ITEM 662.200101SU – CNG COMPRESSION AND DISPENSING SYSTEM

ITEM 662.200102SU – CNG COMPRESSION AND DISPENSING SYSTEM TIME FILL AREA

DESCRIPTION

This work shall consist of furnishing and installing the CNG Compression and Dispensing System in accordance with the contract documents and as directed by the Engineer.

References
The following documents are referenced as applicable Codes for the installation of the CNG Compression and Dispensing System.

B. NFPA-70. National Electrical Code
C. Fuel Gas Code of New York State
D. Fire Code of New York State

Submittals
The following submittals shall be provided by the Contractor, and approved by the Engineer prior to installation of the CNG Compression and Dispensing System.

A. Manufacturer’s and Installer’s Qualifications.

B. Product Data. Catalog sheets, specifications, and shop drawings indicating manufacturer name, type, applicable reference standard, listing, schedule, or class for specified.

   a. Natural Gas Dryer
   b. Natural Gas Compressor Skid
   c. CNG Storage Tubes
   d. CNG Dispenser and Fast Fill Post
   e. CNG Time Fill Posts
   f. CNG Priority Panel / Time Fill Panel
   g. CNG Communications Panel
   h. CNG Motor Starter Panel
   i. CNG Master Control Panel
   j. Remote Annunciator
   k. Fuel Management System
   l. Concrete Anchors
C. **Samples.** Provide one sample of the time fill nozzle, and one sample of the fast fill nozzle. Samples will not be returned to the Contractor.

D. **Wiring Diagrams.** Field wiring diagrams prepared by the CNG Compression and Dispensing Equipment manufacturer.

E. **Process Diagrams.** Field process piping diagrams prepared by the CNG Compression and Dispensing Equipment manufacturer.

F. **Rigging Plan.** Contractor shall provide a rigging plan for offloading all CNG Compression and Dispensing System Equipment. The rigging plan is to include the crane make / model, crane load chart, site plan with crane location, maximum pick radius, maximum load, maximum boom length to be employed, jib employed, and counterweights employed. The rigging plan shall also include calculations to show that the ground surface can withstand the outrigger loads.

G. **Operations and Maintenance Manuals.** Provide three hard copies of the O&M manuals and two CD’s for all CNG compression and dispensing system equipment. O&M manuals shall include copies of warranties, and start-up and commissioning reports.

**Manufacturer’s Qualifications**
The CNG Compression and Dispensing System shall be fabricated and/or packaged by a single manufacturer with a minimum of 20 years’ experience in the manufacture and packaging of compression and dispensing equipment for CNG filling stations. The manufacturer shall also be an authorized process and CNG packager, and spare parts distributor with the reciprocating gas compressor manufacturer. The manufacturer shall also have staff of service technicians available to perform on-site maintenance of all equipment.

**Installer’s Qualifications**
Installer shall demonstrate complete proficiency in the construction, installation, start up and post-installation service and maintenance of CNG vehicle fueling stations and integration of station system with emergency generator and its electronics. Installer shall be approved by the manufacturer to install the equipment. Experience shall be demonstrated by submitting the following prior to approval to proceed, and is subject to verification:

- List of at least three similar sized CNG station installations undertaken by the installer within the last seven years, with customer name, contact details and location. (Please
highlight locations in the Northeast and/or upper Mid-Atlantic region to indicate experience with regional utilities, code conformance, weather conditions, etc).

- List of CNG stations currently maintained by the installer, if any.
- Details and experience of individuals who will be directly involved in this project, professional certifications held, including copies of manufacturer’s training certificates for all equipment

The installer shall have at least two fully trained technicians on staff at all times to perform warranty and maintenance duties ON ALL EQUIPMENT SUPPLIED, capable of responding to a call out to the site 24 hours per day, 7 days per week, arriving at the site within four hours of notification.

The technicians must be fully trained to operate and perform maintenance on the complete CNG station. They must be familiar with the proposed compressors, dryer, fast fill dispenser, priority/sequential system etc.; will be skilled in reading P&I diagrams and electrical schematics, and trained in the proper use of specialized tools necessary to maintain or repair the facility.

The successful installer shall have the hardware and software required to communicate with the fueling facility via modem or internet.

**Design and Operating Parameters**

**A. Fill Pressure.** CNG station shall provide a temperature-compensated fill pressure of 3,600 psi at 70 degrees Fahrenheit.

**B. Filling Sequence.** CNG shall be dispensed in a cascade filling operation.

**C. Compressor Flow Rate and Power.** Each compressor shall have a flow rate of 800 scfm at 40 psi suction pressure and a drive power of 333 BHP. Each compressor shall have a flow rate of 630 scfm at 30 psi suction pressure and a drive power of 278 BHP.

