All materials, components and accessories sold to Builders are provided subject to written agreements. Any applicable warranties are as set forth in those written agreements.

The Erection Guide is intended to provide erectors with the recommended procedures for constructing buildings as efficiently as possible. However, BlueScope Buildings does not guarantee and is not liable for the quality of erection nor assume any responsibility for building defects that may be attributed to improper erection techniques, or the negligence of other parties.

The erection information presented in this manual is provided as a supplement to the erection drawings supplied with your Building.

The manual is intended as a guide to be used in conjunction with your erection drawings, to help plan and organize your work. It will help you to identify parts, establish an erection sequence, speed up assembly and point out any areas or procedures requiring special emphasis or attention.

Where erection drawings and this guide are in conflict, the job specific erection drawings govern. Read all erection instructions before erecting the building.

*Supplemental Erection Guides are required for Roof and Wall Panels and other building accessories. Always refer to erection drawings for building specific details.*

**BlueScope Buildings reserve the right to change at any time products and/or procedures illustrated in this guide due to continuing product development.**
# Table of Contents

SECTION A – Safety First.................................................................................................................. 5
  Roof Panels/Roof Safety .................................................................................................................. 5

SECTION B – Building Delivery...................................................................................................... 8
  Shortages and damages .................................................................................................................... 8
  Materials unloading and handling .................................................................................................. 9
  Arrival at the Building Site ............................................................................................................ 9
  Unloading ..................................................................................................................................... 10
  Forklifts .......................................................................................................................................... 10
  Slings ............................................................................................................................................ 11
  Hand unloading and handling ......................................................................................................... 12
  Material handling of Panels ........................................................................................................... 12
  Site Storage .................................................................................................................................. 12
  Panels for immediate use ............................................................................................................... 13
  Panels not for immediate use ........................................................................................................ 13
  Trims and Small Parts ................................................................................................................... 14
  Steel Shop Coat finish ................................................................................................................... 15

SECTION C - Recommended tools and equipment ........................................................................ 16

SECTION D – Job site storage and protection ............................................................................... 18
  Do’s and Don’ts .............................................................................................................................. 18
  Job Information ............................................................................................................................. 18
  Jobsite Storage .............................................................................................................................. 18
  Anchor Rods I Base Plates ............................................................................................................ 18
  Temporary Bracing ......................................................................................................................... 18
  Flange Braces ............................................................................................................................... 19
  Brace Rods .................................................................................................................................... 19
  Connection Bolts ........................................................................................................................... 19
  Purlin or Girt Lap Bolts ................................................................................................................... 20
  Purlin or Girt ................................................................................................................................... 20
  Cutting & Burning .......................................................................................................................... 20

SECTION E – Bolt Tightening of grade 8.8 & 10.9 ..................................................................... 21
  Storage .......................................................................................................................................... 21
Snug tight................................................................................................................. 21
Pretensioned joints – 8.8/t, tb, tf bolting............................................................. 22
Tension calibration.................................................................................................. 22
Pretension joints using "turn-of-nut" method......................................................... 23
Pretension joints using "calibrated wrench" method............................................... 25
SECTION F – Foundation & Anchor Rods............................................................. 26
  Diagonal method.................................................................................................. 26
  Transit method .................................................................................................. 26
SECTION G – Erection Procedure Primary Frame ............................................... 31
  Step one .............................................................................................................. 31
  Step two ............................................................................................................ 32
  Step three ......................................................................................................... 37
  Step four ........................................................................................................... 38
  Step five ............................................................................................................ 39
  Step six ............................................................................................................. 40
  Step seven ....................................................................................................... 41
  Shimming .......................................................................................................... 41
SECTION H – Secondary attachment using Bolt retainer ..................................... 42
  IMPORTANT- READ THIS ............................................................................... 43
SECTION I – Rod Bracing...................................................................................... 45
  Wall Brace Detail .............................................................................................. 45
  Rod brace thread protection colour code key ..................................................... 49
  Crane runway alignment.................................................................................... 49
SECTION A – Safety First

Job site safety is the sole responsibility of the contractors on the job site. Contractors are responsible for FULL compliance with all governing regulatory agency’s safety requirements for your specific construction site including but not limited to Federal, State, and local agencies having jurisdiction over your job site. The Contractor is also solely responsible for compliance with all owner specified safety requirements at the job site.

Identification of safety regulatory agency requirements for construction related procedures is beyond the intent of this installation guide. Any action required from BlueScope Buildings regarding safety issues shall be specifically identified in the contract documents.

Roof Panels/ Roof Safety

WARNING: A fall from heights can cause serious injury or even a fatality.

Working off the ground even one metre can be extremely dangerous. Falls from height of 2m or less can be fatal. You should be aware of the hazards while installing roof panels.

