


















Construction Manual

SUGGESTED TOOL KIT YOU WILL NEED BEFORE YOU BEGIN TO CONSTRUCT YOUR KITSET BUILDING:

<p>1.</p>	<p>Personal protective equipment and clothing, e.g:</p> <ul style="list-style-type: none"> • Hi viz vest • Head protection – safety helmet • Eye protection – safety glasses • Hearing protection – ear muffs • Feet protection – steel cap boots • Hand protection – gloves <div data-bbox="225 461 644 658" style="border: 1px solid black; padding: 5px; display: inline-block;">  </div> 
<p>2.</p>	<p>A powerful Cordless drill with a spare battery, or a good electric drill</p> <ul style="list-style-type: none"> • Fixing tek screws for framing, roof sheeting, wall cladding • 3mm, 3.3mm, 4.1mm, 4.9mm, 10mm, 16mm & 18mm steel drill bits • Hex, phillips, pozidrive & square drive bits 
<p>3.</p>	<p>Masonry/hammer drill</p> <ul style="list-style-type: none"> • 12mm concrete drill bit (PA Door anchor bolts) • 16mm concrete drill bit (Wind-posts, roller door jambs & portal anchor bolts for U-Shape plates) • 18mm, 20mm & 24mm concrete drill bits for large buildings as required 
<p>4.</p>	<p>Angle grinder</p> <ul style="list-style-type: none"> • For cutting wind post top ends, girts, general • With steel cutting disc and grinding disc 

5.	<p>Rattle gun or Socket wrench and shifting spanners/crescents</p> <ul style="list-style-type: none"> • 24mm socket for structural bolts • Other size sockets to suit concrete anchor bolts 
6.	<p>Electrical cord & surge protector</p> 
7.	<p>Magnetic Tek Screw Driver Adaptor x 2</p> <ul style="list-style-type: none"> • 3/8" x 65mm for framing screws • 5/16" x 65mm for wall and roof sheeting screws 
8.	<p>Pop rivet gun</p> 
9.	<p>Tin snips</p> 
10.	<p>Tape measures – short and long</p> 
11.	<p>String line</p> 

12.	Spirit level 
13.	Hammer / sledge hammer 
14.	Ladders / working platforms / height access machinery 
15.	Folding tools – for shaping flashings and door and window frames, etc 
16.	Clamps 
17.	Builders pencil & permanent marker 
18.	Caulking gun and tube of clear silicon 
19.	Chemical anchor kits – chemset, anchor fix or similar (only required if the anchor brackets for your building require them, refer your plans and specifications) 

GENERAL CONSTRUCTION TIPS

1. CHECK THE KITSET PARTS SUPPLIED

Your building will have many parts and it is crucial that these parts are checked thoroughly before starting construction for anything that may be missing, damaged or incorrectly supplied. Please check over all the physically delivered material items against the “CUSTOMER CHECKLIST” that you would have been emailed. If you do not have a Customer Checklist then contact your X Span representative for a copy.

It is the customer’s sole responsibility to ensure that all materials noted on the delivery dockets are supplied and that they are in satisfactory condition when taking possession of the kitset items. In the event of material damage or under supply, this must be written on the delivery dockets and signed by the driver. Any claim must be made by written notice to X Span within three (3) business days and subsequently X Span must be given reasonable opportunity to inspect materials following any such notice – otherwise it will be deemed that all materials have been accepted by the customer.

You will also have a document titled “SITE BUILD LIST”. This document lists all the supplied components for your building and where they are to be used. This is a very useful reference during construction to help with knowing where certain parts are to be used.

2. BUILDING PLANS

It is important that you study all pages, all details and all content of the Structural Plans for your building before you commence construction. These Structural Plans produced by X Span, and signed by X Span’s structural engineer, will have a high level of detail to help you understand how to assemble your steel building. These Structural Plans need to be read in conjunction with your Site Build List and this Construction Manual.

