SOURCES SOUGHT NOTICE

Utility Shaft (US) Design and Fabrication of Two

(2) Surface Utility Shaft Intake Fans

Nuclear Waste Partnership LLC (NWP) is publishing this SOURCES SOUGHT NOTICE to identify sources of all qualified business classifications. The purpose of this sources sought notice is to determine the interest and technical capability, and capacity of available manufacturers experienced in the design, and fabrication and delivery of two (2) identical Surface Air Intake Fan Assemblies.

This synopsis is for information and planning purposes and is not to be construed as a commitment. Interested Parties should send a capabilities statement to john.venaglia@wipp.ws prior to **June 1, 2020**.

PLEASE NOTE THAT THIS IS NOT A REQUEST FOR PROPOSAL. NO SOLICITATION EXISTS AT THIS TIME.

Synopsis of Work to be performed includes:

NWP intends to award a firm-fixed price subcontract in accordance with the SOW, specifications, design drawings, applicable codes and other standards referenced in the contract documents. A Fan Assembly will include inlet screen, inlet bell, transition to the vane axial fan, fan motor, outlet duct transition, silencer (if required), and back draft damper. Installation is not required. Upon acceptance this equipment will be placed in service at the Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP), located near the vicinity of Carlsbad, New Mexico. NAICS Industry Code: 3564 (group).

These fan assemblies are required in support of the (greater) **US-Shaft No. 5 and associated Drifts Construction Project**. That completed project will provide a new air intake shaft (Shaft no. 5) and associated drifts to the Underground, to include the installation of the two US Intake Fans.

Fig. 1 of the SOW (attached) shows the US-Shaft No. 5 location and its relationship to the underground airways. Fan Assemblies will be operated independently from one another and not simultaneously.

There not a mandatory Pre-proposal Conference scheduled at this time.

Estimated Solicitation Issuance Date: **June 1, 2020**

Estimated Proposal Due Date: **July 1, 2020**

Estimated price (ROM) is between **$1,000,000 and $5,000,000**.

All responding firms are requested to identify their firm's size and type of business to the anticipated North American Industrial Classification System (NAICS) code. This acquisition is under NAICS Code 236210 – Industrial Construction.

Interested parties should contact John Venaglia at john.venaglia@wipp.ws or 812 243-1606 for initial preview of the Statement of Work and Specifications. **Your review and feedback of these two documents is appreciated.**

STATEMENT OF WORK

Design and Fabrication of Two Surface Utility Shaft Intake Fans

SOW-**20-019**

Revision 0

Date: 03/31/2020

Prepared by

Nuclear Waste Partnership, LLC

Carlsbad, New Mexico

For

U. S. Department of Energy

Waste Isolation Pilot Plant

Sam Montañez	**Signature,** **Project Engineer**	**Date**
Mark Riess	**Signature,** **US Project Manager**	**Date**
Steve Smith	**Signature,** **Capital & Infrastructure Project Manager**	**Date**
Woodrow Meadows	**Signature,** **Quality Assurance**	**Date**

WIPP Nuclear Waste Partnership

An AECOM-led partnership with BWXT and AREVA

Record of Changes

Revision	Description	Date
-	Draft	1/24/20
0	Draft comments incorporated, issue for signatures	03/31/20

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1. ACRONYMS AND ABBREVIATIONS

ABMA	American Bearing Manufacturer's Association
AMCA	Air Movement and Control Association International
AR/VR	Approval Request/Variation Request
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
DOE	U.S. Department of Energy
HIM	Human Interface Module
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NMED	New Mexico Environment Department
NWP	Nuclear Waste Partnership, LLC
OSHA	Occupational Safety Health Administration
RFI	Request for Information
S/CIs	Suspect/Counterfeit Items
SOW	Statement of Work
TRU	Transuranic
UL	Underwriters Laboratories
VFD	Variable Frequency Drive
WIPP	Waste Isolation Pilot Plant

2. INTRODUCTION AND BACKGROUND

1.1. Introduction:

1.1.1. The purpose of this Statement of Work is to provide the project requirements necessary to award a contract to a Subcontractor that can design, fabricate and deliver two (2) identical Surface Air Intake Fan Assemblies (Fan Assemblies) that are to be installed on the collar of a new Utility Shaft (US) no. 5 by a different Subcontractor. A Fan Assembly will include inlet screen, inlet bell, transition to the vane axial fan, fan motor, outlet duct transition, silencer (if required), and back draft damper. These fan assemblies are required for the US-Shaft no. 5 and associated Drifts Construction Project. The completed project will provide a new air intake shaft (Shaft no. 5) and associated drifts to the Underground. Fig. 1 shows the US-Shaft no. 5 location and its relationship to the underground airways that are to be constructed as part of this project. Fan Assemblies will be operated independently from one another and not simultaneously.

1.1.2. The Shaft no. 5 Subcontractor for the US-Shaft no. 5 and drifts project will be responsible for installation of shaft no. 5, underground drifts, shaft collar and air plenum construction. The Fan Assembly installation will be done by others. The 14 ft. diameter air plenum will connect the shaft to the fan assemblies. The plenum will transition to a horizontal connection and the fan assemblies will attach to this

horizontal duct. Figure 2 is a drawing of the plenum and duct that the fan assemblies will connect to.

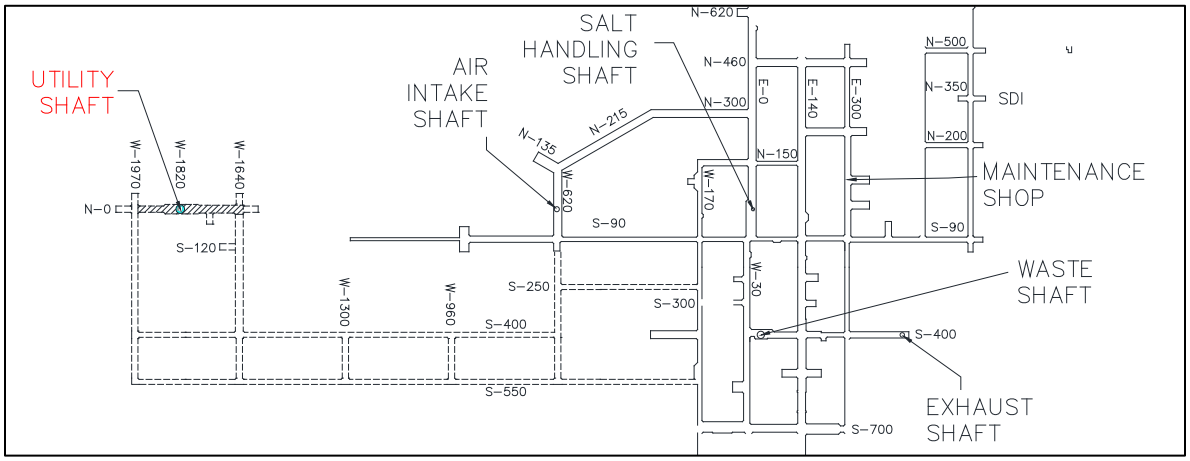


Figure 1: New Utility Shaft location with underground airways (hatched) – to be constructed by the Shaft no. 5 Subcontractor.

