



OFFICE OF GROUND WATER AND DRINKING WATER

WASHINGTON, D.C. 20460

SOLICITATION OF PUBLIC COMMENT FOR PROJECT-SPECIFIC BUILD AMERICA, BUY AMERICA NONAVAILABILITY WAIVER PROPOSAL

SUBJECT: UNDER EVALUATION: Project-Specific Nonavailability Waiver of Build America, Buy America Act Requirements to the Town of Barnstable in Massachusetts, for the Straightway Water Treatment Facility Project for UV-Oxidation System and Generators

Introduction

This solicitation of public comment by the U.S. Environmental Protection Agency (EPA) is to evaluate a Build America, Buy America (BABA) Act waiver request submitted by an assistance recipient based on nonavailability of product(s) for a single project.

This solicitation of public comment does not represent a final agency decision. The purpose of this proposal is to inquire whether potential BABA-compliant products may be available that were not identified by the assistance recipient or through the EPA's BABA-compliant product research efforts, and whether other factors should be considered in the evaluation of a waiver.

The EPA has completed its market research efforts and was unable to identify a BABA compliant product meeting the performance-based specifications, in sufficient and reasonably available quantities and of satisfactory quality. The EPA makes every effort to locate BABA compliant products through its waiver process, and the public comment period provides a meaningful opportunity to vet the Agency's interim research. In the EPA's experience, a viable BABA-compliant product is identified through public comment in many cases. Through this public comment period, commenters may provide information that indicates a waiver may not be needed. For example, if a BABA-compliant option for a specified item is found, the EPA would not issue a final waiver.

Public comments are requested for 15 days (specific dates noted on the EPA's website). Please submit comments to BABA-OW@epa.gov. Please include information in the subject of the

email identifying it as a public comment on this waiver request, such as “Waiver Comment: Barnstable Water Treatment Project” or similar.

Background

The Buy America Preference set forth in section 70914 of the BABA included in the Infrastructure Investment and Jobs Act (Pub. L. No. 117-58), requires all iron, steel, manufactured products, and construction materials used for infrastructure projects under Federal financial assistance awards be produced in the U.S.

Under section 70914(b), the EPA may waive the application of the Buy America Preference, in any case in which it finds that: applying the domestic content procurement preference would be inconsistent with the public interest; types of iron, steel, manufactured products, or construction materials are not produced in the US in sufficient and reasonably available quantities or of a satisfactory quality; or the inclusion of iron, steel, manufactured products, or construction materials produced in the U.S. will increase the cost of the overall project by more than 25 percent. All waivers must have a written explanation for the proposed determination; provide a period of not less than fifteen (15) calendar days for public comment on the proposed waiver; and submit the proposed waiver to the Office of Management and Budget’s (OMB) Made in America Office for review to determine if the waiver is consistent with policy.

Summary

Proposed Waiver: The Environmental Protection Agency is soliciting comments regarding whether to issue a project waiver of the manufactured products requirements of section 70914 of the BABA included in the Infrastructure Investment and Jobs Act (Pub. L. No. 117-58), for the below listed products used in an infrastructure project funded through the Drinking Water State Revolving Fund.

Waiver Type: Nonavailability of compliant products in sufficient and reasonably available quantities or of satisfactory quality.

Waiver Level and Scope: Project level waiver for a single project. No other project will utilize the waiver.

Proposed Waiver Description: Project specific nonavailability waiver of BABA requirements to the Town of Barnstable, MA, for UV-oxidation system and natural gas generators for the Straightway Water Treatment Facility Project.

Project Summary: The project includes the expansion and improvement to the Straightway Water Treatment Plant, the Hyannisport Pump Station, and the Simmons Pond Pump Station, all owned by the Town of Barnstable. The purpose of the project is to construct a new water treatment facility to expand treatment capacity and to accommodate the advanced treatment processes required to meet current drinking water standards. Current groundwater sources are contaminated with 1,4 dioxane among other emerging contaminants. 1,4-dioxane is a regulated drinking water contaminant in Massachusetts and conventional drinking water treatment

processes are generally ineffective for its removal. To meet applicable regulatory requirements and ensure protection of public health, the proposed project includes advanced oxidation treatment specifically for 1,4-dioxane destruction. The UV-oxidation system is required to treat the contaminants, and the natural gas generators will be used to power the new treatment processes.

Length of the waiver: From the effective date of the final waiver until project competition which is estimated to be December 31, 2029.

Summary of Items Covered in the Proposed Waiver (including NAICS):

The applicant is seeking a waiver for UV-oxidation system and natural gas generators.

UV-Oxidation system:

- NAICS: 333318
- PSC: 4610

Generator:

- NAICS: 335312
- PSC: 6115

Description of Efforts Made to Avoid the Need for a Waiver

Both the Town of Barnstable and the EPA made every effort to obtain BABA-compliant products. This is documented both in the waiver request and in the description of the EPA's extensive research efforts described below.

No BABA-compliant products were identified by the applicant or through the EPA's market research completed in July 2026. The market research process included thorough review of the waiver request submission, examination of domestic manufacturer catalogs and other technical data and marketing materials, personal communication with domestic manufacturers, inquiries of regional project officers, and outreach to contractors and engineers with expertise and familiarity with the project. The recipient conducted market research in March of 2026. They contacted 4 manufacturers of UV-oxidation systems and 3 manufacturers of generators. No BABA compliant products were found by the applicant. During market research EPA contacted 10 manufacturers and suppliers of UV-oxidation systems and 10 manufacturers and suppliers of natural gas generators. One manufacturer of UV-oxidation systems responded that they may be able to provide a BABA compliant UV-oxidation system. However, when the project contacted the manufacturer, the manufacturer stated they could not provide a product that would meet the project's technical specifications, specifically they were not certified for potable water treatment in Massachusetts. No BABA-compliant options for the generators were found. Based on the technical evaluation conducted, the claim that BABA-compliant products that meet the project's specification are not available domestically is supported.

Anticipated Impact if No Waiver is Issued

Due to the critical nature of the project, absent a waiver, the project could be significantly delayed while the community seeks other, non-federal funding. This could present a public health risk to the community.

Description of Award

Recipient Name and/or Unique Entity Identifier (UEI):

Recipient Name: Town of Barnstable

Recipient Unique Entity Identifier: WQJTL6UZD8X5

Federal Financial Assistance Identification Number (FAIN):

Federal Financial Assistance Listing Name: 66.468 Drinking Water State Revolving Fund

Federal Financial Assistance Listing Number: 66.468

Federal Financial Assistance Funding amount: \$45,000,000

Total Cost of Infrastructure Expenditures: \$45,000,000



May 14, 2026

Kleinfelder Project No.: [REDACTED]

Ms. Karen Wong
Massachusetts Department of Environmental Protection
100 Cambridge Street
Suite 900
Boston, MA 02114

SUBJECT: BABA Non-availability Waiver for Barnstable Straightway Water Treatment Facility

Dear Ms. Wong:

Kleinfelder is seeking a non-availability waiver on behalf of the Town of Barnstable for the Straightway Water Treatment Facility construction project. This project receives federal funding through the Massachusetts State Revolving Fund (SRF) Drinking Water program and is therefore subject to the domestic content requirements of the Build America, Buy America Act. The project requires the installation of an [REDACTED] UV-oxidation system to remove contaminant 1,4-Dioxane from drinking water. Based on a comprehensive review of available manufacturers, [REDACTED] UV-oxidation system is not produced domestically, and no domestically manufactured, BABA-compliant system is available that meets the project's technical and performance requirements, as detailed in **Attachment A: UV-Oxidation System Specifications**. The project also requires the installation of two 650kW natural gas generators. Based on a comprehensive review of available manufacturers, no domestically manufactured, BABA-compliant generator is available that meets the project's technical and performance requirements, as detailed in **Attachment B: Generator System Specifications**. After careful consideration, it was determined that the use of a de minimis waiver is not appropriate for the requested products. Therefore, the Town of Barnstable respectfully requests a non-availability waiver for the [REDACTED] UV-oxidation system and for the [REDACTED] natural gas generators [REDACTED]

[REDACTED] Approval of this waiver is necessary to allow the project to proceed without delay or redesign and to ensure compliance with applicable drinking water treatment standards.

