SARA SAE PRIVATE LIMITED

Management System Document Control Cover Sheet

Document Title	Ref. No.	Revision No.
Procedure for Magnetic Particle Testing	SSE-QAD-MT-1/97	9

	Name	Position	Signature	Date
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Revision No.	Effective Date	Description / Summary of Revision
0	10/11/2012	Initial Issue
1	10.02.2009	Change of name of company "Sara Sae" to "NOV Sara "
2	21.10.2011	Change of name of company "NOV Sara" to "SARA SAE"
3	10.11.2012	Clauses identified with "line on left " amended
4.	25.04.2014	Compliances with FMC Doc. No. Q01114.
5.	08.11.2015	Compliances with FMC Doc. No. Q01114 Rev. AA, API 6A, API 16A, API 16C
6.	05.06.2017	Compliance with TechnipFMC Doc. No. Q01114 Rev. AB.
7.	25.05.2019	Compliance with Client required. Complete formatting edited.
8.	12.01.2021	Amendment added to bold & Italic Clauses.
9.	18.07.2021	Compliance with ASTM E709-2021 & ASME SEC V -2021 Latest Edition.

1.0 PURPOSE:

1.1 The purpose of this procedure is to establish the requirements for magnetic particle inspection of ferromagnetic materials.

1.2 This procedure provides a system of general conditions and specific instructions as an aid to qualified personnel required to perform magnet particle inspection, using A.C /HWDC Electromagnets.

2.0 SCOPE:

2.1 This procedure gives the methods, techniques, quality, and reporting requirements necessary for the magnetic particle inspection of ferromagnetic materials.

2.2 This procedure covers the magnetic particle inspection of ferromagnetic materials in forgings and fusion welded butt joints in plate and pipe welds, using the magnetic flow technique with A.C /HWDC. Electromagnet yokes. All welds examined shall include 13mm of adjacent base metal on both sides of weld. Prods are not permitted on well fluid surface or sealing surface. DC Yokes and permanent magnets are not permitted.

2.3 The test shall be carried out by continuous wet visible, wet fluorescent and dry magnetic particle method with white contrast paint.

2.4 This procedure covers requirement of PSL 3, all accessible wetted surface and all accessible sealing surfaces of each finished part shall be magnetic Particle inspected after final heat treatment and final machining operations. All magnetic Particle Examination shall use the wet Fluorescent Method. Duplex and super Duplex materials are not suitable for MPT.

2.5 This procedure is applicable to casting components, forging components as well as welded joints for equipment's to be designed, manufactured and tested as per API 6A and other applicable Codes.

2.6 Duplex and Super Duplex Stainless Steels may exhibit ferromagnetic properties but shall not be considered ferromagnetic. Liquid penetrant shall be used for examination of these materials

3.0 REFERENCE STANDARDS:

The latest edition of the Standards and References cited were utilized in the current release of this inspection method. Changes to these Standards and References determined to affect the quality of the products and services of the project shall be cause for revision to this document.

3.1 ASTM E-709 - 2021.

3.2 ASME Sec. V Article 7: 2021: ASME BPVC Non-destructive Testing: Magnetic Particle Examination

3.3 API 1104 :2016 - Welding of Pipelines and Related Facilities.

3.4 ASME VIII :2021- Rules for the Construction of Pressure Vessels. Division 1.

3.5 ASME B31-3 :2014 - Chemical Plant and Petroleum Refinery Piping.

3.6 AWSD1.1:2020- Structural Welding Code.

3.7 SARA SAE Quality Assurance Manual
3.8 SDP-22-004 Personal Certification
3.9 SDP-27-009 Control of Non-Conforming Products
3.10 American Petroleum Institute (API)
3.11 Specification 6A-21st Edition, "Specification for Well Head and Christmas Tree Equipment"
3.12 Specification 16A -4th Edition, "Specification for Drill through Equipment"
3.13 Specification 16D -3rd Edition, "Specification for Control System for Drilling Well Control equipment"
3.14 SNT–TC–1A: 2020: Recommended guidelines for qualification and certification of NDT Personnel.
3.15 Cameron specification no.X-008061

4.0 RESPONSIBILITIES:

4.1 Manager QA/QC shall be responsible for ensuring that the necessary resources are available for the requirements of this procedure to be carried out.