I. PANELS CAN COLLAPSE

Roof panels can be a safe walking surface (except for slipperiness) ONLY when they are completely seamed or fastened as applicable. Panels not completely seamed or fastened are not safe and can collapse suddenly and without warning.
When installing roof panels, **always** use fall protection. Follow these additional safety precautions:

1. Never step, kneel or place weight on an edge or edge corrugations of any panel.
2. Use extra care when installing panels with creased or kinked corrugation or edges. Placing weight on any portion of such a panel before it is completely installed may cause the panel to collapse.
3. Never stand or work within 1.5 metres from the end of a panel that is not completely seamed or fastened.
4. Before a panel is completely installed, always stand, kneel or work directly over the roof structural.
5. Never allow more than one worker to stand, kneel or work on the same panel between two roof structuralss before the panel is completely installed.
6. When walking on roof system liner panel that has been completely fastened to the roof structural, do not step on the sidelap. Step only on the liner panel area that is directly over the roof structural.

**Never use unattached roof panels as a work platform for any purpose.**

This is an **extremely** hazardous practice and should never be done.

**II. PANELS ARE SLIPPERY**

All roof panels, whether painted or unpainted are slippery to walk on. Dew, frost, or any other moisture on roof panels greatly increases the slipperiness of the panels and extra care should be taken. The pitch of the roof can also increase the hazard.

Because of these hazardous conditions, it is **essential** that fall protection be used at all times.
III. LOOSE PANELS MAY SLIDE OUT FROM UNDER YOU

Never step on a single roof panel or a stack of several roof panels lying unattached on the roof structural. If you step onto a single panel on the roof structural, it may slip causing you to lose your balance and fall. Even a stack of several panels on the roof structural may slip if you step on it.

WHAT TO DO TO PREVENT ROOF FALLS

1. **Always Use Fall Protection** - Including but not limited to lifelines, safety harnesses, lanyards, safety nets, scaffolding, man-lifts, catch platforms, and the Sky-Web systems.

2. **If You Need a Work Platform** - for laying insulation or any other purpose, use only platforms constructed in accordance with all safety regulations. *Never* use unattached or partially attached panels as a work platform.

3. **To Avoid Slipping** - wear good work boots while on the roof. The danger from a slip is greatest while installing roof panels or insulation at the edge of the roof. Use walkboards in the flat of panels when installing panels. When working near the edge of the roof, always use fall protection.

4. **To Prevent Panels from Slipping** - Do not step on loose roof panels or even a stack of several roof panels.

5. **Walkboards** - One method to add stability to panels during erection is to place walkboards in the flat of panels. The boards should run the full length of the roof slope and should be fastened together by drilling a hole near the ends of each board and tying it to the next board with rope. Cut a groove in the bottom of each board so that the board will lie flat and not tip back and forth because of the rope. This will prevent the boards from slipping out from under you when you step on them. Adequately secure walkboards to the building. Walkboards are not a substitute for appropriate fall protection.
SECTION B – Building Delivery

- Before the building arrives, make sure space is available to store and inventory the components.
- Review erection drawing documentation
- Check off all primary framing members with manifest and erection drawings.
- Check for quantity of boxes and or crates called for on the manifest.
- Check for purlin or girt bundles as called for on the manifest.
- Check for visible damage.
- Ensure that all wet components have been dried before storing.
- Store all components so that there is no collecting of water in bundles or frames.
- Do not cover tightly. Leave room for air circulation around bundles.
- Store warehouse items in a dry, secure location. i.e. doors, windows, fasteners, mastic.

As the building is shaken out, check all individual boxes, bundles and crates for any damages or shortages. This will help eliminate lost time waiting for replacement materials.

Shortages and damages

- A complete inspection should be made at time of delivery.
- The receiver should not sign delivery receipt if there is any evidence of damage. Notation should be made on the delivery receipt accordingly.
- The carrier should be immediately notified that shipment is damaged and request to send a representative to inspect and verify damage. Also, a copy of the inspection report should be requested.
- If concealed damage is subsequently uncovered, the carrier should be notified immediately and requested to send a representative to inspect and verify the damage. Also a copy of the inspection report should be requested.
- A claim should be filed with the carrier as soon as possible, sending with it the original Bill of Lading, original paid freight bill, copy of the inspection report, disposition of damaged material and amount of claim.
- Concealed damage should be reported within (15) days of delivery.
- Shortages of primary and secondary framing must be reported within (5) working days.
- Shortages of any other materials must be reported within (10) working days.

NOTE: It is the responsibility of the Builder/Erector to check for damaged materials and shortages. Damages should be noted on delivery receipts and your Project Manager notified as soon as possible.
Materials unloading and handling

Arrival at the Building Site

- When fabrication is complete shipment is made to the building site. All building components are carefully bundled, crated and inspected to prevent damage during transportation. The transportation company is responsible for delivering these components undamaged.

- When the shipment is received, check each item against the proper shipping document. If a shortage is discovered, have the transportation agent make a notation to that effect on your manifest.

- Examine your shipment carefully for damage. If any damage is found be sure the agent makes damage notation on the bill before accepting it.

- If damage is concealed until crating or packaging is removed, Call your agent at once for an inspection and obtain an inspection memorandum covering concealed damage.

Unloading and Material Layout Example

NOTE: Leave an access area through one end and the full length of the building for erection equipment.
Unloading

Panels and trim items are quality finished products and must be handled with care to prevent damage.

