BHEEMAA
Infra Solutions Pvt. Ltd.

PRACTICAL GUIDE TO PLANNING THE SAFE ERECTIONOF STEEL STRUCTURES

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PURPOSE:

This Guide sets out practical guidance for planning the safe erection of steel structures. The purpose of the Guide is to define the planning processes and controls necessary to help support best practice outcomes which mitigate health and safety risks for all stakeholders associated with the erection of steel structures. The aim of the guide is to inform stakeholders so that better practices may be considered and implemented and to increase awareness of the legislative requirements in each state for all parties to understand their obligations. Appendix A contains several examples of existing publications, which are relevant reference documents for this Guide. Within the context of this document, “shall” indicates a statement is mandatory and “should” indicates a recommendation.

SCOPE:

This Guide is intended for any person involved with the design, coordination, fabrication, or erection of steel structures. The Guide is intended to apply to all types of projects and provides a framework for the user to determine what steps are appropriate for their scope of work. Stakeholders may need to redefine the processes, roles and responsibilities outlined in this Guide to reflect the contractual arrangement applicable to the specific project and scope of work.

REFERENCE:

- Following documents required to be referred for preparation of this method statement:
- BOQ for PEB structure
- Technical Specification.
- LOI & WO
- Approved GA Drawings & Fabrication Drawings.
- IS 12843 for erection tolerances
- IS 800:2007 applicable design codes.

RESPONSIBILITY:

Project Manager:

- Shall be responsible for control, supervision, and Direction for Implementation of this procedure.
- Overall management and execution of works, which includes quality, safety and safe erection.
- Ensure project resource levels to facilitate timely project execution and completion.
- Planning and monitoring project policies
- Establish and chair meeting related to quality and safety and solving the issues.
- Continually monitors and reviews the performances & effectiveness of the project team.
- Monitoring the performance of major sub-contractors engaged the works.
- For the arranging of over all budgeting, resource planning, execution planning and methodology discussed and approved as per specific job requirement.
- Achieving customer satisfaction constantly with professional standard and ethics.
- To co-ordinate between project site and head office for various discipline.
- To control the follow up document.
- To arranging with procuring department if there is any revision takes care.
- To prepare the agenda for progress review meeting with owner/ contractor.

Site Engineer:

- Shall give the necessary guideline for required activity.
- Supervisor shall ensure the entire person working under him shall be trained and safety inducted.
- He shall be competence to carry his job properly.
- Supervision shall ensure the work start shall be after taking work permit from concern authority.
- He shall motivate his team and ensure the work shall be carry out under his guidance.
- He shall survey the area before start the activity.
- He shall ensure the safety work activity shall be performed during works.
- Ensure all person work in proper PPEs.
- He shall ensure that erection work shall be execute as per drawing and as per the job requirement.
- He shall coordinate with other civil team for day to day activities, if anything required to execute the job safely i.e. ground compaction, proper area handover from client and material is properly Stacking.

Safety In charge:

- Shall facilitate to maintaining a good safe working Condition.
- Regular site safety / monitoring inspection as per regulation and safety rules.
- Conducting all safety induction / periodically and motivation programs.
- Documentation of all equipment's, recording checklist, maintaining site safety documents.
- Arranging safety motivational programs, PEP talk, witnessing and arranging TBT meetings.
- Ensuring workmen having welfare facilities, as per standard and lining with requirements.
- Displaying posters, banners, signage at job site and maintaining them properly.
- Investigating, inspecting job sites and maintaining the site.
- Checking arranging, coordination, maintaining PPEs and recording in registers with help of store in charged.
- Checking and keeping records of TPI reports, color coding, recording the documents.
- Checking and arranging first aid boxes and monitoring stock and inspecting, regularly checking and maintaining.

PREPARATION BEFORE COMMENCE THE WORK:

- Ensure PTW to be followed & taken from concern authority before start of any work activities at site.
- Check all the material as per BOQ and Packing List.
- Physically check the material for any damage, rectify the same in case of damage.
- Bring all the material of particular for assembly at Erection Area.
- Check the anchor bolt conditions, positioning and thread conditions.
- Check the availability of all the tool-tackles, crane, and boom lifts.
- Ensure for Safety Toolbox, work related training and Work permit to be produced.
- Ensure that client and other agencies are informed about the start of the erection.
- Ensure proper housekeeping at site prior to commence the work.
- Erection member must be comprised of steel wire rope of 12 mm dia. with turn buckle.
- Erection member must securely tie up with rigid support like in opposite direction of the load line.
- Before starting the erection activities, handover of site (with checking all dimension as perCivil/Mech. standard) should be done from Civil to mechanical with appropriate Documentation.

Material Unloading from Trailer to Site Yard:

- Purpose: - PEB works material unloading for WOLP site storage yard.
- Scope: - PEB works of WOLP PEB building.
- Manpower: - 4 to 08 persons shall be engaged for unloading at storage yard. Man power involved as riggers, supervisor, and Farana/crane operator.
- Tools & Equipment Machinery: - Farana & trailer.

Job steps:

- Trailer loaded with PEBs material shall be entered from WOLP enter gate.
- Vehicle entry shall be recorded at gate with client Material inward procedure.
- Entry of vehicle shall be entered at designated location.
- Supervisor shall place trailer at unloading Area. And take work permit for unloading of material.
- Placing of F-15/Farana nearby trailer.
- Ensure all tools & tackles shall be checked as per checklist of WOLP & TPI reports available at site.
- Rigger shall issue slings from store and use for material unloading.
- All material shall be unloaded at designated location.
- All material shall be kept on wooden plank.
- Site supervisor shall be checked all material as per packing list.
- Receiving of documents shall be given to trailer operator after unloading and material checking.

Control measures:

- Site supervisor shall ensure material inward at site. Required PPEs shall be given to trailer operator and helper at gate.
- Site supervisor shall ensure vehicle shall reach safely at designated storage yard.
- Trailer operator shall ensure he shall drive safely to designated location.

- Site safety norms shall be followed during unloading of material.
- Riggers shall use WOLP approved Tools and tackles. Supervisor shall ensure the same.

- All PPEs shall be worn by riggers as per job requirement, i.e., hand gloves etc.
- 6-meter tagline shall be fixed and used by rigger on both end of material.
- All material shall be kept on wooden planks below 1.5-meter height.
- Good lighting condition shall be available during job. Over loading of material is strictly prohibited.
- Experienced riggers shall be used for material unloading and shifting works.

Material Shifting from Storage Yard to Erection Grid Area:

- Purpose: - Material shifting for erection works at WOLP Warehouse building from site storage yard to erection Grid line Area.
- Scope: - PEB works of WOLP PEB building.
- Manpower: - 4 to 6 persons shall be engaged for shifting of PEB material from storage yard to erection work Area
- Manpower involved - Riggers, Supervisor, and Farana/crane operator.
- Tools & Equipment Machinery: - F-15.

Job steps:

- Identification of required material by job supervisor and riggers.
- Arrangement of required tools and machinery at storage yard Area.
- Entry of crane/Farana at storage yard at required Area. Supervisor shall ensure proper placing of Farana at material shifting job.
- Take work permit for material shifting from concern client authorities.
- Rigger shall issue slings from store and use for material unloading. Material shall be fixed with webbing slings/slings equally.
- Material shall be kept on wooden plank. And ensure tag line fixed by riggers.
- Site supervisor /foreman shall signal to operator for shifting of material at erection grid.
- Supervisor and rigger shall ensure during shifting vehicle movement shall be slow and as per site safety norms.
- Place material nearby erection grid line Area n wooden plank, barricade the erection, Area.
- Site engineer shall ensure the pathway for shifting of material shall be providing well compacted by client side.

Control measures:

- Site supervisor shall ensure webbing slings shall be fixed properly with packing of tube or some other good packing material.
- Ensure approved JSA to be followed for each activity while working at site.
- Required PPEs shall be given to all riggers and helpers during works.
- Site supervisor shall ensure vehicle shall reach safely at designated erection grid line.
- Pathway shall be check by operator before shifting of material.
- Operator shall ensure he shall drive safely to designated location. Site safety norms shall be followed during shifting of material.

- Riggers shall use WOLP approved Tools and tackles. Supervisor shall ensure the same.
- All PPEs shall be worn by riggers as per job requirement, i.e., hand gloves etc.
- 6-meter tagline shall be fixed and used by rigger on both end of material. All material shall be kept on wooden planks below 1.5-meter height.
- Good lighting condition shall be available during job. Over loading strictly prohibited.

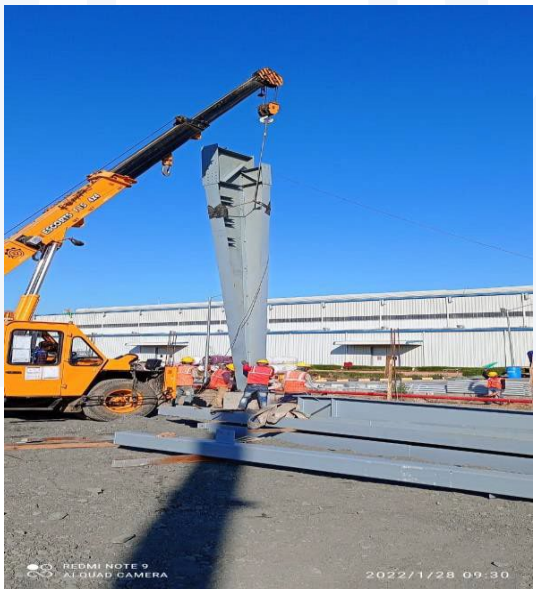
PROCEDURE FOR ERECTION OF COLUMNS:

Sidewall framing Columns assembly works

Purpose: Erection of columns & side wall framing works at WOLP Warehouse building.
Scope: PEB works of WOLP.
Manpower: 4 to 6 persons shall be engaged for erection of column & side wall assembly.
Manpower involved: Riggers, Supervisor, and Farana/crane operator.
Tools & Equipment Machinery: F-15 /Farana. Girts, Pulley, tag line rope, guy ropes, hardware.

