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WATER SUPPLIES DEPARTMENT

STANDARD SPECIFICATION M-06-05

FOR

LIQUID CHLORINE CONTAINERS

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LIQUID CHLORINE CONTAINERS

Section 1 - General

1.1 Standards and Specifications

The liquid chlorine containers (containers) used for storage and transportation of liquid chlorine for the Water Supplies Department (WSD) shall be designed, manufactured and tested in accordance with the latest version of the relevant National Standards generally recognised for supply of liquid chlorine. Tenderers shall provide duplicate copies of such standard (in English or Chinese) together with a brief summary of the requirements for consideration.

1.2 Statutory Requirement

Under the Dangerous Goods (General) Regulations 64 and 66, Chapter 295, Laws of Hong Kong, all chlorine containers are required to be approved by the Director of Fire Services before they are put into use in Hong Kong. As such, the contractor shall ensure that all containers used for supply of liquid chlorine are in full compliance with this requirement including those provided by the Purchaser.

For newly manufactured chlorine containers, the contractor shall obtain prior approval from the Fire Services Department (FSD) for use of the containers in Hong Kong and submit a copy of the approval letter to WSD prior to using.

1.3 Inspection and Testing

Inspection and testing of new containers shall be carried out in accordance with the requirements as stipulated in the applied standard for the design and manufacturing of the containers, and to the satisfaction of an Independent Inspection Body (IIB) who shall be appointed following the requirements as stipulated in WSD Standard Specification EM-00-01. All the costs associated with the inspection and testing shall be borne by the contractor. A full report of the prescribed inspections and testing covering each container shall be endorsed by the IIB before they are submitted to the Fire Services Department for approval. After approval, one copy of the report shall be forwarded to WSD for reference and record purposes.

1.4 Capacities

- (a) The capacity of the container for supply of liquid chlorine in steel drums shall be 1000 kg.
- (b) The capacity of the container for supply of liquid chlorine in steel cylinders shall be 50 kg.

1.5 Filling Ratio

The filling of containers with liquid chlorine shall be in accordance with the Dangerous Goods (General) Regulation 70, Chapter 295, Laws of Hong Kong. The filling ratio shall be not greater than 1.19.

1.6 Marking

1.6.1 General

The following markings shall be permanently stamped on the body of each container for identification:-

- (a) Manufacturer's identification marking
- (b) Serial number
- (c) Date of manufacture/Date of 1st test
- (d) Hydraulic test pressure
- (e) Water capacity (in litres)
- (f) Tare weight
- (g) Weight of chlorine
- (h) Manufacturing standard

1.6.2 Drums

The following identification markings shall be prominently and legibly painted on each chlorine drum for easy recognition of the particulars in addition to the stamped markings.

- (a) Name of chemical and label of dangerous substance in accordance with the Factory and Industrial Undertakings (Dangerous Substances) Regulations.
- (b) Serial number
- (c) Tare weight
- (d) Date of last test/Due date for next test
- (e) Hydraulic test pressure

1.6.3 Cylinders

An information tag for easy recognition of the particulars of each chlorine cylinder shall be provided, which shall include:-

- (a) Serial number of the cylinder
- (b) Tare weight
- (c) Date of last test/Due date of next test

The information tag can be in the form of an aluminum plate, with the particulars stamped on, enclosed and sealed in a transparent cover for securely tied to a stainless steel flange of 1 mm thick screwed onto the neck of the cylinder as shown in Appendix I. The contractor can suggest other alternative method of tying the information tag onto the cylinder to WSD for consideration and approval.

1.7 Painting

The chlorine containers including the attachment such as the protection cap, lugs and hexagonal screw plugs at the dome ends of drums shall be painted in golden yellow colour to BS EN 1089-3. A red dot shall be painted on the hexagonal head of fusible plug for both cylinders and drums to differentiate it from other solid plugs for easy identification.

The contractor shall ensure that all internal and external screw threads, including the setscrews for clamping the chlorine drum protection cap, shall be completely free from painting for free turning of the screw threads. The screw threads shall be properly protected prior to application of paint, if applicable.

