RADIOGRAPHIC EXAMINATION

JAICO

PREPARED BY : _____ DATE : _____

REVIEWED BY : _____ DATE : _____

APPROVED BY : _____ DATE : _____

CUSTOMER

REVIEWED BY : _____ DATE : _____

APPROVED BY : _____ DATE : _____

REMARK :

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1.0 SCOPE AND PURPOSE

This procedure describes the requirements and techniques for Radiographic Examination(RT) of ferrous materials and their welds.

2.0 APPLICABLE CODES AND STANDARDS

The following Codes and Standards are referred to herein.

(a) ASME Code Sec.V ('98Ed. & Latest Applicable Addenda)
(b) ASME Code Sec.VIII, Div.1 ('98Ed. & Latest Applicable Addenda)
(c) SNT-TC-1A (Current Code Adopted Editions)

3.0 PERSONNEL QUALIFICATION

3.1 All personnel performing the RT shall be certified in accordance with the "JA-WR-1(Standard of NDE Personnel Qualification and Certification)" which complies with the requirements of SNT-TC-1A.

3.2 The results of Radiographic examination shall be evaluated only by personnel certified to JAICO RT Level II or III.

4.0 RADIATION SOURCE

4.1 Portable X-ray Generating Machine

4.1.1 The radiographic technique shall demonstrate that the required radiographic sensitivity has been obtained.

4.1.2 The verification of focal spot size shall be acceptable in accordance with the manufacturer's publications such as technical manuals.
The focal spot size may be determined by the pinhole method.

4.2 Iridium-192 (Ir-192)

4.2.1 Ir-192 may be used as a source for all Radiographic Examination provided they have adequate penetrating ability.

4.2.2 The verification of source size shall be acceptable in accordance with the manufacturer's publications such as technical manuals.
The source size may be determined by ASTM E1114-86.

4.2.3 The recommended minimum thickness for which Ir-192 may be used is as follows;

Material	Minimum Thickness Iridium-192 in.(mm)
Steel	0.75(19)

The maximum thickness for the use of radioactive isotope is primarily dictated by exposure time ; therefore, upper limits are not shown.
The minimum recommended thickness limitation may be reduced when the radiographic techniques used demonstrate that the required radiographic sensitivity has been obtained.

4.3 Maximum Source Size (X-ray, Ir-192)

Maximum source size to be used radiographic examination by using X-ray machine or Ir-192 will be as follows.

X-ray Machine : 0.1 in. (2.5mm) x 0.1 in. (2.5mm)

Ir - 192 : 0.11 in. (2.8mm) x 0.12 in. (3.0mm)

5.0 MATERIALS

5.1 Film Selection

Radiographs shall be made using industrial radiographic film and its brands to be used are as follows or equivalent ;

- Dupont Cronex NDT #45, 55, 65, 70, 75
- AGFA - Gevaert D2, D4, D5, D7
- Fuji #50, 80, 100
- Kodak R, M, AA, T, AX

5.2 Intensifying Screens

5.2.1 There is no exposure advantage to the use of 0.005 in. in front and back lead screens below 125KV in the radiography of 1/4 in.(6.35mm) or lesser thickness steel.

5.2.2 The minimum thickness of the front lead screen should be 0.005 in.

5.2.3 The back lead screen should be at least 0.005 in. (0.13mm) thickness and greater thickness may be used if desired for greater protection against backscattered radiation.

5.2.4 To avoid image unsharpness due to screens, there shall be intimate contact between the lead screen and the film during exposure, and all screens shall be handled carefully to avoid dents and scratches, dirts, or grease on active surfaces.

5.2.5 The fluorescent screens shall not be used for all radiographic examination.

5.3 Film Cassette

The cassette shall be firmly fixed and maintained as closely as practical against the surface of the component during exposure.

6.0 IDENTIFICATION OF RADIOGRAPHS

6.1 System of Identification

6.1.1 A system shall be used to produce permanent identification on the radiograph traceable to the contract, component, weld seam, or part numbers, as appropriate. In addition, the Manufacturer's symbol or name and the date of the radiograph shall be plainly and permanently included on the radiograph. This identification system does not necessarily require that the information appear as radiographic images. In any case, this information shall not obscure the area of interest.

6.1.2 When re-radiographing repair areas, a lead letter "R" shall be used as follows;

1st Repair - R, 2nd Repair - R2, 3rd Repair - R3, etc.

6.2 Location Markers

Location markers which are to appear as radiographic images on the film shall be placed on the part, not on the exposure holder/cassette. Their locations shall be permanently marked on the surface of the part being radiographed when permitted, or on a map, in a manner permitting the area of interest on a radiograph to be accurately traceable to its location on the part, for the required retention period of the radiograph. Evidence shall also be provided on the radiograph that the required coverage of the region being examined has been obtained.

6.2.1 Single-Wall Viewing

a) Source side markers

Location markers shall be placed on the source side when radiographing the following ;

(1) Flat components or longitudinal joints in cylindrical or conical components.

