Handbook for Piping / Mechanical Inspectors

Sr. No.	Question	Answer	Answer Reference
1.	What are the responsibilities of a mechanical inspector?	**To Conduct Inspection** of all mechanical activities **To witness** testing and monitoring of the product, fabrication and installation process **Recordkeeping** per SATIP	PQP
2.	What is Schedule Q?	Schedule Q is a part of contract agreement (between Client and Contractor) that does contain client's minimum quality requirements for a specific project / contract.	Sch. Q
3.	What is PQP?	PQP stands for Project Quality Plan; it is the document which describes that how contractor will manage the scope of work based their Quality System correlated to Client's Schedule Q.	PQP
4.	What is NCR?	NCR stands for Non Conformance Report; a NCR would be issued to the culprit once non conformity is observed.	
5.	Who are authorized to issue NCR?	All QA/QC personnel can issue NCR	PQP
6.	What is the timeline for INCR (Internal NCR) to be forwarded to client?	Contractor shall forward all INCR to Client within 48 hours of issuance.	Sch. Q
7.	What are the content of NCR ?	**Description** of Non-Conformity **Root Cause Analysis**(to find the cause of Non-Conformity) **Corrective Action**(action taken on the system / product to debug the errors) **Preventive Action**(Proactive measures to avoid the non-conformity)	
8.	What is the timeline for Root Cause Investigation and initiate corrective action?	Within 7 days of issuance	Sch. Q
9.	What is the timeline to respond clients NCR?	It must be responded in written within 48 hours	Sch. Q
10.	What are the Inspection levels / Responsibilities during construction phase?	**Surveillance:** QA/QC organization to monitor work in progress without notice from Construction Organization **Witness:** QA/QC organization shall be notified of the timing of Inspection or test in advance. However, the inspection or test shall be performed as scheduled if the QA/QC organization representative is not present. **Hold:** QA/QC organization shall be notified of the timing of inspection or test in advance. Inspection or test shall	SATIP

		not be carried out without the QA/QC organization representative in attendance.	
11.	**What are the Inspection levels for contractor supplied materials per SAER 1972?**	**Level 0:** Documentation Requirement only; no vendor inspection required **Level 1:** Only final inspection is required prior to shipping **Level 2:** Includes, as a minimum, pre inspection meetings, one or more unspecified in progress surveillance / visits, all witness and hold points, final inspection and release for shipment **Level 3:** Same as Level 2, except that in progress surveillance shall be on regular basis (Daily, Weekly or Bi-weekly) **Level4:** Resident Inspector continually monitoring the work	**SAER 1972**
12.	**What are the SA-175 forms?**	SA-175 forms establish minimum inspection and testing requirements for procured inspect-able material and equipment.	**SAER 1972**
13.	**What minimum amount of Documents do you need to inspect a Material?**	Actually it depends upon level of inspections; however below listed documents are the minimum requirements: Related Drawing (IFC and Controlled) Material Take off (IFC and Controlled) Material Requisition and its approval Purchase Requisition and its approval Purchase Order Packing List / Tally Sheet Material Test Certificates Vendor Inspection Report Inspection Disposition Report / Inspection Release Note Delivery Note	
14.	**What is the timeline to award an ACD to LBE, NCR and Worksheet?**	Within 05 working days	**Sch. Q**
15.	**List down the full forms of most frequently used abbreviations.**	ASME: American Society of Mechanical Engineers ASTM: American Society for Testing of Materials AISI: American Iron and Steel Institute ANSI: American National Standard Institute API: American Petroleum Institute AWS: American Welding Society AISC: American Institute of Steel Construction ISO: International Organization for Standardization SAES: Saudi Aramco Engineering Standards SAEP: Saudi Aramco Engineering Procedures SATIP: Saudi Aramco Typical Inspection Plan SAIC: Saudi Aramco Inspection Checklist SATR: Saudi Aramco Test Report SASD: Saudi Aramco Standard Drawings NCR: Non Conformance Report	

		ACD: Agreed Completion Date PQI: Project Quality Index QMIS: Quality Management Information System RFI: Request for Inspection IIR: Internal Inspection Request CAR: Corrective Action Report CSD: Consulting Services Department G. I.: General Instructions PIP: Process Industry Practice SIS: Safety Instruction Sheet IFB: Issued for Bid IFC: Issued for Construction P& ID: Piping and Instrument Diagram UG / AG: Under Ground / Above Ground RSA: Responsible Standardization Authority PQR: Procedure Qualification Record	
16.	**What are the basic terms and definitions related to piping and pipelines?**	**Code Break:** The physical location on the piping system where the design Code changes from one Code to another, such as from ASME B31.4 to ASME B31.3. **Critical Plant Equipment and Piping:** A designation imposed on equipment or piping system that will entail extra design requirements with the objective to minimize business interruption. **Cross-Country Pipeline:** The pipeline and its appurtenances used to transport fluids across the country or offshore between isolated plant areas or camps. **Design Agency:** The agency responsible for designing the piping system. It could be the design Contractor, the Lump Sum Turn Key Contractor or in house design organization of Saudi Aramco. **Design Conditions:** All conditions (such as pressure, temperature, ambient conditions, service, etc.) that govern all or part of the design and selection of piping components. **Design Factor:** It is numerical multiplier used to calculate the allowable stresses for transportation piping systems. This factor is used by ASME B31.4 and ASME B31.8 Codes. **Flowlines:** Pipelines connected to oil, gas or water wells for production, injection or well testing. **Hazardous Service:** Any fluid service other than Category D as defined in ASME B31.3. **Maximum Allowable Operating Pressure (MAOP):** This term refers to the maximum pressure at which a piping system can be operated within the provisions of the applicable ASME B31.4 and or B31.8 codes. It is the maximum internal pressure permitted in the piping system for continued operation at the most severe condition of coincident internal or external pressure and temperature (minimum or maximum) expected during service.	**SAES-L-100**

