SL-A1

Sara Sae

SARA SAE PRIVATE LIMITED.

Management System Document Control Cover Sheet

Procedure for Magnetic Particle Testing	**SSE-QAD-MT-1/97**	**4**

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DATE 04/08/14

Revision Status

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.

Contents

1. 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. 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 including fusion welded butt joints in plate and pipe welds, using the magnetic flow technique with A.C /HWDC. Electromagnet yokes.

2.3 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.

2.4 This is the Company approved procedure and shall be adhered to at all times except where the Client or Contract specifies other requirements.

3. REFERENCES

3.1 ASME V - Nondestructive Examination.

3.2 API 1104 - Welding of Pipelines and Related Facilities.

3.3 ASME VIII - Rules for the Construction of Pressure Vessels. Division 1.

3.4 ASMEB31-3 - Chemical Plant and Petroleum Refinery Piping.

3.5 AWSD1.1 - Structural Welding Code.

3.6 SARA SAE Quality assurance Manual
- 3.6.1 SDP-22-004 Personal Certification
- 3.6.2 SDP-27-009 Control of Non-conforming Products

3.7 American Petroleum Institute (API)
- 3.7.1 Specification 6A "Specification for Well Head and Christmas Tree Equipment"
- 3.7.2 Specification 7K "Specification for "Drilling Well services"
- 3.7.3 Specification 11E "Specification for Pumping Units"
- 3.7.2 Specification 16A "Specification for Drill through Equipment"
- 3.7.3 Specification 16C "Specification for Choke and kill system"
- 3.7.4 Specification 16D "Specification for Control System for Drilling Well Control equipment"

3.8 American Society for Testing of Metals:
- 3.8.1 ASTM E-709, "Standard Guide for Magnetic Particle Testing"

3.9 FMC Q01114: Magnetic Particle Examination of Ferromagnetic Materials and Welds

4. RESPONSIBILITIES

4.1 The President/Manager QA 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 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. DEFINITIONS

5.1 Company – SARASAE PRIVATE LIMITED

5.2 Client - Those companies, Organizations or Individuals to which the company is contracted to provide Services.

5.3 Contract - The form of agreement for the provision of the Services to the Client by the Company.

5.4 Services - All things provided under the Contract including all activities to be carried out by the company for the client.

6. PROCEDURE

6.1 PERSONNEL QUALIFICATIONS

6.1.1 The NDT Inspector shall be trained, qualified and certified to a minimum ASNT (third party) Level II, reference to SNT-TC-1 A, "Recommended Practice for Non-Destructive Testing Personnel Qualification and Certification", and SARA written Practice SES-26-743 OR international equivalent, i.e., PCN, CSWIP in the applicable NDT method.

6.2 EQUIPMENT AND TESTING MEDIA

6.2.1 An A.C. /DC electromagnet yoke or Permanent Magnet having a minimum lifting power of 4.5kg (AC) / 18kg (DC) of ferrite steel with the poles set at the intended test spacing shall be used.

6.2.2 However, for A.C. electromagnet Yoke use on as required basis, i.e. call – out basis, a magnetic lifting power function check shall be carried – out prior to use and documented using the same form as in 6.2.1 indicating the intended purpose.

6.2.3 Testing media from a recognized manufacturer shall be used.

6.2.4 Recognized manufacturers include Magnaflux and Chemetall or equivalent.

6.2.5 Unacceptable system performance verification tests shall result in re – inspection of all parts examined since the last acceptable verification.

6.2.6 Wet magnetic particle Suspension shall be prepared as specified in SE 709 section 8. Exxon Isopar M or equivalent light petroleum distillate may be used as a vehicle to suspend the magnetic particle. The particle concentration of the suspension must be checked prior to each shift by the following method:

6.2.6.1 Circulate the suspension a minimum of thirty (30) minutes to assure thorough mixing of particles.

6.2.6.2 Place a sample of the suspension in a 100ml Centrifuge tube and allow it to settle for a minimum of 60 minutes preferably on a non-vibrating surface.

6.2.6.3 The settled particles should appear as a solid layer. The acceptable particle concentration is 0.1 to 0.4 ml, by volume for fluorescent particles and 1.2 to 2.4 ml. per 100 ml for non – fluorescent particle.

6.2.6.4 Magnetized or contaminated particles will appear as loose agglomeration in the suspension. Particles suspension having this appearance will be discarded and replaced with new particle suspension in a cleaned tank.

6.2.6.5 The temperature of the particle solution shall not exceed 43 C and will be within +/- 14° of the part being examined.

6.3 GENERAL PROCEDURE:

6.3.1 If a part or piece holds a residual magnetism field from a previous magnetization that will interfere with the examination, the part must be demagnetized.

6.3.2 All surfaces within 25mm of the area to be examined shall be free of grease, clean, dry, and free of irregularities which could mask, or be confused with an indication.

6.3.3 Only solvent-based cleaner and remover from an approved manufacturer shall be used for cleaning prior to application of the white contrast paint.

