

PII-MT

Magnetic Particle Examination

PNDT-MT

Revision 05

Prepared By:

Brandon Champion – Chief Operations Officer, NDT Level III

Reviewed By:

William Mustin – Director of Advanced Services, NDT Level III

Approved By:

Oscar Gonzales – VP Quality & Corporate RSO, ASNT NDT Level III #201657

Signatures on file – available upon request



September 7, 2026

Prime Inspections Inc.

1621 Primewest Parkway, Katy, TX 77449
(870) 291-1991

Revision / Change Summary

Revision/Change	No.	Date	Description
Initial	0	4/12/2020	Initial Issue
Revision	01	8/12/2021	Code Review; updated for ASME Section V 2021 Edition
Revision	02	1/1/2024	Code Review; updated for ASME Section V 2023 Edition; added yoke lifting power verification requirements
Revision	03	1/1/2025	Code Review; updated for API 1104 21st Edition; added MT acceptance criteria per Section 9.5
Revision	04	1/1/2026	Code Review; updated for ASME Section V 2025 Edition; added field strength verification per Article 7
Revision	05	9/7/2026	Complete rewrite to ASME Section V Article 7 (2025 Edition) and API 1104 21st Edition Section 9.5; expanded yoke technique requirements (AC electromagnetic yoke, 10 lb minimum lifting power, 2-4 inch leg spacing); added wet visible (black on white) and fluorescent method provisions; added UV light intensity requirements (1000 $\mu\text{W}/\text{cm}^2$) and visible light requirements (100 FC); added field strength verification, calibration intervals, and personnel qualification per SNT-TC-1A 2020; expanded appendices with acceptance criteria tables and technique sheet template

Prime Inspections Inc.

1621 Primewest Parkway, Katy, TX 77449
(870) 291-1991

Table of Contents

1.0 SCOPE
2.0 REFERENCED DOCUMENTS
3.0 DEFINITIONS AND ABBREVIATIONS
4.0 RESPONSIBILITY
5.0 PERSONNEL QUALIFICATIONS
6.0 EQUIPMENT AND MATERIALS
7.0 SURFACE PREPARATION
8.0 MAGNETIZATION TECHNIQUE
9.0 PARTICLE APPLICATION
10.0 INSPECTION AND OBSERVATION
11.0 EVALUATION OF INDICATIONS
12.0 STANDARDS OF ACCEPTANCE
13.0 CALIBRATION AND VERIFICATION
14.0 PROCEDURE QUALIFICATION
15.0 RECORDS AND DOCUMENTATION
16.0 SAFETY
17.0 REVISION HISTORY

APPENDICES

Appendix I – Yoke Lifting Power Verification Procedure
Appendix II – Field Strength Verification Procedure
Appendix III – Acceptance Criteria Tables (API 1104 21st Edition Section 9.5)
Appendix IV – UV Light and Visible Light Verification Procedure
Appendix V – Technique Sheet Template

1.0 SCOPE

1.1 This procedure establishes the minimum technique requirements for performing magnetic particle examination (MT) of welds, base materials, and related components using the electromagnetic yoke technique with wet visible (black on white) and/or wet fluorescent magnetic particles. This procedure is written in accordance with ASME Section V, Article 7, 2025 Edition and API 1104, 21st Edition, Section 9.5 (Magnetic Particle Inspection) for pipeline girth welds and related fabrication welds.

1.2 This procedure is applicable to ferromagnetic materials including carbon steel, austenitic stainless steel cladding over ferromagnetic base material, and other ferromagnetic alloys where magnetic particle examination is specified. It covers pipe diameters from 2 in. (50 mm) NPS through 56 in. (1420 mm) NPS and greater, with wall thicknesses from 0.125 in. (3 mm) through 2.500 in. (63.5 mm) and greater, as applicable to the component geometry and access conditions.

1.3 The technique described herein utilizes alternating current (AC) electromagnetic yokes with continuous magnetization for the detection of surface and near-surface discontinuities. The yoke technique is applicable to components of various geometries including pipe welds, plate welds, structural welds, and castings where the yoke can make intimate contact with the examination surface.

1.4 This procedure covers the wet visible (black on white) magnetic particle method as the primary technique, with provisions for the wet fluorescent method where specified by the referencing code or customer specification. The visible method utilizes black magnetic particles applied against a white contrast background for examination under visible light. The fluorescent method utilizes fluorescent magnetic particles examined under ultraviolet (UV-A) light.

1.5 Magnetic particle examination under this procedure is capable of detecting surface-opening discontinuities such as cracks, seams, laps, laminations, and similar linear indications, as well as near-surface subsurface indications. The method is limited to ferromagnetic materials and is not applicable to austenitic stainless steels, non-ferrous materials, or non-ferromagnetic alloys.

1.6 For pipeline girth weld acceptance, magnetic particle examination shall be performed in accordance with API 1104, 21st Edition, Section 9.5 (Magnetic Particle Inspection). Acceptance criteria for MT examination of pipeline welds shall be in accordance with API 1104 21st Edition Section 9.5 as detailed in Appendix III of this procedure.

1.7 This procedure may be used with codes other than those listed in Section 2.0 if the requirements of those codes are met. The designated NDT Level III shall approve any additional equipment, techniques, or applications to be used under this procedure.

1.8 This procedure does not cover magnetic particle examination using permanent magnet yokes, prods, or coil/bench techniques. Those methods are covered under separate procedures. This procedure does not cover dry magnetic particle techniques; wet continuous techniques only are addressed herein.

2.0 REFERENCED DOCUMENTS

2.1 The following documents are referenced in this procedure. Current editions apply unless otherwise noted. Where a referenced document contains requirements that conflict with this procedure, the referencing code or contract specification shall govern.

2.2 Codes and Standards

2.2.1 ASME BPVC Section V, Nondestructive Examination, 2025 Edition, Article 7 – Magnetic Particle Examination

2.2.2 ASME BPVC Section I, Power Boilers, 2025 Edition, PW-51 (Magnetic Particle Examination of Welds)

2.2.3 ASME BPVC Section VIII, Pressure Vessels, Divisions 1 and 2, 2025 Edition, Appendix 7 (Magnetic Particle Examination) as applicable

2.2.4 ASME B31.1, Power Piping, 2024 Edition

2.2.5 ASME B31.3, Process Piping, 2024 Edition

2.2.6 ASME B31.4, Pipeline Transportation Systems for Liquids and Slurries, 2025 Edition

2.2.7 ASME B31.8, Gas Transmission and Distribution Piping Systems, 2025 Edition

2.2.8 API 1104, Welding of Pipelines and Related Facilities, 21st Edition — Section 9.5 (Magnetic Particle Inspection) for MT acceptance of pipeline welds

