SARA SAE PRIVATE LIMITED

Management System Document Control Cover Sheet

Document Title	Ref. No.	Revision No.
Procedure for Ultrasonic Testing for forgings, bar stock, wrought products and mill shapes	**SES 26-761**	**2**

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Sara Sae

CONTENTS:

Sara Sae

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ULTRASONIC TESTING PROCEDURE FOR FORGINGS,BAR STOCK WROUGH PRODUCTS AND MILL SHAPES

1.0 SCOPE

1.1 The contents and direction of this procedure shall be followed whenever ultrasonic examinations are performed on products produced by Sara Sae ,Pvt. Ltd., India.

1.2 This procedure establishes the methods, personnel requirements and acceptance criteria for performing ultrasonic examinations of forgings, wrought products, mill shapes and bar stocks of steel and Inconel materials.

1.3 The ultrasonic examinations shall be performed on raw materials (forgings, wrought products, bar stock and mill shapes)in accordance with API 6A / 17D.For API6A product specifications level refer to determine quality level (PSL 1 to PSL 4) in order to determine the appropriate scope of examination.

1.4 For API 6A will reference ASTM A388 and mandates the flat bottom hole technique; the back reflection technique shall not be employed on production components.

1.5 This Inspection method meets the requirements of ASTM-A-388,ASME SECTION V-Article 5 and API 6A / 17D

2.0 PERSONNEL

2.1 NDT personnel will be qualified and certified in accordance with a SARA written practice that satisfies ASNT recommended practice SNT-TC-1A.

2.2 Level I personnel may participate in inspection activities in order to train as required prior to certifying as a NDT level II Inspector. They shall be under the direct physical supervision of NDT Level II or NDT Level III personnel at all times during inspection activities.

2.3 Personnel evaluation and interpreting indications, and reporting test results will satisfy the NDT Level II requirements as minimum.

2.4 The Ultrasonic Testing Personnel certified to Limited Ultrasonic Certification as per SARA written practice number SES-26-743 shall be involved only in conducting the straight beam technique scan plans by ensuring the part descriptions meet the Length /Diameter ratio as per FMC scan plan requirement.

2.5 All personnel performing examinations per this procedure shall have an annual vision examination that complies with the requirements of SNT-TC-1Aor ISO 9712 equivalent programs,i.e (PCN or EN 473 etc)

NDT Level III shall be responsible for:

2.6 Developing, qualifying, and approving procedures. Establishing and approving techniques, interpreting codes, standards, specifications and procedures.

2.7 Designating the particular NDT methods, techniques and procedures to be used.

2.8 The NDT operations for which qualified an assigned and should be capable of interpreting and evaluating results in terms of existing codes, standards and specifications.

2.9 Establishing techniques and to assist in establishing acceptance criteria when none are otherwise available.

2.10 Personnel utilized the Supplier (*NDT Level III, in the methods in which certified, should be capable of training and examining NDT Level I and II personnel for certification in the methods.)

3.0 REFERNCED DOCUMENTS

Document	Title
API Specification 6A	Specification for Well Head and Christmas Tree Equipment
API Specification 16A	Specification for Drill Through Equipment
API Specification 16C	Specification for Choke and kill system
API Spec 17D	Specification for Subsea Wellhead and Christmas Tree Equipment
ASTM A-388	Ultrasonic Inspection of Heavy Steel forgings
ASTM E 114	Standard Practice for Ultrasonic Pulse Echo straight Beam Examination by the contact method.
ASTM E317	Standard Practice for evaluating Performance Characteristics of ultra-sonic Pulse Echo Examination Instruments and Systems without the use of Electronic Measurement instruments.
ASTM E 428	Standard Practice for fabrication and control of steel reference blocks used in Ultrasonic testing
ASTM E2375	Standard Practice for Ultrasonic Testing of Wrought Products
ASTM -E587	Standard practice for ultra-sonic angle beam examination by the contact method.
ASME Sec-V Article 5	Ultrasonic Examination For Material
SNT-TC-1A	ASNT recommended practice for the qualification and certification for Non-destructive testing personnel
FMC Q02324 Rev. H	Ultrasonic Testing procedure for forgings, Barstock, wrought products, and mill shapes.
FMC Q00100	Edition / Revision levels of FMC Technologies Referenced Specifications
FMC Q02200	Non destructive Examination personnel Qualification and certification(written practice)
FMC Q02310	FMC Specification for Referencing Other Ultrasonic Testing Specifications and Procedures (Bridging Document)

4.0 GENERAL

The following information contains acceptable ultrasonic procedures for inspection of API equipment and shall be adhered to for such equipment.

4.1 As far as practical, subject the entire volume of each item to ultrasonic examinations in the required no of perpendicular directions. For Scan plans of typical shapes refer to applicable scan plan.

4.2 If, due to configuration, the item cannot be 100% volumetrically examined in the required no of perpendicular directions using the straight beam technique use angle beam examinations as necessary to effect 100% of maximum feasible coverage Equipment .When the configuration does not allow 100% volumetric examination, the report shall include a description of the area where UT is not performed.

