ADVERTISED BID

CITY OF ST. LOUIS

OFFICE OF THE SUPPLY COMMISSIONER
1200 MARKET ST RM 324
ST LOUIS MO 63103-2842

... We agree to furnish the following articles to the City of St. Louis, free of any extra charges, in the quantity named and at the prices respectively stated:

REQUEST FOR QUOTE	PAGE
4201600246	1

ADDRESS CORRESPONDENCE TO

TO

SHIP TO

LAMBERT AIRPORT
P O BOX 10036
ST LOUIS MO
63145

SEE TERMS AND CONDITIONS ON THE REVERSE SIDE OF THIS QUOTATION SHEET.

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
01/14/16				

REPLY DUE BY: 02/09/16 12:00 O'CLOCK NOON

NEEDED BY DATE	QUANTITY	UNIT	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
	REQ LINE NUMBER : 0001					
	1	EA	AIRP	16R024601		
	AIRPORT MULTI-TASKING SNOW REMOVAL VEHICLE W/HEAVY DUTY SINGLE FRAME FORWARD MOUNTED CAB, 24 FOOT PLOW W/HANDS FREE HITCH, 22 FOOT HIGH PERFORMANCE MID-MOUNT BROOM & 1250 GALLON REARMOUNT DEICER W/BOOMLESS DISTRIBUTION ACCORDING TO ATTACHED SPECIFICATIONS. ALL DEVIATIONS MUST BE STATED ON THE ATTACHED DEVIATION SHEETS.					
	BIDDERS PLEASE CHECK/COMPLETE BELOW: ( ) FREIGHT IS INCLUDED IN THE QUOTED PRICE ( ) WE WILL CHARGE FOR FREIGHT/DELIVERY IN THE AMT OF: $.					
	BRAND ---------- PRODUCT NO. ----------					
	OR ACCEPTABLE EQUAL; UNLESS "NO SUBSTITUTE" ALLOWED MANUFACTURER BRAND AND/OR CATALOG DESCRIPTION IN SPECIFYING ANY ITEM DOES NOT RESTRICT BIDDERS TO THAT MANUFACUTERER,BRAND, OR CATALOG DESC. IDENTIFICATION THE BIDS SUBMITTED MUST BE OF SUCH CHARACTER, QUALITY, AND/OR EQUIVALENCE THAT IT WILL SERVE THE PURPOSE FOR WHICH IT IS TO BE USED EQUALLY WELL AS THAT SPECIFIED, AND BE ACCEPTABLE TO THE USING DEPARTMENT. BIDDER MUST FURNISH COMPLETE DATA AND INFORMATION FOR ITEMS BID THAT DO NOT MEET THE SPECIFICATIONS LISTED IN THE BID.					
					TOTAL →	

NAME OF FIRM	**STATE DELIVERY:**	COMPTROLLER Date
ADDRESS	CALENDAR DAYS	
CITY STATE	SIGNED BY:	SUPPLY COMMISSIONER Date
PHONE Area Code ( )		

ADVERTISED BID

CITY OF ST. LOUIS

OFFICE OF THE SUPPLY COMMISSIONER
1200 MARKET ST RM 324
ST LOUIS MO 63103-2842

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REQUEST FOR QUOTE	PAGE
42016Q0246	2

ADDRESS CORRESPONDENCE TO

TO

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ST LOUIS MO
63145

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DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
01/14/16				

REPLY DUE BY: 02/09/16 **12:00 O'CLOCK NOON**

NEEDED BY DATE	QUANTITY	UNIT	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT

::
BIDS WILL BE AWARDED BASED ON OFFICIAL SPECIFICATIONS
PROVIDED BY SUPPLY DIVISION ONLY & ANY RELATED ADDENDA.
ALL INQUIRIES RELATED TO THIS BID MUST BE IN WRITING
(LETTER/E-MAIL/FAX) TO STEPHEN GREGALI:

GREGALIS@STLOUIS-MO.GOV/P:314-622-4250/FX:314-622-4141
::
CHECK HERE IF YOU WANT A BID TABULATION:
ALLOW 30 DAYS FOR RESULTS ----------

STATE BEST GUARANTEED DELIVERY: ---------- A.R.O.

ALL ITEMS SHALL BE F.O.B. DESTINATION

FREIGHT OR DELIVERY CHARGES MUST BE INCLUDED IN QUOTE
OR INDICATED BELOW IN ORDER TO RECEIVE PAYMENT!

( ) FREIGHT IS INCLUDED IN THE QUOTE PROVIDED
- OR -
( ) WE WILL CHARGE $ ---------- FREIGHT/DELIVERY

THE CITY RESERVES THE RIGHT TO SPLIT AWARDS, VENDOR MUST
INDICATE (SPLIT) OR (ALL OR NONE) FOR MULTI LINE BIDS.

------ BIDDING "ALL OR NONE"

------ SPLIT AWARD ACCEPTABLE

TOTAL →

NAME OF FIRM	STATE DELIVERY:	COMPTROLLER Date
ADDRESS	CALENDAR DAYS	
CITY STATE	SIGNED BY:	SUPPLY COMMISSIONER Date
PHONE Area Code ( )		

ADVERTISED BID

CITY OF ST. LOUIS

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1200 MARKET ST RM 324
ST LOUIS MO 63103-2842

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REQUEST FOR QUOTE	PAGE
4201600246	3

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63145

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01/14/16				

REPLY DUE BY: 02/09/16 **12:00 O'CLOCK NOON**

NEEDED BY DATE	QUANTITY	UNIT	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
	PLEASE PROVIDE CONTACT INFORMATION FOR THIS BID:					
	NAME: ----------					
	E-MAIL: ----------					
	PHONE: ----------					
	ORDINANCE #60643 - A CITY OF ST LOUIS BUSINESS LICENSE IS REQUIRED IF YOUR COMPANY MEETS ANY OF THE FOLLOWING: (CHECK AS APPROPRIATE):					
	----- BUSINESS IS LOCATED WITHIN THE CITY LIMITS					
	----- DELIVERY WITHIN CITY LIMITS IS BY COMPANY TRUCK					
	----- SALES CALLS ARE MADE WITHIN THE CITY LIMITS					
	* VENDORS SHOULD NOTE IF THEY ARE MINORITY OR WOMEN OWNED BUSINESS (CHECK) MBE ---------- WBE----------					
	LIST ITEMS MANUFACTURED, ASSEMBLED OR PRODUCED IN A FOREIGN COUNTRY ON THE ENCLOSED (BUY AMERICAN) FORM FOR BIDS TOTALING $1,000 OR HIGHER					
					TOTAL →	

NAME OF FIRM	**STATE DELIVERY:**	COMPTROLLER Date
ADDRESS	CALENDAR DAYS	
CITY STATE	SIGNED BY:	SUPPLY COMMISSIONER Date
PHONE Area Code ( )		

ADVERTISED BID

CITY OF ST. LOUIS

OFFICE OF THE SUPPLY COMMISSIONER
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ST LOUIS MO 63103-2842

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REQUEST FOR QUOTE	PAGE
4201600246	4

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ST LOUIS MO
63145

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DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
01/14/16				

REPLY DUE BY: 02/09/16 **12:00 O'CLOCK NOON**

NEEDED BY DATE	QUANTITY	UNIT	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
	********** WEBSITE INFORMATION **********					
	*				*	
	* TO DOWNLOAD SUPPLY BIDS GO TO:				*	
	*				*	
	* HTTP://STLOUIS-MO.GOV/SUPPLY/BID-NOTICES.CFM				*	
	*				*	
	* CLICK ON BID NOTICES				*	
	**********				**********	
					TOTAL →	

NAME OF FIRM	STATE DELIVERY:	COMPTROLLER Date
ADDRESS	CALENDAR DAYS	
CITY STATE	SIGNED BY:	SUPPLY COMMISSIONER Date
PHONE Area Code ( )		

AIRPORT AUTHORITY
LAMBERT ST. LOUIS INTERNATIONAL AIRPORT
SPECIFICATIONS FOR AIRPORT MULTI-TASKING SNOW REMOVAL VEHICLE W/HEAVY DUTY SINGLE FRAME FORWARD MOUNTED CAB, 24 FOOT PLOW W/HANDS FREE HITCH, 22 FOOT HIGH PERFORMANCE MID-MOUNT BROOM, AND 1250 GALLON REARMOUNT DE-ICER W/BOOMLESS DISTRIBUTION
REQUISITION # 42016R0246

These specifications contemplate the furnishing and delivery of one new Airport Multi-Tasking Snow Removal Vehicle with Heavy Duty Single Frame 4X4 Chassis with rear third non driving axle, Forward Mounted Cab, Airport Runway Plow With Hands Free Hitch and High Performance Mid-Mount Broom, 1250 gallon deicer with boomless liquid distribution, and indicate in general the type, size, and quality desired.

This vehicle shall be all wheel drive and must be designed and manufactured in the United States, for the specific purpose of snow removal, with a minimum 76,000 pound GVW rating, approximate wheel base of 349 inches (center of driving front to center of driving rear axle). The total engine horsepower on board shall be 950 hp minimum. The configuration shall be two engine, front mounted plow, mid mounted broom, forward mounted cab design with near center steering, chassis drive engine behind the cab and rear mounted broom engine, and 1250 gallon deicer tank behind rear broom engine. This vehicle shall comply with all applicable FMCSR and FMVSS quality/safety standards, and requirements of the FAA Advisory Circular 150/5220-20.

This multi-tasking vehicle shall be designed for one man operation and used up to 45 MPH during snow removal operations on ramps, taxiways and runways. The design of these units shall ensure positive tire-to-ground tractive effort while brooming and doing full wall-to-wall turn-arounds. The unit shall have a net clean width of 18.0 feet after the broom with 22 foot liquid spray distribution, with 2 ft. of spray pattern extending to each side beyond the swept path. The overall length with the plow in the bulldoze position shall be no more than 58 feet. The wall-to-wall turning circle with the 24 foot plow attached shall be no more than 96 feet.

All parts and components of this unit shall be engineered to sustain the maximum load limits and severe operating conditions encountered in snow removal, while resulting in minimum wear and failure.

These specifications require the doing of all things necessary or proper for, or incidental to the furnishing of said unit. All items of design and equipment not listed in these specifications, but involved in carrying out their intent, are required to be furnished by the bidder, the same as if these items were specifically mentioned and described in these specifications. The unit must be fully assembled and tested prior to delivery by a qualified factory representative. Vehicle shipping costs to the airport is the responsibility of the Bidder. FOB the Buyer.

STATE ANY DEVIATIONS

Chassis

General

The operator shall be positioned near cab center for visibility in high speed snow removal operations. Minimum cab height shall be 132" as measured from the ground to the top of the cab.

The front plow to front axle dimension shall be kept as close as possible. This cab location and the axle to plow dimension are necessary in order to have the operator as far forward as good engineering practices will permit, allowing greater visibility and maneuverability while clearing contaminants from runways and taxiways.

The chassis shall be designed to permit easy and safe mounting and dismounting of the unit for operators and service personnel. Grab bars shall be installed as required for safe mounting and dismounting by personnel following OSHA standards of 3-point contact during all mount and dismount activities. This shall include a minimum 1-inch diameter vertical grab bar behind each door, to include round tactile material for improved grip. The inside of each door shall include a minimum 1-foot grab handle positioned under the window. It shall be made of minimum 1-inch diameter material, round only (no sharp edges or corners) for safety. All sheet metal, cowling, steps and fenders shall be free of sharp edges and protrusions, and include ample supports and bracing to prevent distortion and cracking. All steps or walkways shall be raised lug or expanded metal type construction.

Frame

The frame shall be single frame design. No articulation of any type such as bearing, fifth wheel, or pintle shall be accepted. This allows faster and safer turns since no pivoting action as with articulating frames. The frame shall be of Grade 8 bolted construction, with heat treated, minimum 110,000 psi yield strength, single channel carbon

STATE ANY DEVIATIONS

Frame cont.

manganese steel rails, connected by an adequate number of cross members to resist frame distortion from the lateral stress expected in this application. Minimum bar size shall be 12.375" X 3.875" X .375, with minimum 2,500,000 inch pound RBM per rail. The frame shall be the industry standard nominal 34 inch width. An integral front frame extension shall be provided. There shall be no notches in the frame to accommodate the extension. Frame liners, wrappers, fish plating, or bolt on extensions are not acceptable. The center frame over the broom structure shall be fabricated from tubular steel and formed plate attaching to high strength steel channels. Tubular rails shall have a minimum cross section of 12 inches tall x 4 wide by 0.38 thick.