2.2.9 ASTM E709, Standard Guide for Magnetic Particle Testing

2.2.10 ASTM E1444/E1444M, Standard Practice for Magnetic Particle Testing

2.2.11 ASTM E2297, Standard Guide for Use of UV-A, Visible Light, and Densitometry for Radiographic Examination and Magnetic Particle and Liquid Penetrant Examinations

2.2.12 ASTM E1316, Standard Terminology for Nondestructive Examinations

2.2.13 ASME Section V, Article 7, Mandatory Appendix I – Alternate Yoke Procedure Qualification (as applicable)

2.3 Company and Regulatory Documents

2.3.1 ASNT SNT-TC-1A, 2020 Edition — Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

2.3.2 PII-WP-1, Prime Inspections Inc. Written Practice for NDT Personnel Qualification, Latest Revision

2.3.3 OSHA 29 CFR 1910.95, Occupational Noise Exposure (as applicable for UV light safety)

2.3.4 ACGIH TLV for UV-A light exposure as applicable

3.0 DEFINITIONS AND ABBREVIATIONS

3.1 The following definitions and abbreviations apply throughout this procedure:

3.2 Definitions

MT — Magnetic Particle Testing — a nondestructive examination method that uses magnetic fields and fine ferromagnetic particles to detect surface and near-surface discontinuities in ferromagnetic materials.

Yoke — An electromagnet or permanent magnet that induces a magnetic field in the material between its poles (legs). AC electromagnetic yokes are used under this procedure.

AC Yoke — An alternating current electromagnetic yoke that induces an alternating magnetic field in the test material. AC fields provide excellent detection of surface discontinuities.

Lifting Power — The ability of the yoke to lift a specified weight of carbon steel. The minimum lifting power for yokes used under this procedure shall be 10 lb (45 N) at the maximum leg spacing used.

Leg Spacing — The distance between the contact points (poles/legs) of the yoke when placed on the test surface. The effective leg spacing for the yoke shall be between 2 in. (50 mm) and 4 in. (100 mm).

Magnetic Flux Density — The measure of the number of magnetic lines of force per unit area, typically measured in gauss (G) or tesla (T). Adequate flux density is required for proper particle indication formation.

Wet Visible Method — A magnetic particle technique using black iron oxide particles suspended in a liquid carrier, viewed against a white contrast background under visible light. Black on white contrast provides high sensitivity for surface discontinuities.

Wet Fluorescent Method — A magnetic particle technique using fluorescent particles that are viewed under UV-A (black) light in a darkened environment. Fluorescent particles provide higher sensitivity than visible particles.

Bath — The suspension of magnetic particles in a liquid carrier (water or oil). The bath concentration shall be verified per Section 9.0.

Continuous Technique — A magnetization technique in which the magnetic field is applied while the bath is being applied and the examination is performed while the field is maintained.

Particle Concentration — The amount of magnetic particles in the bath, typically measured using a pear-shaped centrifuge tube or settling tube. The concentration shall be verified at the start of each shift and after each bath mix.

Relevant Indication — An indication caused by a discontinuity that requires evaluation per the applicable acceptance criteria.

Non-Relevant Indication — An indication caused by conditions other than a discontinuity, such as magnetic permeability changes, geometry, or surface conditions, that are not relevant to the acceptability of the part.

Linear Indication — An indication in which the length is more than three (3) times the width.

Rounded Indication — An indication in which the length is three (3) times the width or less.

Aligned Indication — Three or more rounded indications in a line separated by 1/16 in. (1.6 mm) or less edge-to-edge, evaluated as a linear indication.

Field Strength Verification — Verification that the magnetic field strength is adequate to produce particle indications on the test surface, verified using a known artificial flaw or Pie field indicator.

Demagnetization — The process of removing residual magnetism from the test material after magnetic particle examination, when required.

3.3 Abbreviations

MT — Magnetic Particle Testing

MT-TC — Magnetic Particle Testing — Yoke Technique

NDE / NDT — Nondestructive Examination / Nondestructive Testing

ASME — American Society of Mechanical Engineers

API — American Petroleum Institute

ASNT — American Society for Nondestructive Testing

SNT-TC-1A — ASNT Recommended Practice for NDT Personnel Qualification

NPS — Nominal Pipe Size

OD / ID — Outside Diameter / Inside Diameter

AC — Alternating Current

DC — Direct Current (not used under this procedure)

UV-A — Ultraviolet light in the 315-400 nm wavelength range

μW/cm² — Microwatts per square centimeter (UV light intensity unit)

FC — Foot-candle (visible light intensity unit)

PII — Prime Inspections Inc.

CQM — Corporate Quality Manager

JHA — Job Hazard Analysis

PPE — Personal Protective Equipment

4.0 RESPONSIBILITY

4.1 The Corporate Quality Manager (CQM) of Prime Inspections Inc. is responsible for the overall administration, maintenance, and control of this procedure, including ensuring that it is reviewed at intervals not to exceed one year and that it remains compliant with the latest editions of all referenced codes and standards.

4.2 The designated ASNT NDT Level III (MT) is responsible for the technical content of this procedure, the qualification and certification of personnel, the review and approval of technique sheets, and the resolution of technical issues arising during examination. The Level III shall also be responsible for procedure qualification demonstrations when required by the referencing code or client.

4.3 The NDT Level II technician is responsible for performing examinations in accordance with this procedure, performing and documenting calibrations and equipment verifications, collecting and evaluating data, preparing examination reports, and identifying indications that require evaluation by the Level III.

4.4 The NDT Level I technician may perform calibrations and examinations under the direct supervision of a Level II or Level III technician but shall not perform final evaluation or acceptance of indications. The Level I shall report any indications detected to the supervising Level II or Level III.

4.5 The client or owner/user is responsible for providing applicable design drawings, weld joint details, material specifications, and any specific examination requirements beyond those covered by this procedure. The client shall also be responsible for providing or approving mock-up or demonstration blocks when required for procedure qualification.

4.6 The responsible fabricator or manufacturer shall be responsible for the review, interpretation, evaluation, and acceptance of completed MT examination results to assure compliance with the requirements of ASME Section V, Article 7, and the referencing Code Section. Acceptance shall be completed prior to presentation of the examination results and accompanying documentation to the Inspector.

4.7 At any time while performing work under this procedure, should it become evident that procedure requirements cannot be met, the technician shall immediately contact the supervisor or lead technician for resolution. The technician shall not proceed with examination until the issue is resolved.

4.8 Prior to beginning work, all personnel shall read, understand, and follow the requirements of the applicable Job Hazard Analysis (JHA) and all site-specific safety requirements, including the use of appropriate personal protective equipment (PPE).

5.0 PERSONNEL QUALIFICATIONS

5.1 Personnel performing magnetic particle examinations in accordance with this procedure shall be qualified and certified in accordance with the requirements of ASNT SNT-TC-1A, 2020 Edition, and PII-WP-1, Prime Inspections Inc. Written Practice, latest revision.