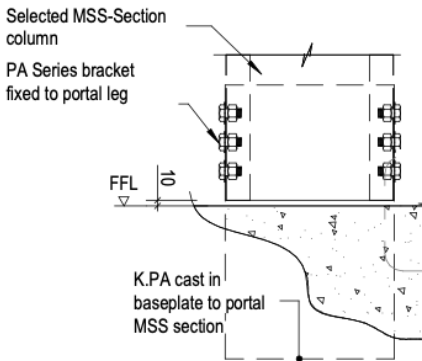
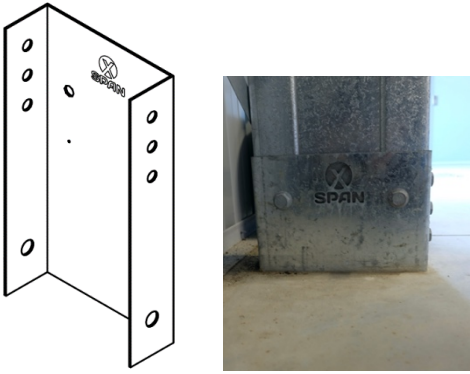
If in doubt about any detail on your Structural Plans contact your local X Span representative for clarification and advice. Please do not make assumptions. This Construction Manual is a useful tool to identify some generic construction tips, provide useful advice and to help make assembly of your steel building easier.

3. PORTAL BRACKETS IDENTIFICATION

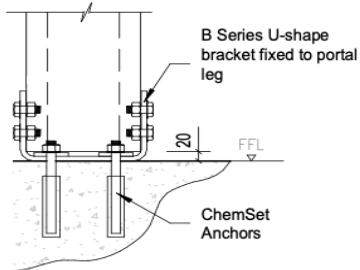
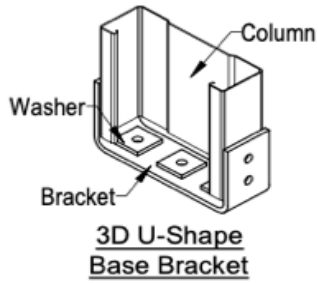
Below are the main K5S® portal brackets. Please note that these items, along with all other components, will be clearly identified in your set of Structural Plans for your steel building (Note: if your building is a mono-pitch roof design then no Apex joint brackets are supplied).

Portal Anchor brackets

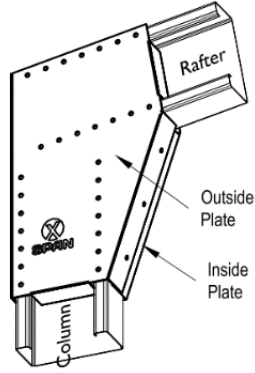
- Cast-in-concrete e.g. PA300



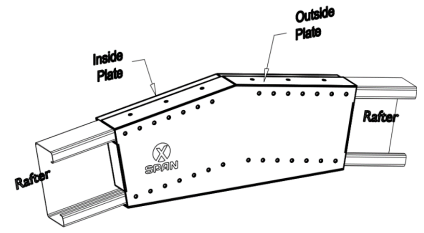
- Surface Mounted U-Shape e.g. B15



Portal Knee joint brackets



Portal Apex joint brackets



4. FRAMING TEK SCREWS

It is important to take note that there are 2 types of framing tek screws supplied.

- a) **Atlas tek screws** – these are for the installation of the K5S® steel portal bracket system.

NO OTHER TEK SCREW CAN BE USED FOR FIXING THESE BRACKETS.



- b) **General 14g framing tek screws** – these can be used for all other connection details for the framing of the building and are most likely to be a Konnect or Bremick branded 25mm or 30mm tek screw. These may vary on a job by job basis.

Under NO circumstances can these screws be used for the installation of the K5S® portal brackets.

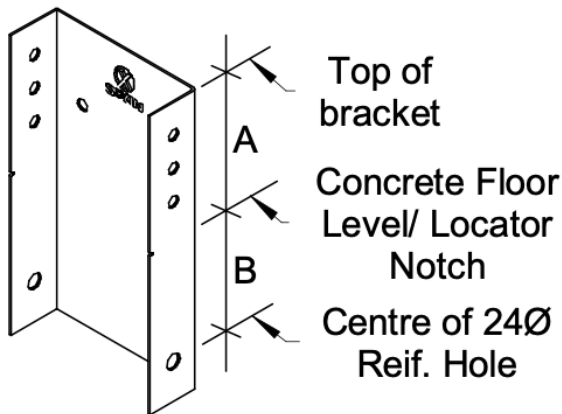


CONSTRUCTION METHODOLOGY

1. BUILDING SET OUT

- a. Ensure your building site is level and clear of any debris and obstructions. Ideally this level and clear area should extend for 3m outside the building footprint.
- b. In the Structural Plans you will find detailed measurements for the concrete foundations/slab and anchor bracket set out, including foundation plans, foundation details, foundation/earthworks & ground preparation notes, structural base plans, steel notes and connection details etc.
- c. Below is a diagram showing the height that PA anchor brackets need to be set at in relation to the FFL (Finished Floor Level of concrete). **IMPORTANT** – Prior to setup you need to check that all portal anchor brackets have been correctly manufactured to the right size, so that they fit snug to the outside of relevant portal legs.

