



Install metal structures and features

AHCLSC308

By the end of this topic, you should be able to:

- Plan and prepare work
- Set out the site for the structure
- Prepare and cut metal components
- Assemble and erect structure
- Check quality of work and clean-up site

You will be directed to complete a number of activities during this presentation.
Compile your responses into one submission and email your work to training@cstc.org.au
with the subject 'AHCLSC308 Activities'

Metal structures/features

- There are a range of metal structures/features that may be built, including:

Fences



Handrails



Seats



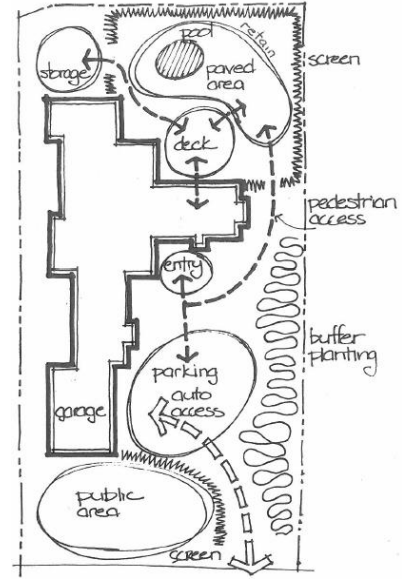
Screens



Plan and prepare work

- To prepare for metal landscape projects, you should interpret plans and specifications
 - Landscape concept plans
 - These are a visual record of ideas
 - Usually rough freehand drawings

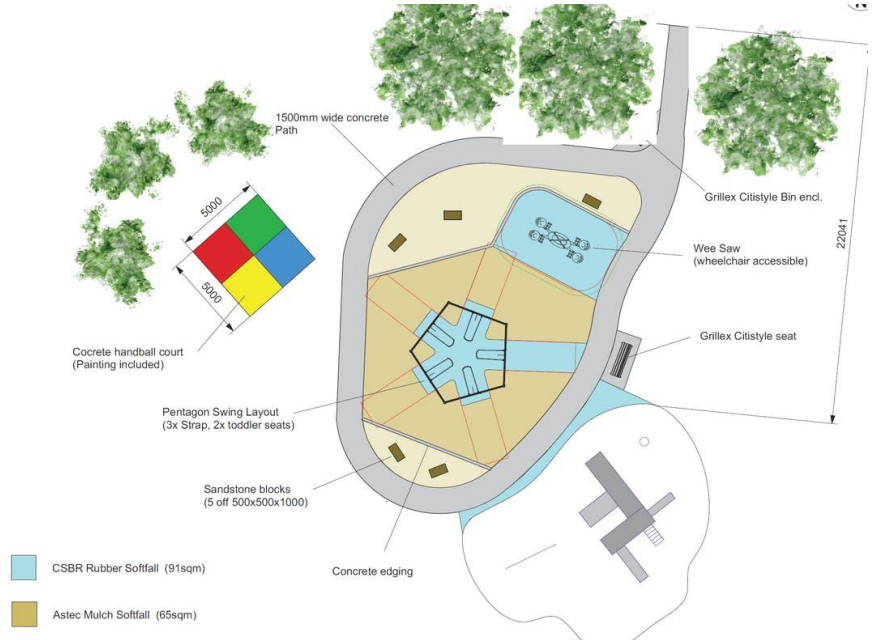
Activity 1: Draw a simple concept plan for a proposed landscape design which includes metal structures/features



Plan and prepare work

- To prepare for metal landscape projects, you should interpret plans and specifications
 - Landscape plans

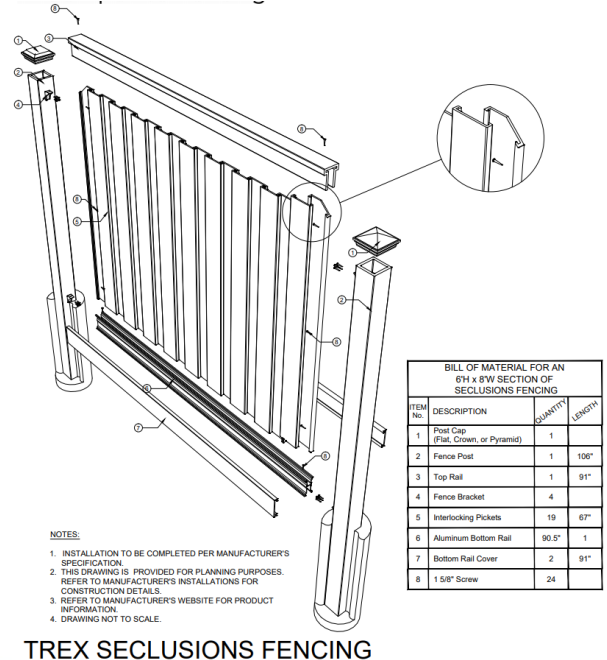
Activity 2:
Identify/list the detail
on the landscape
plan shown



