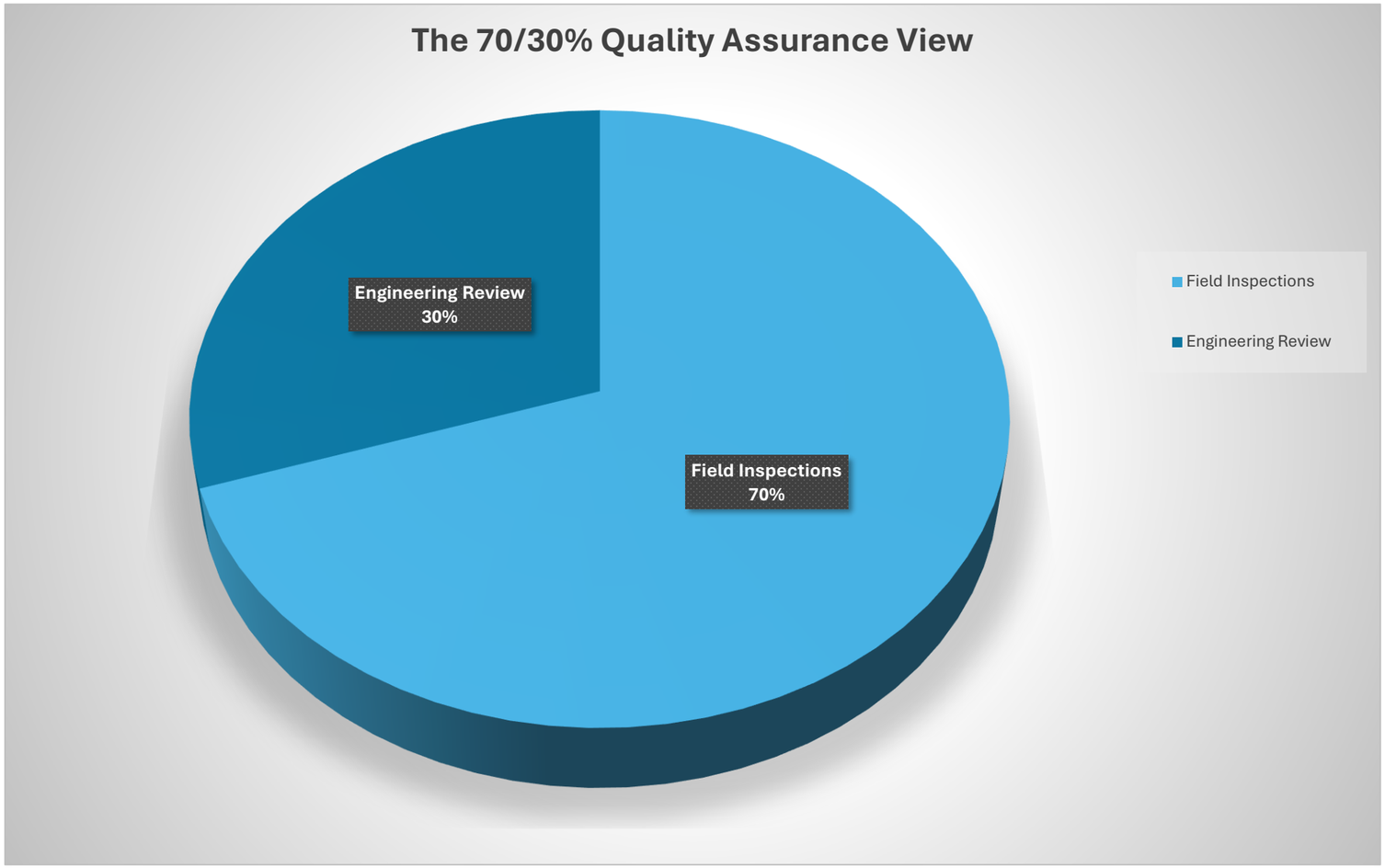
Introduction to Quality Assurance by COOR GROUP:

