



Cattle Head Capture Unit

Meat & Livestock Australia Technology Transfer Kits

This Technology Transfer Kit is one in a series of Do-It-Yourself (DIY) resources prepared for the Australian meat industry to encourage the development of project engineering skills at meat processing sites while implementing simple but useful items of technology. This kit is designed to provide the essential information to allow processors to carry out suitable modifications and installations at their own sites to improve some aspects of their processing performance. As each processing site has unique design and construction features the information in this kit should be used as a guide only. Some modifications from this kit to ensure the successful application at individual sites are likely. No warranty is given on the outcome of the use of this kit or the information it contains.

DIY Kit # 1 - Cattle Head Capture Unit

The head capture unit can be fitted to new, or existing, cattle knocking boxes to improve the effectiveness, operator safety and animal welfare of cattle stunning. The time to operate the head capture mechanism is compensated for by time saved in waiting for the animal to settle before applying the stun, and any time that may have been lost with reapplication after an ineffective stun. As a result the overall time for processing the animal through the knocking box is not extended using the head capture unit.

The unit has been modified since its original development to improve its operation. In particular conveyor belt curtains have been added between the side restraint bails and the back wall and door respectively. These ensure that during operation the animal can not place its foreleg between the bail and the knocking box. Prevention of the foreleg entering this space, in this way, does not interfere with operation of the restraining bails but prevents hindering of the mechanism's operation or injury to the animal.

The head capture unit can be used in conjunction with cartridge powered penetrating or percussion type captive bolt stun guns. It is also

suitable for use with pneumatically or hydraulically powered stun mechanisms. As the head restraint mechanism lifts the animal's head, it is not suitable for stunning from behind the head (poll stunning).

Description

The cattle head capture unit consists of several separate mechanisms that are programmed to operate in sequence. The elements of the system in the order in which they operate are:

- A pneumatically operated pusher attached to the inside of the knocking box entrance door to move the animal forward so that its head is in front of the restrainer side bails and to prevent the animal backing away during restrainer operation. The pusher is shown in Photograph 1.
- A pneumatically operated bail mechanism attached to the inside of the knocking box discharge door, and a similarly operated bail mechanism attached to the inside back of the box. These bails operate independently but simultaneously to restrain the head from moving forward or back. The open and closed bail mechanism is shown in Photographs 3 & 4 respectively.
- A pneumatically operated chin lifting mechanism mounted either on the door or the fixed side of the knocking box. Mounting position is dependent on the available space. The chin lifter is shown in Photograph 2.
- A box section attached to the closed end of the pen to prevent the animal from lowering its head prior to operation of the restraining mechanism. This ensures that the animal's head is not lowered below the range of the chin-lifting device. The box section is shown in Photographs 2 & 5.
- An angle box section attached to the fixed side of the knocking box assists in ensuring that the stunned animal exits smoothly from the box. The angle box section is shown in photograph 5.

The sequence of operation of the various components of the head capture unit is:

1. The knocking box entrance door opens and the animal is driven in until the door can be shut.



2. A switch is operated to commence the head capture cycle.
3. The pusher moves the animal forward so that the head is fully past the bails and in the correct position for capture. The pusher also prevents the animal from backing away before the restraining bails close.
4. The opposing bails close simultaneously on the animal's neck.
5. The chin lifter operates to raise the head so that the frontal area is approximately horizontal.
6. The operator stuns the animal. As the animal is securely restrained close to the operator's position an extension handle is not required for the stun gun.
7. The discharge door is opened, automatically activating the retraction of the pusher, restraining bails and chin lifter. If an ineffective capture occurs then the pusher, restraining bails and chin lifter can be manually operated.
8. An operator in the shackling area hoses out the knocking box as necessary prior to the discharge door closing and the next animal entering.

Benefits

Operation of the head capture unit over an extended period, in the daily operation of a beef-processing abattoir, has highlighted the following benefits:

- The animal is consistently presented in an ideal position for stunning. The stun operator does not have to wait for the animal to settle down and assume a favourable position for stunning.
- As the animal is consistently presented in an ideal position for stunning there are virtually no ineffective stuns. The cost of cartridges for re-stuns is saved, as is the lost time in re-loading.
- The animal is restrained after the stun has been applied and is only freed as the opening of the knocking box door activates the retraction sequence. Consequently the animal can not make any sudden head movements that may injure the operator or jerk the stunning device free. Savings through reduced operator injuries and reduced maintenance of bent and broken stunner bolts are achieved as a result.
- As the animal is securely restrained in the knocking box, the incidence of bruising, as a result of the animal thrashing about, is reduced.
- Similarly the lowering of the animal by the retracting bails and chin lifter reduces the incidence of bruising though the animal falling heavily after stunning.
- As multiple stuns are avoided the animal is despatched more humanely.

Materials

The necessary materials are shown on the appended drawings. Logic for the control system, to provide the correct operating sequence, is given in the appended ladder diagram.

Construction is of mild steel, hot dip galvanised prior to assembly and installation.

