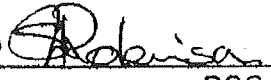


Reference	Rev	Page
DSG-318-011	0	i

KOEBERG NUCLEAR POWER STATION
TECHNICAL SERVICES
DESIGN & SPECIFICATION GROUP

FILE NUMBER DSG-318-011
(Note: This Specification is a Revision of
Specification 0702.06.002)

TITLE : TRANSPORT QUALIFICATION TYPE TESTING OF TES
CONCRETE WASTE DISPOSAL DRUMS

AUTHENTICATED	
SIGNED	 DSG
DATE	9.6.88

Reference	Rev	Page
DSG-318-011	0	ii

KOEBERG NUCLEAR POWER STATION

TECHNICAL SPECIFICATION

DESIGN & SPECIFICATION GROUP

for

TRANSPORT QUALIFICATION TYPE TESTING OF
TES CONCRETE WASTE DISPOSAL DRUMS

APPROVED: <i>Brian Donda</i>		DATE: 29/3/88
PARAGRAPHS	PREPARED BY	REVIEWED BY
1 Through 12	<i>B. Donda</i>	<i>L. Uys</i>

RECORD OF REVISIONS

Rev	Date	Description of Revisor	Prep.	Rev.	Appr.
0	29/3/88	Rewritten and Reissued As Rev 0	<i>D.P.</i>	<i>my</i>	<i>ED</i>

Reference	Rev	Page
DSG-318-011	0	1 of 7

TECHNICAL SPECIFICATION
FOR
TRANSPORT QUALIFICATION TYPE TESTING OF
TES CONCRETE WASTE DISPOSAL DRUMS

INDEX

1.0	SCOPE
2.0	REFERENCES
3.0	INTERFACES
4.0	ENVIRONMENTAL CONDITIONS
5.0	SERVICE CONDITIONS
6.0	OVERALL DESIGN REQUIREMENTS
7.0	VERIFICATION AND TESTS
8.0	QUALITY ASSURANCE
9.0	DOCUMENTATION
10.0	MARKING AND IDENTIFICATION
11.0	PACKAGING AND SHIPPING
12.0	APPENDICES

Reference	Rev	Page
DSG-318-011	0	2 of 7

1.0 SCOPE

1.1 General

- 1.1.1 This specification establishes testing requirements to demonstrate an acceptable level of control of the radiation hazards to persons, property and the environment that are associated with the transport of radioactive material in concrete waste disposal drums.
- 1.1.2 These concrete waste disposal drums are considered to be strong industrial packages for low-level solid radioactive materials in terms of Reference 2.1.1. This specification complies with the testing requirements set forth in Reference 2.1.1 for this type of container.
- 1.1.3 Should any conflicts arise between this specification and any of the reference documents, the Contractor/Vendor/Supplier shall obtain clarification from the ESKOM representative before proceeding with the tests.

1.2 Scope of Supply

- 1.2.1 This specification defines the qualification of concrete waste disposal drums for transportation.
- 1.2.2 The Contractor/Vendor/Supplier shall state the results of the tests conducted on the concrete waste disposal drums.

1.3 Definitions

1.3.1 Concrete Waste Disposal Drum

Five types of concrete drums are used for different types of waste and different activity levels.

Drum Type	O.D. (m)	I.D. (m)	Thickness (m)	External height (m)	Waste Capacity (m ³)	Total weight when full (t)
CI	1,40	1,10	0,15	1,30	0,360	4 to 5
CII	1,40	0,80	0,30	1,30	0,120	4 to 5
CIII	1,40	0,60	0,40	1,30	0,040	4 to 5
CIV	1,10	0,80	0,15	1,30		3
CII filt- er	1,40	0,80	0,30*	1,30		3

* The thickness of bottom concrete is 0,15 m to allow for the encapsulation of tall filters.

Reference	Rev	Page
DSG-318-011	0	3 of 7

(1.3.1 continued)

The first two types are usually for medium activity resins and concentrate. Type III is only used for high-activity wastes (resins).

According to their activity, filters are set either in Type II Filter drums or in Type IV drums.

Drum drawings are included in Appendix 8.1.

