INSTRUMENTATION CABLE

1. GENERAL

1.1 Product Data

.1 Submit product data in accordance with Division 1 and Division 16.

1.2 Related Work

.1 Refer to Division 16.

1.3 Inspection

.1 Provide adequate notice to the Engineer so that all cable installations can be inspected prior to connecting equipment.

1.4 Standards

.1 All wire and cable shall be CSA approved.

2. PRODUCTS

2.1 Twisted Pair Shielded Cables (TPSH)

.1 TPSH shall be constructed as follows:

.1 Copper conductors, stranded, minimum #18 AWG, PVC insulated, twisted in nominal intervals of 50 mm.

.2 Insulated for 600V, 90° C.

.3 100% coverage aluminum foil or tape shield.

.4 Separate bare stranded copper drain wire, minimum #18 AWG.

.5 Overall flame retardant PVC jacket to CSA-C22.2.

.6 The entire cable assembly to be suitable for pulling in conduit or laying in cable tray.

.7 Shaw Type 1751-CSA or Beldon equivalent.

.2 Where multiconductor TPSH cables are called for, each pair shall be individually shielded, continuous number coded, and the cable assembly shall have an overall shield and overall flame retardant PVC jacket.

2.2 RTD And Multi Conductor Shielded Cable

.1 RTD cables shall be CSA approved and shall be constructed as follows:

.1 3 or more copper conductors, stranded, minimum #18 AWG.

.2 PVC insulated for 600V.

.3 100% coverage aluminum foil or tape shield.

.4 Separate bare stranded copper drain wire.

.5 Overall flame retardant PVC jacket to CAS-C22.2

2.3 Teck Cables

.1 As per Division 16.

2.4 Wire

.1 As per Division 16.

3. EXECUTION

3.1 Analog Signals

.1 Use TPSH cable for all low level analog signals such as 4-20 mA, 1-5 VDC, 0-10 VDC, pulse type circuits 24 VDC and under, and other signals of a similar nature.

.2 Use RTD cable for connections between RTDs and transmitters or DCS RTD inputs.

3.2 Digital Signals

.1 Use TPSH cable for all low level input (24V and below) and output signals to the CDACS.

.2 Use Teck cable or wire and conduit for power to instruments, for 120V signals other than those mentioned above and as otherwise indicated on the drawings. Use stranded wire and cable to supply power to instruments.

3.3 Installation

.1 Install instrumentation cables in conduit systems or in cable trays. Use a minimum of 300 mm length of liquid tight flexible conduit to connect the field sensors to the conduit.

.2 Where non-armoured instrumentation cables are installed in cable trays, provide barriers in the tray to separate instrumentation cables from power cables.

.3 At each end of the run leave sufficient cable length for termination.

.4 Do not make splices in any of the instrumentation cable runs. Where splices are required, obtain approval from the Engineer prior to installing the cable. Do not splice cables to gas detection heads.

.5 Where splices are necessary in instrumentation cables other than coaxial cables, perform such splices on terminal blocks in terminal boxes. Keep splices in instrumentation cable to a minimum and separated physically from power circuits. Cable shields shall be terminated on insulated terminals and carried through to the extent of the cable.

.6 Where splices are made to coaxial cables, use standard coaxial cable connectors

.7 Ground cable shields at one end only. Unless otherwise specified, ground the shields at the marshalling panel.

.8 Protect all conductors against moisture during and after installation.

3.4 Conductor Terminations

.1 All equipment supplied shall be equipped with terminal blocks to accept conductor connections.

.2 Instrumentation conductors, where terminated at equipment terminals other than clamping type terminal blocks, shall be equipped with Burndy-YAE-2 or STA-KON, self-insulated, locking type terminators, sized as required to fit conductors and screw terminals.

3.5 Testing

.1 Test all conductors for opens, shorts, or grounds. Resistance values shall not be less than those recommended by the cable manufacturer.

3.6 Identification

.1 Identify all instrumentation cables.

.2 Identify each conductor with wire numbers using a machine printed heat shrink wire marker, similar to Raychem TMS or equivalent.

END OF SECTION

POWER SUPPLIES

1. GENERAL

1.1 References - General

.1 Refer To Section 17010.

2. PRODUCTS

2.1 Power Supply and Conditioning Equipment

.1 General

.1 Provide all DC power supplies as required for all instrument circuits. All circuits to be powered from the marshalling panels. Power supplies to be equal to Hammond or G.F.C., complete with an over voltage protection module.

