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WELDING QC INSPECTOR — ARAMCO APPROVAL EXAM PREPARATION GUIDE

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Series	Saudi Aramco Welding QC Inspector Exam Preparation
Document	Complete Study Guide — Welding QCI Principles, Standards & 200 Questions
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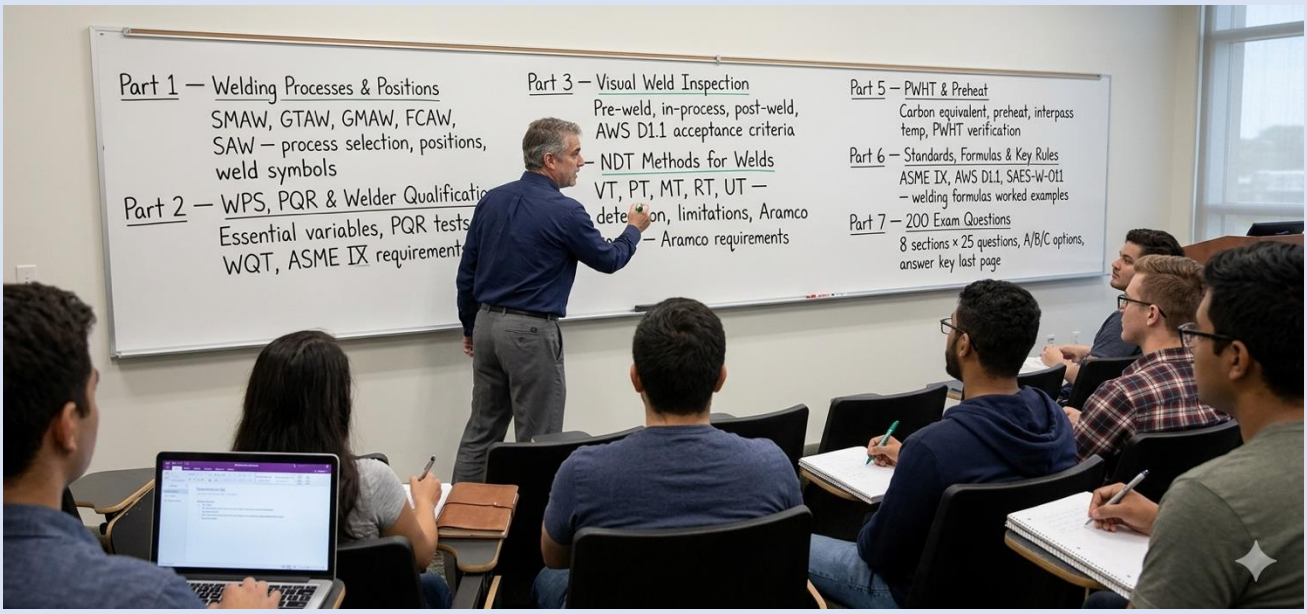
HOW TO USE THIS GUIDE

This guide is for inspectors and engineers preparing for the Saudi Aramco QC Inspector Approval exam. Study Parts 1–6, then answer all 200 questions. Check answers on the last page only.

Section	Content
Part 1 — Welding Processes & Positions	SMAW, GTAW, GMAW, FCAW, SAW — process selection, positions, weld symbols
Part 2 — WPS, PQR & Welder Qualification	Essential variables, PQR tests, WQT, ASME IX requirements
Part 3 — Visual Weld Inspection	Pre-weld, in-process, post-weld, AWS D1.1 acceptance criteria
Part 4 — NDT Methods for Welds	VT, PT, MT, RT, UT — detection, limitations, Aramco requirements
Part 5 — PWHT & Preheat	Carbon equivalent, preheat, interpass temp, PWHT verification
Part 6 — Standards, Formulas & Key Rules	ASME IX, AWS D1.1, SAES-W-011 — welding formulas worked examples
Part 7 — 50 Exam Questions	8 sections × 25 questions, A/B/C options, answer key last page



PART 1 — WELDING PROCESSES & POSITIONS

1.1 WELDING PROCESSES

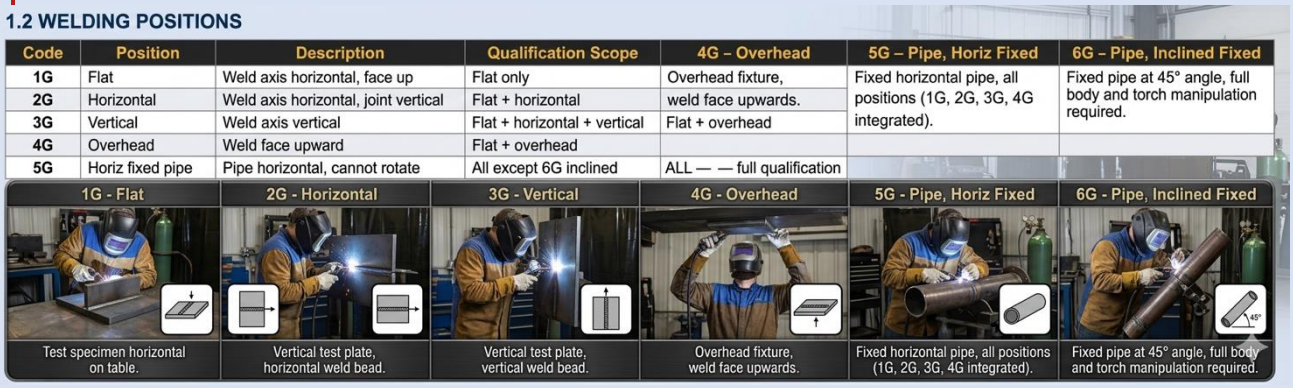
> *EXAM: Welding processes appear in 15–20% of questions. Know shielding method and key limitations.*

Process	Abbr	Shielding	Key Aramco Use
Shielded Metal Arc	SMAW	Flux on electrode	General piping, structural, repair
Gas Tungsten Arc	GTAW/TIG	Inert gas — Argon	Root pass — stainless, alloy, critical piping
Gas Metal Arc	GMAW/MIG	Inert/active gas	Structural, fabrication
Flux Cored Arc	FCAW	Flux core + gas	Heavy fabrication, structural, outdoor
Submerged Arc	SAW	Granular flux	Vessel long seam, high deposition

