ATTACHMENT H

SPECIFICATIONS FOR BACKHOE-LOADER INTEGRAL MEDIUM-DUTY, HEAVY-DUTY & SUPER-DUTY

1. **DESCRIPTION**

This specification describes a pneumatic-tired, backhoe loader (JCB, JOHN DEERE, CASE, CAT or equivalent) equipped with a diesel engine, front-end loader bucket, and rear mounted backhoe of integral design. The unit shall safely dig, break out, lift, carry and dump the loads required by the specifications. Units supplied to this specification shall meet or exceed these requirements.

2. **GENERAL**

Each unit shall be new, and of the latest design of a model in current production or an update of an existing model. Each unit shall be furnished with identical equipment, options and features as listed below. The items listed under "Optional Equipment" should not be included in the contract price but all items listed should be available as "options" as an add or deduct under the cost plus 10% rule contained in Section VII B of the solicitation. Units shall be furnished completely assembled, fully serviced, and ready for immediate operation. The right is reserved to reject any and all bids proposing to furnish equipment, which, in the opinion of the Using Entity's engineers and/or staff, is not satisfactory for the Using Entity's use in the proposed application.

Note: For purposes of this solicitation, each size category of backhoe loader will represent a separate lot; as a result, vendors may choose to bid in only one, two or all three size categories. The award will involve multiple vendors.

3. **DIMENSIONS AND WEIGHT**

3.1. **Medium Duty:** Base machine with ROPS enclosed cab and manufacturer's standard loader, backhoe, and buckets shall weigh a minimum 13,800 lbs., as bid, without tire ballast, additional counterweights, or optional equipment.

3.2. **Heavy Duty:** Base machine with ROPS enclosed cab and manufacturer's standard loader, backhoe, and buckets shall weigh a minimum 14,800 lbs., as bid, without tire ballast, additional counterweights, or optional equipment.

3.3. **Super Duty:** Base machine with ROPS enclosed cab and manufacturer's standard loader, backhoe, and buckets shall weigh a minimum 15,500 lbs., as bid, without tire ballast, additional counterweights, or optional equipment.

3.4. Overall transport width: 100 inches maximum.

3.5. Overall transport height and length with backhoe loaded on trailer with boom tucked, bucket curled and boom assembly locked in transport position with tires specified below: 13'6" maximum and 29 feet maximum, respectively.

4. **COUNTERWEIGHTS**

The complete unit with front-end loader and backhoe including option(s) identified on the purchase order shall have necessary counterweights installed for proper balance and stability during operation and loading. However, these counterweights shall not be included in the above minimum weight calculations. Liquid in tires is not acceptable as counterweights.

5. **WHEELBASE**

5.1. **Medium Duty**: Minimum 80 inches.

5.2. **Heavy Duty**: Minimum 83 inches.

5.3. **Super Duty**: Minimum 84.5 inches.

6. **ENGINE**

The unit shall be powered by a Tier IV, heavy-duty, liquid-cooled, 4-cylinder, diesel engine that meets current EPA emission requirements. The engine shall be equipped, as a minimum, as follows:

6.1. **Medium Duty:** Minimum horsepower of 71
6.2. **Heavy Duty:** Minimum horsepower of 95
6.3. **Super Duty:** Minimum horsepower of 100
6.4. Electrical system (12-volt) with alternator, starter, voltage regulator and heavy-duty battery.
6.5. Key pad or keyed ignition switch, with safety device to prevent ignition from starting when transmission is in gear.
6.6. Electronic control or Governor.
6.7. Air cleaner shall be Donaldson Type or equivalent, heavy-duty, two-stage, dry-type, with restriction indicator.
6.8. Oil filter, heavy-duty with replaceable element. In no instance shall the unit lose oil pressure to critical engine components while working on slopes.
6.9. Fuel filter/water separator, heavy-duty with replaceable element.
6.10. Heavy-duty radiator and cooling system with 50-50 mixture of water and permanent-type antifreeze.
6.11. Fuel Tank of sufficient capacity for 8 hours operation, minimum
6.12. Muffler and exhaust pipe of sufficient length to exhaust fumes away from the operator's cab. If muffler is of a vertical design, exhaust pipe shall be angled at the top to prevent rain from directly entering the exhaust system.