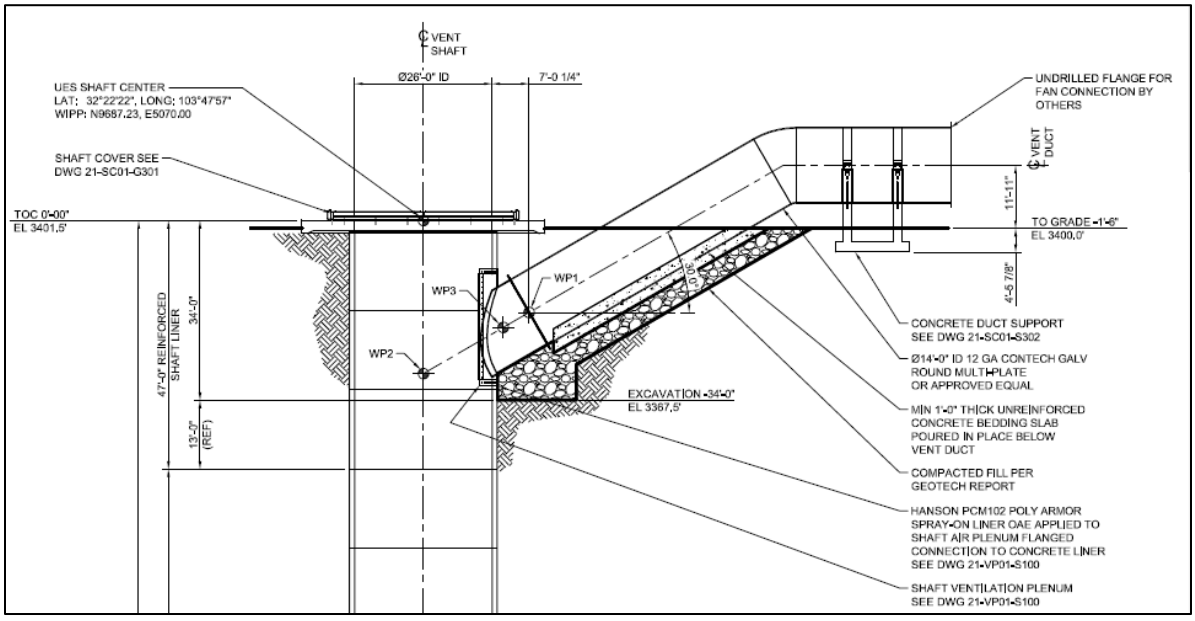


Figure 2: Surface plenum from US to horizontal fan position – to be constructed by the Shaft no. 5 Subcontractor.

1.1.3. The Subcontractor shall deliver the Fan Assemblies to the U.S. Department of Energy's (DOE) Waste Isolation Pilot Plant (WIPP) Underground Repository.

WIPP Location: Waste Isolation Pilot Plant, 32 Road Miles East of Carlsbad, NM
34 Louis Whitlock Rd
Carlsbad, NM 88220

1.2. Background:

1.2.1. Nuclear Waste Partnership, LLC (NWP), is the Management and Operating (M&O) Subcontractor for the DOE Carlsbad Field Office (CBFO) at the WIPP site. The WIPP site is located in Southeastern New Mexico, 32 road miles east of Carlsbad. The DOE CBFO manages the WIPP site for DOE's Office of Environmental Management (EM). The Defense Nuclear Facility Safety Board (DNFSB), the Environmental Protection Agency (EPA) and the New Mexico Environmental Department (NMED) provide oversight of the WIPP. The WIPP is a deep geologic repository for permanent disposal of Transuranic (TRU) waste, which is a by-product of the nation's nuclear defense program.

1.2.2. There are three basic groups of structures associated with the WIPP facility: surface structures, shafts and underground structures. Four vertical shafts currently connect the surface facility to the underground. These are the Waste Shaft, Salt Handling Shaft, Exhaust Shaft and the Air Intake Shaft. The WIPP surface structures and underground structures accommodate the personnel, equipment, and support services required for the receipt, preparation, transfer and disposal of TRU waste from the surface to the underground repository. The area containing the WIPP surface structures is a controlled access Property Protection Area (PPA) surrounded by a chain link fence and covers approximately 35 acres.

3. DESCRIPTION OF WORK

3.1. Scope of Work:

3.1.1. This SOW is prepared for the engineering, design and fabrication of two (2) fan assemblies located at the top of a new Utility Shaft at the WIPP facility. The fan assemblies will provide a majority of the intake air to the repository. The design is to have two fan assemblies, each capable of the full ventilation and pressure to provide a majority of the intake air to the repository. One fan will be on standby with one in operation. Backdraft dampers are required on each fan to ensure leakage through the idle fan is minimized. The functioning fan will be monitored by operators in the Central Monitoring Room (CMR) at WIPP. Variable Frequency Drives (VFD) are required for each fan.

3.1.2. The Subcontractor's scope of work shall include all necessary materials, services, engineering, labor, tools, consumables, equipment, supervision, technical support, quality control, and all incidentals necessary for the detailed design of the fan assemblies and fan mounting base, fabrication/assembly, performance requirements, testing requirements, quality standards, packaging, shipping, receiving, handling, storage and delivery of the fan assemblies as specified by this SOW and subsequent contract documents. The required scope of work shall include, as a minimum, the following requirements:

A. The Subcontractor shall be responsible for the design of the Fan Assemblies based on the requirements in Appendix A, Air Intake Fan Data Sheet and the requirements in this SOW and subsequent contract documents. NWP intends on contracting an engineering firm to develop final drawings of the duct system

from the plenum location, associated duct work to the fan assembly, foundation requirements, duct support structures, electrical system components, and fan control structure. The Subcontractor shall provide a conceptual duct design for how the Fan Assemblies will tie to the existing 14 ft. circular Plenum. The conceptual design will be submitted to NWP for approval at least 21 calendar days prior to fabrication of the Fan Assemblies. This design needs to be detailed enough for the engineering firm to develop detailed drawings of the fan system from inlet to Plenum. The conceptual design developed by the Subcontractor will be used to calculate the final fan total pressure. All additional pressure losses from the fan inlet, transitions, silencer, backdraft damper and duct work to the Plenum need to be calculated by the Subcontractor to include in the final fan total pressure. Reference Appendix B, Option for Parallel Fan Installation, for an example of a potential duct work design.

