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अमृतं तु विद्या

# Bharatiya Vidya Bhavan's Sardar Patel College of Engineering

(Government-Aided Autonomous Institute)

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## REPORT ON REVIEW OF ANALYSIS & DESIGN FOR 120 METER LATTICE WIND MAST

The above job was assigned to Sardar Patel College of Engineering, Mumbai – 400058, by M/S Clique Consultants Pvt. Ltd., A 601, Lancelot, Opp. Shastrinagar, Near Korakendra, S.V. Road, Borivali (W), Mumbai – 400092 on behalf of M/S Ramkrishna Iron Works Private Limited, Mumbai.

The scope of the job is to review the analysis & design and drawings of 120 meter lattice wind mast & calculation submitted by M/S Clique consultants for the wind mast for wind speed 47Meter/sec.

The following documents were submitted to us for the scrutiny by M/S Clique Consultant.

1. Structural drawing for wind mast ( Super & substructure )
2. Structural drawing for Boom assembly
3. Design calculations document
4. Engineering 3-D model of structure in STAAD Pro

A couple of meetings took place between Dr. M. M. Murudi, Prof. & Head of Structural Engineering Department, Dr. A. A. Bage, Associate Professor in Structural Engineering Department, Mr. D M Senjalia, Director, M/S Clique Consultants Private Limited, Mr. A. D. Paranjape, Director, M/S Clique Consultants Private Limited, Ms. Zeenat Tai, Assistant Engineer from M/S Clique Consultants Private Limited to discuss and clarify certain information regarding the analysis and design of the above referred project. The suggestions/recommendations emerging out of discussions have been incorporated in the final design.

Wind mast structural system is designed for 47Meter/sec wind speed , structure is of square shape , having size 350 mm x350 mm form by four corner leg 50x50x6 mm up to height of 50meter from ground & 40x40x6 mm for the upper portion.



For stability against lateral load , all corner legs are braced in horizontal & inclined direction by 13 mm square bar, grade of all steel material is  $f_y$  250 MPa.

To control the deflection Against lateral forces Lattice structure is tied with 8 mm dia galvanized steel wire ropes in 6/19 (12/6/1) in all four direction at every 10 meter height. Minimum breaking force is 33 kN & Grade 1570 MPa.

At the tower top Boom is provided to support wind sensor, boom is projected by 2850 mm from tower , structural system for same consists of 35 mm dia 3mm thick pipe & triangular truss.


For wind forces generation IS 875 -2015, Part-3 and IS 802-1995 are considered, 3-D analysis is carried out for the structure with help of STAAD Pro Software to find out the forces in members of structural system & at Foundation level. To capture the 3 dimensional behavior of cable, non linear analysis for cable is performed with the help of STAAD Pro Software.

Following are our observations and comments made during the scrutiny work.

1. The loads considered in the design are as per the norms laid down by IS 875:1987
2. The grade of concrete used is M-25 and steel used is Fe-415.
3. The structure has been analysed for lateral loads arising due to wind load conforming to IS 875:2015 and for dynamic effect conforming to IS 802:1995.
4. The structural elements of the mast and boom are designed as per IS 800: 2007.
5. Footings are designed as per IS 456:2000 using limit state method.

Finally, the structural model is checked after accounting for the above mentioned loads. The steel sections including bracing members selected for the steel mast are adequate and design is safe. For footings, the area of the steel reinforcement, grade of concrete and steel chosen are adequate and design is safe. The structural design calculations satisfy the requirements of IS 456:2000, IS 875:2015 and IS 802:1995.

Faculty members involved

Dr. M. M. Murudi 

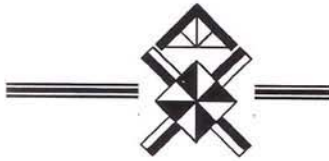
Dr. A. A. Bage 



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*Clique*

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ENGINEERING CONSULTANTS

Our Ref. No. CC 16 / C500 / 021

Date : Mar 04, 2016

## TO WHOMSOEVER IT MAY CONCERN

This is to certify that at the request of M/s Ramkrishna Iron Works Private Limited, their Design of 120M Tall Lattice Wind Mast having below mentioned specifications was evaluated and verified by us for Structural Stability:

1. 120m Tall Slender Lattice Structure Supported by Inclined Pre-Tensioned Wireropes
2. Basic Wind Velocity : 47 mtr / sec
3. Wind Loading in conformity to IS : 875 - 2015, Part 3 – Wind Loads and IS : 802 - 1995, Part 1 / Sec 1 – Material and Loads
4. Lattice Structure is 350mm x 350mm full height, formed using Four Corner Legs of ISA 50 x 50 x 6 upto 50m from Base and Four Corner Legs of ISA 40 x 40 x 6 above 50m, Lacing & Bracing Members of 13mm Square Bars and Section Flange Members of ISA 50 x 50 x 6, all Grade 250MPa ( RKIWPL Drg No. BY - 1 – 3010, Rev. R6 dtd 04.03.2016 )
5. Wireropes adopted are 8mm dia Galvanised Steel Wire-ropes in 6 x 19 ( 12 / 6 / 1 ) Construction in Conformity to IS:2266 : Steel Wire Ropes for General Engineering Purpose - Specification, of Grade 1570MPa with Minimum Breaking Force of 33kN
6. Pre-Tensioning in Wirerope : 2.5kN
7. Wirerope Anchoring Blocks, in Concrete Construction, on Four Orthogonal Directions( RKIWPL Drg No. BY - 4 – 4004 Rev. R6 dtd 04.03.2016 ) are as under:
  - 7.1 1850 mm Long x 1850mm Wide x 1200mm Deep placed at 27m from Mast Centre
  - 7.2 2300 mm Long x 2300mm Wide x 1200mm Deep placed at 45m from Mast Centre
  - 7.3 2500 mm Long x 2500mm Wide x 1200mm Deep placed at 55m from Mast Centre
8. Central Mast is supported on 1850 mm x 1850mm x 500mm Thick Concrete Footing
9. On Each of Four Orthogonal Directions, One Set of Cables is Anchored 27m from Mast Centre and tied with Lattice Structure at 10m,20m,30m and 40m Level
10. On Each of Four Orthogonal Directions, Another Set of Cables is Anchored 45m from Mast Centre and tied with Lattice Structure at 50,m 60m,70m and 80m Level
11. On Each of Four Orthogonal Directions, Another Set of Cables is Anchored 55m from Mast Centre and tied with Lattice Structure at 90,m 100m,110m and 118m Level
12. Forces in all Lattice and Cable Elements are found within Permissible Limits
13. Cable Anchor Blocks are found safe against Uplift, Sliding and Overturning
14. Boom Arm made of 35mm OD x 3mm thk MS Pipe Supported using 700mm Long Bracket (RKIWPL Drg No. BY - 4 – 4025 Rev. R6 dtd 04.03.2016 ) is certified Structurally Adequate.

After due verification, including Non-Linear Analysis, it is certified that the design as submitted by M/s Ramkrishna Iron Works Private Limited is structurally sound and stable in conformity to IS : 800, IS : 802 and IS : 875 upto 47mtr / sec wind velocity.

For Clique Consultants Private Limited

A D Paranjape, Director  
MIE ( India ) Regn No. M 041815

Encl : Analysis & Design Review Report  
( C500 / CI / DS / A4 / 111, Rev R3 dtd 04.03.2016 )

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*[Signature]*

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