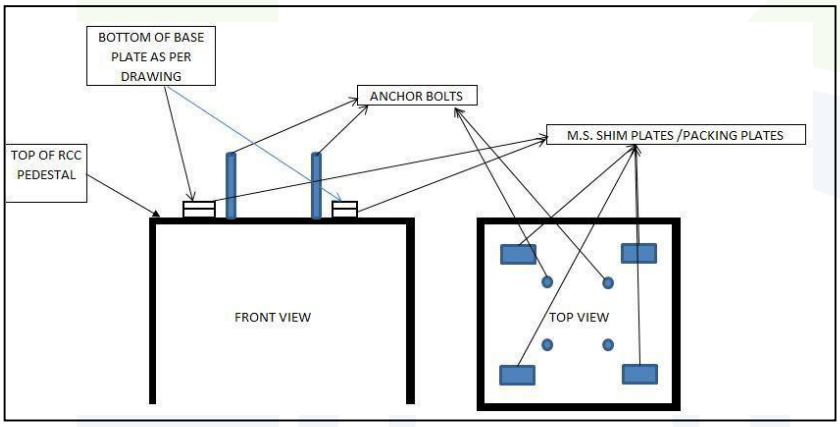
Job steps:

- Identification of required material by job supervisor and riggers and erection grid line Area.
- Shift the side wall frame material at required grid line
- Take erection / height work permit by approving authority.
- Check the ground condition of the before start of erection work. Client has to provide good, compacted ground for erection works and machinery movement.
- Arrangement of required tools and machinery at erection yard Area.
- Riggers shall use WOLP approved slings from store for erection work. Slings shall be fixed with proper packing during column erection work.
- Ensure guide rope shall be tied properly on column head & plumb the column properly, before releasing sling used for erection of column.
- Barricade the work Area and put warning sign of do not enter.



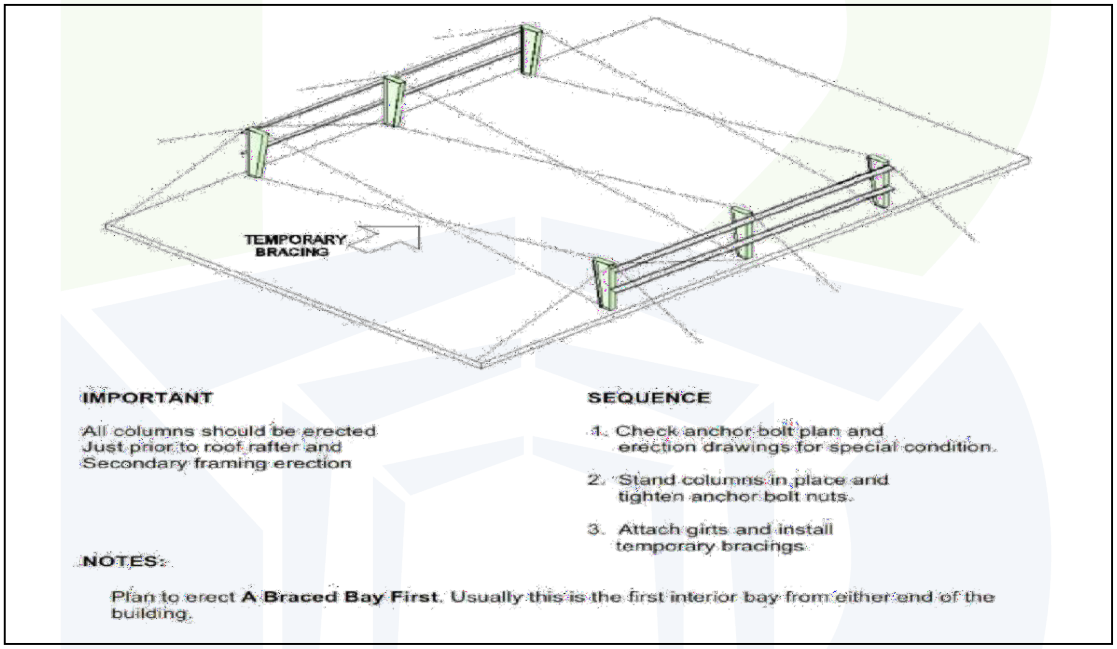
- Column height shall be access with man lift then other column also require to be erected in same method.
- Before releasing the Farana, ensure vertically of column in plumb. Tie guy ropes on both side of columns.
- Then secure the columns via putting diagonal bracings & tube bracing of the column during erection works.
- Foreman / Signal man shall signal to operator for erection of column at erection grid.
- Supervisor shall ensure smooth erection of portal and bracing works, Release the sling from the strut tube and bracing with help of man lift.
- Girts fixing works shall be done with the help of rope; pulley rope shall be fixed on the top of the column with help of rope.
- Team of 2-4 person shall pull girts with the help of rope tied on the both ends .No person shall cross or enter the miscell erection Area during erection works.
- Riggers shall guide the material on clits and do the nut bolting with help of man lift & fixed girts.
- Miscell fixing i.e. clits and girts shall be erect with the help of rope pulley for better stability as per PEB work procedure and method statement.
- Ensure wire guy ropes to be installed while erecting columns & properly highlight guy rope with caution tape.

Control measures:



- Site engineer shall ensure the ground condition and satisfy himself that ground condition of warehouse for side wall frame erection works.
- Check all machinery and tools and tackles issued for erection is WOLP approved.
- Webbing slings shall be fixed properly with packing of rubber tube or some other good packing material in erection activity.
- Job specific PPEs shall be given to all riggers and helpers during works.
- Site supervisor shall ensure vehicle shall reach safely at designated erection grid line.
- Ground shall be check by operator before erection works.
- Signal man shall give proper signal to Farana operator during erection works.
- All PPEs shall be worn by riggers as per job requirement i.e. hand gloves etc.
- 6-meter tagline shall be fixed on the bottom of the column and used by rigger to guide the column on erection grid line Area.
- No person shall come under side wall framing work, ensure Area soft barricading.

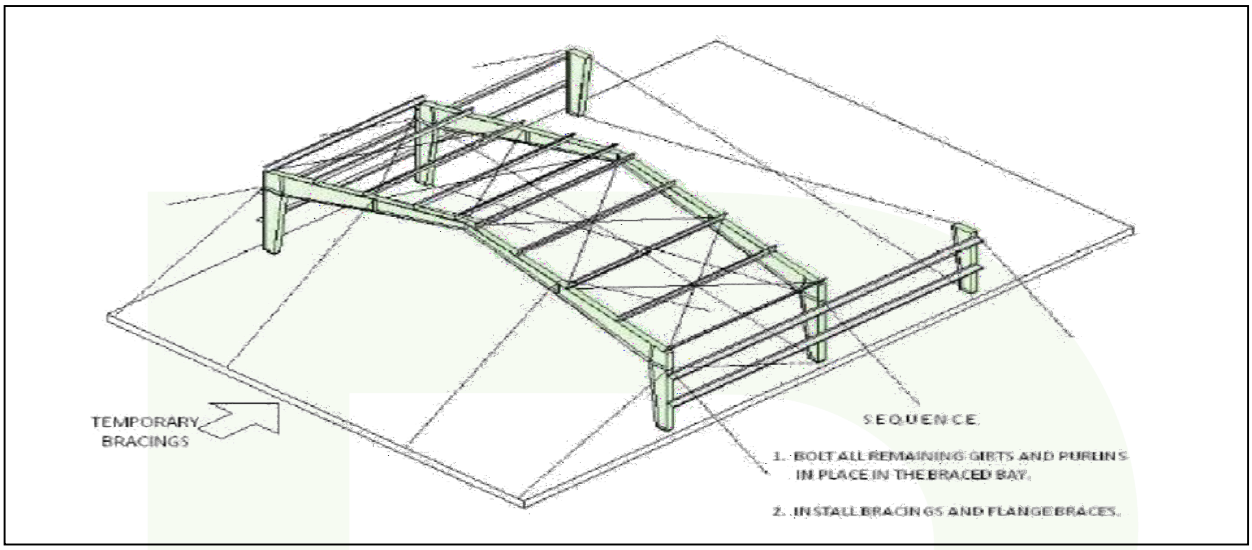
- Good lighting condition shall be available during job.
- Erection shall start from side wall column of designated Grid AREA of brace bay only.
- Bring the column designated AREA as per drawing and part mark to the GRID.
- Attach connection clips for eaves strut and girt with the main columns at ground only.
- Tie one end of column top with wire sling by providing packing underneath.
- Lift the column designated AREA with the help of Farana / crane gradually.
- Erect the column on pedestal. Take care about threads of anchor bolts while inserting base plate into this. There should not be damage to threads.
- Immediately tighten the nuts of anchor bolts using proper washers.
- Align and level the column, if there is any gap between the bottom of the base plate and top of R.C.C Column place the M.S. shim plates.
- After checking the verticality, Retightens the nut and place the erection member in positioned by providing wire rope on both side along the anchor bolt direction with Peg Angles.



- Verticality & tightening of anchor bolt shall be checked by Execution Engineer & QC Engineer of WOLP as per Quantum of Check mentioned in ITP.
- Calibration certificate of all Tightening and Alignment instruments used to check, shall be submitted to the client.
- Note: The Farana/crane should be released slowly only after placing the Guy Ropes and full tightening of bolts.
- Same procedure has to be followed for erecting other columns from applicable grid line.
- Install the connection member between the two columns.
- Install the girt and flange braces in same manner.
- Connect both the temporary Bracings as per Figure no. 1.

Note: Same procedure has to be followed in other side of designated start of erection Area, side wall for erection of columns and temporary bracing.

PROCEDURE FOR ERECTION OF RAFTERS:



- Connect all the rafter segments at Grid line of one frame shall be erected with proper resources arrangement as per drawing & material shall be assemble at the ground itself.
- All connections are field bolted, all bolts are high tensile.
- All bolts to be installed using turn of nut method and shall be tightened and checked using appropriate Torque wrench after alignment of with brace bay to brace bay.
- After completion of rafter section fix the flange brace to rafter section. Attach the one end of flange braces with the rafter at ground itself.
- Fixed all connection clips of purlin and one end of all flange braces before lifting the rafter. It is easier to assemble these pieces on ground than at height.
- Install and tighten entire AREA-erected frame connections bolts, as each grid from designated Area where frame is assembled.
- Torque tightening (as per approved standard) shall be checked for each & every bolt at ground itself.
- Tie the one end of wire sling with the rafter. Tie Sling should be of 20 meter in length used for erecting Rafter.
- Lift the rafter gradually and place it with the help of Farana / cranes with proper Guy ropes. End of the rafter should be hold with temporary bracing from ground.