Project Summary

This waiver is required for the ongoing New Barnstable Straightway Water Treatment Plant construction project. The project involves the expansion and improvement of the Straightway Water Treatment Facility (WTF), the Hyannisport Pump Station, and the Simmons Pond Pump Station, owned by the Town of Barnstable, Massachusetts. The project includes the construction of a new approximately 11,000-square-foot water treatment facility to provide expanded treatment capacity and to accommodate advanced treatment processes required to meet current and anticipated drinking water standards. Raw water supplied to the Straightway WTF originates from multiple groundwater sources,

[REDACTED]. Sampling data from these sources has identified the presence of 1,4-dioxane, a regulated chemical contaminant of concern under Massachusetts drinking water regulations, necessitating the incorporation of advanced treatment processes as part of the facility improvements. As part of the project, the Town will install a dedicated UV-oxidation system designed to provide reliable treatment for 1,4-dioxane. The project also includes the replacement of the Hyannisport and Simmons Pond drinking water wells and pump stations, demolition of existing facilities; and associated site improvements located at [REDACTED]. The total materials cost of the project is approximately [REDACTED]. Collectively, the proposed improvements to the Straightway Water Treatment Facility and surrounding pump stations are essential to ensuring the long-term safety, and regulatory compliance of the Town of Barnstable's drinking water supply.

Project Budget

[REDACTED]

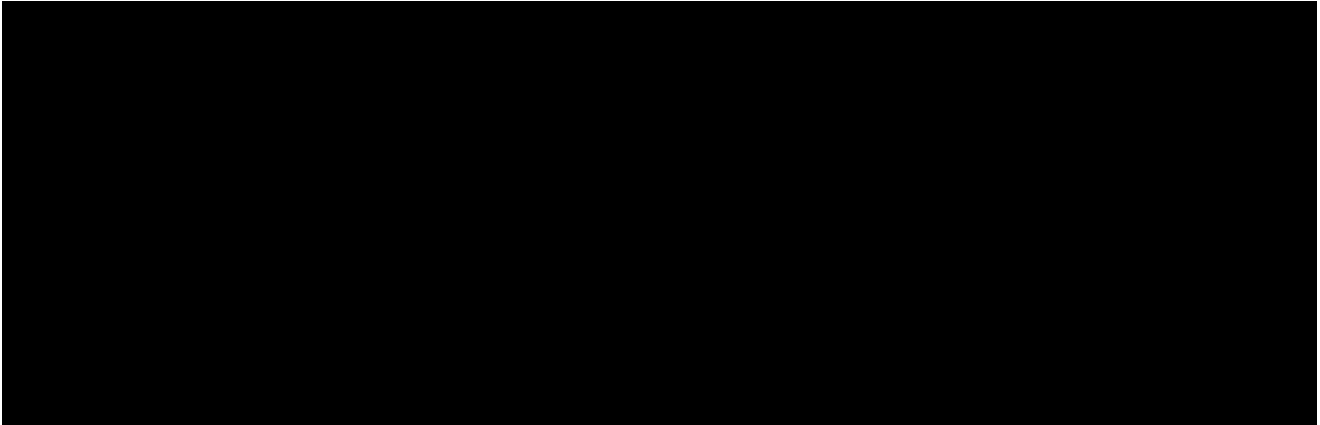
[REDACTED]

[REDACTED]

Waiver Need

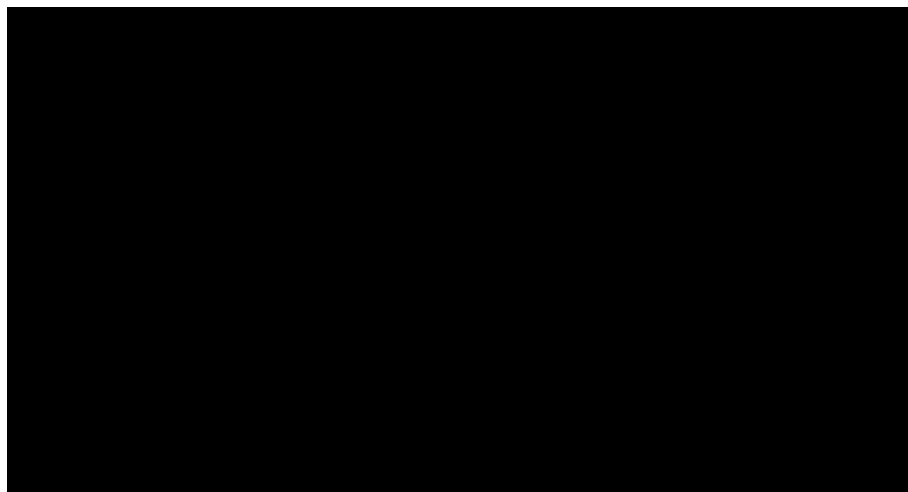
1,4-dioxane poses a risk to public health due to its potential carcinogenicity and its documented adverse effects on the liver and kidneys following long-term exposure. 1,4-dioxane is a regulated drinking water contaminant in Massachusetts and conventional drinking water treatment processes are generally ineffective for its removal. To meet applicable regulatory requirements and ensure protection of public health, the proposed project includes advanced oxidation treatment specifically for 1,4-dioxane destruction. Based on our review of the MassDEP List of Approved Technologies for use in Massachusetts, the [REDACTED] is the only approved technology identified for this application. Therefore, a Buy America, Build America waiver is necessary because no domestically produced alternative has been identified that satisfies both the project specifications and Massachusetts

technology approval requirements. The UV-Oxidation System specifications for this project are included in **Attachment A**. Additionally, equivalent generators that meet the size and fuel requirements of the [REDACTED] natural gas generators as shown in the project specifications are not produced in the United States. The generator system specifications for this project are included in **Attachment B**. Additionally, drawings and product submittal data are included in **Attachments F** and **G** for the UV-Oxidation System and the generators, respectively.

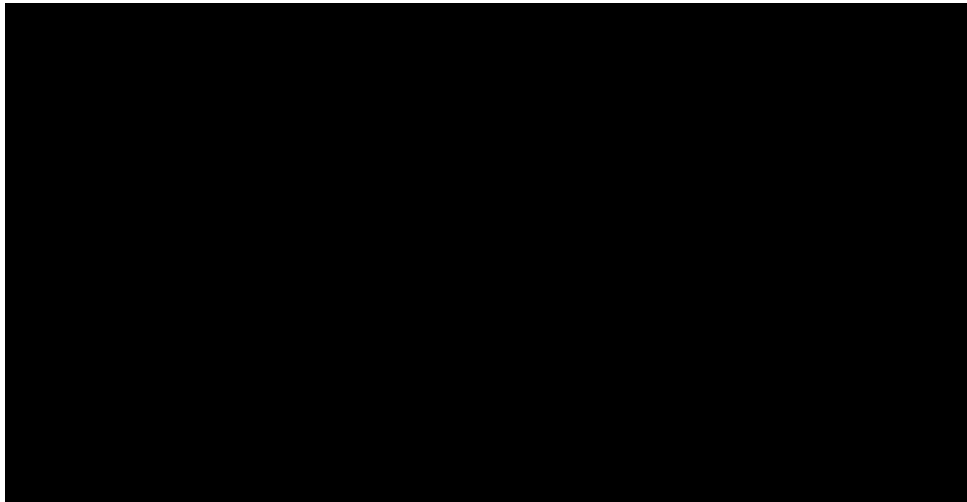


Efforts made to avoid the need of a waiver

To avoid the need for this waiver, multiple UV/[REDACTED] system suppliers were contacted to find a domestically produced equivalent system. Vendors contacted for the UV/AOTP system are listed below in **Table 3**. No vendors were found who could provide an equivalent BABA compliant UV [REDACTED] system. Requests to these vendors are included in **Attachment C: [REDACTED]**.



To avoid the need for this waiver, multiple generator suppliers were contacted to find a domestically produced equivalent system. Vendors contacted for the generators are listed below in **Table 4**. No vendors were found who could provide an equivalent BABA compliant generator system. Requests to these vendors are included in **Attachment D: Generator Inquiries**.



