MaxiTrans, Refrigerated Rear Trailer - Body Separation

Report

Out of Scope

March 2022

Version 2

This report contains information which may be restricted under privacy requirements.

Some information contained in this report may be commercially sensitive.

Maintenance and operation of the failed unit was not investigated.

Investigation into the failed vehicle's original heavy vehicle specialist certification has not been conducted.[1]

Contents

[1] The welded connection which failed does not require specific certification

Introduction

In January 2020, Waka Kotahi NZ Transport Agency (Waka Kotahi) was informed of an incident where the refrigerated body of a 2014 Maxi-CUBE rear B-train trailer, registered to Halls Refrigerated Transport Limited (Halls), had completely separated from its chassis and fallen onto the road whilst in service.

The trailer was manufactured by MaxiTrans Industries (NZ) Pty Limited (MaxiTrans).

An investigation was initiated to establish a root cause for the failure and assess whether compliance with applicable rules and legislation had been met.

Investigation

Crashed vehicle inspection

An inspection of the trailer was carried out to determine the failure mode. On 13 January 2020 the trailer was inspected by Heavy Vehicle Specialist Engineer (HVSC) s 9(2)(a) and me in Christchurch.

(See Appendix 1)

The inspection identified that the body to chassis attachment had failed at its plug welded interface.

It was s 9(2)(a) opinion that the failure was due to an unsuitable design which was executed with poor welding.

Inspection of the failed welds identified poor fusion of the materials.

The Waka Kotahi inspection found that the failed vehicle exhibited a lack of weld fusion, likely as a result of poor weld execution. Polishing at the broken welds indicated a long period of operation whilst broken.

Inspection of other vehicles

Over 13-14 January 2020, available trailers at Hall's and MaxiTrans sites in both Christchurch and Auckland were inspected by s 9(2)(a) and me. These inspections identified that vehicles of exactly the same design as the crashed vehicle exhibited similar failures but vehicles with different designs did not.

A number of trailers in operation around the country were identified, 37 of those had the same body attachment design.

The action requested by Waka Kotahi was for all trailers to be inspected immediately to confirm their design type and modifications (if any), identifying how widespread the use of the failed design was and if similar failures were evident.

Inspections conducted by MaxiTrans and reported by industry confirmed a large number of failures at the body connection points for all vehicles in service with the same body to chassis connection design[2].

Findings confirmed the unconventional body to chassis connection interface, originally employed by MaxiTrans was failing. The design relied solely on plug welds for retention of the body to a 90x90x8mm rolled steel angle profile used for mounting. This steel angle was in turn bolted to the chassis.

A subgroup of 11 trailers was identified as being modified from their originally built state. This incorporated a changed body to chassis attachment method. At the request of Halls, these trailers were inspected by the modifier Fruehauf NZ Ltd, and a report was provided by HVSC s 9(2)(a).

[2] Of the unmodified Hall's fleet 50% of the trailers had failings when inspected (excluding the crash unit)

Summary of inspection reports

An inspection of all trailers identified as originally constructed with the design was carried out and reported by industry.

37 trailers were identified as constructed with the failed design:

- 11 of the 37 trailers were modified post-entry into service and were reported as having no connection faults.
- 11 of the 37 trailers were unmodified and reported as having connection faults.
- 15 of the 37 trailers were unmodified and reported as having no connection faults.

In addition, 10 reports were received for trailers with a different design. These reports did not indicate connection faults.

The above data supports the fact that the plug weld connection design was failing on multiple units.

In-service inspection

The design utilises a welded connection which is obscured by its components. The welded points are the only load bearing attachment between the body and its mounting angle which is bolted to the chassis; the welds are a critical connection. The weld type employed is a plug weld, therefore only the outer face is visible for inspection; the working connection is inside the parent material, therefore obscured.

Inspection of the trailers identified that confirming the condition of the failed design's plug welded connection between the body and chassis angle mount was difficult with the naked eye and basic hand tools.

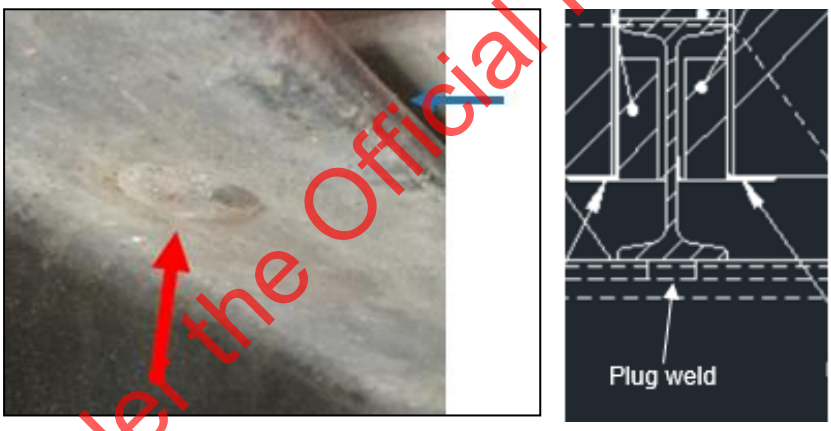

Image 1:

The red arrow in image 1 indicates the finished face of the plug weld which is visible for inspection. The blue arrow in image 1 indicates a space between the two profiles which should be connected by the plug weld.

The weld in image 1 is broken; this was demonstrated for the purposes of the photo by inserting a jack (out of the image) which lifted the body away from the mounting angle. Without the jack in place gravity causes the space to close and the weld visibly appears sound.

Some trailers exhibited previous in-service repair of varying types around the body attachment. The repairs were likely conducted to address movement or cracking as a symptom of body attachment failure. Observed repairs were localised to a small area of the attachment and had not successfully addressed the root cause of failure.

Certificate of Fitness (CoF) inspections had not identified the failure primarily due to the design type and the need for tools to aid identification of failure.

Enquiries and interactions with MaxiTrans

It should be noted that MaxiTrans Industries worked proactively with Waka Kotahi, providing a repair solution to correct this design failure, and committed to rework all trailers with the same body attachment design.

During the course of this investigation, MaxiTrans were co-operative with Waka Kotahi. Interactions were via email, telephone and several face to face and web meetings.

It's important to note that some of the MaxiTrans representatives were not employed by MaxiTrans at the time this design was used and therefore relied on historic information, or their understanding of events or processes from this time. In addition, the ownership of MaxiTrans New Zealand has changed since the time of the original vehicle crash.

Correspondence was primarily made with the following people employed by MaxiTrans at the time of investigation:

- s 9(2)(a)
- [redacted]

MaxiTrans were asked about design analysis and calculations. They were aware of a requirement for the body attachment to meet specified stresses with G-forces acting in various directions. They did not supply their analysis (as requested) to verify compliance with clauses 3.1(3), 3.2(1) & 3.2(2) (a)(b)(c)(d) of the Land Transport Rule - Heavy Vehicles 2004 rule 31002.

