in this specification. Fuel for the drill shall come from the truck fuel tank.

UPRIGHT DRILL FRAME WITH PERMANENTLY COUPLED DRIVELINE: The upright drill frame shall be hydraulically actuated permitting 90-degree fold over for traveling. The depth of the upright part of the base frame shall be at least 8 inches for rigidity. Two 2.5 inch ID double-acting hydraulic cylinders that have a minimum of 1.375-inch diameter rods shall control the drill frame movement. The direct-coupled mechanical drive train to the rotary shall not have to be disconnected when folding the upright drill frame over to a horizontal travel position.

HYDRAULIC SYSTEM: This system shall have a heavy-duty engine driven hydraulic pump run independently of the gear train with a capacity of not less than 25.1 GPM at 2,000 PSI. The system shall be equipped with a full-flow replaceable element hydraulic oil filter in the low pressure return line. A hydraulic oil cooler shall be furnished. The hydraulic oil reservoir shall have adequate capacity and shall be equipped with level indicator sight eyes, a vented filler cap and a magnetic drain plug. The hydraulic pump shall be driven from a point in the line of power transmission so that hydraulic power will be available whenever the engine is running.

DRILLER'S CONTROL PANEL: All controls and gauges needed for the various drilling operations shall be placed in such a manner as to be easily accessible and convenient for the drill operator while permitting a view of the drilling operation at all times. The driller's control panel shall be mounted on the left rear of the drill and shall include the following instrumentation and controls:

- (a) Keyed ignition switch and starter button.
- (b) Push-button emergency engine shut-off switch.



- (c) Electric engine throttle switch.
- (d) Transmission gear selector and lock-out clutch handle and auxiliary spindle brake set valve.
- (e) Gauges: Hour meter, tachometer, engine oil pressure, engine oil temperature and volt meter.
- (f) Hydraulic gauges for systems pressure and pull-down pressure.
- (g) Feed rate and feed pull-down pressure controls.
- (h) Feed and detented feed levers.
- (i) Hydraulic controls for all standard and provided optional components.

The drill controls shall be arranged in groups and situated for convenience according to frequency of use. For safety and convenience, the hydraulic levers shall have directional control that corresponds with cylinder movement. For example, moving the feed lever up shall extend the feed cylinders.

SAFETY AND EMERGENCY SHUT-DOWN SYSTEM: Push-button emergency shut-off switches shall be located on the control panel and on the right side of the main drill frame. Two emergency multi-directional wobble shut-off switches with extended levers shall be located near the bottom of and parallel to the feed cylinders. When any emergency shut-off switch is activated, a drive line brake is engaged to stop the spindle rotation in less than one revolution, the clutch is released, and the engine is shut down. The system shall also include a lock-out type clutch handle that positively locks the clutch handle in the down or disengaged position and an auxiliary spindle brake set valve. A neutral start switch is to be included that only allows the engine to start when the clutch is disengaged. A mast-raising alarm shall be included to alert the drill crew to look for overhead obstructions.

MAST: The mast shall be secured by bolts to the upright drill frame and shall be removable from the drill when not needed. With the mast in a vertical position, the sheaves shall be not less than 18 feet from the base of the drill main frame. The maximum line pull of the draw works shall be evenly distributed on four cross-braced tubular members with an adequate margin of safety. Pairs of 8 inch diameter sheaves shall be aligned with the rope or wire rope they carry. Two hydraulic cylinders shall be provided to raise and lower the upright drill frame and mast.

DRAW WORKS: The draw works shall include two hydraulic hoists and a hydraulic wireline hoist with additional sheaves. Mounting shall be on the mast for the purpose of accompanying the wireline hoist.



The first hydraulic hoist shall have a maximum pulling capacity of not less than 5,000 pounds. Maximum line speed shall be not less than 50 feet per minute. One hydraulic lever shall be furnished for controlling hoisting or lowering and rotation speed.

The hoist shall include at least 60 feet of 3/8 inch diameter rotate resistant wire rope and a safety Shur-Lok hook.

