

Edmonton Fire Department

All Terrain Pumper

Production Specification

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GENERAL SPECIFICATIONS

1. This specification is intended to cover the supply of an All Terrain Pumper / Brush Truck for the City of Edmonton Fire Rescue Service (FRS). The All Terrain Pumper (ATP) is to consist of:
 - 1.1. Four (4) truck bodies to be installed on four (4) user supplied chassis.
2. It is preferred that the delivery of all 4 apparatus occur prior to spring thaw (March / April). Bidders able to provide delivery with sufficient lead time to permit the training all of operational personnel (approx duration = 1 month – placing delivery late Feb / early Mar 2012) may be given preference.
3. All items offered must comply with the most current requirements of the Canadian Motor Vehicle Safety Regulations, Alberta Traffic Safety Act, Regulations of the Occupational Health and Safety Statutes & applicable ULC & NFPA standards (1901, 1906, etc.).
4. The Contractor is to affix its assigned National Safety Mark and the final compliance label to the vehicle and ensure that the completed vehicle is in compliance with the applicable CMVSS requirements.
5. The Contractor is required to attend a pre-build meeting in Edmonton to ensure a clear understanding of the project requirements. Full layout drawings will be required.
 - 5.1. Drawings to be in colour and on “B” sized paper (17”x11”)
 - 5.2. There shall be five (5) views of the truck with the doors closed (Top, Left, Right, Front, Rear), four (4) views of the truck with the doors open (Top, Left, Right, Rear) and four (4) views of any walk-in area (Top, Left, Right, Rear)
 - 5.3. All compartment door openings and usable space shall be clearly shown in metric.
 - 5.4. The trucks overall length, height, width, wheelbase and cab-to-axle dimensions shall be clearly shown.
 - 5.5. The angles of approach and departure shall be shown in the maximum loaded condition to the nearest degree.
 - 5.6. All lighting packages will be clearly shown on the drawing and verified accurate per the most current NFPA standards.
 - 5.7. The exterior view shall show all scene lights, marker lights, speakers, horns, exhaust, tow points, exterior outlets, windows, winch receivers, tow hitches, exterior ladders and any other item important to the function of the vehicle.
 - 5.8. The open view shall show all trays, shelves, air system components, hydraulic components, tool boards, storage modules and any other items important to the function of the vehicle.
 - 5.9. The interior view for all walk-in areas shall show all seating positions, desks, cabinets, windows, tech equipment, radio locations and any other item important to the function of the vehicle.
 - 5.10. Any changes to the BID drawing will require a revision which will be clearly annotated in the upper right hand side of the drawing showing the revision number, reason for the revision, date and who made the changes.
 - 5.11. Drawing Text Block items: 5.11.1. Purchaser's name. 5.11.2. Body size and material type. 5.11.3. Chassis manufacturer and model number. 5.11.4. Unit description. 5.11.5. Wheelbase (WB) 5.11.6. Cab-to-axle (CA) distance. 5.11.7. Overall length (OAL) 5.11.8. Overall width, (OAW) 5.11.9. Overall height (OAH) 5.11.10. Scale, date, drawn by, drawing number and sheet number.
6. The unit should incorporate current components for which service is available Canada wide with maximum 1 day delivery of operationally critical components to Edmonton.
7. Materials and workmanship shall be of the highest grade in accordance with modern practice, free from all defects or imperfections affecting performance.
8. All welding is to conform to CSA standard W59 or better.
9. All capacity ratings will be in accordance with the applicable SAE Standards and be provided in metric units.
10. Where special tools are required for routine service on any component of the apparatus, such tools shall be provided with the apparatus.

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11. Apparatus components that interfere with repair or removal of other major components shall be attached with fasteners, such as cap screws and nuts, so that the components can be removed and installed with ordinary hand tools. These components shall not be welded or otherwise permanently secured into place.

12. Definitions:

12.1. City: The City of Edmonton – Fleet Services (FS) or the Edmonton Fire Rescue Service (FRS)

12.2. Length: Dimension parallel to vehicle frame.

12.3. Width: Dimension horizontally perpendicular to vehicle frame.

12.4. Height: Dimension vertically perpendicular to vehicle frame.

12.5. Preferred: Item or component which is to be quoted if available.

12.6. Or Approved Equal: Item or component which will perform at least as well as the one specified. Suppliers must clearly state when an item, other than the one specified, is being offered. The Supplier must provide specifications and/or samples for testing if requested by the City.

12.7. Mandatory: Item or component for which substitutes will not be accepted. This phrase is used when the City has standardized on a particular item or component.

12.8. Contractor: Successful Bidder.

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MANDATORY REQUIREMENTS

1. The unit must be a new, incorporating the latest designs.
2. Unit must incorporate a removable / interchangeable skid system.
3. Unit must have pump and roll capability.
4. Unit must be converted to single rear wheels.
5. Front & rear track width must be the same.
6. Unit must be compliant with all applicable NFPA standards (1906, 1901, etc.).
7. Unit must be compliant with all Federal (CMVSS), Provincial and Municipal regulations & standards.
8. The Contractor must use the chassis' provided by the City.
9. Bidders must have built at least 10 equivalent apparatus in the last two years. Provide references with full contact information & apparatus overview with bid.
10. All manuals & documentation must be provided with the completed unit upon delivery (or earlier).
11. Layout drawings must be provided with the bid.
12. Weight distribution must be provided with the bid for: a. Empty vehicle (showing max payload per axle - fully fuelled but no cargo, fire suppressants, occupants, etc.) b. Fully loaded vehicle (2x 250lb occupant, water, foam, fuel & 500lbs for vehicle inventory as shown in appendix).
13. Operating, maintenance & parts manuals must be provided for: a. all components installed b. only for installed components (i.e. not full product lines).
14. Hydraulic & electrical schematics/drawings must be as built.
15. Delivery of the completed vehicles must be via flat-deck transport. Driving the vehicles to Edmonton is not acceptable.