Plan and prepare work

- To prepare for metal landscape projects, you should interpret construction details
- Details the components of a structure and how they fit together
- Provides material symbols

Activity 3: List the materials required for the metal structure construction plan shown



- To prepare for metal structure/feature projects, you should familiarise yourself with the task requirements
 - Required materials, tools and equipment
 - Proposed site of metal structure/feature
 - Location of services
 - Measurements
 - Drainage requirements

- The materials to be used for metal structure/feature projects will differ depending on the work to be completed.
- However, some common materials include:
 - Metal posts
 - Fastenings (e.g. screws, bolts)
 - Concrete
 - Steel reinforcement
 - Paint and other finishes

It is your responsibility to check the quantities and quality of materials matches the specifications

Plan and prepare work

- To prepare for metal structure/feature work projects, you should organise required PPE, machinery, tools and equipment
 - **PPE may include:** Face mask, gloves, goggles, ear protection, long pants, sleeved clothing, wide brimmed hat, work boots
 - **Safety equipment may include:**
 - Bunting and barricades to reduce risks to personnel on site (e.g. marking exclusion zones)
 - Signage to convey safety messages – placed visibly in the relevant work area, at eye height
 - **Tools and equipment may include:** Shovel, spade, stringlines, levels (line, spirit), square, electric drill, saw, grinder, paint brush, tape measure and cement mixer



Ensure they are appropriately selected, prepared and used for the task, following manufacturer recommendations

Plan and prepare work

- To prepare for metal structure/feature projects, you should familiarise yourself with the work area
 - Identify any WHS hazards and assess risks (e.g. unauthorised persons in work area, underground services, manual handling)
 - Consider the environmental impacts of the proposed works (e.g. noise, waste materials, degradation of land/flora/fauna)
- Report hazards to your supervisor within a timely fashion – especially emergency situations

Workplace risk assessment

- Risk is measured in terms of the seriousness of the possible **consequences** of the hazard and the **likelihood** that those consequences will occur, as in the matrix shown below:

Likelihood

- 1: Very Likely
- 2: Likely
- 3: Possible
- 4: Unlikely
- 5: Very Unlikely

Consequences

- A: Death or Permanent Disability
- B: Serious Injury
- C: Lost Time Injury
- D: Casualty Treatment
- E: First Aid

Matrix	A	B	C	D	E
1	E	E	H	H	M
2	E	H	H	M	M
3	H	H	M	M	L
4	H	M	M	L	L
5	M	M	L	L	L

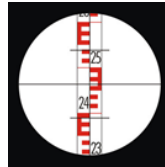
Prepare profile and footings

- Follow the steps outlined below when setting up the site:
 - Locate services (e.g. telephone, gas, electricity, water, cable, sewerage)
 - Contact Dial Before You Dig to check the location of such services
 - Mark out the position of the metal structure or feature
 - Locate existing elements/structures to take measurements from
 - Mark out the construction area
 - Use chalk on hard paved surfaces
 - Use stringlines and pegs over soil or turf
 - Marking Paint
 - A long garden hose may also be useful for marking out shapes on both hard and soft surfaces



Prepare profile and footings

- Follow the steps outlined below when setting out the site:
 - Establish survey benchmarks
 - Benchmarks are based on established datum points
 - A datum is a level surface above or below which all heights are measured – think of it as a ‘starting point’



