MISSOURI DEPARTMENT OF TRANSPORTATION

GENERAL SERVICES DIVISION

DRAFT SPECIFICATIONS

FOR

35,000 LB. GVWR

SINGLE AXLE DUMP TRUCK

WITH 10 FT. BED

June 25, 2007

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STANDARD SPECIFICATIONS

The Missouri Department of Transportation, Central Office General Services Division, shall hereafter be referred to as “MoDOT.” The Missouri Department of Transportation, Central Office General Services Fleet Manager shall hereafter be referred to as the “MoDOT Fleet Manager.”

The successful bidder shall hereafter be referred to as the “Vendor.” The outfitter or installer of all non-chassis manufacturer installed components shall hereafter be referred to as the “Body Builder.”

This specification is designed to provide MoDOT with efficient and dependable single-axle trucks for maintenance operations. Their use will include material hauling, trailer towing, and operation of hydraulically controlled snowplows and a 10-foot material spreader. Each truck shall be complete with all standard equipment, plus any optional or special equipment to meet the complete specifications as stated in this bid. Each truck shall be fully operational, with all mechanical adjustments made prior to delivery. The hydraulic/spreader control system shall have all hydraulic function controls calibrated for proper operation before inspection and delivery of the completed truck. Calibration of the granular material application, and the granular pre-wet system, shall be the responsibility of MoDOT.

For each truck:

1. **All** chassis, body, component, and snow equipment grease fittings shall be lubricated per manufacturer’s specifications.
2. Chassis driveline universal joints shall be lubricated until fresh grease appears at all four bearing caps.
3. Each truck shall be equipped with all safety components that are required by the current Federal Motor Vehicle Safety Standards, with the exception of a fire extinguisher and reflective triangles.
4. Each truck shall also comply with all vehicle weight, dimension, and safety requirements of the State of Missouri.
5. The Vendor shall provide specific information for the lubricants and coolant required by the complete chassis. This information shall include an ASTM, TMC, or MIL. Spec number for the following items:

    A. Engine Oil
    B. Engine Coolant
    C. Power Steering Fluid
    D. Manual Transmission Fluid
    E. Rear Axle Lubricant
    F. Chassis Lubricant
    G. Driveline Lubricant

Fabrication of components and installation of systems must be performed in the Body Builder’s own shop, or other facility which shall be pre-approved by the MoDOT Fleet Manager.

Certain options are cause for chassis specification changes. It is advised that prospective chassis vendors review the entire specification, including the Optional Equipment sections.

All items not specifically listed in this specification, but necessary for proper and efficient operation of this unit, must be supplied and included in the bid price.

COMMON REQUIREMENTS

The following specifications shall apply to common requirements for all components included in the purchase package of single axle trucks, including optional equipment. Included are requirements for the following items:

1. Exception and/or Approved Equal Requests
2. Manuals and Service Publications
3. Paint
4. Prototype Truck
5. Pilot Inspections
6. Pre-Delivery Inspection
7. Warranty
8. Training

1. EXCEPTION AND/OR APPROVED EQUAL REQUESTS

A. All specified chassis equipment is to be OEM installed, either as standard equipment, a line installed option or factory authorized DSO/SE installation unless otherwise specifically stated.

B. Any items that are not available as chassis OEM installations, and/or any other component, installation, item, or equipment that a Vendor wishes to bid differently than requested in these specifications must be listed clearly on an attached sheet, and will require pre-approval from the MoDOT Fleet Manager. Any literature, technical data and/or other 'proof' needed to support such a request shall be included.

C. All items requiring MoDOT Fleet Manager pre-approval are to be submitted at such date and time determined by MoDOT at the pre-bid conference.

D. Final approval of any Vendor or manufacturer's equipment may require a demonstration, current user list, and/or tour of their facility to determine compliance and acceptability. Vendors shall make available, upon request and within one week of notification by MoDOT, any or all of the following:

i. **Demonstration -** A typical and similar same model machine and/or component shall be provided to MoDOT for up two working days of unimpeded evaluation. A physical use demonstration may be conducted if applicable at a MoDOT Maintenance Facility. Equipment will be operated by MoDOT personnel.

ii. **Contact List** – The name, address, and telephone number of other customers using the same equipment within the State of Missouri that can be contacted and a visit arranged.

iii. **Facility Tour** – Vendor shall provide a list of suitable times to MoDOT within regular daytime work hours when an inspection tour of their installation and/or manufacturing facility would be convenient.

E. All costs associated with providing any or all of these items are the sole responsibility of the vendor. Inability to comply with any or all will be adequate reason for bid rejection.

F. MoDOT reserves the right to reject, without reservation and in our opinion, any equipment and/or Vendor it deems:

i. Not capable of conveniently and/or economically performing the work required.
ii. The Vendor has limited or no experience with, to include components, parts, pieces or items that, previous to this bid, the Vendor has not marketed, manufactured, or installed, generally meaning it is not a normal production item, installation and/or function in their facility.
iii. Does not have an adequate service and support infrastructure in place to provide continuing long-term service and support of the product(s) being proposed.

G. MoDOT reserves the right to waive compliance on minor technicalities on this specification; to reject any or all bids; and to accept that bid which, in the opinion of MoDOT, is in the best interest of the State.

H. Changes to this specification after bid award must be made in writing, approved, and signed by a General Services Equipment Inspector.

2. MANUALS AND SERVICE PUBLICATIONS/SOFTWARE

Publications must be bound into manuals or installed in binders when delivered to MoDOT; boxed, shrink-wrapped or otherwise unbound loose pages are not acceptable.

A. Operator Manuals

A complete set of operator manuals shall be furnished with each completed truck.

i. A complete set of Operator Manuals for the chassis, engine, transmission, and all OEM installed components shall be furnished with each completed truck.
ii. A complete set of Operator Manuals for all Body Builder-installed components shall be provided with each completed truck.

B. Service Manuals

i. **Chassis**

Service manuals are to include diagnostic and repair procedures for all OEM installed components including, but not limited to, the chassis, engine, electronic engine controls, fuel system, emissions system, electrical system including all controllers, transmission, axles, and HVAC.

a. **Paper Copies** – Two (2) complete sets for each model year per district, 10 districts total.
b. **CD-ROM** - Two (2) complete sets for each model year per district, 10 districts total.
c. **On-Line Version** – An on-line service system, comparable to those available to dealerships, shall be provided, with accessibility for 100 concurrent users. MoDOT must pre-approve on-line systems.

ii. **Body Builder-Installed Components**

Service manuals are to include diagnostic and repair procedures for all Body Builder-installed components, including but not limited to, the

hydraulic system, spreader control system, warning light system, material spreaders, and underbody and wing plows.

Paper Copies – Twenty (20) complete sets per district, 10 districts total. A change of supplied components shall require updated manuals to be issued.

C. Diagnostic Software

Diagnostic software provided shall include the engine and emissions, transmission, chassis electrical systems, and ABS brakes. A diagnostic software set shall include the four listed software programs and all necessary cables and interface devices:

i. Vendor shall provide ten (10) diagnostic software sets per district, ten (10) districts total.
ii. Vendor shall provide a "per set price," allowing additional sets to be purchased.
iii. New software to support product upgrades, and cables and interface devices if different, shall be provided at the previously described quantities. Vendor shall provide a price for the new software, and cables and interface devices, if different, allowing additional sets to be purchased.

D. Parts Manuals

i. **Chassis**

On-line Version – An on-line parts catalog system, comparable to those available to dealerships, shall be provided, with accessibility for 100 concurrent users. Parts system shall be complete for all OEM-installed components, including but not limited to, the chassis, engine, electronic engine controls, fuel system, emissions system, electrical system including all controllers, transmission, axles, and HVAC. Catalogs shall be fully illustrated. MoDOT must pre-approve on-line systems.

ii. **Body Builder-Installed Components**

Manuals shall be complete for all Body Builder-installed components, including but not limited to, the hydraulic system, spreader control system, warning light system, material spreaders, and underbody and wing plows.

Paper Copies – A VIN-number specific manual shall be supplied with each completed truck. This manual shall include:

1. Make and model of all Body Builder-installed components.
2. Complete, fully illustrated parts listing for all Body Building-installed components.
3. Each add-on electrical accessory circuit shall have its own circuit diagram, showing the complete power and ground sides, routing, wire color and gauge, pin numbers, switches, breaker or fuse location and/or number, and specific ground point locations.

4. Each add-on air powered accessory circuit shall have its own circuit diagram, showing valve location, air line color, air line size, and routing.
5. A complete hydraulic schematic of all accessory circuits, including flow specifications and pressure settings for relief valves on each circuit.
6. For each hydraulic hose installed, the diameter and overall length of the hose, including both fittings, and the type and size of each fitting.

E. Line Sheet

Each completed truck shall be delivered with a factory line sheet listing all chassis component codes as installed by the chassis manufacturer. An on-line version may be substituted in lieu of paper copies. MoDOT must pre-approve on-line versions.

3. PAINT

All Equipment shall be thoroughly cleaned and completely painted with a high quality corrosion resistant finish. Finish shall be smooth, shiny, and free of runs, overspray, and/or other defects.

**** NO bare ferrous metal components shall be visible on the chassis, or any OEM or Body Builder-installed components.****

A. Truck Cab and Chassis

i. Truck cab shall be painted with a two-step factory base coat, clear coat process.
ii. Cab paint color shall be: DuPont N2065-Yellow.
iii. Frame and undercarriage shall be completely painted with a high quality black single-step finish to provide maximum corrosion protection.

B. Body-Builder-Installed Components

i. All manufactured ferrous equipment attached to the chassis shall be sand or media blasted to remove all mill scale, oils, dirt, rust, shipping primer and/or other contaminants from the steel surfaces, then thoroughly cleaned. This shall include at a minimum the front plow hitch; dump body, any wing plow or underbody scraper, valve enclosures, reservoir, and any other components that are subject to corrosion.
ii. Paints and primers used shall be 100% lead and chromate free. MSDS on products used shall be made immediately available to MoDOT upon request.
iii. All components shall be painted with a premium quality polyurethane or powder coated finish, consisting of minimum 2 mils dry film build corrosion resistant epoxy primer top coated with 2-3 mils dry film build paint. Minimum finished application thickness, 4 mils dry film build.
iv. All visible finishes shall be smooth, shiny, and free of runs, overspray, and/or other defects.

v. Body accessories that are required to be welded on, i.e., ladders, steps, tarp brackets, warning light brackets, cab shield, etc., are to be installed by the Body Builder prior to priming.

vi. Upon completion of component installation, the Body Builder shall touch-up factory chassis paint damaged during component installation.

vii. Colors:

a. All components used in the fabrication of a MoDOT truck that are required to be painted yellow shall be painted the same color as the cab, Dupont N2065 or a MoDOT pre-approved equivalent. These components include, but are not limited to, dump body, attachments to the dump body, and hydraulic oil reservoir.

b. All components used in the fabrication of a MoDOT truck that are required to be painted black shall be PPG DAR9000 or a MoDOT pre-approved equivalent. These components include, but are not limited to, the front bumper, front snowplow hitch and lift assembly, valve enclosure, rear hitch plate, all frame modification work, fabricated frame components, and the underneath side of the dump body.

4. PROTOTYPE TRUCK

A. A dump truck from MoDOT's previous contract will be made will be made available for prospective vendors to view and analyze. The truck will be available at the Missouri Department of Transportation Headquarters, Jefferson City, Missouri. Vendors are responsible for their own costs, if any are incurred, to view this truck. MoDOT reserves the right to move and/or use the truck in an emergency. An appointment must be made through the General Services Division. Contact a General Services Specialist at 573-526-7932.

B. The truck will illustrate the minimum acceptable design, subject to new specification changes. Any deviation from the design or new specifications will require review and pre-approval by the MoDOT Fleet Manager.

5. PILOT INSPECTIONS

A. Vendor shall notify MoDOT upon completion of the pilot chassis. Vendor may be required, at MoDOT's discretion, to make arrangements for an inspection of the chassis at the point of manufacture. Discrepancies and/or findings of non-compliance will be listed and must be corrected and/or addressed to the satisfaction of the MoDOT Fleet Manager before the rest of the chassis are built.

B. Within eight (8) weeks after receipt of cab and chassis, the Body Builder shall notify MoDOT of completion of the pilot truck, including all Body Builder installed components in the proposed locations. Arrangements will be made for MoDOT's inspection at the Body Builder's facility. Discrepancies and/or findings of non-compliance will be listed and must be corrected and/or addressed to the satisfaction of the MoDOT Fleet Manager before the rest of the trucks are built or outfitted.

C. All costs associated with all pilot inspections, including travel, lodging, and food, for four (4) MoDOT employees must be included in the bid price. In the event that multiple reviews are required prior to final approval of the pilot truck, the costs to MoDOT for those trips are the responsibility of the Vendor as well.

6. PRE-DELIVERY INSPECTION

A. Vendor/Body Builder

Upon completion, the Vendor and/or Body Builder shall do a thorough pre-delivery inspection of each completed truck to include the chassis and all installed components and snow equipment. Inspection shall be customized to reflect snow removal truck requirements, including but not limited to: hydraulic system individual pressure settings, hydraulic controls operation, spreader control system operation, wing plow and underbody scraper operation, dump bed and tailgate operation, tarp system, warning lights, hydraulic hose and electrical wire routing and protection. Inspection results shall be recorded on a pre-printed form, which shall include the last 8 digits of the truck VIN. A copy of this inspection, signed and dated by the technician who does it, shall be placed in the left door pocket of each truck.

B. MoDOT

MoDOT reserves the right to complete a thorough pre-delivery inspection of each completed truck at the final assembly point. This inspection will include the chassis and all installed components and snow equipment. Vendor shall provide a weekly production and planned delivery schedule to accommodate plant inspections and deliveries to districts. Trucks shall not be delivered to MoDOT destinations without prior approval by the MoDOT Fleet Manager.

7. WARRANTY

If any standard retail warranty exceeds these minimum terms, the standard warranty shall apply. Information on such warranties shall be submitted to MoDOT.

