

DEPARTMENT OF THE ARMY
 Omaha District, Corps of Engineers
 106 South 15th Street
 Omaha, Nebraska 68102-1618

:NOTICE: Failure to acknowledge : Solicitation No. DACA45 02 R 0033
:all amendments may cause rejec- :
:tion of the offer. See FAR : Date of Issue: 25 JUN 2002
:52.215-1 of Section 00100 : Date of Receiving Proposals:
 08 AUG 2002

Amendment No. 0001
 10 July 2002

SUBJECT: Amendment No. 0001 to specification and drawings for Construction of
 CONSTRUCT HYDRANT FUEL SYSTEM, PDC NO. QJVF 95-2002P1, MINOT AFB,
 NORTH DAKOTA.
 Solicitation No. DACA45 02 R 0033.

TO: Prospective Offerors and Others Concerned

1. The specifications and drawings for subject project are hereby modified
 as follows (revise all specification indices, attachment lists, and drawing
 indices accordingly).

a. Specifications. (Descriptive Changes.)

(1) Section 00110, Page 5, Table 1, to the end of the table, add:

“

Tab 5	Subcontracting Plan
	a. Subcontracting Plan (if a large business)

“.

(2) Section 00800, Page 6, delete paragraph 1.8 in its entirety
 and substitute:

“1.8 GOVERNMENT-FURNISHED PROPERTY

Pursuant to CONTRACT CLAUSES clause: "Government-Furnished Property
 (Short Form)" the Government will furnish to the Contractor the following
 property to be incorporated or installed in the work. Such property will
 be furnished at the project site and the Contractor shall accept delivery
 when made, and unload and transport the property to the jobsite at his
 own expense. All such property will be installed or incorporated into
 the work at the expense of the Contractor. The Contractor shall verify
 the quantity and condition of such Government-furnished property when
 delivered to him, acknowledge receipt thereof in writing to the
 Contracting Officer, and in case of damage to or shortage of such
 property, shall within 24 hours report in writing such damage or shortage
 to the Contracting Officer.

Quantity	Item/Description	Estimated Dollar Value
1	300 kw Diesel-Generator (See Section 16264A)“.	\$45,000

(3) General Wage Decision ND020005, delete General Wage Decision No. ND020005 in its entirety and substitute modified General Wage Decision No. ND020005 dated 07/05/2002.

(4) Section 01330, Submittal Register, revise submittal register in accordance with attached register for Section 16264A.

b. Specifications (New and/or Revised and Reissued). Delete and substitute or add specification pages as noted below. The substituted pages are revised and reissued with this amendment.

<u>Pages Deleted</u>	<u>Pages Substituted or Added</u>
Section 16264A	Section 16264A

c. Drawings (Not Reissued). The following drawings are revised as indicated below with latest revision date of 10 July 2002. These drawings are not reissued with this amendment.

(1) Dwg. AF 125-20-01, Sheet C1.04, NOTES, following note 3, add:

"4. EACH PUMPHOUSE HAS EIGHT (8) 50,000 GALLON UNDERGROUND FUEL STORAGE TANKS. AFTER COMPLETION OF THE EXISTING OUTLET REMOVAL, THE PIPE FROM THE LATERAL CONTROL PITS SHALL BE FLUSHED WITH 2 GALLONS OF WATER PER FOOT LENGTH OF PIPE, AND THE TANKS SHALL BE CLEANED PER SPECIFICATION SECTION 02115A."

d. Drawings (Reissued). The following drawings are revised with latest revision date of 10 July 2002, and reissued with this amendment.

(1) Dwg. AF 125-20-01, Sheet E6.01.

(2) Dwg. AF 125-90-01, Sheets M1.01 and M2.01.

(3) Dwg. AF 125-90-01, Sheets E1.01 and E4.01.

2. This amendment is a part of the proposing papers and its receipt shall be acknowledged on the Standard Form 1442. All other conditions and requirements of the specifications remain unchanged. If the proposals have been mailed prior to receiving this amendment, you will notify the office where proposals are received, in the specified manner, immediately of its receipt and of any changes in your proposal occasioned thereby.

a. Hand-Carried Proposals shall be delivered to the U.S. Army Corps of Engineers, Omaha District, Contracting Division (Room 301), 106 South 15th Street, Omaha, Nebraska 68102-1618.

b. Mailed Proposals shall be addressed as noted in Item 8 on Page 00010-1 of Standard Form 1442.

