

ENGINEERING ANALYSIS REPORT OF CEMENT BLOCK MACHINE ROTATING ARM



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1.0 INTRODUCTION

This report presents a design analysis on the current cement block machine's rotating arm that manufactured by Universal Engineering Works. This task has been carried out as part of the company regulation in order to ensure the safety during operation. Figure 1 show a schematic view of the machine. Part No: NSP-LS (Crane) has chine connection to the parts No: Trolley, NSP-LS-42 and U-Hock-1 and totally are hanging with the part No: LS-Assem 1 (Rotating Arm). The whole rotating arm and crane attached to the machine. The crane is use to carry the wet block cement during the produce in each cycle. Wight of produced wet block cement in each cycle is 178 kg and the weight of the crane itself is 178 kg, in overall the total load which applied on the rotating arm part No: LS-Assem 1 is 356 kg. within this report evaluate the safty of the Rotating arm, crane and the component connected to those including trolley, NSP-LS-42 and U-Hock.

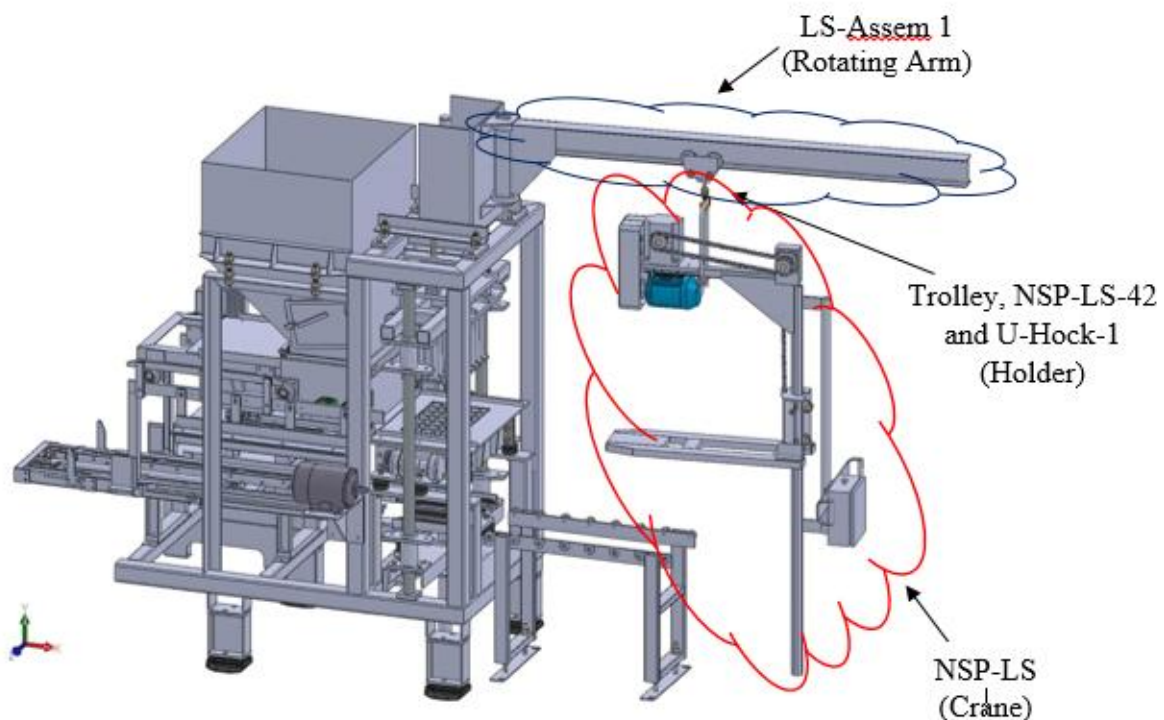
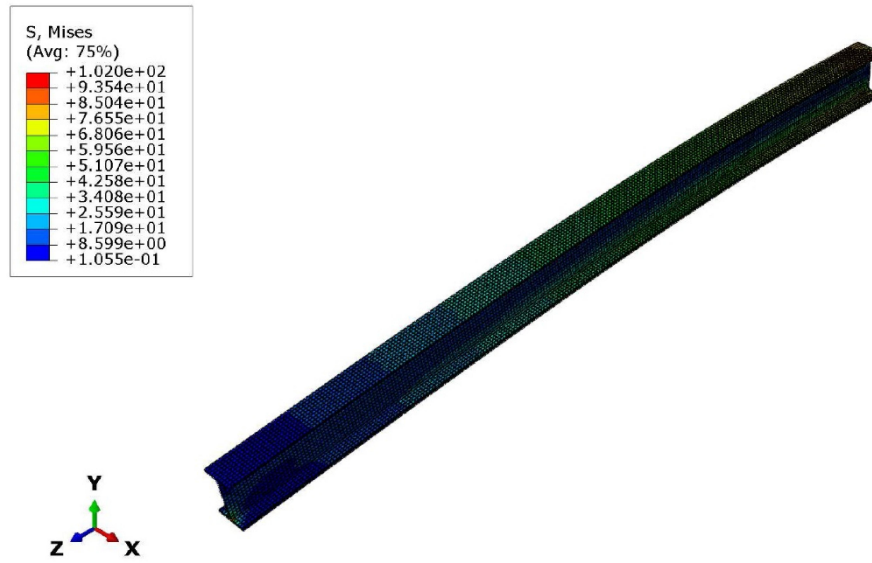