5.2 Personnel certified to MT Level II may perform examinations, evaluate indications, and make interpretations as to the acceptability of indications. This includes performing all required calibrations, equipment verifications, and preparing examination reports. An MT Level III shall review and approve all final examination reports.

5.3 MT Level I personnel may perform equipment calibrations and data acquisition under the direct supervision of a Level II or Level III technician but shall not perform final evaluation or acceptance of indications.

5.4 In addition to the training requirements established above, technicians shall have documented additional training for operating the specific manufacturer or model of yoke equipment and UV/visible light measurement instruments being used. This is specific hardware training on the equipment being utilized. Documentation of this training shall be maintained in the personnel certification file.

5.5 When required by client or referencing code, the technicians shall have participated in and successfully demonstrated detection and evaluation of flaws in mock-up(s) or other client test standards prior to performing production examinations.

5.6 Near-vision acuity shall be verified annually in accordance with SNT-TC-1A. Personnel shall be capable of reading Jaeger No. 1 (or equivalent) at a minimum distance of 12 in. (300 mm). For MT Level II and Level III personnel performing interpretation, near-vision acuity shall be verified annually.

5.7 Color vision shall be verified annually. Personnel performing examinations using the wet visible (black on white) method shall be capable of distinguishing black against white background. Personnel performing fluorescent MT shall be capable of distinguishing fluorescent indications under UV-A light.

5.8 Personnel shall be trained on this specific procedure and its applicable safety requirements prior to performing examinations under this procedure. Training records shall be maintained in accordance with PII-WP-1.

5.9 Personnel certification records shall be available for review by the client, Inspector, or jurisdictional authority upon request.

6.0 EQUIPMENT AND MATERIALS

6.1 The magnetic particle examination system shall consist of the following major components:

- 6.1.1 AC electromagnetic yoke(s) with a minimum lifting power of 10 lb (45 N) at the maximum leg spacing used. The yoke shall produce an alternating magnetic field of sufficient strength to produce readable indications on the test surface.
- 6.1.2 Wet magnetic particles: black iron oxide particles for visible (black on white) examination, suspended in a liquid carrier (water or oil). Fluorescent magnetic particles for fluorescent examination when specified.
- 6.1.3 Bath reservoir/spray applicator: A squeeze bulb, spray gun, or aerosol can for application of the magnetic particle bath to the examination surface.
- 6.1.4 White contrast background: water-based white contrast paint or aerosol for visible (black on white) examination, applied to the examination surface prior to particle application.
- 6.1.5 UV-A (black) light source: One or more ultraviolet light fixtures with a primary emission in the 315-400 nm range (peak at approximately 365 nm) for fluorescent MT examination. The UV light shall produce a minimum intensity of 1,000 $\mu\text{W}/\text{cm}^2$ at the examination surface.
- 6.1.6 Visible light meter: A calibrated visible light meter for verifying ambient visible light levels during examination and evaluation.
- 6.1.7 UV light meter: A calibrated UV-A radiometer/photometer for verifying UV light intensity at the examination surface.
- 6.1.8 Field strength indicator: A known artificial flaw device (e.g., Pie field indicator, Burmah-Castrol strip, or Ketos ring) for verification of adequate magnetic field strength at the examination surface.
- 6.1.9 Settling tube (centrifuge tube): A pear-shaped centrifuge tube for verifying bath particle concentration.
- 6.1.10 Lifting test weight: A carbon steel weight or plate of known mass (10 lb minimum) with a handle or attachment for verifying yoke lifting power.
- 6.1.11 Magnifying device (5x to 10x) for evaluation of small indications as needed.
- 6.1.12 Location markers, identification tags, and measuring devices for mapping and recording indication locations.

6.2 Yoke Specifications

6.2.1 The AC electromagnetic yoke used under this procedure shall have the following minimum specifications:

- (a) Type: AC electromagnetic yoke
- (b) Minimum lifting power: 10 lb (45 N) at maximum leg spacing used
- (c) Leg spacing range: 2 in. (50 mm) to 4 in. (100 mm) adjustable or fixed
- (d) Power source: 110/120 V AC, 50/60 Hz or battery-powered
- (e) Articulating legs: Capable of conforming to curved and flat surfaces

6.3 Magnetic Particle Bath

- 6.3.1 Wet Visible (Black on White): Black iron oxide magnetic particles suspended in a liquid carrier. The particles shall have high magnetic permeability and low coercive force. The particle size shall be in the range of 5-30 μm . The carrier shall be either water-based or oil-based as specified by the manufacturer.
- 6.3.2 Wet Fluorescent: Fluorescent-coated magnetic particles suspended in a liquid carrier. The particles shall produce a yellow-green fluorescence under UV-A light with a wavelength of 365 nm. The carrier shall be non-fluorescent.

6.3.3 Bath concentration: The concentration of magnetic particles in the bath shall be verified at the start of each shift and after each new bath mix using a settling tube. The concentration shall be within the manufacturer's recommended range, typically 1.0 to 2.5 mL of particle volume in a 100 mL bath sample after 30 minutes of settling.

6.4 White Contrast Background (Visible Method)

6.4.1 A white contrast background shall be applied to the examination surface prior to applying black magnetic particles for the wet visible method. The white contrast paint shall be water-based or solvent-based and shall provide a uniform white background for maximum black/white contrast.

6.4.2 The white background shall be thin and uniform, shall not obscure surface features or indications, and shall be fully dry before applying the magnetic particle bath.

6.5 Equipment Maintenance

6.5.1 All equipment used under this procedure shall be maintained in accordance with the manufacturer's operating manuals. Yoke pole contact surfaces shall be kept clean and free of paint, rust, or other materials that could reduce contact effectiveness.

6.5.2 Damaged yoke leg insulation, frayed power cords, or other equipment defects shall be repaired or replaced before the equipment is returned to service.

7.0 SURFACE PREPARATION

7.1 The surface of the material to be examined shall be prepared such that surface irregularities, weld reinforcement, spatter, paint, oil, grease, dirt, scale, or other conditions do not interfere with the formation or interpretation of magnetic particle indications.

7.2 Weld reinforcement shall not exceed the maximum permitted by the referencing code section. Excessively high weld reinforcement, sharp transitions, or irregular weld profiles may reduce the effectiveness of magnetic particle examination and should be ground smooth prior to examination.

7.3 Grinding marks, if present, shall not be oriented in a direction that could mimic or mask relevant indications. Grinding should be performed parallel to the expected direction of indications (i.e., perpendicular to the weld axis for longitudinal weld indications) where practical.

7.4 Surface preparation may include grinding, machining, wire brushing, abrasive blasting, or other methods as necessary to achieve a clean, smooth surface suitable for magnetic particle examination.