5.0 ULTRASONIC EQUIPMENT

5.1 Instrument :-

5.1.1 A pulse – echo ultrasonic instrument capable of generating frequencies from 1 MHz to 10 MHz will be utilized for all examinations. The instrument will have a linear presentation (5%) for at least 75% of the screen height. Linearity will be verified per ASTM E 317.

5.1.2 Controls that affect instrument linearity will be in the OFF position during calibration check and examination.

5.1.3 Alarms will be clearly audible or visible to the examiner, when used.

5.1.4 Recordings equipment will produce a clear, unambiguous inspection record when used.

5.2 Search unit:-

5.2.1 Straight beam scanning will be performed with a search unit having a maximum active area of 1 sq.in(645.sq.m)with ¾ inch (19.05mm) minimum and 1-1/8 inch (28.6mm) maximum dimensions .The preferred search unit frequency is 2.25 to 5 MHz For austenitic materials of other coarse gained material, a lower frequency transducer may be used down to 1 MHz

5.2.2 A smaller sized search unit may be used to better investigate various geometrics to help pin point and evaluate indications necessary.

5.2.3 Angle beam scanning will normally be performed with a 1 inch (25.4 mm) X 1inch (25.4mm)or 1 inch (25.4 mm) × ½ inch (12.7mm) search unit. A 45 degree angle wedge will be used unless the OD/ID ratio or other geometric configuration causes a failure to calibrate. The preferred search unit frequency is 2.0MHz For austenitic materials or other coarse grain material, a lower frequency transducer may be used down to 1 MHz Other angle wedges may be used as required to facilitate inspection.

5.2.4 Search units will be used at their rated frequencies.

5.2.5 Variables such as production material grain structure, geometry and anticipated type/size of discontinuity to be detected may require the use of other frequencies to assure adequate penetration and better resolution

5.2.6 Certification is required on all search unit. Minimum Certification will include the search unit waveform, frequency spectrum, and effective beam dimensions at -3db from the center axis amplitude.

5.3 Couplant :-

5.3.1 Couplants with good wetting characteristics such as light weight oil, glycerin or equivalent will be used. The couplant used will not be harmful to the part being examined.

5.3.2 The couplant used for calibration will be the same couplant used during examinations.

5.4 Reference Blocks:-

5.4.1 The material to be used for reference blocks shall be similar in acoustic attenuation to the material which is to be examined. The grain size heat treat condition, physical and chemical composition, surface finish, and manufacturing procedures (rolling, forging and so forth) are variables to be considered in matching acoustic responses.

5.4.2 The block material will be ultrasonically examined and meet the requirements of ASTM -E428.

5.4.3 Each reference block will be serialized. Records will be retained to provide traceability to material; and inspection results.

5.4.4 Surface finish of the reference blocks shall be comparable to, but no better than the item to be examined.

5.4.5 Geometry of the reference blocks is not limited's to the requirements of ASTM E428.An actual item or other shape can be used provided that the blocks demonstrate the required accuracy.

5.4.6 Each reference block will be permanently marked with the type and size of reflector(s).reflectors in each block will meet the following requirements.

STRAIGHT BEAM EXAMINATION REFERENCE BLOCKS

- 1/16- inch (1.6mm) Flat Bottom Hole for thickness up to and including 1-1/2-inches(38mm)
- 1/8 –inch(3.2)Flat Bottom Hole for thickness greater than 1-1/2(38mm) up to and including 6-inches(152 mm)
- ¼-inch (6.35mm) Flat Bottom Hole for thickness greater than 6-inches 9152mm)

Angle Beam Examination Reference Blocks

- Rectangular or 60 degree vee notches with a depth equal to the lesser of ¼-inch (6.35mm) or 3% of the wall thickness (1/4- inch maximum),length of approximately 1-inch (25.4mm) and a width not greater than twice the depth 1/8-inch (3.2 mm) maximum. Notches must be oriented 90-degrees from the direction of examination.
- Rings or hollow forgings having an OD/ID ratio of less than 2:1 and an axial length greater than 2-inches (51mm) require ID and OD notches.
- Hollow forgings having an axial length greater than 6 times the wall thickness require ID and OD transverse notches.

5.4.7 Flat Bottom Hole Reference reflectors will meet the dimensional requirements specified in ASTM E428.

5.4.8 Blocks used for angle beam calibration on curved surfaces shall be of similar curvature and thickness as the area under examination. The similarity shall be sufficient to meet the transfer correction criteria in 8.0.

Alternate Flat – Bottom Hole Sizes:

If blocks with the specific flat – bottom hole sizes are not available, alternative sizes may be used provided the instrument gain is changed by a factor given by the ratio of the two relevant holes. For cases where only a larger size is available, the gain must be increased by the ratio $(d_r/d_a)^2$where d_r and d_a are respectively diameters of the reference and acceptable FBH. With Instrument having gain control calibrated in Db, the required change is given by 40 Log $(d_r/d_a)^2$dB. Table 1 can be used for extrapolation of gain between any standard hole sizes in the range of 1/64 through 8/64. Gain extrapolation shall be restricted to hole diameters having ratios no greater than 2:1, requiring gain changes no greater than 12 dB.

