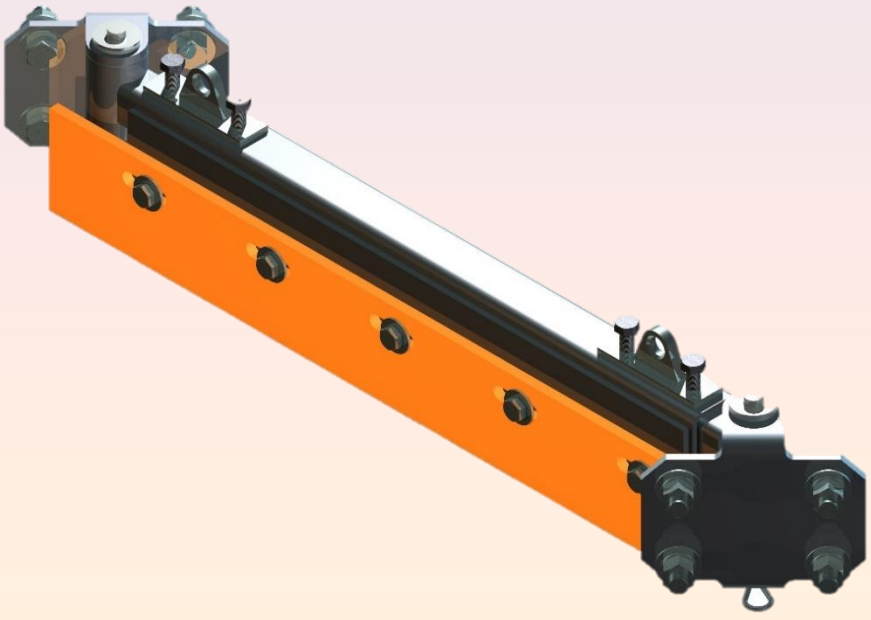
ENGINEERING SERVICES & SUPPLIES PTY LTD
Ph: 1800 074 446 www.esseng.com.au

Diagonal Plough

Installation, Operation & Maintenance Manual



Location	Address	Phone & Email
CURRUMBIN	11 – 13 Traders Way PO Box 121 Currumbin QLD 4223	(07) 5589 2000 esscur@esseng.com.au
GLADSTONE	Shed 2, 4 Helen Street PO Box 1475 Clinton QLD 4680	(07) 4972 3759 essgla@esseng.com.au
KALGOORLIE	Unit 1 / 182 Boulder Road Kalgoorlie WA 6430 PO Box 10471 Kalgoorlie WA 6433	(08) 9021 7991 esskal@esseng.com.au
KARRATHA	26 Midas Road Malaga WA 6090	(08) 9248 4111 esskar@esseng.com.au
MACKAY	1 Progress Street Paget, QLD 4740 PO Box 5755 Mackay Mail Centre QLD 4741	(07) 4952 4600 essmac@esseng.com.au
MAITLAND	Unit 2 Barton Court 6 Johnson Street Maitland NSW 2320	(02) 4932 3544 essmai@esseng.com.au
PERTH	26 Midas Road Malaga WA 6090	(08) 9248 4111 essper@esseng.com.au
TOWNSVILLE	Unit 4/ 585 Ingham Rd Mt St John Townsville QLD 4818	(07) 5589 2032 esstow@esseng.com.au
VICTORIA	Unit 4 / 238 Governor Road Braeside VIC 3195	(03) 9587 3979 essvic@esseng.com.au
WOLLONGONG	Unit 1 / 20 Doyle Avenue PO Box 343 Unanderra NSW 2526	(02) 4251 9801 esswol@esseng.com.au
TOLL FREE 1800 074 446 FROM ANYWHERE IN AUSTRALIA VSS TOLL FREE 1800 300 877		

WARRANTY

ESS* WARRANTS** the **Diagonal Plough** to be free of defects both in materials and workmanship for a period of 12 months from the date of despatch of the product from the ***ESS factory. The warranty given by ***ESS*** in this regard will extend only to replacing or repairing product shown to be defective.

The warranty also is subject to the following restrictions:

(a) Installation of the product contrary to the instructions contained in the supplied manual will void such warranty absolutely;

(b) The warranty will not extend to any liability for injuries incurred and which result from the use of the product contrary to the instructions in the manual;

(c) Save as prescribed by law, ***ESS*** will not be liable for any damage sustained by a purchaser or a third party by way of consequential loss arising out of defects in the product.

You are asked to note that ***ESS*** offers purchasers a service whereby either:

(a) It will install the product and certify the correctness of such installation, or

(b) Certify the correctness or otherwise of the installation of the product by third parties.

This certification service is designed to ensure that you obtain the full benefit of the ***ESS*** warranty hereby provided. If you would like to take advantage of the installation certification service provided, please contact ***ESS*** regarding the service.

Refer to the Final Checklist at the back of this manual.

Visit the ***ESS*** website www.esseng.com.au to register your product warranty.

CONTENTS

FIGURES

1.0 SAFETY

The Diagonal Plough is designed to be quickly and easily serviced by appropriate personnel.

Under no circumstances should servicing or installation of the cleaner be carried out whilst the belt is in operation.

The conveyor must be shut down and locked out before any person enters or reaches into the conveyor enclosure.

Ensure that only suitably qualified and trained personel install and service this product. Ensure that all site and statutory safety procedures are followed.