4.2 Operations Management/NDT Level III shall be responsible for ensuring that the requirements of this procedure are fully implemented at all times.

4.3 Employees involved in the implementation of this procedure shall be responsible for adherence to the requirements stated within

5.0 PROCEDURE QUALIFICATION:-

5.1 When procedure qualification is specified, a change of requirement in Table 1 identified as an essential variable from the specified value, or range of values, shall require re-qualification of the written procedure and validation of the technique.

5.2 A change of requirement identified as a nonessential variable from the specified value, or range of values, does not require re-qualification of the written procedure.

5.3 All changes of essential or nonessential variables from the value, or range of values, specified by the written procedure shall require revision of, or an addendum to, the written procedure.

5.4 The extent of examination shall be specified by the customer or the referencing Code Section.

TABLE-1

Requirement	Essential Variable	Nonessential Variable
Magnetizing technique.	√	
Magnetizing current type or amperage outside range specified by this Article or as previously qualified.	√	
Surface preparation	√	
Magnetic particles (fluorescent/visible, colour, particle size, wet/dry)	√	
Method of particle application	√	
Method of excess particle removal	√	
Minimum light intensity	√	
Existing coating , greater than the thickness demonstrated	Not Applicable	
Nonmagnetic surface contrast enhancement ,when utilized	Not Applicable	

Performance demonstration ,when required	√	
Examination part surface temperature outside of the temperature range recommended by the manufacturer of the particles or as previously qualified	Not Applicable	
Shape or size of the examination object		√
Equipment of the same type		√
Temperature (within those specified by manufacturer or as previously qualified)		√
Demagnetizing technique		√
Post –examination cleaning technique		√
Personnel qualification requirements		√

6.0 EXAMINATIONCOVERAGE:

6.1 Areas of the component to be examined shall be as specified by customer, applicable engineering specification or agreed quality plan with customer.

6.2 All examination shall be conducted with minimum 10% overlap for assuring 100% coverage of the required area.

7.0 PERSONAL REQUIREMENTS:

7.1 All non-destructive testing personnel performing examination in accordance with this procedure are qualified in accordance with EESPL Written Practice (SES -26 - 743), which meets or exceeds the requirement of ASNT recommended practice SNT–TC–1A - 2020.

7.2 Personnel performing specific calibrations and examinations to evaluate for acceptance or rejection in accordance with this specification and recording results shall be qualified and certified to at least Level I.

7.3 Personnel interpreting and evaluating results of examinations with respect to applicable codes and standards shall be qualified and certified to at least Level II

7.4 All NDE Level I, NDE Level II or NDE Level III certification of personnel shall be valid and current as per Written Practice Number: SES -26 – 743 latest revision.

8.0 EQUIPMENT:

The equipment may be stationary, portable, or Articulation yoke. The magnetizing equipment shall be equipped with a power source capable of delivering the required current levels necessary to produce the magnetic field. Either alternating current (AC) or half wave rectified direct current.(HWDC) shall be used.

8.1 Accessories: Following accessories shall be used with above mentioned magnetic particle testing equipment:

8.1.1 Calibrated Ultraviolet Light intensity measuring instrument (Measuring Unit: Micro watt/ cm2).

8.1.2 Calibrated visible light level measuring instrument (Measuring Unit: Lux).

8.1.3 Calibrated residual field measuring instrument. (Measuring Unit: Gauss).

8.2 Calibration / verification of equipment and accessories shall be performed in accordance with below intervals of E- 709 and whenever maintenance is performed which affects the function of the equipment.

TABLE 1 Required Verification Intervals

Item	Maximum Time Between Verification[A]
Lighting:[B]	
Visible light intensity	Weekly
Ambient light intensity	Weekly
Black light intensity	Daily
Battery powered black light intensity check	Before and after each use
Black light integrity	Weekly
System Performance:[C]	Daily
Wet particle concentration	8 hours, or every shift change
Wet particle contamination:[C]	1 week
Water break test	Daily
Equipment calibration check:[D]	
Ammeter accuracy	6 months
Timer control	6 months
Quick break	6 months
Yoke dead weight check	6 months
Black and white light meters	6 months
Gaussmeter or Field Indicator accuracy	6 months

8.3 When the electromagnetic Articulation yoke will lift the weight as follows at maximum leg spacing, it is considered verified to have the necessary power required to perform the examination. The verification interval for the dead weight check on electromagnetic Articulation yoke is every six months and after any repairs that could affect its operation.

