

final report

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Upgrade Mark IV cattle restraining box

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Abstract

Project W.LIV.0374 described the design and operating characteristics of the Mark 4 restraining box. This original design allowed for easy conversion between manual and automatic versions. Both versions use a scissor frame squeeze and rollover crush. Following release of design and installation of prototype Mark 4 restraining box in Indonesia the automatic version has been the preferred option. The automatic version uses an external power source and hydraulics to operate both the squeeze and rollover.

Feedback from in-market consultants and exporters, as well as the independent assessment of both the design and operational aspects of the Mark 4 restraining box, identified design improvements that will allow for improved operator compliance and greater adherence to OIE animal welfare guidelines. This report (project W.LIV.3004) details those design modifications and outlines the specifications and materials to build a Mark 4.1 restraining box as well as operation guidelines and suggested maintenance requirements.

Executive summary

In 2011, the government suspended exports of cattle to Indonesia and subsequently introduced new conditions for a re-opening of the trade to Indonesia, involving:

- The exporter being able to demonstrate whole of supply chain control through to slaughter in Indonesian abattoirs
- Traceability of the cattle through the supply chain
- Adherence to World Organisation for Animal Health (OIE) guidelines
- Independent third party audit of these supply chain arrangements

The OIE Terrestrial Animal Health Code states that the process of slaughter without stunning should not be exempt from the guidelines and consequently methods of restraint have to comply with several basic requirements, as detailed below:

- Provision of a non-slip floor
- Avoidance of excessive pressure applied by restraining equipment that causes struggling or vocalisation in animals
- Equipment engineered to reduce noise of air hissing and clanging metal
- Absence of sharp edges in restraining equipment that would harm animals
- Avoidance of jerking or sudden movement of restraining device
- Avoidance of mechanical clamping of the legs or feet of the animals as the sole method of restraint

The Mark 4 restraining box uses a scissor frame restraint and rollover crush to apply a controlled lateral squeeze to cattle and turn them 90 degrees onto their side (W.LIV.0374 Review of mark three and development of mark four cattle restraining box). This reduces excessive handling of cattle and presents the animal in a position for quick and effective slaughter. Animal welfare outcomes are improved from earlier box designs as animals do not fall to a lying position. The Mark 4 restraining box was designed to be operated both manually or automatically. Uptake of the automatic version in Indonesia has been the preferred option. The automatic version uses an external power source and hydraulics to operate both the squeeze and rollover. The Mark 4 boxes have a number of design features that comply with the OIE guidelines. These include:

- Non-slip flooring, smooth action, low noise tilting mechanism
- Padded squeeze restraint with no sharp edges or projections.
- Pressure control mechanism to limit the applied pressure, ensuring that excessive pressure is not applied to the thorax and abdomen during restraint (when operated correctly).
- Solid sides to limit exposure to the activity of the slaughter floor
- Well-lit area and aperture in the end wall of the box to encourage forward movement.
- Lateral tilt platform to present animal in the correct position for slaughter without stunning and bleeding. Lateral restraint also enables the head to be positioned post-slaughter to keep the sticking wound open and reduce the likelihood of prolonged time to brain death.

Feedback from in-market consultants and exporters, as well as the independent assessment (Schipp, 2011; Hewitt, 2011) of both the design and operational aspects of the Mark 4 restraining box, identified design improvements that would allow for improved operator compliance and greater adherence to OIE animal welfare guidelines. These can be summarised as follows:

- Incorporation of neck restraining arm to restrain the neck for effective slaughter.
- Modification of the body squeeze, to allow for effective hold whilst exerting less pressure on the abdomen, thus avoiding excessive compression when operated correctly.
- Reduction in the width of the body squeeze base to improve animal movement into the restraining box.
- Upgraded power unit to increase the speed of the neck capture, body squeeze and tilting process.
- Fully enclosed sheeting added to sliding door and side of box to reduce visual disturbance to livestock and influx of light under the bottom edges of the box.

The design and use of the Mark 4.1 restraining box can ensure consistent animal welfare outcomes compliant with OIE and DAFF guidelines during restraint and slaughter providing that SOPs and work instructions are implemented effectively. The application of the body squeeze and neck restraint bar holds animals effectively to facilitate slaughter without prior stunning.

Restraint of the neck using the modified neck restraint bar also improves worker safety as there is no requirement to manually restrain the animal's head. While this project is limited to the ability of the Mark 4.1 design to meet OIE requirements, it is recognised that complete compliance to the standards is dependent on the action and behaviours of the slaughtermen using the equipment. The actual operation and routine maintenance of the equipment is beyond the scope of this project, though is pertinent to the overall delivery of acceptable animal welfare outcomes. The use of the Mark 4.1 restraining box as a method of restraint for non-penetrating mechanical stunning requires further practical assessment.

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1 Background

Since 1998, the Australian industry and Government has funded the development of cattle restraining boxes, mainly for implementation in SE Asia for halal slaughter of cattle. These simple yet effective designs have relied on restraining animals without the use of pneumatics, hydraulics or electricity.

Previous R&D Project W.LIV.0374 designed a 'Mark 4' cattle restraining box. The design allowed for either manual or automated operation. Prototype Mark 4 boxes have been built and shipped to both Indonesia and the Middle East for use in restraining cattle prior to slaughter without stunning. In Indonesia there are also Mark 4 copy boxes which have been built by local operators based on the design drawings provided in the W.LIV.0374 final report.

The recent introduction and implementation of the new regulatory framework for livestock exporters has resulted in exporters having to comply with DAFF guidance on OIE animal welfare outcomes. In order for supply chains to meet independent audit criteria, it is essential that the design of the Mark 4 restraining box considers and complies with OIE design guidelines.

Feedback from in-market consultants and exporters, as well as the independent assessment of both the design and operational aspects of the Mark 4 restraining box (Hewitt, personal observations), identified design improvements that will allow for improved operator compliance and greater adherence to OIE animal welfare guidelines.

The purpose of this project was to modify and upgrade the Mark 4 design to reflect the current model that is being successfully operated to comply with OIE Slaughter of animals design guidance (Chapter 7.5 - slaughter of cattle without stunning) and the DAFF guidance on meeting OIE animal welfare code outcomes.

2 Project objectives

The following were identified as objectives for the project:

1. Modify and upgrade the Mark 4 design to reflect the current model that is being successfully operated to comply with OIE Slaughter of animals design guidance (Chapter 7.5 - slaughter of cattle without stunning) and the DAFF guidance on meeting OIE animal welfare code outcomes.
2. Complete final report including
 - a. all associated CAD drawings for any design modifications
 - b. photographs and operational video footage of amended Mark 4 design
 - c. the requirements for automated operation
 - d. recommended maintenance program
 - e. specifications for all materials and associated machinery and hydraulics.

Objective 1

The upgraded Mark 4 cattle restraining box design (Mark 4.1) will meet the following design capabilities:

- Restrain cattle from 300 – 600 kg liveweight
- Require minimal adjustments to any mechanically functioning parts such as a counterweight mechanism
- Meet OIE standards
- Be easily and readily adapted to incorporate the use of stunning
- Require minimal stockman training or operator skill
- Is quick and efficient
- Is able to be automatically (hydraulics) operated.

The design should particularly consider and / or comply with the following:

- Provision of non slip flooring
- Method of restraint is appropriate for size and class of animal
- Animals are presented for slaughter without being unduly stressed
- Restraining equipment is free from obstructions and sharp edges
- The head is restrained in a manner which facilitates sticking
- The head is restrained for as short as time possible prior to sticking

Objective 2

The final report will include:

- Description of materials and specification of manufacturing grade steel
- CAD drawings of completed design including any modifications to the original Mark 4 design
- A written review of operating capabilities with suggested modifications to improve design and function
- Recommendations for maintenance program including both design components and hydraulics and associated machinery
- Photographs and video footage of operation in Indonesia
- A written description of automatic operation features including power loads and pressure requirements for hydraulics as well as specifications of pressure release valves.

The completed prototypes and design drawings will remain the property of MLA.

3 Methodology

The Mark 4 restraining box (developed in W.LIV.0374 Review of mark three and development of mark four cattle restraining box) was installed and trialled in a small number of abattoirs in Indonesia and the Middle East. The Mark 4 design has been used successfully for restraining cattle to facilitate slaughter without prior stunning. The design and operation of the restraining box has been subject to further scrutiny following the implementation of a new regulatory framework which requires compliance with external audit criteria (in-line with OIE guidelines). Following in-market assessment and operational review by consultants and exporters, a series of modifications were made to the Mark 4 restraining box. A full description of the modifications and the ability of the box to meet the specified design criteria outlined in Objective 01 are detailed in Section 4.1. A technical review of the ability of the modified design to meet OIE and DAFF guidelines was also undertaken and is presented in Section 4.2.

4 Results and discussion

4.1 Modifications to the design and operation of the Mark 4 restraining box

Feedback from in-market consultants and exporters, as well as the independent assessment of both the design and operational aspects of the Mark 4 restraining box (Schipp, 2011; Hewitt, 2011), identified design improvements that will allow for improved operator compliance and greater adherence to OIE animal welfare guidelines. They are as follows (Figure 01):

- Reduction in the width of the body squeeze base to improve animal movement into the restraining box (1)
- Incorporation of neck restraining arm to restrain the neck for effective slaughter (2)
- Fully enclosed sheeting added to the rear sliding door and side of box to reduce visual disturbance to livestock and influx of light under the base of the box (3)
- Modification of the body squeeze (4) and rubbers (5/6), to allow for effective hold whilst exerting less pressure on the abdomen, thus avoiding excessive compression when operated correctly.
- Upgraded power unit to increase the speed of the neck capture, body squeeze and tilting process.

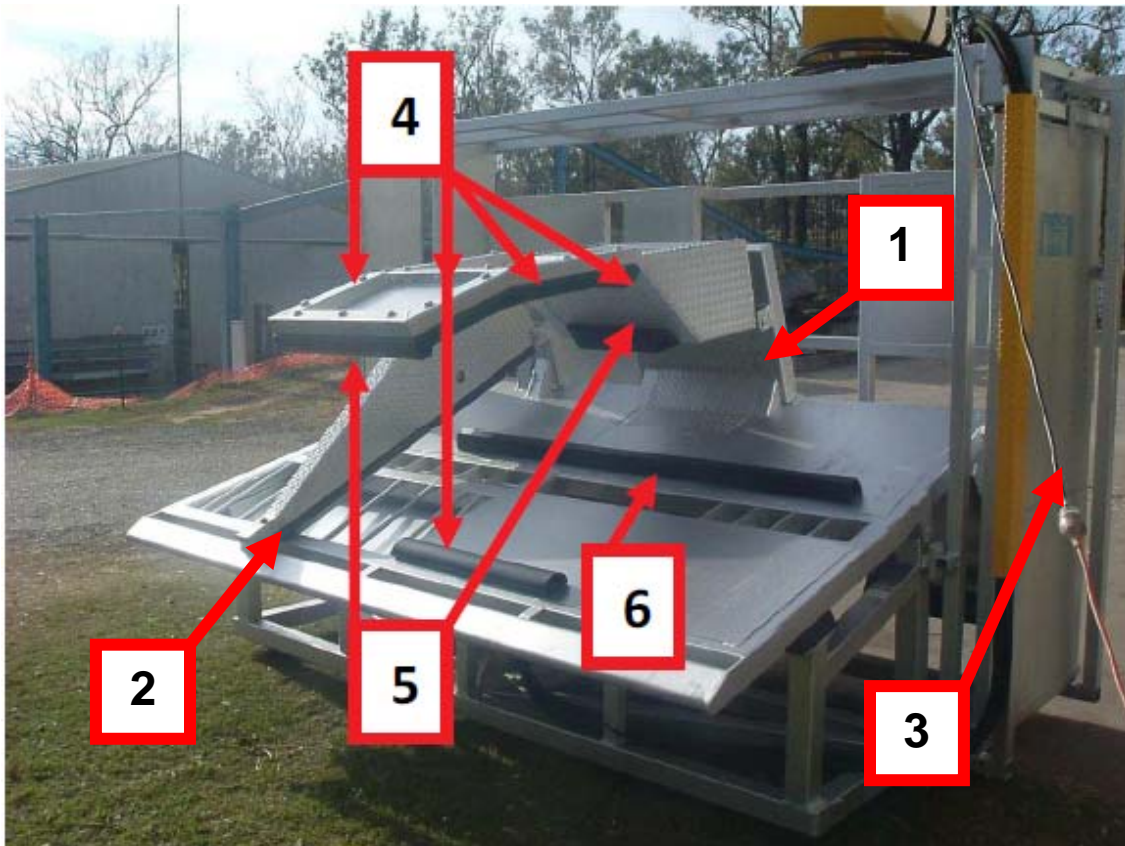


Figure 01: Summary diagram of the restraining box modifications (Mark 4.1 restraining box)

4.1.1 Addition of metal sheeting to box sides and sliding door

The influx of light under the sides of restraining boxes can impede the movement of animals into the box and cause them to lower their heads affecting the ability to position them correctly for restraint. This can be overcome in the short term by fitting the box with a rubber skirting material, however it is easily damaged and requires regular replacement (Figure 02). The modified Mark 4.1 restraining box has modified metal panels that extend to the floor, thus removing the requirement for additional rubber skirting material. The sliding gate has also been constructed from solid sheeting, although the aperture in the end wall has been retained to encourage forward movement into the box.



Figure 02: Rubber skirting material on the Mark 4 restraining box

4.1.2 Incorporation of a neck restraint arm

During slaughter without pre-stunning, the level of restraint required to expose the throat, perform an effective cut and hold the animal still until it has bled out is greater than is needed for conventional slaughter (with pre-slaughter stunning). Once the animal was positioned in lateral recumbency in the original Mark 4 restraining box, it was necessary to manually restrain the head using two operatives to facilitate slaughter by a third operative. When using the Mark 4 box, approximately a third of animals exhibited excessive movement of the head during tipping and attempted capture for slaughter (Personal observations in one abattoir, L. Hewitt). Not only is this an animal welfare issue as it a) increases the duration and stress of restraint and b) increases the risk of physical injury to the animal, it also represents a serious safety risk to the operatives. The solution to this issue was the incorporation of a mechanical form of neck restraint equipment into the box. A neck restraining bar was fitted into the Mark 4.1 and used successfully to reduce movement of the head during the tipping process and subsequent slaughter (Figure 03). A combination of the lateral restraint position and the use of the neck restraint arm facilitated effective sticking within 10 seconds of the animal being positioned for slaughter (ie.in the lateral position with head restrained). It should be noted that the current neck restraint arm is a relatively 'passive' form of neck restraint and does not actively fix the head (which can be a cause of stress during restraint). The mechanism is based closely on the equipment used in commercial cattle crushes and stunning boxes used throughout Australia, US and EU. It is important that the design of any head or neck restraint equipment does not have a negative impact on animal movement into the restraining box (by presenting a physical obstruction to movement into the box) or interfere with the slaughter and bleeding processes. If inappropriate head restraint is used it can be a factor contributing to prolonged consciousness relating directly to:

- Poor position of the neck for sticking and optimum placement of the cut
- Increased pain and distress experience during the slaughter procedure
- Reduction in the rate of blood flow from the neck wound and closure of the neck wound during bleeding

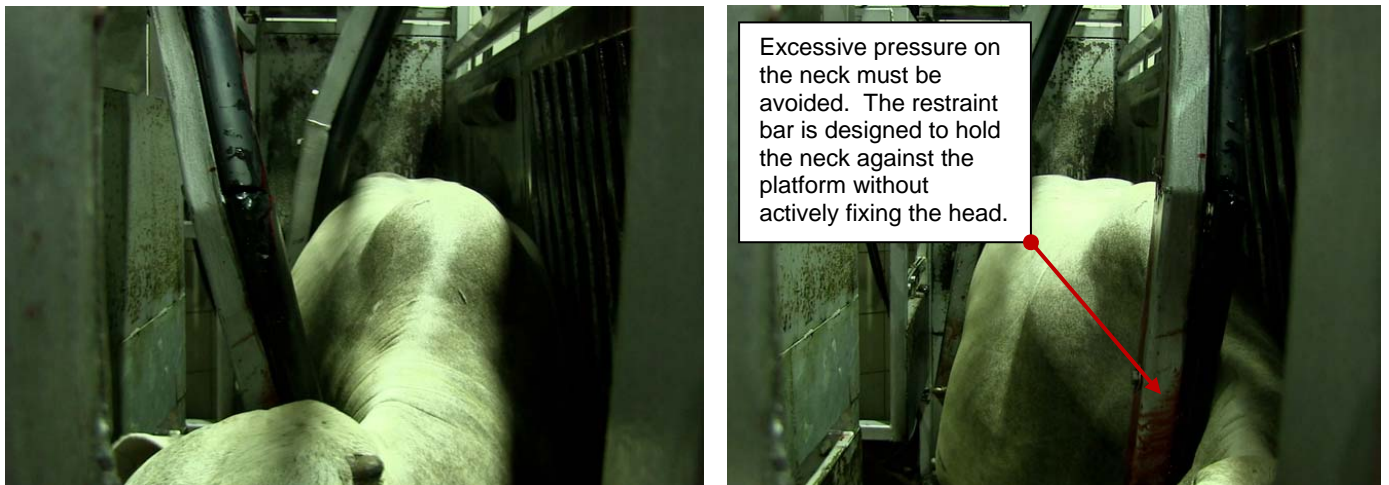


Figure 03: Neck restraining arm in open and closed position

4.1.3 Modification of the body squeeze

The scissor frame is designed to apply a body squeeze to the animal and support its weight during tilting and lateral restraint. The modified scissor frame (in the Mark 4.1 box) has been manufactured to follow the curve of the animal's abdomen. This has the benefit of effectively holding the animal whilst exerting less pressure on the abdomen, thus avoiding excessive compression when operated correctly. The space between the platform and the base of the scissor restraint has been increased in the Mark 4.1 by approximately 15cm (Figure 04 - exact measurements included in Appendix 8.1) as a smaller gap was perceived by a small number of animals as a physical barrier and increased the likelihood of baulking during movement into the box.

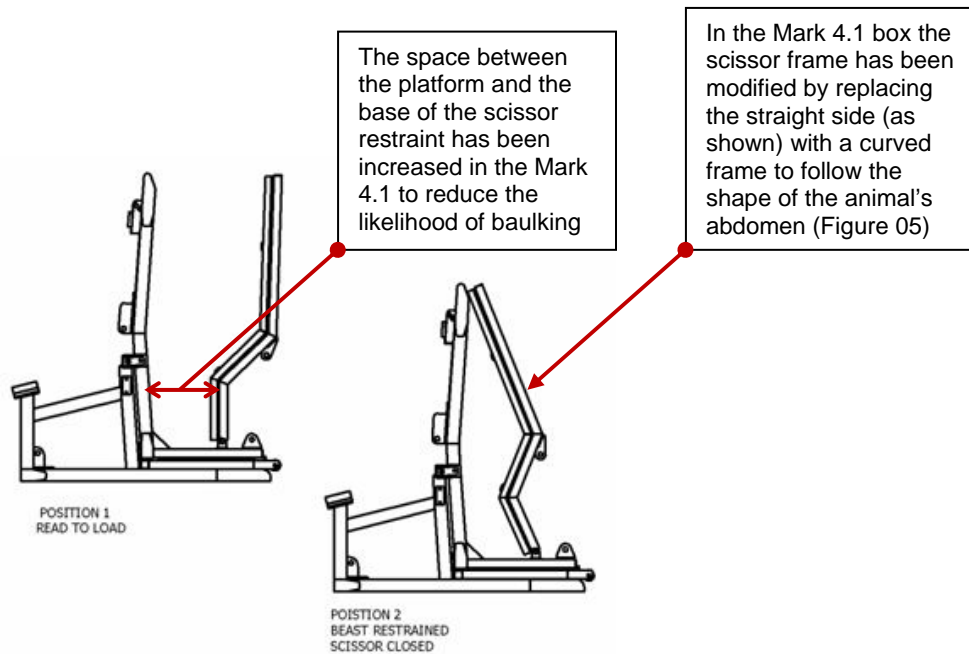


Figure 04: CAD drawing of the scissor restraint in the original Mark 4 restraining box



Figure 05: Animal being held in position in the curved scissor frame of the body squeeze (Mark 4.1 restraining box)

4.1.4 Upgrade to the power unit

The existing 0.75kw hydraulic power unit in the Mark 4 was upgraded to a 2.2kw unit. In addition to providing sufficient hydraulic power to tilt and restrain larger animals, the new unit also improves the speed of capture which reduces the overall time that the animal is held in restraint. The hydraulic power unit operates all the functions of the restraint box with the exception of the sliding door, which is manually operated. The restraint function is fitted with a pressure release mechanism to prevent the application of excessive pressure during capture and restraint of the animal. The Mark 4.1 control valve part number is OP10-D-D-D-2000 (Appendix 8.2.7). This simply means it has three D Spools in the mono-block valve assembly.

4.2 Compliance with OIE and DAFF guidance

The World Organisation for Animal Health (OIE) has developed a set of normative documents for member countries, designed to improve the welfare of animals through a science-based approach. One such document is the Terrestrial Animal Health Code 2011, which includes a requirement to minimise avoidable pain and suffering at every stage of the pre-slaughter and slaughter processes until the death of the animal. The OIE concluded that the process of slaughter without stunning should not be exempt from the guidelines and consequently methods of restraint have to comply with several basic requirements.

The current Mark 4 design (prior to modification) has a number of design features that comply with the OIE guidelines. These include:

- Non-slip flooring, smooth action, low noise tilting mechanism.
- Padded squeeze restraint with no sharp edges or projections.
- Pressure control mechanism to limit the applied pressure (and overriding pressure release valve), ensuring that excessive pressure is not applied to the thorax and abdomen during restraint (when operated correctly).
- Solid sides to limit exposure to the activity of the slaughter floor. Note: It is recommended that the front of the box is positioned away from the activity on the floor or screened.
- Lateral tilt table to present animal in the correct position for slaughter without stunning and bleeding.
- Lateral restraint also enables the head to be positioned post-slaughter to keep the sticking wound open and reduce the likelihood of prolonged time to brain death.

Although the restraint of cattle using the Mark 4 box was generally compliant with OIE and DAFF guidance, elements of the design and operational process required improvement. Several design modifications were made to the Mark 4 box (described in Section 4.1) with a view to ensuring full compliance when operated correctly. The table below summarises how the additional modifications ensure compliance with the OIE/DAFF guidelines and recommendations.

Upgrade the Mark IV cattle restraining box

Summary of OIE guideline/ recommendation	Additional design features of Mark 4.1 box to comply with OIE Terrestrial Animal Health Code 2011
Restraint and slaughter is carried out without causing undue stress to the animals	Modification of the box sides and sliding door to increase the depth of the solid sheeting. This replaces the requirement to fit the box with rubber skirting. The presence of solid sides reduces visual disturbance and the likelihood of animals baulking as they enter the box. The metal sheeting is also more robust and does not require regular maintenance as in the case of the rubber material.
Avoidance of excessive pressure applied by restraining equipment that causes struggling or vocalisation in animals.	Modification of the body squeeze, to allow for effective hold whilst exerting less pressure on the abdomen, thus avoiding excessive compression when operated correctly. Correct operation in accordance with written work instructions and SOPs avoids the application of excessive pressure. In the event of incorrect operation, a release valve overrides the mechanism to remove all applied pressure on the animal.
Avoidance of jerking or sudden movement of restraining device.	The upgraded powerload provides sufficient hydraulic power to tilt and restrain larger animals, whilst improving the speed of capture and restraint.
Animals are restrained for a short as time possible.	A combination of the lateral restraint position and the use of the neck restraint arm facilitates effective sticking within 10 seconds of the animal being positioned for slaughter (ie.in the lateral position with head restrained).
Animal welfare concern associated with bleeding out by severance of blood vessels in the neck without stunning - Failure to cut both common carotid arteries; occlusion of cut arteries; pain during and after the cut.	Restraint of the head using the neck bar means that the neck does not need to be over extended to enable effective throat cutting and severance of both carotid arteries. It is important not to overextend the neck as this can lead to tearing of the neck tissues during slaughter. Once the neck has been cut, restraint in the lateral position with the neck restraint bar in place enables the animal's head to be positioned in such a manner that the incision does not close back over the knife. This prevents further pain and distress and also reduces the likelihood of severed blood vessels becoming occluded and thereby potentially delaying the time to unconsciousness.

5 Success in achieving objectives

All objectives have been achieved in full. The upgraded Mark 4 cattle restraining box design (Mark 4.1) meets the design capabilities outlined in Objective 01. The appendices included in this report contain the CAD drawings of completed design including any modifications to the original Mark 4 design and an operating manual which covers recommendations for a maintenance program (including both design components and hydraulics and associated machinery).

6 Impact on meat and livestock industry – now and in five years time

The use of the Mark 4.1 restraining box will further improve the animal welfare of Australian cattle at the point of slaughter for those supply chains seeking to comply with DAFF guidance on slaughter without stunning. The use of the box will also improve processing efficiency and operator safety. This will have a long term benefit to the industry by encouraging the demand for Australian cattle, whilst improving standards of animal welfare throughout the export chain.

7 Conclusions and recommendations

The design and use of the Mark 4.1 restraining box can ensure consistent animal welfare outcomes compliant with OIE and DAFF guidelines during restraint and slaughter providing that SOPs and work instructions are implemented effectively. The application of the body squeeze and neck restraint bar holds animals without causing undue stress to facilitate slaughter without prior stunning. Restraint of the neck using the modified neck restraint bar also improves worker safety as there is no requirement to manually restrain the animal's head. While this project is limited to the ability of the Mark 4.1 design to meet OIE requirements, it is recognised that complete compliance to the standards is dependent on the action and behaviours of the slaughtermen using the equipment. The actual operation and routine maintenance of the equipment is beyond the scope of this project, though is pertinent to the overall delivery of acceptable animal welfare outcomes. The use of the Mark 4.1 restraining box as a method of restraint for non-penetrating mechanical stunning requires further practical assessment.