SAFETY LABELS

Pictograph labels are used to show graphically where potential safety hazards exist around this product. These labels do not represent every possible hazard. They are not intended to be a substitute for safe work practices and good judgment. These labels and *ESS* technical manuals use specific words to identify the severity of the hazard. They are described below. Take time to read and understand the meaning of these words and symbols.

Danger labels call attention to imminently hazardous situations that will result in serious personal injury or death if not avoided. Injury from these hazards is immediate in nature and has a high probability of resulting in a serious or fatal accident if proper precautions are not followed.

Warning labels call attention to potentially hazardous situations that could result in serious personal injury or death if not avoided. Injury from these hazards is usually serious in nature, and a severe or fatal accident can occur if proper precautions are not followed.

Caution labels call attention to potentially hazardous situations that may result in minor or moderate personal injury if not avoided. Injury from these hazards is normally less serious than those from Danger or Warning hazards. However, there is still the potential for an accident resulting in serious injury if proper precautions are not followed.

2.0 INTRODUCTION

The *ESS* Diagonal Plough is designed to remove fugitive material from the inner side of the return strand of a conveyor belt.

The *ESS* Diagonal Plough is normally located before the tail pulley, gravity take up, mid-drive unit or any other position where fugitive material can become trapped between the belt and pulley, causing damage or wear to the belt, pulley or pulley lagging.

The *ESS* Diagonal Plough, unlike conventional Vee-type ploughs, is suitable for use on either single directional or reversing belts. It is also particularly useful on single direction belts where fugitive material needs to be deposited on one side of the belt only.

The *ESS* Diagonal Plough is suspended from brackets attached to each side of the conveyor structure. The Plough blade is set at approximately 45° to the belt direction, and rides on the belt removing material without needing adjustment. The Plough blade will self adjust until the wear limits are reached, preventing any contact between the plough frame and the belt.

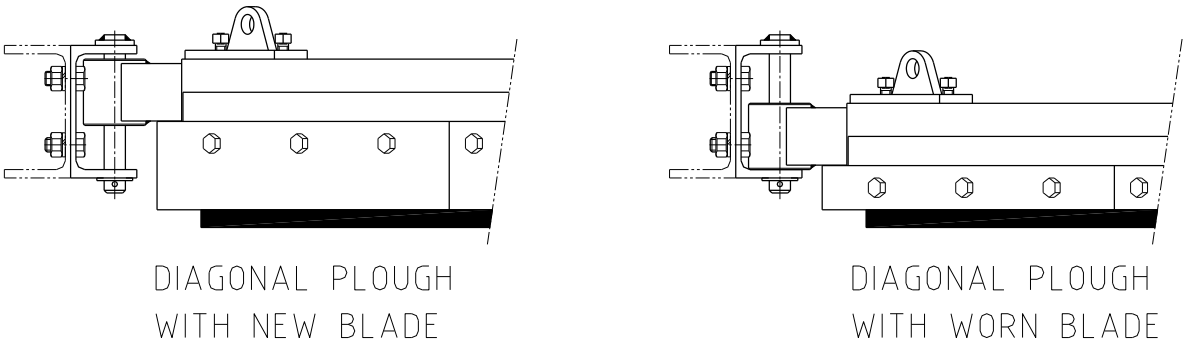


Figure 1 - Diagonal Plough

The *ESS* Diagonal Plough features a urethane blade for long life and efficient cleaning, and can also be supplied in FRAS urethane for underground Coal and similar applications. Safety chains are fitted to prevent damage in the event of fastener failure.

PREPARATION FOR INSTALLATION

Ascertain Installation Position

As previously noted, the *ESS* Diagonal Plough is intended to be installed on the inside return conveyor belt, just before the tail pulley, gravity take-up or similar.

The position selected for installation should have a flat, taut belt, and good access for installation and maintenance.

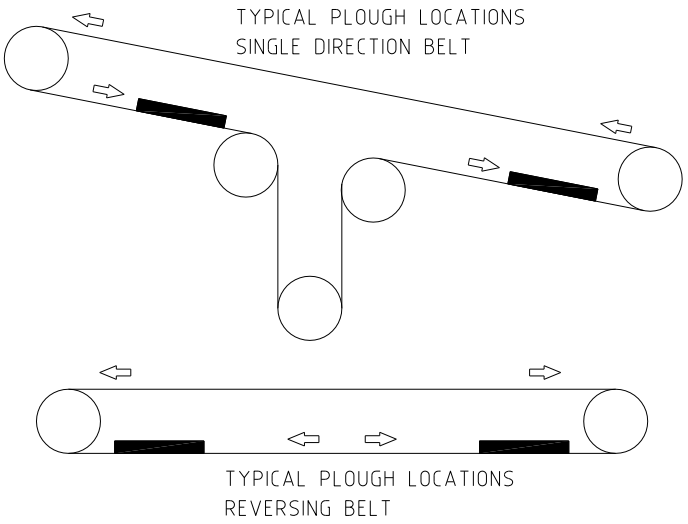


Figure 2 - Diagonal Plough Locations

Observe Belt Conditions

- Is the belt flat and taut or does it sag?
- Does the belt bounce or vibrate?
- The Diagonal Plough will operate best on a flat, vibration free belt. Try to achieve these conditions by appropriate use of flat rollers.