6.3.4 Drying of the pre-cleaned surfaces shall be accomplished by normal evaporation. A minimum of five (5) minutes shall be allowed before applying of white contrast paint.

6.3.5 The temperature of the surface being examined shall not exceed 57°C throughout the examination period.

6.3.6 Field Indicators:

6.3.6.1 Pie Field Indicator: Suitable field strength and direction is clearly indicated by a line of magnetic particle across the copper face.

6.3.6.2 Linear Slotted Shims: Suitable field strength is indicated by a clear indication on the strip. Linear slots must be lined up perpendicular to the field direction and multiple strips (minimum 2) used to verify multidirectional magnetizing processes.

6.3.6.3 Circular Slot Shims: Suitable field strength is indicated by either a particle indication on opposite sides of the circle for single directional magnetization.

6.3.7 White contrast paint shall be applied in controlled passes at a distance of 15 – 30 cm to give an opaque coating which provides adequate contrast with the test surface.

6.3.8 Adequate time will be allowed for the paint to dry before examination.

6.3.9 A Burmah Castrol Strip shall be placed aligned parallel with the direction of any discontinuities on the test surface.

6.3.10 The inspected area shall be considered to be not greater than the circle inscribed between the pole pieces.

6.3.11 All inspection shall be conducted with sufficient overlap to assure 100% coverage and at least two separate examinations shall be performed on each area. During the second inspection, the lines of magnetic flux shall be approximately perpendicular to those used during the first examination.

6.3.12 The inspected area shall be free from interfering debris.

6.3.13 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.

6.3.14 Fluorescent Particle Examination shall be conducted in a darkened area (Max

Light intensity 2 FTC or 21.5 Lux) using filtered black light. The Black light intensity at the examination surface shall not be less than 1300μW/cm².

6.3.15 Reflectors and filters should be checked and if necessary cleaned prior to use. Cracked or broken filters shall be replaced immediately

6.3.16 When using mercury vapor bulb, allow black light to warm up for a minimum of five minutes prior to its use. Prior to the start of test 5 minutes period shall be allowed for technician eyes to adjust to dark viewing. Photosensitive glasses are not allowed.

6.3.17 In those cases where residual ink or paint could interfere with subsequent processing or with service requirements, post cleaning is required. It is particularly important where residual inspection materials might combine with other factors in service to produce corrosion or interfere with welding operations.

6.3.22 Solvent-based remover/cleaner shall be used for post inspection cleaning.

6.4 MT Inspection Procedure :

Wet Fluorescent Method:

This Method utilizes fluorescent magnetic Particle suspended in a vehicle (water or petroleum distillate) that are sprayed, flowed or poured on the surface to be examined. Fluorescent magnetic Particles will glow a bright greenish – yellow when viewed under a black light

6.4.1 Select a Yoke Suitable for the configuration to be examined.

6.4.2 Applicable light intensity should meet the criteria of clause 6.3.18.

6.4.3 Surface Temperature should meet the criteria of clause 6.3.6

6.4.4 Magnetization: Each Part must be magnetized in two directions, approximately 90 degree to each other. Place yoke perpendicular to or parallel to the weld or other area to be examined.

6.4.5 Turn on the magnetizing force for the yoke and at the same time apply the particle suspension by spraying, flowing or pouring on the area to be examined.

6.4.6 While the magnetizing force is still applied, evaluate the surface of examination for any indications. Mark any relevant indications observed

6.4.7 Repeat the examination above with the yoke positioned at 90 deg. to the first examination.

6.4 EVALUATION OF INDICATIONS

6.4.1 All indications shall be investigated to the extent that the Inspector can evaluate such indications in terms of the applicable acceptance criteria.

6.4.2 Relevant indications are those which result from mechanical discontinuities. Such indications shall include the following :-

Cracks.

Linear indications – those indications in which the length is more than three times the width.

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

6.4.3 Non-relevant indications include:-

Localized surface imperfections, such as may occur from machining marks or

surface conditions. These are not relevant to the detection of unacceptable discontinuities and shall not be reported.

6.4.4 Any questionable or doubtful indications shall be retested to verify whether or not actual discontinuities are present.

6.4.5 As a guide, this can be achieved by using either a fluorescent tube of 80W at a distance of approximately 1m or a tungsten filament pearl lamp of 100W at a distance of approximately 0.2m.

6.4.6 If any indications are believed to be non-relevant on the basis that they are not associated with a surface rupture (i.e magnetic permeability variations , nonmetallic stringers) , they shall be examined by LPT methods , or removed and re-inspected, to confirm their non-relevancy.

6.5 ACCEPTANCE STANDARDS

6.5.1 The acceptance standards for the interpretation of items inspected shall be Client requirements or the Contract Document.

6.5.2 If no Client requirements or Contract Document are available the international specification relevant to the work scope shall be used.

