

## SECTION C : TECHNICAL REGULATIONS

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**CONVENTION:**

**Black Text:** Regulations as approved by the WMSC on 24/06/2024

**Pink Text:** Changes to the regulations compared to the 2026 F1 technical Regulations – Issue 8.  
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**[Red Text]:** Information on applicable Governance and relevant Advisory Committee

**[Orange Text]:** Reference information on relevant Guidance Document(s): non-binding and non-regulatory

**[Green Text]:** Comments / explanations / indication of further work: non-binding and non-regulatory

**CONTENTS:**

<b>ARTICLE C1: GENERAL PRINCIPLES</b>	<b>8</b>
C1.1 Formula One World Championship	8
C1.2 Regulatory Framework	8
C1.3 Interpretation of and amendments to these Technical Regulations	8
C1.4 Dangerous construction	9
C1.5 Compliance with the regulations	9
C1.6 New systems or technologies	9
C1.7 Duty of Competitor and PU Manufacturer	10
<b>ARTICLE C2: DEFINITIONS AND FUNDAMENTAL DIMENSIONS</b>	<b>11</b>
C2.1 Formula One Car	11
C2.2 Competition	11
C2.3 Component classification categories	11
C2.4 Power unit	11
C2.5 Power train	11
C2.6 Coordinate systems and conventions	11
C2.7 Principal planes	12
C2.8 Fundamental Dimensions	13
C2.9 Reference Volumes and Surfaces	13
C2.10 Precision of Numerical Values	13
<b>ARTICLE C3: AERODYNAMIC COMPONENTS</b>	<b>14</b>

C3.1	Definitions	14
C3.2	General Principles	16
C3.3	Legality Checking	18
C3.4	Component Definition	19
C3.5	Floor Bodywork	20
C3.6	Plank	24
C3.7	Front Bodywork	26
C3.8	Rear Bodywork	28
C3.9	Tail and Exhaust Tailpipe	29
C3.10	Front Wing (FW)	30
C3.11	Rear Wing (RW)	35
C3.12	Final Assembly	38
C3.13	Bodywork not defined in Articles C3.5 to C3.12	39
C3.14	Wheel Components	40
C3.15	Wheel Bodywork Assembly	41
C3.16	Apertures	42
C3.17	Suspension and Driveshaft Fairings	44
C3.18	Aerodynamic Component Flexibility	46
<b>ARTICLE C4: MASS</b>		<b>51</b>
C4.1	Definitions	51
C4.2	Minimum mass	51
C4.3	Mass distribution	51
C4.4	Ballast	52
C4.5	Adding during the race or sprint session	52
C4.6	Reference Mass of the driver and Driver Ballast	52
<b>ARTICLE C5: POWER UNIT</b>		<b>53</b>
C5.1	Definitions ICE	53
C5.2	Definitions ERS	56
C5.3	Engine specification	59
C5.4	Power Unit Energy Flow	60
C5.5	Turbo Charger	64
C5.6	Power unit geometrical constraints and dimensions	65
C5.7	Mass and centre of gravity	67
C5.8	Engine intake air	68
C5.9	Variable geometry systems	69
C5.10	Exhausts	69
C5.11	Fuel systems	69
C5.12	Ignition systems	70
C5.13	Ancillaries	70

C5.14	Power unit torque or power demand	70
C5.15	Power unit control	71
C5.16	Engine high rev limits	72
C5.17	Starting the engine	73
C5.18	Stall prevention systems	73
C5.19	Energy Recovery System (ERS)	73
C5.20	MGU-K	75
C5.21	Energy Store	76
C5.22	ES design and installation	77
C5.23	ERS General electrical safety	78
C5.24	Replacing power unit parts	80
C5.25	Oil and coolant systems and charge air cooling	80
C5.26	Component Classification	80
C5.27	Single ICE Mode	80
<b>ARTICLE C6: FUEL SYSTEM</b>		<b>81</b>
C6.1	Fuel tanks	81
C6.2	Fittings and piping	81
C6.3	Fuel tank fillers	82
C6.4	Refuelling	82
C6.5	Fuel draining and sampling	82
C6.6	Fuel System Hydraulic Layout	83
<b>ARTICLE C7: OIL AND COOLANT SYSTEMS AND CHARGE AIR COOLING</b>		<b>86</b>
C7.1	Location of lubricating oil tanks	86
C7.2	Location of lubricating oil system	86
C7.3	Oil and coolant lines	86
C7.4	Heat exchangers	86
<b>ARTICLE C8: ELECTRICAL SYSTEMS</b>		<b>88</b>
C8.1	Definitions	88
C8.2	Software and electronics inspection	88
C8.3	Control electronics	89
C8.4	Start systems	90
C8.5	Data acquisition	90
C8.6	Telemetry	91
C8.7	Driver inputs and information	91
C8.8	Master switch	92
C8.9	Driver radio	92
C8.10	Accident analysis	92
C8.11	Accident data	94

C8.12	FIA Marshalling system	94
C8.13	Track signal information display	95
C8.14	Medical Impact warning system	95
C8.15	Installation of electrical systems or components	95
C8.16	Timing transponders	95
C8.17	Cameras and camera housings	96
C8.18	Electromagnetic radiation	97
C8.19	Sensor signals	97

## **ARTICLE C9: TRANSMISSION SYSTEM** **98**

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C9.1	Definitions	98
C9.2	Fundamental provisions	99
C9.4	Clutch control	99
C9.5	Clutch disengagement	101
C9.6	Homologated Gearbox and Component Classification	101
C9.7	Gearbox Dimensions	102
C9.8	Gear ratios	102
C9.9	Reverse gear	103
C9.10	Gear changing	103
C9.11	Torque transfer systems	104
C9.12	Driveshafts	104
C9.13	Driveshaft Torque Sensors	104
C9.14.	Structural Connection to Survival Cell	104

## **ARTICLE C10: SUSPENSION, STEERING SYSTEMS, WHEELS AND TYRES** **105**

---

C10.1	Definitions	105
C10.2	Sprung suspension	105
C10.3	Outboard suspension	107
C10.4	Inboard suspension	108
C10.5	Steering	109
C10.6	Suspension Uprights	110
C10.7	Wheel rims	110
C10.8	Tyres	113
C10.9	Wheel attachment and retention	114
C10.10	Dimensions	115

## **ARTICLE C11: BRAKE SYSTEM** **116**

---

C11.1	Brake circuits and pressure distribution	116
C11.2	Brake callipers	116
C11.3	Brake discs and pads	117
C11.4	Brake pressure modulation	117

C11.5	Liquid cooling	117
C11.6	Rear brake control system	117
C11.7	Supply of Brake Friction and Brake System Hydraulic components	117
<b>ARTICLE C12: SURVIVAL CELL</b>		<b>118</b>
C12.1	Definitions and General Requirements	118
C12.2	Survival cell specifications	118
C12.3	Intrusion Protection	121
C12.4	Roll Structures	123
C12.5	Cockpit Specification	125
C12.6	Cockpit Padding	126
C12.7	Seat fixing and removal	128
C12.8	Driver Fit Information	128
<b>ARTICLE C13: SAFETY STRUCTURES AND HOMOLOGATION</b>		<b>129</b>
C13.1	General Principles	129
C13.2	Survival Cell Frontal Impact Test	129
C13.3	Roll Structure Testing	131
C13.4	Survival Cell Load Tests	133
C13.5	Side Impact Structure	137
C13.6	Front Impact Structure	140
C13.7	Rear Impact Structure	144
C13.9	Headrest Load Test	146
C13.10	Wheel Rim Impact Test	147
<b>ARTICLE C14: SAFETY EQUIPMENT</b>		<b>148</b>
C14.1	Fire Extinguishers	148
C14.2	Rear view mirrors	148
C14.3	Rear lights	149
C14.4	Safety Tethers	149
C14.5	Safety Harnesses	150
C14.6	Driver Cooling Systems	150
C14.7	Lateral Safety lights	151
C14.8	Driver's Drink System	151
<b>ARTICLE C15: MATERIALS</b>		<b>152</b>
C15.1	Definitions	152
C15.2	General Principles	153
C15.3	Permitted Materials (Components Outside the PU Perimeter)	154
C15.4	Specific Prohibitions and Restrictions (Components Outside the PU Perimeter)	157
C15.5	Specific Exceptions (Components Outside the PU Perimeter)	157

C15.6	Prescribed and Homologated Laminates (Components Outside the PU Perimeter)	158
C15.7	Materials, processes and construction – General (Components inside the PU Perimeter)	159
C15.8	Materials and construction – Components (Components inside the PU Perimeter)	160
C15.9	Materials and construction – Pressure charging and exhaust systems (Components inside the PU Perimeter)	162
C15.10	Materials and construction – Energy recovery, storage systems and electronic systems (Components inside the PU Perimeter)	163

---

**ARTICLE C16: FUEL AND ENGINE OIL** **164**

C16.1	Basic principles	164
C16.2	Definitions	165
C16.3	Fuel properties	166
C16.4	Composition of the fuel	167
C16.5	Fuel approval	167
C16.6	Fuel sampling and testing at a Competition	168
C16.7	Engine oil definitions	168
C16.8	Engine oil properties	169
C16.9	Composition of the engine oil	170
C16.10	Engine oil approval	170
C16.11	Sampling and testing at a Competition	170
C16.12	Recycling of Engine Oil	170

---

**ARTICLE C17: COMPONENTS' CLASSIFICATION** **171**

C17.1	Definitions	171
C17.2	General Principles	171
C17.3	Listed Team Components (LTC)	173
C17.4	Standard Supply Components (SSC)	175
C17.5	Transferable Components (TRC)	176
C17.6	Open Source Components (OSC)	177
C17.7	Defined Specification Components (DSC)	178
C17.8	List of LTC, SSC, TRC, OSC, and DSC	179

---

**ARTICLE C18: POWER UNIT COMPONENTS' CLASSIFICATION** **181**

C18.1	Definitions	181
C18.2	General Principles	182
C18.3	Listed Power Unit Components (LPUC)	184
C18.4	Standard Supply Power Unit Components (SSPUC)	185
C18.5	Open-Source Power Unit Components (OSPUC)	186
C18.6	Defined Specification Power Unit Components (DSPUC)	188
C18.7	List of LPUC, SSPUC, OSPUC and DSPUC	189

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**APPENDIX C1: DEFINITIONS** **190**

<b>APPENDIX C2: REGULATION VOLUMES</b>	<b>191</b>
<b>APPENDIX C3: DRAWINGS</b>	<b>206</b>
<b>APPENDIX C4: POWER UNIT SYSTEMS, FUNCTIONS, COMPONENTS AND SUPPLY PERIMETER</b>	<b>211</b>
<b>APPENDIX C5: HOMOLOGATION AND DEVELOPMENT OF POWER UNITS, FUEL AND OIL FOR 2026-2030</b>	<b>221</b>
<b>APPENDIX C6: SUPPLY OF POWER UNITS, FUEL AND OIL FOR 2026-2030</b>	<b>226</b>
<b>APPENDIX C7: COMPONENTS' CLASSIFICATION AND PERIMETER</b>	<b>238</b>
<b>APPENDIX C8: APPROVED CHANGES FOR FUTURE YEARS</b>	<b>247</b>

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**ARTICLE C1: GENERAL PRINCIPLES****C1.1 Formula One World Championship**

**C1.1.1** The FIA will organise the FIA Formula One World Championship (the "Championship") which is the property of the FIA and comprises two titles of World Champion, one for drivers and one for constructors. It consists of the Formula One Grand Prix races which are included in the Formula One calendar and in respect of which the ASNs and organisers have signed organisation agreements with the FIA. All the participating parties (FIA, ASNs, organisers, Competitors, Power Unit (PU) Manufacturers, Suppliers and circuits) undertake to apply as well as observe the rules governing the Championship and, where applicable, must hold FIA Super Licences which are issued to drivers, competitors, officials, organisers and circuits, or register in accordance with the provision of the Regulations.

**C1.1.2** The Championship and each of its Competitions are governed by the FIA in accordance with the Regulations, as defined below.

**C1.2 Regulatory Framework**

**C1.2.1** The regulations applicable to the Championship are the International Sporting Code (the "Code"), the Formula One Technical Regulations (the "Technical Regulations"), the Formula One Sporting Regulations (the "Sporting Regulations"), and the Formula One Financial Regulations (the "Financial Regulations"), as amended from time to time, together referred to as the "Regulations".

**C1.2.2** Subject to Article C1.2.3, these Regulations are issued by the FIA and apply to the whole calendar year referred to in the title and to the Championship taking place within that calendar year. Any changes made by the FIA for safety reasons may come into effect without notice or delay.

**C1.2.3** These Technical Regulations regard the FIA Formula One World Championship starting from 2026, and additionally outline various requirements that the PU Manufacturers and their Suppliers must satisfy in the period 2022–2025 in order to be able to homologate a Power Unit for the 2026 FIA Formula One World Championship.

**C1.3 Interpretation of and amendments to these Technical Regulations**

**C1.3.1** The definitive text of the Technical Regulations shall be the English version which will be used should any dispute arise as to their interpretation.

**C1.3.2** Headings in this document are for ease of reference only and do not affect the meaning of the Technical Regulations.

**C1.3.3** Unless stated otherwise, references to "Articles" herein are to articles of these Technical Regulations.

**C1.3.4** In the sense of the Regulations, terms referring to natural persons are applicable to any gender.



**C1.3.5** Any terms not defined in these Technical Regulations have the meaning given to them in the “FIA 2022 Formula 1 Technical Regulations – Issue 12” (the “2022 Technical Regulations”). In the event that ascribing the meaning of a defined term in the 2022 Technical Regulations to an undefined term in these Technical Regulations results in a significant impact to the design of the 2026 Power Unit, PU Manufacturers bound by these Technical Regulations may ask the FIA for guidance and the FIA will then issue guidance on the meaning of the relevant term. Such guidance will be communicated by the FIA to all PU Manufacturers.

**C1.3.6** Any amendments to these Technical Regulations that do not relate specifically to the Power Unit or that relate to matters of form rather than substance (such as re-numbering, reference corrections, etc.) will not be subject to the approval of the PU Manufacturers. Any amendments to these Technical Regulations that relate to substantive matters concerning the Power Unit will be subject to the prior approval of the PU Manufacturers in accordance with the 2026 F1 PU Governance Agreement, as referenced in Article 1.1 of Appendix **C6**.

#### **C1.4 Dangerous construction**

The stewards may prohibit the participation of a vehicle whose construction is deemed to be dangerous. Should the relevant information become apparent during a session, such a decision may apply with immediate effect.

#### **C1.5 Compliance with the regulations**

Formula 1 Cars must comply with these regulations in their entirety at all times during a Competition.

Should a Competitor or PU Manufacturer introduce a new design or system or feel that any aspect of these regulations is unclear, clarification may be sought from the FIA Formula One Technical Department. If clarification relates to any new design or system, correspondence must include:

- a. A full description of the design or system.
- b. Drawings or schematics where appropriate.
- c. The Competitor or PU Manufacturer's opinion concerning the immediate implications on other parts of the car of any proposed new design.
- d. The Competitor or PU Manufacturer's opinion concerning any possible long-term consequences or new developments which may come from using any such new designs or systems.
- e. The precise way or ways in which the Competitor or PU Manufacturer feels the new design or system will enhance the performance of the car.

#### **C1.6 New systems or technologies**

Any new system, procedure or technology not specifically covered by these Technical Regulations, but which is deemed permissible by the FIA, will only be admitted until the end of the Championship during which it is introduced. Following this the Formula One Commission will be asked to review the technology concerned and, if they consider (in their sole discretion) that such new system, procedure, or technology adds no value to Formula One in general, it may be specifically prohibited by the FIA.

**C1.7 Duty of Competitor and PU Manufacturer**

It is the duty of each Competitor to satisfy the FIA and the stewards that its Formula 1 Car complies with these regulations in their entirety at all times during a Competition. With regard to PUs used on a Formula 1 Car, this duty and responsibility also extends to the PU Manufacturer.

The design of the car, its components and systems shall, with the exception of safety features, demonstrate their compliance with these regulations by means of physical inspection of hardware or materials. Unless explicitly requested by an Article, no mechanical design may rely upon software inspection as a means of assessing compliance.

Due to their nature, the compliance of electronic systems may be assessed by means of inspection of hardware, software, and data.

CAD models may be requested by the FIA in order to check compliance with the Regulations. Such models should be supplied in a format and by a method specified by the FIA. In such cases, scanning technology will be used by the FIA to check that the physical car is the same as the inspected CAD models.

Each Competitor and each PU Manufacturer must ensure that all relevant personnel (whether employee, consultant, contractor, secondee or any other type of permanent or temporary personnel) associated with its participation in the Championship are appropriately informed with respect to the ways in which their areas of responsibility may impact the compliance of the Competitor and/or PU Manufacturer (as applicable) with the Regulations.

Each Competitor and each PU Manufacturer must ensure that the FIA ethics and compliance hotline with respect to the Regulations is clearly communicated to all relevant personnel.

**ARTICLE C2: DEFINITIONS AND FUNDAMENTAL DIMENSIONS****C2.1 Formula One Car**

An automobile (the car) designed solely for speed races on circuits or closed courses that is propelled by its own means, moving by constantly taking real support on the ground, of which the propulsion and steering are under the direct control of a driver aboard the vehicle. It runs on four non-aligned complete wheels, with wheel centres that are arranged symmetrically about the plane  $Y=0$ , when in the straight-ahead position, to form the front and rear axles.

**C2.2 Competition**

As defined in Article 2.2 of the Sporting Regulations

**C2.3 Component classification categories**

The terms LTC, SSC, TRC, DSC, OSC, LPUC, SSPUC, DSPUC and OSPUC, defined in Articles C17 and C18 and used throughout the Regulations, refer to the classification of the car's components in terms of their Design, Intellectual Property, Manufacture and Supply.

**C2.4 Power unit**

As defined in Article C5.1.2

**C2.5 Power train**

As defined in Article C5.1.1

**C2.6 Coordinate systems and conventions****C2.6.1 Car Coordinate System**

A right-handed Cartesian (X, Y, Z) coordinate system will be used in these regulations, defined in the following way:

- a. The X axis is the longitudinal direction of the car and increases rearwards.
- b. The Y axis is the transverse direction of the car and increases to the (driver's) right-hand side.
- c. The Z axis is the vertical direction and increases upwards.

**C2.6.2 Further conventions**

- a. If no units are specified, it is implicit the unit will be in millimetres
- b. Unless otherwise specified, the positive side of the Y axis is used in the various Articles and it is implicit that a symmetrical rule applies for the other side of the car.
- c. The terms "inboard" or "outboard", when used in reference to the Y coordinate, respectively refer to closer to or further away from the plane  $Y=0$ .
- d. A suffix may be used for local coordinates in specific rules, (e.g.  $X_w$ ,  $Y_w$ ,  $Z_w$ ), where these local axes are defined within a specific Article for local use.
- e. Planes will be referred to as the axis to which they are normal to (e.g. X-Plane or  $X_A = 300$  plane).
- f. A wheel is defined to be in the straight-ahead position when its rotational axis lies in an X-Plane.

