METHOD OF STATEMENT FOR BUILDING STRUCTURAL STEEL ERECTION

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Table of Content

1. Introduction
2. Purpose
3. Scope
4. HSE
5. Responsibilities
   - 5.1 Construction Manager
   - 5.2 Site Supervisor
   - 5.3 QC Engineer
   - 5.4 HSE Inspection
   - 5.5 Surveyor
   - 5.6 Execution Forman
6. Procedure
   - 6.1 Plant and Equipment
   - 6.2 Workforce
   - 6.3 Permeant Materials and Consumable
   - 6.4 Materials
   - 6.5 Site Planning and Preparation
   - 6.6 Work Methodology
7. WTP Building Erection
   - 7.1 Foundation Ready for Erection
   - 7.2 Erection of Steel Column
   - 7.3 Erection of Beam (Between Columns)
   - 7.4 Erection of Vertical Bracing
   - 7.5 Erection of Roof Trusses
   - 7.6 Erection of Interior Platform
   - 7.7 Erection of Roof
   - 7.8 Erection of Purlins and Tension Rods
   - 7.9 Plumpness Checks
   - 7.10 Bolt Tightening Checks
   - 7.11 Paint Inspection and Touch up painting
   - 7.12 Erection Schedule
8. Conclusion
9. Attachment

1. Introduction

Those in the power generation industry know how critical a reliable, steady stream of high purity water is. For power generation, water is used in high pressure boilers, turbines and cooling towers. Water treatment for power generation is a vital process that requires a dependable technology. High purity water ensures proper operation of steam generation system and reduces blowdown frequency and use of boiler chemicals. High purity water is also able to better protect against erosion and damage to equipment. This building is water treatment plant of the power station project.

2. Purpose

The purpose of this method statement is to outline the general requirements and precautionary measures which will be taken into consideration for the structural steel assembly and erection works of the steel structural buildings.

3. Scope

This method statement identifies the general steps, arrangements and precautions for the structural steel assembly and erection works of the steel structural building.

4. HSE (Health , Safety and Environment)

All works shall be in compliance with International Standard, codes, requirements and instructions. At this type of this project should be have a proper Risk assessment which supposed to be prepare by the HSE team of contractor ranking the hazards associated with project works and control measures to be taken to mitigate the hazards to an acceptable level prior to the start of the work.
Each work scope or task will have a completed and approved Job Hazard Analysis (JHA) identifying the potential hazards and control measures that will be implemented to protect people and environment.

5. Responsibility

5.1 Construction Manager

The Construction Manager is responsible for the overall management of the project construction team to ensure that safe and effective operations are conducted and properly documented.

5.2 Site Supervisor

Site Supervisor is responsible for implementation of Construction Manager’s directives, coordinating key personnel and supplying all necessary machinery, equipment and devices to conduct entire site activities.

5.3 QC Engineer

QC Engineer is responsible for clarifying the inspection and testing requirements for structural steel works, implements all inspection and testing of structural steel works at Site according to the approved Inspection and Test Plans.

5.4 HSE Inspector

HSE Inspector shall closely monitor the implementation of works in accordance with Health and Safety procedure to ensure that all necessary precautions are being fulfilled.

5.5 Surveyor

The Surveyor is responsible for setting out the coordinates and elevations of structures.

5.6 Execution Foreman

Execution Forman is responsible for controlling the manpower in accordance with the Site Supervisor's instructions, to ensure that the qualified workers with right tools are assigned to each work post. He is responsible for implementation of the work in accordance with HSE plans and procedure, method statements and requirements stipulated by the Risk Assessment. He will participated to the daily tool-box talks and ensure participation of the work team as well. He will also be responsible for the use of correct personnel protective equipment at all times.

6. Procedure

6.1 Plant and Equipment

- Boom Truck or Mobile Crane

- Fork Lift

- Articulated Man Lift

- Trailer
- Crane-Lifting studies for above 10ton shall presented, according to the availability and size of the cranes.
- Grinding Machine
- Diesel Generator
- Air Compressors
- Hand tools
- Guide rods
- Electrical tools
- Survey Equipment
- Light Towers
- Measurement Devices
- Torque Wrench

6.2 Workforce

Workforce allocation shall be done based on quantum of job involved in order to finish the job within stipulated period with the required quality and safety.
There are many crew will work at the site which mentioned below:

Site Engineer	**Erection Crew**	**Bolt Tightening Crew**	**Material Handling Crew**
Rigger	**Crane Operator**	**Bolt Tightness**	**Crane Operator**
Survey Team	**Rigger**	**Man lift Operator**	**Rigger Helper**
Painter	**Scaffolder**		**Signalman**
Supervisor	**Fitter**		
Operator	**Foreman**		
Driver	**Banks Man**		
Laborer	**Helper**		

6.3 Permanent Martials and Consumables

Item No.	Description	Purpose
1	Steel Columns and Prefabrication Parts	For Structural Erection
2	Bolt , Nuts, Washers	For Structural Steel Erection
3	HSE materials (Barricades, warning sign, etc.)	For Safety Requirement
4	Fuel	For Machinery equ.

