GPU Nuclear

GPU Nuclear Corporation
Post Office Box 480
Route 441 South
Middletown, Pennsylvania 17057-0191
717 944-7621
TELEX 84-2386
Writer's Direct Dial Number:

(717) 948-8400

May 10, 1989
4410-89-L-0041/0148P

US Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Dear Sirs:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Program for Surveying the Endfitting Storage Containers

Attached for information is a description of the GPU Nuclear plan for surveying the upper endfitting storage containers which are currently located in a designated area at the 347' elevation of the Reactor Building. The storage of the upper endfitting containers was previously evaluated in GPU Nuclear letters 4410-86-L-0132, dated August 16, 1986, and 4410-86-L-0160, dated September 9, 1986, which were reviewed and approved by NRC letters NRC/TMI-86-090, dated September 10, 1986, and NRC/TMI-86-096, dated September 25, 1986, respectively.

The purpose of this activity is to ascertain the amount of Special Nuclear Material in each upper endfitting container to facilitate appropriate disposal. The containers will be measured separately.

The attached evaluation demonstrates that this activity does not pose a criticality or radiological safety concern.

Sincerely,

M B Roche

M. B. Roche
Director, TMI-2

RDW/emf

Attachment

A001
1/1

cc: F. I. Young - Senior Resident Inspector, TMI
W. T. Russell - Regional Administrator, Region I
J. F. Stolz - Director, Plant Directorate I-4
L. H. Thonus - Project Manager, TMI Site

PROGRAM FOR SURVEYING THE ENDFITTING STORAGE CONTAINERS

I. INTRODUCTION

The purpose of this safety evaluation is to describe GPU Nuclear's plan for surveying the upper endfitting storage containers which are currently located in a designated area at the 347' elevation of the Reactor Building (RB). The purpose of this activity is to ascertain the amount of Special Nuclear Material (SNM) in each upper endfitting storage container. This activity involves transferring each upper endfitting storage container to a designated and shielded enclosure, draining the container, and performing measurements to ascertain the quantity of SNM. If it is determined that there is SNM in an upper endfitting storage container, the container will be handled and stored in the RB in accordance with plant procedures pending final disposition. This report describes the methodology for surveying the upper endfitting storage containers, assesses the criticality potential for this activity, and describes the radiological controls to maintain this activity ALARA.

II. BACKGROUND

The storage of upper endfitting containers was previously evaluated by GPU Nuclear (References 1 and 2) and reviewed and approved by the NRC (References 3 and 4). The upper endfitting storage containers are located in a designated area on the 347' elevation of the RB. The upper endfittings were placed in 55 gallon drums. Each drum was wrapped in lead and placed in an NC-90 shipping container. Each upper endfitting storage container is filled with reactor grade water (i.e., borated between 4350-6000 ppm).

Reference 1 estimated that there was a total of 70 endfittings and that each upper endfitting could contain approximately 2 to 3 kg of fuel if the fuel was packed solidly within the flow spaces in the endfitting casing. Each upper endfitting storage container was limited to a maximum of ten (10) endfittings. However, the total number of endfittings collected was 18 and the maximum number of endfittings loaded in a single container was six (6). The upper endfitting storage area contains criticality monitors per Table 4.3-3 of the Recovery Operations Plan.

III. METHODOLOGY FOR SURVEYING THE UPPER ENDFITTING STORAGE CONTAINERS

The upper endfitting storage containers will be surveyed on an individual basis. Figure 1 shows the expected configuration for this activity. The upper endfitting storage containers will be moved individually from their present location to a shielded counting station located at the top of the "A" D-Ring, or other suitable location neutronically decoupled from the current endfitting storage area. The endfitting storage container will be placed in a shielded enclosure (see Figure 1). The upper endfitting storage container will be drained, flushed, and re-drained. If demineralized water is utilized for flushing the containers, controls shall be established to preclude any potential for an inadvertent Reactor Vessel boron dilution event. Boron present, either in the water or in crystalline form, will compete with the uranium to capture thermal neutrons thereby affecting the fuel quantification

predictions; thus, it will be necessary to drain each endfitting storage container. A remote camera will be utilized to view the internals of each upper endfitting storage container to obtain information about the geometry of the endfittings.

GPU Nuclear plans to use a low energy neutron interrogation technique to quantify the amount of SNM in each endfitting storage container. Low energy neutrons will be used to induce fission reactions in the fuel located on the endfittings, thus producing characteristic high energy neutrons. Four (4) He-4 detectors, which discriminate against low energy neutrons, will measure the fast neutrons generated by induced fission of fuel material on the endfittings (see Figure 2). The measured flux will be used to determine the quantity of fuel present.

