

Concrete Guidelines

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Introduction

This guide has been developed to assist contractors achieve the correct installation of concrete in slabs and ramps in ProWay Yards (both sheep and cattle). It describes the various steps and techniques involved required to ensure a quality ProWay project outcome.

As a general rule, ProWay installers will lay concrete for core yard areas. When larger and more complex slabs are involved, ProWay recommends professional concreter's be engaged by the client.

The information is general in nature and intended to guide contractors for standard scenarios. Specialist advice from ProWay construction staff should be sought for complex or specific design issues not covered in this guide. General industry information is readily available ConcreteBasics.pdf (ccaa.com.au) and should be referred to as required.

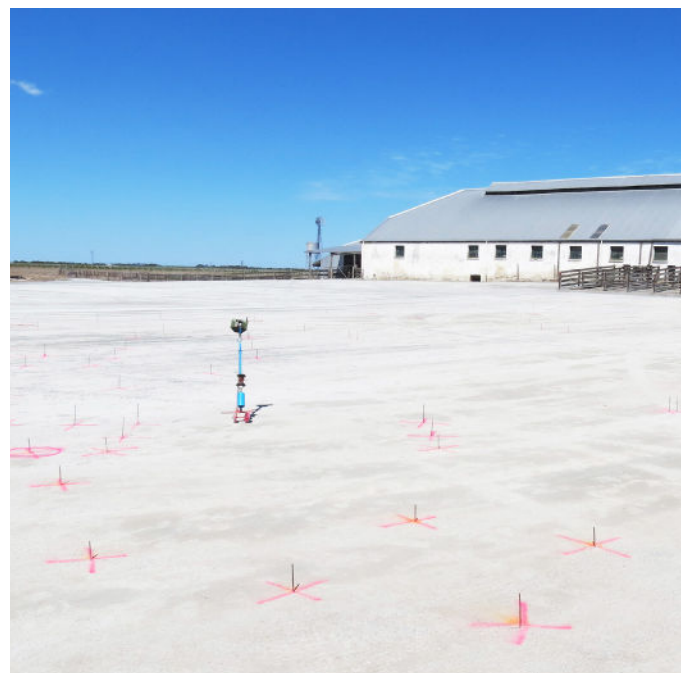
Concrete is an unforgiving commodity so appropriate effort in preparation and set up is critical in achieving a successful and trouble-free concrete pour. Having sufficient resources available to assist on the day is a crucial element of success.



Pad Conditions

The pad should have been appropriately prepared by the client prior to the installer arriving in accordance with the site preparation guidelines issued by ProWay. Ensure you check that the pad has been formed correctly and that adequate compaction has been achieved. Poor compaction will lead to movement and slab cracking in the future.

Check for any high spots where slabs are to be installed. High spots will reduce slab thickness, strength and integrity. High spots can be found easily with string lines or a laser and then the site adjusted slightly as required. Thicker is better, particularly in high load / traffic areas.



Slabs or Yards first?

With more and more yard areas being concreted and under cover, there is an increasing trend to lay the concrete slab first and then install the yards.

This process has distinct advantages for larger slabs however requires the use of "block outs" to create concrete free areas. Holes are typically dug prior to keep the site clean and undamaged. Advantages include easier and unhindered access for the concrete pour and finishing, generally resulting in quicker placement of the slab.

Steel reusable block outs are best for post holes and timber form work can be used for race hoop block outs. Form work release agent can be used to prevent concrete from sticking to the block outs. If using block outs, careful planning needs to occur and particular attention taken with hoops that have cross members that sit below or level with the finished concrete. In these scenarios, larger block outs are used to exclude concrete from between the two hoop posts.

Typically block outs are set at the required finished concrete level which allows you to screed across the top and use as height levels. Some contractors prefer deeper block outs which better cater for uneven hole edges and are easier to remove. This option loses the ability to screed across as they stick up above the finished level.



Rectangular and round block outs in place ready for concrete pour



Block outs in place and being sprayed with formwork release agent



Slab with block outs for posts

Slab Drainage

Drainage of slabs needs to be considered and planned prior to forming up for concrete. Drainage details should have been provided to the client to assist with the pad preparation and levels should be checked to ensure the slopes (if any) are in accordance with the site preparation plan. You should have a copy of the site preparation plan which should detail drain locations and falls in your project documents. If in doubt please check with your designer.

