ESKOM

GENERATION NUCLEAR GROUP

(KOEBERG NUCLEAR POWER STATION)

Specification Title

STATIONARY VENTED LEAD ACID BATTERIES FOR USE IN CLASS 1E AND NSF APPLICATIONS

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KOEBERG NUCLEAR POWER STATION

NUCLEAR ENGINEERING

	APPROVED: G Smith	DATE: 1996-03-20
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RECORD OF REVISIONS

Rev	Date	Description of Revision	Prep.	Rev.	Appr.
5	2010-02-25	Complete revision addressing/including the following: - References in §2.0 including IEEE Std 450-2002. - NSF batteries (testing and commissioning requirements). - Battery capacity formula. - Attachment 10.4 "Doc Checklist"	MBF	EJK/ BM/ CH	AMK

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Full details of all deviations from this specification must be submitted to ESKOM (KOEBERG) in writing for clearance prior to manufacture/despatch of the product.

ESKOM

KOEBERG NUCLEAR POWER STATION

TECHNICAL SPECIFICATION

1.0 SCOPE

1.1 This specification details ESKOM (Koeberg) requirements for supply, manufacture, factory commissioning and delivery to Koeberg Nuclear Power Station of tubular type, wet charged, stationary, vented lead acid batteries.

Off loading and all subsequent handling of battery cells at site will be Eskom (Koeberg) responsibility.

Nothing in this specification shall lessen the selected manufacturer's obligations detailed in any other documentation forming part of the contract.

This specification applies to both NSF and 1E battery cells due to the interchangeability of certain types of battery cells.

1.2 Extent of Supply

Batteries shall be supplied to conform to the specific requirements detailed in Schedule A of this specification.

Batteries shall be supplied with the accessories, hardware and fittings as indicated in Schedule A to enable the equipment to be placed in service and function correctly.

2.0 REFERENCES

2.1	SABS - IEC 896 - 1	-	Stationary lead acid batteries General requirements and methods of test Part 1: Vented types
2.2	DSG-311-043	-	Seismic qualification of lead acid batteries for use at Koeberg Nuclear Power Station.
2.3	IEEE Std 535-1979	-	IEEE Standard for Qualification of Class 1E-lead acid storage Batteries for Nuclear Power Generating Stations.
2.4	IEEE Std 450-2002	-	IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead – Acid Batteries for Stationery Applications.
2.5	DSG-318-087	-	Quality requirements for the procurement of assets, goods and services.
2.6	ASME NQA-1:subpart 2.2	-	Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Stations.

3.0 BATTERIES CHARGING ROUTINE

3.1 Float Charge:

A constant voltage of (2.23V x number of cells) is maintained at the battery terminals.

Under normal operating circumstances the battery will be retained on float charge for the full duration of a reactor fuel cycle.

3.2 Full Charge:

A constant voltage (2.28V x number of cells) is applied to the battery terminals for 40 hours every month during routine servicing.

The 40-hour full charge will be automatically initiated if the AC supply to the battery charger is interrupted for more than 5 minutes.

The charging current is limited to 0,5 $C_{10.}$ amperes.

3.3 Boost charge

Boost charging requires the battery to be disconnected from the switchboard and under normal operating conditions access is available at outage intervals. The manufacturer shall ensure that this mode of operation will not adversely influence battery performance and/or expected service life.

A constant voltage (2.6 x number of cells) is applied at the battery terminals with the charging current limited to 0,07 $C_{10.}$ Amperes

4.0 DESIGN REQUIREMENTS

4.1 Environmental Conditions

The battery room conditions are:

(a)	Atmospheric pressure	:	860 to 1060 mbar
(b)	Temperature	:	15 °C to 35 °C
(c)	Maximum relative humidity	:	90%
(d)	Radiation	:	Background

4.2 Nominal Ampere Hour Capacity

The battery manufacturer shall offer, from his standard range, a battery, which meets the following requirements:

4.2.1 Over the temperature range specified in Clause 4.1 and at the end of the expected service life, the battery shall sustain the design load current specified in Schedule A for one hour and the terminal voltage shall not fall below 1,86 volts per cell.

4.2.2 At the end of the discharge under conditions specified in Clause 4.2.1 and with a 50% increase in load current (maintained for 15 seconds) the terminal voltage shall not fall below 1,80 volts per cell.

