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Contents

Race control

Welcome to the seventh edition of the ASMMR newsletter. This is the final edition before the end of the year, which means the next issue will be the first of Volume 2; a little milestone. Hopefully the past six issues, along with this one have been useful, or at least entertaining. I am aware that the previous issues have been clinically weighted, however, that simply reflects my clinical background. I am guided on the paraclinical and rescue topics by the information that I can find, either on the internet or by discussion with relevant individuals at events. As a result, the coverage of these topics may not be as balanced as would be desirable and I would be more than happy for any corrections or contributions. To try and redress the weighting, this issue's review topic covers some of the issues around roll cages and some insights into why they can cause us such a headache; figuratively and literally.

As the majority of major motorsporting categories have wound up for the season, the results section contains a few alternative results.

Otherwise, have a good Christmas and play safely through the New Year

Good luck.

Matthew Mac Partlin

Rescue review

Roll cages (ROPS)

Roll cages, or Roll Over Protection Structures (ROPS), have become central to the design of racing vehicles, with an accepted safety function. They serve a number of purposes in addition to their primary one.

The main function of a ROPS is competitor safety in a collision. They were originally designed with a roll-over in mind, hence the name, however, as vehicle stability improved and competitive racing evolved, their function expanded to include front-end, rear-end and side impact protection. They perform well in front and rear end collisions, but continue to demonstrate weakness in side impacts greater than a glancing blow. No roll cage guarantees competitor survival in all collision types.

Additional functions of the ROPS include safety harness and seat attachment and improved vehicle stiffening, which allows greater tailoring of suspension and other race settings.

From the rescue team's perspective, the roll cage usually allows a competitor to survive a significant collision with relatively little injury, but can create a reasonable amount of difficulty with regards to extrication, especially if there is a large degree of deformation.

It is worth understanding a little bit of the engineering behind roll cages. The following is an outline of the major features of roll cages.

Roll cage specifications are covered by Schedule J of the CAMS regulations (http://www.camsmanual.com.au/pdf/10_gen_req/GQ11_Schedule_J_Q409.pdf). The Schedule includes:

1) Definition:

"*Safety cage: A multi-tubular structure installed in the cockpit and fitted close to the body shell, the function of which is to reduce the deformation of the body shell (chassis) in case of an impact. A safety cage must be made up of a main roll bar and a front roll bar (or of two lateral roll bars), their connecting members, one diagonal member, backstays and mounting points*"

2)Categories requiring a roll cage

Not all categories require a roll cage, though one is generally recommended. In general, speed-limited events where only one vehicle is active, may not require a roll cage.

3) Components

The exact requirements are determined by the category within which the vehicle competes. The minimum is a horizontal main hoop with a back stay, for open cockpit vehicles. See Article 7 of CAMS Schedule J for further details.

4) Technical specifications regarding engineering, manufacture, fitting and mounting, positioning within the vehicle relative to the occupants and padding.

5) Additional requirements

For example, roll cage tubing may not carry fluids and must not impede driver or passenger exit from the vehicle.

ROPS specifications are also regulated by the FIA, under the individual categories.

Some of the issues regarding ROPS are as follows:

1) Standard versus Certified cages

A standard roll cage is a pre-manufactures structure, designed to fit the most common vehicle chassis. The material is usually cold-drawn high tensile steel, also known as CDS, with the minimum dimensions of 44.45mm diameter and 2.6mm wall thickness for the main hoops and forward legs and 38.1mm diameter and 2.6mm wall thickness for all other components. It achieves the minimum required yield strength of 350MPa (50763.195 psi) while keeping the cost down, but a weight sacrifice is paid (10 – 20+ kgs depending upon the model and design).

Certified cages are custom fit to the vehicle and may use more advanced materials, such as cromoly and Reynolds T45. They can achieve much higher yield strengths for a much reduced weight but usually require more intricate cage design, lengthier and more intricate workmanship, specialist welding and certification and, as a result, significantly greater cost.

