

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. Installation of a magnetic type source capture exhaust removal systems. Refer to plans for quantity of emergency response vehicles served by each system. These specifications outline the scope of work and minimum requirements for the complete installation of a vehicle exhaust removal system for the Mount Kisco Fire District. Any exceptions, no matter how slight, shall note in the bid stating "alternate being proposed". The bidder shall take full responsibility for any additional costs an alternate system may present. Bidders are required to provide whatever documentation with their bid pertaining to any exceptions taken for the department to evaluate. This information must include the make and model of equipment proposed. It will be used to determine equivalents to the specifications. Failure to provide such documentation may be cause for rejection of bid. The Fire Company reserves the right to accept or reject any or all bids if it is in the best interest of the fire department.
- B. The system(s) installed shall be suitable for a total of three (3) apparatus bays. Each bay shall utilize a track system that accommodates vehicles parked in tandem. Refer to drawings for quantity of vehicles parked in tandem at each bay location.

## 1.02 SECTION INCLUDES

- A. Straight track systems.
- B. Ductwork.
- C. Exhaust fans.
- D. Controllers.

## 1.03 REFERENCES

- A. National Fire Protection Association (NFPA)
- B. Air Movement and Control Association (AMCA)
- C. International Mechanical Code (IMC)
- D. American National Standards Institute (ANSI)
- E. American Society of Mechanical Engineers (ASME)
- F. National Electric Code (NEC)
- G. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- H. Underwriters Laboratory (UL)

## 1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions, sizes, weights and point loadings, locations and sizes of field connections, and details on wall and roof penetrations.

- C. Product Data: Provide manufacturers literature and data sheets indicating rated capacities, dimensions, weights and point loadings, accessories, electrical characteristics and connection requirements, wiring diagrams, and location and sizes of field connections.
- D. Provide fan curves with specified operating point clearly plotted.
- E. Submit sound power levels for both fan inlet and outlet at rated capacity.
- F. Manufacturer's Installation Instructions: Indicate assembly and installation instructions.
- G. Manufacturer's Warranty.

#### 1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 017820.
- B. Operation and Maintenance Data: Include instructions for fan lubrication, motor and drive replacement, spare parts list, automatic start and automatic disconnect systems, and wiring diagrams.

#### 1.06 QUALITY ASSURANCE

- A. Fans
  1. Performance Ratings: Conform to AMCA 210.
  2. Sound Ratings: AMCA 301, tested to AMCA 300 shall not exceed 64 dB at 25 feet radius of unit.
  3. Fabrication: Conform to AMCA 99.
- B. All major components shall be ISO 9001 certified.
- C. Electrical controllers shall be UL listed.

#### 1.07 WARRANTY

- A. The vehicle exhaust system and component parts shall be warranted to be free from defects in material and workmanship for a period of two (2) years. A copy of the equipment manufacturer's warranty must be submitted with the shop drawings.
- B. Contractor/vendor shall provide annual inspection of the system for a period of two (2) years. Copy of the inspection report shall be supplied to the chief of the department and shall include any repairs or adjustments made.

#### 1.08 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., as suitable for the purpose specified and indicated.

### PART 2 - PRODUCTS

#### 2.01 TRACK SYSTEM

- A. Shall be delivered and installed as a magnetic track system. The system shall be designed for vehicles with under carriage exhaust tailpipe configurations. System shall be capable of handling up to four apparatus per bay in tandem arrangement allowing the operator to attach

the system at the vehicle entrance and reach its designated rest position. The basis of design is as manufactured by Magnegrip or as an equal to the specifications to follow.

B. Operating Logic

1. The operating logic of this system shall complete the following cycle. Upon the vehicles return to the apparatus floor of the fire station, a 5" dia. exhaust ventilation hose equipped with a magnetically controlled grabber nozzle shall be attached to vehicles exhaust tailpipe at the door opening. The method of securing the system to the vehicle shall be achieved via magnetic cuff. The design shall ensure virtually 100% source capture of the exhaust fumes at the tailpipe. Once the system has been secured to the vehicle's tailpipe, the exhaust fan shall automatically and instantaneously be energized by the output pressure of exhaust from any motor vehicle to assure total collection of exhaust gases. The vehicle can now be positioned (backed in) in its designated parking position and the hose will follow.
2. Upon emergency dispatch of the vehicle, the output pressure generated by any internal combustion engine shall again automatically energize the exhaust fan. As the vehicle leaves the apparatus floor, the flexible hose with grabber nozzle shall travel along the track and trolley system with the vehicle as it exits the station. The nozzle shall disconnect automatically and smoothly from the vehicle at a preset distance from the exiting door. The exhaust fan shall continue to run to evacuate the exhaust from the duct system and then shut down automatically.

