71-9315

Department of Energy
Washington, DC 20585

OCT 26 2006

ATTN: Document Control Desk,
Director, Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Document Control Desk:

Request for Additional Information (RAI) for Amendment #2 of the ES-3100 Certificate of Compliance (CoC) were received by the U.S. Department of Energy on September 20, 2006. The RAI responses for Amendment #2 of CoC No. 9315, Model ES-3100 Shipping Package, Docket No. 71-9315, TAC No. L24006, and a copy of this letter, will be sent by express mail directly to Kimberly J. Hardin, Project Manager, from BWXT Y-12. The responses are compiled in the document Y/LF-773.

If you have any questions, please contact me at 301-903-5513 or Jeff Arbital at (865) 576-8254.

Sincerely,

James M. Shuler

James M. Shuler
Manage, Packaging Certification Program
Safety Management and Operations
Office of Environmental Management

cc:
Dana Willaford, DOE ORO
George B. Singleton, BWXT Y12
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Y/LF-773

BWXT Y-12

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Y-12 NATIONAL SECURITY COMPLEX

REQUEST FOR ADDITIONAL INFORMATION

CoC Revision 2

Docket No. 71-9315
TAC No. L23818

CoC No. 9315
Model ES-3100 Shipping Package

BWXT Y-12, L.L.C.

October 25, 2006

MANAGED BY
BWXT Y-12, L.L.C.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

UCN-13672 (10-00)

Y/LF-773

REQUEST FOR ADDITIONAL INFORMATION

COC REVISION 2

CoC No. 9315
Model ES-3100 Shipping Package

October 25, 2006

Prepared by the
Y-12 National Security Complex
Oak Ridge, Tennessee 37831

Managed by
BWXT Y-12, L.L.C.
for the
U.S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-84OR21400

Chapter 3 Thermal

3-1 Justify that increasing the water content of the Kaolite slurry by 10% does not result in a particle size gradation in the slurry and a density gradient in the final product.

The kaolite is a thermal insulator. Thermal heat transfer calculations are based on the kaolite having a uniform thermal conductivity. The thermal conductivity will vary with position if the kaolite density is not uniform.

This information is necessary to ensure compliance with 10 CFR 71.31(a)(1), 71.33(a)(5), and 71.33(b)(3).

Applicant Response:

We have used this manufacturing specification for casting Kaolite 1600™ in shipping packages for about ten years with little reworking required. This material casting and baking process has worked well. Early in the ES-3100 manufacturing process, unacceptable high density product was resulting standard lots of dry Kaolite 1600™ powder. Densities were slightly above the required density of 22.4 ± 3 lb/ft^3. This deviation on final density caused the rejection several drum parts within a few days, stopping production.

A total process review found the quality control used by Thermal Ceramics, Inc. (vendor of Kaolite 1600™) was not always tight enough to serve the purposes that BWXT Y-12 had for the ES-3100 (even though the product did meet the Thermal Ceramics, Inc. corporate specifications for Kaolite 1600™). To mitigate this problem, the remaining lot of dry Kaolite 1600™ at the ES-3100 manufacturer was discarded and a special blend of Kaolite 1600™ was devised by Thermal Ceramics, Inc. to meet the needs of the ES-3100. This special blend remains as Kaolite 1600™, but has a tighter tolerance band. This new product was given the Thermal Ceramics, Inc. product code GI80ACCUMD0027. Kaolite 1600™ with product code GI80ACCUMD0027 has a tighter than normal tolerance band, which results from a slightly higher expanded vermiculite-to-Portland cement mass ratio. Expanded vermiculite is a water absorber and thus some additional water was required to allow the mixture to flow during casting. In addition, the increased water used for mixing required an increase in the baking time from 38 to 44 hours @ 500°F for proper dehydration. Ten drums following this new product code and water mixture specification had an average density of 22.48 lb/ft^3. This is well within the required tolerance for the cast Kaolite 1600™ density and thus the problem was solved.

