

Address:
First Floor
Spencer House
137 Kolmar Road
Papatoetoe

Postal Address:
PO Box 23 759
Auckland
New Zealand

Communications:
Phone: (09) 279 3301
Fax: (09) 277 7984

TECHNICAL BULLETIN #4

**TO: ALL VCNZ CERTIFIERS, VCNZ APPROVED ENGINEERS,
AND NZHRA MEMBER CLUBS**

REVISION #00

1586/25E

CERTIFIERS A-ARM INSPECTION GUIDE

This Bulletin takes effect as at the 1st of June 1996

INTRODUCTION:

This Bulletin has been developed to provide NZHRA Certifiers with a procedure and the necessary information from which to properly inspect and assess a Scratch-Built A-Arm Independent Front Suspension unit. There are a number of specific aspects that require particular consideration, which are outlined in this document.

RULES AMENDMENTS:

1. Rules affected by this change are (New Vehicle Code):

2.24, Page 65

The Rules are to be changed from:

"Proposed design must first be submitted to NZHRA for approval. Drawings of proposed suspension must be to scale and clearly indicate geometry, construction detail and material specifications"

Application details must incorporate all design criteria required within Technical Bulletin #3 'Scratch-Built A-Arm Independent Front Suspensions' (Reference Number 1535/25E)"

to remain the same but be immediately followed by:

"Any vehicle having a Scratch-Built A-Arm Independent Front Suspension must be inspected in accordance with Technical Bulletin #4 'Certifier A-Arm IFS Inspection Guide' (Reference Number 1586/25E) in addition to the normal Certification Inspection Process."

1.17, Page 51

The existing Rule is to be preceeded by:

“Any vehicle which has undergone a steering change which may affect steering and/or suspension geometry should be subjected to the applicable parts of the Certification Inspection Process detailed within Technical Bulletin #4 “Certifiers A-Arm IFS Inspection Guide” (Reference Number 1586/25E).

2. Rules affected by this change are (Retrospective Vehicle Code):

1.16, Page 193

This existing Rule is to be preceeded by:

“Any vehicle which has undergone a steering change which may affect steering and/or suspension geometry should be subjected to the applicable parts of the Certification Inspection process detailed within Technical Bulletin #4 “Certifiers A-Arm IFS Inspection Guide” (Reference Number 1586/25E).

BACKGROUND:

As outlined in the background section of Technical Bulletin #3 “Scratch-Built A-Arm Independent Front Suspensions” (Reference Number 1585/25E), the popularity of these suspensions has necessitated not only improved systems for the analysis of IFS Units, but also for a more comprehensive inspection process. The Technical Advisory Committee has developed this Bulletin to highlight a number of specific issues that the Certifier should look for and consider, as well as detailing the procedure by which a thorough toe change (bump steer) swing-check can take place.

This procedure can also be used by the home builder during the early stages of the IFS Construction Process.

GEOMETRY INSPECTION PROCEDURE

1. Toe In - Toe Out (Toe Change)

This is the most important factor for steering control. Any geometry change is called bump-steer and the more bump-steer there is, the more difficult the steering and handling characteristics of the vehicle can be. Below is a guide to simply and approximately check the total amount of toe change that takes place over the vehicle’s full suspension travel.

Requirements:

- The steering system is to be all connected;
- The estimated ride height of the chassis is to be noted via the shock absorber pivot

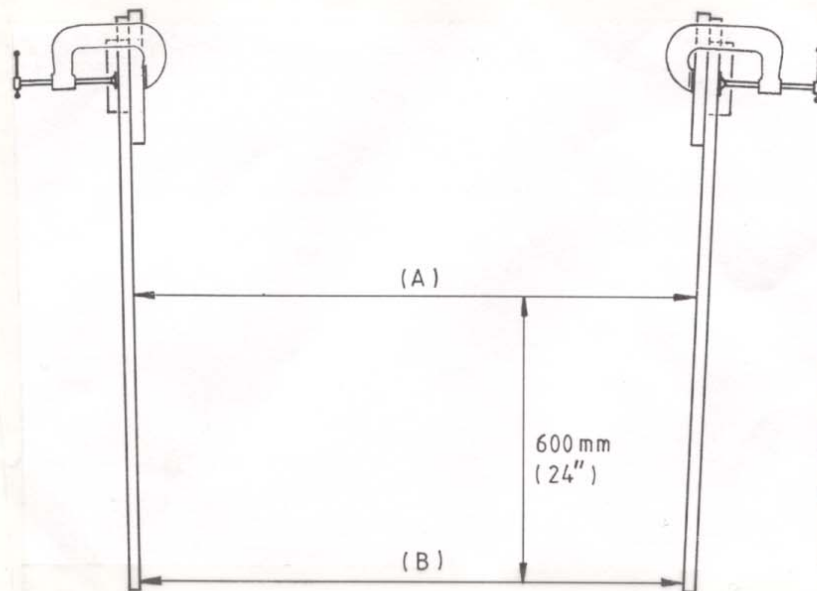
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- distance, or the chassis height from the ground;
- Disc brakes and calipers are to be fitted;
- Two pieces of 18mm or 25mm square furniture tube approximately 1.5m long;
- Two small G-Clamps;
- Tape measure;
- Blocks to support discs;
- Floor jack and axle stands.