Trial Assemble Diagonal Plough

Familiarise yourself with the parts and operation of the Diagonal Plough. Plan the installation. Measure and pre-fabricate any mounting brackets that may be required. See section 4 for examples of typical mount / stringer arrangements.

ASSEMBLE THE NECESSARY TOOLS AND SAFETY EQUIPMENT REQUIRED FOR THE JOB

INSTALLATION

NOTE: BEFORE PROCEEDING WITH INSTALLATION, ENSURE THAT THE CONVEYOR BELT DRIVE IS FULLY ISOLATED AND LOCKED OUT.

DO NOT ALTER SPECIFIED DIAGONAL PLOUGH INSTALLATION DIMENSIONS TO AVOID SITE OBSTACLES. THE DIAGONAL PLOUGH WARRANTY WILL BE VOIDED IF NOT INSTALLED TO SPECIFIED DIMENSIONS.

If the Plough has been designed into a new conveyor or upgrade using data supplied by ESS, steps 1 and 2 may not be required.

Step 1 Using the drawings at the back of this manual, or by using the ***ESS*** Diagonal Plough itself, determine the positions where the Plough mounts will attach to the conveyor stringers or structure. If using the plough, place the unit on the return belt with the blade contacting the belt. The unit should be at approximately 45° to the belt travel, and the mounts should be in good flat contact with the stringers / structure. Mark the positions of the mounts on the stringers / structure. Note that the ends of the plough frame telescope for fine length adjustment to cater for minor variations in mount positioning.

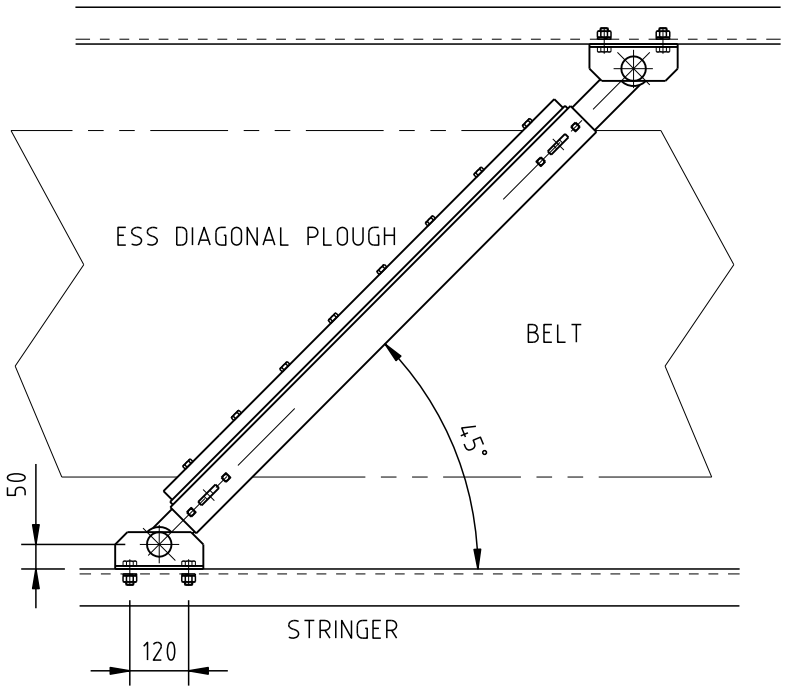


Figure 3 - Diagonal Plough Positioning

Step 2 At the mount position on each stringer, mark and drill 4 holes, Ø18 for M16 bolts. The holes should be at 120mm horizontal centres, and at 75mm vertical centres, with the first holes 70mm above the return belt. If the stringers are not located to allow direct bolting of the plough mounts, fabricate appropriate adaptor plates or brackets – see examples below.

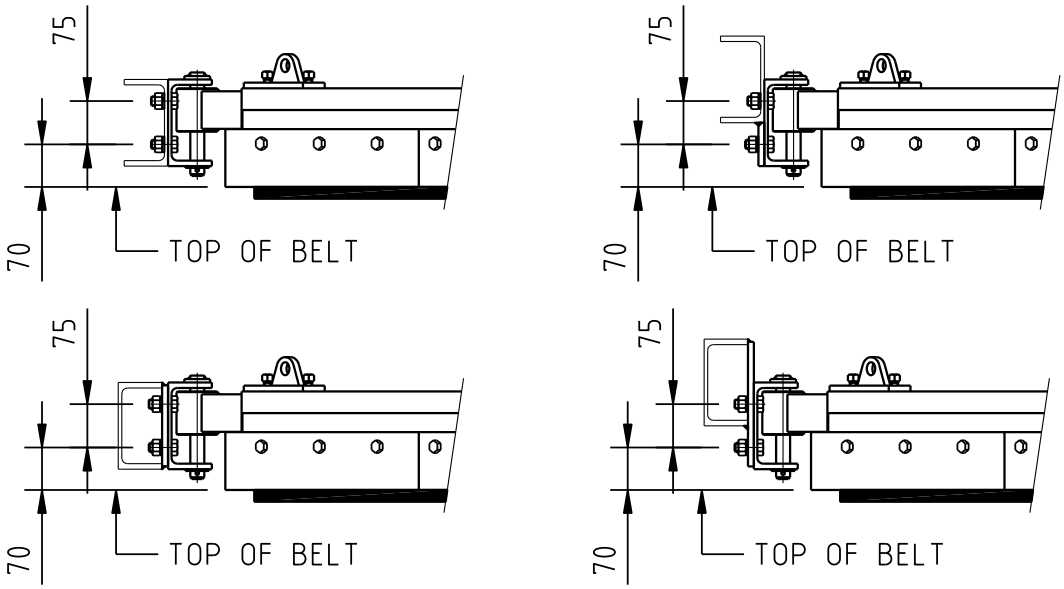


Figure 4 - Typical Mount / Stringer Arrangements

Step 3 The plough is now ready for final installation. Place the plough on the belt with the blade contacting the belt. Place the mount at one end of the plough against the stringer / bracket and loosely bolt in place.