7.5 Paint, coatings, or other non-conductive surface layers shall be removed from the examination area prior to magnetic particle examination, as they may reduce the effectiveness of the magnetic field and prevent proper contact of the yoke legs. Where coatings must remain, the maximum allowable coating thickness shall be per the manufacturer's recommendation and the yoke's lifting power shall be verified through the coating.

7.6 Backing rings or strips, if used, shall not be considered as part of the material thickness for examination purposes.

7.7 For visible (black on white) MT, the white contrast background shall be applied after surface preparation is complete and the surface is clean and dry. The white background shall provide a uniform, thin, and continuous coating over the entire area of interest.

7.8 The surface shall be dry before application of the magnetic particle bath. Any moisture, oil, or other contaminants shall be removed prior to examination.

8.0 MAGNETIZATION TECHNIQUE

8.1 General

8.1.1 Magnetization shall be achieved using an AC electromagnetic yoke with continuous magnetization technique. The yoke shall be placed on the examination surface with the legs in intimate contact with the material to induce a magnetic field in the area of interest.

8.1.2 The AC electromagnetic yoke shall have a minimum lifting power of 10 lb (45 N) at the maximum leg spacing used. The lifting power shall be verified at the start of each shift and after any equipment change in accordance with Appendix I of this procedure.

8.1.3 The leg spacing of the yoke shall be between 2 in. (50 mm) and 4 in. (100 mm). The leg spacing shall be selected based on the geometry of the part and the area to be examined. For wider areas, multiple overlapping yoke placements shall be used to achieve full coverage.

8.2 Magnetization Directions

8.2.1 To ensure detection of all significant discontinuities, the area of interest shall be examined in at least two approximately perpendicular magnetization directions. The yoke shall be repositioned between the two examinations such that the magnetic field direction is approximately perpendicular for each examination.

8.2.2 For longitudinal welds, the first examination shall be performed with the yoke legs positioned perpendicular to the weld axis to detect longitudinal indications (cracks, seams, laps). The second examination shall be performed with the yoke legs positioned parallel to the weld axis to detect transverse indications.

8.2.3 For circumferential/girth welds, the first examination shall be performed with the yoke legs positioned perpendicular to the circumferential weld axis (i.e., legs across the weld) to detect circumferential/longitudinal indications. The second examination shall be performed with the yoke legs positioned parallel to the circumferential weld axis (i.e., legs along the weld) to detect transverse indications.

8.2.4 Each examination area shall be overlapped by at least 1 in. (25 mm) from the previous examination area to ensure complete coverage with no gaps.

8.3 Continuous Technique

8.3.1 The continuous technique shall be used for all examinations under this procedure. The magnetic field shall be applied and maintained while the magnetic particle bath is applied to the examination surface and while the examination/observation is performed.

8.3.2 The sequence shall be as follows: (a) Place the yoke on the examination surface and energize the yoke to establish the magnetic field; (b) Apply the magnetic particle bath to the examination surface while the yoke is energized; (c) Allow the bath to flow over the examination surface; (d) Observe the examination surface for indications while the yoke remains energized; (e) De-energize the yoke after the observation is complete.

8.3.3 The yoke shall remain energized during the entire application and flow of the bath. The yoke shall not be energized and de-energized rapidly (pulsed) during the examination, as this may cause particle agitation that produces false or non-relevant indications.

8.3.4 The bath shall be applied in a gentle manner to avoid washing away formed indications. The bath flow should be directed from one end of the area of interest toward the other end, or from the center outward, at low pressure.

8.4 Field Strength Verification

8.4.1 The magnetic field strength at the examination surface shall be verified at the start of each shift and after any equipment change using a field strength indicator (e.g., Pie field indicator, Burmah-Castrol strip, or

similar device) in accordance with Appendix II of this procedure.

8.4.2 The field strength indicator shall produce a clear, readable indication at the examination surface when the yoke is energized at the leg spacing and conditions to be used for production examination. If the field indicator does not produce a readable indication, the yoke leg spacing shall be reduced or the yoke shall be replaced or repaired.

8.4.3 For examination of materials with varying geometry or thickness, field strength verification shall be performed on the most unfavorable geometry or thickest section to ensure adequate field strength at all examination locations.

9.0 PARTICLE APPLICATION

9.1 Bath Preparation and Verification

9.1.1 The magnetic particle bath shall be prepared in accordance with the manufacturer's instructions. The bath shall be agitated or circulated continuously during use to maintain the particles in uniform suspension.

9.1.2 Bath concentration shall be verified at the start of each shift and after each new bath mix using a pear-shaped settling tube (centrifuge tube). A 100 mL sample of the bath shall be placed in the settling tube and allowed to settle for 30 minutes. The settled particle volume shall be within the manufacturer's recommended range, typically 1.0 to 2.5 mL for visible particles and 0.1 to 0.4 mL for fluorescent particles.

9.1.3 If the bath concentration is outside the specified range, the bath shall be adjusted by adding particles or carrier as necessary and re-verified. Bath concentration records shall be maintained per Section 15.0.

9.2 Particle Application Procedure

9.2.1 For the wet visible (black on white) method, the white contrast background shall be applied and allowed to dry completely before the yoke is energized and the black magnetic particle bath is applied.

9.2.2 The yoke shall be energized and the magnetic field established before the magnetic particle bath is applied. The bath shall be applied by spray, squeeze bulb, or aerosol can while the yoke is energized.

9.2.3 The bath shall be applied in a gentle, low-pressure manner to avoid disturbing formed indications. The bath should be directed to flow across the examination surface, not directly at the surface with high pressure.

9.2.4 Excess bath shall be allowed to drain or be gently blown from the examination surface to allow the indications to be visible. Care shall be taken not to wash away formed indications.

9.2.5 The examination surface shall be observed for indications while the yoke is still energized and the bath is still flowing or immediately after the bath flow has stopped. The yoke shall remain energized until the observation is complete.

9.3 Bath Carrier

9.3.1 Water-based carrier: When a water-based carrier is used, a wetting agent may be added per the manufacturer's recommendations to ensure proper wetting of the examination surface. The water-based carrier shall not cause corrosion of the examination surface.

9.3.2 Oil-based carrier: When an oil-based carrier is used, the oil shall have a flash point above the maximum surface temperature expected during examination. The oil shall be compatible with the magnetic particles used.

9.3.3 The carrier type (water or oil) shall be documented in the technique sheet and examination report.

10.0 INSPECTION AND OBSERVATION

10.1 Observation Conditions

10.1.1 For wet visible (black on white) MT examination, the examination shall be performed under adequate visible light with a minimum intensity of 100 foot-candles (1,076 lux) at the examination surface. The ambient visible light level shall be verified using a calibrated visible light meter at the start of each shift.

