Low Volume Vehicle Technical Association (inc)

INFORMATION SHEET

 # 02 - 2023 (May 2023)

Helping New Zealanders Build & Modify Safe Vehicles

Aftermarket Tubular Suspension Arms with Cantilever-style Ball Joints

Introduction

This Information Sheet is released in conjunction with LVVTA Safety Alert #02-2023, and explains the issues with aftermarket upper and lower suspension arms made by various American companies, which feature poor designs, and in some cases poor workmanship. These companies include Ridetech, Chris Alston's Chassis Works/KP Components, and Porterbuilt/PBFab - however there may be others we are not yet aware of. LVVTA is concerned for the safety of road users and occupants of vehicles fitted with these potentially unsafe arms.

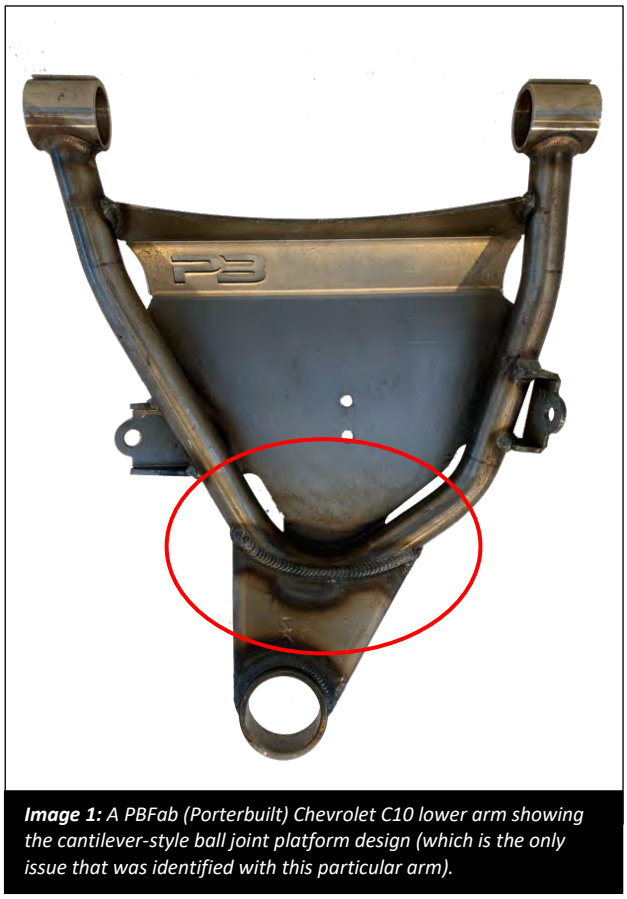

Image 1: *A PBFab (Porterbuilt) Chevrolet C10 lower arm showing the cantilever-style ball joint platform design (which is the only issue that was identified with this particular arm).*

Background

A trend has emerged with aftermarket manufacturers (in most cases) utilising a one-piece, U-shaped tubular arm design with a separate folded steel platform for the ball joint attachment. Due to the design (which uses a large cantilever), strength and durability issues are of significant concern with numerous versions of these arms. The concerns include the risk of fatigue failure due to the extra leverage acting on the welded connection to the ball joint mounting platforms. In some cases poor weld quality has also been identified, and in other cases airbag/spring mounting platforms have been so poorly designed that they actually bend under the vehicle's weight.

Guidance for Affected Vehicle Owners

LVVTA technical staff and the LVVTA Technical Advisory Committee have examined a number of different versions of these arms, and are developing a database of arm designs that have been assessed, including their rectification status, part number, description, and any relevant photos. In the first instance, any owner of a vehicle fitted with potentially affected suspension arms should stop using the vehicle, and visit *www.lvvta.org.nz/aftermarket-arms* to determine whether the arms are of the affected type, and if so, check the status.