A. Truck Chassis

i. The chassis manufacturer shall guarantee to furnish all warranty services gratis at franchised dealers within the State of Missouri.

ii. From the date that MoDOT assigns the completed truck to its requesting location, the manufacturer and/or its representative shall provide a no-deductible, all-inclusive warranty (less normal maintenance) for a minimum of 1 year/12,000 miles, whichever comes first.

iii. From the date that MoDOT assigns the completed truck to its requesting location, the manufacturer and/or its representative shall provide a no-deductible warranty (less normal maintenance) for a minimum 2 years/24,000 miles, whichever occurs first, for the drive train.

iv. From the date that MoDOT assigns the completed truck to its requesting location, the manufacturer and/or its representative shall provide a no-deductible warranty (less normal maintenance) for a minimum 5 years/80,000 miles, whichever comes first, for the engine, engine

electronics, fuel system including injectors and emission system components.

B. Snow Removal Equipment

From the date that MoDOT assigns this equipment to its requesting location, the manufacturer and/or its representative shall provide a no-deductible, all-inclusive warranty (less normal maintenance) for a minimum of one year.

C. Body Builder-Manufactured/Installed Components

From the date that MoDOT assigns the completed truck to its requesting location, the Body Builder shall provide a no-deductible, all-inclusive warranty (less normal maintenance) guaranteeing the design, material, installation, and workmanship of the completed unit and all installed components for a minimum of one year. LED warning light system warranty shall be for a period of two years.

The Body Builder shall provide a list of authorized repair stations that will perform warranty repairs on all Body Builder-installed components on the truck. These stations, one per district, should be centrally located within each district, and handle all associated billing directly with the Body Builder.

D. In-House Warranty

The Vendor shall establish and honor an in-house warranty program. This program shall cover the entire truck as delivered, including the chassis and all Body Builder-installed components and snow equipment.

i. **Chassis** - The in-house warranty shall remain in effect for the duration of the chassis warranty.

ii. **Body Builder-Installed Components** - The in-house warranty shall remain in effect on all Body Builder-installed components for a minimum of one year (two years for LED light system) after assignment of the truck to its requesting location.

iii. **Conditions -** For the first year after acceptance by MoDOT there shall be no minimum price restriction, and prior approval of the Body Builder or Vendor will be needed for repairs expected to exceed $500.

For the second year and remainder of applicable warranties, there shall be a $40 minimum price exclusion, parts and labor combined. Prior approval from the Vendor will be needed for repairs expected to exceed $500.

The Vendor or Body Builder shall reimburse all warranty parts supplied by MoDOT. Warranty repair labor provided by MoDOT shall be reimbursed by the Vendor. The Vendor shall submit an hourly labor rate based on fair market value with the bid. The hourly reimbursement rate must be pre-approved by the MoDOT Fleet Manager prior to contract award. All shipping for new parts sent and warranty return parts shall be paid by the Vendor or Body Builder.

8. TRAINING

The Vendor, in cooperation with all sub-contractors, shall provide training to MoDOT as described below. All training content and scheduling shall be coordinated through a General Services Equipment Inspector at 573-522-5233.

Training not meeting the needs of the attendees will require review, and the revised course conducted at a later date at the vendor's expense.

A. Operator

Vendor shall collaborate with MoDOT to provide the necessary operator training for the completed truck, including diesel particulate filter regeneration, and all Body Builder-installed components. Vendor and MoDOT shall agree on the content of this material, based on the differences between the new trucks of this contract, and the existing fleet. Vendor shall, at his expense, provide necessary materials and information to MoDOT's HRED division, who will use this material to update existing operator training material.

B. Mechanics

The Vendor, in cooperation with sub-contractors, shall provide technical training for all components of the complete truck. All costs for training and materials are the responsibility of the Vendor.

1. **Vendor-Supplied Training -** The Vendor shall provide training for the listed critical areas. This training shall consist of the same training as is provided to technicians employed by dealerships who sell these components, with the following exceptions:

    a. Course content shall be tailored to meet the specific needs of MoDOT mechanics, and shall not place emphasis on areas or components not specified in these specifications. Course shall also include as much hands-on content as needed to reinforce lecture content.
    b. If feasible, class location should be at the MoDOT HRED training facility in Jefferson City, Missouri, or locations specified within each district.
    c. A minimum of 2000 hours of training per year for the duration of the contract, covering all areas of the complete truck, shall be provided. For example, an eight-hour class, attended by ten mechanics, will be considered as 80 hours of training.
    d. The Vendor shall provide toll-free telephone numbers for technical assistance to MoDOT mechanics on all major components on the completed truck.

2. Critical Areas

a. **Cab and Chassis Systems**

i. Engine diagnostics and repair, including electronic controls, fuel system, and emissions system.
i. Electrical system controllers, operation and diagnostics.
ii. Automatic transmission diagnostics and repair.

b. **Body Builder-Installed Components**

i. Hydraulic system operation, diagnostics and repair.
ii. Electrical accessories operation, circuits, diagnostics and repair.
iii. Spreader control system operation, diagnostics and repair.
iv. Warning light system operation, diagnostics and repair.

9. IN-HOUSE TRAINING

The Vendor, in cooperation with sub-contractors, shall provide technical training materials to MoDOT. This material (Power Point presentations, CDs, handouts, etc.) shall be the same material used for the Vendor-supplied training. This material may be used by MoDOT personnel for additional in-house technical training.

SPECIFICATIONS
FOR
SINGLE AXLE DUMP TRUCK CHASSIS
GVWR: 35,000

1. BRAKES

A. **System Type** – Full dual air system with Bendix four-channel anti-lock system, rated at or above axle GVWR requirements.
B. **Compressor:** Bendix 13.2 CFM Tu-Flo 550.
C. **Air Dryer:** Bendix AD-IP heated air dryer.
D. **Front brakes:** Front brakes shall be cam actuated, 16.5” X 5” non-asbestos lined with MGM type 20 long stroke chambers.
E. **Rear Brakes:** Rear brakes shall be cam actuated,16.5” X 7” non-asbestos lined with MGM TR3030 long stroke brake chambers and heavy duty spring actuated parking brake.
F. **Slack Adjusters:** Automatic slack adjustors at all wheel positions.
G. **Trailer Brakes:** Truck shall be equipped to pull a four-wheel trailer with air brakes. Truck shall have a hand control valve, tractor protection valve, and trailer anti-lock provisions. Air lines must be run to the rear of the frame rails for glad-hand installation by Body Builder.
H. **Clear Frame Configuration:** Installation of the air tanks and/or dryer shall not inhibit the installation of snow removal equipment anywhere underneath the truck behind the cab (clear frame).

2. CAB

A. **Cab Design:** Conventional, nominal 82-inch wide, high-height cab shall have over 56.5 inches floor-to-headliner height and minimum 70 inches of shoulder room. Design shall be suitable to provide adequate headroom with the specified air-ride seats.
B. **Bumper-Back of Cab (BBC):** 105 inch minimum.
C. **Hood:** Three-piece tilting assembly, with spring tilt assist mechanism.
D. **Interior trim/insulation package:** Shall include a full headliner and back-of-cab trim panel(s). Color shall be medium brown or gray.
E. **Pedals:** All pedals shall be suspended from cowl. Floor mounted pedals are not acceptable.
F. **Front Grille:** Stationary to clear front snowplow hitch.
G. **Glass:** All tinted.
H. **Horns:** Air, top-of-cab with snow covers, or frame mounted under hood.
I. **Wing Vent Windows:** Operable, both doors.
J. **Sun visors:** Interior, left and right.
K. **Grab Handles:** Two interior, vertical, left and right.
L. **Grab Handles/Arm Rests:** Two interior, left and right, on doors.
M. **Mirrors:** West coast breakaway type, left and right, heated, set for 102-inch trailer, 7”x16”. Integral heated convex, left and right, below primary west coast mirrors, 8” round or 6” x 6” rectangular.
N. **Heater, air conditioning, and defroster:** Factory installed, highest BTU capacity available. Side window defrosters to operate with the windshield defroster system. Heater air selection for outside air source or in-cab air re-circulation. Air conditioning system to have self-diagnostic capabilities.

O. **Floor covering:** Heavy-duty rubber/vinyl floor mat with sound deadening backing covering entire floor, dark color.

P. **Seats:** Driver/passenger vinyl covered high-back air suspension with 3-point seat belts, tethered to allow free suspension movement. Each shall have an adjustable inboard armrest. National Cush-N-Aire Hi-Bac 195 or tallest approved equal.

Q. **Seat Belts:** Seat belts shall be a highly visible color, such as red or orange.

R. **Steering:** Factory tilt column with the smallest diameter steering wheel available for the specified front axle.

S. **Storage Areas:** Map pockets in both doors or other large storage area suitable for manuals and other incidentals. Must not be mounted to or part of back-of-cab interior liner.

T. **Overhead console:** Required, suitable for installation of a 2-way radio.

U. **Cab Suspension:** Factory installed air ride rear cab suspension.

V. **Bug/Stone Screen:** Factory installed, behind grille.

3. CHASSIS

A. **Ground Clearance:** There shall be a minimum 13 inches ground clearance under any frame mounted components, such as the fuel tank and/or its mounting brackets, steps, air tanks, battery box, etc.

B. **Battery Box:** Mounted left side behind cab, must not interfere with equipment. Non-spliced cables.

C. **Cab Steps:** Maximum ground to first cab entrance step height shall not exceed 18 inches. All steps shall be minimum of 5.5 inches wide. Steps required on both sides. MoDOT Fleet Manager must pre-approve step configuration.

D. **Power steering:** Integral hydraulic, gear. Ram system is not acceptable.

E. **Hydraulic Pump Drive:** Suitable chassis will have clearance provisions for a crankshaft driven, front PTO driveshaft. Driveshaft may run through frame cross members, but shall not pass through the radiator, charge air cooler, or air conditioning condenser.

F. **Wheelbase:** Wheelbase shall be determined by the collaboration between the chassis Vendor and Body Builder using the guidelines in the Dump Body Mounting section.

4. ELECTRICAL

A. **Alternator:** Leece-Neville BLP2303H, 140-ampere minimum, pad mounted.

B. **Batteries:** Three batteries, maintenance free, 12 volt, 1950CCA total.

C. **Cigar lighter**: A cigar lighter or power outlet shall be provided.

D. **Gauges:** Three way type; visual, light, and buzzer, dash mounted, easy operator viewing: Oil Pressure, Coolant Temperature, Air Pressure, Speedometer, Ammeter or Voltmeter, Fuel, Tachometer, and Hourmeter,

E. **Hourmeter:** OEM electronic. Must provide true engine running hours-of-operation.

F. **Low Coolant Level Warning:** Audible alarm.

G. **Ignition Switch:** Automotive key with accessory position. Each set of truck keys (2 sets required) shall have a key tag identifying the MoDOT number, which will be supplied to the successful bidder. Starter system shall include a clutch pedal safety switch on all manual transmission equipped trucks.

H. **Windshield Wiper System:** Electric with intermittent operation, electric washer pump. If a heavy duty or severe service wiper system option is available, it must be provided. Wipers shall be forced to the slowest intermittent speed if left on for a predetermined length of time with the parking brake set. Headlights shall be automatically turned on when the wipers are turned on.

I. **Exterior Light Test:** A pre-trip inspection feature shall cycle exterior lights enabling one person to check them.

J. **Radio:** AM/FM stereo.

K. **Courtesy lamps:** OEM interior lights to fully illuminate interior of cab and cab step areas.

L. **Electrical Protection:** Re-settable circuit breakers in lieu of fuses.

M. **Turn Signal Switch:** Self-canceling.

N. **Snow Plow Light Connections:** Factory installed harness with connector for installation of snowplow lights. Harness must provide circuits for high and low beam headlights, marker lights, and turn signals. A factory installed, dash mounted switch shall switch operation from the OEM headlights to the snowplow light headlights. Marker lights and turn signals must function on plow lights regardless of the dash switch position.

N. **Trailer Light Connection:** Factory installed 7-way connection socket (J560), anti-lock brake compatible, with sufficient cable to reach the rear of the frame. Socket must be wired for turn signal operation independent of brake lamps.

O. **2-Way Radio Wiring:** Factory installed wiring and circuit protection shall be installed with wires terminating in the overhead console. Wire ends shall be heat-shrinked to prevent accidental grounding. One circuit to be hot continuously with 20-amp protection, one circuit to be hot with ignition switch on, with 5-amp protection.

5. ENGINE

A. **Diesel:** Domestic, electronically controlled, turbocharged 4-stroke, liquid cooled, in-line 6-cylinder cast-iron skirt block only. Engine management system must be capable of road speed governing. Final engine management system electronic parameters will be determined at time of bid award.

B. **Displacement:** 466 cubic inch minimum.

C. **Certified Power Ratings Minimums:** 230 horsepower, 620 lb/ft torque, 420 lb/ft clutch engagement torque.

D. **Oil Drain Plug:** Magnetic.

E. **Air Intake System:** Total air intake system restriction shall be less than 18 inches/water at rated RPM/torque.

F. **Air Filter:** Two dry elements meeting engine manufacturer optimum filtration requirements.

G. **Antifreeze:** Extended life, testing to a minimum -35 degrees Fahrenheit.

H. **Radiator:** Largest capacity available for provided engine/chassis combination. If an optional corrosion resistant radiator coating or treatment is available, it must be provided.

I. **Engine Oil Filter(s):** Spin-on, throw away.

J. **Throttle:** Dash or steering wheel mounted, electronic, adjustable.

K. **Fan:** Air operated positive on-off temperature controlled clutch type with automatic mechanical failure lockup (on) provision. Viscous drives and electric clutches not acceptable.

L. **Engine Warning/Shut Down System:** Audible buzzer and lamp warning for high engine temperature and/or low engine oil pressure with automatic engine shut down feature. System must have an emergency override.

M. **Hydraulic Pump Drive Apparatus:** All trucks shall be ordered with an engine crankshaft front drive adapter plate suitable for installation of a Spicer No. 1310 accessory drive connector.

N. **Engine Control Harness:** Factory installed to provide Body Builder installation of remote PTO controls. Body Builder connection point to be located inside the cab.

O. **Engine Block Heater:** 120 Volt/ 1250 Watt. Receptacle shall be mounted below the drivers' door

P. **Restriction Indicator:** Indicator shall be mounted on or near the air filter housing, and provide graduated intake system restriction increments from 8 to 20 inches water. Filter Minder 3781-325 or approved equal.