.2 Provide redundant configurations for power supply equipment serving more than one instrument loop, so that failure of a single unit will not disable all or any shared part of the instrumentation and communication system. Provide diode isolation for redundant direct current supply units, and ground the negative terminal of the power supply.

.3 Power supplies and transmitters feeding circuits that run in non-armored cable in cable tray shall meet the requirements for Class 2 circuits as defined under Section 16 of the CEC Part I.

.4 Unless otherwise required, all DC power supplies to be rated 28VDC, adjustable plus or minus 5 percent, and set to provide 26.4 volts on the panel direct current bus. Size the power supply for two times the connected load, minimum size is 2 amps.

2.2 Noise Suppression

.1 Provide power conditioners in each panel to power AC instrumentation and control loads. Power conditioners are Oneac Series CX.

2.3 UPS Power Supply

.1 Provide a uninterruptible power supply (UPS) in each panel to power CDACS equipment.

.2 Provide a UPS for each CDACS workstation. Connect the workstation and its associated peripherals such as network concentrators, printers, etc. to the UPS.

.3 Size UPS standby capacity for 30 minutes at full load rating.

.4 Provide on-line units from Exide, Oneac, Toshiba or Best.

3. EXECUTION

3.1 References - General

.1 Refer To Section 17010, Part 3.

END OF SECTION

INSTRUMENT AIR SUPPLY AND TRANSMISSION

1. GENERAL

1.1 References - General

.1 Equipment, Products and Execution must meet all requirements detailed in Section 17010.

2. PRODUCTS

2.1 Pneumatic and Process Connections

.1 Pipe, fittings, valves, tubing, tube fittings, etc. required under this section of the contract to be Swagelok or equivalent and rated for the service in which they are to be employed. Tubing and fittings to be made of stainless steel.

.2 Dimensions:

.1 Process connections 12 mm (nominal) O.D. tubing

.2 Output/signal 10 mm (nominal) O.D. tubing

.3 Air supply 12 mm pipe (nominal) to isolation valves and 10 mm O.D. tubing (nominal) from isolation valves to end devices (e.g. valves).

.3 Provide a continuous support channel or raceway for all tubing.

2.2 Air Sets

.1 Provide all pneumatic actuator assemblies with an air set.

.2 Provide Fischer 67FR air sets unless specified otherwise in the Instrument Specification Sheets (ISS) of Section 17701.

.3 Air set to be complete with filter regulator and output gauge.

2.3 Solenoid Valves

.1 Provide ASCO Redhat type solenoid valves unless specified otherwise on the Instrument Specification Sheets (ISS) of Section 17701.

.2 Solenoid enclosures to be minimum EEMAC 4; corrosive areas require EEMAC 4X and hazardous areas require EEMAC Type 9. Refer to Division 16 for area classifications.

.3 Provide manual overrides on coils when solenoid is used to actuate a valve.

.4 Standard coil voltage: 120 VAC.

.5 Pipe size: 3-way valve - 6mm; 4-way valve - 10mm.

.6 Maximum operating pressure: 850 kPa instrument air.

.7 Minimum operating pressure: 420 kPa instrument air.

3. EXECUTION

3.1 References - General

.1 Refer To Section 17010.

3.2 Tubing and Fitting Installation

.1 Group instruments logically together. Orient instrument air and process connection isolation valves to provide consistent handle indication of normal open/closed status.

.2 Complete final location of field instruments to provide sufficient clearance for access to all maintenance settings, to provide unobstructed viewing of instrument indicators and to permit instrument calibration and maintenance during normal operation of the site.

.3 Slope tubing installations 20 mm per 2 meters of run down to process connection.

.4 Support tubing in channel or raceway if exposed or in close proximity to rotating equipment or high traffic areas Otherwise do not exceed 1 m between tubing supports.

.5 Field bend all turns with a minimum bending radius of 50 mm.

.6 Avoid non-terminal connections in tubing runs.

.7 Use teflon tape on all threaded fittings. Do not apply tape on the first two threads.

.8 Tubing shall terminate at devices with fittings or 90° bends, to allow removal of tubing without disturbing the device mounting.

.9 Complete the final 300 mm (nominal) of air tubing to instruments or control valves installed in process equipment with flexible reinforced neoprene hose. Support the tubing at the hose connection. Locate the hose connection to facilitate unrestricted removal of the instrument or control valve and to minimize transmission of process equipment vibration into the tubing.