GPU Nuclear currently plans to perform this activity using a photoneutron source assembly (see Figure 1) consisting of: a) a beryllium cylinder located under the upper endfitting storage container and inside the shielded enclosure; and b) an antimony gamma source and its shield located outside the sampling enclosure.

Following the measurement sequence described above, approximately 1 kg of natural uranium oxide in a secured, retrievable source will be placed in the drum. This will allow correction for variable amounts of neutron poisons that could be present in each endfitting storage container. Each upper endfitting storage container will then be re-surveyed. A comparison of the data from the two (2) measurements will enable quantification of the SNM in the storage container. This technique will compensate for interference in the measurement technique (e.g., caused by boron residue and other neutron absorbers in the drum). Upon completion of the measurements, the endfittings will be stored in the RB pending final disposition.

The exact sequence of the sampling program shall not be limited to that described above. Changes in sequence will not necessitate a revision to this safety evaluation unless safety concerns created by the change are not bounded by this safety evaluation and references thereto.

IV. CRITICALITY ASSESSMENT

As discussed in Reference 1, a limit of ten (10) endfittings was specified for each endfitting storage container. Currently, there is a total of 18 upper endfittings in the endfitting storage area and the maximum number of endfittings in a single container is six (6). Reference 1 conservatively estimated that each endfitting could contain approximately 2 to 3 kg of SNM if it were packed solidly within the flow spaces in the endfitting casing. Based on the maximum of ten (10) endfittings per container, the maximum estimated fuel debris in any container would be 30 kg. This amount is significantly less than the established administrative safe fuel limit of 70 kg which ensures subcriticality. Additionally, if all of the 18 endfittings were loaded with fuel to the maximum theoretical value (e.g., 2 to 3 kg of fuel), the total amount of SNM is conservatively estimated to be between 36 and 54 kg. This quantity is also less than the administrative limit discussed above. Thus, subcriticality during endfitting measurement is assured.

During this planned activity, the upper endfitting storage area criticality monitors will be operable per Table 4.3-3 of the Recovery Operations Plan. Each upper endfitting storage container will be measured individually; thus, based on the evaluations in this section, no additional criticality monitoring is required.

V. RADIOLOGICAL CONTROLS AND ALARA

An ALARA evaluation of the activities described in this evaluation has been performed (Reference 5). When an endfitting container is in the shielded enclosure, the dose rate is 30 mR/hr at 8 feet from the side of the enclosure. The bottom of the endfitting storage container is unshielded and has a contact dose rate of approximately 120 R/hr. Thus, handling of the upper endfitting storage containers and the actual measurement technique will be performed remotely. Per Reference 5, radiological exposures for the activities described in this safety evaluation are not expected to exceed 37 person-rem.

VI. 10 CFR 50.59 EVALUATION

10 CFR 50, Paragraph 50.59, permits the holder of an operating license to make changes to the facility or perform a test or experiment, provided the change, test, or experiment is determined not to be an unreviewed safety question and does not involve a modification of the plant Technical Specifications.

10 CFR 50, Paragraph 50.59, states a proposed change involves an unreviewed safety question if:

a. The probability of occurrence or the consequence of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or

b. The possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or

c. The margin of safety, as defined in the basis for any Technical Specifications, is reduced.

Each of the above criteria is evaluated below.

Has the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report been increased?

The safety considerations relative to the storage of the upper endfittings evaluated in References 1 and 2 were based on the following estimates:

- 70 loose endfittings;
- Each endfitting containing approximately 2 to 3 kg of SNM; and
- Maximum of ten (10) endfittings per storage container.

Currently, a total of 18 endfittings are stored in the endfitting storage area with a maximum of six (6) endfittings in any single container. The planned activity involves surveying each upper endfitting storage container separately to determine the amount of SNM present in each container. Additionally, the sampling location is neutronically decoupled from the endfitting storage area. Thus, this activity actually decreases the potential for a criticality event as described in Reference 1. Any other potential accident scenarios (e.g., dropped storage container) are bounded by the analyses in Reference 1. Thus, this activity does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated.

Has the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report been created?

The potential accident scenarios associated with this planned activity are similar to those described in References 1 and 2. Thus, the surveying of the endfitting storage containers does not create the possibility of an accident or malfunction of a different type than any previously evaluated in References 1 and 2.

Has the margin of safety, as defined in the basis for any Technical Specifications, been reduced?

Reference 6 proposed the addition of the criticality monitors for the upper endfitting storage area to Table 4.3-3 of the Recovery Operations Plan. This proposal was approved by the NRC per Reference 7. These criticality monitors will continue to be operable during this activity as required by Table 4.3-3 of the Recovery Operations Plan. Currently, the upper endfitting storage containers are borated to a concentration between 4350-6000 ppm. Though boration of these containers is not required by the Technical Specifications (Tech. Specs.), the basis for 4350-6000 ppm ensures subcriticality under all credible conditions (Reference Tech. Spec. Basis 3/4.1.1). Draining the endfitting storage containers is necessary since the boron can impede the measurement technique. However, based on the analysis in Section IV, the potential for criticality in a single endfitting storage container is not credible. If a container is verified to contain SNM as result of the planned activity, it will be handled and stored in accordance with plant procedures. Thus, this activity does not reduce the margin of safety, as defined in the basis for any Tech. Specs.