2.0 REFERENCES

- 2.1 The testing methods identified in this specification were adapted from the following:
 - 2.1.1 International Atomic Energy Agency Safety Series 6; Regulations for the Safe transport of Radioactive Materials, 1973 Revised Edition (as amended).
 - 2.1.2 "Specifications and Drawings for TES Consumables and Accessories"; KBA 1217 TES 800, Rev 1.
 - 2.1.3 "Solid Waste Treatment - TES - System - Annual Concrete Drum Production", KBA 0917TES 800, Rev 1.
 - 2.1.4 ESKOM Technical Specification No. DSG-318-003 "Manufacture of TES Concrete Waste Disposal Drums and the Supply of Filler Materials".

3.0 INTERFACES

- 3.1 The concrete waste disposal drums to be tested are representative of drum types used in the solid waste disposal system (TES) for Koeberg Units 1 and 2.

4.0 ENVIRONMENTAL CONDITIONS

4.1 Ambient Conditions

Temperature Min/Max	-2°C to 35°C
Pressure	Atmospheric
Relative Humidity	100%
Salt	Sea Air
Water	Mist and Fog

Reference	Rev	Page
DSG-318-011	0	4 of 7

5.0 SERVICE CONDITIONS

Not Applicable

6.0 MATERIALS

The constituent materials of the concrete waste disposal drums are given in reference 2.1.4.

7.0 TEST PROCEDURE AND VERIFICATION

7.1 A complete series of tests shall be performed on a prototype of each drum type.

7.2 The contents of each drum type tested shall simulate as closely as practicable the expected normal radioactive contents.

7.3 Preparation of a Specimen for Testing.

7.3.1 Each drum shall be examined before testing to identify and record faults or damage including the following:

- (a) divergence from the specification (Reference 2.1.4) or the drawings
- (b) defects in construction;
- (c) corrosion or other deterioration, and
- (c) distortion of features.

7.3.2 The drum type shall be clearly specified.

7.3.3 The external features of the drum shall be clearly identified so that reference may be made simply and clearly to any part of such specimen.

7.4 Testing the Integrity of Containment and Shielding

7.4.1 After any of the applicable tests specified in paragraphs 7.5 - 7.8, it shall be further demonstrated that the integrity of the containment, or of the containment and shielding, has been retained to the extent required in paragraph 7.9 for the drum type tested.

Reference	Rev	Page
DSG-318-011	0	5 of 7

7.5 Tests for Demonstrating Ability to Withstand Normal Conditions of Transport

- 7.5.1 The tests are: the water spray test, the free drop test, and the compression test. Prototypes of each drum type must be subjected to the free drop test, and the compression test, preceded in each case by the water spray test. One prototype of each drum type may be used for all the tests, provided that the requirements of paragraph 7.5.2 are complied with.
- 7.5.2 The time interval between the conclusion of the water spray test and the succeeding test shall be such that the water has soaked in to the maximum extent, without appreciable drying of the exterior of the specimen. In the absence of any evidence to the contrary, this interval shall be taken to be about two hours if the water spray is applied from four directions simultaneously. No time interval should elapse, however, if the water spray is applied from each of the four directions consecutively.

7.6 Water Spray Test

- 7.6.1 Any water spray test shall be considered as satisfactory provided that:
- (a) The amount of water per unit of ground area is approximately equivalent to a rainfall rate of 5 cm per hour;
 - (b) the water impinges upon the specimen at an angle of approximately 45° from the horizontal;
 - (c) the water is approximately uniformly distributed, as in a rainfall, over the entire surface of the specimen in the direction of the spray;
 - (d) the duration of the spray is at least one hour;
 - (e) the orientation of the drum is such that the effects are expected to be the most severe for the features under investigation, and the specimen is supported so that it does not sit in a pool of water.

7.7 Free Drop Test

- 7.7.1 The specimen shall fall onto the target so as to suffer maximum damage in respect of the safety features to be tested.

Reference	Rev	Page
DSG-318-011	0	6 of 7

- 7.7.2 The height of fall measured from the lowest point of the drum to the upper surface of the target shall be not less than 1.2 m, except that for drums weighting more than 5300 kg (when full), the height of fall shall not be less than the distance specified below for the applicable drum weight.

FALL DISTANCE FOR DRUMS (WHEN FULL) WEIGHING MORE THAN 5000 kg

Drum weight (when full) (kg)	Free fall distance (m)
5 000 to 10 000	0.9
10 000 to 15 000	0.6
More than 15 000	0.3

7.7.3 Target for the Drop Tests

- 7.7.3.1 The target shall be a flat, horizontal surface of such a character that any increase in its resistance to displacement or deformation upon impact by the specimen would not significantly increase the damage to the specimen.

