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Released 1994

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

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EXPLOSIVES DEPARTMENT—TNX

- #1 E. E. Swensson
#2 S. J. Bugbee - 700 Area File
#3 P. W. Crane
#4 K. G. Jones
#5 E. V. Lewis
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#10 Hood Worthington
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#13 Yellow Copy

August 11, 1944

~~Photocopy~~

THIS DOCUMENT CONSISTS OF 7 PAGES

To: E. E. Swensson
Production Superintendent

From: P. W. Crane and E. V. Lewis

Subject: Use Grading of Classified Slugs

Reference: (1) Letter Bugbee to Notman, 6-3-44, #7-164
(2) Letter Lewis to Swensson, 7-12-44, #3-341
(3) Letter Lewis to Swensson, 8-4-44, #3-485

INV:
9-47

At a meeting held in S. J. Bugbee's office on 8-7-44 an agreement was reached by members of the Technical Division, Operating Department, and Technical Department as to groups of slug classifications to be assigned to regions of varying degrees of severity of exposure in the pile. Estimates of the slugs to be available in the groups established are included herein, together with a plan for allocation to the pile.

I Use Grades

The classifications assigned to the three groups established are shown below. Classes produced by the classification system given in the second and third reference are denoted by giving in order the frost, penetration, and diameter class.

Slugs produced before the use of telltales in the top caps and classified by the classification system given in the first reference are to be subjected to a fluoroscopic inspection for cap thickness. Two usable cap thickness classes are recognized:

Class 1 - Both caps 0.350" to 0.399" thick.

Class 2 - Either or both caps outside class 1 limits but within overall range 0.300" to 0.500" thick.

Grade I - For most severe exposure

New Classes: 111 and 211

Old Classes made with telltales: A, B, and C1 provided diameter meets class 1 requirements of reference 2 and provided telltale is visible and length is between 8.600" and 8.800".

Old Classes made without telltales: A, B, and C1 in cap thickness class 1 provided diameter meets class 1 requirements of reference 2.

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Classification Changed and Changed To

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By Authority of CG-PR-2

CH Henrich, 6-15-92

By J. E. Savelly, 9-25-94

Verified By J. E. Savelly 9-25-94

E. S. Swensson From P. W. Crane
E. V. Lewis

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Grade II - For Moderate Exposure

New Class: 121

Old Class made with telltale: C3 provided diameter meets class 1 requirements of reference 2, telltale is visible, length is between 8.600" and 8.800", and frost test shows no melted area.

Old Classes made without telltale: C3 provided cap thickness meets at least class 2 requirements and diameter and frost tests meet above requirements.

A, B, and C1 in cap thickness class 2 and diameter class 1.

Grade III - For Least Severe Exposure

New Classes: 112, 122, 212, 221, and 311

Old Classes made with telltale: A, B, and C1 which are withheld from Grade I by reason of class 2 diameter, provided telltale is visible and length is between 8.600" and 8.800".

C3 subject to requirements just stated.

C2 which meet length and diameter requirements for grade I and are not in frost test class 4.

Old Classes made without telltale: A, B, and C1 in cap thickness class 1 or 2 which are withheld from grade I or II by reason of class 2 diameter.

C3 showing melted areas in the frost test not worse than those of class 2 of the second reference and in diameter class 1 and cap thickness class 1 or 2.

C2 not in frost test class 4 provided diameter is in class 1 and cap thickness in class 1 or 2.

The following classes not meeting the above requirements shall be held in a reserve group:

New Classes: 222, 312, 321, 322, 411, and 412.

Old Classes: A, B, C1, C2, and C3 meeting grade III length or end requirements but failing in other respects.

Slugs from old classes C4 and E1 made with telltales are subject to reclassification following partial reinspection according to reference 2 and 3 and to assignment to types on the basis of their new classification.

Slugs from old classes C4 and E1 made without telltales are subject to diameter inspection in accordance with reference 2, to fluoroscopic inspection as stated earlier, and to reclassification disregarding the dimensional phases of the original inspection. They may then be graded as detailed above.

II Forecast of Slugs Available 9-1-44

During the period from 7-19-44 to 8-7-44 inclusive, slugs were canned at an average rate of 1200 per day. It is expected that the canning rate for the balance of the month will average 1500 slugs per day, or 1.25 times the previous rate. In making the forecast, the rate of production of each grade through 8-7 was increased by this factor to estimate production for the balance of the month, with the following results:

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II Forecast of Slugs Available 9-1-44 Cont'd.

<u>Grade</u>	<u>Actual To 8-7</u>	<u>Average Rate</u>	<u>Estimated</u>		<u>Total 8-31</u>
			<u>Rate</u>	<u>to 8-31</u>	
I	2790	139.5	174.4	4186	6976
II	4693	234.7	293.4	7042	11735
III	2386	119.3	149.1	3578	5964
Reserve	2183	109.2	136.5	3276	5459

A forecast of the exact distribution of material classified under the older system is not at present feasible. Figures now available suggest that of 38,516 slugs classified under the older system, some 28,855 should be available for use in the three grades and reserve. Assuming the same relative distribution as in new material, which should be valid since no material change in individual classification has occurred, the yield and total from old and new classifications available 9-1-44 should be:

<u>Grade</u>	<u>From Old Classification</u>	<u>Total</u>
I	6680	13,656
II	11237	22,972
III	5710	11,674
Reserve	5228	10,687

A detailed forecast for grade I was made under the following assumptions:

- 1) 90% of class A, B, and C1 slugs in diameter class 1.
- 2) 25% of class A, B, and C1 slugs made without telltales in cap thickness class 1.
- 3) 83% of class A, B, and C1 slugs in frost test class 1.