		Normal Operating Conditions: The expected conditions (such as pressure, flow, temperature, ambient conditions, service, etc.) to occur during normal operation per design. **Off-Plot:** Off-plot refers to any area outside of the plot limits. Off-plot can include plant areas such as roads, pipeways and open lots between plant units. **On-Plot:** On-plot refers to any area inside the plot limit. On-plot piping is generally, but not necessarily, designed to ASME B31.3 code except in area(s) set aside for piping within other code or government regulations. **Perimeter-Fence:** The fence which completely surrounds an area designated by Saudi Aramco for a distinct function (plant or camp). **Plant-Area:** The designated area engaged in the production, processing, storage and transportation of crude oil, gas, refined products and their derivatives. It could be inside an onshore perimeter fence, or on the decks of offshore structures. **Plant Piping:** Pressure piping system, within an identified plant-area. **Plant Utility Service:** The supply of steam, water, air, nitrogen or inert gas within a processing plant. **Plot Limit:** The plot limit is a boundary, within the plant area, which surrounds a single plant or function. The plot limit may be physical such as a fence (not necessarily an SSD fence), a wall, the edge of a road or pipe-way, chains and posts or a boundary indicated on an approved plot plan. **Production Pipelines:** Those pipelines engaged in transporting crude oil or gas from the producing wells to the designated facility for processing. These include flowlines, testlines, trunklines and transmission lines. **Process Piping:** Pressure piping which is designed in accordance with ASME B31.3. This piping is typically found in petroleum refineries, chemical plants, cryogenic plants, and related processing plants and terminals. **Power Piping:** Pressure piping which is designed in accordance with ASME B31.1 and typically found in electric power generating plants. **Testlines:**Flowlines that are used for testing an individual producing well without affecting the operation of the trunklines. **Transportation Piping:** Pressure piping system that is designed in accordance to ASME B31.4 or/and 31.8. Typically, these pipelines transport hydrocarbon fluids or others between processing plants or storage facilities to export terminals and end users. **Trunklines:** Pipelines to which two or more flowlines are connected.	

		Well Head Piping: The piping system connecting the wellhead to the flowline first isolation valve.	
17.	**What are the Sections of ASME Boiler and pressure vessel code?**	**ASME Section I:** Rules for Construction of Power Boiler **ASME Section II:** Materials Part A: Ferrous Material Part **B**: Non-Ferrous Material Part C: Specifications for Electrodes and Filler Wire Part D: Properties **ASME Section IV:** Rules for construction of heating Boiler **ASME Section V:**Non Destructive Examination (NDE) **ASME Section VI:**Recommended Rules for care and operation of heating Boilers **ASME Section VII:**Recommended Guidelines for care of Power Boilers **ASME Section VIII:**Rules for Construction of Pressure Vessels **ASME Section IX:**Welding and Brazing Qualification	
18.	**What are the different ASME Pressure Piping Codes for B31 series**	**ASME B 31.1:**Power Piping **ASME B 31.2:**Fuel Gas Piping **ASME B 31.3:**Process Piping **ASME B 31.4:**Pipeline Transportation System for Liquid Hydrocarbon and other Liquids **ASME B 31.5:**Refrigeration Piping **ASME B 31.8:**Gas Transmission and Distribution Piping System **ASME B 31.9:**Building Service Piping **ASME B 31.11:**Slurry Transportation Piping System	
19.	**What are the different ASME Codes for Material (ASME B16 and B36 series)**	**ASME B16 Series** **Flanges:** **ASME B16.1:**Cast Iron Pipe Flanges and Flanged Fittings(Classes 25, 125 and 250) **ASME B16.5:**Pipe Flanges and Flanged Fittings (up-to 24 inches) **ASME B16.47:**Large Diameter Steel Flanges (26 to 60) **ASME B16.49:** Factory Made Wrought Steel But-welding Induction Bends for Transportation and Distribution Systems **But Welded Fittings:** **ASME 16.9:**But Welded Fittings **ASME 16.28:**But welding short radius elbows and returns bends. **Gaskets:** **ASME 16.20:**Metallic Gaskets for Pipe Flanges **ASME 16.21:**Non-metallic Flat gaskets for pipe flanges **Socket and Threaded Fittings:** **ASME 16.11:**Forged fittings, socket welded and threaded **Valves:** **ASME 16.10:**Face to Face & End to End Dimensions of Valves	

		ASME 16.34: Valves, Flanged , Threaded and Welding Ends **ASME B36 Series** **Pipes:** **ASME 36.10:**Welded and Seamless wrought steel pipe **ASME 36.19:**Stainless Steel Pipe	
20.	**What does ASTM describe?**	ASTM describes Standard Specifications of Materials	
21.	**What are the ASTM Codes for Materials?**	**Pipe** **Carbon Steel:** **ASTM A 53:** Pipe, Steel, Black and Hot Dipped,Zinc Coated, Welded and Seamless **ASTM A106:**Seamless CS Pipe for High Temperature Service **ASTM A 333:**Seamless and welded steel pipe for low temperature service **Stainless Steel** **ASTM A312:** Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes **Tube** **Carbon Steel:** **ASTM A 178:**Electric-Resistance-Welded CS & Carbon-Manganese Steel Boiler and Super heater Tubes **ASTM A 179:**Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Condenser Tubes **ASTM A 192:**Seamless Carbon Steel Boiler Tubes for High-Pressure Service **ASTM A 334:**Seamless & Welded Carbon and Alloy-Steel Tubes (Low-Temp) **Stainless Steel** **ASTM A 213:** Seamless Ferritic& Austenitic Alloy-Steel Boiler, Super heater, & Heat-Exchanger Tubes **Wrought Iron Fittings** **Carbon Steel:** **ASTM A 234:**Piping Fittings of Wrought CS & Alloy Steel for Moderate & High Temp Service **ASTM A 420:**Piping Fittings of Wrought CS and Alloy Steel for Low-Temperature Service **Stainless Steel** **ASTM A 403:**Specification for Wrought Austenitic Stainless Steel Piping Fittings **Forged Fittings** **Carbon Steel:** **ASTM A 181:**Carbon Steel Forgings, for General-Purpose Piping **ASTM A 105:**Specification for Carbon Steel Forgings for Piping Applications **ASTM A 350:**Carbon & Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping **Stainless Steel:** **ASTM A 182:**Forged or Rolled Alloy & SS Pipe Flgs, Forged Fittings, Valves & Parts (Hi-Temp) **Cast Fittings**	