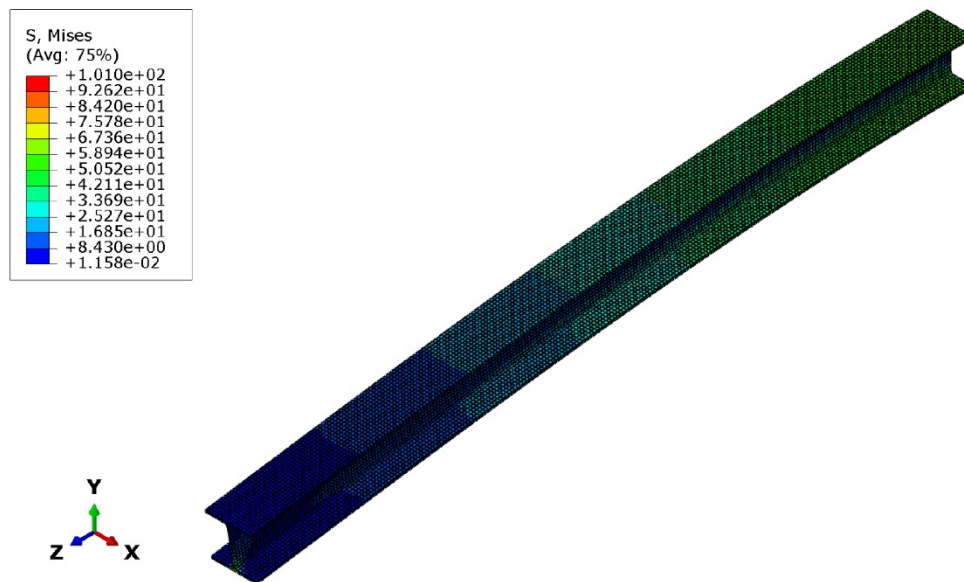
Figure 1: Schematic view of Cement Block machine design and manufactured by Company X

2.0 ANALYSIS

A Finite Element Method has been used to analyze the rotating arm current design. The safety factor was assume $1.5 \times$ working load. The total load applied on the critical points of rotating part by concerning the safety factored. Von Mises criterion result shown in the Figure 2. It shows that for the I beam part No: SP-LS-07 the maximum stress is 100 MPa hence the module of elasticity for the material used for this part is 210 MPa so current rotating arm design is safe. Since this part need to hole the cyclic load therefore it may fatigue phenomenon happen. Concerning the fatigue load in order to increase the safety suggested the W beam. Compared the initial part (I beam) under the same load with the suggested part (W beam) It can be observe that the maximum stress decrease to 58 MPa. Detail of the I beam and W beam for the part No SP-LS-07 is shown in Figure 3 and 4 respectively.