- shall help to connect the rafter with column connection at both ends. Refer Figure no. 2 for details.
- Hold rafter of designated Area in place until it is securely bolted to the column of other grid line, temporary bracing is installed to hold assembled frame in place.
- The temporary bracing should be tightened with same tension on opposite sides.
- After completion of
  - 1st sequential erection (Rafter with column), alignment (straightness/verticality) & leveling shall be checked.

Note: At all the haunches (connecting plates of rafter) temporary bracing must be installed.

- As per above procedure, lift the Second Rafter between (designated) GRID and hold with crane in place until the section is bolted to columns.
- All purlins, flange braces and sag rod should be bolted in place.
- Install all roof bracings (designated) and tightened fully along with alignment of braced bay by placing the temporary bracing at position.
- Ensure brace bay complete with all required member & alignment till side wall to ridge area, No further erection is to proceed until the above mentioned steps are complete.
- Farana/ Crane have to be released only after the completion of above steps.
- Proceed with the erection of next frames in same manner as explained above as per drawing.
- Soon after erection of third frame, complete the overlapping of purlins at middle rafter.

Note: Please note that flange braces are very important members. We should not proceed for further erection without erecting all flange braces of the erected frames.

- Complete the erection up to GRID designated braced bay in same manner.
- Align the complete building up to designated braced bay in totality, before proceeding further.
- Temporary bracing can be removed only after completion of Sheet Installation.

Note: As per above procedure of AREA ready for erection shall be complete with all member aligned and torquing as per job requirement.

Work Method for rafter Erection:

- Purpose: -Rafter erection works at WOLP Warehouse building at required erection Grid line Area.
- Scope: - PEB works of WOLP PEB building.
- Manpower: - 10-20 persons shall be engaged for erection of PEB rafter erection work at required grid line as per drawing.
- Manpower involved - Riggers, Supervisor, and Farana/crane operator, boom lift.
- Tools & Equipment Machinery: - F-15 /Farana & Boom Lift, wire rope lifeline, hole Bari.

Job steps:

- Identification of required material by job supervisor and riggers and erection grid line Area.
- Check the capacity of crane/Farana before erection of the rafter.
- Check the ground condition of the before start of erection work. Client has to provide good, compacted ground for erection works and machinery movement.
- arrangement of required tools and machinery at erection yard Area.
- Riggers shall use WOLP approved slings from store for erection work. Slings shall be fixed with proper packing on the rafter.
- Barricade the work Area and put warning
- sign of do not enter.
- There may be single rafter or rafter in joints, if any joints all possible joints shall be done on the ground level as per drawing.
- Tightening of rafter shall be done as per PEB method statement.
- Ensure fixing on lifeline post with 8mm wire rope as per length of the rafters, life line should be tight properly.
- Fixing miscall member on the ground if any as per drawing clits f purlin and bracing etc. as per structure design.
- Ensure the tag line at both side of rafters, to guide the material at column level.
- Foreman / Signal man shall signal to operator for erection of rafter at erection grid.
- Rafter shall be placed at column holes/besides as per drawing and fixing with nut –bolts. Nut –bolts shall be of different sizes as per drawing and shipper.
- Riggers shall guide the material with help of tag line and workman shall fix it with access of boom lift.
- All nuts shall be tightening as per procedure and QAP and boom lift shall be used to keep require nuts bolts and other erection accessories. Same shall be below of swell of boom lift.
- Workman shall tie require tools via rope while working at height work.
- Release the sling from the rafter with help of boom lift.
- Same activity shall be carried out for other grid line for rafters' erection work.
- Miscall fixing i.e. clits and purlin shall be fixed by sitting on the top of the rafter and workman shall anchor there safety harness on life lines.
- Purlin fixing shall be done after rafter erection works.

Representative pic:

Control measures:

- Site engineer shall ensure the ground condition and satisfy himself that ground condition is ok for erection works.
- Webbing slings shall be fixed properly with packing of tube or some other good packing material during erection of rafter.
- Required PPEs shall be given to all riggers and helpers during works.
- Site supervisor shall ensure machinery; boom lift and Farana shall reach safely at designated erection grid line.
- Ground shall be check by operator before start of work.
- Ensure all life line arrangement and life line post shall be fixed at ground level. And life line shall be tied properly.
- Ensure height work permit taken from authorized person and copy of permit shall be available at site.
- Signal man shall give proper signal to Farana operator during erection works.no other person shall give signal to operator.
- Check load chart of the machinery, and do not over load the machine.
- All PPEs shall be worn by riggers as per job requirement, i.e. hand gloves etc.
- A tagline shall be fixed on the both end of the rafters and rigger shall guide the material to column level.
- No person shall come under erected of rafter works, ensure Area soft barricading.
- No person shall throw material from the height and unauthorized entry restricted.
- Good visual lighting condition shall be available during job.
- Approved HIRA to be followed at site & ensure erection crew working at height shall have height pass.

Work Method for purlin & sag rod works.

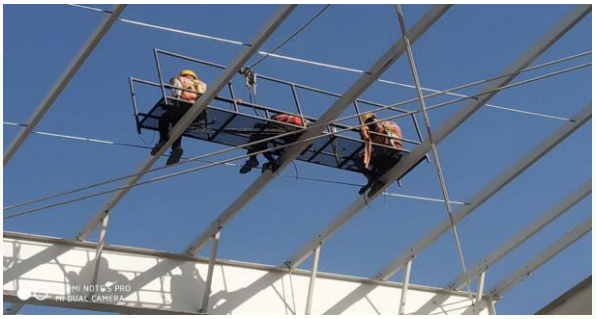
- Purpose: -purlin erection works at WOLP Ware House building at required erection Grid line Area.
- Scope: - PEB works of WOLP PEB building.
- Manpower: - 06-10 persons shall be engaged for fixing of purlin erection works & 4-5 person for sad rod fixing works at required grid line as per drawing.
- Man power involved - Riggers, Supervisor, and Farana/crane operator, boom lift.
- Tools & Equipment Machinery: - F-15 & Boom Lift, pp rope, hole Bari.

Job steps:

- Identification of required material by job supervisor and riggers and erection grid line Area.
- Place the material nearby grid line Area
- Take erection / height work permit by approving authority.
- Check the ground condition of the before start of erection work. Client has to provide good compacted ground for erection works and machinery movement.
- Arrangement of required tools and machinery at erection yard Area.
- Riggers shall use good quality of rope for pulling of purlin from ground level to rafter level
- Barricade the work Area and put warning sign of do not enter.
- Experienced riggers shall sit on the rafters anchoring there safety harness on the life line arrangements
- Rigger shall fix pulley rope /or can pull purlin manually from the ground level.
- Ensure 2-4 person shall be on the ground and at least 2 people at either side of rafters for purlin erection works.

- Access shall be provided by boom lift at the top of the rafter, and workman shall fix there harness on the life line arrangement.
- Workman shall use carry bag tie properly for nut bolting of purlin at top of rafter level.
- Ensure the tag line at both side of purlin, during erection work and shall be easy to guide the material at rafter level.
- Bracing and strut tube fixing work shall be done with Farana and both side tag lines shall be used to guide the material at rafter and column level.

- The sag rod fixing work shall proceed after providing sag rod platform shall be placed above the purlin, 3-4 person shall anchor safety harness & fix sag rods.
- Work Area shall be restricted for other movement. Sag rod fixing gang shall have rope for pulling sag rod from ground level to purlin level.



- Do not throw any material from height.

Control measures:

- Site engineer shall ensure the ground condition and satisfy himself that ground condition of Ware House for erection works.
- Check all machinery and tools and tackles issued for erection is TPI certified & have Valid Tag on machinery.
- Webbing slings shall be fixed properly during erection of bracing and strut tube works. Both side tag line shall be use.
- Required PPEs shall be given to all riggers and helpers during works.
- Site supervisor shall ensure machinery; boom lift and Farana shall reach safely at designated erection grid line.
- Ground shall be check by operator before start of work.
- Ensure all lifeline arrangement and lifeline post shall be fixed at ground level. And lifeline shall be tied properly. Boom lift shall be used for access and regress.
- Ensure height work permit taken from authorized person and copy of permit shall be available at site.
- Signal man shall give proper signal to Farana operator during erection works.no another person shall give signal to operator.
- Check load chart of the machinery, and do not overload the machine.
- All PPEs shall be worn by riggers as per job requirement, i.e., hand gloves etc.
- A tagline shall be fixed on both end of the purlin and rigger shall guide the material to rafter/column level.
- No person shall come under erected of rafter works, ensure Area soft barricading.
- No person shall throw material from the height and unauthorized entry restricted.
- Good visual lighting condition shall be available for ground assembly work in extended hours.

Points to be noted:

- After completion of primary and secondary erection [completion of structure], installation of Sheets should start. Structure without sheeting should not be left standing for prolong times.
- Ensure all bolts tightening, alignment reports to be prepared, check, approved & signed off from WOLP before start of sheeting works.

