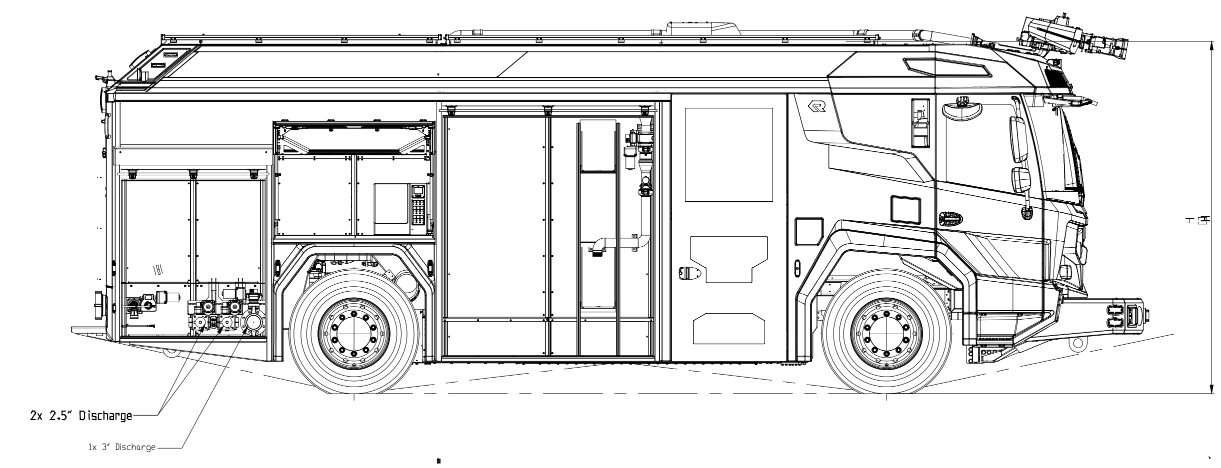
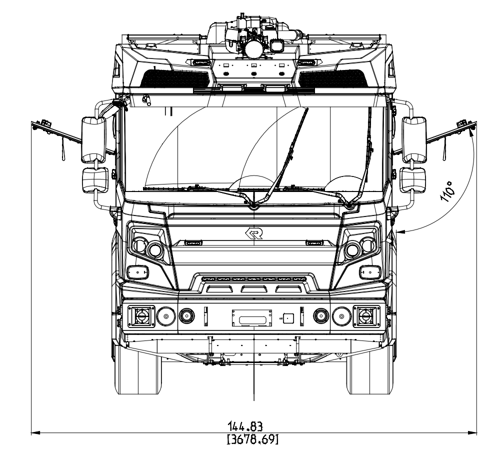
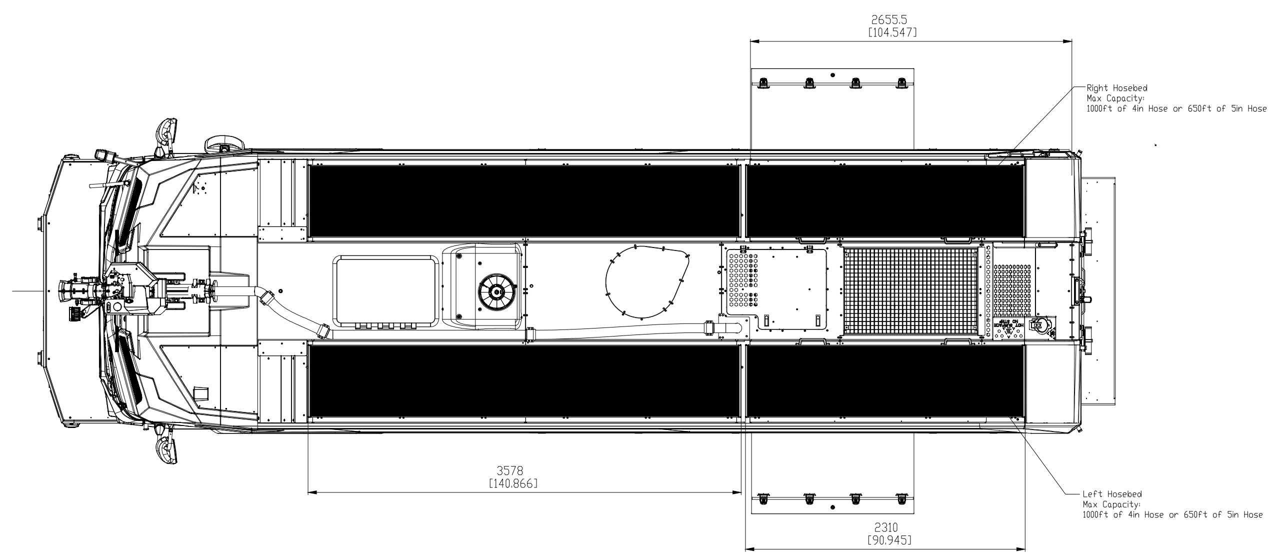
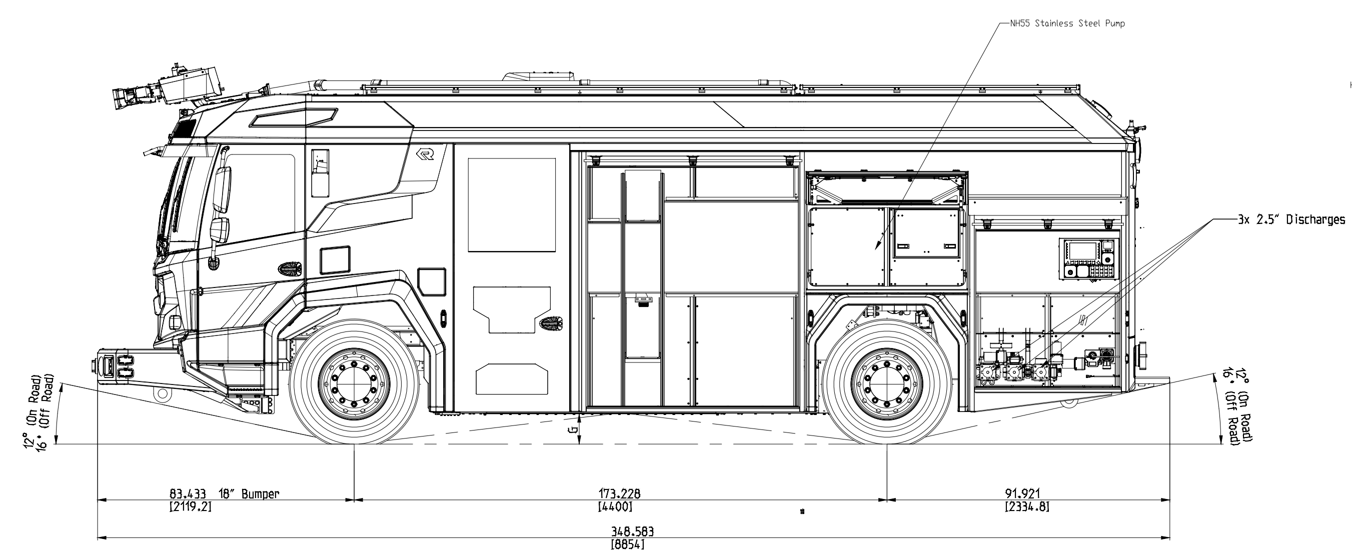
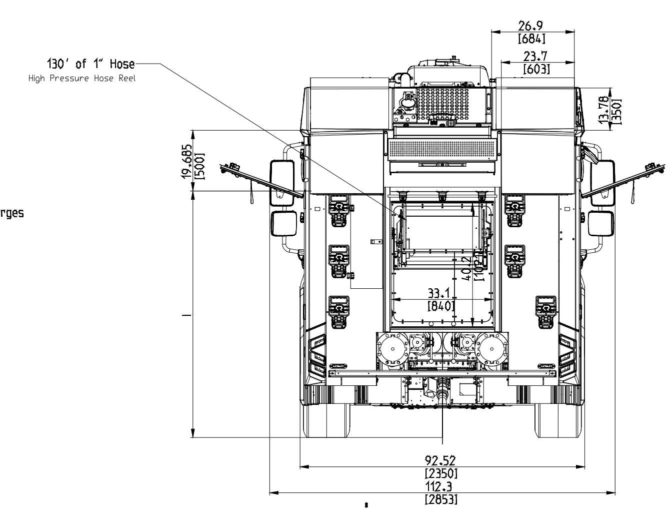