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INSPECTION & DELIVERY

1. The Contractor will be required to deliver the completed unit to Fleet Services Branch (FS), Fire Service Centre, 18603-106A Ave NW, Edmonton, Alberta. 1.1. State the expected per vehicle delivery costs.
2. The Contractor will be liable for any loss or damage to the vehicle and its components and accessories as supplied by the City of Edmonton. The Contractor is to certify that adequate insurance coverage is in force to cover this type of loss while the vehicle is in the custody of the Contractor or the Contractor's agents.
3. The Contractor is to contact the designated representative of the City of Edmonton to arrange for inspection of the unit(s). A minimum of thirty-five (35) working days notice shall be required prior to the requested inspection date. Minimum inspection requirements are:
 - 3.1. Upon completion of installation of the body and equipment on to the frame, prior to painting.
 - 3.2. Upon completion of the unit.
4. Test and verify all operational controls and safety systems.
5. The Contractor shall be responsible for all costs related to movement of equipment, for installation of additional equipment, pre-delivery, defect correction, and warranty, prior to acceptance.
6. Top up fuel tanks after delivery to Edmonton, up to 400 liter capacity.
7. Supply a tare weight ticket from a certified scale for the fully fuelled, completed unit (must include individual axles, tongue, etc. as appropriate).

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LITERATURE & TRAINING

1. Literature to be provided prior to fabrication:
 - 1.1. Weight Distribution.
 - 1.2. Pre-production Drawing.
 - 1.3. Warranty details.
2. Literature to be provided with (or prior to) delivery:
 - 2.1. Five sets of operation and maintenance manuals (for the entire order).
 - 2.2. Three sets of electronic copies (preferred that these can be easily manipulated for creation of FRS training manuals – e.g. pdf).
 - 2.3. Two sets of paper copies
 - 2.4. Three sets of parts manuals (should include part numbers, lists of suggested usage/condition based replacement parts – e.g. filters, etc., and supplier contact info).
 - 2.5. As built colour drawings (B size – 17"x11") 2.4. Hydraulic and electrical schematics, must be AS BUILT.
 - 2.6. Completed City of Edmonton Receiving Report (hardcopy sample is included with this Tender Package but an electronic version will be required prior to delivery of the vehicles), included with the attached Detailed Specification, which includes the part numbers of common replacement parts, the serial numbers of major components etc. (see Appendix C).
 - 2.7. Stability and load test record.
 - 2.8. Engineering certification(s).
 - 2.9. Manufacturer's name and address.
 - 2.10. Country of manufacture.
 - 2.11. Source for service and technical information.
 - 2.12. Parts replacement information.
 - 2.13. Descriptions, specifications, and ratings of the chassis, pump, etc.
 - 2.14. AS-BUILT wiring diagrams for low voltage and line voltage systems to include the following information (hard copies to be printed in colour & laminated on "B" size 17"x11" paper):
 - 2.14.1. Pictorial representations of circuit logic for all electrical components and wiring.
 - 2.14.2. Circuit identification.
 - 2.14.3. Connector pin identification.
 - 2.14.4. Zone location of electrical components.
 - 2.14.5. Safety interlocks.
 - 2.14.6. Alternator–battery power distribution circuits
 - 2.14.7. Input/output assignment sheets or equivalent circuit logic implemented in multiplexing systems.
 - 2.14.8. Lubrication charts.
 - 2.14.9. Instructions regarding the frequency and procedure for recommended maintenance.
 - 2.14.10. Overall apparatus operating instructions.
 - 2.14.11. Safety considerations.
 - 2.14.12. Limitations of use.
 - 2.14.13. Inspection procedures.
 - 2.14.14. Recommended service procedures.
 - 2.14.15. Troubleshooting guide.
 - 2.14.16. Apparatus body, chassis, and other component manufacturer's warranties
 - 2.15. Special data required by this standard:

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- 2.15.1. A material safety data sheet (MSDS) for any fluid that is specified for use on the apparatus.
3. The Contractor shall supply, at the time of delivery, at least one (1) copy per vehicle of the following documents:
 - 3.1. Owner's name and address.
 - 3.2. Apparatus manufacturer, model, and serial number.
 - 3.3. Paint manufacturer and paint number(s).
 - 3.4. Company name and signature of responsible company representative.
 - 3.5. Certification of compliance of the optical warning system.
 - 3.6. Siren manufacturer's certification of the siren.
 - 3.7. Written load analysis and results of the electrical system performance tests.
 - 3.8. Certification of slip resistance of all stepping, standing, and walking surfaces.
 - 3.9. If the apparatus has a line voltage power source, the certification of the test for the power source.
 - 3.10. Any other required manufacturer test data or reports.
4. Operator Training:
 - 4.1. Provide operator training at a site designated by the City of Edmonton (within Edmonton, AB).
 - 4.2. Training is to include all aspects of operation for the unit including safety.
 - 4.3. All daily maintenance, servicing, and inspections are to be covered during the training.
 - 4.4. State the actual training time. A minimum of a one (1) full day course is expected.
 - 4.5. Training is to occur immediately prior to the unit entering service. This may occur one (1) or more weeks after delivery of the unit.
 - 4.6. State how much notice is required prior to training.
 - 4.7. Provide a DVD video covering training.
5. Mechanic/Technician Training:
 - 5.1. Provide training for mechanics and other service personnel at a site designated by the City of Edmonton (within Edmonton, AB).
 - 5.2. Training is to include operation, safety, preventative maintenance, trouble shooting, inspections, and maintenance/repair procedures.
 - 5.3. A minimum one (1) full day course is expected
6. Final scheduling of operator / mechanic training to be reviewed at the pre-build to ensure coverage for all training & service staff.

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PAINT

1. Prior to painting:
 - 1.1. All surfaces shall be sandblasted to remove all surface oxidation and imperfections.
 - 1.2. All surfaces shall be prepared in accordance with the paint manufacturer's instructions and in accordance with good practice.
2. Sand all surface weldments and joints.
3. All electrical, hoses, valves, couplers, fittings, exhaust, etc. shall be installed after painting of the body or properly masked during painting.
4. The body shall be painted with a single color of PPG Delfleet® Evolution paint per approved customer sprayout.
5. Prior to the assembly and reinstallation of exterior components; i.e. warning and DOT lights, handrails, steps, door hardware, and miscellaneous items, an isolation tape, or gasket shall be used to prevent damage to the finish painted surfaces. These components shall be fastened to body using either a plastic insert into body metal with stainless steel screws or zinc coated nutserts into body surface using stainless steel bolts to prevent corrosion from dissimilar metals.
6. Touch-up paint shall be provided with completed vehicle.
7. Paint Color: Match cab/chassis supplied paint color.
8. Expanded metal surfaces to be powder coated or electrostatically painted.
9. The entire underside of body shall be sprayed with black automotive undercoating to a thickness of 3 mm (1/8 in.). Undercoating shall cover all areas underside of body and wheel well area to help prevent corrosion under the vehicle.
10. Stainless steel, aluminum or plastic tanks do not require coatings.
11. Manufacturer's dry times must be followed to ensure maximum adhesion.
12. All decals, name plates, tool compartments, mud flaps and electrical fixtures must be installed after the paint has fully hardened.
13. No company and/or manufacturer's logos are to be affixed to the Unit(s) without the written consent of the Owner's Fleet Section.
14. There shall be the following graphics applied to the completed unit(s):
 - 14.1. One (1) 4.0" white reflective stripe with blue outline along the cab sides
 - 14.2. Two (2) Edmonton Fire Department door crests, one (1) per side
 - 14.3. Two (2) -three (3) digit unit numbers, one (1) per side
 - 14.4. Red/yellow chevron material coving as much of the apparatus rear as possible
 - 14.5. One (1) 4" white reflective stripe covering 25 percent of the front bumper surface
 - 14.6. Four (4) 94.0 square inch reflective door panels, one (1) per door
 - 14.7. Two (2) 2.0" red/white sections of conspicuity tape, one (1) along each flat bed side