- g. Unless otherwise specified any measurements and references will be with the wheels in the straight-ahead position.
- h. Unless otherwise specified, when a viewing direction is stated, “front” and “rear” are parallel to the X axis, “side” is parallel to the Y axis (in the direction towards the plane  $Y = 0$ ) and “above”, “below” and “plan” are parallel to the Z axis.
- i. Unless otherwise specified, directions of angles, slopes and incidences are taken in context of the right-handed Cartesian coordinate system defined in C2.6.1. For example, a positive slope within a Y-Plane would be characterised by positively increasing X and Z components.

### C2.6.3 Wheel Coordinate System

A local Cartesian ( $X_w, Y_w, Z_w$ ) coordinate system will be used for each wheel, defined in the following way:

- a. The origin of the wheel coordinate system is the intersection of the rotational axis of the wheel and the inboard plane of the wheel rim.
- b. The  $X_w$  axis lies in the inboard plane of the wheel rim and increases in the rearward direction. With the wheel in the straight-ahead position and the car at its legality ride height, the  $X_w$  axis is parallel to the car’s X-Axis.
- c. The  $Y_w$  axis is coincident with the wheel’s axis of rotation and increases towards the plane  $Y=0$ . Referring to this axis, the terms “inboard” or “outboard” respectively refer to closer to or further away from the plane  $Y = 0$ .
- d. The  $Z_w$  axis lies in the inboard plane of the wheel rim and increases upwards.
- e. Once the wheel coordinate system is defined as above, then it maintains a fixed orientation relative to the suspension upright at all other suspension articulations.

### C2.7 Principal planes

- a. The **Plane  $Z = 0$**  is defined as a horizontal plane sitting at the bottom of the sprung part of the car, with the exception of the plank assembly defined in Article C3.6.
- b. The **Plane  $Y = 0$**  is defined as the plane of symmetry of the car.
- c. The **Plane  $X_A = 0$**  is defined as the X-Plane that lies on the forward limit of the Survival Cell.
- d. The **Plane  $X_C = 0$**  is defined as an X-Plane at the rear of the cockpit.
- e. The planes  **$X_F = 0$**  and  **$X_R = 0$**  are defined as a X-Planes which respectively pass through the origin of the two front or two rear wheels coordinate systems, as defined in Article C2.9.3, with the wheels in the straight-ahead position and the car at the Legality Ride Height.
- f. The plane  **$X_{DIF} = 0$**  is defined as the X-Plane containing the axis of rotation of the final drive as defined in Article 9.7.1.
- g. The plane  **$X_{PU} = 0$**  is defined as the X-Plane which passes through the mounting face of the connections between the **ICE** and the **Survival Cell**, as defined in Article C5.6.17.
- h. The plane  **$X_{FIS} = 0$**  is defined as the X-plane passing through the forward most point of the Front Impact Structure.

**C2.8 Fundamental Dimensions****C2.8.1 Width**

With the exception of the tyres and the wheel rims defined in Article C10.7.2, no part of the car may lie more than 950mm from the plane  $Y=0$  at Legality Ride Height.

**C2.8.2 Wheelbase**

The distance between the planes  $X_F = 0$  and  $X_R = 0$  must be less than or equal to 3400mm at Legality Ride Height.

**C2.8.3 Front Wheel Position**

The plane  $X_F=0$  must lie between  $X_A = 0$  and  $X_A = 150$  inclusive.

**C2.8.4 Cockpit Position**

The distance between  $X_A = 0$  and  $X_C = 0$  must be greater than or equal to 1830mm and less than or equal to 2030mm.

**C2.8.5 Rear Bulkhead Position**

The distance between  $X_C = 0$  and  $X_{PU} = 0$  must be greater than or equal to 360mm

**C2.9 Reference Volumes and Surfaces**

“Reference Volumes” and “Reference Surfaces” and their position in space are defined in Appendix C2 using the car’s coordinate system, and are used throughout the Technical Regulations for geometrical constraints. For convenience, Reference Volumes are preceded by the prefix “RV-” and Reference Surfaces by the prefix “RS-”.

**C2.10 Precision of Numerical Values**

Any numerical values specified in these Regulations as limits (maxima or minima), will be considered to be the limits regardless of the decimals quoted.

**ARTICLE C3: AERODYNAMIC COMPONENTS****C3.1 Definitions****C3.1.1 Aerodynamic Components or Bodywork**

Aerodynamic Components or Bodywork are parts of the car in contact with the External Air Stream.

- a. The following components are Bodywork:
  - i. all components described in Article C3.
  - ii. inlet or outlet cooling ducts, up to the component they provide cooling for.
  - iii. inlet ducts for the power unit (air boxes) up to the air filter.
  - iv. primary heat exchangers, as defined in Article C7.4.1 (b).
- b. The following components are not Bodywork:
  - i. cameras and camera housings, as defined in Article C8.17.
  - ii. rear view mirrors as defined in Article C14.2.
  - iii. the ERS status light.
  - iv. parts associated with the mechanical functioning of the power train, transmission of power to the wheels, and the steering system, provided none are designed to achieve an aerodynamic effect.
  - v. wheel rims and tyres.
  - vi. brake disc assemblies, calipers, and pads.

**C3.1.2 Frame of Reference**

A Frame of Reference is a coordinate system, geometry, component, or group of components to which stated Bodywork must remain immobile.

**C3.1.3 External Air Stream**

External Air Stream is the flow of air around the car that has a primary impact on its aerodynamic performance.

**C3.1.4 Component Bodywork**

Unless otherwise stated, all individual Bodywork Components described in Articles C3.5 to C3.11, and in Article C3.14, prior to any Trim and Combination operations, **and before the addition of Apertures**, must:

- a. be single volumes that are simply connected.

A simply connected volume is a volume where any closed curve lying on the surface can be continuously contracted to a single point without leaving the surface.

- b. in any X, Y and Z plane, only contain a single section.

**C3.1.5 Aerodynamic Surfaces**

Aerodynamic Surfaces are Bodywork surfaces which remain in contact with the External Air Stream after any Trim and Combination operations have been performed, after any Fillets and Edge Radii have been applied and after any Final Assembly described in Articles C3.12 and C3.15.

**C3.1.6 Trim and Combination**

A Trim and Combination operation can only be performed once all sub-components are fully defined. The only regions of a volume that can be removed as part of a trimming process are those that are internal to the body they are trimmed by. Once components are trimmed and combined, and any Fillet Radius or Edge Blend permitted by the relevant Article is applied, the resultant volume must maintain both continuity and tangency in any X, Y,  $\varphi$  and Z plane, at the boundaries between the adjacent sections of the component parts. Unless otherwise stated:

- a. The elective trimming of volumes beyond or outside of any overlap is not permitted.
- b. Trim and Combination operations must result in a single volume.

**C3.1.7 Concave and Convex Curvature**

When references are made to the curvature of Aerodynamic Surfaces, without specifying a plane of intersection, the local curvature at any point is defined as the curvature of the intersection of the surface with a plane passing through a line normal to the surface at that point. Both convex and concave radius of curvature are defined as the minimum radius, in each respective direction, that is obtained when the intersecting plane rotates 180 degrees around the normal line.

**C3.1.8 Normal to an Aerodynamic Surface or curve**

The normal at any point on an Aerodynamic Surface is a vector perpendicular to that point on the surface, pointing toward the local External Air Stream. For a curve, the normal at any point is considered the same as that of the surface containing the curve.

**C3.1.9 Tangency Continuity**

Tangency Continuity at a point on a curve or surface is achieved if the tangent value is continuous. At intersections between two curves or surfaces, Tangency Continuity requires that the curves or surfaces be tangent and have coinciding normals.

If two adjacent surfaces are not tangent continuous but can become so by applying an edge radius of up to 1mm along their boundary, they will be considered tangent continuous at this boundary, provided such an edge radius is permitted under the relevant Articles.

Unless otherwise stated, the Aerodynamic Surfaces of all Bodywork and sub-bodywork components described in Articles C3.5 to C3.11, and Article C3.14, must maintain Tangency Continuity.

**C3.1.10 Curvature Continuity**

Curvature Continuity between two curves, at a given point of a curve, between two surfaces or within a surface is satisfied if the value of the curvature is continuous and in the same direction.

**C3.1.11 Open and Closed Sections**

A section through Bodywork, from a plane of intersection, is considered closed if it forms a complete boundary on its own; otherwise, it is considered open.

**C3.1.12 Fillet and Edge Radius**

A Fillet Radius is formed by rounding an internal corner (included angle less than 180 degrees) with a concave surface by only adding material, whilst an Edge Radius is created by smoothing an external corner (included angle greater than 180 degrees) with a convex surface by only removing material.

In both instances, the resulting surface must consist of arcs that adhere to specified radius limits, connect two fully defined surfaces tangentially without inflection, and align perpendicularly to their intersection. Unless otherwise stated, both Fillet and Edge Radii may vary in size along the boundary perimeter, but these changes must be continuous.

If a discontinuity in tangency exists at the trailing edge where a Fillet Radius has joined parts, a closed aerodynamic fairing may be added immediately behind the trailing edge. This fairing must: ~~not exceed the combined cross-section of the preceding Fillet Radius/Radii and any trailing edge immediately adjacent to the Fillet and must~~

- a. maintain both continuity and tangency in any X, Y and Z plane with the filleted parts.
- b. fit within a sphere of diameter ~~three~~ two times the maximum trailing edge Fillet Radius.

Furthermore, all Fillet and Edge Radii and all Closed Aerodynamic Fairings must lie in their entirety within the union of Reference Volumes that contain the parts to which these features are applied.

~~Fillet and Edge Radii shall be considered to belong to all Aerodynamic Bodywork to which the Fillet or Edge Radius is being applied.~~

**C3.1.13 Aerodynamic Seal**

An Aerodynamic Seal reduces the air flow rate between two regions of differing pressures to the minimum feasible magnitude.

**C3.1.14 Gurney**

A Gurney is a component that, where permitted, may be attached to the trailing edge of a profile to adjust its aerodynamic performance. In any plane perpendicular to the trailing edge, a Gurney must comprise of a flat section, up to 1mm thick, of a height specified in the relevant regulation, and include a bonding flange on the wing's surface. This flange may extend no more than 20mm in length and 1mm in thickness. No part of the Gurney shall extend beyond a line perpendicular to the surface at the profile's trailing edge.

**C3.2 General Principles****C3.2.1 Objective of Article 3**

A primary objective of Article C3 is to promote close racing by minimising the aerodynamic performance loss when one car follows another. To assess this objective, Competitors may be asked to provide relevant information to the FIA upon request.



The Intellectual Property of this information remains with the Competitor, will be protected, and will not be disclosed to any third parties.

### **C3.2.2 Aerodynamic Influence**

Except for the driver-adjustable bodywork specified in Articles ~~C3.10.9~~ C3.10.10 and C3.11.6, and minimal parts related to their operation, as well as flexible seals allowed by Articles C3.14 and C3.17.7, all aerodynamic components or Bodywork must be rigidly fixed and immobile relative to their defined Frame of Reference defined in Article C3.4. These components must also provide a uniform, solid, hard, continuous, and impervious surface at all times.

Any device or structure designed to bridge the gap between the sprung part of the car and the ground is strictly prohibited.

Apart from necessary parts for the adjustments described in Articles ~~C3.10.9~~ C3.10.10 and C3.11.6, and incidental movements from the steering system, any car system, device, or procedure that alters the aerodynamic characteristics of the car through driver movement is forbidden.

Furthermore, the aerodynamic effect of any component not classified as Bodywork must be incidental to its primary function. Designs intended to enhance any such aerodynamic effects are prohibited.

### **C3.2.3 Symmetry**

All bodywork must be nominally symmetrical with respect to  $Y = 0$ . Therefore, unless otherwise specified, any regulation in Article C3 concerning one side of the car will be assumed to be valid for the other side of the car including references to the maximum number of components allowed per side.

Minimal exceptions to the requirement of symmetry of this Article will be accepted for the installation of non-symmetrical mechanical components, for asymmetrical cooling requirements or for asymmetrical angle adjustment of the FW Flap defined in Article ~~C3.10.9~~ C3.10.10.

Bodywork on the unsprung mass must respect this Article when the suspension position of each wheel is virtually reorientated so that its wheel coordinate system axes (described in Article C2.6.3) are parallel to their respective axis of the car coordinate system (described in Article C2.6.1).

### **C3.2.4 Section and Article Titles**

Section and Article Titles within Article C3 have no regulatory value.

### **C3.2.5 Pressure Tappings**

Pressure measuring apertures are permitted on the car, provided they:

- a. have an internal diameter of no more than 2mm.
- b. are flush with the underlying geometry.
- c. are only connected to pressure sensors or are completely blanked.

**C3.3 Legality Checking****C3.3.1 Digital legality checking**

Assessment of compliance with Article C3 will be carried out digitally using CAD models provided by the teams. In these models:

- a. Components may only be designed:
  - i. to the edge of a Reference Volume, or
  - ii. with a precise geometrical feature, or
  - iii. to the limit of a geometrical criterion (save for the normal round-off discrepancies of the CAD system),  
when:
    - iv. the regulations specifically require an aspect of the bodywork to be designed to this limit, or
    - v. it can be demonstrated that the design does not rely on lying exactly on this limit to conform to the regulations, such that it is possible for the physical bodywork to comply.
- b. Components that must follow a precise shape, surface or plane must be designed without any tolerance, save for the normal round-off discrepancies of the CAD system.
- c. Bodywork required to be visible from a prescribed direction may include surfaces parallel to that direction, provided it can be shown that such parallel surfaces could instead be drawn at an infinitesimally small included angle and still comply with all relevant Articles.

**C3.3.2 Physical legality checking**

Cars may be measured during a Competition in order to check their conformance to the CAD models discussed in Article ~~C3.2.4~~ C3.3.1 and/or to ensure they remain inside the Reference Volumes.

- a. Unless otherwise stated, a tolerance of  $\pm 3\text{mm}$  will be accepted for manufacturing purposes only with respect to the CAD surfaces. Where measured surfaces lie outside of this tolerance but remain within the Reference Volumes, a Competitor may be required to provide additional information (e.g. revised CAD geometry) to demonstrate compliance with the regulations. Any discrepancies contrived to create a special aerodynamic effect or surface finish are not permitted.
- b. Irrespective of a), geometrical discrepancies at the limits of the Reference Volumes must be such that the measured component remains inside the Reference Volume.
- c. A positional tolerance of  $\pm 2\text{mm}$  will be accepted for the Front Wing Bodywork, Rear Wing Bodywork, Exhaust Tailpipe, and Tail. This will be assessed by realigning each of the groups of Reference Volumes and Reference Surfaces that define the assemblies, by up to 2mm, from their original position, to best fit the measured geometry.
- d. Irrespective of b), and except for regions within the four holes defined in Article C3.6, a tolerance of  $Z = \pm 2\text{mm}$  will be accepted for parts of the car lying on the  $Z = 0$  plane, within  $-375 \leq Y \leq 375$  and ahead of  $X_R = 0$ .

- e. Minimal discrepancies from the CAD surfaces will also be accepted in the following cases:
  - i. Minimal repairs carried out on aerodynamic components and approved by the FIA.
  - ii. Tape, provided it does not achieve an aerodynamic effect not otherwise permitted by Article C3.
  - iii. Junctions between bodywork panels.
  - iv. Local bodywork fixing details.

### C3.3.3 Datum Points

All cars must be equipped with optical target mountings in the following locations:

- a. One on the forward part of the top of the survival cell.
- b. Two positioned symmetrically about  $Y = 0$  on the top of the survival cell close to  $X_C = -875$ .
- c. Two positioned symmetrically about  $Y = 0$  on the side of the survival cell close to  $X_C = -875$ .
- d. Two positioned symmetrically about  $Y = 0$  on the side of the survival cell close to the rear mounts of the secondary roll structure.
- e. Two positioned symmetrically about  $Y = 0$ , within an axis-aligned cuboid with an interior diagonal defined by points  $[X_C = 0, 175, 970]$  and  $[X_C = 150, -175, 870]$ .
- f. One probed point on the RIS or gearbox case.

In all cases, a file containing the coordinates of the required datum points must be supplied for each survival cell.

Full details of the requirements are given in the Appendix to the Technical and Sporting Regulations.

### C3.3.4 Supports for Scrutineering

All cars must be equipped with 3 pads that will be used to support the car during scrutineering. The pads must be rigidly mounted to the Survival Cell, ICE or Gearbox Case as appropriate. The pads must be on the plane  $Z = 0$  and will be used to define this plane when inspecting the underside of the car. Pads must be in the following locations:

- a. Two positioned symmetrically about  $Y = 0$ , between  $X_C = -600$  and  $X_C = -700$  and 150mm from  $Y = 0$ .
- b. One on  $Y = 0$  between  $X_{PU} = 380$  and  $X_{PU} = 580$ .

Details of the requirements are given in the Appendix to the Technical and Sporting Regulations.

## C3.4 Component Definition

The permitted bodywork and relevant Frame of Reference (as defined in Article C3.1.2, and used to establish compliance with Article C3.2.2), for each group is defined in the following Articles.

### C3.4.1 Bodywork part of the sprung mass of the car

The only permissible sprung mass Bodywork is defined under Articles C3.5 to C3.11 and Articles C3.1.1 (a) (ii) to (iv). The Frame of Reference for all sprung mass Bodywork is the coordinate system defined in Article C2.6.1.

Any Bodywork subject to Final Assembly as per Article C3.12, must first be classified under one of the groups specified in Articles C3.5 to C3.11.

Compliance of each Bodywork group with Article C3 will be assessed independently and before any Trim and Combination operations and Fillet application described in Article C3.12, and any Aperture application described in Article C3.16. Furthermore, the use of components not defined as Bodywork to achieve compliance with the Bodywork regulations is not permitted. The FIA may request to inspect any removed geometry post-assembly.

After final assembly, provided any modification does not result in the surfaces becoming Aerodynamic Surfaces as defined in C3.1.5, modifications are allowed to the following:

- a. Internal Ducts.
- b. Non-Aerodynamic Surfaces ~~provided any modification does not result in the surfaces becoming Aerodynamic.~~

#### C3.4.2 Wheel Bodywork

The only permissible Wheel Bodywork is defined in Article C3.14. The Frame of Reference for all parts classified as Wheel Bodywork is the corresponding upright structure and coordinate system detailed in Article C2.6.3.

#### C3.4.3 Suspension Fairings

The only permissible Suspension Fairings are defined in Article C3.17. In order to assess compliance with Article C3.2.2, the Frame of Reference of any Suspension Fairing is the structural suspension member that it is attached to.

### C3.5 Floor Bodywork

#### C3.5.1 Floor Body

**Floor Body** bodywork must:

- a. fully lie in its entirety within **RV-FLOOR-BODY**.
- b. when viewed from below, fully obscure:
  - i. **RS-FLOOR-BODY**.
  - ii. **RV-PU-ICE**
  - iii. **RV-DIFF**.
- c. when viewed from below, lie exactly on the surfaces of **RV-FLOOR-BODY** that are visible from below and directly beneath:
  - i. ~~RV-FLOOR-BODY~~ if directly below **RS-FLOOR-REF**.
  - ii. **RS-FLOOR-STEP**.
- d. have up to two sections in any Z-Plane.
- e. be fully visible from either above or below, such that any surface obscured from one direction is visible from the other.