Due to the weight and size of the bundles, a mechanical lift or hoist should be used for unloading.

Forklifts

Extreme care should be taken to avoid panel damage from fork blades. It may be necessary to lift and block up one end of bundle to allow for proper clearance of blades.

Bundle should be balanced on blades so material will not slide. Longer bundles may require more than one lifting device.

Ends of fork blades should extend enough so entire bundle rests on blades. To avoid damage to panels covered only with shrink wrap, blocking should be placed at back of fork blades.

1. Add a spacer block on forks to space out for one package on forks.

2. Move fork truck to rear or side of railer lift package and block.

3. Centre fork truck under package and unload.
**Slings**

Crane lifting of the "INDIVIDUAL BUNDLES" should be by nylon slings (or similar material) located at a minimum of two points along the length of the bundle. Suitably stiff insert should be located at the top and bottom of the bundles at the sling positions to protect the edges of the panels.

If bundles are longer than 4.5 metres, it is suggested that a properly designed and fabricated spreader bar is used.

Balance load so material will not slide.

Extreme care should be taken to avoid bumping and snagging of the bundles when lifting.
Hand unloading and handling

When carrying panels by hand always lift from bundle, never drag. Gloves should always be worn when handling panels.

Material handling of Panels

A. Carry panels on edge in a vertical position for stiffness

B. Picking up panels at ends and rotating in propeller shape will cause damage.

Site Storage

Keep panels dry. If panels arrive wet or become wet at the jobsite, break them open and dry completely.
**Panels for immediate use**

If the panels are to be used immediately, the bundle should be placed at pre-planned strategic locations around the perimeter of the building as close as possible to the planned work areas. Consult the panel layout drawings to determine these locations. As far as practical, the bundles should be placed as close to installation area as possible to avoid later site maneuvering or undue handling.

Protect opened bundles with polyethylene cover (or similar material) when erection stops at end of the day. If panels are crated, replace the lid of the crate before covering.

Bundles for panels which are shipped on edge should be kept in upright position during storage and unloading. Block up edge of bundle with 5cm x 10cm located at the bearers to keep panels from slipping. DO NOT stack material on opened bundles.

**NOTE:**

Moisture trapped within panel bundles can cause the finish to soften and become more susceptible to erection handling damage. Panels stored wet for extended periods in humid conditions will oxidize (rust).

**Panels not for immediate use**

If panels are not required for immediate use, they should be carefully deposited in a designated area, preferably under cover.

Store bundles to allow for drainage. Wood blocking to elevate one end of bundle is recommended.

The bundles should be stacked on a firm, level surface, clear of debris. Bundles should be stacked no more than two high with any bearers of the upper bundles in-line with the bearers of the lower bundle. Where bearers do not align, place 5cm x 15cm wood planks longitudinally between the two bundles to help distribute the load.

Provide for ventilation of bundles if conditions are such that condensation may occur. Protective shrink wrap material on bundles should either be slit or loosened.
**Trims and Small Parts**

Due care should be afforded to the unloading and storage of trims and small items (fasteners, sealants, etc.) that arrive on site for inclusion in the work.

Trim items are normally shipped in cartons, which should not be allowed to get wet. Use 5cm x 10cm blocking spaced no more than 90cm under cartons. Keep cartons square to prevent bending trim items.

Cover exposed cartons with 4 mil polyethylene or equal. Leave ends open to provide air circulation.

Do not open cartons until ready for use. Protect loose material from damage.
Steel Shop Coat finish

1. Steel shop coat is intended to provide short term protection for steel members during transportation and temporary job site exposure during erection. Shop coat formulation is not designed to protect against environmental exposure for extended periods.

2. Shop coat finish inconsistencies shall not be grounds for rejection as shop coats are not intended to be finish coats.

3. Members shall be kept free of contact with the ground. Members shall be blocked and sloped to provide water drainage or covered to prevent water from ponding on steel members.

4. It is the contractors responsibility to insure that when finish coats are applied over the shop coat that the painting contractor verifies compatibility between shop coat and finish coat.

5. Galvanized members shall be stored as described above. If nested secondary members get wet during transit, un-stack, block and slope members to allow trapped moisture to drain and dry. Discoloration from white rust does not affect service life and shall not be grounds for rejection.
SECTION C - Recommended tools and equipment

The following list of tools and equipment should be considered for efficient building erection. This equipment may vary from area to area due to variations in building proportions, complexities, jobsite conditions and erection personnel. This list is intended to serve as a recommendation only and should not be interpreted as a limitation to your erection equipment. The builder is responsible for providing equipment commensurate with the type of building being erected. Safety Equipment must meet regulatory requirements.

