Senate Rural Affairs and Transport References Committee

INQUIRY INTO ANIMAL WELFARE STANDARDS IN AUSTRALIA'S LIVE EXPORT MARKETS

Index of Documents Tabled at Katherine Hearing
Friday, 2 September 2011

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2/9/11	Ms Jo-Anne Bloomfield, Hodgson River Station	Four photographs on two pages. First one marked *Bloomfield Trust – Steers 27.08.11*	2
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2/9/11	Mr John Armstrong, Gilnockie Station	Documents provided by Mr John Armstrong: 1. Extract from Manual of yard plans for South East Asian abattoirs – pages i, iii, 1, 2 and 3. 2. Meat and Livestock Australia/Livecorp publication dated October 2004, *Manual for cattle slaughter restraining box – Revised Mark 1 and Mark 2 boxes* 3. Meat and Livestock Australia/Livecorp publication, dated June 2006, titled *Manual of yard plans for South-East Asian abattoirs*- [includes DVD marked "1. Drawings and images from Manual of yard plans for South-East Asian abattoirs, June 2006 and 2. Manual for cattle slaughter restraint box, revised Mark 1 and Mark 2 boxes, October 2004"] 4. Opening Statement provided at 2 September 2011 hearing in Katherine	5 42 70 3

Bloomfield Trust – Steers 27.08.11.

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A compact disk comes with this manual. This CD contains drawings and images from this manual and a copy of the earlier publication 'Manual for cattle slaughter restraining box'.

Abstract

This manual will demonstrate with the use of plans, three-dimensional drawings and descriptive text, cattle yard designs that are suitable for both privately operated and public South-East Asian abattoirs.

The following factors have been taken into consideration in developing this manual:

- the high cost and scarcity of suitable land for abattoir infrastructure
- the best utilisation of locally available construction materials
- the need to be able to process both local, lead cattle in small numbers and imported cattle using the same facilities
- the safety of all people working in the abattoir yards
- the colour and life of the meat
- the welfare of livestock using the yards.

1 Background

1.1 Design logic

A long working relationship in South-East Asian countries has highlighted the need to upgrade designs for abattoir cattle yards. Often butchers in these countries will negotiate at the abattoir to buy or select cattle immediately prior to slaughter. It is important that cattle are presented up to this point in a calm and well conditioned state. Butchers are increasingly aware that pre slaughter feeding and the quiet handling of the cattle prior to slaughter improves the meat colour and longevity of the carcase.

1.2 Traditional abattoir

A traditional abattoir is one that can process a number of cattle at any one time in the same building using a designated team of usually four workers for each animal. None of the suppliers to the wet market want to be last to the market tables, so high throughput over a short time is essential.

The South-East Asian meat industry prefers a traditional abattoir to provide slaughter services where a slaughter team is paid to deliver within a short space of time, typically between 2100 hours and 0200 hours each night. Many attempts have been made to introduce abattoirs with a gravity line, however with this system there will always be an obvious first and last meat seller to the market, and for this reason this type of system has not been adopted. It is only in recent times that South-East Asian abattoirs have been willing to share a slaughter restraining box. Local slaughter traditions do have a strong commercial and cultural basis and for this reason, changes to the traditional system must have strong, commercial drivers.

1.3 Modern abattoir

Imported Australian cattle have only been in the South-East Asian market for a relatively short time however some of the existing abattoirs were built by the Dutch some 80 years ago. This manual attempts to overcome some of the early design problems by incorporating features to minimise the disturbance and subsequent stressing of cattle. These design features are listed below.

1. Feed and water troughs are provided for every holding pen including areas holding local cattle.

2. Gates are positioned in the pens to assist with selecting and singling out individual cattle.
3. The use of laneways [3 metres wide] have been maximised to move cattle (cattle prefer to stand along side each other to remain confident and at ease).
4. The use of cattle races [71 cm wide] have been minimised as cattle made to stand in a race-head to tail for some time will loose confidence and stress.
5. Cattle enter and exit yards from different gates to improve the flow of cattle.
6. Virtually all 90° corners have been eliminated in the cattle yard layout and replaced with 45° and 135° corners.
7. Because some new abattoirs may only require relatively small production and throughput, there is scope to incorporate only one race exiting the forcing pen leading to one restraining box. The restraining box could be either a Mark 1 or Mark 2 box depending on the throughput and the available abattoir budget.

The cattle yard designs offer an optional yard or fence height. In a well-designed yard, cattle will tend to look for an opening at eye level and only jump when put under pressure by stockmen. The recommended minimum height for all internal yards or pens is 1.6 metres and a minimum height of 1.7 metres for perimeter or boundary yard panels. Due to the high cost of materials in South-East Asia, this manual has taken the option to be conservative so as to minimise costs of construction.

At the time of producing this manual, mild steel black pipe and mild steel 3 mm plate are the preferred building materials along with concrete. The designs in this manual have attempted to make the best utilisation of the building materials with minimum off-cuts.

2 Yard site selection

The site location of the abattoir yard should minimise the impact of the development on the local community and the environment. The abattoir yard site should be at least 100 metres from the feedlot, buildings used for human habitation and any factory, public road or public place that is likely to use meat or meat products. Potable water, electricity and drainage facilities, including disposal of abattoir effluent, storm water and site drainage and sewage disposal, must also be available.

Stock pens must drain away from the abattoir and processing areas with the abattoir having the highest elevation. The area should be free of dust, odours and located away from city dumps and sewage disposal systems.

Undesirable soil types that are subject to significant expansion and contraction should be avoided, as should heavy soils that are subject to water logging. Sites subject to flooding or rising water tables must also be avoided.

liveexport

Manual for cattle slaughter restraining box

Revised Mark 1 & Mark 2 boxes

Project number: LIVE.309

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LIVECORP

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1 Introduction

This manual will describe the principles and features of the improved pre-slaughter restraining boxes (Mark 1 and Mark 2) for potential builders and users of the boxes.

In 2000, the live export industry identified improving the traditional pre-slaughter and slaughter handling of imported Australian cattle in Asia and the Middle East to be a priority. In the Asian market place Australian imported cattle have historically been discounted in the market. This has largely been due to suboptimal slaughter techniques resulting in dark cutting meat and a reduced shelf life. The additional stress encountered in slaughtering Australian cattle without adequate restraint often results in a lowering of muscle glycogen and an elevated muscle pH. By improving animal welfare during pre-slaughter and at slaughter, meat quality is improved, operator safety is enhanced and the efficiency of processing is superior.

Since 2000, the following developments have occurred:

- During October 2000, a cattle restraining box (Mark 1) was designed and built in Darwin,
- During 2001, four Mark 1 boxes were built and installed in Indonesia,
- During 2002, a further five Mark 1 boxes were installed in Malaysia, Indonesia, Middle East and Brunei
- During 2003, industry sought to improve the design of the Mark 1 box. Amal Services was contracted to incorporate minor improvements to the existing Mark 1 box and develop a prototype of a modified restraining box (Mark 2)
- At the time of printing of this manual, there are nineteen Mark 1 boxes and one prototype Mark 2 box installed.

2 Revised Mark 1 box

2.1 Operational guidelines

Issues targeted for modification in the design in the original Mark 1 restraining box project included.

1. Warping of the panels at welding and during galvanizing was remedied by improved welding and hot galvanised dipping techniques. Refer to Appendix 4 drawing numbers 003-006.

2. The steel panels and doors made excessive noise when kicked by the cattle and this was remedied by using Ultra High Molecular Weight Poly-ethylene (UHMWPE) bearings (sliders) in the door channel. This can also be substituted overseas with the use of local hard wood pre-soaked in food grade oil. Refer to Appendix 4 drawing numbers 007-008.

3. The dimensions of the concrete plinth (platform) were modified by increasing its height and the addition of a sump to facilitate blood collection and simplify leg tying. The most recently installed box has a plinth height of 600 mm, which further improves operator conditions Refer to Appendix 4 drawings 001-002.

4. The panel and door hinges were strengthened without affecting the ease of fabrication outside Australia. Refer to Appendix 4 drawing 001-002-and 013 for manufacture.

5. The catches to release the main door were modified to further protect the operator. Refer to Appendix 4 drawing 001 - 005 for location and 012 for manufacture.

6. The issue of cattle occasionally striking their head on the concrete plinth has been addressed by the use of a sedan car tyre (only) placed under the head as the animal falls.

7. The ease of operation has improved while respecting cultural and industrial relation implications as the cattle cannot see the operator, however the operator can see the position of the cattle. Refer to Figures 3.1 and 3.2 in Appendix 3.

8. The box dimensions are a height of 1.8 metres, an inside width of 0.710 metres and an internal length of 2.2 metres.

9. The standing revised Mark 1 box has an approximate weight of 650 kg, which is not significantly different to the original Mark 1 design.

2.2 Design logic

The majority of Halal restraining boxes that have been commissioned in Asia during the past 25 years have usually been designed on the principle of restraining the legs of the cattle using hydraulics or other mechanical methods. This approach simply gives the animal a point of resistance to struggle against, which contributes to the animal's level of stress.

The design principle of the Mark 1 box (and Mark 2 box) is to take advantage of the inability of the bovine to collect and right itself when it is lying on its side in a position where its head is lower than the rest of its body while its legs are immobilised. Using this design, the animal will cast itself by an operator tying its legs using two soft ropes attached to the two legs on the side the animal falls from the box. As the animal falls onto its side, the front and hind legs closest to the floor are held loosely by the ropes with the animal's body and head laying down the 15% grade on the floor adjacent to the box.

Once the head is seized by the slaughter man, the animal is unable to rise. Because the centre of gravity of the beast is quite low down the slope, very little effort is required by the slaughter man to restrain the animal in this prone position. From here the animal's head can be secured by ropes to allow safe access to the exposed throat of the animal. The design allows the animal to be restrained and slaughtered in a way that results in the minimum amount of stress to the animal with minimal physical effort and danger to the slaughterman. Importantly, the design has been developed for simplicity, minimal maintenance and ease of construction to ensure it is a practical and affordable investment for any level of slaughter facility.

2.3 Design features

The Mark 1 box (and the Mark 2) boxes are primarily designed to meet the requirements of the numerous municipal slaughterhouses in Islamic countries. Simplicity is the key feature. Other important considerations include:

- Neither hydraulic nor pneumatic systems are used due to their inherent cost and maintenance problems.
- Steel pipes, flat bar and steel plate are used as building materials, which are all available in even the smaller cities of Asia.
- To meet the Australian code of construction it would be necessary to plate both sides of the gates, however for Asian clients, this is not a necessary expense if a facility is only handling small numbers per day.

It is important that the construction should follow some basic minimum standards:

- All pipe ends must be closed or filled to minimise corrosion.
- All new metal surfaces or weld joints must receive a suitable undercoat (primer), plus a final coat, if hot dipped galvanising is not an option.
- Hot dipped galvanising will greatly improve the working life of the box, however, the steel panels and doors should be a minimum of 3 mm plate to minimise warping and subsequent corrective straightening. The use of 3 mm plate does significantly increase the weight of the box.
- A method to minimize warping during galvanising is to weld the posts onto the panels prior to galvanising. It is also important that the panels enter the galvanising dip parallel to the bath so that the heating and the cooling of the panel is even to minimise expansion and contraction differences
- A guillotine gate is used at the entrance to the box as it is easier to block cattle coming from behind than using a gate that closes from the side.
- Construction and finish as per the plan will minimize the collection of stagnant blood and water on the steelwork.
- The concrete slab laid within the box must have a non-slip and waterproof surface, be impact resistant (32 MPA reinforced) and have a 2% grade to the open door. Refer to Appendix 4 drawings 001-002.
- The concrete slab (32 MPA reinforced) laid adjacent to the side-opening doorway must have a 15% slope away from the box.
- The inside width of the restraining box must be 71 cm and have smooth parallel sides

2.4 Benefits of the Mark 1 box

The revised Mark 1 box (and the Mark 2 box) through improved animal welfare design features will produce more consistent meat quality in Australian cattle, i.e. the colour, shelf life and appearance of the meat are enhanced.

Reducing the time from the Halal incision to the animal loosing consciousness (bleed time) is a critical influencing factor on the resulting quality of the meat in both the non-refrigerated wet market and the supermarket refrigerator.

In all Halal markets having bright red oxygenated beef is the priority to maximise shelf life and promote rapid sales turnover.

In comparison to most Australian cattle, it is generally observed that the majority of indigenous cattle, which are normally more tractable and therefore less stressed, bleed much more rapidly. In addition to the meat quality benefits, this has the added benefit of increasing the hourly throughput through the abattoir.

The operation of the restraining box is such that cattle can be processed with minimal stress, resulting in minimal detrimental affects to the quality of meat. It is equally important for cattle to feel confident and unafraid immediately prior to the point of restraint for slaughter. In order for this to occur, the race leading to the restraining box should be plated on the inside or filled so as to entirely block the vision of the following cattle.

A good indicator of stress in animals prior to slaughter is their level of vocalisation. Confident and unafraid animals will not vocalise as much as stressed cattle.

2.5 Slaughter management principles

2.5.1 Pre-slaughter

The most important pre-slaughter principles are:

- **Do** rest cattle prior to slaughter that have been transported for greater than 3 hours.
- **Do** offer **familiar** feed and water to cattle held in slaughterhouse holding pens even if the holding time is only 1 -2 hours.
- **Do not** use electric prodders on cattle.
- **Do not** allow cattle to wait in a race prior to slaughter.
- **Do not** allow cattle to observe the lead cattle being slaughtered. Steel plated cattle race sides and race gates will block their vision.

2.5.2 Post-slaughter

The most important post-slaughter principles are:

- **Do** use a sharp knife for Halal slaughter. The major blood vessels of the neck will bleed faster if severed with a sharp knife rather than the serrated cut of a blunt knife.
- **Do** position the head of the slaughtered animal along the natural line of its body to allow for more rapid bleeding post incision.

2.6 Shipping and installation

The important factors in relation to shipping and installation are:

- The Mark 1 box is constructed in three separate pieces for easy sea and land transport.
- For boxes built in Australia that have been sandblasted and then painted with a two-pack epoxy paint, a small tin of priming paint and a tin of a final coat is included for touch-up after installation. The majority of boxes built in Australia are hot galvanised prior to shipping.
- Three soft leg ropes are supplied (silver ropes).
- An abattoir that is slaughtering a maximum of 20 cattle per hour should have a race that is a maximum of 4 metres long from the forcing pen to the restraining box i.e. sufficient to hold two cattle. Holding anymore than two cattle in a raceway will stress the cattle and make them more difficult to handle. Stress at this time will increase the incidence of dark cutting meat.
- Preferably, the restraining box should be connected to the holding pens via a curved raceway. Refer to the drawing in Appendix 2.
- A religious representative should confirm the positioning of the box prior to installation in order to satisfy important, ritual requirements.
- The restraining box should be illuminated by a double florescent light mounted 2.5 metres directly above the box. The enclosed race need not be illuminated. Cattle will always move more easily from a dark area to a light area. Refer to Appendix 1, Figure 1.
- A guillotine gate at the entry point to the box is preferred, so as to block a following animal more effectively than a slide gate.

2.7 Operational guide

The efficient operation of the box will be highly dependent on the initial training during and immediately after commissioning of the installed box. Experience has shown that the ideal is to use three slaughtermen from another abattoir who are skilled in the use of the box to demonstrate the operation of the box and supported with a seminar presenting a video clip and slides.

- For the successful processing of 10 to 15 head per hour, there is a requirement for three operators. One man is required on each side of the box and a third man is required to be ready on the side where the gate opens.
- A rope noose is tied on both the fore leg and hind leg on one side only. The legs to be tied are those on the side on where the gate opens.
- Next fasten the two ropes to the cleats on the opposite side of the box. Refer to the location of the cleats mounted on the two steel posts. Refer to Appendix 4, drawings 001-002.
- It is not recommended that a rope be placed on the animal's head until it has been released and falls from the box. Doing so can panic the animal causing it to fall inside the box.
- After both ropes are secured to the cleats, the large side door and the front door are simultaneously fully opened.
- Two things can happen:

1. Either the animal jumps out tripping itself. Refer to Appendix 3, Figures 3.2 and 3.3, or
2. The animal will stand still. In this case the slaughter man should reach into the rear of the box, grasp the tail and pull the animal away from the box. The animal will then trip and fall as in 1.

When the animal has fallen onto the sloping floor, the slaughter man should secure the head of the animal and apply a rope or halter to hold the head in the restraint position. When the slaughter man is satisfied with the position and the level of restraint then the slaughter process can proceed.

It is observed that the majority of cattle that are restrained in this manner on the platform, which slopes at 15 degrees with their head being the lowest point, will not struggle and will remain quiet.

The Mark 1 box can be utilized for either Halal or non-Halal slaughter. If used for Halal slaughter, an expected throughput is 15 to 20 head per hour. For slaughter using a captive bolt stunner, 20 to 30 cattle per hour is achievable. To utilize the box with a stunner it will be necessary to construct an operator platform on the side of the box that the leg ropes are tied off onto the cleats.

Prior to any box installation, it is vital to carry out a site visit prior to installation to observe the direction of slaughter during the actual operation. Using a compass, the direction that animal's throat is facing should be planned and marked before concreting the box in. The use of digital photography during the initial site visit is very helpful to confirm the location and direction of the box.

3 Mark 2 box

There is scope for two different boxes in most market places. The new box (Mark 2) will improve animal welfare, increase the efficiency of blood collection and improve workers' safety. The major modification to the Mark 1 box is the inclusion of a tilting door (vertical to horizontal) rather that a swinging door. The tilting door lowers the restrained animal gently to the horizontal position prior to slaughter.

As the Mark 2 box is more expensive to construct, it will be budget constraints and the level of sophistication at the abattoir that will influence the choice, of either a Mark 1 box or a Mark 2 box. Both boxes have the capacity to slaughter 15 to 20 cattle per hour. The main influence on the rate of throughput will remain the cattle bleed time.

3.1 Operational upgrades

The most critical points of operational upgrades are:

- All construction materials are readily available in importing countries.
- The restraining box should be galvanised to maximise its working life.
- Only springs and levers are used in the operation of tilting door.
- There are no hydraulic or pneumatic requirements for its operation.
- Operators can maximise blood collection via a funnel built into the tilting door.
- There is provision in the revised Mark 1 design to upgrade to a Mark 2 box by the addition of an extra post and the tilting door.
- The fixed panel in the Mark 2 box is the same in the revised Mark 1 box meaning the basic construction and installation are the same for both boxes.
- The Mark 1 and Mark 2 boxes are able to restrain cattle from 380 kg. to 800 kg live weight. The only adjustments necessary being the length of the leg ropes, which will alter the position of the animal over the blood drain or to suit an operator's preference.
- The Mark 2 box remains rectangular, straight sided, at floor level, non-slip, well lit and with an open top (300 lux). The box dimensions are a height of 1.8 metres, a width of 0.7 metres and a length of 2.2 metres.
- The standing Mark 2 box has an approximate weight of 900 Kg
- A double florescent light should be sited above the box so as to eliminate any shadows that would baulk the entry of cattle. Refer to Appendix 1, Figure 1.1.

3.2 Design logic

The majority of the logic that is incorporated in the Mark 1 box is included in the Mark 2 box.

The base for the box on which the animal stands and the platform or concrete plinth on which the animal falls is elevated 80 cm above the floor of the abattoir. This improves operations for both the people that place the ropes on the animal's legs and the slaughterman when the animal is restrained on its side.

The major difference in the Mark 2 box is the cattle are lowered (tilted) to the slaughter position on a 'L' shaped door, which provides a table allowing improved access for the slaughter man. The animal is restrained on the lowered door, which acts as a table. Allowing for the 15degree slope, the lowered door is elevated 450 to 550 cm above the floor of the abattoir.

When the lever for the side door is tripped and tilted to rest on the floor of the abattoir, the height of the table from the abattoir floor allows for a receptacle to be placed underneath a funnel built into the tilt door for the collection of blood. The collection of blood in this manner will increase the volume of blood retained for sale by the abattoir owner. Blood collection should be a minimum of 3% of the animal's live weight. In the majority of countries, abattoirs collect blood for resale. In most countries, legislation bans the release of blood into effluent ponds, so this approach will minimise this problem. Blood has a biochemical oxygen demand (B.O.D.) of around 200,000 mg/litre, compared to most abattoir effluent, which has a biochemical oxygen demand of around 2,500 mg/litre. Biochemical oxygen demand is an assay used as a standardized assessment of the amount of oxidisable, or respirable, organic matter in water. It is used routinely as an index of the amount of organic pollution of water.

3.3 Design features

As with the Mark 1 box, the Mark 2 relies on:

- restricting the vision of cattle in the box to minimise stress,
- a smooth-sided and level floor to minimise injury,
- sufficient height of the box sides to discourage animals jumping out of the box, and
- appropriate lighting placed over the box to encourage cattle to walk into the box without the use of an electric prodder.

The tilting side door of the box is triggered by a release catch and slowed by means of 3 or 4 adjustable torsion springs. Refer to the drawing in Appendix 8. The 3 mm side door tilts to form a table that has a height of 450 to 550mm above the abattoir floor. The 6 to 10mm steel floor of the box also tilts to rest at 90 degrees to the horizontal. Three pipe legs with rubber buffers are fitted to the tilting door to ensure a cushioned stop at the end of the tilting operation.

As with the Mark 1 box, the Mark 2 box has the following common features:

- The use of soft ropes to capture a single foreleg and a single hind leg, which are tied to cleats fixed to the frame of the box.
- Cattle move easily into the box, which is illuminated directly from directly above.
- The floor of the restraining boxes should be level and non-slip.
- The inside width of the restraining box must be 71 cm and have smooth parallel sides. (V-shaped restraining boxes encourage Australian cattle to jump, turn around or sit down).

3.4 Benefits of the Mark 2 box

Additional benefits of the Mark 2 box over the Mark 1 box include:

- The tilting action of the door improves animal welfare by minimising the impact when the animal falls from the box.
- The collection of blood is more efficient as the blood can drain through the tilted door when positioned on the floor.
- The tilted door provides a table affect, which is a better working position for the slaughterman.
- The tilted door improves hygiene by reducing the potential for contamination from the floor of the abattoir.
- The Mark 2 box will meet the criteria for equipment in export abattoirs where pre-slaughter stunning is not practised. Refer to the Commonwealth of Australia Manual "Construction and Equipment Guidelines for Export Meat". ISBN 0 644 03897 7.

3.5 Slaughter management principles

3.5.1 Pre-slaughter

The most important pre-slaughter principles are:

- **Do** rest cattle prior to slaughter that have been transported for greater than 3 hours.
- **Do** offer **familiar** feed and water to cattle held in slaughterhouse holding pens even if holding time is only 1 to 2 hours.
- **Do not** use electric prodders on cattle.
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3.5.2 Post-slaughter

The most important post-slaughter principles are:

- **Do** use a sharp knife for Halal slaughter. The major blood vessels of the neck will bleed faster if severed with a sharp knife rather than the serrated cut of a blunt knife.
- **Do** position the head of the slaughtered animal along the natural line of its body to allow for faster bleeding post incision.

3.6 Shipping and installation

The Mark 2 box can be stacked in two sections, bolted or wired together for easy shipping. A forklift and a dockside crane will easily load the box onto the deck of a ship or truck.

All installation details including the depth of posts and the height of the platform can be seen in Appendix 7, drawings 001 and 002. Note the black lines and unbroken lines showing the shape of the concrete plinth. The following issues are important during shipping and installation:

- As with the Mark 1 box, it is essential is to seek and follow the advice of religious authorities in the positioning of the box for Halal slaughter.
- The connecting cattle race is to be a maximum of two cattle lengths from the forcing pen to the box entrance.
- The cattle race should be internally lined with 2-3 mm mild steel plate to restrict the view of cattle inside the box.
- It is important that the box is both squared and plum prior to pouring the footings to ensure that the tilting door will fall and reload with minimum effort. The same concrete standards as for the Mark 1 box apply.

3.7 Operational guide

The operational guidelines for the Mark 2 box are the same as the Mark 1 box except for the operation of the tilting door. Rather than opening a swinging side door and the front door of the box for the animal to fall as with the Mark 1 box, a lever is pulled at the front of the box to release the tilting door into the table position. After the animal is removed from the horizontal door, the door and box floor will tilt back up into the original position assisted by the torsion springs.

4 Comparison of the Mark 1 and Mark 2 boxes

A quick comparison between the two boxes is provided in Table 1.

Table 1 A comparison between the Mark 1, Mark 1 (revised) and Mark 2 boxes.

	Mark 1	Mark 1 (revised)	Mark 2
Weight of box	650 kg	650 kg	900 kg
Estimated average throughput	15-20 Australian cattle per hour	15-20 Australian cattle per hour	15-20 Australian cattle per hour
Method of operation	Mechanical hinges and slides	Mechanical hinges and slides	Mechanical hinges and slides
Method of restraint	Crush and two leg ropes	Crush and two leg ropes	Crush and two leg ropes
Technique to position animal	Swinging side and front doors	Swinging side and front doors	Tilting side door and floor
Provision for blood collection	No	Yes	Yes
Level of animal welfare	√	√	√√√
Level of operator safety	√	√√	√√√
Dimensions of installed box	1.8 high 0.7 wide 2.2 long	1.8 high 0.7 wide 2.2 long	2.194 high 0.7 wide 2.2 long
Capacity of box	380 to 800 kg animal	380 to 800 kg animal	380 to 800 kg animal
Cost of manufacture – Darwin*	A$6,300	A$6,300	A$10,000
Cost of manufacture – Jakarta*	A$4,500	A$4,500	A$7,000

* Estimate not including installation costs

N.B. The original plans, drawings and images contained in the following Appendices are available by contacting Meat and Livestock Australia Limited.

5 Acknowledgements

Food Science Australia – Cannon Hill, Brisbane

Mr. Rod Waltho, Rod's Welding –Darwin

Dr Ross Ainsworth – Australasian Livestock Services Pty Ltd. Darwin

Pak Karnadi Winaga – P.T. Karawaci, Jakarta

Mr. Kel Carrick – inventor, Darwin

Australian cattle exporters, for shipping numerous restraining boxes throughout Asia for nil cost

Appendix 1

Model Mark 1 box

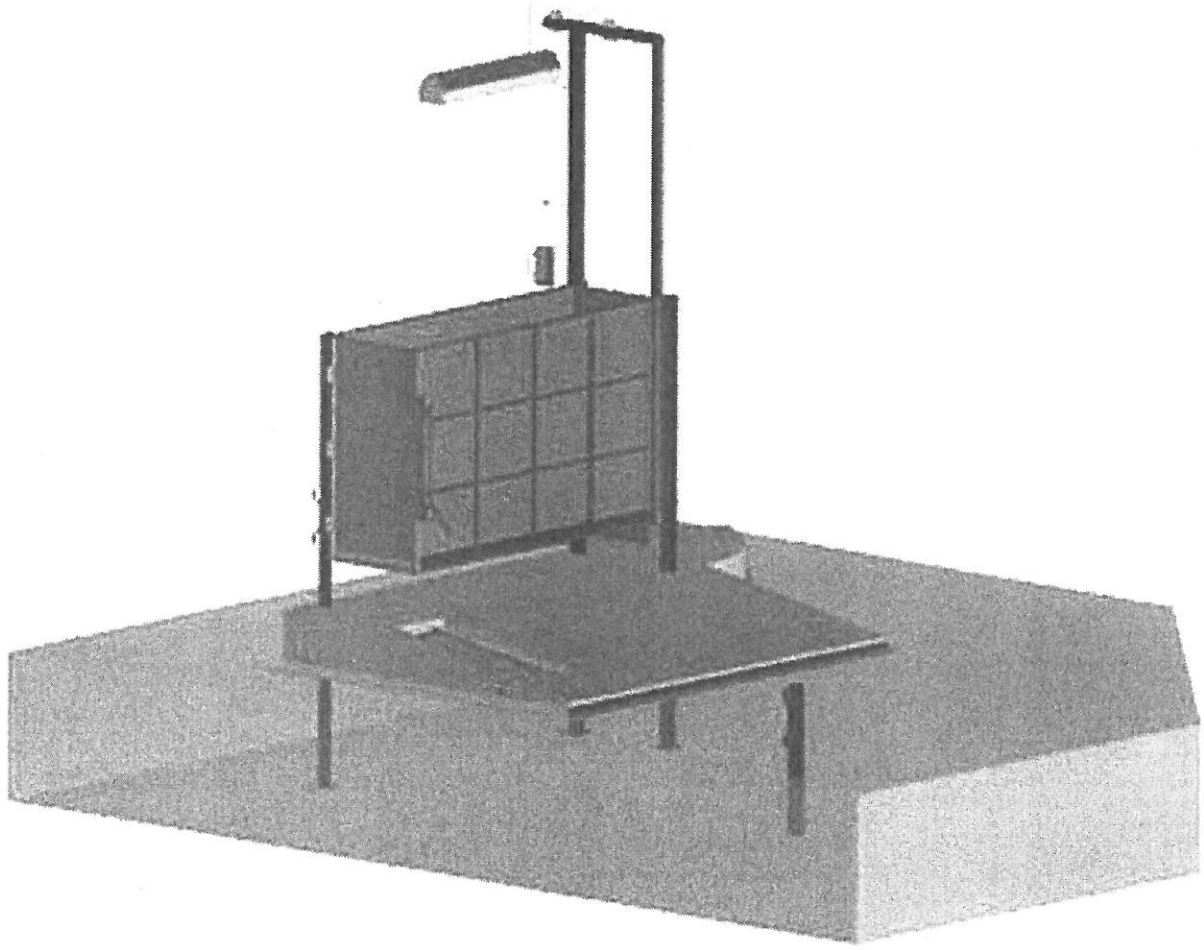


Figure 1.1 Mark 1 Box Closed

Appendix 1 continued

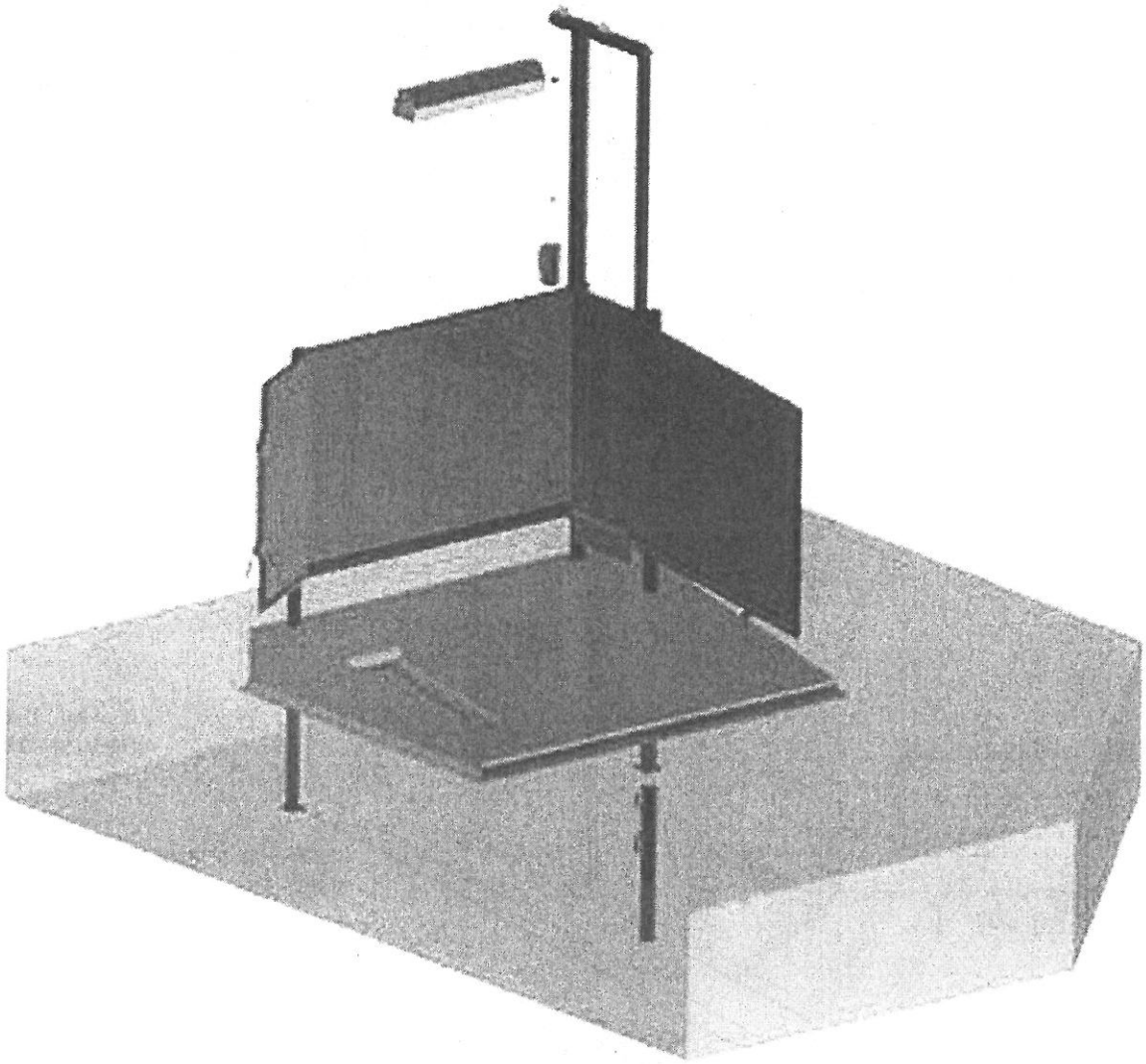


Figure 1.2 Mark 1 Box Open

Appendix 2

Mark 1 box isometric drawing

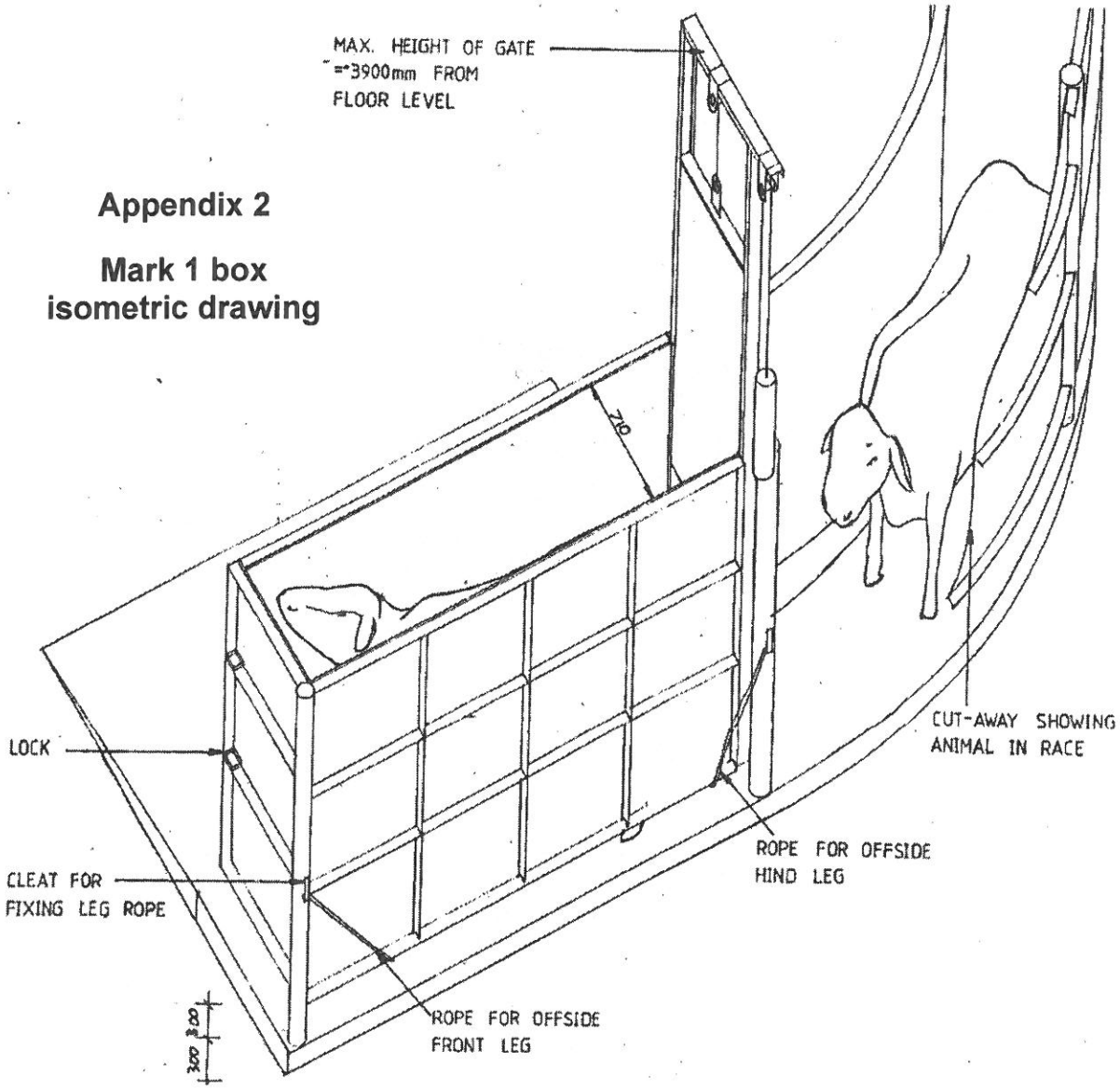


Figure 2.1 Mark 1 box at end of cattle race

HALAL RESTRAINING BOX	PLAN	1 - BOX CLOSED ANIMAL WAITING IN RACE	TROPPO ARCHITECTS PTY LTD.