1.8 Isolation Valves and Protection

The isolation valves for chlorine drums and cylinders shall comply with the requirements of BS 341: Part 1 and BS EN 849 respectively for chlorine applications. The valve body shall be made of forged steel to PD 970 with monel metal valve spindle and PTFE gland packing.

To cope with the standard connections for containers, the valve outlet connection shall be right-hand threaded male of size 3/4" BSP for cylinders and M24 for drums. If the outlet connections of other sizes are offered, the container shall be provided with the necessary adapter for the chlorine valve to suit the standard connection.

Each chlorine container shall be provided with a suitably designed metal cap to protect the outlet valves of drums and cylinders. The protection cap shall be in the form of a stout metal cap which shall be standardised for the same type of containers. The thickness of the cap for the drum shall be not less than 4 mm.

The protection cap of chlorine drums shall be guided by three mild steel lugs welded on the body. The welding of the mild steel lugs shall be strong enough to sustain any possible impact. The raised surface of each lug shall have a tapped hole for insertion of a setscrew for clamping the protection cap in a secured position. The peripheral clearance between the mild steel lugs and the cap shall be not more than 6 mm to ensure full locking of the protection cap by the three setscrews. WSD reserves the right to reject the chlorine supply container if its protection cap is not properly secured by the setscrews. The setscrews for clamping the cap shall be stainless steel of suitable grade.

A sketch showing the configuration for guarding of the chlorine drum by the protection cap is shown in Appendix II. The protection cap design for cylinders is shown in Appendix III. The contractor shall submit the design of the protection cap with detailed dimensions for each type of chlorine containers supplied to WSD for consideration and approval.

Section 2 - Chlorine Cylinders

2.1 General

The materials, design, manufacture, inspection and testing of chlorine cylinders shall be in accordance with BS EN 1964-1. The cylinders shall be of seamless construction.

2.2 Material

The steel used in the manufacture of the cylinders shall be in accordance with Clause 4 of BS EN 1964-1.

2.3 Dimensions

The external diameter of cylinders of capacity 50 kg shall be approximately 230 mm. The overall length of the cylinder shall be of uniform size not exceeding 1700 mm. A sketch showing the dimensions of 50 kg cylinders is shown in Appendix III. The cylinder wall shall be not less than 6 mm thick.

2.4 Other Acceptable Standards

Chlorine cylinders in compliance with one of the following National Standards are also acceptable. The Contractor shall submit one copy of the relevant National Standard to WSD for reference.

- (a) DOT 3A/3AA - USA
- (b) JIS B8241 - Japan
- (c) GB 5099 - China

2.5 Safety Device

Each chlorine cylinder shall be provided with a fusible metal plug (either filled type or screwed type) at the isolation valve. The fusible metal plug shall serve as a pressure relief device for relieving excessive pressure in the event of overheating to prevent rupture. The melting temperature of the filled type fusible plug shall withstand the chlorine pressure in the cylinder at that temperature.

2.6 Tests

The cylinders shall be tested to BS EN 1964-1 to meet with Fire Services Department's requirements for approval. The following table contains a brief summary of the requirements, which are by no means exhaustive.

Description of Test	Relevant Clause(s) in BS EN 1964-1
a. Heat treatment test	Cl. 4.1
b. Hardness test	Cl. 7.4.1
c. Mechanical tests including	
(i) tensile test	Cl. 7.1.2.1
(ii) bend test	Cl. 7.1.2.2
d. Hydraulic tests	Cl. 7.4.2
e. Tightness test	Cl. 7.5
f. Hydraulic burst test	Cl. 7.2
g. Pressure cycling test (for new design only)	Cl. 7.3

2.6.1 Hydraulic Pressure Test

The hydraulic test pressure of the cylinders shall meet with the requirements as laid down in Cl. 7.4.2 of BS EN 1964-1, which shall be not less than 3300 kPa.

2.6.2 Hydraulic Burst Test

One cylinder shall be randomly selected for hydraulic burst testing from every batch of new cylinders, except where the number in the batch exceeds 100 containers, in which case one cylinder shall be additionally taken in every 101 or part thereof.