6.4 Materials

Structural-Steel Materials
All Steel Material should be confirm to;

- EN 10025,ASTM A36
- BS 5950 Part 1 ,2 Min Requirement Structural Steel

6.5 Site Planning and Preparation

Necessary work permit shall be taken before starting the job. The job will be carried out as per approved drawing and specification.

6.6 Work Methodology

6.6.1 Preparation

The site supervisor will complete all necessary conditions, plant production and assembly processes, before starting erection activities
the following checking activities will be performed which are namely anchor coordination, shims location, and elevation, cleaning of shear key packed, structure element cleaning, structure column base plate center line marking.

TYPICAL FOR ALL STEEL STRUCTURE

- HSE Supervisor and Site Supervisor shall carry out the safety inspections to ensure that safety requirements laid out by the erection team are being followed during the erection of steel structures.

- Site Supervisor shall prepare all material and equipment prior to start any activities at various stages of the erection and construction work.
- Personal Protective Equipment (PPE) shall be provided to all workforce involved in the job.
- The cranes and other rigging gears shall have to pass inspection prior to use at site in order to ensure their safety-worthiness at work.
- Scaffolding shall be erected by qualified scaffolders.
- Prior to the erection, the upper portion of the pedestals shall be chipped prior to grouting.

6.6.2 Erection

- Work permit will be taken before commencement of the Structural steel lifting activities.
- Training for all personnel for working at height will be provided.
- All plant and equipment shall be suitable, and of sufficient capacity to complete erection of steel work.
- Column base plates shall be set and shimmed to the correct positions and elevations.
- All steel shall be plumbed and levelled.
- During erection, temporary bracing and guys shall be used to maintain structural stability if necessary.
- Alignment and adjustment of various members forming part of complete frame of structure will be done before permanently fastening.
- The foundation will be checked whether it is correctly formed and the bolts are set accurately.
- Correct positions and elevations will be controlled by using the data given before the erection.
- All steel structures and the crane girders will be erected within the tolerances given in standards, procedures, technical specifications and within this method of statement.

6.6.3 Technical Erection Methodology

6.6.3.1 General

- The erection of the steel work shall be carried out in conformity with this method statement and in such a way as to ensure stability at all time.
- Foundation bolts shall not be used to ensure to secure unguided columns against overturning unless they have been checked for this mode of use.
- Throughout the erection of the structure, the steel work shall be made safe against Temprory erection loads, including those due to erection equipment or its operation and against the effects of wind loads on the unfinished structure.

- For buildings, at least one third of the permanent bolts in each connection can be considered to contribute to stability of the part completed structure.

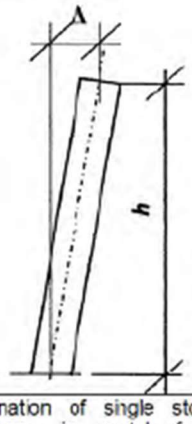
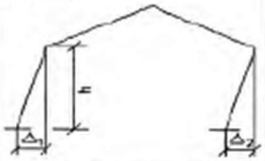
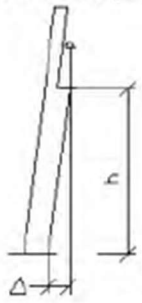
6.6.3.2 Temprory Works

- All Temprory bracing and temporary restrains shall be left in position until erection is sufficiently advanced to allow its safe removal.
- If it is required that bracings in tall buildings are to be de-stressed as erection progresses, to release the forces induced in them by vertical loads, this shall be carried out progressively one panel at a time. During such de-stressing sufficient alternative bracing shall be in place to ensure stability. If necessary, additional bracing shall be added temporarily for this purpose.

6.6.3.3 Fit-Up and Alignment

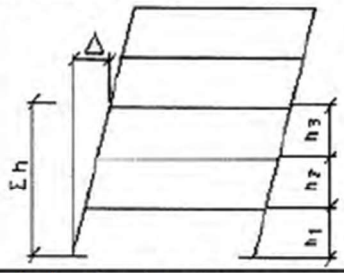
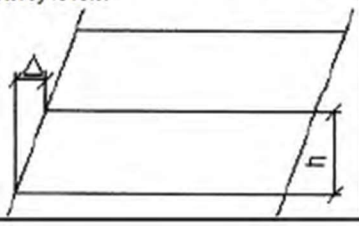
- Care shall be taken that no part of the structure is permanently distorted or overstressed of stacking of steel work components or by erection loads during the erection process.
- Each part of the structure shall be aligned as soon as practicable after it has been erected and final assembly completed as soon as possible thereafter.
- Permeant connection shall not be made between components until sufficient of the structure has been aligned, levelled, plumbed and temporarily connected to ensure that components will not be displaced during subsequent erection or alignment of the remainder of the structure.
- Shims shall be made of flat steel unless otherwise specified. Shims shall have similar durability to that of the structure.
- If lack-of-fit between erected components cannot be corrected by use of shims.
- In case of misalignment of holes for bolts, the method of corrected by shall be checked for consistency with the requirements of Related Standard/code.

