

PROJECT TITLE: ENGINE TEST CELL EXHAUST PARTICULATE REDUCTION

DETROIT DIESEL CORPORATION 13400 W. OUTER DRIVE / DETROIT, MI. 48239-4001 / 313-592-5000

Bids Due: May 28, 2025, by 3:00 PM

Email Quote

Copy

Elyse Finnegan Purchasing <u>elyse.finnegan@daimlertruck.com</u>. Anthony Podojil Plant Engineering anthony.podojil@daimlertruck.com

Project Description:

DDC is exceeding the permitted opacity for the M11 exhaust stack that handles discharge from 26 engine test cells. A new filtration system must be provided to bring the recorded opacity levels below the 20% that is stipulated within the governing permit for this stack. The scope of services generally consists of one 15,000 CFM dust collector and one 12,000 CFM dust collector at grade level with two exhaust fans also at grade level, dual VFD control panels for each fan, and supporting infrastructure (compressed air, fire suppression, fire alarm, and power from the existing building). The existing exhaust system must remain active until changeover to the new filtration system during a scheduled production shutdown. New ductwork shall be installed up to the tie-in point in preparation for the changeover.

1.	GENERAL REQUIREMENTS	2
2.	PROCESS EQUIPMENT MECHANICAL REQUIREMENTS	4
3.	PROCESS EXHAUST SYSTEMS	5
4.	FOUNDATION AND SITE WORK	6
5.	EXHAUST SYSTEM DEMOLITION	6
6.	FIRE PROTECTION PIPING - GENERAL	7
7.	PROCESS EQUIPMENT ELECTRICAL REQUIREMENTS	9

1. GENERAL REQUIREMENTS

1.1. General

- 1.1.1. The following sections include specific information for the installation of two (2) new Filtration Systems that will treat the exhaust air discharge from two (2) sets of Test Cells, one system has twelve (12) cells #73-84 and will exhaust 12,000 CFM. The second set of cells has fourteen (14) cells #101-114 and will exhaust 15,000 CFM, at the Detroit Diesel Corporation (DDC) Plant in Detroit Michigan.
- 1.1.2. This Specification intends to highlight the critical requirements of this project and system components. This document and supplementing drawings shall be considered by the Seller (also referred to as the Contractor) to be the minimum standards required for a workable and complete system. Approval for any deviation or changes (commercial or design) shall be obtained in writing from Detroit Diesel Engineering.
- 1.1.3. This Section cautions the Seller to check the drawings for errors to verify all elements of the installation package and shall indicate any discrepancies or recommendations.
- 1.1.4. The following pages will define the mechanical Scope of Work for the modifications to the existing exhaust ductwork, new ductwork to the Filtration System, interconnecting ductwork from the filter to the exhaust fan, fan discharge ductwork to a freestanding exhaust stack located on the exterior of the existing buildings. DDC's representative, in writing, must approve all deviations from this specification and/or drawings provided.
- 1.1.5. The following pages will define the electrical Scope of Work for the addition of new Substation feeder breaker, Bus Way, Process exhaust systems, maintenance lighting & receptacles and grounding. DDC's representative, in writing, must approve all deviations from this specification and/or drawings provided.
- 1.1.6. All design, construction, installation, and purchase of equipment and systems shall meet Detroit Diesel standards, specifications, guidelines, codes, and regulations unless indicated otherwise in this specification. The most rigid requirements shall apply when there are differences between the standards and codes.
- 1.1.7. The Contractor shall include all sales tax in their quote.
- 1.1.8. All on-site labor must be "Union" Trades.
- 1.1.9. All work must conform to DDC Construction General Conditions.
- 1.1.10. The Contractor must be familiar with DDC's "Due Care Plan".
- 1.1.11. The Contractor must remove all demolition materials from the job site and legally dispose of all materials.
- 1.1.12. The Contractor to provide and coordinate all gondola and truck movements on the job site.
- 1.1.13. The Contractor shall limit noise, fumes, dust, and disruption to adjacent work areas. Work "off-shifts" as required. No disruptive work is permitted in the building during the day shift (7:00 AM 3:30 PM).
- 1.1.14. The Contractor shall provide all needed lifts, fork trucks, etc. as required. DDC equipment and propane may **not** be used by contractors.

