CYLINGAS

SOURCING ENERGY TO OUR LIVES

TANK BUILDING METHODOLOGY

PRESENTATION HIGHLIGHTS

- ***Introduction of Cylingas***
- ***Tank Design & Construction Codes***
- ***Tank Erecting Methods & Procedures***
  - *Conventional Method | Jacking up Method*
  - *Jacking up Techniques*
- ***Demonstration – Tank Construction***
- ***Cylingas Preferred Method - Jacking***

INTRODUCTION - History

- *Established in 1974*
- *Late H.H. Sheikh Rashid Bin Saeed Al Maktoum, the Ruler of Dubai*
- *Cylingas Started Production in 1976*
- *First LPG Cylinder Manufacturing Company in GCC.*
- *Location: Al Quoz Industrial Area 3, Dubai – UAE*

INTRODUCTION – Key Business

SITE CONSTRUCTION/EPC PROJECTS

SHOP FABRICATION PROJECTS

LPG PROJECTS

EHS & QUALITY

OHSAS 18001:2007

ISO 14001:2004

ISO 9001:2008

MANUFACTURING STANDARD

"U"

"U2"

"R"

"NB"

INTRODUCTION – Major Activities

- **EPC / Site Construction Projects**
  - *Tank Farm, Plant Piping, Storage Tanks for Crude Oil & Finished Products etc.*
- **Pressure Vessels & Tanks Manufacturing**
  - *Knock out Drums, Filters, Vent Drums, Separators etc.*
- **Gas Projects**
  - *Storage Tanks & System Installation for LP, Propane*
  - *Aerosol/Odorless & Synthetic Natural Gases*
  - *Piping Networks Industrial, Building etc.*
- **Maintenance Projects**
  - *Storage Tank Repair, Tank Bottom Plates Replacement, Loading Arm Maintenance etc*


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TANKS & PIPING PROJECTS - Executed By Cylingas

EFDTT Project - ENOC Fujairah Distribution & Trading Terminal

EPC Contract

Engineering, Procurement & Construction Of 12nos. Vertical Storage tanks + Floating suction & Floating suction level indicator for tank 8 Nos., 29Mts. Dia. x 24 Mts. High (mix: internal aluminium floating deck + internal carbon steel pontoon type floating deck) 4 Nos., 41Mts. Dia. x 24Mts. High (mix: internal aluminum floating deck + internal carbon steel pontoon type floating deck)

ELOMP Project - Lubricants and Grease Manufacturing Plant - Fujairah

EPC Contract

Design, Engineering, Procurement, Construction, Fabrication & Commissioning of Base Oil Storage Tanks and Vessel, additive vessels, compartmental tanks, 9 Nos. Vertical Storage Tanks (various sizes), 16 Nos. Vessels (various capacities), 6nos. Additive vessels with 7 Vertical Storage tanks, ranging from 5Mts Dia. X 14Mts High to 15Mts. Dia. X 18Mts High 14 Homogeneous vessels ranging from 2.7Mts Dia. X 7.5Mts High. to 4250Mts Dia. X 9Mts High, total plant and utility piping, structural works for pipe racks and walk ways, equipment erection and fire fighting system, loading Bay with associated facilities at inside Port of Fujairah.

Falcon Project – Horizon Terminal at Jebel Ali For Dubai Airport

Engineering, procurement, construction, & civil works of 7nos. Vertical Storage tanks (3 tanks CS Roof and remaining with Aluminum dome roof). Ranging from 14Mts Dia. X 13Mts High to 40Mts Dia. X 25Mts High

VHFL Project – Vopak Horizon Fujairah Limited

Design, Engineering, Supply, Fabrication, Painting, Erection/Installation, Testing and Pre-commissioning of 8 Nos. Product Storage Tanks of sizes: 55m Dia x 25m Ht. 4 Nos. & 39m Dia x 25m Ht. and its associated civil works.

DEWA Project-Phase II & Phase III

FUEL FARM-Airports

Engineering, Supply, Fabrication, Painting, Erection/Installation, Testing and Commissioning of 3 Nos. Fixed Cone Roof Diesel Storage Tanks of sizes: 35M Dia x 14.5 M Ht. & 3 Nos. 35Mtrs. Dia.X 5.1Mtrs. high for Diesel & 1 No. 21 Mtrs. Dia.X15.7 Mtrs. high for Demineralised Water Tank

Design, Engineering, Supply, Fabrication, Painting, Erection/Installation of

DUBAI Airport: 5 Nos. Truss Supported Fixed Cone Roof Storage Tank for Aviation Jet Fuel & 1 No. Refuel Storage Tank. Sizes: 33M Ø x 14.6M Ht. (4 Nos.), 17Mtrs. Ø x 11.6Mtrs. Ht. (1 No.) & 7Mtrs. Ø x 5.2Mtrs. Ht. including Floating Suctions

FUJAIRAH Airport: 1 No. Aviation Jet Fuel Tank API-650 Size 10Mtrs. Ø x 10Mtrs. Ht.

ADCO BUHASA Project - Fuel Storage Tanks, Abu Dhabi

Erection, Testing and calibration of 2 Floating Suction Tanks of size 30.5 m Dia x 12.5m ht., 2 Fresh Water Tanks of size 9.14m Dia x 7m ht. & 2 Disposal Water Tanks of size 16m Dia x 11.5m ht. – Total 6 Tanks.

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TANK DESIGN & CONSTRUCTION CODES – API650

API 650 proved its versatility in tank design with
Progressive improvisations & increased application worldwide

- 12th edition is in use from March 2013.

- Appendix B, E with new appendix EC (commentary on Appendix E), G, H, K, P, S with new Appendix SC (Covers mixed Carbon Steel and Stainless Steel), V, New Appendix X (Duplex Stainless Steel Storage Tanks) and Appendix Y(API Monogram).

OVERVIEW OF ASSOCIATED CODE

EN 14015 -2004 IS BRITISH CODE FOR STORAGE TANK REPLACES BS 2654
Similar to API 650, API STD 620 design and construction of large, welded, low-pressure carbon steel storage tanks vertical axis of revolution.