- Electric screw guns with magnetic heads (Recommend 2000 RPM with depth sensing nose piece or adjustable clutch).
- Electric sheet metal nibbler and shears for cutting sheeting on job site. Keep replacement cutting bits in stock.
- Arc welding equipment with extra welding leads for welding (portable).
- Bolt Tension Calibrator; (such as Skidmore-Wilhelm)
- Extension ladders (at least two that are long enough for high buildings).
- One (1) set of torches with gauges and hoses for cutting (keep replacement tips in stock).
- Steel tapes for checking measurements (30m, 15m, 10m and several 3m). Stretch tape for measuring along rakes.
- At least one level.
- Sheet metal cutters (straight, left, and right cut).
- Sufficient amount of suitable cable for temporary bracing no less than12mm in diameter.
- One (1) rattle gun with assortment of impact sockets.
- Appropriate number of chokers and rope for use when the crane arrives for raising structural steel.
- At least one (1) ratchet and socket wrench set with appropriate extensions and attachments (heavy duty) 12mm and 19mm ratchets).
- Plenty of electrical extension cords for all tools used at one time.
- Shop and sledge hammers.
- Podgers/podging spanner.
- Crow bar and heavy duty drift pins.
- Skill saw with metal cutting blades and carbide tip blade.
- Hack saws.
- Framing square and tri-squares.
• Transit and level rod.
• Vise grips (assortment of types).
• Adjustable/shifting (heavy duty).
• Box end wrenches (assortment).
• Open ended spanners (assortment).
• Straight line string.
• Chalk boxes with replacement line and chalk.
• Caulking guns.
• Ample supply of pop rivet tools, both manual and electric powered.
• Staple pliers for stapling insulation and ample supply of replacement staples.
• 9mm drive electric drill and appropriate twist drills.
• 12mm drive electric drill and appropriate twist drills.
• Brooms.
• Approved safety devices.
SECTION D – Job site storage and protection

Do’s and Don’ts

*Job Information* - "For construction" drawings must be the only drawings at the jobsite. Erection guides are sent to every Builder’s office and with each building. Be sure at least one copy is on each jobsite.

*Jobsite Storage*

- Always inventory building components within 2 weeks of delivery. This will avoid lost time waiting for replacement.
- Inventory and store all warehouse items in a dry and secure location. Only take out bolts, fasteners, mastic, etc. that will be used each day.
- All frame components should be stored to prevent water ponding in the webs.
- All bundled gage components should be stored dry and covered. If the bundle gets wet, you **must** un-stack and dry each part.
- Wall and roof panels must be covered to insure air circulation between bundles. If the bundle gets wet, you **must** un-stack and dry each part.
- All packing slips should be removed and the bundle or box marked with an identifying mark referencing the corresponding packing slip.

*Anchor Rods I Base Plates*

- Keep anchor bolt projection at dimension called for on anchor rod plans.
- Tighten anchor rod nuts.
- If anchor rods do not fit the base plate, contact your Project Manager for written direction and authorization. Never make modifications on your own.

*Temporary Bracing*

- It is the responsibility of the erector to design and provide for all temporary bracing. This includes size, type, location, and quantity.
- Never begin erecting a building without having temporary bracing on site along with a plan for installing and securing it.
- As erection proceeds, all brace rods, flange braces, struts, purlin/girt laps should be installed prior to panel installation.
- All buildings will require temporary bracing during erection.
- Do not remove temporary bracing until wall and roof coverings are installed.
**Flange Braces**

- All flange braces must be installed per the erection drawings.
- Never remove, relocate or omit a flange brace. If holes were omitted in manufacturing, it is the responsibility of the erector to insure that all flange braces called for on the erection drawings have been installed.
- If a flange brace is called for at a location which will interfere with a window, overhead door, or other required accessory, get written authorization from BlueScope Buildings engineer before moving or omitting the brace.
- Flange braces are required even when you have liner panels. See erection drawings.
- See erection drawings for bolting requirements of flange braces to frames and secondary member.
- Never substitute self-drilling fasteners for bolts.

**Brace Rods**

- Always tighten rods as snug as possible. Reduce rod sag as much as possible without creating distress in the connection to framing members. Matching rods should always be equally tensioned in each bay.
- Never remove or omit a brace rod.
- Never relocate any brace rods. If relocation is necessary due to interference with doors, openings etc., contact project manager for written direction and authorisation.

**Connection Bolts**

- Use correct bolt length and type called for on the erection drawings or erection drawing details.
- Install correct quantity of bolts called for on frame cross sections or specific details.
- Insure that all high strength bolts are properly tightened. See drawings for direction if bolts require full-tensioning or snug tight.
- Never use an grade 4.6 bolt and nut where grade 8.8 bolts are called for.
**Purlin or Girt Lap Bolts**

- All purlin/girt lap bolts are to be installed in the outermost set of holes.
- All purlin/girt laps will require bolts to be "snug tight" and located as shown in Secondary Section of this guide.
- Pull all lap conditions up tight, sometimes reversing the lap will allow the purlins to nest better. A little time spent on making a tightly nested lap will pay off when installing wall and roof panels.

**Purlin or Girt**

- Always block up wall girts to insure straightness.
- Never load roof purlins at mid bay. Keep all loading directly over the frames.
- When loading roofing bundles on to the roof purlins, always block the purlins to prevent crushing and rolling.
- Never overload roof purlins. When in doubt, ask what is a safe load for your specific location.