1.2. Health and Safety

- 1.2.1. While each project organization is responsible for the safety of their operations and employees, all project participants have an obligation to assist in the enforcement of safety requirements. The Contractor must complete and submit a Job Site Safety Plan.
- 1.2.2. Detroit Diesel reserves the right to question and, if necessary, stop methods and practices creating a direct threat and potential liability for catastrophic losses. Catastrophic losses include death, permanent injury or illness, damage to facilities

or equipment by fire, explosion, water or chemical contamination, business interruption, or environmental contamination from spills or releases of hazardous liquids, dusts, fibers, gases, etc. into the air, water, soil, or sewers.

- 1.2.3. There shall be no less than two people on site at all times. In case of an accident requiring emergency assistance, a person will be capable of summoning help.
- 1.2.4. DDC safety requirements will be strictly enforced. The site specific DDC policies and procedures regarding fall hazard control, energy lockout, and confined spaces, respectively will be provided by DDC as required.
- 1.2.5. The successful contractor must provide DDC with their company's safety and health plans for review and approval prior to beginning any work on site.

1.3. General Specifications

General Items

- 1.3.1. The specifications and drawings in this package were assembled to highlight the major requirements of this project. The Contractor shall consider these documents as minimum requirements for the outlined work.
- 1.3.2. The Contractor shall be responsible for the complete installation of all elements of this project as noted within these specifications. The omission from these specifications of any minor details of construction, installation, material, or essential services shall not relieve the Contractor of the responsibility to furnish a complete and workable system. All work and materials shall be in full accord with the specification included in this document.
- 1.3.3. All materials used for this project shall be new, first quality, free from rust, and selected in accordance with the drawings, unless specifically called for rework or relocation in the bid documents. It shall be the Contractor's responsibility to ensure that all materials delivered to the job site be protected from the elements and/or environment or other causes. Any erected components found to include rust, or defects shall be restored to DDC's satisfaction or replaced new. This responsibility is concurrent with all erection and terminated with DDC's final acceptance.
- 1.3.4. All workmanship shall be in accordance with the best-accepted practices for the various trades involved. Solely DDC's Project Supervisor or his representative shall judge improper or inadequate workmanship. The Contractor shall restore, repair, and/or renew said materials and workmanship to the satisfaction of DDC.

<u>Drawings</u>

1.3.5. The accompanying drawings show the major items of work and do not necessarily show all minor items associated with the scope of work. The Contractor shall verify all elements, dimensions, etc. shown on the drawings before proceeding with the work.

Field Checking

- 1.3.6. The Contractor and all subcontractors are responsible for field checking the existing area and compare its findings against the drawings and specifications. Unless otherwise stated, the Contractor (or subcontractors) shall affect all necessary project related alterations at no additional cost to DDC.
- 1.3.7. The Contractor shall field check the existing ductwork to ensure correct duct sizing for all connections and modifications to the existing ductwork. This may require removal of insulation and cladding to confirm sizes prior to fabrication and installation.

Start-Up, Testing, Debug and Stand-by

1.3.8. The Contractor shall provide skilled trades support to assist the Owner in their start-up, testing and debug efforts, to supply a complete and properly operating

installation. The testing and debug shall continue until it is demonstrated to DDC's satisfaction that the system is ready to operate without restriction of production. For bidding purposes, the Contractor shall include 1 pipefitter, 1 mechanic, and 1 electrician for (2) 8-hour days per ventilation system.

1.3.9. Stand-by support shall begin after all start-up, testing and debug is complete and the system is ready for production. The Contractor shall include 1 pipefitter, 1 mechanic, and 1 electrician for (1) day for an 8-hour shift and provide an hourly rate for each trade for additional stand-by support if needed.

Final Inspection

- 1.3.10. Upon completion of the work, the Contractor shall conduct a final inspection of the complete installation and ensure that the equipment and piping installed by him have been cleaned and are in complete and satisfactory working order. The Contractor must also ensure that all surplus materials and debris left by his work are removed from the premises and the site is left in a presentable state.
- 1.3.11. The Contractor and DDC or his designated representative shall then survey the completed work to determine if all parts of the installation follow the drawings and specifications. Attention shall be directed to field modifications and other variations from the working drawings.