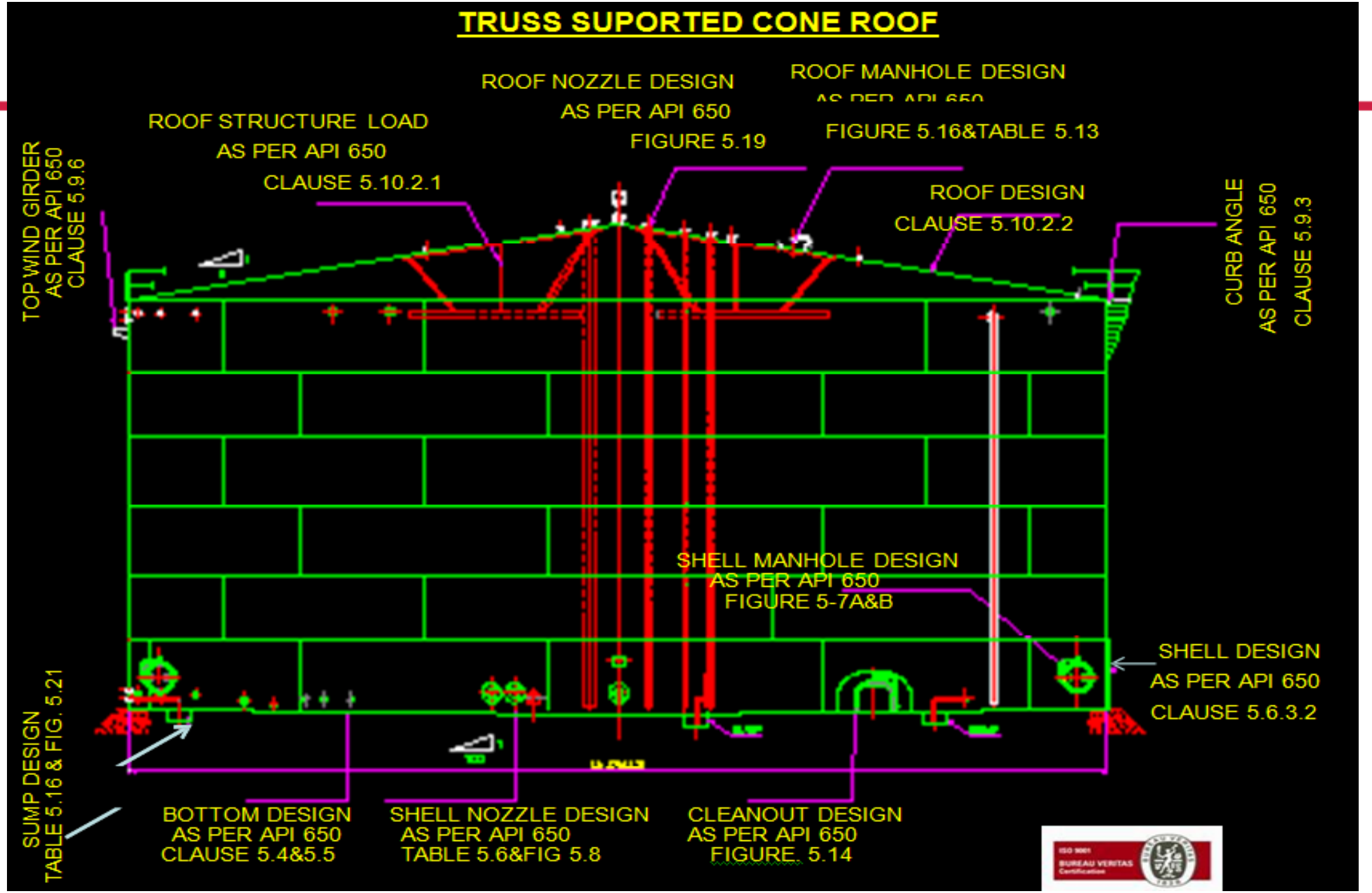
NEW TRENDS- Design Calculations

Traditional design methods, now improved with conversion of Manual calculations of API 650 on Microsoft excel sheets replaced by use of exclusively designed software

1. **ETANK**
2. **TANK 2012 VERSION 4.0**

- All these software incorporate the latest addendum of APIs 650 and 653 of the latest editions and can design supported cone roof design (Rafters, girders and columns), Seismic and wind design, Anchorage design etc.
- They cover venting requirements of tank as per API 2000 (inbreathing/ out breathing and fire exposure).