7. **FUEL SYSTEM**

For Diesel powered vehicles and equipment, fuel system components and Diesel engines shall be compatible with B20 bio-diesel blends, minimum. For gasoline powered vehicles and equipment, fuel system components and gasoline engines shall be compatible with E10 ethanol blends, minimum.

8. **OPERATORS STATION**

Enclosed cab, full and integral type, providing roll-over protection in accordance with the current SAE J1040 Standard equipped with, but not limited to, the following.

8.1. Unit shall include factory-installed air conditioner meeting design and performance requirements of the current SAE J169 and SAE J1503 standards and heater-defroster. A/C system component locations shall not hamper the operator entering or exiting the cab or operating the equipment. Air intake shall not draw equipment exhaust gasses into cab enclosure.
8.2. Tinted safety or shatterproof glass.
8.3. Sound suppression to meet OSHA requirements measured in accordance with the current SAE J1166.
8.4. Cab dome light.
8.5. Cab pressurizer complete with filter
8.6. Windshield wipers & wiper fluid provided on both front and rear windows.
8.7. Interior rear-view mirror.
8.8. Rear view mirrors, left and right outside mounted.
8.9. Adjustable spring-cushioned, upholstered seat and back rest with arm rests and seat belt meeting the current SAE J386 Standard.
8.10. Horn.

8.11. Cab floor shall be equipped with a heavy duty form fitting, rubber mat or coated with a skid-resistant material.
8.12. Two sliding or swing-back windows for fresh air ventilation.
8.13. Hand and foot throttle.
8.14. Hydraulic power steering.
8.15. Instrumentation shall include the manufacturer's standard instrumentation package including, but not limited to, the following gauges, indicators and alarms located at the operator's station. If an electronic monitoring system is furnished and monitors at least the following conditions, it is acceptable.
8.15.1. Fuel Gauge.
8.15.2. Hourmeter, electric quartz type, shock proof, totally sealed case, with readout up to 9,999.9 hours.
8.15.3. Tachometer
8.15.4. Engine oil pressure gauge or indicator light visible to the operator during operations.
8.15.5. Engine coolant temperature gauge visible to the operator during operations.
8.15.6. Torque convertor oil temperature gauge.
8.15.7. Ammeter or volt meter or indicator light.
8.15.8. Audible alarm and warning light for high engine coolant temperature and low engine oil temperature.
8.15.9. DEF Level Indicator

9. **TRANSMISSION**

Each unit shall be equipped with a synchronized power shuttle or power shift transmission having not fewer than four forward gear speeds and two reverse gear speeds.

9.1. There shall be a single-control hydraulic reverser, so that when the control is in the forward position, the unit will move forward, and when the control is in the rear position, the unit will move backward.
9.2. Unit shall maintain a minimum travelling speed of 15 mph when traversing a maximum seven degree grade and shall have a minimum road speed of 20 mph on level ground with the tires required by this specification.
9.3. Unit drivetrain shall be four wheel or all-wheel drive.

10. **DIFFERENTIAL**

Differential lock, torque proportioning system, or Using Entity approved equal shall be provided.

11. **AXLES**

Manufacturer's heavy-duty front and rear axles shall be provided.

12. **BRAKES**

The tractor shall be equipped with a service brake system, secondary brake system, and parking brake system meeting the requirements of the latest version of SAE J/ISO 3450 Standard.

12.1. Service brakes shall be wet-disc type.
12.2. The secondary brake system shall stop the machine in the event of any single failure in the service brake system, or in the event of an engine failure.
12.3. The parking brake system shall hold the fully loaded machine stationary on any grade the unit can negotiate.
12.4. Brake systems may use common components.

13. **TIRES**

Tire and rim load capacity shall meet or exceed front axle load capacity, including all options identified on Purchase Order.