10.1.2 For wet fluorescent MT examination, the examination shall be performed in a darkened area with a maximum ambient visible light level of 2 foot-candles (21.5 lux). The UV-A light intensity at the examination surface shall be a minimum of 1,000 $\mu\text{W}/\text{cm}^2$. The UV-A light intensity shall be verified using a calibrated UV-A radiometer/photometer at the start of each shift.

10.1.3 A minimum dark adaptation period of 1 minute shall be observed before performing fluorescent MT examination. Personnel shall not wear photochromic or dark-tinted lenses during examination.

10.2 Examination Coverage

10.2.1 The examination shall be performed systematically by placing the yoke at sequential locations along the area of interest. Each yoke placement shall overlap the previous placement by at least 1 in. (25 mm) to ensure full coverage with no gaps.

10.2.2 For each yoke placement, the bath shall be applied and the surface observed for indications while the yoke is energized. The yoke shall then be de-energized, repositioned to the next location, and the process repeated.

10.2.3 Two examinations shall be performed at each location with the yoke rotated approximately 90° between examinations to ensure detection of indications in both perpendicular directions per Section 8.2.

10.3 Interpretation of Indications

10.3.1 Indications observed during examination shall be evaluated as relevant or non-relevant. Relevant indications are those caused by actual discontinuities in the material. Non-relevant indications may be caused by geometry, magnetic permeability changes, surface conditions, or other non-discontinuity conditions.

10.3.2 Non-relevant indications shall be investigated and documented. If a non-relevant indication is suspected, the area may be re-examined after surface conditioning (e.g., grinding, cleaning) or by using another NDT method to verify the nature of the indication.

10.3.3 Relevant indications shall be classified as linear or rounded. Linear indications are those with a length more than three (3) times the width. Rounded indications are those with a length three (3) times the width or less.

10.3.4 Aligned indications: Three or more rounded indications in a line separated by 1/16 in. (1.6 mm) or less edge-to-edge shall be evaluated as a linear indication.

10.4 Indication Recording

10.4.1 All relevant indications shall be recorded on the examination report. The location, length, and orientation of each indication shall be documented. A dimensioned sketch or photograph may be used to record indication locations.

10.4.2 For recording indication locations, the position shall be referenced to a known datum (e.g., 0° or 12 o'clock position for circumferential welds) and the distance from the datum shall be measured and recorded.

11.0 EVALUATION OF INDICATIONS

11.1 Evaluation of all relevant indications shall be performed by a minimum MT Level II certified technician. Indications shall be evaluated against the applicable acceptance criteria as specified in Section 12.0 and Appendix III.

11.2 Non-Relevant Indications

11.2.1 Non-relevant indications are those caused by conditions other than actual material discontinuities. Common causes of non-relevant indications include:

- (a) Magnetic permeability changes at heat-affected zones, weld toes, or material transitions
- (b) Geometric conditions such as sharp corners, threads, keyways, or fillets
- (c) Surface conditions such as scratches, tool marks, or surface roughness
- (d) Excessive magnetic field strength or improper yoke placement
- (e) Part configuration or material thickness changes

11.2.2 Non-relevant indications shall be investigated by the technician. If the cause can be attributed to a non-discontinuity condition, the indication shall be documented as non-relevant with the cause noted. If the cause cannot be determined, the indication shall be evaluated as relevant.

11.3 Relevant Indications

11.3.1 Relevant indications are those caused by actual material discontinuities including cracks, seams, laps, laminations, incomplete fusion, incomplete penetration, and other planar or volumetric flaws that intersect or are near the examination surface.

11.3.2 Linear Indications: Indications with a length more than three (3) times the width. Linear indications typically represent planar discontinuities such as cracks, seams, laps, or lack of fusion.

11.3.3 Rounded Indications: Indications with a length three (3) times the width or less. Rounded indications typically represent volumetric discontinuities such as porosity or inclusions.

11.3.4 Aligned Indications: Three or more rounded indications in a line separated by 1/16 in. (1.6 mm) or less edge-to-edge shall be evaluated as a linear indication per the applicable acceptance criteria.

11.4 Verification and Re-Examination

11.4.1 When doubt exists as to the nature of an indication, verification may be obtained by re-examination with MT using an alternative technique, or by using another NDT method such as ultrasonic testing (UT), radiographic testing (RT), or liquid penetrant testing (PT) as applicable.

11.4.2 The surface may be ground or otherwise conditioned before re-examination to remove surface irregularities that may produce non-relevant indications. The amount of material removed shall be documented and shall not exceed the maximum permitted by the referencing code or engineering specification.

11.4.3 If after re-examination the indication persists, it shall be evaluated as relevant and dispositioned per the applicable acceptance criteria.

12.0 STANDARDS OF ACCEPTANCE

12.1 Unless otherwise specified, code-specific magnetic particle acceptance criteria shall be used for evaluation as applicable. A project-specific addendum shall be developed to address project-specific acceptance criteria as required by the customer.

12.2 For API 1104, 21st Edition applications, the acceptance criteria for magnetic particle inspection shall be in accordance with API 1104 21st Edition Section 9.5. The acceptance criteria are reproduced in Appendix III of this procedure.

12.3 API 1104, 21st Edition Section 9.5 – Magnetic Particle Acceptance Criteria

12.3.1 The following acceptance criteria apply to magnetic particle examination of pipeline welds in accordance with API 1104, 21st Edition, Section 9.5. These criteria are applicable to welds in pipe with a nominal wall thickness as specified.

12.4 General Acceptance Criteria (API 1104 21st Edition Section 9.5)

12.4.1 The following imperfections shall be considered defects if they exceed the following criteria:

Imperfection Type	Unacceptable If:
Crack (all types)	Any crack, regardless of length
Linear indication	Length > 1/8 in. (3 mm)
Rounded indication	Maximum dimension > 1/8 in. (3 mm)
Aligned indications (4 or more rounded in a line)	Separated by 1/16 in. (1.6 mm) or less edge-to-edge; evaluated as a linear indication with total length > 1/8 in. (3 mm)
Incomplete fusion (IF)	Any length, when detectable by MT
Incomplete penetration (IP)	Any length, when detectable by MT
Undercut (internal)	Depth > 1/32 in. (0.8 mm) or > 25% of wall thickness
Undercut (external)	Depth > 1/32 in. (0.8 mm) or > 12-1/2% of wall thickness

12.5 Indication Classification

12.5.1 Any indication with a maximum dimension of 1/16 in. (1.6 mm) or less shall be classified as non-relevant. Any larger indication believed to be non-relevant shall be regarded as relevant until re-examined by MT or another NDT method to determine whether an actual imperfection exists.

12.5.2 Relevant indications are those caused by imperfections. Linear indications are those in which the length is more than three (3) times the width. Rounded indications are those in which the length is three (3) times the width or less.

12.5.3 Aligned indications: Four (4) or more rounded indications in a line, separated by 1/16 in. (1.6 mm) or less edge-to-edge, shall be evaluated as a linear indication. The total length of the aligned indications shall be measured and evaluated against the linear indication acceptance criteria.