1.2 WELDING POSITIONS

Code	Position	Description	Qualification Scope
1G	Flat	Weld axis horizontal, face up	Flat only
2G	Horizontal	Weld axis horizontal, joint vertical	Flat + horizontal
3G	Vertical	Weld axis vertical	Flat + horizontal + vertical
4G	Overhead	Weld face upward	Flat + overhead
5G	Horiz fixed pipe	Pipe horizontal, cannot rotate	All except 6G inclined
6G	Inclined fixed	Pipe at 45° — most difficult	ALL positions — full qualification

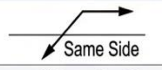
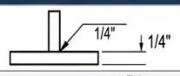
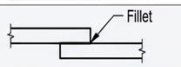
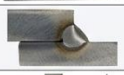
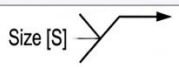
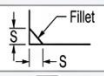
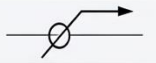
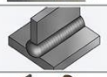
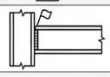
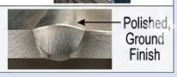
> **6G qualification on pipe qualifies a welder for ALL positions. This is the most comprehensive test.**



1.3 WELD SYMBOL ELEMENTS

Element	Location	Meaning
Arrow side	Below reference line	Weld on same side arrow points to
Other side	Above reference line	Weld on opposite side from arrow
Weld size	Left of symbol	Leg size for fillet / depth for groove
All-around	Circle at elbow	Weld extends completely around joint
Field weld	Flag at elbow	Weld made in field not in shop
Finish G	Letter on symbol	Grind finish required on cap

1.3 WELD SYMBOL ELEMENTS

Element	Location	Meaning	AWS A5.4 Visual Example (Drawing and Weld Cross-Section)	
Arrow side		Weld on same side arrow points to		
Other side		Weld on opposite side from arrow		
Weld size		Leg size for fillet / depth for groove		
All-around		Weld extends completely around joint		
Field weld		Weld made in feld not in shop		
Finish G		Grind finish required on cap		

PART 2 — WPS, PQR & WELDER QUALIFICATION

2.1 WPS ESSENTIAL VARIABLES — ASME IX

> ***EXAM: Essential variable changes require new PQR. This is tested in every exam.***

Variable	Essential?	If Changed
Base metal P-Number	YES	New PQR required
Filler metal F-Number	YES	New PQR required
Welding process	YES	New PQR required
PWHT — with to without	YES	New PQR required
Position (with impact testing)	YES	May require new PQR
Electrode diameter	NO — supplementary	WPS revision only

2.1A — PQR vs WPS: DIFFERENCE AND CREATION SEQUENCE

EXAM: This topic is tested in every Aramco welding exam. Many inspectors confuse the sequence. Understand clearly — PQR comes first, WPS comes after.

WHAT IS A PQR?

PQR stands for Procedure Qualification Record. It is a document that records actual measured data from a test weld made in a controlled condition. The purpose is to prove — by physical testing — that a particular combination of welding variables produces a weld with acceptable mechanical properties.

The PQR records exactly what was done during the test weld: actual amperage used, actual voltage, actual travel speed, actual preheat temperature, actual filler metal used, actual base metal used. After welding, the test coupon is sent to a laboratory. The lab performs tensile tests, bend tests, impact tests if required, and hardness tests. All results are recorded on the PQR. If the results pass, the PQR is certified and signed by a responsible engineer or manufacturer representative.

On Aramco projects, the completed PQR must be submitted to Aramco for review and acceptance before any WPS based on it can be approved for use.

WHAT IS A WPS?

WPS stands for Welding Procedure Specification. It is the instruction document that tells the welder exactly how to make a weld on the job. It specifies the ranges of variables allowed — not just one fixed value. For example, the WPS may say amperage range 90–130A, preheat minimum 75°C, filler metal F-Number 4, base metal P-Number 1.

The WPS is written based on the qualified PQR. The ranges written in the WPS must fall within the qualified ranges established and proven by the PQR.

WHICH ONE IS CREATED FIRST?

PQR is always created first. This is the correct sequence:

Step 1 — A preliminary welding procedure (pWPS) is written to guide the test weld. Step 2 — A test weld is made following the pWPS under controlled and witnessed conditions. Step 3 — Test coupons are cut from the test weld and sent to an approved laboratory. Step 4 — Laboratory performs all required mechanical tests — tensile, bend, impact, hardness. Step 5 — All test results are recorded and the PQR is signed and certified. Step 6 — On Aramco projects, the certified PQR is submitted to Aramco for review and approval. Step 7 — Once the PQR is accepted, the WPS is written based on the qualified PQR data. Step 8 — The WPS is stamped and approved by Aramco. Step 9 — Only then is the WPS issued to the welding station for use.

KEY DIFFERENCE — SUMMARY TABLE

PQR — What actually happened during the test weld — actual recorded values — laboratory results — certifies the procedure is mechanically sound — created FIRST

WPS — Instruction document for the welder on the job — shows allowable ranges — references the supporting PQR number — issued to welding station — created AFTER PQR is certified

IMPORTANT RULE:

A WPS without a supporting certified PQR has no technical basis. If a QCI finds a WPS on site with no PQR reference, or the referenced PQR has not been reviewed by Aramco, that WPS must be placed on hold and escalated immediately. No welding shall proceed on that procedure.

One PQR can support multiple WPS documents, as long as the variables used in each WPS remain within the qualified ranges of that PQR.

2.2 PQR MECHANICAL TESTS — ASME IX

Test	Qty	Purpose	Acceptance
Tensile (reduced section)	2	Verify minimum tensile strength	≥ base metal minimum UTS
Side bend (>19mm thick)	4	Ductility and fusion	No crack > 3mm after bending
Face bend (<19mm)	2	Cap fusion and ductility	No crack > 3mm after bending
Root bend (<19mm)	2	Root fusion and ductility	No crack > 3mm after bending
Charpy impact (if required)	3 per location	Notch toughness	Per ASME IX Table QW-171

PQR must be certified by the manufacturer. On Aramco, PQR must be submitted for Aramco review before WPS is approved.

2.3 WELDER QUALIFICATION — KEY RULES

Rule	Requirement
6G qualifies ALL positions	Inclined fixed pipe — full scope
Qualification expiry	6 months unused = expired — ASME IX QW-322
Re-qualification	Documented re-test after expiry — Aramco requirement
Welder stamp	Each weld must be stamped for traceability to WQR
Pre-weld check	Valid WQR, correct process, correct position — all must match

Welder Selection by Qualification: How to Read a Welder ID Card and Match to WPS.

2.4 — HOW TO SELECT THE RIGHT WELDER FOR THE JOB

EXAM: Welder selection errors are one of the most common NCR causes on Aramco projects. A QCI must check every point below before allowing any welder to start.
A welder is not selected by experience or by the supervisor's preference. A welder is selected by qualification — meaning what his WQR card and test records prove he is legally allowed to weld.