A full width rear bumper is required to protect the rear of the vehicle. Bumper shall have an approximate 12 inch height to offer ample protection at rear of the vehicle. There shall be two tow eyes mounted on the rear of the vehicle frame. If the vehicle becomes disabled, the tow eyes shall be able to be used to pull the vehicle off the runway without inflicting damage to the vehicle. Mud flaps shall be provided behind both axles and in front of the rear axle to reduce snow and debris on truck.

Unit shall be rustproofed after paint to match current units in service at STL.

Chassis Engine

The engine shall be a four stroke EPA compliant diesel type, six cylinders, minimum 13 liter nominal displacement, developing a minimum of 475 horsepower at 2100 RPM, Caterpillar, and shall be equipped with latest diesel electronic control and engine management system. The engine shall be provided with full flow, replaceable oil filters, heated fuel water separator, high idle and cruise control, engine manufacturer's standard fuel filtration system, and emergency (power derate) system with indicator and buzzer, in event of high water temperature and/or low oil pressure. Starter shall be Delco.

STATE ANY DEVIATIONS

Chassis Engine cont.

A dry type two stage air cleaner is required with under hood air intake to prevent snow ingestion. Air intake must be switchable to outside air for operation during warmer operations. The air intake filter canister(s) shall be located under the chassis engine hood.

The exhaust must be mounted in a way to protect the crew from burns.

Additionally, switches shall be provided on the dash control panel within easy reach of the operator to allow the operator to select either high engine idle when the vehicle is in a stationary position or cruise control when the vehicle is moving. Either function shall be automatically disabled if the operator utilizes the brake or throttle pedals or parking brake control valve.

The carrier engine access cover shall be a right side fiberglass butterfly type enclosure with a hand pump that requires less than 20 strokes to fully open the cover. Lowering shall be accomplished by means of an orifice release to provide a slow and safe lowering of the hood. A velocity fuse is required in each opening hood hydraulic system to protect against falling hoods if the hydraulic valve or hoses fail. Cooling system, hydraulics and other required elements of the power pack shall be protected by a fiberglass hood. Daily maintenance points shall be clustered at the right side and shall be easily accessed by the right side butterfly cover. The opened cover shall be of adequate size to allow convenient access to the daily maintenance items.

Chassis Engine Cooling System

The cooling system shall consist of a heavy duty side by side combination charge air cooler, engine coolant radiator, transmission oil cooler and hydraulic system cooler with vertical flow for maximum cooling with the top & bottom tanks, and side members welded together to form a rigid frame. The tanks and the core shall be

Chassis Engine Cooling System cont.

STATE ANY DEVIATIONS

constructed of aluminum. The radiator and cooler assembly shall be mounted with vibration isolators alongside of the engine. The transmission cooler shall have a low temperature bypass to allow rapid warm up of the transmission. Twin hydraulic driven fans mounted to the shroud shall provide air flow through the cores and hydraulic valving shall allow the fans to reverse rotation on a predetermined schedule to purge debris buildup. The engine cooling system shall be filled with permanent type antifreeze protecting the system to -34 degrees F. Certification and proof of carrier engine cooling tests is required with the delivery of the unit.

Fuel System

There shall be two fuel systems, one for each engine. Both the chassis engine and broom engine shall have twin tanks with a minimum of 150 gallons of fuel storage.

The tanks shall be constructed of heavy gauge steel and be properly fastened to the frame. A four inch diameter filler neck with chain connected cap and brass tank drain plugs shall be provided. For each fuel system, the twin fuel tanks shall be interconnected, single side fuel fill, 30 GPM fill rate with shut-off valves at each end. A Racor heated fuel/water separator shall be installed in the supply line to each engine.

Transmission

The transmission shall be Allison RDS 4000 series six-speed automatic minimum, with a low gear ratio of 3.51:1, and shall be supplied with the appropriate torque converter for this application. Shifting shall be accomplished via a touch pad shift control within easy reach of the operator. A low transmission oil level sensor system shall be included.

STATE ANY DEVIATIONS

Chassis Drive Line

The chassis driveline shall consist of a front single speed helical gear transfer case that provides reduction to enable high pushing power in lower transmission ranges. Power from the transfer case is routed through a 50/50 differential to divide the power between the front and rear axles. The differential shall be operator lockable and is integral to the front axle. The differential shall be lubricated by an internal lube pump. Power to the rear axle shall transfer through a pair of parallel helical gearboxes to go over the broom head. Chain drive gearboxes are not acceptable. Driveshaft angles must be kept to minimum to avoid driveline vibrations. Hydrostatic ground drives are not acceptable

Axles

The front axle shall be a full floating, torsion flow drive/steer type, with a single reduction hypoid gear design, minimum 29,000 pound GVW rating at the ground, minimum 10" ground clearance, capable of withstanding the loads of the unit being bid. To ensure good maneuverability, the cramp angle of the wheels shall be a minimum of 35 degrees. A driver controlled traction differential unit is required in the front axle.

The rear driving axle shall be a full floating, torsion flow drive/steer type with a single reduction hypoid gear design, minimum 27,000 pound GVW rating at the ground, minimum 10" ground clearance, capable of withstanding the loads of the unit being bid. A driver controlled traction differential unit is required in the rear driving axle.

A third axle, steering but non driving, shall be located at the rear of the unit, approximately under the center of gravity of the liquid de-icing tank.

For extended life, the steering-drive wheel ends on the two drive axles shall be bolted to and removable from the

STATE ANY DEVIATIONS

Axles cont.

center section of the axle housing. The permanently lubricated cardan drive type joints shall be enclosed in a ball and socket. The trunnion pins shall be supported by high capacity low friction sealed spherical bushings to insure long life and smooth steering at all cramp angles. DOUBLE REDUCTION TYPE AXLES AND HUBS WILL NOT BE ACCEPTABLE.

Six Wheel Steering System

The Six Wheel Steering system shall allow the vehicle with plow attached to accomplish a complete wall to wall turning circle of 96 feet or less to assure the plow can be turned within the confines of a taxiway without damage to lighting or infield surfaces.

Front axle steering shall be Sheppard integral hydraulic power assist gear type. The steering gear shall be rated for heavy duty service. For safety, a mechanical linkage shall be maintained between the operator's steering wheel and front axle, allowing manual steering in the event of a hydraulic or electrical system failure.

The electronic over hydraulically controlled rear axle steering system shall operate in conjunction with the mechanically controlled front wheel steering system. This system must consist of the following components and operating features:

- A mechanical front steering system with hydraulic assist
- Front and rear driving, steerable axles
- Various hydraulic control valves, wheel position sensors, speed sensor and a steering cylinder located on the rear axle
- ECU (electronic control unit) is integral to the vehicle ECU

STATE ANY DEVIATIONS

Six Wheel Steering System cont.

Six wheel steering shall be electronically coordinated through the standard steering wheel. The operator shall have the ability to select the desired mode of operation "on the go" with provisions made for safe transition from one mode to the other. A selector switch within easy reach of the operator shall provide the option of front steer only, crab steer, or coordinated front/rear steer. Additionally, a thumb switch control on the joystick shall be provided for controlling rear steer only.

The system shall include safety provisions for dampening of all wheel steer effects at higher speeds, but it shall also allow full operation while the vehicle is moving at lower speeds. An indicator shall be provided in the cab to display mode selected and rear wheel position. Safety dampening of all wheel steer effects shall be related to vehicle speed

All of the six wheel steering system controls are to be located in the cab easily accessible to the operator. The all wheel steering system must be preprogrammed with multiple steering modes for improved maneuverability. The driver must have the option to select one of the following modes of operation "on the go" based on the driving conditions at hand:

1. **Front Steer:** When in the front mode the vehicle behaves like a conventionally steered vehicle. In this mode, the rear axle is locked and does not steer. Use this mode when enhanced maneuverability is not needed or during operation at speeds greater than 30 mph.
2. **Coordinated Steer**: This mode gives the operator the tightest turning radius of any of the available modes. When the front axle is steered, the rear axle turns in the opposite direction of the front, which reduces the turning radius and enhances maneuverability. This mode also has a deadband feature. Deadband allows the vehicle front axle to be turned a predetermined number of degrees in either direction before the rear axle steers. The deadband varies according to the speed of the vehicle.

STATE ANY DEVIATIONS

Six Wheel Steering System cont.

3. **Crab Steer:** When the front axle is steered, the rear axle steers in the same direction as the front axle. This makes the vehicle travel in a diagonal motion, sometimes called "crab walking". This mode can be useful for parallel parking or for counteracting side forces applied to a vehicle, such as during low speed snow plowing or brooming operations. This mode also has a speed controlled variable deadband.
4. **Operator Controlled Rear Steer.** When in this mode, the rear axles shall be controlled only by a dedicated control in the cab, independent of the front wheel position. This mode is required for backing the vehicle or when the vehicle is moving large amounts of snow and more implement angle is desired. The hydraulic locks shall remain operational; however, the mechanical lock is disengaged (unlocked) at all times when in this mode.
5. **Auto-center feature:** Assists in relocating the rear axle to the straight ahead position after use of the operator controlled rear steer mode.
6. **Switching Between Modes:** The mode switch shall be active at all times. However, the ECU shall not switch modes unless the front axle crosses center for operator safety. If the front axle does not cross center the system shall remain in the previous mode until the front axle crosses center. The rear wheels must also be in the straight ahead position before the mode change occurs.
7. **Wheel Position Indicator:** The system must include a wheel position indicator which shows the front and rear axle position at all times.
8. **Mode Indicator:** The mode indicator feature shall consist of one of four icons on the operator display indicating which mode is selected and whether rear axle is locked
9. **Managers Password:** A password shall be provided which will allow supervisory personnel to "lockout" or "enable" operation of the all-wheel steer system. This password is included to insure that only those operators who are qualified to operate the vehicle all wheel steering system are permitted to do so.

STATE ANY DEVIATIONS

Springs

The unit shall have alloy steel springs of the parabolic taper type, with minimum 29,000 lb. front, minimum 29,000 lb. rear drive axle, and 20,000 pound rating for the third axle. The spring hangers, pins and supports shall be heavy duty to give long life. The pins shall be of the grease type with substantial bronze bushings.

Brakes

The service brakes shall be fully air actuated, drum and shoe type with a minimum 16 CFM air compressor and documented to conform to FMVSS 121, S-cam type at all positions. The parking brakes shall be spring actuated, air released at the rear service brake air chambers with the air switch mounted within the cab and in easy reach of the operator. An electronic anti-lock brake system is required, 4 Sensors-4 Modules. The air system for this unit shall be equipped with frame mounted, heated Bendix AD-IS, or approved equal, air drier system with left side remote air fill point. Remote cable drains shall be provided for each air tank. DISC BRAKES AND DRIVELINE BRAKES ARE NOT ACCEPTABLE. The ABS system shall provide traction control for the rear axle to provide maximum available pushing power without operator interaction. When necessary, in addition to the brake system traction control, the engine shall also derate until traction is reestablished.

Wheels and Tires

This unit shall be equipped with proper sized wheels and tires for the GVW rating of the unit being bid. Single wheels shall be furnished for the front and rear axles. Aluminum disc wheels preferred but steel disc type are acceptable. Wheels shall have an 11-1/4" bolt circle. The tires shall be Goodyear G296 traction tread 445/65R22.5 or equal on drive axles, and 425/65R22 on third axle. Supplied tires must be readily available from commercial truck tire outlets.

A spare wheel and tire of each configuration shall be included with the vehicle.

STATE ANY DEVIATIONS

Cab

This unit shall have a fully enclosed, thermally and acoustically insulated (83 db as measured 6" from the drivers ear at full engine RPM), fiberglass, aluminum, and glass cab. The operator shall be positioned slightly right of center. Adequate space for the convenient installation of two communication radios shall be provided. Minimum cab height shall be 132" as measured from the ground to the top of the cab.

The cab of this unit shall be provided as follows:

1. A tilt/telescoping steering column.
2. A multi section heated windshield, minimum 3000 square inches. Side windows shall be power roll down type, one on each side of cab in each door, 6 square feet each. Rear window shall be minimum 3 sq. ft., stationary type.
3. Windshield Deluge System. A windshield deluge system is required to maintain operator visibility during snow removal operations. As a minimum, the system shall consist of a 5 gpm pump, a 20 gallon reservoir, two discharge nozzles above the front windshield, one discharge nozzle above each side window, one discharge nozzle above left and right rear view mirrors, and the associated plumbing to make a functional system. Fill point shall be conveniently located no higher than the bottom of cab door for easy refill from ground level. Discharge shall be controlled by a dash-mounted switch in conjunction with wiper controls. This system SHALL NOT rely on regular wet wiper discharge for function, but shall allow single shot discharge for best operational convenience
4. Rear view color camera and monitor system. System shall use the broom MDC display for the monitor. Operator selectable on / off. Automatically turns on when chassis is shifted into reverse. Include flood light at rear of deicer which automatically turns on with the camera.
5. Rear corners of cab shall include sight windows for visibility of processed runway surface, approximately 250 square inches each.