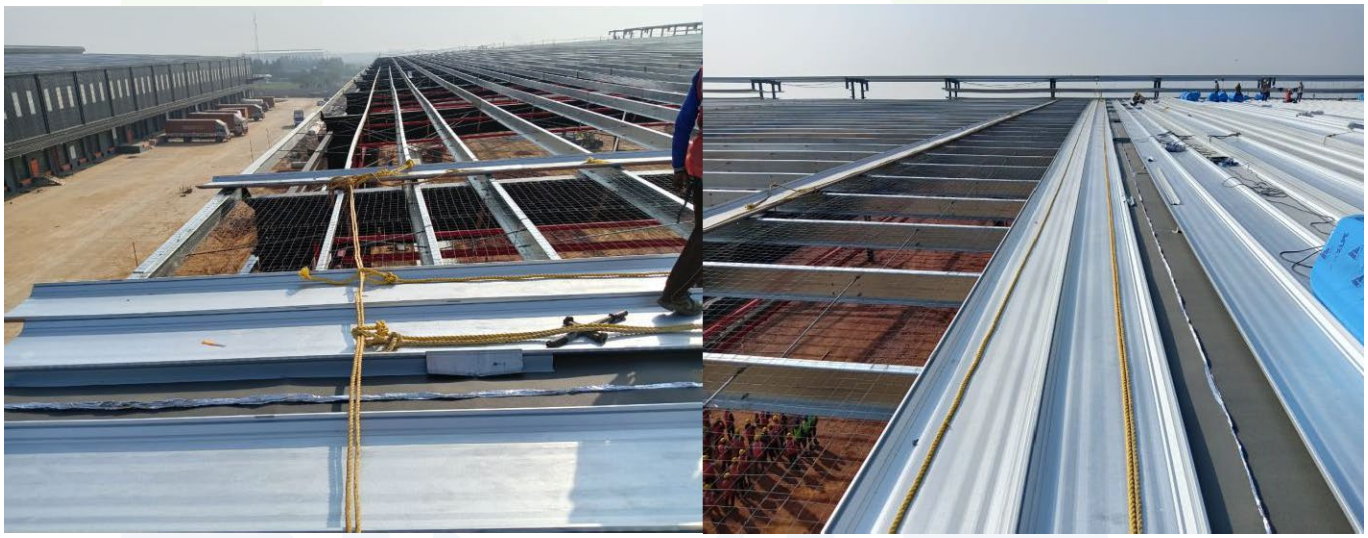
- Ensure paint touch of the structure shall also be completed before proceeding sheeting works.
- Take approval of Phenix QC before proceeding of sheeting works.
- After completion of alignment, the gap between top of RCC pedestal and bottom of base plate (if any) should be grouted by others using (High strength, Non shrinkage grouting material).

Roof Sheeting & Cladding Works

- Metal sheets coil shall be transported from yard to required grid with the help of Farana or May be unloaded near required Grid.
- SSR sheet shall be roll formed at site at roof level with help of scaffolding arrangement.
- Team of 10-15 skills Manpower shall use for sheeting & cladding works.
- Site engineer shall instruct sheeting team and experienced foreman shall be responsible
- Personal to carry out work safely.

- For access on roof scaffolding arrangement shall be used as per the site condition. scaffolding arrangement Details shall be shared prior to start of sheeting work
- Supervisor has to ensure sheeting crew have life lines tied on roof Area so that sheeting workers can Work safely.
- Roof sheets shall be start by as per instruction of site in charge, and approval of Project In charge & QC of Phenix.
- First bay of ready to sheet area shall have safety net arrangement thereafter life lines arrangement shall be perused for work.
- Sheeting work shall start from either side of erected gable end.
- Sheeting team leader shall ensure life line arrangement shall be available to sheeting gang.
- He has to fix line dori on side wall to ensure right line shall be match during works.
- Shifting of sheet at roof level can be done by fixing of ropes from ground level to PEB roof level.
- Sheet shall be profiled at site level, PCC of size 9 by 4 sqm shall be given by client for SSR machine platform at side wall area, can be referred from above pic.

- Platform shall be erected at site then place machine on the platform & sheet rolled formed at building height.
- All people working on the roof shall tie their harness on the lifeline fix from ridge to sidewall PEB structure.
- Leader should match and align the sheet as per drawing and requirement and screw the same.
- This ongoing process shall cover the roof with sheets; life line shall be shifted as per requirement.
- Full time roof work supervision to be done & one engineer shall check the sheeting work frequently.
- All check list and required doc shall be maintained throughout the project.
- Daily housekeeping shall be maintained on the roof by sheeting gang.
- The 50 mm glass wool insulation roll shall be placed on purlin top & thereafter sheets, ensure layer of insulation shall be properly lapped at end & side area as per drawing.
- Ensure no person step on insulation directly, use temporary sheet wherever required.



Safety precaution:

- This activity shall be carry when a particular bay of sheeting done.
- It's a continues ongoing process till sheets match on the other side of gable end.
- 2 meter away Area from the edge on the roof shall be considering green zone after completion of sheeting work.
- Side wall and end wall roof Area shall have 18 mm pp rope as life lines protection for edge work on roof.
- Life lines shall be fixed on sheet fixing Area covering bay as per requirement.
- Daily tbt shall be conducted and proper training shall be given to sheeting gang regarding safety precaution during roof sheeting works.
- Ensure persons shifting sheet shall be 2 meter away from the edge Area of side wall.
- Ensure screw shall be kept properly in bucket & maintain proper housekeeping at roof level.
- Industrial male female sockets to be used for screw machine. Screws shall be fixed properly as per drawing & in line.
- Do not shift the roof in heavy wind pressure, use anemometer to check the wind pressure.
- All persons shall pick the roof sheet and lower the roof sheets with proper rhythm.

- All shifted sheets until unless fixed shall be tie with rope to avoid flew of sheets.
- Never keep huge bundle of sheets at one place, shall be uniformly distributed over a large area in such a manner to avoid deflection in structure.
- Never walk or kept foot on high rib of roof sheet, foot shall be kept where valley is available to avoid damages in rib of sheets.

Side wall sheeting works:

- All side walls sheeting works shall be carried out after grouting of PEB columns.
- Structure shall be proper aligned, and all necessary report shall be filled and approved by client to start the work.
- Riggers shall shift the material nearby grid Area as per requirement of sheeting material.
- All riggers and operator shall be properly trained for shifting works and take necessary permit to start the works.
- Fitter & engineer shall measure the required sheeting length as per drawing and arrange the required tools for the work.

- Fitter shall arrange hook system to lift the sheet with help of rope at designated place.
- Rigger and fitter shall hold the sheets and other person shall screw the sheet with girts and the side wall cladding process shall continue as per drawing.
- For cladding works MEWP shall be use during works and workmen shall always tie safety harness on anchor points.
- 6 meter Levelled and compaction Area shall be given by client for easy movement of man lift.

Torque values for applicable bolts shall be as followed:

Torque Values for High Strength Bolts

Torque Chart			
HSB - Property class 8.8 (ASTM A325 / IS 1367)			
		Electro Galvanized / YZP / Electro Plated	**Hot Dip Galvanized**
Sr. no	Diameter	Tightening Torque (Nm)	Tightening Torque (Nm)
1	M12	75	65
2	M16	185	165
3	M20	375	330
4	M24	650	575
5	M27	950	835
6	M30	1290	1135
7	M33	1750	1545
8	M36	2200	1985
9	M39	2900	2570

Notes:

- Torque selection shall be done precisely based on type of coating
- Above values are for HSB. Shall not apply to Anchor Bolts
- Above M12 value is for HSB. Shall not apply to MS bolts (Purlin Fasteners)
- Where accessibility is difficult for torqueing, snug tightening shall be done with approval of client.

The Alignment & Tolerance Format:

M/S . Bheemaa Infra Solutions Pvt.Ltd

INSPECTION REPORT OF COLUMN PLUMBNESS & STRAIGHTNESS

Job Number :	Building No:	Inspected By:
Customer :	Site Location:	Inspection Date:
Site Engr :	Project Manager:	Format No: PI/TL/WU/PLUMB/04, R-0
Consultant:-	Contractor:- Bheemaa Infra Solutions Pvt.Ltd	Report No. :-

Inspection Stage:

S.NO.	LOCATION	ALONG AXIS -		ALONG AXIS -		ALONG END WALLS		REMARKS
		NORTH	EAST	NORTH	EAST	NORTH	EAST	

NOTE:-
As per IS 12843:1989 Out of Plumbness of column axis from true vertical axis , As measured at column top ;
1) Up to and including 30M height = ± H/1000 or ± 25MM , Whichever is less.
2) Over 30M height = ± H/1200 OR ± 35MM , Whichever is less.
3) Deviation in longitudinal & transverse plans of columns at any point = ± H/1500 or ± 10MM whichever is less.
4) Difference in erected position of adjacent pair of columns along length /width of building prior to truss connection beam with respect to true distance ±5MM.
3) All dimension in MM

CHECKED BY
ENGINEER IN-CHARGE
Bheemaa

VERIFIED BY
CLIENT/PMC

- PCT shall work under the tolerance referred with steel Erection tolerance shall be applicable at site.