(a)



(b)

Figure 2: FEM Mises results. (a) I beam (No SP-LS-07). (b) W beam suggested to use instead of I beam.

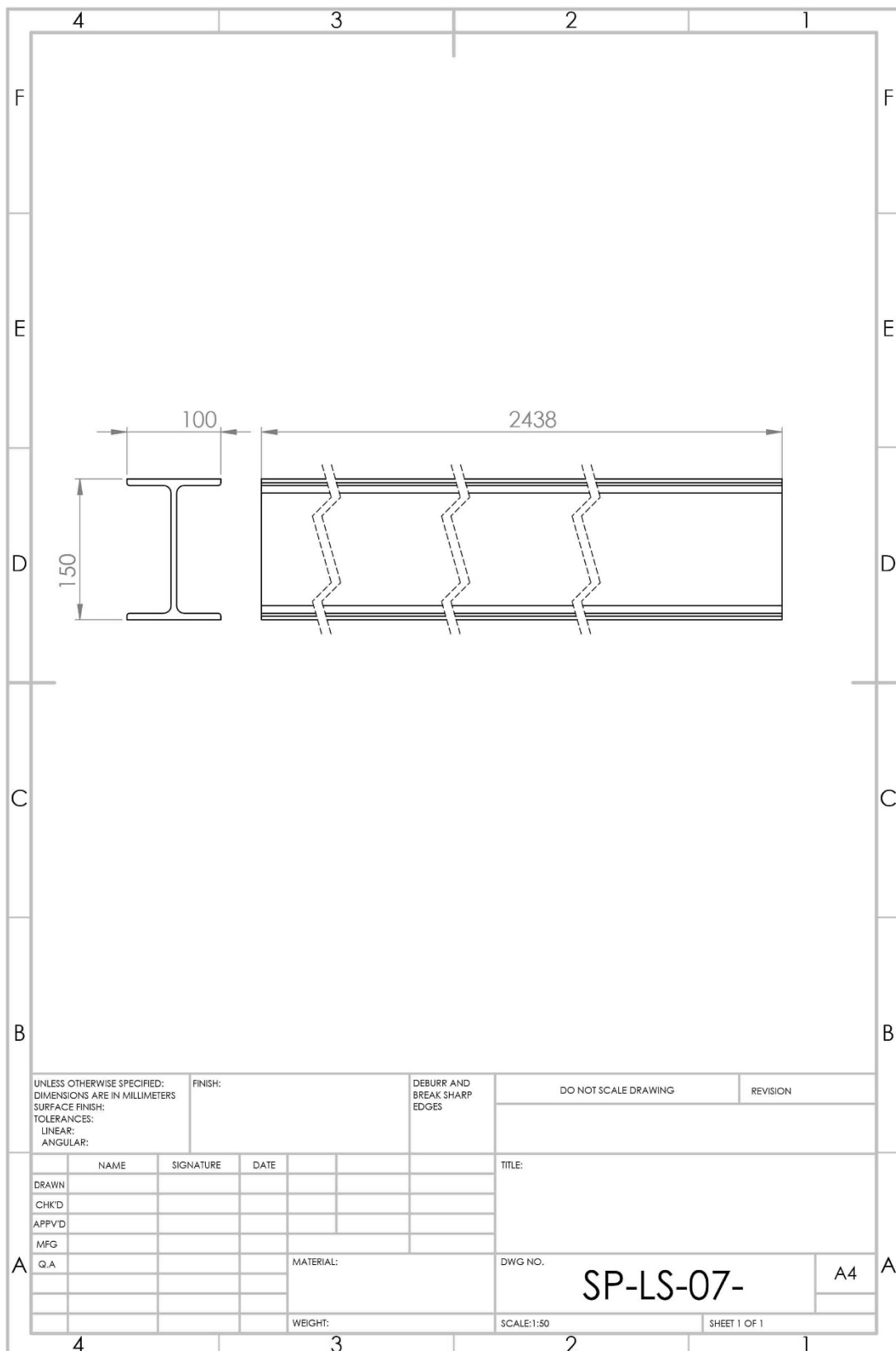


Figure 3: I beam initial shape of part No SP-LS-07

Figure 4: W beam suggested instead of I beam for the part No SP-LS-07

Part No SP-LS-01 as shown in Figure 5 and 6 is use to holding the rotating part and also is connected and welded to the part No: SP-LS-08. Welding area also have to stand for the stress produces by the rotating arm. Still there is enough space for modifying and increasing the welding area and safety therefore, the modified one which is extended more 280 mm and help to change the welding area to 568 mm instead of 288 mm is shown in the Figure 7.