(2) Curved or spherical components whose concave side is toward the source and when the“source-to-material” distance is less than the inside radius of the component.

(3) Curved or spherical components whose convex side is toward the source.

b) Film side markers

Location markers shall be placed on the film side when radiographing either curved or spherical components whose concave side is toward the source and when the “source-to-material” distance is greater than the inside radius.

c) Either side markers

Location markers may be placed on either the source side or film side when radiographing either curved or spherical components whose concave side is toward the source and the “source-to-material” distance equals the inside radius of the component.

6.2.2 Double-Wall Viewing

For double-wall viewing, at least one location marker shall be placed on the source side surface adjacent to the weld (or on the material in the area of interest) for each radiograph.

7.0 PENETRAMETER (IMAGE QUALITY INDICATOR)

7.1 Design

Penetrameters shall be the hole type and shall be manufactured and identified in accordance with the requirements or alternates allowed in SE-1025 and Appendices, ASME Section V.

7.2 Selection

7.2.1 The designated hole penetrameter with essential hole shall be as specified in Table I.

TABLE I. IQI SELECTION

Nominal Single-Wall Material Thickness Range, In.	Penetrameter			
	Source Side		Film Side	
	Designation	Essential Hole	Designation	Essential Hole
Up to 0.25, Incl.	12	2T	10	2T
0.250-0.375	15	2T	12	2T
0.375-0.500	17	2T	15	2T
0.500-0.750	20	2T	17	2T
0.750-1.000	25	2T	20	2T
1.000-1.500	30	2T	25	2T
1.500-2.000	35	2T	30	2T
2.500-4.000	40	2T	35	2T

7.2.2 A smaller hole in a thicker penetrameter or a larger hole in a thinner penetrameter may be substituted for any section thickness listed in Table I, provided equivalent penetrameter sensitivity (EPS) is maintained and all other requirements for radiography are met.

For welds, the thickness or the penetrameter is based on the nominalsingle wall thickness plus the estimated weld reinforcement not toexceed the maximum permitted by the referencing code section. Backing rings or strips are not be considered as part of thickness in penetrameter selection.

7.3 Placement of Penetrameters

7.3.1 Source Side Penetrameter(s)

The penetrameter(s) shall be placed on the source side of the part being examined, except for the condition described in 7.3.2 below.

7.3.2 Film Side Penetrameter(s)

Where inaccessibility prevents hand placing the penetrameter(s) on the source side, it shall be placed on the film side in contact with the part being examined. A lead letter "F", shall be placed adjacent to or on the penetrameter(s), but shall not mask the essential hole where hole penetrameters are used.

7.3.3 Penetrameter Location for Welds

The penetrameter(s) may be placed adjacent to or on the weld. The identification number(s) and, when used, the lead letter "F", shall not be in the area of interest, except when geometric configuration makes it impractical.

7.4 Number of Penetrameters

7.4.1 Except as provided in 7.4.3, one penetrameter shall be used for each radiograph. Each penetrameter shall represent an area of essentially uniform radiographic density.
If the density of the radiograph anywhere through the area of interest varies by more than minus 15% or plus 30% from the density through the body of the hole penetrameter within the minimum/maximum allowable density ranges specified in 13.0, then an additional penetrameter shall be used for each exceptional area or areas and the radiograph retaken. When calculating the allowable variation in density, the calculation may be rounded to the nearest 0.1 within the range specified in 13.0.

7.4.2 If the requirements of 7.4.1 are met by using more than one penetrameter, one shall be representative of the lightest area of interest and the other the darkest area of interest, the intervening densities on the radiograph shall be considered as having acceptable density.

7.4.3 Special Cases

(1) For cylindrical components where the source is placed on the axis of the component for a single exposure, at least three penetrameters, spaced approxi-mately 120 deg. apart, are required under the following conditions:

(a) When the complete circumference is radiographed using one or more film holders, or;

(b) When a section or sections of the circumference, where the length between the ends of the outermost sections span 240 or more deg., is radiographed using one or more film holders. Additional film locations may be required to obtain necessary penetrameter spacing.

(2) For cylindrical components where the source is placed on the axis of the component for a single exposure, at least three penetrameters, with one placed at each end of the span of the circumference radiographed and one in the approximate center of the span, are required under the following conditions:

(a) When a section of the circumference, the length of which is greater than 120 deg. and less than 240 deg., is radiographed using just one film holder, or;

(b) When a section or sections of the circumference, where the length between the ends of the outermost sections span less than 240 deg., is radiographed using more than one film holder.

(3) In (1) and (2) above, where sections of longitudinal welds adjoining the circumferential weld are radiographed simultaneously with the circumferential weld, an additional penetrameter shall be placed on each longitudinal weld at the end of the section most remote from the junction with the circumferential weld being radiographed.