Appendix 3 Mark 1 box pictures showing operation

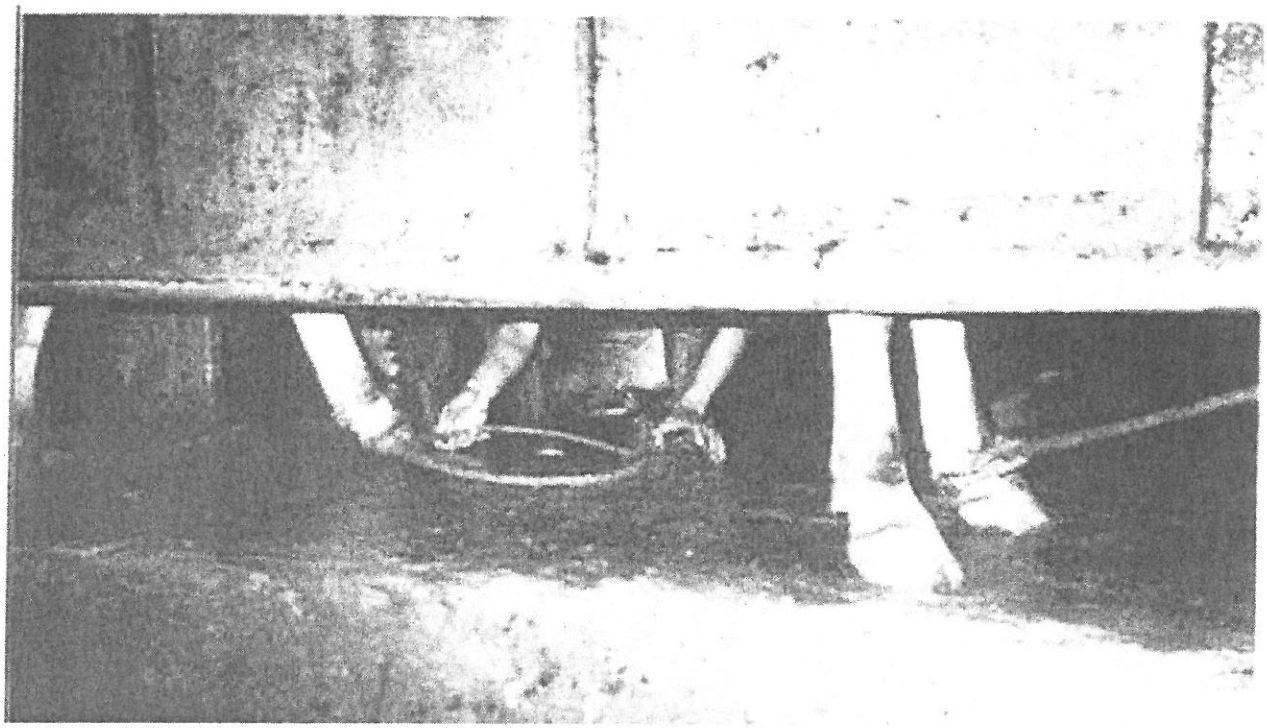


Figure 3.1 **Mark 1 and Mark 2 box - catch and tie front foot first**

Appendix 3 continued

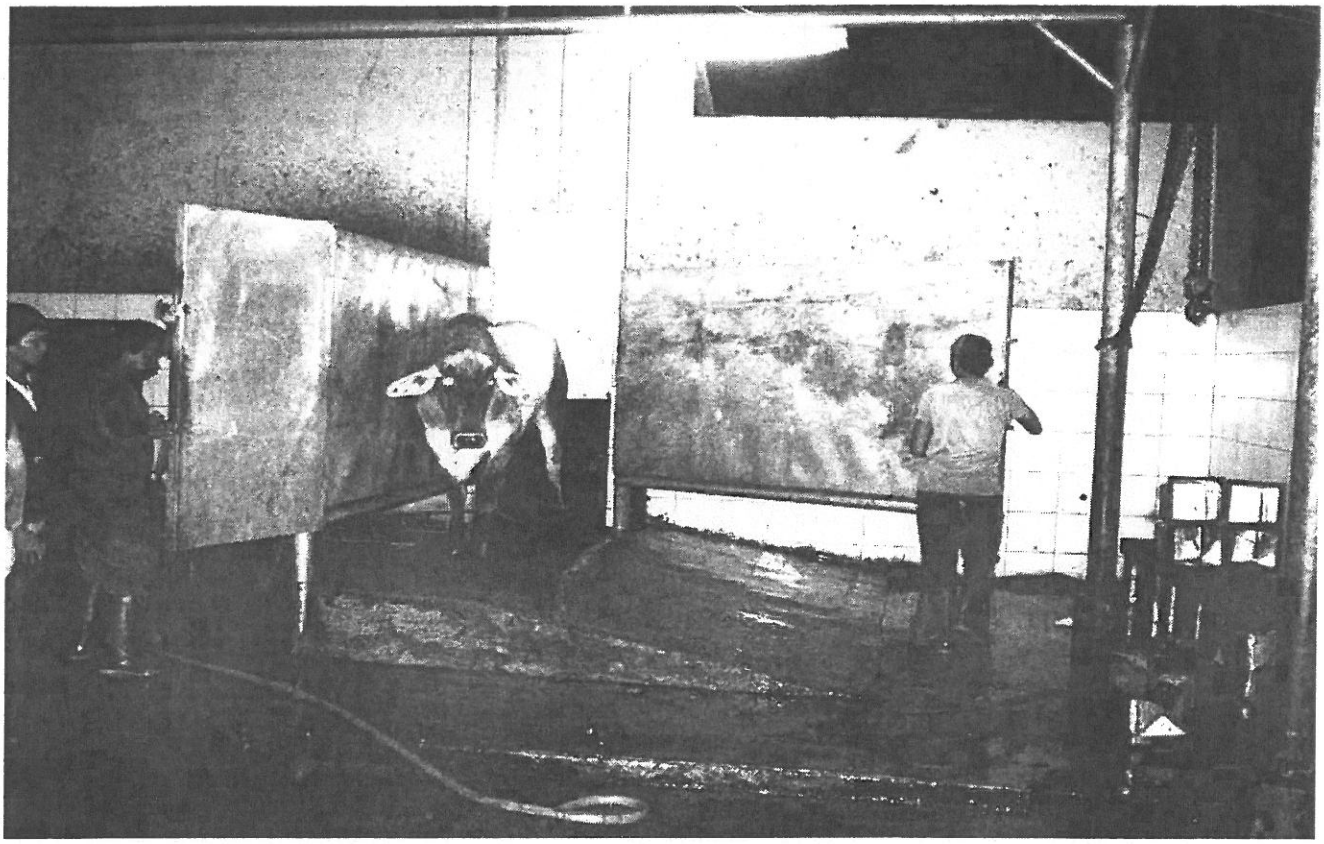


Figure 3.2 Mark 1 box - after attaching the ropes, open the doors

Appendix 3 continued

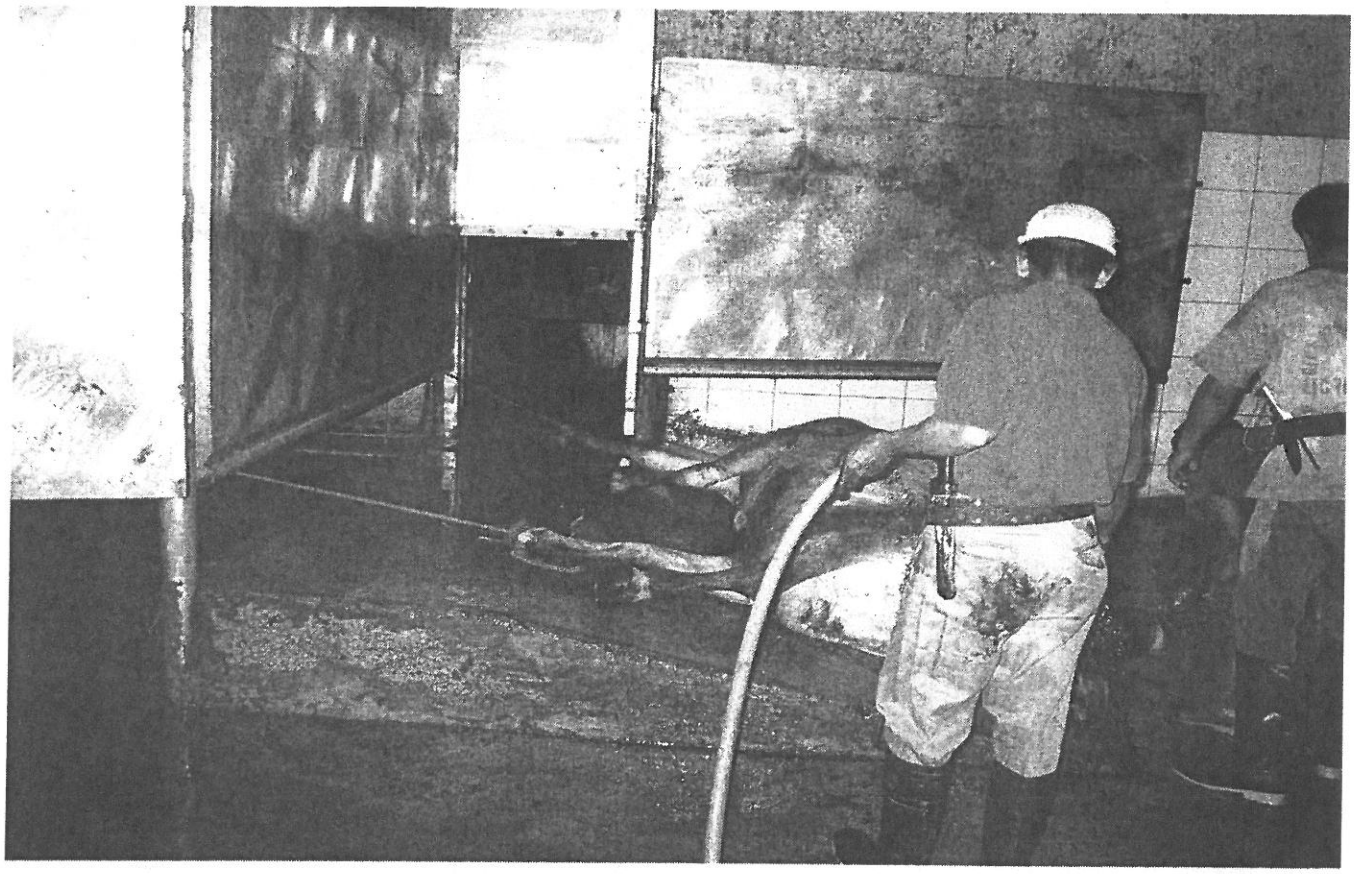


Figure 3.3 **Mark 1 box - cattle drop to their side of their own accord**

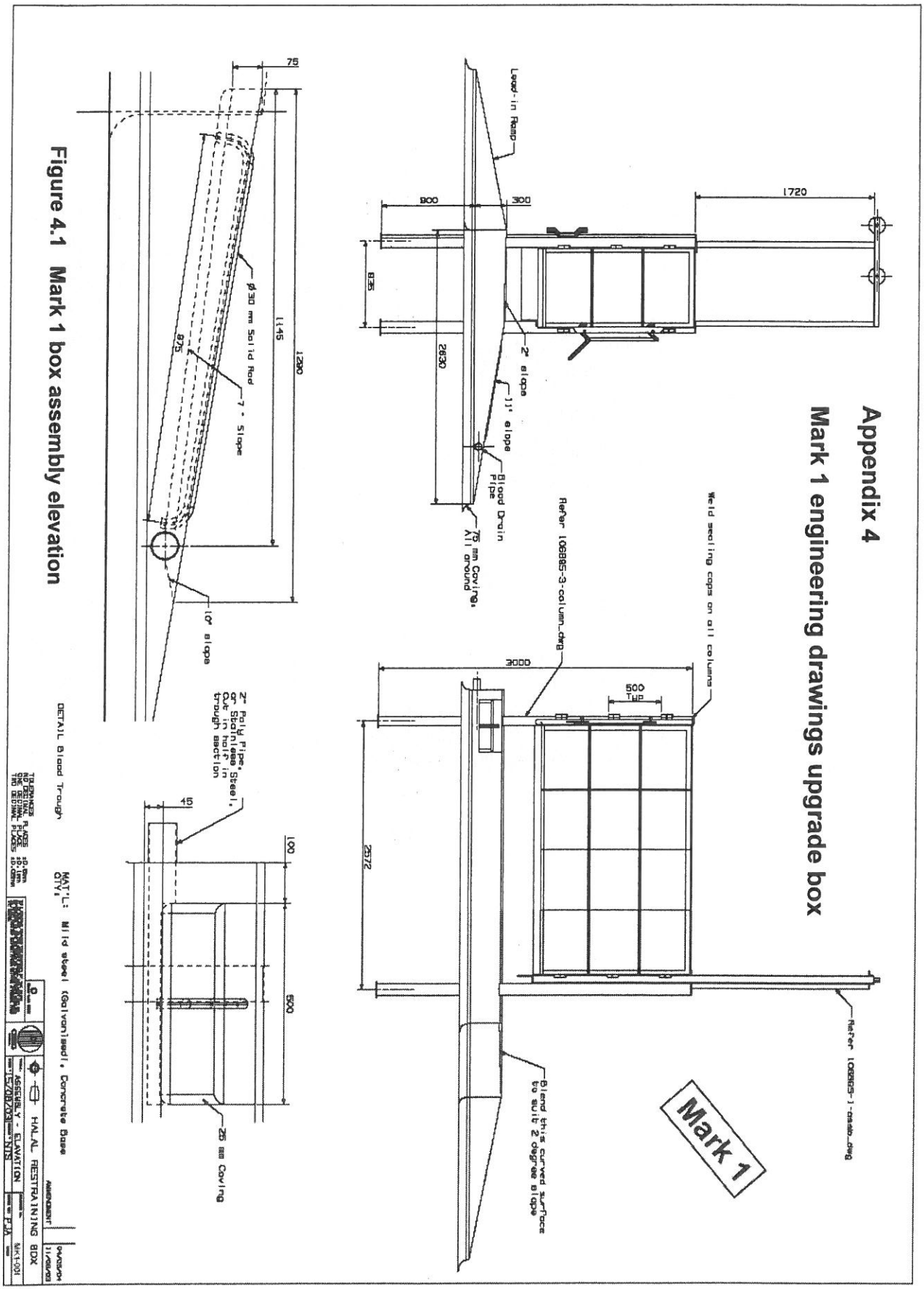


Figure 4.1 Mark 1 box assembly elevation

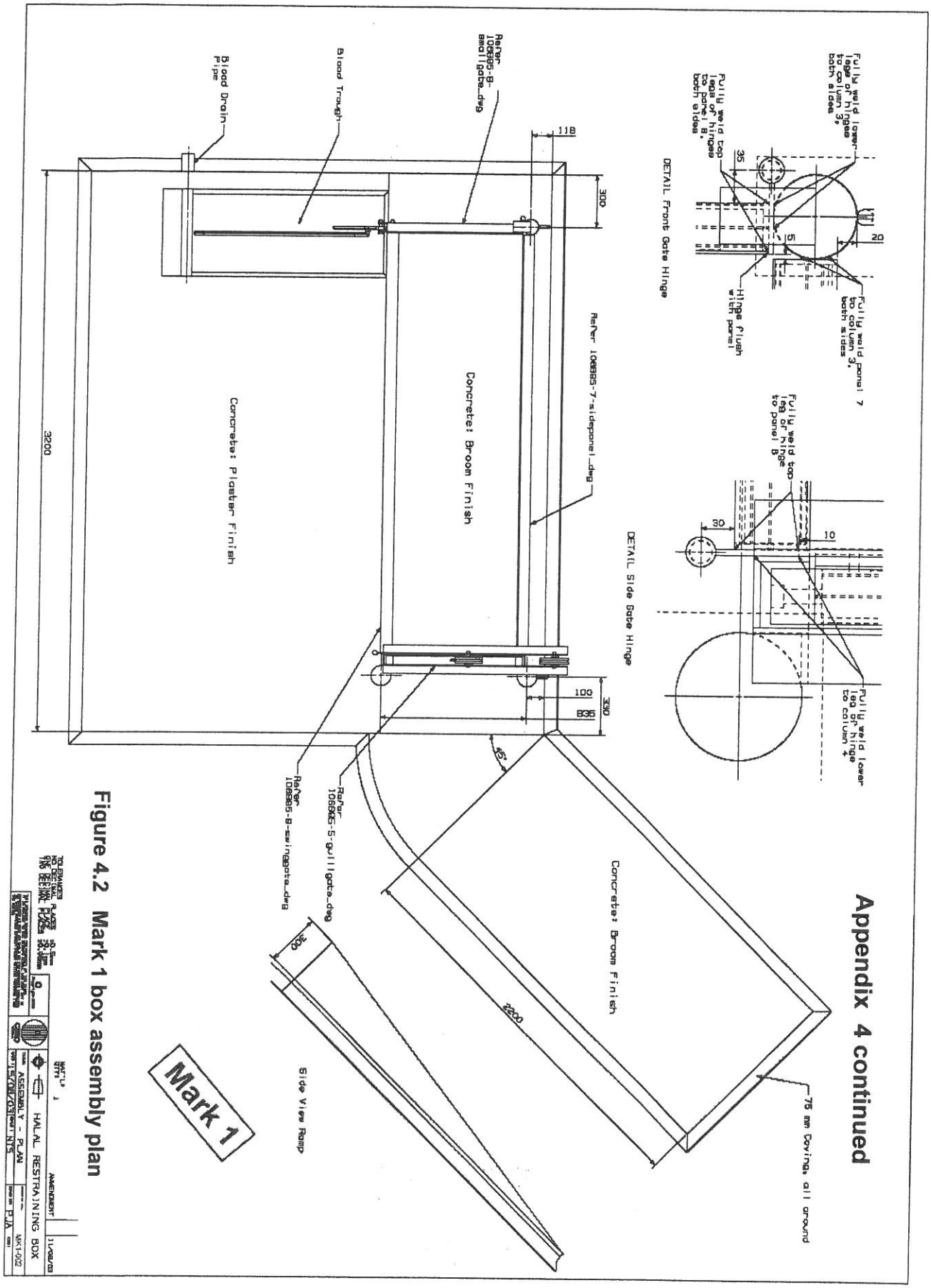
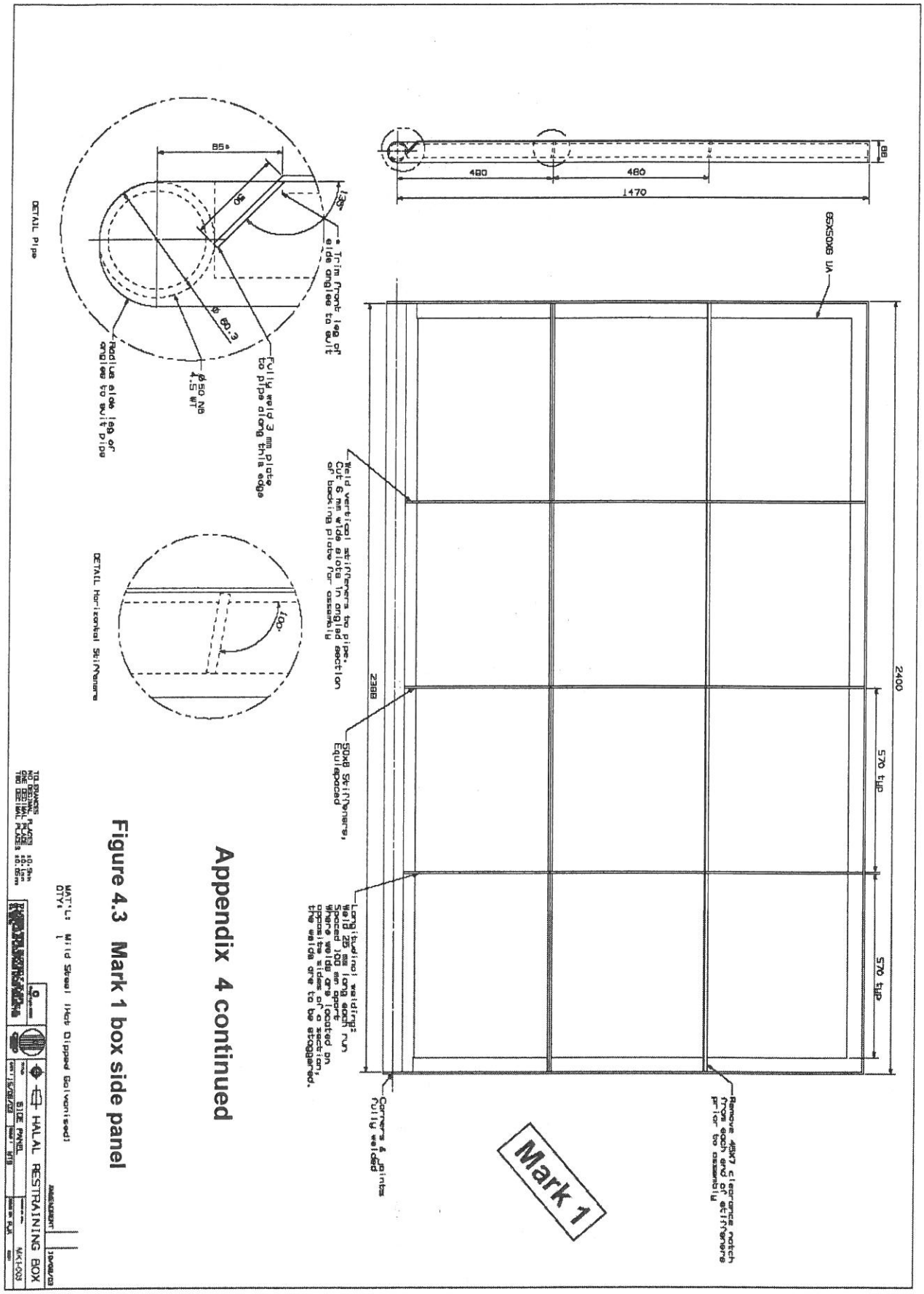


Figure 4.2 Mark 1 box assembly plan



Appendix 4 continued

Figure 4.3 Mark 1 box side panel

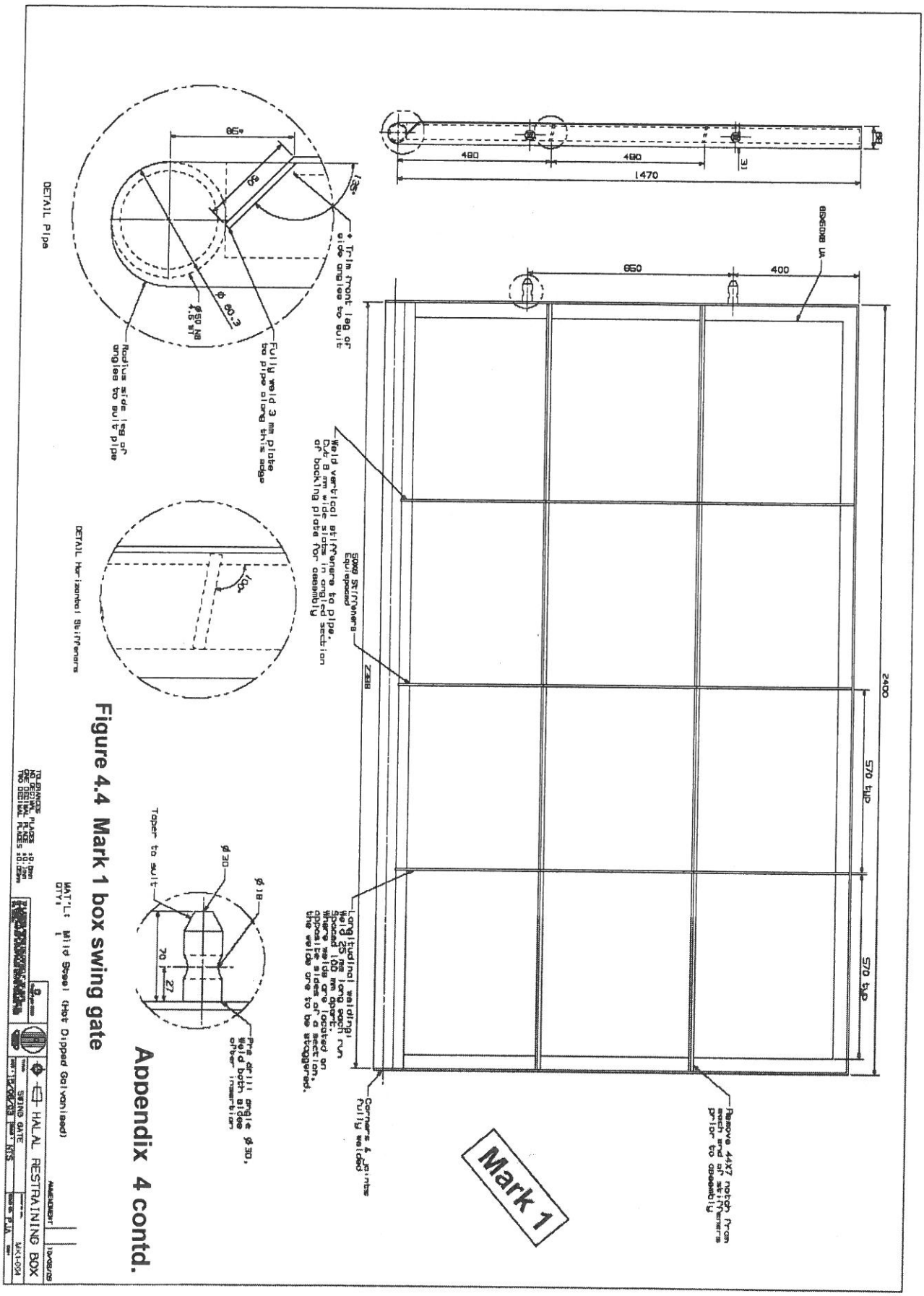


Figure 4.4 Mark 1 box swing gate

Appendix 4 contd.