6. EXHAUST

A. **Exhaust Stack:** Right-hand vertical, with sweep elbow to direct exhaust away and above cab.

B. **Shielding:** Stack must be shielded the full height of the cab.

C. **Clamps/Flex Tubing:** If flex tubing is used the tubing and clamps shall be stainless steel.

D. **Back Pressure:** Muffler backpressure not to exceed 1-inch Hg.

E. **Clear Frame Configuration:** Exhaust system design and/or components shall not hinder the installation of under-frame snow removal equipment anywhere behind the cab.

7. FRAME

A. **Rails:** Single rail, laminated rails not accepted.

B. **Strength:** 120,000 PSI minimum.

C. **RBM:** 2,500,000 in/lb minimum.

D. **Integral Extension:** Must have a minimum of 20" integral frame extension in front of grille.

E. **Bumper:** Delete factory front bumper.

F. **After-Frame (AF):** 55 inches minimum.

8. FRONT AXLE AND SUSPENSION

A. **Axle:** Standard manufacture 14,000-14,600 lb rated capacity.

B. **Axle Setting:** Set forward only. Axle set-back not to exceed 32" measured from the grille.

C. **Seals:** Wet, Stemco or approved equivalent.

D. **Suspension:** Parabolic tapered leaf springs, 14,000 lb. rated capacity, and auxiliary rubber booster springs, rated 2,000 lb. capacity each, with shock absorbers.

9. FUEL SYSTEM

A. **Fuel Tank:** Single non-polished aluminum, minimum 70-gallon capacity, left side mounted. Tank shall not extend more than 5 inches beyond rear line of cab.

Any portion of tank used as a step shall have non-skid grating. Tank shall be equipped with a drain port with plug.

B. **Fuel Maintenance System:** Fuel-water separator, with thermostatic fuel temperature controlled electric heater, and fuel filter with restriction/change indicator. Components shall be factory installed ahead of fuel primer and other fuel filter(s). Fleetguard or approved equal. Must be installed under the hood.

C. **Tank Heater:** Artic Fox in-tank fuel heater, engine coolant type. Must have a factory installed manual shut-off valve for summer operation. A Body Builder-installed shut-off valve may be substituted upon approval of the chassis manufacturer and MoDOT Fleet Manager.

10. REAR AXLE AND SUSPENSION

A. **Axle:** Standard manufacture 21,000 lb. minimum rated capacity.

B. **Drain Plug:** Magnetic

C. **Main Springs:** Multi-leaf, 23,000 lb minimum rated capacity with variable deflection rate.

D. **Overload Springs:** Multi-leaf, 4,500 lb rated capacity with the highest deflection rate available.

E. **Ratio:** Ratio to provide adequate grade ability and rear wheel torque, and provide sustained 65 MPH highway cruise speed at GVWR. Final determination to be at time of bid award.

11. TRANSMISSION

A. **Model:** Allison 3000RDSP, 6-speed, close ratio, automatic transmission.

B. **Shifter:** Dash mounted push button type with ‘Mode’ select button.

C. **Fluid:** Castrol Trans-Synd synthetic transmission fluid.

D. **Fluid Sensor:** Internal fluid level sensor.

E. **Cooler:** Extended heavy-duty type oil cooler.

F. **Drain Plug:** Magnetic, or magnet in oil pan.

G. **Secondary Shift Schedule:** Secondary shift schedule shall be programmed to change transmission shift points for snowplowing operations.

H. **Gauge:** Instrument cluster shall include a transmission temperature gauge.

I. **Protection Programming:** Transmission shall be programmed to automatically shift to neutral upon application of the truck parking brake.

12. WHEELS AND TIRES

A. **Front Wheels:** Heavy service 9.00 inch steel hub piloted Budd style 10-bolt. White powder coat finish.

B. **Front Tires:** Goodyear G291 or pre-approved equivalent, 315/80R22.5, LR "J", 18 PR, tubeless steer tread. Tires cannot be speed restricted below 65 mph.

C. **Rear Wheels:** Heavy service 8.25 inch steel hub piloted Budd style 10-bolt. White powder coat finish.

D. **Rear Tires:** Goodyear G164RTD or pre-approved equivalent. 11R22.5, LR "G", 14 PR, on/off road tubeless M&S drive tread

E. **Wheel Guards:** For metric hub-piloted wheels with flanged mounting nuts. Installed between hub/wheel, and between dual wheels.

13. ACCESSORY OPERATION PROVISIONS

A. Electric Accessories Power Supply: Factory-installed power supply system to control Body Builder-installed electric accessories. This shall consist of factory-installed; dedicated power supply, dash-mounted switches with indicator lights, circuit protection, single point location for Body Builder connections, and self-diagnostic capabilities. Larger indicator lights may be required for certain accessories. System must be programmable to allow for certain parameters that may be required for operating accessories in a particular manner. A determination of the accessories controlled by this feature and their operation will be made at the pre-bid conference.

B. Air Accessories Power Supply: Factory-installed power supply system to control Body Builder-installed air accessories. This shall consist of factory-installed regulated air supply, dash-mounted switches with indicator lights, single point location for Body Builder connections, and self-diagnostic capabilities. System must be programmable to allow for certain parameters that may be required for operating accessories in a particular manner. A determination of the accessories controlled by this feature and their operation will be made at the pre-bid conference.

SPECIFICATIONS
FOR
BODY BUILDER PREPARATION

1. THREADED FASTENERS

A. All threaded fastener components (bolts, washers, nuts) with a diameter designation greater than or equal to SAE 1/2 inch shall be of minimum grade 8 composition. Nuts shall be all metal self-locking, lock washers are not acceptable. A minimum of two bolt threads must extend through all nuts. All components shall have grade identifier marks and a registered manufacturer's logo.

B. All threaded fastener components (bolts, washers, nuts) with a diameter designation greater than or equal to SAE 1/4 inch up to less than SAE 1/2 inch shall be minimum grade 5 composition. Nuts shall be self-locking, either poly-lock or all metal, lock washers are not acceptable. A minimum of two bolt threads must extend through all nuts. All components shall have grade identifier marks and a registered manufacturer's logo.

C. All threaded fastener components (screws/bolts, washers/lock washers, nuts) with a diameter designation less than SAE 1/4 inch shall be minimum grade 2 composition.

2. ELECTRICAL AND ILLUMINATION INSTALLATION

A. All installed wiring must be of adequate size to handle the anticipated loads of all electrical components. All wiring must be uninterrupted, and complete with no splices.

B. All wiring must be color-coded.

C. All wire terminal ends (spade, ring, etc.) shall be: crimped, soldered to the wires and heat shrank, or weatherproof connectors. Scotch-Loc fasteners and/or crimp butt connectors are not acceptable for any connection.

D. All electrical connections shall be protected with dielectric silicone grease.

E. All wiring shall be enclosed in a protective wiring loom, conduit, or wrapped harness.

F. The edges of all holes through which wiring must pass shall be protected with a grommet.

G. Low current circuits, such as the spreader light or relay activation circuits, shall be controlled by the chassis electric accessory power supply.

H. High current circuits, such as the tarp motor circuit, shall be powered directly from the battery, and protected by a master re-settable breaker, or a fusible link.

I. Body Builder installed wiring going to the rear of the frame and dump body shall be grouped together and bound. This bound harness shall then be secured to a painted metal strap, approximately 1 ¼" X ¼" in size. This strap shall be secured to the top of the frame cross members away from the side rails.

J. All wiring to lamps shall be stress relived within 6 inches of the lamp.

K. Wiring routed through the hydraulic enclosure sides shall be routed through a sealed compression type strain relief, or a molded bulkhead fitting.

3. AUXILIARY SNOWPLOW HEADLIGHTS

If factory installed snowplow lights, or a suitable factory installed bracket is available, it may be submitted for approval. The MoDOT Fleet Manager must pre-approve any bracket before production begins.

A. Front auxiliary halogen headlights shall be Truck-Lite model 645.
B. Auxiliary headlights shall not obstruct the driver's vision, and be mounted approximately 64” from ground level, and at approximately the same width apart as truck’s headlamps.
C. Light shall be secured to a fender mounted, 3-point assembly bracket. Bracket shall be made from stainless steel.
D. All fasteners attaching the bracket to the fender shall be stainless, and be secured using locknuts.
E. Reinforced rubber washers or grommets shall insulate the bracket from the hood. Fasteners attaching the bracket to the hood shall be insulated from the hood by a 2-inch minimum diameter rubber washer or grommet and 2-inch minimum diameter plated washer.
F. Auxiliary headlights shall be grounded back to chassis ground; minimum 14-gauge wire shall be used. Drill holes to accommodate wire size.

4. HYDRAULIC INSTALLATION

A. All hoses shall be routed in a manner to minimize rub points and bends. Critical rub points shall be wrapped for protection.
B. All hoses shall be routed or shielded to protect them from heat sources.
C. Teflon tape shall not be used in the hydraulic system.
D. Hydraulic hoses shall not be secured to any factory-installed chassis wiring, cables, hoses, or lines.
E. Hydraulic hoses shall not be secured in the same bundle with any electrical wiring.
F. Hydraulic hoses shall be bundled together and routed by themselves.
G. Hoses shall be adequately supported and securely fastened to withstand snow and icing conditions.
H. All pressure and return hoses shall be rated for at least 3000 PSI working pressure.
I. Hydraulic hoses running to the rear of the truck shall be secured to a painted metal strap, approximately 1-1/4-inch x 1/4-inch in size. This strap shall be secured to the top of the frame cross members away from the side rails.
J. Each hose going to the dump body shall have 90-degree bulkhead mounted JIC elbows installed at the rear of the truck frame near the dump body hinge. These elbows shall split each hose going to the dump body into two hoses, allowing for easier routing and replacement.
K. Hydraulic ports shall be “o-ring” type.

5. AIR POWERED ACCESSORY INSTALLATION

A. All lines shall be routed in a manner to minimize rub points and bends. Critical rub points shall be wrapped for protection.
B. All lines shall be routed or shielded to protect them from heat sources.

C. Air lines shall be colored, identifying individual circuits, with each circuit being a different color. Color-coding shall remain consistent for the duration of the contract.

D. Body Builder installed accessory air lines going to the rear of the frame and dump body, shall be grouped together and bound with the Body Builder installed wiring going to the rear of the frame and dump body. This bound harness shall then be secured to a painted metal strap, approximately 1 ¼" X ¼" in size. This strap shall be secured to the top of the frame cross members away from the side rails.

E. All air-powered accessories shall be controlled by the chassis air accessory power supply.

6. BUMPER, FRONT SNOWPLOW HITCH AND LIFT ASSEMBLY

Heavy-duty channel, swept back front bumper. The bumper must be designed to attach the design of snowplow currently used by MoDOT, and to evenly transmit the snowplow load to the truck frame under continuous severe service. See attached drawings SP-6, SP-6-A, SP-6-B, SP-6-CA, SP-6-D, SP-6-E, SP-6-F, SP-6-G, SP-6-H, SP-6-J, SP-6-NA, SP-6-W, SP-6-X, SP-6-Y, and SP-6-Z.

A. Bumper shall be secured to the truck frame using fine thread, grade eight, frame style hardware. Nuts shall be all metal, top-lock style locknuts. Serrated hardware is not acceptable.

B. Lift assembly shall include a Monarch CS250 hydraulic cylinder for lifting the snowplow.

C. The lift assembly shall fold down when not in use. The front snowplow hitch and lift assembly must be securely welded to the front bumper.

D. Hydraulic quick couplers shall be installed on the front bumper as listed in the Hydraulic Specification section, item 9.

7. REAR HITCH PLATE AND PINTLE HITCH

A 3/4-inch thick steel rear hitch plate shall be securely welded and gusseted to rear of frame rails. Rear hitch plate shall include the following items:

A. Service and emergency trailer glad-hands, positioned away from the center of the rear hitch plate to prevent interference with a trailer tongue when making tight turns. Glad-hands shall be mounted to a bulkhead fitting installed in the plate, and have tethered, removable covers.

B. The J560 trailer connection furnished with the chassis shall be mounted through the rear hitch plate in a suitable location.

C. Two (2) Buyers Products B50 or pre-approved equivalent DOT "D" rings, with 20-ton capacity each, shall be securely welded to the rear hitch plate.

E. A Premier model Saf-Tit 100 rigid pintle hitch shall be installed on the rear hitch plate using grade eight hardware torqued to specifications. Hitch shall be 24" centerline height above the ground, plus or minus 1".

8. TOOL BOX

A Weather Guard model R-524-B or equal toolbox must be included and mounted on the right hand outside frame rail.

9. GREASE ZERKS

A. ALL GREASE ZERKS WILL BE THREADED. DRIVE IN ZERKS ARE NOT ACCEPTABLE.

B. All threaded holes for grease zerks shall be of sufficient depth to prevent the zerk from bottoming out when tightened.

10. BACK-UP ALARM

A back-up alarm, meeting OSHA specifications, shall be installed at the rear of the frame. Alarm shall be installed in a protected area.

SPECIFICATIONS
FOR
HYDRAULIC/SPREADER CONTROL SYSTEM

1. CONTROL SYSTEM

The hydraulic/spreader control system shall be a complete control system that operates on a CAN BUS, using CAN OPEN J1939 protocol. The system shall consist of modules that reside on the BUS, and allow flexibility in mounting configurations. The system shall be completely expandable and allow for additional modules to be added to the BUS, such as a joystick control for an optional underbody scraper. The system controller, or valve driver module, shall control all standard hydraulic functions; dump body hoist, snowplow lift, snowplow left/right, auger, spinner, hydraulic driven pre-wet, and optional hydraulic functions. The control system shall be capable of providing ground speed sensing, closed loop spreader and granular pre-wet system operation. The control system shall be capable of applying 200-400 lbs. of granular material per lane mile at speeds up to 45 mph. The actual application rate shall be +/- 5% of the selected application rate. The spreader control system shall work equally well whether the truck is driven forward or in reverse.

A. All modules of the system shall be software upgradeable using a laptop and interface cable. The system shall have an Ethernet port for accessing a built in Web server. The Web server may be used to configure or troubleshoot a system by connecting to a PC. Interface shall utilize Internet Explorer and not require any proprietary software to connect to the system. No external components shall be required to calibrate the system.

B. The system shall incorporate three levels of security and access that are password protected and defined by the user. The three levels of access shall provide access to the system setup, data, configuration fields, and parameters based upon access given.