The hydraulic burst pressure for cylinders shall be not less than the calculated value as stipulated in Cl. 7.2 of BS EN 1964-1. The cylinder shall remain in one piece without fragmentation after the testing.

Section 3 - Chlorine Drums

3.1 General

The design, manufacture, inspection and testing of the chlorine drums shall be in accordance with PD 5500. The drum shall be made from steel plates welded together by electric-arc fusion process.

3.2 Material

The steel used in manufacturing the drum shall be in accordance with BS EN 10028 and BS EN 10029. The thickness of the steel plate shall be not less than 12 mm. The minimum ultimate stress and ultimate strain of the steel plates shall be 560 MPa and 0.2 respectively.

3.3 Dimensions

The external diameter and overall length of the drum shall be approximately 820 mm and 2080 mm respectively. These dimensions are indicative only but the supported rings of the drum must be suitably spaced for seating on the caster supports as shown in Appendix IV.

3.4 Other Acceptable Standards

Chlorine drums in compliance with one of the following National Standards are acceptable. The Contractor shall submit one copy of the relevant National Standard to WSD for reference.

- (a) AS 1210 - Australia
- (b) ASME Boiler and Pressure Vessel Code Section VIII - USA
- (c) JIS B8243 - Japan
- (d) GB 5100 - China

3.5 Safety Device

Each chlorine drum shall be provided with at least one fusible plug (either filled type or screwed type) with tapered pipe thread for relieving excessive pressure in the event of overheating to prevent rupture. The contractor shall advise in the Technical Schedule the number of fusible plug(s) to be provided for each drum according to the applied design standard for the drums to be supplied. The

melting temperature of the filled type fusible plug shall withstand the chlorine pressure in the drum at that temperature.

3.6 Lifting Provision

The end rings of the drum at both ends shall be used for lifting. They shall be designed to have sufficient strength to enable lifting of the drum by hooks.

3.7 Tests

The testing of the drums shall be to BS EN 10028, BS EN 10029 and PD 5500. The following table contains a brief summary of the requirements which are by no means exhaustive.

Description of Test	Relevant British Standards
a) Tensile test and impact test of plate materials	Cl. 9, 10 and 11 of BS EN 10028-1
b) Radiographic examination of welded joints	Cl. 5.6.4 and 5.7 of PD 5500
c) Post-weld heat treatment	Cl. 4.4.3 of PD 5500
d) Hydraulic pressure testing	Cl. 5.8.2 and 5.8.3 of PD 5500

3.7.1 Radiographic Examination of Welds

100% radiographic examination of all welded seams in accordance with Cl. 5.6.4 and 5.7 of PD 5500 shall be performed on every drum to confirm no defect at the welds.

3.7.2 Hydraulic Pressure Test

Hydraulic pressure test shall be carried out on each drum in accordance with Cl. 5.8.2 and 5.8.3 of PD 5500 and shall be not less than 3300 kPa.

Section 4 - Emergency Repair Tool Kit

4.1 General

Where specified in the Particular Specification, one set of emergency repair tool kit manufactured to the requirements as stipulated by the Chlorine Institute for 'emergency kit A' and 'emergency kit B' for chlorine cylinders and chlorine drums respectively shall be provided for each chlorine installation of WSD so that immediate action can be taken to temporarily stop the minor leaks from the container by using the tool kit in case of chlorine leakage. Where such requirement is specified, the contractor shall provide a list of recommended repair

tool kit with detailed unit cost for each item by completing the Schedule in Appendix V for the Purchaser's consideration. The items and quantities of tools to be purchased will be at the sole discretion of the Purchaser who also reserves the right not to buy any of them.

