

BODY SHELL

Body shell preparation and strengthening is important for two major reasons:

- 1) It will help prolong the life of the shell, by reducing fatigue failures and limiting accident damage.
- 2) it will improve the car's handling by increasing the stiffness of the structure.

The first and most important stage in building up a competition car, is to prepare the body structure. Ideally you should start with a new unpainted shell. However, if you have decided to prepare an already built-up car, we strongly advise that you completely strip out the shell, removing all wiring, trim, and mechanical components. This helps to avoid damage (or burning) during welding operations, and it also makes the shell easier to handle.

The shell should have all its sealer material and sound-deadening pads removed. At the same time, clean out all the seams. If you leave any material in place, not only is there a residual risk of fire, but it is often difficult to get a good-quality weld on a 'dirty' seam. Not only will this take weight out of the car, but at the same time it allows you to check on the condition of the shell from time to time.

If you plan to competition-prepare a used shell, check carefully for any corrosion which may already have occurred, and eliminate this completely. If necessary, put the shell on to a body jig, to check that it is straight and square - this particularly applies to a shell which may once have sustained accident damage.

Some versions of the SIERRA XR4 × 4, and most SIERRA RS/RS500 COSWORTHs, were sold from new with a sliding and tilting glass sunroof in place. For competition purposes, it is recommended that this installation be removed from the car, and a steel roof panel put in its place.

STRENGTHENING and ROLL CAGE:

Motorsport regulations now authorise the same seam welding and strengthening methods to be applied to Group A **and** Group N cars. Such strengthening is considered advisable for all SIERRAs used in all types of motorsport.

The regulations for Group N and Group A cars state that:

'Strengthening of the **suspended** part is allowed, provided the material used follows the original shape, and is in contact with it.'

This not only means that seam welding is authorised, but that double-skinning operations may be carried out on the floor pan, in the wheel arches, and around suspension pick-up points.

It is also permitted to fit reinforcement bars - bolted, but **not** welded - between the suspension turrets at front and rear on Group A; front only on Group N.

It is permissible for all redundant brackets (for instance, those usually used to clip electrical wiring, or to support standard fuel tanks) to be removed.

We recommend that the roll cage should be fitted to the body structure **before** any seam-welding is done, for the cage gives valuable support to the shell and will stop any tendency for it to twist while welding is being carried out. If the body shell to be used is not brand new, it should be jig-checked and straightened out, before installation of the cage begins.

All Ford-sourced Group A factory suspension and steering parts have been developed around 16in. wheels and tyres. If this size of tyre is to be used on your car; before beginning body shell preparation be sure to check that there is sufficient clearance between tyres and body items on full rebound, full bump and (at the front) on full lock.

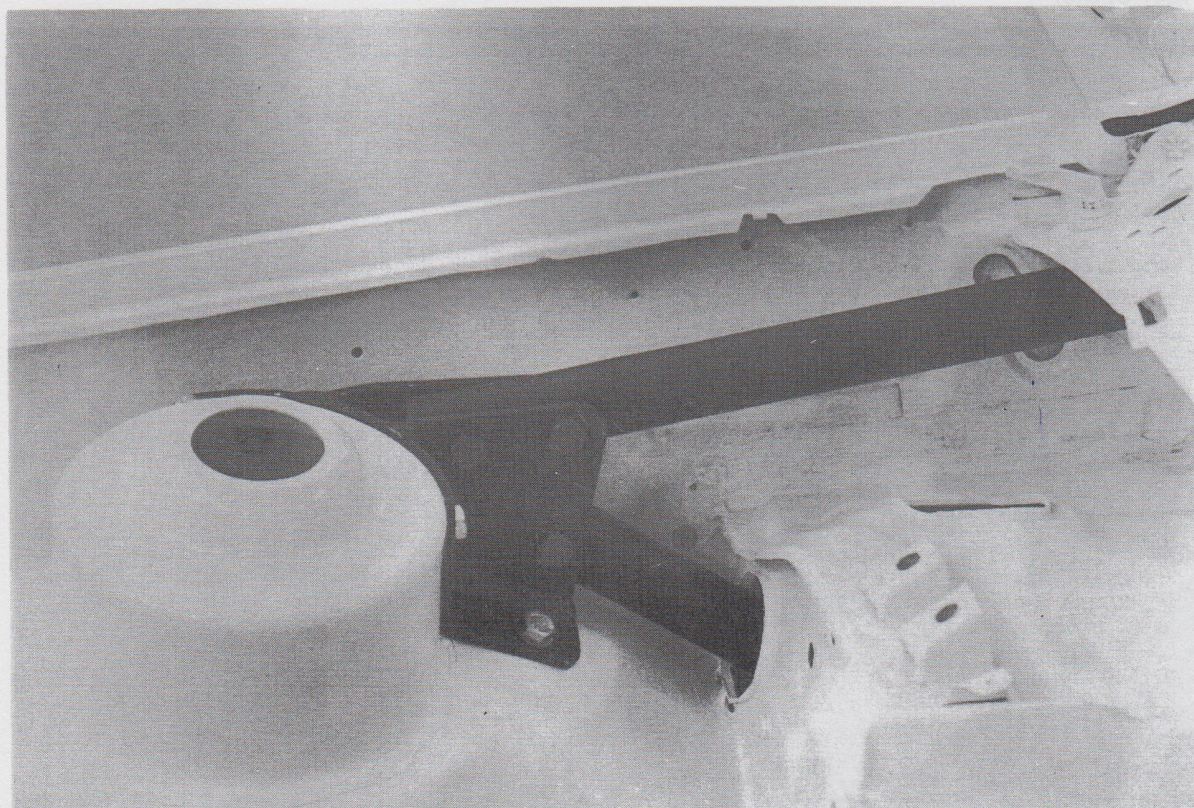
ROLL CAGE:

In each case, specially-designed roll cages have been developed for the SIERRA XR4 × 4, and the SIERRA RS/RS500 COSWORTH models. The use of a properly certified roll cage is compulsory in all motorsport events requiring sporting homologation forms. The cages illustrated in the appropriate homologation forms are authorised for use in Group N and Group A cars.

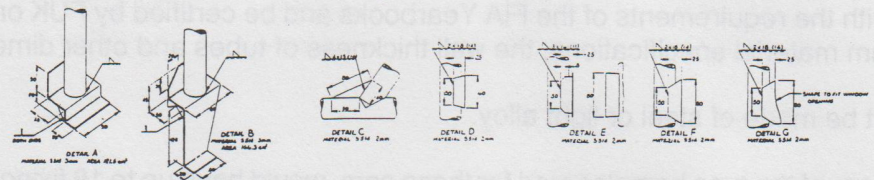
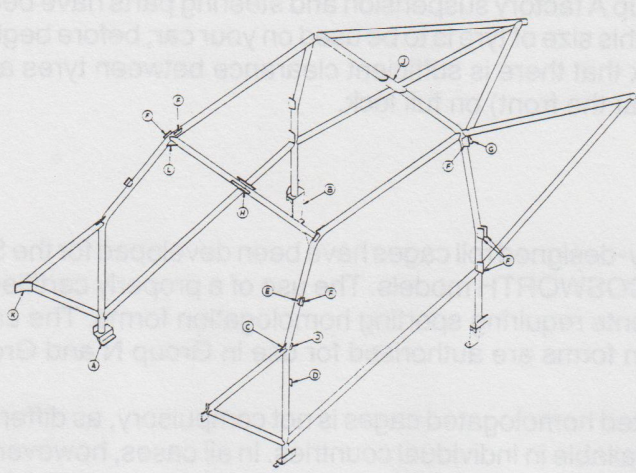
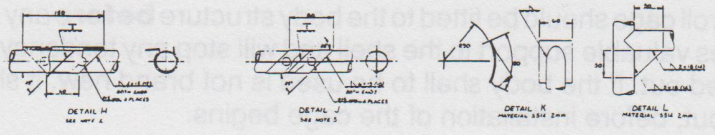
The use of the illustrated homologated cages is not compulsory, as different cages from different manufacturers are available in individual countries. In all cases, however, the design of a cage must comply with the requirements of the FIA Yearbooks and be certified by FUK or ASN, which specify minimum material specifications, the wall thickness of tubes and other dimensions.

Tubes must be made of steel or light alloy.

A typical cage, of the type homologated for these cars, would have up to 18 fixing points to the body structure, not only to the floor and to the door and windscreen pillars, but to the top of the front suspension strut mountings and to the rear suspension damper turret mountings. Such cages are supplied in several major bolt-together sections, with all the fixing brackets, reinforcements and fixings.

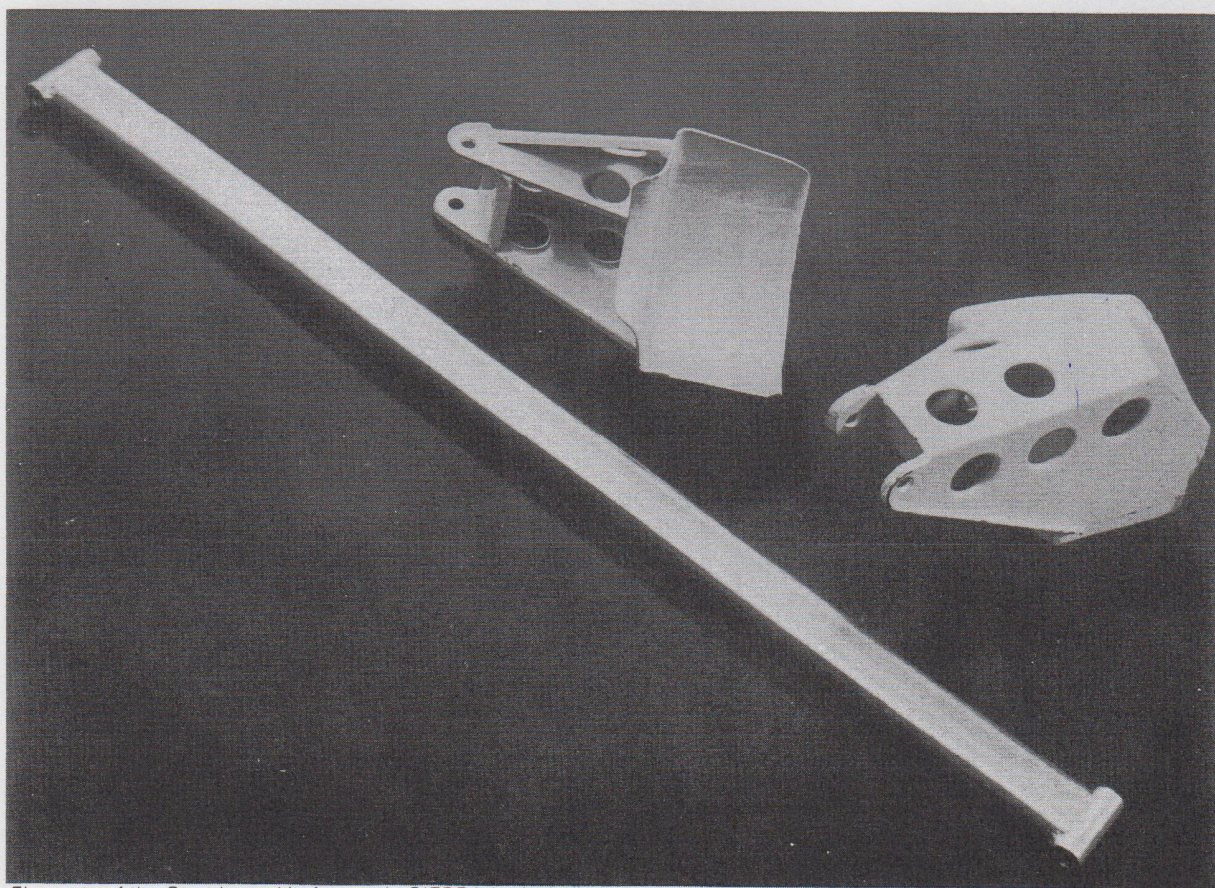


Always fit a roll cage which has a forward extension which bolts to the front strut towers. This needs access holes in the front bulkhead - these must be sealed off against fire, fumes and petrol after the cage has been fitted.

