PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Related Requirements.

.2 Reference Standards.

.3 Variable Frequency Drive.

.4 Measurement and Payment.

1.2 RELATED REQUIREMENTS

.1 Section 01 91 13 – Start Up, Commissioning and Training

.2 Section 25 30 05 – Process Instrumentation and Control System Testing

.3 Section 26 00 00 – Summary of Electrical Work.

.4 Section 26 00 10 – General Electrical Requirement.

.5 Section 26 08 10 – Electrical Testing.

.6 Section 26 08 20 – Electrical Testing by Contractor.

1.3 REFERENCE STANDARDS

.1 Section 01 42 19 – Reference Standards.

.2 Canadian Standards Association (CSA):

- .1 CSA C22.1 – Canadian Electric Code, Safety Standard for Electrical Installations
- .2 CSA C22.2 No. 94 – Special Purpose Enclosures
- .3 CSA 22.2 No. 14-05 – Industrial Control Equipment

.3 Institute of Electrical and Electronics Engineers Inc. (IEEE):

- .1 IEEE 519 – IEEE Recommends Practices and Requirements for Harmonic Control in Electrical Power Systems.

.4 National Electrical Manufacturer's Association (NEMA):

- .1 NEMA 250 – Enclosures for Electrical Equipment.
- .2 NEMA ICS 6 – Industrial Control and Systems: Enclosures

.5 National Fire Protection Association (NFPA):

- .1 NFPA 70 – US National Electric Code.

.6 Underwriters Laboratories (UL):

.1 UL 508 – Industrial Control Equipment.

1.4 DEFINITIONS

.1 Variable Frequency Drive – VFD.

.2 Programmable Logic Controller – PLC.

.3 Human Machine Interface – HMI.

1.5 SYSTEM DESCRIPTION

.1 The existing VFDs are located in the Control Plant Structure, as shown on Drawings No. M101 and M102, and are used to control the speed of the centrifugal blower motors (Existing Blower #1 and Existing Blower #2).

.2 The existing VFDs to be decommissioned and salvaged, and replaced with new replacement VFDs as per these specifications.

.3 The VFDs will be controlled by the PLC and interlocked with the emergency stop button to shut down the active blower in the event of an emergency.

.4 The VFDs shall be supplied as a fully packaged unit. The VFD shall include controllers, control circuitry, protective equipment, and accessories as necessary to provide the specified function.

.5 The supply and installation of the VFD shall include all VFD unit testing, design coordination, programming and configuration requirements necessary to provide the specified function.

1.6 PERFORMANCE CRITERIA

.1 Minimum continuous current ratings: Full nameplate current of driven motor at rated voltage, torque and speed or current rating specified, whichever is greater.

.2 The VFD unit supplier shall note that the VFD enclosure shall not exceed the available space allocated for the installation indicated on the drawings.

1.7 PROGRESS SUBMITTALS

.1 Section 01 33 00 – Submittal Procedures.

.2 Shop Drawings

.1 Drawing: Include dimensional information and conduit routing locations.

.2 Unit Description: Include amperage ratings, enclosure ratings, fault ratings, horsepower ratings, and nameplate information.

.3 Wiring Diagrams:

.1 Power Diagram: Include amperage ratings, circuit breaker frame sizes, and circuit breaker continuous amperage ratings.

.2 Control Diagram: Include disconnect devices.

.4 Product Data:
.1 VFD and Operator Interface publications.

1.8 CLOSEOUT SUBMITTALS

.1 Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data:
.1 Service and contact information.
.2 VFD and operator interface User Manuals.
.3 Troubleshooting / Service Manuals.

1.9 WARRANTIES

.1 Assign directly to the Owner Manufacturer's warranties on materials and equipment (including internal components).

.2 Warranty Period: minimum 12 months from date of commissioning and not less than 18 months from date of manufacture.

.3 The Contractor shall coordinate with the VFD manufacturer and be responsible for the VFD warranty and all VFD problems incurred during and after installation at the work site, as well as provide and warranty any individual VFD units sent to the manufacturer for required equipment run testing. Supply technical assistance during testing at the manufacturer's factory, coordinate shipping, and pay for all costs.

1.10 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00 – Common Product Requirements: Requirements for delivery, storage and handling.

.2 Deliver and store products with labelling in place.

.3 Contractor shall coordinate the shipping of equipment with the Manufacturer.

.4 Use every precaution not to damage products.

PART 2 PRODUCTS

2.1 VARIABLE FREQUENCY DRIVE

.1 Manufacturer: Schneider Electric, Altivar ATV930 Series, or approved equivalent.
.1 Adjustable frequency drive using pulse width modulation.
.2 Operation Interface: Keypad with LCD display.
.3 Internal/External Supply: 24VDC.
.4 Analog Inputs: 3.
.5 Analog Outputs: 2.
.6 Discrete Inputs: 8.

.7 Discrete Outputs: 2.

.8 Modbus TCP/IP communications (RJ45 connector).

.2 Ratings:

.1 Horsepower rating: 15hp.

.2 Input voltage: 600V (+/- 10 percent), 3 phase, 57 to 73 Hz, voltage imbalance of +/- 3 percent.

.3 Continuous Output current: 13.5A @ 600V (heavy duty application).

.4 Frequency Drift: +/- 1 percent rated value no load to full load.

.5 Atmosphere: Noncondensing relative humidity to 95 percent.

.6 VFD Efficiency: A minimum of 95 percent at 100 percent speed and torque at 40 degrees Celsius ambient based upon measurement of input power versus output power with all specified components in system.

.7 Input Speed Signal: Provisions for a 4-20 mA DC from an external source. Input shall be isolated.

.3 Location: Within Control Plant Enclosure as shown on Drawings.

.4 Mounting: Wall mount.

.5 Drive Interface: Refer to Drawings.

.6 Microprocessor Digital Control:

.1 Drive operating parameters programmable.

.2 Sealed keypad with pushbuttons or sealed membrane type keypad with LED or LCD display.

.3 Operating parameters, fault, and diagnostic data maintained in non-volatile memory.

.4 Display fault and diagnostic data.

.7 The drive shall include, as a minimum the following programmable parameters:

.1 Minimum and maximum frequency limits.

.2 Independent acceleration and deceleration rates.

.3 Voltage parameters.

.4 Overload and torque limits.

.5 Current limit.

.6 Speed profile.

.8 Protective Features and Functions:

.1 Current limiting fuses, regulators or other techniques for both internal and external fault protection.

.2 EMC input filter.

.3 Output Line reactor: 5%.

.4 Overvoltage protection on the incoming AC line.

.5 Ground fault protection.

.6 Single-phase fault or three-phase short-circuit on VFD output terminals without damage to any power component.

.7 Overspeed (over frequency).

.8 Line or fuse loss.

.9 Power unit over-temperature.

.10 Circuit protection for the following conditions:

.1 VFD fault.

.2 Motor protection interlock.

.3 Emergency stop.

.4 Motor stall protection.

.5 Internal faults.

.9 Design and manufacture equipment in accordance with applicable NEMA and IEEE recommendations and be designed for installation in accordance with NEC. Equipment shall have UL and/or CSA approval.

.10 Control shall be suitable for operation in ambient temperatures of -10 to 40ºC.

.11 Enclosure: Nema 4X

.12 Quantity: 2.

.13 Tag: VFD-1. VFD-2.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Section 01 73 00 – Execution: Requirements for examination of existing conditions before starting work.

3.2 DECOMMISSION EXISTING VFDS

.1 Disconnect and salvage existing VFDs to facilitate installation of new VFD units.

.2 Dispose of existing VFDs on-site as directed by Engineer.

3.3 INSTALLATION

.1 Install products in accordance with Manufacturer’s specifications and instructions.

.2 Connect VFD power as shown on Drawings.

.3 Connect VFD discrete contacts, analog and control signals to PLC as shown on Drawings.

.4 Configure, program, test and commission VFD.

3.4 FIELD QUALITY CONTROL

.1 Section 01 45 00 – Quality Control.

.2 VFD testing: Section 26 08 10 and Section 26 08 20.

.3 Startup and Commissioning: Section 01 91 13.

.4 Employ and pay for services of the equipment manufacturer's field service representative to:

.1 Inspect equipment covered in these specifications.

.2 Supervise adjustments and installation checks.

.3 Conduct startup of equipment and perform operational checks; provide a checklist of all inspections.

.4 Attend facility commissioning and make adjustments to the VFD as required during the commissioning of the Works.

3.5 PROTECTION OF THE FINISHED WORKS

.1 Section 01 73 00 – Execution: Requirements for protection of installed works.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 Refer to Section 01 29 00 – Payment Procedures: Requirements for measurement and payment.

4.2 VARIABLE FREQUENCY DRIVE

.1 Schedule of Prices Item No. 23 05 14/01

.2 Measurement Basis: Per VFD unit installed.

.3 Payment Basis: Unit Price. Includes decommissioning and disposal of existing VFDs, supply and installation of variable frequency drives VFD-1 and VFD-2, accessories, and mounting hardware, electrical connections, connection to the PLC, programming, testing, startup, commissioning, attendance of Manufacturer's field service representative during commissioning of works.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

.1 This Section specifies the requirements for the installation of owner supplied process valves and appurtenances associated with the landfill gas control plant at the locations shown in Drawings. This section must be referenced and interpreted simultaneously with all other sections pertinent to the Works described herein.

1.2 SECTION INCLUDES

.1 Supply and install valves for the landfill gas control plant and flare.

.2 Electrically Actuated Butterfly Valve (XV-101).

.3 Electrically Actuated Butterfly Valve (XV-140).

.4 Measurement and Payment.

1.3 RELATED REQUIREMENTS

.1 Section 01 91 13 – Start up, commissioning, and training.

.2 Section 23 11 23 – Process Piping.

.3 Section 23 52 39 – Flare.

.4 Section 25 30 00 – General Requirements for Instrumentation and Control.

.5 Section 25 30 01 – PLC Control Panel.

.6 Section 25 30 03 – Process Control System Development and Programming.

.7 Section 25 30 05 – Process Instrumentation and Control System Testing.

.8 Section 25 90 00 – Control Plant Operation Description.

.9 Section 26 00 00 – Summary of Electrical Work.

.10 Section 26 00 10 – General Electrical Requirement.

.11 Section 26 08 10 – Electrical Testing.

.12 Section 26 08 20 – Electrical Testing by Contractor.

1.4 REFERENCE STANDARDS

.1 Section 01 42 19 – Reference Standards.

.2 Abbreviations for electrical terms shall be to CSA Z85-1983.

.3 Abbreviations of standards organizations referenced in this and other sections are as follows:

ACI	American Concrete Institute
CSA	Canadian Standards Association
CEC	Canadian Electrical Code
IEEE	Institute of Electrical and Electronic Engineers
ANSI	American National Standards Institute
NBC	National Building Code
NFPA	National Fire Protection Association
EEMAC	Electrical & Electronic Manufacturers Association of Canada (formerly CEMA)
FM	Factory Mutual
NEMA	National Electrical Manufacturers Association (U.S.)
JIC	Joint Industry Conference
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
IES	Illuminating Engineering Society
NETA	National Electrical Testing Association
CUL	Canadian Underwriters Laboratories Inc.
ETL	Electrical Testing Laboratories, Inc.
ASTM	American Society for Testing and Materials
AASHTO	American Association of State Highway and Transportation Officials
GRI	Geosynthetic Research Institute

.4 American Society for Testing and Materials (ASTM):

.1 D5034 – Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test).

.2 D5035 – Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Test).

1.5 DEFINITIONS

.1 LFG – Landfill Gas composed of approximately 50 percent methane and 50 percent carbon dioxide on a volumetric basis.

.2 Process Piping – All stainless steel piping, fittings, appurtenances, accessories associated with the landfill gas control plant, including intake manifold, discharge manifold, flare spool, discharge spool, discharge elbow, and condensate drain lines.

.3 SS – Stainless Steel

1.6 SUBMITTALS

.1 Submit in accordance to Section 01 33 00 – Submittal Procedures.

.2 Certificates:

.1 Submit certificates signed by Manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Dimensions.

1.7 CLOSEOUT SUBMITTALS

.1 Submit maintenance and Engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.8 QUALITY ASSURANCE

.1 Comply with requirements specified in Section 01 45 00 – Quality Control.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Delivery, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Protect valves, actuators and appurtenances from physical damage.

PART 2 PRODUCTS

2.1 ELECTRIC ACTUATED BUTTERFLY VALVES XV-101 AND XV-140 (OWNER SUPPLIED)

.1 Manufacturer: Crane Flowseal, Class 150, high performance eccentric butterfly valve

.2 Diameter: 150 mm.

.3 Process Fluid: Landfill Gas.

.4 Body: 316 stainless steel.

.5 Body Type: Lugged.

.6 Ends: Single flanged, B16.5, Class 150.

.7 Disk: 316 stainless steel.

.8 Stem: 316 stainless steel.

.9 Seat: UHMWPE/Viton.

.10 Adapter: carbon steel adapter for Actuator.

.11 Actuator:

.1 Manufacturer: RCS Dresser SURE 150.