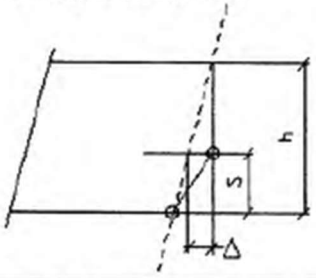
6.6.3.4 Essential Erection Tolerances – Single Store Columns

No	Criterion	Parameter	Permitted deviation Δ
1	Inclination of single-storey columns generally: 	Overall inclination in storey height *h*:	Δ = ± *h*/300
2	Inclination of single storey columns in portal frame buildings: 	Mean inclinationof all the columns in the same frame: [For two columns: $\Delta = (\Delta_1 + \Delta_2)/2$]	Δ = ± *h*/500
3	Inclination of any column that supports a crane gantry: 	Inclination from floor level to bearing of crane beam:	Δ = ± *h*/1000

4	Straightness of a single storey column: 	Location of the column in plan, relative to a straight line between position points at top and bottom: - generally - structural hollow sections	$\Delta = \pm h/750$ $\Delta = \pm h/750$

Essential Erection Tolerances – Multi-Storey Columns

No	Criterion	Parameter	Permitted deviation Δ
1	Location at each storey level, relative to that at the base level: 	Location of the column in plan, at any storey level relative to a vertical line through its centre at base level:	$\Delta = \pm \Sigma h/(300\sqrt{n})$
2	Inclination of a column, between adjacent storey levels: 	Location of the column in plan, relative to a vertical line through its centre at the next lower level:	$\Delta = \pm h/500$

3	Straightness of a continuous column between adjacent storey levels: 	Location of the column in plan, relative to a straight line between position points at adjacent storey levels:	$\Delta = \pm h/750$
4	Straightness of a spliced column, between adjacent storey levels: 	Location of the column in plan at the splice, relative to a straight line between position points at adjacent storey leves:	$\Delta = \pm s/750$ with $s \leq h/2$
NOTE	Table D.1.12 multi-storey columns applies to that are continuous over more than one storey. Table D.1.11 single storey columns applies to storey-height columns in multi-storey buildings.		