B. As a minimum, each Fan Assembly shall consist of the following items:

- Direct Drive Vane Axial Fans (Fan),
- Fan blade setting shall be manually adjusted without removing fan (with the fan power off)
- Electric Fan Motor(s)
- VFD and Controls
- Guards
- Inlet Bells
- Silencers (as needed)
- Inlet screens
- Air Flow Elements
- Electrical Power Hook-ups
- Interlocks
- Instrumentation
- Controls
- Interfacing Circuitry
- Grounding requirements

C. The Fan Assembly's system and component requirements shall also include the following, as a minimum:

- Detailed design drawing of the fan assemblies with recommended foundation specification and duct connections.
- Recommended spare parts
- Testing, start-up and commissioning assistance

D. A VFD matched to the fan driver shall be provided with the Fan Assemblies. NWP will provide the building to house the fan controls, VFD, and

instrumentation connections that will be used to connect to the Central Monitoring System. Power and instrument communication lines will be provided by NWP to the building location. The Subcontractor shall be responsible for specifying the building space requirements and the required distance of the building to the fans.

E. Each Electric Fan Motor shall be specifically matched to the VFD in order to meet the fan starting and operating characteristics as specified in Appendix A, Air Intake Fan Data Sheet.

F. The Subcontractor shall prepare detailed fabrication and assembly drawings for the fan assemblies. These detailed fabrication and assembly drawings for the fan assemblies shall be submitted to NWP for approval at least 21 calendar days prior to fabrication.

G. The Subcontractor shall be responsible for the handling, packaging, shipping and delivery of the Fan Assemblies from the Subcontractor's fabrication facility to the WIPP site.

H. The Subcontractor shall provide written installation instructions for the fan assemblies, including drawings. These written installation instructions for the fan assemblies, including drawings shall be submitted to NWP for approval at least 21 calendar days prior to starting fabrication.

I. The Subcontractor shall perform Factory Acceptance Testing (FAT) on the Fan and on the Fan Assemblies. This FAT shall verify that the fan and fan assemblies meet the performance requirements specified in Appendix A, Fan Data Sheet. The Subcontractor shall submit to NWP a factory acceptance test plan at least 21 calendar days prior to performing the factory acceptance testing. The Subcontractor shall notify NWP in writing at least 21 calendar days prior to performing the FAT in order for NWP to witness the FAT. Both fan assemblies shall be factory acceptance tested. If the FAT cannot be performed at the Subcontractor's fabrication facility, an alternate testing facility and testing plan shall be proposed for NWP approval. The need for an alternate testing facility and testing plan shall be identified with the Subcontractor's proposal.

J. The Subcontractor shall identify the support and anchorage requirements for the fan assembly mounting base, including unit weights and recommended anchorage hardware.

K. The Subcontractor shall provide all Submittals in accordance with this SOW, Appendix E and subsequent contract documents.

The Subcontractor shall not use Suspect/Counterfeit Items (S/CIs) and materials as defined in DOE document no. DOE O 414.1D for construction of the Fan Assemblies, spare parts and all other required items. The Subcontractor shall develop and implement as part of their Packaging, Shipping, Receiving, Handling and Storage Plan, effective controls for the detection and prevention of S/CIs that meet the applicable requirements of DOE O 414.1D to prevent the introduction of S/CIs into the Fan Assemblies, spare parts and all other required items. The Subcontractor shall refer to DOE Handbook no. DOE-HDBK-1221, Suspect/Counterfeit Items Resource Handbook, for further information. An item

that does not conform to established requirements is not normally considered an S/CIs if the conformity results from one or the following conditions:

- Defects resulting from inadequate design or production QC.
- Damage during shipping, handling, or storage.
- Improper installation.
- Deterioration during service.
- Degradation during removal.
- Failure resulting from aging or misapplication or other similar causes, which do not involve a misrepresentation about nature, quality, form or function.

The types of material, parts and components known to have been misrepresented include, but are not limited to the following items:

- Fasteners such as bolts, nuts and washers.
- Cranes and hoists, as well as other hoisting, rigging, electrical equipment and devices.
- Plates.
- Bars.
- Shapes.
- Channel members and structural items.
- Welding rods and electrodes.

3.1.3. The Subcontractor shall submit all Requests for Information to NWP for resolution by NWP using form no. EA09DC01-1-0, rev. 2, Request for Information. RFIs shall be processed within 5 working days upon receipt from the Subcontractor. The Subcontractor shall provide 21 calendar days to review and respond to all RFIs.

3.1.4. All required submittals shall be submitted to NWP for approval as Approval /Variation Requests (AR/VR), in accordance with the AR/VR process established in WP 15-PC3041, Approval/Variation Request Processing and in accordance with Attachment D – Submittals Table.

3.1.5. The fans will be set on a concrete foundation to be provided by another Subcontractor. The Subcontractor shall write performance specifications as appropriate, for equipment instrumentation and appurtenances that are required by the design. Any equipment or structural fabrication drawings shall be the Subcontractor's responsibility and shall be properly coordinated and detailed to the satisfaction of NWP engineering.

3.1.6. Work/Equipment to be provided by NWP:

A. Electrical service for the fan assemblies.

B. Electric Fan motor/Control Building requirements for space and air conditioning.

C. Local alarms, controls, and interface panels for interfacing with the Subcontractor's VFD and any Fan Assembly mounted instruments.

D. Instrumentation control wiring at the Electric Fan Motor/Control Building location. This wiring will be used to communicate with the CMR (to be done by NWP).

E. Handling of the fan assemblies and spare parts after delivery.

F. Assistance with Post Installation Testing.

3.1.7. Appendix B is a drawing of the shaft with plenum. Appendix C is a conceptual sketch of a proposed parallel fan system as an option for the parallel Fan Assembly installation with the Fan/Motor Control Building shown. This sketch is for informational purposes only. The Subcontractor shall submit detailed Fan Assembly design drawings that include a bill of material and fabrication/assembly drawings and layouts to NWP for approval at least 21 calendar days prior to fabrication of the fan assemblies. The Subcontractor shall submit a fabrication schedule for the Fan Assemblies to NWP for approval with the proposal. Energy conservation shall be considered at all levels of design and implemented as practical.

4. APPLICABLE DOCUMENTS

4.1. Applicable Codes, Regulations, Laws, Guides and Standards:

The latest version of codes, specifications and standards referred to by number or title shall form a part of this specification to the extent required by the reference thereto. In the event of a conflict between the documents referenced, the Subcontractor shall notify NWP of the conflict in writing, e-mail is acceptable.