Patching and Replacing of Damaged Work

1.3.12. Patching and replacing of damaged work shall be done by personnel who installed the work. Damaged items shall be brought back to their original condition. The Contractor shall cover all expenses to repair damage (to equipment or DDC's facility) caused by his work force.

2. PROCESS EQUIPMENT MECHANICAL REQUIREMENTS

2.1. General

- 2.1.1. The following items address minimum general, mechanical, and design requirements for the equipment installation.
- 2.1.2. All equipment shall be set and all connections completed between equipment as required to ensure a complete and workable system.
- 2.1.3. The Contractor shall furnish all labor, equipment and materials required to install two (2) new Owner furnished Test Cell Process Exhaust Filtration Systems, including the (2) exhaust fans, (2) air pumps, (2) powder feed systems as shown on the bid drawings. Include all miscellaneous parts and hardware to complete the job. Contractor shall receive, unload and set the new equipment outside the building.
- 2.1.4. The Contractor shall furnish all labor, materials and equipment to install the new exhaust ductwork from the existing test cell ductwork on the roof, to the new filtration equipment, all new interconnecting ductwork from the filters to the exhaust fan, and a new freestanding exhaust stack with test port access platform and a ladder to the existing roof, as shown on the bid drawings.
- 2.1.5. The contractor shall provide all fan balancing/validation to ensure the fans were not damaged during shipping and installation.
- 2.1.6. The Contractor shall perform air flow testing and provide a report with findings once the fans are operational. Verification of air flows must be determined prior to the beginning of production.
- 2.1.7. The Contractor shall furnish and install hard construction fences with signage around the new construction areas outside the building for the duration of the project.

- 2.1.8. Pinch points less than 20" shall be eliminated as much as possible. Any pinch point that the operator could get caught in, in the "normal" operation of the device, must be guarded. All pinch points must be brought to the attention of the DDC project supervisor and eliminated.
- 2.1.9. Equipment shall be accessible for maintenance without the removal of adjacent equipment. Minimum clearance for a man shall be 24 inches (U.N.O).
- 2.1.10. No hot work shall be performed on structural steel without the approval of the DDC project supervisor. There shall be no welding to building steel.
- 2.1.11. All concrete floors shall be protected from damage including but not limited to diapering of motorized equipment to prevent oil damage.
- 2.1.12. The Contractor shall design, furnish and install all necessary foundation work for the two (2) new Dust Collectors, two (2) new Exhaust Fans, and two (2) new freestanding exhaust stacks as shown on the bid drawings.
- 2.1.13. The freestanding exhaust stacks shall be designed per the latest edition of the SMACNA Guide for Freestanding Steel Stack Construction.

3. PROCESS EXHAUST SYSTEMS

3.1. General

- 3.1.1. Provide, and install the new exhaust ductwork systems as required to support the processes as shown on the bid drawings, and as indicated here-in. Each system shall be a fully functional system including installation of all devices as outlined in the Process sections.
- 3.1.2. The Contractor shall design, engineer, fabricate, deliver, install, start-up and debug complete and fully functional, process Ventilation and exhaust ductwork systems. These systems shall include but are not limited to the following:

3.2. Test Cells Exhaust Ductwork

- 3.2.1. Prior to fabrication of any new ductwork the Contractor shall remove a section of the existing insulation and cladding and confirm the existing duct sizes.
- 3.2.2. The Contractor shall design, engineer, and size the test cell exhaust ductwork based on the layout of the ductwork as indicated on the bid drawings. The exhaust ductwork runs shall be supported on the roof of the building, to the collector, from the collector to the exhaust fan and to the exhaust stack.
- 3.2.3. The exhaust ductwork and fittings shall be constructed of minimum #16 gauge 304 stainless steel with airtight construction. Ductwork shall be sized for an average of 4,000 FPM velocity
- 3.2.4. Duct flanges shall be a minimum of 1 ½" x 1 ½" x 1/8" angles installed on the exterior of the ducts. Flanges for ducts greater than 20" shall be 1 ½" x 1 ½" x 3/16 angle.
- 3.2.5. Transformations and offsets shall not be made abruptly and elbows for turns shall have easy bends with center radius not less than 1.5 times the width of the duct. All sharp turns shall be avoided.
- 3.2.6. The Contractor shall furnish and install new pressure relief dampers at the start of the ductwork runs on both systems as shown on the bid drawings. Ductwork sizes shall be field verified prior to fabrication and installation.
- 3.2.7. The Contractor shall furnish and install insulation on all test cell exhaust ductwork, excluding the free-standing stack. Insulation shall be 3" thick, rated for 200F, with a #20 GA. Aluminized cladding over the insulation.
- 3.2.8. The Contractor shall furnish and install two (2) new freestanding on grade exhaust stack as shown on the bid drawings. Stacks shall have two (2) 3" diameter test posts at 90 degrees on the stack at the specified elevation. A testing service