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WARRANTY

1. Describe warranty offered. Selection will be influenced by coverage. All bidders are to provide a minimum one (1) year warranty covering 100% parts and labour. A two (2) year unlimited warranty is preferred.
2. Provide with the bid a copy of the warranty policy. The warranty policy is to list any items which are not covered or any limiting circumstances or conditions.
3. Provide with the bid a complete list of all warranty options available complete with pricing.
4. The City of Edmonton seeks maximum product support in the form of warranty coverage. Time is of the essence in getting the machine back into productive service. Records of warranty work frequency, supplier response, costs and machine downtime will be monitored to establish an information base from which relative cost performance will be calculated, for future acquisition guidance.
5. The warranty coverage is to be inclusive of all parts and labour necessary to correct defects during the warranty period.
6. Warranty to commence on the day the vehicle first enters service, not the date of initial delivery.
7. Correction under warranty is to cover defective materials and/or workmanship, premature failure, and design deficiencies that impede effective performance.
8. Bidder to assume responsibility for obtaining Original Equipment Manufacture component coverage (engines, transmissions hydraulics etc.).
9. The Contractor is to provide a warranty summary card with each unit purchased, listing details of coverage for all installed components (other than those supplied by the Owner).
10. State if a mechanic would be sent out to a job site or City service shop to perform repairs? State if towing charges would be covered during the warranty period?
11. Bidder to note that The City of Edmonton has the facilities and capabilities to perform approved rechargeable warranty work that is mutually agreed on, and to propose the use of these where mutually acceptable. Preference may be given to bidder accepting this proposal. Clearly define warranty work conditions.
12. State hourly rate reimbursement for City completed warranty work.
13. During the warranty period, the Contractor is to provide copies of work orders for all warranty work conducted by the dealer within 48 hours of the completion of the work. The work orders are to contain sufficient detail as to the problem description, any tests that were conducted and what was done to repair the condition. Work orders should be faxed to the Warranty Administrator at (780) 496-5499.
14. The City of Edmonton purchases some parts by tender. The parts purchased may not be O.E.M. parts. Are warranties affected by this policy? If so, in what way?
15. State maximum time in calendar days for delivery of spare parts from receipt of order.
16. **NOTE: Due to the critical nature of this type of unit, service & replacement components for installed devices and equipment should be readily available in Canada (preferably in Edmonton, Alberta).**

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ELECTRICAL & LIGHTING

1. Lighting and reflector equipment shall be provided to meet all applicable Canadian and Provincial regulations currently in effect.
2. A complete schematic drawing of the complete electrical system installed, is required to be provided upon completion of the unit. The drawing is to be generated using a computer based CAD program.
3. The Contractor must ensure all electrical integration with chassis electrical system is done in strict accordance with the manufacturer's recommended and approved methods. Correction of any electrical problems related to improper integration shall be at the Contractor's expense.
4. All wiring connections are to be made inside junction boxes. Sealed splices shall be located within 12 in. of lamps, switches, or equipment. There shall not be any hidden connections in the body electrical systems.
5. All wiring shall be arctic flex, multistrand. Wire gauge shall be selected based on circuit load and length in accordance with good design practice.
6. All wiring is to be neatly routed and is to be protected from impact, direct road splash and abrasion.
7. All cables are to have sufficient length to be neatly routed in areas that are not subject to damage.
8. All cables are to be provided with strain relief near each end, and are to be supported at intermediate points using bolt on vinyl coated wire clamps. Clamps are to be located at a spacing of 24 in., or less along the length.
9. All terminal connections are to be made using tongue terminals unless otherwise specified.
10. All wiring connections are to be rosin core soldered and shrink tube sealed.
11. All ground wires to return to suitable junction box.
12. Provide protection for lamps by installing a sealed continuously welded box or approved alternate behind all lamps. Wiring is to enter the sealed boxes by appropriately sized waterproof entrance fittings.
13. Junction Box (12VDC):
 - 13.1. Truck-Lite 50401 or equal.
 - 13.2. Installed in an accessible location.
 - 13.3. All body marker, clearance, signal/brake, and backup lights shall be wired to the junction box.
14. The junction box only shall be connected to the chassis lighting circuits.
15. All exposed wiring shall be enclosed in plastic loom.
16. All electrical connections shall be soldered and shrink tubed unless a junction box is used.
17. Low Voltage - Electrical System Performance Test.
 - 17.1. The vehicles low voltage electrical system shall be tested and certified by the manufacturer. The certified test results shall be delivered with the completed vehicle. Tests shall be performed when the air temperature is between 0°F and 110°F (-18°C and 43°C).
18. Test Sequence
 - 18.1. The following three tests shall be performed in the order in which they appear below. Before each test, the batteries shall be fully charged until the voltage stabilizes at the voltage regulator set point and the lowest charge current is maintained for 10 minutes. Failure of any of these tests shall require a repeat of the sequence.
 - 18.2. *Reserve Capacity Test*
 - 18.2.1. The engine shall be started and kept running until the engine and engine compartment temperatures are stabilized at normal operating temperatures and the battery system is fully charged. The engine shall be shut off, and the minimum continuous electrical load shall be activated for 10 minutes.

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18.2.2. All electrical loads shall be turned off prior to attempting to restart the engine. The battery system shall then be capable of restarting the engine. Failure to restart the engine shall be considered a test failure of the battery system.