	DOCUMENT NAME/NO.	TITLE
1)	ABMA 9	Load Ratings and Fatigue Life for Ball Bearings
2)	ABMA 11	Load Ratings and Fatigue Life for Roller Bearings
3)	AMCA 99	Standards Handbook
4)	AMCA 201	Fans and Systems
5)	AMCA 204	Balance Quality and Vibration Levels for Fans
6)	AMCA 210	Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
7)	AMCA 211	Certified Ratings Program - Product Rating Manual for Fan Air Performance
8)	AMCA 300	Reverberant Room Method for Sound Testing of Fans
9)	AMCA 301-2005	Methods of Calculating Fan Sound Ratings from Laboratory Test Data

10) AMCA 311	Certified Ratings Program – Product Rating Manual for Fan Sound Performance
11) ASHRAE 68	Laboratory Method of Testing to Determine the Sound Power in a Duct
12) ASTM A36/A36M	Standard Specification for Carbon Structural Steel
13) ASTM A108-07	Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
14) ASTM A653/A653M	Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process
15) ASTM A240/A240M	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
16) ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
17) ASTM D1056	Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber
18) AWS D1.1/D1.1M	Structural Welding Code - Steel
19) AWS D1.3/ D1.3M-2008	Structural Welding Code-Sheet Steel
20) AWS D1.6/ D1.6M-2007	Structural Welding Code-Stainless Steel
21) AWS D9.1/ D9.1M-2012	Sheet Metal Welding Code
22) IEEE 112	IEEE Standard Test Procedure for Polyphase Induction Motors and Generators
23) IEEE 519	Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
24) IEEE 841	IEEE Standard for Petroleum and Chemical Industry--Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors--Up to and Including 370kW (500hp)
25) ISA-5.1	Instrumentation Symbols and Identification
26) NEMA ICS 7	Industrial Control and Systems: Adjustable-Speed Drives
27) NEMA ICS 7.1	Safety Standards for Construction and Guide for Selection, Installation, and

	Operation of Adjustable-Speed Drive Systems
28) NEMA MG 1	Motors and Generators
29) NEMA MG 2	Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors and Generators
30) NFPA 70	National Electric Code
31) NRTLs	OSHA's Nationally Recognized Testing Laboratory Program
32) Recommended Practice No. SNT-TC-1A	Personnel Qualification and Certification in Nondestructive Testing
33) UL	Underwriters Laboratories

4.2. Applicable WIPP Site Procedures and Forms:

The following NWP documents shall be provided to the Subcontractor as part of the Request for Proposal process:

DOCUMENT NO.	DOCUMENT TITLE
1) Procedure no. WP 15-PC3041, rev. 12	Approval/Variation Request Processing
2) Form no. EA15PC3041-2-0, rev. 6	Approval/Variation Request (AR/VR)
3) Form no. EA09DC01-1-0, rev. 2	Request for Information

5. FAN ASSEMBLY TECHNICAL REQUIREMENTS

5.1. Fan Assembly Performance Requirements: The Subcontractor shall ensure that the following performance requirements are met:

5.1.1. The Subcontractor shall submit data including equipment outlines, catalog information for fans, VFDs, instrumentation and drivers, construction details, VFD controls, maintenance and operating manuals, fan performance curves, motor performance curves and data; VFD ratings that include: short circuit rating, voltage, continuous current, interrupting ratings and cable termination sizes. The Subcontractor shall submit certifications that products meet or exceed the specified requirements. This data and certifications shall be submitted at least 21 calendar days prior to fabrication of the Fan Assemblies. The Subcontractor shall submit data sheets for the Fans and VFDs with the proposal.

5.1.2. The requirements and work performed in accordance with this SOW and subsequent contract documents shall be done in accordance with the Subcontractor's Quality Assurance procedures approved by NWP.

5.2. Fan Assembly Electrical Design Requirements: The Subcontractor shall ensure that the following electrical design requirements are met:

5.2.1. The electrical design for the fan assemblies shall include, as a minimum, power demand, one-line diagrams, three-line diagrams, cable routing, interfaces, overcurrent protection, schematic diagrams, wiring diagrams, panel arrangements and grounding requirements.

5.2.2. The Subcontractor shall submit the electrical design drawings that include one-line diagrams, three-line diagrams, cable routing, interfaces, overcurrent protection, schematic diagrams, wiring diagrams, panel arrangements and grounding requirements to NWP for approval at least 21 calendar days prior to fabrication of the fan assemblies.

5.2.3. Electrical designs for this project shall comply with DOE requirements.

5.3. **Fan Assembly Electric Motor Requirements:** The Subcontractor shall ensure that the following electric motor requirements are met:

5.3.1. The electric fan motors shall be rated at the Subcontractor's specified voltage of 460 Volts or higher and shall be suitable for use in the desired application as specified in Appendix A, Air Intake Fan Data Sheet.

5.3.2. The Subcontractor shall select an electric fan motor that has a manufacturer's minimum efficiency rating of 95% and shall operate within the full range of the fan's specified torque and RPM curves. The selected electric fan motor and VFD shall be approved by the NWP project engineer prior to fabrication.

5.3.3. The Subcontractor shall ensure that all AC motors are rated, built, tested and applied in accordance with NEMA Standard MG1 and IEEE 841.

5.3.4. The electric fan motor shall be rated for inverter duty in accordance with NEMA MG-1, Part 31.

5.3.5. The electric fan motor starting current shall not exceed 6.5 times rated full load current at rated voltage, except for high efficiency motors. The electric fan motor shall be capable of withstanding the number of starts normally imposed by the driven equipment without appreciable loss of service life.

5.3.6. The electric fan motor shall operate without exceeding the applicable vibration allowances provided by NEMA MG 1, Part 7.

5.3.7. The remote operation, interfacing, indication and control requirements for the electric fan motor shall be incorporated in the schematic and all terminals for remote wiring and interfacing indicated on the wiring diagram.

5.4. **Fan Assembly Starter Requirements:** The Subcontractor shall ensure that the following starter requirements are met:

5.4.1. The Subcontractor shall ensure that the Fan will start via the VFD and no starter or other mechanism shall be required to start the fan.

5.5. **Fan Assembly Variable Frequency Drive Requirements:** The Subcontractor shall ensure that the following VFD requirements are met:

5.5.1. VFD Power Requirements: The VFD shall be designed and manufactured for incoming service line voltage, steady state voltage variation +/- 10 percent and frequency variation +/- 2 Hertz.

5.5.2. The VFD shall be designed for a service factor of 1.15 and shall power the motor in response to a variable speed control input. Note: The VFDs shall be de-rated for operation at the plant site surface elevation. The 1.15 service factor shall not be used to satisfy this requirement.