**Cutting & Burning**

- Never use a torch to "field drill" structural connection holes. Holes must be drilled or "burned & reamed". If you feel you must use a torch to make a hole, burn a small "pilot hole", then ream to achieve smooth hole of proper size.
- If field cutting of members is done with a torch, grind it smooth and touch up with primer.
- Never modify, cut, cope, or make holes in members unless authorized by an engineer, or as required on erection drawings.
SECTION E – Bolt Tightening of grade 8.8 & 10.9

Depending on building use and location or type of connection, high strength bolts will be tightened to a “snug tight” condition, or a “pretensioned” condition. See erection drawings for specific requirements. For more information on high strength bolts, reference Design Guide 1: Bolting in Structural Steel Connections.

Storage

- Store bolts, nuts, and washers, in closed containers to protect them from dirt and corrosion.
- Store closed containers in a protected shelter.
- Return unused bolts, nuts, and washers to protected storage.
- Do not install bolts that have become dirty or rusty.

Snug tight

- For joints requiring only "snug tight" conditions: (allowed 4.6/S and 8.8/S only): snug-tight connections do not require washers.
- Insert bolts and install nuts (w/ washers if required) in all holes. Connections designated as 8.8/N and 10.9/N shall be installed with bolt head on side of the thinnest plate.
- Tighten bolts “systematically”. For end plate connections, tighten bolts near flanges first and work toward centre of beam. For clips, tighten from most rigid part toward “free edge” of clip or plate. See Figure 1.

- Snug-tightened condition is achieved with a few impacts of an impact wrench (solid sound) or full effort of an ironworker using an ordinary spud wrench.
- Bring connected parts into “firm contact”. See figure 2.
**Pretensioned joints – 8.8/t, TB, TF bolting**

Joints that require pretension must use one of the following tightening methods and all methods must be calibrated for each representative fastener assembly prior to installation.

- Turn-Of-Nut Method
- Calibrated Impact Wrench Method
- Twist Off Type Tension -Control Bolt Method (See manufacturer’s instructions)
- Direct Tension Indicator Method (See manufacturer’s instructions)

**Tension calibration**

- A hydraulic tension calibrator (e.g. Skidmore-Wilhelm Bolt Tension Calibrator) shall be used to validate that the tightening method used achieves required bolt tension. (See manufacturer’s instructions)
- Take three fastener assemblies of each diameter, length, and grade to validate each assembly to tension values shown in Table 1.
- Verify that the lubrication of the fastener assembly is similar to condition that will be present when installation work is done.
- Log results for the calibrated assembly.
Table 1

<table>
<thead>
<tr>
<th>Bolts Diameter (mm)</th>
<th>8.8</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bolt Tension KN</td>
<td>Torque Nm</td>
</tr>
<tr>
<td>12</td>
<td>31.8</td>
<td>77</td>
</tr>
<tr>
<td>16</td>
<td>59.2</td>
<td>190</td>
</tr>
<tr>
<td>20</td>
<td>95.6</td>
<td>372</td>
</tr>
<tr>
<td>24</td>
<td>138</td>
<td>640</td>
</tr>
<tr>
<td>30</td>
<td>219</td>
<td>1314</td>
</tr>
<tr>
<td>36</td>
<td>319</td>
<td>2297</td>
</tr>
<tr>
<td>42</td>
<td>437</td>
<td>3671</td>
</tr>
</tbody>
</table>

Pretension joints using "turn-of-nut" method

- Bring connection to "snug tight" condition. See procedure above.
- Matchmark each nut, bolt, and steel surface at the corner of the bolt and nut as shown in Figure 3.
- Using the same systematic procedure as used during the snugging phase, rotate each nut or bolt head the required turns as shown in Table 2.
- These added turns can be accomplished using impact wrenches or spud wrenches.

Figure 3
# Table 2 Nut rotation from the snug-tight condition

<table>
<thead>
<tr>
<th>Bolt Length</th>
<th>Disposition of Outer Face of Bolted Parts (see notes 1,2,3, and 4)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Both faces normal to bolt axis</td>
<td>One face normal to bolt axis, other sloped</td>
</tr>
<tr>
<td>Up to and including 4 diameters</td>
<td>1/3 turn</td>
<td>½ turn</td>
</tr>
<tr>
<td>Over four diameters but not exceeding 8 diameters</td>
<td>½ turn</td>
<td>2/3 turn</td>
</tr>
<tr>
<td>Over 8 diameters but not exceeding 12 diameters (see note 4)</td>
<td>2/3 turn</td>
<td>5/6 turn</td>
</tr>
</tbody>
</table>

**Note:**

1. Tolerance on rotation
2. Nut Rotation is rotation relative to the bolt, regardless of the component turned.
   - Rotation ½ turn or less: Tolerance 1/12 turn (30°) over, nil under
   - Rotation 2/3 turn or more: Tolerance 1/8 turn (45°) over nil under
3. Nut rotation specified are only applicable to connections in which all the material is steel.
4. There are no recommendations for the degree of rotation required for bolt lengths exceeding 12 diameters. The required rotation must be established by actual test in a suitable tension measuring device which simulates conditions of solidly fitted steel.
Pretension joints using “calibrated wrench” method