18.3. *Alternator performance test*

18.3.1. Test at idle

18.3.1.1. The minimum continuous electrical load shall be activated with the engine running at idle speed. The engine temperature shall be stabilized at normal operating temperature. The battery system shall be tested to detect the presence of battery discharge current. The detection of battery discharge current shall be considered a test failure.

18.3.2. Test At Full Load

18.3.2.1. The total continuous electrical load shall be activated with the engine running up to the engine manufacturer's governed speed. The test duration shall be a minimum of 2 hours. Activation of the load management system shall be permitted during this test.

18.3.2.2. An alarm sounded by excessive battery discharge, as detected by the warning system required in 13.3.4, or a system voltage of less than 11.8 V dc for a 12 V nominal system, 23.6 V dc for a 24 V nominal system, or 35.4 V dc for a 42 V nominal system for more than 120 seconds shall be considered a test failure.

18.3.3. *Low Voltage Alarm Test*

18.3.3.1. The following test shall be started with the engine off and the battery voltage at or above 12 V for a 12 V nominal system, 24 V for a 24 V nominal system, or 36 V for a 42 V nominal system.

18.3.3.2. With the engine shut off, the total continuous electrical load shall be activated and shall continue to be applied until the excessive battery discharge alarm activates. The battery voltage shall be measured at the battery terminals.

18.3.3.3. The test shall be considered a failure if the alarm does not sound in less than 140 seconds after the voltage drops to 11.70 V for a 12 V nominal system, 23.4 V dc for a 24 V nominal system, or 35.1 V for a 42 V nominal system.

18.3.3.4. The battery system shall then be able to restart the engine. Failure to restart the engine shall be considered a test failure.

19. Low voltage - electrical system performance test.

19.1. Documentation - The manufacturer shall deliver the following with the fire apparatus:

19.2. Documentation of the electrical system performance tests.

19.3. A written electrical load analysis, including the following:

19.4. The nameplate rating of the alternator.

19.5. The alternator rating.

19.6. Each of the component loads specified that make up the minimum continuous electrical load.

19.7. Additional electrical loads that, when added to the minimum continuous electrical load, determine the total continuous electrical load.

19.8. Each individual intermittent electrical load.

20. All wiring is to conform to the following colour code as far as practicable. Colour Use White Ground Black Clearance lamps, identification lamps and side marker lamps. Yellow Left turn lamps, stop lamps and hazard lamps. Red Backup lamps and backup alarm. Green Right turn lamps, stop lamps and hazard lamps. Brown Tail lamps and license lamps.

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CHASSIS

1. The body shall be installed on a user supplied 2012 Ford F450 Chassis (see Appendix A for full chassis specifications) Year: 2012 Make: Ford Model: F450 Supercab GVWR: 7,484kg (16,500lbs) FGAWR: 2,540kg (5,600lbs) RGAWR: 5,443kg (12,000lbs) Tires: To be replaced as per this specification Engine: 6.8L EFI V10 Gas (supplied with only midship 106L fuel tank) Transmission: Ford 5spd TorqShift Automatic with Tow/Haul mode Differential ratio: 4.88 Drive: 4x4 manual engagement with manual locking hubs Wheelbase: 4.11m (162") Cab-to-Axle: 1.52m (60") Axle-to-Frame: 1.21m (47.6") Colour: Vermillion Red
2. Chassis specs to be confirmed at pre-build meeting prior to submitting order for chassis'.
3. All necessary labels and placards shall be provided to meet the requirements of NFPA 1901/1903.
 - 3.1. One (1) additional label shall be provided in the cab stating "WARNING: DO NOT EXCEED 96KPH/60MPH".

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CHASSIS MODIFICATIONS

1. Wheels

- 1.1. The chassis must be converted to single rear wheels.
- 1.2. The front and rear tracks must be the same width.
 - 1.2.1. Offset rims may be required on the front wheels to permit a single track width.
 - 1.2.2. Preference for wheels & rims that are interchangeable for any position on vehicle.
- 1.3. The wheels shall be Firematic brand B.R.A.T. Super Single 19.5 wheels.
 - 1.3.1. The wheels shall be painted black prior to installation on the completed apparatus.

2. Tires

- 2.1. Minimum tire width 34cm (13.5").
- 2.2. Minimum tire diameter 91cm (36.0").
- 2.3. Tires shall be directional.
- 2.4. Tires payload ratings must be as high as achievable. The City understands that payload ratings may be decreased by converting to single rear wheels but wishes to maintain the highest payload possible.
- 2.5. Tread pattern should be designed for 70% off-road / mud (i.e. aggressive tread); 30% on road use.
 - 2.5.1. The vehicle may be used during the winter and on ice – this must be taken into consideration for tire selection.
- 2.6. The tire provided shall be Interco Tire Company IROK Super Swamper Custom 19.5" Rugged On/Off Road 16 ply tires.

3. Fender Flares.

- 3.1. The full width of the tires should be covered by the body – wider fender flares may be required to fulfill this requirement.

4. Ground Clearance.

- 4.1. Highest available ground clearance is preferred (without affecting on-road performance or payload).
- 4.2. A 6.0" suspension lift shall be provided.
- 4.3. The majority of components shall be readily available. Drawings and manufacturing information shall be provided for any components that are custom fabricated.
- 4.4. Payload must not be adversely affected by any changes in the suspension.
- 4.5. Drivelines must not be adversely affected by any changes in the suspension.
- 4.6. State the minimum ground clearance with a fully loaded apparatus (water, foam, 500lbs of equipment and two 250lb operators).

5. Running boards / Entry Steps.

- 5.1. Aluminum running boards / entry steps are to be installed to:
 - 5.1.1. Minimize entry / exit step height.
 - 5.1.2. Protect the sills of the chassis.
- 5.2. Steps to be equipped with NFPA certified anti-slip material. Diamond Back anti-slip material shall be installed on the running board surface. Large drain holes shall be cut into the material to prevent water, dirt, and debris from accumulating on the surface.
- 5.3. Steps are to be the full length of the door openings on both sides.