MaxiTrans conducted an internal investigation[3]. (Annex 5)

MaxiTrans's internal investigation report does not assess a root cause(s) for the failure. It does not address how the failed design was assessed and approved for production. The report has not addressed how substandard welding passed through MaxiTrans quality controls or addressed specific controls on welding design, weld qualification, welding processes or weld execution. The internal investigation covers the check of all designs, identification of affected trailers and checks to ensure this issue was isolated to this custom trailer design. It also covers some identified areas for improvement as stated below:

- "Current procedures have been reinforced and updated with extra checks from area supervisor and engineering team. Final inspection will be done by NZTA approved certifier as normal."

and

- "MaxiTrans have implemented some further quality checks and audits."

The claimed use of, and adherence to, AS/NZS:1554 Welding of Steel Structures and AS 2980 Qualification of Welders for Fusion Welding of Steels, is not supported by the information MaxiTrans provided.

The manufacturing check sheets provided do not appear to be specific design controls, welding controls or qualified welding inspections and appear more generic and appearance focused rather than specific control of fabrication quality.

MaxiTrans have not demonstrated or provided information which describes the use of a quality control system with robust and specific gates to control the quality of design and then fabrication.

[3] The MaxiTrans internal investigation was not carried out immediately and was only initiated after being asked in a meeting with Waka Kotahi in February 2021.

Conclusions

Failure of the vehicle's body to chassis connection was not a one-off incident. It was identified that 42% of trailers of this design had failed.

Connections of the same design regularly failed and were undetected by normal vehicle inspection and CoF inspection as the fault was difficult to identify.

General safety requirements are that a chassis, body, or other load bearing structure must be of adequate strength for all conditions of loading and operation for which the vehicle was constructed. If this requirement is considered, the body to chassis connection design is not suitable for its duty. Analysis completed against the requirements of the Heavy Vehicle Rule showed that the combination of these plug welds, if ideally executed, would be sufficient to meet the requirements for vehicle body and equipment attachment in a static situation. However, there appears to be no consideration given to any weld defects or fatigue i.e., cyclic and dynamic loading. Although this is not a specific requirement in the vehicle body and equipment attachment section of the Rule, when general safety requirements are considered, the plug welded connection's resistance to cyclic & dynamic loads is not suitable or adequate.

Reliance on these plug welds alone, without the ability to quality check fusion between the two materials, was another contributing factor in the cause of failure with this design. This is supported by the agreement and comment from s 9(2)(a) . When discussing fusion of plug welds into a 20mm hole and the ability to quality check, s 9(2)(a) commented, "*that's why we will never rely on it again to be that only".*

MaxiTrans appear to have a high reliance on New Zealand's Heavy Vehicle Certification process, however the welded connection at this point is not subject to Heavy Vehicle Certification.

MaxiTrans were cooperative with Waka Kotahi through this investigation. They were proactive with rectification work, including identifying the affected trailers, design of a repair solution and committing to rework all affected trailers in a short time frame.

MaxiTrans failed to supply information that demonstrates adherence to the following clauses of the Land Transport Heavy Vehicles 2004 Rule 31002 *8.5(1)(b), 8.5(2)(a)(b):*

8.5 (1) *A person who manufactures, stocks or offers for sale a chassis assembly for use in a vehicle must provide, with the chassis assembly:*

(b) information in English regarding the maintenance and servicing of the chassis assembly; and…

8.5 (2) *A person who manufactures or offers for sale a vehicle must:*

(a) ensure that the vehicle complies with this rule; and

(b) provide instructions to be followed by a person, who operates or maintains the vehicle, to ensure the safe operation of the vehicle.

It's unlikely failure to supply maintenance and servicing information was a contributing factor to the root cause of failure for these trailers. However, including an inspection point for the unconventional connection in the required information may have aided early detection of failure.

Recommendation

It is recommended that MaxiTrans are issued a warning letter reminding them of their obligations as a manufacturer, that their product is subject to legislative rules and their adherence to these rules is mandatory.

It is also recommended that Waka Kotahi explore the introduction of a certification requirement for the attachment of bodies that contain a load but are not fitted with certified load anchorage points.

Appendix

1. Engineering Report – Maxi-CUBE Body Separation January 2020

Engineering Report

Maxi-CUBE Body Separation
January 2020

Report Date- 16 January 2020

s 9(2)(a)

Index

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4 Appendix A & B not included in this report

1.0 Executive Summary

The refrigerated body of a 2014 Maxi-CUBE Reefer rear B-train trailer Registration number Z827T entirely separated from its chassis in early January 2020 and fell onto the road.

The Maxi-CUBE refrigerated body floor cross members are attached to the trailer chassis via a long angle mount that is bolted to the outside of each chassis rail. Each of the 21 floor cross members are attached to each of these angle mounts with a single 20 mm diameter plug weld. It was these plug welds which broke at the interface of the bottom of the floor cross members and the top of the chassis attachment angles, and allowed the body to fall off the chassis.

The failure of these welds was caused by a combination of poor welding and unsuitable design:-

- The welds had very little fusion to the floor cross members, caused partly by the difficult overhead position in which they were done and partly as a result of inadequate welder skill for this rather difficult positional welding work.
- Repetitive loads are applied to these welds, in particular the front welds experienced high loads for which they were unsuitable. Eventually the front welds failed and it was then the next welds that were subjected to these high loads. In domino fashion over the months and years the welds progressively broke, until there were too few welds left to restrain the body and it fell off.
- These plug weld failures were not observed by in-service inspectors due to the breakage occurring at the interface between the cross members and the attachment angle, and this was impractical or impossible to see. The plug welds look sound when viewed from below.

This particular issue is limited to refrigerated bodies connected with only a single row of plug welds to the chassis attachment angle, where the plug welds have been carried out in an overhead position. It is believed that only Maxicube have carried out manufacture in this way. Thirty-four such vehicles have been identified, though up to eleven of these may have already been modified in 2016 by Fruehauf. Inspection of these thirty-four vehicles is ongoing and should be complete by Maxitrans by the end of this week.

Maxitrans have now designed a welded gusset attachment arrangement that will be installed to join the floor cross members and the support angle member. This will be fitted at each location, giving a total of 42 assemblies to be installed on most vehicles. These have the advantages over the existing plug welds of being substantially stronger, easier to install correctly and any subsequent deterioration can be readily seen by in-service inspection, well before an unsafe condition develops. Public safety can therefore be confidently expected to be maintained by these modified body attachments.