Drawings

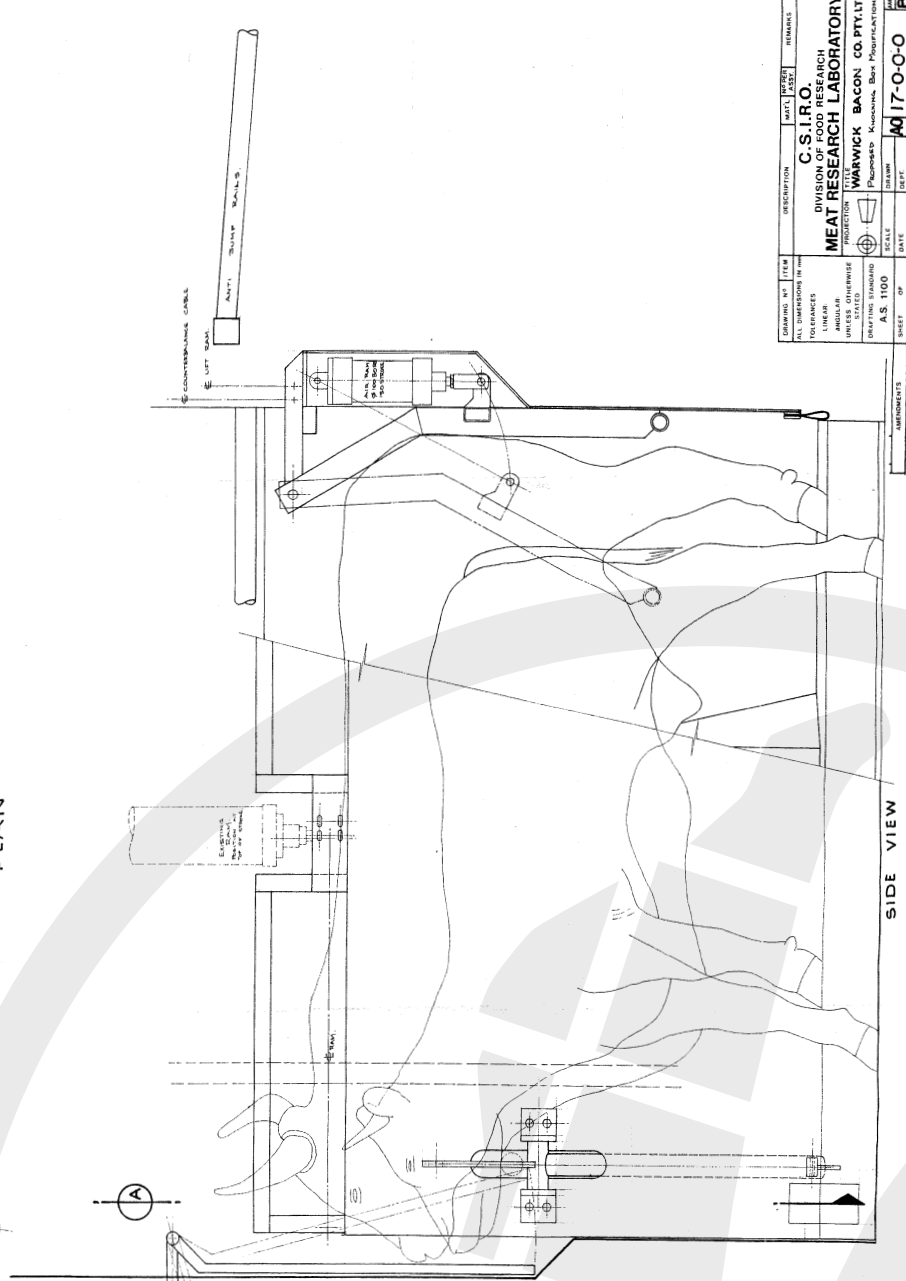
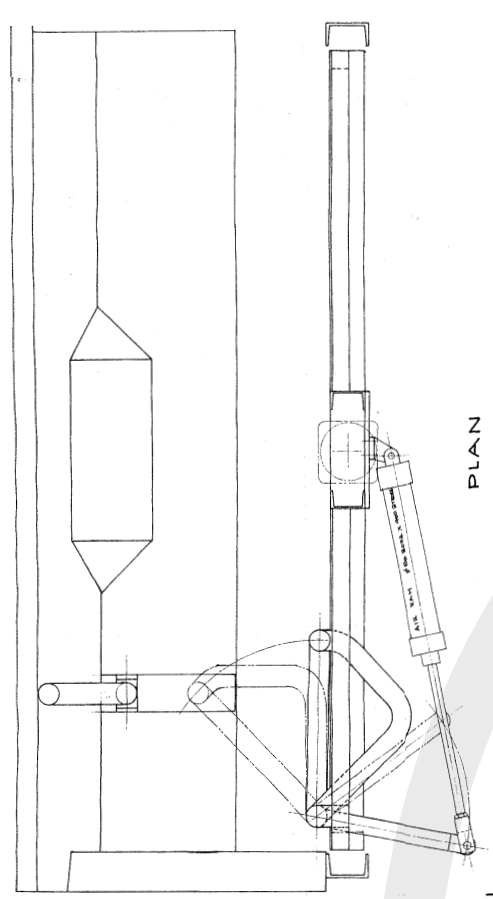
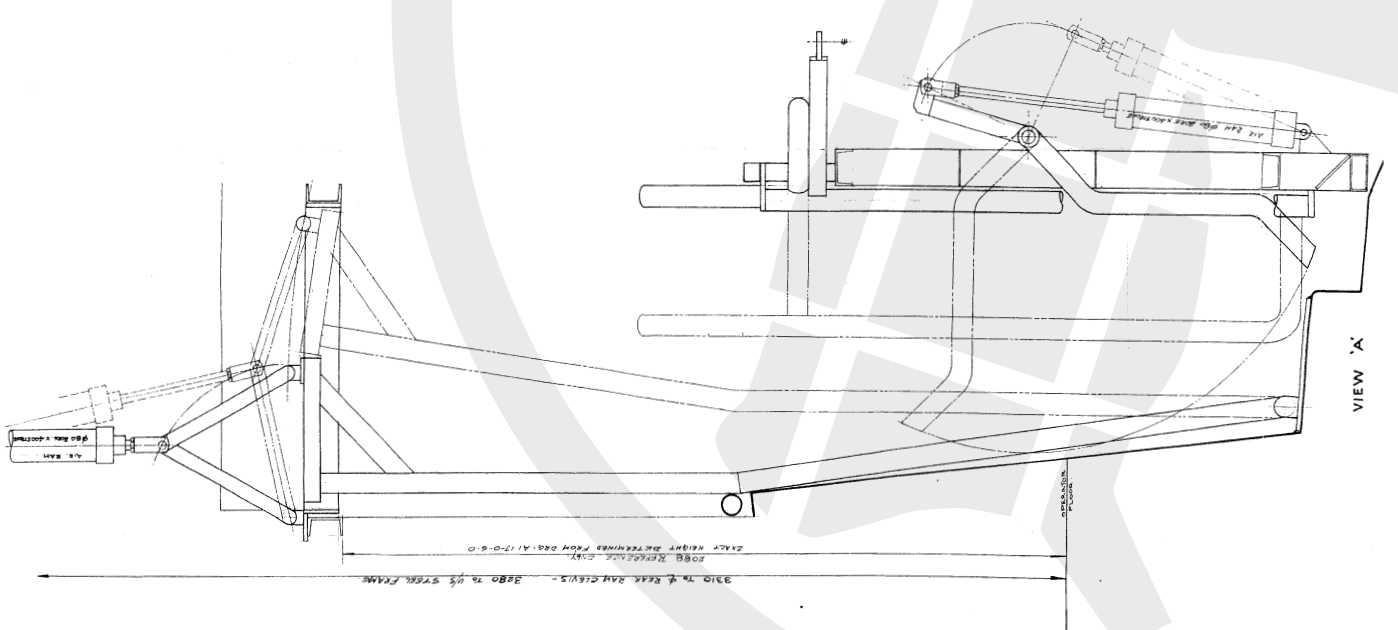
The appended engineering drawings show:

17-0-0-0	Proposed knocking box modifications
17-0-1-0	Knocking box exit door
17-0-1-1	Exit door bearing detail
17-0-2-0	Chin lift assembly
17-0-3-0	Entry gate and pusher assembly
17-0-4-0	Left hand bail detail
17-0-5-0	Right hand bail detail
17-0-6-0	Neck bail mounting details
A4 1	Amendment to bail activation assembly
A4 2	Bellcrank bearing detail