This forecast indicated some 4056 slugs would meet grade I requirements, bringing the total for this grade to 11,032, or enough to meet the charging requirements. The distribution among the remaining classes may be expected to be close to that required.

III Zoning of Slugs in 105B Unit

It was agreed in the meeting that the three grades of slugs described in the previous section would be distributed in three zones in the pile. The size of these zones is based on the estimated numbers of slugs of each class which will be available on September 1, 1944. The shape and position of the zones in the pile are based on the isograms of power and of slug jacket temperature which are to be expected in the fully loaded 1500 tube flattened pile. This was done since it is planned to start the 105B unit with the loading of approximately 800 tubes and then extend it to 1500 tubes before all of the original loading has been discharged.

The three zones are described below and are illustrated in Figures 1 and 2.

Zone 1.

This zone which is common to both the 800 and the 1500 tube loading is a cylinder containing approximately 11,000 slugs of Grade 1. The radius is 15 tubes from the longitudinal axis of the pile and the length, 16 slugs. One end of this cylinder is located at a distance of ten slugs from the charging end of the active zone and the other end is six slugs from the discharge end of the active zone. The cylinder is thus displaced toward the discharge end by distance of two slugs. At the discharge

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III Zoning of Slugs in 105B Unit Cont'd.

Zone 1 Cont'd.

end of the cylinder, there is an additional circular pad with a five-tube radius which extends toward the discharge end for a distance of four slugs.

The outer curved surface of the cylinder extends to the isogram representing 80% of maximum power. The slugs at the end of the cylinder nearest the charging end operate at 85% of the maximum power and those at the extreme end of the zone near the discharge face operate at 32% of the maximum power. A comparison of the temperature and power conditions in this zone with those of the other zones is given in Table 1 and in Figures I and II. o

All slugs in this zone will have shown no evidence of penetration during inspection since it is believed that these should stand the combination of high power generation and high jacket temperatures prevalent there.

Zone 2

The initial loading of 800 tubes will contain approximately 15,000 slugs of Grade II in this zone. These will fill in the space 6 slugs long between Zone 1 and the discharge face and a space 7 slugs long between Zone 1 and the charging face. There will also be a thin shell approximately one tube in thickness around Zone 1. When the loading is expanded to 1500 tubes, this hollow cylindrical shell will be added to until it is 5 tubes thick and will extend to within 2 tubes of the outside border of the pile. It will then contain around 24,000 slugs. If more or less slugs of Grade II are available, the outer radius of the shell will be adjusted accordingly.

The slugs in this zone will show penetration but will be excellent for frost test. They will be exposed to considerably less severe combinations of power and temperature than those in Zone 1 but to approximately the same maximum water temperature.

Zone 3

In the 800 tube loading Zone 3 will comprise a slice 3 slugs thick and the full diameter of the small pile and will be located between the charging end of the pile and Zone 2. In this part of the pile both temperature and power are very low. When the expansion to 1500 tubes takes place, Zone 3 will consist of a thin shell around Zone 2, 2 slugs thick extending to the outer edge of the pile. As now proposed, this Zone will then contain around 13,000 slugs of Grade III, although it may be smaller provided more than 24,000 Grade II slugs are available for Zone II.

These three zones are compared in the following tabulation:

E. E. Swensson from P. W. Crane
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Table I

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Zone		Maximum Power Relative To Hottest Slug	Maximum Jacket Temperature °C	Most Severe Condition Involving Jacket Tem- perature and Power	
				Power %	°C
I	50° Outlet water			75-100	45-53
	800 tubes	100	55	75-100	45-53
	1500 tubes	100	55	75-100	45-53
	65° Outlet Water				
	800 tubes	100	75	75-100	60-70
	1500 tubes	100	75	75-100	60-70
II	50° Outlet water				
	800 tubes	85	50	55	50
	1500 tubes	85	53	62	53
	65° Outlet water				
	800 tubes	85	67	55	67
	1500 tubes	85	73	62	73
III	50° Outlet water				
	800 tubes	40	27	40	27
	1500 tubes	40	32	40	30
	65° Outlet water				
	800 tubes	40	36	40	36
	1500 tubes	40	43	40	40

P. W. Crane
P. W. Crane - Chief Supervisor
100 Technical

E. V. Lewis
E. V. Lewis - Chief Supervisor
Statistical - Technical Department

PWC:EVL:jdd

FIGURE 1

PATTERN FOR INITIAL CHARGING OF 105-B UNIT (800 TUBES)
PLAN VIEW SHOWING JACKET TEMPERATURE AND POWER ISOGRAMS

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