

## INSTRUMENTATION AND CONTROLS GENERAL REQUIREMENTS

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- .3 Commissioning of the instrumentation and control system to include but not be limited to the following:
  - .1 Supervise installation of components, wiring connections and piping connections.
  - .2 Supervise wiring continuity and pipe leak tests.
  - .3 Verify instrument calibration and provide written report.
  - .4 Function check and adjust under operational conditions the instruments and control equipment.
  - .5 Coordinate instruments and control equipment supplier's service personnel as required for complete system testing.
  - .6 Instruct plant personnel in correct method of operation of instruments and control equipment.
  - .7 Direct plant personnel at hand-over as to final adjustment of the system for correct operation of plant.
  - .8 Ensure that the instrumentation and control equipment suppliers cooperate to complete the work of this section.
  - .9 Verify signal levels and wiring connections to all instrumentation and control equipment.

### 3.16 Training

- .1 Provide training, described in detail in Division 1, as required by the plant's personnel to become fully competent in the proper operation and maintenance of all control devices, control valves, and ancillary instrumentation described under this section of the specification.

### 3.17 Test Forms

Form Number	Title
ITR	Instrument Test Report
LCR	Loop Check Report

**END OF SECTION**

## INSTRUMENTATION AND CONTROLS GENERAL REQUIREMENTS

### LOOP CHECK REPORT

- ☐ CHECKED OUT OK  
☐ NOT APPLICABLE  
☐ FURTHER ACTION REQUIRED

	INSTRUMENT TAG NO.									
LOOP NO. _____										
SHEET NO. _____										
P & I DWG. NO. _____										
<b>INSTALLATION COMPLETE</b>										
Primary Element										
Impulse Lines										
Block and Drain Valves										
Air Supply/Filter/Reg.										
Wiring										
Tracing/Insulation/Housing										
Mounting and Location										
CDACS I/O & Status										
<b>CALIBRATED</b>										
Impulse Lines Press. Tested										
<b>LOOP CHECKED</b>										
Element To Receiver										
X Mtr. to Receiver										
X Mtr./Trans. to Receiver										
X Mtr./Trans. to Switches										
Switches to Annunciator										
Interlocking Circuit										
Controller to Valve										
Controller Action D or R										

## INSTRUMENTATION AND CONTROLS GENERAL REQUIREMENTS

REMARKS:

### READY FOR START-UP

DATE: \_\_\_\_\_

Installed by: \_\_\_\_\_

Checked by \_\_\_\_\_

SYSTEM: \_\_\_\_\_

SERVICE: \_\_\_\_\_

LOCATION: \_\_\_\_\_

MAKE: \_\_\_\_\_

SERIAL NO.: \_\_\_\_\_

ELEMENT: \_\_\_\_\_

DESIGN SETTING/RANGE: \_\_\_\_\_

SIGNAL IN: \_\_\_\_\_ OUT: \_\_\_\_\_

INSTRUMENT CONDITION: \_\_\_\_\_

PROJECT NO.: \_\_\_\_\_

TAG NO. \_\_\_\_\_

MODEL: \_\_\_\_\_

CSA: \_\_\_\_\_

RANGE: \_\_\_\_\_

CONTACT TO: \_\_\_\_\_ ON: \_\_\_\_\_

ASSOCIATED INSTRUMENT: \_\_\_\_\_

CONFORM TO SPEC: \_\_\_\_\_

DATA SHEET: \_\_\_\_\_

	TEST 1				TEST 2			
TEST METHOD								
	INPUT		OUTPUT		INPUT		OUTPUT	
PROCESS	INC.	DEC.	INC.	DEC.	INC.	DEC.	INC.	DEC.
TEST POINT 1								
TEST POINT 2								
TEST POINT 3								
TEST POINT 4								
TEST POINT 5								
COMMENTS								

**INSTRUMENTATION AND CONTROLS  
GENERAL REQUIREMENTS**

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<b>GRAPHS</b>		

TESTED BY: \_\_\_\_\_

CHECKED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_

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Reviewed and Approved

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Date

## **SCOPE OF WORK**

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### **1. GENERAL**

#### **1.1 General**

- .1 This section is intended to generally describe and outline the scope of work required to be carried out in conjunction with this contract. Execution of this work shall be read in combination with the specifications and drawings.

#### **1.2 Measurement and Control Devices**

- .1 Provide, install, calibrate, loop check and commission all measurement and control devices as indicated on drawings and specified herein.
- .2 Provide the related devices, wiring, and control signals for all motor control applications as indicated on drawings and specified herein. Co-ordinate submittals for and performance of this work with Division 16. Loop check and commission all motor control devices in co-operation with Division 16.