Whilst some areas are required to be flat to facilitate installation of specialist equipment such as cattle crush, weigh boxes, bulk handlers and races, the balance of the slabs should fall away from these level areas. Many work areas have roof over covers and whilst no rain will enter these areas, typically clients want to hose these areas down to keep them clean. Drainage in these spaces is critical and in many cases, will require the installation of a sump and the concrete drained to this. Alternatively, a spoon drain can be installed to drain water to the edge of the slab. Spoon drains can be free formed using a template, however levels are critical to ensure flow. The larger the slab and working areas, the more likely a sump or spoon drain is required.



Underground Services

Prior to pouring concrete all underground services need to be in place. Ideally services are not trenched in until the site is prepared and pegged out. This sequence avoids clashes with post holes and structures. Services are likely to include electrical and water services and for jobs that involve pneumatics, compressed air and controls wiring may also be installed under the slab. If in doubt please check with your designer. Underground services are the responsibility of the client and need to be considered early in the design phase.

For all underground services it is essential that any conduits are placed correctly and joined and glued properly. If cabling is to be installed at a later date, correct and appropriate draw wires need to be installed. Conduits should protrude a minimum of 600 mm above the finished concrete level for future connection. All conduits and pipes should be protected from concrete where they penetrate the slab. This can be facilitated by placing a larger conduit or pipe around the primary conduit or using standard expansion foam wrapped around the primary conduit and secured with tape. Foam block outs are another alternative for protecting conduits and this can be filled in at a later date with concrete once the installation is complete.

If placing water supplies under concrete there should be no joins in the pipe under the slab and the pipe should be curved up to avoid any elbow at the riser.

All under slab services need to sit below ground level and this will require trenching and appropriate backfilling and compaction.

The conduit locations under slabs shall be permanently marked and should be documented on an as installed plan. Taking photographs of the trenches with conduits in place prior to backfilling creates an excellent record.



Formwork

Once you are satisfied that the pad is prepared correctly and the levels are accurately understood, formwork can be installed. Formwork should be simple to build, easy to handle and re-usable. It also needs to be accurate and strong.

Typically, all slabs are 100 mm thick and timber proves to be a suitable formwork. Where curves form part of the design, flexible formwork such as "Con-Form" (www.con-form.com.au) can be used. Ensure adequate support is provided to all formwork by means of steel or timber pegs at a maximum span of 800mm. Ensure you place safety caps on all formwork pegs to prevent injury.

Never have formwork up against ProWay posts. All slabs should extend 200 mm outside posts in the race or yards as per the design provided.

Refer to construction plans and site set out and double check levels and dimensions once all formwork is in place – its too hard to change on the run when the concrete arrives.



Underlay

Once all the formwork is in place and checked for levels, the underlay or vapour barrier can be installed. This is a heavy plastic film and typically 200 um thick.

The underlay helps the concrete cure more slowly and strongly as moisture from the setting concrete is not sucked away by the sand underneath. It also prevents rising moisture in the slab, and limits friction between the slab and the ground, reducing the chance of any cracks forming as the slab cools and shrinks.

Overlap any joins in the plastic by at least 200mm and tape. Tape the plastic around any service risers. Spraying the ground first with water, soaking the ground and wetting the plastic also helps the prevention of cracking.



Reinforcement

All slabs should have some form of reinforcement which can be in the form of either traditional steel reinforcing mesh (SL72) or one of the modern polypropylene fibre mesh products on the market.

ProWay have used ReoCo (ReoShore) polypropylene fibre mesh for an extended period with good results. Polypropylene additives are quicker, safer and easier than traditional steel reinforcing mesh.

ReoCo distribute to all concrete suppliers from eastern and western state warehouses. They can be contacted on 1300 00 TEXO (8396) Footpath, Pavements and Cycleways - ReoCo

If using steel mesh, a single layer of SL72 should be installed, tied and supported by appropriate plastic chairs.

If using ReoCo poly fibre mesh then this is added to the concrete at the batching site at a rate of 3kg/m³. Alternatively, it can be added at the site direct into the mix. Typically, it is supplied in 1 kg bags and its use should be discussed with the supplier at the point of ordering.

Note: If plant is more than 1-1.5hrs away, please add the additive when at site. Also have the Concrete truck arrive with a dry mix and add water on site. This method will reduce the concrete going off in the truck on the way to site.



