Nash Engineering FZCO

DOCUMENT COVER SHEET

DOCUMENT TITLE

MAGNETIC PARTICLE EXAMINATION PROCEDURE
NE/MT/AWS/WO8356/01

CLIENT	ENERPROCESS
PROJECT NAME	TBA
MANUFACTURER	NASH ENGINEERING FZCO
ADDRESS	JEBEL ALI FREE ZONE , DUBAI, U.A.E.
NASH W.O.NO	N-8356
DESCRIPTION	STRUCTURAL SUPPORTS
P.O.NO.	ENER-NASH-2025-PO-200

REV	COMMENTS	DATE	NASH	ODS MIDDLE EAST
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MAGNETIC PARTICLE EXAMINATION PROCEDURE FOR STRUCTURAL STEEL

00	**NEW ISSUE**	**05.03.2025**	**RAK**	**P.N**	**S.Saha LEVEL-III**	
REV. NO.	**COMMENTS**	**DATE**	**PREPARED BY**	**CHECKED BY**	**APPROVED BY**	**CLIENT**

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1. Scope:

1.1. This Non-destructive Examination Procedure details the minimum requirements for conducting Magnetic Particle Examination by AC Electromagnet with the application of non-fluorescent particles on the test surface.

1.2. This Magnetic Particle Examination procedure shall be applied for detecting discontinuities, which are on the surfaces of ferromagnetic Structural materials and welds irrespective of shape and size when specified by relevant documents.

1.3. The extent of examination shall be 100% unless otherwise specified in the applicable document and or client's specifications.

2. Reference Documents:

2.1 The following documents are referred:

2.1.1 AWS D1.1 Ed:2020
2.1.2 ASTM E-709
2.1.3 ASME SECTION V EDITION : 2023.
2.1.4 ASME SECTION VIII DIVISION 1, EDITION : 2023.
2.1.3 ASNT SNT TC 1A 2006 edition & 2016 edition.
2.1.4 Nash Engineering Written Practice NE/WP/NDE/001 Rev 4

3. Personnel Qualification:

3.1 All personnel conducting Magnetic Particle Examinations using this Procedure shall be qualified to a minimum of Level II in accordance with NASH ENGINEERING written practice (refer 2.1.4). All Level II personnel shall meet the minimum education, training & experience requirements as per SNT TC 1A (refer 2.1.3).

3.2 As defined in the Written Practice, a person certified in accordance with the older version of the written practice shall remain certified until the next scheduled recertification. Recertification shall be based on Written Practice which refers to current code approved edition of SNT-TC-1A. Recertification may be based on evidence of continued satisfactory performance or reexamination in full or part as per the Written Practice.

3.3 Personnel conducting Magnetic Particle Examination shall have vision, with correction if necessary, to enable to read Jaeger Type No. J2 Standard Chart at a distance of not less than 300mm, and is capable of distinguishing and differentiating contrast between colors or shades of gray used. Vision tests shall be

conducted annually and be current during examination.

3.4 Personnel conducting Magnetic Particle Examination shall be competent in conducting the testing as described in this Procedure.

3.5 Personnel conducting Magnetic Particle Examination should be aware of the safe-practice requirements during examination.

4 NDE Method Technique:

4.1 Wet Continuous Color Contrast Magnetic Particle Examination using AC Electromagnet.

5 Test Equipment:

5.1 AC Electromagnet with adjustable poles shall be used. The minimum and maximum pole spacing utilized during examination shall be 3 in. and 8 in. respectively.

5.2 The equipment essentially produces longitudinal magnetization in the component tested.

5.3 AC Electromagnet or any other equivalent equipment having same or better capacity can be used.

5.4 The lifting capacity of at least 40 lbs (11 Kgs.) for AC Electromagnet at a maximum pole spacing (8 Inches) that shall be used during inspection and shall be checked at least **ONCE EVERY 30 DAYS** whenever malfunctioning of the Magnet is suspected.

Note: Minimum and maximum pole spacing utilized during examination shall be between 3" and 8".