5.5.3. The VFD shall be specifically designed for electric fan motor applications and shall include the following fan specific features:

A. Dynamic braking.

B. Heating of motor windings for winter operation.

5.5.4. Permissive interlock for damper position switches. The permissive interlock is to delay start until switch is made. The VFD shall be a standard production model of the manufacturer. As a minimum, the following protective functions shall be provided:

A. AC input phase loss and overvoltage protection.

B. Motor and drive overload protection.

C. Output ground fault protection.

D. DC under-voltage protection.

E. Output short-circuit protection.

F. Over-temperature protection.

G. Surge protection from AC input line transients.

C. Delay start until switch is made.

H. Output phase protection.

5.5.5. In the event of a power loss, the VFDs shall be designed to shut down safely without component failure.

5.5.6. The Subcontractor shall ensure that there shall be no damage to the VFD in the event that an input or output contactor is opened or closed while the VFD is operating.

5.5.7. The Subcontractor shall determine where the VFDs shall be located as part of the Fan Assembly design. The Subcontractor shall be responsible for the fan layouts and distance to VFD building location. The Subcontractor shall verify that the distance from the VFD to the building is acceptable and whether input or output mitigation is required to prevent unacceptable voltage spikes at the motor or system harmonics.

5.5.8. The VFD internal control voltage shall be the manufacturer's standard. A Micro-processor based controller shall control, monitor and protect the entire VFD control system. The control and testing cards shall be modular and the plug-in type.

5.5.9. The Subcontractor shall provide the following control features for the VFD:

A. Volts/Hertz or sensor-less vector control.

B. Minimum and maximum speed set points with 8 preset speeds.

C. Current limit and set point.

D. Acceleration time (independent, adjustable and linear or S curve).

E. Deceleration time (independent, adjustable and linear or S curve).

F. The VFD shall be capable of speed control proportional to analog input of 4-20 mA DC. VFD analog input impedance shall be 250 ohms maximum.

G. The Human Interface Module (HIM) keypad shall be provided and mounted through the VFD front enclosure.

H. The HIM keypad shall be removable and contain non-volatile memory for uploading and downloading parameters for single and multiple drive installations.

I. The HIM keypad shall have Hand-Off-Auto functions with VFD's speed controls.

J. The following status indications shall be available on the VFD or VFD interface panel:

- Power On
- Run – Red Lens
- STOP – Green Lens

5.5.10. The following condition alarms shall be provided with the VFD and VFD interface panel:

A. Micro-processor Failure

B. Input/Phase Loss

C. Overcurrent/Instantaneous Trip

D. Input Overvoltage

E. Over-temperature

F. Overload

G. Ground Fault

5.5.11. The external control power of the VFD output power contactors can be 120V AC.

5.5.12. Provisions shall be made for remote control (ON-OFF) of the VFD by a maintained output contact. The output contact shall be closed for ON and opened for OFF.

5.5.13. The Subcontractor shall add a provision to remotely control the VFD from the site monitoring system. The Subcontractor shall identify the stable operating range of the VFD (for example, 40 to 60 Hz).

5.5.14. The Subcontractor shall ensure that the VFD selected shall be designed such that all condition alarms listed in section 5.5.9, paragraph J, and shall cause tripping of a fault output contact. If an input or output contactor is specified, this contact shall open the contactor.

5.5.15. The Subcontractor shall provide status signals via "dry contacts" rated for 3A, 24 VDC and limited by the total number of available input and output contacts.

5.5.16. The Subcontractor shall ensure that metering and indication are provided for the VFD. The display for local indication shall be discrete meters or selectable LED or LCD and mounted on the VFD's front panel. Remote indication shall require a 4-20 mA output from the VFD for each indication required. The outputs shall be isolated and ungrounded, capable of driving a load of 600 ohms.

5.5.17. For the enclosure of the VFD controller, the front of the enclosure or HIM panel shall include control functions and displays for the VFD variables.

5.5.18. The VFD shall have a speed input feedback loop. This loop shall match the driven equipment speed with the demand speed input.

5.5.19. The Subcontractor shall provide one set of each type and style of fuses as spare parts. These spare parts shall be delivered with the Fan Assemblies.

5.5.20. The Subcontractor shall provide communications for remote alarm, status and control of the VFD. Communications protocol options shall include Ethernet.

5.5.21. All enclosures shall be NEMA Type 12 enclosures.

5.5.22. The Subcontractor shall ensure that grounding for the enclosure shall meet the requirements of NFPA 70, National Electric Code and the following requirements:

A. Twisted pair cable shield shall not be connected with electrical system grounding but shall "float" at the VFD end.

B. Provisions shall be included for terminating an equipment grounding conductor for incoming line leads and motor leads.

5.5.23. The grounding conductor shall be green.

5.5.24. The VFD shall be manufactured by the ABB Group, Toshiba or Eaton companies unless approved in writing by NWP Electrical Engineering. The ABB Group is the NWP preferred VFD manufacturer.

5.5.25. The VFD shall include the following communications capabilities:

A. 6 – Programmable discrete inputs.

B. 6 - Programmable discrete outputs.

C. 2 – Programmable analog inputs.

D. 2 – Programmable analog outputs.

E. Ethernet Port.

5.6. **Additional Instrumentation Requirements:** The Subcontractor shall ensure that the following additional instrumentation requirements are met:

5.6.1. The Subcontractor shall ensure that remote monitoring of fan conditions shall be included in the fan assembly design by providing both a local display and a 4-20 mA output signal. The signal instrumentation shall comply with the ISA 5.1 standard where applicable. The Subcontractor shall provide recommendations for fan monitoring that may include the following:

1) Real-time fan bearing vibration.

2) Real-time fan and motor bearing temperature.

3) Real-time motor winding temperature.

4) Real-time Airflow (in fan assembly).

5) Real-time Fan Static Pressure.

6) Motor Voltage.

7) Motor Amperage.

5.6.2. The Subcontractor shall ensure that remote monitoring of the fans shall be through a local processing unit as determined by NWP Engineering.

5.6.3. NWP will provide airflow sensors in the plenum leading to the shaft. The Subcontractor shall incorporate a flow sensor in the fan assembly.

5.6.4. The Subcontractor shall not assign an equipment number to the Fan Assemblies. The equipment numbers shall be provided by NWP when required.

5.7. **Fan Assembly System Requirements:** The Subcontractor shall ensure that the following Fan Assembly system requirements are met:

5.7.1. The required fan duty requirements for each Fan while operating singularly and NOT in parallel shall be as follows:

A. The Fan's full ventilation demand is 520,000 cfm at 4.5 in. w.g. total delivered pressure (at the Plenum – this pressure does not include losses through the Fan Assembly or duct transitions to the Plenum) at a density of 0.068 lbm/ft^3 with fan efficiency greater than 80 percent.

B. The Fan's inlet air temperatures are expected to be between -17 ºF and 115 ºF.

5.7.2. It shall be the Subcontractor's responsibility to calculate the total and static pressure requirements of the new Fan Assembly System across the fan inlet, screen, silencer and exhaust duct to the horizontal plenum connection. The calculated total and static pressure is to the match point on the intake plenum. The Total Pressure (TP) and Static Pressure (SP) shall include the following considerations:

A. The additional pressure requirements associated with the inlet bell and screen. The Fan Assembly and duct work design shall take into account "Inlet System Effect Factor" as defined by AMCA Publication 201-90.