		Carbon Steel: **ASTM A 216:**Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service **ASTM A 352:**Steel Castings, Ferritic& Martensitic, for Pressure-Containing Parts, Suited for Lo-Temps **Stainless Steel:** **ASTM A 217:**Steel Castings, Martensitic Stainless & Alloy, for Pressure-Containing Parts, Suited for High Temperature Service **ASTM A 351:**Specification for Castings, Austenitic, for Pressure-Containing Parts **Plates** **Carbon Steel:** **ASTM A 285:**Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength **ASTM A 515:**Pressure Vessel Plates, CS, for Moderate- and Lower-Temperature Service **ASTM A 516:**Pressure Vessel Plates, CS, for Moderate- and Lower-Temperature Service **Stainless Steel:** **ASTM A 240:**Chromium & Chromium-Nickel SS Plate, Sheet, & Strip for Press Vess& Gen Apps **Bolting Materials** **Carbon Steel:** **ASTM A307**STD Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength **ASTM A194**STD Spec-Carbon & Alloy Steel Nuts for Bolts for High Press and/or High Temperature Service **ASTM A563** STD Spec – Carbon and Alloy Steel Nuts **Stainless Steel:** **ASTM A193** STD Spec Alloy-Steel & SS Bolting Matls for High Temp or High Pressure Service & Special Apps **ASTM A320** STD Spec – Alloy-Steel & SS Bolting Materials for Low-Temperature Service	
21.	**What are the different API Standards?**	**API 5L:**Specification for Line Pipe **API 6D:**Pipeline Valves **API 526:**Flanged Steel Pressure Relief Valve **API 594:**Check Valves (Flanged, Lug, Wafer and But Welding) **API 510: CONSTRUCTION OF PRESSURE VESSEL.** **API 598:**Valve Inspection and Testing **API 599:**Metal Plug Valves, Flanged, Threaded and Welding Ends **API 600:**Bolted Bonnet steel gate valves for petroleum and natural gas industries **API 602:**Compact Steel Gate Valves Flanged, Threaded, Welding and Extended Body Ends **API 603:**Corrosion Resistant Bolted Bonnet Gate Valves, Flanged and But Welding Ends **API 608:**Metal Ball Valves, Flanged, Threaded and Welding Ends	

		API 609: Butterfly Valves, Flanged, Lug and Wafer Type **API 620:**Design and Construction of Large welded low pressure storage tanks **API 650:**Welded Steel Tanks for Oil Storage **API 653:**Tank Inspection, Repair, Alteration and Reconstruction **API 1104:**Welding of Pipelines and Related Facilities	
22.	**What is the AWS Standard Reference for Structural Steel Welding?**	**AWS D1.1:** Structural Welding Code-Steel	
23.	**Define the Mechanical Properties of Materials**	**Compressive strength:Maximum stress a material can withstand before compressive failure (MPa).** **Ductility:Ability of a material to deform under tensile load (% elongation).** **Malleability:Abilty of material's to deform under compressive stress.** **Fatigue limit:Maximum stress a material can withstand underrepeated loading (MPa)** **Fracture toughness:Energy absorbed by unit area before the fracture of material (J/m^2)** **Hardness:Ability to withstand surface indentation (e.g. Brinell hardness number)** **Elasticity: it is the tendency of solid materials to return to their original shape after being deformed** **Plasticity (physics):Ability of a material to undergo irreversible deformations** **Shear strain:Change in the angle between two perpendicular lines in a plane** **Shear strength:Maximum shear stress a material can withstand** **Tensile strength:Maximum tensile stress a material can withstand before failure (MPa)** **Yield strength :The stress at which a material starts to yield (MPa)**	**TODAY QUESTION15/03/2014**
24.	**What is the Difference between Pipe and Tube?**	**Pipe:**Pipe is identified by NB and thickness is defined by Schedule **Tube:**Tube is identified by OD& its thickness as BWG (Birmingham wire gauge or 1/100 inch).	**Important question**
25.	**What is Hoop Stress?how you calculate it?**	*Stresses which are generated circumferentially due to the action of Internal pressure of pipe are calledHoop Stress.* *Hoop Stress (S_h) = $Pd_o/ 2t$*	**Important question**

