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**Pacific Gas and
Electric Company®**

Work Procedure: WP 347-41
 Effective Date: 03/09/2022 Rev. 3

Applied Technology Services (ATS)

Magnetic Particle Inspection of Ferritic Steel Welds and Components

☐ Yes ☒ No Approved for Nuclear Quality-Related Work ☒ ☐ Periodic Use ☒ Reference Use

1. Scope

- 1.1 This procedure describes the methods and requirements for magnetic particle examination of ferromagnetic materials using either: the dry particle color contrast method; wet particle color contrast method; or the wet particle, fluorescent method using either AC or DC yoke, permanent magnet (i.e., Y5 magnet), current flow techniques using prod equipment or bench equipment.
- 1.2 This procedure is not for use on the Diablo Canyon Power Plant (DCPP) or components destined for DCPP.
- 1.3 This procedure satisfies the requirements of ASME Section V for all techniques of examination and satisfies the requirements of AWS D1.1 for the yoke and prod techniques using the dry powder technique.
- 1.4 This procedure is applicable for examination of ferromagnetic materials, including weldments and bolting, for detecting surface flaws.
- 1.5 Where the requirements of the code or standard applicable to the project are in conflict with or are not addressed by the requirements of this procedure, the requirements of the applicable code or standard shall govern. For specific project applications, such as condition assessments, where the codes and standards referenced in this procedure may not apply, this procedure may be used for guidance.

2. Target Audience

- 2.1 ATS personnel who are performing examinations shall be qualified and certified in accordance with Reference 11.1.
- 2.2 Vendor's employees may perform work to this procedure independently if the vendor's NDE personnel qualification and certification program has been approved by ATS or the vendor's personnel have been certified by ATS. Other vendor personnel shall work under the supervision of ATS personnel certified to at least Level II in accordance with Reference 11.1 and the supervising ATS individual shall be responsible for the examination and evaluation.

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- 2.3 Personnel shall be certified as Level II or Level III in order to independently perform an examination and interpretation. Trainees and Level I personnel shall be supervised by a Level II or Level III individual and shall not independently evaluate the results of an examination.

3. Safety

- 3.1 Where work is performed at a PG&E site, the applicable PG&E site safety practices shall be followed.
- 3.2 Magnetic ink materials and associated cleaners (used for pre-cleaning and post-cleaning steps), such as acetone and alcohol, are flammable and must be stored in appropriate containers isolated from any open flame or heat source. Use cleaning materials in well-ventilated areas and do not use where welding is in process.

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4. Discussion

- 4.1 The methods outlined in this procedure are intended for the detection of discontinuities on the surface of the area to be examined. This procedure does not address use of the magnetic particle examination method for detection of subsurface discontinuities. Continuous magnetization is required for all techniques described in this procedure.
- 4.2 The component to be examined shall be magnetized in at least two separate magnetic flux line directions which are approximately perpendicular, relative to each other, across each segment of the entire required examination surface area.

5. Definitions

N/A

6. Responsibilities

- 6.1 The NDE unit Supervisor ensures that only qualified and certified personnel are assigned to perform and comply with this procedure.
- 6.2 Magnetic particle testing certified technicians are responsible to comply with this procedure and complete all required records and reports.
- 6.3 Level II and Level III personnel are responsible for Level I personnel when called for by this procedure.

7. Instructions

7.1 Materials and Equipment

- 7.1.1 The magnetizing apparatus shall be capable of generating a magnetic field of the required strength and adequacy in the component or part to be examined.
 - a. Direct current or rectified current (full wave or half wave) may be used to generate the magnetic field (e.g., with direct contact head shots, central conductors, and fixed coils or wrapped cables).

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7.1.1 (continued)

- b. An alternating or direct current (AC or DC) electromagnetic Yoke may also be used to generate the magnetic field (i.e., with a Parker Contour Probe, Magnaflux Y-6, or similar equipment).
- c. In remote locations or limited access, permanent magnets such as a Y5 yoke may be used.
- d. Other magnetizing equipment, which meets the intent of this procedure, may be used with the approval of the cognizant ATS Level III.

7.1.2 All magnetic particle materials used for examinations in accordance with this procedure shall comply to Reference 11.3 and any product or project specific requirements. Any site-specific procedures concerning miscellaneous process materials shall apply.