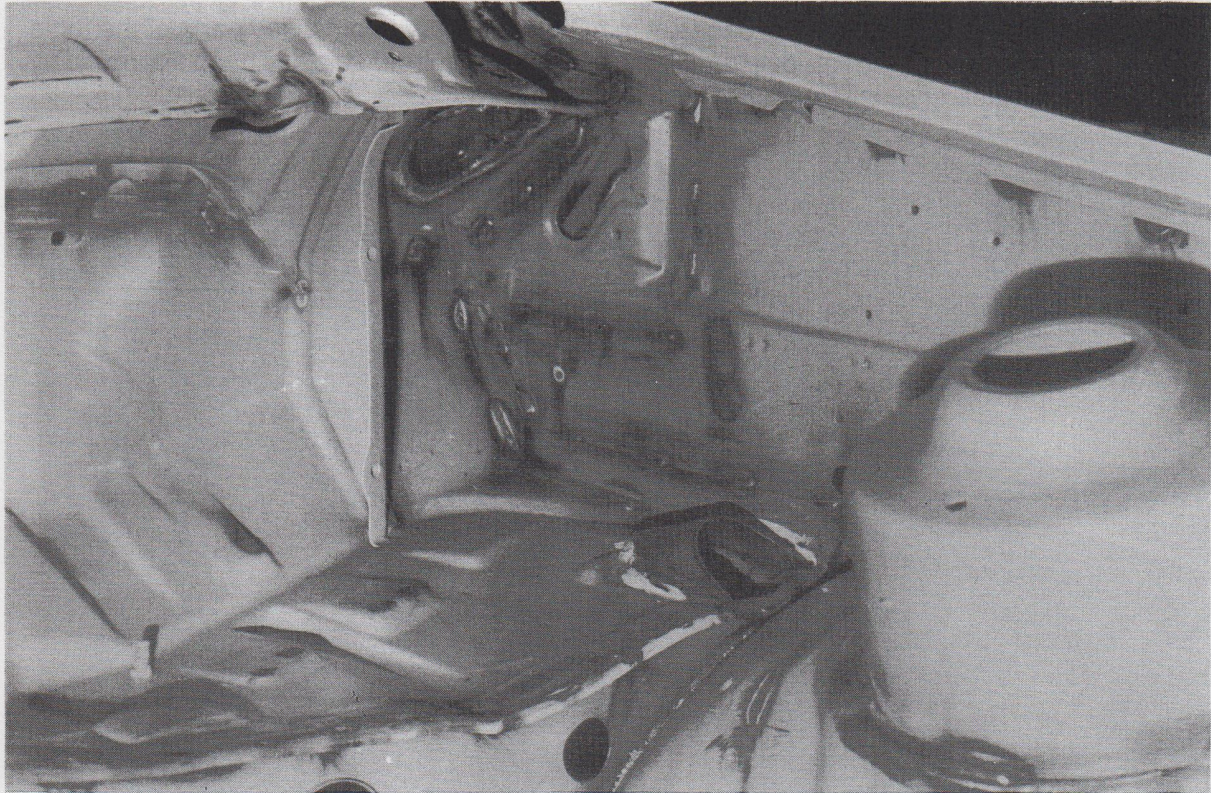


This is a 'lightweight' version of the SIERRA RS COSWORTH roll-cage, as designed by the engineers at Boreham, which is welded-up and becomes integral with the body shell.

Included in all such assemblies, should be safety bars across the door apertures and cross-braces between front and rear suspension damper top mountings. In some cases there will be cross-bracing tubes across the car under the facia/instrument panel, and behind the front passenger seats.

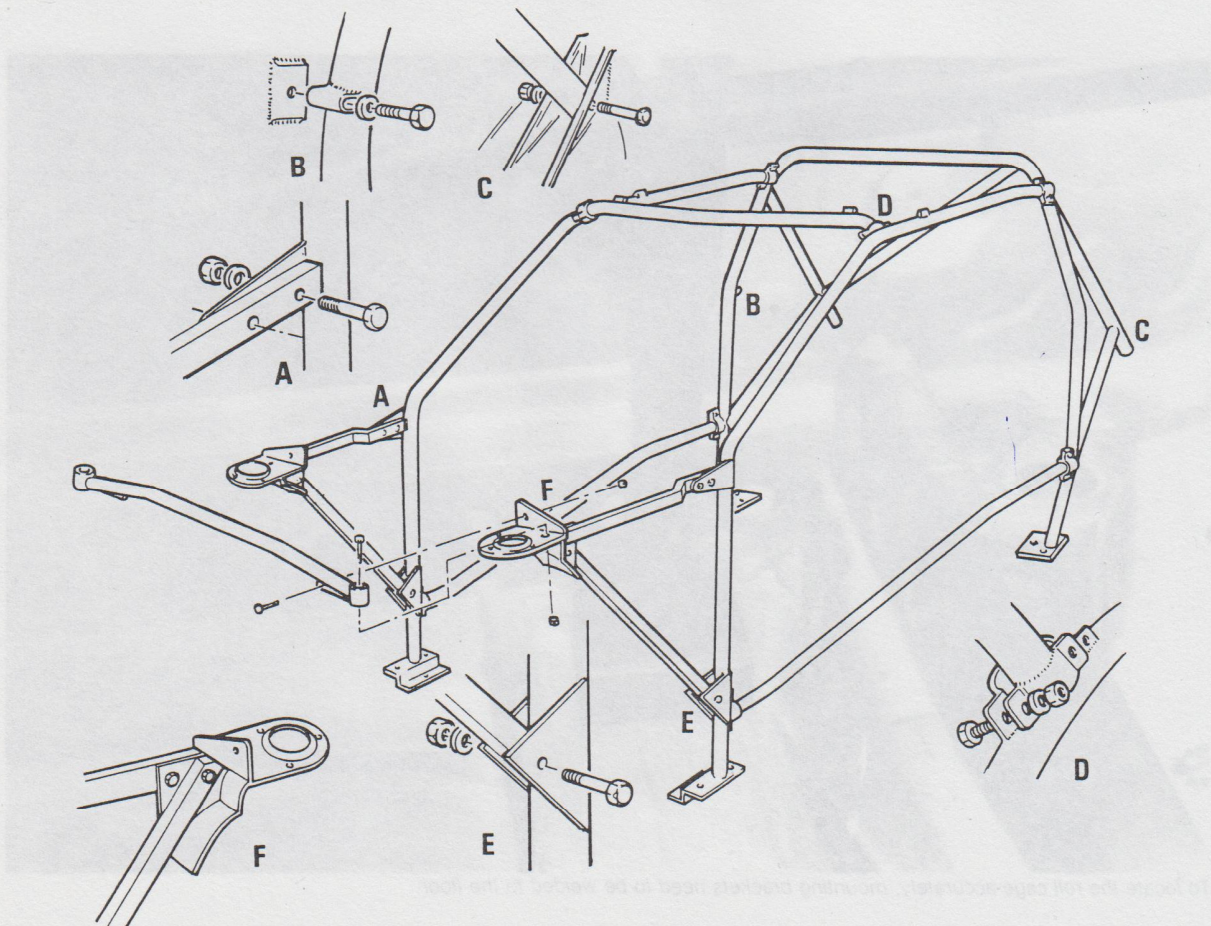


Elements of the Strut brace kit, for use in SIERRA bodyshells.



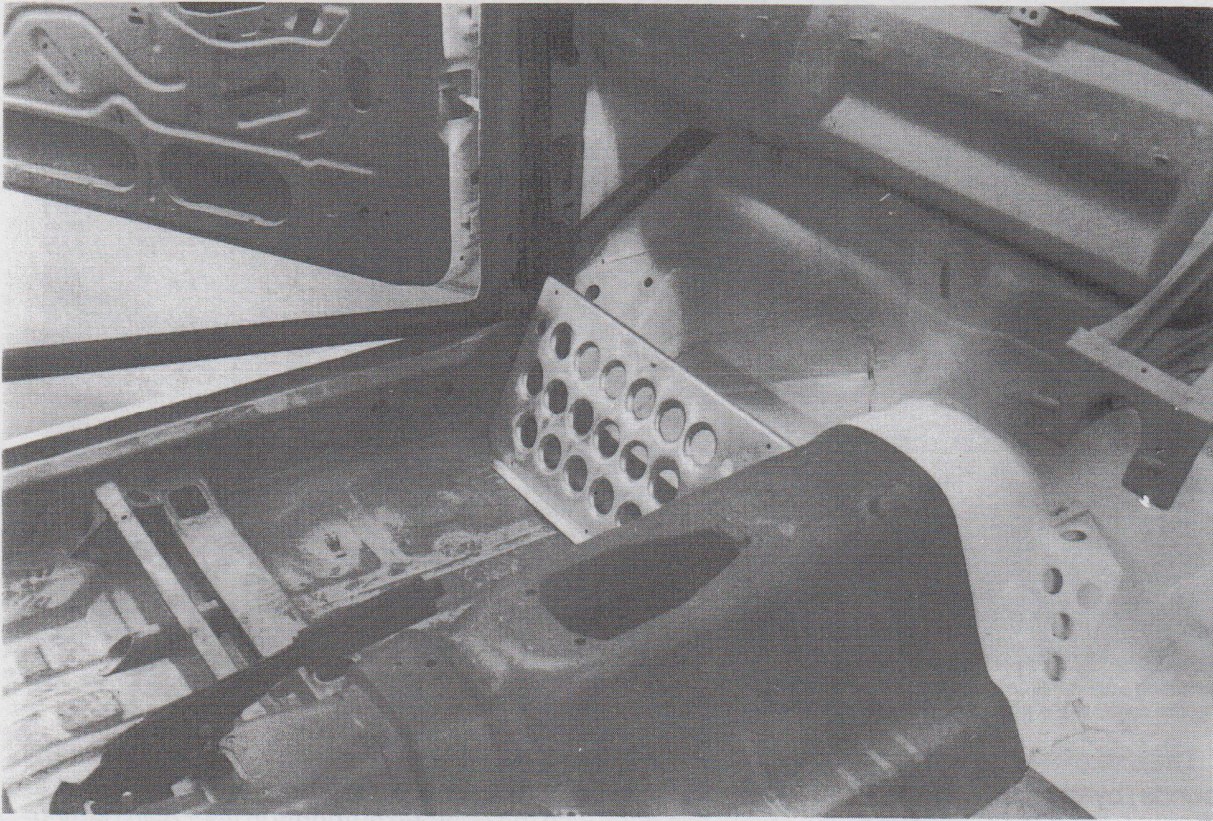
When fitting a full roll cage to the SIERRA, it is necessary to cut access holes into the bulkhead for tubes to reach the front towers. After fitting the cage, these apertures must be sealed off against fire, fumes, petrol, etc.