STATE ANY DEVIATIONS

Cab cont.

6. Four peep windows, 550 square inches total, are required in the cab front fascia below the windshield to assist operator in monitoring plow and casters.
7. All windows shall be tinted safety glass, DOT approved and stamped.
8. Minimum four electric variable speed heated wipers, providing operator absolute, clear line of vision, providing a minimum of 80% swept surface of the windshield. Heated wipers are required on right and left side windows.
9. Six quart reservoir for wet arm wipers required. System shall include an automated sequence which soaks the windshield and performs wiper sweep with the press of a single button, minimizing dry wipe
10. High output, fresh air type heater/defroster with multispeed fan motor, mounted behind the operator to minimize visibility obstructions to the front. Cab heater with defroster shall be capable of maintaining a 50 degree F inside temperature at sea level when the ambient temperature is -40 degrees F.
11. The Heater/Ventilation shall include a screened, vent is required near cab rear for fresh air intake into the HV unit. Air flow of 380 CFM minimum required. Vent controls shall be provided from panel selection including inside or outside air intake.
12. Air conditioning integral with cab heater system.
13. Cab doors shall be provided with stainless steel piano type hinges. Hinges shall be bolted to the door and bolted to the cab frame. Hinges shall not be welded to doors and/or cab. Interior lower panels of doors shall include a nonmetallic liner to assist in sound absorption. Side sight peep windows required in lower portion of each door, 150 square inches each. Glass pane in each skin of door required.
14. Auxiliary power outlets (2) required near center of cab for access by operator or passenger.
15. Fire extinguisher, cab mounted, 2A:10BC (5 lb.)
16. Dual, heated, motorized West Coast type mirrors operated from the operator position in the cab.
17. Self-canceling turn signals with hazard switch.
18. Key type starter switch for chassis engine. Integrated safety checks shall prevent starting when an unsafe condition is detected.

STATE ANY DEVIATIONS

Cab cont.

19. Coat hooks.
20. Cup holders (three) shall be located between the seats.
21. The operator seat shall be air ride, high back, fully adjustable in the horizontal and vertical positions, left side arm rest, adjustable lumbar support, cloth covered, load adjustable and furnished with 3 point type safety belts. Custom right side adjustable arm rest shall contain joystick for implement and, if equipped, all wheel steer control. Arm rest control shall include a vertical stow feature to facilitate easy egress/ingress of operator. A detent shall hold arm rest in the stowed position, with release control provided for operator.
22. An air ride, high back, fully adjustable in the horizontal and vertical positions, adjustable lumbar support passenger seat shall be provided to the left of the driver.
    It shall also be equipped with three point type safety belts; arm rests are not required.
23. All digitally controlled electrical circuits shall be protected by solid state circuitry and logic. Power supplies to control modules shall be protected by manual and automatic reset circuit breakers. Master wiring circuitry boxes shall be mounted behind operator. Circuit breakers controlling all analog circuits shall be easily accessible.
24. The interior of cab shall be fully insulated. The floor of the cab shall be insulated with thermal-acoustical sound barrier floor mat.
25. Master connection point for radios in center of cab, below windshield, within reach of operator and passenger.
26. Electric horn and air horn.
27. Multiple access panels in upper console to allow easy access to switch and wiring connections.
28. A warning device to indicate door open, transmission in gear is required.

STATE ANY DEVIATIONS

Cab cont.

Instrumentation shall be centered on a color liquid crystal display mounted to the tilt/telescoping steering wheel. Available information shall include:

1. Speedometer/odometer
2. Tachometer and hour meter that registers when engine is running only.
3. Voltmeter.
4. Air pressure gauge, dual system
5. Time and date
6. Fuel level with low level indicated by color: yellow at 15% remaining, red with audible alarm at 5% remaining.

Warning Icons required for:

7. Low Air Pressure
8. ABS Fail
9. ABS Communication Lost
10. Engine Stop
11. Engine fail warning
12. Low voltage
13. Engine overheat
14. Engine low oil pressure
15. Engine air intake restriction
16. Transmission overheat
17. Transmission fail
18. Control system node communication lost
19. Transmission communication lost

STATE ANY DEVIATIONS

Cab cont.

20. Parking brake applied
21. Transmission range
22. Traction lock engaged
23. Windshield washer fluid low level indicator
24. Message center for fault messages affecting operation.
25. Hydraulic temperature warning
26. Hydraulic fluid level low
27. Left and Right turn indicators
28. High beam indicator

A summary of fault messages with most probable resolutions shall be provided in the service manuals required elsewhere in this specification.

Multiple selections of display shall be provided for operation and maintenance. Fault codes shall be "notify of failure" with operator attention drawn to the area of fault. Display of ground speed required. Display shall include selectors to page through digitally displayed instrumentation for maintenance and routine pre-operation check list procedures.

Electrical and Lighting

Electrical system shall be multiplex technology for efficiency and maximization of control parameters. All lighting on this vehicle shall conform to FMVSS. All lighting shall be 12 volts, and shall include, but not be limited to, the following:

STATE ANY DEVIATIONS

Electrical and Lighting cont.

1. Two fender mounted headlights w/ integral turn signals per FMVSS.
2. Two LED trapezoid type lights, one each on left and right light bar,
3. Dual LED stop, tail, turn, clearance and backup lights per FMVSS. Back up alarm Preco 1040 with auto adjustment for noise level,
4. Code 3 CL199 LED beacon shall be center mounted on forward portion of cab roof with matching beacon at rear of unit
5. Two LED cab dome lights.
6. Variable intensity instrument lighting, push button control with ramp up through approximately 16 steps.
7. All instruments and controls shall be labeled in a manner to remain legible for the life of the unit and shall be illuminated.
8. All wiring shall be either harness, cable, split loomed, or shrink-wrapped. All wiring shall be color-coded, wire numbered matching drawing schematics and terminal strip, and labeled every 3 inches as to what it is used for. The gauge wire and processes shall be in accordance with common wiring practices. Exterior wring shall be SXL insulation type where appropriate.
9. Required circuit breakers for analog circuits shall be easily accessible.
10. Two headlights with high/low beam and integral turn signals mounted on a light bar near front outside corners of cab near leading edge. Light bar shall be vertical and made of round material to allow infinite positioning and aiming of auxiliary lighting as specified. Deutsch type sealed connector required at each light bar to pass electrical connections through cab shell.
11. One 12-volt, 240-amp minimum alternator with built-in regulator.
12. Four multipurpose type work lights to be mounted under chassis engine hood.
13. Two HID lights on cab mount light bar with switch in cab
14. Four mid mounted work lights to illuminate the broom area

STATE ANY DEVIATIONS

Electrical and Lighting cont.

15. Six 12-volt maintenance free batteries with a minimum total of 6000 cold cranking amperes. Batteries shall be installed in two frame mounted compartments with corrosion resistant interiors. A four battery compartment shall be located near the chassis engine and a two battery compartment shall be located near the broom engine. The batteries of both compartments shall be connected so both the chassis engine and broom engine use all six batteries.
16. A 1.5 volt trickle charger is required.

On Board Diagnostics and Electronic Control System

Functional control of vehicle shall be centered on an electronic control system utilizing J1939 data bus. Reliability and precision operation of the unit requires heavy reliance on solid state circuitry and components and minimized reliance on traditional multipin "physical switch" type relays. Electronic control systems shall include on board diagnostic assistance and other features to simplify the operation, troubleshooting, and repair of the chassis.

Electronic control modules shall be of the highest reliability and durability for use in mobile equipment. System shall comply with the following:

1. High amp manual resettable circuit breaker protection is required upstream from the electronic control modules
2. Y's from the data bus to the modules shall be physically labeled in the vehicle for ease of maintenance and troubleshooting

On Board Diagnostics Features and Performance cont.

STATE ANY DEVIATIONS

3. Control boxes shall include a dual external LED tattletale, one LED displaying constant illumination indicating power supply, and one LED displaying a "heartbeat" indicating internal proper function
4. A timer module shall serve to keep electronic modules live for 5 minutes after last cycle of door switches indicating egress from vehicle. This unit shall maintain heartbeats and power indicators at modules and their function without the key switch on. After a 5 minute period without a change of status in door switches, unit shall automatically shut down completely.
5. Data bus terminal resistors shall be EXTERNAL to control modules for ease and economy of replacement. Terminal resistors within the control boxes shall NOT be used as part of the electronic system structure.
6. Certifications of testing and durability of electronic modules
   a. EMI-RFI (meeting mil-spec of 150 volts/meter)
   b. Salt spray survival for 1,000 hours minimum (ASTM B117)
   c. Water immersion
   d. High temperature tested at 125% overload for 100 hours, minimum;
   e. Vibration tested to 50 g's
7. ECM shall be overload and reverse polarity protected with self-diagnostic capabilities
8. Field Effect Transistors (FETs) shall provide power output to electrical functions, acting as a solid state relay and circuit breaker in one
9. FETs shall shut off automatically in the event of short to ground, cycling on and off to test itself for proper function to avoid damage while allowing search and repair of fault
10. Individual FET ratings and over-current protection to be programmed to values of 1 to 15 amps depending on task assignment

STATE ANY DEVIATIONS

On Board Diagnostics Features and Performance

Electronic control system shall include and enable diagnosis of chassis and engine systems by means of the LCD dash display. Transmission diagnostics shall be accessible through blink codes from the transmission pushbutton shift selector. Chassis anti-lock brake diagnostic codes shall be accessible through blink codes using the chassis ABS indicator on the display and the ABS blink code switch. System shall include the following at a minimum:

1. Direct readout of codes on the display
2. Message area on LCD to display error message to operator as any system function fails. Available during operation on operations screen
3. Error message toggle if more than one failure is present
4. Password registration with chassis OEM's Service Department
5. Memory retention of failures until cleared by maintenance personnel with password access
6. Real time operational indicator of system function on diagnostics/maintenance screens

There shall also be diagnostic connection ports for advanced chassis, engine, and transmission diagnostics.

Plow and Broom Controls

The control for the plow and broom shall be the same. The hydraulic pump for the controls shall be driven by the chassis engine and provide sufficient flow and pressure capacity for all systems.

The operator's control shall be an integrated with the chassis and broom. All switches shall be lighted rocker style. It shall have all necessary functions to operate the plow and shall have the following:

- Multifunction CAN controlled joystick with multi-switch head for plow and broom lift/lower and left/right swing
- Switch for plow float on/off
- Low hydraulic oil level warning light

STATE ANY DEVIATIONS

Plow and Broom Controls cont.

- Switch for hitch lock and unlock
- Hitch lock confirmation light, on indicates locked
- Audible buzzer sounds when hitch is not locked

Pump: Pump shall be driven by the chassis engine. It shall allow the plow to swing full in 8 seconds at engine 800 RPM.

Hydraulic Reservoir: Minimum 25 gallon capacity with baffle. Equipped with visual sight glass and low oil level sensor, magnetic drain plug, 40 mesh filter basket cap with riser as part of the tank. Minimum of 12 gauge steel construction.

Hydraulic System Filtration: A high pressure filter assembly shall be installed between the pump and control valves to provide improved protection against contamination in the many small passages of the load sense control functions.

Hydraulic Control Valve: Shall be an aluminum manifold with D03 4 way controls mounted for the swing and lift functions. A separate cartridge shall be activated for the plow float. An electrically activated valve shall reduce pressure when no function is activated. An additional valve shall be plumbed in parallel to operate the lock cylinder for the lock pin on the moldboard detach quick hitch.

Plumbing: Suction hoses shall be sized to prevent cavitation during cold starts. Pressure hoses shall be properly sized to minimize pressure loss connections; from the pump to the control manifold will be ¾" ID, from the control manifold to the plow functions will be ½ ID. Flow in hoses must not exceed 25 ft. /second. All pressure hoses will have a rating of 3000 PSI. All hoses shall be anchored away from bolts and sharp edges to prevent wear, fatigue or fire.

STATE ANY DEVIATIONS

Plow and Hitch

General

These specifications describe a Power Reversible Plow with a flared discharge and polymer moldboard with trip feature, manufactured expressly for airport runway high speed and ramp plowing. This plow shall be rigidly built of new material suited for continuous work under extreme conditions of snow removal.