Table 1 Maximum Permissible Tolerances in Erected Steel Columns

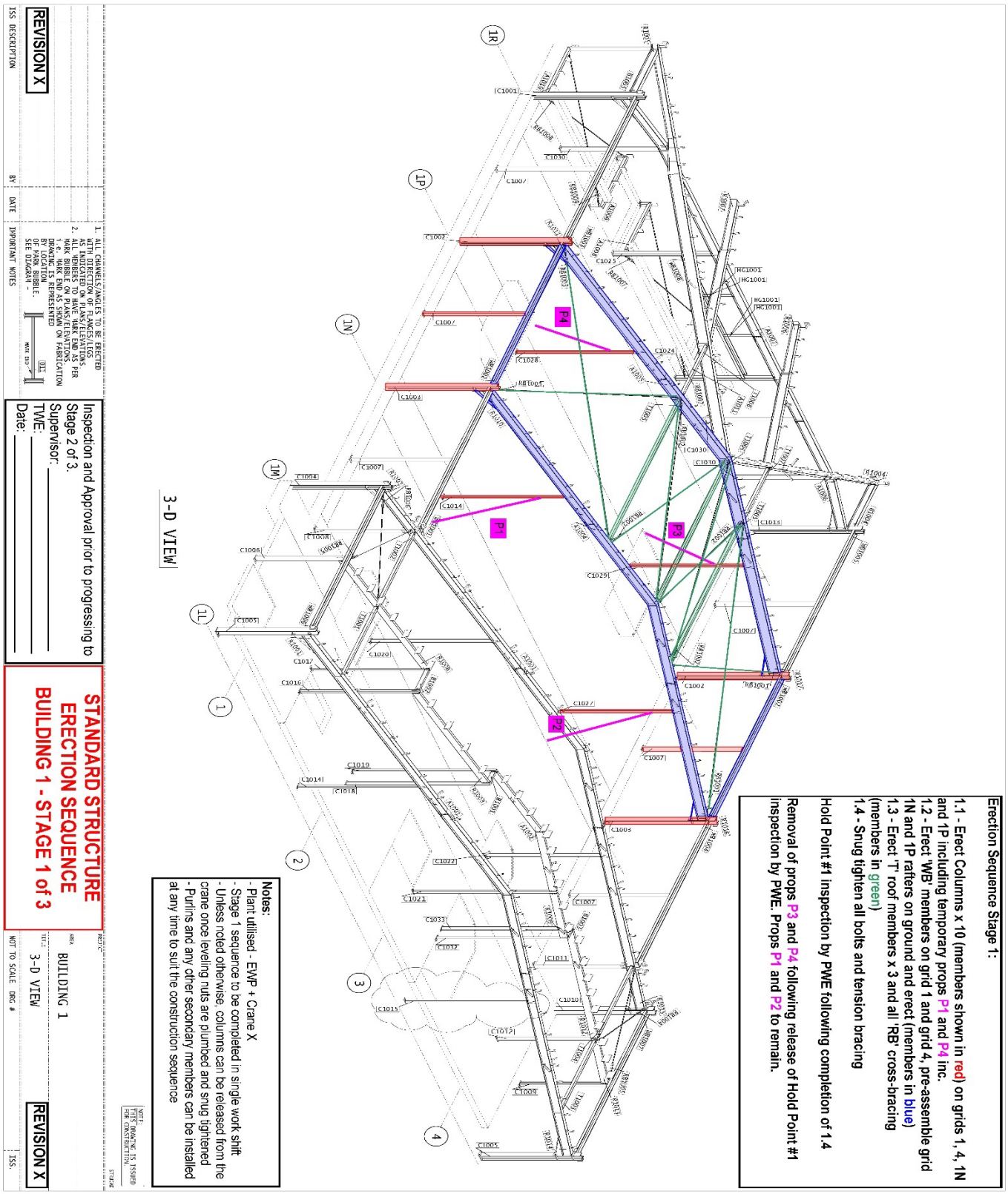
Sl. No.	Description	Tolerance
(1)	(2)	(3)
i)	Deviation of column axis at foundation top level with respect to true axis:	
	a) in longitudinal direction	±5 mm
	b) in lateral direction	±5 mm
ii)	Deviation in the level of bearing surface of columns at foundation top with respect to true level	±5 mm
iii)	Out of plumbness (verticality) of column axis from true vertical axis, as measured at column top:	
	a) For columns without any special requirements:	
	1) up to and including 30 m height	$\pm \frac{H}{1\,000}$ or ±25 mm whichever is less
	2) over 30 m height	$\pm \frac{H}{1\,200}$ or ±35 mm whichever is less
	b) For column with special requirements like cranes or such similar requirements:	
	1) up to and including 30 m height	$\pm \frac{H}{1\,000}$ or ±20 mm whichever is less
	2) over 30 m height	$\pm \frac{H}{1\,500}$ or ±25 mm whichever is less
iv)	Deviation in straightness in longitudinal and transverse planes of column at any point along the height	$\pm \frac{H}{1\,500}$ or ±10 mm whichever is less
v)	Difference in the erected positions of adjacent pairs of columns along length or across width of building prior to connecting trusses, beams with respect to true distance	±5 mm
vi)	Deviation in any bearing or seating level with respect to true level	±5 mm
vii)	Deviation in difference in bearing levels of a member on adjacent pair of columns both across and along the building	±5 mm

NOTES

1 Tolerance specified under iii(a) and iii(b) should be read in conjunction with iv and v.

2 'H' is the column height in mm.

APPENDIX – I: ERECTION SEQUNCE – STANDERED STRUCTURES

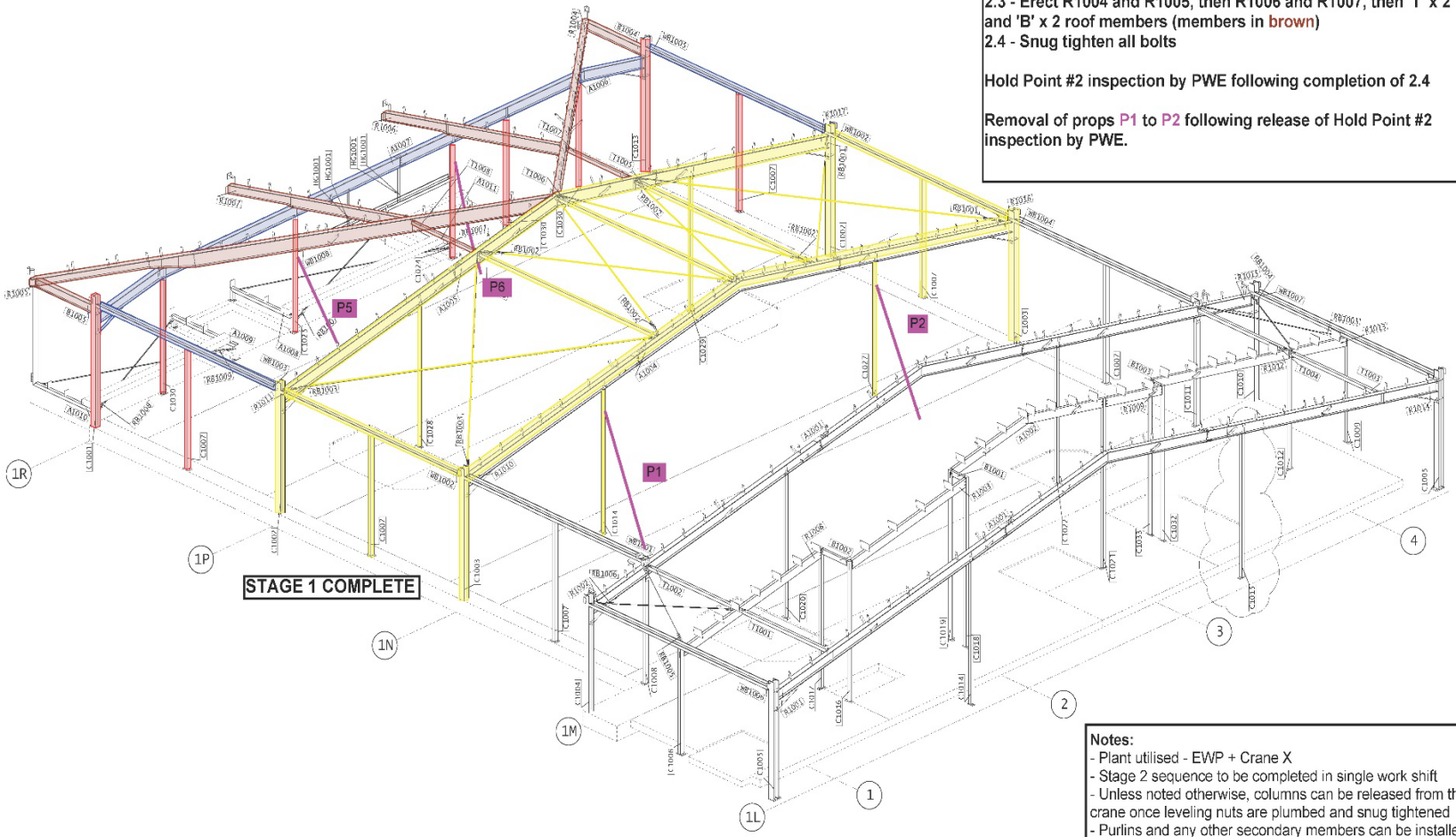


Erection Sequence Stage 2:

2.1 - Erect Columns x 9 (members shown in red) on grids 1, 4 and 1R including temporary props P5 to P6
2.2 - Erect 'WB' members on grid 1 and grid 4, pre-assemble grid 1R rafter A1006+A1007 on ground and erect (members in blue)
2.3 - Erect R1004 and R1005, then R1006 and R1007, then 'T' x 2 and 'B' x 2 roof members (members in brown)
2.4 - Snug tighten all bolts

Hold Point #2 inspection by PWE following completion of 2.4

Removal of props P1 to P2 following release of Hold Point #2 inspection by PWE.



3-D VIEW

Notes:
- Plant utilised - EWP + Crane X
- Stage 2 sequence to be completed in single work shift
- Unless noted otherwise, columns can be released from the crane once leveling nuts are plumbed and snug tightened
- Purlins and any other secondary members can be installed at any time to suit the construction sequence

NOTE: THIS DRAWING IS ISSUED FOR CONSTRUCTION.

STRUCAD

REVISION X

ISS | DESCRIPTION | BY | DATE

1. ALL CHANNELS/ANGLES TO BE ERECTED WITH DIRECTION OF FLANGES/LEGS AS INDICATED ON PLANS/ELEVATIONS.
2. ALL MEMBERS TO HAVE MARK END AS PER MARK BUBBLE ON PLANS/ELEVATIONS. i.e. MARK END AS SHOWN ON FABRICATION DRAWING IS REPRESENTED BY LOCATION OF MARK BUBBLE. SEE DIAGRAM -

IMPORTANT NOTES

Inspection and Approval prior to progressing to Stage 3 of 3.
Supervisor: _____
TWE: _____
Date: _____

STANDARD STRUCTURE ERECTION SEQUENCE BUILDING 1 - STAGE 2 of 3

PROJECT
AREA BUILDING 1
TITLE 3-D VIEW

REVISION X

NOT TO SCALE | DRG # | ISS.

