METHOD STATEMENT
FOR
INSTRUMENT CALIBRATION

01 Introduction of HSE instructions 10-Oct-04 MAA HM SAA
00 For initial issue and approval 15-Sep-03 K.J Rauf FH SS

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1. OBJECTIVE

The objective of this method statement is to provide general guidelines for calibration, testing, identification and storage of instrument at project sites.

2. SCOPE

Scope of this method statement covers the following activities.

- Material handling
- Procedure
- Precautions
- Inspection

3. REFERENCE

3.1 PROJECT RECORDS

- System Flow Sheets for Instrumentation.
- Instrument Calibration Standards, specifications.
- Others.

3.2 PROJECT QUALITY PLAN (PQP)

- Project Quality plan for Instrument calibration.

3.3 CODES AND STANDARDS

- Related latest Standard Codes and Specifications

4 ABBREVIATIONS/DEFINITIONS

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<td>PM</td>
<td>Project Manager</td>
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<td>SM</td>
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<td>CM</td>
<td>Construction Manager</td>
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5 RESPONSIBILITIES

- It is overall responsibility of PM/SM to organize resources to perform construction activities as per project specification, in compliance with quality, schedule & HSE requirements.

- It is the responsibility of CM that construction activities are executed according to the relevant project specifications, in compliance with quality, schedule & HSE requirements.

- DE will ensure that all the works are performed safely as per latest Approved For Construction (AFC) drawings & specifications.

- The relevant DE and Supervisor will ensure that all the piping work is conducted in accordance with this method statement and project specifications.

- The QA&QC Inspector will ensure that all work is executed according to PQP and that requirements of quality dossier are fulfilled.

- HSE and Construction activities shall be carried out with the close coordination of client.

6 PROCEDURES

The procedure consists of the following:

- Receipt, Storage, Handling, Preservation and Delivery of instrument
- Test equipment control and traceability
- Calibration plan
- Calibration procedure

6.1 RECEIPT AND STORAGE OF MATERIAL

- The material received from client shall be stored in the designated area of the warehouse.

- Arrangements shall be made, and maintained, to ensure protection against the effects of local weather and construction environment.

- During shifting of the material special care shall be taken to protect from any damage. Proper lifting and transporting equipment shall be used as required.

- All material shall be segregated accordingly to facilitate location of the items.

6.2 HANDLING AND CONTROL OF MATERIAL

- Instruments, valves shall be shifted to calibration shop.

- Instruments and valves shall be calibrated in the calibration shop as per their relative calibration procedure.
The calibration data shall be recorded on their respective formats. Install a sticker mentioning the details i.e. date, type, rate, location and the particular tag number.

The calibrated instrument shall be stored in a separate compartment.

The instrument nonconformed with the calibration shall be returned back to main store with a sticker and the corrective action request (CAR).

The open ports and tube ends of the instruments shall be safe guarded by means of relevant size of stop plugs or tape.

Protect the stem of temperature measuring instrument to avoid bending or damaging.

The calibrated instruments shall be issued to site for installation at the time of installation.

6.3 TEST EQUIPMENT CONTROL AND TRACEABILITY

All the equipment being used for the calibration shall be itself calibrated and certified by a third party. The calibration record shall be maintained on a format called control sheet calibration equipment. For reference see sample enclosed with.

6.4 CALIBRATION PROCEDURES

For calibration of instruments and equipment procedure are as listed below:

6.4.1 Pressure transmitter
6.4.2 Temperature transmitter
6.4.3 Signal converter (I/P or P/I)
6.4.4 Pressure switch
6.4.5 Pressure Gauge
6.4.6 Control Valve
6.4.7 Pneumatic Operated Valve (ON / OFF)
6.4.8 Safety Relief Valve/ Pressure Safety Valve (P.S.V.)
6.4.9 Differential Pressure Transmitter
6.4.10 Orifice Plate

6.4.1 PRESSURE TRANSMITTER

Place the transmitter at the test table, read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Arrange the test bench for calibration of the pressure transmitter.

2) Supply regulated air pressure (instrument air) or electric power supply to the transmitter.

3) Apply required pressure by pressure generator (a dead weight tester, variable air supply or a hand-operated pump) and a check out put on multi meter or pressure gauge.
4) The actuating pressure shall be connected to the instrument's process port.

5) Apply pressure approximately to the full range of the transmitter to check leakage in the system, use soapy water for detection.

6) De--pressurize the system.

7) Check and record the readings at "zero percent" pressure.

8) Now increase the pressure step wise and record the readings for "25%,50%,75% and 100%.

9) Decrease the pressure in descending order from 100% to 0% in stages of 75%,50%,25% and at last at 0% and record the readings. These shall verify the previous readings taken.

10) In case percentage error is greater than the specification requirements, adjust the "zero and span" again and repeat the step # 7, # 8, # 9.

11) After completing the process issue the test report for site use and record.