.2 Enclosure: CSA certified NEMA 4 for Class I Division 2 Hazardous area.

.3 Type: Electric spring-return actuator, fail closed.

.4 Indicator: beacon visual indicator.

.5 Override: Triac declutchable gear override, ductile iron body, with 325mm hand wheel.

.6 Minimum actuator torque: 135 Newton Metres.

.7 Operating temperature: -40 degrees C to 60 degrees C.

.12 Quantity: 2 (Owner Supplied)

.13 Tags: XV-101 and XV-140

.14 Location: Upstream of Condensate Knockout Pot and upstream of Flare.

2.2 ACTUATED CONDENSATE DRIP TRAP (OWNER SUPPLIED)

.1 Varec Model 246AT-6, electric actuated valve assembly.

2.3 HARDWARE (CONTRACTOR SUPPLED)

.1 Bolt Sets: ASME 18.2, 304 stainless steel, unless otherwise indicated in Drawings.

.2 Gaskets: Neoprene, minimum 3.17 mm thick, full-faced.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Section 01 73 00 – Execution.

.2 Verify items provided by other Sections are properly sized and located.

3.2 QUALITY CONTROL

.1 Section 01 45 00 – Quality Control.

3.3 EXISTING VALVE DECOMMISSIONING

.1 Disconnect salvage and protect all existing wiring and controls to existing actuators by qualified electrician.

.2 Remove, salvage and dispose of existing valves (XV-101, XV-105, XV-140 and XV-150) as directed by Engineer.

.3 Disconnect and remove wiring for XV-105 and XV-150.

3.4 PREPARATION

.1 Valve and mating flange preparation.

.1 Inspect adjacent pipeline, remove rust, scale, welding slag, and other foreign materials.

.2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.

.3 Install butterfly valves with disc in almost close position.

.4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

.2 Clean all debris, and dirt from inside of piping before placing valves in place.

.3 Erect and support valve in respective positions free from distortion and strain on appurtenances during handling and installation. Inspect material for defects in workmanship and material.

3.5 GENERAL INSTALLATION

.1 Prior to installation, protect stored valves and appurtenances from damage due to exposure.

.2 Clean all debris, and dirt from inside of piping before placing valves in place.

.3 Erect and support valves in respective positions free from distortion and strain on appurtenances during handling and installation. Inspect material for defects in workmanship and material.

Clean out debris and foreign material from valve openings and seats, test operating mechanisms to check functioning.

.4 Check nuts and bolts for tightness.

.5 Repair valves and other equipment which does not operate easily or are otherwise defective at no additional cost to Owner.

.6 Set plumb and support valves in conformance with manufacturer's instructions.

3.6 BUTTERFLY VALVES (OWNER SUPPLIED)

.1 Install in accordance with manufacturer's instructions.

.2 Do not use gaskets between pipe flanges unless instructed otherwise by valve manufacturer.

.3 Verify suitability of valve for application by inspection of identification tag.

.4 Mount actuator onto valve prior to installation.

.5 Handle valve with care so as to prevent damage to disc and seat faces.

.6 Valves in horizonal pipe lines shall be installed with stem in horizonal position to minimize liner seal and wear.

.7 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement.

3.7 INSTALLATION – ELECTRIC ACTUATORS

.1 Electrical connections be made by qualified electrician.

.2 Cycle valve operation from fully closed to fully opened then back to fully closed.

.3 At same time, check travel stop settings for proper disc alignment.

3.8 ACTUATED CONDENSATE DRIP TRAP (OWNER SUPPLIED)

.1 Install Low Pressure Drip Trap as per manufacturers specifications and recommendations.

.2 Orientate Drip Trap to allow for removal and maintenance.

3.9 CLEANING

.1 Clean installed products in accordance to manufacturer's recommendation.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 Refer to Section 01 29 00 – Payment Procedures: Requirements for measurement and payment.

4.2 DECOMMISSION ACTUATORS XV-105 AND XV-150

.1 Schedule of Prices Item No. 23 05 26/01

.2 Payment Basis: Lump Sum. Includes disconnection and decommissioning existing valve and actuator for XV-105 and XV150 and disposal of valves, actuators and wiring on site.

4.3 ELECTRIC ACTUATED BUTTERFLY VALVE (XV-101)

.1 Schedule of Prices Item No. 23 05 26/02

.2 Payment Basis: Lump Sum. Includes decommissioning existing valve and actuator; Installation of owner supplied butterfly valve and actuator; supply and install hardware, bolt sets, gaskets, electrical connections, connection to PLC and control systems, alignment and configuration, testing, start-up and commissioning.

4.4 ELECTRIC ACTUATED BUTTERFLY VALVE (XV-140)

.1 Schedule of Prices Item No. 23 05 26/03

.2 Payment Basis: Lump Sum. Includes decommissioning existing valve and actuator; Installation of owner supplied butterfly valve and actuator; supply and install hardware, bolt sets, gaskets, electrical connections, connection to PLC and control systems, alignment and configuration, testing, start-up and commissioning.

4.5 ACTUATED CONDENSATE DRIP TRAP (TCV-234)

.1 No separate measurement will be made for the supply and installation of the flare low pressure drip trap. Payment for the supply and installation of the flare actuated condensate drip trap to be included in the Schedule of Prices Item No. 23 11 23/06.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

.1 This Section specifies the requirement for the decommissioning of pipe spools as shown on Drawings, and the supply and installation of process piping, propane line, fittings, and appurtenances in locations shown in Drawings. This Section must be referenced and interpreted simultaneously with all other sections pertinent to the Works described herein.

1.2 SECTION INCLUDES

.1 Welder's Certifications.

.2 Process Piping and Fittings.

.3 Buried Propane Line.

.4 Flame Retention Pipe.

.5 Pilot Gas Pipe.

.6 Flare Condensate Drain Line.

.7 Execution

.8 Measurement and Payment.

1.3 RELATED REQUIREMENTS

.1 Section 23 05 26 – Process Valves.

.2 Section 23 05 29 – Pipe Stands and Supports.

.3 Section 31 23 10 – Trenching and Excavation.

.4 Section 26 51 10 – Heat Trace.

1.4 REFERENCE STANDARDS

.1 Section 01 42 19 – Reference Standards.

.2 American Society of Mechanical Engineers (ASME):

.1 ASME B1.1 0 - Unified Screw Threads.

.2 ASME B16.3 – Malleable Iron Threaded Fittings Classes 150 and 300.

.3 ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

.4 ASME B16.9 – Factory-Made Wrought Buttwelding Fittings.

.5 ASME B16.15 – Standard for Cast Bronze threaded Fittings 125 and 250 lb.

.6 ASME B16.18 – Standard for Cast Copper Alloy Solder-Joint Pressure Fittings.

.7 ASME B16.22 – Standard for Wrought Copper and Bronze Solder-Joint Pressure Fittings.

.8 ASME B18.2 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).

.9 ASME B31.4 - Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.

.10 ASME B36.19M – Stainless Steel Pipe.

.3 American Society for Testing and Materials (ASTM):

.1 ASTM A36 – Standard Specification for Carbon Structural Steel.

.2 ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.3 ASTM A182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

.4 ASTM A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.

.5 ASTM A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.6 ASTM A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Purpose.

.7 ASTM A307 – Standard Specification for Carbon Steel Externally Threaded Standard Fasteners.

.8 ASTM A312 – Seamless and Welded Austenic Stainless Steel Pipe.

.9 ASTM A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.

.10 ASTM A536 – Standard Specification for Ductile Iron Castings.

.11 ASTM A733 - Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples.

.12 ASTM B75 – Specification for Seamless Copper Tube.

.13 ASTM B88 - Standard Specification for Seamless Copper Water Tube.

.14 ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.15 ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service.

.16 ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

.17 ASTM D1330 – Standard Specification for Rubber-Sheet Gaskets.

.18 ASTM F405 – Standard Specification for Corrugated Polyethylene Tubing and Fittings.

.19 ASTM F667 – Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

.20 ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

.21 ASTM F2306 – Standard Specification for 12 to 60 in. (300 to 1500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.

.4 American Welding Society (AWS):

.1 AWS B3.0 – Welding Procedure and Performance Qualification.

.5 Expansion Joint Manufacturers Association Standard.

1.5 DEFINITIONS

.1 DR: Dimension Ratio. Actual outside pipe diameter divided by the wall thickness

.2 HDPE: High Density Polyethylene

.3 LFG: Landfill Gas

.4 SS: Stainless Steel

.5 Process Piping – All stainless steel pipe, fittings, appurtenances, and accessories associated with the landfill gas control plant.

1.6 SYSTEM DESCRIPTION

.1 Decommission and salvage the Bypass Spool, and Elbow Spool, associated manual shut-off valve, and electric actuated isolation valve.

.2 Supply and install all piping, fittings, and appurtenances associated with the Discharge Spool, flare stack, and condensate drain.

.3 All stainless steel pipe, fittings, and appurtenances shall be 316L stainless steel, unless otherwise indicated in drawings.

.4 All HDPE pipe shall be DR11 unless otherwise indicated on drawings.

1.7 WELDING CERTIFICATIONS AND PERMITS

.1 Contractor responsible for all permits and inspections associated with the works.

.2 The Contractor shall have all steel pipe works, fittings and associated appurtenances welded by a gas fitter with a valid Class A Pressure Welder Certificate issued by the Technical Safety Authority of British Columbia.

1.8 PROGRESS SUBMITTALS

.1 Section 01 33 00 – Submittal Procedures: Requirements for progress submittals.

.2 Certificates: Submit copies of all Welder’s Certificates of Qualifications.

.3 Submit Manufacturer’s certificate of conformance.

.4 Schedules for all pipe, fittings, flexible connectors, adapters, couplings, expansion joints, and other appurtenances.

.5 Manufacturer's Instructions: Indicate special procedures required to install products specified.

1.9 QUALITY ASSURANCE

.1 Comply with the requirements specified in Section 01 43 00 – Quality Assurance.

.2 Welder Qualifications:

.1 Qualifications of welders: Welding shall be performed by welders holding current Class A Pressure Welder Certificate issued by the Technical Safety Authority of British Columbia.

.2 Qualify and certify welding procedures, welders, and operators in accordance with ANSI B31.1, for shop and project site welding of pipe works.

.3 Visually inspect welding while the operators are making the welds and again after the work is completed. After the welding work is completed, hand or power wire brush welds and clean them. Inspect welds for defects exceeding tolerances allowed by code under which the weld was made. Repair all defects exceeding tolerance.

.4 Perform work in accordance with Technical Safety BC, and Occupational Health and Safety Regulations.

1.10 CLEANING AND DESCALING

.1 All welded or heat treated stainless steel pipe, fittings, and appurtenances shall be descaled, pickled, and cleaned prior to delivery to site as per ASTM A380.

.2 The Contractor shall inspect all pipe and welds to ensure pipe is properly descaled, pickled, and cleaned prior to shipment to site to construct the Works.

.3 Contractor will give 24-hour notice prior to shipping stainless steel pipe to site. Pipe delivered to site which has not been properly descaled, pickled, and cleaned, or shows visible signs of rust or corrosion will be rejected and must be replaced at the Contractor’s expense.

1.11 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00 – Common Product Requirements: Product delivery, storage, and handling requirements.

.2 Deliver and store piping with labeling in place.

.3 Deliver, store, and handle pipe, fittings and appurtenances in accordance with applicable requirements of the specified references, the Manufacturer's instructions, and as specified herein.

.4 Contractor is responsible for conducting an inspection at the time of delivery to verify that the correct products and the expected quantities are received. Pipes and accessories should be visually inspected for damage and signs of rust or corrosion.

.5 Under no circumstances will a dropped pipe be used unless inspected and accepted by Consultant.

PART 2 PRODUCTS

2.1 PROCESS PIPING AND FITTINGS

.1 Materials: ASME B36. 19M Stainless Steel, Type 316L unless otherwise indicated on drawings. Dimensions as shown on Drawings.

.2 Joints: Butt welded conforming to ASME 16.9.

.3 Fittings: Fitting Schedules shall match the adjoining pipes and be of an IPS butt-welding type that complies with ANSI/ASME B16.9 and MSS SP-43.

.4 Accessories:

.1 Flanges: ASME B16.5, ANSI 150 lb, 316L stainless steel, flat faced.

.2 Blind Flanges: ASME B16.5, ANSI 150 lb, 316L stainless steel, flat faced, pressure rating equivalent to piping.

.3 Gaskets: Neoprene, minimum 3.17 mm thick, full-faced.

.4 Bolt Sets: ASME 18.2, 304 stainless steel, unless otherwise indicated in Drawings. Project bolt ends 6 mm beyond surface of nuts.

.5 Drain Ball Valve:

.1 316 stainless steel full port ball valve, with lockable lever actuator.

.2 Diameter: 19 mm.

.3 Connections: NPT.

.4 Nipple: 50mm long, 19mm diameter, threaded 316 stainless steel.

2.2 PIPE SUPPORTS

.1 Pipe Supports:

.1 Material: Galvanized Steel.

.2 Dimensions: As shown on Drawings.

.2 Riser: Galvanized, as shown on Drawings.