Admin Office :
Flat : 304, SriNilayam, Mathrusri Nagar, Calvary Temple Road, Miyapur, Hyderabad, Telangana - 500049

Plant Address :
Survey#323, Konapur Village, Sadasivpet(M), Sangareddy (D), Telangana - 502291

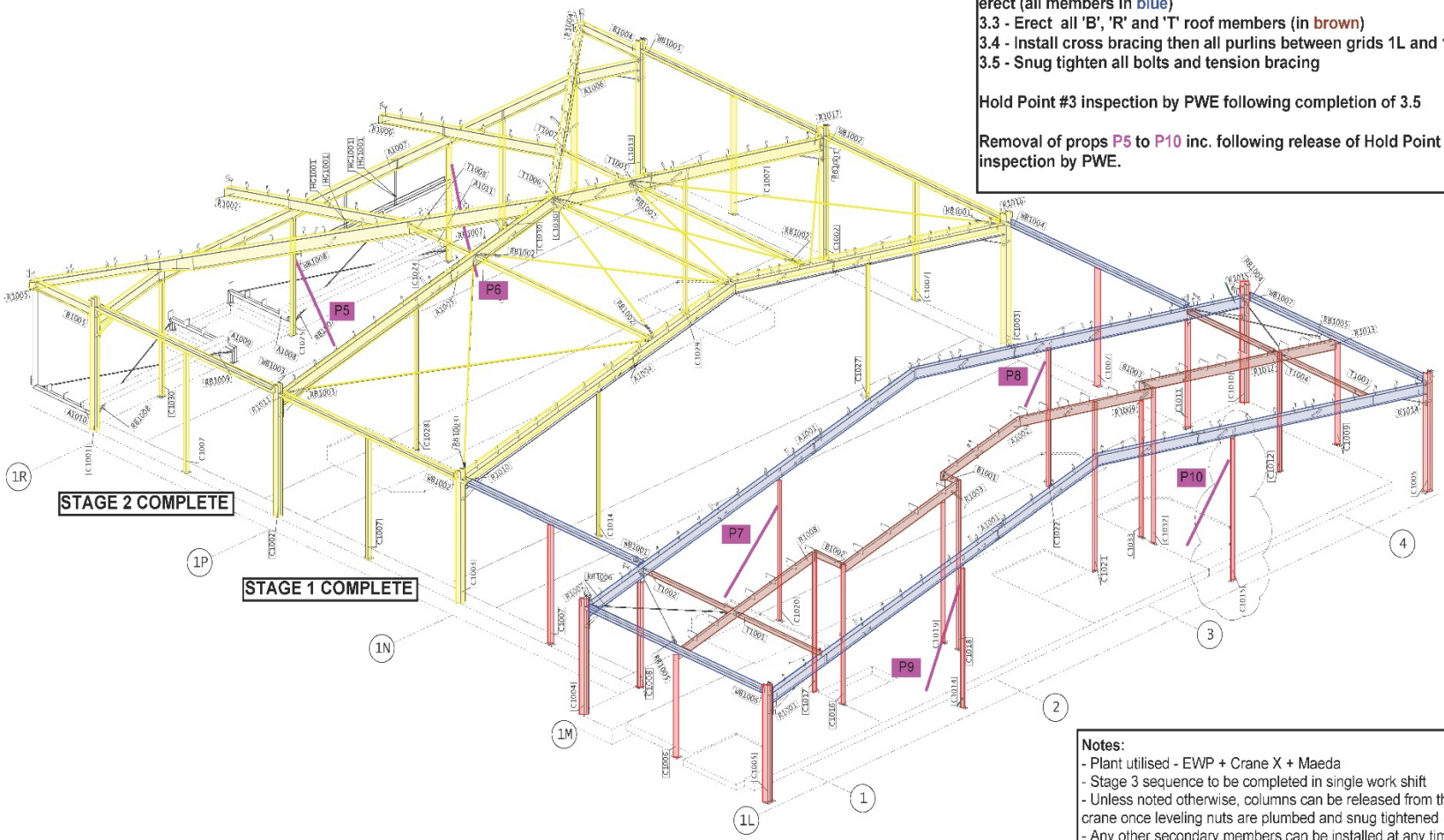
Ph No : 040 40178889 | **Email :** info@bheemaa.com

Erection Sequence Stage 3:

3.1 - Erect all columns x 22 (members shown in red) including temporary props P7 to P10 inc
3.2 - Erect 'WB' members x 4 on grid 1 plus adjacent and grid 4 plus adjacent , pre-assemble grid 1M and 1L rafters on ground and erect (all members in blue)
3.3 - Erect all 'B', 'R' and 'T' roof members (in brown)
3.4 - Install cross bracing then all purlins between grids 1L and 1N
3.5 - Snug tighten all bolts and tension bracing

Hold Point #3 inspection by PWE following completion of 3.5

Removal of props P5 to P10 inc. following release of Hold Point #3 inspection by PWE.



3-D VIEW

Notes:
- Plant utilised - EWP + Crane X + Maeda
- Stage 3 sequence to be completed in single work shift
- Unless noted otherwise, columns can be released from the crane once leveling nuts are plumbed and snug tightened
- Any other secondary members can be installed at any time to suit the construction sequence

NOTE: THIS DRAWING IS ISSUED FOR CONSTRUCTION.

1. ALL CHANNELS/ANGLES TO BE ERECTED WITH DIRECTION OF FLANGES/LEGS AS INDICATED ON PLANS/ELEVATIONS.
2. ALL MEMBERS TO HAVE MARK END AS PER MARK BUBBLE ON PLANS/ELEVATIONS. i.e. MARK END AS SHOWN ON FABRICATION DRAWING IS REPRESENTED BY LOCATION OF MARK BUBBLE. SEE DIAGRAM –

REVISION X

ISS	DESCRIPTION	BY	DATE	IMPORTANT NOTES

Inspection and Approval of completed structure.
Supervisor: _____
TWE: _____
Date: _____

STANDARD STRUCTURE ERECTION SEQUENCE BUILDING 1 - STAGE 3 of 3

PROJECT
AREA BUILDING 1
TITLE 3-D VIEW
REVISION X
NOT TO SCALE DRG # ISS.

Admin Office :
Flat : 304, SriNilayam, Mathrusri Nagar, Calvary Temple Road, Miyapur, Hyderabad, Telangana - 500049

Plant Address :
Survey#323, Konapur Village, Sadasivpet(M), Sangareddy (D), Telangana - 502291

Ph No : 040 40178889 | **Email :** info@bheemaa.com

APPENDIX – II: ERECTION SEQUNCE – NON STANDRED STRUCTURES

NON-STANDARD STRUCTURE - ERECTION SEQUENCE METHODOLOGY

Contract: Example
Site: Building 1
Stage: 1 to 3

Date: XX/XX/XXXX
Revision: XX
Originator: X

Stage	Member Erection Sequence	Member Mark	Member Size	Length (mm)	Mass (t)	Comment	TWE Witness / Hold Point	TWE Sign Off
1	1	C1003	200UC60	5966	0.256	Snug tighten all base plate anchor bolts.		
1	2	C1014	89X6 SHS	6325	0.146	Snug tighten all base plate anchor bolts. Install temporary prop P1, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
1	3	C1027	89X6 SHS	6325	0.073	Snug tighten all base plate anchor bolts. Install temporary prop P2, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
1	4	C1003	200UC60	5966	0.256	Snug tighten all base plate anchor bolts.		
1	5	C1007	150x100x5RHS	5598	0.076	Snug tighten all base plate anchor bolts.		
1	6	C1002	200UC60	5966	0.256	Snug tighten all base plate anchor bolts.		
1	7	C1029	89X6 SHS	6270	0.072	Snug tighten all base plate anchor bolts. Install temporary prop P3, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
1	8	C1028	89X6 SHS	6270	0.072	Snug tighten all base plate anchor bolts. Install temporary prop P4, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
1	9	C1002	200UC60	5966	0.256	Snug tighten all base plate anchor bolts.		
1	10	C1007	150x100x5RHS	5598	0.076	Snug tighten all base plate anchor bolts.		
1	11	WB1002	250X90PFC	7741	0.27			
1	12	WB1002	250X90PFC	7741	0.27			
1	13	R1010 + A1004 + R1016	310UB40	23100	1.56T	Rafter preassembled, includes member 2 x 50x50EA at end columns		
1	14	R1011 + A1005 + R1017	360UB57	23100	1.56T	Rafter preassembled, includes member 2 x 50x50EA at end columns		
1	15, 16, 17	T1005, T1005, T1006	100X4SHS	7758	0.096	Any order		
1	18 to 25 inclusive	RB1001, RB1002, RB1003	20DIA	11059, 8119, 11084	0.029, 0.022, 0.0.29	Any order, tension once all installed		
1	N/A	Purlins	Z200	various	various	Any order	HOLD POINT #1	
1						Temporary props P3 and P4 able to be removed ONCE HOLD POINT #1 released by TWE	PROP REMOVAL ACCEPTANCE	