C. The system shall have a built in diagnostic feature allowing technicians to view all input signals in real time. The system shall also provide error logging and system status change logging for reviewing operator inputs.

D. The system shall be capable of both automatic and manual modes, and provide a lock out of manual mode.

E. The system shall provide ‘blast’ and ‘pause’ functions, and be capable of gate control.

F. The system shall be capable of operating at least four different programmed materials.

G. The system software shall incorporate a “test speed” mode for use in testing the system safely without requiring the truck to be moving or the drive axles engaged.

H. The system shall provide monitoring, and audible and visual operator warning, for low hydraulic oil level and hydraulic oil overheat conditions.

I. The system shall suspend operation of the spreader and all hydraulic accessory functions in the event of a low hydraulic oil level and/or hydraulic oil overheat condition. The system shall have an override feature to allow function use in an emergency situation.

J. Auger feedback sensor shall be mounted to a hydraulic flow meter. Flow meter shall be mounted inside the hydraulic control valve enclosure. Feedback sensor

shall be hard wired to the valve driver module. Feedback sensor shall be replaceable independent of the flow meter.

K. The system shall provide open loop operation in the event of a feedback sensor failure.

L. The system shall use input from a pressure switch in the pre-wet enclosure to prevent pre-wet pump run-dry. This shutdown feature shall incorporate a buffer to prevent liquid pump shutdown due to an intermittent signal caused by sloshing material in the supply tanks.

M. The system shall provide stand-alone operation of the feeder circuit, and spinner circuit, for powering hydraulic accessories other than a slip-in spreader.

N. The system shall provide stand-alone operation of the pre-wet system, allowing it to be used for other operations.

2. VALVE DRIVER MODULE

A. The valve driver module shall be mounted inside the hydraulic control valve enclosure. No portion of the valve driver module may be outside of the hydraulic valve enclosure.

B. The valve driver module shall accept closed loop feedback signals and digital inputs.

C. The valve driver module shall have a minimum of 14 PWM output channels.

D. All PWM outputs shall be software configurable, and controlled by closed loop operation, proportional input devices, or digital input devices.

E. The valve driver module shall have internal over temperature shutdown, over current shutdown, and low voltage shutdown.

F. All electrical connections shall be IP68 sealed when mated utilizing threaded connections for positive retention.

G. The valve driver module will reside on the BUS as the “master”, and all truck values and configurations shall be saved in this module.

3. OPERATOR CONTROLS AND DISPLAY MODULES

A. System controls and display shall be resistant to salt and other chemicals used during the snow removal process.

B. System controls shall utilize detented rotary encoders for setting material application rates.

C. System controls shall utilize snap action push buttons for navigation through the system program, and function selection.

D. System controls shall be backlit for nighttime operation.

E. System display screen shall be a minimum of 20 square inches.

F. System controls and display shall be mounted in a factory made, painted or powder coated bracket. System display shall be operator adjustable for proper viewing angle.

G. System display shall automatically adjust brightness level for nighttime operation.

H. System display shall show; auto/manual mode, current material, granular rate, pre-wet rate, lane width, system status, error messages, plow float activated, system hydraulic pressure, and road temperature sensor information if optioned.

4. HYDRAULIC FUNCTION CONTROL LEVER MODULES

Hydraulic function control levers shall be proportional CAN BUS controls. Controls shall be mounted to the right of the driver and be within easy reach. Control levers to be labeled with decals for operation.

A. Truck shall be equipped with a single axis control lever with center position dead man lock for the dump body up/down. Control lever shall be spring returned to neutral. Configuration of the center position lock must be pre-approved by the MoDOT Fleet Manager.

B. Truck shall be equipped with a dual axis control lever for the snowplow lift, and snowplow left/right. Control lever shall be spring returned to neutral from all directions. Control lever shall be capable of placing the snowplow lift valve in float when moved to the extreme forward position. Control lever handle shall be equipped with a maintained pass/pause switch, and a momentary blast switch.

C. Controls shall be mounted in a factory style stand, spaced for full axis control.

5. CONTROL SYSTEM CABLE

Specifications shall be for all cables associated with the hydraulic/spreader control system.

A. System cables shall meet ISO rating IP68 and NEMA 6.

B. The connectors shall be 0-ring sealed.

C. The cable jacket should be TPE (thermoplastic elastomer), and molded to the connectors.

D. Connectors and harness should be rated and tested for a temperature range from –30C to + 70C.

E. Connectors should be tested to be water tight when submerged in 6’ of water for 24 hours, in 275’ of water for 1 hour, and when subjected to a 1000-psi pressure wash.

F. The connectors should be designed to have no corrosion after 5000 hours in 35C salt spray.

G. Cabling should be rated excellent in low temperature flexibility and in its resistance to oxidation, heat, oil, sunlight, ozone, abrasion, electrical priorities, flame, gasoline, degreaser solvents, alcohol, and weld slag.

SPECIFICATIONS
FOR
GRANULAR PRE-WET SYSTEM

The hydraulic driven pre-wet system enclosure shall be mounted outboard of the truck frame ahead of the rear axle. The suction and discharge hoses shall be routed to the rear of the truck frame and secured with bulkhead mounted cam-lock couplers. Mounting location must be approved by the MoDOT Fleet Manager at the pilot review before the rest of the trucks are built.

A. The pre-wet system shall come complete with mounting hardware. Pump and hydraulic motor shall be mounted in a weather tight enclosure.
B. The pre-wet system shall be hard-wired to, and completely controlled, by the spreader control system.
C. The pre-wet system shall be hard-plumbed to, and supplied by the four-circuit motor manifold in the hydraulic valve assembly.
D. Liquid pump shall be a corrosion resistant bronze design.
E. Pump shall be self-priming, positive displacement design.
F. A manual bleed valve shall be installed in the suction hose at the enclosure to facilitate easier pump priming.
G. Unit shall come with a precision-machined stainless steel shaft.
H. Pump shall have oil-less carbon graphite bushings.
I. Pump shall have long wearing, mechanical shaft seal.
J. Pump shall have bronze gears.
K. The pre-wet system shall have a relief valve to protect against over-pressurization.
L. Pump shall have a maximum pressure rating of 100 psi.
M. Pump shall be plumbed through a 0-15 GPM flow meter, made of a non-corrosive material.
N. Pump shall be capable of producing 9 GPM at 40 PSI, with 4.5 GPM maximum oil flow to the motor.
O. Hydraulic connections shall be bulkhead mounted in the enclosure.
P. All hydraulics inside enclosure shall be hard plumbed.
Q. The pre-wet system shall have a pressure switch in the pump outlet circuit. The spreader control system shall use this switch to shut off the liquid pump to prevent damage to the pump from running dry.
R. Flow meter sensor wiring and pump outlet pressure switch wiring shall be combined in one single bulkhead mounted connector in the pre-wet enclosure, allowing for one cable between the pre-wet enclosure and hydraulic function control valve enclosure.
S. The pre-wet system shall include a ¼ turn valve and strainer-filter assembly for installation on the storage tanks on the material spreader.
T. The pre-wet system shall include spray nozzles and plumbing for installation on the material spreader. Nozzles should be of sufficient size and type for the capacity of the pre-wet system.
U. If a material spreader is optioned, components listed in lines ‘S’ and ‘T’ must be installed on the spreader and tested.
V. If a material spreader is not optioned, components listed in lines ‘S’ and ‘T’ shall be shipped loose, and placed in the frame-mounted tool box.

SPECIFICATIONS
FOR
HYDRAULIC SYSTEM

Vendor shall include with the bid, detailed manufacturer's literature on all major hydraulic components.

All components of the hydraulic system, including optional equipment, shall be designed to operate efficiently at a system maximum pressure of 2000 PSI.

NOTE: Hydraulic specifications listed in this section are for the **standard hydraulic configuration.** Trucks equipped with an underbody scraper or a mid-mount wing plow will require additional valves and controls. All components installed on the standard hydraulic configuration shall be capable of easily accepting the necessary additional hydraulic components for the underbody and wing snowplows as listed in the optional equipment section. The cost for additional hydraulic components required for the operation of an optional underbody or wing plow shall be included in the cost of that option.

1. HYDRAULIC RESERVOIR

The hydraulic oil reservoir shall be mounted to provide 3-4 inch clearance between the cab and reservoir.

A. The tank shall be of the upright design and mounted on top of the frame rails positioned between the cab and dump body.
B. Reservoir shall come complete with all mounting hardware; frame mounting angles, bolts with poly locknuts, and springs.
C. Reservoir shall be a minimum 40-gallon capacity.
D. Reservoir shall have a full baffle to prevent sloshing.
E. Reservoir and baffle shall be constructed of 10 gauge pickled and oiled steel.
F. Reservoir shall have a screened filler neck with a breather cap on the drivers' side.
G. A sight/temperature gauge shall be mounted on the drivers' side of the reservoir, and be easily visible. Sight/temperature gauge housing shall be all aluminum.
H. Reservoir bottom shall have a 3" NPT port for suction.
I. Suction strainer shall be 2" NPT with a 3-5 psi built in bypass, and have a full flow ball valve installed at the reservoir suction fitting. A heavy plastic wire tie shall be installed to insure the ball valve remains in the open position unless it is intentionally closed.
J. Reservoir shall have a ¾" NPT port with a magnetic plug for draining the reservoir.
K. Reservoir shall have a ¾" NPT port for the pump case drain.
L. Reservoir back shall have a 3/8" NPT port for the solenoid drain.
M. Reservoir back shall have a ½" NPT port for the low oil sensor.
N. Reservoir top shall come with provision for a tank-mounted filter on the passenger side.

2. HYDRAULIC RETURN FILTER ASSEMBLY

A. Filter assembly shall be mounted on the top of the hydraulic reservoir.
B. Filter assembly shall have a 10-micron replaceable cartridge element.
C. Filter assembly shall be capable of 80 GPM flow capacity.
D. Filter assembly shall have one 1 ¼" NPT port.
E. Filter assembly shall have a built in by-pass and a bypass condition indicator.

3. HYDRAULIC PUMP

A. The pump shall be axial piston, load-sensing type, and be driven off the engine crankshaft by means of a drive shaft.
B. The pump shall a minimum 5.18 cubic inch (85 cubic centimeter) displacement, and capable of 56 GPM (theoretical) at 2500 RPM and 4000 PSI.
C. The pump case drain must be positioned as high as possible and directed back to the reservoir without passing through the return line filter.
D. The pump must have an internal bleed down compensator.
E. The pump must have a keyed shaft with an SAE 2-bolt mounting flange.
F. The pump must have side ports. Rear ports are not acceptable.
G. Ports must be of the split flange design, sized accordingly for the displacement of the pump.
H. Suction fitting shall be a flanged, formed elbow hose barb. Fitting shall be of adequate size for the displacement of the pump.
I. Discharge fitting shall be an o-ring thread flange block. Fitting shall be of adequate size for the displacement of the pump.
J. A manual, high-pressure ball valve shall be mounted to pressure port of pump.
K. System shall be performance checked. System standby pressure shall be set at 400 psi. System main pressure shall be set at 2000 psi.
L. A pressure test port shall be provided at the pump by installing a 3/8" male Aeroquip FD45-1002-6-6.

4. HYDRAULIC PUMP DRIVE

A. The driveline must be 1280/1310 series solid shaft style.
B. Driveline must be installed according to manufacture's instructions to assure proper alignment.
C. The pump shall be driven off the engine crankshaft with a flange yoke.
D. Pump shaft shall have a flange yoke installed to allow shaft to be un-bolted from pump.
E. Universal joints used in the shaft must have grease zerks in the center of the bearing caps.
F. Hardware used for installation of the pump driveshaft shall be to driveline manufacturers specification. All drive shaft installation hardware shall be torqued to specifications.

5. HYDRAULIC FUNCTION CONTROL VALVES

Hydraulic function control valves shall be bulkhead fitting mounted in a weather-tight enclosure with the fittings on the bottom of the enclosure. Valves shall be mobile hydraulic, cast iron, stackable, load sensing type. All valves shall be operated with proportional electric coils. Proportional coils shall be compatible with the control system valve driver module PWM outputs. All valves within the valve assembly shall have parallel inlets. Valve assembly inlet and outlet ports shall be 1-inch o-ring. Work ports shall be ¾" o-ring. A and B ports shall be individually flow adjustable.

Standard Hydraulic Function Control Valve Arrangement

A. **Dump Body Hoist:** Double acting cylinder valve, with a work port relief valve for down pressure protection on port "A". Pressure setting shall be such that the relief valve will protect the dump body components if the hoist is powered down with the dump body props in place. Valve shall be spring return to neutral. Valve shall be pressure and flow-compensated, and have an adjustable flow range of 0 to 30 GPM. Valve shall prevent any up or down movement of a raised dump body when valve is in the neutral position. Valve shall have a manual override for both raise and lower functions.

B. **Front Plow Lift:** Single acting cylinder valve. Valve shall be spring return to neutral, with float capability in the lower position. Valve shall be pressure and flow-compensated, and have an adjustable flow range of 0 to 15 GPM. Valve shall have a manual override for both raise and lower functions.

C. **Front Plow Angle:** Double acting cylinder valve. Valve shall be spring return to neutral. Valve shall be pressure and flow-compensated, and have an adjustable flow range of 0 to 15 GPM. Valve shall have a manual override for both left and right functions.

D. **Spreader:** 4-circuit motor manifold. The manifold shall be an integral part of the valve assembly. Manifold to contain three solenoid operated, electrically variable, two port, pressure compensated, spool type, normally closed when de-energized, proportional flow control cartridges. Each cartridge shall operate by a 12-volt DC coil. Each cartridge shall have a manual override. The flow requirements for each circuit are as follows:

1. Spreader Auger 15 GPM
2. Spreader Spinner 11 GPM
3. Prewet Pump 7 GPM
4. Anti-Ice Pump 15 GPM (cavity plugged if not used for accessory circuit)

E. **Hydraulic Accessory:** A hydraulic accessory circuit shall be provided. This circuit shall be pressure and flow compensated. Accessory circuit shall have an adjustable flow of 0 to 22-25 GPM. Accessory circuit shall be capable of full pump output at engine idle and regulated to a maximum flow of 22-25 GPM. Accessory circuit shall use the same hose and coupler as the spreader auger circuit. It is permissible install a proportional flow-control cartridge in the un-used fourth circuit of the spreader manifold and 'tee' this circuit into the auger circuit to accomplish this, provided it does not affect the circuit when used as the spreader auger supply. Accessory circuit shall have a manual override.