(4) In order to maintain the continuity of records involving subsequent exposures, all radiographs exhibiting penetrameters which qualify the techniques permitted in accordance with (1),(b) or (3) above shall be retained.

7.5 Shims

7.5.1 Shims Under Hole Penetrameters

A shim of material radiographically similar to the weld metal shall be placed between the part and the penetrameter, if needed, so that the radiographic density throughout the area of interest is no more than minus 15% from (lighter than) the radiographic density through penetrameter.

7.5.2 The shim dimensions shall exceed the penetrameter dimensions such that the outline of at least three sides of the penetrameter image shall be visible in the radiograph.

7.6 IQI Sensitivity

Radiography shall be performed with a technique of sufficient sensitivity to display the hole penetrameter image and the specified hole in Table I, which are essential indications of the image quality of the radiograph. The radiographs shall also display the indentifying numbers and letters.

8.0 SOURCE TO FILM DISTANCE

8.1 Minimum source to film distance shall be determined by geometrical unsharpness requirements.

8.2 Geometric unsharpness of the radiograph shall not exceed 0.020in.(0.5mm)

8.3 Geometric unsharpness of the radiograph shall be determined in accordance with ;

$$Ug = Fd/D$$

Where,

Ug = Geometrical unsharpness

F = Source size ; The maximum projected dimension of the radiating source (or effective focal spot) in the plane perpendicular to the distance D from the weld or object being radiographed, in.

D = Distance from source of radiation to weld or object being radiographed, in.

d = Distance from source side of weld or object being radiographed to the film, in.

9.0 PREPARATION OF EXAMINATION

9.1 Materials

Surfaces shall satisfy the requirements of the applicable materials specifications, with additional conditioning,if necessary, by any suitable process to a degree that surface irregularities can not mask or be confused with discontinuities.

9.2 Welds

The weld ripples or weld surface irregularities on both the inside (where accessible) and outside shall be removed by any suitable process to such a degree that the resulting radiographic image due to any irregularities cannot mask or be confused with the image of any discontinuity.

9.3 Surface Finish

The finished surface of all butt-welded joints may be flush with the base material or may have reasonably uniform crowns, with reinforcement not to exceed that specified in the referencing Code Section.

10.0 RADIOGRAPHIC TECHNIQUE

10.1 A single-wall exposure technique shall be used for radiography whenever practical. When it is not practical to use a single-wall technique, a double-wall technique shall be used. An adequate number of exposures shall be made to demonstrated that the required coverage has been obtained.

10.2 Single-Wall Technique

In the single-wall technique, the radiation passes through only one wall of the weld(material), which is viewed for acceptance on the radiograph.

10.3 Double-Wall Technique

10.3.1 Double-Wall Viewing

For materials and for welds in components 3 1/2 in. or less in nominal outside diameter, a technique may be used in which the raidation passes through two walls and the weld(material) in both walls is viewed for acceptance on the same radiograph. For double-wall viewing, only a source side penetrameter shall be used. Care shall be exercised to ensure that the required geometric unsharpness is not exceeded. If the geometric unsharpness requirement can not be met, then single-wall viewing shall be used.

(1) For welds, the radiation beam may be offset from the plane of the weld at an angle sufficient to separate the images of the source side and film side portions of the weld so that there is no overlap of the areas to be interpreted. When complete coverage is required, a minimum of two exposures taken 90 deg. to each other shall be made for each joint.

(2) As an alternative, the weld may be radiographed with the radiation beam positioned so that the images of both walls are superimposed. When complete coverage is required, a minimum of three exposures taken at either 60 deg. or 120 deg. to each other shall be made for each joint.

(3) Additional exposures shall be made if the required radiographic coverage cannot be obtained using the minimum number of exposures indicated in 10.3.1, (1) or (2) above.

10.3.2 Single-Wall Viewing

For materials and for welds in components, a technique may be used in which the radiation passes through two walls and only the weld (material) on the film side wall is viewed for acceptance on the radiograph. When complete coverage is required for circumferential welds (materials), a minimum of three exposures taken 120 deg. to each other shall be made.

10.4 Film Overlap

Radiographic images of continuous lengths of the same weld or object being radiographed shall overlap at least 1 in. on either side end of film.

11.0 SCATTERED RADIATION

11.1 Scattered radiation may be reduced by suitable filtration.

11.2 Backscatter Radiation Check

A lead symbol "B" with minimum dimensions of $\frac{1}{2}$ in.(13mm) in height and $^1/_{16}$ in.(1.6mm) in thickness, shall be attached to the back of each film holder during each exposure to determine if backscatter radiation is exposing the film.

11.3 Excessive Backscatter.

If a light image of the "B" appears on a darker background of the radiograph, protection from backscatter is insufficient and the radiograph shall be considered unacceptable. A dark image of the "B" on a lighter background is not cause for rejection.

