FAVELLE FAVCO CRANES

OPERATING, MAINTENANCE AND PARTS MANUAL

CRANE TYPE	:	OFFSHORE PEDESTAL CRANE
CRANE MODEL	:	6/10K
CRANE SERIAL NO.	:	1845
CUSTOMER	:	BANUWATI - K
DELIVERY DATE	:	MAY 2013
PRIME MOVER	:	DIESEL-HYDRAULIC

Designed & Manufactured by:

FAVELLE FAVCO CRANES (M) SDN. BHD.

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FOREWORD

This manual provides operation; maintenance, installation and parts list information for this specific crane.

It is intended as a guide to both the operator and the maintenance personnel to assist them in obtaining the maximum performance and life of the equipment.

The manual does not include manufacturing drawings and in the event of major repairs or replacements, FAVELLE FAVCO CRANES or their nearest representative should be contacted.

To use this manual, refer to next page for an abridged table of contents. Refer to the section which contains the information then refer to table of contents at the front of this section for the specific paragraph, drawing or part required.

All information disclosed in this manual is to be considered confidential and proprietary by FAVELLE FAVCO CRANES and the owner. Communication of the contents to others should not take place without prior written consent.

FAVELLE FAVCO CRANES (M) SDN. BHD.

WARRANTY

FAVELLE FAVCO CRANE (M) SDN. BHD. warrants its products to be free from defects to material and workmanship for a period of twelve (12) months from the date of being placed in operation/offshore commissioning/SAT (Site Acceptance Test) or eighteen (18) months from FAT (Factory Acceptance Test) whichever come first and not exceeding twelve (12) months from date of delivery of the product to the original Purchaser user. The obligation of **FAVELLE FAVCO CRANE (M) SDN. BHD.** (herein after called the Company) options any part of the product, which in the Company's opinion is defective in material and workmanship. All costs of transportation, lodging, labor and shipping of the product to and from the Company's factory shall be charged and paid by Purchaser's. The Company will allow no claim unless such claim is submitted in writing to the Company within thirty (30) days of the date of discovery of the defect(s).

This warranty shall not apply to products which have been operated in a manner other than recommended by the Company or which has been misused or neglected or damaged through an accident or which has been repaired, altered or modified or used in any manner, which in the Company's opinion adversely affects its performance.

This warranty and the Company's obligation hereunder is in lieu of all other warranties, expressed or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose and all direct, indirect or consequential damages with respect to the sale or use of its products.

No person is authorized to change or otherwise modify this warranty or assume any other liability on behalf of the Company unless such change, modification or assumption is made in writing and signed by an officer of the Company.

Any item of the product not manufactured by the Company shall not be covered by this warranty or the implied warranties of merchantability and fitness for a particular purpose or any other warranty from the Company, such items being subject to the warranties of their respective manufacturers.

FAVELLE FAVCO CRANES (M) SDN. BHD.

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Chapter 1.0

GENERAL

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1.1 GENERAL STATEMENT

The 6/10K is a diesel-hydraulic operated, rope luffed boom crane, with a rotating super structure. It consists of 36.6m boom with maximum capacity of 11.5 T double falls main hoist and maximum capacity of 2.2 T single fall fly hoist. Refer to the load chart drawing for further details on lifting capacity.

The crane described in this manual is designed for use in an Offshore Environment for off-loading and back loading supply vessels, general work on the platform and transfer of personnel.

1.2 DESIGN CRITERIA

The design is in accordance with the following specification:

- API Specification 2C Specification for Offshore Cranes.

1.3 PERFORMANCE DATA

Capacity

Main Hoist	: Up to 11.5 T (25353 lb) at SWL 28.0 m (91.9ft) radius (on - board) Up to 7.5 T (16534 lb) at SWL 37.0 m (121.4ft) radius (on - board)
Aux. Hoist	: Up to 2.2 T (4850 lb) at all radii (on – board)
Personnel Hoisting	: Up to 0.9 T (1984 lb) at all radii

Speed

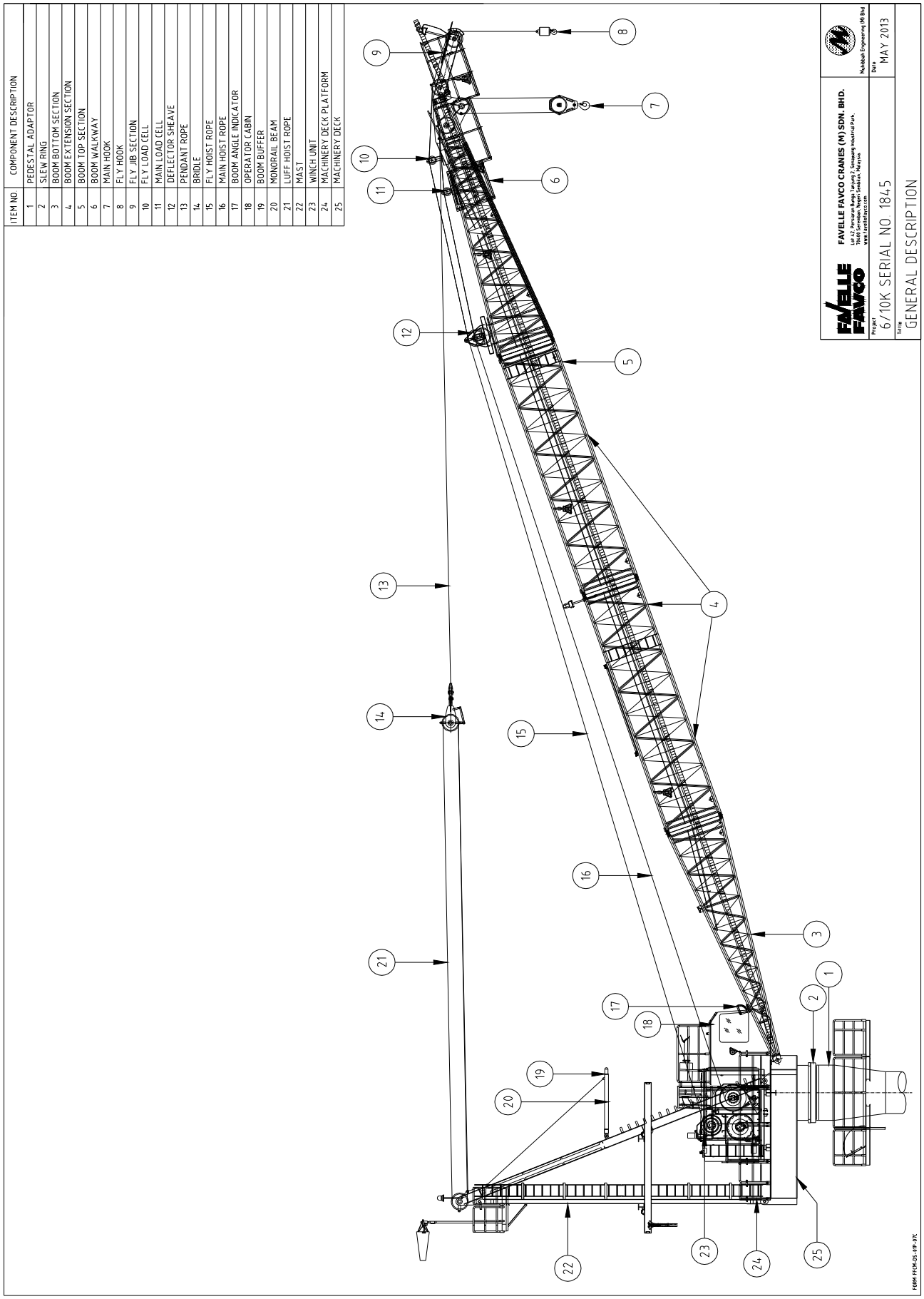
Main Hoist Speed	: Up to 29.8 m/min (1.63ft/sec) @ 11.5 T (25353 lb) SWL
Aux. Hoist Speed	: Up to 83.8 m/min (4.58ft/sec) @ 2.2 T SWL (4850 lb) (average)
Slew Speed	: Up to 1.59 r.p.m.
Luff Speed	: Approximately 94.1 seconds from maximum to minimum radius (theoretical).

1.4 MAJOR CRANE COMPONENTS

For erection, dismantling and transportation purposes, the crane can be broken down into the following main components.

- Pedestal Assembly
- Winch Assembly
- Machinery Deck Assembly
- Boom Assembly
- Mast Assembly
- Cabin Assembly

ITEM NO	COMPONENT DESCRIPTION
1	PEDESTAL ADAPTOR
2	SLEW RING
3	BOOM BOTTOM SECTION
4	BOOM EXTENSION SECTION
5	BOOM TOP SECTION
6	BOOM WALKWAY
7	MAIN HOOK
8	FLY HOOK
9	FLY JIB SECTION
10	FLY LOAD CELL
11	MAIN LOAD CELL
12	DEFLECTOR SHEAVE
13	PENDANT ROPE
14	BRIDLE
15	FLY HOIST ROPE
16	MAIN HOIST ROPE
17	BOOM ANGLE INDICATOR
18	OPERATOR CABIN
19	BOOM BUFFER
20	MONORAIL BEAM
21	LUFF HOIST ROPE
22	MAST
23	WINCH UNIT
24	MACHINERY DECK PLATFORM
25	MACHINERY DECK



1.5 SAFETY

The importance of safe operation cannot be over emphasized. Carelessness and neglect on the part of operators, job supervisors and planners, rigging personnel, and job site personnel can result in their death or injury and costly damage to the crane or property.

The safety information in this publication is intended only as a guide to assist qualified operators in safe operation.

Favelle Favco Cranes cannot foresee all hazards that will arise in the field; therefore safety remains the responsibility of crane operator, maintenance workers and crane owner.

1.5.1 Operator's qualifications

The crane shall be operated only by the following qualified personnel:

1. Designated operators.
2. Trainee under the direct supervision of a designated operator.
3. Inspectors and maintenance or test personnel when necessary in the performance of their duties.

No other personnel shall be allowed to enter operator's cabin while crane is in operation.

Qualified person is defined as one who by reason of training and experience is thoroughly familiar with crane operations and the hazards involved. Such a person shall be physically and mentally fit to operate cranes.

Operator training and qualifications is crane owner's responsibility

1.5.2 Operator's Conduct

1. The operator shall not engage in any practice, which diverts their attention while operating the crane.
2. The operator shall not operate the crane when physically or mentally unfit or under the influence of drugs or alcohol.
3. The operator shall be responsible for all operations under their direct control. When the safety of an operation is in doubt, the operator shall have the authority to stop the operation and refuse to continue until the unsafe conditions have been corrected.
4. The operator shall be thoroughly familiar with operation of the crane and its proper care. If adjustments or repairs are necessary of if there are know defects that impair safe operation, the crane shall not be operated until the unsafe conditions have been corrected.

5. If there is a warning sign at the start controls, the operator shall not start the engine until the sign has been removed by the person who installed it.
6. Before starting the engine, the operator shall make sure that:
   a) All daily inspection and maintenance services have been performed.
   b) All controls are in the off position and all brakes and locking devices are applied or engaged.
   c) All personnel are in the clear.
7. The operator shall test all controls, limits and communication systems (which applicable) at the start of each shift. Any defects found shall be corrected before operation is begun.
8. The operator shall not lift any loads if the machine exceeds the levelness tolerance of 1%. The machine must be level before lifting loads.
9. The operator shall not start crane movement if the load or designated signal person is not within their range of vision.
10. The operator shall respond to signals from the person directing the lift or from the designated signal person. When a signal person or crane follower is not required, the operator is responsible for the lift. Operator shall obey a stop signal at all times, no matter who gives the command.
11. The operator shall verify that the capacity chart being used is the correct one for how the crane is equipped (boom length, load line reeving, counterweight, etc).

The only load charts that may be used with this crane are those included in the Drawing Section of this manual and located inside the operator's cabin. Do not use any other capacity charts with this crane. If capacity charts are missing contact Favelle Favco Cranes.

12. The operator shall perform the following operations before leaving the operators cabin for any reason:
   a) Park the crane and position the upper works so the crane does not interfere with operation of other equipment
   b) Land any attached load
   c) Move all controls to off
   d) Stop the engine
13. The operator shall perform the following operations if power or a control function fails during operation:
   a) Land all suspended loads
   b) Switch all controls to off
14. If the crane will be operated at night, the operator shall make sure that there is sufficient lighting for safe operation. The load and landing area shall be illuminated.

15. The operator shall not operate the crane during periods of bad weather if his ability to see the load or signal person is impaired by darkness, fog, rain, snow, etc.
16. Wind can cause the crane to tip or the boom and other attachments to collapse. The operator or the designated person directing the lift shall compensate for the effect of wind load and boom by reducing speeds, or combination of both.
17. Unless otherwise specified on the load chart, stop operation under the following wind conditions:
    a) If the wind causes the load to swing forward past the allowable operating radius or sideways past either the boom heel pin, land the load.
    b) If the wind exceeds the limit stated on the appropriate load chart, land all loads and apply brakes, lower the boom onto blocking at ground level or otherwise restrain it.

Do not operate in winds speeds in excess of 20.1m/s.

1.5.3 Handling the load

A. Size of load

1. The crane shall not be loaded beyond the applicable rated capacity
2. The operator or designated person directing the lift shall verify that the weight of the load is within the rating for the radius which the load will be lifted.
3. The load chart for the crane is kept in the operator's cabin.

B. Attaching the load

1. Attach the hook to the load with slings, or other suitable rigging. Each hook shall have a latch that is in proper working order. Hook latches shall not be wired open.
2. Only use sling and other rigging, which are in safe operation condition and have a rating equal to or greater than the load to be lifted.
3. Do not warp the load line around the load.
4. Use suitable protection between slings and sharp edges on the load.
5. Secure unused legs of a multi leg sling before handling a load with one leg of the sling.

C. Lifting/Moving the load

1. Before lifting or moving the load, the operator or the designated person directing the lift shall make the following checks:
    a) The load is secured and properly balanced in the slings or lifting device before lifting the load more than few centimeters/inches.

    b) The lift and swing paths are clear of personnel and obstructions.

c) The load is free to be lifted.

d) The load line is not kinked or otherwise damaged.

e) Multiple part load lines are not twisted around each other in such a manner that the lines will not separate when the load is lifted.

f) The hook is brought over load in a manner that will minimize twisting or swinging.

g) The load line and boom hoist ropes are properly spooled on the drums and seated in the sheaves.

h) The operator shall test the brakes each time a load approaching the rated load is handled by lifting the load a few centimeters/inches and positioning the control handle in neutral.

2. While lifting the load, the operator shall take the following precautions:

a) Accelerate and decelerate the load smoothly to avoid excessive stress on the crane boom and machinery.

b) Avoid sudden starts and stops while swinging. Keep the swing speed under control to prevent the load from swinging out beyond the radius at which the load can be handled and to minimize the pendulum action of the load.

c) Use taglines or other restraints to control the load when necessary.

d) Do not exceed any swing limitations (areas of operation) given on load chart.

e) Do not allow the load, the boom or any other part of the crane to contact obstructions.

f) Do not hoist, or lower, or swing the load while personnel are on the load hook.

g) Avoid carrying the load over personnel. Loads, which are suspended, shall be blocked or supported by the ground or a suitable structure before personnel are allowed to work under or between them.

h) Operate with caution when using two or more cranes to lift the same load. One designated person shall be responsible for the operation when two or more cranes are used to lift the same load. The designated person shall analyze the lift and instruct all personnel involved in the proper rigging and positioning of the load and all movements to be made. Decisions such as the necessity to reduce crane ratings, load position, boom position, ground support, and speed of movements shall be in accordance with the designated person's decision.

i) Do not lower the load or the boom to the point that less than five full wraps of wire remain on the respective drum.

D. <u>Holding the Load</u>

When a load is suspended, the operator shall take the following precautions;

1. Not leave their position at the controls.

2. Not allow personnel to stand or pass under the load.
3. Move controls to off.

E. Signals

1. Signals to the operator shall be in accordance with the standard signals.
2. The operator should easily understand all signals to the operator at all times. The operator shall not respond to any signals, which are not clearly understood.
3. When it is necessary to give instructions to the operator, all crane motions shall be stopped.
4. The signal person shall:
   a) Be qualified by experience with crane operations and thoroughly familiar with the standard signals.
   b) Be positioned in clear view of the operator. The signal person's position should give him or her clear view of the load, the crane and the operating area.
   c) Direct the load so the load does not pass over personnel.
   d) Keep unnecessary personnel out of the crane's operating area.

F. Getting onto or off crane

1. Personnel getting onto or off the crane shall do so only at designated areas and only while the crane is parked.
2. When personnel use ladders to get onto and off the crane, their hands shall be free of any objects. Objects that cannot be carried in pockets or tools belts shall be lifted into place with a hand or hoist.

G. Cabins, Ladders and Walkways

1. Necessary clothing and personal belongings shall be stored so they do not interfere with access to the operator's cabin or with operation of the crane.
2. Tools, oil cans spare parts and other necessary equipment shall be stored in toolboxes and not allowed to lie around loose in the operator's cabin or walkways and stairs. All waste shall be disposed off.

H. Refuelling

1. When using a portable container to refuel the crane, the container shall be a safety-type can equip with an automatic closing cap and a flame arrestor.
2. The engine shall be stopped before refuelling the crane.
3. Smoking and open flames shall be prohibited in the refuelling area.

I. Fire Extinguishers

1. A portable fire extinguisher shall be installed in the cabin at all time.

2. The operator and all maintenance personnel shall be thoroughly familiar with the location, use and care of the fire extinguisher.

1.5.4 Safe maintenance practices

Training/ qualification of maintenance personnel is responsibility of the crane owner.

1. Perform the following steps before starting a maintenance procedure:
   a) Park the boom where it will not interfere with other equipment or operations.
   b) Lower all loads to the ground.
   c) Move all controls to off and secure all functions against movement by applying or engaging all brakes.
   d) Stop the engine and render the starting means inoperative.
   e) Place warning signs alerting other personnel that the crane is being serviced.

Do not remove sign until it is safe to return crane to service.

2. Do not attempt to maintain or repair any part of the crane while the engine is running, unless absolutely necessary.

If the engine must be run, keep your clothing and all parts of your body away from moving parts. Maintain constant communication between person at controls and person performing maintenance or repair procedure.

3. Wear clothing that is relatively tight and belted.

Do not wear loose fitting clothing

4. Wear appropriates eye protection and an approved hard hat.
5. When climbing onto the crane, use hands and the handrails, steps and ladders. Lift tools and other equipment, which cannot be carried in pockets or tools belts onto and off the crane with hand lines or hoist.
6. Lower the boom onto the boom rest before doing work on the boom.
7. Pressurized air and hydraulic oil can cause serious injury. Make sure all air and hydraulic lines, fittings and components are tight and serviceable.
8. Relieve pressure before disconnecting air and hydraulic lines and fittings.
9. Do not remove the radiator cap while the coolant is hot or under pressure. Stop the engine, wait until pressure drops and the coolant cools, and then slowly remove the cap.

10. Avoid battery explosion: do not smoke while performing battery maintenance; do not short across the battery terminals to check its charge.
11. Avoid battery acid contact with skin and eyes. If contact occurs, flush the area with water and immediate consult a doctor.
12. Stop the engine before refueling the crane.
13. Do not smoke or allow open flames in the refueling area.
14. Hydraulic oil can be also flammable. Do not smoke or allow open flames in the area when filling hydraulic tanks.
15. Never handle wire rope with bare hands. Wear leather rigging gloves.
16. Only use cleaning solvents, which are non-volatile and non-flammable.
17. Do not lift heavy components by hand. Use a hoist jack, or blocking to lift components.
18. Use care while welding or burning on crane. Cover all hoses and components with non-flammable shields or blankets to prevent a fire or other damage.
19. Disconnect and lock the power supply switch before attempting to service high voltage electrical components and before entering tight areas containing high voltage components.
20. When assembling and disassembling booms, jibs or masts on ground, securely block each section to provide adequate support and alignment. Do not go under boom or mast sections while connecting bolts or pins are being removed.
21. Unless authorized in writing by Favelle Favco do not alter the crane in any way that might affect the performance (to include welding, cutting, or burning of structural members or changing pressures and flow of air/hydraulic components). Doing so will invalidate all warranties and load charts and make the crane owner liable for any resultant accidents.
22. Keep crane clean. Accumulations of dirt grease, oil rags, paper and other waste will not only interfere with safe operation and maintenance but also create a fire hazard.
23. Store tools, oils cans, spare parts and other necessary equipment in toolboxes. Do not allow these items to lie around loose in the operator's cabin or on walkways.
24. Do not store flammable materials on the crane.
25. Do not return the crane to service at the completion of maintenance or repair until all guards and covers have been reinstalled, trapped air has been bled from the hydraulic systems, safety devices have been reactivated, and maintenance equipment has been removed.
26. Perform a function check to ensure proper operation at the completion of maintenance or repair.

Chapter 2.0

INSTRUCTION FOR INSTALLATION (ONSHORE & OFFSHORE)

Section 2.1 Delivery Checks

Section 2.2 Erection Accessories

Section 2.3 Crane Erection – General

Section 2.4 Crane Erection Guide

Section 2.5 Attachment

2.1 DELIVERY CHECKS

A. Packing List

FFCM will prepare a packing list of items that will be shipped. The packing list will be prepared to reflect the actual packing arrangement of the components, that is, items packed in containers can be systematically identified by container numbers or bulk item numbers

The packing list will identify:

a) All bulk materials

b) All containerized items

c) All loose items in boxes

B. Prior to Release

All items in the packing list will be identified and verified that items are packed in a manner suitable for shipping.

All boxes and loose items shall be secured to the base of the flat rack and/or container.

Items in bulk or containers shall then be located in designated storage areas or placed directly on transportation vehicles for delivery.

C. Check List

Each component of the crane must be checked immediately after delivery to site. Components can be damaged during transport, and is important that any damage incurred during transport be discovered prior to erection so that safe operation and structural integrity of the crane are not affected. Any damage must immediately be reported to **Favelle Favco Cranes (M) Sdn. Bhd.**, who will decide whether the damaged component can be repaired or if a new part is required.

The following check list will be of assistance when checking a crane after delivery to the site:

- Check against delivery dockets, packing list and delivery specification to ensure that delivery is complete.
- Make a note of all damages and describe them, obtaining truck driver's name and vehicle registration number for your insurance purposes.
- Ensure that components have adequate support and are clear of mud, water etc., when stored on site.
- Structural components shall be free from deformations.
- Crane wire ropes shall be clean, well lubricated and stored on reels or on winch drums for transport.

- Ensure that all connector pins, washers and fastening devices are on site, adequately lubricated and are ready for initial assembly.
- Check all oil and water levels on the power pack and top up where necessary (See lubrication schedule for grades and quantities).
- Repair the damaged and scuffed areas of paintwork.

2.2 ERECTION ACCESSORIES

A. Erection Gear

Ensure that adequate slings and lifting gear is available on site and conforms to the local statutory requirements.

Chains must not be used under any circumstances on boom sections as these sections are manufactured from thin wall, high tensile tube.

Lifting beams must have adequate strength and conform to requirements of the relevant authorities.

B. Reeving and Sock

A manila or hemp reeving rope complete with “wire rope sock” will be required to assist the reeving of the luff, main hoist and auxiliary hoist wire ropes. Ensure that the “sock” will pass over the respective “buttons” on the wire ropes.

C. Drum Reel Support

A stand for the reels of wire rope may be required so that the wire ropes may be reeved onto the winch drums without kinking and twisting.

2.3 CRANE ERECTION - GENERAL

Prior to crane erection, ensure that:

i. The crane components have been checked and are in good working condition.
ii. Adequate mobile cranage, including lifting slings, erection gear etc., is available.
iii. Construction crew and tools are available for the job.
iv. A service engineer will be required to commission the crane upon the completion of erection.

2.4 CRANE ERECTION GUIDE

Depending on the availability of suitable carnage for erection, the machinery deck can be installed either bare or partially assembled with cabin and slew drive. It is recommended that the machinery deck is suitably secured to the hook with at least four slings or chains, which must be adjustable in length to have the slew ring mounting surface as level as possible.

Tighten slew ring studs using clamping force shown on slew ring assembly drawing in ***Chapter 9.0***.

The following is a suggested erection procedure for the upper structure of the crane.

ITEM	ERECTION PROCEDURE FOR UPPER CRANE STRUCTURE	CHECK
1)	Fix pedestal adaptor to client's pedestal. Check: a) Correct orientation before welding. b) Weld on pedestal adaptor and pedestal interface (NDT). c) Levelness and flatness of top flange. Refer to ***Attachment A*** at the end section for the procedure. d) Put slip ring and all its attachments into the pedestal before installing the machinery deck.	
2)	Fit pedestal platform to the pedestal adaptor. Ensure all external attachments to the pedestal adaptor are attached.	
3)	Prepare Machinery Deck Assembly for lifting. a) Machinery deck including slew drive and slew ring to be bolted to pedestal adaptor. Secure the pins properly b) Fit access ladders, platforms, handrails and other accessories. c) Bolt control cabin into position. Avoid damage to the hydraulic hoses and/or electric cables. d) Check main hoist, luff, slew and fly winch drive gearbox oil levels. e) Check hydraulic oil tank level; remove water from tank if present, top up with new clean oil. f) Exchange filters elements if necessary. g) Check relief valve settings, pressure switch settings. h) Check all hydraulic hoses and fittings. Ensure that the emergency lowering needle valves on main hoist and luff are tightly closed.	
4)	Fit winch and powerpack assembly to machinery deck and bolt securely. Refer to bolt torque chart, i.e. drawing MA4-9900.069.	
5)	Lift machinery deck including slew drive and slew ring to be bolted to pedestal adaptor. Tighten slew ring studs using clamping force shown on Slew Ring Assembly drawing.	

6)	Assemble the slip ring as per Slip Ring Assembly drawing.	
7)	Connect mast, complete with sheaves, braces, ladders and boom buffer to machinery deck. Lower carefully into position. All pins to be slightly greased and securely locked into position.	
8)	Winch, powerpack and slew drive can now be made operative: a) Connect all fluid hoses as marked or as shown on fluid circuits, including hooking up the hoses to slew drive. b) Hook up power lines to machinery deck. c) Hook up control lines to and from powerpack. d) Hook up control lines to cabin.	
9)	Fit and connect hoses to luff in deceleration and stop limit, and bleed lines. Mount luff in deceleration and stop limit to boom heel.	
10)	The complete boom is assembled together with the pendant straps and luffing bridle, which is temporarily supported on the boom. Lift boom with slings only (to prevent damage) and connect to the machinery deck. Hold boom in position until luff rope can take the load or hold with erection pendants if available.	
11)	The luff system is reeved by running the reeving rope through the sheaves and using the luff drum as windlass. Both rope ends to be securely locked into position. Remove temporary bridle support as soon as bridle lifts off the boom. Remember to reeve the luff rope as per reeving diagram, securely clamping to drum assembly.	
12)	Final checks prior to load testing and/or actual work must be undertaken. They should include the following: a) Check all fluid levels as set in 'Daily Check List'. b) Check all components are lubricated. c) Test run electric motor and bleed off air in hydraulic system. d) Test main hoist and luff motion, and check hydraulic hoses and fittings for leaks. Rectify if required.	
13)	Reeve the main hoist rope as shown on the reeving diagram, i.e. MA3-5000.258. ***All hoist ropes must lie tightly on bottom layers to prevent crushing of rope during heavy lifts.***	
14)	Uncouple the limit switches then re-connect the luff and main hoist limit switches on the winch and adjust luff limit to its maximum and minimum radius position. Check load chart in ***Chapter 9.0*** for radius settings according to boom length. Adjust hoist limits as set.	
15)	Check and configure Crane Safe Load Indicator.	
16)	Follow commission procedures to commission crane.	
17)	Fill in final approval documents for submission.	

Note: For detailed installation, refer Crane Installation Procedure drawings as followed.

2.5 ATTACHMENTS

A. **Attachment A** *(Procedure For Flatness Measurement)*

B. **Attachment B** *(Crane Installation Procedure)*

C. **Attachment C** *(Crane Lifting Arrangement Drawings)*

Attachment A

FAVELLE FAVCO

PROCEDURE No : FFCM – QA – 29P	REV : 02	Effective Date : 07/04/2011

Title : Procedure For Flatness Measurement.(Circumference And Redial).

REV	DOCUMENT HISTORY	EFFECTIVE DATE	ORIGINATOR
00	Initial Release	01/04/2009	Shahril Nizal
01	Replace New Sketch Marking For Pedestal Adaptor And Machinery Deck.	25/04/2009	Shahril Nizal
02	Change new sample report	07/04/2011	Shahril Nizal

APPROVED BY			
NAME	DESIGNATION	SIGNATURE	DATE
YAP ENG JIN	GENERAL MANAGER		21/4/11
LIM YUIN KHONG	MANAGEMENT REP.		12/4/2011

1.0 PURPOSE

1.1 The purpose for this procedure is to ensure proper steps, precaution and consideration to be taken during the flatness measurement on the machined surface with the use of laser measurement equipment.

2.0 SCOPE

2.1 This procedure applies for the flatness measurement of circular planes or a machined surface such as slewing bearing flange with the use of laser measurement and alignment system.

3.0 REFERENCES

3.1 Easy-Laser Measurement And Alignment System's Manual
3.2 FFCM-PD-02W - Flange Machining Work Instruction

4.0 DEFINITIONS

4.1 FFCM - Favelle Favco Cranes (M) Sdn. Bhd.
4.2 ELMS - Easy- Laser Measurement And Alignment System

5.0 PROCEDURE

5.1 GENERAL

Prior to any measurement of the flange flatness on the machined surface, the following steps and precautions shall be taken into consideration as these variables may contribute to the accuracy of the measurement.

5.1.1 Preparation
Setup of Adaptor
Adaptor is to be supported to ensure there is no movement possible; care is to be taken to set up so that there is no possibility of any deformation of the flange.

5.1.2 Temperature

5.1.2.1 As temperature may affect the accuracy of the measurements it is important to ensure and maintain the differential of surface temperature of component from ambient temperature to within 10°C (Celsius). Stabilizing of the components temperature to the ambient temperature may be achieved by placing it in the environment for a minimum of two

(2) Hours prior to any measurements being taken.

5.1.2.2 The time of measurement shall be recorded and verified, a signature will be required for the person recording and another for verification of the time.

5.1.2.3 The temperature of the flange and shell 250mm from the flange shall be recorded as will the ambient temperature.

5.1.3 Surface cleaning

The surface shall be free of any debris from machining operation, lubricant and protective coating (if any) which may contribute to the accuracy of the measurements taken.

5.1.4 Marking

5.1.4.1 As general practice, the number of measurement points to be taken shall be equidistant around the circumference starting at "1" position on the Adaptor as described below:

FLANGE ≤200MM WIDTH

Flange Diameter	Measurement Points
1. 2.0 m and below	32 area (min.) = 64 points (Inner and Outer)
2. Above 2.0 m	68 area (min.) = 136 points (Inner and Outer)

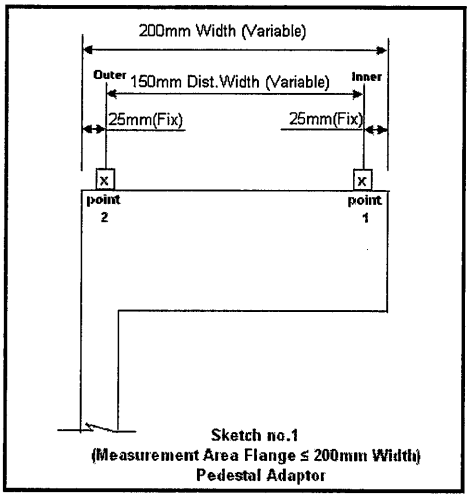
FLANGE >200MM WIDTH

Flange Diameter	Measurement Points
1. 2.0 m and below	32 area (min.) = 64 points (Inner and Outer A) 32 area (min.) = 64 points (Inner and Outer B)
2. Above 2.0 m	68 area (min.) = 136 points (Inner and Outer A) 68 area (min.) = 136 points (Inner and Outer B)

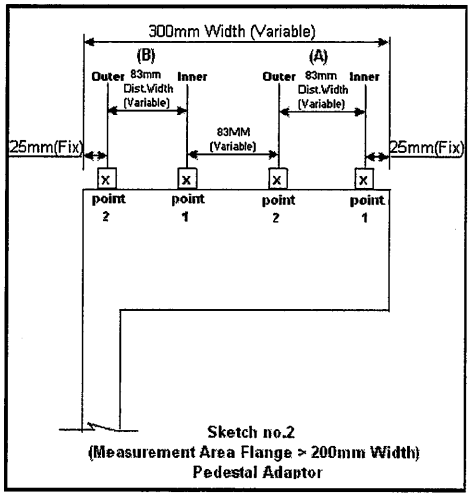
5.1.4.2 Mark all the measurement points in indelible marker on the surface as a reference.

5.1.4.3 At each of the measurement points, a measurement shall be taken on the inner and outer of the machined flange as a minimum.(refer sketch no:1)

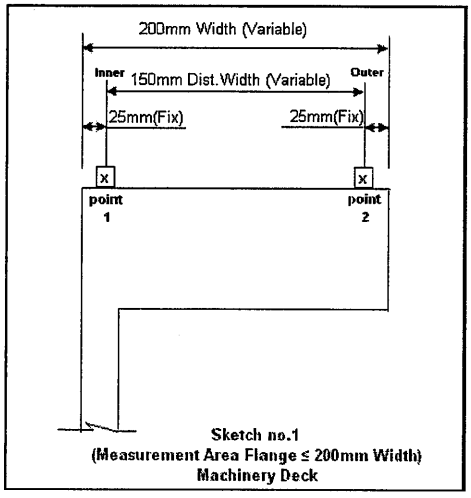
5.1.4.4 Above than 200mm width a measurement shall be taken on the inner and outer (A) also inner and outer (B) of the machined flange.(refer sketch no:2)



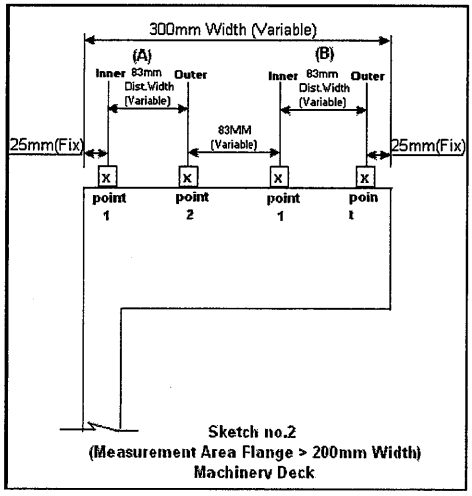
Sketch no.1
(Measurement Area Flange ≤ 200mm Width)
Pedestal Adaptor



Sketch no.2
(Measurement Area Flange > 200mm Width)
Pedestal Adaptor



Sketch no.1
(Measurement Area Flange ≤ 200mm Width)
Machinery Deck



Sketch no.2
(Measurement Area Flange > 200mm Width)
Machinery Deck

5.2 SETUP OF ELMS

5.2.1 Place the ELMS at or near the measurement component. Level ELMS to within 0.05 mm to three (3) points evenly placed on the circle as shown in Figure 1 below.

Figure 1

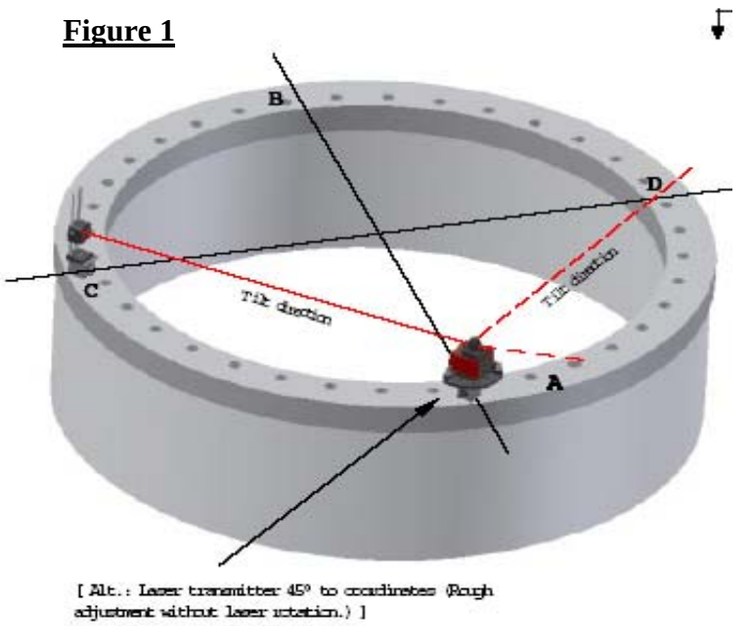
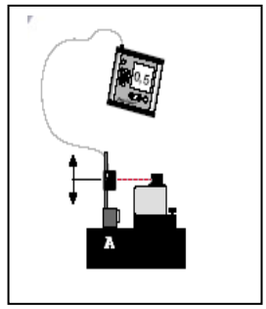


Figure 2



REFERENCE POINTS

Number of Points	Reference Points
1. 64 points	Point no:1 , Point no:22 , Point no:43
2. 136 points	Point no:1 , Point no:46 , Point no:91

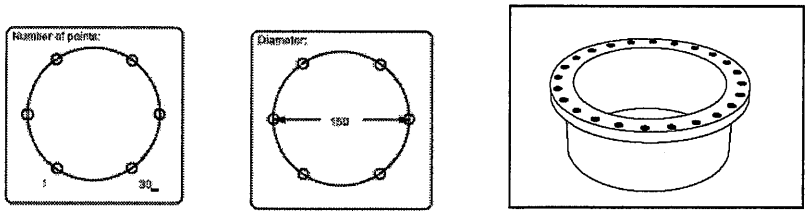
5.2.2 Start the laser rotation and program Values or Flange, then adjust the detector up or down on the rods within 0.05mm at pos. A (Figure 2) as shown above. Then place the detector at B and C and adjust the value within 0.05mm with the tilt screws at the transmitter. When the values at A, B and C are within 0.05mm the measurement can start.

5.3 FLATNESS MEASURING

After all the above has been taken into consideration and aligned, it is ready for taking measurement for the surface flatness. However the following steps shall follow :

5. 3.1 Record Traceability
Enter the number of measurement points (64–136) and the center of the flange diameter for the measurement points (for documentation).
Example of points as shown in the Figure 3.

Figure 3



5.3.2 Measurement Record
Place the detector on the first measurement point on the inner flange and record the value (zeroing can be made at the first point). Then continue with the rest of the points until all reading has been taken on the marked measurement points.

5.3.3 Result
The result can be displayed as a table or a graph. The largest deviation from zero sets the scale on the display to one of three possible. Smallest and largest measurement values are displayed as Min. and Max. Up to 10 measurement points can be displayed at each page.

5.3.4 Selecting Reference Points.
Three of the measurement points can be set as reference by setting one point as reference. The program calculates the two others, evenly placed on the circle. The reference points are set to zero. The other points will be recalculated. New reference points can be set on a previous stored measurement.

5.3.5 Upon completion of recording the flatness measurement, the result can be down loaded into computer for 3-D presentation, recalculation and report. Sample of the report is shown in Attachment 1.

5.3.6 The acceptance and rejection of the result shall comply with the criteria as determined in the project specification or drawing of the component measured.

5.4 PRECAUTION

The following precaution shall be observed after machining and flatness measurement as these will constitute the accuracy of the flatness :

5.4.1 No modification, hot work which include but not limited to heating, cutting or welding be allowed directly on the component with machined surface.

5.4.2 Disallow removal of component's internal supports which include but not limited to the internal support bracing.

5.4.3 The component shall be placed or sit on the flat ground. Care shall be taken on places or supports which may constitute deformation to the surface measure.

5.4.4 Care shall be taken on activities which may constitute deformation on the component.

5.4.5 In the event that the above works is unavoidable, the flatness re-measuring shall be performed as per the steps described in Clause 5.1 and 5.2.

ATTACHMENT I

Three points are set to zero by choosing one point, the two other will be calculated by the program, evenly placed at the circle. Zero points marked with yellow and red. See attached sample of report.

1) Sample report, Flange ≤200mm Width – FFCM-QA-29P-01A
2) Sample report, Flange > 200mm Width – FFCM-QA-29P-02A

FLATNESS MEASUREMENT REPORT

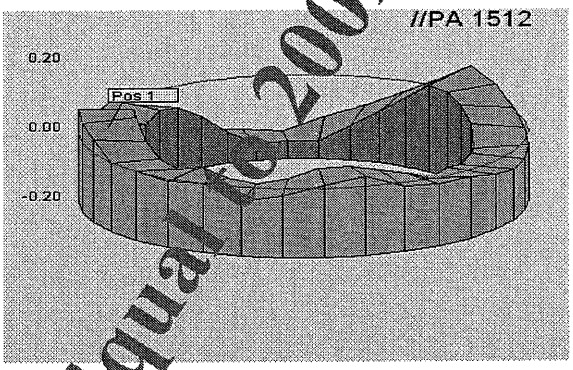
Project / Location :	XXXX	**Date :**	XXXX
Client :	XXXX	**Crane Serial No:**	XXXX
Crane Model :	XXXX	**Verified By :**	XXXX
Conducted By :	XXXX	**Signature :**	XXXX
Signature :	XXXX		

FAVELLE FAVCO

Subject / Component Detail	**Adaptor Flange For Crane Serial no. : XXXX**

Measurement Detail								
Equipment Detail			**Temperature (Deg.C)**			**Time Measured (HH:MM)**		**Ref. Planar Tolerance**
Manufacturer	**Model**	**Serial No.**	**Ambient**	**Flange**	**Shell**	**Start**	**Finished**	**(< 0.05 mm)**
Easy-Laser (Transmitter)	Easylink 2.0	32109	XXXX	XXXX	XXXX	XXXX	XXXX	Within 0 - 0.03
Easy-Laser (Receiver)	P85	32405						

ID (mm)	XXXX
OD (mm)	XXXX
Avg Flg. Thk (mm)	XXXX
Surface Profile (Micron)	XXXX
Points (Nos)	XXXX
Dist Width (mm)	XXXX
Dist Btw Pts (mm)	XXXX



Easylink 2.3 P1
Registered to SHAHRIL NIZAL BIN SHAMSUDIN, FAVELLE FAVCO CRANE (M) SDN BHD

Filename:	//PA 1512
Date:	08.08.25
Time:	11:45
Program:	Flange
Unit:	mm
Serial:	32559 / 32405
Temp:	28.5C

FLATNESS READING				**STRAIGHTNESS READING**
				Deviation
Pos	Ref	Inner	Outer	(Inner) - (Outer)
	1	0	-0.02	0.02
	2	-0.02	-0.01	0.01
	3	0	0.01	0.01
	4	-0.01	-0.03	0.02
	5	-0.05	-0.09	0.04
	6	-0.11	-0.14	0.03
	7	-0.15	-0.15	0
	8	-0.15	-0.16	0.01
	9	-0.15	-0.12	0.03
	10	-0.1	-0.08	0.02
	11	-0.05	-0.03	0.02
	12	0	0.02	0.02
	13	0.05	0.02	0.03
	14	0.05	0.05	0
	15	0.03	0.01	0.02
	16	0	-0.02	0.02
	17	-0.05	-0.06	0.01
	18	-0.04	-0.05	0.01
	19	-0.05	-0.05	0
	20	-0.04	-0.04	0
	21	-0.05	-0.02	0.03
	22	-0.02	-0.02	0
	23	0	-0.01	0.01
	24	0.03	0.03	0.01
	25	0.02	0.01	0.01
	26	0.01	-0.02	0.01
	27	-0.03	-0.04	0.01
	28	-0.02	0	0.02
	29	0	-0.01	0.01
	30	0.02	0	0.02
	31	-0.01	0	0.01
	32	0.02	0.04	0.02
	33	0.07	0.06	0.01
	34	0.07	0.07	0

Max	0.08	Max	0.04
Min	-0.16	Acceptance	XXXX
Peak-Peak	0.24	Result	XXXX
Average level	-0.02		
Standard dev	0.04		
Flatness Rms	0.06		
Acceptance Peak To Peak	XXXX		
Result	XXXX		

FLATNESS MEASUREMENT REPORT

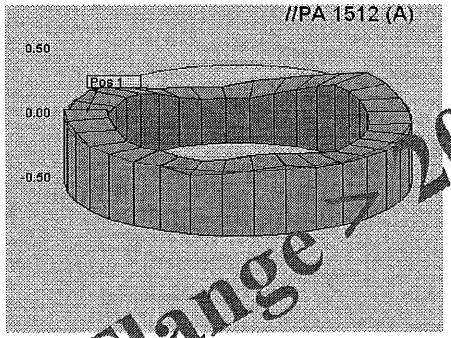
Project / Location :	XXXX	**Date :**	
Client :	XXXX	**Crane Serial No:**	
Crane Model :	XXXX	**Verified By :**	
Conducted By :	XXXX	**Signature :**	
Signature :			

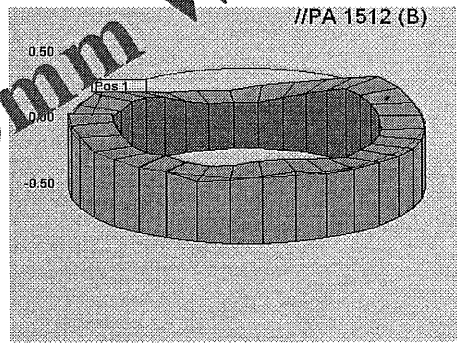
FAVELLE FAVCO

Subject / Component Detail	**Adaptor Flange For Crane Serial no. : XXXX**

Measurement Detail								
Equipment Detail			**Temperature (Deg.C)**			**Time Measured (HH:MM)**		**Ref. Planar Tolerance**
Manufacturer	**Model**	**Serial No.**	**Ambient**	**Flange**	**Shell**	**Start**	**Finished**	**(< 0.5 mm**
Easy-Laser (Transmitter)	Easylink 2.0	32109	XXXX	XXXX	XXXX	XXXX	XXXX	With 10 to 0.03
Easy-Laser (Receiver)	P85	32405						

ID (mm)	XXXX
OD (mm)	XXXX
Avg Flg. Thk (mm)	XXXX
Surface Profile (Micron)	XXXX
Points (Nos)	XXXX
Dist Width -A- (mm)	XXXX
Dist Width -B- (mm)	XXXX
Dist Btw Pts (mm)	XXXX





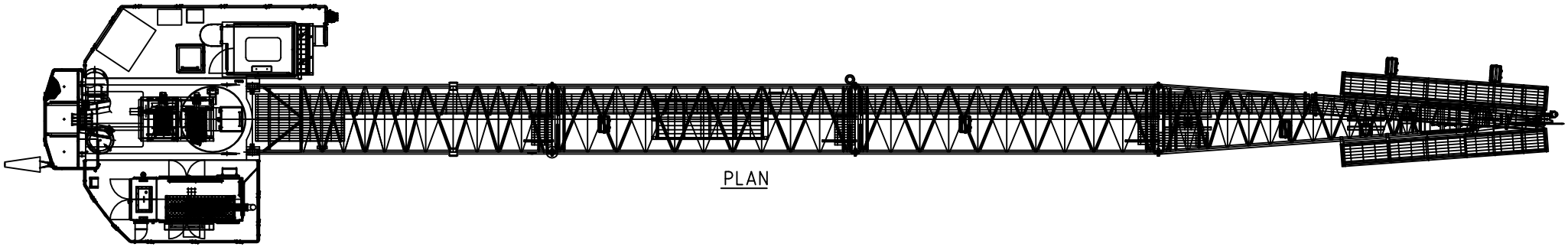
Easylink 2.3 P1
Registered to SHAHRIL NIZAL BIN SHAMSUDIN, FAVELLE FAVCO CRANE (M) SDN BHD

Filename:	//PA 1512 (A)	//PA 1512 (B)
Date:	08.08.25	08.08.25
Time:	11:45	11:00
Program:	Flange	Flange
Unit:	mm	mm
Serial:	32559 / 32405	32559 / 32405
Temp:	28.5C	28.5C

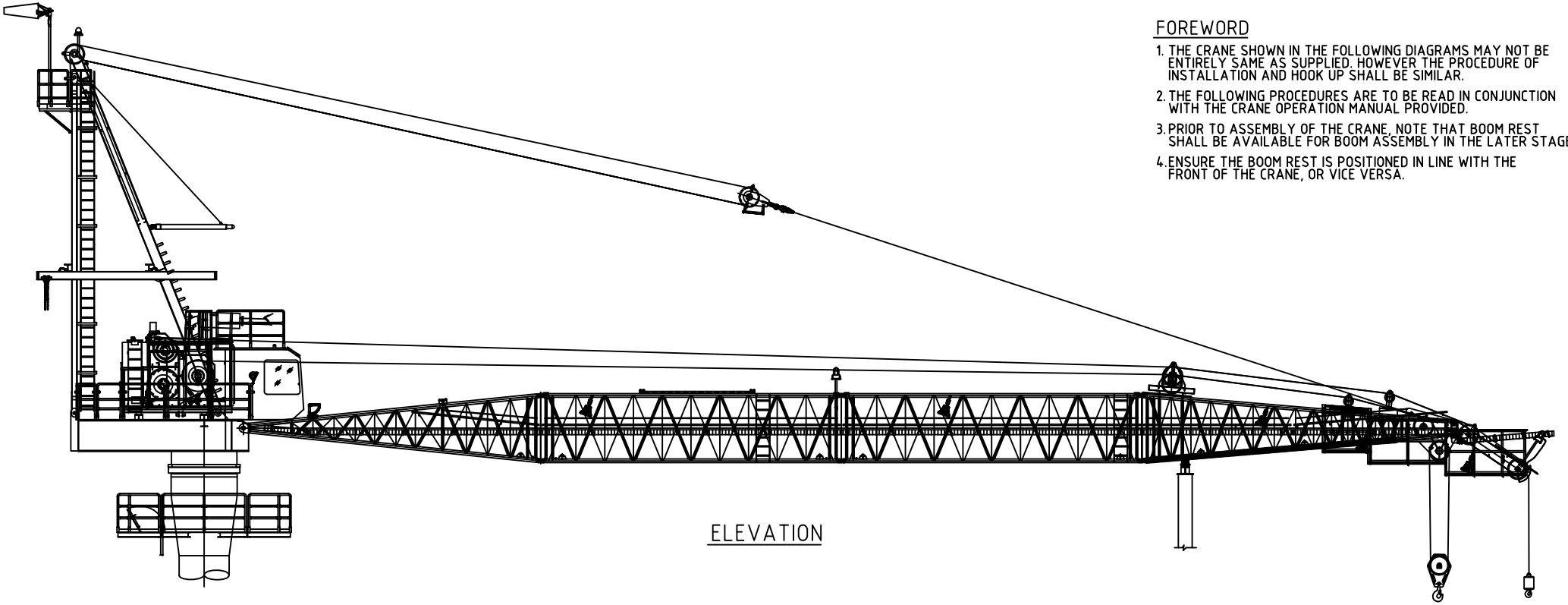
		FLATNESS READING							**STRAIGHTNESS READING**		
		(A)				**(B)**			**Deviations**	**Deviations**	**Deviations**
Pos	**Ref**	**Inner**	**Outer**	**Deviation**	**Pos**	**Ref**	**Inner**	**Outer**	**Deviation**	**(A)**	**(B)**	**(A)+(B)**
1		0	-0.02	0.02	1		0	0.03	0.03	0.02	0.03	0.05
2		-0.02	-0.01	0.01	2		0.03	0.02	0.01	0.01	0.01	0.02
3		0	0.01	0.01	3		0.01	0.05	0.04	0.01	0.04	0.05
4		-0.01	0.03	0.02	4		0.01	0.02	0.01	0.02	0.01	0.03
5		-0.05	-0.09	0.04	5		0.01	0.02	0.01	0.04	0.01	0.05
6		-0.1	-0.14	0.03	6		0.04	0.05	0.01	0.03	0.01	0.04
7		-0.15	-0.15	0	7		0.09	0.07	0.02	0	0.02	0.02
8		-0.15	-0.16	0.01	8		0.03	0.03	0	0.01	0	0.01
9		-0.15	-0.12	0.03	9		0.02	-0.01	0.03	0.03	0.03	0.06
10		-0.1	-0.08	0.02	10		-0.02	-0.01	0.01	0.02	0.01	0.03
11		-0.05	-0.03	0.02	11		0	-0.02	0.02	0.02	0.02	0.04
12		0	0.02	0.02	12		0	0.04	0.04	0.02	0.04	0.06
13		0.05	0.08	0.03	13		0.07	0.05	0.02	0.03	0.02	0.05
14		0.05	0.05	0	14		0.09	0.08	0.01	0	0.01	0.01
15		0.03	0.01	0.02	15		0.11	0.1	0.01	0.02	0.01	0.03
16		0	-0.02	0.02	16		0.12	0.09	0.03	0.02	0.03	0.05
17		-0.05	-0.04	0.01	17		0.04	0.05	0.01	0.01	0.01	0.02
18		-0.04	-0.05	0.01	18		0.02	0.03	0.01	0.01	0.01	0.02
19		-0.05	-0.05	0	19		0.02	0	0.02	0	0.02	0.02
20		-0.04	-0.04	0	20		0	-0.03	0.03	0	0.03	0.03
21		-0.05	-0.02	0.03	21		-0.03	-0.07	0.04	0.03	0.04	0.07

FLATNESS READING									STRAIGHTNESS READING		
		(A)				(B)			Deviations	Deviations	Deviations
Pos	Ref	Inner	Outer	Deviation	Pos	Ref	Inner	Outer	Deviation	(A)	(B)	(A)+(B)
	22	-0.02	-0.02	0		22	-0.06	-0.03	0.03	0	0.03	0.03
	23	0	-0.01	0.01		23	0	0.02	0.02	0.01	0.02	0.03
	24	0.02	0.03	0.01		24	0.07	0.06	0.01	0.01	0.01	0.02
	25	0.02	0.01	0.01		25	0.04	0.04	0	0.01	0	0.01
	26	-0.01	-0.02	0.01		26	0.05	0.04	0.01	0.01	0.01	0.02
	27	-0.03	-0.04	0.01		27	0.05	0.03	0.02	0.01	0.02	0.03
	28	-0.02	0	0.02		28	0.04	0.04	0	0.02	0	0.02
	29	0	-0.01	0.01		29	0.02	0.06	0.04	0.01	0.04	0.05
	30	-0.02	0	0.02		30	0.03	0.03	0	0.02	0	0.02
	31	-0.01	0	0.01		31	0.06	0.05	0.01	0.01	0.01	0.02
	32	0.02	0.04	0.02		32	0.02	0.03	0.01	0.02	0.01	0.03
	33	0.07	0.06	0.01		33	0.04	0.04	0	0.01	0	0.01
	34	0.07	0.07	0		34	0	0	0	0	0	0
Max		0.08			Max		0.12				Max	0.07
Min		-0.16			Min		-0.07				Acceptance	XXXX
Peak-Peak		0.24			Peak-Peak		0.19				Reults	XXXX
Average level		-0.02			Average level		0.03					
Standard dev		0.04			Standard dev		0.03					
Flatness Rms		0.06			Flatness Rms		0.04					
Acceptanece Peak To Peak		XXXX			Acceptanece Peak To Peak		XXXX					
Result		XXXX			Result		XXXX					

Attachment B



PLAN



ELEVATION

FOREWORD

1. THE CRANE SHOWN IN THE FOLLOWING DIAGRAMS MAY NOT BE ENTIRELY SAME AS SUPPLIED. HOWEVER THE PROCEDURE OF INSTALLATION AND HOOK UP SHALL BE SIMILAR.
2. THE FOLLOWING PROCEDURES ARE TO BE READ IN CONJUNCTION WITH THE CRANE OPERATION MANUAL PROVIDED.
3. PRIOR TO ASSEMBLY OF THE CRANE, NOTE THAT BOOM REST SHALL BE AVAILABLE FOR BOOM ASSEMBLY IN THE LATER STAGE.
4. ENSURE THE BOOM REST IS POSITIONED IN LINE WITH THE FRONT OF THE CRANE, OR VICE VERSA.

FAVELLE FAVCO CRANES (M) SDN. BHD.
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70400 Seremban, Negeri Sembilan, Malaysia.
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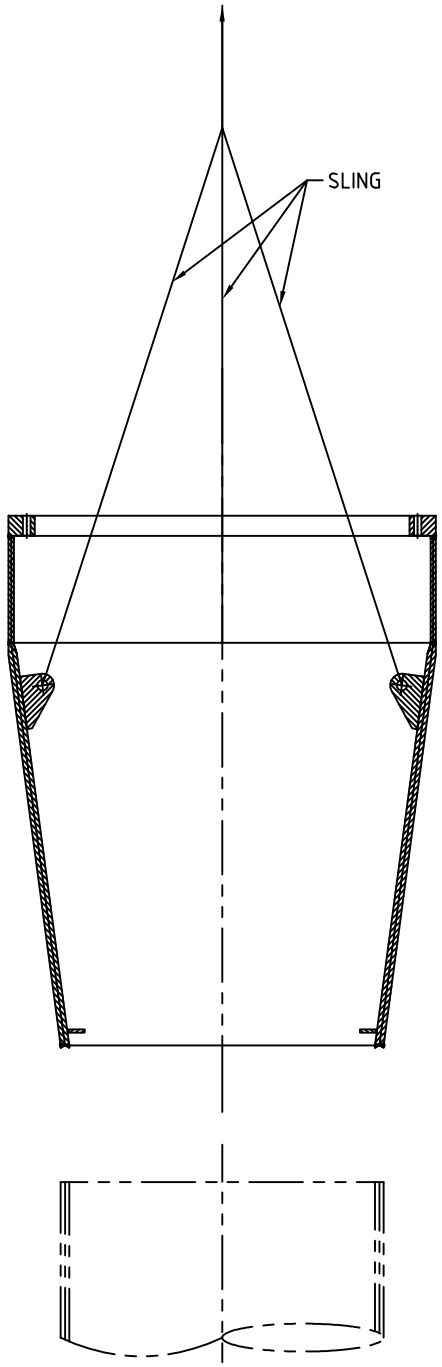
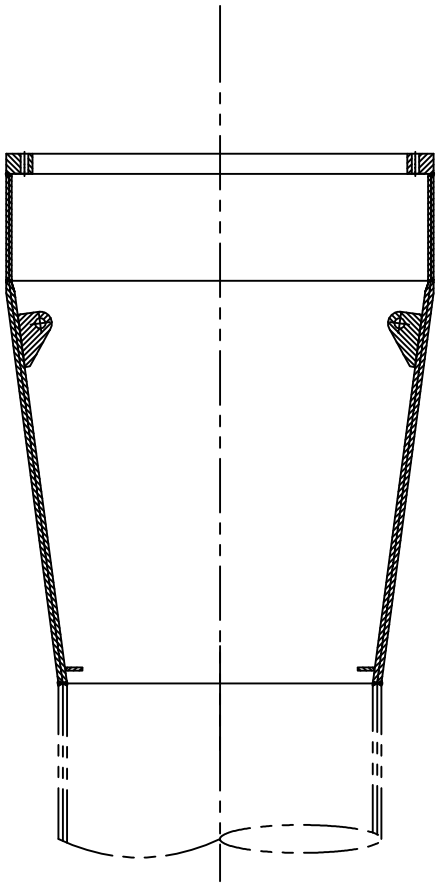
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
CRANE INSTALLATION PROCEDURE	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
1/8	1 : 150	1845	~ N.A	CIP-001





PEDESTAL ADAPTOR INSTALLATION

1. LIFT PEDESTAL ADAPTOR BY MEANS OF 3 LIFTING LUGS. SLOWLY LOWER TO THE INTERFACE AND CAREFULLY ALIGN BOTH TOGETHER. PEDESTAL COLUMN SURFACE PERPENDICULAR TO VERTICAL WITHIN 0.25°.
2. PERFORM BUTT JOINT BETWEEN ADAPTOR AND THE COLUMN.
3. CHECK THE SLEW RING MOUNTING SURFACE FOR FLATNESS DEVIATION & SLOPE.
4. A MAXIMUM OUT OF FLATNESS TOLERANCE IS 0.112 mm AND CAN BE REACHED ONLY ONCE THROUGHOUT A SECTION OF 180°.
5. INSTALL EXTERNAL PLATFORM, LADDER AND OTHER ACCESSORIES.

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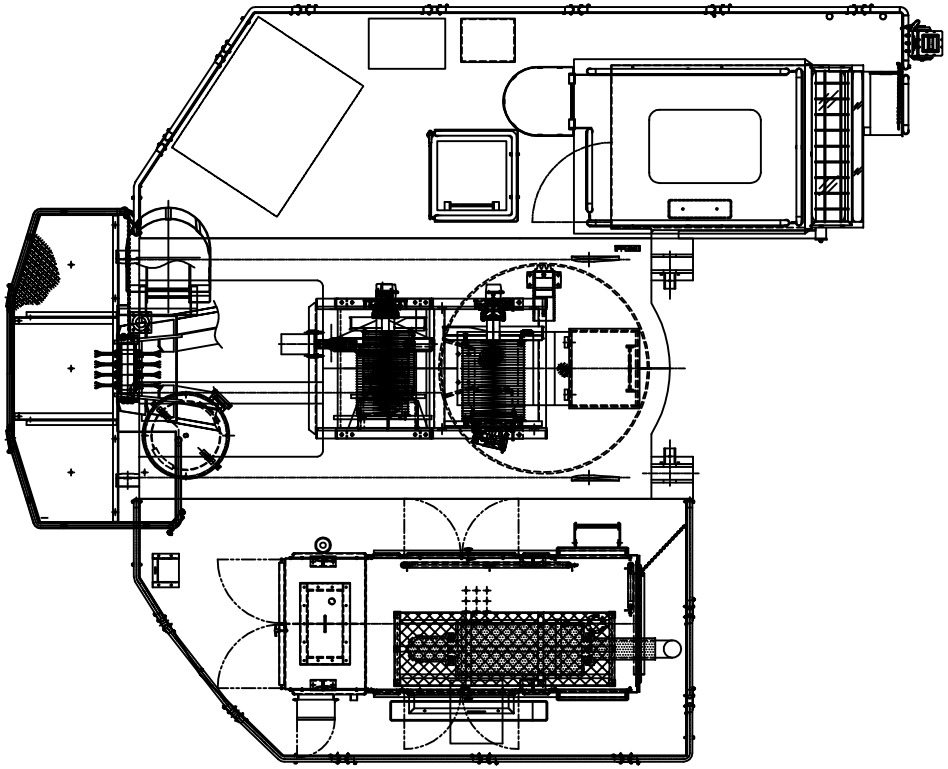
70400 Seremban, Negeri Sembilan, Malaysia.
www.favellefavco.com

Muhibbah Engineering (M) Bhd

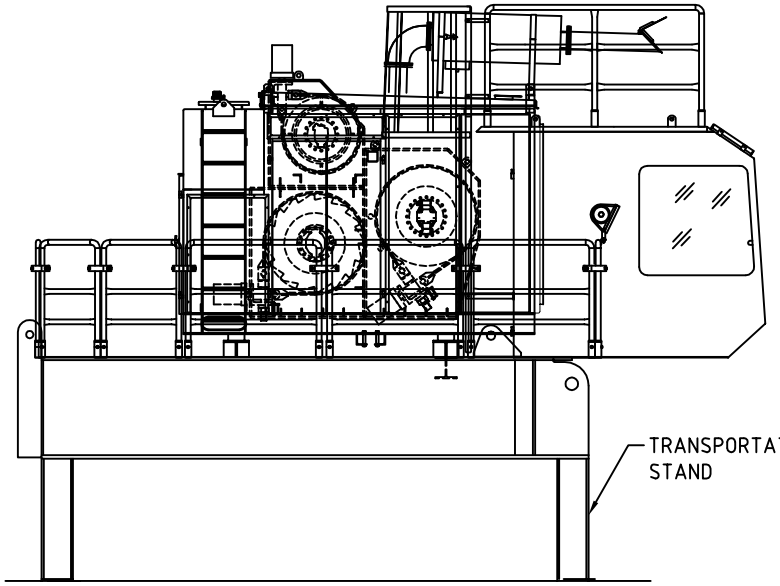
Title	Model	Rev.
CRANE INSTALLATION PROCEDURE	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
2/8	1 : 30	1845	~ N.A	CIP-002



MACHINERY DECK ASSEMBLY

1. PLACE CRANE MAIN STRUCTURE (MACHINERY DECK , WINCH ASSEMBLY AND SLEW DRIVE ASSEMBLY) ON TRANSPORTATION STANDS.
   ALLOW CLEARANCE OF APPROXIMATELY 900 mm UNDERNEATH THE SLEW BEARING CONTACT SURFACE.
2. CHECK THE SLEW RING MOUNTING SURFACE FOR FLATNESS DEVIATION & SLOPE.
3. A MAXIMUM OUT OF FLATNESS TOLERANCE IS 0.112 mm AND CAN BE REACHED ONLY ONCE THROUGHOUT A SECTION OF 180°.



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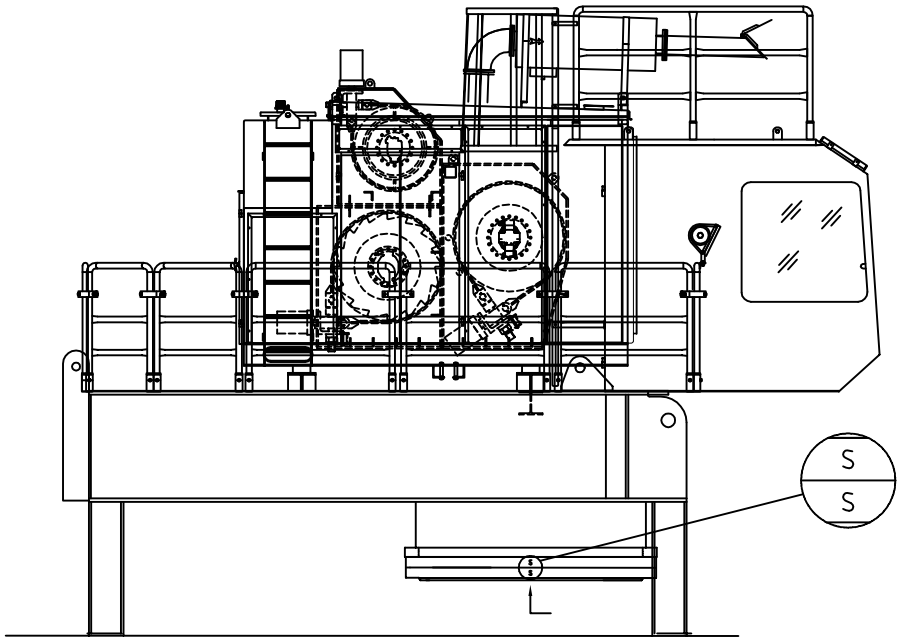
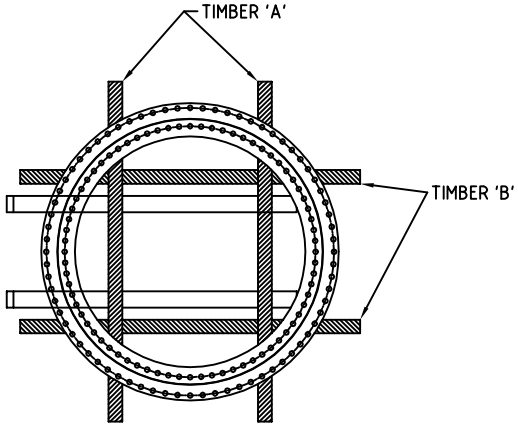
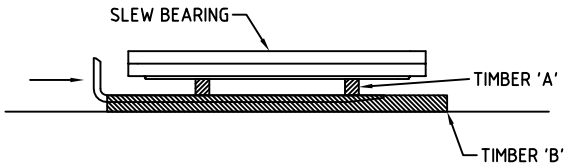
Title	Model	Rev.
CRANE INSTALLATION PROCEDURE	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
3/8	1 : 60	1845	~ N.A	CIP-003







SLEW BEARING INSTALLATION

1. REMOVE ALL PACKAGING FROM SLEW RING. CHECK IF SLEW BEARING IS IN GOOD CONDITION TO BE USED.
2. USE SUITABLE SPACED TIMBERS TO PROTECT SLEW BEARING SURFACE WHEN MOVING WITH FORKLIFT.
3. SLOWLY LOCATE SLEW BEARING UNDERNEATH THE CRANE MAIN STRUCTURE. ENSURE THE 'HARDNESS GAP' OF BEARING RACEWAY EMBOSSED 'S' IS LOCATED AT FURTHEST FROM MAIN LOADED ZONE I.E. 'S' POINT SHALL BE POSITIONED 90° TO THE BOOM REST LOCATION.
4. USING 3 GUIDE PINS, DEPOSIT THE SLEW BEARING ONTO THE CRANE MAIN STRUCTURE. ENSURE THE BOLT HOLES ARE ALIGNED.
5. FIT ALL SLEW BOLTS THROUGH THE MACHINERY DECK FLANGE AND SLEW BEARING.
6. NIP ALL SLEW BOLTS TO 'SNUG' POSITION.
7. RE-INSTALL SLEW DRIVES AS PER 'SLEW DRIVE ASSEMBLY' DRAWING.
8. CHECK THE BACKLASH AT COLOURED GREEN TEETH AND ADJUST IF NECESSARY. THE BACKLASH TO BE 0.50 - 0.65 mm.
8. TIGHTEN THE SLEW BOLTS AS PER 'SLEW RING ASSEMBLY' DRAWING.

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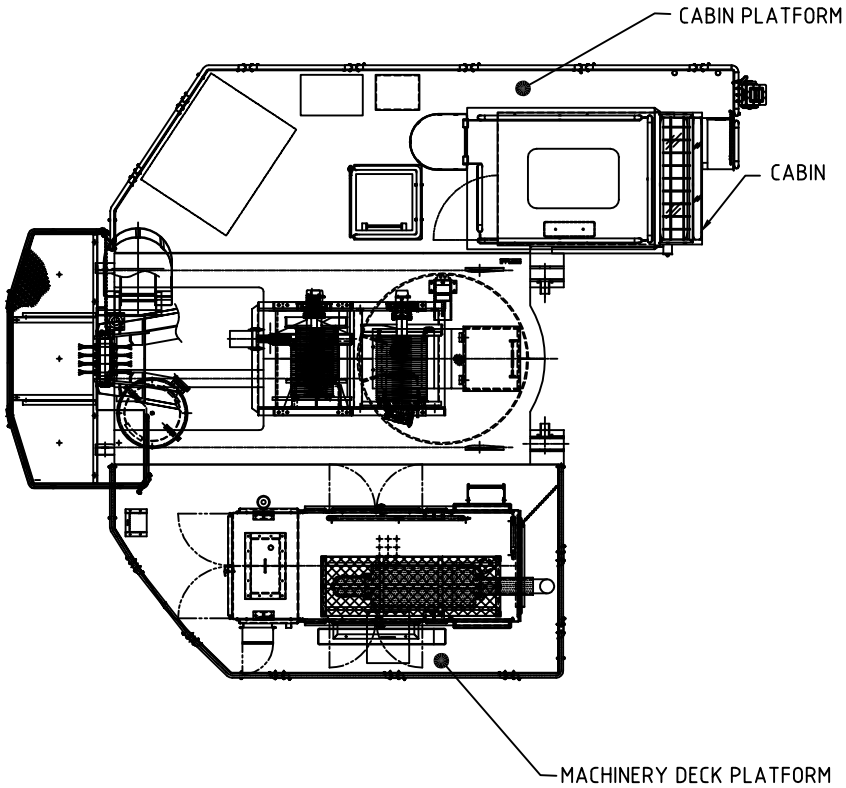
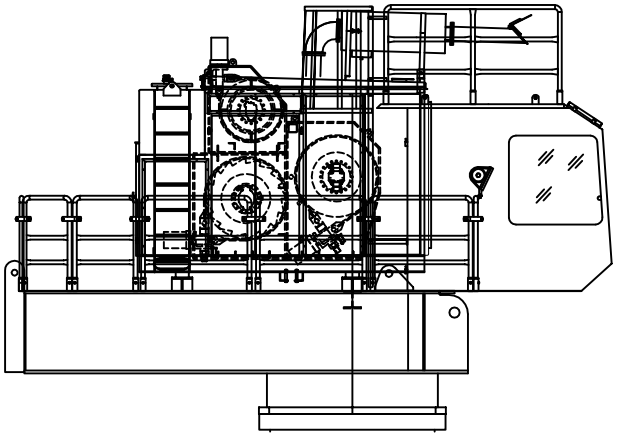
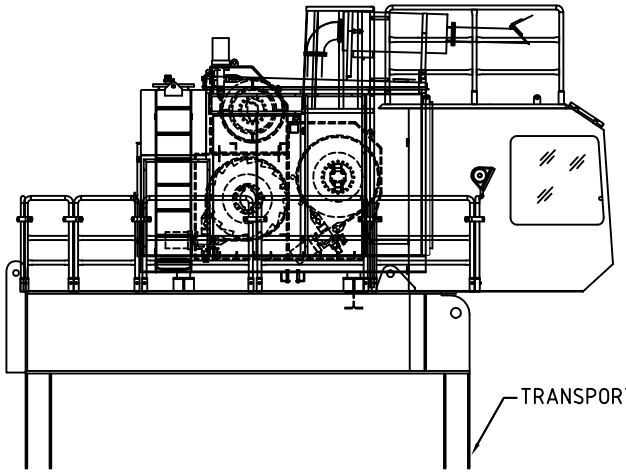
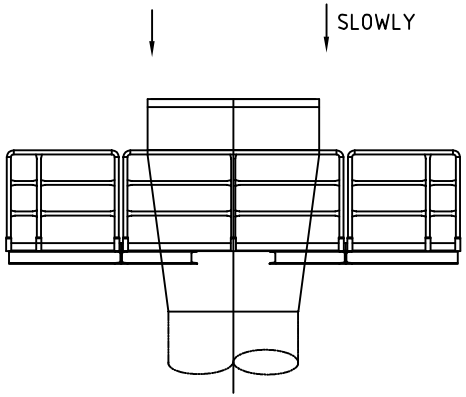
Title	Model	Rev.
CRANE INSTALLATION PROCEDURE	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
4/8	1 : 125	1845	~ N.A	CIP-004









MACHINERY DECK INSTALLATION

1. INSTALL MACHINERY PLATFORM, CABIN PLATFORM AND CABIN AS PER 'MACHINERY DECK ASSEMBLY' DRAWING.
2. FIT ALL HANDRAILS, ACCESS LADDER AND TRAP DOOR TO THE PLATFORM
3. RE-CONNECTALL INTERFACE HYDRAULIC HOSES AND ELECTRIC CABLE. PLEASE REFER ELECTRICAL SCHEMATIC DIAGRAM AND HYDRAULIC CIRCUIT FOR CONNECTION DETAILS.
4. ATTACH ROPE GUIDES ON BOTH ENDS OF MACHINERY DECK ASSEMBLY AND LIFT IT UP LEVELLY OVER THE PEDESTAL ADAPTOR. (REMOVE ALL TRANSPORTATION ATTACHMENTS BEFORE LIFTING)
5. CAREFULLY LOWER THE MACHINERY DECK ASSEMBLY ONTO PEDESTAL ADAPTOR. USE GUIDE ROPES TO ALIGN BOLT HOLES.
6. FIT ALL SLEW BOLTS THROUGH THE SLEW BEARING AND PEDESTAL FLANGE.
7. NIP ALL SLEW BOLTS TO 'SNUG' POSITION.
8. TIGHTEN THE SLEW BOLTS AS PER 'SLEW RING ASSEMBLY' DRAWING.
9. ASSEMBLE ALL MISCELLANEOUS ITEMS AS PER ASSEMBLY DRAWING.

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Title	Model	Rev.
CRANE INSTALLATION PROCEDURE	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
5/8	1 : 75	1845	~ N.A	CIP-005

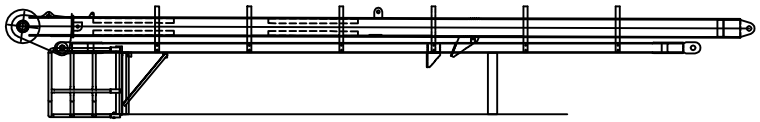


FIGURE 6A

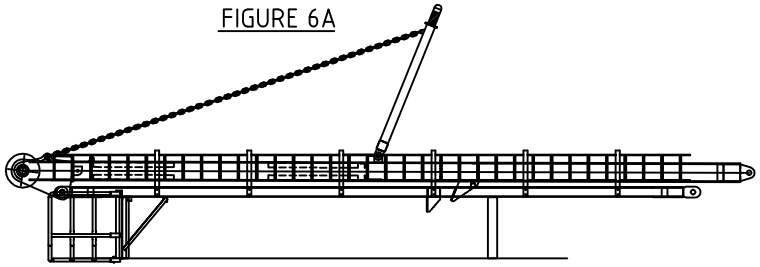


FIGURE 6B

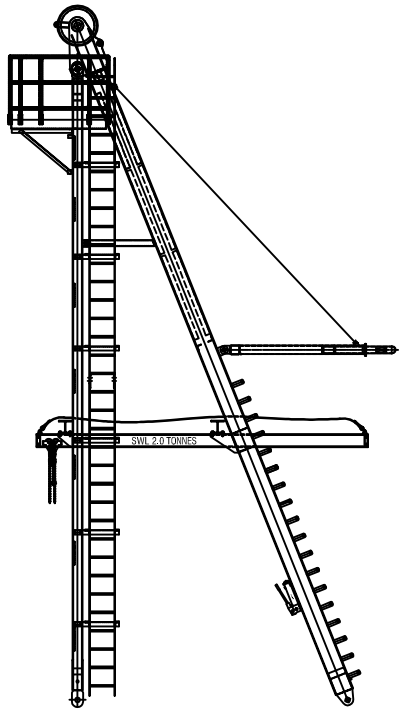
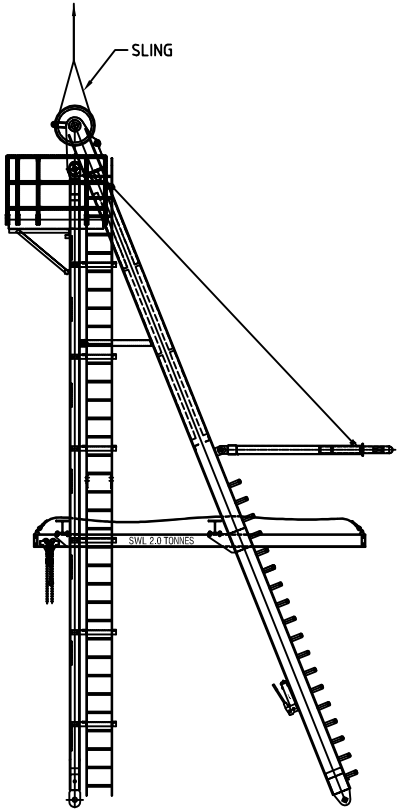


FIGURE 6C



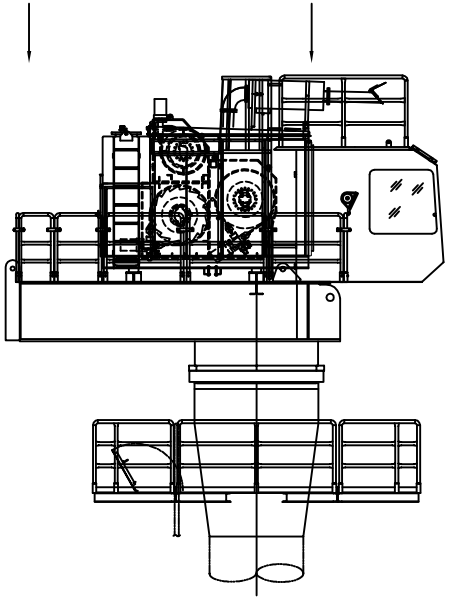


FIGURE 6D

MAST INSTALLATION

1. MAST ASSEMBLY WILL BE RECEIVED AS SHOWN IN FIGURE 6A. MAST SHOULD BE ERECTED ON LEVEL GROUND WITH ADEQUATE CLEARANCE ALL AROUND.
2. ATTACH MAST ACCESS LADDER AND CAGE AS PER 'MAST ASSEMBLY' DRAWING.
3. FIT BOOM BUFFER ASSEMBLY WITH HOLDING CHAIN IN TENSION BY SELFWEIGHT.
4. USE MAST HEAD SHEAVE AS LIFTING POINT. LOOP THE SLING AROUND MAST HEAD SHEAVE AND SLOWLY LIFT UP THE STRUCTURE SO THAT FRONT & REAR LEGS WILL SPREAD BY ITSELF. CONTINUE LIFTING IT UP UNTIL STOPPER LEGS FALL DOWN TO HOLD MAST FRONT LEG IN OPEN POSITION. (REMOVE TRANSPORTATION STANDS BEFORE LEGS ARE ON THE GROUND)
5. LIFT UP THE MAST ASSEMBLY SLOWLY OVER THE CRANE AS SHOWN IN FIGURE 6D. ENSURE THE MAST CLEARS THE WINCHES BY ADJUSTING MAST FRONT LEGS.
6. INSERT MAST PIN FOR BOTH MAST FRONT & REAR LEGS TO SECURE THE MAST LEGS JOINT.
7. ASSEMBLE MONORAIL AND OTHER MISCELLANEOUS ITEMS AS PER ASSEMBLY DRAWING.

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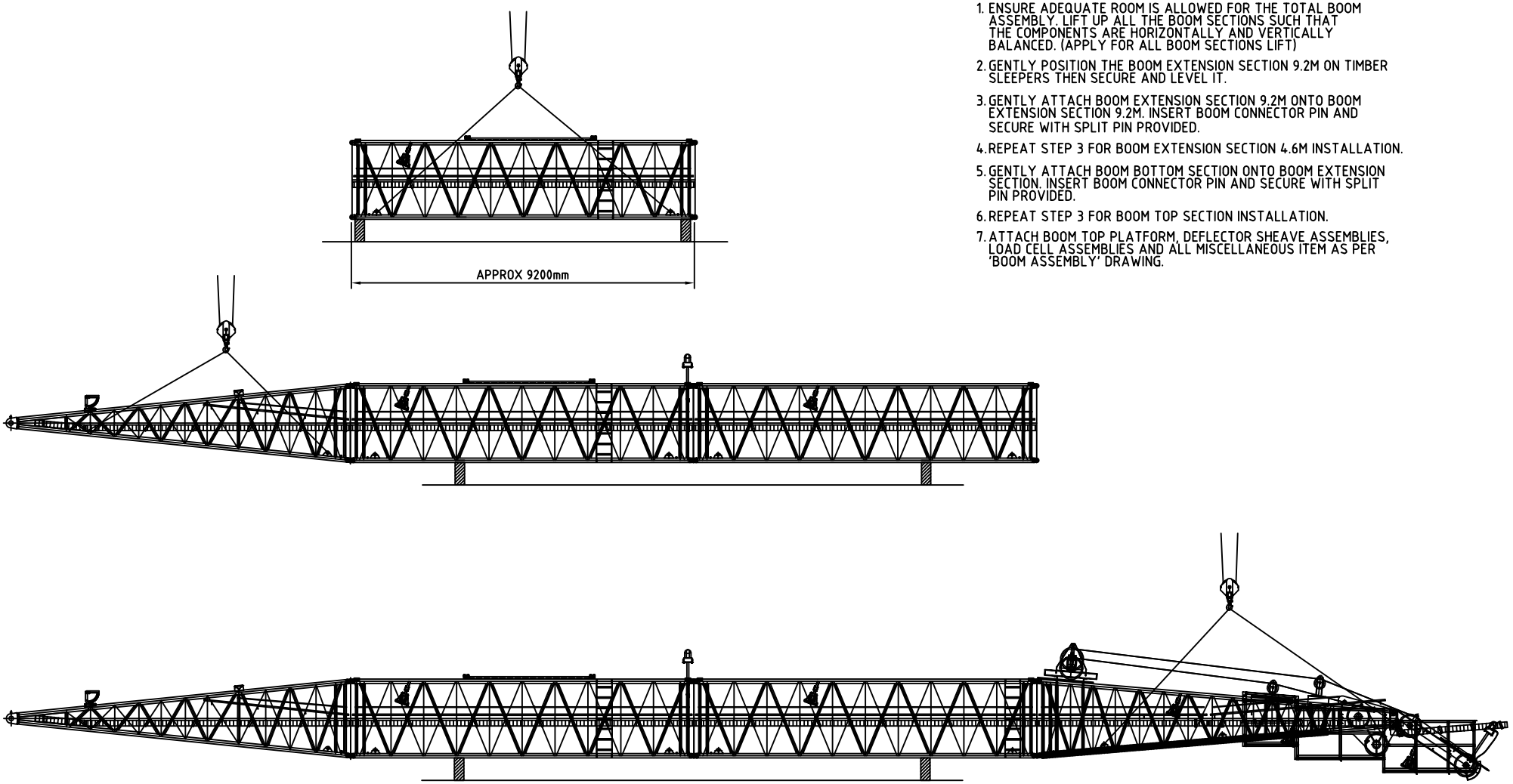
Title	Model	Rev.
CRANE INSTALLATION PROCEDURE	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
6/8	1 : 80	1845	~ N.A	CIP-006

BOOM ASSEMBLY

1. ENSURE ADEQUATE ROOM IS ALLOWED FOR THE TOTAL BOOM ASSEMBLY. LIFT UP ALL THE BOOM SECTIONS SUCH THAT THE COMPONENTS ARE HORIZONTALLY AND VERTICALLY BALANCED. (APPLY FOR ALL BOOM SECTIONS LIFT)
2. GENTLY POSITION THE BOOM EXTENSION SECTION 9.2M ON TIMBER SLEEPERS THEN SECURE AND LEVEL IT.
3. GENTLY ATTACH BOOM EXTENSION SECTION 9.2M ONTO BOOM EXTENSION SECTION 9.2M. INSERT BOOM CONNECTOR PIN AND SECURE WITH SPLIT PIN PROVIDED.
4. REPEAT STEP 3 FOR BOOM EXTENSION SECTION 4.6M INSTALLATION.
5. GENTLY ATTACH BOOM BOTTOM SECTION ONTO BOOM EXTENSION SECTION. INSERT BOOM CONNECTOR PIN AND SECURE WITH SPLIT PIN PROVIDED.
6. REPEAT STEP 3 FOR BOOM TOP SECTION INSTALLATION.
7. ATTACH BOOM TOP PLATFORM, DEFLECTOR SHEAVE ASSEMBLIES, LOAD CELL ASSEMBLIES AND ALL MISCELLANEOUS ITEM AS PER 'BOOM ASSEMBLY' DRAWING.



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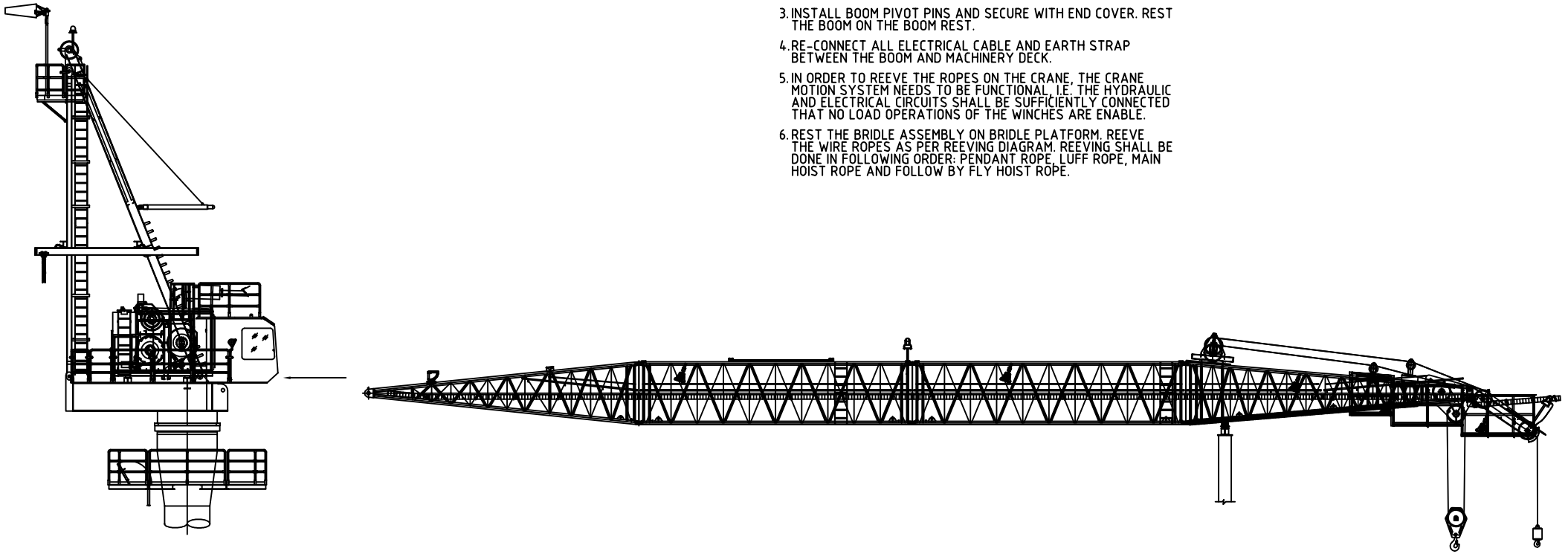
Title	Model	Rev.
CRANE INSTALLATION PROCEDURE	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
7/8	1 : 125	1845	~ N.A	CIP-007

BOOM ASSEMBLY INSTALLATION

1. SLING THE COMPLETED BOOM ASSEMBLY AND ENSURE BOOM IS LEVEL WHEN LIFTED WITH EQUAL SLING LENGTHS. SLINGS USED SHOULD BE RATED FOR THE LOADS AND SHALL BE PLACED IN A MANNER, WHICH DOES NOT DAMAGE PAINT WORK OR CHORDS.
2. LIFT THE BOOM ASSEMBLY AND FIT IT TO THE MACHINERY DECK LUG.
3. INSTALL BOOM PIVOT PINS AND SECURE WITH END COVER. REST THE BOOM ON THE BOOM REST.
4. RE-CONNECT ALL ELECTRICAL CABLE AND EARTH STRAP BETWEEN THE BOOM AND MACHINERY DECK.
5. IN ORDER TO REEVE THE ROPES ON THE CRANE, THE CRANE MOTION SYSTEM NEEDS TO BE FUNCTIONAL, I.E. THE HYDRAULIC AND ELECTRICAL CIRCUITS SHALL BE SUFFICIENTLY CONNECTED THAT NO LOAD OPERATIONS OF THE WINCHES ARE ENABLE.
6. REST THE BRIDLE ASSEMBLY ON BRIDLE PLATFORM. REEVE THE WIRE ROPES AS PER REEVING DIAGRAM. REEVING SHALL BE DONE IN FOLLOWING ORDER: PENDANT ROPE, LUFF ROPE, MAIN HOIST ROPE AND FOLLOW BY FLY HOIST ROPE.