.3 Galvanizing: Hot-dipped galvanizing with medium zinc coating of 600g/m to CSA G164-M92.

.4 Bolt Sets: ASME 18.2, 10mm diameter, 304 stainless steel, Project bolt ends 6 mm beyond surface of nuts.

.5 Quantity: 4

2.3 BURIED PROPANE LINE

.1 ASTM B88, Type L copper pipe, suitable for propane tank application.

.2 Diameter: 13 mm.

.3 Propane line shall be buried as shown on Drawings.

.4 Bedding Sand: Clean sand, with 100 percent passing the 4.76 mm sieve.

.5 Ball valves:

.1 Approved ball valve type, suitable for outdoor propane applications, installed between the propane tank and the flare valve & regulator assembly.

.2 Quantity: 2.

.3 Tag Number: BLV-232 & BLV-233

.4 Location:

.1 Propane Tank.

.2 Flare Valve and Regulator Assembly.

.6 Fittings: Wrought copper and bronze solder.

.7 Warning Tape: Standard, 4-mil polyethylene 76 mm (3 inch) wide tape, detectable type, blue with black letters, and imprinted with “BURIED GAS LINE BELOW”.

2.4 FLAME RETENTION PIPE

.1 Pipe: ASTM B88, Type L Copper, suitable for propane gas application.

.2 Diameter: 13 mm.

.3 Fittings: Wrought copper and bronze solder.

.4 Flame check: Varec Model 5200 (Owner Supplied).

.5 Location: Pipe connection between Flare Pilot Valve and Regulator Assembly and Flare.

2.5 PILOT GAS PIPE

.1 Black steel, ASTM A53, Schedule 40, suitable for propane gas application.

.2 Diameter: 50 mm.

.3 Nipples: Steel, ASTM A733, Schedule 40.

.4 Fittings: ANSI B16.3 threaded malleable iron.

.5 Joints: Threaded.

.6 Location: Pipe connection between Flare Pilot Valve and Regulator Assembly and Flare.

2.6 FLARE CONDENSATE DRAIN

.1 Actuated Condensate Drip Trap: Refer to Article 2.2, Section 23 05 26 – Process Valves.

.2 Ball Valve:

.1 Full Port 316 SS Ball Valve, lever actuator.

.2 Diameter: 25mm.

.3 Connections: NPT.

.3 Condensate Drain Line:

.1 25mm diameter SCH40 316 SS

.2 Accessories:

.1 Insulation:

.1 Type: Pre-molded fiberglass with self sealing lap.

.2 Thickness: 25 millimeters.

.2 Aluminum Protective Jacket: 0.5 mm (0.020 inch) stucco embossed aluminum jacketing, conforming to ASTM B209.

.3 Strapping: Stainless steel strapping and wing seals. Provide strapping 25 mm minimum width with a minimum thickness of 0.5 mm (0.020 inch). Provide wing seals 12 mm wide or greater with a minimum thickness of 0.75 mm.

.4 Pipe Stand:

.1 Galvanized steel.

.2 Anchor bolts: 12mm diameter x 50mm Hilti kwik bolts.

.3 Size: as shown on Drawings.

2.7 BURIED CONDENSATE LINE

.1 HDPE Pipe: DR 11, 50 mm diameter.

.2 Joints: Thermal butt fusion except flanged connections as shown on Drawings.

.3 Bedding Sand: Clean sand, with 100 percent passing the 4.76 mm sieve.

.4 Accessories:

.1 Flanges: ASTM A536 ductile iron backing flanges with Class 150 ANSI B 16.5 standard drilling and corrosion resistant coatings. Complete with 1-piece molded polyethylene stub ends unless otherwise indicated on drawings. Connections shall have same or greater pressure rating as pipes.

.2 Electrofusion Couplers: DR11

.3 Gaskets: Neoprene, minimum 3.2 mm thick.

.4 Bolt Sets: Hexagonal type, 304 Stainless steel unless otherwise indicated in Drawings.

.5 Warning Tape: Standard, 4-mil polyethylene 76 mm (3 inch) wide tape, detectable type, blue with black letters, and imprinted with “BURIED GAS LINE BELOW”.

.5 Fittings: DR 11 HDPE pipe fittings, suitable for pressure rating as specified and fusion to main pipe with dimensions as specified in Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Section 01 73 00 – Execution.

.2 Verify excavations are ready to receive work. Excavations, dimensions and elevations are as shown on Drawings.

.3 Verify items provided by other Sections are properly sized and located.

3.2 PROCESS PIPING DECOMMISSIONING

.1 Disconnect Utilization Facility Electric Actuated Valve by qualified electrician.

.2 Remove and salvage electrical conductors from PLC panel to Utilization Facility Electric Actuated Valve.

.3 Remove and salvage Utilization Facility Manual Shut-Off Valve.

.4 Disconnect and salvage existing temperature instrument TIT-104 from Bypass Spool.

.5 Remove and salvage existing Bypass Spool and Elbow Spool as shown on drawings.

.6 Dispose of decommissioned materials on site as directed by Engineer.

3.3 DISCHARGE SPOOL

.1 Confirm dimensions of Discharge Spool prior to manufacturer.

.2 Install Discharge Spool immediately upon removal of existing Bypass Spool.

.3 Installation of Discharge Spool by Class A pipe fitter.

3.4 UTILIZATION FACILITY CHARGE LINE

.1 Install stainless steel bling flanges immediately upon removal of the existing Elbow Spool assembly, manual isolation valve, and electric actuator valve.

3.5 PIPE TRENCH PREPARATION

.1 Excavate grades to elevations as shown on Drawings.

.2 Hand trim excavations to required elevations.

.3 Ensure that the excavation remains dry and groundwater elevation remains below the base of the excavation elevation until adequate backfill is placed to ensure installed pipe will not become dislodged.

.4 Ensure that excavation foundation is suitable for pipe bedding placement. Excavation foundation shall be free of large stones, soil clumps, frozen soils, debris and deleterious material.

.5 Trench width shall be sufficiently wide to allow for compaction of pipe bedding in the haunches and adjacent to the sides of the pipe.

.6 Remove large stone and other hard materials which could damage pipe or impede consistent backfilling and compaction.

3.6 BURIED PROPANE LINE

.1 Prevent debris and water from entering the propane line.

.2 Avoid excessive transportation and movement which can cause damage to line.

.3 Install pipe, fittings, manual shut-off valves and accessories in accordance with applicable codes and Manufacturer's instructions.

.4 Lay pipe to slope gradients as shown on Drawings with maximum variation from true slope of 1 cm in 3 m. Maintain positive drainage for all pipe sections.

.5 Use laser equipment for controlling grade of propane line installation.

.6 Backfill to lines and grades as shown on Drawings. Place buried warning tape as shown on Drawings.

3.7 INSTALLATION OF PROCESS PIPING

.1 Prevent debris and water from entering the pipe.

.2 Avoid excessive transportation and movement which can cause damage to pipe.

.3 Install heat trace as per Section 26 51 10.

.4 Install insulation in accordance with these Specifications.

.5 Install piping to lines and grades as shown on Drawings. Provide temporary support where required, ensuring that heat trace, insulation and jacket are not damaged during installation.

.6 Remove debris from pipes and fittings prior to assembly.

.7 Prior to flange assembly, remove rust resistance coating from machined surfaces, clean gaskets and smooth burrs. Ensure flange joints are tight, and prevent strain upon valves, condensate knock-out pot, and flame arrestor assembly.

.8 Examine pieces for damage. Do not install pieces that are damaged according to the Consultant. If any damaged pieces are discovered after installation, remove and replace the damaged piece with sound piece at no additional cost to the Owner.

.9 Handle pipe with equipment designed to prevent damage to the pipe, coatings, or insulation. Repair abrasions prior to the application of insulation.

3.8 BURIED CONDENSATE LINE INSTALLATION

.1 Prevent debris and water from entering inside of pipe.

.2 Do not bend in a radius smaller than recommended by Manufacturer when staged on Site or installed in the trench.

.3 Perform thermal fusion in sheltered areas with temperature maintained in accordance with Manufacturer's instructions.

.4 Avoid excess transportation and possible damage to the pipe.

.5 Prior to thermal fusion in the field on any pipe on a given date, provide a test weld and operating data to Engineer including welding temperature, machine number, date of last service, and clearance certificate.

.6 Install pipe, fittings, and accessories in accordance with Manufacturer's instructions.

.7 Lay pipe as shown on Drawings with maximum variation from true slope of 1 cm in 3 m. Maintain positive drainage for all pipe sections.

.8 Backfill to lines and grades indicated on Drawings.

.9 Place buried pipe tape as shown on Drawings.

.10 Place warning tape as shown on Drawings.

.11 The Contractor shall stockpile all excavated materials not used for backfilling or cover soil on site as directed by Engineer.

.12 Soil used for backfill shall be placed in a loose lift that results in a compacted lift thickness of no greater than 150 mm (6 inches). The maximum permissible pre-compaction soil clod size is 150 mm.

.13 Surplus soil excavated from trenches shall be hauled to the landfill active area.

3.9 FIELD QUALITY CONTROL

.1 Section 01 45 00 – Quality Requirements: Field Inspection and testing.

.2 Hydrostatic Pressure and Leakage Test for Stainless Steel Process Piping as follows;

.1 Provide labour, equipment and materials required to perform hydrostatic and leakage tests as specified herein.

.1 Notify Consultant at least 24 hours in advance to all proposed tests.

.2 Perform tests in the presence of the Consultant.

.2 Test system by closing butterfly valve and placing temporary blind flange at the end of the discharge elbow.

.3 Test HDPE condensate line at a pressure of 30 kPa. Utilize nitrogen to charge the pipes and maintain pressure for adequate period to allow for expansion of the piping. Fittings, valves, and expansion joints shall be accessible for inspection during the pressure test. A pressure test will be deemed successful if the designated pressure is maintained for a period of no less than 2 hours with no measurable pressure drop throughout the duration of the test. The temperature must be constant to within 1 degree C during the entirety of the test or adjusted with the appropriate correction factor.

.4 Use soap for leak detection at all connections.

.5 Examine joints for leakage. Remove and replace any joints with leakage from the pipeline and retest the system.

.6 Ensure that normal safety precautions are observed for exposed piping.

.7 Locate and repair defects if leakage occurs.

.8 Repeat testing procedures until pressure drop is eliminated or within specified allowances for the full length of pipe.

.9 If tests indicate Works to not meet specified requirements, remove Works, replace and retest.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 Refer to Section 01 29 00 – Payment Procedures: Requirements for measurement and payment.

4.2 DISCHARGE SPOOL DECOMMISSIONING

.1 Schedule of Prices Item No. 23 11 23/01

.2 Payment Basis: Lump Sum. Includes decommissioning of existing bypass spool; supply, cleaning and descaling, and installation of Discharge Spool, bolts, gaskets, fittings and appurtenances.

4.3 UTILIZATION FACILITY DISCHARGE LINE DECOMMISSIONING

.1 Schedule of Prices Item No. 23 11 23/02

.2 Payment Basis: Lump Sum. Includes decommissioning of existing manual shut-off valve, electric actuated valve, and elbow spool; supply and installation of stainless steel blind flanges, drain valve, bolt sets, gaskets, and appurtenances.

4.4 PIPE SUPPORTS

.1 Schedule of Prices Item No. 23 11 23/03

.2 Payment Basis: Lump Sum. Includes supply and installation of pipe supports and appurtenances.

4.5 BURIED PROPANE LINE

.1 Schedule of Prices Item No. 23 11 23/04

.2 Measurement Basis: by the linear metre measured along the centerline of the buried propane pipe.

.3 Payment Basis: Unit Price. Includes excavation, temporary stockpiling, supply and installation of propane line, fittings, valves, tags, bedding sand, warning tape, placing and compacting of fill, base course, subbase course, and regrading to grade shown on Drawings.

4.6 FLAME RETENTION PIPE

.1 Schedule of Prices Item No. 23 11 23/05

.2 Payment Basis: Lump Sum. Includes supply and installation of the flare retention pipe, flame check, fittings and appurtenances, connection to flare valve and regulatory assembly, and flare burner assembly.

4.7 PILOT GAS PIPE

.1 Schedule of Prices Item No. 23 11 23/06

.2 Payment Basis: Lump Sum. Includes supply and installation of the pilot gas pipe, flame check, fittings and appurtenances, connection to flare valve and regulatory assembly, and flare burner assembly.

4.8 FLARE CONDENSATE DRAIN LINE

.1 Schedule of Prices Item No. 23 11 23/07

.2 Payment Basis: Lump Sum. Includes installation of Owner Supplied actuated condensate drip trap; supply and installation of the Flare condensate drain line, piping, ball valve, insulation, pipe stand, and accessories.

.3 Payment for heat trace included in Payment Item No. 26 00 00/01.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Existing Flare Decommissioning.

.2 Flare (Owner Supplied).

.3 Flare Condensate Drain (Owner Supplied).

.4 Execution.

.5 Measurement and Payment.

1.2 RELATED REQUIREMENTS

.1 Section 01 91 13 – Start-up, Commissioning and Training.