3. Section 02115A will be added by a subsequent amendment.

4. Offers will be received until 2:00 p.m., local time at place of receiving proposals, 08 AUG 2002.

Attachments:

General Wage Decision No. ND020005 dated 07/05/2002

Submittal Register for Section 16264A

Spec Pages listed in 1.b. above

Dwgs. listed in 1.d. above

U.S. Army Engineer District, Omaha

Corps of Engineers

106 South 15th Street

Omaha, Nebraska 68102-1618

10 July 2002

DRL/4547

General Decision Number ND020005

General Decision Number ND020005
Superseded General Decision No. ND010005

State: North Dakota

Construction Type:

BUILDING

County(ies):

WARD

Building Projects (does not include single family homes and
apartments up to and including 4 stories)

Modification Number	Publication Date
0	03/01/2002
1	07/05/2002

COUNTY(ies):

WARD

BRND0002B 06/01/1996

	Rates	Fringes
BRICLAYERS	19.35	1.50

CARP1176C 05/01/1999

	Rates	Fringes
CARPENTER(Including formwork, drywall hanging, drywall finishing, & cabinet installation; excluding metal building erection, heat and frost insulation, soft flooring & gypcrete flooring)	14.26	5.80

* ELEC0714E 07/01/2002

	Rates	Fringes
WARD COUNTY: ELECTRICIANS(including low voltage wiring for telephones, computers, doorbells, alarms, & HVAC controls)	21.42	6.15+11%

PLUM0338C 01/01/1998

	Rates	Fringes
PLUMBERS(incl HVAC piping)	19.56	4.30

SHEE9010A 06/04/1998

	Rates	Fringes
SHEET METAL WORKERS(HVAC only)	15.11	4.93

SUND1024A 03/23/2000

	Rates	Fringes
HEAT AND FROST INSULATOR LABORERS:	8.00	.66
Unskilled	8.70	
Mason Tender	9.88	
PAINTERS (including paper hanging ecluding drywall finishing)	12.05	
POWER EQUIPMENT OPERATORS:		
Crane	15.55	5.10
Skid Steer	9.64	
TILE SETTER	11.50	.22

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
=====

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can

be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION						CONTRACTOR											
Construct Hydrant Fuel System, Minot AFB, North Dakota																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		16264A	SD-02 Shop Drawings														
			Layout		G RE												
			Drawings		G RE												
			Acceptance	3.9	G RE												
			SD-03 Product Data														
			Performance Tests	3.5.5	G RE												
			Sound Limitations	2.6	G RE												
			Integral Main Fuel Storage Tank		G ED												
			Day Tank		G RE												
			Vibration Isolation	1.4.6	G RE												
			Field Engineer	1.4.8	G RE												
			Site Welding		G RE												
			Site Visit		G RE												
			SD-06 Test Reports														
			Onsite Inspection and Tests	3.5	G RE												
			SD-07 Certificates														
			Sound limitations	2.6	G RE												
			Materials and Equipment	2.1	G RE												
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SECTION 16264A

GFCI DIESEL-GENERATOR SET, STATIONARY 15-300 KW, STANDBY APPLICATIONS
02/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1998) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 106	(1997a) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 135	(1997) Electric-Resistance-Welded Steel Pipe
ASTM A 181/A 181M	(1995b) Carbon Steel Forgings for General-Purpose Piping
ASTM A 234/A 234M	(1997) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

ASME INTERNATIONAL (ASME)

ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.5	(1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24
ASME B16.11	1996) Forged Fittings, Socket-Welding and Threaded

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(1997) National Electrical Safety Code
IEEE Std 1	(1986; R 1992) General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1

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IEEE Std 100	(1996) IEEE Standard Dictionary of Electrical and Electronics Terms
IEEE Std 120	(1989) Electrical Measurements in Power Circuits
MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)	
MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1996) Pipe Hangers and Supports - Selection and Application
MSS SP-80	(1997) Bronze Gate, Globe, Angle and Check Valves
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 30	(1996; Errata TIA 96-2) Flammable and Combustible Liquids Code
NFPA 70	(2002) National Electrical Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Layout; G-RE
Drawings; G-RE

- a. thru d. --> Not Used.
- e. Exhaust system.
- f. Electric wiring of relays, breakers, programmable controllers, and switches including single line and wiring diagrams.
- g. Not Used.
- h. Location, type, and description of vibration isolation devices.
- i. Not Used.
- j. Not Used.
- k. Panel layouts.
- l. Mounting and support for each panel and major piece of electrical equipment.