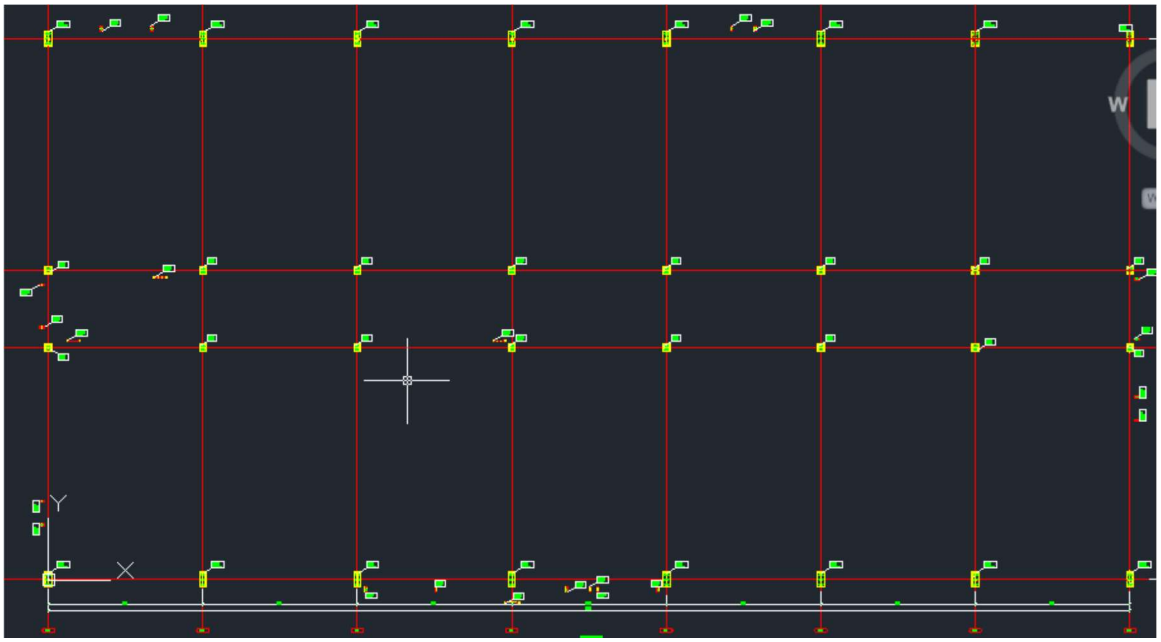
7. BUILDING ERECTION

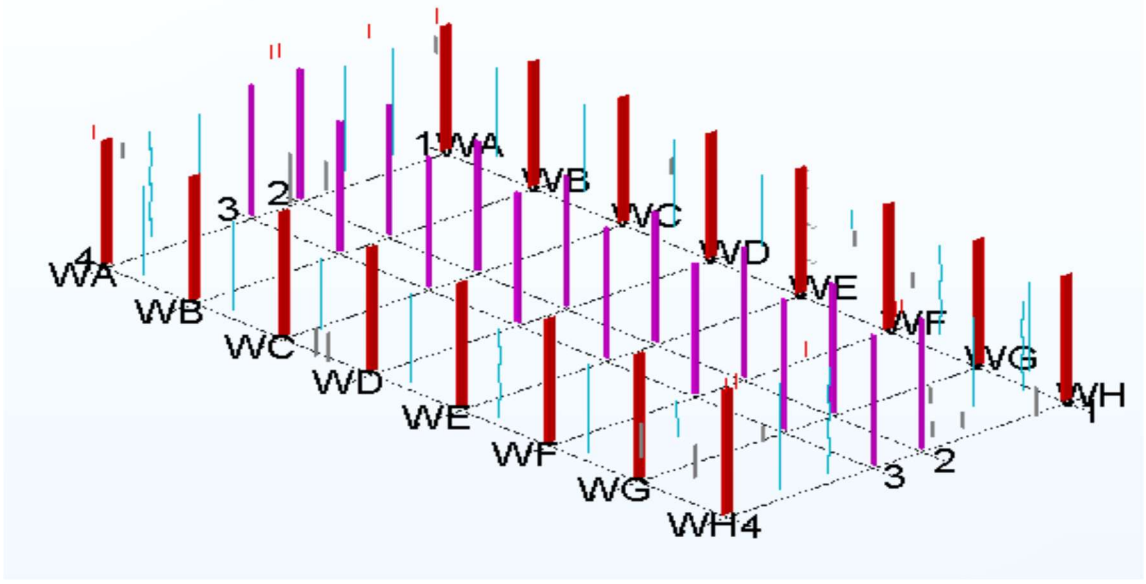
7.1 Foundation Ready for Erection

Shim Plate must be set before erection of column. Setting of shim plates shall commence on chipped reinforced concrete.

7.2 Erection of Steel Columns

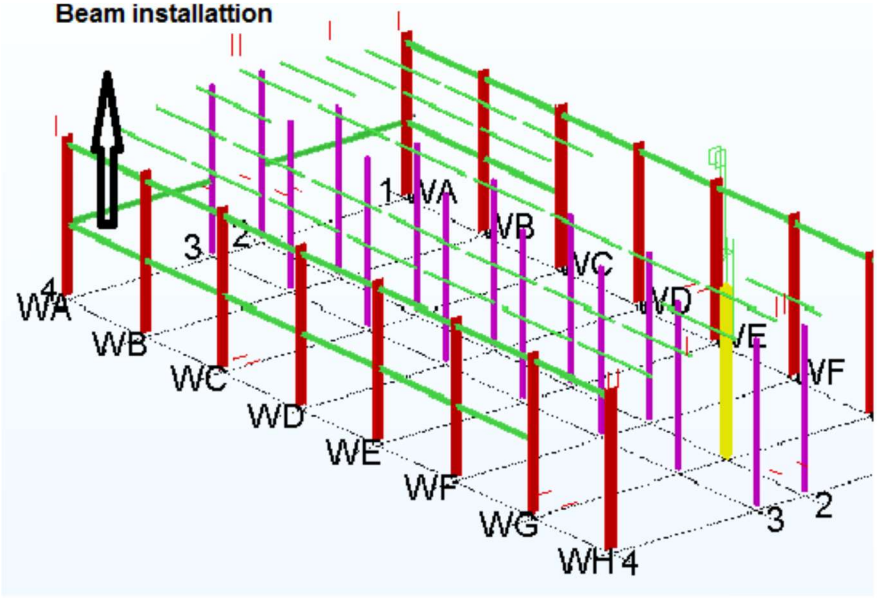
Grids are consist of 1 to 4 and A to H grids as shown on the drawings. Erection of columns shall commence on column WC50 (at grids W1/WA) and to be continued respectively as shown on the drawing.





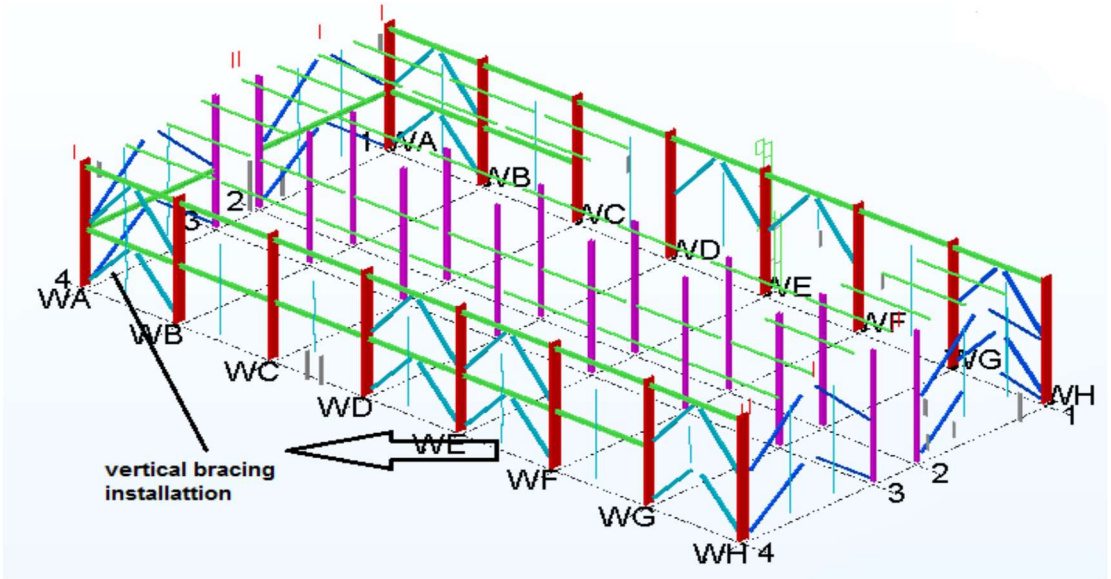
7.3 Erection of Beams (Between Column and Column)

Erection of beams shall commence beam WB50 (Between grids W1 to WA-WB) and to be continued respectively as shown on the drawing.