Joins

Joins are planned breaks in concrete which allow it to move and thus prevent random cracking. Joins can be made before or during the pour (termed Construction Joins) or after the concrete has been placed (termed Control Joins). ProWay slabs employ both techniques and doesn't have a preference. Often the types of joins used will depend on the concreter's personal preference and slab design.

Construction Joins

Willis Joins

This profile is particular to ProWay and provided if we are installing the slab. It consists of a folded galvanised section that has a central V which allows the concrete to contract and expand without losing its vertical alignment. Willis Joins can also be used in continuous pours at strategic locations and at the end of a day's pour. In the later situation it has pre-drilled holes which enable 12 mm dowels measuring 150 mm to be installed at 300-400 mm spacings, ready for the next pour.

The top of the Willis joins shall be placed 10 mm below the finished level of the concrete and they are typically placed every 9 meters apart or at strategic locations in the slab and these will be detailed in the concrete plans.



Dowel Joins

These are an alternative to the Willis Joins.

At the end of the pour, prepare boxing predrilled, place 10mm expansion foam against the boxing and insert 12mm dowels 150mm long at spacing of 300-400 centres.

When work resumes the next day, simply remove the boxing and start the next pour.



Joints

Control Joints

Tool Joints

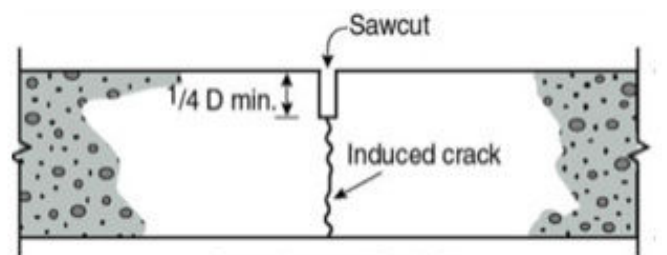
Tool Joints are strategically placed cracks or cuts placed in the concrete to induce cracking which will occur due to drying, shrinking and ground movement. By introducing controlled joints, random cracking is likely to be lessened and cracks less noticeable. Control joint locations will be indicated on the construction plans.

For a control joint to be effective it must be at least $\frac{1}{4}$ and up to $\frac{1}{3}$ of the thickness of the slab (25-35 mm)



Saw Cuts

Concrete saw cuts should be done at every 3m spacing. This should be done within 12-24 hrs after the pour. Saw cuts should be marked out with a straight edge and carried through to the edge of the slab. Large saws often can't get close to fence lines and obstacles so in these situations a hand-held saw with a smaller diameter blade can be used to complete the cut.



Concrete

Strength – 25Mpa concrete should be used along with 3 kg/m³ of ReoCo polypropylene fibre mesh

Slump – 80 mm slump concrete will provide for appropriate working and strength

Curing – concrete reaches maximum strength in approximately 28 days but can be walked on between 24-48 hours. Avoid trafficking stock on slabs within 14 days and no heavy traffic (vehicles) should traffic the areas within 28 days.

Adding Water – Whilst adding water will in some cases facilitate easier placing, the disadvantages of this include the following:

- Lower compressive strengths.
- Segregation of the concrete mix under certain conditions resulting in variable quality throughout the concrete mass.
- Cracking - with too much water, there will be lower tensile strength, and a tendency towards high shrinkage and subsequent cracking.
- Dusting and scaling - bleeding of excess water brings too many fines to the surface of floors.
- Sand streaks - excess water bleeding up the sides of forms washes out cement paste and leaves an unsightly streaked surface.



WARNING - DO NOT ADD WATER TO THE MIX

Concrete Volume

Concrete is supplied by the cubic meter (m³) and is the client's responsibility to recommend a local redimix concrete supplier and pay for all concrete ordered to site.

It is the contractors responsibility to calculate and order the concrete based on the supplied design and in manageable loads.

Once established, it is up to the contractor to determine when and how much concrete is required.

Most redimix trucks can carry up to 6m³ and will allow orders in increments of 0.1m³ however may have minimum orders.

It's good practice to plan around truck capacities to minimise trips and pours – saving time and money. Small batches (eg under 3m²) can often include freight surcharges.

Always show the client the proposed slab area before ordering concrete and pouring.

As part of the ITPs, you must take photos of the boxing and send to the relevant designer and area representative for confirmation before pouring.



Post Holes

The majority of holes will be a standard size depending on sheep or cattle yards.

Some posts however (long posts, double post hoops and rotary force posts) are larger in diameter (450 mm) and some cases deeper (1000 mm).