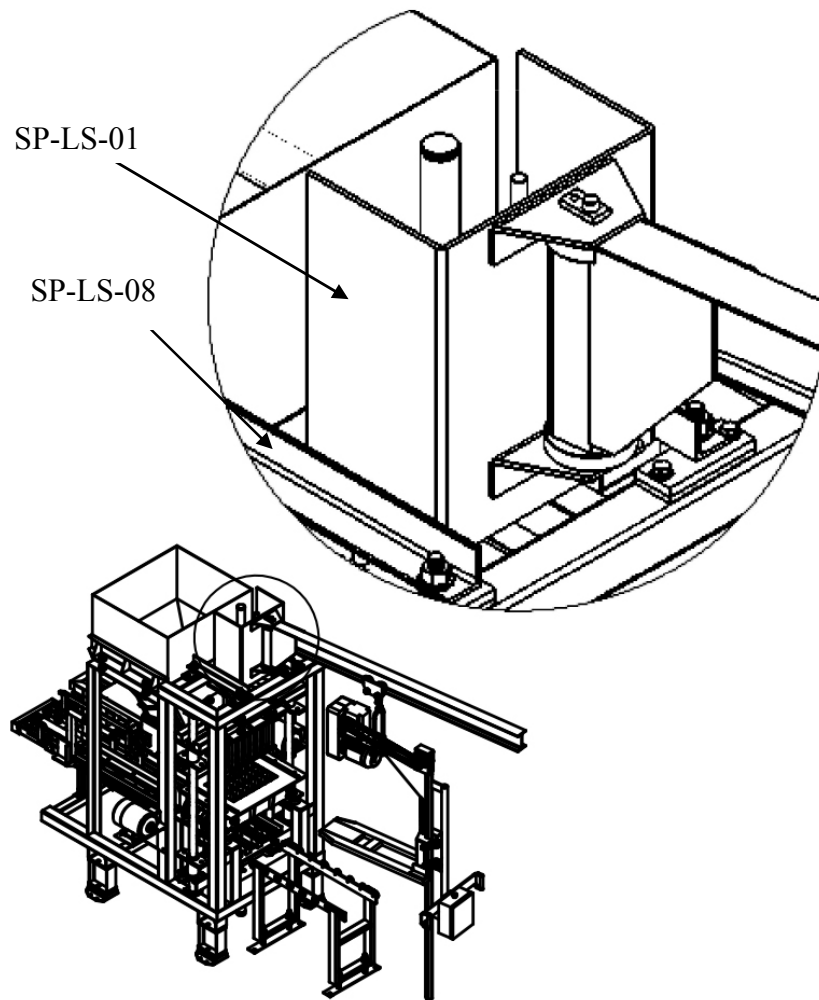


Figure 5: Details of the rotating part holder

4	3	2	1
F			
E			
D			
C			
B			
A			

An isometric technical drawing of a U-shaped metal bracket or channel. The drawing shows three vertical faces meeting at two corners. A dimension line with arrows indicates a width of 288 units across the base of one of the legs.

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						MATERIAL:				DWG NO. <div style="font-size: 2em; font-weight: bold; text-align: center;">SP-LS-01</div>		A4	
						WEIGHT:				SCALE: 1:10		SHEET 1 OF 1	

Figure 6: Initial shape of part No SP-LS-01

4	3	2	1
F			F
E			E
D			D
C			C
B			B
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Figure 7: Suggested shape for the part No SP-LS-01

Parts No: Trolley, NSP-LS-42 and U-Hock-1 as shown in Figure 7 are connected to each other as chin and using for holding the whole Crain and wet block material. We need to be consider that if any of them face to problem such as deformation or failure would be cases to be broken and the crane would be fall down therefore, all need to have one more safety support in parallel with the initial one as shown in Figure 8.