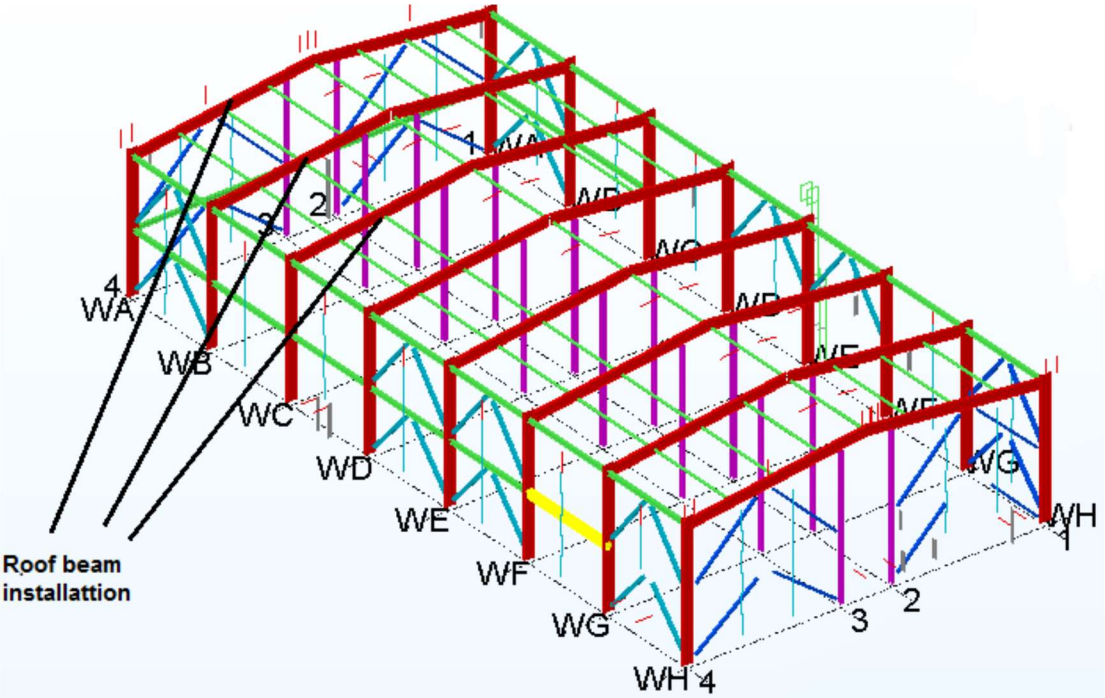
7.4 Erection of Vertical Bracings

Erection of vertical bracings shall commence respectively from erected beams.



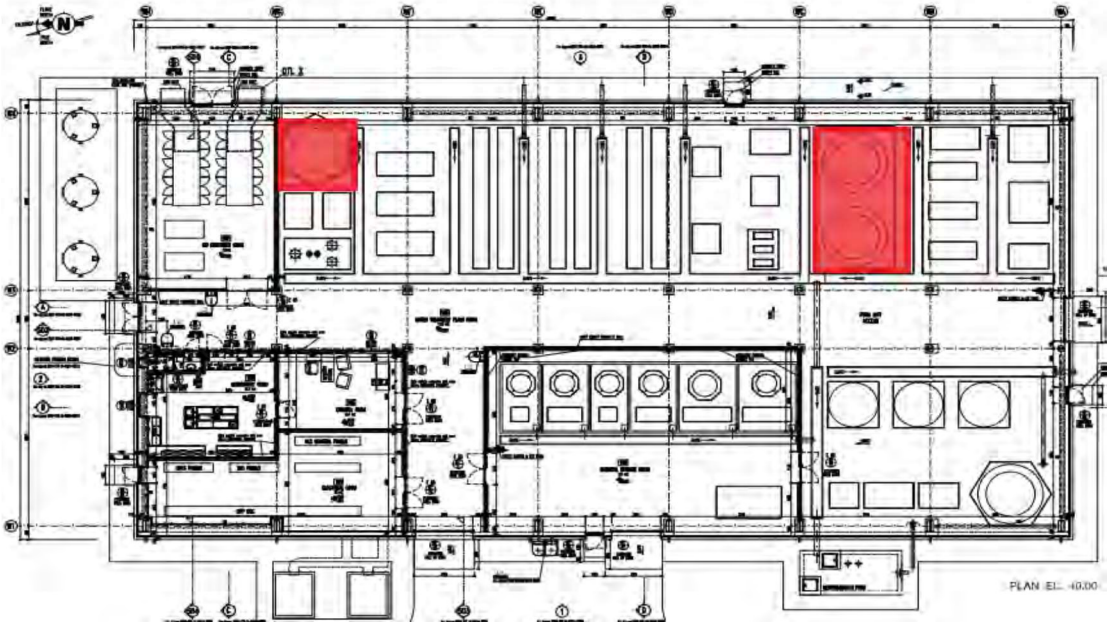
7.5 Erection of Roof Trusses

Erection of beams shall commence starting from the beams between grids WA/W1 and WA/W2 and then beams between grids WA/W3 and WA/W4. Erection of total 8 roof trusses will be done respectively.