12.0 QUALITY OF RADIOGRAPHS

All radiographs shall be free from mechanical, chemical, or other blemishes to the extent that they do not mask and are not confused with the image of any discontinuity in the area of interest of the object being radiographed. Such blemishes include, but are not limited to ;

(a) Fogging.
(b) Processing defects such as streaks, water marks, or chemical stains.
(c) Scratches, finger marks, crimps, dirtiness, static marks, smudges, or tears.
(d) False indications due to defective screens.

13.0 RADIOGRAPHIC DENSITY LIMITATIONS

13.1 The transmitted film density through the radiographic image of the body of the appropriate hole penetrameter and the area of interest shall be 1.8 minimum for single film viewing for radiographs made with an X-ray source and 2.0 minimum for radiographs made with a gamma ray source. The maximum density shall be 4.0 for single viewing.

13.2 A tolerance of 0.05 in density is allowed for variations between densitometer readings.

13.3 When shims are used the plus 30% density restriction of 7.4.1 may be exceeded, provided the required penetrameter sensitivity is displayed and the density limitations of 13.1 are not exceeded.

14.0 FILM PROCESSING

Standard Guide for Controlling the Quality of Industrial Radiographic Film Processing, SE-999, or Part III of Standard Guide for Radiographic Testing SE-94 and Technical Handbook of Manufacturer (Fuji, Gevaert, Kodak & Dupont Film Co.) shall be used as a guide for manual processing film.

15.0 VIEWING FACILITIES

Viewing facilities shall provide subdued background lighting of an intensity that will not cause troublesome reflections, shadows, or glare on the radiograph. Equipment used to view radiographs for interpretation shall provide a variable light source sufficient for the essential penetrameter hole to be visible for the specified density range.
The viewing conditions shall be such that light from around the outer edge of the radiograph or coming through low-density portions of the radiograph does not interfere with interpretation.

16.0 ACCEPTANCE STANDARDS

16.1 Indications shown on the radiographs of welds and characterized as imperfections are unacceptable under the following conditions ;

16.1.1 Linear Indication

(1) Any indication characterized as a crack, or zone of incomplete fusion or penetration.

(2) Any other elongated indication on the radiograph which has length greater than :

- 1/4 in.(6mm) for t up to 3/4 in.(19mm)
- 1/3t for t from 3/4 in. to 2 1/4 in.(19mm to 57mm)
- 3/4 in.(19mm) for t over 2 1/4 in.(57mm)

t = the thickness of the weld excluding any allowable reinforcement. For a butt weld joining two members having different thicknesses at the weld, t is the thinner of these two thicknesses. If a full penetration weld includes a fillet weld, the thickness of the throat of the fillet shall be included in t.

(3) Any group of aligned indications that have an aggregate length greater than t in a length of 12t, except when the distance between the successive imperfections exceeds 6L where L is the length of the longest imperfection in the group.

16.1.2 Rounded Indication

(1) Relevant Indications

Only those rounded indications which exceed the following dimensions shall be considered relevant.

- 1/10 t for t less than 1/8 in.
- 1/64 in. for t from 1/8 in. to 1/4 in., incl.
- 1/32 in. for t greater than 1/4 in. to 2 in., incl.
- 1/16 in. for t greater than 2 in.

(2) Maximum Size of Rounded Indication

- The maximum permissible size of any indication shall be $\frac{1}{4}$t or $\frac{5}{32}$ in., whichever is smaller; except that an isolated indication separated from a adjacent indication by 1 in. or more may be $\frac{1}{3}$t, or $\frac{1}{4}$ in., whichever is less.
- For t greater than 2 in. the maximum permissible size of an isolated indication shaa be increased to $\frac{3}{8}$in.

(3) Aligned Rounded Indications

Aligned rounded indications are acceptable when the summation of the diameters of the indications is less than t in a length of 12t (See Fig.1). The length of groups of aligned rounded indications and the spacing between the groups shall meet the requirements of Fig.2.

(4) Spacing

The distance between adjacent rounded indications is not a factor in determining acceptance or rejection, except as required for isolated indications or groups of aligned indications.

(5) Rounded Indication Charts

The rounded indications characterized as imperfections shall not exceed that shown in the charts. The charts in Fig.3 through 8 illustrate various types of assorted, randomly dispersed and clustered rounded indications for different weld thicknesses greater than ⅛ in. These charts represent the maximum acceptable concentration limits for rounded indications. The chart for each thickness range represent full-scale 6 in. radiographs, and shall not be enlarged or reduced. The distributions shown are not necessarily the patterns that may appear on the radiograph, but are typical of the concentration and size of indications permitted.

(6) Weld Thickness t less than 1/8 in.

For t less than 1/8 in. the maximum number of rounded indications shall not exceed 12 in a 6 in. length of weld. A proportionally fewer number of indications shall be permitted in welds less than 6 in. in length.

(7) Clustered Indications

The illustrations for clustered indications show up to four times as many indications in a local area, as that shown in the illustrations for random indications.
The length of an acceptable cluster shall not exceed the lesser of 1 in. or 2t. Where more than one cluster is present, the sum of the lengths of the clusters shall not exceed 1 in. in a 6 in. length weld.