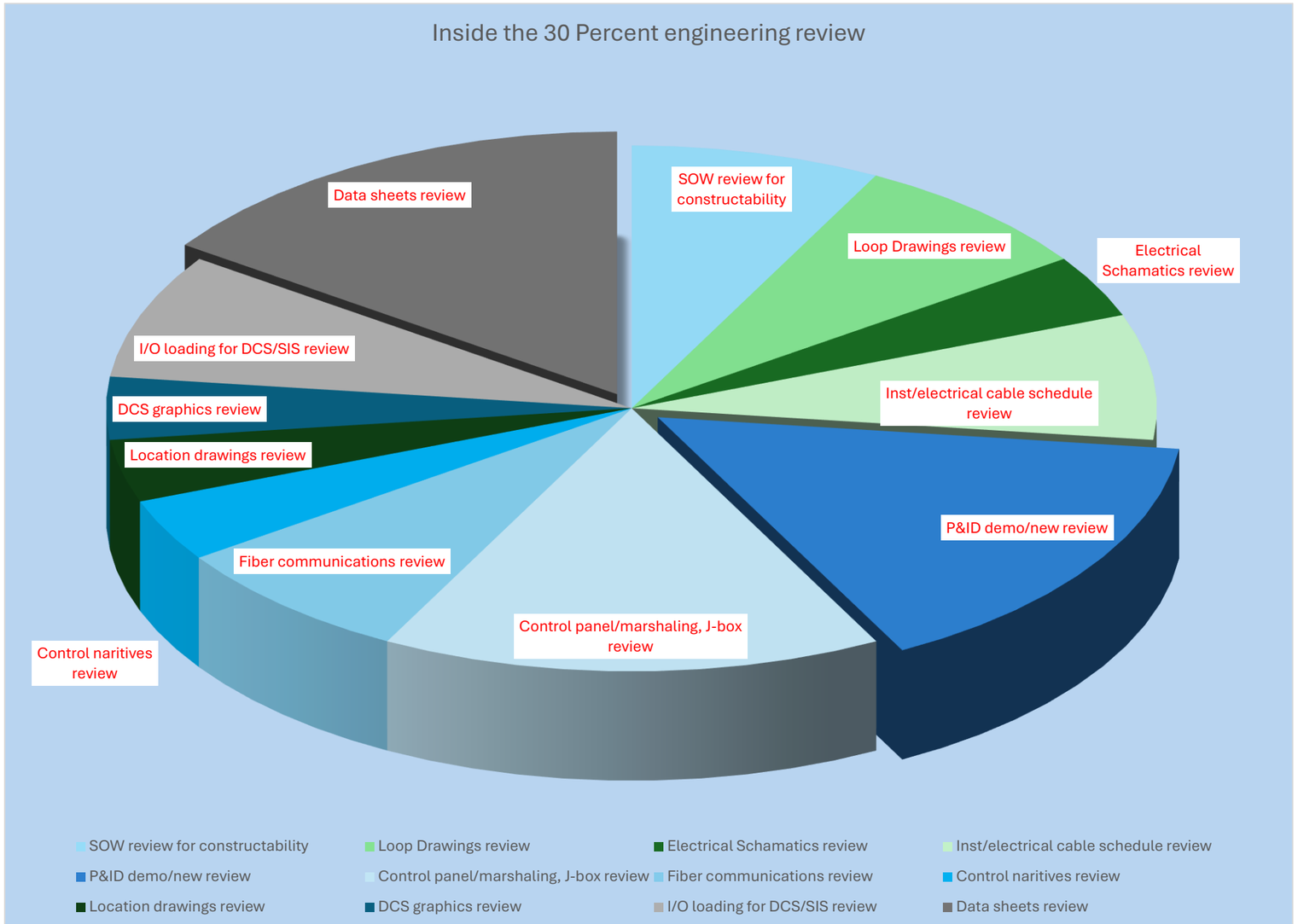
Quality Assurance is an extra layer of insurance that will pay off down the road. The need for QA inspections is a must for a product being sold to the consumer and more importantly, ensuring that the product is safe to use.