The use of a cage with forward extensions is authorised in Group A and is accepted (on safety grounds) by the vast majority of scrutineers for Group N cars. Before beginning Group N preparation, however, it is essential that you check this point with the sporting authority in your own particular country.

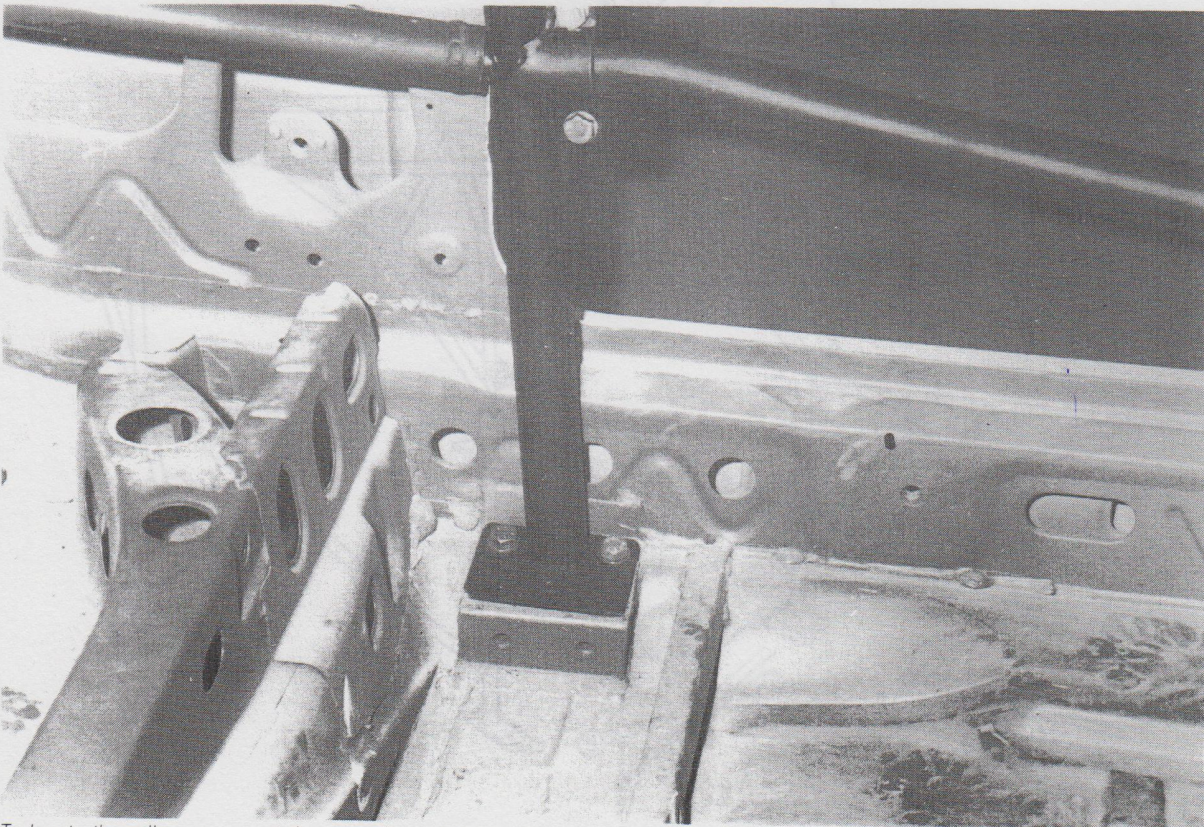


Conventional roll cages are supplied in several sections, which are bolted together inside the shell.

Note: To accommodate such complex cages, it may be necessary to cut away parts of the fascia and door trim panels, where these would otherwise obstruct the tubes. This has been approved by the sporting authorities and does not affect the car's eligibility.

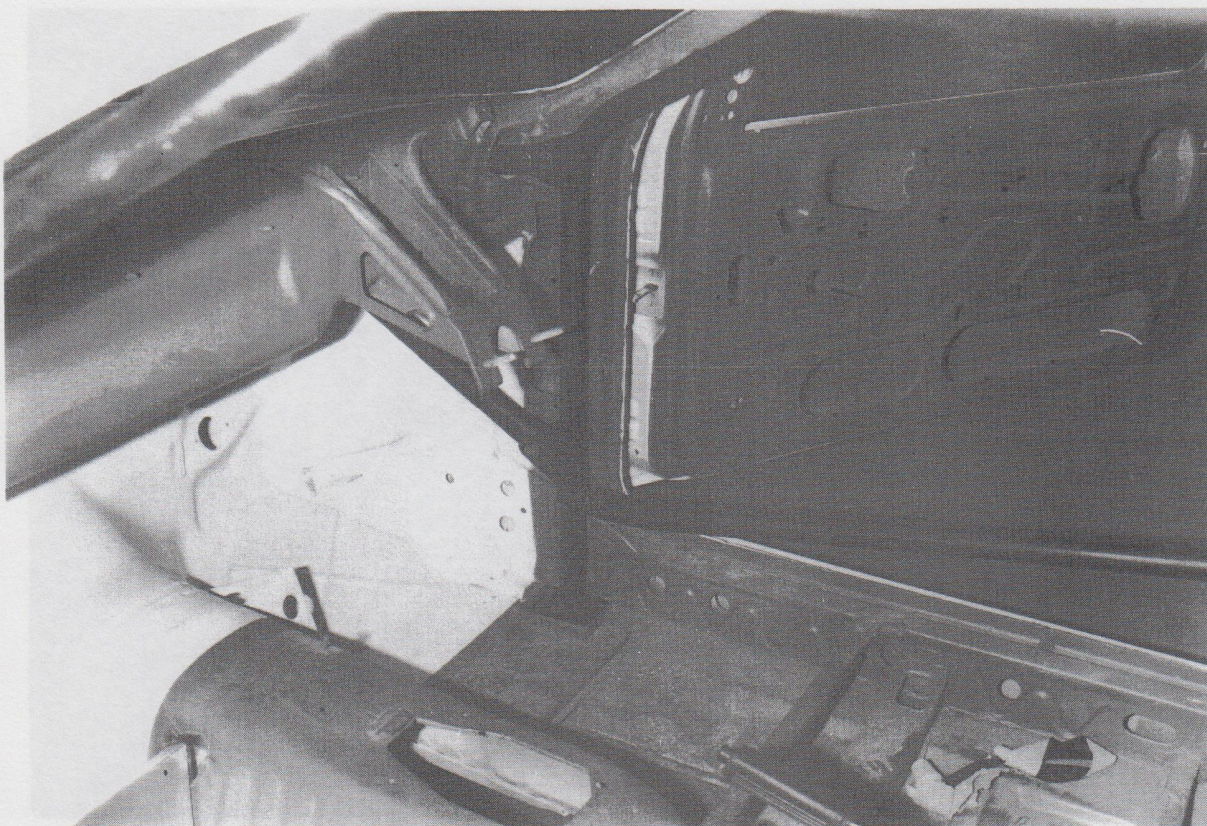


This SIERRA has had its roll cage fitted and there is a light-alloy footrest for the co-driver's use.

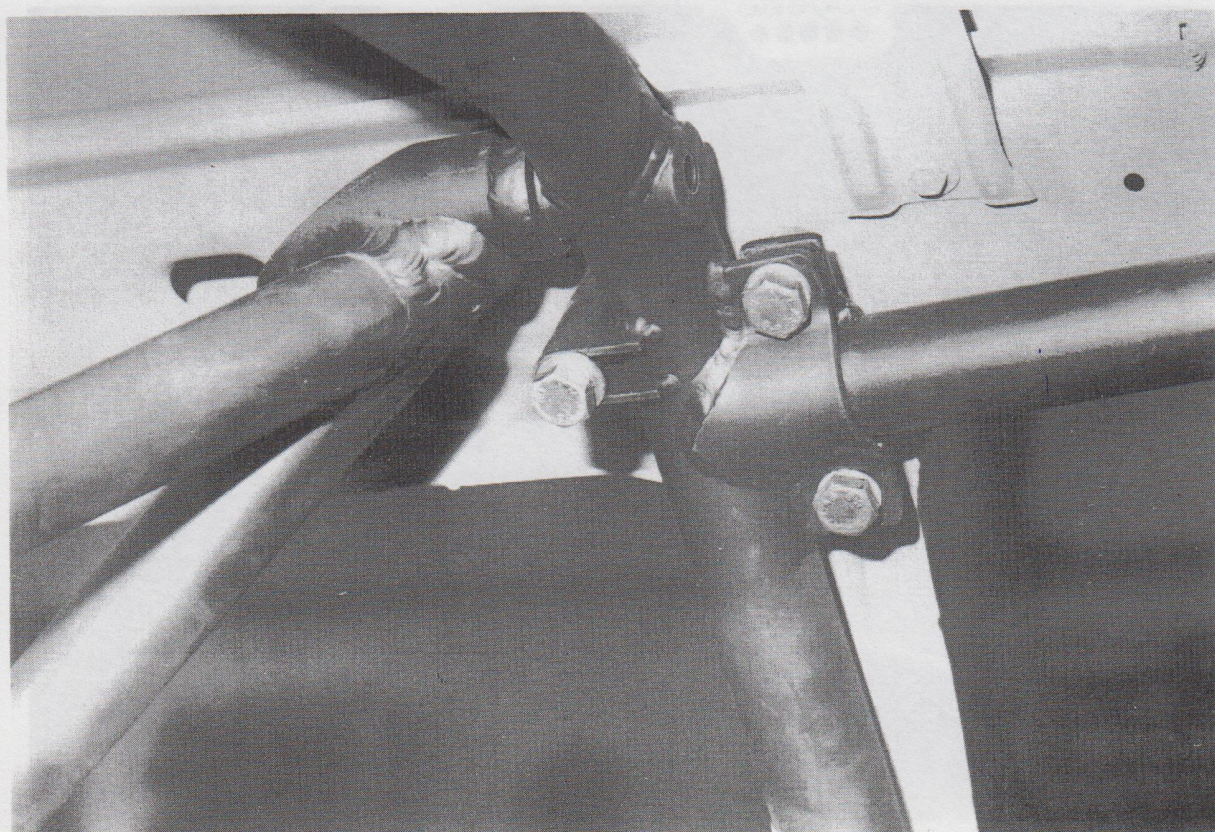


To locate the roll cage accurately, mounting brackets need to be welded to the floor.

You will also see that it is necessary to relocate certain components to make space for the forward-facing tubes to be run between the passenger side of the bulkhead, and the top of the strut towers. Only the fuse box may be relocated on Group N cars.