16.2 Spot Examination of Welded Joints

16.2.1 Welds in which indications are characterized as cracks or zones of imcomplete fusion or penetration shall be unacceptable.

16.2.2 Welds in which indications are characterized as slag inclusions or cavities shall be unacceptable if the length of any such indication is greater than ⅔t, where t is the thickness of weld excluding any allowable reinforcement. For a butt weld joining two members having different thicknesses at the weld, t is the thinner of these two thicknesses.
If a full penetration weld includes a fillet weld, the thickness of the throat of the fillet shall be included in t. If several indications within the above limitations exist in line, the welds shall be judged acceptable if the sum of the longest dimensions of all such indications is not more than t in a length of 6t (or proportionately for radiographs shorter than 6t) and if the longest indications considered are seperated by at least 3L of acceptable weld metal where L is the length of the longest indication. The maximum length of acceptable indications shall be ¾ in. Any such indications shorter than ¼ in. shall be acceptable for any plate thickness.

16.2.3 Rounded indications are not a factor in the acceptability of welds not required to be fully radiographed.

17.0 REEXAMINATION

17.1 The welds being radiographed showing unacceptable imperfections shall be repaired as per the repair procedure and then reexamined by the same radiographic technique and procedure as was used originally.

17.2 When a spot has been examined and the radiograph discloses welding which does not comply with the minimum quality requirements of 16.2 above, two additional spots shall be radiographically examined in the same weld increment at locations away from the original spot.

(1) If the two additional spots examined show welding which meets the minimum quality rquirements of 16.2 above, the entire weld increment represented by the three radiographs is acceptable provided the defects disclosed by the first of the three radiographs are removed and the area repaired by welding. The weld repaired area shall be radiographically examined in accordance with the foregoing requirements.

(2) If either of the two additional spots examined shows welding which does not comply with the minimum quality requirements of 16.2 above, the entire increment of weld represented shall be rejected.
The entire rejected weld shall be removed and the joint shall be re-welded or, at the fabricator's option, the entire increment of weld represented shall be completely radiographed and only defects need be corrected.

(3) Repair welding shall be performed using a qualified procedure and in a manner acceptable to the inspector. The rewelded joint, or the weld repaired areas, shall be spot radiographically examined at one location in accordance with the foregoing requirements.

18.0 RECORDS

18.1 All resulting film records shall be permanently identified as subsequent repair radiographs and retained as a permanent part of the record in fire proof filling cabinet by customer unless otherwise specified.

18.2 The radiographic set-up information, processing date and evaluation results shall be recorded on the report form of Radiograph Examination (Exhibit 1-1, 1-2) attached to this procedure.