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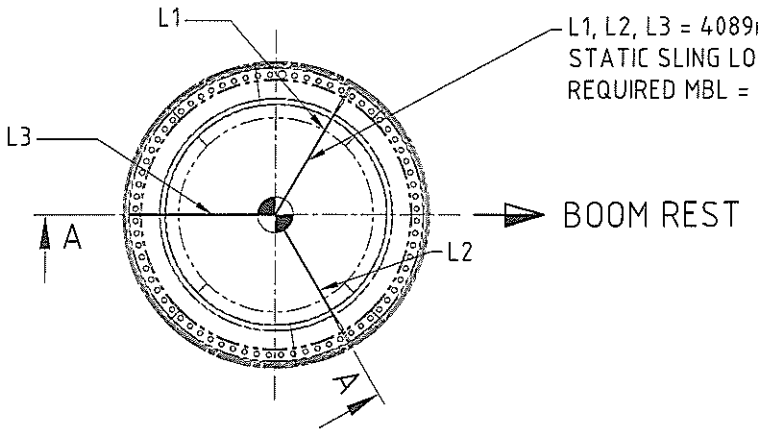
Title	Model	Rev.
CRANE INSTALLATION PROCEDURE	6/10K	A

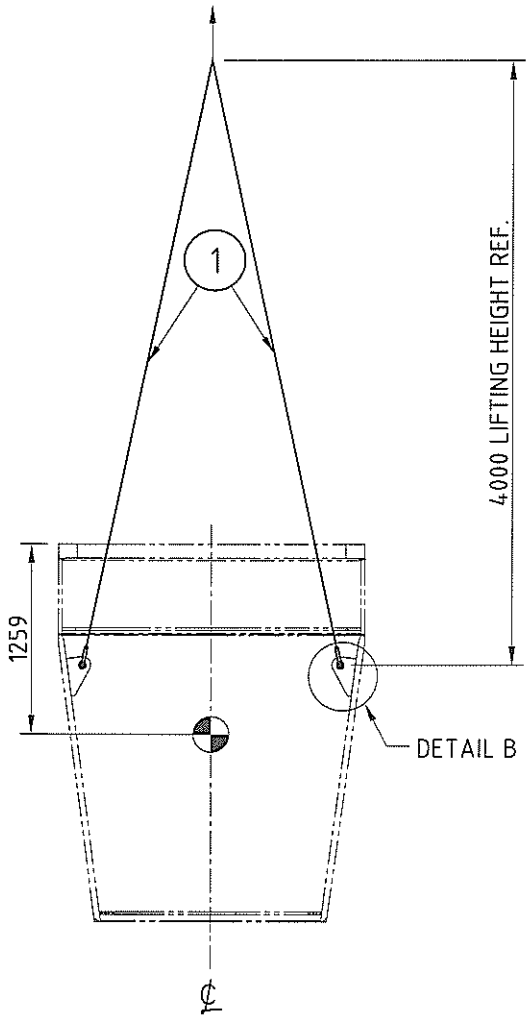
Sheet	Scale	S/No.	Weight	Drawing Number
8/8	1 : 150	1845	~ N.A	CIP-008

Attachment C

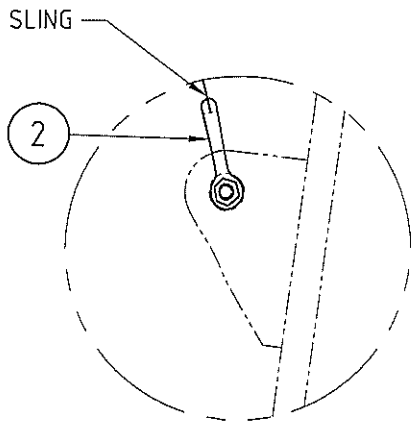


PLAN

TOTAL LIFTING WEIGHT + RIGGING WEIGHT = 7.694T



SECTION A-A



DETAIL B
SCALE: 1 : 10

NOTES

1. THE HEIGHT OF THE HOOK SHALL NOT BE LESS THAN THE LENGTH SPECIFIED IN THE DRAWING DURING LIFTING.
2. ALL WIRE ROPE TERMINATED WITH 600mm SOFT EYE BOTH END.
3. THE LIFTING PROCESS SHALL BE PERFORMED AT A VERY SLOW SPEED TO AVOID EXCESSIVE DYNAMIC LOAD.
4. ITEM 1 & 2 REQUIRE TEST CERTIFICATE.
5. SPECIFIED LENGTH IS FROM OUTER EYE TO OUTER EYE BUT NOT ACTUAL ROPE LENGTH. ROPE LENGTH USED SHALL NOT BE LESS THAN SPECIFIED.
6. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M1100-0387-X00.

Date	Description	ECN Number	Rev

TOLERANCE UNLESS NOTED OTHERWISE				Drawn By: RIZ
FABRICATION		MACHINING		
≤ 1000	± 1	≤ 30	± 0.2	Draft Checked: JACK
> 1000, ≤ 2000	± 2	> 30, ≤ 100	± 0.3	
> 2000, ≤ 3000	± 3	> 100, ≤ 300	± 0.5	Engg. Checked: MEZ
> 3000, ≤ 6000	± 4	> 300, ≤ 1000	± 0.8	
> 6000	± 5	> 1000	± 1.2	Approved By: ----
ANGLE ±1°				

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Weight	First Use On S/No.	Title
~11kg	1845	PEDESTAL LIFTING ARRANGEMENT
	Scale: 1 : 50	

Drawing Number	Sheet
M1100-0387-X00	1/1

DO NOT SCALE FROM DRAWING IF IN DOUBT ASK FFCM ENGINEERING DEPT

Favelle Favco Cranes (M) SDN.BHD
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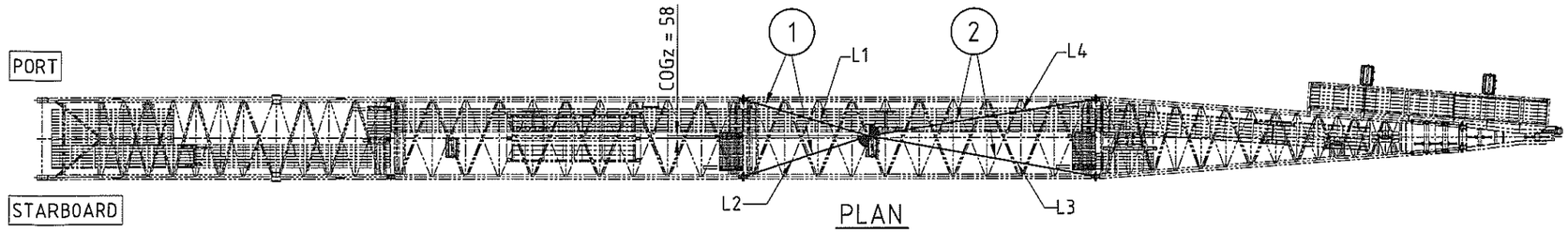
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

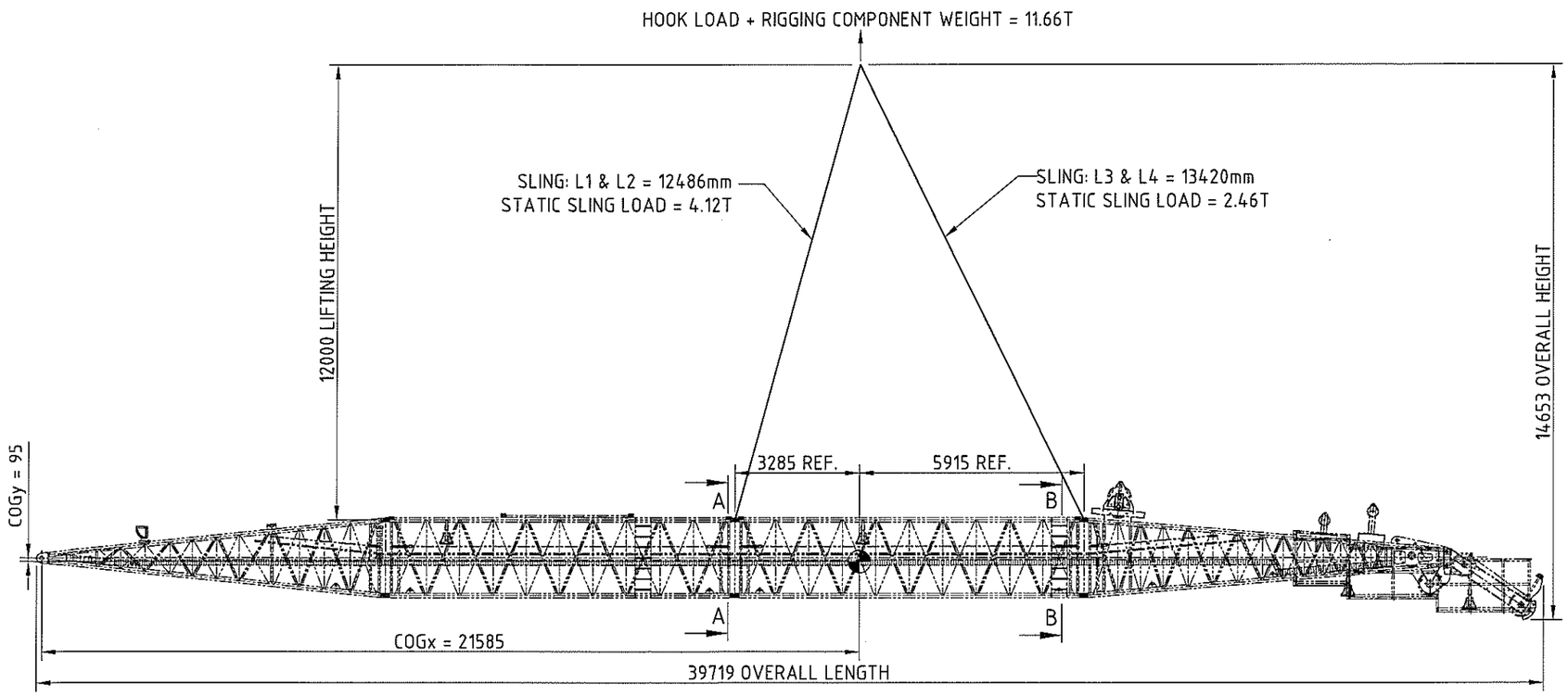
ITEM CODE (BOM No) : M1100-0387-X00
BOM DESCRIPTION ..: PEDESTAL LIFTING ARRANGEMENT
FILENAME .....: M11000387X00A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRWG NO. M1100-0387-X00)

APPROVED ..: AJS
CHECKED .....: MEZ
PREPARED ..: RIZ
DATE .....: 15/04/13
SN .....: 1845

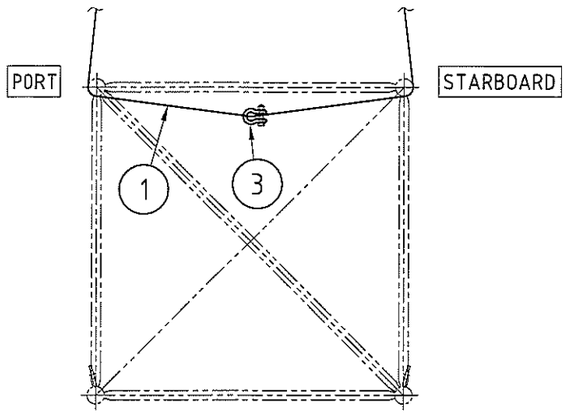
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	12,267	mtr(s)	3	ALAX-0006-9000	ROPE SLING, DIA 13MM	4.089		TEST CERT. IS REQUIRED	8,50	
	2	3,00	pcs		ALGX-0012-3000	SHACKLE, BOW, BOLT & NUT, 3.25T			GREEN PIN (HOLLAND)	1,90	



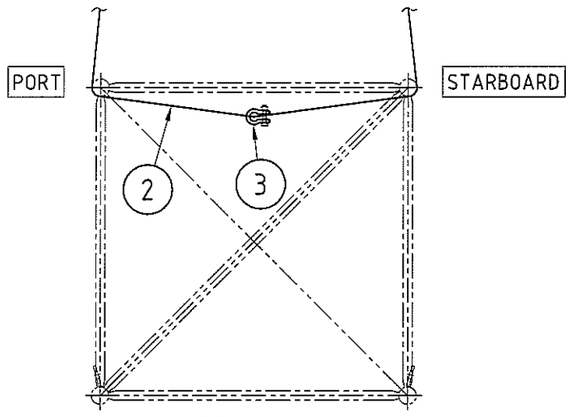
PLAN



ELEVATION



SECTION A-A
SCALE: 1 : 40



SECTION B-B
SCALE: 1 : 40

NOTES

1. THE HEIGHT OF THE HOOK SHALL NOT BE LESS THAN THE LENGTH SPECIFIED IN THE DRAWING DURING LIFTING.
2. THE LIFTING PROCESS SHALL BE PERFORMED AT A VERY SLOW SPEED TO AVOID EXCESSIVE DYNAMIC LOAD.
3. ALL ITEM REQUIRE TEST CERTIFICATES.
4. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M1100-0388-X00.

Date	Description	ECN Number	Rev

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000, ≤ 2000	± 2	> 30, ≤ 100	± 0.3
> 2000, ≤ 3000	± 3	> 100, ≤ 300	± 0.5
> 3000, ≤ 6000	± 4	> 300, ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ±1°			

Drawn By: ADI
Draft Checked: JACK
Engg. Checked: MEZ
Approved By: ----

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Weight:	First Use On S/No.:	Title:
~59kg	1845	BOOM LIFTING ARRANGEMENT
	Scale: 1 : 150	

Drawing Number: M1100-0388-X00
Sheet: 1/1

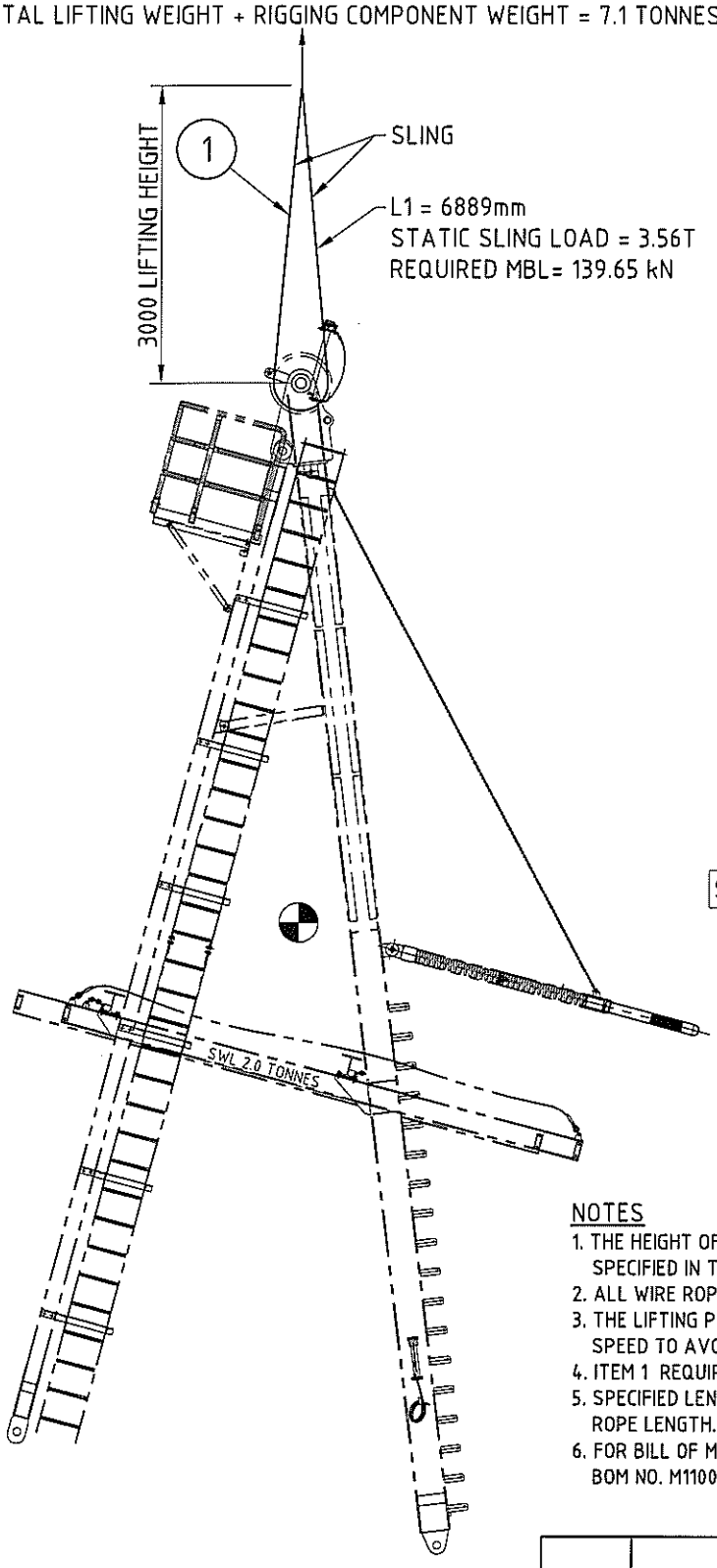
Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M1100-0388-X00
BOM DESCRIPTION ..: BOOM LIFTING ARRANGEMENT
FILENAME .....: M11000388X00A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIALL IST FOR DRAWING NO. M1100-0388-X00)

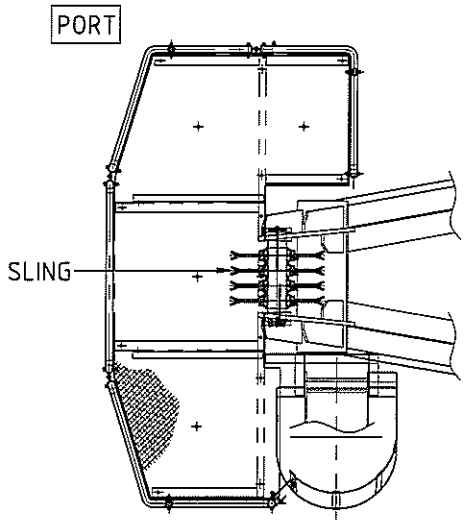
APPROVED ..: AJS
CHECKED .....: MEZ
PREPARED ..: ADI
DATE .....: 17/04/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	24,972	mtr(s)	2	ALHX-0011-5000	WEB SLING, 150MM (W)	12.486			26,80	
	2	26,84	mtr(s)	2	ALHX-0011-5000	WEB SLING, 150MM (W)	13.420			28,80	
	3	2,00	pcs		ALGX-0015-0000	SHACKLE, BOW, BOLT & NUT, 6.5T			GREEN PIN (HOLLAND)	3,10	

TOTAL LIFTING WEIGHT + RIGGING COMPONENT WEIGHT = 7.1 TONNES



STANDARD ELEVATION VIEW



PLAN VIEW
SCALE: 1 : 50

NOTES

1. THE HEIGHT OF THE HOOK SHALL NOT BE LESS THAN THE LENGTH SPECIFIED IN THE DRAWING DURING LIFTING.
2. ALL WIRE ROPE TERMINATED WITH 600MM SOFT EYE BOTH ENDS.
3. THE LIFTING PROCESS SHALL BE PERFORMED AT A VERY SLOW SPEED TO AVOID EXCESSIVE DYNAMIC LOAD.
4. ITEM 1 REQUIRE TEST CERTIFICATES BY REPUTABLE THIRD PARTY.
5. SPECIFIED LENGTH IS FROM OUTER EYE TO OUTER EYE BUT NOT ACTUAL ROPE LENGTH. ROPE LENGTH USED SHALL NOT BE LESS THAN SPECIFIED.
6. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M1100-0389-X00.

Date	Description	ECN Number	Rev

TOLERANCE UNLESS NOTED OTHERWISE				Drawn By: AIS
FABRICATION		MACHINING		
≤ 1000	± 1	≤ 30	± 0.2	Draft Checked: JACK
> 1000, ≤ 2000	± 2	> 30, ≤ 100	± 0.3	
> 2000, ≤ 3000	± 3	> 100, ≤ 300	± 0.5	Engg. Checked: ----
> 3000, ≤ 6000	± 4	> 300, ≤ 1000	± 0.8	
> 6000	± 5	> 1000	± 1.2	Approved By: ----
ANGLE ±1°				

FAVELLE FAVCO CRANES (M) SDN. BHD.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400 Seremban, Negeri Sembilan, Malaysia.
www.favellefavco.com

Weight :	First Use On S/No.:	Title:
~ 7kg	1845	MAST LIFTING ARRANGEMENT
	Scale: 1 : 75	

Drawing Number:	Sheet:
M1100-0389-X00	1/1

DO NOT SCALE FROM DRAWING IF IN DOUBT ASK FFCM ENGINEEERING DEPT.

Favelle Favco Cranes (M) SDN.BHD
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Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M1100-0389-X00
BOM DESCRIPTION ..: MAST LIFTING ARRANGEMENT
FILENAME .....: M11000389X00A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. M1100-0389-X00)

APPROVED ..: AJS
CHECKED .....: MEZ
PREPARED ..: AIS
DATE .....: 16/04/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
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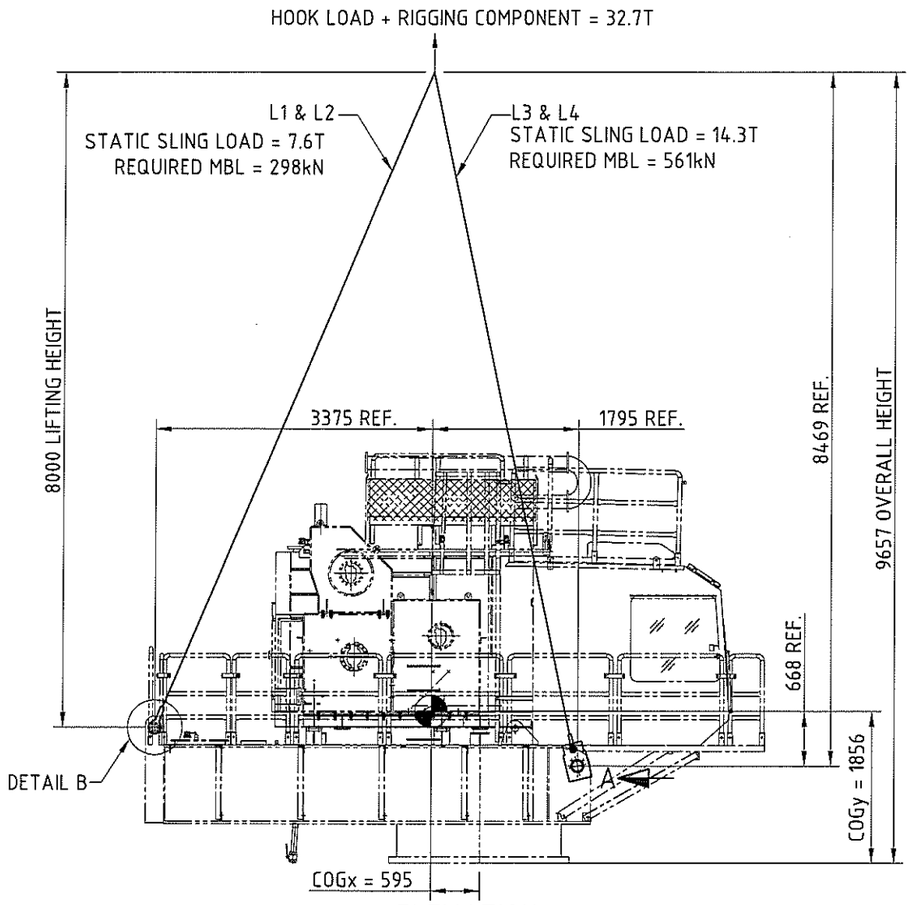
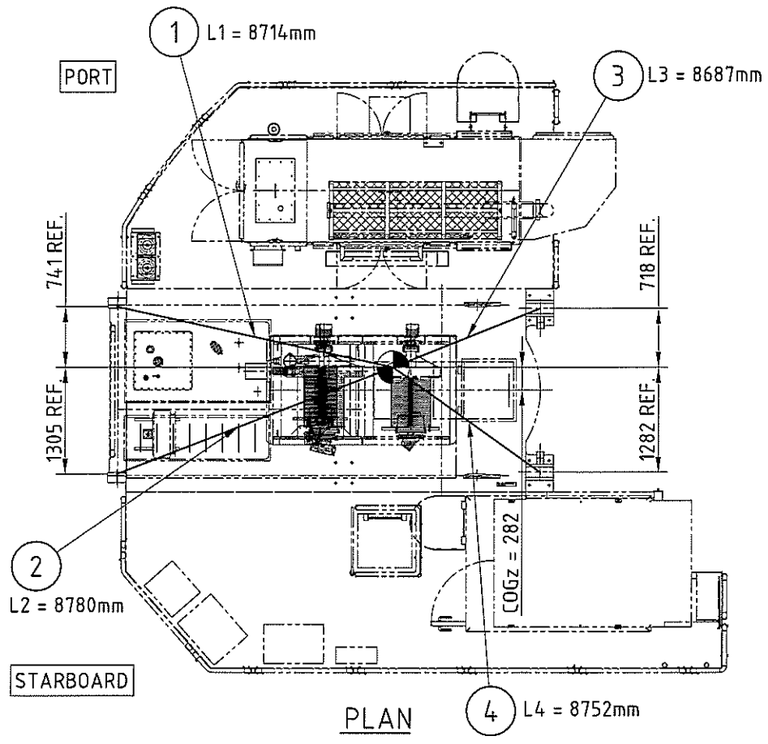


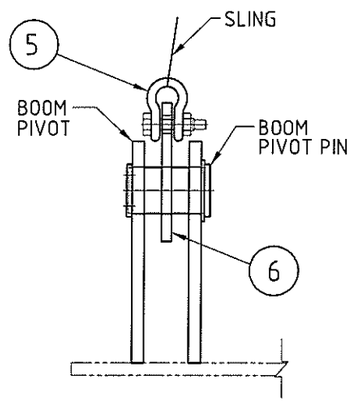
ELEVATION



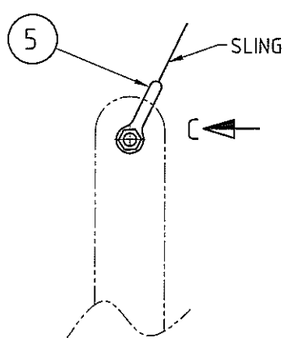
PLAN

NOTES

1. ALL WIRE ROPES TERMINATE WITH 600mm SOFT EYE AT BOTH END.
2. SPECIFIED ROPE LENGTHS ARE MEASURED FROM EYE TO EYE NOT ACTUAL ROPE LENGTHS. ROPE LENGTH USED SHALL NOT BE LESS THAN SPECIFIED.
3. ITEM 1 TO 6 REQUIRE TEST CERTIFICATES BY REPUTABLE THIRD PARTY.
4. ITEMS MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY MECHANICAL AND CHEMICAL CERTIFICATES.
5. THE LIFTING PROCESS SHALL BE PERFORMED AT A VERY SLOW SPEED TO AVOID EXCESSIVE DYNAMIC LOAD.
6. THE HEIGHT OF THE HOOK SHALL NOT BE LESS THAN THE HEIGHT SPECIFIED IN THE DRAWING DURING COMMENCEMENT OF LIFTING.
7. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M1100-0390-X00.



VIEW A
SCALE: 1 : 20



DETAIL B
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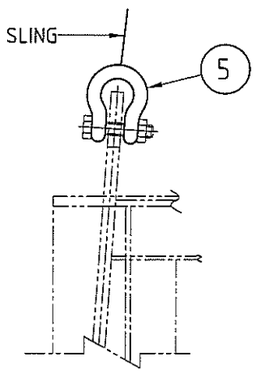
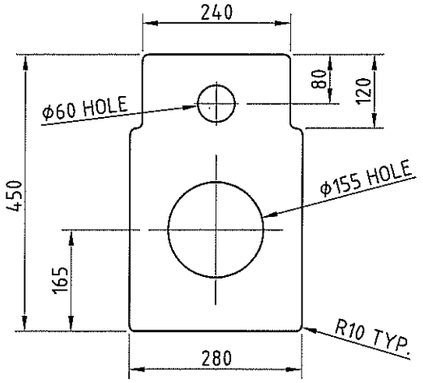


VIEW C
SCALE: 1 : 20



ITEM 6
SCALE: 1 : 10

Date	Description	ECN Number	Rev

TOLERANCE UNLESS NOTED OTHERWISE

FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000, ≤ 2000	± 2	> 30, ≤ 100	± 0.3
> 2000, ≤ 3000	± 3	> 100, ≤ 300	± 0.5
> 3000, ≤ 6000	± 4	> 300, ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2

ANGLE ±1°

Drawn By: SRR
Draft Checked: JACK
Engg. Checked: MEZ
Approved By: ----

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www.favellefavco.com

Weight:	First Use On S/No.:	Title:
~206kg	1845	MACHINERY DECK LIFTING ARRANGEMENT
	Scale: 1 : 75	
	Drawing Number: M1100-0390-X00	Sheet: 1/1

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M1100-0390-X00
BOM DESCRIPTION ..: MACHINERY DECK LIFTING ARRANGEMENT
FILENAME .....: M11000390X00A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. M1100-0390-X00)

APPROVED ..: AJS
CHECKED .....: MEZ
PREPARED ..: SRR
DATE .....: 23/04/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	8,714	mtr(s)	1	ALAX-0005-9000	ROPE SLING, DIA 22MM	8.714		TEST CERT. IS REQUIRED	17,20	
	2	8,78	mtr(s)	1	ALAX-0005-9000	ROPE SLING, DIA 22MM	8.780		TEST CERT. IS REQUIRED	17,30	
	3	8,687	mtr(s)	1	ALAX-0006-6000	ROPE SLING, DIA 32MM	8.687		TEST CERT. IS REQUIRED	36,30	
	4	8,752	mtr(s)	1	ALAX-0006-6000	ROPE SLING, DIA 32MM	8.752		TEST CERT. IS REQUIRED	36,60	
	5	4,00	pcs		ALGX-0014-7000	SHACKLE, BOW, BOLT & NUT, 17T			GREEN PIN (HOLLAND)	35,20	
	6	63,40	kg(s)	2	ASP0-3200-018X	PL32	450	280		63,40	

Chapter 3.0

INSTRUCTION FOR PRESERVATION DURING TRANSPORT AND STORAGE (BEFORE & AFTER INSTALLATION)

Section 3.1 General

Section 3.2 Preservation during Transport

Section 3.3 Storage (Before Crane Installation)

Section 3.4 Storage (After Crane Installation)

Section 3.5 Storage (Slip Ring)

Section 3.6 Temporary Storage (Less Than 30 Days)

Section 3.7 Long Term Storage (More Than 30 Days)

3.1 GENERAL

Preservation is the keeping, protection and maintenance carried out on equipment before taken into use. Initial preservation is the application for the preservatives and protection carried out upon completion of the manufacturing – for a storage period of minimum 12 months.

3.2 PRESERVATION DURING TRANSPORT

Packing shall ensure the safety of all crane components from damages and corrosion during transportation and shall be suitable for crane operation and handling. All crane components are to be delivered in standard export packing, suitable to the nature of the components and mode of transportation.

Special precautions, as stated, are made for the following items:

- The cabin windows will be covered with wood pieces and tied in place. It will be shined wrapped in plastic.
- The power pack will be wrapped in plastic.
- The winch frame will be shrink wrapper in plastic.
- The assembly will be stored on flat racks. Hence, will be suitable for pick up with forklifts.

3.3 STORAGE (BEFORE CRANE INSTALLATION)

Prior to the installation of the crane, the crane components should be stored in an area having firm and dry ground. The selected area should be free from blasting and painting works. The structural components should be elevated from the ground by means of placing wooden shims beneath the components. All electrical and small components are preferably to be stored indoors.

3.4 STORAGE (AFTER CRANE INSTALLATION)

After installation of the crane, the equipment is able to remain unused for long periods without having a detrimental effect on any components. However, the crane should be run periodically and maintained such that when required, all equipment will be fully and correctly operable.

3.5 STORAGE (SLIP RING)

3.5.1 Short Term Storage

To store the slip ring in original packing case or box in dry conditions preferably at a constant temperature between 0°C and +30°C.

3.6 TEMPORARY STORAGE (LESS THAN 30 DAYS)

This section assumes that the crane will be operated at least once per month, even though it may be in storage for a longer period.

- Preparation for Storage

Mechanical

a) Ensure all bearing is greased.
b) Ensure ropes are well lubricated.
c) Check levels in all gearboxes and brakes and top up with clean oil if necessary.
d) Drain two liters of hydraulic oil to remove any water present. Check tank level and top up if necessary.
e) Refer to manufacturer instruction for preparation of diesel engine for storage.
f) Seal all breathers to brakes and gearboxes with strong tape.
g) Drain sludge tank so that if a leak develops ample tank capacity is available.
h) Secure all loose items or remove from crane.
i) Check lubrication of open gears.
j) Check function of anti-condensation heaters.(if any)

Electrical

a) Isolate circuit required.
b) Check all external cables for signs of deterioration.
c) Check function of all lightings.

- Restoring Crane to Operation

a) Remove all breather seals.
b) Check under winches, engine, etc., for signs of leaks during storage.
c) Check gearbox, hydraulic tank, coolant, and engine oil levels.
d) Perform pre-commissioning procedure.

NB After a 10 minute warm up period; operate all crane motions for a minimum of 10 minutes each (with loads if possible).

3.7 LONG TERM STORAGE (MORE THAN 30 DAYS)

It is not recommended to leave the crane inoperable for more than 30 days. However, if this is necessary, the following actions must be taken.

- **Preparation for Storage**

Mechanical

a) Ensure all bearing and open gear teeth are lubricated.
b) Ensure ropes are well lubricated. Removes any tension from the ropes to prevent flat spot from occurring.
c) Refer to manufacturer instruction for engine storage.
d) Drain gearbox and brake oil then top up to correct level with clean oil.
e) Seal all openings to the crane, including exhaust outlet, luff rope roof cutout, fuel tank breather, etc.
f) Drain two liters of hydraulic oil to remove any water present, and then top up hydraulic oil to appropriate level.
g) Ensure sheave rope grooves are protected against corrosion.
h) Check all hydraulic lines for signs of leakage and rectify as required.
i) Drain sludge tank.
j) Secure all loose items or remove from crane.

Electrical

a) Check all junction boxes for internal moisture and place desiccant inside.
b) Check all limit switches for corrosion, moisture etc. and rectify as required.
c) Check operation of all lightings. Turn off and isolate fitting is not required.
d) Check all cable / glands for signs of deterioration or corrosion. Rectify as required.
e) Check all earth bonding for signs of deterioration or corrosion. Rectify as required.

- **Restoring Crane to Operation**

a) Drain preserving oil from engines and fills with operating engine oil. Remove seals from breather and engine exhaust.
b) Fill the coolant system with clean soft water, inhibitor fluid and antifreeze (if in cold conditions).
c) Fill fuel system and prime engine.
d) Change air filter element(s).
e) Remove all desiccants from junction boxes.
f) Remove all seals to gearboxes, machinery house, limit switches, etc.
g) Perform pre-commissioning procedure.

NB Normal routine maintenance and checking after restoration is now appropriate.

Chapter 4.0

INSTRUCTION FOR COMMISSIONING

Section 4.1 Commissioning Procedure

4.1 COMMISSIONING PROCEDURE

The commissioning procedure is the step where the crane is prepared to be utilized. Prior to making the crane conducive for operations, the offshore performance test procedure should be carried out at erection site.

The purpose of the procedure is to prove that the correct operation and load test of the crane is in accordance with the client's specification and requirements of API 2C in an offshore environment. The scope of the procedure will encompass inspections and operational tests of the cranes functions as well as load tests of the cranes. They are as follows:

1. Preparations should be done prior to tests at the erection site. Test weights should be verified for accuracy by qualified inspector.

2. All lifts should be planned in advance taking into account the crane's physical location, the available staging and assembling the test loads.

3. Relief valves on hydraulic cranes should not be adjusted above the manufacturer's recommended pressures.

4. Lubrication Systems:

   - Check hydraulic for leaks or damage to the system.
   - Machine surrounds to be clean and free from oil. Inspect for leaks during and after the operational tests.
   - Check all gear boxes are filled to correct level with lubricant
     - Main Hoist gearbox
     - Luff gearbox
     - Fly Hoist gearbox
     - Slew gearbox

   - Check slew ring is greased correctly
     - Slew ring open gears
     - Slew ring- internal

   - Check ropes are greased correctly
     - Main Hoist rope
     - Luff rope
     - Fly Hoist rope
     - Pendant rope

5. Structure

- Visually inspect the crane boom to ensure it is damage free
- Visually check all the wire ropes
- Check all bolts are fitted and tight, and all split pins, cotter pins and keepers are correctly installed.

6. Mechanisms

- Check the operations of all brakes
- Check operation of luff ratchet

7. Electrical

- Check operation of all flood lights.
- Check operation of all aviation lights.
- Check operation of all fluorescent lights.
- Check operation of all emergency light.
- Check operation of horn.
- Check operation of window screen wiper and washer.
- Check operation of air-conditioner.
- Check operation of general purpose outlet.
- Check operation of cabin fan.
- Check operation of cabin spotlight.
- Check operation of windsock light.
- Check operation of the following annunciator alarms :-
  - Engine overspeed
  - Engine water temperature high
  - Engine oil temperature high
  - Engine oil pressure high
  - Engine water level low
  - Hydraulic oil level low
  - Hydraulic oil temperature high
  - Fuel level low
  - Boost pressure low
  - Ultimate limit
  - Main hoist up limit
  - Main hoist down limit
  - Fly hoist up limit
  - Fly hoist down limit
  - Luff in limit
  - Luff out limit

8. Miscellaneous

- Check all ladders and platforms are properly fixed and secured.
- Check all doors and windows are fitted and functioning.

9. Operational tests:

- Check operation of engine start and stop.
- Demonstrate operation of main hoisting motion limit.
- Demonstrate operation of main hoisting and lowering function over its full range if practical.
- Demonstrate operation of luffing and lowering functions over its pre-defined range.
- Demonstrate operation of fly hoisting motion limit.
- Demonstrate operation of fly hoisting and lowering function over its full range if practical.
- Demonstrate operation of slewing functions over its pre-defined range.
- Check operation of luff down limit override.
- Check operation of slew limit override (if any).

10. Safety:

- Check the correct load-rating chart for the configuration in use is fitted in the cabin.
- Check operation of the crane hook safely latched.
- Check operation of primary and secondary safe load indicator.
- Check operation of first overload warning.
- Check operation of second overload warning.
- Check the accuracy of actual load and radius reading while carrying out manoeuvring tests.

11. Check operation of indicators, including gauges and alarms, by demonstration or simulations.

12. Static load test:

- Main hoist
- Auxiliary hoist

Chapter 5.0

INSTRUCTION FOR OPERATION

Section 5.1 General

Section 5.2 Crane Safety

Section 5.3 Description of Safety Equipment

Section 5.4 Check List

Section 5.5 Operating Instruction

Section 5.6 Lifts

Section 5.7 Handling of Heavy Loads

Section 5.8 Crane Shut Down Instruction

Section 5.9 Emergency Load Lowering Procedure (Main & Aux. Hoist)

Section 5.10 Standard Hand Signal

5.1 GENERAL

This section of the manual covers operations and safe use of the crane.

The crane operator should read through this section to gain a basic understanding of crane operation and safety, before attempting to operate the crane. This section covers routine operations, heavy lifting safety precautions as well as emergency procedures.

By reading through this section the crane operator should become familiar with the safety equipment available to ensure the crane be operated safely.

Instructions on the operations of the crane are also explained to familiarise the operator with this particular crane.

5.2 CRANE SAFETY

5.2.1. Prior to Crane Operation

These are some of the safety precautions the crane operator should observe.

a. Only qualified operators should be permitted to operate the crane. Thorough training in accident prevention is essential. For further operator requirements, refer to Section 2.1 and 3.1.2 of the latest edition of API Recommended Practice 2D. (Recommended Practise for Operation and Maintenance of Offshore Cranes)
b. Unauthorised personnel should be prevented from gaining access to the crane.
c. The operator must be physically and mentally fit, to operate the crane.
d. The crane must be operated by a person who is familiar with this crane's limitations, safety equipment and operating instructions.
e. The directions of your local inspection authority concerning the operation of this equipment should be posted inside the control cabin.
f. Never alter any equipment or change any pressure settings without prior written permission from Favelle Favco Cranes (M) Sdn. Bhd.
g. Never heat, weld or oxy-cut on the boom sections or any other structural components without prior permission and procedures given by Favelle Favco Cranes (M) Sdn. Bhd.
h. Strictly adhere to the daily check list in this section to avoid untimely crane shut down or failure.
i. The operator should be instructed to check the operation of the main hoist and aux. hoist.
j. The operator should be instructed to report any occasion when a rope becomes kinked or displaced from a sheave or rope drum. This situation requires careful checking of the rope. Operations should stop if a dangerous condition exists.

5.2.2. During Crane Operation

These are some of the safety precautions the crane operator should observe.

- Ensure the crane has sufficient fuel and oils to prevent unexpected shutdown when working.
- Do not operate the crane if any limits or safety equipments are out of order.
- The crane should not be operated in winds exceeding one hour mean speed of ***20.1m/s***. When the operating wind speed is exceeded, the boom has to be placed in the stowed position (i.e. parked on the boom rest).
- Under strong wind conditions bulky loads should be handled with care.
- Never divert your attention while operating.
- Pay attention to the appointed signalman only.
- Do not start the crane operation until signalman or load is in full view.
- Obey an emergency signal at any time no matter who gives it.
- If there is any doubt as to safety, refuse to handle loads until safe conditions exist.
- Conveyance of persons on the hook is prohibited.
- Control levers must be operated steadily at all times. Operate all motion control in such a manner that motions stop without jerking. Use extra care with slew motion to avoid dangerous swinging of load.
- Observe engine tachometer during operations to avoid stalling or load run-away.
- Avoid high shock loads in hydraulic system and structure.
- Never lift a load in excess of the rated load capacity chart. Pay attention to the overload system.
- Never lift any load past maximum boom radius.
- Do not use limit switches as stopping devices.
- Never apply slew brakes while slewing or when crane is moving.
- Do not lift more than one separately rigged loaded at a time.
- Do not leave the operating seat when a load is on the hook or with engine running.
- Do not load aux. hoist, when a load is on the main hook, and vice versa.
- Subsea lifting is generally not allowed.
- Never swing a load over people. Use warning horn.
- Use tag lines for handling bulky loads.
- Crane must only be used for vertical lowering and lifting of load. Pulling, dragging or nipping at fixed loads is prohibited.
- Once the hook has reached a landing, stop hoisting down. This is to avoid slackening of the wire rope which may result in the incorrect re-reeling on the winch drum.
- The crane should only be serviced when out of operation. Do not perform electrical service or mechanical service while the crane is operating.

5.3 DESCRIPTION OF SAFETY EQUIPMENTS

5.3.1. General Description

Motion control levers provided in the cabin consist of a joystick type control and single or dual function lever controls. All valves increase the speed of each motion proportionally to the deflection of the levers from the neutral position.

All control levers are of the "deadman" type, which spring return to the neutral position upon their release.

A manually operated control valve operates the slew brake. The slew brake is applied only when boom is to be held in position during heavy winds or when the crane is stowed.

The main hoist and aux. hoist are released whenever the motion control levers are moved from the neutral position. These brakes automatically apply when the control levers are returned to neutral.

Other controls and related equipment are as described in the next sub-section.

5.3.2. Safe Load Indicator (SLI)

Safe load indicator provides the operator with a clear and continuous picture of the margin of safety by indicating hook radius, the load on the hook and the permitted safe working load for a given radius. Visual and audible indication of approaching overload is provided. A 'self check' system to allow operator to check correct functioning of equipment is also provided.

5.3.3. Alarm Annunciator Panel

Alarm annunciator panel provides mainly engine and hydraulic system protection with visual and audio alarm warning.

The annunciator has a test button to allow the operator to check the alarm and indicators at any given during crane operation. Gauges in correlation with the annunciator are provided on the engine panel for maintenance purposes.

5.3.4. Boost Pressure Switch

When boost pressure drops excessively (or lost) the switches will stop all motions and automatically apply all brakes except slew brake.

5.3.5. Emergency Stops

This is a palm push lock down button mounted on the operator's control panel and at the engine. When activated, it ceases all motions, applies all brakes and shuts down engine.

5.3.6. Luff Drum Pawl

This provides a positive lock on the luff drum and engages with engine shutdown.

5.3.7. Pressure Cut Off

The hoist, auxiliary and luff pumps are fitted with a pressure cut off system, which de-strokes the pumps when the system is overloaded (this occurs at approximately 110% of S.W.L) due to the brakes not releasing or to an excessive hook load.

5.3.8. Luff in Deceleration and Stop

When the incoming boom trips the deceleration and motion stop limit valve, luff motion automatically decelerates and stops. The brakes are applied, overriding the manual control in the cabin.

5.3.9. Boom Buffer

This provides a load on the boom at minimum radius to ensure that a slack luff rope is not possible at absolute minimum radius.

5.3.10. Horn

Horn can be energized through manual control by the operator to warn personnel.

Buzzer which connected to crane annunciator system will automatically energize if any alarm activated.

The buzzer which incorporated in the safe load indicator system will automatically operate when an overload condition exists.

5.3.11. Limit Switches & Alarms

Hoist Limit Switch is operated through drum shaft. Contacts within the limit switch are automatically reset when the motion is driven in the opposite direction.

Up limits must be set with boom at maximum radius and starting with the ultimate up limit.

A. Main Hoist

Set ultimate limit, which stops the engine and all crane motions, with hook at approximately 1.0 metres below boom head, measured from centreline of head sheave to the top of hook block.

The up limit is set approximately 1.5 metres below ultimate limit setting and stops the hoist motion and applies the brakes.

B. Aux. Hoist

Set ultimate limit, which stops the engine and all crane motions, with hook at approximately 1.0 metres below boom head, measured from centreline of head sheave to the top of hook block.

The up limit is set approximately 2.0 metres below ultimate limit setting and stops the hoist motion and applies the brakes.

A minimum of five full wraps of rope must remain on the drum in operation condition.

C. Luff In Limit

Like the hoist limit switch, the luff limit switch is operated through the drum shaft. The luff up limit is set at minimum radius / maximum angle as per load chart.

Whenever triggered, luff up limit switch contacts will change position and luff brakes applied hence cut luff up motion. Alarm at annunciator panel will also be triggered.

D. Luff Out Limit

Like the hoist limit switch, the luff limit switch is operated through the drum shaft. The luff down limit is set at maximum radius / minimum angle as per load chart.

Whenever triggered, luff down limit switch contacts will change position and luff brakes applied hence cut luff up motion. Alarm at annunciator panel will also be triggered.

E. Luff Down Override

This switch is a spring return key type. It is used to park the boom in the boom rest. When the luff out override key is selected, it will give the application to further boom down and used to park into boom rest position.

F. Slew

The slew control is fitted with mechanical operated valves, which stops the motion and apply the brake when tripped.

All motion stop limits must be approached slowly to prevent jerking of the crane due to the application of brakes.

G. Slew Limit *(if any)*

Crane is design to slew continuously towards left or right. In the present of forbidden slew sector, the crane slew motion will be automatically de-activated and visual and audible alarm is activated to notify the crane operator.

5.3.12. Re-fuelling

The refueling point is located on top of cover inside machinery house. The fuel level gauge and dipstick at the fuel tank cover allows the operator to judge the current fuel level and coordinate refueling.

Keep all flames and any devices emitting electromagnetic radiation away when refueling.

5.4 CHECK LISTS

5.4.1. Daily

According to the usage of this crane, “Daily Check List” means inspection either by the crane operator or the maintenance personnel whenever the crane is to be operated.

It is imperative that the crane operator is informed by the previous operator or the person responsible for the crane of any shutdown or problem.

It must be noted that the following daily checks do not include all specific direction given for the engine.

A. Check prior to engine start

- Check for sufficient fuel oil to avoid untimely engine shut down during operation.
- Check radiator water level (check for leaks).
- Check gearboxes oil level (check for leaks).

Do not overfill.

- Check hydraulic oil tank level.

Do not overfill.

- Visually check for oil leakage around the power pack and winch.
- Visually check for leakage or damage in non-mechanical system.
- Check ropes for defects. The ropes shall be free of kinks, loose strands or rust. Ensure that ropes are lying correctly in all sheaves and on their drums.
- Ensure windows are clean.
- Visually check for loose, missing or corroded bolts, pins, keepers or cotter pins.
- Visually check loose gear to be used, such as slings, sling hooks and shackles (if applicable).

B. Checks during the warm up period (prior to operation)

- Check the filter visual indicators. Replace elements if required.
- Check hydraulic fitting for leakage.
- Check engine oil level (dipstick).
- Check control pressure. The minimum pressure shall be 3000 kPa (30 bars).
- Check engine throttle control and tachometer when oil is sufficiently warmed up.
- Check dead man controls. Ensure that all motion controls return to zero position by themselves.
- Check safe load indicator and run a comparison with the mechanical angle indicator on the boom.
- Check slew brake.
- Check hoist brake(s).
- Check that there is absolutely no motion creep with brakes applied. If any motion is detected, immediately shut down the crane and contact qualified maintenance personnel.

  With brakes released, creep up in both hoists and luff is possible, as the pumps can be set slightly off centre to avoid the load or boom drop with heavy loads.
- Check annunciator panel to ensure visual and audible alarm is working.
- Check main hoist up limit.
- Check luff down limit.
- Check warning horn.
- Check emergency stop buttons.
- Check aviation warning light(s).
- Check hydraulic oil tank temperature before any heavy work. The minimum temperature shall not be less than 25 – 35 degrees Celsius, depending on the oil type. Refer to the *Chapter 6.0* of this manual for further information.
- Check that load chart for applicable boom length is installed in the cabin.
- Check emergency lowering needle valve is present and tightly closed.
- Ensure that wind is not excessive for crane operation and type of lift.

5.4.2. Monthly

A. General

- Ensure windows are clean.
- Check aviation warning light(s) is working.
- Visually check for oil leakage around the power pack and the winch.
- Visually check for leakage or damage in the non-mechanical system.
- Visually check for loose, missing or corroded bolts, pins, keepers or cotter pins.
- Visually check loose gear to be used, such as slings, sling hooks and shackles (if applicable).
- Further check all control mechanisms for proper adjustment, excessive wear of components and contamination by foreign matter.

B. Below check must be carried out with the engine running.

- Check main hoist, aux. hoist and luff ropes for defects. Ensure that ropes are lying correctly in all sheaves and on their drums.
- Check engine oil level (dipstick).
- Check radiator water level (cap and dipstick).
- Check pump drive gearbox oil level.
- Check hydraulic oil level indicator on the hydraulic oil tank.
- Check safe load indicator and run a comparison with mechanical boom angle indicator.
- Check the “annunciator panel” to ensure visual and audible alarms are working.
- Check the fuel level gauge at fuel tank.

C. The crane must be put through all motions during below check

- Check the load chart for applicable boom length is installed in the cabin.
- Check hoist brake.
- Check hoist up limit.
- Check operation of emergency stop.
- Check the throttle control.
- Check luff down limit.
- Check deadman controls.
- Check emergency lowering needle valve(s) is present and tightly closed.

5.5 OPERATING INSTRUCTION

This manual assumes that the operator is qualified and authorised to operate the crane. The operator has also studied the sections of this manual in order to be familiar with the crane's procedures and limitations.

Prior to starting of the engine the operator must have carried out the daily checks as set out in previous section.

If ***Hydraulic Start*** is used:

a) Before starting ensure envelop:
- Charge pressure in accumulator (110 Bar).

Needle valves to drain must remain closed at all time.

- The two emergency stop buttons, one in the cabin and one in machinery house are released.
- Engine throttle lever is in idle position.

b) Turn the engine start switch (ignition key) in the cabin to activate the fuel and air solenoid valve. Then depress the foot pedal at powerpack until the engine has started.

If engine has failed to start and the accumulator pressure has dropped, the accumulator has to be manually charged through the accumulator manifold. (Refer to hydraulic circuit)

Warm up diesel engine as recommended (refer to "Engine Operation and Maintenance Manual"), then continue with remaining daily checks. Drive all motions at half speed only while checking, until the hydraulic system warms up.
When ignition key is switched on, the annunciator will show low boost pressure until engine is started. The safe load indicator is also switched on through the ignition switch and it will show boom radius, load in tonnes and permitted load in tonnes.

When the crane is started with cold and thick hydraulic oil in the system, the filter bypass may indicate on the annunciator until the hydraulic oil warms up.

Motion control valves on the consoles consist of two lever joystick controls. These valves are of the 'deadman' type and return to neutral when released, ceasing all motion. The motion speeds are in direct proportion to the deflection of the lever from the neutral position. Care must be taken at all times to ensure that all motion controls are operated smoothly and progressively and not 'plugged' or 'counter switched' before the load stops.

Example: Pull the lever from zero to approximately half stroke and a pressure between 5 and 18 bars actuates the pump from zero to full displacement. The rest of the valve stroke, giving a pressure from 18 to 28 bars destrokes the hydraulic motor towards its minimum displacement if the load on the hook allows. Adjustment within the motor is automatic towards faster speed, if the torque required is satisfied. This only applies to the main hoist and luff motions.

The safe load indicator (SLI), which continually shows the radius, actual and permitted load at any specific radius must be observed at all times. This is to avoid tripping the motion cut-out. When overload condition occurs, the operator should immediately luff in or lower the load to the ground. Further information on using the SLI or SLI manual can be found in *Chapter 10.0* of this manual.

Care should be taken when approaching minimum radius to prevent the load swinging into the crane.

All crane alarms are provided as an operator's aid only and should not be solely relied on. The operator should be aware at all times of the permitted safe working load, the current load on the hook and the current radius.

To ensure enough power for operation, the engine should be operated at full RPM.

Observe operation of brakes and luff ratchet frequently to ensure correct operation. All brakes and the luff ratchet should be in the applied position when the engine is not running.

During normal operation, the slew brake control lever is in the working position (brake open). If during windy conditions the boom must be held in its position for a prolonged period, the valve can be moved into the lock position after motion has stopped (brake closed).

Do not apply the slew brake while the crane is slewing.

5.6 LIFTS

All lifts are undertaken by observing the safe load indicator for the hoist in operation.

Subsea lifting is generally not allowed. For any subsea lift, please consult Favelle Favco Engineering.

Hooks must be stripped and all bearings cleaned of salt water, otherwise rapid failure of the bearings will occur.

To check the load, tension the rope by pulling the control valve slowly in the up direction. Release lever immediately when either indicator shows overload.

If the indicator shows overload, then the load must be lightened, or the lifting radius reduced.

5.7 HANDLING OF HEAVY LOADS

The engine is capable of handling any full load operation, however,

1. When lifting heavy loads, the control shall pull slowly to accelerate the load to maximum hoist speed.

2. When lifting heavy loads, the hook speed is dependent on the available horsepower from the engine. Engine speed will fall when either the hoist control lever is moved too fast or when the load is too heavy. The control lever must be eased off immediately to avoid engine pull out.

3. The same applies when using two motions simultaneously under load conditions. It is advisable to immediately lower the speed on hook or luff motion before the engine pulls out.

4. When lowering medium to heavy loads it may be necessary to ease off the hoist control lever as well. The same precaution must be taken when luffing out with a heavy load. This will prevent the engine over speeding and the load running out of control.

5.8 CRANE SHUT DOWN INSTRUCTIONS

Engine and hydraulic components should be allowed a sufficient “cooling off” period prior to shutdown. At the end of an operating shift, the crane must be positioned so that the boom is facing towards the boom rest. Luff out slowly until the boom is safely in the rest and secure. The bridle may also be lowered into the bridle cradle, and the slew lock applied.

The boom is to be lowered gently into the rest to prevent damage to the boom.

a) Hook should be fully up to avoid swinging into equipment.

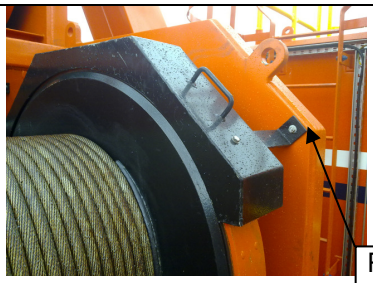
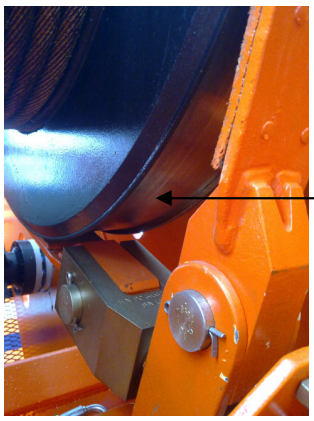
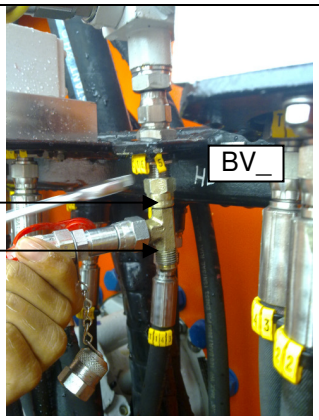
b) Running engine at approximately half speed for at least 5 minutes after crane has been working hard should be sufficient for cooling off purposes.

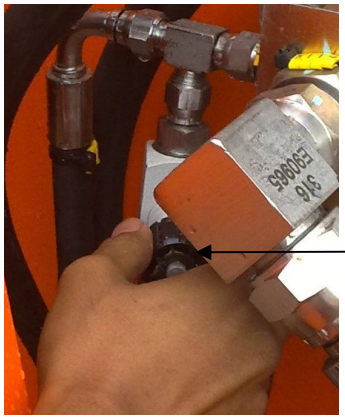
c) Engine is switched off by turn off the ignition key in the cabin console panel after sufficient cooling down period.

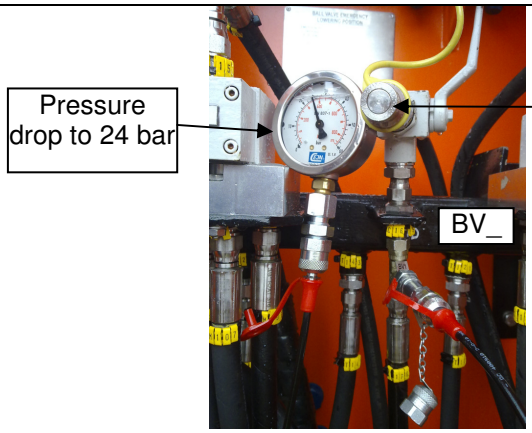
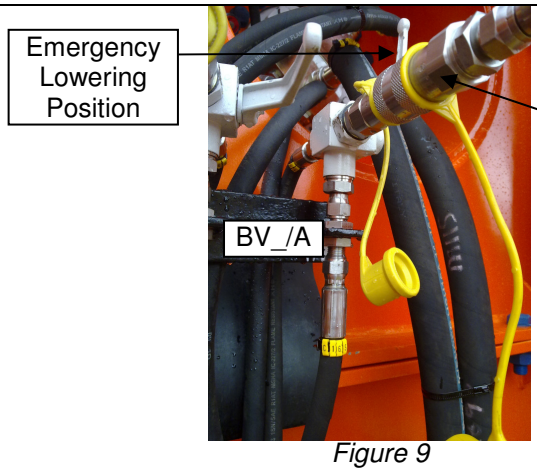
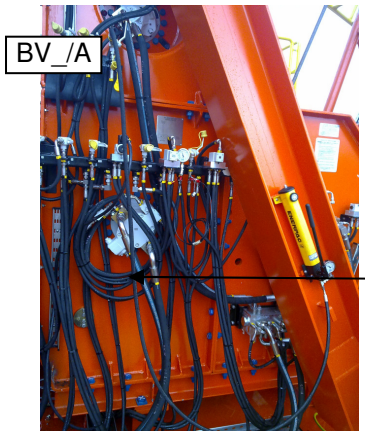
d) Before leaving the crane, a visual check of component should be undertaken and any discrepancies must immediately be reported to the installation manager or the person responsible for the crane.

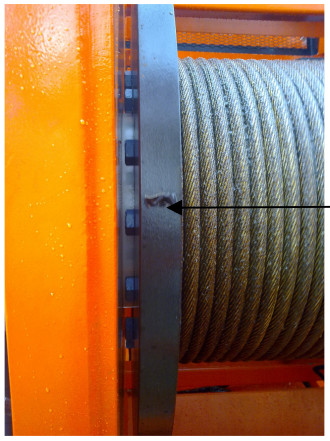
For operational use of a crane in a seismically active area, it is recommended that the crane bestowed on its boom rest when it is not being used.

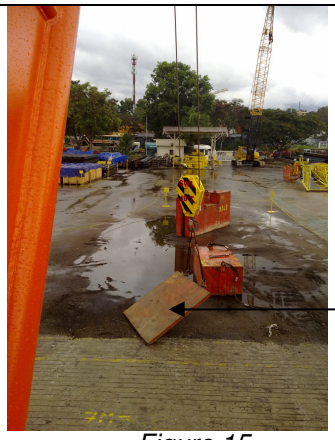
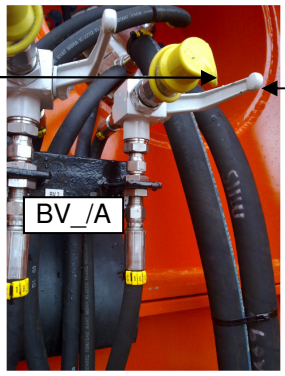
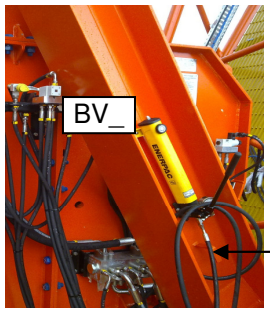
5.9 EMERGENCY LOAD LOWERING PROCEDURE (MAIN & AUX. HOIST)

Steps	Figures	Procedure
1	 *Figure 1*  *Figure 2*	- Remove band brake guard to access the band surface and drum. *(Refer Figure 1)* - If no access to band brake surface, measure temperature by pointing the temperature probe at band brake surface opening near to band brake clevis and connector pin. *(Refer Figure 2)*
2	 *Figure 3*  *Figure 4*	- Remove one of the Pressure Gauges on the hand pump and connect via the Stauff Fitting Connection ("Tee fitting") to the 3-way ball valve for disc brake, (valve '**BV_**') test fitting to monitor the brake release pressure to the disc brake. *(Refer Figure 3 & Figure 4)* * Note for (**BV_**) **1** – Main Hoist **2** – Fly Hoist Example: **BV1** – Main Hoist Disc Brake Ball Valve

3	 *Figure 5*	- Connect emergency lowering line (which is connected to hand pump) to 3-way ball valve on disc brake (Valve '**BV_**') via quick connection. *(Refer Figure 5)*
4	 *Figure 6*	- Open bypass Needle Valve on hydraulic motor by 2 turns CCW direction. *(Refer Figure 6)* - Switch Valve '**BV_**' from <u>Normal Position</u> to <u>Emergency Lowering Position</u>. *(Refer Figure 6)* *Caution: Ensure Valve '**BV_**' remains in Emergency Lowering Position* - Close Relief Valve on hand pump.
5	 *Figure 7*	- Slowly release disc brake by pumping pressure. Disc brake is fully disengaged when pressure reached 30 Bar. *(Refer Figure 7)* *Caution: Brake may release at 14-16 bar. Switch Valve '**BV_**' back to normal position if drum starts to rotate.*

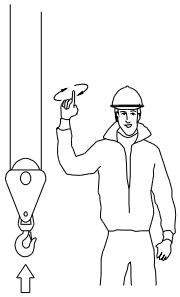
6	 *Figure 8*	- Disconnect hand pump from quick connection. Ensure the 30 bar pressure is still reading on the pressure gauge on the valve '**BV_**'. *Note: When disconnecting the quick connect coupling, the pressure may drop to 18 bar (Refer Figure 8)* - Open Relief Valve on hand pump to release any existing pressure.
7	 *Figure 9*  *Figure 10*	- Connect emergency lowering line (which is connected to hand pump) to 3-way ball valve on band brake (valve '**BV_/A**') via quick connection. *(Refer Figure 9 & Figure 10)* - Switch Valve '**BV_/A**' from <u>Normal Position</u> to <u>Emergency Lowering Position</u>. *Caution: Ensure Valve '**BV_/A**' remains in <u>Emergency Lowering Position</u>. (Refer Figure 9)* * Note for (**BV_/A**) **1** – Main Hoist **2** – Fly Hoist Example: **BV1/A** – Main Hoist Band Brake Ball Valve

8	 *Figure 11*	- Close Relief Valve on hand pump. *(Refer Figure 11)*
9	 *Figure 12*	- Slowly release band brake by pumping pressure into actuator. *Warning! : Drum will start to rotate and lower the load. Stop pumping pressure into actuator when drum is rotating.* *Caution: When pumping up the actuator and find the drum starts to rotate before reach 14 bar, stop operation. Check brake adjustment and re-adjust if required. (Refer Figure 12)*
10	 *Figure 13*	- Switch both valve '**BV_**' and '**BV_/A**' to normal position after drum rotates about 4 revolutions. *Caution: Lowering speed not to exceed approximately 1 drum rpm. (Refer Figure 13)*

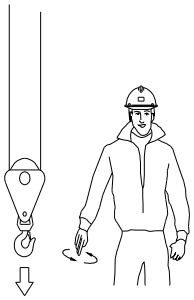
11	 *Figure 14*	- Wait for approximately 30 minutes before next lowering attempt is performed OR until band brake drum surface temperature is below 120℃ (Monitor Temperature of drum surface prior to restarting the lowering operation). *(Refer Figure 14)*
12	 *Figure 15*	- Repeat step 1 to 11 for another attempt until load is successful lowered onto the ground. *(Refer Figure 15)* *Caution: Switch both valve '**BV_**' and '**BV_/A**' to <u>Normal Position</u> when lowering is too fast!*
13	 *Figure 16*  *Figure 17*	- Once the load is successfully lowered, disconnect and switch following components to its normal position; *(Refer Figure 16 & Figure 17)* a) Emergency lowering hose (which is connected to the hand pump) b) 3-way ball valve '**BV_**', valve '**BV_/A**' and needle valve. c) Remove Pressure gauge and Stauff fitting connection at disc brake release line on valve '**BV_**' and reaffix back onto the hand pump for storage.

5.9 STANDARD HAND SIGNALS

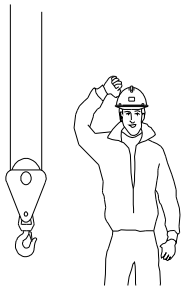
STANDARD CRANE HAND SIGNALS



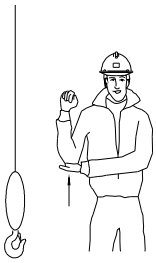
HOIST
With forearm vertical, forefinger pointing up, move hand in a small horizontal circle.



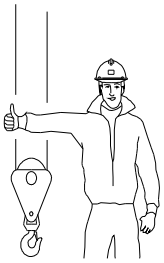
LOWER
With arm extended downward, forefinger pointing down, move hand in small horizontal circles.



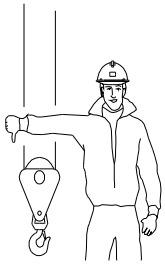
USE MAIN HOIST
Tap fist on head then use regular signals.



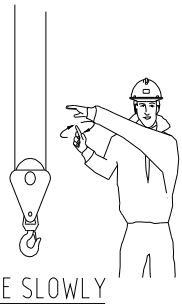
USE FLY HOIST (auxiliary hoist)
Tap elbow with hand, then use regular symbols.



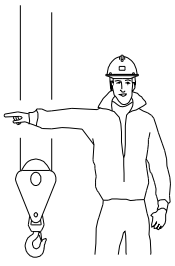
RAISE BOOM
Arm extended, fingers closed, thumb pointing upward.



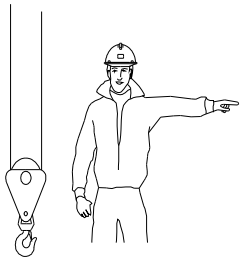
LOWER BOOM
Arm extended, fingers closed, thumb pointing downwards.



MOVE SLOWLY
Use one hand to give motion signal and place other hand motionless in front of hand giving the motion signal.
(hoist slowly shown as example)



SLEW
Arm extended, point with finger in direction of swing of boom.



STOP
Arm extended, palm down, hold position rigidly.

DWG. MA3-9900.074 REV. C

Chapter 6.0

INSTRUCTION FOR MAINTENANCE

Section 6.1 Preventative Maintenance – General

Section 6.2 Maintenance – Detailed

Section 6.3 Recommended Oils and Greases

Section 6.4 Ropes – General

Section 6.5 Maintenance Log

Section 6.6 Slew ring Wear Inspection

Section 6.7 Boom Pivot Bush Wear Inspection

Section 6.8 Crane Fastener Torque

6.1 PREVENTATIVE MAINTENANCE - GENERAL

This section of the manual covers routine maintenance recommendations for the crane.

The owner must establish a regular maintenance schedule, suited to the specific application and local conditions, using this manual as a guide in conjunction with component manufacturer's manuals.

It is recommended that the owner of this crane clearly define the responsibilities of the crane operators and the maintenance personnel.

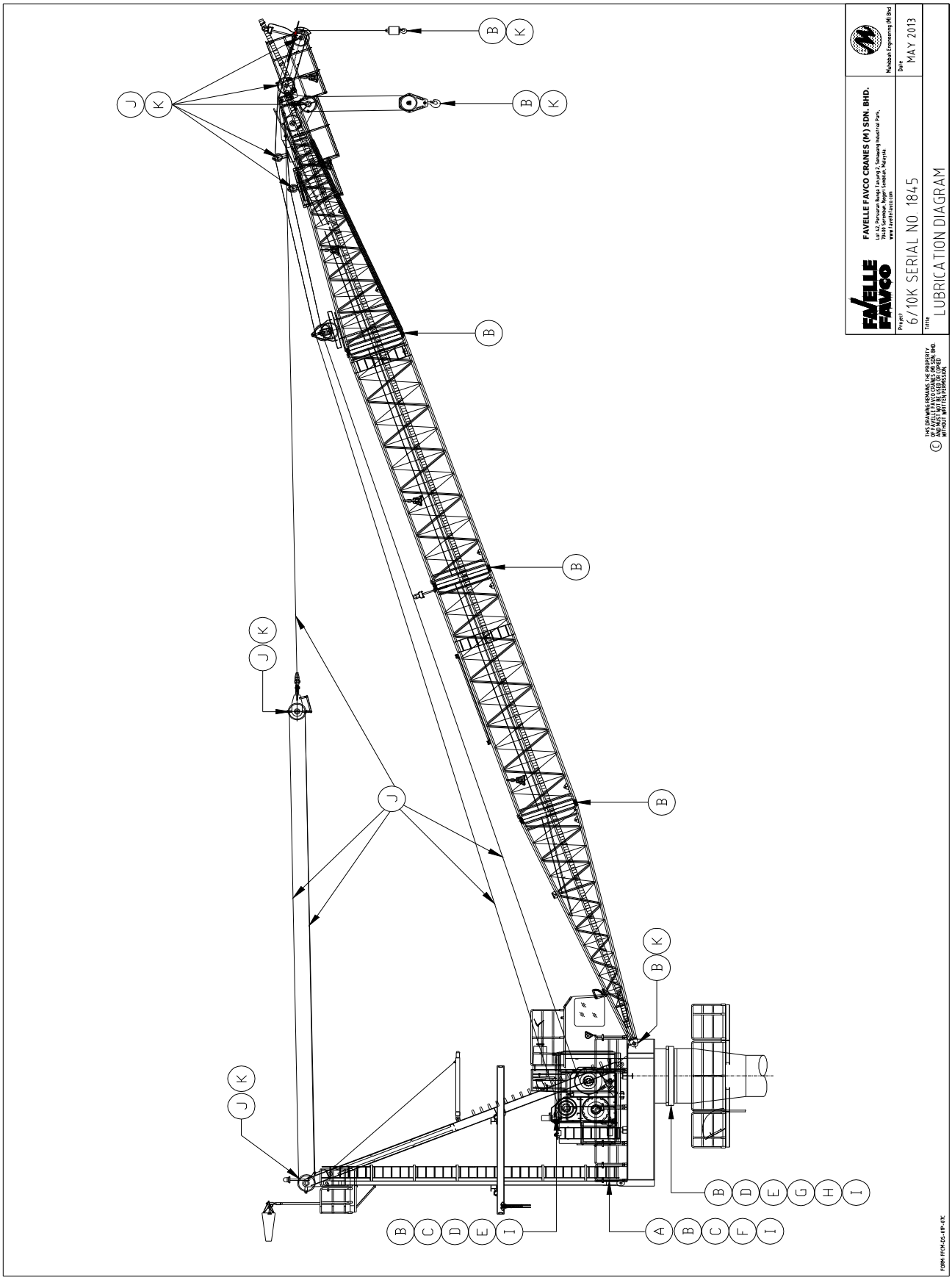
As the owner gains experience, and operating schedules established, the following recommended procedures and checks should be modified to suit the operating pattern.

For this reason, specific quantities and times are not specified for normal maintenance procedures, e.g. greasing, fuelling, inspections, etc. These requirements should be determined by observation, and practical application of established maintenance procedures.

A maintenance logbook should be used to establish the required schedule. This logbook should contain the Slew Ring Clearance record.

In later sub-sections, we recommend periodical checks, lubrication schedule and *system* maintenance. These are based on an annual usage of 2000 hours.

6.2 MAINTENANCE – DETAILED



A. Diesel engine

Please refer to sub-vendor's "Operation & Maintenance Manual" for diesel engine maintenance instruction.

B. Overall Inspection

A thorough examination of the crane should be carried out after the initial 100 hours of operation.

Bolts or screws and hydraulic fittings should be checked and re-tightened if necessary. Refer to drawing *MA4-9900.069* at the end of this section for recommended bolt tightening torques.

C. Hydraulic system

Maintenance of the hydraulic system mainly involves changing the oil and oil filter elements.

Typical system maintenance checks are:

a) Check filter clogging indicator gauge, light or mechanical pin, whichever is applicable when starting the engine. It is recommended that the frequency of filter element change to be 500 operating hours.
b) Check tank oil level regularly, with crane absolutely level.
c) Top up with correct oil as specified.
d) Use clean oil receptacles.
e) Check air breather on tank for clogging.
f) Check the system instrumentations i.e. ensure pressure gauges, etc., are functioning satisfactorily.
g) Refer to *Appendix A: Major Component Lubrication Table* at end of this section for hydraulic oil change frequency.
h) Check for external leaks. Repair immediately.
i) Check that pipe work is sound and where rubber hose is used, ensure there is no chaffing occurring.
j) Check that all system pressures are normal for the application. When a maintenance shutdown occurs, it is advisable to examine the oil tank for sludge and foreign matter and completely clean if necessary. This is imperative if a component failure has occurred.

D. Planetary gearboxes (Motion Drive)

The models that used on this crane are as below:

Main Hoist : L&S, GFT36 W3 4000/1
Fly Hoist : L&S, GFT17 W2 4000
Luff Hoist : L&S, GFT36 W3 4000/2
Slew : L&S, GFB36 T3 1000

Refer to *Appendix A: Major Component Lubrication Table* for oil change frequency at end of this section.

During oil change, we recommend that the inside of the gearbox be flushed out with flushing fluid recommended by the lubricant manufacturer.

Oil should be changed when hot to prevent build up of sludge deposit. Oil levels should be checked once per month. If more than 10% of total oil capacity has to be added, check for oil leaks.

Oil level on horizontal mounted boxes is on the centreline. *Figure 6-A1, 6-A2 & 6-A3* illustrates the winch drive gearbox maintenance.

Vertical mounted boxes (slew drives) are filled to the top through the oil plug. *Figure 6-B* illustrates the slew gearbox maintenance.

Please also refer to respective sub vendor's manual at *Chapter 10.0*

E. Disc brakes (part of planetary gearbox)

The hoist winch and slew gearbox disc brake is maintenance free.

In case of malfunctions, any repair works on the multi-plate parking brake, make sure always replace:

a) Disc
b) Springs
c) Seals

F. Pump drive gearbox

The models that used on this crane is Stiebel, 4383 (i=0.7576)

Refer to *Appendix A: Major Component Lubrication Table* for oil change frequency at end of this section.

During oil change, we recommend that the inside of the gear case be flushed out with flushing fluid recommended by lubricant manufacturer.

Oil should be change when hot to prevent build up of sludge deposit.

It is advisable to check oil level at least once per month. If more than 10% of total oil capacity has to be added, check for oil leaks.

If oil level rises, pump shaft seal or seals are faulty and must be replaced.

Oil level is indicated by the maximum notch on the measuring stick (part of breather).

Please also refer to respective sub vendor's manual at *Chapter 10.0.*

G. Slew ring

Refer to *Appendix A: Major Component Lubrication Table* for lubrication interval at end of this section.

The slew bearing must always be greased liberally until a collar of fresh grease is formed around the whole circumference of the bearing gaps and seals. The bearing should be rotated during lubrication. This is to ensure fresh grease forms at the seals and the bearing gaps around the slew ring.

Sealing materials are subjected to ageing when exposed to a number of environmental conditions; seals require maintenance and depending on their condition, may have to be replaced. The seals must be checked at lease every 6 months.

Check & re-torque slew bolts. Refer to drawing *MA3-2600.226* for the pre-load value.

Slew gear backlash shall be checked when re-tightening the slew bolts.

H. Open gears

Grease open gears with the recommended compounds avoiding bare metal-to-metal contact. For best result apply with brush sparingly to avoid dripping or splattering. Check weekly.

I. Maintenance / Inspection of Splined Pinion Drive.

Cranes fitted with splined pinion drive, i.e. slew drive must be inspected prior to erection of the crane. This must be repeated every 10,000 working hours, or every two years, whichever occurs first. Failure to do so can result in the premature failure.

The following is a procedure for inspection of the pinion spline.

a) Remove the pinion from gearbox output shaft.
b) Wash down and clean the male and female splines and inspect for wear.
c) Hands fit the pinion to the shaft and rock the pinion backwards and forwards as per normal rotation. Any movement greater than 1mm at the outer edge of the teeth of the pinion indicates the pinion and/or the gearbox output shaft must be replaced. Any visual signs of significant corrosion or wear also indicate that the pinion and/or gearbox shaft must be replaced.
d) If the pinion and the gearbox shaft wear are within limits, remove the pinion and apply a liberal coating of graphite-based grease to the splines.
e) Refit the pinion.

Repeat the procedure for each pinion.

J. Wire Ropes

Use compound when necessary to prevent rusting. Check weekly. Refer also *Section 6.4* for detailed maintenance information

K. Greasing Points

Grease all bearing and bushes, where applicable. This shall include, but not limited to the following:

Boom pivot bushes	every 50 hours or weekly
Sheaves	every 200 hours or monthly
Luff ratchet	every 200 hours or monthly

The grease nipples can be found at:

- ❖ Boom pivot pin
- ❖ Sheave pins
- ❖ Hoist drum bearings
- ❖ Slew ring all round
- ❖ Door hinge

L. **Filter Element** (if any)

a.) Refer to *Figure 6-C* for the filter used.

- Ensure that the oil supply lines to the filter are closed and the line decompressed to atmosphere.
- Drain the oil in filter by removing the bowl which is threaded into housing. Unscrew by applying the correct spanner to the base hexagon.
- Cover the bowl vertically to clear the element assembly, which will remain in the housing.
- Dislodge the element from the housing. Remove carefully.
- Paper elements cannot be cleaned, and must be replaced. Cranes fitted with washable elements should be cleaned appropriately before replacing the element.

b.) Fitting the clean element.

- Before replacing the element, thoroughly clean the interior of the bowl and the accessible areas of the housing. Replace element, wire only, 'O' ring seal and lubricate.
- Push the element spigot into the housing until it holds in place.
- Replace bowl rim seal and lubricate housing and bowl before refitting bowl.
- Screw the bowl rim seal and lubricate the housing and tighten with the correct spanner.

Miscellaneous Components Maintenance:

Sheave

Inspect the groove condition. Check if noise is generated on the sheave assembly.

Floodlights

Thoroughly check the condition of floodlights brackets, joints, safety chains, fasteners, and self- levelling mechanism. Repair or replace parts if sign of corrosion is observed.

Unpainted Components

Unpainted parts of the crane, such as shafts and pins, should be inspected on a regular basis and preserved with a spray-on coating.

Connections / Joints

Unless otherwise specified, connections / joints on the crane such as bolted, pinned, clamped connections, shall be inspected for corrosion. When non-metallic material such as Teflon, rubber, nylon & etc are used on these connections, they shall be inspected for degradation and replaced if necessary. This shall be carried out every 2,000 working hours or every 12 months, whichever comes first.