13.1. Front tires shall be type F-3, tubeless, industrial rib or truck type tread, mounted on rims of proper width as recommended by the tire manufacturer.

13.2. Rear tires shall be type R-4, tubeless, industrial traction tread, mounted on rims of proper width as recommended by the tire manufacturer.

14. **HYDRAULICS**

The hydraulic system(s) as normally provided by the manufacturer shall be of size, type and capacity to perform all required operations of the tractor-loader-backhoe and meet, but not be limited to, the following:

14.1. System shall be sealed against contaminants and any necessary air vents shall be filtered (10 micron maximum filter sized for the full flow of the hydraulics).

14.2. Cooling system shall maintain hydraulic oil at satisfactory operating temperatures up to at least 110 degrees F ambient temperature during continuous heavy-duty operations.

14.3. Pressure-relief valve(s).

14.4. Hydraulic oil filter(s) with replaceable element(s).

14.5. Reservoir with visual oil level indicator or dipstick.

14.6. All hydraulic cylinders shall be double acting type.

14.7. In accordance with ISO 3457, any hydraulic hoses within 3 feet of the operator and carrying hydraulic fluid above 725 psi and/or at a temperature of more than 122F shall be guarded/sleeved.

15. **LOADER, BUCKET**

Each unit shall be equipped with general purpose or multi-purpose (4-in-1) type loader bucket meeting the following requirements:

15.1. **Medium Duty**

15.1.1. Minimum 1.0 cu. yd. capacity (heaped) per SAE J742, latest edition.

15.1.2. Minimum lift capacity to maximum height: 5,100 lbs.

15.1.3. Minimum breakout force: 8,500 lbf.

15.1.4. Maximum dumping clearance under bucket shall not be less than 8ft 4 inches.

15.1.5. Bucket width shall not exceed 96 inches and shall extend beyond the front tire outside edges.

15.2. **Heavy Duty**

15.2.1. Minimum 1.25 cu. yd. capacity (heaped) per SAE J742, latest edition.

15.2.2. Minimum lift capacity to maximum height: 6,300 lbs.

15.2.3. Minimum breakout force: 10,200 lbf.

15.2.4. Maximum dumping clearance under bucket shall not be less than 8ft 4 inches.

15.2.5. Bucket width shall not exceed 96 inches and shall extend beyond the front tire outside edges.

15.3. **Super Duty**

15.3.1. Minimum 1.25 cu. yd. capacity (heaped) per SAE J742, latest edition.

15.3.2. Minimum lift capacity to maximum height: 7,400 lbs

15.3.3. Minimum breakout force: 11,100 lbf.

15.3.4. Maximum dumping clearance under bucket shall not be less than 8ft 7 inches.

15.3.5. Bucket width shall not exceed 97 inches and shall extend beyond the front tire outside edges.

15.4. **All Backhoe Loader Size Categories**

15.4.1. Bolt on cutting blade.

15.4.2. Fixed installation.

15.4.3. Bucket control shall be the single joystick type. Controls shall be easily accessible to the operator.

15.4.4. Reach at maximum height shall be at least 24 inches.

15.4.5. Lift control positions: raise, lower, hold, and float.

15.4.6. Bucket control positions: rollback, hold, and dump.

16. **LOADER, BACKHOE**

The heavy-duty backhoe shall be hydraulically operated, with power controls for raising, lowering, digging, swinging, and dumping the bucket. It shall be permissible to swing and dump simultaneously.

16.1. **Medium Duty**

16.1.1. The crowd digging force shall be no less than 6,700 pounds.

16.1.2. For the base unit equipped with a standard dipper, the boom lift capacity (at a 10-foot height) per SAE J31, shall not be less than 2,500 pounds.

16.1.3. The digging depth shall be not less than 14 feet when equipped with manufacturer's standard 24 inch trenching bucket.

16.1.4. Maximum reach beyond pivot point shall not be less than 17 feet 10 inches.

16.1.5. The maximum dumping clearance shall not be less than 8ft 6 inches when equipped with manufacturer's standard 24 inch trenching bucket.