Acceptable Flat-Bottom Hole Diameter, 1/64 in. [mm]	Reference Flat-Bottom Hole Diameter, 1/64 in. [mm]							
	1 [0.4]	2 [0.8]	3 [1.2]	4 [1.6]	5 [2.0]	6 [2.4]	7 [2.8]	8 [3.2]
1 [0.4]	0 dB	+12 dB						
2 [0.8]	-12 dB	0 dB	+7 dB	+12 dB				
3 [1.2]		-7 dB	0 dB	+5 dB	+9 dB	+12 dB		
4 [1.6]		-12 dB	-5 dB	0 dB	+4 dB	+7 dB	+10 dB	+12 dB
5 [2.0]			-9 dB	-4 dB	0 dB	+3 dB	+6 dB	+8 dB
6 [2.4]			-12 dB	-7 dB	-3 dB	0 dB	+3 dB	+5 dB
7 [2.8]				-10 dB	-6 dB	-3 dB	0 dB	+2 dB
8 [3.2]				-12 dB	-8 dB	-5 dB	-2 dB	0 dB

Note 1—Blank areas contain absolute values of gain changes greater than ±12 dB and are not applicable, see 7.3.1.1.

Note 2—Reference FBH diameter refers to the size of the FBH in the reference blocks. Acceptance FBH diameter refers to the extrapolated FBH. Table entries are calculated as follows:

$$40 \log_{10}\left(\frac{\text{reference FBH diameter}}{\text{acceptance FBH diameter}}\right) = \text{dB}$$

Note 3— +dB = instrument gain increase; −dB = instrument gain decrease.

Note 4—If the dB control has a minimum incremental change of 2 dB and the extrapolation requires an uneven dB change, the dB control shall be adjusted for 1 dB more gain than required. For instance, in this case note the dB control in Note 5 would be increased by +10 dB instead of +9 dB.

Note 5—Explanation of Extrapolation: With a reference FBH of 5/64 in. [1.98 mm] and an acceptance FBH of 3/64 in. [1.191 mm], the difference is +9 dB. Since the acceptance FBH is smaller than the reference FBH, the gain must be increased by 9 dB from the reference FBH setting.

Note 6—This table assumes a linear relationship between the amplitude of the response of an instrument and the area of a flat-bottom hole target. This assumption is approximately valid only for certain material configurations and combinations of search units and instrument parameters.

Table 1: dB Gain Changes between FBH Sizes

For Forgings other than Ring Forgings :-

For examination surface diameter of 20-inches (508mm) and less, a single curved basic calibration block shall be used on surfaces in the range of curvature from 0.9 to1.5 times the basics calibration block diameter.

For examination surface diameters greater than 20-inches (508 mm),a block of essentially the same curvature or a flat block shall be used.

5.4.9 A convex block will be used for convex test surfaces, and a concave block will be used for concave test surfaces, as applicable.

5.5 API 6A Stem Material Reference Blocks

A 1/8 –inch (3.2 mm) Flat Bottom Hole for straight beam examination and a 1/16 inch(1.6 mm) side drilled hole for angle beam examinations. Holes should be drilled radially to a depth of 3/4 inch (19 mm) or 1/2t,whicheveris less.

5.6 Scanning and Overlap:

The manual scanning rate shall not exceed 6 inches (152mm) per second. To ensure 100% coverage of material volume index the search unit with at least a minimum of 15% overlap with each pass is required during scanning at all times of inspection.

6.0 MATERIAL CONDITION

6.1 Material shall be examined after heat treatment for mechanical properties (exclusive of stress relief treatments)and prior to machining operations that limit effective interpretation of the examination results.

6.1.1 Forgings that require machining prior to quench and temper will be examined after quench and temper only if the geometrical shape does not limit effective interpretation. Machined forgings that geometrically limit effective interpretation shall be ultrasonically examined while in the simplest shape and examined again after quench and temper

6.1.2 The surfaces of the forging to be examined shall be free of extraneous material such as loose scale, paint, and dirt and so forth.

6.1.3 The surface roughness of forged or cast material must allow proper coupling of search units, typically maximum between 250-350 RMS. The UT technician shall ascertain the surface roughness suitability and direct the need of surface grinding in spots wherever required. The surfaces shall be comparable to the Reference block used for calibration. Machined surfaces shall have a surface finish of 250 RMS or better.

7.0 CALIBRATION

7.1 Instrument calibration shall be as per latest edition of ASTM E 317.

7.2 Straight beam calibration

7.2.1 Reference block technique establishes minimum three point DAC curve.

7.2.2 Calibrate the screen range using the reference block. The screen range shall cover at least 2 material Thickness.

7.2.3 The db gain control shall be adjusted on the UT instrument so that the indication responding with the highest amplitude is set at 80% of full screen height (FSH). Appoint either manually or electronically made marking the amplitude height on the instrument screen. Without adjusting the gain control, a point shall be made for at least two other reflectors that are at different distances than the first. A line shall be drawn connecting each point establishing Distance amplitude correction curve. The DAC is primary reference level (PRL).