C. Suction track Profile

1. Shall be one piece continuous round profile equivalent to 6" round duct, with no splices, extruded profile in a minimum length of 19 feet. Construction shall serve as both a ducting system and trolley transport compartment. Track diameter shall be equivalent to 6" round duct and a minimum gauge thickness 0.175". The bottom of track profile will have a continuous slot that will accept specially designed rubber sealing lips designed to seal the underside of the track profile under negative suction.

D. Track Material

1. Shall be aircraft aluminum alloy type AA-06063. track shall be extruded as a one piece unit in a minimum of 19' lengths.

E. Vertical Support/Bracing

1. Shall be provided to securely mount entire length of track profile to building structure. Support legs shall be provided for every 10' of track length. Supports shall be constructed of Aluminum alloy type AA-6063 to provide strength and keep total system weight to a minimum. Leg supports shall be a one piece construction and meet a minimum seismic 4 requirement. All leg supports shall have side bracing constructed from tubular zinc plated steel to provide stabilization of track system. Angle shall be completely adjustable to the leg support and mounted perpendicular to direction of track. Typical support angle shall be 45 degrees from center line of support.

F. Track Splicing Joint

1. Shall be formed by an extrusion equal to the internal diameter of suction track profile. Splice shall be internally located and cover no less than half the circumference of the track profile. track splicing shall be safely secured by no less than 16 (Qty) 1 1/4" x 3/8" bolts, nuts and lock washers. Each of which shall pass directly through exterior track profile / splicing joint and be secured with internal locking washer and nut. Self tapping bolts/screws shall not be acceptable.

G. Middle track Duct Connection

1. Shall be rectangular to 6" diameter round transition fitting fabricated from 20 gauge galvanized steel. Rectangular slot shall be 19" long by 1 3/4" high with 3/8" external flange to slide into track profile.

- H. Suction Trolley Assembly
1. The trolley assembly shall be designed to transport the flexible hose assembly along with the vehicle as it enters and exits the station. The trolley shall be supported internal of the track profile. The trolley shall utilize sealed bearing loaded wheels formed to fit the internal track profile to support the trolley chassis and hose assembly. The trolley chaste shall be aluminum powder coated black finish. The chassis shall be fitted with a tapered cone equal to in size or exceeds in area (sq. inches) the diameter of the exhaust ventilation hose which it is attached to. The trolley assembly shall be equipped with rubber impact bumpers at both front and rear of chassis to eliminate metal to metal contact which would destroy or damage trolley assemblies.
- I. Emergency Automatic Disconnect
1. Shall be provided to enable the vehicle to back off the system through a rear exit door or when it may become necessary to depart from the normal path of exit, in the event of a malfunctioning of the over-head door which commonly allows exit of vehicles from station or if the front line responding vehicle in a series of two, malfunctions impeding the normal exit of the second vehicle.
- J. Upper Hose Assembly
1. The upper hose shall be 5" in diameter and manufactured for the sole purpose of venting high temperature exhaust gases, which are produced by internal combustion engines. Flexible hose shall be rated for 900 degrees (F) continuous, 1050 degrees (F) intermittent temperatures. The outside of the exhaust hose shall have a protective lamination the entire length of the hose to protect fire apparatus in the event vehicle and hose come in contact with each other.
- K. Lower Hose Assembly
1. Shall be a rigid 2 foot long section of hose identical in characteristics to the upper hose assembly. Lower hose shall support connection nozzle and reducing elbow in a rigid fashion as to allow for operator to place hose collection device onto tailpipe without bending. Lower hose is the only section of hose which shall release in the event of safety disconnect.
- L. Safety Handle Disconnect Coupling
1. Incorporated in the design of the system shall be a safety breakaway device enabling a physical disconnect between the exhaust system and the vehicle in the event of system malfunction or human error. The devise shall incorporate a handle for attaching the system to the vehicle without bending over. The coupling shall enable the lower two foot hose assembly to freely rotate 360 degrees. The device shall utilize a quick connect fitting so the lower hose can be snapped back into place without the use of any tools. The quick connect shall allow the lower hose to be manually disconnected and relocated to any other system should the vehicle be relocated. The device shall be reusable and have an adjustable release tension.
- M. Hose Suspension Saddle
1. The hose saddle shall be fabricated of steel with a heat resistant protective paint. The saddle shall support the hose and serve as the stress point during the system release. The design of saddle shall join two sections of hose together at its midpoint intersection and provide a smooth 93 degree transition.
- N. Magnetic Nozzle and Transition Elbow
1. The nozzle attachment shall be designed to mate up with the vehicle tailpipe in such a manor to prevent the operator from having to bend over to attach the nozzle.
  2. The nozzle shall allow a sealed connection to the end of the tailpipe which is to be outfitted with a conical male adaptor designed for mating up with the nozzle. The nozzle shall be