NON-STANDARD STRUCTURE - ERECTION SEQUENCE METHODOLOGY

Contract: Example
Site: Building 1
Stage: 1 to 3

Date: XX/XX/XXXX
Revision: XX
Originator: X

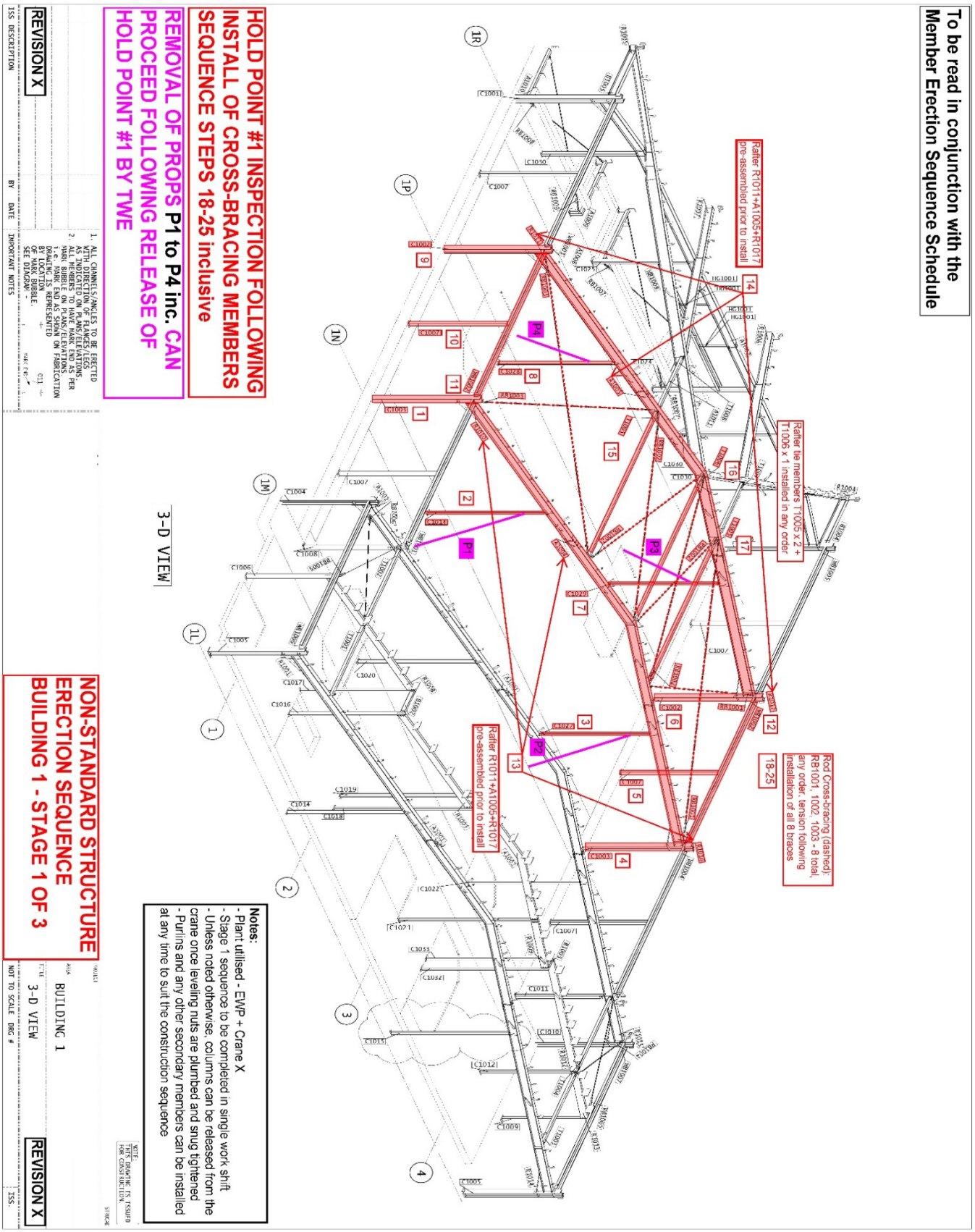
Stage	Member Erection Sequence	Member Mark	Member Size	Length (mm)	Mass (t)	Comment	TWE Witness / Hold Point	TWE Sign Off
2	26	C1001	200UC60	5699	0.259	Snug tighten all base plate anchor bolts.		
2	27	C1007	150x100x5RHS	5598	0.076	Snug tighten all base plate anchor bolts.		
2	28	WB1003	250X90PFC	7790	0.272			
2	29	C1030	150x100x5RHS	5484	0.075	Snug tighten all base plate anchor bolts.		
2	30	C1025	150x100x5RHS	5484	0.078	Snug tighten all base plate anchor bolts. Install temporary prop P5, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
2	31	C1024	150x100x5RHS	5484	0.078	Snug tighten all base plate anchor bolts. Install temporary prop P6, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
2	32	C1030	150x100x5RHS	5484	0.078	Snug tighten all base plate anchor bolts.		
2	33	C1030	150x100x5RHS	5484	0.078	Snug tighten all base plate anchor bolts.		
2	34	C1013	150x100x5RHS	5484	0.078	Snug tighten all base plate anchor bolts.		
2	35	C1007	150x100x5RHS	5598	0.076	Snug tighten all base plate anchor bolts.		
2	36	WB1005	250X90PFC	7790	0.232			
2	37	WB1008	250X90PFC	6547	0.272			
2	38	A1006 + A1007	310UB40	23562	1.08	Rafter preassembled, includes member 2 x 50x50EA at end columns		
2	39	R1005	410UB60	15927	1.07			
2	40	R1004	410UB60	15926	1.07			
2	41	R1006	310UB40	10105	0.325			
2	42	R1007	310UB40	10100	0.325			
2	43	B1004	250UB34	2491	0.075			
2	44	T1007	100X4SHS	2829	0.037			
2	45	T1008	100X4SHS	2811	0.037			
2	46	B1005	250UB31	2486	0.075			
2	47	HG1001 x 4	20DIA	1255	0.008	Hanger connections WB1008 to A1006/1007	HOLD POINT #2	
2						Temporary props P1 and P2 able to be removed ONCE HOLD POINT #2 released by TWE	PROP REMOVAL ACCEPTANCE	

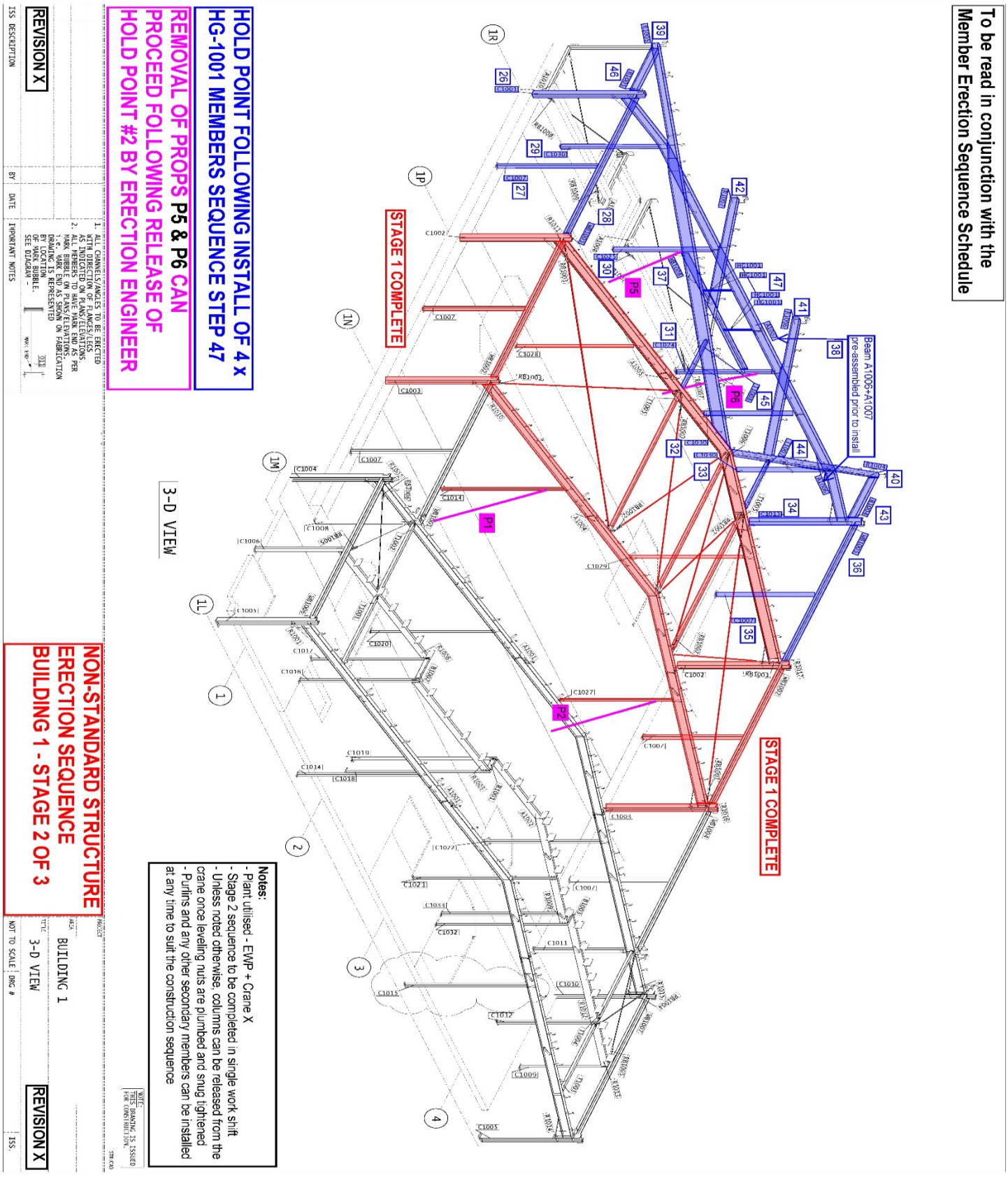
NON-STANDARD STRUCTURE - ERECTION SEQUENCE METHODOLOGY

Contract: Example
Site: Building 1
Stage: 1 to 3

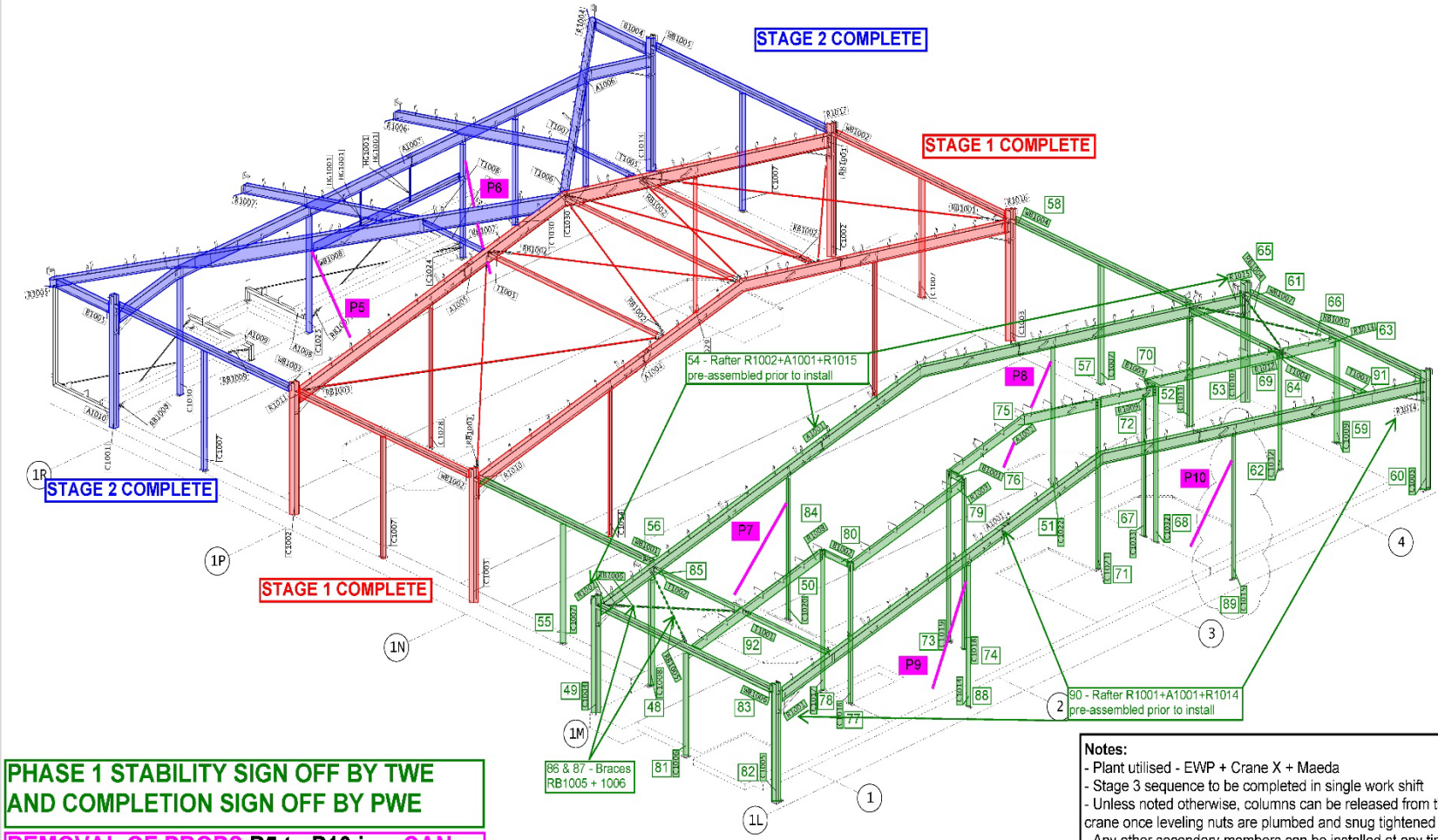
Date: XX/XX/XXXX
Revision: XX
Originator: X