8.4 The dead weight test shall be performed using 10 pound (4.5 kg) weight for AC Articulation yokes with leg spacing of 2 to 4 inch.

8.5 The dead weight test shall be performed for DC Articulation yoke using 30 pound (13.5 kg) weight with the legs spaced at 2 inch to 4 inch or a 50 pound (23.0) weight with legs spaced at 4 inch to 6 inch.

8.6 A streaker or other identification means shall be provided as evidence that verification has been performed in the past six months to preclude conducting the verification test each time it is used. If for any reason, a verification sticker or other identification of verification is not provided, then Articulation yoke shall be re-verified.

9.0 Examination Medium:

The magnetic particle examination shall use any of the below Magnetic particles. Particles manufactured by MAGNAFLUX (Table 1) shall be used.:

9.1 Fluorescent Magnetic Particle:

9.1.1 Visible Ambient Light Level — Examine fluorescent penetrant indications under ***UV-A Irradiance(UV-A LAMPS)*** in a darkened area. Visible ambient light should not exceed 2 ft candles (20 Lx).As per manufacturer's recommendation it is important to remember that LED UV Lamps are at full intensity immediately when turned on , so can be use immediately.

9.1.2 ***UV-A Irradiance*** Intensity - The ***UV-A Irradiance*** intensity at the examination surface shall be not less than 1000 µW/cm2 when measured with a suitable UV-A Irradiance meter.

9.1.3 ***UV-A Irradiance*** Warm-up - Allow the ***UV-A Irradiance*** to warm up for a minimum of 5 min prior to its use or measurement of the intensity of the ultraviolet light emitted.

9.1.4 Dark Area Eye Adaptation - It is recommended that the inspector be in the darkened area for at least 5 min prior to examining parts using UV-A Irradiance so that his eyes will adapt to dark viewing (22lux).

9.1.5 Photo chromatic or permanently tinted lenses shall not be worn during examination.

9.1.6 The ultraviolet light source intensity shall be measured at the start of each magnetic particle examination, at the beginning of shift, at maximum interval of 8 hours of continuous magnetic particle examination, when the work location is changed or when the light is extinguished and re-lighted.

9.1.7 Unacceptable intensity readings will result in re – inspection of all parts examined since the last acceptable intensity reading.

9.2 Dry Particle:

Visible dry magnetic powders are to be applied by dusting directly onto the surface of the part being examined. Reuse of the dry particle powder is not permitted under this procedure.

9.2.1 The area under inspection shall be illuminated by daylight or artificial light from either a normal tungsten filament lamp or a fluorescent tube, to a level of illumination not less than 100 FTC (1076 Lux) so as to enable a proper evaluation to be made of the indications revealed. The viewing conditions shall be such that no glare will be experienced during inspection of the component.

9.2.2 Unacceptable intensity readings will result in re – inspection of all parts examined since the last acceptable intensity reading.

9.3 Wet Particle Systems:

The dry or paste concentrate particles are to be suspended in a vehicle such as water or light petroleum distillate. The manufacturer supplied the pre-mixed wet particles in right concentration with suspending in light petroleum distillate in aerosol cans. The wet particles always applied on the best surface by spraying UV-A irradiance.

Table-1.

Type of Particle	Color	Manufacturer	Model	Particle Size Unit: u
Wet Visible Type	Black ink	Magnaflux	7HF	Less than 45 u
	White Contrast	Magnaflaux	WCP-2	Less than 45 u
Wet Fluorescent Type	Yellow Green	Magnaflaux	14 HF	Less than 45 u
Dry Powder	Red	Magnaflaux	8A	Less than 180 u

10.0 Wet Particle System:

10.1 Wet Bath Concentration Check:

10.1.1 The bath concentration shall be checked at least once every 8 hours of operation when magnetic particle testing is being performed and at any other time deemed necessary by the operator

10.1.2 Turn on the bath circulation pump and mechanically agitate the bath. Flush the hose and allow the pump to agitate the bath for a minimum of 30 minutes.