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m. Not Used..

Acceptance; G-RE

Drawings which accurately depict the as-built configuration of the installation, upon acceptance of the diesel-generator set installation. Layout drawings shall be revised to reflect the as-built conditions and submitted with the as-built drawings.

SD-03 Product Data

Performance Tests; G-RE

Sound Limitations; G-RE

Sound power level data for the packaged unit operating at 100% load in a free field environment. The data should demonstrate compliance with the sound limitation requirements of this specification.

Integral Main Fuel Storage Tank; G-ED

Day Tank; G-RE

Calculations for the capacity of each day tank, including allowances for recirculated fuel, usable tank capacity, and duration of fuel supply.

Vibration Isolation; G-RE

Vibration isolation system performance data for the range of frequencies generated by the engine-generator set during operation from no load to full load and the maximum vibration transmitted to the floor. Description of seismic qualification of the engine-generator mounting, base, and vibration isolation.

Field Engineer; G-RE

A letter listing the qualifications, schools, formal training, and experience of the field engineer.

Site Welding; G-RE

A letter listing the welder qualifying procedures for each welder, complete with supporting data such as test procedures used, what was tested to, and a list of the names of all welders and their qualifications symbols.

Site Visit; G-RE

A site visit letter stating the date the site was visited and listing discrepancies found.

SD-06 Test Reports

Onsite Inspection and Tests; G-RE

a. A letter giving notice of the proposed dates of all onsite

inspections and tests at least 14 days prior to beginning tests.

b. A detailed description of the Contractor's proposed procedures for onsite tests including the test including the test plan and a listing of equipment necessary to perform the tests. Submission shall be at least 7 days prior to beginning tests.

c. Six copies of the onsite test data described below in 8-1/2 x 11 inch 3-ring binders with a separate section for each test. Sections shall be separated by dividers with tabs. Data plots shall be full size 8-1/2 x 11 inches minimum), showing all grid lines, with full resolution.

- (1) A description of the procedures for onsite tests.
- (2) A list of equipment used, with calibration certifications.
- (3) A copy of measurements taken, with required plots and graphs.
- (4) The date of testing.
- (5) The parameters verified.
- (6) The condition specified for the parameter.
- (7) The test results, signed and dated.
- (8) A description of all adjustments made.

SD-07 Certificates

Sound limitations; G-RE

A certification from the manufacturer stating that the sound emissions meet the specification.

Materials and Equipment; G-RE

A letter stating that where materials or equipment are specified to comply with requirements of UL, or other standards, written proof of such compliance has been obtained. The label or listing of the specified agency, or a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency are acceptable as proof.

Inspections; G-RE

A letter certifying that all facilities are complete and functional, that each system is fully functional, and that each item of equipment is complete, free from damage, adjusted, and ready for beneficial use.

1.3 SYSTEM DESCRIPTION

The GFCI engine-generator set shall be installed and tested.

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1.4 GENERAL REQUIREMENTS

1.4.1 Engine-Generator Set

The engine generator set will be available to the Contractor on or before the 1st of May 2003. It will be a 300 kw standby-rated unit.

1.4.2 Not Used.

1.4.3 Not Used

1.4.4 Verification of Dimensions

Before performing work, the premises shall be visited and details of the work verified. The Contracting Officer shall be advised in writing of any discrepancies before performing any work.

1.4.5 Conformance to Codes and Standards

Where equipment is specified to conform to requirements of any code or standard such as UL, the design, fabrication and installation shall conform to the code.

1.4.6 Vibration Isolation

The engine-generator set shall be provided with vibration-isolation in accordance with the manufacturer's standard recommendation. Vibration-isolation system shall be the type that secures the base to the unit's foundation.

1.4.7 Not Used

1.4.8 Field Engineer

The Contractor shall have the engine-generator set manufacturer furnish a qualified field engineer to supervise the complete installation of the engine-generator set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment. The field engineer shall have attended the engine-generator manufacturer's training courses on installation and operation and maintenance for engine generator sets.