Appendix 4 continued

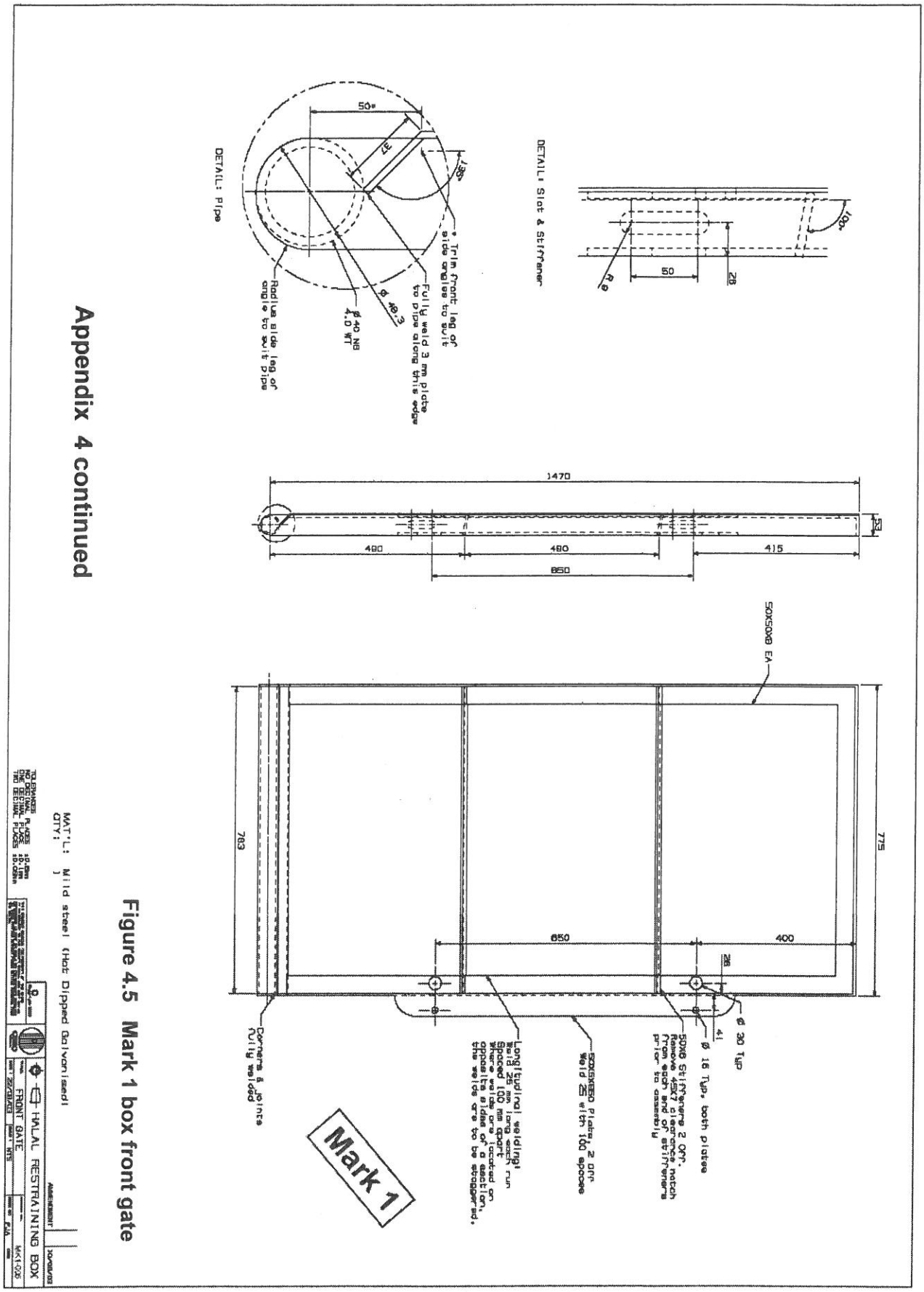


Figure 4.5 Mark 1 box front gate

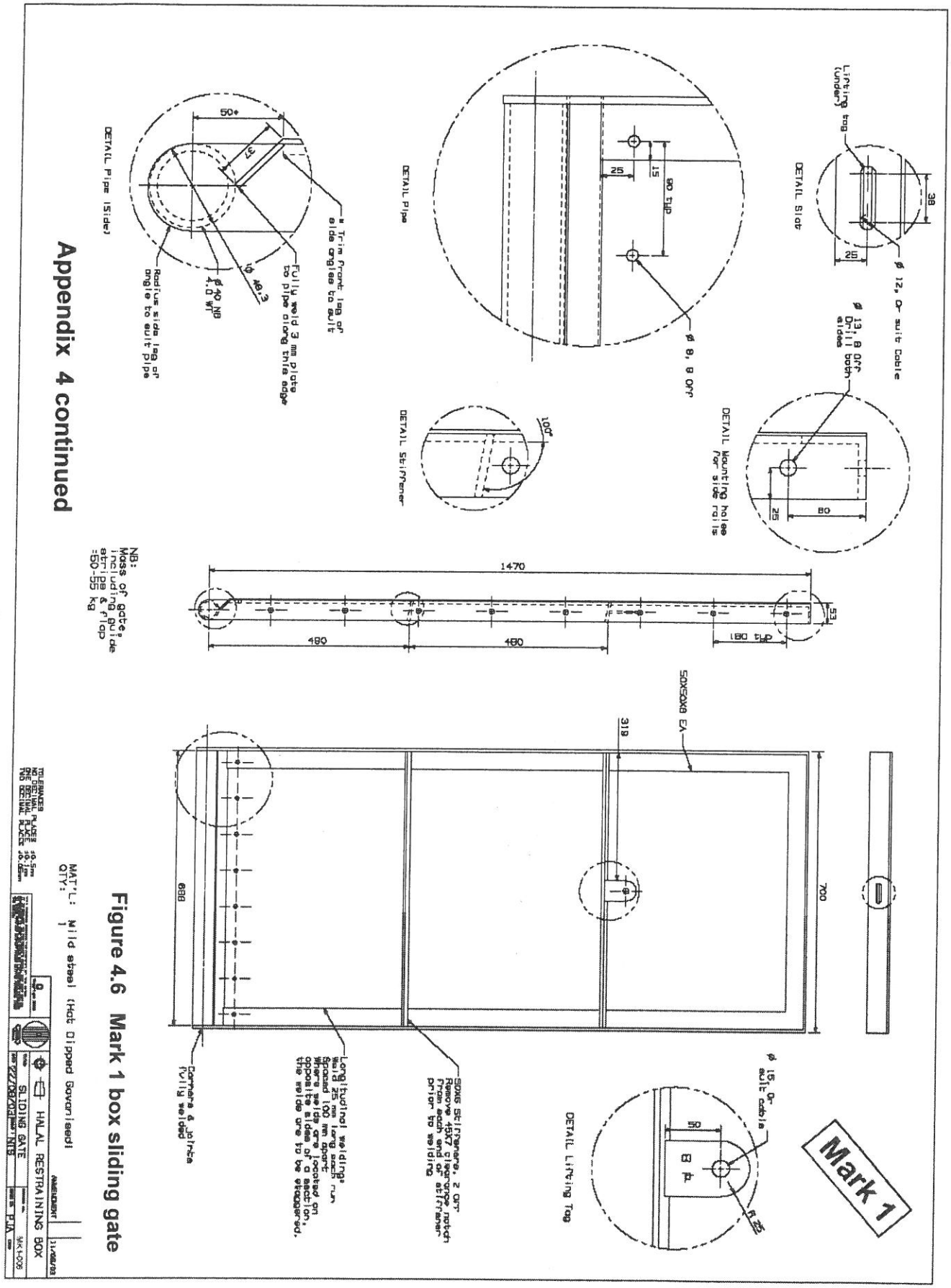


Figure 4.6 Mark 1 box sliding gate

Appendix 4 continued

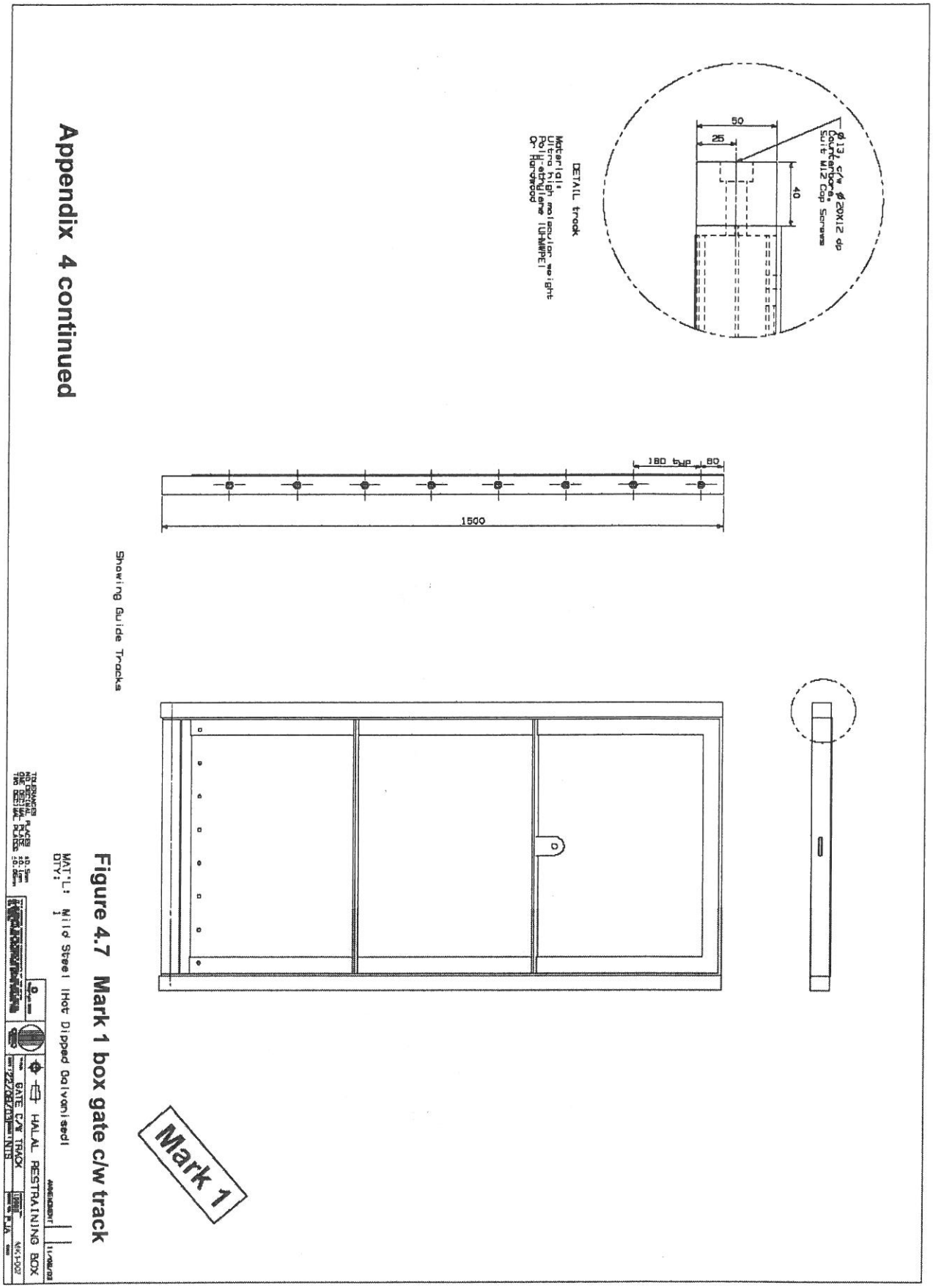
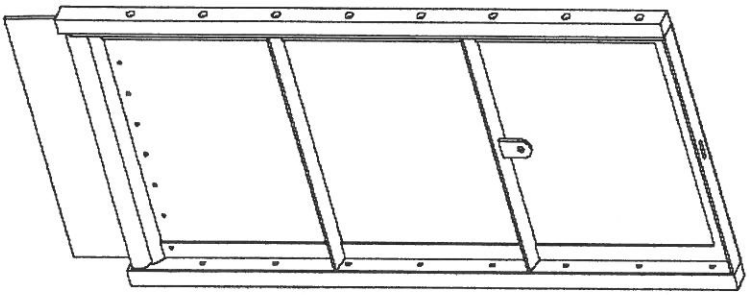
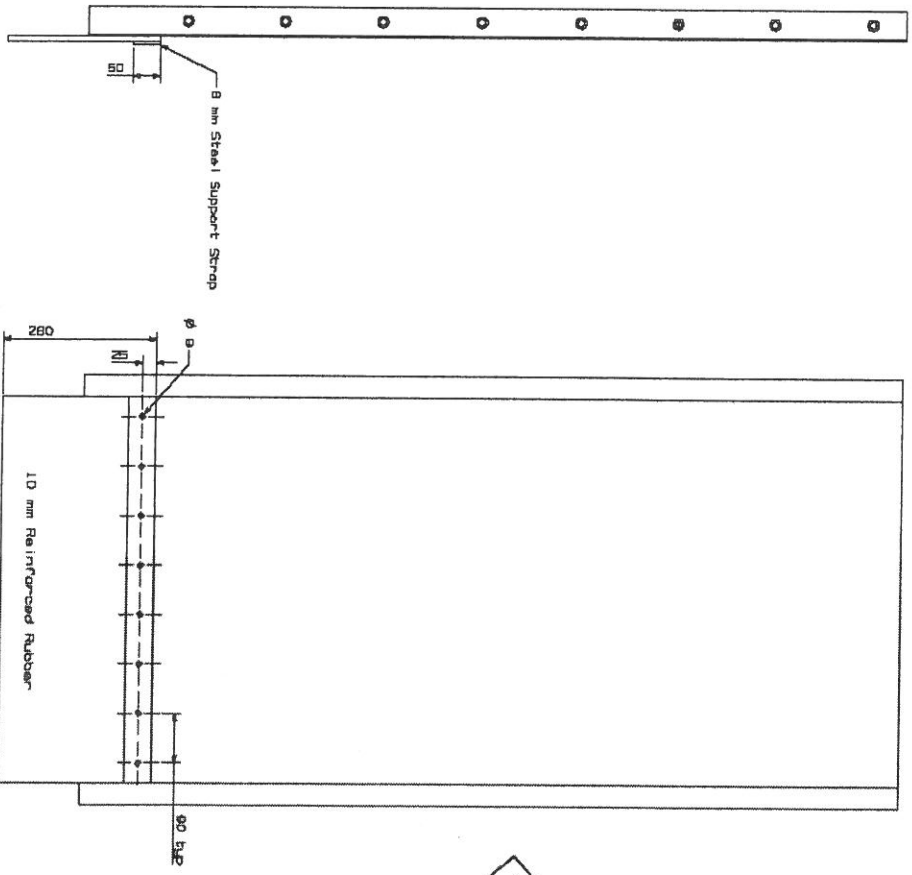


Figure 4.7 Mark 1 box gate c/w track

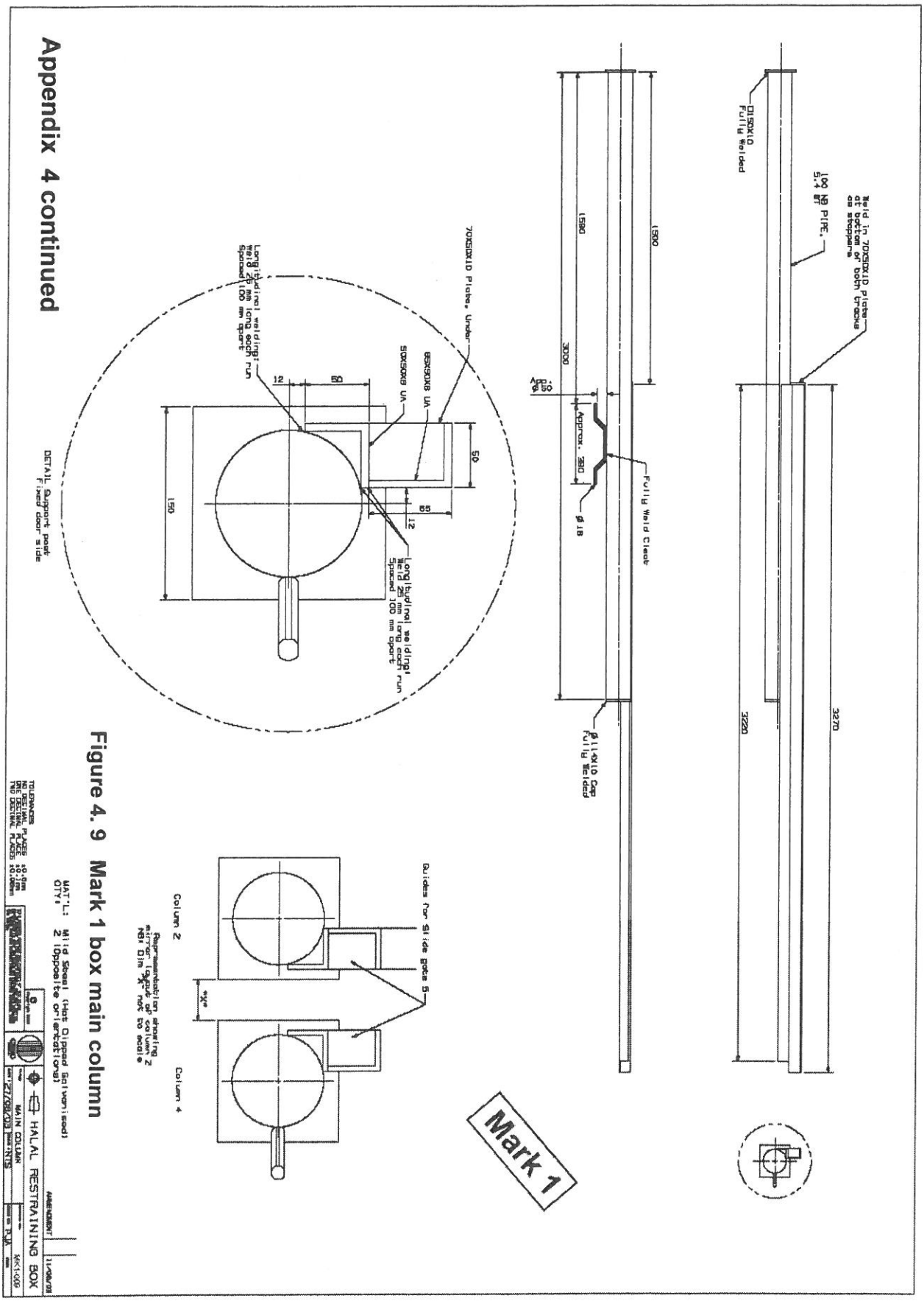
Appendix 4 continued





Showing Rubber Flap

Figure 4.8 Mark 1 box gate with flap


Appendix 4 continued
DETAIL Support post
Fixed door side
70X50X10 Plate, Under
65X50X8 UA
50X50X8 UA
Long intermittent welding: Weld 25 mm long each run Spaced 100 mm apart
12
50
150
65
Long intermittent welding: Weld 25 mm long each run Spaced 100 mm apart
Weld in 70X50X10 plate at bottom of both tracks as stoppers
150 NB PIPE
D150X10 Fully Welded
1500
1590
3000
Approx. 380
Ø 18
Fully Weld Cleat
Ø 114X10 Cap Fully Welded
3220
3270
Mark 1
Guides for Slide gate 5
Column 2
Column 4
Figure 4. 9 Mark 1 box main column
MAT'L: Mild Steel (Hot Dipped Galvanised)
QTY: 2 (Opposite orientations)
TOLERANCES
UNLESS OTHERWISE SPECIFIED
ONE DECIMAL PLACES ±0.1mm
TWO DECIMAL PLACES ±0.00mm
HALAL RESTRAINING BOX
MAIN COLUMN
27/08/09
SHEET 1 OF 1
SIZE A4

Appendix 4 continued

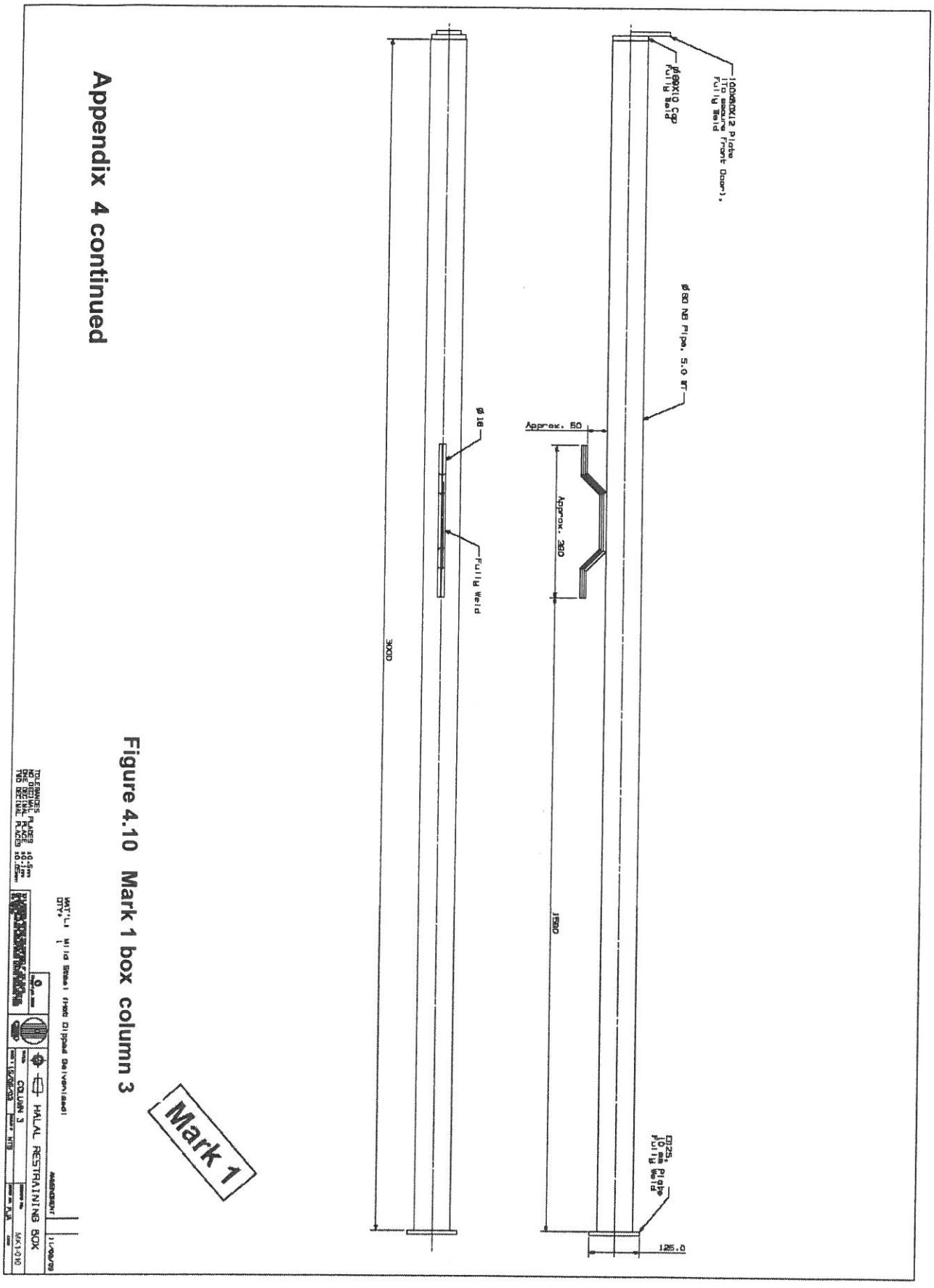


Figure 4.10 Mark 1 box column 3

Appendix 4 continued

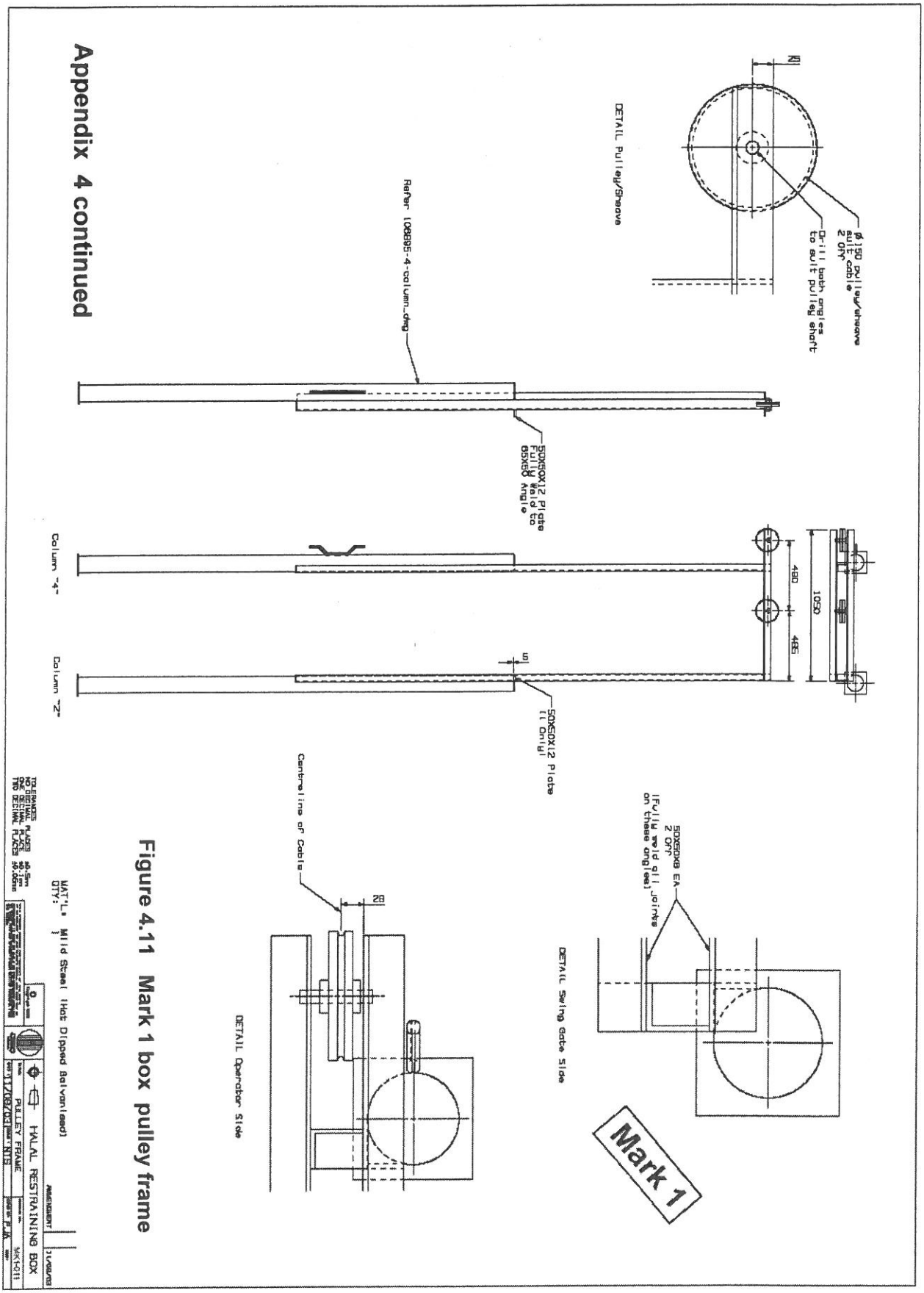


Figure 4.11 Mark 1 box pulley frame

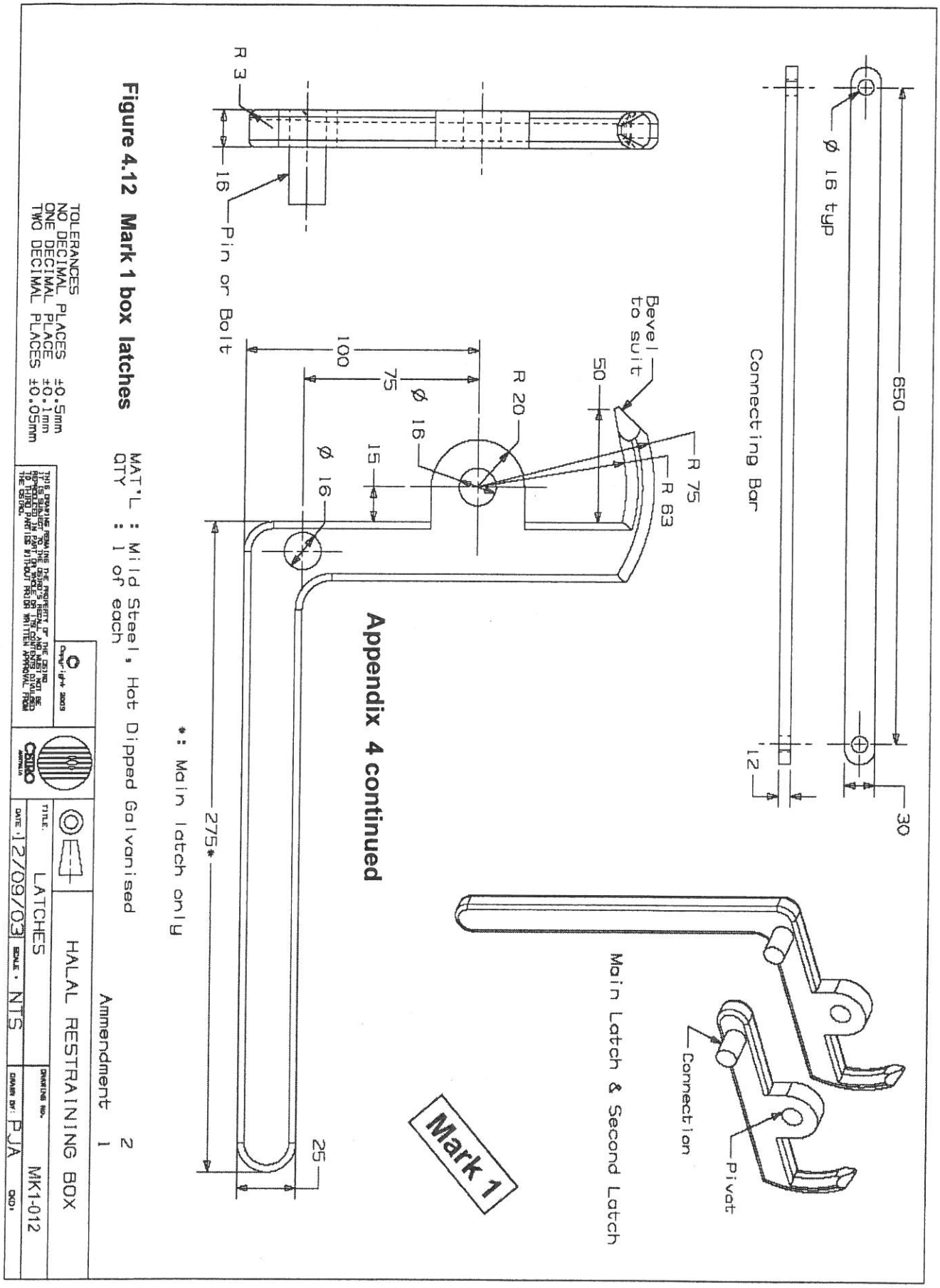
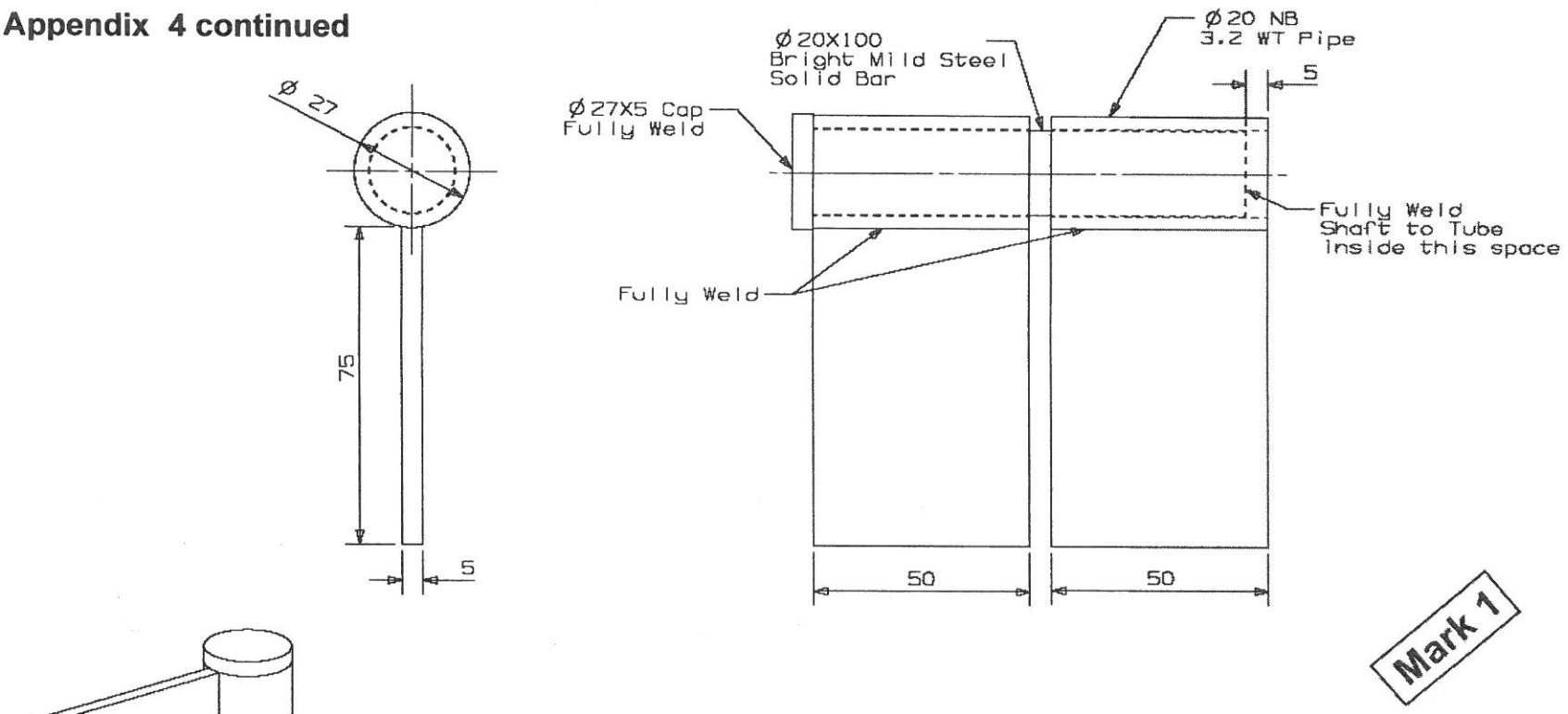


Figure 4.12 Mark 1 box latches

Appendix 4 continued



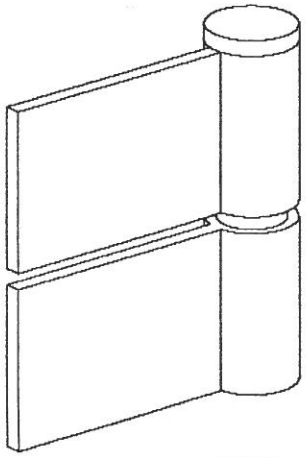


Figure 4.13 Mark 1 box hinge assy.

