



Luss Engineering

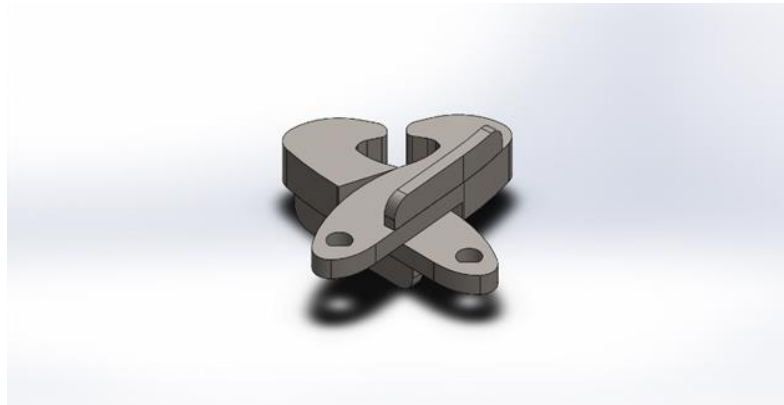
7 GANTON COURT WILLIAMSTOWN VIC 3016

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FEA, Capacity and Test Report No: #6062S



Description:

FEA test date: Tuesday, 26 April 2022

Description: Luss Engineering 5t Rail Lifter/Scissors

Designer/Fabricator: Luss Engineering

Design Standard: AS4991-2004

Study types: FEA, 3rd party Computation, Practical Load Test

Capacity Certificate

3rd Party Engineering firm/Lifting Certificate Supplier: Oamps Industries

Date: 02/03/23

3rd Party Engineering Analysis serial number: LV424418

3rd Party Engineering Computation Number: OA-LV0613

Certificate Of Test

Load Test Supplier: Certex/Lifting Victoria

Sample Physical Test Date: 02/03/23

Report Number: T63355

Certex Ref: 804093

WLL: 5T

Load Applied: 98.10kN

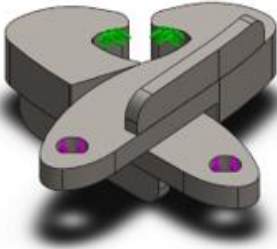
APPENDIX 1: FEA

Apply 49,033.25N to Model #6062S : Luss Engineering 5t Rail Lifter/Scissors 5,000KG


Assumptions:

1. Fixed points used in model are repeatable in application
2. Force is applied uniformly and vertical through model body
3. Force is gradual, no impact loads


Model Information:



Model name: 6062S
Current Configuration: Default

| Solid Bodies | | | |
|--|------------|---|----------------------|
| Document Name and Reference | Treated As | Volumetric Properties | Date Modified |
| 6062S  | Solid Body | Mass:14.5956 kg Volume:0.00185931 m ³ Density:7,850.02 kg/m ³ Weight:143.037 N | Apr 26 08:59:37 2022 |

Material Properties

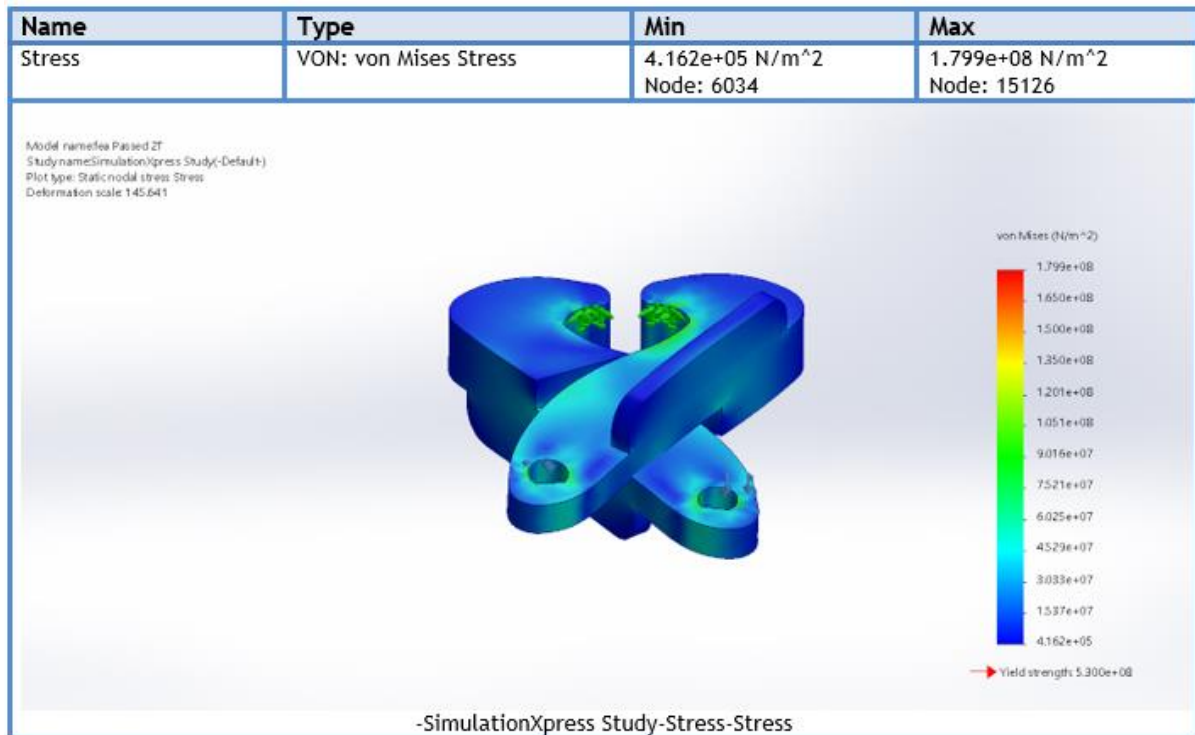
| Model Reference | Properties | Components |
|---|--|------------------------------|
|  | Name: AISI 1045 Steel Model type: Linear Elastic Isotropic Default failure criterion: Max von Mises Stress Yield strength: 5.3e+08 N/m ² Tensile strength: 6.25e+08 N/m ² | Main Body X2 (mirrored part) |