The front attachment plow hitch to the chassis shall be a "Hands Free" type. It shall allow hands free interchange of the plow and other attachments from the operator position in the cab. It shall be hydraulically operated (plow lift, swing, and lock) and designed for power reversible runway plows. The plow moldboard and push frame must be capable of being completely removed or attached from the vehicle's cab without leaving the operator's seat and without the need to disconnect or reconnect hydraulic lines and connections by the operator. It shall be automated and fully repeatable. The entire process of hitching or unhitching shall be possible by one man in not more than 2 minutes and shall be positive connected with hydraulically operated lock pins. There shall be three sections of the hitch: 1) Chassis side, 2) module, and 3) moldboard side. All hydraulics and structure for plow lift, swing, oscillation, and lock shall be on the module section, which shall be located between the chassis and the moldboard sections of the hitch. The moldboard section shall be a J-Hook style coupling. Provisions shall be made to allow the module portion to be readily removable from the chassis.

Plow Hitch: Chassis Side

On the front chassis frame rails shall be a DIN plate style coupler for connection of the module. It shall consist of two side (cheek) plates of adequate size bolted to the chassis frame rails with a welded 0.63 inch thick push plate. This flat mounting push plate shall have two top mounting pockets to accept the mating portion of the module and slots for four 1 inch diameter swing bolts.

STATE ANY DEVIATIONS

Plow and Hitch

Plow Hitch: Lift, Swing, Oscillation Lock Module

The module (hydraulics and structure for the plow lift, swing, oscillation, and lock) shall be mounted and unmounted from the chassis by means of a chassis mating DIN plate hitch of a size sufficient to support the weight and operation of the plow. Two steel claws and four 1 inch diameter swing bolts with nuts that are part of the module will lock the connection between the module and chassis. The entire process of removing or installing the module shall be possible by one man in not more than 10 minutes. All hardware shall be grade 8. Bolts shall have sufficient shank length so that no thread is in the bearing areas.

Lift: The plow lift system of the module shall be a parallel lifting type consisting of two parallel tubular lift arms of 3 inch x 3 inch x 0.31 inch wall steel tubing. The design shall incorporate a dual acting plow lift cylinder. The hydraulic double acting plow lifting cylinder shall be 4 inch bore 15.75 inch stroke with a 2 inch diameter rod. This lift cylinder will also serve to "hands free" remove and attach the plow moldboard. The plow lift hydraulic system will be furnished with a relief valve to prevent no more than 200 PSI down pressure. The lifting cylinder arrangement shall incorporate a mechanical transport lock that shall take the weight of the plow off the hydraulic cylinder during plow transport, and shall act as a safety in the event of a hose failure during transport.

Swing: The plow swing system of the module shall be equipped with two telescoping type hydraulic cylinders enabling the plow to be angled left, right or straight ahead. Maximum angle to the left or right shall be 32 degrees. The telescopic hydraulic cylinders shall be of the two stage type with an outside diameter of 4.50 inch and a rod diameter of 2.50 inch. For corrosion protection, the tubular stage shall be chrome plated and the rods shall be nitrided. The cylinders shall be 19.00 inch long from center mounting hole to center of mounting hole when retracted and shall have a stroke of 20.25 inches. The cylinders shall be heavy duty to allow for heavy snow plowing under severe conditions and shall be equipped with a double acting hydraulic cushion valve mounted on the plow to protect the cylinders from damage. Mounting plates for the swing cylinders shall be 0.63 inch in thickness. The cylinder mounting bolts shall be 1.00 inch diameter. The hydraulic port in the angling cylinders

STATE ANY DEVIATIONS

Plow Hitch: Lift, Swing, Oscillation Lock Module cont.

Swing cont.:
shall be 0.75-16 standard straight SAE "O" ring thread. The hoses used shall be standard 0.50 inch SAE 100R2 rated.

There shall be a DX type bushing installed in the center of each yoke assemblies for low friction movement of the swing pin. The two parallel tubular lift arms shall be attached to the top and bottom yoke. The yokes / lifting arms connections shall have a hardened steel sleeve bushing.

Oscillation: The plow oscillation system of the module shall incorporate a drive frame that allows oscillation of the plow with respect to the chassis in order to follow the pavement contour. The plow shall oscillate a minimum of 2 degrees overall. The oscillation mechanism shall consist of two front facing vertical plates which can pivot and slide. When the plow is carried in the raised position and angled right or left the plow shall remain approximately level to the pavement.

The front plate shall be 0.50 inch thick steel plate with a bushing on the top for the oscillation pivot tube and slots cut in the bottom for the oscillation slide bushings. The back plate shall consist of a formed 0.38 inch plate and backing plate to form a boxed section. The oscillation pivot tube and oscillation slide bushings shall be welded in place facing forward on the boxed section. The back side of the boxed section shall attach to the plow swing pivot pin (center vertical).

A 0.38 inch thick poly plate shall be sandwiched between the two oscillation plates to reduce friction and wear. No metal on metal. The oscillation assembly (two plates) shall be held together with five bolts, 1.0 inch diameter with backing plates and lock nuts. There shall also be two rubber cushions bolted to the plow push frame to limit and cushion the end of oscillation travel.

STATE ANY DEVIATIONS

Plow Hitch: Lift, Swing, Oscillation Lock Module cont.

Lock: The plow lock system of the module shall aid in the hands free attachment of the plow moldboard and to positively secure the plow moldboard to the hitch module. The top of the front oscillation plate shall have a steel receptacle with a tapered sideways lead in to accept the J-hooks of the moldboard. The bottom of the front oscillation plate shall incorporate an outward acting, horizontal, double acting hydraulic lock cylinder operated from cab with a switch. At the ends of the cylinder shall be 2.5 inch diameter lock pins. When activated, the lock pin translates into the mating holes in the plow moldboard pushframe. The lock pins shall be tapered to pull the moldboard and the module together to form a positive lock. The lock pins will be capable of being installed without the need of an additional hydraulic cylinder to push the moldboard away. A proximity sensor with confirmation light in the cab shall also be provided to confirm the pins are locked on the holes.

Plow Hitch: Moldboard Side
The plow push frame will have two J-hooks each 1.50 inches thick that will allow the operator to lower the plow hitch, drive forward into the hooks, and then pick up the moldboard. At the bottom of the push frame shall be the mating holes for the lock pins to secure the moldboard to the plow hitch.

The moldboard and pushframe frame, once detached, will rest on the ground on the caster tires and the cutting edge only. No blocking shall be needed. Lead in on the J-hooks shall be great enough to compensate for forward moldboard roll.

Plow Push Frame

The push frame shall be of severe duty design with no less than three horizontal steel tubes each having a cross section of 3 inch x 5 inch X 0.25 inch wall rectangular tube. There shall be six urethane cushions on the bottom of the plow frame compressed to a length of 4 inch by means of six bolts – 1.25 inch in diameter and six lock nuts. For durability and safety on the runway, each cushion assembly shall have a 1.50 inch OD hardened steel sleeve

STATE ANY DEVIATIONS

Plow Push Frame cont.

tube over each bolt for sliding inside the push frame. This prevents over compression of the urethane cushion when assembling and prevents wear of the bolt. The urethane cushions mount to a pivot weldment that connects the push
frame to the moldboard via four pivot pins. The pivot pins shall be 1045 CR steel, 1.50 inches in diameter.

The swing stops shall have a poly liner installed to allow free oscillation of the plow frame. When swung to 32-degrees, the plow push frame shall stay against the stops as the operator raises and lowers the plow, no additional swing adjustment needed.

Four heavy-duty braces on top of the plow frame shall allow the plow and cutting edge angle to be adjusted to positions of 65, 75, and 85 degrees from horizontal for optimum snow handling performance.

Moldboard Assembly

The moldboard shall not be less than 50 inches high in the center portion and not less than 76 inches high at the discharge ends when the moldboard is set at 65 degree attack angle, nor less than 24 feet long at the cutting edge, and formed so as to lend itself to high speed plowing operations. In order to offer a low coefficient of friction and resistance to both corrosion and impact, the moldboard sheet shall be formed from 0.38 inch thick VHMW unwelded polyethylene sheet. When set at 75 degrees, the moldboard shall overhang the cutting edge by a minimum of twelve inches the entire length of the plow.

The sheet shall be formed from a polyethylene material that is made from new resin (recycled material is not acceptable), and shall be color impregnated and ultra violet stabilized to a lime green pigmentation for best visibility in snow removal operations. Welding of sheet is not allowed.

STATE ANY DEVIATIONS

Moldboard Assembly cont.

Moldboard reinforcement shall include a full length formed angle across the top front of the steel shell and sixteen vertical ribs tying the upper shell to the cutting edge mounting angle and its reinforcement. There shall be two ribs at each of the four push points, and four ribs at the end of each flared end of the plow. The sixteen steel vertical ribs shall be made from 0.25 inch thick plate and have a varying cross section, becoming wider as they approach the cutting edge mounting angle. A 0.50 inch thick formed plate will be welded to the cutting edge angle to support the center 80 inches of the plow. On either side of the center 0.50 inch thick formed plate, there will be a 0.75 inch thick formed cutting edge support of varying section not less than 73 inches long. There shall be no span between reinforcing ribs in excess of 3.5 feet.

The vertical ribs shall provide support and frame work for a series of window openings in the rear steel moldboard backing frame, tying top reinforcement to the bottom reinforcement. Window opening design shall provide long term, stable backing support for the moldboard, and help prevent moisture buildup behind the polymer plow face. The polymer moldboard shall be bolted to this durable framework for maintenance of proper snow handling shape. Moldboard shall consist of three separate polyethylene sheets, one for the center section and one for each flared end of the plow. Polyethylene to be retained by 0.625 inch diameter carriage bolts with locking hardware to avoid loss on the operations area of the airfield.

Means of moldboard attack angle adjustment shall be incorporated so to provide 65, 75 and 85 degree settings (from ground plane to back of cutting edge) for use with either steel, carbide, rubber or urethane cutting edges throughout the life of the plow.

Spray Guard Deflector

A spray guard/deflector shall bolt to the top discharge point at the moldboard flange or reinforcement, tangential

STATE ANY DEVIATIONS

Spray Guard Deflector cont.

to the upper radius of the modified "J" style moldboard to direct snow forward, down, and toward the trailing edge of the plow. It shall consist of a heavy duty rubber belting, 0.40 inch thick x 12.00 inches wide, and shall include a metal retaining strap, 0.25 inch thick x 2.00 wide, with necessary mounting hardware. The hardware shall be of the locking type to minimize opportunity for loss on the aircraft operating areas of the airport. Provisions shall be provided in the mounting system to adjust the spray guard perpendicular to the moldboard on a case by case basis as desired by the airport for seasonal variation in operations.

Cutting Edge

Shall be of polyurethane, 2 inches thick x 12 inches with mounting holes to A.A.S.H.O. standard and shall be supplied with a beveled steel retaining strap, 0.50 inch thick x 2.50 inches wide. The polyurethane blade shall be reversible with multiple holes for position adjustment. The cutting edge to be provided in multiple segments for ease of installation and handling. The polyurethane shall have a minimum Brinell hardness of "Shore A-83 Durometer" and a minimum tensile strength of 6,000 P.S.I.

Caster Wheel Assembly

Pneumatic casters shall be capable of swiveling 360 degrees. Wheels shall be a three-piece design, 9 inch diameter X 6 inch wide minimum, each wheel, axle and bearing assembly shall be rated at 3,916 pounds at 31mph each for severe duty use. Wheel shall be a five mounting bolt design. They shall ride on hubs fitted with Timken tapered roller bearings. The axle shall be a minimum of 1.375 inch in diameter with 1.375 inch diameter bearings 5 inches apart.

STATE ANY DEVIATIONS

Caster Wheel Assembly cont.

Tires shall be 21 x 8.0 on a 9 inch rim for additional load carrying ability, 14 ply minimum. There shall be a total of two tire and wheel assemblies, mounted in a single arrangement at each end of the swing frame. One assembly to the right of center, one assembly to the left of center. Dual tire and wheel assemblies will not be accepted. Tires shall be pneumatic, and delivered with appropriate air pressure, 130 psi, as shall be called out in service manuals to be provided with the machine.