2.0 Introduction

In early January 2020 the refrigerated body of a Maxi-CUBE Reefer rear B-train trailer completely separated from its chassis and fell onto the road.

This report covers the engineering aspects of this failure.

Make= Maxi-CUBE Reefer
Model= 3 axle semi trailer (rear B-Train trailer unit)
Year= 2014
Registration number Z827T
VIN= 7AT0PR00X14087180
Owner= Halls Refrigerated Transport
Fleet number= 1533
Tare= 6970 kg
GVM= 23000 kg

The trailer internal loading at the time of the event was with bread buns, pallets double stacked, with the load up to within a few hundred millimetres of the roof.

The vehicle was in the midst of a moderate left hand bend when the body fell off to the right, onto the opposing road lane. Fortunately no one was injured in this event. Bodies falling off their chassis are rare but dangerous and an investigation was called for by NZTA.

This report has been prepared for NZTA and is for their use only.

3.0 Inspection of failed trailer

The body and the chassis were viewed in BTR's yard, 121 Bellam Road, in Christchurch by Out of Scope of NZTA and s 9(2)(a) on Monday 13 January 2020. By co-incidence s 9(2)(a) of Maxitrans were there at the same time to view this trailer.

Body

Chassis- twisted

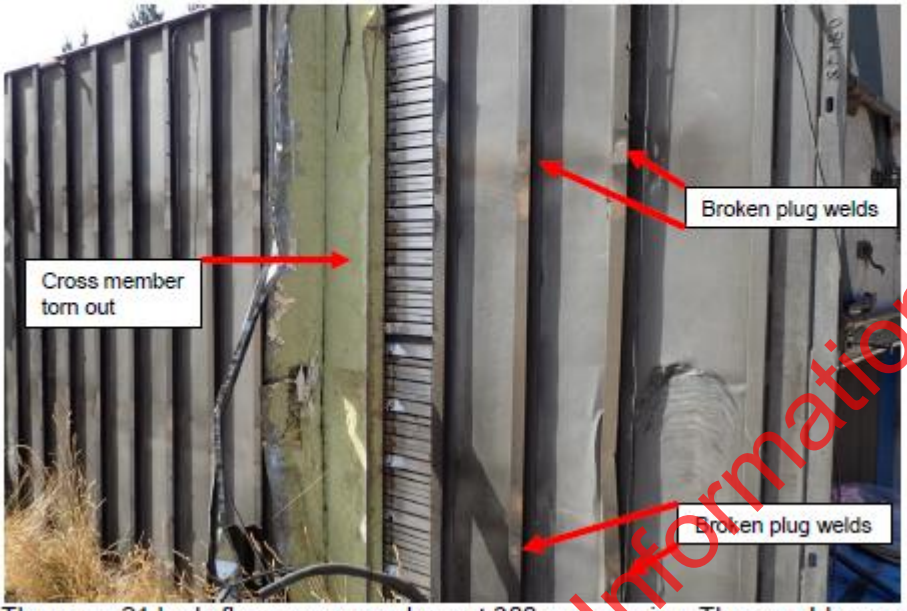
The body is largely intact having separated from its mounting angles. These mounting angles are still bolted to the chassis.

Right rail- only the angle at the rear has resisted the body falling off

Left rail- the angle did not resist the body falling off

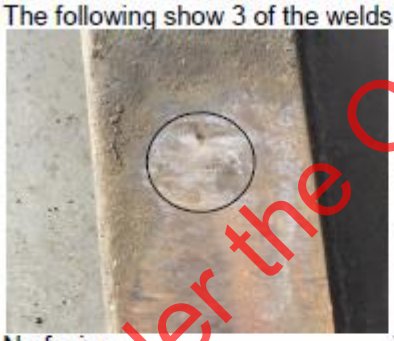
The attachment angle is 90 x 90 x 8 mm and is secured to the chassis with 12 off bolts per side M16 Cl 10.9.

All but one of the body cross members remained with the body and separated cleanly from the chassis. This one cross member was near the second axle and was torn out of the floor.



There are 21 body floor cross members at 300 mm spacing. They are I-beams 100 x 45.

There has been little fusion of the plug welds to the body floor cross members. The following show 3 of the welds to the underside of these cross members.



No fusion

Very little fusion

Little fusion

The following five photos show the lack of fusion of the plug welds that are visible on the top of the attachment angle. Note that these probably show the better of the welds as those with even less fusion would have broken earlier and been rubbed smooth by wear.





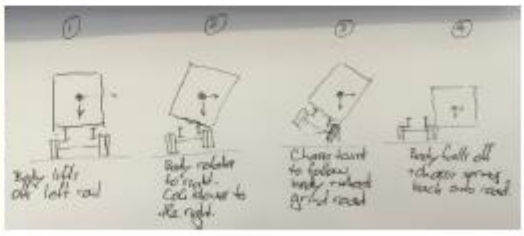
This was the best of the welds, but it still has about half of its area that is not fused.

The following three photos show the top of plug welds that have been broken for some time and have been rubbed smooth by wear.

It is notable that someone was aware of some part of this problem as they had in the past fillet welded the front right floor cross member lower flange to the attachment angle. This was insufficient and these welds had also broken some time ago.

From the appearance of the welds and the wear on the chassis and on the body floor cross members it appears as if all twenty one of the welds on the left side and the front six on the right side were fully broken prior to the final incident. With so many of the attachment welds broken, there was considerable movement taking place between the front of the body and the chassis member that it rests on. The chassis at this point is 130 mm wide and the wear is 145 mm wide or more, so that has been a total of at least 15 mm side movement.

The chassis is twisted and the outside wall of the right side forward tyre and its rim have been in hard contact with the road. It is believed that after the body started to roll off, the chassis was then forced to roll after it, but finally the chassis was able to spring back once the body was clear.



4.0 Inspection of operational trailers

A selection of refrigerated trailers were viewed in Hall's yards and in Maxitrans workshops in both Christchurch and Auckland by Out of Scope of NZTA and s 9(2)(a) on Monday 13 and Tuesday 14 January 2020. We met with s 9(2)(a) at Halls in Auckland and s 9(2)(a) among others at Maxitrans workshops.

Maxitrans have identified that there are five different types of Maxi-CUBE body design in respect of their mounting.

1. Rear B-train (This is the design type that failed)

These use a single plug weld to connect each floor cross member to each attachment angle. Up-hand welding is used for the plug welds. The attachment angles are attached to the chassis by bolts.

2. Lead B-train

These use double plug welds to directly connect each floor cross member to the chassis top flange. Down-hand welding is used for the plug welds. The body is also connected by bolts at the front between the skid plate and the chassis. At the rear the body is securely welded to the chassis.