The second hydraulic hoist shall have a maximum pulling capacity of not less than 1,800 pounds. Maximum line speed shall be not less than 200 feet per minute. One hydraulic lever shall be furnished for controlling hoisting or lowering and rotation speed. The hoist shall include at least 60 feet of 3/8 inch diameter rotate resistant wire rope and a safety Shur-Lok hook.

The hydraulic wireline hoist shall have a maximum pulling capacity of not less than 1,800 pounds. Maximum line speed shall be not less than 200 feet per minute. One hydraulic lever shall be furnished for controlling hoisting or lowering and rotation speed. The hoist shall be capable of holding up to 900 feet of 3/16 inch diameter wireline cable. 300 feet of cable shall be provided.

SLIDING BASE, IN-OUT: A sliding base shall be furnished for moving the drill in and out so that the drill spindle can be positioned to facilitate alignment of augers and drill rods and to provide clearance from the hole for handling augers, casing and other down-hole tools. With the slide base extended, the center of the auger drive shall be at least 15 inches from the rear of the truck to provide ample working room. The in-out slide base shall have at least 15 inches of travel and shall be hydraulically operated. The in-out slide base shall have a replaceable nylatron (or approved equal) wear plate between the metal slide surfaces.

SLIDING BASE, SIDEWAYS: A sliding base shall be furnished for moving the drill to either side so that the drill spindle can be positioned to facilitate alignment of augers and drill rods when starting or drilling a hole. The sideways slide base shall have at least 8 inches of travel and shall be hydraulically operated. The sideways slide base shall have nylatron (or approved equal) wear plate between the metal slide surface.

MUD PUMP ASSEMBLY: The mud or water pump shall be a progressing cavity type pump (3L6 or equal) and shall have an infinitely adjustable output of 0 to 36 gallons per minute and a maximum pressure of 225 PSI. Pump output shall not be affected by changes in engine RPM. Power for the mud pump shall be supplied by a hydraulic motor operated from the drill hydraulic system. The assembly shall include a pressure gauge, a 1-1/2 inch



pressure port with sufficient 1-1/2 inch high pressure hose to connect to the control panel, service tee with 1 inch bypass at the operator's panel and a 2 inch suction port with 2 inch suction hose to the water tank. A 2 inch by 25 foot long suction hose with foot valve and strainer and a cam type quick disconnect connection of the water pump shall be provided. Provisions shall be made for drainage of the mud pump and lines.

STANDPIPE WITH HOSE TO CONTROL PANEL: A 1-1/2 inch diameter standpipe shall be mounted on the upright drill frame and connected by a 1-1/2 inch high pressure hose to the mud pump output at the control panel. A 1-1/2 inch high pressure hose shall connect the standpipe to the stabilized side feed water swivel.

HYDRAULIC HAMMER: A hydraulic hammer system shall be furnished that will lift a 140 pound drive weight 30 inches and completely release the weight for a 30 inch free fall. No rope or cable shall be attached to the weight that might impede free fall. The system shall have a minimum rate of at least 50 blows per minute. The hammer shall be preset at the factory for a consistent weight fall height through the use of adjustable priority hydraulic control valves. Once the valves are set, the fall height of the hammer weight shall not be affected by engine throttle adjustments. The fall height shall have a tolerance of plus or minus 1/2 inch. A method for visual verification of the fall height of the weight while the hammer is in operation shall be provided. The hammer shall be mounted on one single-acting hydraulic cylinder which is dedicated to the operation of the hammer device and shall be attached to the upright drill frame opposite of the control panel. The hammer device shall be hydraulically raised or lowered by this hydraulic cylinder through 60 inches of vertical travel. A 140 pound drive weight shall be furnished. A safety feature shall be furnished that will prevent the hammer from operating if the anvil is not in place.

ROD HOLDER AND BREAKOUT DEVICE: A rod holder that clamps drill rod or pipe hydraulically by means of a hydraulic cylinder and the control shall be furnished. The device shall swing on and off the hole from a pivot point near the right rear leveling jack and shall have in and out adjustment. The rod holder shall store flush with the rear of the platform and out of the way when drilling with auger tools. A hydraulic breakout wrench shall be furnished.