Method:

1. Using the floor jack and axle stands lift the front chassis and remove the front wheels;
2. Remove the front suspension coil springs or coil over shock absorber units;
3. Put the blocks under the discs to support the discs at approximately their normal position;
4. Lower the vehicle down until its normal ride height is approximated;
5. Clamp on the RHS square tube to discs and have it protruding out beyond the front of the vehicle, (see Figure 1);

Figure 1



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6. Mark off the front tyre diameter at the point where it would extend to the front of each section of RHS;
7. Measure across the Front (B) of the two RHS pieces. Then measure across the Rear marks (A). This difference is toe in or toe out amount.
8. Adjust the toe so that there is approximately 3mm of toe in;
9. Jack up the chassis to provide maximum suspension droop (push suspension down to max coil/shock length);
10. Measure dimensions (A) and (B). The difference between them is the toe in or toe out (see Figure 1);
11. Repeat Step 10 approximately every 1"(25mm) unit suspension is fully up (minimum coil/shock length) or until suspension hits the bump stops;
12. Most front suspension have some degree of toe change and it is difficult to put a figure on the maximum allowable amount. We know it is possible to be within 3mm to 6mm over the normal suspension range. The steering should have been moved around to get the best minimum toe change possible, especially in the normal suspension movement range.

2. Camber Change

The actual angles are difficult to measure in a garage situation without a precision engineers level, but a rule of thumb would be that the unit should move to a more negative angle (top of wheel inwards).

This should be done by setting the camber at approximately 0 degrees at normal ride height. (A square off level ground can be used).

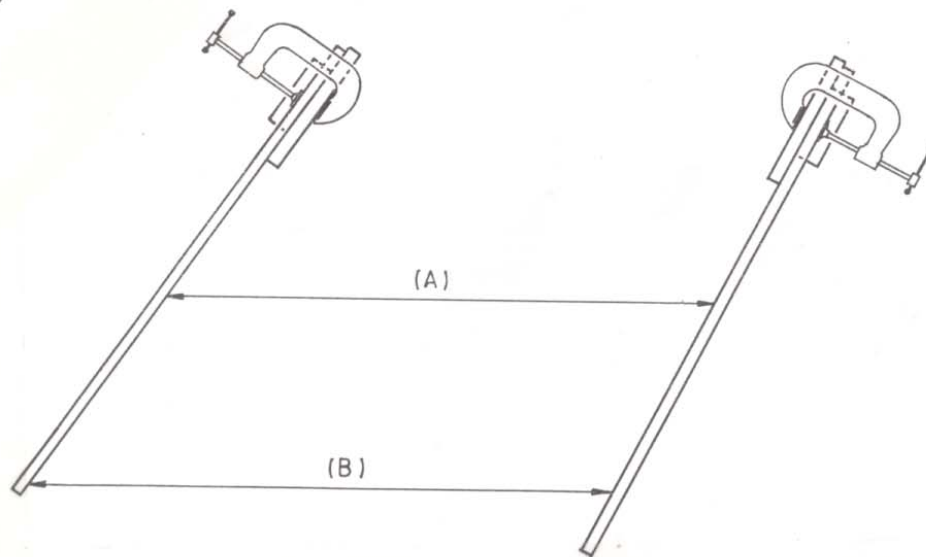
Lower the chassis down and ensure that wheels/discs move into a negative camber situation. This should not be a large amount and as a guide up to 5 degrees would be considered normal.

3. Ackermann Angle

Modern IFS Units do not necessarily require perfect Ackerman Angles as per the NZHRA Code of Construction Manual Figure 1F. Therefore the Ackerman Angle is acceptable provided that it is at least parallel or towards positive.

A simple check can be made by using the RHS section bolted to the discs and wheels turned to full lock, as shown in Figure 2. (See Figure 2)

Figure 2



For positive Ackerman (B) must be greater than (A)

4. Castor Angle

This can also be difficult to measure, however the centre of the upper stub axle ball joint should lie further back (rearwards) than the centre of the lower ball joint. The normal range would be approximately 1 degree negative to 5 degrees negative.

This is the crucial angle to be fixed properly when welding in an aftermarket assembly. Care must be taken to ensure that front and rear chassis heights are in their approximate ride height positions before the unit is welded in.

Minor adjustments can be made by a wheel alignment shop.

5. Steering Bind

A check should be made with wheels swung at full lock (both ways), then with suspension lifted up and down (without springs) to ensure that there is no steering binding with suspension arms. Also ensure that the steering cannot overcentre on the inside turning wheel because the steering system is set at too small an angle. This can be checked by trying to force the inside turning wheel/disc into more turn.

6. Final Alignment

This should be carried out on a proper alignment machine after the vehicle has been driven to allow bushes to settle under the vehicle's normal weight. Just lowering down off a floor

jack will not allow the IFS to assume its normal ride height or suspension geometry.

COST:

This procedure can take up to two-and-a-half hours to complete from start to finish, and therefore must be treated as a separate part of the Certification Inspection Process whenever it is necessary to be carried out.

The Certifier is to charge for his time at a reasonable hourly rate. A recommended maximum fee for this Inspection Service on the basis of two-and-a-half hours at \$40.00 per hour, is \$100.00.

Note that this inspection process will not be necessary where the IFS used is an NZHRA Type-Approval Unit, and the Certifier is satisfied that it has been installed in accordance with the IFS manufacturer's specifications.

Signed: 

Tony Johnson
General Manager
New Zealand Hot Rod Association (Inc)

Date: 24 April 1997 .

Any enquires relating to the information provided within this Bulletin may be directed to the Project Manager, Chris Litherland, or alternatively to the NZHRA Office.

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