**C3.5.2 Floor Foot**

**Floor Foot** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-FLOOR-FOOT**.
- b. when viewed from above, fully obscure **RS-FLOOR-FOOT**.
- c. have up to two sections in any Z-Plane.

**C3.5.3 Main Floor**

**Main Floor** results from the Trim and Combination of the following components:

- a. **Floor Body**.
- b. **Floor Foot**.

A Fillet Radius, no greater than 30 mm, may be applied along the intersection between the remaining component parts.

Once fully defined, **Main Floor** must:

- c. be a single, simply connected volume, with no overlapping regions.

**Main Floor** Aerodynamic Surfaces must:

- d. contain no radius of curvature less than 25mm, except for regions of convex curvature:
  - i. within 5mm of the plan-view-boundary of **Main Floor**, when viewed from below.
  - ii. within 40mm of the point  $[X_R, Y, Z] = [-335, 400, 50]$ .
  - iii. of convex curvature, visible from above, and within 10mm of the load application points defined in Article C3.18.7.

~~**3.5.4 Floor Board**~~

~~**Floor Board** bodywork must:~~

- ~~a. fully lie within **RV-FLOOR-BOARD**.~~
- ~~b. have up to two sections in any Z-Plane.~~

~~Assessing each section independently, in any Z-Plane, a line tangent to any part of the section visible from outboard, when measured against a Y-Plane with a positive slope pointing towards  $Y=0$ , must:~~

- ~~c. subtend an angle of at least 10 degrees, except for regions within 100mm of the forwardmost point of the section.~~

~~In any Z-Plane, within 100mm of the rearmost point of the rearmost section:~~

- ~~d. a line tangent to any part of the section visible from outboard, when measured against a Y-Plane with a positive slope pointing towards  $Y=0$ , must subtend an angle more than 20 degrees.~~
- ~~e. no part of the section visible from inboard may be more than 10mm distant from the section visible from outboard.~~

~~**Floor Board** Aerodynamic Surfaces must:~~

- ~~f. in any Z-Plane, assessing each section independently, contain no concave radius of curvature less than 1000mm visible from outboard;~~
- ~~g. contain no radius of curvature less than 25mm, except for regions of convex curvature;~~
- ~~i. within 5mm of the boundary of **Floor Board**, when viewed from the side;~~

#### C3.5.4 Floor Board

**Floor Board** bodywork must:

- a. lie in its entirety within **RV-FLOOR-BOARD**.
- b. have up to three sections in any X, Y and Z-Plane.

**Floor Board** Aerodynamic Surfaces visible from outboard must:

- c. rearward of  $X_F = 825$ , have a normal to any point on the surface, which subtends an angle of at least 15 degrees when measured against a X-Plane, and has a positive X component.
- d. contain no concave radius of curvature less than 200mm.

Furthermore,

- e. compliance with (c) and (d) is not required within 25mm of up to two points, which may be no closer than 50mm to each other.

#### C3.5.5 Floor Bib

**Floor Bib** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-FLOOR-BIB**.
- b. be fully visible from either above or below, such that any surface obscured from one direction is visible from the other.

**Floor Bib** Aerodynamic Surfaces must:

- c. have no concave radius of curvature:
  - i. visible from below.
  - ii. less than ~~45mm~~ 50mm, if visible from above.
- ~~d. have no convex radius of curvature less than 15mm. Except for regions below  $Z = 5$ , within 5mm of the plan-view boundary of **Floor Bib**.~~

#### C3.5.6 Floor Leading Edge Device

**Floor Leading Edge Device** bodywork must:

- a. lie in its entirety within **RV-FLOOR-LED**.
- b. have up to five sections in any X-Plane.
- c. above  $Z = 60$ mm, be no less than 4mm thick (being the minimum distance when measured normal to the surface in any direction).

**Floor Leading Edge Device** Aerodynamic Surfaces must:

- d. above  $Z = 60\text{mm}$ , contain no convex radius of curvature less than 2mm

### C3.5.7 Floor Bodywork Assembly

**Floor Bodywork Assembly** results from the Trim and Combination of the following components:

- a. **Main Floor.**
- b. **Floor Board.**
- c. **Floor Bib.**
- d. **Floor Leading Edge Device.**

Before trimming, any **Floor Board** remaining below **Main Floor** must be discarded.

A Fillet Radius, no greater than 25mm, may be applied along the intersections between the remaining component parts.

Once fully defined, **Floor Bodywork Assembly** must:

- e. be a single, simply connected volume, with no overlapping regions.
- f. when viewed from the side, fully obscure **RS-FLOOR-BOARD**.
- g. forward of  $X_F = 1500$ , when viewed from the rear, fully obscure **Floor Leading Edge Device**.

Furthermore:

- h. in the Fillet that joins **Floor Bib** to **Main Floor**, flexibility is permitted to allow compliance of the Front Floor Structure when the front of the car meets the ground.

### C3.5.8 Floor Bodywork Group

Once the components defined in Articles C3.5.1 to 3.5.7 have been constructed in accordance with these provisions, including any sub-assembly operations, the resulting union is defined as **Floor Bodywork**.

### C3.5.9 Floor Auxiliary Components

Once **Floor Bodywork** has been fully defined, the following may be fitted:

- a. Up to ~~two~~ **three Floor Body Stays**, which may be designed to only take load in tension, and which must:
  - i. have an inboard attachment location that lies between  $X_{DIF} = 150$  and  $X_{DIF} = 325$ , or ahead of  $X_R$ .
  - ii. be fixed on their inboard end to ~~either the Rear Impact Structure or~~ the entirely sprung part of the car.
  - iii. be fixed on their outboard end to **Floor Bodywork**.
  - iv. have a circular cross section with a diameter no more than 5mm, except for minimal details at the inboard and outboard attachment points, or for adjustment purposes.
  - v. ~~be designed to only take load in tension.~~
- b. Up to six **Floor Board Stays**, each of which must:
  - i. lie in its entirety within **RV-FLOOR-BOARD**.

- ii. fit within a sphere of diameter 30mm.
  - iii. lie no closer than 100mm to any other **Floor Board Stay**.
  - iv. when viewed from the side, be fully obscured with **Floor Bodywork** in place.
- c. A single **Floor Board Brace**, which must:
- i. lie in its entirety within an axis aligned cuboid of the following dimensions  $[X, Y, Z] = [30, 890, 30]$  and **RV-FLOOR-BRACE**.
  - ii. be rigidly fixed at its inboard end to **Forward Chassis**.
  - iii. be rigidly fixed at its outboard end to **Floor Board**.
  - iv. when viewed from the side, be fully obscured with **Floor Bodywork** in place.

### C3.6 Plank

~~Below the central surfaces of the Floor Body, the~~ A Plank Assembly must be fitted, consisting of the plank, the skids, and the mountings. The requirements of this Article must be satisfied when considering both sides of the car.

The following provisions apply to the Plank Assembly:

- a. The upper surface of the Plank Assembly must lie at  $Z = 0$ , so that no air can pass between it and the Floor Body or Bib lower surfaces.
- b. The Plank Assembly must be symmetrically arranged about  $Y = 0$ .
- c. The forward edge of the Plank Assembly must lie at  $X_F = 430$
- d. The rearmost edge of the Plank Assembly must lie at  $X_R = -600$ .
- e. The thickness of the Plank Assembly measured normal to the lower surface must be  $10\text{mm} \pm 0.2\text{mm}$  and must be uniform when new. A minimum thickness of 9mm will be accepted due to wear, and conformity to this provision will be checked at the peripheries of the designated holes.
- f. The Plank Assembly must have four precisely placed holes the positions of which are given by **RV-PLANK**. To establish the conformity of the Plank Assembly after use, its thickness will only be measured at these holes, regardless of whether plank or skid material is present.

Four additional 10mm diameter holes are permitted provided their sole purpose is to allow access to the bolts which secure the Accident Data Recorder to the survival cell.

The following provisions apply to the plank:

- g. The geometry of the plank must conform to **RV-PLANK** with a general manufacturing tolerance of  $\pm 0.5\text{mm}$  and a tolerance on thickness given in (e) above.
- h. The material of the plank is free, but it must be homogeneous with a specific gravity between 1.3 and 1.45, or if pocketed be made from a bonded assembly the upper 0.5mm of which must have a specific gravity of between 1.3 and 1.65 and the remainder, excluding pockets, be made from a homogeneous material with a specific gravity of between 1.3 and 1.45.
- i. The plank may comprise no more than three pieces, the forward one of which may not be any less than 900mm in length.



- j. In the areas between  $X_F = 630$  and  $X_C = -800$  and behind  $X_C = -400$ , pocketing of the lower 9.5mm of the plank from above is permitted. The pocket depth may not reduce the remaining plank material thickness to less than 2mm from either the lowest surface below the reference plane when new or the lower surface of any recesses necessary to fit the skids permitted by items k) to r) of this Article. Furthermore, the periphery of any pocket, in any horizontal plane parallel to the reference plane, must be not less than 10mm from either the edges of the plank or any holes or recesses in the plank. In vertical cross section the internal pocket fillet radii must be at least 3mm and in horizontal cross section 10mm. Pockets may only be filled with a material having a specific gravity of less than 0.25.

The following provisions apply to the skids. The lower surface of the plank may be fitted with flush mounted metal skids which:

- k. May only be fitted in place of plank material.
- l. Have a total area no greater than 24000mm<sup>2</sup> when viewed from below.
- m. Are no greater than 4000mm<sup>2</sup> in area individually when viewed from below.
- n. Are fitted in order that their entire lower surfaces are visible from below.
- o. Must have a minimum cross-sectional thickness of 15mm across its external boundaries in plan view.

The minimum wall thickness between an internal fixing hole and the external boundaries of the skid must be no less than 7.5mm.

- p. Must have an upper surface no more than 3mm below the reference plane.
- q. Must be designed such that they are secured to the car using the fasteners described in items t) to w) of this Article and that, when viewed from below, no part of the skid is more than 50mm from the centre line of a fastener which passes through that skid.
- r. Must be made from Titanium alloy (according to AMS4928 or AMS4911 in annealed condition). Furthermore, they may only be machined from solid and no processes (such as forging, rolling, welding, heat treatment or coating) may be carried out either before or after machining.
- s. If positioned entirely inboard of  $Y = 120$  and between  $X_F = 425$  and  $X_F = 625$ , must be fastened directly to the Front Floor Structure with zero degrees of freedom:

The following provisions apply to the plank and skid mountings. The plank and skids must be fixed to the car using fasteners which:

- t. Are no smaller than M6 and are made from grade 12.9 or 10.9 steel.
- u. If used to attach a skid to the car, must employ at least 1 fastener per 1,000mm<sup>2</sup> of skid area.
- v. If used to attach a skid to the car, the team must be able to show by calculation that the shanks of the fasteners (which may be no less than 6mm diameter) are the weakest point in the attachment of the skids to the car.
- w. May use a load spreading washer if required.

The total area of the fasteners and any load spreading washers employed with them when viewed from below must be less than 7,500mm<sup>2</sup>. The area of any single fastener plus its load-spreading washer may not exceed 500mm<sup>2</sup>.

No part of any fastener or load-spreading washer may be more than 8mm below the reference plane. For the avoidance of doubt, the skirts referred to in items k) to s) of this Article will not be treated as load spreading washers.

### C3.7 Front Bodywork

#### C3.7.1 Nose

**Nose** bodywork must:

- a. **fully lie in its entirety** within **RV-NOSE**.
- b. when viewed from above, fully obscure **RS-NOSE**.

**Nose** Aerodynamic Surfaces must:

- c. in any X-Plane:
  - i. contain no concave radius of curvature.

Furthermore, between  $X_F = -950$  and  $X_A = 0$ , the part of this section, which is visible from above, must:

  - ii. be tangent to the Z-Axis at its outermost extremity.
  - iii. have no radius of curvature less than 45mm at  $X_A = 0$ .
  - iv. have no radius of curvature less than 20mm forward of  $X_A = 0$ .

The following will be exempt from the above:

- d. Cameras in Position 2.
- e. Mounting brackets defined in Article C8.17.7.

#### C3.7.2 Forward Chassis

**Forward Chassis** bodywork must:

- a. **fully lie in its entirety** within **RV-CH-FRONT**.
- b. completely enclose **RV-CH-FRONT-MIN**.
- c. have up to two sections in any Z-Plane.

**Forward Chassis** Aerodynamic Surfaces must:

- d. in any X-Plane contain:
  - i. no convex radius less than 45mm.
  - ii. no concave radius less than 500mm.

#### C3.7.3 Mid Chassis

**Mid Chassis** bodywork **is exempt from Article C3.1.4 within RV-ROLL-HOOP, but** must:

- a. **fully lie in its entirety** within **RV-CH-MID**.

~~b. prior to the definition of Apertures in Article 3.16, only contain apertures within RV-STRAP.~~

b. have up to two sections in any Z-Plane.

**Mid Chassis** Aerodynamic Surfaces must:

- c. contain no concave radius of curvature less than ~~25mm~~ 50mm, except for regions within:
  - i. ~~20mm~~ 50mm of bodywork bonded to the **Secondary Roll Structure** as defined in Article C12.4.2.
  - ii. ~~10mm~~ 25mm of the Apertures defined in Article **C3.16.9** and ~~3.16.10~~.
  - iii. ~~RV-STRAP~~ **RV-ROLL-HOOP**.

#### C3.7.4 Mirror

**Mirror Body** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-MIRROR-BODY**.

**Mirror Inner Stay** bodywork must:

- b. ~~fully~~ lie in its entirety within **RV-MIRROR-ISTAY**.
- c. intersect **Mirror Body** and **Mid Chassis**.

**Mirror Rear Stay** bodywork must:

- d. ~~fully~~ lie in its entirety within **RV-MIRROR-RSTAY**.
- e. intersect **Mirror Body** and **Sidepod**.
- f. in any X-Plane, measure less than:
  - i. 50mm in Z.
  - ii. 10mm in Y.

**Mirror** results from the Trim and Combination of the following components:

- g. **Mirror Body**.
- h. **Mirror Inner Stay**.
- i. **Mirror Rear Stay**.

A Fillet Radius, no greater than 10mm, may be applied along the intersections between the remaining component parts.

Once fully defined, **Mirror** must:

- j. be a single volume with no overlapping regions.

#### C3.7.5 Driver Cooling

**Driver Cooling** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-DRI-COOL**.
- b. be fully visible from either above or below, such that any surface obscured from one direction is visible from the other.

**Driver Cooling** Aerodynamic Surfaces must:

- c. contain no radius of curvature less than 10mm.

### C3.7.6 **Front Bodywork Assembly**

**Front Bodywork** results from the Trim and Combination of the following components:

- a. **Nose.**
- b. **Forward Chassis.**
- c. **Mid Chassis.**
- d. **Mirror.**
- e. **Driver Cooling**, if present.

A Fillet Radius, no greater than 10mm, may be applied along the intersections between the remaining component parts.

Once fully defined, **Front Bodywork Assembly** must:

- f. be a single volume, with **have** no overlapping regions.

### C3.7.7 **Front Bodywork Group**

Once the components defined in Articles C3.7.1 to C3.7.6 have been constructed in accordance with these provisions, including any sub-assembly operations, the resulting union is defined as **Front Bodywork**.

## C3.8 **Rear Bodywork**

### C3.8.1 **Sidepod**

**Sidepod** bodywork must:

- a. **fully** lie in its entirety within **RV-SIDEPOD**.
- b. in its entirety, lie more than 50mm from **Floor Board**.

**Sidepod** Aerodynamic Surfaces must:

- c. contain no radius of curvature less than:
  - i. 50mm in a convex direction.
  - ii. 100mm in a concave direction.except for:
  - iii. convex regions within 25mm of the Aperture C3.16.8.

### C3.8.2 **Engine Cover**

**Engine Cover** bodywork must:

- a. **fully** lie in its entirety within **RV-EC**.
- b. have up to two sections in any Z-Plane.

- c. when viewed from the side, fully obscure **RS-EC**.

**Engine Cover** Aerodynamic Surfaces must:

- d. in any X-Plane outboard of  $Y = 5$ , contain:
- i. no convex radius of curvature less than 75mm.
  - ii. no concave radius of curvature less than 50mm.

except for regions:

~~iii. within **RV-STRAP**.~~

- iii. within 20mm of ~~the **Secondary Roll Structure**, defined in Article C12.4.2, and~~ the lower **Side Impact Structure**, defined in Article C13.5.1, where the radius of curvature must not be less than 10mm.

- iv. inboard of  $Y = 25$ , where the radius of curvature must not be less than 25mm.

- e. contain no surfaces parallel to an X-Plane ahead of  $X_R = -55$ .

Furthermore:

- f. rearward of  $X_R = -300$  and below  $Z = 350$ , the X component of any normal to the surface visible from the side must not be negative.

### C3.8.3 Rear Bodywork Assembly

**Rear Bodywork** results from the Trim and Combination of the following components:

- a. **Sidepod**.
- b. **Engine Cover**.

Once fully defined, **Rear Bodywork Assembly** must:

- c. be a single, simply connected volume, with no overlapping regions.

### C3.8.4 Rear Bodywork Group

Once the components defined in Articles C3.8.1 to C3.8.3 have been constructed in accordance with these provisions, including any sub-assembly operations, the resulting union is defined as **Rear Bodywork**.

## C3.9 Tail and Exhaust Tailpipe

### C3.9.1 Tail

**Tail** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-TAIL**.
- b. when viewed from below, be fully obscured by **Floor Body** forward of  $X_R = \del{+25} 300$ .
- c. below  $Z = 300$ , have up to two sections in any Z-Plane.

### C3.9.2 Exhaust Tailpipe

**Exhaust Tailpipe** bodywork is exempt from Article C3.1.4 (a), but rearwards of  $X_R = -55$  must:

- a. ~~fully~~ lie in its entirety within **RV-TAILPIPE**.

- b. have up to two sections in any Y and Z-Plane.
- c. have a wall thickness of between 0.5mm and 1.2mm.
- d. have an exit whose entire circumference lies:
  - i. between  $X_R = 245\ 395$  and  $X_R = 250\ 400$ .
  - ii. above  $Z = 350$ .
- e. have a circular internal cross-section of a constant diameter between 100mm and 130mm.
- f. remain unobstructed internally and in full compliance with the provisions of this Article after Final Assembly of all **Bodywork** groups.

When considering both sides of the car, over its last 150mm it must:

- g. comprise of a single tailpipe and a support ~~which~~.
  - i. The support must ~~fully~~ lie in its entirety within an individual instance of **RV-TAILPIPE-BRACKET**.
  - ii. **RV-TAILPIPE-BRACKET** may have a free orientation in space but must intersect both Exhaust Tailpipe and Tail.
- h. have an internal surface which ~~is~~ is a right circular cylinder and has ~~an~~ a single axis that:
  - i. lies on  $Y = 0$ .
  - ii. ~~has an axis that~~ forms an angle between  $\neq 0.0$  and  $0.5^\circ$  to the X-Axis.