		Where P = Force Acting from Inside. *d_o= OD of Pipe.* *t = Pipe Thickness*	
26.	**How can we classify the flanges?**	Pipe flanges are classified in different ways based on pipe attachment, Pressure-Temperature (PT) rating,facing, face finish.	
27.	**Can Raised Face Flange convert to Flat Face Flange?**	Yes, it can be as far as the pressure and temperature ratings would remain unchanged.	**ASME B16.5 and ASME B 16.47**
28.	**What are the flange types based on facing / mating surfaces?**	Flat face. (FF) Raised face. (R/F) Tongue and groove. (T/G) Male and female. (M/F) Ring type joint. (RTJ)	
	How can flanges be classified based on face finish?	Smooth finish Serrated finish	
	What do you means by Series A and Series B Flanges?	There are two series of flange dimensions.**Series A** specifies flange dimensions for generaluse flanges. **Series B**specifies flange dimensions forcompact flanges which, in general, have smaller boltcircle diameters than Series A flanges. These two seriesof flanges are not interchangeable. The user shouldrecognize that some flanged valves, equipment boltedbetween flanges, and flanged equipment may only becompatible with bolt circle diameter of one series offlanges.	**ASME B 16.47**
29.	**How to check the dimensions of the flanges?**	OD of Flange, Thickness of Flange, Length through hub, Dia of Hub, Raised Face Dia, Dia of Bolt Circle, Dia of Bolt hole, Fillet Radius.	**ASME B 16.47**
30.	**What are the flange types based on pipe attachments?**	**Slip on:** The Slip-on type flanges are attached by welding inside as well asoutside. These flanges are of forged construction. **Socket Weld:** The Socket Weld flanges are welded on one side only. These are used forsmall bore lines only. **Screwed:**The Screwed-on flanges are used on pipe lines where welding cannot becarried out. **Lap Joint:**The Lap Joint flanges are used with stub ends. The stub ends are weldedwith pipes & flanges are kept loose over the same. **Welding Neck:**The Welding neck flanges are attached by butt welding to the pipe. Theseare used mainly for critical services where the weld joints needradiographic inspection. **Blind:**The Blind flanges are used to close the ends which need to be reopened. **Reducing:** The reducing flanges are used to connect between larger and smallersizes without using a reducer. In case of reducing flanges, the thicknessof flange should be that of the higher diameter. **Integral:** Integral flanges are those, which are cast along with the pipingcomponent or equipment.	
31.	**Why do we make color coding on Spiral Wound Gasket and where it would be done on Gasket?**	Spiral Wound **gaskets** shall be marked with a color code that identifies the windings and filler materials. A continuous color around the outer edge of the centering ring shall identify the winding metal. The color identifying the filler material for NPS i'/* and larger shall have four intermittent stripes spaced approximately 90 deg apart on the outer edge of the centering ring. Smaller size gaskets shall have a minimum of two stripes 180 deg apart.	**ASME B 16.20**

32.	**What are the Types of Gasket based on Construction type?**	Full Face Spiral Wound Metallic Ring Type Metal Jacketed Inside Bolt Circle	
33.	**What are the Saudi Aramco Engineering Standards applicable for pipelines and Plant Piping?**	**SAES-A-004:**General Requirements for Pressure Testing **SAES-A-005:**Safety Instruction Sheet **SAES-A-007:**Hydrostatic Testing Fluids and Lay-Up Procedures **SAES-H-200:**Storage, Handling and Installationof Externally Coated Pipe **SAES-L-100:**Applicable Codes and Standardsfor Pressure Piping Systems. **SAES-L-101:**Regulated Vendors List for Pipes, Fittings, Flanges and Tubes. **SAES-L-102:**Regulated Vendors List for Valves **SAES-L-105:**Piping Material Specifications **SAES-L-108:**Selection of Valves **SAES-L-109:**Selection of Flanges, Stud Bolts and Gaskets Piping Standards **SAES-L-125:**Safety Instruction Sheet for Piping and Pipelines **SAES-L-150:**Pressure Testing of Plant Piping and Pipelines **SAES-L-310:**Design of Plant Piping **SAES-L-350:**Construction of Plant Piping **SAES-L-410:**Design of Pipelines **SAES-L-420:**Scraper Trap Station and Appurtenances **SAES-L-440:**Anchors for Buried Pipelines **SAES-L-450:**Construction of On-Land and Near-Shore Pipelines **SAES-L-460:**Pipeline Crossings Under Roads and Railroads **SAES-L-470:**Trenchless Pipelines Construction Requirements	
34.	**What are the Saudi Aramco Engineering Standards applicable for Tanks?**	**SAES-D-001**: Design Criteria for Pressure Vessels **SAES-D-008:** Repairs, Alterations, andRe-rating of Process Equipment **SAES-D-100:** Design Criteria of Atmospheric and Low-Pressure Tanks **SAES-D-101:** Regulated Vendors List Managed Commodities for Pressure Vessels and Storage Tanks **SAES-D-108:** Repair, Alteration and Reconstruction of Storage Tanks **SAES-D-109**: Design of Small Metallic Storage Tanks **SAES-D-110:** Design of Fiberglass-Reinforced Plastic (FRP) Storage Tanks **SAES-D-116:** Underground Storage Tank System	
35.	**What are the Saudi Aramco Engineering Standards applicable for Centrifugal Pumps?**	**SAES-G-005:** Centrifugal Pump **SAES-G-006:** Positive Displacement Pumps - Controlled Volume **SAES-G-007:** Submersible Pumps and Motors for Water Well and Offshore Service **SAES-G-101:** Regulated Vendors List for Pumps and Mechanical Seals **SAES-G-115:** Lubrication, Shaft Sealing and Control Oil Systems	

		SAES-G-116: Cleanliness Standard for Lube/Seal Oil and Fluid Power Systems	
36.	**What are the Saudi Armco Engineering Procedures involved in Pipelines and Piping?**	**SAEP-20:**Equipment Inspection Schedule **SAEP-29:**General Instructions and Guidelines for Online Valve Preventive Maintenance **SAEP-35**: Valves Handling, Hauling, Receipt Tests and Storage **SAEP-122:**Project Records **SAEP-306:** Assessment of Pipeline Defects **SAEP-302**: Instructions for Obtaining a Waiverof a Mandatory Saudi Aramco Engineering Requirement **SAEP-311:**Installation of Hot Tapped and Stopple Connections **SAEP-310:**Piping and Pipeline Repair **SAEP-327**:Disposal of Wastewater from Cleaning,Flushing and Dewatering Pipelines and Vessels **SAEP-351**:Bolted Flange Joints Assembly **SAEP-379:**Quality Issues Notification **SAEP-381:**Project Quality Issues Escalation Process **SAEP-1028:**Chemical Cleaning and Flushing of Lube/Seal Oil and Fluid Power Systems **SAEP-1160**:Tracking and Reporting of Welding, NDT and Pressure Testing for Capital Projects **SAEP-1150:** Inspection Coverage on Projects SAEP-1151:- REPLACEMENT OF SAER 1972	
37.	**What are the SAMSS involved in Pipelines, Piping, Valves and Fittings?**	**01 SAMSS-024-: PIPE**Handling and Nesting **01-SAMSS-022:**Fracture Control Testing Procedures for Line Pipe **01-SAMSS-010:** Fabricated Steel Piping **01-SAMSS-043 :** Carbon Steel Pipes for On-Plot Piping **01-SAMSS-039:**Induction Pipe Bends **01-SAMSS-046 :** Stainless Steel Pipe **01-SAMSS-038 :**Small Quantity Purchase of Pipe from Stockist and Approved Pipe Mills **01-SAMSS-035:**API Line Pipe **02-SAMSS-005 :** Butt Welding Pipe Fittings **SAMSS-009:** Design and Fabrication of Scraper Traps **04-SAMSS-001:**Gate Valves **04-SAMSS-002:**Globe Valves **04-SAMSS-003 :**Additional Requirements for Low Temperature Valves **04-SAMSS-005:**Check Valves, Swing Type **04-SAMSS-035:**General Requirements for Valves **04-SAMSS-041:** Expanding Plug Valve **04-SAMSS-042:** 4-Way Diverter Valve	