MAT'L : Mild Steel Hot Dipped Galvanised
QTY : 6

Ammendment	2	
	1	18/09/03

TOLERANCES
NO DECIMAL PLACES ±0.5mm
ONE DECIMAL PLACE ±0.1mm
TWO DECIMAL PLACES ±0.05mm

CSIRO AUSTRALIA

HALAL RESTRAINING BOX

TITLE. HINGE ASSY
DRAWING No. MK1-013
DATE : 12/09/03 SCALE : NTS
DRAWN BY: PJA CKD:

Appendix 6 Mark 2 box pictures showing operation

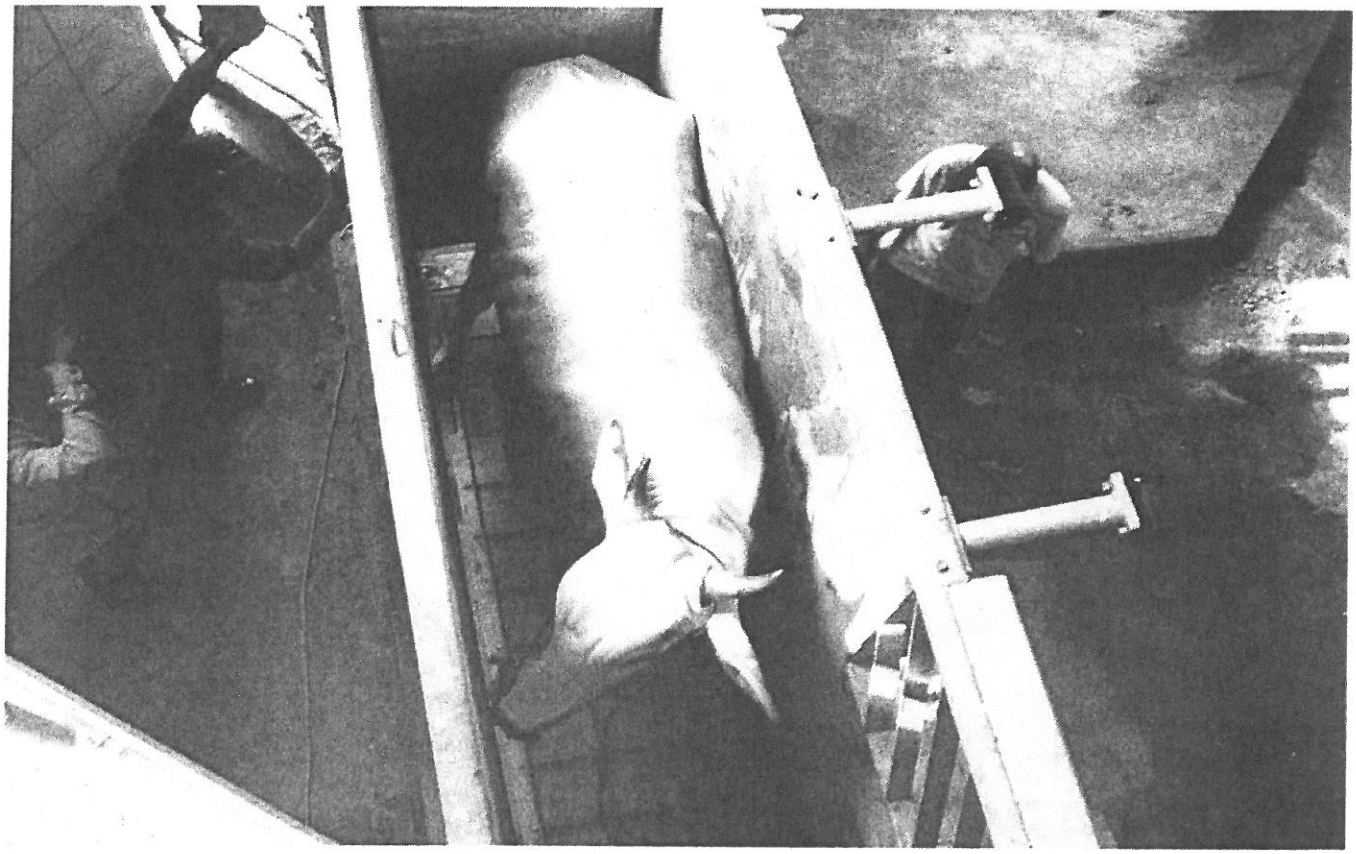


Figure 6.1 Mark 2 box immediately prior to releasing tilt side door

Appendix 6 continued

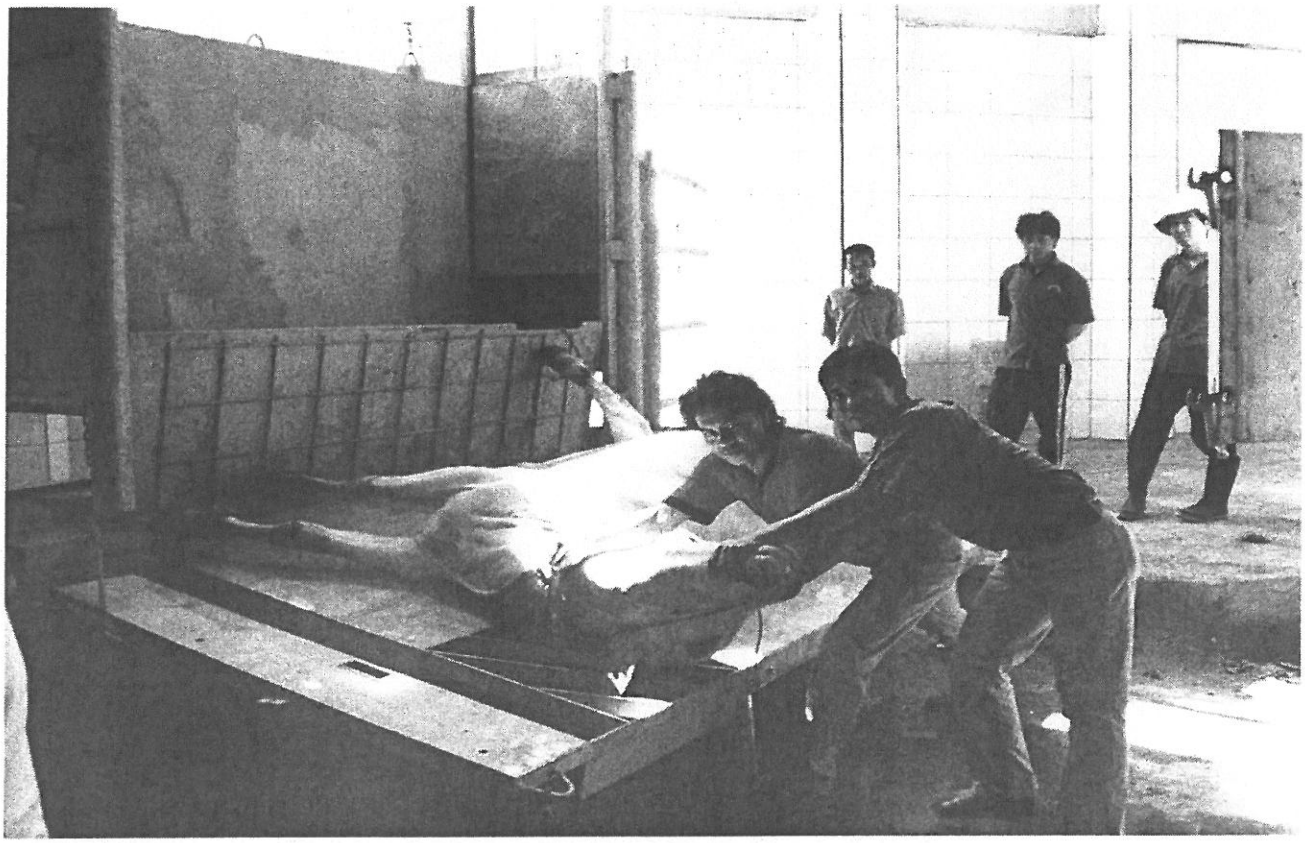


Figure 6.2 Mark 2 box open

Appendix 6 continued

Figure 6.3 Mark 2 box - restrained animal

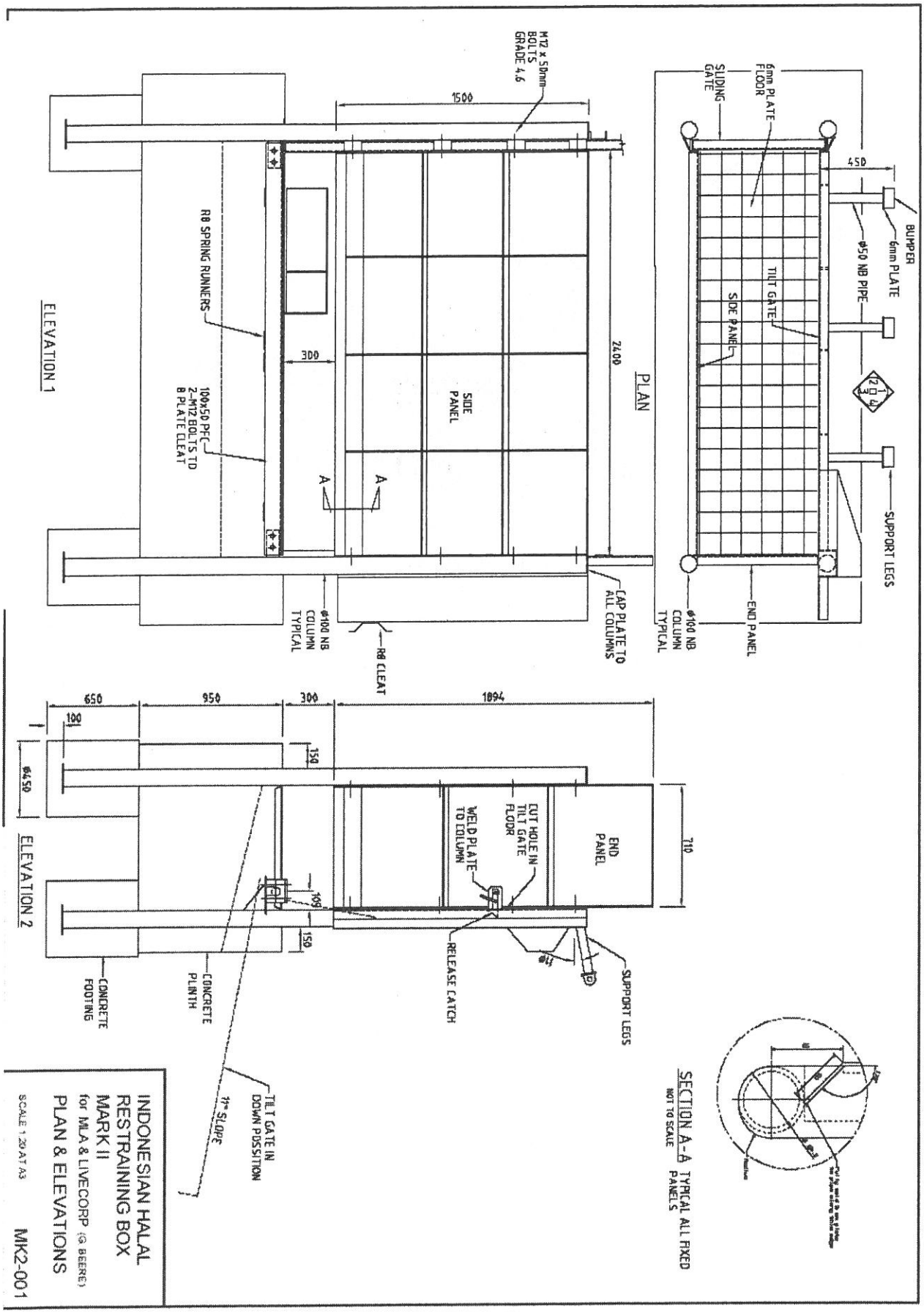
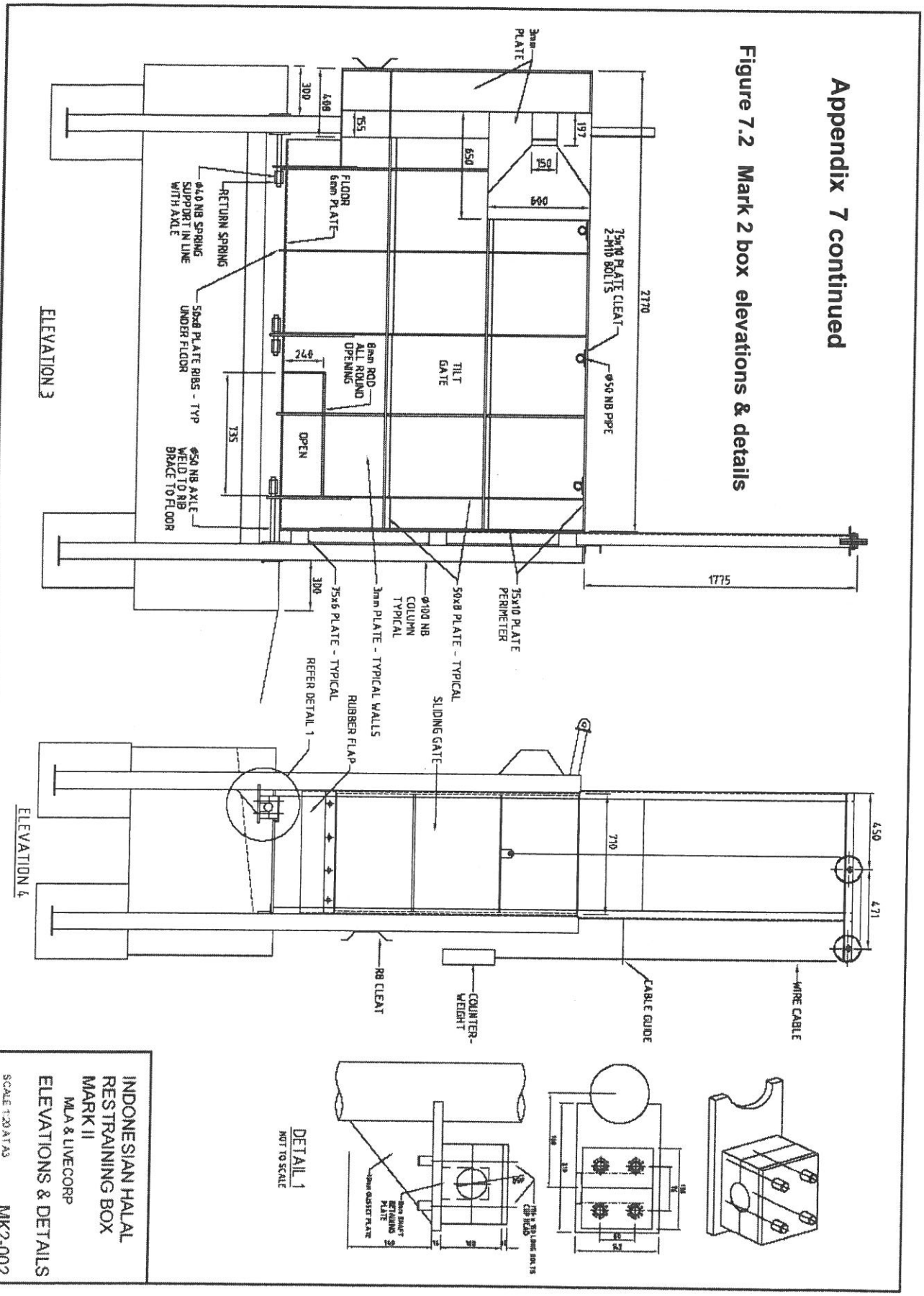


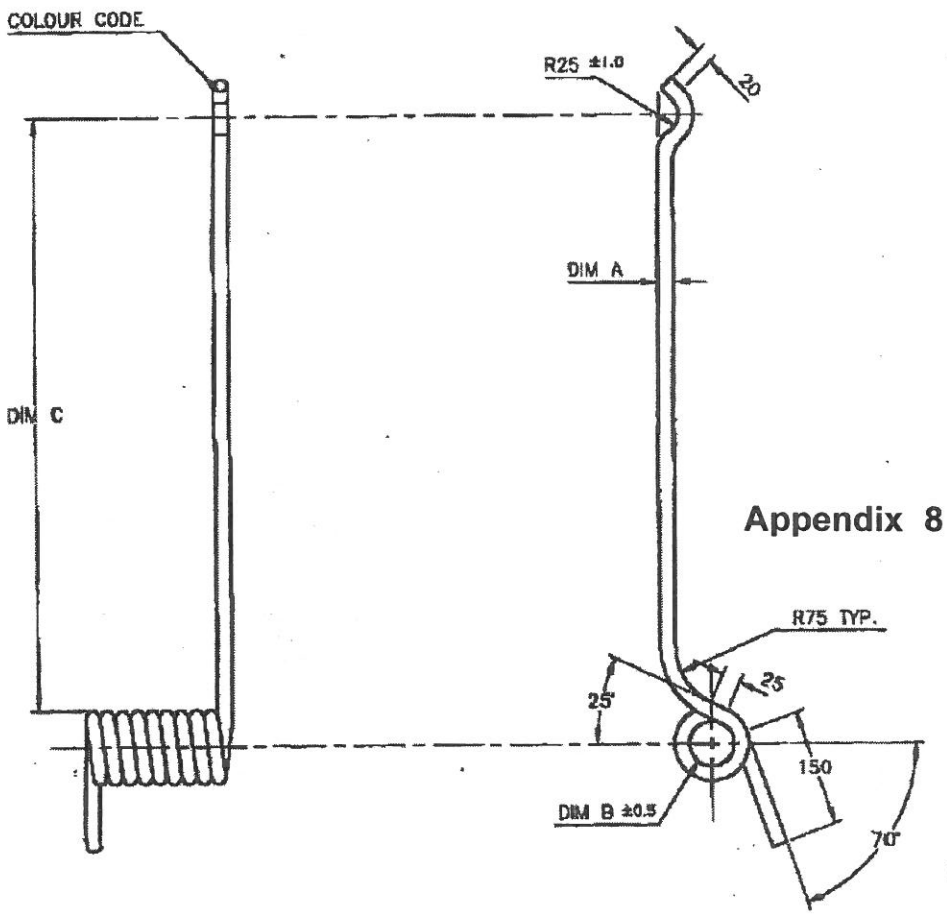
Figure 7.1 Mark 2 box plan & elevations

Appendix 7 Mark 2 box engineering drawings

Appendix 7 continued

Figure 7.2 Mark 2 box elevations & details





Ⓐ

DIM A	DIM B	DIM C	TOTAL COILS	COLOUR CODE	PART No.
17	57	740	9	YELLOW	HF003/17
19	57	740	9	BLACK	HF003/19

GENERAL NOTES

1. MATERIAL: BHP X4K92M61S (OR EQUIVALENT).
2. HARDENED AND TEMPERED TO 42–47 HRC.
3. SPRINGS TO BE COLOUR CODED (REFER TO TABLE).

Appendix 8 Mark 2 box picture of torsion spring

Figure 8.1 Mark 2 box gate torsion spring

REV	DESCRIPTION	DATE	BY
A	ADDED PART NUMBERS	14-12-99	M.T.

A4 | DO NOT SCALE DRAWING

INDUSTRIAL ENGINEERS AND SPRING MAKERS PTY. LTD. (S.A.)

DRAWN	M. TURNER
CHECKED	L. WILLS
DATE	07-08-98
SCALE	1 : 8

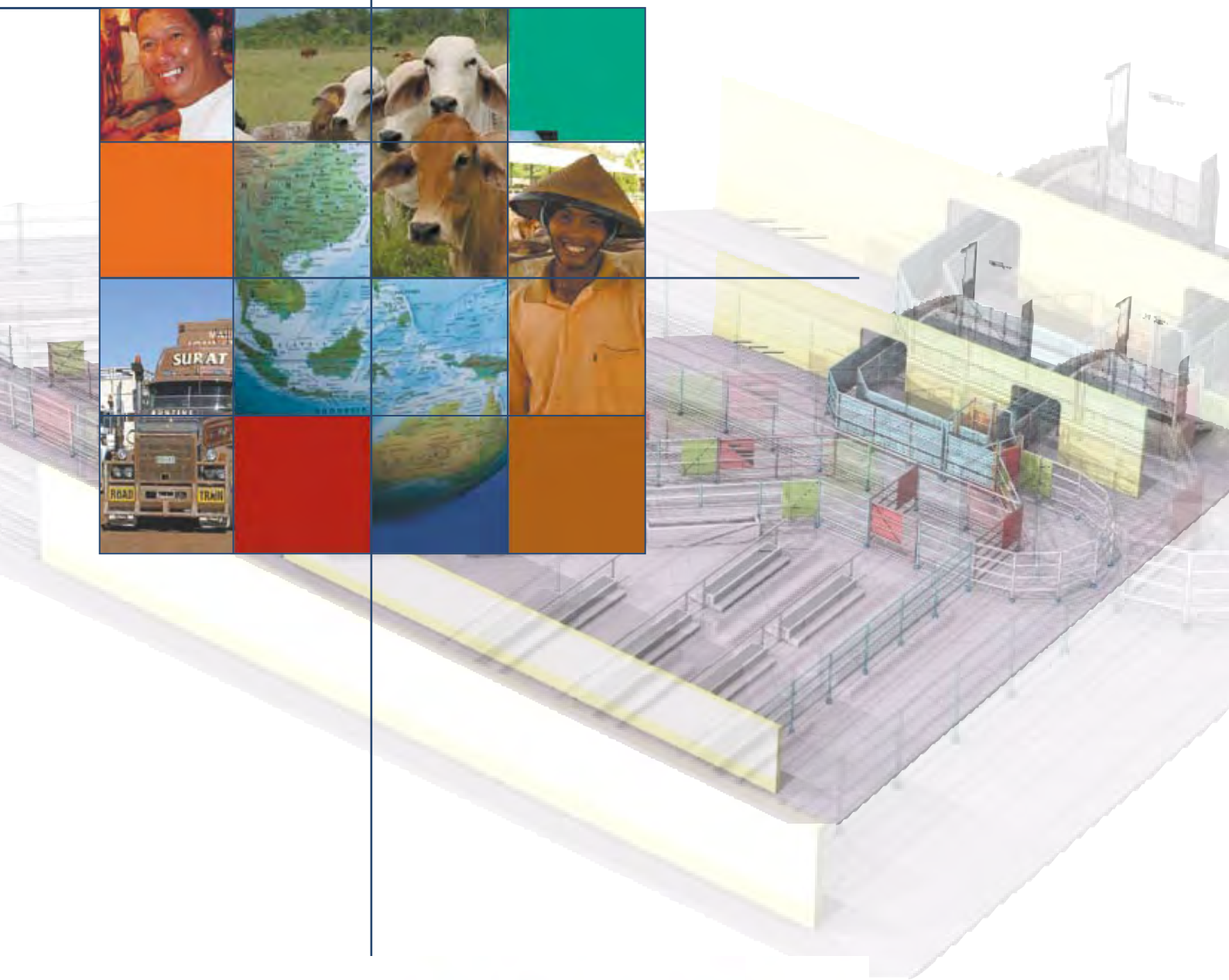
TITLE: LOW LOADER TAIL GATE TORSION SPRING

TOLERANCES UNLESS SPECIFIED
LENGTHS (X) = ± 3 mm
LENGTHS (.X) = ±
ANGLES ° = ± 2°

DRAWING NUMBER: HF003

BLANK PAGE FOR NOTES

Manual of yard plans
for South-East Asian abattoirs



LIVECORP

mla
MEAT & LIVESTOCK AUSTRALIA

Project code: LIVE.236

Prepared by: Geoffrey C Beere
Amal Services Pty Ltd

Published by Meat & Livestock Australia Limited
First Published June 2006
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ABN 39 081 678 364
ISBN 1 74036 9416

Contents

A compact disk comes with this manual. This CD contains drawings and images from this manual and a copy of the earlier publication 'Manual for cattle slaughter restraining box'.

Foreword

WALLCO PASTORAL COMPANY PTY LTD

This is a manual that has been far overdue, it is practical and simple and would greatly assist small abattoirs in Asia or the Middle east in providing a very humane way of handling, holding and slaughtering cattle, "especially Australian cattle".

John Quintana
Managing Director
Wallco Pastoral
www.wallco.com.au

WALLCO PASTORAL COMPANY PTY LTD
ABN 46 077 798 139 ACN 077 798 139
3rd Floor, 43 Cavenagh St, Darwin NT 0800 GPO Box 435, Darwin NT 0801
Phone: (08) 9881 0333 Fax: (08) 8941 8058 E-mail: admin@wallco.com.au

Abstract

This manual will demonstrate with the use of plans, three-dimensional drawings and descriptive text, cattle yard designs that are suitable for both privately operated and public South-East Asian abattoirs.

The following factors have been taken into consideration in developing this manual:

- the high cost and scarcity of suitable land for abattoir infrastructure
- the best utilisation of locally available construction materials
- the need to be able to process both local, lead cattle in small numbers and imported cattle using the same facilities
- the safety of all people working in the abattoir yards
- the colour and life of the meat
- the welfare of livestock using the yards.

1 Background

1.1 Design logic

A long working relationship in South-East Asian countries has highlighted the need to upgrade designs for abattoir cattle yards. Often butchers in these countries will negotiate at the abattoir to buy or select cattle immediately prior to slaughter. It is important that cattle are presented up to this point in a calm and well conditioned state. Butchers are increasingly aware that pre slaughter feeding and the quiet handling of the cattle prior to slaughter improves the meat colour and longevity of the carcase.

1.2 Traditional abattoir

A traditional abattoir is one that can process a number of cattle at any one time in the same building using a designated team of usually four workers for each animal. None of the suppliers to the wet market want to be last to the market tables, so high throughput over a short time is essential.

The South-East Asian meat industry prefers a traditional abattoir to provide slaughter services where a slaughter team is paid to deliver within a short space of time, typically between 2100 hours and 0200 hours each night. Many attempts have been made to introduce abattoirs with a gravity line, however with this system there will always be an obvious first and last meat seller to the market, and for this reason this type of system has not been adopted. It is only in recent times that South-East Asian abattoirs have been willing to share a slaughter restraining box. Local slaughter traditions do have a strong commercial and cultural basis and for this reason, changes to the traditional system must have strong, commercial drivers.

1.3 Modern abattoir

Imported Australian cattle have only been in the South-East Asian market for a relatively short time however some of the existing abattoirs were built by the Dutch some 80 years ago. This manual attempts to overcome some of the early design problems by incorporating features to minimise the disturbance and subsequent stressing of cattle. These design features are listed below.

1. Feed and water troughs are provided for every holding pen including areas holding local cattle.

2. Gates are positioned in the pens to assist with selecting and singling out individual cattle.
3. The use of laneways [3 metres wide] have been maximised to move cattle (cattle prefer to stand along side each other to remain confident and at ease).
4. The use of cattle races [71 cm wide] have been minimised as cattle made to stand in a race head to tail for some time will loose confidence and stress.
5. Cattle enter and exit yards from different gates to improve the flow of cattle.
6. Virtually all 90° corners have been eliminated in the cattle yard layout and replaced with 45° and 135° corners.
7. Because some new abattoirs may only require relatively small production and throughput, there is scope to incorporate only one race exiting the forcing pen leading to one restraining box. The restraining box could be either a Mark 1 or Mark 2 box depending on the throughput and the available abattoir budget.

The cattle yard designs offer an optional yard or fence height. In a well-designed yard, cattle will tend to look for an opening at eye level and only jump when put under pressure by stockmen. The recommended minimum height for all internal yards or pens is 1.6 metres and a minimum height of 1.7 metres for perimeter or boundary yard panels. Due to the high cost of materials in South-East Asia, this manual has taken the option to be conservative so as to minimise costs of construction.

At the time of producing this manual, mild steel black pipe and mild steel 3 mm plate are the preferred building materials along with concrete. The designs in this manual have attempted to make the best utilisation of the building materials with minimum off-cuts.

2 Yard site selection

The site location of the abattoir yard should minimise the impact of the development on the local community and the environment. The abattoir yard site should be at least 100 metres from the feedlot, buildings used for human habitation and any factory, public road or public place that is likely to use meat or meat products. Potable water, electricity and drainage facilities, including disposal of abattoir effluent, storm water and site drainage and sewage disposal, must also be available.

Stock pens must drain away from the abattoir and processing areas with the abattoir having the highest elevation. The area should be free of dust, odours and located away from city dumps and sewage disposal systems.

Undesirable soil types that are subject to significant expansion and contraction should be avoided, as should heavy soils that are subject to water logging. Sites subject to flooding or rising water tables must also be avoided.

3 Abattoir yard drainage

Storm water, sewage and effluent should be diverted away from the abattoir wastewater treatment ponds and not mixed with wastewater in anaerobic/aerobic ponds.

The pen area space is to be roofed and have paved or concreted floors. Lane ways and forcing pens should not be included in the equation when calculating pen areas. Pen areas should be calculated on the basis of approximately 2–4 square metres per slaughter animal. There should be sufficient space for all the cattle in the pen to lie down and rest. This manual promotes the dry cleaning of cattle pens (solids) prior to washing so as to be able to reduce the amount of solids in the effluent.

A graded or sloping concrete pen floor with a broom finish is the best. It is important that the placing of any drains inside pens, laneways, ramps etc be avoided to minimise any injury to cattle. The shadows caused by drains also baulk cattle when they are moved. Spoon drains are recommended in preference to rectangular or straight-sided drains. There should be sufficient pen floor area in the abattoir holding yards to hold cattle for one day's production.

Rectangular drains in cattle yards and pens should be avoided due to the risk of livestock injuries and the baulking of cattle.

Spoon drains (spoon shaped) have no corners, therefore are an efficient means of moving solids and water away from yards for treatment.

Concrete broom finish

A stiff broom used to roughen the new concrete floor surface prior to hardening provides a non-slip surface for cattle.

Surface on concrete described as broom finish. A broom finish will give a good non-slip surface for cattle. Brush strokes to be at 90˚ to the direction of the movement of cattle.

4 Yard designs, models and plans

4.1 'V' force yard

The words 'V force' in this instance refer to the design or shape of the area were cattle are moved from a laneway into a raceway.

The plan on **Figure 1** shows an abattoir yard plan, with the concept being to minimise the use of 90° corners and replace them with 45° and 135° corners. The plan allows for the addition or deletion of angle pens. This design illustrates the use of four angle pens. Each pen is 3 metres wide and 14 metres long, and can hold up to 15 slaughter weight cattle. Pens can have a greater length than 14 metres but if so, a dividing swing gate should be fitted. Cattle pens with a separate entrance and exit gate makes it easier to move imported cattle.

Figure 2 shows a model of the 'V' forcing pen. **Figure 3** shows a plan of the 'V' forcing pen, while **Figure 4** depicts a model of the complete 'V' force yard.

The design makes allowance for the construction of lairage for tethered cattle and there is provision in both the 'V' force yard design and the following 'D force' yard designs (**Figures 5 to 8**) for local or tethered cattle to enter a raceway by a swing gate into a laneway.

Swing gate is the name given to a gate that is usually hinged at one end and swings through 180°. The swing gate in these plans has a steel plate fitted and this not only adds strength but also acts as a visual guide for cattle.