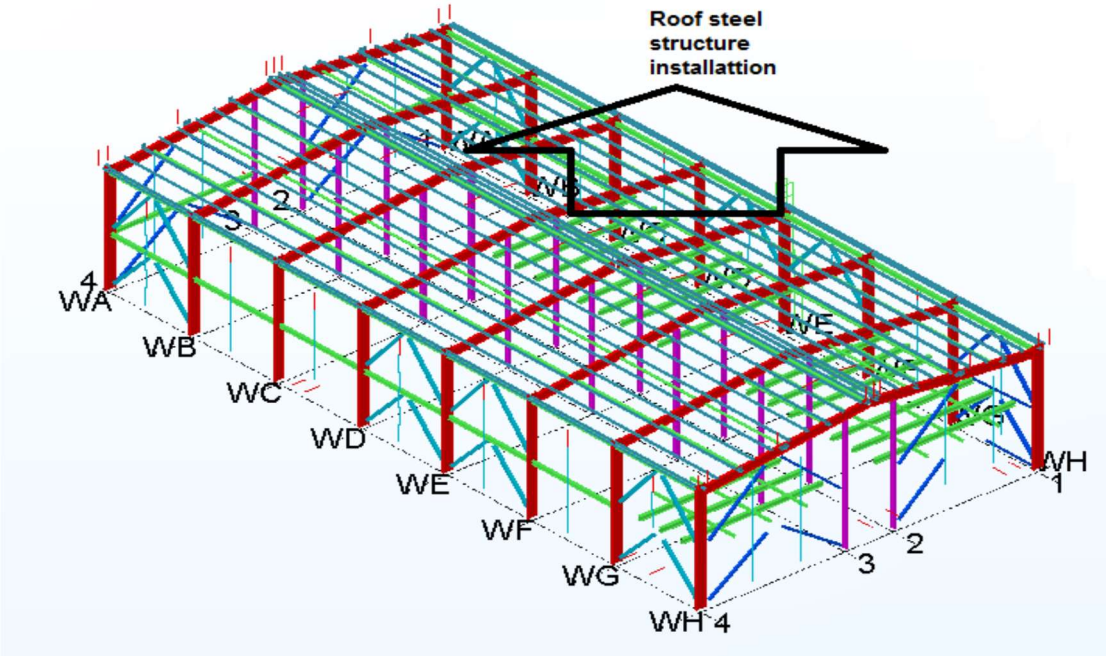


7.6 Erection of Roof

After erection of interior platform at EL +5.250, erection of beam and horizontal diagonals on roof will be completed (Please see the figure-7).Purlins and horizontal bracings at grids WB-WC/W3-W4 and WF-WG/W3-W4 will not be installed until the equipment shown on below figure are put on their place.