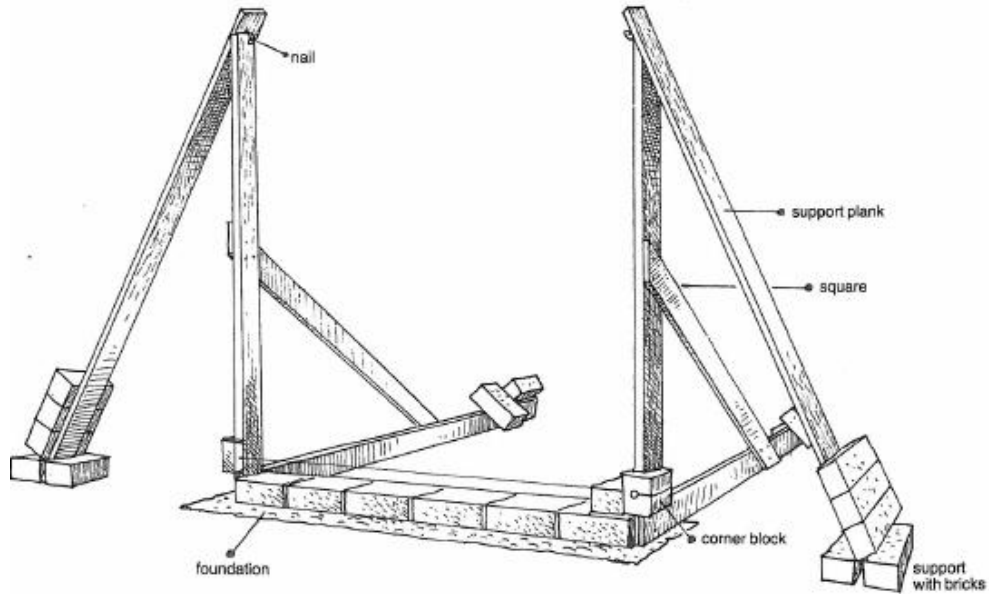
- The position of the job datum should be clearly marked on site plans
- Benchmarks are fixed points of known height to which other points can be referred
- Benchmarks should be established on positions or structures where they cannot be disturbed by construction activity

Prepare profile and footings

- Follow the steps outlined below when setting out the site:
 - Establish profiles to conform to the designated tolerances
 - A profile is a temporary fixture (e.g. timber pegs with cross boards attached) which assists in determining a structure's position and intended height
 - Stringlines are positioned from profile to profile in the exact position and height of the structure/feature. By sighting through two stringlines (i.e. one at the top of the feature construction and one at the bottom), a plane or finished face can be seen
 - This is the front face to build the metal structure/feature to



Prepare profile and footings



Prepare profile and footings

- Depending on the type of structure/feature, footings may need to be constructed to secure the structure into the ground
- A foundation is the excavated trench or hole into which the footing is placed – it is responsible for supporting the structure/feature
 - It is necessary for the foundation to be excavated to a stable base material
 - If there are any areas that are soft fill, they should be compacted and filled with a roadbase-type material
- The concrete should be poured into the foundation continuously, rather than in small sections, to avoid movement of the structure/feature



Prepare and assemble metal components

- To prepare metal components for assembly, you should:
 - Check your materials
 - Check packs of metal on delivery for any defects
 - Advise the supplier immediately if you encounter any issues
 - Check the delivery docket to ensure the order is complete
 - Lay out components are laid out for easy identification and access (e.g. according to material and size, stacked next to the job area or next to the plant required to move it (not blocking access)).
 - Mark out the position of cuts and joins
 - Mark out the position of all joints on posts and position galvanised saddles, where applicable
 - Use a pencil to square and mark out all cuts and joins
 - Line up all metal requiring cutting or joining at the same position to check there are no errors
 - Always cut to the waste side of mark-out lines
 - Securely clamp metal before cutting it with either hand tools or power tools (e.g. hand saw or electric saw)

- There are various methods that may be used to fix/join metal components, including:
 - **Drilling:** Using screws, nuts and bolts to connect pieces
 - **Riveting:** Punching a hole into two pieces of metal to be joined, and connecting them with a metal rod known as a rivet
 - **Welding:** Melting pieces and adding a filler material to become a strong joint
- It is difficult to recover from mistakes when working with metal, so check measurements and markings before you commencing work
 - For example: Hold brackets up to the structure, then mark and pre-drill holes. Ensure all required components are flush.