### C3.10 Front Wing (FW)

#### C3.10.1 Front Wing Profiles

**Front Wing Profiles** bodywork is exempt from Article C3.1.4 (b) but must:

- a. ~~fully~~ lie in its entirety within **RV-FW-PROFILES**.
- b. comprise of three, non-intersecting, simply connected volumes.
- c. have up to three sections in any ~~X~~, Y ~~or~~ Z-Plane.
- d. when viewed from above, fully obscure **RS-FW-PROFILES**.

In any Y Plane:

- e. the distance between adjacent sections must lie between 5mm and 15mm at their closest position.
- f. the rearmost point of every section must be visible when viewed from below.
- g. except for the rearmost section, the rearmost point of every section must not be visible when viewed from above.
- h. assessing each section independently, within 40mm of the rearmost point of each section:
  - i. a line tangent to any part of the section visible from below must have a positive slope. The slope of this line will be considered in the Y-Plane.

- ii. no part of the section visible from above may be more than 10mm distant from the section visible from below, if outboard of  $Y=400$ , or 15mm if inboard of  $Y = 400$ .

**Front Wing Profiles** Aerodynamic Surfaces must:

- i. in any Y-Plane contain:
  - i. no concave radius of curvature visible from below.
  - ii. no concave radius of curvature less than 50mm visible from above.
- j. when measured against a vertical plane normal to **RS-FW-SECTION**, contain no normal to any point on the surface that subtends an angle greater than ~~25°~~ 30°.

Furthermore:

- k. The ~~rearward-most~~ **rearmost** point of every individual Y-section, when projected in Z ~~onto the reference~~ a plane through  $Z = 0$ , must produce a single tangent continuous curve with no radius of curvature less than 200mm.
- l. Once the **Front Wing Profiles** are fully defined Gurneys up to 10mm in height may be fitted to the trailing edge of the upper surface of the rearmost section. These Gurneys are considered to be part of the Front Wing Profiles and must satisfy the provisions of this Article except for ~~sections~~ (h) and (~~f~~j) and, for the inner extremity of the innermost Gurney and outer extremity of the outermost Gurney, ~~section~~ (j k).

### C3.10.2 Front Wing Endplate Body

**Front Wing Endplate Body** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-FWEP-BODY**.
- b. have up to two sections in any Y-Plane.

**Front Wing Endplate Body** Aerodynamic Surfaces must:

- c. contain no ~~convex~~ radius of curvature less than 5mm.
- d. contain no concave radius of curvature less than 100mm.

### C3.10.3 Front Wing Outboard Footplate

**Front Wing Outboard Footplate** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-FWEP-OFP**.
- b. below  $Z =$ ~~75~~ 160, have up to two sections in any Z-Plane.

**Front Wing Outboard Footplate** Aerodynamic Surfaces must:

- c. contain no radius of curvature less than 5mm.
- d. contain no concave radius of curvature less than 50mm if:
  - i. visible from below.
- e. outboard of  $Y = 825\text{mm}$ , ~~contain no concave radius of curvature and~~ visible from:
  - i. the side. ~~or~~
  - ii. above.

**C3.10.4 Front Wing Inboard Footplate**

**Front Wing Inboard Footplate** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-FWEP-IFP**.

**C3.10.5 Front Wing Endplate ~~Fence Diveplane~~**

**Front Wing Endplate ~~Fence Diveplane~~** bodywork must:

- a. ~~fully~~ lie in its entirety within:
  - i. an axis aligned cuboid of the following dimensions [X, Y, Z] = [300, 325, 50].
  - ii. ~~RW-FWEP-FENCE RV-FWEP-DIVEPLANE~~.

**Front Wing Endplate ~~Fence Diveplane~~** Aerodynamic Surfaces must:

- b. contain no convex radius of curvature less than 5mm.
- c. contain no concave radius of curvature less than ~~250mm~~ 50mm.

**C3.10.6 Front Wing Endplate**

**Front Wing Endplate** results from the Trim and Combination of the following components:

- a. **Front Wing Endplate Body.**
- b. **Front Wing Outboard Footplate.**
- c. **Front Wing Inboard Footplate.**
- d. **Front Wing Endplate ~~Fence Diveplane~~.**

Before trimming, any **Front Wing Endplate Body** remaining below **Front Wing Inboard Footplate** and any ~~Front Wing Endplate Fence~~ remaining below ~~Front Wing Outboard Footplate~~ must be discarded.

A Fillet Radius, no greater than ~~40mm~~ 40mm, may be applied along the intersections between **Front Wing Endplate Body** and **Front Wing Diveplane**. A Fillet radius, no greater than 10mm, may be applied along the intersections between the remaining component parts.

Once fully defined, **Front Wing Endplate** must:

- e. be a single, simply connected volume, with no overlapping regions.
- f. be no less than 10mm thick if visible from the side.
- g. when viewed from above, fully obscure **RS-FWEP-TOP**:
- h. when viewed parallel to the Y-Axis from inboard, fully obscure **RS-FWEP-SIDE** and **Front Wing Endplate Diveplane**.

**C3.10.7 Front Wing Pylon**

**Front Wing Pylon** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-FW-PYLON**.
- b. in any Z plane:
  - i. have a total area no greater than 4000 mm<sup>2</sup>.



- ii. measure ~~less~~ no more than ~~20mm~~ 35mm in the Y direction.

### C3.10.8 Front Wing Strake

**Front Wing Strake** bodywork must:

- a. lie in its entirety within:
  - i. an axis aligned cuboid of the following dimensions [X, Y, Z] = [775, 20, 100].
  - ii. **RV-FW-STRAKE**.
- b. have up to two sections in any Z-Plane.

### C3.10.9 Front Wing Assembly

**Front Wing Assembly** results from the Trim and Combination of the following components:

- a. **Front Wing Profiles**.
- b. **Front Wing Endplate**.
- c. **Front Wing Pylon**.
- d. **Front Wing Strake**.

Before trimming is applied, any **Front Wing Profiles** remaining outboard of **Front Wing Endplate** and any **Front Wing Pylon** remaining below **Front Wing Profiles** must be discarded.

A Fillet Radius, no greater than 10mm, may be applied along the intersections between the remaining component parts.

Once fully defined, **Front Wing Assembly** must:

- e. be a single volume, with no overlapping regions.
- f. when viewed from below, fully obscure **Front Wing Pylon**.
- g. when viewed from above, fully obscure **Front Wing Strake** forward of  $X_f = -650$ .

### C3.10.10 Front Wing Rotation System

Except for the forwardmost volume, the **Front Wing Profiles**, including any fitted gurney and portions of **Front Wing Auxiliary Components** that are attached to these volumes, may be rotated about a fixed axis whilst the car is in motion. Bodywork that can rotate in such way is defined as **FW Flap**.

Furthermore:

- a. no part of **FW Flap** may lie outboard of  $Y = 580$ .
- b. the axis of rotation of **FW Flap** must:
  - i. be aligned with a Y-Axis.
  - ii. at  $Y = 580$ , lie within the volume of **FW Flap** and within 20mm of the forwardmost point of **FW Flap**.
- c. there must be no relative movement between the constituent parts of the **FW Flap**.
- d. any rotation must maintain:

- i. the geometric relationship between the rearmost two volumes as defined in Article C3.10.1.
- ii. compliance with all bodywork regulations except for Article C3.10.1 (a), (e), and (h) (i).
- e. the design is such that failure of the system will result in **FW Flap** returning to its normal high incidence position.
- f. any rotation may only be commanded by direct driver input and controlled using the control electronics specified in Article C8.3.
- g. the adjustment permitted under this Article is only allowed when the car is stationary or when specifically permitted by Article x.x of the Sporting Regulations.
- h. at any Y-Plane, the distance between adjacent volumes at their closest position must lie between xx mm and xx mm.

### C3.10.11 Front Wing Auxiliary Components

The following **Front Wing Auxiliary Components** are permitted on each side of the car:

- a. **Front Wing Flap Hangers**
  - i. fully lie within a freely positioned Reference Volume.
  - ii. when projected in X onto an X-Plane, have a projected area less than 500mm<sup>2</sup>.
  - iii. be rigidly fixed to respective profiles.
  - iv. have a minimum distance from other Flap Hangers and the Front Wing Adjuster Plate of 125mm.
- b. **Front Wing Adjuster Plate**
  - i. fully lie within a Reference Volume fixed to car centreline.
  - ii. be rigidly fixed to the rearmost two profiles and intersect the FW Flap rotation axis.
- c. **Front Wing Separators**
  - i. fully lie within a Reference Volume.
  - ii. positioned at Y = 0 and arranged symmetrically about the car centre plane, lying in their entirety between Y = ±570 and Y = ±590.
  - iii- designed and arranged such that the relationship between the single volumes can only change whilst the car is in motion in accordance to Article C3.10.9.
  - iv. aligned to provide a bearing across at least 40mm<sup>2</sup> when the distance between adjacent volumes is at its closest position.
- d. **Front Wing Fishplates**
  - i. minimal exceptions to Article C3.10.1 provided they fully lie within Y = ±577 and Y = ±583.
  - ii. be minimally sized to allow 20mm of overlap between adjustable and non-adjustable parts over complete rotation range.
- e. A fairing that contains a single tyre temperature sensor. The entire fairing and sensor must:

- i. fully lie within a freely positioned instance of **RV-FW-SENSOR**.
- ii. intersect either **Front Wing Profiles** or **Front Wing Endplate**.

Furthermore, once all **Front Wing Auxiliary Components** have been defined:

- f. A Fillet Radius no greater than 4mm will be permitted where they intersect **Front Wing Assembly**.
- g. They must be arranged such that they are not visible from both the side and below with **Front Wing Assembly** in place.

### C3.10.12 Front Wing Bodywork Group

Once the components defined in Articles C3.10.1 to ~~C3.10.10~~ C3.10.11 have been constructed in accordance with these provisions, including any subassembly operations, the resulting union is defined as **Front Wing Bodywork**.

## C3.11 Rear Wing (RW)

### C3.11.1 Rear Wing Profiles

**Rear Wing Profiles** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-RW-PROFILES**.
- b. comprise of three, non-intersecting, simply connected volumes.
- c. have up to three sections in any X, Y ~~or~~ and Z-Plane.

In any Y Plane:

- d. the distance between adjacent sections must lie between 10mm and 15mm at their closest position.
- e. ~~assessing each section independently;~~ within 40mm of the rearmost point of ~~each~~ the ~~forwardmost~~ section, a line tangent to any part of the section visible from below must not subtend an angle greater than ~~the stated value~~ 10 degrees, when measured against the X-axis, with positive angles pointing in the positive X and Z directions.

~~i. Forwardmost volume: 10 degrees.~~

~~ii. Intermediate volume: 40 degrees.~~

~~iii. Rearmost volume: 65 degrees.~~

**Rear Wing Profiles** Aerodynamic Surfaces must:

- f. in any Y-Plane, contain:
  - i. no concave radius of curvature visible from below.
  - ii. no concave radius of curvature less than 100mm ~~visible from above~~.
- g. when measured against a Y-Plane, contain no normal to any point on the surface that subtends an angle greater than 20°.

Furthermore:

- h. compliance with (e), (f) and (g) is not required within 5mm of **Additional Rotation Bodywork** defined in Article C3.11.7 (d).
- i. once the **Rear Wing Profiles** are fully defined, a Gurney of up to 20mm may be fitted to the trailing edge of the upper surface of the rearmost section. This Gurney is considered part of the Rear Wing Profiles and must satisfy the provisions of this Article except for ~~sections~~ (f) and (g).

### C3.11.2 Rear Wing Endplate Body

**Rear Wing Endplate Body** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-RWEP-BODY**.
- b. have up to two sections in any Y-Plane
- c. when viewed from the side, fully obscure **RS-RWEP**.

**Rear Wing Endplate Body** Aerodynamic Surfaces must:

- d. contain no concave radius of curvature less than 100mm.

### C3.11.3 Rear Wing Brace

**Rear Wing Brace** bodywork must:

- a. ~~fully~~ lie in its entirety within:
  - i. an axis aligned cuboid of the following dimensions [X, Y, Z] = [100, 375, 40].
  - ii. **RV-RW-BRACE**.

In any Y Plane:

- b. have at least one axis of symmetry.

**Rear Wing Brace** Aerodynamic Surfaces must:

- c. contain no concave radius of curvature less than 100mm.

### C3.11.4 Rear Wing Pylon

**Rear Wing Pylon** bodywork must:

- a. ~~fully~~ lie in its entirety within **RV-RW-PYLON**.
- b. when viewed from above, rearwards of  $X_R = 250$ , be fully obscured by **Rear Wing Profiles**.
- c. in any Z plane:
  - i. have a total area no greater than 5000 mm<sup>2</sup>, except for regions within 30mm of **Exhaust Tailpipe**.
  - ii. measure less than 25mm in the Y direction, except for regions inside of ~~RV-TAIL-EXH~~ **RV-TAILPIPE**.

### C3.11.5 Rear Wing Assembly

**Rear Wing Assembly** results from the Trim and Combination of the following components:

- a. **Rear Wing Profiles**.
- b. **Rear Wing Endplate Body**.

- c. **Rear Wing Brace.**
- d. **Rear Wing Pylon.**

Before trimming is applied, any **Rear Wing Profiles** and **Rear Wing Brace** remaining outboard of **Rear Wing Endplate Body** must be discarded.

A Fillet Radius, no greater than 10mm, may be applied along the intersections between the remaining component parts.

Once fully defined, **Rear Wing Assembly** must:

- e. be a single volume, with no overlapping regions.

### c3.11.6 **Rear Wing Rotation System**

Except for the forwardmost volume, the **Rear Wing Profiles**, including any fitted gurney and portions of **Rear Wing Auxiliary Components** that are attached to these volumes, may be rotated about a fixed axis whilst the car is in motion. Bodywork that can rotate in such a way is defined as **RW Flap**.

- a. No part of **RW-Flap** may lie outboard of  $Y = 535$ .
- b. The axis of rotation of **RW Flap** must:
  - i. be aligned with a Y-Axis.
  - ii. lie between  $X_R = 450$  and  $X_R = 525$ .
  - iii. lie within 10mm of a **Rear Wing Profile** volume at  $Y = 530$ .
- c. Any rotation must maintain:
  - i. the geometric relationship between the rearmost two volumes as defined in Article C3.11.1.
  - ii. compliance with all bodywork regulations except for Article C3.11.1 (a), (d), (e) and (f).
- d. The design is such that failure of the system will result in **RW Flap** returning to its design position.
- e. Any rotation may only be commanded by direct driver input and controlled using the control electronics specified in Article C8.3.
- f. The adjustment permitted under this Article is only allowed when the car is stationary or when specifically permitted by Article x.x of the Sporting Regulations.
- g. At any Y-Plane, the distance between adjacent volumes at their closest position must lie between 10 mm and 65 mm.

### c3.11.7 **Rear Wing Auxiliary Components**

The following **Rear Wing Auxiliary Components** are permitted on each side of the car:

- a. **Rear Wing Flap Hangers**
  - i. ~~fully~~ lie in its entirety within a freely positioned Reference Volume.
  - ii. when projected in X onto an X-Plane, have a projected area less than 500mm<sup>2</sup>.

- iii. be rigidly fixed to respective profiles.
  - iv. have a minimum distance from other **Flap Hangers** of 125mm.
- b. **Rear Wing Separators**
- i. ~~fully~~ lie in its entirety within a Reference Volume.
  - ii. positioned at  $Y = 0$  and arranged symmetrically about the car centre plane, lying in their entirety between  $Y = \pm 515$  and  $Y = \pm 535$ .
  - iii. designed and arranged such that the relationship between the single volumes can only change whilst the car is in motion in accordance to Article C3.11.6.
  - iv. aligned to provide a bearing across at least  $40\text{mm}^2$  when the distance between adjacent volumes is at its closest position.
- c. **Rear Wing Rotation Fairing**
- i. fully lie within a fixed position Reference Volume.
- d. **Additional Rotation bodywork**
- i. fully lie within a freely positioned Reference Volume.
  - ii. lie outboard of  $Y = 535$ .

Furthermore, once all **Rear Wing Auxiliary Components** have been defined:

- e. A Fillet Radius no greater than 4mm will be permitted where they intersect **Rear Wing Assembly**.
- f. They must be arranged such that they are not visible from both the side and below with **Rear Wing Assembly** in place.

### C3.11.8 **Rear Wing Bodywork Group**

Once the components defined in Articles C3.11.1 to C3.11.7 have been constructed in accordance with these provisions, including any sub-assembly operations, the resulting union is defined as **Rear Wing Bodywork**.

## C3.12 **Final Assembly**

Prior to Final Assembly, all bodywork groups described in these Articles must be fully defined. Furthermore, each proceeding Final Assembly sub-section must be complete before moving **onto** the next.

### C3.12.1 **Front to Rear Bodywork Assembly**

The **Front Bodywork** and the **Rear Bodywork** must be trimmed to each other. The result of this assembly will be known as **Upper Bodywork**. A Fillet Radius, no greater than 50mm, may be applied along the intersections between these volumes.

### C3.12.2 **Upper Bodywork and Floor Assembly**

The **Upper Bodywork** and **Floor Assembly** must be trimmed to each other. Furthermore:

- a. before trimming, any **Mid Chassis** or **Rear Bodywork Engine Cover** remaining below the **Floor Bodywork** must be discarded.

- b. the intersection formed by any remaining **Upper Bodywork** regions and **Floor Bodywork** must produce no more than one curve.
- c. a Fillet Radius, no greater than 50mm, may be applied along the intersection between these volumes.
- d. once all volumes are trimmed and filleted, no part of **Mid Chassis**, **Rear Bodywork Engine Cover**, the Fillet Radius between **Rear Bodywork Engine Cover** and **Floor Bodywork**, or the Fillet Radius between **Mid Chassis** and **Floor Bodywork**, may be visible from below.

### C3.12.3 Tail to Floor and Upper Bodywork Assembly

The **Tail** and the **Upper Bodywork to Floor Assembly** must be trimmed to each other. A Fillet Radius, no greater than 25mm, may be applied along the intersections between these volumes.

### C3.12.4 Front Wing Bodywork to Nose Assembly

The **Front Wing Bodywork** and the **Nose Bodywork** must be trimmed to each other. Furthermore:

- a. a Fillet Radius, no greater than 25mm, may be applied along the intersections between these volumes.
- b. except for **Front Wing Pylon**, no part of **Front Wing Bodywork** may intersect **Nose Bodywork**.

### C3.12.5 Rear Wing Bodywork to Tail Assembly

The **Rear Wing Bodywork** and the **Tail Bodywork** must be trimmed to each other. A Fillet Radius, no greater than 10mm, may be applied along the intersections between these volumes.