B. The additional pressure requirements associated with the exhaust to a duct and through the exhaust duct to the plenum. Design shall take into account "Outlet System Effect Factor" as defined by AMCA Publication 201-90. The Subcontractor shall include the pressure loss for the backdraft damper in the fan vendor calculations.

C. Sound attenuation shall be based on a "not to exceed value of 85 dBA at 1 meter (3.28 ft.) from the fan". If this is not achievable, the Subcontractor shall provide predicted sound levels at 1 meter from fan with silencers and/or duct insulation for NWP to evaluate.

D. Any duct losses to and from the fan to the plenum.

5.7.3. The fan shall be designed with a minimum life expectancy of 20 years with due consideration placed upon the prevailing intake air conditions (high dessert with blowing sand/wind).

5.7.4. The design and fabrication of the Fan Assemblies shall conform to this SOW and subsequent contract documents.

5.7.5. All components shall be corrosion resistant.

5.7.6. The fan shall be designed for the "minimum performance" limit for Class III Fans in accordance with the AMCA Publication 99-86.

5.7.7. The fan shall be designed based on AMCA certification performance ratings and the fan shall bear the AMCA seal.

5.7.8. The fan bearings shall be of the most appropriate type to provide a life of at least 100,000 hours. The bearings shall be sized for the class and maximum speed of the fan on which it is mounted. Tubing and fittings shall be provided to allow lubrication of all bearings without the removal of guards or screens.

5.7.9. The Subcontractor design engineer shall include components that will ensure balanced airflow to the inlets of each fan.

5.7.10. The fan shall be selected to operate in the stable part of the pressure-quantity curve for its predicted maximum duty. The fan selection shall also provide stable operation from 100% to 50% of design RPM.

5.7.11. The Fans shall have the capability to manually adjust the impeller blades.

5.7.12. The Fan motors shall be controlled by the VFD (inverter duty) and shall be specifically rated and matched to the drive by the Subcontractor.

5.7.13. All of the Fan's major components shall be equipped, if necessary, with lifting lugs ("eyes") located close to the center of gravity of the device that it is lifting. Lifting lugs ("eyes") must be appropriately designed to support the weight of the component.

5.7.14. All Fan Assembly welding shall be performed in accordance with the specifications listed in this SOW and subsequent contract documents.

5.7.15. The Fan Assemblies shall be factory tested per AMCA Standards. This includes fan performance and noise. VFD testing and vibration testing shall also be performed. The Subcontractor shall provide ports for Pitot tube traverse readings in order to verify internal instrument readings.

5.8. **Fan Assembly Civil and Structural Requirements:** The Subcontractor shall ensure that the following civil and structural requirements are met:

5.8.1. Structural design and drawings shall consist of:

A. Duct connections to plenum and each fan (design of duct from discharge of fan to single plenum)

B. Supports for duct to each fan

C. Fan, silencer, inlet bell supports

D. Fan supports (structural, if required)

E. Details on the connection to the horizontal plenum (designed by others)

5.9. Equipment Classification:

5.9.1. The Fan Assemblies are classified as Balance of Plant by NWP (industrial grade).

5.10. Subcontractor Required Meetings: The Subcontractor shall meet the following meeting requirements:

5.10.1. Pre-Proposal Meeting: The Subcontractor is invited to attend an on-site Pre-Proposal Meeting and visit the location where the Fan Assemblies will be installed. The date and time for the Pre-Proposal Meeting shall be specified in the Request for Proposal.

5.10.2. Post Award Meeting: The Subcontractor shall attend a Post Contract Award meeting to go over expectations and schedules for the tasks/submittals required to be met by the Subcontractor. The date and time for the Post Contract Award meeting shall be determined by NWP after contract award.

5.11. Subcontractor Work Plans: The Subcontractor shall ensure that the following requirements for work plans are met:

5.11.1. The Subcontractor shall submit a Packaging, Shipping, Receiving, Handling and Storage Plan. The Plan must include forms that will be utilized to document receipt, receipt inspection and acceptance, identify storage requirements and maintenance requirements during storage.

5.11.2. The Fan Assemblies shall be stored in a NWP warehouse upon delivery. The Subcontractor shall submit a Lift Plan for hoisting and setting the Fan Assemblies in the NWP warehouse.

5.12. Subcontractor Additional Requirements: The Subcontractor shall ensure that the following additional requirements are met:

5.12.1. The Subcontractor must have the capability and experience to design, fabricate and deliver the Fan Assemblies and all other required items in accordance with standard commercial practices and their NWP approved QA program. The Subcontractor shall provide qualified/trained personnel to perform all work activities required by this SOW and subsequent contract.

5.12.2. All on-site visits required by the Subcontractor shall occur during normal WIPP site workdays (Monday thru Thursday) and working hours (6:00 a.m. to 4:00 p.m.).

5.12.3. Use of tobacco, tobacco products (i.e. snuff, chewing tobacco), e-cigarettes or similar, etc. shall be prohibited except in designated smoking areas and shall not be used within 50 feet of any flammable items.

5.12.4. Subcontractor Employee Identification: Subcontractor personnel who will be required to come on site shall obtain Subcontractor badge(s) which shall be provided by NWP Security. Subcontractor personnel shall wear their Subcontractor badges in the front, located between the neck and waist at all times while at the WIPP site.

5.12.5. Subcontractor Employee Fitness for Duty Screening: The Subcontractor shall comply with NWP's requirements for Fitness for Duty screening, policies and restrictions. This shall apply to all Subcontractor personnel before being badged and while at the WIPP site.

5.12.6. The Subcontractor shall maintain a list of approved screened personnel who will or may come on site and submit this list to NWP with the proposal prior to any Subcontractor employee or representative coming on site.

5.12.7. The Subcontractor shall submit for NWP approval warranties for all components of the Fan Assemblies. These warranties shall be submitted to NWP for approval at least 21 calendar days prior to fabrication.

6. Quality Assurance Requirements: The Subcontractor shall ensure that the following QA requirements are met:

6.1. The Subcontractor shall submit their QA Program to NWP for approval with the proposal. Any work required by this SOW and subsequent contract documents shall be performed under the Subcontractor's NWP approved QA Program.

6.2. The Subcontractor must submit a Quality Control and Inspection Plan for NWP review and approval which includes the Quality Control (QC) and inspection requirements specific to work activities:

a. The Quality Control and Inspection Plan must define the inspection requirements
b. The Quality Control and Inspection Plan must list the required testing
c. Plan must identify required hold points for QC inspections
d. The Quality Control and Inspection Plan must identify the source of each requirement, the inspection criteria, and provide forms to be completed as the work progresses to assure required documentation is collected.