Anticipated impact if no waiver is issued

If a Buy America, Build America non-availability waiver is not granted for the Straightway and Hyannisport Water Treatment Facilities project, the project would be unable to proceed as designed, as no domestically manufactured UV-oxidation system or generator system has been identified that can meet the project's specifications. Denial of the waiver would necessitate redesign of the project's treatment process and electrical design to accommodate non-equivalent alternatives, resulting in significant project delays, increased costs, and risks to public health.

Sincerely,

KLEINFELDER

Tyler Bernier
Senior Project Engineer

cc: Matt O'Dowd, PE, Project Engineer
Terren Nodeland, EIT, Staff Engineer
File

SECTION 11270

UV-OXIDATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Furnish all labor, materials, equipment and appurtenances required to provide a closed vessel UV-oxidation/disinfection system complete with an automatic mechanical cleaning system and variable output lamp drivers. The UV system shall be complete and operational with all control equipment and accessories specified herein and as shown on the contract drawings.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Section 01650 – Facility Start-Up and Commissioning
 - 2. Section 11352 – Chemical Storage and Feed Equipment
 - 3. Section 11355 – GAC Adsorber System
 - 4. Section 13300 - Instrumentation and Controls System
 - 5. Section 15062 – Interior Process Piping
 - 6. Section 15400 – Plumbing
 - 7. Division 16 – Electrical

1.3 SYSTEM DESCRIPTION AND REQUIREMENTS

- A.
- B.

1. [REDACTED]
2. Contractor shall obtain and provide copies of the actual invoices from [REDACTED] to the Owner. Should the Contractor negotiate or otherwise acquire a reduction in the pricing identified, fifty percent (50%) of the differential will be refunded to the Owner.

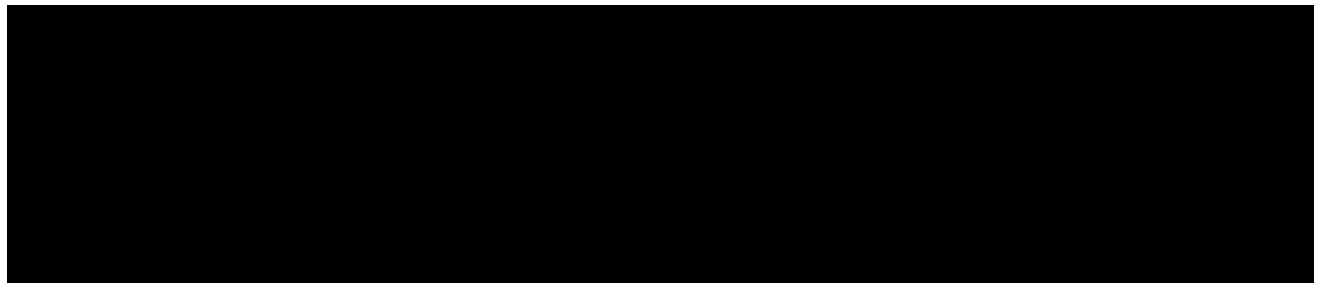
C. Design Criteria:

1. The UV-oxidation Manufacturer shall provide equipment to treat feed water to the following characteristics:

TABLE 1.0 SYSTEM DESIGN CRITERIA

Peak (Design) Flow:	2800	gpm
Design UVT (minimum):	95	% (at 254 nm, 1 cm path length)
Primary Target Contaminant:	1,4-dioxane	
Primary Target Contaminant Influent Concentration:	1	ppb
Disinfection Requirement:	No Disinfection Credits Required	
Oxidant Used:	Hydrogen Peroxide	
Oxidant Dose:	10.5	ppm (mg/L)

- a. Raw Water Quality: The treatment system shall be designed to provide removal of 1,4-Dioxane from the Straightway 1 & 2, Simmons Pond, and Hyannisport Wells in Barnstable, MA. Table 1.1 below summarizes design contaminant of concern raw water quality taken during pilot



Bolded results represent concentrations that exceed the level of concern

- b. The treatment system must meet all performance requirements while treating any single well water source or any blend of well water sources. The treatment system supplier shall provide a written guarantee that the finished water quality will meet the following treated water quality requirements:

Total 1,4-Dioxane < 0.3 ug/L 100% of the Time

2. Hydraulics:

- a. With two trains in operation and one in standby, total head loss shall be no greater than 1 psi.
- b. The UV-oxidation Manufacturer shall submit sufficient information, in the form of detailed shop drawings and hydraulic calculations, to confirm that the equipment furnished under this Section will have hydraulic losses within the limitations specified.

3. Electrical

- a. The total power consumption of all duty UV chambers providing treatment meeting the contaminant log-reduction the design criteria specified in Section 1.3.C.1 must not exceed 185 kW.
- b.

D. System Components:

1. The UV-oxidation system shall be comprised of the following components:

- | | | |
|----|--------------------------------|--------------------------------------|
| a. | UV Chambers: | 3 (2 duty + 1 Standby) |
| b. | Flow Capacity per Chamber: | 1400 gpm (with 1 Chamber on Standby) |
| c. | Number of Lamps per Chamber: | 96 |
| d. | Control Power Panel (CPP): | 1 CPP Per Chamber |
| e. | System Control Center: | 1 SCC Per Site |
| f. | UV Intensity Sensor(s): | 6 Per Chamber |
| g. | Automatic Cleaning System: | 1 Per Chamber |
| h. | Hydraulic System Center (HSC): | 1 HSC Per Chamber |
| i. | Peroxide Pump Skid (1): | 1 Per Site |

(1) Refer to Specification Section 11352 for requirements of the hydrogen peroxide chemical metering pump skid.

E. Performance Requirements

1. The UV-oxidation system shall destroy chemical contaminants while the UV system is operated in advanced oxidation process (AOP) mode. The system shall be designed to achieve the log-reduction targets specified in this section for the influent water quality.

2. The UV-oxidation system shall be designed to operate in an environment with ambient relative humidity of 5-100% and ambient air temperature of 34° – 104°F (10°-40°C).
3. In the event that any part(s) of the UV-oxidation system fails to meet the guaranteed or other specified performance requirements during startup and commissioning, the UV-oxidation supplier shall guarantee that at their sole expense, they will provide all necessary material and personnel to modify the system to meet the specified performance requirements and rerun the performance tests or remove that part(s) of the system that is not operating properly and replace it with equipment that meets the necessary performance criteria.
5. All costs incurred for retesting, including, but not limited to the energy and the Owner's and Engineer's time, shall be borne entirely by the UV-oxidation Manufacturer.

1.4 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Specification Section 01300:
 1. Complete description in sufficient detail to permit comparison with the specifications.
 2. Dimensions and installation requirements.
 3. Descriptive information including catalogue cuts and manufacturers' specifications for all major components.
 4. Electrical schematics, wiring diagrams, and layouts.
 5. System controls narrative.
 6. Documentation of the UV manufacturer's service capabilities including location and experience.
 7. Performance guarantee and warranty letters.
 8. Proposed dimensional floor plan portraying piping and equipment layout to accommodate proposed equipment 
- B. UV Manufacturer shall submit a report detailing the sizing calculations for the full-scale system based on projects of similar size and application and treating similar contaminants.
- C. Manufacturer shall provide evidence that the end-of-lamp-life output factor used in sizing is certified by a third-party.
- D. The contractor shall submit a startup, commissioning, and performance testing plan for review by the Engineer.