Standard Sheep Yard post holes are 300mm in diameter and 700mm deep.

To fill a standard hole to natural ground level estimate 0.05 m³ (20 posts per m³). To dome the post you require a further .01 m³ per post.

E.g. for 45 holes (domed) and 16 holes to ground level:
 $(45 \times 0.06) + (16 \times 0.05)$
 $= 2.7 + 0.8$
 $= 3.5 \text{ m}^3 \text{ (approx.)}$



Standard Cattle Yard post holes are 300mm in diameter and 800mm deep.

To fill a standard hole to natural ground level estimate 0.06 m³ (16 posts per m³). To dome the post you require a further .01 m³ per post.

E.g. for 54 holes (domed) and 20 holes to ground level:
 $(57 \times 0.07) + (20 \times 0.06)$
 $= 3.99 + 1.2$
 $= 5.2 \text{ m}^3 \text{ (approx.)}$



Slab Areas

Slab concrete volumes depend on the boxing height (standard 100mm) and how level the site is. A site which has an uneven surface will mean the slab is thicker or thinner in areas.

In severe cases high spots should be cut back and low spots filled with crusher dust or compacted road base before pouring.

The supplied construction plan will provide the area of the slab (m²) and when formed up in accordance with the design can be multiplied by the slab height (0.1) to calculate the cubic meters required.

E.g. for a 14m² slab on level ground with 100mm boxing: $14 \times 0.1 = 1.4\text{m}^3$

In some cases slab areas may differ in size based on the client physically seeing the area allowed for. In some cases they may prefer to increase some areas such as walkway widths.

If there are changes to the slab specified on the design, you will need to calculate the updated area.

For complex slabs, traditional area calculation techniques or area calculator smart phone apps can be used. ProWay have had good success using the CamToPlan App which allows you to measure complex slabs with the camera quickly and accurately.



Over Ordering

Experienced concreters will order a small amount of extra concrete on top of the total load to cater for ground level changes and formwork variations. How much extra will depend on the total volume required. For single truck loads (up to 6 m³) generally a rule of thumb is an extra 5%. For large pours that require multiple truck loads, typically you will add any extra to the last load and only when you have a better understanding of how the pour volumes are going.

Always discuss with the client prior to pouring where any minimal excess concrete can go. Then in the case you have concrete left over, a pre-prepared overflow slab area can be poured rather than sending excess back.

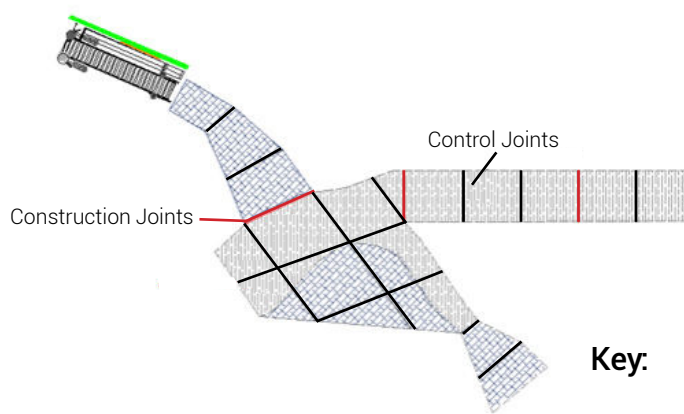
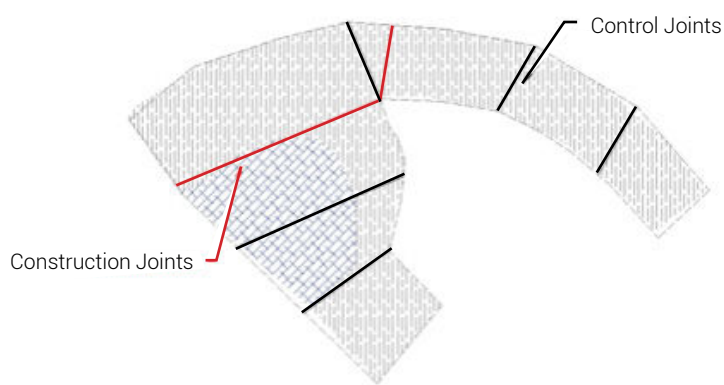
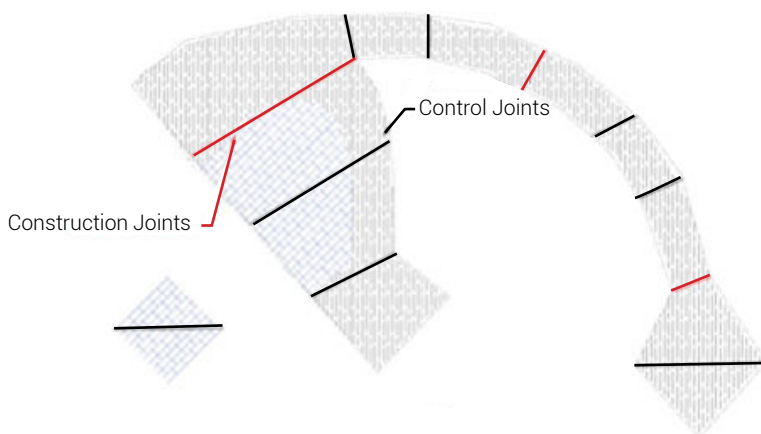
Discuss this early in your planning with the client as it will be too late when this situation arises as you will need to be focusing on the main slab. It is not acceptable to dump excess concrete in the yards.