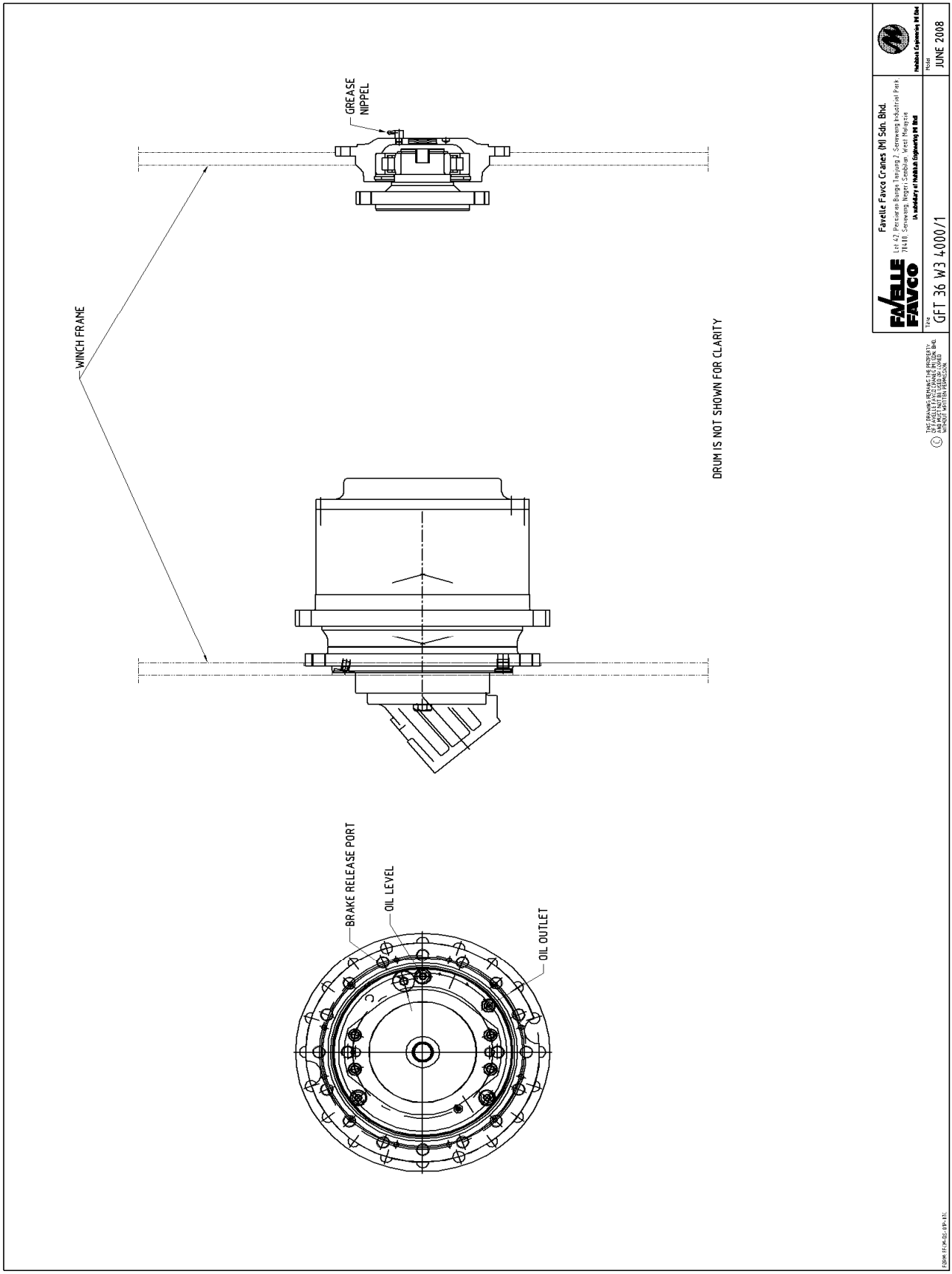


FIGURE 6-A1 MAIN HOIST GEARBOX

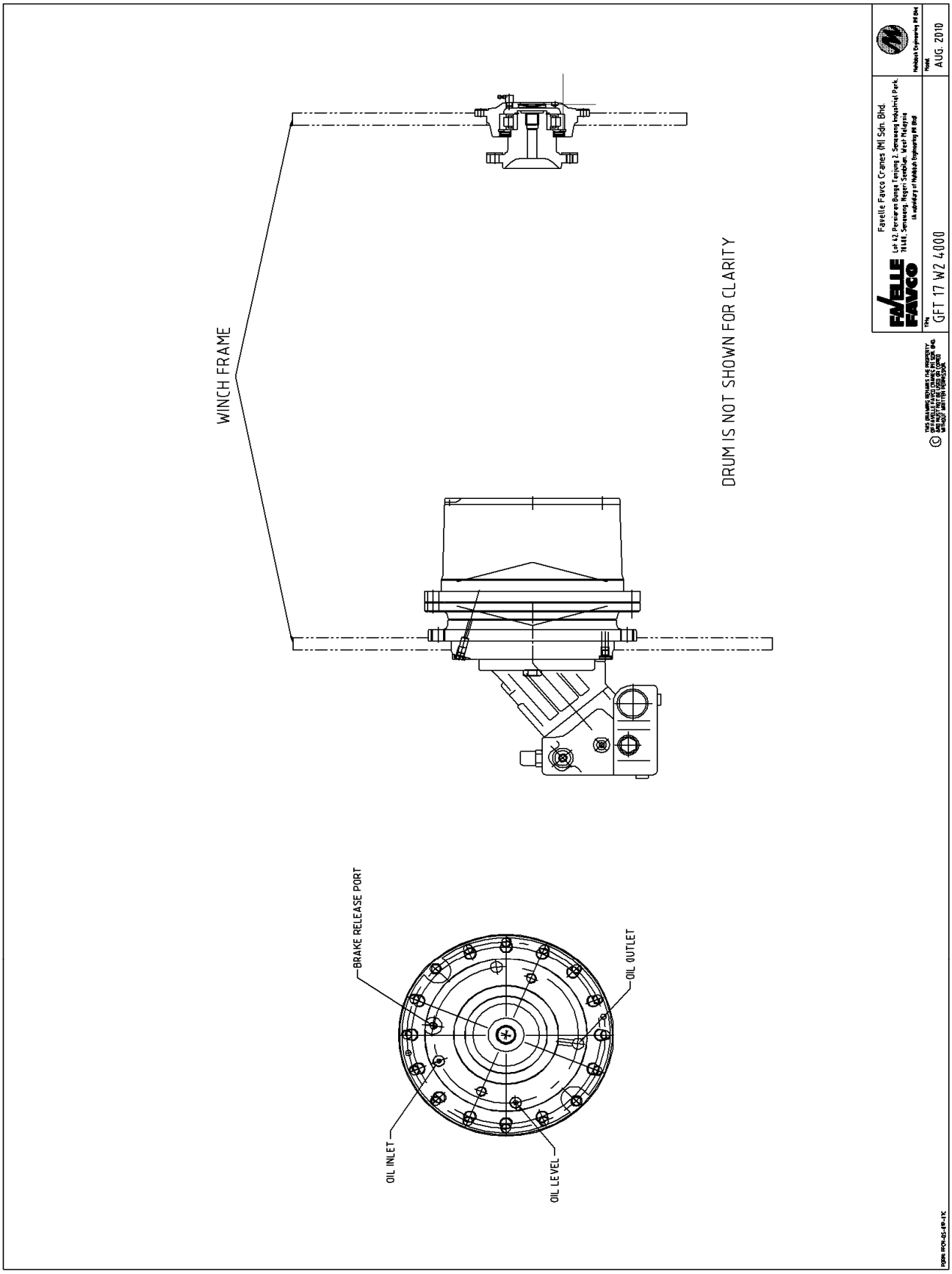


FIGURE 6-A2 FLY HOIST GEARBOX

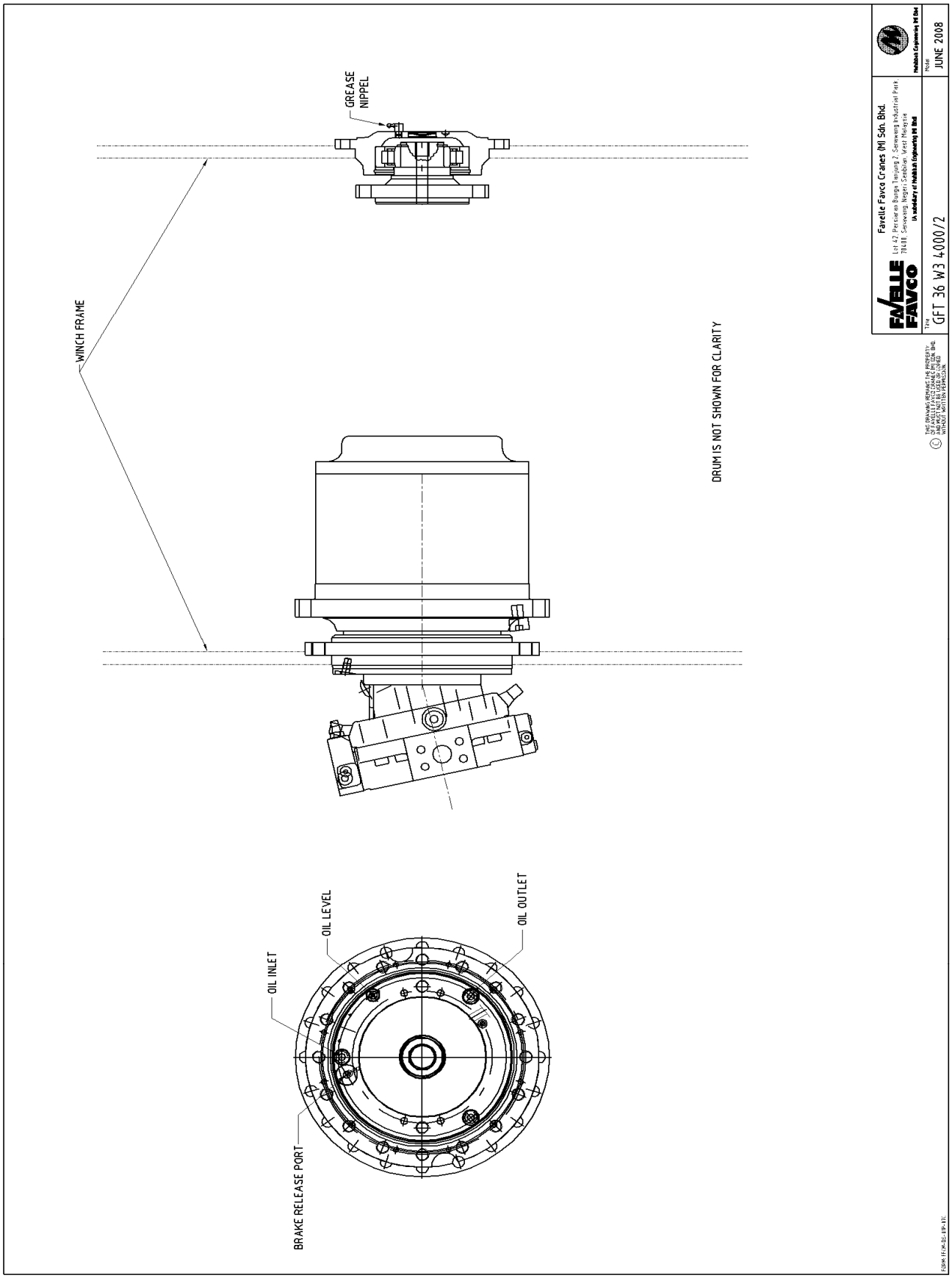


FIGURE 6-A3 LUFF HOIST GEARBOX

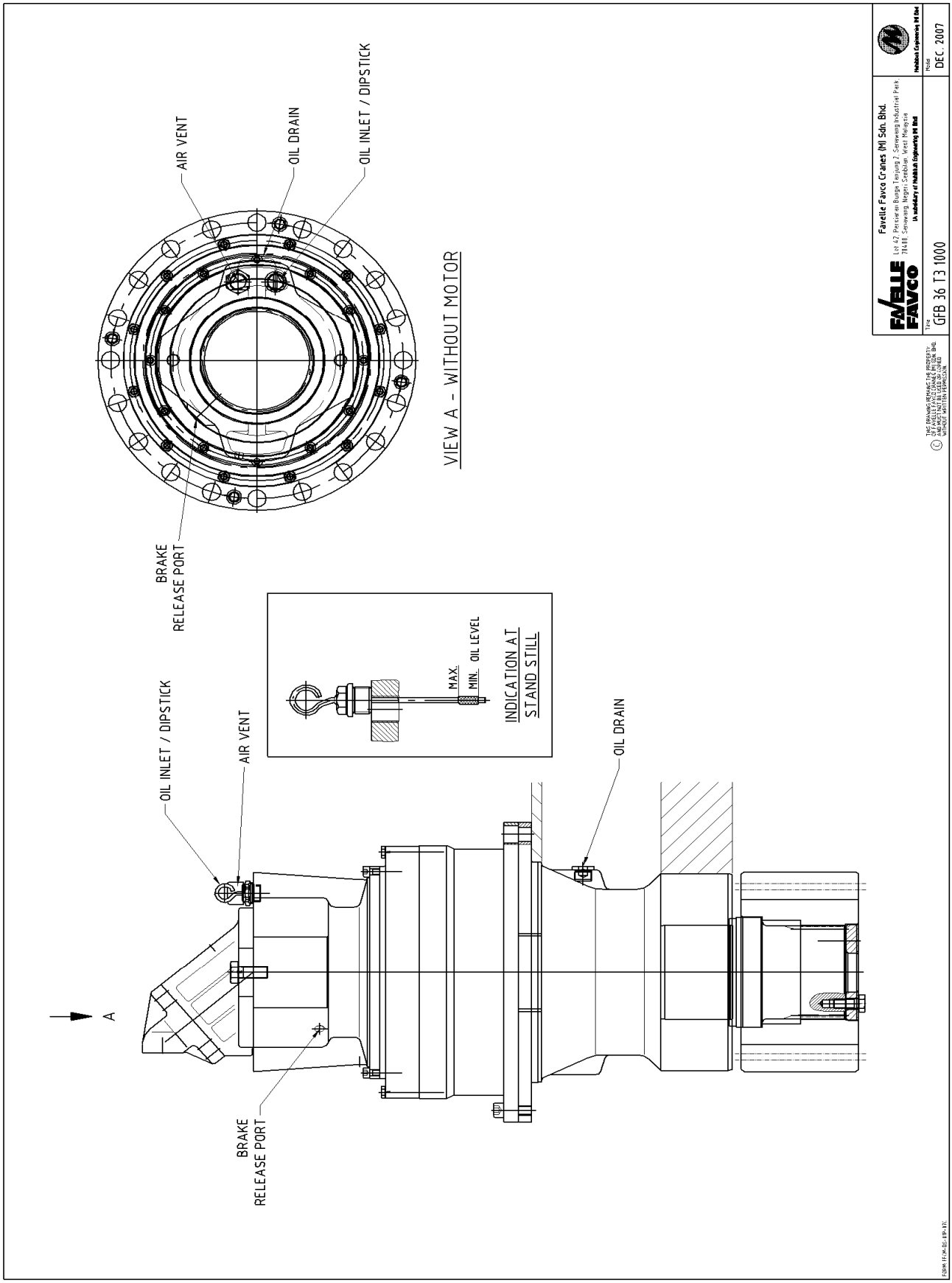
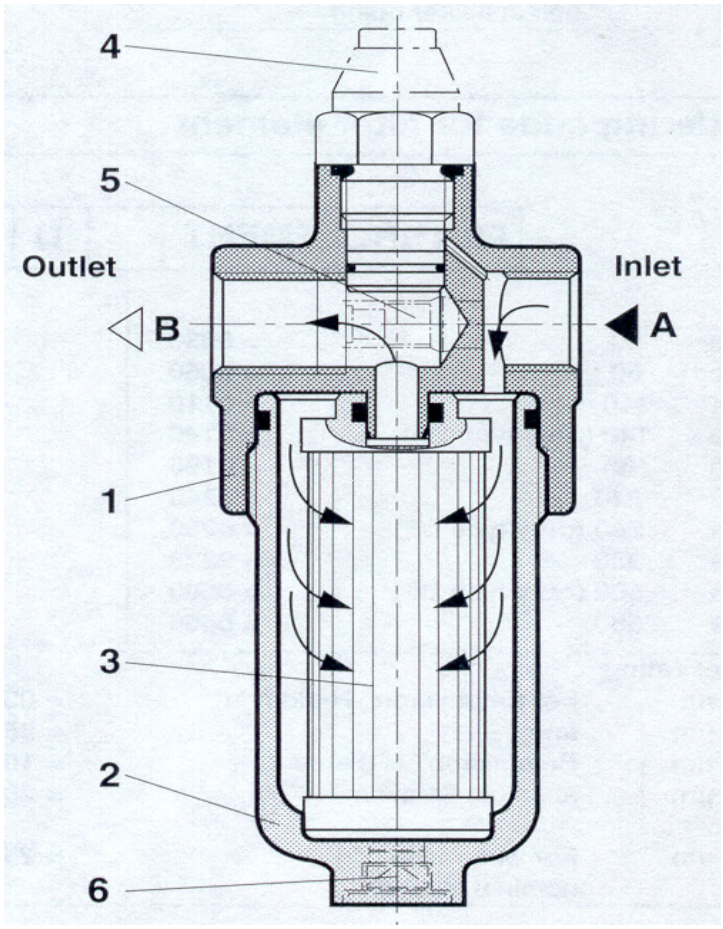


FIGURE 6-B SLEW DRIVE GEARBOX



LEGEND:

1. FILTER HEAD
2. FILTER HOUSING
3. FILTER ELEMENT
4. CLOGGING INDICATOR
5. BYPASS VALVE
6. OIL DRAIN SCREW

FIGURE 6-C PRESSURE LINE FILTER

6.3 RECOMMENDED OILS AND GREASES

6.3.1 Hydraulic System Oil

For optimum performance and service life of hydraulic axial piston pumps and motors, the viscosity is to be around 30 centistokes (30cst) at 60°C. Favelle Favco recommends using hydraulic oil of ISO viscosity class "VG68" or hydraulic oil with SAE grade 20W-20. Both types of fluid with a viscosity index of minimum 95 are suitable for tropical conditions or for areas with high ambient temperatures.

For areas where the ambient temperature falls below zero or daytime ambient temperature is between 0°C to maximum of +20°C, thinner oil as ISO - VG 46 or 32 must be used. In any case, oil must be warmed up to a minimum temperature as shown on following table before full pressure operation can commence. Hydraulic oil heater shall always powered to ensure the temperature of hydraulic oil always maintain around 25°C – 35°C.

Oil should be exchanged and stored in clean drums for future use before ambient temperature falls below 0 ° Celsius and the allowable viscosity of the oil in the system rises above 1000 cst.

Approx. Day Time Ambient Temperature		Below 0°C	(0°) to (+20°C)	(+10°) to (+35°C)
Hydraulic Oil : ISO Class		VG 32	VG 46	VG 68
Hydraulic Oil : SAE Grade			10W - 20	20W -20
	Viscosity	Hydraulic Oil Temperature		
Oil must be heated to reach minimum temperature of	1000cst	-10°C	-5°C	0°C
Preferred minimum starting Temperature	600cst	-5°C	0°C	+5°C
Minimum full pressure working temperature	100cst	+20°C	+27°C	+33°C
Optimum working temperature	30cst	+40°C	+50°C	+60°C
Maximum working temperature	20cst	+50°C	+60°C	+70°C
Short time peak temperature (critical)	15cst	+60°C	+70°C	+80°C

FAVELLE FAVCO recommends the following oils mentioned in the major component lubrication table.

6.3.2 Planetary Gearboxes (Motion Drive)

Refer to *Appendix A*: Major Component Lubrication Table at end of this section for recommended lubricant brands.

Splitter Gearbox

Refer to *Appendix A*: Major Component Lubrication Table at end of this section for recommended lubricant brands

6.3.3 Disc Brake (part of transmission gearboxes)

The hoist winches disc brake is maintenance free.

6 3.4 Slew Ring

The grease must be solely KP 2 K greases, i.e. lithium-saponified mineral oils of NLGI Grade 2 with EP additives. It MUST NOT include MOLYBDENUM DISULPHIDE.

Refer to *Appendix A*: Major Component Lubrication Table at end of this section for recommended lubricant brands.

6.3.5 Grease (Grease Nipple)

Grease must contain an effective corrosion prevention additive and must be consistent after extreme periods of service.

Refer to *Appendix A*: Major Component Lubrication Table at end of this section for recommended lubricant brands

6.3.6 Open Gear Teeth

This compound is highly water-resistant and of an adhesive nature.

Refer to *Appendix A*: Major Component Lubrication Table at end of this section for recommended lubricant brands.

6.3.7 Wire Rope

Refer to *Appendix A*: Major Component Lubrication Table at end of this section for recommended lubricant brands

Appendix A

FAVELLE FAVCO

Title:	MAJOR COMPONENT LUBRICATION TABLE
Document No.:	FFM184512-MC-14
Revision:	A
Model:	6/10K
Serial No.:	1845

Prepared	Checked	Approved
TAMIL	2/7/2013	

Item No.	Locations	Components	Lubrication Manufacturer	Recommended Lubricants	Frequency of Change	Volume (LTR)	Rev
1	Powerpack	Hydraulic Oil Tank	SHELL CALTEX	Tellus 68 Rando HD 68 *If temperature reaches 0°C, use Tellus 46 or Rando HD 46	Frequency of hydraulic oil change depends on the cleanliness of the oil. Drain 1 litre of oil after each 100 hrs of operation or 2 weeks & check for water. If water is present, drain until removed & top up with new oil. Hydraulic oil change to be performed after 2000 hours of operation or every 12 months.	600	
		Pump Drive Gearbox	SHELL MOBIL CASTROL BP-MACH ESSO	Omala 220 MobilGear 630 Alpha SP 220 Energol GR-XP 220 Spartan EP 220	First oil change to be performed after 200 hours of operation. Subsequent oil change to be performed after 2000 hours of operation, or at least once every 12 months.	5.6	
2	Winch Drive	Planetary Gearbox	SHELL MOBIL CASTROL BP-MACH ESSO	Omala 150 MobilGear 629 Alpha SP 150 Energol GR-XP 150 Spartan EP 150	First oil change to be performed after 150 hours of operation. Subsequent oil change to be performed after 1500 hours of operation, or at least once every 12 months.	3.0 (Main), 1.5 (Fly) & 3.0 (Luff)	
		Spline Drives	ROCOL MOLYKOTE	Dry Moly Paste ASP G-N Plus	Every month.	-	
3	Slew Drive	Planetary Gearbox	SHELL MOBIL CASTROL BP-MACH ESSO	Omala 220 MobilGear 630 Alpha SP 220 Energol GR-XP 220 Spartan EP 220	First oil change to be performed after 150 hours of operation. Subsequent oil change to be performed after 1500 hours of operation, or at least once every 12 months.	6.5	
		Spline Drives	ROCOL MOLYKOTE	Dry Moly Paste ASP G-N Plus	Every month.	-	
4	Slew Ring	Slew Bearing Raceway	SHELL MOBIL BP-MACH	Alvania EP (LF)2 Mobilux EP2 Energrease LS-EP2	Check every 50 hours.	-	
		Slew Bearing Open Gear	SHELL ROCOL	Malleus OGH TuftGear Universal	Check weekly.	-	
5	Boom Pivot Pin, Sheave & Bearing Support (Winch)	Grease Points	SHELL MOBIL	Alvania EP (LF)2 Mobilux EP2	Check weekly.	-	
6	Pinion	Open Gear Teeth	ROCOL	TuftGear Universal	Check weekly.	-	
7	Wire Rope	Wire Ropes	ROCOL	RD 105	Check weekly.		

6.4 ROPES - GENERAL

6.4.1 HANDLING OF ROPES

During unreeling or uncoiling rope, attention should be given to avoid the introduction of kinks or twists into the rope. This type of damage is permanent and places weak spot in the rope. Mount the reel on a vertical or horizontal axle and rotate the reel as the rope is pulled off.

When pulling rope out of a coil, the coil should be rolled on the ground to allow it to uncoil. It should be treated the same as if it were being uncoiled from a spool.

Other points to note include:

- The stored rope shall be covered in a well-ventilated area and away from excessive heat. If covered storage is not available, the rope and reel shall be covered with hemp material. This prevents humidity built up which would result in corrosion of the rope.
- For long periods of storage, apply a lubricant coating to the outside layer of the rope on the reel, and cover the rope and reel with hemp material.
- Care shall be taken during shipping and handling of the reel and rope to prevent damage to the rope. The loose end of the rope on the reel shall be secured properly to the reel. Do not drive a nail through the centre of the wire rope.

6.4.2 Fitting a New Rope

When anchoring a new rope on the drum, make sure that the entire cross section of the rope is held solid; otherwise the inner strands may be drawn from the attachment, leaving only the outer strands anchored. This can result in core protrusion.

The end of the rope should be brazed or tightly served to ensure no movement between the inner and outer layers of strand can occur.

When winding the new rope on from a reel, always wind from the top of the reel to the top of the drum or from the bottom of the reel to the bottom of the drum. Failure to do this will put a reverse bend in the rope and shorten its life. Check with Reeving Diagram drawing under *Chapter 9.0* to ensure correct winding. *Figure 6-D* illustrates this concept.

The first layer on the drum must be wound on tight and true. Open or wavy winding will cause serious damage to multiple layers. Adjacent turns should be tapped against each other with a wooden mallet, when drum is not grooved.

Never allow ropes to become slack. This can cause incorrect coiling on the drum, which may allow the rope to jump off the drum or sheaves. If the rope has become slack, check the coiling on the drum before continuing.

Limit must be reset when a new rope is fitted.

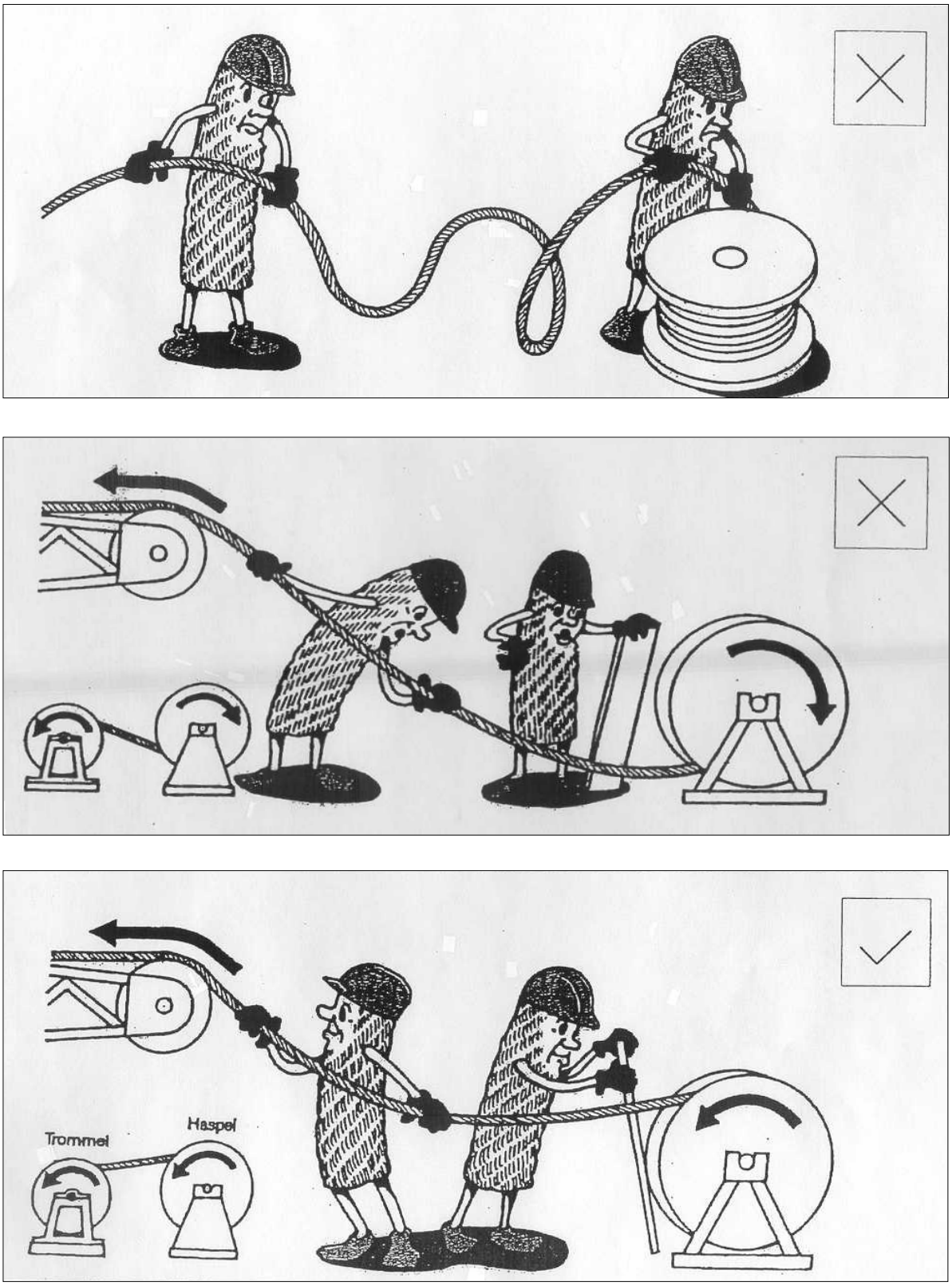


Figure 6-D CORRECT METHOD FOR REEVING ROPE

6.4.3 Correct Reeving

Reeving of hoist or luff ropes must always conform to the reeving diagram.

After installing, run the rope through its operating cycle several times with a light load and at reduced speed.

This is to ensure that the new rope

- Adjusts itself gradually to working conditions,
- Strands to become seated,
- Some stretch to occur and
- Diameter to reduce slightly as the strands and core are compacted.

By following the procedure above to condition the rope, a longer working life of the rope can be achieved.

Always observe the first spooling onto the drum of a new rope.

6.4.4 Rope Inspection

All running ropes in continuous service should be visually inspected once every working day. A thorough inspection of all ropes in use should be made at least once a month. Any rope damage should be noted and the cause be determined and fixed before loading the rope.

No precise rules can be given to determine the exact time for replacements of ropes, since many variable factors are involved. Safety in this respect depends largely upon the use of good judgment by an appointed or authorised person. Conditions such as the following should be sufficient reason for questioning rope safety and for consideration of replacement.

A. Reduced Wire Rope Diameter

Reduction from rope diameter in a non-working area (an area away from the sheaves) compared to the lowest diameter of rope measured in three (3) working areas (areas where the rope regularly goes over a sheave) of more than 6% is observed. See *Figure 6-E* for proper method of measuring rope diameters.

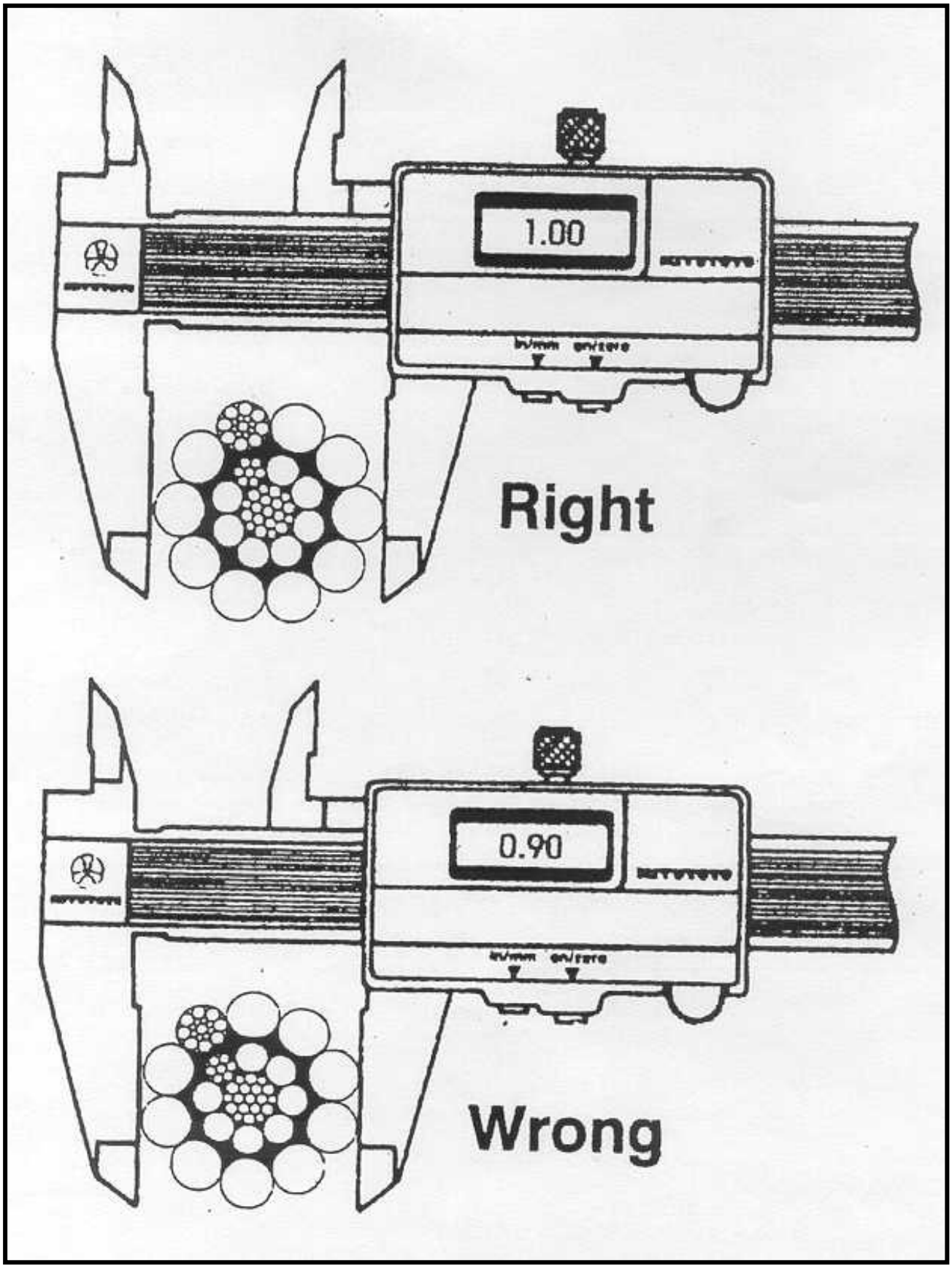


Figure 6-E Proper method of measuring rope diameter

B. Broken Wires

- **For non rotation-resistant ropes used in the luff hoist (if applicable)**
  In running ropes, six (6) randomly distributed broken wires within one (1) lay length or three (3) broken wires in one strand within one (1) lay length.
- **For rotation-resistant ropes used in the main and auxiliary hoist**
  In running ropes, four (4) randomly distributed broken wires within one (1) lay length or two (2) broken wires in one strand within one (1) lay length.
- **For standing ropes such as boom pendants (if applicable)**
  In running ropes, three (3) broken wires within one (1) lay length or two (2) broken wires at the end connection.

C. Wire Rope Deterioration

See *Figure 6-F* for detailed wire rope deterioration, kinking, crushing, bird caging or any other damage resulting in the distortion of the rope construction.

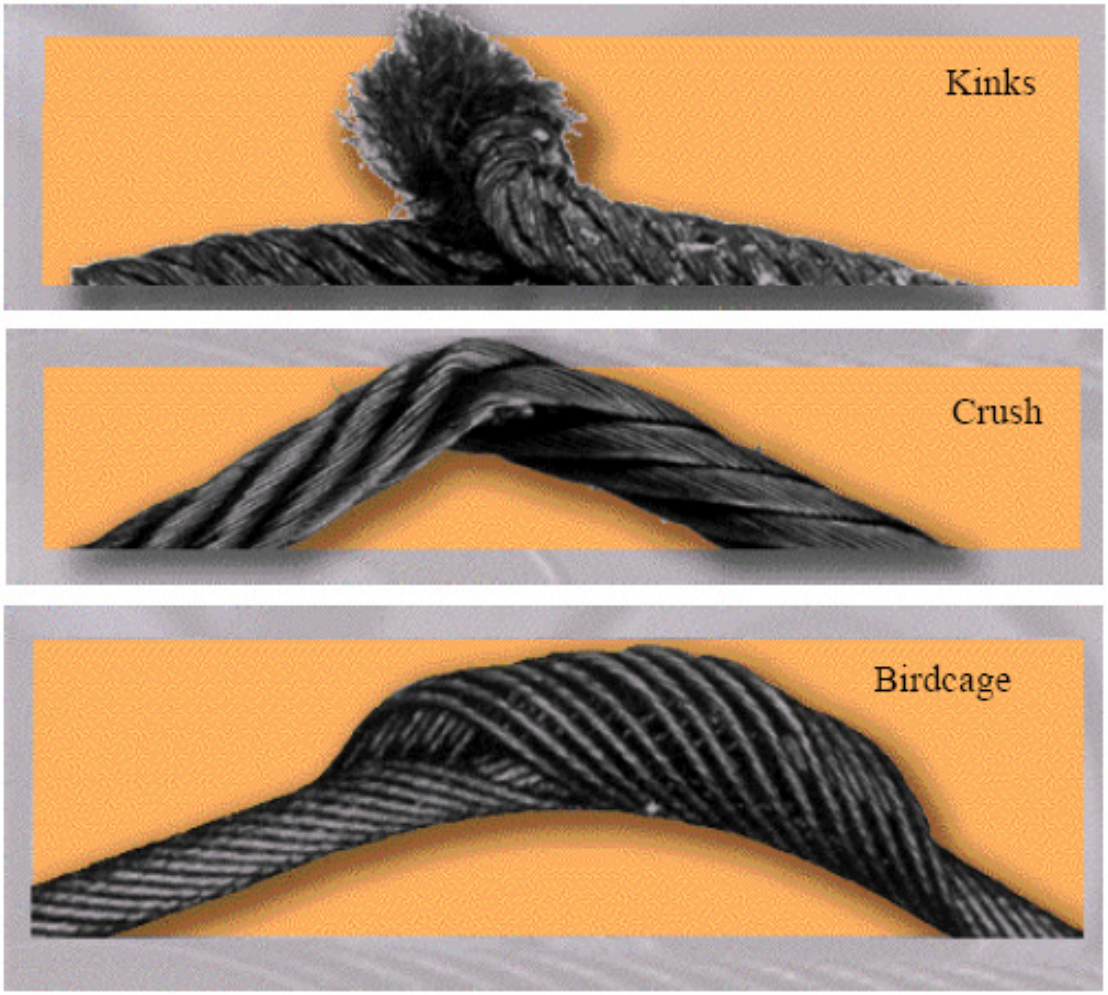


Figure 6-F Wire rope deterioration

D. **Wire Rope Wear**

Wears of more than one-third of the original diameter of the outside wires of the strand are worn.

E. **Heat Damage to Wire Rope**

There is evidence of any heat damage from any source. Passing a rope over a frozen or non-turning sheave can generate heat, so can contact with structural members of the crane, improperly grounded welding leads or lightning strikes.

F. **Valley Break to Wire Rope**

If one (1) valley break is observed, this may indicate internal rope damage requiring close inspection of this section of the rope. See *Figure 6-G.* When two (2) or more valley breaks are found in one (1) lay length the rope should be discarded.

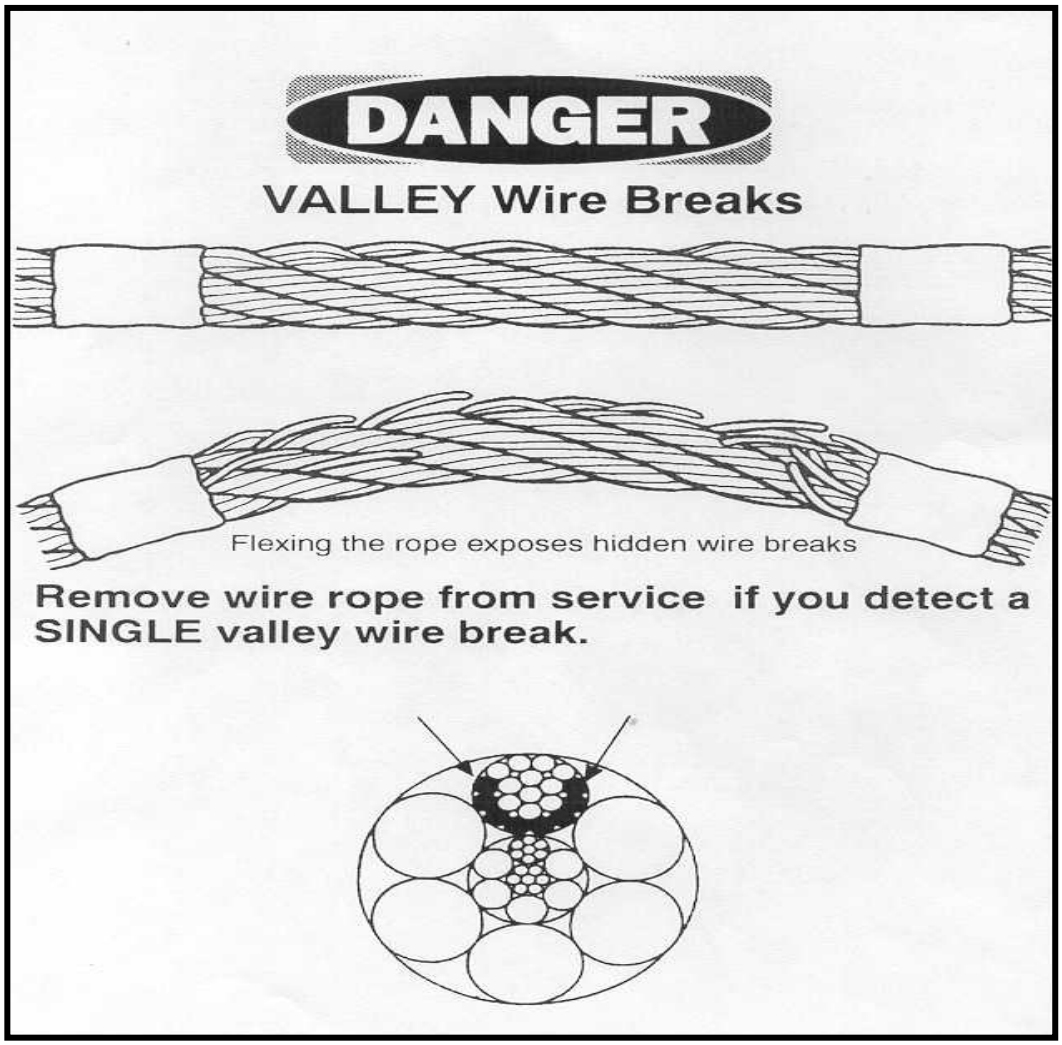


Figure 6-G Valley Breaks

G. Wire Rope Length

There is an observation of the increase in the length of an individual rope lay. This increase in lay length and accompanying reduction in diameter can be caused by failure of the core. This usually occurs more readily in ropes of rotation-resistant construction. See *Figure 6-H* for core failures in rotation-resistant wire rope.

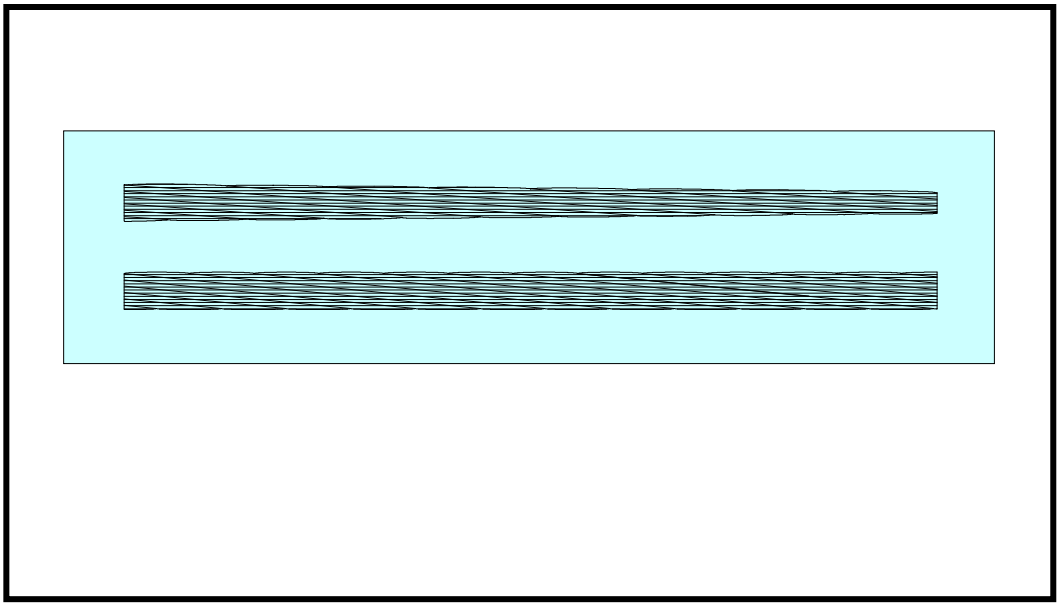


Figure 6-H Core failure in rotation resistance wire rope

H. Wire Rope Corrosion

Extensive external and/or internal permanent corrosion is cause for rope replacement.
In the case of rotation resistant ropes, which consist of a number of strand layers, internal corrosion may not be readily detectable. During inspection, outer stands must be separated to assess internal rope condition.
Wires in the rope, which are corrosively pitted would greatly reduce flexibility and will break much earlier as a result of rope bending over sheaves.

6.4.5 ROPE LUBRICATION

A wire rope is made up of hundreds of wires, which move relative to each other when the rope runs over sheaves. When a rope is manufactured it is completely filled with lubricant; firstly, to minimise frictional wear; and secondly, to keep out moisture and resulting corrosion.

It is vital that this lubrication be preserved to get the maximum life from the rope. An external coating of lubricant must be applied to the rope regularly to prevent the escape of the internal lubricant and also reduce friction on the sheaves.

a) Lubricating the rope is as important as greasing any other part of the crane. Any of the following methods can be used to lubricate the rope:
   - Pouring of lubricant onto rope as it passes over a sheave. Wipe off excess.
   - Swab the rope when not in motion with lubricant soaked rags.
   - Brush or spray with lubricant.
   - Pressure lubrication.

b) Points to Remember
   - Never overload.
   - Avoid shock loading ropes. Take up any slack carefully and apply the power smoothly and steadily.
   - Protect ropes from sharp edges.
   - Avoid dragging ropes from under loads.
   - Avoid rolling loads with ropes.
   - Avoid dropping ropes from heights.

c) Prevent loops in slack lines from being pulled tight and kinking. A weak spot will always remain no matter how well the kink seems to have straightened out. If a loop formed does not pull it out, unfold it. Avoid reverse bends.

d) Never wind more that the proper amount of rope on to any drum.

e) Ensure that the rope ends are properly seized.

f) Ensure that the ropes do not bind in the sheaves.

g) Watch for local wear. Premature wear at one spot is common. Uneven wear can be minimised by moving the rope so that different sections are at critical wear points. Cutting a few meters of rope from the drum and re-anchoring it can distribute the wear.

h) Maintain the equipment over which the rope runs. Worn grooves, poor alignment of sheaves and worn bearings can result in shock loads and excessive vibration.

6.4.6 SHEAVE

Refer to Reeving diagram for sheaves. Performance below checks for all the sheaves and fill in below table.

Sheave location & No.	Root Wear	Flange Wear	Lateral Wobble	Cracks in Web, Hubs, or Flange	Comments

A. Root Wear

The root area in the inner concave area of the sheave rim, where the rope sits on. Check for excessive wear, corrosion and deformations, which could damage the rope.

B. Flange Wear

The flanges are the sidewalls of the rim. Check for excessive play. Check bearings, seals, spacers and pins for wear.

C. Lateral Wobble

Move the sides of the sheave and check for excessive play. Check bearings, seals, spacers and pins for wear**.**

D. Crack in Web, Hub of Flange

Check for signs of cracks or corrosion. Check the web for straightness and alignment to the centre.

6.5 MAINTENANCE LOG

(This is a general maintenance sheet and items not applicable are to be deleted).

MAINTENANCE LOG SHEET A

(DAILY)

DAILY MAINTENANCE CHECK							
ITEM (WHERE APPLICABLE)	**Mon**	**Tues**	**Wed**	**Thurs**	**Fri**	**Sat**	**Sun**
DATE							
TIME							
OVERALL INSPECTION							
CHECK ENGINE OIL LEVEL							
CHECK DIESEL FUEL LEVEL							
CHECK PUMP DRIVE OIL LEVEL							
CHECK HYDRAULIC OIL LEVEL							
CHECK RADIATOR WATER LEVEL							
CHECK ENGINE AIR CLEANER							
CHECK MAIN HOIST ROPE LAY							
CHECK AUX. HOIST ROPE LAY							
CHECK LUFF ROPE LAY							
CHECK ANNUNCIATOR ALARMS (VISUAL & AUDIBLE)							
CHECK MAIN HOIST UP LIMIT							
CHECK AUX. HOIST UP LIMIT (IF APPLICABLE)							
CHECK LUFF IN LIMIT							
CHECK LUFF OUT LIMIT							
CHECK BATTERY SYSTEM (IF APPLICABLE)							
CHECK WINCH HOLD DOWN BOLTS							
CHECK POWER PACK HOLD DOWN BOLTS							
CHECK EMERGENCY STOP FUNCTION							
OPERATOR NAME & SIGNATURE							

REMARKS

MARK **S** FOR **SATISFACTORY**

MARK **US** FOR **UNSATISFACTORY**

MAINTENANCE LOG SHEET B

(WEEKLY OR EVERY 40 WORKING HOURS)

WEEKLY MAINTENANCE CHECK								
ITEM (WHERE APPLICABLE)	1st	2nd	3rd	4th	5th	6th	7th	8th
HOUR-METER READING								
DATE								
TIME								
OVERALL INSPECTION INCLUDING VISUAL CHECK FOR OIL LEAKAGE AROUND POWER PACK & WINCH								
CHECK OPERATION OF LUFF RATCHET								
CHECK MAIN HOIST ROPE FOR DEFECTS AND/OR FAILURE								
CHECK AUX. HOIST ROPE FOR DEFECTS AND/OR FAILURE (IF APPLICABLE)								
CHECK LUFF ROPE FOR DEFECTS AND/OR FAILURE								
INSPECT & GREASE SLEW RING BEARINGS								
INSPECT & GREASE MAIN HOIST DRUM GEAR								
INSPECT & GREASE AUX. HOIST DRUM GEAR (IF APPLICABLE)								
INSPECT & GREASE LUFF DRUM GEAR								
INSPECT & GREASE SLEW RING GEAR								
GREASE BOOM HEEL BUSHES								
OPERATOR NAME & SIGNATURE								

REMARKS

MARK **S** FOR **SATISFACTORY**

MARK **US** FOR **UNSATISFACTORY**

MAINTENANCE LOG SHEET C

(MONTHLY OR EVERY 100 WORKING HOURS)

MONTHLY MAINTENANCE CHECK								
ITEM (WHERE APPLICABLE)	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
HOURMETER READING								
DATE								
TIME								
CHECK ENGINE OIL LEVEL								
CHECK RADIATOR WATER LEVEL								
CHECK PUMP DRIVE OIL LEVEL								
CHECK MAIN HOIST BRAKE								
CHECK AUX. HOIST BRAKE (IF APPLICABLE)								
INSPECT & GREASE SHEAVE BEARINGS OF MAST, BRIDLE, BOOM AND HOOK SHEAVES ASSEMBLIES								
INSPECT & GREASE MAIN HOIST DRUM BEARINGS								
INSPECT & GREASE AUX. HOIST DRUM BEARINGS (IF APPLICABLE)								
INSPECT & GREASE LUFF DRUM BEARINGS								
INSPECT & GREASE MAIN HOIST DRUM DRIVE BEARINGS								
INSPECT & GREASE AUX. HOIST DRUM DRIVE BEARINGS (IF APPLICABLE)								
INSPECT & GREASE LUFF DRUM DRIVE BEARINGS								
INSPECT & GREASE SLEW DRIVE BEARINGS								
OPERATOR NAME & SIGNATURE								

REMARKS

MARK **S** FOR **SATISFACTORY**

MARK **US** FOR **UNSATISFACTORY**

MAINTENANCE LOG SHEET D

(EVERY THREE MONTHS OR EVERY 250 WORKING HOURS)

THREE MONTHS MAINTENANCE CHECK								
ITEM (WHERE APPLICABLE)	1st	2nd	3rd	4th	5th	6th	7th	8th
HOURMETER READING								
DATE								
TIME								
INSPECT & GREASE MAIN HOIST DRUM BEARINGS								
INSPECT & GREASE AUX. HOIST DRUM BEARINGS (IF APPLICABLE)								
INSPECT & GREASE LUFF DRUM BEARINGS								
INSPECT & GREASE MAIN HOIST DRUM DRIVE BEARINGS								
INSPECT & GREASE AUX. HOIST DRUM DRIVE BEARINGS (IF APPLICABLE)								
INSPECT & GREASE LUFF DRUM DRIVE BEARINGS								
INSPECT & GREASE SLEW DRIVE BEARINGS								
LUBRICATION OF LIMIT SWITCHES								
INSPECT THE HYDRAULIC OIL TANK								
INSPECT BAND BRAKES & ACTUATORS (IF APPLICABLE) - MAIN - LUFF - AUX.								
OPERATOR NAME & SIGNATURE								

REMARKS

MARK **S** FOR **SATISFACTORY**

MARK **US** FOR **UNSATISFACTORY**

MAINTENANCE LOG SHEET E

(EVERY 2,000 WORKING HOURS)

EVERY 2,000 WORKING HOURS								
ITEM (IF APPLICABLE)	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
HOURMETER READING								
DATE								
TIME								
INSPECT SLEW DRIVE SPLINED PINIONS								
OPERATOR NAME & SIGNATURE								

MAINTENANCE LOG SHEET F

(EVERY 10,000 WORKING HOURS)

EVERY 10,000 WORKING HOURS								
ITEM (IF APPLICABLE)	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
HOURMETER READING								
DATE								
TIME								
INSPECT SLEW DRIVE SPLINED PINIONS								
OPERATOR NAME & SIGNATURE								

Note: Boom pivot bush and slew ring clearances are to be logged on the procedure sheets on the following pages.

6.6 SLEW RING WEAR INSPECTION

(Every 12 months or 2000 hours operating hours, whichever comes first)

Refer to following procedure for inspection and record purpose. Replacement is required when permissible clearance is exceeded.

CRANE MODEL	PERMISSIBLE INCREASE IN BEARING CLEARANCE (MM)
8/10K	1.0
7.5/10K	1.0
6/10K / 150RL / 200RL	1.0
5/10K / 100RL	3.2
60RL	3.2
25RL	3.0

Taken from Rothe Erde GmbH
'Rothe Erde Slewing Bearings Catalogue 4.07/1.0' (2007 edition).
Wear Measurement - Maximum permissible bearing clearances

Procedure to check slew bearing clearance

Four measuring points are indicated with welded plates on circumference of pedestal adaptor. The measurement shall be performed between the lower mating structure and the bearing bolted to superstructure ('D', Fig. 1). The measurement procedures are given as followed:

1. Luff boom in to 5.3m radius from boom rest position.
2. Measure the distance between welded plate and bearing surface with depth gauge at four measuring points.
3. Record the base values obtained in tabular form and allocate them to the respective base measurements.

Measurement	Base Measurement
Measuring Point 1	
Measuring Point 2	
Measuring Point 3	
Measuring Point 4	

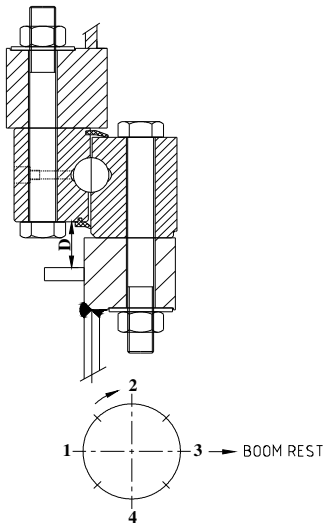


Figure 1

(Illustration Diagram)

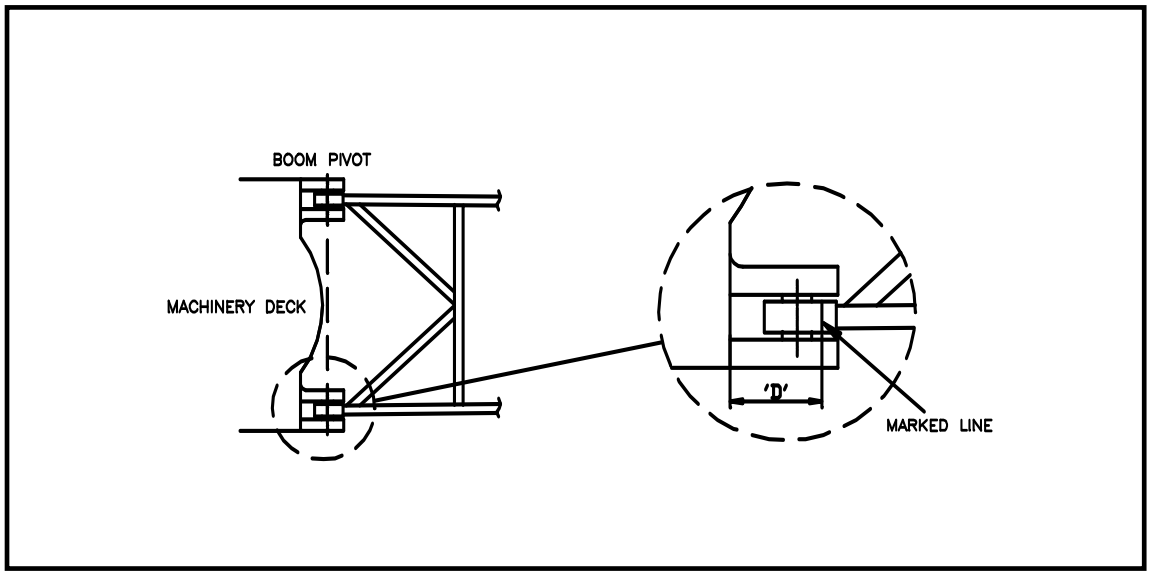
6.7 BOOM PIVOT BUSH WEAR INSPECTION

Refer to following procedure for inspection and record purpose.

1. Boom up to maximum allowed angle.
2. Mark line permanently at boom pivot as shown.
3. Measure distance from marked line to edge of machinery deck, 'D' as shown using vernier calliper. Record reading. This first recorded reading will be used for future comparison.

DATE	READING 'D'	DIFFERENCE ΔD

Note Δd should not exceed 3.0 mm.



6.8 CRANE FASTENER TORQUE

FORM: FFCM-DS-MIP-16C

METRIC SERIES (CLEAN DRY THREADS)				
FASTENER SIZE IN mm	GRADE 8.8		GRADE 10.9	
	Nm	Ft-lbs	Nm	Ft-lbs
M 12	49	37	71	53
M 14	78	58	114	84
M 16	120	89	177	131
M 20	242	179	345	255
M 24	419	310	596	440
M 27	614	454	874	645
M 30	833	615	1186	875

SLEW RING METRIC SERIES (CLEAN DRY THREADS)			
FASTENER SIZE IN mm	HOLE DIAMETER (mm) ISO 273	GRADE 10.9	
		Nm	Ft-lbs
M 20	22	322	238
M 24	26	557	411
M 27	30	816	602
M 30	33	1107	817

NOTES

1. USE THESE TORQUE VALUES UNLESS SPECIFIED OTHERWISE ON DRAWINGS.
2. NOT FOR USE ON METRIC STRUCTURAL BOLTS.
3. FOR REFERENCE: 1 Ft-Lb = 1.356 Nm / 0.738 Ft-Lbs = 1.0 Nm.
4. FOR OTHER COATING APPLICATIONS & OTHER BOLT SIZES, REFER TO ENGINEERING DEPARTMENT.
5. FOR SLEW RING BOLTS : TIGHTENING TORQUE = 0.7 x STRESS AT 0.2% ELONGATION, Rp0.2
   FOR GENERAL BOLTS : TIGHTENING TORQUE = 0.75 x STRESS AT 0.2% ELONGATION, Rp0.2
   FOR BOTH BOLT TYPES, TORQUE CO-EFFICIENT FACTOR = 0.1
   REFER ISO 898-1: 1999 (E) TABLE 3
   FOR GRADE 8.8, Rp0.2 = 640 MPa FOR d =< 16, 660 MPa FOR d > 16
   FOR GRADE 10.9, Rp0.2 = 940 MPa
6. FOR GRADE 12.9 BOLTS, TIGHTENING TORQUE VALUE SHALL FOLLOW GRADE 10.9 BOLTS UNLESS SPECIFIED OTHERWISE IN REF. DRAWINGS.

Cat	Item	Qty	Description	Material/Reference	Kg	Approved	Checked	Drawn	Description	Date	Rev.
						AJS	TEO	CXN	(E18374) NOTE 6 ADDED.	28.06.12	D
						AY	TEO	CAC	GENERAL REVISION OF THE TORQUE TABLE (ECN E:7954)	08.11.04	C
						AY	CCS	FYK	VALUES FOR M12 & M14 UPDATED	08.10.03	B
						AY	CCS	FYK	ORIGINAL ISSUE	31.07.03	A

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Muhibbah Engineering (M) Bhd

Title	Model	Rev.
FLUOROCARBON FASTENER TORQUES	STD.	D

Sheet	Scale	S/No.	Weight	Drawing Number
1/1	N/A	N/A	~ N/A	MA4-9900.069

Chapter 7.0

TROUBLE SHOOTING

Section 7.1 General troubleshooting List

Section 7.2 Planetary Drives

Section 7.3 Ropes

7.1 GENERAL

The following table will be very useful for finding and solving causes of breakdowns and common problems that occur during crane operation. Needless to say this table is not exhaustive, as it is impossible to set down all the causes and their associated solutions.

PROBLEM	PROBABLE CAUSE	REMEDY
A No boost pressure (or very low) (with engine running) - engine should cut out [motion]	Faulty pressure gauge.	Replace.
	Damaged/blocked boost pump suction hose(s).	Stop immediately - call FFCM.
	Damage drive coupling between engine and gearbox.	Stop immediately - call FFCM (replace).
	Boost pressure setting too low.	Check reason. Boost pressure relief valve should match circuit. Consult FFCM.
B No motions (with engine running)	Lines between cabin & winch frame connected incorrectly.	Check lines. If in doubt, consult FFCM.
	No boost pressure (or very low boost pressure).	Stop immediately - call FFCM.
	Limits are tripped or malfunctioning.	Reset or replace as necessary. Consult FFCM.
	Check solenoid and spool movement; Repair/replace as necessary.	Replace levers.
	Faulty relay.	Check wiring.
	Faulty/jammed main oil solenoid.	Check solenoid and spool movement; Repair/replace as necessary.

PROBLEM	PROBABLE CAUSE	REMEDY
C No hoist up (other motions OK)	Hoist winch is overloaded	Reduce load to comply with load chart.
	Brake not releasing	Check brake valve & check cabin control lever functionality
	Pump relief valves set incorrectly	Qualified personnel can adjust; Check reason
	Pump controller not functioning correctly.	Replace controller; qualified personnel to inspect/repair
	Emergency lowering bypass valve open or leaking	Close or replace
	Winch drives damaged	Consult FFCM
	Hoist up limit is tripped	Qualified personnel can bypass or reset as necessary if at top hoist down
	Leakage or block in hoist up control line from lever	Fix leak or replace hose as necessary
D No hoist down (other motions OK)	Hoist down limit is tripped (if fitted).	Qualified personnel can bypass or reset as necessary.
	Brake not releasing.	Check brake valve & check cabin control lever functionality
	Pump controller not functioning correctly	Replace controller. Qualified personnel to inspect/repair
	Leakage or block in hoist down control line from lever	Fix leak or replace hose as necessary
E Loaded hook drops slightly before lifting	Brake releasing too early	Qualified personnel to adjust
	Pump not correctly in neutral	Qualified personnel to adjust
	Excessive leakage in pump or motor	Consult FFCM

PROBLEM	PROBABLE CAUSE	REMEDY
F Empty hook (or light load) initially jumps up when hoisting.	Brake releasing too late	Qualified personnel to adjust
	Pump not correctly in neutral	Qualified personnel to adjust
G No luff up (other motions OK)	Luff up limit tripped (if fitted)	Qualified personnel can bypass or reset as necessary
	Luff in deceleration valve tripped or malfunctioning	Qualified personnel to adjust and check
	Luff ratchet not releasing	Check cylinder
	Luff winch is overloaded	Reduce load to comply with load chart
	Brake not releasing	Check brake valve & check cabin control lever functioning
	Pump relief valves set incorrectly	Qualified personnel can adjust - check reason
	Pump controller not functioning correctly	Replace controller. Qualified personnel to inspect/repair
	Winch drives damaged	Consult FFCM
	Leakage or block in luff control line from lever	Fix leak or replace hose as necessary
H Luff ratchet not releasing	Brake valve shuttle (if applicable) problem.	Replace if necessary
	Luff ratchet solenoid (if applicable) problem.	Replace coil or valve as necessary - fault trace if signal not coil.
	Ratchet cylinder not functioning properly	Check cylinder.
	Brake valve release pressure set incorrectly (if applicable).	Qualified personnel can adjust as necessary. Check reason.
	Damaged / leaking cylinder line	Replace/repair if as required.

PROBLEM	PROBABLE CAUSE	REMEDY
I No luff down (other motions OK)	Luff down limit is tripped.	Qualified personnel can bypass or reset as necessary.
	Luff ratchet not releasing.	Qualified personnel can adjust as necessary. Check reason.
	Brake not releasing.	Check brake valve - check cabin control lever functioning.
	Pump controller not functioning correctly.	Replace controller. Qualified personnel to inspect/repair.
	Leakage or block in luff down control line from lever.	Fix leak or replace hose as necessary.
J Crane will not slew (other motions OK)	Slew brake is on.	Move slew brake lever to off' position.
	Slew limit is tripped (if fitted)	Slew in opposite direction. Qualified personnel can bypass or reset as necessary.
	Brake not releasing.	Check brake valve in cabin.
	Pump controller not functioning correctly.	Replace controller Qualified personnel to inspect/repair.
	Cabin control lever not functioning correctly.	Replace lever. Qualified personnel to inspect/repair.
	Slew drive damaged.	Consult FFCM.
	Pump relief valves set incorrectly.	Qualified personnel can adjust - check reason.

PROBLEM	PROBABLE CAUSE	REMEDY
K Engine will not start	Air receiver's pressure is too low.	Recharge air receiver to the required pressure.
	Batteries are flat.	Check correct voltage from electric circuit. Charge or replace as necessary.
	No diesel fuel.	Check tank level and fill as required.
	Fuel filters or air cleaner is blocked.	Check and replace as required.
	Starter motor damaged.	Check starter motor and pinion. Replace as required.
	Hydraulic oil is too thick (especially in cold climate)	Replace with lower viscosity oil.
	Fuel is contaminated (eg. water) or waxed (ie. incorrect fuel for cold climate)	Check fuel, filters and water separator (where applicable).
	Ultimate limit(s) tripped.	Check limits. Qualified personnel can bypass if necessary.

7.2 PLANETARY DRIVES

PROBLEM	CAUSE	SOLUTION
With motor running the shaft output doesn't turn	Incorrect motor assembly.	Check coupling between gear unit and motor.
	Internal malfunction.	Contact FFCM or service Center.
	Brake blocked.	Check hydraulic circuit.
Oil leak from breather during operation	Level too high.	Lower oil level.
	Incorrect breather position.	Check breather position.
	Possible wear of multi-disk seals or hydraulic motor.	Contact FFCM or service Center.
Oil leak from seal	Clogging breather plug.	Unscrew and thoroughly clean the plug/breather.
	Stiffening of seals due to prolonged storage.	Clean the area and check for leakage again after a few days.
	Damaged or worn seals.	Contact FFCM or service Center.
Excessive noise	Internal malfunctions.	Contact FFCM or service Center.
Disc brake does not release	Residual pressure in hydraulic circuit.	Check hydraulic circuit.
Excessive vibrations	Gear unit incorrectly installed.	Check the connection and inline configuration.
	Coupling structure weak.	Strengthen the structure.
	Internal malfunction.	Contact FFCM or service Center.
Excessive heating	No ventilation.	Removing fairing.
	High thermal pressure.	Insert oil circulation.
Multi-disc brake does not release	No pressure to the brake.	Check connections to hydraulic circuit.
	Internal malfunction.	Contact FFCM or service Center.
	No pressure in the circuit.	Check hydraulic circuit.
Multi-disc brake does not brake	Pressure delivered to brake.	Check hydraulic circuit.
	Worn discs.	Contact FFCM or service Center.

7.3 ROPES

PROBLEM	CAUSE / ACTION
Mechanical damaged caused by the rope contacting the structure of the crane on which it is operating or an external structure – usually of a localized nature.	• Generally results from operational conditions. • Check sheave guards and supports / guides sheave to ensure that the rope has not jumped out of the intended reeving system. • Review operating conditions.
Opening of strands in rotation resistant, low rotation and parallel closed ropes – in extreme circumstances the rope may develop a birdcage distortion or protrusion of inner strands.	• Check sheave and drum groove radii using sheave gauge to ensure that they are no smaller than nominal rope radius +5%. • Repair or replace drum / sheaves. • Check feet angles in the reeving system. • Check installation method – turn induced during installation causes excessive rope rotation resulting in distortion. • Check if the rope has been cut on site prior to installation or cut to remove a damaged section. If so, was the correct cutting method used. Incorrect cutting of rotation resistant, low rotation and parallel closed ropes can cause distortion in operation. • Rope may have experienced a shock load.
Broken wires or crushed or flattened rope on lower layers at crossover points in multi-layer coiling situations. Wire breaks usually resulting from crushing or abrasion.	• Check tension on underlying layers. • Review wire rope construction. • Do not used more than necessary. • Check drum diameter. Insufficient bending ratio increases tread pressure.
Wire looping from strands.	• Insufficient service dressing. • Consider alternative rope construction. • If wires are looping out of the rope underneath a crossover point, there may be insufficient tension on the lower wraps on the drum. • Check areas for rope crushing or distortion.

PROBLEM	CAUSE / ACTION
Pigtail or severe spiraling in rope.	• Check that the sheave and drum diameter is large enough. • Indicates that the rope has run over a small radius or sharp edge. • Check to see if the rope has jumped off a sheave and has over a shaft.
Two single axial lines of broken wires running along the length of the rope approximately 120 degrees apart indicating that the rope is being nipped in a tight sheave.	• Check sheave and drum groove radii using sheave gauge to ensure that they are no smaller than nominal rope radius +5%. • Repair or replace drum / sheave if necessary.
One line of broken wires running along the length of the rope indicating insufficient support for the rope, generally caused by oversize sheave or drum grooving.	• Check to see if the groove diameter is no greater than 15% the nominal rope diameter. • Repair or replace drum/sheaves is necessary. • Check for contact damage.
Short rope life resulting from evenly / randomly distributed bend fatigue wire breaks caused by bending through the reeving system. Fatigue induced wire breaks are characterized by flats ends on the broken wires.	• Bending fatigue is accelerated as the load increases and as the bending radius decreases. Consider improving factor. • Check wire rope construction.
Short rope life resulting from localized bend fatigue wire breaks. Fatigue induced wire breaks are characterized by flats ends on the broken wires.	• Bending fatigue is accelerated as the load increases and as the bending radius decreases. Consider improving factor. • Check wire rope construction. • Localized fatigue breaks indicate continuous repetitive bends over a short length. Consider whether it is economic to periodically shorten the rope in order to move the rope to the system and progressively expose fresh rope to severe bending zone.

PROBLEM	CAUSE / ACTION
Broken rope – ropes are likely to break when subjected to substantial overload or misuse particularly when a rope has already been subjected to mechanical damage. Corrosion of rope both internally or externally can also result in a significant loss in metallic area. The rope strength is reduced to a level where it is unable to sustain the normal working load.	• Review operating condition.
Wave or corkscrew deformations normally associated with multi-strand ropes.	• Check sheave and drum radii using sheave gauge to ensure that they are no smaller than nominal rope radius +5%. • Repair drum or sheaves. • Check fleet angles in the reeving system. • Check the rope has been secured in accordance with manufactures instructions. • Check operating conditions for induced turn.
Rotation of the load in a single fall system.	• Review rope selection. • Consider use of rotation resistant or low. rotation rope.
Rotation of the load in a multi-fall system resulting in cabling of the rope. Possibly due to induced turn installation or operation	• Review rope selection. • Consider use of rotation resistant or low rotation rope. • Review installation procedure or operating procedures.
Core protrusion or broken cores in a single layer six or eight strand rope.	• Caused by repetitive shock loading – review operating conditions.
Rope accumulating or stacking at drum flange – due to insufficient fleet angle.	• Review drum design with original equipment manufacturer – consider adding rope kicker, fleeting sheave.

PROBLEM	CAUSE / ACTION
Sunken wraps of rope on the drum normally associated with insufficient support from lower layers of rope or grooving.	• Check correct rope diameter. • If grooved drum check groove pitch. • Check tension on underlying layers. • Make sure that the correct rope length is being used. Too much rope may aggravate the problem.
Short rope life induced by excessive wear and abrasion.	• Check fleet angle to drum. • Check general alignment of sheaves in the reeving system. • Check that all sheaves are a free to rotate. • Review rope selection.
External corrosion.	• Consider selection of galvanized rope. • Review level and type of service dressing.
Internal corrosion.	• Consider selection of galvanized rope. • Review frequency amount and type of service dressing. • Consider selection plastic impregnated wire rope.

Chapter 8.0

SPARES, SERVICE AND REPAIR

Section 8.1 Spare Parts

Section 8.2 Service and Repair of Structural and Mechanical Components

Section 8.3 Service and repair of Hydraulic and Electrical Components

8.1 SPARE PARTS

Great care has been taken to provide the maximum information required for replacement of faulty equipment through stocked spares or to order additional spares required through normal wear.

It is recommended that complete spare units are stocked for fast replacement and minimum down time of this crane.

When ordering spares, always state:

1.	Crane Type:	6/10K
2.	Crane Serial Number:	1845
3.	Name of Part:	*(Eg. Filter element)*
4.	Drawing No. Of Part:	*(Eg. MA3.6200.XXXM)*
5.	Revision No:	*(Eg. Rev. A)*
6.	Item No:	
7.	A description of the unit needed.	
8.	Include any manufacturer's data that is stamped on the part.	

8.2 SERVICE AND REPAIR OF STRUCTURAL AND MECHANICAL COMPONENTS

8.2.1 Arc Welding

Due to the materials used and the forces imposed on the structural components of this crane, repair or modifications, and in particular arc welding, should only be carried out in accordance with Favelle Favco Cranes (M) SDN. BHD. recommended procedures. These are available with written request.

In the event that repairs or modifications to the steel work above the slew ring require electric arc welding, the welding ground cable SHALL be grounded above the slew ring.
Failure to observe this precaution could result in damage to the slew ring.

8.2.2 Shaft and Pins

All shafts and pins are fabricated from high tensile steel and must never be replaced with any material other than as specified by Favelle Favco Cranes (M) SDN. BHD.

8.2.3 Fasteners

Care should be exercised when replacing bolts or cap screws to ensure that the correct thread and bolt grade is selected and the correct tightening torque is applied.

In general, metric thread fasteners are fitted, but other threads such as UNC and UNF may be used on pumps and various other proprietary components. Where grade and torque of a bolt is critical, the requirements are shown on the relevant drawing.

The following is offered as a guide:

- ISO Grade 8.8 bolts are used throughout the crane, for cover plates, brackets, handrails etc., and other non-primary structural components. Bolts 12mm or less are of stainless steel type (SS316).
- Grade 8.8 or 10.9 bolts are used mainly on winches, slew drives, slew ring, power pack, slip ring assembly (if applicable), winch frame, bridle and mast.

Refer recommended tightening torques at the end of *Chapter 6.0*.

8.2.4 Reinstatement of Coatings

Washing down to remove all grease and other foreign matter is essential before any coating repairs are carried out.

If the top coats are mechanically damaged and require repair, feather back rough edges and re-apply paint to the recommended thickness.

Refer to Customer's specification for paint to be used.

If damage has affected the primer, re-prime and re-coat after spot blasting or mechanical scrubbing to clean the metal.

8.3 SERVICE AND REPAIR OF HYDRAULIC AND ELECTRICAL COMPONENTS

8.3.1 Hydraulic

Concentration should be given to preventative maintenance of hydraulic components rather than complete overhaul, which requires highly specialized repair equipment and skills. The wear rate of pump and motors is negligible as long as ample boost pressure is provided and the oil is kept free from impurities and operated in a manner that the temperature in the hydraulic circuit does not exceed 70 degrees Celsius.

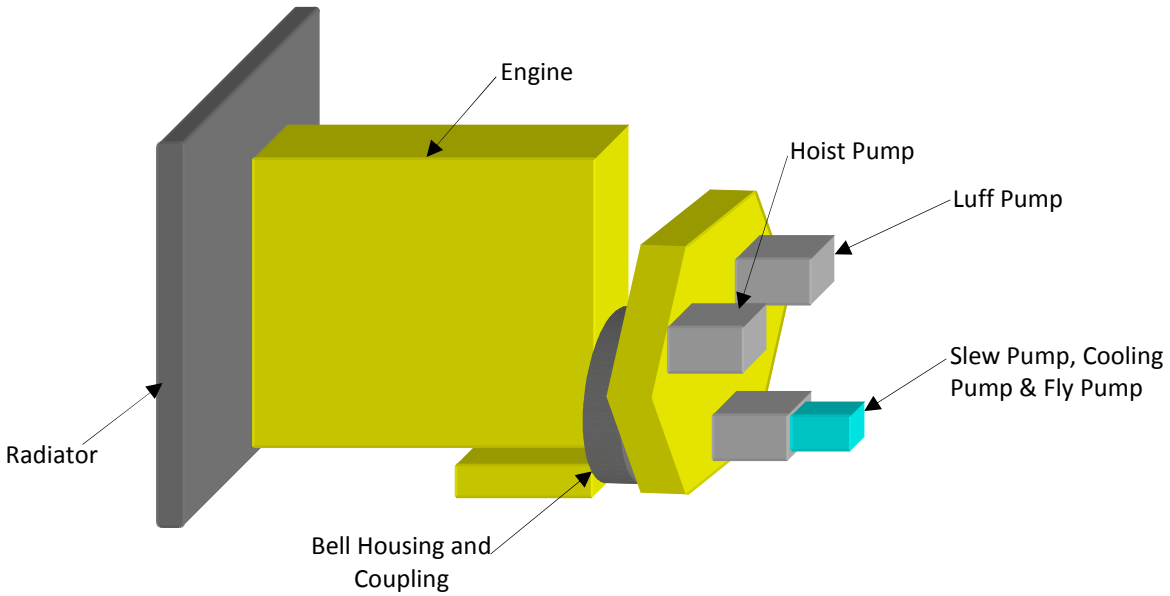
Although this crane manual contains exploded and sectional views which would assist in stripping and rebuilding of hydraulic components, it is recommended that under normal circumstances such work should be carried out by FFCM or the component distributor. It is however, recognized that circumstances may arise where strip and rebuild of hydraulic units by the user becomes necessary.

Claims under guarantee however, cannot normally be entertained especially when untrained personnel have stripped pumps or motors.

It is therefore, recommended that arrangements be made for the stocking of exchange units with additional minor parts e.g. Seals, O-Ring, etc.

Faulty units should be returned to the manufacturer directly through the nearest Favelle Favco agent for reconditioning.

Before removing any unit from the installation, clean areas adjacent to sockets and drains. Remove pipes or hoses and cover these component ports to prevent the ingress of dirt.
Dismantle and rebuild any hydraulic components only under the cleanest conditions.



8.3.2 Electrical

Electrical components within this crane are serviceable by a competent electrician, the exception being any electronic items.

As previously mentioned, it is recommended to have exchange units for the most important parts stocked for fast replacement.

There are strict warnings and procedures to be followed for each piece of equipment. These warning and procedures are noted **on the individual components e.g. "WHEN CIRCUITS ARE ALIVE, COVER MUST BE KEPT TIGHT".**

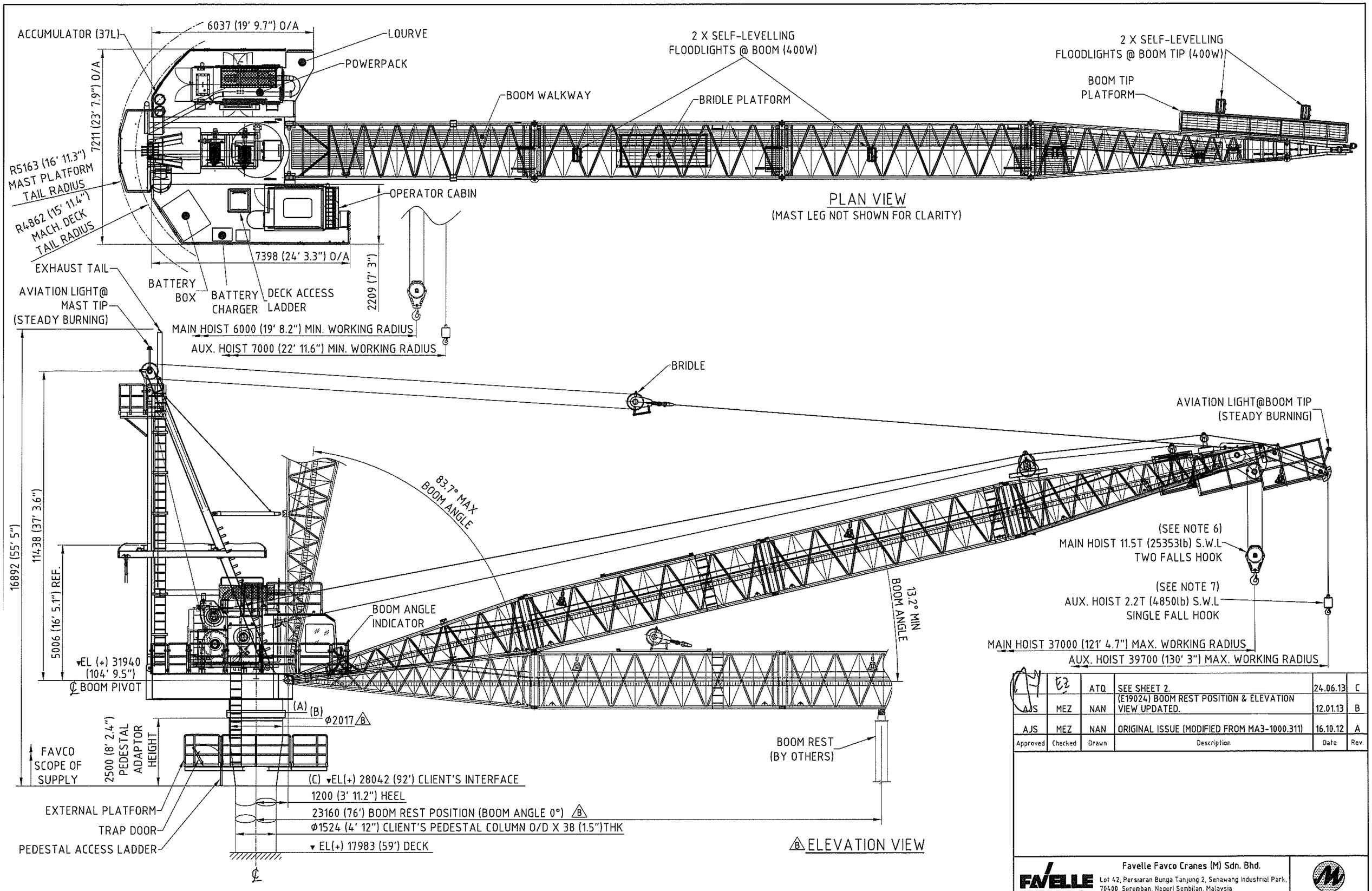
Before any piece of electrical apparatus is serviced, all sources of electrical supply, within the area in which the electrical apparatus is located, must be isolated (shut off).

Chapter 9.0

AS BUILT DRAWINGS

AS BUILT DRAWING SN 1845			
No.	**Description**	**Drawing No.**	**Rev.**
1.	General Arrangement	MA3-1000.388	C
2.	Machinery Deck Assembly	MA3-2000.461	A
3.	BOM - Machinery Deck Assembly	M200-0461-0000	A
4.	Cabin Assembly	MA3-2100.329	B
5.	BOM - Cabin Assembly	M210-0329-0000	B
6.	Load Chart	MA3-2170.308	A
7.	Rope Specification Plate	MA3-2175.305	A
8.	Winch Assembly (F4T)	MA3-2300.335	A
9.	BOM - Winch Assembly (F4T)	M230-0335-0000	A
10.	Winch Assembly (L10T)	MA3-2300.340	A
11.	BOM - Winch Assembly (L10T)	M230-0340-0000	A
12.	Winch Assembly	MA3-2300.469	A
13.	BOM – Winch Assembly	M230-0469-0000	A
14.	Winch Assembly (H7T)	MA3-2300.472	A
15.	BOM - Winch Assembly (H7T)	M230-0472-0000	A
16.	Drum Assembly (L10T)	MA3-2320.192	B
17.	BOM - Drum Assembly (L107T)	M232-0192-0000	A
18.	Drum Assembly (F4T)	MA3-2320.220	A
19.	BOM - Drum Assembly (F4T)	M232-0220-0000	A
20.	Drum Assembly (H7T)	MA3-2320.267	A
21.	BOM - Drum Assembly (H7T)	M232-0267-0000	A
22.	Band Brake Assembly (7T)	MA3-2360.044	E
23.	BOM - Band Brake Assembly (7T)	M236-0044-0000	C
24.	Band Brake Assembly (4T)	MA3-2360.045	E
25.	BOM - Band Brake Assembly (4T)	M236-0045-0000	C
26.	Band Brake Assembly (10T, Nut Stopper)	MA3-2360.046	D
27.	BOM - Band Brake Assembly (10T, Nut Stopper)	M236-0046-0000	B
28.	Limit Switch Assembly (F4T)	MA3-2370.153.XXX	A
29.	BOM - Limit Switch Assembly (F4T)	M237-0153-0100	A
30.	Limit Switch Assembly	MA3-2370.158.XXX	A
31.	BOM - Limit Switch Assembly	M237-0158-0100	A
32.	Slew Encoder Assembly	MA3-2370.163	A
33.	BOM - Slew Encoder Assembly	M237-0163-0000	A

AS BUILT DRAWING SN 1845			
No.	**Description**	**Drawing No.**	**Rev.**
34.	Drive Assembly (F4T)	MA3-2390.126	E
35.	BOM – Drive Assembly (F4T)	M239-0126-0000	A
36.	Drive Assembly (L10T)	MA3-2390.173	B
37.	BOM – Drive Assembly (L10T)	M239-0173-0000	A
38.	Drive Assembly (F7T)	MA3-2390.252	A
39.	BOM - Drive Assembly (F7T)	M239-0252-0000	A
40.	Powerpack Assembly	MA3-2400.257	A
41.	BOM - Powerpack Assembly	M240-0257-0000	A
42.	Slew Drive Assembly	MA3-2500.190	A
43.	BOM - Slew Drive Assembly	M250-0190-0000	A
44.	Slew Ring Assembly	MA3-2600.226	B
45.	BOM - Slew Ring Assembly	M260-0226-0000	B
46.	Mast Assembly	MA3-3000.177	B
47.	BOM - Mast Assembly	M300-0177-0000	B
48.	Boom Assembly – 36.6m	MA3-4000.335	A
49.	BOM - Boom Assembly – 36.6m	M400-0335-0000	A
50.	Reeving Diagram	MA3-5000.258	A
51.	BOM- Reeving Diagram	M500-0258-0000	A
52.	Electrical Schematic Diagram	MA3-6100.337	B
53.	BOM - Electrical Schematic Diagram	M610-0337-0000	B
54.	Hydraulic Circuit	MA3-6200.307	B
55.	BOM - Hydraulic Circuit	M620-0307-0000	B
56.	Pedestal Assembly	MA3-7000.341	B
57.	BOM - Pedestal Assembly	M700-0341-0000	B
58.	Pedestal Adaptor Welding Details	MA3-7100.296	A
59.	BOM - Pedestal Adaptor Welding Details	M710-0296-0000	B
60.	Slipring Assembly	MA3-7300.243	A
61.	BOM – Slipring Assembly	M730-0243-0000	A
62.	Ø620 / Ø550 Sheave Assembly	MA4-9510.064.XXX	B
63.	BOM – Ø620 / Ø550 Sheave Assembly	M951-0064-0100	B
64.	BOM – Ø620 / Ø550 Sheave Assembly	M951-0064-0300	B
65.	BOM – Ø620 / Ø550 Sheave Assembly	M951-0064-0400	B
66.	BOM – Ø620 / Ø550 Sheave Assembly	M951-0064-0600	B



	EZ	ATQ	SEE SHEET 2.	24.06.13	C
AJS	MEZ	NAN	(E19024) BOOM REST POSITION & ELEVATION VIEW UPDATED.	12.01.13	B
AJS	MEZ	NAN	ORIGINAL ISSUE (MODIFIED FROM MA3-1000.311)	16.10.12	A
Approved	Checked	Drawn	Description	Date	Rev.

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Muhibbah Engineering (M) Bhd

Title: GENERAL ARRANGEMENT

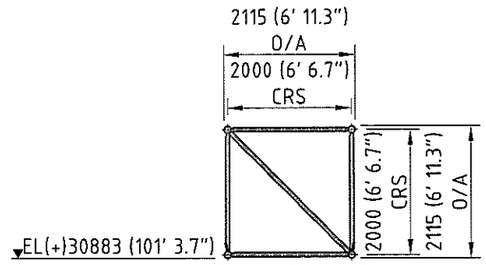
Model: 6/10K | Rev.: C

Sheet	Scale	S/No	Weight	Drawing Number
1/3	1 : 125	1845	~SHT.2	MA3-1000.388

S/N 1845 (6/10K) - 36.6m (120 ft) BOOM
MAIN HOIST 2 FALLS / AUX. HOIST 1 FALL / BOOM HOIST 8 FALLS
BANUWATI-K PROJECT
TAG NO.: H-900

BOOM ANGLE (°)	RADIUS (m (ft))	S.W.L (IN TONNES (IN POUNDS))		
		ONBOARD DF=1.33	OFFBOARD	
			S.W.H = 0.9m	S.W.H = 2.74m
83.7	6.0 (19.7)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
80.5	8.0 (26.2)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
77.3	10.0 (32.8)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
74.0	12.0 (39.4)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
70.7	14.0 (45.9)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
67.3	16.0 (52.5)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
63.8	18.0 (59.1)	11.5 (25,353)	11.5 (25,353)	10.5 (23,149)
60.3	20.0 (65.6)	11.5 (25,353)	11.5 (25,353)	9.1 (20,062)
56.5	22.0 (72.2)	11.5 (25,353)	10.3 (22,707)	7.8 (17,196)
52.6	24.0 (74.7)	11.5 (25,353)	9.2 (20,282)	6.9 (15,211)
48.5	26.0 (85.3)	11.5 (25,353)	8.4 (18,518)	6.0 (13,227)
44.1	28.0 (91.9)	11.5 (25,353)	7.6 (16,755)	5.4 (11,905)
39.2	30.0 (98.4)	11.0 (24,250)	6.9 (15,211)	4.8 (10,582)
36.6	31.0 (101.7)	10.4 (22,928)	6.6 (14,550)	4.6 (10,141)
33.8	32.0 (105.0)	9.8 (21,605)	6.3 (13,889)	4.4 (9,700)
27.5	34.0 (111.5)	8.8 (19,400)	5.8 (12,786)	4.0 (8,818)
19.2	36.0 (118.1)	8.0 (17,637)	5.4 (11,905)	3.8 (8,377)
13.2	37.0 (121.4)	7.5 (16,534)	5.2 (11,464)	3.7 (8,157)

AUX. HOIST 2.2T(4,850lb) : PERSONNEL LIFT 0.9T(1,984lb)
@ ALL RADII (MIN 7.0m(22' 8.2") - MAX 39.7m(130' 3"))
API 2C MINIMUM RECOMMENDED HOOK SPEED: 15.1 m/min (0.82 ft/sec)
MAXIMUM OPERATING WIND SPEED: 20.1 m/sec (66.0 ft/sec) A
RATING METHOD: GENERAL METHOD



BOOM SECTION
@ BOOM REST
SCALE: 1 : 100

B BOOM REST LOADING

VERTICAL LOAD : 15.7 T
HORIZONTAL LOAD : 8.9 T
(DUE TO WIND LOAD & TRANSPORTATION)

LOADING @ SLEW RING (A)

MAX. DYNAMIC MOMENT	660.6 Tm
CORRESPONDING AXIAL LOAD	57.9 T
MAX. AXIAL LOAD	72.8 T
CORRESPONDING DYNAMIC MOMENT	256.3 Tm

LOADING @ PEDESTAL ADAPTOR (B)

INCLUDES PEDESTAL FACTOR 1.5, CATEGORY 1 OR CATEGORY 2 DESIGN LOADS (IN ACCORDANCE WITH API-2C)

MAX. DYNAMIC MOMENT	931.8 Tm
CORRESPONDING AXIAL LOAD	82.3 T
MAX. AXIAL LOAD	86.0 T
CORRESPONDING DYNAMIC MOMENT	382.3 Tm

LOADING @ PEDESTAL INTERFACE (C)

INCLUDES 2.0 TIMES THE STATIC RATED LOAD (IN ACCORDANCE WITH API-2A)

MAX. DYNAMIC MOMENT	864.8 Tm
CORRESPONDING AXIAL LOAD	76.7 T*
MAX. AXIAL LOAD	77.8 T*
CORRESPONDING DYNAMIC MOMENT	145.2 Tm

B

COMPONENT WEIGHTS

MACHINERY DECK ASSEMBLY	28.7 T (63,273lb)
PEDESTAL ASSEMBLY	7.3 T (16,064lb)
BOOM ASSEMBLY	10.8 T (23,810lb)
BRIDLE ASSEMBLY	0.6 T (1,323lb)
MAIN HOOK ASSEMBLY	0.6 T (1,323lb)
FLY HOOK ASSEMBLY	0.2 T (441lb)
RIGGING WEIGHTS	2.2 T (4,850lb)
TOTAL CRANE WEIGHTS (DRY)	50.4 T (111,084lb)

TECHNICAL DATA

AREA CLASSIFICATION:
ENTIRE CRANE (INCLUDING E&I) IN SAFE ZONE, EXCEPT BOOM IS CLASS 1, DIVISION 2, GROUP D, TEMP. CLASS T3.

MAIN HOIST:	11.5 TONNE(25,353 lb) S.W.L - 2 FALLS
SPEED:	11.5 TONNE(25,353 lb) @ 0-29.8 m/min(1.63 ft/sec) (AVERAGE)
AUX. HOIST:	2.2 TONNE(4,850 lb) - SINGLE FALL
SPEED:	0-83.8 m/min(4.58 ft/sec) (AVERAGE)
LUFF:	MAX. TO MIN. RADIUS IN 94.1 SEC APPROX. (THEORETICAL)
SLEW:	0-1.59 RPM
POWERPACK:	DIESEL-HYDRAULIC CAT 3406, C-RATING 358kW @ 2100 RPM
OPERATING WIND SPEED:	20.1 m/s(66 ft/sec)
STOWED WIND SPEED:	42.4 m/s(139 ft/sec)

NOTES

1. THIS CRANE IS BUILT IN ACCORDANCE WITH API-2C 7TH EDITION.
2. ALL DIMENSIONS ARE IN MILIMETRES UNLESS SPECIFIED OTHERWISE.
3. RATED LOAD IS IN METRIC TONNES AND REFER TO LOAD BELOW THE HOOK.
4. MAIN HOIST IS REEVED IN TWO FALLS.
5. AUXILIARY HOIST IS REEVED IN SINGLE FALL.
6. S.W.L OF MAIN HOIST HOOK IS 15.0T. HOWEVER, THE LIFTING CAPACITY IS AS PER MAX. SWL OF LOAD CHART.
7. S.W.L OF AUX. HOIST HOOK IS 4.0T. HOWEVER, THE LIFTING CAPACITY IS AS PER MAX. SWL OF LOAD CHART.

*8. AXIAL LOADING AT PEDESTAL INTERFACE IS INCLUDED WEIGHT OF PEDESTAL ASSEMBLY.