4.3 Number of Cells

The number of cells proposed by Eskom (Koeberg) is stated in Schedule A.

If the supplier is of the opinion that a different number of cells would be more suitable for the particular battery application, this shall be stated in Schedule B and an explanatory statement shall be indicated in the Deviation Schedule.

The number of spare cells to be supplied is stated in Schedule A.

The spare cells shall form part of the battery for the FACTORY COMMISSIONING test sequence.

4.4 Battery Dimensions

4.4.1 The manufacturer shall detail guaranteed cell dimensions in Schedule B.

4.4.2 The height of the battery stillage (including porcelain insulators) should not exceed 260 mm.

4.5 AC Component of Charging current

The batteries must be able to withstand continuously without damage the following RMS value of ripple current

0,05 C_{10} A for C_{10} >400 AH

0,10 C_{10} A for $C_{10} \leq$ 400 AH

4.6 Maximum Charge Current

The batteries must be able to withstand, without damage, an initial charge current of 0,5 C_{10} amperes when operating in Full Charge Mode (2,28 v/cell)

4.7 Capacity for Overcharge

The batteries must be capable of withstanding an overcharge of 2,4 V/cell for 3 months without sustaining irreversible damage or the C_{10} capacity falling below 85% of the cell rated capacity.

4.8. Endurance in Discharge Recharge Cycles

4.8.1 The batteries must be capable of providing 60 discharge/recharge cycles as specified in 6.3 without sustaining irreversible damage or the C_{10} capacity falling below 85% of the cell rated capacity.

4.8.2 The battery will be discharged at the C_{10} rate and terminated when the average cell voltage has decayed to 1,80 volts.

4.8.3 The recharge rate is specified in Clause 6.2.

4.9 Performance Guarantees

The manufacturer shall list the guaranteed efficiency, service life and service warranty period for the battery in accordance with the charging routines specified in clause 3.0.

4.10 Cell Configuration

Eskom (Koeberg) will indicate the required cell configuration and cell spacing for the battery.

This configuration will apply during the factory commissioning detailed in Clause 6.1.

All intercell links will be formed to fit the specified configuration and will be supplied with the battery.

Any flexible link with poorly secured heat shrink is to be discarded.

The manufacturer may inspect the plant battery rooms.

4.11 Marking of Cells

4.11.1 Polarity of Terminal Posts

All terminal posts on each cell shall be clearly and indelibly marked with its polarity.

4.11.2 Electrolyte Level and Specific Gravity

The maximum and minimum electrolyte levels, and the recommended fully charged condition specific gravity, shall be clearly and indelibly marked on each cell container.

4.11.3 Numbering of Cells

Manufacturers name, type code and year of manufacture shall be clearly and indelibly marked on each cell.

(a) Each cell shall be labelled with a consecutive cell number and this information shall cross reference all data sheets/test records contained in the BATTERY DATA FILES.

(b) Labels shall be of a material that will be unaffected by the environment, and will remain legible for the life of the battery.

(c) The labels shall be legible from a distance of 2 meters, (minimum size of 25 mm), and shall have black numbers on white background.

(d) The labels shall be affixed to the top of the cells. The positioning of the labels shall be such that the visual inspection of plates and electrolyte levels is not impeded.

(e) The adhesive used for the labels shall be unaffected by the environment, and shall hold the labels securely for the life of the battery.

4.12. Cell Structural Requirements

4.12.1 Separators

(a) The Separators shall be of sheet/sleeve form

(b) The length and width of the separators shall be greater than that of the plates.

(c) The life of the separators shall be at least equal to the life of the plates.

4.12.2 Plate Assemblies

(a) The plates shall be designed to minimise sedimentation, loss of active material, distortion and buckling.

(b) The positive and negative plate assemblies, including separators, shall be rigid when fixed in the cell containers.

4.12.3 Cell Containers

(a) Unless otherwise approved, containers shall be fully transparent and free from imperfections.

(b) Internal stresses in containers shall be relieved by annealing if appropriate.

(c) When resting on a level surface the containers shall stand firmly, and their top surfaces shall be horizontal.

4.12.4 Cell Assembly

All cells shall be assembled so that the terminal post positions on adjacent cells will line up with a displacement of not more than 5 mm in any plane.