7. Requirements for Subcontractor Deliveries: The Subcontractor shall ensure that the following Fan Assembly delivery requirements are met:

7.1. The Subcontractor shall specify the earliest site delivery date in calendar days after contract award with their proposal. After contract award, the Subcontractor shall coordinate, in writing, all deliveries with NWP. In addition, the Subcontractor shall not ship any items to the WIPP site without written permission from NWP.

7.2. The Subcontractor shall be responsible for ensuring that the driver for the delivery company is a U.S. citizen and has a valid driver's license.

7.3. All items (Fan Assemblies, components, parts, etc.) that are being delivered to the WIPP site by the Subcontractor or a third party delivery company shall have a delivery invoice which includes the Subcontractor's name, NWP procurement document no., detailed description of what items are being delivered and the location of the storage area for the items. The Subcontractor shall not deliver any items to the WIPP site without the previous items being met.

7.4. The Subcontractor shall specify the recommended unloading, storage and handling procedures for the Fan Assemblies and any other items supplied as part of this SOW and subsequent contract documents.

7.5. The Subcontractor shall provide a representative to be on-site during the delivery and receipt of the Fan Assembly shipment(s) for the purpose of providing technical assistance and inspecting materials for any defects or omissions.

ATTACHMENT A – Air Intake Fan Data Sheet

QTY. 2

LOCATION: SURFACE FANS ON UTILITY SHAFT NO 5 (OPERATING SINGULARLY AND **NOT** IN PARALLEL)

FAN CRITERIA (AT FULL LOAD):

AIRFLOW*: 520,000 CFM
NO STARTER
VARIABLE FREQUENCY DRIVE(S)/ ONE FOR EACH FAN
EFFICIENCY > 80% @ FULL LOAD
FAN DELIVERED PRESSURE*: 4.5 IN. W.G
AIR DENSITY: 0.068 LB/FT^3
AIR INLET DESIGN TEMP. (ºF)/RH (%): WINTER -17 ºF /25% SUMMER 115 ºF/20%
* AT AIR DENSITY GIVEN.
* FAN DELIVERED PRESSURE **DOES NOT INCLUDE LOSSES THROUGH FAN ASSEMBLY TO PLENUM**.

FAN SELECTION (AT FULL LOAD): SELLER PROVIDED

FAN MODEL: _____ FAN TYPE: _____ MANUFACTURER: _____

TOTAL PRESSURE**: _____ STATIC PRESSURE**: _____

BHP: _____ RPM: _____

DISCH. VEL. _____

SOUND ATTENUATOR: ___ YES ____ NO BLADE/IMPELLER TYPE: _____

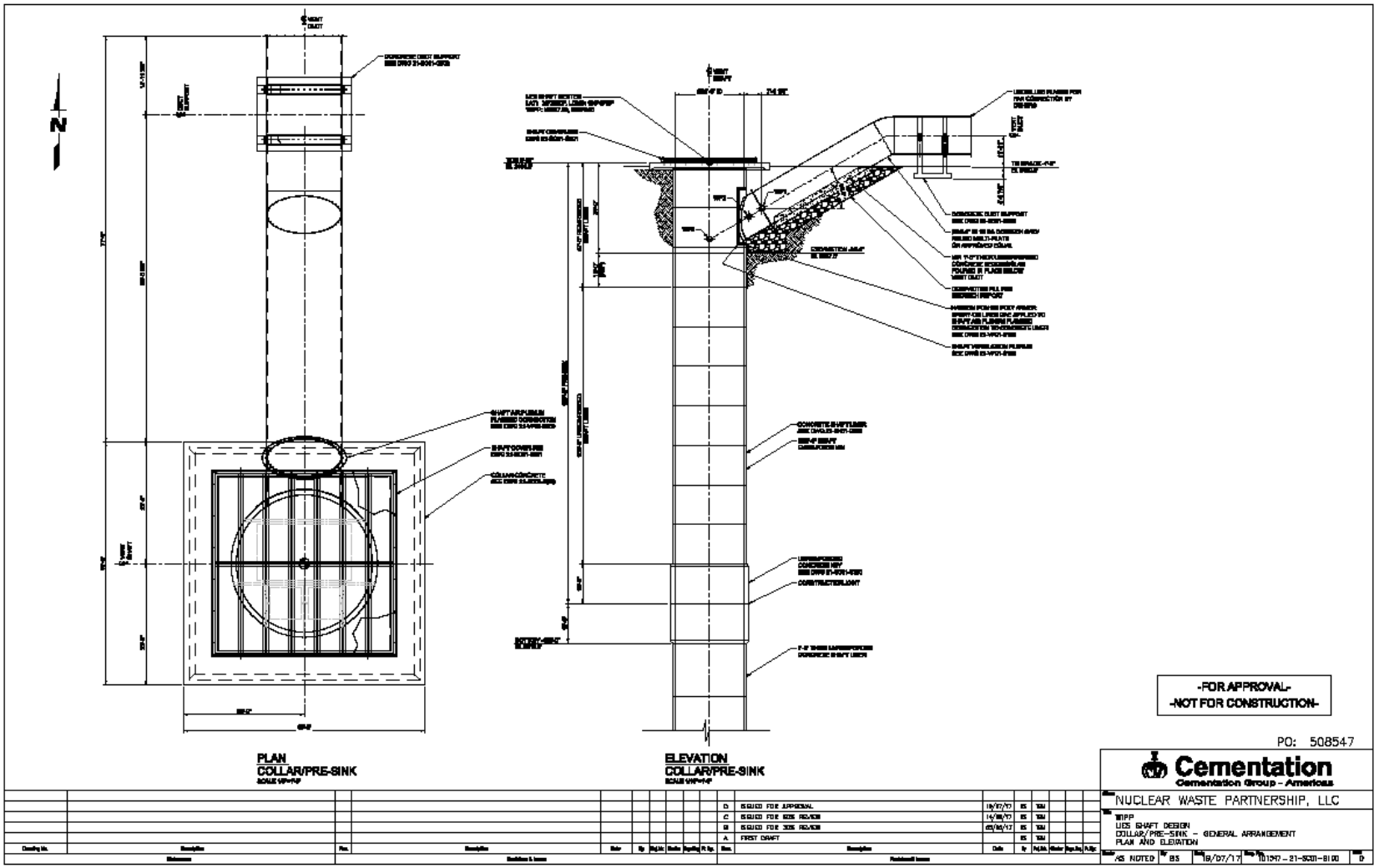
** FAN TOTAL PRESSURE AND FAN STATIC PRESSURE INCLUDING ADDITIONAL PRESSURES FROM ENTRY LOSS, EXIT LOSS, DUCT, SOUND ATTENUATION, ETC.