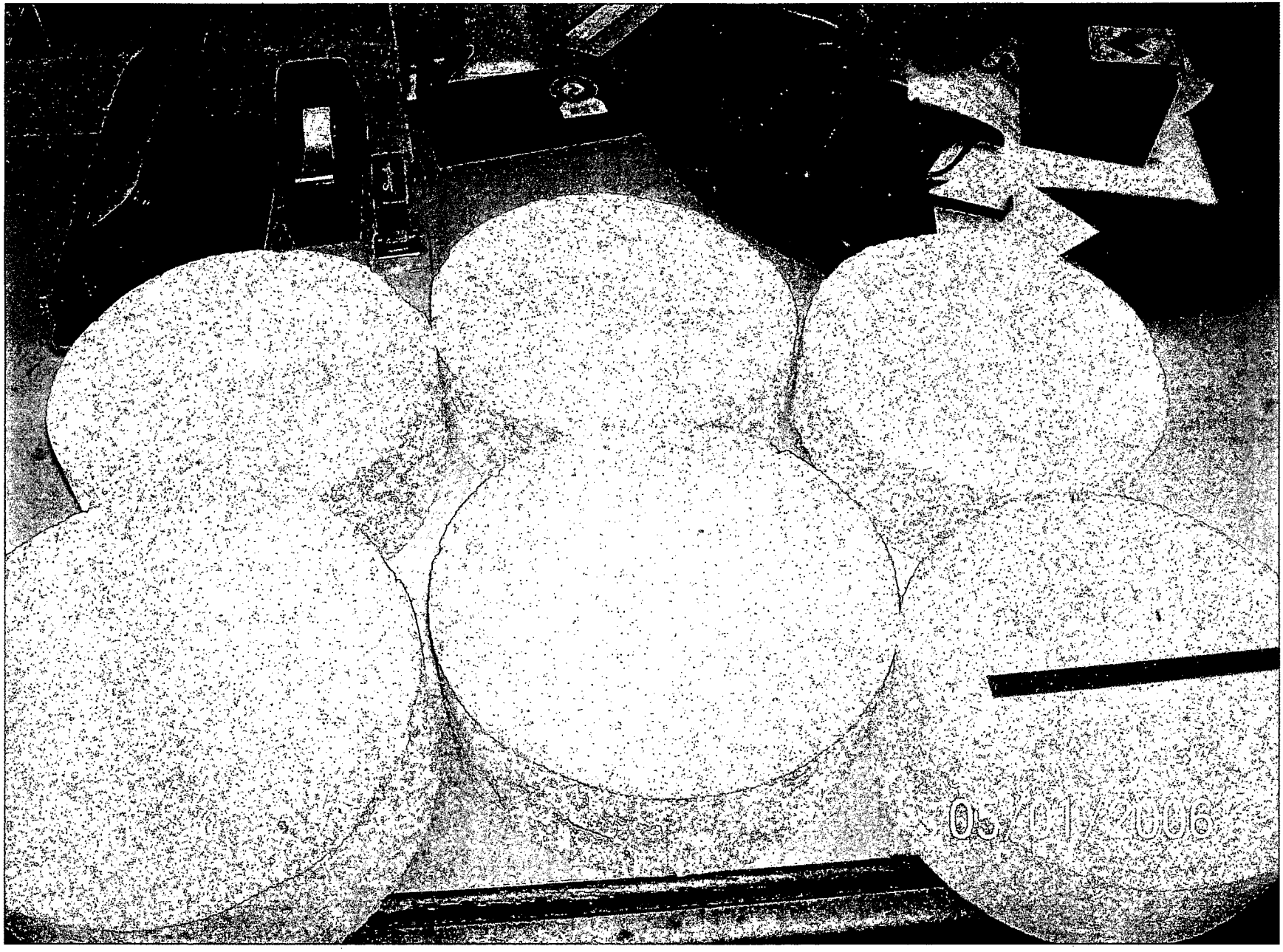
The additional water needed for the mixing and casting process has been determined to be 10%. The resultant water-to-powder weight ratio increased from 1.5 to 1.65 (e.g., 1.65 lbs. of filtered water per lb. of Kaolite 1600™ powder). The 1.65 water-to-powder ratio was selected by testing a range of ratios (1.5, 1.6, 1.7, and 1.8). At a ratio of 1.5, the new Kaolite 1600™ (product code GI80ACCUMD0027) had to be forced into the casting. After testing the other ratios, a value of 1.65 was selected as the optimum, and resulted in an acceptable final density of 22.4±3 lb/ft^3.