END OF SECTION

PROCESS TAPS AND PRIMARY ELEMENTS

1. GENERAL

1.1 References - General

.1 Equipment, Products and Execution must meet all requirements detailed in Section 17010.

2. PRODUCTS

2.1 Process Taps

.1 Provide pressure gauge and thermowell taps. Coordinate requirements with Division 13.

2.2 Primary Elements

.1 Provide primary elements and transmitters as specified on the Instrumentation Specification Sheets (ISS) of Section17701.

.2 Provide written assurance that the instrument manufacturer approves the selection of materials of primary elements, which are in contact with the specified process fluid and inert to the effects of the process fluid.

.3 Provide drip pots installed below sensing elements measuring gas. Provide seamless, stainless steel drip pots consisting of a 50mm by 300mm pipe with an isolating valve and a drain valve. Provide a separate drip pot for each sensing line. Locate the drain valve within 500mm of the floor.

.4 Provide diaphragm seals on any fluid other than clean water or glycol.

.5 When diaphragm seals are specified with a pressure gauge or a pressure switch provide the assembly filled with ethylene glycol and calibrated by the manufacturer.

.6 Provide ethylene glycol filled assembly calibrated by the manufacturer when in-line pressure sensors are specified with a pressure gauge or a pressure switch or in combination.

3. EXECUTION (NOT USED)

END OF SECTION

TRANSMITTERS AND INDICATORS

1. GENERAL

1.1 References - General

.1 Equipment, products and execution must meet all requirements detailed in Section 17010.

2. PRODUCTS

2.1 Transmitters and Indicators

.1 Provide transmitters and indicators as specified on the Instrument Specification Sheets of Section 17701.

.2 Transmitters shall have adequate power output to drive all devices associated with the loop. Provide signal boosters as required to achieve adequate signal strength or to isolate the signal.

.3 All transmitters to have local indication scaled in percent. Provide a lamicoid label indicating the calibrated range and engineering units and mount adjacent to the transmitter. Mount the transmitter so the indicator is visible by the operator.

.4 Remote indicators similar to Action Instruments model V560 for use in unclassified areas. Action Instruments model V560-EP for use in class 1 areas is acceptable.

.5 Where the loop specification calls for a transmitter and an indicator to be mounted in the same panel, an indicating transmitter may be considered acceptable, provided the indicator is normally visible from outside the enclosure.

3. EXECUTION

3.1 References - General

.1 Refer To Section 17010.

END OF SECTION

CONTROL VALVES AND POWERED ACTUATORS

1. GENERAL

1.1 Work Included

.1 Supply, installation and testing of electric and/or pneumatic powered actuators and accessories for controlled devices such as valves, gates, dampers etc.

.2 Sizing and selection of modulating control valve components.

.3 Size and match powered actuators to controlled devices.

1.2 Related Work

.1	General Process Provisions:	Division 13
.2	Process Piping:	Division 15
.3	Process Valves:	Division 15
.4	Detailed Valve Specification Sheets:	Division 15
.5	Controls and Instrumentation:	Section 17010

1.3 Submittals for Review

.1 Submittals in accordance with Division 1 and Section 17010.

.2 Furnish shop drawings for complete actuator assemblies and accessories prior to delivery.

.3 Provide calculations for sizing, noise, cavitation and actuator torque calculations, etc., in addition to the requirements of Division 13.

.4 Submit a completed ISA S20.50 Instrument Specification Sheet for each device.

1.4 Submittals For Information Only

.1 Submit the following in addition to the requirements of Division 1 and Section 17010:

.2 Factory calibration and testing reports. Handwritten reports not to be accepted.

.3 Operations and maintenance manuals in accordance with Division 13.

1.5 Service Conditions

.1 Provide electrical enclosures rated for the area classification. Refer to Division 16 for classification of plant areas.

.2 Control air to be instrument quality, oil free, supplied between 555 kPa minimum to 810 kPa maximum pressure.

.3 Refer to the Instrument Specification Sheets in Section 17701 for process and design conditions.

.4 Refer to Section 17010 for additional details.

1.6 Shipment, Protection and Storage

.1 Ship and store equipment in accordance with Division 1 and Section 17010.

1.7 Delivery and Storage

.1 Deliver valves and actuators to site use loading methods which do not damage casings or coatings.

.2 Clearly tag all control valves and actuators, stating size, type, coatings and mating parts.