## C3.13 Bodywork not defined in Articles C3.5 to C3.12

In addition to the bodywork defined and regulated by Articles C3.5 to C3.12, the following components are permitted:

- C3.13.1 A transparent windscreen, that measures less than 30mm in Z, less than 300mm in Y, and is no more than 3mm thick, may be fixed to the forward face of the cockpit opening and may extend above **RV-CH-MID**.
- C3.13.2 Antennae and pitot tubes may be mounted on the upper surface of the survival cell ahead of the cockpit opening and may extend above **RV-BODY-FRONT**.
- C3.13.3 The following fairings may be attached to the **Secondary Roll Structure** defined in C12.4.2, or the cameras defined in Articles C8.10.3 and C8.17.6:
  - a. A fairing bonded to the Secondary Roll Structure which must:
    - i. **fully lie in its entirety** within a 20mm offset from the Secondary Roll Structure or High-Speed Camera.
    - ii. be above Z = 695mm.
    - iii. be outside of **RV-COCKPIT-HELMET**.
    - iv. contain no convex radius less than 2mm.
  - b. An additional fairing around the Secondary Roll Structure forward mounting and the camera defined in Article C8.17.6, which:

- i. must lie in **its entirety within RV-SECONDARY-ROLL**.
- ii. may be joined to Front Bodywork with a Fillet Radius no greater than 10mm.

**C3.13.4** Ducts (as specified in Article C3.1.1) and primary heat exchangers which must not be visible when viewed from the outside of the car, at any angle perpendicular to the X-axis. This is assessed with the bodywork defined in Articles C3.5 to C3.12 present but prior to the application of apertures permitted in Articles C3.16.

**C3.13.5** A slip sensor and its fairing may be mounted underneath the Forward Chassis provided it lies within **RV-SLIP**. The surface of the combined slip sensor and fairings in contact with the external airstream must form a single curve when intersected by any Z plane.

### **C3.14 Wheel Components**

#### **C3.14.1 General Principles**

The following principles apply throughout Articles C3.14 and C3.15.

- a. When referred to individually, Wheel Components will have the words “Front” or “Rear” prefixed to the Component name.
- b. The Wheel Component name on its own refers to both the Front and Rear Components simultaneously.
- c. Any criterion of visibility will be considered in the Wheel Coordinate System ( $X_w$ ,  $Y_w$ ,  $Z_w$ ) and will assume that the sprung mass, the suspension, the **RV-FWH-DRUM** assembly, the Aerodynamic Seals and the complete wheels have been removed.

Furthermore, **Wheel Bodywork** and any Aerodynamic Seals must:

- d. be rigid and rigidly secured to the suspension uprights.
- e. not be rigidly secured to the suspension members.

Rigidly secured means not having any degree of freedom.

#### **C3.14.2 Drum**

The **Front Drum** and **Rear Drum** bodywork:

- a. must be made to the geometry defined by **RV-FWH-DRUM** and **RV-RWH-DRUM** respectively.
- b. must be fitted with an Aerodynamic Seal, in the outboard of the two annotated volumes, between the drum and the axle.
- c. may be fitted with an Aerodynamic Seal, in the inboard of the two annotated volumes, between the drum and the wheel rim.
- d. both any such Aerodynamic Seals must be circumferential, continuous (around an arc of 360°) and uniform.

The following modifications may be applied to the **Drum** inboard of  $Y_w = -5$ :

- e. Apertures, as defined in Article C3.16, provided they are sealed internally so as to prevent any airflow from one aperture to another.
- f. Minor modifications to the **Front Drum** between  $Z_w = 155$  and  $Z_w = 230$  provided these:



- i. permit the outboard suspension to connect to the upright.
- ii. do not protrude from the original surface into the external air stream.

#### C3.14.3 Scoop

The **Front Scoop** and **Rear Scoop** bodywork must:

- a. fully lie in its entirety within **RV-FWH-SCO** and **RV-RWH-SCO** respectively.
- b. be fully visible from inboard.

**Front Scoop** and **Rear Scoop** Aerodynamic Surfaces must:

- c. contain no radius of curvature less than 20mm,

except for regions:

- i. within 5mm of the rearward-most rearmost line formed by the intersection between any  $Z_w$  plane and **RV-RWH-SCO**.

#### C3.14.4 Rear Drum Lip

The **Rear Drum Lip** bodywork must:

- a. fully lie in its entirety within **RV-RWH-LIP**.

**Rear Drum Lip** Aerodynamic Surfaces must:

- b. contain no concave radius of curvature less than 20mm.

#### C3.14.5 Internal Cooling Ducts

The **Internal Cooling Ducts** are classed as LTC and must:

- a. fully lie in its entirety within the volume defined by the union of the **Drum** and the **Scoop**.

### C3.15 Wheel Bodywork Assembly

Prior to **Wheel Bodywork Assembly**, all Bodywork groups described in Article C3.14 must be fully defined. Furthermore, each proceeding **Wheel Bodywork Assembly** sub-section must be completed before moving on to the next.

#### C3.15.1 Rear Drum to Rear Drum Lip

The **Rear Drum** and the **Rear Drum Lip** must be trimmed to each other. A Fillet Radius of no greater than 25mm may be applied at the intersection between these volumes. The result of this union will still be known as **Rear Drum**.

#### C3.15.2 Drum to Scoop

The respective **Drum** and **Scoop** must be trimmed to each other. A Fillet Radius of no greater than 20mm may be applied at the intersection between these volumes. The result of this union will be known as **Outboard Wheel Bodywork**.

**C3.15.3 Outboard Wheel Bodywork to Internal Cooling Ducts**

The **Outboard Wheel Bodywork** and **Internal Cooling Ducts** must be trimmed to each other. Furthermore, once the apertures in Article C3.16 have been applied, any flow linking the inlet to the outlet must pass through a  $Y_w$  plane outboard of  $Y_w = -50$ , with the exception of ducts that cool electrical components.

**C3.16 Apertures**

Once the Final Assembly and **Wheel Bodywork Assembly** have been fully defined, the apertures listed in the following table may be applied. Apertures shall be interpreted as mathematical surfaces bound by their peripheries **and can only be defined after their respective Reference Volume has been translated and rotated**. Unless otherwise stated, each aperture may only be applied once, and all apertures must:

- a. **fully lie in their entirety** within the stated Aperture RV. Unless otherwise stated, each individual Aperture RV:
  - i. is an axis aligned cuboid that is bounded by a single internal diagonal extending from [0,0,0] to the stated co-ordinates.
  - ii. may be freely translated in space.
  - iii. may be rotated **about [0, 0, 0]** within the prescribed limits. [X° Limit, Y° Limit, Z° Limit]. **Any rotation must be applied before any translation.**

**All Aperture RVs are referenced to the Car Coordinate System except for the Wheel Bodywork Aperture RVs which are referenced to the Wheel Coordinate System.**

- b. in any X, Y and Z plane, **only contain a single section** contain no more sections than the number permitted in the stated Bodywork Group.
- c. be fully coincident with the surface of the stated Bodywork Group only.
- ~~d. all Wheel Bodywork Aperture RVs are referenced to the Wheel CSYS~~
- d. have a surface area no greater than the stated area, per side of the car.
- e. **unless otherwise stated**, be fully visible from the **given direction stated**, with the aperture surface assumed to be non-transparent.
- f. respect all other stated criteria.
- g. not overlap any other aperture, except for **C3.16.15**.

	(c)	(a.i) / (a.iii)	(d)	(e)	(f)
C3.16.1 Nose	Nose	[15, 40, 20] [0°, ±10°, 0°]	750	Front	i. Must <b>fully lie in its entirety</b> forward of X = -1100.
C3.16.2 FW Adjuster	Nose <b>Adjuster</b>	[100, 10, 10] [0°, 0°, 0°]	750	Below	i. Placeholder to allow FW rotation mechanism through the nose lower surface
C3.16.3 Driver Cooling	Driver Cooling	[20, 100, 20] [0°, ±10°, 0°]	1000	Front	

	(c)	(a.i) / (a.iii)	(d)	(e)	(f)
C3.16.4 FSU IB	Nose and Forward Chassis	[90, 10, 30] [0°, ±10°, ±10°]	2500	Side	i. Up to two apertures (one each for push/pullrod and trackrod) are permitted. ii. No point on the aperture may be more than 100mm from any other point.
C3.16.5 F-Scoop Inlet	Front Scoop	[50, 125, 175] [0°, 0°, 0°]	15,000	<del>Front</del> None	<del>i. Must fully lie forward of X<sub>w</sub> = -50.</del> i. Except for minimal incidental leakage, all air which enters the Front Scoop Inlet must exit the Front Scoop Outlet.
C3.16.6 F-Scoop Outlet	Front Scoop	[75, 125, 175] [0°, 0°, 0°]	15,000	Rear	i. Must <del>fully</del> lie in its entirety rearward of X <sub>w</sub> = 100 and above Z <sub>w</sub> = -50. ii. Only air which has entered the Front Scoop Inlet shall exit the Front Scoop Outlet.
C3.16.7 Floor Auxiliary	Floor	[10, 15, 60] [0°, ±20°, 0°]	750	Front	i. Must <del>fully</del> lie in its entirety above Z = 100 and forward of X <sub>F</sub> = 650.
C3.16.8 Sidepod Inlet	Sidepod	[20, 475, 250] [0°, ±80°, ±30°]	80,000	Front	i. Must <del>fully</del> lie in its entirety above Z = 275.
C3.16.9 Cockpit Entry	Chassis Mid	<del>RV-COCKPIT-APERTURE</del> [850, 200, 200] [0°, 0°, 0°]	<del>140,000</del> 175,000	Above	<del>i. Must not be translated.</del> ii. Visibility must be assessed with the Secondary Roll Structure removed.
C3.16.10 Roll Hoop Inlet	Chassis Mid	<del>[10, 160, 175]</del> RV-ROLL-HOOP [0°, <del>±10°</del> 0°, 0°]	15,000	Front	<del>i. Must fully lie above Z = 770.</del> i. Must not be translated. ii. Up to three apertures may be applied.
C3.16.11 EC Louvre Cooling	Engine Cover	RV-BW-APERTURE [0°, 0°, 0°]	150,000	Above or Side	i. RS-BW-APERTURE must be fully obscured when viewed through the aperture from above. ii. Any exposed surfaces visible when viewed from above must fully lie within 50mm of the untrimmed surface. iii. Must not be translated.
C3.16.12 EC Y25 Cooling	Engine Cover	[1200, 25, 20] [0°, ±20°, 0°]	30 000	Above	i. Must <del>fully</del> lie in its entirety inboard of Y = 25. ii. RS-EC must be fully obscured when viewed from the side.
C3.16.13 EC Rocket	Engine Cover	[10, 250, 300] [0°, 0°, 0°]	100,000	Rear	i. Must <del>fully</del> lie in its entirety rearward of X <sub>R</sub> = -55.
C3.16.14 R-Tyre Sensor	Floor or Engine Cover	[5, 60, 30] [0°, ±20°, ±45°]	1500	Rear	i. Must be fully obscured from below with <b>Floor Body</b> present.
C3.16.15 RSU IB	Engine Cover	[120, 10, 100] [±10°, 0°, ±30°]	12 000	Side	i. A single aperture is permitted for each suspension member and driveshaft. ii. No point on the aperture may be more than 200mm from any other point. iii. At the legality ride height defined in Art 10.1.4, for parts forward of X <sub>R</sub> = -55, the aperture must enclose the suspension member or driveshaft, including its fairing.
C3.16.16 R-Scoop Inlet	Rear Scoop	[50, 100, 175] [0°, 0°, 0°]	10,000	<del>Front</del> None	<del>i. Must fully lie forward of X<sub>w</sub> = 100.</del> i. Except for minimal incidental leakage, all air which enters the Rear Scoop Inlet must exit the Rear Scoop Outlet.

	(c)	(a.i) / (a.iii)	(d)	(e)	(f)
C3.16.17 R-Scoop Outlet	Rear Scoop	[150, 100, 175] [0°, 0°, 0°]	10,000	Rear	i. Must <del>fully</del> lie in its entirety rearward of $X_w = 100$ and above $Z_w = -50$ . ii. Only air which has entered the Rear Scoop Inlet shall exit the Rear Scoop Outlet.

### C3.17 Suspension and Driveshaft Fairings

**C3.17.1** Suspension Fairings must be fitted to all suspension members defined in Article C10.3.6, except for those of circular cross section.

**C3.17.2** Each Suspension Fairing, relative to its corresponding suspension member, must:

- a. fully cover the member and any components mounted to the member, over the span exposed to the external air stream.
- b. be rigid and have zero degrees of freedom relative to the member. Except for suspension conforming to Article C10.3.3, where minimal deformation or articulation will be allowed in shared cover sections to accommodate nominal misalignment of relevant suspension members through the suspension travel range.
- c. lie entirely ahead of  $X_R = ~~165~~ 300$ .

**C3.17.3** The surface bounded by the external cross-section of each Suspension Fairing, when taken normal to the corresponding suspension member's load line defined in Article C10.3.6 (a) must:

- a. intersect the load line, except for front suspension elements, locally, for the sole purpose of ensuring minimum clearance with the wheel rim at full steering lock.
- b. have at least one axis of symmetry where the larger one will be called the 'major axis.'
- c. have no dimension which exceeds:
  - i. 100mm.
  - ii. 5mm larger than the major axis.
- d. have an aspect ratio no greater than C3.5:1, where aspect ratio is the ratio of the major axis to the maximum thickness, measured in the direction normal to the major axis.
- e. have an incidence (defined as the angle between the major axis and  $Z=0$  with the car at its legality ride height, as defined in Article C10.1.4) which lies within the following ranges:
  - i. For Front Suspension Fairings, between 10deg (nose down) and 0deg.
  - ii. For Rear Suspension Fairings, between 10deg (nose down) and -10deg (nose up).

**C3.17.4** Fairings of suspension members which share an attachment point will be considered by a virtual dissection into discrete components. Such fairings will be allowed local minimal exceptions to Article C3.17.3 (b), (d) and (e) close to the junction of the suspension members, including minimal cut outs to allow the passage of a suspension member connected inboard to the rockers defined in Article C10.4.1. After application of any such cut out, the resultant fairings must still seal the internal volume of the fairings from the external airstream.

**C3.17.5** A Driveshaft Fairing may be fitted around the driveshaft defined in Article C9.12. This fairing must be rigid and have zero degrees of freedom relative to the axis of the driveshaft.

Furthermore, the surface bounded by the external cross-section of this fairing, when taken normal to the driveshaft axis must:

- a. respect the criteria of Article C3.17.3 except for:
  - i. part (a), which must instead intersect the driveshaft axis.
  - ii. part (e), where the range is between 10deg (nose down) and -10deg (nose up).

**C3.17.6** The angle between the normal to any point of the surface of a Suspension or Driveshaft Fairing and a plane normal to the corresponding suspension member's load line or driveshaft axis must not exceed 15 degrees. Except for, regions close to inner and outer attachment points, or close to the junction between suspension members that share an attachment.

**C3.17.7** In order to permit suspension travel while maintaining an Aerodynamic Seal, minimal flexible components may be fitted between a Suspension and Driveshaft Fairing and the following components:

- a. **Wheel Bodywork**, as defined in Article C3.15.
- b. **Front Bodywork**, as defined in Article C3.7.
- c. **Engine Cover Bodywork**, as defined in Article C3.8.2.
- d. **Tail Bodywork**, as defined in Article C3.9.
- e. **Gearbox Case**, as defined in Article C9.1.5.
- f. **Rear Wing Pylon**, as defined in Article C3.11.4.
- g. The Suspension Fairing covering the suspension member connected inboard to the rockers defined in Article C10.4.1.

With the car at its Legality Ride Height, these flexible components must:

- h. contain a Fillet Radius of up to 30mm between the components they are sealing.
- i. except for the Fillet Radius defined in (g h), conform with the shape restrictions of the two components they are sealing. For clarity, parts of these components may be replaced with the flexible component.
- j. be designed in such way as to maintain their shape integrity with the car in motion, and as much as possible, with the suspension at another position than that of the Legality Ride Height.

When the suspension is at the Legality Ride Height and the Wheels are in the straight-ahead position, exceptions to (g h) and (h i) are permitted in regions internal to the volume bounded by the Fillet Radius defined in (g h) between:

- k. Suspension Fairings and **Front Wheel Bodywork**.
- l. the Front Trackrod Suspension Fairing and **Front Bodywork**.

**C3.18 Aerodynamic Component Flexibility****C3.18.1 Introduction of load/deflection tests**

In order to ensure that the requirements of Article C3.2.2 are respected, the FIA reserves the right to introduce further load/deflection tests on any part of the bodywork which appears to be, or is suspected of, moving whilst the car is in motion.

**C3.18.2 Load/deflection linearity**

All load deflection tests must have a nominally linear elastic relationship unless otherwise stated.

**C3.18.3 Rear Wing Skins**

The skins of the Rear Wing Profiles may deflect no more than 2mm when a 60N force is applied to the skin normal to and away from the element.

The force will be applied using a vacuum cup of 50mm diameter and the deflection will be measured at the outer diameter of the cup.

**C3.18.4 Front Wing Bodywork Flexibility**

The flexibility of **Front Wing Bodywork** will be tested by applying a load of [0, 0, -1000] N at points  $[X_F, Y, Z] = [-400, \pm 750, 200]$  or  $[-600, \pm 750, 200]$ .

The load will be applied in a downward direction using a 50mm diameter ram on a rectangular adaptor measuring 350mm in the X-direction and 135mm in the Y-direction. This adaptor must be supplied by the team and should:

- a. have a flat top surface without recesses.
- b. be fitted to the car to apply the full load to the bodywork at the test point and not to increase the rigidity of the parts being tested.
- c. be placed with the inner face 685mm from  $Y = 0$ .
- d. be placed with its forward face at  $X_F = -665$  mm.
- e. be placed with its top face at  $Z = 200$ .
- f. have a mass of no more than 2kg.

The deflection will be measured relative to the survival cell and along the loading axis.

When the load is applied symmetrically to both sides of the car the vertical deflection must be no more than 15mm.

When the load is applied to only one side of the car the vertical deflection must be no more than 20mm.

**C3.18.5 Front Wing Flap Flexibility**

Any part of the trailing edge of any Front Wing Flap may deflect no more than 5mm, when measured along the loading axis, when a 60N point load is applied normal to the flap.

**C3.18.6 Front Floor Flexibility**

Bodywork flexibility will be tested by applying a load vertically upwards using a 50mm diameter pad with a gimble interface to the loadcell. The position of the centre of the pad will be given by the FIA and will be on the underside of the plank within a quadrilateral area, with vertices at points:

- a.  $[X_F = 460, 50]$ ,  $[X_F = 610, 65]$ ,  $[X_F = 610, -65]$ ,  $[X_F = 460, -50]$ .

The deflection will be measured along the loading axis.

At all times during the test, the load at a given deflection must exceed the load given by a straight-line graph defined by connecting the following coordinates in order:

- b. (0 mm, 0 N) (1 mm, 0 N) (5 mm, 4000N) (25mm, 6000N).

This must be the case whether the deflection is increasing, decreasing, or held constant. The test will have no more than a maximum load of 8000N or a maximum deflection of 15mm (whichever is reached first) unless specifically requested by the FIA to investigate behaviour above these limits.

The load deflection relationship must be strictly monotonic with both increasing and decreasing deflection.

**C3.18.7 Outboard Floor Flexibility**

The outboard edge of the **Floor Bodywork Group** may deflect no more than 8mm in Z, at any point between  $X_R = -1260$  and  $X_R = -350$ , when a distributed load of  $[0, 0, -600]$  N is applied to each side of the car.