1.5 STORAGE AND INSTALLATION

The Contractor shall properly protect material and equipment in accordance with the manufacturers recommended storage procedures, before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be as specified.

2.1.1 Not Used.

2.1.2 Pipe (Sleeves, Fuel/Lube-oil, Compressed-Air, Coolant and Exhaust)

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ASTM A 53, ASTM A 106 or ASTM A 135, steel pipe. Pipe smaller than 2 inches shall be Schedule 80. Pipe 2 inches and larger shall be Schedule 40.

2.1.3 Pipe Flanges and Fittings

- a. Pipe Flanges and Flanged Fittings: ASTM A 181/A 181M, Class 60, or ASME B16.5, Grade 1, Class 150.
- b. Pipe Welding Fittings: ASTM A 234/A 234M, Grade WPB or WPC, Class 150, or ASME B16.11, 3000 lb.
- c. Threaded Fittings: ASME B16.3, Class 150.
- d. Valves: MSS SP-80, Class 150.
- e. Gaskets: Manufacturers Standard.

2.1.4 Pipe Hangers

MSS SP-58 and MSS SP-69.

- 2.2 NOT USED
- 2.3 NOT USED
- 2.4 NOT USED
- 2.5 NOT USED

2.6 SOUND LIMITATIONS

The noise generated by the installed diesel generator set operating at 100 percent load shall not exceed the following sound pressure levels in any of the indicated frequencies when measured at a distance of 75 feet from the end of the exhaust.

Frequency Band (Hz)	Maximum Acceptable Pressure Level (Decibels)
31	87
63	87
125	77
250	70
500	64
1,000	61
2,000	60
4,000	60
8,000	62

2.7 NOT USED

2.8 EXHAUST SYSTEM

The system shall be as recommended by the diesel generator set manufacturer. Piping shall be supported so as to minimize vibration. Where a V-type engine is provided, a V-type connector with necessary flexible sections and hardware shall connect the engine exhaust outlets.

2.8.1 Flexible Sections and Expansion Joints

A flexible section at each engine and an expansion joint at each muffler

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shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for diesel-engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.

2.8.2 Exhaust Muffler

A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for outside or inside horizontal mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature 400 degrees F resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations in paragraph SOUND LIMITATIONS. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

2.8.3 Exhaust Piping

Horizontal sections of exhaust piping shall be sloped downward away from the engine to a condensate trap and drain valve. Changes in direction shall be long-radius. Exhaust piping, mufflers and silencers installed inside any building shall be insulated in accordance with paragraph THERMAL INSULATION and covered to protect personnel. Vertical exhaust piping shall be provided with a hinged, gravity operated, self-closing, rain cover.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

Installation shall provide clear space for operation and maintenance in accordance with NFPA 70 and IEEE C2. Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the engine-generator set.

3.2 PIPING INSTALLATION

3.2.1 General

Piping shall be welded. Connections at valves shall be flanged. Connections at equipment shall be flanged except that connections to the diesel engine may be threaded if the diesel-engine manufacturer's standard connection is threaded. Except as otherwise specified, flanged fittings shall be utilized to allow for complete dismantling and removal of each piping system from the facility without disconnecting or removing any portion of any other system's equipment or piping. Connections to all equipment shall be made with flexible connectors. Pipes extending through the roof shall be properly flashed. Piping shall be installed clear of windows, doors, and openings to permit thermal expansion and contraction without damage to joints or hangers, and with a 1/2 inch drain valve at each low point.

3.2.2 Supports

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Hangers, inserts, and supports shall be of sufficient size to accommodate any insulation and shall conform to MSS SP-58 and MSS SP-69. Supports shall be spaced not more than 7 feet on center for pipes 2 inches in diameter or less, not more than 12 feet on center for pipes larger than 2 inches but no larger than 4 inches, and not more than 17 feet on center for pipes larger than 4 inches in diameter. Supports shall be provided at pipe bends or change of direction. If support requirements in these specs conflict with those indicated on the drawings, the requirements on the drawings shall govern.

3.2.2.1 Ceiling and Roof

Exhaust piping shall be supported with appropriately sized type 41 single pipe roll and threaded rods; all other piping shall be supported with appropriately sized type 1 clevis and threaded rods.