K5S® Portal Anchor Bracket Setup Details



Bracket	A	B	Bolts per flange
PA200	166	125	2
PA250	218	175	3
PA300	218	225	3
PA350	218	275	3
PA400	270	300	4



- d. The photos above show examples of how the PA anchor brackets can be secured in place prior to pouring the concrete foundations.
- e. When setting up the PA anchor brackets make sure firstly that the orientation of each anchor bracket coincides with what is shown on the Structural Plans, and secondly that the two anchor brackets for each individual portal are orientated the same. Refer to the structural base plans for correct orientation of each PA anchor bracket. In most cases the end portals are orientated with the open 'C' facing out for end walls that are closed in with wall cladding, and facing in when the wall is not clad.
- f. The end portals may be a smaller size "C" section than the mid portals. Make sure each anchor bracket is the correct size to suit the portal leg and ensure they are positioned correctly in the foundations as per the orientation and set out dimensions on the Structural Plans.
- g. K5S® Portal Anchor ("PA") brackets are the most commonly used bracket for bolting the bottom of the portal legs to. These are cast-in the concrete, and therefore need to be set up prior to pouring the foundations (see photos and table above). For our smaller shed range that typically uses smaller sized portal sections, for example C150 portals, a U-Shape surface mounted anchor bracket, "B" type, is commonly specified and supplied. These require fixing on top of the concrete foundations, secured with threaded bolts and chemical anchor as detailed on the Structural Plans.

2. ASSEMBLY OF THE PORTALS

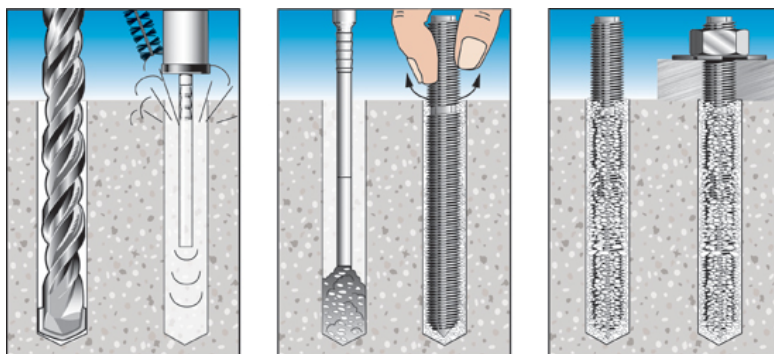
- a. Assemble your first portal with the bottom end of portal columns positioned into Portal Anchor brackets to determine width of portal, with the flat side of the portal members facing down.
- b. Pack portal columns & rafters off the floor slab to enable enough clearance under to install the Atlas tek screws into the K5S® knee and apex brackets for ease of assembly.
- c. Refer to the Structural Plans for dimensions of each portal, including the diagonal measurements.
- d. Fit the 'Inside' knee and apex brackets first and then secondly fit the 'Outside' brackets.
- e. NOTE: USE ONLY THE ATLAS TEK SCREWS SPECIFIED ABOVE FOR FIXING OF THE PORTAL BRACKETS.
- f. The 'Inside' knee brackets will have either a small notch or 3mm diameter hole – these are for locating the position of the portal leg on the knee bracket and the portal rafter on the apex bracket. The portal rafter locates to the edge of the knee bracket so there is no need for any locating detail there.
- g. Square up the portal frame by checking diagonal measurements & apex height as specified on Structural Plans supplied. Run a string line or mark a chalk line on the floor between the bottom of the portal legs. Measure from this line to get the correct apex height of the portal before fixing all Atlas screws to the portal knee and apex joints.