Generic Slab Designs

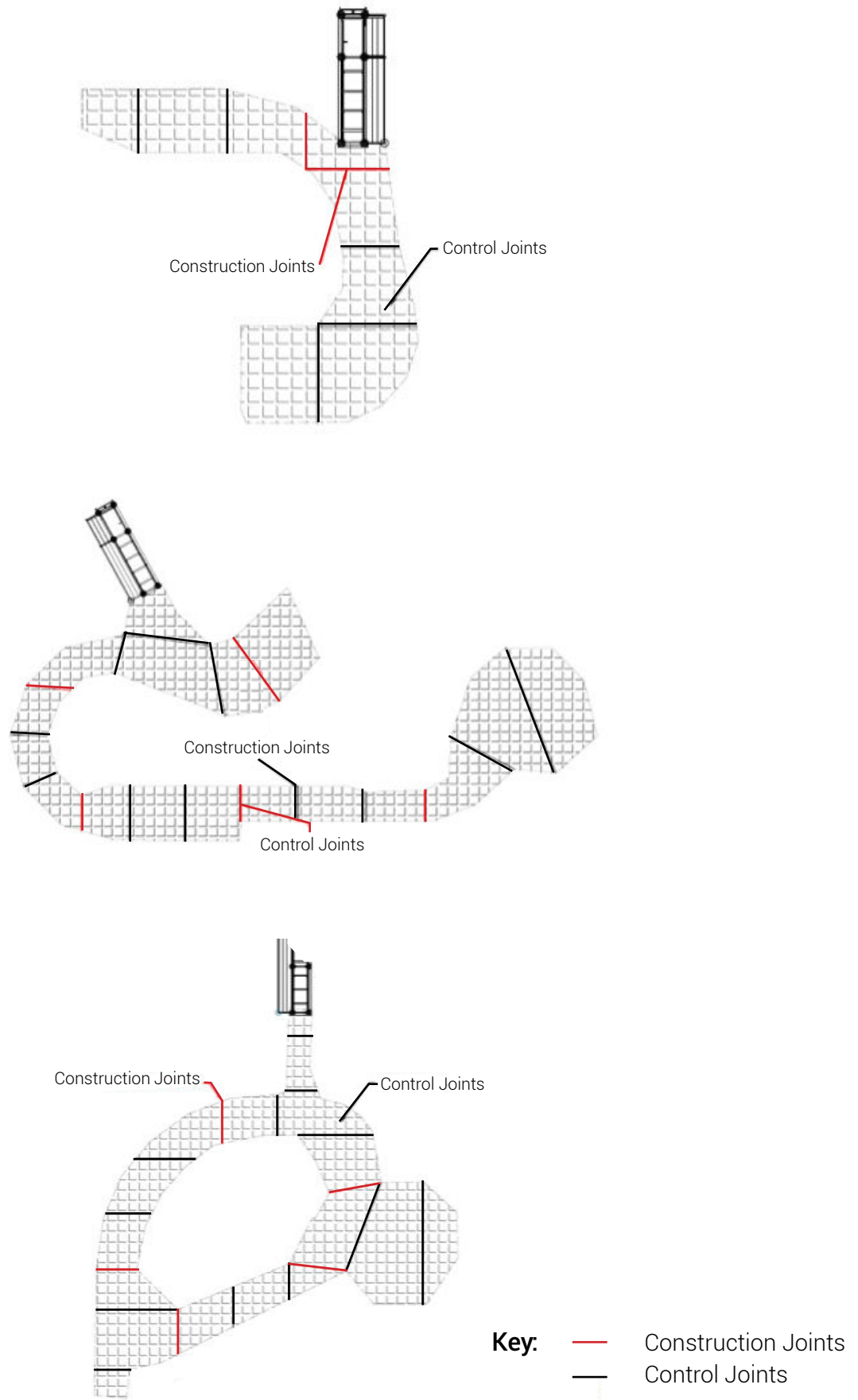
The client's civil contractors have a tendency to either misinterpret or ignore ProWay instructions therefore it is critical to monitor progress and the quality of the pad. This ensures a quality product and no timing issues occur around readiness for peg outs and construction.