- When using calibrated wrench method, a hardened washer is required under the turned element.
- Bring connection to “snug tight” condition. See procedure above.
- Look up, in the pre-verification log book, the required installation torque for the assembly being installed.
- Using the same systematic procedure as used during the snugging phase, apply the installation torque to each bolt in the joint.
- Visually watch the wrench chuck turn. Do not exceed the required turns given in Table 2. If the wrench consistently turns fastener past the turns given in Table 2, re-establish the required installation torque for the impact wrench.
SECTION F – Foundation & Anchor Rods

All anchor rod embedment requirements and details shall be designed and furnished by others. Rod details shown are for illustration only.

Diagonal method

- Adjust the foundation layout lines until dimensions A & B are equal in length. 6mm tolerance.
- Check again for correct building length and width per building drawings. 6mm tolerance

NOTE:

With either method, Use a transit to the top elevation of all batter boards at the same exact elevation. Usually this elevation is the required finished concrete floor slab elevation.

Bottom of base plate elevation tolerance may not exceed 3mm from specified elevation.

Transit method

- Locate transit exactly over corner intersection point of string line.
- Sight along one building line. Swing transit through 90° to establish adjacent building line.
- For accurate results, transit must be exactly level and properly calibrated.
NOTE:
Grease rod threads for protection during pouring of concrete.

NOTES
1. Anchor rod diameter along with dimensions (X) (Y) & (Z) is shown on the detailed anchor rod layout plan.
2. Anchor rods are not furnished by manufacturer. All items shown on this page/ are furnished by foundation contractor.
3. Mark form for template location before pouring. Set anchor rods and attach templates after screeding.
IMPORTANT:

All reinforcing steel for foundation walls, footings, tie rods, hair pins, wire mesh or any other steel used specifically for concrete application shall be designed and furnished by others. All reinforcing steel shown in this manual is for illustrative purposes only.
NOTES:

1. Make sure template is snug against and square with form.

2. Dimensions (X) & (Y) and anchor rod diameter will be shown on a detailed anchor rod layout.
Attach to floor with 5mm dia. power actuated concrete anchor (or other approved methods). Space anchors as shown on erection drawings and details.

**NOTE:**
Fastener should be located as far from outside edge of slab as is reasonable to prevent concrete spalling.
SECTION G – Erection Procedure Primary Frame

Step one

1. Stand columns and attach. Check anchor rod plan and erection drawings for special conditions.

2. The number of girts and temporary bracing required to secure columns shall be determined by erector.

NOTE:

1. Plan to erect a braced bay first. Usually this is the first interior bay from either end of the building.

2. Refer to the bolt tightening section of this manual for acceptable methods of tightening bolts.

3. Bolt in place as many clips and flange braces as possible before raising frame to reduce in-the-air erection time.

4. It is the responsibility of the erector to provide temporary erection bracing until the structure is complete.

5. It is highly recommended that the erector consult with the overall project professional for advice on temporary bracing procedures.
**Step two**

1. Raise first rafter beam and haunch frame section into place. All high strength bolts are to be tightened before raising.

2. Hold in place until this section is secured to columns and temporary bracing is tied off to hold frame in place.

3. If interior columns are present, apply temporary bracing at interior columns, in addition to braces shown.

Temporary bracing per building frame requirements.
Bolting roof beam sections together

Rigid frame roof beams are shipped in two or more sections which must be bolted together at the jobsite. Layout and block up roof beams in the relative position of assembly. Butt sections together and align holes in the ridge plates, then bolt up. Draw bolts up evenly.

Attach braces and clips

Attachment of flange braces on the ground Single (one side) or double (both sides) flange braces may be specified. Check your primary framing erection drawing for locations. If braces are required on both sides of the roof beams, attach those on the opposite side when the roof beam assembly is raised into vertical position.

Set Roof Beam Assembly

After the braces and clips are attached and the columns are set and braced, the roof beam assembly is ready to be bolted to the columns.

Shown below are methods which may be used for rigging slings for lifting roof beam assemblies.

NOTE:
Regardless of the method you use; make sure it is suitable and adequate for the job when considering the weight and size of the roof beam assemblies and hoisting equipment available.

NOTE:
Roof beam sections are blocked up to facilitate assembly and to enable other parts to be attached.
Sling with softener

Block between flanges to avoid damage to roof beam. Softeners should be used at the sling connections to avoid damaging the chokers.

After the sling is secured to the roof beam assembly, make a test lift to determine if the sling is properly positioned. Insert a spud through the hole in the roof beam flange at the sling connections to prevent sling from slipping. The sling is correctly positioned when test lift indicates minimum frame distortion. Note the location of the sling connections for positioning on the remaining roof beam assemblies. While the roof beam assembly is still accessible from the ground, connect tag lines and guy lines for guiding the roof beam into place and tying off the rigid frame after erection.