5.5 Wet magnetic particles shall be utilized and good contrast shall be created either by contrast point (maximum 50 microns) or by colored magnetic powder.

6 Test Materials:

6.1 Test materials as defined in Table 8.1 are used during the examination

Table 8.1

Material	Brand	Manufacturer
Black Ink (Magnetic Ink) Non-Magnetic surface Contrast enhancement	ZCHEK-WP ZCHEK-9E BLACK	ZCHEK

6.2 Test materials will be in ready-mix aerosol containers

6.3 Intermixing of test materials from different Groups is not permitted.

6.4 This procedure is valid for only those family or group of materials as listed in the above table 8.1, for which a satisfactory demonstration has been carried out and documented. Refer to supplements for details.

7 Surface Preparation:

7.1 Prior to inspection, surfaces shall be dry and free from any contamination, which might interfere with the proper formation or interpretation of the magnetic particle patterns. With the exception of undercuts, which are within specification allowances, the contour of welds shall be blended smoothly and gradually into the base metal. Surface irregularities shall be removed to the extent that they will not interfere with the interpretation of the test results. Then final magnetic particle inspection shall be performed in the final surface and heat-treated conditions.

7.2 Surface temperature shall be not exceed 50°C

8 Equipment & Examination Method:

8.1 Equipment. The magnetizing apparatus shall be capable of inducing, in the item under test, a magnetic flux of suitable intensity in the desired direction longitudinal magnetization.

8.2 Equipment accuracy (Accuracy of the equipment meter) Magnetic particle testing equipment shall be checked for accuracy at the time of purchase and at an interval not to exceed 1 year or whenever the equipment has subjected to major electrical repair periodic overhaul or damage. Comparative readings shall be taken for at least 3 different current output levels encompassing the usable range.

8.3 Magnet equipment. The equipment shall be checked prior to use each day for adequacy of magnetization strength. With the pole spacing set to the maximum, the lifting power, as applied to carbon or alloy steel, shall be 40 pounds (11 Kgs) minimum for AC ElectromagnetS. Adequacy of magnetic field on the test surface shall be checked by an ASTM Field Indicator/ Pie Gauge. Alternately, a Gauss meter may be used to check the adequacy of the field.

8.4 Non-Relevant Indication:

The following methods may be used to prove non-relevancy.

a. At least 10% of each type of indication shall be explored by removing the surface roughness believed to have caused the type of indication to determine if defects are present.

b. The absence of indications under re-inspection by MPI after removal of the surface roughness shall be considered to prove that the indications were non-relevant with respect to actual defects.

c. If re-inspection reveals any indications. These and all of the original indications shall be considered relevant.

8.4.1 A minimum light intensity of 100 fc (1076 Lx) is required on the surface to be examined to ensure adequate sensitivity during the examination and evaluation of indications. When examination is carried out in day light, the minimum light intensity requirement of 1076Lx is well exceeded; however in case the examination is carried out in under a shed in remote corner, inside a vessel or at night time, the light intensity needs to be verified. In such cases, artificial lighting like normal hand lamps may provide light

intensity of more than 1076Lx. However, the light source, technique used, and light level verification is required to be demonstrated one time, documented, and maintained on file. A calibrated light meter shall be used for verification of light intensity. The light meter shall be calibrated at least once a year or whenever a meter has been repaired. If the meter has not been in use for one year or more, calibration shall be done before being used.

THE CONTRAST PAINT SHALL BE APPLIED IN A VERY THIN COATING NOT TO MASK THE ARE OF TESTING.

8.5 Ark Strikes:
Ark strikes, if found on the test surface, shall be ground out and re-inspected by AC Electromagnet methods or visually inspected at 5 x minimum magnification.

8.6 Final cleaning:
Whenever stated by client specification and after completion of inspection all magnetic particles shall be removed from all parts. All temporary plugs shall be removed from holes and cavities.