platform shall be included capable of supporting two (2) men and 100 pounds of test equipment, with access ladder from the existing roof.

- 3.2.9. Supports/hangers shall be connected to the ductwork with reinforcement at the duct in the form of a #12 ga galvanized saddle or band clamp.
- 3.2.10. The Contractor shall furnish and install all required duct supports, support steel, hangers, all new roof curb flashings, rods, clips, clamps, saddles, nuts, bolts, etc. for a complete and fully functional system.
- 3.2.11. All the existing test cells exhaust ductwork interior surfaces shall be cleaned by a company that specializes in cleaning industrial ductwork. The cleaning method must be approved by DDC prior to any work starting. Water blasting is not acceptable, it must be mechanically cleaned and vacuumed. The goal is to remove all the soot and contaminates that have accumulated in the ductwork over the years. Cleaning of the silencers on the test cells 101-114 is not required as we do not believe they can be cleaned.

4. FOUNDATION AND SITE WORK

4.1. General

- 4.1.1. The Contractor shall furnish all labor, materials and equipment to provide, and install the new foundations required to support the process equipment as shown on the bid drawings, and as indicated here-in. The contractor shall design and submit for approval all shop drawings required for the new foundation work, prior to fabrication and installation.
- 4.1.2. The Contractor shall furnish all labor, materials and equipment to provide and install the new screen fencing around the process exhaust equipment outside the building as shown on the bid drawings.
- 4.1.3. Fences shall be 8'-0" high with 10'-0" wide gates that swing open 180 degrees. The new chain link fence will be a black vinyl coated chain link and the screening should be black PVC slats for all fencing and gates. The fence shall be purchased and installed by "Industrial Fence Company.
- 4.1.4. The Contractor shall furnish all labor, materials and equipment to install the bollards around the new screen fencing as shown on the bid drawings. There are thirteen (13) 6" diameter bollards required and one (1) 12" diameter bollard. Paint all bollards safety yellow.

5. EXHAUST SYSTEM DEMOLITION

- 5.1. The scope of removal work shall be as shown on the drawings and described in these specifications.
- 5.2. Prior to fabrication of any new ductwork the Contractor shall remove a section of the existing insulation and cladding and confirm the duct diameters.
- 5.3. If any materials are discovered that may contain asbestos or there is a question of such content, stop work and contact Michele Buckler @ 313-587-7169 immediately for testing and/or removal.
- 5.4. The demolition drawings show major items to be removed or relocated and may not note every item for removal. Removal work shall encompass complete removal of materials, where so stated, and removal of hangers, support steel, braces, brackets, clips, pipes, conduits, cable tray, lag bolts, etc. with the objective being to leave a finished, clean area.
- 5.5. All items to be removed have a definite termination point, whether this point is indicated on the drawings, described in the Specifications or self-explanatory.