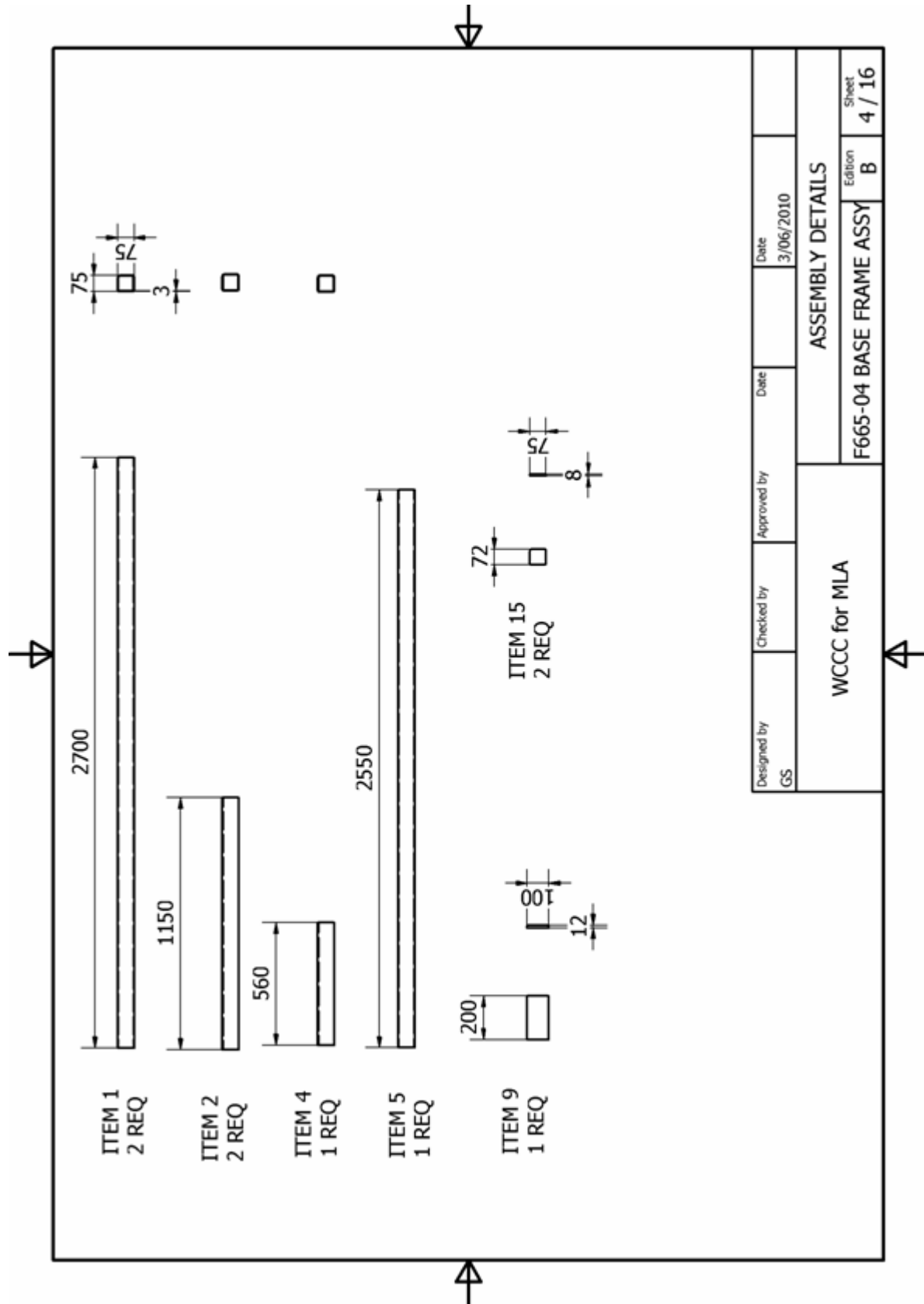
8 Appendices

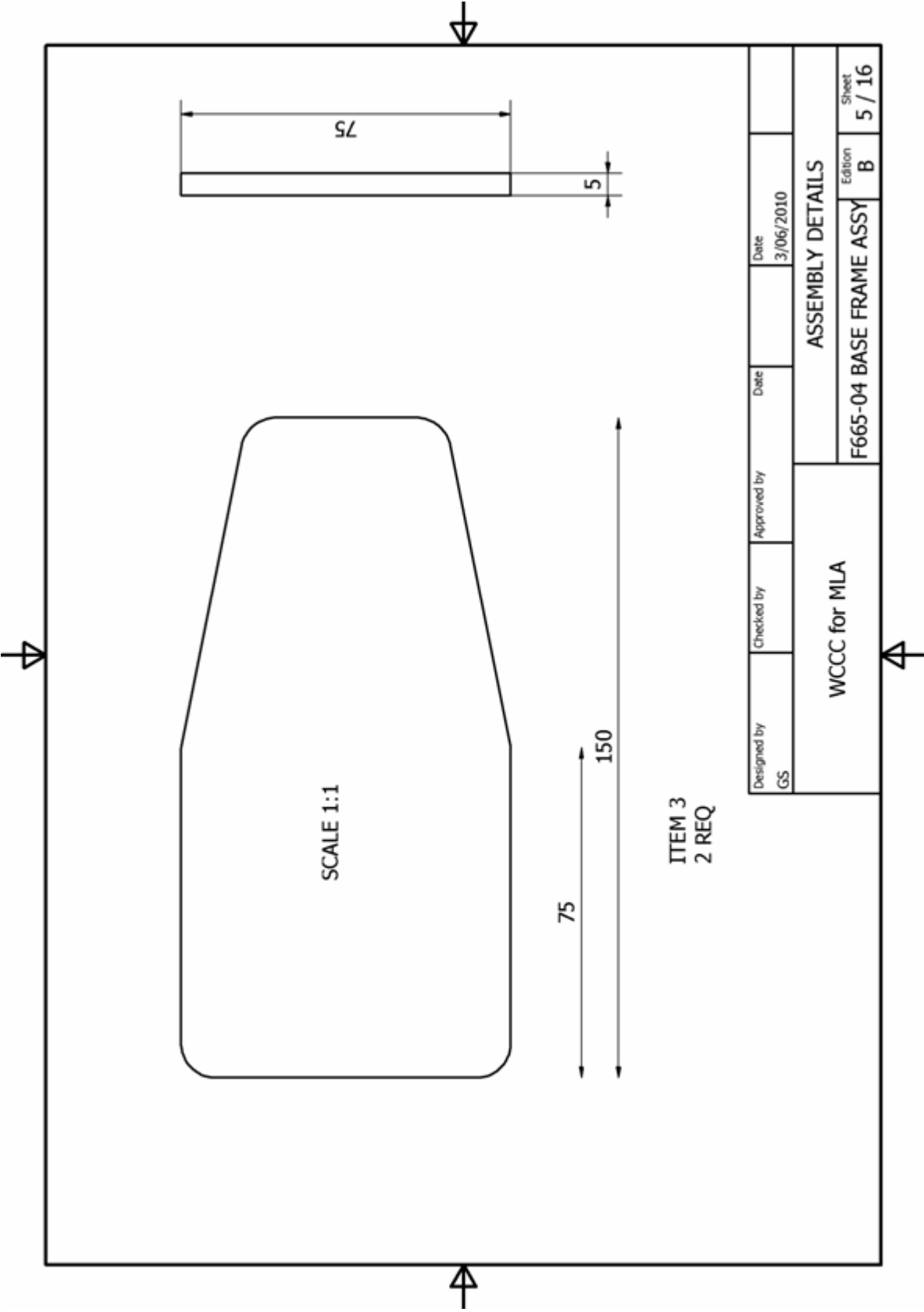
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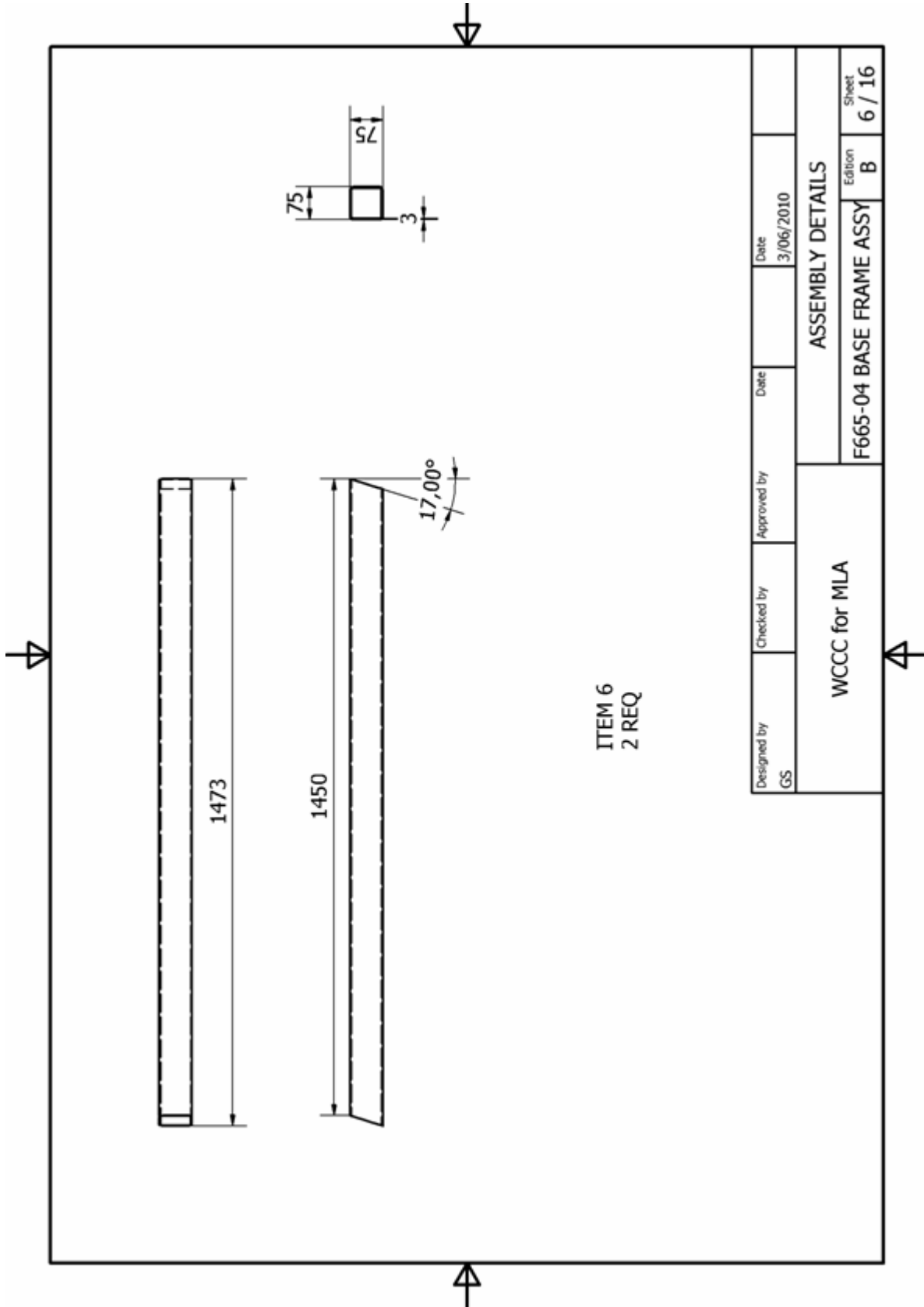
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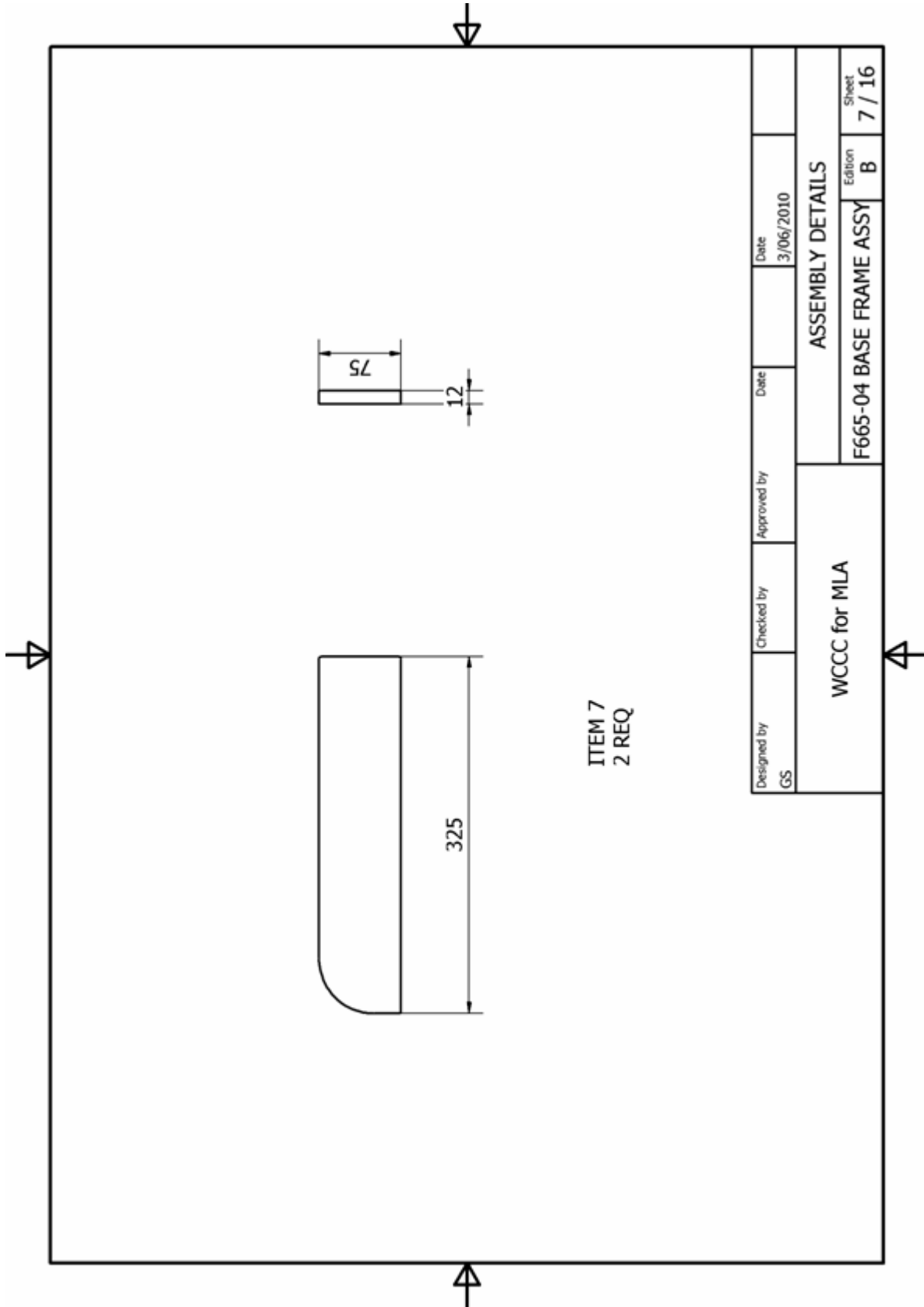
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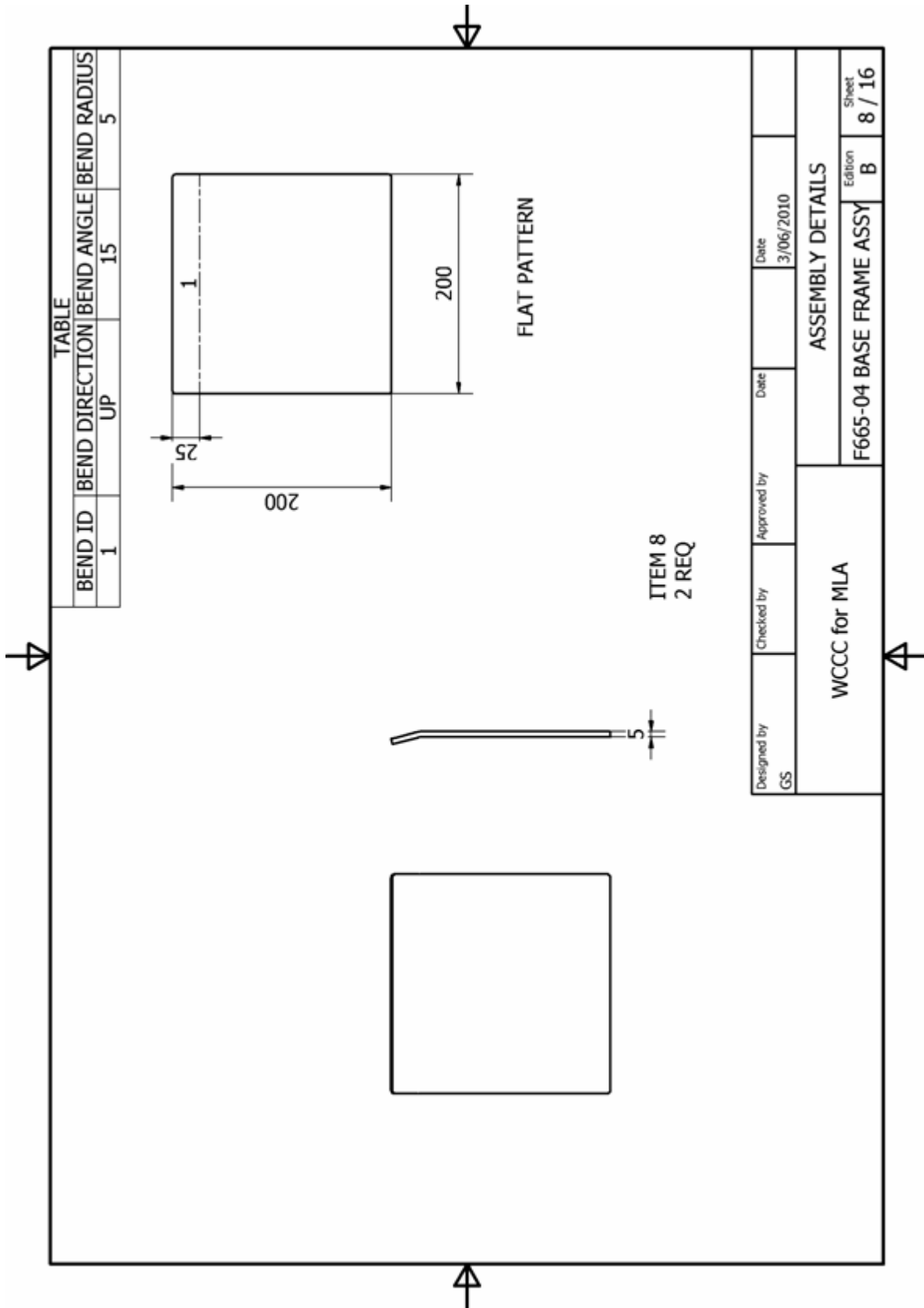
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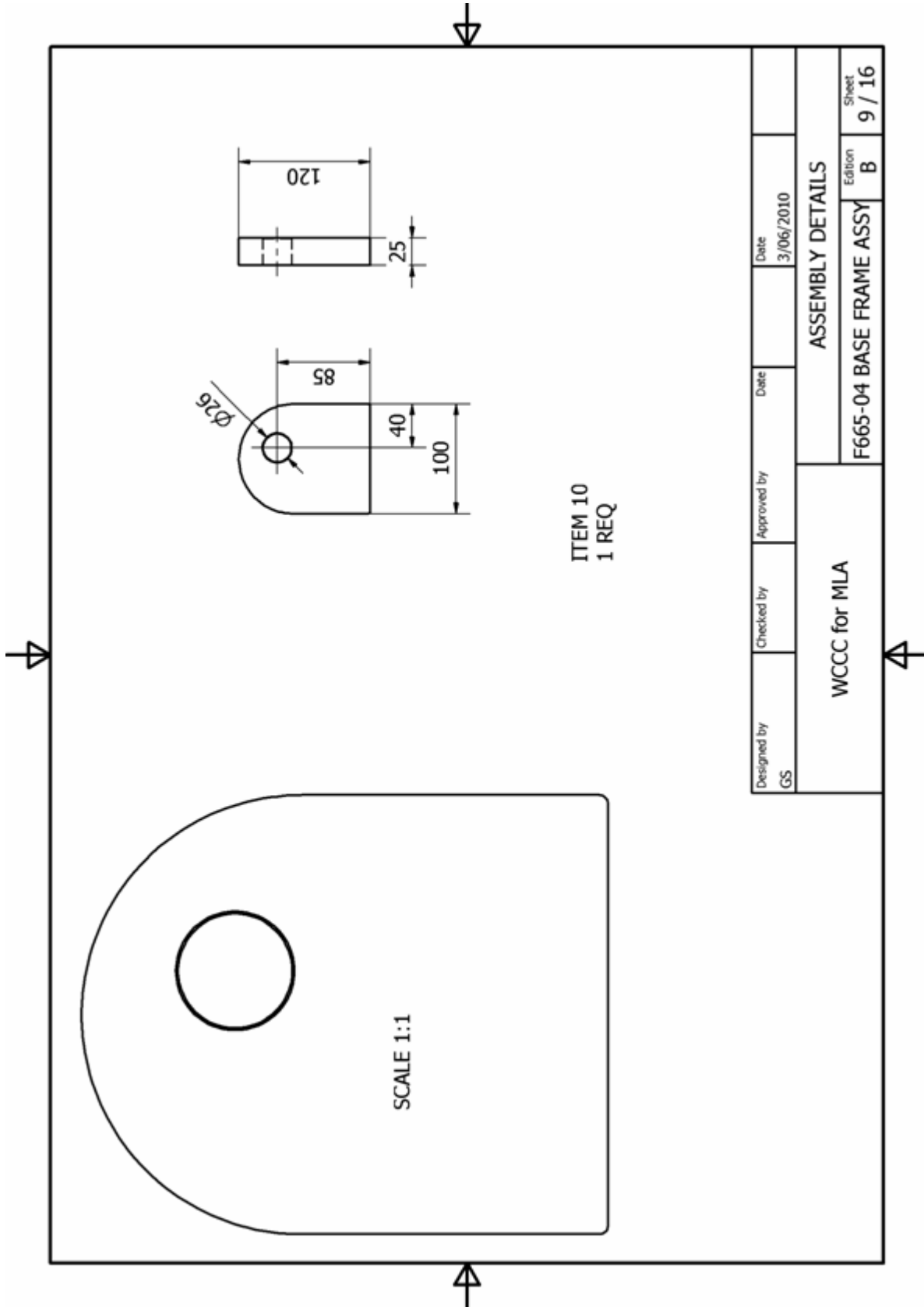




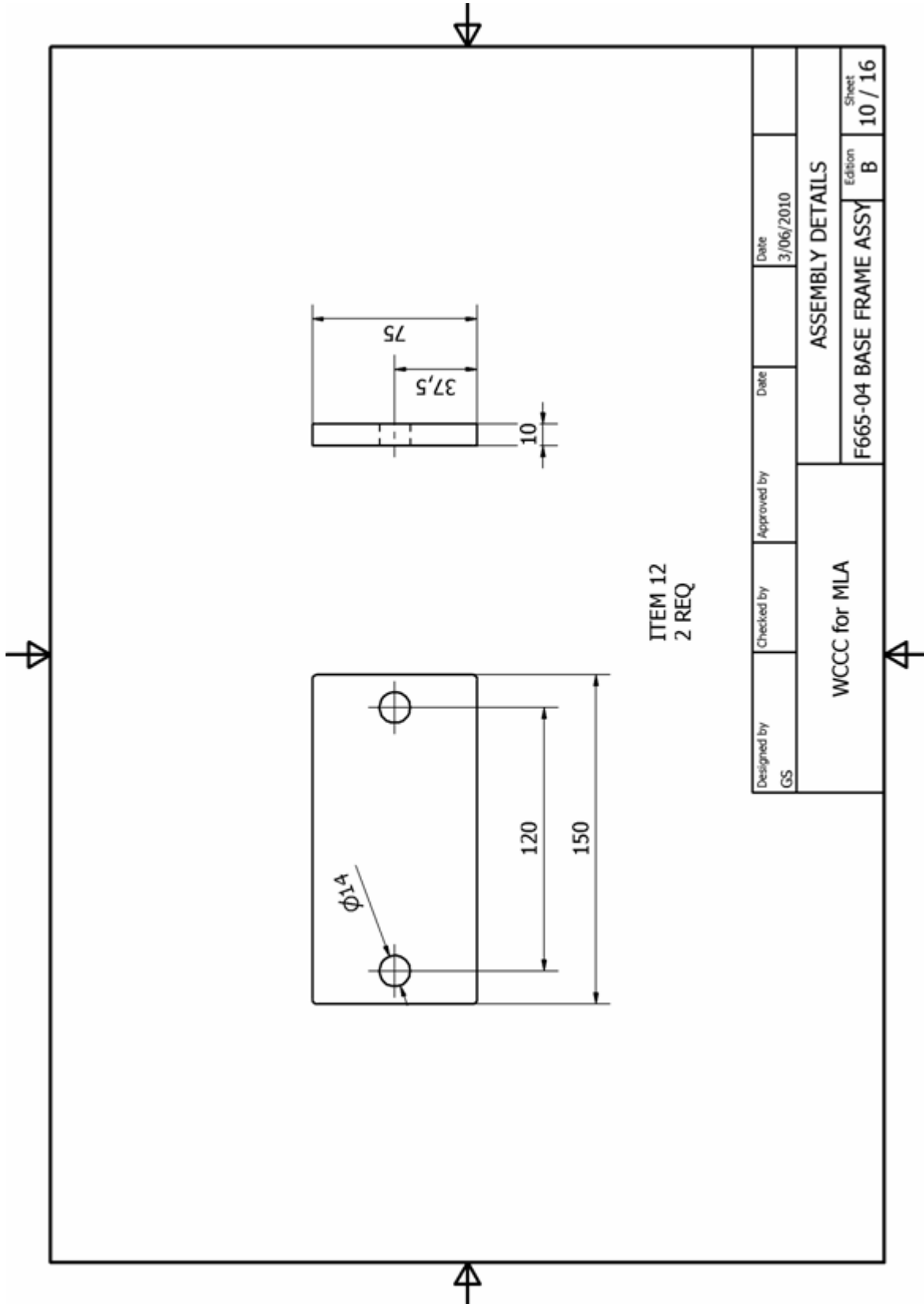


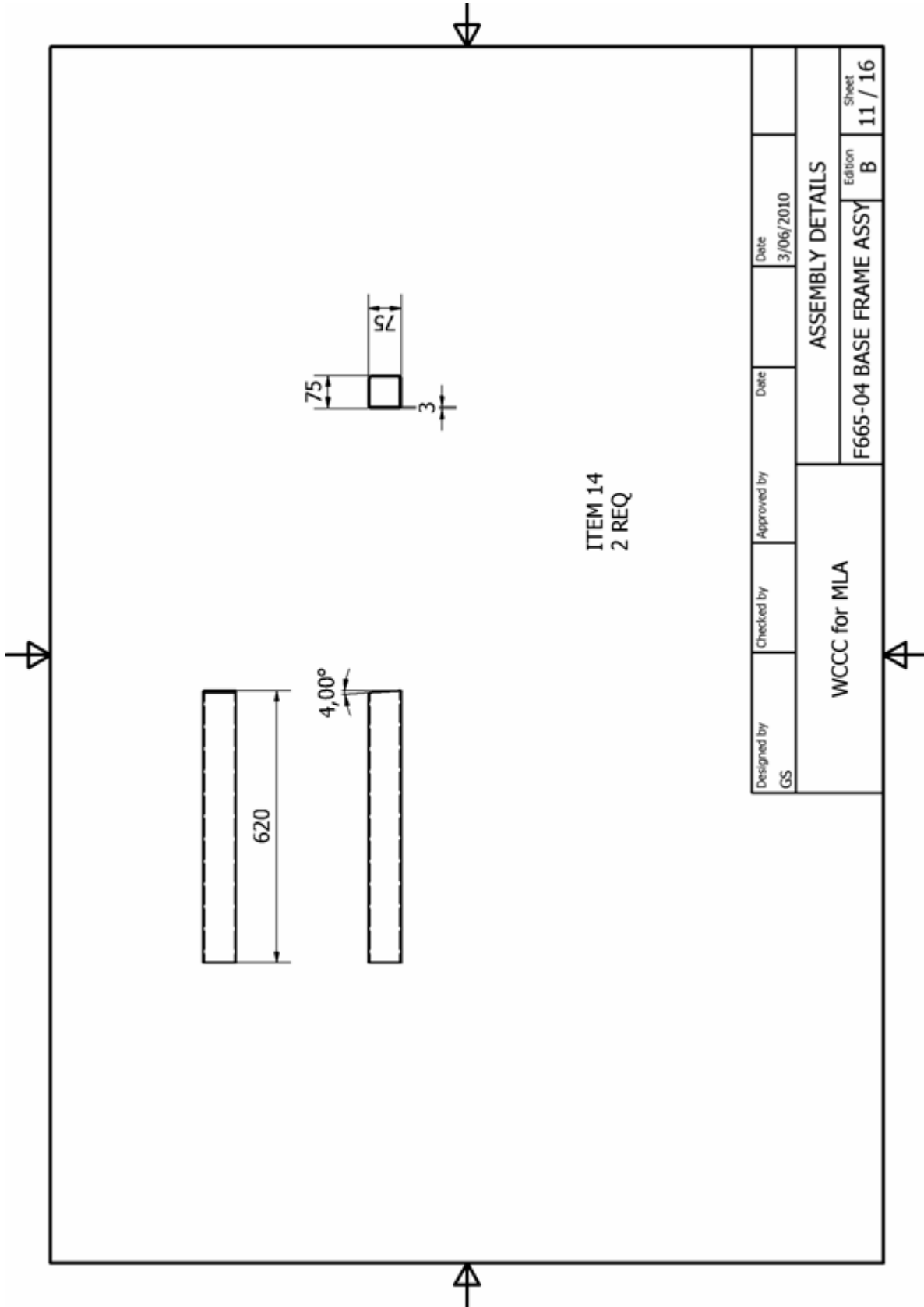


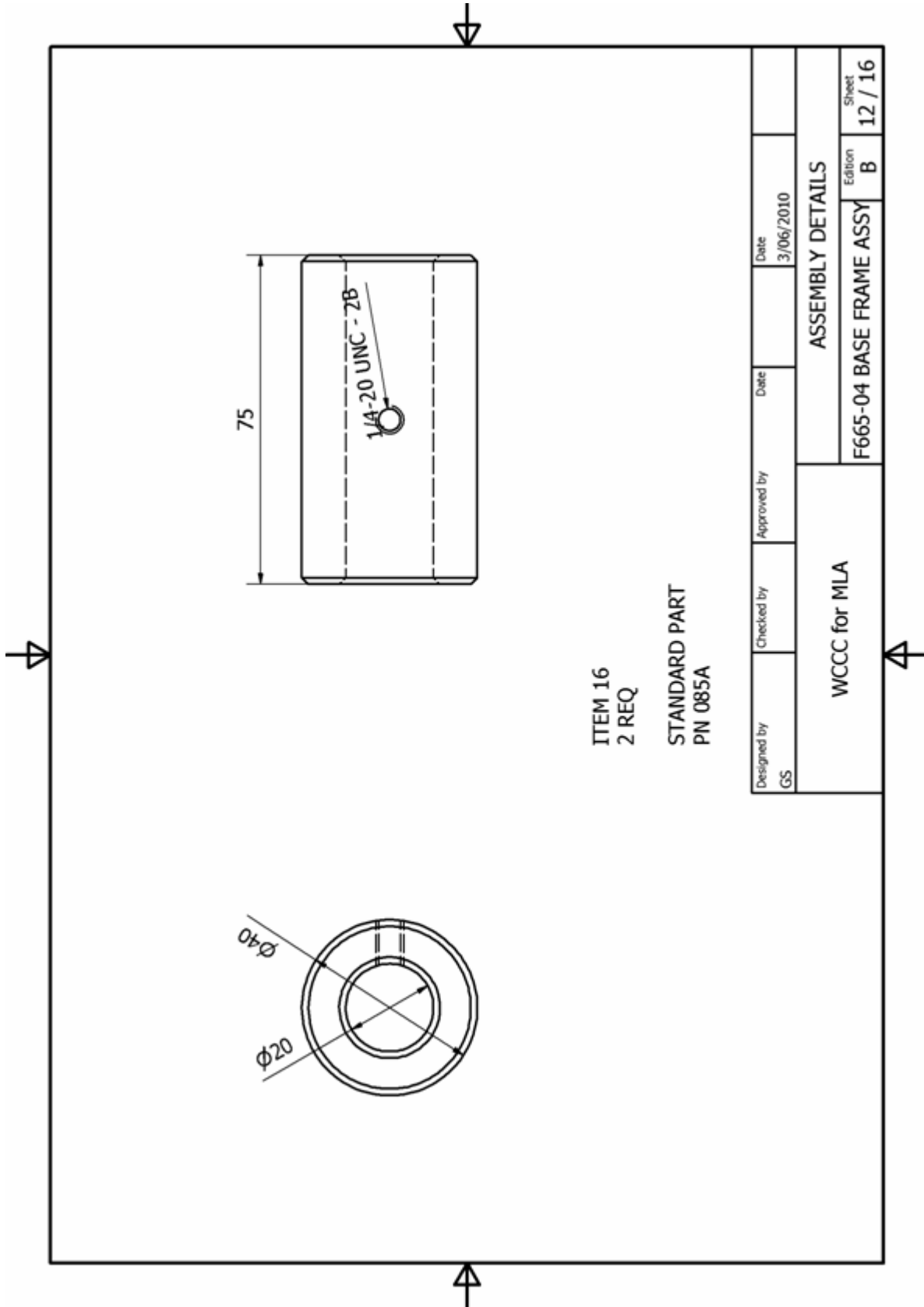




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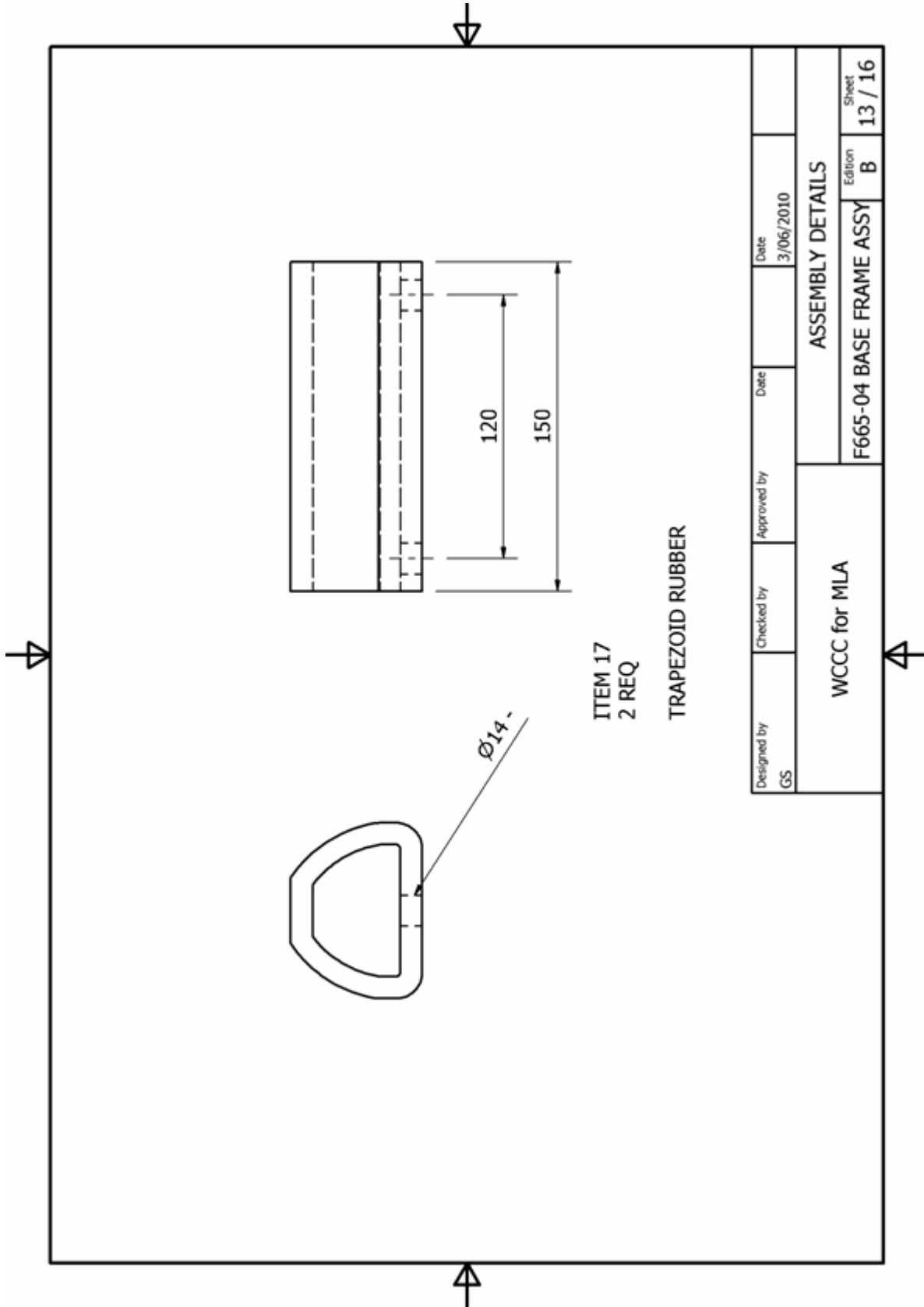