WHAT IS A WQR CARD?
WQR stands for Welder Qualification Record. Every qualified welder carries a card or has a record on file. This card is the legal evidence of what that welder is qualified to do. As a QCI, you read this card before every job assignment.

WHAT TO CHECK ON THE WQR CARD — POINT BY POINT

1. WELDER NAME AND ID NUMBER Confirm the card belongs to the person standing in front of you. Check the name and the ID number match. On Aramco projects, the welder ID is also stamped on each weld for traceability. If the card does not match the person, stop immediately.
2. WELDING PROCESS The WQR card states which process the welder is qualified for — SMAW, GTAW, FCAW, SAW, or combination. This must exactly match the process specified in the WPS for the joint being welded. If the WPS says GTAW root and the welder is only qualified for SMAW, he cannot do that root pass. No exceptions.
3. F-NUMBER — FILLER METAL GROUP The F-Number tells you which group of filler metals the welder is qualified to use. ASME IX groups filler metals into F-Numbers F1 through F6 for arc welding. Qualification on one F-Number within a group qualifies the welder for other F-Numbers within the same group or lower, depending on ASME IX QW-433 rules. Check the WPS filler metal F-Number and confirm the welder's F-Number qualification covers it. If the WPS calls for F6 (stainless) and the welder is only qualified on F4, he cannot weld that joint.

F-Number Reference: F1 — Low hydrogen and carbon steel electrodes (E6010, E6011) F2 — E6012, E6013 type F3 — E6020, E6022 type F4 — E7015, E7016, E7018 — most common on Aramco carbon steel work F5 — Stainless steel electrodes (E308, E316 series) F6 — Solid wire and filler rods — GTAW/GMAW solid wire

4. P-NUMBER — BASE METAL GROUP The WQR card shows which P-Number base metals the welder is qualified to weld. P-Numbers group base metals by similar properties. P1 is carbon steel — the most common on Aramco. If the job involves P8 (austenitic stainless) or P91 (creep-resistant alloy), the welder must be specifically qualified for those P-Numbers. Qualifying on P1 alone does not cover P8 or P91.
5. POSITION QUALIFIED The WQR card states the position or positions the welder is qualified for. Positions are: 1G — Flat pipe or plate 2G — Horizontal 3G — Vertical 4G — Overhead 5G — Fixed horizontal pipe — all positions except inclined 6G — Fixed 45° inclined pipe — qualifies for ALL positions

If the WPS requires a 6G position weld and the welder is only qualified 1G and 2G, he cannot do that weld. 6G is the highest qualification and covers all others. Always confirm the welder's qualified position matches or exceeds the position required by the WPS for that joint.

6. PIPE DIAMETER — THICKNESS RANGE The WQR card shows the diameter and wall thickness range the welder is qualified for. Qualifying on a small diameter pipe (under 73mm OD) qualifies for that diameter and above only if specific rules are met per ASME IX QW-452. Qualifying on plate does not automatically qualify for small bore pipe. Check the pipe size and wall thickness on the drawing against the welder's qualified range.

Thickness qualification general rule — ASME IX QW-451: If test coupon thickness is less than 19mm — qualified range is 1.5mm minimum to 2T maximum If test coupon thickness is 19mm or above — qualified range is 5mm minimum to unlimited maximum

7. EXPIRY DATE Under ASME IX QW-322, a welder's qualification expires if he has not used that process for more than 6 months. On Aramco, the QCI must verify the welder has been actively welding that process within the last 6 months. If expired, the welder must re-qualify before being assigned. Do not accept verbal confirmation — verify from the weld log or project records.
8. ARAMCO APPROVAL STAMP On Aramco projects, the WQR must carry Aramco review acceptance. A welder qualified only under a contractor's internal procedure without Aramco review is not acceptable for Aramco work. Verify the Aramco stamp or acceptance letter reference on the WQR.

QUICK SELECTION CHECKLIST — USE BEFORE EVERY WELD ASSIGNMENT
Check 1 — Welder name and ID match the person Check 2 — Process on WQR matches WPS process Check 3 — F-Number covers the filler metal in the WPS Check 4 — P-Number covers the base metal being welded Check 5 — Position qualified covers the position required Check 6 — Pipe diameter and wall thickness within qualified range Check 7 — Qualification not expired — active within 6 months Check 8 — Aramco acceptance stamp present on WQR
All 8 checks must pass. If any single check fails — the welder does not start. Assign the correct qualified welder or raise the issue to the welding supervisor with documentation.

PART 3 — VISUAL WELD INSPECTION

3.1 PRE-WELD INSPECTION CHECKLIST

Check Item	Reference	Acceptance Criteria
WPS approved and at weld station	SAES-W-011	Aramco stamp on WPS — current revision
Welder WQR valid — process and position match	ASME IX / WQR	WQR card current and applicable
Base material — heat number traced to MTC	SAES-W-011	MTC on file — grade matches drawing
Fit-up gap within WPS range	WPS	Root opening within essential variable
Bevel angle confirmed	WPS	Within tolerance ±2.5°
Joint cleanliness — 25mm from bevel	SAES-W-011	Bright metal — no oil, moisture, rust
Preheat confirmed by thermocouple	WPS / CE calc	Minimum preheat — 75mm from joint

3.2 VISUAL ACCEPTANCE CRITERIA — AWS D1.1

> ***EXAM: Visual criteria appear in 20–25% of questions. Memorise ALL limits.***

Defect	Definition	Limit

Undercut	Groove melted into base metal at weld toe	Maximum 0.8mm depth
Porosity	Gas pockets in weld metal	Max 10mm diameter — frequency limits apply
Overlap	Weld metal over toe without fusion	NOT acceptable — any amount
Crack	Any fracture in weld or HAZ	NOT acceptable — any crack any size
Incomplete fusion	No bond between passes	NOT acceptable
Arc strike	Accidental arc outside weld zone	NOT acceptable — grind and MT test
Excessive convexity	Cap too high	Maximum 3mm above flush

> **ANY CRACK = STOP work immediately. Raise NCR. Weld must be removed and re-welded. No repair of cracks.**