Based on the above evaluation, the planned activity does not constitute an unreviewed safety question pursuant to 10 CFR 50.59.

VII. REFERENCES

1. GPU Nuclear letter 4410-86-L-0132, dated August 16, 1986, "Storage of Upper Endfittings."

2. GPU Nuclear letter 4410-86-L-0160, dated September 9, 1986, "Endfitting Storage."

3. NRC Letter NRC/TMI-86-090, dated September 10, 1986, "Storage of Upper Endfittings."

4. NRC Letter NRC/TMI-86-096, dated September 25, 1986, "Storage of Upper Endfittings.

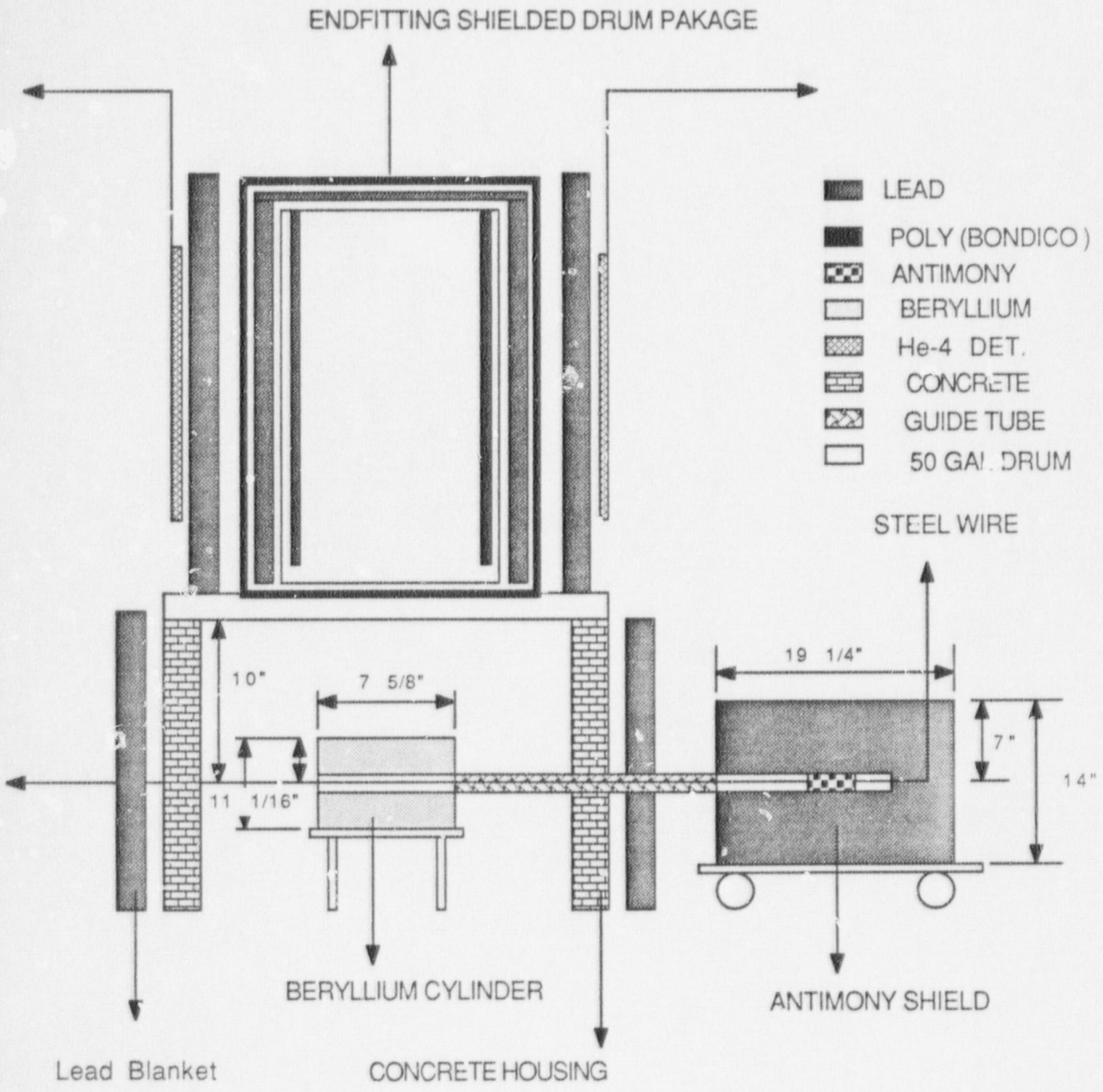
5. "ALARA Evaluation for Disposition of Upper Endfittings," Design Engineering memorandum DEOE-1436, dated April 27, 1989.