There are other factors involved when it comes to the petrochemical industry that can lead to unsafe installations, injuries to personnel, and potentially damaging our environment if there is not a QA program in place.

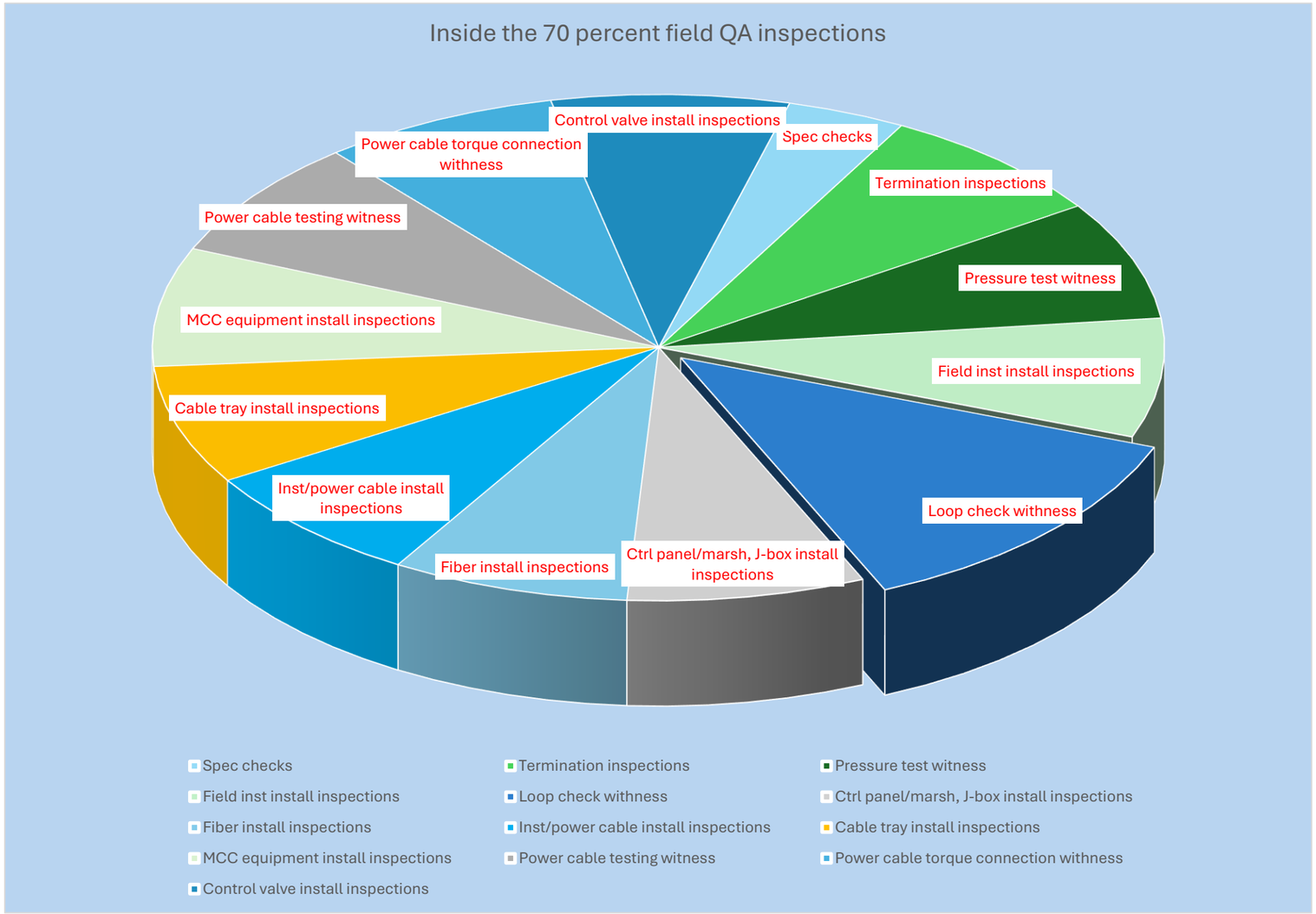
Does your site have a QA program in place that covers the minimum checks?