PART 4 — NDT METHODS FOR WELDS

4.1 NDT METHOD SELECTION

Method	Abbr	Detects	Limitation
Visual Testing	VT	Surface defects — cracks, profile	Surface only — first NDT always
Liquid Penetrant	PT	Surface-breaking defects	Non-porous materials only
Magnetic Particle	MT	Surface + near-surface cracks	Ferromagnetic material only
Radiographic	RT	Volumetric — porosity, slag, fusion	Radiation hazard — exclusion zone
Ultrasonic	UT	Volumetric — planar cracks, laminations	Skilled operator required
TOFD	TOFD	Precise depth sizing of planar defects	Level II specialist only
PAUT	PAUT	Full volumetric — real-time imaging	Setup complexity

4.2 RT REQUIREMENTS — ARAMCO

Requirement	QCI Verification
RT procedure approved by Aramco	Verify procedure reference and stamp
Film type per ASME V Article 2	Check film type against approved procedure
IQI sensitivity 2% — source side	Verify IQI placement before exposure
Densitometer calibrated — current certificate	Verify before use
RT Work Permit — exclusion zone confirmed	Verify permit issued, barriers in place
Level II technician for interpretation	Verify PCN or ASNT Level II certificate

> **RT interpretation requires minimum Level II. Level I assists under supervision — cannot interpret independently.**

PART 5 — PWHT & PREHEAT

5.1 CARBON EQUIVALENT — PREHEAT

> ***EXAM: CE calculation and preheat appear in every Aramco welding exam. Master the formula.***

CE (IIW Full): CE = C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15

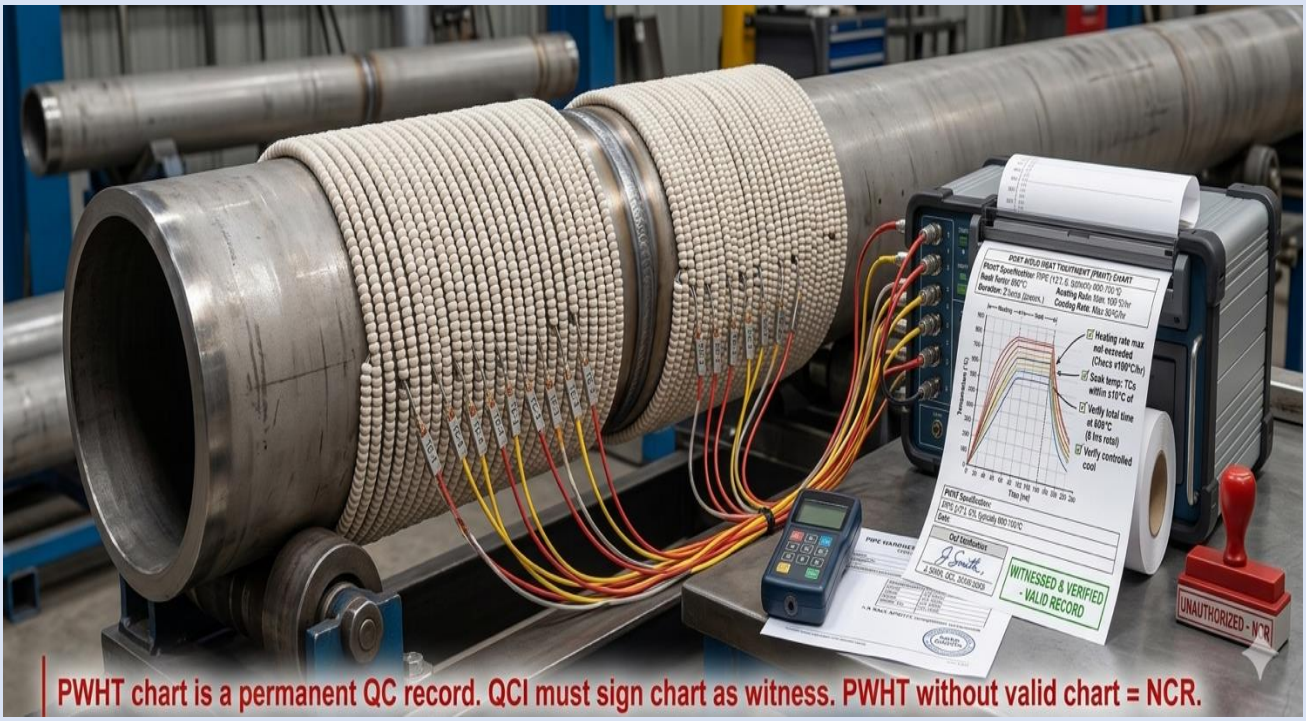
CE (AWS D1.1 Simplified): CE = C + Mn/6

CE Value	Weldability	Preheat Required
< 0.35	Excellent	None normally required
0.35 – 0.41	Good	50–100°C — check WPS
0.41 – 0.45	Fair	100–150°C mandatory
> 0.45	Poor	150–250°C — strict hydrogen control

Example: C=0.20, Mn=1.2 → CE = 0.20 + 1.2/6 = 0.40 → Fair — preheat likely required per WPS.

5.2 PWHT INSPECTION REQUIREMENTS

PWHT Parameter	Requirement	QCI Verification
Heating rate	Max 50–150°C/hour per material	Verify thermocouple chart — rate not exceeded
Soak temperature	Per WPS — typically 600–700°C CS	All thermocouples within ±15°C of each other
Soak duration	Typically 1 hour per 25mm thickness	Verify total time at temperature on chart
Cooling rate	Max 50°C/hour to 300°C then free	Verify controlled cool on chart
Hardness after PWHT	Max 22 HRC sour service (NACE MR0175)	Verify hardness results — weld, HAZ, base



PART 6 — STANDARDS, FORMULAS & KEY RULES

6.1 KEY WELDING FORMULAS

> ***EXAM: All formulas below have appeared in Aramco welding QCI examinations.***

Formula	Expression	Example
CE (Simplified)	C + Mn/6	C=0.18, Mn=0.9 → 0.18+0.15=0.33 → Good
Fillet throat	Leg × 0.707	Leg=10mm → 7.07mm throat
Heat input (J/mm)	(A × V × 60) / Travel speed (mm/min)	200A×25V×60/300=1000 J/mm
NDE quantity	Total × (NDE%/100)	200 welds × 10% = 20 welds
Repair rate (%)	(Repaired/Total) × 100	20/200×100 = 10% → review triggered
Acceptance rate (%)	(Accepted/Total) × 100	185/200×100 = 92.5% — below 97% hold

6.2 STANDARDS REFERENCE

Standard	Coverage
ASME IX	WPS, PQR, WQT — welding and brazing qualifications
AWS D1.1	Structural welding — visual criteria, weld profiles, NDT requirements
AWS D1.5	Bridge welding — higher toughness CVN requirements
ASME B31.3	Process piping — welding, NDE, pressure testing
API 1104	Pipeline welding and related facilities
SAES-W-011	Aramco supplementary welding requirements — on-plot
NACE MR0175	Sour service — 22 HRC maximum HAZ hardness
ASME V	NDE methods — RT, UT, PT, MT procedures

Critical Points to Avoid NCR in Welding QC

PART 6A — CRITICAL POINTS: WHAT TO NEVER IGNORE TO AVOID NCR
An NCR — Non-Conformance Report — is raised when work does not meet the specified requirements. Every NCR costs time, money, and damages the contractor's quality record with Aramco. Most NCRs in welding are not caused by poor welding skill. They are caused by poor inspection discipline — things the QCI failed to check before or during the work.
The following points are the most common causes of welding NCRs on Aramco projects. Never ignore any of them.