7.1.3 Lighting Equipment

- a. When performing examinations using the dry particle, color contrast method, any supplemental lighting, such as flashlights, drop lights, room fixture lights, sun light, etc., may be used to ensure compliance with the lighting requirements stated in paragraph 7.4 of this procedure.
- b. When performing examinations using the wet fluorescent magnetic particle technique, an ultraviolet (black) light source, capable of generating an ultraviolet light intensity equal to or greater than 1000 $\mu\text{W}/\text{cm}^2$ at the examination surface, shall be used. Additionally, the black light shall be equipped with a filter which passes wavelengths at or near 365 nm predominantly. Black lights with cracked or broken filters shall not be used.
- c. Ultraviolet light intensity detectors shall be capable of verifying the minimum ultraviolet light intensity of 1000 $\mu\text{W}/\text{cm}^2$ when required by section 7.4.2.
- d. Visible (white) light intensity detectors shall be capable of verifying the minimum white light intensity of 100-foot candles (fc) (1000 lux) when required by section 7.4.1.

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7.1.4 Yoke Lift Weights

- a. At least a 10 pound (4.5 kg) ferromagnetic test block shall be used for AC Yoke calibration.
- b. At least a 40 pound (18kg) ferromagnetic test block shall be used for DC York calibration.
- c. Each weight shall be weighed with a scale from a reputable manufacturer and marked with the nominal weight prior to its first use. The weight must be verified if damaged in a manner that could cause loss of material.

7.1.5 Consumables

- a. Consumables shall have a settlement check completed to verify the concentration of magnetic media in the carrier fluid. Using a 100ml centrifuge flask, take a sample from the pre-mixed medium ensuring that medium is adequately mixed and demagnetized before the settlement test.
- b. Prepared bath and aerosol cans shall be checked with at least 1 can per batch number or 1 sample per gallon shall be settlement checked.
- c. Fill the settlement flask to the 100ml line and allow the particulate time to settle for approximately 60 minutes for petroleum distillate or 30 minutes for water based. Refer to IAW Para T-765.1 of 2010 ASME Section V on page 138 for reference.
- d. Fluorescent particles should have a settling volume between 0.1 ml to 0.4ml in a 100ml sample, and between 1.2ml to 2.4ml per 100ml sample for non-fluorescent materials.

- 7.1.6 For examinations performed to References 11.3, 11.4 and 11.5, the use of the magnetic particle field indicator (pie gauge) or artificial flaw shims for determination of the adequacy and direction of magnetic fields is only permitted when specifically referenced for the magnetizing techniques in Reference 11.3. Verification of field strength by other means, such as a Hall Effect probe can be used in accordance with the requirements of the applicable code or standard.

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- 7.1.7 Amperage gauges (ammeters) may be required to measure current strength on some magnetizing equipment. If so required, system and gauges shall be calibrated annually per IAW Para T-761.1 & T-763 of 2010 ASME Section V on page 137.
- 7.1.8 Additional equipment such as a 6-inch (150 mm) scale, magnifying glass, mirror, or anything else which might aid in the performance or evaluation of the examination may be used.
- 7.1.9 Calibration Requirements
- a. Calibration of electromagnetic yokes is defined as demonstration of lifting power. The requirements for direct current (DC) and alternating current (AC) techniques are described in Sections 7.1.9.a.1 and 7.1.9.a.2. The lifting power demonstration of each electromagnetic yoke is required and shall be documented at least once per year or whenever the equipment has been subjected to major electrical repair, periodic overhaul, or damage. Magnetizing (or lifting power) power of the yoke shall be checked prior to use, and, if the yoke is to be used from a generator or with extension cords, the lifting capability shall be checked with the same generator and extension cord lengths.
 1. AC electromagnetic yokes or variable yokes using the AC setting shall have a demonstrated lifting power of at least 10 pounds (4.5kg).
 2. DC electromagnetic yokes or variable yokes using the DC setting shall have a demonstrated lifting power of at least 40 pounds (18kg). Where compliance with Reference 11.6 or 11.7 is required, the lifting power shall be at least 50 pounds for leg spacing greater than 4 in. (100 mm).
 3. Yoke leg spacing is defined as the shortest distance between yoke legs at the contact area and this dimension shall be limited to a range of 3.0 in. (75 mm) to 6.0 in. (150 mm). The lifting power calibrations in paragraph 7.1.4 of this procedure shall be demonstrated at the maximum yoke leg spacing to be used during the examination.