fabricated from zinc plated steel or stainless steel. The nozzle shall have the ability to add or subtract magnets from the nozzle thereby providing an adjustment capability for magnetic hold strength to the tailpipe conical adaptor. The manufacture shall offer the nozzle and tailpipe adaptor in 3", 3.5", 4", 5", & 6", & 7" diameters to accommodate all tailpipe diameters and configurations.

3. To ensure there is no leakage of exhaust, the magnetic connection shall be accomplished in such a manner that there is no gap between the vehicle tailpipe termination point and the nozzle connection to the tailpipe. The earth magnets shall be adjustable and easily removable for replacement. They shall be positioned to hold the nozzle connection to the tailpipe while the vehicle is entering and exiting the station without releasing. The nozzle shall incorporate a debris screen to prevent foreign objects from entering the system and a 67 degree transition to direct the exhaust gasses up the hose. The exterior of the nozzle shall be chrome plate for corrosion resistance and aesthetics.
4. The nozzle attachment shall be designed to mate up with the vehicle tailpipe in such a manner to allow a sealed connection to the end of the tailpipe while also inducing ambient air through a specialized tailpipe adaptor installed on the vehicle. The manufacture shall offer the nozzle and tailpipe adaptor in 3", 3.5", 4", 5", 6", & 7" diameters to accommodate all tailpipe diameters and configurations.

O. Vehicle Tailpipe Configuration

1. Tailpipes shall be at a 90° angle (perpendicular to apparatus) on passenger side of vehicle and shall not extend out any further than the apparatus body. There shall be a minimum clearance of 4" from the top of the pipe to the apparatus body. Tail pipes at a 45° angle of departure shall not be acceptable since exhaust blow back into station after the system release will be uncontrollable. All tailpipes shall be modified by the owner.

P. Safety Features

1. The system shall be designed and capable of capturing virtually 100% of the exhaust gas and particulate at the tailpipe. The system shall not detach itself from the apparatus during power failure.
2. A balancer shall be used to keep the hose off the floor and away from the vehicle. It shall be a self-adjusting weight balancer and provide a constant lifting force without locking in an extended position. Balancer shall have a stainless steel cable for the purpose of retracting the hose away from the vehicle upon release.

## 2.02 EXHAUST FAN

- A. The blower unit shall be a AMCA type B, direct drive spark resistant blower capable of delivering 500 CFM per vehicle. Exhaust fan shall be tested in accordance to AMCA standard # 210 in an AMCA approved test facility.
- B. Fan Housing and Impeller
  1. The housing shall be of one piece construction fabricated from galvanized steel with epoxy powder coat paint inside and out. The design shall allow the user to remove the fan motor and impeller without removing the inlet or outlet duct connections. The impeller shall be fabricated from aluminum and be designed as a radial blade backward incline type wheel.
- C. Fan Motor
  1. Shall be UL listed and manufactured by a readily available nationally recognized motor manufacturer and meet EPAC standards.
- D. Exhaust Blower
  1. Shall provide a minimum of 500 CFM per vehicle at the properly calculated pressure loss of the system design.
- E. Motor Type

1. Shall be a totally enclosed fan cooled or ventilated type with a readily available NEMA frame from 5 6 - 145 T.
- F. Motor Bearings
1. Shall be a totally enclosed self lubricated type.
- G. Vibration Isolating
1. Fan shall be manufactured as a complete assembly to assure the least possible vibration or movement. Fan wheel shall be both statically and dynamically balanced.