Avoid inducing impact to roof beams when lifting or setting on the columns.

NOTE:

Beam clamps can be effectively used to facilitate the handling of roof beams. Beam clamps attached to the top flange of the beams permit the beam to hang naturally in a vertical position. A choker wrapped around the beam lifts from the bottom and the beam is easily unbalanced.
Setting roof beam on column

(Face bolted connections similar)

Raise the roof beam assembly slowly and guide into position so roof beam flanges are aligned with column flanges and bolt in place.

Use of spud wrench for aligning holes

A spud wrench will be useful for aligning the holes. Secure the guy lines to stabilize the frame before releasing the crane.

CAUTION:

Be very careful when tilting the assembled roof beams into a vertical position to avoid twisting which can damage the flanges.

CAUTION:

Beams will have a tendency to roll over until secondary and flange braces are installed. Do not release lifting rigging until beam’s are stabilized.
NOTE:

It is the responsibility of the erector to provide adequate temporary bracing.

**Step three**

1. Raise second haunch and roof beam frame section.
2. Hold in place until this section is bolted to columns, and lead purlins have been attached.
3. Add brace near strut purlin, keeping strut purlin in tension until purlin can be stabilized with intermediate channel braces or sheeting.
4. Continue to "Leap Frog" temp. braces as additional frames and purlin struts are installed.
Step four

1. Bolt in place all remaining eave members, purlins and girts of the braced bay.
2. Install brace rods and flange braces.
3. Square and plumb braced bay before erecting adjacent bays.
**Step five**

1. Locate transit as shown above (In This Particular Case Slightly To The Left Of The First Rigid Frame).

2. Make sure transit is perfectly level.

3. Rotate transit until you get the same exact tape reading at points A & B (Base Of Column.) Measure from web of column.

4. Lock horizontal rotation of transit.

5. Adjust rod bracing and temporary bracing until the tape reading at points A & B is obtained at all points indicated on above sketch. Take all readings from web of column.

6. Columns shall be plumb at points C to within; height (mm)/500.

   EX  \[
   \frac{4000}{500} = 8\text{mm}
   \]

7. Beams shall be straight from column to column (Points D) to; span (mm)/500.

   EX  \[
   \frac{1400}{500} = 28\text{mm}
   \]
Step six

8. Proceed with the erection of the remaining frames.
9. Plumb frames in longitudinal direction using similar procedure described in STEP 5. (Tolerance: Height/500)

NOTE:
Remove temporary bracing only after all paneling has been installed.
Step seven

1. Complete erection of all primary & secondary components.

2. Note that after completion of all secondary framing in one end bay, attachment of roof panels may commence and be worked in conjunction with the completion of primary & secondary framing.

Shimming

Shims available upon request

Corrections of minor misfits by moderate amounts of shimming, reaming, grinding, welding or cutting shall be considered to be normal erection operations.
SECTION H – Secondary attachment using Bolt retainer

- Bolt retainers are solely for the purpose of holding the bolt in place for a relatively short period of time. Full connection strength is not attained until the hex nut has been properly installed.
- Install bolt retainer on as many bolts as desired to
- Bolt Retainer temporarily hold bolt in place.
- Bolt retainer need not be removed.

OPERATION IS CRUCIAL
Install bolt retainer on bolt with prongs out.
Roof panel bundles are often located on the roof structurals prior to installation.

This procedure can cause damage if the bundles are located over unsupported areas. If the bundles are to be located on the roof structurals, adhere to the following blocking procedure.

1. All structurals, flange bracing, permanent and temporary bracing and etc. must be in place, plumb, and bolts tightened, before blocking is installed, and panels bundles are placed on the roof.

2. Panel bundles should only be located over centre lines of frames, not over jack beams or jack trusses.
3. Blocking should be installed between all purlins at frames where bundles are to be located. Length of blocking should be equal to purlin spacing.

4. Remove blocking after panels are installed.

5. When the alternate blocking method is used, the same procedures must be followed.
SECTION I – Rod Bracing

Wall Brace Detail

Rod braces shall be tightened snugly such that the rod does not sag more than (mm)/500.