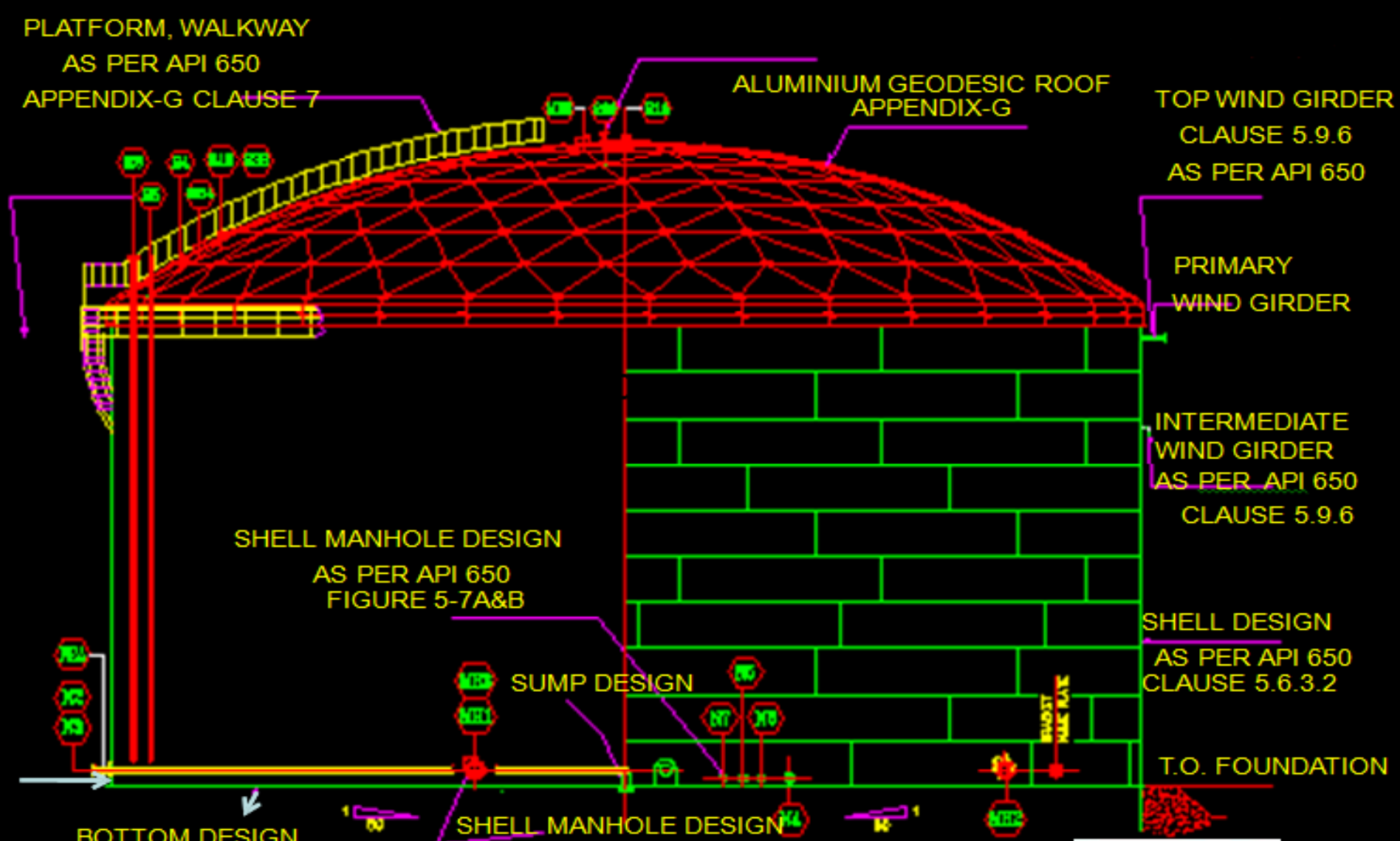
TRUSS SUPORTED CONE ROOF



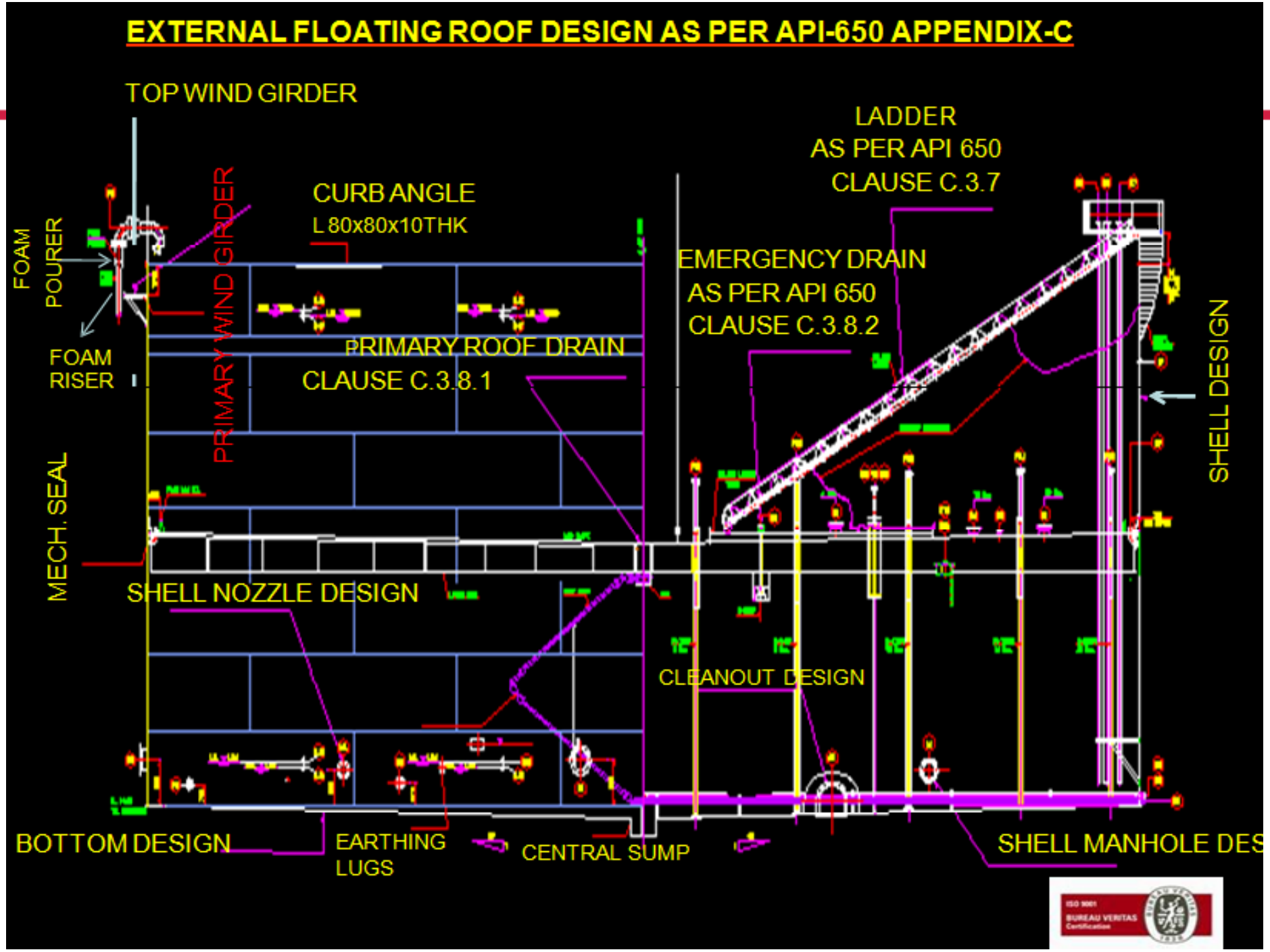
ALUMINIUM GEODESIC ROOF

AS PER API 650

APPENDIX-G CLAUSE 8.2



EXTERNAL FLOATING ROOF DESIGN AS PER API-650 APPENDIX-C



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TANK ERECTION – Conventional Method

1. **Sheet by Sheet Method/Conventional Method:**

   Bottom and annular plate erection, then lower course shell erection, finally upper course

Advantages

a. Suitable for all diameters and height
b. Dimensional Control - Shell and bottom shape close to designed ones

Disadvantages

a. Long duration of Erection/Construction
b. Working at Heights (Safety Concern)
c. More Resources Required

Jacking History

The technology of Swedish Company Bygging Uddemann AB where the Hydraulic Jacks are positioned inside the tank, the shell courses rest on Elevators.