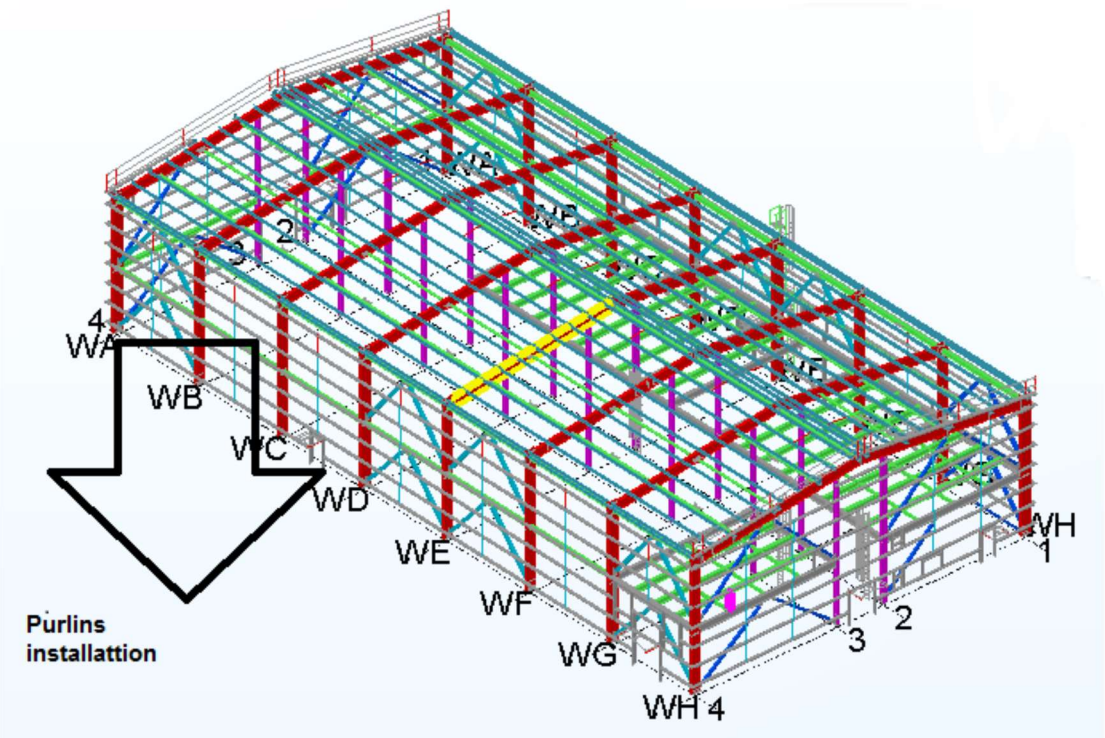


Roof bracings and purlins between axes WC-WH/1-2 should be erected after the erection of interior platforms. In case of any changes in the equipment locations, the Owner will be informed about these situations and works will be progressed accordingly.



7.7 Erection of Purlins and Tension Rods

Purlins to be installed starting from the sides and should continue with the roof according to the marking drawing.

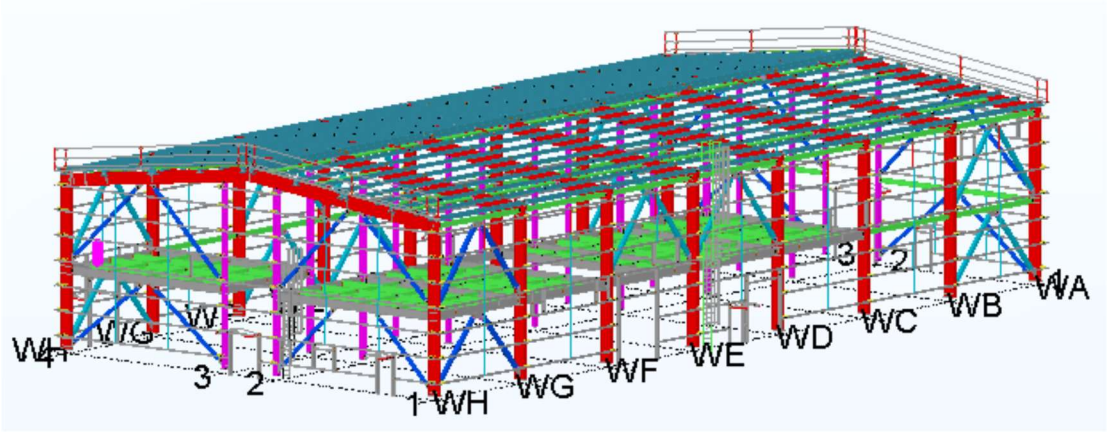


7.8 Plumpness Checks

The plumpness of the columns and the structure will be checked with surveyor according to ITPs and standards and the as-built drawings will be prepared accordingly.

7.9 Bolt Tightening Checks

After completion of plumpness checks, bolt tightening checks should be completed and the structure should be completed. The purlins and tension rods which haven't been installed due to the pending equipment insertions will be installed after placement of the equipment and the bolt tightening of those will be done after erection. Man lifts and man baskets will be used for the inspection of tightened bolts.



7.10 Paint Inspection and Touch up Painting

After completion of the structure erection and bolt checks, a final inspection for final paint will be done. Man lifts will be used for the inspection. Identified defected areas will be touched up by using the same vendor provided RAL 7035 code paints.

7.11 Erection Schedule

Total Erection day for this building 30 working days.

7.0 QUALITY ASSURANCE

Quality Assurance System shall be operated conforming to related standards.
Controls and checks shall be established and documented through relevant.
All inspection and testing activities shall be done as per approved Inspection and Test Plan for Structural Steel Erection. Prior to erection leveling plates shall be inspected for correct level and orientation. Installed members' alignment, level and plumpness shall be checked right after the
erection. Bolt tightening shall be inspected as per approved ITP for Structural Steel Erection. Bolt tightening equipment (torque wrenches) shall be inspected for their calibration before starting with tightening activities.

8. Conclusion

Method statements are particularly important in the construction industry because many everyday tasks involve high-level risks. Workers use dangerous equipment, work from heights, and are often exposed to hazardous materials. Injuries in the construction industry are common, and the fatal injury rate in this industry is three times higher than the all-industry rate. But with method statements, construction companies can make sure control measures mitigate risks and protect workers, site visitors and members of the public from harm.