7.8 Compression Test

- 7.8.1 The specimen shall be subjected for a period of 24 h, to a compressive load equal to the greater of the following:

- (a) The equivalent of 5 times the weight of the actual drum;
- (b) The equivalent of 1000 kg/m² multiplied by the vertically projected area of the drum.

- 7.8.2 The load shall be applied uniformly to two opposite sides of the specimen, one of which shall be the base on which the drum would normally stand.

7.9 Acceptance Criteria

- 7.9.1 The activity level on the outside surface of the drum being tested shall not exceed 200 mrem/h dose rate following any of the aforementioned tests.

Reference	Rev	Page
DSG-318-011	0	7 of 7

7.10 Final Report

- 7.10.1 Each drum type tested shall have a Summary Report sheet completed (Table 1, Appendix 8.2).
- 7.10.2 The ESKOM Engineer shall state on the Summary Report sheet any special conditions. These special conditions could include particular acceptance criteria, free fall distance, etc.
- 7.10.3 The results stated on the Summary Report sheet will be reviewed by the cognizant ESKOM Engineer to determine the drum's acceptability for use at Koeberg.

8.0 APPENDICES

8.1 Figures

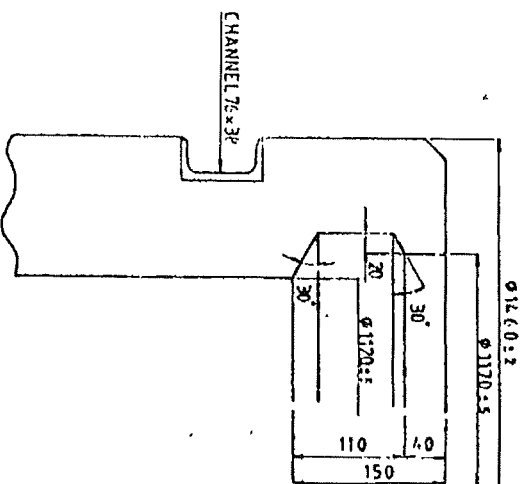
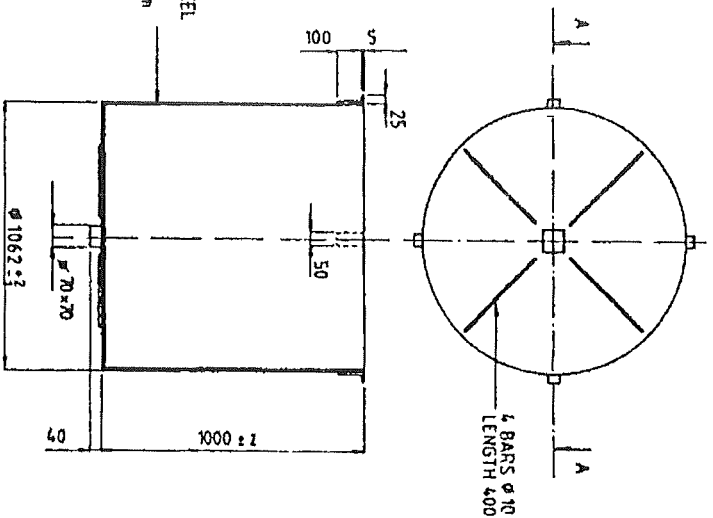
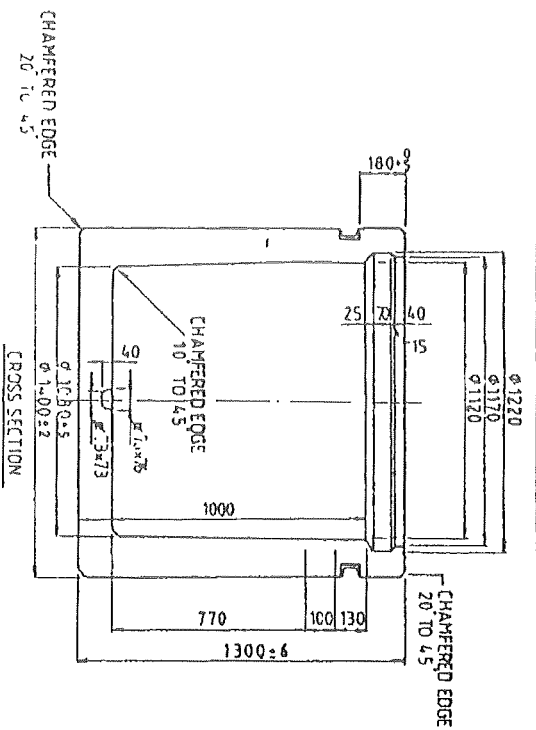
- (a) Figure 1 CI Type Drum
- (b) Figure 2 CII Type Drum
- (c) Figure 3 CIII Type Drum
- (d) Figure 4 CIV Type Drum