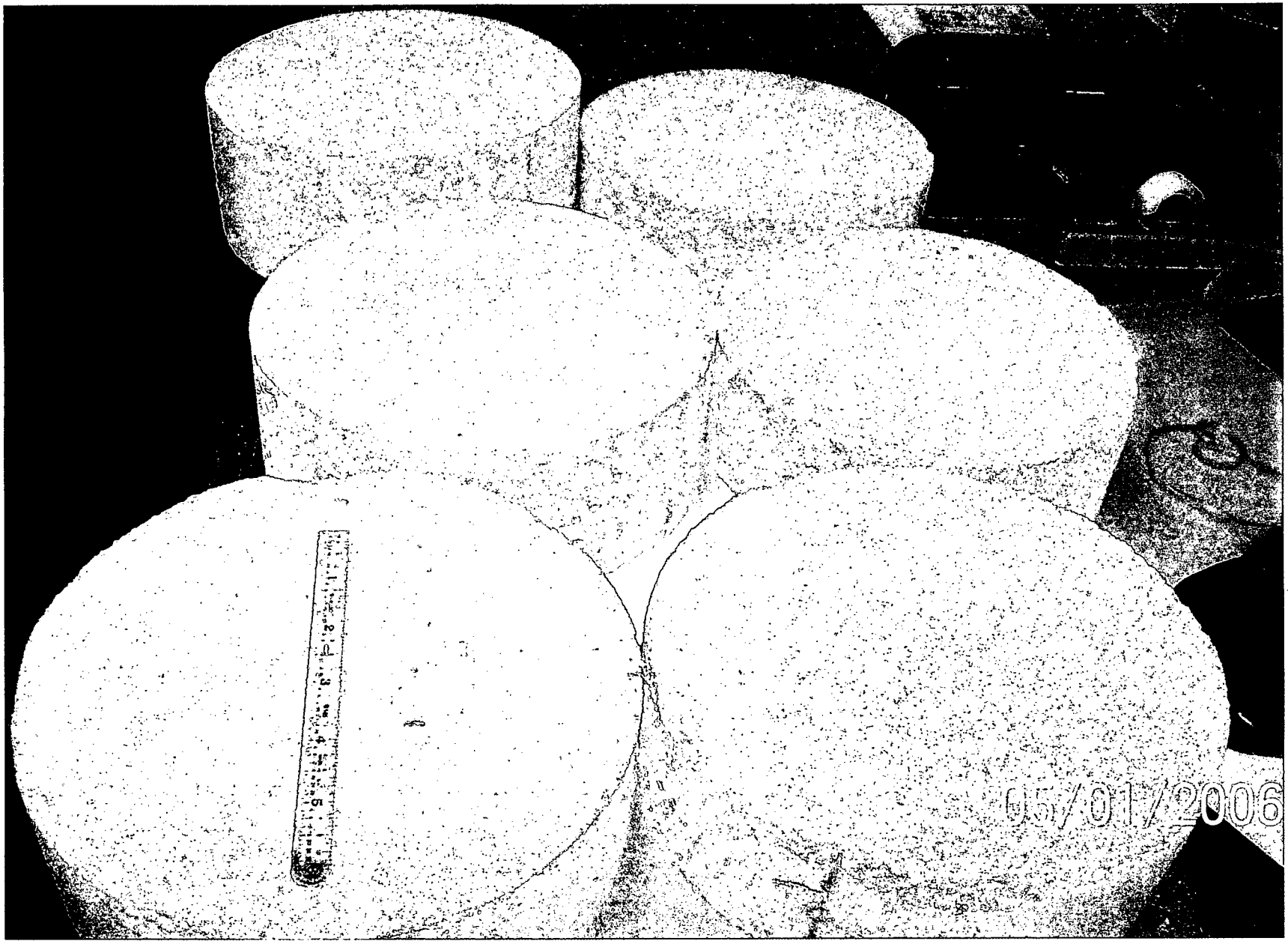
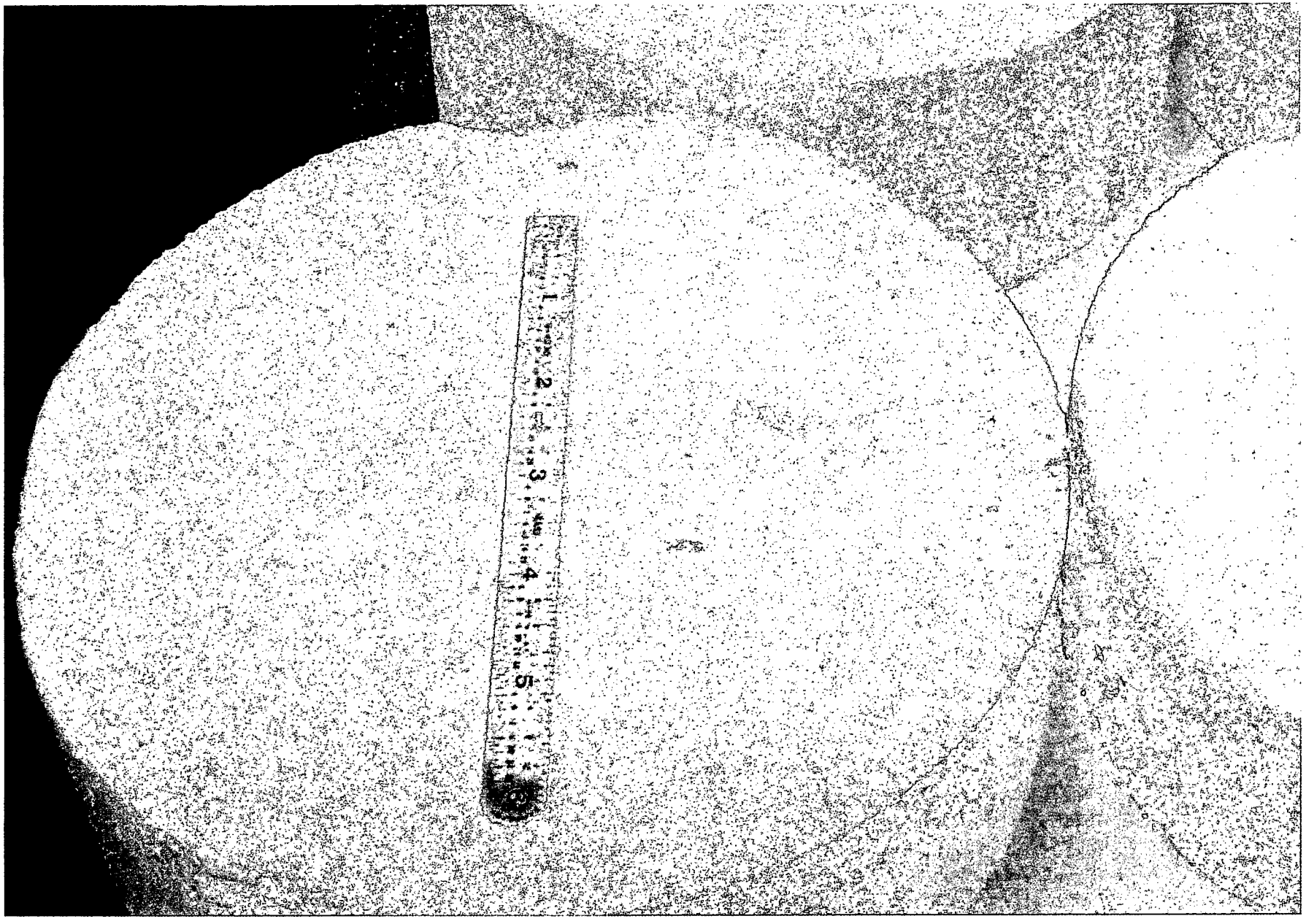
As a side benefit, it appeared that the air bubbles inherent to cast Kaolite 1600™ refractory

materials were smaller and fewer. Typically, the cured matrix has some variations in the uniformity of cement, expanded vermiculite, air and moisture. These variations become insignificant in volumes of 100 cubic centimeters or larger. With more water in the mixture and improved flow during casting, these variations are reduced. Smaller, less frequent air bubbles are seen, and a more uniform thermal conductivity results.

The attached photographs show cast and baked Kaolite 1600™ using a mixing ratio of 1.65. The sections were obtained by casting Kaolite 1600™ in a tin-plated steel pail (9 in. diameter) and then slicing to about 3.25" thickness. Each successive photograph has a greater magnification. Greater material uniformity is observed, with small, infrequent air bubbles, as predicted.

No revisions to the SAR have been made as a result of this RAI.

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