Stage	Member Erection Sequence	Member Mark	Member Size	Length (mm)	Mass (t)	Comment	TWE Witness / Hold Point	TWE Sign Off
3	48	C1008	150x100x5RHS	5225	0.066	Snug tighten all base plate anchor bolts.		
3	49	C1004	200UC60	5534	0.229	Snug tighten all base plate anchor bolts.		
3	50	C1020	89X6 SHS	6327	0.073	Snug tighten all base plate anchor bolts. Install temporary prop P7, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
3	51	C1022	89X6 SHS	6327	0.073	Snug tighten all base plate anchor bolts. Install temporary prop P8, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
3	52	C1011	150x100x5RHS	5225	0.066	Snug tighten all base plate anchor bolts.		
3	53	C1010	200UC60	5534	0.229	Snug tighten all base plate anchor bolts.		
3	54	R1002 + A1001 + R1015	310UB40	29158	1.78T	Rafter preassembled, includes member 2 x 50x50EA at end columns		
3	55	C1007	150x100x5RHS	5598	0.076	Snug tighten all base plate anchor bolts.		
3	56	WB1001	250X90PFC	7714	0.277			
3	57	C1007	150x100x5RHS	7714	0.076	Snug tighten all base plate anchor bolts.		
3	58	WB1004	250X90PFC	7714	0.277			
3	59	C1009	150x100x5RHS	5170	0.071	Snug tighten all base plate anchor bolts.		
3	60	C1005	200UC60	3534	0.229	Snug tighten all base plate anchor bolts.		
3	61	WB1007	250X90PFC	7791	0.272			
3	62	C1012	89X6 SHS	3577	0.065	Snug tighten all base plate anchor bolts.		
3	63	R1013	250X90PFC	1926	0.089			
3	64	T1004	100X4SHS	3862	0.049			
3	65	RB1004	20DIA	4307	0.013			
3	66	RB1005	20DIA	4292	0.012			
3	67	C1033	89X6 SHS	4623	0.079	Snug tighten all base plate anchor bolts.		
3	68	C1032	89X6 SHS	4623	0.079	Snug tighten all base plate anchor bolts.		
3	69	R1012	250X90PFC	3926	0.249			
3	70	B1003	250X90PFC	537	0.031			
3	71	C1021	89X6 SHS	5066	0.089	Snug tighten all base plate anchor bolts.		
3	72	R1009	250X90PFC	1946	0.94			
3	73	C1019	89X6 SHS	5066	0.089	Snug tighten all base plate anchor bolts.		
3	74	C1018	89X6 SHS	5066	0.089	Snug tighten all base plate anchor bolts.		
3	75	A1002	250X90PFC	6833	0.271			
3	76	B1001	150X75PFC	544	0.01			
3	77	C1016	89X6 SHS	4193	0.073	Snug tighten all base plate anchor bolts.		
3	78	C1017	89X6 SHS	4193	0.073	Snug tighten all base plate anchor bolts.		
3	79	R1003	310UB40	10188	0.498			
3	80	B1002	150X75PFC	1071	0.019			
3	81	C1006	150x100x5RHS	5170	0.071	Snug tighten all base plate anchor bolts.		
3	82	C1005	200UC60	5534	0.23	Snug tighten all base plate anchor bolts.		
3	83	WB1006	250X90PFC	7791	0.272			
3	84	R1008	250X90PFC	5928	0.262			
3	85	T1002	100X4SHS	3944	0.05			
3	86	RB1005	20DIA	4307	0.013			
3	87	RB1006	20DIA	4296	0.012			
3	88	C1014	89X6 SHS	6325	0.073	Snug tighten all base plate anchor bolts. Install temporary prop P9, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
3	89	C1015	89X6 SHS	6325	0.073	Snug tighten all base plate anchor bolts. Install temporary prop P10, connect to column. Prop type and column temporary connection as per TWE Detail XX.		
3	90	R1001 + A1001 + R1014	310UB40	29158	1.74T	Rafter preassembled, includes member 2 x 50x50EA at end columns		
3	91	T1003	100X4SHS	3812	0.049			
	92	T1001	100X4SHS	3812	0.049			
3	93	Purlins	Z25024	various	various		HOLD POINT #3	
3						Temporary props P5 to P10 inclusive able to be removed ONCE HOLD POINT #3 released by TWE	PROP REMOVAL ACCEPTANCE	


To be read in conjunction with the Member Erection Sequence Schedule
HOLD POINT #1 INSPECTION FOLLOWING INSTALL OF CROSS-BRACING MEMBERS SEQUENCE STEPS 18-25 inclusive
REMOVAL OF PROPS P1 to P4 inc. CAN PROCEED FOLLOWING RELEASE OF HOLD POINT #1 BY TWE
Rafter R1011+A1005+R1017 pre-assembled prior to install
Rafter tie members T1005 x 2 + T1006 x 1 installed in any order
Rod Cross-bracing (dashed): RB1001, 1002, 1003 - 8 total, any order, tension following installation of all 8 braces
18-25
P1
P2
P3
P4
3-D VIEW
Notes:
- Plant utilised - EWP + Crane X
- Stage 1 sequence to be completed in single work shift
- Unless noted otherwise, columns can be released from the crane once leveling nuts are plumbed and snug tightened
- Purlins and any other secondary members can be installed at any time to suit the construction sequence
NON-STANDARD STRUCTURE
ERECTION SEQUENCE
BUILDING 1 - STAGE 1 OF 3
BUILDING 1
3-D VIEW
REVISION X
ISS DESCRIPTION BY DATE IMPORTANT NOTES


To be read in conjunction with the Member Erection Sequence Schedule
HOLD POINT FOLLOWING INSTALL OF 4 x HG-1001 MEMBERS SEQUENCE STEP 47
REMOVAL OF PROPS P5 & P6 CAN PROCEED FOLLOWING RELEASE OF HOLD POINT #2 BY ERECTION ENGINEER
STAGE 1 COMPLETE
STAGE 1 COMPLETE
Beam A1006+A1007 pre-assembled prior to install
P1
P2
P5
P6
3-D VIEW
Notes:
- Plant utilised - EWP + Crane X
- Stage 2 sequence to be completed in single work shift
- Unless noted otherwise, columns can be released from the crane once leveling nuts are plumbed and snug tightened
- Purlins and any other secondary members can be installed at any time to suit the construction sequence
NON-STANDARD STRUCTURE
ERECTION SEQUENCE
BUILDING 1 - STAGE 2 OF 3
BUILDING 1
3-D VIEW
NOT TO SCALE
REVISION X
REVISION X
ISS DESCRIPTION
BY
DATE
IMPORTANT NOTES

To be read in conjunction with the Member Erection Sequence Schedule



3-D VIEW

PHASE 1 STABILITY SIGN OFF BY TWE AND COMPLETION SIGN OFF BY PWE

REMOVAL OF PROPS P5 to P10 inc. CAN PROCEED FOLLOWING RELEASE OF HOLD POINT #3 BY TWE

Notes:
- Plant utilised - EWP + Crane X + Maeda
- Stage 3 sequence to be completed in single work shift
- Unless noted otherwise, columns can be released from the crane once leveling nuts are plumbed and snug tightened
- Any other secondary members can be installed at any time to suit the construction sequence

NOTE: THIS DRAWING IS ISSUED FOR CONSTRUCTION.

1. ALL CHANNELS/ANGLES TO BE ERECTED WITH DIRECTION OF FLANGES/LEGS AS INDICATED ON PLANS/ELEVATIONS.
2. ALL MEMBERS TO HAVE MARK END AS PER MARK BUBBLE ON PLANS/ELEVATIONS. i.e. MARK END AS SHOWN ON FABRICATION DRAWING IS REPRESENTED BY LOCATION OF MARK BUBBLE. SEE DIAGRAM -

MARK END

REVISION X

ISS	DESCRIPTION	BY	DATE	IMPORTANT NOTES

NON-STANDARD STRUCTURE ERECTION SEQUENCE BUILDING 1 - STAGE 3 OF 3

PROJECT
AREA BUILDING 1
TITLE 3-D VIEW
NOT TO SCALE DRG # ISS.

REVISION X

Plant Address :
Survey#323, Konapur Village, Sadasivpet(M),
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Admin Office :
Flat : 304, SriNilayam, Mathrusri Nagar, Calvary Temple Road,
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