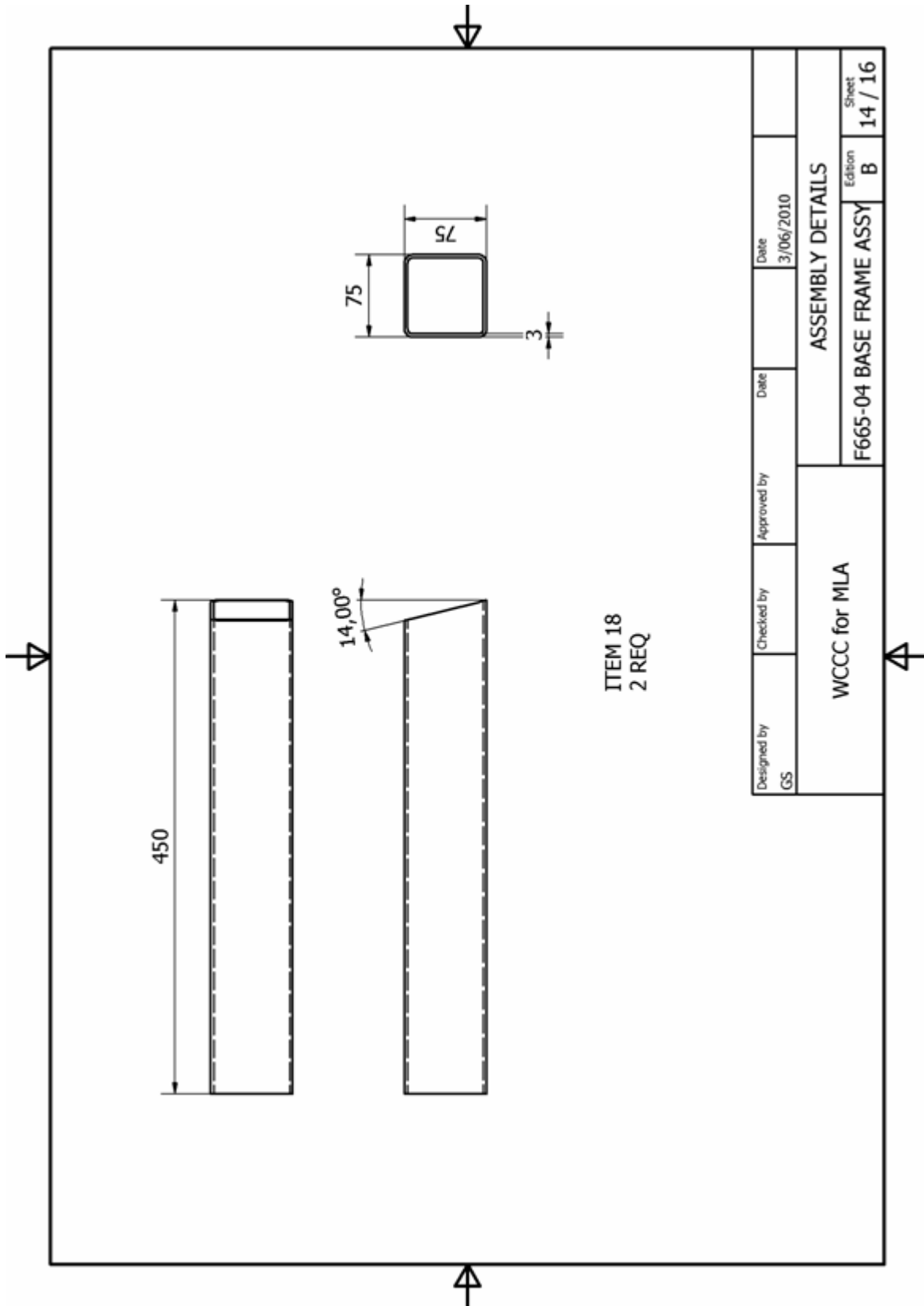


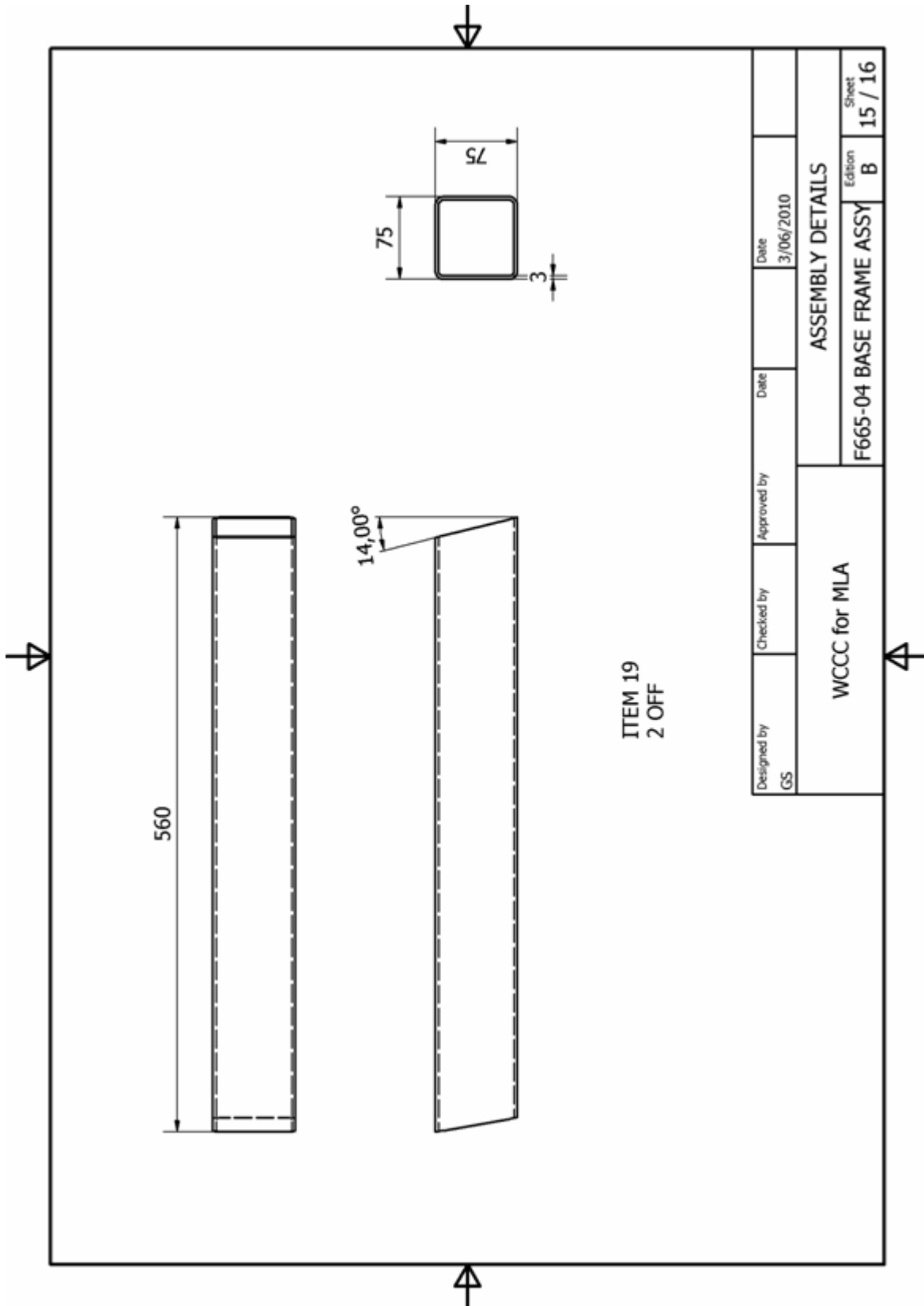
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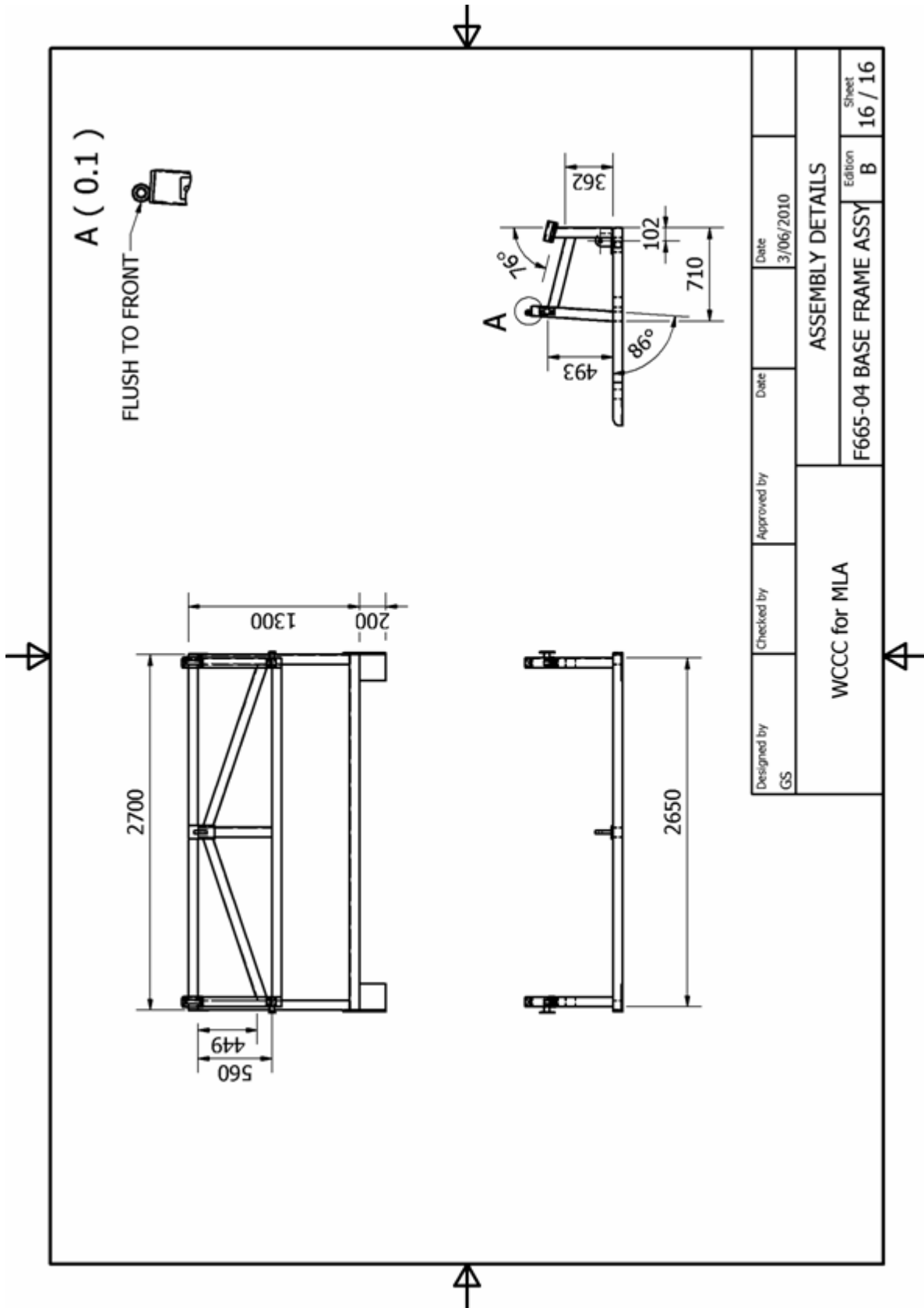
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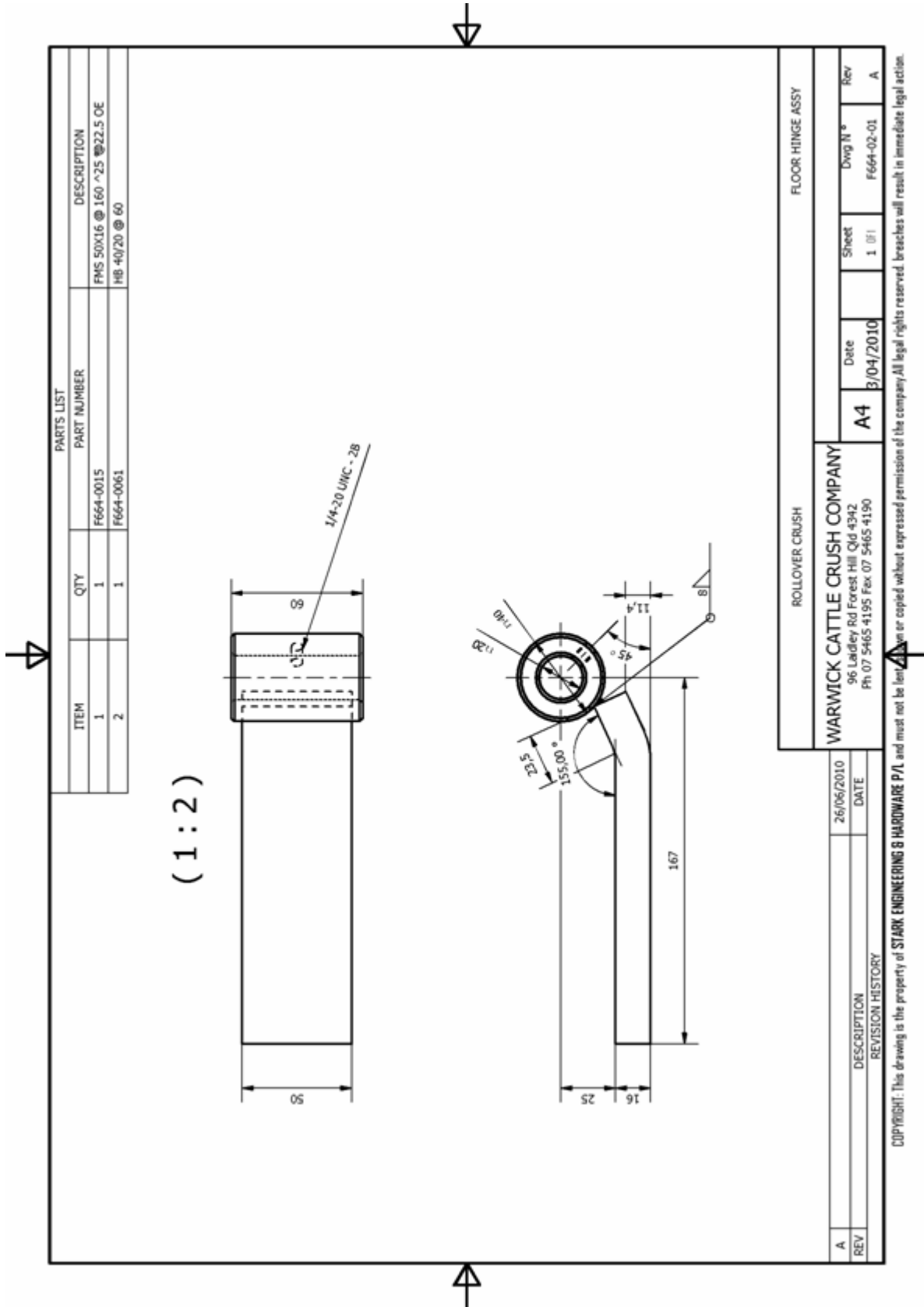






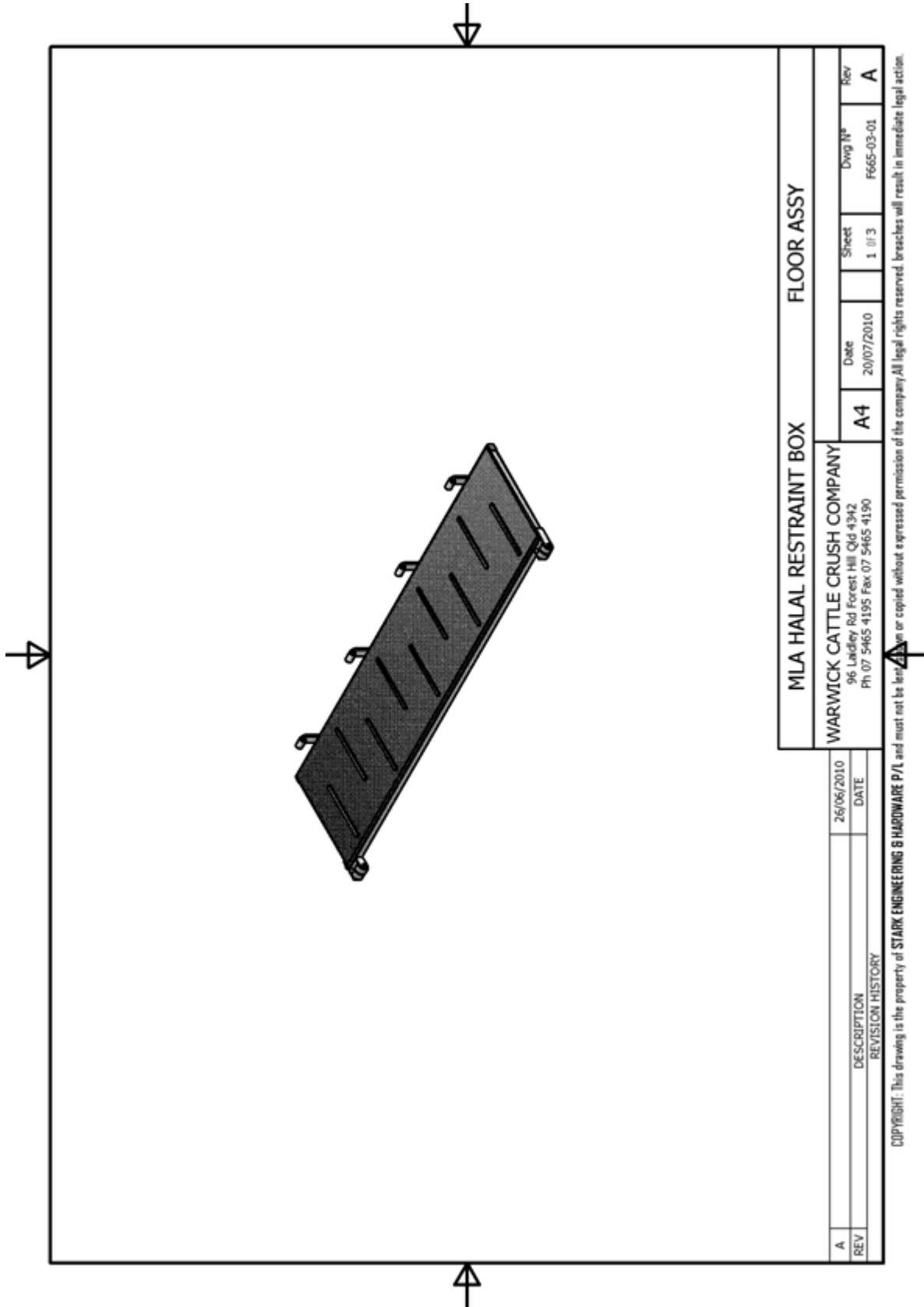
8.1.2 Floor hinge assembly

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8.1.3 Floor assembly drawings

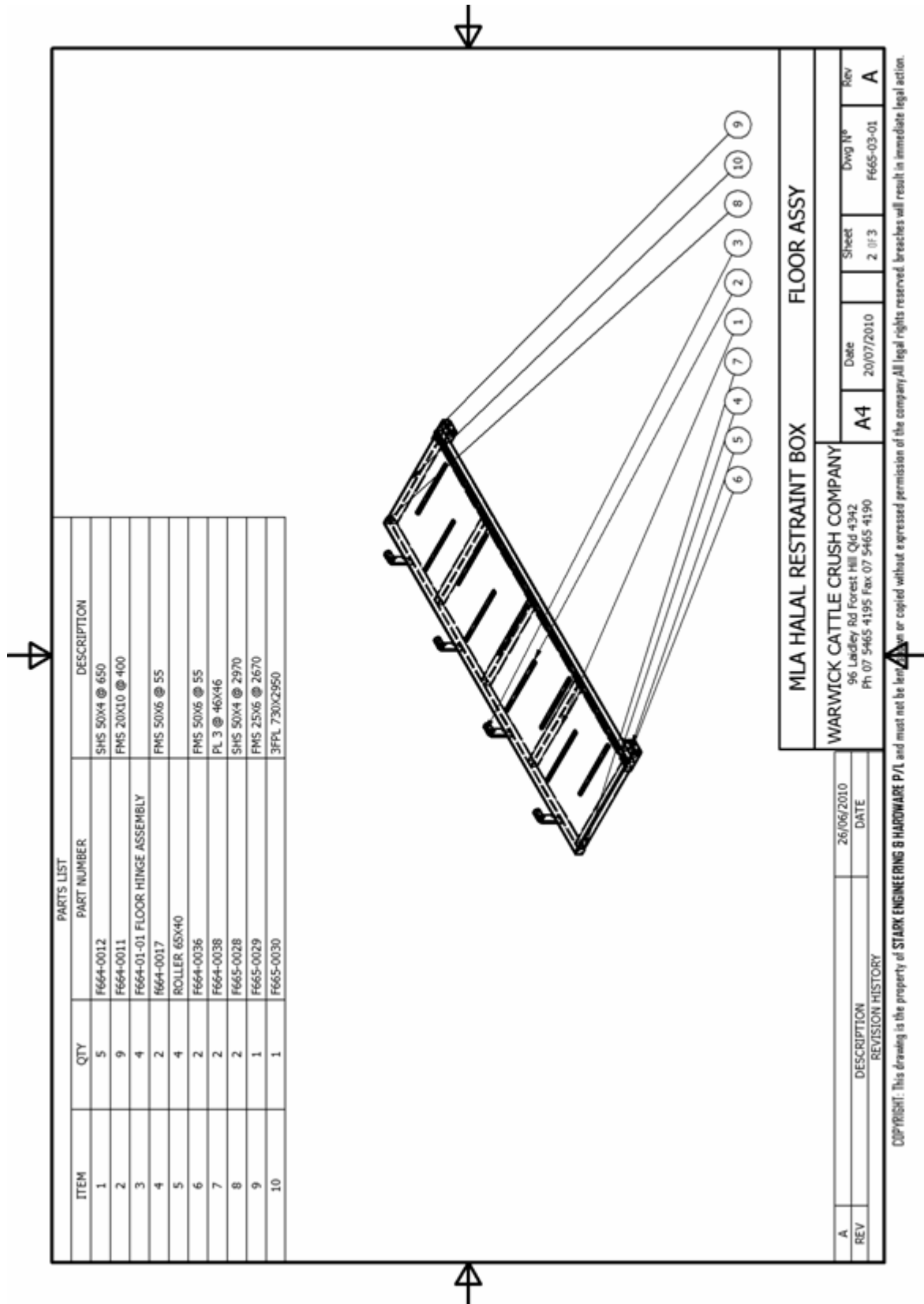
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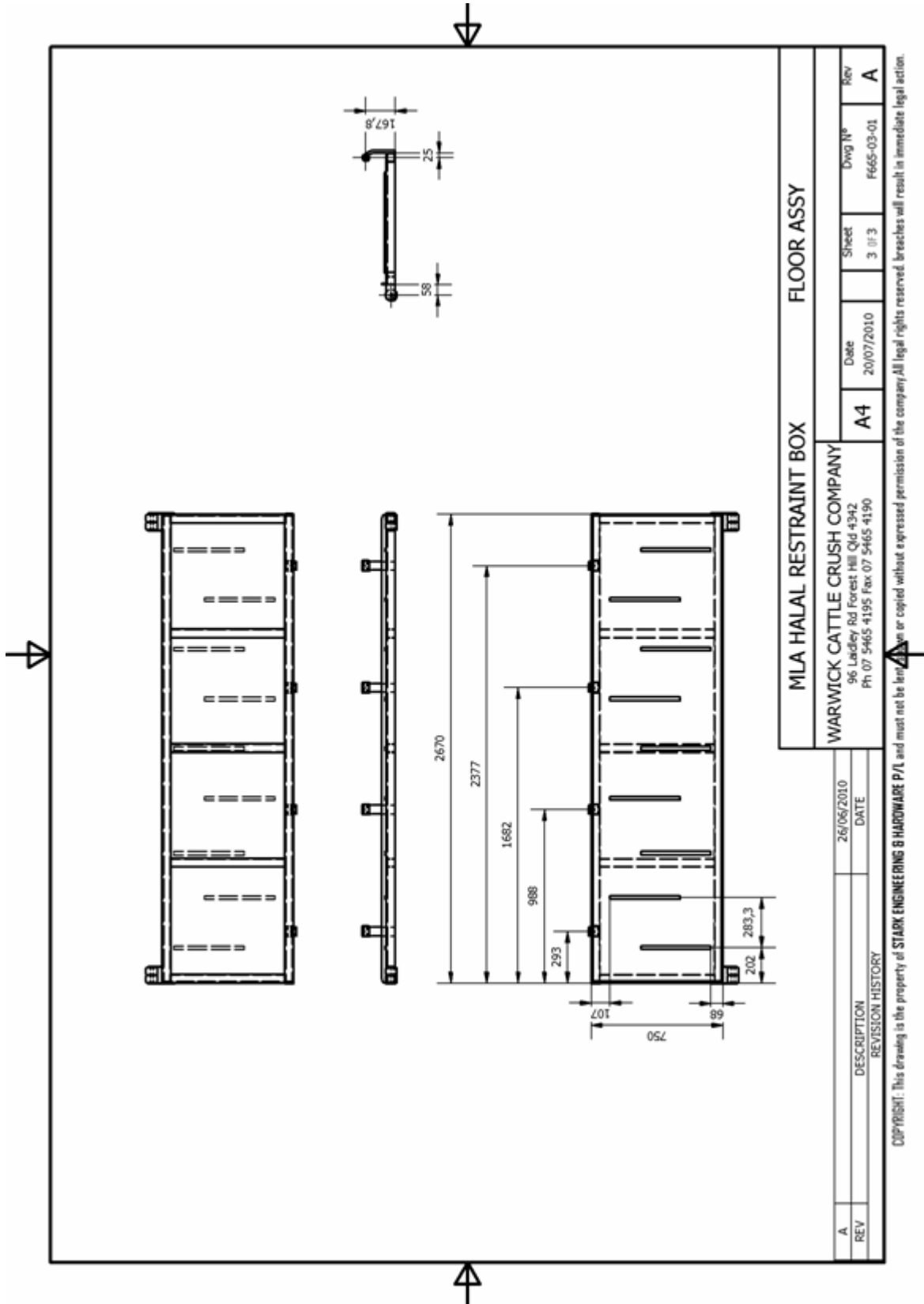


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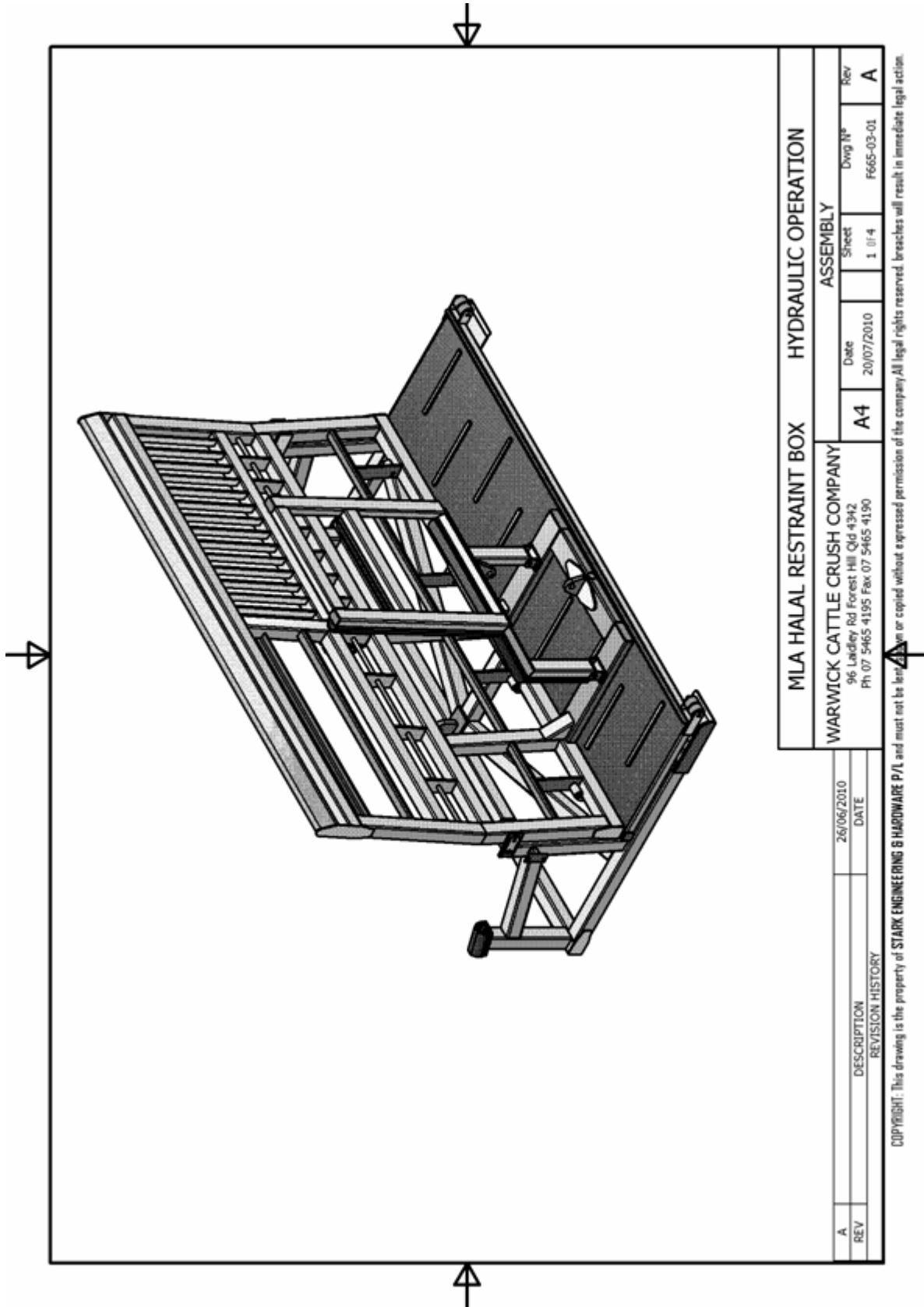
Upgrade the Mark IV cattle restraining box





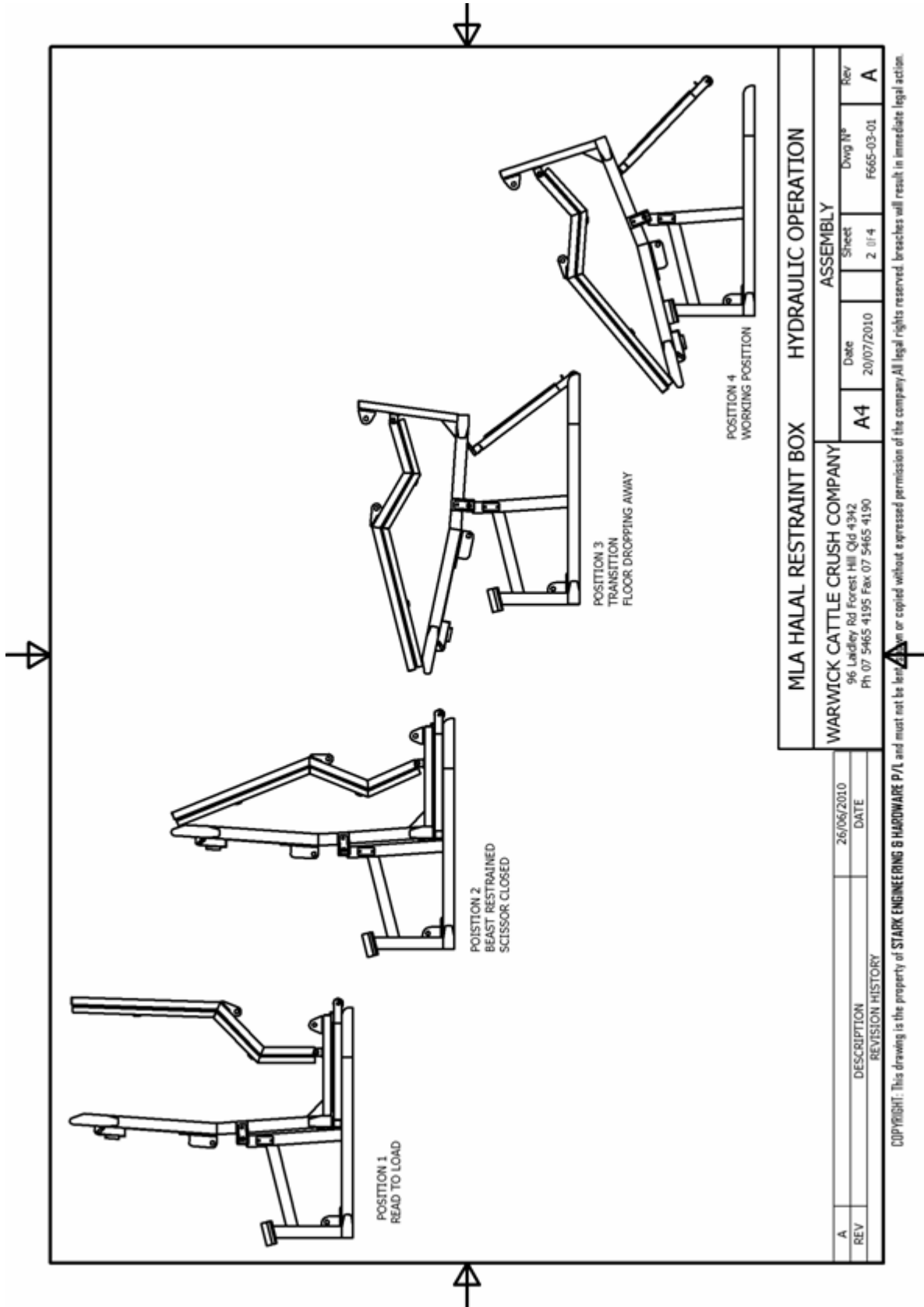
8.1.4 Hydraulic operation drawings

Upgrade the Mark IV cattle restraining box



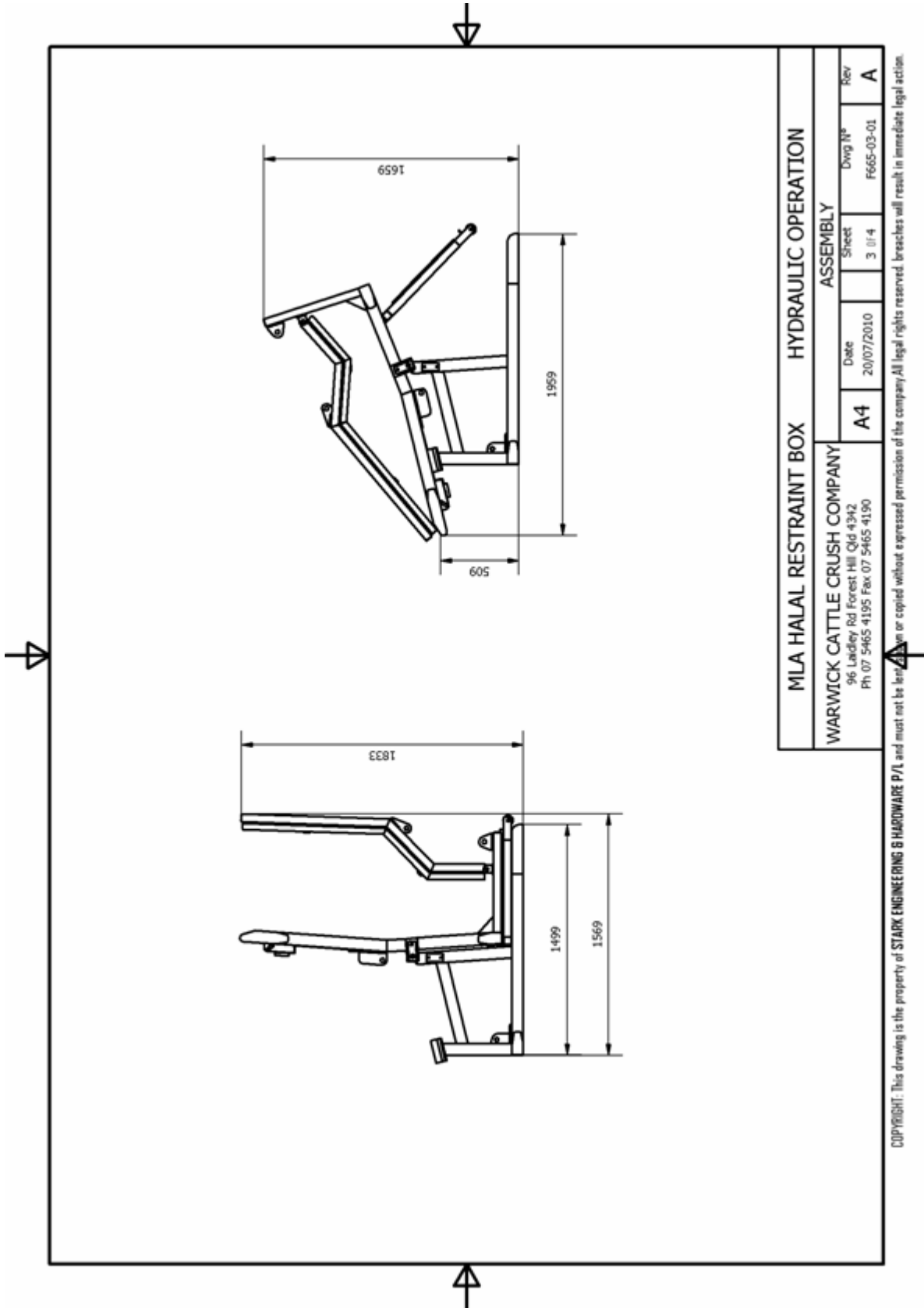
A		26/06/2010		WARWICK CATTLE CRUSH COMPANY		MLA HALAL RESTRAINT BOX		HYDRAULIC OPERATION	
REV	DESCRIPTION	DATE		A4	Date	20/07/2010	Sheet	1 of 4	Dwg No
	REVISION HISTORY								F665-03-01
									Rev
									A