Suspension Level	Height H	Ground Clearence G	Ground to Hosebed Floor I
Operation	2837 / 111.7"	175 / 6.9"	1959 / 77.1"
On-Road	2912 / 114.6"	250 / 9.8"	2034 / 80.1"
Off-Road	3012 / 118.6"	350 / 13.8"	2134 / 84"
Fording	3132 / 123.3"	470 / 18.5"	2254 / 88.7"
Standard Tire 385/65R22.5"			





Notes:

1. OVERALL HEIGHT IS IN LOADED CONDITION. UNLOADED HEIGHTS MAY BE 4" ABOVE HEIGHTS SHOWN.
2. DO NOT SCALE DRAWING.
3. ALL DIMENSIONS ARE APPROXIMATE AND SUBJECT TO ENGINEERING CHANGES.
4. DRAWING MAY OR MAY NOT SHOW ALL ITEMS AS DESCRIBED IN THE WRTITTEN DETAIL
5. INCLUSION OF AN ITEM ON THE DRAWING DOES NOT CONSTITUTE INCLUSION OF THAT ITEM WITH THE FINAL DELIVERED UNIT.

REVISED: -	DATE:
REVISED: -	DATE:
REVISED: -	DATE:
DRAWN: -	DATE:

APPROVED BY:		CHASSIS: ROSENBAUER RT
		PUMP: RB
MAXIMUM HEIGHT	N/A	TANK:
MAXIMUM LENGTH	N/A	TYPE: PUMPER
BODY WIDTH	92.5"	AERIAL: N/A

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001	-	-	-	-	-	wie gezeichnet/as drawn
Var instance	MATERIAL material	OBERFLAECHE surface	GEWICHT weight	BEMERKUNG 1 comment 1	BEMERKUNG 2 comment 2	AUSFUEHRUNG version

ROSENBAUER INTERNATIONAL
AKTIENGESELLSCHAFT
PASCHINGERSTRASSE 90
4060 LEONDING, AUSTRIA

PRUEFMASZ inspection dimensions

VOLUMEN volume: -

FLAECHENINH./area: -

Werkstueckkanten nach/workpiece edges to EN ISO 13715

Oberflaechenangaben nach/surfacefinish to EN ISO 1302 | Passungen nach/basis fit to EN ISO 286-2 | Form-Lagetoleranzen nach/form and location tolerances to EN ISO 1101 | Schweisszeichen nach welding symbols to EN ISO 2553, System "A" | Schweissnahtvorbereitung weld preparing to EN ISO 9692

TOLERANZEN / tolerances: DIN ISO 2768-m/K

BEZEICHNUNG/title: RTX

RTX 500 Demo 1

	DATUM/date	NAME/name
GEZ drawn	X	X
GEPR checked	X	X

MODELL/VORRICHT.NR. model/apparatus.nr. 001

ERSTE PROJEKTION ISO 128 first angle projection

MASZEINHEIT units of measure [MM]

MASZSTAB scale: 1:20

FORMAT size: A0

ZEICHNUNG NR. drawing nr.: 17012B-008

AENDERUNGSINDEX revision index: .

BLATT/VON sheet/of: 1/1

Rosenbauer RTX

Electrically Driven Firefighting Vehicle

Technical Description

RTX Demo 1

(RTX Stock 1E5579)

Table of Contents

Introduction – Rosenbauer RTX / Electric Fire Fighting Vehicle

Description

Based on the Concept Fire Truck (CFT) concept study, Rosenbauer has developed the RTX (Revolutionary Technology) series, the fire fighting vehicle of the future.

The electric drive enables purely electric operation in municipal fire-fighting operations, and a vehicle architecture tailored to the requirements of modern, urban fire brigades, focusing on safety, ergonomics, functionality, and digital mission support.

PRODUCT SPECIFICATIONS All specifications and descriptions contained in this document are verified to be accurate at the time of printing. However, this vehicle is series development phase and continuous improvements are being integrated. We reserve the right to make product modifications at any time. If such modifications are implemented, they surpass the functionality and specification in this document.