.3 When stored on site use storage methods recommended by the manufacturer to prevent damage, undue stresses, or weatherproofing.

1.8 Process Valve and Actuator Schedules

.1 Refer to the Instrument Specification Sheets and the instrument index for valve and actuator identification and for details. Power actuated devices, which require automation, as shown on the P & IDs, have their actuators and all ancillary instrumentation specified under Division 17. The device material specifications are found under Division 13 or Division 15.

.2 Actuator abbreviations are referenced in the Instrument Specification Sheets and described in part 2.2 of this section.

2. PRODUCTS

2.1 General

.1 Provide new material only.

.2 Provide all actuator mounting hardware and accessories mounted on the device prior to shipment.

.3 Provide actuators of NEMA 4 construction, suitable for use in an industrial environment.

.4 Provide device and actuator as a matched set from the same manufacturer wherever possible.

.5 Tag the control devices, accessories and actuators to indicate operating characteristics. Tag the actuator inlet and outlet ports for electric or pneumatic services. Electric actuators must be CSA approved.

.6 Refer to Section 17140 for air sets.

.7 Refer to Section 17140 for solenoid valves.

2.2 Actuator Types

.1 Pneumatic Diaphragm Actuators - General

.1 Provide diaphragm quarter turn and linear actuators capable of continuous duty over the full operating range.

.2 Unless specified otherwise, the actuators shall fail to the open position when the control function fails or when pressure is removed from the actuator diaphragm.

.3 Each actuator to be capable of operating in any horizontal or vertical orientation.

.4 When manual actuation is specified fit each actuator with a hand wheel, mounted in line with the valve shaft, which will enable manual override control of the valve.

.5 House all internal components in a cast iron enclosure, drip-proof and corrosion-proof.

.2 Pneumatic Diaphragm Quarter Turn Actuators, Modulating Type (PDQM)

.1 Diaphragm operators to be suitable for mounting on quarter turn valves intended for modulating service.

.3 Pneumatic Diaphragm Linear Actuators, Modulating-Type (PDLM)

.1 Diaphragm operators to be suitable for mounting on sliding-stem valves and dampers requiring linear actuation intended for modulating service.

.4 Pneumatic Diaphragm Quarter Turn Actuators, Open/Close-Type (PDQO)

.1 Diaphragm operators to be suitable for mounting on quarter turn valves intended for on/off service.

.2 Provide a solenoid valve, an airset and accessories as detailed on the ISS for each actuator.

.3 Provide two needle valves (snubbers) for each actuator. The needle valves to control instrument air flows such that the actuator travels a full stroke within a time range adjustable from 1 to 30 seconds with separate adjustments for each direction of travel.

.5 Pneumatic Piston Actuators - General

.1 Provide piston actuators of the type specified on the Instrument Specification Sheets. Two types of quarter-turn pneumatic piston actuators are available: rack and pinion or linkage. Actuators to be capable of continuous duty over the full operating range.

.2 Unless specified otherwise on the Instrument Specification Sheets, the actuators will fail to the open position when the control function fails or when pressure is removed from the actuator diaphragm.

.3 When manual actuation is specified, fit each actuator with a hand wheel to enable manual override control of the valve.

.4 Each actuator to be capable of operating in any horizontal or vertical orientation.

.5 House internal components in a cast iron enclosure, drip-proof and corrosion proof.

.6 Where valves are intended to fail open or closed, provide spring loaded actuators. Where they are intended to fail to last operating position, provide double acting actuators.

.6 Pneumatic Piston Quarter Turn Actuator, Modulating Type (PPQM)

.1 Piston actuators to be suitable for mounting on quarter turn valves or dampers intended for modulating service.

.7 Pneumatic Piston Quarter Turn Actuator, Open/Close Type (PPQO)

.1 Piston operators to be suitable for mounting on quarter turn valves or dampers intended for on/off service. Sector types are not permitted

.2 Provide actuator accessories such as limit switches and position switches as described in the Instrument Specification Sheets and in Section 17216.

.3 Provide two needle valves (snubbers) for each actuator. The needle valves to control instrument air flows such that the actuator travels a full stroke within a time range of 1 to 30 seconds with separate adjustments for each direction.

.8 Electro-Mechanical Actuators, General

.1 Provide electric actuators of type specified on the ISS.

.2 Unless noted otherwise, the actuator will fail to the last position when the control function or power fails.