Vertical adjustment shall be accomplished through two caster barrel arrangements. The outer barrels of the barrel arrangements shall be heavy duty steel tubing, not less than 4.25 inch OD x 3.75 inch ID, provided as part of the major caster mounting bracketry as a welded unit. Inner tubes shall be from not less than 3.25 inch OD x 2.25 inch ID for grease/lubrication fit. Inner tubing to be ground and hard chrome plated to mate with honed outer steel tube housing. Inner tube shall be held centered in outer tube by means of heavy duty nylon rings at top and bottom. The screw adjustment rod shall be heavy threaded rod fitted with jam nut for maintaining adjustment from not less than 1.375 inch diameter stainless steel, threaded rod.

Each caster assembly shall be equipped with a spring loaded adjustable brake dampener so to minimize wheel wobble.

Stands

The moldboard shall have a pair adjustable leg stands to be used for plow removal / storage with the other remaining weight on the caster tires. They shall aid in raising the cutting edge during change. They are required for safety and storage reasons.

STATE ANY DEVIATIONS

Color

Moldboard= Lime green for high visibility on airfield
Drive Frame=Low gloss black

Broom

General

The broom head shall provide a swept path of 18.0 feet at full angle. It shall be 46 inches in diameter and be capable of producing 4800 Ft-Lbs. of torque at maximum hydraulic pressure of 5075 psi and 500 RPM, with an air blower system capable of producing 23,000 CFM at 400 MPH. The broom head and air blower shall be hydrostatic drive with infinitely variable speed hydraulic pumps and fixed displacement motors. The broom shall have the ability to remove snow, ice, slush, sand and other debris at rated speeds up to 40 MPH depending on conditions. To confirm this, the following must be supplied with the bid.

1. The exact proposed broom and air blower drive power system components including engine, gearbox, and hydrostatic pumps and motors must have in field proven experience. No prototypes shall be allowed. The location and serial number along with contact and phone number of at least 5 airports must be supplied with the bid.
2. Engineering hydraulic power calculations confirming the broom speed and available torque values must be supplied with the bid. This includes sizes and specifications of all components from the engine to the broom shaft including specification sheets for the broom and air blower hydrostatic pumps and motors showing type, size, and manufacture. Efficiency losses must also be accounted for. The calculations must be understandable, complete, logical, and in a mathematical order per the Society of Automotive Engineers (SAE) and the Fluid Power Society standard formulas and practices. The burdened of proof is the responsibility of the bidder.

Failure to provide the above information for whatever reason will result in disqualification.

STATE ANY DEVIATIONS

Deicer

General

A 1250 gallon de-icing system shall be mounted at the rear of the MTE. The system shall include a hydraulic driven agent pump, plastic agent tank, spray boom, and an open loop remote control system. The system shall be capable of dispensing liquid de-icing agent at rates of at least 1 gallon per 1000 square foot while traveling at 25 MPH with a spray path 22 feet wide. The product tank and system plumbing shall be mounted integral to the MTE. The boom assembly shall be mounted at the rear of the overall unit with a deicing liquid quick disconnect fill port mounted at the rear. The control system shall be mounted in the MTE chassis cab.

Engine Assembly

The engine used to power the broom head and air blower system shall be a six-cylinder Caterpillar C-13 turbo-charged diesel engine rated a minimum 475 HP, 12.5 liter displacement minimum. It shall be liquid-cooled, Tier III EPA emission certified, and equipped with electronic controls for fuel injection and engine management including an automatic shutdown system with manual override and an electrical connector for CAT diagnostic system.

The engine shall be provided with a full-flow replaceable oil filter and bypass filter, 12-volt starter, master battery switch, and a dual air intake two-stage air cleaner.

1. External turbine type pre-cleaner
2. Primary dry element and safety element

The dual air intake shall allow the system to draw under hood air to prevent snow ingestion, outside air for peak performance or a blend of both to modulate engine intake air temperature. The air intake filter canister(s) shall be located under the chassis engine hood.

STATE ANY DEVIATIONS

Engine Assembly cont.

The exhaust system with rain-cap shall be mounted on top of engine enclosure. The heavy-duty cooling radiator and heavy-duty charge air cooler shall also be mounted on top of the engine enclosure for space considerations. Antifreeze shall have protection to minus 34 degrees Fahrenheit with distilled water for anti-corrosion purposes and supplemental coolant additive for cavitation and corrosion protection. The cooling fan for the radiator and charged air cooler shall be hydraulically driven with automatic thermostat (high / low) control. The fan shall periodically and automatically reverse, for the purpose of eliminating snow accumulations on the radiators. The fuel tanks shall be capable of holding up to 150 gallons of diesel fuel for 10 hours of operation. A Racor heated fuel water separator with 200-watt heater to remove water and contamination in the fuel supply shall also be supplied. Application approval from engine manufacture must be supplied at delivery. 1500 watt immersion heater and automatic ether start system required for each engine.

Engine Enclosure

The engine access cover shall be a two sided fiberglass butterfly type enclosure with a hand pump on each side that requires less than 30 strokes to fully open each cover. Lowering shall be accomplished by means of an orifice release valve to provide a slow and safe lowering of the hood. A velocity fuse shall be included in each circuit to protect the maintenance technician from accidental closure due to hydraulic pump or valve failure.

Cooling system, hydraulics and other required elements of the power pack shall be protected by a fiberglass hood. Daily maintenance points shall be easily accessed through the opened full length butterfly covers.

The fiberglass engine enclosure shall cover the chassis including cat walks, fenders, engine, to eliminate snow accumulation. It shall be weatherproof design and totally enclosed to eliminate snow ingestion. Airflow through the enclosure must be controlled. The engine enclosure shall be pressurized using the cooling fan for the radiator

STATE ANY DEVIATIONS

Engine Enclosure cont.

and charged air cooler. Four switched lights in the enclosure, two on left, two on right side shall be included. The platforms shall be continuous along full length inside the engine enclosure, both sides, allowing access to all components requiring periodic maintenance. Steps and assist handles shall be provided for access to both the left and right side platforms.

Broom Hitch

The broom hitch shall provide low friction, free flotation, shock absorbing, and weight transfer for the broom head.

The low friction, free flotation is required so that it is independent of broom chassis for vibration and bounce considerations and to accommodate surface irregularities. A parallel arm system with four horizontal pins shall be used. The two arms shall be box construction for torsional stiffness with 2-inch diameter pins on greaseable low friction bushings, DX prelubricated type (no metal on metal).

To maximize vehicle tractive effort, braking, steerability, and overall handling of the broom chassis, the broom chassis shall carry approximately 50% of the broom weight by utilizing a weight transfer system. A pair of hydraulic cylinders shall support the parallel arms of the hitch. Pressure in the hydraulic cylinders provides the lift necessary to transfer approximately 50% of the broom weight to the chassis. A control valve adjusts the oil in and out of the cylinders to provide the same weight transfer no matter what the surface irregularities. The vertical stroke of the cylinders and thus the hitch shall be 24" minimum.

The pair of hydraulic cylinders shall also "free float and dampen" the parallel arms of the hitch to minimize broom bounce at high vehicle speeds. The broom hitch must have hydraulic cylinders to provide an active shock absorbing systems.

STATE ANY DEVIATIONS

Broom Angle

The broom head shall be capable of swinging 35 degrees left or right, selectable from an operator's joystick. Using a longer broom than specified to accommodate swept path for larger swing angles are unacceptable due to storage and maneuverability reasons. The swing shall be accomplished by means of dual swing arms with four pivot points, which ensures the weight of the broom head remains approximately on the chassis centerline regardless of the position of the broom head. The broom pattern shall not vary more than 0.5 inches end to end for the whole width of the broom.

The bearing mechanism shall allow frictionless motion through the swing and shall be accomplished by utilizing four vertical parallel shafts at least 2.5 inches in diameter at each end of both swing arms. The swing arms themselves shall be made from formed steel plate and machined steel tubing with greaseable low friction bushings, DX prelubricated type (no metal on metal).

Broom Oscillation

The broom oscillation shall provide true flotation left to right for the broom head so that it is independent of broom chassis to accommodate surface irregularities and thus minimize brush pattern variation during operation. It shall have at least 8 degrees (+4, -4) of free floating oscillation from left to right. The ability of the broom head to oscillate shall be provided by means of a spherical bearing assembly and low friction nylon pads.

Broom Elevation and Brush Pattern Adjustment

The broom head elevation shall be a vertical lift type such that the relationship of the broom hood and deflector to the ground does not change except the height. The horizontal angle does not change. The elevation action shall have adequate stroke to achieve ground clearance during transport when not in use. The lift shall be powered

STATE ANY DEVIATIONS

Broom Elevation and Brush Pattern Adjustment cont.

utilizing two 3 inch diameter hydraulic lift cylinders, one on each end of the broom frame, controlled by the operator's joystick. The lift cylinders shall be equipped with a counterbalance valve, which prevents the broom head from creeping down.

There shall be an automatic broom pattern control system with adjustment from cab. A time based system shall be used to readjust the broom pattern by counting the time in the broom down position. When the preset time is reached, the broom head will index down a preset amount. At that time the timer is reset and restarts counting. Time running in the up mode is not counted.
Manually adjusting the pattern from the cab or broom head will reset the timer.

A manager controlled activation / deactivation setting shall allow operator to adjust broom pattern from inside the cab when activated. Manual adjustment (Push a button) increases the pattern in predetermined increments. Same for pattern decrease. These broom pattern adjustments can be achieved in the cab while moving and without raising the broom head. There shall be an additional pattern control switch at the broom head for control from outside.

Broom Head

The brush itself shall be 46 inches in diameter and 22 feet long comprised of two 11 foot sections. The broom head frame must sustain the loads imposed by the snow removal capacity of the unit. It shall be fabricated from steel tube-in-tube design with 0.44 inch walls and include provisions for grease between the mating surfaces. The hydrostatic broom drive shall be dual end drive. Power shall be supplied from two variable displacement hydrostatic pumps (Sauer-Danfoss 90 series type) mounted on the engine's gearbox. The gearbox shall be a parallel shaft pump drive with precision gears, AGMA 10 rating and a dipstick for oil level measurement.

STATE ANY DEVIATIONS

Broom Head cont.

Two high-speed hydrostatic motors (Sauer-Danfoss 90 series type) each connected to a planetary reduction gear-box shall be mounted within the inner diameter of the broom cores outer ends to minimize overall width. The motor gearbox connections shall utilize a static o-ring seal, wet spline type. No dynamic seal shall be used for reliability purposes. The motors shall not support the broom core loads and the planetary gear box shall be hydraulic oil bath lubricated (case flushing type).

Speed of broom shall be infinitely variable from 0 to 500 RPM. Available torque at the broom shaft shall be 4800 ft-lbs at maximum hydraulic pressure of 5075 psi for maximum snow moving capabilities. Engineering hydraulic power calculations confirming these values must be provided with the bid. Power shall be transmitted to the broom core from the gearboxes utilizing keyed tapered hubs to prevent any looseness in the connection for vibration concerns and high strength molded urethane drive cogs into replaceable hardened steel core drive sprockets of the core. Hardened steel pilot plates shall support the radial loads.

The brush speed shall automatically adjust depending on the vehicle speed. An increase in vehicle speed shall increase the broom rotational speed. There shall be six ranges for the operator to choose from to match the conditions.

For example:
Idle: 60 RPM
Range 1: 175 to full RPM
Range 2: 250 to full RPM
Range 3: 275 to full RPM
Range 4: 310 to full RPM
Range 5: 350 to full RPM

STATE ANY DEVIATIONS

Broom Head cont.

The broom rotational speed shall also compensate for bristle wear to maintain a constant bristle tip speed relative to vehicle speed no matter what the brush diameter. The result is that the broom rotational speed must increase as the vehicle goes faster and as the brush wears. Manual override capabilities shall also be supplied.

A maximum 2 inch gap between broom core sections shall be obtained by using a center bearing assembly utilizing the same components as the drive ends. The center bearings shall be encased in a sealed housing and be provided with oil bath lubrication. Manual greasing of bearings is unacceptable. The left and right side core sections shall be connected to each other by a center shaft so the two sections rotate at the same speed, and that the power produced by each of the end drive assemblies is transmitted across the full length of the core assembly.

The broom end plates shall be steel fabricated using 0.38 inch thick welded steel plate construction with 14 inch diameter, 0.38 inch thick steel tube for mounting the broom drive gearboxes. The end plates shall be reinforced horizontally and vertically using formed channel. The broom end plates shall be secured to broom frame with four 1 inch diameter grade 5 bolts.

The unbolted end plates shall slide outward to allow easy access for core and bristle replacement. The slide mechanism shall be round telescoping tube in tube design. A second 2 inch square tube shall slide on a plastic slide providing additional support and allowing repeatable location of brush centerline alignment during broom core remove and replace operations.