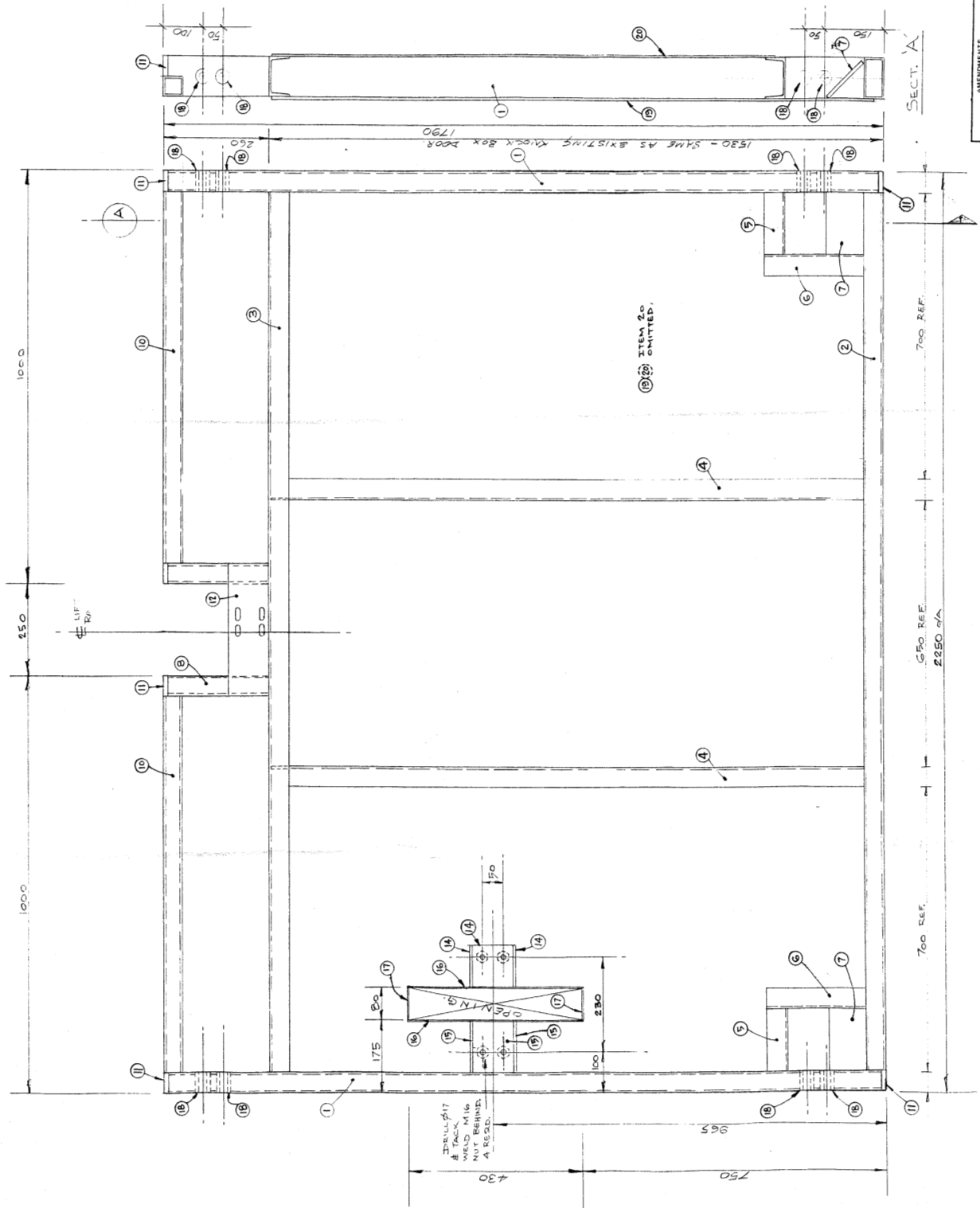
Ladder diagram for control system

Photograph 1. The pneumatically operated pusher unit in a partially forward position.





DRAWING NO.	ITEM	DESCRIPTION	DATE	BY	REVISIONS
<p>C.S.I.R.O. DIVISION OF FOOD RESEARCH MEAT RESEARCH LABORATORY</p> <p>UNLESS OTHERWISE INDICATED DRAWING STANDARD A.S. 1100</p> <p>WARWICK BACON CO. PTY. LTD. Pharkeba, Kalamook, Dist. Murrumbidgee</p>					
SCALE			DATE	DEPT.	SHEET
A.S. 1100					A17-0-0
AMENDMENTS			OF		



NOTES:-
 ITEM 18 BOSS - ALTER O.D. IF NECESSARY TO SUIT SHOP DRILL SIZE.
 ITEM 12. PNEUMATIC RAM MOUNTING HAS MAKE HOLES/SLOTS AS NECESSARY DURING ASSEMBLY. DOOR OPENING, RAM EYE NOT DRAWN. MANUFACTURE SAME AS EXISTING.

DRAWING NO	ITEM	DESCRIPTION	MAT.	QTY	REMARKS
20	3 THICK	HEAT	1	CUMMERBUDD	
19	6 THICK	HEAT	1	CUT 200X190	
18	3 THICK	HEAT	2	MACE 51 LONG	
17	3 THICK	HEAT	2	CUT 100 X 40	
16	3 THICK	HEAT	2	CUT 100 X 40	
15	100 X 6	HEAT	3	CUT 100 LONG	
14	100 X 6	HEAT	3	CUT 100 LONG	
12	100 X 12	HEAT	1	CUT 200 LONG	
11	50 X 12	HEAT	1	CUT 100 LONG	
10	51 X 51 X 4	RHS	2	CUT 850 LONG	
9	102 X 51 X 4.5	RHS	2	CUT 245 LONG	
7	100 X 50 X 3	CHANNEL	2	CUT 785 LONG	
6	100 X 50 X 3	CHANNEL	2	CUT 150 LONG	
5	100 X 50 X 3	CHANNEL	2	CUT 1470 LONG	
4	100 X 50 X 3	CHANNEL	2	CUT 2 145 LONG	
3	100 X 50 X 3	CHANNEL	2	CUT 1125 LONG	
2	102 X 51 X 4.5	RHS	2	CUT 7100 LONG	
1	102 X 51 X 4.5	RHS	2	CUT 7100 LONG	

C.S.I.R.O.
 DIVISION OF FOOD RESEARCH
MEAT RESEARCH LABORATORY

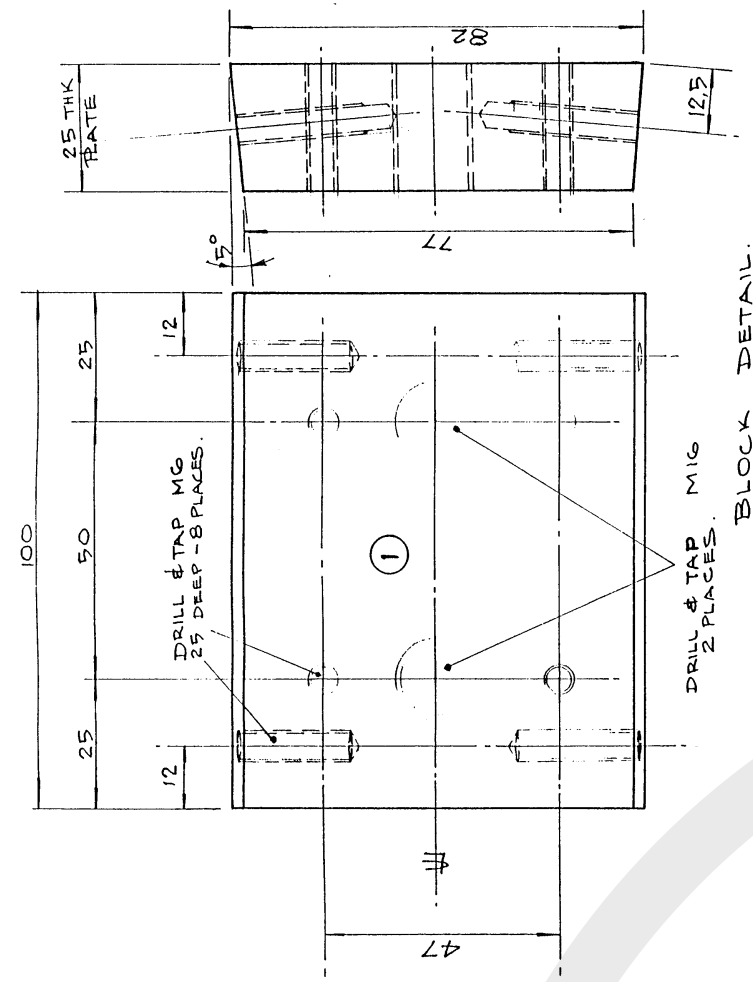
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 KNOCK BOX EXIT DOOR

WARWICK BACON CO. PTY. LTD.