4.12.5 Filler/Vent Plugs

The filler/vent plugs shall be readily removable, and so located as to permit the easy filling and topping-up of cells and the unimpeded use of a hydrometer.

The plugs shall be designed so that they permit the free escape of gases from the cells, but also allow electrolyte vapour to be trapped and returned to the cells.

Combined vent/electrolyte level indicators are required for batteries installed in seismic frames as identified in Schedule A.

4.12.6 General Information

The supplier shall submit a certified data sheet containing the following information with the Battery File detailed in clause 8.2.2.

- overall width (horizontal dimension parallel to plate surface)
- overall length (horizontal dimension perpendicular to plate surface
- height to top of cell cover

- overall height to top of terminal post
- mass of one cell complete
- quantity of electrolyte per cell
- details of stillage mounting

5.0 TYPE/ROUTINE TESTS – 1E/1A and NSF applications

5.1 Type Tests

5.1.1 Additional sequence of tests for the seismic qualification of battery cells:

NOTE: *These tests are not required for battery cells that have been previously seismically qualified by testing, analysis or extrapolation. If the battery cells offered have not been previously seismically qualified, proof must be submitted by the manufacturer that the cells offered are structurally identical in all respects to the battery cells that have been seismically qualified.*

The type tests shall be performed on the battery or the rack, or both, in a specific order, as follows, unless an alternative sequence can be justified.

5.1.1.1 Radiation exposure (as required) as per IEEE Std 535 – 1979 Section 8.1.

NOTE: If the total integrated dosage over the life of the battery does not exceed 10^2Gy, radiation exposure is **NOT** required for qualification.

5.1.1.2 Aging as per DSG-311-043 (Ref. IEEE Std 535 – 1979 Section 8.2) or an equivalent approved specification.

5.1.1.3 Seismic qualification as per DSG-311-043 (Ref. IEEE Std 535-1979 Section 8.3) or an equivalent approved specification.

5.1.2 Performance and Characteristics

The manufacturer must supply copies of all type tests performed on the cells in respect to the design requirements specified in clause 4.0. If type testing has not been performed or any alterations have been made to existing qualified cell types, justification must be provided as to the cell capabilities to meet these requirements.

5.1.3 Acid Proof property test of vent plugs

The plugs to be tested are fitted on cells, which are then permanently overcharged at 0,03 C_{10} amps for one week. Reagent papers (i.e. Litmus or methyl-orange) are placed 2 cm above the orifices of the vent plugs. No change of colour of the reagent shall be noticed.

5.1.4 Flame-proof property test of vent plugs

The vent plugs to be tested are fitted on cells, which are overcharged at 0,03 C_{10} amps so that strong boiling takes place on all plates. A flame placed about 10 cm above the vent plug orifice shall not cause an explosion inside the cells.

5.2 Routine Tests

5.2.1 Containers

(a) Test of dielectric strength of containers:

Each container shall be subjected to a test of dielectric strength at a voltage "U" corresponding to 1000 volts per mm of thickness of the container, with a minimum of 10 000 volts.

The container shall be immersed completely in water (interior and exterior before this for a period 48 hours so that any pores or cracks may have time to soak up water.

At the time of testing, the water level shall be adjusted to 4 cm below the top edge of the container. The inside, the outside, and the edge shall be carefully wiped and dried before the test.

The test shall be performed by immersing one electrode inside and one electrode outside the container. No flashover may occur.

(b) Test of resistance to heat:

The containers shall be wiped, fitted with their covers and filled with water, which shall then be maintained at a constant temperature of 65 °C for 12 hours. The maximum sags of the sides are measured after cooling and after emptying the containers. None of these sags may exceed 1,5% of the width of the wall.

5.2.2 Sealing Test on Cells

(a) Inclination Tests

The cells shall be inclined at 30° to the vertical on each of their sides for 5 minutes. No leak or seepage of electrolyte shall be noticeable either before, during or after the tilt tests. Electrolyte level shall be at maximum.

(b) Overpressure Test

This test shall be performed at a temperature between 15°C and 35°C.

A pressure of 0,03 bar (3 kPa) above atmospheric is applied and maintained for 15 seconds. No leak shall occur.

5.3 Test Certificates

5.3.1 Single copies of certificates detailing the results of all type and routine tests performed on the equipment shall be included in the QA File detailed in clause 8.2.1.