1. WELDING WITHOUT AN APPROVED WPS AT THE STATION The WPS must be physically present at the welding station — not in the QC office, not on the supervisor's desk. It must carry the Aramco approval stamp. If the WPS is not at the station, stop work. This alone is an NCR.

2. ALLOWING AN UNQUALIFIED OR EXPIRED WELDER TO WELD Check the WQR card before the first arc is struck. If the welder's qualification is expired, does not cover the process, position, or material — stop immediately. Any weld made by an unqualified welder is an automatic NCR and may require full removal and re-weld.

3. SKIPPING PRE-WELD PREHEAT VERIFICATION If the WPS requires preheat and the QCI does not verify it with a calibrated temperature measurement device before welding starts, and a non-conformance is found later, the QCI cannot prove compliance. Always measure preheat with a contact thermometer or temperature-indicating crayon and record it. Do not rely on the welder's word.

4. USING WRONG OR UNAPPROVED FILLER METAL Filler metal must match the WPS exactly in type, grade, and classification. Check the electrode or wire packet against the WPS every time a new batch is opened. Verify the heat number is recorded on the weld traceability record. Using a filler metal that looks similar but has a different classification is an NCR.

5. FAILING TO CHECK FIT-UP BEFORE WELDING Root gap, bevel angle, high-low misalignment — all must be within WPS tolerances before the root pass starts. Once the root is welded, you cannot correct fit-up. If fit-up was wrong and the weld is made, the entire joint may require cut-out. Always check fit-up and record it.

6. NOT CONTROLLING INTERPASS TEMPERATURE The WPS specifies a maximum interpass temperature. If the welder continues welding without allowing the joint to cool to within that limit, the weld properties are compromised. Use a contact thermometer between passes. Do not assume it is acceptable because it looks cool. Exceeding interpass temperature is an NCR.
7. ACCEPTING A WELD WITH A CRACK No crack anywhere in any weld is acceptable under any standard — AWS D1.1, ASME IX, ASME B31.3, or SAES-W-011. If a crack is found, stop work on that weld immediately, raise an NCR,

and arrange for the weld to be removed and re-welded. A QCI who accepts a cracked weld or attempts repair without raising an NCR is committing a serious professional violation.

8. SIGNING A TEST RECORD FOR WORK YOU DID NOT WITNESS Never sign an inspection record, IR test record, radiograph review, or PWHT chart for work you did not personally witness. If you were not present, you cannot certify it. This is falsification of QC records and is a dismissal offence on all Aramco projects.

9. MISSING A HOLD POINT Aramco ITPs define Hold Points — inspections where Aramco inspector must be physically present before the work proceeds. If you proceed past a Hold Point without the Aramco inspector's signature, all work done after that point is non-conforming. Check the ITP before every major activity.

10. NO WELDER STAMP ON THE WELD Every completed weld must be stamped with the welder's ID stamp for traceability. If a weld is found without a stamp, it cannot be traced to a qualified welder and will be NCR raised. After each weld is completed, confirm the welder has stamped it before moving to the next joint.

11. WRONG ELECTRODE STORAGE Low hydrogen electrodes — E7016, E7018 and all similar — must be stored in a certified oven at 120–150°C after opening the sealed packet. Electrodes left on the ground, in open air, or in a bucket are absorbing moisture. Welding with wet electrodes causes hydrogen-induced cracking. This is one of the most common and most damaging NCR causes. Check the electrode oven and confirm temperature every day.

12. SKIPPING NDT BEFORE PWHT If PWHT is required, all NDT — RT, UT, MT as specified in the ITP — must be completed and accepted before PWHT begins. Running PWHT on a weld that has not been NDT-accepted creates a non-conformance because rejectable defects may be present that heat treatment cannot fix and may make worse. Confirm NDT sign-off before PWHT starts.

HOW TO CLOSE AN NCR

An NCR is not closed by the contractor alone. It is closed only when the root cause has been identified, the corrective action has been completed, and the accepting

authority — in most cases the Aramco QC representative or TPI — has physically verified the closure and signed off.

These are the steps to close an NCR correctly:
STEP 1 — STOP THE NONCONFORMING WORK As soon as the nonconformance is identified, stop the specific work activity that is nonconforming. Mark or tag the nonconforming item with a RED tag — Do Not Use, Hold, or NCR Raised — depending on the project system. Do not allow work to continue on that item until the NCR is resolved.

STEP 2 — RAISE THE NCR DOCUMENT Complete the NCR form with the following information: NCR number — from the project NCR register Date and time of discovery Location — spool number, weld number, line number, area Description of the nonconformance — what was found, what standard it violates, exact reference Name of person who identified it Reference document — WPS number, ITP reference, standard clause
On Aramco projects, the NCR is raised in the project quality management system. The NCR is formally issued to the contractor and a response deadline is set — typically 7 calendar days for initial response.

STEP 3 — IDENTIFY ROOT CAUSE The contractor must investigate and document the root cause. Not the symptom — the actual reason it happened. Common root cause categories in welding NCRs: Lack of inspection — QCI did not check before work started Welder error — deviation from WPS Supervision failure — supervisor allowed work without QC clearance Material control failure — wrong material issued Training gap — personnel not trained on procedure
Root cause must be honest and documented. A shallow root cause like "welder mistake" without explanation is not accepted on Aramco projects.

STEP 4 — DEFINE CORRECTIVE ACTION The corrective action must address the actual nonconformance and the root cause. There are two parts: Immediate corrective action — what is done to fix the nonconforming item now. Example: defective weld cut out and re-welded, tested and accepted. Preventive corrective action — what is done to prevent recurrence. Example: toolbox talk delivered, QCI pre-weld checklist updated, daily electrode oven temperature log introduced.
Both parts must be documented.