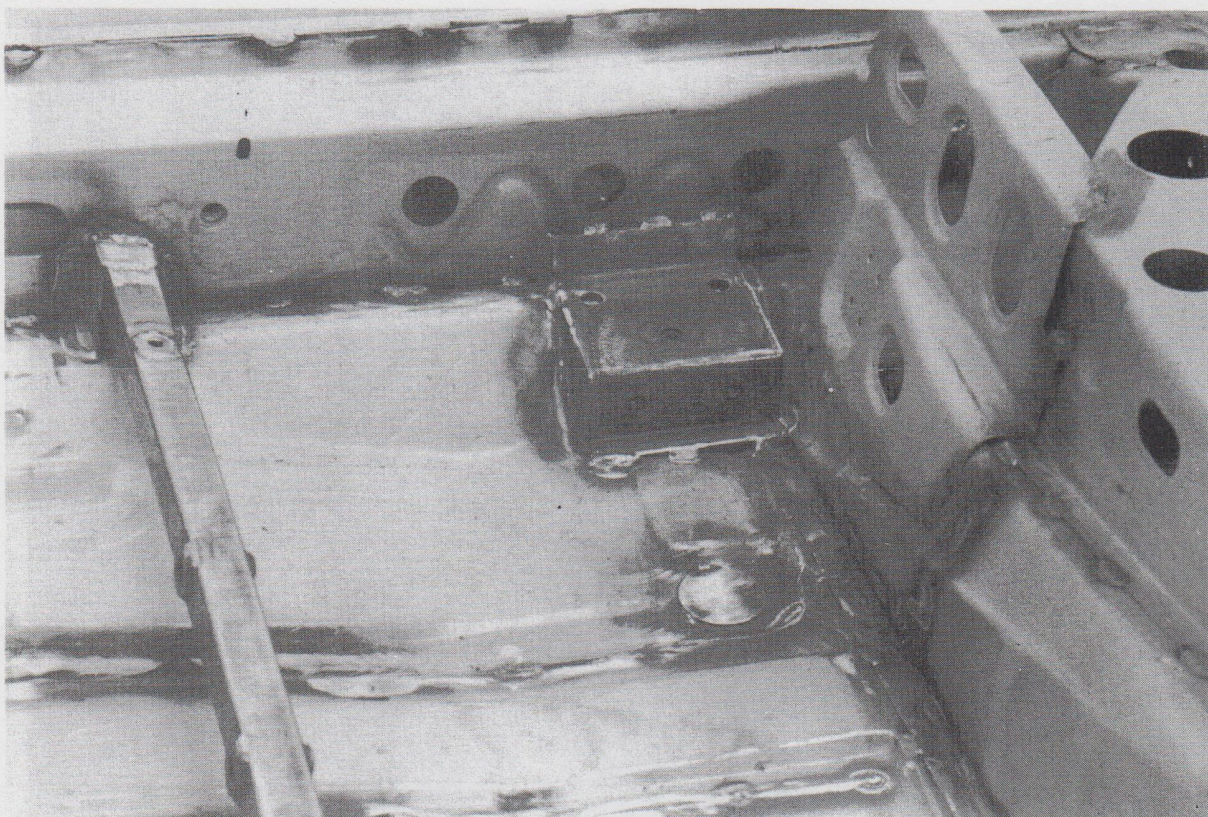


The roll cage should be mounted snugly against the edge of the body shell. Note the forward extensions, which are passed through the bulkhead to meet at the front strut towers.

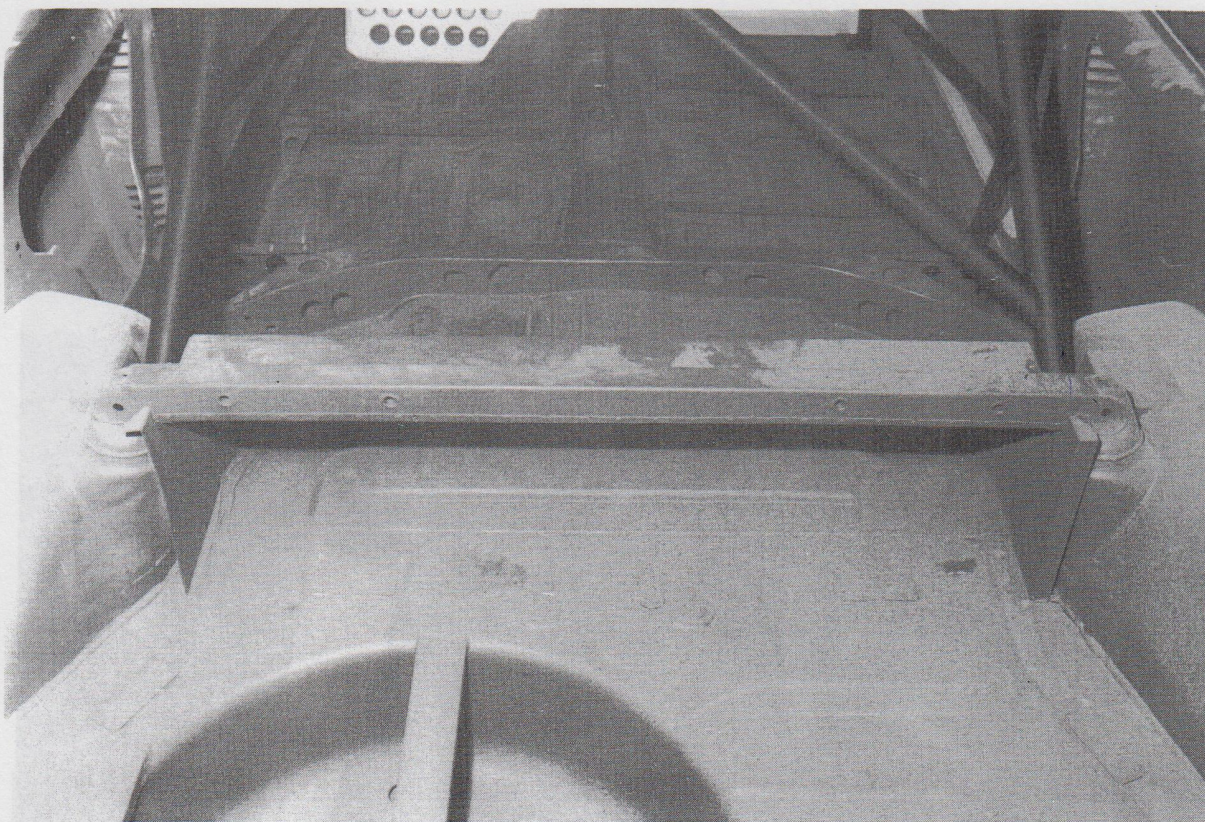


When buying a cage, always check that there is ample weld, and very solid brackets, to give the car its maximum possible strength and rigidity.

To work out 'what goes where', study the picture in the appropriate homologation form and loosely assemble the cage outside the car, before again breaking it down into sections, ready for assembly to the car.

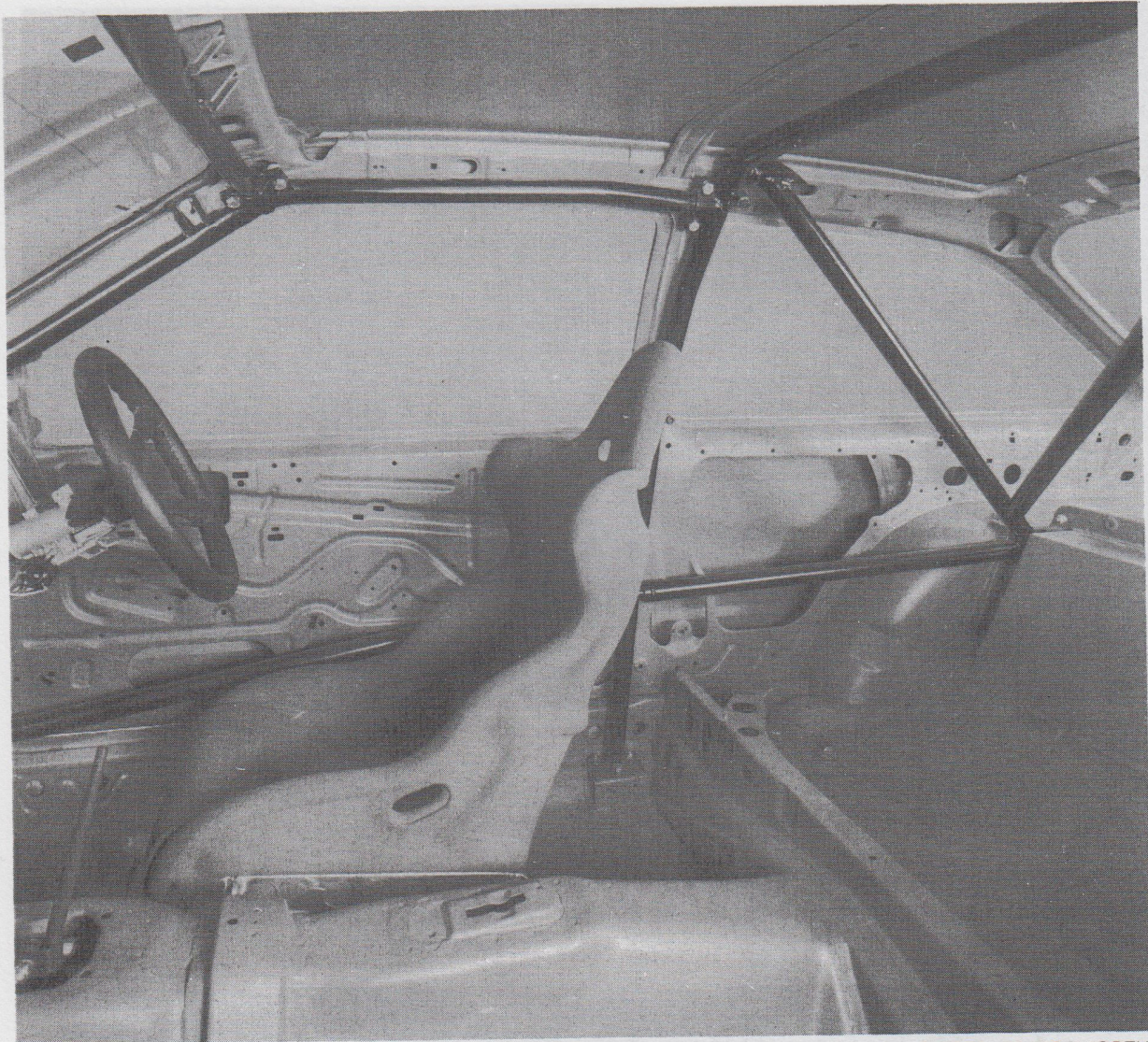


It is necessary to fit reinforcement and mounting brackets for the roll cage. This one is located behind the seat, close to the sill and rear-seat toeboard.



On the 'works' rally cars, the positions of the roll cage, the fuel tank mounting position and the brace between the rear damper towers have all been carefully integrated.

As required by international regulations, add reinforcement plates at all roll cage attachment points. These must be of 3mm minimum thickness. In every case, it is advisable to offer up the cage **before** welding these reinforcing plates into position. Adjust plate thicknesses, as necessary, to ensure a snug fit between cage and body shell. There is usually enough adjustment in any roll cage assembly for you to make a satisfactory fit; the holes for mounting the bracket around the front strut towers, for instance, have to be drilled on the spot.