.2 Section 23 05 26 – Process Valves.

.3 Section 23 05 29 – Pipe Stands.

.4 Section 23 11 23 – Process Piping.

.5 Section 25 30 01 – PLC Control Panel.

.6 Section 25 30 05 – Process Instrumentation and Control System Testing.

.7 Section 25 90 00 – Control Plant Operation Description.

.8 Section 26 00 00 – Summary of Electrical Work.

.9 Section 26 00 10 – General Electrical Requirements.

.10 Section 26 08 10 – Electrical Testing.

.11 Section 26 08 20 – Electrical Testing by Contractor.

1.3 REFERENCE STANDARDS

.1 Section 01 42 19 – Reference Standards.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength

.3 Canadian Standards Association (CSA):

.1 CSA C22.1 – Canadian Electric Code, Safety Standard for Electrical Installations.

.2 CSA B149.1 – Natural Gas and Propane Installation Code.

.3 CSA B149.2 – Propane Storage and Handling Code.

.4 CSA B149.6 - Code for Digester Gas and Landfill Gas Installations.

.5 CSA 22.2 No. 40 – cutout, Junction, and Pull Boxes.

.4 National Electrical Manufacturer's Association (NEMA):

.1 NEMA 250 – Enclosures for Electrical Equipment.

.2 NEMA ICS 6 – Industrial Control and Systems: Enclosures.

.5 Underwriter's Laboratories (UL):

.1 UL 508A – Industrial Control Equipment.

1.4 DEFINITIONS

.1 Programmable Logic Controller – PLC.

.2 Landfill Gas – LFG.

.3 Stainless Steel – SS.

1.5 SYSTEM DESCRIPTION

.1 The Owner Supplied Flare will be equipped with a discontinuous pilot ignition system (pilot fuel conservation) to be programmed to shut down pilot once the main flame is proven.

.2 Flare equipped with four thermocouples: pilot thermocouple, two main flame thermocouples, and high temperature thermocouples.

.3 Flare Control Panel to be mounted by Contractor at Control Plant as shown on Drawings

.4 Electronic Ignition system / spark generator to be remotely installed outside the Class 1 Div. II area as shown on electrical drawings.

.5 The Flare Control Panel shall be controlled by the PLC Control Panel to permit both manual ignition and automatic re-ignition of the flare as per the Control Plant Operation Description presented in Section 25 90 00 – Control Plant Operation Description.

1.6 PERFORMANCE CRITERIA

.1 The Owner Supplied LFG flare control panel is equipped with a fuel conservation option to permit discontinuous use of the pilot. The flare control panel shall shut down the pilot once the main flame is proven.

.2 The Flare shall be capable of operating only when one of the two main flame thermocouples is operational or above the programmed set point.

1.7 PROGRESS SUBMITTALS

.1 Section 01 33 00 – Submittal Procedures: Requirements for progress submittals.

1.8 CLOSEOUT SUBMITTALS

.1 Section 01 78 00 – Closeout Submittals.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Section 01 61 00 – Common Product Requirements: Requirements for delivery, storage, and handling.

.2 Deliver and store products with labeling in place.

.3 Contractor shall coordinate the shipping of equipment with the Manufacturer.

.4 Use every precaution not to damage products.

.5 Store equipment and materials as recommended by Manufacturer.

1.10 MAINTENANCE

.1 Extra Materials: Provide the extra materials suitably packaged for long term storage and legibly marked as to the package content. Providing the following extra materials:

- .1 One main flame Thermocouple assembly.
- .2 One pilot Thermocouple assembly.
- .3 Flare ignitor spark plug.
- .4 Thermal shut-off valve winged inspection nuts and fuse.
- .5 Flame arrestor SS bank assembly and gasket kit.

PART 2 PRODUCTS

2.1 FLARE (OWNER SUPPLIED)

.1 Manufacturer: Varec,

.2 Model 244W.

- .1 CSA approved for landfill gas application.
- .2 150mm (6-inch diameter) self-supporting flare.
- .3 316 SS stack.
- .4 316 SS windscreen.
- .5 Non-continuous (fuel conservation) pilot ignition system.
- .6 Thermocouple pilot and main flame detection and monitoring systems.
- .7 Remote Flare Control Panel

.1 Location: Electrical Room.
.2 Enclosure: NEMA 4
.3 Power: 115/130 VAC.
.4 Remote Start: Dry Contact.
.5 Heater and thermostat mounted in enclosure.

.8 Remote Spark Generator, NEMA 4X.
.1 Location: as shown on drawings.

.9 Support stand for Flare Pilot Valve and Regulator Assembly.

.10 Support stand anchors: 6 mm diameter Hilti Qwik-Bolt or HIT HY-200, conforming to ASTM A307.

.11 Propane pilot assembly and flanged connection.

2.2 FLARE STAND (OWNER SUPPLIED)

.1 Fabricated: 316 Stainless Steel, Schedule 80 piping.

.2 Dimensions: As shown on Drawings.

.3 Connections: ASME B 16.5, ANSI 150 lbs, 316 SS, flat faced.

.4 Threadolet: 25mm dia. 316 SS.

2.3 ACCESSORIES (CONTRACTOR SUPPLIED)

.1 Gaskets: Neoprene, minimum 3.17 millimeters thick, full faced.

.2 Bolt Sets: Hexagonal type, 304 Stainless steel unless otherwise indicated in Drawings.

2.4 FLARE CONDENSATE DRAIN (OWNER SUPPLIED)

.1 Refer to Section 23 11 23 – Process Piping.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Section 01 73 00 – Execution: Requirements for examination of existing conditions before starting work.

3.2 DECOMMISSION EXISTING FLARE

.1 Notify Consultant a minimum of 72 hours prior to commencing decommissioning of existing flare assembly.

.2 Disconnection of existing flare control panel electrical components by qualified electrician.

.3 Disconnection of existing propane station and propane line by qualified gas fitter.

.4 Remove and dispose of on Site the existing flare control panel as directed by Consultant.

.5 Disconnection of existing thermocouples by qualified electrician.

.6 Provide temporary support for existing flame arrestor assembly.

.7 Disconnect and remove existing flare and flare stand.

.8 Dispose of existing flare and flare stand on site as directed by Consultant.

3.3 INSTALLATION

.1 Notify Consultant a minimum of 72 hours prior to commencing installation of flare assembly.

.2 Install products in accordance with Manufacturer's specifications and instructions.

.3 Install and connect all flare components and accessories.

.4 Connect Flare Panel and thermocouples to Control Panel PLC.

.5 Adjust all pressure regulators as per Manufacturer's recommendations and specifications.

.6 Install all wire and conduit runs and supports.

3.4 QUALITY CONTROL

.1 Section 01 45 00 – Quality Control: Requirements for inspection and testing.

.2 Ensure all gaskets and seals are properly seated and there is no evidence of landfill gas leaking from any mechanical connections, seals, or blower casing.

.3 Start-up and Commissioning: Section 01 91 13.

.4 Notify Consultant a minimum of 72 hours prior to commencing testing and commissioning of flare assembly.

.5 Perform testing of Flare in accordance with Manufacturer's recommendations.

3.5 PROTECTION OF FINISHED WORK

.1 Section 01 73 00 – Execution: Requirements for protection of installed works.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 Refer to Section 01 29 00 – Payment Procedures: Requirements for measurement and payment.

4.2 LANDFILL GAS FLARE

.1 Schedule of Prices Item No. 23 52 39/01

.2 Payment Basis: Lump Sum Price. Includes decommissioning of existing flare, transportation of flare assembly from onsite laydown area to control plant facility, erection of Owner supplied flare on existing flare foundation, installation of the owner-supplied flare, regulator panel, and flare control panel, and connection to existing flame arrestor assembly; supply and install accessories, mounting hardware, connection to Control Plant PLC, testing, startup, and commissioning.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

.1 This section covers the general requirements which are applicable to provide a complete functional process control, instrumentation, communication and signal system for the Landfill Gas Management System. This Section must be referenced and interpreted simultaneously with all other Sections pertinent to the Works described herein.

1.2 SECTION INCLUDES

.1 Related Requirements.

.2 Reference Standards.

.3 Definitions.

.4 Quality Assurance.

.5 Functional Requirements.

.6 Submittals.

.7 Products.

.8 Execution.

.9 Measurement and Payment.

1.3 RELATED REQUIREMENTS

.1 Section 01 91 13 – Start-up, Commissioning and Training.

.2 Section 25 30 01 – PLC Control Panel.

.3 Section 25 30 05 – Process Instrumentation and Control System Testing.

.4 Section 25 90 00 – Control Plant Operation Description.

.5 Section 26 00 00 – Summary of Electrical Work.

.6 Section 26 00 10 – General Electrical Requirements.

.7 Section 26 08 10 – Electrical Testing.

.8 Section 26 08 20 – Electrical Testing by Contractor.

1.4 REFERENCE STANDARDS

.1 Section 01 42 19 – Reference Standards.

.2 Canadian Standards Association (CSA):

.1 CSA C22.1 – Canadian Electric Code, Safety Standard for Electrical Installations.

.3 Institute of Electrical and Electronics Engineers (IEEE):

.1 IEEE 100 – Standard Dictionary of Electrical and Electronics Terms.

.4 International Society of Automation (ISA):

.1 ISA S5.4 – Instrument Loop Diagrams.

.2 ISA S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves.

.3 ISA S51.1 – Process Instrumentation Terminology.

.4 ISA TR20.00.01 – Specification Forms for Process Measurement and Control Instruments Part 1: General Considerations.

.5 National Electrical Manufacturer's Association (NEMA):

.1 Nema ICS 1 –Industrial Control and Systems General Requirements.

1.5 DEFINITIONS

.1 Variable Frequency Drive – VFD.

.2 Programmable Logic Control – PLC.

.3 Human Machine Interface – HMI.

.4 Systems Integrator / Controls Contractor – A firm engaged in the business of detailed control system design and engineering, instrumentation component purchase, system and panel assembly, programming, and implementing the specified process control and industrial automation systems.

1.6 QUALITY ASSURANCE

.1 Systems Integrator / Controls Contractor responsibility

.1 General

.1 The control system and instrumentation integration including panel building, programming, testing, start-up, operational testing, and commissioning shall be performed by a Systems Integrator staffed with qualified personnel, possessing necessary equipment and experience in performing similar installations.

.2 PLC and instrumentation terminations to be done by Systems Integrator/ Controls Contractor. All terminations in the PLC cabinet to be done by the Systems Integrator / Controls Contractor.

.3 The components, modules, devices, and control system equipment shall be recognized industrial quality products. Commercial or office grade products are prohibited.

.4 All equipment and materials supplied and installed must be suitable for minimum Class I Division II hazard area where shown on Drawings.

.5 The overall system performance shall be demonstrated to and accepted by the Owner.

.6 The programming and configuration application software packages shall be the latest version available.

.2 Systems Integrator / Controls Contractor Qualifications

.1 System Integrator / Controls Contractor specializing in control system construction, instrumentation integration, and programming with a minimum of 5 years' experience.

.2 Systems Integrator / Controls contractor shall submit the following evidence of experience:

.1 Submit evidence of experience in performing three similar successful projects in the last five years.

.2 Submit training and certification information.

.3 Pre-submittal conference call

.1 Schedule a pre-submittal conference with Consultant and Owner within 30 calendar days after Contract award to discuss the work, process controls, equipment, submittal format, and establish the framework for project coordination and communication between Contractor, System Integrator / Controls Contractor, and Consultant.

.2 The pre-submittal conference call shall not replace the Product and Shop Drawing submittal review process.

.4 Process Equipment Coordination

.1 Division 25 specified equipment shall be coordinated for proper operation with equipment specified in other Divisions.

.2 Equipment shall be integrated, finished, and installed in conformance with the drawings, specifications, and recommendations of the equipment manufacturer and the related process equipment manufacturers.

.3 Systems Integrator / Controls Contractor shall obtain manufacturer's technical information for items of equipment not provided with, but directly connected to, the control system. Provide the necessary coordination and components for correct signal interfaces between specified equipment and the control system.

.4 Systems Integrator / Controls Contractor shall coordinate with project subcontractors and equipment suppliers.

.5 Systems Integrator / Controls Contractor shall provide installation supervision for the duration of the project.

.6 Conflicts between the plans, specifications, manufacturer drawings and installation instructions shall be presented to the Consultant for resolution before proceeding.

1.7 FUNCTIONAL REQUIREMENTS

.1 The Systems Integrator / Controls Contractor drawings and integration practices shall be defined in IEEE 100, ISA S5.1, and NEMA ICS 1.

.2 Submittal Drawings

.1 The Contractor's Systems Integrator / Controls Contractor shall prepare detailed installation drawings.

.2 Drawing prints shall be 11" x 17" with minimum lettering size of 1/8".

.3 Connection Diagrams: show components of control panel in an arrangement similar to the actual layout of the panel including internal wiring between devices within the panel. Show terminal blocks used for internal wiring or field wiring.

.4 Interconnection Diagrams: show panel, panel devices, and field devices with wire numbers, cable numbers, raceway numbers, terminal boxes, terminal block numbers, panel numbers, and field device tags.