6.4.2 TEMPERATURE TRANSMITTER

Place the transmitter at the test table, read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Arrange the test bench for calibration of the temperature transmitter.

2) Connect the input side of the transmitter to the temperature signal generator (it could be a decade box arrangement, with temperature probe and temperature bath or a process calibrator).

3) Connect a multi meter on the signal output side of the transmitter to monitor and match the readings at the transmitter display.

4) Apply the temperature signal (by means of process calibrator or temperature bath) to the transmitter.

5) Set the zero range and span of the transmitter.

6) Apply the simulated signal in the ascending order starting from 0% to 100% of the assigned range in the following steps 0%, 25%, 50%, and 100%.

7) Check and record the values, adjust for any variation in the set signal and the output signal.

8) To verify the readings decrease the simulated signal in descending order from 100% to 0% (same stages as in step # 7), record the values.

9) In case percentage error is greater than the specification requirements, adjust the "zero and span" again and repeat the step # 7, # 8.
10) After completing the process issue the test report for site use and record.

6.4.3 SIGNAL CONVERTER (I/P OR P/I)

Place the converter at the test table, read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Arrange the test bench for calibration of the converter.
2) Connect the simulated power source to the input port
3) Connect the instrument air supply. Apply the pressure and check the leakage and confirm if it is secure, use soapy water for detection.
4) Set the zero range and span of the converter.
5) Apply the simulated signal in the ascending order starting from 0% to 100% of the assigned range in the following steps 0%, 25%, 50%, and 100%.
6) Check and record the values, adjust for any variation in the set signal and the output signal.
7) To verify the readings decrease the simulated signal in descending order from 100% to 0% (same stages as in step # 7), record the values.
8) In case percentage error is greater than the specification requirements, adjust the "zero and span" again and repeat the step # 5, # 6, # 7.
9) After completing the process issue the test report for site use and record.

6.4.4 PRESSURE SWITCH

Place the pressure switch at the test table, read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Arrange the test bench for calibration of the pressure switch.
2) Connect the process port of the switch to the pressure generator.
3) Connect a multi meter on the output terminals.
4) Apply the actuating pressure by a pressure generator (dead weight tester, variable air supply or a hand-operated pump) approximately and assure that there is no leakage in the system.
5) De-pressurize the system.
6) Apply the actuating pressure step by step up to a little less than the set value, rest for a while, increase the pressure to the setting value, decrease the pressure up to resting value and record the results.
7) Repeat the step # 6 twice and record the results.
8) In case results not meeting the specification requirements, adjust the preset value of pressure according to the requirements.
9) Repeat step # 6 and # 7, record the results. If not satisfactory repeat after readjustment.
11) After completing the process issue the test report for site use and record.

6.4.5 PRESSURE GAUGE

Place the pressure gauge at the test table, read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Arrange the test bench for calibration of the pressure gauge.

2) Connect the process port of the pressure gauge to the pressure generator.

3) Apply the actuating pressure by a pressure generator (dead weight tester, variable air supply or hand-operated pump) approximately and assure that there is no leakage in the system, use the soapy water for detection.

4) De-pressurize the system.

5) Now increase the pressure step wise and record the readings for "25%, 50%, 75% and 100%.

6) Decrease the pressure in descending order from 100% to 0% in stages of 75%, 50%, 25% and at last at 0% and record the readings. These shall verify the previous readings taken.

7) In case percentage error is greater than the specification requirements, adjust the "zero and span" again and repeat the step # 5 and # 6.

8) After completing the process issue the test report for site use and record.

6.4.6 CONTROL VALVE

Place the control valve at the test table, read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Arrange the test bench for calibration of the control valve.

2) Confirm the availability of instrument air.

3) Confirm the arrangement of block valve and vent valves.

4) Connect the regulated air supply (standard signal) to the pneumatic calibrator / pressure gauge in parallel.

5) Apply the pressure and check the leakage and confirm if it is secure, use soapy water for detection.

6) When the positioner is operating the control valve, the stroke test shall be performed with the positioner.
7) Put the signal to load the actuator and check the movement of stem by travel indicator at different steps. Increase and decrease the signal to check the full opening and tight close.

8) Now increase the pressure step wise, check and record the readings for "25%,50%,75% and 100% (opening for N.C. valves while closing for N.O. valves ).

8) Decrease the pressure in descending order from 100% to 0% in steps of 75%,50%,25% and at last at 0% and record the readings. These shall verify the previous readings taken.

9) In case percentage error is greater than the specification requirements, adjust the spring tension or positioner for "zero and span" until the error comes in the specified range. Repeat the step # 8 and # 9 to ensure the accuracy.

10) Disconnect the supply to perform air failure action or lock up action test.

11) Seat leakage test is not performed in the calibration shop.

12) After completing the process issue the test report for site use and record.

6.4.7 PNEUMATIC OPERATED VALVE (ON / OFF)

Place the control valve at the test table, read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Check the valve visually.