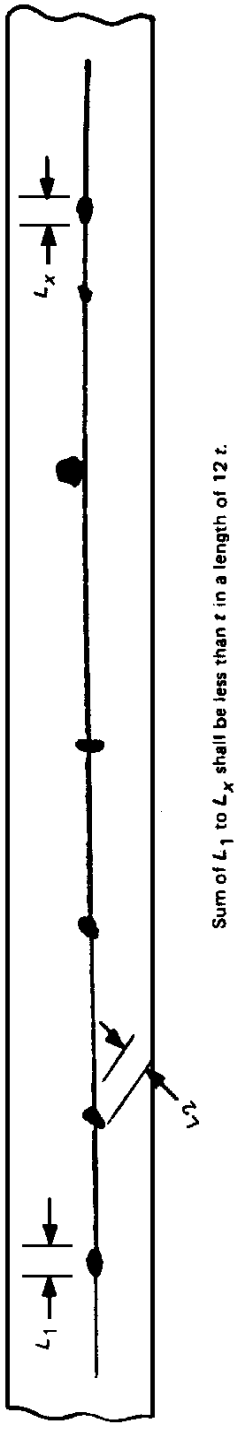


FIG 1. ALIGNED ROUNDED INDICATIONS

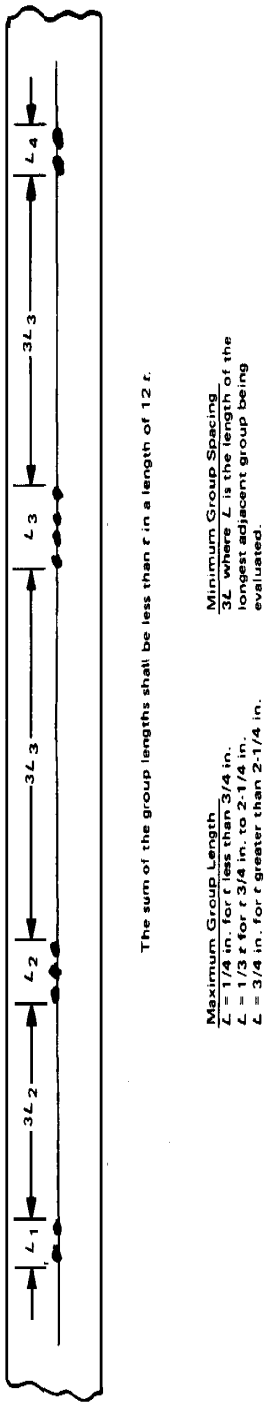
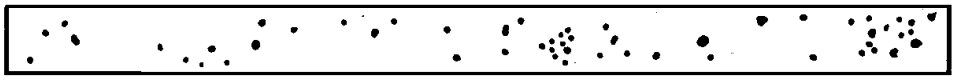
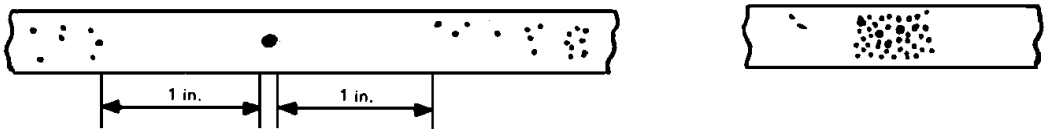


FIG 2. GROUPS OF ALIGNED ROUNDED INDICATIONS



RANDOM ROUNDED INDICATIONS

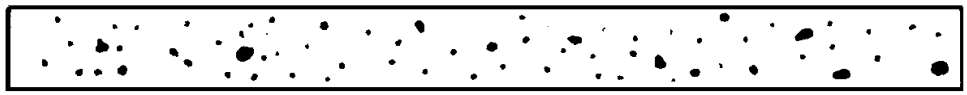
Typical concentration and size permitted in any 6 in. length of weld