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7.1.9 (continued)

b. Magnetizing Equipment with Ammeters

1. Magnetizing equipment with ammeters shall be calibrated once every twelve months, or whenever the equipment has been subject to major electric repair, periodic overhaul, or damage. If the equipment has not been in use for a year or more, calibration shall be performed prior to first use for any examination. The unit's meter reading shall not deviate by more than 10% of full scale, relative to the actual current value as shown by the test meter. When measuring half-wave rectified current with a direct current test meter the subsequent readings shall be multiplied by two.
2. The accuracy of each ammeter shall be verified every six months by equipment traceable to a national standard. Comparative readings shall be taken for at least three different current output levels encompassing the usable range.

c. Light intensity detectors shall be calibrated annually at a minimum.

7.1.10 Wet Horizontal Units. Refer to the requirements of the applicable code or standard when using wet horizontal units.

7.2 Surface Preparation Requirements

- 7.2.1 Prior to the examination, the required examination surface area and, where applicable, at least 1.0 in. (25 mm) of the adjacent surface shall be dry and free of any dirt, grease, oil, scale, welding flux, or other materials which might interfere with the examination.
- 7.2.2 Pre-cleaning or any other substance removal process shall be accomplished using appropriate materials such as detergents, organic solvents, de-scaling solutions, paint removers, vapor degreasing, or any combination of these materials and appropriate mechanical methods as necessary. Materials and methods used for cleaning shall be in compliance with the requirements of any applicable site practices and procedures.

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7.2.3 Coatings

- a. When compliance with Reference 11.3, 11.4 or 11.5 is required, if it is undesirable to remove nonconductive coatings, such as paint, which are present on the examination surface area, the examination may be performed through the coating at customer's request provided a successful procedure qualification via demonstration is performed. The requirements for procedure demonstration are described in Article 7 of Reference 11.3.
- b. When compliance with Reference 11.6 or 11.7 is required, if it is undesirable to remove nonconductive coatings, such as paint, which are present on the examination surface area, the examination may be performed through the coatings on the order of 1 or 2 mils (0.02 to 0.05 mm) at the customer's request. If the coating thickness exceeds 2 mils (0.05 mm), the procedure must be demonstrated that flaws can be detected through the maximum coating thickness through which the examination will be conducted as required by Reference 11.7.
- c. When a contrasting surface is required, white contrast paint from a reputable manufacturer may be used and shall be applied in a fine, even coating. Measurement of the thickness of contrast paint is not required, but demonstration of the capability of the test shall be demonstrated and recorded.

7.3 Temperature

- 7.3.1 A temperature measuring instrument shall be used to measure the examination component surface temperature if greater than ambient or if required by the referenced Code or standard or project. Unless otherwise specified by the manufacturer, the following temperature limitations shall apply:
 - a. Dry particle, color contrast examinations shall not be performed on components with a surface temperature exceeding of 600F (315.5°C).
 - b. Wet particle, fluorescent examinations shall not be performed on components with a surface temperature exceeding of 135F (57.2°C).

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7.4 Lighting Requirements

7.4.1 When performing wet or dry particle, color contrast examinations, lighting shall be sufficient enough to clearly observe and define indications. A white light intensity equal to or greater than 100 foot-candles (1000 lux) at the examination surface will satisfy the requirements of the codes and standards referenced in Section 11 of this procedure. If the ambient light available is insufficient, other lighting equipment shall be used in order to comply with previously stated lighting requirements. When compliance with Reference 11.3, 11.4 or 11.5 is required, the light source, technique used, and light level verification is required to be demonstrated at least one time, documented, and maintained on file.

7.4.2 Wet fluorescent magnetic particle examinations shall be performed in a darkened area using an ultraviolet light (i.e., black light). An ultraviolet light intensity equal to or greater than 1000 $\mu\text{W}/\text{cm}^2$ at the examination surface shall be used. The examination shall be performed in a darkened area with no greater than 2 foot-candles of white light, and the examiner shall be in the darkened area for at least five minutes prior to performing the examination, to allow his eyes to adjust to the light. If the examiner wears glasses or lenses, they shall not be photosensitive. The black light shall be allowed to warm up for 5 minutes prior to intensity measurement of the ultraviolet light or the subsequent start of any examinations. The black light intensity shall be measured prior to use, whenever the light's power source is interrupted or changed, and at the completion of the examination or series of examinations.

7.5 Field Strength Verification

7.5.1 When required by this procedure, a magnetic particle field indicator shall be used to verify magnetic field sensitivity adequacy and the magnetic force flux line direction on the component surface. This may be accomplished by positioning the indicator on the surface of the examination component during the examination. The magnetizing current shall be sufficient to develop a clear pattern on the indicator.