**D. Future Expansion.** Provisions shall be included for a third future compressor of equal size to the two included in the project. This shall include all controls and motor starters necessary for connection of the future compressor.

**E. Emergency Shut Down.** The CNG compression and dispensing equipment shall include an emergency shut down (ESD) system that shall be initiated either manually at an ESD button, or automatically by the equipment. The ESD system shall shut off the power and
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gas supply to the compressor and dispenser. The ESD system shall also shut off gas supply to the entire station at the gas header. The ESD shall also initiate Automatic Transfer Switches to transfer to normal source power thereby stopping operation of the generator. The ESD system shall initiate an alarm at the remote annunciator, and shall dial an emergency phone call to the County’s 24 hour emergency monitor. Control circuits shall remain shut down on ESD until manually reactivated by an authorized operator.

a. Automatic ESD conditions shall include:
   i. Low suction pressure
   ii. High discharge
   iii. Heat detection at dispenser
   iv. Heat detection and methane detection within compressor enclosure

F. Operating Scenarios

a. The CNG Master Control Panel shall be capable of performing the following operating scenarios:
   i. One compressor operation, #1, #2, or #3 alternating on utility power.
   ii. Two compressor operation, #1, #2, or #3 alternating lead / lag on utility power.
   iii. Peak shaving, one compressor operation, #1 or #2 alternating on generator power.
   iv. Peak shaving, two compressor operation, #1 or #2 alternating lead on generator power, #1, #2, or #3 alternating lag on utility power.
   v. Emergency, one compressor operation, #1 or #2 alternating on generator power

b. The one compressor, two compressor, and peak shaving scenarios shall be field selectable at the CNG Master Control Panel. The Master Control Panel shall also allow for 5/2 scheduling of two scenarios per day.

c. Peak shaving scenarios shall signal ATS 1 (for Compressor 1), or ATS 2 (for Compressor 2) to Go To Source 2 on call for compressor operation. Compressor run shall be delayed on a field adjustable timer up to 2 minutes to allow for ATS to switch and for the generator to be ready to accept the load.

d. Emergency scenario shall be automatic on signal of ATS 3 switch in the Source 2 position.

e. The CNG Master Control Panel shall nominate the available compressor with the lowest run hours to operate as the lead compressor. With two compressors
available for lag operation, the compressor with the lowest run hours shall operate as the lag compressor.

**Extra Materials**
Provide the Owner with the following extra materials furnished in the manufacturer’s original packaging.

**A. Hose Assembly.** Furnish four fast-fill and three time-fill hose assemblies complete with nozzle, fill and vent hose, and break-aways.

**B. Filters.** Four of each size and type of filters.

**MATERIALS**
Materials shall conform to the requirements specified in this section and shall be listed and labeled as required in the referenced Codes.

**Natural Gas Dryer**

**A. General.** Natural Gas Dryer shall be a single vessel, manual closed-loop regeneration type skid-mounted dryer rated at 150 psi. The dryer shall have a flow rate capacity of 2,700 scfm at 50 psi. The dryer shall include a digital dew point meter, filters before and after the drying vessel, three valve block and bypass piping for isolation of the dryer, an insulated adsorber vessel and electric heating element, stainless steel desiccant screens and diffusers, a desiccant drain and fill port on the adsorber vessel, and an air cooled gas cooler with non-sparking fan and TEFC motor. The adsorber vessel shall be manufactured and stamped per ASME Section VIII, and piping designed per ASME B31.3. The dryer shall also feature local temperature and pressure gauges for process and regeneration monitoring. The skid-mounted instrument and controls shall be suitable for NEC Class 1, Division 2, Group D electrically classified areas, with panel-mounted regen start, stop, and alarm reset pushbuttons, and remote ESD contacts. The control panel shall also feature a heater element and over-temperature shutdowns and blower/heater interlocks.

**Natural Gas Compressor Skid**

**A. General.** Compressor skid shall be a single manufactured unit including the reciprocating gas compressor, motor, receiving tanks, coolers, and local electrical controls, all within a weatherproof sound attenuating enclosure. CNG compressor skid shall include explosion proof light fixtures, heat and methane detectors.
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B. Reciprocating Gas Compressor. Reciprocating compressor shall be a four throw reciprocating gas compressor with a rated at 560 BHP, 1,800 RPM, and a total rod load of 20,000 lbs. Compressor shall include a lube oil pump to provide filtered oil to all moving parts in the compressor frame. Compressor shall feature a forged steel crankshaft, cast iron crankcase with removable aluminum top and end covers, cast iron crosshead guides and lubricated crossheads, forged steel four bolt rigid connecting rods, an enclosed and continuously lubricated chain drive that is adjusted by positive positioning eccentric vernier.