6. HYDRAULIC FUNCTION CONTROL VALVE ENCLOSURE

The hydraulic function control valve enclosure must be mounted on the outside of the left hand frame rail. Enclosure must clear the underbody scraper, if optioned. Enclosure shall allow easy access to hose connections.

A. Enclosure shall be three (3) pieces: the enclosure body, valve mounting plate, and the lid.
B. Enclosure body and valve plate shall be constructed of ¼" steel.
C. The sides of the body shall have integral, formed mounting angles.
D. The outside lip of the enclosure shall have a gasket all the way around to seal from weather when lid is installed.
E. The lid shall be made of 10-gauge steel with a minimum 1" lip on all sides.
F. Lid shall be held on with rubber latches on each side.
G. Lid shall have 2 lifting handles.
H. The top and front of the enclosure shall be open with the lid off.
I. Valve plate shall bolt to the inside of the enclosure for ease of mounting.
J. There shall be a formed gasket to seal the valve plate to the enclosure.
K. Enclosure shall be large enough to accommodate a valve assembly capable of at least 10 functions.

7. SNOWPLOW CUSHION VALVE

A. A double-relief cushion valve must be installed for front snowplow angle.
B. The valve shall be set at 2000 PSI.
C. The valve shall be constructed of a high-tensile cast iron body with ball and spring style relief that has hardened seats.
D. The valve shall be installed at the front bumper/snowplow hitch.
E. Valve shall have o-ring thread ports.

8. HYDRAULIC HOSES

A. Suction hose from the reservoir to the pump shall be SAE 100R4 style of adequate size for the displacement of the pump. Hose shall be connected to the pump barbed fitting, and double clamped with T-bolt style stainless steel super clamps. Hose shall be connected to the reservoir ball valve with a king nipple, double clamped with T-bolt style stainless steel super clamps.
B. All hoses, with the exception of the suction hose, shall be rated for a working pressure of 3000 psi.
C. All hose ends, with the exception of the suction hose, shall be swivel or swivel adapters.
D. Hose ends connecting to valve assembly shall be 90-degree female JIC swivel.
E. Pressure hose shall be of adequate size for the displacement of the pump, with female JIC swivels at both ends.
F. Return hose shall be of adequate size with female JIC swivels at both ends.
G. Hoist hoses shall be ¾" ID with female JIC swivels at both ends.
H. Snowplow hoses shall be 3/8" ID with female JIC swivels at both ends.
I. Auxiliary hydraulic hoses to the right rear corner of the dump body dump body shall be 3/8" ID with female JIC swivels at each end. The auxiliary hydraulic hoses shall be "teed" at the control valve enclosure with the front snowplow lift, and left/right circuits.

J. Auger hose to the left rear corner of the dump body shall be 3/4-inch ID with female JIC swivels at both ends. The auger circuit shall have a capped 'tee' installed at the valve enclosure, enabling later installation of another hose routed to the front of the truck.

K. Spinner hose to the left rear corner of the dump body shall be 1/2-inch ID with female JIC swivels at both ends.

L. Spreader return hose to the left rear corner of the dump body shall be 1-inch ID with female JIC swivels at both ends. The spreader return circuit shall have a capped 'tee' installed at the return filter assembly, enabling later installation of another hose routed to the front of the truck.

M. Pump case drain shall be 3/4-inch I.D. minimum with female JIC swivels at both ends, and also have a 3/4-inch NPT ball valve installed at the reservoir.

N. Load sense line shall be 3/8-inch ID with female JIC swivels at both ends.

9. HYDRAULIC QUICK-DISCONNECT COUPLINGS

All hydraulic couplers shall be full flow Aeroquip FD45, Parker 60 series, or equivalent. A dust cap or plug shall be furnished with every male and female quick coupler.

See Dump Body section for detailed layout and mounting of couplers "C" through "F".

A. The front snowplow lift circuit shall be equipped with a male 3/8" FD45-1002-6-6 coupler installed in the front bumper. A 34" X 3/8" ID hose with a female 3/8" FD45-1003-6-6 coupler shall be installed on the hydraulic lift cylinder.

B. The snowplow cushion valve shall be equipped with a male 3/8" FD45-1002-6-6 coupler, and a 34" X 3/8"ID hose with a female 3/8" FD45-1003-6-6 coupler.

C. The auxiliary hydraulics at the right rear corner of the dump body shall be equipped with three male 3/8" FD45-1002-6-6 couplers.

D. The spinner circuit shall have a ½" male FD45-1002-8-10 coupler at the left rear corner of the dump body.

E. The auger circuit shall have a 3/4-inch male FD45-1002-12-12 coupler at the left rear corner of the dump body.

F. The spreader return circuit shall have a 1-inch male FD45-1002-16-16 coupler at the left rear corner of the dump body.

SPECIFICATIONS
FOR
"LOW-PROFILE" MULTI PURPOSE DUMP BODY

The following specifications and dimensions shall apply to a low profile multipurpose truck mounted dump body and hoist. This dump body shall be used for several different highway maintenance operations where the floor of the body needs to be readily accessible from the side of the truck, from ground level. This accessibility shall be accomplished with fold down sides, and a maximum floor height of 48" when mounted on a chassis with 11R22.5 rear tires. This dump body shall be capable of hauling a variety of materials up to the GVWR capacity of the chassis. This dump body shall also accommodate a 10' slip-in material spreader with attached liquid storage tanks.

1. GENERAL

The dump body provided shall be a multipurpose style, with fold down sides. Underbody cross-members for support will not be allowed. The floor, sides, and main long sills are to be full length with no cross-splices. All boxed areas of the dump body shall be sealed. No wiring or hoses shall be run through any boxed area. All welds shall be continuous. All hinge pins shall be removable.

A. 10-foot maximum inside length.
B. 95-inch minimum outside width.

2. MATERIAL

The dump body main long sills, floor, tailgate, sides, front, front rail, rear rail, and corner posts, shall be constructed using a minimum of grade 65 hi-tensile steel, rated 65,000-psi yield and 80,000-psi tensile strength.

A.	Main Long Sills	1/4-inch
B.	Floor	3/16-inch
C.	Front	12-gauge
D.	Sides	12-gauge
E.	Tailgate	12-gauge
F.	Rear posts	3/16-inch

3. DUMP BODY MOUNTING

A. The rear edge of the dump body pivot pin shall be 0 to 1–inch forward from the rear face of the rear hitch plate.
B. The dump body pivot, measured from the centerline of the pivot pin to the rear face of the dump body not including the tailgate, shall be a minimum of 9 inches and a maximum of 12 inches.
C. The chassis wheel base shall be such that the rear axle is located a maximum of 48-inches from the rear of the dump body, measured from the axle centerline to the rear vertical face of the dump body, not including the tailgate.
D. Hydraulic oil reservoir shall be mounted to provide 3 to 4-inch clearance between the cab and reservoir.
E. The dump body shall be mounted as close as possible to the hydraulic oil reservoir, with a minimum of 3-inch clearance, excluding the sub frame of the reservoir and hoist.

F. A 4-gauge battery cable ground strap shall be installed from the dump body to the truck frame by means of a 5/16-inch cadmium plated bolt. Star washers shall be installed on both sides of the strap eye to insure a good ground.

4. PLATFORM

Platform to be 100% constructed of 3/16" grade 65 steel with a minimum tensile strength of 80,000 psi.

A. **Long Sills:** Long sills shall be structural steel or a fabricated tube with a minimum thickness of 1/4". Height shall be such to provide a platform floor height of no more that 48" at the highest point with the bed empty. If boxed construction, long sills must be sealed. No hoses or wiring shall be run through the length of the long sills.

B. **Cross-sills:** None

C. **Side rails:** Fabricated design, forming a box channel. Side rails must have cut-outs for wheel clearance/tire chains.

D. **Rear rail:** Structural or fabricated tube design.

E. **Front rail:** Structural or fabricated tube design.

F. **Floor:** One piece smooth steel.

G. **Tie downs:** Pop-up style tie downs shall be installed in the platform floor, with a minimum of two tie-downs per side. Tie downs shall have reinforced openings. Tie down assemblies shall be adequate to secure a loaded, 5 cubic yard slip-in material spreader, or other similar heavy cargo. The rear tie-down shall be 12 to 14 inches forward from rear of dump body. The front tie down shall be 12 inches forward from the rear edge of front permanent side. Tie-down assemblies shall use 3/8-gr.70 chains.

5. HOIST

A. Hoist shall be a trunnion mount head lift, single-acting cylinder.

B. The hoist should be designed to accept a Model CS90-4-3- MAILHOT cylinder or pre-approved equal. The cylinder sleeves shall be nitride coated. Sub-frame hoists are not acceptable.

C. A flared body bracket will be attached to either the hoist frame or body understructure to align body in position and keep from moving side to side.

6. DUMP BODY PIVOTS

Dump body pivots shall facilitate thorough greasing. Bushings shall have an internal radial groove in line with the grease fitting. Pivot pins shall be drilled and cross drilled.

7. BODY PROPS

A. A storable body prop shall be provided on each side of the dump body.

B. Pivots for the body props shall be greasable.

C. Body props shall be constructed to withstand the down-pressure of the hoist without damaging the dump body, chassis, or any related components.

8. BULKHEAD/CAB PROTECTOR

The bulkhead/cab protector shall be non-removable, with a formed doghouse for the trunnion mount head lift cylinder. The cab protector shall be of sufficient height to accommodate a slip in spreader and warning lights.

A. The cab protector shall not interfere with the cab mounted vertical exhaust pipe.

B. The cab protector shall be mounted, welded, and gusseted to prevent flexing or vibration.

C. The cab protector shall have angled material deflector at top to keep dumped material from spilling onto the hydraulic oil reservoir.

D. The cab protector shall extend 12 inches forward from front edge of headboard.

9. SIDES

A. PERMANENT

1. The permanent side shall extend rearward from the headboard.

2. Length shall be such as to have 22” inside from front sheet to rear of the permanent side.

3. Side shall be tapered, with the height at the front being 24”, and the rear height matching the fold-downside.

4. Side shall have a backing strip to serve as a stop/seal when side is locked in the upright position. This backing strip shall start two inches above the floor, and go to within one inch of the top of the side.

B. FOLD DOWN SIDE

Fold down sides shall be one-piece design. The top and bottom of the sides shall be fabricated to form a tubular design. No vertical stiffeners allowed, except on the extreme ends.

1. Height of sides shall be a minimum of 14 inches and a maximum of 16 inches above the floor.

2. Length of sides shall be 72 inches.

3. Top of sides shall be debris-shedding type.

4. The end sections shall be constructed using steel of adequate dimension to provide structural integrity, and latch support.

5. Fold down sides shall have a minimum of three greasable, stainless steel hinges per side. Hinges shall not to protrude outside the width of the platform.

6. Neither the sides, nor the hinges shall protrude above surface of platform when the sides are in the lowered position.

7. A positive stop to prevent the sides from engaging with the truck’s tires when lowered shall be provided.

8. Sides shall require no more than 50# of lifting effort throughout their 180-degree travel.

9. Sides shall have no provision for extension boards.

C. FOLD DOWN SIDE LATCHES

Fold down sides shall have two independent stainless steel latches per side, locking the fold down side in the upright position to the front and rear permanent sides. Latches shall be hand operated, quick release, and positive locking. All latches must be pre-approved.

1. Latches shall operate smoothly and easily without the use of tools.
2. Latches shall not exceed width of platform.
3. Latches shall be a minimum of ½" diameter.

10. LADDER

A storable ladder shall be provided each side of the platform. The rear edge of the ladder shall be even with rear edge of the front permanent side. Sides when folded down shall not interfere with the use or stowing of ladder. The horizontal rungs shall be made of galvanized grip-strut steel.

Handles shall be installed on the bulkhead/cab protector corner posts to correspond with the ladders, and not exceed the width of the platform. A ½" diameter steel rod shall be welded to rear of each bulkhead/cab protector corner post at a height of 32"-34" from floor, extended straight out to the rear 3", then straight down, and welded to the top of the permanent side.

11. TAILGATE

The tailgate shall be double-acting and travel 180 degrees. Tailgate shall be vertically straight when closed. The top and bottom of the tailgate shall be fabricated to form a tubular design. No vertical stiffeners allowed except on extreme ends. Chains shall be provided to control opening width at the bottom of the tailgate, or support tailgate horizontally from the top.

A. Tailgate shall require no more than 50 pounds of lifting effort throughout its 180-degree travel.
B. The end sections shall be constructed using steel of adequate dimension to provide structural integrity and latch support.
C. Tailgate shall have a maximum 20 inches height above the floor when closed.
D. Tailgate chains shall be 3/8-inch grade 70.
E. Tailgate lower pins shall be a minimum of 1-inch stress proof shaft.
F. When the tailgate is lowered parallel to body floor, the inside surface of the tailgate shall provide a smooth level joint between the tailgate and the body floor.
G. A license plate bracket shall be welded on the left-hand side of the tailgate.
H. A hinged "D" ring shall be mounted top and center of the tailgate to provide a lifting hook for removing the tailgate.

12. TAILGATE LATCHES

A. UPPER LATCHES

Tailgate shall have two independent stainless steel latches, one on each side, locking the tailgate in the upright position to the corner posts. Upper latches shall also serve as the pivot for the tailgate when releasing the lower latches. Latches shall be hand operated, quick release, and positive locking. Latch assembly shall prevent the tailgate from shifting sideways. All latches must be pre-approved.

1. Latches shall operate smoothly and easily without the use of tools.
2. Latches shall be a minimum of 3/4-inch diameter.
3. Latches shall have a minimum of 1-inch engagement.