3.2.2.2 Wall

Wall supports for pipe shall be made by suspending the pipe from appropriately sized type 33 brackets with the appropriate ceiling and roof pipe supports.

3.2.3 Flanged Joints

Flanges shall be 125 pound type, drilled, and of the proper size and configuration to match equipment and diesel-engine connections. Gaskets shall be factory cut in one piece 1/16 inch thick.

3.2.4 Cleaning

After fabrication and before assembly, piping interiors shall be manually wiped clean of all debris.

3.2.5 Pipe Sleeves

Pipes passing through construction such as ceilings, floors, or walls shall be fitted with sleeves. Each sleeve shall extend through and be securely fastened in its respective structure and shall be cut flush with each surface. The structure shall be built tightly to the sleeve. The inside diameter of each sleeve shall be 1/2 inch, and where pipes pass through combustible materials, 1 inch larger than the outside diameter of the passing pipe or pipe covering.

3.3 ELECTRICAL INSTALLATION

Electrical installation shall comply with NFPA 70, IEEE C2, and Section 16415A ELECTRICAL WORK, INTERIOR.

3.3.1 Vibration Isolation

Flexible fittings shall be provided for all conduit, cable trays, and raceways attached to engine-generator sets. Metallic conductor cables installed on the engine generator set and from the engine generator set to equipment not mounted on the engine generator set shall be flexible stranded conductor. Terminations of conductors on the engine generator set shall be crimp-type terminals or lugs.

3.4 FIELD PAINTING

Field painting shall be as specified in Section 09900A PAINTING, GENERAL.

3.5 ONSITE INSPECTION AND TESTS

3.5.1 Test Conditions

3.5.1.1 Data

Measurements shall be made and recorded of parameters as specified. Unless otherwise indicated, data shall be taken during engine-generator set operation and recorded in 15 minute intervals and shall include: readings of engine-generator set meters and gauges for electrical and power parameters; oil pressure; ambient temperature; and engine temperatures available from meters and gauges supplied as permanent equipment on the engine-generator set. In the following tests where measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.), stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Electrical measurements shall be performed in accordance with IEEE Std 120. Definitions and terms are in accordance with IEEE Std 100. Temperature limits in the rating of electrical equipment and for the evaluation of electrical insulation shall be in accordance with IEEE Std 1.

3.5.1.2 Power Factor

Engine-generator set operating tests shall be made utilizing a load with the power factor of 0.80 (80 percent).

3.5.1.3 Contractor Supplied Items

The Contractor shall provide all equipment and supplies required for inspections and tests including fuel, test instruments, and loadbanks at the specified power factors.

3.5.1.4 Instruments

Readings of panel gauges, meters, displays, and instruments, provided under this specification shall be verified during test runs by test instruments of precision and accuracy greater than the tested items. Test instrument accuracy shall be at least as follows: current, 1.5%; voltage, 1.5%; real power, 1.5%; reactive power, 1.5%; power factor, 3%; frequency, 0.5%. Test instruments shall be calibrated by a recognized standards laboratory within 90 days prior to testing.

3.5.1.5 Sequence

The sequence of testing shall be as specified in the approved testing plan unless variance is authorized by the Contracting Officer. Field testing shall be performed in the presence of the Contracting Officer. Tests may be scheduled and sequenced in order to optimize run-time periods; however the following general order of testing shall be followed: Construction Tests; Inspections; Safety run Tests; and Performance Tests and Final Inspection.

3.5.2 Construction Tests

Individual component and equipment functional tests for fuel piping,

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coolant piping, and lubricating-oil piping, electrical circuit continuity, insulation resistance, circuit protective devices, and equipment not provided by the engine-generator set manufacturer shall be performed prior to connection to the engine-generator set.

3.5.2.1 Piping Test

- a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping, until the outflowing fluid has no obvious sediment or emulsion.
- b. Fuel piping which is external to the engine-generator set shall be tested in accordance with NFPA 30. All remaining piping which is external to the engine generator set shall be pressure tested with air pressure at 150% of the maximum anticipated working pressure, but in no case less than 150 psig, for a period of 2 hours to prove the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

3.5.2.2 Electrical Equipment Tests

- a. Low-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the distribution bus. Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

R in megohms = (rated voltage in kV + 1) x 304,800/(length of cable in meters).