- Tips with regards to assembling, joining and fixing metal components:
 - Bracing (temporary or permanent) may be required to hold components into place and rigid until assembly is complete
 - When the structure is finished, ensure all components are secured and complete
 - Undertake cosmetic work as required (e.g. cutting off overhangs, plugging holes) before any painting occurs
 - The aim of any coating is to do two things:
 - Protect the metal from the elements
 - For wrought iron or steel in severe conditions, use a primer
 - For aluminium and brass use an SLS etch primer
 - Enhance the structure's aesthetics

Assemble and erect structure

- Examples of metal feature installation: Colorbond fence
- Step 1: Measure and mark out a string line
 - Run a string line along where the colorbond fence will be built and where the posts will be set-out and sunk. Use the marker paint to mark along the ground where the string line is.
- Step 2: Measure and mark where the fence posts will be sunk
 - Place the plinth, so that it's running along the string line and flush with where the fence will start. Use the marker paint to mark on the ground where the end of the plinth is. Using the plinth as your measure, pick it up and then mark where the next post will be set-out and sunk. Repeat this until you reach the end of where the fence will be. Remove the string line.



Assemble and erect structure

- Examples of metal feature installation: Colorbond fence
- Step 3: Before digging the post holes
 - Before you start digging, call your water, gas and electricity providers to make sure that there aren't any pipes where you'll be digging. Also, take into account the height of the plinth, the fence panel and the fence capping, this will help you work out how high to set your posts, so that you have a straight line running across the top of the fence. Refer to the instructions for help.
- Step 4: Dig the holes for the posts
 - Dig the holes for the posts where you marked the spots on the ground with the marker paint. The depth of the holes will depend on how high you want to set the posts.



Assemble and erect structure

- Examples of metal feature installation: Colorbond fence
- Step 5: Join two posts together
 - Where two fence panels meet you will need to join two posts together, so that Colorbond fence panels can be fitted on either side. To join the posts lay them back to back on the saw horses and clamp them together at both ends, so they are flush. Read the instructions that come with the colorbond posts. It tells you where the screws should be drilled, depending on the length of the post. After joining one side with screws, turn the posts over and fix from the other side.
- Step 6: Sink the posts and check their height
 - Sink the first and second posts at either end of the first plinth. With your tape measure, check the height of both posts. If a post needs to be higher, add more soil to the hole. If the post needs to be lower, take some soil out of the hole. Do this until both posts are the same height.



- Examples of metal feature installation: Colorbond fence
- Step 7: Check that the fence is level
 - It's important before setting the posts that you check that the fence is level. Place the spirit level on the plinth board to make sure it's flat. If necessary, adjust the soil level below the plinth to get it flat. Use the spirit level to also check that the posts are straight.
- Step 8: Set the posts in the ground
 - Once the posts are straight, pour the quickset concrete around them, add the water, following the instructions on the pack. Backfill the hole with dirt and use the spirit level to check that that the post is still straight. If it isn't adjust it as required. Continue this process of laying the plinths, digging the holes and setting the posts into the ground until you've finished.



Assemble and erect structure

- Examples of metal feature installation: Colorbond fence
- Step 9: Cutting a plinth board to size
 - When you come to the end of the fence, you might need to cut a plinth board to fit. To do this, measure the gap between the last two posts. Mark this distance out on a plinth board. Clamp the plinth board to the saw horse and cut it. Slide this piece of plinth between the last two posts and make sure it's sitting level.
- Step 10: Install the bottom rail
 - Before you can put the Colorbond panels in place, you will need to install the bottom rail. Insert the rail between the first and second post and use the spirit level to make sure it's level. Once its level, use the cordless drill to screw through the post and into the bottom rail to secure it.



Assemble and erect structure

- Examples of metal feature installation: Colorbond fence
- Step 11: Insert the first panel
 - This where you will need someone to help you. Always follow the instructions and install one Colorbond panel at a time. Starting at one corner, insert the bottom of the panel near the end post, tip it onto an angle and then push it down into the bottom rail. Slide the panel back, so that it's flush with the post.
- Step 12: Insert the top rail into the first panel
 - Slide the top rail, between the two first and second posts so that it secures the first panel. Push the corrugations on the Colorbond panel into the top rail but leave the last corrugation free, so that the next panel can be secured to it.