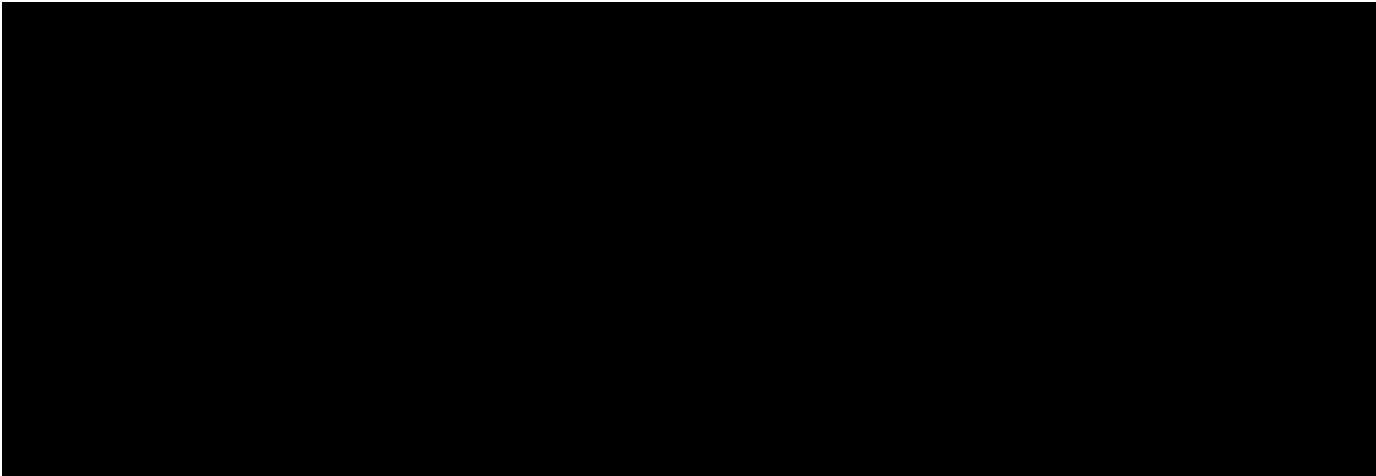
1.5 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. The Manufacturer shall be regularly engaged in the manufacture of UV-oxidation systems and supply evidence of at least twenty currently-operating UV-oxidation systems that have been continuously operating for the treatment of chemical contaminant(s) for at least 3 years in a municipal application and meeting an ongoing performance warranty (guaranteeing that the design reduction in chemical contaminant(s) is continually being met) with a flow rate in excess of 2.3 USMGD (360 m³/hr). UV-oxidation systems in industrial applications shall not be considered relevant experience.
- C. The Manufacturer shall also supply evidence of at least five municipal installations each with a flow rate of at least 1.0 million gallons per day (USMGD, or 158 m³/hr) treating chemical contaminants for municipal drinking water distribution. For further clarification, UV-oxidation systems in industrial applications shall not be considered relevant experience.
- D. The UV Manufacturer shall also demonstrate experience with UV disinfection systems in municipal drinking water applications with a proven track record of at least one thousand installations globally, each with a flow rate of at least 1.0 USMGD (158 m³/hr).

1.6 GUARANTEE

- A. The equipment furnished under this section shall be free of defects in materials and workmanship, including damages that may be incurred during shipping. Standard warranty is 12 calendar months from equipment Substantial Completion or 18 calendar months from the date of delivery (the "Warranty Period"), whichever occurs first. One-year extended warranty is required.
- B. The UV lamps shall be warranted for 15,000 hours of operation (prorated after 9,000 hours) or 36 months after shipment, whichever occurs first.

1.7 DELIVERY, STORAGE AND HANDLING



PART 2 - PRODUCTS

2.1 UV REACTOR

- A. The UV reactor chamber shall be of welded construction manufactured from 2205 duplex stainless steel. The UV reactor chamber shall be pickled, passivated and bead blasted for uniform external finish.
- B. The UV reactor chamber shall be designed to handle a maximum operating pressure of 60 psi and shall be fully assembled and hydrostatically tested to 1.5 times the rated operating pressure, for at least 10 minutes without leakage, in the factory prior to shipment.
- C. Each UV reactor chamber shall be supplied with 12" AWWA Class B inlet/outlet connections.
- D. Each UV chamber shall consist of low pressure, high output UV lamps arranged perpendicular to the direction of flow.
- E. Each lamp shall be enclosed in an individual quartz sleeve, one end of which shall be closed and the other sealed with compressed O-rings.
- F. Each quartz sleeve shall be independently sealed within the chamber.
- G. The UV reactor chamber shall be designed such that operating personnel at the plant can change the lamps without draining the chamber.
- H. The UV reactor chamber shall be provided with access ports for easy access to the quartz sleeves and cleaning system.
- I. All access to lamps, sleeves, and cleaning system shall be from one side of the UV reactor chamber.
- J. Piping shall be designed so that the reactor chamber will be full of water at all times. Air trapped in the chamber shall result in chamber shut down to avoid overheating.
- K. The UV reactor chamber shall be installed horizontally.
- L. All wetted components within the reactor chamber shall be NSF 61 certified.

2.2 UV LAMPS

- A. The UV lamps shall be low pressure high output type with a 101 cm (40 inch) arc length and a power input of 500W.
- B. The maximum number of lamps shall be 96 per reactor.
- C. The filament shall be significantly rugged to withstand shock and vibration.
- D. The lamp bases shall be resistant to UV and ozone.
- E. The lamps shall be operated by variable output electronic ballasts with 1% power increments, from 30% to 100% of full rated output with no loss of lamp efficiency.
- F. Manufacturer shall provide evidence that the end-of-lamp-life output factor used in sizing is certified by a third-party. The UV chamber shall be of welded construction manufactured from 2205 duplex stainless steel. The UV chamber shall be pickled, passivated and bead blasted for uniform external finish.

2.3 UV LAMP SLEEVES

- A. The UV lamp sleeves shall be manufactured from Type 214, fully annealed clear fused quartz tubing.
- B. Lamp sleeves shall be domed at one end.
- C. The open end of the lamp sleeve shall be sealed by means of an o-ring and stainless steel compression plate.

2.4 UV INTENSITY SENSOR(S)

- A. The UV Intensity Sensor(s) shall be located inside the chamber and contained within protective quartz sleeves.
- B. One sensor shall be provided for every 16 lamps.
- C. Sensor(s) shall incorporate SiC diodes and provide NIST-traceable measurement with a total absolute uncertainty of 15% or less at an 80% confidence level.
- D. Sensor(s) must meet the requirements of the EPA 815-R-06-007. Sensor(s) must filter out wavelengths below 240 nm and have a spectral response peaking between 250 nm and 280 nm with less than 10% coming from wavelengths greater than 300 nm.
- E. The complete sensor assembly and the internal circuit board containing the diode shall each be serialized.
- F. The quartz sensor shall be cleaned by the mechanical wiping system.

2.5 LAMP DRIVER

- A. Lamp drivers shall be of a high frequency output, fully electronic design with a minimum efficiency of 95% at full load, and a power factor of 99% or better.
- B. Lamp driver shall have a variable operation range of 30% to 100% of full rated output and be adjustable in 1% increments.
- C. The maximum allowable total current harmonic distortion (current THD) shall not exceed 10% at the maximum power level.
- D. Each lamp driver shall supply power to four lamps.
- E. Lamp driver shall have a mean design life expectancy of at least 10 years.
- F. Drivers shall be rack mounted and changeable without the use of tools.

2.6 CONTROL POWER PANEL (CPP)

- A. One control power panel (CPP) will be provided with each UV chamber.
- B. The CPP enclosure material of construction shall be Mild Painted Steel.
- C. The CPP enclosure shall be rated NEMA Type 12, ventilated with cooling suitable for indoor installation.
- D. Power distribution and lamp driver control for each UV chamber shall be through the associated CPP. The CPP shall house all lamp drivers.
- E. The CPP shall be designed to operate with the following electrical supply:
480V, 60 Hz, 3 phase, 4 wire + GND (from a grounded wye source).
- F. Signal wiring interfacing the UV chamber with the CPP, shall be as shown on the contract drawings.
- G. The CPP shall be installed within 65 ft (external running cable length) of the UV chamber.
- H. Each CPP shall be provided with a lockable disconnect handle that shall shut down the chamber/cabinet power when the cabinet door is opened.
- I. Each CPP enclosure shall be floor mounted.
- J. Each CPP section (defined as being accessible by a single door) shall contain a minimum of 24 lamp drivers.
- K. Controller
 - 1. The CPP shall be equipped with a [REDACTED] which continuously monitors and controls the UV chamber's functions. Custom electronics, an input flow signal (supplied by Contractor), and the UV sensor(s), provide the controller with the necessary indications of system parameters.