The load will be applied simultaneously at 6 points on each side of the car, nominally at  $[X_R, Y = 695]$ :

- a.  $[-480]$ ,  $[-635]$ ,  $[-790]$ ,  $[-945]$ ,  $[-1100]$ ,  $[-1255]$ .

A 2mm tolerance on position will be permitted for manufacturing reasons.

When viewed from above, and with the **Floor Bodywork Group** as fully defined in Article C3.5.8 in place, nothing other than the bodywork may be visible within 15mm of any load application point. A load application point that does not meet this requirement may be moved, in X and/or in Y, by the minimum amount necessary to comply. The FIA may require load points to be moved if, in their view, the load location or the floor shape has been specifically designed to permit greater levels of outboard floor flexibility in untested regions of the floor.

Once the load application positions are fully defined, Teams must provide a suitable means of applying the load to the upper surface of the bodywork. The load will be applied through a rod of diameter 2.3mm. Details of this arrangement are provided in the appendix to the Technical and Sporting Regulations. The contact of any load-spreader with the bodywork must lie within a cylinder of diameter 25mm, coaxial with the load application axis. If the Team's preferred method requires through-holes, these holes must be sealed on either or both of the upper and lower surfaces at all times the car is on the circuit and during any assessment of any visibility from above around load application points.

Loads will be applied to these rods in two stages:

- b.  $[0, 0, -50]$  N to each load application point to give 300N per side.

- c. [0, 0, -100] N to each load application point to give 600N per side.

Deflection will be measured by laser scanning of the bodywork at each loading stage.

#### C3.18.8 Central Floor Flexibility

- a. Bodywork within **RV-PLANK** may deflect no more than 2mm at the two holes in the plank at  $X_F=1080$  and no more than 2mm at the rearmost hole, when the car, without driver, is supported at these positions. The car will be supported on 70mm diameter pads, centred on the holes, and only in contact with the underside of the Plank Assembly. The displacement will be measured at the supports, relative to the reference plane at the centre of each hole.

Furthermore, the stiffness for any deflection exceeding that defined in the previous paragraph must be no less than 15kN/mm.

Competitors will be required to demonstrate the local vertical stiffness and design installation of the skids and plank to the FIA for the regions around the periphery of each of these three holes. Compliance with Article C3.6 (e). will only be assessed in the regions that are at least 90% as stiff as the stiffest part of the periphery. Any designs intended to protect these regions of the periphery from wear will not be accepted.

- b. Competitors will be required to demonstrate compliance with these provisions by way of a detailed inspection of both the CAD and the physical installation, as well as Finite Element analysis.
- c. Bodywork on the reference plane may deflect no more than 0.2mm when the car, without driver, is supported at the two holes in the plank at  $X_F=1080$  and at the rearmost hole in the plank. The car will be supported on 40mm diameter pads, centred on the holes, and only contacting the bodywork on the reference plane. For the two holes at  $X_F=1080$  the displacement will be measured at the supports, relative to the survival cell datum points detailed in Article C3.3.3. For the rearmost hole, the displacement will be measured at the support, relative to the power unit at the uppermost transmission mounting studs detailed in Article C5.x.x.

#### C3.18.9 Rear Wing Mainplane Flexibility

- a. Bodywork may not deflect more than 6mm along the loading axis and  $1.0^\circ$  in a Y-Plane, when two loads of [0, 0, -1000] N each, are applied simultaneously to the Rear Wing Profiles. The loads will be applied at [ $X_R = 350, \pm 325, 835$ ]
- b. Bodywork may not deflect more than 6mm along the loading axis and  $1.0^\circ$  in a Y-Plane, when two loads of [324, 0, -940] N each, are applied simultaneously to the Rear Wing Profiles. The loads will be applied at [ $X_R = 300, \pm 325, 825$ ]

The loads in (a) and (b) will be applied through adaptors, supplied by the team, that lie between 275mm and 375mm from  $Y=0$  and between  $X_R = 200$  and at least  $X_R = 450$ . The upper surface each adaptor must lie at  $Z = 835$  and should have a counterbore of 52mm diameter for the application of the load in (b).



The angular deflection will be measured on the rear wing profiles, at  $[X_R, Y]$   $[325, \pm 150]$ , and  $[375, \pm 450]$  and relative to the Rear Impact Structure. Teams must provide four pads to support tracking targets. Details of the targets is given in the Appendix to the Technical and Sporting Regulations.

The tests defined in this Article may be performed with the RW Flap removed. In such cases the permitted deflections will be 25% higher than those defined in (a) and (b).

#### **C3.18.10 Rear Wing Flap Flexibility**

The RW Flap may deflect no more than 7mm horizontally when a 500N load is applied horizontally. The load will be applied in the plane  $Z = 800$  at one of three separate points which lie within 50mm of the car centre plane and 300mm either side of it. The loads will be applied in a rearward direction using a suitable 25mm wide adaptor which must be supplied by the relevant team.

The deflection will be measured along the loading axis and relative to the forward part of the Rear Wing Mainplane at the same Y-station.

#### **C3.18.11 Rear Wing Mainplane Trailing Edge**

The forward-most aerofoil element of Rear Wing Profiles may deflect no more than 3mm along the line of load application, when a 200N load is applied normal to the lower surface. The load will be applied in line with the trailing edge of the element at  $Y = 0$ ,  $Y = \pm 150$ , or at  $Y = \pm 450$ .

The deflection will be measured relative to the forward part of the Rear Wing Mainplane at the same Y-station.

The loads will be applied using a suitable adaptor, supplied by the relevant team, which:

- a. may be no more than 50mm wide.
- b. which extends no more than 10mm forward of the trailing edge.
- c. incorporates an 8mm female thread in the underside.

#### **C3.18.12 Rear Wing Endplate Flexibility**

The Rear Wing Endplates described in Article C3.9.2 may deflect no more than 10mm, when measured along the loading axis, when a 50N point load is applied in an inward direction normal to the car centre plane using a spherical 15mm diameter tip at  $[X_R, Z] = [725, 500]$ . For this measurement, the contribution of the rigid-body rotation of the whole wing assembly will be removed.

#### **C3.18.13 Rear Wing Slot Gap Deflection**

With the hydraulic system active and the Rear Wing Rotation System deployed, a spherical gauge must not pass through the gap between the forwardmost and its adjacent profile within **RV-RW-PROFILES**. The gauge will have a diameter of 65mm +0.00 / -0.05mm and a load of 10N will be applied during the test.

**C3.18.14 Additional Diagnostics**

To allow the behaviour of ~~the Rear Wing Bodywork~~ to be monitored, ~~using the onboard cameras,~~ Competitors ~~may be~~ are required, as determined by the FIA, to apply contrasting markers ~~must be applied~~ to Bodywork within RV-RW-PROFILES and within RV-RW-BEAM, and may be required to run additional cameras provided by the FIA. Details and positions of these markers and additional Cameras ~~and their positions~~ are given in the Appendix to the Technical and Sporting Regulations.

A Competitor may be required to run an additional camera in any free practice session. Such a camera will not be considered as Bodywork.

**ARTICLE C4: MASS****C4.1 Definitions****C4.1.1 Car mass**

Is the mass of the car, including tyres, plus Mass of the Driver (as defined in Article C4.1.2) and Driver Ballast (defined in Article C4.4.2), but without fuel.

**C4.1.2 Mass of the Driver**

Is the mass of the driver with the seat, and driving equipment, as specified in Appendix L of the **Code** but excluding the Safety Harness.

**C4.1.3 Nominal Tyre Mass**

The Nominal Tyre Mass is defined as the mass of a set of new, production, dry weather, tyres, rounded to the nearest 1kg.

All masses will be measured by the tyre provider and published after the final day of TCC opportunity (as defined in Article C10.8.c of the Sporting Regulations) prior to the start of the Championship and will be the mean mass of sample of 50 tyres per axle.

In the case of a change in tyre specification during the championship, the Nominal Tyre Mass will be adjusted if required.

**C4.2 Minimum mass**

The Minimum Mass is 724kg plus the Nominal Tyre Mass.

At all times during the Competition, the mass of the car, as defined in Article C4.1, must not be less than the Minimum Mass.

When a Heat Hazard is declared, the Minimum Mass will be increased by 4kg.

If, when required for checking, a car is not already fitted with dry-weather tyres, its mass will be determined using a set of dry-weather tyres selected by the FIA technical delegate.

**C4.3 Mass distribution**

With the car resting on a horizontal plane:

- i. the mass measured at the front axle must not be less than the minimum mass specified in Article C4.2 factored by 0.44.
- ii. the mass measured at the rear axle must not be less than the minimum mass specified in Article C4.2 factored by 0.54.

If, when required for checking, a car is not already fitted with dry-weather tyres, its mass will be determined using a set of dry-weather tyres selected by the FIA technical delegate.

If, when required for checking, a Heat Hazard has been declared, the increase in mass will not be considered.

**C4.4 Ballast****C4.4.1 General**

Ballast can be used provided it is secured in such a way that tools are required for its removal and that it remains immobile with respect to the sprung mass in its entirety. It must be possible to fix seals if deemed necessary by the FIA technical delegate.

**C4.4.2 Driver Ballast**

Ballast designated for the purpose of achieving the driver mass specified in Article C4.6.2 must:

- a. Be entirely located to the car between the front and rear extent of the cockpit entry template.
- b. Be attached securely to the survival cell and sealed by the FIA.
- c. Be clearly identified.
- d. Have a density greater than  $7500\text{Kg/m}^3$ .

A nominal such mass of 10kg should be present for the impact test described in Article C13.2.

**C4.4.3 Ballast Ahead of  $X_A=0$** 

Any ballast mounted ahead of  $X_A=0$ , that is not mounted within the forward-most profile of **Front Wing Profiles**, must be present during the Front Impact Structure Dynamic Test defined in Article C13.6.3.

**C4.5 Adding during the race or sprint session**

With the exception of compressed gases, no substance may be added to the car during the race or sprint session. If it becomes necessary to replace any part of the car during the race or sprint session, the mass of the new part must not be more than that of the original part.

**C4.6 Reference Mass of the driver and Driver Ballast**

**C4.6.1** The reference **Mass of the Driver** will be established by the FIA technical delegate at the first Competition of the Championship, this reference mass may be amended at any time during the Championship season if deemed necessary by the FIA technical delegate.

**C4.6.2** The reference **Mass of the Driver** plus the mass of any **Driver Ballast** must not be less than 82kg at any time during the Competition.

**ARTICLE C5: POWER UNIT****C5.1 Definitions ICE****C5.1.1 Power train**

The power unit and associated torque transmission systems, up to but not including the drive shafts.

**C5.1.2 Power unit (PU)**

The internal combustion engine and turbocharger, complete with its ancillaries, the energy recovery system and all actuation systems and PU-Control electronics necessary to make them function at all times.

**C5.1.3 Engine (ICE)**

The internal combustion engine including ancillaries and actuator systems necessary for its proper function.

**C5.1.4 Turbo Charger (TC)**

The assembly of a compressor used for pressure charging of the engine, a turbine connected to the engine exhaust system used to drive the compressor, the drive system between the compressor and the turbine and their respective housings and bearings.

**C5.1.5 Engine cubic capacity**

The volume swept in the cylinders of the engine by the movement of the pistons. This volume shall be expressed in cubic centimetres. In calculating engine cubic capacity, the number Pi shall be 3.1416.

**C5.1.6 Combustion chamber**

An enclosed space in the engine cylinder controlled by the opening and closing of the poppet valves in which combustion takes place.

**C5.1.7 In-cylinder pressure sensor**

A sensor whose function is to measure the pressure in the combustion chamber.

**C5.1.8 Knock sensor**

A sensor whose sole function is to measure the knock intensity in the combustion chamber.

**C5.1.9 Fuel injector**

Any device or component that delivers fuel into an oxidiser.

**C5.1.10 High pressure fuel pump**

A mechanical device whose sole function is to pressurise the fuel to the pressure required for the high -pressure injection. It may be electronically controlled.

**C5.1.11 Fuel Flow meter**

A sensor whose function is to measure the flow of the fuel passing through it.

**C5.1.12 Ignition Coil**

Assembly including an induction coil that supplies the voltage to the spark plug.

**C5.1.13 Ancillaries**

A component whose function is to support the primary activities of a main system to allow it to operate.

**C5.1.14 Pressure charging**

Increasing the weight of the charge of the fuel/air mixture in the combustion chamber (over the weight induced by normal atmospheric pressure, ram effect and dynamic effects in the intake and/or exhaust system) by any means whatsoever. The injection of fuel under pressure is not considered to be pressure charging.

**C5.1.15 Compressor inlet**

A component containing a duct of closed cross section through which all air destined for combustion enters any compressor.

**C5.1.16 Compressor outlet**

One or more components each of them containing a duct of closed cross section through which all air destined for combustion exits the compressor.

**C5.1.17 Engine Plenum**

A pressurised vessel upstream of the combustion chamber containing all of the air destined for combustion. This vessel (or vessels) may be comprised of several components. Pipes, as generally understood, conveying air from the compressor to the engine are not part of the engine plenum.

**C5.1.18 ~~Main~~ Oil Tank**

The ~~main~~ oil tank is a singular vessel directly connected to the engine oil feed at the inlet of the oil pressure pump.

**C5.1.19 Auxiliary Oil Tank (AOT)**

An Auxiliary Oil Tank (AOT) is a singular vessel connected to the engine whose sole function is to hold engine oil for the replenishment of the engine lubrication system.

**C5.1.20 Engine exhaust system**

Assembly of parts conveying the engine exhaust fluids from the cylinder head up to but not including the turbine and/or wastegate. It does not include the turbine or wastegate exit tailpipe(s). A set comprises left and right assemblies.

**C5.1.21 Valve Stem**

The valve stem is the part of the component that slides within the valve guide during operation.

**C5.1.22 Wastegate**

A device used to release exhaust fluids from the complete exhaust system, anywhere downstream of the exhaust valves and upstream of the turbine wheel.

**C5.1.23 Pop-off valve**

A device used to release air from the engine intake air system, anywhere downstream of the compressor wheel and upstream of the intake valves, and to recirculate it upstream of the compressor wheel.

**C5.1.24 Cylinder Liner**

A component installed into the crankcase whose primary function is to provide a durable surface on which the piston and piston rings run. There must be only a single cylinder liner per cylinder bore and the liner may also provide the sealing interface between the cylinder bore and the cylinder head.

**C5.1.25 Insert**

An insert within a PU component is a non-dismountable part whose function is solely to locally support a function of this component.

**C5.1.26 Top Deck (Appendix C3, Drawing 6)**

The single plane surface of the block, normal to the cylinder centreline coincident with the primary connection between the crankcase and the cylinder head.

**C5.1.27 Deck Height (Appendix C3, Drawing 6)**

The distance on each bank between the crank axis and the top deck.

**C5.1.28 Journal bearing diameter (Appendix C3, Drawing 7)**

The maximum diameter of the bearing journal across its entire width excluding fillet radii.

**C5.1.29 Journal bearing width (Appendix C3, Drawing 7)**

The minimum width of the inner bearing surface at its minimum diameter. This excludes any additional bearing shell width resulting from edge chamfers, radii or any other relieving feature.

**C5.1.30 Exclusivity agreement**

An exclusivity agreement is deemed to be any agreement concluded between the supplier of such parts (including any PU manufacturer) and any PU Manufacturer, which has the purpose and/or the effect of restricting or delaying the possibility for such a supplier:

- a. to consider any request from another PU Manufacturer; and/or
- b. to supply, under reasonable commercial conditions, a part meeting the applicant's specifications.

**C5.1.31 Cylinder Head**

The Cylinder Heads are the components that close all the cylinders of each bank of the engine and form the structure between the combustion chambers and the camshaft bearings between at least the front of the forward cylinder bore and the rear of the rearward cylinder bore on each bank.

**C5.1.32 Heat Shield**

A heat shield is a component or an assembly whose primary function is to shield components from thermal radiation and is not permanently attached to another component or assembly (such as by riveting, bonding, welding, brazing, or plating).

**C5.1.33 Throttle**

A variable geometry device or arrangement which restricts the airflow into the ICE by means of a variable area restriction within the intake. The throttle may only comprise of one or more rotating butterfly valve or one or more rotating barrel valve.

**C5.1.34 Thermal Insulation**

Thermal insulation is a part fitted adjacent to a component whose primary function is to reduce the heat transfer between that component and its surroundings.

**C5.1.35 Trumpet**

A trumpet is a component(s) that extends the geometrical path of air destined for combustion directly into each individual cylinder. The trumpet(s) may also include any Throttle(s) permitted by C5.8.3.

**5.1.36 ICE Ballast**

Ballast is a component fixed to the ICE whose sole purpose is to provide a mass to adjust the final weight of the ICE as fitted.

**5.1.37 Flywheel**

Inertial components connected directly to the rear of the crankshaft

**C5.2 Definitions ERS****C5.2.1 Energy Recovery System (ERS)**

A system that is designed to recover energy from the car, store that energy and make it available to propel the car and, optionally, to drive any ancillaries and actuation systems necessary for its proper function.

**C5.2.2 MGU-K Control Unit (CU-K)**

The bi-directional DC-AC power converter sat between the ES and the MGU-K. It is composed of power modules, DC-link capacitor(s), gate driver board(s), CUK logic board, and may contain other devices that perform functions related to the CU-K operation such as DC bus discharge circuits, sensors, Y-capacitors, housing, and cooling systems.

**C5.2.3 ES main enclosure (ESME)**

External structure that encloses at least the elements listed in Article C5.19.7 and allows their installation inside of the ERS Reference Volume (RV-PU-ERS). It may be composed of elements rigidly linked to form a continuous closed volume.

**C5.2.4 Motor Generator Unit - Kinetic (MGU-K)**

The Motor Generator Unit - Kinetic is the rotating electromechanical machine that converts electrical energy into mechanical energy (a 'motor') and vice versa (a 'generator').



**C5.2.5 MGU-K mechanical transmission**

The MGU-K mechanical transmission is defined as the device that provides any mechanical speed reduction between the MGU-K and a rotating part of the ICE specifically and only for the MGU-K. If the MGU-K mechanical transmission connects to a shaft/component on the ICE that is already rotating at a speed above or below crank speed for other purposes, that existing gear ratio (driving some part of the ICE other than the MGU-K) is not included in the MGU-K transmission. The MGU-K mechanical transmission may be wholly mounted on the ICE or on the MGU-K or partly on both.

**C5.2.6 Energy Store (ES)**

The part of ERS that stores energy, including its safety control electronics and a minimal housing.

**C5.2.7 DC-DC Converter**

An electronic circuit or electromechanical device, only capable of consuming energy, that converts a source of direct current (DC) from one voltage level to another for use by the electrical and electronic components of the car and power unit.

**C5.2.8 DC-DC Unit**

The unit containing the DC-DC(s) that converts from high to low voltage.

**C5.2.9 Power Box Unit**

An electronic device used to drive the high pressure fuel pump, injection and ignition system.

**C5.2.10 Control Electronics - Power Unit (PU-CE)**

Any component used to control Power Unit sub-systems and containing programmable semiconductors or high-power switching devices.

It includes, but is not limited to, MGU-K control unit (CU-K), power box, DC-DC Unit, power distribution board.

It excludes any FIA Standard ECU, FIA sensors and ES safety control electronics.