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6. Front Bumper.
 - 6.1. Supply & Install a heavy duty off-road style bumper.
 - 6.1.1. Should have full protection for the front of the apparatus, (i.e. brush guards, etc.).
 - 6.1.2. Suggested make is "Buck Stop" or equivalent.
 - 6.1.2.1. The bumper brush guard(s) and headlight hoop(s) will be custom fabricated to allow for customization of accessory mounting.
 - 6.2. Should have two (2) clevis style tie-off points on either side of the front bumper.
 - 6.3. Should have two (2) ports for additional forward lighting.
 - 6.4. Should have mounting location and fairlead rollers for the specified winch.
 - 6.4.1. Mounting location should not affect approach / departure angles of vehicle.

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LIGHTING

1. Unless otherwise specified, all lighting is to be wired to a keyed ignition source.
2. At least 6" of extra slack wire shall be left at each fixture to facilitate repair and maintenance of components.
3. Scene / Perimeter
 - 3.1. Perimeter
 - 3.1.1. The ground beneath each entry door shall be illuminated with a minimum of one (1) 9" LED (white) light stick.
 - 3.1.2. The ground beneath the sides & rear of the apparatus shall be illuminated with a minimum of two (2) 9" LED (white) light sticks per side.
4. Emergency
 - 4.1. Wig-Wag
 - 4.1.1. Supply & Install a headlight wig-wag module, to be activated by the master lighting switch and able to be disabled via a separate switch on the controller (lighting controller layout – to be as per Appendix B). Wig-Wag lights to be enabled / disabled as per NFPA guidelines.
 - 4.2. Headlight Strobes
 - 4.2.1. Supply & Install two (2) white strobes, one (1) in each headlight assembly. Whelen Vertex Super-LED white strobes are preferred.
 - 4.3. Lightbar (Upper zones A, B, C, D)
 - 4.3.1. Supply & Install one (1) 55" light bar. Whelen Edge Ultra Freedom II FC Series Super-LED light bar is preferred.
 - 4.3.2. All modules to be red LED with clear lenses.
 - 4.3.3. Should include LED front take-down lights and side alley lights.
 - 4.3.4. Should be configured such that the take-down lights wig-wag when the master switch is activated (should be able to be overridden by the take-down switch for steady "on" operation). Wig-Wag lights to be enabled / disabled as per NFPA guidelines.
 - 4.3.5. Supply a light bar configuration drawing.
 - 4.4. Grill lighting
 - 4.4.1. Lower – front facing (Zone A)
 - 4.4.1.1. Install two (2) red Whelen M4 Series Linear-LED Super-LED (M4C) grill lights on the front push bumper.
 - 4.4.2. Lower side facing (Zones D & B)
 - 4.4.2.1. Install one (1) red Whelen M4 Series Linear-LED Super-LED (M4C) grill light on each side of the front push bumper – facing sideways for a total of two (2) provided.
 - 4.5. Lower – Rear - Side facing
 - 4.5.1. Supply & Install two (2) Whelen M4 Series Linear-LED Super-LED (M4C) - one (1) per side with chrome bezel.
 - 4.5.2. Brush guards are required on side facing lights
 - 4.6. Lower – Rear - Rear facing
 - 4.6.1. Supply & Install two (2) Whelen M4 Series Linear-LED Super-LED (M4C) - one (1) per side of the rear apron with chrome bezel
5. Clearance / Identification
 - 5.1. Shall be Truck-lite model 33 LED with black grommet (or equivalent) as required per Transport Canada CMVSS.

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6. Stop/Turn/Tail/Backup
 - 6.1. Preference for Stop / Tail lights to be Whelen M6 Series LED (M6BTT)
 - 6.2. Preference for Turn lights to be Whelen M6 Series LED (M6T)
 - 6.3. Preference for Backup lights to be Whelen M6 Series LED (M6BUW)
7. Service lights
 - 7.1. Install two (2) under hood service lights (one per side of the hood)
 - 7.2. Lights to be switched at each unit
 - 7.3. Lights should be white LED and should be wired hot (directly to the battery) via a battery minder system that will shut down the load once the battery reaches a preset level.
 - 7.4. Level should be set so that the battery has sufficient residual power to start the chassis engine.
8. Secondary forward lighting:
 - 8.1. Install two (2) Baja Designs PreRunner 6" HID driving lights in the front bumper ports.
 - 8.2. Lights should have clear replaceable polycarbonate lenses.

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ELECTRICAL

1. Shore Power
 - 1.1. Supply and Install one (1) shore power inlet. Kussmaul 20 amp "Super Auto-Eject" shore power inlet preferred.
 - 1.2. The shore power connections shall automatically disengage from the vehicle when the chassis ignition is engaged.
 - 1.3. The outlet cover shall be yellow
 - 1.4. The shore power plug shall be located on the front streetside corner of the body
 - 1.5. Shore power shall be wired to the specified 120 volt battery conditioner
 - 1.6. A matching 20 ampere plug shall be shipped with the apparatus for owner supplied external power source wiring.
2. Battery Conditioner
 - 2.1. Supply and install one (1) battery charger. Xantrex TRUECharge2 (20A – 12VDC) battery charger preferred. The charger shall be located in the crew area of the cab, behind the front seat. A protective cover shall be provided to prevent items from being stored on top of the unit and damaging it.
3. Battery Charge Indicator
 - 3.1. A Kussmaul 091-94-12E charge indicator display shall be provided and located on the front streetside corner of the body, adjacent to the shore power inlet. This single battery system indicator is a suppressed zero bar graph voltage display which may be installed in any 12 volt system.
4. Siren & Controller
 - 4.1. Install two (2) Whelen model SA314B 100W black, epoxy coated siren speakers in front grill area of the chassis. The siren speakers shall be mounted on the front push bumper, one (1) per side adjacent to the center grill guard uprights. The siren speaker shall be mounted sufficiently rearward to ensure they remain within the bumper envelope and are protected in the event the bumper contacts brush, etc.
 - 4.2. Install one (1) light and siren controller. D & R Electronics (www.dandrelectronics.com) RDS16 S light and siren controller preferred. The siren shall be programmed to allow the steering wheel horn ring to actuate the air horn function of the siren when the siren is in use (responding mode).
 - 4.3. Lighting controller configuration as per Appendix B.
5. Master Disconnect
 - 5.1. Supply & Install one (1) master disconnect switch in the dash panel within easy reach of the driver.
 - 5.2. A green "battery on" pilot light should be installed in a location that is visible from the driver's seated position.