Step 4 Loosen the 4 lock screws on top of the mainframe securing the telescoping ends. Place the unattached plough mount against the other stringer / bracket and again loosely bolt in place.

Step 5 Centre the mainframe / blade assembly to the belt, ensuring equal blade overhang on each side of the belt. Tighten the mount bolts on each side. Tighten the lockscrews to secure the telescoping ends.

Step 6 Attach the safety chain(s) to the Plough and then anchor, by welding or shackling, to the structure. Allow a minimum of 50mm slack for blade wear. Ensure that the plough moves freely on the sliding mounts.

Step 7 Installation is now complete. Remove tags and return belt to service.

3.0 COMMISSIONING

Step 1 Start the belt- Observe the action of the Diagonal Plough. The Diagonal Plough should ride smoothly on the belt with no chatter or vibration. If vibration is present, contact *ESS* on 1800 074446 for further advice.

Step 2 Demonstrate the Diagonal Plough to the operating and maintenance supervisors and crew. Make a short run of the system. Show the operators how the Diagonal Plough operates, explaining the operating and maintenance procedures listed below.

Step 3 Secure the system for production. Follow plant procedure to secure the conveyor for actual production.

4.0 OPERATOR TRAINING

The decision to purchase *ESS* Belt Cleaning equipment is the first step toward achieving a clean plant. The next step is the correct installation of the equipment as outlined in this manual. The final step is to maintain and service the equipment to guarantee ongoing performance.

ESS strongly recommends that operators are correctly trained to maintain *ESS* equipment, or that *ESS* is commissioned to maintain the equipment on a scheduled basis.

The benefits of efficient cleaners outweigh the cost of maintaining the cleaners many times.

1. Adhere to all local safety rules.
2. Give a “Hands On” instruction with the conveyor system shut down.
3. Give a “Hands On” instruction with the conveyor system running.
4. All service must be recorded and given to a person of responsibility.
5. Encourage the person being trained to look for possible problems developing on the system, eg. excessive or unusual vibration, belt tracking excessively, tears or damage to belt, seized idlers, missing bolts, etc. A warning to the maintenance department to rectify small problems can save the company a lot of money in repairs and production costs.
6. Impress how important it is to maintain and service the cleaners correctly.

5.0 ROUTINE MAINTENANCE AND SERVICE

Although the Diagonal Plough requires only minimal maintenance, regular inspection and servicing is the key to effective conveyor belt cleaning. It is recommended that the plough be inspected once per week. Actual service intervals will vary considerably from plant to plant.

CAUTION DO NOT REACH INTO THE CONVEYOR UNDER ANY CIRCUMSTANCES WHILST THE CONVEYOR IS RUNNING.

Routine External Inspection

Step 1. Visually inspect the condition of the Plough. Observe the condition and action of the Plough with the belt running. If vibration or other unusual conditions exist, shutdown the conveyor and carry out a Shutdown Service as described below.

Step 2. Observe the condition of the blade. If necessary (and if plant rules allow it), hose any material build-up from the blade. If the blade is excessively worn or blade to belt contact is not even, shutdown the conveyor and carry out a Shutdown Service as described below.

DO NOT REACH INTO THE CONVEYOR WHILST IT IS RUNNING.

SHUTDOWN INSPECTION / SERVICE

Step 1 Shut down and lock out the conveyor.

Step 2 Visually inspect the blade. Check the condition of the mount bushes, looking for excessive wear or play in the mount pin. Check that all fasteners are secure.

If the blade is not excessively worn, and mount bushes and fasteners are in good condition, return the Plough to service. Service completed.

If the blade or mount bushes are excessively worn or damaged, proceed.

Step 3. Remove the R-Clip and washer on the lower end of the locating pin at each mount.

Step 4. Whilst supporting the Plough, withdraw the locating pin from each mount. Remove the mainframe and blade assembly from the conveyor enclosure and place in an accessible area.