(R in megohms = (rated voltage in kV + 1) x 1000/(length of cable in feet))

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

- b. Ground-Resistance Tests. The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- 1) Single rod electrode - 25 ohms.
- 2) Multiple rod electrodes - 25 ohms.
- 3) Ground mat - 25 ohms.

- c. Circuit breakers and switchgear shall be examined and tested in accordance with manufacturer's published instructions for

functional testing.

3.5.3 Inspections

The following inspections shall be performed jointly by the Contracting Officer and the Contractor, after complete installation of each engine-generator set and its associated equipment, and prior to startup of the engine-generator set. Checks applicable to the installation shall be performed. The results of those which are physical inspections (I) shall be documented by the Contractor and submitted in accordance with paragraph SUBMITTALS. Inspections shall verify that equipment type, features, accessibility, installation and condition are in accordance with the contract specification.

1. Drive belts. (I)
2. Governor type and features. (I)
3. Engine timing mark. (I)
4. Starting motor. (I)
5. Starting aids. (I)
6. Coolant type and concentration. (I)
7. Radiator drains. (I)
8. Block coolant drains. (I)
9. Coolant fill level. (I)
10. Coolant line connections. (I)
11. Coolant hoses. (I)
12. Combustion air filter. (I)
13. Intake air silencer. (I)
14. Lube oil type. (I)
15. Lube oil drain. (I)
16. Lube-oil filter. (I)
17. Lube-oil-fill level. (I)
18. Lube-oil line connections. (I)
19. Lube-oil lines. (I)
20. Fuel type. (I)
21. Fuel-level. (I)
22. Fuel-line connections. (I)
23. Fuel lines. (I)
24. Fuel filter. (I)
25. Access for maintenance. (I)
26. Voltage regulator. (I)
27. Battery-charger connections. (I)
28. Wiring & terminations. (I)
29. Instrumentation. (I)
30. Hazards to personnel. (I)
31. Base. (I)
32. Nameplates. (I)
33. Paint. (I)
34. Exhaust system. (I)
35. Access provided to controls. (I)
36. Enclosure. (I)
37. Engine & generator mounting bolts (proper application). (I)

3.5.4 Safety Run Tests

- a. Perform and record engine manufacturer's recommended prestarting checks and inspections.
- b. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a

reasonable warm-up period.

- c. Activate the manual emergency stop switch and verify that the engine stops.
- d. Remove the high and pre-high lubricating oil temperature sensing elements from the engine and temporarily install temperature gauge in their normal locations on the engine (required for safety, not for recorded data). Where necessary, provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- e. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize. Monitor the temporarily installed temperature gauges. If temperature reading exceeds the value for an alarm condition, activate the manual emergency stop switch.
- f. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- g. Remove the high and pre-high coolant temperature sensing elements from the engine and temporarily seal their normal location on the engine and temporarily install temperature gauges in their normal locations on the engine (required for safety, not for recorded data). Where necessary provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- h. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize.
- i. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- j. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- k. Operate the engine generator-set for at least 30 minutes at 100 percent of service load.
- l. Verify proper operation of the governor and voltage regulator.
- m. Verify proper operation and setpoints of gauges and instruments.
- n. Verify proper operation of ancillary equipment.
- o. Manually adjust the governor to increase engine speed past the overspeed limit. Record the RPM at which the engine shuts down.