6. GPU Nuclear letter 4410-86-L-0129, dated August 18, 1986, "Recovery Operations Plan Change Request No. 39."

7. NRC Letter NRC/TMI-86-091, dated September 11, 1986, "Recovery Operations Plan Change No. 35."

FIGURE 1

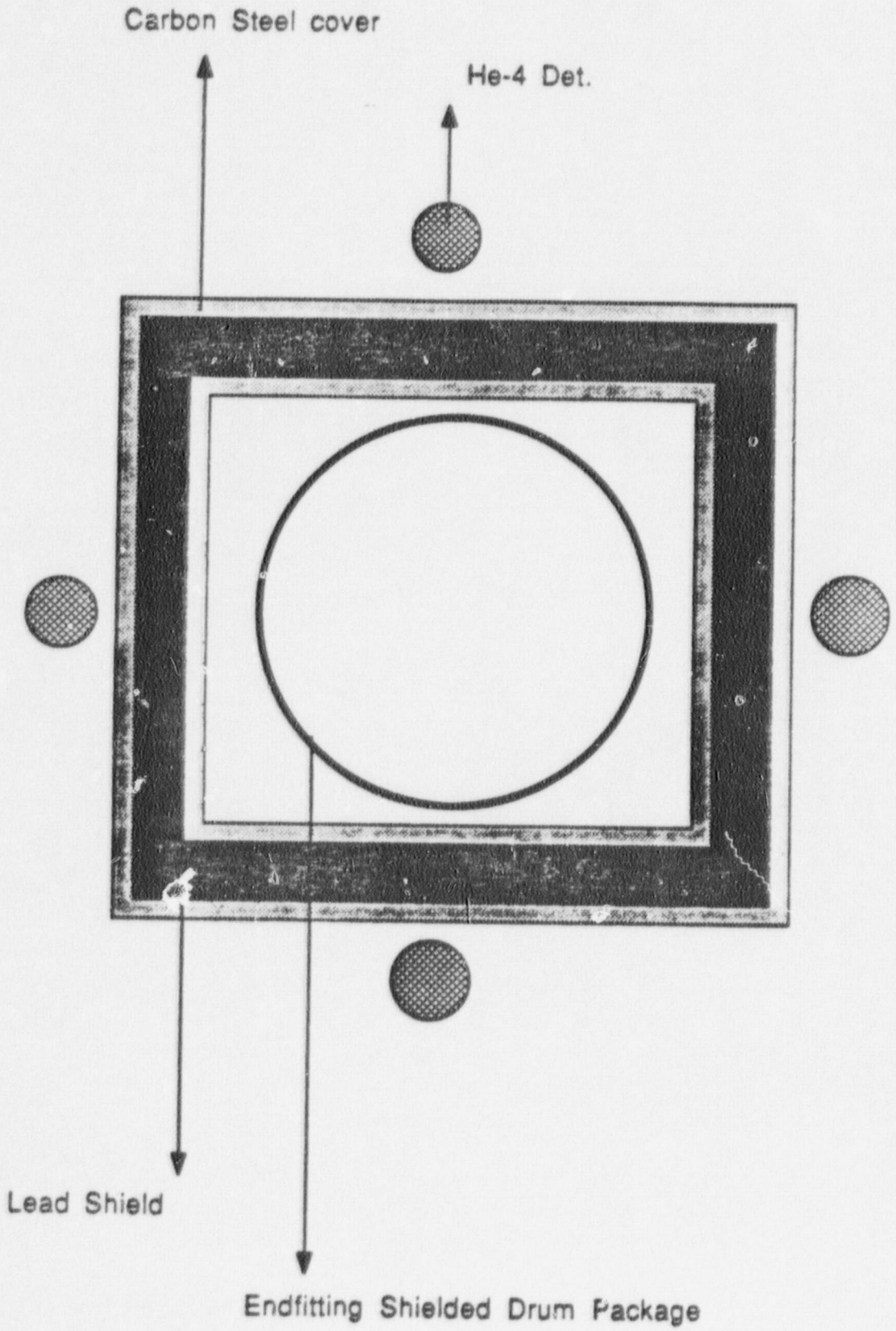
PLANNED ENDFITTING MEASUREMENT CONFIGURATION (Side View)



* DRAWING IS NOT TO SCALE

FIGURE 2

PLANNED ENDFITTING MEASUREMENT CONFIGURATION (Top View)



* Drawing is not to scale