- 5.6. The Contractor shall furnish all labor materials and equipment to complete the following work:
 - 5.6.1. Disconnect the existing exhaust duct at the start of the run on the ductwork from Test Cells 73-84, remove the existing 90-degree elbow to the roof. (A new pressure relief damper shall be installed at this location)
 - 5.6.2. Disconnect the existing exhaust duct near the end of the run from Test Cells 73-84. Remove a section of ductwork as shown on the bid drawings and cap the roof curb watertight.
 - 5.6.3. Remove the existing abandoned Test Cell exhaust ductwork that goes through the roof on an angle and connects to the existing exhaust fan system on the roof. The new section of exhaust ductwork shall utilize the existing roof opening to exit the building and connect to the new dust collector, as shown on the demolition photos drawing.
 - 5.6.4. The existing ductwork from Test Cells 101-114 goes through a roof opening, has a tee with a large blast gate and the duct runs across the roof to the existing exhaust fan, the tee and blast gate shall be removed and a short section of the existing duct. A new 90-degree elbow shall be installed, and new exhaust ductwork shall run across the roof and down to the new dust collector as shown on the bid drawings.
 - 5.6.5. The existing ductwork and exhaust fan system on the roof shall be abandoned in place.
- 5.7. This demolition shall not impact the function of the existing system until changeover.
- 5.8. All utilities shall be reviewed to determine which are to remain connected to equipment and left intact. If the utilities are branch lines fed from feeders of equipment being removed, the utility branches shall be reworked to achieve the most direct and practical route or run to the building main header.
- 5.9. This demolition shall take place inside the Owner's facility, and on the roof. No smoking is permitted inside the building or on the roof.
- 5.10. The Contractor shall always protect the existing roof during demolition and installation. Any damage caused to the roof by this contractor shall be repaired at their cost. If a roof repair is required, the contractor will use the existing plant roofing installation contractor to maintain the roof warranty.
- 5.11. Welding and burning permits from plant security prior to any welding or burning will be required.
- 5.12. The building fire protection system must always be in service during demolition. No portion of the building fire protection is to be impaired or terminated without prior approval in writing from the Plant Security Department. This includes system valves, alarms, and individual sprinklers. Demolition work shall be discontinued in all areas affected by decommissioning the fire protection system until the system is back in operation.
- 5.13. A fire watch shall be set during all hazardous removal work.
- 5.14. If cutting torches are used, all precautions necessary to prevent setting fires shall be taken including use of fire-retardant blankets and maintenance of fire extinguishing apparatus adjacent to cutting area.

6. FIRE PROTECTION PIPING - GENERAL

6.1. The Contractor's Fire Protection Sub-Contractor shall be completely responsible to design, furnish, and install all required process fire protection systems, including all labor, materials

and equipment required to install the fire protection systems for the new Test Cells dust collection system.

- 6.2. The contractor shall furnish and install all fire protection piping from the plant mains to the dust collectors located outside the building. The piping outside the building will be a dry pipe system. Contractor shall assume tie-in point within 100 feet / 30 meters.
- 6.3. The Contractor shall submit Hydraulic calculation information including the following information:
- 6.4. Number of sprinklers calculated.
- 6.5. Design density.
- 6.6. Require pressure and flow at the base of the riser.
- 6.7. Hydraulic calculation file name.
- 6.8. Successful Bidder shall coordinate any fire system shutdown directly with the plant prior to commencing with actual work.
- 6.9. The Fire Protection design drawings are to be submitted to the Owner's Insurance Representative and the local fire department for approval, prior to starting any work.
- 6.10. Contractor is responsible for coordinating with local fire marshal regarding fire protection modifications, if required.
- 6.11. The contractor shall submit Fire Protection permit application and obtain FP permit through the Redford Township AHJ. Upon award, Contractor shall immediately start the permit process and allow 4-6 weeks for permit delivery.
- 6.12. The Fire Protection Contractor shall submit the following at the end of the project:
- 6.13. Two (2) CD's of the "Final As-built" record drawings.
- 6.14. Two (2) copies of the catalog brochure folder.
- 6.15. Two (2) copies of the signed test certificates.
- 6.16. Two (2) copies of the "Final As-built" record drawings.
- 6.17. One (1) copy of the two (2) year warrantee.
- 6.18. The Fire Protection Sub-Contractor is to install his piping in a professional and plumb manner. Care must be given in the routing of the piping to give clearance to allow the service of any other equipment.
- 6.19. The piping must be supported in accordance with the latest editions of the NFPA 13 Standard. The piping shall be supported only from substantial structural members.
- 6.20. The position of the sprinkler deflectors are to be such that they are not obstructed by any lights, pipes, conduits, ductwork, structural members or any other item.
- 6.21. All trapped piping exceeding five (5) gallons are to be provided with a low point ball valve drain with a plug and a valve identification sign.
- 6.22. The routing of all of pipes is to be such that it provides the maximum headroom. The Fire Protection Contractor shall relocate his piping (without compensation) for better clearance if directed by the project manager.
- 6.23. Pre-test all of the piping before scheduling the approving authorities to witness the tests. The Owner's representatives require a minimum of forty-eight (48) hour notice.