EX. $\frac{10600}{500} = 21\text{mm}$

Long rods may require intermediate support from roof secondary members to reduce sag.
<table>
<thead>
<tr>
<th>Rod Dia MM</th>
<th>CLEVIS PART #</th>
<th>TURNBUCKLE PART #</th>
<th>COUPLING PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>10mm</td>
<td>097572</td>
<td>097574</td>
<td>47039</td>
</tr>
<tr>
<td>12mm</td>
<td>097573</td>
<td>095271</td>
<td>47122</td>
</tr>
<tr>
<td>16mm</td>
<td>095277</td>
<td>095046</td>
<td>47610</td>
</tr>
<tr>
<td>20mm</td>
<td>095278</td>
<td>095047</td>
<td>47758</td>
</tr>
<tr>
<td>24mm</td>
<td>095279</td>
<td>095048</td>
<td>47784</td>
</tr>
<tr>
<td>24mm</td>
<td>095280</td>
<td>095272</td>
<td>47890</td>
</tr>
<tr>
<td>28mm</td>
<td>095281</td>
<td>095273</td>
<td>47915</td>
</tr>
<tr>
<td>32mm</td>
<td>095282</td>
<td>095274</td>
<td>46906</td>
</tr>
<tr>
<td>36mm</td>
<td>095874</td>
<td>095873</td>
<td>47894</td>
</tr>
<tr>
<td>40mm</td>
<td>096961</td>
<td>095275</td>
<td>47985</td>
</tr>
<tr>
<td>ROD DIA</td>
<td>NUT</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>10mm</td>
<td>095321</td>
<td>096408</td>
<td>46040</td>
</tr>
<tr>
<td>12mm</td>
<td>095230</td>
<td>095872</td>
<td>095946</td>
</tr>
<tr>
<td>16mm</td>
<td>095233</td>
<td>095945</td>
<td>095946</td>
</tr>
<tr>
<td>20mm</td>
<td>095235</td>
<td>095946</td>
<td>095948</td>
</tr>
<tr>
<td>24mm</td>
<td>095237</td>
<td>095947</td>
<td>095948</td>
</tr>
<tr>
<td>24mm</td>
<td>095238</td>
<td>095948</td>
<td>095949</td>
</tr>
<tr>
<td>28mm</td>
<td>095239</td>
<td>095949</td>
<td>095949</td>
</tr>
</tbody>
</table>
ROD BRACING
0 3 R S 2 5 1 0 —— Means 3/8" diam rod: RS assembly code: 25'-10" long
I E * * F F I I
DIA LENGTH

COMMON GENERATED MARK NUMBER

Ship Loose - (Hillside Washer, (2) Flat Washers & Hex Nut)

RS RODS
THREAD BOTH ENDS
WITHOUT TURNBUCKLE

Clevis

Rod Length
(As Shown On Erection Drawings)

Clevis

4" 6" 6" 4"

RU RODS
CLEVIS BOTH ENDS

Ship Loose - (Hillside Washer, (2) Flat Washers & Hex Nut)

RT RODS
CLEVIS ONE END

6" 6" 4"

Rod Length
(As Shown On Erection Drawings)
**Rod brace thread protection colour code key**

<table>
<thead>
<tr>
<th>THREAD PROTECTION REFERENCE KEY FOR ROD BRACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLEEVE COLOR</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>BLUE</td>
</tr>
<tr>
<td>BLACK</td>
</tr>
<tr>
<td>RED</td>
</tr>
<tr>
<td>YELLOW</td>
</tr>
<tr>
<td>ORANGE</td>
</tr>
<tr>
<td>GREEN</td>
</tr>
<tr>
<td>WHITE</td>
</tr>
</tbody>
</table>

**Crane runway alignment**

Crane systems must be installed in strict accordance with crane manufacturer instructions. All steel support framing must be plumbed and aligned carefully for proper operations.

If crane manufacturer instructions conflict with instructions below, the stricter instructions shall govern.

- Crane support columns shall be erected plumb to 90mm or less.
- Crane runway beams shall be installed to tolerances shown in Table A. below.
- Crane rails shall be aligned as shown in Figure 1.
• Absolutely **NO FIELD WELDING** is allowed unless specifically shown on drawings or authorized by a registered engineer. Weld metal and base metal fatigue shall be considered in weld design.

• Crane operations may cause vibrations in building components. Clamps and ties (by others) may be required to minimize vibration noise.

• Construction tolerances in concrete elevations, steel fabrication tolerances, and erection tolerances may require field shimming of crane support beams to achieve proper elevation and alignment.
<table>
<thead>
<tr>
<th>Item</th>
<th>TABLE A</th>
<th>CRANE RUNWAY BEAM ERECTION</th>
<th>Tolerance</th>
<th>Max. Rate of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Span</strong></td>
<td><img src="image1" alt="Diagram" /></td>
<td></td>
<td>90mm</td>
<td>60mm per 6m</td>
</tr>
<tr>
<td><strong>Straightness</strong></td>
<td><img src="image2" alt="Diagram" /></td>
<td></td>
<td>90mm</td>
<td>60mm per 6m</td>
</tr>
<tr>
<td><strong>Elevation</strong></td>
<td><img src="image3" alt="Diagram" /></td>
<td></td>
<td>90mm</td>
<td>60mm per 6m</td>
</tr>
<tr>
<td><strong>Beam to Beam Top Running</strong></td>
<td><img src="image4" alt="Diagram" /></td>
<td></td>
<td>90mm</td>
<td>60mm per 6m</td>
</tr>
<tr>
<td><strong>Beam to Beam Underhung</strong></td>
<td><img src="image5" alt="Diagram" /></td>
<td></td>
<td>90mm</td>
<td>60mm per 6m</td>
</tr>
<tr>
<td><strong>Adjacent Beams</strong></td>
<td><img src="image6" alt="Diagram" /></td>
<td></td>
<td>10mm</td>
<td>60mm per 6m</td>
</tr>
</tbody>
</table>