Assemble and erect structure

- Examples of metal feature installation: Colorbond fence
- Step 13: Insert the other panels
 - Follow the same procedure to insert the next panel. Insert the lower end of the panel first, so that its first corrugation overlaps with the last corrugation on the first panel. Push the second panel into the bottom rail. Push the top rail down to secure the second panel. Insert the final panel, the same way.
- Step 14: Secure the top rail
 - After installing of the Colorbond panels in the first section of fencing, push the top rail down to secure them. Use the spirit level to make sure the top rail is level. Once level, use the cordless drill and screws to secure the top rail by drilling through the posts at either end of the panels.



- Examples of metal feature installation: Colorbond fence
- Step 15: Install the other Colorbond panels
 - Repeat the previous steps to install the bottom rail, the infill panels and the top rail until you have completed the large sections of the Colorbond fence.
- Step 16: Cut an infill panel to fit
 - If you need to cut a Colorbond panel to fit, measure the distance between the two posts. Mark this distance at the top and bottom of the Colorbond panel and use the spirit level to draw a straight line between them.



- Examples of metal feature installation: Colorbond fence
- Step 17: Cut the panel
 - Put on the safety glasses, gloves and ear muffs and use the angle grinder to cut the panel along the line you marked.
- Step 18: Measure and cut the top and bottom rails
 - Using the measurements from the infill panel that you cut, measure and mark them onto a rail for the top and bottom of the fence. Clamp the rail onto the saw horse and use the angle grinder to cut the two rails to the right length.



- Examples of metal feature installation: Colorbond fence
- Step 19: Insert the last panel
 - Slide the bottom rail between the two posts. Make sure it's level and secure it with the cordless drill and screws. Insert the last panel. Secure it using the top rail. Check that the top rail is level. Use the cordless drill and screws to secure it to the posts.
- Step 20: Fit the caps to the post
 - To finish the fence off, fits the caps by pushing them onto the posts. For half posts, use the tin snips to cut either side of a full cap and snap it in half. Fit these half-caps on top of the half posts at either end of the fence.



Assemble and erect structure

- Examples of metal feature installation: Screens
- Step 1: Dig the post holes
 - Measure the width of your screen panels and mark the corresponding position for the posts on the ground. Then dig your holes deep enough to hold a third of your posts, which will help support the weight of your screen.
- Step 2: Concrete the posts in
 - Before you start, make sure you follow the screen manufacturers instructions and wear your safety gear. Insert your posts in the holes, pour in the concrete and mix in some water. For these panels, the manufacturer advises using ready mix concrete instead of quick set concrete.



- Examples of metal feature installation: Screens
- Step 3: Check the levels
 - Use your spirit level to make sure the posts are straight. Also, measure the posts top to bottom to ensure they're the same height. And make sure they are the correct width apart.
- Step 4: Backfill the holes
 - Once the concrete has set, fill the holes back up with dirt.



- Examples of metal feature installation: Screens
- Step 5: Attach the brackets to the screen
 - Hold the brackets up to the back of the screen's frame and pre-drill holes either side of the frame. Then screw the brackets on. Repeat this process for the other three brackets. You should have two on each side of the panel.
- Step 6: Attach the screen panel to the posts
 - Now pre-drill holes into the inside of the posts and screw the panel onto them. The brackets sit at the back of the screen with two on each side to hold the panel securely in place. This will make the front of the screens flush to the front of the posts.



- Examples of metal feature installation: Screens
- Step 7: Install more screen panels
 - If you want to add more screens, install additional posts by repeating Steps 1-4 and attach the screens the same way you did in Steps 5-6.



- After constructing the metal structure/feature, you are required to complete the following practices:
 - Compare the quality of the finished works with the drawings and specifications standards
 - Record and/or report your work outcomes to your supervisor
 - Clean up the work area
 - Store any unused metal components for future re-use
 - Shut down, maintain, clean and store tools and equipment
 - Follow manufacturer's specifications and supervisor's instructions
 - Report faults that are discovered in logbook and/or site records

Activity 4: Have team members take photos and videos of your involvement with metal structures/features. Be sure to include all stages of construction.

- After installing the metal structure/feature, you are required to complete the following practices:
 - **Dispose of materials that cannot be reused or recycled**
 - Separate soil, reusable and waste material (e.g. organic, inorganic and recyclable piles)
 - Ensure that you follow the enterprise guidelines (e.g. JSA and SWMS for handling and disposing of waste)
 - Follow Safety Data Sheets (SDS) and environmental plans to ensure environmentally safe practices