Complete 'V' Yard Layout		Plan	
Drawn by	Drawn	Scale A4	
D Beere	15/08/07	1 : 250	

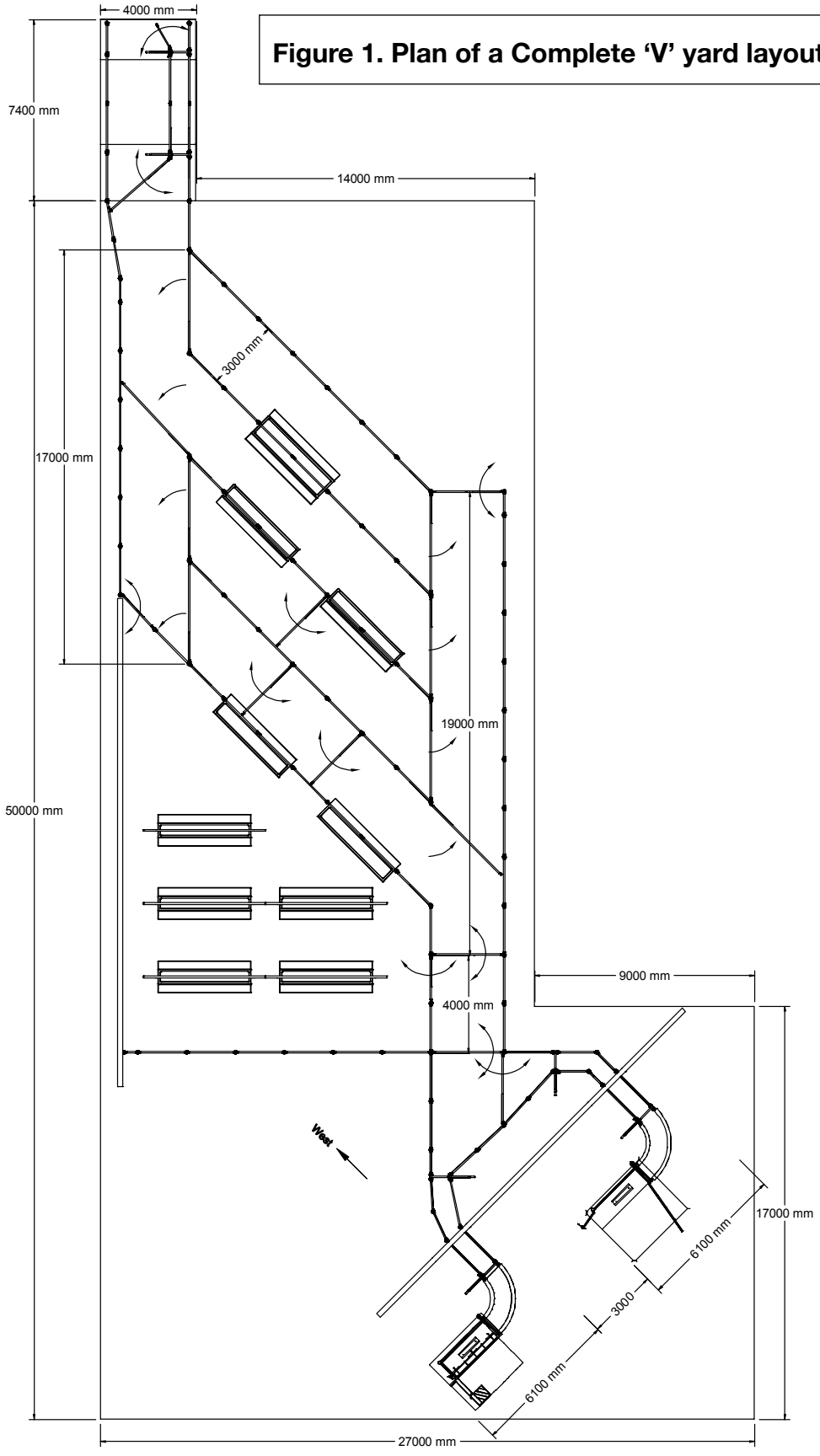


Figure 1. Plan of a Complete 'V' yard layout

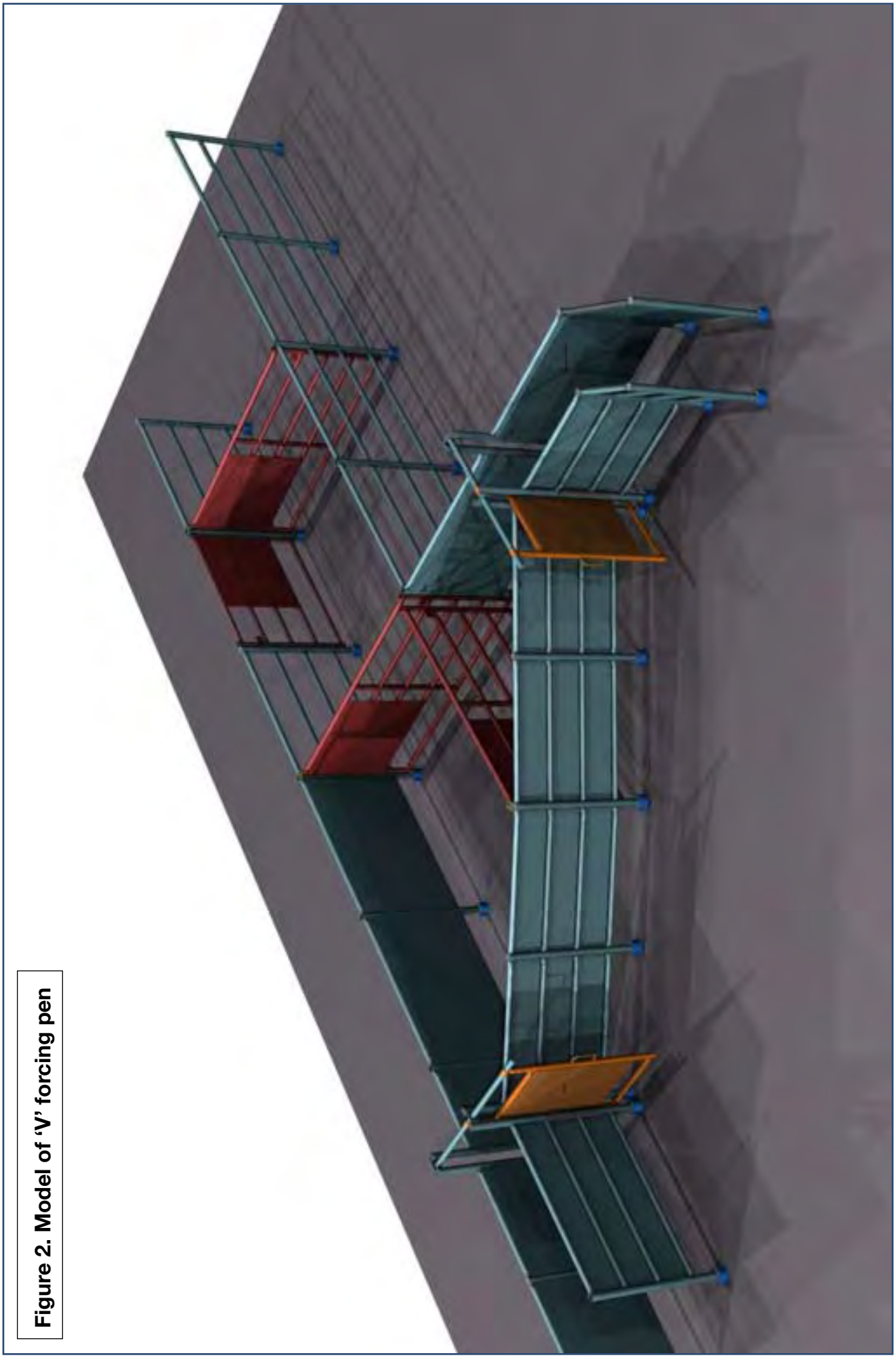


Figure 2. Model of 'V' forcing pen

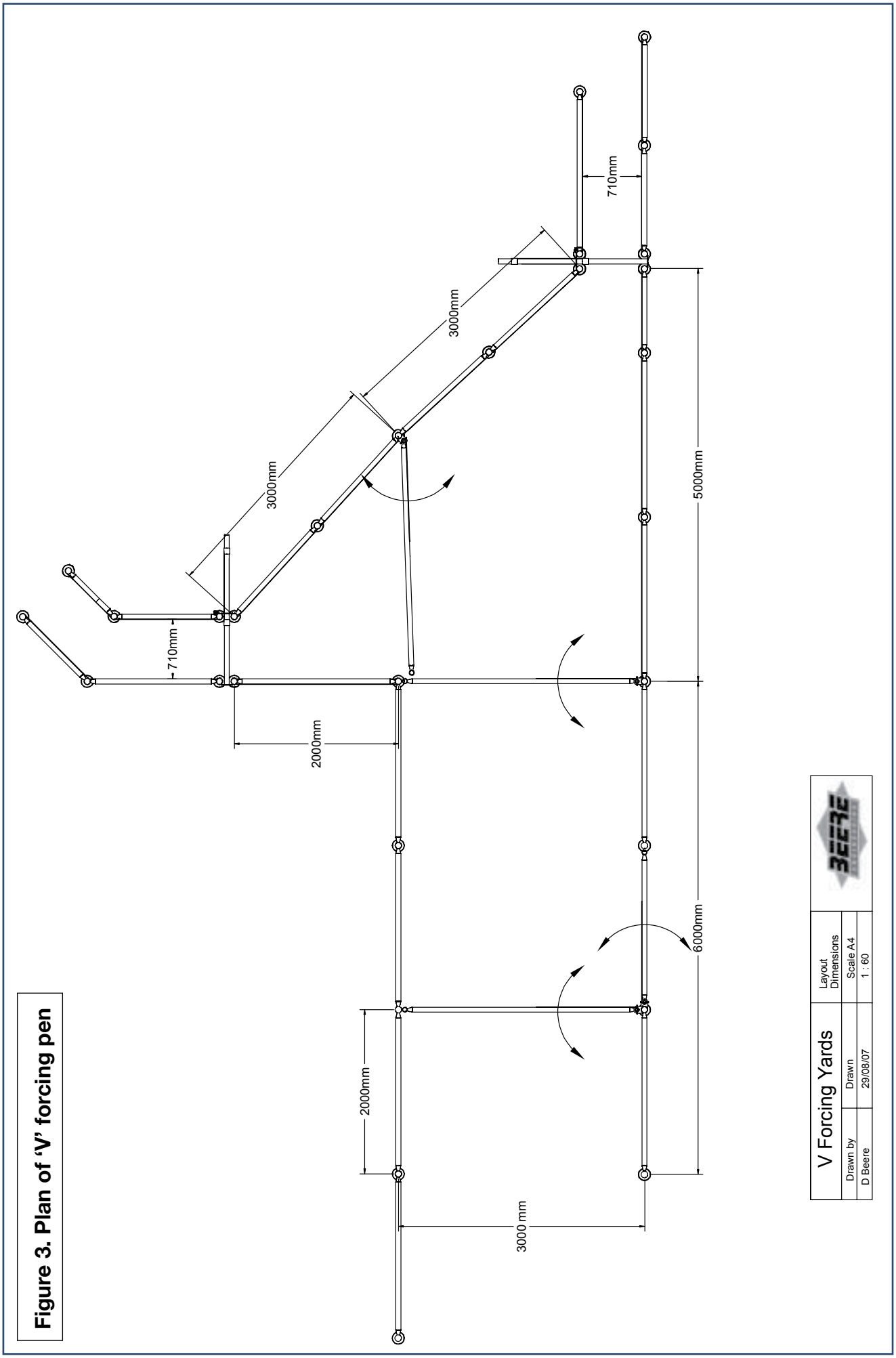


Figure 3. Plan of 'V' forcing pen

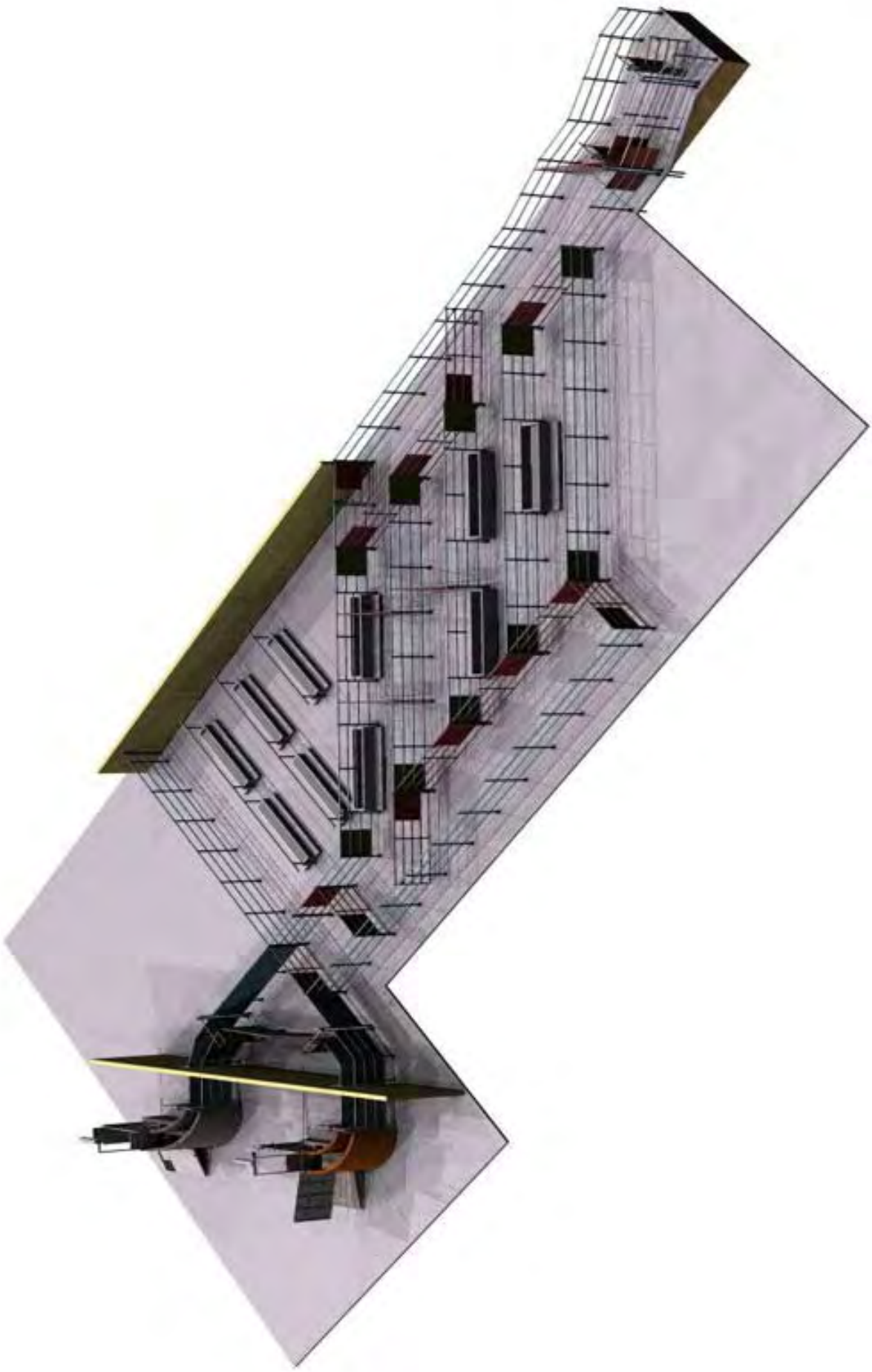


Figure 4. Model of complete 'V' force yard

4.2 'D' force yard

The words 'D force' in this instance refer to the design or shape of the area were the cattle are moved from a laneway into a raceway. The overall design of this slaughter yard is the same as the 'V' yard; it is the design of the forcing area that is different. Refer to **Figure 5**.

It is advantageous to line the inside perimeter of the 'D' with rubber sheet or used conveyer belt fixed to the pipe rails to a height of 1.6 metres.

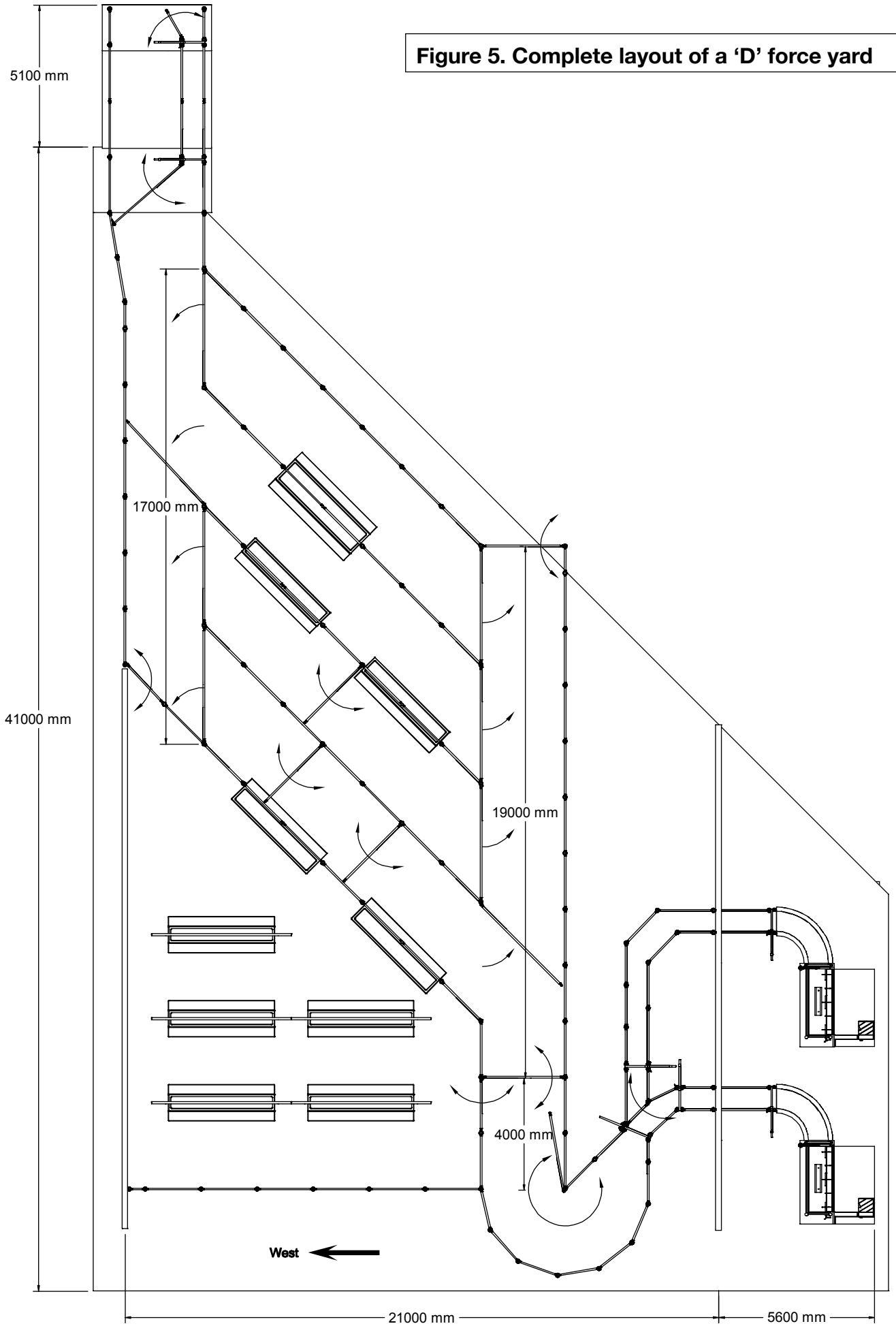
Figure 6 shows a model of the 'D' force pen.

The plan of a 'D' force pen is shown in **Figure 7**. **Figure 8** is a model of a complete 'D' yard layout.

In both the 'V' and a 'D' force yard designs, the direction of Kiblat is labelled with a 'West arrow'. The position of Kiblat will determine the placement of the restraining boxes however the 'D' and the 'V' can be repositioned to make the most economic use of the available land to fit the yard. One of the biggest costs of constructing an abattoir cattle yard in Asia is the cost of the land.

Complete D Yard Layout		Plan
Drawn by	Drawn	Scale A4
D Beere	16/08/2007	1 : 200

Figure 5. Complete layout of a 'D' force yard



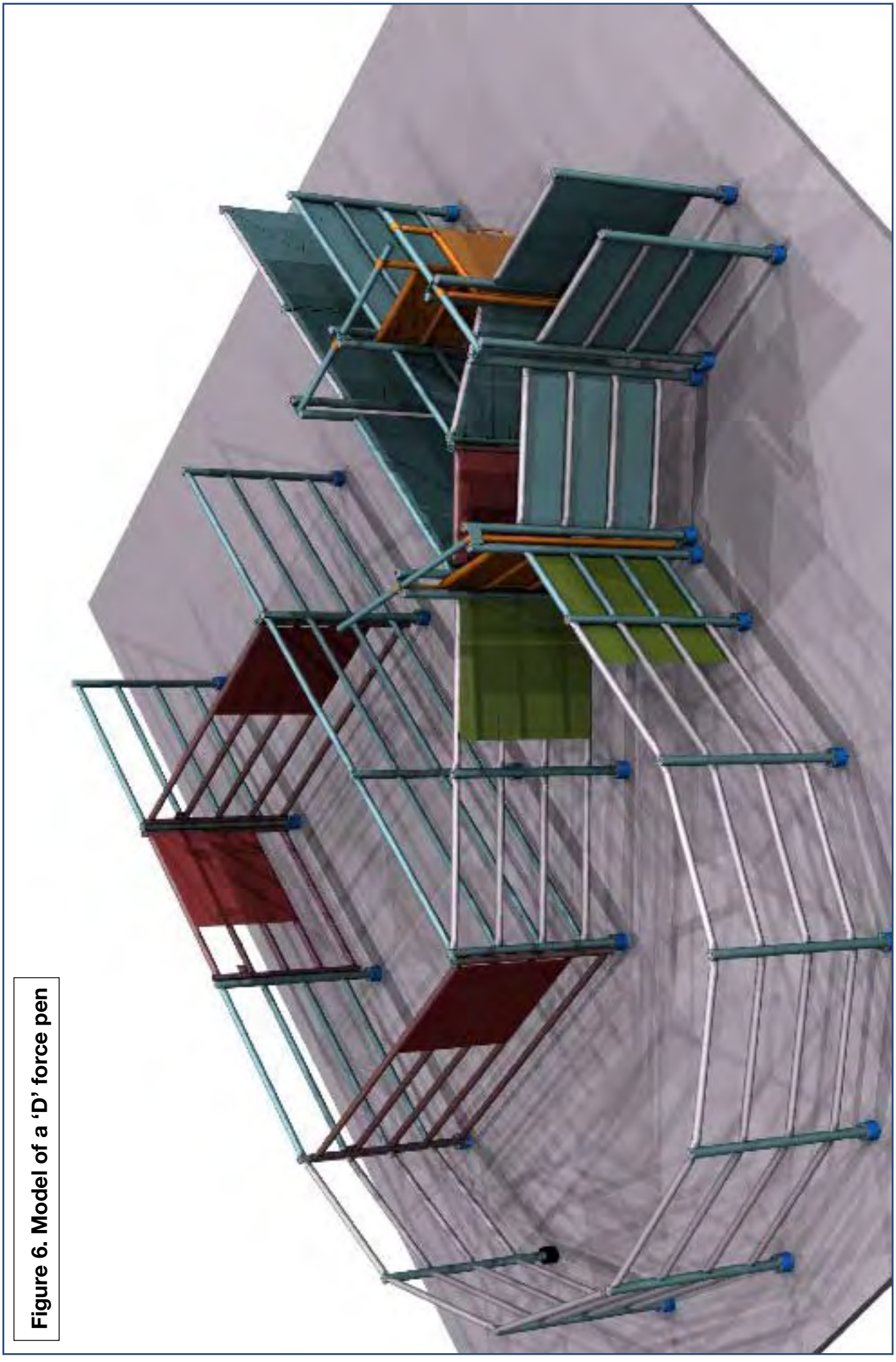
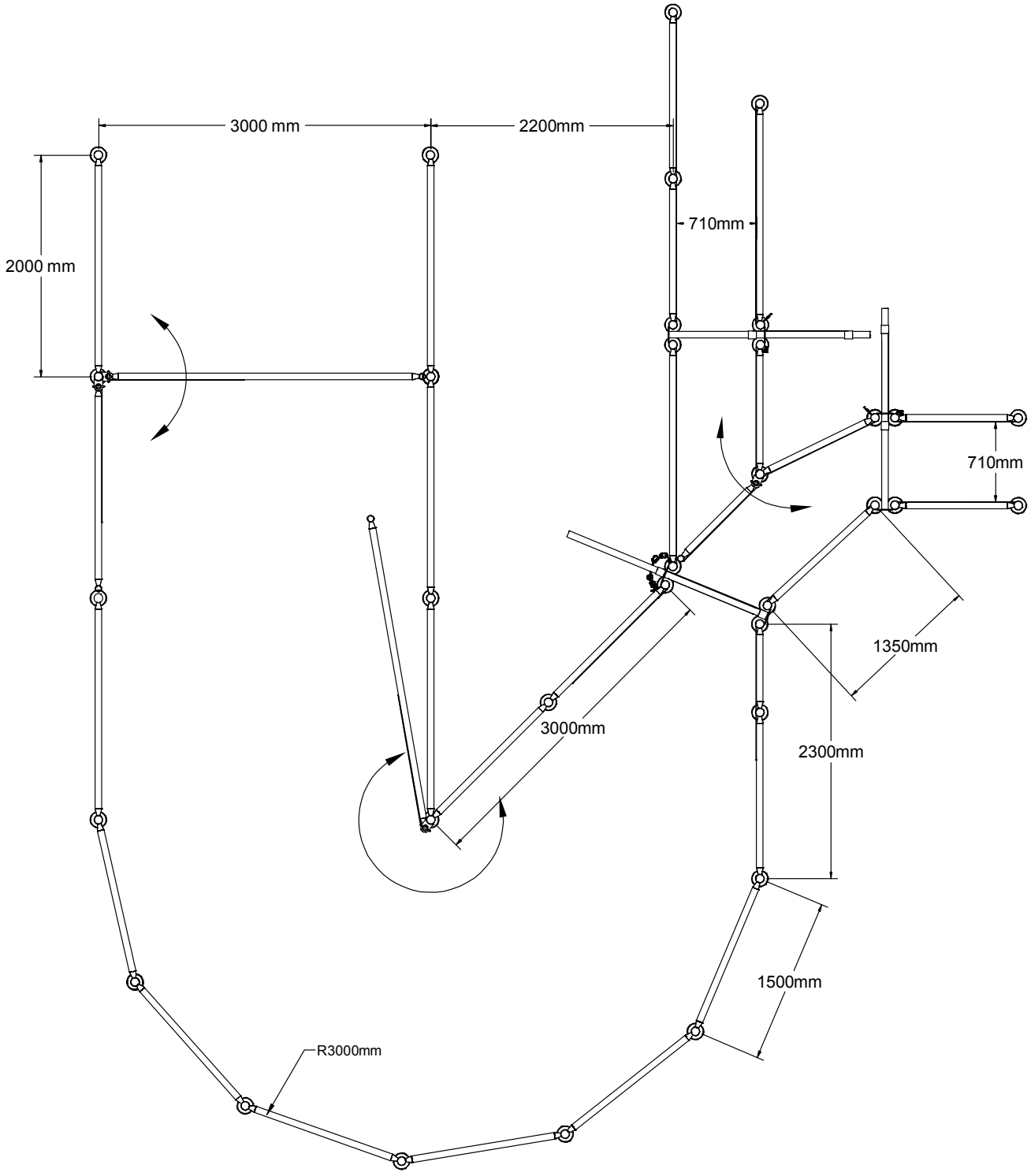


Figure 6. Model of a 'D' force pen

Figure 7. Plan of a 'D' force pen



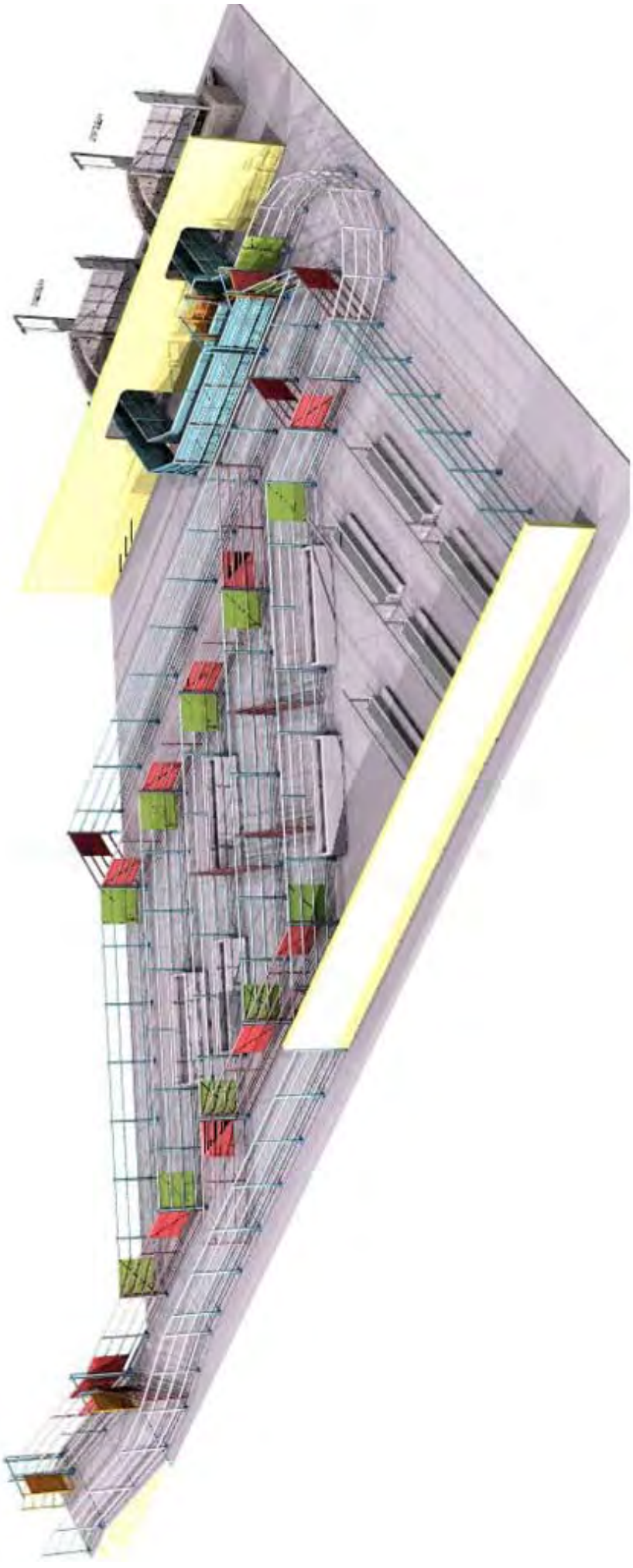


Figure 8. Model of a complete 'D' yard layout

4.3 Mark 1 and Mark 2 box

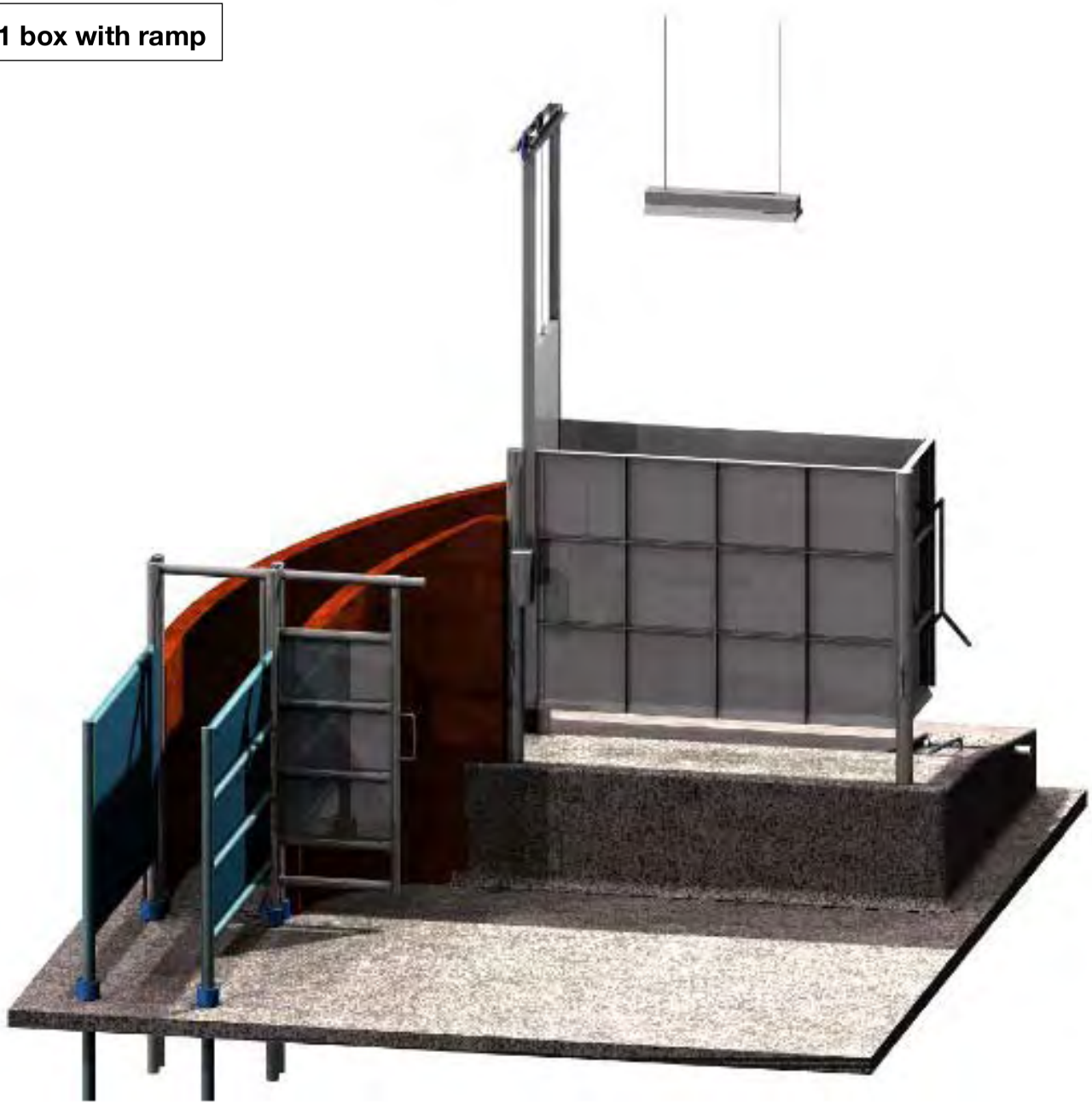
Models of a Mark 1 box closed and open and a model of a Mark 2 box open are shown as **Figures 9, 10 and 11** respectively. The engineering drawings of both boxes are published in a previous manual titled “Manual for cattle slaughter restraining box” Project number: LIVE.309, October 2004. A copy of this manual is included on the CD attached as part of this manual.

The revised Mark 1 boxes are now installed on a concrete plinth 80 cm off the floor surface, which allows for:

- easier operator access
- improved access to collect the blood from the slaughtered animal
- lessens the need for a 1 tonne electric hoist (three phase), as there is enough height above the floor to position a wheeled slaughter trolley adjacent to the concrete plinth.

Please note the mounting position of the florescent light over the box. This is placed in this position to encourage cattle into the box allowing the closing of the door.