3. Full Trailer

These use double plug welds to directly connect each floor cross member to the chassis frame top flange. Down-hand welding is used for the plug welds. The body is also connected by bolts at the front to the ball race. At the rear the body is bolted to the rear bumper which is welded to the chassis.

4. Maxi-CUBE VAN (2 or 3 or 4 axle Articulated semi-Trailers)

These use double plug welds to directly connect each floor cross member to the chassis frame top flange. Down-hand welding is used for the plug welds. The body is also connected by bolts at the front to floor cross members. At the rear the body is bolted to the rear bumper which is welded to the chassis.

5. Rigid truck body

The floor cross members are fillet welded to the chassis runner and this is mounted either using V-style bolted mounts or bolted spring mounting to the chassis.

4.1 Rear B-Train units

Of the 34 rear B-Train units in question they are not all identical:-

A) There are 11 units that were built in 2011 that were converted in 2016 from 2 axle to 3 axle unit configuration by Fruehauf. Two of these have been inspected by Maxitrans and it has been found that both of these now have a different arrangement securing the chassis to the body;

- Firstly the securing angle extends forward to the large cross member under the front wall of the body, and is welded to this cross member.
- Secondly the securing angle is attached to the floor cross members with fillet welds and not plug welds.

It is not yet known if all 11 have this same changed configuration, and there is a possibility that some of these 11 had new chassis made by Fruehauf in 2016.

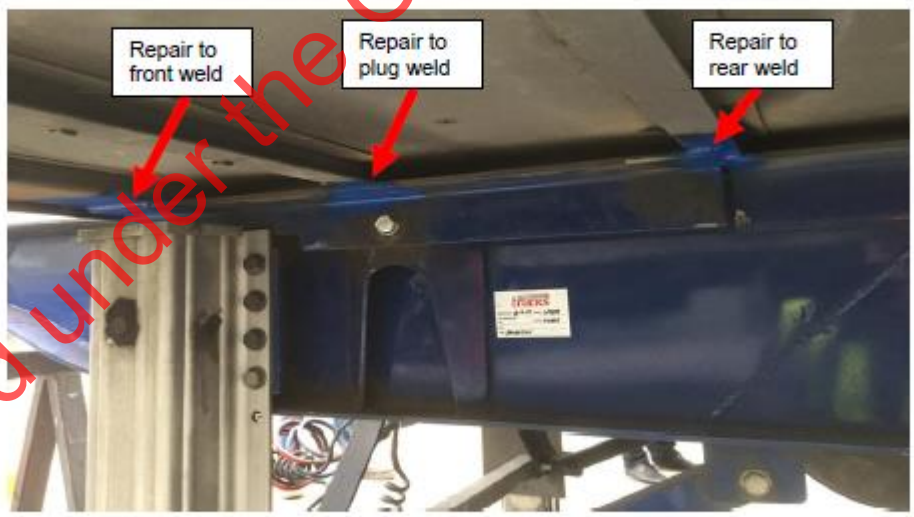
Neither of the two so far inspected have had broken floor cross member securing welds, but then this work was only done in 2016. The failed unit had been repaired with fillet welds for the front right joint and that was unsuccessful, so perhaps these will also eventually be unsuccessful. Maxitrans also advise that they used to take their support angles forward and weld it to the front wall cross member, but this did not survive well. It is therefore possible that future problems could occur with these 11 units and perhaps they should receive the same modification as is proposed for the other 23 units.

Photo of an older unit where the top flange of the support angle has been taken forward and welded to the front wall cross member. This has cracked and has needed repair as Maxitrans say is not uncommon. Yet the Fruehauf modified units are different in that it is the complete angle that is taken forward and the welding is to the front and rear only of the large wall cross member.

Fruehauf modified unit showing the angle that is taken forward to the front wall cross member and the welded to it at this members front and rear only.

B) Four of the units cart top hung meat carcases on a high mileage daily loop. There are some differences in the body construction to allow for this top supported load, but the floor construction is common to the standard unit.
It is curious that with three of the four trailers inspected, no floor cross member plug weld defect has yet been found. It could be that these four units were made at a different time by a different welder, or that the top hung load leads to gentler cornering by the driver, or the route may be less demanding, or the daily loading method is not so severe on the structure, or some other reason.

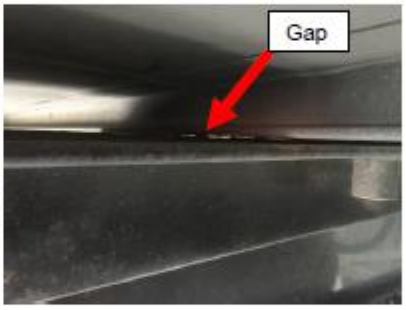
C) One of the units is purpose built to carry mushrooms and is lighter. Some of its floor cross member to chassis securing details are different. It has a support angle that attaches to the body wall front cross member, but inspection has shown cracks in this attachment and in one plug weld.



Maxitrans are in the process of inspecting the 34 rear B-Train units that they had built over the years. Broken body connection plug welds are being found in about half of the trailers. The failures are most commonly being found in the front floor cross member, with some trailers having up to six of the front cross member welds broken. In addition Maxitrans had found the occasional random plug weld that was not connected, it could be that these welds were never fused at all.

Maxitrans have found that the only effective way to inspect for insecure floor cross members is to jack them upwards. The following photo shows the technique used.

On some failed joints it is possible to see light through the gap (on an unloaded empty trailer), and sometimes cross members with failed welds show some degree of rust bleed. A pry bar proved to be ineffective, or the locations inaccessible, and the force required was too great to safely apply. In practice a man with a jack is the way to check these parts.



A hint of rust bleed is visible at some joints where the welds are broken, but this is not a reliable method of identifying this problem.

From below a failed plug weld still looks sound.

Failed welds on the floor front cross members lead to movement between the chassis and the front of the body and with experience this can provide an indication of broken welds.

4.2 Units other than Maxicube rear B-Train units

The bodies of refrigerated units are held to their vehicle chassis in a wide variety of methods. Random inspections of all of the units that happened to be in Halls yards and at Maxitrans workshops during the visits did not raise any new concerns. These inspections included a wide variety of Maxicube vehicles as well as units made by Fairfax, Steelbro and Schmitz.

Schmitz body connection to the chassis appears to be very robust, but what is under the insulation is unknown.

5.0 Root cause analysis

Understanding the root cause of a problem is a necessary part of reliably determining a cure. In this case the body has fallen off the chassis as a result of failed welds, with the following identifying the root cause.