STEP 5 — IMPLEMENT AND RECORD EVIDENCE Carry out the corrective action and gather objective evidence. Evidence examples: Repair weld NDT report — accepted Revised checklist — signed and dated Training attendance record — signed by all attendees Oven temperature log — showing compliance from date of NCR onwards New inspection record — showing the repaired item has been re-inspected and accepted
Without objective evidence, the NCR cannot be closed. Written statements alone are not sufficient.

STEP 6 — SUBMIT FOR VERIFICATION Submit the completed NCR response — root cause, corrective action, preventive action, and all objective evidence — to the Aramco QC representative or TPI for review.

The Aramco QC representative will review the submission and may physically inspect the repaired item or corrected condition before accepting.

STEP 7 — FORMAL CLOSURE Once the Aramco QC representative or TPI is satisfied that the corrective action is complete, effective, and verified, they sign the NCR closed. The NCR status is updated to Closed in the project quality register. The NCR document is filed permanently in the project quality records.
IMPORTANT: An NCR that is not closed before mechanical completion will prevent the project from achieving final acceptance. Always track open NCRs and push for closure well before the project end date.

FIRST TWO HOURS ON DUTY: WELDING QCI MORNING DISCIPLINE
When a Welding QCI arrives on site at 7:00 AM, the first two hours are the most critical of the entire working day. What is done — and what is missed — in these two hours determines whether the shift runs clean or produces NCRs. This is not optional activity. This is core professional duty.

7:00 AM — SIGN IN AND COLLECT YOUR DOCUMENTS
Sign the site attendance register. Collect your QC daily log book, your copy of the active ITP, the weld log for your area, and the NCR register. If you do not have these, you cannot do your job. Do not proceed without them.

7:05 AM — REVIEW PREVIOUS SHIFT HANDOVER
Check the handover notes or talk directly with the outgoing QCI or supervisor. Find out: What welds were completed in the previous shift What is still in progress Any NCRs raised — open or pending Any materials placed on hold Any failed inspections pending re-test Any items approaching a Hold Point today
If there is no formal handover, write a note in your log that handover information was not available and why.

7:15 AM — CHECK THE WELD LOG AND PLAN YOUR DAY
Open the weld log for your area. Identify: Which joints are planned for welding today Which joints are approaching RT, PWHT, or NDT Hold Points today Which welds completed yesterday need VT or final inspection Prioritise Hold Points first — if Aramco inspector is required and has not been notified, notify immediately.

7:25 AM — VERIFY WELDER QUALIFICATIONS FOR TODAY'S WORK
Before any welder picks up an electrode, check every WQR card for the welders assigned to your area today. Confirm: Name and ID match Process matches WPS Position qualified matches joint requirement Not expired Aramco acceptance stamp present
If any welder fails this check, report to the welding supervisor immediately and do not allow that welder to start.

7:35 AM — CHECK WPS AT EVERY ACTIVE WELDING STATION

Walk every active welding station. At each station confirm: The correct approved WPS is physically present — Aramco stamped The WPS revision is current — not superseded The welder can identify which WPS he is working to
If a station has no WPS, or the wrong WPS, stop work at that station and do not allow welding to start until the correct WPS is in place.

7:45 AM — INSPECT ELECTRODE OVEN AND FILLER METAL CONTROL
Go to the electrode storage area and the portable oven at the work face. Check: Oven is switched on and temperature is within required range — typically 120–150°C for low hydrogen electrodes Temperature chart or log is being maintained Electrodes in the oven are correct grade and match the WPS filler requirement No opened electrodes or wire spools are left unprotected from weather or moisture overnight Record the oven temperature in your daily log
This check alone prevents one of the most frequent causes of NCR on Aramco welding projects.

8:00 AM — CONDUCT PRE-WELD INSPECTION FOR FIRST JOINTS OF THE DAY
Before the first welds of the day start, physically inspect each joint that is ready to weld. Check: Fit-up — root gap, bevel angle, high-low within WPS tolerance Joint cleanliness — 25mm from bevel — bright metal, no oil, moisture, or mill scale Preheat — measure and record with contact thermometer or temperature crayon — confirm minimum temperature per WPS Material traceability — heat number of pipe or plate traceable to MTC on file
Record all findings in your pre-weld inspection log. Do not start any weld that fails pre-weld inspection. Tag the joint and inform the supervisor of what needs to be corrected.

8:30 AM — WITNESS FIRST ROOT PASSES
Be present at the weld station when root passes begin for the first joints of the day. Watch and confirm: Welder is using correct electrode or wire Amperage and voltage are within WPS range — check with clamp meter if needed Interpass temperature is being monitored No arc strikes outside the joint Welder is stamping each joint after completion
You are not supervising the welder. You are verifying that the procedure is being followed.

8:50 AM — UPDATE YOUR LOG AND CONFIRM HOLD POINT NOTIFICATIONS
Before 9:00 AM, update your QC daily log with everything you have checked, found, corrected, or escalated in the first two hours. Confirm that all Hold Point notifications for today have been submitted to Aramco QC or TPI with enough notice for them to attend. On Aramco projects, Hold Point notification is typically required 24 hours in advance. If a Hold Point is today and was not notified yesterday, escalate immediately to the QC manager.

THE RULE FOR THESE TWO HOURS:

A problem found at 7:30 AM before welding starts takes 30 minutes to correct. The same problem found at 4:00 PM after 200 welding meters have been completed takes 3 weeks and three NCRs to resolve.
The first two hours protect the entire day.

