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## **TECHNICAL BULLETIN #3**

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

REVISION #00

1585/25E

### **SCRATCH BUILT A-ARM INDEPENDENT FRONT SUSPENSION**

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

#### **INTRODUCTION:**

This Bulletin has been developed to cover a rule change within the NZHRA Code of Construction Manual relating to Independent Front Suspension.

The intention of the rule amendment is to provide more detailed information to the prospective builder in order that he or she can meet the specific information requirements of the Technical Advisory Committee when submitting Design Approval Applications. This information has been compiled after lengthy consultation with the industry and professional engineers, and evaluating current Independent Front Suspension models presently on the market.

#### **RULES AMENDMENTS:**

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

2.24, Page 65

The Rule is 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"* to remain the same but be immediately followed by:

***"Application details must incorporate all design criteria required within Technical Bulletin #3 Scratch-Built A-Arm Independent Front Suspensions (Document Reference #1585/25E)"***

2. No Rules are affected by this change in the Retrospective Vehicle Code.

## **BACKGROUND:**

Over recent years, the popularity and use of the Scratch-Built Custom A-Arm Type Independent Front Suspension units have dramatically increased. Properly designed and constructed, these units provide superior ride and handling, as well as a high degree of visual appeal.

To design and build one of these units is a complex issue however, and a high degree of knowledge and expertise is necessary to correctly design and construct a functional and safe unit. Unlike some aspects of Hot Rod construction, the TAC sees IFS design and fabrication as something that a layman should not become involved in without obtaining sufficient information. Actual design correctness is vital and advice should be sought from written guidelines and suitably qualified persons before attempting such a project. Constructing an IFS can be likened to repairing an automatic transmission; simple enough for those who understand them, yet many pitfalls await the inexperienced.

The Technical Advisory Committee spends considerable time evaluating each Design that is submitted, and often a lot of time for both the TAC and the builder is wasted because of initially incomplete and/or poorly presented data provided from the builder, both in written and drawing form.

Much time and cost has been invested by the TAC on this subject including professional analysis of IFS geometry and loading capabilities so that the TAC is in a position to properly evaluate these units for prospective builders, and provide well researched and educated advice.

## **DETAIL REQUIREMENTS:**

It is necessary for any prospective builder to present to the TAC all relevant information in a clear and logical form, and include a proper set of drawings, prepared to scale and showing all detail clearly.

All of the following specific components of information must be provided within the Design Approval Application:

1. Dimensions between all pivot points' centres on the complete suspension setup;
2. Upper and lower A-Arm shapes and dimensions. (Note: Actual arm shapes must be exactly duplicated);
3. Construction and type of pivot joints/bushes;
4. Spindle/stub axle details, include type, diameters, and notice of any machining to be carried out;
5. Brakes - Calipers and disc set up, and brake hose attachments and routes;
6. Steering setup including rack or steering box details and mounting details, with any rack modifications noted;

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7. Dimensions of main supporting subframe and details of attachment to the chassis;
8. Details of coil/shocks and method of mounting;
9. Types of welding proposed, and the person who is to carry out welding;
10. Full material specifications are required for each component. This includes tube diameters and thickness, steel plate thicknesses, stainless steel and mild steel grading, fastener details, bush materials, (eg: nolathene, urethane etc.).

### **COST:**

During 1994 and 1995 a greatly disproportionate level of cost was applied to the IFS subject, and in order to fund other projects, some of this cost must be recuperated over a period of time. To this end a levy has been applied (effective as of the 1st of January 1995) to all Design Approval Applications incorporating a Scratch-Built A-Arm Independent Front Suspension of \$50.00 inc GST, over and above normal Design Approval Application Fees.

### **One-Off Units**

This levy assists the TAC in the evaluation of the IFS proposed, and allows for calculation work if any of the specifications of the proposed unit is outside what is considered to be the normally accepted parameters of design or material type, size, or specification.

### **Type Approval**

The same levy is also applied to any manufacturers intending to build more than one of the same unit for the purpose of sale, and covers the cost of issuing Type Approval for the unit if required and approved. Type Approval should be requested in writing when submitting the IFS proposal to the TAC. Note that in this case, additional information such as the type of vehicle and maximum vehicle weights that the units are proposed to be fitted to are required.

### **GENERAL INFORMATION:**

To follow are some general guidelines which will assist when designing and constructing an A-Arm Type Independent Front Suspension Unit, to help towards ensuring a successful outcome.

When designing and constructing an Independent Front Suspension some helpful points to note are:

#### **Steering**

1. Ensure that positioning of the stub axle steering arm and tie rod end pivot centre are in the right place to avoid bump steer;
2. Ensure that when using rack and pinions that the correct length rack is used and mounted height is correct to avoid bump steer;

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3. Ensure sufficient clearance between steering tie rod and lower arm on full lock throughout the suspension travel;
4. Ensure that steering system will not cause the inner wheel steering arm to go over centre with too much lock, and cause binding up. (ie: RH wheel in RH turn and LH wheel in LH turn);
5. When selecting the rack and pinion steering, ensure that a normal (lock to lock) amount of steering wheel turn exists. Normal is considered to be approximately 2.5 to 3 turns lock to lock.

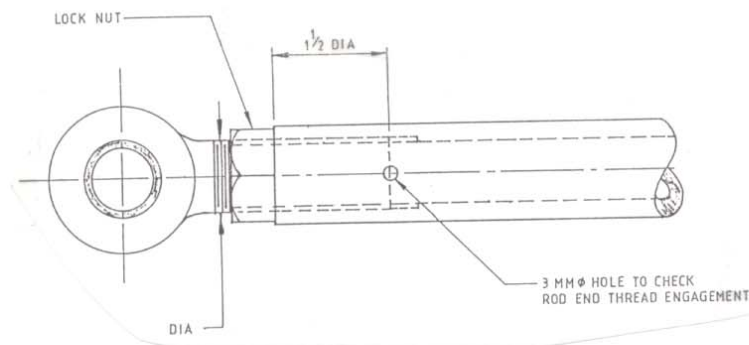
### Suspension Geometry

6. When installing the Suspension Unit, ensure that the front and rear of chassis are at normal ride height so that the caster angle can be initially taken into account before permanently attached. This is important as some IFS top arms cannot be adjusted enough to give proper caster, if not "close" at set up;
7. Before final installation and welding an NZHRA Certifier should be asked to carry out a full suspension swing-check to ensure against bump steer, and that proper camber change is incorporated. This check must be conducted in accordance with Technical Bulletin #4 "Certifiers A-Arm IFS Inspection Guide", Reference Number 1586/25E;

### Suspension A-Arms

8. Normal shape "A" Arms should be manufactured of a minimum of Schedule-80 Tube;
9. Any bends should be carried out using a proper bender and have minimal distortion in the bend area;
10. Suspension arms using adjustable JNS type or Heim-joint rod ends must have witness holes through the tube at one-and-a-half times the diameter of the thread to ensure sufficient thread engagement, by use of a thin wire. The hole should be 3 mm diameter on the lower side. (See Diagram 1)

Diagram 1



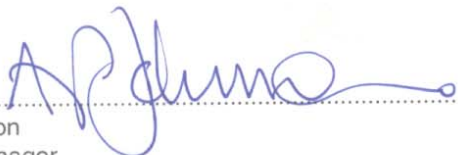
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11. "A" Arm welding should be carried out using only TIG welding;

**Crossmember**

12. Crossmember subframe thickness should be 4 mm minimum.

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

Date: 25/05/97.....

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