2) Bolted versus Fully welded

The cage needs to be secured to the chassis to be of any use. The two main methods are bolting and direct welding. Bolting involves drilling bolt-holes into the chassis at the feet of the cage and fixing the cage's feet with a minimum of three bolts to a load-spreading footplate. The only real advantage is the ease of removal, which may be important if the competitive car is also to be driven on the road and the roll cage does not fit within state road authority regulations (eg Vic Roads Vehicle Standards Information 28 – Internal roll bars and roll cages). However, it can wrench free of the chassis if not properly secured and leaves holes in the chassis once removed. There is no cost benefit of significance.

Fully welded cages are welded at all foot points directly to the chassis. They give greater stability to the structure and provide greater chassis strengthening. They are less likely to wrench free in a collision unless the workmanship of the welding is poor. Removal usually requires the roof and floor of the car to be cut out and replaced.

3) Manufacture and engineering

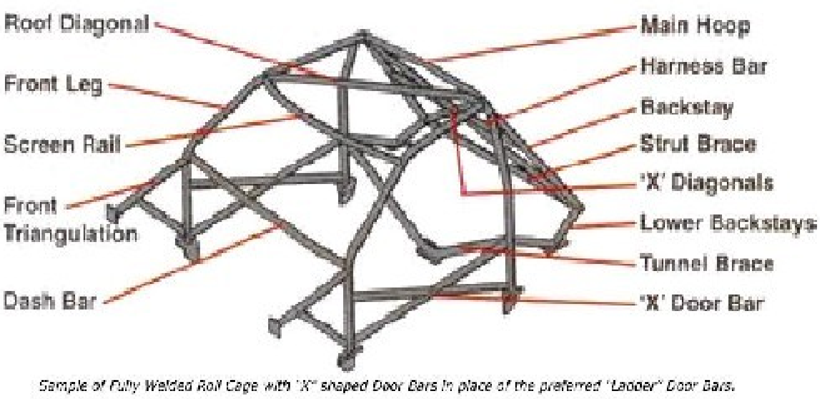
Material: Cold-drawn seamless high tensile steel versus Cromoly - see above.
Tube joints: Previously joints were bolted together. Nowadays they must be welded. Poor workmanship can result in warping, deformity, stress fracturing and primary failure in a collision.
MIG and TIG welding are the most common welding methods. TIG gives a better aesthetic finish (smoother with a smaller raised bead) but is no stronger than MIG and runs an increased risk of under-penetration, which may result in joint rupture in a collision. Welded-in cages usually have their foot plates MIG welded.
In situ assembly versus Full assembly installation. Theoretically, full assembly installation places a fully constructed roll cage into a vehicle. All the joints can be welded with good access and should therefore should be of high quality. It requires the vehicle to be built around the roll cage, or for the roof or floor to be cut away for installation and later reattached. In situ assembly welds the components together inside the car and requires awkward manouvres to ensure that all joints are properly welded.

4) Padding

Padding is required on any part of the cage that the competitors body, especially the head, could come into contact in the event of an impact. It is regulated by both CAMS and the FIA (FIA Standard 8857-2001 Roll cage Padding - updated: 26.06.2002). It must be non-flammable, can absorb kinetic energy and may cost from $15 - $100 per metre.

5) Extrication

While improving the construction and design of roll cages will reduce the incidence of poor outcomes from competitive impacts, there are still collisions that require emergent extrication of an injured competitor. Additional cage components have, in some categories, made competitor access increasingly difficult. Rear seat access in the professional categories can be impossible and even passenger seat access may be exceedingly troublesome. With improved material strength, extrication devices such a spreaders, rams and cutting tools are having increasing difficulty, leading to delayed access and extrication times. It is a bit difficult to get exact details as roll cage material characteristics are quoted in units of pressure (Mpa and psi) and extrication tools quote units of force (Nm and lbf), so if anyone can supply more details regarding extrication tool limitations and alternative options, it would be greatly appreciated.