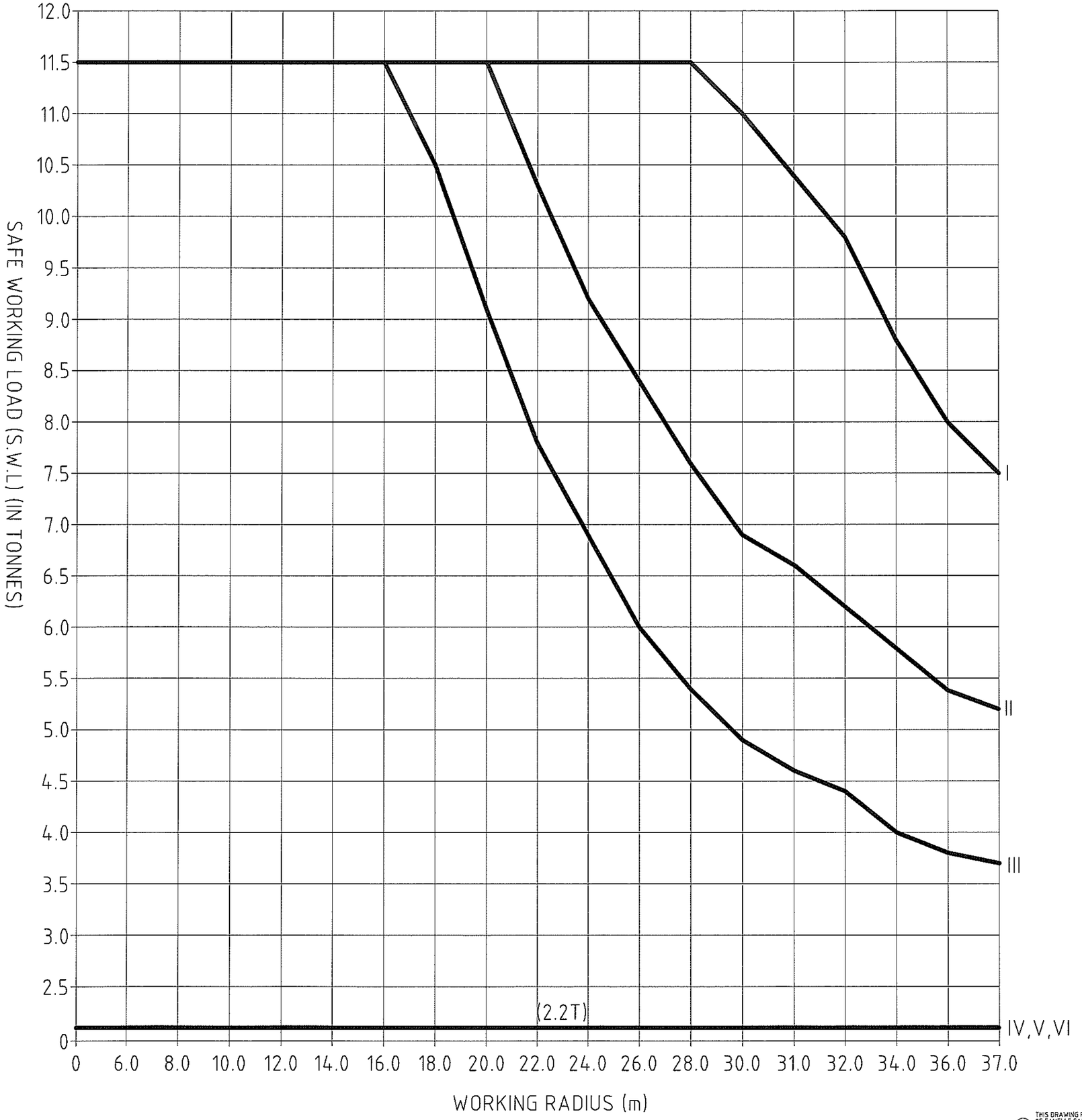
9. THIS DRAWING COME WITH S.I. UNIT AND IMPERIAL UNIT.

Approved	Checked	Drawn	Description	Date	Rev.
		ATQ	(E19870) MAXIMUM OPERATING WIND SPEED REVISED.	24.06.13	C
AJS	MEZ	NAN	(E19024) BOOM REST LOADING & API 2C MIN. RECOMMENDED HOOK SPEED UPDATED.	12.01.13	B
AJS	MEZ	NAN	ORIGINAL ISSUE (MODIFIED FROM MA3-1000.311)	16.10.12	A

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
GENERAL ARRANGEMENT	6/10K	C

Sheet	Scale	S/No	Weight	Drawing Number
2/3	1 : 1	1845	~50.4T	MA3-1000.388



I --- (MAIN HOIST) ONBOARD CONDITION WITH DF: 1.33

II --- (MAIN HOIST) OFFBOARD CONDITION WITH S.W.H: 0.9m

III--- (MAIN HOIST) OFFBOARD CONDITION WITH S.W.H: 2.74m

IV--- (AUX. HOIST) ONBOARD CONDITION WITH DF: 1.33

V --- (AUX. HOIST) OFFBOARD CONDITION WITH S.W.H: 0.9m

VI--- (AUX. HOIST) OFFBOARD CONDITION WITH S.W.H: 2.74m

Approved	Checked	Drawn	Description	Date	Rev.
		ATQ	SEE SHEET 2.	24.06.13	C
AJS	MEZ	NAN	SEE SHEET 1 & 2.	12.01.13	B
AJS	MEZ	NAN	ORIGINAL ISSUE (MODIFIED FROM MA3-1000.311)	16.10.12	A

FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

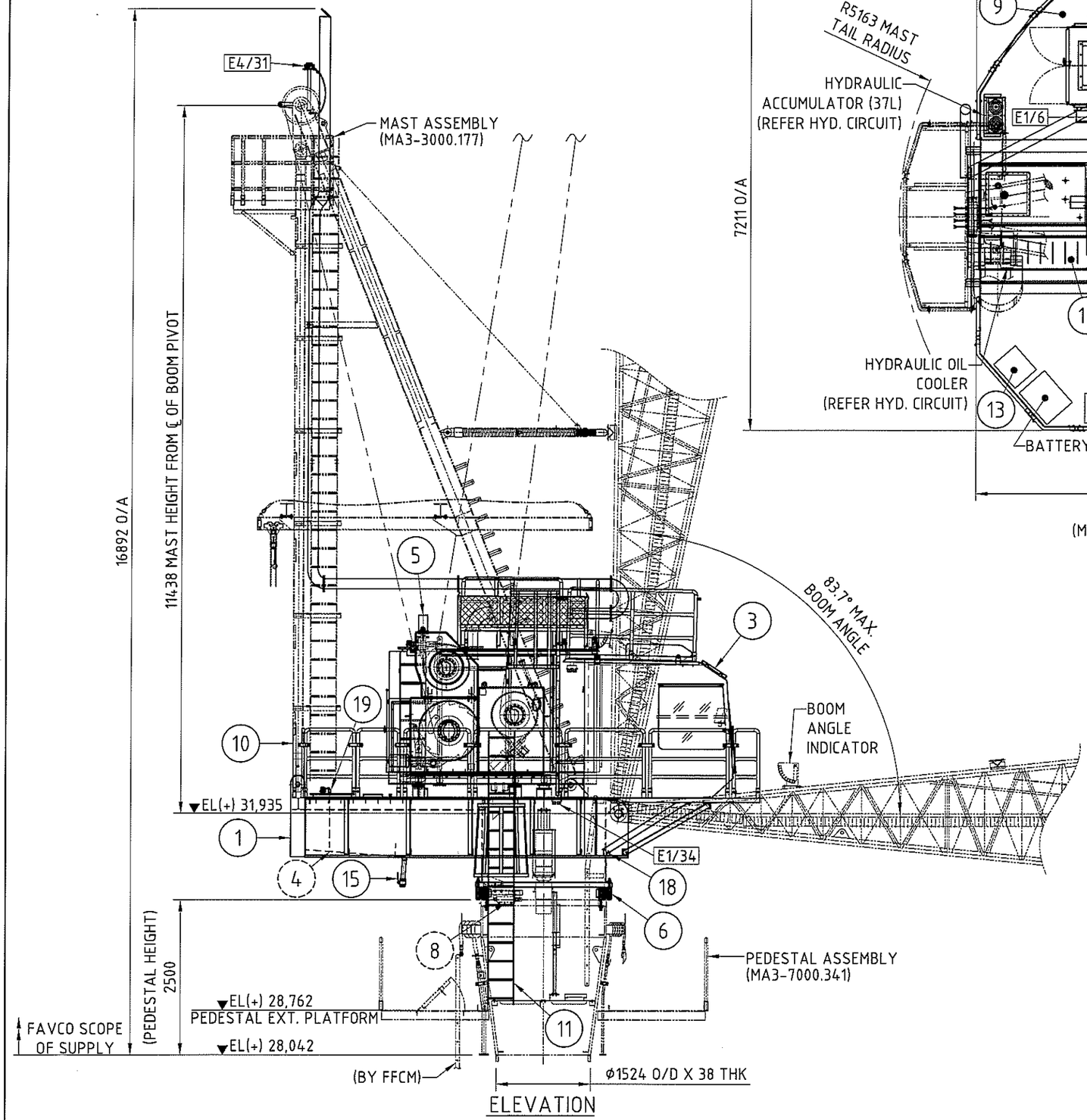
Muhibbah Engineering (M) Bhd

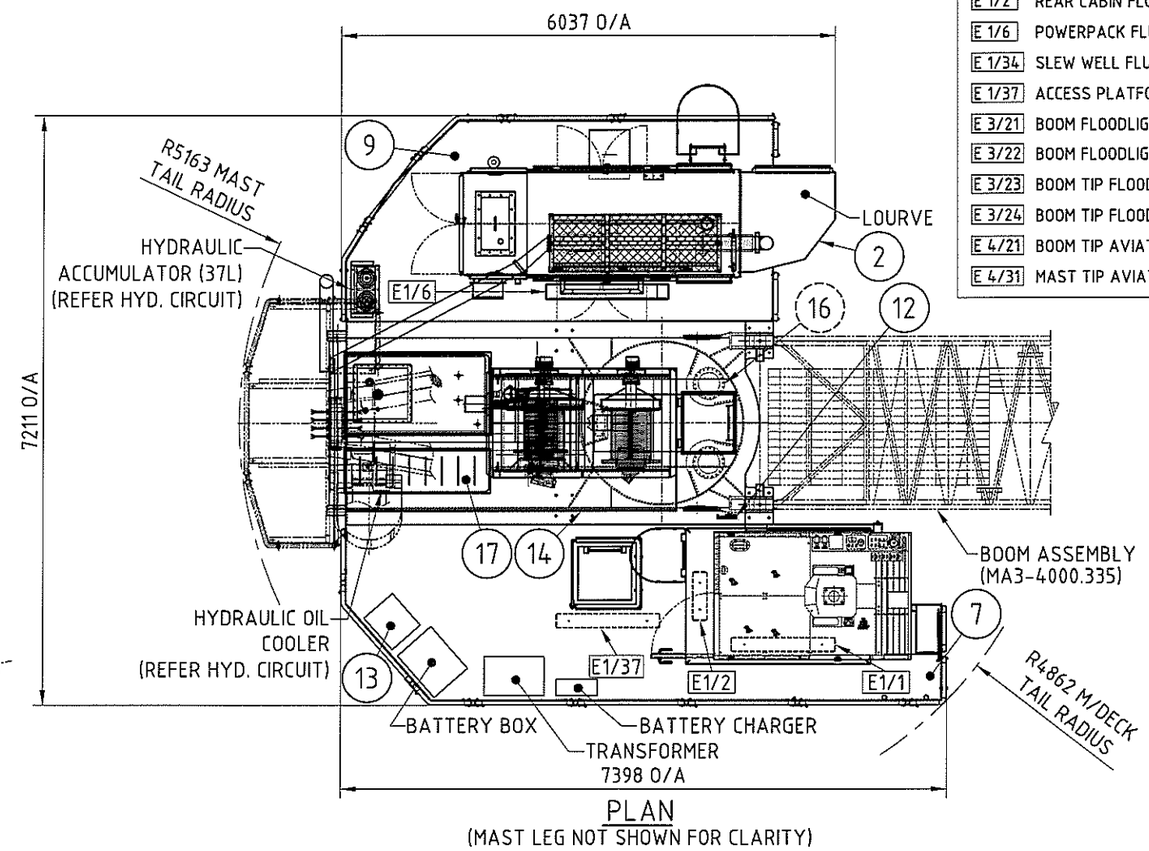
Title: GENERAL ARRANGEMENT

Model: 6/10K

Rev.: C

Sheet	Scale	S/No.	Weight	Drawing Number
3/3	1 : 1	1845	~SHT 2	MA3-1000.388





PLAN
(MAST LEG NOT SHOWN FOR CLARITY)

LIGHTING LEGEND

E 1/1	CABIN FLUORESCENT LIGHT (C/W BAT. BACKUP) (2x36W)
E 1/2	REAR CABIN FLUORESCENT LIGHT (C/W BAT. BACKUP) (2x18W)
E 1/6	POWERPACK FLUORESCENT LIGHT (2x36W)
E 1/34	SLEW WELL FLUORESCENT LIGHT (C/W BAT. BACKUP) (2x18W)
E 1/37	ACCESS PLATFORM FLUORESCENT LIGHT (C/W BAT. BACKUP) (2x36W)
E 3/21	BOOM FLOODLIGHT 1 (400W) HPS (NOT SHOWN)
E 3/22	BOOM FLOODLIGHT 2 (400W) HPS (NOT SHOWN)
E 3/23	BOOM TIP FLOODLIGHT 1 (400W) HPS (NOT SHOWN)
E 3/24	BOOM TIP FLOODLIGHT 2 (400W) HPS (NOT SHOWN)
E 4/21	BOOM TIP AVIATION LIGHT (10W) (NOT SHOWN)
E 4/31	MAST TIP AVIATION LIGHT (10W)

NOTES

1. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M200-0461-0000
2. HYDRAULIC HOSES & FITTINGS ESTIMATED WEIGHT IS 0.5T.
3. HYDRAULIC COMPONENTS ESTIMATED WEIGHT IS 0.5T.
4. ELECTRICAL COMPONENTS ESTIMATED WEIGHT IS 0.7T.

Approved	Checked	Drawn	Description	Date	Rev.
		SCF	ORIGINAL ISSUE (MODIFIED FROM MA3-2000.372)	27.10.12	A

FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Huhibbah Engineering (M) Bhd)

Huhibbah Engineering (M) Bhd

Title	Model	Rev.
MACHINERY DECK ASSEMBLY	6/10K	A

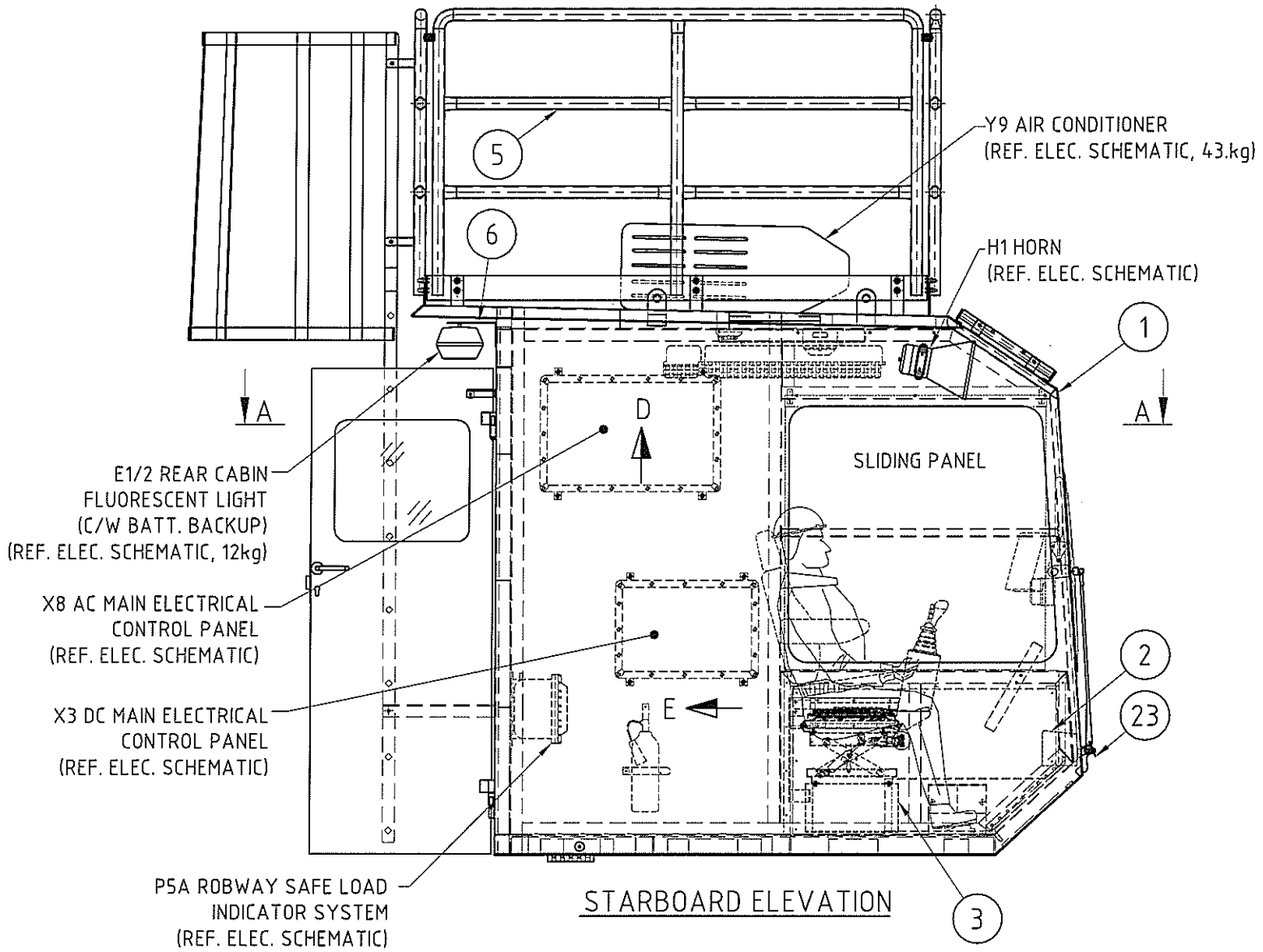
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 75	1845	~29682kg	MA3-2000.461

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

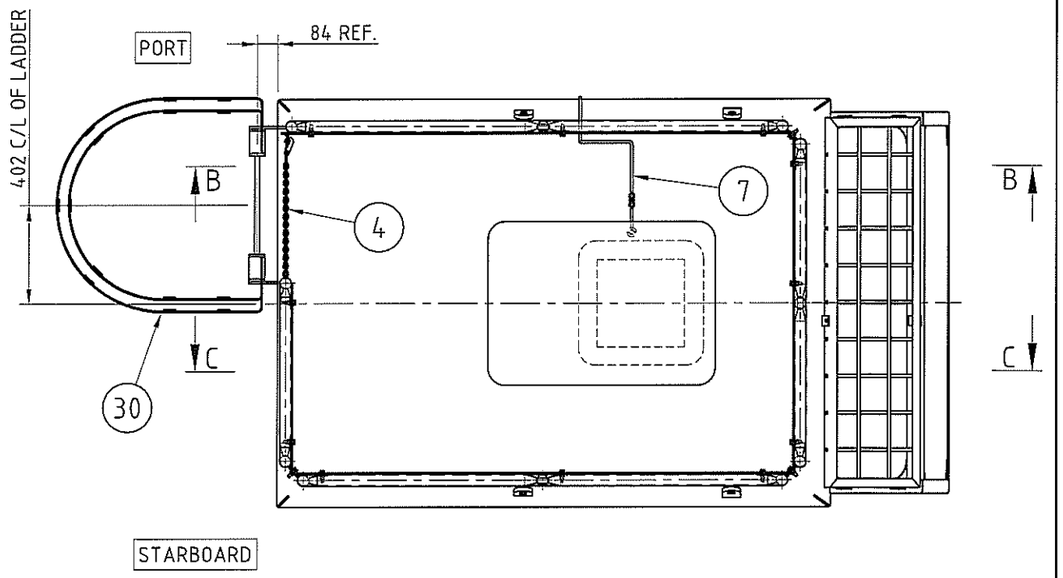
ITEM CODE (BOM No) : M200-0461-0000
BOM DESCRIPTION ..: MACHINERY DECK ASSEMBLY
FILENAME .....: M20004610000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2000.461)

APPROVED ..: AJS
CHECKED ....: MEZ
PREPARED ..: SCF
DATE .....: 27/10/12
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M202-2024-0000	DECK MAIN FRAME				7,860.00	
	2	1.00	pcs		M240-0257-0000	POWERPACK ASSEMBLY				4,800.00	
	3	1.00	pcs		M210-0329-0000	CABIN ASSEMBLY				1,450.00	
	4	1.00	pcs		S202-7001-0000	DIESEL TANK DETAILS (1200 LTR)				426.00	
	5	1.00	pcs		M230-0469-0000	WINCH ASSEMBLY				6,700.00	
	6	1.00	pcs		M260-0226-0000	SLEW RING ASSEMBLY				2,888.00	
	7	1.00	pcs		M205-1116-0000	CABIN PLATFORM & HANDRAIL DETAILS				1,200.00	
	8	1.00	pcs		M251-0030-0000	SLEW LOCK ASSEMBLY				68.00	
	9	1.00	pcs		M203-1347-0000	MACHINERY DECK PLATFORM & HANDRAIL DETAILS				1,350.00	
	10	1.00	pcs		M203-2203-0000	MACHINERY DECK REAR HANDRAILS				40.00	
	11	1.00	pcs		M203-0255-0000	DECK ACCESS LADDER				120.00	
	12	1.00	pcs		M540-0013-0000	LUFF IN DECEL & STOP ASSEMBLY				6.00	
	13	1.00	pcs		SKM0-0362-0000	CHAIN BLOCK STORAGE BOX				32.00	
	14	1.00	pcs		M202-7096-0000	MACHINERY DECK WINCH & POWERPACK STOOL ARRANGEMENT				199.00	
	15	1.00	pcs		M202-5358-0000	MACHINERY DECK BRACKET ARRANGEMENT				416.00	
	16	1.00	pcs		M202-6022-0100	M/DECK MOUNTING BRACKET				290.00	
	17	1.00	pcs		S202-7004-0000	REAR DECK COVER-B				59.20	
	18	1.00	pcs		S202-6007-0000	DECK PLATFORM MOUNTING DETAILS (B)				51.00	
	19	1.00	pcs		M202-1129-0000	FUEL TANK COVER ARRANGEMENT				27.00	



STARBOARD ELEVATION



PLAN VIEW

Approved	Checked	Drawn	Description	Date	Rev.
		FRD	(E19713) SEE SHT.4.	16.05.13	B
AJS	MFH	FRD	ORIGINAL ISSUE (MODIFIED FROM MA3-2100.278)	07.12.12	A

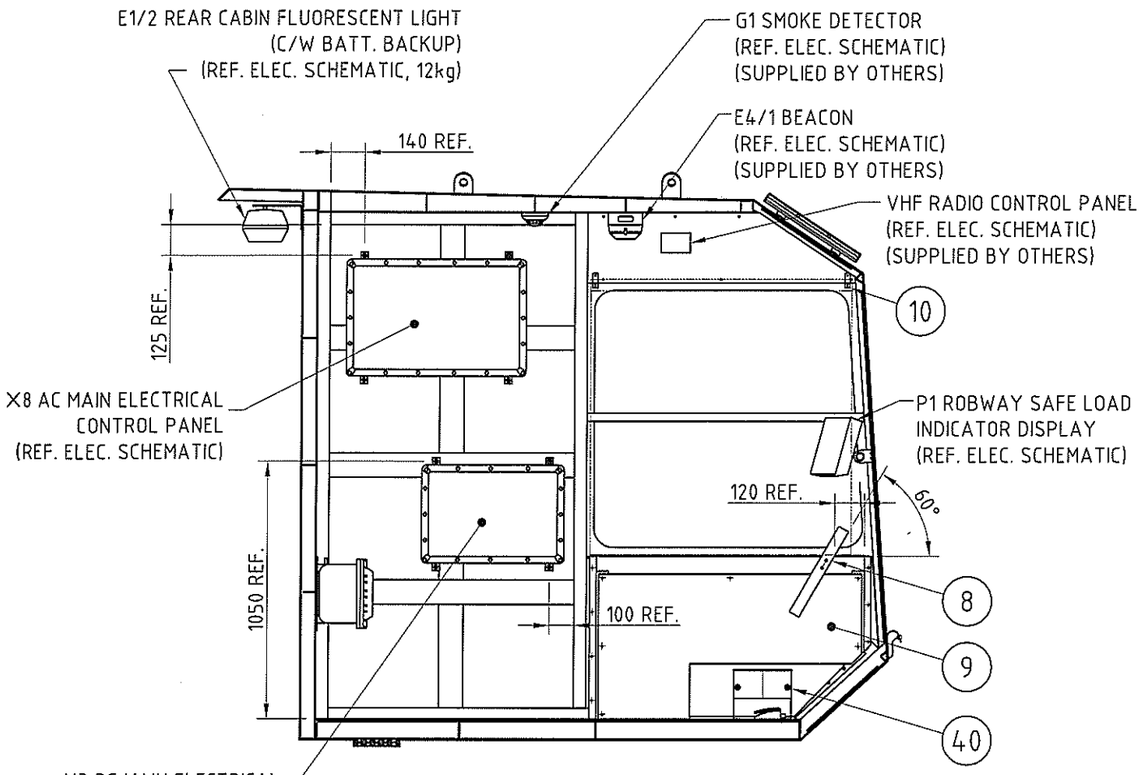
FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

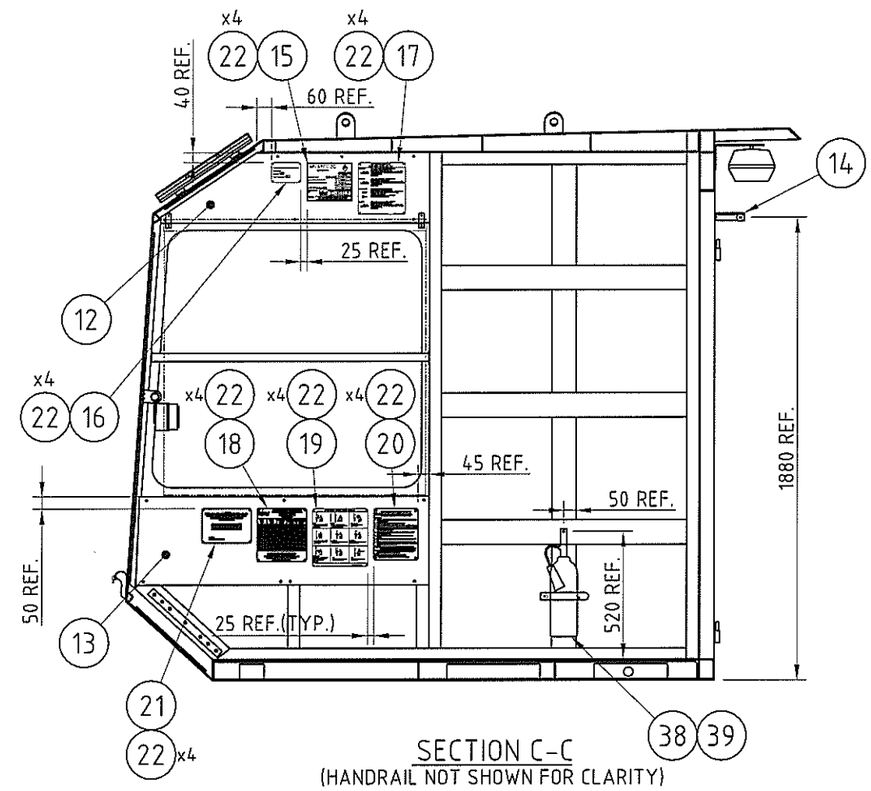
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
CABIN ASSEMBLY	6/10K	B

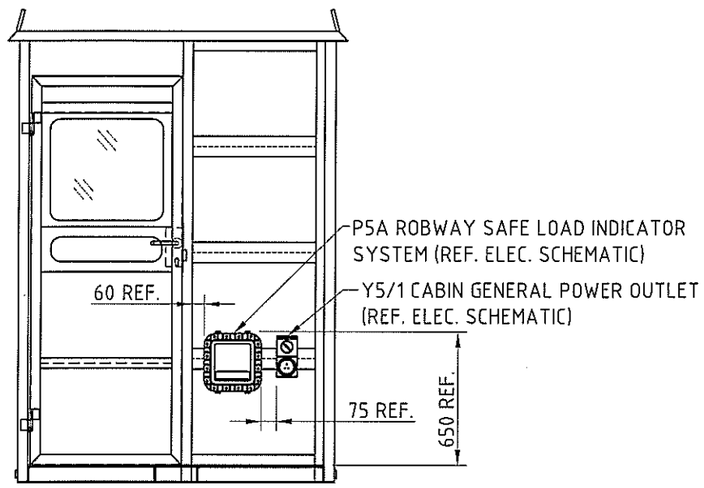
Sheet	Scale	S/No.	Weight	Drawing Number
1/4	1 : 25	1845	~SHT.4	MA3-2100.329



SECTION B-B
(HANDRAIL & LADDER NOT SHOWN FOR CLARITY)



SECTION C-C
(HANDRAIL NOT SHOWN FOR CLARITY)



VIEW E
SCALE: 1 : 30

Approved	Checked	Drawn	Description	Date	Rev.
		FRD	(E19713) SEE SHT.4.	16.05.13	B
AJS	MFH	FRD	ORIGINAL ISSUE (MODIFIED FROM MA3-2100.328)	07.12.12	A

FAVELLE FAVCO

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70400, Seremban, Negeri Sembilan, Malaysia
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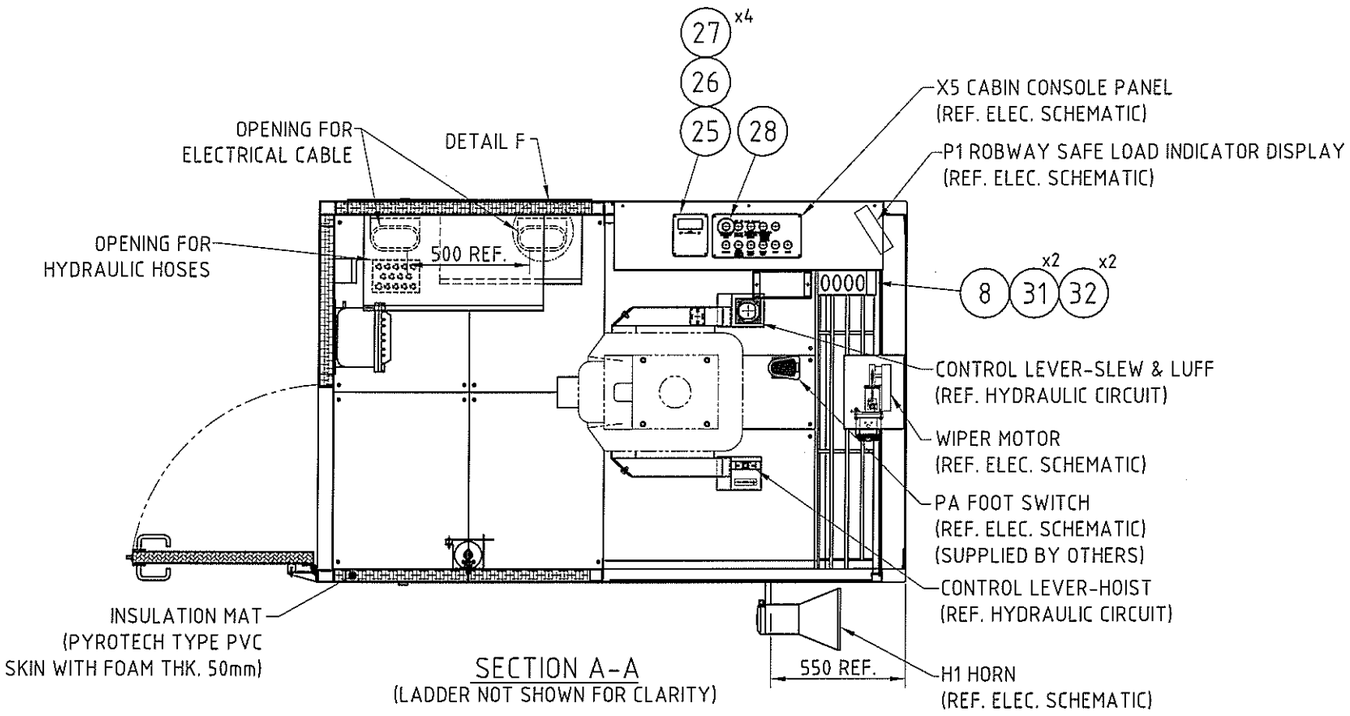
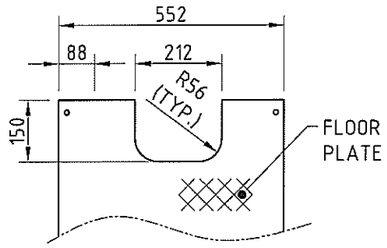
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
CABIN ASSEMBLY	6/10K	B

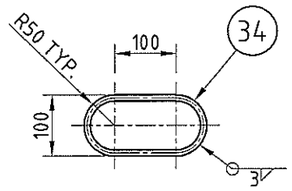
Sheet	Scale	S/No.	Weight	Drawing Number
2/4	1 : 25	1845	~SHT.4	MA3-2100.329



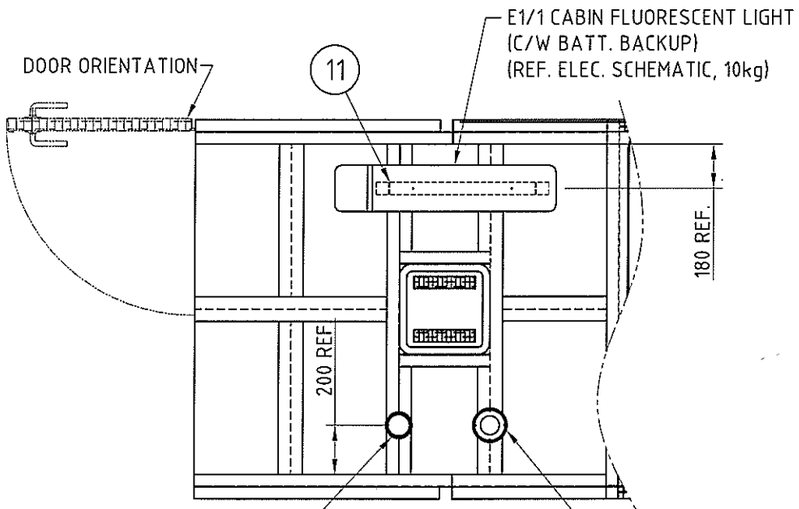
SECTION A-A
(LADDER NOT SHOWN FOR CLARITY)



CUTOUT FLOOR PLATE
SCALE: 1 : 15



DETAIL F
SCALE: 1 : 10



VIEW D
(LOOKING TOWARD ROOF)

Approved	Checked	Drawn	Description	Date	Rev.
		FRD	(E19713) SEE SHT.4.	16.05.13	B
AJS	MFH	FRD	ORIGINAL ISSUE (MODIFIED FROM MA3-2100.328)	07.12.12	A

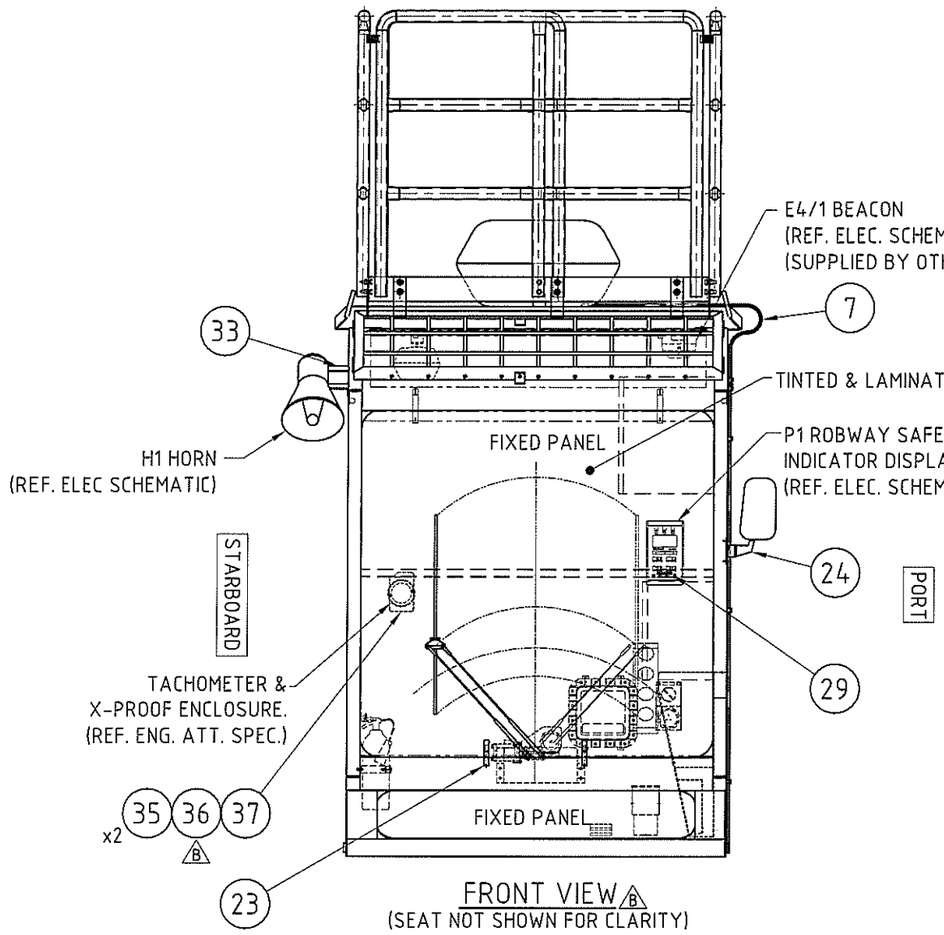
FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

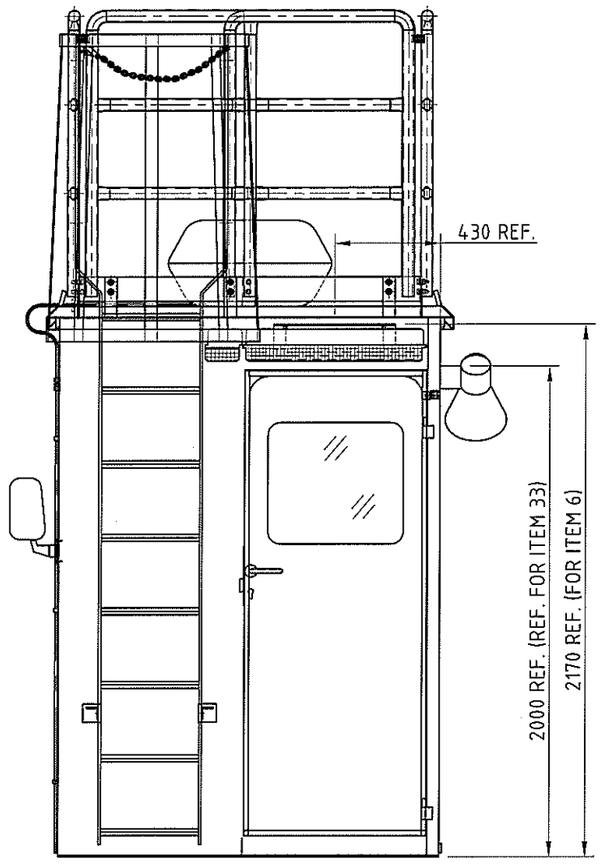
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
CABIN ASSEMBLY	6/10K	B

Sheet	Scale	S/No.	Weight	Drawing Number
3/4	1 : 25	1845	~SHT.4	MA3-2100.329



FRONT VIEW B
(SEAT NOT SHOWN FOR CLARITY)



REAR VIEW

NOTES

1. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M210-0329-0000.
2. ELECTRICAL COMPONENT ESTIMATE WEIGHT IS 350kg.

Approved	Checked	Drawn	Description	Date	Rev.
		FRD	(E19713) ITEM 36 WAS SKM-1019. FRONT VIEW UPDATED.	16.05.13	B
AJS	MFH	FRD	ORIGINAL ISSUE (MODIFIED FROM MA3-2100.328)	07.12.12	A

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
CABIN ASSEMBLY	6/10K	B

Sheet	Scale	S/No.	Weight	Drawing Number
4/4	1 : 25	1845	~1874 kg	MA3-2100.329

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M210-0329-0000
BOM DESCRIPTION ..: CABIN ASSEMBLY
FILENAME .....: M21003290000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19713

APPROVED ..: AJS
CHECKED ....: OOM
PREPARED ..: FRD
DATE .....: 16/05/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M211-0108-0100	CABIN DETAILS				1,162.00	
	2	1.00	pcs		M212-1064-0000	WIPER MOTOR COVER PLATE				1.60	
	3	1.00	pcs		M212-1101-0200	CABIN SEAT ARRANGEMENT (APM FS6239)				57.00	
	4	1.00	pcs		M203-0221-0200	SAFETY CHAIN ASSEMBLY				1.00	
	5	1.00	pcs		M203-2257-0000	CABIN HANDRAIL				147.00	
	6	1.00	pcs		M212-1069-0200	FLUORESCENT LIGHT BRACKET (WALL)				2.40	
	7	1.00	pcs		M212-0007-0000	AIRCOND DRAIN PIPE				15.00	
	8	1.00	pcs		M990-0061-0200	LABEL, PRESSURE GAUGE PANEL			1.5MM X 490MM X 190MM, SS 316	1.00	
	9	1.00	pcs		SKM0-1819-0000	CABIN CONSOLE				32.00	
	10	1.00	pcs		M212-1093-0000	SUNBLIND ARRANGEMENT				0.20	
	11	1.00	pcs		M212-1070-0200	FLUORESCENT LIGHT BRACKET (ROOF)				2.70	
	12	1.00	pcs		M990-0493-0100	NAME PLATE SUPPORT				2.00	
	13	1.00	pcs		M990-0493-0200	NAME PLATE SUPPORT				3.40	
	14	1.00	pcs		SKM0-1633-0000	CABIN DOOR STOPPER				0.30	
	15	1.00	pcs		M990-0673-0000	LABEL, API MONOGRAM PLATE					
	16	1.00	pcs		M990-0674-0000	LABEL, CRANE INFORMATION CHART					
	17	1.00	pcs		M217-5305-0000	LABEL, ROPE SPECIFICATION PLATE					
	18	1.00	pcs		M217-0308-0000	LABEL, LOAD CHART					
	19	1.00	pcs		M990-0074-0002	LABEL, CRANE HAND SIGNAL			1.5MM X 225MM X 235MM, SS 316		
	20	1.00	pcs		M990-0414-0100	LABEL, EMERGENCY LOWERING PROCEDURE			1.5MM X 180MM X 210MM, SS 316		
	21	1.00	pcs		M990-0675-0000	LABEL, SLI DUTY LIST NAME PLATE				0.30	
	22	28.00	pcs		CEPO-W000-0043	BLIND RIVET : 1/8 INCH X 3/8 INCH					
	23	1.00	pcs		M212-1079-0000	WIPER WASHER NIPPLE BRACKET				0.10	
	24	1.00	pcs		M212-1094-0002	CABIN SIDE MIRROR ARRANGEMENT				0.20	
	25	1.00	pcs		M215-7015-0800	ENGINE THROTTLE ASSEMBLY					
	26	1.00	pcs		M990-0154-0001	LABEL, CONTROL PANEL NAME PLATE				0.50	
	27	6.00	pcs		AFBM-0502-0X02	SCREW, HEX, M5 X 0.8 X 20					
	28	1.00	pcs		M990-0486-0000	EMERGENCY STOP COVER (STAHL-8003)				0.10	
	29	1.00	pcs		SKM0-1467-0000	RCI 4100 DISPLAY SUPPORT BRACKET				0.30	

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

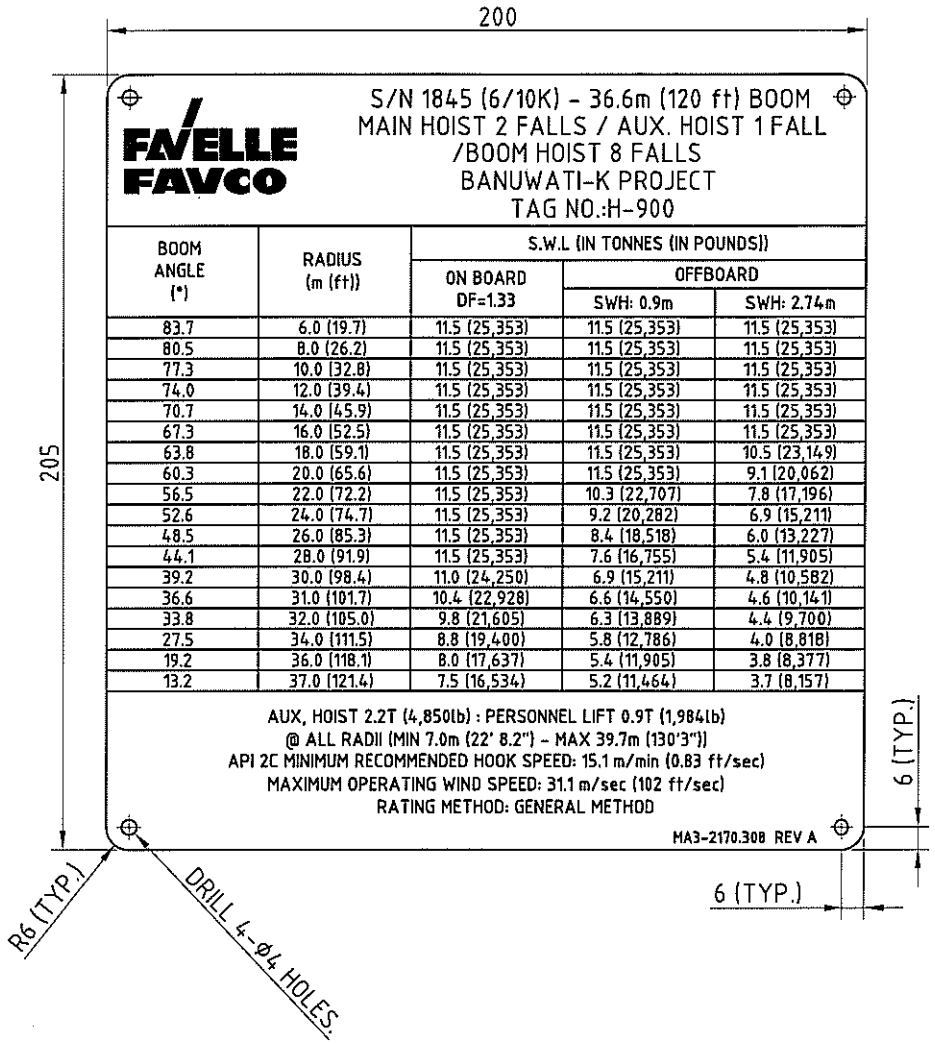
ITEM CODE (BOM No) : M210-0329-0000
BOM DESCRIPTION ..: CABIN ASSEMBLY
FILENAME .....: M21003290000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19713

APPROVED ..: AJS
CHECKED ....: OOM
PREPARED ..: FRD
DATE .....: 16/05/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	30	1.00	pcs		M203-0114-0000	MAINTENANCE LADDER				86.00	
	31	2.00	pcs		AFBM-0802-0X02	SCREW, HEX, M8 X 1.25 X 20					
	32	2.00	pcs		AFWM-0800-0X02	WASHER, FLAT, M8					
	33	1.00	pcs		SKM0-1163-0000	HORN BRACKET SIDE MOUNTED				0.30	
	34	1.00	kg(s)	1	ASR0-1000-018X	RB10 X 0.62kg/m	483			1.00	
	35	8.00	pcs		AFBM-0602-0X02	SCREW, HEX, M6 X 1 X 20					
	36	1.00	pcs		SKM0-1631-0000	SERVICE HOUR METER SUPPORT BRACKET				1.00	B
	37	1.00	pcs		M243-1034-0113	ENGINE ATTACHMENT TAGGING			"TACHOMETER", 0.8MM X 20MM X 90MM, SS 316		
	38	1.00	pcs		AAHX-0000-5000	FIRE EXTINGUISHER, 2KG			EVERSAFE, MODEL EC-2	5.60	
	39	1.00	pcs		M930-0001-0100	FIRE EXTINGUISHER BRACKET			EC-2, 2.2kg ABC	0.50	
	40	1.00	pcs		M990-0494-0100	WIPER WASHER COVER				1.20	

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE	± 1°		

FORM: FFCM-DS-01P-06C



BOOM ANGLE (°)	RADIUS (m (ft))	S.W.L (IN TONNES (IN POUNDS))		
		ON BOARD DF=1.33	OFFBOARD	
			SWH: 0.9m	SWH: 2.74m
83.7	6.0 (19.7)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
80.5	8.0 (26.2)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
77.3	10.0 (32.8)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
74.0	12.0 (39.4)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
70.7	14.0 (45.9)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
67.3	16.0 (52.5)	11.5 (25,353)	11.5 (25,353)	11.5 (25,353)
63.8	18.0 (59.1)	11.5 (25,353)	11.5 (25,353)	10.5 (23,149)
60.3	20.0 (65.6)	11.5 (25,353)	11.5 (25,353)	9.1 (20,062)
56.5	22.0 (72.2)	11.5 (25,353)	10.3 (22,707)	7.8 (17,196)
52.6	24.0 (74.7)	11.5 (25,353)	9.2 (20,282)	6.9 (15,211)
48.5	26.0 (85.3)	11.5 (25,353)	8.4 (18,518)	6.0 (13,227)
44.1	28.0 (91.9)	11.5 (25,353)	7.6 (16,755)	5.4 (11,905)
39.2	30.0 (98.4)	11.0 (24,250)	6.9 (15,211)	4.8 (10,582)
36.6	31.0 (101.7)	10.4 (22,928)	6.6 (14,550)	4.6 (10,141)
33.8	32.0 (105.0)	9.8 (21,605)	6.3 (13,889)	4.4 (9,700)
27.5	34.0 (111.5)	8.8 (19,400)	5.8 (12,786)	4.0 (8,818)
19.2	36.0 (118.1)	8.0 (17,637)	5.4 (11,905)	3.8 (8,377)
13.2	37.0 (121.4)	7.5 (16,534)	5.2 (11,464)	3.7 (8,157)

AUX. HOIST 2.2T (4,850lb) : PERSONNEL LIFT 0.9T (1,984lb)
@ ALL RADII (MIN 7.0m (22' 8.2") - MAX 39.7m (130'3"))
API 2C MINIMUM RECOMMENDED HOOK SPEED: 15.1 m/min (0.83 ft/sec)
MAXIMUM OPERATING WIND SPEED: 31.1 m/sec (102 ft/sec)
RATING METHOD: GENERAL METHOD

MA3-2170.308 REV A

NOTES

1. ALL LETTERING TO BE IN BLACK.

Cat	Item	Qty	Description	Material/Reference	Kg	Approved	Checked	Drawn	Description	Date	Rev.
	1	1	PL 1.5 X 200 W X 205 LG	S.S 316L	0.5			NOR	ORIGINAL ISSUE.	16.01.13	A

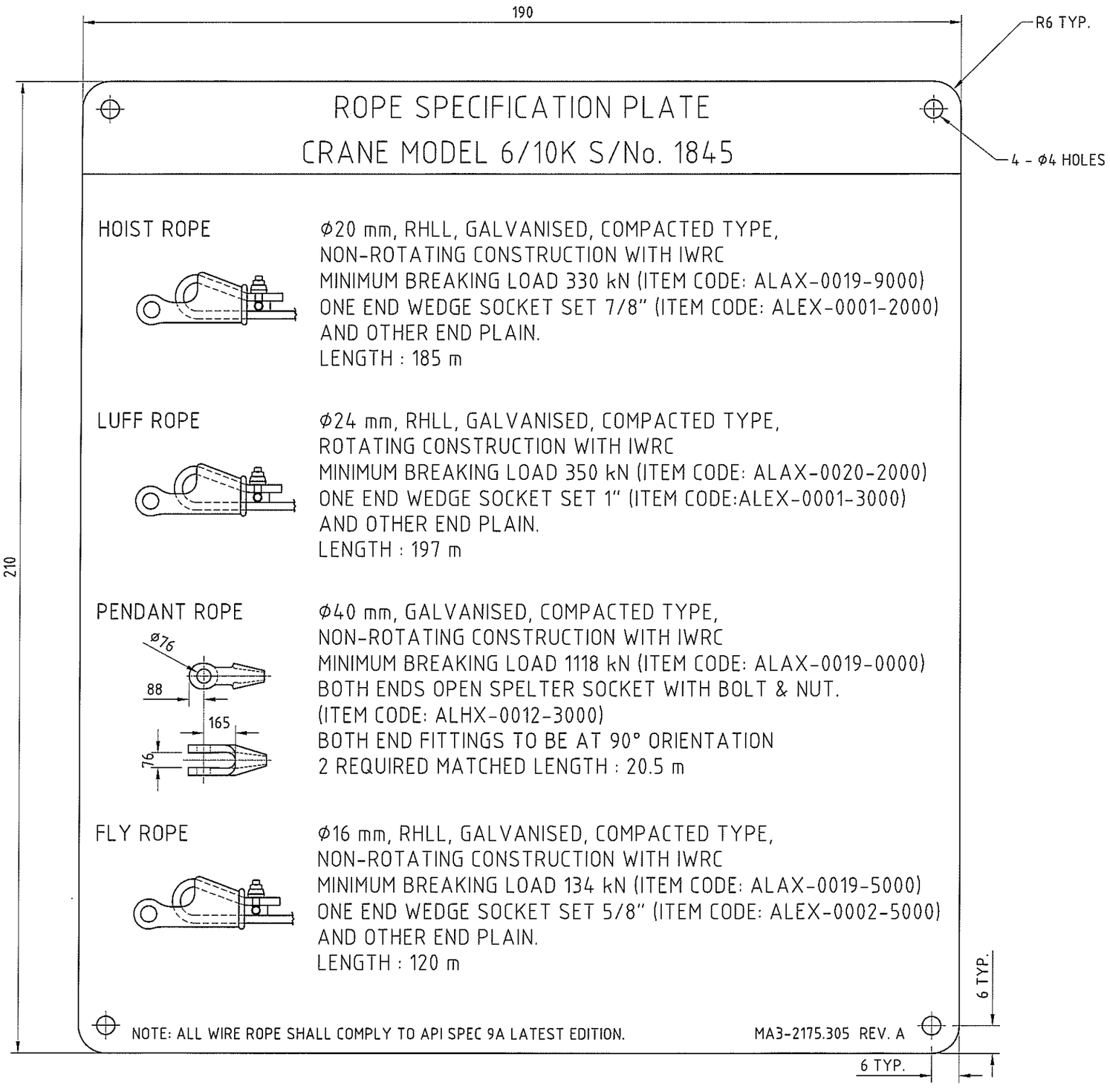
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title	Model	Rev.
LOAD CHART	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 2	1845	~0.5 kg	MA4-2170.308

MATERIAL LIST						
CAT	ITEM	QTY	DESCRIPTION	LENGTH	MATERIAL/REFERENCE	KG
	1	1	PL 1.5 x 190	210	SS 316	0.5



NOTES

1. ROPE SPECIFICATION PLATE TO BE LOCATED IN DRIVER'S CONTROL CABIN.
2. LETTERS TO BE IN BLACK.

Approved	Checked	Drawn	Description	Date	Rev.
		SYZ	ORIGINAL ISSUE (MODIFIED FROM MA3-2175.276)	04.02.13	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FAVELLE FAVCO
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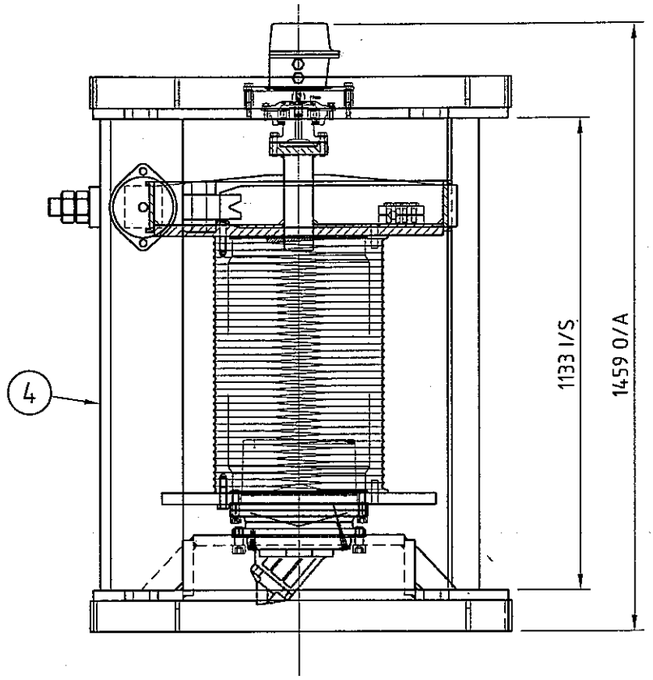
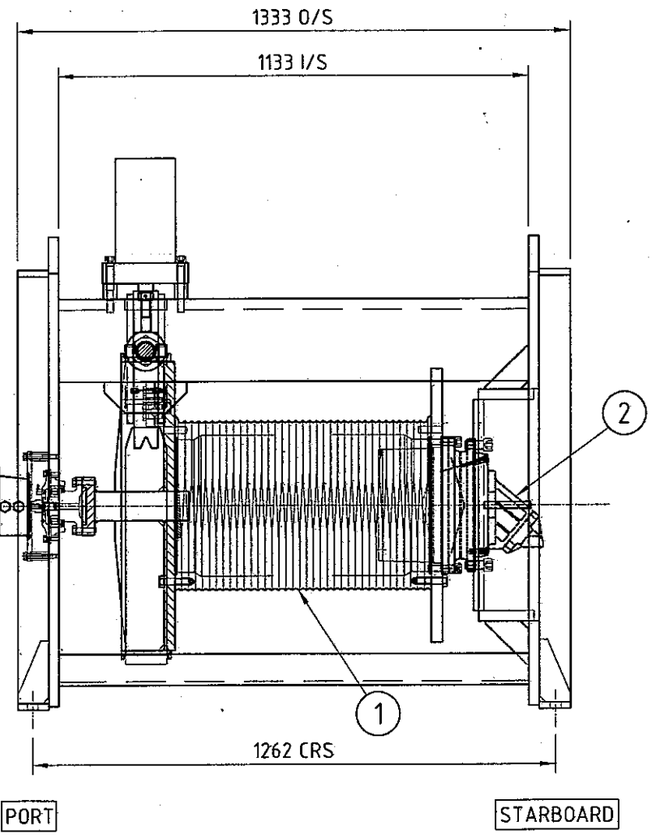
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400 Seremban, Negeri Sembilan, Malaysia
[A subsidiary of Muhibbah Engineering (M) Bhd]
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
ROPE SPECIFICATION PLATE	6/10K	A

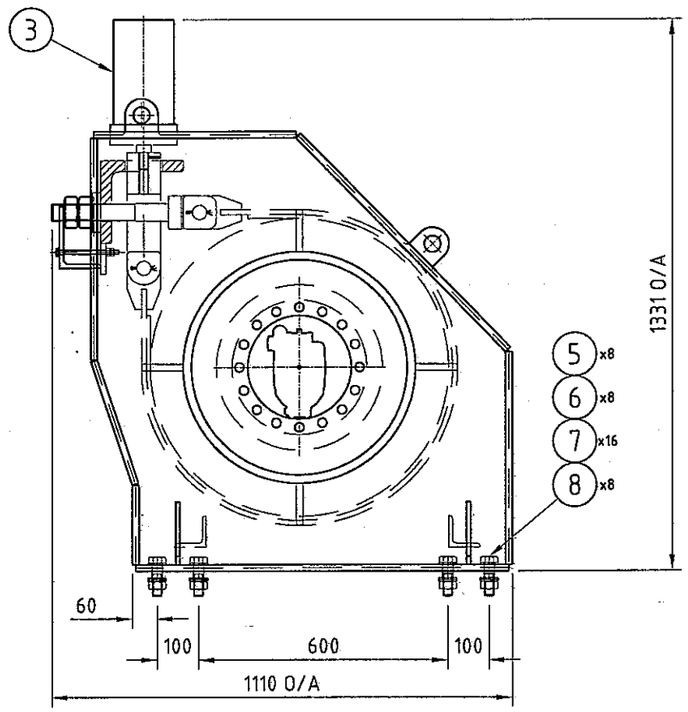
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 1	1845	~0.5 kg	MA3-2175.305



PLAN VIEW



REAR VIEW



ELEVATION

NOTES

1. ITEMS MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY TO MECHANICAL & CHEMICAL CERTIFICATES. FOR CHARPY IMPACT REQUIREMENTS REFER TO THE APPLICABLE CONTRACT DESIGN SPECIFICATION.
2. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M230-0335-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		TXF	ORIGINAL ISSUE (MODIFIED FROM MA3-2300.325)	17.12.09	A

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
WINCH ASSEMBLY (F4T)	6/10K	A

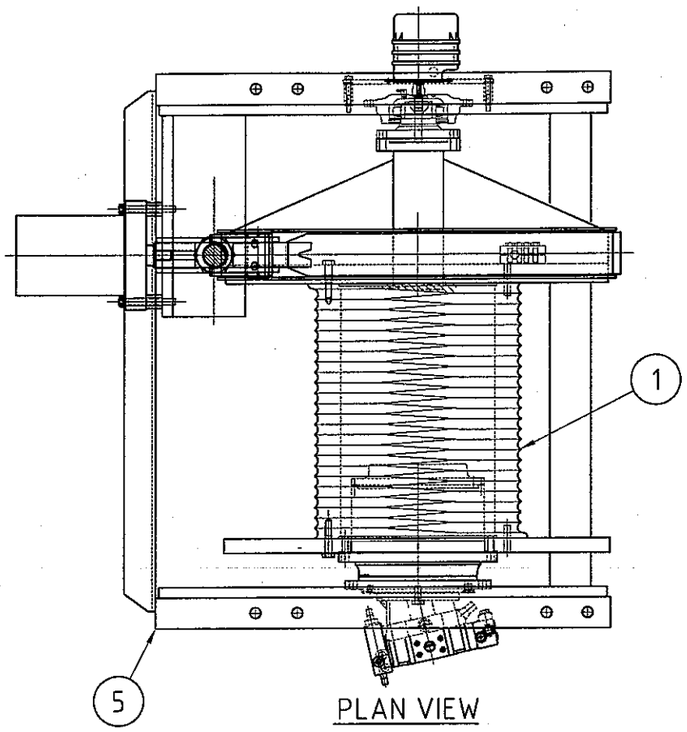
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 15	1638	~1.6T	MA3-2300.335

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

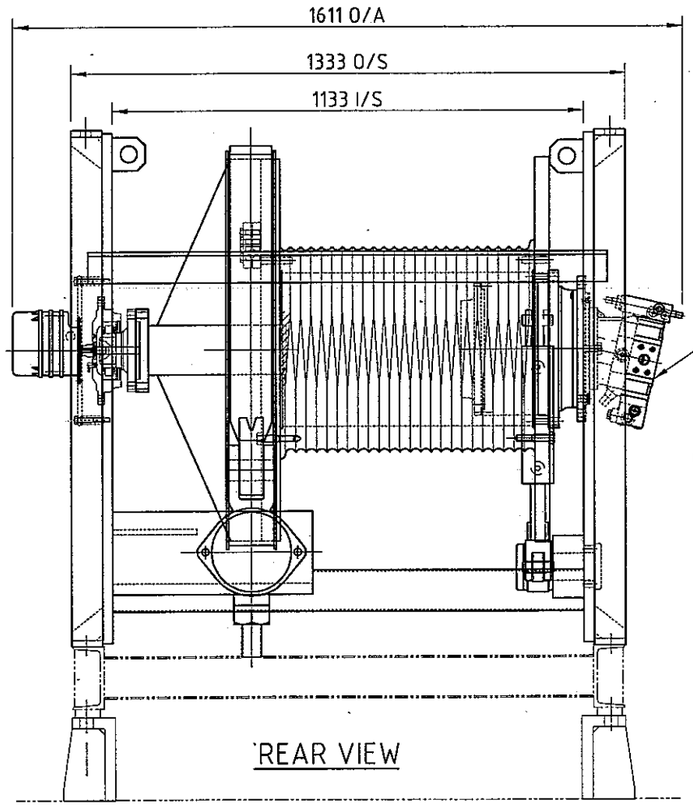
ITEM CODE (BOM No) : M230-0335-0000
BOM DESCRIPTION ..: WINCH ASSEMBLY (F4T)
FILENAME .....: M23003350000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST DWG NO. MA3-2300.335)

APPROVED ..: AJS
CHECKED ....: TXF
PREPARED ..: NANI
DATE .....: 17/12/09
SN .....: 1638

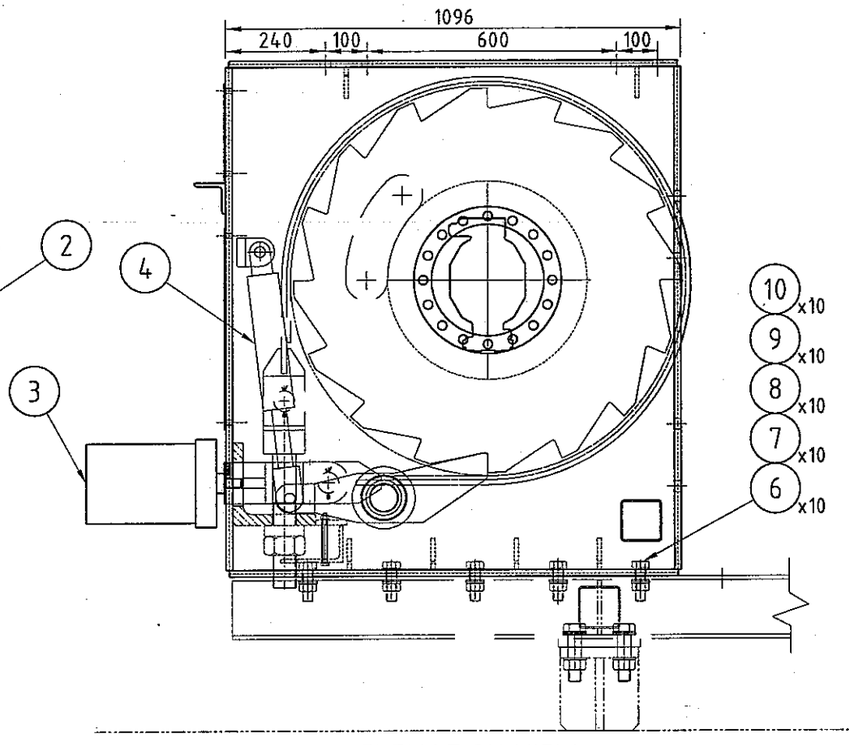
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M232-0220-0000	DRUM ASSEMBLY (F4T)				565.00	
	2	1.00	pcs		M239-0126-0000	DRIVE ASSEMBLY (F4T)				250.00	
	3	1.00	pcs		M236-0045-0000	BAND BRAKE ASSEMBLY (4T)				84.00	
	4	1.00	pcs		M231-0220-0000	WINCH FRAME DETAILS (F4T)				712.00	
P	5	8.00	pcs		M926-0069-0100	BOLT, HEX, M24 X 3.0, LG 80/54			EQUIVALENT TO I/C AFAM-2408-0F10	3.00	
P	6	8.00	pcs		M926-0069-0002	NUT, HEX, M24 X 3.0			EQUIVALENT TO I/C AFNM-2400-0F10	1.00	
	7	16.00	pcs		AFWM-2400-0F00	WASHER, FLAT, M24			FLUOROCARBON COATED		
	8	8.00	pcs		AFSM-2400-0F00	WASHER, SPRING, M24			FLUOROCARBON COATED		



PLAN VIEW



REAR VIEW



ELEVATION VIEW

NOTES

1. ITEM MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY TO MECHANICAL & CHEMICAL CERTIFICATES. FOR CHARPY IMPACT REQUIREMENTS REFER TO THE APPLICABLE CONTRACT DESIGN SPECIFICATION.
2. FOR BILL OF MATERIALS, REFER BOM NO. M230-0340-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		FAM	ORIGINAL ISSUE (MODIFIED FROM MA3-2300-328)	12.01.10	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE	± 1°		

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
WINCH ASSEMBLY (L10T)	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 15	1638	~ 7.1T	MA3-2300.340

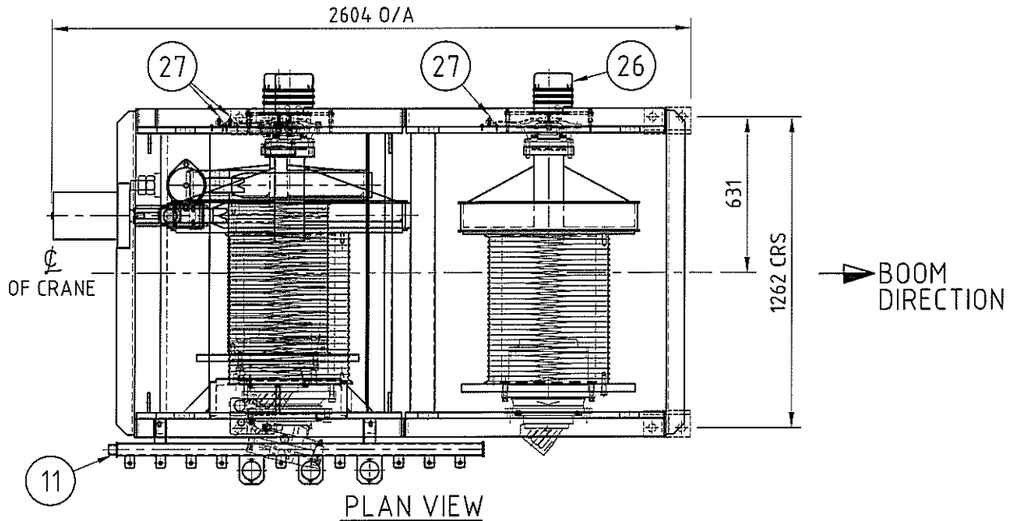
Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M230-0340-0000
BOM DESCRIPTION ..: WINCH ASSEMBLY (L10T)
FILENAME .....: M23003400000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO.MA3-2300.340)

APPROVED ..: AJS
CHECKED ....: DOM
PREPARED ..: SUZI
DATE .....: 12/01/10
SN .....: 1638

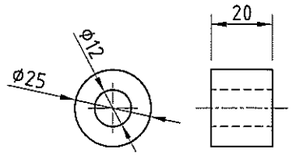
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M232-0192-0000	DRUM ASSEMBLY (L10T)				943.00	
	2	1.00	pcs		M239-0173-0000	DRIVE ASSEMBLY (L10T)				434.00	
	3	1.00	pcs		M236-0046-0000	BAND BRAKE ASSEMBLY (10T)				98.00	
	4	1.00	pcs		M235-0021-0000	LUFF RATCHET ASSEMBLY				34.00	
	5	1.00	pcs		M231-0221-0000	WINCH FRAME DETAILS (H10T)					
P	6	10.00	pcs		M926-0069-0100	BOLT, HEX, M24 X 3.0, LG 80/54			EQUIVALENT TO I/C AFAM-2408-0F10	4.00	
P	7	10.00	pcs		M926-0069-0002	NUT, HEX, M24 X 3.0			EQUIVALENT TO I/C AFNM-2400-0F10	1.00	
	8	10.00	pcs		AFWM-2400-0F00	WASHER, FLAT, M24			FLUOROCARBON COATED		
	9	10.00	pcs		AFTM-2400-0F00	WASHER, TAPERED, M24			FLUOROCARBON COATED		
	10	10.00	pcs		AFSM-2400-0F00	WASHER, SPRING, M24			FLUOROCARBON COATED		

WINCH TECHNICAL DATA			
DESCRIPTION	HOIST (7T)	FLY (4T)	LUFF (L10T)
DRUM ROOT DIA. (mm)	ϕ480	ϕ400	ϕ480
DRUM LENGTH (mm)	609	618	613
WIRE ROPE SIZE (mm)	ϕ20	ϕ16	ϕ24
MAX. WIRE ROPE LAYER	3	5	5
GEARBOX	INTERNAL DRIVE TYPE GFT 36 W3 4000 i=79.4	INTERNAL DRIVE TYPE GFT 17 W2 4000 i=45.4	INTERNAL DRIVE TYPE GFT 36 W3 4000 i=79.4
BRAKING SYSTEM - FAIL SAFE TYPE			
STATIC BRAKE	MULTI DISC	MULTI DISC	MULTI DISC
DYNAMIC BRAKE	BAND BRAKE	BAND BRAKE	BAND BRAKE
HYDRAULIC MOTOR	A2FE63	A2FE63	A6VE80
LIMIT SWITCH	ROTARY	ROTARY	ROTARY



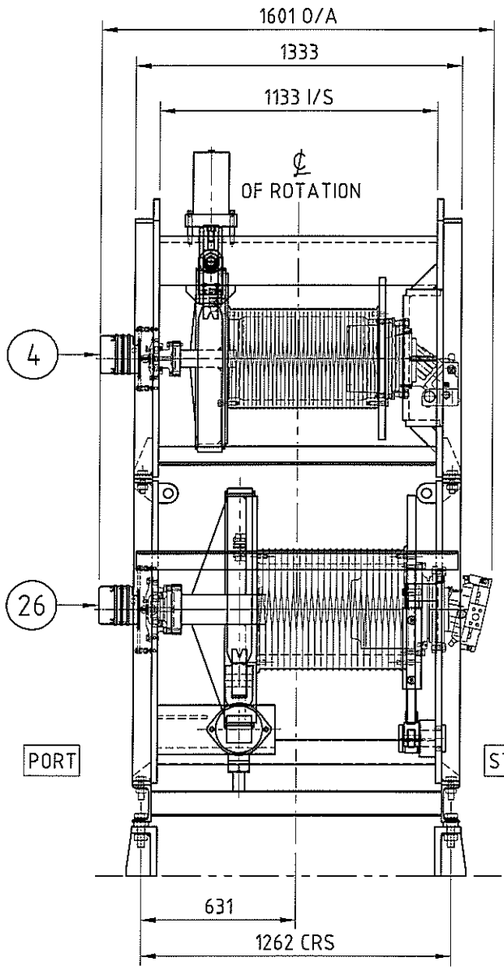
PLAN VIEW

(LUFF ROPE GUARD, DRUM GUARDS AND RAIN GUARDS NOT SHOWN FOR CLARITY)



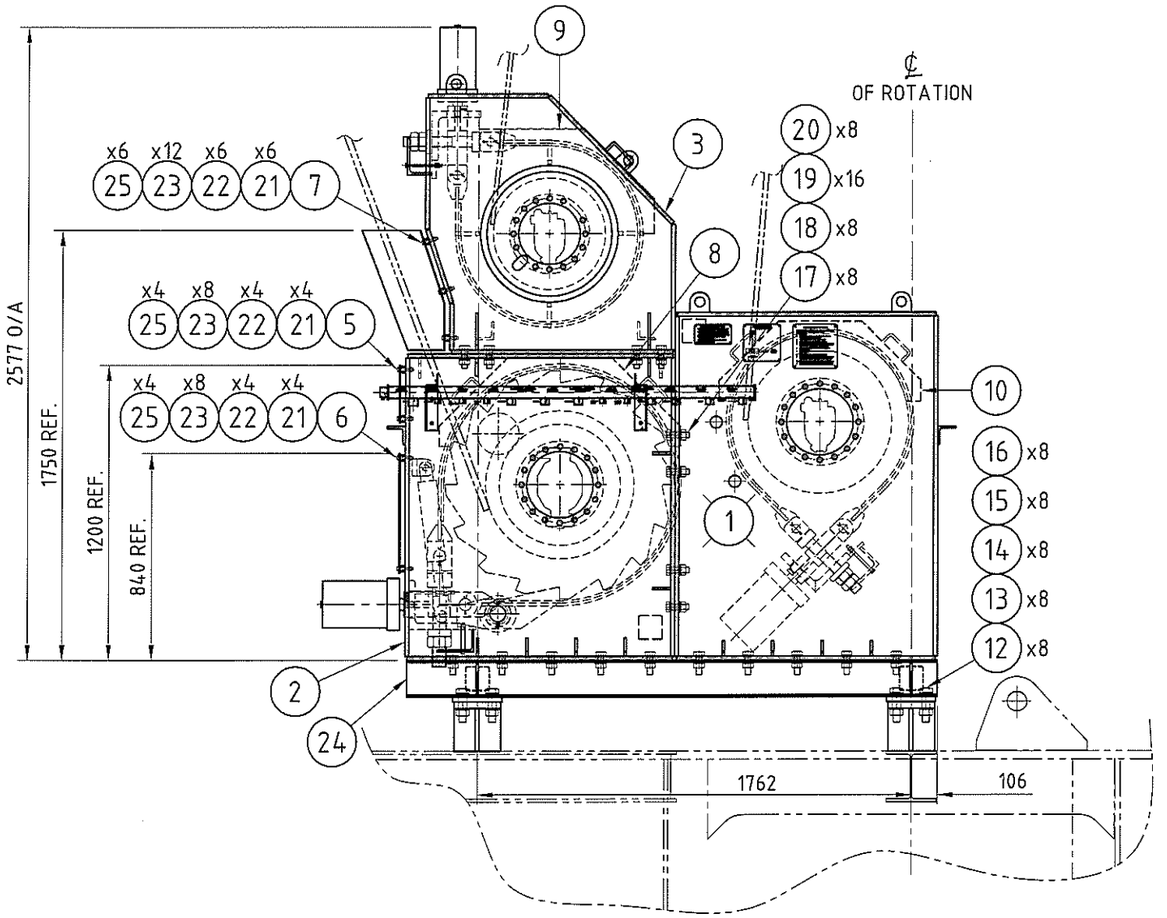
ITEM 25

SCALE: 1 : 2



REAR VIEW

(LUFF ROPE GUARD, DRUM GUARDS AND MAIN HOIST WINCH NOT SHOWN FOR CLARITY)



ELEVATION VIEW - STARBOARD

NOTES

1. ITEM MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY TO MECHANICAL & CHEMICAL CERTIFICATES. FOR CHARPY IMPACT REQUIREMENTS REFER TO THE APPLICABLE CONTRACT DESIGN SPECIFICATION.
2. FOR BILL OF MATERIAL, REFER TO BOM NO. M230-0469-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		NOR	ORIGINAL ISSUE (MODIFIED FROM MA3-2300.461)	30.10.12	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title	Model	Rev.
WINCH ASSEMBLY	6/10K	A

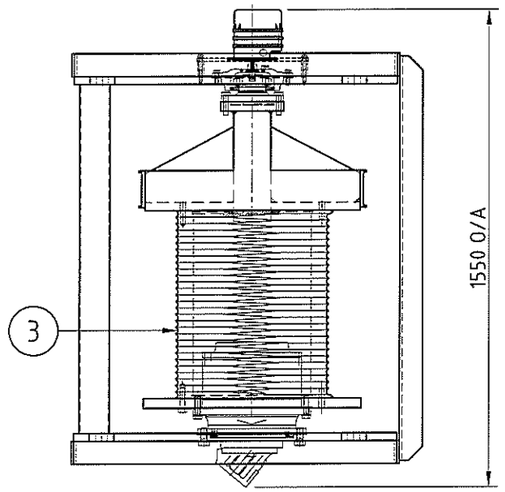
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 25	1845	~4882 kg	MA3-2300.469

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M230-0469-0000
BOM DESCRIPTION ..: WINCH ASSEMBLY
FILENAME .....: M23004690000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2300.469)

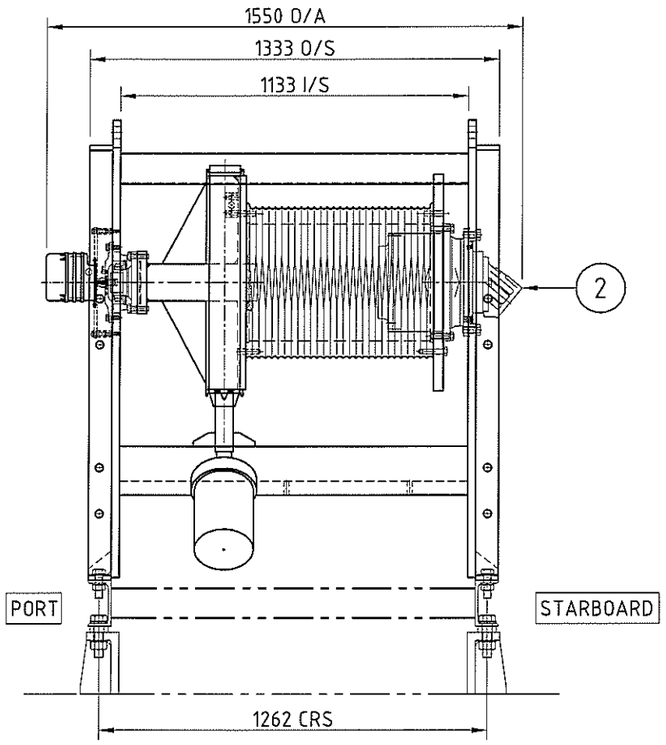
APPROVED ..: AJS
CHECKED ....: SYZ
PREPARED ..: NOR
DATE .....: 30/10/12
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M230-0472-0000	WINCH ASSEMBLY (H7T)				1,500.00	
	2	1.00	pcs		M230-0340-0000	WINCH ASSEMBLY (L10T)				1,514.00	
	3	1.00	pcs		M230-0335-0000	WINCH ASSEMBLY (F4T)				1,615.00	
	4	1.00	pcs		M237-0153-0100	LIMIT SWITCH ASSEMBLY (F4T)				2.50	
	5	1.00	pcs		M231-5168-0001	LUFF DRUM GUARD				8.00	
	6	1.00	pcs		M231-5168-0002	LUFF DRUM GUARD				14.00	
	7	1.00	pcs		M231-5176-0000	LUFF ROPE GUARD				18.00	
	8	1.00	pcs		M231-5202-0000	RAIN GUARD (H10T, L10T)				14.00	
	9	1.00	pcs		M231-5199-0000	RAIN GUARD (F4T, F7T)				7.00	
	10	1.00	pcs		M231-5195-0000	RAIN GUARD (F4T,F7T,H7T)				14.00	
	11	1.00	pcs		M231-5318-0000	BRACKET MOUNTING ARRANGEMENT				20.00	
P	12	8.00	pcs		M926-0068-0300	BOLT, HEX, M30 X 3.5, LG 120/66			EQUIVALENT TO I/C AFAM-3012-0F10	7.10	
P	13	8.00	pcs		M926-0068-0002	M30 NUT			EQUIVALENT TO I/C AFNM-3000-0F10	1.80	
	14	8.00	pcs		AFWM-3000-0F00	WASHER, FLAT, M30			FLUOROCARBON COATED		
	15	8.00	pcs		AFTM-3000-0F00	WASHER, TAPERED, M30			FLUOROCARBON COATED		
	16	8.00	pcs		AFSM-3000-0F00	WASHER, SPRING, M30			FLUOROCARBON COATED		
	17	8.00	pcs		AFAM-2408-0F08	BOLT, HEX, M24 X 3 X 80			FLUOROCARBON COATED		
	18	8.00	pcs		AFNM-2400-0F08	NUT, HEX, M24 X 3			FLUOROCARBON COATED		
	19	16.00	pcs		AFWM-2400-0F00	WASHER, FLAT, M24			FLUOROCARBON COATED		
	20	8.00	pcs		AFSM-2400-0F00	WASHER, SPRING, M24			FLUOROCARBON COATED		
	21	14.00	pcs		AFNM-1000-0X02	NUT, HEX, M10 X 1.5					
	22	14.00	pcs		AFAM-1006-0X02	BOLT, HEX, M10 X 1.5 X 60					
	23	28.00	pcs		AFWM-1000-0X02	WASHER, FLAT, M10					
	24	1.00	pcs		M231-0210-0000	WINCH BASE FRAME				137.00	
	25	1.10	kg(s)	14	ASR0-2500-026X	RB25 X 0.56kg/m	20			1.10	
	26	2.00	pcs		M237-0158-0100	LIMIT SWITCH ASSEMBLY (SAFE ZONE)					
	27	3.00	pcs		SKM0-1042-0000	WINCH GREASE LINE ASSEMBLY					

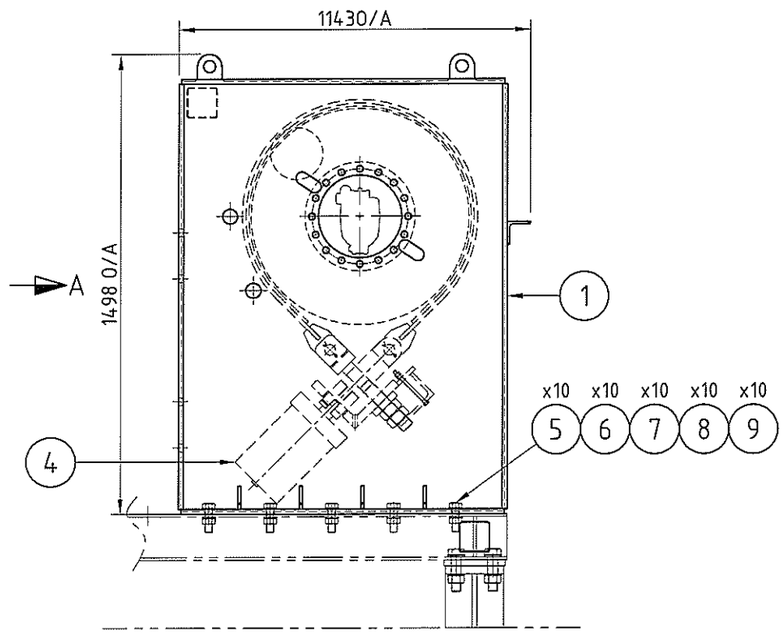


PLAN VIEW

(BAND BRAKE NOT SHOWN FOR CLARITY)



VIEW A



ELEVATION VIEW - STARBOARD SIDE

NOTES

1. ITEMS MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY TO MECHANICAL & CHEMICAL CERTIFICATES. FOR CHARPY IMPACT REQUIREMENTS REFER TO THE APPLICABLE CONTRACT DESIGN SPEC.
2. FOR BILL OF MATERIAL (BOM) REFER BOM NO. M230-0472-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		NOR	ORIGINAL ISSUE (MODIFIED FROM MA3-2300.356)	06.12.12	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title: WINCH ASSEMBLY (H7T)

Model: 6/10K | Rev.: A

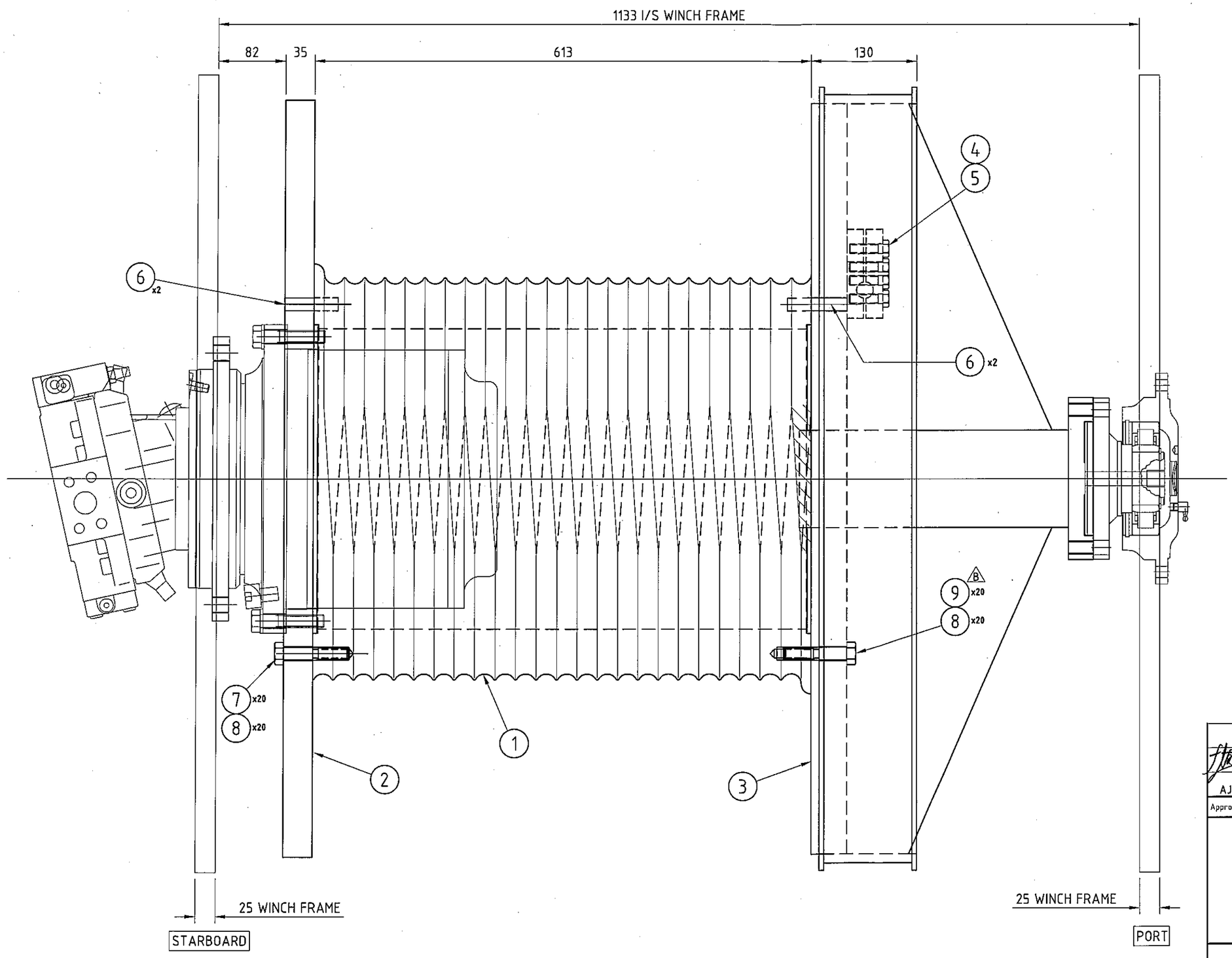
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 20	1845	~1728 kg	MA3-2300.472

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M230-0472-0000
BOM DESCRIPTION ..: WINCH ASSEMBLY (H7T)
FILENAME .....: M23004720000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2300.472)