PART 7 — EXAM QUESTION BANK — 200 QUESTIONS

Total: 200 questions | 3 options A/B/C | Passing score 180+/200

> **Answer all 200 questions BEFORE checking the answer key on the last page.**

SECTION 1 (Q1–25)				
1	SMAW shielding is provided by?	A Inert gas cylinder	B Flux coating on electrode — produces shielding gas and slag	C Granular flux
2	GTAW uses what electrode type?	A Consumable coated rod	B Non-consumable tungsten — filler added separately	C Flux-cored wire
3	6G position qualifies welder for?	A Horizontal pipe only	B ALL positions — most comprehensive pipe qualification	C Fixed horizontal only
4	1G welding position is?	A Vertical — weld axis up	B Flat — weld axis horizontal, face up	C Horizontal fillet
5	WPS stands for?	A Weld Performance Standard	B Welding Procedure Specification	C Work Preparation Schedule
6	Essential variable change in WPS requires?	A Document revision only	B New PQR — re-qualification of procedure	C Supervisor approval only
7	Changing base metal P-Number is?	A Non-essential variable	B Essential variable — new PQR required	C Supplementary essential
8	WQT stands for?	A Welding Quality Test	B Welder Qualification Test — individual welder certification	C Weld Quality Trace
9	Welder qualification expires unused for?	A 3 months	B 6 months — ASME IX QW-322 — re-test required after expiry	C 12 months
10	Undercut maximum depth AWS D1.1?	A 1.6mm	B 0.8mm (1/32 inch) maximum depth at weld toe	C No limit
11	Any crack in weld is?	A Acceptable if small	B NEVER acceptable — any crack — stop work, NCR, remove and re-weld	C Acceptable with concession
12	Overlap in weld is?	A Acceptable	B Never acceptable — weld metal over toe without fusion	C Acceptable if thin
13	Arc strike on base metal must be?	A Left as-is	B Ground out — area tested by MT — NCR required	C Covered by next pass
14	Porosity max diameter AWS D1.1?	A 25mm	B 10mm maximum — frequency limits also apply per Table 6.1	C 5mm
15	VT (visual testing) is performed?	A After all NDT complete	B First — before any other NDT — always	C Only when specified
16	RT requires what exclusion zone?	A No zone required	B Radiation hazard — minimum 30 metres typically — per RT permit	C 1 metre only
17	RT film density per ASME V must be?	A 1.0 to 2.0	B 2.0 to 4.0 — below 2.0 too light — above 4.0 too dark	C 0.5 to 1.5
18	MT can only be used on?	A All metals	B Ferromagnetic materials — carbon and low alloy steel	C Austenitic stainless only

19	PT detects?	A Subsurface defects	B Surface-breaking defects only — cracks, porosity open to surface	C Volumetric defects
20	CE formula simplified (AWS D1.1)?	A CE = C × Mn	B CE = C + Mn/6	C CE = C + Si/4
21	CE = 0.22. Weldability is?	A Poor — high preheat	B Excellent — preheat generally not required	C Fair — some preheat
22	CE above 0.45 requires?	A No preheat	B 150–250°C preheat — strict hydrogen control — per WPS	C 50°C preheat only
23	PWHT purpose?	A Prevent porosity	B Relieve residual stresses — reduce hydrogen cracking risk — meet hardness requirements	C Improve weld colour
24	Hardness limit sour service (NACE MR0175)?	A 35 HRC max	B 22 HRC maximum (approximately 248 HV)	C No hardness limit
25	Fillet weld throat formula?	A Throat = Leg × 1.414	B Throat = Leg × 0.707 (sin 45°)	C Throat = Leg / 2
SECTION 2 (Q26–50)				
26	Heat input formula units?	A Amps × Volts only	B (A × V × 60) / travel speed mm/min — result in J/mm	C Travel speed only
27	200 welds, 10% RT — how many welds?	A 10	B 20 — 200 × (10/100)	C 2
28	RT sample selection must be by?	A The welder	B QC Inspector or TPI — random — NOT by the welder	C Project manager
29	Repair rate above 5% triggers?	A No action	B Procedural review and additional welder testing	C Project shutdown
30	ASME IX governs?	A Vessel design	B Welding and Brazing Qualifications — WPS, PQR, WQT	C Piping inspection
31	AWS D1.1 governs?	A Pipeline welding	B Structural Welding — Steel — visual criteria, NDT, welder qualification	C Pressure vessel welding
32	SAES-W-011 governs?	A Coating inspection	B Aramco welding requirements — on-plot piping and equipment	C Lifting operations
33	Aramco minimum weld acceptance rate?	A 90%	B Minimum 97% — below triggers quality hold	C 85%
34	Weld repair maximum attempts before cut-out?	A No limit	B Typically two — third failure requires weld cut-out and re-weld	C One only
35	Purpose of welder stamp on each weld?	A Decoration	B Traceability — identify which welder made each weld — links to WQR	C Heat number mark
36	PQR tensile test acceptance?	A 80% of base metal UTS	B Equal to or above minimum specified tensile strength of base metal	C Any positive result
37	PQR bend test failure criterion?	A Any bend angle change	B Any crack > 3mm on convex surface after bending	C Surface irregularity
38	C=0.18, Mn=0.9. CE simplified?	A CE = 0.18	B CE = 0.33 — 0.18 + 0.9/6 = 0.33	C CE = 0.45
39	Fillet leg 12mm. Throat?	A 12mm	B 8.49mm — 12 × 0.707	C 6mm
40	PWHT chart must be?	A Optional	B Mandatory permanent QC record	C Filed by foreman

			— signed by QCI as witness	
41	Stainless root pass — back purge with?	A CO2	B Argon — prevent root oxidation (sugaring)	C No purge needed
42	Incomplete fusion in weld is?	A Acceptable if small	B Never acceptable — lack of bond — NCR required	C Acceptable with concession
43	Filler wire wrong grade found. QCI must?	A Use — close enough	B Stop — quarantine all wire — raise NCR — identify all welds made with wrong filler	C Return and continue
44	Welder not qualified for position. QCI must?	A Allow if skilled	B Stop — NCR — arrange re-qualification or use qualified welder	C Reduce position requirement
45	PWHT not done but required. QCI must?	A Accept if weld looks good	B Stop — NCR — PWHT must be completed per WPS before any further work	C Do PWHT later
46	Hold Point — Aramco inspector unavailable. Test proceed?	A Yes — waiting too long	B No — Hold Point requires Aramco inspector physically present and signed off	C Yes if QCI witnesses
47	Crack found during MT. QCI must?	A Monitor for growth	B Stop — NCR — weld must be removed and re-welded — no repair of cracks	C Grind and blend
48	Supervisor asks QCI to sign uninspected work. Must?	A Sign — supervisor authority	B Refuse — falsification of QC records — gross misconduct	C Sign with note
49	Wrong process used (SMAW not GTAW per WPS). Must?	A Accept if RT passes	B Stop — NCR — wrong process is essential variable violation — weld may need removal	C Continue with correct process
50	In exam — if any essential welding variable violated. Answer is always?	A Accept if weld looks good	B Stop work — raise NCR — essential variable violation — WPS re-qualification or weld removal	C Continue with note

ANSWER KEY

> **STOP — Do not look until all 200 questions answered.**

Q1–20	Ans	Q21–40	Ans	Q41–60	Ans	Q61–80	Ans	Q81–100	Ans
1	**B**	21	**B**	41	**B**				
2	**B**	22	**B**	42	**B**				
3	**B**	23	**B**	43	**B**				
4	**B**	24	**B**	44	**B**				
5	**B**	25	**B**	45	**B**				
6	**B**	26	**B**	46	**B**				
7	**B**	27	**B**	47	**B**				
8	**B**	28	**B**	48	**B**				
9	**B**	29	**B**	49	**B**				
10	**B**	30	**B**	50	**B**				
11	**B**	31	**B**						
12	**B**	32	**B**						
13	**B**	33	**B**						
14	**B**	34	**B**						
15	**B**	35	**B**						
16	**B**	36	**B**						
17	**B**	37	**B**						
18	**B**	38	**B**						
19	**B**	39	**B**						
20	**B**	40	**B**						

Your Score	Result	Action
48–50	Excellent	Ready for Aramco exam. Review any weak areas.
36–43	Good	Review weak sections before sitting real exam.
25–30	Needs Work	Re-study sections below 70% before reattempting.
Below 25	Not Ready	Complete full re-study of all parts.