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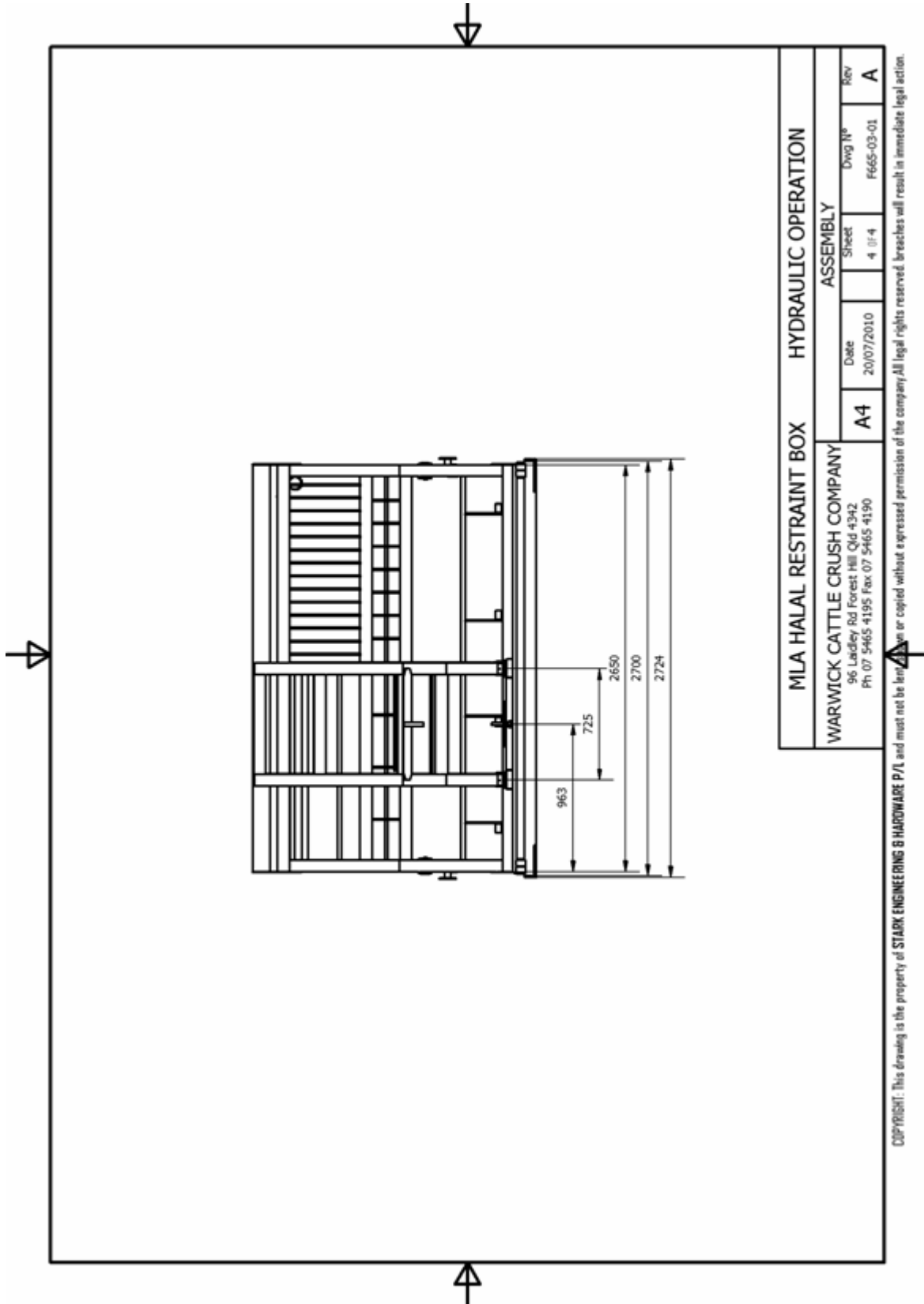


MLA HALAL RESTRAINT BOX		HYDRAULIC OPERATION	
WARWICK CATTLE CRUSH COMPANY		ASSEMBLY	
96 Ludkey Rd Forest Hill Qld 4342		Date	Dwg No
Ph 07 5465 4195 Fax 07 5465 4190		20/07/2010	F665-03-01
REVISION HISTORY		Sheet	Rev
A		2 of 4	A

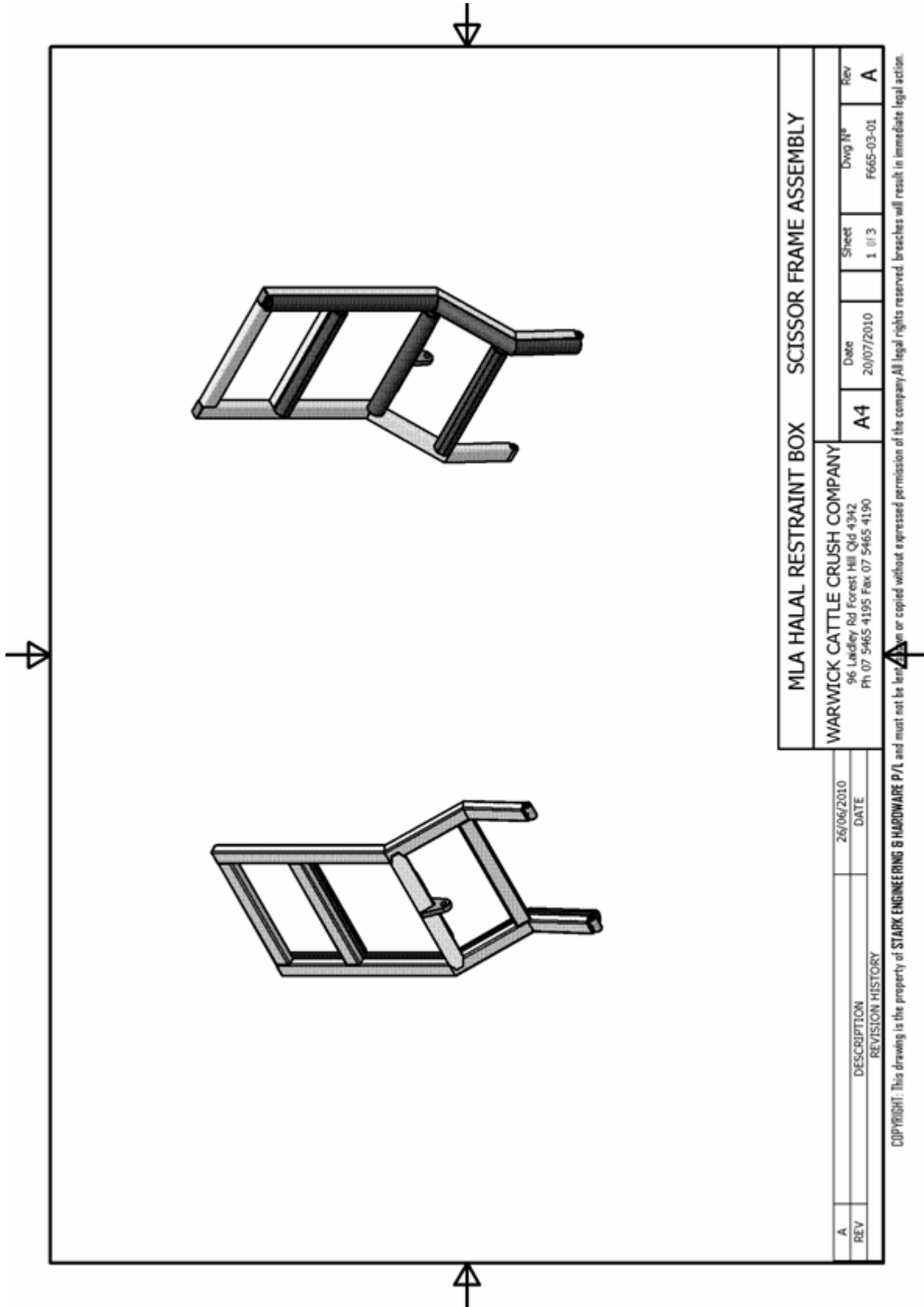
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Upgrade the Mark IV cattle restraining box

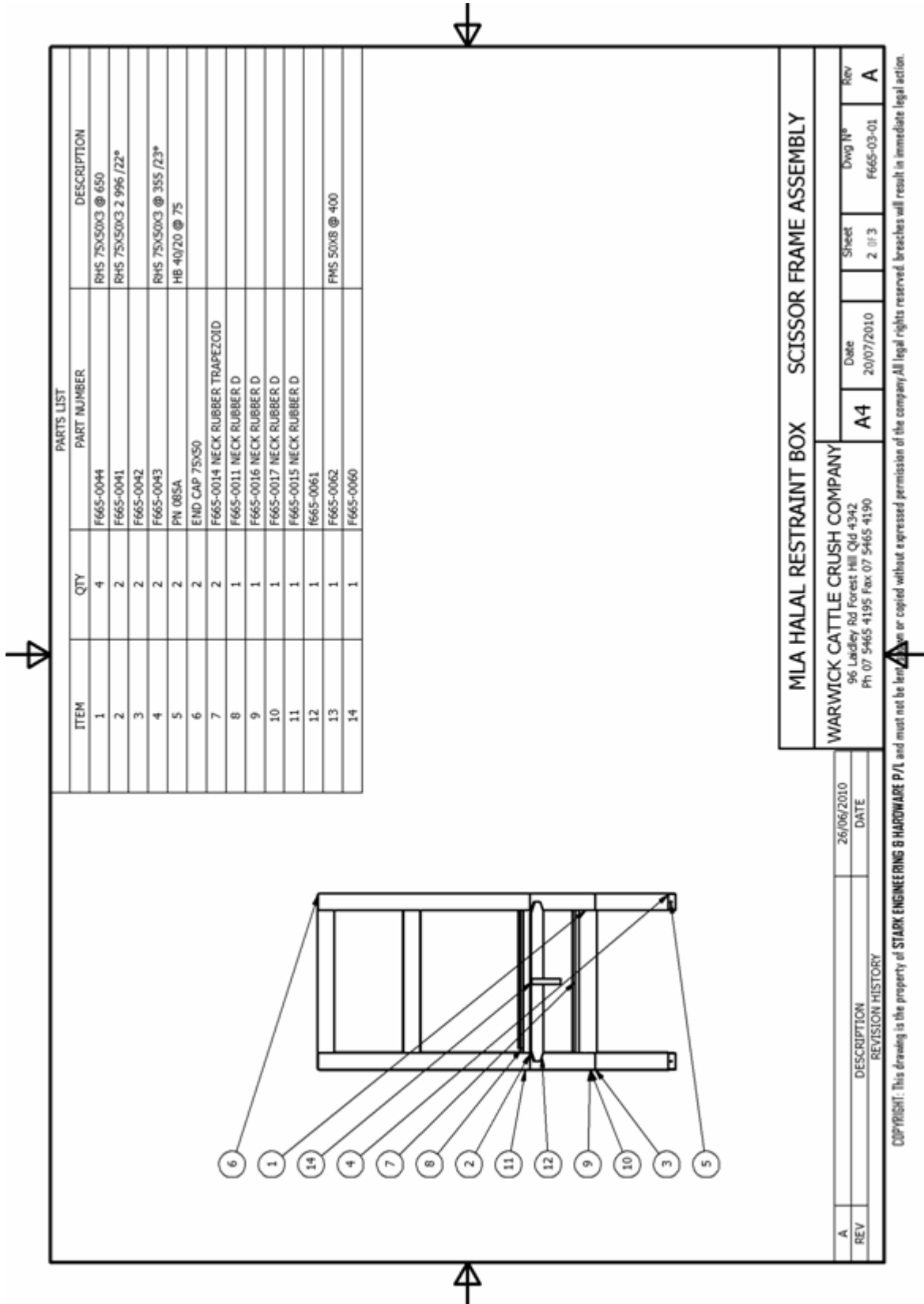


8.1.5 Scissor frame assembly

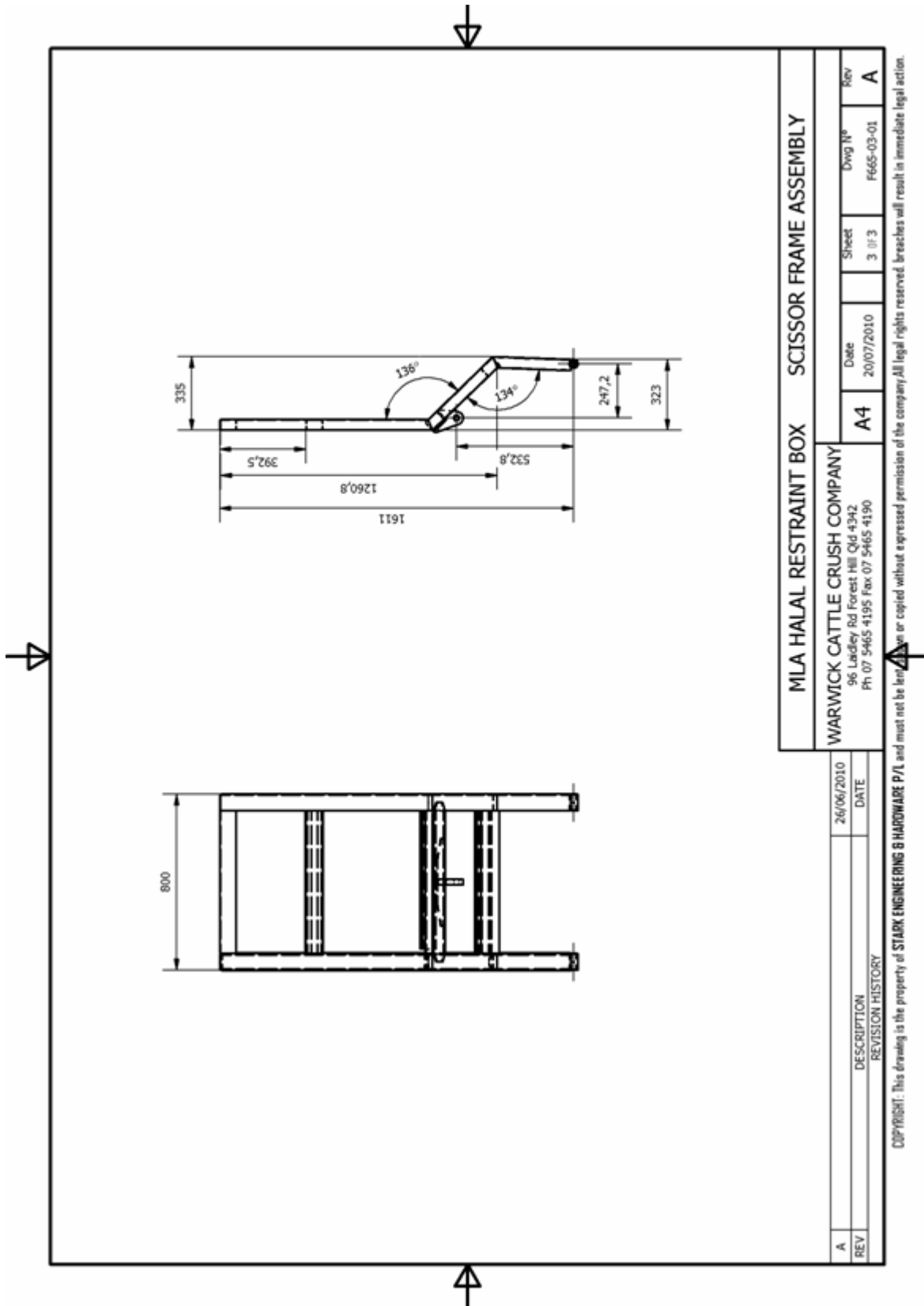


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REV	DESCRIPTION	DATE		96 Laidley Rd Forest Hill Qld 4342	A4	Date	20/07/2010	Sheet	1 of 3
	REVISION HISTORY			Ph 07 5465 4195 Fax 07 5465 4190				Dwg No	F665-03-01
									Rev
									A

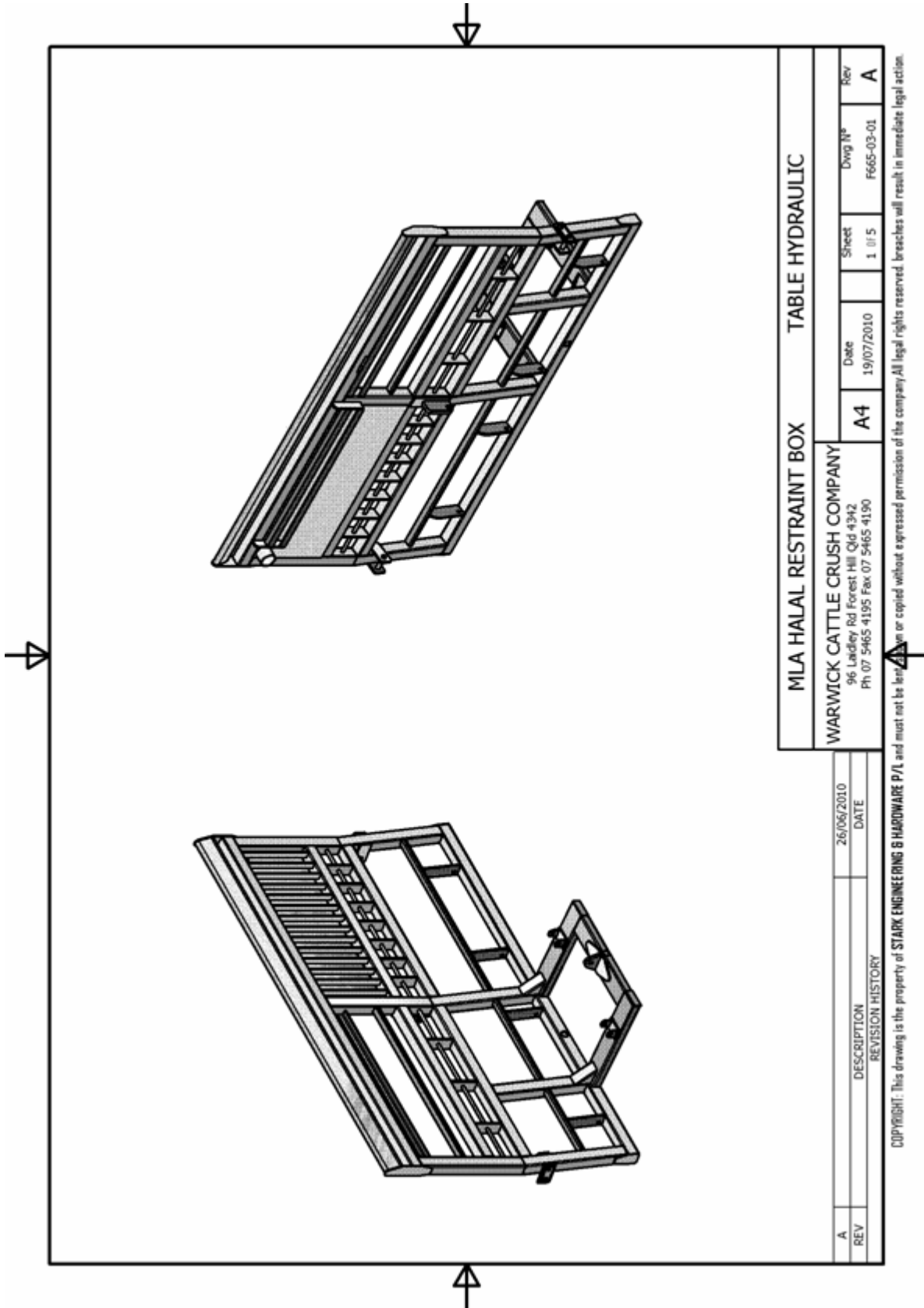
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Upgrade the Mark IV cattle restraining box

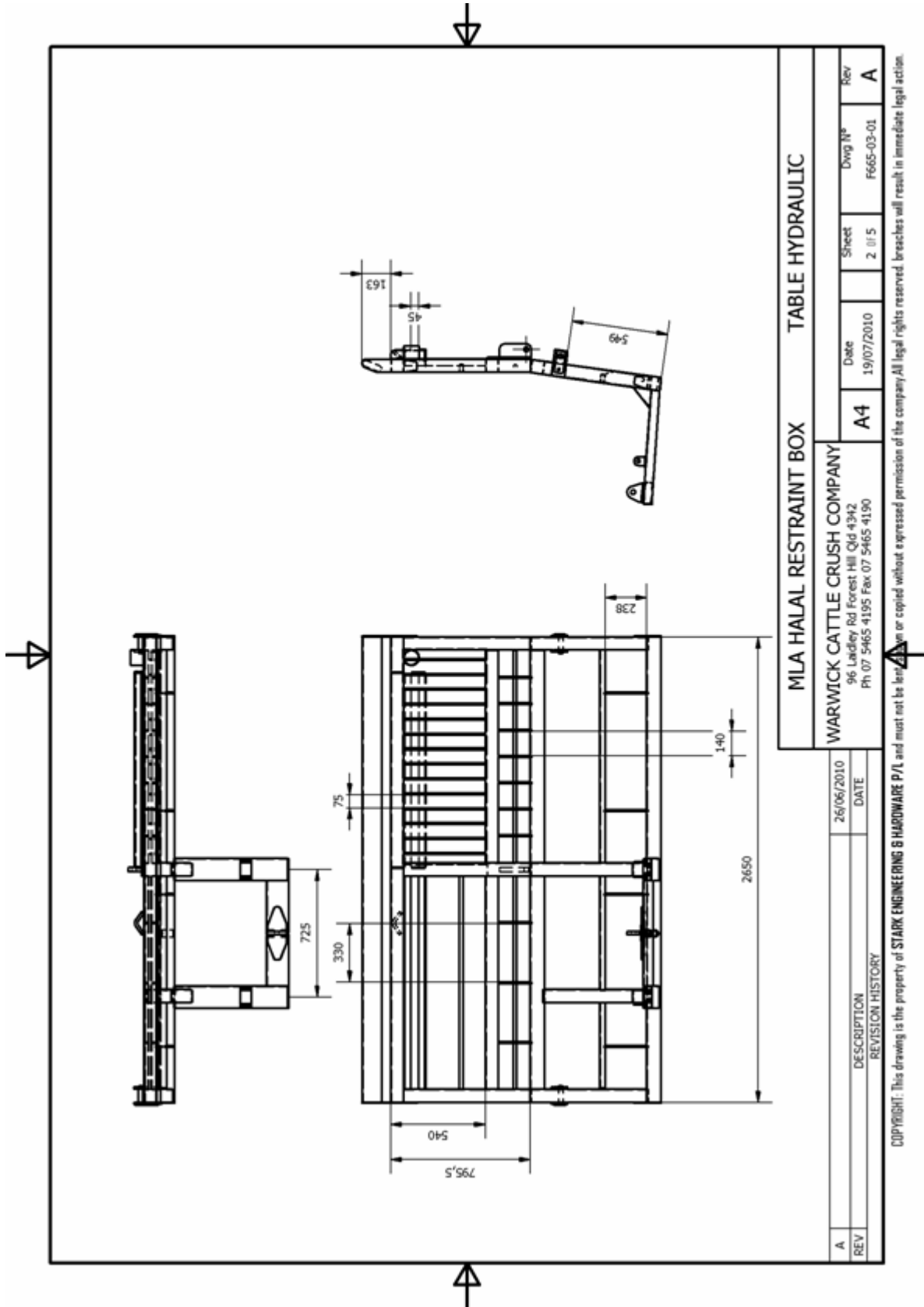


8.1.6 Hydraulic table drawings



A		26/06/2010		WARWICK CATTLE CRUSH COMPANY		TABLE HYDRAULIC		Rev	
REV	DESCRIPTION	DATE		A4	Date	Sheet	Dwg No	A	
	REVISION HISTORY				19/07/2010	1 OF 5	F665-03-01		

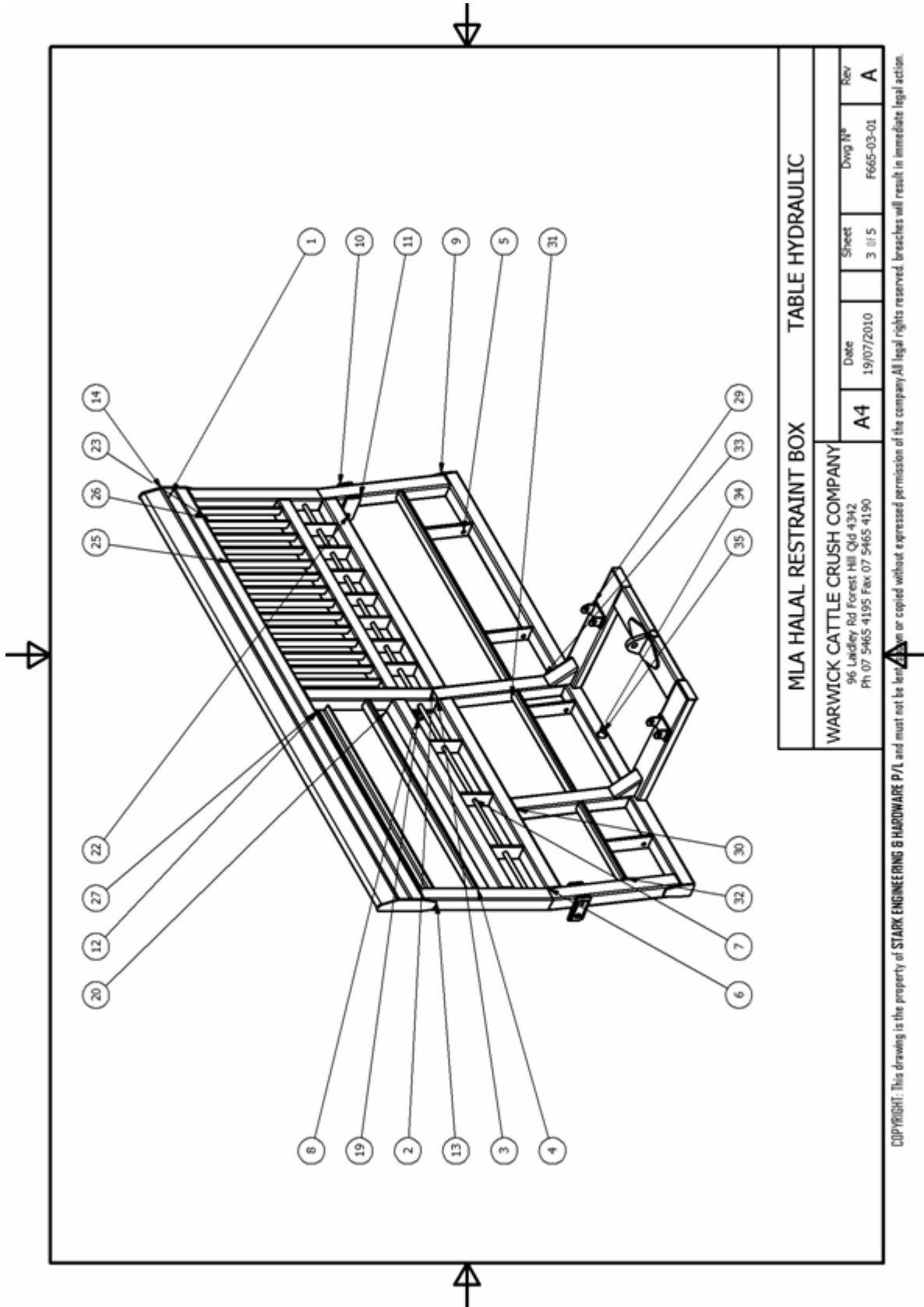
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A		26/06/2010	WARWICK CATTLE CRUSH COMPANY		Date	Sheet	Dwg No	Rev
REV	DESCRIPTION	DATE	96 Ludkley Rd Forest Hill Qld 4342		19/07/2010	2 of 5	F665-03-01	A
	REVISION HISTORY		Ph 07 5465 4195 Fax 07 5465 4190					

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Upgrade the Mark IV cattle restraining box



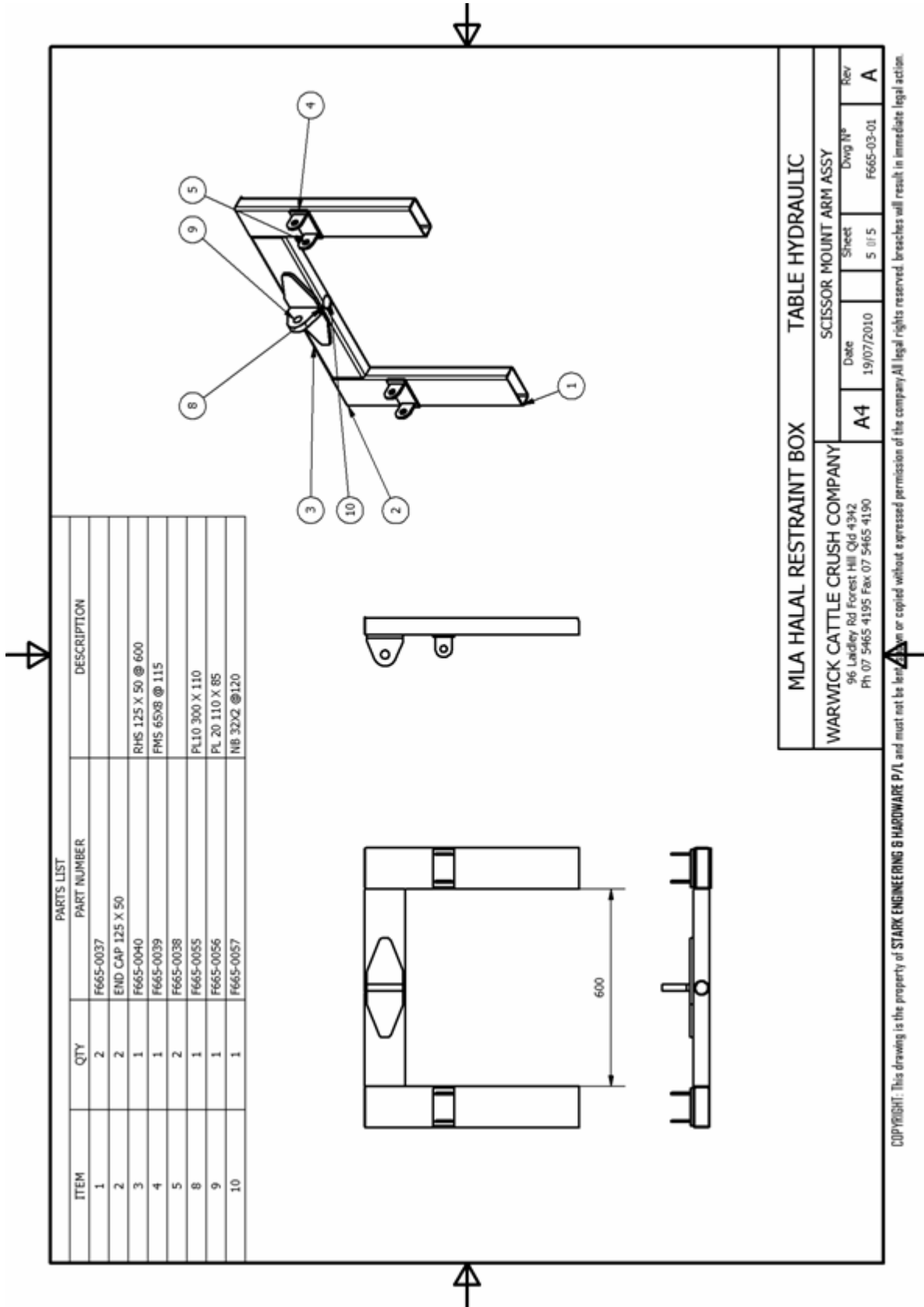
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WARWICK CATTLE CRUSH COMPANY 96 Ludkley Rd Forest Hill Qld 4342 Ph 07 5465 4195 Fax 07 5465 4190		Date 19/07/2010	Sheet 3 of 5
A4		Dwg No F665-03-01	Rev A

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ITEM		QTY	PARTS LIST	
			PART NUMBER	DESCRIPTION
1		1	F665-0031	SHS 75X3 @ 2650
2		3	F664-0053	SHS 75X3 @ 725 /4° OE
3		3	F664-0054	SHS 75X3 @ 675 /4° OE
4		2	F665-0033	RHS 50X25X3 @ 1212
5		4	F644-0050	FMS 75X10 @ 245
6		4	F665-0032	SHS 75X3 @ 1362
7		10	F664-0049	FMS 75X10 @ 190 /4° OE
8		2	F665-0035	BRIGHT 19 @ 1212
9		2	F664-0023	FMS 75X5 @ 150
10		2	F644-0051	FMS 75X10 @ 125
11		2	F664-0093	FMS 50X10 @ 125
12		2	F665-0034	EA 40X6 @ 1212
13		2	F665-0001	FMS 75X5 @ 150
14		1	F665-002	CATTLE RAIL 115 @ 2650
16		1	TIE HOOK 16	
17		1	F665-0020	
18		1	F665-0021	
19		1	F664-0045	PL25 @ 75X180
20		1	F664-0086	
21		1	F665-0022	
22		2	F664-03-01 HINGE PIN	
23		1	F665-0045	SH 2mm GALV 1227 X 480
25		14	F665-0049	FMS 40X10 @465
26		1	F665-0050	
27		2	F665-0048	FMS 50 X 10 @ 196
28		2	F665-0047	
29		1	F665-01-02 SCISSOR MOUNT ARM HYD	
30		1	F665-0051	SHS 75 X 3 @ 595
31		1	F665-0052	RHS 50X25X3 @ 650
32		1	F665-0053	RHS 50X25X3 @ 487
33		2	F665-0054	SHS 75X3 @155 /47° BE
34		1	F665-0058	SHS 75X3 @ 2650
35		1	F665-0059	NB 32X2 @71

MLA HALAL RESTRAINT BOX		TABLE HYDRAULIC	
WARWICK CATTLE CRUSH COMPANY			
96 Ladbroke Rd Forest Hill Qld 4342			
Ph 07 5465 4195 Fax 07 5465 4190			
REV	DESCRIPTION	DATE	26/06/2010
A			
A4	Date	19/07/2010	Rev
Sheet	4 of 5	Dwg No	F665-03-01
A			