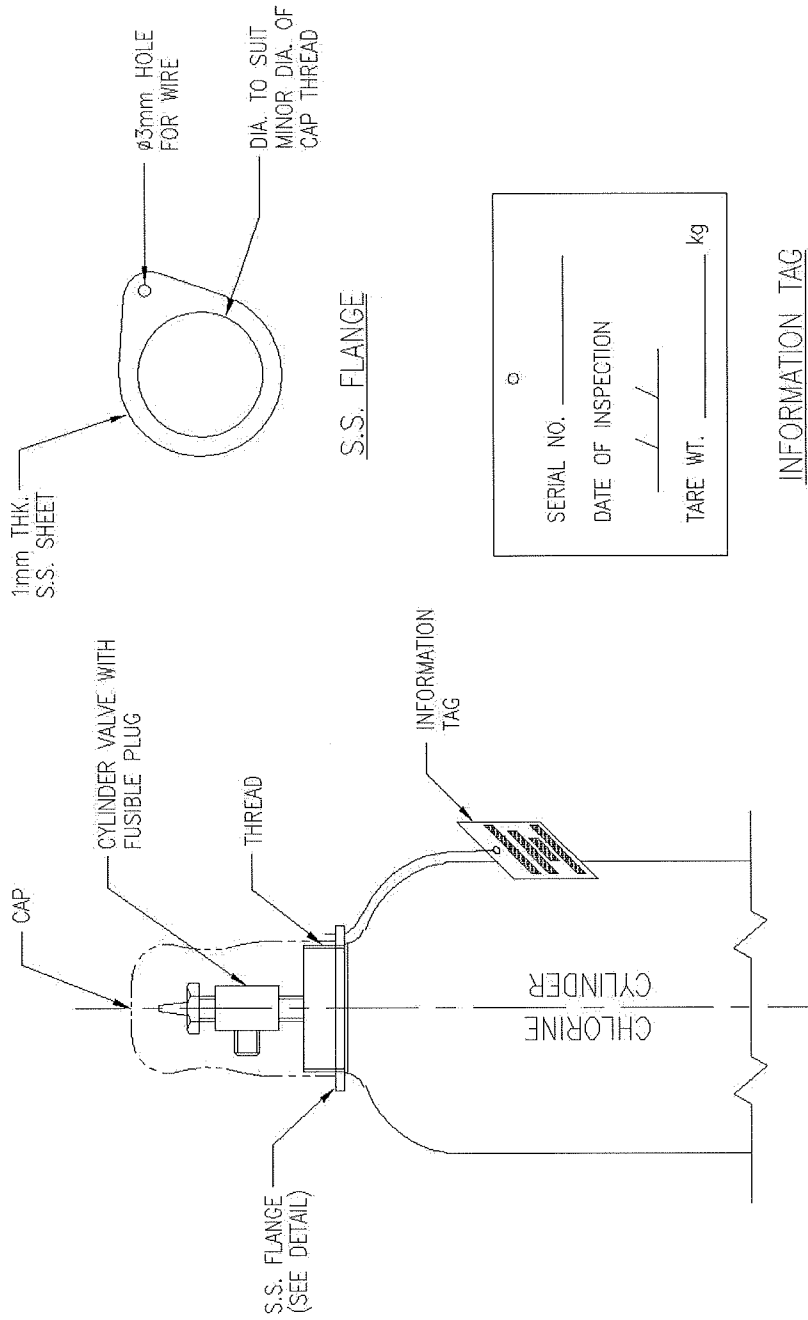
Section 5 – Technical Schedules

5.1 General

The technical schedules in Appendices V to VII shall be included in the tender document for completion by the tenderers, where appropriate.