When a B-Train travels over a road that has a twist in it, the lead trailer axle group will take up one transverse slope and the rear trailer axle group will take up another transverse slope. Something must accommodate this twist between the two trailer axle groups, yet most of the components are rather rigid:-

- The suspension on these trailers is specifically made to have high lateral rotational stiffness so that the trailer does not roll outwards in a corner and so provides the trailer with a high SRT (Static Roll Threshold) result and this makes for a stable trailer.
- The refrigerated body is inherently very stiff due to its size.
- The fifth wheel connecting the two trailers is a single oscillating unit and this provides very little transverse rotation.
- However there is a 1800 mm length of chassis forward of the body which can flex to a limited extent to take up the required twist.

When the chassis forward of the refrigerated body twists it applies a load to the body attachments and in particular to the first body attachment. Larger twists in the road results in larger loads applied to the connections. These loads are routinely repeated and to avoid failure the connections must be suitable for these fatigue loads applied.

Other loads will also apply to these chassis attachment welds including side loads from cornering and from the steering forces plus loads experienced from loading the payload, and from the vehicle swaying, yawing and pitching as it travels.

The plug welds have been poorly carried out with little fusion between the attachment angle and the floor cross members. These poor welds are partly as a result of carrying out these welds in an overhead position and partly as a result of insufficient skill by the welder to satisfactorily carry out these very difficult welds. It is an unrealistic design that specifies such welds without; suitable workshop technical support, quality assurance practices, quality control measures and weld inspectors in place to ensure that such welds are suitably carried out.

In summary, the loads applied to the welds have been too great for these poor quality welds to withstand in the long term and they have failed, probably in a domino fashion over the years, starting from the front end. The inaccessible location of the weld failures has meant that this problem has not been seen by in-service inspection. Eventually a cornering load has overwhelmed the remaining welds and the body has fallen off.

6.0 Repair proposed

When correcting structural failures in a trailer, the designer is often faced with the decision of making the parts stronger or more flexible. Making the part stronger is the easier approach but it is not always completely successful. Increasing flexibility to reduce the loads to acceptable levels requires careful understanding and detailing, and is demanding work but it often gets a better long term result.

Making a part stronger normally increases the parts rigidity, and where a component is failing as a result of deflection imposed due to say the road surface, then increasing the parts strength can also increase the load applied. This increased load can mean that the stronger part also suffers along with other items that were previously performing satisfactorily.

What Maxitrans have proposed is to strengthen the connection between each floor cross member and the attachment angle. They intend to do this by adding gussets as the following images show.

This new arrangement will be fitted at each location, giving a total of 42 assemblies to be installed on most vehicles.

This arrangement has several advantages over the existing plug welds:-

- Substantially stronger connection
- Easier to correctly install
- Any subsequent deterioration can be readily seen by in-service inspection, well before an unsafe condition develops.

As a result of the stronger and stiffer connection there is a possibility that at some stage cracks will form in some of these connections, perhaps starting at the front such connection. But given the high number of these connections that are proposed per vehicle, and that any failure will be slowly progressive and obvious, then any such defects will be picked up by the CoF Inspectors well before there is any further risk of body detachment. So the proposed modified attachments could be inconvenient for the owners in the long term, but that is a commercial matter between them and Maxitrans.

Public safety can be confidently expected to be maintained by these modified body attachments as proposed by Maxitrans.

Annex

Inclusions:

1. MaxiTrans publication / statement (17/01/2020)
2. Letter from s 9(2)(a) 3 February 2020
3. Email to s 9(2)(a) 1 March 2020
4. MaxiTrans internal investigation document
5. Original build check sheet, supplied by MaxiTrans (Pages 1,2 & 5)
6. Original weld procedure, supplied by MaxiTrans (Pages 1,4 & 5)

1. MaxiTrans publication/statement:

MaxiTRANS

Dated: 17-01-2020

TO WHOM IT MAY CONCERN

MaxiTrans and NZTA have agreed that the risk associated is isolated to one design of vehicle i.e. *Tag Refer B-Trains unit* only. All other MaxiCUBE products have a different mix of mountings between the chassis and body, which has been cleared from investigation. For effected vehicles, MaxiTrans have provided a repair solution and have started implementing where required. All impacted vehicle owners have been contacted and all affected vehicles are being inspected.

Other than *Tag Refer B-train unit* are safe to run on the road and only require the routine COF inspections.

Below is example of mounting style that is at risk:

MaxiTRANS

Above mounting style is only applicable to Tag Refer B-train as depicted below:

Please contact MaxiTRANS Engineering or Service on 09-269-0712 for any enquiries re effected vehicles.

s 9(2)(a)

MaxiTRANS Industries

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P: +64 9 269 0712 | **M:** s 9(2)(a)

E: s 9(2)(a) @maxitrans.co.nz

W: www.maxitrans.co.nz

MaxiSAFE – ZERO Injuries – EVERY Day

2. Letter from s 9(2)(a) **3 February 2020**

3rd February 2020

Out of Scope
Senior Manager, Safer Vehicles
50 Victoria Street
Wellington 6141
New Zealand

Dear Sir,

Re: 2014 Maxi-Cube Trailer Detachment

We acknowledge the following points and specific requirements mentioned in your letter dated 23rd January 2020 being;

- The process and procedures adopted by MaxiTRANS from the design stage to manufacturing
- Actions MaxiTRANS is taking to ensure that significant risk to land transport safety which has occurred in this case has been eliminated for in service and future vehicles

In response to the points stated above, MaxiTRANS trailers are manufactured onsite and/or from local and imported structural components.

When importing partially built up heavy trailers or the structural components, MaxiTRANS ensure that it complies with all applicable Acts, Regulations, Land Transport Rules and NZ Transport Agency published guidelines to ensure all heavy trailers produced by MaxiTRANS are safe and compliant.

For any offshore manufacture, MaxiTRANS ensures that the manufacturer has a quality management system (QMS) that tracks materials from source to the completed vehicle or component and is available for audit by MaxiTRANS.

All the welded components are manufactured to comply with AS/NZS1554 by welders certified to either AS/NZS1554 or AS/NZS 2980 for the particular weld type use. (Please see attached example of complete QMS/PDS: 93721 NZ19898 Full Trailer Chassis.pdf)

A Heavy Vehicle Certifier, appointed by NZTA, completes a thorough check before any assembly of components to ensure that all welding meets NZTA standards, rules and regulations. Once satisfied with the workmanship, relevant documentations, welders' tickets etc. an LT400 is issued and the vehicle is presented for compliance.

When manufacturing a trailer onsite there are hundreds of active SOPs that are followed in manufacturing the trailer. Several examples are attached for your info. (Attachment: Skidplate.pdf, Ball race Bolting Procedure.pdf, TIFB14 Freighter Dolly-Fabricating Drawbar.pdf)

Any trailer that is manufactured onsite is subjected to detailed inspections.at each step by welding supervisors, onsite Engineers and NZTA appointed heavy vehicle engineering certifiers.