1. General

1.1. Vehicle Type

Type:	The RTX shall have a Volvo – Penta Electric drive system with Rosenbauer auxiliary power backup system. Integral design comprising of substructure, cab, and body as one unit. 
Year:	Latest model, production year from 2022

1.2. Dimensions and Weight

Length:	Approximately 28.5’ | 724 mm
Width:	Approximately 92.5” (excluding mirrors) | 2349 mm
Overall Height: (Without equipment)	Street mode: Approximately 115” (9.6 ft) | 2921 mm Operation mode: Approximately 111” (9.2 ft) | 2819 mm Off-road mode: Approximately 118” (9.8 ft) | 2997 mm Fording/Wading mode: Approximately 123” (10.2 ft) | 3124 mm
Wheelbase:	173” | 4400 mm
Approach Angle:	Street mode: Approximately 17° Off-road mode: Approximately 23°

Departure Angle:	Street mode: Approximately 12° Off-road mode: Approximately 18°
Tilt Angle:	Meets NFPA 1901 standard
Turning Circle: (wall-to-wall)	≤ 47' with rear axle steer | 14.3 m ≤ 57' without rear axle steer | 17.4 m
Permissible gross vehicle weight:	38,350 lbs. | 17,395 kg
Permissible front axle load:	16,500 lbs. | 7,484 kg
Permissible rear axle load:	21,850 lbs. | 9,910 kg
Operational weight:	The design of the vehicle and the stowage of equipment is such that the weight is distributed symmetrically around the center of the vehicle. The total weight of the vehicle (chassis and body), equipment, accessories, full water tank and foam tank and crew (4 crew members X 250 lbs. = 1000 lbs. | 4 crew members X 113 kg = 450 kg) is within the permitted axle loadings. The total estimated weight for firefighting and rescue equipment is about 6,000 lbs. | 2,721 kg and other contributing weights include a full 500 gallon | 2000 liter (as standard) water tank and 26 gallon | 100 liter foam tank. The operational vehicle weight will be within 90% of the designed axle loads

2. Chassis

2.1. Drivetrain

Drive:	• Electric drive system with auxiliary power backup system • 4 x 4 all-wheel drive (two electric motors, one per axle)
Electric Motor	• Permanent Magnet Synchronous Motor/Generator • Drive power: at least 175 kW peak / 125 kW continuous acc. to UN ECE R85 • Torque: at least 310 ft-lbs. / 185 ft-lbs. continuous (Motor torque) • The transmission control system is to be able to respond the driver's action to control and adjust the output from the electric motor(s) or the powertrain automatically to match the driving and road conditions.
Auxiliary Power Backup System	• BMW, 4-stroke, 6 cylinders in line with common rail injection, turbo charger and inter cooling

	• Certification: Tier IV final (Stationary Generator Set) • Power: 200 kW (270 hp) • Fuel tank: 33 gallon | 125 liter tank for diesel with left hand fill • DEF tank: 2 ½ gallon | 9 liter for DEF with right hand fill • The vehicle has an energy backup system engine which drives the electric motor as a generator and thus provides additional energy to charge the vehicle batteries.
Battery	• Type: Lithium Ion Technology • Certified According ECE R100-2 • Capacity: 2 Batteries of 66 kWh (each) (132kWh in total). • Plug in Charging suitable to local electrical grid utilizing CCS1  • The battery pack is in a non-exposed location. • Battery installation and HV system Installation according ECE R100 • The battery packs of the vehicle are capable of being charged high-power direct current charger. • The charging plug is installed on the Vehicle next to the driver's door. • Estimated Charging time: o SOC (State of Charge) 0%-80 % Approximately 45 min with DC – depending on the size of the charger.

	• The vehicle displays the charging status (SOC) within the drive cabin, on both dashboards. • The vehicle system such as battery pack and electric motor(s), power train, brake system, etc. is controlled and/or monitored by an electronic control management system • The vehicle is equipped with an active battery cooling/heating unit
Vehicle Performance:	• Max. speed: Approximately 68 MPH | 105 KPH with full load • Acceleration: from 0 to 50 MPH | 80 KPH ≤ 30 seconds • The vehicle is capable of being started smoothly from rest up a 14° gradient (1 in 4) • The vehicle has a range of approximately 62 miles | 100 kilometers in electric mode. Engaging the auxiliary power backup system will extend the range approximately 310 miles | 500 kilometers in hybrid mode, without refueling. Actual results may vary. • The vehicle can pump 500 GPM @150 PSI from draft for approximately 60 minutes in electric mode and then an additional 4 hours in hybrid mode, without refueling. Actual results may vary.
2.2. Front and Rear Axle	
Front and Rear Axle	• Independent front and rear suspension • 2-speed gearbox (standard driving in second gear, and first gear only for ascent in steep grades) • Automatic Differential (ADM) with pneumatically controlled differential lock visible on driver's display • Planetary hub reduction at each wheel
Front and Rear Suspension	• Hendrickson pneumatic strut with high-pressure air suspension and shock absorber, with the ability to select driving levels (ground clearance) • Anti-roll bar
Adjustable Ground Clearance:	The vehicle shall be equipped with an adjustable height suspension that allows the driver to adjust the ground clearance based on current terrain conditions. The suspension can be adjusted through a switch located in the switch panel under the central display.

		
	↓ Operation mode 7” (speed limited for safety)	→ On-road mode – 10” (default position)
		
	↑ Off-road mode – 14”	↑↑ Fording / Wading mode – 19” (speed limited for safety)

2.3. Steering

Steering:	• Hydraulic/electric power steering • Steering unit is power, or power assisted type. It shall permit manual steering enough to bring the vehicle to a safe stop.
All Wheel Steering:	The vehicle shall be equipped with rear-axle steering to reduce the turning radius to allow for increased maneuverability through narrow urban streets. When all-wheel steering is engaged, the rear axle steering is controlled by an electronic/hydraulic system proportional to the front wheel steer angle and the vehicle speed. 

	• Mode 1 | **Cornering**: the steering angle of the rear wheels will be ***opposite*** to the front steer direction up to a maximum of 10° depending on the front wheel steering angle. The faster the vehicle drives, the less the rear axle is steered. At approximately 18 MPH, the rear wheel steering will automatically disengage. • Mode 2 | **Crab Steering:** Crab steering mode allows the vehicle to be driven ***diagonally*** by steering the rear wheels in the same direction as the front wheels up to 10°. At approximately 18 MPH, the rear wheel steering will automatically disengage
Steering wheel position:	Left Hand Drive
2.4. Tires	
	• Front: single tire - 385/65 R22.5 on aluminum rim • Rear: single tire - 385/65 R22.5 on aluminum rim • There shall be a tire pressure indicator at each tire's valve stem on the vehicle that shall indicate if there is insufficient pressure in the specific tire.

2.5. Brakes	

Braking System:	• EBS – electronic braking system (includes ABS function)
	
	• Slack adjusters are fitted with auto slack adjusters to reduce the need to manually adjust maintain brake clearance within tolerance.
	
	• Where the brake is of a type in which air pressure provides all the braking effort to the wheels, the following requirements are met:
	  ○ Each part of the split or dual air system is provided with its own air pressure reservoir or reservoirs.
	  ○ Built in compressor is standard electrically driven, and as soon shoreline is connected the compressor is active (as well if vehicle is drive mode)
	  ○ As a safety feature, it is important that the air braking system cannot be driven if the pressure in the reservoirs is below that at which the warning systems operate, as the brake performance may be inadequate until the pressure has time to build up.
	