### 2.03 DUCTWORK

- A. SMACNA class I conveying and must meet or exceed criteria for construction and performance as outlined in Round Industrial Duct Construction Standards for the designed operating pressure.
- B. Materials of Construction
1. Materials of construction, unless otherwise specified, for all duct and fittings shall be minimum G-30 galvanized sheet metal in accordance with ASTM-A525 and A527.
- C. Duct Size
1. All duct subject to positive or negative pressure shall be of round spiral pipe construction, with the range of available sizes not to exceed 14 inches in diameter.
- D. Duct Gauge
1. Duct gauge shall depend on diameter and a minimum operating pressure. Acceptable gauge and reinforcement requirements shall be in accordance with SMACNA guidelines. Bidder shall document their designed operating pressure on their design submission.
- E. Duct Length
1. Duct shall be provided in 10' continuous lengths wherever possible. Except when interrupted by fittings, round spiral duct section shall not be less than 10 feet long.
- F. Exhaust Fittings
1. All exhaust fittings shall be round and have a wall thickness 2 gauges (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected. Branch entrances shall be factory fabricated fittings or factory fabricated duct /tap assemblies. Fittings shall be constructed so that air streams converge at angles of 45°.
- G. Standard Welded Seams
1. Standard seam joints shall be continuous welded on all fittings. All welded joints shall be coated with a protective paint, inside and out to prevent damage to galvanized surface.
- H. Turning Elbows
1. Shall be die stamped and used for all diameters and pressures.
- I. Tapered Body Fittings
1. Shall be used wherever particular fallout is anticipated, and where air flow is introduced to the transport duct manifold.
- J. Exhaust Joint Construction
1. All joint connections which are not continuous welded shall be supplied with a transition coupling from the downstream end only. Coupling shall be fully welded and shall provide a fitting size projection to fit inside a downstream fitting or another duct section. Couplings shall have a two inch minimum insertion length and shall be 2 gauge numbers (one even

gauge number) heavier than the duct to which they are connected. This along with a 600 high temperature silicon seal will constitute the primary mechanical seal.

- K. Duct Conveying Velocity
  - 1. Shall be a minimum of 2000 - 3000 feet / minute transport velocity per UMC code. No exceptions.
- L. Exhaust Rain Cap
  - 1. Shall be manufactured in accordance with EPA standard for free draft rain cap requirements. Included as an intricate part of this rain cap shall be a back draft damper to provide protection from rain and other inclement weather.
- M. Exhaust Duct Penetration
  - 1. In all cases when making a wall penetration it should be clearly indicated in the bid drawing and be accomplished via use of a professional core drilling machine if possible. The core drilling shall be properly sized to reduce the diameter to the smallest possible size.

#### 2.04 CONTROLLER

- A. Shall be manufactured and delivered as an Operating System Three series controller(s), as manufactured by Magnegrip or as an equal to the specifications to follow.
- B. Controller Logic
  - 1. Shall be designed to sense the output pressure which is normally generated by any internal combustion engine designed to propel any motor vehicle. The operating logic shall be designed to complete this cycle, at any point in time, when a collection device is connected to a motor vehicle's exhaust tail pipe and at which time the vehicle is manually or automatically energized by the operator. The controller shall automatically sense the engine's output pressure and energize the electrical contactors which will provide proper full load amperage to the exhaust system motor. The controller, through the use of a three minute fixed timer, shall keep the contactors energized for the three minute minimum fixed time.
- C. Electrical controller shall be UL listed/approved and manufactured in accordance with Underwriters Laboratories standard UL-508 enclosed industrial control panels. The electrical trolley shall include a limited energy control circuit.
- D. Electrical Enclosure
  - 1. Shall be NEMA 12 rated and UL listed as Type 12.
- E. Enclosure Keylock
  - 1. Shall be provided and mounted in electrical enclosure to restrict access to internal components of controller by only authorized entry.
- F. Control Transformer
  - 1. To be UL listed industrial control circuit transformer with primary and secondary fuse blocks. Transformer shall be provided with multitap primary 208V through 480V, AC, and 24V through 120V secondary.
- G. Electrical Timer
  - 1. Shall be solid state, 3 minute fixed timer. Operating logic shall complete this cycle; Input voltage is applied to the timer at all times. Upon closure of a normally open isolated start switch, the load energizes and remains energized as long as the switch is closed. When the start switch opens, the timing cycle starts. At the end of the present time delay, the load de-energizes and the timer is ready for a new timing cycle. Timer shall be UL Recognized component under file number E65038.