6.0 FACTORY COMMISSIONING

The required work sequence is:

6.1 Assembly

6.1.1 Configure the cells as the connection diagram identified in Schedule A.

6.1.2 Include spare cells as part of the battery.

6.1.3 Form and fit the interconnecting links that will be supplied with the battery and torque as indicated in Schedule B.

6.1.4 All link bolts shall be of sufficient length to accommodate an additional link without disconnecting the bolt.

6.1.5 Select and identify 10% of the cells to be used as pilot cells.

6.2 Filling and Charging

6.2.1 Reference all S.G's to 25°C (add 7 points or 0.007 to the specific gravity for every ten degrees above 25°C or subtract 7 points or 0.007 from the specific gravity for every ten degrees below 25°C.)

6.2.2 Fill with 1,230 to 1,235 S.G electrolytes.

6.2.3 Allow at least 4 hours standing time to stabilise cell temperatures as near as possible to ambient. Prior to placing on charge, top up the electrolyte levels to maximum.

6.2.4 Between 4 and 72 hours after filling, place the battery on charge at $0{,}07C_{10}$ amperes for at least 24 hours and monitor and record S.G, voltage and temperature of selected pilot cells every 2 hours.

Reduce the charge rate to $0{,}035C\ C_{10}$ amperes if the temperature of any of the pilot cells exceed 45°C and continue charging until 1,68 C_{10} AH's have been supplied to the battery.

6.2.5 Allow the battery to stand on open circuit for 24 hours.

6.2.6 Charge at $0{,}035\ C_{10}$ amperes for at least 24 hours and monitor and record SG, voltage and temperature of the selected pilot cells at 2-hour intervals. Continue charging until a minimum of 2.52 C_{10}Ah's have been supplied to the battery and the SG and voltage readings remain constant over three consecutive hourly intervals. When this condition has been reached take readings of voltage and specific gravities of all cells. Adjust SG's as required to achieve the range 1,245 to 1,255.

6.2.7 When all the SGs are within specification adjust the electrolyte levels to maximum by removing the excess acid or topping up with 1.250 specific gravity acid.

6.2.8 Allow the battery to stand on open circuit for between 4 and 24 hours.

6.3 Cycling Discharge Test

6.3.1 Discharge at $0{,}10\ C_{10}$ amperes until the battery voltage reaches (1,80 x number of cells) volts or any cell reaches 1,75 volts.

Discharge test recordings to be:

Battery voltage at 1 minute intervals for the first 5 minutes

- Voltage of all cells on the hour for 9 hours
- Voltage of cells at 9,5 hours and then at 15 minutes intervals to the end of test.

6.3.2 Recharge the battery at $0,07C_{10}$ amperes until the criteria of 6.2.4 and 6.2.6 have been satisfied and monitor in accordance with 6.2.4 and 6.2.6.

6.3.3 Repeat Item 6.3.1.

6.3.4 Recharge the battery at $0,07C_{10}$ amperes until the criteria of 6.2.4 and 6.2.6 have been satisfied and monitor in accordance with 6.2.4 and 6.2.6.

Cell SG acceptance criteria with battery at top of charge on the final charge is 1,245 to 1,255 at 25 °C.

6.4 Capacity Test

6.4.1 Between 4 and 24 hours after completion of charge, record SG and voltage of all cells and the temperature of the pilot cells.

6.4.2 Discharge at 0,3 C_{10} amperes until the battery voltage reaches (1,86 x number of cells) volts or any cell reaches 1,83 volts.

Discharge test recordings to be:

- Battery voltage at 1 minute intervals for the first 5 minutes
- Voltage of all cells at 15 minutes intervals to the end of test.

6.4.3 The volt drop across all interconnecting links shall be measured at the base of the cell terminal post immediately below the link connection within the first 5 minutes of the capacity test.

Volt drop acceptance criteria are:

Inter-cell - 15mV (for the life of the battery bank)
Inter-row - 40mV

NOTE:
Voltage drops are to be recorded.

6.4.4 Calculate and record the temperature corrected battery capacity using the formula:

t_a (25°C) = t_m/(1 + 0.006 (T – 25))

where

t_a (25°C) = actual corrected time at 25°C

t_m = measured time on discharge and

T = average measured temperature at commencement of discharge.