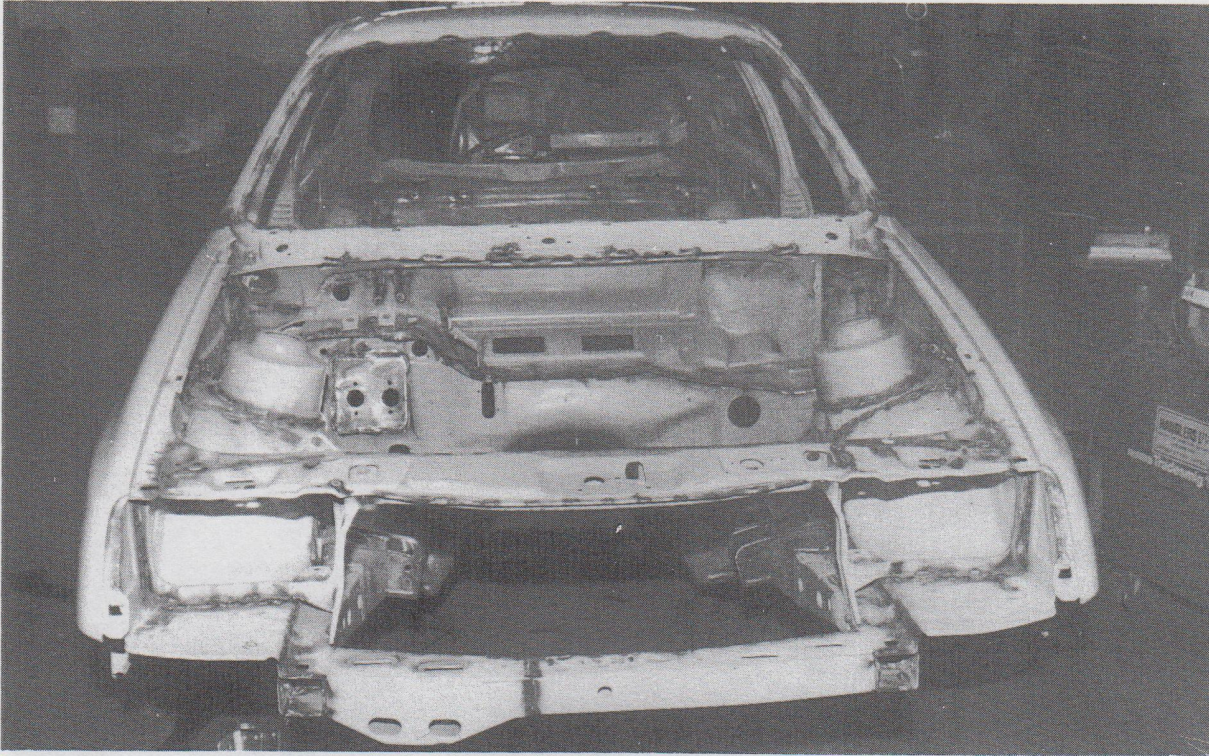


This demonstration body shell shows the layout of the 'works' rally cage in the body shell of a SIERRA RS COSWORTH.

To install the front section of the cage and to fix it to the strut towers, it is necessary to provide suitable clearance holes in the front passenger footwells and bulkhead. At the same time, weld in reinforcing tubes in these holes.

BODY STRENGTHENING:

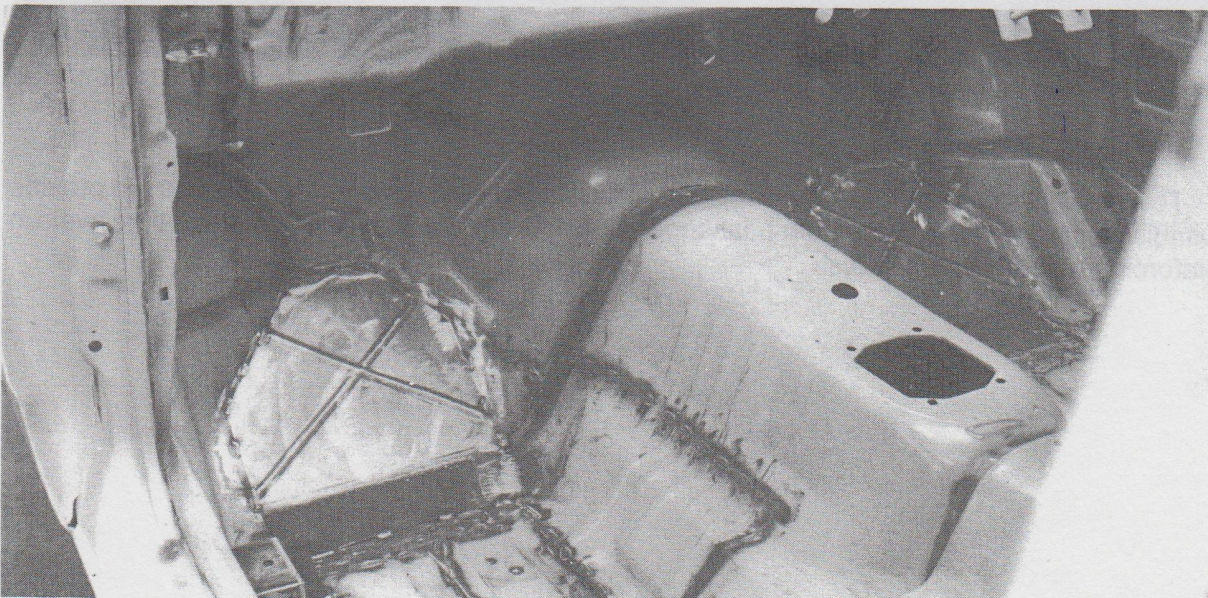
Start from an absolutely clean shell. Work gradually around the shell, 'stitching' a half-inch run of weld every 1½ inch or so (15mm every 40mm or so), along **every** exposed spot-welded body seam that you can find. Work underneath the car, in the engine bay, inside the car - anywhere that it is possible to see and to reinforce a seam. Apply this technique, too, to spot welded edges such as the windscreen, side-window, door and tailgate apertures though if you have access to a portable spot welder it is often tidier to use this to add extra spot welds on such exposed seams.



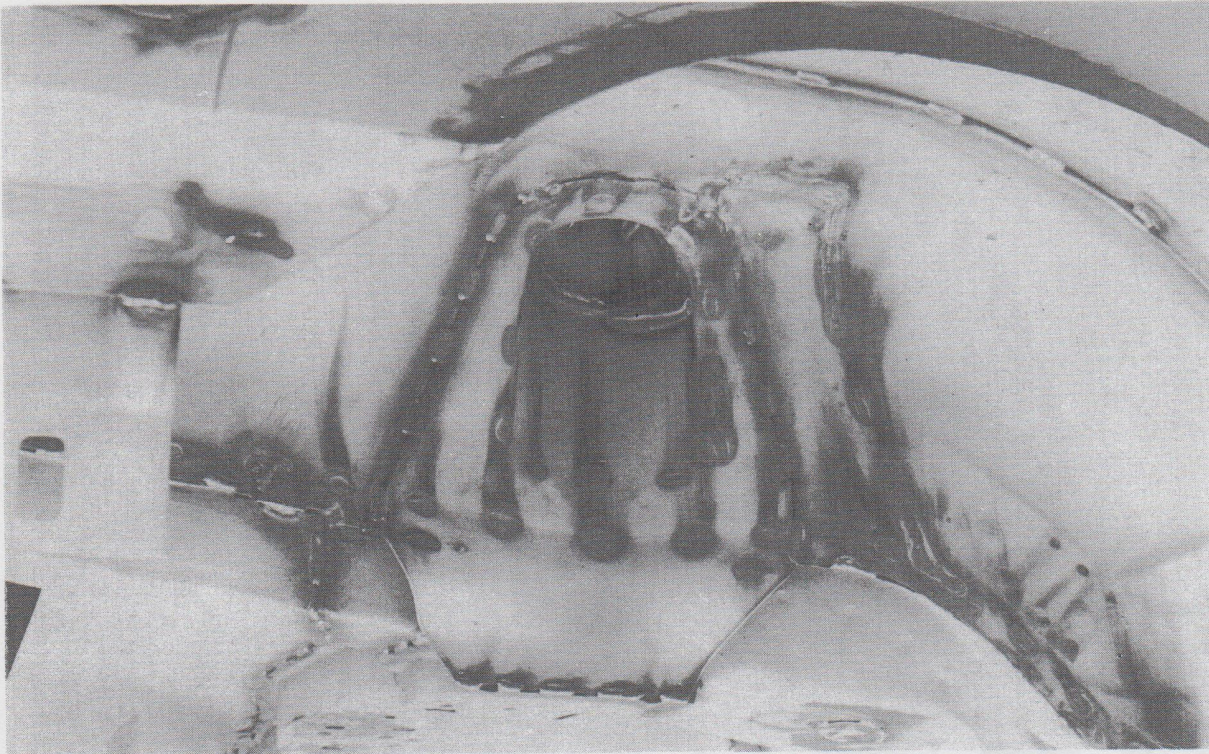
Every welded panel joint should be reinforced when preparing a car for motorsport.

The standard wheel arches, skirts and spoilers must all be retained on the completed car so that it continues to comply with homologation requirements.

The following areas of a SIERRA body shell should be given welded plates to improve rigidity of the structure - i.e. they should be double skinned, with the added metal following the original contours:



On Group A SIERRAs, it is recommended that both front footwells are reinforced.



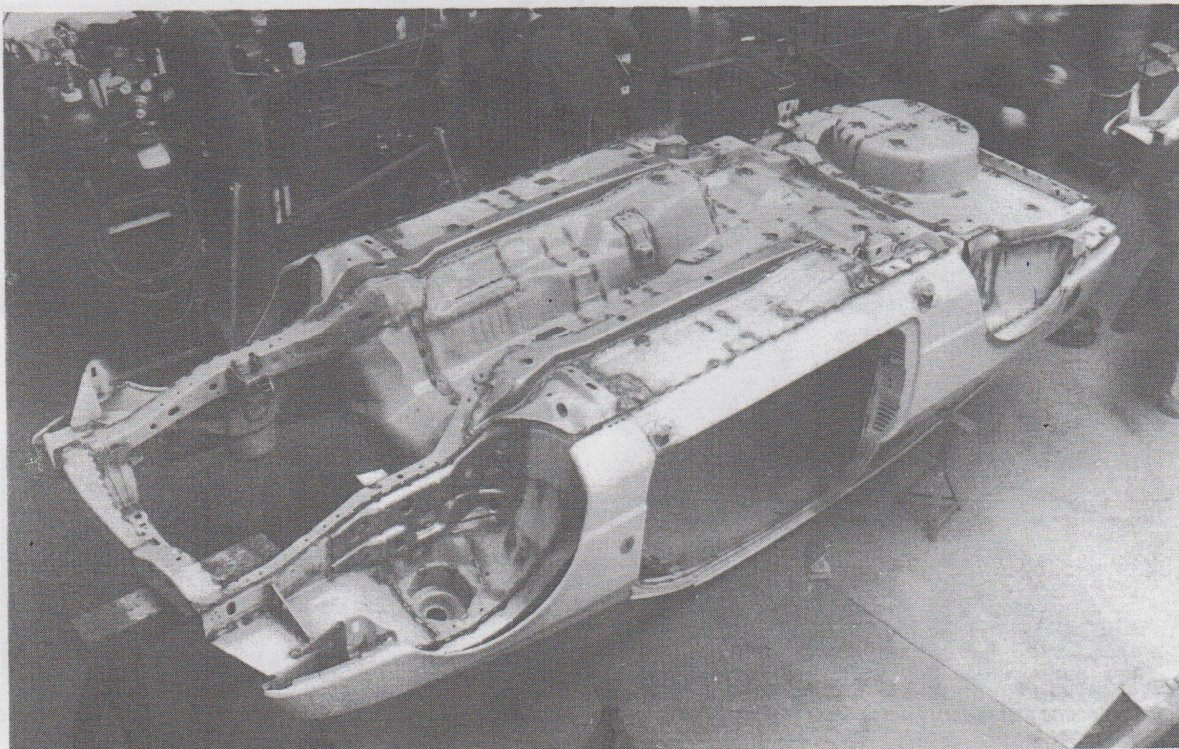
The front strut towers should be carefully reinforced, by adding extra welds to all panel joints.