Broom Cores

The two core sections must be split core design for easy handling and efficient (tight) wafer stacking and sustain the loads imposed by the snow removal capacity of the unit. They shall be tubular steel construction with four drive bats, equally spaced around a tube to center each brush wafer. The drive sprockets shall be replaceable hardened steel. Each core shall be individually dynamically balanced to acceptable values at rated RPM.

STATE ANY DEVIATIONS

Broom Cores cont.

The brush on the cores shall be full width and designed for runway operation and shall be field replaceable with maximum ease without the use of special tools. The wafers shall be a 50/50 combination of polypropylene and wire, confirming to Mil Spec F-83002. The bristles shall be fastened in a radial wafer fashion to a steel ring. Polypropylene bristles shall be fastened to the steel ring by fusing their base to form a solid loop about the circumference of the ring, then mechanically holding them in place by wrapping the top of the ring over the fused bristle ends to form a dovetail. Wire bristles shall be fastened to the steel ring with wire. The polypropylene bristles shall be 0.075" x 0.105" oval shaped with an 8 pounds total wafer weight minimum. The wire bristles shall have a mean diameter of 0.018 inches, galvanized, with a carbon content of 0.81 to 0.86 percent and a 10 pounds total wafer weight minimum. All wafers shall be a within 50 oz-in static balance and marked at the heavy location.

One spare set of broom cores shall be shipped loose with the vehicle.

Broom Casters

There shall be four single tire pneumatic caster assemblies. Each caster assembly shall be free to rotate 360 degrees. The radial pneumatic tires shall be 180/70R8 16 ply. Spring-loaded adjustable automotive type disk brake shall be supplied per caster to prevent caster shimmy at all sweeping speeds. Caster hubs shall be oil filled to provide oil bath lubrication to the caster bearings. No greasing necessary or allowed. The caster assembly shall be non-suspension type allowing the brush to follow the ground contours as close as possible. The broom head caster support shall be mounted to the main broom frame in back of the brush and within the swept path at all times.

STATE ANY DEVIATIONS

Broom Hood

The broom hood shall shield the top half of the brush completely and fabricated from heavy-duty 10-gauge sheet steel securely bolted to the broom frame. It shall be nonclog design to prevent ice buildup during freezing slush removal operations at rated speeds. It shall provide the necessary quick access to the brush for replacement of bristles and for inspection. There shall be an adjustable and replaceable stripper bar across the front of the broom to prevent snow carryover. The stripper bar shall be near tangential to the broom outside diameter. The adjustment to bristle diameter wear shall be performed using two mechanical acme thread jacks, one each end of the scoop and broom frame. The adjustment shall position the stripper bar to the bristle diameter.

A stationary hanging rubber deflector shall be mounted in front of the brush. The rubber deflector keeps snow down and contained to reduce snow buildup on the vehicle. The result is a smooth, consistent, efficient, and controlled flow of the snow leaving the bristles without having the operator adjust anything.

There shall also be an integral broom hood "shaker" to remove accumulated snow off the broom hood. This shaker is basically a table on top of the hood which shakes fore and aft approximately two inches which forces the snow off and to the front of the brush.

End marker lights are required on the broom head, with amber LED facing front and red LED facing rearward.

Air Blower

The forced air blower shall be dual centrifugal impeller type with dual inlets and dual outlets. It shall be mounted on the broom head with the nozzles directly behind the brush. The complete swept path shall be covered by the air flow.

STATE ANY DEVIATIONS

Air Blower cont.

It shall produce 23,000 CFM total at 400-mph velocity air out both sides at the same time. Both nozzles shall blow in same direction at any given time. Deflectors at the nozzle ends shall direct the flow to one side or the other. The nozzle deflector's control shall be hydraulic and interlocked with the broom head angle to blow in the direction of broom casting thus controlled by the operator's joystick. The nozzle deflectors change direction as the broom swings. A separate control shall allow the nozzle deflector's direction opposite of the broom angle by choice. An additional control shall permit blowing without broom operation. The velocity and CFM at each nozzle shall be certified by an independent test facility and supplied with the bid.

The centrifugal impellers shall be independently driven via a hydrostatic motors. The two motors, one for each impeller, shall be mounted directly to the impeller shaft. Power to the motors shall be supplied from a variable displacement hydrostatic pump (Sauer-Danfoss 90 series type) mounted on the engine's gearbox allowing infinite control of blower speed from 0 to 100%. Both impeller / shaft assemblies shall be dynamically balanced at the rated RPM. All controls for the air blower shall be remotely operated from within the cab.

Hydraulic System

All hoses for all systems shall be properly sized and strength to work with the pressure and volume of oil required. All hydraulic positioning functions (broom head lift, broom head swing, deflector, and air nozzle lift) shall be equipped with a hydraulic position locking system. A counterbalance valve shall be used for the broom lift and a pilot operated check valve for the other functions including broom swing left and right, and air nozzles left and right. All hydraulic functions of the broom shall be electric over hydraulic valving. Connectors to the solenoids shall be interlocking type to provide a secure connection, which can withstand normal pressure washing procedures. Fluid and components shall be design for temperature to –20 degrees F ambient cold start. The hydraulic fluid reservoir shall be 50-gallon minimum. Shut off valves for all filters below tank fluid level shall be installed to allow filter changes without loss of oil.

STATE ANY DEVIATIONS

Hydraulic System cont.

Proper filtering shall be done on both the high pressure and low pressure circuits and shall conform to SAE J931. There shall be a 5-micron absolute rating on the hydrostatic pumps' filters and placed in the charge pressure lines. There shall be a clogged filter indicator light on the cab control panel indicating filter replacement.

The hydraulic oil cooler shall be mounted at the rear of the engine enclosure and shall be separate from the engine radiator to ensure adequate airflow. The dedicated fan for the hydraulic oil cooler shall be hydraulically driven with automatic thermostat (high/low) control for correct temperature under all conditions, winter and summer. It shall be controlled by a thermostatic switch to avoid excessively cold oil operation and designed such that thermostatic failure results in the cooling fan being engaged. A pressure relief shall allow cold hydraulic oil to bypass the cooler for shorter warm up times. A hydrostatic oil temp gauge and warning light for low hydrostatic oil level shall also be supplied.

Broom Controls and Instrumentation

The operator's control for the broom in the chassis cab shall use the same display as the chassis. One display total in the Cab for both the chassis and auxiliary equipment. It shall have a Monitor, Diagnostic and Control (MDC) for the broom. It shall use CAN (Controller Area Network) serial bus system technology. As stated the MDC station must incorporate diagnostics which displays what is wrong with a particular system. All systems for the broom and broom engine must be part of the diagnostics. All functions and displays must be in easy reach of the operator and integrated into the chassis instrumentation.

The control in the chassis cab shall have all the necessary functions to operate the broom and air blower and shall have the following:

1) A 1.5 inch diameter broom engine emergency stop push button (twist for on, push for off)

STATE ANY DEVIATIONS

Broom Controls and Instrumentation cont.

2) Multifunction CAN controlled joystick with multi switch head for plow and broom lift/lower and left/right swing. Broom controls integrated with electric over hydraulic plow controls for simple operator control. It shall also incorporate the shaker on/off and the display control: broom only, air blower duct only, or both.

The swing, lift and blower nozzle shall be microprocessor controlled (no relays) and have automatic one touch for cycle complete control. This allows the operator to have hands free operation during cycle movement. Moving the joystick in the opposite direction can reverse the cycle. A switch shall allow the operator to use the automatic control or disengage the system.

3) Broom controls and displays:

- Touchpad with sealed pushbuttons
- Broom engine main operating screen
    - Engine, broom and air blower speed control and display
    - Oil pressure with visual and audible warning alarms
    - Coolant temperature with visual and audible warning alarms
    - Hydraulic oil temperature with visual and audible warning alarms
    - Engine tachometer
    - Voltmeter and warning indicators
    - Air filter restriction warning and alarm
    - Alarms for engine diagnostics and visual warning indicators and displayed faults
    - Mode selector: auto / manual
    - Broom rotational speed tachometer
    - Status display for:
        - Broom / air duct coordination
        - Weight transfer system
        - Front and rear steering position

STATE ANY DEVIATIONS

Broom Controls and Instrumentation cont.

- Menu selection screen: specific MDC function screens are accessed through this screen
- Video screen
  - Enables a video system to be manually turned on and off
- Lighting screen
  - Daytime / nighttime display screen brightness selection
- Joystick / touch pad screen: this screen mimics the features of the joystick
  - Brush lift up / down
  - Broom swing left / right
  - Deflector up / down
  - Mode auto / manual
  - Broom on / off
  - Blower on / off
  - Shaker hood on / off
- Auxiliary gauge panel: this screen is used for systems monitoring
  - Engine, broom and air blower speed control and display
  - Per cent engine power
  - Engine hour meter
  - Inlet air temperature
  - Broom hydrostatic pressure
- Settings screen
  - Joystick control: broom only, blower duct only, or both
  - Air blower nozzle direction: coordinate / opposite broom swing
  - Weight transfer with audible alarm when in the off position
  - Core life hours

STATE ANY DEVIATIONS

Broom Controls and Instrumentation cont.

- Maintenance hours
- Automatic broom pattern control
  - Pattern increase / decrease
  - Broom height position

- Engine diagnostics screen
  - Display active faults
  - Active fault codes
- Output diagnostics: this screen is for display only and shows the controller output diagnostics.
  - Individual system output test function
  - Output diagnostics last 25 fault history
- Setup screen: this screen allows authorized personnel to change the vital settings without the use of a notebook computer and is password protected.

Controls located in the broom engine enclosure shall be the following:
Single circuit breaker with Master Battery disconnect

Deicer

General

A 1250 gallon de-icing system shall be mounted at the rear of the MTE. The system shall include a hydraulic driven agent pump, plastic agent tank, spray boom, and an open loop remote control system. The system shall be capable of dispensing liquid de-icing agent at rates of at least 1 gallon per 1000 square foot while traveling at

STATE ANY DEVIATIONS

General cont.

25 MPH with a spray path 22 feet wide, with 2 ft. of spray coverage to each side of the 18 foot swept path of the broom. The product tank and system plumbing shall be mounted integral to the MTE. The boomless spray assembly shall be mounted at or near the rear of the overall unit. A de-icing liquid quick disconnect fill port shall be mounted at the center rear. The control system shall be mounted in the MTE chassis cab.

Control

The application rate adjustment and boom valve functions shall be controlled from inside the cab. It shall be adjustable from 0.5 gallons per 1000 square feet @ 25 MPH for anti-icing to 1.5 gallon per 1000 square feet @ 25 MPH. The main vehicle controller shall enable the operator to set the application rate. The control system shall automatically compensate flow rates for changes in vehicle speed. Controls shall include discharge on/off, and flow rate adjustment. Pressure shall be controller with a microprocessor that automatically adjusts pump discharge to maintain a constant pressure.

Tank and Pump System

The agent tank shall have a capacity of 1250 U.S. gallons. The tank shall be UV stabilized linear polyethylene material capable of containing material with a 1.7 specific gravity and shall have gallon markings molded on side. A 16" diameter filler cap shall be provided in the top of the tank. All components shall be plumbed with flange fittings, where possible, to facilitate field repairs if needed. A ball valve will be installed between the tank and pump. All necessary valves, fittings, and hoses for spray operation are to be included. All plumbing fittings and valves that are exposed to de-ice product will be constructed of glass-filled polypropylene or stainless steel. All valves are to be conveniently located for operator use. A polypropylene Y-style line strainer with a 20-mesh screen is to be included between the tank and the pump. The liquid chemical pump shall be centrifugal type with

STATE ANY DEVIATIONS

Tank and Pump System cont.

minimum 1.5" diameter suction and 1.25" diameter pressure ports, and supply up to 50 gpm @ 40 PSI min. The hydraulic motor shall be directly coupled to the liquid pump (no belt/chain drive). The hydraulic motor will require no more than 6 gpm @ 2000 psi. The system will be capable of self-loading liquids from a ground-based tank or mobile nurse tank. A **coupler to be specified by STL** with plug shall be provided to fill the tank from the ground. All wiring and hydraulic hoses shall be routed away from pinch points, sharp corners and heat sources. Deicer pressure lines and plumbing to distribution manifold shall be 1.25" diameter minimum. All fittings must be sized to accommodate maximum flow requirement. System valving shall include provisions for recirculation of liquid product to the tank.