16.2. **Heavy Duty**

16.2.1. The crowd digging force shall be no less than 8,000 pounds.

16.2.2. For the base unit equipped with a standard dipper, the boom lift capacity (at a 10-foot height) per SAE J31, shall not be less than 3,000 pounds.

16.2.3. The digging depth shall be not less than 14.4 feet when equipped with manufacturer's standard 24 inch trenching bucket.

16.2.4. Have a maximum reach beyond the pivot point of not less than 17 feet 10 inches.

16.2.5. The maximum dumping clearance shall not be less than 8ft 6 inches when equipped with manufacturer's standard 24 inch trenching bucket.

16.3. **Super Duty**

16.3.1. Backhoe performance with standard dipper and 24 inch trenching bucket and without quick attach adapter shall be as follows:

16.3.1.1. The crowd digging force shall be no less than 8,449 pounds.

16.3.1.2. Bucket digging force shall be no less than 12,600 pounds.

16.3.1.3. The boom lift capacity (at a 10ft height) per SAE J31, shall not be less than 3,000 pounds.

16.3.2. The maximum digging depth shall not be less than 14.5 feet when equipped with the manufacturer's standard 24 inch trenching bucket.

16.3.3. Have a maximum reach beyond the pivot point of not less than 19 feet.

16.3.4. The maximum dumping clearance shall not be less than 12 feet when equipped with manufacturer's standard 24 inch trenching bucket.

16.3.5. For each super duty unit purchased the following shall also be provided:

16.3.5.1. A 48 inch cleanup and grading bucket shall be shipped with each super duty unit. This unit shall be shipped within the front loader bucket for convenience. Any necessary adapters and fittings for attachment to the quick coupler shall also be provided.

16.3.5.2. A hydraulically extendable dipper (with all controls, counterweights, and unit itself installed) of at least 3ft 5 inches between the extended and retracted positions.

16.4. **All Backhoe Loader Size Categories**

16.4.1. Backhoe control shall be by two pilot-operated joysticks. Controls shall be switchable between "backhoe" and "excavator" control patterns.

16.4.2. Stabilizers or outriggers shall be individually, hydraulically controlled from the operator's seated position, shall provide a 9'5" minimum stance, and shall have street pads.

16.4.3. The backhoe shall be equipped with a heavy-duty trenching bucket of 24 inches width.

16.4.4. The backhoe shall be capable of digging at any angle within a swing arc of not less than 180 degrees.

16.4.5. Acceptable means shall be provided for positive locking of the boom assembly in the transport position to provide safety and reduce stresses on the hydraulic system.

17. **EQUIPMENT**

The unit shall be complete with all standard accessories normally furnished. In addition, equipment shall be furnished as follows:

17.1. Unit to meet all applicable OSHA requirements.

17.2. Two headlights, two red taillights and brake lights, and two double-face amber flashing lights, meeting requirements of ASAE/ASABE S279.9, latest edition.

17.3. Slow Moving Vehicle (SMV) Identification Emblem, meeting requirements of the current SAE J943 Standard, and mounted in accordance with the standard.

17.4. Horn.

17.5. Adjustable spring-cushioned, upholstered seat and back rest with seat belt meeting the current SAE J386 Standard.

17.6. Rear view mirrors, left and right outside mounted.

17.7. Turn signal controls for off, flash right, flash left, or flash both lights.

17.8. Two front and two rear work lights mounted on top front and top rear of ROPS/cab, switch controlled from the operators station.

17.9. Non-skid access steps and grab handles.

17.10. Back-up alarm, 107 dB minimum, and permanently marked as such.

17.11. Lifting link, backhoe mounted. When installed, link shall not restrict the movement of any bucket or coupler identified on the Purchase Order. Backhoe mounted is preferred. Bucket mounted is acceptable provided it does not interfere with bucket rotation. If bucket mounted, a hook must be provided on <u>each</u> bucket the vendor provides to the State in the performance of this contract.

17.12. Rear fenders.

17.13. Boom safety lock(s) or other mechanical means to hold boom in the raised position to allow servicing of the equipment.