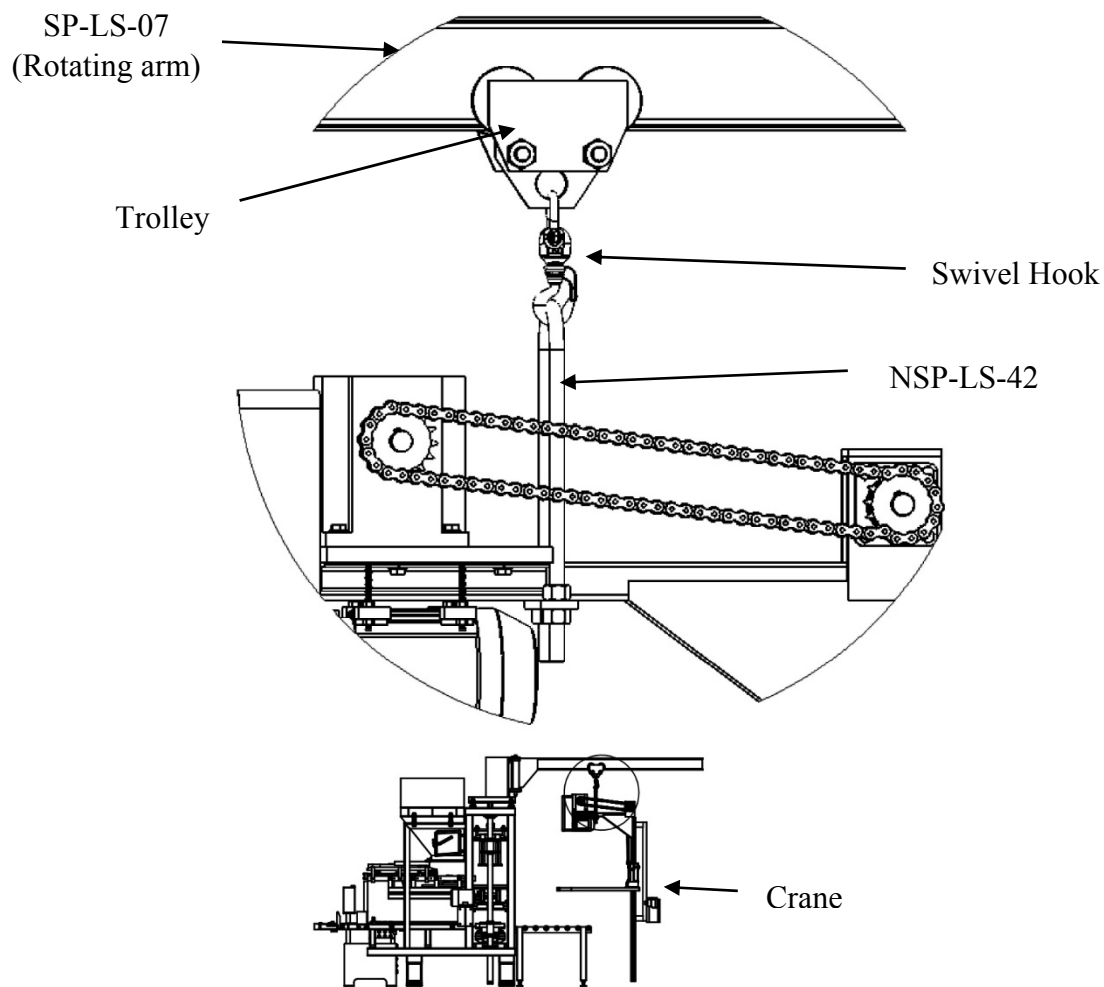


Figure 7 Connecting system of the crane and rotating part

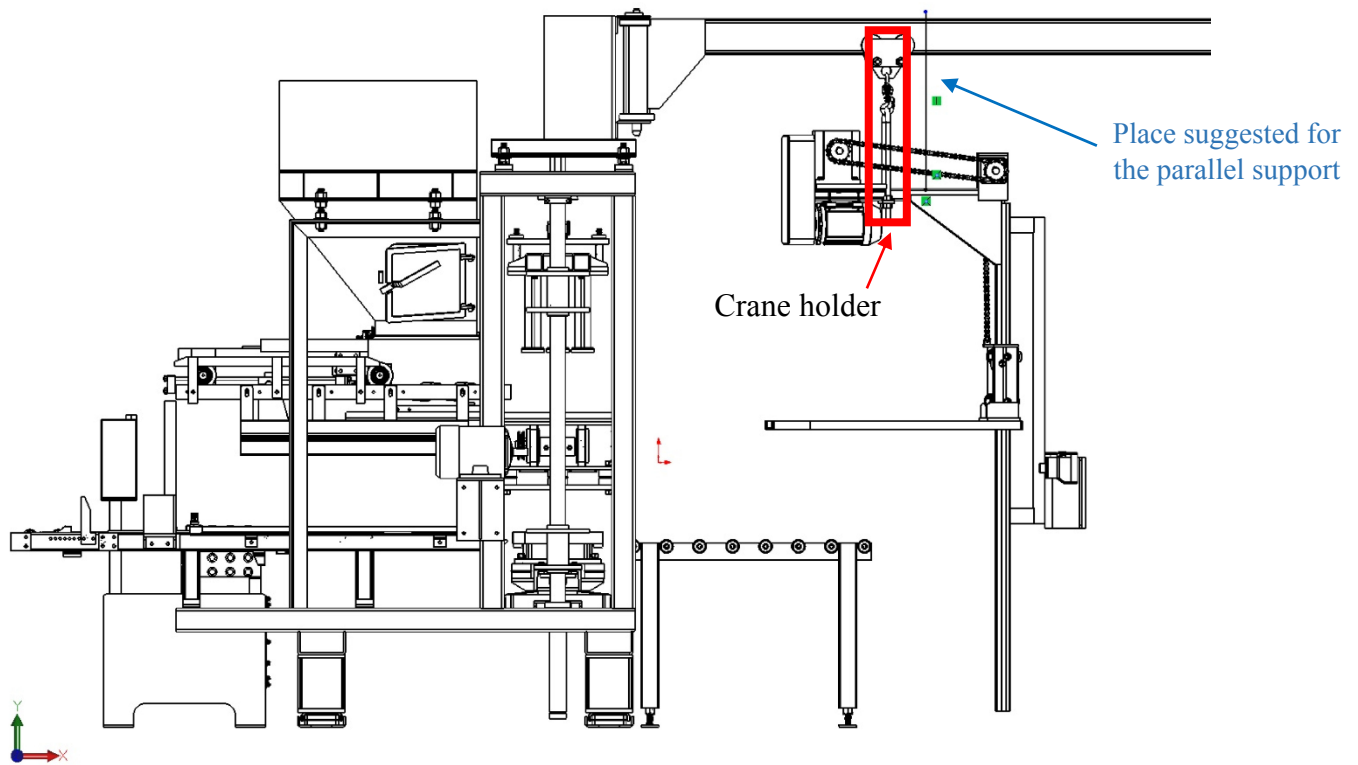


Figure 8: U-Hock-1 chine connection and the area suggested to be supported in parallel with in U-Hock

3.0 CONCLUSION AND RECCOMENDATION

Based on the analysis rotating system the recommendation and improvement system are as follow:

- 1) Replace I beam (No SP-LS-07) with W beam in order to improve the safety under cyclic load.
- 2) Component No SP-LS-01 shall being modify and extent more 280 mm, in this case the area of the welding with the part No: SP-LS-08 would be increase (refer Figure 5,6 and7).
- 3) Parts No Trolley, Swivel Hook and NSP-LS-42 have chine connection to each other and are using for holding the crane. Suggested use one more connection support in parallel with the current one to protect the operator if any parts broken.