SCALE 1:5
 AS, 1100

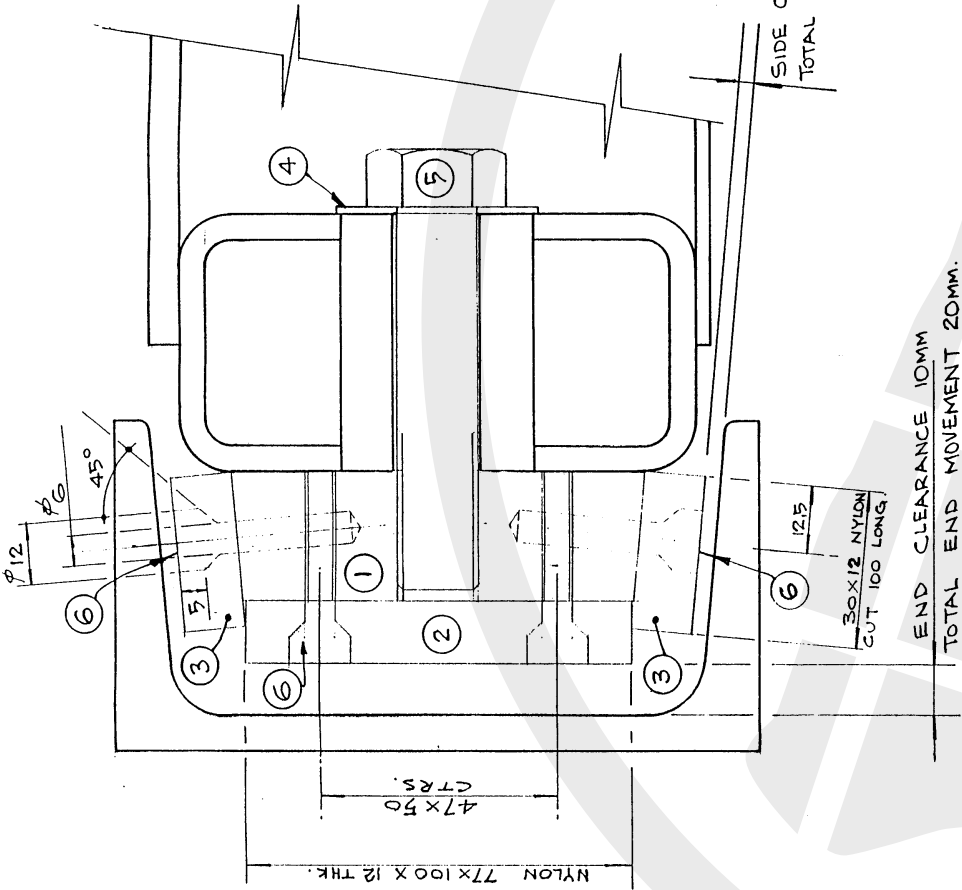
DATE 10/5/67
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SHEET OF

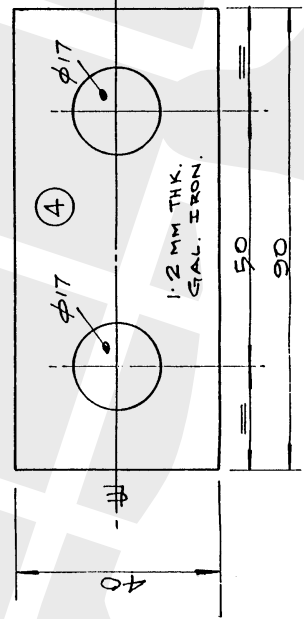


ALL DIMENSIONS IN mm
 TOLERANCES
 LINEAR:
 ANGULAR:
 UNLESS OTHERWISE
 STATED

SIDE CLEARANCE 3MM
 TOTAL SIDE MOVEMENT 6MM.

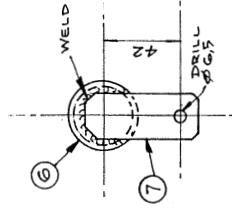
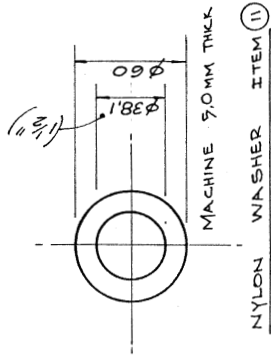
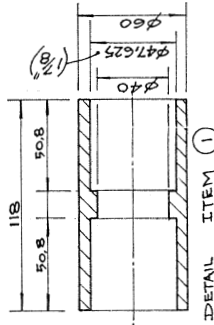
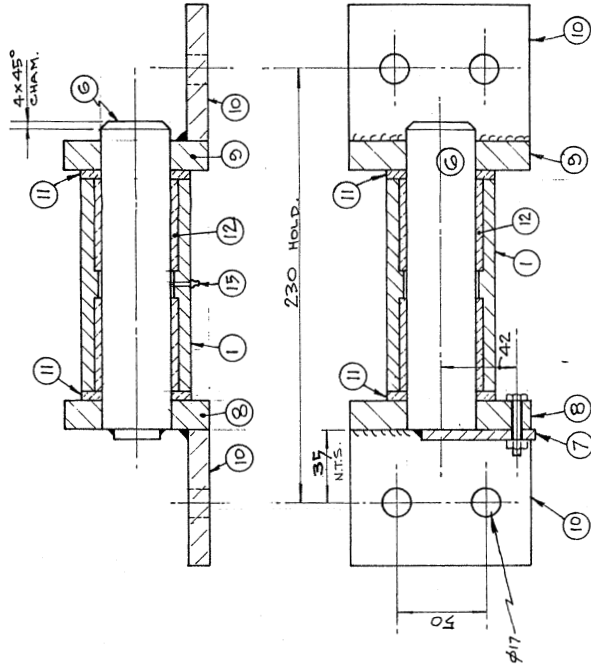
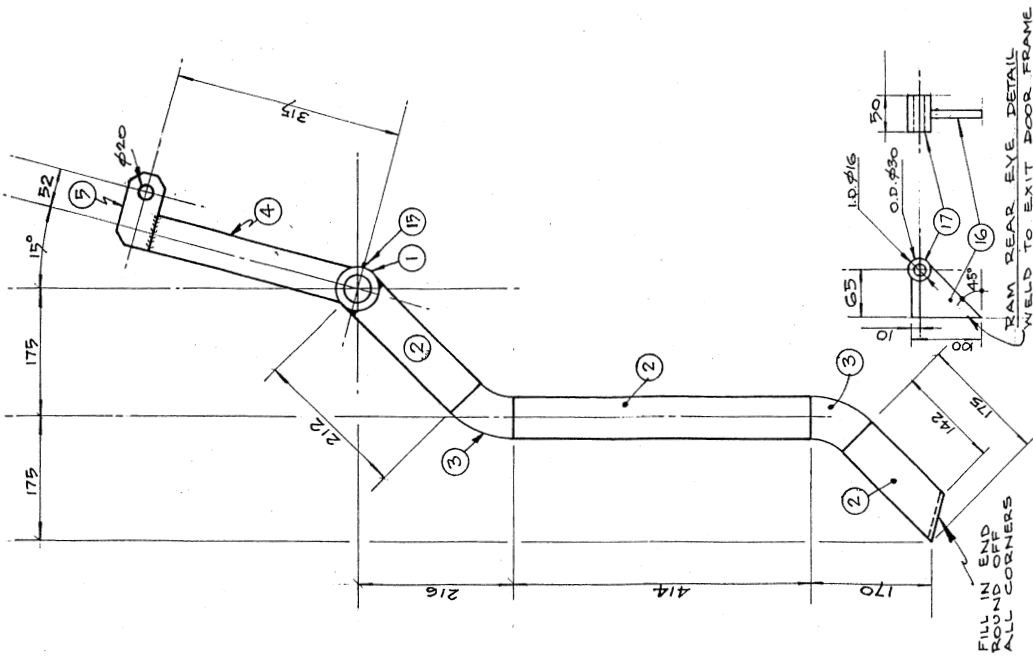


END CLEARANCE 10MM
 TOTAL END MOVEMENT 20MM.