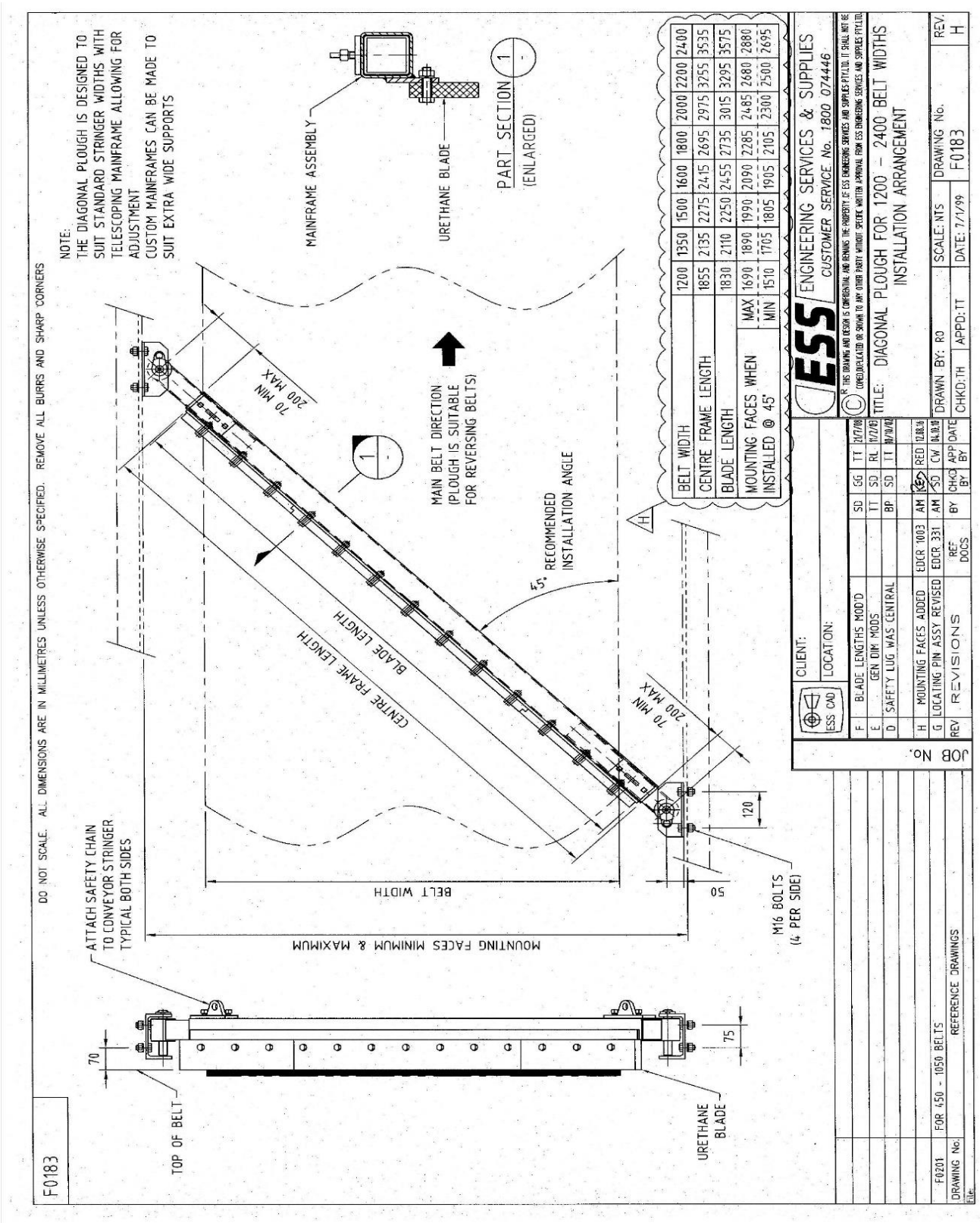
Step 5. Clean and inspect the Plough blade, and replace if necessary. Inspect closely the locating pin bushes and replace if worn (test for play by inserting the locating pin in the bush – the pin should be a neat sliding fit without lateral movement of the pin).

Step 6. Re-install the Plough, ensuring that all fasteners are adequately secured. Refer to Section 4 Operator Training for additional set-up information.