10.1.3 Bath concentration shall be determined by settling volume through the use of an pear-shaped centrifuge tube as specified in ASTM E-709 with a 1-mL stem (0.05 mL division) for fluorescence particles and 1.5-mL stem (0.1 mL division) for visible particles. The settling time shall be 30 minutes for aqueous suspension (water suspension) and 60 minutes for non aqueous suspension (oil suspension). The volume setting out at the bottom of the tube is indicative of the particle concentration in the bath.

10.1.4 If the bath concentration is low in particle content, add the sufficient amount of particle materials to obtain desired concentration; if the suspension is high in the material add sufficient water to obtained desired concentration.

10.1.5 If the settled particle appears to be loose agglomerates rather than a solid layer, take a second sample. If still agglomerated, the particles may have become magnetized; and shall be replaced.

10.1.6 The allowable settling volume of suspended fluorescent particles shall be between 0.1 ml to 0.4 ml. If the bath concentration found more than 0.4 ml add additional liquid and recheck the concentration as above. If the bath concentration found less than 0.1 ml then add some particles and recheck the bath concentration again.

10.1.7 Visible Magnetic particles, having good contrast with backing examination surface, can also be used in place of Fluorescence Magnetic Particles with ferromagnetic suspension as shallow in following table. Fluorescence Visible Magnetic Particles suspended in water or kerosene with the concentration of 1.2 mL to 2.4 mL per 100 mL of bath sample, measured with pear shaped centrifuge tube, shall be used.

10.1.8 Examination with wet visible magnetic particle testing technique shall be limited to as welded joints with surface preparation with wire brush or welded joints with surface preparation with grinding process.

10.1.9 For magnetic particle examination of components with PSL 3 / 3G and PSL 4 only continuous wet fluorescent magnetic particle examination technique shall be used.

10.2 Wet Bath Contamination:

10.2.1 The bath shall checked daily for contaminants such as dirt, scale, oil, lint, or other material which can reduce the performance of magnetic particle examination.

10.2.2 The liquid vehicle shall be examined with a UV-A Irradiance. The liquid will have a little fluorescence. Its colour can be compared with a freshly made-up sample. If used sample is noticeably more fluorescent than the comparison standard, the bath shall be replaced.

10.2.3 The graduated portion of the centrifuge tube shall be examined under an ultraviolet light for striation, bands, difference in colour or appearance. Bands or striation may indicate contamination. If the total volume of contaminates, including bands or striations exceeds 30% of the volume of magnetic particles, or if the liquid is noticeably fluorescent, the bath shall be replaced.

10.3 WATER BREAK CHECK:

10.3.1 When water is used as vehicle in ferromagnetic suspension, water break check shall be performed daily as per Paragraph 20.7.5 of ASTM E 709.

10.3.2 The water break check shall be performed by flooding a part, similar in surface finish to those under examination, with suspension, and then noting the appearance of the surface of the part after the flooding is stopped. If the film of suspension is continuous and even all over the part, sufficient wetting agent is present. If the film of suspension breaks, exposing bare surfaces of the part, and the suspension forms many separate droplets on the surface, more wetting agent is needed or the part has not been sufficiently cleaned. When using the fluorescent method, this check shall be performed independently under both UV-A Irradiance(lamp)and visible light.

11.0 GENERAL EXAMINATION REQUIREMENTS:

11.1 Surface Conditioning:

11.1.1 Satisfactory results are generally obtained when the surface are in the as-welded, as-rolled, as-cast or as-forged condition.

11.1.2 However surface preparation by grinding or machining may be necessary where the surface irregularities could mask indications due to discontinuities.

11.1.3 Extraneous Matter. Prior to magnetic particle examination, the surface to be examined and all adjacent areas within at least one inch must be dry and free of all dirt, grease,

lint, scale, welding flux and spatter, oil or other extraneous matter that could interfere with the examination.

11.1.4 Cleaning. Cleaning of surfaces is accomplished using detergents, organic solvents, descaling solutions, paints removers, vapour degreasing, sand or grit blasting or ultrasonic cleaning methods. These and /or other methods must have no detrimental effect on the component or the MPT consumables.

11.1.5 The temperature at the examination surface shall be below 48 Deg. C.

11.1.6 Where a rust preventative oil has been applied, thorough cleaning is necessary for performance of the examination.