HYDRAULIC EXTRUDER: A hydraulic extruder for 3 inch and 5 inch thin wall tubes that are 36" in length shall be mounted on the truck platform. The extruder shall include a hydraulic directional control valve and shall be powered by the drill hydraulic system and shall have a sample catcher.



WATER TANK: The water tank shall have a 150 gallon capacity. The tank shall be all aluminum construction and shall have internal baffles. The tank shall include inlet, discharge and drain ports, as well as plumbing to the mud pump.

HYDRAULIC LEVELING JACKS: Heavy-duty hydraulic leveling jacks shall be furnished that are individually operated from the control panel at the left rear of the drill. The jacks shall provide adequate leveling capability and shall be strong and rigid enough to easily support the total weight of the machine plus the loads generated when retracting drilling tools. Check valves shall be furnished in the hydraulic lines to prevent leakage or slippage of the jacks while the drill is set up on a site. The chrome-plated jack piston rods shall be completely enclosed to safeguard them from damage. The jack foot pads shall be minimum 14 inch diameter.

Two jacks shall be mounted at the rear of the platform, one on each corner. The maximum cylinder travel shall not be less than 36 inches. The minimum outside diameter of the jack cylinders shall be 4.5 inches with a 4 inch bore and 2.5 inch diameter piston rod.

One jack shall be mounted at the center front of the truck. The maximum cylinder travel shall not be less than 36 inches. The minimum outside diameter of the jack cylinders shall be 4.5 inches with a 4 inch bore and 2.5 inch diameter piston rod.

A heavy-duty front bumper with tow shackles shall be provided.

DRILL PLATFORM: The drill platform shall be constructed from structural steel members and 12 gauge safety tread deck plate. A watertight tool box shall be provided on the passenger and driver side below the platform deck ahead of the rear wheels. Drill rod and auger racks shall be furnished above the deck. Clearance lights shall be included. The platform width shall not exceed 96 inches. The platform shall be for an 84 inch CA axle truck.

A folding driller's step at the left rear corner of the platform shall be supplied (dimensions' 19" X 28").

The drill platform shall be undercoated.

Dual pipe vises with a 1-5/8 inch hex shank attached shall be provided to fit two hex sockets located on both the right, left sides of the drill platform.



The rear of the truck shall be equipped with a pair of tow shackles having a minimum capacity of 6-1/2 tons each.

A tow hitch with a 2 inch receiver tube and electric socket shall be furnished.

COLOR: The drill unit, drill platform and all parts normally painted shall be primed and painted a DuPont N2065-Yellow School bus yellow color. A color sample shall be furnished to the successful bidder.

All exposed hydraulic cylinder piston rods shall be covered to prevent over spray during painting.

Wiring: All installed wiring must be of adequate size to handle anticipated loads of all electrical components. All wiring terminal connections shall be crimped and soldered or use weatherproof connectors. All wiring must be uninterrupted and complete with no splices. All wiring must be color-coded, shielded, enclosed in wiring loom or wrapped harness. A complete simple to read wiring diagram must be included in each finished unit

MISCELLANEOUS: All equipment cataloged as standard shall be furnished and shall be included in the purchase price of the unit. The component parts of the unit shall be of proper size and design to safely withstand maximum stresses imposed by a capacity load, and the manufacturer's rated loads for chains, bearings and universal joints shall not be exceeded when the unit is loaded with such loads.

The torque capacity of each driven part shall be equal to or exceed the torque capacity of its driving member.

All items which require periodic lubrication shall be provided with a suitable lubrication fitting.

All pressure systems shall be provided with suitable pressure relief valves. With the exception of the drill rotary box, spindle and drilling tools, all moving parts which are so located as to be a hazard to operating or maintenance personnel shall be fully enclosed or properly guarded. Protective devices shall not impair the operating functions.

The equipment to be furnished under these specifications shall be warranted against defective design, materials and workmanship as standard with the manufacturer. Three copies of the manufacturer's standard guaranty or warranty shall be furnished.