		04-SAMSS-047: High Performance Butterfly Valves (Including Triple-Offset **04-SAMSS-048:**Valve Inspection and Testing Requirements **04-SAMSS-049:** Inspection and Testing Requirements for API SPEC 6A, 10000 PSI Valves **04-SAMSS-050:**Gate Valves, Through Conduit Type, APISPEC 6D **04-SAMSS-051:** Ball Valves, API SPEC 6D **04-SAMSS-052:**Ball Valves, API SPEC 6A **04-SAMSS-053:**Steel Lubricated Plug Valves - Flanged and Welding End	
38.	**What do you mean by Hydrogen Induced Cracking (HIC)**	Hydrogen Induced Cracking (HIC) is the mechanism, related to hydrogen blistering, that produces subsurface cracks parallel to the surface and, sometimes, stepwise cracks in the through-thickness direction.	
39.	**What is HIC Resistant Material?**	HIC resistant steel is manufactured via the electric arc furnace with desulphurisation, dephosphorisation, ladle refining and vacuum degassing to provide ultra clean and homogeneous steel. HIC steel is particularly suited for pressure equipment where wet H2S corrosion can be a problem.	
40.	**What is the Difference between Hydrostatic test and Pneumatic Test?**	**Hydrostatic Test:** A pressure test conducted using water or other approved liquid as the test medium. **Pneumatic Test:** A pressure test conducted using air or other approved gas as the test medium or in conjunction with liquid.	**SAES-A-004**
	What do you mean by Strength and Tightness test?	**Strength Test:** A pressure test at an internal pressure determined in accordance with this standard and the applicable Code to verify the integrity of the piping systems or equipment for service at the design pressure. **Tightness Test:** A pressure test to ensure tightness of the piping system (i.e., no leaks in the system) at the test pressure.	**SAES-A-004**

41.	**What are the contents of Hydrostatic test Package?**	▪ Flow Chart ▪ Reference the "Approved" Pressure Test Procedure ▪ Pressure Test Diagram which shall include the limits of piping (including test manifold) and equipment included in each pressure test, high points and low points (drain), locations of pressure gauges, test pressures, test temperature, test fluid, line flushing requirements, and safety precautions ▪ Relief valve capacity, testing and installation ▪ Pressure gages and recorders calibration records ▪ COMPANY Safety Instruction Sheet (for critical piping) and Pressure Test Report Form ▪ Copies of P&ID and isometric drawings of the piping system to be pressure tested ▪ Piping spools control sheet with NDT extent and results. ▪ Pre-pressure test check List ▪ Re-instatement procedure and Check List ▪ Flange set completion documentation for permanent installations ▪ Identification of pressure testing SPC from contractor ▪ Lay-up method to be applied ▪ Verification of chemical dosing calculations when applicable ▪ Test manifold hydro test verification	**SAEP-1160**
	What is the formula for Hydrostatic test pressure?	**MAOP =** (2*SMYS*WT*DF)/D **Initial Test Pressure =** (2*0.90*SMYS*WT)/D **&** At-least 1.25 times of MAOP for class location **1** At-least 1. 5 times of MAOP for class location **2, 3 and 4**	**SIS & ASME B31.8**
42.	**What do you mean by Pre Test Punch list and how to identify Item A and B?**	Punch list consists of the items to be done / rectified. **A) Items must be cleared before pressure testing** **B) Items could be cleared after pressure testing**	
43.	**What is the validity of Calibration of Pressure Gauge, Relief Valve, Pressure Recorder, Temperature Recorder and Manifold?**	**Pressure Gauge:** 01 Month **Relief Valve:** 01 Week **Pressure Recorder:** 01 Month **Temperature Recorder:** 01 Month **Test Manifold:**Test Manifold for new construction shall be revalidated for each new project & for operating facilities it is 60 months.	**SAES-A-004**
44.	**What is the Minimum No. of Gauges required for Hydrostatic Test?**	A minimum of two pressure gauges are required for the test system. One pressure gage shall be on the test manifold and the other(s) on the test system. Their accuracy shall be within 5% of one another.	**SAES-A-004**
	How will you select a suitable Pressure Gauge?	All gauges shall have a range such that the test pressure is within 30 to 80% of the full range.	**SAES-A-004**
45.	**What error is allowed between pressure gauges?**	Pressure Gauges accuracy shall be within 5% of one another.	**SAES-A-004**