#### **1.3 Gas Detection and Alarms**

- .1 Provide and install a complete ambient gas detection system for monitoring of the wetwell. The gas detection system is to have redundant sensors for both combustibles and H<sub>2</sub>S detection.

### **2. WORK INCLUDED**

#### **2.1 Related Work**

- .1 The Administrative Sections under Division 00 (Bidding and Contract Requirements) and 01 (General Requirements) shall be considered to be part of these Specifications.

#### **2.2 General Requirements**

- .1 General Clean-up.
- .2 All inspection and other permits, licenses required by various Inspection Agencies and local regulations.
- .3 Special testing or inspection, additional to the above as specified or covered by a Cash Allowance.
- .4 Scaffolding.
- .5 Shop Drawings.
- .6 Label all instruments with their specific tag numbers as listed on P&ID drawings and the instrument index.
- .7 Identify all cabling from the field devices and instruments to respective marshalling panels.

## SCOPE OF WORK

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- .8 Project Record Documents (As-Built Drawings) where specified.
- .9 Operating and Maintenance Data, where specified.
- .10 Testing and commissioning of the complete installation.

### 2.3 Materials

- .1 Provide one PLC, operator interface terminal, alarm dialer, and Ethernet/modem switch. The contractor shall review and agree the I/O from the PLC I/O Index list and procure peripheral equipment (i.e., racks, battery backup, power supplies, I/O cards) as indicated in Sections 17110, 17500, PLC Instrument Specification Sheet and as shown on the tender drawings.
- .2 Software tools and related programming for the PLC and operator interface terminal.
- .3 Control panels associated with any equipment covered under this section of Work.
- .4 Tray systems, including overhead, floor, riser, etc. which are intended to contain cables, buses or any device associated with or connected to the power system.
- .5 Grounding systems as required by the Electrical Code or as otherwise specified in the bid documents.
- .6 Control and instrumentation systems - electrical or electronic including infrared, solar, high frequency, ultra high frequency, and microwave control and instrumentation systems, with auxiliary equipment and components unless specified otherwise.

## 3. WORK EXCLUDED

### 3.1 General Requirements

- .1 Temporary power.
- .2 Temporary light.
- .3 Hoisting.
- .4 Barriers.
- .5 Special testing or inspection not specified or covered by Cash Allowance.

### 3.2 Other Work Excluded

- .1 Painting (on site), except touch-up of electrical equipment (Division 9).
- .2 Control transformers supplied with Mechanical Equipment (Division 15).

## SCOPE OF WORK

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### 4. UNITS OF MEASUREMENT

#### 4.1 General

- .1 The Contract Documents have been prepared using the modified International System (SI) units of metric measurement. Whenever appropriate, available metric products shall be used unless otherwise specified herein.
- .2 Only metres (m) and millimetres (mm) are used. Generally, metres are used for measurements of 10 metres or more, and millimetres for measurements below 10 m.
- .3 All measurements on drawings are in millimetres unless otherwise indicated.

#### 4.2 Conversions

- .1 The following three conversion methods were used in product and location dimensions:
  - .1 Hard Conversion: Industry available products, which are manufactured in metric measurements.
  - .2 Soft Conversion: Products, which are still manufactured in Imperial units and are converted in specifications using arithmetic conversion factors.
  - .3 Rationalized Conversion: Dimensions, which are soft, converted and rounded off for ease of measurements.
- .2 In cases where measurements may be open for interpretation, dual dimensions have been incorporated until hard conversions can be used exclusively.

### 5. DEFINITIONS

#### 5.1 General

- .1 All terminologies, abbreviations and acronyms used in this document are as listed in the various Standards, Codes, Rules and Bulletins used herein.

### 6. FORMAT

#### 6.1 Sections

- .1 The Sections are written in a three-part format: General, Products and Execution.

#### 6.2 Reference

- .1 Imperative tense has been used throughout this Document for work intended for the successful Contractor. There shall be no work exclusions unless they have been clearly identified as such herein.
- .2 Any reference to "Design Authority" shall mean Earth Tech Canada Inc.



## **SCOPE OF WORK**

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- .3 The word "provide" shall mean "supply and install" unless otherwise indicated.

### **7. CODES**

#### **7.1 General**

- .1 All Codes, Standards, Rules, Regulations, Bulletins, By-laws etc., shall be those that are currently enforced in the locality of job site, unless otherwise specified herein.