B. LOWER LATCHES

1. An over-center locking device on each side of the dump body shall hold the tailgate securely closed. The latching fingers shall be forged steel.
2. The tailgate latch cross shaft assembly shall be supported on each end by bushings.
3. This locking device shall be operated by an air cylinder, which shall be mounted between the long sills. Air cylinder shall be controlled by the chassis air accessory power supply.
4. Locking device shall be adjustable at each side of the dump body.
5. A manual over-ride shall be provided on the outside of the dump body, allowing the operator to lock or unlock the tailgate using a simple adjustable wrench and without removing components.
6. Lubrication points on the tailgate latch cross-shaft shall facilitate easier greasing by means of grooved bushings and/or shaft.
7. Grease zerks at each end of the tailgate cross-shaft shall be visible and accessible from the outside face of the dump body.

13. REAR CORNER POST

The rear corner posts shall extend below the side and rear rails to allow for reinforcement of this joint. Rear posts shall be of sufficient size and structure to accommodate all loads imposed on tailgate and side doors. Hydraulic couplers shall be mounted in bottom of rear post, or immediately below it.

A. Rear posts shall be made of 3/16” structural steel or fabricated tube.
B. Rear posts shall not exceed the height of the tailgate.
C. Rear posts shall have a backing strip to serve as a stop/seal when side is locked in the upright position. This backing strip shall start two inches above the floor, and go to within one inch of the top of the side.

14. HYDRAULIC COUPLERS

Coupler description specifications are listed in the Hydraulic Section, item 9, lines C through F.

The curbside of the dump body shall have three, 3/8-inch male couplers. Couplers shall be attached to male pipe X male JIC bulkhead fittings mounted on the rear corner post, or side rail near the rear of the bed. Couplers may be mounted immediately beneath the rear post if space in post or rails will not allow. MoDOT Fleet Manager must approve location at the pilot inspection before the rest of the trucks are built.

The drivers' side of the dump body shall have three male couplers for the slip-in spreader. Couplers shall be attached to male pipe X male JIC bulkhead fittings mounted on the rear corner post, or side rail near the rear of the bed. Couplers may be mounted immediately beneath the rear post if space in post or rails will not allow. MoDOT Fleet Manager must approve location at the pilot inspection before the rest of the trucks are built.

The hydraulic lines shall extend from the lowest rub rails to the body's main long sills through a fabricated enclosure on the under side of the body. The main long sills shall have passageways at the rear for the hydraulic lines. Passages through the long sills shall be sealed around the passage to prevent moisture entry into the long sill.

15. BRAKE, TURN AND TAILLIGHTS

Lighting shall meet all Federal and State DOT specifications, which recently includes and requires an independent running light on the rear corners.

A. All lights shall be mounted in shockproof rubber grommets.
B. All lights, except the backup light, shall be LED.
C. All lights shall be connected to a one piece wiring harness with molded connectors.
D. Each rear corner post shall have a built in, recessed 2-inch x 6-inch oval stop/turn taillight. Suitable makes and models are Truck Lite Model 60050R or Peterson Model M420R2.
E. Backup lights shall be recessed 2-inch x 6-inch oval lights. A protective light enclosure shall be mounted below the rear of the dump body. These lights shall be spaced far enough apart as to be visible when a slip-in material spreader is installed in the dump body.
F. A one and one-half (1 1/2) inch pipe shall extend through long sills at the rear for routing of electric wiring. Pipes are to be fully welded, sealing the joint at the long sill.

16. RAISED BODY INDICATOR

A sealed proximity switch shall be mounted near the hoist assembly to control a raised body indicator light. The light shall be controlled by the chassis electric accessory power supply. A dash mounted indicator light shall be provided, be plainly visible to the seated operator, be red in color, and flash when the dump body is raised.

17. SPREADER LIGHT

One Truck Lite model 80360 work light shall be mounted below the left rear dump body corner. The light shall be controlled by the chassis electric accessory power supply. Light will not hinder the operations of the material spreader.

18. TARP

A “window shade” style tarp, such as Aero’s Easy Cover or Pulltarp’s Supershield system shall be provided. The housing for the tarp and spring roller assembly shall be heavy duty steel that is powder coated black. The housing shall rest on the top of the bulkhead and the doghouse. The entire unit shall be bolted on using stainless or zinc plated bolts.

A series of stainless or zinc plated body hooks shall be systematically installed on the sides of the body to secure the tarp. The hooks shall not exceed the width of the platform nor interfere with the 180-degree fold-down feature of the sides. The tarp material shall be heavy-duty asphalt and as wide as the inside width of the body. Tarp shall have sections of bungee cord or other type of stretchable material sewn into it that allows for the tarp to be secured to the body’s hooks without the use of independent cords with hooks. Brackets for securing the pull rope and the tarp when extended shall be installed per manufacture’s instructions, but not to interfere with the designed functions of the body.

19. MUD FLAP BRACKETS

Friction type mud flap brackets to be attached to the underside of the dump body at the rear. These brackets shall allow replacement of the mud flap by removing only one fastener. See attached drawing. Mud flaps shall be 24" wide and long enough to satisfy FMVSS. Front mud flap brackets to be attached to underside of bed. Front mud flaps shall be 24” wide and long enough to keep rear tires from throwing debris on the back of the cab.

20. CONSPICUITY

Dump body shall be outfitted with DOT-C2 11-inch red/7-inch white parabolic retro-reflective conspicuity tape (Reflexite or equal) as per MoDOT guidelines. Layout pattern will be provided to successful vendor.

SPECIFICATIONS
FOR
LED WARNING LIGHT SYSTEM

Trucks are to be equipped with an LED warning light system using the following specifications. MoDOT Fleet Manager must evaluate and pre-approve the warning light system.

1. Warning light system must meet SAE Class 1 requirements.
2. System shall be plainly visible at a minimum distance of 1000 feet on a sunny day.
3. System shall emit light that is amber in color.
4. System shall provide 360 degrees of visibility in a horizontal plane around the truck.
5. System shall flash the two light head assemblies on the cab shield simultaneously, then the two light head assemblies on the rear corners of the dump body simultaneously, alternating back and forth.

1. CENTRALIZED CONTROLLER

A. The LED controller shall operate on 12 volts DC and operate through the range of approximately 10-16V DC with nominal degradation of performance in either intensity or flash rate. All standard mounting hardware shall be included. The LED system controller shall be mounted behind driver's seat on the back wall of the cab.

B. The LED controller shall have RFI suppression circuit(s) to prevent radiated, as well as conducted, interference problems.

C. The controller shall be powered by a factory work light circuit, or other approved factory-installed accessory operation circuit. This circuit shall provide 'key-off' operation of the LED light system. Circuit shall have its own factory-installed circuit protection and switch. A dash mounted indicator light shall indicate when the warning lights are operating.

D. The LED controller shall have four outputs, one for each of the four individual light heads to be installed on the truck. Outputs shall power each light head by means of a two-wire circuit. Controller connections for the individual light heads shall be made using male/female spade terminals. Controller housing shall also provide strain relief for the individual light head harnesses.

E. The LED controller shall produce a burst of four impulses per burst to each light head, at a minimum flash rate of 70, maximum flash rate of 110 bursts per minute. MoDOT Fleet Manager must pre-approve flash pattern.

F. The LED controller shall be reversed input polarity protected. Controller shall also provide full output short-to-ground protection to prevent damage to the controller and light heads.

2. LED MODULES

The system shall use individual LED modules, approximately 3-inch x 5-inch in size. This module must be used in all of the installed light heads. The modules shall be easily replaced.

3. CAB SHIELD (TOP) LIGHT ASSEMBLIES

A. Two light heads shall be mounted to the cab shield of the dump body, one on each side of the body. Light heads are to be permanently mounted to a fixed mount, and elevated to provide ample cross-visibility of the light head from the front and rear of the truck. Each light head assembly shall contain a minimum of three LED modules inside a common housing. For each light head, one module shall face to the front, one shall face to the rear, and one shall face to the side of the truck. The combination of the two light heads shall provide 360 degrees of visibility in a horizontal plane. The light head lenses shall be made of polycarbonate material, and have a smooth outer surface. All module connections shall be made inside the light head housing. Light heads shall provide a means of connecting the individual modules together, such as bus bars with spade terminals, so that all LEDs in the head light simultaneously. The configuration of the bus bar/s shall allow for potentially different lighting configurations of future operations. Each light head shall have a 12-inch maximum two-wire cable with a two-pin weatherpak connecter for connecting to the extension harness from the central controller. Each light head shall have protective guards sufficient enough to protect the light head assembly from low hanging tree branches. Protective guards shall not compromise the intensity or visibility of the light head.

B. Mirror or gutter-mounted light bars are not acceptable.

4. REAR LIGHT HEAD ASSEMBLIES

Light heads shall be mounted on each rear corner of the dump body. Each light head shall contain a minimum of two LED modules inside a common housing, with the modules flush or slightly below the surface of the housing to afford protection for the modules and lenses. For each light head, one module must face to the rear and one shall face to the side of the truck. The combination of the two heads shall provide a minimum of 180 degrees of visibility in a horizontal plane from the rear of the truck. Each light head shall also be capable of emitting light in a vertical plane to provide adequate visibility of the light from the rear of the truck when the dump body is in the raised position. The light head lenses shall be made of polycarbonate material, and have a smooth outer surface. Light heads shall provide a means of connecting the individual modules together so that all LEDs in the head light simultaneously. Each light head shall have a 12-inch maximum, two wire cable with a two-pin weatherpak connecter for connecting to the extension harness from the central controller.

5. CABLE HARNESSES

A. The cable shall be expected to maintain its electrical, mechanical, and environmental integrity for the life of the vehicle on which it is originally installed on, without the need for re-wiring at any future time.

B. The cable shall be flexible in cold weather, and tolerant of hot temperatures.

C. Cables shall be two-conductor, with each power conductor a minimum of 14-gauge. Cable shall have an outer jacket enclosing both conductors.

D. Insulation jacket shall be highly resistant to abrasion, corrosion, oil / grease, and normal highway chemicals or environmental abuse for the normal life expectancy of the vehicle.

E. The cable will be available in bulk from the manufacturer.

F. Splices will <u>not</u> be allowed.

OPTIONAL EQUIPMENT THAT MAY BE REQUIRED

Vendor shall bid the cost for providing and installing the following options. Bid price shall include the optioned equipment, all associated items needed for installation, and labor for installation.

1. Manual Transmission 44
2. Fully Automated 6-Speed Manual Transmission 44
3. Two-Speed Axle 44
4. Crew Cab 44
5. Tow Hooks 45
6. Power Mirrors 45
7. Pavement Temperature Sensor 45
8. Automatic Tire Chains 45
9. Dual Steering 45
10. Western Style, 10-Foot Dump Body 45
11a. Right Hand Mid-Mount Wing 50
11b. Left Hand Mid-Mount Wing 50
12. Underbody Scraper 52
13. 10-Foot Skid-Mounted Materials Spreader 55
14. Barn Door Tailgate For Western Style Dump Body 58
15. Truck Mounted Attenuator (TMA) Pockets 59

1. MANUAL TRANSMISSION

A. 6 speed synchronized manual transmission.
B. Low gear ratio shall be a minimum of 9:1.
C. High gear shall be 1:1
D. Clutch shall be a twin plate ceramic 14-inch with dampened discs.

2. FULLY AUTOMATED 6-SPEED MANUAL TRANSMISSION

A. Low gear ratio shall be 6.55:1.
B. High gear ratio shall be .78:1.
C. Nominal torque capacity 660 lb. ft.
D. Eaton FO-6406B-DM3

3. TWO-SPEED AXLE

Two-speed axle shall be air shifted and have a minimum 35% ratio split. For manual transmissions, chassis control of the two-speed shall prevent the axle from downshifting above 10 mph. For automatic transmissions, chassis control of the two-speed axle shall prevent the axle from shifting above 10 mph.

4. CREW CAB

Integral factory built four-door crew-cab with bench seat and seat belts for all passengers.

5. TOW HOOKS

Four factory installed tow hooks, 2 front and 2 rear, located on the outside of the frame rails. Tow hooks shall be bolted on at the end of the frame rails.

6. POWER MIRRORS

Factory installed four-way power right-hand mirror, controllable from the drivers seat. Mirror shall also meet all of the requirements for standard mirrors listed in the chassis specifications section, item “2”, line “M”. Factory installed four-way power mirrors, right-hand and left-hand, controllable from the drivers seat, may be submitted if a single power right-hand mirror is not available.

7. PAVEMENT TEMPERATURE SENSOR

Road Watch Model RS-232 by Sprague Controls. Sensor information shall be displayed on the spreader control display. Sensor to be mounted in a location that will provide accurate operation, such as a mirror mount, or behind the front bumper.

8. AUTOMATIC TIRE CHAINS

INSTA-CHAIN or ONSPOT brand chain systems complete with universal mounting brackets and to include an inline safety valve from air tank to the automatic tire chains. Automatic tire chains shall be controlled by the chassis air accessory power supply.

9. DUAL STEERING

Provide dual steering and controls to allow the vehicle to be steered and driven from either side in the cab. Option shall also include right-hand instrument panel.

10. WESTERN STYLE, 10-FOOT DUMP BODY

The following specifications and dimensions shall apply to the five (5) cubic yard capacity truck-mounted dump body and hoist. The complete dump body shall be capable of accommodating a 10-foot, slip-in material spreader with attached liquid storage tanks.

Bids will not be considered on any body and hoist that deviate from these specifications.

1. GENERAL

The dump body provided shall be a Western style. No underbody cross-members for support will be allowed. The floor, sides, and main long sill are to be full length with no cross-splices. All boxed areas of the dump body shall be sealed. No wiring or hoses shall be run through any boxed area. All welds shall be continuous. All hinge pins shall be removable.

A. Dump body capacity shall be five cubic yards water level.
B. 10-foot maximum inside length.
C. 95-inch minimum outside width.

D. 86-inch minimum inside width.
E. 24-inch minimum side height with raised ends.

2. MATERIAL

The dump body main long sills, floor, tailgate, sides, and front shall be constructed using a minimum of grade 65 high-tensile steel, rated 65,000-psi yield and 80,000-psi tensile strength.