11.1.7 Before magnetic particle examination is conducted, a check of the examination surface shall be conducted to locate any surface discontinuity openings which may not attract and hold magnetic particles because of their width.

11.2 Magnetic Field Strength:

11.2.1 Suitable means of establishing the necessary magnetic flux shall be either by passing a current through the material with contact electrodes, or by inducing a field in the part with coils or central conductors, using one or more of the techniques. The use of hand held prods to achieve magnetization is not allowed on wetted or sealing surfaces. The use of such prods is not permitted without prior written agreement with clients.

11.2.2 Sufficient magnetic field strength can be established by:

11.2.2.1 Known Discontinuities – Experiments with similar/identical parts having known discontinuities in all areas of interest.

11.2.2.2 Artificial Discontinuities – Verification of indications derived from shims For verifying field strength when using the continuous method.

11.2.2.3 Note: The pie gage may be used in conjunction with the formulas in this procedure and are typically for field direction only

11.2.2.4 The field strength of an electromagnetic yoke is verified when the dead weight test is performed as described in Paragraph 5.6. The field/magnetic flux indicator may be used when deemed necessary by the technician to verify the field strength in the area of examination. This verification shall be performed daily prior to use.

11.3 Direction of Magnetization:

11.3.1 To ensure the most effective detection of discontinuities, it is necessary to examine each area at least twice, with lines of flux in one case approximately perpendicular to the lines of flux in the other.

11.4 Magnetizing Method

11.4.1 Perform the inspection using the continuous method; that is, bathing the part with the examination medium to provide an abundant source of suspended particles on the surface of the part and terminating the bath application immediately prior to cutting off the magnetizing current. Proper sequencing of the operation is essential to indication formation and retention.

12.0 INSPECTION TECHNIQUES:

The electromagnetic yoke shall be placed on each area two times for magnetic particle examination such that the yoke placement on the same area shall be perpendicular to yoke placement for first case in the same area. Alternating or direct current electromagnetic yokes, shall be used to create a longitudinal field between the poles.

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13.0 STEPS FOR OPERATION:

Magnetization shall be perform on each area at least twice, with lines of magnetic flux during second magnetization shall be approximately perpendicular to first magnetization. For this purpose, the electromagnetic yoke shall be placed on each area two times for magnetic particle examination such that the yoke placement on the same area shall be perpendicular to yoke placement for first case in the same area.

14.0 DEMAGNETIZATION:

14.1 The component shall be demagnetized after completion of magnetic particle examination and after interpretation and evaluation of test results.

14.2 The demagnetization shall be performed using electromagnetic yoke. The yoke shall be put in AC mode and place its pole on the part. Then move the yoke around the area and slowly withdraw the yoke away from part when AC is flowing through it. It is recommended that yoke should withdraw up to 3 foot distance for demagnetization whenever possible.

14.3 After demagnetizing the residual magnetism shall be checked in the forging. The forging showing residual magnetization more than 3 gauss shall be demagnetized again. The forging showing residual magnetic field less than or equal to 3 gauss are acceptable for residual magnetic field.

15.0 Extent and Area of Examination:

15.1 For API 6A-PSL 2 and API 16A Components:

- All accessible wetted and all accessible sealing surfaces of each finished part shall be examined after final heat treatment (if any) and after final machining operations.
- Weld Preparation for all type of pressure containing repair weld including repair weld of corrosion resistance and hard-facing overlay.

15.2 API 6A-PSL 3, 3G, 4

- All accessible surfaces of each finished part shall be examined after final heat treatment (if any) and after final machining operations.
- Weld Preparation for all type of pressure containing production weld, repair weld and corrosion resistance and hard-facing overlay.

15.3 Pressure Containing Production Welds & Repair Welds, Corrosion resistance overlay and Hard-Facing overlay For API 6A (PSL 2, PSL 3/PSL 3G, PSL4), API 16A

- Examinations shall include 100% of the entire weld area plus ½" (13mm) of the adjacent base material on both sides of the weld.

16.0 POST CLEANING

16.1 After completion of interpretation and evaluation of indication, reporting and demagnetization, the examination surface shall be cleaned for removal of all residual magnetic particles and liquid from examination surface.