Obligations of an LVV Certifier

When LVV certifying a vehicle fitted with tubular cantilever-style suspension arms, an LVV Certifier must ensure the arms have been either confirmed by LVVTA as not requiring any rectifications, or have been modified to meet LVV requirements as per rectification details on the applicable Information Sheet. In all cases, the LVV Certifier must carry out a thorough visual inspection of all welds. If required, weld rectification details can also be found via the web link above.

Issues

Multiple strength and durability issues have been identified with this style of suspension arm, which will be explained throughout the following three sections:

1. Cantilever-Style Ball Joint Mounting Platform

The most common problem relates to the ball joint platform, which is welded onto the outer part of the U-shaped arm section, creating a large cantilever. There are also no gussets to support the critical function welds at this highly loaded point - in many cases carrying the vehicle's entire corner weight. This results in extremely high load concentrations at the ends of the welds, which is considered to be poor engineering practice.

In some cases this poor design has been found to occur in conjunction with substandard welding, which increases the risk of a catastrophic failure.

Image 2: *This is an example of a Ridetech Chevrolet C10 truck lower arm with cantilever-style ball joint design.*

2. Weld Quality

To make matters worse, some examples of the arms inspected by LVVTA have had significant weld defects (including undercut, craters, and incomplete welds), all of which can significantly reduce the strength of the welded connections and increase the risk of a catastrophic failure or fatigue-related issues, such as cracking. Many of the weld defects were at the most highly loaded connection points.

Image 3: *This is an example of incomplete welds on the coil-over mounts.*

Image 4: *This is an example of a poor weld including craters and incomplete welds at the ball joint end housing.*

Image 5: *This is an example of an incomplete weld and craters, at the ball joint end housing (a highly loaded part of the arm).*

Image 6: *This is an example of a weld at the ball joint end housing (a highly loaded part of the arm) which has significant undercut, a weld defect that reduces the thickness and strength of the parent material.*

3. Airbag Mounting Platforms Bending Under the Static Weight of the Vehicle

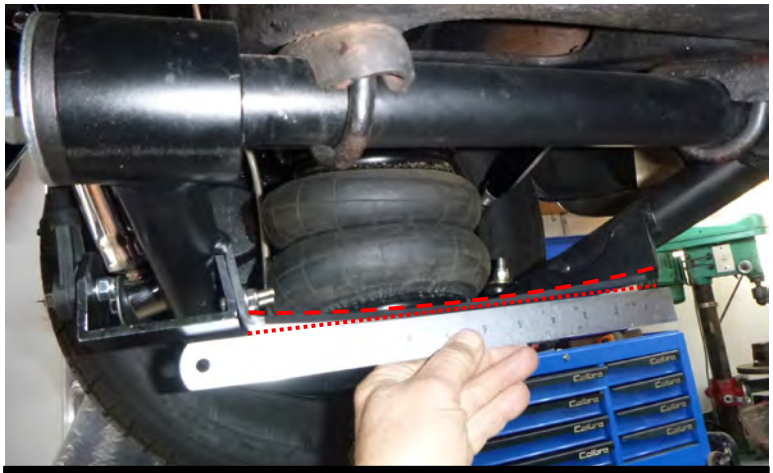

Image 7: *This is an example of a Chevrolet C10 truck Ridetech lower control arm, with a visible bend or sag in the air bag mounting platform.*

Loads on suspension components are significantly higher when a vehicle is in motion, especially in the case of loaded suspension components (where they are required to carry the weight of the vehicle), for example, a lower control arm that has the spring attached to it. In this case, an arm was found to have bending visible to the naked eye when the vehicle's weight was applied to the arms (such as when the vehicle is on a hoist and lowered onto the ground). In real terms, the actual loads on a component could be up to three times the weight of the vehicle (referred to as 3G, or 3 times gravity), when combinations of loads occur, for example hitting a large pot-hole at speed, on a corner, while braking. Automotive suspension components should also be designed to include a safety factor of 1.5. This means a suspension arm should be designed to withstand four and a half times the actual weight of that corner of the vehicle, or 4.5G (4.5 times gravity).