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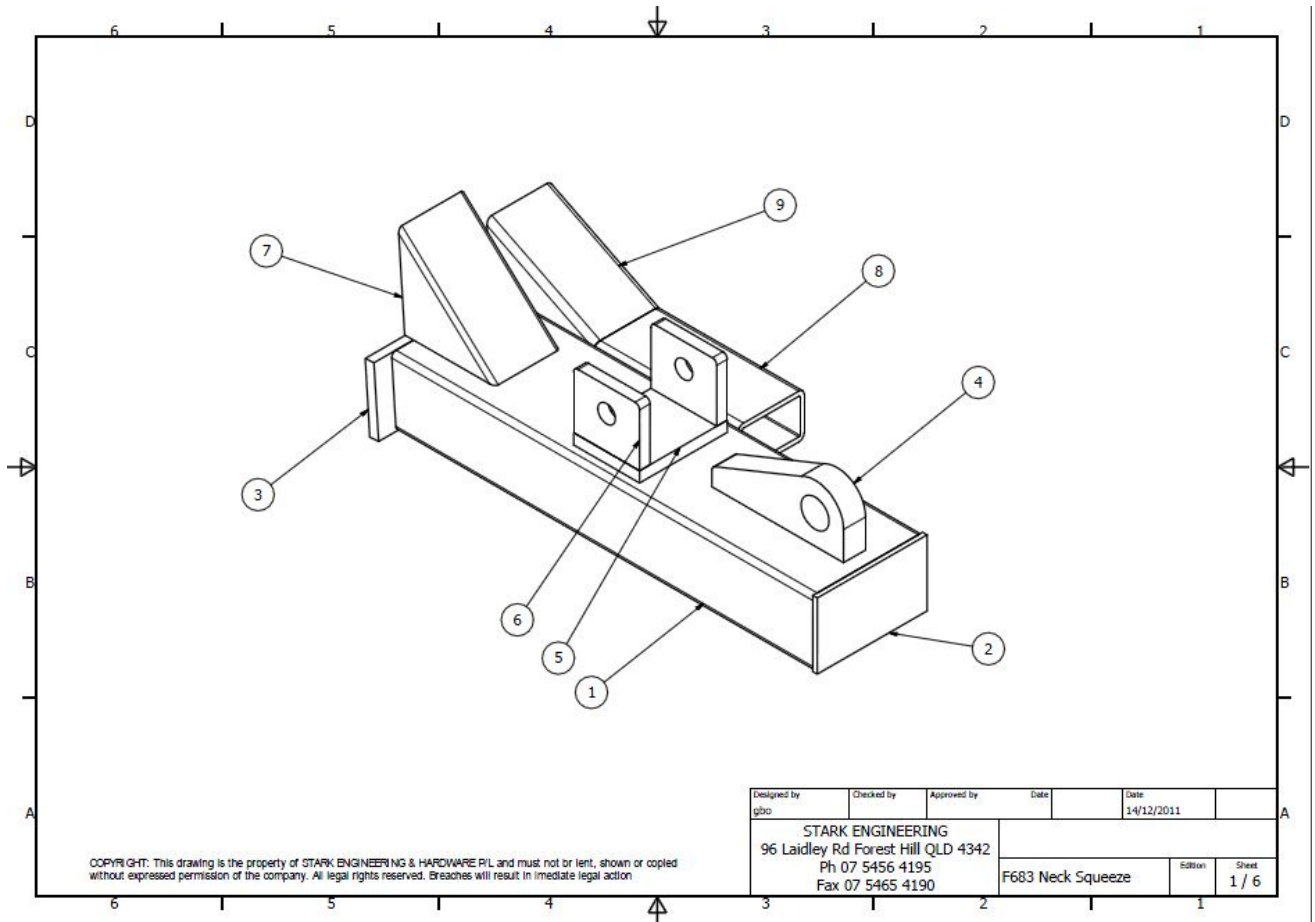
PARTS LIST		
ITEM	QTY	DESCRIPTION
1	2	F665-0037
2	2	END CAP 125 X 50
3	1	F665-0040
4	1	F665-0039
5	2	F665-0038
8	1	F665-0055
9	1	F665-0056
10	1	F665-0057

MLA HALAL RESTRAINT BOX		SCISSOR MOUNT ARM ASSY	
WARWICK CATTLE CRUSH COMPANY		Date	Rev
96 Ludkley Rd Forest Hill Qld 4342		19/07/2010	5 of 5
Ph 07 5465 4195 Fax 07 5465 4190		Dwg No	F665-03-01
		A	

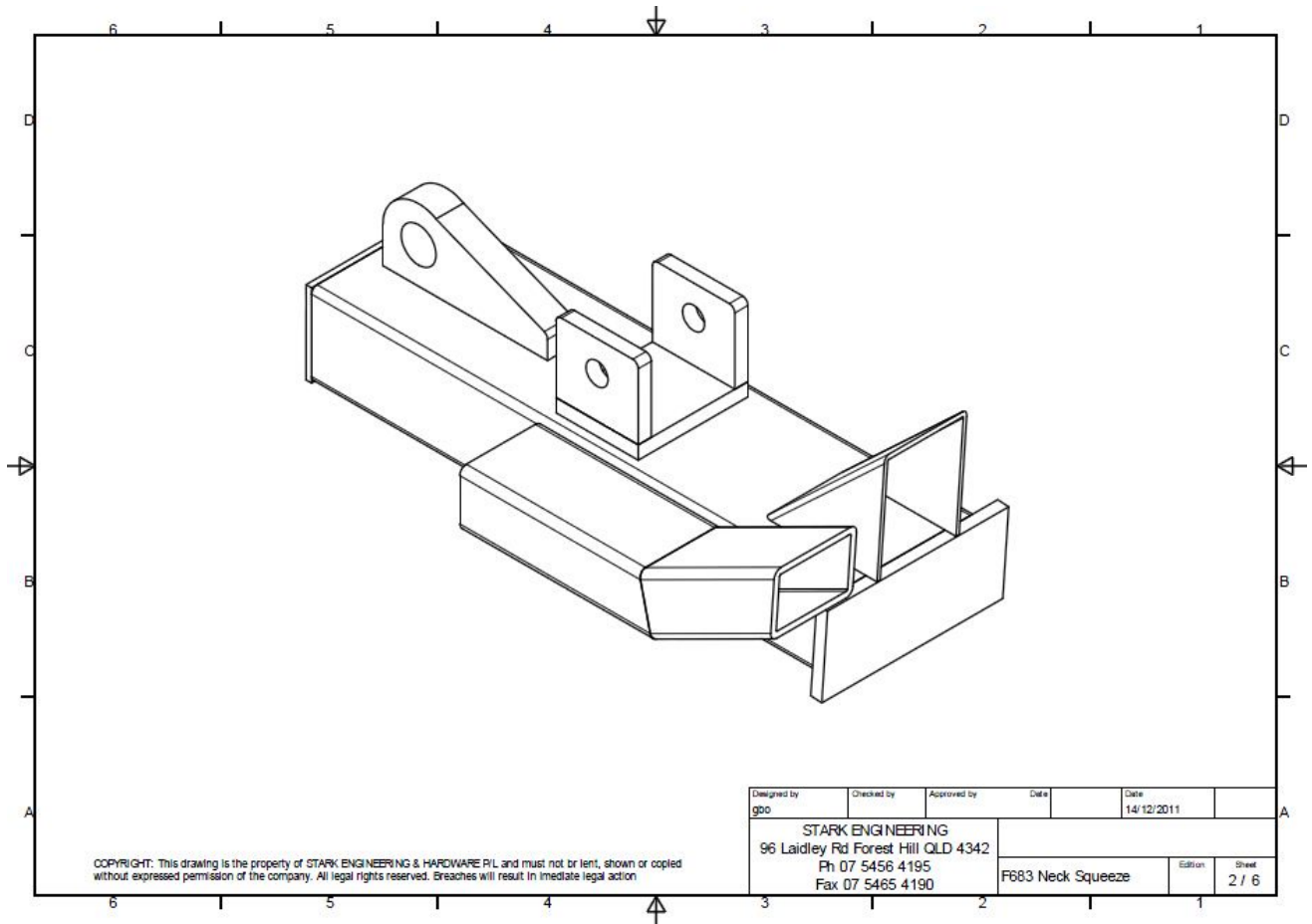
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8.1.7 Modifications to scissor frame and neck restraint bar – drawings

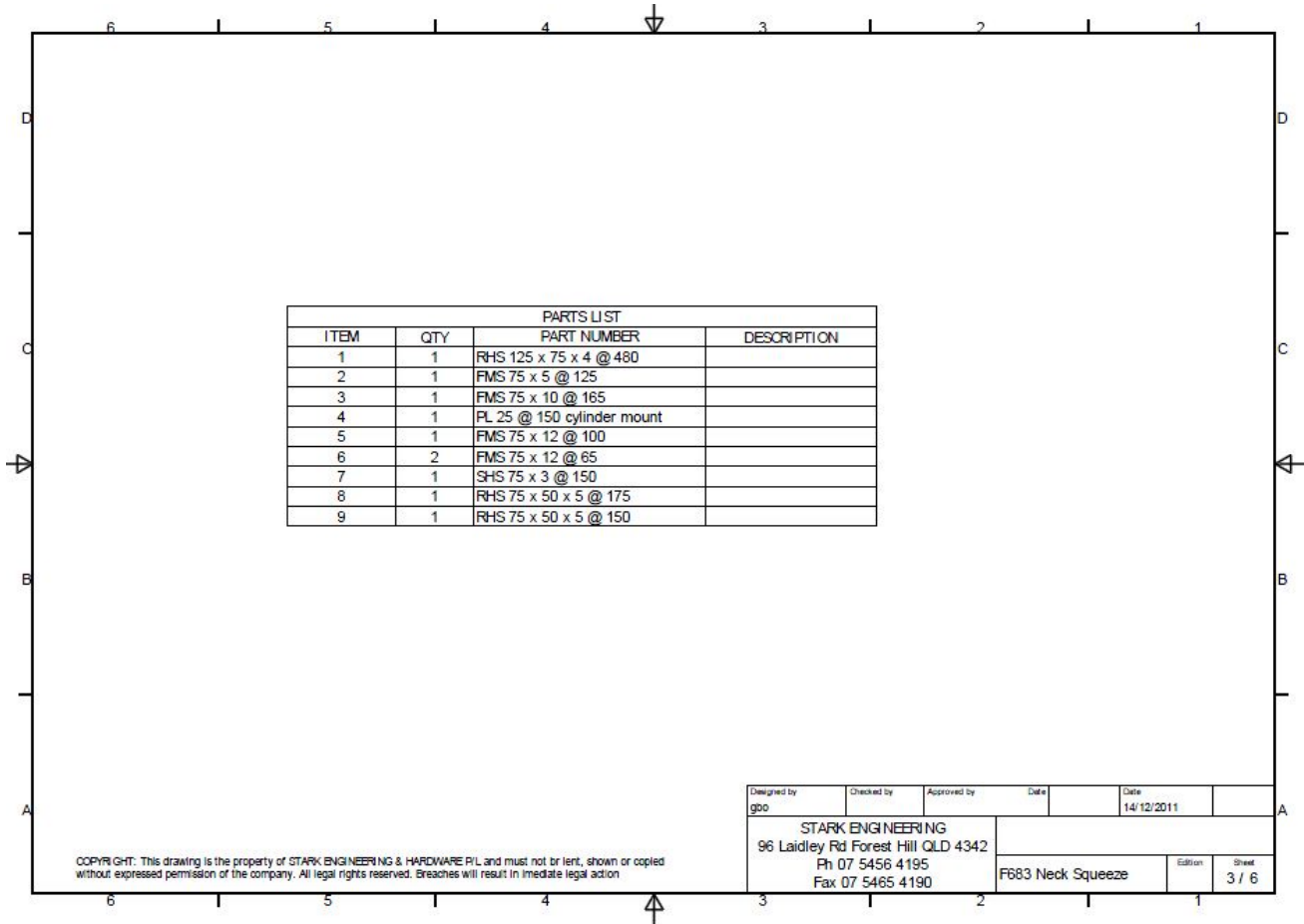
Upgrade the Mark IV cattle restraining box



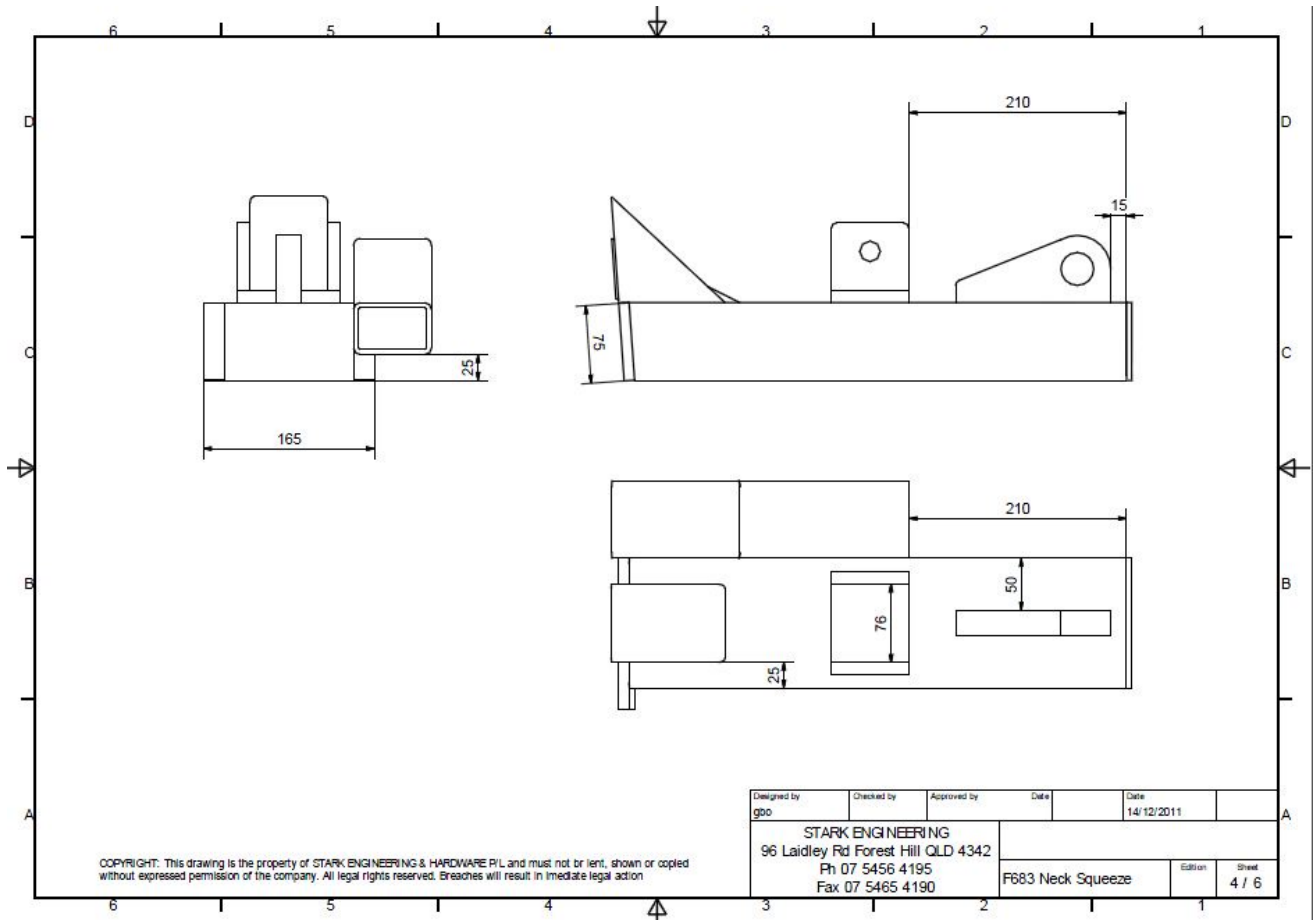
Upgrade the Mark IV cattle restraining box



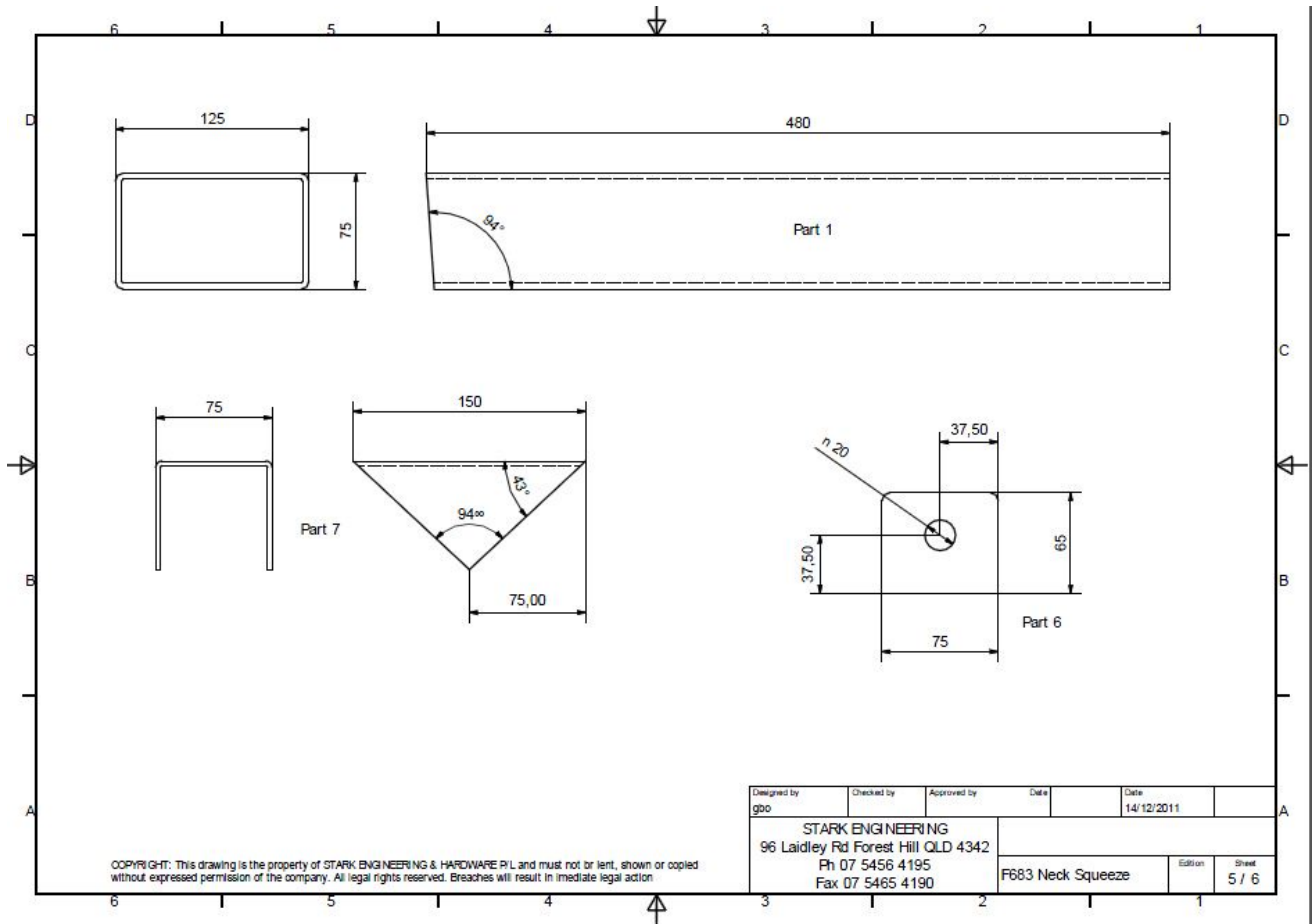
Upgrade the Mark IV cattle restraining box



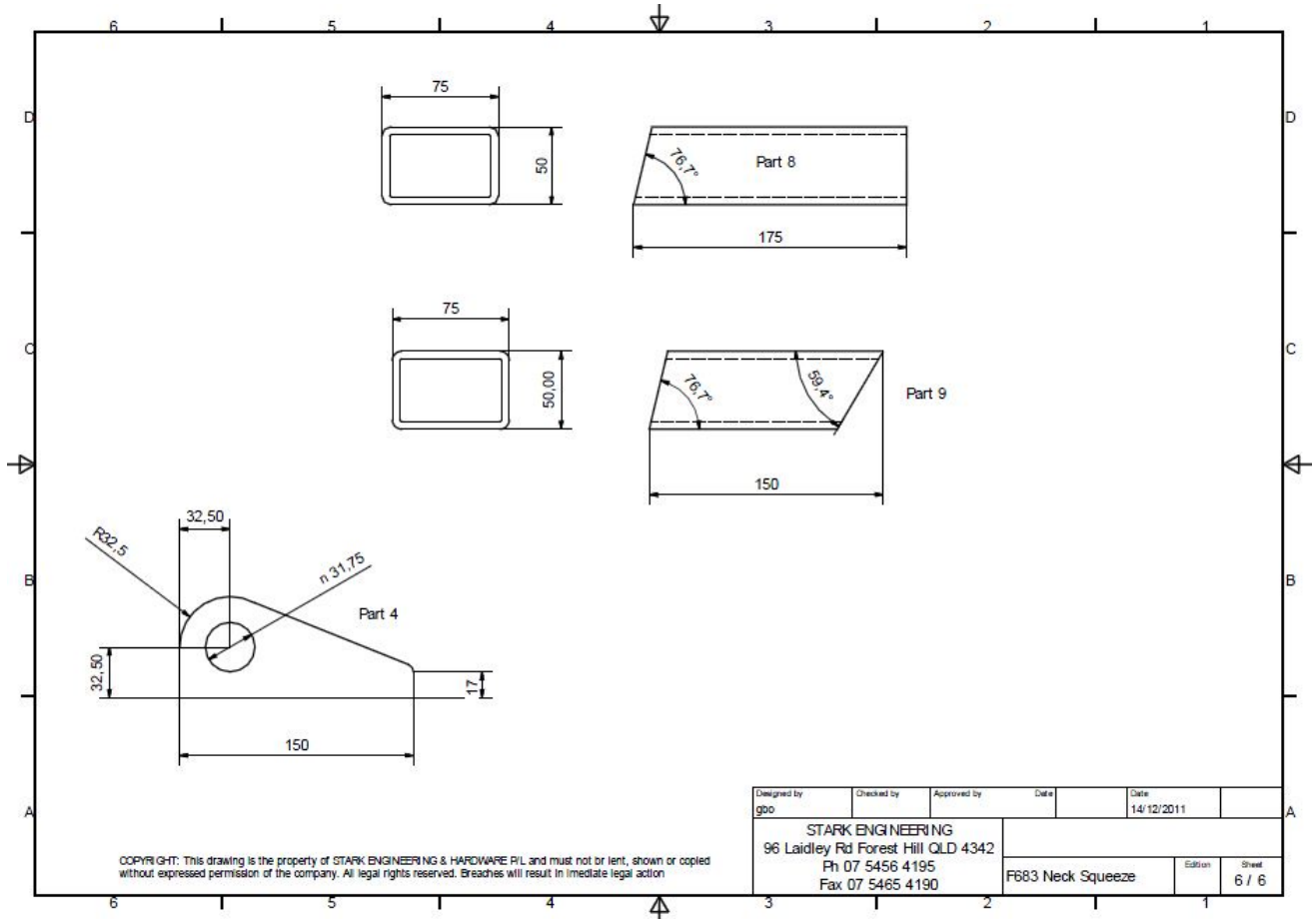
Upgrade the Mark IV cattle restraining box



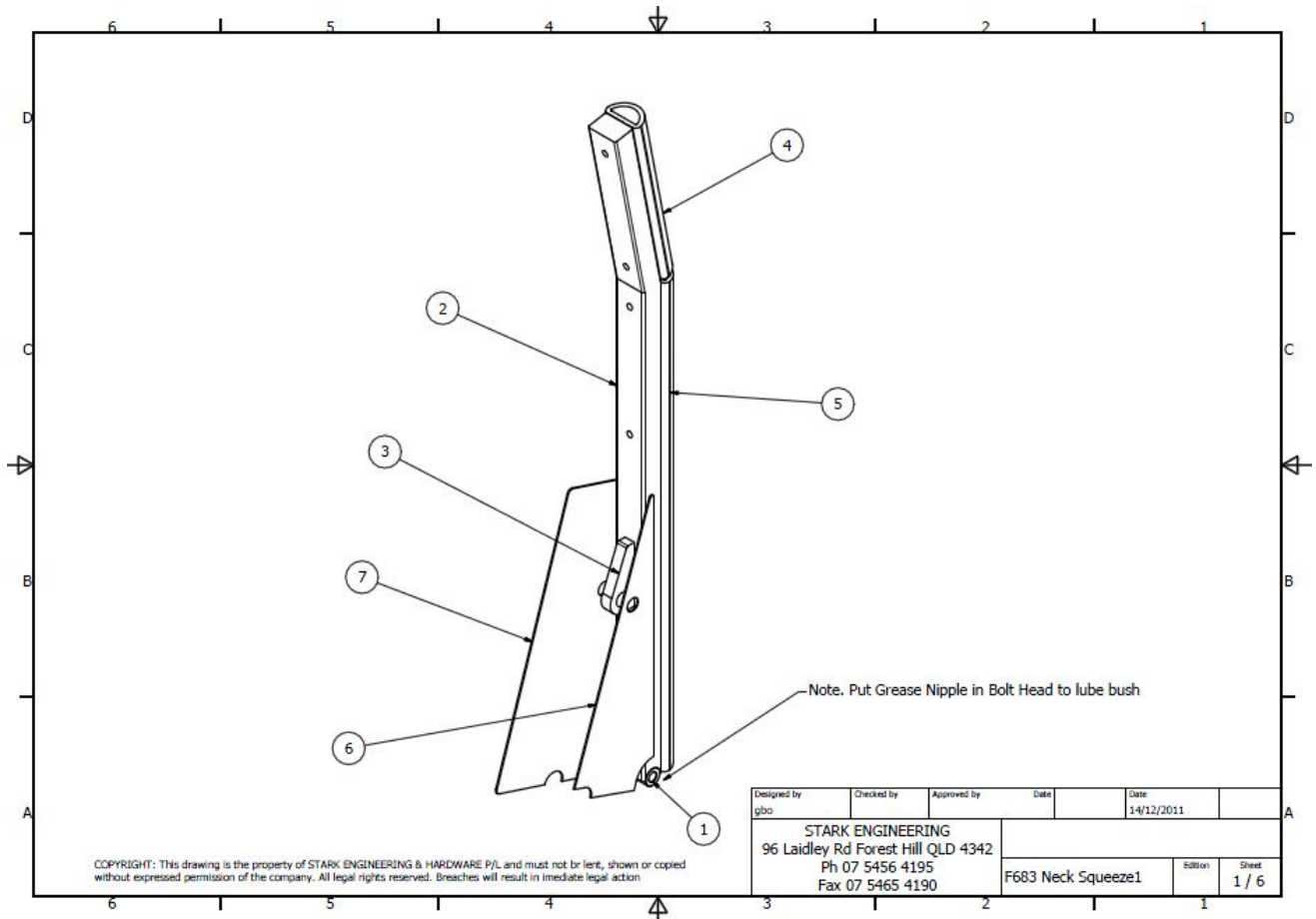
Upgrade the Mark IV cattle restraining box



Upgrade the Mark IV cattle restraining box



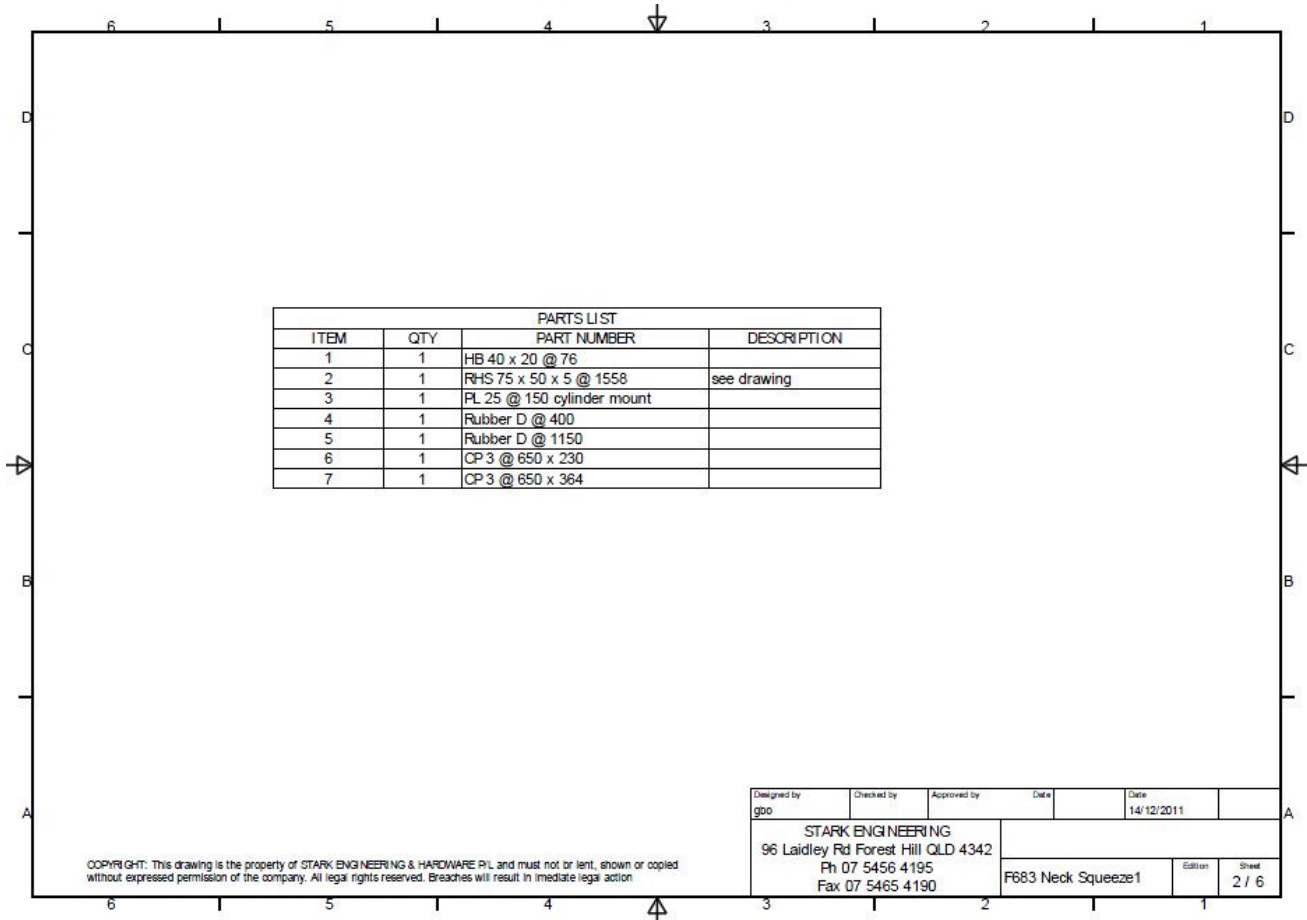
Upgrade the Mark IV cattle restraining box



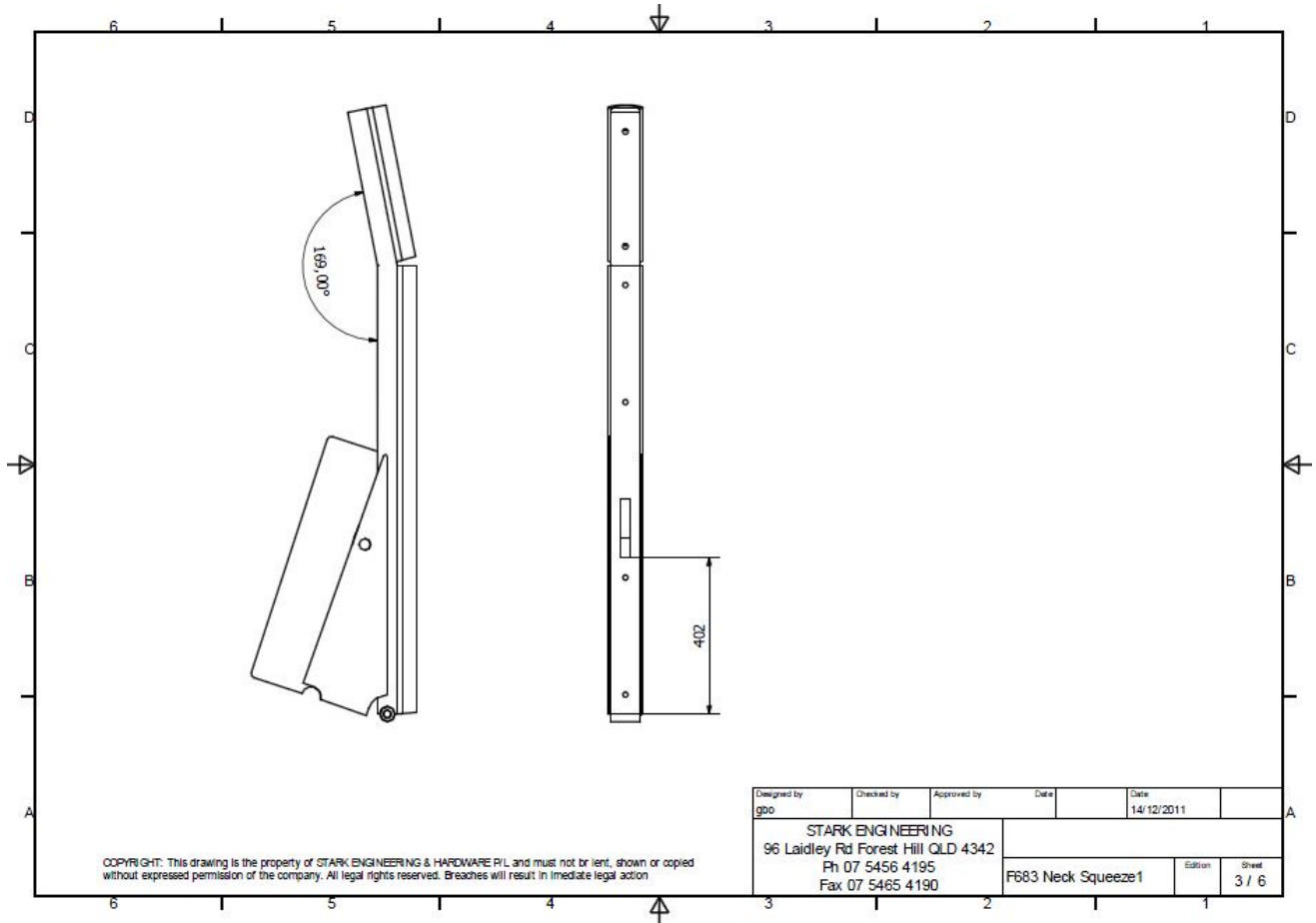
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Designed by g/bc	Checked by	Approved by	Date	Date 14/12/2011
STARK ENGINEERING 96 Laidley Rd Forest Hill QLD 4342 Ph 07 5456 4195 Fax 07 5465 4190			F683 Neck Squeeze1	Sheet 1 / 6