## **END OF SECTION**

## ENCLOSURES

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### 1. GENERAL

#### 1.1 References - General

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

### 2. PANEL COMPONENT, PRODUCTS AND EXECUTION TO MEET ALL REQUIREMENTS DETAILED IN SECTION 17274

#### 2.1 Shop Drawings

- .1 Submit shop drawings for each panel or cabinet assembly. Shop drawings to include: interior layout, exterior layout, and a complete bill of materials for all panel components and sub-assemblies.

#### 2.2 Standards

- .1 All electrical materials and equipment shall be CSA approved and manufactured in accordance with Standards established by EEMAC. This approval applies to complete control system assemblies as well as individual components. If CSA certification is not available, it will be the responsibility of the supplier to obtain individual approval and corresponding stickers from the Electrical Inspection Branch prior to shipment to site. **Engineer will not accept Equipment Vendor's supply without CSA certification or Electrical Inspection Branch approval.**
- .2 All wiring and conduit systems for instrumentation and controls systems to comply with the Canadian Electrical Code.

### 3. PRODUCTS

#### 3.1 General

- .1 Unless otherwise specified, provide outside finishes on all enclosures in ANSI 61 Grey as specified in Division 9.
- .2 The enclosures must be suitable for carrying the weight of the equipment mounted inside the panel and on the doors without any warpage.

#### 3.2 Enclosures

- .1 Provide EEMAC type 1A gasketed enclosures in dedicated MCC rooms and control rooms only.
- .2 All enclosures for mounting outside of MCC rooms and control rooms to be EEMAC Type 4, watertight except where otherwise specified.
- .3 Enclosures for certain equipment in corrosive atmospheres to be EEMAC 4X approved for the classification (e.g., chemical cleaning).

## ENCLOSURES

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- .4 Enclosures for mounting field control indicator lamps and switches in unclassified areas to be Allen Bradley model 800T-xTZ die cast enclosures.
- .5 Enclosures for mounting field control indicator lamps and switches in Class 1 areas to be Allen Bradley model 800H-xHHX7 cast aluminum enclosures.
- .6 Provide EEMAC 7/3R enclosures for equipment in and around classified areas.

### 3.3 Floor Mounted Cabinet Enclosures

- .1 Fabricate enclosures from 11 gauge steel panels complete with necessary stiffening to form a rigid free-standing lineup. The structures must be suitable for carrying the weight of the equipment mounted inside the panel and on the doors. Provide removable top and bottom cable entry plates.
- .2 Provide cabinets with front access only. Doors shall be key lockable and fitted with 3-point heavy duty latching assemblies. Provide a continuous piano hinge and a pneumatic hold open device on each door.
- .3 Finish the interior of the enclosure with white paint. Provide a switched fluorescent light fixture and) 120VAC duplex convenience receptacle inside the enclosure.

### 3.4 Marshaling and Control Panels

- .1 Document, layout supply, fabricate, test, and deliver to site fully equipped and functional panel assemblies.
- .2 Supply all components contained on or within the panels fully wired under this section of the specification.
- .3 The selection of all accessories, materials and methods for fabrication not covered by this specification, but which are necessary to complete the fabrication of the control panels, is the responsibility of the panel fabricator.
- .4 Refer to the instrument installation detail drawings for panel dimensions.
- .5 Refer to the instrument installation detail drawings for terminal component types and general locations.

### 3.5 Wiring and Accessories

- .1 Refer to specification section 17275 for information related to panel devices.
- .2 Provide wiring inside the panels according to the following specifications:
  - .1 Control wiring to be a minimum of #16 AWG tinned stranded copper; insulation rated at 600 V.
  - .2 Wiring for power distribution shall be a minimum of #14 AWG tinned stranded copper; insulation rated at 600 V.
  - .3 Refer to Division 16 for cable routing requirements.