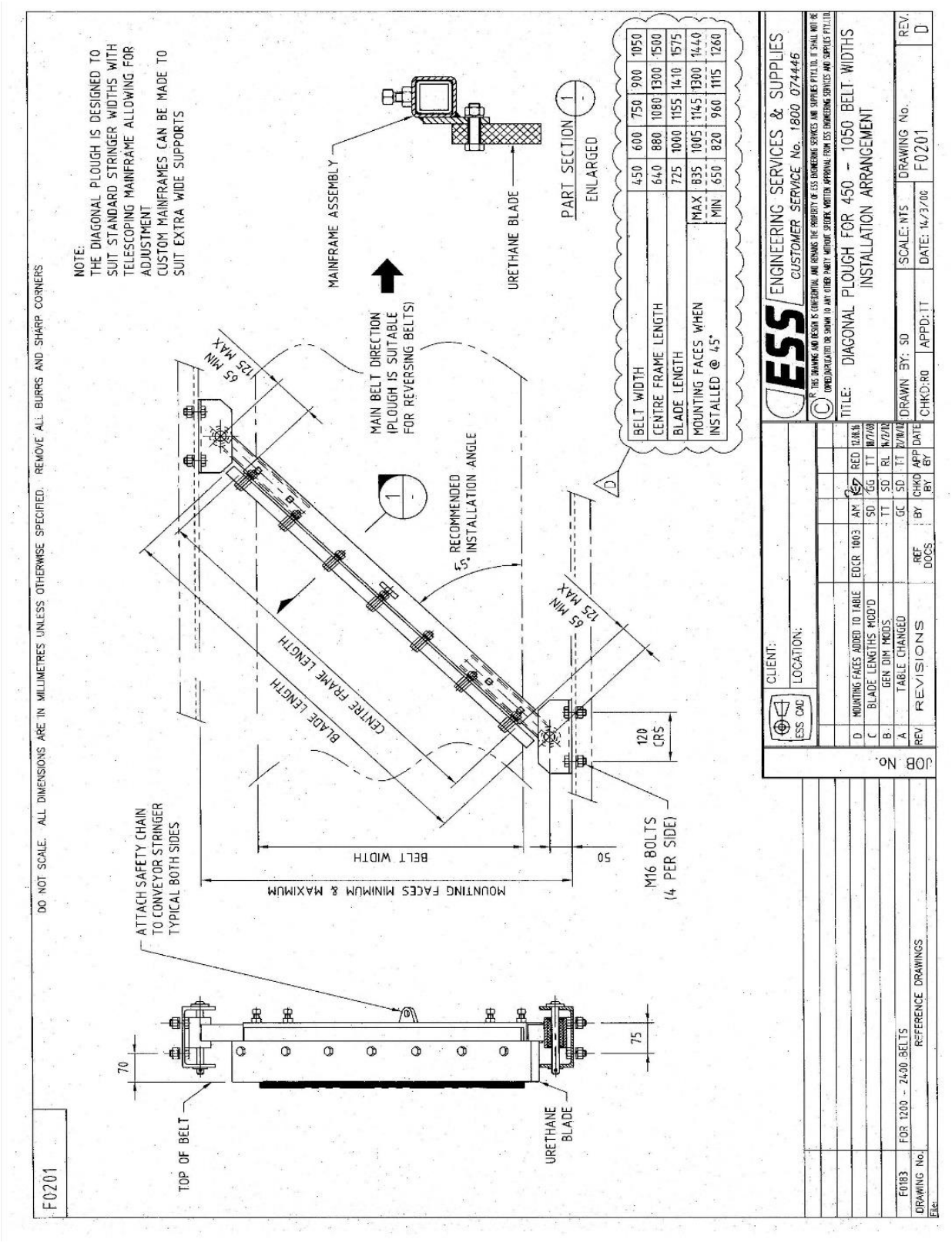
Step 7. Remove locks and return the conveyor to service.

6.0 INSTALLATION ARRANGEMENT DRAWING

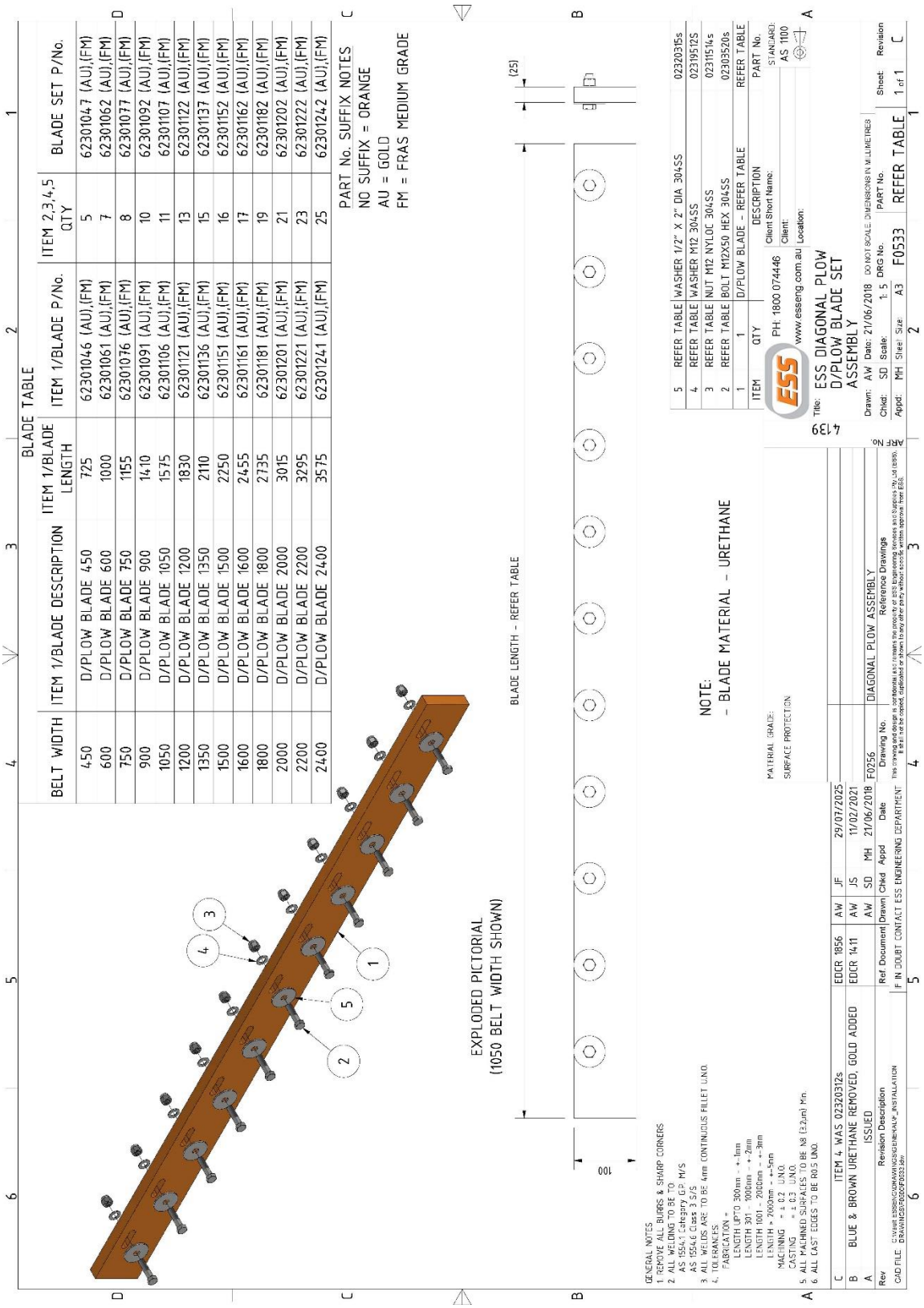
F0183 – Diagonal Plough For 1200 -2400 Belt Widths