2) Connect the instrument air to the actuator of the valve.

3) Set the multi meter at continuity range and connect it to the output terminals of the limit switch, if specified.

4) Check the leakage in the system or actuator assembly; use the soapy water for detection.

5) Check the action of valve by switching the power supply "ON / OFF". Check the action of limit switch if specified.

6) Check the stroke time by full opening and full closing if specified.

7) Check valve action for instrument air failure, if specified.

8) Seat leakage test is not performed in the calibration shop.

9) Record all the values and issue .

10) After completing the process issue the test report for site use and record.
6.4.8 SAFETY RELIEF VALVE/ PRESSURE SAFETY VALVE (P.S.V.)

Place the safety relief valve at the test table. Read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Inspect the P.S.V. for the following
   a) Visual inspection for any missing or damage.
   b) P.S.V. meets the specification requirements.
   c) Seat leakage test.
   d) Pop test.

2) To calibrate the P.S.V. use the master gauge.

3) Use nitrogen gas for both the seat leakage test and the pop test.

4) Perform the tolerance test. Pop test and pressure tolerance tests shall be according to the client's requirements and specifications.

5) Spring adjustment and seat lapping shall be made as per specification requirements.

6) Seal the adjustments after calibrating with a wire and metal clasp.

7) Make a test report and issue a certificate.

6.4.9 DIFFERENTIAL PRESSURE TRANSMITTER

Place the differential pressure transmitter at the test table. Read the information given on the instrument tag and specifications supplied along with by the vendor.

1) Inspect the differential pressure transmitter for the following

2) Make a visual inspection for any missing or damage.

3) Connect the transmitter's process connections to the pneumatic calibrator.

4) Connect an AVO meter at the output terminals of the transmitter.

5) Supply regulated air pressure (instrument air) or electric powersupply to the transmitter.

6) Apply pressure approximately to the full range of the transmitter to check leakage in the system, use soapy water for detection.

7) De-pressurize the system.

8) Check and record the readings at "zero percent" pressure.

9) Now increase the pressure step wise and record the readings for "25%,50%,75% and 100%".
10) Decrease the pressure in descending order from 100% to 0% in stages of 75%, 50%, 25% and at last at 0% and record the readings. These shall verify the previous readings taken.

11) In case percentage error is greater than the specification requirements, adjust the "zero and span" again and repeat the step # 8, # 9, # 10.

12) After completing the process issue the test report for site use and record.

### 6.4.7 ORIFICE PLATE

Place the orifice plate at the test table. Read the information given in the specifications or supplied along with by the vendor.

1) Inspect the orifice plate for the following
   a) Make visual inspection for any damage i.e. It shall have perfectly smooth surface without any scratch and without any bowing.
   b) A sharp, non-reflecting edge on the upstream face where relevant or a radius on a quadrant edge orifice.
   c) The data such as orifice bore dimension, tag number engraved on upstream side of the orifice plate.

2) Measure the outside diameter of the orifice plate by means of a Vermeer-caliper, it shall be according to the specifications.

3) Measure the orifice plate bore diameter by means of a Vermeer-caliper, it shall be according to the specifications.

4) Record the measurements and the conditioned observed on the report format.

### 6.2.5 INSPECTION

- Quality inspection plan (QIP) specific to project requirements shall be made and inspection activities are recorded on the formats as given in para related documents or client supplied formats may be used.

### 7.0 TOOLS AND EQUIPMENT

The following tools and equipment is used for calibration of instrument at site.

- Dead weight tester (0-1200 Bar)
- Calibrator MA, MV, TE (22mA, 1000mV TC output)
- Process calibrator (0-99Ma, 0-1000Mv, 10vdc, tc)
- Multi meter Digital (750VAC, 1000V, 20M OHM, 10A)
- Manometer Digital (130Kpa)
- Auto Loop Calibrator (10V, 100Ma in put / 10 & 100 Ma out put)
- M Amp / m Volt Source (0-100 m Amps, 0-10 v Input / Output)
- Temperature Bath Dry Box (Ambient to 600 °C)
- Pneumatic Calibrator (30 PSI, 2.15Kg/cm)
- Pneumatic Calibrator (0-2 Bar/ 0-330 PSI & 0-10000 mm of H2O, 0-400 Inch of H2O)
8. HSE INSTRUCTIONS

- All efforts shall be made to keep the environment clean.
- No smoking is permitted in restricted areas.
- During the calibration always follow the instruction manual and the special instructions given by the manufacturer. All the calibration shall be according to the client's specification. Only trained engineers, inspectors and technicians shall perform the calibration work.

9. RELATED DOCUMENT

9.1 QA&QC/FRM-08 Corrective Action Request (CAR) form.
9.2 QA&QC/FRM-316 Certification of primary calibration STD.
9.3 QA&QC/FRM-317 Certification of secondary calibration STD.
9.4 QA&QC/FRM-318 Control valve pre-installation calibration.