56.	**What would be the hydrostatic test pressure for Manifold?**	Before employing the pressure testing manifold in the actual system pressure test, it shall be separately pressure tested to **at least 1.2 times the system test pressure** but not less than the discharge pressure of the pump used for the pressure testing.	**SAES-A-004**
47.	**What is the set pressure of Pressure Relief Valve (PRV)?**	Pressure test relief valve(s) of adequate capacity set to relieve at 5% above the test pressure shall be installed unless the test pressure is less than 85% SMYS at which time it can be set at 10% above the test pressure.	**SAES-A-004**
48.	**What is the duration of Hydrostatic testing of Plant Piping?**	The test pressure shall be maintained for a sufficient time, but shall not be less than 30 minutes, to determine that there are no leaks	**SAES-L-150**
49.	**What is the duration of Strength Test and Tightness test While Hydrostatic testing of aboveground Pipeline?**	**The strength test** pressure shall be maintained for 2hours. **Tightness test** shall be conducted at 95% of the strength test pressure, immediately after the completion of the strength test. The tightness test pressure shall be maintained as long as required for the inspector to examine all exposed joints.	**SAES-A-004**
50.	**What is the duration of Strength Test and Tightness test While Hydrostatic testing of underground Pipeline?**	**The strength test** pressure shall be maintained for 2hours. A 24-hour recorded **tightness test** shall be applied when the pipeline is buried or insulated, or is partially buried or insulated for more than 300 m (1000 ft) or 10% of its total length whichever is less.	
51.	**What should be the Water Quality for Hydrostatic test? What is the chlorine content?**	**General:** Water used for any part of the hydrotesting or subsequent lay-up shall have a **sulfate reducing bacteria (SRB) count of 10^3 per ml** or less as determined by the RapidChek II Method or alternative test method approved by Supervisor, CTU/ME&CCD/CSD. Water that has a higher bacteria count may be accepted at the discretion of the Supervisor, CTU/ME&CCD/CSD, after treatment with biocide and retesting. **Water may be reused** for hydrotesting, as in a pipeline tested segment by segment. The water must meet the requirements of Paragraph 4.2.3 and **must have an oxygen level of less than 20 ppb**, or additional chemical treatment will be required. **Carbon Steel and Low Alloy Steel Equipment:** **Treatment of Hydrostatic Test Water When the equipment contact time with hydrotest water may exceed 14 days,**an approved oxygen scavenger (see	**SAES-A-007**

		Appendix 1) shall be added to the hydrostatic test water. Treat the water before it enters the system. Use batching scrapers and/or a slug of nitrogen to separate the air in the system from coming in contact with the treated water, and then fill the system with water injecting sufficient oxygen scavenger to maintain its residual concentration at greater than 20 ppm and an oxygen concentration of less than 10 ppb. **Stainless Steel Equipment** **Type 300-series stainless steels** shall be tested only with water that has very low chloride content in order to avoid pitting and stress corrosion cracking. **The maximum allowable chloride concentration is 50 ppm**. Verify the quality of the water following the requirements of Paragraph 4.2.	**SAES-A-007** **PARA 6.1**
	What General Instruction can be referred to conduct pressure test safely?	**GI-0002.102** Pressure Testing Safely	
52.	**What are the contents of Tie-in Package?**		
53.	**What is Hot Tapping?**	**Hot Tap** Process is a mechanical procedure for tapping a charged process line using special equipment without shutting the line down.	
54.	**What are the contents of Hot Tap Package?**		
55.	**What are the Requirements for Coated Pipe Storage, Handling, Transportation and stringing?**	**5.1 General Handling Requirements** **5.1.1** The coated pipe shall be handled at all times in a manner that prevents damage to the pipe walls, beveled ends, and to the coating (including internal coatings, if applied). **5.1.2** All equipment, including field bending machines and pipe cradles, that contact the coated surface of the pipe shall be padded. Slings shall be nylon or equivalent; steel cables shall not be used. **5.1.3** Coated pipes shall not be rolled or dragged on the ground. Coated pipes shall be protected by wrapping polyethylene strings near the pipe ends. **5.1.4** Bevel protectors, when used, shall be firmly attached to the pipe. **5.2 Stacking Requirements during Storage and Transportation** **5.2.1** During storage the coated pipes shall be placed at least 150 mm off the ground on either rock-free sand berms covered with polyethylene sheeting or on padded skids spaced and leveled so that the pipes are supported without damaging the coating. **5.2.2** FBE-Coated Pipes FBE-coated pipes shall not be stacked directly against each other at any time during storage or transportation. They shall be separated by full	**SAES-H-200**

		encirclement, noncompressible rubber padding or equivalent at least 10 mm thick. **5.2.2.1** Twelve meter (12 m) joints of pipe shall have at least 3 full encirclement separation pads. Two (2) shall be located 1 to 3 m from each end of the pipe and 1 in the middle. **5.2.2.2** Twenty four meter (24 m) double-jointed pipe lengths shall have at least 5 full encirclement separation pads placed so that 2 of them are 1 to 3 m from the outer ends of the pipe and 3 of them support the center section of the pipe. Placement of the pads should be approximately equidistant from each other. **5.2.2.3** Additional separation pads shall be used if required to keep the coated pipes from touching each other. **5.2.2.4** The separation pads shall be attached by some mechanical means that ensures they will stay in place. The FBE coated pipes shall be protected from direct sunlight in order to prevent UV degradation. This shall be done by covering the stacked pipes with tarpaulins or similar protection. The tarpaulins must be maintained in good condition for as long as the pipes are exposed to direct sunlight. In case FBE coated pipes are stored outdoors without appropriate cover for more than six months, FBE coated film must be checked for premature deterioration (see 09-SAMSS-091). **Stringing Requirements** Externally coated line pipe strung along the right-of-way shall be supported on rock-free sand, sand bags, rubber tires, or similar compressible material to prevent coating damage. (See also the general handling requirements in Paragraph 5.1.)	
56.	**What are the Requirements for Pipeline Bending?**	**B.1 Workmanship** **B.1.1** At any point along a preformed bend, the pipe diameter shall not be reduced by more than 2-½% of the nominal pipe diameter. Bends shall not be made closer than 600 mm from edge of the line pipe joint (location of the field circumferential welds). **B.1.2** Preformed bends shall be made by welding into the correct location of the string a length of pipe which has been bent with a smooth stretch bending machine. **B.1.3** Bending of spiral wound line pipe shall be conducted with proper tools and performed with skilled operators because spiral wound pipe is more prone to buckling. For example, a hydraulic bending mandrel and polyurethane-lined bending dies should be used for spiral-welded pipe.	