12.6 Base Material Imperfections

12.6.1 Imperfections in the base material detected by magnetic particle examination shall be reported to the Customer. The disposition of these imperfections shall be as directed by the Customer.

12.7 When doubt exists about the type of imperfection being disclosed by an indication, verification may be obtained by using other NDT methods such as ultrasonic testing (UT), radiographic testing (RT), or liquid penetrant testing (PT) as applicable.

13.0 CALIBRATION AND VERIFICATION

13.1 Yoke Lifting Power Verification

13.1.1 The lifting power of each AC electromagnetic yoke shall be verified at the start of each shift and after any equipment change or repair. The verification shall be performed in accordance with Appendix I of this procedure.

13.1.2 The yoke shall be energized at the maximum leg spacing to be used and shall lift a 10 lb (45 N) carbon steel weight or plate. If the yoke fails to lift the weight, the yoke shall not be used for production examination until the issue is resolved.

13.1.3 Lifting power verification records shall be maintained per Section 15.0. The record shall include: date, yoke serial number, leg spacing, weight lifted, and the name of the person performing the verification.

13.2 Field Strength Verification

13.2.1 The magnetic field strength at the examination surface shall be verified at the start of each shift and after any equipment change using a field strength indicator (e.g., Pie field indicator, Burmah-Castrol strip, or Ketos ring) in accordance with Appendix II of this procedure.

13.2.2 The field strength indicator shall be placed on the test surface and the yoke energized at the leg spacing and conditions to be used for production examination. The indicator shall produce a clear, readable indication at the examination surface.

13.2.3 If the field strength indicator does not produce a readable indication, the yoke leg spacing shall be reduced, the contact surfaces shall be cleaned, or the yoke shall be replaced or repaired before proceeding.

13.3 Bath Concentration Verification

13.3.1 The bath concentration shall be verified at the start of each shift and after each new bath mix using a pear-shaped settling tube. A 100 mL sample of the bath shall be placed in the settling tube and allowed to settle for 30 minutes.

13.3.2 The settled particle volume shall be within the manufacturer's recommended range. For visible particles, the typical range is 1.0 to 2.5 mL. For fluorescent particles, the typical range is 0.1 to 0.4 mL. The specific range shall be as specified by the particle manufacturer.

13.3.3 If the bath concentration is outside the specified range, the bath shall be adjusted by adding particles or carrier as necessary and re-verified before proceeding.

13.4 Light Meter Calibration

13.4.1 Visible light meters and UV-A light meters shall be calibrated at intervals not exceeding 12 months by the meter manufacturer or an accredited calibration laboratory. Calibration certificates shall be maintained with the equipment.

13.4.2 The visible light meter shall be used to verify ambient visible light levels at the examination surface for both visible and fluorescent MT examination. For visible MT, the minimum ambient visible light shall be 100 foot-candles (1,076 lux). For fluorescent MT, the maximum ambient visible light shall be 2 foot-candles (21.5 lux).

13.4.3 The UV-A light meter shall be used to verify UV-A light intensity at the examination surface for fluorescent MT examination. The minimum UV-A intensity shall be 1,000 $\mu\text{W}/\text{cm}^2$ at the examination surface.

13.5 Calibration Intervals Summary

Verification Item	Frequency	Requirement
-------------------	-----------	-------------

Yoke lifting power	Each shift / after equipment change	≥10 lb (45 N) at max leg spacing
Field strength indicator	Each shift / after equipment change	Readable indication at test surface
Bath concentration	Each shift / after each new mix	Within manufacturer's range (settling tube)
Visible light meter calibration	Annual (12 months max)	Per manufacturer or accredited lab
UV-A light meter calibration	Annual (12 months max)	Per manufacturer or accredited lab
UV-A light intensity (fluorescent)	Each shift	≥1,000 μW/cm² at surface
Ambient visible light (visible MT)	Each shift	≥100 FC (1,076 lux) at surface
Ambient visible light (fluorescent MT)	Each shift	≤2 FC (21.5 lux)

14.0 PROCEDURE QUALIFICATION

14.1 When procedure qualification is required, any change to a requirement identified as an essential variable (see the essential variables table below) shall require requalification of this procedure by demonstration. Where a range is specified for an essential variable, the bounding values of the range shall be qualified by demonstration. A change of a requirement identified as a non-essential variable does not require requalification of the written procedure.

14.2 All changes of essential or non-essential variables from those in this procedure shall require a revision of, or an addendum to, the procedure. The essential and non-essential variables for magnetic particle examination using the yoke technique are listed in the table below.

Variable	Essential	Non-Essential
Yoke type (AC electromagnetic yoke)	X	
Yoke lifting power (≥ 10 lb / 45 N)	X	
Leg spacing range (2-4 in. / 50-100 mm)	X	
Magnetization technique (continuous)	X	
Particle type (wet visible black on white)	X	
Particle type (wet fluorescent)	X	
Bath carrier type (water or oil)	X	
Bath concentration range	X	
Material type or thickness range	X	
Acceptance criteria (code or standard)	X	
UV-A light intensity ($\geq 1,000$ $\mu\text{W}/\text{cm}^2$)	X	
Visible light intensity (≥ 100 FC)	X	
Field strength verification method	X	
White contrast background (visible method)		X
Application method of bath (spray, squeeze)		X
Location marker placement method		X
Recording method (sketch, photo)		X
Personnel qualification		X

15.0 RECORDS AND DOCUMENTATION

15.1 Examination Report: A technique sheet and examination report shall be developed for each specific project. The report shall contain, as a minimum, the following information:

- (a) Date of examination
- (b) Name and/or identity and certification level for personnel performing the examination
- (c) Identification of the weld, part, or component examined including weld number, serial number, or other identifier
- (d) Examination method, technique, procedure identification, and revision (PII-MT Rev 05)
- (e) Material type, specification/grade, and wall thickness
- (f) Pipe diameter (NPS) and schedule as applicable
- (g) Yoke type, manufacturer, model, and serial number
- (h) Yoke lifting power verification result and date
- (i) Field strength verification result and date
- (j) Leg spacing used during examination
- (k) Bath type (wet visible or wet fluorescent), particle manufacturer and lot number
- (l) Bath carrier type (water or oil)
- (m) Bath concentration verification result (settling tube reading)
- (n) Visible light intensity at examination surface (foot-candles)
- (o) UV-A light intensity at examination surface (for fluorescent MT, $\mu\text{W}/\text{cm}^2$)
- (p) Ambient visible light level for fluorescent MT (foot-candles)
- (q) Acceptance criteria (code, edition, section)
- (r) Results of the examination, including all relevant indications
- (s) Location, length, and orientation of each indication
- (t) Disposition of indications (accept, reject, repair, re-examine)
- (u) Sketch or photograph of indication locations as applicable

15.2 Calibration Records: The following calibration and verification records shall be maintained:

- (a) Yoke lifting power verification records (date, yoke S/N, weight lifted, leg spacing, technician name)
- (b) Field strength verification records (date, indicator type, yoke S/N, result, technician name)
- (c) Bath concentration verification records (date, settling tube reading, bath type, technician name)
- (d) Visible light meter calibration certificate (annual)
- (e) UV-A light meter calibration certificate (annual)
- (f) UV-A light intensity verification records (date, light meter S/N, intensity measured, technician name)
- (g) Visible light intensity verification records (date, light meter S/N, intensity measured, technician name)

15.3 Storage of Records: All examination records and reports shall be maintained in accordance with Prime Inspections Inc. retention policies and the referencing code section requirements. Unless otherwise specified, records shall be retained for a minimum of 5 years or as required by the referencing code or customer specification.