APPROVED ..: AJS
CHECKED ....: SYZ
PREPARED ..: NOR
DATE .....: 06/12/12
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M231-0265-0000	WINCH FRAME DETAILS				776.00	
	2	1.00	pcs		M239-0252-0000	DRIVE ASSEMBLY (F7T)				210.00	
	3	1.00	pcs		M232-0267-0000	DRUM ASSEMBLY				643.00	
	4	1.00	pcs		M236-0044-0000	BAND BRAKE ASSEMBLY (7T)				94.00	
P	5	10.00	pcs		M926-0069-0100	BOLT, HEX, M24 X 3.0, LG 80/54			EQUIVALENT TO I/C AFAM-2408-0F10	4.00	
P	6	10.00	pcs		M926-0069-0002	NUT, HEX, M24 X 3.0			EQUIVALENT TO I/C AFNM-2400-0F10	1.00	
	7	10.00	pcs		AFWM-2400-0F00	WASHER, FLAT, M24			FLUOROCARBON COATED		
	8	10.00	pcs		AFTM-2400-0F00	WASHER, TAPERED, M24			FLUOROCARBON COATED		
	9	10.00	pcs		AFSM-2400-0F00	WASHER, SPRING, M24			FLUOROCARBON COATED		



ROPE CAPACITY ON DRUM

LAYER 1	34.0 m
LAYER 2	40.2 m
LAYER 3	45.1 m
LAYER 4	46.3 m
LAYER 5	45.1 m
TOTAL CAPACITY	210.7 m

NOTES

1. MAX. WORKING WIRE ROPE ON DRUM IS 3 LAYERS.
   IF EXCEED 3 LAYERS, WIRE ROPE GUARD MUST BE PROVIDED.
2. FOR BILL OF MATERIAL (BOM) REFER TO BOM NO. M232-0192-0000

Approved	Checked	Drawn	Description	Date	Rev.
		NANI	(E16006) NOTES NO. 2 ADDED. MATERIAL LIST REMOVED.	25.08.10	B
AJS	CWC	TPO	ORIGINAL ISSUE (MODIFIED FROM MA3-2320.169)	03.08.07	A

Favelle Favco Cranes (M) Sdn. Bhd.
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Muhibbah Engineering (M) Bhd

Title: DRUM ASSEMBLY-(L10T)

Model: 7.5/10K | Rev.: B

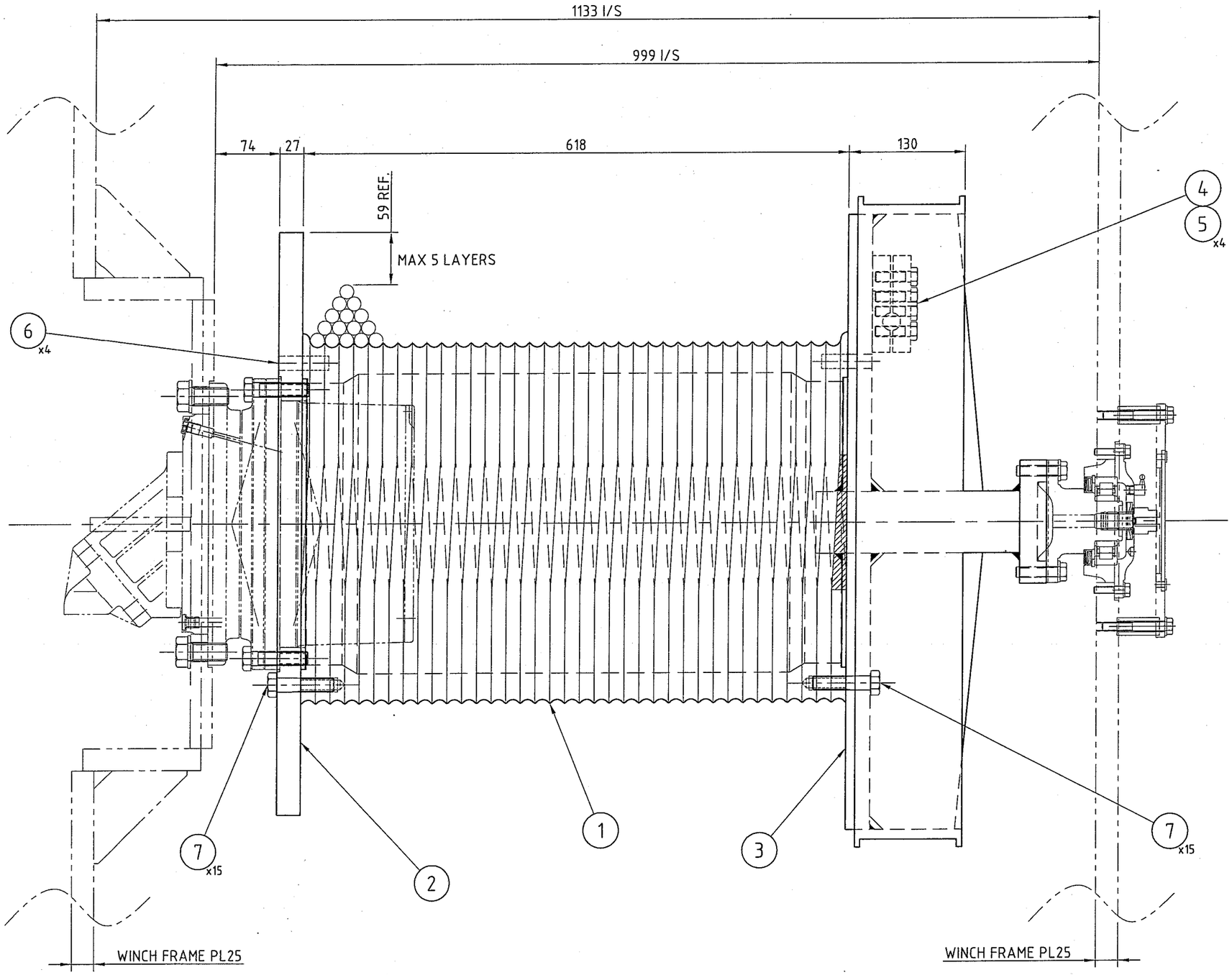
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 5	1469-70	~943 kg	MA3-2320.192

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M232-0192-0000
BOM DESCRIPTION ..: DRUM ASSEMBLY - (L10T)
FILENAME .....: M23201920000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DWG NO. MA3-2320.192)

APPROVED ..: AJS
CHECKED ....: MUS
PREPARED ..: NANI
DATE .....: 25/08/10
SN .....: 1469-70

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M232-1047-0200	MACHINING, DRUM, 480DIA/24DIA			CAST STEEL	413.00	
	2	1.00	pcs		M233-0082-0000	DRUM FLANGE (DIA 480/DIA 24)				155.00	
	3	1.00	pcs		M233-0216-0000	BRAKE DRUM FLANGE (DIA 580/DIA 24)				369.00	
	4	1.00	pcs		M923-0019-0400	WELDED ROPE CLAMP - DIA 24				2.00	
	5	4.00	pcs		AFBM-1204-0F08	SCREW, HEX, M12 X 1.75 X 40			FLUOROCARBON COATED		
	6	4.00	pcs		AFYM-1607-0X01	PIN, DOWEL, DIA 16 X 70					
P	7	20.00	pcs		M926-0071-0400	BOLT, HEX, M16 X 2.0 X 70/38 LG				2.80	
	8	40.00	pcs		AFWM-1600-0F00	WASHER, FLAT, M16			FLUOROCARBON COATED	2.00	
P	9	20.00	pcs		M926-0071-0300	BOLT, HEX, M16 X 2.0 X 80/38 LG				3.24	



ROPE CAPACITY ON DRUM

LAYER 1	44.4 m
LAYER 2	50.1 m
LAYER 3	54.7 m
LAYER 4	56.3 m
LAYER 5	56.1 m
TOTAL CAPACITY	261.6m

NOTES

1. ITEMS MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY TO MECHANICAL & CHEMICAL CERTIFICATES. FOR IMPACT REQUIREMENTS, REFER TO THE APPLICABLE CONTRACT DESIGN SPECIFICATION.
2. FOR BILL OF MATERIALS, REFER TO BOM NO. M232-0220-0000

Approved	Checked	Drawn	Description	Date	Rev.
		JEGA	ORIGINAL ISSUE (MODIFIED FROM MA3-2320.161)	25.01.10	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FAVELLE FAVCO
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Muhibbah Engineering (M) Bhd

Title	Model	Rev.
DRUM ASSEMBLY (F4T)	6/10K	A

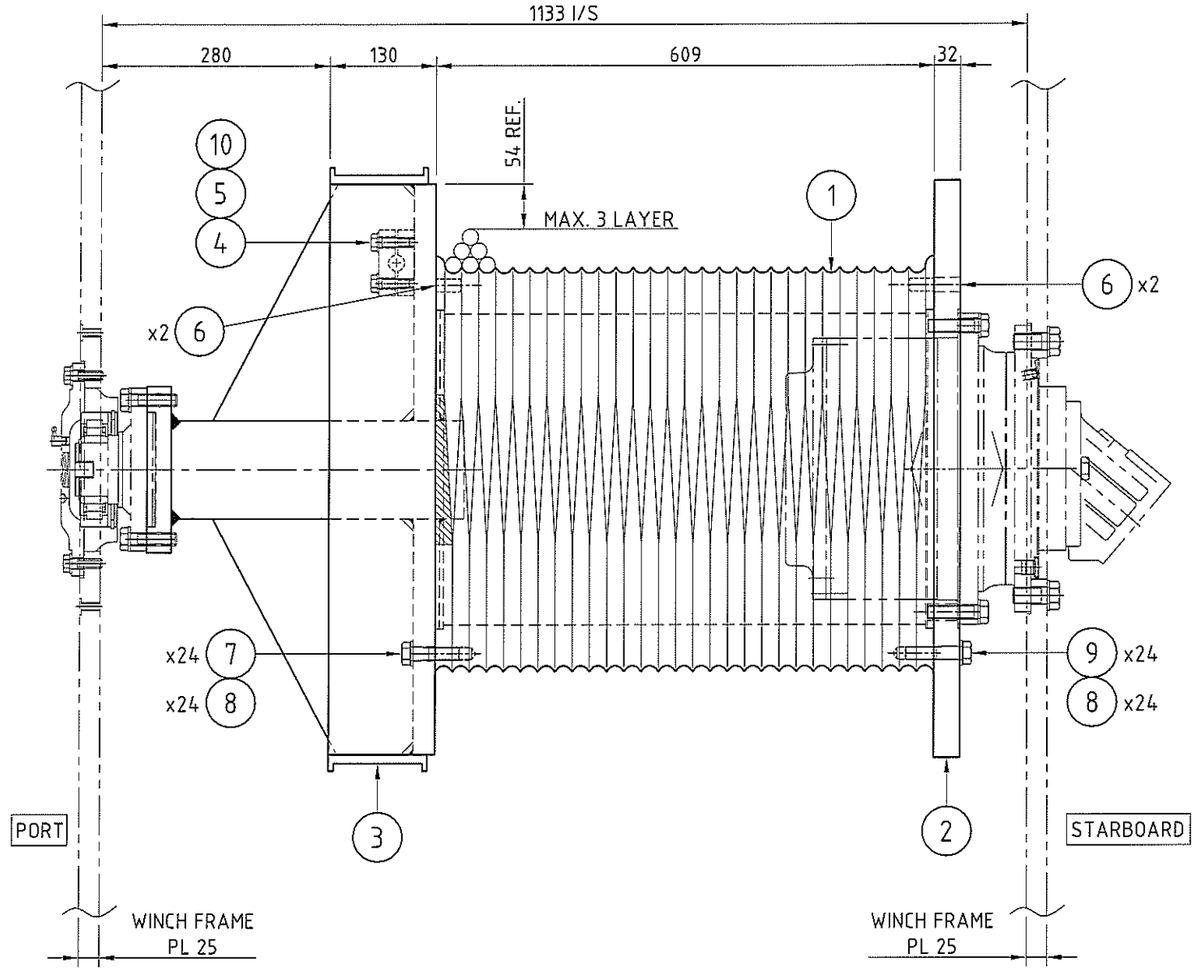
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 5	1638	~510 kg	MA3-2320.220

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M232-0220-0000
BOM DESCRIPTION ..: DRUM ASSEMBLY (F4T)
FILENAME .....: M23202200000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DWG NO. MA3-2320.220)

APPROVED ..: AJS
CHECKED ....:
PREPARED ..: NANI
DATE .....: 25/01/10
SN .....: 1638

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M232-1049-0200	MACHINING, DRUM, 400DIA/16DIA			CAST STEEL	270.00	
	2	1.00	pcs		M233-0087-0000	DRUM FLANGE (DIA 400/DIA 16)				60.00	
	3	1.00	pcs		M233-0247-0000	BRAKE DRUM (DIA 400/DIA 16)				174.00	
	4	1.00	pcs		M923-0019-0200	WELDED ROPE CLAMP - DIA 16				2.00	
	5	4.00	pcs		AFBM-1204-0F08	SCREW, HEX, M12 X 1.75 X 40			FLUOROCARBON COATED		
	6	4.00	pcs		AFYM-1605-0X01	PIN, DOWEL, DIA 16 X 50					
P	7	30.00	pcs		M926-0071-0200	BOLT, HEX, M16 X 2.0 X 60/38 LG				4.00	



ROPE CAPACITY ON DRUM

LAYER 1	40.8 m
LAYER 2	47.0 m
LAYER 3	46.4 m
TOTAL CAPACITY	134.2 m

NOTES

1. ITEM MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY TO MECHANICAL & CHEMICAL CERTIFICATES. FOR CHARPY IMPACT REQUIREMENTS, REFER TO THE APPLICABLE CONTRACT DESIGN SPECIFICATION.
2. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M232-0267-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		NOR	ORIGINAL ISSUE (MODIFIED FROM MA3-2320.224)	11.12.12	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
[A subsidiary of Muhibbah Engineering (M) Bhd]
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
DRUM ASSEMBLY (H7T)	6/10K	A

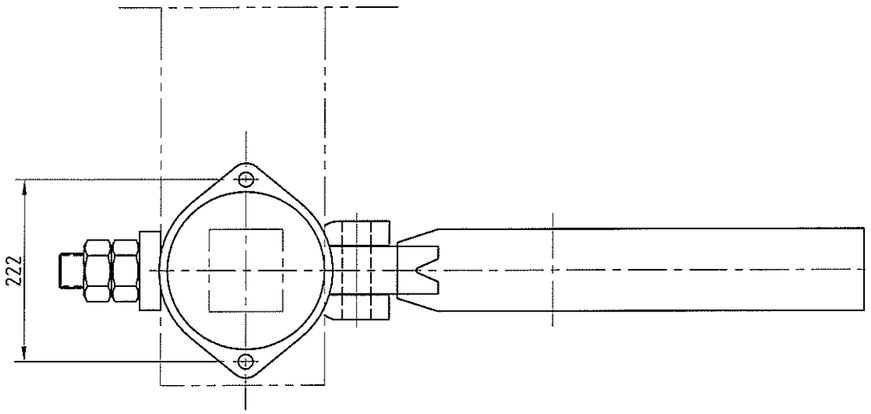
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 7.5	1845	~ 651 kg	MA3-2320.267

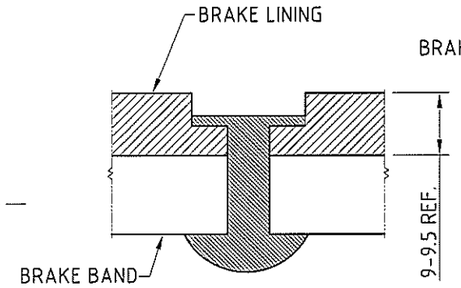
Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M232-0267-0000
BOM DESCRIPTION ..: DRUM ASSEMBLY (H7T)
FILENAME .....: M23202670000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2320.267)

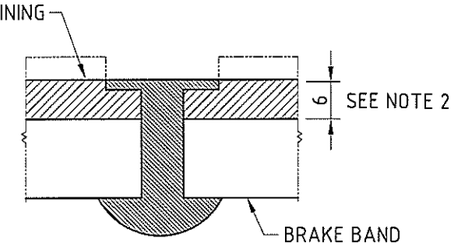
APPROVED ..: AJS
CHECKED ....: SYZ
PREPARED ..: NOR
DATE .....: 11/12/12
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M232-1065-0000	MACHINING, DRUM, 480DIA/20DIA			CAST STEEL	350.00	
	2	1.00	pcs		M233-0266-0000	DRUM FLANGE (DIA 480/ DIA 20)				83.00	
	3	1.00	pcs		M233-0284-0000	BRAKE DRUM FLANGE				210.00	
	4	1.00	pcs		M923-0019-0300	WELDED ROPE CLAMP - DIA 20				2.00	
	5	4.00	pcs		AFBM-1204-0F08	SCREW, HEX, M12 X 1.75 X 40			FLUOROCARBON COATED		
	6	4.00	pcs		AFYM-1605-0X01	PIN, DOWEL, DIA 16 X 50					
P	7	24.00	pcs		M926-0071-0200	BOLT, HEX, M16 X 2.0 X 60/38 LG				3.00	
	8	48.00	pcs		AFWM-1600-0F00	WASHER, FLAT, M16			FLUOROCARBON COATED		
P	9	24.00	pcs		M926-0071-0400	BOLT, HEX, M16 X 2.0 X 70/38 LG				3.00	
	10	4.00	pcs		AFWM-1200-0F00	WASHER, FLAT, M12			FLUOROCARBON COATED		

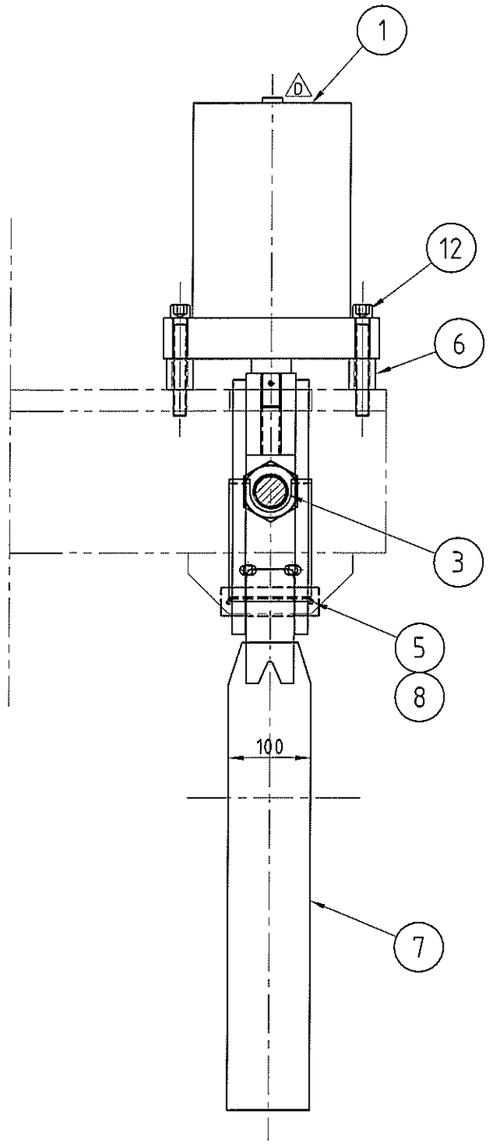


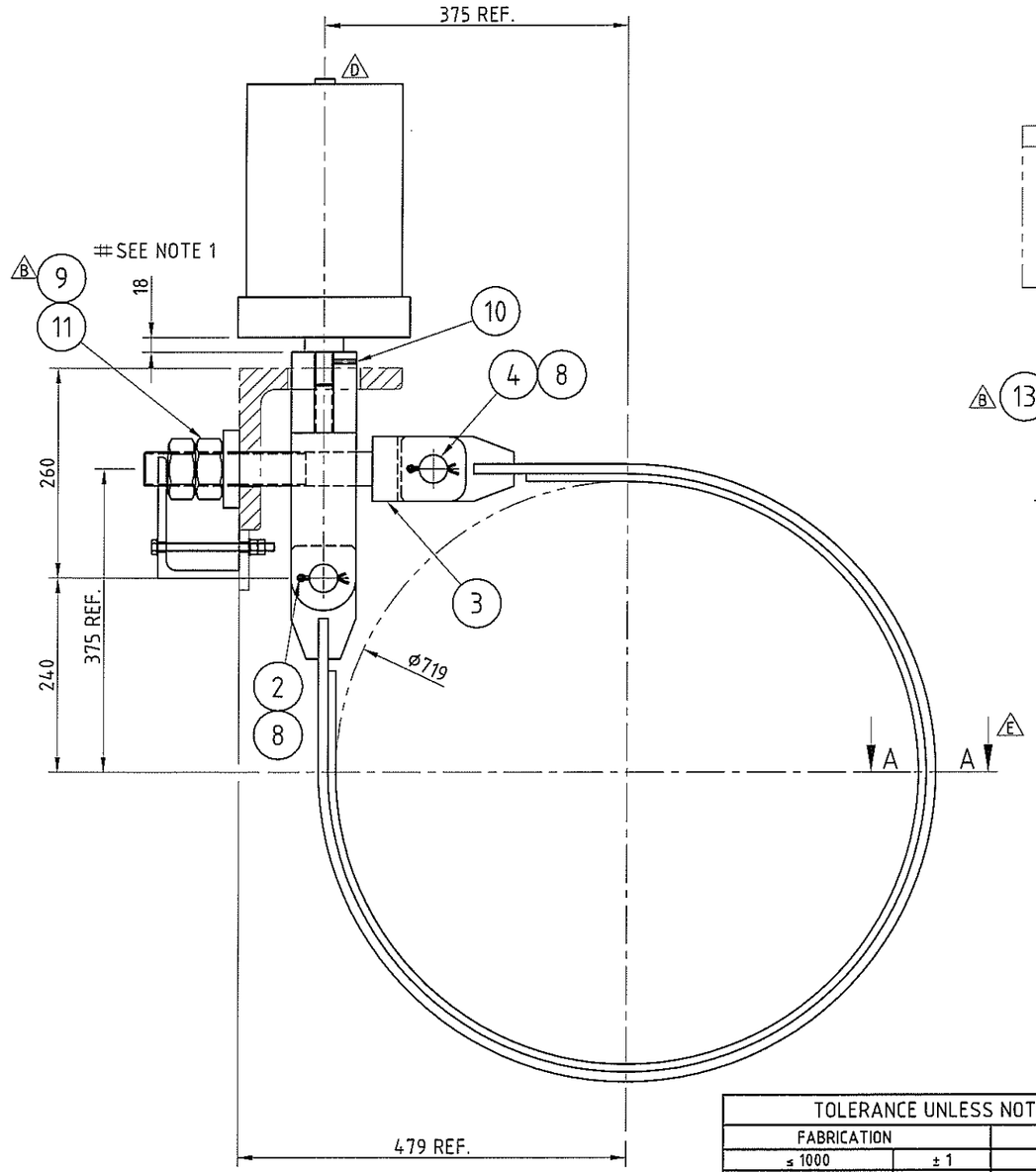


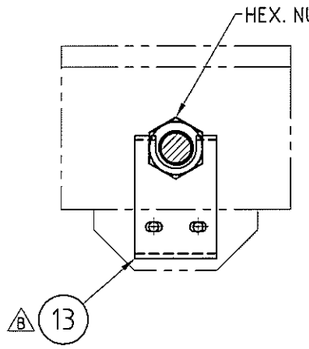
SECTION A - A (E)
(BRAKE LINING THICKNESS DURING FIRST INSTALLATION)

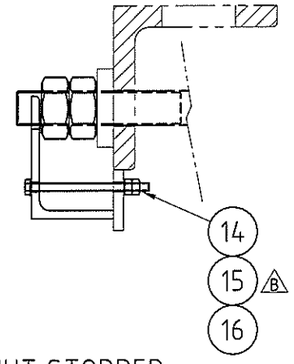


SECTION A - A (E)
(BRAKE LINING THICKNESS AFTER COMPLETE WORN OUT)









MOUNTING DETAIL FOR NUT STOPPER

NOTES

D #1. BY TIGHTENING NUT ITEM 9, INCREASE THE SPINDLE PROTRUSION LENGTH UNTIL THE INDICATOR FLUSH WITH THE ACTUATOR SURFACE. READJUST REGULARLY TO MAINTAIN SUFFICIENT BRAKING TORQUE.

E 2. REPLACE BAND BRAKE LINING WHEN LINING IS 6mm THICK ONLY.

C 3. FOR BILL OF MATERIALS (BOM), REFER BOM NO M236-0044-0000.

		AZN	(E18917) NOTE 2 UPDATED.SECTION A-A ADDED.	02.11.12	E
AJS	TEO	WAN	(E16712) BRAKE ACTUATOR UPDATED WITH ADDITIONAL INDICATOR. NOTE 1 UPDATED.	07.04.11	D
AJS	CWC	CML	(E14849) MATERIAL LIST REMOVED. NOTE 3 ADDED.	05.08.09	C
AY	TPO	MUK	(ECN NO:E 10701) ITEM 9 WAS 1, ITEM 13 WAS MA3-2361.044, ITEM 15 WAS 2	16.08.06	B
AY	TPO	SCS	ORIGINAL ISSUE (MODIFIED FROM MA3-2360.036)	21.06.06	A
Approved	Checked	Drawn	Description	Date	Rev.

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

Favelle Favco Cranes (M) Sdn. Bhd.
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(A subsidiary of Huhibbah Engineering (M) Bhd)
Huhibbah Engineering (M) Bhd

Title: BAND BRAKE ASSEMBLY (7T)

Model	Rev.
100RL	E

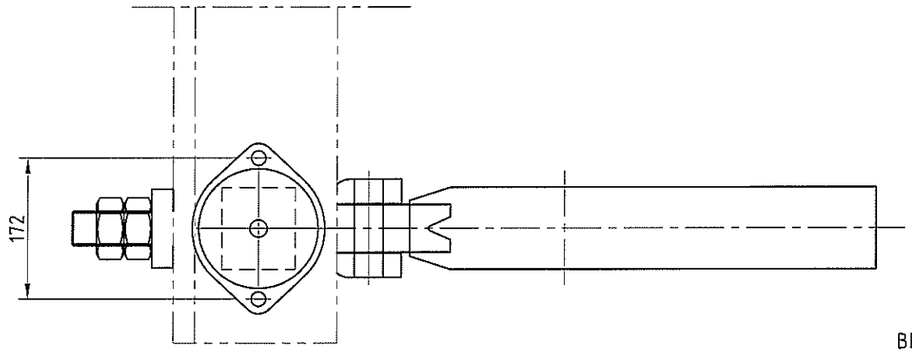
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 7.5	1385	~ 94kg	MA3-2360.044

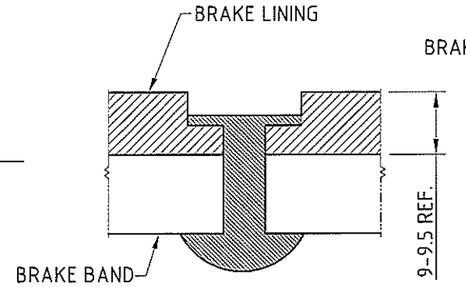
Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M236-0044-0000
BOM DESCRIPTION ..: BAND BRAKE ASSEMBLY (7T)
FILENAME .....: M23600440000C
CURRENT REV .....: C
REV DESCRIPTION ...: REFER TO ECN NO. E18545

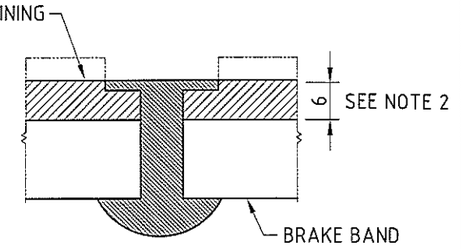
APPROVED ..: AJS
CHECKED ....: TEO
PREPARED ..: TRN
DATE .....: 28/08/12
SN .....: 1385

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M625-0026-0000	BRAKE ACTUATOR TYPE 2 (7" BORE)				35.00	
	2	1.00	pcs		M236-1029-0001	CONNECTOR				9.00	
	3	1.00	pcs		M236-1029-0004	CLEVIS				14.00	
	4	1.00	pcs		M236-1029-0005	CLEVIS PIN				1.00	
	5	1.00	pcs		M236-1029-0006	CONNECTOR PIN				1.00	
	6	2.00	pcs		M236-1029-0007	SPACER				0.40	
	7	1.00	pcs		M236-1051-0000	BRAKE BAND DIA 719 (7T)				31.00	
	8	4.00	pcs		AFZM-0607-0X01	PIN, SPLIT, DIA 6 X 70					C
	9	2.00	pcs		AFNM-4200-0F08	NUT, HEX, M42 X 4.5			FLUOROCARBON COATED		B
	10	1.00	pcs		AFGM-0602-5X02	SCREW, GRUB, M6 X 1 X 25					
	11	1.00	pcs		AMEA-0014-5000	BEARING, CYL ROLLER THRUST					
	12	2.00	pcs		AFDM-1612-0F12	SCREW, SHC, M16 X 2 X 120			FLUOROCARBON COATED		
	13	1.00	pcs		M236-1055-0000	NUT STOPPER MOUNTING DETAILS				2.70	B
	14	2.00	pcs		AFAM-1014-0X02	BOLT, HEX, M10 X 1.5 X 140					
	15	4.00	pcs		AFNM-1000-0X02	NUT, HEX, M10 X 1.5					B
	16	4.00	pcs		AFWM-1000-0X02	WASHER, FLAT, M10					

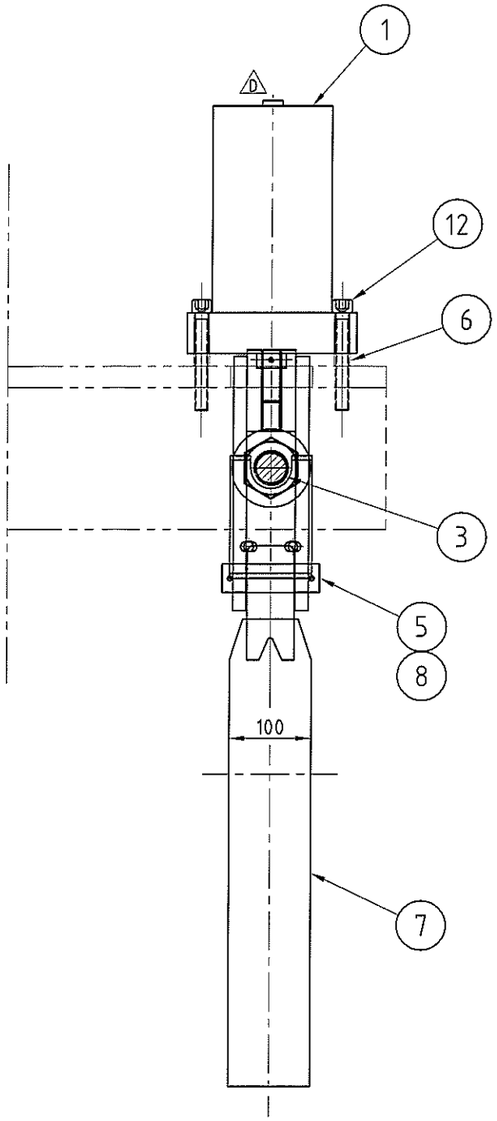


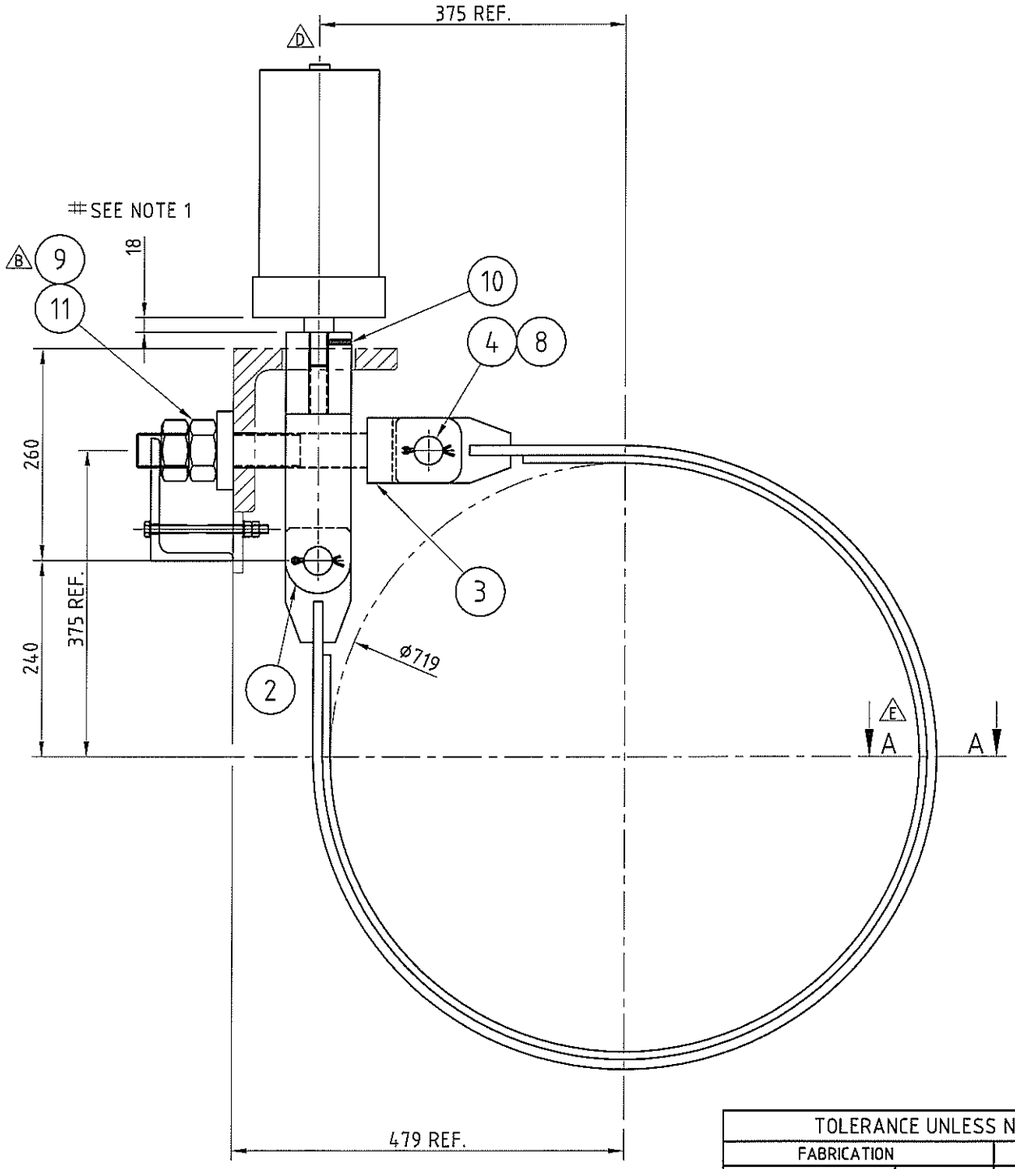


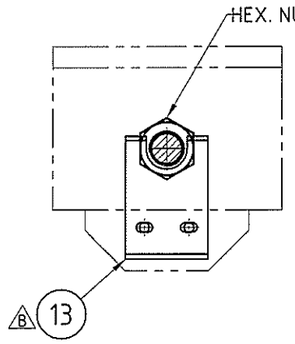
SECTION A - A △E
(BRAKE LINING THICKNESS
DURING FIRST INSTALLATION)

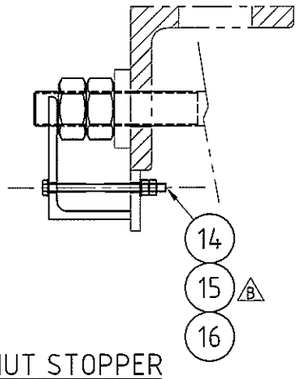


SECTION A - A △E
(BRAKE LINING THICKNESS
AFTER COMPLETE WORN OUT)









MOUNTING DETAIL FOR NUT STOPPER

NOTES

△D #1. BY TIGHTENING NUT ITEM 9, INCREASE THE SPINDLE PROTRUSION LENGTH UNTIL THE INDICATOR FLUSH WITH THE ACTUATOR SURFACE. READJUST REGULARLY TO MAINTAIN SUFFICIENT BRAKING TORQUE.

△E 2. REPLACE BAND BRAKE LINING WHEN LINING IS 6mm THICK ONLY

△C 3. FOR BILL OF MATERIAL (BOM) REFER BOM NO. M236-0045-0000.

		AZN	(E18917) NOTE 2 UPDATED. SECTION A-A ADDED.	02.11.12	E
AJS	TEO	WAN	(E16712) BRAKE ACTUATOR UPDATED WITH ADDITIONAL INDICATOR. NOTE 1 UPDATED.	07.04.11	D
AJS	CML	SUF	(E14849) MATERIAL LIST REMOVED. NOTE 3 ADDED.	09.09.09	C
AY	SCS	MUK	(ECN NO:E 10701) ITEM 9 WAS 1, ITEM 13 WAS MA3-2361.044, ITEM 15 WAS 2	16.08.06	B
AY	TPO	SCS	ORIGINAL ISSUE (MODIFIED FROM MA3-2360.037)	21.06.06	A
Approved	Checked	Drawn	Description	Date	Rev.

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title: BAND BRAKE ASSEMBLY (4T)

Model	Rev.
100RL	E

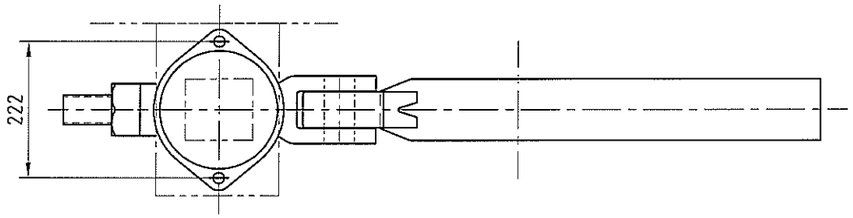
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 7.5	1385	~ 84kg	MA3-2360.045

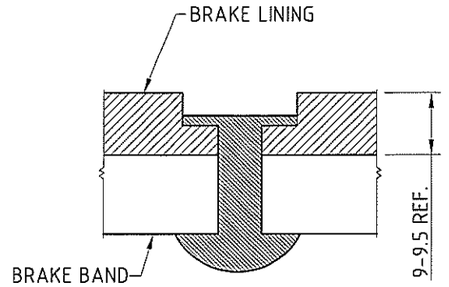
Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M236-0045-0000
BOM DESCRIPTION ..: BAND BRAKE ASSEMBLY (4T)
FILENAME .....: M23600450000C
CURRENT REV .....: C
REV DESCRIPTION ...: REFER TO ECN NO. E18545

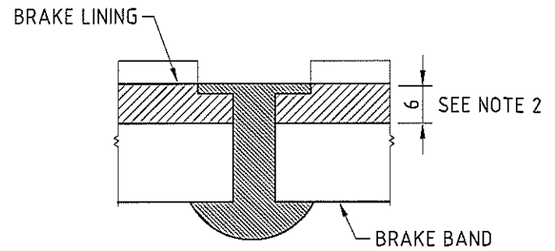
APPROVED ..: AJS
CHECKED ....: TEO
PREPARED ..: TRN
DATE .....: 28/08/12
SN .....: 1385

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M625-0020-0000	BRAKE ACTUATOR TYPE 1 (5" BORE)				25.00	
	2	1.00	pcs		M236-1029-0001	CONNECTOR				9.00	
	3	1.00	pcs		M236-1029-0004	CLEVIS				14.00	
	4	1.00	pcs		M236-1029-0005	CLEVIS PIN				1.00	
	5	1.00	pcs		M236-1029-0006	CONNECTOR PIN				1.00	
	6	2.00	pcs		M236-1029-0007	SPACER				0.40	
	7	1.00	pcs		M236-1051-0000	BRAKE BAND DIA 719 (7T)				31.00	
	8	4.00	pcs		AFZM-0607-0X01	PIN, SPLIT, DIA 6 X 70					C
	9	2.00	pcs		AFNM-4200-0F08	NUT, HEX, M42 X 4.5			FLUOROCARBON COATED		B
	10	1.00	pcs		AFGM-0602-5X02	SCREW, GRUB, M6 X 1 X 25					
	11	1.00	pcs		AMEA-0014-5000	BEARING, CYL ROLLER THRUST					
	12	2.00	pcs		AFDM-1612-0F12	SCREW, SHC, M16 X 2 X 120			FLUOROCARBON COATED		
	13	1.00	pcs		M236-1055-0000	NUT STOPPER MOUNTING DETAILS				2.70	B
	14	2.00	pcs		AFAM-1014-0X02	BOLT, HEX, M10 X 1.5 X 140					
	15	4.00	pcs		AFNM-1000-0X02	NUT, HEX, M10 X 1.5					B
	16	4.00	pcs		AFWM-1000-0X02	WASHER, FLAT, M10					

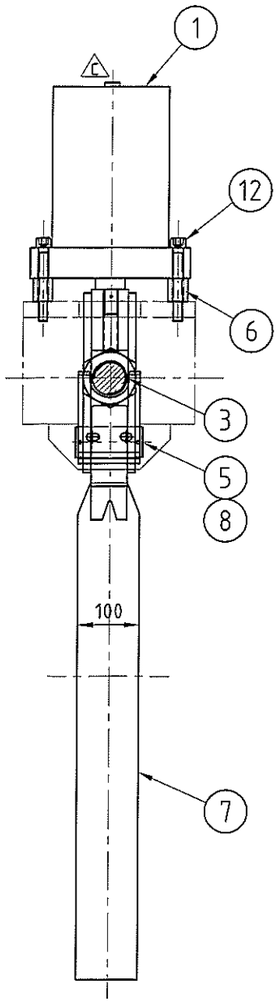


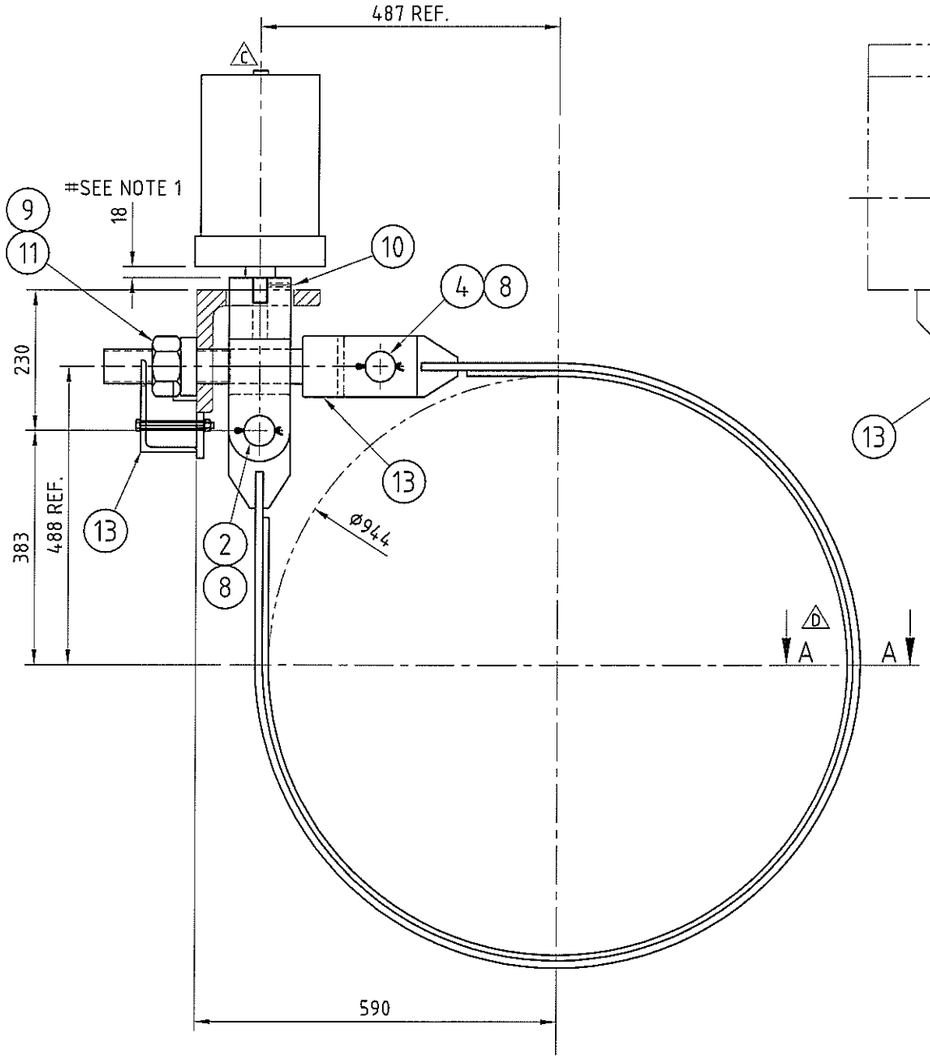


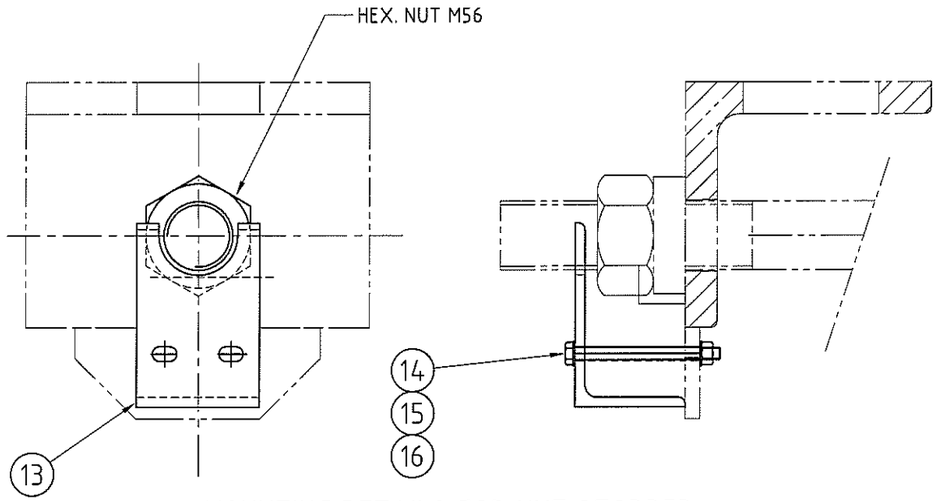
SECTION A - A △D
(BRAKE LINING THICKNESS DURING FIRST INSTALLATION)
SCALE: 1 : 7.5



SECTION A - A △D
(BRAKE LINING THICKNESS AFTER COMPLETE WORN OUT)
SCALE: 1 : 7.5







MOUNTING DETAILS FOR NUT STOPPER
SCALE: 1 : 5

NOTES

△C #1. BY TIGHTENING NUT ITEM 9, INCREASE THE SPINDLE PROTRUSION LENGTH UNTIL THE INDICATOR FLUSH WITH THE ACTUATOR SURFACE. READJUST REGULARLY TO MAINTAIN SUFFICIENT BRAKING TORQUE.

△D 2. REPLACE BAND BRAKE LINING WHEN LINING IS 6mm THICK ONLY.

△B 3. FOR BILL OF MATERIAL (BOM), REFER BOM NO. M236-0046-0000.

		AZN	(E18917) NOTE 2 UPDATED.SECTION A-A ADDED.	02.11.12	D
AJS	TEO	WAN	(E16712) BRAKE ACTUATOR UPDATED WITH ADDITIONAL INDICATOR. NOTE 1 UPDATED.	07.04.11	C
AJS	CWC	TXF	(E 14849) MATERIAL LIST REMOVED. NOTE 3 ADDED.	28.09.09	B
AY	CWC	MUK	ORIGINAL ISSUE (MODIFIED FROM MA3-2360.038)	19.07.06	A
Approved	Checked	Drawn	Description	Date	Rev.

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
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(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
BAND BRAKE ASSEMBLY(10T, NUT STOPPER)	8/10K	D

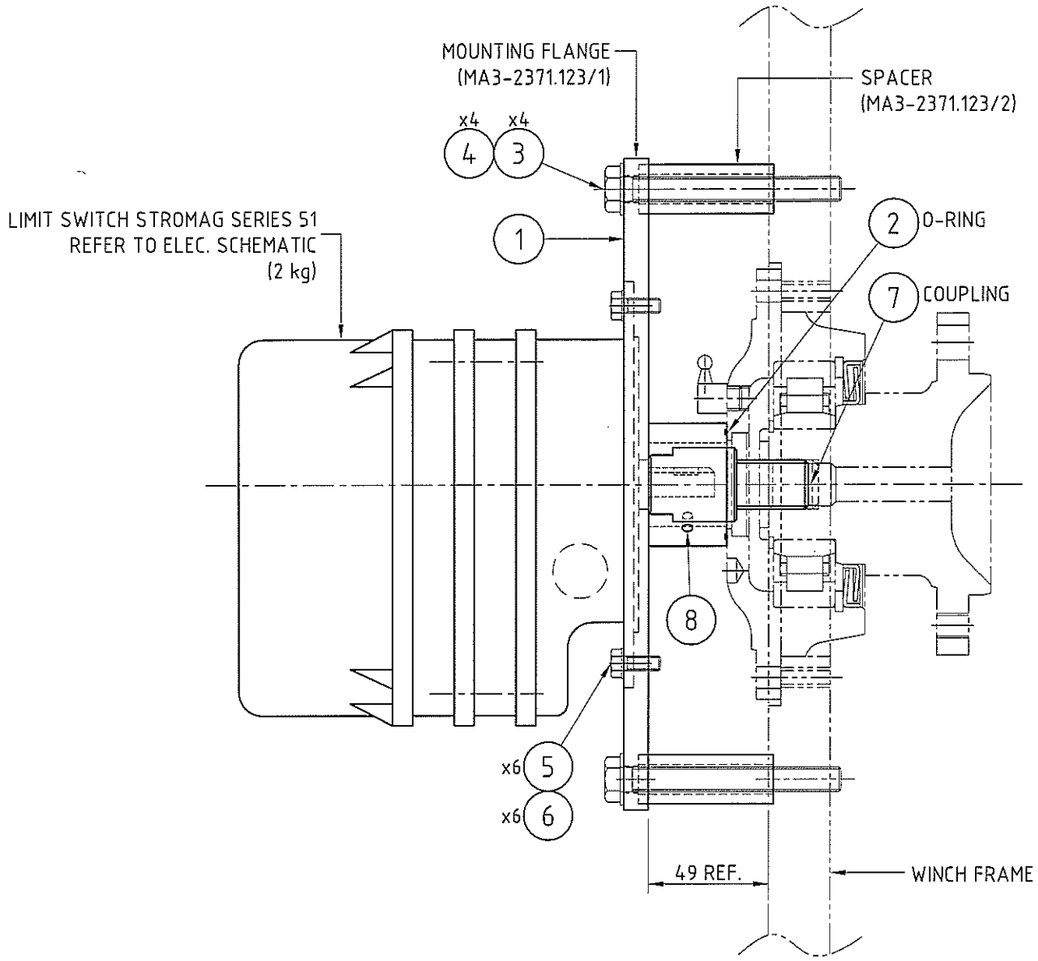
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 10	1381	~98 kg	MA3-2360.046

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

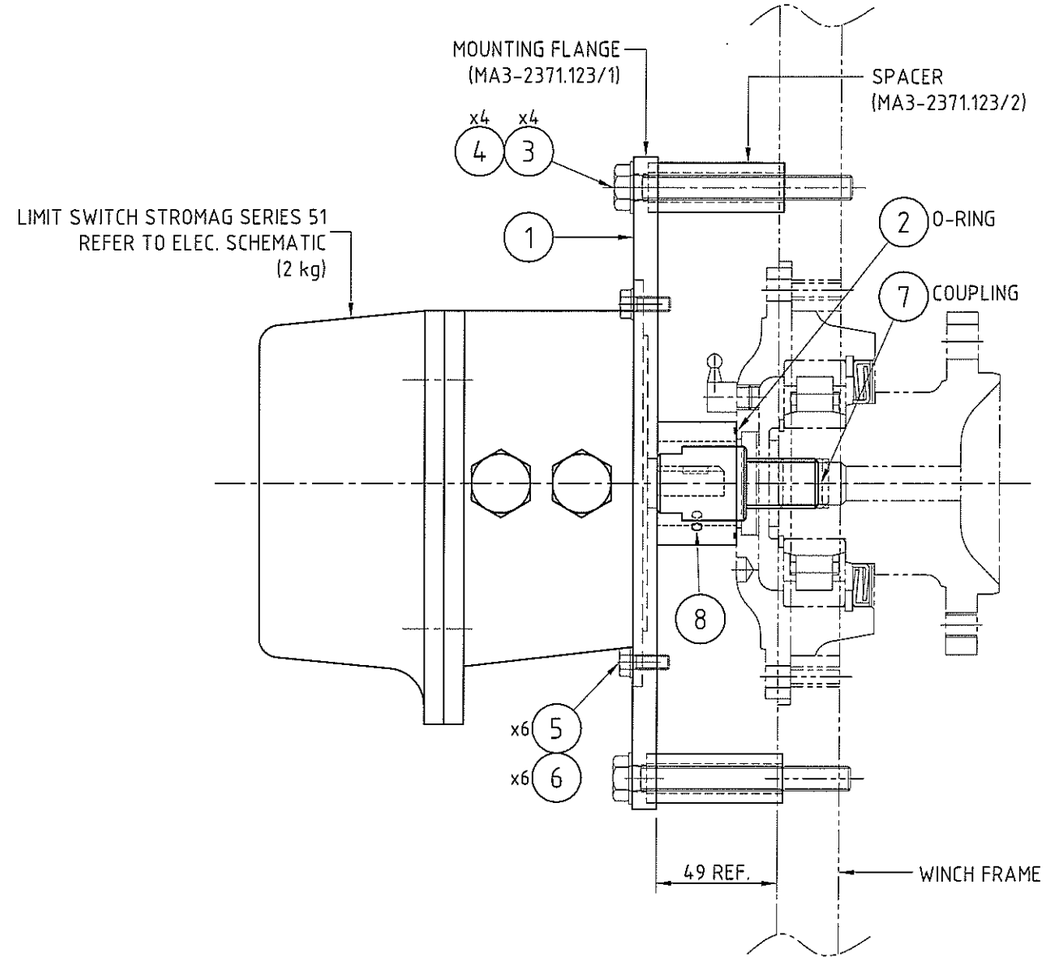
ITEM CODE (BOM No) : M236-0046-0000
BOM DESCRIPTION ..: BAND BRAKE ASSEMBLY (10T, NUT STOPPER)
FILENAME .....: M23600460000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E18545

APPROVED ..: AJS
CHECKED ....: TEO
PREPARED ..: TRN
DATE .....: 28/08/12
SN .....: 1381

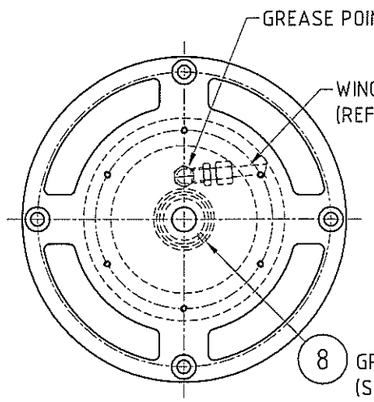
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M625-0026-0000	BRAKE ACTUATOR TYPE 2 (7" BORE)				35.00	
	2	1.00	pcs		M236-1027-0001	CONNECTOR				10.00	
	3	1.00	pcs		M236-1027-0004	CLEVIS				14.00	
	4	1.00	pcs		M236-1027-0005	CLEVIS PIN				2.00	
	5	1.00	pcs		M236-1027-0006	CONNECTOR PIN				2.00	
	6	2.00	pcs		M236-1027-0007	SPACER				0.40	
	7	1.00	pcs		M236-1053-0000	BRAKE BAND (10T)				33.00	
	8	4.00	pcs		AFZM-0608-0X01	PIN, SPLIT, DIA 6 X 80					B
	9	1.00	pcs		AFNM-5600-0F08	NUT, HEX, M56 X 5.5			FLUOROCARBON COATED		
	10	1.00	pcs		AFGM-0602-5X02	SCREW, GRUB, M6 X 1 X 25					
	11	1.00	pcs		AMEA-0014-4000	BEARING, CYL ROLLER THRUST					
	12	2.00	pcs		AFDM-1612-0F12	SCREW, SHC, M16 X 2 X 120			FLUOROCARBON COATED		
	13	1.00	pcs		M236-1054-0000	NUT STOPPER MOUNTING DETAILS				1.20	
	14	2.00	pcs		AFAM-1012-0X02	BOLT, HEX, M10 X 1.5 X 120					
	15	2.00	pcs		AFNM-1000-0X02	NUT, HEX, M10 X 1.5					
	16	4.00	pcs		AFWM-1000-0X02	WASHER, FLAT, M10					



SAFE ZONE LIMIT SWITCH ASSEMBLY
(DWG NO. MA3-2370.153.001)



EX-PROOF LIMIT SWITCH ASSEMBLY
(DWG NO. MA3-2370.153.002)



SIDE VIEW
(LIMIT SWITCH & END BEARING SUPPORT
NOT SHOWN FOR CLARITY)
SCALE: 1 : 5

DRAWING NO.	ITEM 7 COUPLING	APPLICATION	GEARED CAM LIMIT SWITCH
MA3-2370.153.001	MA3-2371.124/1	SAFE ZONE	STROMAG SERIES 51 #P/NO :_BM 699 - B5/IP66
MA3-2370.153.002	MA3-2371.124/2	EX-PROOF	STROMAG SERIES 110 #P/NO :_NE 6EX-FV-B3/B5/IP66

NOTES

1. ACTUAL PART NO. SHALL REFER TO ELECTRICAL EQUIPMENT SCHEDULE
2. GREASE DRAIN PLUG SHOULD BE REMOVED WHEN GREASING & REINSTALLED AFTER GREASING.
3. GREASE POINT USED SHOULD BE ABOVE CENTRE LINE OF THE END BEARING, UNUSED GREASE POINTS SHOULD BE PLUGGED.
4. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M237-0153-0X00 WHERE X REFER TO DRAWING EXTENSION NUMBER.

Approved	Checked	Drawn	Description	Date	Rev.
		NOR	ORIGINAL ISSUE (MODIFIED FROM MA3-2370.074)	23.11.12	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

Favelle Favco Cranes (M) Sdn. Bhd.
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(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
LIMIT SWITCH ASSEMBLY (F4T)	350RL	A

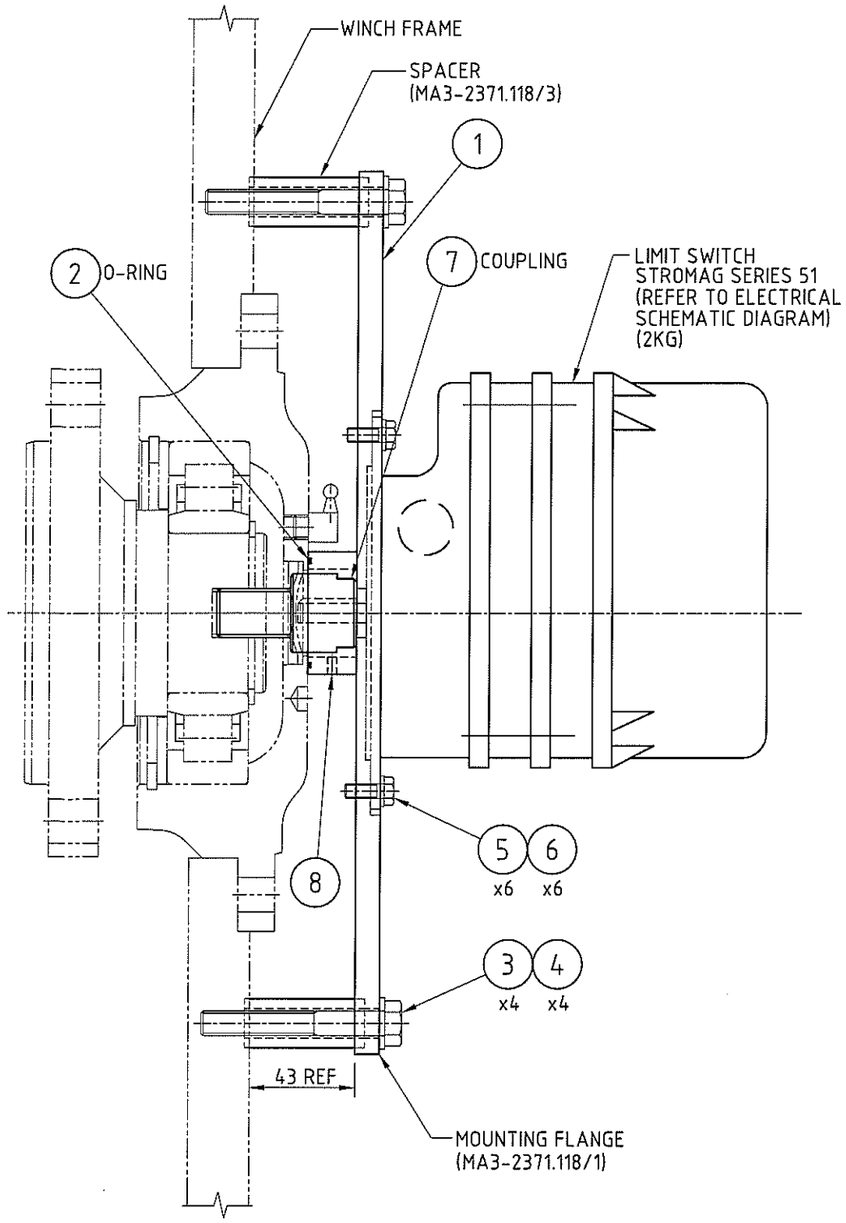
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 2.5	1831	~ 7 kg	MA3-2370.153.XXX

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

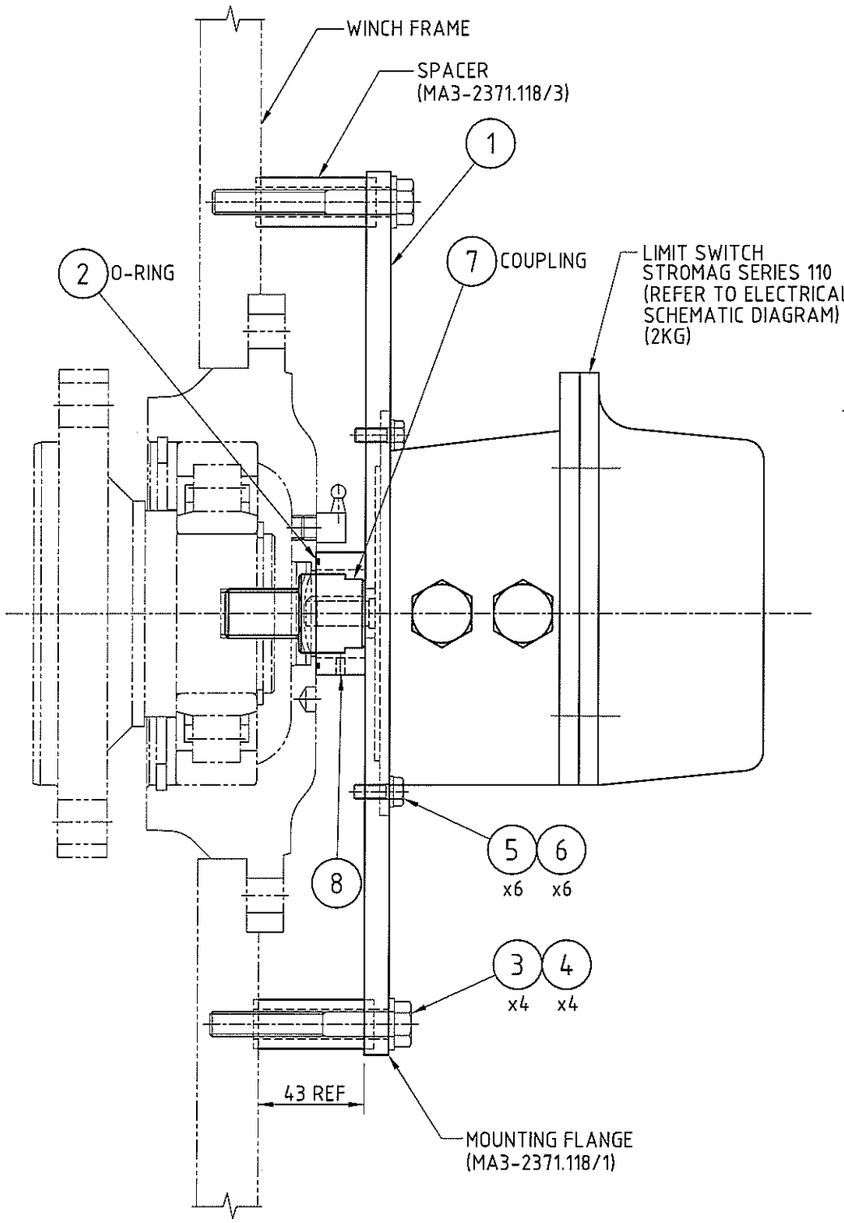
ITEM CODE (BOM No) : M237-0153-0100
BOM DESCRIPTION ..: LIMIT SWITCH ASSEMBLY (F4T)
FILENAME .....: M23701530100A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DWG NO. MA3-2370.153.001)

APPROVED ..: AJS
CHECKED ....: WAI
PREPARED ..: NOR
DATE .....: 23/11/12
SN .....: 1831

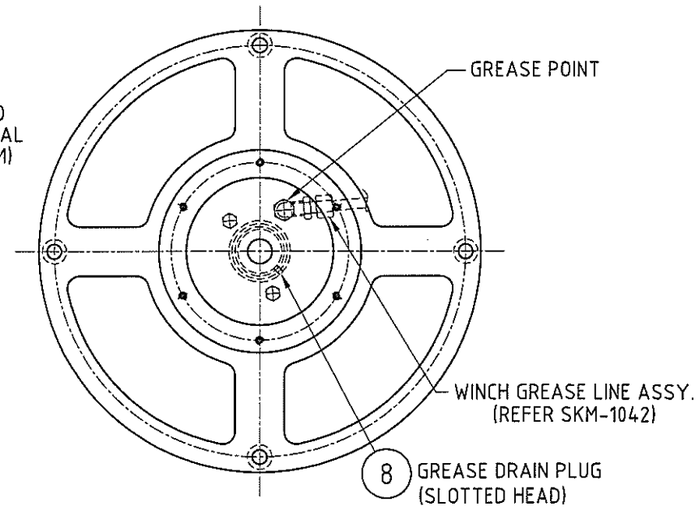
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M237-1123-0000	LIMIT SWITCH DETAILS				4.00	
	2	1.00	pcs		AMQM-2041-044V	O-RING, ID 41.00MM X OD 44.56MM X 1.78MM THK			VITON		
	3	4.00	pcs		AFBM-1009-0X02	SCREW, HEX, M10 X 1.5 X 90					
	4	4.00	pcs		AFWM-1000-0X02	WASHER, FLAT, M10					
	5	6.00	pcs		AFBM-0601-6X02	SCREW, HEX, M6 X 1 X 16					
	6	6.00	pcs		AFWM-0600-0X02	WASHER, FLAT, M6					
	7	1.00	pcs		M237-1124-0001	LIMIT SWITCH COUPLING				1.00	
	8	1.00	pcs		AFCM-0406-0X02	SCREW, CHEESE HEAD SLOTTED, M4 X 0.7 X 6					



SAFE ZONE LIMIT SWITCH ASSEMBLY
(DWG NO. : MA3-2370.158.001)



EX-PROOF LIMIT SWITCH ASSEMBLY
(DWG NO. : MA3-2370.158.002)



SIDE VIEW

(LIMIT SWITCH & END BEARING SUPPORT
NOT SHOWN FOR CLARITY)

SCALE: 1 : 5

DRAWING NO.	ITEM 7 (COUPLING)	APPLICATION	GEARED CAM LIMIT SWITCH
MA3-2370.158.001	MA3-2371.107/1	SAFE ZONE	STROMAG SERIES 51 * P/NO : __BM 699 - B5/IP66
MA3-2370.158.002	MA3-2371.107/2	EX-PROOF	STROMAG SERIES 110 * P/NO : __NE 6EX-FV-B3/B5/IP66

NOTES

1. SUITABLE FOR WINCHES F7T, H7T & L10T (L&S GEARBOX).
2. * ACTUAL PART NO. SHALL REFER TO ELECTRICAL EQUIPMENT SCHEDULE
3. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M237-0158-0X00 WHERE X REFER TO DRAWING EXT.
4. GREASE DRAIN PLUG SHOULD BE REMOVED WHEN GREASING & REINSTALLED AFTER GREASING.
5. GREASE POINT USED SHOULD BE ABOVE CENTRE LINE OF END BEARING. UNUSED GREASE POINTS SHOULD BE PLUGGED.
6. ROTATE MOUNTING FLANGE 90° CLOCKWISE IF GREASE DRAIN PLUG INTERFERE WITH PLUGGED GREASE POINT.

Approved	Checked	SRR	ORIGINAL ISSUE (MODIFIED FROM MA3-2370.120)	09.10.12	A
		Drawn	Description	Date	Rev.

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
LIMIT SWITCH ASSEMBLY	100RL	A

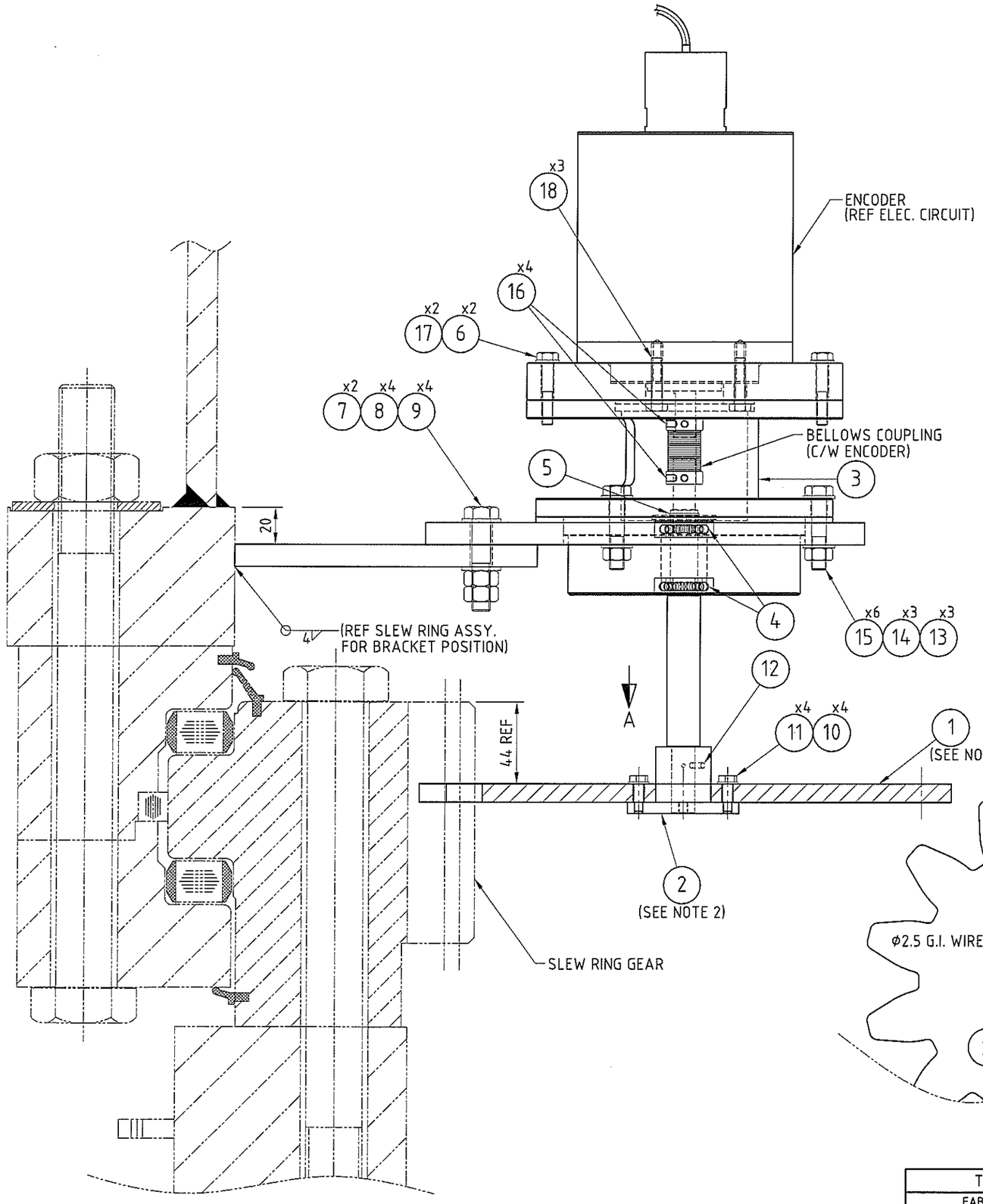
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 2.5	1820-21	~ 6kg	MA3-2370.158.XXX

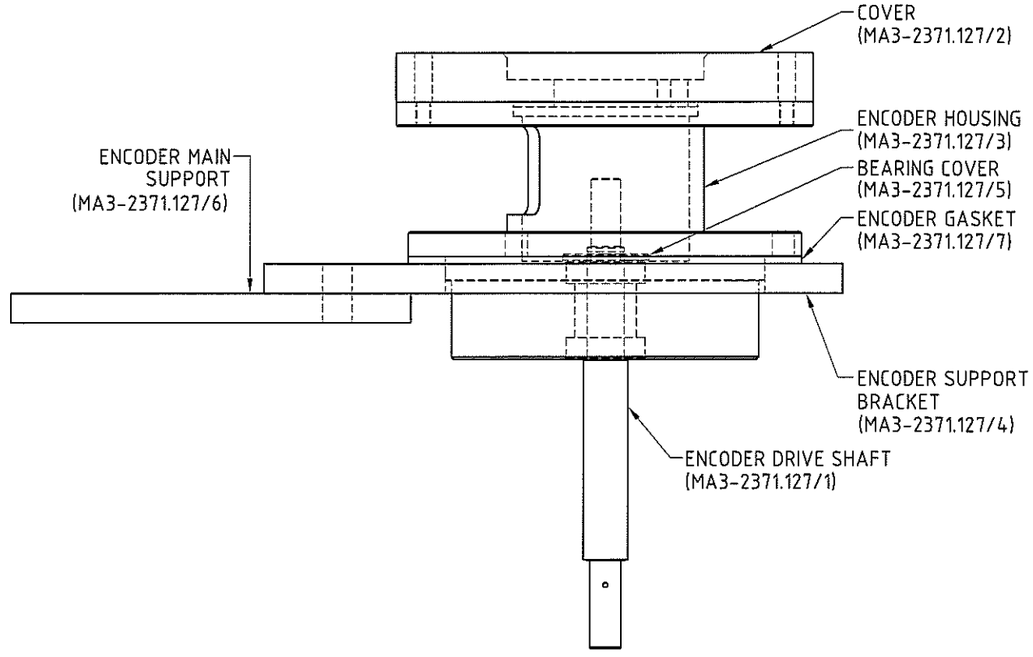
Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M237-0158-0100
BOM DESCRIPTION ..: LIMIT SWITCH ASSEMBLY
FILENAME .....: M23701580100A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DWG NO. MA3-2370.158.001)

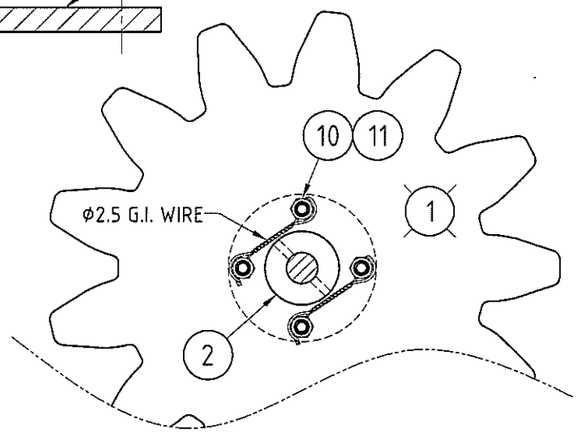
APPROVED ..: AJS
CHECKED ....: KSL
PREPARED ..: SRR
DATE .....: 09/10/12
SN .....: 1820-21

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M237-1118-0000	LIMIT SWITCH DETAILS				5.00	
	2	1.00	pcs		AMQM-2041-044V	O-RING, ID 41.00MM X OD 44.56MM X 1.78MM THK			VITON		
	3	4.00	pcs		AFAM-1007-5X02	BOLT, HEX, M10 X 1.5 X 75					
	4	4.00	pcs		AFWM-1000-0X02	WASHER, FLAT, M10					
	5	6.00	pcs		AFBM-0601-6X02	SCREW, HEX, M6 X 1 X 16					
	6	6.00	pcs		AFWM-0600-0X02	WASHER, FLAT, M6					
	7	1.00	pcs		M237-1107-0001	LIMIT SWITCH COUPLING				0.30	
	8	1.00	pcs		AFCM-0406-0X02	SCREW, CHEESE HEAD SLOTTED, M4 X 0.7 X 6					





ITEM 3



VIEW A

NOTES

1. UNLESS OTHERWISE NOTED ALL WELDING IS TO BE IN ACCORDANCE WITH AWS D1.1 (LATEST EDITION)
2. PRE-ASSEMBLE ITEMS 1 & 2 TOGETHER BEFORE INSERTING AND CONNECTING TO ENCODER DRIVE SHAFT.
3. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M237-0163-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		SRR	ORIGINAL ISSUE (MODIFIED FROM MA3-2370.159)	07.02.13	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FORM: FFCM-DS-01P-07C

FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title: SLEW ENCODER ASSEMBLY

Model	Rev.
6/10K	A

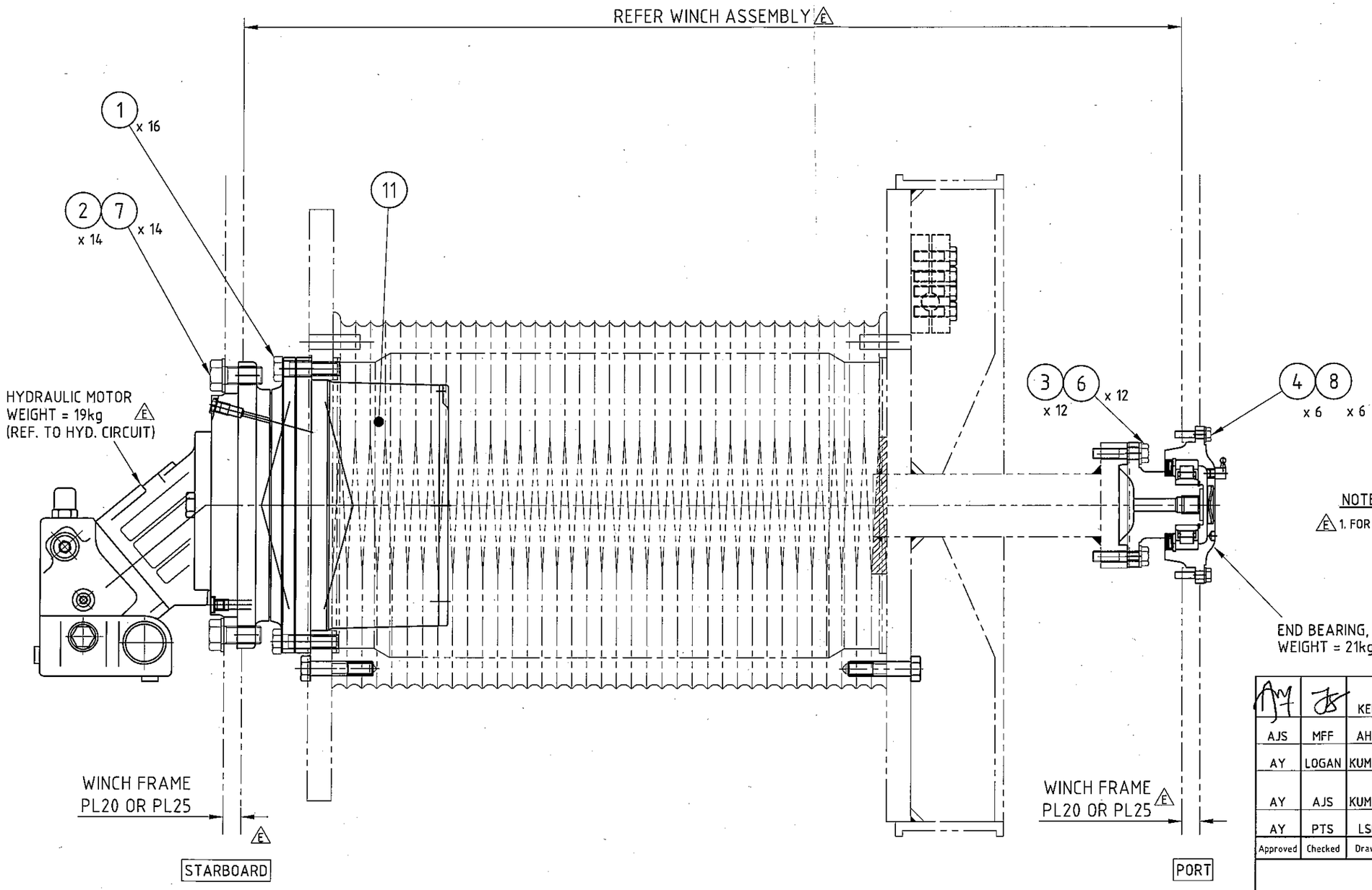
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 2.5	1845	~ 34 kg	MA3-2370.163

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M237-0163-0000
BOM DESCRIPTION ..: SLEW ENCODER ASSEMBLY
FILENAME .....: M23701630000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2370.163)

APPROVED ..: AJS
CHECKED .....: SYZ
PREPARED ..: SRR
DATE .....: 07/02/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M237-1101-0000	LIMIT GEAR PROFILE - 15T, 16M				1.00	
	2	1.00	pcs		M237-1102-0000	1/2" DRIVE SHAFT HUB DETAILS				0.80	
	3	1.00	pcs		M237-1127-0000	SLEW ENCODER DETAILS				32.00	
	4	2.00	pcs		AMEA-0030-7000	BEARING, BALL WITH 2 SHIELDS				0.10	
	5	1.00	pcs		AMEB-0006-2000	CIRCLIP, EXTERNAL			DIN 471, D1400		
	6	2.00	pcs		AFAM-0603-5X02	BOLT, HEX, M6 X 1 X 35					
	7	2.00	pcs		AFAM-1005-0X02	BOLT, HEX, M10 X 1.5 X 50					
	8	4.00	pcs		AFNM-1000-0X02	NUT, HEX, M10 X 1.5					
	9	4.00	pcs		AFWM-1000-0X02	WASHER, FLAT, M10					
	10	4.00	pcs		AFBM-0501-6X02	SCREW, HEX, M5 X 0.8 X 16					
	11	4.00	pcs		AFWM-0500-0X02	WASHER, FLAT, M5					
	12	1.00	pcs		AFXM-0303-0X01	PIN, SPRING, DIA 3 X 30					
	13	3.00	pcs		AFAM-0804-0X02	BOLT, HEX, M8 X 1.25 X 40					
	14	3.00	pcs		AFNM-0800-0X02	NUT, HEX, M8 X 1.25					
	15	6.00	pcs		AFWM-0800-0X02	WASHER, FLAT, M8					
	16	4.00	pcs		AFGM-0400-5X02	SCREW, GRUB, M4 X 0.7 X 5					
	17	2.00	pcs		AFWM-0600-0X02	WASHER, FLAT, M6					
	18	3.00	pcs		AFBM-0602-5X02	SCREW, HEX, M6 X 1 X 25					



NOTES

(E) 1. FOR BILL OF MATERIALS (BOM), REFER TO BOM NO. M239-0126-0000.

		KEN	(E15944) MATERIAL LIST REMOVED. ITEM 4 LG WAS 30, QTY ITEM 6 WAS 28. NOTE 1 ADDED. WEIGHT UPDATED. BALLOON UPDATED.	30.07.10	E
AJS	MFF	AHM	(E12610) ITEM 5 REMOVED.	02.10.07	D
AY	LOGAN	KUMAR	(REFER TO ECN NO. E7788) REVISED ITEM 1 & 2 GRADE WAS 8.8	30.09.04	C
AY	AJS	KUMAR	(REFER TO ECN NO. E7767) REVISED ITEM 1, 3 & 4 SCREW, HEX M8, M16 & M20 WAS BOLT, HEX M8, M16 & M20	23.09.04	B
AY	PTS	LSL	ORIGINAL ISSUE	07.06.04	A
Approved	Checked	Drawn	Description	Date	Rev.

FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title	Model	Rev.
DRIVE ASSEMBLY (F4T)	STD	E

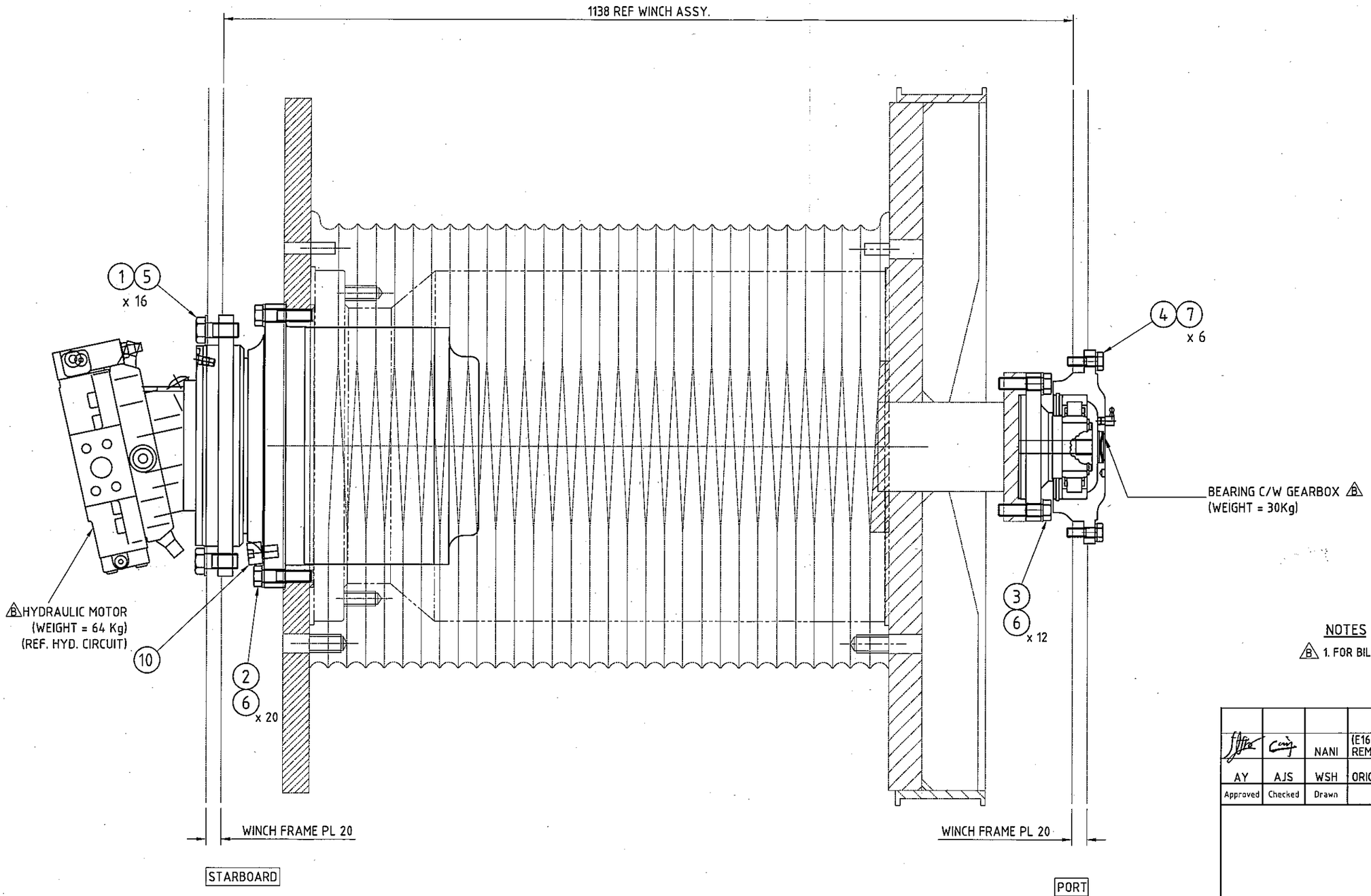
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 5	STD	~130kg (E)	MA3-2390.126

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M239-0126-0000
BOM DESCRIPTION ..: DRIVE ASSEMBLY (F4T)
FILENAME .....: M23901260000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DWG NO. MA3-2390.126)

APPROVED ..: AJS
CHECKED ....: JEGA
PREPARED ..: KEN
DATE .....: 30/07/10
SN .....: STD

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	16.00	pcs		AFBM-1606-5F08	SCREW, HEX, M16 X 2 X 65			FLUOROCARBON COATED		
	2	14.00	pcs		AFBM-2004-5F08	SCREW, HEX, M20 X 2.5 X 45			FLUOROCARBON COATED		
	3	12.00	pcs		AFBM-1205-0F08	SCREW, HEX, M12 X 1.75 X 50			FLUOROCARBON COATED		
	4	6.00	pcs		AFBM-0803-0F08	SCREW, HEX, M8 X 1.25 X 30			FLUOROCARBON COATED		
	6	12.00	pcs		AFWM-1200-0F00	WASHER, FLAT, M12			FLUOROCARBON COATED		
	7	14.00	pcs		AFWM-2000-0F00	WASHER, FLAT, M20			FLUOROCARBON COATED		
	8	6.00	pcs		AFWM-0800-0F00	WASHER, FLAT, M8			FLUOROCARBON COATED		
	11	1.00	unit(s)		AMCX-0008-9000	GEARBOX, PLANETARY			L&S	90.00	



NOTES

B 1. FOR BILL OF MATERIAL REFER TO BOM NO. M239-0173-0000

Approved	Checked	Drawn	Description	Date	Rev.
		NANI	(E16006) NOTES 1. ADDED. MATERIAL LIST REMOVED. DWG UPDATED.	25.08.10	B
AY	AJS	WSH	ORIGINAL ISSUE (MODIFIED FROM MA3-2390.124)	24.11.06	A

FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, Southern Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title: DRIVE ASSEMBLY (L10T)

Model: 6/10K | Rev.: B

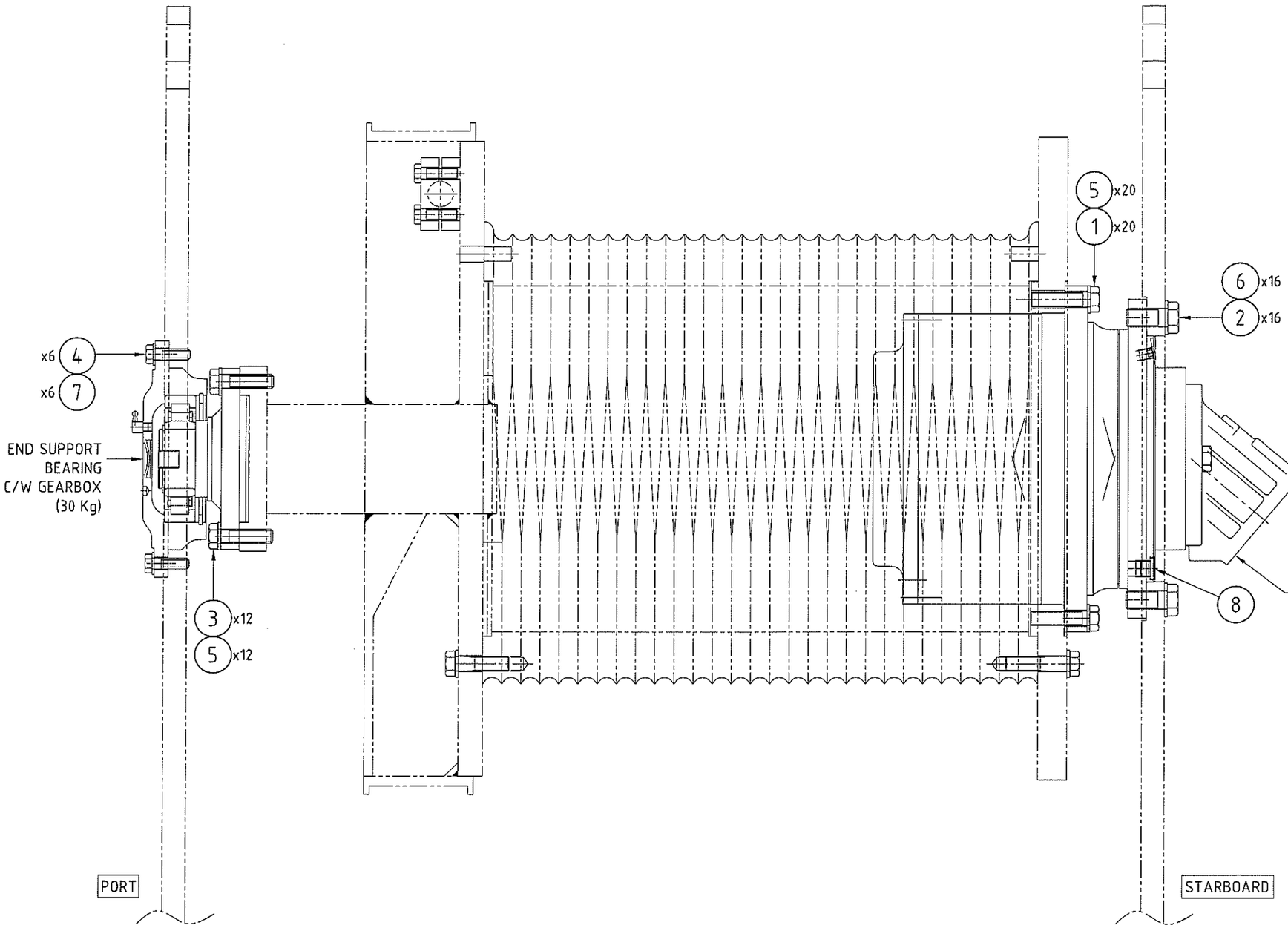
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 5	1396-97	~434 kg	MA3-2390.173

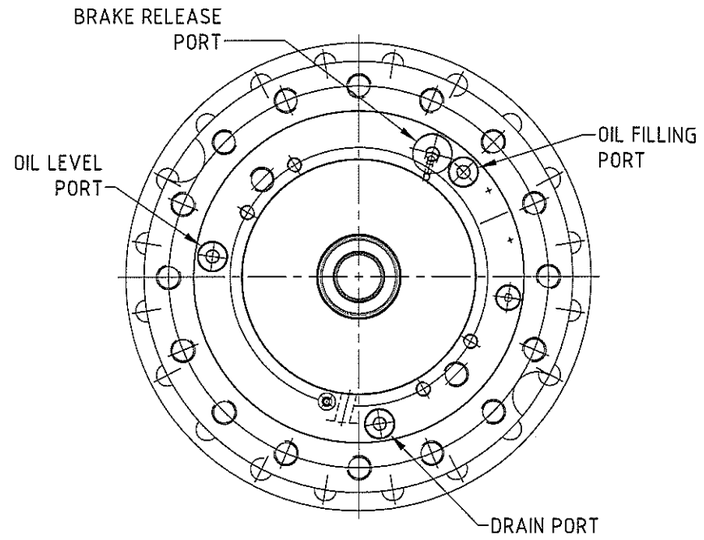
Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M239-0173-0000
BOM DESCRIPTION ..: DRIVE ASSEMBLY (L10T)
FILENAME .....: M23901730000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2390.173)

APPROVED ..: AJS
CHECKED ....: MUS
PREPARED ..: NANI
DATE .....: 25/08/10
SN .....: 1396-97

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	16.00	pcs		AFBM-2004-5F08	SCREW, HEX, M20 X 2.5 X 45			FLUOROCARBON COATED		
	2	20.00	pcs		AFBM-1606-5F08	SCREW, HEX, M16 X 2 X 65			FLUOROCARBON COATED		
	3	12.00	pcs		AFBM-1605-5F08	SCREW, HEX, M16 X 2 X 55			FLUOROCARBON COATED		
	4	6.00	pcs		AFBM-1204-0F08	SCREW, HEX, M12 X 1.75 X 40			FLUOROCARBON COATED		
	5	16.00	pcs		AFWM-2000-0F00	WASHER, FLAT, M20			FLUOROCARBON COATED		
	6	32.00	pcs		AFWM-1600-0F00	WASHER, FLAT, M16			FLUOROCARBON COATED		
	7	6.00	pcs		AFWM-1200-0F00	WASHER, FLAT, M12			FLUOROCARBON COATED		
	10	1.00	unit(s)		AMCX-0002-8000	GEARBOX, PLANETARY			L&S	340.00	





VIEW A

(ALL PORTS INDICATED ARE ON MOTOR MOUNTING FACE. MOTOR NOT SHOWN FOR CLARITY)

NOTES

1. FOR GEARBOX LUBRICANTS, REFER TO DRAWING MA3-9900.323.
2. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M239-0252-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		NOR	ORIGINAL ISSUE (MODIFIED FROM MA3-2390.162)	24.07.12	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Huhibbah Engineering (M) Bhd)
Huhibbah Engineering (M) Bhd

Title	Model	Rev.
DRIVE ASSEMBLY (F7T)	200RL	A

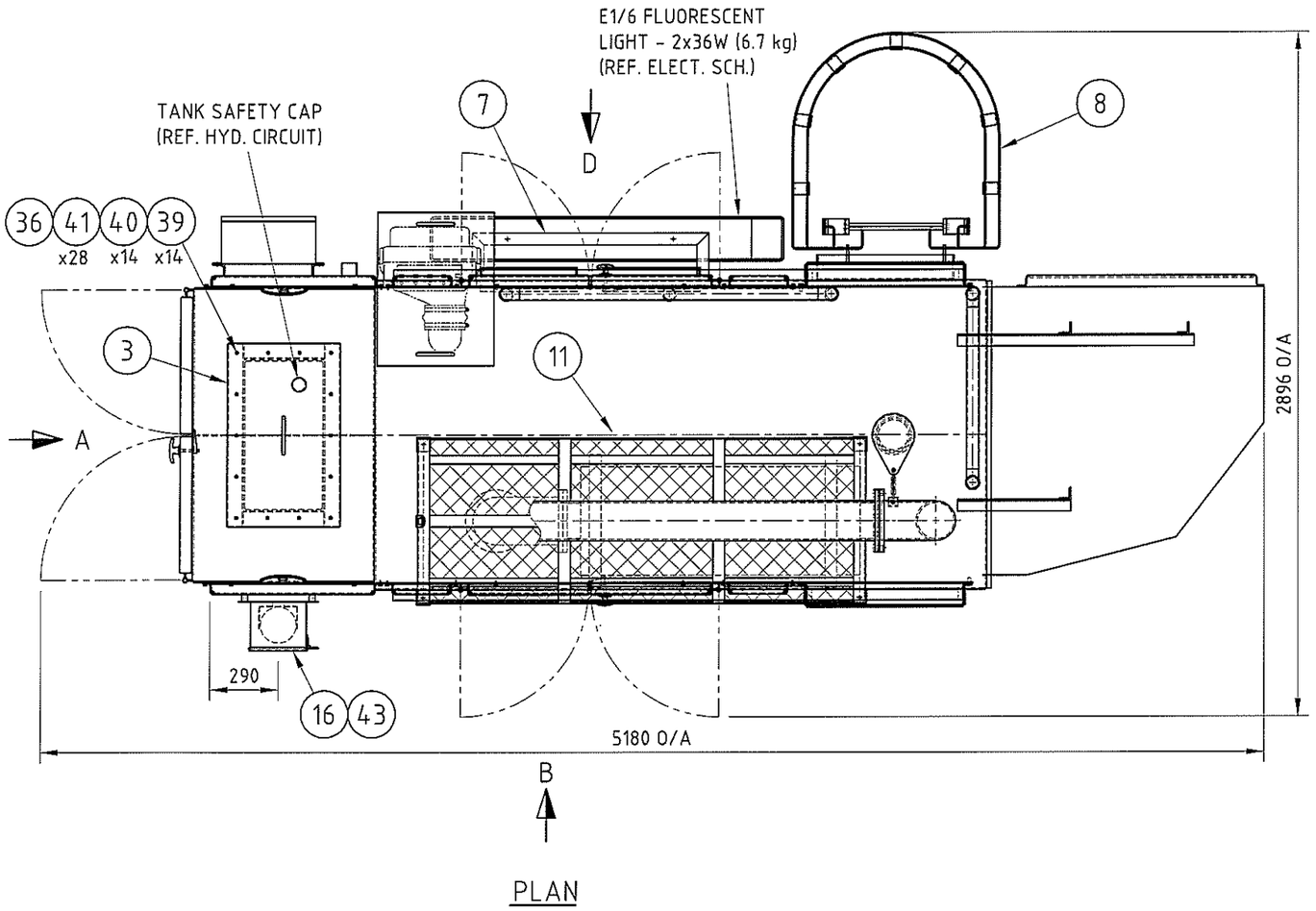
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 5	1281	~ 210kg	MA3-2390.252

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

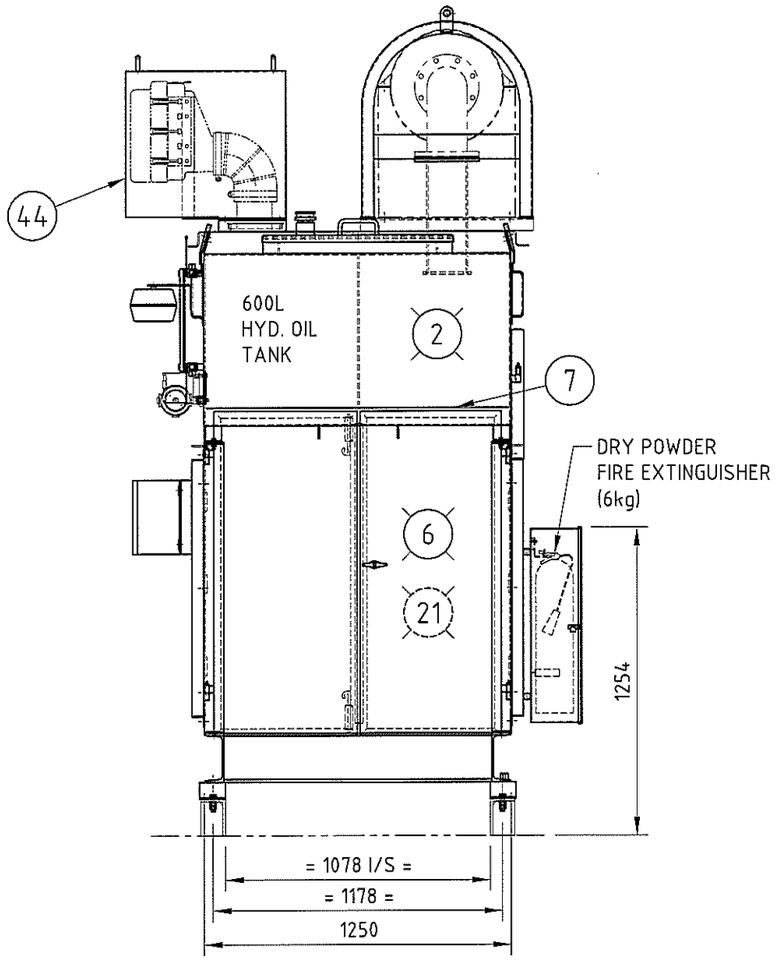
ITEM CODE (BOM No) : M239-0252-0000
BOM DESCRIPTION ..: DRIVE ASSEMBLY (F7T)
FILENAME .....: M23902520000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2390.252)

APPROVED ..: AJS
CHECKED ....: JEGA
PREPARED ..: NOR
DATE .....: 24/07/12
SN .....: 1281

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	20.00	pcs		AFBM-1606-5F08	SCREW, HEX, M16 X 2 X 65			FLUOROCARBON COATED		
	2	16.00	pcs		AFBM-2004-5F08	SCREW, HEX, M20 X 2.5 X 45			FLUOROCARBON COATED		
	3	12.00	pcs		AFBM-1605-5F08	SCREW, HEX, M16 X 2 X 55			FLUOROCARBON COATED		
	4	6.00	pcs		AFBM-1204-0F08	SCREW, HEX, M12 X 1.75 X 40			FLUOROCARBON COATED		
	5	32.00	pcs		AFWM-1600-0F00	WASHER, FLAT, M16			FLUOROCARBON COATED		
	6	16.00	pcs		AFWM-2000-0F00	WASHER, FLAT, M20			FLUOROCARBON COATED		
	7	6.00	pcs		AFWM-1200-0F00	WASHER, FLAT, M12			FLUOROCARBON COATED		
	8	1.00	unit(s)		AMCX-0009-1000	GEARBOX, PLANETARY			L&S	160.00	



PLAN



VIEW A

(ACCESS LADDER & HANDRAIL
NOT SHOWN FOR CLARITY)

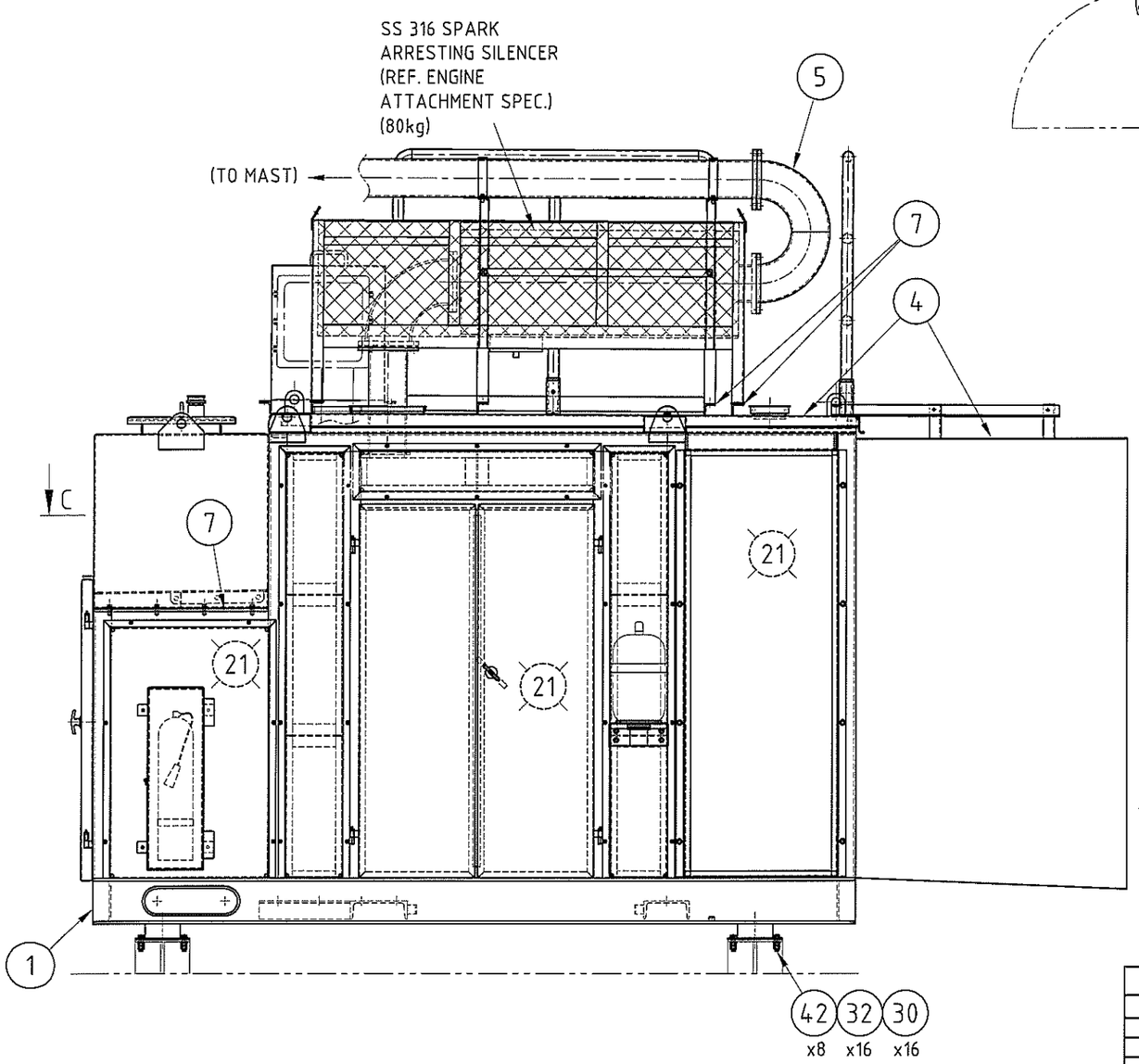
Approved	Checked	Drawn	Description	Date	Rev.
		LZM	ORIGINAL ISSUE (MODIFIED FROM MA3-2400.222)	19.11.12	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

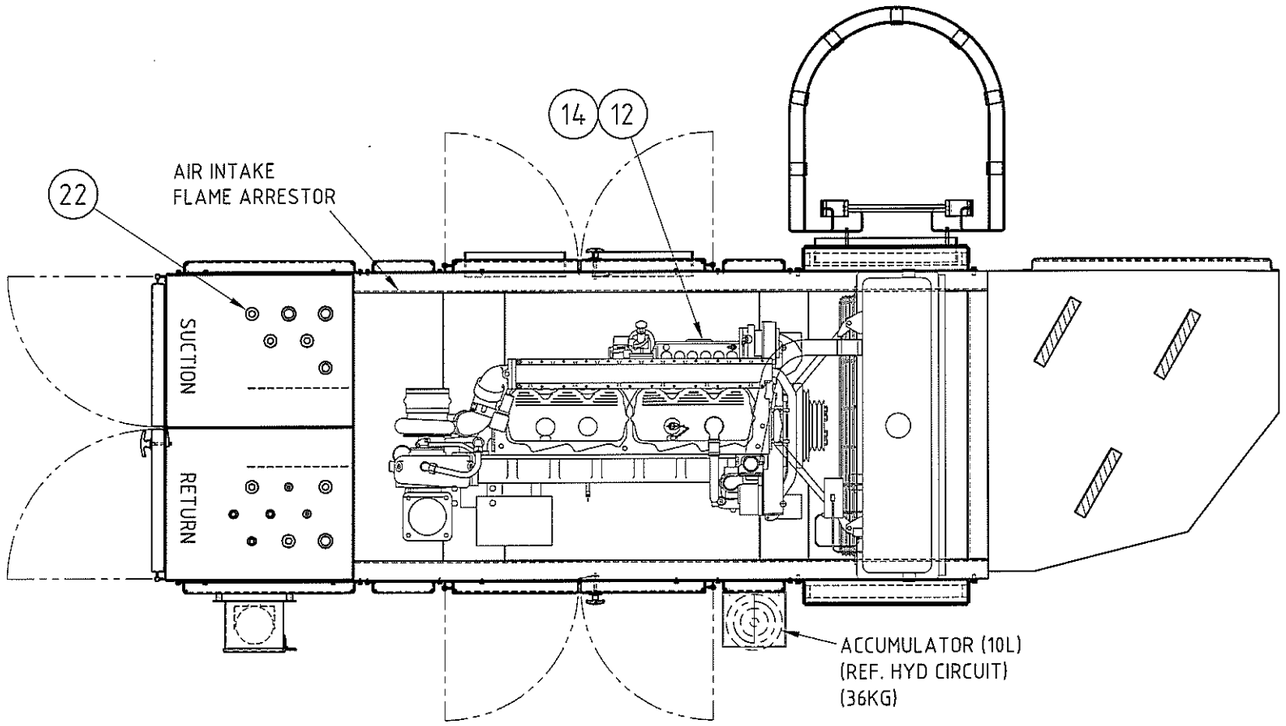
FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
POWERPACK ASSEMBLY	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
1/4	1 : 25	1845	SHT 4	MA3-2400.257



VIEW B



SECTION C-C

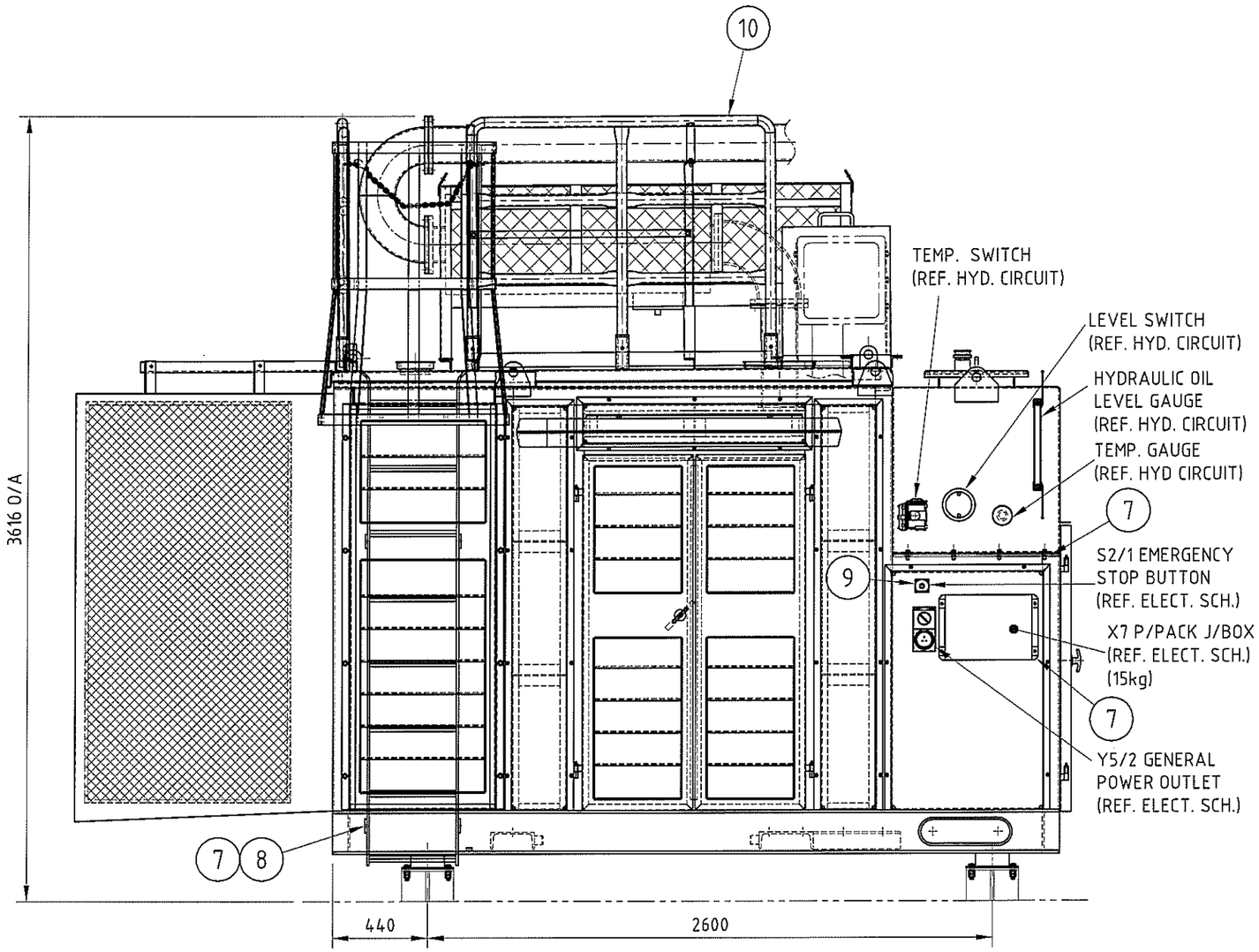
TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

Approved	Checked	Drawn	Description	Date	Rev.
		LZM	ORIGINAL ISSUE (MODIFIED FROM MA3-2400.222)	19.11.12	A

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
POWERPACK ASSEMBLY	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
2/4	1 : 25	1845	SHT 4	MA3-2400.257



VIEW D

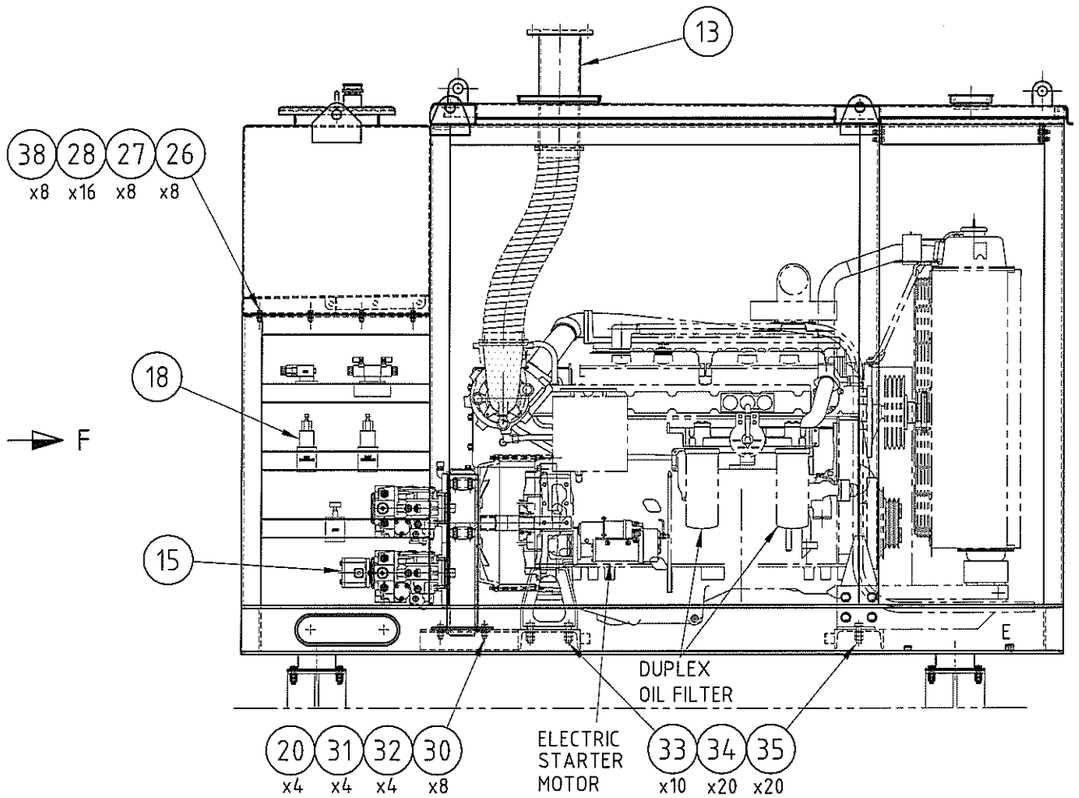
		LZM	ORIGINAL ISSUE (MODIFIED FROM MA3-2400.222)	19.11.12	A
Approved	Checked	Drawn	Description	Date	Rev.

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE	± 1°		

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

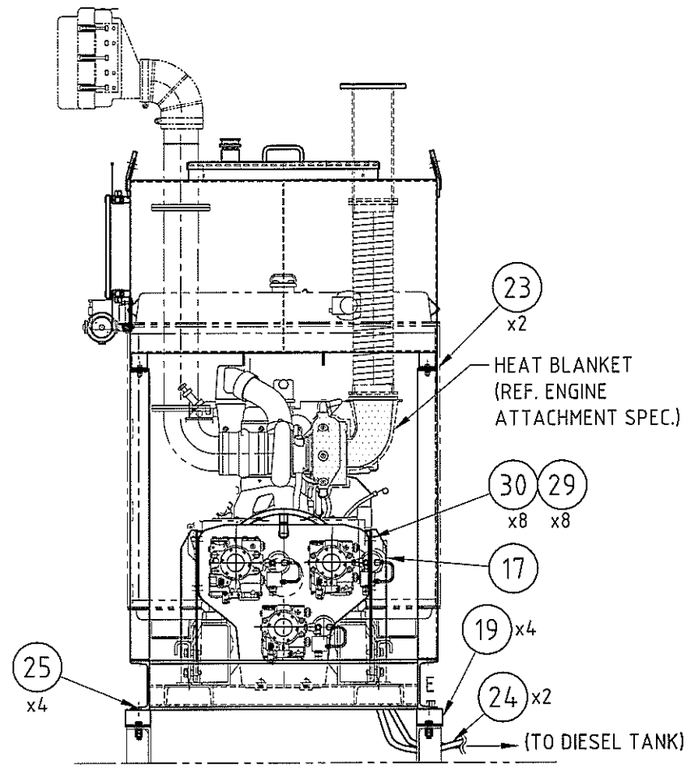
Title	Model	Rev.
POWERPACK ASSEMBLY	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
3/4	1 : 25	1845	SHT 4	MA3-2400.257



VIEW B (WITHOUT WALL)

(ACCESS LADDER, HANDRAIL
& MUFFLER NOT SHOWN FOR CLARITY)



VIEW F

NOTE

1. THE ENGINE DRY CONDITION WEIGHT IS 4.0 T.THE ENGINE OPERATION WEIGHT IS 4.8 T.
2. HYDRAULIC FILTERS TO BE MOUNTED NEAR THE ENGINE MOUNTING LEG.
3. ALL INSTRUMENTS IN POWERPACK ARE IN SAFE ZONE.
4. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M240-0257-0000.
5. GEARBOX TO BE MOUNTED ON GEARBOX SUPPORT BRACKET BEFORE PUMPS ARE INSTALLED.
6. SECONDARY HYDRAULIC STARTER IS LOCATED OPPOSITE & SAME LEVEL AS THE ELECTRIC STARTER.

Approved	Checked	Drawn	Description	Date	Rev.
		LZM	ORIGINAL ISSUE (MODIFIED FROM MA3-2400.222)	19.11.12	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE	± 1°		

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Senawang, Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
POWERPACK ASSEMBLY	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
4/4	1 : 25	1845	~5754kg	MA3-2400.257

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M240-0257-0000
BOM DESCRIPTION ..: POWERPACK ASSEMBLY
FILENAME .....: M24002570000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2400.257)

APPROVED ..: AJS
CHECKED ....: SYZ
PREPARED ..: LZM
DATE .....: 19/11/12
SN .....: 1845

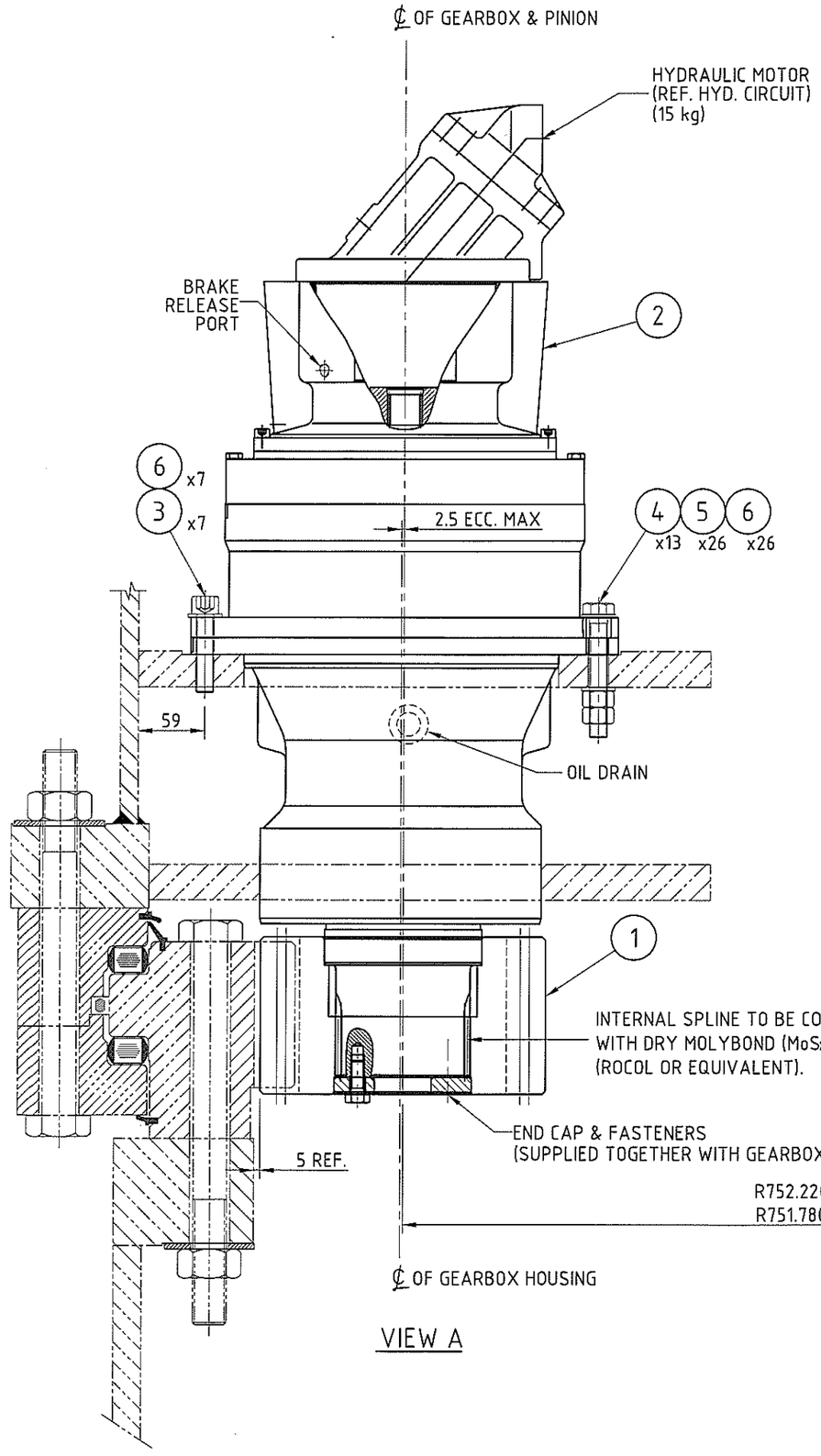
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M241-0228-0000	POWERPACK BASE FRAME CAT3406 (3350 O/L)				300.00	
	2	1.00	pcs		M242-0173-0200	HYDRAULIC OIL TANK (600L)				262.00	
	3	1.00	pcs		M242-1067-0100	HYDRAULIC TANK COVER				15.00	
	4	1.00	pcs		M241-1410-0000	POWEPACK ENCLOSURE				1,800.00	
	5	1.00	pcs		M243-1063-0000	EXHAUST MUFFLER PIPING EXTENSION				1,000.00	
	6	1.00	pcs		M241-1159-0000	POWERPACK FRONT DOUBLE DOOR				48.00	
	7	1.00	pcs		M241-1411-0000	POWERPACK ACCESSORIES WELDMENT				40.00	
	8	1.00	pcs		SKM0-1782-0000	ACCESS LADDER				93.00	
	9	1.00	pcs		M990-0467-0000	EMERGENCY STOP COVER (TELEMECANIQUE)				0.10	
	10	1.00	pcs		M241-1413-0000	POWERPACK HANDRAIL				40.00	
	11	1.00	pcs		M241-2034-0000	MUFFLER WIRE GUARD				64.00	
	12	1.00	pcs		M243-0238-0000	ENGINE ATTACHMENT SPECIFICATION					
	13	1.00	pcs		M241-2022-0800	EXHAUST END 6"				30.00	
	14	1.00	pcs		M243-0146-0000	BARE ENGINE SPECIFICATION (3406)				1,500.00	
	15	1.00	pcs		M245-0199-0000	SPLITTER GEARBOX SPECIFICATION				382.00	
	16	1.00	pcs		AAHX-0002-2000	FIRE EXTINGUISHER, 6KG				6.00	
	17	2.00	pcs		M241-1165-0000	GEARBOX SUPPORT				18.00	
	18	1.00	pcs		M241-0254-0000	HYDRAULIC VALVE & BRACKET ARRANGEMENT					
	19	4.00	pcs		AMJX-0000-2000	DAMPENER, VIBRATION			LEE & LEE	4.00	
	20	4.00	pcs		AFSM-1600-0F00	WASHER, SPRING, M16			FLUOROCARBON COATED		
	21	1.00	set(s)		ASPX-0002-4000	INSULATION MATERIAL, 45MM THK					
	22	1.00	pcs		M242-1141-0000	HYDRAULIC OIL TANK SOCKET ARRANGEMENT					
	23	0.12	m2	2	ASPX-0002-3000	RUBBER PAD, 3 THK	770	80			
	24	2.00	pcs		SKM0-0966-0500	ENGINE FUEL HOSE					
	25	4.00	pcs		AFTM-1200-0X02	WASHER, TAPERED, M12					
	26	8.00	pcs		AFBM-1204-0X02	SCREW, HEX, M12 X 1.75 X 40					
	27	8.00	pcs		AFNM-1200-0X02	NUT, HEX, M12 X 1.75					
	28	16.00	pcs		AFWM-1200-0X02	WASHER, FLAT, M12					
	29	8.00	pcs		AFBM-1603-0F08	SCREW, HEX, M16 X 2 X 30			FLUOROCARBON COATED		

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

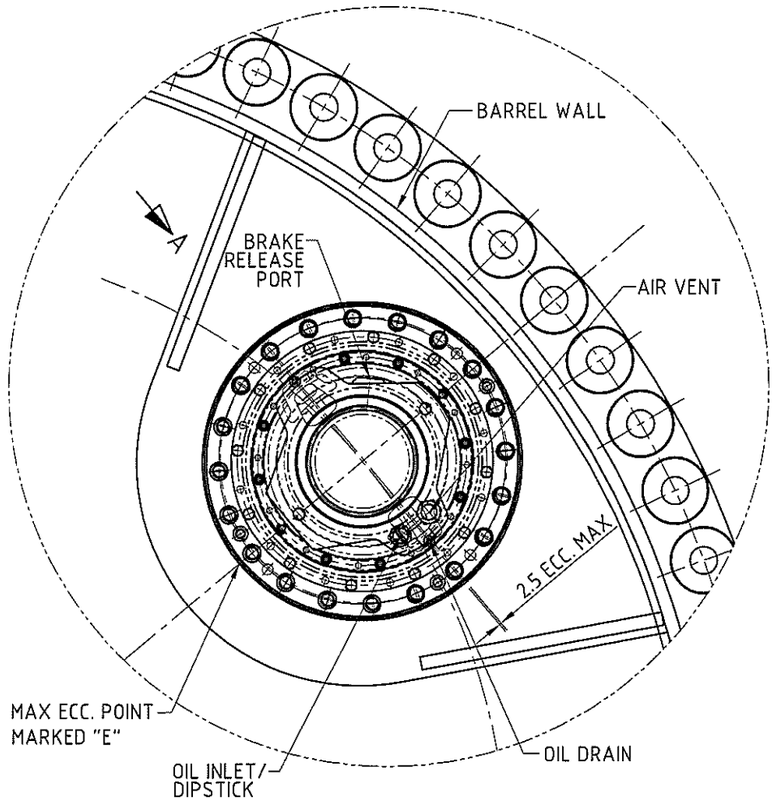
ITEM CODE (BOM No) : M240-0257-0000
BOM DESCRIPTION ..: POWERPACK ASSEMBLY
FILENAME .....: M24002570000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2400.257)

APPROVED ..: AJS
CHECKED ....: SYZ
PREPARED ..: LZM
DATE .....: 19/11/12
SN .....: 1845

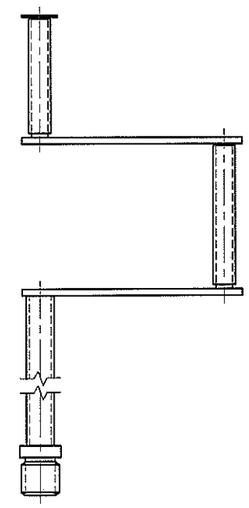
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	30	32.00	pcs		AFWM-1600-0F00	WASHER, FLAT, M16			FLUOROCARBON COATED		
	31	4.00	pcs		AFBM-1605-0F08	SCREW, HEX, M16 X 2 X 50			FLUOROCARBON COATED		
	32	20.00	pcs		AFNM-1600-0F08	NUT, HEX, M16 X 2			FLUOROCARBON COATED		
	33	10.00	pcs		AFAM-2007-0F08	BOLT, HEX, M20 X 2.5 X 70			FLUOROCARBON COATED		
	34	20.00	pcs		AFNM-2000-0F08	NUT, HEX, M20 X 2.5			FLUOROCARBON COATED		
	35	20.00	pcs		AFWM-2000-0F00	WASHER, FLAT, M20			FLUOROCARBON COATED		
	36	0.36	m2	1	AHRX-0007-1000	GASKET, 6MM THK	770	470			
	38	8.00	pcs		AFSM-1200-0X02	WASHER, SPRING, M12					
	39	14.00	pcs		AFBM-1003-5X02	SCREW, HEX, M10 X 1.5 X 35					
	40	14.00	pcs		AFNM-1000-0X02	NUT, HEX, M10 X 1.5					
	41	28.00	pcs		AFWM-1000-0X02	WASHER, FLAT, M10					
	42	8.00	pcs		AFBM-1606-0F08	SCREW, HEX, M16 X 2 X 60			FLUOROCARBON COATED		
	43	1.00	pcs		M930-0002-0000	FIRE EXTINGUISHER ENCLOSURE				20.00	
	44	1.00	pcs		M243-1064-0000	AIR INTAKE FILTER ASSEMBLY				30.00	



VIEW A



PLAN VIEW
SCALE: 1 : 7.5



ITEM 7
SCALE 1:7.5

NOTES

1. REFER TO SLEW RING ASSEMBLY FOR QUANTITY OF SLEW GEARBOX REQUIRED.
2. U.N.O. ALL BOLTS TIGHTENED TO DRAWINGS A3-9900.214 (BLACK BOLTS) OR MA4-9900.069 (FLUOROCARBON/ XYLAN COATED BOLTS)
3. ITEM 7 SHALL BE ONE UNIT PER CRANE.
4. FULLY CLEAN MATING SURFACE OF GEARBOX AND MOUNTING FLANGE.
5. FOR RECOMMENDED GEARBOX LUBRICANTS, REFER TO MA3-9900.323.
6. BOLT NEAREST TO THE OIL DRAIN CAN BE INSTALLED BOTTOM UP IF OBSTRUCTION OCCUR.
7. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M250-0190-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		SRR	ORIGINAL ISSUE (MODIFIED FROM MA3-2500.162)	26.02.13	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
SLEW DRIVE ASSEMBLY	6/10K	A

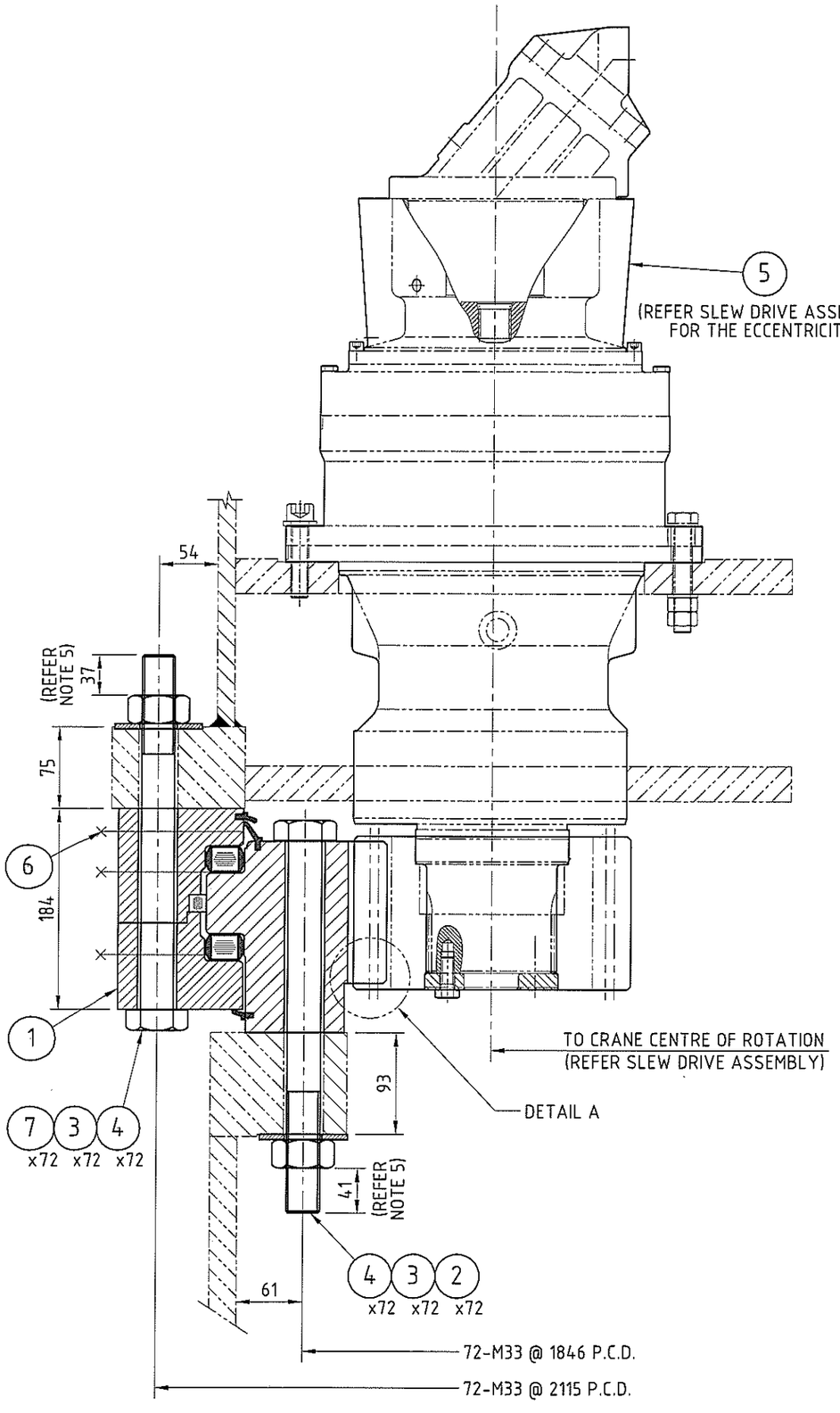
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 5	1845	~262kg	MA3-2500.190

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

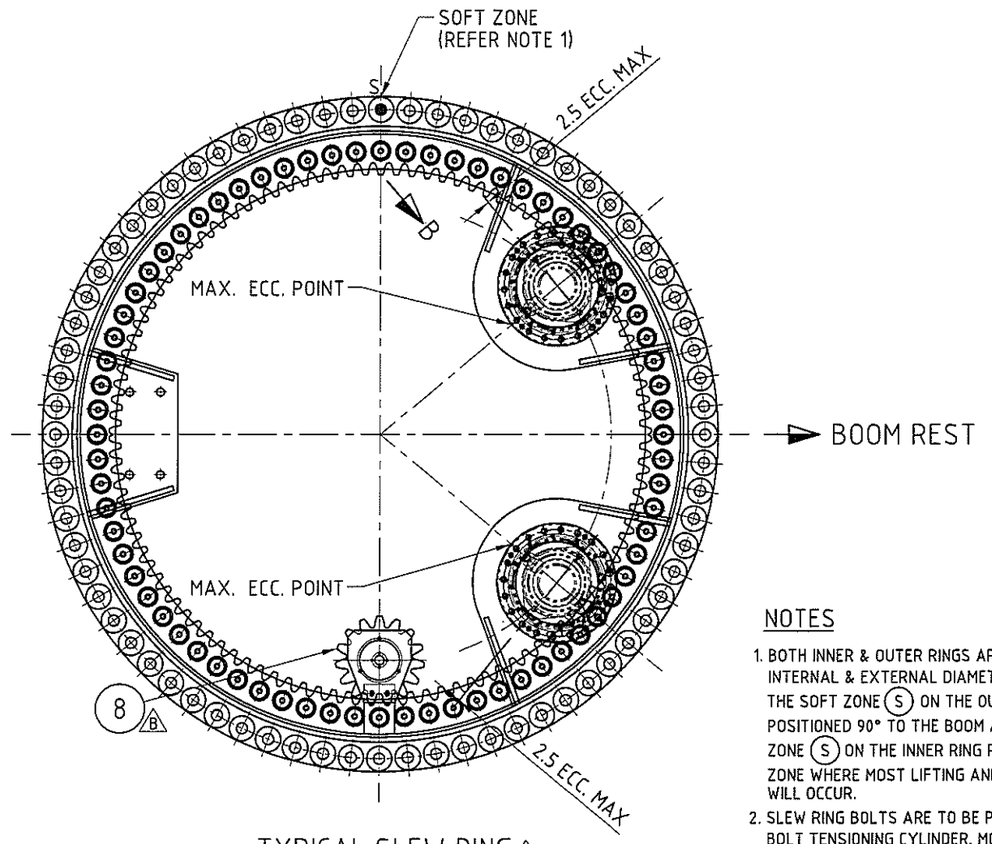
ITEM CODE (BOM No) : M250-0190-0000
BOM DESCRIPTION ..: SLEW DRIVE ASSEMBLY
FILENAME .....: M25001900000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-2500.190)

APPROVED ..: AJS
CHECKED ....: SYZ
PREPARED ..: SRR
DATE .....: 26/02/13
SN .....: 1845

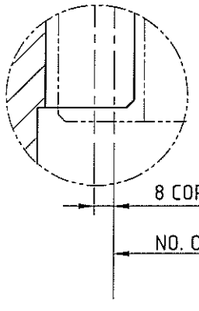
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
P	1	1.00	pcs		M250-1055-0000	SLEW PINION, Z=13, M=16				27.00	
	2	1.00	unit(s)		AMCX-0018-5000	GEARBOX, PLANETARY			L&S	215.00	
	3	7.00	pcs		AFDM-1607-0F12	SCREW, SHC, M16 X 2 X 70			FLUOROCARBON COATED		
	4	13.00	pcs		AFAX-0018-5000	SCREW, HEX, M16 X 2 X 110			FLUOROCARBON COATED		
	5	26.00	pcs		AFNM-1600-0F10	NUT, HEX, M16 X 2			FLUOROCARBON COATED		
	6	33.00	pcs		AFWM-1600-0F00	WASHER, FLAT, M16			FLUOROCARBON COATED		
	7	1.00	pcs		M250-1099-0200	MANUAL SLEW HANDLE				4.50	



VIEW B



TYPICAL SLEW RING (B)
SCALE 1:20



DETAIL A
SCALE: 1 : 2.5

NO. OF TEETH	MODULE	CORRECTED P.C.D.	THEORETICAL CORRECTION
107	16	1728	-8 (GEAR)
13	16	224	+8 (PINION)

TIGHTENING PROCEDURES

DETAILS :-	BOLTS PRE-LOAD 46.5 TONNES (456kN)
STEP (1)	DETERMINE BOLT TIGHTENING SEQUENCE.
STEP (2)	INSTALL BOLTS INTO SLEW RING BY HAND OR NUT RUNNER.
STEP (3)	TIGHTENING BOLTS IN CROSS PATTERN TIGHTENING SEQUENCE TO 228kN, APPROX. 50% OF FULL PRE-LOAD.
STEP (4)	TIGHTEN BOLTS IN SAME SEQUENCE TO 456kN, 100% OF PRE-LOAD VALUE WITH AN INCREMENT OF 10% OF PRE-LOAD VALUE.
STEP (5)	WAIT 30 MINUTES, RE-CHECK ALL NUTS AND RE-TIGHTEN IF NEEDED.

NOTES

1. BOTH INNER & OUTER RINGS ARE MARKED (S) ON THE INTERNAL & EXTERNAL DIAMETER.
   THE SOFT ZONE (S) ON THE OUTER RING SHOULD BE POSITIONED 90° TO THE BOOM AND THE SOFT ZONE (S) ON THE INNER RING POSITIONED OUTSIDE THE ZONE WHERE MOST LIFTING AND SLEWING UNDER LOAD WILL OCCUR.
2. SLEW RING BOLTS ARE TO BE PRE-LOADED WITH A MULTI-STAGE BOLT TENSIONING CYLINDER. MODEL : ITH MS33 OR EQUIVALENT. PRE-LOAD TO BE 456 kN.
   TIGHTENING OF THE SLEW BOLTS WITH A TORQUE MULTIPLER OR TORQUE WRENCH IS NOT RECOMMENDED.
3. FOR GREASING OF BEARING & TEETH REFER TO CRANE MANUAL.
4. BACKLASH AT COLOURED GREEN TEETH TO BE 0.50 - 0.65mm.
5. FOR BOLT TENSIONER OPERATION, MINIMUM ACCEPTABLE LENGTH IS 33mm.
6. ITEMS MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY TO MECHANICAL & CHEMICAL CERTIFICATES. FOR CHARPY IMPACT REQUIREMENTS REFER TO THE APPLICABLE CONTRACT DESIGN SPECIFICATIONS.
7. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M260-0226-0000

Approved	Checked	Drawn	Description	Date	Rev.
		SRR	(E19220) TYPICAL SLEW RING UPDATED. ITEM 8 ADDED.	20.02.13	B
AJS	SYZ	SRR	ORIGINAL ISSUE (MODIFIED FROM MA3-2600.197)	22.10.12	A

FAVELLE FAVCO
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(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
SLEW RING ASSEMBLY	6/10K	B

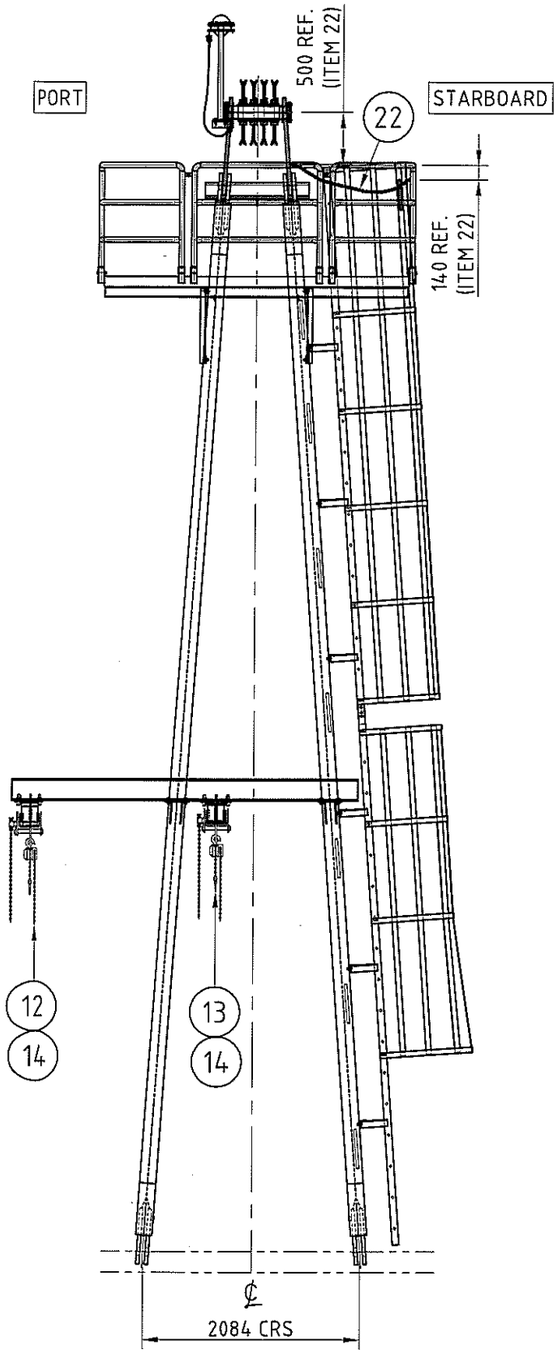
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 5	1845	~ 2.5 T	MA3-2600.226

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M260-0226-0000
BOM DESCRIPTION ..: SLEW RING ASSEMBLY
FILENAME .....: M26002260000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19220

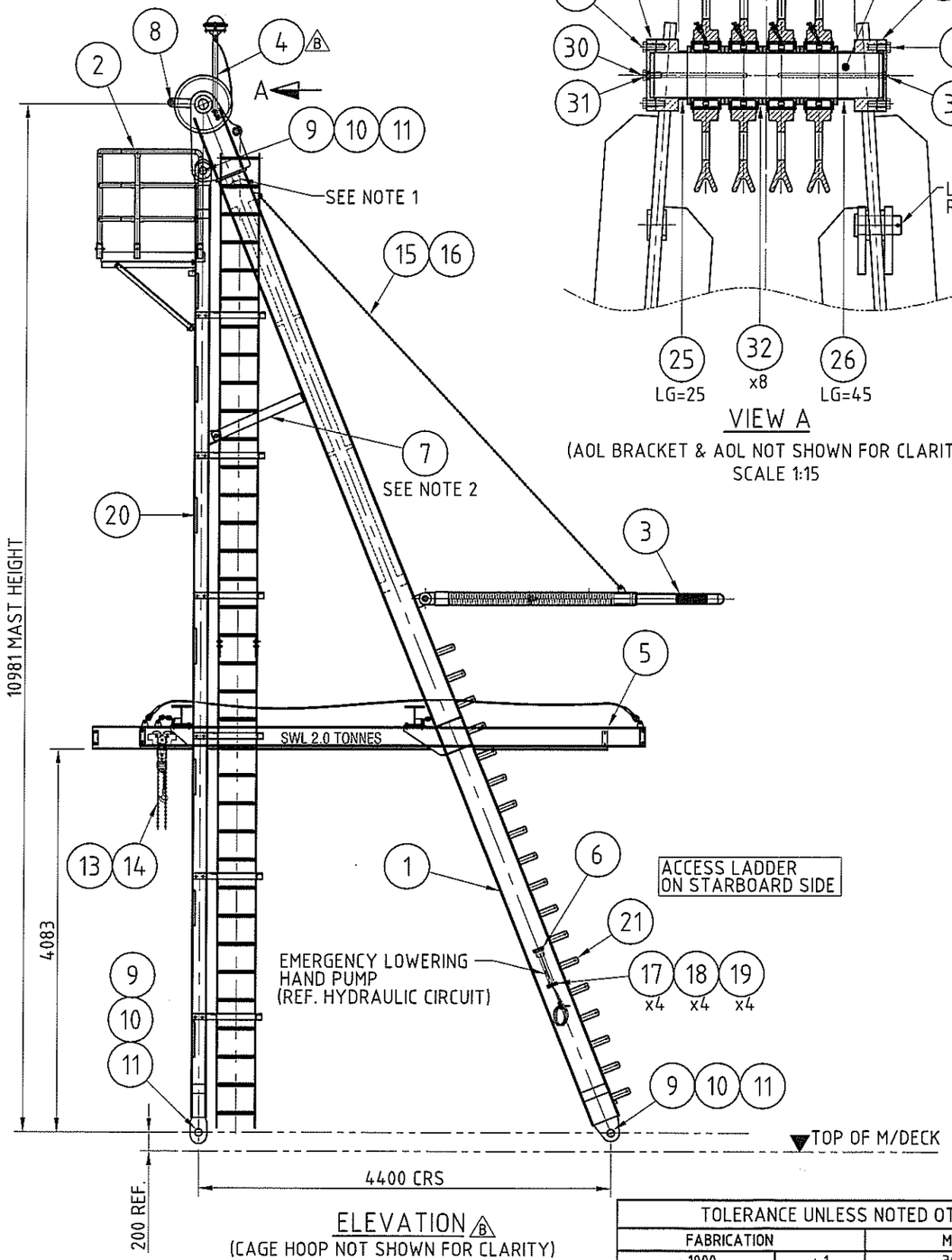
APPROVED ..: AJS
CHECKED ....: SYZ
PREPARED ..: SRR
DATE .....: 20/02/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		AMEE-0001-5000	BEARING, SLEW			ROTHE ERDE, WITH RETAINER & WITHOUT ECCMS	1,705.00	
P	2	72.00	pcs		M926-0032-0400	M33 SLEW BOLT, LG 340/111				184.30	
P	3	144.00	pcs		M926-0032-0002	M33 SLEW NUT				41.50	
	4	144.00	pcs		M926-0032-0004	HARDENED WASHER, M33, OD80 X ID34 X THK5				23.20	
	5	2.00	pcs		M250-0190-0000	SLEW DRIVE ASSEMBLY				410.00	
	6	24.00	pcs		M265-1002-0400	SLEW RING GREASE LINE ASSEMBLY				4.60	
P	7	72.00	pcs		M926-0032-0300	M33 SLEW BOLT, LG 325/91				177.10	
	8	1.00	pcs		M237-0163-0000	SLEW ENCODER ASSEMBLY				34.00	B



REAR VIEW Ⓑ

(MAST FRONT LEGS NOT SHOWN FOR CLARITY)

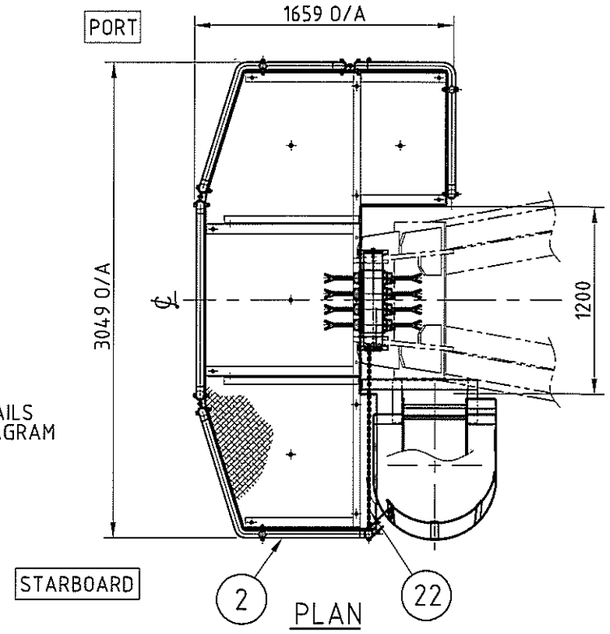


ELEVATION Ⓑ

(CAGE HOOP NOT SHOWN FOR CLARITY)

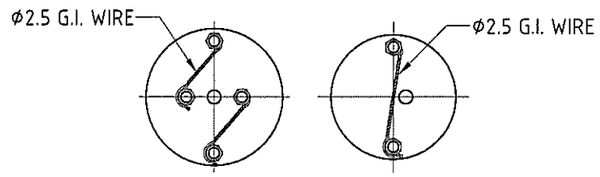
VIEW A

(AOL BRACKET & AOL NOT SHOWN FOR CLARITY)
SCALE 1:15



PLAN

(MAST LEGS NOT SHOWN FOR CLARITY)
SCALE 1:40



WIRE SCREW HEAD TOGETHER (TYP.)

SCALE: 1 : 10

NOTES

1. USE THE INDICATED LUG OF MAST DETAILS MA3-3200.061.001 FOR LIFTING & SLIDING OF MONORAIL BEAM.
2. BEFORE LIFTING MAST ASSEMBLY FOR ERECTION ITEM 7 IS TO BE IN A POSITION AS SHOWN.
3. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M300-0177-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		YAN	(E19477) ITEM 4, REAR & ELEVATION VIEW UPDATED. TOTAL WEIGHT WAS 6450kg.	20.03.13	B
AJS	MEZ	YAN	ORIGINAL ISSUE (MODIFIED FROM MA3-3000.152)	18.10.12	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

Favelle Favco Cranes (M) Sdn. Bhd.
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Muhibbah Engineering (M) Bhd

Title	Model	Rev.
MAST ASSEMBLY	6/10K	B

Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 60	1845	Ⓑ ~6447kg	MA3-3000.177

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M300-0177-0000
BOM DESCRIPTION ..: MAST ASSEMBLY
FILENAME .....: M30001770000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19477

APPROVED ..: AJS
CHECKED ....:
PREPARED ..: YAN
DATE .....: 20/03/13
SN .....: 1845

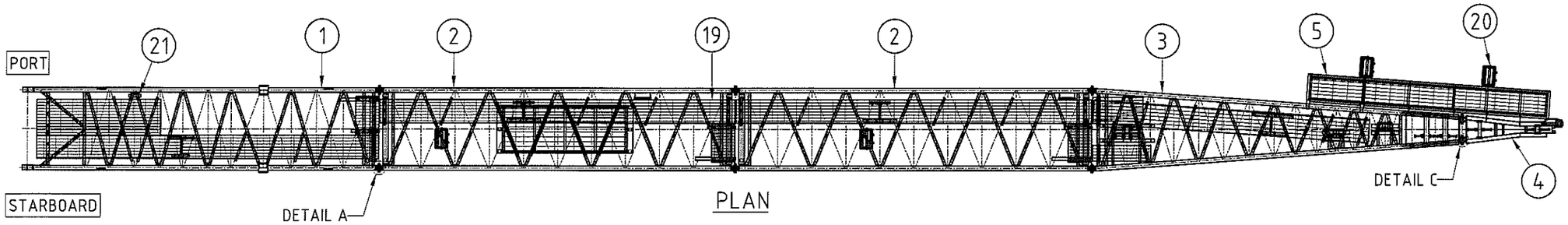
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M320-0061-0100	MAST DETAILS				3,772.00	
	2	1.00	pcs		M330-0008-0000	MAST PLATFORM & LADDER ARRANGEMENT				759.00	
	3	1.00	pcs		M310-0106-0000	BOOM BUFFER ASSEMBLY				317.00	
	4	1.00	pcs		M4501-0152-002	AVIATION LIGHT ASSEMBLY			TO SUIT FA-165EX, PHAROS MARINE AUTOMATIC POWER	7.00	B
	5	1.00	pcs		M350-1093-0000	MONORAIL BEAM DETAILS				1,012.00	
	6	1.00	pcs		SKM0-1727-0000	HANDPUMP MOUNTING BRACKET				0.44	
	7	1.00	pcs		S323-0002-0000	REAR LEG STOPPER ARRANGEMENT				50.00	
	8	1.00	pcs		M955-0019-0900	STANDARD ROPE GUARD	540			2.60	
	9	6.00	pcs		S305-0001-0100	MAST LEG CONNECTOR PIN - DIA 80				51.00	
	10	12.00	pcs		S990-8003-0100	SAFETY PIN DIA 20				4.80	
	11	12.00	pcs		AFZM-0505-0X02	PIN, SPLIT, DIA 5 X 50					
	12	1.00	set(s)		ALHX-0015-0000	GEAR TROLLEY, 2T			OZ BLOCK	30.50	
	13	1.00	set(s)		ALHX-0018-2000	GEAR TROLLEY, 2T			OZ BLOCK	30.50	
	14	2.00	set(s)		AALX-0006-0000	CHAIN BLOCK, 2T			OZ BLOCK	39.00	
	15	11.80	mtr(s)	2	ALGX-0012-0000	CHAIN, DIA 8MM	5,900			8.80	
	16	8.00	pcs		ALGX-0002-8000	SHACKLE, 5/16 IN, 3/4T (G-2130)			CROSBY, TEST CERT. IS REQUIRED		
	17	4.00	pcs		AFBM-0602-5X02	SCREW, HEX, M6 X 1 X 25					
	18	4.00	pcs		AFNM-0600-0X02	NUT, HEX, M6 X 1					
	19	4.00	pcs		AFWM-0600-0X02	WASHER, FLAT, M6					
	20	1.00	pcs		M330-3003-0300	MAST BRACKET ARRANGEMENT				4.20	
	21	1.00	pcs		SKM0-1671-0000	MAINTENANCE MONORAIL ACCESS LADDER				51.00	
	22	1.00	pcs		M203-0221-0500	SAFETY CHAIN ASSEMBLY				1.50	
	23	4.00	pcs		M951-0064-0600	SHEAVE DIA 620/DIA 550 ASSEMBLY				235.20	
	24	1.00	pcs		M305-0087-0100	MAST HEAD SHEAVE PIN DIA 120				55.00	
	25	1.00	pcs		M990-1047-0400	SPACERS	25			0.30	
	26	1.00	pcs		M990-1047-0400	SPACERS	45			0.60	
	27	1.00	pcs		M234-5271-0000	DIA 120 PIN END COVER				4.00	
	28	1.00	pcs		M234-5236-0000	DIA 120 PIN END COVER				6.00	
	29	4.00	pcs		AFBM-1605-0F08	SCREW, HEX, M16 X 2 X 50			FLUOROCARBON COATED		

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

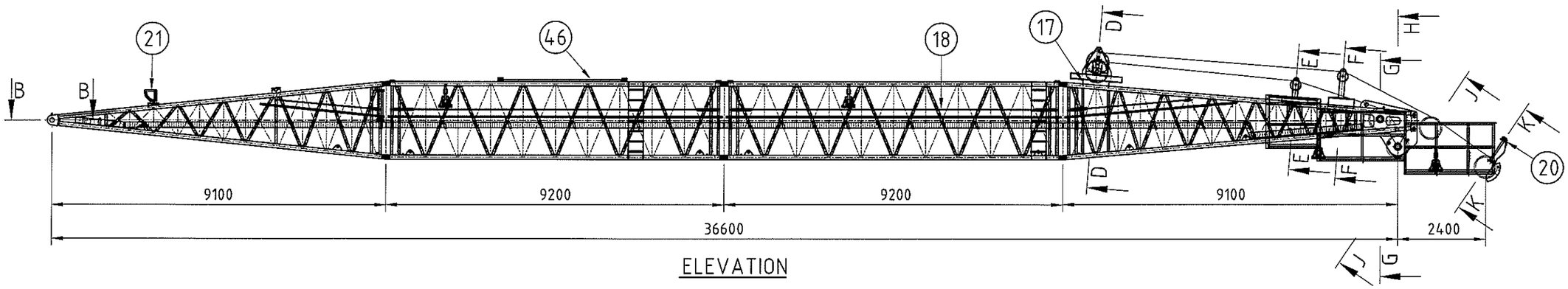
ITEM CODE (BOM No) : M300-0177-0000
BOM DESCRIPTION ..: MAST ASSEMBLY
FILENAME .....: M30001770000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19477

APPROVED ..: AJS
CHECKED ....:
PREPARED ..: YAN
DATE .....: 20/03/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	30	2.00	pcs		AFBM-1604-0F08	SCREW, HEX, M16 X 2 X 40			FLUOROCARBON COATED		
	31	2.00	pcs		AMYX-0002-8000	GREASE NIPPLE, 1/8 IN BSPP					
	32	8.00	pcs		M990-1048-0200	SPACER				4.40	



PLAN



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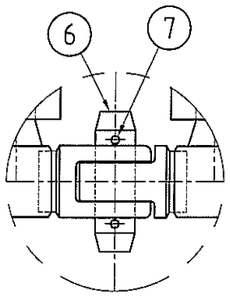
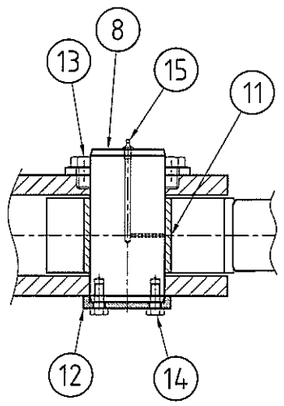
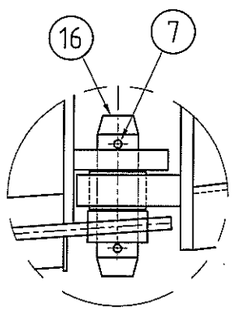


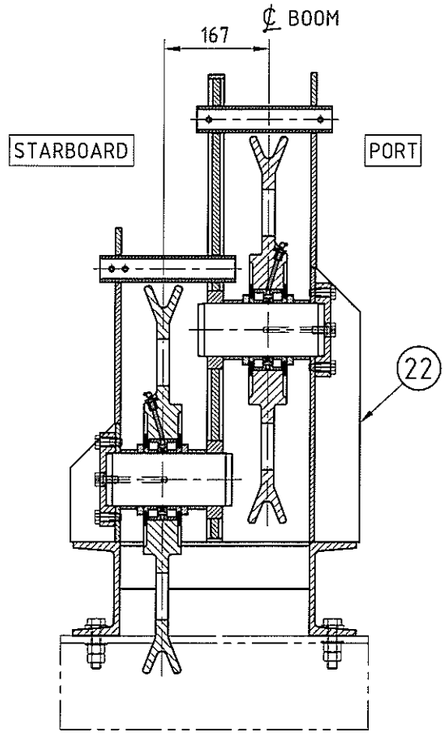
DETAIL A (TYP.)
SCALE: 1 : 10



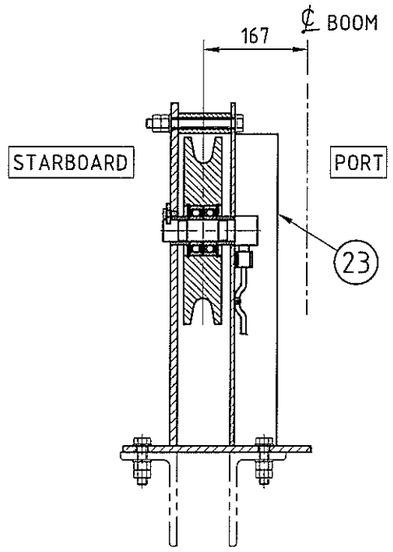
SECTION B-B
SCALE: 1 : 10



DETAIL C (TYP.)
SCALE: 1 : 10



SECTION D-D
SCALE: 1 : 10



SECTION E-E
SCALE: 1 : 10

		YAN	ORIGINAL ISSUE (MODIFIED FROM MA3-4000.271)	30.10.12	A
Approved	Checked	Drawn	Description	Date	Rev.

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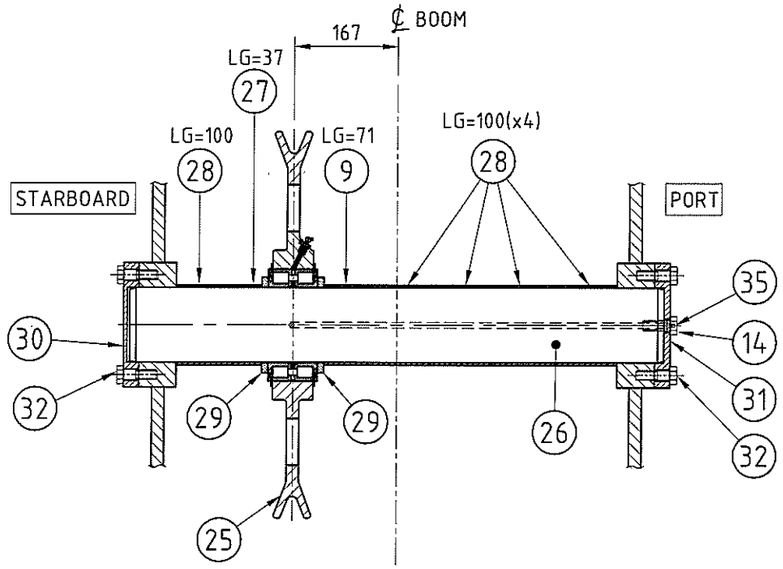
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
BOOM ASSEMBLY-36.6m	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
1/2	1 : 125	1845	SHT.2	MA3-4000.335



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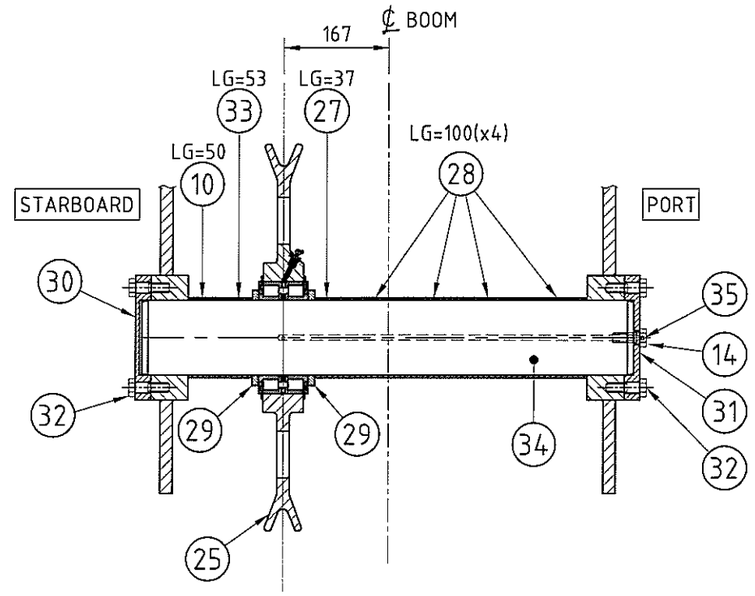
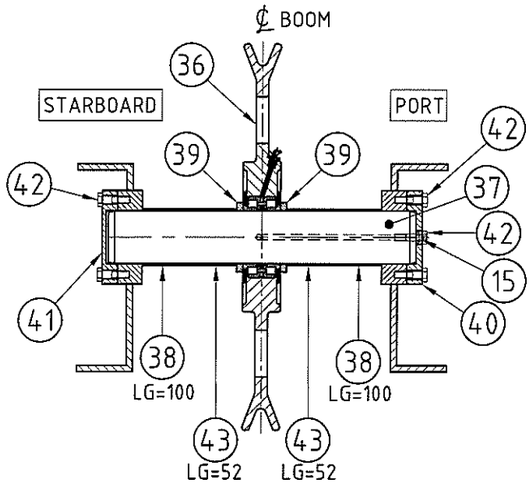
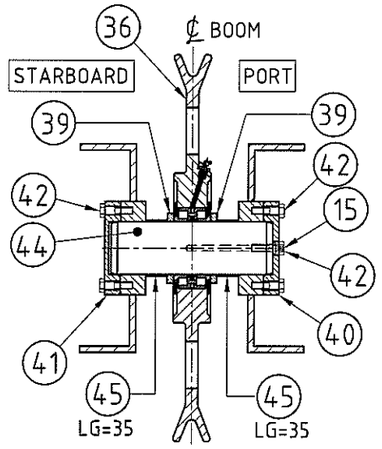


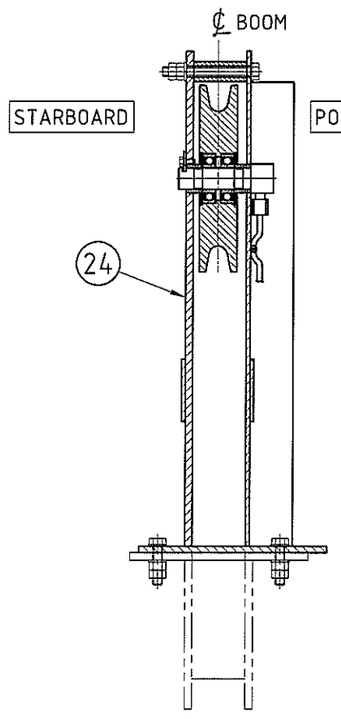
SECTION H-H



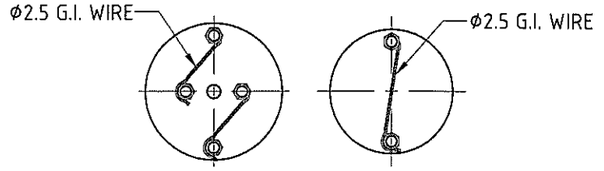
SECTION J-J



SECTION K-K



SECTION F-F



WIRE SCREW HEAD TOGETHER (TYP.)

NOTES

1. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M400-0335-0000.

		YAN	ORIGINAL ISSUE (MODIFIED FROM MA3-4000.271)	30.10.12	A
Approved	Checked	Drawn	Description	Date	Rev.

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(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title	Model	Rev.
BOOM ASSEMBLY-36.6m	6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
2/2	1 : 10	1845	~10601kg	MA3-4000.335

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M400-0335-0000
BOM DESCRIPTION ..: BOOM ASSEMBLY - 36.6M
FILENAME .....: M40003350000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-4000.335)

APPROVED ..: AJS
CHECKED ....: MEZ
PREPARED ..: YAN
DATE .....: 30/10/12
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M410-0102-0000	BOOM BOTTOM SECTION - 9.1M				1,686.00	
	2	2.00	pcs		M420-0098-0000	BOOM EXTENSION SECTION - 9.2M				3,284.00	
	3	1.00	pcs		M430-0131-0000	BOOM TOP SECTION - 9.1m				2,002.00	
	4	1.00	pcs		M435-0062-0000	BOOM FLY JIB DETAILS				513.00	
	5	1.00	pcs		M431-0069-0000	BOOM TOP PLATFORM ASSEMBLY				381.00	
	6	12.00	pcs		M940-0027-0100	BOOM CONNECTOR PIN - DIA 65				72.00	
	7	32.00	pcs		AFZM-1310-0X02	PIN, SPLIT, DIA 13 X 100					
	8	2.00	pcs		M990-8151-0500	BOOM PIVOT PIN				46.00	
	9	1.00	pcs		M990-1047-0500	SPACERS	71			0.90	
	10	1.00	pcs		M990-1047-0400	SPACERS	50			0.60	
	11	2.00	pcs		M990-8155-0000	BOOM PIVOT PIN BUSH				10.00	
	12	2.00	pcs		M234-5009-0000	DIA 120 SHAFT END COVER				4.00	
	13	4.00	pcs		AFBM-2403-5F08	SCREW, HEX, M24 X 3 X 35			FLUOROCARBON COATED		
	14	8.00	pcs		AFBM-1604-5F08	SCREW, HEX, M16 X 2 X 45			FLUOROCARBON COATED		
	15	4.00	pcs		AMYX-0000-6000	GREASE NIPPLE, 1/8 IN BSPP			SS 316		
	16	4.00	pcs		M405-0116-0100	FLY JIB PIN DIA 65				28.00	
	17	1.00	pcs		M401-0109-0000	BOOM BRACKET & SUPPORT DETAILS				248.00	
	18	1.00	pcs		M470-0507-0000	MANSAFE SAFETY ASSEMBLY				60.00	
	19	1.00	pcs		M470-0508-0000	BOOM WALKWAY ASSEMBLY				760.00	
	20	1.00	pcs		M450-0236-0000	LIGHTING & CABLE TRAY ASSEMBLY				430.00	
	21	1.00	pcs		M480-0048-0200	BOOM ANGLE INDICATOR ASSEMBLY				7.60	
	22	1.00	pcs		M460-0111-0100	DEFLECTOR SHEAVE BRACKET ASSEMBLY				256.70	
	23	1.00	pcs		M440-0084-0200	LOAD CELL ASSEMBLY				32.00	
	24	1.00	pcs		M440-0087-0300	LOAD CELL ASSEMBLY				41.00	
	25	2.00	pcs		M951-0064-0400	SHEAVE DIA 620/DIA 550 ASSEMBLY				120.40	
	26	1.00	pcs		M405-0140-0100	DIA 120 SHEAVE PIN				76.00	
	27	2.00	pcs		M990-1047-0400	SPACERS	37			1.00	
	28	9.00	pcs		M990-1047-0500	SPACERS	100			11.00	
	29	4.00	pcs		M990-1048-0200	SPACER				2.20	

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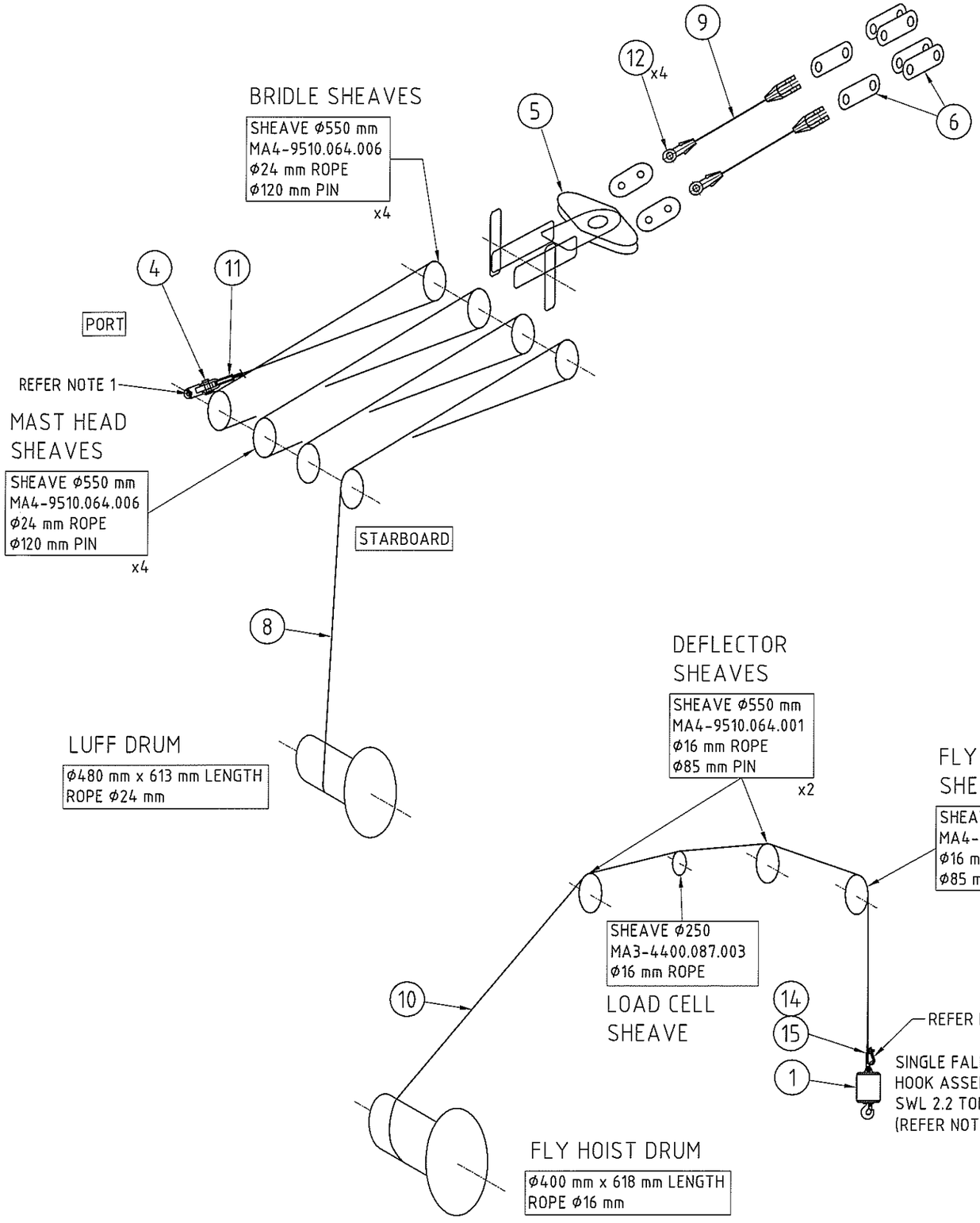
Malaysia

ITEM CODE (BOM No) : M400-0335-0000
BOM DESCRIPTION ..: BOOM ASSEMBLY - 36.6M
FILENAME .....: M40003350000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-4000.335)

APPROVED ..: AJS
CHECKED ....: MEZ
PREPARED ..: YAN
DATE .....: 30/10/12
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	30	2.00	pcs		M234-5195-0000	DIA 120 PIN END COVER				10.00	
	31	2.00	pcs		M234-5173-0000	Ø120 PIN END COVER				10.00	
	32	8.00	pcs		AFBM-1605-5F08	SCREW, HEX, M16 X 2 X 55			FLUOROCARBON COATED		
	33	1.00	pcs		M990-1047-0500	SPACERS	53			0.60	
	34	1.00	pcs		M405-0212-0100	MAIN HEAD SHEAVE PIN DIA 120				70.00	
	35	2.00	pcs		AMYX-0001-0000	GREASE NIPPLE, 1/4 IN BSPP			SS 316		
	36	2.00	pcs		M951-0064-0100	SHEAVE DIA 620/DIA 550 ASSEMBLY				118.20	
	37	1.00	pcs		M405-0142-0100	DIA 85 SHEAVE PIN				22.00	
	38	2.00	pcs		M990-1047-0300	SPACER	100			2.20	
	39	4.00	pcs		M990-1048-0100	SPACERS				1.30	
	40	2.00	pcs		M234-5175-0000	DIA 85 PIN END COVER				6.00	
	41	2.00	pcs		M234-5199-0000	DIA 85 PIN END COVER				6.00	
	42	12.00	pcs		AFBM-1204-5X02	SCREW, HEX, M12 X 1.75 X 45					
	43	2.00	pcs		M990-1047-0300	SPACER	52			1.20	
	44	1.00	pcs		M405-0143-0100	DIA 85 FLY SHEAVE PIN				12.00	
	45	2.00	pcs		M990-1047-0200	SPACER	35			0.80	
	46	1.00	pcs		M470-0419-0000	DEFLECTOR, BRIDLE PLATFORM & LADDER ASSEMBLY				267.00	



NOTES

1. REFER TO DRAWING NO. MA3-5600.031 FOR ROPE END TERMINATION USING WEDGE SOCKET.
2. REFER TO ROPE SPEC. PLATE FOR ROPE TERMINATION.
3. S.W.L. OF FLY HOIST HOOK IS 4.0 T. HOWEVER THE LIFTING CAPACITY IS AS PER MAX. S.W.L. OF LOAD CHART.
4. S.W.L. OF MAIN HOIST HOOK IS 15.0 T. HOWEVER THE LIFTING CAPACITY IS AS PER MAX. S.W.L. OF LOAD CHART.
5. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M500-0258-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		SYZ	ORIGINAL ISSUE (MODIFIED FROM MA3-5000.229)	04.02.13	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

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Muhibbah Engineering (M) Bhd

Title: REEVING DIAGRAM

Model	Rev.
6/10K	A

Sheet	Scale	S/No.	Weight	Drawing Number
1/1	NTS	1845	~ 3.0 T	MA3-5000.258

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M500-0258-0000
BOM DESCRIPTION ..: REEVING DIAGRAM
FILENAME .....: M50002580000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-5000.258)

APPROVED ..: AJS
CHECKED ....: KSL
PREPARED ..: SYZ
DATE .....: 04/02/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	unit(s)		M530-0084-0000	4T HOOK BLOCK SPECIFICATION			RO40478	215.00	
	2	1.00	unit(s)		M530-0112-0000	15T HOOK BLOCK SPECIFICATION			KB 400.20.1.15.E	500.00	
	3	1.00	pcs		M560-0123-0000	HOIST ANCHOR ASSEMBLY				57.00	
	4	1.00	pcs		M560-0083-0000	LUFF ANCHOR ASSEMBLY				8.00	
	5	1.00	pcs		M520-0073-0000	BRIDLE ASSEMBLY				590.00	
	6	1.00	pcs		M950-0045-0000	PENDANT LINK ASSEMBLY				118.00	
	7	185.00	mtr(s)	1	ALAX-0019-9000	ROPE, WIRE	185,000			372.00	
	8	197.00	mtr(s)	1	ALAX-0020-2000	ROPE, WIRE	197,000			504.00	
	9	41.00	mtr(s)	2	ALAX-0019-0000	ROPE, WIRE	20,500			325.00	
	10	120.00	mtr(s)	1	ALAX-0019-5000	ROPE, WIRE	120,000			155.00	
	11	1.00	set(s)		ALEX-0001-3000	WEDGE SOCKET, 1 IN (S-421T)			CROSBY	14.00	
	12	4.00	pcs		ALHX-0012-3000	OPEN SPELTER SOCKET FOR ROPE SIZE 40 - 42MM			GOFORTH	108.00	
	13	1.00	set(s)		ALEX-0001-2000	WEDGE SOCKET, 7/8 IN (S-421T)			CROSBY	10.00	
	14	1.00	pcs		ALHX-0004-5000	WIRE ROPE CLIP, 5/8 IN (G-450)			CROSBY	1.00	
	15	1.00	set(s)		ALEX-0002-5000	WEDGE SOCKET, 5/8 IN (S-421T)			CROSBY	4.40	

Project:	BANUWATI-K	Model:	6/10K	S/N:	1845
Drawing No:	MA3-6100.337	Revision:	B	Date:	11.03.13

FAVELLE FAVCO STANDARD FOR ASSEMBLY ELECTRICAL PANELS ACCORDING TO IEC 60204-1 (Electrical Equipment of Machines)

1. Conductors in main power circuit are dimensioned according to the selected components (circuit breaker etc.) but not less than 2.5mm²

2. Conductors in control circuit not less than 1.5mm²

3. Colour code for panel wires:

For 3-phase AC power:

L1:	Red
L2:	Yellow
L3:	Blue
Protective ground:	Yellow/Green Striped

Power (2/3 phase AC or DC power circuit):

Live:	Black
Neutral:	Light Blue
Protective ground:	Yellow/Green

AC control/supply circuit (single phase):

Live:	Red
Interconnecting wire:	Red
Neutral:	Light Blue

DC control/supply circuit (24Vdc):

Plus:	Dark Blue
Interconnecting wire:	Dark Blue
Minus:	White

Internal circuits which are live even the main circuit breaker is switched Off: Orange

Labelling:

4. Wire ends on components are supplied with cord end terminals and labelled according to the used terminal on the component.