C. Reciprocating Gas Compressor Manufacturer Support. Reciprocating gas compressor manufacturer must provide 24 hour technical support for the compressor.

D. Reciprocating Gas Compressor Warranty. The reciprocating gas compressor shall be warranted to be free of defects in material and workmanship for a period of 12 months from the date the compressor is placed in service, or for 18 months from the date of shipment, whichever comes first. The crankshaft, crankcase casting, connecting rods, crossheads, and crosshead guide castings shall be warranted to be free of defects in material and workmanship for a period of 72 months. The cylinder bodies, pistons, and piston rods shall be warranted to be free of defects in material and workmanship for a period of 24 months. These warranty periods shall be based on the owner’s use of 100% OEM parts for maintenance. Warranty for other than owner’s use of 100% OEM parts for maintenance shall be free of defects in material and workmanship for a period of 12 months from the date the compressor is placed in service, or for 18 months from the date of shipment, whichever comes first. The crankshaft, crankcase casting, connecting rods, crossheads, and crosshead guide castings shall be warranted to be free of defects in material and workmanship for a period of 36 months for other than owner’s use of 100% OEM parts for maintenance.

E. Motor. The motor shall be a 350 bhp, TEFC, 449T NEMA frame motor rated at 460VAC, 60Hz, 1,800 rpm, and a 1.15 service factor.

CNG Storage Tubes

A. General. CNG storage tubes shall be seamless ASME pressure vessels, rated to 5,500 psi, constructed of SA372, Grade J, Class 70 steel, with an outside diameter of 20 inches and a minimum wall thickness of 1.303 inches. Storage tube nominal water volume shall be 34.1 cubic feet. Storage tubes shall be factory primed and painted.

B. Arrangement. CNG storage tubes shall be rack-mounted in racks of three storage tubes.

C. Valves. Each CNG storage tube shall have one manual 1” ball valve on each end. Ball valves shall be able to be locked with a pad lock, and the contractor shall provide keyed-alike locks on ball valves adjacent to pressure relief valves to lock the manual ball valves in the open position. Pressure relief valves shall be set by the manufacturer to the safety
relief pressure indicated on the plans. Drain valves shall be located on the bottom of each tank. All valves shall be stainless steel, and rated for a minimum pressure equal to the pressure rating of the storage tube.

D. Vent. Each storage tube pressure relief valve shall be directly connected to a 2” Sch. 80 steel vent pipe that extends to 10 feet above grade. Up to three storage tubes may be vented to the same vent stack. One vent stack shall feature an additional threaded connection for venting of the fast-fill dispensers. Vent stack shall include a secondary support that can be bolted to a concrete foundation. Vent stack shall include a condensate drip leg at the bottom of the stack, and a rain cap at the top of the stack.

CNG Dispenser and Fast Fill Post

A. Dispenser. Dispenser shall be a dual hose type capable of dispensing CNG in a cascade filling operation for a temperature compensated fill pressure of 3,600 psi at 70 degrees Fahrenheit at flow rates up to 5,000 scfm at 3,000 psi. Dispenser shall include a stainless steel enclosure, independent coalescing particulate filters, and a pneumatically actuated full flow ball valve with spring-loaded main actuator on each pressure inlet pipe. The ball valve shall close when the control arm is turned off, and on ESD shut down. The dispenser shall also feature a quarter-turn manual ball valve accessible on the outside of the dispenser upstream of the break-away device. Dispenser shall vent to the storage tube vent manifold. Dispenser shall feature an integrated sensor to facilitate temperature compensated filling, and it shall be compatible with POS protocols. Electrical components shall be suitable for NEC Class 1, Division 1 hazardous electrical areas within the dispenser, and NEC Class 1, Division 2 outside the dispenser.

B. Fast Fill Post. Single nozzle, 10’ tall, powder coated 2” Sch. 40 steel pipe with baseplate, and steel gauge hood for holstering of nozzle when not in use. Post shall include flexible hose for gas supply and vent suitable for dispensing pressure, retractor reel, manual shut-off valve, and hose break-away device. Hose length shall be 11’-6”. Nozzle shall be NGV1, Type 1.