17.14. Fire extinguisher, minimum 2 ½ pounds, UL rating 1A-10B:C. The fire extinguisher shall be installed in a suitable and readily accessible location within the cab.

17.15. All exposed electrical wiring shall be insulated and enclosed in a fibrous loom, plastic loom or flexible conduit for protection from external damage and short circuits. Wiring shall be securely fastened at sufficient intervals to prevent sagging and insure clearance of mechanical parts. Routing of the wiring through the sub-frame, operator's platform or the like shall not interfere with the normal operation and use or present a safety hazard. A sealed, splice-free modular wiring harness is acceptable. Rubber grommets shall be used wherever wire or harness pass through metal.

17.16. Backhoe bucket (except 48 inch cleanup and grading bucket) shall come with removable digging teeth or teeth with replaceable tips. Bucket shall include any necessary adapters and fittings for attachment to the backhoe.

18. **ELECTRICAL**: System shall be designed to prohibit Radio Frequency Interference (RFI) & Electromagnetic Interference (EMI). Electrical system shall be shielded to prevent any internal / external interference which may impact how the equipment operates when exposed to 150-watt two-way mobile radios operating on Public Safety Frequencies designated by the FCC (CFR 47, Part 90) (Low Band VHF 40-50 MHz, High Band VHF 155-165 MHz, High Band SHF 700-800 MHz).
    18.1. Wiring shall be AWG or equivalent. Appropriate sized wire shall be used for demands of circuit.
    18.2. Wiring shall be routed in wire loom, grommets shall be used when wires pass through walls.

19. **MAINTENANCE**
    All replaceable filter elements for air, fuel, hydraulics, and engine oil shall be available from at least one of the following U.S. manufacturers: AC, Wix, Donaldson, or Baldwin. Replacement tires and tubes shall be available from at least one of the following U.S. manufacturers: Goodyear, Firestone, or General. Replacement or replenishment lubricants required throughout the unit (engine oil, transmission fluid, hydraulic fluid, gear oil, brake fluid, power steering fluid, and grease) shall be available from at least one of the following major manufacturers: Exxon, Texaco, or Citgo. Details concerning the manufacturer and items name or part number for the above maintenance items shall be provided wherever requested on the bid questionnaire.

Note: All threaded fasteners, hydraulic fittings, belts, hoses, and electrical fasteners shall be metric or U.S., and shall meet one or more of the following standards, SEA, JTC, DIN, ISO, UNC, UNF, NPTF

20. **EQUIPMENT OPTIONAL**
    The following items should be available as optional equipment but not included in the standard equipment offered:
    20.1. In lieu of an enclosed ROPS cab, provide an open ROPS cab, eliminating sub-paragraphs 8.1 – 8.6.
    20.2. Backhoe buckets, except 48 inch cleanup and grading, provided with removable digging teeth or teeth with replaceable tips. Bucket shall include any necessary adapters and fittings for attachment to the backhoe.
        20.2.1. 12-inch trenching
        20.2.2. 18-inch trenching
        20.2.3. 24-inch heavy-duty
        20.2.4. 30-inch heavy duty
        20.2.5. 36-inch heavy duty
        20.2.6. 48-inch cleanup and grading
        20.2.7. 60-inch heavy duty ditch cleaning type
    20.3. Loader bucket digging teeth: Provide bolt-on digging teeth with quick-change replaceable teeth. Delete bolt-on cutting edge.
    20.4. Manually-operated backhoe bucket quick coupler. Various bucket sizes as above shall also be available.

20.5. Wain-Roy quick coupler or equivalent, rigid type, furnished and installed, consisting of a single wide hook and manually installed, self-aligning pin, pinned to the backhoe dipper in place of the bucket.