.3 Unless otherwise specified, electric actuators to be 120 V/-1 ph/60 Hz for service where required torque is less than 115 Nm and 3 ph/60 Hz for service with torque above 115 Nm. Provide each actuator with a high torque, reversible motor which is capable of continuous duty over the full operating range.

.9 Electric Quarter Turn Actuators, Open/Close Type (EMQO) and Modulating Type (EMQM)

.1 Provide electric operators suitable for mounting on quarter turn valves or dampers intended for on/off and modulating service.

.2 Provide each actuator with built-in motor overload protection.

.3 Fit each actuator with a hand wheel, which will enable manual override control of the valve.

.4 Each actuator to be capable of operating in any horizontal or vertical orientation.

.5 Provide external mechanical indication of valve position. Provide an external visual position indicator for each positioner.

.6 House internal components in a EEMAC 4 enclosure, moisture-resistant and corrosion-resistant. Internal components to be permanently lubricated.

.7 Motors will be rated at 20 percent intermittent duty cycle.

.8 For remote indication provide the actuator with two SPDT travel limit switches, 10A, 125V AC, CSA listed. The travel limit switches to be adjustable.

.9 Provide the actuator with two SPDT torque limit switches, 10A, 125V AC. The torque limit switches to be factory preset and field adjustable.

.10 Provide adjustable mechanical limit stops to ensure over-turning of the valve does not occur.

.11 Protect exterior mounted actuators against low temperature and condensation.

.12 The actuator speed will be field adjustable.

.13 Provide a terminal board for field wiring. Include contacts to indicate the open/closed status of the valve.

.10 Electric Linear Actuators, Open/Close Type (EMLO) and Modulating Type (EMLM)

.1 Electric actuators for gates to be comprised of an electric motor and one or two gear boxes, depending on the gate design.

.2 Provide a sufficiently sized motor to seat and unseat gates and, if necessary, for control to traverse from full open to full closed position in small increments, in response to control signals.

.3 The actuator will impart a travel speed of 2.5 m/hr to modulating gates and 18.0 m/h to open/close gates unless otherwise specified on the ISS. The actuator speed to be field adjustable.

.4 The actuator shall be fully compatible with the gate. Mount at operating height on the frame.

.5 Actuators to accept 3phase/60 Hz power. Protect motors against reversed phase rotation.

.6 Actuators to accept a 4-20 mA control signal for remote proportional control of gate opening.

.7 The drive train to be rated for heavy duty, continuous service. Connect the actuator drive shaft to gear box shaft(s) through a removable flexible mechanical coupling. Where the actuator is fitted to two stems, ensure that the gearing in each gearbox allows both stems to move identically.

.8 House the internal components of actuators and related gear boxes in weather proof, corrosion proof metal enclosures. Electrical components to be contained in EEMAC 6 enclosures. All electrical and mechanical components shall be capable of continuous operation in an ambient temperature range of -40°C to plus 40°C.

.9 Provide a space heater for each actuator.

.10 Fit actuators with a capstan hand wheel operator. Fit hand wheel assemblies with a clutching mechanism which prevents hand wheel operation during normal motor operation. Provide a 1:1 gearing ratio with respect to the main drive shaft for the hand wheel.

.11 Fit removable safety guards over all moving drive train components between the actuator and each gear box.

.12 Provide adjustable limit switches on each actuator to define the upper and low limit of the stroke.

.13 High torque switches will protect the equipment and the structure against excessive gate travel. Provide high torque protection at the lower and upper ends of the stroke.

.14 Provide a controller enclosure to contain a motor contactor complete with overload protection. Provide line, load, and external control terminal strips.

.15 Fit each actuator with an electronic positioner to control gate elevation in response to a continuous 4-20 mA DC input signal.

.16 Provide a local operating station with a Local-Off-Remote switch and an Open-Close-Auto switch

2.3 Current to Pneumatic (I/P) Converters

.1 Provide I/P converters where required, as indicated on the drawings.

.2 Supply all required hardware for mounting the I/P on the controlled device.

.3 I/P converter to be of EEMAC 4 construction or as specified in the Instrument Specification Sheet.

.4 I/P converter to operate with instrument quality, control air at an operating pressure range of 20 to 200 kPa.

2.4 Valve Positioners

.1 When specified on the ISS supply compatible positioners pre-mounted to each actuator. Do not amount the positioner upside down.