APPROVED	CHECKED	OOM PREPARED	11.03.13 DATE	B REVISION

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West Malaysia.

5. Terminals strips to be labelled on the top and on the bottom.

6. All components to be marked with component number according to the electrical drawing. An identical marking to be present at the component plate.

7. Incoming multiple cables are, as far as possible, to use cables with number marked wires.
8. Terminal blocks to be marked with an overall terminal number (e.g. X1) and a number corresponding to the wire number of the cable, meaning wire no. 1 is connected to terminal no. 1 etc.

9. If terminal number and wire number of the multiple cables do not match or if colour coded cables are used, the cable wires must be labelled with the terminal number.

10. The cables should be marked with cable number according to the electrical drawing.

11. Internal wiring type shall be flame retardant.

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West Malaysia.

ATTACHMENT: ELECTRICAL SCHEMATIC DIAGRAM

This is attachment for:

Project:	BANUWATI-K	Model:	6/10K	S/N:	1845
Drawing No:	MA3-6100.337	Revision:	B	Date:	14.03.13

This is for current revision

Revision:	B	Date:	14.03.13	ECN:	E19476

Description:

Electrical Block Diagram

Sheet 3: Cable Gland (M20) labeled as Z800H & Z200H and Cable (2CX2.5mm2) labeled as W800H added for slipring heater supply. X20A Transformer (8kVA) & respective Cable & Cable Gland added. Smoke Detector, Gas Detector, PAGA Beacon, PA Systems & Aviation Light wiring connection moved to X3 Main DC Electrical Control Panel.

Sheet 5: Wiper (Y1), Washer (Y2) , Horn (Y7), MGOP Warning Light (E4/1), Manual Call Point (S50) & respective Cable & Cable Gland added.

Electrical Wiring Diagram

Sheet 6: X20 labeled changed to X20A Transformer J/Box capacity of 8kVA. E1/2 Fluorescent Light updated to 2x18W ratings.

Sheet 7: 2 units GPO (Y5/1 & Y5/2) removed to page 8. Circuit Breaker (QH) 2 Pole 2 Ampere, terminal block and internal wiring added for slipring heater.

Sheet 8: X20B Transformer J/Box capacity of 5kVA added for 2 units GPO (Y5/1 & Y5/2).

Sheet 9: Smoke Detector, Gas Detector, PAGA Beacon & PA Systems are labeled 'By Others'.

Cable Gland Arrangement

Sheet 21: X8 AC Main Control Panel cable entry layout added. X3 DC Main Control Panel cable entry layout updated.

Bill of Material (BOM) M61003340000B
Sheet 1-10: Component List updated.

Remarks:
- Some of the changes made as per client comments.
- Some of the changes made as per client specifications.

		OOM	14.03.13	B
APPROVED	CHECKED	PREPARED	DATE	REVISION

FAVELLE FAVCO CRANES (M) SDN. BHD. (351073-T)
Lot 42, Persiaran Bunga Tanjung 2,
Senawang Industrial Park, 70400 Seremban,
Negeri Sembilan Darul Khusus, Malaysia.

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Legend	2
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Electrical Wiring Diagram	6-15
Control Panel Arrangement	16-17
Terminal Block Arrangement	18-20
Cable Gland Arrangement	21

ATTACHMENT:
1) Favelle Favco standard for assembly electrical panels
2) Bill of Materials M610-0337-0000

		OOM	11.03.13	B
AJS	OOM	MFH	03.12.12	A
Approved	Checked	Drawn	Date	Rev.

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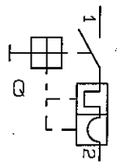
Muhibbah Engineering (M) Bhd

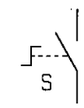
Printed: 3/23/2013 Changed: 3/23/2013

Legend:

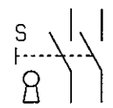
1. Aviation Light
2. Winsock Light
3. Indicating Light



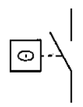
Miniature Circuit Breaker (1 Pole)



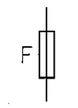
Selector Switch



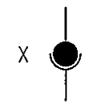
Selector Key Switch (2NO)



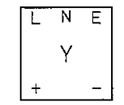
Level Switch



Fuse

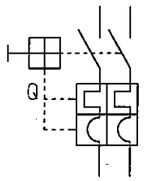


Slipring

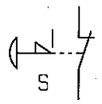


Battery Charger

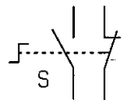
Floodlight



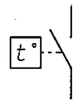
Miniature Circuit Breaker (2 Pole)



Emergency Stop Switch

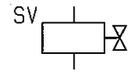


Selector Switch (1NO+1NC)



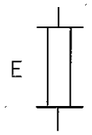
Temperature Switch

Gauge

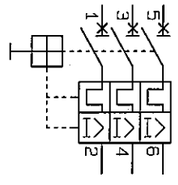


Solenoid Valve

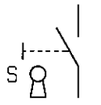
Diode



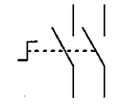
Fluorescent Light (Without Battery Backup)



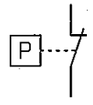
Miniature Circuit Breaker (3 Pole)



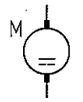
Selector Key Switch



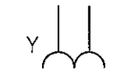
Selector Switch (2NO)



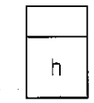
Pressure Switch



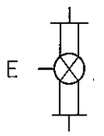
Motor (Wiper /Washer)



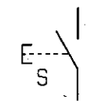
G.P.O. (General Purpose Outlet)



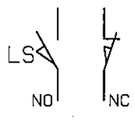
Hour Meter



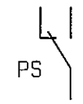
Fluorescent Light (With Battery Backup)



Pushbutton Switch

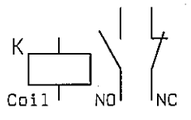


Rotary Limit Switch

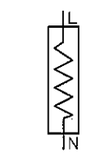


Anti-cavitation Pressure Switch

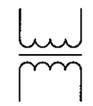
Sender



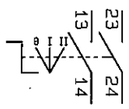
Relay



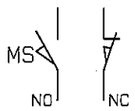
Heater



Transformer

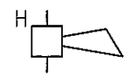


3 Position Selector Switch (2NO)

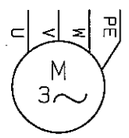


Lever Limit Switch

Filter Blocked Pressure Switch



Horn



Motor

Terminal Block

For example:

Xa — Terminal block no.c in junction box a.

Xa.b — Terminal block no.c in junction box a, which is corresponding with junction box b.

Approved	Checked	Drawn	Description	Date	Rev.
		OOM	Refer Attachment	11.03.13	B
AJS	OOM	MFH	Original Issue	03.12.12	A

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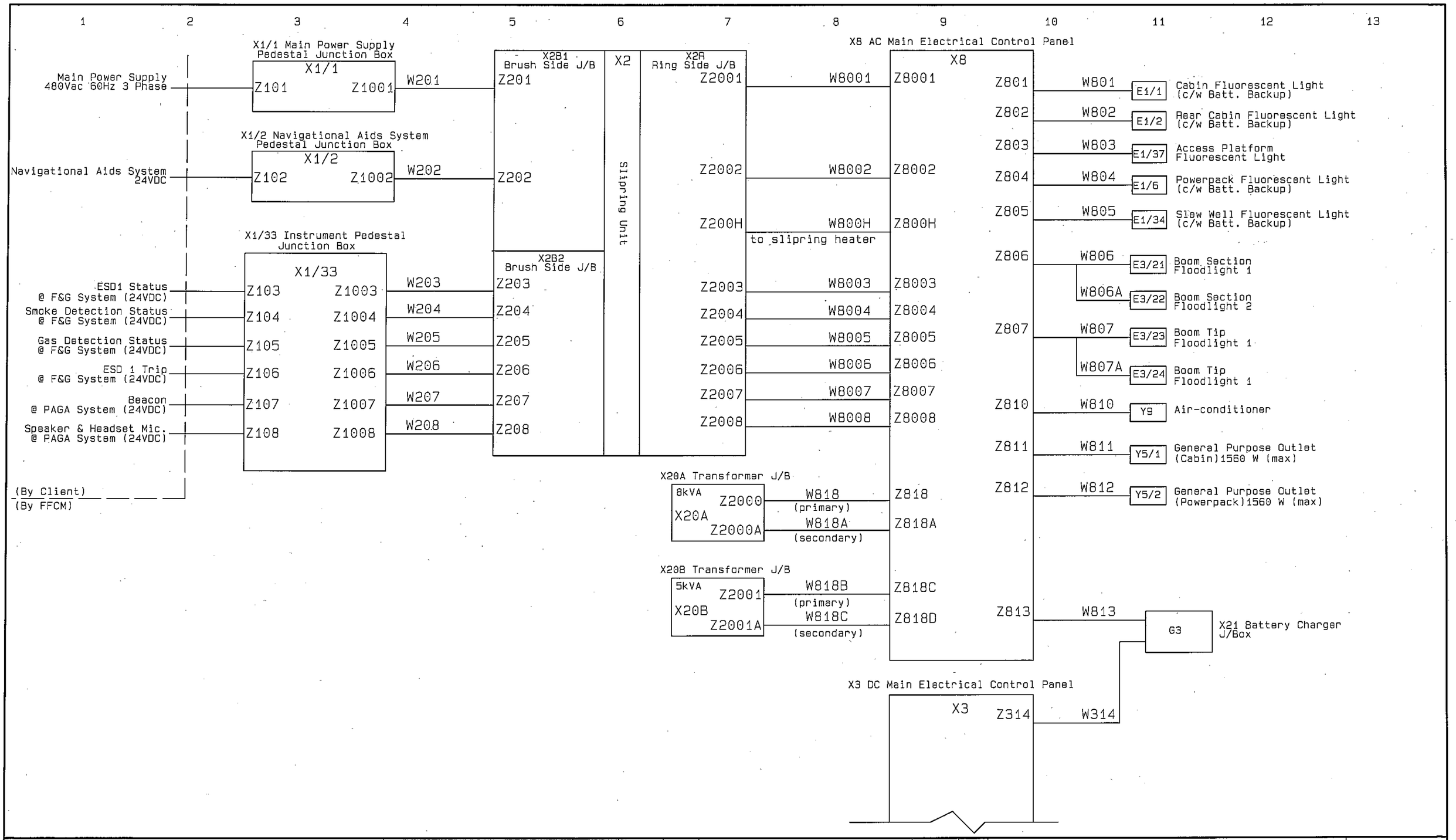
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
Legend	6/10K	B

Sheet	Scale	Serial No.	Weight	Drawing Number
2/21		1845	N/A	MA3-6100.337



Approved	Checked	Drawn	Description	Date	Rev.
AJS	OOM	OOM	Refer Attachment	11.03.13	B
		MFH	Original Issue	03.12.12	A

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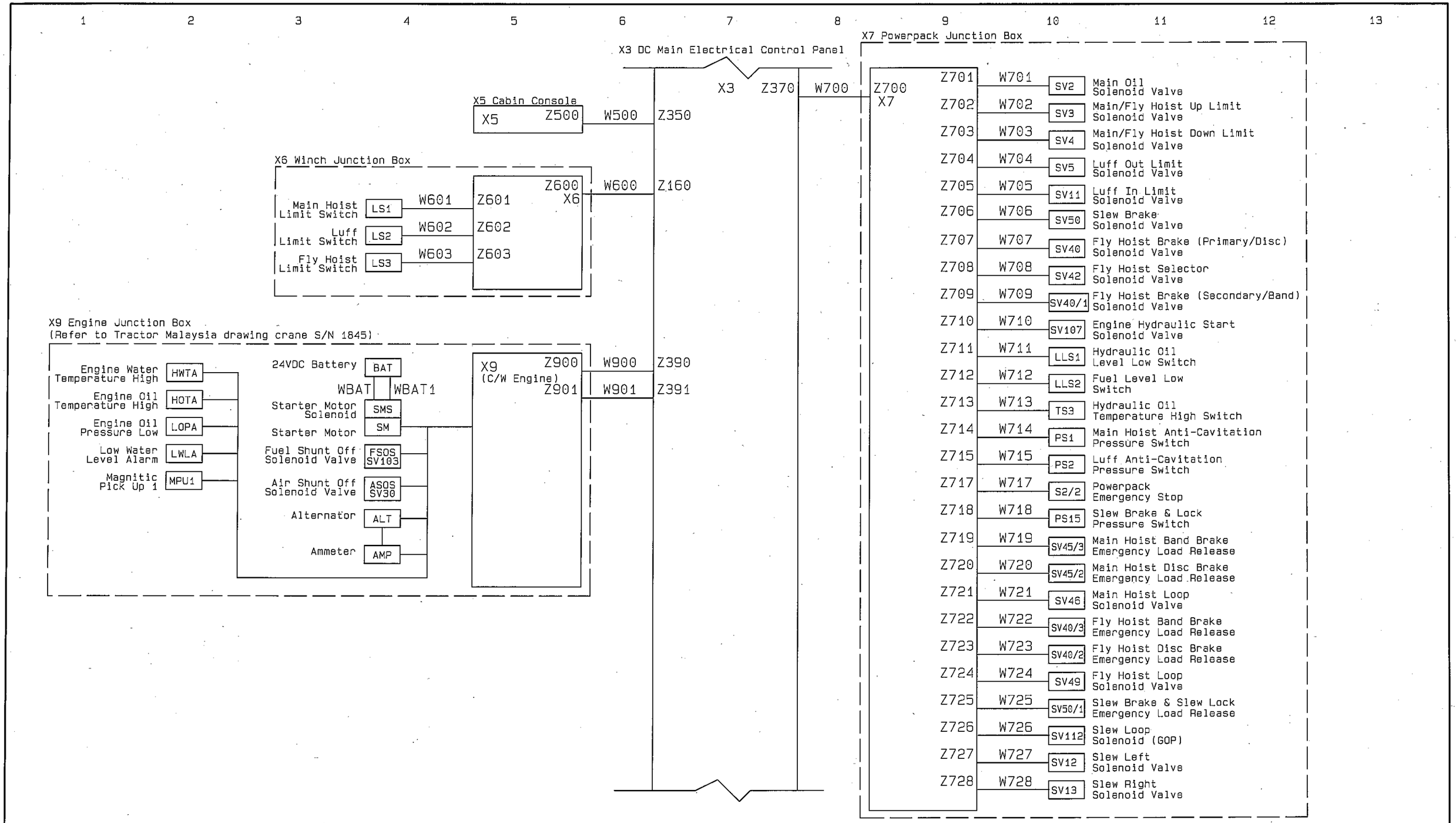
Title: Block Diagram
Model: 6/10K
Rev.: B
Sheet: 3/21
Scale:
Serial No.: 1845
Weight: N/A
Drawing Number: MA3-6100.337



Approved	Checked	Drawn	Description	Date	Rev.
		OOM	Refer Attachment	11.03.13	B
AJS	OOM	MFH	Original Issue	03.12.12	A

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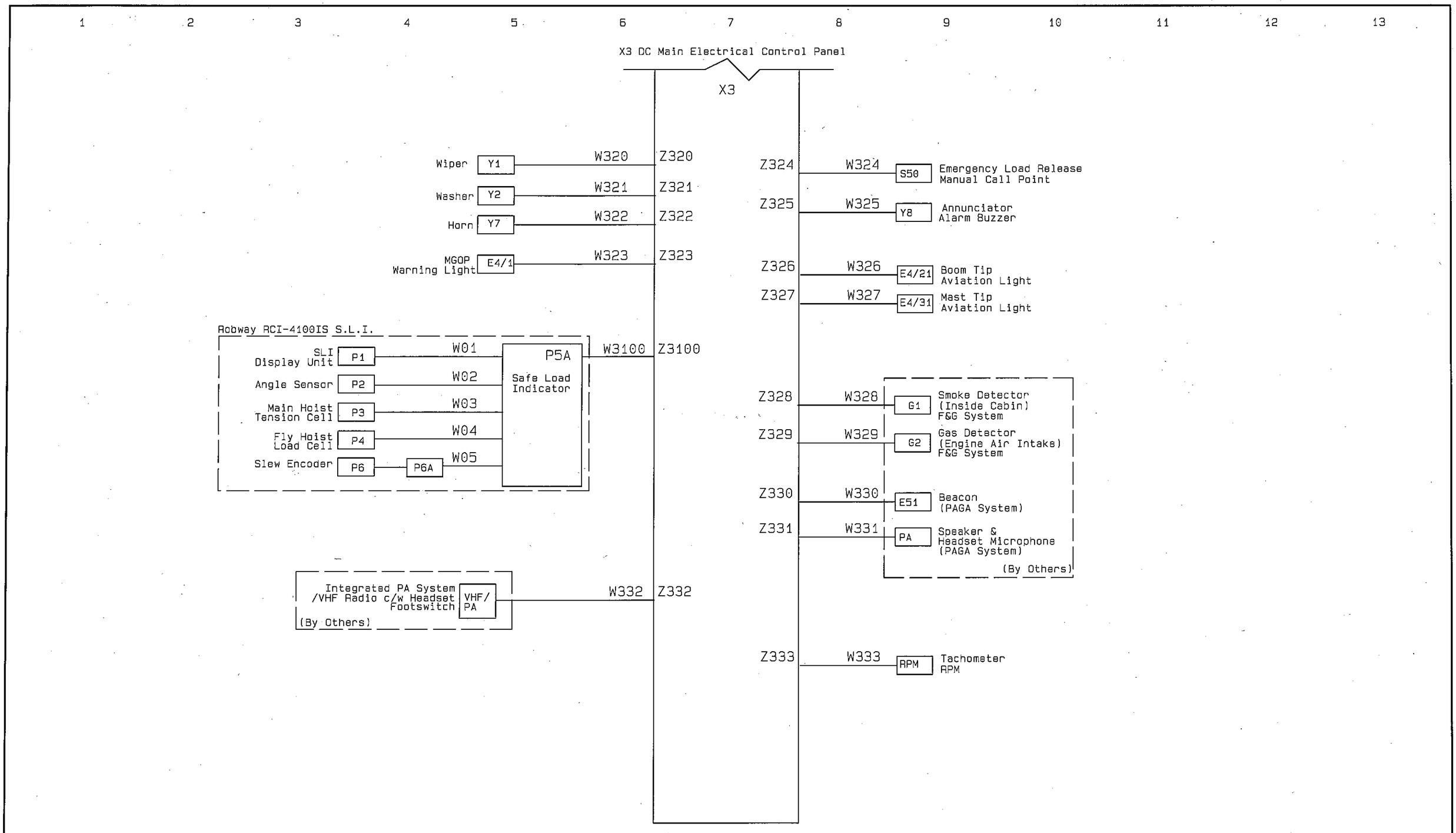
Title: Block Diagram

Model	Rev.
6/10K	B

Sheet	Scale	Serial No.	Weight	Drawing Number
4/21		1845	N/A	MA3-6100.337



Approved	Checked	Drawn	Description	Date	Rev.
		OOM	Refer Attachment	11.03.13	B
AJS	OOM	MFH	Original Issue	03.12.12	A

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Title: Block Diagram

Model	Rev.
6/10K	B

Sheet	Scale	Serial No.	Weight	Drawing Number
5/21		1845	N/A	MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels

L1 8.4
L2 8.4
L3 8.4
L 7.1
N 7.1

Q1 32A
Internal Wiring from Q1 Circuit Breaker to T1 Transformer use 16mmsq

Q3 80A
Internal Wiring for Q3 Circuit Breaker use 16mmsq

Internal Wiring for Q3 Circuit Breaker use 16mmsq

Q4 2A
Internal Wiring for Fluorescent Light use 2.5mmsq

S10

Q5 10A

S11

Internal Wiring for Fluorescent Light use 2.5mmsq

X8.2
X2.8
X2.1/1
X1/1
Main Power Supply 480VAC 60Hz 3phase
Anti Condensation Heater 230VAC
Slip Ring Unit
35A/480VAC
20A/480VAC
X2A Ring Side J/B
X2B1 Brush Side J/B
Spares
X1/1 Main Power Supply Pedestal J/Box

X8.20
X20.8
T1
7kVA
480VAC 60Hz 3phase
120VAC 60Hz 1phase
X20A Transformer J/Box

X8.20

X8

E1/1
Cabin Fluorescent Light (cw Bat. Backup) 2 X 18W

E1/2
Rear Cabin Fluorescent Light (cw Bat. Backup) 2 X 18W

E1/37
Access Platform Fluorescent Light 2 X 36W

E1/6
Powerpack Fluorescent Light (cw Bat. Backup) 2 X 36W

E1/34
Slew Wall Fluorescent Light (cw Bat. Backup) 2 X 18W

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		OOM	Refer Attachment	11.03.13	B
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Title: Wiring Diagram
Model: 6/10K
Rev.: B
Sheet: 6/21
Scale:
Serial No.: 1845
Weight: N/A
Drawing Number: MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels

L 6.13
N 6.13

Q6 16A — Internal Wiring for Flood Light use 2.5mmsq — S12 — X8 L3 N3 PE — E3/21 E3/22 — Boom Section Flood Light 1 400W HPS — Boom Section Flood Light 2 400W HPS

Q7 16A — Internal Wiring for Flood Light use 2.5mmsq — S13 — X8 L4 N4 PE — E3/23 E3/24 — Boom Tip Flood Light 1 400W HPS — Boom Tip Flood Light 2 400W HPS

Q8 16A — Internal Wiring for Air Cond use 2.5mmsq — X8 L5 N5 PE — L1 L2 Y9 — Air-conditioner 1.25 HP

Q11 10A — Internal Wiring for VHF/PA System use 2.5mmsq — X8 L8 N8 PE — U2 — PA3 Gooseneck Mic — PA8 — PA7 — PA2 Speaker — PA6 PTT Footswitch — (By Others) PA/VHF Radio System

QH 2A — Internal Wiring for VHF/PA System use 2.5mmsq — X8 L10 N10 PE — X2.8 HEATER HEATER — 5A/120VAC — X2 — H — Self-regulated SLIPRING HEATER

Q12 16A — Internal Wiring for Battery Charger use 6mmsq — X8 L9 N9 PE — G3 L N E + − — Battery Charger 24VDC

X8 AC Main Electrical Control Panel

X3 DC Main Electrical Control Panel — X3 M3 P3

Internal Wiring for Battery Charger use 6mmsq — -VE 10.1 — +VE 10.1

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		OOM	Refer Attachment	11.03.13	B
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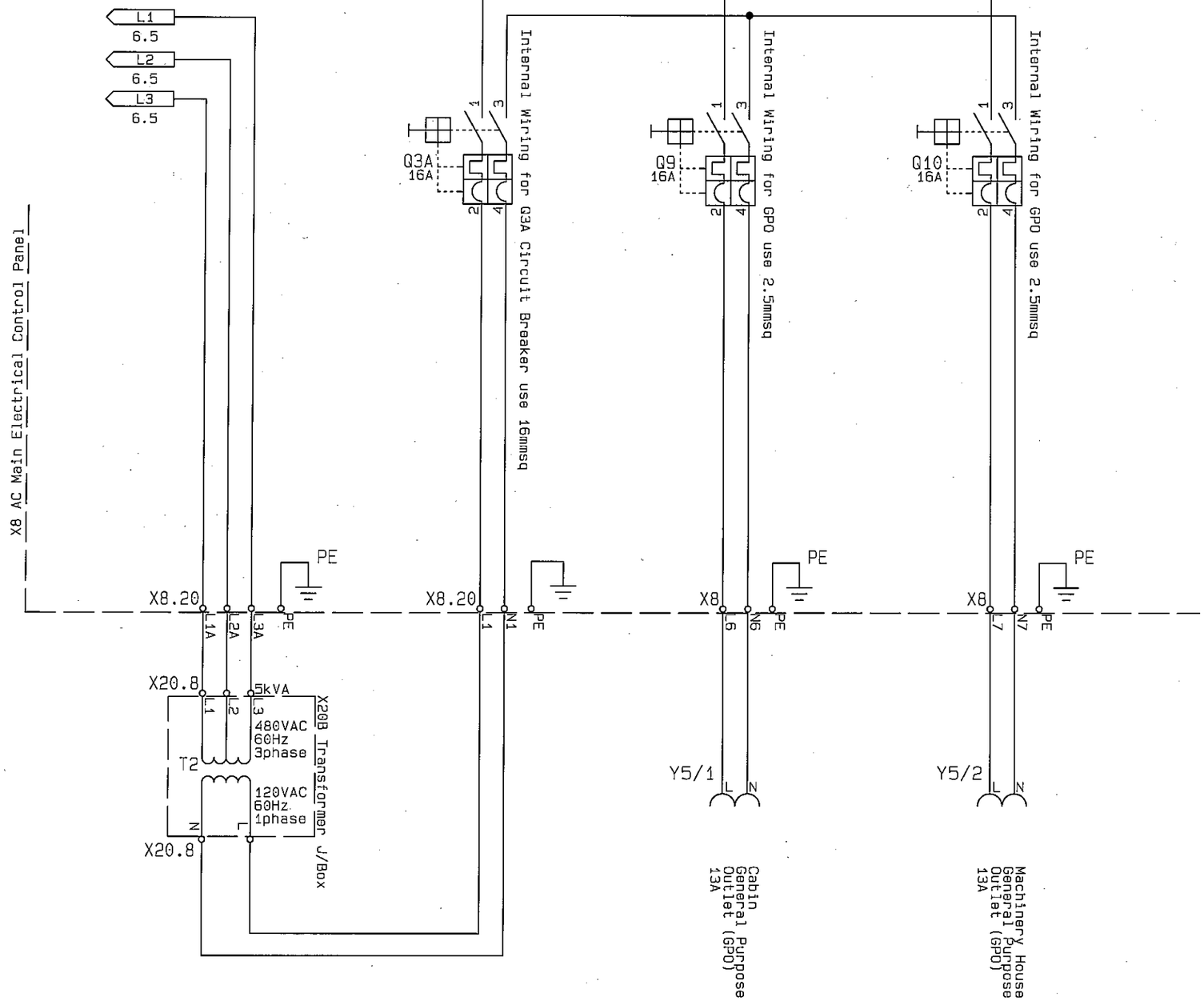
Title: Wiring Diagram
Model: 6/10K
Rev.: B
Sheet: 7/21
Scale:
Serial No.: 1845
Weight: N/A
Drawing Number: MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels



		OOM	Refer Attachment	11.03.13	B
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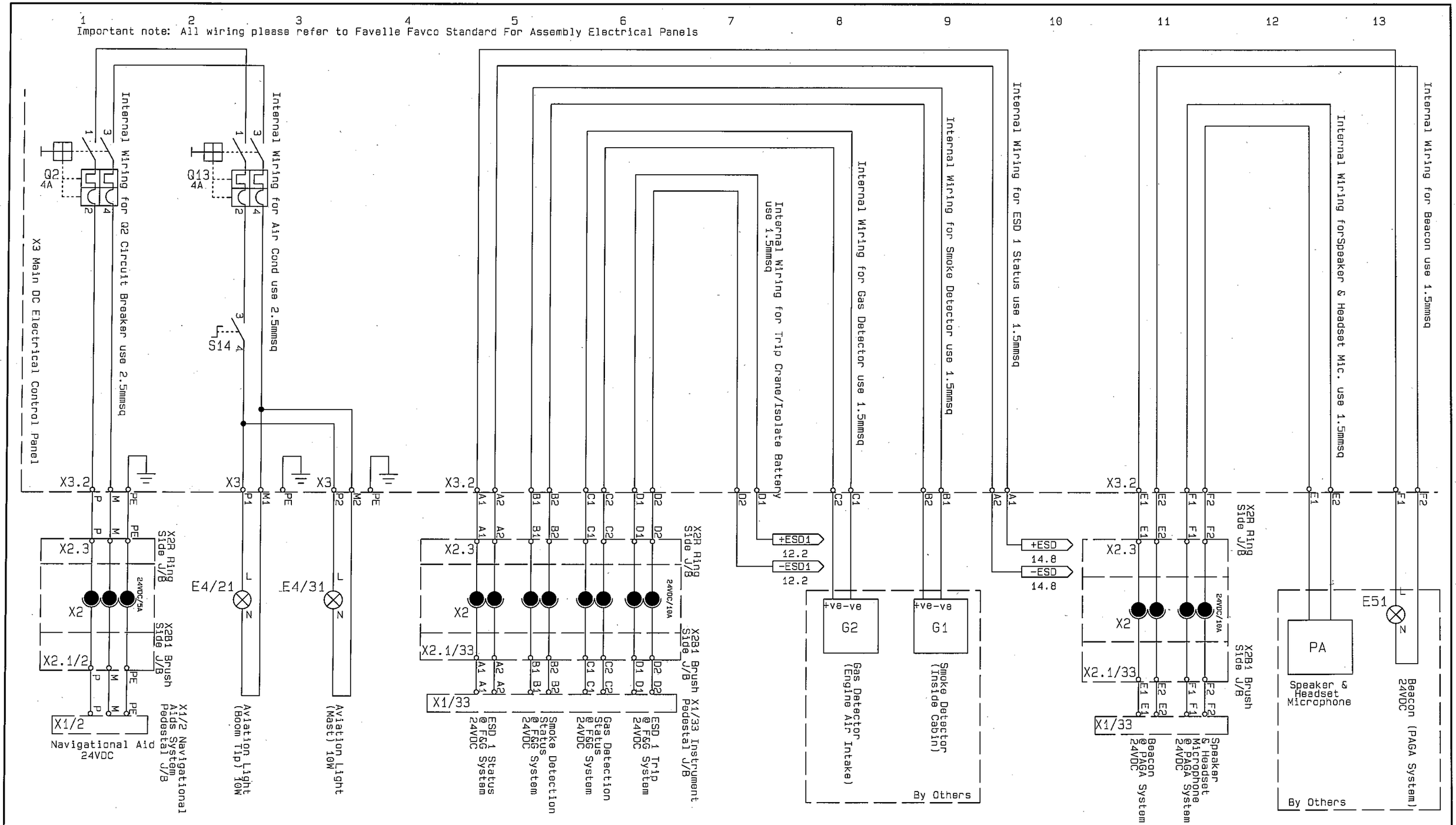
Title: Wiring Diagram

Model: 6/10K

Rev.: B

Sheet	Scale	Serial No.	Weight	Drawing Number
8/21		1845	N/A	MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels



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		OOM	Refer Attachment	11.03.13	B
AJS	OOM	MFH	Original Issue	03.12.12	A

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Title: Wiring Diagram

Model	Rev.
6/10K	B

Sheet	Scale	Serial No.	Weight	Drawing Number
9/21		1845	N/A	MA3-6100.337

1 2 3 4 5 6 7 8 9 10 11 12 13

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels

+VE
7.13

+24V2
12.2

+24V1
11.1

0VDC
11.1

X3 Main DC Electrical Control Panel
Tachometer

RPM

X3.9 X9 1 1

X3.9 X9 3 14

X3.9 X9 4 30A

X3.9 X9 5 1A

X9 Engine J/B
(Refer to Tractor Malaysia drawing crane 1845)

24VX9

K2/2
(12/5)

K2/1
(12/3)

F1
20A

Q14
32A

X3 14

X3 15

X3.9 6

X3.9 7

PU 20

PU 19

PU 18

ESS PU (4)

MPU

Magnetic Pick-up

BAT
24VDC

SMS1
(6)

AMM

Ammeter

ALT

Alternator

SM

Starter Motor

SMMS1

FSOS

ESS

SMMS1
(4)

SR3
(9)

(Energize to Shutdown)

CT
ESS

Cranking

OS
ESS
(4)

Engine Overspeed

TD1
(10)

SR3

TD1

X9 2

X9 12

X9 11

X3.9 2

X3.9 12

X3.9 11

Starting System: Electric Start

-VE
7.13

K10

OS
14.1

Note:
TD is only for "Safe Zone Engine".
It is to protect ASOS when energize to shut down.

24VDC Battery

Engine Starter Relay /6

Fuel Shut Off Solenoid Valve

Electronics Speed Switch

Starter Motor Solenoid /2

Air Shut Off Solenoid Valve

Cranking Relay 12/3 12/4

Engine Air Shut Off Relay /7

Timer Relay <5s /9

Overspeed Relay

		OOM	Refer Attachment	11.03.13	B
AJS	OOM	MFH	Original Issue	03.12.12	A
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70400 Seremban, Negeri Sembilan Darul Khusus, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title: Wiring Diagram

Model: 6/10K

Rev.: B

Sheet	Scale	Serial No.	Weight	Drawing Number
10/21		1845	N/A	MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels

+24V1 10.13

+24V1 12.1

X3 1A 2 S50 1 X3 3 — Emergency Load Release Manual Call Point — X3 Main Electrical C/P

K13 (11) 14 11

K122/1 (2) 14 11

K13 (11) 22 21

K122/1 (2) 24 21

K122/2 (1) 14 11

K122/2 (1) 24 21

X3 4 E4/1 X3 2 — MGOP Warning Light

X3.5 16 — 24VX5 13.7

X5 Cabin Console

Main/Fly Hoist Selector: 13 21 S25 14 22

Main Hoist Engaged Indicator: E17 X1 X2

Fly Hoist Engaged Indicator: E18 X1 X2

X3.5 17 18 2

X3.5 X3.5 X3.5

X3.7 17 18 19

X7 17 SV45/3 1 2 X7 17 SV45/2 1 2 X7 17 SV46 1 2 X7

X7 18 SV40/3 1 2 X7 18 SV40/2 1 2 X7 18 SV49 1 2 X7

X7 19 SV50/1 1 2 X7 19 SV112 1 2 X7

0VX7 12.9

K122/2 + − K122/1 + −

K16 + − K13 + − KMF + −

0VDC 10.13

0VDC 12.1

Emergency Load Release Relay 2 — /8 /10

Emergency Load Release Relay 1 — /3 /6

Main Hoist Band Brake Emergency Load Release Solenoid Valve

Main Hoist Disc Brake Emergency Load Release Solenoid Valve

Main Hoist Loop Solenoid Valve

Fly Hoist Band Brake Emergency Load Release Solenoid Valve

Fly Hoist Disc Brake Emergency Load Release Solenoid Valve

Fly Hoist Loop Solenoid Valve

Slew Brake & Lock Emergency Load Release Solenoid Valve

Slew Loop Solenoid Valve

Fly/Main Selector Switch Relay — 13/4

Main/Fly Changeover Relay — /3 /6

Main/Fly Input Relay — 15/5

Approved	Checked	Drawn	Description	Date	Rev.
AJS	OOM	MFH	Original Issue	03.12.13	B
		OOM	Refer Attachment	11.03.13	A

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Title: Wiring Diagram

Model	Rev.	Sheet	Scale	Serial No.	Weight	Drawing Number
6/10K	B	11/21		1845	N/A	MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels

+24V1 11.13 | X3.7 | X7 | Powerpack Emergency Stop | S2/1 | X7 Powerpack J/B | K1 (1) | +24V2 10.5

Q15 2A | Q16 2A | Q17 4A | +24V2 13.1

X3.6 | X6 Winch J/B | 24VX6 13.9

X3.5 | X5 Cabin Console

Cabin Emergency Stop Ignition | S2/1 | S1 | Engine Stop | S4 | Engine Start | S3 | Engine Starter Selector | S65 | Luff Out Override | S5 | Horn | S8 | Washer | S9/1 | Wiper | S9

Main Hoist Up Limit | LS1 /1 | Main Hoist Down Limit | LS1 /5 | Luff In Limit | LS2 /1 | Luff Out Limit | LS2 /2 | Fly Hoist Up Limit | LS3 /1 | Fly Hoist Down Limit | LS3 /5

XD1 | +ESD1 9.7 | -ESD1 9.7

K3/1 | K8 (13/9) | K10 (10/8) | K10 (10/8) | K6 (15/5) | K11 15/4 | K12 (15/3)

X3 | X3 Main Electrical C/P | Y7 | Y2 | Y1

X3.7 | X7 | X7 Powerpack J/B | SV3 | SV4 | SV11 | SV5 | SV13 | SV12 | 0VX7 11.9 | 0VX7 13.2

0VDC 11.13 | 0VDC 14.1

K1 | K3 | K2/1 | KR | K2/2 | KHL

/3 Ignition Relay | Stop Relay | 10/4 Electric Start Relay | 15/5 Roadway Restart Relay | 10/4 13/3 Hydraulic Start Relay | Horn | Washer | Wiper | Interlock Hoist Up Limit | Main/Fly Hoist Up Limit Solenoid Valve | Main/Fly Hoist Down Limit Solenoid Valve | Luff In Solenoid Valve | Luff Out Solenoid Valve | Slew Right Solenoid Valve | Slew Left Solenoid Valve

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AJS	OOM	MFH	Original Issue	03.12.12	A
		OOM	Refer Attachment	11.03.13	B

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Title: Wiring Diagram | Model: 6/10K | Rev.: B

Sheet	Scale	Serial No.	Weight	Drawing Number
12/21		1845	N/A	MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels

+24V2 12.13

X7 Powerpack J/B

X3.7

24VX7 14.7

PS1 Main Hoist Anti-Cavitation Pressure Swith

PS2 Luff Anti-Cavitation Pressure Swith

K2/2 (12/5)

K16 (11/11)

X5 Cabin Console

24VX5 11.12

S29 Slow Brake Swtich

X3.5

BRAKE 15.4

E50 Slow Brake Engaged Indicator

X6 Winch J/B

24VX6 12.11

24VX6 14.9

LS1 /21 Main Hoist Ultimate Limit

LS2 /21 Luff Ultimate Limit

LS3 /21 Fly Hoist Ultimate Limit

X3.6

+24V2 14.1

24VX26 14.1

S25 Acknowledge

S23 Alarm Reset

S24 Lamp Test

PMU

K5

K8

SV2 Low Boost Pressure Relay 14/7

SV40 Main Oil Solenoid Valve

SV40/1 Engine Start Hydraulic Solenoid Valve

SV42 Fly Hoist Brake (Disc/Primary) Solenoid Valve

SV50 Fly Hoist Select Solenoid Valve

Fly Hoist Brake (Band/Secondary) Solenoid Valve

Slew Brake Solenoid Valve

0VX7 12.13

0V

0V 15.1

Ultimate Limit Relay 12/2 14/8

X3 Main Electrical C/P

Y8 Alarm Buzzer

Approved	Checked	Drawn	Description	Date	Rev.
		OOM	Refer Attachment	11.03.13	B
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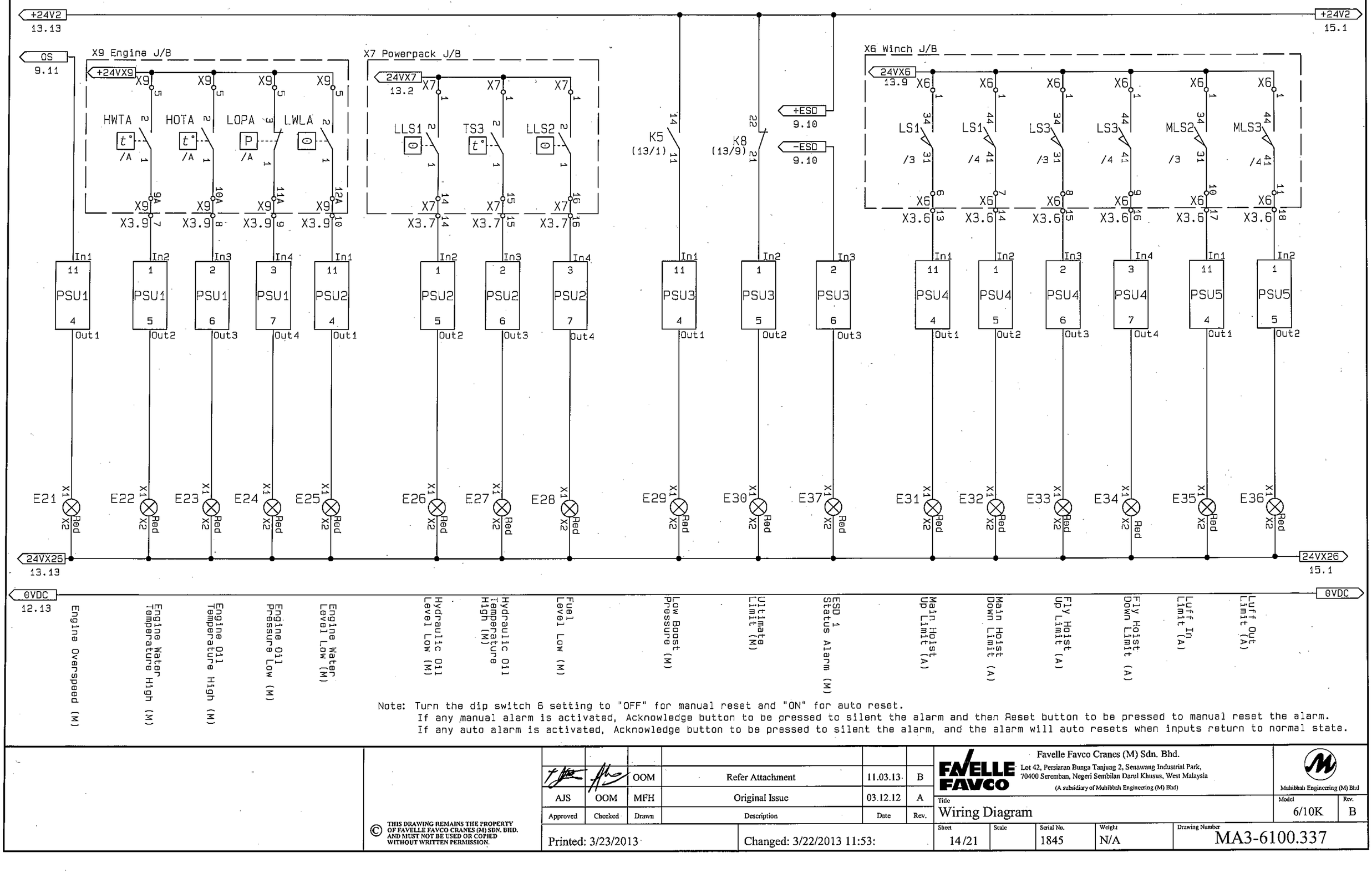
Title: Wiring Diagram

Model: 6/10K

Rev.: B

Sheet	Scale	Serial No.	Weight	Drawing Number
13/21		1845	N/A	MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels



Note: Turn the dip switch 6 setting to "OFF" for manual reset and "ON" for auto reset.
If any manual alarm is activated, Acknowledge button to be pressed to silent the alarm and then Reset button to be pressed to manual reset the alarm.
If any auto alarm is activated, Acknowledge button to be pressed to silent the alarm, and the alarm will auto resets when inputs return to normal state.

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AJS	OOM	MFH	Original Issue	03.12.12	A
		OOM	Refer Attachment	11.03.13	B

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Title: Wiring Diagram
Model: 6/10K
Rev.: B
Sheet: 14/21
Scale:
Serial No.: 1845
Weight: N/A
Drawing Number: MA3-6100.337

Important note: All wiring please refer to Favelle Favco Standard For Assembly Electrical Panels

Robway Rated Capacity Indicator RCI 4100IS

+24V2
14.13

KA
(12/4)

X3.7
X7
PS15
Slew Brake & Lock Pressure Switch
X7 Powerpack J/B
BRAKE
13.8

PROCESSOR BOARD

RS-232 DATA LOGGING CONNECTION

D1031Q -SA WINCH INPUT SELECT
D1063S LOAD 1 (FLY)
D1063S LOAD 2 (MAIN)
D1031D ATB
ATB 1 ATB 2 (MAIN) (FLY)

9-16 Haz Area

In3 PSU5 Out3
In4 PSU5 Out4
In4 PSU3 Out4

KMF
(11/12)

OD2
OD3

4 core armoured cable

4 core screened cable (blue)
4 core screened cable (blue)
4 core screened cable (black)

P6A J/Box

E38 Red X2
E39 Red X2
E40 Red X2

K12
K11
K6

24VX26
14.13

0V
13.13

Spare
Spare
Spare 12/13
Slew Left Limit Relay 12/12
Slew Right Limit Relay
12/9
Overload Limit Relay 110%

P2
ANGLE SENSOR
ANGES4130

P6
SLEW ENCODER
AVM14

P4
FLY LOAD CELL
CELRW1500CA

P3
MAIN LOAD CELL
CELRW1500CA

P1
DISPLAY UNIT
DISRCI4100

Note: Details wiring of P5 ROBWAY Control Panel, please refer to crane S/N 1845 ROBWAY manual.

Approved	Checked	Drawn	Description	Date	Rev.
AJS	OOM	MFH	Original Issue	03.12.12	A
	OOM		Refer Attachment	11.03.13	B

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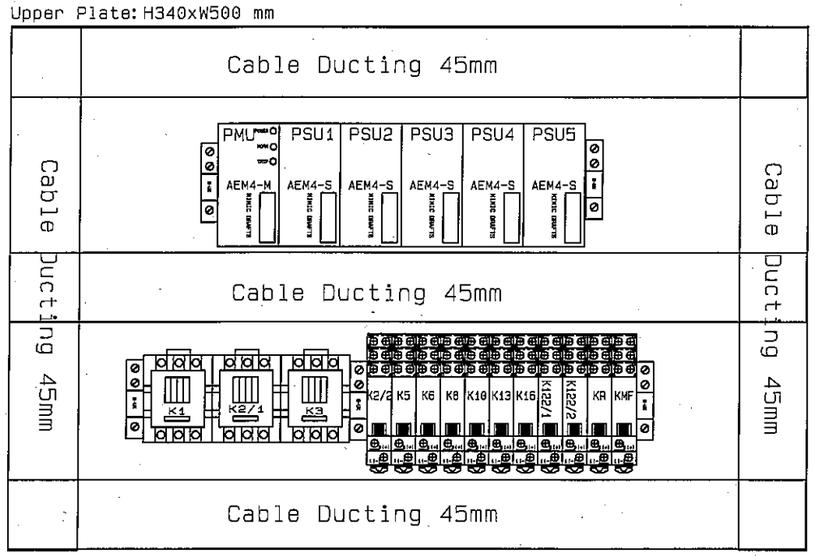
Multibbah Engineering (M) Bhd

Title: Wiring Diagram
Model: 6/10K
Rev.: B
Sheet: 15/21
Scale:
Serial No.: 1845
Weight: N/A
Drawing Number: MA3-6100.337

X3 DC Main Electrical Control Panel

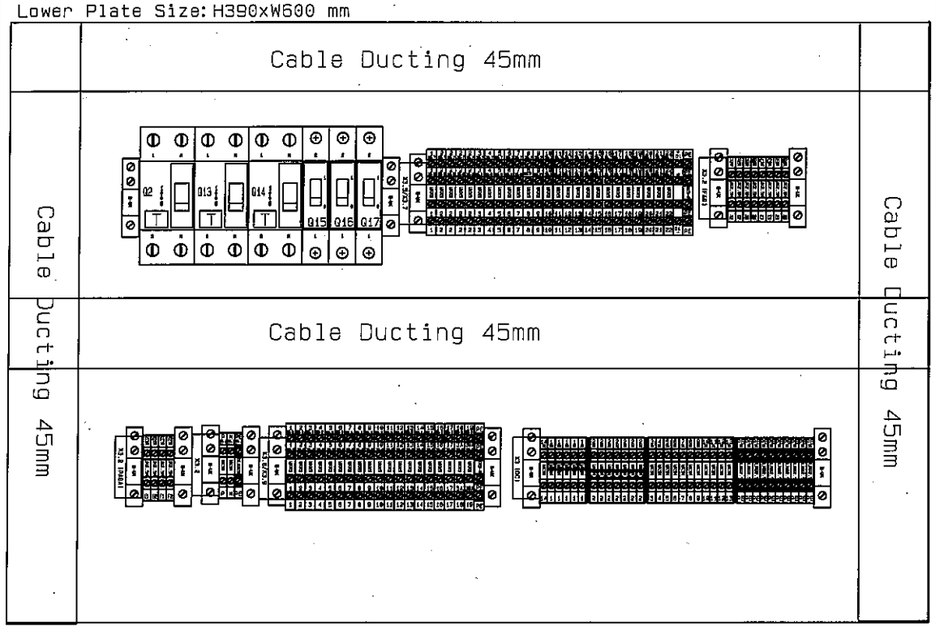
ADS EJB 18B (Ext.: H535xW735xD388 Int.: H430xW640xD315 mm)

Upper Plate: H340xW500 mm



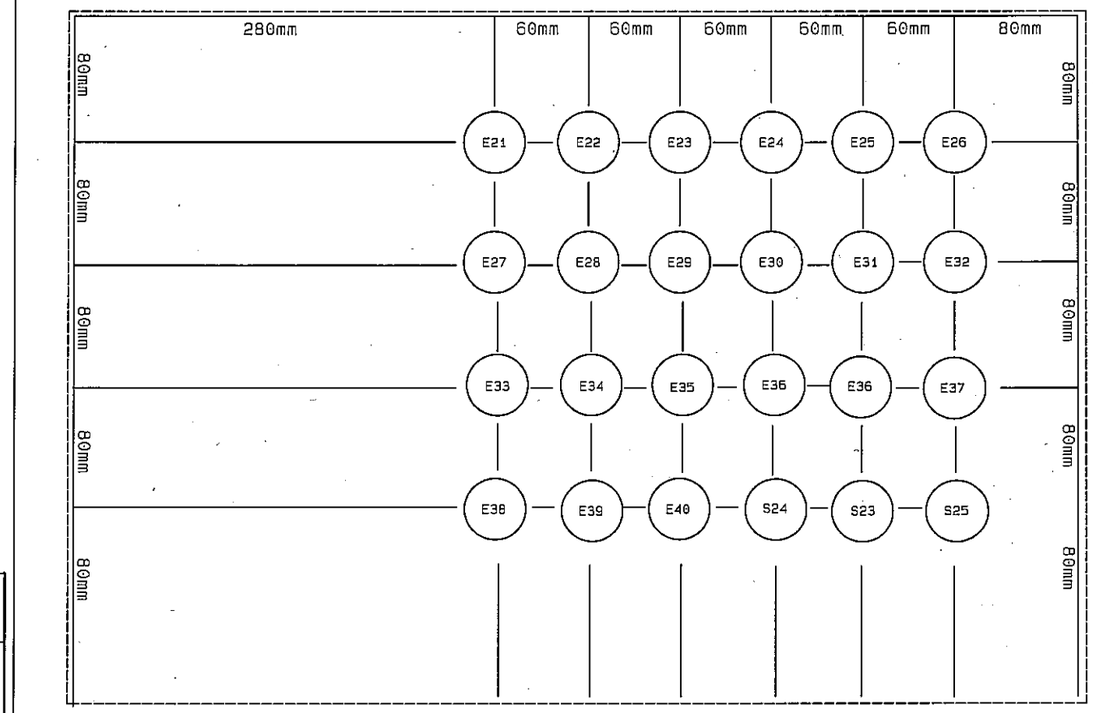
Cable Gland Entries

Lower Plate Size: H390xW600 mm



Cable Gland Entries

X3 External size: H535xW735 mm



Cable Gland Entries

Legend:

E21: Engine Overspeed (M)
E22: Engine Water Temp. High (M)
E23: Engine Oil Temp. High (M)
E24: Engine Oil Pressure High (M)
E25: Engine Water Level Low (M)

E26: Hydraulic Oil Level Low (M)
E27: Hydraulic Oil Temp. High (M)
E28: Fuel Level Low (M)
E29: Boost Pressure Low (M)
E30: Ultimate Limit (M)

E31: Main Hoist Up Limit (A)
E32: Main Hoist Down Limit (A)
E33: Fly Hoist Up Limit (A)
E34: Fly Hoist Down Limit (A)
E35: Luff In Limit (A)

E36: Luff Out Limit (A)
E37: ESD1 Alarm (M)
E38: Spare
E39: Spare
E40: Spare

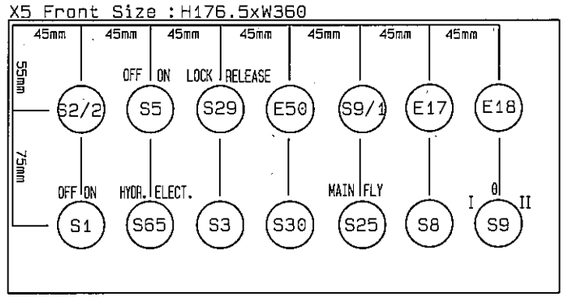
S23: Alarm Reset
S24: Lamp Test
S25: Acknowledge

E21-E40 holes dia. are 25mm
S23-S25 holes dia. are 25mm

X5 Cabin Console Panel

Stahl 8125/5071-2 (H176.5xW360xD91 mm Exe)

X5 Front Size : H176.5xW360



Legend:

S1: Ignition
S2/2: Emergency Stop
S3: Engine Start
S5: Luff Out Override
S9: Wiper
S8: Horn
S9/1: Washer

S25: Main/Fly Hoist Selector
S30: Engine Stop
E50: Slew Brake & Lock Engaged Indicator
S29: Slew Brake & Lock
S65: Engine Starter Selector
E17: Main Hoist Engaged Indicator
E18: Fly Hoist Engaged Indicator

All hole diammeter is 32.5mm

Important Note: Junction box internal layouts are subjected to change during assembly.
To be updated according to as-built.

		OOM	Refer Attachment	11.03.13	B
AJS	OOM	MFH	Original Issue	03.12.12	A
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Muhibbah Engineering (M) Bhd

Title: Control Panel Arrangement

Model	Rev.
6/10K	B

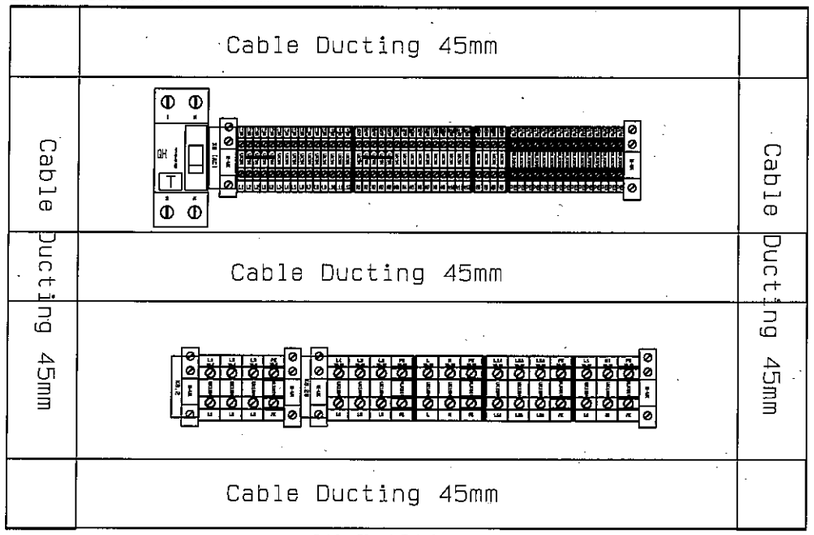
Sheet	Scale	Serial No.	Weight	Drawing Number
16/21		1845	N/A	MA3-6100.337

1 2 3 4 5 6 7 8 9 10 11 12 13

X8 AC Main Electrical Control Panel

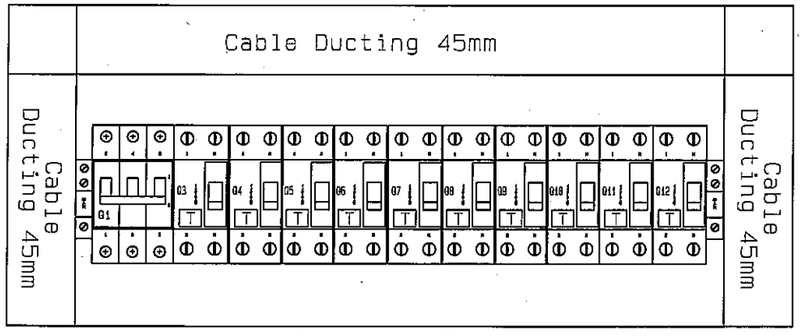
ADS EJB 15A (Ext.: H426xW576xD265 Int.: H350xW500xD230 mm)

Lower Plate: H340xW500 mm



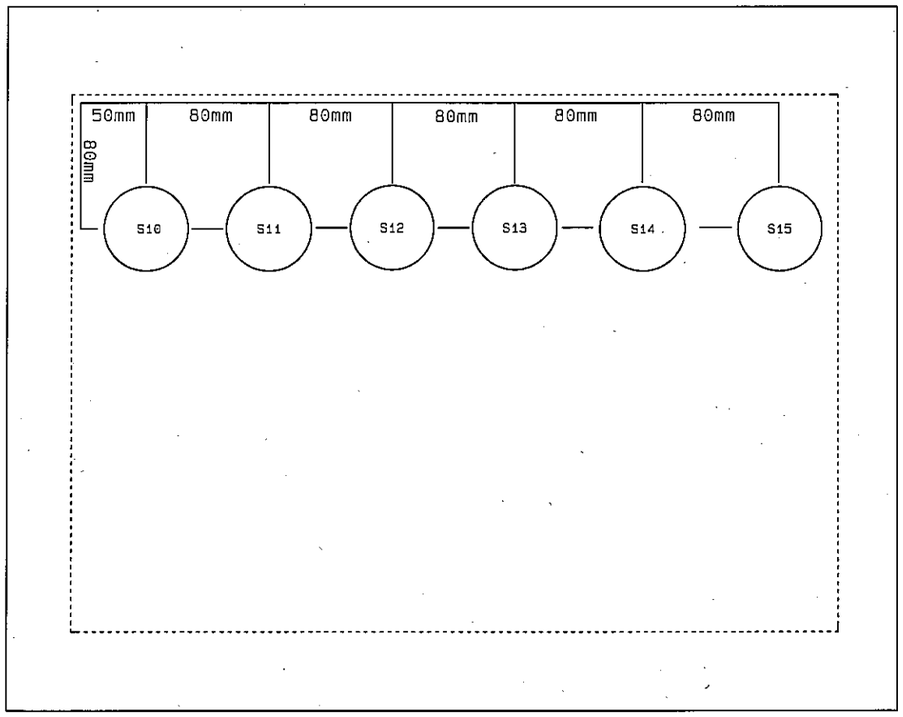
Cable Gland Entries

Upper Plate: H210xW500 mm



Cable Gland Entries

X3 External size: H426xW576 mm



Cable Gland Entries

S10: Cabin Light
S11: Platform Lights
S12: Boom Section Floodlights
S13: Boom Tip Floodlights
S14: Aviation Lights
S15: Spare

S10-S15 holes dia.are 32.5mm

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		OOM	Refer Attachment	11.03.13	B
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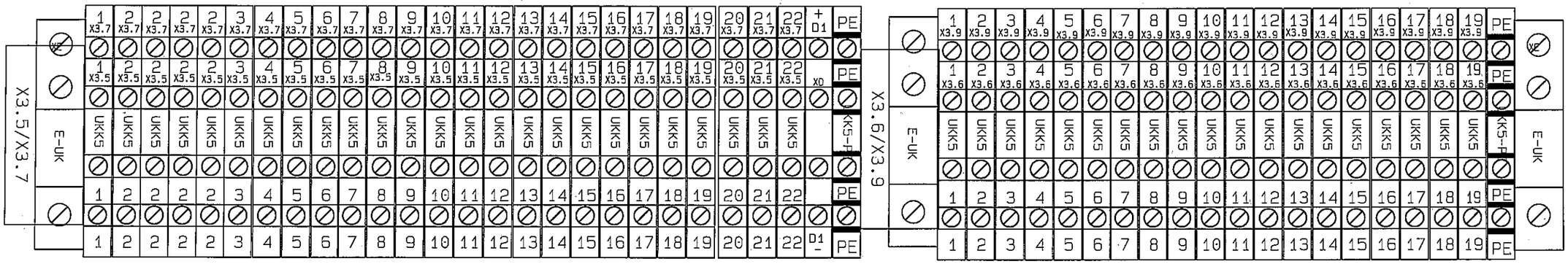
Title: Control Panel Arrangement

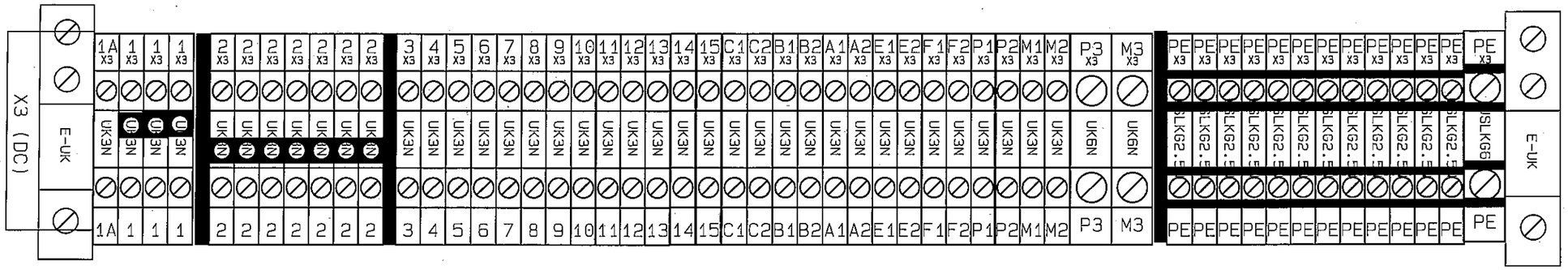
Model	Rev.
6/10K	B

Sheet	Scale	Serial No.	Weight	Drawing Number
17/21		1845	N/A	MA3-6100.337

X3 DC Main Electrical Control Panel

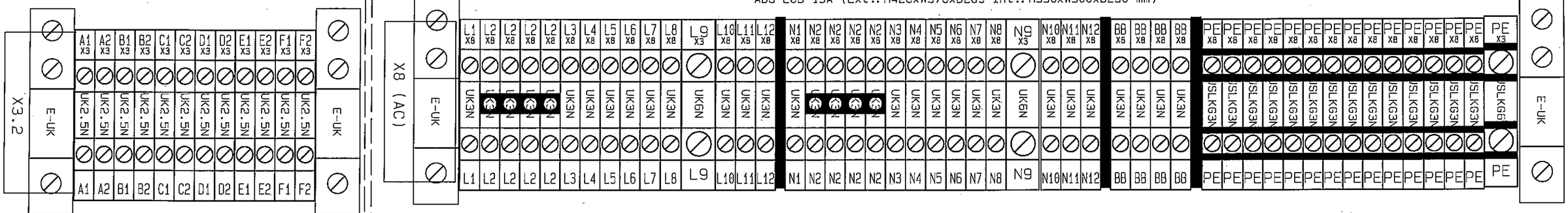
ADS EJB 18B (Ext.: H535xW735xD388 Int.: H430xW640xD315 mm)





X8 AC Main Electrical Control Panel

ADS EJB 15A (Ext.: H426xW576xD265 Int.: H350xW500xD230 mm)



CONTINUE TO SHEET 19

Approved	Checked	Drawn	Description	Date	Rev.
		OOM	Refer Attachment	11.03.13	B
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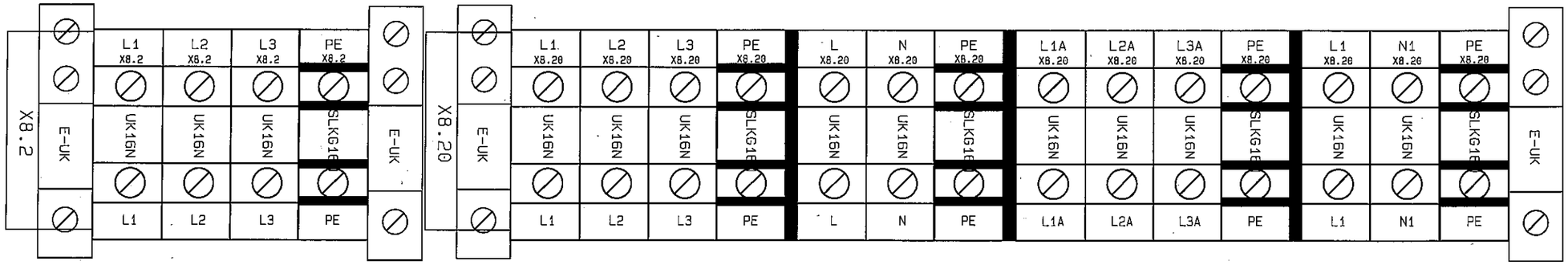
Title: Terminal Block Arrangement

Model	Rev.
6/10K	B

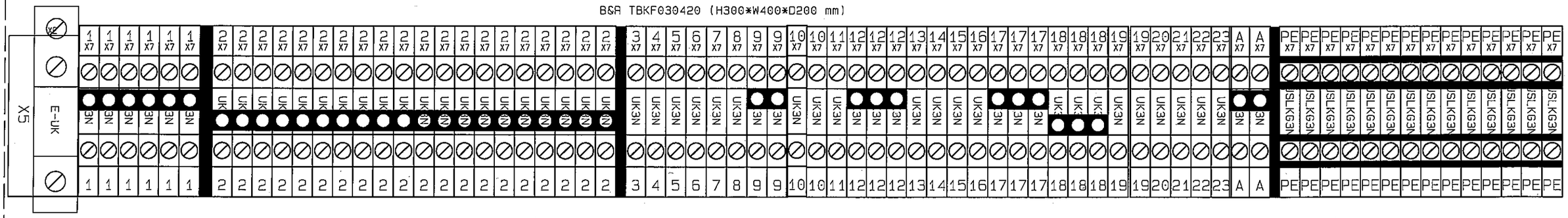
Sheet	Scale	Serial No.	Weight	Drawing Number
18/21		1845	N/A	MA3-6100.337

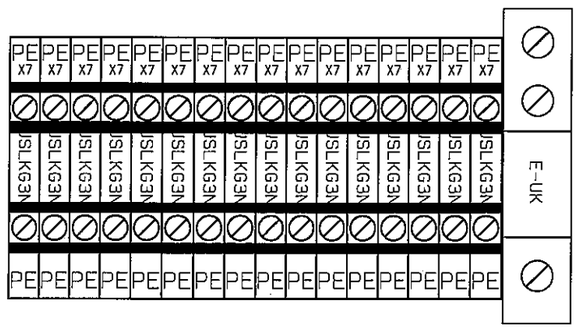
CONTINUE FROM SHEET 18



X7 Powerpack Junction Box

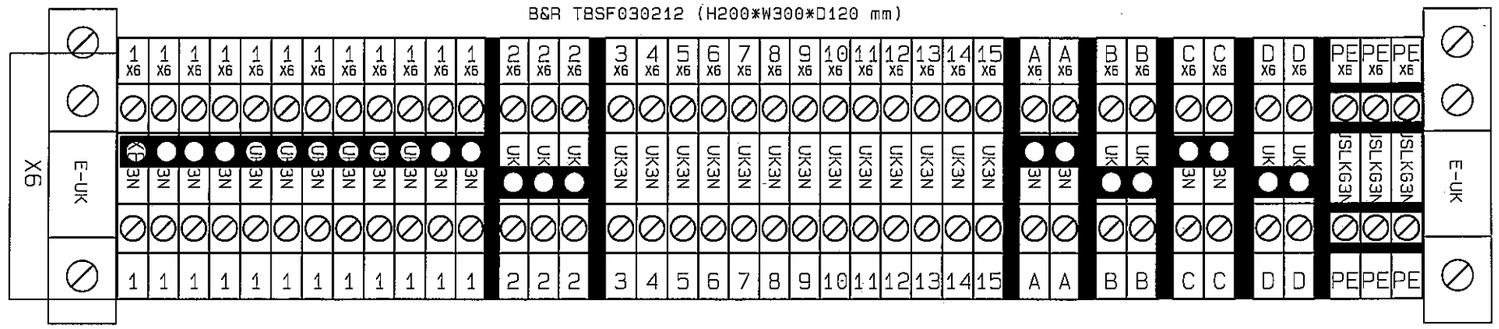
B&R TBKF030420 (H300*W400*D200 mm)





X6 Winch Junction Box

B&R TBSF030212 (H200*W300*D120 mm)



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AJS	OOM	MFH	Refer Attachment	11.03.13	B
			Original Issue	03.12.12	A

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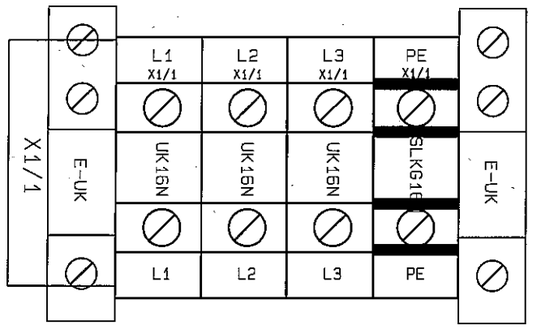
Title: Terminal Block Arrangement

Model: 6/10K | Rev.: B

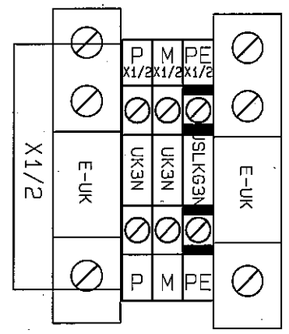
Sheet	Scale	Serial No.	Weight	Drawing Number
19/21		1845	N/A	MA3-6100.337

1 2 3 4 5 6 7 8 9 10 11 12 13

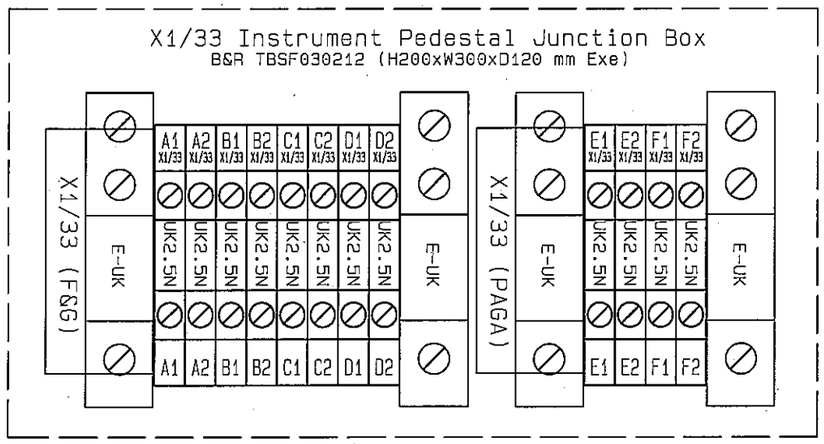
X1/1 Main Supply Pedestal Junction Box
B&R TBSF020212 (H200xW200xD120 mm Exe)



X1/2 Navigational Aids Pedestal Junction Box
B&R TBSF020212 (H200xW200xD120 mm Exe)



X1/33 Instrument Pedestal Junction Box
B&R TBSF030212 (H200xW300xD120 mm Exe)



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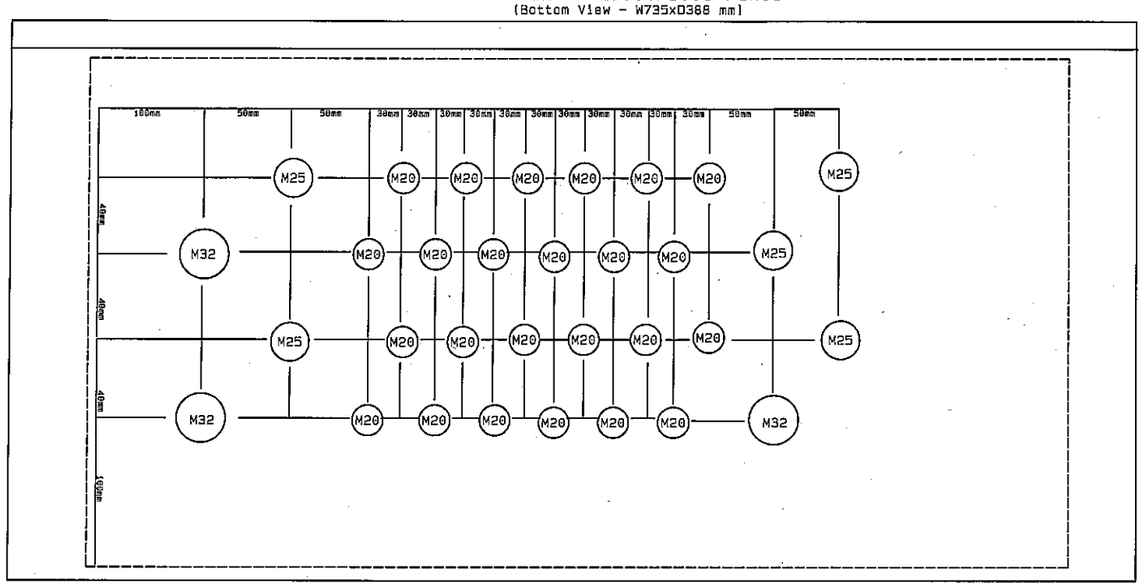
Muhibbah Engineering (M) Bhd

Title: Terminal Block Arrangement
Model: 6/10K
Rev.: B

Sheet	Scale	Serial No.	Weight	Drawing Number
20/21		1845	N/A	MA3-6100.337

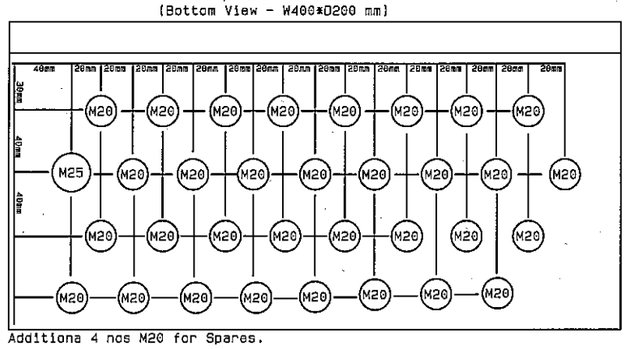
1 2 3 4 5 6 7 8 9 10 11 12 13

X3 Main DC Electrical Panel
(Bottom View - W735xD368 mm)



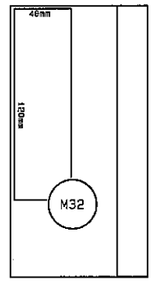
Additional 1 nos. of M32, 3 nos. of M25 & 8 nos. M20 spares

X7 Powerpack Junction Box
(Bottom View - W400*D200 mm)

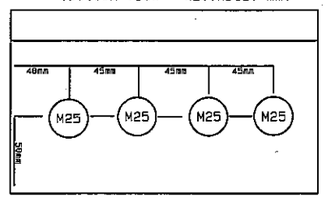


Additiona 4 nos M20 for Spares.

X5 Cabin Console Control Panel
(Left View - H176.5xD91 mm)

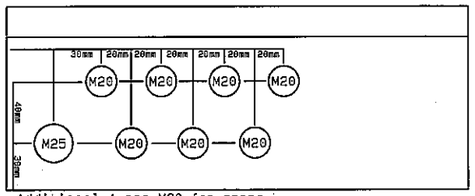


X1/1 Main Power Supply Pedestal Junction Box
(Bottom view - W200xD120 mm)



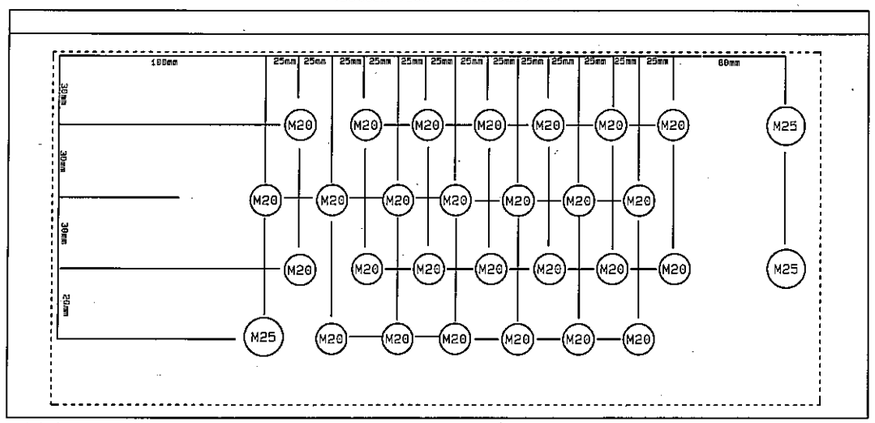
Additional 2 nos. M25 for spare

X6 Winch Junction Box
(Bottom View - W300xD120 mm)



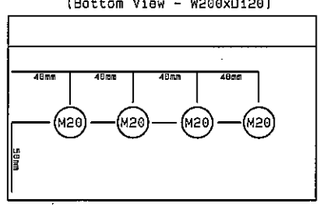
Additional 1 nos M20 for spare

X8 AC Main Electrical Panel
(Bottom View - W581xD280 mm)



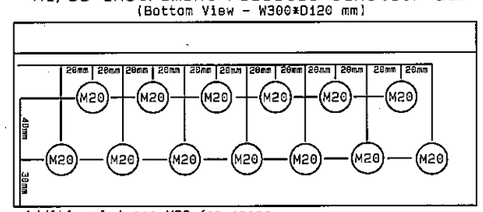
Additional 6 nos of M20 for Spares

X1/2 Navigational Aids Pedestal Junction Box
(Bottom View - W200xD120)



Additional 2 no of M20 hole for spare

X1/33 Instrument Pedestal Junction Box
(Bottom View - W300*D120 mm)



Additional 1 nos M20 for spare

		OOM	Refer Attachment	11.03.13	B
AJS	OOM	MFH	Original Issue	03.12.12	A
Approved	Checked	Drawn	Description	Date	Rev.