- 6.24. The pressure of the test is to be minimum of (200) psi or (50) psi above the Plant's maximum static pressure for a minimum period of two (2) hours.
- 6.25. The Fire Protection Sub-Contractor is to have a witnessed pressure test of all the new piping prior to connecting any new protection to existing mains.
- 6.26. The time frame for the connection into the existing water supplies shall be determined by the Plant. No additional compensation will be given for an off-shift or weekend connection requirement.

7. PROCESS EQUIPMENT ELECTRICAL REQUIREMENTS

7.1. General Requirements

- 7.1.1. All work shall be in accordance with Electrical Codes, Supplemental Plant Specifications, and the bid documents.
- 7.1.2. All work requiring power outages shall be scheduled three weeks in advance with the plant.
- 7.1.3. Final locations of control panels, bus way, conduit runs, field equipment, and other equipment shall be coordinated with and approved by DDC prior to installation.
- 7.1.4. The Contractor shall provide all materials (unless noted) and labor required for a complete installation and interface with all related equipment.
- 7.1.5. All new equipment needs to be submitted for approval by plant engineering unless otherwise directed in writing by an authorized DDC representative.
- 7.1.6. All runs of communication (Ethernet) cabling shall be in a 10' foot conduit riser or cable tray from the termination point and in bridle rings or J-hooks routed above truss level.
- 7.1.7. Control panels shall be properly placed and securely fastened to the plant floor by this Contractor. Mounting angles may be required.
- 7.1.1. Manufacturer's recommendations, installation instructions, procedures, and requirements shall be followed for all equipment provided and/or installed under this contract.
- 7.1.2. All control and power wiring shall be labeled on each end of each individual conductor. Spare wiring shall be clearly marked as to source.
- 7.1.3. In general, wire splices shall not be allowed. In cases where device pigtails must be accommodated, ring terminal type crimp connectors shall be used with threaded fasteners and insulating covers to provide a reliable connection. Wire nuts are not acceptable and shall not be allowed.
- 7.1.4. All power wiring required to operate the control panels, drives and power systems is to be furnished and installed by this Contractor. This shall include, but is not limited to, properly sized connectors, conductors, cables, conduit, cable tray, etc.
- 7.1.5. All power feeder lugs shall be torqued per the manufacturer's specifications by this Contractor. A verification sticker should be installed.
- 7.1.6. Motor terminations shall be made in the motor connection box with full ring type compression deforming copper connectors. The connectors shall be sized properly and securely bolted together and insulated in accordance with DDC requirements. Insulation shall be complete according to motor locations.
- 7.1.1. The grounding conductor shall be continuous green or bare, as required, for all systems. Neutral conductors shall be continuous white for all systems. Identification of all ungrounded conductors at junction boxes, wireways, and/or terminations shall be by means of insulation color or colored tape.
- 7.1.2. Power feed and control panel over-current and short circuit/ground fault protection sizing shall be properly coordinated to provide adequate power distribution system isolation under fault conditions. Faults occurring within a machine system shall be limited to that system, to prevent affecting other equipment, without the need for

maintenance access to bus plugs or other facilities distribution points for replacing fuses or resetting breakers.

- 7.1.3. Power feeds have been defined to indicate power distribution requirements for the Bidder. Final equipment design loads may vary slightly from that indicated herein depending on the Contractor's final design approach. The Contractor shall furnish and install adequate power feeds taking into voltage drop requirements based on distance for termination to Contractor's equipment, as defined in these specifications and as approved by the Owner.
- 7.1.4. Non-electrical items, including pipelines, tubing or any devices for handling air, gases or liquids, shall not be located in enclosures or compartments containing electrical control equipment.

7.2. Dust Collectors

- 7.2.1. The owner will pre-purchase the following equipment:
 - (1) 12,000 cfm dust collector (Cells 73-84).
 - (1) 15,000 cfm dust collector (Cells 101-114).
- 7.2.2. The contractor is responsible for all conduit and wiring between the bus plug and dust collector.
- 7.2.3. The Contractor is responsible for all conduit and wiring between the dust collector electrical panel and associated equipment (motors, field devices, etc.).
- 7.2.4. The contractor is responsible for a network connection (Modbus TCP) between the dust collector control panel and a plant monitoring panel.