MaxiSAFE
Send all our people home safely

MaxiTRANS INDUSTRIES LTD 61 Spartan Road PO Box 217, Takanini, Auckland 2105, New Zealand T: +64 9 269 0712 www.maxitrans.co.nz

MaxiTRANS ensures that all welders have current welding tickets and follow the welding/assembly procedures. Each area supervisor also completes a unit inspection check before assembling (Example attached: Unit inspection checklist – Vans.doc)

All manufactured products go through a final quality audit before handover to the customer. (Example attached: Quality check document)

MaxiTRANS has been completing the inspection regime and has checked almost all similarly built trailers. The risks in the active trailers has been eliminated. Any future builds of such trailer type will be of the updated design which will ensure that all trailers are safe to operate in NZ.

Safety is paramount for MaxiTRANS. MaxiTRANS ensures that its products are robust, built for New Zealand roads and safe to operate.

Please note, our products are engineered to withstand normal wear and tear and road use with an additional buffer of strength for safety. The life and safe operating condition of our equipment can be significantly impacted by events outside of our control as a manufacturer including significant impacts, maintenance and inspection processes and loading weights.

If you wish to discuss anything further, please do not hesitate to contact us.

Yours Sincerely

s 9(2)(a)

MaxiTRANS Industries PTY Ltd.

3. Email to s 9(2)(a) 1 March 2020

From: Out of Scope
Sent: Sunday, 1 March 2020 5:41 PM
To: s 9(2)(a) @maxitrans.co.nz>
Subject: Maxi-Cube Body Separation

s 9(2)(a)

Many thanks for meeting with my team and I on Friday.

Following the meeting you wanted me to send my notes.

Firstly I must acknowledge the effort your company has put into making the vehicles safe which were examined following the Maxi-Cube trailer body separation in January. This was a serious event which raised significant risks to Land Transport Safety, concerns about the original design and the poor quality of plug welds during manufacture.

Prior to the meeting you had been provided with a copy of our engineers report.

At commencement I provided an overview of the back ground, highlighted our concerns, our role and our ability to seek information.

I was pleased you immediately indicated your company wanted to cooperate fully and were prepared to provide any information we sought.

We agreed to outline our concerns and the information we would require however you felt you would need more time to respond.

I outlined how we would need to understand:

- How these trailers were built, New Zealand or Australia?
- Where were the components sourced from?
- Who designed the trailers?
- Who certified the trailers?
- Where assembled?
- What Investigation had been completed by Maxi Trans?
    - Was there an investigation re the design – What was the reasoning behind the design and had safety been compromised based on need to reduce cost.
    - What investigation had been completed re the quality of workmanship – What action taken to ensure it isn't repeated. I.e. defective welds and training of staff involved in the original construction.
    - What changes to quality assurance have been made:
        - To check welding
        - To test the finished trailers

I understood you would be commencing an internal enquiry re the above over the next two weeks.
You agreed to review other designs and disclose to Waka Kotahi if there was any suggestion of a safety risk.
You also indicated you were happy for us to review other designs on request.

We agreed that Out of Sco would work directly with your team re our Investigation and remain our lead.

You said you would consider updating TTMF and RTF.

Once again thankyou for your cooperation and please let us know when you are ready to provide Out of Sco a response in relation to the above.

Regards
Nga mihi

Out of Scope / Senior Manager Safer Vehicles
Te Koopu Waeture (Regulatory Services)

4. MaxiTrans internal investigation document:

Dated: 12-08-2020

INTERNAL INVESTIGATION OF HALL'S TRAILER INCIDENT

VIN 7AT0PR00X14087180

Background:

MaxiTRANS was informed by NZTA about an incident involving a MaxiTRANS trailer in January 2020 after being involving in an accident. It was reported that the body had detached from the chassis after the impact. Following the incident, MaxiTRANS generated complete list of all possibly affected products and investigated the root cause of the failure.

Investigation and Actions:

- In this particular design, the body to trailer connection mainly relies on a series of single plug welds with no other secondary means of attachment between body and chassis.
- It was found the cause of the detachment was due to the single row of plug welds failing in operation and due to there being no secondary connection the body completely detached from the chassis.
- There were around 38 custom designed trailers, of this design, most of them were in the Hall's fleet. All trailers had been recalled and had the approved repair procedure as discussed in conjunction with NZTA within one month of the incident.
- MaxiTRANS continued with internal investigation and checked all designs in relation to body/chassis connection to be assured that the issue is isolated to this particular model/design and that no other trailers pose a safety risk.
- MaxiTRANS provided a complete list of different trailer types designed by MaxiTrans to NZTA as well detailing the MaxiCUBE body design in respect to mounting.
- Current procedures have been reinforced and updated with extra checks from area supervisor and engineering team. Final inspection will be done by NZTA approved certifier as normal.
- MaxiTrans have implemented some further quality checks and Audits. See Appendix A (Unit inspection checklist – fabrication) , APPENDIX B (Final Inspection checklist – MaxiCube) & APPENDIX C (FTA – example Audit File)

s 9(2)(a)

MaxiTRANS Industries

APPENDIX A

Unit Inspection Checklist - Fabrication (Non-Skel)

Job Number:						
Customer:						
First Inspection by:						
Date:			Date of rectification:			
Requirements	Achieved / Not Achieved / Not Applicable (✓)	(×)	Issues Found	Decision (✓)	(×)	
Framework						
Welds correct & neat						
Swarf /dirt removed						
Kerb side-Sliding posts						
Correct size						
Kerb side-Coamings						
Not scratched						
Not dented						
Pocket welds						
Kerb side-Rope rails						
Not scratched						
Not dented						
Weld correctly blended						
Road side-Coamings						
Not scratched						
Not dented						
Pocket welds						
Road side-Rope rails						
Not scratched						
Not dented						

	Weld correctly blended					
Doors & Rear Frames						
	Welding quality					
	Square of frame					
	Correct material used					
	Welding quality					
	Ferry work					
	Chain plate					
	Transit lock beam					
	Walls					
	Checking against drawing					
	Lower raise valve bracket					
	Toolbox bracket					
	Tank bracket					
Lead unit-Tow Hitch (5th Wheel)						
	Fully welded					
Lead unit-Skid plate						
	Correct material					
	Welding quality					
	Straightness					
	Skid plate flat no burrs					
Lead unit-Suspensions under						
	General appearance of main rail welds					
	General welding completed					
King Pin						
	All king pin bolts torqued					
Lead unit-Floor						
	General welding correct					
Apron						
	Check apron plate is flush against skid plate					
	Check material					
	Check against drawing					
Base frame						
	Check material					
	Check square of base frame					
	Check against drawing					