- End of Specification-

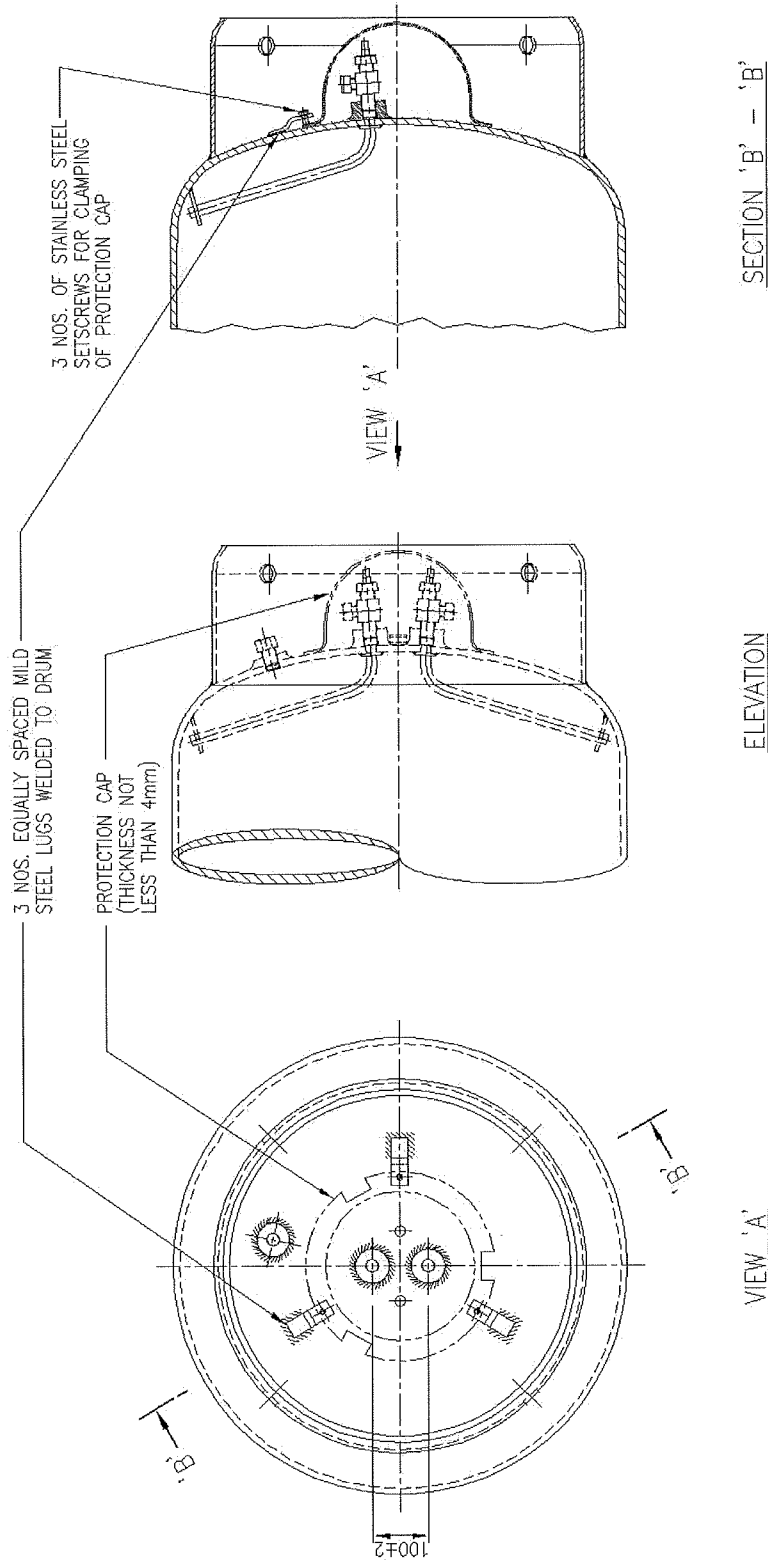
Appendix I



EXAMPLE OF FIXING