ENGELHARD INDUSTRIES, INC.
D. E. Makepeace Division

Review of Criticality Policies and Procedures
Summary of Manufacturing Operations

1. MELTING

Vacuum Induction
Air Induction
Vacuum Arc

2. FABRICATION

Forging
Rolling
Drawing
Swaging

3. CUTTING

Machine Lathe
Milling
Shearing
Slitting
Sawing

4. HEATING

Annealing
Stress Relieving

5. JOINING

Welding
Brazing

6. CLEANING

Scrubbing
Pickling
Degreasing
Vapor Blast
Grit Blast

7. NON-DESTRUCTIVE TESTING

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Pages 2 through 7 redacted for the following reasons:

Exemption (b)(4)

PRINCIPLES AND POLICIES FOR MAINTAINING NUCLEAR SAFETY

Nuclear Safety is the responsibility of the Criticality Control officer and his staff. In order to assure complete safety in inter-plant processing, strict control is exercised over all movement of fissionable material. Every movement must be cleared in advance with the Criticality Control monitor. He has the authority to stop immediately any operation or handling procedure which he feels may be potentially dangerous.

Prior to the beginning of work on any project involving fissionable material, the criticaltiy control officer will contact representatives from Production, Engineering, and Accountability to work out acceptable procedures for handling and processing. These procedures are then incorporated into a feasibility report which is submitted for AEC approval. When this approval is received, the material is released for processing. It is the responsibility of the supervisory personnel to see that the limits established in the feasibility report are adhered to in production. At the same time the Criticality control staff monitors all operations to assure that this is being done.

In addition to the physical controls used to prevent the accumulation of a potential critical mass, administrative controls are also used. All process sheets issued to the production floor pertaining to work with special nuclear materia must first be approved by the criticality officer. This assures that instructions to supervisory and floor personnel are in accordance with the acceptable limits as set forth in the feasibility report.

In addition, the Criticality control staff works very closely with both Production control and Accountability. A copy of the route card which accompanies the material as it travels through production is submitted to the Criticality officer before it enters the shop. Any discrepancies in the sequence of operation which conflict with the feasibility report or standard safety procedures will be noted and resolved before any actual movement or handling takes place. No material is moved or processed without a route card and proper clearance from the Criticality control section. Red route cards are used to distinguish enriched material.

Shipments of enriched material are scheduled by Production Control after prior approval from both Criticality Control and Accountability. This insures the proper packing of the material and the issuance of the correct forms for shipment. No enriched material is packed without the direct supervision of Criticality control.

Receipt of special nuclear material is handled under the supervision of Criticality control after being informed of receipt by Accountability. The maintenance of the storage vaults and areas in a safe condition is a direct responsibility of Criticality control. No material is received in or issued out without the prior knowledge and approval of Criticality and Accountability.

The operation of greatest hazard insofar as accidental criticality is concerned, is the pickling of special nuclear material. In this area a rigid administrative control is applied over the entire operation from the makeup of the pickle solutions to the disposal of the used acids. Every piece of material which is pickled is weighed both before and after the operation to determine the quantity which remains in solution. This weight difference is assumed to be all uranium of the particular alloy which is being pickled in computing U-235 weight in solution. When a pre-determined limiting amount of U-235 has gone into solution as calculated from weight loss data, the solution is sampled and transfered to a polyethylene carboy for storage. When analytical results are received, carboys may be combined in one 30 or 55 gal. polyethylene lined drum as long as the amount of U-235 in the drum totals less than 500 grams.

In certain instances pickle tanks have been equipped with 1" overflows leading to a 5" I.D. always safe container. This limits the height of the solution to where it approaches an infinite slab or always safe condition. This cannot always be done, however, due to the size of the material being pickled.

REFERENCES: LA-2053, Nuclear Safety Guide, Hilliman
LA-1623, Safety Tests for Melting and Casting, Orelloy, Hart
LA-1958, Critical Masses of Fissionable Metals as Basic Nuclear Safety Data, Paxton and Grimes.