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FLAT DECK

1. Toolboxes, storage compartments and the water pump skid unit shall be attached to the flat deck.
 - 1.1. Tool boxes shall be suspended below the deck immediately behind the cab. Tool boxes shall extend to the level of the cab floor but should not extend below the bottom of the cab.
 - 1.1.1. The forward tool box doors shall be designed to support the weight of a person standing on them. The inner door liners shall be fabricated from NFPA compliant tread plate material to provide a non-skid stepping surface.
 - 1.2. Top storage bins shall be fabricated from tread plate material with a side opening door. The storage bins shall be equipped with either large drain holes or a sweep out/wash out interior to allow the compartments to be easily cleaned. The storage bins shall be designed to hold long tools including rakes.
2. The sides and rear apron of the flat deck shall house all of the required side & rear facing emergency, clearance & identification lighting as applicable by the NFPA and Transport Canada.
3. The deck & structure shall be constructed of aluminum (for weight conservation).
4. The deck surface shall be NFPA compliant polished aluminum treadplate of no less than 1/8" thickness.
5. The deck shall be constructed of 1/8" NFPA aluminum tread plate material, with a 2"x3"x1/4" aluminum sub-frame. A total of four (4) cross members shall be utilized and bolted to the chassis.
6. State how the deck will be mounted to the chassis.
7. Headache rack
 - 7.1. The back of the cab is to be protected with a headache rack.
 - 7.2. Rack is to stay within the contours of the cab (i.e. not project out past the cab profile).
 - 7.3. Rack to be constructed of 2" x 2" square tubing with perforated aluminum (50% open space) centers.

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SKID UNIT

1. General

- 1.1. The entire pump system shall be mounted on a removable skid. This is to allow for interchangeability of skids and ease of servicing.
- 1.2. Skid frame must be strong enough to allow lifting of the entire unit, suggested construction material is aluminum. Provide details on the skid frame construction.
- 1.3. Skid must be removable via:
 - 1.3.1. Over-head crane - a minimum of 4 removable lifting eyes are required.
 - 1.3.2. Fork lift – fork tunnels shall be provided
- 1.4. Skid must be removable in a reasonable amount of time (faster is preferred)
 - 1.4.1. State estimated time of removal
 - 1.4.2. State estimated time of installation
- 1.5. The skid should be securely fastened to the deck when operational. State method of securement.
- 1.6. All electrical, plumbing, etc. connections between the chassis and the skid should be designed so that they are easy to disconnect (for removal of the skid) and accessible (for servicing without removal of the skid).
- 1.7. Altitude in Edmonton is roughly 2,200 ft above sea level.

2. Water Tank

- 2.1. The water tank shall be a UPF poly tank. A lifetime manufacturer's warranty shall guarantee that the tank will be free from manufacturing defects in materials and workmanship for the service life of the apparatus.
- 2.2. The tank shall have a capacity of 1,363L (300 GAL-UK) +/- 10 GAL-UK.
- 2.3. The tank shall be designed for fire department use and be baffled to reduce stability problems caused by the water moving in the tank.
- 2.4. The tank shall have a clear strip in the rear area of the tank that will act as a manual water level indicator.
- 2.5. An anti-cavitation device shall be provided in the tank outlet to allow maximum use of the available water at high flows.
- 2.6. The top of the tank shall have a removable oval inspection lid.
- 2.7. A fill tower shall be installed on top of the tank to provide alternate filling capability as well as providing adequate venting of the tank.
- 2.8. There shall be two (2) standard tank openings; one (1) for tank to pump suction with an anti-swirl plate and one (1) for a tank fill line.
 - 2.8.1. State the diameter of the tank supply & tank fill lines.
- 2.9. Tank overflow shall drain behind the rear wheels.
 - 2.9.1. The tank overflow diameter shall be larger than the quick fill inlet pipe diameter.
 - 2.9.2. Drains / overflows must not drain water in front of or on the rear wheels.

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3. Foam

- 3.1. One (1) 45.5L (10 GAL UK) UPF poly foam tank shall be installed on the skid.
- 3.2. The tank should be located so it is easy to fill.
- 3.3. The tank should be properly vented.
- 3.4. The tank should be equipped with a manual fill system that is designed to prevent aeration of the foam.
- 3.5. A clear foam level gauge / sight glass shall be located on the side of the tank
 - 3.5.1. Level gauge shall be visible from an operator standing on the ground
- 3.6. There shall be a clear overflow line that directs the overflow into a smaller poly containment device located on the skid unit.
- 3.7. There shall be a purge system capable of purging the entire foam system and all discharges that are foam capable.
- 3.8. The tank / purge system shall have a secondary "quick" drain with a 50mm (2") poly valve plumbed into a quick disconnect clear flex hose to permit the foam to be quickly drained / purged. This is to permit the foam tank to be filled with decon foam for decontamination of personnel.
- 3.9. Foam shall be dispensed via a Foam Pro 1601 digital proportioning system & digital controller.
- 3.10. Foam system should be installed with remote start stop for operation from within the cab for pump & roll operations.
- 3.11. Foam system shall be equipped with a low level indicator to display on both the main and auxiliary pump panel.
- 3.12. Maximum concentrate level required is 1%; Edmonton FRS uses Niagara Class A/B foam.

4. Pump

- 4.1. High pressure – low flow pump (5 GPM / 19LPM @ 250 Psi / 1,723kPa; 150GPM / 568LPM @ 50PSI / 345kPa).
- 4.2. State drive type (Belt / Transmission; a non-belt driven is preferred).
- 4.3. Pump body made from aluminum alloy.
- 4.4. Bronze impeller
- 4.5. Suggested model CET P/N PFP-18hpHND-HP (or equivalent).
 - 4.5.1. State the provided pump make / model & provide full specs.
- 4.6. Primer (Electric is preferred).
- 4.7. Inlets to pump
 - 4.7.1. Tank Supply
 - 4.7.2. Auxiliary 65mm (2.5") inlet

5. Valves

- 5.1. Stainless steel Akron valves are preferred in all applications (no substitutes).

6. Inlets

- 6.1. Valves to be ¼ turn manually operated valves unless otherwise specified.
- 6.2. Tank to pump (electrically operated – controls should be located on both control panels).
- 6.3. Dedicated 65mm fill line for quick fill with ¼ turn ball valve – to be plumbed into base of tank so can also be used as drain.