	• Braking system is according ECE R13.

Service Brake:	• Dual-circuit pneumatic system

	• 17” disc brakes on all wheels. • When applied, the service brake shall bring the fully laden vehicle to a complete stop within 50’ | 15 m from an initial speed of 30 MPH | 48 KPH. The vehicle shall not deviate from its course by more than 20% of its width to either side.
Parking Brake:	• Spring loaded and air controlled without linkages • An indication will be provided in the for the driver in the cab to indicate when the brake is applied.
Regenerative Braking:	• The braking system is designed to convert the kinetic energy generated during the braking operation into electrical energy stored onboard the High-voltage battery pack for reutilization. • The regenerative braking system is adjustable in three modes (Off | Low | Medium | High).
Air Compressor	• Electrically driven air compressor with air dryer

2.6. Additional Safety Features

ADAS	• Following road safety systems are installed: (Advanced Driver Assistance Systems) *(Available late 2023)* ○ Front Collision Warning (FCW) ○ Lane Departure Warning (LDW) ○ Turning Assist (TA) 

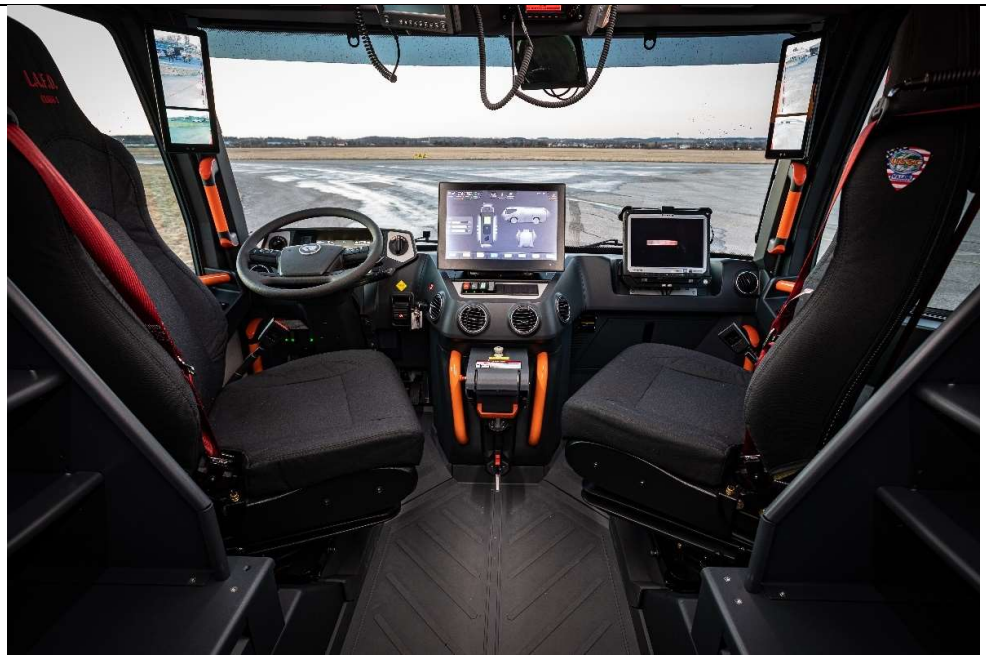
3. Cab

3.1 Cab Features

General:	The cab concept is incorporated in the superstructure and enable an openly connected drivers and crew cab for enhanced communication. This design offers better comfort for the crew due to the open space and increased height inside. Each firefighter will have a comfortable and safe sitting position and enough space

	to prepare himself for the emergency call. The cab is insulated against noise, vibration, and extreme temperatures. The floor surface shall be covered with anti-skid rubber plates, which are easily removable and washable, to reduce contaminants after an incident • The maximum noise level within the cabins shall not exceed 80 dB (EN 1846) • The cab safety is according ECE R29
Front Bumper – 18"	An 18" painted front bumper shall be provided. A front bumper hose well capable of holding 100' of 1.75" hose shall be provided in the center of the bumper extension. The hose well shall be provided with an aluminum treadplate cover with thumb latches.
3.2 Seating	
Driver Seat	• A Bostrom adjustable driver seat shall be provided. The seat shall be capable of pivoting 90° and be equipped with a 3-point safety belt and head restraint.
Officer Seat	• A Bostrom adjustable driver seat shall be provided. The seat shall be capable of pivoting 90° and be equipped with a 3-point safety belt and head restraint.
Crew Seats:	• Two side-facing seats shall be provided in the main crew-section of the cabin. Side-facing seats are mounted 90° to the direction of travel, facing inwards, thus enabling enhanced communication and improved safety. These seats shall be equipped with a 4-point safety belt, a backrest, head restraints. • Two additional seats shall be installed, forward facing on the rear wall crew-section of the cab.
Seat Features	• Seat covers will be of such material to be easily washable to help minimize exposure to cancer-causing contamination. • All seats are provided with ECE approved seat belts
Cab Storage:	• A rear wall "action tower" shall be provided in for additional storage space for equipment. The action tower can be configured to accommodate multiple shelves and storage boxes. • Two crew action towers shall be provided next to the side-facing crew seats for additional equipment storage.

Doors:	• A cab entry door shall be provided for both driver and officer at the front-section of the cab. • The crew cab shall be equipped with wide hinged doors for easy entry and exit. The large entrance with a low positioned step and wide doors allows a safe and ergonomic access. • Both the front and rear cab doors shall be provided with power windows. • Glazing material is according ECE R43 • All cab doors are equipped with a central locking system. • The windshield shall be a heated one-piece safety laminated glass. 
Air Conditioning:	• Air-conditioning unit (HVAC – for Heating, Ventilation, Air Conditioning), which is powered by the vehicle battery pack, comprising of variable speed compressor(s), cooling unit of minimum 17,000 BTU/h cooling capacity, both manual and automatic temperature control system, multispeed control air blowers delivering cool air via well insulated air ducts throughout the cabin are provided. The drive of the air-conditioning unit is powered by the vehicle's electrical system. The volume and direction of air flow at each air outlet can be manually controlled at the air outlet. Filter(s) are provided at easily accessible positions for regular cleaning. • An auxiliary crew-cab air conditioning will be mounted on roof.
Mirror Replacement System:	• A mirror replacement system shall be provided in place of the standard door mount mirrors. The system shall include a rear facing camera on the upper front corner of the cab on each side. The cameras shall be displayed on 12.3" monitors on the "A" pillars in the cab.
Central Display	• A large 15" color LCD touch display is installed in the center dashboard, easily reachable from the drivers and passengers' position. The clearly arranged control unit will allow quick operation for the driver and passenger. Moreover, the cabin crew will also be able to see all necessary information relating to the incident from their seats.