ISOLATED INDICATION
Maximum size per Table I

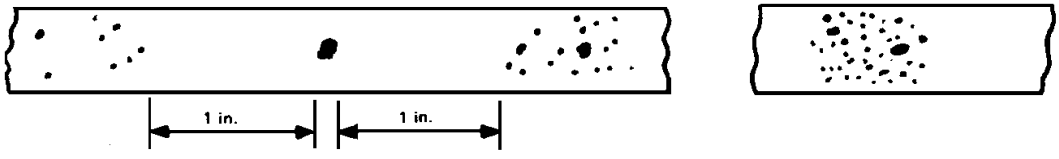
CLUSTER

FIG 3. CHARTS FOR t EQUAL TO $\frac{1}{8}$-$\frac{1}{4}$ in. INCLUSIVE



RANDOM ROUNDED INDICATIONS

Typical concentration and size permitted in any 6 in. length of weld



ISOLATED INDICATION
Maximum size per Table I

CLUSTER

FIG 4. CHARTS FOR t EQUAL TO $\frac{1}{4}$-$\frac{3}{8}$ in. INCLUSIVE

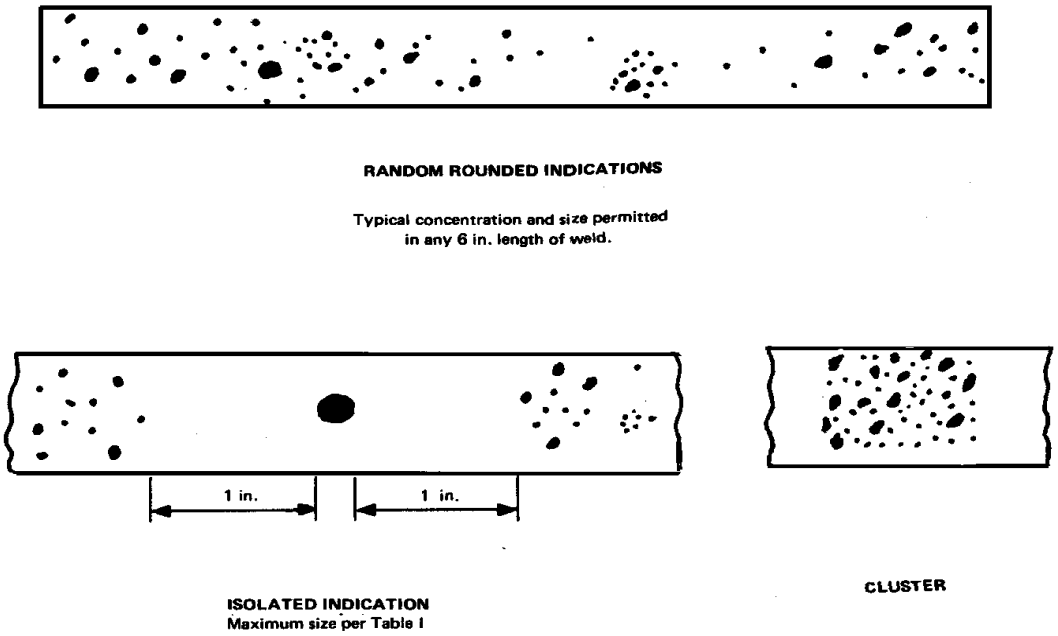


FIG 5. CHARTS FOR t EQUAL TO $\frac{3}{8}$-$\frac{3}{4}$ in. INCLUSIVE

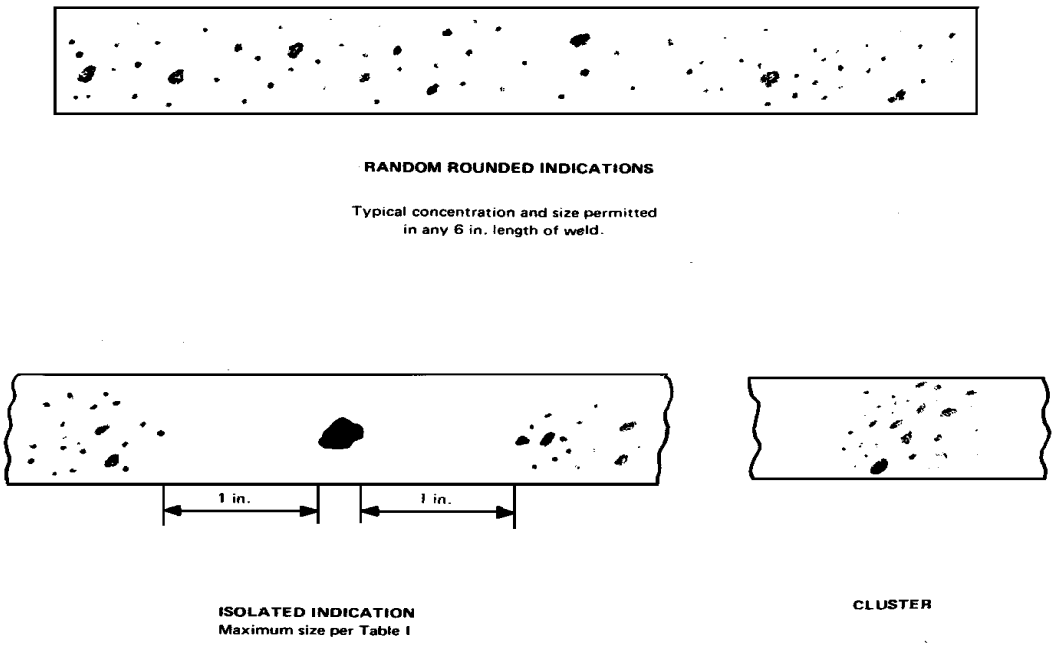
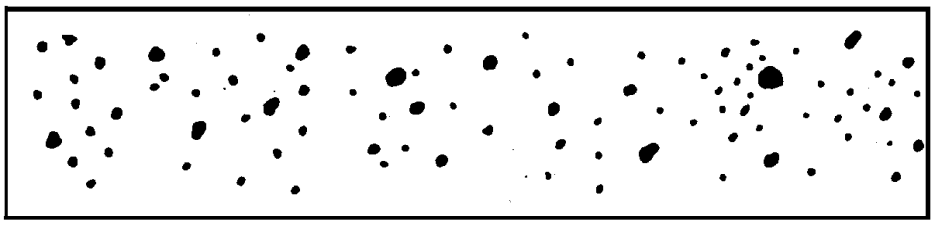
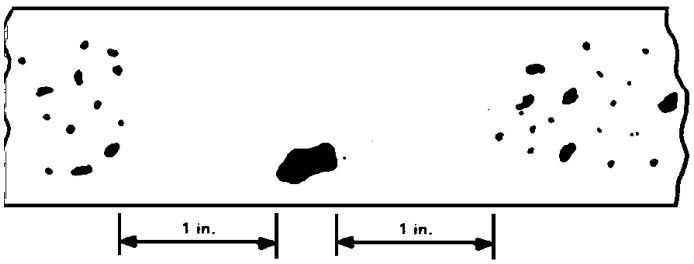


FIG 6. CHARTS FOR t EQUAL TO $\frac{3}{4}$-2 in. INCLUSIVE

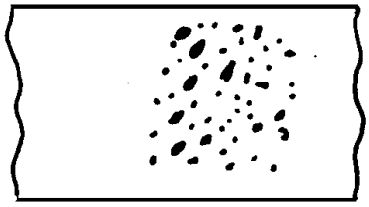


RANDOM ROUNDED INDICATIONS

Typical concentration of size permitted in any 6 in. length of weld.