ABBREVIATIONS — COMPLETE WELDING QC REFERENCE

WELDING PROCESSES

SMAW — Shielded Metal Arc Welding
GTAW — Gas Tungsten Arc Welding
GMAW — Gas Metal Arc Welding
FCAW — Flux Cored Arc Welding
SAW — Submerged Arc Welding
TIG — Tungsten Inert Gas Welding
MIG — Metal Inert Gas Welding
MAG — Metal Active Gas Welding
OAW — Oxy-Acetylene Welding
PAW — Plasma Arc Welding
EBW — Electron Beam Welding
LBW — Laser Beam Welding
ESW — Electroslag Welding
EGW — Electrogas Welding

WELDING PROCEDURE AND QUALIFICATION DOCUMENTS

WPS — Welding Procedure Specification
PQR — Procedure Qualification Record p
WPS — Preliminary Welding Procedure Specification
WQT — Welder Qualification Test
WQR — Welder Qualification Record
CWI — Certified Welding Inspector
CSWIP — Certification Scheme for Welding Inspection Personnel
IWE — International Welding Engineer
IWT — International Welding Technologist
IWI — International Welding Inspector
AWS — American Welding Society
ASME — American Society of Mechanical Engineers
PCN — Personnel Certification in Non-Destructive Testing
ASNT — American Society for Nondestructive Testing

STANDARDS AND CODES

ASME IX — ASME Boiler and Pressure Vessel Code Section IX — Welding and Brazing Qualifications
ASME V — ASME Boiler and Pressure Vessel Code Section V — Nondestructive Examination
ASME VIII — ASME Boiler and Pressure Vessel Code Section VIII — Pressure Vessels
ASME B31.3 — Process Piping Code
ASME B31.1 — Power Piping Code
AWS D1.1 — Structural Welding Code — Steel
AWS D1.5 — Bridge Welding Code
API 1104 — Welding of Pipelines and Related Facilities
API 650 — Welded Tanks for Oil Storage
SAES-W-011 — Saudi Aramco Engineering Standard — Welding Requirements for On-Plot Piping

NACE MR0175 — Sulphide Stress Cracking Resistant Materials for Oilfield Equipment
ISO 9001 — Quality Management Systems ISO 3834 — Quality Requirements for Fusion Welding of Metallic Materials

NDT METHODS

VT — Visual Testing
PT — Liquid Penetrant Testing
MT — Magnetic Particle Testing
RT — Radiographic Testing
UT — Ultrasonic Testing
PAUT — Phased Array Ultrasonic Testing
TOFD — Time of Flight Diffraction
AUT — Automated Ultrasonic Testing
ET — Eddy Current Testing
LT — Leak Testing
HT — Hardness Testing

WELDING TERMS AND METALLURGY

HAZ — Heat Affected Zone
PWHT — Post Weld Heat Treatment
CE — Carbon Equivalent
CJP — Complete Joint Penetration
PJP — Partial Joint Penetration
CVN — Charpy V-Notch Impact Test
UTS — Ultimate Tensile Strength
YS — Yield Strength
HRC — Hardness Rockwell C Scale
HV — Hardness Vickers
HB — Hardness Brinell
OD — Outside Diameter
ID — Inside Diameter
WT — Wall Thickness
THK — Thickness
SS — Stainless Steel
CS — Carbon Steel
LTCS — Low Temperature Carbon Steel
CRA — Corrosion Resistant Alloy
P91 — Grade 91 Chromium-Molybdenum Alloy Steel

MATERIALS AND CONSUMABLES

MTC — Material Test Certificate
MTR — Material Test Report
PMI — Positive Material Identification
COC — Certificate of Conformance
TDC — Traceability Document Control
MSDS — Material Safety Data Sheet
SDS — Safety Data Sheet
LOT — Lot Number (filler metal batch identification)

HN — Heat Number

QUALITY AND PROJECT DOCUMENTS

QCI — Quality Control Inspector

QC — Quality Control

QA — Quality Assurance

QMS — Quality Management System

ITP — Inspection and Test Plan

HP — Hold Point

WP — Witness Point

RV — Review Point

NCR — Non-Conformance Report

CAR — Corrective Action Report

MRB — Material Review Board

RFI — Request for Inspection

RFT — Request for Testing

TPI — Third Party Inspector / Third Party Inspection

MDR — Material Deficiency Report

IR — Insulation Resistance (also used for Inspection Record in some project systems)

FAT — Factory Acceptance Test

SAT — Site Acceptance Test

CL — Checklist SCE — Safety Critical Element

DRAWINGS AND ENGINEERING

P&ID — Piping and Instrumentation Diagram

ISO — Isometric Drawing

GA — General Arrangement Drawing

WD — Weld Detail Drawing

BOM — Bill of Materials

BOQ — Bill of Quantities

DWG — Drawing

REV — Revision

RFI — Request for Information

MOC — Management of Change

MWO — Maintenance Work Order

PWO — Project Work Order

WO — Work Order SO — Sales Order

HEAT TREATMENT AND TEMPERATURE

HT — Heat Treatment

PHT — Pre-Heat Treatment

PWHT — Post Weld Heat Treatment

IT — Interpass Temperature

MIN — Minimum

MAX — Maximum °C — Degrees Celsius °F — Degrees Fahrenheit HH:MM — Hours and Minutes format used on PWHT charts

PROJECT AND SITE TERMS

QCM — Quality Control Manager

QAM — Quality Assurance Manager

PM — Project Manager

SM — Site Manager

WS — Welding Supervisor

FW — Field Weld

SW — Shop Weld

SP — Spool (prefabricated piping assembly)

CU — Cut (field cut)

TW — Tie-in Weld

NDE — Nondestructive Examination (same as

NDT — used interchangeably in many Aramco documents)