	 • The functionality of this screen includes all necessary information about chassis, superstructure and firefighting systems. Also, the firefighting system and superstructure can be monitored and controlled via this screen.
Cooling Drawer/ Refrigerator	A cooling drawer/refrigerator shall be provided in the rear wall action tower. 

4. Body

Construction:	The versatile lightweight construction consists of CNC laser cut, and CNC machine formed aluminum sheet. The immensely strong superstructure is permanently joined onto the chassis therefore making the vehicle easier, safer, and more stable to maneuver in extreme situations. This provides a structure which does not require a traditional framework and can be described as a self-supporting body

	structure. The light weight and low center of gravity enhance both vehicle speed and safety. The load bearing capacity of every individual component is precisely established using finite element computation. For a sustainable construction of the body, glass fiber reinforced plastic (GFRP) is not used in assembly. The glass fiber particles contained in GFRP can be inadvertently inhaled, which could result in health issues. In addition, all plastics used in the vehicle will be easy to recycle.
Design:	Each side is divided into three (3) independent equipment compartments plus one (1) compartment in the rear. • The construction of the roof and walkway on the rear body will be able to withstand a minimum static load of 330 lbs. • Access panels shall be provided for the inspection of the battery packs and firefighting components for maintenance purposes.
4.1. Equipment Compartments	
Design:	• The interior of the body compartments shall be provided with high power LED strip lights. The compartment light will be controlled by an automatic "On-Off" switch located on each compartment door. A "master" switch for isolating the compartment lighting circuits shall also be provided. • Luminous tape is used on the pull-out trays for safety and the highly reflective quality will makes them visible during night-time. • All compartments are provided with fittings, strips and brackets for holding all equipment and tools securely in position. • All compartments shall have provision for drainage of water. • All electrical junctions or wiring within compartments are protected from mechanical damage by equipment stored in the compartment. All terminal strips shall have protective covers.
Roll-Up Doors:	Manual anodized aluminum roll-up doors shall be provided for the side body compartments. A “Do Not Move Apparatus” indication shall be provided in the cab to indicate when a roll up door is not closed properly.
Integrated Profile System:	The separation walls between the compartments are made of extrusion aluminum profiles, which allows for very flexible and compact equipment mounting.
4.2. Equipment Mounting	
Equipment Mounting	Loose equipment on the truck shall be mounted with a system that is efficient and maximizes the amount of equipment that can be carried on the apparatus.

	The equipment mounting system shall be a modular type of stowage system consisting of stowage brackets, slide out trays, swing out shelves, swing out tool boards, etc., etc. for holding equipment in secured position. A design layout clearly marking the stowage requirements shall be provide prior to construction. Examples of equipment mount solutions are as follows:
Shelves & Tool Boards	Customizable swing-out tool boards provide optimum access to the equipment and the interior storage areas behind them. Shelves are provided in the storage compartments.  
Brackets:	Quick release brackets, as shown above, ensuring positive fixture and fast removal of the accessories are provided for those accessories that are delivered with the vehicle.
Hygiene Wall Option	A slide-out hygiene wall can be placed in the body. The hygiene wall shall include a water faucet, air gun, disinfectant dispenser, and soap dispenser, and paper towel holder. 

4.3. Hosebed

	The vehicle shall be provided with two individual hose beds located on the left and right side of the truck. The left side shall be configured to store LDH supply line, and the right side shall be configured to store attack lines. Hosebed configuration to be determined at the pre-construction conference.	

4.4. Ladder Storage

System:	Ground ladders shall be stored in a slide in compartment through the rear of the body on the driver side of the vehicle. The following ladders shall be provided: • One (1) 24' two-section ladder • One (1) 14' roof ladder • One (1) 10' folding attic ladder

5. Firefighting System

5.1. Fire Pump

Rosenbauer NH-55	A Rosenbauer Model NH-55 fire pump shall be mounted and installed. The pump system shall have a rated capacity of 1500 GPM and shall meet all applicable sections of NFPA standards. The pump shall be constructed and mounted in accordance with the following specifications. Pump shall deliver the percentage of rated discharge at pressures indicated below: 100% of rated capacity at 150 pounds net pressure 70% of rated capacity at 200 pounds net pressure 50% of rated capacity at 250 pounds net pressure 100% of rated capacity at 165 pounds net pressure
Pump Material	The pump body is to be of high-quality seawater resistant stainless steel.

	The pump manufacturer shall test the pump for 10 minutes hydrostatically at a pressure of 500 PSIG. Hydrostatic certification by the pump manufacturer shall be provided. Impeller and Shaft The high-grade stainless steel impellers shall be accurately balanced and mounted on a stainless steel pump shaft. The shaft shall be supported by three roller bearings; two located in the gearbox and one in the suction intake. Bearings shall be protected from water and sediment by maintenance free self-adjusting mechanical seals.
Location:	The pump is mounted in the center of the vehicle, above the rear axle.
Pump Drive:	By means of electric motor or via the auxiliary power backup system.
Priming Pump:	• Type: Double piston priming pump. • Control: Automatic, by pressure in the fire pump. • Drive: Via V-belt • Suction lift: 10' | 3 m within 30 sec. Maximum suction lifts to 25'| 7.6 m (attainable vacuum 80%)
Thermal Protection:	Automatic thermal protection is provided for the pump. If the pump is operating against closed deliveries and the water temperature becomes too high, the drain valve will automatically open to discharge the hot water.
Pressure Governor:	A Rosenbauer LCS pressure governor and monitoring system unit shall be installed. The pump controls shall include a DigiView display module and a DigiPot adjustment module as well as an intake pressure sensor, discharge pressure sensor, and cables. The pressure governor shall include pre-selects that can be selected on the pump panel control display. The pump pressure shall be kept at a constant pressure, independent of the hydrant intake pressure (max. 115 to 145 PSI) and of the discharged water or water / foam volume. The pressure governor can work automatically without pump operator input.
Intakes:	• A TFT 6" NST x 4" NST intake adapter shall be provided for each intake. A 4" NST cap shall be provided with chain or cable securement. • Two 6" NST master intakes shall be provided at the rear of the body and include a strainer and cap. The intake shall not more than 40" off the ground. • Two 2-1/2" auxiliary gated suction intake shall be provided at the rear of the body. The control valve shall be a quarter turn ball valve and shall have 2-1/2" NST female thread of chrome plated brass. A 2-1/2" chrome plated plug shall be provided. The threads shall be NST and the plug shall be equipped rocker lugs and chain or cable securement.