		B.1.4 For internally coated pipe, the bend angle per bite may be reduced to minimize damage to the coating. (As a minimum, the internal coatings shall withstand the bends described in B.2). **B.1.5** For relatively thin wall spiral-welded pipe, the bend angle per bite may need to be reduced (typically to 75% of normal) to avoid wrinkling the pipe. **B.2 Preformed Bends Bites and Angle** **B.2.1** The maximum permissible localized bend or "bite" at one place on the pipe and the minimum spacing of such bites are shown in Table B1. **Table B1 –** Maximum Localized Bend **Nominal Pipe Size** / **Minimum Bite Spacing** / **Maximum Bend Per Bite** Inch / mm / in Degrees 6 / 300 / 4.5 8 / 300 / 3.8 10 / 300 / 2.8 12 / 300 / 2.3 14 / 300 / 1.7 16 / 300 / 1.5 18 / 300 / 1.2 20 / 450 / 0.9 24 / 450 / 0.75 30 / 450 / 0.6 36 and larger / 450 / 0.5 **B.2.2 Wide Bends Radius** The wide bend radius of 210 meter can be achieved by applying a maximum bend or "bite" at one place on the pipe of 0.50 degrees and minimum spacing of such bites of 0.9 m.	
57.	**What are the Requirements for Thrust Boring?**	1: SAES-L-450 2:Thrust boring should not be used where open cut and trench can be achieved 3:	
58.	**What are the Requirements for Installation of Sectionalizing Valves & Jump-overs?**		
59.	**What are the Requirements forInstallation of Scraper trap Installation**		
60.	**What are the Requirements for Pipeline Internal Cleaning/Flushing/Scraping**		
61.	**What are the Requirements of Flanged Joint (Gasket**	Gasket: 1: Size ,Class , ASME Stander, Approve Manufacture Bolts ,Nuts 1:size,length,grade,approved Manufacture	

	Verification & Bolt Tightening)		
62.	**What are the Requirements for Pipeline Re-instatement Inspection**	All spools,valves,bolts nuts,gaskets installation must bbe compeleted	
63.	**What are the requirements for Valve Hydrostatic Testing?**		
64.	**What are the Requirements of Pneumatic Testing?**		
65.	**How to witness fit-up of pipes? What are the tolerances?**	**High Low:** 3 mm maximum **Root gap:** 2 to 3 mm **Bevel angle:** 35degree +-2.5 **Root face:** per WPS	
66.	**What does a SIS contains?**	SIS Contains **Equipment Data and Operating Limits**	
67.	**What are the Different functions of valves?**	**A.** Isolation. **B.** Regulation. **C.** Non-Return. **D.** Special purpose.	
68.	**How to preserve a valve?**	**1:** **Flanged valves NPS 2" and smaller shall be fitted with UV resistant plastic covers.** **2:** **For other size, valve end flanges shall be fitted with plywood covers.** **3:** **The cover shall be attached by machine bolts with a nut & washer fitted on the inside of the flange. There shall be four (4) bolts on valves up to NPS 10 inch nominal size and eight (8) bolts on valves NPS 12 inch and larger.** **4:** **The raised face portion of the flange and the ring joint groove shall be covered with a heavy grease.** **5:** **A heavy duty moisture-proof disc shall be fitted between the greased flange face and the cover.** ***6: The ends of threaded and socket weld end valves shall be protected with tight fitting plastic caps.***	
69.	**What are the Different types of valve?**	**01**: Gate valve. **02**:Ball valve **03**:Plug valve. **04**:Piston valve. **05**:Diaphragm Valve.	

		06:Butterfly valve. **07**:Pinch valve. **08**: Globe valve. **09**: Needle valve **10**: Check valve.	
70.	**What are the Reducers and its types?**	1:Ecentric reducer. 2:concentric reducer.	
71.	**What are the PSL-1 and PSL-2 as per API 5L?**	PSL-1:-Provide a stander quality level for line pipe. PSL-2:-Has additional mandatory requirement for chemical composition,notch toughness and strength properties and additional NDE.	
72.	**What is Pikotek Gasket and where it is usually used?**	Pikotek is a non metallic gasket that is made with Teflon seal which is supported by glass reinforcement epoxy(gre) laminated.	
73.	**What is weep hole?**	Weep hole is provided in the supports to release hot gasses during welding and it made down side of supports at 6 o clock condition.	
74.	**Is it possible to make weep hole after hydrostatic testing?**	**No**	
75.	**How can flanges be classified based on face finish?**	**A:** Smooth finish. **B:** Serrated finish.	
76.	**Why do we provide High Point Vent (HPV) and Low Point Drain (LPD) in piping?**	**HPV:** For removing Air during Hydro-test. **LPD :** For draining water after conducting Hydro-test.	
77.	**What do you mean by Jacketed Piping?**		
78.	**What are Weldolet and Sockolet? And where they are used?**	Weldolet and Sockolet are basically self-reinforced fittings. **Weldolet:**Weldolet is used for Butt weld branch connection where standard tee is not available due to size restrictions and the piping is of critical / high-pressure service. **Sockolet:**Sockolet is used for socket welding branch connection, which require reinforcing pad.	
79.	**How the valves are classified based on its method of operation?**	Valves are classified based on its method of operation as: **A.** Self- operated valves. **B.** Operated valves	
80.	**Describe different types of destructive and non-destructive tests?**	**DESTRUCTIVE TEST:** Bend test, Tensile test, Impact test, and Hardness test. **NON-DESTRUCTIVE TEST:** DPT, MPT, Radiography and ultrasonic test	
81.	**What are the different types of hardness tests carried out?**	1: Brinell Hardness Test. 2: Rockwell Hardness Test. 3: Vicker Hardness Test	
82.	**What do you mean by Hoop Stresses and how do you calculate it?**	Stresses which are generated circumferentially due to the action of Internal pressure of pipe are called Hoop Stress. It is calculated by; - Hoop Stress (S_h) = $Pd_o/ 2t$ Where P = Force Acting from Inside. d_o= OD of Pipe. t = Pipe Thickness.	**Important question**
83.	**How does Hoop Stress affect the system?**	As per membrane theory for pressure design of cylinders, as long as hoop stress is less than yield stress of Moc, the design is safe. Hoop stress	

