SECTION V
Article 2, Mandatory Appendix IX
Paragraph IX-277.1

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>PROPOSED</th>
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<tr>
<td><strong>IX-263 BEAM WIDTH</strong></td>
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<tr>
<td>When a change in motion of the source, detector, travel speed, or any combination of these occurs, the beam width shall be controlled by a metal diaphragm such as lead. The diaphragm for the energy selected shall be at least 10 half value layers thick.</td>
<td>When a change in the motion of the source, detector, travel speed, or any combination of these occur, the beam width shall be controlled by a metal diaphragm such as lead. The diaphragm for the energy selected shall be at least 10 half value layers thick.</td>
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**IX-274 GEOMETRIC AND IN-MOTION UNSHARPNESS**

IX-274.1 Geometric Unsharpness. Recommended geometric unsharpness shall be determined in accordance with T-274.1.

IX-274.2 In-Motion Unsharpness. In-motion unsharpness of the radiograph shall be determined in accordance with

\[ \beta_M = \frac{w_M}{D} \]

where

- \( D \) = distance from source of radiation to material/weld being radiographed
- \( d \) = distance from source side of the material/weld being radiographed to the film
- \( UM \) = in-motion unsharpness
- \( w \) = beam width at the source side of the material/weld measured in the direction of motion determined as specified in IX-263

**IX-275 LOCATION MARKERS**

(a) When encoders are used for in-motion applications, location markers are not required. A calibration check shall be performed to verify that the displayed distance does not exceed ±1% of the actual distance moved.

(b) When encoders are not used, the requirements of T-275 shall apply.

(a) When encoders are used for automated examination techniques, location markers are not required. A calibration check shall be performed to verify that the displayed distance does not exceed ±1% of the actual distance moved.

(b) When encoders are not used, the requirements of T-275 shall apply.
IX-277 USE OF IQIS TO MONITOR RADIOGRAPHIC EXAMINATION

IX-277.1 Placement of IQIs.

(a) Source-Side IQI(s). When using separate blocks for IQI placement as described in T-277.1(a), the thickness of the blocks shall be such that the image brightness at the body of the IQI is judged to be equal to or greater than the image brightness at the area of interest for a negative image format. If verified by measurement, pixel intensity variations up to 2% are permitted in the determination of “equal to.” This image brightness requirement is reversed for a positive image format.

(b) For longitudinal welds examined using an in-motion technique, hole IQIs shall be placed adjacent to and on each side of the weld seam, or on the weld seam at the beginning and end of the weld seam, and thereafter at approximately equal intervals not exceeding 36 in. (914 mm). Wire IQIs, when used, shall be placed across the weld seam at an angle that is approximately between 2 deg and 5 deg to the rows/columns of the detector and spaced as indicated above for hole IQIs.

(c) For circumferential welds examined using an in-motion technique, hole IQIs shall be placed adjacent to and on each side of the weld seam or on the weld seam in each quadrant or spaced no greater than 36 in. (914 mm) apart, whichever is smaller. Wire IQIs, when used, shall be placed across the weld seam at an angle that is approximately between 2 deg and 5 deg to the rows/columns of the detector and spaced as indicated above for hole IQIs.

(d) For in-motion techniques, the IQI may be placed above the surface of the pipe or held in position between the surface of the pipe and the imager by a fixture attached to the imager or scanning device. Acceptability of such IQI placement shall be demonstrated during procedure qualification.

(e) All other requirements of T-277.1 shall apply.

IX-A-221 DEMONSTRATION BLOCK

The demonstration block shall meet the requirements of Mandatory Appendix VIII, Supplement A, Figure VIII-A-221-1 and shall be of material that is radiographically similar to the material described in the procedure.

(a) A minimum of two demonstration blocks, representing the minimum and maximum thicknesses of

IX-277 USE OF IQIS TO MONITOR RADIOGRAPHIC EXAMINATION

IX-277.1 Placement of IQIs.

(a) Source-Side IQI(s). When using separate blocks for IQI placement as described in T-277.1(a), the thickness of the blocks shall be such that the image brightness at the body of the IQI is judged to be equal to or greater than the image brightness at the area of interest for a negative image format. If verified by measurement, pixel intensity variations up to 2% are permitted in the determination of “equal to.” This image brightness requirement is reversed for a positive image format.

(b) For longitudinal welds examined using an automated examination technique, hole IQIs shall be placed adjacent to and on each side of the weld seam, or on the weld seam at the beginning and end of the weld seam, and thereafter at approximately equal intervals not exceeding 36 in. (914 mm). Wire IQIs, when used, shall be placed across the weld seam at an angle that is approximately between 2 deg and 5 deg to the rows/columns of the detector and spaced as indicated above for hole IQIs.

(c) For circumferential welds examined using an automated examination technique, hole IQIs shall be placed adjacent to and on each side of the weld seam or on the weld seam in each quadrant or spaced no greater than 36 in. (914 mm) apart, whichever is smaller. Wire IQIs, when used, shall be placed across the weld seam at an angle that is approximately between 2 deg and 5 deg to the rows/columns of the detector and spaced as indicated above for hole IQIs.

(d) For automated examination techniques, the IQI may be placed above the surface of the pipe or held in position between the surface of the pipe and the imager by a fixture attached to the imager or scanning device. Acceptability of such IQI placement shall be demonstrated during procedure qualification.

(e) All other requirements of T-277.1 shall apply.

IX-A-221 DEMONSTRATION BLOCK

The demonstration block shall meet the requirements of Mandatory Appendix VIII, Supplement A, Figure VIII-A-221-1 and shall be of material that is radiographically similar to the material described in the procedure.

(a) A minimum of two demonstration blocks, representing the minimum and maximum thicknesses of
the procedure thickness range, shall be required for procedure qualification.
(b) Additional blocks may be used to validate specific parameters at intermediate thicknesses throughout the total thickness range.
(c) As an alternative to (a) and (b), one block containing a series of embedded notches of different depths may be used with shim plates of appropriate thicknesses to provide demonstration of both the minimum and maximum thicknesses to be qualified for the procedure.

For in-motion procedures, pipe, rolled plate, or other suitable product forms may be used to accommodate radiation devices, transport mechanisms, and related fixturing as necessary in order to replicate procedure application variables.

For automated examination techniques, pipe, rolled plate, or other suitable product forms may be used to accommodate radiation devices, transport mechanisms, and related fixturing as necessary in order to replicate procedure application variables.
SECTION V
Article 1, Mandatory Appendix I
I-121.1 RT

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<thead>
<tr>
<th>CURRENT</th>
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<tr>
<td><strong>I-121.1 RT — Radiography.</strong></td>
<td><strong>INSERT</strong></td>
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<td><em>analog image:</em> an image produced by a continuously variable physical process (for example, exposure of film).</td>
<td><em>automated examination technique:</em> a 2D radiographic examination in which the radiation source and the detector are held in a pre-determined fixed position, then moved in a controlled progression to perform the examination. Alternatively, the source/detector may remain stationary while the component is moved to perform the examination.</td>
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<tr>
<td><em>annotate:</em> to provide an explanatory note on the digital image.</td>
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