Sheep Yards



Key: — Construction Joints
— Control Joints

Cattle Yards



Concrete Pour

The easiest way to pour the concrete is straight from the chute, but most concrete trucks will have a maximum chute length of 4m, so a wheelbarrow is needed to place concrete further away. Place the concrete into the furthest position from the truck first. Screed off the formwork and the pegs to establish a level pad of concrete.

Use a sawing and chopping motion with the screed, as this helps compact the concrete, releasing any air bubbles trapped inside.

As the pour progresses, screed off the previously screeded sections, using the level pegs as reference points.

When you are nearing the end of the pad, have the truck drive forward to pour right up to the edge of the formwork. Remember to pull out the level pegs as you go. They can easily get lost in the wet concrete. The pad now needs floating to smooth it, and then a second time when drier to achieve the desired finish either broom or stamped as per ProWay stamping.

Use an edging trowel to round the corners of the pad.

Vibrated concrete will eliminate air bubbles by vigorously shaking the freshly poured concrete.

On hot, windy days lay wet hessian bags or plastic over the slab to minimise surface cracking by drying out too quickly. A good tip is to always have water on-site, even light spraying a few hrs after pour to minimise cracking. Also water site night before and pour early morning.



Concrete Finishing

The surface finish on the concrete is very important and can't be changed once it is in place. Differing animal hoof sizes require different surface treatments. Timing for adding surface treatments such as stamping and brooming is critical.

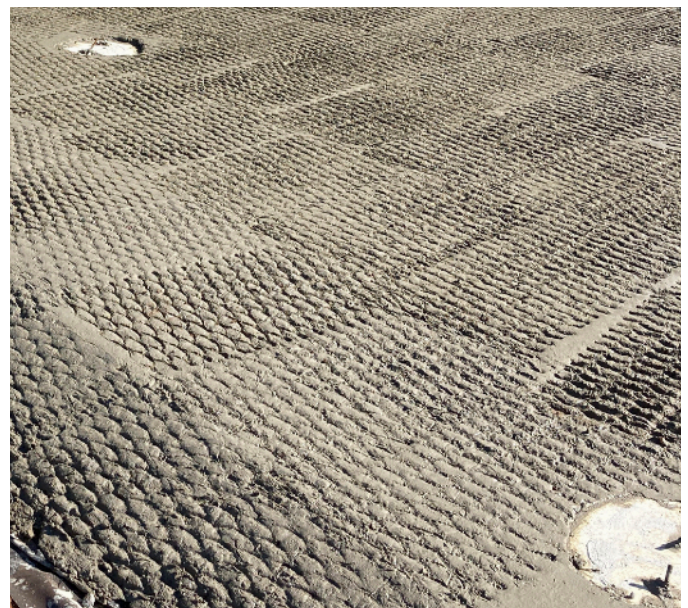
Pedestrian Areas

These should be all broom finished. This will ensure safe trafficking and also allow easier cleaning.



Sheep Yards

Stamping with expanded mesh provides an ideal finish in the working areas of sheep yards.



Concrete Finishing

Shearing Shed Ramps

Sheep ramps can become slippery very easily. They should be broom finished then horizontally stamped or raked to improve grip for sheep.