Printed: 3/23/2013 Changed: 3/23/2013 9:01:3

FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400 Seremban, Negeri Sembilan Darul Khusus, West Malaysia
(A subsidiary of Mohibbah Engineering (M) Bhd)

Mohibbah Engineering (M) Bhd

Title: Cable Gland Arrangement

Model	Rev.
6/10K	B

Sheet	Scale	Serial No.	Weight	Drawing Number
21/21		1845	N/A	MA3-6100.337

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M610-0337-0000
BOM DESCRIPTION ..: ELECTRICAL SCHEMATIC DIAGRAM
FILENAME .....: M61003370000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER ECN NO. E19476

APPROVED ..: AJS
CHECKED ....: AHA
PREPARED ..: OOM
DATE .....: 11/03/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	BAT	2.00	pcs		AEGA-0008-8000	BATTERY, SEALED LEAD ACID, 12VDC, 200AH			CAT	80.00	
	E1/1, E1/2, E1/34	3.00	pcs		AEAA-0013-4000	Fluorescent light, 2x18W, c/w battery backup, 120VAC, 60Hz,			CEAG, P/N.12260879101,ref i/c 243271		B
	E1/6	2.00	pcs		AEAA-0020-3000	Fluorescent light, 110VAC/47-63Hz, 2x36W, EEx ed			CEAG, Cert. req´d for Zone 1		B
	E1/37	1.00	pcs		AEAA-0029-4000	Fluorescent light, 2x36W, 110VAC, 60Hz, IP56			KESKOM		
	E3/21, E3/22, E3/23, E3/24	4.00	pcs		AEAA-0015-5000	Floodlight, 400W, 120VAC, 60Hz, Eex'de'			Chalmit, Cert. req'd for Zone 1		
	E4/1	1.00	pcs		AEAA-0035-3000	BEACON, FLASHING, XENON, 24VDC, Red, Eexia, IP66 & 67			MEDC, Cert req'd for Zone 0, 1 & 2. (For use in Safe Area, barrier not required), ATEX approved.		B
	E4/21, E4/31	2.00	pcs		AEAA-0036-6000	LED AVIATION LIGHT, 24VDC, 3W, 10cd			PHAROS MARINE, Cert req'd for Zone 1.	6.00	B
	E17, E18, E50	3.00	pcs		AEAB-0002-3000	Indicating light, 20-254VAC/DC, EExde			Stahl, Cert. req´d for Zone 1		B
	E17, E18	2.00	pcs		AEAB-0002-6000	Bezel for Indicating light, green			Stahl, Cert. req'd for Zone 1		
	E50	1.00	pcs		AEAB-0002-7000	Bezel for Indicating light, red			Stahl, Cert. req'd for Zone 1		B
	E21, E22, E23, E24, E25, E26, E27, E28, E29, E30, E31, E32, E33, E34, E35, E36, E37, E38, E39, E40	20.00	pcs		AEAB-0003-5000	Pilot lights, red, EEx d, 5W, max voltage 380V			ADS, Cert. req'd for Zone 1		

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APPROVED ..: AJS
CHECKED ....: AHA
PREPARED ..: OOM
DATE .....: 11/03/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	K1, K2/1, K3	3.00	pcs		AECB-0007-2000	Contactor, 24VDC, 1NO+1NC, 25A			Telemecanique, Included inside enclosure		
	K2/2, K5, K6, K8, K10, K11, K12, K13, K16, K122/1, K122/2, KMF, KR, KHL	14.00	pcs		AECB-0002-0000	Relay, 24VDC, DPDT			Omron, Included Inside Enclosure		B
	K2/2, K5, K6, K8, K10, K11, K12, K13, K16, K122/1, K122/2, KMF, KR, KHL	14.00	pcs		AECB-0005-1000	Socket			Omron, Included Inside Enclosure		B
	LS1, LS2, LS3	3.00	pcs		AECA-0001-4000	Rotary limit switch, 6 contacts			Stromag,		
	P1, P2, P3, P4, P5, P6, P6A	1.00	pcs		M611-1241-0000	SPECIFICATION, S.L.I			FOR CRANE S/N 1845		B
	PMU	1.00	pcs		AEAC-0001-5000	Alarm annuciator, master, 24VDC			Mimic, Included Inside Enclosure		
	PSU1, PSU2, PSU3, PSU4, PSU5	5.00	pcs		AEAC-0001-6000	Alarm annuciator, slave, 4I/O, 24VDC			Mimic, Included Inside Enclosure		
	PMU, PSU1, PSU2,	6.00	pcs		AEAC-0001-7000	Socket, AEM, 11 pin			Mimic, Included Inside Enclosure		

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	PSU3, PSU4, PSU5										
	Q1	1.00	pcs		AECC-0011-1000	Circuit breaker 3-pole 32A			Hager, Included Inside Enclosure		B
	Q2, Q13, Q17	3.00	pcs		AECC-0010-3000	Circuit breaker 2-pole 4A			Hager, Included Insde Enclosure		B
	Q3	1.00	pcs		AECC-0038-0000	CIRCUIT BREAKER, 2-POLE 80A			HAGER, Included inside Enclosure		B
	Q4, Q14, Q15, Q16	4.00	pcs		AECC-0008-8000	MCB, 2A, 2-poles			Hager, Included Inside Enclosure		B
	Q5, Q11	2.00	pcs		AECC-0008-3000	Circuit breaker 2-pole 10A			Hager, Included Inside Enclosure		B
	Q6, Q7, Q8, Q12, Q3A, Q9, Q10	7.00	pcs		AECC-0008-4000	Circuit breaker 2-pole 16A			Hager, Included Inside Enclosure		B
	Q14	1.00	pcs		AECC-0013-5000	MCB, 32A, 2-poles			Hager, Included inside enclosure		B
	S1	1.00	pcs		AEPA-0009-2000	Key selector switch, 1NO, EExde			Stahl, Cert. req'd for Zone 1		
	S2/1	1.00	pcs		AEPA-0029-3000	Emergency Stop Button			Stahl, Cert. req'd for Zone 1		
	S2/2	1.00	pcs		AEPA-0025-3000	Emergency stop w/box, 1NC+1NO,EEX,IP66,RED			Stahl, Cert. req'd for Zone 1		
	S3	1.00	pcs		AEPA-0014-8000	Push button, green, 2NO, EExde			Stahl, Cert. req´d for Zone 1		
	S4	1.00	pcs		AEPA-0025-6000	Push button, red, 1NC, EExde			Stahl, Cert. req´d for Zone 1		
	S5	1.00	pcs		AEPA-0012-6000	Key switch spring return to left, 1NO, Ex-e			Stahl, Cert. req´d for Zone 1		
	S8, S9/1	2.00	pcs		AEPA-0010-1000	Push button, black, 1NO, EExde			Stahl, Cert. req'd for Zone 1		
	S9	1.00	pcs		AEPA-0025-7000	3-position selector switch, 2NO, Eexde			Stahl, Cert. req'd for Zone 1		
	S25, S65	2.00	pcs		AEPA-0010-0000	2-position selector switch, 1NO+1NC, Eexde			Stahl, Cert. req'd for Zone 1		
	S29	1.00	pcs		AEPA-0027-1000	2 Position Selector Switch			Stahl		B
	S50	1.00	pcs		AEPA-0011-2000	Emergency stop with breakglass,EExd, 1NO+1NC			ADS, Cert. req'd for Zone 1		
	S10, S11, S12, S13,	6.00	pcs		AEPA-0012-8000	Selector switch, 1NO, 16A, EEx d, max voltage 500V			ADS, Cert. req'd for Zone 1		

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CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	S14, S15										
	S23, S24, S25	3.00	pcs		AEPA-0012-9000	Push button, black, 1NO+1NC, EExd			ADS, Cert. req'd for Zone 1		
	T1	1.00	pcs		AEGB-0014-2000	TRANSFOMER PRI: 480VAC 3P 60HZ, SEC: 120VAC 1P 60HZ, INPUT CURRENT:9A, OUTPUT CURRENT:66A, 8KVA			QPS, Included Inside Enclosure		B
	T2	1.00	pcs		AEGB-0016-3000	Transformer Pri: 5KVA, 480VAC, 3P 60HZ, Sec:120VAC 1P 60HZ, Input Current:6A, Output Current:41.7A			QPS, Included Inside Enclosure		B
	W201, W8001	20.00	mtr(s)		AEDB-0013-4000	Cable,4C+E x 16mm2, Armoured, Power,Black, 600/1000V			Draka, IEC 60332		
	W202, W203, W204, W205, W206, W207, W208, W803, W806, W806A, W807, W807A, W810, W811, W812, W8002, W8003, W8004, W8005, W8006, W8007, W8008, W800H, W326, W327, W328, W329, W330, W331, W332	470.00	mtr(s)		AEDB-0004-1000	Cable,2C+E x 2.5mm2 Armoured, Power, Black, 600/1000V			Draka, IEC 60332		B
	W801,	40.00	mtr(s)		AEDB-0004-9000	Cable,3C+E x 2.5mm2, Armoured, Power,Black, 600/1000V			Draka, IEC 60332		B

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CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	W802, W804, W805										
	W818, W818B	20.00	mtr(s)		AEDB-0005-2000	Cable,3C+E x 6mm2, Armoured, Power, Black, 600/1000V			Draka, IEC 60332		B
	W818A, W818C	20.00	mtr(s)		AEDB-0006-8000	Cable,2C+E x 16mm2, Armoured, Power,Black, 600/1000V			Draka, IEC 60332		B
	W320, W714, W715	30.00	mtr(s)		AEDB-0004-8000	Cable,3C+E x 1.5mm2, Armoured, Power,Black, 600/1000V			Draka, IEC 60332		
	W321, W322, W323, W324, W325, W333, W701, W702, W703, W704, W705, W706, W707, W708, W709, W710, W711, W712, W713, W717, W718, W719, W720, W721, W722, W723, W724, W725, W726, W727, W728	250.00	mtr(s)		AEDB-0010-8000	Cable, 2C+E x 1.5mm2, Armoured, Power, Black, 600/1000V			Draka, IEC 60332		B
	W3100	10.00	mtr(s)		AEDB-0006-1000	Cable, 7C+E x 1.5mm2, Armoured, Power, Black, 600/1000V			Draka, IEC 60332		

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	W601, W602, W603	30.00	mtr(s)		AEDB-0002-5000	Cable,10C+E x 1.5mm2, Armoured, Power, Black, 600/1000V			Draka, IEC 60332		B
	W901, W314, W813	30.00	mtr(s)		AEDB-0004-3000	Cable,2C+E x 6mm2, Armoured, Power,Black, 600/1000V			Draka, IEC 60332		B
	W600, W900	20.00	mtr(s)		AEDB-0002-8000	Cable,19C+E x 1.5mm2, Armoured, Power,Black, 600/1000V			Draka, IEC 60332		B
	W700, W500	20.00	mtr(s)		AEDB-0003-8000	Cable,27C+E x 1.5mm2, Armoured, Power,Black, 600/1000V			Draka, IEC 60332		B
	X1/1, X1/2	2.00	pcs		AEEX-0033-7000	Junction Box, H200 X W200 X D120, SS 316			B & R, Cert. Req'd for Zone 1		B
	X1/33, X6	2.00	pcs		AEEX-0034-8000	Junction Box, W300 X H200 X D120, SS 316, Exe IIC T6, IP66			B & R, Cert req'd for Zone 1		
	X3	1.00	pcs		AEEX-0015-4000	EEx-d Junction box			ADS, Ext dia. H535xW735xD388		
	X5	1.00	pcs		AEEX-0007-1000	Junction Box, W360 X H175 X D91, IP66, SS316, Eex'e			Stahl, Stainless steel, 176.5x360x91		
	X7	1.00	pcs		AEEX-0033-6000	Junction Box, H300 X W400 X D200, SS 316			B & R		
	X8	1.00	pcs		AEEX-0019-0000	Junction box, W581xH460xD280, aluminium alloy, IP65, Eex'd'			ADS, Cert req'd for Zone 1		
	X20A, X20B	2.00	pcs		AEEX-0015-4000	EEx-d Junction box			ADS, Ext dia. H535xW735xD388		B
	X8.2, X8.20	8.00	pcs		AEDD-0001-2000	Terminal			Phoenix Contact, Included inside enclosure		
	X8.2, X8.20	3.00	pcs		AEDD-0000-2000	Earth connector			Phoenix Contact, Included Inside Enclosure		
	X3, X3.2, X6, X7, X8	162.00	pcs		AEDD-0001-6000	Terminal			Phoenix Contact, Included Inside Enclosure		
	X3, X3.2, X6, X7, X8	60.00	pcs		AEDD-0005-0000	Earth connector			Phoenix Contact, Included Inside Enclosure		
	X3.5/X3.7, X3.6/X3.9	44.00	pcs		AEDD-0005-1000	Terminal, 2 layers			Phoenix Contact, Included Inside Enclosure		
	X3.5/X3.	2.00	pcs		AEDD-0005-2000	Earth connector, 2 layers			Phoenix Contact, Included Inside Enclosure		

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	7, X3.6/X3.9										
	XD1	1.00	pcs		AEDD-0004-9000	Terminal and Diode			Phoenix Contact, Included Inside Enclosure		
	Y1	1.00	pcs		AAKX-0008-4000	Wiper motor, 24VDC c/w 32" Wiper Arm Blade			Doga		
	Y2	1.00	pcs		AAKX-0003-1000	ELECTRIC WINDSHIELD WASHER, 24VDC			DOGA		
	Y5/1, Y5/2	2.00	pcs		AEPC-0000-1000	General purpose outlet, 110VAC, 50/60Hz, 16A, 3-poles, IP67			Mennekes		B
	Y7	1.00	pcs		AEAC-0000-5000	Horn 24VDC 118dB			Seagull,		B
	Y8	1.00	pcs		AEAC-0002-1000	Sounder, 24VDC, Exia			LGM, Cert. req'd for Zone 0		B
	Y9	1.00	unit(s)		AEMX-0002-3000	Air conditioner, 115VAC, 60Hz, 1.25 HP			Seamach		
	Z321, Z322, Z323, Z324, Z325, Z333, Z701, Z702, Z703, Z704, Z705, Z706, Z707, Z708, Z709, Z710, Z711, Z712, Z713, Z717, Z718, Z719, Z720, Z721, Z722, Z723, Z724, Z725, Z726, Z727,	65.00	set(s)		AEQA-0008-2000	Cable gland, M20-0, brass, Eex'de', c/w full accessories			Hawke, Cert. req'd for Zone 1		B

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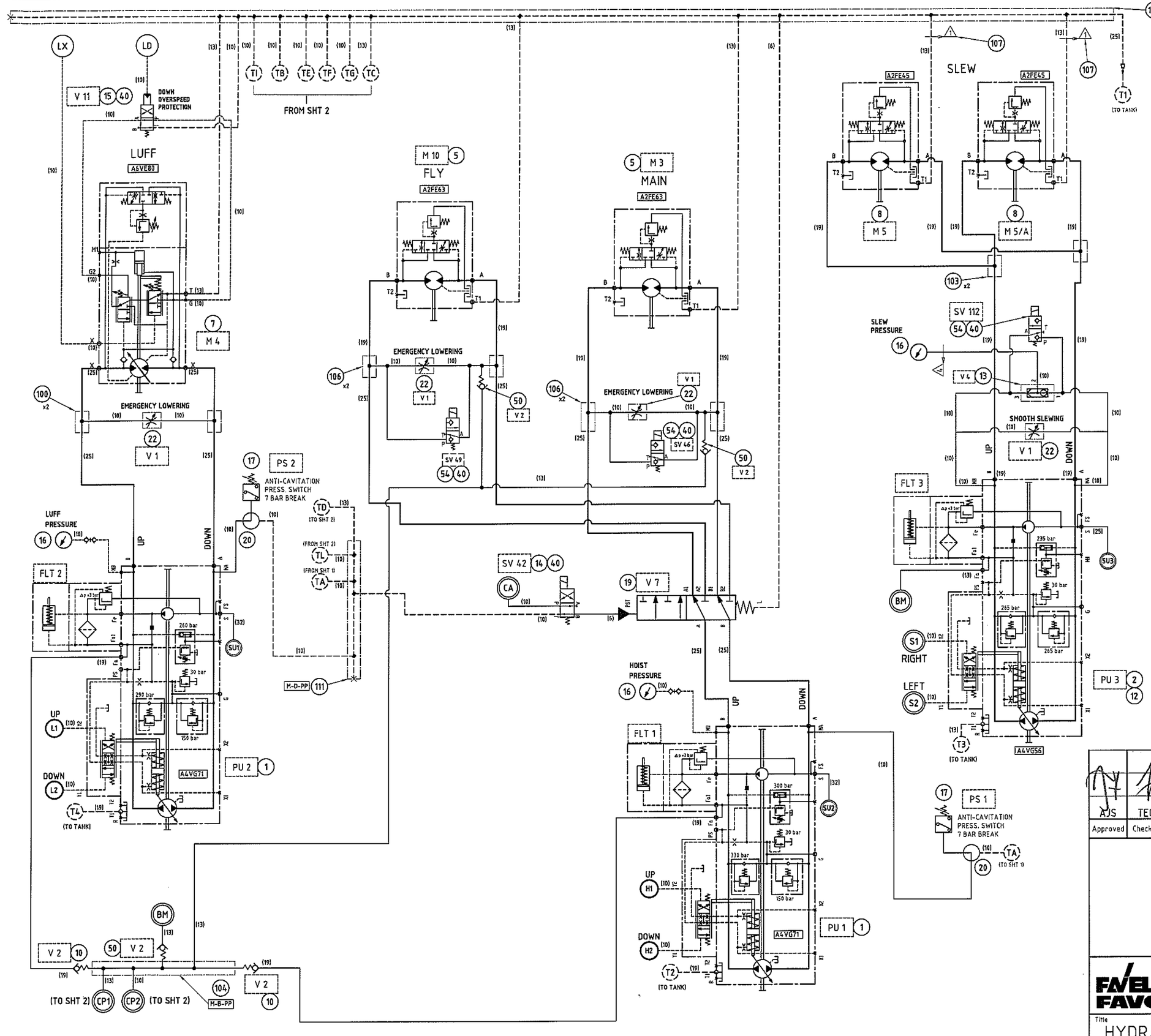
	Z728										
	Z102, Z103, Z104, Z105, Z106, Z107, Z108, Z1002, Z1003, Z1004, Z1005, Z1006, Z1007, Z1008, Z202, Z203, Z204, Z205, Z206, Z207, Z208, Z2002, Z200H, Z2003, Z2004, Z2005, Z2006, Z2007, Z2008, Z8002, Z800H, Z8003, Z8004, Z8005, Z8006, Z8007, Z8008	80.00	set(s)		AEQA-0005-5000	Cable gland, M20-A, brass, Eex'de', c/w full accessories			Hawke, Cert. req'd for Zone 1		B
	Z801, Z802, Z803, Z804, Z805, Z806,	70.00	set(s)		AEQA-0005-5000	Cable gland, M20-A, brass, Eex'de', c/w full accessories			Hawke, Cert. req'd for Zone 1		B

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	Z807, Z810, Z811, Z812, Z813, Z320, Z314, Z714, Z715, Z391, Z901, Z3100, Z818, Z818C, Z326, Z327, Z328, Z329, Z330, Z331, Z332										
	Z101, Z1001, Z201, Z2001, Z8001, Z818A, Z818D, Z360, Z600, Z390, Z900	25.00	set(s)		AEQA-0005-3000	Cable gland, M25, brass, Eex'de', c/w full accessories			Hawke International, Cert. req'd for Zone 1		B
	Z350, Z500, Z700, Z370	7.00	set(s)		AEQA-0005-4000	Cable gland, M32, brass, Eex'de', c/w full accessories			Hawke International, Cert. req'd for Zone 1		B
	ZPLUG	25.00	set(s)		AEQB-0009-2000	Stopping plug, M20, BNP, Eex'd', c/w full accessories			Raxton, Cert. req'd for Zone 1		
	ZPLUG	5.00	set(s)		AEQB-0014-4000	Stopping plug, brass+nickel plated, M25, c/w full accessories			Raxton, Cert req'd for Zone 1		
	ZPLUG	3.00	set(s)		AEQB-0009-4000	Stopping plug, M32, brass + nickel plated, Eex'd', c/w full accessories			Raxton, Cert. req'd for Zone 1		



LUFF PRESSURE SETTINGS

START OF CONTROL	: 16 BAR
P.O.R. SETTING (UP)	: 250 BAR
P.O.R. SETTING (DOWN)	: 140 BAR
MAX. MOTOR SPEED	: 4200 RPM
MAX. DRUM SPEED	: 52.9 RPM
MIN. MOTOR DISP.	: 42.3 CC/REV

DIRECTION OF ROTATION (ANTI-CLOCKWISE PUMP)			
SERIES	SIZE	PILOT/CONTROL PRESSURE	DIRECTION FLOW
A4VG(HD)	28...56	Y_1 or X_1	B To A
		Y_2 or X_2	A To B
A4VG(HD)	70...250	Y_1 or X_1	A To B
		Y_2 or X_2	B To A
A10VG(DG)	ALL	X_1	B To A
		X_2	A To B

	DIESEL ENGINE SPEED	: 2100 RPM
	PUMP SPEED	: 2100 X 1.320 = 2772 RPM
THEOR.	LUFF PUMP FLOW	: 187.0 L/MIN.
	BOOST PUMP FLOW	: 54.3 L/MIN.
	HOIST PUMP FLOW	: 187.0 L/MIN.
	BOOST PUMP FLOW	: 54.3 L/MIN.
	SLEW PUMP FLOW	: 147.5 L/MIN.
	BOOST PUMP FLOW	: 32.2 L/MIN.
	COOLING PUMP FLOW	: 42.1 L/MIN.

Approved	Checked	Drawn	Description	Date	Rev.
		SYZ	(E19220) SEE SHEET 2.	11.01.13	B
AJS	TEO	SYZ	ORIGINAL ISSUE (MODIFIED FROM MA3-6200.281)	08.11.12	A

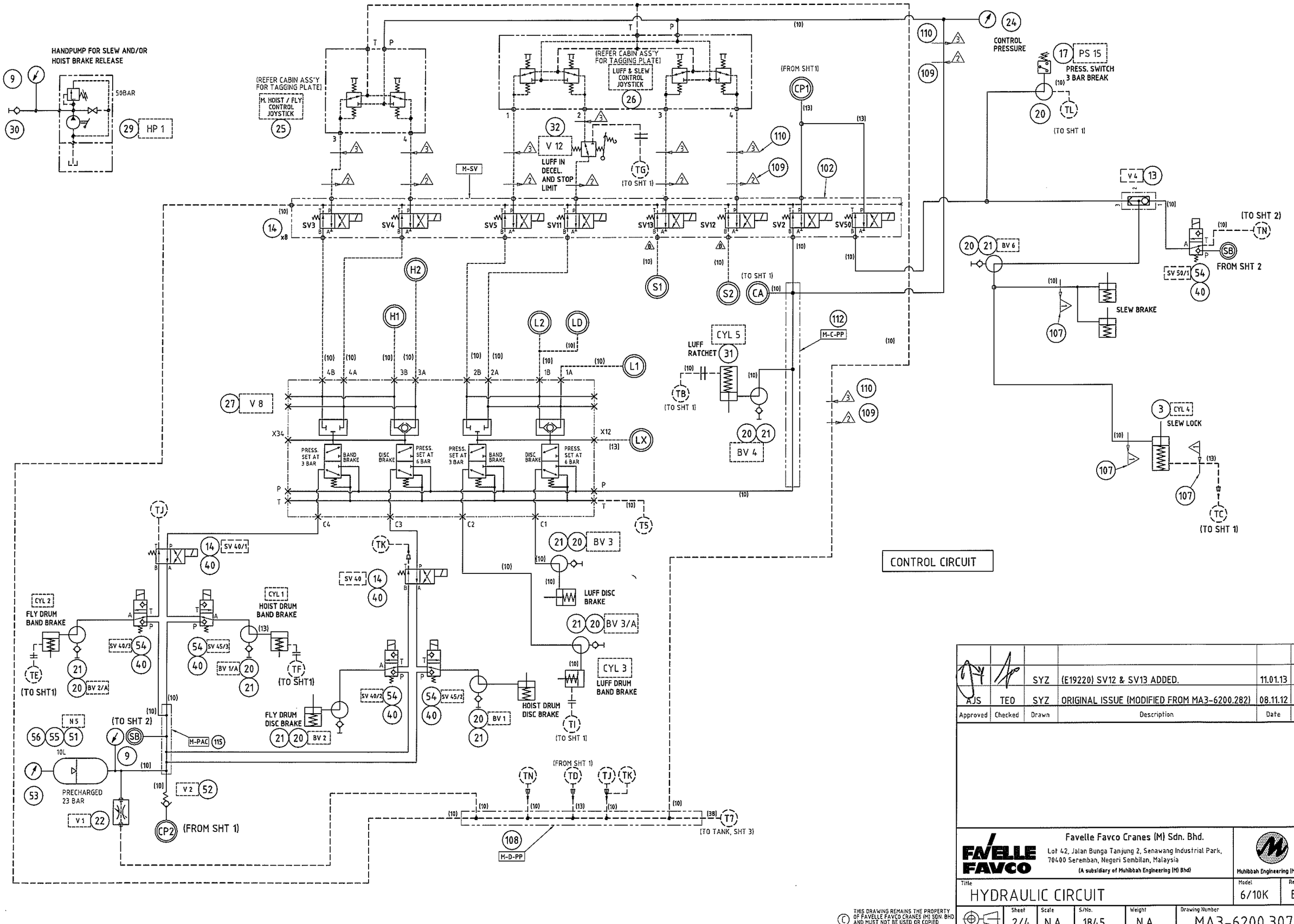
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400 Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title: HYDRAULIC CIRCUIT

Model	Rev.
6/10K	B

Sheet	Scale	S/No.	Weight	Drawing Number
1/4	N.A.	1845	N.A.	MA3-6200.307



Approved	Checked	Drawn	Description	Date	Rev.
		SYZ	(E19220) SV12 & SV13 ADDED.	11.01.13	B
AJS	TED	SYZ	ORIGINAL ISSUE (MODIFIED FROM MA3-6200.282)	08.11.12	A

FAVELLE FAVCO

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Muhibbah Engineering (M) Bhd

Title	Model	Rev.
HYDRAULIC CIRCUIT	6/10K	B

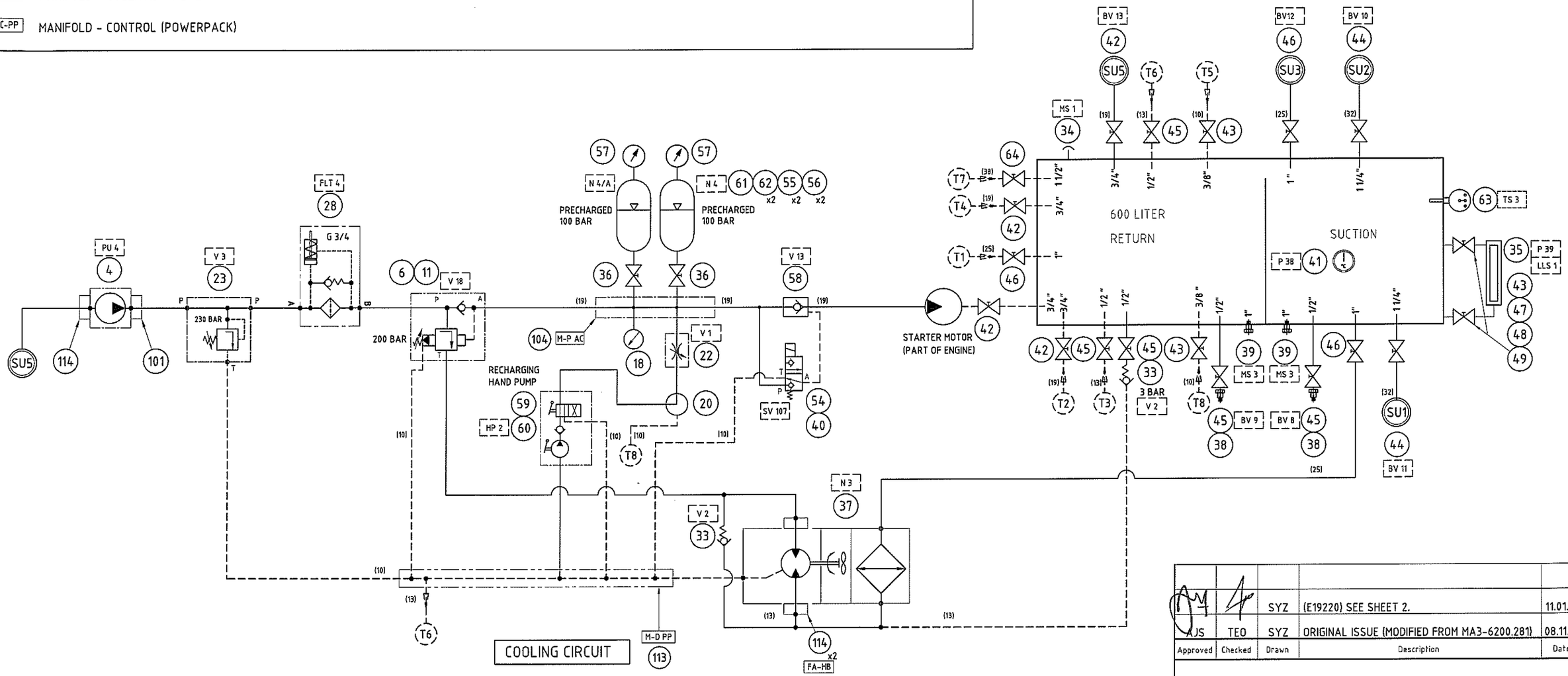
Sheet	Scale	S/No.	Weight	Drawing Number
2/4	N.A.	1845	N.A.	MA3-6200.307

LEGEND:

- 2 — TO POWERPACK DIRECTION
- 2 — FROM POWERPACK DIRECTION
- 1 — TO SLEW WELL DIRECTION (DECK FLR.)
- 1 — FROM SLEW WELL DIRECTION (DECK FLR.)
- 3 — TO CABIN
- 3 — FROM CABIN
- M-SV — MANIFOLD - SOLENOID VALVE
- M-C-PP — MANIFOLD - CONTROL (POWERPACK)
- M-B-PP — MANIFOLD - BOOST (POWERPACK)
- M-D-PP — MANIFOLD - DRAIN (POWERPACK)
- M-P AC — MANIFOLD - ACCUMULATOR
- TO TANK (WINCH)
- MANIFOLD

NOTES:

1. POWERPACK IN SAFE ZONE.
2. E & I IN SAFE ZONE.
3. HYDRAULIC FITTING TO BE ZINC PLATED.
4. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M620-0307-0000.



Approved	Checked	Drawn	Description	Date	Rev.
		SYZ	(E19220) SEE SHEET 2.	11.01.13	B
AJS	TEO	SYZ	ORIGINAL ISSUE (MODIFIED FROM MA3-6200.281)	08.11.12	A

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Muhibbah Engineering (M) Bhd

Title	Model	Rev.
HYDRAULIC CIRCUIT	6/10K	B

Sheet	Scale	S/No.	Weight	Drawing Number
3/4	N.A.	1845	N.A.	MA3-6200.307

LEGEND (MAJOR HYDRAULIC COMPONENTS TAGGING):

COMMON HYDRAULIC COMPONENTS:

PU 1	MAIN HOIST / FLY PUMP
PU 2	LUFF PUMP
PU 3	SLEW PUMP
PU 4	COOLING PUMP
M 3	HOIST MOTOR
M 4	LUFF MOTOR
M 5	SLEW MOTOR
M 5/A	SLEW MOTOR (2ND UNIT)
M 10	FLY MOTOR
CYL 1	BAND BRAKE ACTUATOR (MAIN HOIST)
CYL 2	BAND BRAKE ACTUATOR (FLY)
CYL 3	BAND BRAKE ACTUATOR (LUFF)
CYL 4	SLEW LOCK
CYL 5	LUFF RACHET CYLINDER
HP 1	HAND PUMP (EMERGENCY LOWERING)
HP 2	HAND PUMP (HYDRAULIC START)
V 1	NEEDLE VALVE
V 2	CHECK VALVE
V 3	RELIEF VALVE
V 4	SHUTTLE VALVE
V 7	FLY / MAIN HOIST SELECTOR VALVE
V 8	BRAKE VALVE
V 11	LUFF DOWN OVERSPEED VALVE
V 12	LUFF IN DECEL. VALVE
V 18	UNLOADER VALVE
N 3	OIL COOLER
N 4	HYDRAULIC ACCUMULATOR
N 4/A	HYDRAULIC ACCUMULATOR (2ND UNIT)
N 5	HYDRAULIC ACCUMULATOR (GOP)
FLT 1	HOIST FILTER
FLT 2	LUFF FILTER
FLT 3	SLEW FILTER
FLT 4	COOLING FILTER
P 38	HYDRAULIC OIL TEMPERATURE GAUGE
P 39	HYDRAULIC OIL LEVEL GAUGE
BV 1	MAIN HOIST DISC BRAKE BALL VALVE
BV 1/A	MAIN HOIST BAND BRAKE BALL VALVE
BV 2	FLY DISC BRAKE BALL VALVE
BV 2/A	FLY BAND BRAKE BALL VALVE
BV 3	LUFF DISC BRAKE BALL VALVE
BV 3/A	LUFF BAND BRAKE BALL VALVE
BV 4	LUFF RACHET BALL VALVE
BV 6	SLEW BRAKE BALL VALVE
BV 8	OIL TANK DRAIN VALVE (SUCTION)
BV 9	OIL TANK DRAIN VALVE (RETURN)
BV 10	MAIN HOIST/FLY PUMP SUCTION BALL VALVE
BV 11	LUFF PUMP SUCTION BALL VALVE
BV 12	SLEW PUMP SUCTION BALL VALVE
BV 13	COOLING PUMP SUCTION BALL VALVE
MS 1	FILLER BREATHER
MS 3	MAGNETIC PLUG

HYDRAULIC COMPONENTS WITH ELECTRICAL CONNECTION:

SV 2	MAIN OIL SOLENOID VALVE
SV 3	HOIST UP LIMIT SOLENOID VALVE
SV 4	HOIST DOWN LIMIT SOLENOID VALVE
SV 5	LUFF DOWN LIMIT SOLENOID VALVE
SV 11	LUFF UP LIMIT SOLENOID VALVE
SV40	FLY HOIST BRAKE (DISC/ PRIMARY) SOLENOID VALVE
SV40/1	FLY HOIST BRAKE (BAND/ PRIMARY) SOLENOID VALVE
SV40/2	EMERGENCY FLY HOIST BRAKE RELEASE (DISC)
SV40/3	EMERGENCY FLY HOIST BRAKE RELEASE (BAND)
SV 42	FLY / HOIST SELECT SOLENOID VALVE
SV45/2	EMERGENCY MAIN HOIST BRAKE RELEASE (DISC)
SV45/3	EMERGENCY MAIN HOIST BRAKE RELEASE (BAND)
SV 46	MAIN HOIST LOOP SOLENOID (GOP)
SV 49	FLY HOIST LOOP SOLENOID (GOP)
SV 50	SLEW BRAKE SOLENOID VALVE
TS 3	HYDRAULIC OIL TEMP. SWITCH
SV50/1	SLEW BRAKE EMERGENCY RELEASE SOLENOID
SV 107	HYDRAULIC STARTER SOLENOID VALVE
SV 112	SLEW LOOP SOLENOID VALVE
PS 1	HOIST ANTI-CAVITATION PRESSURE SWITCH
PS 2	LUFF ANTI-CAVITATION PRESSURE SWITCH
PS 15	SLEW BRAKE & LOCK PRESSURE SWITCH
LLS 1	HYDRAULIC OIL LEVEL SWITCH
SV 12	SLEW LEFT LIMIT SOLENOID VALVE (B)
SV 13	SLEW RIGHT LIMIT SOLENOID VALVE (B)

Approved	Checked	Drawn	Description	Date	Rev.
		SYZ	(E19220) SV12 & SV 13 TAGGING ADDED.	11.01.13	B
AJS	TEO	SYZ	ORIGINAL ISSUE (MODIFIED FROM MA3-6200.281)	08.11.12	A

FAVELLE FAVCO

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(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title: HYDRAULIC CIRCUIT

Model: 6/10K

Rev.: B

Sheet	Scale	S/No.	Weight	Drawing Number
4/4	N.A.	1845	N.A.	MA3-6200.307

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M620-0307-0000
BOM DESCRIPTION ..: HYDRAULIC CIRCUIT
FILENAME .....: M62003070000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19220

APPROVED ..: AJS
CHECKED ....: TEO
PREPARED ..: SYZ
DATE .....: 11/01/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	2.00	pcs		AHAX-0009-9000	PUMP, AXIAL PISTON, VARIABLE DISPLACEMENT			REXROTH		
	2	1.00	pcs		AHAX-0008-5000	PUMP, AXIAL PISTON, VARIABLE DISPLACEMENT			REXROTH		
	3	1.00	unit(s)		AHEX-0000-9000	CYLINDER, SINGLE ACTING			POWERMATICS		
	4	1.00	pcs		AHAX-0015-4000	PUMP, GEAR			REXROTH		
	5	2.00	unit(s)		AHBX-0006-2000	MOTOR, AXIAL PISTON, FIXED DISPLACEMENT(REPLACED WITH I/C AHBX-0016-8000)			REXROTH		
	6	1.00	pcs		AHFX-0012-9000	VALVE, UNLOADER			REXROTH		
	7	1.00	unit(s)		AHBX-0006-9000	MOTOR, AXIAL PISTON, VARIABLE DISPLACEMENT			REXROTH		
	8	2.00	unit(s)		AHBX-0005-7000	MOTOR, AXIAL PISTON, FIXED DISPLACEMENT (REPLACED WITH I/C AHBX-0008-6000)			REXROTH		
	9	2.00	pcs		AHPX-0005-5000	GAUGE, PRESSURE			CEJN		
	10	2.00	pcs		AHFX-0003-3000	VALVE, CHECK			REXROTH		
	11	1.00	pcs		AHMX-0000-5000	SUBPLATE			REXROTH		
	12	1.00	pcs		AHRX-0015-2000	PAD, AUXILIARY MOUNTING			REXROTH		
	13	2.00	pcs		AHFX-0011-1000	VALVE, SHUTTLE			REXROTH		
	14	11.00	pcs		AHFX-0004-3000	VALVE, DIRECTIONAL CONTROL			REXROTH		B
	15	1.00	pcs		AHFX-0005-5000	VALVE, DIRECTIONAL			REXROTH		
	16	3.00	pcs		AHPX-0005-3000	GAUGE, PRESSURE			CEJN		
	17	3.00	pcs		AECA-0002-6000	PRESSURE SWITCH			BARKSDALE		
	18	1.00	pcs		AHPX-0005-4000	GAUGE, PRESSURE			CEJN		
	19	1.00	pcs		AHFX-0005-1000	VALVE, MULTIWAY DIRECTIONAL			REXROTH		
	20	12.00	pcs		AHFX-0013-0000	VALVE, BALL, 3 WAY			HYDAC		
	21	8.00	pcs		AHKD-0000-9000	COUPLING, QUICK CONNECT, 3/8 IN BSP MA			M/STEEL		
	22	6.00	pcs		AHFX-0005-2000	VALVE, NEEDLE			HYDAC		
	23	1.00	pcs		AHFX-0010-2000	VALVE, PRESSURE RELIEF			REXROTH		
	24	1.00	pcs		AHPX-0005-2000	GAUGE, PRESSURE			CEJN		
	25	1.00	pcs		AHFX-0012-7000	VALVE, JOYSTICK			REXROTH		
	26	1.00	pcs		AHFX-0012-8000	VALVE, JOYSTICK			REXROTH		
	27	1.00	pcs		M625-0087-0000	VALVE, BRAKE (4 SECTION)					
	28	1.00	pcs		AHGX-0001-0000	FILTER, PRESSURE			HYDAC		

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
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Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M620-0307-0000
BOM DESCRIPTION ..: HYDRAULIC CIRCUIT
FILENAME .....: M62003070000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19220

APPROVED ..: AJS
CHECKED ....: TEO
PREPARED ..: SYZ
DATE .....: 11/01/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	29	1.00	pcs		AHJX-0000-5000	PUMP, HAND			ENERPAC		
	30	1.00	pcs		AHKD-0000-8000	COUPLING, QUICK CONNECT, 3/8 IN BSP FE			M/STEEL		
	31	1.00	pcs		AHEX-0001-2000	CYLINDER, SINGLE ACTING			POWERMATICS		
	32	1.00	pcs		AHFX-0012-0000	VALVE, JOYSTICK			REXROTH		
	33	2.00	pcs		AHFX-0003-6000	VALVE, CHECK			REXROTH		
	34	1.00	pcs		AHHX-0001-2000	FILLER BREATHER			INTERNOMEN		
	35	1.00	pcs		AHPX-0004-2000	GAUGE, LEVEL			HYDAC		
	36	2.00	pcs		AHFX-0015-8000	VALVE, DRAIN, 2 WAY			JUTHYE		
	37	1.00	unit(s)		AHLX-0004-2000	COOLER, OIL			HYDAC		
	38	2.00	pcs		AHKG-0006-0000	PLUG, 1/2 IN BSPP					
	39	2.00	pcs		SKM0-0390-0000	MAGNETIC PLUG ASSEMBLY					
	40	13.00	pcs		AHMX-0000-1000	SUBPLATE			REXROTH		
	41	1.00	pcs		AHPX-0014-8000	GAUGE, TEMPERATURE			WIKA		
	42	4.00	pcs		AHFX-0001-8000	VALVE, LOW PRESSURE BALL			HYDAC		
	43	4.00	pcs		AHFX-0002-2000	VALVE, LOW PRESSURE BALL			HYDAC		
	44	2.00	pcs		AHFX-0001-6000	VALVE, LOW PRESSURE BALL			HYDAC		
	45	5.00	pcs		AHFX-0001-1000	VALVE, LOW PRESSURE BALL			HYDAC		
	46	3.00	pcs		AHFX-0001-4000	VALVE, LOW PRESSURE BALL			HYDAC		
	47	2.00	pcs		AHNX-0001-4000	SWIVEL, 3/8 IN BSPP MA X 9/16 IN JIC FE					
	48	2.00	pcs		SKM0-0334-0000	M12(F) - 3/8" BSPP (M) ADAPTOR					
	49	2.00	pcs		AHKF-0024-2000	NIPPLE, 3/8 IN BSPP MA X 9/16 IN JIC MA					
	50	3.00	pcs		AHFX-0002-9000	VALVE, CHECK			REXROTH		
	51	1.00	unit(s)		AHDX-0001-7000	ACCUMULATOR, 10 LTR			PARKER		
	52	1.00	pcs		AHFX-0004-1000	VALVE, CHECK			REXROTH		
	53	1.00	pcs		AHPX-0013-9000	PRESSURE GAUGE ADAPTOR WITH GAUGE			PARKER		
	54	9.00	pcs		AHFX-0013-5000	VALVE, DIRECTIONAL POPPET			REXROTH		
	55	3.00	pcs		AHDX-0001-1000	ACCUMULATOR, SUPPORT BRACKET			PARKER		
	56	3.00	pcs		AHDX-0001-5000	ACCUMULATOR, CLAMP			PARKER		
	57	2.00	pcs		AHPX-0015-3000	PRESSURE GAUGE ADAPTOR WITH GAUGE			PARKER		

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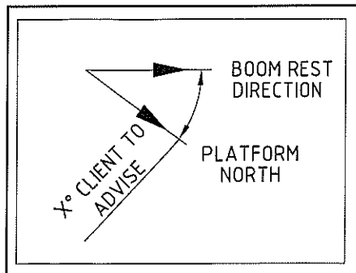
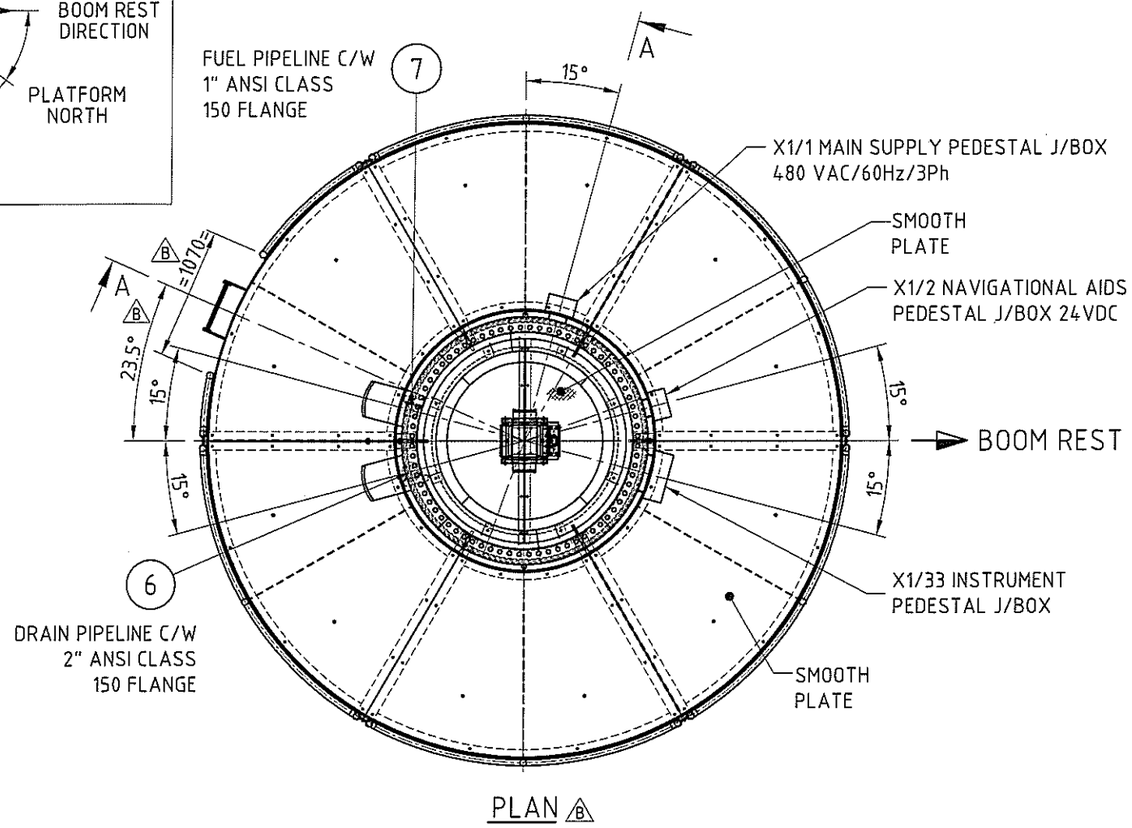
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M620-0307-0000
BOM DESCRIPTION ..: HYDRAULIC CIRCUIT
FILENAME .....: M62003070000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19220

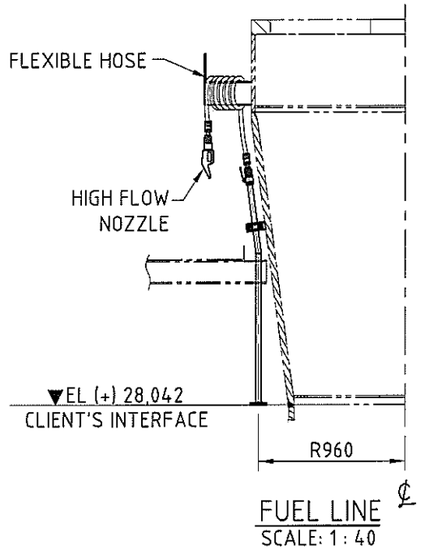
APPROVED ..: AJS
CHECKED ....: TEO
PREPARED ..: SYZ
DATE .....: 11/01/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	58	1.00	pcs		AHFX-0017-1000	VALVE, PILOT CHECK			REXROTH		
	59	1.00	pcs		SKM0-1507-0000	HAND PUMP TANK					
	60	1.00	unit(s)		AHJX-0001-1000	PUMP, HAND			CONTARINI		
	61	1.00	pcs		AHRX-0004-7000	CHARGING SET			PARKER		
	62	2.00	unit(s)		AHDX-0001-6000	ACCUMULATOR, 37 LTR			PARKER		
	63	1.00	pcs		AECA-0004-5000	TEMPERATURE SWITCH			MURPHY		
	64	1.00	pcs		AHFX-0001-5000	VALVE, LOW PRESSURE BALL			HYDAC		
	100	2.00	pcs		M623-0047-0000	FLANGE ADAPTOR 1" SAE CODE 62 - 3/8"			LUFF MOTOR		
	101	1.00	pcs		SKM0-0159-0001	FLANGE CLAMP ADAPTOR			COOLING PUMP		
	102	1.00	pcs		M623-0006-0800	SOLENOID VALVE MANIFOLD					B
	103	2.00	pcs		M623-0160-0000	SLEW MANIFOLD			DECK FLOOR		
	104	2.00	pcs		M962-3005-0400	3/4" - 1/2" MANIFOLD			POWERPACK		
	105	1.00	pcs		M623-0219-0000	DRAIN MANIFOLD			WINCH		
	106	4.00	pcs		M623-0048-0000	3/4" CODE 62 MANIFOLD - 6000 PSI			MAIN/FLY MOTOR		
	107	2.00	pcs		M623-0201-0000	SLEW DRIVE BULKHEAD MANIFOLD			DECK FLOOR		
	108	1.00	pcs		M623-0216-0000	DRAIN MANIFOLD					
	109	1.00	pcs		M623-0343-0000	BULKHEAD MANIFOLD			POWERPACK FLOOR		
	110	1.00	pcs		M623-0342-0000	BULKHEAD MANIFOLD			CABIN		
	111	1.00	pcs		M623-0003-0400	1/2" - 3/8" BSPP MANIFOLD			POWERPACK		
	112	1.00	pcs		M962-3001-0300	3/8" BSPP MANIFOLD			POWERPACK		
	113	1.00	pcs		M623-0003-0600	1/2" - 3/8" BSPP MANIFOLD			POWERPACK		
	114	3.00	pcs		SKM0-0159-0002	FLANGE CLAMP ADAPTOR			OIL COOLER MOTOR, COOLING PUMP		
	115	1.00	pcs		M623-0003-0500	1/2" - 3/8" BSPP MANIFOLD			POWERPACK		

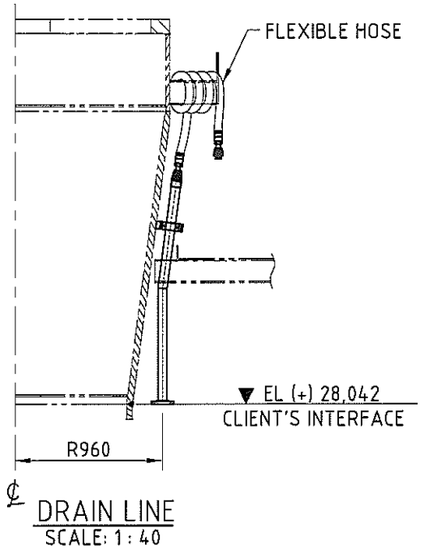




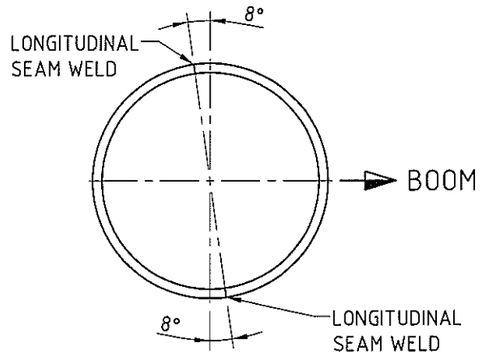
PLAN B



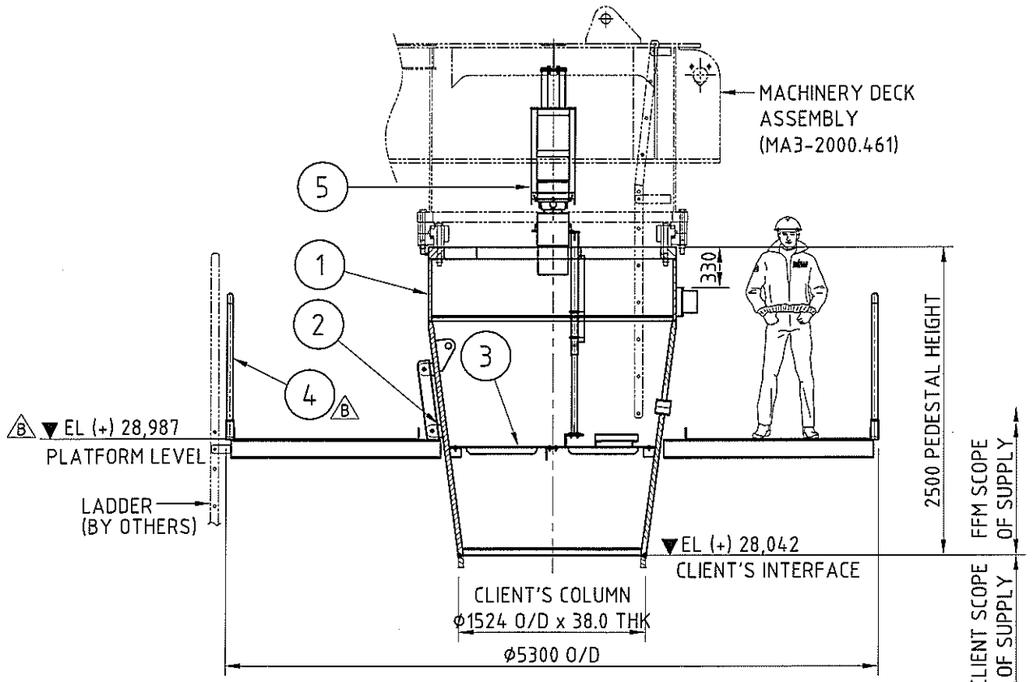
FUEL LINE
SCALE: 1 : 40



DRAIN LINE
SCALE: 1 : 40



WELDING ORIENTATION FOR
PEDESTAL ADAPTOR (CONE)
SCALE: 1 : 40



SECTION A-A B
(JACKING PADS NOT SHOWN FOR CLARITY)

NOTES

1. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M700-0341-0000.

		RIZ	(E19231) PLAN, SECTION A-A & ITEM 4 UPDATED. SECTION B-B REMOVED. TOTAL WEIGHT WAS 7276 kg.	16.01.13	B
AJS	MEZ	RIZ	ORIGINAL ISSUE (MODIFIED FROM MA3-7000.272)	15.10.12	A
Approved	Checked	Drawn	Description	Date	Rev.

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400, Seremban, Negeri Sembilan, Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
PEDESTAL ASSEMBLY	6/10K	B

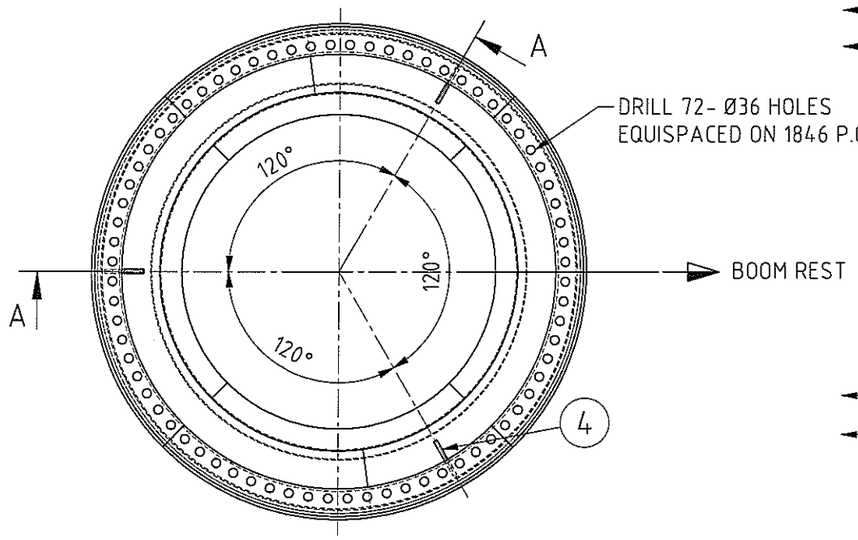
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 50	1845	~6995 B kg	MA3-7000.341

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

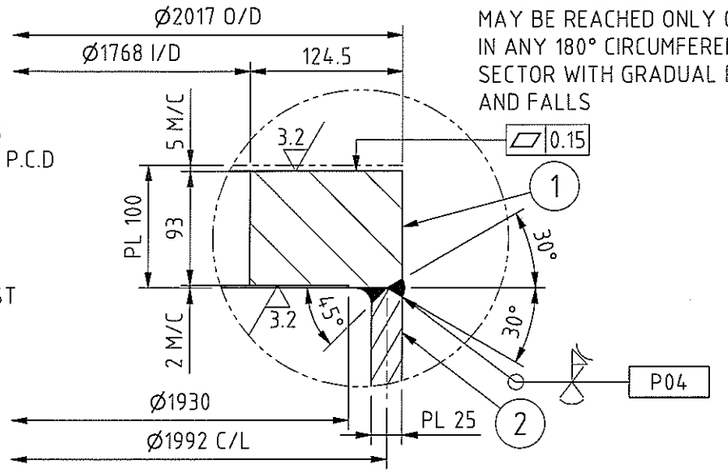
ITEM CODE (BOM No) : M700-0341-0000
BOM DESCRIPTION ..: PEDESTAL ASSEMBLY
FILENAME .....: M70003410000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19231

APPROVED ..: AJS
CHECKED ....: MEZ
PREPARED ..: RIZ
DATE .....: 16/01/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M710-0296-0000	PEDESTAL ADAPTOR WELDING DETAILS				4,726.00	
	2	1.00	pcs		M710-1144-0000	PEDESTAL BRACKET & SUPPORT ARRANGEMENT				65.00	B
	3	1.00	pcs		M720-1389-0000	PEDESTAL INTERNAL PLATFORM				141.00	
	4	1.00	pcs		M720-1400-0000	PEDESTAL EXTERNAL PLATFORM				1,865.00	B
	5	1.00	pcs		M730-0243-0000	SLIP RING ASSEMBLY				178.00	
	6	1.00	pcs		M712-1149-0200	DRAIN LINE ASSEMBLY				12.00	
	7	1.00	pcs		M712-1148-0100	FUEL LINE ASSEMBLY				7.50	

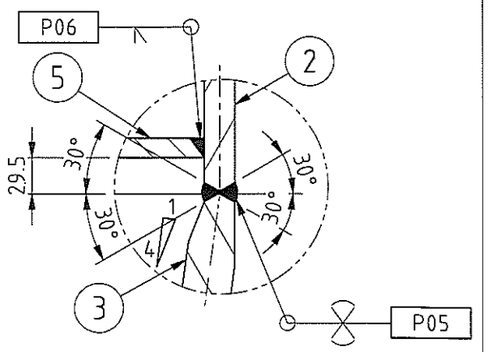


PLAN VIEW
SCALE: 1 : 25

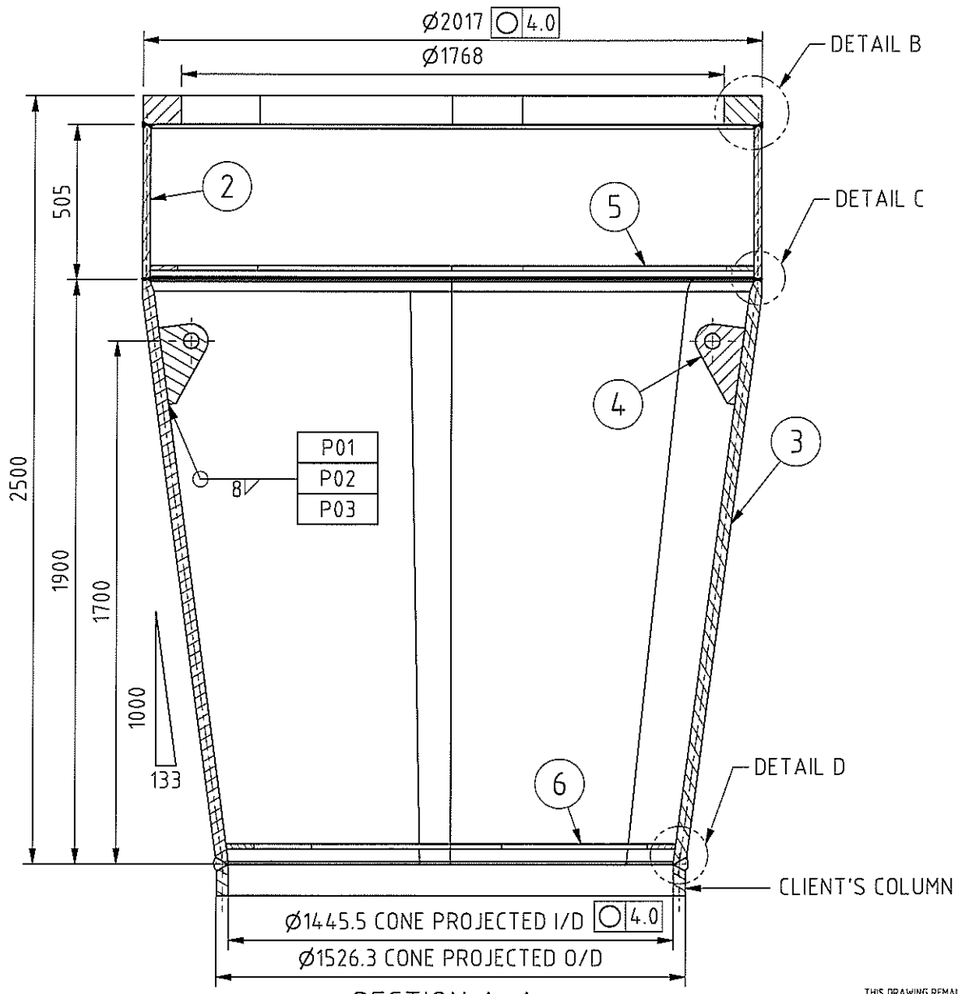


DETAIL B
SCALE: 1 : 5

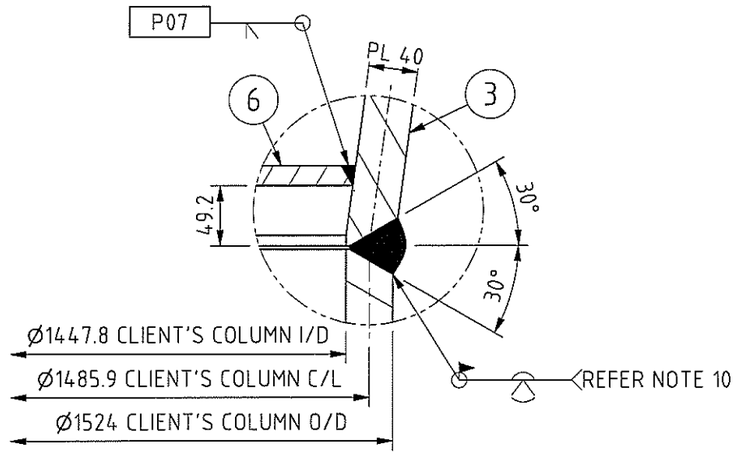
MAXIMUM MEASURED VALUE MAY BE REACHED ONLY ONCE IN ANY 180° CIRCUMFERENTIAL SECTOR WITH GRADUAL RISES AND FALLS



DETAIL C
SCALE: 1 : 5



SECTION A-A



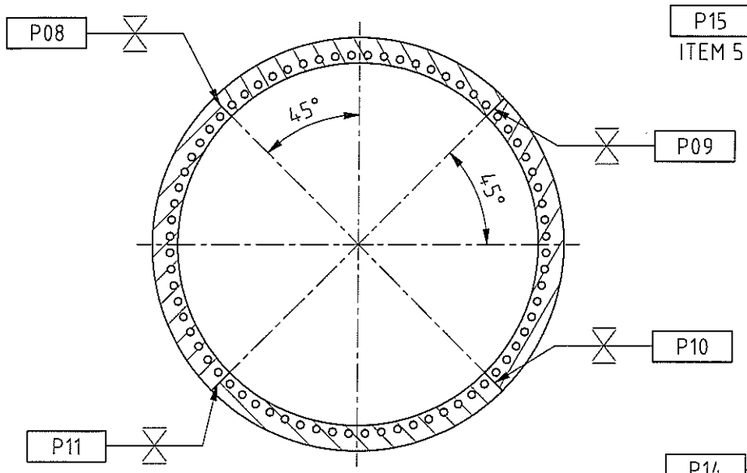
DETAIL D
SCALE: 1 : 5

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤1000	± 1	≤ 30	± 0.2
> 1000 , ≤2000	± 2	> 30 , ≤100	± 0.3
> 2000 , ≤3000	± 3	> 100 , ≤300	± 0.5
> 3000 , ≤6000	± 4	> 300 , ≤1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

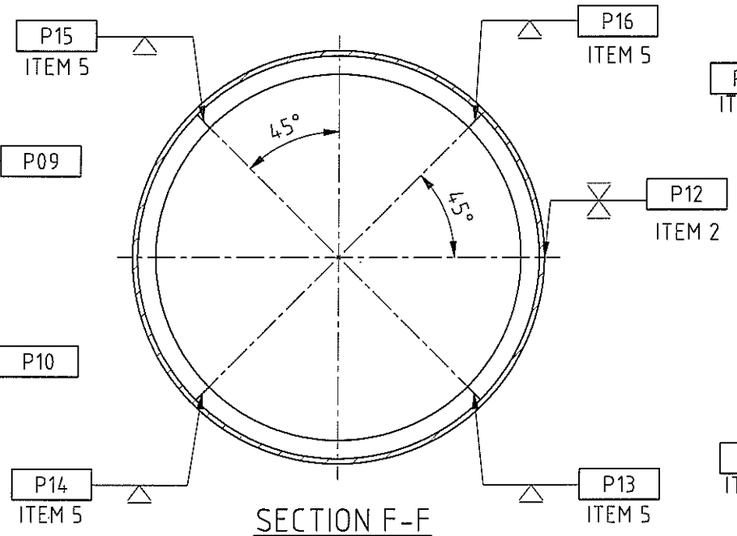
Approved	Checked	Drawn	Description	Date	Rev.
		RIZ	ORIGINAL ISSUE (MODIFIED FROM MA3-7100.263)	16.10.12	A

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400 Senawang, Negeri Sembilan, West Malaysia.
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

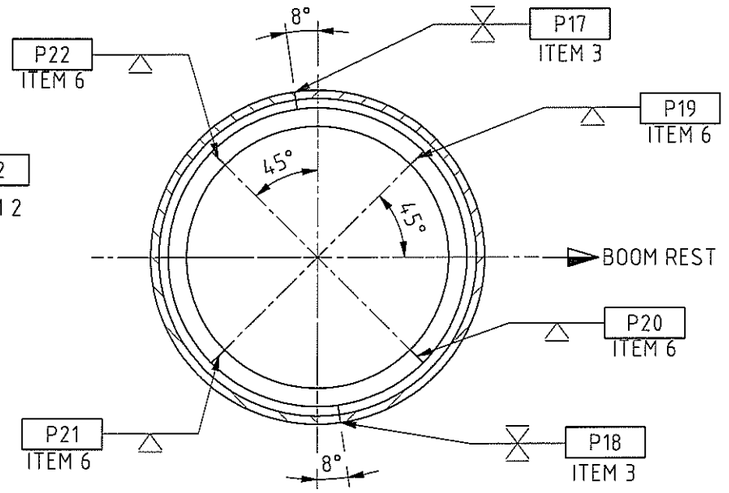
Title: PEDESTAL ADAPTOR WELDING DETAILS
Model: 6/10K
Rev: A
Sheet: 1/3
Scale: 1 : 20
S/No: 1845
Weight: ~ SHT.3
Drawing Number: MA3-7100.296



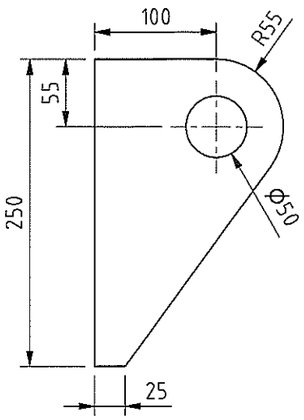
SECTION E-E



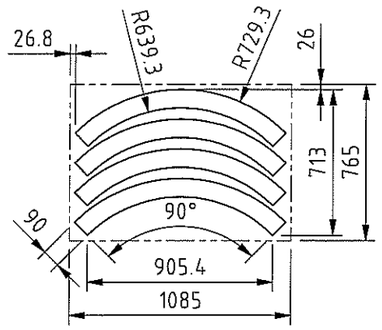
SECTION F-F



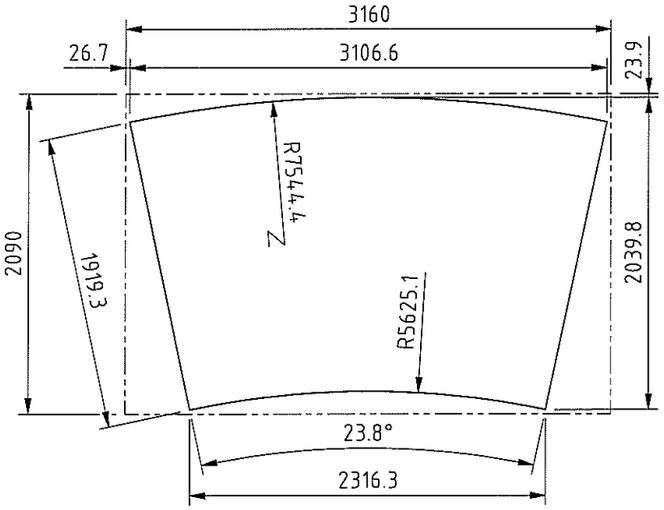
SECTION G-G



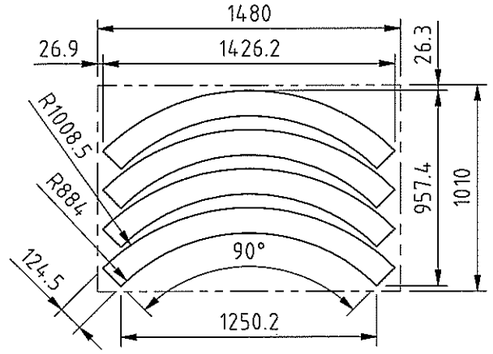
ITEM 4
SCALE: 1 : 5



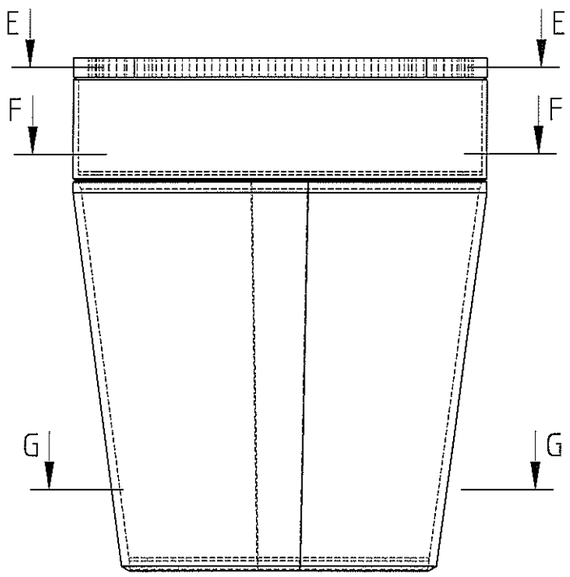
DEVELOPMENT FOR ITEM 6



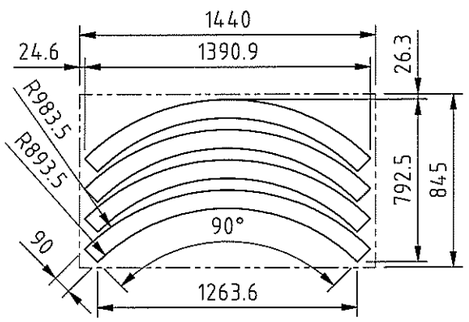
DEVELOPMENT OF ITEM 3
SCALE: 1 : 40



DEVELOPMENT FOR ITEM 1



ELEVATION FOR
PEDESTAL WELDING



DEVELOPMENT FOR ITEM 5

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤1000	± 1	≤ 30	± 0.2
> 1000 , ≤2000	± 2	> 30 , ≤100	± 0.3
> 2000 , ≤3000	± 3	> 100 , ≤300	± 0.5
> 3000 , ≤6000	± 4	> 300 , ≤1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

Approved	Checked	Drawn	Description	Date	Rev
		RIZ	ORIGINAL ISSUE (MODIFIED FROM MA3-7100.263)	16.10.12	A

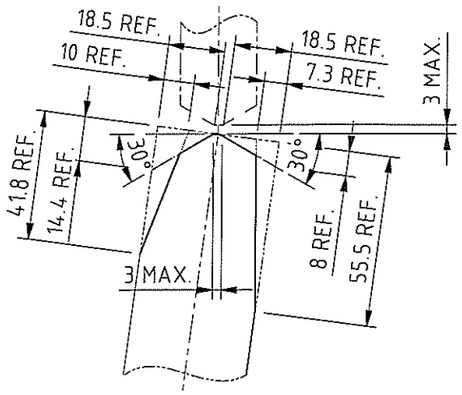
FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park,
70400 Senawang, Negeri Sembilan, West Malaysia.
(A subsidiary of Muhibbah Engineering (M) Bhd)

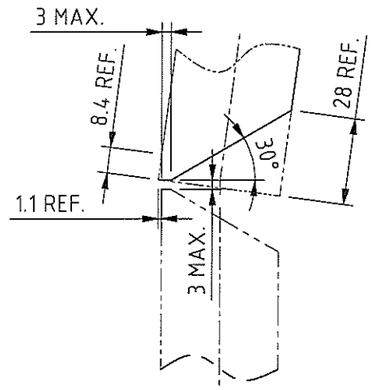
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
PEDESTAL ADAPTOR WELDING DETAILS	6/10K	A

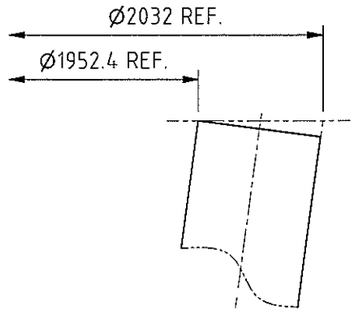
Sheet	Scale	S/No	Weight	Drawing Number
2/3	1 : 30	1845	~ SHT.3	MA3-7100.296



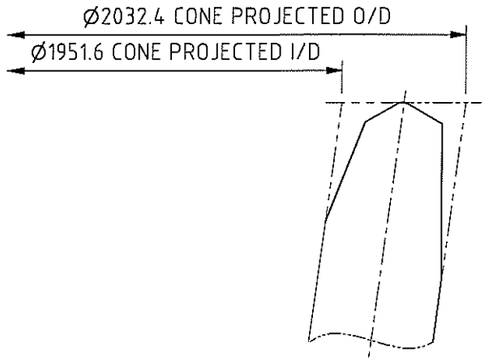
CONE TOP PROFILE DETAIL FOR ITEM 3



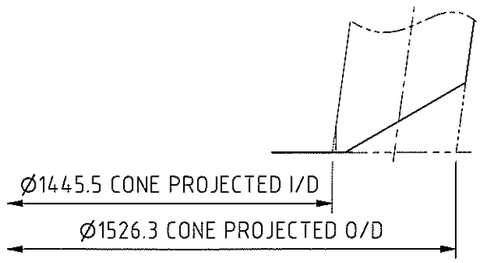
CONE BOTTOM PROFILE DETAIL FOR ITEM 3



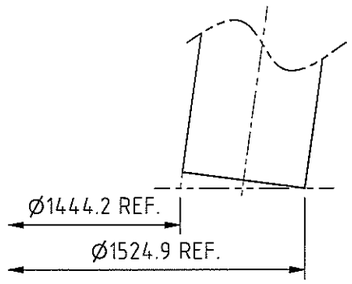
CONE TOP DETAIL AFTER ROLLING



CONE TOP DETAIL AFTER PROFILING



CONE BOTTOM DETAIL AFTER PROFILING



CONE BOTTOM DETAIL AFTER ROLLING

NOTES
1. ALL WELDING & WELD PREPARATION TO BE IN ACCORDANCE WITH AWS.D1.1 LATEST EDITION.
2. FOR WELD PROCEDURE & NON DESTRUCTIVE TESTING REFER TO WELD & NDT SCHEDULE WNS-M7100.296
3. LONGITUDINAL BUTT WELDS IN BARREL MUST BE LOCATED AS FAR AS POSSIBLE FROM FLANGE JOINT WELDS. SEAM LOCATIONS TO BE SUBMITTED
4. FLATNESS OF MOUNTING SURFACE TO BE VERIFIED AFTER INSTALLATION OF PEDESTAL AND PRIOR TO ASSEMBLY WITH SLEW RING
5. STEELWORK TO BE PREPARED TO FAVCO SPEC.E010 PRIOR TO PAINTING
6. FLAME CUT SURFACES SHOULD BE UNIFORM AND CLEAN BEFORE WELDING
7. UNLESS NOTIFIED OTHERWISE, ALL WELDS TO BE 8mm CONTINUOUS FILLET WELDS.
8. ITEMS MARKED CATEGORY 'P' (PRIMARY) IN THE BOM REQUIRE MATERIAL TRACEABILITY TO MECHANICAL AND CHEMICAL CERTIFICATES.FOR CHARPY IMPACT REQUIREMENTS REFER TO THE APPLICABLE CONTRACT DESIGN SPECIFICATION.
9. THE ORIENTATION OF THE PEDESTAL MUST BE MAINTAINED FOR THE CUT AND SUBSEQUENT JOINT.
10. OVERALL LEVELNESS OF SLEW RING MOUNTING FLANGE SHALL BE WITHIN 0.5 DEGREE FROM ABSOLUTE HORIZONTALITY AFTER FINAL INSTALLATION TO CLIENT STRUCTURE.
11. FOR BILL OF MATERIAL (BOM), REFER TO BOM NO. M710-0296-0000.
12. MATERIAL FOR PEDESTAL ADAPTOR FLANGE SHALL BE CHECKED FOR THROUGH THICKNESS PROPERTY.

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤1000	± 1	≤ 30	± 0.2
> 1000 , ≤2000	± 2	> 30 , ≤100	± 0.3
> 2000 , ≤3000	± 3	> 100 , ≤300	± 0.5
> 3000 , ≤6000	± 4	> 300 , ≤1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

Approved	Checked	Drawn	Description	Date	Rev.
		RIZ	ORIGINAL ISSUE (MODIFIED FROM MA3-7100.263)	16.10.12	A

FAVELLE FAVCO
Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Persiaran Bunga Tanjung 2, Senawang Industrial Park, 70400 Senawang, Negeri Sembilan, West Malaysia.
(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev
PEDESTAL ADAPTOR WELDING DETAILS	6/10K	A

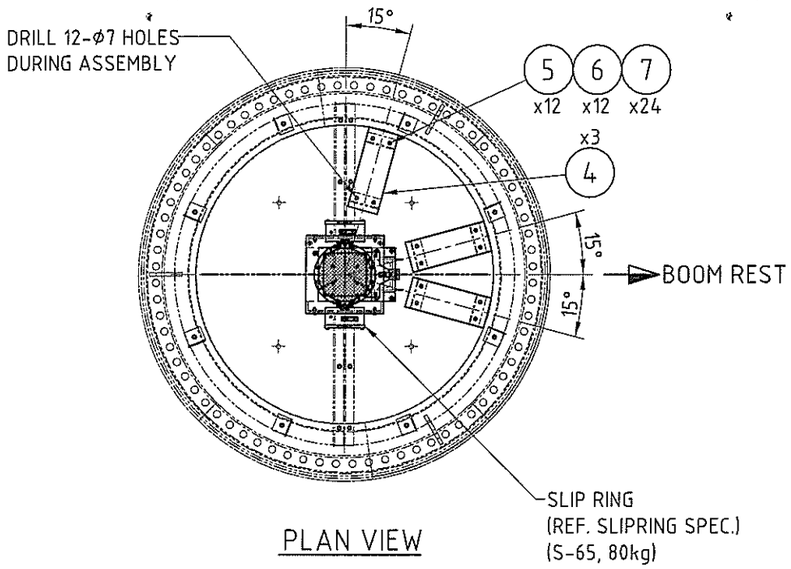
Sheet	Scale	S/No	Weight	Drawing Number
3/3	1 : 2	1845	~4512 kg	MA3-7100.296

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

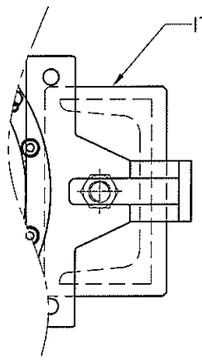
ITEM CODE (BOM No) : M710-0296-0000
BOM DESCRIPTION ..: PEDESTAL ADAPTOR WELDING DETAILS
FILENAME .....: M71002960000B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E19075

APPROVED ..: AJS
CHECKED ....: MEZ
PREPARED ..: MNZ
DATE .....: 06/12/12
SN .....: 1845

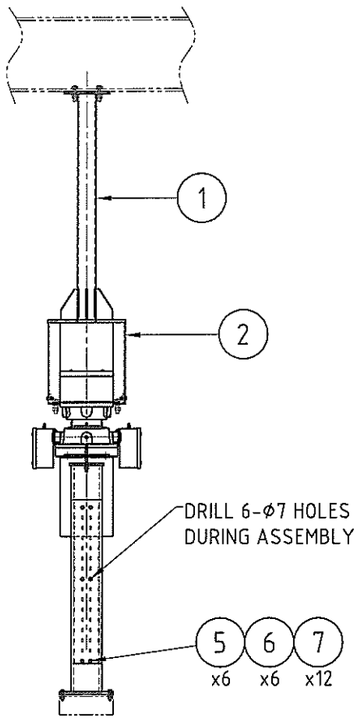
CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
P	1	491.10	kg(s)	1	ASP1-0000-0142	PL100	1,480	1,010	CHARPY TEMP: -20℃	491.10	B
P	2	620.00	kg(s)	1	ASP0-2500-0142	PL25	6,258	505	CHARPY TEMP: -20℃	620.00	B
P	3	3,276.10	kg(s)	2	ASP0-4000-0142	PL40	3,160	2,090	CHARPY TEMP: -20℃	3,276.10	B
P	4	9.30	kg(s)	3	ASP0-1600-0142	PL16	250	155	CHARPY TEMP: -20℃	9.30	B
P	5	66.70	kg(s)	1	ASP0-1600-0142	PL16	1,440	845	CHARPY TEMP: -20℃	66.70	B
P	6	48.80	kg(s)	1	ASP0-1600-0142	PL16	1,085	765	CHARPY TEMP: -20℃	48.80	B



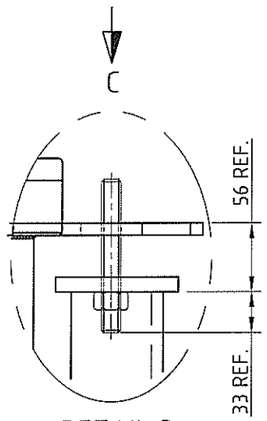
PLAN VIEW



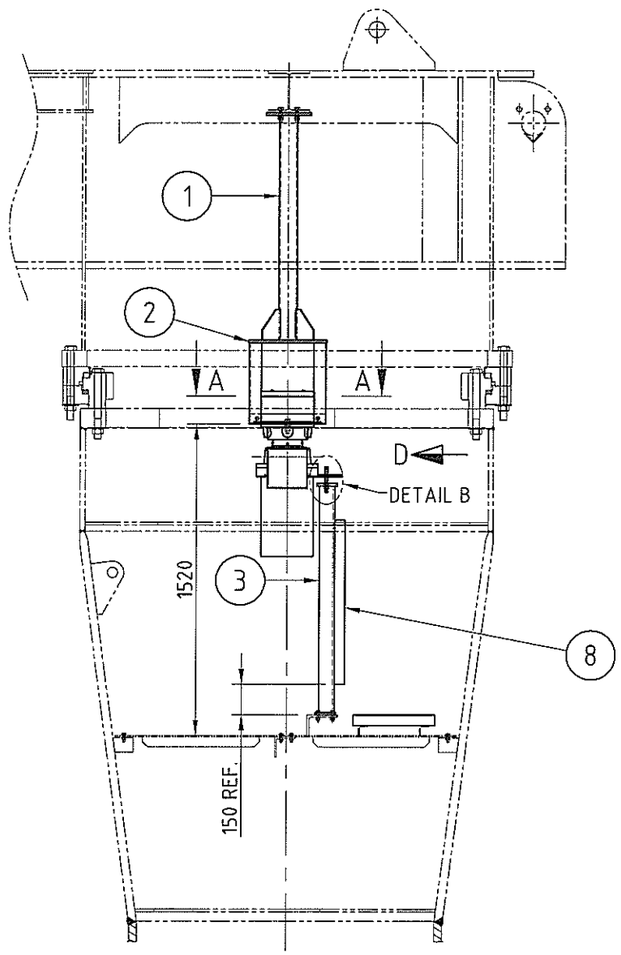
VIEW C
SCALE: 1 : 5



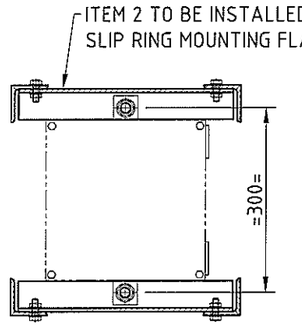
VIEW D



DETAIL B
SCALE: 1 : 5



ELEVATION VIEW



SECTION A-A
SCALE: 1 : 10

NOTES

1. UNLESS OTHERWISE NOTED ALL WELDING IS TO BE IN ACCORDANCE WITH AWS D1.1 (LATEST EDITION)
2. ALL WELDED JOINTS TO BE 6mm CONTINUOUS FILLET WELDS U.N.O.
3. BILL OF MATERIAL (BOM), REFER TO BOM NO. M730-0243-0000.

Approved	Checked	Drawn	Description	Date	Rev.
		RIZ	ORIGINAL ISSUE (MODIFIED FROM MA3-7300.242)	22.03.13	A

TOLERANCE UNLESS NOTED OTHERWISE			
FABRICATION		MACHINING	
≤ 1000	± 1	≤ 30	± 0.2
> 1000 , ≤ 2000	± 2	> 30 , ≤ 100	± 0.3
> 2000 , ≤ 3000	± 3	> 100 , ≤ 300	± 0.5
> 3000 , ≤ 6000	± 4	> 300 , ≤ 1000	± 0.8
> 6000	± 5	> 1000	± 1.2
ANGLE ± 1°			

Favelle Favco Cranes (M) Sdn. Bhd.
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(A subsidiary of Muhibbah Engineering (M) Bhd)
Muhibbah Engineering (M) Bhd

Title	Model	Rev.
SLIP RING ASSEMBLY	6/10K	A

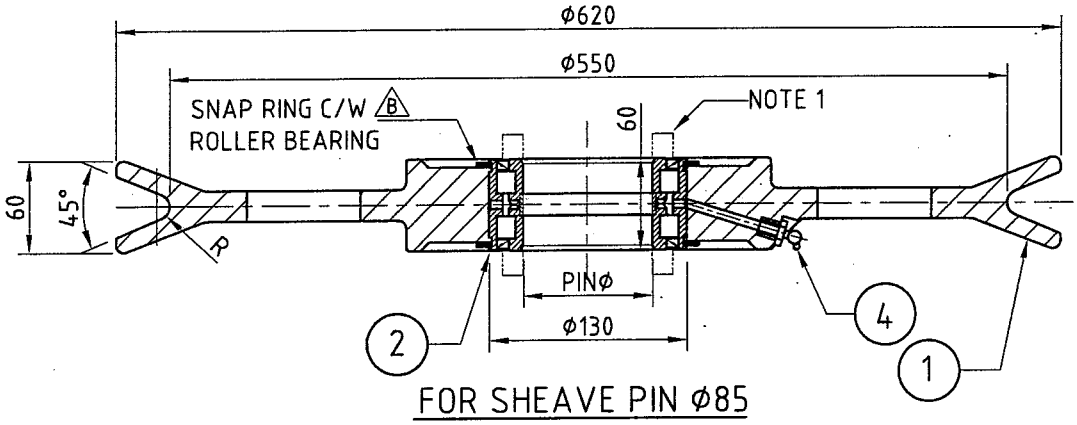
Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 30	1845	~ 158kg	MA3-7300.243

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

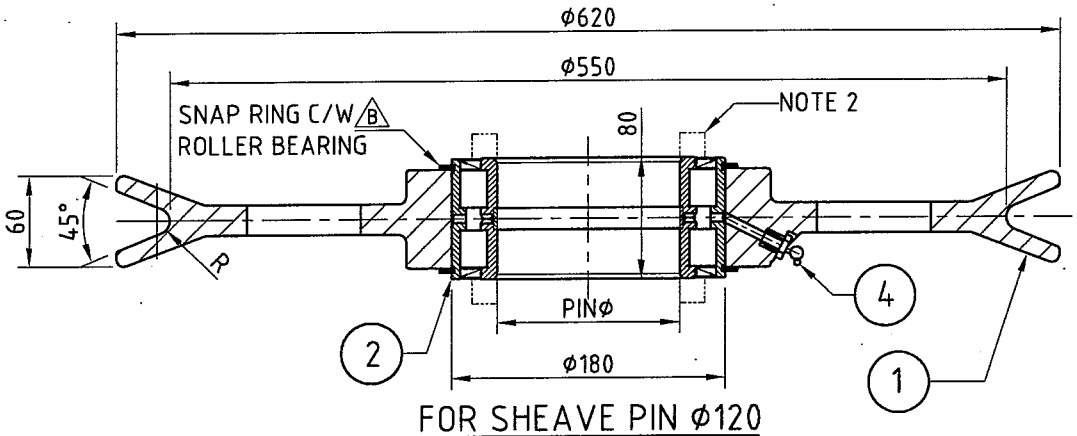
ITEM CODE (BOM No) : M730-0243-0000
BOM DESCRIPTION ..: SLIP RING ASSEMBLY
FILENAME .....: M73002430000A
CURRENT REV .....: A
REV DESCRIPTION ...: ORIGINAL ISSUE (MATERIAL LIST FOR DRAWING NO. MA3-7300.243)

APPROVED ..: AJS
CHECKED ....: KAN
PREPARED ..: RIZ
DATE .....: 22/03/13
SN .....: 1845

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M7301-0308-004	SLIP RING MOUNTING BRACKET DETAILS (ADJUST)				20.00	
	2	1.00	pcs		M730-1306-0000	SLIPRING MOUNTING BRACKET DETAILS				25.00	
	3	1.00	pcs		M730-1307-0000	SLIP RING SUPPORT BRACKET DETAILS				31.00	
	4	1.20	mtr(s)	3	AEQC-3250-150Y	CABLE TRAY:150MM X 50MM X 1.2MMT	400			1.20	
	5	18.00	pcs		AFBM-0602-5X02	SCREW, HEX, M6 X 1 X 25					
	6	18.00	pcs		AFNM-0600-0X02	NUT, HEX, M6 X 1					
	7	36.00	pcs		AFWM-0600-0X02	WASHER, FLAT, M6					
	8	0.80	mtr(s)	1	AEQC-3250-150Y	CABLE TRAY:150MM X 50MM X 1.2MMT	800			0.80	



FOR SHEAVE PIN ϕ85



FOR SHEAVE PIN ϕ120

SHEAVES ϕ620/ϕ550						
DRAWING No.	ITEM 1	ITEM 2	R	PIN ϕ	kg	BOM NO. B
MA4-9510.064.001	MA3-9511.038.001	SL04 5017 2NR	8.5	85	59.1	M951-0064-0100
MA4-9510.064.002	MA3-9511.038.002	SL04 5024 2NR		120	61.5	M951-0064-0200
MA4-9510.064.003	MA3-9511.038.003	SL04 5017 2NR	10.5	85	57.8	M951-0064-0300
MA4-9510.064.004	MA3-9511.038.004	SL04 5024 2NR		120	60.2	M951-0064-0400
MA4-9510.064.005	MA3-9511.038.005	SL04 5017 2NR	13.0	85	56.4	M951-0064-0500
MA4-9510.064.006	MA3-9511.038.006	SL04 5024 2NR		120	58.8	M951-0064-0600
MA4-9510.064.007	MA3-9511.038.007	SL04 5017 2NR	15.0	85	55.3	M951-0064-0700
MA4-9510.064.008	MA3-9511.038.008	SL04 5024 2NR		120	57.7	M951-0064-0800

NOTES

1. SEALS MUST BE ADEQUATELY SUPPORTED BY SPACER WITH MINIMUM OD 112MM.
2. SEALS MUST BE ADEQUATELY SUPPORTED BY SPACER WITH MINIMUM OD 153MM.

B 3. FOR BILL OF MATERIAL (BOM) REFER TO TABLE.

Approved	Checked	Drawn	Description	Date	Rev.
AM	Chuhfg	NANI	(E14849) NOTE 3 ADDED, TABLE UPDATED. ITEM 3 REMOVED. MATERIAL LIST REMOVED	11.11.09	B
AY	AJS	AIM	ORIGINAL ISSUE	30.10.06	A

FAVELLE FAVCO

Favelle Favco Cranes (M) Sdn. Bhd.
Lot 42, Jalan Bunga Tanjung 2, Senawang Industrial Park, 70400 Senawang, Seremban Negeri Sembilan, West Malaysia
(A subsidiary of Muhibbah Engineering (M) Bhd)

Muhibbah Engineering (M) Bhd

Title	Model	Rev.
SHEAVE ϕ620/ϕ550 ASSEMBLY	STD	B

Sheet	Scale	S/No.	Weight	Drawing Number
1/1	1 : 5	STD	~REF	MA4-9510.064.XXX

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M951-0064-0100
BOM DESCRIPTION ..: SHEAVE DIA 620/DIA 550 ASSEMBLY
FILENAME .....: M95100640100B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO. E14849

APPROVED ..: AJS
CHECKED ....: HAH
PREPARED ..: YANA
DATE .....: 11/11/09
SN .....: STD

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M951-1038-0100	MACHINING, SHEAVE, 620DIA/550DIA, R 8.5, PIN 85DIA				59.10	
	2	1.00	pcs		AMEA-0014-0000	BEARING, CYL ROLLER					
	3		pcs		0000-0000-0000	ITEM REMOVED FROM PREVIOUS REVISION					B
	4	3.00	pcs		AMYX-0000-6000	GREASE NIPPLE, 1/8 IN BSPP			SS 316		

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M951-0064-0300
BOM DESCRIPTION ..: SHEAVE DIA 620/DIA 550 ASSEMBLY
FILENAME .....: M95100640300B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO.E14849

APPROVED ..: AJS
CHECKED ....: NRL
PREPARED ..: YANA
DATE .....: 11/11/09
SN .....: STD

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M951-1038-0300	MACHINING, SHEAVE, 620DIA/550DIA, R 10.5, PIN 85DIA				57.80	
	2	1.00	pcs		AMEA-0014-0000	BEARING, CYL ROLLER					
	3		pcs		0000-0000-0000	ITEM REMOVED FROM PREVIOUS REVISION					B
	4	3.00	pcs		AMYX-0000-6000	GREASE NIPPLE, 1/8 IN BSPP			SS 316		

Favelle Favco Cranes (M) SDN.BHD
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Senawang Industrial Park, 70400 Seremban
Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M951-0064-0400
BOM DESCRIPTION ..: SHEAVE DIA 620/DIA 550 ASSEMBLY
FILENAME .....: M95100640400B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO.E14849

APPROVED ..: AJS
CHECKED ....: NRL
PREPARED ..: YANA
DATE .....: 11/11/09
SN .....: STD

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M951-1038-0400	MACHINING, SHEAVE, 620DIA/550DIA, R 10.5, PIN 120DIA				60.20	
	2	1.00	pcs		AMEA-0014-1000	BEARING, CYL ROLLER					
	3		pcs		0000-0000-0000	ITEM REMOVED FROM PREVIOUS REVISION					B
	4	3.00	pcs		AMYX-0000-6000	GREASE NIPPLE, 1/8 IN BSPP			SS 316		

Favelle Favco Cranes (M) SDN.BHD
Lot 42, Persiaran Bunga Tanjung 2
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Negeri Sembilan Darul Khusus
Malaysia

ITEM CODE (BOM No) : M951-0064-0600
BOM DESCRIPTION ..: SHEAVE DIA 620/DIA 550 ASSEMBLY
FILENAME .....: M95100640600B
CURRENT REV .....: B
REV DESCRIPTION ...: REFER TO ECN NO.E14849

APPROVED ..: AJS
CHECKED ....: NRL
PREPARED ..: YANA
DATE .....: 11/09/09
SN .....: STD

CAT	POS.	TOTAL QTY FOR UOM	UOM	PCS	ITEM CODE	DESCRIPTION	LENGTH (MM)	WIDTH (MM)	REMARK	KG	CHG REV
	1	1.00	pcs		M951-1038-0600	MACHINING, SHEAVE, 620DIA/550DIA, R 13.0, PIN 120DIA				58.80	
	2	1.00	pcs		AMEA-0014-1000	BEARING, CYL ROLLER					
	3		pcs		0000-0000-0000	ITEM REMOVED FROM PREVIOUS REVISION					B
	4	3.00	pcs		AMYX-0000-6000	GREASE NIPPLE, 1/8 IN BSPP			SS 316		