Pump Discharges:	• Pump discharges and locations are as follows:
	• **Driver Side**
	  ○ Three (3) 2-1/2" discharge(s) shall be installed below the left side pump panel in the L3 compartment and shall be controlled by an electric valve. The discharge(s) shall have 2-1/2" NST male hose threads. A color-coded nameplate label shall be provided adjacent near the discharge. A quarter-turn drain/bleeder valve shall be installed. A 2-1/2" NST rocker lug chrome plated vented cap and cable, or chain securement shall be provided.
	• **Officer Side**
	  ○ Two (2) 2-1/2" discharge(s) shall be installed in the lower area of the R3 compartment and shall be controlled by an electric valve. The discharge(s) shall have 2-1/2" NST male hose threads. A color-coded nameplate label shall be provided adjacent near the discharge. A quarter-turn drain/bleeder valve shall be installed. A 2-1/2" NST rocker lug chrome plated vented cap and cable, or chain securement shall be provided.
	  ○ One (1) 3" discharge shall be installed in the lower area of the R3 compartment and shall be controlled by an electric valve. The discharge(s) shall have 4" NST male hose threads. A color-coded nameplate label shall be provided adjacent near the discharge. A quarter-turn drain/bleeder valve shall be installed. A 4" NST rocker lug chrome plated vented cap and cable, or chain securement shall be provided.
	• **Front Bumper**
	  ○ One (1) 2-1/2" discharge(s) shall be installed in the front bumper. The discharge(s) shall have 2-1/2" NST male hose threads. A color-coded nameplate label shall be provided adjacent near the discharge. A quarter-turn drain/bleeder valve shall be installed. A 2-1/2" NST rocker lug chrome plated vented cap and cable, or chain securement shall be provided.
	• Final configuration and placement of discharges to be determined during the pre-construction conference:

Speedlays	Two (2) 1-3/4" pre-connect hose speedlay shall be installed ahead of the front of body in the transverse area of L1/R1. The outlet shall be equipped 2" NPT female swivel x 1-1/2" male NST hose threads. The speedlays shall be provided with removal trays and be designed to accommodate the following: • Tray 1 - Top: 200’ of 1.75” hose • Tray 2 – Bottom: 200’ of 1.75” hose
Booster Reel	• One high pressure booster reel shall be provided in the rear compartment. The reel shall be provided with 130’ of 1” rubber booster hose. The reel shall be provided with an electric reel rewind push button/foot switch.

Plumbing:	• Water plumbing is made of stainless steel or high-pressure rubber hose.
	• Foam concentrate pipework is made of foam concentrate resistant material (as polypropylene, stainless steel or bronze).
	• Heat exchange pipework is corrosion resistant material.
	• The plumbing is arranged to permit the following operations:
	  ○ Hydrant-to-Tank
	  ○ Tank-to-Pump-to-Discharge outlet
	  ○ Hydrant-to-Pump-to-Discharge outlet
	• Design working pressure of the whole system must be adequate to withstand output pressures of the fire pump.
	• Means are provided to limit the transmission of pressure surges back to the low-pressure parts of the main pump system to between 175 and 200 PSI. Any such pressure limiting device may be incorporated in the pump or elsewhere. It is designed to avoid the possibility of air leaks that might impair the ability of the main pump when working from open water.

Drain valves:	• An automatic central water drain system is installed with additional pressured air purging function.
	• The following functions will be activated from the pump panel:
	  ○ Empty/drain water from the pump and piping.
	  ○ Blowout remaining water to dry the pump interior.
	• Carry out a dry vacuum test.

Pump Panel:	• A digitally controlled pump panel with a 10” display and soft touch buttons shall be installed in the L3 compartment in the area above the discharges. The control buttons are designed for working conditions with firefighting gloves. • The control panel is waterproof (IP65) and provide good screen visibility under direct sunlight. • Final configuration to be determined at the pre-construction conference.

Controls:	• Control buttons for firefighting system, foam admixing system, illumination system.
	• An adequately illuminated main digital control panel is provided at the rear of the vehicle and shall include the following distinctly labelled for easy identification:
	  ○ Pump pressure gauge (Master Gauge)
	  ○ High pressure gauge (if equipped)
	  ○ Compound (Vacuum and pressure) gauge
	  ○ Pump RPM indicator (tachometer)
	  ○ Control valves for water & foam tank
	  ○ Water tank & foam tank level indicators
	  ○ Primer controls
	  ○ A high-pressure stage control lever

	○ An automatic pump pressure controller to eliminate fluctuations in pressure that can occur when using multiple nozzles and in varying operating conditions. • All gauges and instruments are protected against accidental damage, excessive vibration and are readily visible at the pump operator's position. • Pumping engine oil pressure and engine coolant temperature gauges with visual warnings (light indicator) are provided and are grouped together with the tachometer.
5.2. Water Tank	
Capacity:	Approximately 500 gallons | 2,000 liters
Design:	The water tank is integrated in superstructure, manufactured with latest plate tank technology, designed for long lifetime, extraordinary stability and low weight. The tank is suitable for transport of drinking water.
Material:	Polypropylene (PP)
Location:	In the middle between the front and the rear axle for optimal load distribution.
Features:	The standard design of the tank shall include: • Inspection manhole 18" | 457 mm diameter • Tank drain with manually actuated ball valve • Overflow system • Electric tank level sensor • Automatic tank level regulating system for direct water supply directly from the hydrant into the water tank, allowing continuous operation from tank without overflowing.
Water/Foam Level Indicators:	External indication of water and foam (if equipped) tank levels are located on both sides of the vehicle, just rearward of the B pillars.
5.3. Foam Tank	
Capacity:	Approximately 26 gallons | 100 Liters
Design:	The foam compound tank is suitable for transport and storage of all known brands of synthetic and protein-based foam compounds.
Material:	Polypropylene (PP)
Features:	The standard design of the tanks shall include:

	• Inspection manhole & Top fill of at least 250mm diameter • Tank drain with ball valve • Overflow system with spilling prevention to release pressure and vacuum. • Electric tank level sensor • One (1) intake, with 1 ½" female coupling and blank coupling, suitable for filling the tank by means of a foam compound decanting pump • All connections and pipes are dimensioned to meet all flow requirements

5.4. Foam System

Design:	Fully automatic foam proportioning system, usable for synthetic, protein and flour-protein foam compounds incl. AFFF.
Performance:	Various adjustable percentages are possible (max. foam ad-mixing capacity 62 gallons /min.), constantly and independent of discharge.
Features:	• One (1) suction line from the foam tank, with electro pneumatically controlled ball type valve. • One (1) external suction and flushing line 1 ½", with 1 ½" Storz coupling and blank cap in bronze, for suction operation from external source.
Foam System	A Rosenbauer Variomatic 6.2 GPM foam system shall be provided. The foam system is capable of supplying up to 4 injection points individually.