Loads and Fixtures

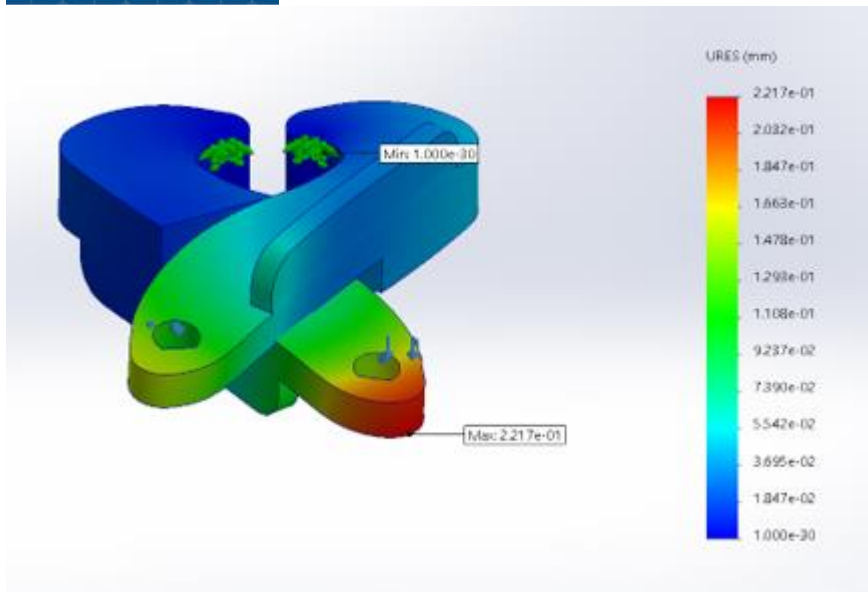
| Fixture name | Fixture Image | Fixture Details |
|--------------|--|---|
| Lower Face |  | Entities: 2 face(s) Type: Fixed Geometry |

| Load name | Load Image | Load Details |
|-----------|---|---|
| Lug Holes |  | Entities: 2 face(s) Type: Apply normal force Value: 49,033.3 N |