CNG Time Fill Posts

A. General. Single nozzle, 10’ tall, powder coated 2” Sch. 40 steel pipe with baseplate, and steel gauge hood for holstering of nozzle when not in use. Post shall include flexible hose for gas supply and vent suitable for dispensing pressure, retractor reel, manual shut-off valve, and hose break-away device. Hose length shall be 22’. Nozzle shall be NGV1, Type 1.
CNG Priority Panel / Time Fill Panel

A. General. Powder coated steel enclosure including gas-actuated solenoid valves and controls to prioritize gas flow through the system. Panel shall include 1” ball valves for compressor discharge; low, mid, and high bank storage; low, mid, and high dispenser supply. Panel shall include ¾” ball valves for time fill supply. Panel shall include pressure gauges to indicate pressure in each storage tube bank, as well as time fill pipe pressure. Panel shall include meter for flow to the time fill system.

CNG Communications Panel

A. General. NEMA 4, powder coated steel enclosure for Ethernet and telephone interface between customer and CNG equipment. Panel shall include an autodialer for call out of ESD activation.

CNG Motor Starter Panel

A. General. NEMA 3R, powder coated steel enclosure for compressor soft-start motor starters and overcurrent protection, gas dryer overcurrent protection and start contactor, and dry-type transformer and overcurrent protection to provide 120V power to control panels, compressor lights and oil heaters, dispensers, and fuel management terminals. Panel shall feature solid copper bus bars, and be rated for 65k AIC. Panel shall include HOA switches for each compressor and lights indicating compressor operation.

CNG Master Control Panel

A. General. NEMA 3R, powder coated steel enclosure for interconnection and control of all CNG compression and dispensing equipment. Panel shall include PLC for customer interface, and an ESD button.

Remote Annunciator

A. General. Remote annunciator shall be an Omntec RA-LU1, Pneumercator RA100, or equal approved by the Engineer, audio / visual alarm panel connected to the ESD circuit of the Motor Starter Panel. Remote annunciator shall include a red LED indicator that shall remain illuminated until the alarm condition is corrected. The remote annunciator shall also feature a minimum 95 dB horn with auto time-out. The enclosure shall be non-metallic NEMA 4X.
A. General. Fuel management system shall be E.J. Ward FCT-RT with stainless steel enclosure, as required for compatibility with Suffolk County’s existing fleet management system. No substitutions will be accepted.

Concrete Anchors

A. General. Anchors shall be the size noted on the plans. Anchors shall be mechanical type, 316 stainless steel. Nuts and washers shall be type 316 stainless steel.

CONSTRUCTION DETAILS

General

A. Offload all equipment from the Manufacturer’s delivery truck in accordance with the approved Rigging Plan.

B. Install all CNG compression and dispensing system components in accordance with the manufacturer’s written instructions.

C. Bolt all components to concrete foundations with anchor bolts as indicated on the plans.

Start-Up and Commissioning

A. The CNG compression and dispensing system manufacturer shall be responsible for performing start-up and commissioning services on all CNG compression and dispensing equipment. The cost of these services shall be paid by the Contractor. Factory acceptance tests shall be performed on the compressors and dispensers at the design suction and discharge pressures to check and confirm proper controls functions, wiring connections, compressor skid vibrations, flow rates, and electrical loads. Field start-up and commissioning shall include a thorough inspection of the equipment to check for shipping damage and to ensure that the equipment is installed properly. The manufacturer shall also confirm the gas inlet system, and shall check for leaks in all pipe, tubing, and equipment. The manufacturer shall purge all equipment of air and inert gasses. The manufacturer shall check all electrical connections. The manufacturer shall start all equipment and confirm proper operation; including temperatures, pressures, electrical draw, and flow. Start-up and commissioning shall include an eight hour minimum training session for the Owner to demonstrate and discuss the operations and maintenance of the equipment. Start-up and commissioning shall include furnishing the O&M manuals and manufacturer’s commissioning check lists and reports to the Owner.
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METHOD OF MEASUREMENT

This work will be measured on a lump sum basis.

BASIS OF PAYMENT

The lump sum price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment will be made under:

Item 662.200101SU – CNG Compression and Dispensing System

A. This item includes furnishing and installing the equipment indicated in the progress payments below.

B. Progress payments will be made at the unit price bid at the following installation milestones:

   a. Natural Gas Dryer = 10%
   b. Natural Gas Compressor Skid = 40%
   c. CNG Storage Tubes = 10%
   d. CNG Dispenser and Fast Fill Post = 10%
   e. CNG Priority Panel / Time Fill Panel = 5%
   f. CNG Communications Panel, CNG Motor Starter Panel, CNG Master Control Panel, Remote Annunciator, Fuel Management System = 5%
   g. Satisfactory Start-up and Commissioning = 20%

At the discretion of the Engineer, partial progress payments may be made based on work actually performed within the Contractor’s billing period.

Item 662.200102SU– CNG Compression and Dispensing System Time Fill Area

A. This item includes furnishing and installing the time fill posts.