5.5. Roof Monitor

Roof Monitor	• One (1) pressure outlet connected to the cab roof turret. Line diameter 4", pneumatically actuated. • The monitor and water tank shut off valve shall also be provided with manual override control. • Pressure feed from the fire pump to the roof monitor is controlled by a mechanical type shut off valve located on the rear of the fire vehicle adjacent to the suction intake.
Location:	On cabin roof of vehicle
Control:	• A joystick control handle is provided in the driver's cabin for initial firefighting purpose to operate the monitor from inside the cabin. The control handle shall allow the operator to control all movements of the monitor. The control handle is of the type whereby the position of the control handle indicates the monitor

	position throughout its range of movements. To facilitate operation of the monitor from the cabin, the following instrumentation is provided inside the cabin: ○ Water & Foam tank level gauge ○ Water pressure gauge ○ Water tank suction ○ Monitor valve controls ○ Pump throttle control  
Emergency operation:	In case of electric failure, the monitor can be operated manually by hand wheels located on the monitor.
Operation ranges:	Water straight stream throw range: 250' | 76.2 m
Output: (Full)	up to 800 GPM | 3,028 LPM
Output: (50%)	up to 400 GPM | 1,514 LPM
Nozzle:	O - Stream Nozzle
Rotation:	max. 270° degrees (depending on the vehicle contour)
Elevation:	-20 to +70 degrees (depending on the vehicle contour)
Lights:	Two (2) high intensity spotlights are installed on the monitor

6. Electrical System

6.1. Electric/Electronics

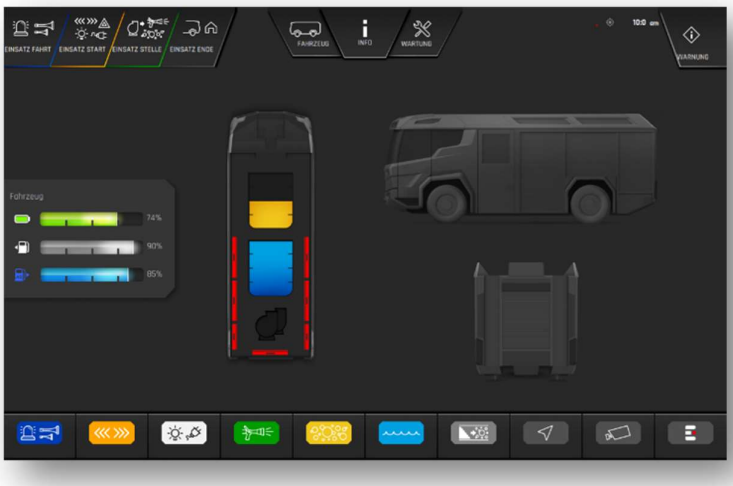
Description:	• A 24-volt electrical system for lighting, firefighting system and general accessories charging shall be provided

	• Main vehicle system on/ off switch electrically operated on the dashboard • 24-volt battery system master power switch shall be provided in the crew cab • All electrical circuits are separately fused, suitably indicated and grouped into a common fuse box. • Charging ports (12V and USB) inside the crew cab to plug in mobile radio chargers, mobile phones, tablets etc. • All electrical wiring shall be secured and suitably protected against heat, condensation, and physical damage. • A 24V DC to 12V DC converter is installed to provide different circuits for communications equipment to be installed in the vehicle. • All wiring shall be function coded. Digital as built wiring schematics shall be provided upon delivery of the vehicle.
DOT Lights: Federal Motor Vehicle Safety Standards (FMVSS)	The vehicle shall follow national highway codes including: • Headlights with high/low beam • Two (2) front direction indicators with hazard warning device • Required marker lights • A rear white lamp illuminating the license plate • LED taillight clusters including taillights, turn signals and back-up lights
Back-Up Alarm	An audible back-up warning alarm shall be provided at the rear of the vehicle and activate when the vehicle is placed in reverse. The audible warning shall be a minimum 80 of dBA.
6.2. Digital Instrument Clusters	

Instrument Cluster:
(Driving)
	All information necessary for driving the vehicle is shown on the driver's display.
	• Information
	  ○ Speedometer (electronic)
	  ○ Tachometer (electronic)
	  ○ Transmission mode (N / D / R)
	  ○ Odometer
	  ○ Dual air pressure (indication and warning)
	  ○ Differential locks activated
	  ○ Fuel level
	  ○ Ad-blue level
	  ○ Voltmeter
	  ○ External temperature
	  ○ Clock (Local time and UTC)
	  ○ Indicator left/right
	  ○ Lights (low beam / high beam, fog lights, rear fog lights)

	○ Additional brake system deactivated ○ Individual indicators for each of the batteries are provided in the driver's cabin to indicate when the battery is low, and when the battery is charging. • Warnings ○ Engine oil pressure low for the auxiliary power backup system ○ Coolant temperature high for the auxiliary power backup system ○ Coolant level low for the auxiliary power backup system ○ Park brake engaged ○ Fuel level low for the auxiliary power backup system ○ Exhaust system for the auxiliary power backup system ○ Engine check/stop for the auxiliary power backup system ○ ABS deactivated ○ Brake pads worn out 

	
Steering Wheel Control:	An arrangement of buttons on the steering wheel shall allow controlling of several incident related functions fundamental during emergency driving, without removing hands from the steering wheel, therefore increasing safety. The functions include: - Warning Lights / Scene Lights / Siren / Front Flashers - Menu Toggle Function (for driver's display)
Central Display:	A 15" color LCD touch-display is installed in the center area of the dashboard, easily reachable from the driver and co-driver seat. The clearly arranged control unit will allow easy and quick operation for the driver or co-driver. Moreover, the cabin crew will also see all necessary information relevant to the incident from their seating positions. The functionality of this display screen includes all necessary information about chassis, superstructure (incl. open roll-up doors) and firefighting system. The control of the visual warning installation and illumination system is incorporated. The control of the acoustic warning installation can be incorporated in the display, only if a CAN-communication is possible. The following buttons are always provided at the display: ○ Optical alarm devices ○ Acoustic alarm devices ○ Pump operation ○ Pump operation / manual operation ○ Foam operation ○ Scene lighting ○ Warnings ○ System information ○ Error messages / error memory



Additional service screens in the display shall contain detailed information regarding engine, gearbox and superstructure.

Activation and deactivation of the fire pump (automatic mode) as well as engine speed adjustment will be done via corresponding buttons. Pressing the "Start"-button activates an automatic mode (Pump and Roll) with following functions:

- Activation of PTO of torque converter
- Increase engine speed
- Open water tank suction valve
- Engage priming pump (if specified)
- Pump speed is infinitely variable via turn switch.