.2 Each positioner to service the entire operating range of the actuator. The equipment position shall be fed back to the positioner through a mechanical linkage

.3 Positioner to operate with instrument quality, oil-free control air.

.4 Provide three independent, interchangeable cams for each positioner -linear function, square function, and square root function.

.5 Mount a pressure gauge on the positioner to measure air output.

2.5 Position Switches and indicators

.1 When specified, actuator position switches include two (2) form C 2 amp contacts in an EEMAC 4 (minimum) rated enclosure.

.2 Cams to be fastened to a splined shaft and adjustable without set screws.

.3 Provide a visual indicator with beacon type display showing red when the controlled device is closed position and green in open.

.4 Supply all required hardware for mounting of position monitor in accordance with the specified valve/actuator orientation.

.5 Diaphragm actuated valves to have external position monitor actuated through linkages.

.6 Enclosures to be suitable for environment to which they are exposed.

2.6 Manual Loading Station

.1 Manual loading station shall consist of a manually adjustable loading regulator, changeover valve (manual/automatic), a gauge for manual signal pressure indication, a gauge for automatic signal pressure indication, an air set and air supply isolating valve.

.2 Mount loading station on a galvanized plate attached to a floor stand. Locate station within 2m of the controlled device.

3. EXECUTION

3.1 Preparation

.1 Prior to installation of the valve and/or gate actuators, field measure and check all equipment locations, pipe alignments, and structural installations. Ensure that sufficient space and accessibility is available for pneumatic and electric actuators.

.2 Where conflicts are identified, inform the Engineer and initiate the necessary modifications at no cost to the Owner.

3.2 Installation

.1 Install actuators, related panels, and the interconnecting air tubing and wiring as shown in the drawings, and as recommended by the manufacturer.

.2 Install control valves as described in Division 13.

3.3 Field Testing and Commissioning

.1 Provide testing and commissioning in accordance with Division 1 and Section 17010, Part 3.

.2 Factory test each actuator assembly prior to shipment.

.3 The manufacturer's representative will be required to commission the electric and/or pneumatic actuators to verify the installation and make final travel limits and torque adjustments.

3.4 Training

.1 Provide training in accordance with Division 1.

END OF SECTION

1. **HEADING 1**

1.1 Heading 2

.1 Heading 3

.1 Heading 4

.1 Heading 6

.2 EACH OF THE FOLLOWING HEADINGS INDENTS BY .3 AND BEGINS NUMBERING FROM .1

- **Indent styles: You can only use bullets or manual numbering. Automated numbering will alter this style to and change to Heading 2 and reformat Heading 1**

END OF SECTION

MISCELLANEOUS PANEL DEVICES

1. GENERAL

1.1 References - General

.1 Equipment, Products and Execution must meet all requirements detailed in Section 17010.

2. PRODUCTS

2.1 Miscellaneous Panel Devices

.1 Pilot Lights

.1 Provide pilot lights of the transformer type for extended lamp life, oil tight, push to test, complete with appropriate colour lenses. Normal colours used are run=red, stop=green unless otherwise depicted elsewhere. Refer to Division 16 for additional information.

.2 Terminals

.1 Provide strap screw type terminal blocks rated for 600 volts.

.2 Identify each terminal block within an enclosure with a unique machine printed terminal block number. Cabinet chassis grounding terminal blocks to be identified by the electrical ground symbol.

.3 Connections to screw terminals to be locking fork tongue insulated crimp type wire connectors.

.4 Terminals to be Wiedmuller or approved equal.

.5 Provide a group of terminals for each of 120 VAC hot and neutral and 24 VDC positive and negative power. Distribution wiring to have a thermal magnetic circuit breaker upstream of all major blocks of loads, adequately sized to protect the connected load while not causing nuisance tripping.

.6 Provide Wiedmuller disconnect type terminal blocks for each load or loop powered from the marshalling panels.

.3 Nameplates

.1 Refer to Section 17010 for nameplate specification.

2.2 Signal Current Isolator

.1 Isolator to provide galvanic isolation of milliampere transmission signals from transmitters with inadequately isolated output circuits.

.2 Isolator to be housed in a NEMA 250, Type 4/7 conduit body and derive its operating power from the signal input circuit.

.3 Input and output signals to be 4 to 20 mA, with an error not exceeding 0.1 percent of span. Input resistance will not exceed 550 ohms with an output load of 250 ohms.

.4 Isolator to be Moore Industries.