TAB WASHER DETAIL.

6	32	C/SUNK SCREW M6X25 UNBRASO #01923005
5	4	BOLT M16 X 75 STRUCTURAL GALVANIZED.
4	4	TAB WASHER - 90X40X 1.2THK GAL. IRON.
3	8	SIDE BEARING - 30X100 X 12 THK. NYLON.
2	4	END BEARING - 77X 100 X 12 THK. NYLON.
1	4	BEARING BLOCK - 82X 100 X 25 THK. STEEL.
Nº N ^o REQD.		DESCRIPTION
C.S.I.R.O. DIVISION OF FOOD RESEARCH		
MEAT RESEARCH LABORATORY		
TITLE	EXIT DOOR BEARING DETAIL	AM/IT
SHEET	OF	A317-0-1-1
DRAFTING	A.S.1100	DATE 16/3/87.
SCALE	1:1	DRAWN RMW
DEPT.	P. D.	



DRAWING NO	ITEM	DESCRIPTION	MATL	INPBR	REMARKS
	17	REAR EYE	Ø30 SOLID	1	MACH. 50 LONG.
	16	REAR EYE SUPPORT	12THK PIPE	1	CUT 100X 65.
	15	GREASE NIPPLE		1	
	14	BOLT & NUT	M6X30	1	
	13	BOLT	M16X40 GAL STRUCTURAL	4	NOT DRANN
	12	LUBRON BEARING	LB 24 30 32	2	BEARING SERVICE
	11	NYLON WASHER	Ø60 NYLON	2	CUT 75 LONG.
	10	BOLT PLATE	100X12 FEAT	2	CUT 80 LONG.
	9	PIN SUPPORT	100X16 FEAT	1	CUT 80 LONG.
	8	PIN SUPPORT	100X16 FEAT	1	CUT 80 LONG.
	7	PIN TAB	25X6 FEAT	1	CUT 62 LONG.
	6	PIN	1/2 DIA. BRIGHT	1	MACH. 170 LONG.
	5	CLEVIS EYE	50X16 FEAT.	1	CUT 102 LONG.
	4	RAM ARM	50X16 FEAT.	1	300 REED.
	3	45° ELBON	LONG. RAD. STD. WT. 30MMAL	2	
	2	PIPE	Ø2 1/8 X 3/81 WALL SCH 40	1	100D REED.
	1	BEARING HOUSING	Ø60 MS.	1	MACH. 118 LONG.

ALL DIMENSIONS IN MM
TOLERANCES
LINEAR:
ANGULAR:
UNLESS OTHERWISE
STATED

DRAFTING STANDARD
A.S. 1100

SHEET OF

DATE 18/3/87

SCALE 1:2

DRAWN RMW

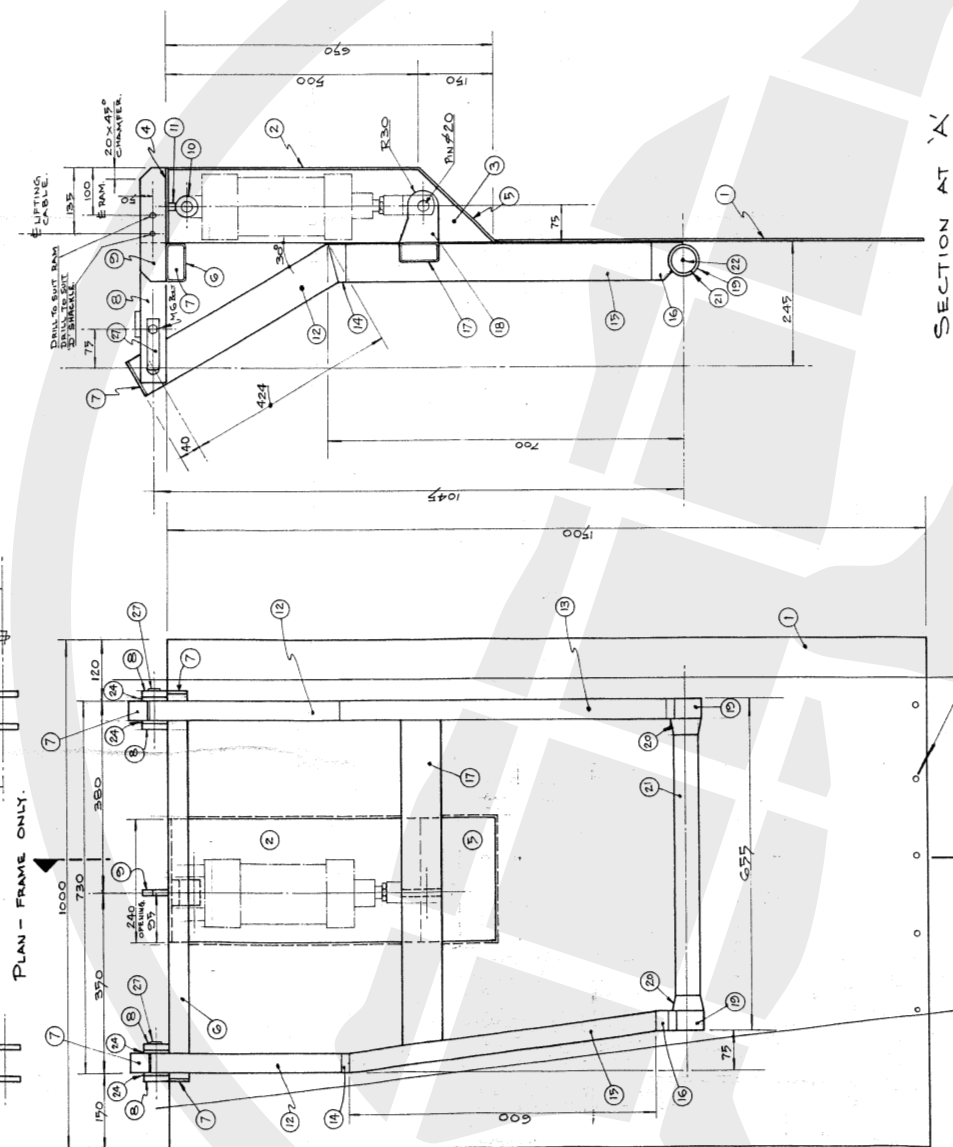
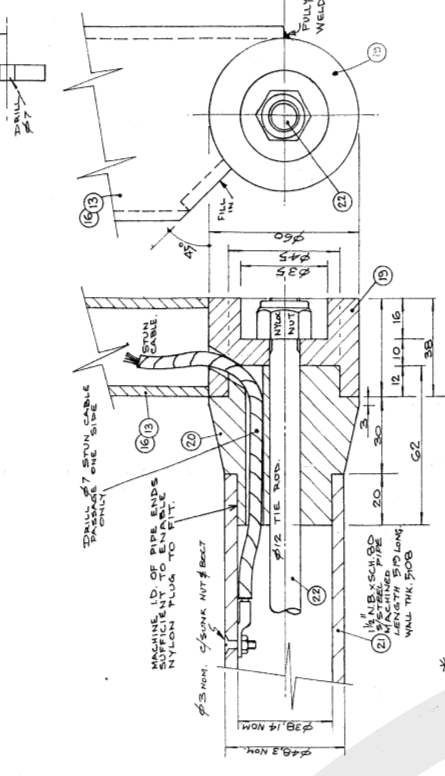
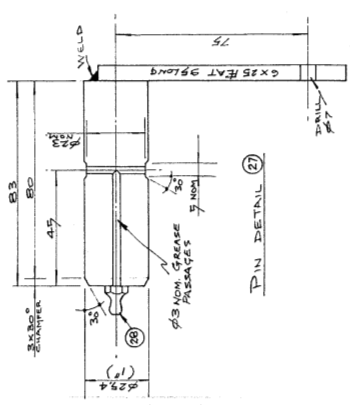
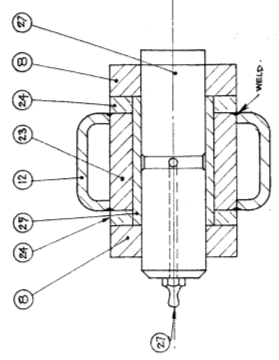
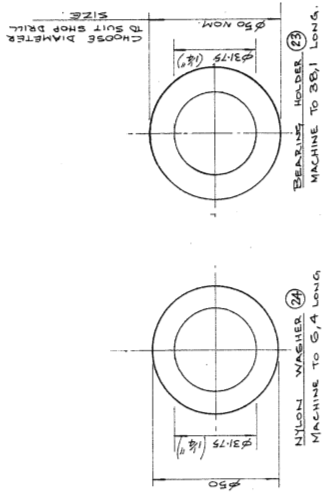
DEPT. A2 17-0-2-0