8.2 Tables

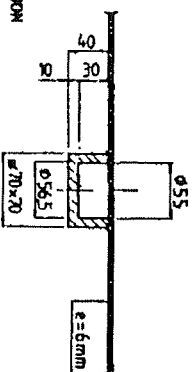
- Table 1 Summary Report Sheet

METAL LINER FOR TYPE C1 DRUM

CROSS SECTION DETAIL

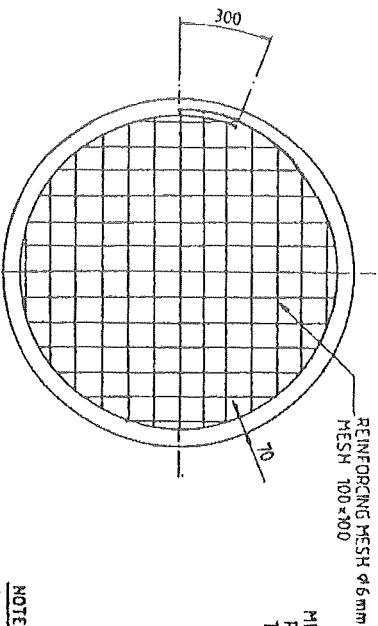


SECTION A-A



- NOTES:
1. METAL LINERS ARE FABRICATED IN ACCORDANCE WITH ESCOM TECHNICAL SPECIFICATION NP 0702.06.003. METAL LINERS FOR TES CONCRETE WASTE DISPOSAL DRUMS
 2. TOLERANCES
 - a. PARALLELISM OF HS CHANNEL : 4mm
 - b. CONCENTRICITY OF DRUM : ±5mm
 - c. PARALLELISM OF BASE : 4mm

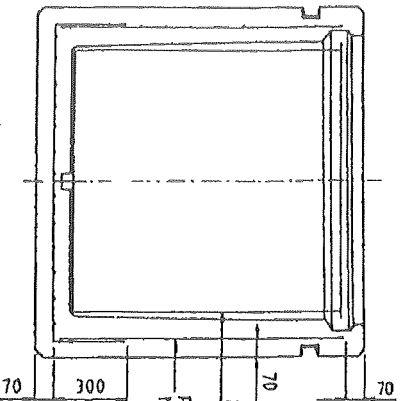
BOTTOM REINFORCEMENT



METAL LINER

REINFORCING MESH Ø6mm
MESH 100 x 100

BODY REINFORCEMENT

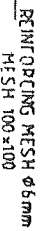
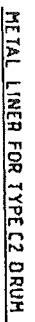
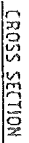


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TYPE C1 DRUM AND METAL LINER

CONTAINER TYPE C1

PT355/50.007 A



BOTTOM REINFORCEMENT

NOTES

- | | | | | |
|---|---|--|--|--|
| 1. METAL LINERS ARE FABRICATED IN ACCORDANCE WITH ESCO TECHNICAL SPECIFICATION NO. 0702.06.003. METAL LINERS FOR TDS CONCRETE WASTE DISPOSAL DROPS | | | | |
| 2. TOLERANCES | | | | |
| a. PARALLELISM OF PDS CHANNEL: 4mm | | | | |
| b. CONCENTRICITY OF DROM: 25mm | | | | |
| c. PARALLELISM OF BASE: 4mm | | | | |
| | 1 | | | |
| KEY EXPLAINED NOTES 1 & 2 AND
REV. NO. 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 | | | | |