16.2 Post cleaning shall be performed with dray rag, hand wire brush, solvent cleaning or with detergent and water.

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17.0 EVALUATION OF INDICATIONS:

17.1 Relevant Indication - An indication with the major dimension greater than 1/16" (1.5mm).

17.2 Such indications shall include the following:-

17.2.1 Cracks.

17.2.2 Linear indications – those indications in which the length is equal to, or greater than three (3)times the width.

17.2.3 Rounded indications or indications which are circular or elliptical with the length less than three (3)times the width.

18.0 ACCEPTANCE STANDARDS

18.1 Acceptance Criteria

18.1.1 For API 6A products (PSL 2)

- ✓ **Ferromagnetic materials**
- ✓ No relevant linear indication.
- ✓ No relevant indication with a major dimension equal to or greater than 5 mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 in^2) area.
- ✓ four or more relevant indications in a line separated by less than 1.6 mm (1/16 in.) (edge to edge) are unacceptable.
- ✓ No relevant indications in pressure contact sealing surfaces.

➢ **Weld NDE**

- ✓ No relevant linear indication.
- ✓ No relevant indication with a major dimension equal to or greater than 5mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 $in.^2$) area.
- ✓ four or more relevant indications in a line separated by less than 1,6 mm (1/16 in.) (edge to edge) are unacceptable.
- ✓ No relevant indications in pressure contact sealing surfaces.
- ✓ No rounded indications greater than 3 mm (1/8 in.) for welds whose depth is 16 mm (5/8 in.) or less, or 5 mm (3/16 in.) for welds whose depth is greater than 16 mm (5/8 in.)

➢ **Repair Welds**

- ✓ No relevant linear indication.
- ✓ No relevant indication with a major dimension equal to or greater than 5mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 in^2) area.
- ✓ Four or more relevant indications in a line separated by less than 1.6 mm (1/16 in.) (edge to edge) are unacceptable.
- ✓ No relevant indications in pressure contact sealing surfaces.
- ✓ No rounded indications greater than 3 mm (1/8 in.) for welds whose depth is 16 mm (5/8 in.) or less, or 5 mm (3/16 in.) for welds whose depth is greater than 16 mm (5/8 in.).

18.1.2 For API 6A products (PSL 3/3G, 4)

➢ **Ferromagnetic materials** *(Only Wet Florescent Method)*

- ✓ No relevant linear indication.

- ✓ No relevant indication with a major dimension equal to or greater than 5mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 in^2) area.
- ✓ Four or more relevant indications in a line separated by less than 1.6 mm (1/16 in.) (edge to edge) are unacceptable.
- ✓ No relevant indications in pressure contact sealing surfaces.

➢ **Weld NDE**

- ✓ No relevant linear indication.
- ✓ No relevant indication with a major dimension equal to or greater than 5mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 in^2) area.
- ✓ Four or more relevant indications in a line separated by less than 1.6 mm (1/16 in.) (edge to edge) are unacceptable.
- ✓ No relevant indications in pressure contact sealing surfaces.
- ✓ No rounded indications greater than 3 mm (1/8 in.) for welds whose depth is 16 mm (5/8 in.) or less, or 5 mm (3/16 in.) for welds whose depth is greater than 16 mm (5/8 in.)

Note: For PSL-4, Welding is not permitted, except weld overlay.

➢ **Repair Welds**

- ✓ No relevant linear indication.
- ✓ No relevant indication with a major dimension equal to or greater than 5mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 in^2)area.
- ✓ Four or more relevant indications in a line separated by less than 1.6 mm (1/16 in.) (edge to edge) are unacceptable.
- ✓ No relevant indications in pressure contact sealing surfaces.
- ✓ No rounded indications greater than 3 mm (1/8 in.) for welds whose depth is 16 mm (5/8 in.) or less, or 5 mm (3/16 in.) for welds whose depth is greater than 16 mm (5/8 in)

Note: For PSL-4, Welding is not permitted, except weld overlay.

18.1.3 <u>For API 16A products</u>

➢ **Acceptance Criteria for Surfaces other than Pressure- contact (Metal to Metal) Sealing Surfaces**

- ✓ No relevant linear indication.
- ✓ No relevant indication with a major dimension equal to or greater than 5mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 in^2) area.
- ✓ Four or more relevant indications in a line separated by less than 1.6 mm_(1/16 in.) (edge to edge) are unacceptable.