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7. Discharges
 - 7.1. Valves to be ¼ turn manually operated valves unless otherwise specified.
 - 7.2. Hose reel.
 - 7.3. Monitor (electric valve).
 - 7.4. Manifold (stainless steel).
 - 7.4.1. Three (3) 38mm outlets (1/4 turn ball valve on each).
 - 7.4.2. Outlets to be supplied capped
 - 7.4.3. Caps to be tethered to prevent loss.
8. Provide a table with sizing / diameters for all inlets / discharges (include return to tank, tank supply, etc.).
9. Engine shall:
 - 9.1. Be gas operated (with stand-alone fuel tank – not plumbed into chassis tank).
 - 9.2. Approximately 18HP.
 - 9.3. Be air cooled.
 - 9.4. V-twin cylinder design.
 - 9.5. Have 12V Electric start (start/stop from both main & aux pump panels).
 - 9.6. Have auxiliary rope start.
 - 9.7. State make / model offered, provide full specs with bid.
Honda GX610-QDW 18HP, 4-stroke, OHV, 2 cylinder "V", 31.8 lb/ft @ 2,500 RPM.
10. Fuel
 - 10.1. Minimum 22L (4.8 GAL UK) capacity.
 - 10.2. Remote mounted poly tank with priming system (as required).
 - 10.3. Mechanical shutoff valve at tank.
 - 10.4. Sufficient fuel to run pump continuously for 4 tanks of water.
 - 10.5. Must be located so that if required to be filled during operation is not in close proximity to any exhausts / hot surfaces.
11. Exhaust system shall:
 - 11.1. Be equipped with noise suppression system to minimize noise levels.
 - 11.2. Be directed vertically away from all work areas.
 - 11.3. Be equipped with a flapper valve to prevent rain / debris entry into the exhaust system (as required).
12. Monitor
 - 12.1. Supply & Install one (1) skid mounted Akron 3462 Forestry Monitor electronically controlled water monitor.
 - 12.2. Nozzle: Style 3293 low flow adjustable fog nozzle with flush.
 - 12.3. The monitor shall be located on top of the skid, along the centerline, directly behind the cab.
 - 12.4. Monitor controls should be located inside the cab (joystick with digital direction display) and at the main pump panel (tethered remote).

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13. Booster Hose Reel

- 13.1. Supply & Install one (1) hose reel.
- 13.2. Reel shall:
 - 13.2.1. Be located on the fore/aft center line of the skid tank, on top of the skid, behind the monitor.
 - 13.2.2. Be electric rewind hose reel with 12' tethered remote and push button on main control panel.
 - 13.2.2.1. Push button control on main pump panel to be weather proof.
 - 13.2.3. Include manual rewind back up.
 - 13.2.4. An adjustable brake shall be provided to allow adjustment of the reel tension.
 - 13.2.5. Hose to deploy only to the curbside of apparatus.
 - 13.2.6. Be equipped with two (2) chrome plated vertical guide rollers (full height of the reel) and two (2) chrome plated horizontal full width rollers. Rollers must prevent contact of the hose with any components on the skid.
 - 13.2.7. Have a method of securing the hose / nozzle once the reel is fully rewound.
 - 13.2.7.1. Nozzle securement device should be at deck level.
- 13.3. Hose shall be 100' (45m) of 1" (20mm) high pressure booster hose – Reeltex red booster hose.
 - 13.3.1. Specify type of hose construction.
- 13.4. An Akron 4802 1" Assault Nozzle with Pistol Grip and Spinning Teeth shall be provided with the hose reel. The nozzle shall be capable of running pressure from 100-580 PSI with flow rates of 50, 100, or 150 LPM.

14. Pump Panel (Main – standard full control panel)

- 14.1. To be located on the rear of the apparatus
- 14.2. Black anodized non-reflective metal base
- 14.3. Rain shield
- 14.4. Night operations light weight toggle switch
- 14.5. LED illumination
- 14.6. Vernier type throttle control
- 14.7. Pressure gauge, liquid filled, mounted flush (4.5" compound)
- 14.8. Ignition power light – power on
- 14.9. Adjustable choke control – push / pull
- 14.10. Starter button – push to start
- 14.11. Ignition switch – on/off
- 14.12. Auxiliary lighting switch – on/off
- 14.13. Automatic Safety switch (water pressure cut-out for low pressure) with override
- 14.14. Low oil pressure warning light
- 14.15. Alternator monitoring ammeter gauge
- 14.16. Elapsed engine hour operation meter
- 14.17. Push button type circuit breakers for panel electronics
- 14.18. Hose reel circuit breaker
- 14.19. Panel mounted electric hose reel rewind button
- 14.20. Remote connection for electric hose reel control
- 14.21. Remote connection for monitor & discharge valve
- 14.22. Foam system controls (incl purge controls) with level indicator
- 14.23. Electronic water level gauge

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15. Pump Panel (Auxiliary – inside the cab between front seats)

- 15.1. Black anodized non-reflective metal base
- 15.2. Night operations light weight toggle switch
- 15.3. LED illumination
- 15.4. Vernier type throttle control
- 15.5. Pressure gauge, liquid filled, mounted flush (4.5" compound)
- 15.6. Ignition power light – power on
- 15.7. Adjustable choke control – push / pull
- 15.8. Starter button – push to start
- 15.9. Ignition switch – on/off
- 15.10. Auxiliary lighting switch – on/off
- 15.11. Automatic Safety switch (pressure cut-out) with override
- 15.12. Low oil pressure warning light
- 15.13. Tank to pump control
- 15.14. Joystick control for monitor (with electronic pan/tilt indicator)
- 15.15. Foam system controls with level indicator
- 15.16. Electronic water level gauge

16. Plumbing

- 16.1. Deadhead preventer – install a small diameter recirculation line to prevent pump from overheating when discharges are shut down.
- 16.2. No valleys or crests are permitted in the suction line.
- 16.3. All inlets should be screened and include tethered caps (as per NFPA).
- 16.4. Install a check valve in the high pressure discharge to prevent back flow.
- 16.5. All ¼ turn valves will be swing out Akron 8800 series valves.
- 16.6. All plumbing (suction or pressure) lines will be high pressure hose with stainless steel liners. Threads for hose connection:
 - 16.6.1. 25mm – NPT
 - 16.6.2. 38mm – NPT
 - 16.6.3. 65mm – AMA
- 16.7. Suction inlet (tank to pump) – the pump suction shall be plumbed to the water tank through a 2.5" (65mm) electrically controlled valve.
- 16.8. Suction Hose – supply & mount two (2) sections of suction rated hose with the appropriate connections on the driver side of the skid (on top of the storage bin for ground engaging tools) as per NFPA requirements.