2

BODY REINFORCEMENT

METAL LINER

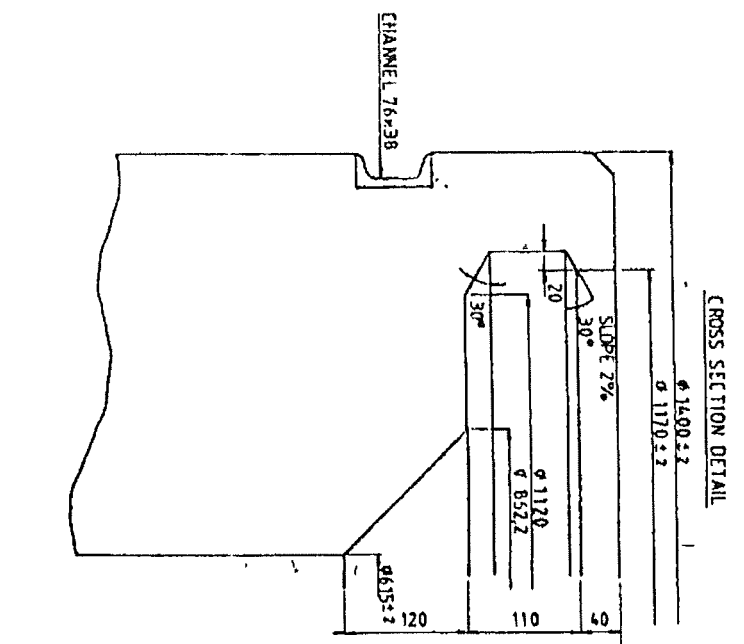
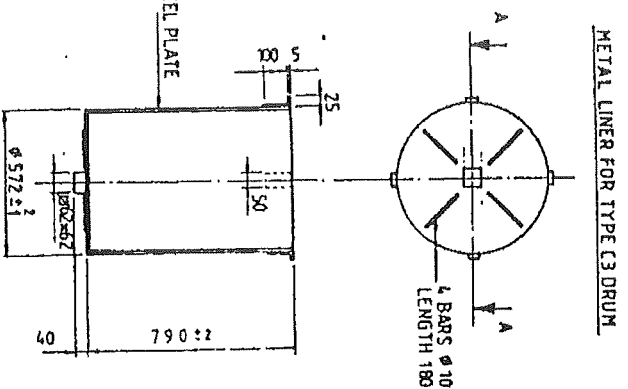
REINFORCING MESH ϕ 6mm
MESH 100x100

[illegible]

TYPE C2.DRUM AND METAL LINER
CONTAINER TYPE C2

ESCOM • EVKOM

PT 355/50.007 B



NOTES

1. METAL LINERS ARE FABRICATED IN ACCORDANCE WITH ESCOM TECHNICAL SPECIFICATIONS
Nº 0702.06.003. METAL LINERS FOR TES WASTE DISPOSAL DRUMS

2. TOLERANCES

a. PARALLELISM OF RS CHANNEL : 4mm

b. CONCENTRICITY OF DRUM : ±5mm

c. PARALLELISM OF BASE : 4mm

BODY REINFORCEMENT

1		KIT DELIVER, NOTES RE 2 ADDED					
2		BY ESCOM KIT C2A 8700700000-00000					
NEW	AUTM	DATE	REVISIONS/REVIEWS	BY	CHGD	ATTACHED OR-AMENDS	
	MAG	DATUM	WORK REF/WORKITEM#	DTUM	NGES	YELLOWING/STRENGTH	
			WESTERN CAPE				
			REGION				
							
			WES-KAAPLANDSE				
			STREEK				
CHGD	EJ.V.	8.7.85					
MODS							
PREPARED							
CHECKED	RWM	8.7.85					
SCALE							
SCALE	N.T.S.						
TYPE C3 DRUM AND METAL LINER CONTAINER TYPE C3 ESCOM • EVKOM				PT 355/50.007 C			
						NEW	1

TYPE C3 DRUM AND METAL LINER
CONTAINER TYPE C3

Reference	Rev	Page
DSG-318-011	0	1 of 2

APPENDIX 8.2
TABLE 1
SUMMARY REPORT SHEET

I. DRUM TYPE: _____

II DIMENSIONS: _____

Ø.D. (m): _____

I.D. (m): _____

Thickness (m): _____

External Height (m) _____

Total Weight When Full (Kg): _____

Other observations regarding drum condition: _____

III WATER SPRAY TEST

Amount of water per unit ground area: _____

Duration of Spray: _____

Drum Orientation: _____

Observations (surface activity level, etc.): _____

IV FREE DROP TEST:

Height of Fall: _____

Drum Orientation. _____

Observations (surface activity, drum condition, etc.): _____

Reference	Rev	Page
DSG-318-011	0	2 of 2

APPENDIX 8.2
TABLE 1
SUMMARY REPORT SHEET

V COMPRESSION TEST:

Compressive Load (kg) : _____

Duration of Test (hrs): _____

Orientation of Drum: _____

Observations (surface activity level, drum condition, etc.): _____

VI GENERAL COMMENTS/OBSERVATIONS

Prepared by: _____ Date: _____

Witnessed by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved by: _____ Date: _____