9. Direction of Magnetization / Application of Particle

9.1 To ensure detection of discontinuities having axis in any direction, at least two separate inspections shall be carried out on each area. The second inspection shall be with the magnetic field at right angles to that used in the first inspection. A different means of magnetizing may be employed for the second inspection of the area.

9.1.1 To check the field adequacy in the required direction ASTM field indicators (Pie Indicators) or Burma Castrol strips (Slotted Shims) shall be utilized.

9.2 Minimum of 10% overlap shall be maintained to ensure 100% coverage of the area under examination.

9.3 Magnetic particle shall be applied while the current is on and inspection shall be performed during the same time.

10. Demagnetization

10.1 Demagnetizing equipment shall consist of units, such as the open coil or box type demagnetizer, with sufficient capacity to demagnetize the item.

10.2 Demagnetization.When required, all items shall be demagnetized at the following stages to obtain satisfactory indications of discontinuities:

a) Prior to testing, if the material contains strong remnant fields from some previous operation and inspection.
b) After all magnetic particle testing is completed, if the remnant field interferes with the removal of the magnetic particles in cleaning the part or when specified in the appropriate equipment specification.

11. Acceptance Criteria

Acceptance criteria for magnetic particle inspection shall be as per the visual inspection standards and given in table 8.1 of AWS D 1.1.

12. Reporting Documentation

10.1Report

Reports shall be given for each examination with the interpretation of discontinuities encountered preferably with a sketch showing location of defects to enable quick and understood defect repairs.
Reports shall include all information that is required by the applicable fabrication document or invoking specification.
The Report shall have the following information as a minimum:

a) Client
b) Project
c) Location
d) Item/Drawing No.
e) Material
f) Surface condition
g) Test temperature
h) Technique
i) Method
j) Equipment
k) Illumination
l) Sensitivity
m) Consumable utilized
n) Welders Number
o) Evaluation
p) Results ACC / REJ

and the followings:

- Procedure number, Examination personnel identity, level and signature
- Weld identification, Method of magnetization
- Date of inspection, Type of inspection medium
- Applied magnetic field strength, Heat treatment condition of weld
- Whether original weld or repair (O or R), Flaws detected and locations
- Acceptance criteria / Specification & Conclusions: Acceptance or rejection with respect to the specification.

13. Safety

All technicians involved with Magnetic Particle Inspection for NASH ENGINEERING shall be aware of the hazards involving the liquids utilized and shall fully understand the manufacturer's instructions.

All personnel shall abide by the client's safety regulations and take particular care when utilizing scaffolding and ensuring there is adequate lighting prior to commencement of any works.

14. **Procedure Revision**

a. Whenever family of consumables is change.
b. Whenever there is a change in technique and or method requirements.
c. Revised procedure shall be approved by the authorised inspector/ client.

ANNEXURE I ACCEPTANCE CRITERIA

Nash Engineering FZCO

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DATE:

REPORT NO.:

PAGE OF

MAGNETIC PARTICLE EXAMINATION REPORT

CLIENT :			**LOCATION:**
PROJECT:			**JOB NO.:**
SURFACE COND.:			**DESCRIPTION :**
MT PROCEDURE & REV. :			**MATERIAL & THICKNESS :**
LIGHTING EQUIPMENT:			**TEST TEMP.:**
			EQUIPMENT & CURRENT TYPE: **MODEL No.:**
LIFTING POWER CHECK:			**TECHNIQUE:**
PARTICLES/ CONSUMABLES:	**PRE-CLEANER:**	**SURFACE CONTRAST ENHANCEMENT:**	**MAGNETIC PARTICLES:**
ACCEPTANCE CRITERIA / SPECIFICATION: **AWS D1.1 2010 TABLE 6.1**		**DATE OF EXAMINATION:**	

RECORD OF INDICATION & EVALUATION:

TECHNICIAN :	**CLIENT REP.:**	**AI / TPI.**
LEVEL :	**NAME:**	**NAME:**
SIGNATURE :	**SIGNATURE:**	**SIGNATURE:**
DATE :	**DATE:**	**DATE:**