Actual capacity (%) = (t_a (25°C) / t_r) x 100

where

t_r = rated time for discharge, obtained from the table below .

It is recognised that tubular cells require a number of cycles to attain full capacity, it is accepted that nominal capacity may not be reached at this point. The capacity obtained will be compared to nominal data and a decision made by Eskom (Koeberg) as to the acceptance or rejection. In the case of rejection further cycling may be applied in order to achieve acceptable performance.

Capacity acceptance criteria shall not be less than 90% unless otherwise stipulated by Eskom..

Nominal capacities at 25°C after cycling to full performance:

Plate size	Nominal duration
50 Ah	1h 47m
70 Ah	1h 51m
100 Ah	1h 34m
125 Ah	1h 24m

6.4.5 Recharge the battery at 0,07C_{10} amperes until the criteria of 6.2.4 and 6.2.6 have been satisfied and monitor in accordance with 6.2.4 and 6.2.6.

6.5 Float Charge

6.5.1 Battery to be placed on charge at (2,23 x number of cells) volts for 48 hours;

6.5.2 Record SG and voltage of each cell and the temperature of the pilot cells immediately prior to conclusion of the float charge.

Cell acceptance criteria are:

SG	-	1,245 to 1,255 at 25 °C
Voltage	-	not less than 2,20 volts

NOTE:
All cell electrolyte to be at maximum level.

6.6 Test Certificates

6.6.1 Two copies of the test data for the full sequence of factory commissioning tests shall be submitted to Eskom (Koeberg) prior to delivery of the equipment;

6.6.2 Eskom (Koeberg) reserves the right to witness any test or request verification of any test result at the manufacturers' works.

The manufacturer shall provide Eskom (Koeberg) with at least 7 working days prior notice of the commencement of factory commissioning tests.

7.0 ENGINEERING QUALITY REQUIREMENTS

All batteries supplying DC switchboards shall comply with the Quality Assurance requirements for quality level Q2 as mentioned in the following ESKOM Standards:

DSG-318-087 : Requirements for the Procurement of Assets, Goods and Services

8.0 DOCUMENTATION

8.1 Eskom (Koeberg) identification code

Each battery is assigned a unique plant identifying code, which will be indicated in Schedule A of this specification.

The assigned code shall appear on all documentation supplied by the selected manufacturer.

8.2 Battery Data Files

The selected manufacturer shall compile and submit the following battery specific files prior to delivery of the equipment.

8.2.1 Q.A. File

This file shall be supplied direct to:

Q.A. Receipt Inspection
Bulk Stores
Koeberg Nuclear Power Station

This file shall reference the Koeberg battery identification code and include but not necessarily be limited to the following documentation:

- A formal statement with authorising signatures of the selected manufacturer certifying that the battery has successfully passed all inspections/tests.
- Type/Routine test certificates (as applicable)
- Seismic qualification report *(only required for battery cells that have not been previously seismically qualified as described in section 5.1.1. or when there are substantial design changes to the battery cell.)*
- Material certificates
- QC manufacturing plan
- QC manufacturing hold point inspection/test reports
- Factory commissioning test reports
- Despatch inspection report

8.2.2 Battery File

This file shall be supplied direct to:

The Manager
Electrical Maintenance Services
Koeberg Nuclear Power Station

This file shall reference the Koeberg battery identification code and include:

- Factory commissioning test reports
- Installation/maintenance instructions for the specific battery.
- Battery data sheet indicating discharge characteristics cell dimensions and electrolyte quantity/weight.
- Stillage assembly drawing if required.
- Identification list of all ancillary equipment which will be supplied with the battery.

9.0 PACKAGING AND TRANSPORT

9.1 All packaging and transport to be performed in accordance with ASME NQA-1 subpart 2.2.

9.2 Batteries and associated ancillary equipment shall be transported by ROAD.

9.3 Battery cells will be transported on new wooden pallets.

9.4 Individual cells will be contained in a cardboard box and the cells will be firmly secured to the pallet with plastic wrap.

9.5 The assembled pallet must be capable of handling by forklift.

10.0 ATTACHMENTS

10.1	Schedule A	-	Eskom requirements.
10.2	Schedule B	-	To be completed by the manufacturer.
10.3	Deviations Schedule	-	To be completed by the manufacturer.
10.4	Document checklist	-	To be completed by the manufacturer.