.5 Schematic Diagrams: Show, by means of graphic symbols, the electrical connections and functions of a specified circuit arrangement.

.6 Network Block Diagram: Provide a network block diagram of the overall SCADA system, with annotated boxes to show the primary network components (controllers, hubs, switches, computers, displays), and annotated interconnecting lines that show the system communication media and communication protocols.

.7 Loop diagrams: Provide loop diagrams for analog and discrete signals interconnected into the control system circuits.

1.8 SUBMITTALS

.1 Section 01 33 00 – Submittal Procedures: Requirements for progress submittals.

.2 Detailed product literature, showing product specifications and model number breakdown. Mark to denote features and options included.

.3 Manufacturer's installation manuals, including:

.1 Installation details/drawings.

.2 Electrical connection diagrams.

.3 Calibration procedures.

.4 Nameplate list with material, tag number and description.

.5 Systems Integrator / Controls Contractor Evidence of Experience.

.6 Data sheets in accordance with ISA 20 for each instrument. Identical instruments may be submitted with one common ISA data sheet and accompanying tag list.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Equipment and materials shall be new, free from defects, and industrial-grade, as specified.

.2 Each type of instrument, instrument accessory, and device used throughout the work shall be manufactured by one firm, where possible.

.3 Electronic equipment shall be of solid-state construction with printed or etched circuit boards of glass epoxy of sufficient thickness to prevent warping.

PART 3 EXECUTION

3.1 GENERAL

.1 Equipment shall be installed in locations that are accessible for operation and maintenance services.

.2 Support systems shall be hot-dip galvanized after fabrication or shall be 316 stainless steel, as shown or specified.

3.2 TESTING AND INSPECTION

.1 Delivery Inspection: The Contractor shall notify the Consultant upon arrival of any material or equipment to be incorporated into the work. The Contractor shall remove protective covers or otherwise provide access in order that the Consultant may inspect such items.

.2 Testing: Refer to Section 25 30 05 – Process Instrumentation and Control System Testing.

3.3 COMMISSIONING

.1 Commissioning: Refer to Section 01 91 13 – Start-up Commissioning and Training.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 No separate payment will be made for work under this Section.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

.1 This Section specifies the general requirement for the PLC Control Panel, panel cabinet, and accessories.

1.2 SECTION INCLUDES

.1 PLC Control Panel.

.2 Remote HMI.

.3 Programming software.

.4 Program development and commissioning.

.5 Measurement and Payment.

1.3 RELATED REQUIREMENTS

.1 Section 01 90 00 – Start-up, Commissioning and Training.

.2 Section 25 30 00 – General Requirements for Instrumentation and Control.

.3 Section 25 30 03 – Process Control System Development and Programming.

.4 Section 25 30 05 – Process Instrumentation and Control System Testing.

.5 Section 25 90 00 – Control Plant Operation Description.

.6 Section 26 00 00 – Summary of Electrical Work.

.7 Section 26 00 10 – General Electrical Requirements.

.8 Section 26 08 10 – Electrical Testing.

.9 Section 26 08 20 – Electrical Testing by Contractor.

1.4 REFERENCE STANDARDS

.1 Section 01 45 00 - Quality Requirements: Requirements for references.

.2 Canadian Standards Association (CSA):

.1 CSA C22.1 – Canadian Electric Code, Safety Standard for Electrical Installations.

.2 CSA C22.2 No. 94 – Special Purpose Enclosures.

.3 CSA 22.2 No.14-05 – Industrial Control Equipment.

.4 CSA 22.2 No. 40 – Cutout, Junction, and Pull Boxes.

.5 CSA 22.2 No. 66 – Low Voltage Transformers – Part 1: General Requirements.

.3 National Electrical Manufacturer's Association (NEMA):

.1 Nema 250 – Enclosures for Electrical Equipment.

.2 Nema ICS 6 – Industrial Control and Systems: Enclosures.

.4 Underwriters Laboratories (UL):

.1 UL 508A – Industrial Control Panels.

1.5 DEFINITIONS

.1 Variable Frequency Drive – VFD.

.2 Programmable Logic Control – PLC.

.3 Human Machine Interface – HMI.

.4 Landfill Gas – LFG.

.5 Systems Integrator / Controls Contractor – A firm engaged in the business of detailed control system design and engineering, instrumentation component purchase, system and panel assembly, programming, and implementing the specified process control and industrial automation systems.

1.6 GENERAL REQUIREMENTS

.1 Provide only CSA approved materials and meet all applicable industry standards and codes.

.2 Control panels shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking should be located so as to be clearly visible to qualified persons before examination, adjustment, servicing or maintenance of the equipment. All components used interior to the control panel to be "touch safe" to person or persons opening the control panel while energized.

.3 All Control Panel Wiring to be "Touch Safe" as per IP20 Standards. This rating assures that a probe approximately the size of a finger is not able to make contact with any hazardous or energized parts.

.4 Clearly indicate on the door of the control panel if there can be more than one voltage source.

.5 All control panels to be constructed and certified as per the most recent edition of CSA C22.2 No.286.

1.7 SYSTEM DESCRIPTION

.1 The PLC Control Panel is located in the LFG Control Plant, either pedestal mounted or mounted on the plywood wall in the Control Plant as shown on Drawings.

.2 The PLC Control Panel shall be designed, supplied and constructed, programmed, installed and commissioned by the Contractor. The PLC Control Panel shall include all components required for the control, monitoring, data logging, and alarm annunciation notification for the safe operation of the centrifugal blowers, VFDs, landfill gas analyser, field instrumentation, flare, and isolation valves.

.3 PLC terminations to be done by the System Integrator / Controls Contractor as specified in Section 26 00 00.

.4 Install and program PLC and HMI software.

.5 Install and program VTSCADA software (Contractor Supplied).

1.8 PROGRESS SUBMITTALS

.1 Section 01 33 00 – Submittal Procedures: Requirements for progress submittals.

.2 B. Shop Drawings:

.1 Dimensional Drawings:

.1 Exterior panel and layout.

.2 Interior devices and layout.

.2 Wiring Drawings:

.1 Schematic diagrams.

.2 Internal wiring diagrams.

.3 Connection diagrams.

.3 Include conduit routing locations for control panel enclosure.

.4 Indicate electrical characteristics and connection requirements, including layout of assemblies, wiring connections and diagrams, weight, support structure, and external power requirements.

.5 Arrangement drawing of the PLC Control Panel enclosure indicating the front door and rear panel equipment arrangement, dimensions, and clearances between face and rear mounted equipment. A list of materials and components shall accompany the layout drawings.

.6 Nameplate engraving schedule: Indicate nameplate size, character size, panel, equipment tag number and description.

.7 Heat load calculations for each cabinet based on the specified ambient temperatures.

.3 Product Data

.1 Marked product literature of all the enclosure electrical devices and components mounted on or within the PLC Control Panel.

.2 List of miscellaneous items and cables.

1.9 CLOSEOUT SUBMITTALS

.1 Section 01 78 00 – Closeout Submittals.

.2 Control System Manual including the following elements:

.1 Overview of Control System.
.2 Operating Modes Overview.
.3 Operation Instructions.
.4 Control Loop Narrative.
.5 Maintenance.
.6 Troubleshooting.
.7 Data Export.

.3 Record Documents: PLC Control Panel bill of materials.

.4 Drawings:
.1 Dimensional control panel layout.
.2 Wiring diagrams.
.3 Control logic diagrams.

1.10 WARRANTIES

.1 Assign directly to the Owner manufacturer's warranties on material and equipment (including internal components).

.2 Warranty Period: 2 years.

1.11 QUALIFICATIONS

.1 Fabricator: CSA/UL-certified panel shop, specializing in the manufacturing of custom control panels, with a minimum of 5 years' experience.

.2 Systems Integrator: Refer to Section 25 30 00.

1.12 REGULATORY REQUIREMENTS

.1 Furnish products listed and classified as CSA as suitable for the purposes as specified.

1.13 ENVIRONMENTAL CONDITIONS

.1 PLC Control Panel shall be suitable for operation in ambient conditions between -10 degrees C and 50 degrees C.

.2 Maintain PLC Control Panel enclosure internal temperature above 0 degrees C and below 30 degrees C during and after installation of products, and during normal operation of the products.

1.14 DELIVERY, STORAGE AND HANDLING

.1 Section 01 61 00 – Common Product Requirements: Requirements for delivery, storage, and handling.

.2 Deliver and store products with labeling in place.

.3 Contractor shall coordinate the shipping of equipment with the Manufacturer.

.4 Use every precaution not to damage products.

.5 Equipment shall be installed immediately upon delivery to site unless otherwise approved by Consultant.

PART 2 PRODUCTS

2.1 PLC CONTROL PANEL

.1 Programmable Logic Controller
- .1 Manufacturer: Allen Bradley 5069 CompactLogix.
- .2 Model: 5069-L320ER.
- .3 I/O Module and Subbase Configuration: Shown on Electrical Drawings.
- .4 Programming Software: Studio 5000 Logix Designer, version as recommended by Manufacturer.

.2 Local HMI
- .1 Manufacturer: Red Lion
- .2 Model: Graphite Series G12S1100
- .3 Display size: 12 Inch.
- .4 Touchscreen Resolution: 1280 x 800
- .5 Ambient operating temperature: -20 degrees C to 60 degrees C.
- .6 Enclosure: Nema 4X (Face only).
- .7 Power: 10-30VDC.
- .8 Ports:
  - .1 Serial Ports:
    - .1 Communication Ports:
      - .1 RS-232 Port via RJ12 connector.
      - .2 RS-422/485 Port via RJ45 connector.
    - .2 Programming Ports:
      - .1 RS-232 Port via RJ12 connector.
  - .2 USB Ports:
    - .1 Programming Port: USB Type B.
    - .2 Host Ports: Two (2) USB Type A.
  - .3 Ethernet Ports:
    - .1 10/100Base-T Port via RJ45 connector.
- .9 Network Media: 100BaseTX.
- .10 Connection cables.
- .11 Panel mounting hardware.
- .12 Accessories:
  - .1 GOFILM12 – G12 Overlay Film
    - .1 Quantity: 2 packages (10/package)

.13 Programming software: Crimson, version as recommended by Manufacturer.
.14 Location: PLC Control Panel front cover.

.3 Ethernet Switch:
.1 Manufacturer: Allen Bradley.
.2 Model: 1738-US8T.
.3 Ports: 8-RJ45
.4 Data Rate: 10Base-T or 100Base-TX
.5 Input Voltage: 18-30VAC or 12-48VDC
.6 Input Frequency: 47-63 Hz
.7 Flow Control: half-duplex/full duplex
.8 Status Indication: Power Connection/Activity
.9 Operating Temperature: -40ºC - 75ºC
.10 Rating: IP 30
.11 Plug-in Connector: Copper RJ45, shielded
.12 Mounting: Horizontal or Vertical on DIN TS 35 rail

.4 LED Panel Indicator Lights.
.1 Plastic construction, oil and dust-tight, rated Nema 4X.
.2 Diameter: 22mm.
.3 Integral LED.
.4 Screw clamp connections.
.5 Colour: As per drawings.
.6 Voltage 24V AC or DC.
.7 Manufacturer: SE, model XB7 or CSA approved equivalent.
.8 Location: PLC Control Panel front cover.

.5 Control Switch.
.1 Plastic construction, oil and dust-tight, rated Nema 4X.
.2 Diameter: 22mm.
.3 3-position +/-45º.
.4 Contacts: 2 NO.
.5 Manufacturer: SE, model XB7 or CSA approved equivalent.
.6 Location: PLC Control Panel front cover.

.6 Emergency Stop Button:
.1 Oil and dust-tight indicator lights, rated Nema 4X.
.2 Non-Illuminated Pushbutton, Non-Illuminated, Maintained-Turn-to-Release.
.3 Two normally closed contacts, operated simultaneously by button action.
.4 Manufacturer: SE, model XB7NS8445 mushroom head or CSA approved equivalent.
.5 Location: PLC Control Panel front cover.

.7 Magnetic Control Relays:

.1 Single pole double throw type switch, rated to minimum 10A at 120V.
.2 Coil voltage to be 24VDC.
.3 LED indicator, DIN mountable connection socket.
.4 Manufacturer: Omron MY4N-D2 or CSA approved equivalent.
.5 Location: PLC cabinet relay compartment.

.8 DC Power Supply:
.1 Input voltage: 120V, 1 phase, 60Hz.
.2 Output power: 480VA at 24VDC.
.3 DIN rail mountable.
.4 Manufacturer: Phoenix Contact UNO2-PS/1AC/24DC/480W or CSA approved equivalent.

.9 Terminal Blocks:
.1 Screw connection type, DIN mountable, mountable, modular terminal blocks.
.2 Include 20 percent extra terminal block capacity for future use.
.3 Manufacturer: Weidmuller WDU4 or CSA equivalent.
.4 Location: PLC cabinet.

