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RADIOGRAPHIC INSPECTION OF  
FULL SCALE CHARGES

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SPECIFICATIONS

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*WRT*

1. Inner Charge

A charge is rejected if it contains:

- a. Air bubbles or cavities of at least 4 mm. in diameter.
- b. Stress cracks of at least 2 x 15 mm.
- c. Low density areas of at least 5 mm. in diameter.

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2. Barrel.

Based on previous experiences, the quality of these charges is divided into four classes:

- Class 1 - Air cavities or low density areas in the central portion of charge. (Rejected)
- Class 2 - Small cavities of about 3 mm. in diameter scattered throughout the charge. (Rejected)
- Class 3 - Low density channels (segregated TNT) below surface. (Accepted)
- Class 4 - No defects observed. (Accepted)

If there are low density or air bubbles of at least 3 mm. in diameter up to about 1 1/2" below the surface, such a charge is classified as Class 3.

In order to insure the accurate location of such defects, two views are taken of such questionable charges. Pentagonal charges are turned 72° around their axis for the second view; hexagonal

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charges 120°. In having two views, the actual location of these defects is found by reconstruction.

3. Lenses.

View A - A lens is rejected if this view shows:

- a. A deformed apex, such as broken off or melted off.
- b. Baracol mixed with the Composition B, and,
- c. The inner component not in the center of the lens.

View B - A charge is rejected if these views show air cavities, air bubbles or other defects of the Composition B within 1 cm. from the surface of the slow component.

TECHNIQUE OF THE RADIOGRAPHIC INSPECTION

1. The Fat Man (325 37-18)

One side view is taken under the following conditions:

150 KV      90 MAS      Focal Spot Film Distance, 72"

The heavy industrial type cassette with Paterson No. 245 Industrial Intensifying Screens is used for this purpose. Based on experimental work, the Eastman Kodak Industrial Type F Film has been selected for this purpose. A Leibol-Flarsheim Parallel Grid is placed on the top of the cassette. A half-inch lead plate is placed underneath the cassette in order to absorb the back scattering from the floor. Lead letters indicating the number of the charge, the type of the charge, the date, the film number, are placed on the top of the grid and covered with a 1/4" lead plate during the above mentioned normal exposure time. When

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this exposure is finished, the lead plate is removed and additional 10 to 15 MAS produce the necessary shadow of these lead letters on the previously unexposed part of the film.

These films are developed in a commercial x-ray developer based on the time-temperature chart, (4½ minutes at 68°F.).

2. Baratol (32L 54-57)

In order to be able to penetrate this material (density about 2.42), radium is used for this purpose. This radium, (in our case 2½ Curies compressed to a cylinder with a diameter of 14 millimeters and a height of 7 millimeters) is placed in a specially designed lead bomb whose cover can be lifted by a remote cranking device in order to assure complete safety for the operator. The charges are placed in a circle around the radium source in order to provide an exposure for many charges at the same time. When the necessity arises, a second layer of charges can be placed on top and behind the first one. The source-film distance under normal conditions is 36". Eight thousand one hundred twenty-five milligram hours are used for this exposure. In changing the distance, the inverse square law is applied. A special film-screen combination has been developed as follows:

In using a 14" x 17" cardboard holder, four 0.005" lead foils and two Eastman Kodak Industrial Type A Films are placed in this holder in such a way that each film is placed between two lead screens, the lead touching the films.

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The entire setup is, therefore, as follows:

Lead foil; Film; Lead foil; Lead foil; Film; Lead foil

This combination seems to fulfill all requirements in order to insure satisfactory resolutions. The film nearest to the charge gives conclusive information about the condition of the thicker part of the Baratol, whereas the second film takes care of the thinner part of the charge because the three lead foils in front of this film decrease the amount of transmission. In order to improve the resolution, it is advisable to use a Leibel-Flarsheim Parallel Grid in front of the cassette, the lead strips parallel to the floor.

A specially designed charge holder is used for this type of charge. One-half inch sponge rubber is mounted on the horizontal plate of this holder in order to prevent any damage to the corners of the charge. The cardboard cassette slides into a vertical opening of this charge holder. On the top of the vertical plate a piece of wood with grooves carries the lead letters marking the films during exposure. In order to insure satisfactory contrast of these lead letters, a lead plate (1/16" thick) is mounted on the back of this wooden letter holder.

Commercial x-ray developer is used, enriched with one gram of potassium iodide per 10 gallons of developer, which produces a clear image. The developing time is 8 minutes at 68°. (For more detail see: LA Report 345: "Use of Radium for Radiographic inspection of Baratol and Baronal").

3. Lenses (32L 54-37 B/Stl.)

In order to inspect this charge, x-rays are used in this case again. Two specific views are taken in order to inspect the condition of the apex of the Baratol and in order to in-

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spect the condition of the Composition B.

**View A - Inspection of the Apex of the Baratol.**

The charge is placed on a wooden holder in such a way that the axis of the charge is parallel to the film. The following technique is applied in this case:

190 KV            180 MAS            Focal Spot Film Distance, 72"  
Heavy industrial type cassette with Patterson No. 245 Intensifying Screen.

Eastman Kodak Industrial Type F Film.

On the top of the cassette a 0.005 lead foil; on top of it a Leibert-Flarsheim Parallel Grid.

**View B - Inspection of the Overcast Composition B.**

In order to insure satisfactory resolution of the condition of the overcast Composition B, the charge is placed on a wooden holder in such a way that there is a 60° angle between the axis of the charge and the film.

Two to three views are taken of this charge, each time rotated around its own axis. The exposure technique is as follows:

220 KV            180 MAS            Focal Spot Film Distance, 72"  
Heavy industrial type cassette with Patterson No. 245 Industrial Screen.

Eastman Kodak Industrial Type F Film.

These films are also developed in the same way as the films of the Fat Man.

The lead letter marking procedure is the same as in case No. 1. Again, 1/8" lead plate is used underneath the cassette in order to eliminate the back scattering from the floor.

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