L. Operator Interface

1. Monitoring and control of each [REDACTED] [REDACTED] [REDACTED] chamber shall be accomplished through the [REDACTED] 7" display operator interface located on the CPP.
2. The operator interface shall be menu driven and shall display the following system information when prompted: chamber status, individual lamp status, lamp operating hours, contaminant log reduction, UV intensity, power level, alarms, alarm history.
3. The most recent alarms shall be displayed on the operator interface when prompted, recorded by alarm type, date and time of occurrence, and date and time of correction.

M. Remote Monitoring/Control - The communication between the UV chambers and the plant control center shall be through the following protocol:

1. Each chamber shall be capable of being placed in either local or remote mode via the operator interface.
2. Each system shall be provided with the following customer interface soft signals:
 - Discrete output indicating alarm.
 - Discrete output indicating warning.
 - Discrete output indicating system ready.
 - Discrete ON/OFF status.
 - 4-20 mA flow signal analog input from flow meter.

2.7 SAFETY FEATURES

- A. Each UV chamber shall be equipped with a temperature switch to prevent the chamber from overheating at temperatures above 50°C (122°F). The temperature switch shall be wired to the CPP and shall shut the chamber down and initiate an alarm condition when activated.
- B. Each UV chamber shall be equipped with a water level switch to prevent operation of the UV lamps in air. The level sensor shall be wired to the CPP and shall shut the chamber down and initiate a critical alarm condition if low water level is detected.

2.8 SYSTEM CONTROL CENTER (SCC)

A. General

1. One System Control Center (SCC) will be provided with the UV-oxidation system to control the functions of the UV-oxidation system and coordinate operation of the UV chambers.
2. The SCC shall be wall mounted.

3. The SCC enclosure material of construction shall be Painted Mild Steel.
4. The SCC enclosure shall be rated NEMA Type 4.
5. The SCC is equipped with a PLC controller which continuously monitors and controls the UV chamber functions. Custom electronics, UV transmittance and feedback from the peroxide dosing system provide the PLC with the necessary indication of system parameters.
6. The SCC shall be capable of operating in contaminant treatment (advanced oxidation) mode and adjusting the applied UV energy and hydrogen peroxide feed rate based on input parameters in a manner consistent so as to minimize O&M costs.

B. Operator Interface

1. Complete control and monitoring of the UV-oxidation system shall be accomplished through the operator interface located on the SCC.
2. The operator interface(s) shall be menu driven and shall display the following system information when prompted: chamber status, individual lamp status, lamp operating hours, contaminant log reduction, oxidant system settings, UV transmittance, UV intensity, power level, alarms, alarm history.
3. The most recent alarms shall be displayed on the operator interface when prompted, recorded by alarm type, date and time of occurrence, and date and time of correction.

C. Remote Monitoring/Control – The communication between the UV chambers and the plant SCADA shall be through the following protocol:

1. Each chamber shall be able to operate in either local or remote (automatic) mode.
2. The SCC shall be provided with the following soft signals for alarm confirmation at the plant:
 - Discrete output indicating Alarm.
 - Discrete output indicating Warning.
 - UVT signal

2.9 CLEANING SYSTEM

- A. Each UV chamber shall be equipped with an integrated automatic on-line sleeve cleaning system.
- B. The cleaning system shall be driven by a hermetically sealed magnetically coupled hydraulic drive. The drive system shall be designed such that all hydraulic connections are outside the UV chamber. The hydraulic fluid used shall be biodegradable.

- C. The cleaning system shall provide mechanical cleaning abilities for the lamp and UV intensity sensor sleeves, complete with an automatically-initiated and controlled cleaning cycle. The UV system shall be fully operational and treating water while cleaning.
- D. Cleaning cycle intervals shall be field adjustable via the operator interface. Manual cleaning system control shall also be through the operator interface.
- E. Wiper seals shall be changeable from the endplate and without accessing the interior of the UV chamber.
- F. Automatic chemical cleaning systems connected externally to the UV chamber(s) will not be considered acceptable

2.10 SPARE PARTS

- A. The following spare parts shall be supplied:
 - 1. 45 UV lamps
 - 2. 30 Sleeves
 - 3. Set of seals and O-rings for one reactor
 - 4. Set of replacement wiper seals for one reactor
 - 5. 2 Face Shields, able to block UV light wavelengths between 200 and 400nm
 - 6. 5 Ballasts
 - 7. 2 UV intensity sensors

2.11 ON-LINE UV TRANSMISSION MONITOR

- A. An on-line UV Transmission (UVT) monitor shall be supplied to automatically monitor the UV Transmission of the process stream (measured at 254 nm, 1 cm pathlength). UV Transmission range shall be 70% to 100%.
- B. The UVT Monitor shall include a UV lamp, UV sensor, drive system, system controller and operator interface.
- C. The operator interface shall display the system status and allow for manual on/off system control. The operator interface of the System Controller shall be located on the door of the enclosure.
- D. Enclosure shall be 304 stainless steel, NEMA Type 4X. Enclosure shall be wall mounted and weigh no more than 65 pounds / 29.5 kg.
- E. Inlet/outlet fittings to be 3/8" female for connection to process stream and drain. Supply tubing/piping shall be a maximum of 1/4" internal diameter.

- F. Enclosure dimensions shall be no greater than 20 inches (508 mm) wide by 20 inches (508 mm) high and 10 inches (254 mm) deep.
- G. A 4-20 mA output shall be provided for data transmission to remote devices. A discrete common alarm shall be provided for remote indication of alarm condition.
- H. The system shall be designed to handle flow rates of 0.1 gpm (0.4 l/min.) – 0.5 gpm (2.0 l/min) at a maximum inlet pressure of 30 psi (210 kPa).
- I. Power supply to the System Controller shall be 120 Volt, 1 phase, 2 wire + ground, 15 amp power supply, 250 VA.
- J. System Controller panel shall be UL, CSA, or CE approved.
- K. System Controller panel to be installed in an indoor, non-freezing environment.
- L. The process stream temperature range to be 2-40°C (36-104°F).
- M. The expected life of the System Controller lamp shall be 9,000 hours.

PART 3 - EXECUTION

3.1 INSTALLATION

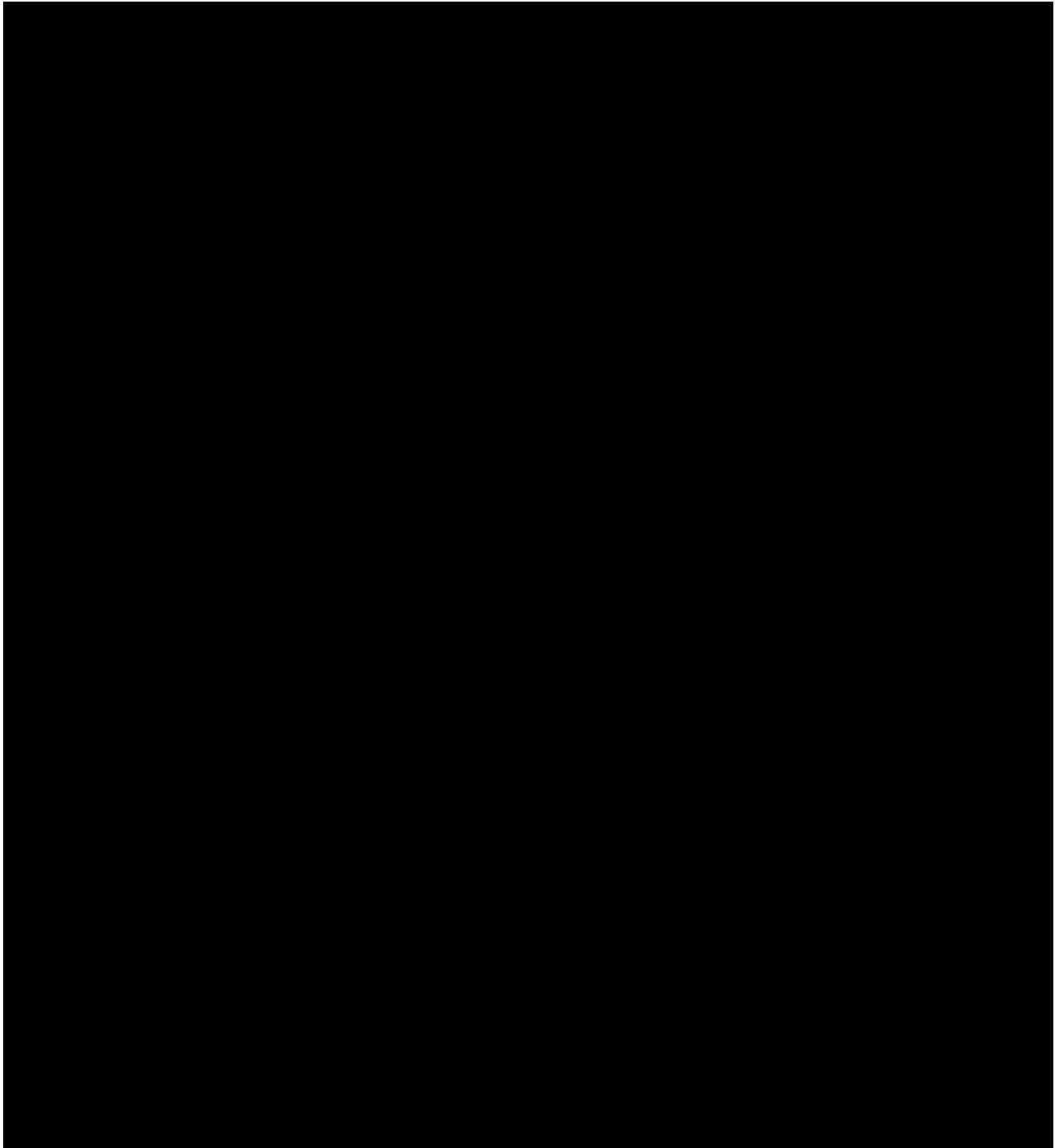
- A. Install items in accordance with manufacturer's printed instructions, as indicated and specified.