- h. After the first portal has been assembled on the ground, it may be simpler to assemble the other portals on top as a stack to make it easier to get the overall dimensions correct.
- i. On small buildings the portals may be able to be stood up in place using a small team of people. However on bigger buildings it is recommended a hiab or crane is hired (operated by a professional operator) to crane the portals into place. If all the portals are assembled prior, this will minimise the time a crane needs to spend on site.
- j. Each portal, as it is erected, should be securely bolted to the portal anchor brackets, checked for plumb and securely braced.
- k. Wind Posts:
 - i. Refer to the Structural Plans for wind post locations. End portals and partition/divisional wall portals are the only portals that will have wind posts. The number of wind posts required will be shown on the Structural Plans. Note: if preferred the wind post top bracket(s) can be fitted to the portal rafters before standing the portal up.
 - ii. First position the wind post in the correct position, with the bottom 5mm above FFL. NB: the bottom end will have two holes pre-drilled for connection to the WA base anchor bracket.
 - iii. The wind post WA anchor bracket can be positioned and fitted to the floor at this stage also – refer to the Structural Plans for correct location.
 - iv. The wind post will need cutting to its correct length. Use the angle grinder with the steel cutting disc for this. See the detail in the Structural Plans for how the top of the wind post should be cut/notched around the rafter.
 - v. Fit the wind post top bracket to the portal rafter using 16mm structural bolts. You will need to drill 18mmØ holes for the bolts in the rafter and likewise the top of the wind post. However, for wind posts whereby the top of the wind post is positioned in line with an apex bracket (if relevant to your shed type) then part of the wind post top bracket has been manufactured for fixing with x 12 tek screws to this location, instead of bolts. In lieu of the pre-drilled apex bracket tek holes that have been covered up by the wind post top bracket, insert the same number of tek screws through the wind post top bracket and into the apex bracket as close to those positions as possible.
 - vi. Fix all wind posts to the top bracket and the WA base anchor bracket as per detail shown on the Structural Plans.
- l. Tips:
 - i. When assembling portals, to minimise the number of tek screws needing to be installed from underneath, install the 'Inside' knee bracket to the portal leg first, and the inside apex bracket to the rafters first. Then when you turn them over to join the rafters to the legs, the only tek screws needing to be installed from underneath will be rafter nest of the inside knee bracket.
 - ii. Before standing each portal frame put Tek screws along the rafters and legs @ the spacings of the roof purlins and wall girts for easy location when installing the roof purlins and wall girts down the track.
 - iii. Ensure all brackets are fully secured with tek screws in all holes before lifting the portals into place.
 - iv. Installing the wind posts, wall girts and any other framing members on the end portals, whilst they are lying on the ground, may in some cases be easier and save time rather than do the framing after the portal is erected.

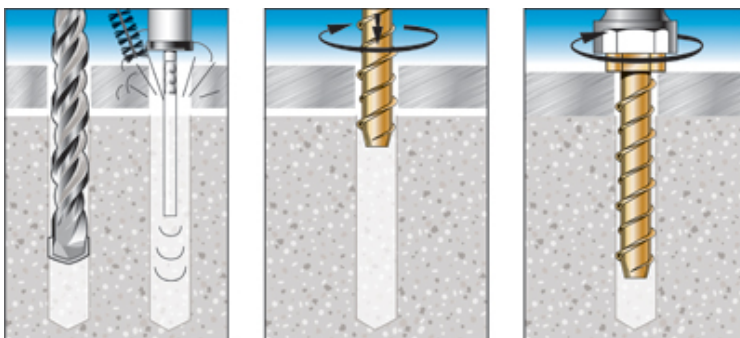
3. GENERAL CONSTRUCTION

The Structural Plans for your steel building need to be read in conjunction with your Site Build List and this Construction Manual. Refer to these 3 documents for all detail regarding the construction of your building. Listed below is a general order of construction, including a few tips.