AMDT

PROJECTION

TITLE
WARWICK BACON CO. P/L
CHIN LIFT ASSEMBLY.

C.S.I.R.O.
DIVISION OF FOOD RESEARCH
MEAT RESEARCH LABORATORY



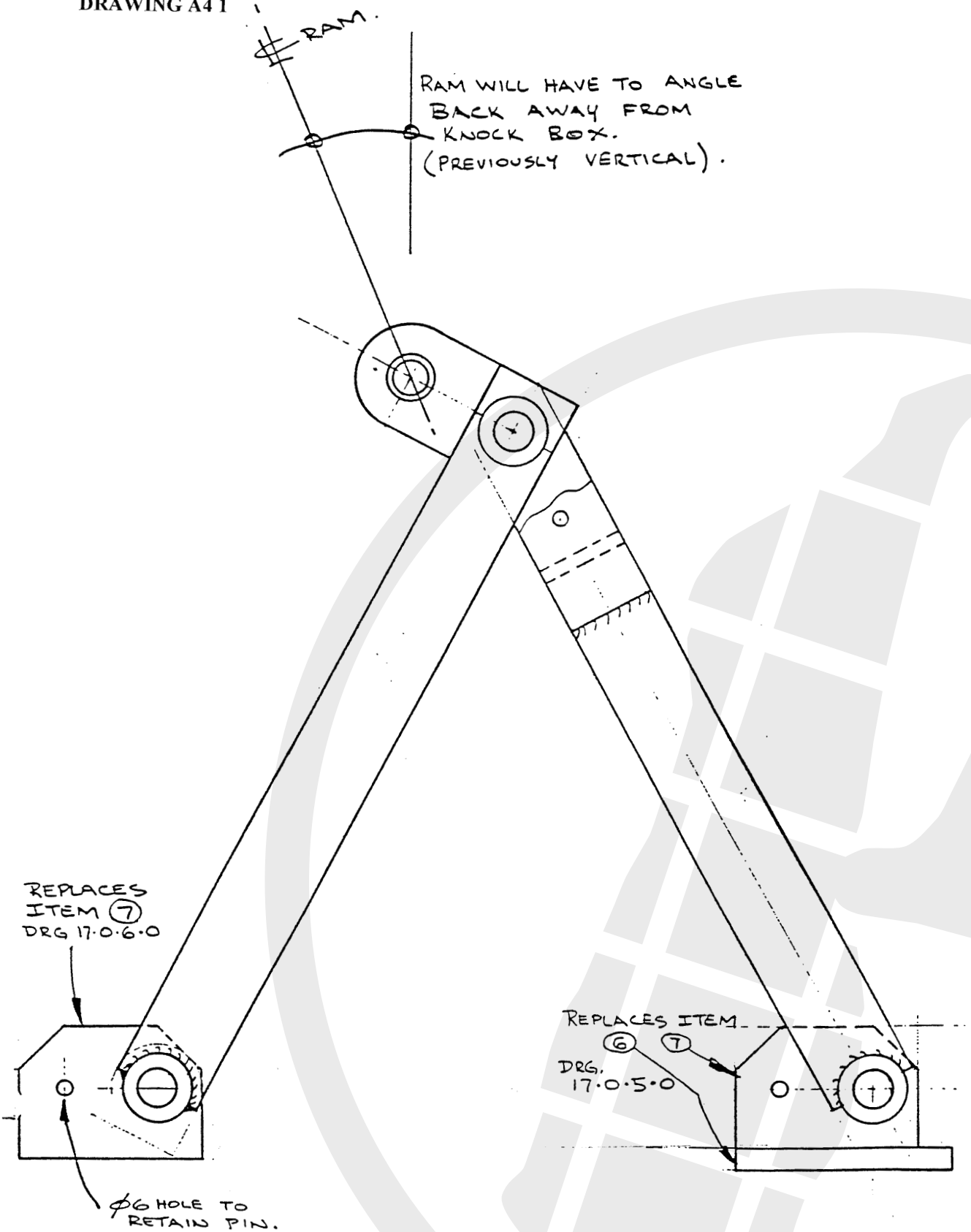
ITEM	DESCRIPTION	MATL	QTY	REMARKS
27	GREASE NIPPLE		2	
26	BRACE	BOX 12 IN.	2	CUT 75 LONG.
25	NYLON WASHER	0.50 X 0.54	2	
24	NYLON WASHER	0.50 X 0.54	2	MACH. S.A. LONG.
23	BEARING HOLDER	0.50 X 0.50	2	MACH. S.B.1 LONG.
22	TIE ROD	0.50 X 0.50	2	CUT 5.5 LONG.
21	ELECTRODE TRIGGER	0.50 X 0.50	2	MACH. S.B.1 LONG.
20	ELECTRODE HOLDER	0.50 X 0.50	2	4.0 X 0.50
19	RAM ROD	0.50 X 0.50	2	10.5 X 7.5 X 0.50
18	PUSHER CROSS ARM	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
17	PUSHER ARM	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
16	PUSHER ARM	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
15	PUSHER ARM	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
14	PUSHER ARM	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
13	PUSHER ARM	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
12	PUSHER ARM	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
11	SEAR EYE	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
10	SEAR EYE	0.50 X 0.50 X 0.50	1	0.50 X 0.50 X 0.50
9	LIFTING PLATE	0.50 X 12 IN.	1	CUT 2.00 LONG.
8	BLANKING PLATES	0.50 X 12 IN.	4	CUT 2.00 LONG.
7	END PLATES	5 THICK PLATE	4	CUT 76 X 98.
6	TOP BRACE	0.50 X 0.50 X 0.50	1	CUT 37 LONG.
5	TOP BRACE	0.50 X 0.50 X 0.50	1	CUT 37 LONG.
4	TOP PLATE	5 THICK PLATE	1	CUT 20 X 15 X 0.50
3	SIDE PLATE	5 THICK PLATE	2	CUT FROM 0.50 X 140
2	BACK PLATE	5 THICK PLATE	1	CUT 45 X 250
1	ENTRY GATE	5 THICK PLATE	1	CUT 190 X 1000