15.4 Documentation of Personnel and Procedure Demonstrations

15.4.1 Personnel or procedure demonstrations performed shall be performed and documented as specified by the referencing code section. When documentation requirements for personnel or procedure demonstrations are not specified by the referencing code section, the following information shall be recorded as a minimum:

- (a) Name of the organization responsible for preparation and approval of the examination procedure
- (b) Examination method applied (Magnetic Particle — Yoke)
- (c) Procedure number and designation (PII-MT Rev 05)
- (d) Number and date of most recent revision
- (e) Date of the demonstration
- (f) Name and certification level of personnel performing the demonstration

16.0 SAFETY

16.1 All magnetic particle examination work performed under this procedure shall comply with applicable federal, state, and local safety regulations, including OSHA 29 CFR 1910 (General Industry) and applicable site-specific safety requirements.

16.2 Prior to beginning work, all personnel shall read, understand, and follow the requirements of the applicable Job Hazard Analysis (JHA) and all site-specific safety requirements, including the use of appropriate personal protective equipment (PPE).

16.3 Personal Protective Equipment (PPE): All personnel shall wear appropriate PPE including safety glasses, hard hat, safety shoes, and gloves as required by the site-specific requirements. For fluorescent MT examination, UV-A protective glasses shall be worn to prevent eye exposure to UV-A light.

16.4 UV-A Light Safety: Personnel performing fluorescent MT examination shall not look directly at the UV-A light source. UV-A protective glasses shall be worn at all times when the UV-A light is in operation. Skin exposure to UV-A light shall be minimized. The UV-A light source shall be turned off when not in use.

16.5 Electrical Safety: The AC electromagnetic yoke operates on 110/120 V AC. All electrical equipment shall be in good condition with no frayed cords or damaged plugs. Ground fault circuit interrupter (GFCI) protection shall be used when operating in wet or damp environments. Equipment shall be inspected before each use for damage.

16.6 Bath Material Safety: The magnetic particle bath and white contrast background may contain chemicals that can cause skin or eye irritation. Material Safety Data Sheets (MSDS) or Safety Data Sheets (SDS) for all bath materials and contrast paints shall be available at the examination site. Personnel shall avoid skin contact with the bath and wash hands after handling.

16.7 Confined Space: When performing MT examination in confined spaces, all applicable confined space entry procedures shall be followed, including atmospheric testing, ventilation, and rescue procedures as required by site-specific requirements.

16.8 Any questions regarding safety concerns or requirements shall be directed to the lead technician, supervisor, or facility representative before beginning or resuming work.

17.0 REVISION HISTORY

17.1 This procedure shall be reviewed at intervals not to exceed one year by the designated NDT Level III and the Corporate Quality Manager. The review shall verify that the procedure remains current with the latest editions of all referenced codes and standards.

17.2 All revisions to this procedure shall be documented in the Revision / Change Summary at the front of this procedure. Each revision shall be reviewed and approved by the Corporate Quality Manager and the designated NDT Level III.

17.3 When a revision is issued, the previous revision shall be superseded and shall be removed from service. The current revision level shall be identified on the cover page and on each page of the procedure.

Revision History Summary

Revision	Date	Description of Change
0	4/12/2020	Initial Issue
01	8/12/2021	Code Review; updated for ASME Section V 2021 Edition
02	1/1/2024	Code Review; updated for ASME Section V 2023 Edition; added yoke lifting power verification requirements
03	1/1/2025	Code Review; updated for API 1104 21st Edition; added MT acceptance criteria per Section 9.5
04	1/1/2026	Code Review; updated for ASME Section V 2025 Edition; added field strength verification per Article 7
05	9/7/2026	Complete rewrite to ASME Section V Article 7 (2025 Edition) and API 1104 21st Edition Section 9.5; expanded yoke technique, wet visible/fluorescent methods, calibration, and appendices

APPENDIX I

Yoke Lifting Power Verification Procedure

This appendix provides the procedure for verification of the AC electromagnetic yoke lifting power in accordance with ASME Section V, Article 7.

- 1.0 Purpose: To verify that the AC electromagnetic yoke has a minimum lifting power of 10 lb (45 N) at the maximum leg spacing to be used for production examination.
- 2.0 Equipment Required: AC electromagnetic yoke, 10 lb (45 N) carbon steel weight or plate with attachment, calibrated to known mass.
- 3.0 Procedure:
 - 3.1 Energize the yoke and place the legs on the carbon steel weight or plate at the maximum leg spacing to be used for production examination.
 - 3.2 Ensure the yoke legs are in intimate contact with the weight or plate surface.
 - 3.3 Lift the weight or plate by energizing the yoke. The yoke shall hold the weight or plate for a minimum of 1 second without slipping or dropping.
 - 3.4 If the yoke successfully lifts and holds the 10 lb (45 N) weight, the yoke is acceptable for use.
 - 3.5 If the yoke fails to lift the weight, clean the yoke leg contact surfaces, reduce the leg spacing, or replace/repair the yoke before re-testing.
- 4.0 Documentation: Record the date, yoke serial number, leg spacing, weight lifted, and the name of the person performing the verification on the Yoke Lifting Power Verification Record.
- 5.0 Frequency: Lifting power verification shall be performed at the start of each shift, after any equipment change or repair, and at any time the yoke's performance is in question.

APPENDIX II

Field Strength Verification Procedure

This appendix provides the procedure for verification of magnetic field strength at the examination surface in accordance with ASME Section V, Article 7.