- H. Engine Start Switch
  - 1. Start switch shall be engine pressure sensing type capable of recognizing the output pressure of any type of motor vehicle. Electrical contact shall be dry type or not exceed 24V.
- I. Push to Stop Button
  - 1. Shall be illuminated amber contact push button. This device shall meet UL Type 4X rating. Indicator light/start button shall be mounted on the enclosure cover and be identified by engraved ledger plate.
- J. Wiring
  - 1. Wiring shall be run in wire channel to allow for easier identification of wiring circuit and appearance. All wiring circuitry shall meet UL listed for proper bending radiuses and terminations.
- K. Terminal Block
  - 1. Shall be 600 V, UL rated, recognized and shall provide individual connection points for remote controls, power and motor connections.
- L. Wiring Identification
  - 1. Shall be computer generated and identify all terminals, fuses, contactors, on both supply and termination points.
- M. Labeling
  - 1. Shall be provided and secured permanently to the exterior of electrical controller, indicating the manufacturer, their address and telephone number. The cover shall have user instructions and any warnings or cautions required by Underwriter Laboratories.
- N. Electrical Wiring Schematic
  - 1. Wiring schematic shall be provided with each electrical control box supplied. Wiring schematic shall show internal circuitry as well as all primary and secondary connections to the controller. This schematic shall be provided as a "D" print drawing to the department.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Do not operate fans for any purpose until ductwork is clean, bearings lubricated, and fan has been test run under observation.
- C. Install fans with resilient mounting and flexible electrical leads. Fan shall be roof mounted and/or hung from structure above as indicated on the drawings. Exhaust shall discharge at a minimum 3'-0" above roof level.
- D. Install flexible connections at fan inlet. Ensure metal bands of connectors are parallel with minimum one inch (25 mm) flex between ductwork and fan while running.
- E. Furnish all labor and material necessary to modify the existing tail pipes to meet the manufacturers specifications. All modifications shall be completed using chromed materials.
- F. Provide pitot tube openings where required for testing of systems, complete with metal cap with spring device or screw to ensure against air leakage.



- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Coordinate placement of roof, wall, and/or floor penetrations.
- I. Provide overhead exhaust tracks and/or track systems at the locations shown on the contract drawings. Lengths shall be field verified with the owner to adequately meet the vehicle requirements.
- J. All tracks shall terminate within 1' of their respective overhead doors.
- K. All roof work shall be performed by a qualified roofing contractor so as not to void any warranties that may exist.
- L. A high velocity no loss stack head shall be installed to the output of the blower unit as per the American Conference of Governmental Industrial Hygienists recommended practices.
- M. An Inline silencer shall be installed to the output of the Blower Unit to reduce Noise levels.
- N. A galvanized steel enclosure with sound absorbing insulation shall be mounted around each fan assembly.
- O. All exterior ductwork and enclosure shall be properly prepared and painted to blend into surrounding conditions.
- P. All electrical control work as required for a complete and functional system.
- Q. All district Vehicles shall be modified to accept the exhaust system.
- R. All penetrations through concrete or block walls shall be core drilled.
- S. System shall be tested and balanced in accordance with specification section 230594.
- T. Inspect system for proper operation at completion of construction.

### 3.02 OPERATOR TRAINING

- A. Shall be provided, one (1) training session per location. A minimum of 48 hours notice shall be required prior to the scheduling of this training session.

**END OF SECTION 233418**