C.S.I.R.O.
DIVISION OF FOOD RESEARCH
MEAT RESEARCH LABORATORY
PROJECT TITLE
WARWICK BACON CO. PTY. LTD.
ENTRY GATE AND PUSHER ASSEMBLY
SCALE 1/4" = 1"
DATE 3/12/67
DRAWN BY
AS. 1100
SHEET OF
17-0-3-C

DRAWING A41

RAM.

RAM WILL HAVE TO ANGLE
BACK AWAY FROM
KNOCK BOX.
(PREVIOUSLY VERTICAL).

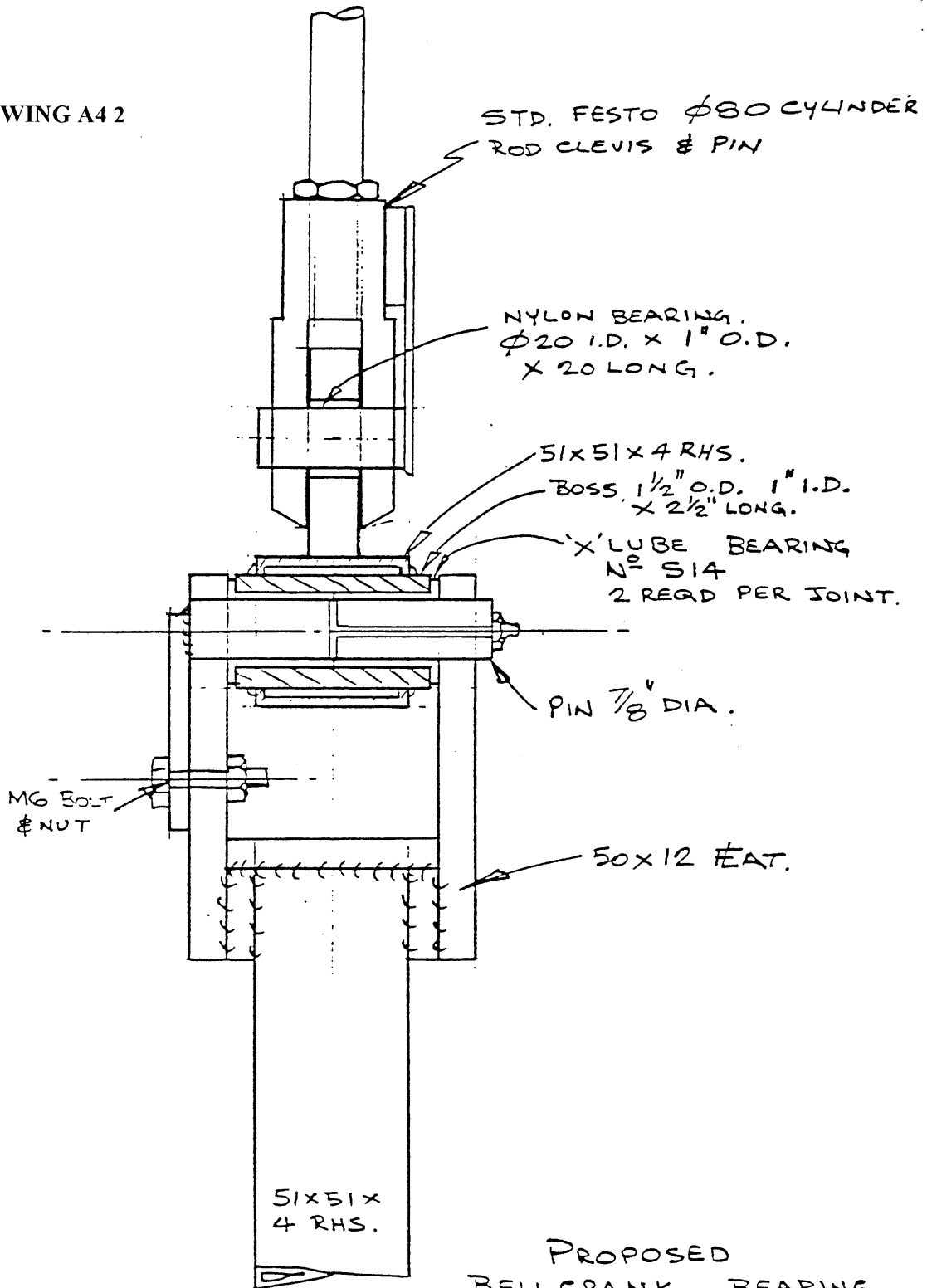


REPLACES
ITEM ⑦
DRG 17.0.6.0

REPLACES ITEM
⑥ ⑦
DRG.
17.0.5.0

φ6 HOLE TO
RETAIN PIN.