The engineering review is very important at the first level (IFA) issued for approval, in fact, it is your last chance to get it right. And if not performed, the 30% will bring lots of headaches and generate many RFI's, change orders which leads to increasing the scope of work and the estimated cost. Does this sound familiar?



This section is the final part that needs to be 100% correct prior to PSSR. How are you managing these installations and ensuring that the installer is following your standards?



The typical answers we hear from some organizations that aren't accustomed to a third party that performs these services: QA, Calibrations and commissioning.

1. We trust that the installer will follow our standards.
2. They have a Quality Control (QC) person monitoring the project.
3. The project is a turnkey deliverable, so the EPC/Installer is responsible for a robust installation along with the utmost reliability within the equipment commissioned.
4. Implementation of Quality Assurance (QA) is not in our budget, and we do not see a need for it.

The four answers above are in fact the cause of a total failure of a project. In most cases, leading to very expensive rework by the installer following the EPC's mistakes.

Coor Group

ITP: Inspection Test Plan

Forms: Third Party QA or Client I/E Contractor QC | EPC

IFA Construction Package Review	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	I/E Contractor QC
Perform squad check on IFA documents. All documents to depict the correct depiction on demo and new scope of work. Identify discrepancies/markup and resubmit for corrections.	Perform squad check on IFC documents. All documents shall depict the correct depiction on demo and new scope of work. Use the original IFA marked-up documents for the final IFC review. Any remaining discrepancies will be treated as punch items. Move to construction with max 1% punch items.		Inspection: 100%	Inspection BY EPC: 100%
IFA documents: Instrument index, P&ID's, Loop drawings, marshaling, j-boxes, relay panels, DCS/SIS cabinets, locations, motor schematics, conduit/cable tray, grounding, installation details, datasheets, flow calculation reports.	IFC documents: Instrument index, P&ID's, Loop drawings, marshaling, j-boxes, relay panels, DCS/SIS cabinets, locations, motor schematics, conduit/cable tray, grounding, installation details, datasheets, flow calculation reports.		Inspection: 100%	Inspection BY EPC: 100%

SAT (Software Acceptance Test)	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	Vendor QC
SAT shall be driven by the control system index and the P&ID's. The datasheets and loop drawings shall be vetted during the test. Follow the EPC's inspection test plan. Packaged vendor equipment shall be vetted including software/field I/O's. SAT validations: Graphics, alarms/trips settings, square-root settings on D/P flowmeters, linear settings on inline flowmeters, split-range configurations, motor start/stop/run, vendor integration, etc.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Ware-house received; specification checks	**Report all discrepancies to the instrument engineer/Construction Manager/PM**	**Forms**	**Third Party QA or Client**	**I/E Contractor QC**
Perform specification check on procured devices per datasheet. Highlight sections on datasheet that pertain to the specification check and initial/date.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Smart Devices: field inst: PT's/LT's/FT's/TT's, AT's Power up device, establish communication, validate parameters per datasheet; LRV/URV, I.D. tag, max range, materials, model#, Serial#, Dampening, GWR's measure antenna/install centering rings, Manufacture cal records. If calibration records are not available, a calibration must be performed.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Control/Isolation Valves: Power up device, establish communication and validate parameters per datasheet. Ensure limit switches are set and DVC position switches are active/set. Validate name plate data/correctly installation on actuators, valve body, solenoid, air regulators, limit switches, air boosters/quick exhaust, closure time, volume tanks, direction of travel, fire-checks, no pockets on tubing, etc.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Orifice plates shall be inspected for; smooth and free of any gouging/pitting, no warpage or bulging, use a micrometer to measure bore size and shall match datasheet, paint the inlet side yellow for confirmation of specification check once the orifice plate is installed. Validate name plate on regulators, Level gauges, flow gauges, rotameters, thermowells, Flame scanners, sample conditioning panels. Thermocouples and RTD's shall be checked with a FLUKE 724/725 for ambient temperature.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Wire reels: Perform OHM/continuity checks on all pairs for multi-core cables, single twisted cables and document readings. Power cables/bus ducts shall be Megged and documented. This validation shall be completed upon arrival.	Wire reels: Perform OHM checks on all pairs for multi-core cables, single twisted cables and document readings. Power cables shall be Megged and documented. This validation shall be completed after signal/control and power cables are pulled to their destination.		Random	Inspection: 100%