- a. **U-Shape anchor brackets (surface mounted)** – If relevant to your building design, install U-Shape portal anchor brackets where required. These brackets will need to be chemset fixed with threaded bolts as specified on the Structural Plans. Steps as follows:
- Drill hole to the required size and depth
 - Blow or vacuum out all loose debris
 - Fill the hole with chemset product
 - Insert the threaded bolt in the hole
 - Tighten the nut on the base bracket



- b. **Wind post WA brackets, roller door jamb WA brackets and other opening jamb brackets (surface mounted)** – These brackets are fixed using tru-bolts, simply screwed into the hole as per the following steps and diagram:
- Drill hole to the required size and depth
 - Blow or vacuum out all loose debris
 - Insert the tru-bolt in the hole
 - Tighten the nut on the base bracket



- c. **Standing of portals** – brace them extremely well to avoid the risk of them falling or blowing over from sever wind. If in doubt, always over brace.....it is better to be safe than to be sorry! Use your level to make sure they are installed plumb. Fix some rows of roof purlins to help position and brace portals as they are erected.
- d. **Wall girts and roof purlins (tophat material)** – install as per the details and locations specified on your Structural Plans and Site Build List. When fixing the ends of tophats at doorway and window openings ensure the height and depth of the tophat is correct. It is easy to open up (reduces the depth) or close up (increases the depth) the flanges of the tophat and this can affect the neat fitting of any flashings that are fixed to them - e.g. window and door jamb flashings, header flashings, etc.

- e. **Vermin Flashing to base** – if applicable to your building design, this acts as the bottom wall girt where required. This would be a standard member for any building that has a concrete slab.
Predrill the holes for the masonry screw bolts first. See the Structural Plans for maximum spacings of the screws.
- f. **Eave Flashing** – fits over the upper most wall girt and first roof purlin using wafer tek screws, along the side of the building.
If there is roof safety netting and underlay to be installed, predrilling the flashing for the safety netting tie-off, prior to installation, will save time later.
- g. **End angle trimmer** – fits over the ends of the roof purlins at each end and acts as the top wall girt/fixing member for the end wall sheeting. Fix with wafer teks as per the details on the Structural Plans.
- h. **Wall and roof cross bracing** – install as per the details on the Structural Plans. To ensure maximum effectiveness these must be taut, with no sag or slack present.
- i. **Wall and roof fly bracing** – if applicable install as per the details on the Structural Plans.
- j. **Bracing posts** – if applicable install as per the details on the Structural Plans.
- k. **Roller door frames** – install as per the details and locations specified on the Structural Plans. Jamb (side) members will need to be cut to length if the roller door is located in an end wall. For side wall located roller doors, jambs should be supplied to the correct length.
- l. **Window and door frames** – installed as per the details on the Structural Plans.
- m. **Roof sheeting installation**
 - i. Check the quantity of roof sheets and their effective cover compared to the length of the building to make sure there will be enough. In some cases you may need to start the first sheet up to 100mm from the end to get sufficient cover.
 - ii. If there is roof safety netting & roofing paper (underlay) under the roof sheeting then this must be installed before the roof sheeting is screwed in place. If the eave flashing has been predrilled prior to installation this will make it easier to tie off the safety netting.
 - iii. Remember, the netting is only there to hold up the roofing paper and/or for placement as required under skylight roof sheeting. It is not there to carry the weight of a person or any materials other than the roofing paper.
 - iv. If applicable, be careful to apply the building paper evenly to avoid crinkles or bubbles and with the required overlap as per manufacturers specifications.
 - v. Align first roof sheet at one end of the building. It is important to get this sheet plumb and aligned. Allow the sheet end to protrude into gutter the recommended overhang – refer Connection Details on the Structural Plans.
 - vi. Fix the supplied roofing tek screws, through the rib, in locations and frequency as specified on the Structural Plans.
 - vii. If the last sheet to be applied on the roof requires cutting along the edge, and this edge cut is located in the pan.....then cut sheet edge and if required turn up the pan edge with a folding tool to avoid future leaks. Tin snips or ideally electric nibblers are best suited to cut sheeting (Note: Do NOT use an angle grinder or a rotating saw blade as these tool types will create sparks and hot debris which will damage the surface of colour coated material such as Colorsteel sheeting).