Front passenger footwells.

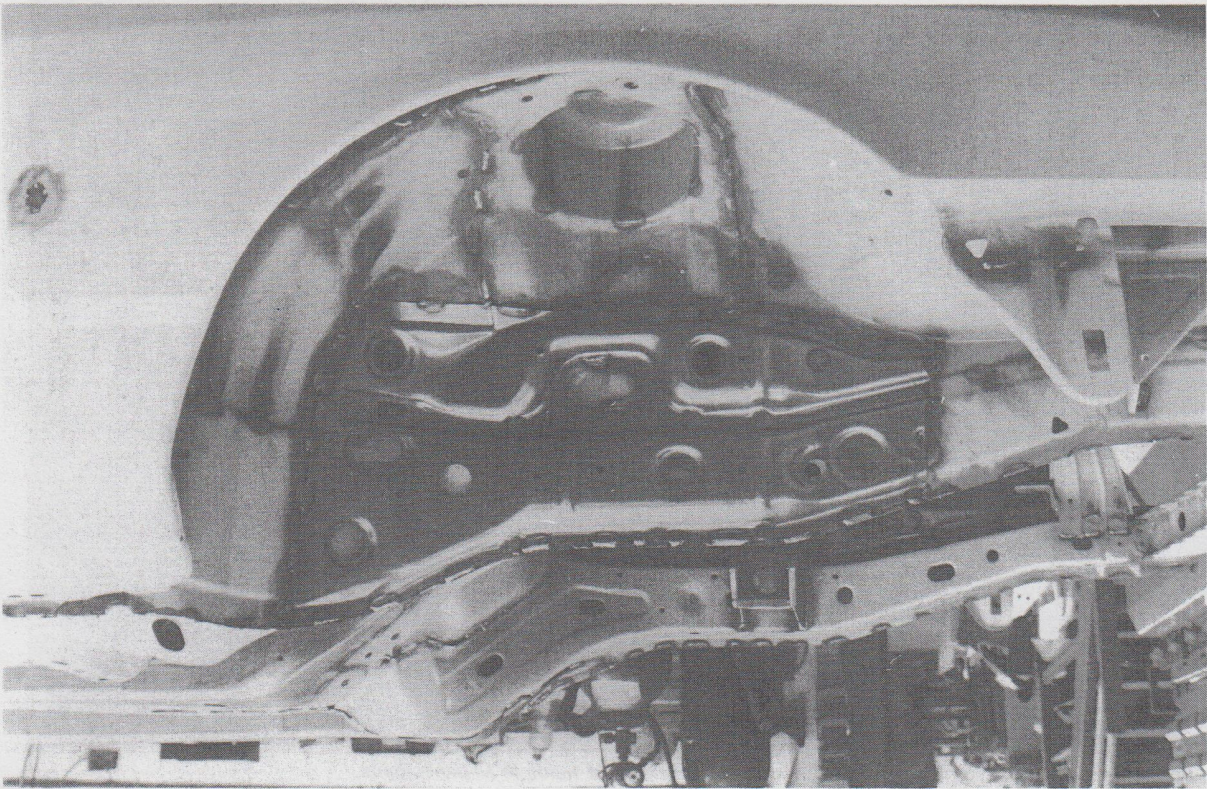
Boot floor/spare wheel area

The junction of the engine bay/chassis leg and the inner wing panel where they are adjacent to the MacPherson strut for the front suspension.

The inner wheel arches and the underside of the car, using the Body Stiffening Kit. Note that these panels **must** be foam-filled for them to comply with Group A regulations reference article 255, 5-7-1, of Appendix J.

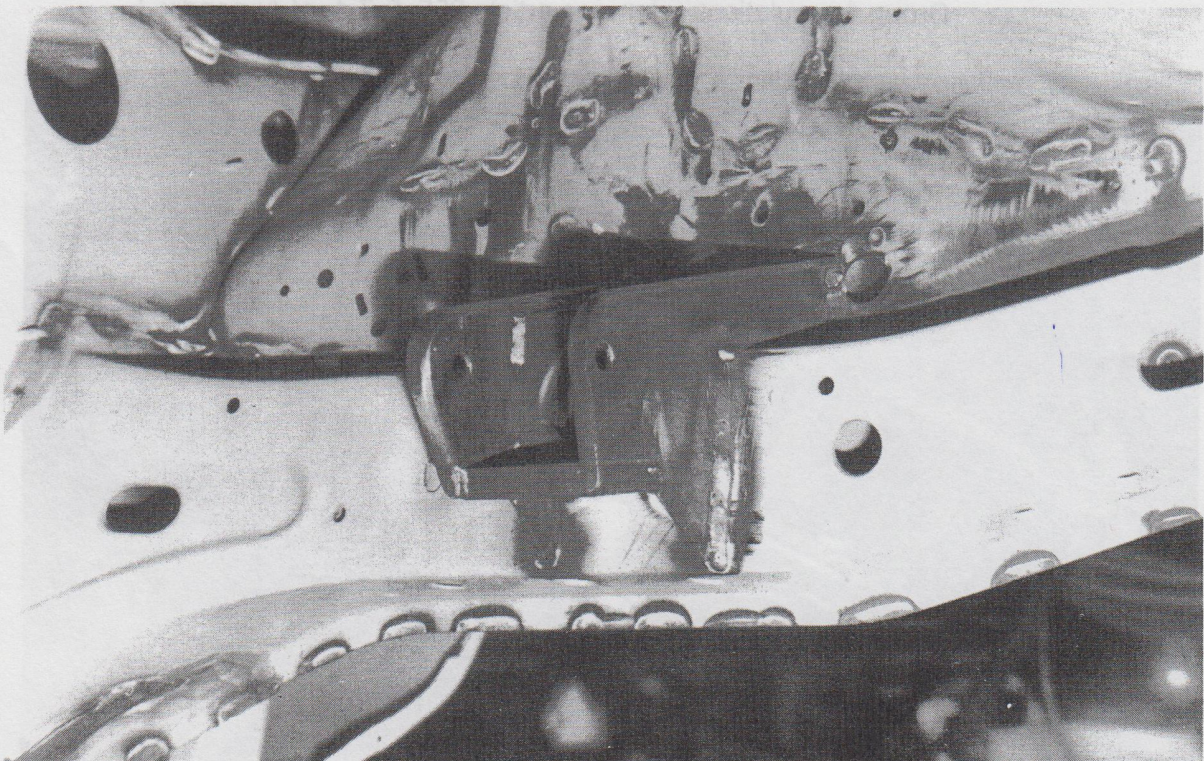


This SIERRA RS COSWORTH body shell being prepared for Group A motorsport has already had the Body Reinforcement Kit (9092963) welded into place, inside the front wheelarches, and under the floorpan.

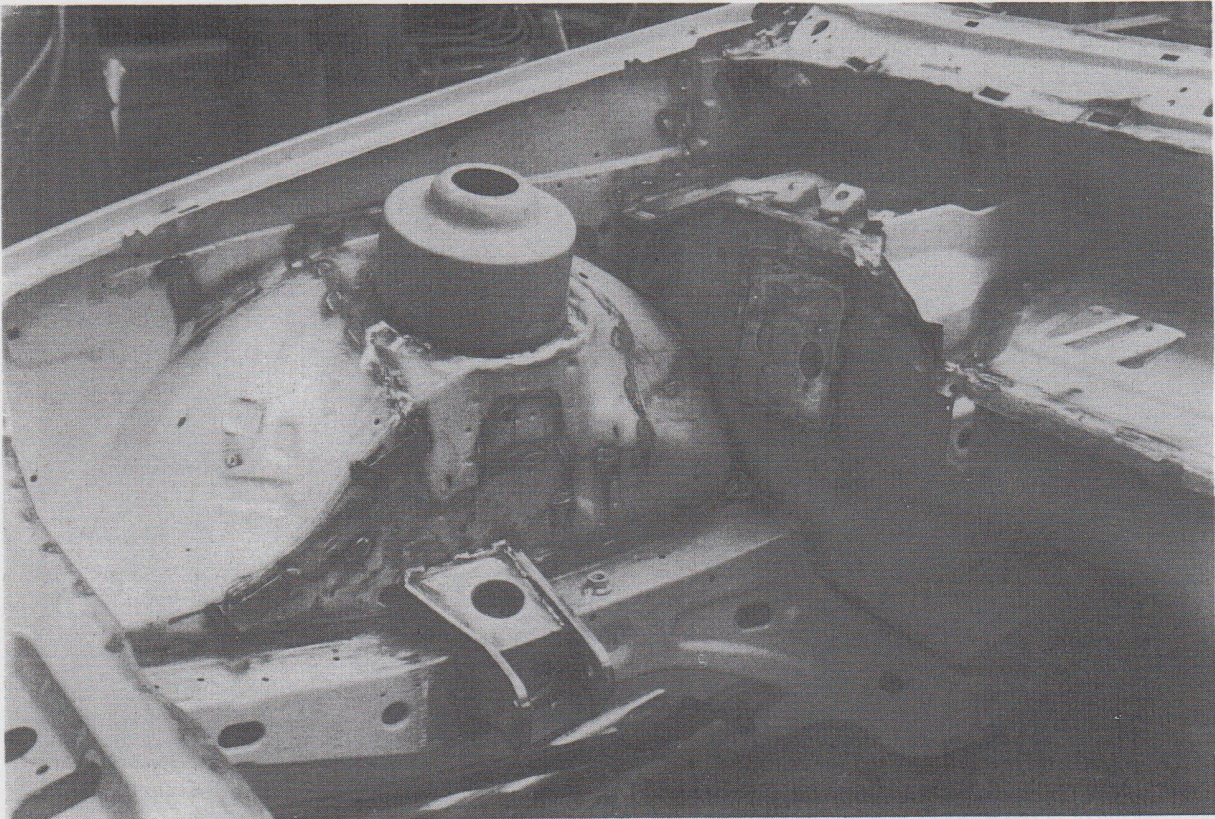


One of the panels from the Body Reinforcement Kit (9092963) welded into place inside the front wheelarch.

At this point, rather than later in the assembly of the car (and if the car is to use appropriate components), the following work should also be carried out:



It is recommended that special Engine Mounting brackets should be welded to the side rails (sometimes called 'chassis legs') of the SIERRA body shell.