Motors/Transformers/switch gear: information on data plate shall be compared with specifications/datasheets/schematics/one-lines: Name plate, horsepower, power factor, voltage, amps, etc.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Audit: N/A
Field inst installation inspections	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	I/E Contractor QC
Typical field instrumentation can be installed ahead of witnessing such as: PT's, TT's, D/P's, Capillary LT's, TE's/TW's, Switches, etc. All GWR's level transmitters shall be witnessed of insertion/bolt-up.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Control/isolation valve installation inspections	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	Mechanical Contractor QC
Control/isolation valves shall be installed per project related documents, ISO's. Installations shall be validated using P&ID's/ISO's/computer model. Installation inspection includes Name tag, direction of flow, access for removal, actuator orientation/hand wheel access, etc.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Conduit/Seal tight flex installation inspections	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	I/E Contractor QC
Conduit/seal tight flex installations shall be mechanically sound and uniform. The installer shall keep a 360-degree max bend rule and minimize the use of fittings in between 360 degrees if possible. Installation inspections include Low point drains, supports, all support cuts painted with cold galvanize paint, STL grease on pipe threads. Conduit/flex installation shall be completed by the installation details. Seal tight flex connectors shall be tight, the lock ring shall be removed at the transmitter/smart positioner housing, avoid using 90-degree fittings, all seal-tight flex shall run up to the field devices. Always use the correct seal-tight flex in hot surface areas; black outer jacket is rated for 302-F and the gray outer jacket is rated for 176-F.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Random	Inspection: 100%
Cable tray installation inspections	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	I/E Contractor QC
Cable tray shall be installed by the installation details. Cable trays shall be properly supported, grounded, identified, dividers as needed, free of sharp edges, etc.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Signal/control wire and power cable termination inspections	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	I/E Contractor QC

Field inst/smart positioners/limit switches; terminations shall be clean with one loop of slack inside the housing, one wire label over both BLK/WHT wires, use fork lugs, wrap shield and tape, SIS signals use red labels. All terminal strip terminations shall be uniform with the same label method as the field end. In addition, the overall homerun labels shall be on the cable prior to tie-wrapping the cable to the back-plain/Panduit. terminations shall have some copper showing 1/16" indicating that the insulation is not pinched. A tug test shall be performed on all terminations including vendor equipment. Power cables with compression lugs shall be torqued.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Cabinet/junction box installation inspections	**Report all discrepancies to the instrument engineer/Construction Manager/PM**	**Forms**	**Third Party QA or Client**	**I/E Contractor QC**
Junction boxes/marshaling, BMS, DCS, SIS, PLC's, interposing relay cabinets; Installation shall be clean, correct tagging, proper grounding. DCS/SIS grounding shall be tested, isolation/equipment ground shall be tagged correctly. Field j-boxes/cabinets shall be installed per the installation details. Terminal strips shall have proper labels including numbers per detail. Homerun terminations shall be in between the terminal strips, homerun penetrations shall be lined up with the layout of final terminations on all new installations, penetration at the bottom of j-box/cabinet. BMS relays/switches/pilot lights shall be rated for classified areas, purge systems shall be installed per details. Switch boxes, motor control HOA's, circuit breakers shall be labeled correctly per the detail drawing.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Instrument air pipe installation inspections	**Report all discrepancies to the instrument engineer/Construction Manager/PM**	**Forms**	**Third Party QA or Client**	**I/E Contractor QC**
Instrument air pipe installation shall be completed by the installation details. All main headers/sub-headers shall be dirt/metal shavings free. The main header shall be blown down first and secondly the sub-header. All sub-headers shall terminate below the user with a low point blowdown/drain and the isolation air valve shall be below the user, ensure that the tube is ran up to the user such as I/P, Solenoid, regulator, rotameter, etc. No pockets are allowed on any instrument air pipe/tubing installation.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Process tubing installation inspections	**Report all discrepancies to the instrument engineer/Construction Manager/PM**	**Forms**	**Third Party QA or Client**	**I/E Contractor QC**