INCIDENT / ACCIDENT / SEVERITY (IMPACT) and RISK ASSESSMENT MATRIX

					FREQUENCY / LIKELIHOOD				
					Very Low Probability - No Statistics at all	**Low Probability -** No Accident Report	**Probable (likely) -** Seen in ENKA projects	**Very Probable -** Seen often in ENKA projects	**Very High Probability-** Seen very often in ENKA projects
	Human	**Environment**	**Property**		**1**	**2**	**3**	**4**	**5**
IMPACT	**No Injury -** Near miss / Hazardous Condition	**No Impact -** Near miss / Hazardous Condition	**No Damage -** Near miss / Hazardous Condition	**A**	**A1**	**A2**	**A3**	**A4**	**A5**
	FA - MT First Aid - Medical Treatment - Slight Injuries	**Low Impact -** Leakage / Local area pollution / No public concern / Short-term cleaning	**Minor Damage -** Equipment parts replacement (Low Cost) / Short term (quickly) repair / No Interruption of project	**B**	**B1**	**B2**	**B3**	**B4**	**B5**
	RWC Restricted Work Case	**Moderate (localized) Impact-** Spill / Local pollution / No public concern / Stop of activity / Local evacuation (only related activity personnel) / Medium-term cleaning	**Moderate (localized) Damage -** Equipment parts replacement (Medium Cost) / Medium-term interruption (for equipment usage) / Interruption of activity-unit	**C**	**C1**	**C2**	**C3**	**C4**	**C5**
	LTI Lost Time Injury	**Very High Impact -** Massive spill / Noncompliance with regulations / Penalties / Suspension of project / Project Personel Evacuation / Long-term cleaning	**Major Damage -** Equipment parts replacement (High Cost) / Long term interruption (for equipment usage) / Interruption of activity-unit (More than one unit - activity)	**D**	**D1**	**D2**	**D3**	**D4**	**D5**
	Fatality - Permanent Disability	**Environmental Disaster -** Serious public concern / Noncompliance with regulations / Major Penalties / / Suspension - Shutdown of Project / Public Evacuation/ Long-term cleaning for out of the project site	**Extensive Damage -** Substantial loss of equipment, facility or plant / Shutdown of project	**E**	**E1**	**E2**	**E3**	**E4**	**E5**

Risk Assessment

No.	Identify Hazard	Effect of the Hazard	Who might be harmed	Risk before precaution			Precaution for Remedial Action	Residual Risk (Likelihood X Severity)			Responsible
				People	Environment	Equipment		People	Environment	Equipment	
1	Defective lifting equipment	Injury , Damage to equipment	All workers	C4		C4	• Ensure lifting equipment has valid certification. • Ensure that lifting accessories are correctly color coded. • *Inspect equ. Prior to use. • Ensure equ. is regularly maintained. • Follow manufacture's instruction.	C1		C1	Site Engineer and Forman
2	Incorrect use of lifting equipment.	Injury , Damage to equipment	All workers	C4		C4	• Riggers, banks, men, person In charge (PIC), crane operator etc. must be competent and qualified. • Supervisor.	C1		C1	Site Engineer and Forman
3	Abrupt movement	Injury , Damage to equipment	All workers	B4		B4	• Load to be lifted/lowered carefully. • Watch out for objects in the way of the load. • Operator to follow the signals of the banks man/PIC.	B1		B1	Site Engineer and Forman Crane Operator
4	Unstable, uneven ground	Injury , Damage to equipment	All workers	C4		C4	• Position crane on stable and even ground. • Ensure the outriggers are set correctly. • Use mats under the outriggers to distribute ground pressure. • Keep sufficient distance from the edge of trenches • Ensure rigger, banks man, PIC, crane operator are qualified. • Supervision.	C2		C2	Site Engineer and Forman Crane Operator
5	Improper handling of load	Injury , Damage to equipment	All workers	C3		C3	• Check suitability of crane position in relation to radius, boom length and load chart.	C1		C1	Site Engineer and Forman Crane Operator

6	Suspended load	Injury , Damage to equipment	All workers	C4		C4	Personal never to be allowed under suspended load or within swinging radius. Not tools, food or drinks to be allowed near moving crane parts. Use tag lines to avoid swinging of the load Restrict the area to and limit number of authorized persons Never leave load unattended. Supervision	C1		C1	Site Engineer and Forman Crane Operator
7	Overloading crane	Injury , Damage to equipment	All workers	C4		C4	Ensure correct capacity crane is selected. Ensure load computer is working correctly. Ensure load charts and boom angle indicator are available. Crane not to be operated on the slope. Inspect equipment prior to use.	C1		C1	Site Engineer and Forman Crane Operator
8	Inadequate work space/ congested area	Injury , Damage to equipment	All worker	C4		C4	Plan the work to avoid congestion and conflict tasks In that area. Ensure adequate space is available to work.	C1			Site Engineer and Forman Crane Operator
9	Insufficient Communication	Injury , Damage to equipment	All worker	C4		C4	Use only qualified riggers, bank man PIC , crane . Restrict area to and limit number of authorized persons.	C1			Site Engineer and Forman Crane Operator
10	Bad weather/wind velocity	Injury , Fatality ,Damage to equipment	All worker	C3		C3	Follow strictly crane manufactures equipment's for wind speed. Stop work Lifting shall be carried out if wind velocity exceed permissible level				Site Engineer Supervisor and Forman Crane Operator
11	Falling from height	Injury , Fatality	Worker who involving activity	D4			%100 tie of full body safety harness. Life line shall be provided	D2			Lifting eng. Supervisor
12	Falling objects	Injury , Fatality, Damage property	All workers	E3			Metal bins shall be used for transport or storage of martials Worker area should be close	E1			Lifting eng. Supervisor