A.	Main Long Sills	1/4-inch
B.	Floor, Tailgate	3/16-inch
C.	Sides, Front	12- gauge
D.	Formed Top Rail	3/16-inch

3. DUMP BODY MOUNTING

A. The rear edge of the dump body pivot pin shall be 0- to 1-inch forward from the rear face of the rear hitch plate.
B. The dump body pivot, measured from the centerline of the pivot pin to the rear face of the dump body not including the tailgate, shall be a minimum of 9 inches and a maximum of 12 inches.
C. The chassis wheel base shall be such that the rear axle is located a maximum of 48-inches from the rear of the dump body, measured from the axle centerline to the rear vertical face of the dump body, not including the tailgate.
D. Hydraulic oil reservoir shall be mounted to provide 3- to 4-inch clearance between the cab and reservoir.
E. The dump body shall be mounted as close as possible to the hydraulic oil reservoir, with a minimum of 3-inch clearance, excluding the sub frame of the reservoir and hoist.
F. A 4-gauge battery cable ground strap shall be installed from the dump body to the truck frame by means of a 5/16-inch cadmium plated bolt. Star washers shall be installed on both sides of the strap eye to insure a good ground.

4. HOIST

A. Hoist shall be a trunnion mount, head lift, double-acting cylinder.
B. The hoist should be designed to accept a Model CS90-4.5-3DA MAILHOT cylinder or pre-approved equal. The cylinder sleeves shall be nitride coated. Sub-frame hoists are not acceptable.
C. A flared body bracket will be attached to either the hoist frame or body understructure to align body in position and keep from moving side to side.

5. DUMP BODY PIVOTS

Dump body pivots shall facilitate thorough greasing. Bushings shall have an internal radial groove in line with the grease fitting. Pivot pins shall be drilled and cross-drilled.

6. BODY PROPS

A. A storable body prop shall be provided on each side of the dump body.
B. Pivots for the body props shall be greaseable.
C. Body props shall be constructed to withstand the down-pressure of the hoist without damaging the dump body, chassis, or any related components.

7. CAB PROTECTOR

A. The half (1/2) cab protector shall not interfere with the cab-mounted vertical exhaust pipe.
B. The cab protector shall be mounted, welded, and gusseted to prevent flexing or vibration.

8. SIDES

A. Sides shall have a formed, debris-shedding top rail.
B. External supports for sides shall be horizontal.

9. TAILGATE

A. The tailgate shall be double-acting, and vertically straight with off-set hinges for positive closure.
B. The tailgate shall have boxed upper, lower, side, and intermediate horizontal rib supports. Lift handles shall be welded on each side just above the bottom support rib.
C. A hinged “D” ring shall be mounted top and center of the tailgate to provide a lifting hook for removing the tailgate.
D. Two 3/8-inch grade 70 spreader/holder chains shall be provided and stowed in boxes that are externally welded on tailgate when not in use.
E. Anchor points for the tailgate chains shall be made from 3/8-inch thick steel. These anchor points shall be lapped on the outside of the dump body with a minimum of 1-inch overlap. Keyhole slot in anchor points shall be configured so that when installed, the link of the tailgate chain nested in the anchor is no more than 1 inch away from the rear face of the dump body at the farthest point.
F. The top hinge pin shall be minimum 1 inch diameter and pivot through a greasable bushing. These pins shall have one end tapered approximately 30 degrees for ease of alignment. 30 degree taper shall be 1/4- to 3/8-inch in length.
G. The tailgate lower pins shall be a minimum 1 1/8-inch diameter. Tailgate shall, without assistance from the locking device, seal against the floor/side sheets of the dump body, with no more than a 1/16-inch gap at any point. With the tailgate closed and the locking device open, tailgate lower pins shall have a 1/8-inch minimum, 1/4-inch maximum gap between the forward edge of the pin and the forward edge of the cradle.
H. A license plate bracket shall be welded on the left-hand side of the tailgate, at approximately half the height of the tailgate.
I. When tailgate is lowered parallel to body floor, the inside surface of the tailgate shall provide a smooth level joint between the tailgate and the body floor.

10. TAILGATE LATCH

A. An over-center locking device device on each side of the dump body shall hold the tailgate securely closed. Latching arms shall be forged steel.
B. The tailgate latch cross shaft assembly shall be supported on each end by bushings.
C. This locking device shall be operated by an air cylinder, which shall be mounted between the long sills. Air cylinder shall be controlled by the chassis air accessory power supply.
D. Locking device shall be adjustable at each side of the dump body.
E. A manual over-ride shall be provided on the outside of the dump body, allowing the operator to lock or unlock the tailgate using a simple adjustable wrench and without removing components.
F. Lubrication points on the tailgate latch cross-shaft shall facilitate easier greasing by means of grooved bushings and/or shaft.

G. Grease zerks at each end of the tailgate cross-shaft shall be visible and accessible from the outside face of the dump body.

11. LADDER

A. A pull out style two-rung ladder shall be installed on each side of the dump body. Location of the ladder shall be such that operator does not have to climb over the tarp bow when the tarp is retracted.
B. Grab handles shall be installed on the outside of the dump body and provide for three points of contact while using the ladder.

12. WIRING AND HOSE ROUTING

A. Wiring and hoses going to the front of the dump body shall be secured to a 1/2-inch diameter painted steel rod which shall be attached to the inside of the long sill by means of 1/2-inch X 1-inch tall stand-offs. Stand-offs shall be placed no farther than 24 inches apart, and be securely welded to the long sill.
B. Wiring inside the rear corner posts shall be secured to 1/4-inch vertical painted steel rods attached inside the rear corner posts by means of 1/4-inch X 1-inch stand-offs, securely welded. Height of stand-off to be sufficient to support all of the wiring inside the corner post. Stand-offs shall be positioned to allow wires to be secured away from the tailgate latch mechanism, and within 6 inches of all lamps. A sufficient amount of wire shall be left between the last point of securement and lamp to allow for the removal of the lamp for replacement.

13. BRAKE, TURN AND TAIL LIGHTS

Lighting shall meet all Federal and State DOT specifications, which recently includes and requires an independent running light on the rear corners.

A. All lights shall be mounted in shockproof rubber grommets.
B. All lights, except the backup light, shall be LED.
C. All lights shall be connected to a one piece wiring harness with molded connectors.

D. Each rear corner post shall have a built in, recessed 2-inch x 6-inch oval stop/turn taillight. Suitable makes and models are Truck Lite Model 60050R or Peterson Model M420R2.

E. Each rear corner post shall have a built in, recessed 2-inch X 6-inch oval back up light.

F. A one and one-half (1-1/2) inch pipe shall extend through long sills at the rear for routing of electric wiring. Pipes are to be fully welded, sealing the joint at the long sill.

14. RAISED BODY INDICATOR

A sealed proximity switch shall be mounted near the hoist assembly to control a raised body indicator light. The light shall be controlled by the chassis electric accessory power supply. A dash mounted indicator light shall be provided, be plainly visible to the seated operator, be red in color, and flash when the dump body is raised.

15. SPREADER LIGHT

One Truck Lite model 80360 work light shall be mounted below the left rear dump body corner. The light shall be controlled by the chassis electric accessory power supply. Light will not hinder the operations of the material spreader.

16. MUD FLAP BRACKETS

Friction type mud flap brackets to be attached to the underside of the dump body at the rear. These brackets shall allow replacement of the mud flap by removing only one fastener. See attached drawing. Mud flaps shall be 24" wide and long enough to satisfy FMVSS. Front mud flap brackets to be attached to underside of bed. Front mud flaps shall be 24” wide and long enough to keep rear tires from throwing debris on the back of the cab.

17. HYDRAULIC COUPLERS

A. Coupler description specifications are listed in the Hydraulic Section, Item 9, lines C through F.

B. The curbside of the dump body shall have three, 3/8" male couplers. Couplers shall be attached to male pipe X male JIC bulkhead fittings mounted on the lowest rub rail near the rear of the bed.

C. The drivers side of the dump body shall have three male couplers for the slip in spreader. Couplers shall be attached to male pipe X male JIC bulkhead fittings mounted on the lowest rub rail near the rear of bed.

D. The hydraulic lines shall extend from the lowest rub rails to the body’s main long sills through a fabricated enclosure on the under side of the body. The main long sills shall have passageways at the rear for the hydraulic lines. Passages through the long sills shall be sealed around the passage to prevent moisture entry into the long sill.

18. CONSPICUITY

Dump body shall be outfitted with DOT-C2 11-inch red/7-inch white parabolic retro-reflective conspicuity tape (Reflexite or equal) as per MoDOT guidelines. Layout pattern will be provided to successful vendor.

19. SPREADER BODY HOLD DOWNS

Four storable winches to be welded prior to priming on the bottom side of upper body rail in a fashion not to exceed the overall width of the body, 4-inch x 10-foot of nylon webbing with flat hook to be included. Body Builder must coordinate placement of winches to line up vertically with the spreader hold down brackets.

20. TARP

A fully automatic two-arm type tarp system shall be installed. It shall be an electric system operated from the cab. The arms and tarp-protecting windshield shall be aluminum. The tarp shall be designed for hot asphalt. The width of the tarp shall be within 4” of the inside width of the dump body. The arm springs shall be adjustable and designed to mount on the underside of the dump body. The elbows of the tarp arms shall be bolted to the arms. The tarp shall be controlled by the chassis electric accessory power supply.

21. REAR POST LOWER COVERS

MoDOT would like to receive proposals for removable covers for the bottom of the rear bed posts. These covers would keep the rear tires from throwing debris up into the rear body posts. These covers would allow for drainage, and be easily removed for servicing components inside the body post.

11a. RIGHT HAND MID-MOUNT WING

11b. LEFT HAND MID-MOUNT WING

NOTE: The following specification shall apply to both option 8a and 8b.

The following specification shall apply to 8-foot mid-mount wing snowplows designed for extended snow plowing. The vendor shall provide all necessary parts and complete the installation of wing plows. Units shall be delivered mounted and fully assembled.

Acceptable right-hand models shall be Henke Model MDPW or Monroe MJW-8.

Acceptable left-hand models shall be Henke Model MDPW-LH or Monroe MJW-8L

Wing shall be designed to plow at a desired height, and be able to float. The moldboard must fold close to the truck for clearing bridges, transporting, or storing. The wing must have an adjustable plowing angle. The height of either end shall be hydraulically controlled from the cab. Wing and assemblies must be easily and quickly attached and removed.

The wing plow shall be built and tested to the latest OSHA requirements and SAE standards.
All welds and mounting brackets shall be of high quality construction. All major assembles such as moldboard, push tubes, mounting plates etc. shall be designed for rugged use.

1. MOLDBOARD

A. Moldboard shall be formed from 10-gauge steel, inboard height shall be minimum of 24 inches, outboard height not to exceed 28 inches. Cutting edge shall be a minimum of 1/2-inch x 8-inch and a minimum length of 8 feet. Moldboard top angle shall be a minimum of 2-inch x 2-inch x 5/16-inch and bottom angle minimum of 4-inch x 4-inch x 3/8-inches.

B. There shall be a minimum of five ribs per moldboard to be continuously welded from top moldboard to bottom of moldboard for structural strength.

C. A full moldboard trip shall be provided. Trip mechanism shall perform at plowing speeds up to 45 MPH.

2. CUTTING EDGE

The leading edge is to be mitered at a 45-degree angle.

3. HYDRAULICS

A. Control Lever

A dual axis control lever shall be installed to operate the wing plow. Control lever shall be CAN BUS proportional electric, and communicate with the valve driver module utilizing the hydraulic/spreader control system cables. Control shall be mounted in the same mounting stand as the standard hydraulic control levers.

B. Valves

Hydraulic function control valves shall be bulkhead fitting mounted in a weather tight enclosure, with the fittings on the bottom of the enclosure. Valves shall be mobile hydraulic, stackable, load sensing type. All valves shall be operated with proportional electric coils. Proportional coils shall be compatible with the control system valve driver module PWM outputs. All valves within the valve assembly shall have parallel inlets. Valve assembly inlet and outlet ports shall be 1” o-ring. Working ports shall be ¾” o-ring. A and B ports shall be individually flow adjustable.

1. Toe-Raise/Lower

Double acting cylinder valve, with a work port relief valve for down pressure protection on port “A”. Work port relief valve shall be set at 500psi. Valve shall be spring return to neutral. Valve shall be pressure and flow compensated, and have an adjustable flow range of 0 to 15 GPM. Valve shall have a manual override for both raise and lower functions.

2. Heel-Raise/Lower

Double acting cylinder valve. Valve shall be spring return to neutral. Valve shall be pressure and flow compensated, and have an adjustable flow range of 0 to 15 GPM. Valve shall have a manual override for both raise and lower functions.

C. Hydraulic Cylinders

A minimum of two (2) double acting cylinders with chrome-plated piston rods shall be included for angling moldboard and applying down pressure to moldboard. The hydraulic cylinders are to be of industrial quality. Vendor shall provide removable cylinder stops of sufficient size to prevent blade from gouging pavement.

D. Hydraulic Hoses and Couplers

All hoses shall be rated for a working pressure of 3000psi.

1. Wing plow hoses shall be 3/8" ID with female JIC swivels at both ends.
2. Hydraulic quick couplers shall be provided, and securely mounted in the wing area to provide easy removal and remounting of the wing.
3. All hydraulic couplers shall be full-flow Aeroquip FD45 or equivalent Parker 60 series. Couplers used shall be: male 3/8-inch FD45-1002-6-6 female 3/8-inch FD45-1003-6-6.
4. A dust cap or plug shall be furnished with every male and female quick coupler.

4. GREASING

All grease points shall provide adequate lubrication for the greased joint.

5. COLOR

Wing plow shall be OEM standard color. Questions regarding color should be referred to this office.

12. <u>UNDERBODY SCRAPER</u>

The intent of this specification is to secure 10-foot underbody scraper designed for plowing and cutting snow and ice. The vendor shall provide all necessary parts and complete the installation of underbody scrapers. Units shall be delivered mounted and fully assembled.

Acceptable model shall be a Henke Model UBS10-XH or pre-approved equal.

The underbody scraper shall be built and tested to the latest OSHA requirements and SAE standards. All welds and mounting brackets shall be high quality construction. The underbody scraper must be easily detachable from the truck.

1. HANGER BRACKETS

Hanger brackets shall be attached to the frame by four (4) heavy-duty mounting legs, minimum of 4-inch S&C 13.8-pound structural channel or better. Bidder shall provide and include detailed installation drawings.

2. HANGERBOARD

Hanger board shall be a minimum of 14-inch top plate width, 10-inch 30-pound S&C channel and 4-inch 13.8-pound S&C channel welded to form a single unit or equivalent.