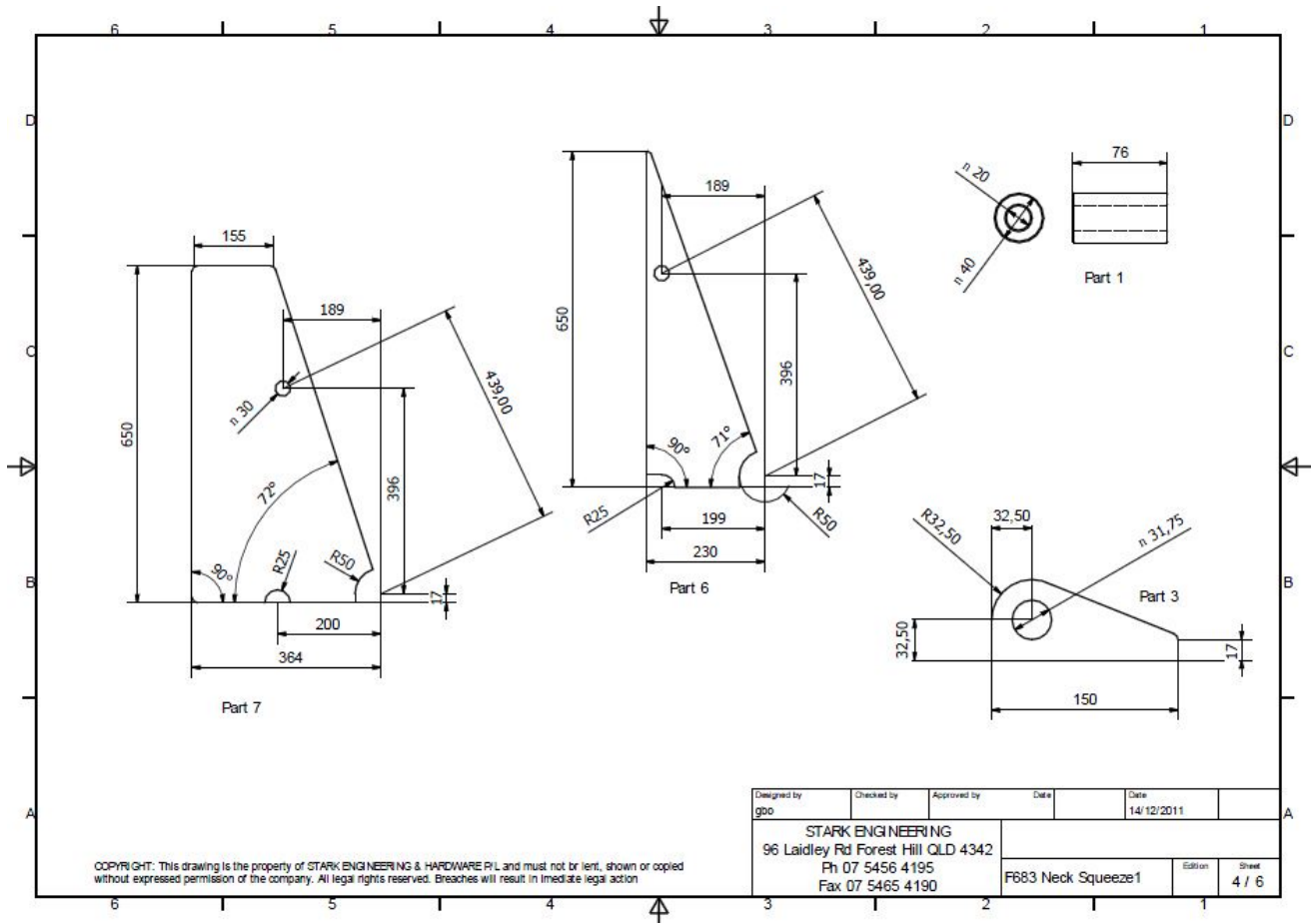
Upgrade the Mark IV cattle restraining box



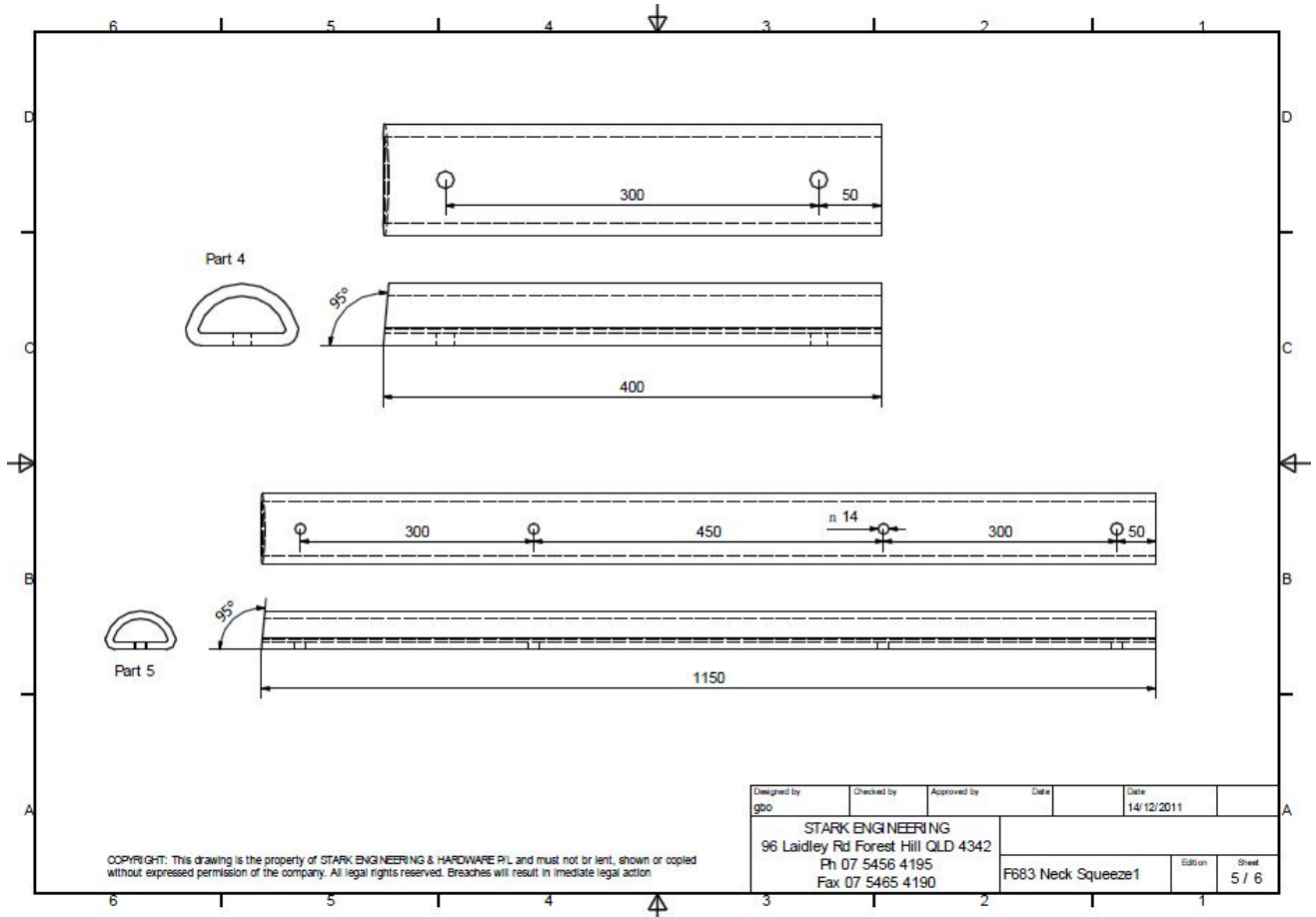
Upgrade the Mark IV cattle restraining box



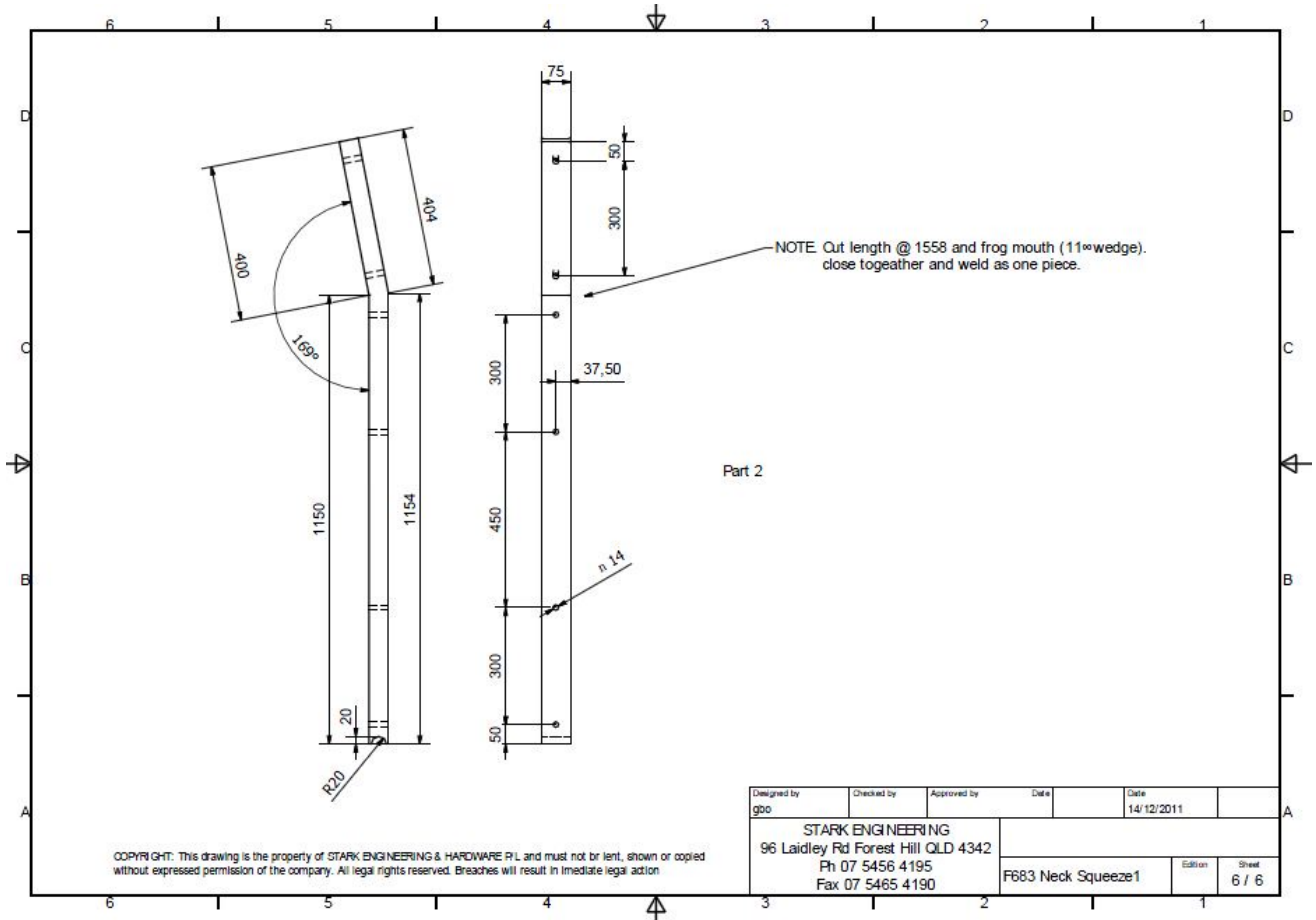
Upgrade the Mark IV cattle restraining box



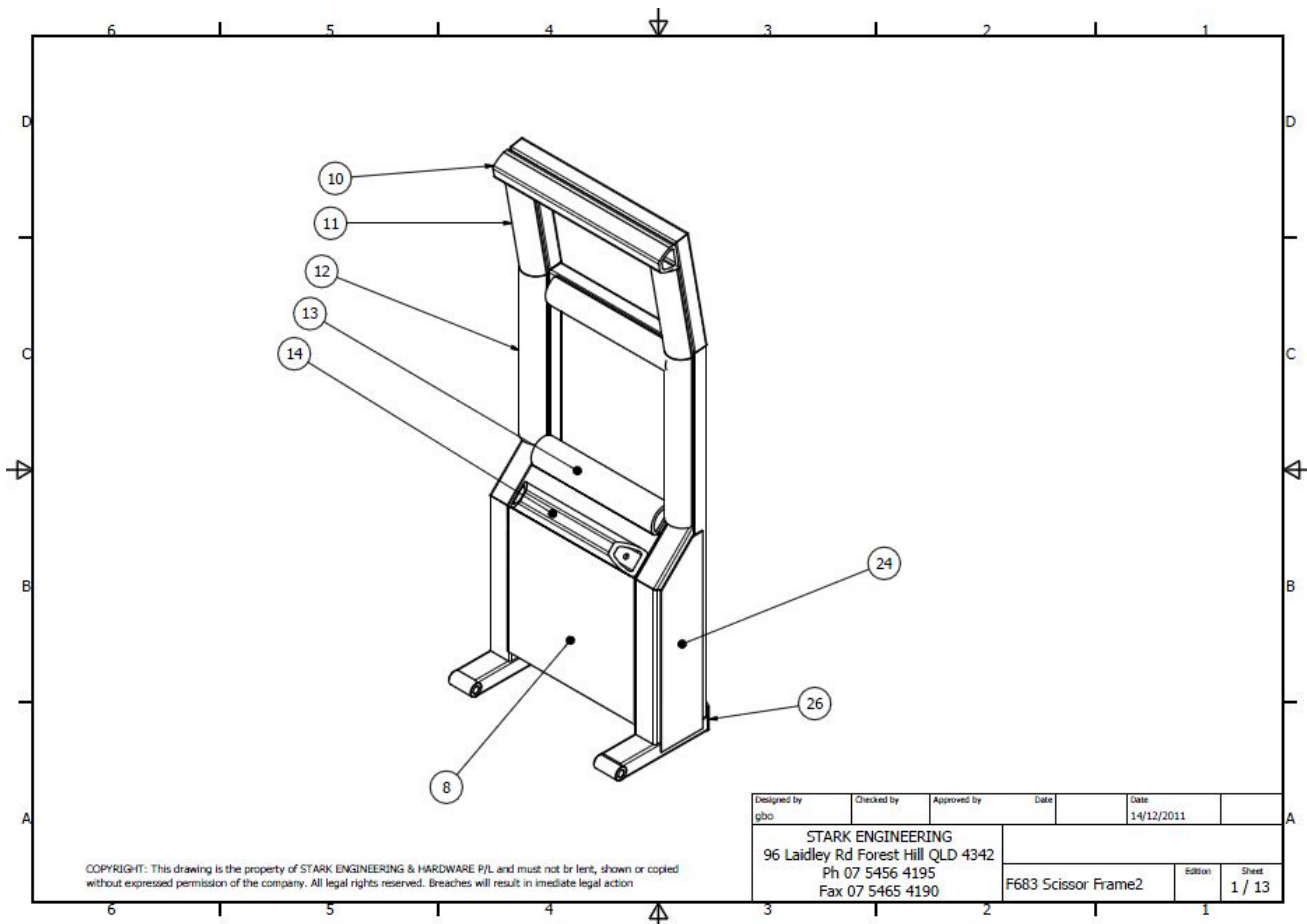
Upgrade the Mark IV cattle restraining box



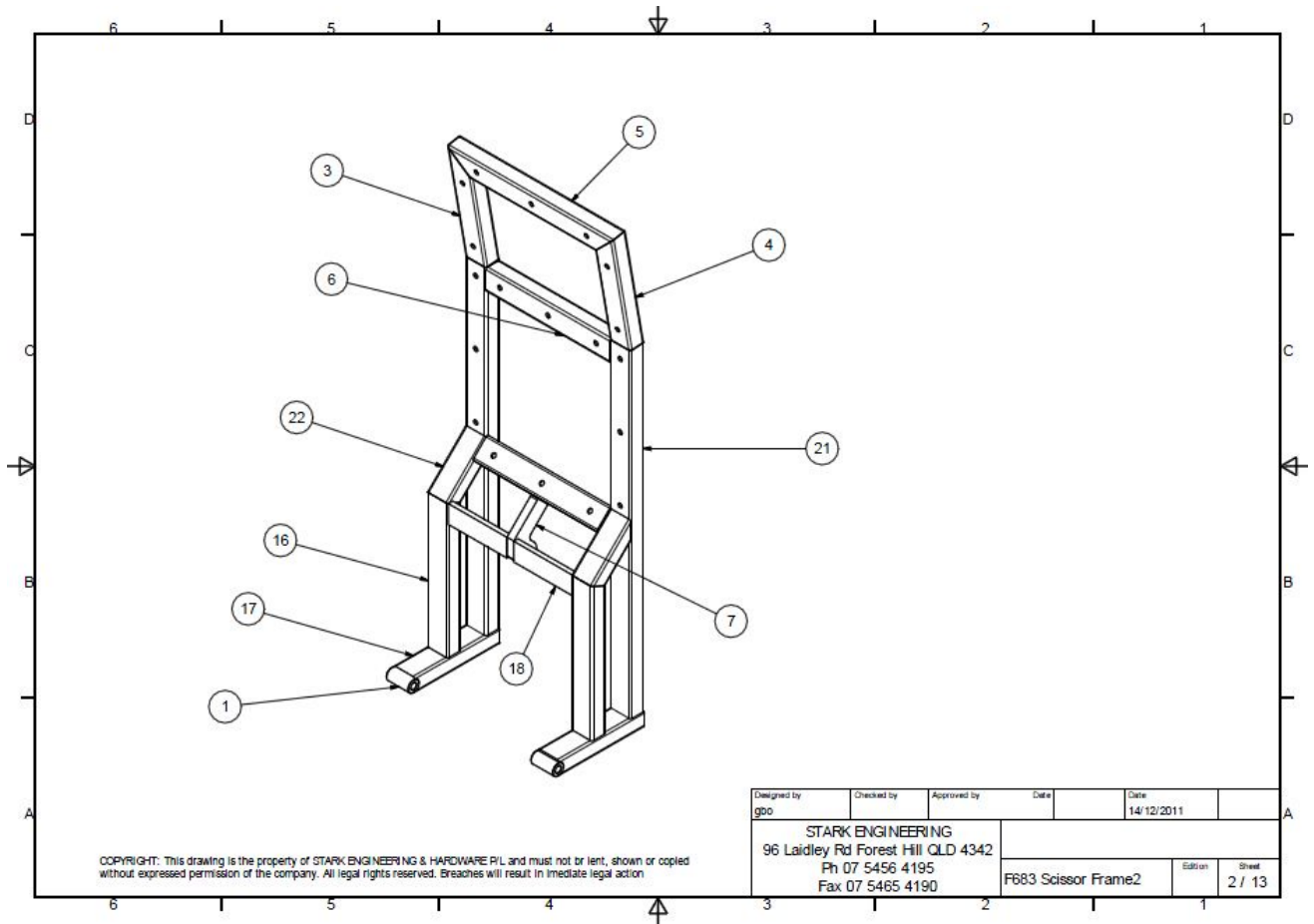
Upgrade the Mark IV cattle restraining box



Upgrade the Mark IV cattle restraining box



Upgrade the Mark IV cattle restraining box



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Designed by gbc	Checked by	Approved by	Date	Date	14/12/2011
STARK ENGINEERING 96 Laidley Rd Forest Hill QLD 4342 Ph 07 5456 4195 Fax 07 5465 4190			F683 Scissor Frame2		Sheet 2 / 13

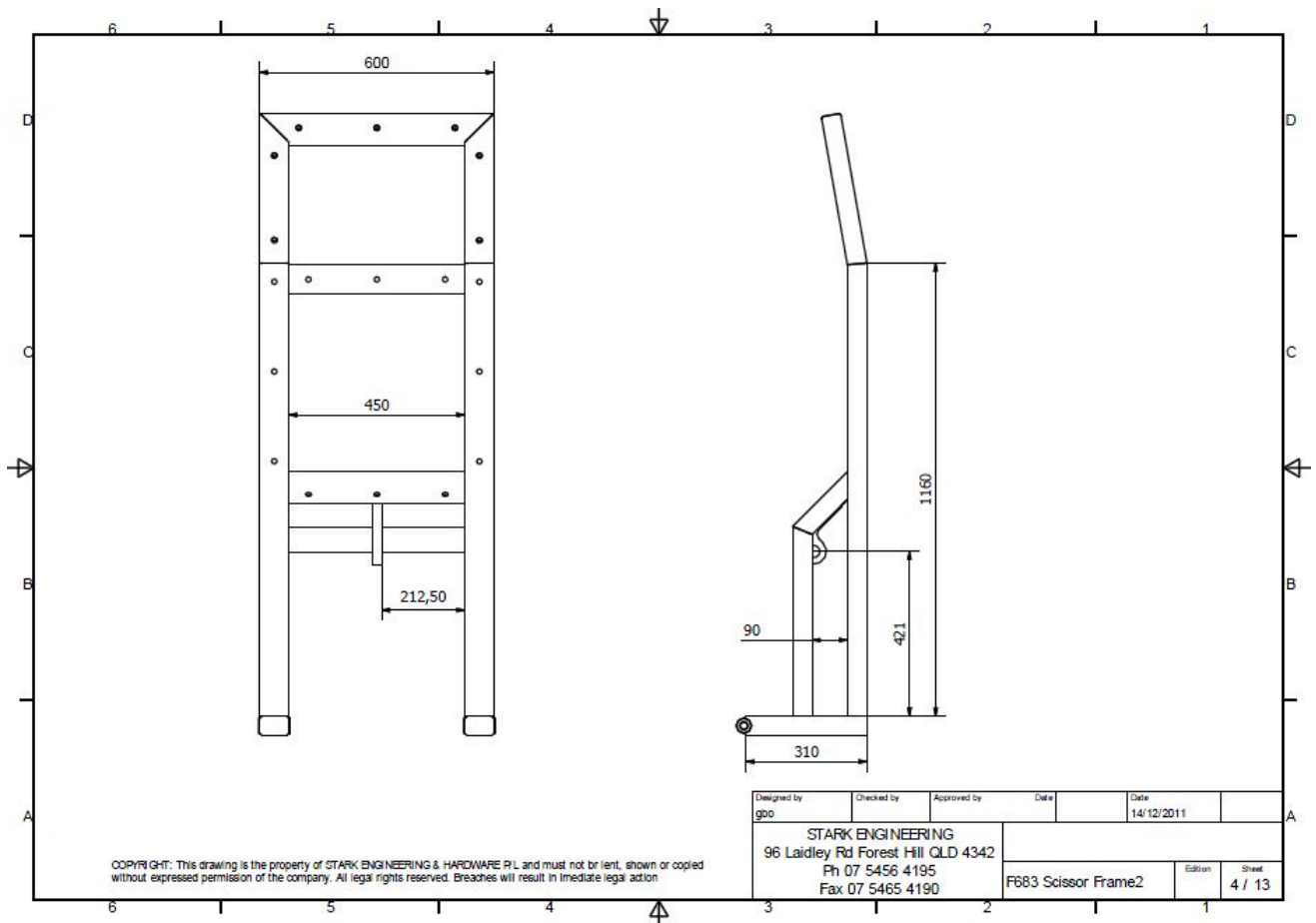
Upgrade the Mark IV cattle restraining box

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	HB 40 x 20 @ 80	
3	1	RHS 75 x 50 x 5 @ 389.4	
4	1	RHS 75 x 50 x 5 @ 389.4A	
5	1	RHS 75 x 50 x 5 @ 600	
6	2	RHS 75 x 50 x 5 @ 450	
7	1	PL 25 @ 250	
8	1	CP 3 @ 460 x 600	
10	1	Rubber A @ 600	
11	2	Rubber D @ 310	
12	2	Rubber D @ 530	
13	2	Rubber D @ 435	
14	1	Rubber A @ 450	
16	2	RHS 75 x 50 x 485	
17	2	RHS 75 x 50 x 5 @ 310	
18	2	FMS 65 x 16 @ 212.5	
21	2	RHS 75 x 50 x 5 @ 1160	
22	2	RHS 75 x 50 x 5 @ 198	
24	2	CP 3 @ 618 x 150	
25	1	PL 2 @ 560 x 618	
26	2	PL 5 @ 100 x 75	

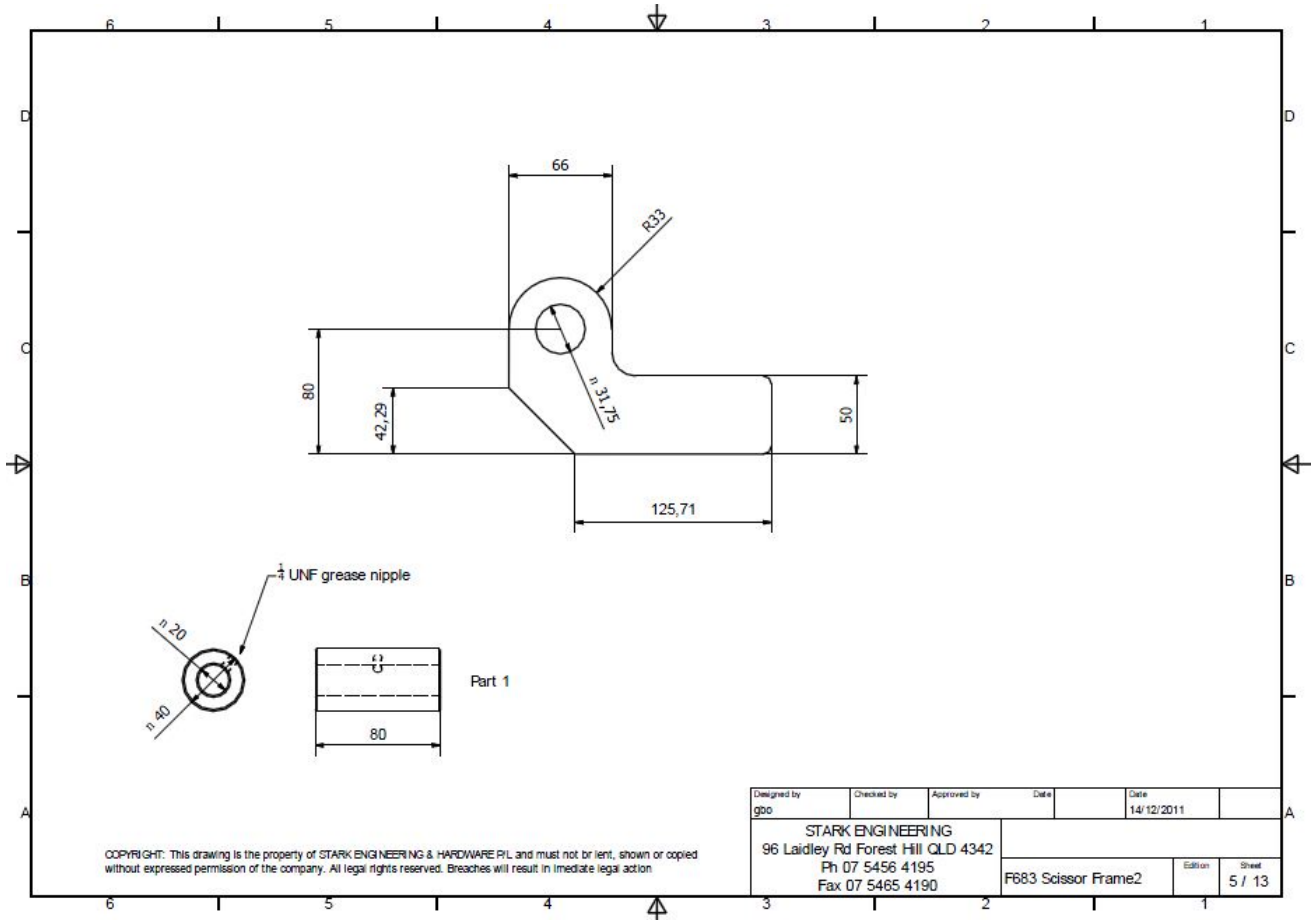
Designed by goo	Checked by	Approved by	Date	Date 14/12/2011	
STARK ENGINEERING 96 Laidley Rd Forest Hill QLD 4342 Ph 07 5466 4195 Fax 07 5465 4190			F683 Scissor Frame2		Edition Sheet 3 / 13

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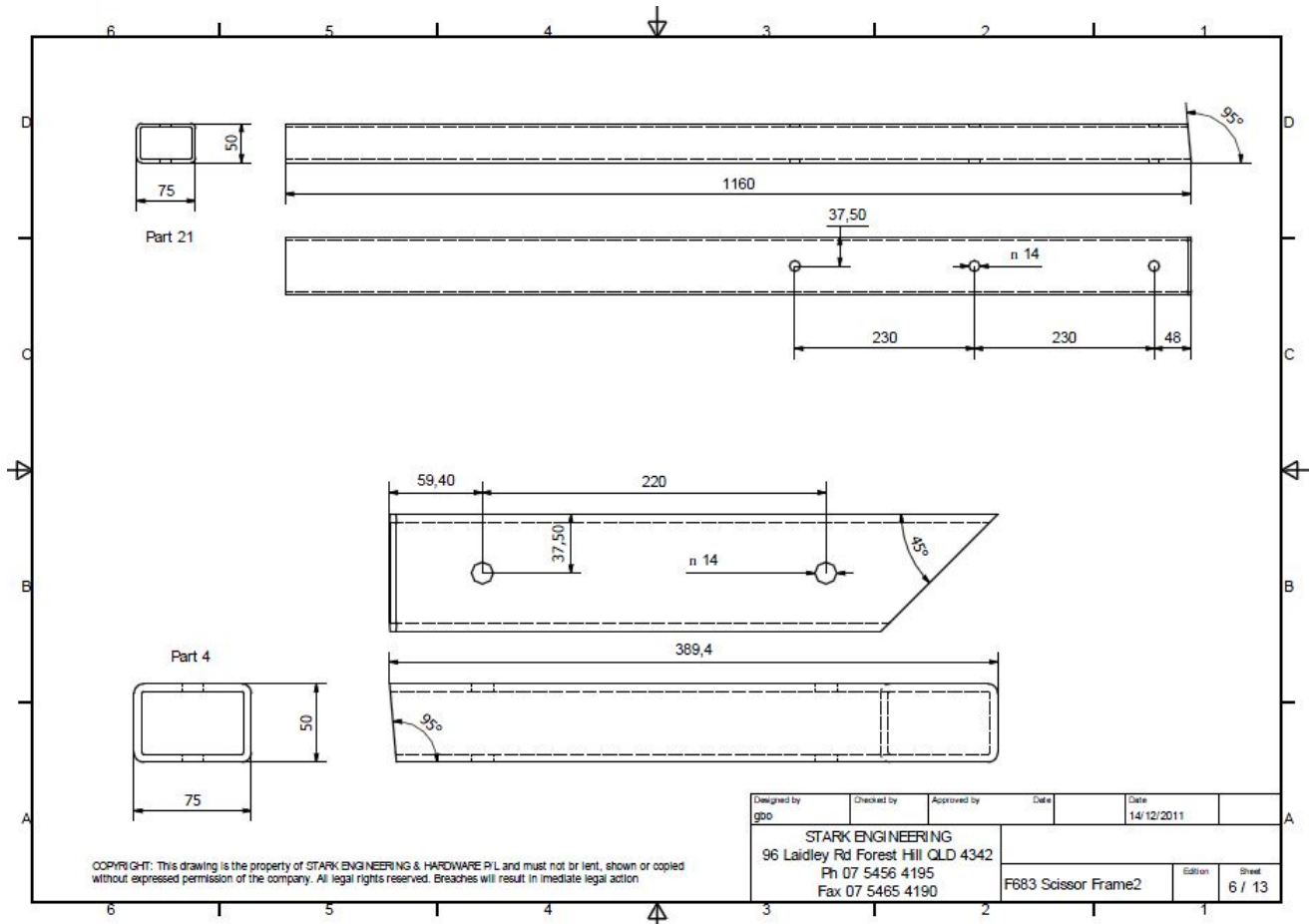
Upgrade the Mark IV cattle restraining box