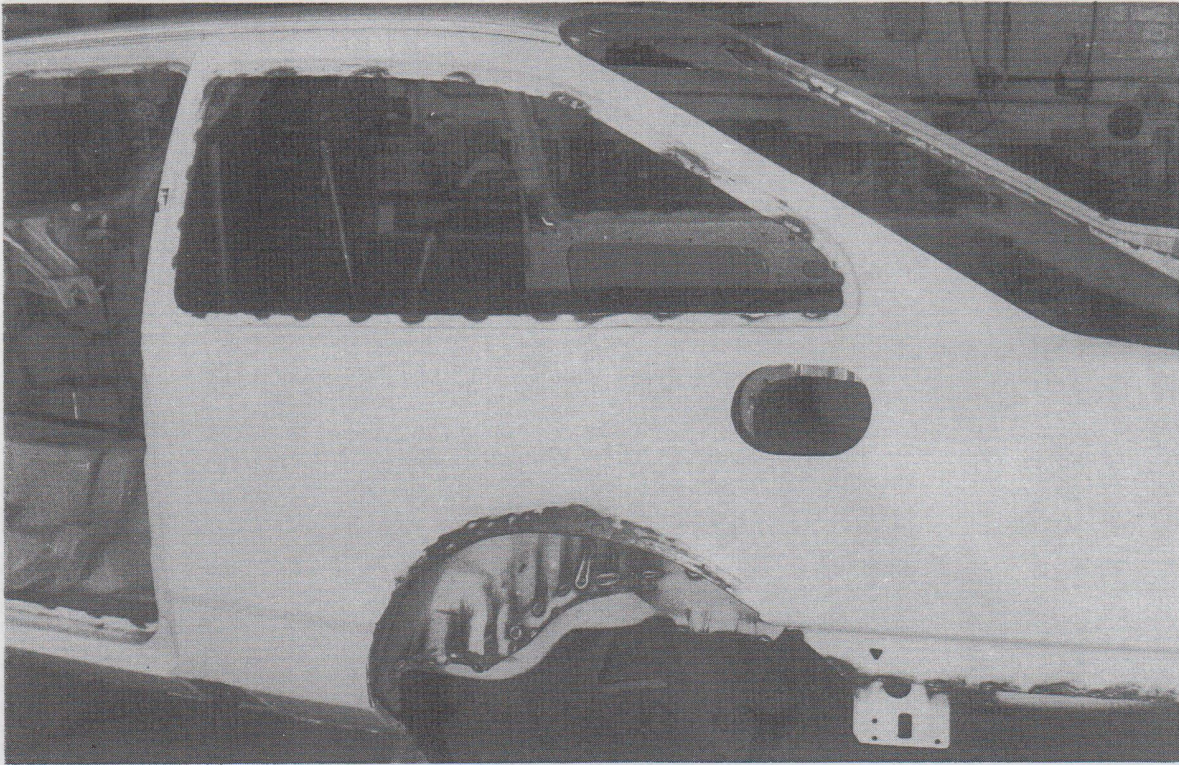


A SIERRA RS COSWORTH body shell, being prepared for Group A motorsport. Note the new fixing panel for the pedal box (this is a right-hand-drive car) and the engine mountings which have been welded to the side rails.

- a) Weld on new Group A engine mounts
- b) Reposition the battery tray, as required
- c) Locate and fit new gearbox mountings
- d) Fit front seat frames
- e) Weld rear roll cage brackets to rear damper turrets, which incorporate repositioned petrol tank brackets.

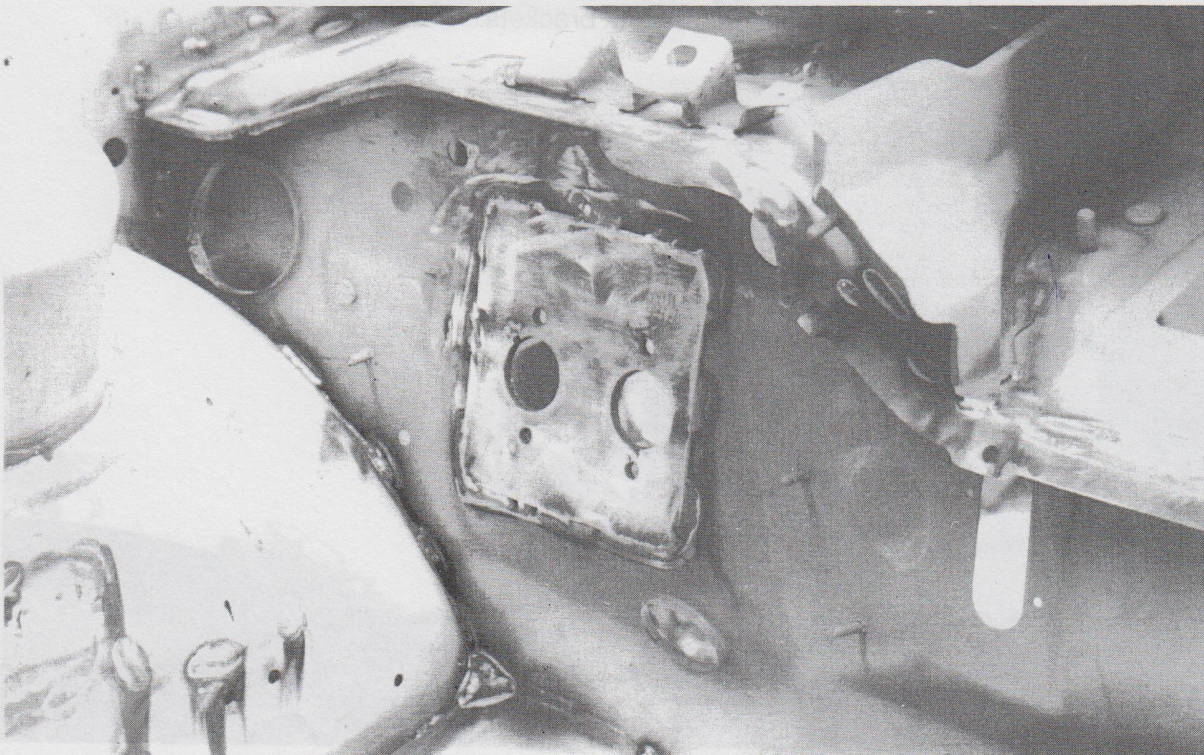


If a Ford-supplied safety bag fuel tank is to be fitted, the existing SIERRA fuel filler access becomes redundant. A closing panel should be welded into place.

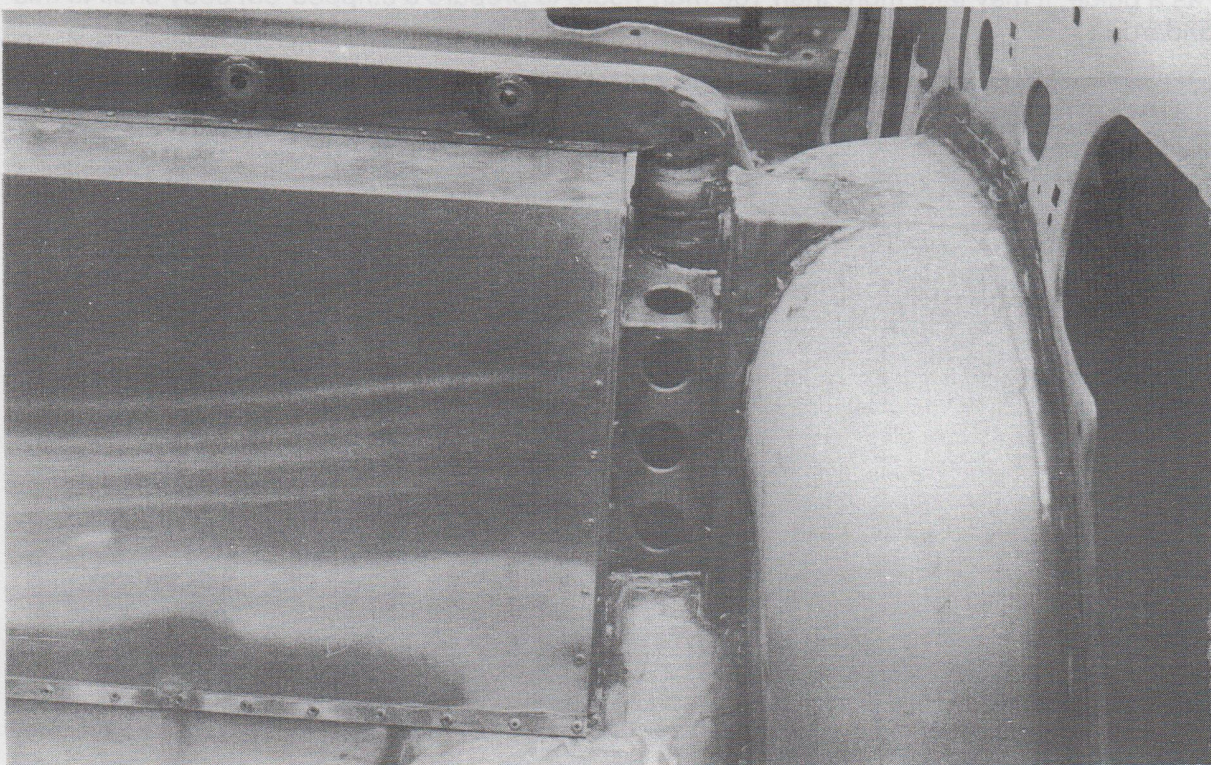


If a Ford-supplied safety bag fuel tank is to be fitted, this needs filler neck access on the left side. The access hole has just been located. Seam-welding of all welded joints is also in progress.

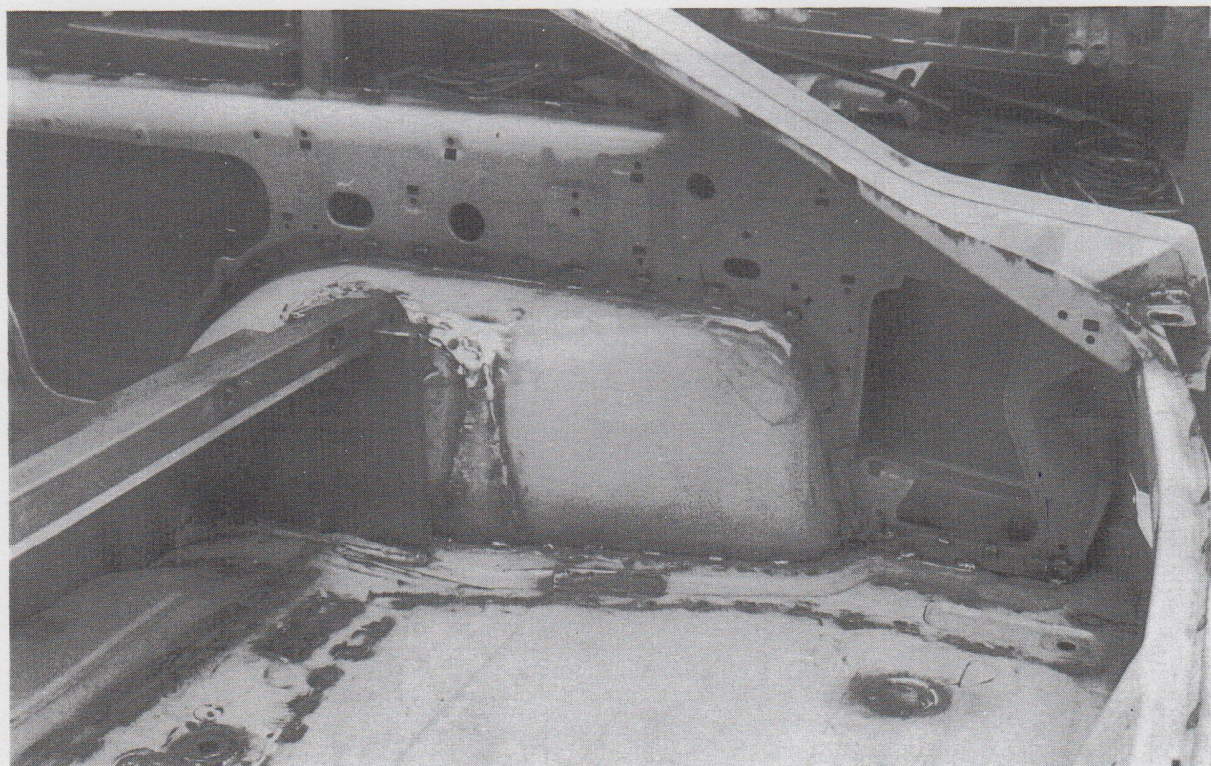
- f) Modify the bulkhead separating the engine bay from the passenger compartment to allow for the roll cage front extensions to pass through to the front suspension turrets. Do not forget that the bulkhead must still be fireproofed when this has been done.
- g) Modify the bulkhead, with a reinforcing plate, for the fitment of the brake pedal box.