F0201 – DIAGONAL PLOUGH FOR 450 – 1050 BELT WIDTHS



F0533 – DIAGONAL PLOW BLADE SET ASSEMBLY



BLADE TABLE

BELT WIDTH	ITEM 1/BLADE DESCRIPTION	ITEM 1/BLADE LENGTH	ITEM 1/BLADE P/No.	ITEM 2,3,4,5 QTY	BLADE SET P/No.
450	D/PLOW BLADE 450	725	62301046 (AU),(FM)	5	62301047 (AU),(FM)
600	D/PLOW BLADE 600	1000	62301061 (AU),(FM)	7	62301062 (AU),(FM)
750	D/PLOW BLADE 750	1155	62301076 (AU),(FM)	8	62301077 (AU),(FM)
900	D/PLOW BLADE 900	1410	62301091 (AU),(FM)	10	62301092 (AU),(FM)
1050	D/PLOW BLADE 1050	1575	62301106 (AU),(FM)	11	62301107 (AU),(FM)
1200	D/PLOW BLADE 1200	1830	62301121 (AU),(FM)	13	62301122 (AU),(FM)
1350	D/PLOW BLADE 1350	2110	62301136 (AU),(FM)	15	62301137 (AU),(FM)
1500	D/PLOW BLADE 1500	2250	62301151 (AU),(FM)	16	62301152 (AU),(FM)
1600	D/PLOW BLADE 1600	2455	62301161 (AU),(FM)	17	62301162 (AU),(FM)
1800	D/PLOW BLADE 1800	2735	62301181 (AU),(FM)	19	62301182 (AU),(FM)
2000	D/PLOW BLADE 2000	3015	62301201 (AU),(FM)	21	62301202 (AU),(FM)
2200	D/PLOW BLADE 2200	3295	62301221 (AU),(FM)	23	62301222 (AU),(FM)
2400	D/PLOW BLADE 2400	3575	62301241 (AU),(FM)	25	62301242 (AU),(FM)

PART No. SUFFIX NOTES
NO SUFFIX = ORANGE
AU = GOLD
FM = FRAS MEDIUM GRADE

EXPLODED PICTORIAL
(1050 BELT WIDTH SHOWN)

BLADE LENGTH - REFER TABLE

NOTE:
- BLADE MATERIAL - URETHANE

MATERIAL GRADE:
SURFACE PROTECTION

GENERAL NOTES
1. REMOVE ALL BURRS & SHARP CORNERS
2. ALL WELDING TO BE TO
AS 1554.1 Category G.P. M/S
AS 1554.6 Class 3 S/S
3. ALL WELDS ARE TO BE 4mm CONTINUOUS FILLET U.N.O.
4. TOLERANCES:
FABRICATION -
LENGTH UP TO 300mm - +-1mm
LENGTH 301 - 1000mm - +-2mm
LENGTH 1001 - 2000mm - +-3mm
LENGTH > 2000mm - +-5mm
MACHINING +-0.2 U.N.O.
CASTING +-0.3 U.N.O.
5. ALL MACHINED SURFACES TO BE N8 (1.2µm) Mn.
6. ALL CAST EDGES TO BE R05 UNO.

Rev	Revision Description	Ref. Document	Drawn	Chkd	Appd	Date
C	ITEM 4 WAS 02320312s	EDCR 1856	AW	JF		29/07/2025
B	BLUE & BROWN URETHANE REMOVED, GOLD ADDED	EDCR 1411	AW	JS		11/02/2021
A	ISSUED		AW	SD	MH	21/06/2018

F0256 DIAGONAL PLOW ASSEMBLY
Reference Drawings

This drawing and design is confidential and remains the property of ESS Engineering Services and Supplies Pty Ltd (ESS). It shall not be copied, duplicated or shown to any other party without ESS's written approval from ESS.

CAD FILE: C:\Vault Issued\DRAWINGS\ENGINEER\D-PLOW_INSTALLATION DRAWINGS\F0533.dwg
IF IN DOUBT CONTACT ESS ENGINEERING DEPARTMENT

ITEM	QTY	DESCRIPTION	PART No.
5	REFER TABLE	WASHER 1/2" X 2" DIA 304SS	02320315s
4	REFER TABLE	WASHER M12 304SS	02319512S
3	REFER TABLE	NUT M12 NYLOC 304SS	02311514s
2	REFER TABLE	BOLT M12X50 HEX 304SS	02303520s
1	1	D/PLOW BLADE - REFER TABLE	REFER TABLE

