

India-Hydrogen Ready

Type 1/Type3 Hydrogen Storage/Transportation solutions



Achievement and Capabilities in India for HP Bottles

- Successfully manufactured and supplied HP Air Bottles to all the Ship Yards and Various Defence Applications including aerospace applications for ISRO in 400 bar Hydrogen Bottles.
- Having the capacity to produce Bottles from 1 lit WC to 3000 lit WC over a wide pressure range of 40 to 400 bar.
- Have developed Type 1 and Type 3 Hydrogen Cylinders for use at 300 and 350 bar for traction and mobility purposes.
- Ground Storage for Hydrogen Fuelling stations, 500 and 900 bar cylinders have been developed.
- India today transports over 3 lac cubic meter per day of Hydrogen thru type 1 hydrogen trailers.
- Across the country manufacturers have supplied well over 10000 CNG Cascades to all CGD Gas Companies and exported to various countries as well.

Jumbo Skids – H₂/CNG/Industrial Gases

- India offers solutions for bulk storage and transportation of Hydrogen as well as Industrial gases in 20 feet and 40 feet trailers.
- India has a capacity to manufacture large size Cylinders upto 3000 ltr. water capacity.

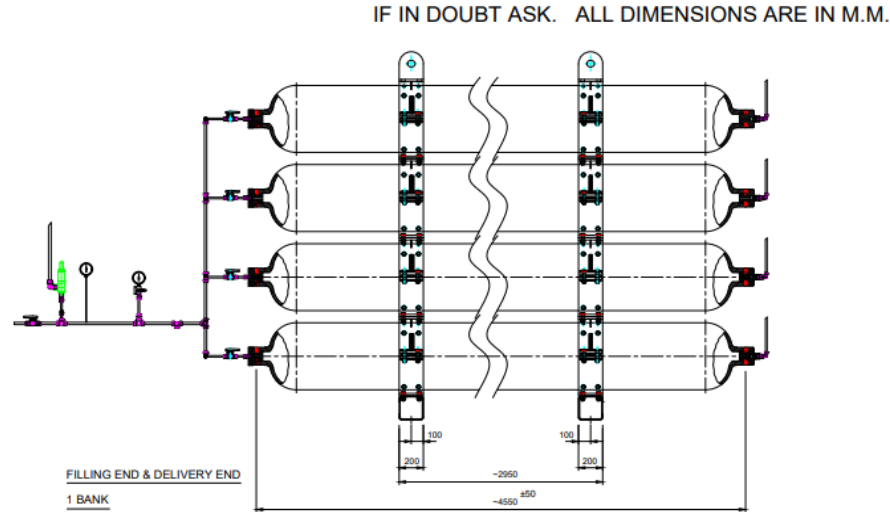
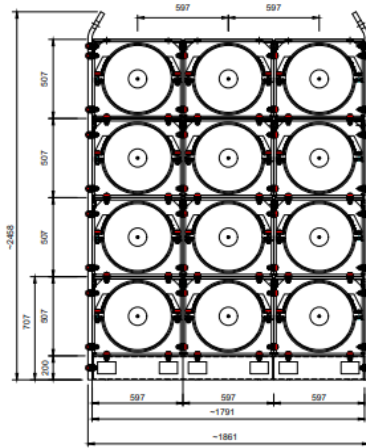


Proposal for Hydrogen Ground Storage – Hydrogen Refuelling Stations

- Manufacturing Capability for manufacture of 500 and 900 bar Working pressure cylinders are now available in India.
- These cylinders shall be designed & manufactured as per IS 7285 Part-2:2017 Amendment No.1. Design Appraised by BIS and approved by PESO.
- The 500 bar Cylinder shall have a water capacity of 390 lit
- Proposed Skid with 12 cylinders having 4680 lit water capacity to hold 2340 m³ of Hydrogen Gas at 500 bar storage pressure.
- The 900 bar Cylinder shall have a water capacity of 285 lit
- Proposed Skid with 2 cylinders having 570 lit water capacity to hold 513 m³ of Hydrogen Gas at 900 bar.