**C5.2.11 ERS-K**

The only part of the ERS allowed to propel the car. It is composed of the MGU-K, the CU-K and the ERS-K phase conductors.

**C5.2.12 Battery management system (BMS)**

The BMS is a set of important safety systems of the ES. The main function is as a monitoring and a charge-balancing circuit to keep all cells under normal operating conditions, within the specified parameters e.g. voltage, temperature, current, state of balance, defined by the manufacturer.

**C5.2.13 High Voltage**

Classification of an electrical component or circuit whose maximum working voltage is > 30 V AC rms or > 60 V DC.

**C5.2.14 Hazardous electric shock**

Physiological reaction generated by an electrical current greater than 2mA passing through the human body.

**C5.2.15 Car main ground**

The electrical reference potential of all conductive parts of the car, typically located on the ICE block.

**C5.2.16 Exposed conductive part**

Conductive part of the electric equipment, which can be touched by a test finger according to IP2X and which is not normally live, but which may become live under single fault conditions.

**C5.2.17 Live part**

Conductive part which belongs to a high voltage component or circuit in normal use and which has an insulation resistance lower than 100Ω/VDC and 500Ω/VAC.

**C5.2.18 Basic insulation**

Insulation applied to live parts which provides protection against hazardous electric shock in case of contact.

**C5.2.19 Supplementary insulation**

Independent insulation applied in addition to basic insulation for protection against hazardous electric shock in the event of a failure.

**C5.2.20 Double insulation**

Insulation comprising both basic insulation and supplementary insulation. Double insulation is composed of two layers of insulators with two different failure modes. Those two layers can be tested separately.

**C5.2.21 Reinforced insulation**

Insulation of hazardous-live-parts which provides a degree of protection against electric shock equivalent to double insulation.

**C5.2.22 Maximum working voltage**

Highest value of AC peak voltage or of DC voltage that can occur under any normal operating conditions according to the manufacturer's specifications, disregarding residual variation of the DC voltage shorter than 100µs. Field weakening is considered as a normal operation, therefore a MGU with a maximum back-EMF higher than the maximum working voltage established by this technical regulation is allowed.

**C5.2.23 Electronic Box**

Unit that contains at least 1 microcontroller.

**C5.2.24 Breakout Box**

Unit used to perform low voltage looms adaptation.

**C5.2.25 ES cell**

The elementary part of the ES that produces and stores electricity through electro-chemical reactions.

**C5.2.26 Cell Tabs**

Cell connection terminals which connect the cathode and anode electrodes to the external circuit.

**C5.2.27 HV DC Bus**

The set of electrical conductors which are not part of the ES or any PU-CE and that serves as the pathway to the electrical energy directly used to propel the car flowing between those elements.

**C5.2.28 ERS Auxiliary Circuit**

Any circuit inside or outside the ES and PU-CE elements which does not form part of the high voltage DC bus current flow path that connects the ES to the CUK and DCDC, and which is typically designed to monitor or to perform functionalities allowing the ERS to operate correctly and safely. Example of auxiliary circuits include, but are not limited to, voltage measurement circuits, insulation measurement circuits, contactor pre-charge circuits, battery (dis)charge connections, cable disconnect detection circuits.

**C5.2.29 ERS-K Phase Conductors**

The components allowing electrical current to flow between the CU-K and the MGU-K windings composed of conductors (e.g. busbars, cables or wires) and respective connection interfaces not part of the ESME or MGU-K.

**C5.3 Engine specification**

**C5.3.1** Only 4-stroke engines with reciprocating pistons are permitted.

**C5.3.2** Engine cubic capacity must be 1600cc (+0/-10cc).

**C5.3.3** All engines must have six cylinders arranged in a 90° “V” configuration and the normal section of each cylinder must be circular.

All six cylinders must be of equal capacity.

**C5.3.4** Engines must have two intake and two exhaust valves per cylinder.

Only reciprocating poppet valves with axial displacement mechanically actuated by the camshafts are permitted.

The sealing interface between the moving valve component and the stationary engine component must be circular. The sealing surfaces on the stationary engine component must be either the cylinder head itself defined by 15.8.8 g), any coating on the cylinder head permitted by 15.7.2, or the conventional inserts permitted by 5.3.7 a).

**C5.3.5** Engine exhaust gases may only exit the cylinder head through outlets outboard of the cylinder bore centre line and not from within the “V” centre.

**C5.3.6** The crankshaft may only have three connecting rod bearing journals.

**C5.3.7** In a Cylinder Head, only inserts approved by the FIA Technical Department will be allowed. The total volume of the inserts listed in a. to c. below cannot be more than 3% of the total volume of each Cylinder Head and these must be confined to:

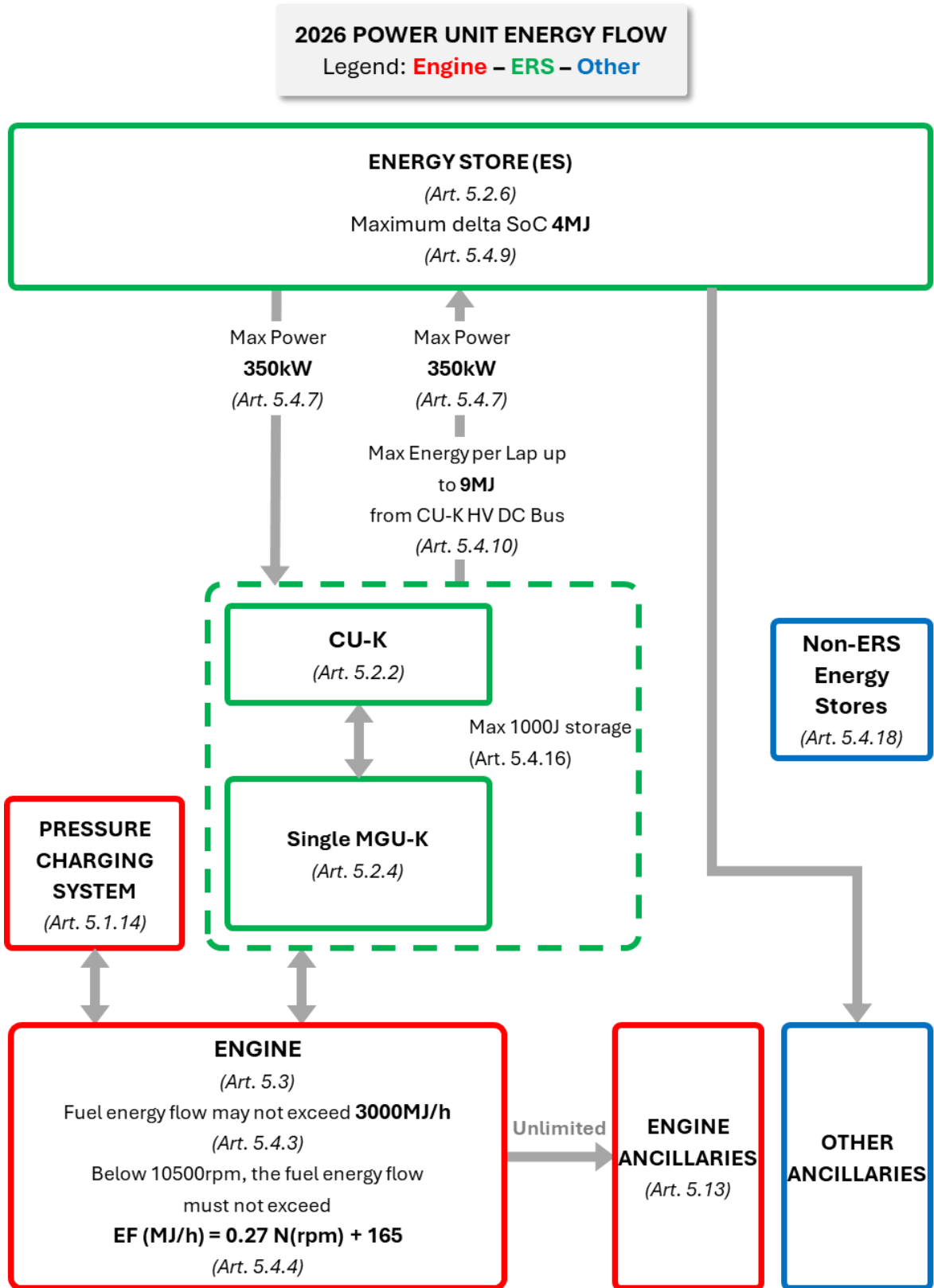
- a. Conventional valve seat inserts
- b. Conventional valve guide inserts

- c. An insert concentric to the spark plug axis with a maximum outside diameter of 15mm

An additional allowance of 1% of the total volume of each cylinder head is permitted for inserts other than those mentioned above, but none of these inserts can be exposed to the combustion chamber.

- C5.3.8** Unless specified otherwise, the total volume of inserts within ~~an~~ ICE components related to items 1 and 4 of the Appendix C4 table 1 of these regulations cannot be more than 10% of the total volume of the component. Inserts in other components are not restricted.
- C5.3.9** All power unit breather fluids may only vent to atmosphere and must pass through a single orifice which is positioned behind  $X_R=0$ , inboard of  $Y=100$  and below  $Z=400$ . No breather fluids may re-enter the power unit.
- C5.3.10** With the exception of leakage through joints (either into or out of the system) all and only the air entering the compressor inlet must enter the combustion chambers.
- C5.3.11** The power unit may be equipped with a maximum of two wastegates and two pop-off valves. Only poppet valves with a circular sealing interface and axial displacement are permitted for the wastegate and pop-off valves.
- C5.3.12** Engine oil consumption must never exceed 0.30l/100km in normal operating conditions.
- C5.3.13** All wastegate exit fluids must pass through a wastegate tailpipe which must be connected to the turbine tailpipe, downstream of the turbine wheel.
- C5.3.14** For the purpose of component classification in Table 1 of Appendix C4, thermal insulation that is permanently attached to another component or assembly (such as by riveting, bonding, welding, brazing, or plating) will be considered part of that component or assembly.
- C5.3.15** The clutch assembly, including but not limited to friction plates, springs, cover plate, may be fitted to the flywheel but will not contribute to the mass of the flywheel. A clutch basket connected directly to the rear of the crankshaft will be classified as a flywheel.
- C5.4 Power Unit Energy Flow**
- C5.4.1** The use of any device, other than the engine described in C5.3 above, and the ERS-K, to propel the car and/or harvest energy, is not permitted.

C5.4.2 Energy flows, power and ES state of charge limits are shown in the energy flow diagram below:



When the car is on the track a lap will be measured on each successive crossing of the timing line, however, when entering the pits the lap will end, and the next one will begin, at the start of the pit lane (as defined in the F1 Sporting Regulations).

- C5.4.3** Fuel energy flow must not exceed 3000MJ/h.
- C5.4.4** Below 10500rpm the fuel energy flow must not exceed  $EF(MJ/h)=0.27*N(rpm)+ 165$
- C5.4.5** At partial load, the fuel energy flow must not exceed the limit curve defined below:  
 $EF (MJ/h) = 380$  when the engine power is equal to or below -50kW  
 $EF (MJ/h) = 9.78 \times \text{engine power (kW)} + 869$  when the engine power is above -50kW  
 [Note: Further discussions will take place to fully evaluate the benefits and consequences of art. C5.4.5 and whether modifications are necessary.]
- C5.4.6** When assessing compliance with the above two articles, the fuel mass flow rates measured by the fuel flow meter will be converted in the SECU in fuel energy flow rates using the energy density and the LHV of the fuel as measured by the FIA. The procedure which will be used to determine these values may be found in the Appendix to the Technical and Sporting Regulations.
- C5.4.7** The absolute electrical DC power of the ERS-K may not exceed 350kW.
- C5.4.8** Additionally, the electrical DC power of the ERS-K used to propel the car may not exceed:
- i.  $P(kW) = 1800 - 5 * \text{car speed (kph)}$  when the car speed is below 340kph  
 $P(kW) = 6900 - 20 * \text{car speed (kph)}$  when the car speed is equal to or above 340kph  
 $P(kW) = 0$  when the car speed is equal to or above 345kph
  - ii. In “override” mode up to:  
 $P(kW) = 7100 - 20 * \text{car speed (kph)}$  when the car speed is below 355kph  
 $P(kW) = 0$  when the car speed is equal to or above 355kph
- The details of the “override” mode are specified in the Sporting Regulations.
- C5.4.9** The difference between the maximum and the minimum state of charge of the ES may not exceed 4MJ at any time the car is on the track.
- C5.4.10** The energy harvested by the ERS-K, as measured at the CU-K HV DC Bus, must not exceed 8.5MJ in each lap, subject to the following additional conditions:
- i. Exceptionally, this limit on energy harvested in each lap may be reduced to 8MJ at Competitions where the FIA determines that the maximum possible energy harvested per lap under braking and in partial load is no more than 8MJ. These Competitions and the vehicle fundamentals used for the calculation of maximum energy harvested will be provided in the Appendix to the Technical and Sporting Regulations.
  - ii. Up to 0.5MJ additional energy may be harvested in each lap subject to the conditions specified in Article xxx of the Sporting Regulations.
- C5.4.11** The MGU-K mechanical torque magnitude may not exceed 500Nm. The torque will be referenced to the crankshaft speed ~~and a fixed efficiency correction of 0.97 will be used to monitor the maximum MGU-K mechanical torque.~~
- C5.4.12** ~~With the exception of cars starting or resuming the race from the pit lane, the MGU-K may only be used during a standing start once the car has reached 50km/h. During a standing start from the grid the MGU-K may only be used once the car has reached 50 km/h.~~

**C5.4.13** The amount of stored energy in ~~any~~ the ES may not be increased by more than 100kJ whilst the car is stationary in the ~~pit lane or~~ garage during the **Sprint and Race** Qualifying Sessions. ~~or during a Race pit stop.~~

**C5.4.14 ERS Policing**

- a. In order to verify that the energy and power requirements of the ERS are being respected, all cars must be fitted with two DC sensors. Those sensors may only be installed outside the sealed perimeter of any PU-CE and used as specified below:

One DC sensor must be connected to the ES high voltage negative DC pole to measure all electrical energy into and out of the energy store via the HV DC Bus.

The other DC sensor must be connected to the CUK high voltage positive DC pole to measure all electrical energy and power into and out of the ERS-K via the HV DC Bus.

The DC sensors voltage sense wire must be connected to the dedicated measurement point defined by the FIA Technical department.

- b. Electrical energy may not flow from or into the ES and CU-K without being directly measured by one of the two DC sensors, previously listed. This must be guaranteed by design and verifiable by inspection.
- c. The design of the ERS and the installation of the two DC sensors must be approved by the FIA.
- d. An airgap of 1mm must be present between the CU-K and any other consumer fitted inside the ES main enclosure. The links allowed to cross the airgap separation volume include, but are not limited to: the elements of the HV DC bus, ERS-K phase conductors, cooling system components, mechanical support(s), low voltage looms and connectors dedicated for communication lines, low voltage power supply, interlock loop systems, temperature sensors, MGU position sensors, EMC screening and any other sensor used by the ERS-K. Those links must be minimal and essential to the CU-K operation.
- e. Details of each ERS auxiliary circuit and its connection to any pole of the ERS high voltage DC bus must be present in the technical dossier, as stated in Article C5.4.14.c. It shall include circuit diagrams and a table with maximum and minimum values of the electrical current that can flow from or into the HV DC bus under normal operating conditions.
- f. With exception of auxiliary circuits, electrical energy with an instantaneous power higher than 2W may not flow from CU-K logic or driver boards (usually low voltage parts) into the CU-K power stage (usually HV). This must be guaranteed by design and verifiable by inspection.
- g. The CU-K must exclusively perform functionalities related to the operation of any MGU-K sensor and to the power conversion between the CU-K DC poles input and the CU-K output going into the MGU-K.
- h. A preliminary technical dossier must be submitted to the FIA before the 21<sup>st</sup> of March of the year preceding the year of introduction. It must include details justifying all the points mentioned in this article. They will be pre-homologated by the FIA. Any further modification following the pre-homologation must also be submitted to the FIA.

**C5.4.15** Cars must be fitted with homologated sensors which provide all necessary signals to the FIA data logger in order to verify the requirements defined in this article are being respected.



- C5.4.16** With exception of the ES, the cumulative amount of stored energy on ERS electronic components supplied by voltage sources should not be higher than 1000J.
- C5.4.17** When the car is on the track the maximum instantaneous electrical power linked to the operation of auxiliary circuits (C5.2.28) connected on the ES side of the ES ~~WT Neg~~ DC Sensor and drawn by the BMS directly from the ES cells must not exceed 50W in total. This must be guaranteed by design and verifiable by inspection.
- C5.4.18** With the exception of the ERS, the cumulative amount of energy stored in the Power Unit should not be higher than 300kJ. Additionally, no more than 20kJ can be recovered per lap at a rate greater than 2kW.
- C5.4.19** When the car is stationary on the grid prior to a standing start the MGU-K torque may only be negative (i.e. charging the ES) except for torque requested by an MGU-K active damping strategy whose sole purpose is to protect the MGU-K mechanical transmission.
- C5.4.20** No off-board ES charger of any kind may be used whilst the car is in the pitlane
- C5.4.21** A fixed efficiency correction of 0.97 will be used wherever it is necessary to convert electrical into mechanical torque.

## **C5.5 Turbo Charger**

- C5.5.1** Pressure charging may only be affected by the use of a sole single stage, single sided Turbo Charger compressor with a single inlet linked to a sole single stage Turbo Charger turbine by a shaft assembly. The compressor blades must be attached to a common hub surface and all air entering the combustion chamber must pass through the single exducer of these blades. The shaft must be designed so as to ensure that the shaft assembly, the compressor and the turbine always rotate about a common axis and at the same angular velocity. With the exception of incidental heat transfer from the Engine exhaust system to its surroundings, ~~the use of the Turbo Charger turbine is the sole permitted means of extracting energy from the exhaust fluids and transferring energy into the rotating parts of the Turbo Charger~~ the energy extracted from the exhaust fluid by the turbocharger turbine is the sole permitted means of transferring energy into the rotating parts of the Turbo Charger. The energy of the rotating parts of the Turbo Charger turbine may not be transferrable to any other component.

Only parts approved by the FIA Technical Department may be used. Further to the provisions of the Article C18.3.5, the approval of the FIA Technical Department is conditional upon the PU manufacturer, intending to use such parts during a Championship season undertaking not to conclude any exclusivity agreement (as defined by Article C5.1.30) for the supply of such parts with the supplier of these parts. The approval request form must be sent by the PU Manufacturer to the FIA before the 1st of November of the preceding year.

- C5.5.2** Engine intake air pressure must be less than 4.8 barA at all times. The pressure of the air will be measured by two FIA approved and sealed devices through which all air destined for combustion must flow. These devices must be installed in FIA approved locations situated in the engine intake air system downstream of the charge air cooling system (as described in Article C5.25.2).
- C5.5.3** The axis of the turbocharger shaft must be parallel to Y=0, inboard of Y=25 and at an angle of 0 +/- 1 degree to X=axis.