7.3. Substation Feeder Breaker & Bus Way

- 7.3.1. The owner will provide the following equipment:
 - (1) Substation Feeder Breaker (1,600 Amp).
 - (5) Pow-R-Way III 1,200 Amp, 3PH, 4W Busway (10' sections).
- 7.3.2. The contractor will provide and install the following equipment:
 - (1) Busway Center Tap Box (1,200 Amp Busway).
 - (2) Busway End Caps.
 - (2) Bus Plugs (200 Amp).
 - (6) Bus Plug Fuses (TBD Amp).

(AR) Cable tray, Hangers, Braces and related hardware to install a complete and functional Busway system.

- 7.3.3. The contractor is responsible for installing and setting up the substation feeder breaker. The contractor will retain the services of Shermco to setup the breaker trip settings. See "Arc Flash Hazard Tagging" section for contact information.
- 7.3.4. The contractor is responsible for all cable tray, conduit and wiring between the feeder breaker and busway center tap box.
- 7.3.5. The contractor must inspect and test the cables and busway.
- 7.3.6. The contractor is responsible for all conduit and wiring between the bus plugs and the dust collector control panels.

7.4. Lighting & Receptacles

- 7.4.1. Spare circuit breakers in the M11 Dyno Water Room receptacle panel will used for the dust collector exterior lighting and receptacles. Separate circuit breaker will be used for lighting circuits and receptacle circuits.
- 7.4.2. This contractor should include labor to identify all current receptacle panel circuits and document on the table included in drawing DE6-00-03.

- 7.4.3. Breakers #14 & #16 will be dedicated for dust collector (Cells 73-84) and breakers #6 & #8 will be dedicated for dust collector (Cells 101-114).
- 7.4.1. Light fixtures and receptacles shall be rated for outdoor use.
- 7.4.2. Lighting power distribution system shall be properly grounded, as required by local codes and standards and the local authority having jurisdiction.
- 7.4.3. The Contractor shall furnish and install all required structural supports and mounting for the new lighting and service receptacles, and associated power feeds.
- 7.4.4. Contractor shall be responsible for all required engineering drawings and material lists associated with the lighting and utility circuits.
- 7.4.5. All new lighting and receptacle arrangements shall be approved by the Owner prior to installation.

7.5. Conduit

- 7.5.1. All conduit shall be provided and installed by this Contractor. Conduit shall be used for all wiring that is coming to or leaving control panels as well as field enclosures and devices.
- 7.5.2. Conduit shall be galvanized, rigid steel heavy wall, comply with ANSI C80.1 and meet the requirements for Underwriters Laboratories, Inc. Label Type "UA".
- 7.5.3. All conduit connections shall be threaded. Setscrew couplings shall not be used. Minimum conduit size shall be $\frac{3}{4}$ ".
- 7.5.4. Rigid metal conduit entering outlet boxes, junction boxes, cabinets or any piece of electrical equipment not having threaded hubs shall use approved fittings to maintain liquid-tight connections.
- 7.5.5. Ends of conduits shall be provided with a malleable iron insulated bushing, except at couplings or threaded type conduits.
- 7.5.6. Conduit fittings for ferrous conduit shall be cadmium plated, galvanized malleable or cast iron with threaded hubs and full body design. Covers shall be of stamped metal.
- 7.5.7. Conduit shall be firmly supported by conduit clamps or malleable galvanized iron straps secured by screws, bolts or anchors. Conduits shall not be supported from pipes, hangers or extensions of installations of other building trades.
- 7.5.8. Pull and junction boxes shall be NEMA 12 without knockouts and shall be provided with piano hinged covers. Explosion proof boxes shall be utilized where required. All boxes shall have a painted gray finish.
- 7.5.9. Conduit runs shall not be mounted on platforms, flooring, along or across walkways, catwalks, accesses to platforms or areas used for pedestrian or vehicular traffic where it may create a trip hazard, obstacle or inhibit cleaning, or attached to conveyor screen guard. Conduit shall not be mounted or suspended from any item that must be removed for maintenance purposes.
- 7.5.10. Conduit runs shall be mounted square to the building steel, ceiling, walls, etc., and conduit shall be offset for proper entry to the enclosure.
- 7.5.1. Power and control wiring shall be run in separate conduits, including motor disconnect wiring.
- 7.5.2. All controls conduits shall include 10% spare conductors with a minimum of 2 conductors.
- 7.5.3. All conduits shall be labeled with the conductor voltage level.