- This is widely used in India, Europe, Far East, Middle East and is described at length in the presentation that follows:

TANK CONSTRUCTION – Jacking up Method

Brief Procedure for tank erection with Jacking method

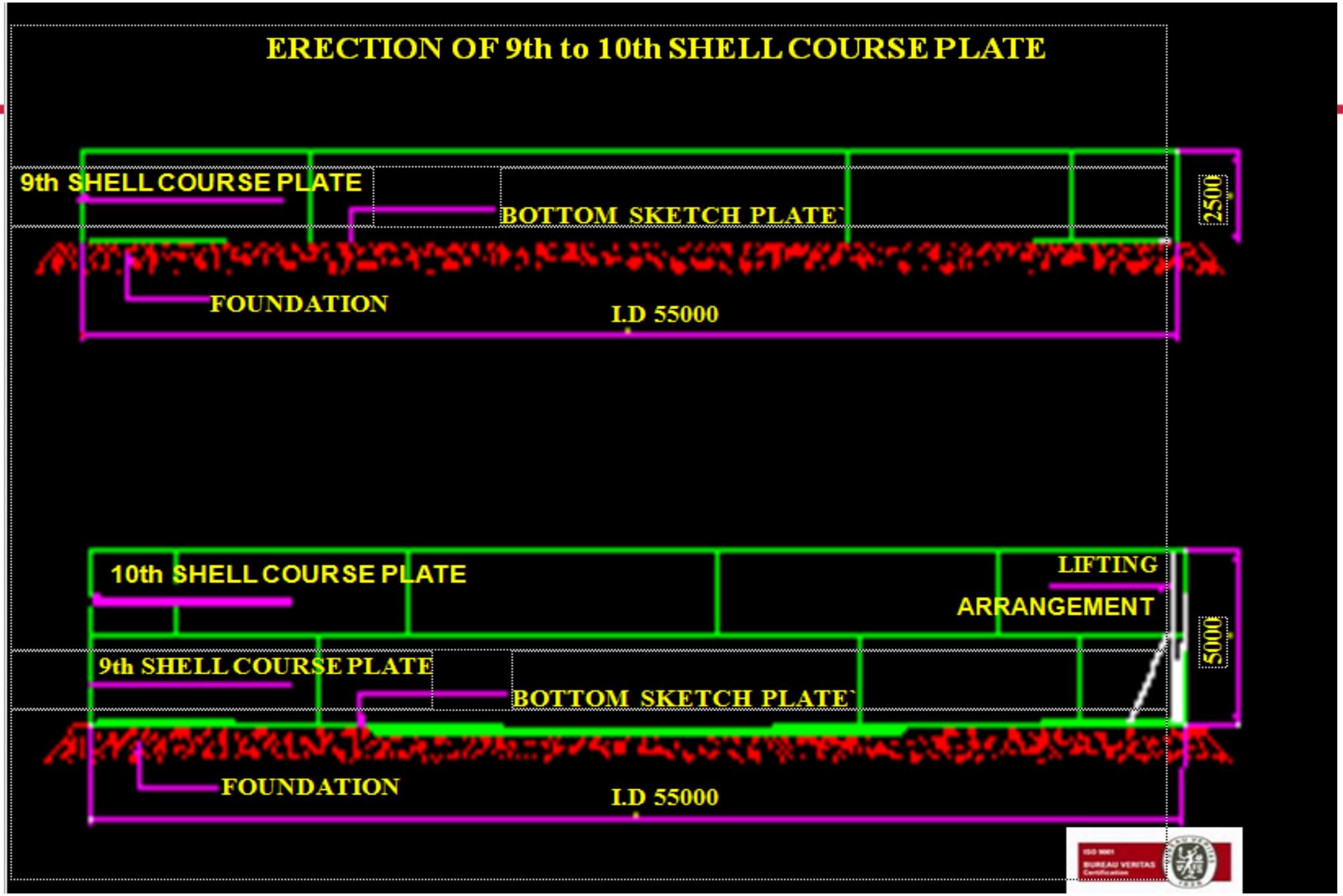
- Once Foundation of tank is ready, Annular and bottom sketch laid and welded
- Top 2 course are erected conventionally so as to accommodate Jack
- Curb angles/compression ring installed
- Cone Roof/CS Dome assembled on curb angle/Compression ring
- Roof plates, wind girders and other supports/platform to be installed
- Jacks arranged inside tank for lifting

[Number of jacks based on total weight of roof & shell courses except bottom courses. Span between two jacks to be kept approx. 3Mtrs. to meet additional wind load, number of jacks can be increased]

ERECTION OF ANNULAR PLATE

BOTTOM SKETCH PLATE

ERECTION OF 9th to 10th SHELL COURSE PLATE



TANK CONSTRUCTION – *Jacking Process*

TANK CONSTRUCTION With Jacking-up Technique

- Roof and top shell rings lifted hydraulically to height where the next course can be inserted