3.2 COMMISSIONING TEST

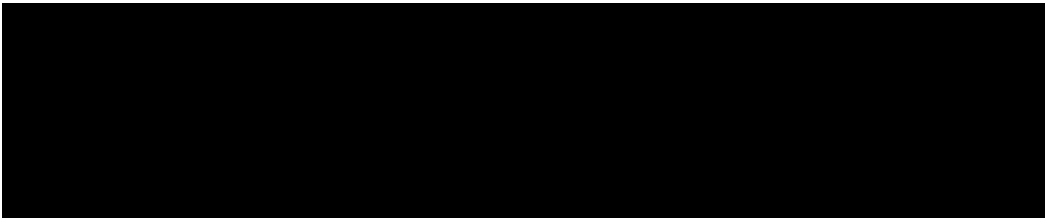
- A. The contractor shall submit a startup, commissioning, and performance testing plan for review by the Engineer.
- B. Prior to Startup, the UV-oxidation Manufacturer shall inspect the installed UV System for proper alignment, correct operation, proper connection, and satisfactory function of all components. The UV-oxidation Manufacturer's representative shall approve the installation and provide certification that the system components have been installed correctly and are ready for operation. If the UV System needs corrective action prior to beginning of commissioning test, the UV-oxidation Manufacturer shall work with the Contractor to make all necessary modifications to meet these specified requirements. The proposed commissioning test procedure shall have been developed by the UV-oxidation Manufacturer and submitted to and approved by the Engineer before scheduling and performing the Commissioning Test.
- B. The UV-oxidation Manufacturer shall require the presence of both the Contractor and the plant control system UV-oxidation Manufacturer during the communication test.
- C. Commissioning test shall be witnessed by the Engineer and shall demonstrate that the UV equipment and related control system operate in accordance with the specifications, including all operating, monitoring, and shutdown functions.

3.3 ACCEPTANCE TESTS

- A. The acceptance testing shall be performed following the commissioning. Acceptance testing shall include head loss testing and intensive effluent quality testing. The proposed acceptance testing procedure shall have been developed by the UV-oxidation Manufacturer and submitted to and approved by the Engineer before scheduling and performing the acceptance test.
- B. Effluent Quality Tests:



5.



3.4 MANUFACTURER'S SERVICES

- A. A factory trained field service technician will provide supervisory oversight for a minimum of five cumulative 8-hour days during the installation of the UV-oxidation system. The field service technician shall be specifically trained in this type of equipment and will provide credential to the Engineer and Owner prior to performing field oversight. The field service technician shall assist the general contractor or subcontractor with technical advice on the installation of the major components of the treatment equipment including but not limited to:
 - 1. Proper setting of the UV chambers, interior lamps, piping, UV sensors, and automatic cleaning system.
 - 2. Proper installation of CPP, SCC, and HSC.
- B. Upon completion of the installation, the services of the factory trained field service technician shall be provided for an additional period of not less than five 8-hour days to check the completed installation, make any required adjustments, initiate a trial performance run, assist in startup testing operations and assist in placing the system in satisfactory operation.
- C. In addition to the above, the manufacturer shall provide the services of the factory trained field service engineer for a period of one day for instructing the operating personnel.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 16612
GENERATOR SYSTEM
(FILED SUB-BID REQUIRED)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 FILED SUB-BID REQUIREMENTS

- A. Work specified under Section 16000 – Electrical FSB is subject to provisions of Sections 44A to 44J, inclusive, of Chapter 149 of General Laws of Massachusetts, as amended to date. The work included under the Section 16612 Generator System shall be the responsibility of the Electrical Contractor and shall include work shown on Contract Drawings.
- B. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the work of this Section.
- C. The Work of this Filed Sub-Bid is shown on the Electrical Contract Drawings. Remaining Contract Drawings are included for reference and coordination.
- D. File sub-bids for such work as provided in INVITATION TO BID and INSTRUCTION TO BIDDERS.
- E. Coordinate the work required with the activities of the other Contractors at the site. Cooperate with other site Contractors to assure steady progress of all work being performed in the area.

1.3 SUMMARY OF WORK

- A. The work of this section includes all labor, materials, tools, equipment and incidentals necessary to furnish and install, put in operation and field test a dual engine generator paralleling system with two natural gas engine driven generator units each with a paralleling controller, electrically operated circuit breaker, cooling system, fuel system, exhaust system, starting system, alternator, and all required accessories for complete operation of the size and rating as specified herein and on the Drawings.

1.4 SUBMITTALS

- A. Manufacturer's literature and brochures shall be submitted for all items to be furnished in accordance with the provisions of Section 01300 – Submittals.
- B. Submittals required under this section include, but are not limited to the following:
 - 1. Manufacturer and model of engine and generator

2. Rated capacity B.H.P.
3. Generator
4. Generator KVA, KW and P.F. rating
5. Voltage
6. Class insulation
7. Temperature rise above 40 degree C ambient
8. Generator efficiency and fuel consumption at full load, 3/4 load and 1/2 load
9. Operating weight and noise levels of complete unit
10. Exhaust piping
11. Battery and charger
12. Auxiliary system power requirements and wiring diagrams.
13. Enclosure with all conduit openings for system operation identified.
14. Manufacturer's certified test record. The test record shall show the generator performance and frequency regulation to satisfy the requirements specified herein, and shall also show fuel consumption rates at 1/2 load, 3/4 load and full rated load.

1.5 QUALITY ASSURANCE

- A. The generator units shall be the standard product, as modified by these Specifications, of a manufacturer regularly engaged in the production of this type of equipment. Engine generator unit shall be a standard production model of proven ability and shall be designed, constructed, and installed in accordance with the best practice and methods. In addition, the manufacturer shall maintain a permanent service organization and supply of spare parts as necessary to provide adequate service within 60 miles of the site.
- B. The engine generators shall be a factory assembled unit specifically designed and fitted for operation on natural gas fuel. The engine generator units shall be free from injurious torsional or other vibration, and shall be assembled on an adequate steel subbase suitable for mounting on vibration isolation pads, on a flat concrete surface which is suitable for supporting the weight of the unit. The vibration installation material shall be furnished with the engine generator unit.
- C. The engine generator units shall be designed and built in accordance with the latest standards of IEEE, NEMA, ANSI and ASME.
- D. The engine generator units shall be designed to minimize the danger of accidents to operating and maintenance personnel. The manufacturer shall, prior to shipment, verify that all electrical connections are tight and that circuits are isolated, that on-set piping

connections are well-made, and that standard safety equipment is included and functions according to design.