7.6. Equipment Grounding

7.6.1. All control panels shall be grounded by this Contractor as required per Detroit Diesel, NFPA Standards along with equipment manufacturer's recommendations. Dust collector equipment components and ductwork shall be electrically interconnected and grounded.

7.6.2. Exothermic welds of ground leads to columns shall be "Cadweld", Burndy Engineering Co. "Thermoweld", or DDC approved equal. Remove paint on column prior to welding ground bar. Equipment grounding shall form a permanent and continuous bonding of conductor enclosures, equipment frames, cable trays, conduit, steel structures, and other non-current-carrying parts of the system to ground.

7.7. Safety and Lockout Procedures

- 7.7.1. All control panels with power feeds greater than 120V shall include a main disconnect. Integral control panel disconnects, interlocked with the enclosure doors are preferred. Where a disconnect means is not provided by the equipment manufacturer the Contractor shall furnish and install a lockable field disconnect.
- 7.7.2. All 3-phase motors shall be equipped with a 3-pole, heavy duty, non-fused safety disconnect switch next to and within sight of the motor. Disconnect switches shall be electrically interlocked (switch position) with the motor control circuit.
- 7.7.3. Equipment lockout placards shall be provided and installed by the Contractor to aid in the location of all safety critical devices (electrical, pneumatic, hydraulic, mechanical, etc., which allows the equipment to be rendered safe with no potential energy available that could cause injury to personnel) and to display lockout procedures for the equipment. The contractor should request standard lockout placard templates from DDC plant engineering.
- 7.7.4. Temporary lockout placards shall be provided with the control panels and shall remain in place until the final placards are approved and install.

7.8. Arc Flash Hazard Tagging

- 7.8.1. The Contractor shall contract the services of Shermco to perform an Arc Flash Hazard Assessment study for the equipment being provided and installed under this contract. This shall include the inspection and data collection required for the arc flash hazard assessment, as well as the calculation required to generate the flash boundary and incident energy data, and minimum PPE requirements for the arc flash labels. Data sheets and calculations shall be reviewed and approved by the Owner prior to label purchase.
- 7.8.2. The Contractor shall furnish and install all required arc flash tagging.
- 7.8.3. Shermco contact: Ryan Broderic, (734)-744-4594.

7.9. Interlocks

- 7.9.1. The current scope of work does not include hardwire interlocks between the dust collectors and test cell equipment.
- 7.9.2. The contractor is responsible for a network connection (Modbus TCP) between the dust collector control panel and a plant monitoring panel.

7.10. Fire Protection

- 7.10.1. Each dust collector will require a sprinkler head (Dry pipe).
- 7.10.2. The contractor is responsible for the hardwire interlock between the fire protection system and the dust collector main control panel.
- 7.10.3. The Contractor shall include the services of Honeywell to design, provide equipment and commission the fire protection system modifications.
- 7.10.4. Honeywell contact: Kate Zupan (216) 347-0927.

7.11. Nameplate and Device Identification Tags

- 7.11.1. Bus plug identification tags shall be supplied and installed by this Contractor. Installation of all bus plug tags shall be completed prior to application of power to the control systems for proper troubleshooting. All tagging is to be approved by DDC prior to installation.
- 7.11.2. Bus plugs shall be labeled with the following information: The plant ID number as assigned by plant engineering, label to identify the equipment it supplies, arc flash labels, the bus plug number that directly feeds the equipment, and the bus number that feeds the busway. Bus plug tags shall be 4 inches high minimum and shall be readable from floor level. Bus plug size, location, bus number, bus section number and stab number for each power drop shall be provided to DDC for facility records.
- 7.11.3. Bus plug ID tags shall include the type and size of the fuses installed.

END OF SECTION