Figure 9. Model Mark 1 box with ramp



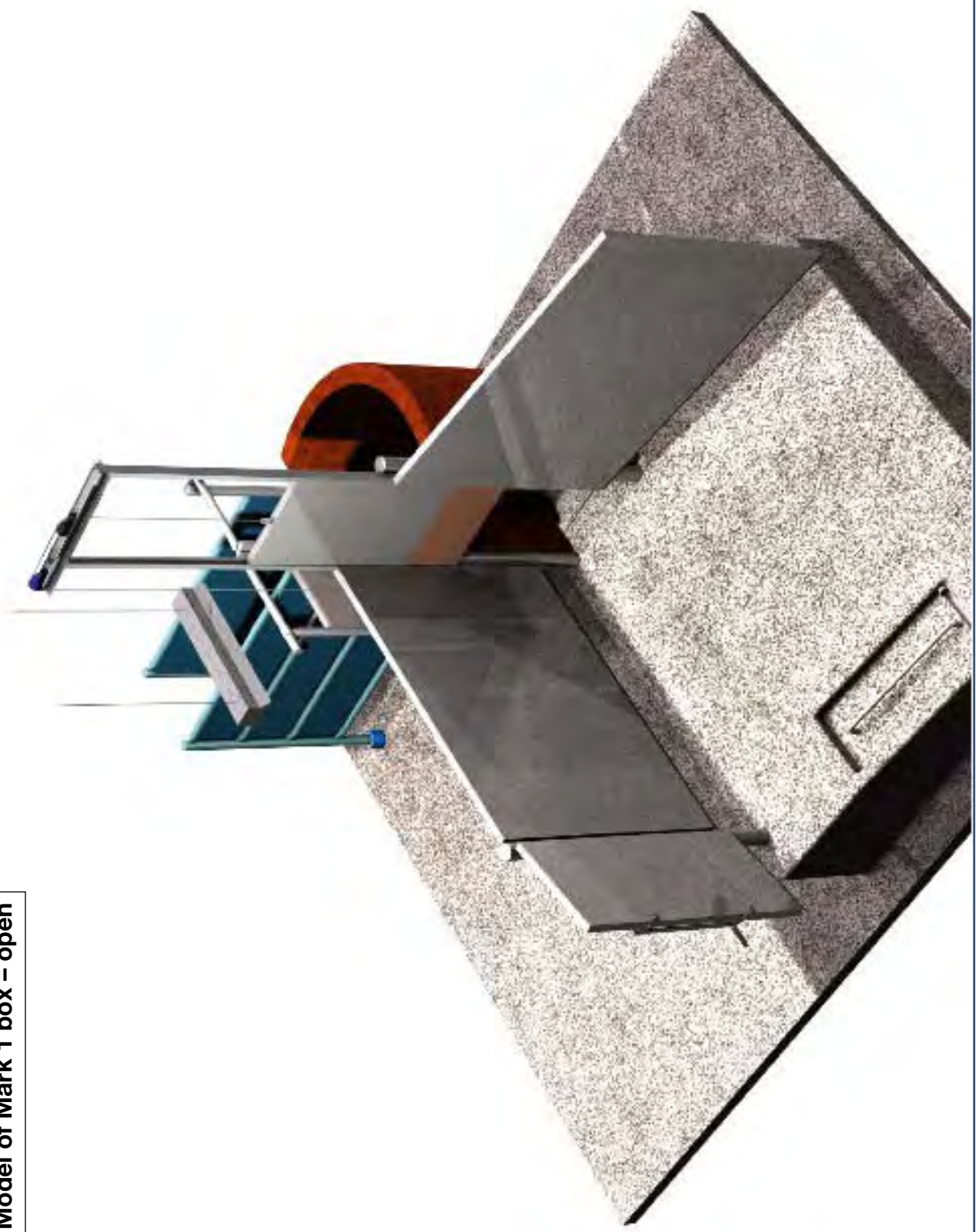
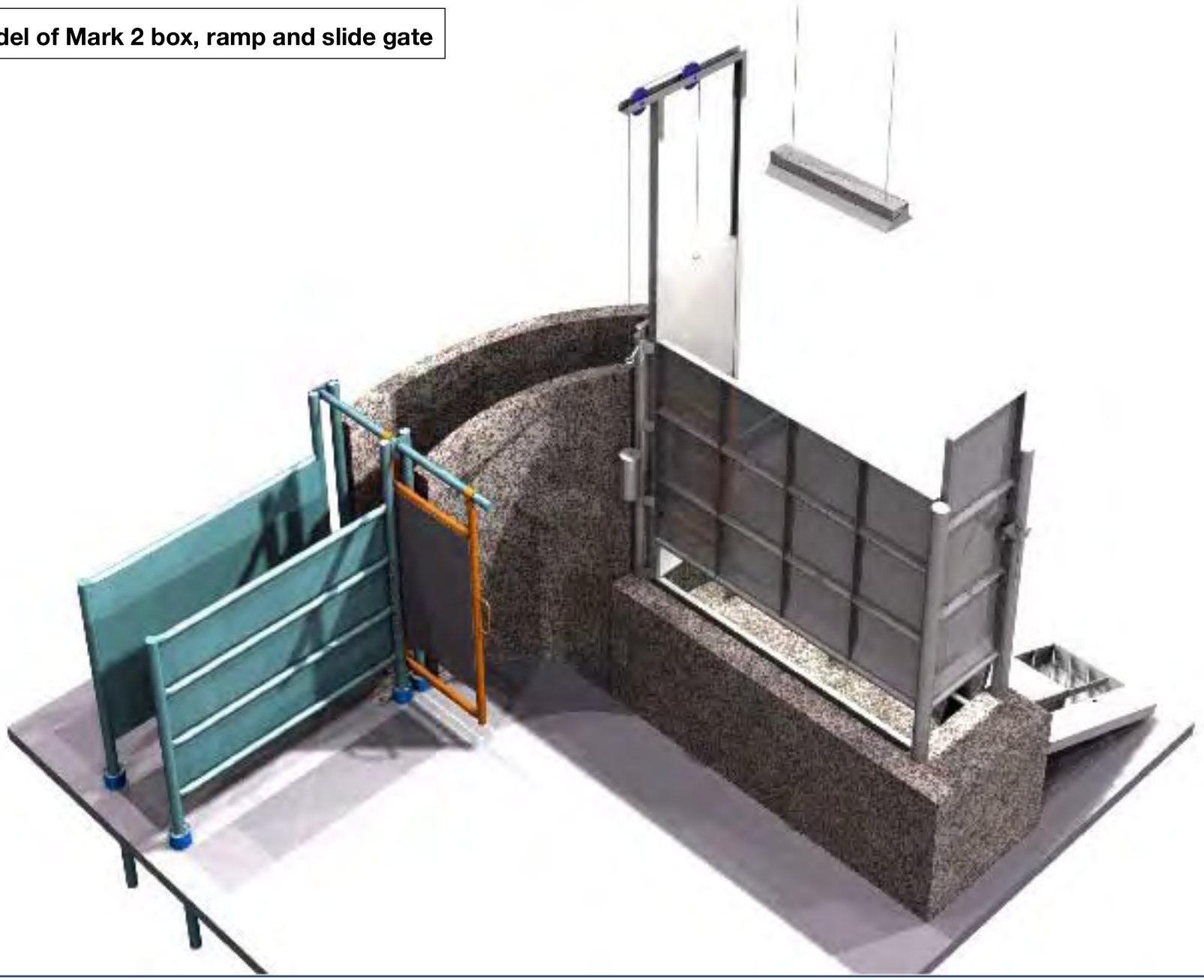


Figure 10. Model of Mark 1 box – open

Figure 11. Model of Mark 2 box, ramp and slide gate



4.4 Sid Parker three-way draft

This three way draft is included in the manual as it is as an essential part of any cattle yard. This simple design modelled in **Figure 12** was put forward by Mr Sid Parker. The inclusion of this drafting concept into yards will save the industry a significant amount of money by reducing stock injuries through the easier sorting or drafting of cattle. This three-way draft design can also be used in a cattle feedlot yard and cattle treatment yard.

Figure 12. Model of Sid Parker three-way draft

4.5 Willie Taylor cattle race and slide gate

This manual makes use of the Willie Taylor cattle race design. A race is used to hold cattle in single file. Ideally the race can be curved and it should not be used to hold cattle for an extended period of time, as cattle become frightened if they have to stand in a race for longer than around 5 minutes. Cattle are moved along a raceway to place them into a restraining box, for treatment or weighing. Cattle can become nervous and agitated standing in a race as they may remember a previous, unpleasant treatment experience. A raceway should have an internal width of 71 cm for cattle and buffalo, with a height of 1.7 metres being sufficient.

It is important to note that races leading cattle to restraining boxes should have their sides internally plated/sheeted so as to reduce stress and bruising and therefore improve meat quality. In races that are used to treat cattle, the sides should be left open to allow operator access. All the plans in this manual are designed to minimise injury to cattle and workers.

There are many ways to construct a sliding gate. The Willie Taylor design has been selected as it is relatively easy to construct, the materials are available in South-East Asia and it is robust and simple in operation. It is important to note that diesel (Solar) should be used as a lubricant on the slide mechanism, not oil as it collects dust and seizes.

Detailed plans complement the model of the race and slide gate, refer to **Figures 13 to 16**.

Figure 13. Willie Taylor cattle race and slide gate

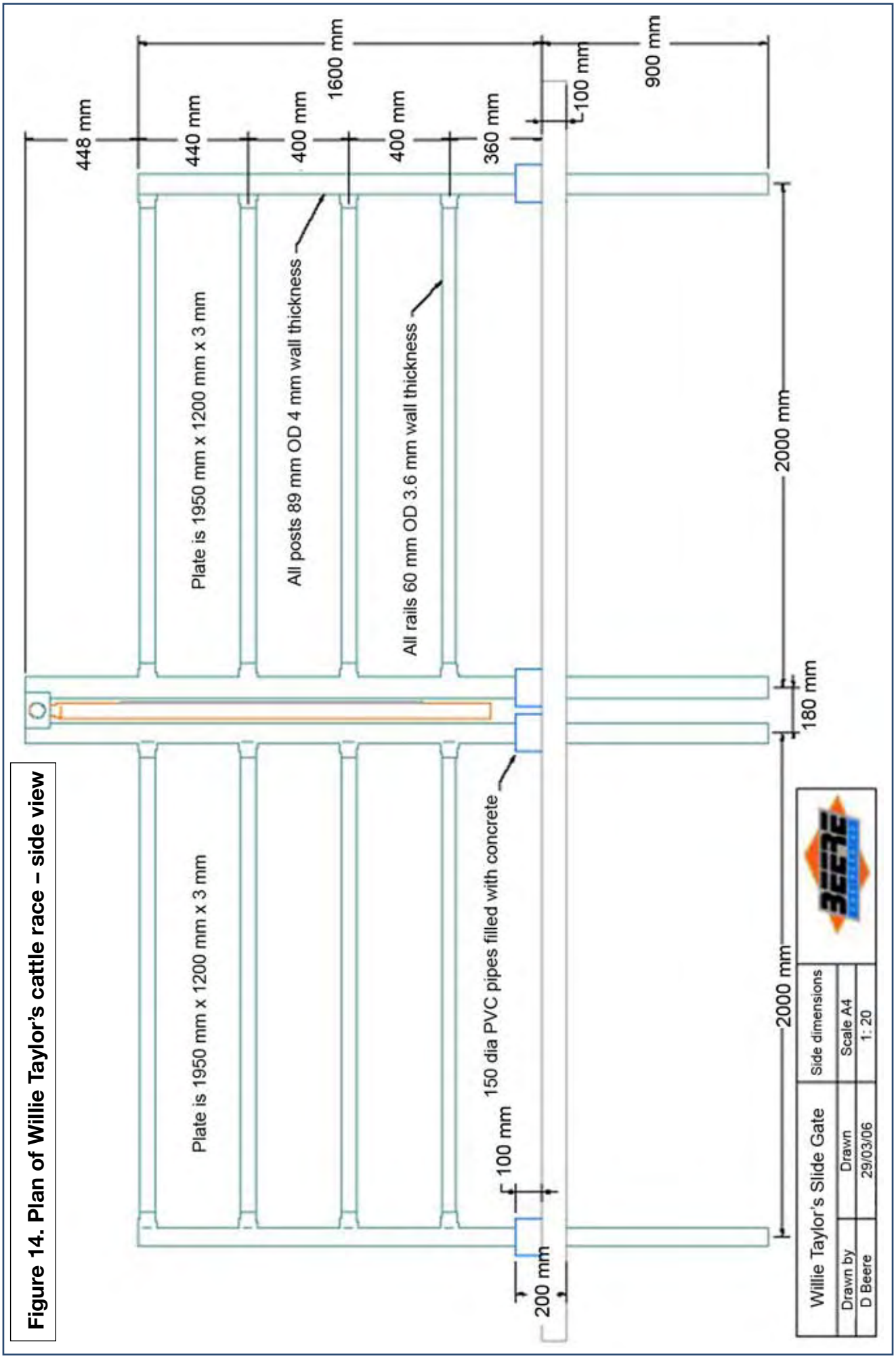
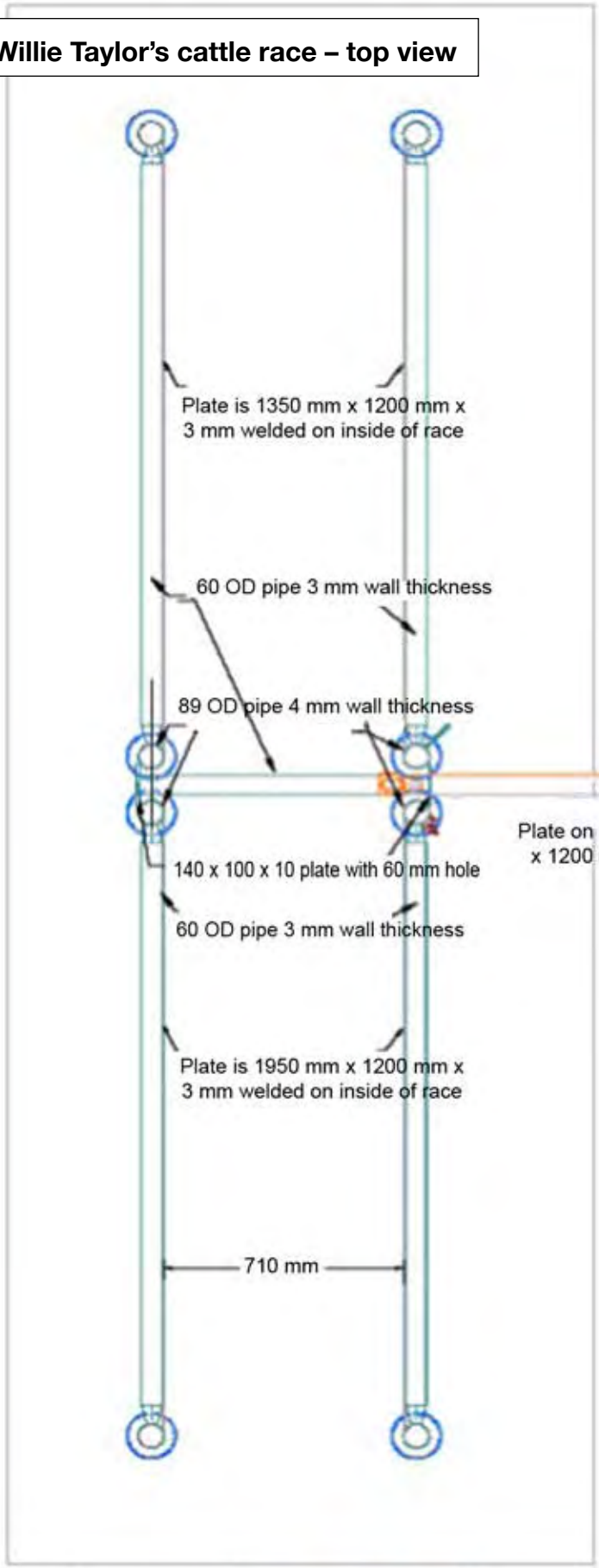


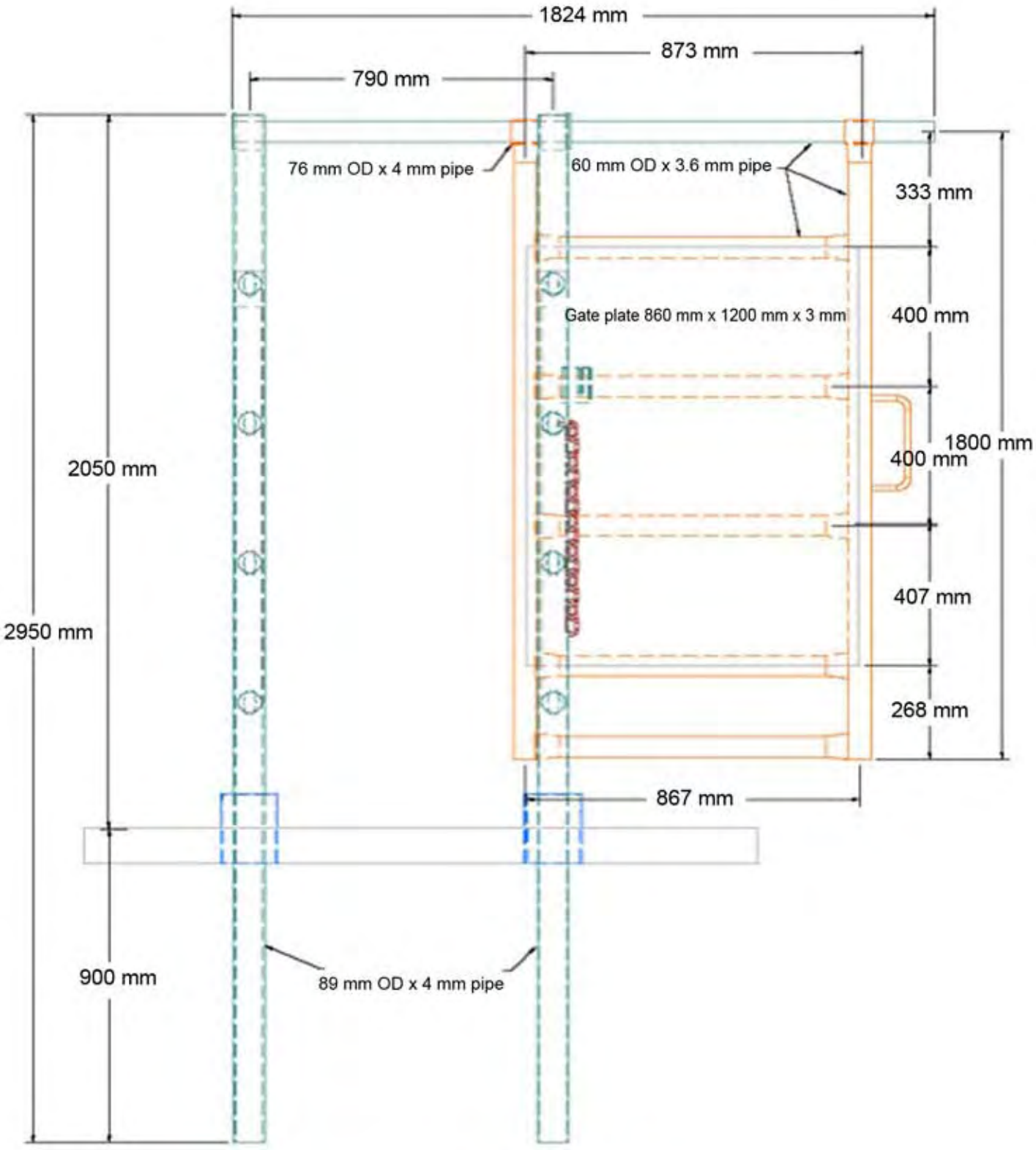
Figure 14. Plan of Willie Taylor's cattle race – side view

Figure 15. Plan of Willie Taylor's cattle race – top view



Willie Taylor's Slide Gate		Plan dimensions	
Drawn by	Drawn	Scale A4	
D Beere	29/03/06	1 : 20	

Figure 16. Plan of Willie Taylor's cattle race – front view



4.6 Loading and unloading ramp

This design shown in **Figures 17** is the minimum standard for an unloading ramp. The area that it occupies has been minimised mainly due to the cost of land and the increasing cost of all construction materials. The reason a loading race has been included is that local butchers might purchase cattle at one abattoir holding yard, reload and relocate to another abattoir. The trucks that transport cattle are of varying sizes, so it is difficult to select a height of the ramp that will suit all vehicles. The design includes a swing gate one metre in length at the top of the ramp to allow for the majority of Asian trucks that have a drop down loading ramp. A minimum quantity of 3 mm steel plate is utilised on this loading and unloading ramp as it allows cattle to better sight the openings.

Two plans follow the model as **Figures 18 and 19** to allow for easier construction.

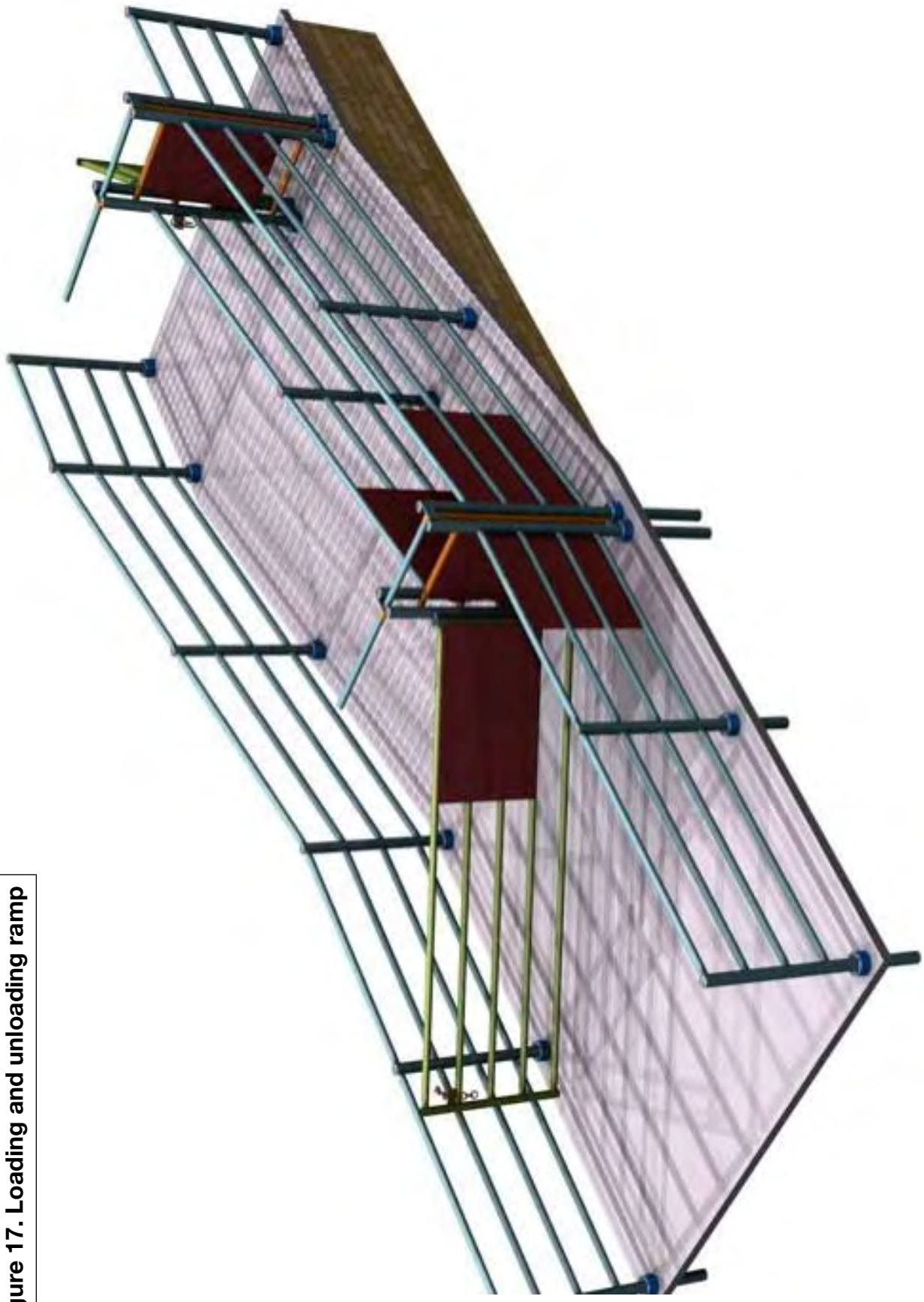


Figure 17. Loading and unloading ramp

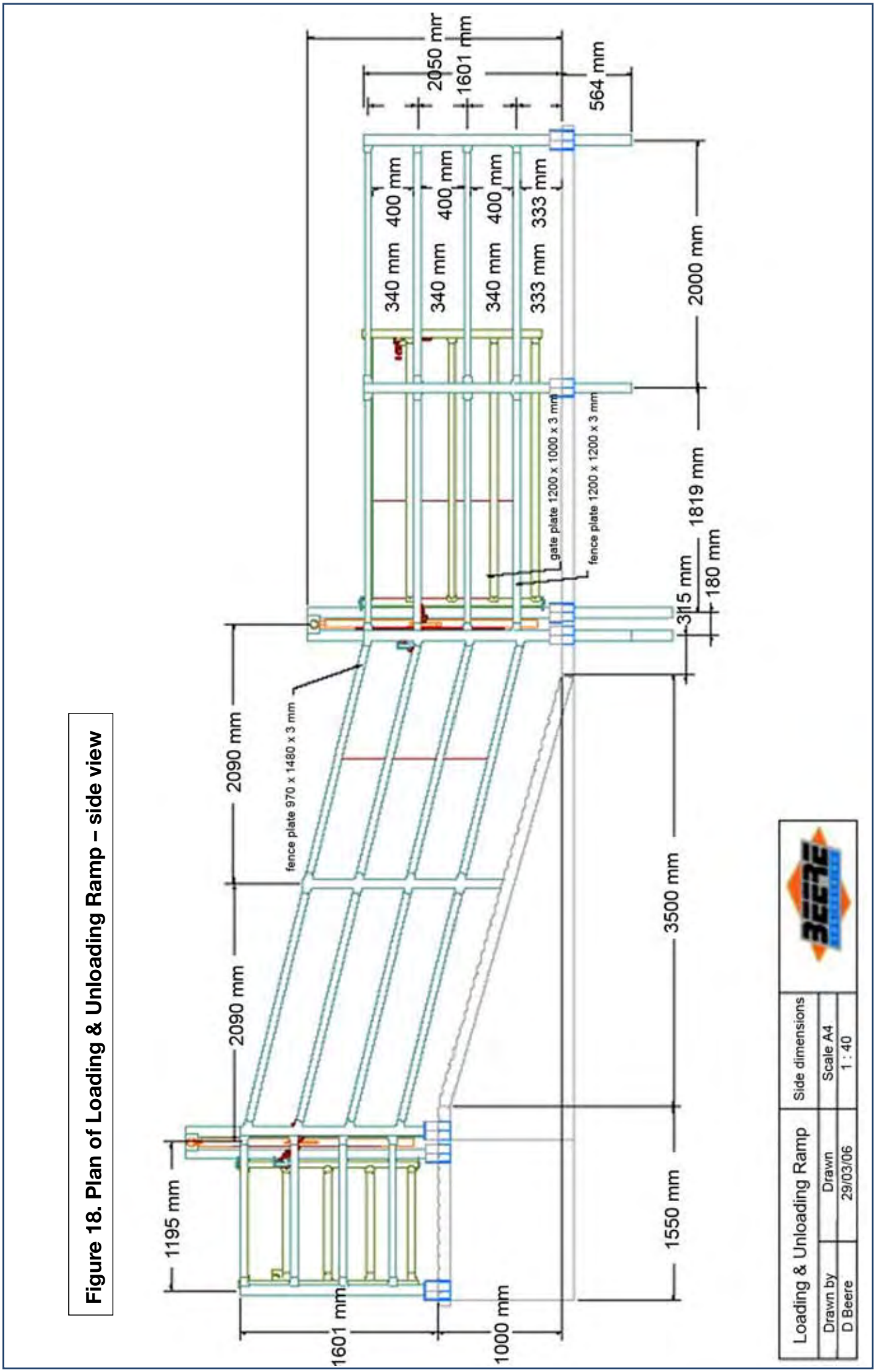


Figure 18. Plan of Loading & Unloading Ramp – side view

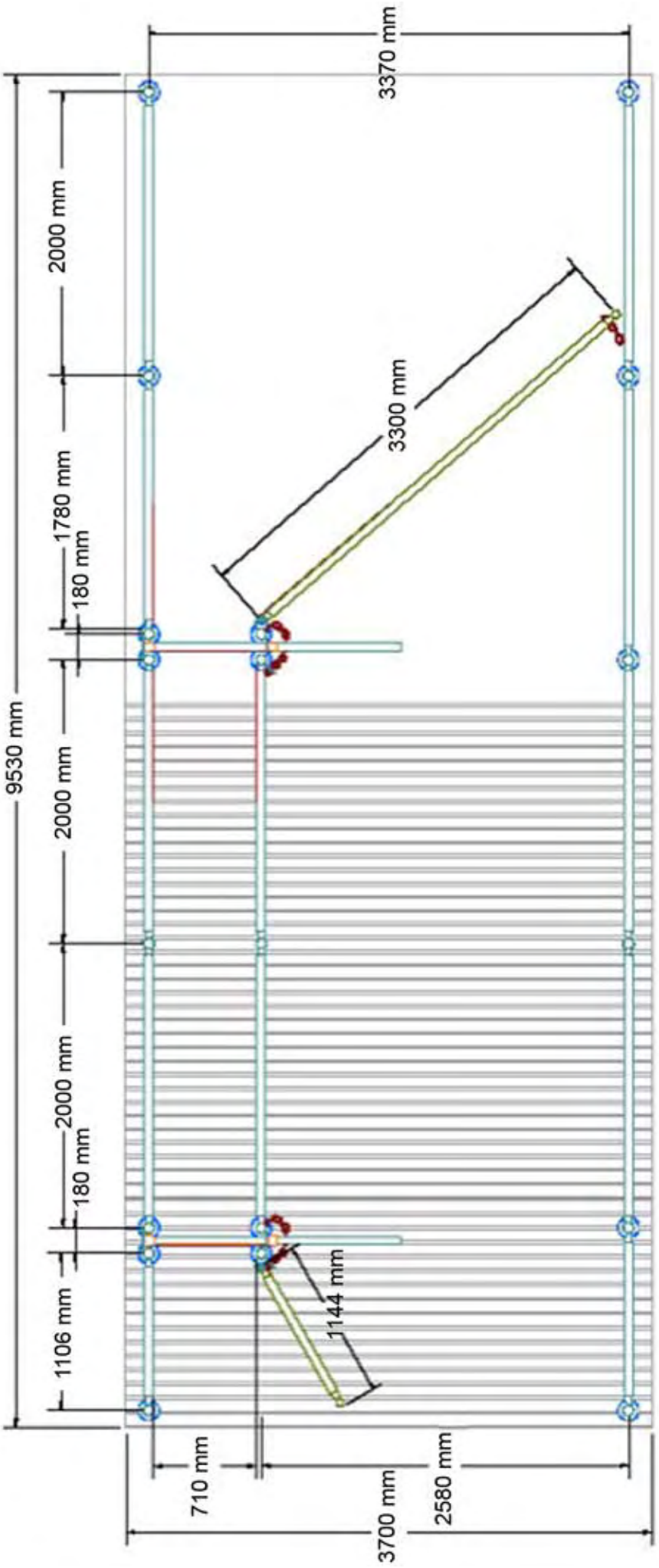


Figure 19. Plan of Loading & Unloading Ramp – top view

4.7 Angle pen with feed and water troughs

This particular model in **Figure 20** shows the inclusion of two 3-metre swing gates that divide an angle yard into three. This is designed to cater for a smaller lot of cattle. All angle pens are provided with a food and water troughs. **Figure 21** shows a plan of an angle pen.

Note there is a raised step [150 mm] at the front of the trough. The purpose of this step is to reduce the amount of faeces and urine that ends up in the trough. Waste material in the trough can contaminate the water and feed and also increase the incidence of salmonellosis. Refer to **Figures 22 to 24** for models and plans.

It is best practice to feed and water cattle right up to the point of slaughter. This practice will minimise pre-slaughter stress. There are two types of troughs in this manual:

- a trough that is sited on the perimeter of the pen, and
- a trough that is sited and shared between 2 pens.