Where part of an arm exhibits visible bending while the vehicle is stationary, bending will become worse when the vehicle is being driven. This raises significant concerns about the long-term strength and durability of these arms as fatigue-related issues will almost certainly become apparent in time.

Rectification

LVVTA technical staff and the LVVTA Technical Advisory Committee have examined a number of different versions, and (in some cases with assistance from local fabricators) are developing a range of rectifications in an effort to enable vehicles fitted with these arms to be LVV certified where possible. While some rectifications have been relatively straightforward, others have required significant re-engineering and testing to confirm the suitability of the finished design. This kind of work is time-consuming and costly, and the assistance of local hot rod engineering shops like Custom Street Rides in Taranaki, and Bad Penny in Hamilton, is greatly appreciated.

Where an arm has been identified by LVVTA as requiring rectifications, and where it is possible for suitable rectifications to be carried out, an Information Sheet will be produced that provides specific templates (if any) and rectification instructions for that particular arm. This will, whenever possible, allow an affected suspension arm to be modified to meet LVV requirements. The LVV Certifier will also use the Information Sheet (along with any relevant LVV technical requirements) to assess the arm for LVV certification. Therefore, it is important that the person carrying rectifications to the arm follows the relevant Information Sheet closely.

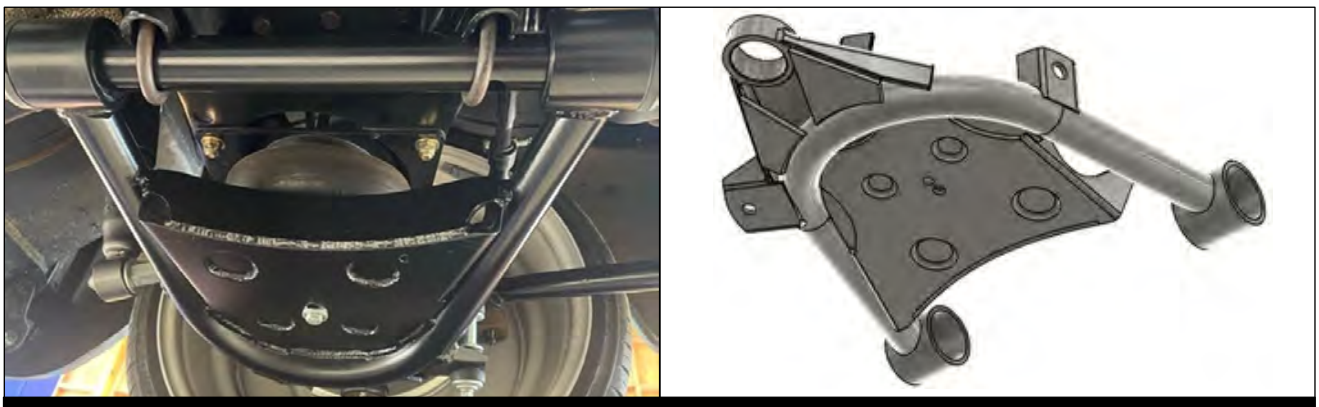

Image 8 and 9: *This is the Ridetech lower control arm shown in Image 7 after significant rectification work to reinforce the ball joint bracket, and eliminate the sagging in the air bag mounting plate. LVVTA thanks Custom Street Rides (CSR) for their assistance with developing and testing this rectification.*

Note: the arm assessment and development of rectifications and associated documents can take a significant amount of time, taking into account that there are a number of different arms on the market which all have to be assessed. Whilst LVVTA will endevour to assist customers in a timely manner, some delays are possible, dependant on LVVTA workload at the time.

Image 10: *Ridetech 'StrongArms' lower control arm.*

Image 11: *PB Fab/Porterbuilt lower control arm.*

Image 12: *Ridetech upper control arm.*

Image 13: *KP Components lower control arm.*

Image 14: Chris Alston's Chassis Works lower control arm.

Image 15: *Ridetech lower control arm.*

FOR FURTHER INFORMATION PLEASE CONTACT YOUR LVV CERTIFIER, OR LVVTA.