4680 lit 12 cylinder to store 2340 m3 of Hydrogen Gas at 500 bar

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|---|-----------------|-----------|-----------|---------------|--------|----------|----------------|--------|-----------|---------------|--------|-----------|----------------------|-----------|-----------|--|
| <ol style="list-style-type: none"> ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED. ALL SHARP CORNERS SHALL BE SUITABLY ROUNDED OFF & GROUND FLUSH. FRAME STRUCTURAL STEEL SPECIFICATION AS PER IS 2062 : 2011 CYLINDER OPERATING PRESSURE 7250 PSI / 50.0 MPa.(AT -20 °C TO +60 °C) CASCADE WEIGHT DETAIL (APROX)
 <table border="0"> <tr> <td>CYLINDER WEIGHT</td> <td>: (WA)</td> <td>14700 Kg.</td> </tr> <tr> <td>CASCADE FRAME</td> <td>: (WB)</td> <td>3046 Kg.</td> </tr> <tr> <td>FITTING WEIGHT</td> <td>: (WC)</td> <td>----- Kg.</td> </tr> <tr> <td>WEIGHT OF GAS</td> <td>: (WD)</td> <td>----- Kg.</td> </tr> <tr> <td>TOTAL CASCADE WEIGHT</td> <td>: (WA+WB)</td> <td>17746 Kg.</td> </tr> </table> | CYLINDER WEIGHT | : (WA) | 14700 Kg. | CASCADE FRAME | : (WB) | 3046 Kg. | FITTING WEIGHT | : (WC) | ----- Kg. | WEIGHT OF GAS | : (WD) | ----- Kg. | TOTAL CASCADE WEIGHT | : (WA+WB) | 17746 Kg. | <ol style="list-style-type: none"> CYLINDER LEN. 4550 mm. (APROX) CYLINDER WEIGHT 1225 Kg. AS SPECIFIED IN CYLINDER DRAWING CYLINDER AS PER IS 7285 PART 2 WELDING PROCESS :-
- FOR NON-PRESSURE RETAINING PARTS LIKE FRAME - MMAW
- FOR PRESSURE RETAINING PARTS - GTAW ALL BUTT WELDS SHALL BE FULL PENETRATION WELDS. EACH ASSEMBLED STORAGE CASCADE WILL BE PNEUMATICALLY PRESSURE TESTED AT 605 BAR FOR TUBING, VALVES, ETC. |
| CYLINDER WEIGHT | : (WA) | 14700 Kg. | | | | | | | | | | | | | | |
| CASCADE FRAME | : (WB) | 3046 Kg. | | | | | | | | | | | | | | |
| FITTING WEIGHT | : (WC) | ----- Kg. | | | | | | | | | | | | | | |
| WEIGHT OF GAS | : (WD) | ----- Kg. | | | | | | | | | | | | | | |
| TOTAL CASCADE WEIGHT | : (WA+WB) | 17746 Kg. | | | | | | | | | | | | | | |

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MM.

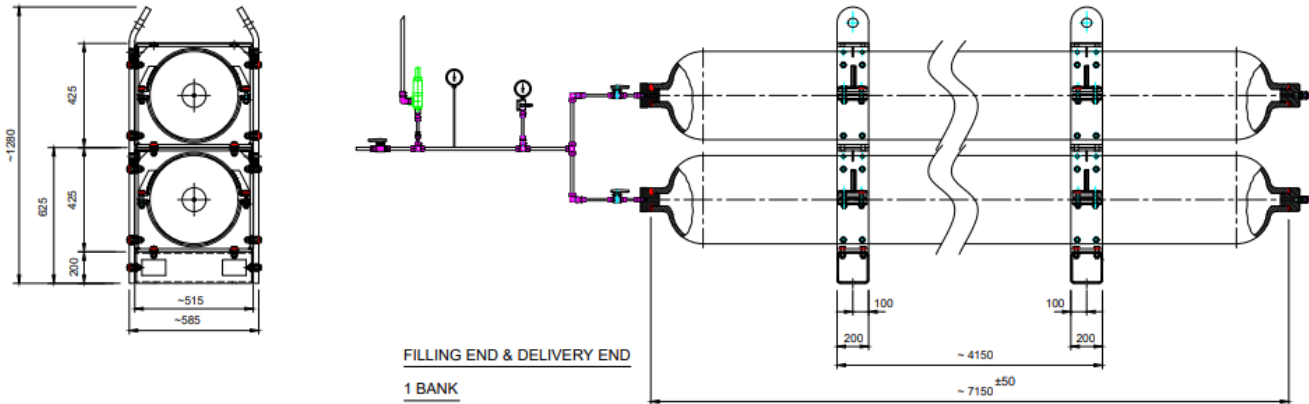
PROJECT	DHIRUBHAI AMBANI GREEN ENERGY GIGA COMPLEX	APPLICATION : H2
Material	-----	Tender no.
Designed by	SUNIL D.KENI	File Name
Checked by	SUNIL D.KENI	CAS406 x 12
Approved by - dt	G.GOYAL	Date
Owner	EKC KANDLA SEZ. EVEREST KANTO CYLINDER LTD.	Date
Title		Scale
G.A. SKID Ø406 x 50 MPa x 390 Ltrs. x 12 CYLS. x 4680 LTR		1 : 1
Drawing no.	EKCK/1956	Rev.
SHEET 1 OF 2	00	00