THE INFORMATION TAG
TO CHLORINE CYLINDERS

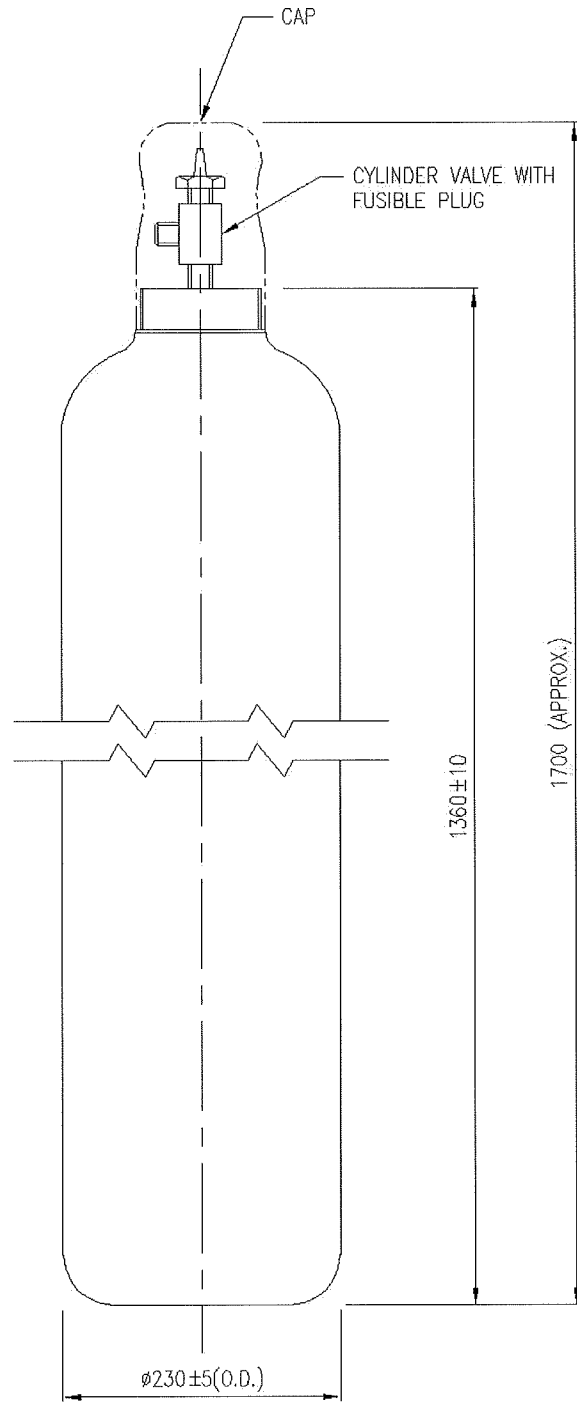
N.T.S.