3. MOLDBOARD

A minimum length of 10 feet, height 17-21 inches, 1-inch thick, high-carbon steel, punched with standard blade holes. Moldboard must be hydraulically angled 45 degrees left and right. The moldboard shall be capable of rising to a horizontal position with a minimum ground clearance of 8 inches when not in use. Moldboard shall be drilled for right-hand and left-hand extensions.

4. HINGE

Hinge shall be a minimum 2-1/2-inch diameter, 96-inch length cold-rolled steel. The hinge shall have multiple grease points to provide full-width lubrication of the hinge.

5. CIRCLE

The circle shall be minimum 1-inch heavy-duty steel, notch-less. The center pin shall be a minimum of 5 inches and a remote mounted grease fitting tube approximately 36 inches long shall be provided. Nylon wear pad required between hold down block and top of circle. Stops shall be welded on after installation of the moldboard to maximize turning radius of the underbody scraper and provide adequate clearance to all truck components.

6. HYDRAULICS

A. Control Lever

A dual axis control lever shall be installed to operate the underbody scraper. Control lever shall be CAN BUS proportional electric, and communicate with the valve driver module utilizing the hydraulic/spreader control system cables. Control shall be mounted in the same mounting stand as the standard hydraulic control levers.

B. Valves

Hydraulic function control valves shall be bulkhead fitting mounted in a weather tight enclosure, with the fittings on the bottom of the enclosure. Valves shall be mobile hydraulic, stackable, load sensing type. All valves shall be operated with proportional electric coils. Proportional coils shall be compatible with the control system valve driver module PWM outputs. All valves within the valve assembly shall have parallel inlets. Valve assembly inlet and outlet ports shall be 1-inch o-ring. Working ports shall be 3/4-inch o-ring. A and B ports shall be individually flow adjustable.

1. **Raise/Lower –** Double-acting cylinder valve with a work port relief valve for down pressure protection on port A. Work port relief valve shall be set at 500 psi. Valve shall be spring return to neutral. Valve shall be pressure and flow- compensated, and have an adjustable flow range of 0 to 15 GPM. Valve shall have a manual override for both raise and lower functions.
2. **Left/Right –** Double-acting cylinder valve. Valve shall be spring return to neutral. Valve shall be pressure and flow-compensated, and have an adjustable flow range of 0 to 15 GPM. Valve shall have a manual override for both raise and lower functions.
3. **Cushion Valve –** Vendor shall provide a double relief cushion valve, mounted on a cross member behind the cab. The valve shall be constructed of a high-tensile cast iron body with ball and spring style relief that has hardened seats. The relief valves shall be set at 750 psi. The valve shall have o-ring thread ports.

C. Cylinders

1. **Raise/Lower –** A minimum of 2 three-inch diameter double-acting cylinders with chrome-plated piston rods.
2. **Left/Right –** A minimum of 2 four-inch double-acting cylinders with 2-inch chrome rods for the reversing of the moldboard.

D. Hydraulic Hoses and Couplers

All hoses shall be rated for a working pressure of 3000 psi.

1. Underbody scraper hoses shall be 3/8-inch ID with female JIC swivels at both ends.
2. Hydraulic quick couplers shall be provided, and securely mounted in the underbody scraper area to provide easy removal and remounting of the scraper.
3. All hydraulic couplers shall be full flow Aeroquip FD45 or equivalent Parker 60 series. Couplers used shall be: male 3/8-inch FD45-1002-6-6, female 3/8-inch FD45-1003-6-6.
4. A dust cap or plug shall be furnished with every male and female quick coupler.

E. Trip Springs

A minimum of two (2) heavy-duty compression springs mounted in 6-inch diameter canisters.

7. GREASING

All grease points shall provide adequate lubrication for the greased joint.

8. COLOR

Underbody scraper shall be OEM standard color. Questions regarding color shall be referred to MoDOT.

13. <u>10-FOOT SKID-MOUNTED MATERIALS SPREADER</u>

1. GENERAL

The following specifications shall apply to the 10-foot skid-mounted, hydraulic driven, materials spreader body. The materials spreader shall be a self-contained, 304 stainless steel, V hopper type. The materials spreader shall be compatible with the multipurpose (contractor) and Western style dump bodies specific in the Single Axle Dump Truck Specifications. The spreader shall be capable of spreading uniformly all types of granular materials: salt, cinders, chemicals, abrasives, and mixtures of these up to a width of 40 feet.

A. The body and conveyor box shall be manufactured into a common unit in accordance with good commercial practices.
B. All stainless steel shall be welded using stainless welding wire.
C. All stainless steel shall be left unpainted.
D. Any carbon steel components shall be chemically cleaned and coated with a lead-free primer and painted with lead-free gray enamel.
E. Unit is to be complete, assembled, and ready to operate.
F. If the spreader is purchased as an option for a single axle dump truck, the spreader shall be mounted in the truck, ready to operate.
G. The manufacturer's standard warranty against defective parts, material, and workmanship shall be furnished. A copy of the warranty is to be attached to the bid.

2. BODY

The body is to be 100% welded on the inside. Cross-member and side-support spacing deviations may be allowed if necessary for component installation. MoDOT must pre-approve any changes.

A. The spreader body shall have a minimum of five (5) cubic yards struck capacity.
B. The spreader shall have an inside body length of 10 feet at the top.
C. The overall height shall not to exceed 56 inches to the top of the center screen support beam.
D. The top inside width shall not be less than 78 inches.

E. The sidewalls must be sloped at approximately a 45-degree angle.

F. The body shall be constructed of a minimum 12-gauge 304 stainless steel.

G. The body shall have a minimum of five (5) cross-members and side supports spaced 12 inches from body ends on 24-inch centers.

H. The body long sill, cross-members and full-length steel channel skids shall be a minimum of 7-gauge 304 stainless steel.

I. The body side supports shall be a minimum of 12-gauge 304 stainless steel.

3. TOP GRATE SCREENS

A. The body is to have a top-grate screen grid, having at least four (4) sections, two on each side.

B. Screens shall be hinged at the center support beam of the spreader body for easy handling.

C. Screens shall be made of either 3/8-inch diameter rods centered on crossbars or 3/8-inch diameter woven wire on heavy-duty frames. Screen openings to be approximately 2-1/2 inches x 2-1/2 inches.

D. The center support beam must be a minimum 2 inch x 6 inch steel tube with a minimum 3/16-inch thickness.

E. The center support beam shall be raised above the top of the body to prevent material build-up on top of the screens.

4. TIE DOWN/LIFTING BRACKETS

A. The body shall have not less than four (4) 10-gauge minimum stainless steel hold down brackets designed for four-inch nylon straps with flat hooks, two on each side. The Vendor must coordinate placement of hold down brackets with dump body manufacturer.

B. A 10-gauge minimum stainless steel lift hook/bracket shall be installed on the front and rear face of the body at each upper corner to allow for easy handling when loading or unloading.

5. CONVEYOR

A. Conveyor box and floor shall be 7-gauge 304 stainless steel.

B. The conveyor chain shall be a heavy-duty pintle chain, Drives D667X or equal. Crossbars shall be 1-1/2 inch x 1/4-inch x 18-inch minimum welded to the chain links on 4-1/2-inch centers.

C. Chain tensioner shall be screw type, spring loaded, on the front idler shaft.

D. A rear belt type bar wiper shall be provided.

E. Front idler shaft bearings shall have grease zerk lines plumbed to the rear of the body.

6. CONVEYOR GEARBOX

A. The conveyor drive gearbox ratio shall be 50:1. Gearbox shall have hardened input and output shafts and a bronze bull gear.

B. The gearbox shall have a high torque, low speed, geroller type hydraulic motor installed. Motor shall be designed to operate effectively at a maximum system pressure of 2000 psi. Hydraulic motors designed to operate at a pressure above 2250 psi will not be acceptable.

C. Hydraulic motor shall have o-ring thread ports.

7. DISCHARGE GATE

An adjustable discharge gate shall be located at the rear of the body to properly adjust the flow of material to the spinner.

A. Maximum feed gate opening shall be 11 inches high x 20 inches wide.

B. The discharge gate and track shall be 7-gauge stainless steel.

C. The screw jack adjusting the discharge gate height shall have nylon U-joints and bushings with grease fittings on jack head.

D. The grease zerk on the jack shall be relocated and plumbed to accommodate greasing from ground level.

8. DROP CHUTE AND SPINNER

A. The drop chute shall be made of a minimum of 12-gauge stainless steel.

B. The drop chute shall bolt to the long sills.

C. The chute shall be fully enclosed and include an operator-adjustable deflector at the bottom to change the flow of material from the middle of the chute to one side or the other.

D. The bottom of the chute shall have a hood with operator-adjustable material deflectors installed on each side and rear of the drop chute.

E. The spinner shall be securely mounted at the bottom of the chute. Spinner motor mounting brackets shall be a minimum of 7-gauge stainless steel.

F. The spinner shall be operated by a high torque, low speed geroller type hydraulic motor with o-ring thread ports.

G. The height of the spinner disk shall be adjustable with an ideal height of 18 inches above the ground.

H. Spinner disk shall be 20 inches in diameter, stainless steel.

9. HYDRAULIC HOSES AND COUPLERS

A. All hydraulic hoses shall be rated for 3000 psi working pressure.

B. Hydraulic hoses shall be long enough to be routed from their respective connection point on the spreader to the male hydraulic couplers mounted in the left rear corner of the dump body.

C. Hoses shall be routed up to the upper left rear corner of the spreader body and secured at a point to allow the hoses to go over the side of the dump body and down to the male couplers at the left rear corner of the dump body.

D. The return circuit for the conveyor and spinner motor shall be “teed” together on the spreader and run together in a common return hose to the truck coupler.

E. Hydraulic hoses shall be sized as follows:

1. Auger hose shall be 3/4-inch ID with female JIC swivels at both ends. Hose shall have a 3/4-inch female FD45-1003-12-12 coupler attached.
2. Spinner hose shall be ½-inch ID with female JIC swivels at both ends. Hose shall have a ½-inch female FD45-1003-8-10 coupler attached.

F. Spreader return hose shall be 1-inch ID with female JIC swivels at both ends. Hose shall have a 1-inch female FD45-1003-16-16 coupler attached.

10. LIQUID CHEMICAL STORAGE

A. Two (2) side-mounted, 100-gallon polyethylene reservoir tanks, one per side, shall be provided.
B. A minimum of a 3-inch top fill port with splash proof vent, and a 3/4-inch suction port shall be molded into each tank.
C. Both tanks shall be plumbed together with a minimum 1-½" ID hose and a tee located at the left rear corner of the spreader.

11. CONSPICUITY

Spreader shall be outfitted with DOT-C2 11-inch red/7-inch white parabolic retro-reflective conspicuity tape (Reflexite or equal) as per MoDOT guidelines. Layout pattern will be provided to the Vendor.

14. <u>BARN DOOR TAILGATE FOR WESTERN STYLE DUMP BODY</u>

1. GENERAL

The following specifications shall apply to the "Barn Door" style tailgate option for the Western style dump body. The barn door style tailgate shall be a convertible, three-way swing tailgate. Tailgate shall swing in the following methods:

A. Tailgate shall pivot on the top pins as in stockpiling or tailgate spreading operations.
B. Tailgate shall pivot on the lower pins as in patching operations with workers shoveling material out of the back of the dump body.
C. Tailgate shall pivot on the right rear corner post of the dump body swinging around to a position parallel and along the right-hand side of the dump body.

2. MATERIAL

The tailgate shall be constructed using a minimum of 3/16-inch, grade 65 high-tensile steel, rated 65,000 psi yield and 80,000 psi tensile strength.

3. TAILGATE

A. The tailgate shall be vertically straight when closed with off-set hinges for positive closure.

B. The tailgate shall be removable using simple hand tools.

C. The tailgate shall be easily convertible to a “barn door” swing, and back to conventional operation from ground level by one person using only simple hand tools, such as pliers and hammer. Configurations requiring the operator to climb on the dump body or needing several tools will not be allowed.

D. All components necessary for converting tailgate operation shall remain on the dump body at all times. Configurations that require the operator to remove and remotely stow components will not be allowed.

E. All pins removed during the removal or installation process of the tailgate shall be tapered approximately 30 degrees for ease of alignment. 30 degree taper shall be 1/4-inch to 3/8-inch in length.

F. Latches holding the tailgate closed in any configuration shall be released by hand effort only.

G. A bump stop shall be provided on the right side of the dump body to keep the tailgate from striking the dump body side.

H. When the tailgate is swung open against the right side of the dump body, it must clear the tarp arms with the tarp retracted.

I. A positive lock shall hold the tailgate open against the right side dump body bump stop.

J. The tailgate shall have boxed upper, lower, side, and intermediate horizontal rib supports. Lift handles shall be welded on each side just above the bottom support rib.

K. A hinged “D” ring shall be mounted top and center of the tailgate to provide a lifting hook for removing the tailgate.

L. Two 3/8-inch, grade 70 spreader/holder chains shall be provided and stowed in boxes that are externally welded on tailgate when not in use.

M. Anchor points for the tailgate chains shall be made from 3/8-inch thick steel. These anchor points shall be lapped on the outside of the dump body with a minimum of 1-inch overlap. Keyhole slot in anchor points shall be configured so that when installed, the link of the tailgate chain nested in the anchor is no more than 1-inch away from the rear face of the dump body at the farthest point.

N. All hinge pins shall pivot through a greasable bushing.

O. The tailgate lower pins shall be a minimum 1-1/8-inch diameter. Tailgate shall, without assistance from the locking device, seal against the floor/side sheets of the dump body, with no more than a 1/16-inch gap at any point. With the tailgate closed and the locking device open, tailgate lower pins shall have a 1/8-inch minimum, 1/4-inch maximum gap between the forward edge of the pin and the forward edge of the cradle.

P. A license plate bracket shall be welded on the left-hand side of the tailgate, at approximately half the height of the tailgate.

Q. When tailgate is lowered parallel to body floor, the inside surface of the tailgate shall provide a smooth level joint between the tailgate and the body floor.

15. TRUCK MOUNTED ATTENUATOR POCKETS

Left-hand and right-hand TMA pockets to be incorporated with the rear hitch plate and welded to the rear of the truck frame per attached specifications. Installation must be approved by the MoDOT Fleet Manager.