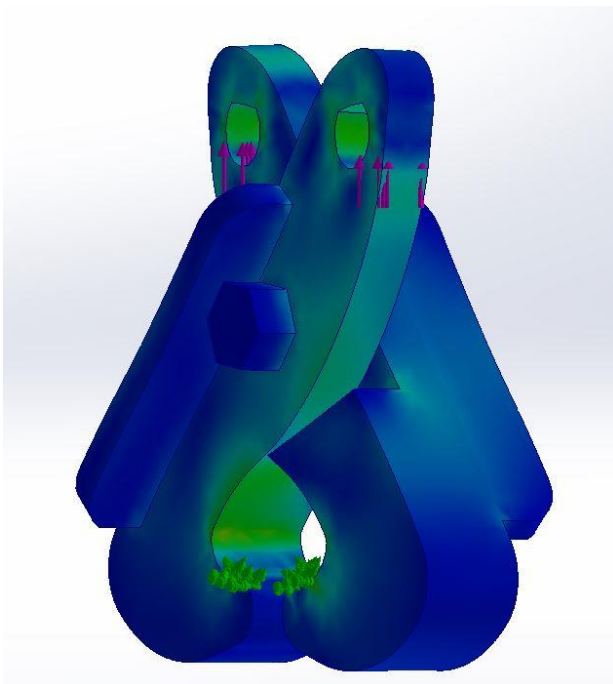
Study Results



| Name | Type | Min | Max |
|--------------|------------------------------|---------------------------|-----------------------------|
| Displacement | URES: Resultant Displacement | 0.000e+00 mm Node: 271 | 2.217e-01 mm Node: 13443 |



| Name | Type | Min | Max |
|------------------|----------------------|--------------------------|-------------------------|
| Factor of Safety | Max von Mises Stress | 2.946e+00 Node: 15126 | 1.274e+03 Node: 6034 |



Conclusion

Model #6062S Passed Finite Element analysis with a Factor of safety

(FOS) = 2.94



APPENDIX 2: 3rd Party Engineering



Navin Kumar
Lifting Victoria
19 Industrial Place
Breakwater, Victoria 3219

Dear Navin,

Please find the following design verification for the Luss Engineering 5t Rail lifter which has been rated to Maximum Rated Capacity (MRC) of 5t, it is recommended carry out proof load testing to at least 2x MRC to validate strength of connections and associated structures.

This Rail lifter has been checks and is correct

Notes:

- Visual inspection is required prior each use.
- Pre-use check list needs to be completed before commencing any work.
- Safe work method needs to be always in place.

Kind Regards

Rohan Hamer



CAPACITY CERTIFICATE

| | | | |
|------------------------|--|----------------------|-------------------------|
| Equipment Description: | Luss Engineering 5t Rail lifter | | |
| MRC: | 5t | Manufacturer's name: | Luss Engineering |
| Serial No.: | LV424418 | Date of manufacture: | 02/2023 |
| Group: | N/A | Design Standard: | AS4991-2004 |
| Computation number | OA-LV0613 | | |

| | |
|--|-----------------------------|
| Owner's name: Luss Engineering | Contact: Rhys Denman |
| Address: 7 Ganton Ct, Williamstown VIC 3016 | |

| | |
|---|--|
| Engineer Rohan Hamer | Company Oamps Industries |
| Address: 19 Industrial Pl, Breakwater VIC 3219 | |
| Telephone No.: 0433147467 | Email: rohan.hamer@certexlifting.com.au |

The Rail Lifter detailed above and on the referenced documents meets the design capacity requirements of AS4991

Rohan Hamer – Senior Engineer

Date: 02/03/2023



MARKING

The Rail Lifter is to be clearly marked with the following information, as appropriate in accordance with AS 4991:

- 1) Identification / serial number
- 2) Rated capacity (5t)

APPENDIX 3: DESIGN VERIFICATION CALCULATIONS

5T Rail grabber Computational analysis.

Shackle lug failure

Allowing for a minimum Pin diameter of 16mm for 3.2T shackle minimum

| Shackle Lug Failure | | | |
|---------------------|---|---------|--------------------|
| Symbol | Parameter | Value | Unit |
| | Input load | 5000 | kg |
| | Impact factor | 1.5 | |
| | Design load | 7500 | |
| Dh | hole diameter | 30 | mm |
| Dp | Minimum pin diameter | 16 | mm |
| R | edge distance | 33 | mm |
| r | radius of curvature of edge of lug | 100 | mm |
| a | distance from edge of hole to edge of lug | 18 | mm |
| t | thickness | 25 | mm |
| Z | loss in shear plane length due to curvature at end of lug | 0.01653 | |
| φ° | shear plane locating angle | 40 | Degrees |
| St | Yield strength of material | 350.0 | Mpa |
| Su | Ultimate Shear Strength (conservative) | 14.2759 | kg/mm ² |
| Sb | Ultimate Bearing Strength (conservative) | 21.4139 | kg/mm ² |
| As | Shear area | 986.97 | mm ² |
| Lsp | Length of shear plane | 19.74 | mm |
| Abr | Bearing Area | 400 | mm ² |
| Results | | | |
| | Shear limit | 14089.9 | kg |
| | Factor of safety | 1.87866 | |
| | Bearing limit | 8565.56 | kg |
| | Factor of safety | 1.14208 | |

Pivot Bolt Shear

Assume loads at both ends applied perpendicular to plane, to give worst case single plane shear