		induced by thermal pressure is twice the axial stress (SL). This is widely used for pressure thickness calculation for pressure vessel.	
84.	**What is stress?**	It is defined as the applied load per unit cross-section of the specimen. The common unit are psi (pound per square inch), kpa, Mpa, kg/cm2.	
85.	**What is strain?**	For tensile load, it is the ratio of increase in length of the specimen under constant sustained load to the original length of the specimen before the load is applied. For compressive load, it the ratio of decrease in length to the original length under sustained load. Strain is thus an observable and measurable quantity as the extension or compression of the specimen can be directly measured. It is a dimensionless quantity.	
86	**What is IAP?**	Inspection assignment package	
87	**Describe the difference between QA & QC?**	**Quality Control** is the operational techniques (Inspection, Examination & Testing) that are used to fulfill requirements for quality. **Quality Assurance** is the system of action and planning needed to provide confidence that a Product or Service will satisfy quality requirements	
88	**Definition of Procedure, Standard, and Specification, code,Code of practice,Instruction, Normative document, Regulation, Technical specification?**	**Procedure:** A specified way to perform an activity. **Standard:** Document, established by consensus, and approved by a recognised body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given content. **Specification:** The document that advises the requirements with which the product or service has to conform. NB. A specification should refer to or include drawings, patterns or other relevant documents and should also indicate the means and the criteria where byconformity can be checked. **Code of practice**: Document that recommends practices or procedures for the design, manufacture, installation maintenance or utilisation of equipment, structures or products **Instruction:** Provision that conveys an action to be performed. **Normative document:**A document that provides rules guidelines or characteristics for activities or their results. **Regulation:** A document providing binding legislative rules that is adopted by an authority. **Technical specification:** A document that prescribes technical requirements to be fulfilled by a product, process or service. NB. A technical specification should indicate, where ever appropriate, the procedure(s) by means of which it may be determined whether the requirements given	

		are fulfilled. A technical specification may be a standard, a part of a standard or independent of a standard	
89	**Describe Pre assembly inspection before flange joint?**	**1:The gasket shall be verified for correct type, rating, dimension and compatibility with the flange facing.** **2:Bolts, nuts and washers shall be visually checked for proper size, grade, dimension and for any physical damage to shanks or threads which would affect the bolt assembly or performance.** **3:The flange facing, particularly the seating area, shall be visually examined for cleanliness and ensure that no damage, such as scratches exist.** **4:For ring joint type flanges, the ring and the ring groove shall be free of damage and dirt.** **5:Proper lubricant for bolts and nuts shall be used. Lubricant for bolts and nuts shall be Jet-Lube SS-30 or other acceptable lubricants listed in Table-SAEP-351-01.** **6:Tightening tools shall be checked for adequacy, performance and calibration, if required.** **7:Lubricant shall not be used in the gasket and the gasket seating area.** **8:Flange shielding shall be installed/reinstalled when required.**	**SAEP-351** **PARA:** **4.1 TO 4.7**
90	**If Leaks Occur During Pressure Testing what you will do?**	**1: Depressurize the piping system** **2: If leak does not stop after re-torquing has been performed, disassemble the flange joint** **3: Inspect stud bolts and nuts for defects or damage to threads or improper cleaning of threads** **4: Inspect flange faces for damage, misalignment** **5: Inspect gasket for damage or defects.**	**SAEP-351** **PARA:8**
91	**Which Torquing Tools are used for bolt torquing?**	6.1: There are various types of tools available toachieve the proper torque value. Selection of the proper tool depends on the stud bolt size, physical location of the flanged joint, and criticality of the flange. Identifying the proper tools shall be resolved between Contractor, SAPMT, Proponent and Inspection prior to commencing the erection of the piping. **6.2**: The manufacturer's instructions shall be followed for the operation, limitation and maintenance of all torque wrenches used to perform flange bolts tightening. **6.3**: Torque wrench calibration shall be performed in accordance with manufacturer's recommendations	**SAEP-351** **PARA:6.1-6.3**

92	**DESCRIBE MECHANICAL IMPECT TEST AND DWTT(DROP WEAR TEAR TEST)?**	**IMPACT TEST :** **DWTT TEST :**	
93	**What we need in pipe marking?**	1: Purchase Order number 2: Item Number 3: heat number 4: 9COM or 9CAT stock number 5: if 9com or 9cat number are not so marked "01-SAMSS-035	**01-SAMSS-035**
94	**How much hardness require for all grades?**	Maximum acceptable hardness for all grades is **250 HV using 5 or 10 kg load**.	**01-SAMSS-035**
95	**What is ISO drawing?**	**show the exact routing of every pipe two inches and above in diameter. Sometimes the drawings to provide further detail contain a plan and elevation .**	
96	**What is P&ID drawing?**	**for engineers, operators and instrument people, shows instruments, piping and vessels or equipment.**	
97	**How you will do work by using PFD drawing**		
98	**What you know about hydrotestdiagrame?**		
99	**Why you use SIS sheet in Hydrotest package?**		
100	**If you found a dent in a pipe what you will do?**		
101	**What you are check before hydrotest?**	**When we are going to hydrotest we must have the approved hydrotest package and hydrotest procedure with us.** **1:internel cleaning and water flushing must be done before hydrotest.** **2:apre test punch listing must be done before hydrotest and all a item must be clear.** **3:the area where we are going to test must be barigate and sign bord putting there for safety resin.** **4:the water use in test must be treated or plant process water and its water analyses report must be on site.** **5:allgauges,reliefvalve,testheader,manifold must have the valid certificate.** **6:gaskets which are used in hydrotest must be from approved manufacture and must be same class.** **7:bolttorqning done before hydrotest as per saep 351.**	
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