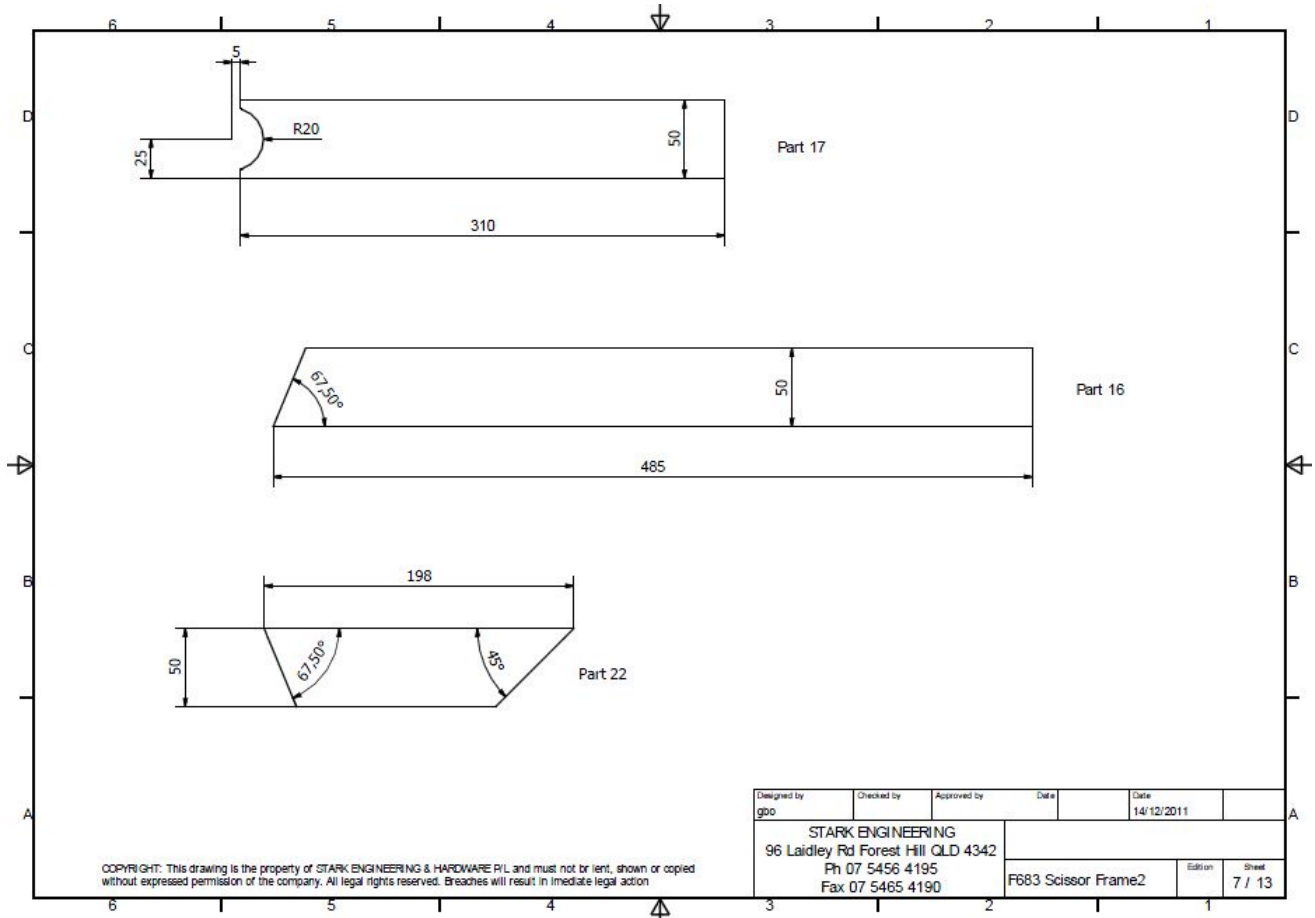
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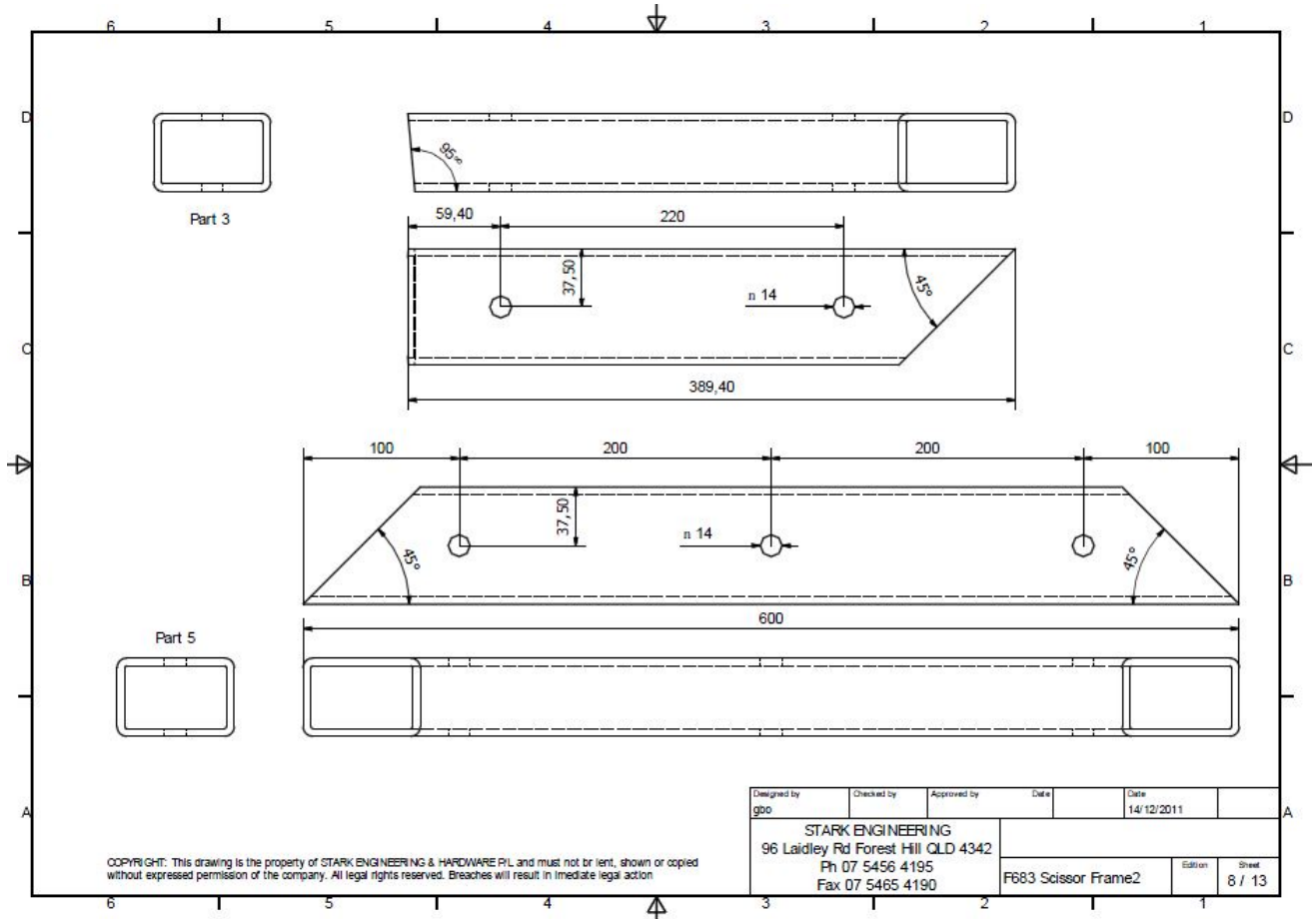
Upgrade the Mark IV cattle restraining box



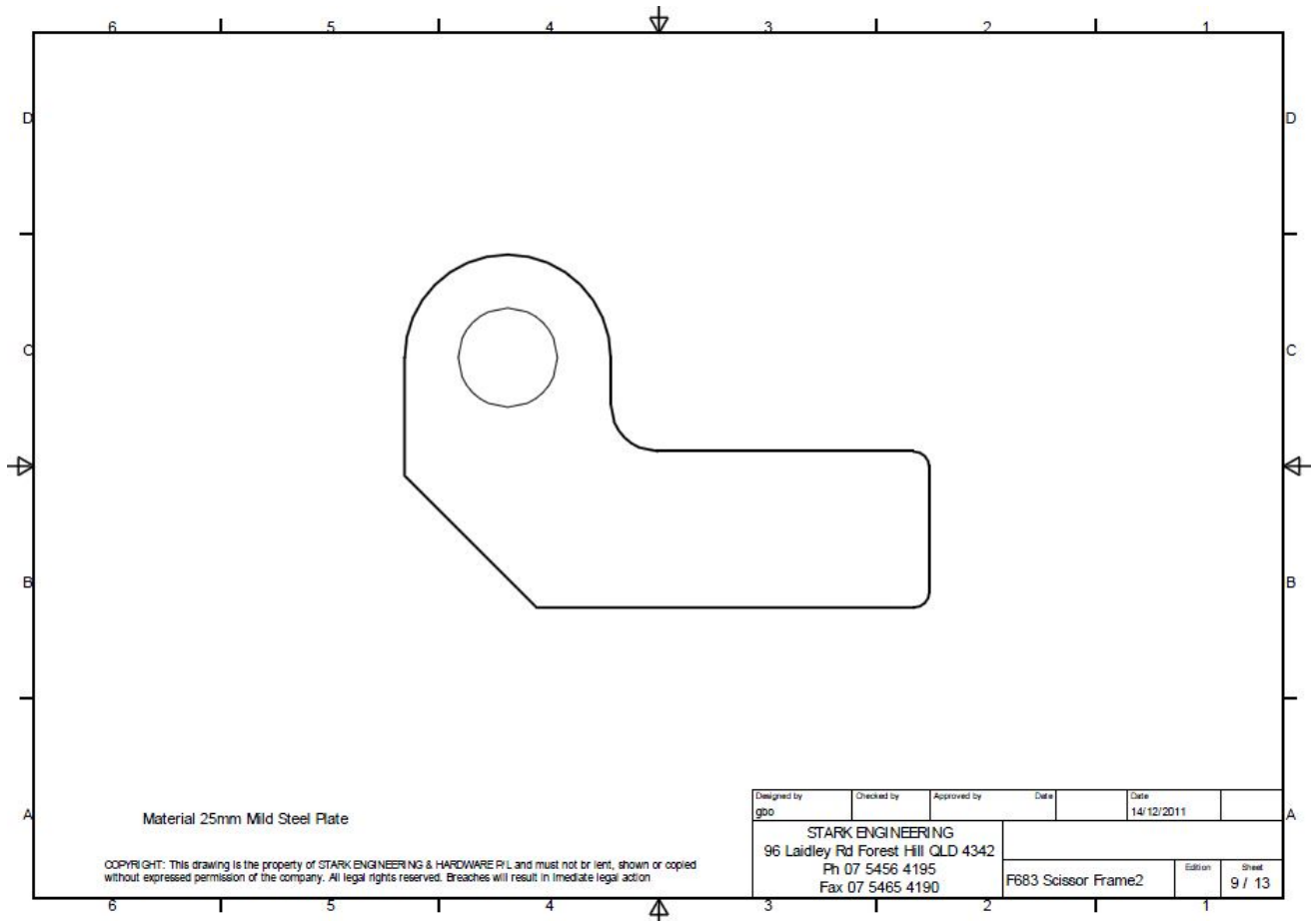
Upgrade the Mark IV cattle restraining box



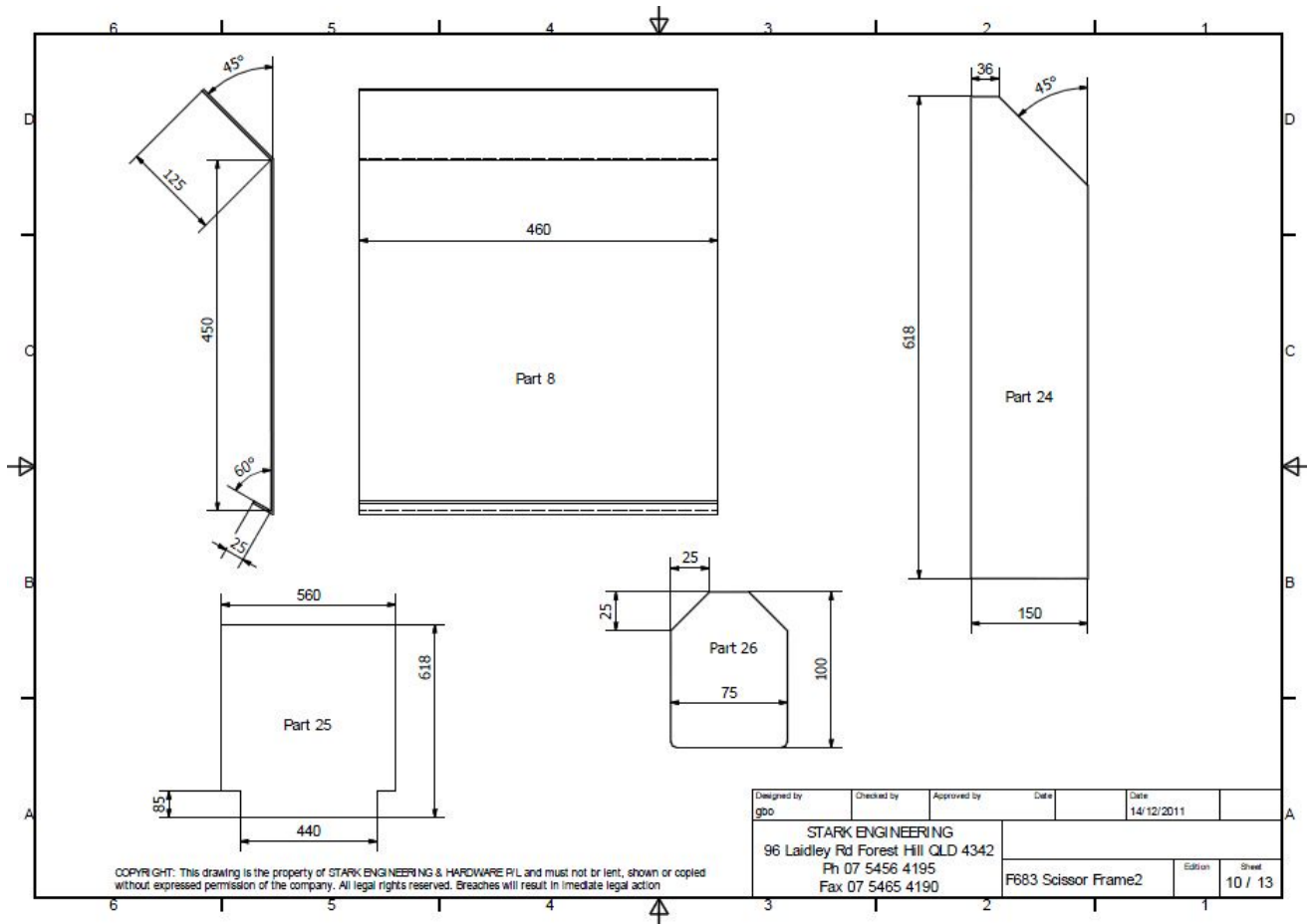
Upgrade the Mark IV cattle restraining box



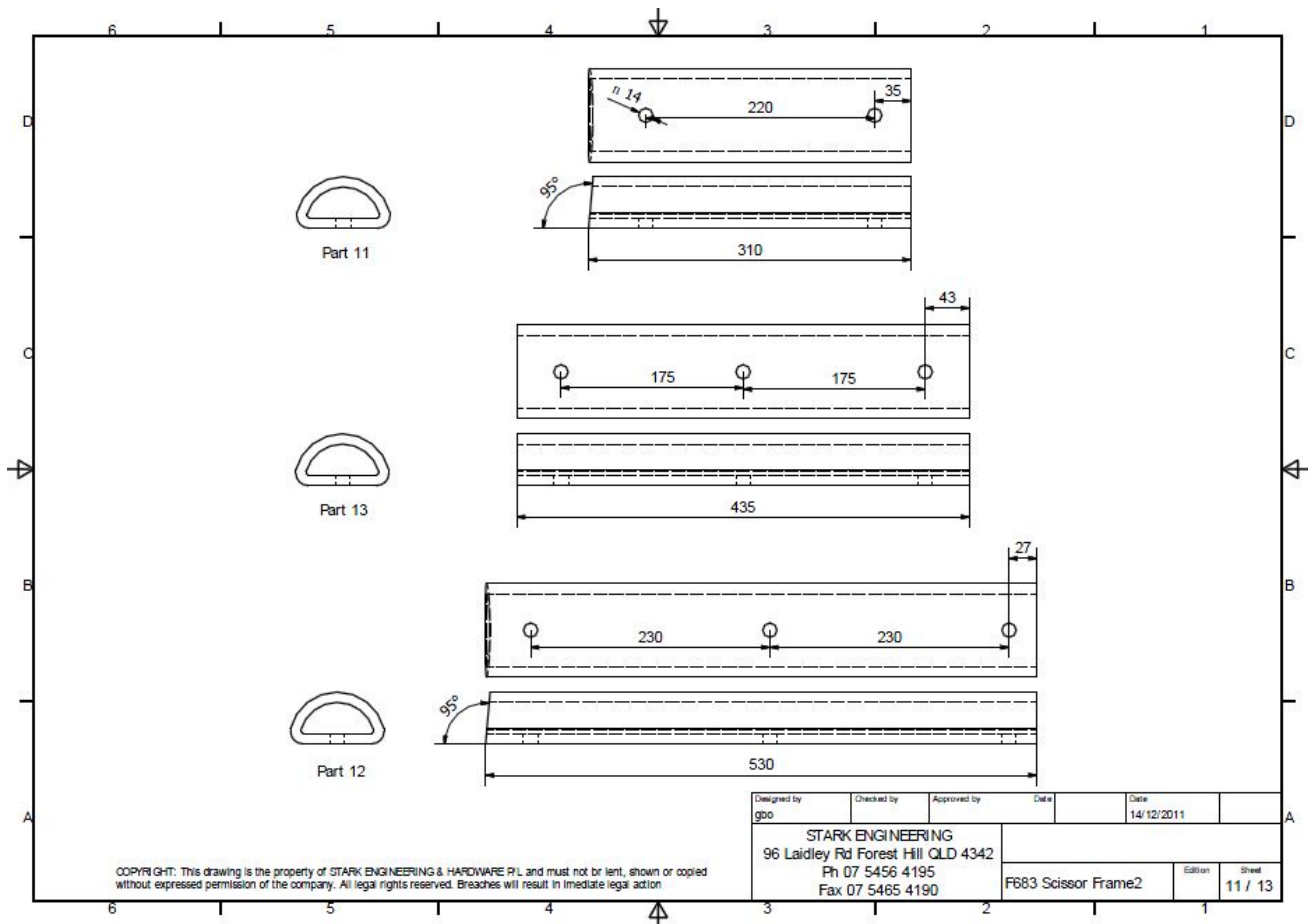
Upgrade the Mark IV cattle restraining box



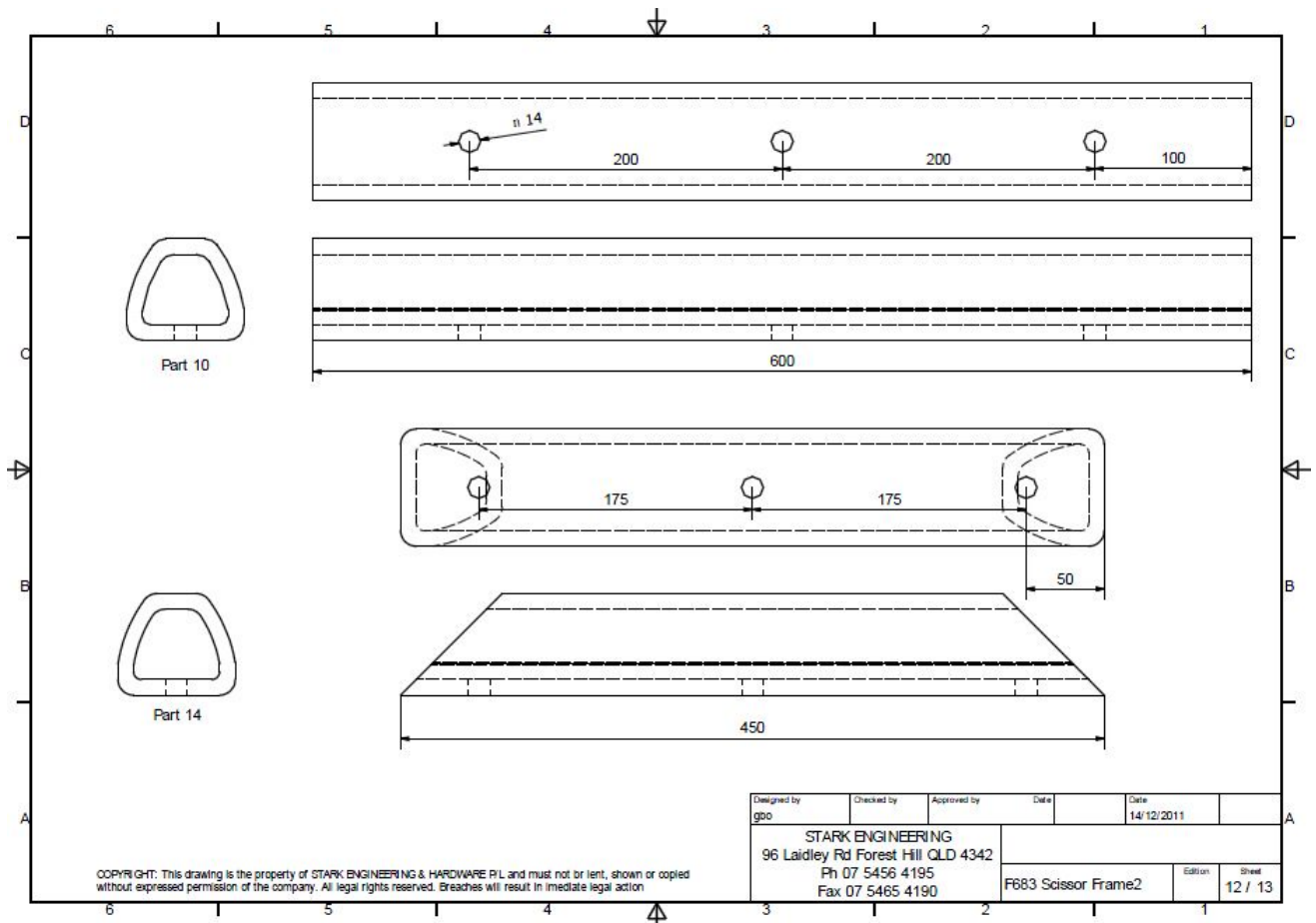
Upgrade the Mark IV cattle restraining box



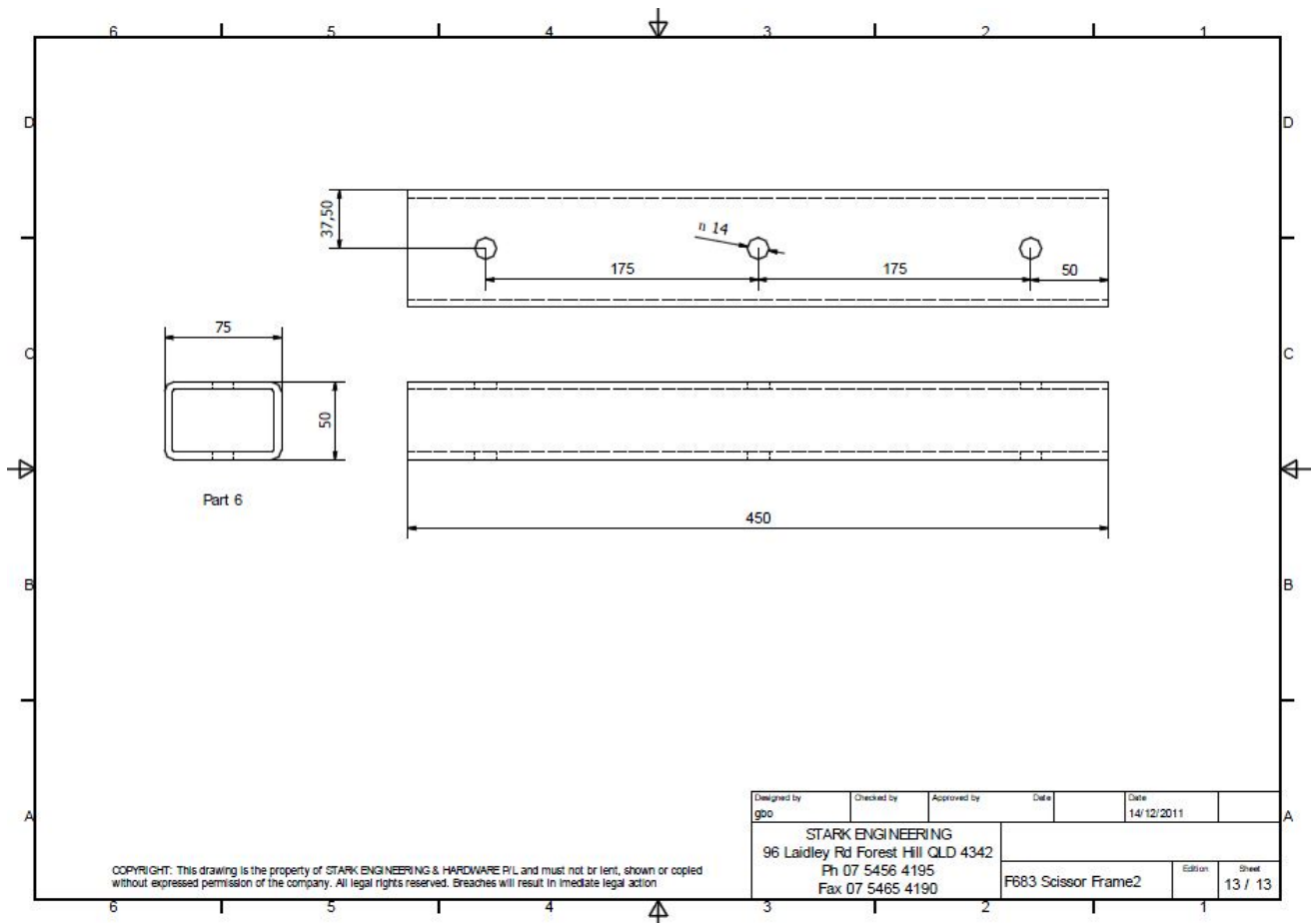
Upgrade the Mark IV cattle restraining box



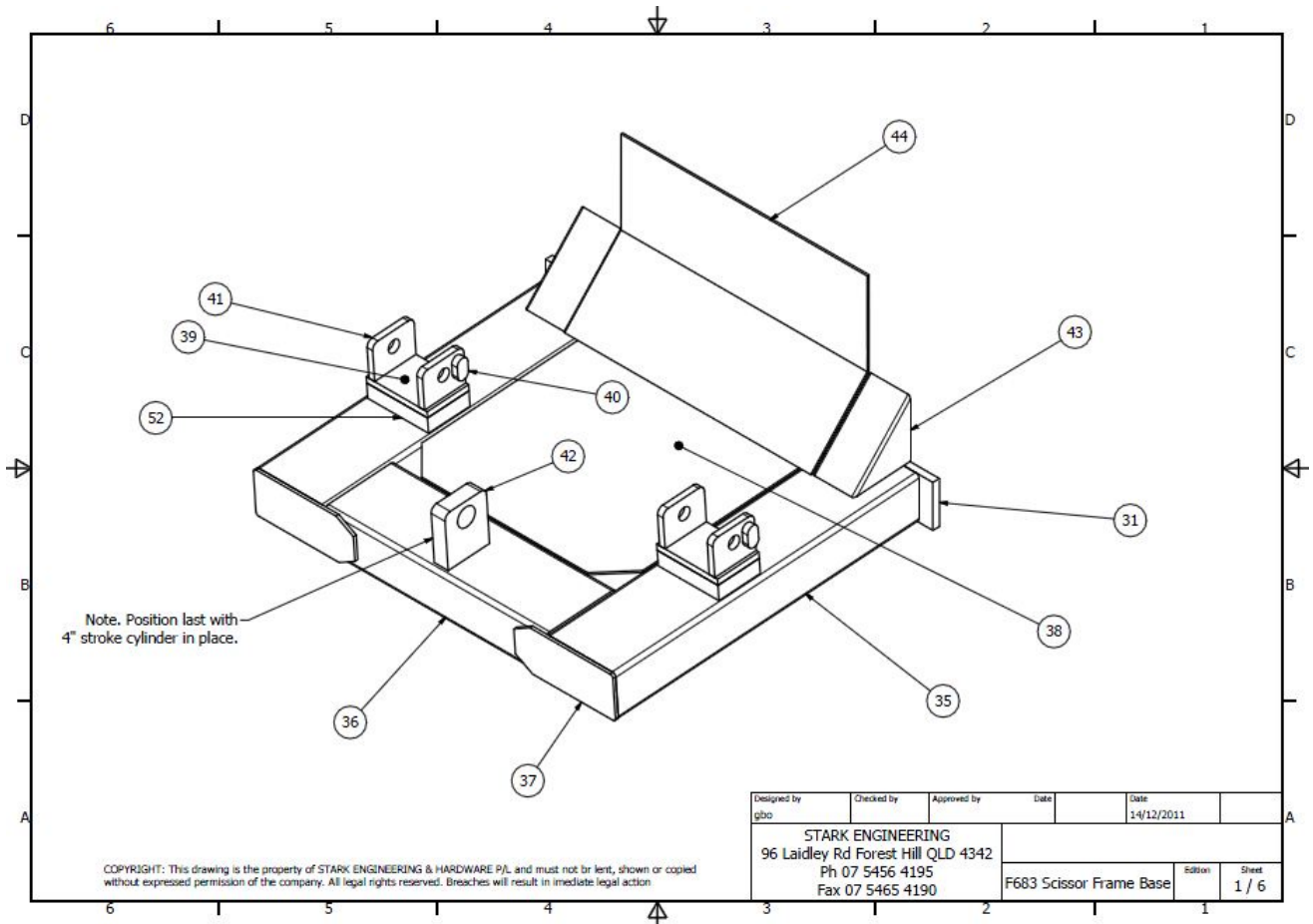
Upgrade the Mark IV cattle restraining box



Upgrade the Mark IV cattle restraining box



Upgrade the Mark IV cattle restraining box



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Designed by gbo	Checked by	Approved by	Date	Date 14/12/2011
STARK ENGINEERING 96 Laidley Rd Forest Hill QLD 4342 Ph 07 5456 4195 Fax 07 5465 4190			F683 Scissor Frame Base	
			Revision	Sheet 1 / 6

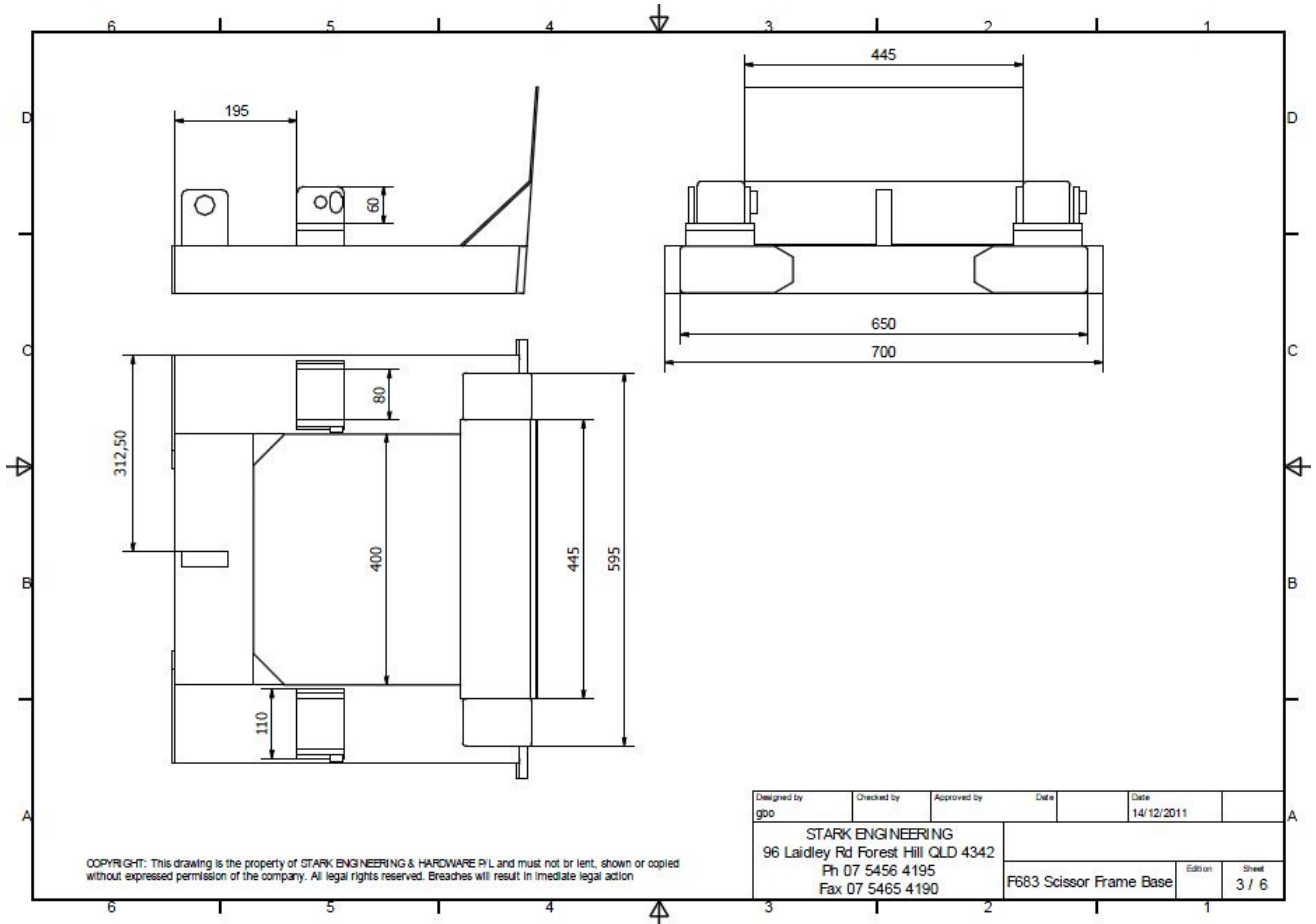
Upgrade the Mark IV cattle restraining box

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
31	1	FMS 75 x 12 @ 700	
35	2	RHS 125 x 75 x 4 @ 550	
36	1	RHS 125 x 75 x 4 @ 400	
37	2	FMS 75 x 5 @ 180	
38	1	CP 3 @ 400 x 350	
39	2	FMS 75 x 10 @ 110	
40	2	Bold head retaining slug	
41	4	FMS 75 x 10 @ 60	
43	2	SHS 75 x 3 @ 150	
44	1	CP 3 @ 445 x 300	
52	2	FMS 75 x 25 @ 110	
42	1	FMS 75 x 25 @ 90	