ATTACHMENT 10.1

SCHEDULE A : ESKOM (KOEBERG) REQUIREMENTS

SPEC CLAUSE NUMBER	DESCRIPTION	REQUIREMENT
8.1	Identification code	
4.2	C_{10} Capacity (AH)	
	Design load (amps)	
4.3	Number of cells in battery	
	Number of spare cells	
4.4	Stillage with insulators	
	Stillage assembly drawing	
	Cell dimensions	
5.1.4	Vent plugs – flame proof	
6.1.1	Battery connection diagram	
6.4.4	Inter-cell links (solid/flexible)	
	Inter-row links (solid/flexible)	

REFER TO ANNEXURE R

All Schedule A requirements are to be confirmed by Design Engineering.

ATTACHMENT 10.2

SCHEDULE B : TO BE COMPLETED BY THE MANUFACTURER

TECH SPEC CLAUSE	DESCRIPTION	DETAILS
4.2	Name of Company	
	Cell Type	
	C_{10} capacity	AH
	Design load	As Schedule A
	Discharge time at design load to 1,86 VPc at 25°c	
	For new battery	mins
	For battery at end of expected service life	mins
	Internal cell impedance after discharge at end of service life	mohm
4.3	Cells or monoblocks	
	Number of cells per monoblock	
	Number of cells/monoblocks in final battery configuration	
	Number of cells/monoblocks in factory commissioning configuration	
4.4	Cell/Monoblock dimensions	
	Length	mm
	Width	mm
	Height to top of cover	mm
	Height to top of terminal post	mm
4.5	Will cells withstand the specified RMS ripple current?	
4.6	Will cells withstand the specified charging current?	
4.7	Will the cells withstand the specified value of overcharge?	
4.8	Will the cells meet the specified endurance requirements?	
4.9	Guarantee period	years
	Expected life	years
	Minimum capacity at end of expected life	%
	Guaranteed ampere hour efficiency at 25°C	%
	Guaranteed watt-hour efficiency at 25°C	%
4.12	Do the cells comply with the specified structural requirements?	
5.1.1	Has the cell design been seismically qualified?	

6.4.4	Inter-cell links	-	Material	
			Surface finish	
			Cross sectional area	mm^2
			Connection bolt grade and material	
			Connection bolt diameter	mm
			Bolting torque	Nm
	Inter-row links	-	Material	
			Surface finish	
			Cross sectional area	mm^2
			Connection bolt grade and material	
			Connection bolt diameter (mm)	mm
			Bolting torque (Nm)	Nm

ATTACHMENT 10.3

DEVIATION SCHEDULE

1. Any deviations/modifications/alternatives offered to technical specification DSG-311-089 shall be listed below with reasons for the departures.

2. No deviations/modifications/alternatives offered to the specification will be recognised unless listed on this Schedule.

3. If no deviations/modifications/alternatives offered, this Schedule must be marked N/A.

SPECIFICATION CLAUSE NUMBER	PROPOSED MODIFICATION

ATTACHMENT 10.4

DOCUMENTATION CHECK-LIST/CERTIFICATES OF CONFORMANCE FOR STANDBY POWER CELLS FOR KOEBERG POWER STATION

DATE:

ORDER NO.:

I.D. CODE:

8.2.1 QA FILE

	INCLUDED	PASS
TYPE/ROUTINE TEST CERTIFICATES:		
5.1.1 PERFORMANCE CHARACTERISTICS	☐	
5.1.2 ACID PROOF TEST	☐	
5.1.3 FLAME PROOF TEST	☐	
5.1.4 LEVEL INDICATOR TEST	☐	
5.2.1 a) DIELECTRIC STRENGTH TEST	☐	
5.2.1 b) HEAT RESISTANCE TEST	☐	
5.2.2 a) INCLINATION TEST	☐	
5.2.2 b) OVERPRESSURE TEST	☐	
MATERIAL CERTIFICATES:		
ACID:	☐	
QC MANUFACTURING PLAN:	☐	
QC INSPECTION/TEST REPORTS:		
TUBE FILLING WEIGHTS	☐	
FACTORY COMMISSIONING TEST REPORTS:		
6.2 FILLING AND CHARGING SHEETS	☐	
6.3 CYCLE DISCHARGE REPORTS	☐	☐