E. Tests

1. At least 48 hours prior to the load test, the manufacturer shall perform a pretest. The pretest shall be conducted in the presence of the Engineer. The pretest shall determine that the unit is ready for load testing and that all components are functioning correctly. All adjustment for tuning the unit shall be made during the pretest. If remedial work is required, the work shall be performed before the load test is conducted.
2. Upon completion of the installation, the manufacturer of the equipment shall test the complete unit, at full load, using load banks, for four continuous hours. During the test, the following data shall be taken at 15 minute intervals:
 - i. Outside air temperature
 - ii. Generator enclosure temperature
 - iii. Oil pressure
 - iv. Oil temperature
 - v. Jacket water temperature
 - vi. Battery charge rate
 - vii. Fuel pressure
 - viii. A.C. Volts
 - ix. A.C. Amps
 - x. Frequency
 - xi. Kilowatts
3. Following the test, three successive simulated power outages shall be conducted using all connected building load.
4. The equipment shall be left in good operating order and the settings of all alarm and shutdown devices verified.
5. Provide on-site sound measuring testing to assure specified maximum sound levels are not exceed at full load, provide test report.

F. Warranty/Service

1. The manufacturer's and dealers Extended Service Coverage shall in no event be for a period of less than five (5) years from date of Owner/Engineer's acceptance of the system and shall include repair parts, labor, travel expense necessary for repairs at the jobsite, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of maintenance and repair. Applicable deductible costs applying only after the first year shall be specified in the manufacturer's warranty. Submittals received without written warranties as specified will be rejected in their entirety. Warranty and maintenance shall be issued and executed by the dealer and may not be subcontracted.

2. The generator set supplier shall have factory trained service representatives and tooling necessary to install, test maintain, and repair all provided equipment and shall be located within 150 miles of the customer's site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.
- B. 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.

1.7 DESIGN CRITERIA

- A. The engine generator units shall comply with the requirements of the Federal Environmental Protection Agency and State of Massachusetts Department of Environmental Protection.
- B. The engine generator units shall be arranged for automatic starting and stopping on failure of, and restoration of the normal source of power, and for automatic load transfer, but not including the automatic load transfer switch which will be furnished separately.
- C. The engine generator units shall include, but not be limited to excitation system, controls, keep warm system, cooling system, silencer, starting batteries, charger, and all essential and desirable appurtenances whether specifically mentioned in this specification or not.
- D. The system described herein, including but not necessarily limited to the engine generator sets, engine auxiliaries, batteries and engine generator control panels shall be furnished by a single supplier who is regularly engaged in the production of natural gas fired engine driven generators.
- E. The voltage regulation shall be within plus or minus two percent from no load to full rated load. On application or removal of full rated load in one step, the transient voltage dip or overshoot shall not exceed twenty percent of rated voltage. Frequency regulation shall be within 3 Hertz from no load to full load.
- F. The voltage regulator shall be insensitive to severe load induced waveshape distortion from SCR or thyrister circuits such as those used in battery charging (UPS) and motor speed control equipment. This SCR immune regulator shall not reduce the motor starting capabilities as specified herein.
- G. Engine generator unit of not less than the KW rating shown on the Drawings, 0.8 power factor capacity. Three (3) phase, 60 Hertz, 480 Volts, 4 wire (grounded wye) alternating current generator shall be furnished.
- H. The engine generator units shall be completely prewired and piped so that only field connections to a master terminal strip for control, auxiliaries and alarms, and power connections to a molded case line circuit breaker and fuel line connections will be required.

- I. The engine generator units and associated auxiliaries systems and components shall be skid mounted and installed outdoors.

1.8 ENGINE GENERATOR UNIT PERFORMANCE

- A. The engine generator units shall maintain rated frequency from no load to full rated load.
- B. The voltage regulation shall be as specified herein and recovery to steady state operation shall be within two seconds.
- C. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus one percent of rated voltage. A rheostat shall provide a minimum of plus or minus five percent voltage adjustment from rated voltage.
- D. Frequency regulation shall be maintained within 2-1/2 percent of rated frequency from no load to full load. The steady state frequency shall be within 0.5 percent of rated frequency.
- E. The engines shall be equipped with a electronic isochronous governor capable of maintaining the engine speed from no load to full load within plus or minus .25 percent of the synchronous speed.

PART 2 –PRODUCTS

2.1 ENGINE

- A. The engines shall be natural gas fueled, four (4) cycle, water-cooled, while operating with nominal speed not exceeding 1800 RPM. The engine shall meet applicable EPA non-road mobile regulations and/or the EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 Emissions Cycle at specified ekW/bHP rating.
- B. The engines shall be furnished with thermostatically controlled jacket water heaters of the size recommended by the supplier. Heaters shall be rated at 6,000 Watts for operation on 208 Volts.
- C. The oil sump will be fitted with pipe nipples, a ball valve, and an extension oil drain.
- D. The engines shall be provided with a governor which maintains the frequency within a bandwidth of the rated frequency, over a steady-state load range of zero to 100% of rated output capacity. The governor shall be configured for safe manual adjustment of the speed/frequency during operation of the engine-generator set, without special tools, from 90 to 110% of the rated speed/frequency, over a steady state load range of 0 to 110% or rated capacity.
 - 1. Steady state speed band, +/- 0.25% of rated speed.
 - 2. Internal oil pump, relief valve and accumulator controls governor operating pressure.

3. Manual speed adjustment knob at top of unit.
4. Positive locking to allow manual speed adjustment.

2.2 COOLING SYSTEM

- A. The engines shall be furnished with a unit mounted radiator. The radiator shall be of sufficient size to cool the water when ambient temperature is 100 degrees F. and the engine generator unit is operating at full rated load continuously.
- B. Cooling systems shall further include water cooled manifolds, pusher fans and high temperature cutout. Provide radiator duct connector complete with suitable gasket, bolts and nuts. The cooling system shall be furnished with sufficient antifreeze solution to protect the cooling system with ambient air temperature down to minus fifty degrees F.
- C. Provide an anti-freeze treatment as recommended by the manufacturer for protection against corrosion and scale formation. The anti-freeze treatment shall be compatible with the antifreeze solution. The anti-freeze will be long life environmentally friendly polypropylene glycol. The concentration will be as recommended by the manufacturer.

2.3 FUEL SYSTEM

- A. The engine shall be equipped with a complete base mounted natural gas fuel system rated for 7 to 13 inch H2O incoming gas pressure including:
 1. Fuel line solenoid valve.
 2. Flexible fuel connectors
 3. Fuel injection system.
 4. Dry fuel filters
 5. Manual shutoff valve
 6. Pressure Gauge
 7. Fuel regulator and any other components normally supplied or recommended by the manufacturer for this application.

2.4 EXHAUST SILENCERS

- A. The engine generator unit shall be provided with a critical type silencer including flexible exhaust fittings. Mounting shall be provided within the enclosure by the Manufacturer. Silencers shall be mounted so that its weight is not supported by the engine. Exhaust piping shall be sized as recommended by the manufacturer. Connection between engine and silencer shall be of the flexible type.

- B. Silencers shall be [REDACTED], or equal for naturally aspirated engines. Silencers shall be [REDACTED] or equal for turbocharged engines.
- C. A flexible section shall be provided at each engine and an expansion joint at each muffler. 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 gas-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.
- D. Horizontal sections of exhaust piping shall be sloped downward away from the engine to a drip leg for collection of condensate with drain valve and cap. Changes in direction shall be long radius. Exhaust piping, mufflers and silencers installed shall be insulated with 3 inches of calcium silicate insulation and covered with aluminum flashing to protect personnel.
- E. All portions of the exhaust system shall be insulated and covered with flashing.