Spray System

The spray system shall provide for a spray path of 22 feet. The boom shall be deployed and stowed from the cab by means of electrical over hydraulic controls. The discharge manifold shall include a center horizontal section and two vertical sections, one on left and one on right. The manifold shall be hard mounted to the rear of the chassis by means of a heavy duty bracket structure. The bracket shall have hard connect provisions to allow installation at a selection of at least three heights. Spray nozzles shall be evenly spaced along the center section to allow full and overlapping coverage with the spray pattern nozzles. The nozzles on the ends of the manifold shall be stream or spray type to provide fluid discharge out to the maximum 22 foot spray width beyond that reached by disbursed spray providing the full coverage from the center portion of the boom.

The spray manifold shall be made from 1.5 inch schedule 40 stainless steel pipe. Tees, caps, elbows and other required fittings also to be stainless steel.

STATE ANY DEVIATIONS

Frame, Axle, and Suspension

The deicer system shall be mounted to a frame platform integral to the main frame of the MTE. The additional weight of the system shall be supported by an air suspension non driving steerable axle whose power steering control is integral to the chassis steering system. Weight of the deicer fluid shall be approximately centered on the rear axle to eliminate the effect of a full or empty tank might have on broom pattern and vehicle control. Because of the position of the axle, it shall have a minimum cramp capability of 45 degrees. Curb to curb turning circle of rear non driving axle shall be no more than 80 feet.

Tires shall be adequate to the weight applied at full fluid load, Goodyear G296, 425/65R22 or equal. Fenders shall be provided over the tag axle tires.

Radios

Shall have the following installed by dealer:
800 Radio (supplied by Airport)
FAA Radio I-com Model A110c (supplied by Dealer)
All antennas and cabling for antennas to be supplied by dealer
Radios to be mounted in vehicle specific, rack style mounting. If not available, consult Airport Fleet Manager for additional mounting options.

Paint

The complete vehicle shall be painted with one (1) coat of metal primer and two (2) coats of FAA approved Chrome Yellow acrylic urethane. The entire broom head shall be low gloss black to aid in melting ice and snow.

STATE ANY DEVIATIONS

Owner's Manual

The successful bidder shall provide the following product documentation and support information on CD upon delivery:

- Operation, Maintenance, and Troubleshooting manuals
- Manuals for equipment supplied by other sources
- Parts manual identifying every part on the unit including schematics for electrical and hydraulic systems.

Training

The unit must be fully assembled and tested prior to delivery. Vehicle shipping costs to the airport is the responsibility of the Bidder. A qualified factory representative must fully install, start-up, and test the unit prior to training. Training shall be performed by factory trained and authorized technician. The training shall be performed at the customer's site and shall be 4 hours for operators training and an additional 4 hours for mechanics training (mechanics shall attend the operating training first). The purpose of this training is to review safe and effective procedures for use and maintenance of the machine, review and test all systems, assure the full function of the machine. Training will be in small groups – both classroom and hands on training is required.

Warranty and Ownership

The bidder shall warrant his equipment as to the specified capacities and performance, and to be free from all defects in design, material and workmanship. All labor, transportation cost and defective parts shall be replaced free of cost. THIS GUARANTEE SHALL CONTINUE FOR ONE (1) YEAR AFTER COMMENCEMENT OF ACTUAL OPERATION OF THE EQUIPMENT. No exceptions to the guarantee requirement will be accepted. Additionally, the engines and transmission shall be warranted for a minimum of two (2) years.

Certificate of origin shall be provided by the manufacturer for ownership transfer.

STATE ANY DEVIATIONS

Insurance

To protect the purchaser from potential involvement in litigation, the manufacturer for this contract shall be adequately covered with liability insurance. The manufacturer shall carry commercial general liability insurance including coverage for the products-completed operations exposure, with limits of not less than $1,000,000 per occurrence and in the annual aggregate for all damage arising out of bodily injury and property damage. The insurance shall be issued by an insurance company with a current A.M. Best rating of A- or higher. A Certificate of Insurance showing that this minimum amount of coverage is currently in force shall be included in the bid package for the bid to be considered.

Component Sourcing

Because of the critical nature of this machinery, it is essential that the complete unit and all components be newly manufactured and unused. To this end, the purchaser reserves the right to compare serial numbers of engines, transmissions, transfer cases and axles with the current production records of the component manufacturers. Any component found to be used, or not of current production will be rejected. The contractor (bidder) will replace the component in question with an appropriate and acceptable new replacement component at his own expense.

Quality and Safety Standards

Each bid must include the vehicle manufacturer's certification that the vehicle meets or exceeds the following requirements based on documented test results. Documented test results shall be provided upon request.

FMVSS 571-103	Windshield defrosting and defogging systems, in accordance with JI944, J198.
FMVSS 571-121	Air brake systems.
FMVSS 571-207	Seating systems.
FMVSS 571-210	Seat belt assembly.

STATE ANY DEVIATIONS

Quality and Safety Standards cont.

FMCSR 393.94	Vehicle interior noise levels.
FMVSS 571-101	Controls and displays.
FMVSS 571-108	Lamps, reflective devices and associated equipment.
FMVSS 571-120	Tire selection and rims for motor vehicles other than passenger cars.
FMVSS 571-206	Door locks and door retention components.
FMVSS 271-209	Seat belt assemblies.
FMCSR 393-65	Fuel systems and fuel tanks.
FMCSR 205	Glazing for windows.
FMCSR 302	Flammability of interior materials.

Service, Parts, and Technical Support

Because of the critical nature of this machinery and the specialized design of the equipment, warranty service, parts availability and technical support is considered an integral part of its purchase. All bidders must be capable of servicing the entire unit including the chassis, and any auxiliary equipment provided thereon.

Therefore the following is required in the bids package:

1) Documentation on how prompt warranty service, parts availability and technical support will be provided.
2) List of key personnel and Service Technicians available for this project. The Service Technicians must be factory trained and be completely trained to perform pre-delivery start-up service, repair service, and maintenance of the unit offered. The Service Technicians must hold current and valid certifications from the manufacturer.

Technical support contact name and phone number

Delivery

Delivery shall be 270-300 days maximum from receipt of purchase order or notice to proceed.

CITY OF ST. LOUIS
DEPARTMENT OF FINANCE
OFFICE OF THE SUPPLY COMMISSIONER

CAROL L. SHEPARD, CPA
SUPPLY COMMISSIONER

FRANCIS G. SLAY
MAYOR

1200 MARKET ST RM 324
SAINT LOUIS MO 63103
PHONE 314-622-4580
FAX 314-622-4141

ATTENTION BIDDERS

Please carefully review all information requested in this bid package.

Failure to submit requested samples, literature or any other requested information may result in disqualification of your bid or any portion of your bid.

Also the reasons indicated below may disqualify your bid. If you have any questions, call the buyer indicated in this bid package.

This form must be returned with your bid.

- Two or more bids submitted for one item, unless instructed to do so. (item rejected)
- Signature missing on bid or any required form.
- Buy American Form not completed or returned. (may be rejected)
- M/WBE Form not completed or returned. (may be rejected)
- Altered or erased unit prices must be initialed.
- Faxed bid, unless specifically requested (will be rejected).
- FOR CONTRACTS ONLY: Please provide your DUNS # _____
- FOR CONTRACTS ONLY: Failure to submit required Bond by the date indicated.

I certify that I have read and understand the information above.

_____ _____

Signature Date

ST. LOUIS DOMESTIC PRODUCTS PROCUREMENT ACT

The City of St. Louis has enacted an ordinance relating to the purchase of domestic products by City government, with penalty provisions. The ordinance amends Section 5.58.010 Revised Code of the City of St. Louis, 1986, as amended by adding thereto new subsections dealing with the requirement that the Supply Commissioner or his designee give preference to goods or commodities manufactured in the United States of America, stating exceptions to said policy. Sections one through six are reprinted below.

Section One. Section 5.58.010 Revised Code of the City of St. Louis is hereby amended by adding the following language: Each solicitation to bid and the method of describing the items to be bid upon of any goods or commodities sought to be purchased by the Office of Supply Commissioner, and any contract entered into by and on behalf of the City of St. Louis and executed by the Mayor and/or the Comptroller of the City of St. Louis wherein the construction, alteration, repair or maintenance of any public works is the subject of the contract so executed, shall contain a provision that the goods or commodities furnished or used in the furtherance of said project by any contractor or subcontractor, manufacturer or supplier as the case may be, shall be manufactured, assembled or produced in the United States, and said requirement as defined above shall be stated in said bid.

Section Two. The provision of Section One of this Ordinance shall not apply in the following instances:

(i) Where the item purchased as the contract entered into for repairs or renovation is less than One Thousand ($1,000.00) Dollars.

(ii) Where no line of a particular good or product is manufactured, assembled or produced in the United States.

(iii) Where the acquisition of United States manufactured or produced goods would increase the cost by more than (10%) percent.

Section Three. The certificate required by this section shall specify the nature of the contract, the product being purchased or leased, the names and addresses of the United States manufacturers and producers contracted by the Commissioner or the project architect or engineer, and an indication that such manufacturers or producers could not supply sufficient quantities or that the price of the products would increase the cost of the contract by more than ten percent.

Section Four. No public agency may authorize, provide for, or make any payment to any vendor or contractor upon any contract in violation of section 2 of this act. Prior to the awarding of the bid and before any public agency authorizes, provides, or makes payment to any vendor or contractor upon any contract to which section 2 or 6 of this act applies, the vendor or contractor shall provide proof of compliance with section 2, and, if applicable, section 6 of this act. Any vendor or contractor who knowingly misrepresents any material fact to the public agency concerning the origin of any manufactured goods or commodities shall be guilty of a Class A misdemeanor.

Section Five. Sections 1 to 6 of this act shall apply only to contracts and subcontracts entered into after the effective date of this act, and shall not limit the use or supply of manufactured goods or commodities purchased or leased prior to the effective date of this act.

Section Six. Nothing in sections 1 or 6 of this act is intended to contravene any existing treaty, law, agreement, or regulation of the United States. All contracts under section 1 or 6 of this act shall be entered into in accordance with existing treaty, law, agreement, or regulation of the United States including all treaties entered into between foreign countries and the United States regarding export-import restrictions and international trade and shall not be in violation of sections 1 to 6 of this act to the extent of such accordance.

Interpretations and Guidelines

Section One: "Shall be manufactured" is interpreted to mean to make or process a raw material into a finished product or to turn-out in a mechanical manner. "Assembled" is interpreted to mean to fit or to join together the parts, gather, or to congregate in a manufacturing environment. "Produced" is interpreted to mean to create by manual or physical effort, to make or yield to customary product or products.

Section Two (I) This is interpreted to mean less than one thousand dollars in aggregate (total purchases).

(III) When applying this subsection, multiply the cost of the foreign product by ten percent and compare the cost to the American product. If the American product cost is less than the sum of the cost of the foreign product plus ten percent, the award will be made to the vendor bidding the American product. The price paid by the City of St. Louis will be the actual price bid by the winning bidder.

Section Three: "Could not supply sufficient quantities" is interpreted to mean in order to meet the using agency's delivery schedule and in quantity specified.

Section Four: The vendor's authorized representative mus complete a self-certification form, as required by the existing procedures previously indicated. These certification forms wil be used to determine whether the manufacturer or producers could, or could not supply sufficient quantities, or the cost o the products would increase the contract by more than ter percent.

Prior to the City awarding the bid, the vendor shall provid certification that the product being bid is manufactured, as sembled or produced in the United States or there is a existing treaty, law or regulation whereby the product bid sha be treated the same as product manufactured, assembled o produced in the United States. The procuring agency sha accept the self certification in order to apply the percentag differential that is applicable under this law. Failure to provid certification shall cause the city to presume that such produc is not American made and preference shall not be considere for that product.

CERTIFICATION FORM
ST. LOUIS DOMESTIC PRODUCTS PROCUREMENT ACT
(BUY AMERICAN)

Bidders are advised of legislation enacted by the City of St. Louis which requires all manufactured goods or commodities used or supplied in the performance of this contract or any subcontract to be manufactured, assembled or produced in the United States, unless obtaining American made products would increase the cost of this contract by more than ten percent.

Section Four requires the vendor or contractor to certify his compliance with this legislation and if applicable, Section Six, if preference is claimed.

This legislation does not apply if the total bid is less than one thousand dollars ($1,000.00).

Bids received will be evaluated on the basis of this legislation. Certificates of compliance must be completed and returned to be considered for preference. Failure to provide certification shall cause the City to presume that such product is not American made.

☐ **CERTIFICATION**
If **all** the specified goods or products are manufactured, assembled or produced in the United States, check box at left and complete certification at the bottom of this form.