Roll cage anatomy, from www.bborr.com/rules.html

Sources

- http://www.camsmanual.com.au/pdf/10_gen_req/GQ11_Schedule_J_Q409.pdf
- http://www.rollcage.com.au/rollcage.html
- http://www.mmsport.com.au/Roll_Cage_Fabrication.php

Recent race results

V8 Supercars

The final event was held in Sydney, at Homebush Bay for the inaugural Telstra 500. A race of attrition, it was a case of who could finish. The street circuit claimed all but 16 of the starting 29 drivers, including the high flyers normally expected to finish in the top 10. Drivers who started outside the top 20 made their way up to the top 5 only to finish in 12th or 17th, if they finished at all. At the close of the season the results are as follows:

1. Jamie Whincup 3349	6. Steven Johnson 2255	11. Michael Caruso 1977
2. Will Davison 3044	7. James Courtney 2192	12. Shane Van Gisbergen 1970
3. Garth Tander 2916	8. Rick Kelly 2162	13. Steven Richards1780
4. Craig Lowndes 2592	9. Russell Ingall 2048	14. Jason Richards 1756
5. Mark Winterbottom 2414	10. Lee Holdsworth 2006	15. Paul Dumbrell 1677

2009 Australian Offshore Powerboat Championship

AUS-1: The Mark Lee trophy, after Round 4

1. MARITIMO: Tom Barry-cotter & Pal Virik Nilsen 2. ACME: Steve Searle & Andrew Searle 3. GLOBAL RACING: Mike Beil & Ross Willaton	4. THE GOOD GUYS: Brendan Frier & Christopher Frier 5. SUV DODGE RAM: Mat Humphrey & Simon Isherwood 6. SIMRAD: Luke Durman & Peter Mcgrath

The Intercontinental Rally Challenge (IRC)

After the completion of 11 rounds in 2009:

1. Kris Meeke (GB) 60 2. Jan Kopecky (CZ) 49 3. Freddy Loix (B) 37 4. Nicolas Vouilloz (F) 31	5. Giandomenico Basso (I) 28 6. Juho Hanninen (FIN) 21 7. Guy Wilks (UK) 15	8. Sebastien Ogier (F) 10 9. Carl Tundo (EAK) 10 10. Alistair Cavenagh (GB) 8

The IRC is organised and promoted by Eurosport Events and has sought to resurrect many of the old "classic" rallies, pre-WRC. It includes Brazil, Kenya and the Czech Republic on its calendar and drivers such as Alastair McRae and Conrad Rautenbach, in addition to those mentioned above. The manufacturer representation is also quite broad, with Peugeot, VW, Ralliart, Skoda, Abarth, Honda and Proton all competing. The 2010 calendar starts in Monte Carlo on the 19th of January.

NASCAR

After all 36 Sprint Cup rounds (wow, what a calendar!)

1. Jimmie Johnson 6652 2. Mark Martin 6511 3. Jeff Gordon 6473 4. Kurt Busch 6446	5. Denny Hamlin 6335 6. Tony Stewart 6309 7. Greg Biffle 6292	8. Juan Montoya 6252 9. Ryan Newman 6175 10. Kasey Kahne 6128

Marcus Ambrose came in at 13th out of a total of 85 drivers. Drivers in 68th to 84th position scored no points during the season and Carl Long, in last place, somehow managed minus 200 points. The results also publish the drivers' earning for the season and Jimmie Johnson topped the list with US$7.339 million ..... what an incentive!

FIA Institute news

Current research projects as of August 2009

- The FIA driver ear accelerometer project is ongoing. Having found the Indy Car accelerometer too bulky, the FIA, in partnership with the US Department of Defence, has developed a $3mm^3$ device which it is in the process of testing.
- There is ongoing R&D into high speed crash barrier design, in order to arrest an impact with as little transmitted force to the driver as possible. It also seeks to prevent the vehicle wedging itself under the barrier, or vaulting over the top.
- Seven Subaru Impreza's have been quired, along with CAD packages, in order to refine roll cage material and design for rally cars.
- Ongoing R&D for race seat design for categories other than F1 and IRL, which have already benefited from previous development.
- Completed development and certification of a helmet for young drivers (7 – 15 yo). They will be mandated from 2010 onwards. More information at www.smf.org
- Support of companies Spengler and Geobrugg in the development of debris fences that protect spectators and marshals from both oblique and direct impacts.
- Support of Delta Motor Sports evaluation of Le Mans prototype aerodynamics to prevent "take-off" accidents.
- A fire safety and extinguisher project is being commenced that aims to evaluate optimal types and quantities of extinguishants, the effect of pre-burn time and the influence of fuel types, including biofuels and other alternatives. The subsequent aim is to refine fire suppression methods and equipment.

Caught by the cameras

A Red Bull Air Race plane in passing between the bollards at full clip.