7.3 Angle beam Beam calibration –Ring and Hollow Forgings

7.4 Adjustment of the sweep line will be such that the full scale horizontal distance is equal to or greater than the area of interest.

7.4.1 Adjust the gain to obtain indication of 80% Full screen height from the id notch and mark the peak level on the screen.

7.4.2 At the same gain setting, obtain a reflection from the OD notch and mark the peak signal level on the screen.

7.4.3 Connect the ID and OD notches to provide the 100 % DAC curve. This is the primary reference level. The DAC may be manually or electronically drawn the screen which will be displayed. When OD notch cannot be detected when examining from the OD surface. Perform the examination, when practical, by examining from the OD utilizing the ID notch and examining from the ID utilizing from OD notch.

7.4.4 The calibration for circumferential scanning shall use axial (longitudinal) OD/ID notches. The calibration for axial (Longitudinal) scanning shall use ID/OD transverse notches.

7.5 A signal to noise ratio of 2:1 or greater is required during calibration.

7.6 Calibration verification is required prior to the evaluation of indications.

7.7 Stem material angle beam calibration is obtained by maximizing the indication amplitude at 80% of full screen height from the 1/16" side drill hole with the beam directed along the axis of calibration standard.

8.0 TRANSFER CORRECTION

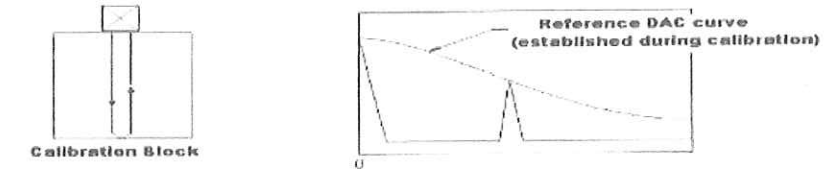
8.1 When required, transfer correction shall be used to correlate the amplitudes from the basic calibration block and the production material. Amplitude correction should be performed at the initial of the examination of similar group of materials and whenever significant changes in surface roughness, condition profile, or coating observed.

8.2 Straight beam

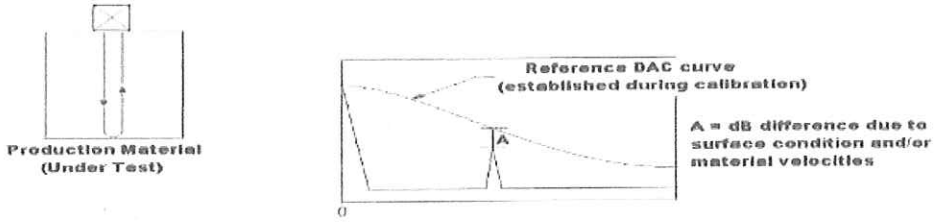
8.2.1 Transfers shall be accomplished by comparing the back wall response from the calibration block and the back wall response from the production material the amplitude of the of both calibration block and the production material shall be evaluated at DAC level. The difference in gain shall be recorded and used for correction for reference sensitivity.

8.2.2 Each type of material, size and wall thickness shall be considered separately in applying the transfer method. In addition at least two (2) areas on the production material under examination shall be checked

STRAIGHT BEAM TRANSFER CORRECTION



CONDITION A - CALIBRATION BLOCK



CONDITION B - PRODUCTION MATERIAL

8.3 Angle beam

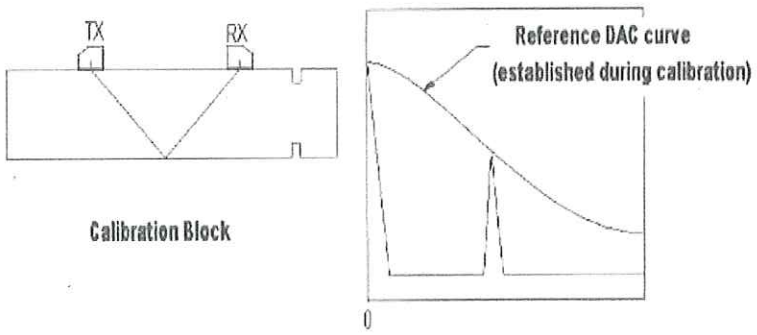
8.3.1 Transfers shall be accomplished by using the through transmission method and two identical angle probes. For any material thickness, at least full skip shall be used. The amplitude for the calibration block and production material responses shall be recorded and used for the correction of the reference sensitivity.

8.3.2 Each type of material and each size and wall thickness shall be considered separately in applying the transfer correction method. In addition two areas on the production material under the exam shall be checked as minimum.