Appendix II



**ARRANGEMENT OF PROTECTION CAP
FOR CHLORINE DRUM ISOLATION VALVES**

Appendix III



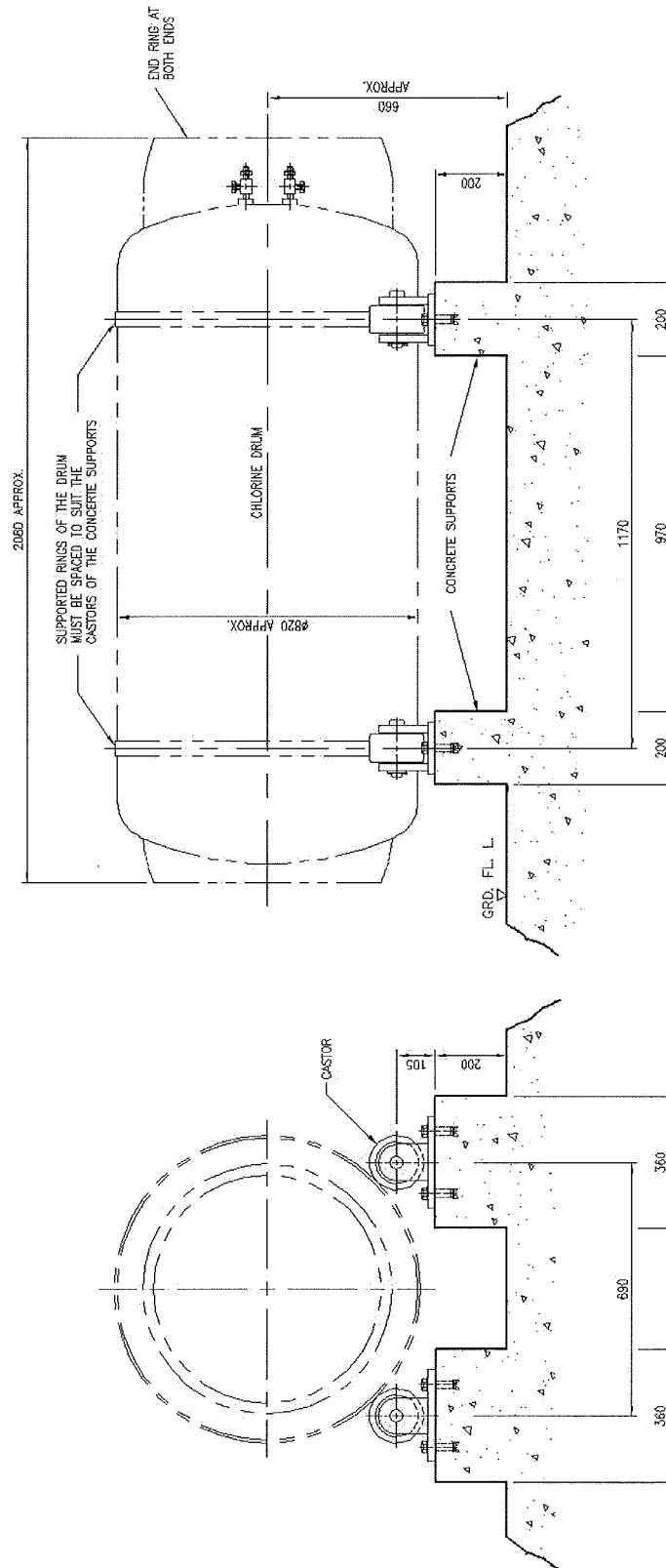
CHLORINE CYLINDER

N.T.S.

NOTE:
1. ALL DIMENSIONS IN mm.

S4015/30
(Revised on 11.5.2007)

Appendix IV



LAYOUT OF CASTORS ON CONCRETE SUPPORTS
FOR CHLORINE DRUM

Appendix V

Schedule of Emergency Repair Tool Kit for Chlorine Containers

The following Schedule of Emergency Repair Tool Kit shall be included in the tender document for completion by the tenderers.

Item No.	Description	Recommended Quantity to be purchased	Unit Cost	Remarks

Appendix VI

Schedule of Technical Data for Chlorine Cylinders

The following Schedule of Technical Data shall be included in the tender document for completion by the tenderers.

Description	WSD Requirements	Contractor's Offer
(a) Materials	BS EN 1964-1	
(b) Design and manufacture) National Standards as) listed in Clause 2.4) of WSD Standard) Specification M-06-05	
(c) Inspection and testing		
(d) Nominal capacity range		50 kg
(e) Water capacity, in litres	--	
(f) Filling ratio	Not greater than 1.19	
(g) Nominal dimensions:		
(i) External diameter	230 mm	
(ii) Overall length	1700 mm	
(iii) Wall thickness	6 mm	
(h) Chlorine isolation valves:		
(i) Design and construction	BS EN849 Forged steel to PD 970 with monel metal valve spindle and PTFE gland packing	
(ii) Materials		
(iii) Fusible plug	Filled or screwed type	
(iv) Melting temperature of fusible plug (°C)	--	
(i) Screw thread of chlorine valve outlet for connection	3/4" BSP right-hand threaded male	

Appendix VII

Schedule of Technical Data for Chlorine Drums

The following Schedule of Technical Data shall be included in the tender document for completion by the tenderers.

Description	WSD Requirements	Contractor's Offer
(a) Materials	BS EN 10028 and BS EN 10029	
(b) Design and manufacture) PD 5500 or other	
(c) Inspection and testing) National Standards as listed in Clause 3.4	
) of WSD Standard	
) Specification M-06-05	
(d) Nominal capacity range	1000 kg	
(e) Water capacity, in litres	--	
(f) Filling ratio	Not greater than 1.19	
(g) Nominal dimensions:		
(i) External diameter	820 mm	
(ii) Overall length	2080 mm	
(iii) Wall thickness	12 mm	
(h) Chlorine isolation valves:		
(i) Design and construction	BS 341 : Part 1	
(ii) Materials	Forged steel to PD 970 with monel metal valve spindle and PTFE gland packing	
(i) Screw thread of chlorine valve outlet for connection	M24 right-hand threaded male	
(j) No. of fusible plug(s) to be provided	At least one	
(k) Melting temperature of fusible plug (°C)	--	