Dolly					
Check hanger					
Check dolly hinge					
Check ball race					
Truck Mounts					
Check if it the right truck					
Check any damage to truck prior to start the job					
Check ball race					
Check all items removed is fitted back to its original place					
Mezz floor if applicable					
Mezz floor stabilizer angles correct against spec					

I have inspected the new equipment. It is as per specification and ready to handover to next department.	*Team leader please sign here once all issues have been rectified:*

Sign off per team before Painting commences

Team	Team Leader – Name & Signature Sign Off
Freighter	
Electrical/Plumbing	
Van	
Rigid	
Paint	

APPENDIX B

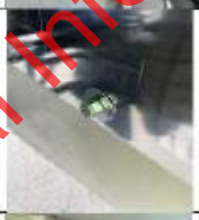
Final Inspection Checklist- Maxicube Section

Job Number:				
Customer:				
Inspection by:		**Date:**		
Requirements		**Comments**	**Decision** (✓)	**Decision** (×)
1	General appearance - all decals			
2	General appearance - Clean			
3	General appearance-Rivets			
4	General appearance-Sealing			
5	General appearance- Paint			
6	General appearance- No rust marks (Cab & Unit)			
7	Check all exterior and interior walls and underneath for stickers, cable ties, masking tape etc and remove			
8	Guard- Correct fitment			
9	Guard-Correct Colour			
10	Guard-Not scratched			
11	Guard-Correct level			
12	Guard-Clean			
13	All Galvanized parts tidy			
14	All Zinc plated parts tidy			
15	All parts that are manually operated in good condition			
16	Steps- Good condition			
17	Folds- Good condition			
18	Lights- Placement			
19	Lights- Straight			
20	Lights- Not loose			
21	Wires tidy – cable ties trimmed			
22	Plumbing tidy – cable ties trimmed			
23	Wheels & Wheel nuts – Secure, correct & clean			
24	Important bolts torqued (Marked)			

25	I-Bolt torqued (Marked)			
26	Body Mount Bolts Secure			
27	Kingpin bolts torqued (Marked)			
28	5 th Wheel greased & marked			
29	Landing leg greased			
30	Ringfeeder coupling secure			
31	Airbag bolts secure			
32	Door operation good			
33	Correct Fridge Fitted			
34	Correct Underbody Gear fitted			
35	Roof Sealed			
36	Tail lift operating correctly			
37	Overall cleanliness			
38	Tool Box - Locks			
39	Tool Box -Lid			
40	EBS plug – Correct placement			
41	EBS plug – Good condition			
42	Ferry hook- Correct placement			
43	Ferry hook- Good condition			
44	Interior Appearance-clean and tidy			
45	Check for filing burns under aluminum extrusion			
I have inspected the new equipment. It is as per specification and ready to handover to the customer.		Signature (Maxicube Area Supervisor)	Date	

APPENDIX C

Audit No.	3
Unit NZ Serial No.	NZ20019
Unit Type	MaxiCUBE Reefer Rigid
Inspection Checklist - Area	Rigid
Customer	s 9(2)(a)
Audit Inspection Completed By	

No.	Location	Description	Update Checklist Y/N	Photo	Correct action taken if applicable
1	Framework	Paint quality poor	No		
2	Guards – front LHS	Fastener wrong size	No		
3	Back corner of unit	Rods need to be cut	No		
4	Cab & roof	Rust flecks	Yes		
5	Internal wall	Scratched	No		

5. Original build check sheet, supplied by MaxiTrans (Pages 1,2 & 5)

MaxiTRANS Australia Pty. Ltd
UNIT Inspection Checklist

MaxiCube Reefer & Dry Freight

Customer Name	HALL
Serial No.	87180

TICK FOR PASS - X FOR FAIL /RECORD ISSUE

First inspection by s 9(2)(a) Date 23/7

Second inspection by Date

Line Inspection		Issues Found		
Build Specification	**CORRECT**	**Issue: describe fault & location**		
UNIT to be checked against Build Specification			Fixed	Final
All sections checked	✓			
and Marked on Build Spec	✓			
Trailer dimensions filled out				
Vin Plates				
Check VIN plates & vin numbers		N2.		
all match Build Spec.				
PIC sheets				
all sections completed				
Missing or incomplete				
all outstanding work completed				
Fridge			Fixed	Final
Correct to Build spec		N/A		
Correct installed and not damaged				
Runs correct				
Serial No.written in PIC sheet				
Fridge plug fitted if fridge not required				
Fuel Tank		N/A		
Correct installed				
Fuel line & breather correct				
Paint/Gal coverage				
Tank Clean				
Corner posts				
Top corner castings straight/sealed	✓			
Fitted flush with monos in bottom	✓			
Glued correctly	✓			
Not damaged or scratched	✓			
Decals correctly fitted	✓			
Apron plate				
Skidplate connection to baseplate	✓			
Skidplate flush with apronplate	✓			
Bolts & nyloc nuts tensioned	✓			
Paint & gal coverage	✓			
Swarf & dirt removed - skel	✓			
All sealing correct	✓			
Skidplate				
Skidplate correctly fitted	✓			
Bolts & nyloc nuts tensioned	✓			
Skidplate flat no burrs	✓			
No insulation in inspection holes	✓			
Kingpin				
Correct position & type	✓			
Not Damaged	✓			
Bolt tensioned & marked	✓			