6.5.3 For parts belonging to API specs following acceptance criteria shall apply:

6.5.3.1 No relevant indication with a major dimension equal to or greater than 5mm(3/16 inch)

6.5.3.2 No more than ten relevant indications in any continuous 40 cm sq.(6 inch sq.) area.

6.5.3.3 Four or more relevant indications in a line separated by less than 1.6 mm (1/16 inch) are unacceptable.

6.5.3.4 No relevant indication in pressure contact sealing surfaces.

6.5.3.5 MT subcontractors must use this examination method and acceptance criteria in performing the examination.

6.6 EXAMINATION OF REPAIRS

6.6.1 Repairs shall be re-examined by the same procedure used for the original examination.

6.7 POST INSPECTION CLEANING & DEMAGNETIZATION

6.7.1 When required, post inspection cleaning shall be accomplished to remove residual inspection materials by flushing with solvent then finally wiping with rags.

6.7.2 In the case of using HWDC, Demagnetization is necessary until the residual field is less than 3 Guass which is verified by a Guass meter.

6.7.3 Demagnetization can be done by energizing the magnet and pulling away from the specimen (Implying Reverse the current /Reduce the field)

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6.8 REPORTING

6.8.1 A Magnetic Particle Examination report is required and will contain the following as minimum information. Sample format of report as per Annexure A

6.8.1.1 Report Number

6.8.1.2 Part Number and Revision Level

6.8.1.3 Part Description

6.8.1.4 Weld Number and Welders Symbol

6.8.1.5 Traceability code

6.8.1.6 Date of examination

6.8.1.7 Scope of examination

6.8.1.8 Examination parameter

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

6.8.1.10 Quantity examined

6.8.1.11 Results of examination reject able, and recordable indication

6.8.1.12 Technician name and certification level and type

6.8.1.13 Particles used

6.9 SAFETY

6.9.1 Care shall be exercised during inspection with due regard to the fact that the inspection media may have relatively toxic and flammable properties.

6.9.2 Manufacturer's recommendations shall be followed at all times.

6.9.3 Smoking is prohibited while performing magnetic particle inspection.

6.9.4 Controlled conditions shall be established for correct disposal of pressurized aerosol cans.

6.9.5 Suitable precautions should be taken when using electrical equipment to avoid arcing, sparking or localized over-heating.

Annexure A
Report
Formats

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WORKSHEET FOR MAGNETIC PARTICLE TESTING

Report No.. Doc No: Annex 'A' of SSE/QAD/M

Rev.: 4

S		NS	

Job Ref.. Page 1 of 4

Worksheet Issue Date :

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 :

Weld Configuration : Welding Process : ☐ MMA ☐ TIG ☐ Others

Test Standard :

Acceptance Standard : Acceptance Level :

☐ Others :

Surface Condition . ☐ As welded ☐ Ground ☐ Others Heat Treatment .

LABORATORY INFORMATION

Test Procedure No..

Magnetizing Equipment ☐ Permanent Magnet ☐ A.C. YWDL Yoke Equipment No.:

Test Technique:- Wet Fluorescent Technique Surface Pre Clean ☐ Solvent ☐ Steam

Demagnetization Required # of Gauss after Demag.

Black Magnetic Ink : Batch No.:

Welding Gauge . Suspension Fluid:

Steel Rule . Application of Ink.

Measuring Tape :

Test Temperature : 45°C

Poles Spacing :

Viewing Condition : ☐ Day Light ☐ Background Light ☐ UV Light

☐ ☐ ☐ ☐ 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.:
* Lifting Power Check 18 kg for Permanent Magnet / DC Yoke	☐	☐	Equipment No.:

Equipment Checking at Site . .			
Magnetic Flux Direction Check	☐	☐	Equipment No.
White Light Level Check	☐	☐	Equipment No.

Remarks . 1) * ( ) Tick as Comply

2) * Delete inapplicable

Tested by . Checked by.

Name / Signature .

Qualification :

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WORKSHEET FOR MAGNETIC PARTICLE TESTING

Report No.: Job Ref.: Doc no. Annex A of SSE/QAD/MT-1/97

Rev.: 4

Worksheet Issue Date: Page 2 of 4

Test Results:

§ Description	§ Location / Joint No.	Position	* Weld Type / Leg length mm.	+ Assessment	Acceptable / Unacceptable

Notes: [illegible]

[illegible]

Tested by:

Name / Signature: ____________________

Qualification:

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WORKSHEET FOR MAGNETIC PARTICLE TESTING

Report No: Job Ref.: Doc no: Annex A of SSE/QAD/M
Rev : 4
Worksheet Issue Date : Page 3 of 4

Sketch Sheet : (Location of Test, Legs Position and coverage)
Tested by : Name / Signature : _____ / Qualification :

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WORKSHEET FOR MAGNETIC PARTICLE TESTING

Report No.: Job Ref.: Doc no Annex A of SSE/QA/PMT-1/97

Rev : 4

Worksheet Issue Date : Page : 1 of 1