7.6 Minimum Examination Surface Area Requirements

7.6.1 Welds: The examination surface area parameters shall include the total weld crown surface and 1" inch (25 mm) of the base metal surface adjacent to the weld fusion line on both sides of the weld.

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7.6.2 Bolting – The examination surface area parameters shall include the total surface area of the threads and the head to shank area (as applicable).

a. Nuts – The examination surface area parameters shall include all exposed surfaces.

7.7 Circular Magnetization Method

7.7.1 Central Conductor Technique

- a. A central conductor is used to examine the internal and external surfaces of ring or cylindrical shaped components. When examinations are to be performed on large diameter cylinders, the conductor shall be positioned close to the internal surface of the cylinder. When the conductor is not centered, the circumference of the cylinder shall be examined in increments and a magnetic particle field indicator shall be used to determine the extent of the surface arc which may be examined for each respective conductor position. Bars or cables passed through the bore of a cylinder may be used to induce circular magnetization.
- b. Magnetizing Current Requirements – Direct or rectified (half-wave or full-wave) magnetizing current shall be used. Magnetizing current amperage requirements, for the various diameter examination component categories, shall be determined using the guidelines listed in 7.7.2.b for a single turn central conductor. The magnetic field will increase in proportion to the number of times the central conductor cable passes through a hollow part.
- c. Offset Central Conductor – As an alternative to the use of a field indicator described in 7.7.1.a, when using the 1996 Addenda and later editions and addenda of Reference 11.3, the following process may be used: When the conductor passing through the inside of the part is placed against an inside wall of the part, the current levels of 7.7.2.b shall apply, except that the diameter used for current calculations shall be the sum of the diameter of the central conductor and twice the wall thickness. The distance along the part circumference (exterior) that is effectively magnetized shall be taken as four times the diameter of the central conductor. The entire circumference shall be inspected by rotating the part on the conductor allowing for approximately a 10% field overlap (see figures in Reference 11.3 for clarification)

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7.7.2 Direct Contact Technique (Head Shots)

- a. For this technique, magnetization is accomplished by passing current through the component to be examined. This produces a circular magnetic field which is approximately perpendicular to the direction of current flow in the component.
- b. Magnetizing Current Requirements - Direct or rectified (half-wave or full-wave) magnetizing current shall be used. Magnetizing current amperage requirements, for the various diameter examination component categories, shall be determined using the following guidelines:
 1. Current shall be 300amp/inch (12A/mm) to 800 amp/inch (31A/mm) of outside diameter.
 2. For components with geometric shapes other than round, the greatest cross-sectional diagonal dimension, which is situated in a plane approximately right angles to the current flow, shall determine the inch dimension to be used for amperage requirement calculations in 7.7.2.b.1.
 3. If the magnetizing current amperage levels required in paragraph 7.7.2.b.1 cannot be obtained, the maximum current amperage available may be used provided adequate magnetic field sensitivity can be demonstrated using a magnetic particle field indicator.
 4. For non-cylindrical parts and when examining large parts by clamping contacts to the wall thickness, the field adequacy shall be demonstrated by using the magnetic particle field indicator.

7.8 Longitudinal Magnetization Method

7.8.1 Fixed Coil or Wrapped Cable Technique

- a. For this technique, magnetization is accomplished by passing current through a multi-turn fixed coil (or wrapped cables) which encircle the whole component or segments of oversized examination components as part of an organized inspection sequence. This technique produces a longitudinal magnetic field parallel to the axis of the coil. If a fixed, pre-wound coil is used, the component shall be placed near the side of the coil during the examination. This is of special importance when the coil inside diameter dimension is more than ten times the thickest cross-sectional area of the component.



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7.8.1 (continued)

- b. **Magnetic Field Strength** - The required field strength shall be calculated based on the length (L) and the diameter (D) of the examination component in accordance with (1) or (2), below. Long examination components shall be examined in sections which shall not exceed 18 inch (450 mm), and 18 inch shall be used for the part (L) when calculating the required field strength. For non-cylindrical components, (D) shall be the maximum cross-sectional diagonal dimension.

