

Case Study

Fully Engineered Steel Building Solution help Manikgarh Cement to maintain pollution free environment...



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| Client: | Manikgarh Cement |
| Location: | Gadchandur, District Chandrapur, Maharashtra |
| End Use: | Coal Stacker |
| Brand: | ECOBUILD™ Building Systems |
| Project size: | 7,778 m ² |
| Clear Span: | 85.4 m c/c |

Brief about the client:

Manikgarh Cement is a division of Century Textiles & Industries Ltd., belonging to the BK Birla Group of Companies. Right from its inception, great emphasis has been laid at Manikgarh Cement on maintaining ecological balance and environmental preservation so as to provide green, healthy and pollution free environment. Manikgarh Cement is taking care for effective prevention and control of fugitive emissions such as coal dust. The improvement initiative has started to arrest these dust particles by providing complete enclosure for such operations.

Pre-qualification phase:

Our pre-sales team was in touch with senior management of Manikgarh Cement. In past Tata BlueScope Building Solutions has successfully completed the steel buildings for their stacker and reclaimer shed.

Our pre-sales team spent time with Manikgarh cement project team to understand their specific requirements for this project. During the interaction our team realised that the clear span of building is extremely large i.e 85.4 meters. Our team grasped that the operations of the coal stacker cannot be stopped for steel building erection purpose, as the plant is fully operational and we needed to provide innovative solution so as to ensure both work in parallel without interruption.

Scope of Work:

The scope of work included Design, Manufacture, Supply and Erection supervision for coal stacker shed. The key requirements of the project were.

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- (a) To facilitate coal stacker operations operations the clear span requirement was 85.40 meters and length of building was 84.40 meters. The unobstructed column free space of 7,778 sq.mt. for efficient coal stacker operations.

Building Specifications:



Width (m): 85.40 m c/c of steel line

Width Module: 1@85.4m c/c

Length (m): 84.4 m c/c

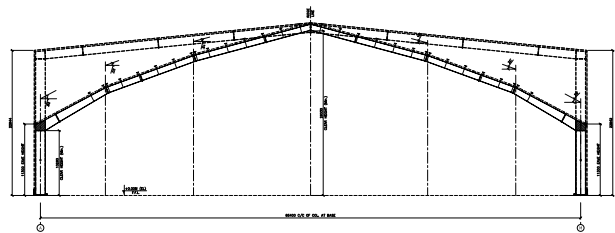
Clear Height (m): 26.03 m at ridge and 10.24 m at eaves.

Collateral Loads:

- (a) Dust load of 0.5 KN/m² considered at rafters and purlins for design.
- (b) Fire hydrant sprinkler system, the building shall be designed to support the additional collateral loads for fire sprinklers of 24kg/m at specific locations.

Challenges:

Engineering: The requirement of clear height of building at ridge was 26.03 meters due to conveyor belt and coal stacker unit. If our designers would have followed the conventional design practices such as maintaining slope of 1 in 10, the height of column at eaves would be about 22.9 meters. Our designers proposed unconventional profile which made this



structure unique. The roof profile designed is 'symmetrical two-sided roofs with three slopes on each side' that allowed building design optimisation. In this profile the upper slope was positioned at a shallow angle (15 degrees), while the lower slope was steep (28 degrees). This design provided advantages of a sloped roof while maximizing headroom near central portion of the building and shortening it at the eaves level.

Construction: (a) Large Clear Span: To complete the largest clear span building executed so far without stopping fully operational coal conveyor. (b) Space Constraint: due to the flow of coal was continuous to cement plant and same was stored inside. The movement of proposed resources such as heavy cranes inside the building was a challenge for frame erection.

Project Planning:

The Manikgarh cement stops coal shed operation once in a year for their annual maintenance activity of coal conveyor and stacker. To do so the operations are halted for 2 to 3 weeks. Tata BlueScope Building Solutions team decided to use this opportunity for major primary steel erection works above the conveyor area of coal stacker.

The erection planning by considering an innovative work methods such as simultaneously using 5 numbers of

60 MT capacity cranes to hold the frames in the air securely for the first braced bay erection. The mechanisation on site such as using two boom lifts to fix the fly joints of rafters while erecting these frames.

Erection Methodology: Our Project management team ensured proper co-ordination for sequential material delivery so that the materials reached at site are erectable and as per erection priority. Construction and certified builder team implemented various time saving erection methodologies such as module wise material stocking, innovative frame lifting method for rafters and purlin erection etc. High level of mechanisation such as use of boom lifts, telescopic cranes has also enhanced speed of erection. As per plan our certified builder deployed adequate trained manpower.

As per our work method statement, team planned the erection of a single frame in three parts i.e. 25.5 meter, A test lift was carried out as per plan at site prior to commencing the actual erection work:



(a) Three adjacent columns along the grid line were erected and girts, pipe bracings, wall bracings were fixed. Four columns on opposite side were also erected similarly. Assembly of rafters at ground in three parts 25.5 meters, 36.4 meters, 25.5 meters with flange brace and life line posts.



(b) The first part of rafter was lifted by one 60 MT. crane. The second part was lifted by another two 60 MT. and one 80 MT. Crane.

(c) The third part of rafter was lifted by one 60 MT. Crane.



(d) Temporary bracings (wire rope) was tightened as per length & height of rafter as the chances of twist of rafter were high.

(e) After ensuring all four connections of first rafter being tightened, Fifth crane (of 80 MT.) at ridge started its role of holding first bay rafter assembly in air and subsequently the four 60 MT. cranes are released one by one.



(f) The cycle was repeated for the second rafter with four 60 MT. Cranes and second rafter was erected in the air by four cranes.

(g) For lifting of pipe struts, bracings two of cranes were used.

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- (h) Ensured sufficient wire ropes (Temporary bracings) fixed for both erected rafters assembly.
- (i) Ensured the completion of first braced bay.
- (j) By repeating all above steps, team completed erection of all primary frames and secondary members erection safely.

36.0 meter and 25.50 meter pieces with the help 5 nos. of cranes each of 60 MT. capacity and with 2 Boom lifts.

Client Support: Good support from client enabled us to complete all the milestones as planned. Our client has provided all the work fonts required as per our detailed planning e.g. The anchor bolt were casted accurately and foundations were ready to erect the building.

Conclusion: Manikgarh Cement had their residential quarters for their employees inside the plant premise and were facing an unobstructed flow of coal dust continuously. Due to erection of steel building structure over the coal shed it has completely arrested the fugitive coal dust in the residential staff quarters and in the entire plant premises.

Intense stake holder engagement during pre-sales and order execution phase, effective communication management and Innovative engineering design adopted for this building optimised the cost of building without compromising with operational requirements of Manikgarh Cement plant.

The erection supervision by a dedicated construction team, adoption of innovative construction techniques and use of boom lifts resulted in safe and on-time completion of the project.



Mr. A. K. Jain,
Executive President
(Mechanical)
Manikgarh Cement

Client Feedback:

"I congratulate Tata BlueScope Building Solutions' team for safe and on-time completion of 85.40m clear span building for our coal shed. The project was completed in a systematic way and up to our satisfaction. The fully engineered solution provided is a good demonstration of synchronization of 'Engineering, Project Management, Manufacturing and Construction Capabilities' that has delivered an outstanding experience. This has given a sense of satisfaction once again for our third project with them. Excellent execution capabilities and experienced construction team, has guided certified builder to follow innovative construction techniques for safe steel building erection. I wish to thank the entire Tata BlueScope Building Solutions team involved in this ambitious project for their excellent co-operation extended during the project phase."