Process tubing shall be installed per the installation details. Tubing shall terminate without pockets on liquid installations and the transmitter shall be below tap. All gas/vapor phase installations shall be above tap without packets. On steam services, pig-tails or a syphon coupling shall be installed to protect the transmitters that are above the tap. Avoid long tubing installations. Filler Tee's shall be installed at the root valves for D/P's below taps using a buffer media such as glycol. For nut/ferrule makeup, use the 1-1/4" turn method. A no-go gauge shall be used on all tubing fittings to ensure proper makeup of nut/ferrules. High/Low sides shall be confirmed on all D/P installations. Flush rings with vent/bleed valves shall be installed vertically and not on an angle. The capillaries on a D/P shall be secured to a tubing tray and the slack coil/tie wrapped in place.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Pressure testing inspections	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	I/E Contractor QC
Pressure testing shall apply to all transmitters with tubing, flange mounted instruments, instrument air headers, analyzer sample/return lines, steam tracing. During pressure testing of D/P's confirm the correct installation of high/low sides by closing the equalizer manifold valve and opening the high side root valve, the pressure should go to zero on the test manifold gauge if it's tube correctly. This method works well on Dekoron tubing which makes it difficult to trace the tubing.	Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.		Inspection: 100%	Inspection: 100%
Loop-check inspections	Report all discrepancies to the instrument engineer/Construction Manager/PM	Forms	Third Party QA or Client	I/E Contractor QC

Loop-checks shall be validated for the utmost accuracy and witnessed by the client or a third-party commissioning group. The following are best practices for executing loop-checks; a third-party commissioning group is always recommended. *Pre-loop checks shall be executed by the area owner/QA inspector and the DCS/SIS technicians. This effort will only cover energizing the I/O ahead of the final loop-check team to build a solid backlog for the final sale. The QA inspector shall have already performed the field inspections that are covered in this ITP document during the construction phase. The QA inspector will have knowledge of the area including all vendor equipment and therefore, the pre-loop checks will become very efficient to complete and generate a solid backlog. * Pre-loop consists of; energizing the field inst, confirming with DCS/SIS for correct tag/description, disconnect/reconnect signal for re-validation. *Control/isolation valves; energize the signal, confirm tag with DCS/SIS technician, disconnect/reconnect signal for re-validation, stroke valve 0%/50%/100% and confirm feed-back indication. *Motor; test the interposing relays by energizing/de-energizing the rays for Start/stop/run, confirm description. *Final loop-checks consist of; validating ranges/LRV-URV/square-root/simulate 4-20 milliamps on a 5-point check. Control/isolation valves; stroke valve on a 5-point check, perform air/electrical failure, validate feedback indications. Motors: disconnect t-leads at motor starter and perform loop-checks, validate start/stop/run. All loop checks shall be witnessed 100% from the DCS/SIS including the field side.	**Discrepancies found shall be documented as a non-conformance. Report all discrepancies to Instrument engineer.**		**Inspection: 100%**	**N/A**