On Group A cars, if a pedal box is fitted, it is necessary to reinforce the bulkhead (firewall) in that area.



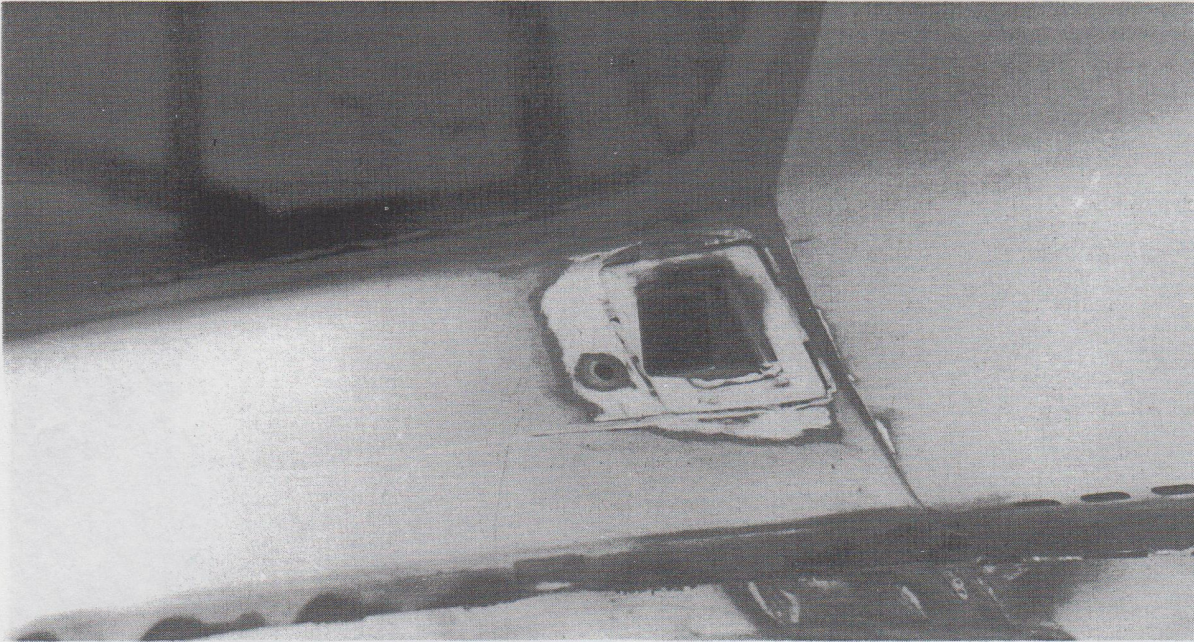
A detail of the way the rear damper towers are reinforced, a safety bag tank cover is located and a bar is placed across the car between the damper towers, in building a Group A SIERRA body shell.



This is the partly-prepared SIERRA RS COSWORTH body shell, showing the rear damper tower/safety bag fuel tank cover/reinforcement brace location.

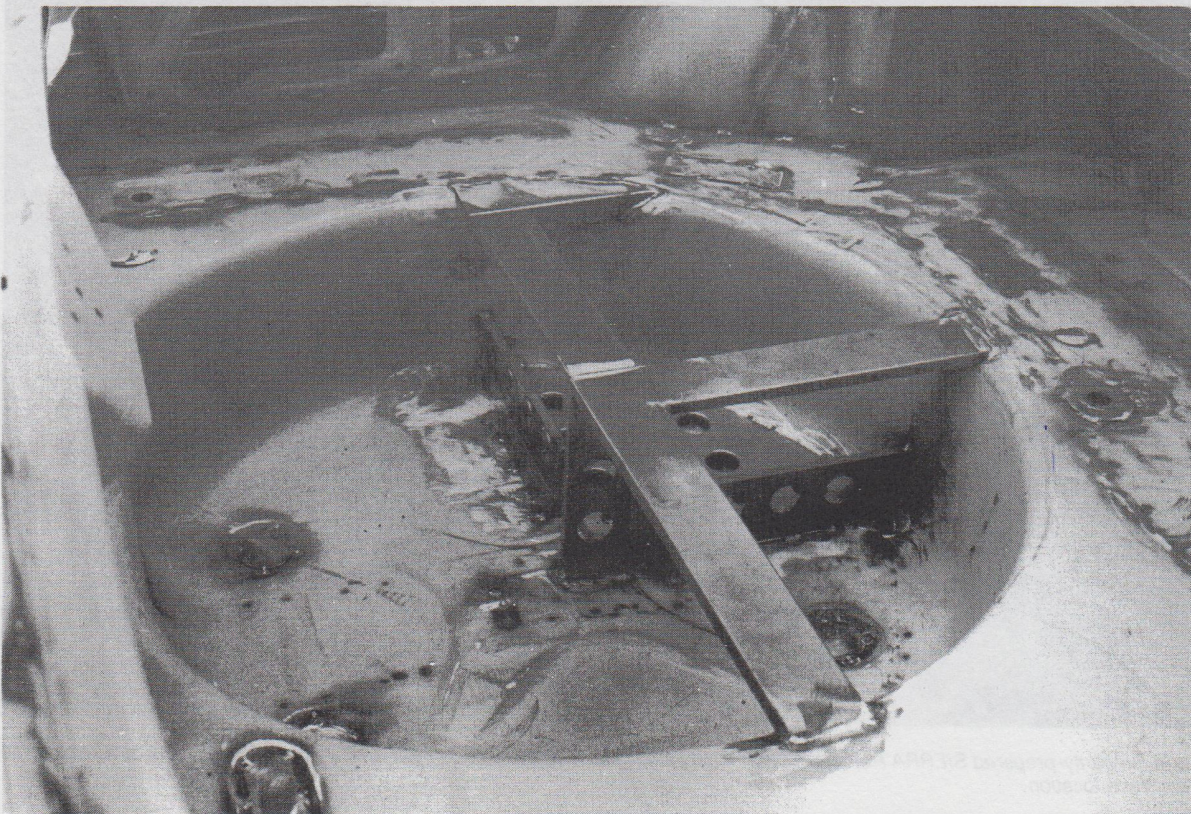
- h) For extra-heavy-duty use, double-skin the top of the front suspension strut mountings.

— as a guide, it may take more than 100 man-hours to prepare a stripped-out body shell to this standard.



On the 'works' rally cars, sturdy jacking points are added to the sills under the doors. When the car is being worked on, it is supported by fixed height workshop stands which locate in these points.

When body shell preparation is complete, we recommend that you spray the engine bay, and all the panels not covered by the exterior colour schemes and sponsors' decals, in white. This aids the tracing of all fluid leaks and panel cracks which might inadvertently occur at a later date.



On most Group A SIERRAs, the spare wheel is re-positioned, inside the passenger compartment at the rear of the car. On race cars no spare wheel is carried. This leaves the spare wheel well available for a different job. In many cases the fuel pumps and filters are located in this area.

TRIM:

Group N:

Please note that on Group N cars all trim must be retained, although it may be locally cut or deformed to allow the rollcage to be fitted.

If the standard seats are to be replaced by competition seats, these must always have a headrest and be ballasted up to standard weights. The seat supports may be modified.

Group A:

In Group A, the carpets, roof lining, and all insulation, may be removed, together with the rear seats, but all the side trim panels normally fitted in the cockpit area (and this includes those panels fitted in what would normally be the rear seat region) must remain in place.



Lightweight competition seats are available, complete with body shell fittings, for the SIERRA.

HEATSHIELDS:

At this stage you should also consider the provision of heat shields in the engine bay.

On the SIERRA RS/RS500 COSWORTH models, the turbocharger itself can become extremely hot, as can the exhaust manifold, and the exhaust downpipe. Precautions should also be taken against the possibility of the exhaust outlet cracking, or breaking off and directing hot exhaust gases and flames towards the electrical wiring. As will be re-emphasised in the **ELECTRICAL** section, electrical wiring should be routed well away from the high-temperature areas and silicon sleeving should be used on rubber or alloy pipework.

Heatshields are available for the electrical alternator, the air cleaner and the battery/header tank; this applies to Left Hand Drive cars. On Right Hand Drive cars, it is strongly recommended that the brake master cylinders should also be protected.

Foil-covered Aramid fibre blanket can be riveted to vulnerable panels - particularly where the exhaust system is routed close to the floor pan.

SUMP, TRANSMISSION AND TANK SHIELDS:

The purpose of under shields is to protect the vulnerable mechanical parts from damage: these can range from lightweight 'stone shields' for tarmac events, to strong shields capable of resisting grounding on rocks on rough rally stages.

Kevlar which is strong and light, can be used, but it is very expensive and has poor abrasion resistance. This material, therefore, tends to be used only for tarmac rallies. For other applications, Duralumin is generally used.

To prevent excessive heat build up, particularly in the case of SIERRA RS/RS500 COSWORTH models, the sump shield used should incorporate cutaway sections on both sides behind the crossmember as the sump shield must allow the passage of cooling air through the engine bay from the water radiator (and in the case of the SIERRA RS/RS500 COSWORTH, the turbo intercooler); where cooling flow would be impaired by the fitment of a comprehensive and close-fitting sump shield. In hot weather therefore, the engine's cooling water temperature should be watched carefully at all times.

For rallying, undershielding may be fitted to cars complying with Group N and Group A regulations, so the shielding described below may be used in all cases, according to the conditions encountered.

In every case, before beginning assembly of the shielding to the car (this applies especially where welded brackets are provided for the shields to be bolted up), loosely assembly everything, complete with all necessary cross-members and brackets, to be sure that you understand the assembly sequence and the exact location of brackets.

Ford has developed a Kevlar skid-shield kit which is suitable for protecting any of the SIERRA models covered in this preparation guide. It protects the engine sump and the main transmission (including the transfer gearbox of the four-wheel-drive SIERRA XR4 × 4 model).

A rear skid shield has also been developed to protect the underside of the final drive/differential assembly, this also being suitable for all casings used in the range of SIERRA models.

In some cases and for use in very rough conditions, SIERRA users may wish to add a third, intermediate shield, linking the main and the differential guards. Ford does not market such a guard. Our advice is that it should be arranged to clamp up between the front shield and the body underside at the front end, so that it cannot accidentally be peeled back, from the front, by heavy impacts.

For Group N use, or in any case where the standard fuel tank position is retained, a mild steel fuel tank stone guard is available. This is a mainstream (not a Motorsport) part, sold through Davenport (UK) or Merkenich (Europe), with a Finis Code of: 6134086.

Note that brake pipes and fuel pipes must be protected if left in position under the car (this applies to Group N use), or they may be re-routed through the interior (this applies to Group A cars).