➢ **Acceptance Criteria for Pressure -contact (Metal to Metal) Sealing Surface**

- ✓ There shall be no relevant indications in the pressure -contracts (metal to metal) sealing surfaces

➢ **Weld NDE**

- ✓ No relevant linear indication.
- ✓ No relevant indication with a major dimension equal to or greater than 5mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 $in.^2$) area
- ✓ four or more relevant indications in a line separated by less than 1.6 mm (1/16 in.) (edge to edge) are unacceptable.
- ✓ No rounded indicators greater than 3 mm (1/8 in.) for welds whose depth is 16 mm (5/8 in.) or less or 5mm (3/16 in) for welds depth is greater than 16 mm (0.63 in.)

➢ **Repair Welds**

Surfaces of ground- out areas for repair welds shall be examined prior to welding to ensure defect removal using acceptance criteria for fabrication welds as below.

- ✓ No relevant indication is acceptable on ground and gouged surface of repair weld preparation.

For completed repair weld

- ✓ No relevant linear indication.
- ✓ No relevant indication with a major dimension equal to or greater than 5mm (3/16 in.)
- ✓ No more than ten relevant indications in any continuous 40 cm^2 (6 in^2) area.
- ✓ Four or more relevant indications in a line separated by less than 1,6 mm (1/16 in.) (edge to edge) are unacceptable.

19.0 REPORTING

17.1 As a minimum following information shall be documented in report: **APPENDIX 'A'-WORK SHEET FOR MANUAL MAGNETIC PARTICLE TESTING:**

17.2 Name of customer.

17.3 Identification of items examined (part number, serial number, drawing number, purchase order number, heat number, lot number as applicable).

17.4 Procedure number and revision, acceptance criteria.

17.5 Area examined or location of magnetic particle examination.

17.6 Forging material and forging thickness at examination surface.

17.7 Magnetic Particle Examination technique, type of equipment used, type of current and amount of current used, type of magnetic particles (wet, fluorescent as per this procedure), type of vehicle, method of application of magnetic particle suspension, bath concentration, coil turns etc.

17.8 Interpretation and evaluation of all relevant indications and their locations.

17.9 Lighting equipment (Artificial lighting, if used)

17.10 Demagnetizing technique.

17.11 Post-examination Cleaning.

17.12 The inspector's signature and level of certification.

17.13 The names and employers of any witnesses to the examination.

20.0 Safety:

S/N#	Safety Requirements	Remarks
1.	Electrical Safety	a. The cables used with ultraviolet lamp as well as electromagnetic yoke must be shock proof with proper connectors. The connecters shall be connected to electric plug having proper earthling for preventing shock.
2.	Personnel Safety	a. The incandescent lamp whenever used must be used in glass envelop having shielding on top side for preventing glare in operator's eyes. b. The ultraviolet lamp must always use with filter. The filter shall have any crack. c. The ultraviolet lamp must always face down. d. Avoid direct contact on ultraviolet light on eyes and skin. e. Hand gloves for preventing direct contact of hand skin with ferromagnetic material or test surface. f. Nose mask for preventing air bon parting entering in inertia of operator.

		g. Wear safety shoes and safety helmet. h. Wear safety belt during working at height.
3.	Fire Safety	a. Pre-mixed bath samples or oil vehicle for wet ferromagnetic particle suspension are flammable. They must be stored in dry and cooled place having storage temperature range specified by the manufacturer. b. Material Safety Data Sheet specified by the pre-mixed ferromagnetic suspension bath material manufacturer must be followed. c. Pre-mixed ferromagnetic bath suspension or oil based wet suspension must be protected from welding arc, grinding spark etc. which can cause fire.