2.5 STARTING SYSTEM

- A. The electric starting system shall consist of the following equipment:
 - 1. The engines shall have a two wire, direct current starter suitable for automatic starting through the load transfer switch.
 - 2. Batteries shall be of the lead-acid type. Batteries shall be guaranteed to have sufficient capacity when in a fully charged state to perform not less than five, 15 second cranks while in an ambient temperature of 0 degrees F without recharging.
 - 3. Current limiting type automatic battery charger conforming to UL 1236 shall be of the static type, magnetic amplifier control with D.C. voltmeter, D.C. ammeter and potentiometer for voltage adjustment. Charger to be completely automatic, charging rate to be determined by the state of the battery, and reducing to milliamp current on a fully charged battery. Charger shall be for 120 Volt, single phase, 60 Hertz A.C. input with an output of not less than 10 amperes. The charger shall be for the correct voltage for the battery, and specifically for charging a lead-acid battery and for panel mounting. The charger shall be furnished with a battery under-voltage alarm system consisting of dry contacts for remote use.

2.6 ALTERNATOR

- A. The alternators shall be single bearing, open, dripproof revolving field, four pole brushless type, permanently aligned to the engine by flexible disc coupling. Each unit shall be reconnectable type having nine leads and shall be factory connected for three phase, 4 wire, 60 Hertz. The rating of the unit shall be as hereinbefore specified.
- B. Alternators shall have Class H insulation provided with a 2/3 pitch rated for use with non-linear variable frequency drive loads and shall be furnished with Amortisseur windings.

Alternators shall have a complete static automatic voltage regulator which will hold the voltage within plus or minus two percent from no load to full rated load. On application of rated load in one step, the transient voltage dip shall not exceed twenty percent. The generator windings shall be braced to withstand any possible short circuit stresses. Alternator shall be "Radio Interference Proof" (RIP) and "Telephone Influence Factor" (TIF) and shall be within the limits of Section 9, ANSI C50.12. Alternators shall have a rotating brushless exciter and rectifier.

- C. The alternator characteristics shall be matched to the torque characteristics of the engine in such a manner that with full load connected to the alternator terminals, the alternator will utilize all the available engine power without exceeding it at all speeds.
- D. The generator exciter shall be of the brushless type. Semiconductor rectifiers shall have a minimum safety factor of 300% for peak inverse voltage and forward current ratings for all operating conditions, including 110% generator output at 40 degrees C 104 degrees F ambient. The exciter and regulator in combination shall maintain generator-output voltage within the limits specified.
- E. Each generator shall be provided with a solid-state voltage regulator, separate from the exciter. The regulator shall maintain the voltage within a bandwidth of the rated voltage, over a steady-state load range of zero to 100% of rated output capacity. Regulator shall be configured for safe manual adjustment of the engine-generator voltage output without special tools, during operation, from 90 to 110% of the rated voltage over the steady state load range of 0 to 100% of rated output capacity. Regulation drift shall not exceed plus or minus 0.5% for an ambient temperature change of 20 degrees C. 68 degrees F.
- F. Alternators shall be furnished with 120V stator heater and controls.

2.7 CONTROLS

- A. The engine generator units shall be furnished with a shock resistant, engine mounted NFPA 110 compliant microprocessor based paralleling controller with master switch buttons, keypad, and digital display. Each engine generator paralleling controller shall communicate with one another and operate as a complete generator system without the need on a Master Control Panel.
- B. The paralleling controller shall include:
 - 1. Isochronous load sharing (real and reactive) with the other system generator control panels.
 - 2. Random first on logic to prevent multiple generators from energizing a dead bus.
 - 3. Automatic synchronizer with dead bus closing.
 - 4. Soft loading and unloading.
 - 5. Protective relaying shall include:
 - i. Synch check (25C)

- ii. Loss of field (40)
- iii. Overcurrent (51)
- iv. Over frequency (81O)
- v. Over power (32O)
- vi. Over voltage (59)
- vii. Reverse power (32R)
- viii. Under frequency (81U)
- ix. Under voltage (27)

6. The controller shall have the following indication lamp and control buttons:

- i. System ready, shutdown active, warning, not in auto, programming mode, synch status, and generator set status lamps
- ii. Master switch Off/Auto/Run buttons
- iii. Breaker Control Buttons

C. Standard data available shall include:

- 1. Jacket water temperature
- 2. Lube oil temperature
- 3. Lube oil pressure
- 4. Battery voltage
- 5. RPM
- 6. A.C. Voltmeter
- 7. A.C. Ammeter
- 8. Frequency meter
- 9. Elapsed time meter calibrated in hours and tenths of hours

D. Accessories shall include:

- 1. Current transformers
- 2. Fuses
- 3. Generator voltage regulator
- 4. Voltage adjusting rheostat
- 5. Fault indication lights one each for:
 - i. Low Oil Pressure
 - ii. High Water Temperature

- iii. Overspeed
 - iv. Overcrank (Fail to Start).
6. Prewarn indication lights one each for:
 - i. Low Oil Pressure
 - ii. High Water Temperature.
 7. 90 DB (a) Audible alarm to sound on any fault or prewarn and an alarm silencer.
 8. Mode selector switch – "AUTO", "OFF", "MANUAL" with audible alarm when switch is not in "AUTO" position.
 9. Control power fuse.
 10. Fixed overcrank timer - four-10 second cranks shall be provided. After four cranks, the unit shall stop and an alarm initiated.
 11. Auxiliary contacts which close when engine is in operation. Contacts shall be rated 10 amperes and shall be used to interlock combustion and ventilation air dampers.
 12. Dry contact, rated 10 Amps 120 volts AC, to open three seconds prior to initiation of engine starting to open generator room dampers.
 13. Common failure relay
 14. Dry contact kit with the minimum following contact signals for remote monitoring:
 - i. Engine Running
 - ii. Not in Auto
 - iii. Generator Fail
 - iv. Generator Fault
 - v. Battery Charger Alarm
 15. Engine sensors for low water temperature near low oil pressure, near high water temperature.
 16. Refer to I-Drawings for additional requirements.
- E. In addition to the equipment included in the control panel described above, the units shall include a power and control junction box mounted on the generator. This junction box shall include:
1. Three phase power conductors terminated with pressure type ring connectors.
 2. Neutral connection.
 3. Terminal block with marked connection points for all external control connections and for jacket heaters, etc.

4. Electrically operated molded case line circuit breaker with interrupting rating of 65 KA amperes RMS.
- F. Automatic shutdown shall be provided for each of the following conditions:
1. High jacket water temperature
 2. Low jacket water pressure
 3. Low lubricating oil pressure
 4. Engine overspeed
 5. Unit fail to start.
- G. Auxiliary normal open dry contacts shall be provided for remote transmission of unit failure.
- H. Provide emergency stop pushbutton operator station with a multi-contacts(one for each generator) for remote mounting in the electrical room.

2.8 SUBBASE

- A. The engine, generator and radiator shall be mounted on a structural steel base designed to maintain proper alignment. Vibration isolators shall be furnished of the size and type recommended by the supplier.

PART 3 – EXECUTION

3.1 MANUFACTURER'S SERVICES

- A. A minimum of two, eight-hour days shall be provided to supervise the installation and testing of the equipment furnished, to assist in start-up and train Owners maintenance personnel.
- B. A minimum of one, four hour day, not including travel time to and from the site, shall be used by a fully qualified field service engineer to make necessary adjustments and to provide operator training on the equipment furnished. This work shall occur after the equipment has been in operation and at the request of the owner, but not to exceed one year after the acceptance of the facility.
- C. Upon completion of the startup and owner acceptance off all engine generators provide an 8 hour on-site training owner training session.

3.2 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – Contract Closeout
- B. Operation and Maintenance Manuals

1. Furnish Operation and Maintenance Manuals as specified in SECTION 01730 – Operation and Maintenance Data.
 2. Maintenance instructions shall be furnished for batteries, to include simple and clear procedures for addition of liquids, maintaining cleanliness, proper ventilation, proper electrical connections.
 3. Maintenance instruction shall be furnished for engines, including recommended lubricants, coolants, etc., recommended maintenance intervals, and recommended ventilation requirements.
 4. The Operating manual shall be a simple starting and stopping procedure, with reference to shop Drawings information for more complicated procedures.
- C. Complete and submit MassDEP standby generator installation compliance permit – refer to Appendix D.

3.3 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700 – Contract Closeout

END OF SECTION 16612