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MISCELLANEOUS

1. Winch
 - 1.1. Supply & Install one (1) 15,000lb winch. WARN M15000 – 15,000lb winch preferred.
 - 1.2. Winch to be permanently mounted within the front bumper.
 - 1.3. Supply a 3.7m (12') tethered control.
 - 1.4. Supply a four (4) roller fairlead system in the front bumper.
2. Partition
 - 2.1. Provide a security partition to isolate the contents of the extended cab portion of the chassis from the occupant area. Final configuration to be reviewed at pre-build.
3. Cab interior cargo securement
 - 3.1. Provide cargo securement required as per NFPA for all contents within the cab (see Appendix D – ATP Equipment Inventory) – final configuration to be reviewed at pre-build.
4. Backup Alarm
 - 4.1. Supply & Install one (1) self-adjusting backup alarm that will automatically activate when the transmission is engaged in reverse.
5. Rear Tow hitch
 - 5.1. Supply & Install a Class 4 rear tow hitch (2" square receiver).
 - 5.2. The hitch should be constructed of steel and pass through the rear apron.
 - 5.3. Trailer wiring:
 - 5.3.1. One (1) 7-way RV style plug (standard SAE wiring)
 - 5.3.2. One (1) 6-pin round plug - FRS wiring configuration (see Appendix E)
 - 5.3.3. One (1) 4-pin flat plug (standard SAE wiring)
 - 5.3.4. One (1) chain link to be welded to the rear apron for trailer brakes break-away
 - 5.3.5. Two (2) u-bolts for trailer safety chains – sufficiently sized to permit towing the maximum weight trailer for the as specified apparatus.
 - 5.4. All components to be located to maximize departure angle and be protected from off-road operations.
6. Skid plates
 - 6.1. Supplied with the chassis from factory – if factory skid plates no longer fit with required chassis modifications, aftermarket skid plates should be installed.
 - 6.2. State locations / make / model offered
7. Mudflaps
 - 7.1. To be equipped with anti-sail chains.
 - 7.2. Install heavy duty mudflaps:
 - 7.2.1. Behind the front wheels
 - 7.2.2. In front of and behind the rear wheels

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COMPARTMENTS/STORAGE

1. Interior

- 1.1. Supply & Install secured storage for the items identified as "Stowed in Cab" in Appendix D – ATP Equipment Inventory.

2. External

- 2.1. All external compartments with doors shall have "sweep out" style floors.
- 2.2. All external storage compartments shall include removable black Dri-Dek matting with tapered front lip.
- 2.3. All compartments shall have white LED strip lighting installed along the full width/height of the top horizontal and/or vertical edges unless otherwise specified. Lighting to be controlled by a mechanical switch on each compartment door (lights enabled when door is opened). On-Scene Solutions (www.onscenesolutions.com) Night Stick LED Tube Lighting - Alternates will be considered.
- 2.4. 1/8 in. polished aluminum checker plate rock guards on the fronts of all forward facing compartments & components (as required).
- 2.5. All components and structural members shall be designed and built to support the body fully loaded to the designed payload capacity of the frame without damage or deformation.
- 2.6. Streetside & Curbside (S1 & C1)
 - 2.6.1. Supply & Install four (4) underbody compartments, two (2) forward of the rear wheels, and two (2) compartments aft of the rear wheels. The compartments shall be as wide and deep as possible.
 - 2.6.2. Compartments shouldn't extend below the bottom of the cab or interfere with the pump skid module.
 - 2.6.3. Compartments shall have horizontally hinged box pan style doors fabricated of 1/8" thick smooth aluminum. The inner liner of the forward doors shall include NFPA compliant tread plate material to act as a stepping surface. The inner liner of the rear doors shall be 1/8" thick smooth aluminum with an unpainted finish. Dri-Deck material shall be mounted to the liner(s) of the rear doors to be used as a protection layer to prevent damage when the doors are used as a work surface.
 - 2.6.4. The hinged door(s) shall have a stainless steel slam type latches. A gasket shall be placed between stainless steel handle and door. Door latches shall be a two-point rotary slam, double-catch latch, recessed inside the double panel door with striker plate.
 - 2.6.5. The hinged door(s) shall have a pair of tailgate style mechanisms to stop the door at 90 degrees.
 - 2.6.5.1. Each door shall be capable of being closed without unlatching.
 - 2.6.5.2. Mechanisms should be strong enough to permit open door to be used as a work surface.
 - 2.6.5.3. The interior surface of the door shall be labeled "NO STEP".
 - 2.6.6. Compartment Layout:
 - 2.6.6.1. One (1) horizontally mounted OnScene Solutions LED Nightstik mounted at the top of the compartment toward the compartment door opening.
 - 2.6.6.2. One (1) ground light shall be provided below the body. OnScene Solutions 9" LED Nightstik is preferred.
 - 2.6.6.3. Two (2) 3-1/2" x 3-1/2" black plastic louvered vents shall be provided.
- 2.7. Ground Engaging tool storage (S2)
 - 2.7.1. Immediately behind the cab on the deck, install two (2) storage bins for storage of ground engaging tools (see ATP inventory in Appendix D).
 - 2.7.2. Bin should have a hinged lid that is able to be securely closed and pneumatic stay to hold open.
 - 2.7.3. Bin must be accessible from an operator standing on the ground.

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OPTIONS

1. Supply a cover/tarp & tie-down locations to protect the skid/pump unit from road debris & weather during driving.
3. Spare Tires / Rims
 - 3.1. Supply a total of two (2) spare left side tire & wheels (1/2 per apparatus)
 - 3.2. Supply a total of two (2) spare right side tire & wheels (1/2 per apparatus)
11. Front mount monitor
 - 11.1. Supply & Install one (1) Akron Forestry Monitor on the front bumper of the chassis (as per Skid Unit Section 10)
 - 11.2. Automatic oscillation & stow
 - 11.3. Remote control from within the cab with joystick / trigger
 - 11.4. Backup handheld tethered controls
 - 11.5. Position feedback
 - 11.6. 2" electric valve with controls on both the main and aux pump panels
 - 11.7. Variable Nozzle sized to max flow of approx 30 GPM (UK)
 - 11.8. Plumbed for quick disconnect
12. Mounting provisions for all tools and equipment in both the cab and body shall be provided as shown in the bid tender appendix. The mounting provisions shall include custom built aluminum brackets as required, PAC tool mounts as required, and all labor to fabricate and install items.