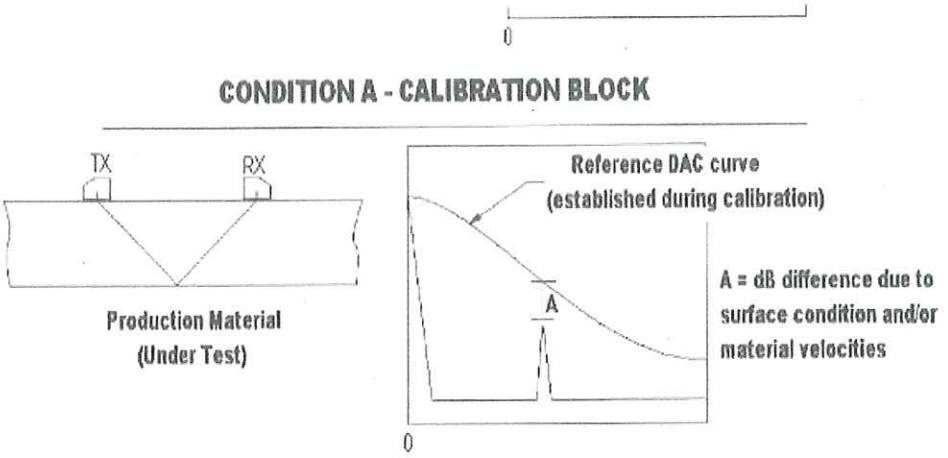
8.3.3 A separate transfer correction determination shall be made for each probe angle.

employed.

ANGLE BEAM TRANSFER CORRECTION



CONDITION A - CALIBRATION BLOCK



CONDITION A - CALIBRATION BLOCK

CONDITION B - PRODUCTION MATERIAL

8.4 Angle beam Transfer correction procedure.

8.4.1 The DAC curve shall be established as per the requirements of 7.4 for the angle beam probe used for the examination.

8.4.2 The calibration block used to establish DAC along with the two angle beam probes of the same type used to establish the DAC, on acting as the transmitter and second as receiver. The probes are directed at each other one skip distance and the signal adjusted to establish DAC.

8.4.3 Without altering the instrument sensitivity, a maximum reflection is obtained at one skip distance on the production material.

8.4.4 The change in gain (dB) required to adjust the amplitude of signal in condition B is to the reference DAC is the transfer correction.

8.5 Allowances shall be made for difference in attenuation or transfer loss between the parent material and the test block used to plot DAC curves.

8.5.1 Difference of less than 2 db no correction is required.

8.5.2 Differences greater than 2 db but less than 8 db shall be compensated for by adjusting the primary response to reflect the transfer correction.

8.5.3 Differences greater than 8 db shall require further analysis to determine the cause and corrective actions. NotifySARA SAE level III for further directions.

8.6 The maximum velocity differences between the calibration block and production material should be less than 2 %

9.0 RECALIBRATION.

9.1 Recalibration is required for significant changes in section thickness or diameter. Any change in the search unit, couplant, operator. Instrument settings (excluding the gain or attenuation controls), coaxial cables, temperature variations +(25F) or 14C or scanning speed used for calibration requires recalibration.

9.2 A complete recalibration is required at least every 4 hours.

9.3 Calibration verification is required after evaluation of indication to avoid misinterpretation of signals.

9.3.1 When a loss of 15 percentage or greater in the reference level is indicated, re-establish the calibration the required calibration and re-examine all the material examined since the preceding calibration check.

9.3.2 When an increase of 15 percent or greater in the reference level is indicated, revaluate all the recorded indications since the preceding calibration check.

9.3.3 Revaluation of all indication is required if the reference points have moved more than 10 percent of the original sweep reading or if the calibration check fails to show the required reference reflector.

10.0 EXAMINATION CRITERIA

Note: Scanning technique shall include at least two perpendicular direction.

10.1 Straight beam technique.

10.1.1 Increase the gain setting from the calibration setting +6 db and the manual scanning rate shall not exceed 152 mm per second.

10.1.2 Due to the effects of an existing - dead zone . if the thickness of the forging under examination is less than or equal to 1.75 inch (44.45mm), or if the measured dead zone is greater than 1/4 inch (6.35mm) , scanning shall be done with dual element transducer.

Note : take all necessary steps to achieve 100% coverage although where 100% coverage is not possible and accessibility is decreased due to only having one surface to scan surface scan from , regardless of the thickness, scanning shall be done with a dual element search unit to minimize the dead zone depth and increase the near surface sensitivity.

10.2 Angle beam technique.

10.2.1 Scan the hollow forging that have an axial length greater than 2 inches and ID/OD ratio of less than 2:1 over the entire surface area circumferentially in both the clockwise and counter clockwise directions with a 45 degree sound path. If the 45 degree sound path does not successfully detect OD and ID notches, you may use the formula in Note A to determine optimal angle for calibration.

10.2.2 Hollow forging which cannot be examined axially using the straight beam technique shall be scanned with the angle beam technique in both axial directions.