- Courses fit up and welded manually/ automatically

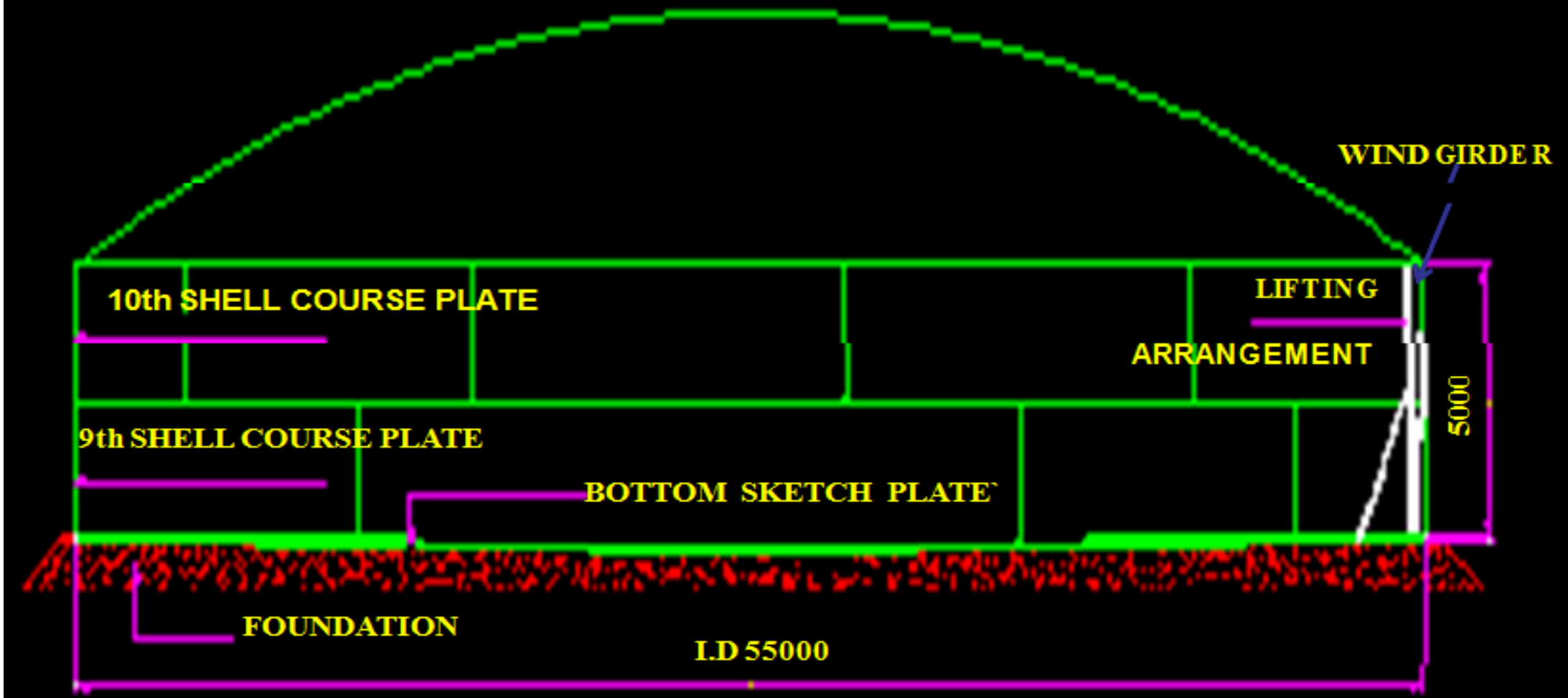
- All the inspection (RT/MPT) are done as per API Std 650/Approved ITP before next jacking

TANK CONSTRUCTION With Jacking-up Technique

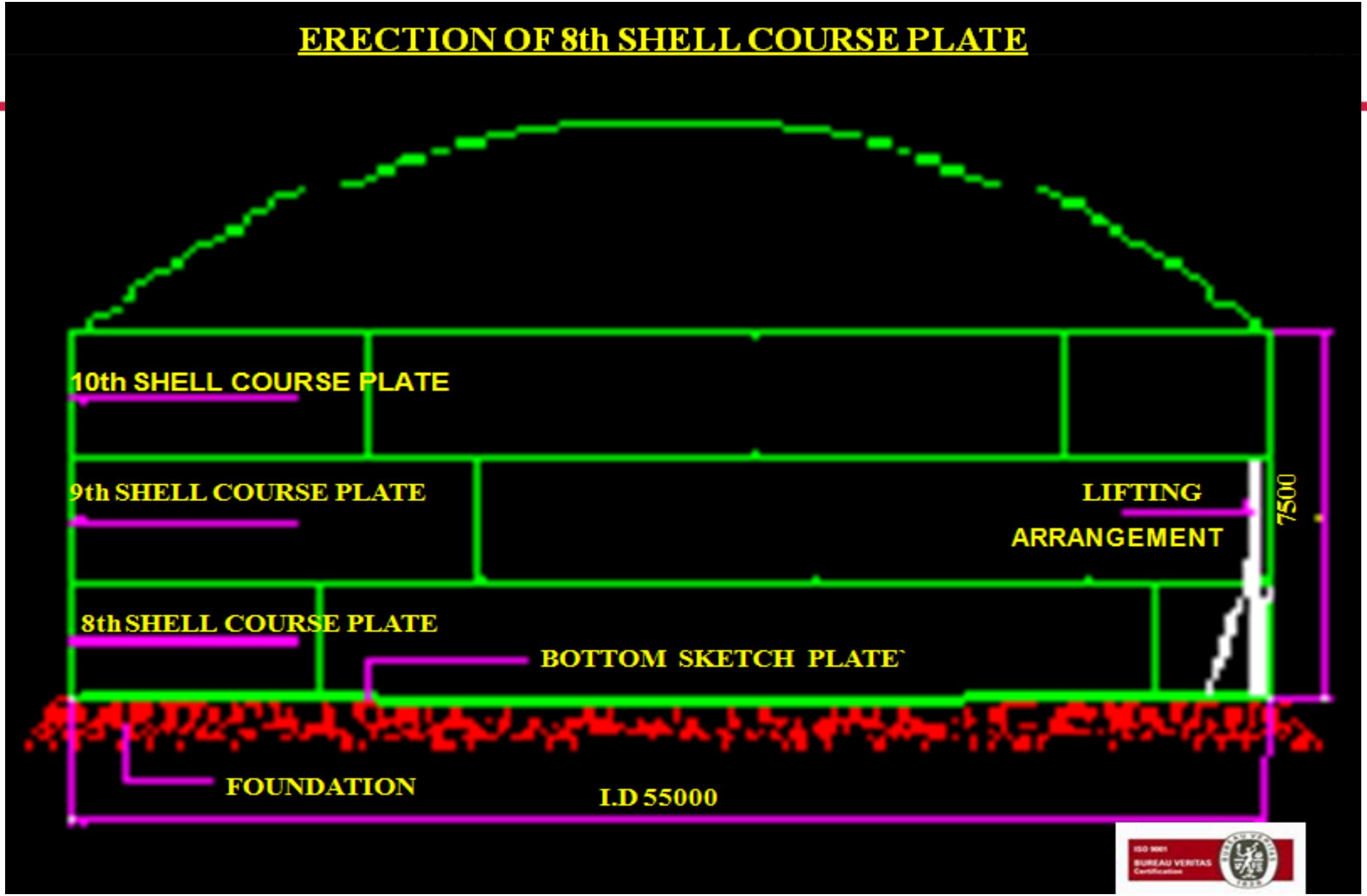
- Further shell rings lifted hydraulically to height where the next course can be inserted sequentially.
- Spiral stairway (with hand rail post and rail pipe) is erected bottom of the stringer to top, welded with support of bracket and stringer
- Other supports and accessories on top course are welded and inspected before jacking up
- Cycle repeated till completion of bottom shell course installed