REMARKS:

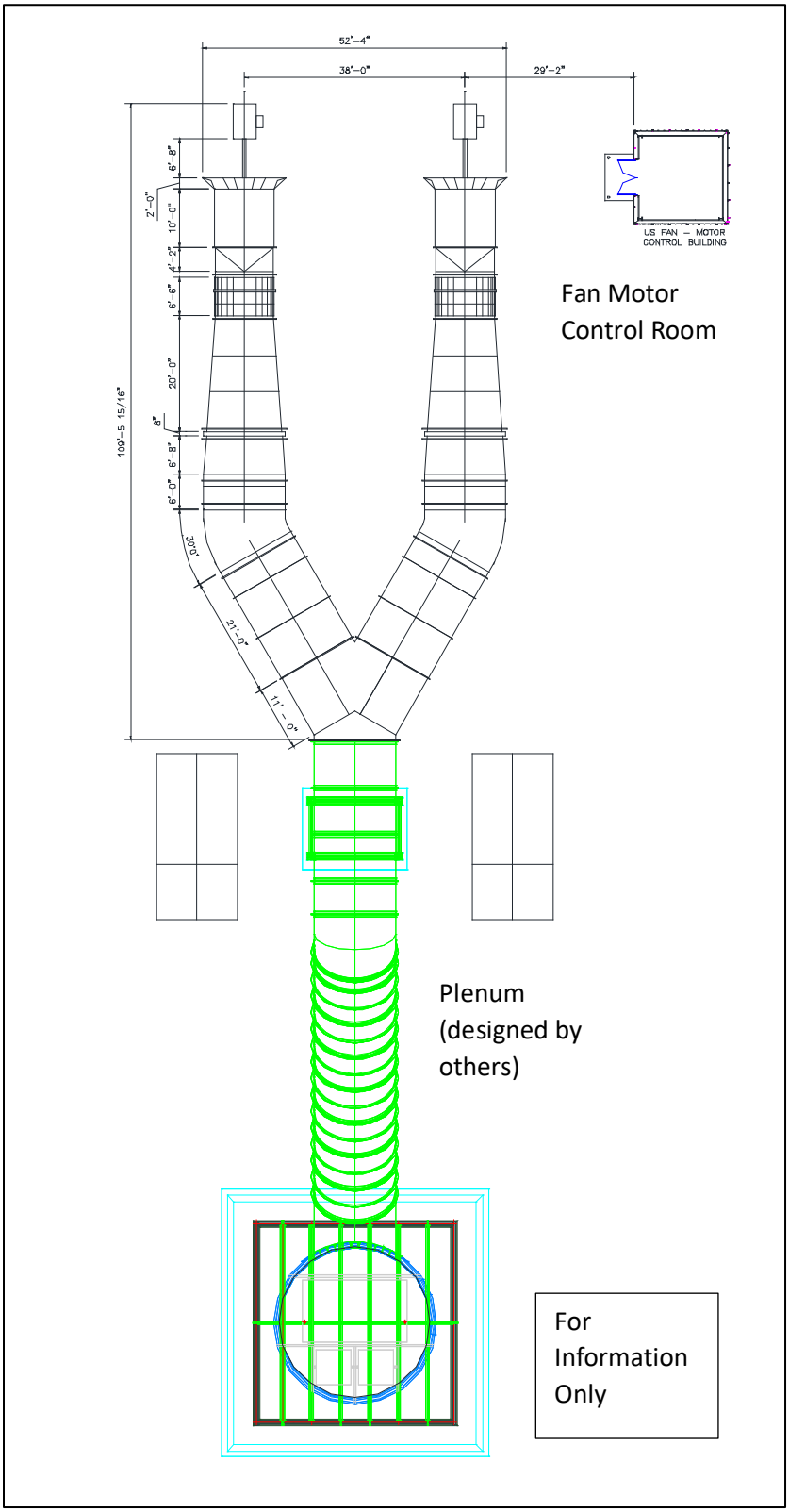
Power provided by NWP – 4160 VAC @ 60Hz

NOTE: Offeror shall fill in all the blanks.

ATTACHMENT B – Reference Drawing of Air Plenum and Utility Shaft



APPENDIX C – Option for Parallel Fan Installation



Attachment D – Submittals Table

SUBMIT DOCUMENTS IN ACCORDANCE WITH THE BELOW CODES:

D – DELIVERY

F – FABRICATION

P – WITH PROPOSAL

R – RECORD

S – SHIPMENT

T – TESTING

SOW or Spec. No.	Description of Submittal or Special Condition	For Approval (A)/ Record (R)	Date Due to NWP or Prior to
SOW Section 2.1.2, Part A	Detailed Drawings of the proposed Duct Work design.	**A**	At least 21 calendar days prior to **F**
SOW Section 2.1.2, Part C and Section 2.1.5	Detailed Fan Assembly Design Drawings that include a bill of material.	**A**	At least 21 calendar days prior to **F**
SOW Section 2.1.2, Part F and Section 2.1.5	Detailed Fabrication and Assembly Drawings and Layouts.	**A**	At least 21 calendar days prior to **F**
SOW Section 2.1.2, Part H	Written Installation Instructions for the Fan Assemblies, including drawings.	**A**	At least 21 calendar days prior to **F**
SOW Section 2.1.2, Part I	Factory Acceptance Testing Plan	**A**	At least 21 calendar days prior to **F**
SOW Section 2.1.3	Individual RFIs	Review and Respond	As initiated
SOW Section 2.1.5	Fan Assembly Fabrication Schedule	**A**	**P**
SOW Section 5.1.1	Equipment Outlines	**A**	At least 21 calendar days prior to **F**

SOW Section 5.1.1	Maintenance and Operating Manuals	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Catalog Information for the Variable Frequency Drives.	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Catalog Information for the Instrumentation and Motors (Drivers).	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Construction Details for each Fan Assembly	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Catalog Information for the Variable Frequency Drive Controls	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Fan Performance Curves	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Motor Performance Curves and data	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Variable Frequency Drive ratings	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Product Certifications	**A**	At least 21 calendar days prior to **F**
SOW Section 5.1.1	Fan Data Sheets	**A**	**P**
SOW Section 5.1.1	VFD Data Sheets	**A**	**P**
SOW Section 5.2.2	Electrical Design Drawings	**A**	At least 21 calendar days prior to **F**
SOW Section 5.11.1	Packaging, Shipping, Receiving, Handling and Storage Plan	**A**	**P**

SOW Section 5.11.2	Lift Plan	**A**	At least 21 calendar days prior to **D**
SOW Section 5.12.6	List of Approved Screened Personnel	**A**	**P**
SOW Section 5.12.7	Warranties for all components of the Fan Assemblies	**A**	At least 21 calendar days prior to **F**
SOW Section 6.1	QA Program	**A**	**P**
SOW Section 6.2	QC Program	**A**	**P**