Concrete Finishing

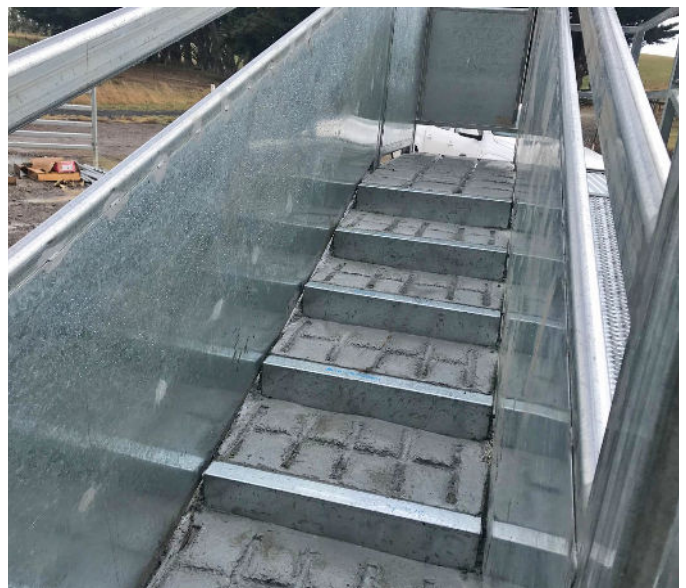
Cattle Yards

Cattle traffic areas should be stamped to improve grip (excluding the crush slab area). A 200 mm square stamped pattern is recommended. This should be worked out from a center line on large areas and where possible, the lines pointing to the draining points to assist cleaning. Broom finish first, then stamp. Try to keep stamp pattern straight and neat and approximately 25-30mm deep. Cattle free areas and pedestrian areas should have a broom finish. ProWay supplies the cattle stamping templates.



Cattle Ramps

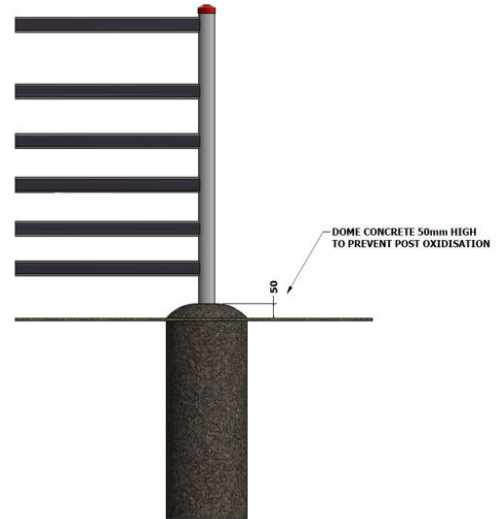
The steps on cattle ramps should be stamped to improve grip.



Concrete Doming and Post Protection

Posts are susceptible to corrosion at the base, particularly in highly corrosive environments. These include coastal regions, high throughput yards where debris builds up quickly around the post and sites where washdown water may be corrosive.

The most important first line of post protection is achieved through doming of the concrete around the post. Concrete should be domed up 50 mm above the finished ground and slab levels. When slabs are utilizing block outs this can be achieved after the main slab pour as part of the post installation.



For very high use sites, a concrete pedestal can be installed to elevate the dome well above the potential hazard zone. To achieve this, utilize a 300mm PVC pipe split template that is held in position till the concrete cures. A dome on the top of this sleeve is still required to run water off.

Forming up concrete pedestals is a two pour process. Set up your cattleyards as normal. When you have enough set up to warrant pouring concrete, fill the holes to 80% full and allow to set. Wrap the two halves of the PVC form around the post and fix together with either tek screws and builders bracing strap or duct tap.

Top up the PVC sleeve making sure that the post is central and either vibrate or tap the sleeve to release any air bubbles in the concrete.

Use a trowel to dome the top of the pedestal to allow water to run off similar to a ground level post foundation. Once set, remove the sleeve. Posts can also be protected with Protective Tapes (Denso) or Commercial Epoxy Paint.



Concrete Doming and Post Protection

Denso Tape

Denso Tape is a petrolatum-based product can be wrapped around posts to provide added protection in corrosive environments. This tape is 100 mm wide and must be installed in double thickness which can be achieved using a spiral wind approach with 50 % overlap. Wrap posts for a length of 200 mm with 50–75mm remaining above the concrete dome when completed.


Denso tape is best applied when the posts are out of the holes and can be wrapped more easily. Wear disposable gloves when installing Denso tape to protect your hands.



Epoxy Paint

Epoxy Paint is generally only used on commercial projects as it needs to be applied in a controlled environment. It is applied at the Bomen Factory. Like Denso Tape, it must continue above the finished domed concrete level by 50-75 mm





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