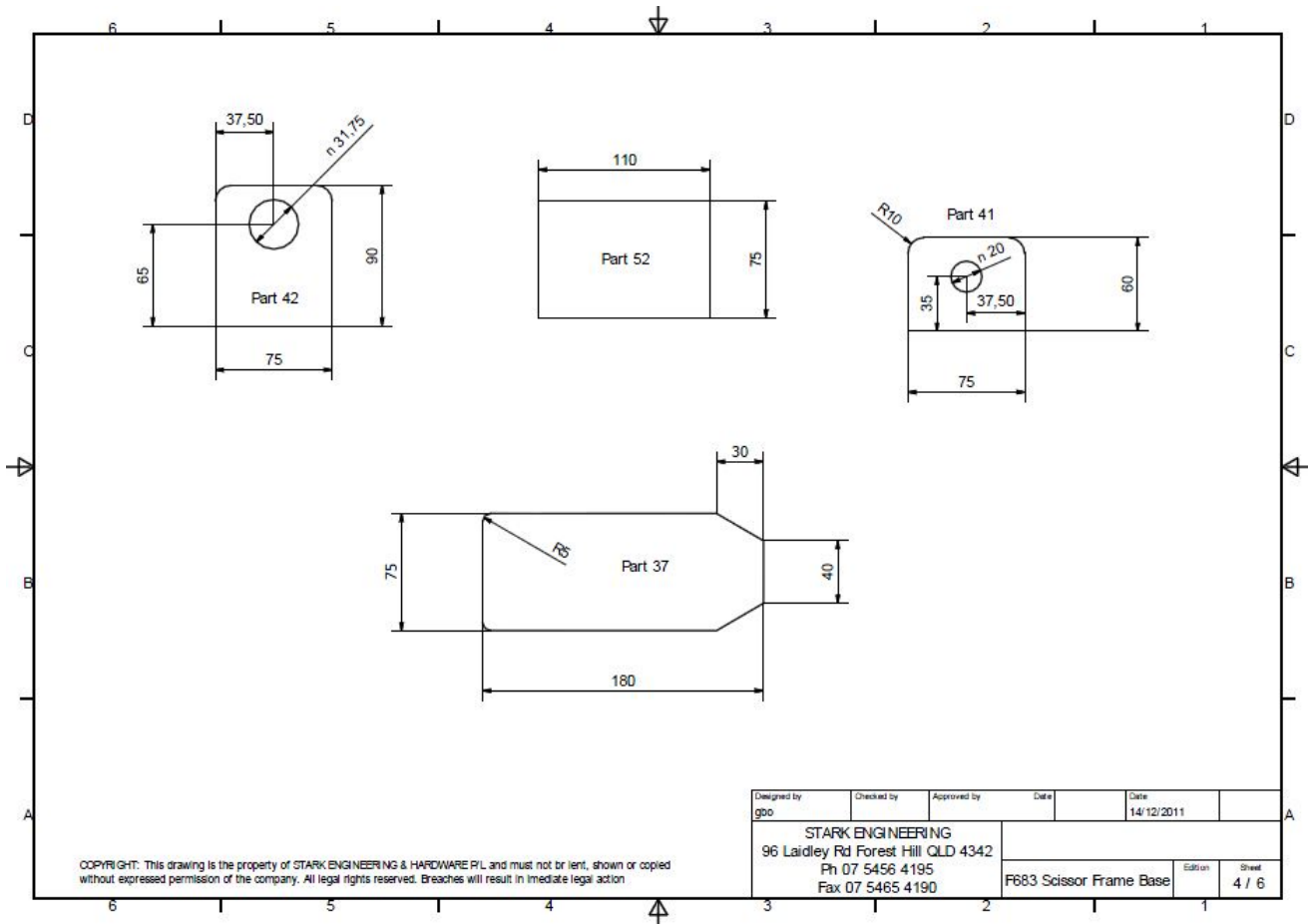
Designed by gbo	Checked by	Approved by	Date	Date 14/12/2011	
STARK ENGINEERING 96 Laidley Rd Forest Hill QLD 4342 Ph 07 5456 4195 Fax 07 5465 4190			F683 Scissor Frame Base		Edition 2 / 6

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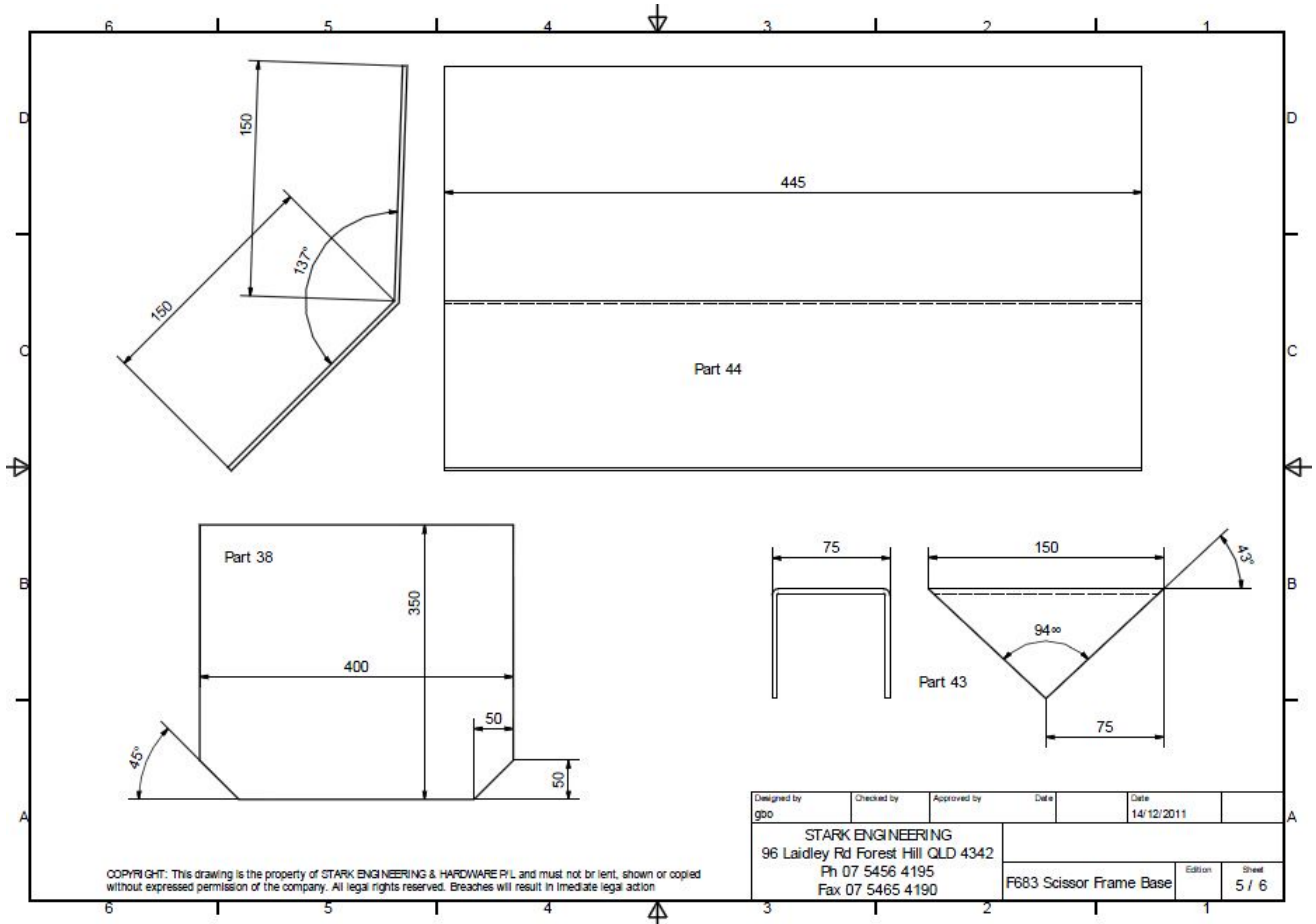
Upgrade the Mark IV cattle restraining box



Upgrade the Mark IV cattle restraining box



Upgrade the Mark IV cattle restraining box



8.2 Manufacturer's manual

8.2.1 Safety instructions

HAVE ALL LOOSE CLOTHING AND LONG HAIR SECURED
KEPT CLEAR OF MOVING MACHINERY



WARNING SAFETY ADVICE

WARNING LOOSE CLOTHING OR UNRESTRAINED LONG HAIR CAN BECOME ENTANGLED IN MOVING MACHINERY CAUSING SEVERE INJURY OR DEATH. KEEP LONG SLEEVES BUTTONED AT THE WRIST, SHIRTS ETC TUCKED IN OR TIED BACK. LONG HAIR SHOULD BE IN A HAIR NET OR SCARF.

AVOID HIGH PRESSURE HYDRAULIC LEAKS



WARNING SAFETY ADVICE

RELIEVE ALL PRESSURE IN THE SYSTEM BEFORE DISCONNECTING THE LINES, HOSES, OR PERFORMING OTHER WORK.

MAKE SURE ALL CONNECTIONS ARE TIGHT AND THAT HOSES AND LINES ARE IN GOOD CONDITION BEFORE APPLYING PRESSURE TO THE SYSTEM.

ANY FLUID UNDER PRESSURE CAN PENETRATE THE SKIN AND CAUSE PERSONAL INJURY, BLINDNESS OR DEATH.

FLUID LEAKS, UNDER PRESSURE, MAY NOT BE VISIBLE. USE A PIECE OF CARDBOARD OR WOOD TO FIND LEAKS; NEVER USE YOUR BARE HAND.

WEAR SAFETY GLASSES FOR EYE PROTECTION. IF ANY FLUID IS INJECTED INTO THE SKIN, IT MUST BE SURGICALLY REMOVED WITHIN A FEW HOURS BY A DOCTOR FAMILIAR WITH THIS TYPE OF INJURY.

KEEP HANDS AND FEET CLEAR OF MOVING MACHINERY



WARNING SAFETY ADVICE

SERIOUS OR FATAL INJURIES COULD OCCUR IF A PERSON COMES IN CONTACT WITH MOVING MACHINERY.

8.2.2 Assembly and commissioning

Securely mount the HYDRAULIC HALAL KILL TABLE onto suitable base like concrete or a solid floor to prevent it from moving or toppling. There are 4 mount lugs attached to the base frame. It is recommended to fit five 12mm to 25mm solid spacers under the four mounting points and one directly under the Hydraulic Roll Ram base to facilitate floor cleaning under the table.




⚠ NOTE: This HYDRAULIC HALAL KILL TABLE MUST BE BOLTED DOWN SECURELY

8.2.3 Pre-operation checklist

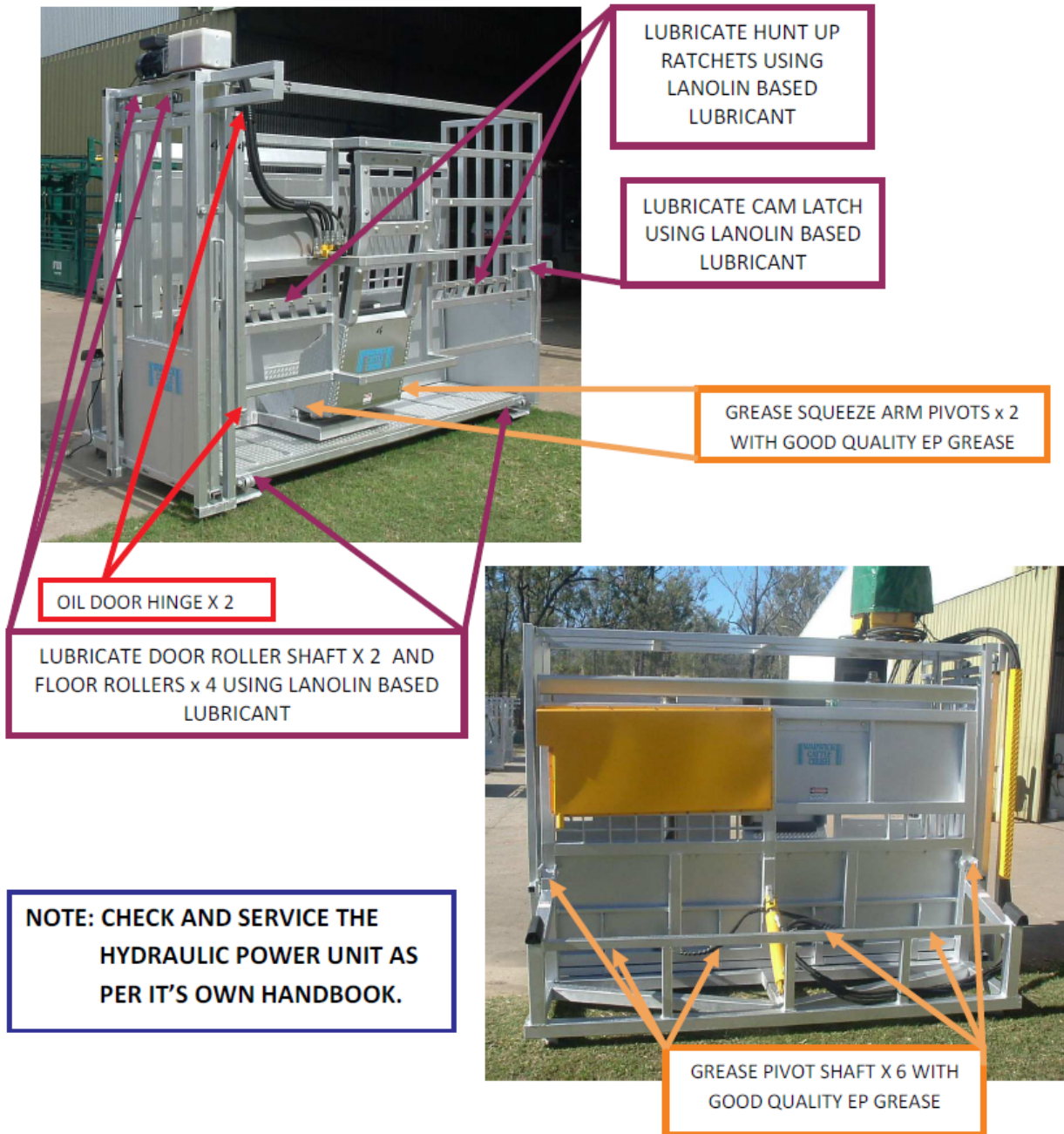
BEFORE WORK COMMENCES

Check the HYDRAULIC HALAL KILL TABLE, Power Unit and the work area and insure that:-

1. There are no obstructions, clutter and or tripping hazards in the work area.
2. That there is NO previous unprepared damage to any of the equipment you are about to use.
3. Check the power unit hydraulic oil (Refer Power Unit Hand Book). It should be filled when cold.
Always use a good quality hydraulic oil (ISO 68).
4. Check all hydraulic lines, cylinders, seals and couplings for leaks or wear.
- 2 If the Power Unit is powered by an internal combustion engine then check fuel and engine oil in the motor in accordance with motor manufactures Handbook instructions.
- 3 If the Power Unit is powered by an electric motor check that the power cable and or plug has no  damage that the cable is appropriately tagged and tested, that the motor has no visual damage and the air vents are not blocked.
4. Start the power unit motor. Wait a few minutes for it to warm up and to see that there are no abnormal noises and or oil leaks.

8.2.4 General maintenance

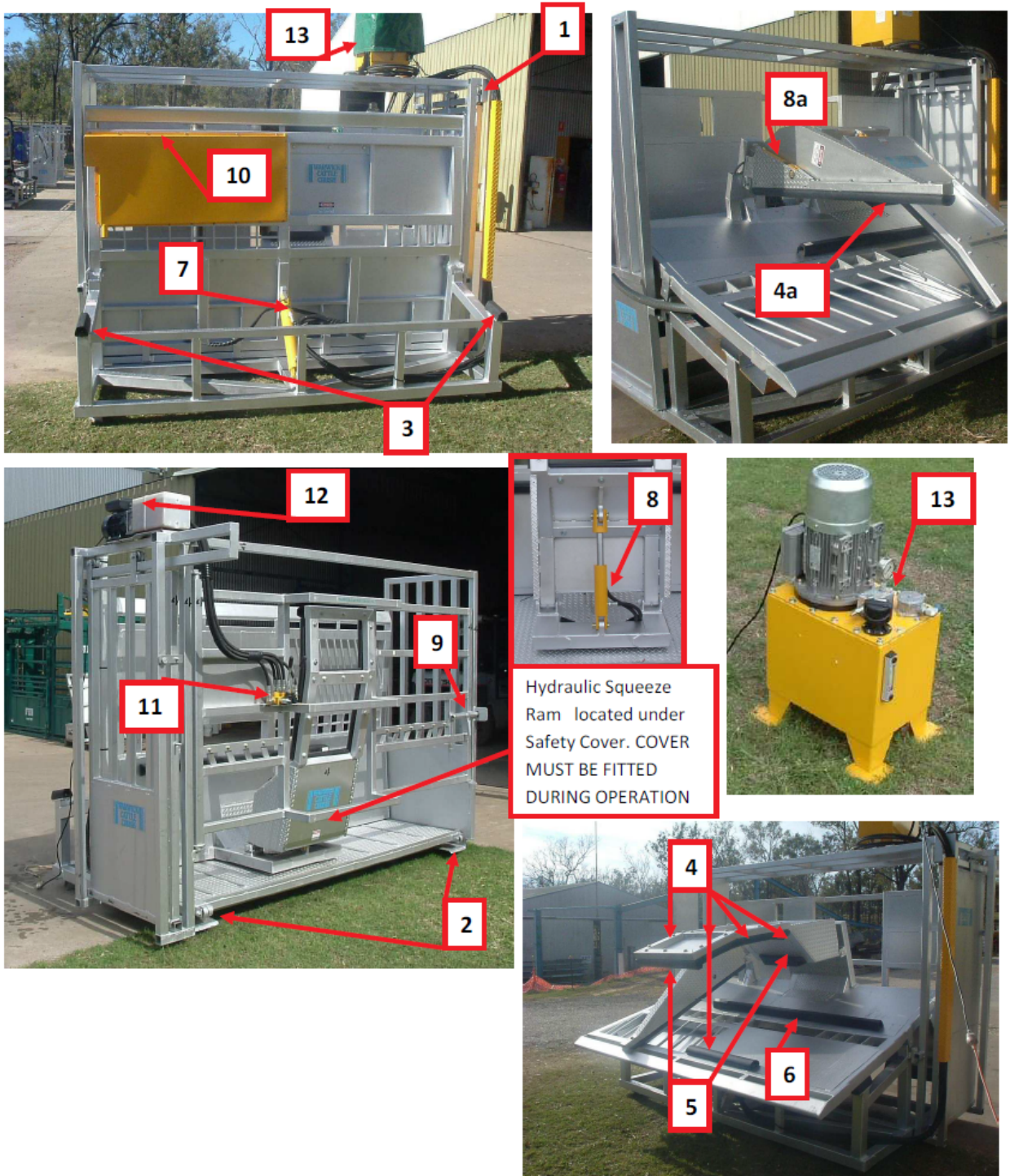
Grease all grease nipples weekly or as required to ensure smooth operation of the unit. There are 8 grease nipples and 2 oil points. LANOLIN BASED LUBRICANT SPRAY CAN BE USED ON THE REST.



8.2.5 Specifications

1. Door Rollers	WCC - Part	2 x RANCHER
2. Floor Rollers	WCC - Part	4 x RANCHER
3. BUMP STOP Rubbers	Trapezoidal	2 x length 150mm
4. D Squeeze Rubbers		2 x 450mm & 2 x 860mm D Rubber
4a. D Neck Bar Rubber		1 x cut to size from 1 full D Rubber
5. Trapezoidal Squeeze Rubbers		1 x 470mm & 1 x 600mm Trapezoidal Rubber
6 Trapezoidal GIRTH Rubber		1 x 1680mm Trapezoidal Rubber
7. Hydraulic Ram Roll		NORDON 3"x 12" NA30A12R15
8. Hydraulic Ram Squeeze		NORDON 2"x 4" NA20A04R12
8a. Hydraulic Neck Arm Ram		NORDON 2"x 4" NA20A04R12 Mark IV only
9. Door Slam Latch		Starkbilt NS Straight Slam Latch
10. Blood Tray		
Paint Primer	Dulux Primer	Cold Gal
Primer Thinner	Dulux Thinner	CR REDUCER
Paint Top Coat	Dulux MSQDE	"ALUMINUM"
Paint Thinner Top Coat	Dulux Duthin	340
OIL (Quantity see Power Unit Handbook)		Good Quality ISO68 Hydraulic Oil.
11. Hydraulic control Valve (2.2 & .75Kw only)	Oilpath	OP10-D-D-D-2000
12. *.75kw Power Unit		4Pole 240V SP 2.2lpm 6litre Hyd Power Pack UP100
13. *2.2kw Power Unit		Starkbilt 2.2kw Power Unit
* Dependent on Model		

8.2.6 Component identification



8.2.7 Controls and pressure release valves

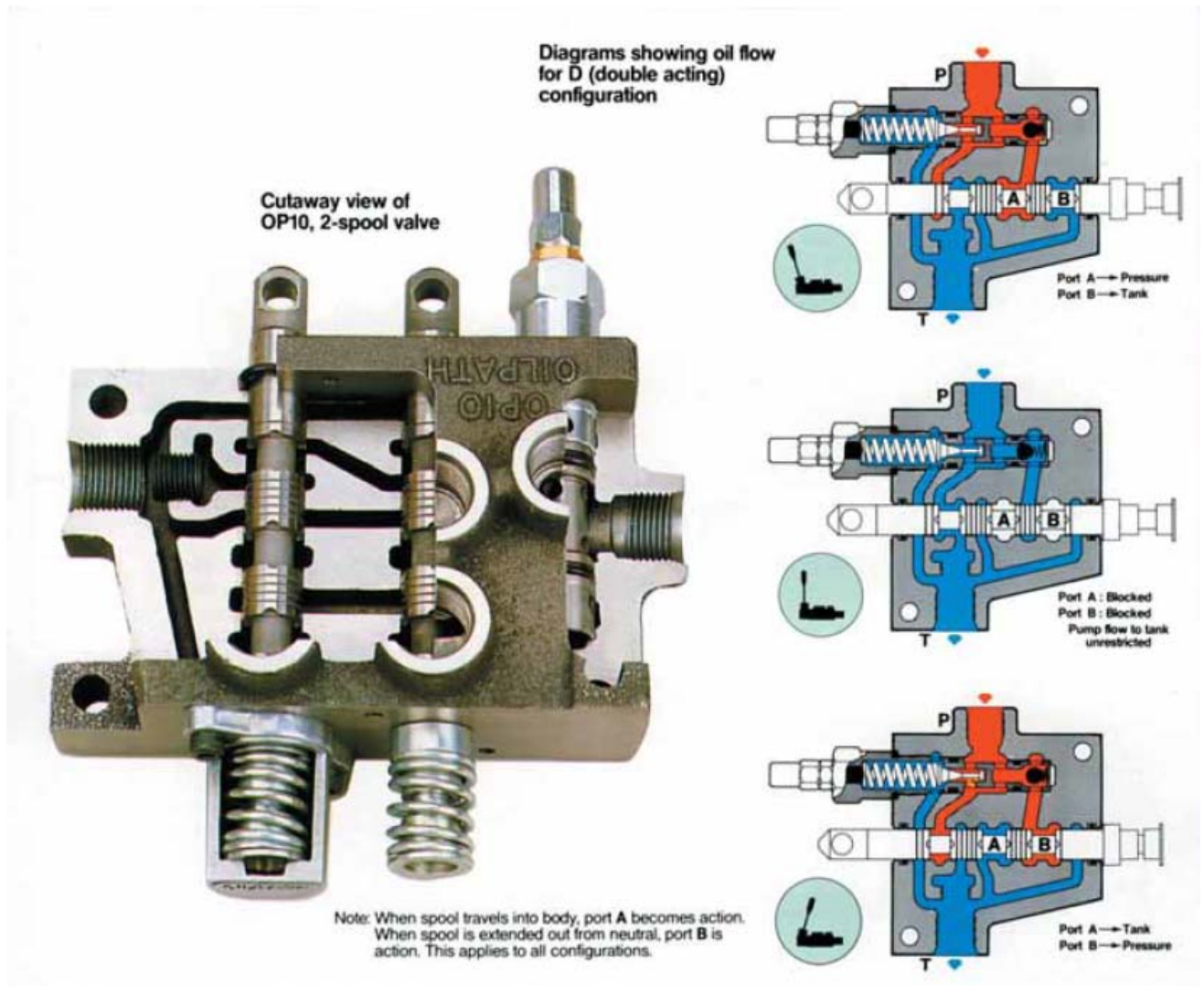
FEATURES

- Proven monoblock high-integrity casting.
- High working pressure.
- Negligible leakage rate.
- Choice of side or top ports for both inlet and outlet.
- Provision for CLOSED CIRCUIT or POWER BEYOND supplied with valve at shipment.
- 1 to 4 spools available, each spool supplied as D, S or M configuration as required.
- 4-way adjustable handle.
- Fully adjustable relief and non-return check contained in one cartridge.
- Hardened steel non-return check seat.
- Additional internal tank gallery. This facility ensures that all seals and PRV vent remain at low pressure when valve is used in POWER BEYOND mode.

SPECIFICATIONS

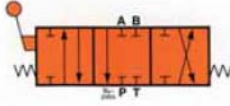
Max. flow capacity	45 litres/min (10 gpm.lmp.)
Max. operating pressure	5000 psi (345 bar)
Max. back pressure	1500 psi (103 bar)
Port size (all ports)	3/4" UNF-16 (SAE 8) 3/8" BSPP on request.
Valve circuitry	Parallel
Approx. weight	1 spool: 3.1kg 2 spools: 4.6kg 3 spools: 6.1kg 4 spools: 7.6kg
O/all fixed dimensions (mm)	198 x 65 (length x height*)
O/all width (mm)	1 spool: 120 2 spools: 160 3 spools: 200 4 spools: 240

*Excluding handle

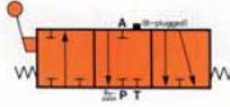


AVAILABLE SPOOL CONFIGURATIONS

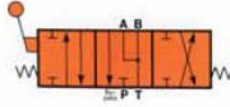
D } Double acting
Q } (Low flow applications)



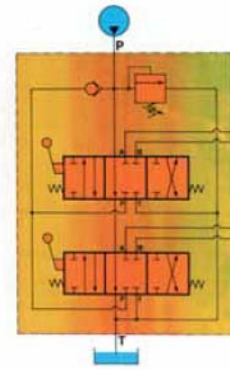
S Single acting



M Motor

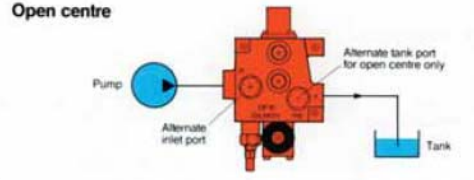


OP10:
Typical circuit for 2-spool double-acting configuration

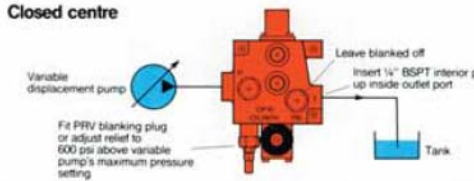


TYPICAL INSTALLATIONS

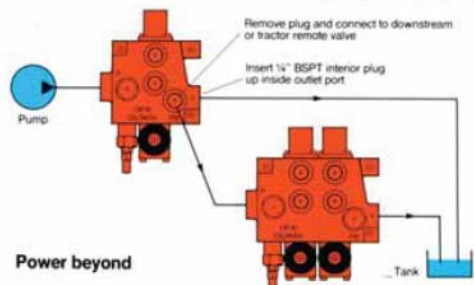
Open centre

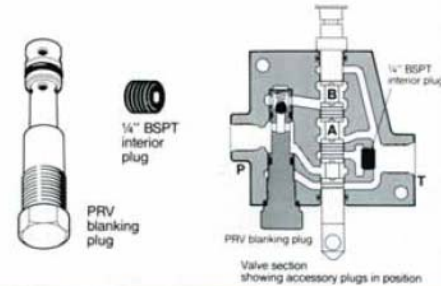


Closed centre



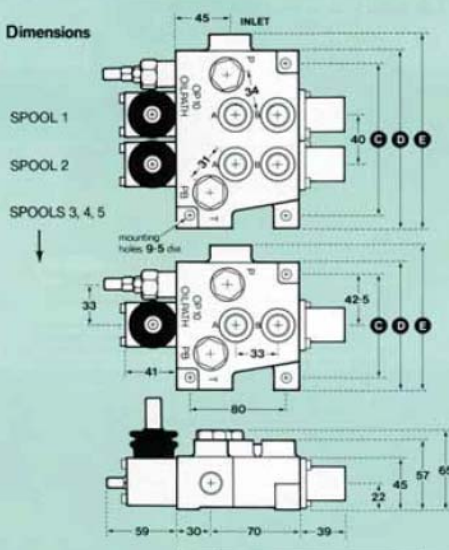
Power beyond





PRV blanking plug
1/4" BSPT interior plug
Valve section showing accessory plugs in position

Dimensions

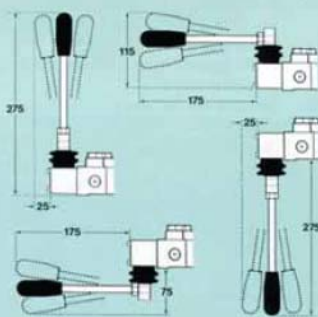


INLET 45
SPOOL 1 40
SPOOL 2 40
SPOOLS 3, 4, 5 42.5
mounting holes: 9.5 dia
33
41
80
59 30 70 39
22 45 65

Dim.	Number of spools				
	1	2	3	4	5
C	85	125	165	205	245
D	107	147	187	227	267
E	120	160	200	240	280

Variable dimensions (to nearest mm)

Approximate clearances for 4-way handle positions



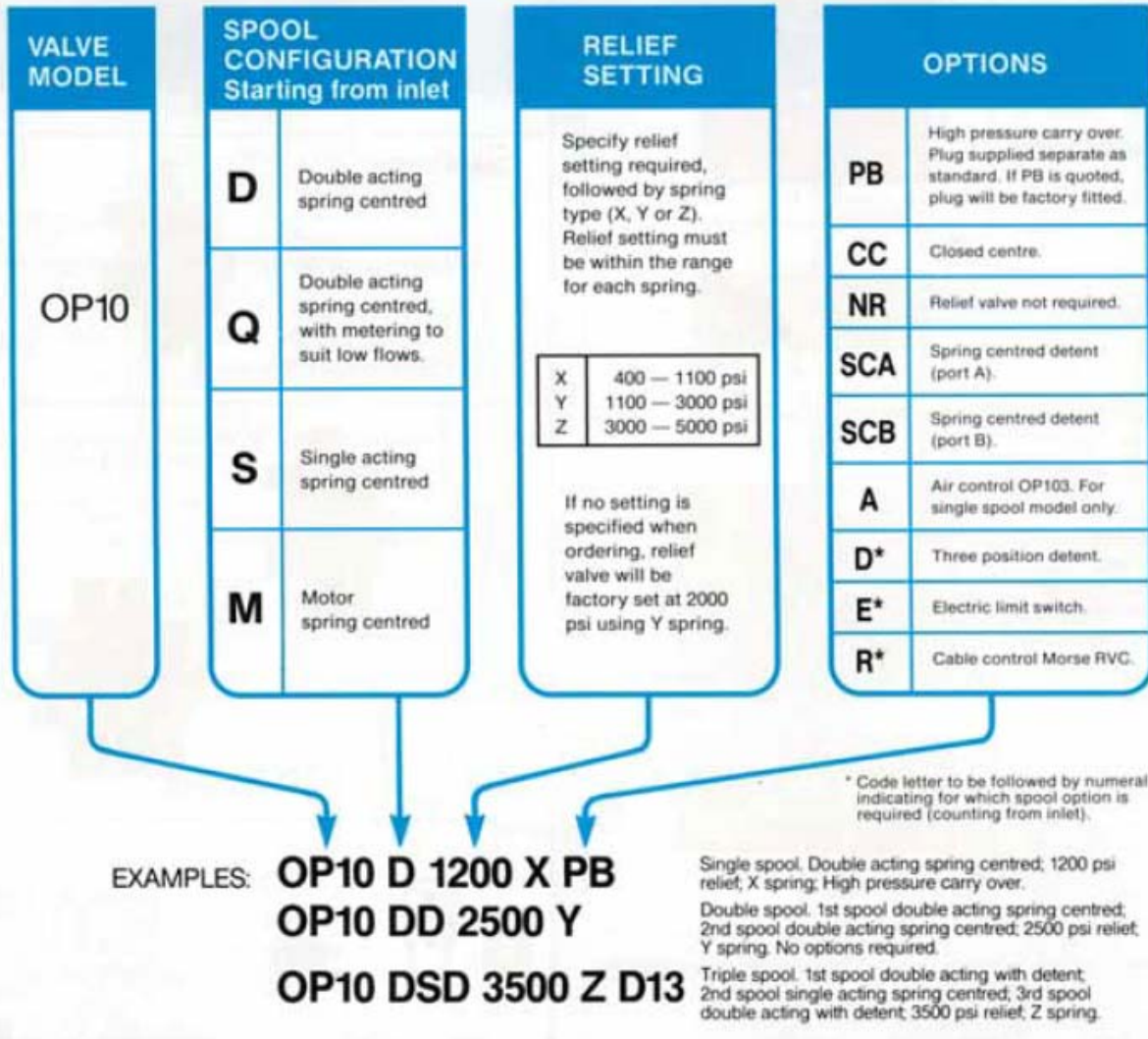
275, 115, 175, 25, 75, 275

Notes:
1. Threaded holes on boss provide for end- or side-mounting of operating handle.
2. Dimensions shown are for minimum handle extent. Handle length can be effectively increased by 10mm.

ORDERING INFORMATION

Oilpath OP10 control valves may be ordered by quoting a number/letter group sequence as follows:

Valve series; Spool configuration; Relief setting; Options required.



9 References

Hewitt, L (2011) Review of the design and operation of the Mark IV restraining box, MLA report.

Schipp, M (2011) An assessment of the ongoing appropriateness of Mark I and IV restraint boxes, Report requested by Senator the Hon. Joe Ludwig, Minister for Agriculture, Fisheries and Forestry