RevNo	Revision note	Date	Checked	Approved by
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570 lit 2 cylinder to store 513 m3 of Hydrogen Gas at 900 bar

FR-EE-00

IF IN DOUBT ASK. ALL DIMENSIONS ARE IN M.M.



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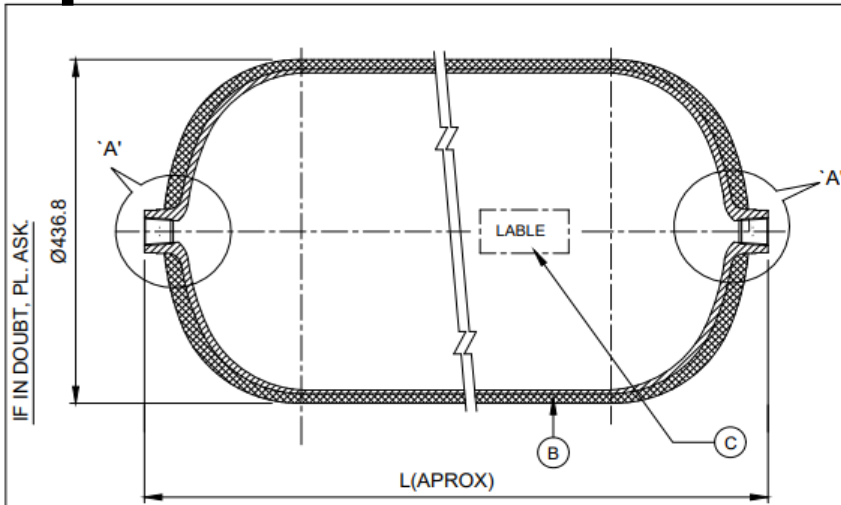
1) ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED. 2) ALL SHARP CORNERS SHALL BE SUITABLY ROUNDED OFF & GROUND FLUSH. 3) FRAME STRUCTURAL STEEL SPECIFICATION AS PER IS 2062 : 2011 4) CYLINDER WORKING PRESSURE 13050 PSI / 90.0 MPa.(AT -20 °C TO +65 °C) 5) CASCADE WEIGHT DETAIL (APROX) CYLINDER WEIGHT : (WA) 4280 Kg. CASCADE FRAME : (WB) 884 Kg. FITTING WEIGHT : (WC) ----- Kg WEIGHT OF GAS : (WD) ----- Kg. TOTAL CASCADE WEIGHT : (WA+WB) 5164 Kg.	6) CYLINDER LEN. 7150 mm. (APROX) CYLINDER WEIGHT 2140 Kg. AS SPECIFIED IN CYLINDER DRAWING 7) CYLINDER AS PER IS 7285 PART 2 8) WELDING PROCESS :- - FOR NON-PRESSURE RETAINING PARTS LIKE FRAME - MMAW - FOR PRESSURE RETAINING PARTS - GTAW 9) ALL BUTT WELDS SHALL BE FULL PENETRATION WELDS. 10) EACH ASSEMBLED STORAGE CASCADE WILL BE PNEUMATICALLY PRESSURE TESTED AT 1090 BAR FOR TUBING, VALVES, ETC.
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UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MM.