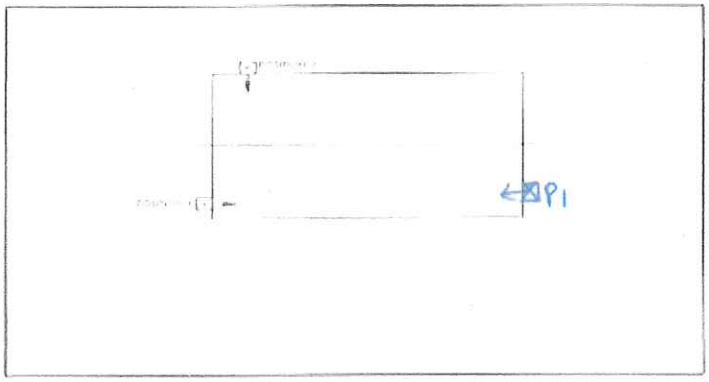
10.2.3 Stem materials having the length greater than 6 times the diameter will be examined with a beam directed along the axis in both the direction utilizing the angle beam technique.

10.2.4 Scanning shall be performed +6db over the referenced level. The manual scanning rate shall not exceed 6 inches per second.

10.3 SCAN PLANS FOR SPECIFIC SHAPES

Please refer the attachment 2 for scan plans.

FOR SOLID BARS



Probe 1
Straight Beam Examination both
Axial face direction

Probe 2
Straight Beam Examination both
Circumferential direction .

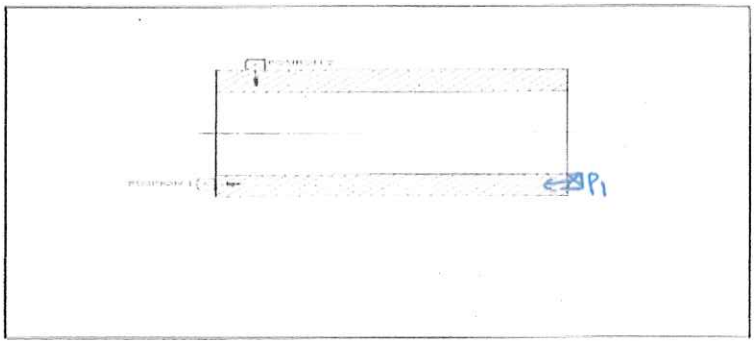
SCAN PLAN FOR STEM MATERIAL

Probe 1
Straight Beam Examination both
Axial face direction

Probe 2
Straight Beam Examination both
Circumferential direction .

Probe 3
Angle Beam Examination with beam directed along the axis in both Axial length wise direction (When the length is greater than six (6) times the diameter for stem material)

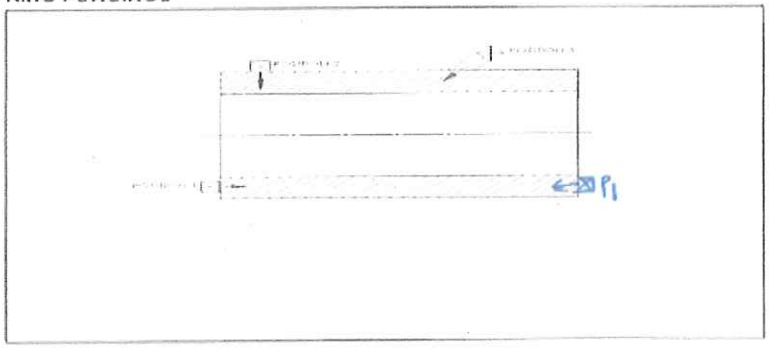
SCAN PLAN FOR HOLLOW RING FORGINGS



Probe 1
Straight Beam Examination both Axial face direction.

Probe 2
Straight Beam Examination both Circumferential direction.

SCAN PLAN FOR HOLLOW RING FORGINGS

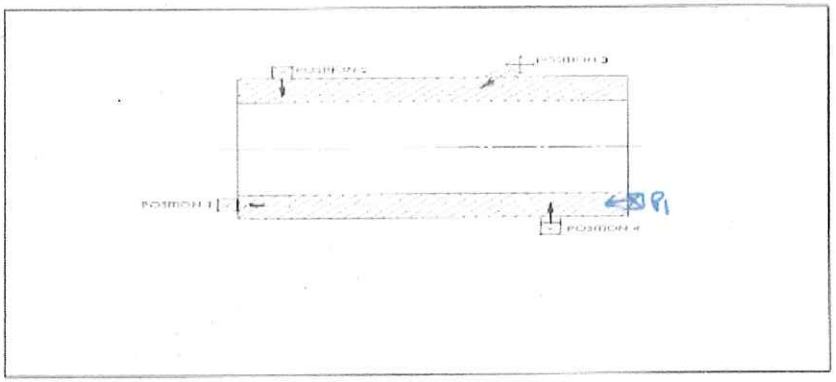


Probe 1
Straight Beam Examination both Axial face direction.

Probe 2
Straight Beam Examination both Circumferential direction.

Probe 3
Angle Beam Examination with beam directed along the axis in both Axial length wise direction. (when the length is greater than six (6) times the wall thickness).