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- p. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of rated load.
- q. Manually fill the day tank to a level above the overfill limit. Record the level at which the overfill alarm sounds. Verify shutdown of the fuel transfer pump. Drain the day tank down below the overfill limit.
- r. Shut down the engine. Remove the time-delay low lube oil pressure alarm bypass and try to start the engine. Record the results.
- s. Attach a manifold to the engine oil system (at the oil sensor pressure port) that contains a shutoff valve in series with a connection for the engine's oil pressure sensor followed by an oil pressure gauge ending with a bleed valve. The engine's oil pressure sensor shall be moved from the engine to the manifold and its normal location on the engine temporarily sealed. The manifold shutoff valve shall be open and bleed valve closed.
- t. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of service load.
- u. Close the manifold shutoff valve. Slowly allow the pressure in the manifold to bleed off through the bleed valve while watching the pressure gauge. Record the pressure at which the engine shuts down. Catch oil spillage from the bleed valve in a container. Add the oil from the container back to the engine, remove the manifold, and reinstall the engine's oil pressure sensor on the engine.
- v. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 100% of service load. Record the maximum sound level in each frequency band at a distance of 75 feet from the end of the exhaust outlet. The measurements should comply with the paragraph SOUND LIMITATIONS. If a sound limiting enclosure is not provided, the muffler shall be modified or replaced as required to meet the sound limitations of this specification. If the sound limitations can not be obtained by modifying or replacing the muffler and air intact silencer, the contractor shall notify the Contracting Officer and provide a recommendation for meeting the sound limitations.
- w. Manually drain off fuel slowly from the day tank to empty it to below the low fuel level limit and record the level at which the audible alarm sounds. Add fuel back to the day tank to fill it above low level alarm limits.

3.5.5 Performance Tests

3.5.5.1 Continuous Engine Load Run Test

The engine-generator set and ancillary systems shall be tested at service load to: demonstrate durability; verify that heat of extended operation

does not adversely affect or cause failure in any part of the system; and check all parts of the system. If the engine load run test is interrupted for any reason, the entire test shall be repeated. The engine load run test shall be accomplished principally during daylight hours, with an average ambient temperature of 60 degrees F. After each change in load in the following test, measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the allowable range.

Measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Data taken at 15 minutes intervals shall include the following:

a. Electrical: Output amperes, voltage, real and reactive power, power factor, frequency.

b. Pressure: Lube-oil.

c. Temperature: Coolant.
Lube-oil.
Ambient.

(1) Perform and record engine manufacturer's recommended prestarting checks and inspections. Include as a minimum checking of coolant fluid, fuel, and lube-oil levels.

(2) Start the engine; make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.

(3) Operate the engine generator-set for at least 2 hours at 75 percent of service load.

(4) Increase load to 100% of service load and operate the engine generator-set for at least 2 hours.

(5) Remove load from the engine-generator set.

3.5.5.2 Load Acceptance Test

Engine manufacturer's recommended prestarting checks and inspections shall be performed and recorded. The engine shall be started, and engine manufacturer's after-starting checks and inspections made and recorded during a reasonable warm-up period. For the following steps, the output line-line and line-neutral voltages and frequency shall be recorded after performing each step instruction (after stabilization of voltage and frequency). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings.

a. Apply load in steps no larger than the Maximum Step Load Increase to load the engine-generator set to 100 of Service Load.

b. Verify that the engine-generator set responds to the load addition and that the output voltage returns to and stabilizes within the rated bandwidths.

3.6 FINAL INSPECTION AND TESTING

- a. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- b. Increase the load in steps no greater than the maximum step load increase to 100% of service load, and operate the engine-generator set for at least 30 minutes. Measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the same range as previous measurements and is within the required range.
- c. Remove load and shut down the engine-generator set after the recommended cool down period. Perform the pre-test inspections and take necessary corrective actions.
- d. Remove the lube oil filter and have the oil and filter examined by the engine manufacturer for excessive metal, abrasive foreign particles, etc. Any corrective action shall be verified for effectiveness by running the engine for 4 hours at service load, then re-examining the oil and filter.
- e. Remove the fuel filter and examine the filter for trash, abrasive foreign particles, etc.
- f. Visually inspect and check engine and generator mounting bolts for tightness and visible damage.
- g. Replace air, oil, and fuel filters with new filters.

3.7 MANUFACTURER'S FIELD SERVICE

3.7.1 Onsite Training

The Contractor shall conduct training course for operating staff as designated by the Contracting Officer. The training period shall consist of a total 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance. The course instructions shall cover pertinent points involved in operating, starting, stopping, servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations such as oil change, oil filter change, and air filter change.

3.7.2 Manufacturer's Representative

The Contractor shall procure the services of the engine generator-set manufacturer as follows: The Contractor shall have a qualified representative of the manufacturer to supervise the installation of the engine generator-set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment.

3.8 NOT USED

3.9 ACCEPTANCE

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Final acceptance of the engine-generator set will not be given until the Contractor has successfully completed all tests and after all defects in installation material or operation have been corrected.

-- End of Section --