Maximum design loading for shear plane = 98.1kN

| Bolt in Single Shear | | | |
|-----------------------------|----------------------------------|--------------|-------------------|
| Symbol | Parameter | Value | Unit |
| | Bolt Type | M24 | |
| | Bolt Strength Class | 8.8 | |
| | Shear plane Load | 98.1 | kN |
| | Tensile Stress Area | 353 | mm ² |
| fub | Ultimate Tensile Strength | 800 | N/mm ² |
| d | Diameter of Shank | 24 | mm |
| d0 | Diameter of Holes | 26 | mm |
| γM2 | Partial Factor (Bolts) | 1.25 | |
| γM3 | Partial Factor (Slip Resistance) | 1.1 | |
| dm | Mean of Across Flats & Points | 38.7846 | mm |
| tp | Thickness of Plate | 26 | mm |
| fup | Ultimate Strength of Plate | 350 | N/mm ² |
| Results | | | |
| | Tensile Resistance: | 203.33 | kN |
| | Shear Resistance - Single Shear: | 135.55 | kN |
| | Factor of Safety | 1.38177 | |
| | Punching Shear Resistance: | 532.22 | kN |

Hook/Curved beam failure

| Stress in Curved Beam for Rectangular Section | | | |
|--|-------------------------------------|--------------|-----------------|
| Symbol | Parameter | Value | Unit |
| r_i | internal radius | 25 | mm |
| r_o | External radius | 104 | mm |
| b | Section width | 50 | mm |
| | Yield Stress of Lug | 350 | Mpa |
| F | Force applied | 50 | kN |
| r_c | Centroidal radius | 64.5 | mm |
| r_n | Neutral axis radius | 55.42 | mm |
| e | distance of NA from centroidal axis | 9.08 | mm |
| M | Moment at critical section | 3225 | kN/mm |
| A | Area at critical section | 3950 | mm ² |
| Results | | | |
| | Stress at inner edge | 122.07 | Mpa |
| | Factor of safety | 2.86720734 | |



| | | | |
|----------------------|--|-------------|-----|
| Stress at outer edge | | 39.96 | Mpa |
| Factor of safety | | 8.758758759 | |

APPENDIX 4: LOAD TEST CERTIFICATE



LEEA Accredited Laboratory Number 1305
This document is issued in accordance with LEEA's accreditation requirements.
The results of the tests included in this document are traceable to Australian/National standards.
This report shall not be reproduced except in full.

Certificate of Test

Issued To

Luss Group Engineering

Report No T63355

Report Date 02 Mar 2023

Our reference 804093

| QTY | EQ ID | Description | Effective Length | WLL | Load Applied |
|-----|----------|---|------------------|------|--------------|
| 1 | LV424418 | RAIL LIFTING CLAMPS, FABRICATED BY: LUSS ENGINEERING, TARE: 15KG, WLL: 5.0T | NA | 5.0T | 98.10kN |

Test Notes (if any)

LOAD TEST CARRIED OUT. PASS

CLIENT TO ENGRAVE THE SERIAL NUMBER, TARE WEIGHT, WLL AND DATE OF TEST.

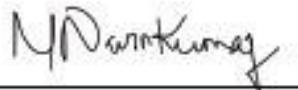
Test Specification: AS4991 - 2004 - LIFTING DEVICES

After removal of the load, each item was examined by a competent officer and found to be free from permanent set flaw or visual defect.

The above articles were examined by a competent person and we hereby certify that:

- (a) A careful examination of each of the articles listed above was carried out.
- (b) After the application of the proof load each of the articles tested was found to have withstood the load without sustaining damage that may affect its intended function or safety and is free from any deleterious permanent set or visible defects

Approved signatory Officer: Navin Kumar



Testing Officer: Navin Kumar

Lifting Solutions Group
Aust Johnson International



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Adelaide • Bibra Lake • Coffs Harbour • Geelong • Kalgoorlie • Melbourne North • Melbourne West • Newcastle • Perth • Port Hedland



General Maintenance and inspections.

- Visual inspection is required prior each use.
- Pre-use check list needs to be completed before commencing any work.
- Safe work method needs to be always in place.
- Pivot Bolt must be inspected prior to each use.
- If any Damage or excessive wear to Pivot bolt Rail Lifter must be repaired. Its Suggested to replace bolt at regular intervals by suitable persons.
- If any Damage or excessive wear to Curve Beam, it must be reported, and decommissioned. Then, Rail Lifter is assessed by appropriately qualified persons for repair or disposal.