SCAN PLAN FOR HOLLOW RING FORGINGS



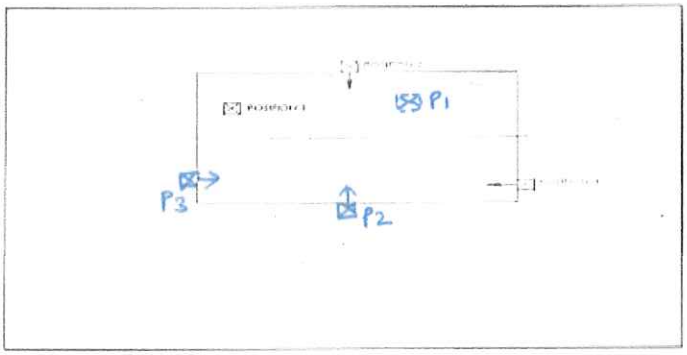
Probe 1
Straight Beam Examination both Axial face direction.

Probe 2
Straight Beam Examination both Circumferential direction.

Angle Beam Examination with beam directed along the axis in both Axial length wise direction. (when the length is greater than six (6) times the wall thickness).

Probe 4
Angle Beam Examination with beam directed along the Circumferential direction. (when OD/ID ratio is less than 2:1 and the length is greater than 2.0 inches)

SCAN PLAN FOR SQUARES AND RECTANGLES



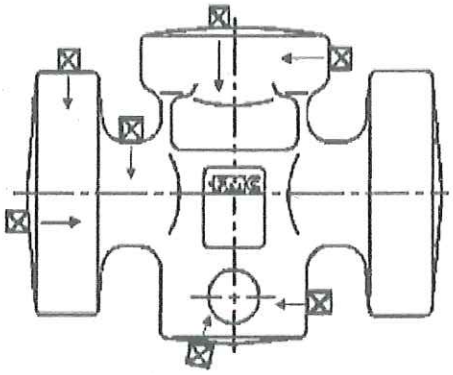
Probe 1
Straight Beam Examination on all Side faces direction.

Probe 2
Straight Beam Examination both Top face & Bottom face direction.

Probe 3
Straight Beam Examination both Axial face direction

SCAN PLAN FOR VALVE BODIES

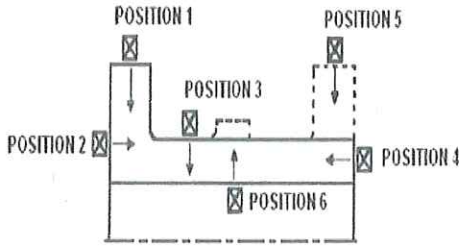
TYPICAL BOTH FLANGES



SCANNING POSITIONS: (All Straight Beam)

Technique 1: All Positions (accessible contact surfaces)

SCAN PLAN FOR HEADS AND SPOOLS



Note A:

To calculate the optimal angle for inspection of ID originating discontinuities, the following formula may be used:

r/R = Sin (of Angle)
Invert Sin (of Angle) = Optimal Inspection Angle
Where r = ID Radius and R = OD Radius.

11.0 GENERAL ACCEPTANCE CRITERIA FOR FORGINGS, BAR STOCKS & MILL SHAPES

11.1 Recordable indications.
Indication exceeding 50%of the reference amplitude line or the Distance Amplitude correction (DAC) CURVE FOR Forgings, bar stock and Mill shapes.
Single indication – Indications greater than 12.7 mm apart, in any direction.
Multiple indication – two or more recordable indications within 12.7 mm of each other in any direction.

11.2 Evaluation of Indication will be carried out with the gain attenuation setting at the calibration reference level.

11.3 The length of indications will be carried out by 6 DB drop Method.

11.4 Record the amplitudes of indication in increments of 1% location to the nearest 2.54 mm and length may be mapped by 6 db drop method.

11.5 Items with reject able indications will be removed in machining operations will be acceptable only if subsequent examination proves that all the rejectable indications have been completely removed.

12.0 SPECIFIC ACCEPTANCE CRITERIA FOR FORGINGS, BAR STOCKS & MILL SHAPES

12.1 No single indication exceeding the reference amplitude.

12.2 No multiple indications exceeding the 50% of the Reference Amplitude.

12.3 Additionally, For API 6A psl 4 material no continuous cluster of indications on the same plane regardless of amplitude shall be found over an area twice the diameter of the search unit.

13.0 Acceptance criteria as per API 16A

The following shall not be accepted:

a) any indication whose signal amplitude exceeds the reference level,

b) any linear indication interpreted as a crack, incomplete joint penetration or incomplete fusion,

c) any slag indication with amplitude exceeding the reference level whose length exceeds that specified in Table 25.

NOTE If a weld joins two members having different thicknesses at the weld, t is taken as the thinner of the two thicknesses.

Weld thickness t		Inclusion length	
mm	(in)	mm	(in)
< 19	$< 0,76$	6,4	0,25
$19 \leq t \leq 57$	$0,76 \leq t \leq 2,25$	$0,33\,t$	$0,33\,t$
> 57	$> 2,25$	19,0	0,75

14.0 POST CLEANING

14.1 Post cleaning should be conducted as soon as possible after the evaluation and Documentation.

14.2 Post cleaning shall be done in order to ensure that all the traces of oil or couplant or any other condition that adversely affect the part shall be immediately removed after evaluation and documentation.