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DEMOSTRATION FOR MAGNETIC PARTICLE TESTING

Report No.:

Doc No: Annex 'A' of SSE/QAD/MT-1/97
Rev : 9

Sample ID.:

Worksheet Issue Date :

Customer : -
Address : ☐ Required by customer ☑ Not required by customer
Project :
Drg. No. Qty :
Location of Test : Date of Test :

INFORMATION PROVIDED BY THE CUSTOMER

Material Description : ☐ Steel ☑ Other :
Material Specification : steel
Weld Configuration : N/A
Welding Process : ☒ MMA ☒ TIG ☒ Others :
Test Standard : ASTM -E-709-21
Acceptance Standard AS PER PROCEDURE SSE-QAD-MT-1/97 REV 9
☒ Others :
Acceptance Level : AS PER PROCEDURE SSE-QAD-MT-1/97 REV 9
Face Condition : ☐ As welded ☐ As ground ☑ Others : m/c
Heat Treatment : N.A

LABORATORY INFORMATION

Test Procedure No.: SSE-QAD-MT-1/97 REV 9
Magnetizing Equipment : ☐ Permanent Magnet ☑ HWDC Yoke
Equipment No.: MM951
Test Technique:- WET FLUORESCENT TECHNIQUE
Surface Pre Clean : ☑ Solvent ☐ Steam
Demagnetization Required ..
Value of Gauss after Demag < 3 Gauss
Black Magnetic Ink : WATER BASE MAGNETIC POWDER
Batch No.:
Welding Gauge : NO
Suspension Fluid: WATER Concentration:
Steel Rule : NO
Application of Ink: POURED ON SURFACE
Measuring Tape : NO
Test Temperature :
Poles Spacing : 3" TO 6" POLES SPACING,OVERLAP
Viewing Condition : ☐ Day Light ☐ Artificial Light ☑ UV Light
Lightning Equipment No.
☐ Others
Test Restriction : ☑ None ☐ Others :

Calibration / Equipment Checking / Viewing Condition Check Record

Equipment Checking at Laboratory : -	Acceptable	Unacceptable	
* Lifting Power Check 4.5 kg for A.C. Yoke	☑	☐	Equipment No.: N/A
* Lifting Power Check 23 kg for Permanent Magnet / DC Yoke	☑	☐	Equipment No.:

Equipment Checking at Site : -			
Magnetic field adequacy strip & shim	☑	☐	Equipment No.: SHIMS AND STRIP
White Light Level Check not more than 20 lux	☑	☐	Equipment No.:
U V -A irredance level checked more than 1000 µwatt/cm2 at 15" distance	☑	☐	Equipment No.:

Remarks : 1) (√) Tick as Comply.
2) * Delete Inappropriate.

Performed by
Name / Signature : /
Qualification :

Reviewed by
Name / Signature :
Qualification :

RAHUL SHARMA
ASNT LEVEL-III UT, RT, MT,
(ID No:- 216723)
CSWIP 3.1 Welding Inspector
(ID No:-83866)

Sara Sae

Sara Sae Pvt Ltd

DEMOSTRATION FOR MAGNETIC PARTICLE TESTING

Report No.: **Job Ref.** **Doc no: Annex 'A' of SSE/QAD/MT-1/97**
Rev : 9
Worksheet Issue Date : **Page : 2 of 4**

Test Results :

§ Description	§ Location / Joint No.	Position	Qty	† Assessment	Acceptable / Unacceptable
		..	1		

Notes : * Delete whichever is inappropriate.
† See attached sketch sheet for location of imperfection notes.

Performed by
Name / Signature : /
Qualification :

Reviewed by
Name / Signature :
Qualification :

RAHUL SHARMA
LEVEL-III UT, RT, MT,
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CSWIP 3.1 Welding Inspector
(ID No:-83866)

Sara Sae

Sara Sae Pvt Ltd

DEMOSTRATION FOR MAGNETIC PARTICLE TESTING

Report No.: Job Ref.

Worksheet Issue Date :

Doc no: Annex 'A' of SSE/QAD/MT-1/97
Rev : 9
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Sketch Sheet : (Location of Test, Legs Position and coverage):-

Performed by
Name / Signature : /
Qualification :

Reviewed by
Name / Signature :
Qualification :

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DEMOSTRATION FOR MAGNETIC PARTICLE TESTING

Report No.:

Job Ref

Worksheet Issue Date :

Calibration details

S.NO.	EQUIPMENT	QAD/ IDENTIFICATION NO.	CALIBRATION DATE	CALIBRATION DUE DATE
1	Electromagnetic Yok			
2	Black Light Lamp			
3	Lux Meter			
4	UV Light Meter			
5	Gauss Meter			
6	Weight			
7	Temp. Gun			
8	Stop watch			

Performed by
Name / Signature :
Qualification :

Reviewed by
Name / Signature :
Qualification :

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