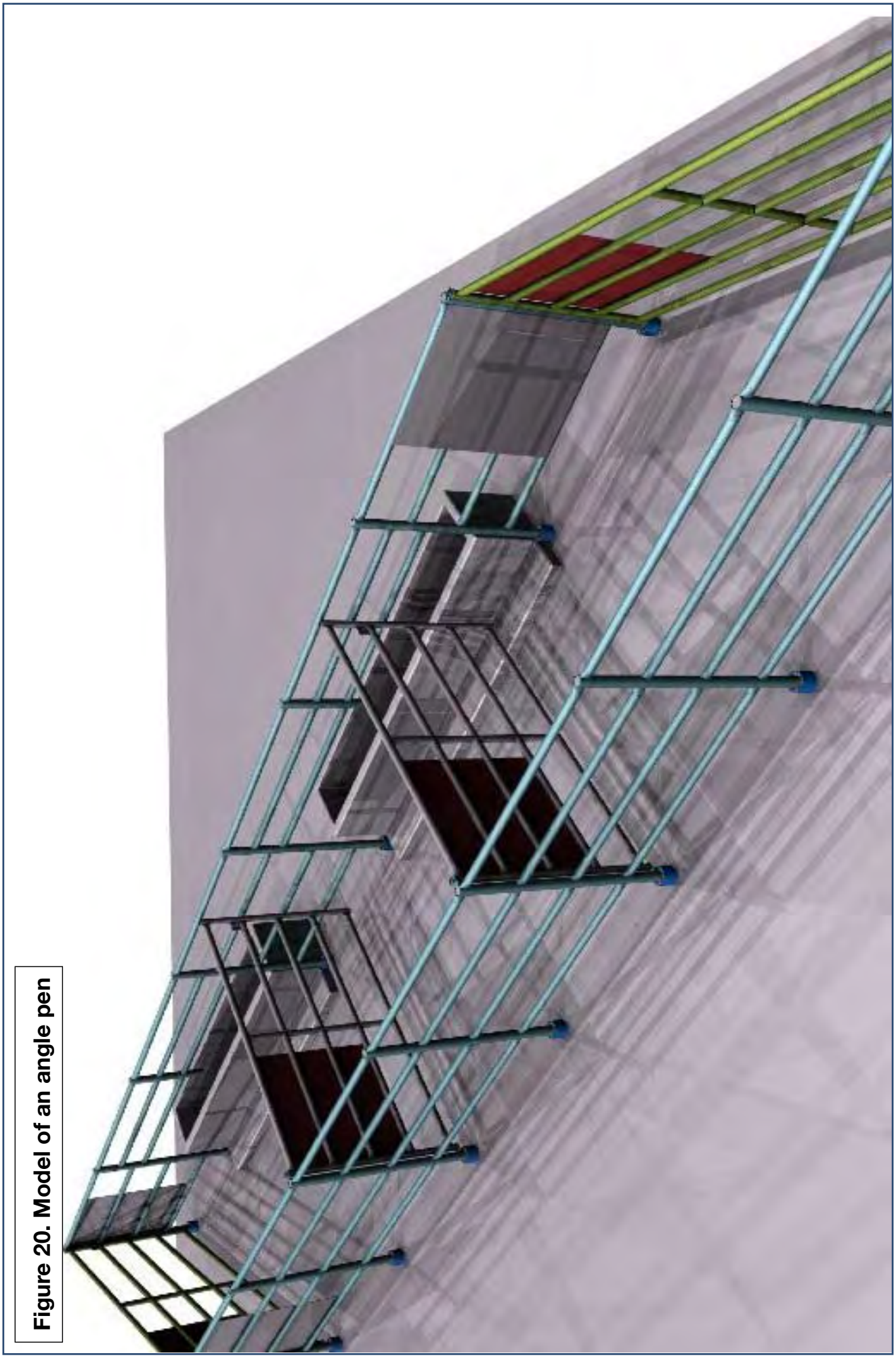
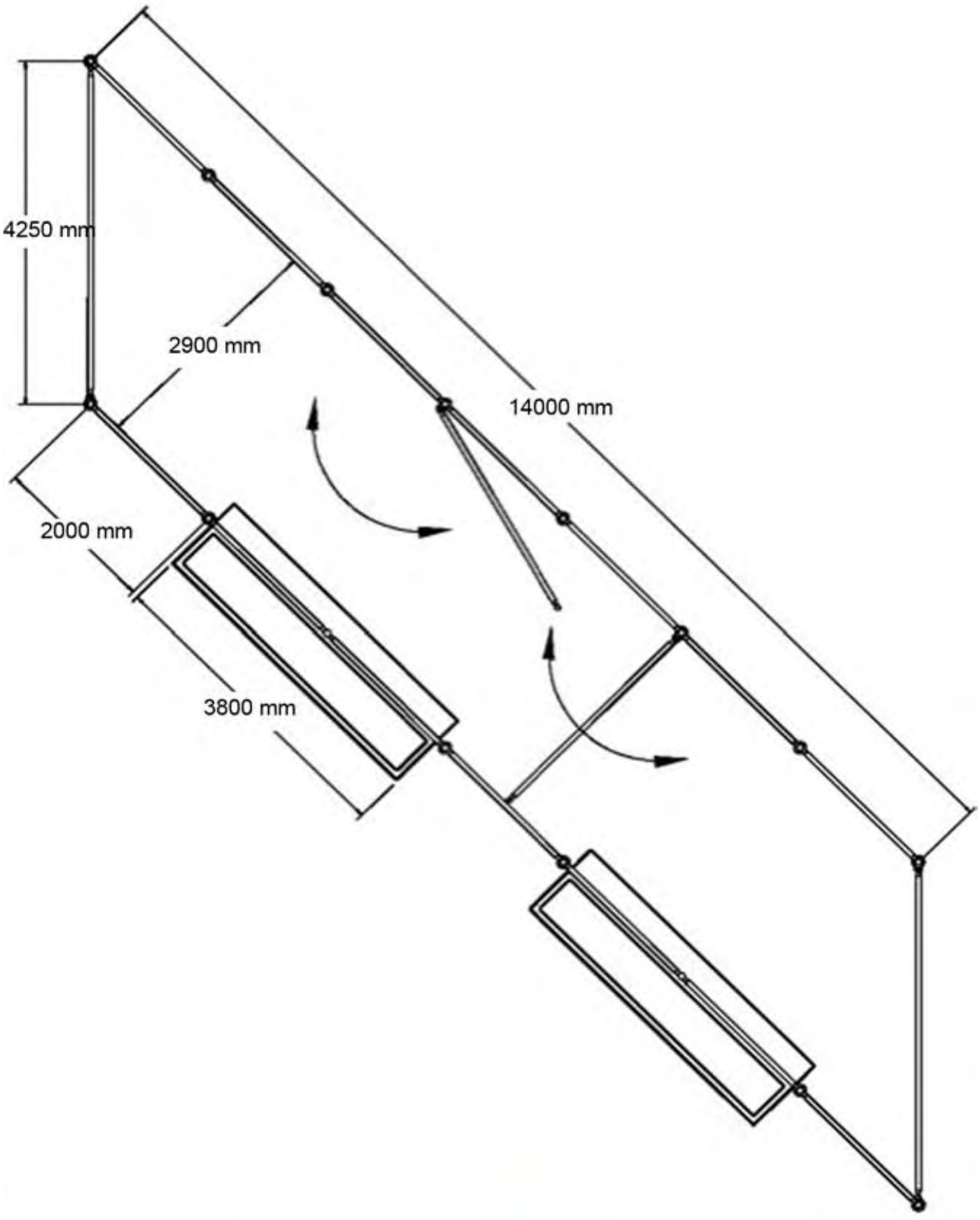


Figure 20. Model of an angle pen

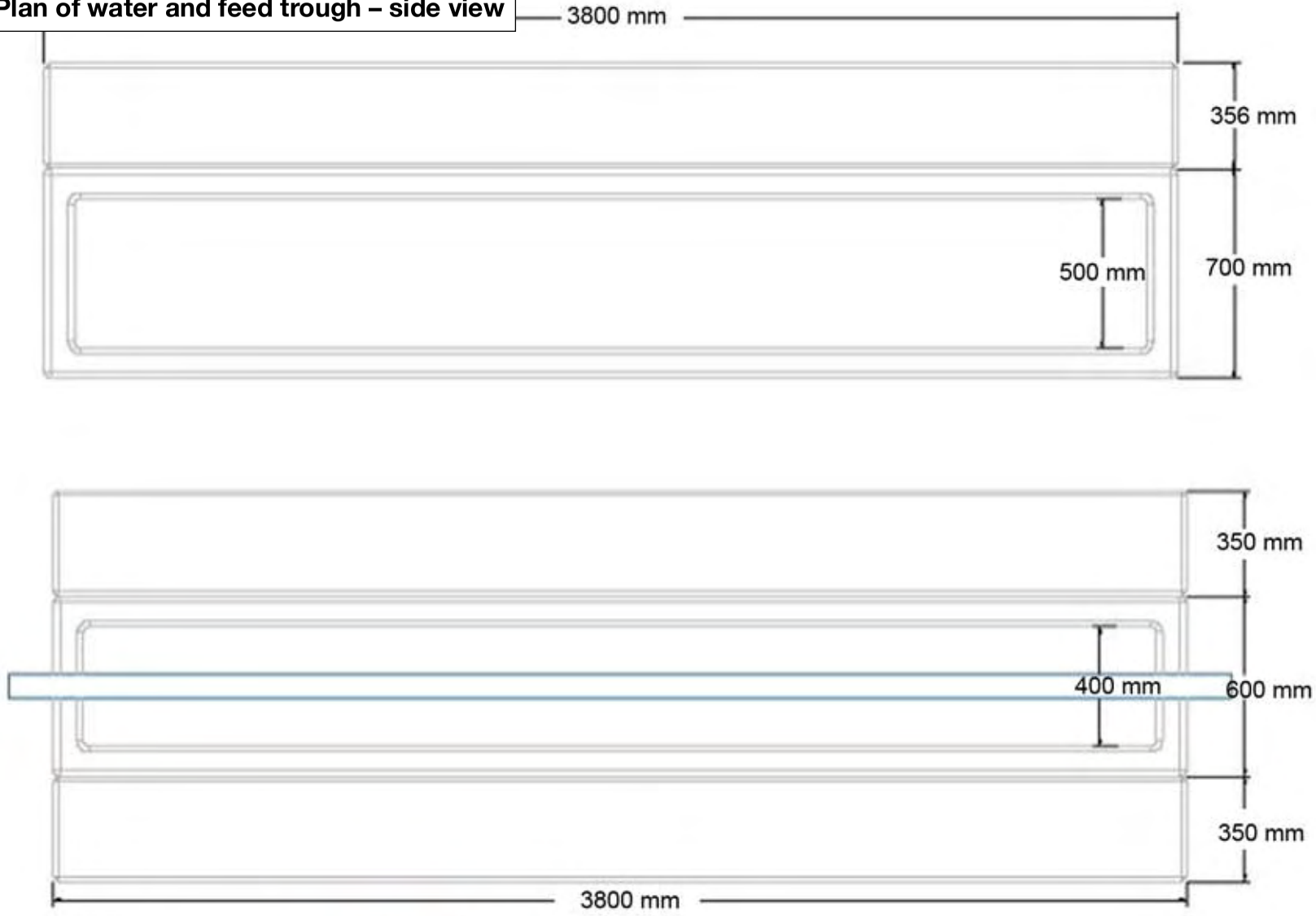
Figure 21. Plan of an angle pen



45 Angle Pen		Layout
Drawn by	Drawn	Scale A4
D Beere	23/02/06	1 : 70

Figure 22. Model of angle pen showing trough

Figure 23. Plan of water and feed trough – side view



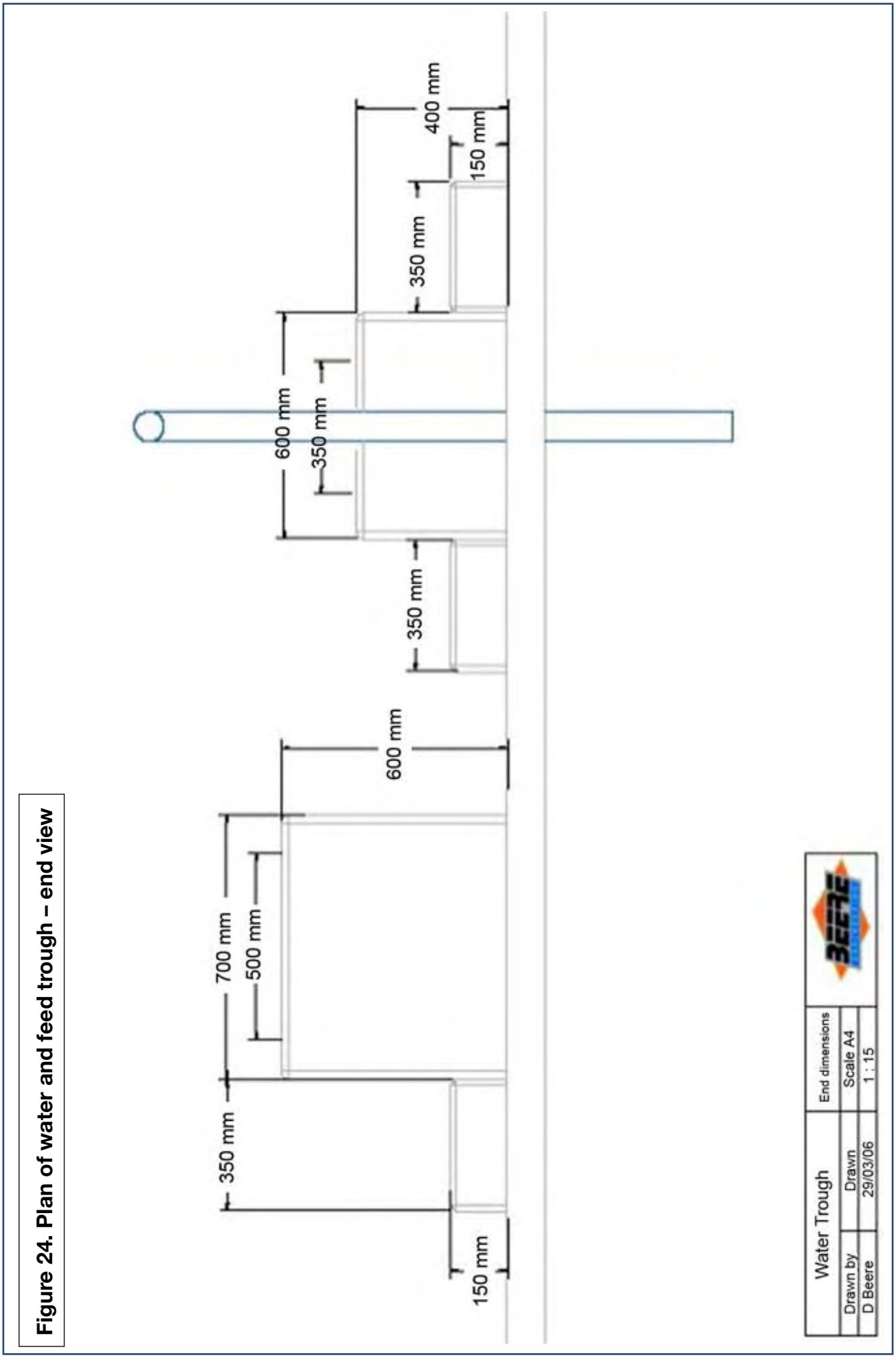


Figure 24. Plan of water and feed trough – end view

4.8 Laneway panels

Compared to a race or an open yard, a laneway is a friendlier way to move cattle as cattle can stand along side one another and remain more confident. This is compatible with their natural herding instinct. It is recommended that laneways be more than 2 metres in width but a maximum of 4 metres wide, as the laneway gates will have to be strengthened to span the gap. Laneways are incorporated in all the complete yard designs in this manual. Laneways are useful to move cattle from the unloading ramp to the pens and from the pens to the forcing area. Refer to **Figures 4 and 8**. Laneways can be constructed with the use of cables to reduce costs. Refer to **Figure 25**.

There are two main reasons for including the design of laneways in this manual. The first is to demonstrate that a laneway designed to move cattle around a compound can be of a lower cost using cables as compared to a typical yard panel of steel. The second reason is that a laneway is a much cheaper alternative than steel panels to move cattle a long distance, e.g. 100 metres between a feedlot and the abattoir. There are a number sources of second hand cable in Asia (second hand high tensile power line).

Note that traditional turnbuckles to tension the cables have been replaced by a length of chain and a mild steel pin. Turnbuckles will often seize in a short time in the tropics and become inoperable leaving badly tensioned or loose cables.

Figure 25. Model of a laneway panel

4.9 Portable yard panels

Portable yard panels can be needed at different times when handling cattle. Refer to **Figures 26 and 27** which show a model and plan.

Figure 28 shows a plan and model for an optional height of a portable panel.

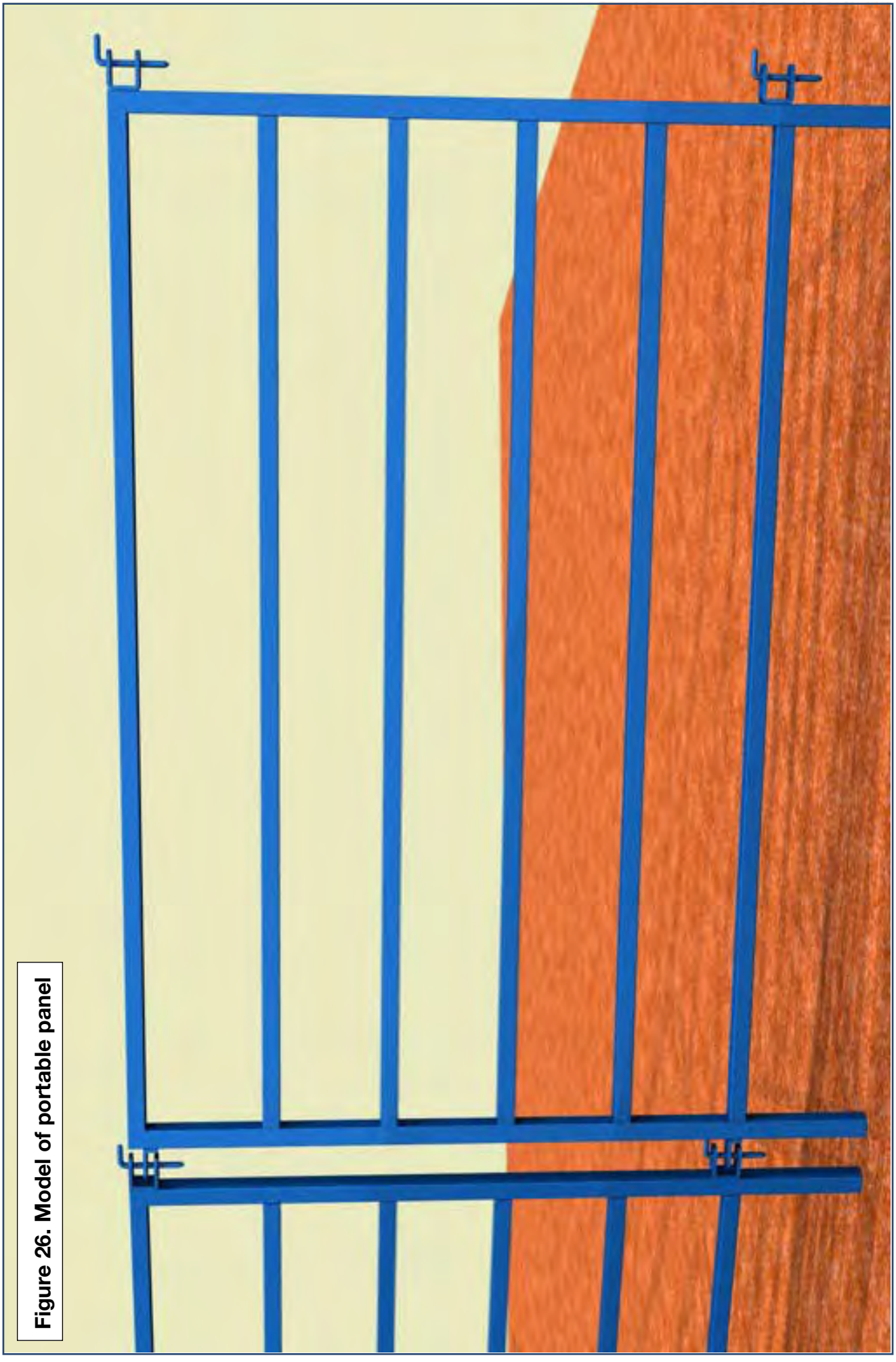


Figure 26. Model of portable panel

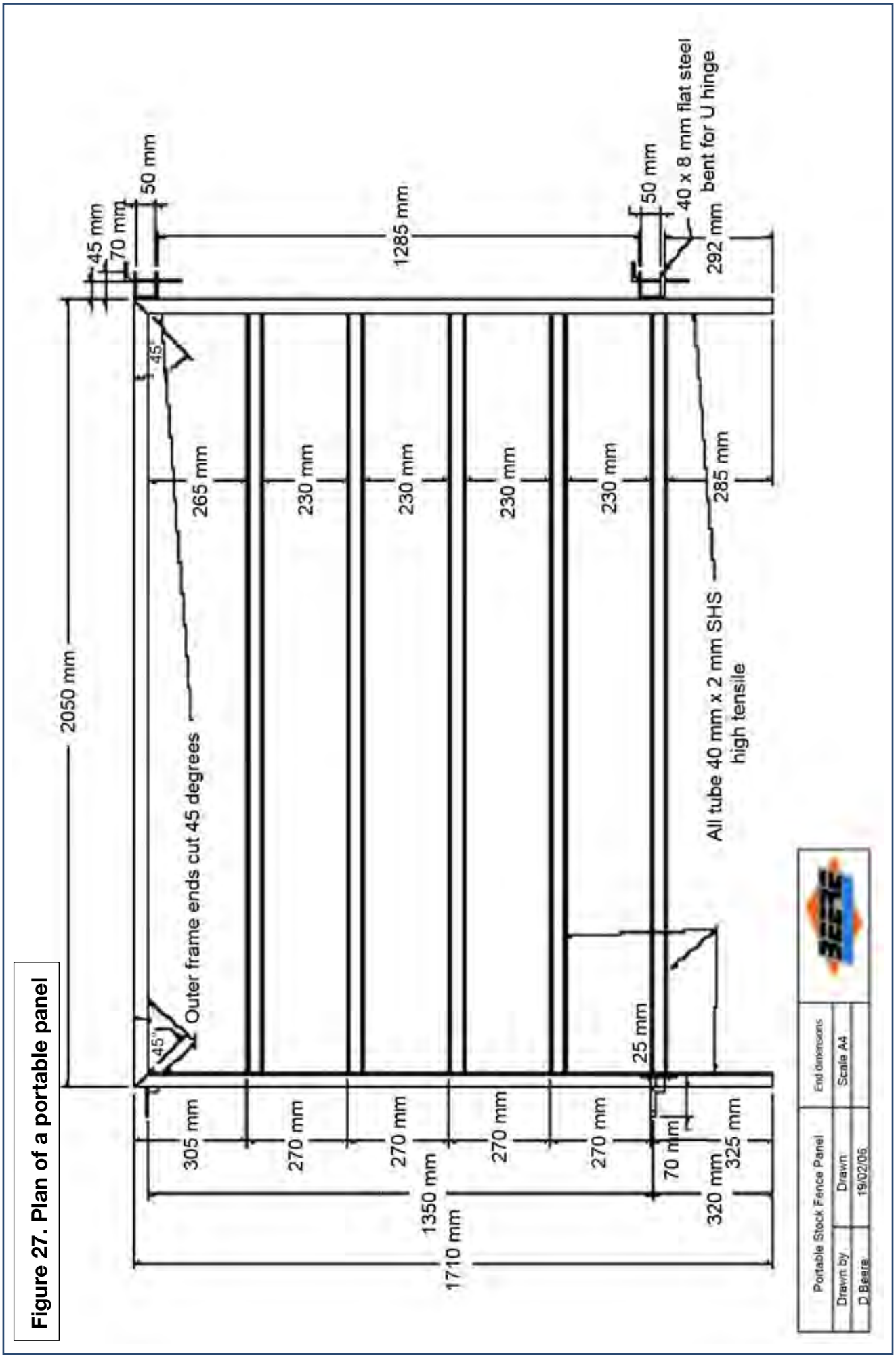


Figure 27. Plan of a portable panel

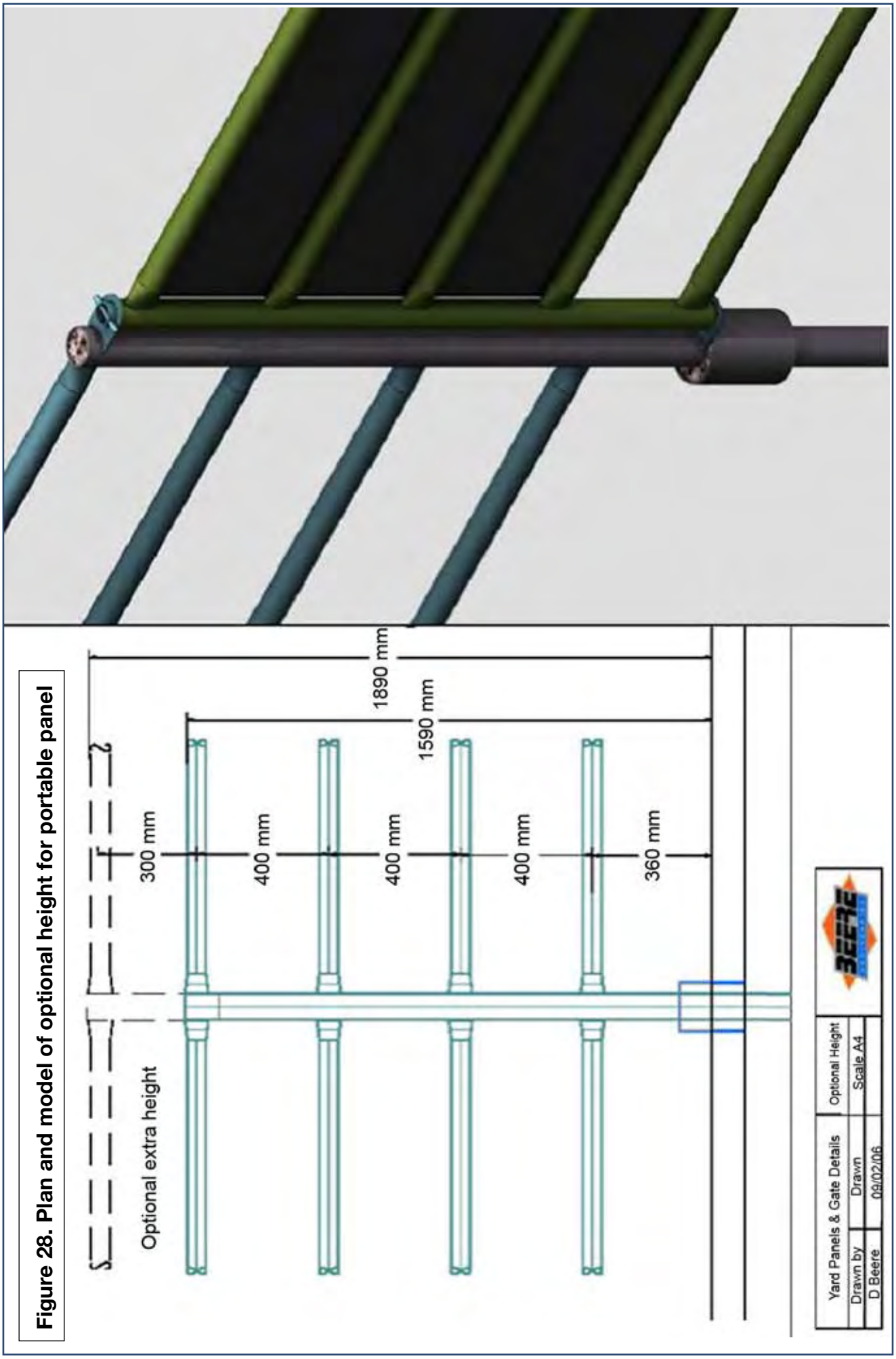


Figure 28. Plan and model of optional height for portable panel

4.10 Gate fastening options

Bolts are often used to fasten gates onto raceways as they make for a better fit. Cattle and in particular, buffalo have a habit of opening a gate bolt, however with this bolt mounted at an angle, it is more difficult for cattle and buffalo to unlock a gate. Refer to **Figure 29**.

Chain fastening gates is the preferred method of fastening a gate as if the gate is damaged or a post sinks slightly, the chain will still line up with post or gate.

A chain hitch on a swing gate. This is the most secure slot design.

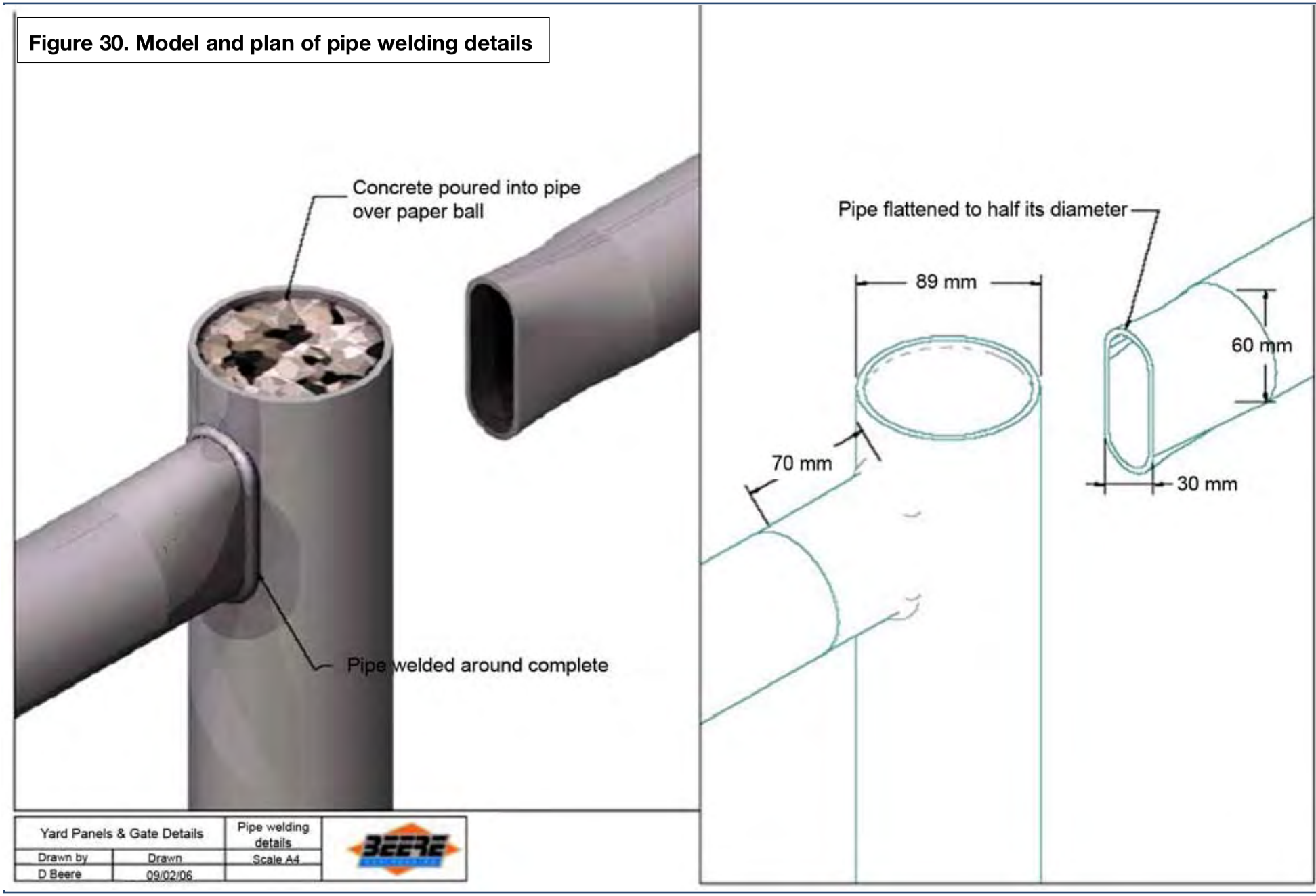
Figure 29. Model of gate closing bolt

4.11 Pipe welding and gate pivots

The welding of pipes to make yard panels requires special attention. Refer to **Figure 30**.

A PVC sleeve is fitted to all cattle yard posts. This will greatly increase the life of the steel post as it is partially protected from urine and faeces. **Figure 31** shows gate pivot details with PVC pipe on posts.

Figure 30. Model and plan of pipe welding details



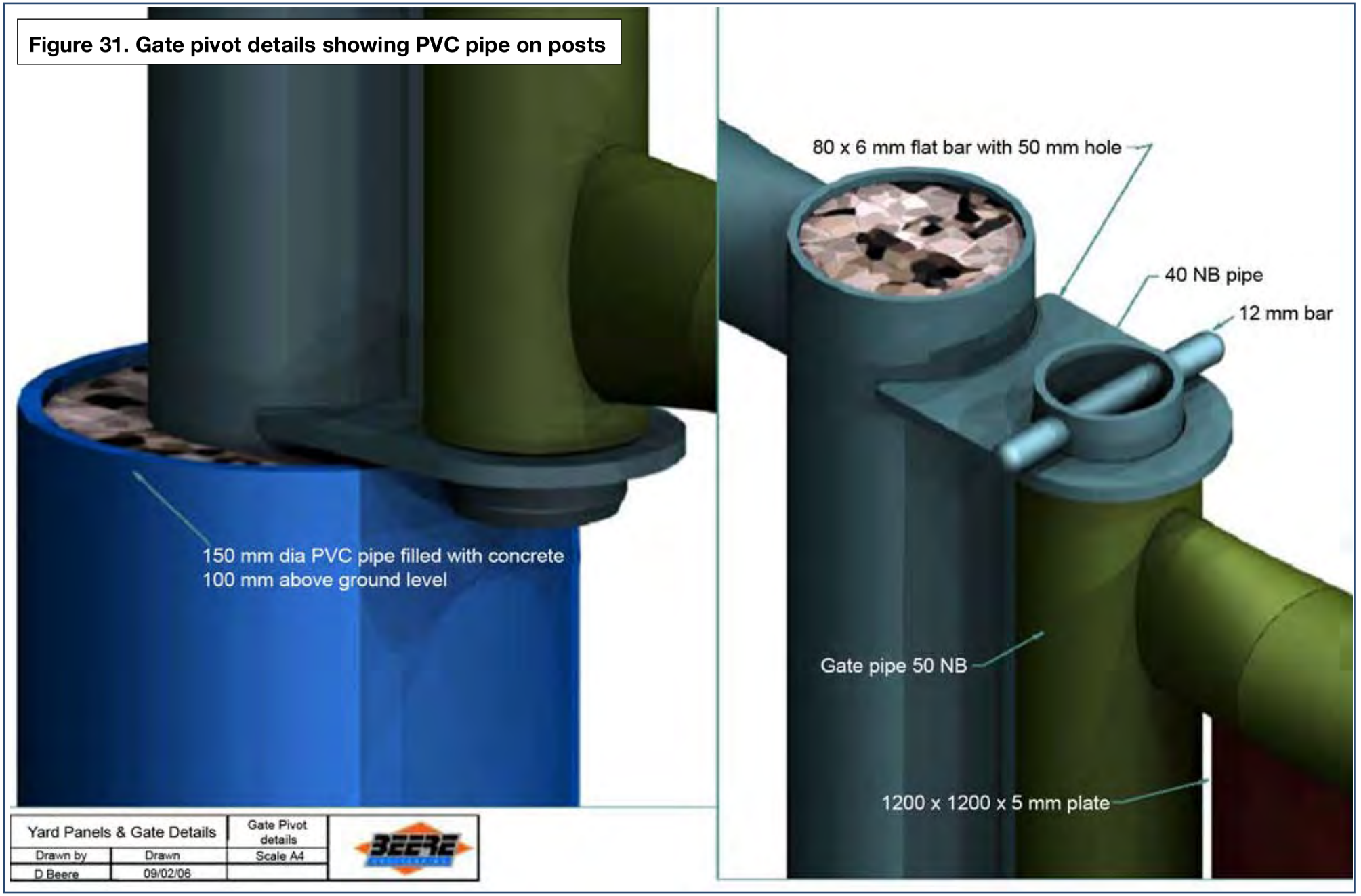


Figure 31. Gate pivot details showing PVC pipe on posts

4.12 Cattle yard roofs

Pens and laneways should be roofed with care taken to divert rain and flood water away from the effluent ponds. Roof height should be a minimum of 4.5 metres from the floor surface. Low roofs in Asian cattle yards can lead to overheating of the cattle due to the lack of air circulation.