TANK UNDER ERECTION

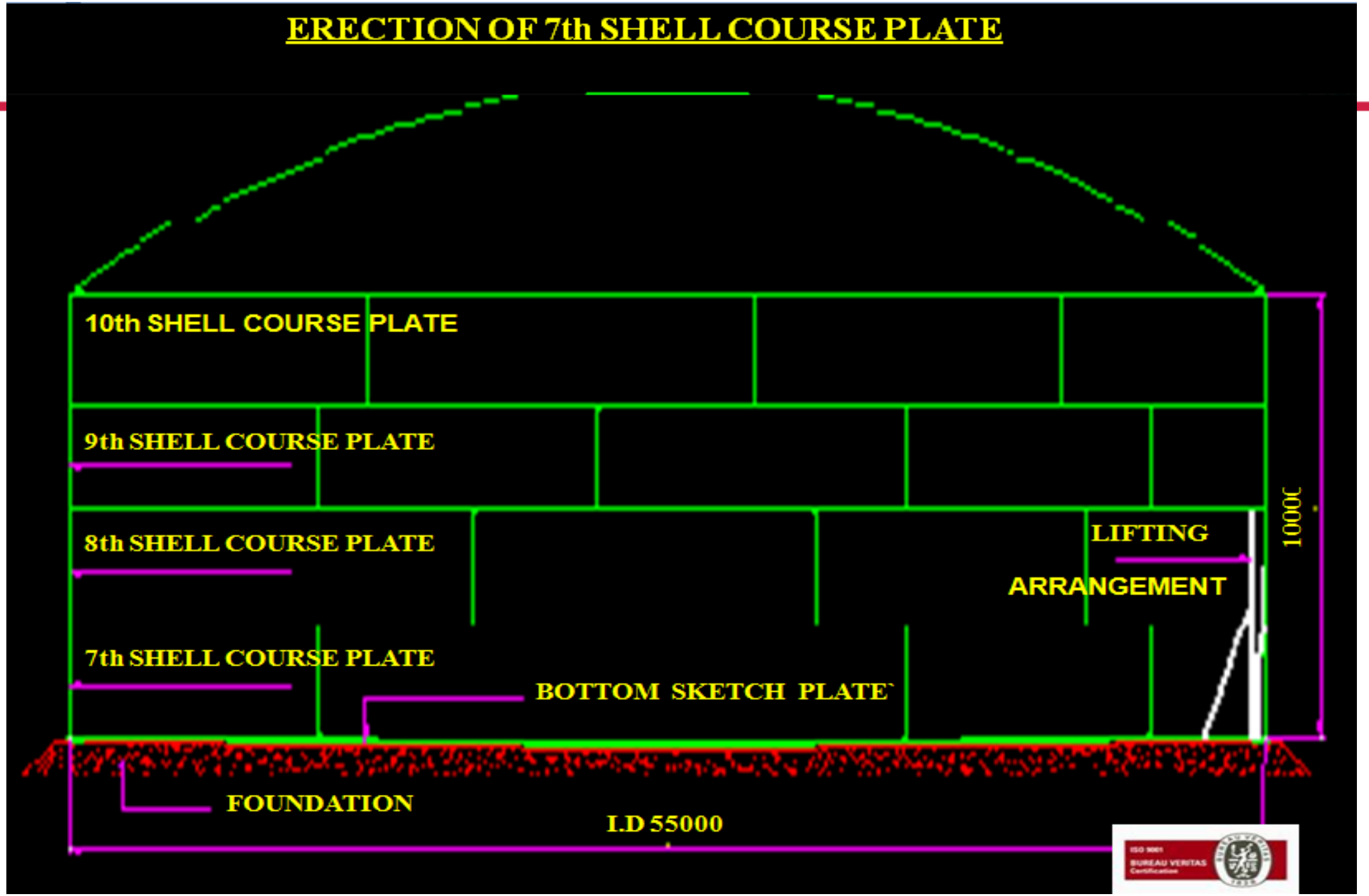
INSTALLATION OF ALUMINIUM DOME ROOF



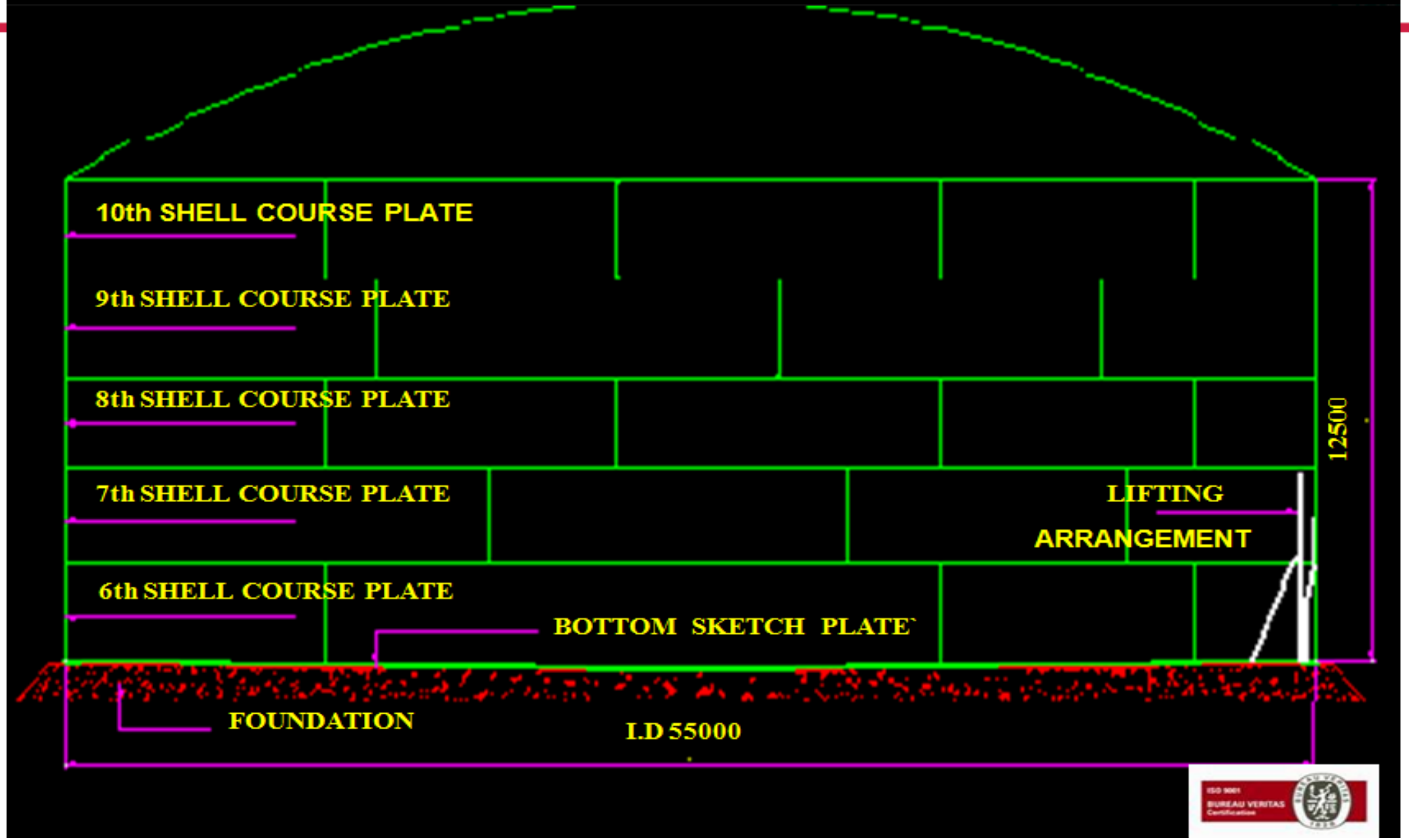
ERECTION OF 8th SHELL COURSE PLATE



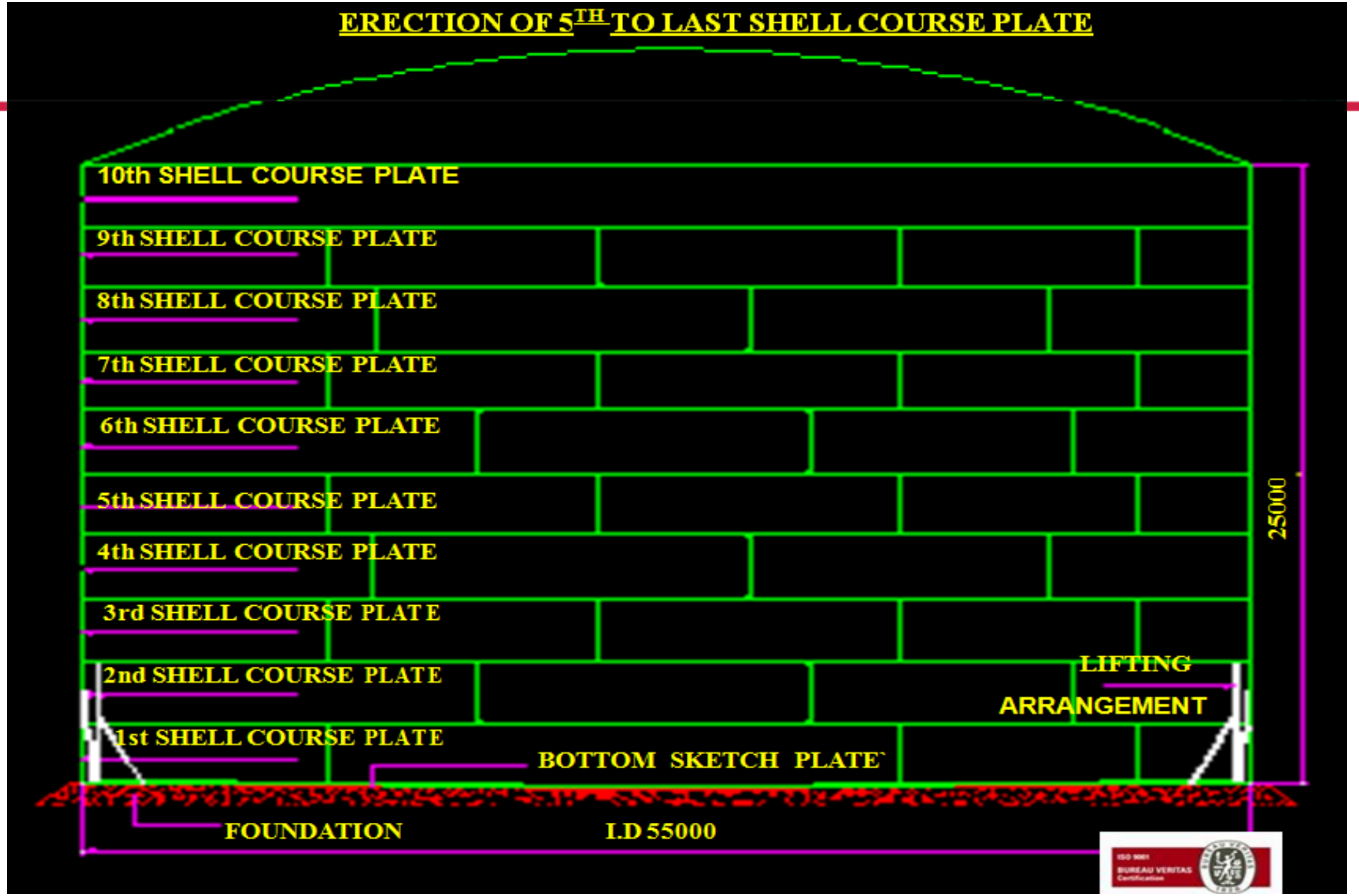
ERECTION OF 7th SHELL COURSE PLATE



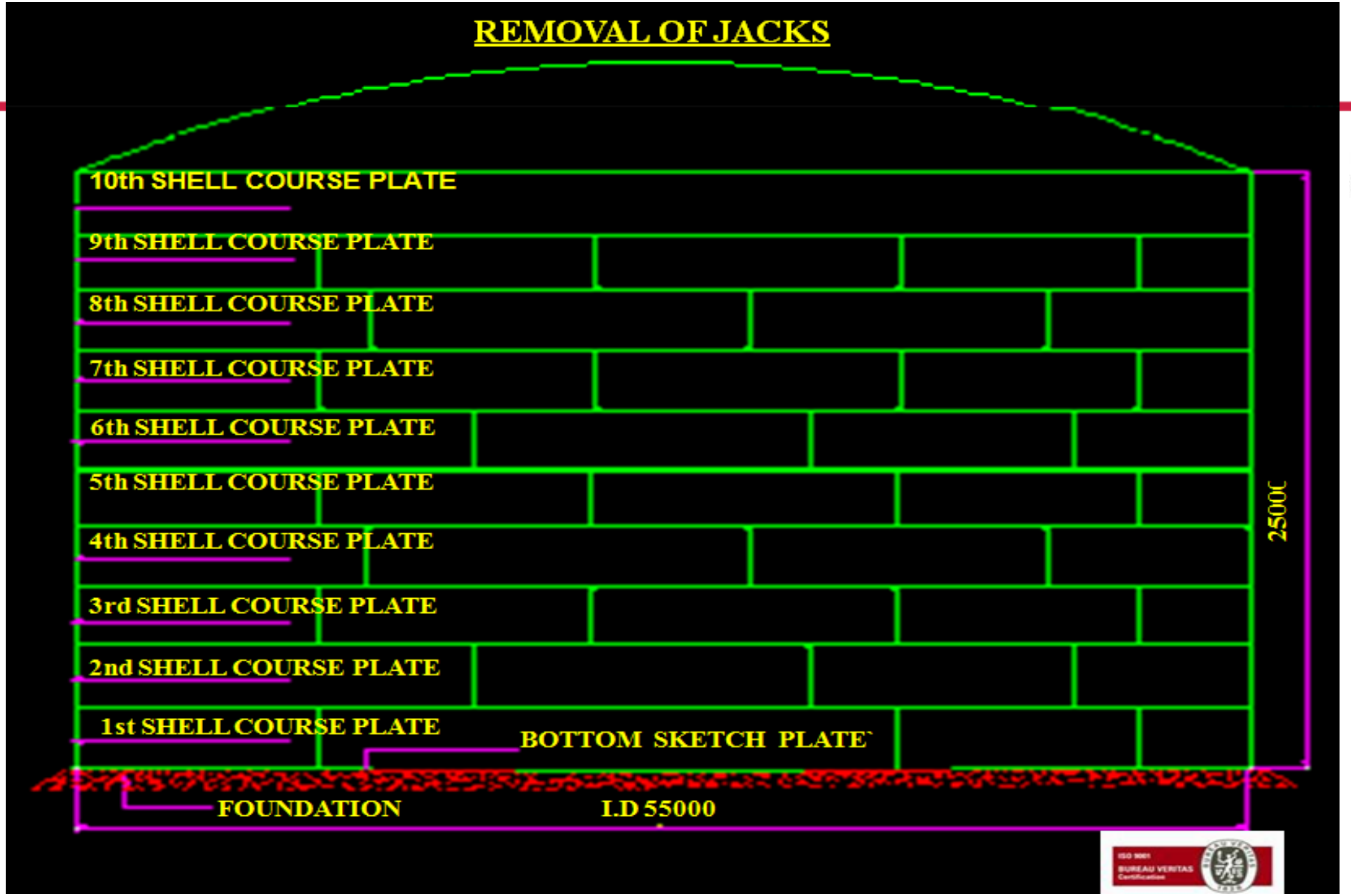
ERECTION OF 6th SHELL COURSE PLATE



ERECTION OF 5TH TO LAST SHELL COURSE PLATE



REMOVAL OF JACKS



TANK CONSTRUCTION With Jacking-up Technique

- Tank elevators are removed
- Bottom shell course aligned properly to annular plates
- Jacks dismantled after completion of welding of 1st shell course
- In common with other construction techniques, Hydro tests done as per API & Client specification for any leaks and foundation settlement
- Aluminium Dome roof after erection is checked for leak, by spraying water as per API 650 appendix G.

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Falcon Project – Erection at Site

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CYLINGAS PREFERRED METHOD JACKING-UP FOR TANKS