.10 AC Line Filter:
.1 Series filter/TVSS.
.2 Input voltage: 120VAC.
.3 Nominal current: 30A.
.4 Nominal frequency: 60Hz.
.5 Configuration: Single phase (2 wire + ground).
.6 Surge current capacity: 25,000A.
.7 Frequency response: 100kHz to 50MHz.
.8 Response time: less than 5ns.
.9 DIN rail mountable.
.10 Manufacturer: Emerson Sola STFV-300-10N or CSA approved equivalent.
.11 Location: PLC cabinet

.11 UPS:
.1 Voltage: 120 VAC input, 120 VAC output.
.2 Nominal Output Capacity: 850 VA.
.3 DIN rail mountable.
.4 Manufacturer: Emerson Sola HD model SDU 850 or CSA approved equivalent.
.5 Location: PLC cabinet

.12 PLC Control Panel Enclosure:
.1 CSA approved, Nema 4, 316 stainless steel, double door as manufactured by Hoffman, Hubbell-Wiegman, or approved equivalent.
.2 Print Pocket: Hubbell-Wiegman WAPPL0810 or equivalent.

.3 Mounting: The enclosure shall have provisions for wall mounting.

.4 Color: The enclosure shall be the manufacturer's standard color or ANSI 61 Grey.

.13 Power Loss Relay:

.1 Input: 95-120VAC, 1-phase (adjustable).

.2 Low voltage setpoint: 90% trip, 93% reset.

.3 Output contacts: 10A @240VAC

.4 Operating temperature: -40ºC to 70ºC.

.5 Din rail mountable.

.6 Manufacturer: Littelfuse, Phoenix Contact, or approved equivalent.

.14 Intrinsically Safe Barriers:

.1 Location of source device: Div 1, Group A or Zone 0, IIC.

.2 Supply voltage: 10 to 35VDC.

.3 LED indicator for power indication.

.4 Isolation: 250VAC between safe circuit and hazardous location.

.5 Manufacturer: MTL, Eaton, Pepperl+Fuchs, or approved equivalent.

.15 Receptacles:

.1 Rating: 15A, 125V.

.2 Configuration: Duplex NEMA 5-15R.

.3 Ground terminals and poles connected to continuous yoke.

.4 Wiring terminals: 8 back-wired entrances, 4 side screws.

.5 Nylon face.

.6 Double wipe heavy phosphor bronze contacts.

.16 Raceway:

.1 Configuration: Narrow slot/finger design.

.2 Size: As indicated on drawings.

.3 Material: Lead-free PVC.

.4 Mounting holes.

.5 Continuous use temperature: 50ºC.

.6 Flammability rating: V-0.

.7 Complete with cover.

.8 Manufacturer: Panduit or approved equivalent.

.17 Fuses:

.1 Voltage: 600V AC, 170V DC.

.2 Ampacity: Sized as per drawings.

.3 Interrupting rating: 100kA @ 600V AC, 10 kA @ 170V DC.

.4 Configuration: G-Si 5 x 20 style, fast acting, rejection style.

.5 Manufacturer: Bussman Class G or equivalent.

.6 Spares: two of each size.

.7 Location: PLC cabinet.

.18 Fuse Holders
- .1 Screw connection type, DIN mountable, mountable, modular terminal blocks.
- .2 Fuse cartridge type G-Si 5 x 20.
- .3 Include 10 percent extra terminal block capacity for future use.
- .4 Manufacturer: Weidmuller ASK1 or CSA equivalent.
- .5 Location: PLC cabinet.

.19 Mini Circuit Breakers
- .1 Voltage: 120V AC, 60V DC.
- .2 Ampacity: Sized as per drawings.
- .3 Interrupting capacity: 10kAIC @ 120V AC.
- .4 Type: thermal magnetic.
- .5 Actuator Type: Toggle.
- .6 Mounting: DIN mountable.
- .7 Operating Temperature: -35ºC to +70ºc.
- .8 Manufacturer: Phoenix Contact, Schneider, Eaton or approved equivalent.

.20 Ground Bus Bar:
- .1 Material: Copper.
- .2 Terminal/Connection Count: 10 minimum, screw/compression style.
- .3 Manufacturer: Schneider, Eaton or approved equivalent.

.21 Enclosure Heater (Anti Condensation)
- .1 Voltage: 120V
- .2 Heater Element: 200W
- .3 Build in thermostat adjustable from -15ºC to 35ºC.
- .4 Fan Auto/On switch with pilot light.
- .5 High temperature protection.
- .6 Manufacturer: Hammond, Hoffman, or approved equivalent.

2.2 REMOTE SCADA COMPUTER

.1 Computer: Owner Supplied PC Computer.

.2 Software: VTSCADA Dual Server Rundant
- .1 VTSCADA Development Runtime, version as recommended by Manufacturer.
  - .1 Quantity: 1
- .2 VTSCADA Runtime, version as recommended by Manufacturer.
  - .1 Quantity: 1
- .3 VTSCADA Thin Client Single, version as recommended by Manufacturer.
  - .1 Quantity: 2
- .4 VTSCADA Alarm Notification, version as recommended by Manufacturer.

.1 Quantity: 2

.5 VTSCADA Connectivity Package, version as recommended by Manufacturer.

.1 Quantity: 1

.3 Location: Server Room located in the landfill office building.

2.3 CONTROL PANEL CONSTRUCTION

.1 Provide only CSA approved materials and meet all applicable industry standards and codes.

.2 Contractor to design, supply and construct each control panel based upon provided IO lists, field measurements, available record drawings.

2.4 LABELLING

.1 Each terminal to be labeled with snap on plastic tags, Wieland type 9705, Weidmuller type FW or FS, Phoenix Contact UC-TM or, machine-printed.

.2 All panel-mounted devices to be labelled by means of engraved lamacoid labels, white lettering on black.

.3 Write on labels are not acceptable.

.4 All terminals labels to match terminal numbers as shown in the contract drawings

.5 Each individual conductor or cable assembly entering the control panel from the field is be labeled with machine printed heat shrink labels identifying the field device name, field device terminal number (or signal type) as well as the control panel terminal designation.

.1 Example:

.1 Field device: PIT 1632, terminals: 1(+ signal) 2 (-signal)

.2 Control panel terminals (MCP-1): Rack 1, Slot 3 term 8(+), Rack 1 Slot 3 term 9 (-)

.3 The labeling of the conductors in the control panel should be as follows:

.1 +Signal = PIT 1632 +SIG / R1S3-8

.2 -Signal = PIT 1632 –SIG / R1S3-9

PART 3 EXECUTION

3.1 EXAMINATION

.1 Section 01 73 03 – Execution and Closeout Requirements: Requirements for examination of existing conditions before starting work.

3.2 EXISTING PLC PANEL DECOMMISSIONING

.1 Decommission existing PLC panel by qualified electrician and System Integrator.

.2 Label all field instrument wires and connections.

.3 Remove and salvage existing PLC, storing on-site as directed by Consultant.

3.3 CONTROL PANEL FABRICATION

.1 Shop fabricate the PLC Control Panel as specified in this Section.

.2 Provide 20 percent spare I/O points. Wire spare I/O points to spare terminal blocks and mark as spare.

.3 Install wireway, sized to provide adequate space for wires using a maximum of 60 percent capacity.

.4 Run wires in wireway and exit the wireway at the point nearest to the device to which it is wired.

.5 Do not splice wires in wireway.

.6 Neatly harness wires within wireways.

.7 Provide wiring terminals required to connect field mounted instruments, flare temperature sensors, blower bearing temperature sensors, blower motor sensor, VFD, Actuator, and devices. Install intrinsically safe relays as required for hazardous area applications.

.8 Internal wiring shall be color coded as follows:

.1 Black: Power (AC)
.2 White: Neutral
.3 Red: Control
.4 Blue: Power (DC)
.5 Yellow: 120 VAC externally powered wiring.
.6 Analog Signal: White (+), Black (-)
.7 Green: Ground.

.9 PLC, HMI, and Remote Monitoring Computer program logic to be developed based upon Section 25 90 00 Control Plant Operation Description.

.10 Owner supplied Remote Monitoring Computer to be connected to the PLC.

3.4 PROCESS CONTROL SYSTEM DEVELOPMENT AND PROGRAMMING

.1 Refer to Section 25 30 03.

3.5 CONTROL PANEL INSTALLATION

.1 Install products in accordance with Manufacturer’s specifications and instructions.

3.6 SCADA COMPUTER INSTALLATION

.1 Owner supplied PC SCADA, data historian, Alarm, and Remote Monitoring Computer to be installed and connected to PLC in Control Plant building by Contractor as directed by Consultant.

.2 Contractor to supply, install, program, configure and commission VSScada software and specified options.

.3 Alarms to be delivered via email and text message as specified by Consultant.

.4 Data historian and backup server configuration.

3.7 PANEL INSPECTION

.1 Owner's representative is to be given the opportunity inspect control panel construction at the control panel assembly shop prior to panel being relocated to the Construction site.

.2 Panel assembler to provide photos of panel construction progress to Owners representative during construction progress for review.

.3 Contractor is to give Owners representative minimum 5 business day notice prior to relocating Control Panel from the panel assembly shop to the Construction site.

.4 Contractor is to assist Owners representative with function testing control panel in the panel shop. These tasks may include but not be limited to:

.1 Voltage measurements
.2 Current measurements (4-20mA VDC, Up to 20Amp AC/DC)
.3 Continuity measurements
.4 Install temporary jumper wires
.5 Push to test of all relays
.6 Simulation of Relay Logic Circuits

3.8 QUALITY CONTROL

.1 Section 01 45 00 – Quality Control.

.2 Systems Functional Testing: Refer to Section 25 30 05.

.3 System Operational Testing: Refer to Section 25 30 05.

.4 Start-up, Commissioning and Training: Refer to Section 01 90 00.

.5 Perform testing of PLC Control Panel in accordance with written test procedures.

.6 Employ and pay for services of the Fabricator and Systems Integrator to:

.1 Inspect equipment covered in these specifications once installed.
.2 Supervise adjustments and installation checks.

.3 Conduct startup of equipment and perform operational checks; provide a checklist of all inspections.

.4 Attend facility commissioning and make adjustments to the PLC Control Panel as required during the commissioning of the Works.

3.9 TRAINING

.1 Refer to Section 01 90 00.

3.10 PROTECTION OF FINISHED WORK

.1 Section 01 73 03 – Execution and Closeout Requirements: Requirements for protection of installed work.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 Refer to Section 01 29 00 – Payment Procedures: Requirements for measurement and payment.

4.2 PLC CONTROL PANEL

.1 Schedule of Prices Item No. 25 30 01/01

.2 Payment Basis: Lump Sum Price. Includes decommissioning of existing PLC panel; supply, fabrication and installation of the PLC Control Panel assembly, accessories, and mounting hardware, software, process control system development and programming of PLC and HMI, control logic development, wiring termination and connections, testing, startup and attendance of Fabricator's field service representatives during commissioning of works.

4.3 REMOTE SCADA COMPUTER

.1 Schedule of Prices Item No. 25 30 01/02

.2 Payment Basis: Lump Sum Price. Includes supply, installation and programming of VTSCADA software on Owner supplied PC Computer and backup server.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

.1 This Section specifies the general requirement for the SCADA radio system between the LFG plant and site office.

1.2 SECTION INCLUDES

.1 SCADA radio transceivers.

.2 Antennas.

.3 RF cabling.

.4 RF installation and commissioning.

.5 Measurement and Payment.

1.3 RELATED REQUIREMENTS

.1 Section 01 90 00 – Start-up, Commissioning and Training.

.2 Section 26 00 00 – Summary of Electrical Work.

.3 Section 26 00 10 – General Electrical Requirements.

.4 Section 26 08 10 – Electrical Testing.

.5 Section 26 08 20 – Electrical Testing by Contractor.

1.4 REFERENCE STANDARDS

.1 Section 01 45 00 - Quality Requirements: Requirements for references.

.2 Canadian Standards Association (CSA):

.1 CSA C22.1 – Canadian Electric Code, Safety Standard for Electrical Installations.

1.5 PROGRESS SUBMITTALS

.1 Section 01 33 00 – Submittal Procedures: Requirements for progress submittals.

.2 Product Data

.1 Marked product literature of all the devices and components used for the SCADA radio system.

.2 List of miscellaneous items and cables.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 00 – Closeout Submittals.

1.7 WARRANTIES

.1 Assign directly to the Owner manufacturer's warranties on material and equipment (including internal components).

1.8 QUALIFICATIONS

.1 Installation to be conducted by a qualified Radio Communication sub-contractor with a minimum of 5-years' experience.

1.9 REGULATORY REQUIREMENTS

.1 Furnish products listed and classified as CSA as suitable for the purposes as specified.

PART 2 PRODUCTS

2.1 RADIO TRANSCEIVER

.1 Data rate: 125, 250, 500, 100, 1250kbps selectable.

.2 Radio frequency: 902-928MHz unlicensed.

.3 Output impedance: 50 Ohms.

.4 Output power: 100mW-1W.

.5 Protocol: TCP/IP, Serial.

.6 Ports: two ethernet, one serial, one antenna.

.7 Voltage: 10-60V.

.8 Operating Temperature: -40°C to 70°C.

.9 DIN Rail Mountable.