1. For components with L/D Ratios Equal To or Greater Than 4, the magnetizing current shall be within + 10% of the ampere-turns value, which is calculated using the following formula:

$$\text{Ampere-turns} = \frac{35,000}{(L/D) + 2}$$

2. For components with L/D Ratios less than 4, but not less than 2, the magnetizing current shall be within 10% of the ampere-turns value, which is calculated using the following formula:

$$\text{Ampere-turns} = \frac{45,000}{L/D}$$

If the area to be magnetized extends beyond 6 in. either side of the coils, the field adequacy shall be demonstrated using a magnetic field indicator. For large parts due to size and shape, the ampere-turns shall be 1200 ampere-turns to 4500 ampere-turns. The field adequacy shall be demonstrated using a magnetic field indicator.

- c. Magnetizing Current Requirements - Direct or rectified (half-wave or full-wave) current shall be used to magnetize components examined by this technique.

7.9 Electromagnetic Yoke Technique

- 7.9.1 When performing electromagnetic yoke examinations, alternating current setting is normally used. Some yokes have both AC and DC settings. The yoke lifting power shall be verified for the current type to be used for the examination per 7.1.9.

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7.9.2 Wet Particle, Fluorescent or Color Contrast Technique

- For yokes having both AC/DC capabilities, position selector switch to the desired mode.
- Position the yoke on the surface to be examined.
- Agitate aerosol can in order to ensure particle suspension.
- Apply current to the yoke.
- Spray the particles in a consistent and even manner onto the component surface until the area of interest is thoroughly covered and watch for the possible formation of magnetic particle indications.
- Under adequate lighting conditions as detailed in section 7.4, examine the part for indications.
- Switch off the current and remove yoke from component surface.

7.9.3 Dry Particle, Color Contrast Technique

- For yokes having both AC/DC capabilities, position selector switch to the desired mode.
- Position the yoke on the surface to be examined.
- Apply current to the yoke.
- Apply the particles in a consistent and even manner onto the component surface until the area of interest is lightly covered and watch for the possible formation of magnetic particle indications.
- Remove excess powder residue with the bulb blower.
- Under adequate lighting conditions as detailed in section 7.4.1, examine the part for indications.
- Switch off the current and remove yoke from component surface.

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7.10 Permanent Magnet (Y5 or similar)

7.10.1 Permanent Magnets may only be used where access is limited and in remote locations where power supply is unavailable.

7.10.2 Permanent magnets shall be kept separated from consumables at all times and shall have the keeper plate attached to the poles of the magnet.

7.10.3 Prior to use, field strength shall be verified by using a lift test weight of 40lbs (18kg) using both feet of the magnet to lift the weight without detachment.

7.10.4 Field adequacy may also be checked using either a pie gauge or Castrol strips.

7.10.5 Post examination cleaning shall be conducted as soon as practical using a process that does not adversely affect the component.

7.10.6 When residual magnetism in the component could interfere with subsequent processing or usage, the component shall be demagnetized in accordance with the requirements of Reference 11.3 or 11.7, as applicable, and any practices or procedures applicable for the project after completion of the examination.

7.10.7 Interpretation of results shall be done under lighting conditions as specified in 7.4 above as applicable to the examination technique.

7.11 Acceptance Standards

7.11.1 For examinations of welds in compliance with Reference 11.3 (ASME Boiler and Pressure Vessel Code, Section VIII, 2010 Edition) the following acceptance standards apply:

- a. Relevant indications are indications which result from imperfections. Any indication believed to be non-relevant shall be reexamined to verify whether or not actual flaws are present. Surface conditioning may precede the reexamination. Non-relevant indications and broad areas of pigmentation, which could mask defects, are unacceptable. Linear indications are indications in which the length is more than three times the width. Rounded indications are indications which are circular or elliptical with the length equal to or less than three times the width.

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7.11.1 (continued)

- b. Only imperfections producing indications with major dimensions greater than 1/16 inch shall be considered relevant.

7.11.2 Imperfections producing the following indications are unacceptable.

- Any cracks or linear indications
- Rounded indications with dimensions greater than 3/16 inch
- Four or more rounded indications in a line separated by 1/16 inch or less edge to edge
- Ten or more rounded indications in any 6 square inch of surface with the major dimension of the area taken in the most unfavorable location relative to the indications being evaluated

7.11.3 For examinations of welds in compliance with Reference 11.5 (API 1104) the following acceptance standards apply:

- a. API 1104 section 9.4: Relevant indications shall be considered defects should any of the following conditions exist:
1. Linear Indications evaluated as crater cracks or star cracks exceed 5/32 inches (4mm) in length.
 2. Linear indications evaluated as cracks other than crater cracks or star cracks.
 3. Linear indications are evaluated as Incomplete Fusion (IF) and exceed 1 inch (25mm) in total length in a continuous 12-inch (300mm) length of weld or 8% of the weld length.
 4. Rounded indications shall be evaluated as either individual or scattered porosity, or classified as cluster porosity.