Issue date 10/07/14 1 of 5

MaxiTRANS Australia Pty. Ltd
UNIT Inspection Checklist

Line Inspection		Issues Found	Fixed
Landing Legs			
Subframe correct /gal/paint coverage	✓		
Lower & raises	✓		
Handle and clip fitted and correct		HANDLE HITS UNIT IN HIGH GEAR.	
Bracing Bolts correct length and tensioned	✓		
Correct feet & bolts	✓		
Centre bar fitment Bolts and washers	✓		
Paint Colour & Coverage	✓		
Water tank			
Correct tank fitted and straight			
Not Damaged/Scratched			
Paint & gal coverage			
Tap & filler bung tight			
Tyre carrier			
Correct Tyre carrier			
Correctly Fitted			
clamps are correct and tight			
Paint/Gal coverage			
Suspensions Under		**Issue: describe fault & location**	
General Appearance of		CLEAN WRITING OFF MAIN VALVE BETWEEN AXLES.	s 9(2)(a)
mainrail welds & sealing	✓		
Suspension correct type	✓		
Air hoses correct & tidy	✓		
Air lines/loom tied neatly	✓		
General welding comleted	✓		
Paint coverage		CLEAN UP + PAINT ALL TANK BRACKETS	s 9(2)(a)
All bolts correctly tensioned		TENSION SHOCKER BOLTS.	
Black straps removed from shockers	✓		
Ride height set & correct	✓		s 9(2)(a)
Raise/lower valve operational		REQUIRES DECAL	
Dump valve fitted & tested	✓		
Load gauge as per spec	✓		
Park release fitted	✓		
Plugs removed BPW boosters	✓		
Brakes adjusted & pins fitted	✓		
ADR spanner fitted	✓		
Dust covers fitted if required	✓		
All fittings & clamps tight	✓		
Rims & tyres correct			
Valve stems opposite			
Valve extentions fitted			
Hubs painted correctly			
Spacers fitted if required			
Wheel nuts tensioned			s 9(2)(a)
Hubometer fitted & correct		FIT INNER.	
Correct guards & flaps fitted	✓		s 9(2)(a)
		CLEAN UNIT OFF UNDERSIDE OF GAL SPACER R.S.	
EBS fitted correctly and commisioned			
Radius guards correct & tight	✓		
Air tested	✓		
Rear Bumper			Fixed Final
Safety Ladder fitted as per spec	✓		
Fitted correctly	✓		
Infills correct and correctly fitted	✓		
Braces fitted & tight	✓		
Dock buffers fitted & tight	✓		
Paint Coverage	✓	REQUIRES TOUCH UPS UNDER	s 9(2)(a)
Long vehicle/road-train sign	✓		
End castings fitted & rivitted	✓		

Issue date 10/07/14

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MaxiTRANS Australia Pty. Ltd
UNIT Inspection Checklist

Line Inspection		Issues Found	Fixed
Decals			
Landing leg decals	✓		
Front wall	✓		
Under body boxes	✓		
Fuel tank	✓		
Rear doors	✓		
Bumper	✓		
Infills	✓		
Any extra signage	✓		
Side walls at rear	✓		
All internal decals	✓		
All sign writing completed	✓		
Fit Road friendly suspension decal	✓	REQUIRED.	s 9(2)(a)
Spares			
All spares in t/box or rear of unit		REQUIRED.	s 9(2)(a)
Spare wheel correct & fitted	✓		
Double loader/ shoring bars	✓		
Any additional spares required		REQUIRED.	s 9(2)(a)
Underbody boxes			
Correct size & position		N/A	
T-handles correct & tight			
No damage or scratches			
Paint/gal coverage			
Internal front wall			
Correct bulkhead fitted	✓		
No damage or holes in panel	✓		
Mesh guards tight	✓		
FRP bulkheads correct	✓		
Bodyrails			
Not scratched or dented		CLEAN + CHECK.	s 9(2)(a)
All corners sealed	✓		
Fasteners correct	✓		
Clean behind bodyrails	✓		

COMMENTS

STRAIGHTEN ROOF LIGHTS RS 2ND 3RD + 5TH. s 9(2)(a)

TOUCH UP LIFTING LUG HOLES AT FRONT s 9(2)(a)
TOUCH UP [illegible] LASHINGS

FULL TOUCH UP REQUIRED. s 9(2)(a)

TOUCH UP FRIDGE MOUNT RoS. s 9(2)(a)

TOUCH UP AT 2/LEGS WHERE LOOM ROD WELDED. s 9(2)(a)

PIPES ON GUARDS NEED BLACK CAPS NOT REFLECTORS s 9(2)(a)

MOST CROSS MEMBERS ARE SCRATCHED (TOUCH UP) s 9(2)(a)

TOUCH UP UNDER CROSS BRACE FOR LANDING LEGS. s 9(2)(a)

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6. Original weld procedure, supplied by MaxiTrans (Pages 1,4 & 5)

MaxiTRANS MANUFACTURING PTY LTD
QUALITY SAFETY PROCEDURE

Task/Operation	**CLASSIC VAN** **SUSPENSION SUB FRAME SETUP** ONLY AUTHORIZED PERSONNEL TO UNDERTAKE THIS TASK
Plant, Equipment and/or Hazardous Substances	• MIG WELDER – SWP P. 006 • AIR GRINDER SANDER – SWP P.078 • MANUAL HANDLING – SWP MH.060 • OXY ACETYLENE CUTTING – SWP H.037
"Before" Checks	• CHECK JIG FOR CLEANLINESS • CHECK DRAWING AS PER WORK ORDER • CHECK MEASUREMENT OF MATERIALS AS PER DRAWING
Safety warnings	• REFER TO SWP'S LISTED ABOVE FOR SAFETY DETAILS
PPE	• Safety Boots, Safety Glasses, Full Length Overalls, Welding Gloves, Riggers Gloves, Hearing Protection, Welding shield, Face shield. OPTIONAL; Leather Apron, Leather Sleeves, Welding Jacket, Hood
Operating Procedure	• CHECK STRAIGHTNESS OF BOLSTERS NOTE: IF BOLSTER IS NOT STRAIGHT PUT IN DISCARD STILLAGE • LAY CORRECT NUMBER OF BOLSTERS INTO BASING JIG AS PER DRAWING • SET SPACINGS AS PER DRAWING • LAY CORRECT NUMBER OF TFB INTO JIG AS PER DRAWING • SET SPACINGS THEN FIT END PLATES AS PER DRAWING (FIG. 1)

FIGURE 1

Implementation Date	16/11/07	Prepared By	s 9(2)(a)	Review Date	16/11/09	Issue No	Document No.
Authorised By	Engineering O.H. & S. Production		Page 1 of 10	Reviewed		1	3.1.3 CVS15

- FRONT OF UNIT: ADJUST THE WIDTH BETWEEN MAINRAILS (DOUBLE CHECK THAT THE MEASUREMENT TO SIDES ARE EQUAL) (FIGS. 9 & 10)
- TACK BRACES AT TOP AND BOTTOM FLANGES.

FIGURE 9

FIGURE 10

- TACK MAINRAILS TO THE TRI-BOLSTER AS SHOWN. (FIG. 11)

FIGURE 11

- TACK TURNBUCKLES TO MAINRAIL THEN ADJUST FOR SQUARE (FIG. 12)

FIGURE 12

- FIT TAPE MEASURE TO REAR OF UNIT AS SHOWN (FIG.13). ADJUST BOLSTER SPACINGS AS NESCESSARY. (REFER TO DRAWING/BUILD SPEC.) (FIGS. 13 & 14)

FIGURE 13

FIGURE 14

- TACK THE OUTER FLANGE OF MAIN RAILS TO BOLSTERS, TRI-BOLSTER & TFB'S. (FIG. 15)

FIGURE 15

- PLUG WELD ALL BOLSTERS TO MAINRAILS STARTING ON THE INNER FLANGE TO AVOID SEPARATION (FIG. 16)

FIGURE 16