6.3. Scene Lights

External:	High power LED strips are incorporated in the roof design on the left and right side, as well as in the rear to illuminate the surrounding field of the vehicle. These continuous, power-saving LED light strips are integrated into each panel above the cab and body. The LED lights are equipped with glare-free lenses. The LED Scene lights produce at least 2000 Lumen per meter, are fitted above the cab and body compartments to suit the scene illumination. The scene lights can be controlled via the central display or for the pump operator's panel. One (1) pair of Hella LED Scene lights shall be provided on the front of the apparatus above the windshield.

6.4. General Illumination

External:	• LED illumination integrated in the roof interior
Internal:	• LED cab interior illumination • LED illumination of each equipment compartment • LED illumination of cabin steps

6.5. Warning Lights

Warning Lights:	A NFPA compliant LED warning light package shall be provided as follows: **Lightbar** • Six (6) Whelen ION LED warning lights shall be mounted on the upper outer edges of the cab. The lights shall be covered with a lens cover that is integrated into the cab. • Two (2) Whelen M4 LED warning lights shall be mounted inboard of the air intakes above the windshield. • One (1) Whelen M4 LED warning light shall be mounted in the center position above the windshield. **Side Upper Warning Lights** • Two (2) pair of Whelen M4 LED warning lights shall be mounted, two on each side of the cab above the cab doors.

	• Two (2) pair of Whelen ION LED warning lights shall be mounted, two on each side at the rear of the vehicle near the upper outer edges of the body. The lights shall be covered with a lens cover that is integrated into the body. • One (1) full length LED warning light strip shall be integrated into the body on each side of the apparatus. **Rear Upper Warning Lights** • One (1) pair of Whelen ION LED warning lights shall be mounted, one each side at the rear of the vehicle near the upper outer edges of the body. The lights shall be covered with a lens cover that is integrated into the body. • One (1) pair of Whelen M4 LED warning lights shall be mounted, one each side of the rear body below the hose bed. **Front Lower Warning Lights** • One (1) pair of Whelen ION LED warning lights shall be mounted on the front of the cab in the outboard location above the grille bar. • Seven (7) Whelen ION LED warning lights shall be mounted directly below the grille bar. **Side Lower Warning Lights** • One (1) pair of Whelen M4 LED warning lights shall be mounted, one each side on the front bumper. • Three (3) pair of Whelen ION LED warning lights shall be mounted, three each side of apparatus near the lower body compartments between the front and rear wheels. • One (1) pair of Whelen ION LED warning lights shall be mounted, one each side of apparatus behind the rear wheels. **Rear Lower Warning Lights** • One (1) pair of Whelen M4 LED warning lights shall be mounted, one each side on the rear of the apparatus above the tailboard. All warning lights are red LED lights unless otherwise specified. Exact warning light configuration shall be determined at the pre-construction conference.
Traffic Advisor	An LED traffic advisor / message board shall be provided at the rear of the apparatus above the rear compartment. The traffic advisor shall include directional flash patterns and up to 5 pre-programmed messages (up to 7 characters in length).
Siren:	A Whelen 295SLSE1 siren / public address system shall be mounted in the cab within easy reach of the driver. The siren is a full-function siren engineered for under-dash or console mounting and includes a noise cancelling microphone.
Speakers	Two (2) Whelen SP123BMC speakers shall be provided, one each side of the front bumper.
Air Horns	Two (2) Grover 24.5” air horns shall be provided, one each side of the front pumper.

Air Horn Activation	There shall be two (2) foot switches, one for the driver and one for the officer to activate the air horns.

6.6. Power Supply Unit

Power Supply Unit	A 6kW power supply unit shall be provided on the apparatus. The power supply unit shall provide 110/220 power from the high voltage batteries when activated. The power supply unit shall be provided with (4) 120V receptacles. 

6.7. Camera Systems

Back-Up Camera	A back-up camera system shall be provided to allow the operator to have an unobstructed rear view while reversing. When the vehicle is placed in reverse, the camera shall display on the main central display as well as on the driver's digital dashboard.
360° Camera System:	A 360° bird view camera system simulating the view from the top of the Vehicle on the LCD color monitor inside the driver's cab is provided.

6.8. Communications

Radio Preparation:	The entire vehicle electrical system is designed to accommodate communications equipment loading without posing any electrical problem when deployed for operations including recharging. The complete system is EMC tested. After delivery radio installation is at own risk.

7. Design	
Overall Vehicle Color:	Cab and body: Flame red - RAL3000 or US corresponding paint code
Fenders and bumpers:	Anthracite grey - RAL7016 as standard. Limited other colors possible.
Roof and roof rail:	Flame red - RAL3000 or US corresponding paint code
Roll-up Doors:	Flame red - RAL3000 or US corresponding paint code
Wheels	Alcoa Aluminum Dura Bright
Lettering and Striping:	Per customer requirements. Exact details to be determined at the pre-construction conference. All reflective material used for the vehicles are of 3M Reflective 680 Series or equivalent.
8. Telematics	
Connected Fleet:	During operation, the digital fleet maintenance system records all of the processes in the emergency vehicle and the built-in components. CAN bus data is stored in a telematics module built into the vehicle and transmitted to the central data storage via GSM. Information about vehicle position, operation and condition is evaluated and can be accessed online. The digital fleet maintenance system supports the administration of the whole fleet through notifications and reports. This ensures that you have access to an overview of the operational readiness of your vehicles wherever you are, at any time. A five-year subscription to Connected Fleet is provided.
9. Documentation	
	One (1) operation manual One (1) maintenance and workshop manual One (1) set of spare parts lists All documents are provided in English.

10. Service + Warranty

Service	The vehicle is serviced by the manufacturer, its subsidiaries or dealer network during the initial 5 years after delivery. The scope of the maintenance will be detailed before delivery.
Warranty	The following warranties according to our general terms and conditions are provided: • 5-year pump warranty • 5-year anti-corrosion warranty for the superstructure • 5-year chassis warranty • 5-year superstructure warranty • 5-year paint warranty (except usual color fading/bleaching due to sun/UV-ray exposure) • 10-year for the water and foam tank • Loose equipment warranty, according to OEM The manufacturer will undertake to remedy any defect resulting from faulty design material or workmanship appearing during the warranty period. Regular wear is not part of the warranty cover. This guarantee is only valid if the manufacturers' guarantee terms and conditions are observed.

11. Available Options

Chargers	
DC Charger	A 50 kW DC charger as external charging station is available. A fast-charging cable compatible with the sockets and receptacles as well as capable of carrying the fast-charging current.