DRAWING A42

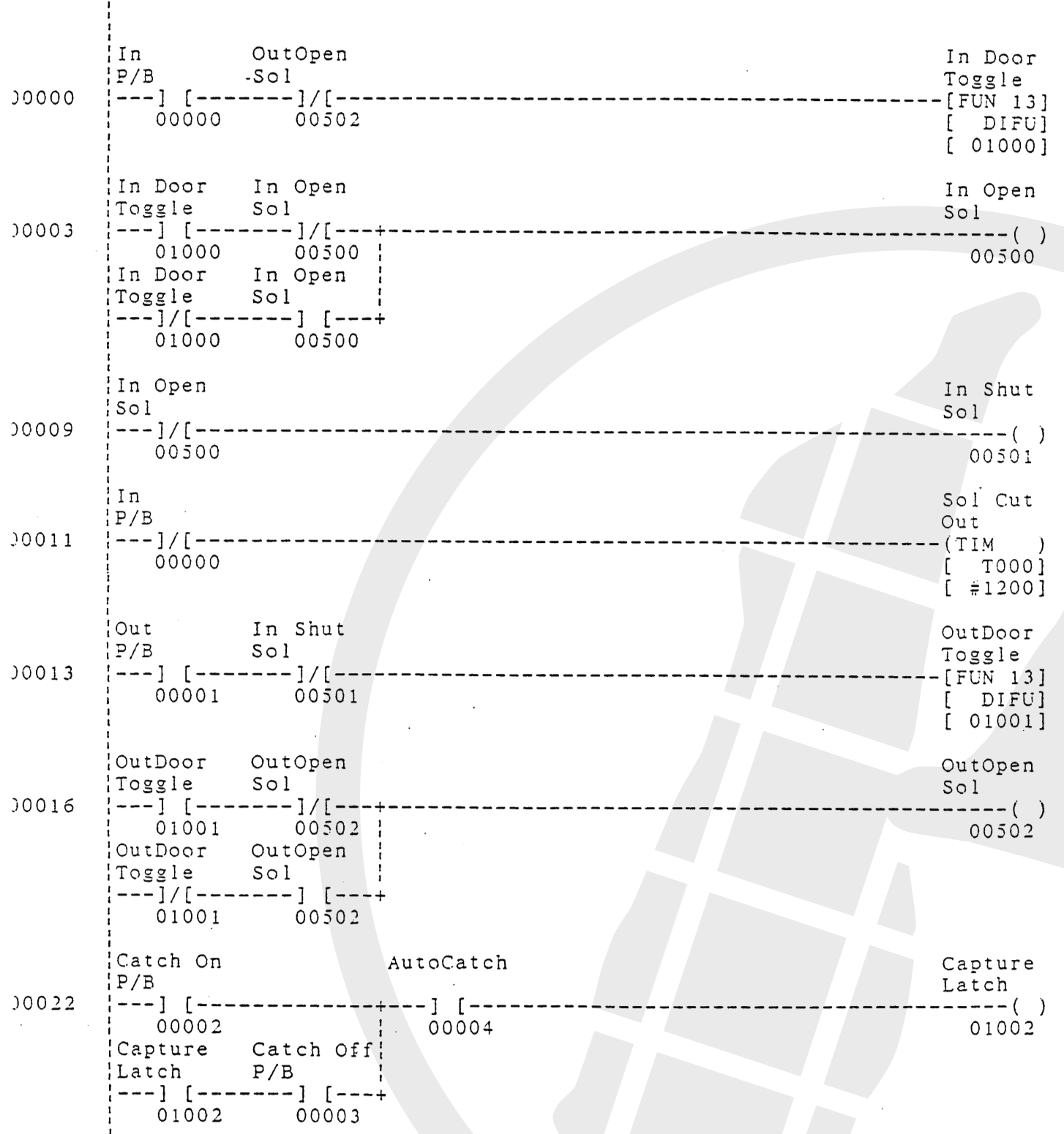


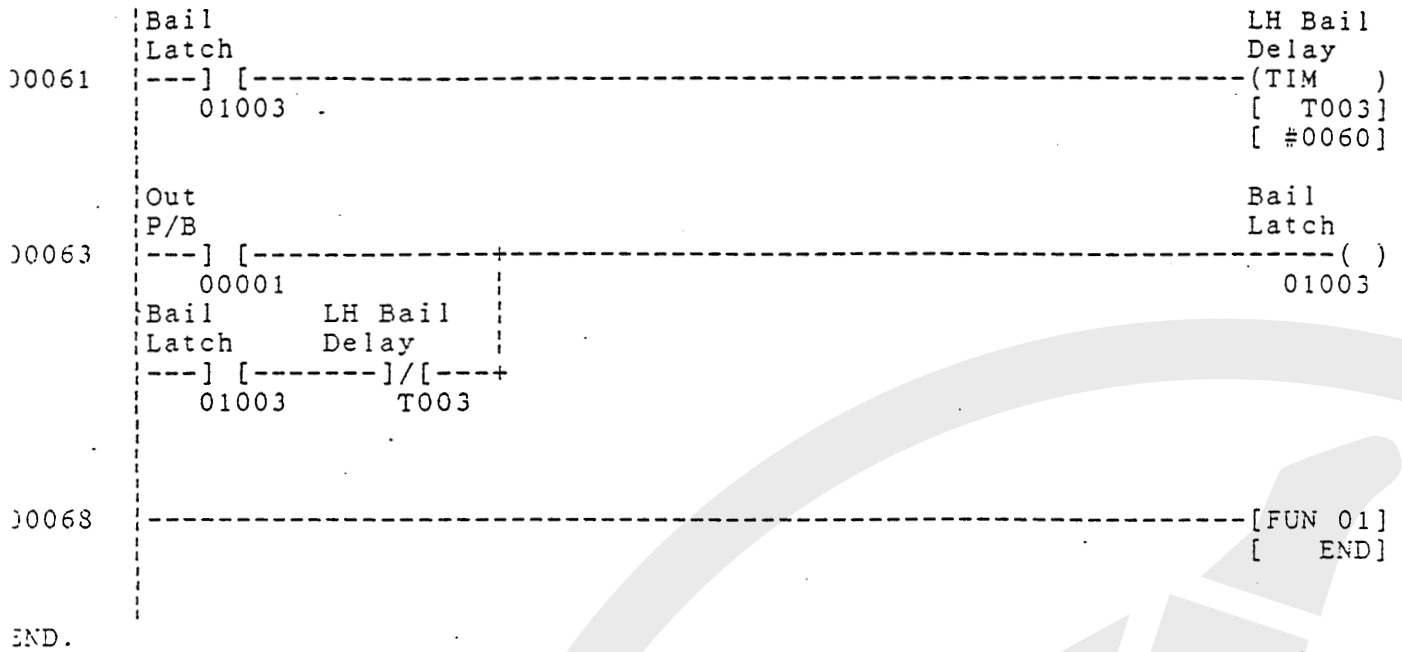
PROPOSED
BELLCRANK BEARING
DETAIL.

CENTRAL JOINT DRAWN,
END JOINTS SIMILAR.

C.S.I.R.O. MEAT
RESEARCH LAB.

R.M. White
13/11/87.





Video presentation

Approximately 10 minutes of the head capture unit in operation showing the important features of design, construction and operation are provided on the Meat and Livestock Australia Technology Transfer DIY Kits' Support Video. Footage relevant to the Cattle Head Capture Unit DIY Kit is approximately located between VCR real time counter units 0:20 to 10:25.

Acknowledgements

Meat & Livestock Australia have prepared this kit with support from the Australian Meat Processors Corporation.

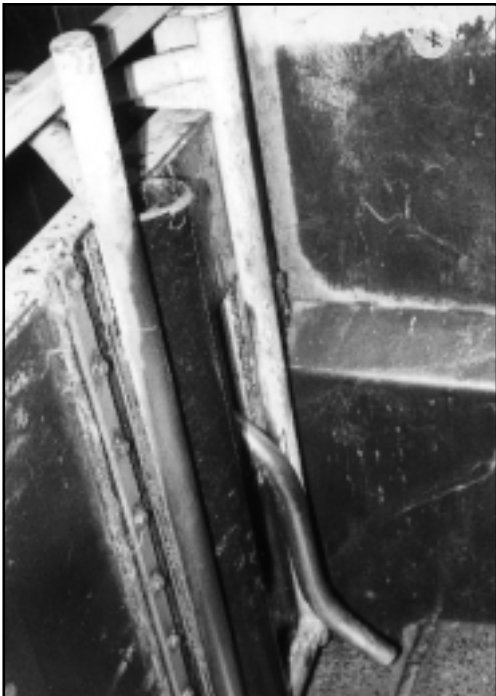
Equipment design

CSIRO - Meat Research Laboratory

Design concept, equipment installation, modification and operation

Warwick Bacon Company

Photograph 2. The head lifting mechanism in a partially raised position.



Photograph 3. Bail mechanism in an open position ready to close on the animal's neck.



Photograph 4. Bail mechanism in a closed position showing the head restrained in an ideal position for stunning and the stunner being applied.



Photograph 5. Inside the knocking box from the entry door showing the square box section that ensures that the animal's head is not lowered and the angled box section that ensures that the stunned animal leaves the box in a foot first position.



Contact

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