☐ **SECTION SIX CERTIFICATION**
If any or all of the specified goods or products are manufactured, assembled or produced in a country other than the "United States", and exemption is requested because such product is Fair Trade Product: (a) list the country, other than the United States, where each good or product you propose to furnish is manufactured, assembled or produced; (b) check box at left of this paragraph and list corresponding commodities and (c) complete Section Six Documentation portion below.

Item Number(s)	Location Where Item Manufactured, Assembled or Produced

☐ **SECTION SIX DOCUMENTATION**
The specified goods or products are treated as manufactured, assembled or produced in the United States under an existing treaty, law, agreement or regulation of the United States regarding export-import restrictions and international trade. List item Number(s) and Treaties covering item below.

_____

_____

_____

DEFINITIONS

MANUFACTURED - to make or process a raw material into a finished product; create, or to produce or to turn-out in a mechanical manner.

ASSEMBLED - to fit or join together the parts in a manufacturing environment.

PRODUCED - create by manual or physical effort, to make or yield the customary product or products.

MUST BE COMPLETED AND SIGNED

I hereby certify that the above information is true and correct and further certify that this statement complies with all provisions of Section 5.58.010 Revised Code of the City of St. Louis, 1985, as amended.

FIRM NAME: _____

ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP:** _____

BY: _____
(SIGNATURE and TITLE)

CITY OF ST. LOUIS/SUPPLY DIVISION
MINORITY/WOMEN BUSINESS ENTERPRISES FORM
(M/WBE FORM)

A. Mayor's Executive Order #28, Section Six - Supply Contracts

1. The goal of the City of St. Louis is that 25% of the value of all contracts let and purchases made by the Supply Commissioner shall be let or made with Minority Business Enterprises (MBEs) and that 5% of the value of all contracts let and purchases made by the Supply Commissioner shall be let or made with Women's Business Enterprises (WBEs).
2. All contracts let by the Supply Division for the purchase or lease of materials, equipment, supplies, commodities or services, the estimated cost of which exceeds $500, shall be subject to this goal.
3. The methods by which the Supply Commissioner shall pursue this goal shall include but not be limited to the following:
   a. The Supply Commissioner shall solicit bids from minority business enterprises and women's business enterprises certified to supply the required materials, equipment, supplies or services;
   b. St. Louis Airport Authority (SLAA) shall provide the Supply Commissioner with a list of minority business enterprises and women's business enterprises qualified to provide each of those commodities that the Supply Commissioner indicates are required by the City;
   c. The Supply Commissioner shall notify SLAA prior to solicitation of bids whenever no such qualified businesses are available;
   d. SLAA shall attempt to identify such qualified businesses, and if successful, shall notify the Supply Commissioner of their availability; and
   e. The Supply Commissioner shall provide such minority business enterprises and women's business enterprises every practical opportunity to submit bids.
4. Joint ventures or mentor-protégé relationships between prime contractors and subcontractors with local MBE and WBE firms are encouraged.
5. Participation of MBE and WBE firms located outside the St. Louis Metropolitan Statistical Area (SMSA) shall not count toward the goals established in this order.

B. SUPPLY DIVISION POLICY

It is the policy of the Supply Division that all bids/contracts awarded adhere to the Mayor's Executive Order #28. All vendors are encouraged to comply with this policy and all other provisions of Executive Order #28. A copy of Executive Order #28 is available upon request. Each Vendor/ Contractor (bidder) must complete, sign and return this M/WBE Form. Failure to complete, sign and return the M/WBE Form will result in the bid being declared non responsive and your bid may be eliminated.

C. OBLIGATION

The bidder agrees to make a good faith effort to ensure that M/WBE businesses have an opportunity to participate in the performance of contracts or subcontracts financed in whole or in part with City funds. The bidder will take all necessary and reasonable steps to ensure that said businesses have an opportunity to compete for and perform under this bid/contract. The bidder shall not discriminate on the basis of race, color, national origin or sex in the award and performance of bids/contracts. The Directory of Disadvantaged, Minority and Women Owned Business Enterprises certified by the City of St. Louis, can be viewed at www.mwdbe.org.

CITY OF ST. LOUIS/SUPPLY DIVISION
MINORITY/WOMEN BUSINESS ENTERPRISES FORM
(M/WBE FORM)

D. BID/CONTRACT IDENTIFICATION

Bid #: _____ or Contract Name: _____

Opening Date: _____ Your Bid Total: $ _____

If your bid is $500 or higher, please complete Section 'E". We are NOT requesting information on how your company currently supports M/WBE suppliers. We want to know if there are opportunities you might consider to work with M/WBE suppliers for THIS SPECIFIC bid/contract.

E. ASSURANCE

MBE/WBE Goal: 25% MBE and 5% WBE (Minimum Participation)

I, acting in my capacity as an officer of the undersigned bidder(s) if a joint venture, hereby assure the City of St. Louis that on this bid/contract my company **will**: **(CHECK ONLY ONE)**

☐ **Meet or exceed the M/WBE goal with: _____% MBE and _____% WBE Participation**

Proposed MBE Vendor Name: _____ Amount $ _____

Item or materials to be supplied by MBE Vendor: _____

Proposed WBE Vendor Name: _____ Amount$ _____

Item or materials to be supplied by WBE Vendor: _____

☐ **Fail to meet the M/WBE goal, but made a good faith effort to meet the goals as follows:**

_____%MBE and _____% WBE Participation (Enter Proposed Vendor information above.)

☐ **Not meet the M/WBE goal for the following reasons(s):(Check All That Apply)**

	Our Company is an MBE certified by the State of:
	Our Company is a WBE certified by the State of:
	We have contacted suppliers listed in the SLAA Directory but have received no reply
	There are no subcontracting opportunities for this bid/contract
	We are a Dealer and the order will be drop-shipped from the manufacturer to the user
	We are the manufacturer and the order will be drop-shipped from the factory to the user
	A letter of explanation is attached
	Other reason: _____

FIRM NAME: _____ FEDERAL ID NUMBER: _____

SIGNATURE: _____ FAX NUMBER: _____

PRINTED NAME: _____ DATE: _____

TITLE: _____ E-MAIL: _____

ORDINANCE #69431
Board Bill No. 295
Committee Substitute
As Amended

An Ordinance repealing Section One, part 86.040 of Ordinance 56716, pertaining to the opening of bids, codified as Section 5.58.040 of the Revised Code of the City of St. Louis, and enacting a new provision on the same subject matter which allows a local bidder to match the lowest bid when the lowest bid is from a non-local bidder; enacting a new provision on the same subject matter; containing severability clause.

WHEREAS, local businesses which seek to enter into contracts with the City of St. Louis are at a competitive disadvantage with businesses from other areas because of the higher administrative costs of doing business in the City;

WHEREAS, the City of St. Louis desires to encourage businesses to remain in the City and to relocate to the City;

WHEREAS, by enacting a local preference law that allows a local firm to match the lowest bid when its bid is within 2% percent of the lowest bid, the City hopes to encourage and stimulate local business.

BE IT ORDAINED BY THE CITY OF ST. LOUIS AS FOLLOWS:

SECTION ONE. Section One, part 86.040, Ordinance 56716 is hereby repealed.

SECTION TWO. Enacted in lieu thereof is the following new section.

5.58.040 - Opening of bids.

A. Proposals shall be opened at the time and place fixed by the advertisement, in the presence of such bidders as desire to be present, and shall be open to the inspection of bidders.

B. The bids shall not be materially modified or amended as to price, specification or otherwise, nor substitutions placed thereon, after opening except when the lowest bid is from a non-local bidder. When the lowest bid is from a non-local bidder, any local bidder within two percent of the lowest bid may match the lowest bid. If a local bidder matches the lowest bid, then the Supply Commissioner may select the bid from the local bidder. If more than one local bidder is within two percent of the lowest bid, then only the lowest local bidder may match the bid. In all other circumstances, modification, supplementation or amendment shall cause rejection of the bid. For purposes of this chapter, local bidder means a bidder whose principal place of business is within the City of St. Louis, has had a valid business license for at least one year, and is current in payment of local taxes. Principal place of business shall be defined as the business's physical office, plant, or site where a majority (51%) of the full-time employees, chief officer, and managers of the business regularly work and conduct business, or where the plant or office and equipment required for the furnishing of the goods or performance of the services provided to the City, as required by the contract, are physically located in the City of St. Louis for at least one taxable year immediately prior to the date of the bid.

C. Bids may be for one or more or all the articles advertised for, but there shall be a specific bid on each article. The award may be made to the lowest bidder for any article, or to the lowest bidder for the entire requisition or any part thereof, but the Board of Standardization may reject any or all bids or any part of any bid.

SECTION THREE. Severability.

The provisions of this section are severable. If any provision of this ordinance is declared invalid, that invalidity shall not affect other provisions of the ordinance which can be given effect without the invalid provision.

Approved: April 29, 2013

CITY OF ST LOUIS, MISSOURI
INSTRUCTION TO BIDDERS (for request for quotations - RFQs)

VENDORS SHOULD CAREFULLY READ THE FOLLOWING INSTRUCTIONS AND TERMS AND CONDITIONS, BEFORE SUBMITTING QUOTATION. **CAUTION: THIS IS NOT AN ORDER**

- Quotations will only be accepted on this form which must be returned in a **sealed envelope**. *The upper left corner of the envelope must include the following information: Vendor Name, Quotation Number and the Due By Date.* This information is also required on any mail delivered next day or overnight.
- Quotations should be typewritten or in ink. Altered or erased unit price(s) must be initialed. One copy of Quotation Sheet must be submitted, please retain a copy for your files.
- The Supply Commissioner reserves the right to reject any or all bids.
- The Supply Commissioner reserves the right to make awards on an item basis or on a total basis.
- Bidders must quote Unit Price(s) and Extension on each item. When an error appears on an extension, the Unit Price(s) will govern.
- When Quotation Sheet requests item(s) by brand name and your quote is for an alternate brand – show brand name(s) with model number(s) and attach full specifications.
- When Quotation Sheet has only a general description(s) of item(s) required – show brand name with model number(s) and attach full specifications.
- Suppliers shall not offer more than one bid on each item. Two or more quotations on the same item may cause a rejection of the bid. Suppliers must determine which one of their many styles or types fully meet the specification.
- Freight or delivery charges must be included in quote, or shown separately on quote, so bid can be evaluated.
- **Bids must arrive no later than NOON** on the date stated or will be rejected. Faxed or E-mailed bids are not accepted unless specifically requested.
- Bids will be publicly opened on the date specified beginning at NOON.
- Prices quoted will be considered firm.
- Bids having an acceptance limit of less than 30 days after opening date may be rejected.
- Time of proposed delivery must be stated in definite terms.
- Failure of Bidder to understand the item(s) requested or any part of the specifications will not be a valid reason for bidding on the wrong item(s). Any questions regarding description of item(s) requested should be cleared with the Buyer listed in the bid document.
- **Samples** when requested must be delivered before actual time of bid opening with each sample plainly tagged showing the name of Bidder, Quotation Number, Brand Name and lot number or quality. Submission of samples does not relieve bidder from meeting the specifications as outlined in the Bid Documents unless the bidder specifically states they are bidding on an alternate.
- All samples are to be submitted to the address listed below unless otherwise stated in Bid Documents.
- Deliveries must be accompanied by a packing slip or invoice, listing the Department, Quotation Number, and the exact quantities of each item included in the shipment.
- ONLY U.S.P., N.F., OR N.N.D. DRUGS ARE ACCEPTABLE. ALL DRUGS MUST COME IN MANUFACTURER'S ORIGINAL PACKAGES, PROPERLY SEALED.
- In the event the successful bidder fails to make delivery of any item or items that meet the conditions and requirements as outlined in this proposal within 7 days of time stated by bidder on face of this quotation sheet, the City reserves the right to purchase said item or items on the "OPEN MARKET" and charge any costs above the BID PRICE to the bidder.
- The laws of the State of Missouri provide that the City of St. Louis pay no State Sales or Use Tax or Federal Excise Taxes and these taxes should be excluded from your bid price. Federal Excise Tax Exemption Certificates will be furnished to successful bidder.
- Suppliers shall save harmless the City of St. Louis from the payment of any and all claims or demands arising out of any infringement, alleged infringement, or use of any patent or patented device, article, system, arrangement, material or process used by him in the execution of this contract.

- Supply Division hours are Monday through Friday – 8:00 A.M. to 5:00 P.M. Main Number: 314-622-4580.

All bids must be submitted in a SEALED ENVELOPE and mailed to:

SUPPLY COMMISSIONER
1200 MARKET ST RM 324
ST LOUIS MO 63103-2842