20.6. Wain-Roy quick coupler attachments:

20.6.1. Bucket, backhoe, heavy-duty, 24", minimum 315 lbs. weight, trenching type. Delete standard bucket.

20.6.2. Bucket, backhoe, heavy-duty, 60", minimum 370 lbs. weight, ditch cleaning type. Delete standard bucket.

20.7. Front-wheel drive, mechanical, with traction tread tires.

20.8. Bucket, heavy-duty, 4-in-1 multi-purpose minimum 1.25 cu. yd. (SAE heaped) capacity, bolt on cutting blade, complete with all hydraulics and controls required. Fixed installation. Delete standard bucket.

20.9. Forklift attachment flip-over, attached to loader bucket, 48 inch forks, adjustable width, minimum 3,000 lbs. capacity.

20.10. American Coupler System (ACS) hydraulic quick coupler or equivalent, furnished and installed, consisting of a single point, self-aligning male master pinned to the loader arm linkage in place of the bucket. (The manufacturer's quick coupler system may be furnished instead of the American Coupler System (ACS) quick coupler if the manufacturer's quick coupler system is completely compatible with the ACS system and its attachments.) Pressure and return line, quick-disconnect connection points, located on the loader bucker arm near the loader bucket pivot pin to provide quick and easy hook-up of hydraulic attachments by the operator standing on the ground. Dust caps with retainers shall also be provided.

20.11. ACS Coupler Attachments

20.11.1. Forklift attachment, for use with ACS quick coupler, 48" forks, adjustable width, minimum 5,000 lbs. capacity.

20.11.2. Bucket, loader, heavy-duty multi-purpose (4 in 1) type, minimum 1.25 cu. yd. (SAE heaped) capacity, complete with all hydraulics needed, with ACS quick coupler. Delete standard bucket.

20.11.3. General purpose bucket, 1.25 cubic yards compatible with the American Coupler System (ACS).

20.12. Extend-A-Hoe (Extendable dipperstick) with a minimum of 3' 5" extension beyond reach of dipper supplied on base unit. Delete manufacturer's standard dipperstick. Add additional counterweight for stability and satisfactory operation. All required hydraulics and controls supplied and installed.

20.13. Demolition Hammer - Unit shall be equipped with a demolition hammer driven by the auxiliary hydraulic tool circuit and mounted on the backhoe boom in lieu of a bucket. The hammer shall produce a minimum of 700 blows per minute with a minimum of 750 foot pounds of energy per blow. Weight of the basic hammer without adapter plates or working tools shall be at least 965 pounds.

20.13.1. The hammer shall be installed on the machine and tested for proper operation prior to delivery.

20.13.2. Demolition hammer shall have quick-disconnect type fitting and couplers to allow for quick and simple changeover from demolition hammer operations to backhoe bucket digging operations.

20.13.3. The hammer shall be furnished complete with one or more of the following working tools as listed on the Purchase Order.
Pipe Driver
Asphalt Cutter
Straight Moil

Line-Cut Chisel
Tamper
Post Driver, 3- or 4-inch (76 or 101 mm).
30-Degree Breaker

20.14. An auxiliary backhoe hydraulic tool circuit and controls powered by the unit's central hydraulic system shall be provided. System shall be complete with all necessary fittings, hoses and related components to power hydraulic attachments such as a hammer, bucket swivel coupler, and other hydraulically operated attachments. The auxiliary hydraulic tool circuit shall include, but not be limited to, the following:

20.14.1. Quick-disconnect, dripless couplers at hose ends to attachment(s).

20.14.2. System activation and tool circuit operation controlled from the operator's station.

20.14.3. Pressure and return line, quick-disconnect connection points, located on the dipperstick near the backhoe bucket pivot pin to provide quick and easy hook-up of hydraulic attachments by the operator standing on the ground. Dust caps with retainers shall also be provided.

20.15. Outrigger cylinder guards to protect exposed cylinder shafts when outriggers are down. Guards shall automatically position themselves when outriggers are lowered and raised.

20.16. Additional Safety lights and installation details/pricing shall be provided to purchaser at time of quote.

20.17. High back seat option in lieu of standard seat.

20.18. Optional equipment additions, deletions and/or substitutions of equipment in accordance with special conditions of the bid invitation (allows purchasing of units from the term contract with various option combinations).