15.0 REPORT REQUIREMENTS

15.1 An ultrasonic examination report is required and will contain the following minimum information. Sample format of report as per Annexure A

15.1.1 Ultrasonic test report number

15.1.2 Part number and revision level

15.1.3 Part description

15.1.4 Traceability code

15.1.5 Date of examination

15.1.6 Scope of examination, including the reference scan plan from this specification that was used (If applicable). Or a sketch of component showing the details of the technique and the scan plan employed for different areas and geometries of the component.

15.1.7 UT procedure number and revision level

15.1.8 Examination parameter transducer frequency, sensitivitysetting, type of instrument, couplant, and any other relevant information required to re do the inspection at the same level.

15.1.9 Type and manufacturer of the equipment, Model, serial number and calibration date.

15.1.10 Reference and calibration block used for the examination

15.1.11 Quantity examined

15.1.12 Results of examination reject able, and recordable indication locations, depth, percentage in DAC and length.

15.1.13 Technician name and certification level and type.

15.1.14 For the purpose of reporting the location of reject able and recordable indication, a sketch will be prepared showing the physical outline of the component to be inspected, including dimension if required.

Sara Sae

Annexure – A
Report Formats

Sara Sae

Sara Sae Pvt Ltd

WORKSHEET FOR MANUAL ULTRASONIC TESTING

Report No.: Job Ref.: Doc no: Annex 'A' of SES26-761

Rev : 1

S		NS	

Worksheet Issue Date : Page 1 of 5

Customer :

Address : ☐ Required by customer ☐ Not required by customer

Project :

Location of Test : Date of Test :

INFORMATION PROVIDED BY THE CUSTOMER

Material Description : ☐ Steel ☐ Other : Material Specification :

Component (Rolled/Forging/Machined) :

Test Standard : Examination Level :

Acceptance Standard : Acceptance Level :

Others :

Surface Condition : ☐ Undressed ☐ Dressed ☐ Others : Heat Treatment :

LABORATORY INFORMATION

Test Procedure No.: Technique :

Flaw Detector : Equipment No.:

Calibration Block / Range : ☐ V1 / Block 1 ☐ V2 / Block 2 ☐ ASME Equipment No.:

Sensitivity : DAC block / Equipment No.:

Couplant : ☐ Polycell Paste ☐ Others : Welding Gauge :

Steel Rule : Measuring Tape :

Test Restriction : ☐ None ☐ Others : Test Temperature : 50°C

Probe Angle	60°	70°	45°	0°	
Probe Type					
Crystal Size					
Frequency					
Serial No.					
Time Base Range					
Reference Level dB					
The following information shall be obtained from daily check					
Visual Check					
Index Point					
Beam Angle					
DAC Curve / Data No.	/	/	/	/	

(√) - Tick as comply

Scanning sensitivity level : 1) Parent metal - compressional probe set 2nd back wall echo at full screen height from sound parent metal.
2) Attenuation & Transfer loss : * Not Applied / Applied (dB Supplemented)

Tested by : Checked by:

Name / Signature : / Qualification :

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WORKSHEET FOR MANUAL ULTRASONIC TESTING

Report No: Job Ref: Doc no: Annex 'A' of SES26-761
Rev : 1
Worksheet Issue Date : Page 2 of 5

Test Results :

Parent Metal Examination Result : ☐ No Lamination ☐ Others :

§ Description	§ Location / Joint No.	Position	* Size (mm) Length/Diameter	† Assessment	Acceptable / Unacceptable

Note : * Delete which ever is inappropriate.
† Not attached sketch that is for location of imperfection notes.

Tested by :

Name / Signature : _____ /_____
Qualification :

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WORKSHEET FOR MANUAL ULTRASONIC TESTING

Report No.: Job Ref.: Doc no: Annex 'A' of SES26- 761
Rev : 1
Worksheet Issue Date : Page 3 of 5

Sketch Sheet : (Location of Test)

Tested by :

Name / Signature : _____ /

Qualification :

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WORKSHEET FOR MANUAL ULTRASONIC TESTING

Report No.: Job Ref.: Doc no: Annex 'A' of SES26-
Rev : 1
Worksheet Issue Date : Page 4 of 5

Sketch Sheet : (Location of Imperfections Notes)

Scan Plans (Refer Clause 10.3 for Procedure no: SES26-761 Rev. 1)

Location / Joint No.	Imperfection No. / Type	Location		Length (mm)	Acceptable / Unacceptable
		From 'X' (datum)	From 'Z' (depth)		

Abbreviation : Planar (PL), Cylindrical (CL), Rounded (RN)

Tested by :

Name / Signature : /
Qualification :

Sara Sae

Sara Sae

Sara Sae Pvt Ltd

WORKSHEET FOR MANUAL ULTRASONIC TESTING

Report No.:	Job Ref.:	Doc no: Annex 'A' of SES26-761
		Rev : 1
	Worksheet Issue Date :	Page 5 of 5