.10 Manufacturer: GE MDS Orbit MCR-900 or approved equivalent.

2.2 ANTENNAS

.1 Yagi Direction antenna:

.1 Frequency: 902-928Mhz.

.2 Impedance: 50 Ohm.

.3 Polarization: Vertical.

.4 Opening angle (horizontal/vertical): 56°/46°.

.5 Gain: 12dBi.
.6 Termination: N female connector.
.7 Mounting hardware and mast clip.
.8 New 24” metal antenna mast and mounting hardware.
.9 Manufacturer: Phoenix contact, TE Connectivity or approved equivalent.

.2 Omnidirectional antenna:
.1 Frequency: 902-928Mhz.
.2 Impedance: 50 Ohm.
.3 Polarization: Vertical.
.4 Beam width: 110^{o} x 360^{o}.
.5 Gain: 2dBi.
.6 Termination: N female connector.
.7 Mounting hardware and mast clip.
.8 New 24” metal antenna mast and mounting hardware.
.9 Manufacturer: Phoenix contact, TE Connectivity or approved equivalent.
.10 Location: Landfill Office

2.3 RF CABLE:

.1 LMR400 antenna cable.
.1 Type N male connectors.
.2 Grounding kit.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Contractor is responsible for installation, wiring, programming, testing, and commissioning of all radio communication equipment.

.2 Contractor to install 900MHz surge suppressors to be installed per RF cable run. Suppressors to be installed in enclosure where radio transceiver is located.

.3 Install cable grounding kit where RF cables enter facilities and buildings.

3.2 RECEIVING ANTENNA

.1 Install Onmi antenna, RF Cable and Radio Transceiver at the Landfill Office. Install Radio Transceiver in the Landfill Office Server Room.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 Refer to Section 01 29 00 – Payment Procedures: Requirements for measurement and payment.

4.2 RADIO COMMUNICAITON SYSTEMS

.1 Schedule of Prices Item No. 25 30 02/01

.2 Payment Basis: Lump Sum Price. Includes supply, installation, testing and commissioning of all radio equipment including radio transceivers, antennas, mounting hardware and cables.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

.1 This section specifies the general requirements applicable to the development and programming of the process control system graphical operator interface, historical data management system, and process control logic. All services, products and submittal described in this specification are the responsibility of the Systems Integrator.

1.2 SECTION INCLUDES

.1 Related Requirements.

.2 Reference Standards.

.3 Measurement.

.4 Measurement and Payment.

1.3 RELATED REQUIREMENTS

.1 Section 01 90 00 – Start-up, Commissioning and Training.

.2 Section 25 30 00 – General Requirements for Instrumentation and Control.

.3 Section 25 30 01 – PLC Control Panel.

.4 Section 25 30 05 – Process Instrumentation and Control System Testing.

.5 Section 25 90 00 – Control plant Operation Description.

.6 Section 26 00 00 – Summary of Electrical Work.

.7 Section 26 00 10 – General Electrical Requirements.

.8 Section 26 08 10 – Electrical Testing.

.9 Section 26 08 20 – Electrical Testing by Contractor.

1.4 DEFINITIONS

.1 Variable Frequency Drive – VFD.

.2 Programmable Logic Controller – PLC.

.3 Human Machine Interface or Graphical Operator Interface – HMI.

.4 Systems Integrator / Controls Contractor – A firm engaged in the business of detailed control system design and engineering, instrumentation component purchase, system and panel assembly, programming, and implementing the specified process control and industrial automation systems.

1.5 QUALITY ASSURANCE

.1 Implementation Plan Meeting

.1 Consultant will schedule and administer a process control system development and programming meeting after the date of Notice to Proceed.

.2 Consultant will make arrangements for meeting, prepare agenda with copies for participants, and preside at meeting. Provide data required to Consultant and be prepared to discuss all items on the agenda.

.3 Minimum attendance required: Owner, Contractor, and Systems Integrator / Controls Contractor.

.4 The primary purpose of the meeting shall be to solicit input from the Owner regarding the implementation of the process control system and to facilitate preparation of the Process Control System Implementation Plan Specified herein.

.5 The Systems Integrator / Controls Contractor shall have in attendance at the meeting a representative who is responsible for the preparation of the Process Control Implementation Plan.

1.6 SUBMITTALS

.1 Section 01 32 00 - Administrative Requirements and Submittal Procedures: Requirements for progress submittals.

.2 The following information shall be provided in accordance with Section 01 32 00:

.1 Process Control Implementation Plan.

.2 Screenshots of all screens developed for the Local Control Panel HMI and SCADA HMI at 50 percent design.

.3 Screenshots of all screens developed for the Local Control Panel HMI and SCADA HMI at 90 percent design.

.4 Digital and hard copies of all programming logic, complete with annotations.

PART 2 PRODUCTS

2.1 PROCESS CONTROL SYSTEM CONFIGURATION REPORT

.1 Bound hard copy and electric (PDF format) report documenting the final configuration of the process control system including the following:

.1 Hardware Configuration.

.2 Process Control Logic.

PART 3 EXECUTION

3.1 PROCESS CONTROL SYSTEM IMPLEMENTATION PLAN

.1 General

.1 The Systems Integrator / Controls Contractor shall prepare an implementation plan for the process control system development and programming work. The implementation plan shall establish guidelines for the development of the local and remote HMI (located in the Blower Room), the historical data management system, and the PLC process control logic, and shall ensure the consistent application of conventions and methods through the course of development. The implementation plan shall specifically address the following:

.1 Tag database structure and configuration.

.2 Tag naming conventions.

.3 HMI standards.

.4 Process control system configuration.

.5 PLC program file organization.

.6 PLC data file organization.

.7 List and description of graphic displays.

.2 Tag Database Structure and Configuration

.1 The implementation plan shall define how the tag database will be organized to logically associate tags with specific input/output types, functions or process areas.

.3 Tag Naming Conventions

.1 A tag naming convention shall be established which provides a structured organization to the tag database facilitating tag searches and substitutions during system development and provide for effective and efficient design, management and operation of the process control system.

.2 Tag names shall, at minimum, contain the following information:

.1 Equipment type designation.

.2 Equipment loop number.

.3 Signal type designation.

.4 HMI Standards

.1 The configuration and development of the graphical operator interface shall be based upon standards prepared specifically for this application. The standards shall be consistently applied to the development of the interface to ensure optimum usability.

.2 All HMI development including tag naming scheme, screen navigation methods, use of pop-ups, etc. shall be implemented in a manner that is consistent with HMI systems in use elsewhere in the Owner’s existing operations at other facilities.

3.2 TAG DATABASE DEVELOPMENT

.1 General

.1 The process control system tag database development shall include the definition of all devices, derived and soft tags and the required alarm processing and data logging and archiving definitions for each tag.

.2 Conventions used in the development of the tag database shall be defined in the Process Control System Implementation Plan.

.2 Tag Types

.1 Tags shall be classified as either device tags, derived tags, or soft tags.

.2 Device tags shall be those tags which have a physical device data source.

.3 Derived tags are those tags whose value is calculated or otherwise derived from another tag. Derived tags have no data source address.

.4 Soft tags are those whose value is obtained from another process software application.

.5 Tags shall be defined for each of the following tag data sources:

.1 Physical input/output variables derived from process control input/output systems.

.2 Control and status derived from the process control logic required to fully implement the process control strategies. This data shall include the following types of information:

.1 Operating set points.

.2 Process operations setup and control parameters including start/stop/, operating mode, normal/maintenance mode, auto restart, etc.

.3 Operating status and fault data including ready, critical alarm, non-critical alarm, etc.

.4 Timing/counting function data including present and accumulated values, blower hour meter, etc.

.3 Operating fault and diagnostic data derived from the external systems, including the following:

.1 Process variable transmitters and analysers.

.2 System alarm conditions.

.3 Process control system diagnostic data.

.4 System status, control and configuration parameters including operating set points, etc.

.4 Operating and fault data derived from the VFD units.

.5 Operating and fault data derived from the flare control panel.

.6 Operating, calibration and fault data derived from the landfill gas analyser.

.3 Data Logging

.1 Tags representing the following types of process variables shall be defined in the tag database for logging. This data shall support historical and real-time dynamic trending functions.

.1 All field instrument values including flow, temperature, and pressure.

.2 Flare Control Panel Status (System, Pilot, Main Flame, and Alarms)

.3 Landfill gas composition including methane, oxygen, and carbon dioxide.

.4 Actuator valve position.

.5 Blower status (on/off).

.4 Alarm Handling, Annunciation, and Data Logging

.1 All discrete tags representing alarm or fault conditions shall be defined in the tag database to be processed as alarms.

.2 All analog tags shall have alarm thresholds defined in the tag database. The value of the alarm thresholds shall be defined by the Consultant during preparation of the Process Control System Implementation Plan.

.3 The tag database shall be configured to implement alarm processing and annunciation.

.4 The alarm list shall be created in accordance with the control strategies and configured so that all new alarms report through Owners alarm reporting software and fire and alarm panel autodialler.

3.3 HMI DEVELOPMENT

.1 General

.1 The process control system HMI development shall include the preparation of the specified graphical displays in accordance with the Process Control Implementation Plan and the requirements of this specification.

.2 The Systems Integrator shall prepare additional graphical displays as may be required to provide a comprehensive process and system management HMI.

.2 Development Guidelines

.1 The HMI shall be developed in accordance with recognized usability practices to ensure efficient and effective use of the process control system. The completed HMI shall adhere to the following principles:

.1 The HMI shall be easy to learn so that the user can quickly start and stop the system.

.2 The HMI shall be efficient to use, so that once the user has learned the system, a high level of productivity is possible.

.3 The HMI shall be easy to remember, so that the casual user is able to return to the system after some period of absence without the need to learn the interface over again.

.2 The layout and organization of each HMI shall be consistent and shall adhere to the following standards:

.1 Position similar information and features of the HMI at the same location on each display.

.2 Enclose groupings of associated data in a frame or box.

.3 Color conventions shall be consistently applied throughout the graphical interface. Foreground colors shall be selected to provide

contrast to the background color. Verify that all colors selected can be viewed by the user.

.4 Text font sizes, colors and types shall be consistently applied throughout the graphical interface.

.3 General Graphic Display Configuration

.1 Full Screen Display

.1 Full screen displays shall be maximized, occupying the full usable area of the window.

.2 Controls to close or minimize the window shall be disabled.

.3 Full screen displays shall remain in the background when a pop-up display is called.

.4 Navigational and utility button bars shall be provided.

.2 Pop-Up Display

.1 Pop-up displays shall not occupy the full window and shall appear in the foreground when called from a full screen display.

.2 Pop-up displays shall appear at a user-defined location on the background display when called, but shall have the capability to be dragged to a different location on the screen.

.3 Pop-up displays shall not be resizable.

.4 Pop-up displays shall be provided with close control.

.4 Graphic Display Types

.1 Graphic displays shall be categorized as either, schematic overview, set point, error log, trend or PLC system status.

.2 Schematic Overview Graphic Display

.1 The schematic overview graphic display shall be presented as a process flow diagram and shall represent major process piping, major equipment, process variable data, and status data.

.2 Schematic overview graphic displays shall be prepared in accordance with the following guidelines except as otherwise approved by Consultant:

.1 Numeric display objects shall be provided to indicate the instantaneous value of all analog process data associated with the process.

.2 Dynamic equipment symbols shall be provided to indicate run, off, (open/close) and fault conditions for all major equipment associated with the process.

.3 Navigational and utility button bars shall be provided.

.4 Schematic overview shall be configured as a full screen display.

.5 Schematic overview display shall be installed on both the local and remote HMI.

.3 Setpoint Graphical Display

.1 The set point graphic display shall present user input variables and set point associated with the process.

.2 The set point display shall be prepared in accordance with the following guidelines except as otherwise approved by Consultant:

.1 Numeric display objects shall be provided to indicate the value of all user defined variables and set points associated with the process.

.2 Navigational and utility button bars shall be provided.

.3 Schematic overview shall be configured as a full screen display.

.4 Set point graphic display shall be installed on the local HMI only.

.4 Error Log Display

.1 The error log graphic display shall be presented as a list of all uncleared error conditions associated with the process.

.2 Error log display shall be prepared in accordance with the following guidelines except as otherwise approved by Consultant:

.1 i. Error Tag.

.2 ii. Time of error.

.3 iii. Error status.

.4 iv. Error log shall be a configured as a full screen display.

.5 v. Error log display shall be installed on both the local and remote HMI. Acknowledgement and clearing of error shall be at the local HMI only.

.5 Trend Graphic Display

.1 The trend graphic display shall present a graphical trend object with the associated controls to adjust the time scale and scroll the time axis.

.2 Trend graphic displays shall be provided for all field instrumentation, including flow, temperature, and pressure instruments.

.3 Trend graphic displays shall be prepared in accordance with the following guidelines except as otherwise approved by Consultant:

.1 Y-axis shall be graduated and labeled in the appropriate engineering units.

.2 Controls shall be provided to adjust the time scale and to scroll the X-axis backwards and forwards.

.3 Navigational control in the form of icons or labels shall be provided to access associated graphical displays.