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7.11.3 (continued)

5. Individual or scattered porosity shall be considered a defect if:
 - a) The size of an individual pore exceeds 3/32 inch (3mm)
 - b) The size of an individual pore exceeds 25% of the thinner of the nominal wall thicknesses joined
 - c) The distribution of scattered porosity exceeds the concentrations permitted
6. Cluster porosity shall be considered a defect if:
 - a) The diameter of the cluster exceeds 1/2" (13mm)
 - b) The aggregate length of cluster porosity in any continuous 12-inch (300mm) length exceeds 1/2" (13mm)

7.11.4 For examinations of welds in compliance with Reference 11.6 (API 5L) the following acceptance standards apply:

- a. API 5L has no requirements for MPI of LW (Laser Welding), SAW (Sub Arc welding) or COW (Combination of SMAW and Sub Arc) but does have a requirement for EW (Electric Welding) and Seamless pipe. The role of ATS NDT is to MPI only those areas that have been dressed in the DSAW or ECDA process requested by the respective pipeline engineer or his/her nominated support staff. It is the policy when dressing to remove all indications found by NDT shall conform to the ATS Dressing procedure (WP 347-04). However, should indications not be removed completely, then they shall comply with the Acceptance Criteria found in 7.11.1.

7.12 Indication Photos

- 7.12.1 If able and accessible, photo quality and quantity of confirmed indications should provide enough detail to understand the location and size of the indication to assist engineering or specialists in making sound repair decisions. Detailed and close up photos should include a ruler or tape measure for reference. An overall photo(s) of the unit or equipment should be taken along with the utilization of photo editing tools to further elaborate the location of the indication(s).



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7.13 Reporting

7.13.1 A report of examination shall be prepared including, as a minimum:

- The identification of the component or area (such as a weld) examined
- Line Number, Mile marker and GPS Coordinates as applicable
- The examiner's name
- The date of the examination
- The equipment used and associated serial numbers
- Consumables used including Manufacturer, type and the associated batch numbers
- The temperature of the component (if significantly above ambient)
- The results of the examination (including the location and dimensions of all unacceptable indications or all reportable indications if such criteria are specified for the project)

7.13.2 The final report should include all examination results and data sheets, images, and other relevant data. Review, approval and control of the final report shall be in accordance with [AP CTL-01, "Control of Records and Documents."](#)

7.14 Post Examination Cleaning

7.14.1 Following the evaluation, the surface shall be cleaned to remove residual examination media, i.e., dry particles or liquid suspension media. No signs of such materials should remain that could interfere with subsequent processing or with service requirements.

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7.15 Waste Disposal

7.15.1 All waste generated in performing magnetic particle examination (soiled cleaning cloths, brushes, and empty containers of solvents or other cleaning compounds) must be processed in accordance with applicable regulations, site procedures and good housekeeping practices.

8. Governing Documents

N/A

9. Records

9.1 See Section 7.12

10. Compliance Requirement/Regulatory Commitment

N/A

11. References

- 11.1 WP 347-01, "Written Practice for the Qualification and Certification of NDE Personnel"
- 11.2 ASME Boiler and Pressure Vessel Code, Section V, 2010 Edition
- 11.3 ASME Boiler and Pressure Vessel Code, Section VIII, 2010 Edition
- 11.4 AWS D1.1 Structural Welding Code, 1988 Edition through the 2006 Edition.
- 11.5 API 1104 20th Edition
- 11.6 API 5L 44th Edition
- 11.7 ASTM E709-01, Standard Guide for Magnetic Particle Examination

12. Appendices

N/A

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13. Attachments

N/A

14. Document Recession

14.1 WI ATS-MT-100 Rev. 2, "Magnetic Particle Inspection of Ferritic Steel Welds and Components"

Approved By [REDACTED], Supervisor, ATS NDE.

Document Owner [REDACTED], Supervisor, ATS NDE

Document Contact [REDACTED], Technologist, ATS NDE

Revision Notes

Revision Number	What Changed?
3	<ul style="list-style-type: none"> Updated procedure to make current format Minor changes and reference updates throughout the work procedure Added section 7.12 Indication Photos to ensure the quality of photos being recorded on final reports