ADVANTAGES

- Work at ground level- safe with lower risks, time saving and economical
- Better productivity, better quality, production of sound welds with welding carried out at ergonomic level
- Stage-wise weld quality inspection feasible with easy access
- Wind damage to shell while erecting, eliminated by the protective tank roof/wind girder at the initial stage.

CYLINGAS PREFERRED METHOD JACKING-UP FOR TANKS

- Tank plumb reading within API 650 tolerances easily achievable
- Less involvement of high capacity cranes
- Scaffolding costs held at minimum
- Hydraulic jacks connected to load by a failsafe friction grip system, saves tank if pump/ hose fails
- Tanks erected with jacks, less susceptible to collapse due to high winds
- Wind girder/roof in place, as the top shell is erected first
- Gap between the tank bottom and shell (350mm) allows wind to flow through the gap, reducing effects of the wind load on shell.

WHY JACKING-UP NOT ALWAYS A CHOICE ???

1. Erection of column supported cone roof tanks, not fully applicable; roof supporting structures and roof plates need a crane for erection

2. Large diameter tanks- ≥90meter with ≥45mm plate thickness double sided automatic girth welding needed to expedite welding of horizontal shell joints. Jacking up method only single sided welding can be achieved. Conventional erection method would be an option for higher speed of welding.

3. May not be fully feasible for double wall tanks

4. For diameter of tanks less than 15meters, jacking up method does not give significant advantage and therefore not recommended. Also for diameter≥ 92meters, Jacking method is not adopted due to requirement of higher capacity power pack necessitating higher HP motor.

Sometimes, Mills are late to deliver low thickness which is required at beginning; hence we are flexible to either ways

For further enquiries and feed back please contact

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THANK YOU