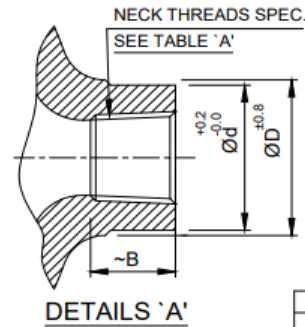
PROJECT	DHIRUBHAI AMBANI GREEN ENERGY GIGA COMPLEX		APPLICATION : H2
Material	-----		Tender no.
Designed by	Checked by	Approved by - dt	File Name
SUNIL D.KENI	SUNIL D.KENI	G.GOYAL	CAS324 x 02
			Date
			03.10.2022
			Scale
			1 : 1
Owner	KANDLA SEZ. EVEREST KANTO CYLINDER LTD.		Title G.A. SKID Ø324 x 900 BAR x 285 Ltrs. x 02 CYLS. x 570 LTR
			Drawing no. EKCK/1929 SHEET 1 OF 2
			Rev. 00

RevNo	Revision note	Date	Checked	Approved by
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Type 3 Cylinder 350 bar for Hydrogen Gas Transportation



THREAD SPECIFICATION (TABLE 'A')									
STD.	TYPE	SIZE	TAPER ON DIA	PITCH	NECK DIA (D)	NECK DIA (d)	THREAD LEN. (Min) mm	VALVING TORQUE (N.m)	
								MIN	MAX
IS:3224:2002		4	2	1.8	14,TPI		25.4		
B.S 341 1982	1"		1.8	14,TPI			22		
B.S 341 2002	1" (25T)		3.25	14,TPI	54	54	22	95	130
	1-1/4" (32T)		1.8	11,TPI			31.75		
ANSI B1.1 1974	1 1/8" -12 UNF -2B						40		



TECHNICAL REQUIREMENTS

NOTE:- ALL DIMENSIONS ARE IN m.m.

- DESIGN, MANUFACTURE AND INSPECTION STANDARD : ISO 11119 - 2 : 2012 (AMD. 2014)
(GAS CYLINDERS-REFILLABLE COMPOSITE GAS CYLINDERS AND TUBES - DESIGN, CONSTRUCTION AND TESTING - PART 2)
- REINFORCED LAYERS : CARBON FIBER + EPOXY RESIN.
CARBON FIBER TENSILE STRENGTH \geq 4000 MPa. COMPOSITE, SHEAR STRENGTH \geq 13.8 MPa.
- HYDRAULIC TEST IS CARRIED OUT FOR THE CYLINDERS ONE BY ONE
TEST PRESSURE IS 52.5 MPa, KEPT TIME 30s AT LEAST ; RATIO OF PERMANENT VOLUMETRIC EXPANSION \leq 5%.
- AUTO FRETAGE PRESSURE HOLDING TIME 45 Sec.
- LIFE OF CYLINDERS IS 15 YEARS, AND ITS FATIGUE IS 7500 CYCLES.
- MEASURES WILL BE TAKEN FOR PROTECTING CYLINDERS BEFORE DELIVERY.

210.0	99.5	1945
200.0	95.0	1860
190.0	91.5	1775
NOMINAL WATER CAPACITY LTR. +5% 0	CYLINDER TARE. WEIGHT Kg. (APPROX)	CYLINDER LENGTH 'L' mm (APPROX)

TECHNICAL PARAMETERS	
DESIGN STANDARD	ISO 11119 - 2 (AMD. 2014)
NORMAL WORKING PRESSURE	35 MPa.
TEST PRESSURE	52.5 MPa.
BURST PRESSURE	\geq 105 MPa.
WORKING TEMPERATURE	- 40 ~ + 65°C
FILLING MEDIUM	HYDROGEN & HYDROGEN EMBRITTLING GASES
LINER MATERIAL	AL (6061) T6

C	LABLE	PAPER OR PLASTIC			
B	COMPOSITE	CARBON FIBRE + RESIN + (0.5 mm TOP COAT OF GLASS FIBER + RESIN)			
A	LINER	AL (6061) T6			
CODE	NAME	MATERIAL			
Itemref	Quantity	material	---	Article No./Reference	
Designed By	Checked By	Approved By - Date	File Name	Date	Scale
S.D.KENI.		G.GOYAL	406	22.09.2022	N.T.S.
Owner	Title/Name		FULLY WRAPPED FIBRE REINFORCED COMPOSITE CYLINDER		
EKC KANDLA (SEZ.) EVEREST KANTO CYLINDER LTD.		Drawing Number	03020205	Rev.0	

RevNo	Revision note	Date	Checked	Approved

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THANK YOU