2.3 Intrinsic Safety Barriers and Relays

.1 Provide intrinsic safety barriers where required for two-wire transmitters of the active, isolating, loop powered type; MTL Type MT3042, Stahl 9005/01-252/100/00, P+F ZG series, or equal.

.2 Provide dual type intrinsic safety barriers for process switches; MTL 787, Panalarm 201-BR2.

.3 Intrinsic safety relays to be Gems, or Warrick.EXECUTION

3. EXECUTION

3.1 References - General

.1 Refer To Section 17010, Part 3.

END OF SECTION

GAS DETECTION SYSTEMS

1. GENERAL

1.1 Description

.1 This section specifies the supply, installation, testing and commissioning of gas detection systems.

.2 Use this specification in conjunction with Section 17010.

1.2 Reference Standards

.1 Conform to the following reference standards in accordance with Division 1:

.1 CSA C22.2 No. 152, Combustible Gas Detection Instruments

.2 Canadian Standards Association (CSA) - C22.1

1.3 Shipment And Storage

.1 Ship and store equipment in accordance with the requirements of Division 1.

.2 Store gas detection instruments in their original shipping containers in a dry location free of fumes or vapors. Never store an instrument in an area where desensitizing agents (such as paints or silicones) may be present.

2. PRODUCTS

2.1 Function

.1 General

.1 Refer to Section 17010, Part 2.

.2 Provide gas detection systems which include:

.1 Field mounted sensors/transmitters.

.2 Alarm beacons.

.3 Room entrance alarm panels.

.3 Provide field elements that are certified Class I, Division I.

.2 Details

.1 The gas detection system will monitor for concentrations of:

.1 Combustible gas (gasoline vapors, etc) at low level sensor (LEL).

.2 H_2S concentrations.

.3 CH_4 (combustible gas), at high level sensor (LEL).

.2 Provide sensors and calibrators as specified on the Instrumentation Specification Sheets (ISS), Section 17701.

.3 Provide combustible gas sensor with dual conduit and a sensor guard to allow the sensors to be ceiling mounted and the sensor electronics to be at maintenance level. The sensor guard will be piped to the maintenance level with polypropylene. Refer to the Instrument Installation Details, Section 17704.

.4 Alarm beacons will operate on 120 V, 60 Hz. Beacons mounted in the process area will be classified Class I, Division I and mounted outdoors will be EEMAC 4X.

.5 Power gas monitors from separate breakers located in a UPS powered panelboard in the electrical room.

.6 Refer to the requirements of Section 17010 for instrument and wiring identification.

.7 Provide 75 mm x 250 mm nameplates in sensor locations engraved "CAUTION: PAINT OR SILICONE COMPOUNDS WILL DAMAGE SENSOR".

2.2 Spare Parts/Tools

.1 Provide a calibration kit including a one-year supply of all gases to calibrate all sensors and sensor types. The calibration kit must include, but not be limited to, all regulators and equipment required to perform regular on-site calibrations.

3. EXECUTION

3.1 General

.1 Refer to the requirements of Section 17010, Part 3 for additional execution details.

3.2 Wiring

.1 Wire devices as shown on the installation details and the cabling diagrams.

.2 Wiring methods must comply with the area classification, CSA C22.2 No. 152 and the requirements of Division 16.

3.3 Field Testing And Inspection

.1 Refer to the requirements of Section 17010, Part 3 for additional details.

.2 Provide an inspection of the gas detection system and all related components. The inspection will comprise of the following:

.1 That the system functions as intended including equipment shutdowns and startups, alarms, reset, calibration, etc.

.2 That the wiring connections to all equipment components show that the installer undertook to observe CSA requirements.

.3 That equipment has been installed in accordance with manufacturer's recommendations and that all signaling devices of whatever manufacture have been operated or tested to verify their operation.

3.4 Commissioning & Start-up

.1 Commissioning and start-up in accordance with CSA Standard C22.2 No. 152 and the requirements of Section 17010, Part 3.

3.5 Certification

.1 Inspection certification: on completion of the inspection and when all of the above conditions have been complied with, the consulting engineer will be issued:

.1 A copy of the inspecting technician's report showing location of each device and certifying the test results of each device.

.2 A certificate of verification confirming that the inspection has been completed and showing the conditions upon which such inspection and certification have been rendered.

3.6 Training

.1 Provide on-site training in accordance with Division 1 and Section 17010.

END OF SECTION