- viii. If you haven't yet weathered the ridge (upper) end of all roofing sheets now is a good time to do it. Simply turn the pans up to the same height as the ribs, with a folding tool or broad clamp pliers.
- ix. After installation, the whole roof should be swept and hosed off to remove all metal fillings, including sweeping/hosing the gutters.

n. Wall cladding installation

- i. Side wall cladding - start the first sheet of wall cladding from a corner and work your way along the wall. If a roller door or open bay exists on a side wall then shorter (header) wall sheets will be supplied to these areas.
- ii. End (gable) wall cladding for a gable type building - check the quantity of end wall cladding sheets provided, then start from the centre of the wall and proceed in both directions to the corners. Each sheet will be supplied at a different length so ensure you use the right length sheet in the correct location. If a roller door exists then shorter (header) wall sheets will be supplied to these areas.
- iii. End wall cladding for a mono-pitch type building - start first sheet of wall cladding from a corner and work your way along the wall. Each sheet will be supplied at a different length so ensure you use the right length sheet in the correct location. If a roller door exists then shorter (header) wall sheets will be supplied to these areas.
- iv. Cut sheets out for PA door, ranch slider and windows openings where applicable. Ensure all steel framing for openings is installed to suit as per the details on the Structural Plans. Tin snips or ideally electric nibblers are best suited to cut sheeting (Note: Do NOT use an angle grinder or a rotating saw blade as these tool types will create sparks and hot debris which will damage the surface of colour coated material such as Colorsteel sheeting).
- v. Make sure that all wall cladding is adequately fixed around all openings. This is particularly important to the underside of any windows so to ensure that the window sill is held firm and rigid. This will help eliminate the risk of the window sagging in the middle, particularly with large double glazed windows which are known to sag in the middle under their own weight.
- vi. Allow the bottom of all relevant wall sheeting to hang below the FFL (Finished Floor Level of concrete) the required measurement as noted on Connection Details on the Structural Plans. In most cases this measurement is 45mm.
- vii. End wall sheets will need the tops to be cut to allow for the rafter rise/roof pitch. Tin snips or ideally electric nibblers are best suited to cut sheeting (Note: Do NOT use an angle grinder or a rotating saw blade as these tool types will create sparks and hot debris which will damage the surface of colour coated material such as Colorsteel sheeting).
- viii. Ensure the end angle trimmer has been installed prior to installing the end wall cladding.
- ix. Keep the bottom/base of wall sheets dead level for a tidy finish - remember that the top of all wall sheeting is covered by the guttering or barge flashing.
- x. Keep all screw lines straight by using a 'flick line', or alternatively predrill the screw holes before installation.
- xi. Fix the supplied wall tek screws, through the pan, in locations and frequency as specified on the Structural Plans.

o. Flashings, guttering system and whirly bird vent installation

- i. Corner, opening and all other wall flashings – fix as required.
- ii. Barge flashing - this can be placed and fixed once all wall flashings have been installed.
- iii. Ridge flashing - before placing and screw fixing the ridge flashing, first unfold the flash guard edging so once the ridging is fixed in place it can be pushed into the pans of the roof sheeting for weather proofing.

- iv. Guttering system – install as required.
 - v. Whirly bird roof vents – install as per manufacturers installation manuals.
- p. **Roller door, PA door and joinery installation**
Install as required as per manufacturers installation manuals and details shown on the Structural Plans.
- q. **Clean Up**
- i. Swarf – there will be lots of metal filings resulting from installing the self-drilling tek screws. Sweeping up after assembling the portal brackets will minimise the swarf being tracked all over the site. When installing the roof, ensure there is no swarf stuck to the soles of footwear. Swarf will rust very quickly and cause unsightly markings in the surface of areas it is in contact with, causing corrosion and spoiling the aesthetics of the building.
High risk areas are horizontal/sill type flashings (e.g. bottom of wall cladding, vermin flashing, door and window header flashings, roof, gutters). Sweep the swarf from these areas as soon as possible at all times. Sweep/flush the gutters out after sweeping the swarf from the roof, before connecting downpipes to the drainage system.
 - ii. Building exterior – on completion wash the entire building thoroughly. Ensure to wash the exterior of your new X Span building on a regular basis in accordance with the New Zealand Steel product maintenance recommendations.
Guidance on suitable environmental conditions, regularity of maintenance requirements and warranties can be sourced at the New Zealand Steel website, www.nzsteel.co.nz. Some product guides and warranties are also available on the X Span website. Specific materials warranties, based on building location and environmental conditions, take precedence over any kitset guarantee on materials provided by X Span.

Happy building!!!!
And if in doubt, phone your local
X Span representative for assistance.

Construction Photos













FROM CONCEPT.....TO COMPLETION.....THE X SPAN EXPERIENCE IS BEST!