ESS
PH: 1800 074446
www.esseng.com.au

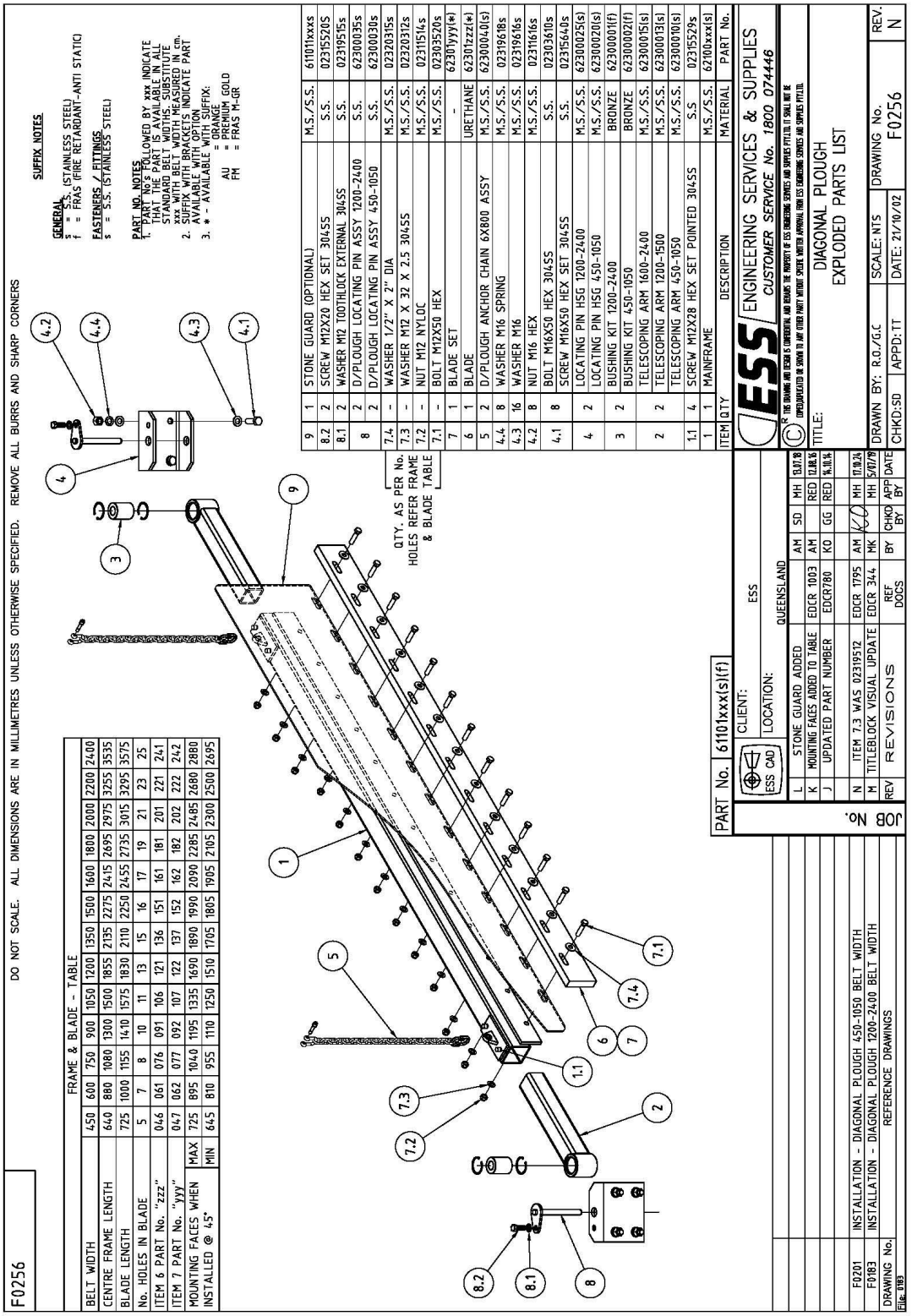
Client Short Name:
Client:
Location:
STANDARD: AS 1100

Title: ESS DIAGONAL PLOW D/PLOW BLADE SET ASSEMBLY

Drawn: AW Date: 21/06/2018 DO NOT SCALE. DIMENSIONS IN MILLIMETRES
Chkd: SD Scale: 1: 5 DRG No. PART No.
Appd: MH Sheet Size: A3 F0533 REFER TABLE
Sheet: 1 of 1 Revision C

7.0 EXPLODED PARTS DRAWING

F0256 – DIAGONAL PLOUGH EXPLODED PARTS LIST



8.0 FINAL CHECKLIST

Site:_____ Number: _____ Date:_____

Site Equipment No./Location: _____ Site Contact: _____

Completed By: _____

(Circle Yes or No Below)

Was equipment to ESS Specification? Yes/No

Drawing No. Ref:_____ Attached? Yes/No

If No, WHY _____

_____

Will this affect performance? Yes/No

If Yes, WHY _____

_____

Was this a standard ☐ service ☐ inspection ☐ installation? Yes/No

If No, WHY _____

_____

Was work carried out as per procedure and JSA? Yes/No

If No, WHY _____

_____

Is equipment fit for commissioning? Yes/No

If No, WHY_____

_____

Was a final inspection carried out while plant was running? Yes/No

If No, WHY_____

_____

Has anything changed from previous service / inspection / installation? Yes/No

If Yes, WHAT _____

_____

Is equipment performance to Client expectations? Yes/No

If No, WHY _____

_____

ESS Signature: _____ Client Signature: _____

9.0 NOTES