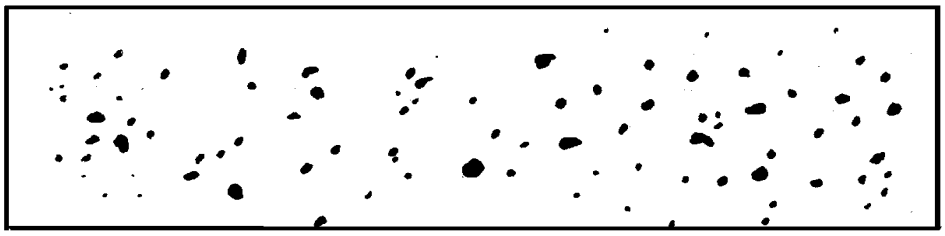


ISOLATED INDICATION
Maximum size per Table I



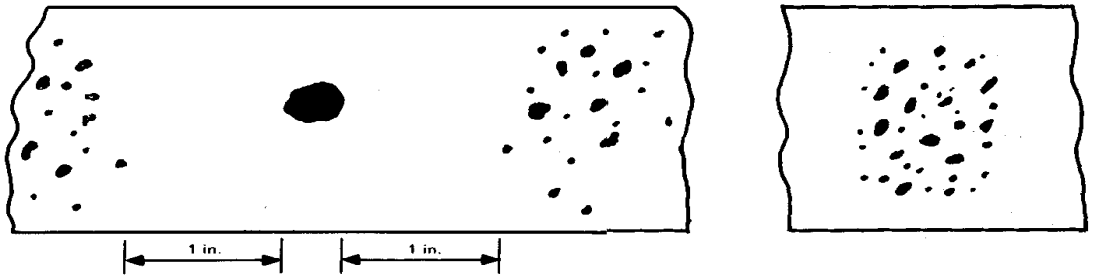
CLUSTER

FIG. 7 CHARTS FOR t OVER 2-4 in., INCLUSIVE



RANDOM ROUNDED INDICATIONS

Typical concentration and size permitted in any 6 in. length of weld.



ISOLATED INDICATION
Maximum size per Table I

CLUSTER

FIG. 8 CHARTS FOR t OVER 4 in.

EXHIBIT 1-1 : REPORT OF RADIOGRAPHIC EXAMINATION (A)

방 사 선 투 과 검 사 보 고 서
REPORT OF RADIOGRAPHIC EXAMINATION

Page of

JAICO Joong Ang Inspection Co., LTD.
☐Daedo-Bldg. 1st FL. 78-8 Non Hyun-Dong Kang Nam-Ku, Seoul, Korea.
☐TEL : (02)545-2961~3. FAX : (02)545-2964

보고서번호 (Report No.)
발주자 (Customer)

1. 공사명 (Project Name) | 2. 부품번호 (P/N) | 3. 도면번호 (DWG. No.)

4. 검사물 (Object)
Material ☐ Steel ☐ Other ☐ S.S ☐ Aluminum
Thickness ☐ mm ☐ inch

5. 검사기법 (Technique)
☐ Single Wall Exposure Single Wall View
☐ Double Wall Exposure Single Wall View
☐ Double Wall Exposure Double Wall View

6. 선원선택 (Selection of Radiation)
X-Ray: Maker; KVP : mA :; Effective Focal Spot Size X ☐ mm ☐ inch
γ-Ray: Isotope; Curie Ci; Source Size X ☐ mm ☐ inch

7. 검사조건 (Exam. Condition)
No. of Exposures Exposure(s)
Distance(SFD) ☐ cm ☐ inch
Angle(Approximate) Degree
Exposure Time Min. Sec.

8. 필름 (Film)
Film brand & Designation
No. of Films per Cassette Sheet(s)
Density Limit Min. ~Max. ☐ Single ☐ Multiple
Development Condition ℃ Min.

9. 투과도계 (Penetrameter)
Type ☐ ASME ☐ KS(JIS) ☐ Other ☐ ASTM ☐ MIL
Mat'l
ID No.
Position ☐ Source Side ☐ Film Side

10. 심 (Shim)
Thickness ☐ With mm ☐ Without

11. 스크린 (Screen)
Lead Screen ☐ Front ☐ Back

12. 적용규격 (Applicable Document)
Spec.
Procedure No.

13. 촬영배치도(Mapping)

Examined by Level _____
Interpreted by Level _____
Approved by Level _____

☐ Witnessed by
☐ Reviewed by

보고일자 (Date of Report) 19 . . .

(210×297mm)

EXHIBIT 1-2 : REPORT OF RADIOGRAPHIC EXAMINATION (B)

방 사 선 투 과 검 사 보 고 서
REPORT OF RADIOGRAPHIC EXAMINATION

Page of

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보고서번호 (Report No.)
발주자 (Customer)

1. 공사명 (Project Name)	2. 부품번호 (P/N)	3. 도면번호 (DWG. No.)

4. 검사결과 및 판정 (Results)

Film Identification No.	Film Size	ACCEPT	REJECT	GRADE	DEFECTS												Remarks
					Root Concavity	Root Convexity	Root Undercut	Cracks	Porosity	Slag Incl.	Tungsten Incl.	Incomp. Pene.	Incomp. Fusion	Undercut	Burn-Thru	Surface Defect	

용접용 (210×297mm)