## ENCLOSURES

- .3 Tag each wire at both ends with a heat shrink sleeve that is machine printed.
- .4 Wiring systems with different voltage levels or types shall be suitably segregated within the panel, according to relevant electrical codes.
- .5 Run all wiring in enclosed plastic wireways such as Panduit. Size all wireways so that the total cross sectional area of the insulated wire and cable does not exceed 40% of the cross sectional area of the wireway.
- .6 Provide a minimum clearance of 40 mm between wireways and any point of wire termination.
- .7 Terminate all wiring, incoming and outgoing, at terminal strips mounted inside the panels. Identify each terminal strip with a terminal strip number, defined as follows:
  - .1 Wire identification to use the connected field device tag name with the wire's corresponding terminal number appended to it.
  - .2 Identify every joint and/or terminal of the above wire run with the same identifier until the wire meets another tagged device, at which point the wire identifier will change to use the new device name and terminal number.
  - .3 For example, pressure transmitter K4-PT-100A located in the field has a 2CTPSH cable connected to it. The cable runs through a junction box to a marshaling panel. The wire identifiers for the pair of wires would be K4-PT-100A all the way to the marshaling panel.
  - .4 Identify spare wires by using the destination identifier, i.e., the location and terminal identifier of the opposite end of the wire are combined to form the wire tag.
- .8 Provide a 120 VAC panel power distribution system and a 24vdc power distribution system in each panel. Provide a thermal magnetic circuit breaker on each main power circuit and a fused terminal block for each branched circuit off the main.
- .9 Provide disconnect type terminal blocks Wieland WK4TSK/U type to isolate field wiring that is powered sourced from the panel.
- .10 Provide sufficient terminals so that not more than 2 wires are connected under the same terminal. Provide 20% spare terminal capacity at each terminal block assembly.
- .11 Terminals shall be Wieland Type WK4/U color coded as follows:

Red	Positive 24VDC
Black	0VDC common and analog signal plus
White	Analog signal common and VAC neutral
Grey	120VAC
Green	Ground
Yellow	Shield
- .12 Provide nameplates for each device on or within the panels and enclosures. Nameplates shall be black lamicoid with white lettering, a minimum of 25 mm x 75 mm in size with up to three lines of 3 mm lettering. Securely fasten nameplates in and situate them in a visible location.

## ENCLOSURES

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### 3.6 Panel Grounding

- .1 Provide a ground system for the instrumentation circuits, isolated from the main power system ground to each marshaling panel.
- .2 Provide grounding lugs for each panel, suitable for termination of up to #2 AWG copper grounding conductor.
- .3 Provide in each marshaling panel an isolated grounding buss bar 6 x 25 x 600 mm, equipped with necessary lugs for accepting two #2 AWG grounding conductors.
- .4 Firmly bond all panel mounted devices on or within the panels to ground. Provide supplementary bonding conductors for backpanels and doors. Attach a separate bonding conductor to all devices that are not firmly fastened to the panels with screws for such devices as case mounted instruments, meters, etc.

## 4. EXECUTION

### 4.1 References - General

- .1 Refer To Section 17010, Part 3.

### 4.2 Mounting Heights

- .1 Unless otherwise specified or a conflict exists, mount all panels, starters and disconnects 2000 mm to top of cover.

**END OF SECTION**

## INSTRUMENTATION CABLE

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### 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.

## INSTRUMENTATION CABLE

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- .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

## INSTRUMENTATION CABLE

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- .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

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### 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 control panel. Power supplies to be equal to Hammond, Phenoix Contact or Omron 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 5 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 Signal Booster / Splitters

- .1 Provide 4-20 mA signal booster/splitters for all analog loops where the connected load(s) are greater the 80% of the transmitters rated output load.
- .2 Signal booster splitters are to be DIN rail mounted in the PLC cabinets.
- .3 Signal booster splitters to be; Moore Industries ECT-DIN.

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## **POWER SUPPLIES**

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### **2.4 UPS Power Supply**

- .1 Provide an uninterruptible power supply (UPS) in the control panel to power PLC, HMI, and Alarm Dialer equipment.
- .2 Size UPS standby capacity for 1 Hour at full load rating.
- .3 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**

## PROCESS TAPS AND PRIMARY ELEMENTS

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### 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, temperature gauge, and thermowell taps as needed. Coordinate requirements with Division 13.
- .2 Process taps for pressure gauges, pressure transmitters, and analyzer sample points are to be fitted with two valve manifold blocks (isolation and drain).
- .3 Process taps for differential pressure gauges and differential pressure transmitters are to be fitted with five valve manifold blocks (isolation X2, equalization X2 and drain).
- .4 Valve manifold blocks to be Swagelok, Wika, or Alco

#### 2.2 Primary Elements

- .1 Provide primary elements and transmitters as specified on the Instrumentation Specification Sheets (ISS) of Section 17701.
- .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 50 mm by 300 mm 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

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### 1. GENERAL

#### 1.1 References - General

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

### 2. PRODUCTS

#### 2.1 Transmitters

- .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 Transmitters may be mounted on adjacent walls provided they are clearly visible and the wall has been reinforced to provide sufficient structural strength to carry the transmitter. In all other locations transmitters are to be mounted on 2" pipe stands visible by the operator. Pipe stands are not to cause obstructions to the movement of material or limit access to equipment.
- .5 Where process elements are not clearly visible by the operator remote mount transmitters shall be used. Conductors from the process element to the corresponding transmitter are to be run in conduit.

#### 2.2 Indicators

- .1 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**