- 1.0 Purpose: To verify that the magnetic field strength at the examination surface is adequate to produce readable particle indications during magnetic particle examination.
- 2.0 Equipment Required: AC electromagnetic yoke, field strength indicator (Pie field indicator, Burmah-Castrol strip, or Ketos ring), magnetic particle bath.
- 3.0 Procedure using Pie Field Indicator or Burmah-Castrol Strip:
 - 3.1 Place the field strength indicator on the test surface at the location to be examined.
 - 3.2 Position the yoke legs on the test surface on either side of the field indicator at the leg spacing to be used for production examination.
 - 3.3 Energize the yoke to establish the magnetic field.
 - 3.4 Apply the magnetic particle bath to the field indicator while the yoke is energized.
 - 3.5 Observe the field indicator for a clear, readable indication at the artificial flaw or notch.
 - 3.6 If a clear indication is produced, the field strength is adequate. If no indication is produced, reduce the leg spacing, clean the yoke contact surfaces, or replace the yoke before re-testing.
- 4.0 Documentation: Record the date, indicator type, yoke serial number, leg spacing, result, and the name of the person performing the verification.
- 5.0 Frequency: Field strength verification shall be performed at the start of each shift, after any equipment change or repair, and whenever the examination surface material or geometry changes significantly.

APPENDIX III

Acceptance Criteria Tables (API 1104 21st Edition Section 9.5)

The following tables reproduce the acceptance criteria from API 1104, 21st Edition, Section 9.5, for magnetic particle examination of pipeline welds. These criteria are provided for reference; the applicable edition of API 1104 shall govern in case of any discrepancy.

Table MT-1 – Magnetic Particle Acceptance Criteria (API 1104 21st Edition Section 9.5)

Imperfection Type	Unacceptable If:
Crack (all types)	Any crack, regardless of length
Linear indication	Length > 1/8 in. (3 mm)
Rounded indication	Maximum dimension > 1/8 in. (3 mm)
Aligned indications (4+ in a line)	Separated by 1/16 in. (1.6 mm) or less edge-to-edge; total length > 1/8 in. (3 mm)
Incomplete fusion (IF)	Any length when detectable by MT
Incomplete penetration (IP)	Any length when detectable by MT
Undercut (internal)	Depth > 1/32 in. (0.8 mm) or > 25% of wall thickness
Undercut (external)	Depth > 1/32 in. (0.8 mm) or > 12-1/2% of wall thickness

Table MT-2 – Indication Classification

Indication Type	Definition	Evaluation
Non-relevant	Maximum dimension $\leq 1/16$ in. (1.6 mm)	Not evaluated; documented as non-relevant
Linear	Length > 3×width	Evaluated per linear indication criteria
Rounded	Length $\leq 3 \times$ width	Evaluated per rounded indication criteria
Aligned	4+ rounded in a line separated by $\leq 1/16$ in. (1.6 mm) edge-to-edge	Evaluated as linear indication
Crack	Any linear indication determined to be a crack	Unacceptable regardless of length

APPENDIX IV

UV Light and Visible Light Verification Procedure

This appendix provides the procedure for verification of UV-A light intensity and visible light levels for magnetic particle examination in accordance with ASME Section V, Article 7 and ASTM E2297.

1.0 Purpose: To verify that the UV-A light intensity at the examination surface meets the minimum requirement of 1,000 $\mu\text{W}/\text{cm}^2$ for fluorescent MT, and that the ambient visible light levels meet the requirements for both visible and fluorescent MT examination.

2.0 Equipment Required: Calibrated UV-A radiometer/photometer, calibrated visible light meter, UV-A light source, examination surface or representative test area.

3.0 UV-A Light Intensity Verification (Fluorescent MT):

3.1 Turn on the UV-A light source and allow it to warm up for a minimum of 5 minutes.

3.2 Place the UV-A radiometer/photometer sensor at the examination surface distance (i.e., the distance from the UV light source to the part surface during examination).

3.3 Read and record the UV-A intensity in $\mu\text{W}/\text{cm}^2$. The measured intensity shall be $\geq 1,000 \mu\text{W}/\text{cm}^2$ at the examination surface.

3.4 If the intensity is below 1,000 $\mu\text{W}/\text{cm}^2$, move the UV light closer to the surface, replace the UV bulb or LED source, or use additional UV light sources.

4.0 Ambient Visible Light Verification (Fluorescent MT):

4.1 With the examination area darkened and the UV light turned off, place the visible light meter sensor at the examination surface.

4.2 Read and record the ambient visible light level in foot-candles. The ambient visible light shall be $\leq 2 \text{ FC}$ (21.5 lux) for fluorescent MT.

4.3 If the ambient visible light exceeds 2 FC, darken the examination area by reducing external light sources, using curtains or shields, or performing the examination at a different location.

5.0 Visible Light Verification (Visible MT):

5.1 Place the visible light meter sensor at the examination surface.

5.2 Read and record the visible light level in foot-candles. The visible light shall be $\geq 100 \text{ FC}$ (1,076 lux) at the examination surface.

5.3 If the visible light is below 100 FC, add additional lighting or reposition existing lights to increase illumination at the examination surface.

6.0 Documentation: Record the date, light meter serial number, calibration due date, measured values, and the name of the person performing the verification.

7.0 Frequency: Light verification shall be performed at the start of each shift, after any equipment change, and whenever examination conditions change.

Table LT-1 – Light Requirements Summary

Parameter	Visible MT	Fluorescent MT
Visible light at surface	$\geq 100 \text{ FC}$ (1,076 lux)	$\leq 2 \text{ FC}$ (21.5 lux)
UV-A light at surface	N/A	$\geq 1,000 \mu\text{W}/\text{cm}^2$

Dark adaptation period	N/A	≥1 minute
Light meter calibration	Annual	Annual

APPENDIX V

Technique Sheet Template

The following template shall be used for the project-specific technique sheet. A separate technique sheet shall be developed for each project or weld configuration.

Parameter	Value
Project Name / Number	
Procedure Number / Revision	PII-MT Rev 05
Yoke Type	AC Electromagnetic Yoke
Yoke Manufacturer / Model	
Yoke Serial Number	
Yoke Lifting Power (lb)	≥10 lb (45 N)
Leg Spacing (in. / mm)	
Magnetization Technique	Continuous
Particle Type (Visible / Fluorescent)	Wet Visible (Black on White)
Particle Manufacturer / Lot No.	
Bath Carrier (Water / Oil)	
Bath Concentration (settling tube)	
White Contrast Background (if visible)	
Field Strength Indicator Type	
Field Strength Verification Result	
UV-A Light Intensity ($\mu\text{W}/\text{cm}^2$)	≥1,000 (fluorescent only)
Ambient Visible Light (FC)	≥100 (visible) / ≤2 (fluorescent)
Visible Light Meter S/N / Cal. Date	
UV-A Light Meter S/N / Cal. Date	
Pipe Diameter (in. / mm)	
Wall Thickness (in. / mm)	
Material Specification / Grade	
Acceptance Criteria (Code / Section)	API 1104 21st Ed. Section 9.5
Examination Area (sketch / map)	
Technician Name / Cert. Level	
Date of Examination	
Results / Indications	

Disposition (Accept / Reject / Repair)	
Level III Review / Approval	

END OF DOCUMENT