.4 Trend graphic displays shall be configured as pop-up graphic displays.

.5 Trend graphic displays shall be installed on both the local and remote HMI.

.6 PLC System Status Graphic Display

.1 The PLC system status graphic display shall present all pertinent data associated with the process PLC system itself.

.2 The PLC system status graphic display shall provide a diagnostic interface for troubleshooting, monitoring, and management of the PLC system. No control is associated with the PLC system status graphic display.

.3 PLC system status graphic display shall be prepared in accordance with the following guidelines except as otherwise approved by Consultant:

.1 Provide a schematic representation of the PLC system where specified.

.2 Provide detailed displays for each PLC processor showing the processor status, including diagnostic and fault codes.

.3 Provide display of communication status of Ethernet, modbus, profibus, and any additional communication links associated with the PLC.

.4 Status of all discrete I/O objects shall be indicated by dynamic text or colored graphical object. Status and raw data value of all analog I/O points shall be indicated by dynamic text.

.5 Dynamic symbols or labels shall be provided to indicate current condition of the processor and its components.

.6 Navigations control in the form of icons or labels shall be provided to access associated graphic displays.

.7 Schematic overview shall be configured as a full screen display.

.8 PLC system status display shall be installed on both the local and remote HMI.

3.4 PROCESS INSTRUMENTATION AND CONTROL SYSTEM TESTING

.1 Systems Functional Testing: Refer to Section 25 30 05.

.2 Systems Operational Testing: Refer to Section 25 30 05.

3.5 START-UP AND COMMISSIONING

.1 System Start-Up and Commissioning: Refer to Section 01 91 13.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 No separate payment will be made for work under this Section.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

.1 This Section specifies the Contractor and Systems Integrator performance in the testing and documentation of the process instrumentation and control system materials and equipment.

1.2 SECTION INCLUDES

.1 Section 01 91 13 – Start-up, Commissioning and Training.

.2 Section 25 30 00 – General Requirements for Instrumentation and Control.

.3 Section 25 30 01 – PLC Control Panel.

.4 Section 25 30 03 – Process Control System Development and Programming.

.5 Section 25 90 00 – Control Plant Operation Description.

.6 Section 26 00 00 – Summary of Electrical Work.

.7 Section 26 00 10 – General Electrical Requirements.

.8 Section 26 08 10 – Electrical Testing.

.9 Section 26 08 20 – Electrical Testing by Contractor.

1.3 DEFINITIONS

.1 Variable Frequency Drive – VFD.

.2 Programmable Logic Controller – PLC.

.3 Human Machine Interface or Graphical Operator Interface – HMI.

.4 Systems Integrator / Controls Contractor – A firm engaged in the business of detailed control system design and engineering, instrumentation component purchase, system and panel assembly, programming, and implementing the specified process control and industrial automation systems.

.5 Process Instrumentation and Control System – PICS

.6 Instrumentation – Field and panel instruments, analysers, primary sensing elements, transmitters, gauges, power supplies, network equipment, and monitoring devices.

1.4 SUBMITTALS

.1 Section 01 33 00 – Submittal Procedures: Requirements for progress submittals.

.2 Certified Factory Calibration Reports.

.3 Instrument Index.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL

.1 General

.1 Materials, equipment, and construction included under this specification shall be inspected in accordance with this Section.

.2 Testing shall be performed by the Contractor, Systems Integrator, or Panel Shop.

.3 Minimum of ten (10) days' notice to be provided to the Consultant prior to any specified testing.

.2 Test Equipment and Materials

.1 Provide test equipment to conduct the specified tests that simulate inputs and read outputs with a rate of accuracy at the point of measurement at least two times greater than the component under test.

.2 Provide a documenting calibration system to conduct process instrumentation and calibration activities that consist of a documenting process calibrator and an instrumentation data management software that captures the calibration results and electronically document instrument data, date of calibration, calibration procedures, and as-found and as-left instrument calibration data.

.3 Witnessing

.1 The Consultant reserves the right to observe field instrumentation testing and calibration procedures. The Consultant shall be notified prior to testing, as specified herein.

3.2 SYSTEM FUNCTIONTAL TESTING

.1 Process Control Strategy / Functional Testing

.1 Control Strategy Testing shall be performed by the programmer. Control Strategy Testing consists of installation and debugging of the PLC control logic program, verifying of the interface points between the PLC and the field instruments and equipment, and exercising the control strategies.

.2 Provide qualified personnel to immediately correct any deficiencies that may be encountered in the Works during Process Control Strategy Testing.

.2 Control System Closed-Loop Testing

.1 Closed-loop testing shall not begin until the Process Control Strategy Testing has been successfully completed and documented to the satisfaction of the Consultant.

.2 Closed-loop testing shall demonstrate stable operation of each control loop under operating conditions.

.3 Control-loop testing will be performed as part of the systems test.

3.3 SYSTEM OPERATIONAL TESTING

.1 Process Control Strategy / Functional Testing

.2 A system acceptance test shall be performed after component tests are completed.

.3 The test of the completed system shall be performed in full operation and shall demonstrate that all functional requirements from the specifications have been met.

.4 The system acceptance test shall demonstrate the following:

.1 Each component of the system operates correctly with all other components of the system.

.2 Analog control loops operate in a stable manner.

.3 Hard-wired and software equipment interlocks perform correctly.

.4 Process control sequences perform correctly.

.5 PLC application programs performs monitoring and control functions properly.

.6 HMI graphics reporting the monitoring and control functions correctly.

.7 All alarm functions are reported properly.

.8 System trends and historical logging are performing properly.

3.4 START-UP AND COMMISSIONING

.1 Refer to Section 01 91 13 – Startup, Commissioning and Training.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 No separate payment will be made for work under this Section.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

.1 This Section presents a summary description of the control logic for the Control Plant operation. Equipment and installation requirements for the control systems are specified in separate Sections within the specifications.

1.2 SECTION INCLUDES

.1 Related Requirements.

.2 Reference Standards.

.3 Definitions.

.4 Quality Assurance.

.5 Execution.

1.3 RELATED REQUIREMENTS

.1 Section 01 91 13 – Start-up, Commissioning and Training.

.2 Section 25 30 00 – General Requirements for Instrumentation Control.

.3 Section 25 30 01 – PLC Control Panel.

.4 Section 23 30 03 – Process Control System Development and Programming.

.5 Section 23 30 05 – Process Instrumentation and Control System Testing.

.6 Section 26 00 00 – Summary of Electrical Work.

.7 Section 26 00 10 – General Electrical Requirements.

.8 Section 26 08 10 – Electrical Testing.

.9 Section 26 08 20 – Electrical Testing by Contractor.

1.4 DEFINITIONS

.1 PLC – Programmable Logic Controller.

.2 VFD – Variable Frequency Drive.

.3 HMI – Human Machine Interface.

.4 GUI – Graphics User Interface.

.5 Instrumentation – Field and panel instruments, analysers, primary sensing elements, transmitters, gauges, power supplies, network equipment, and monitoring devices.

1.5 QUALITY ASSURANCE

.1 PLC Control Logic shall be programmed by the Contractor. The PLC Control Logic Programmer shall be qualified with a minimum of 5 years' experience.

.2 The Contractor shall review all HMI graphic interfaces and user input interfaces with the Consultant prior to the commencement of programming.

.3 The Contactor shall undertake a bench test of the PLC Control Panel, flare control panel, HMI, instrumentation, and remote monitoring systems within 10 working days of the notification of completion for the PLC Control Panel, PLC Control Logic, and remote monitoring computer software (to be approved by the Consultant).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 MODES OF OPERATION

.1 The Control Plant will operate under three operational modes:

.1 Purge.

.2 Normal Operation.

.3 Maintenance.

.2 Purge Mode

.1 The purge mode is the temporary operation of the Blowers/Blower (BL-1 or BL-2) without the ignition of the flare to permit adequate LFG to be vented throughout the system to avoid LFG Analyser critical alarms which would result in an erroneous shut-down of the Control Plant.

.2 Purge Mode is initiated by selecting the Purge Mode of operation and pressing the start button. The main isolation valve (XV-101) and flare isolation valve (XV-140) will be turned to the open position. Upon confirmation that both XV-101 and XV-140 are open (limit switch), the selected blower is turned on and a one (1) minute timer is started.

.3 While operating in Purge Mode, the PLC ignores all critical warning and alarms from the LFG Analyser. All other critical alarm states will remain active.

.4 The selected blower (BL-1 or BL-2) will remain on until either the Control Plant Operator presses the "Stop Button", or the one (1) minute timer expires.

.5 Upon expiration of the one (1) minute timer, or in the case the Control Plant Operator pressing the "Stop Button", the Blower(s) is shut down and the isolation valves (XV-101 and XV-140) are turned to the closed position.

.3 Normal Mode

.1 Normal mode is the normal operating mode for the Control Plant, with all alarm states active. Normal Mode is divided into two (2) operating states (Manual Restart and Automatic Restart).

.1 Manual Restart enacts the shutdown of the Control Plant in the event of a critical alarm or main flame failure. In the event of a main flame failure (main flame thermocouple below set point for a period of one minute), the active blower is shut down and the isolation valves (XV-101 and XV-140) are closed. A main flame error will be logged onto the PLC. The system can only be manually restarted by the Control Plant Operator once the main flame error is cleared from the PLC.

.2 Automatic Restart allows for the Control Plant to re-ignite the flare in the event of a main flame failure, but not other critical alarm states. The PLC will attempt to restart the flare automatically and will log the main flame failure as a non-critical alarm. If five (5) main flame failures occur with one (1) hour, the Control Plant will be shut down, and a critical error will be logged.

.4 Maintenance Mode

.1 Maintenance Mode is similar to Normal Mode with manual restart. However, the Low Methane Critical Alarm and High Oxygen Critical alarms are ignored. The maintenance mode is intended to facilitate adjustments to the well field and will have a two (2) hour timer. Once the timer expires, the Control Plant will automatically switch to Normal Mode with Manual Restart.

3.2 SWITCHING MODE OF OPERATION STATES

.1 While in Normal Mode, the Operator can switch between Manual Restart and Automatic Restart while the Control Plant (flare) is either On or Off.

.2 While in Normal Mode, the Operator can turn Maintenance Mode On/Off while the Control Plant (flare) is either On or Off.

.3 Purge Mode can only be started while the Control Plant (flare) is off and all permissives are cleared.

3.3 BLOWER VFD CONTROL

.1 The blower VFDs shall operate under two operational modes:

.1 Manual VFD Control.

.2 Automatic VFD Control.

.2 Manual VFD Control

.1 VFD speed shall be set manually.

.2 User input range adjustable from 30 – 100 percent (18 – 60 Hz).

.3 Automatic VFD Control

.1 VFD adjusted automatically to a set vacuum pressure as measured at PIT-102.

.2 User input vacuum pressure ranging from -5 to -30 inches water column.

3.4 ALARMS

.1 Alarms are categorized as Critical or Non-Critical Alarms.

.1 Critical Alarms results in the immediate shutdown of the Control Plant with the alarm state logged and emailed outlining the nature of the alarm.

.2 Non-Critical Alarms will only log and email outlining the nature of the alarm. Non-Critical Alarms will not result in the shutdown of the Control Plant.

3.5 CONTROL PLANT SHUTDOWN

.1 The following sequence outlines the shutdown of the Control Plant in event that the “off” button is pressed by the Operator or if a critical alarm condition occurs.

.1 VFD(s) is turned off.

.2 Isolation Valves XV-101 and XV-140 are closed.

.3 Once the isolation valves (XV-101 and XV-140) are closed and the flow rate (FIT-130) is at zero, the Control Plant status will be changed to “OFF”.

3.6 STARTUP PERMISSIVES

.1 All critical and non-critical alarm states must be cleared in order to permit the startup of the Control Plant for all modes.

3.7 USER PROGRAMMABLE SETPOINTS

.1 All setpoints for Critical and Non-Critical Alarms shall be user programmable on the local HMI at the Control Plant. The HMI shall include a User Programmable screen which allows for all setpoints to be altered by the Operator.

3.8 HMI

.1 The PLC Control Panel local HMI will include, at a minimum, the following:

.1 Graphic display of the Control Plant with blower statuses and bearing temperatures, VFD statuses and settings, valve states, flow, temperature of all channels, pressure, LFG Analyser outputs, Operating Mode, and blower hour meter.

.2 Password protected screen lockout.

.3 Alarm log screen with time stamps.

.4 User input variable screen, blower hour meter reset, and datalog sample rate.

.5 Trend analysis for LFG Analyser channels, and field instruments.

.2 The Owner supplied PC Remote SCADA Computer will include, at a minimum, the following:

.1 Graphic display of the Control Plant with blower statuses and bearing temperatures, VFD statuses and setting, valves states, flow, temperature of all channels. Pressure, LFG Analyser outputs, Operating Mode and Blower hour meter.

.2 Alarm log screen with time stamps.

.3 Graphical plot of all logged channels (X-Y plot).

.4 Remote Monitoring Computer will be read-only.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

.1 No separate payment will be made for work under this Section.

END OF SECTION