4.13 Cattle cradle [bed]

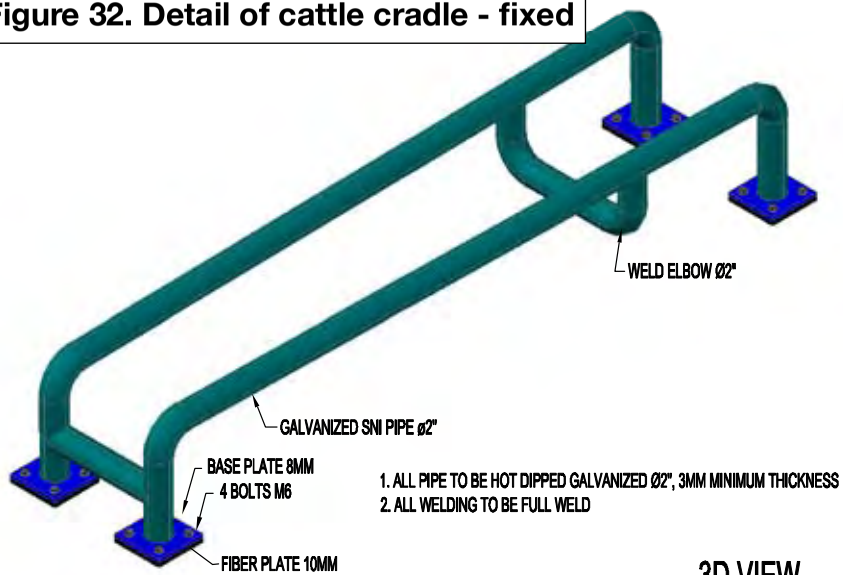
The wheeled cattle cradle is designed to fit along side the concrete plinth, parallel to the Plinth and the 2.4 meter door. Post slaughter the animal can be slid down the concrete ramp onto the cradle, the cradle can then be moved to the dressing area.

The wheeled cradle will assist with the process of hygienic slaughter and the carcase will meet the requirement of being more than 30 cm from the floor surface.

This wheeled cradle has been developed to reduce the need for 3 phase 1 tonne hoist to lift carcase to a bleed rail in small slaughter houses.

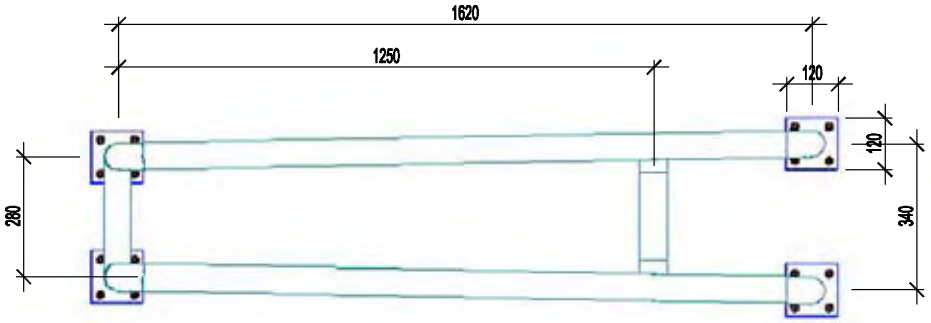
ALL JOINT TOBE FULL WELDED

Figure 32. Detail of cattle cradle - fixed

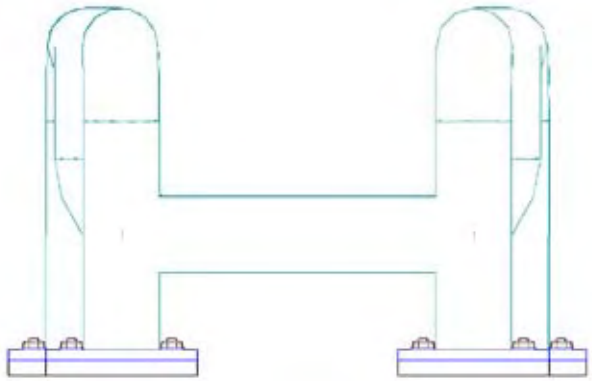


1. ALL PIPE TO BE HOT DIPPED GALVANIZED Ø2", 3MM MINIMUM THICKNESS
2. ALL WELDING TO BE FULL WELD

3D VIEW



TOP VIEW

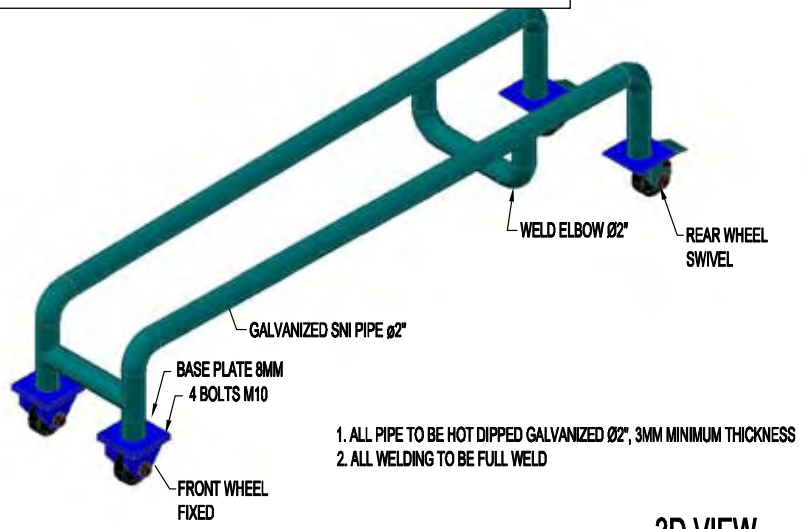


FRONT VIEW

SIDE VIEW

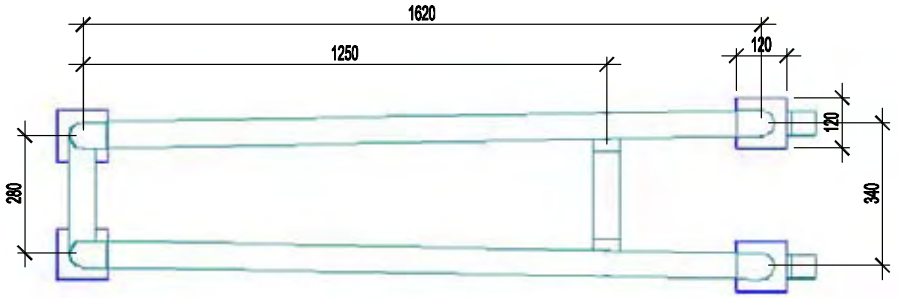
ALL JOINT TOBE FULL WELDED

Figure 32. Detail of cattle cradle - mobile

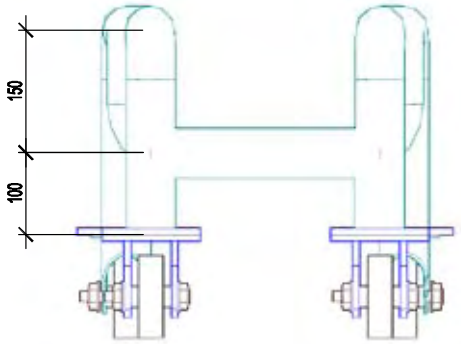


1. ALL PIPE TO BE HOT DIPPED GALVANIZED Ø2", 3MM MINIMUM THICKNESS
2. ALL WELDING TO BE FULL WELD

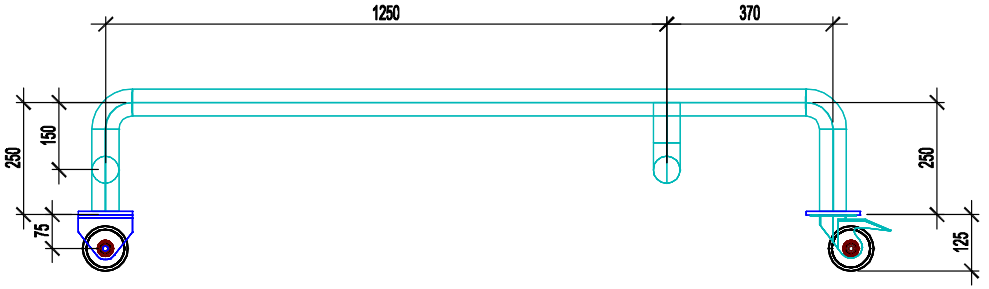
3D VIEW



TOP VIEW



FRONT VIEW



SIDE VIEW

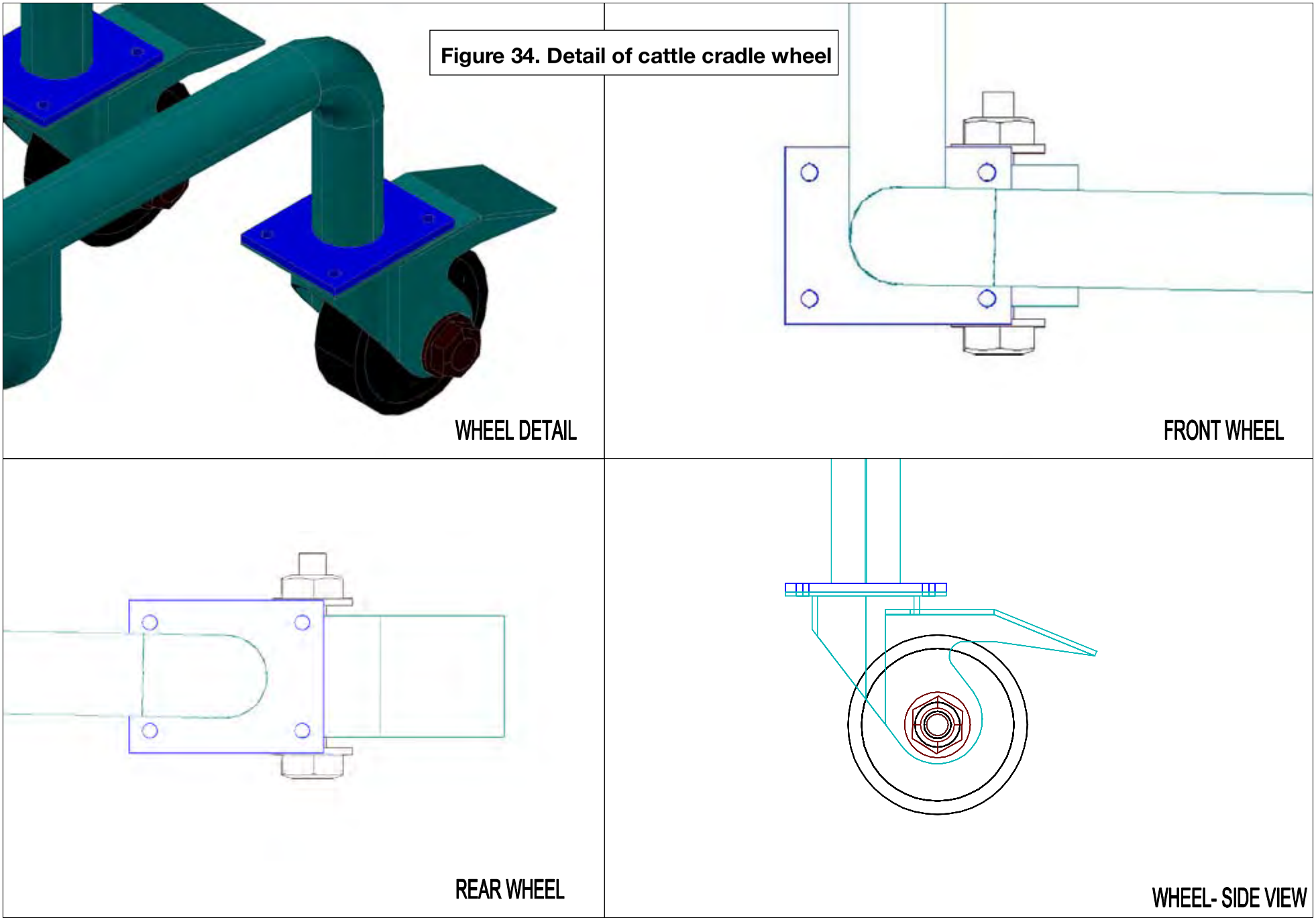
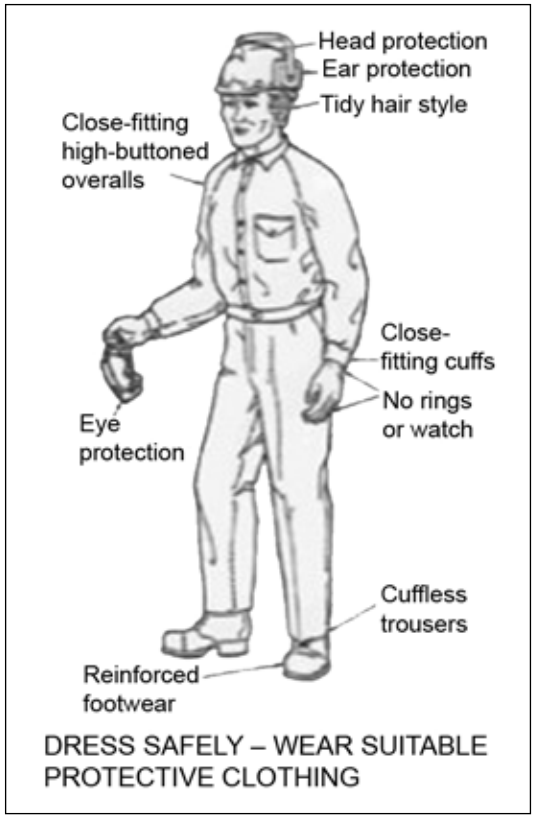


Figure 34. Detail of cattle cradle wheel

5 Construction work safety

Use protective clothes, footwear eye and ear protection when using grinders and other fabrication equipment.

Use protective clothes, footwear eye and ear protection when using welders and other fabrication equipment



Protective clothing recommended when using electrical tools such as side grinders and pipe cutters

Protective clothing recommended when Mig or arc electrical welding

5.1 Personal Protective Equipment (PPE)

Goggles to use when gas welding

To protect your hearing

Leather gloves for arc welding

Protect your eyes while electric welding

BOC Clear Polycarbonate with Chin-guard

Clear screen to use when grinding

Bib Aprons

Leather apron for use when electric welding

Steel capped boots for use at the construction site

A typical builder's mobile work shop

An example of a cattle yard builder's mobile workshop

5.2 Tools of the trade

The purchase of new oxyacetylene equipment will increase productivity and reduce waste

New efficient Mig welders for sale

The following tools of trade should be compulsory for yard builders.

Vernier callipers

Engineers chalk

G clamps

Magnetic square

Quality wire brush

Hammer for cleaning welds

Tempered coal chisel

Centre punch

Suitable hammer

6 Painting of new and existing steelwork

PT ICI Paints Indonesia

This manual strongly advises that in all cattle yard fabrication that the paint requirements outlined below are written into a contract with a yard builder. These specifications were developed with cooperation from Pak Murdoko Hadhy sales manager for Dulux Indonesia. Some contractors will take extreme measures to reduce paint costs!

Dulux

Sudirman Square Office Towers. Tower B.
19th Floor Jl. Jend. Sudirman Kav.45-46
Jakarta 12930
Tel: (62-21) 5750843
Fax: (62-21) 5750841

Factories:
GM/Marketing/Sales/HR/Works
Jl. Raya Jakarta Bogor Km 36.8
Cimanggis, Depok 16955
Tel: (62-21) 8752031
Fax: (62-21) 8751732/8750279

Works/Supply Chain/Finance & Accounting
Jl. Jababoka IV Blok V No. 64
Cikarang, Bekasi 17530
Tel: (62-21) 8935009/8935010
Fax: (62-21) 8934862

Dengan hormat,
Sesuai dengan pembicaraan kita pagi ini, dengan ini kami sampaikan spesifikasi pengecatan untuk Rumah Pemotongan Hewan sebagai berikut:

Alternatif 1		Coverage	
1.	R540-157	QD Grey Green Primer	1 x 30 um	10m^2/lit
2.	R543-101	Marine Undercoat White	1 x 30 um	8m^2/lit
3.	R350-line	Super Structure Finish	2 x 30 um	5m^2/lit

Alternatif 2

1.	Mechanical cleaning SP10, following by			
	R580-2071	Epoxy Metal Primer	1 x 30 um	10m^2/lit
2.	R580-line	Epoxy Bildcote	1 x 80 um	4m^2/lit
3.	R 430-line	Epoxy Tank & Chem. Resistant	2 x 30 um	5m^2/lit

Untuk ketahanan dianjurkan menggunakan alternatif 2 dengan konsekwensi pada harga yang lebih mahal. Terlampir harga yang berlaku sebagi berikut:

R540-157	QD Grey Green Primer	Rp. 46,200/lit
R543-101	Marine Undercoat White	Rp. 41,800/lit
R350-line	Super Structure Finish (std. Color)	Rp. 55,000/lit
R850-41	Thinner	Rp. 14,300/lit
R580-2071	Epoxy Metal Primer	Rp. 71,500/lit
R580-line	Epoxy Bildcote	Rp. 68,200/lit
R430-line	Epoxy Tank & Chem. Resistant	Rp. 83,600/lit
R850-761	Thinner	Rp. 22,000/lit
Kondisi:	Harga di atas adalah harga loco Jakarta, dan dapat berubah sewaktu-waktu tanpa pemberitahuan terlebih dahulu.	

6.1 Table of available local steel materials (Tabel berat besi)

In a previous manual, Australian steel specifications were used and when the fabricator was unable to purchase the specified material it was substituted with an alternative and nothing fitted. This manual has used steel sizes available in Asia and the following tables list the available mild and galvanised steel available in Asia.

Mild steel round bars

Size	Weight
6 mm – 12 M	2.66 kg
6.5 mm – 12 M	3.2 kg
8 mm – 12 M	4.74 kg
9 mm – 12 M	6 kg
10 mm – 12 M	7.4 kg
12 mm – 12 M	10.66 kg
13 mm – 12 M	12.48 kg
16 mm – 12 M	18.96 kg
19 mm – 12 M	26.76 kg
22 mm – 12 M	35.76 kg
25 mm – 12 M	46.2 kg
28 mm – 12 M	57.96 kg
32 mm – 12 M	75.72 kg
36 mm – 12 M	95.88 kg

Hot rolled steel sheets

Size	Weight
1.20 mm x 4'x 8'	28.00 kg
1.40 mm x 4' x 8'	33.00 kg
1.50 mm x 4' x 8'	35.00 kg
1.90 mm x 4' x 8'	44.5 kg
2.00 mm x 4' x 8'	46.7 kg
2.3 mm x 4' x 8'	54.00 kg
2.6 mm x 4'x 8'	6.7 kg
2.80 mm x 4'x 8'	65.3 kg
2.90 mm x 4'x 8'	67.6 kg
3.00 mm x 4'x 8'	70.00 kg
3.20 mm x 4'x 8'	74.7 kg
4 mm x 4'x 8'	93.3 kg
4.50 mm x 4'x 8'	105.00 kg
5 mm x 4'x 8'	117.00 kg
6 mm x 4'x 8'	140.00 kg
8 mm x 4'x 8'	187.00 kg
9 mm x 4'x 8'	210.00 kg
10 mm x 4'x 8'	233.00 kg
12 mm x 4'x 8'	280.00 kg
13 mm x 4'x 8'	303.00 kg
15 mm x 4'x 8'	350.00 kg
16 mm x 4'x 8'	373.00 kg
18 mm x 4'x 8'	420.00 kg

Cold rolled steel sheet

Size	Weight
19 mm x 4’ x 8’	443.00 kg
20 mm x 4’ x 8’	466.00 kg
21 mm x 4’ x 8’	490.00 kg
22 mm x 4’ x 8’	513.00 kg
25 mm x 4’ x 8’	583.00 kg
28 mm x 4’ x 8’	653.00 kg
30 mm x 4’ x 8’	699.00 kg
32 mm x 4’ x 8’	747.00 kg
38 mm x 4’ x 8’	887.00 kg
50 mm x 4’ x 8’	1,167.00 kg
65 mm x 4’ x 8’	1,516.00 kg
75 mm x 4’ x 8’	1,750.00 kg
100 mm x 4’ x8’	2,330.00 kg

Ship plate

Size	Weight
3 mm x 19 mm – 6 M	2.4 kg
3 mm x 25 mm – 6 M	3.3 kg
3 mm x 30 mm – 6 M	4 kg
4 mm x 19 mm – 6 M	3.3 kg
4 mm x 25 mm – 6 M	4.4 kg
4 mm x 30 mm – 6 M	5.4 kg
4 mm x 38 mm – 6 M	6.6 kg
5 mm x 19 mm – 6 M	4.6 kg
5 mm x 25 mm – 6 M	6 kg
5 mm x 30 mm – 6 M	7.10 kg
5 mm x 38 mm – 6 M	9 kg
5 mm x 50 mm – 6 M	12 kg
6 mm x 150 mm – 6 M	44 kg
8 mm x 38 mm – 6 M	14.40 kg
9 mm x 125 mm – 6 M	53.50 kg
9 mm x 150 mm – 6 M	63.60 kg

Equal angle bar @ 6 metre

Size	Weight
20 x 20 x 3 mm	5.31 kg
25 x 25 x 3 mm	6.72 kg
25 x 25 x 5 mm	10.6 kg
30 x 30 x 3 mm	8.16 kg
40 x 40 x 3 mm	11 kg
40 x 40 x 4 mm	14.5 kg
40 x 40 x 5 mm	18 kg
45 x 45 x 4 mm	16.44 kg
45 x 45 x 5 mm	20.5 kg
50 x 50 x 4 mm	18.4 kg
50 x 50 x 5 mm	22.5 kg
50 x 50 x 6 mm	27.58 kg
60 x 60 x 5 mm	27.3 kg
60 x 60 x 6 mm	32.52 kg
65 x 65 x 6 mm	35.46 kg
70 x 70 x 6 mm	38.28 kg
70 x 70 x 7 mm	44.28 kg
75 x 75 x 6 mm	41.22 kg
75 x 75 x 7 mm	45 kg
75 x 75 x 8 mm	54.18 kg
75 x 75 x 9 mm	59.8 kg
80 x 80 x 8 mm	57.96 kg
90 x 90 x 7 mm	57.54 kg
90 x 90 x 9 mm	73.2 kg
90 x 90 x 10 mm	79.8 kg
100 x 100 x 8 mm	73.2 kg
100 x 100 x 10 mm	90.6 kg
120 x 120 x 11 mm	119.4 kg
120 x 120 x 12 mm	130.00 kg
125 x 125 x 12 mm	140.00 kg
130 x 130 x 9 mm	107.1 kg
130 x 130 x 12 mm	140.1 kg
150 x 150 x 12 mm	164 kg
150 x 150 x 15 mm	202 kg
200 x 200 x 15 mm	272 kg
200 x 200 x 20 mm	358 kg
200 x 200 x 25 mm	442 kg
250 x 250 x 25 mm	562 kg

Black & galvanised welded steel pipe

			BS.1387/67	Medium
Size	OD	Tebal	Berat (Weight)	Berat dengan Drat & Socket
½“	21.4 mm	2.6 mm	1.22 kg/m	1.23 kg/m
¾“	27.0 mm	2.6 mm	1.58 kg/m	1.59 kg/m
1	33.7 mm	3.2 mm	2.44 kg/m	2.46 kg/m
1 ¼“	42.4 mm	3.2 mm	3.14 kg/m	3.17 kg/m
1 ½“	48.3 mm	3.2 mm	3.62 kg/m	3.66 kg/m
2”	60.2 mm	3.6 mm	5.09 kg/m	5.16 kg/m
2 ½“	76.0 mm	3.6 mm	6.52 kg/m	6.64 kg/m
3”	88.7 mm	4.0 mm	8.47 kg/m	8.63 kg/m
4:	113.9 mm	4.5 mm	12.10 kg/m	12.40 kg/m
5”	140.6 mm	4.8 mm	16.20 kg/m	16.70 kg/m
6”	166.1 mm	4.8 mm	19.20 kg/m	19.80 kg/m

Black & galvanised welded steel pipe

		BS.1387/67		Light
Size	OD	Tebal	Berat (Weight)	Berat dengan Drat & Socket
½“	21.4 mm	2.0 mm	0.95 kg/m	0.96 kg/m
¾“	27.0 mm	2.3 mm	1.40 kg/m	1.42 kg/m
1	33.7 mm	2.6 mm	2.01 kg/m	2.02 kg/m
1 ¼“	42.4 mm	2.6 mm	2.57 kg/m	2/60 kg/m
1 ½“	48.3 mm	2.9 mm	3.26 kg/m	3.80 kg/m
2”	6.2 mm	2.9 mm	4.11 kg/m	4.18 kg/m
2 ½“	76.0 mm	3.2 mm	5.80 kg/m	5.92 kg/m
3”	88.7 mm	3.2 mm	6.82 kg/m	6.98 kg/m
4:	113.9 mm	3.6 mm	9.88 kg/m	10.20 kg/m
5”	140.6 mm	n.a.	n.a.	n.a.
6”	166.1 mm	n.a.	n.a.	n.a.

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Notes

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John Armstrong
Katherine 2/9

Intro - housekeeping

1 Colleagues 2 Hearing 3 French student.

Restraint Boxes. The comment can be made that had the minister had access to the Manual on Restraint boxes and read it then he could easily have debated many of the four corners videoed assertions. a) no tight restraint of the animal, means no stress, b) chutes for animal travel sheeted in for no stress, the analogy of bi focal users tripping on steps is the same as animals tripping on a rising ramp when all they can see is the flat ground either side of the ramp c) SE Asian butchers preference for better meat quality which ensues from low stress handled stock, d) time restraints for abattoir operators to quickly slaughter animals so supplier can be at market before the competition –no time wasted beating animals. e) Slide gates constructed with noise damping engineering g) safety for workers and welfare of stock often highlighted, f) the use of Temple Brandin techniques in yard design etc.

Quite simply there has been great effort to improve animal welfare, operator safety and meat quality in those markets.

Human Health and Welfare. I ask the committee to spend some time reviewing the work done already on stress measurements in the rural environments when hardship such as drought or market failure occured. Not only is cholesterol a prime indicator so is the cortisol levels. I have included a short summary as prepared by my wife on our views of Cortisol. I implore you to research the provided references there and in my submission to rationalise why it is not a good idea for doctors to 'shoot the messenger' –Cholesterol, in their treatment of stress.

Economics. It is easy to work out how much we must have as a return for our product. If we run say 7,000 head and have a yearly budget of $700,000 then each animal costs us $100 /year. Selling 20%/year mean each animal as it is loaded onto a truck owes us $500. We can't sell it for $350 just for cash flow. It is quite stupid to offer extra loans as bridging finance with their incumbent interest cost which will load up that operating cost, especially when producers are faced with extra cost of holding more animals and lower returns to less profitable markets, if indeed they can access other markets. In my case that is pretty much impossible. We simply need full market price, as we have worked for.

It is not a crime for people to apply personal initiative to expand and improve their operations with extra capital whilst conducting a legitimate business in a seemingly reliable and buoyant market. Yet those who have extended themselves the most say up to 40% of equity being loaned capital will be punished the most. (That's pre ban valuations) Many will go out of business. We are not tall poppies or an industry of "No Consequence" to be cut down with glib comment. We are the inhabitants of what we thought was an honourable country where our Government would defend and help us.

It is worth casting our minds back to the events of October 1973 when OPEC pulled product out of the markets. The result was a very high cost of fuel around the world. Japan in particular had built a high consumption of Australian beef. In 1974 the Japanese market decided to stop buying beef as it cost them too much, our price collapsed - the industry came to a standstill.

Input costs on our NT operations were not then high, as the principle mode of operation was one of harvesting wild animals. People simply stopped operating, grew their own vegetables even personal

health insurances were much cheaper than by comparison to now. Boarding schools for secondary education was the only major cost, and the travel for that was then subsidised.

Cattle Welfare. Numbers built up very quickly. That is where the wild bulls came from that I refer to. Herd structure changed. Prior to the beef crisis the Northern meatworks had given us a half decent market for the first time. Improvements had been put in, mainly fencing, waters, and 24 hour power on most stations where before it was just carbide lights. Genetic improvement did not occur until BTEC cleaned out the feral bulls and Supplementation occurred in line with higher operating costs and the forcing of defraying high infrastructure costs. Smaller family units built up in previously unsettled lands. The NT is a much younger industry than other states, and only the easy water access and better grassed country had been used.

As the beef depression eased the northern works sold product to the American grinding meat markets and Live Export increased. Once again it became profitable to operate, helicopters and bullcatchers (modified Toyotas) were introduced, and the big clean up was underway. BTEC commenced and provided the policy, incentive and reasons to eradicate feral herds. Those herds were either mustered into portable yards or shot to waste. One thing I have not mentioned so far is the gruesome nature of the portable yard full of wild animals. Bulls constantly gore younger animals, wounds become septic in our tropical environment over night, and it is an extremely dangerous workplace. I copped a severely broken leg at the time from a wild bull. Carcase trim at the works for bruising was conducted by a chainsaw, often whole carcases were scrapped. Quite often in the north we mustered animals directly onto barges on the tidal flats that were then shipped direct to an overseas market, complete with all the other animals and bruising that went in the melee. Buffalo and bovine mixed up with brumbies, dingoes perhaps the odd emu.

Wild buffalo are an extremely dangerous animal, they are so quick that they can pierce a thrown match box easily with their horns, and they watch and wait for the unwary stock handler. Trucking all feral animals and often unloading them in the dark was very hazardous, you might ask Mr. Rod Downes of his experiences in the matter. More references may come from Mr. Jeff Newton also appearing later, who was a ringer, then stock Inspector during those times.

This situation at the moment is the beginnings of our industry either wholly or partially sinking back into an abyss of animal welfare dereliction that is impossible for the latte set, any southerner or even supposedly knowledgeable elected representatives to comprehend. Wild bulls goring young animals, which spray pus as they are tossed in the air or bashed against the yard rails, stock handlers who now would be all unskilled, subject to constant danger, heifers in the wild being ridden to death by massive bulls, something I as a helicopter pilot as did all others see on a daily basis. Is that what we want to see? IS it? Put that against a very short piece of television footage which took years to procure, most of which seemed fabricated and the judgement of this ban decision is made to look like a severely irresponsible and criminal act, totally devoid of research or reasoned input.

By the way I was the one who mustered all those types of animals off of Bullo River Valley station, and many other places, I can tell you about in detail if you like. I suggest that this ban has ridden the current owners' finances to death and that of others. That will be on this Governments' conscience if it is not fixed and should be on their debt.

Cortisol

Stress promotes a flight or fight response in individuals by the adrenal gland increasing cortisol levels releasing blood glucose to enable running away from a threat or standing to fight.

Higher and more prolonged levels of cortisol in the bloodstream (like those associated with chronic stress) have been shown to have negative effects, such as:

- Increased depression
- Lowered immunity and inflammatory responses in the body, slowed wound healing, and other health consequences
- Impaired cognitive performance
- Higher blood pressure
- Blood sugar imbalances such as hyperglycaemia
- Suppressed thyroid function
- Decreased bone density
- Decrease in muscle tissue

Tafet, G.E., et. al. "Correlation between cortisol level and serotonin uptake in patients with chronic stress and depression." *Cognitive, Affective, & Behavioral Neuroscience* 1.4 (2001) :388-393(6).