- C5.5.4** The total mass of the turbocharger (TC) must be no less than 12kg.
- C5.5.5** Referring to Drawing 4 of Appendix C3, the turbocharger compressor and turbine must satisfy the following dimensional constraints. Only compressor and turbine wheels approved by the FIA Technical Department will be allowed:
- The compressor exducer blade outer diameter (A) must lie between 100mm and 110mm. For the avoidance of doubt, no part of the compressor wheel (including blades, hub and any blade/hub fillet radius) can have a diameter more than the upper limit and the maximum diameter of the compressor wheel (including blades, hub and any blade/hub fillet radius) cannot have a diameter smaller than the lower limit.
  - The compressor axial distance from the outside diameter of the inducer blade edge to rear plane of exducer, at its outer diameter (B) must lie between 30mm and 35mm
  - The turbine inducer blade outer diameter (C) must lie between 90mm and 100mm. For the avoidance of doubt, no part of the turbine wheel (including blades, hub and any blade/hub fillet radius) can have a diameter more than the upper limit and the maximum diameter of the turbine wheel (including blades, hub and any blade/hub fillet radius) cannot have a diameter smaller than the lower limit.
  - The turbine axial distance from the outside diameter of the exducer blade edge to forward plane of inducer, at its outer diameter (D) must lie between 35mm and 40mm
  - The maximum distance between the rear of the compressor exducer and the front of the turbine inducer (E) will be 175mm
- C5.5.6** The rotational speed of the turbocharger may not exceed 150,000rpm.
- C5.5.7** The compressor inlet must extend upstream of any part of any variable geometry device permitted by Article C5.9
- C5.6 Power unit geometrical constraints and dimensions**
- C5.6.1** The cylinder bore diameter must be 80mm (+/- 0.1mm).
- C5.6.2** The cylinder bore spacing must be 101.0 +/-2mm.
- C5.6.3** No cylinder of the engine may have a geometric compression ratio higher than 16.0. The procedure which will be used to determine this value may be found in the Appendix to the Technical and Sporting Regulations.
- C5.6.4** Each cylinder centreline must pass through the crank axis +/-0.1mm.
- C5.6.5** The crankshaft centre line must lie at Y=0 and Z=90 (+/-0.5mm) and be parallel to the X axis. The power unit may only transmit torque to the gearbox by means of a single output shaft that must be co-axial with the crankshaft. The output shaft must rotate clockwise when viewed from the front of the car.
- C5.6.6** The crankshaft main journal bearing diameter, measured on the crankshaft, must be no less than 44.95mm. The main journal bearing width excluding chamfer must be no less than 18.95mm.
- The surface area of the main journal bearing, calculated using all surfaces within 0.06mm of the maximum radial thickness must be no less than 2500mm<sup>2</sup>. This will be verified by design.

- C5.6.7** The crankshaft crank pin journal bearing diameter, measured on the crankshaft, must be no less than 41.95mm. The crank pin bearing width excluding the chamfer must be no less than 17.95mm. The surface area of the crank pin journal bearing, calculated using all surfaces within 0.06mm of the maximum radial thickness must be no less than 2200mm<sup>2</sup>. This will be verified by design.
- C5.6.8** The deck height must be a minimum of 168mm.
- C5.6.9** The connecting rod length measured between the centre of the crankshaft journal bore and the piston pin bore must lie between 119.5mm and 120.5mm.
- C5.6.10** Each piston must have three piston rings, two compression rings and one oil control ring.
- C5.6.11** The piston pin diameter must lie between 18.0 and 19.0mm.
- C5.6.12** The valve stem diameter must be no less than 4.95mm.
- C5.6.13** The intake valves' head diameter must lie between 32.5mm and 34.5mm. All intake valves must have an identical design.
- C5.6.14** The exhaust valves' head diameter must lie between 27.0mm and 29.0mm. All exhaust valves must have an identical design.
- For each cylinder, the following three planes are defined (see Drawing 5 of Appendix C-3):
  - The “Lateral plane”, which passes through the cylinder centreline and is normal to the crank axis
  - The “Longitudinal plane”, which passes through both the cylinder centreline and the crank axis
  - The “Transverse plane”, which is normal to the cylinder centreline and coincident with the top deck

Referring to the above-defined planes, the following conditions apply:

- a. The axes of the two intake valves must intersect the Transverse plane inboard of the Longitudinal plane, and be symmetrically arranged about the Lateral plane
  - b. The axes of the two exhaust valves must intersect the Transverse plane outboard of the Longitudinal plane, and be symmetrically arranged about the Lateral plane
  - c. The spark plug axis must intersect the Transverse plane within a quadrilateral defined by the four intersection points defined in points (a) and (b) above
  - d. The injector axis must lie on the lateral plane, outside the longitudinal plane, and the angle between the injector axis and the cylinder centreline must be 70deg (+/- 5 deg).
- C5.6.16** All elements of the power unit specified in the relevant column of the table in Appendix C4 of these regulations must be installed in the Reference Volumes defined in Appendix C2 of these regulation and prefixed with **RV-PU-**. Elements must be installed entirely within the relevant Reference Volume. Where Reference Volumes intersect, elements from any of the intersecting volumes will be permitted within the intersection.

Referring to the “REFERENCE VOLUME” column of the Appendix C4:

- a. All the items listed as “ICE” must be installed within **RV-PU-ICE**
- b. All the items listed as “ERS” must be installed within **RV-PU-ERS**

- c. All the items listed as “TC” must be installed within **RV-PU-TC**
- d. All the items listed as “OT” must be installed within **RV-PU-OT**

Additionally, the following elements must be installed entirely within **RV-PU-ERS**:

- e. HV connections and ERS-K phase conductors.
- f. All elements within the ES main enclosure (defined in Article C5.19.7).

**C5.6.17** Engine (ICE) mountings may only comprise six M12 studs for connection to the survival cell and either four or six M12 studs for connection to the gearbox case. These studs may be fitted on the survival cell, power unit or gearbox case, their installed end must be M12 and their free end may be a different diameter. **Every stud must have a tensile strength greater than 100kN.**

The six mounting faces of the studs for connection to the survival cell must lie at  $[X_{PU}, Y, Z]=[0, \pm 270, 25]$ ,  $[0, \pm 360, 270]$  and  $[0, \pm 190, 440]$ . All six of these studs must be used.

The four mounting faces of the studs for connection to the gearbox case must lie at  $[X_{PU}, Y, Z]=[480, \pm 125, 25]$  and  $[480, \pm 265, 360]$ . All four of these studs must be used. Optionally, an additional two studs may be used, provided their coordinates are at  $[X_{PU}, Y, Z]=[480, \pm 150, 140]$ .

A tolerance of +/- 0.2mm will be permitted on all of the above dimensions, all dimensions refer to the centre of the studs. All dimensions in this Article refer to studs fitted symmetrically about the car centre plane.

Any part which provides additional load path, aside from the path through the studs defined above, from the survival cell to the ICE or from the ICE to the gearbox case, is prohibited unless this is incidental to its principal purpose. Furthermore any such part may provide no greater structural connection between these pairs of assemblies than is reasonable for the safe and reliable fulfilment of its purposes.

**C5.6.18** No part of **RV-PU-ERS** that lies above  $Z=51$  may lie forwards of **RS-FWD-FUEL-LIMIT**.

[Note: this item may be moved to the Chassis Regulations at a future date.]

## **C5.7 Mass and centre of gravity**

**C5.7.1** Depending on where the MGU-K mechanical transmission (as defined in item 26 of Appendix C4 to these Regulations) is located, the overall mass of the ICE “PU Mass group” elements as referred to in Appendix C3 to these regulations must be no less than the values defined below:

- a. If all of the speed ratio of the MGU-K mechanical transmission ~~resides in the MGU-K~~ is located in the **RV-PU-ERS** the total mass of the ICE must be no less than 130.0kg.
- b. If all of the speed ratio of the MGU-K mechanical transmission ~~resides in the ICE~~ is located in the **RV-PU-ICE** the total mass of the ICE must be no less than 134.0kg.
- c. If part of the speed ratio of the MGU-K mechanical transmission is ~~situated in the MGU-K and part in the ICE~~ is located in both the **RV-PU-ICE** and the **RV-PU-ERS** the total mass of the ICE must be no less than 132.0kg.

**C5.7.2** The overall mass of the PU must be a minimum of **185 kg**.

- C5.7.3** The centre of gravity of the power unit must be above Z=200. The parts considered are listed as “ICE” and “TC” in the “PU MASS GROUP” column of Appendix C3, with the exception of items 6 (ICE intake air system components), 20 (ICE-mounted electrical components), ~~27~~ 28 (MGU-K Torque sensor), 29 (SCM), ~~38~~ 40 (Powerbox), ~~39~~ 42 (General electrical devices outside of the ESME) 43 (source of energy independent of the ES), 69 (PU air valve regulators) and ~~66~~ 70 (PU air valve system equipment).
- C5.7.4** The mass of a piston (with piston -pin, piston -pin retainers and piston rings) may not be less than 350g.
- C5.7.5** The mass of a connecting rod (with fasteners, small and big end bearings) may not be less than 320g.
- C5.7.6** The mass of the complete crankshaft assembly between the mid positions of the front and rear main bearing journals (including balance masses, bolts, bungs, O-rings between the boundaries), may not be less than 5800g. See drawing 1 in Appendix C3.
- C5.7.7** When establishing conformity with Articles C5.7.1, C5.7.2, C5.7.3 and Appendix C5 of these Regulations, the homologated power unit perimeter will be defined in accordance with the table shown in Appendix 3 of these regulations.
- 5.7.8** ICE Ballast may be fitted to the ICE in order to achieve the required mass subject to the following restrictions:
- It must have no function other than to add mass to the ICE.
  - The sum of all ICE Ballast components will have a maximum mass of 2kg and homologated within a range of +/-100 gram.
  - ICE Ballast must be secured in such a way that tools are required for its removal and that it remains immobile with respect to the sprung mass in its entirety. It must be possible to remove the ballast without breaking seals on any other part of the ICE. It should also be possible to affix a FIA security label to the ballast if deemed necessary by the FIA technical delegate.
  - Have a density greater than 7500Kg/m<sup>3</sup>.
- C5.8** **Engine intake air**
- C5.8.1** With the exception of incidental leakage through joints or cooling ducts in the engine intake air system (either into or out of the system), all air entering the engine must enter the bodywork through a maximum of two inlets which are located on a single X plane between X<sub>C</sub>= -850 and X<sub>R</sub>= -500 and above Z=200.
- Furthermore, any such inlets must be visible in their entirety when viewed from the front of the car without the driver seated in the car and with the secondary roll structure and any parts attached to it removed (see Article C12.4.2).
- C5.8.2** The addition of any substance other than fuel, as described in Article C5.11.3, into the air destined for combustion is forbidden. Exhaust gas recirculation is forbidden.
- C5.8.3** There must be no more than one butterfly or rotating barrel, as described in Article C5.1.33, in the geometrical path of air exiting the compressor outlet and going to any cylinder.

**C5.9 Variable geometry systems**

- C5.9.1** With the exception of wastegates, variable geometry exhaust systems are not permitted. No form of variable geometry turbine (VGT) or variable nozzle turbine (VNT) or any device to adjust the gas throat section at the inlet to the turbine wheel is permitted.
- C5.9.2** Variable valve timing and variable valve lift profile systems are not permitted.
- C5.9.3** Moveable trumpets are not permitted, and any geometry conveying the air from the compressor outlet to the cylinder inlet must be fixed, except the throttles and the pop off valves.

**C5.10 Exhausts**

- C5.10.1** With the exception of incidental leakage through joints (either into or out of the system) and power unit breather fluids, all and only the fluids entering the compressor inlet and fuel injectors must exit from the engine exhaust system.
- C5.10.2** All turbine exit and all wastegate exhaust fluids must pass through the “tailpipe” defined in Article ~~3.8.2.b~~ [C3.9.2 of the 2023 Technical Regulations](#).
- C5.10.3** A minimum wall thickness of 1.0mm of the exhaust pipe is required for all exhaust pipes from the cylinder head to the turbine and wastegate.
- C5.10.4** The engine must be equipped with lambda sensors either fitted into each exhaust secondary, one per cylinder bank, or a single lambda sensor fitted into the turbine tailpipe. These lambda sensors must be connected to the FIA Standard ECU in a manner specified by the FIA and their measurement must be supplied to the FIA at all times.

**C5.11 Fuel systems**

- C5.11.1** The pressure of the fuel supplied to the fuel injectors may not exceed 350barG.
- C5.11.2** There may only be one fuel injector per cylinder and no fuel injectors are permitted upstream of the intake valves or downstream of the exhaust valves. Bespoke injector nozzle designs are permitted.
- C5.11.3** All cars must be fitted with a fuel flow meter, wholly within the fuel tank. This sensor may only be installed and used as specified by the FIA Technical Department. Furthermore, all fuel delivered to the power unit must pass through this homologated sensor and must all be delivered to the combustion chambers by the fuel injectors described by Article C5.11.2.
- C5.11.4** Homologated sensors which directly measure the pressure and temperature of the fuel supplied to the fuel injectors must also be fitted, these signals must be supplied to the FIA data logger.
- C5.11.5** Any device, system or procedure the purpose and/or effect of which is to increase the flow rate or to store and recycle fuel after the measurement point is prohibited. Additional measurements in each sub-circuit of the fuel system may be requested in order to check compliance. When fuel flow rate is above 90% of the maximum fuel flow defined in C5.4.3, fuel pressures must remain constant in each sub-circuit.
- C5.11.6** A maximum of 0.25 litres of fuel may be kept outside the survival cell, but only that which is necessary for the normal running of the engine.
- C5.11.7** The High pressure fuel pump may only be driven by one of the camshafts actuating the intake or exhaust valves

**C5.12 Ignition systems**

- C5.12.1** Ignition is only permitted by means of a single ignition coil and single spark plug per cylinder. No more than one spark per cylinder per engine cycle are permitted.
- C5.12.2** Only conventional spark plugs that function by electrical potential discharge across an exposed gap are permitted.  
Spark plugs are not subject to the materials restrictions described in Articles C15.7 and C15.8.
- C5.12.3** The spark energy per ignition is limited to a maximum of 120.0mJ.

**C5.13 Ancillaries**

- C5.13.1** Unless specified otherwise, ancillaries must be mechanically or electrically driven. Any electrically driven ancillary cannot be linked mechanically to any drivetrain, including the Power Unit. Ancillaries cannot be used to propel the car.
- C5.13.2** With the exception of batteries of less than 100 kJ total capacity used for safety and control purposes during ERS start-up and shut-down operations, which must be prevented from supplying energy under normal ERS operation; electrical energy may not flow from any ancillary in the direction of any DC pole of the ERS high voltage DC bus. This must be guaranteed by design and verifiable by inspection.
- C5.13.3** For the ICE and the TC, all fuel pumps delivering more than 10 barG, coolant pumps, oil pumps, scavenge pumps, oil/air separators and hydraulic pumps must be mechanically driven directly from the engine and/or MGU-K with a fixed speed ratio.
- C5.13.4** For the ESME, the MGU-K and the PU-CE, all ancillaries (including pumps) may be mechanically or electrically driven

**C5.14 Power unit torque or power demand**

- C5.14.1** The only means by which the driver may control acceleration torque to the driven wheels is via a single foot (accelerator) pedal mounted inside the survival cell.
- C5.14.2** Designs which allow specific points along the accelerator pedal travel range to be identified by the driver or assist ~~him~~ the driver to hold a position are not permitted.
- C5.14.3** At any given engine speed the driver torque demand map must be monotonically increasing for an increase in accelerator pedal position.
- C5.14.4** At any given accelerator pedal position and above 4,000rpm, the driver torque demand map must not have a gradient of less than – (minus) 0.045Nm/rpm.
- C5.14.5** At any given engine speed, the minimum torque in the driver torque demand map must be a negative value achievable with the power unit when the ERS-K power is 0 greater than the minimum curve defined as  $\text{Torque (Nm)} = -0.0027 * \text{engine speed (rpm)} - 30$ .
- C5.14.6** Except for conforming to Article C5.4.87, the ~~electrical DC power of the ERS-K must be a minimum of 200kW for 1s~~ driver maximum power demand cannot be reduced by more than 150kW at the start of any full throttle period and the power reduction will remain fixed for a minimum of 1s.
- C5.14.7** The driver maximum power demand cannot be increased during any full throttle period, except when the overtake mode, as specified in the Appendix to the Regulations, is selected by the driver.

- C5.14.8** The driver maximum power demand must not be reduced at any greater than the rates defined below:
- 50kW in any 1s period at Competitions where the FIA determines that the power limited distance exceeds 3500m. These Competitions and the vehicle fundamentals used for the calculation of the power limited distance may be found in the Appendix to the Technical and Sporting Regulations.
  - 100kW in any 1s period at all other Competitions.

Furthermore, the total power reduction is limited to a maximum of 450kW and the resulting electrical DC power of the ERS-K must remain above -100kW.

- C5.14.9** The electrical DC power of the ERS-K may not be reduced at rates greater than those specified in Article C5.14.8, unless:
- the theoretical MGUK power resulting from reduction at rates equal to those specified in Article C5.14.8 is negative;
  - the ICE power is negative and the ERS-K power needs to be reduced further to achieve the driver demand;
  - the ERS-K power needs to be reduced further to achieve the maximum power permitted by Article C5.4.8;
  - the driver power demand is negative;
  - a gearshift is in progress.
  - car speed is below 210kph.

[Note: Further discussions will take place to fully evaluate the benefits and consequences of art. C5.14.9 and whether modifications are necessary, with the aim of preventing by-pass of article C5.14.8 without being too penalising from an energy point of view]

- C5.14.10** Details of the implementation in the FIA Standard ECU of the application and monitoring of Article C5.14 may be found in the Appendix to the Technical and Sporting Regulations.

## **C5.15 Power unit control**

- C5.15.1** The maximum delay allowed, computed from the respective signals as recorded by the FIA ADR or FIA Standard ECU, between the accelerator pedal position input signal and the corresponding output demands being achieved is 50ms.

- C5.15.2** Teams may be required to demonstrate the accuracy of the power unit configurations used by the FIA Standard ECU.

- C5.15.3** Power unit control must not be influenced by clutch position, movement or operation.

- C5.15.4** The idle speed control target may not exceed 4,000rpm.

- C5.15.5** A number of power unit protections are available in the FIA Standard ECU.

A minimum of nine seconds hold time should be configured for the power unit protections enabled during qualifying and race. The configuration of the air tray fire detection and throttle failsafe are exceptionally unrestricted in order to allow each team to achieve the best level of safety.

- C5.15.6** The power unit must achieve the torque demanded by the FIA standard software.

- C5.15.7** Regulatory torque sensors must be fitted to measure the following output torques:



- a. The PU torque output (Ref Appendix C4 Item 21)
- b. The MGU-K torque output (Ref Appendix C4, item 28 ~~27~~)

The installation and the connectivity of each of these torque sensors to the FIA Standard ECU must be approved by the FIA.

For reference, torque sensors will also be fitted to each driveshaft. These will be defined in future versions of 2026 Technical Regulations that also cover the 2026 car.

- C5.15.8** Engine plenum air temperature must be more than ten degrees centigrade above ambient temperature. When assessing compliance, the temperature of the air will be the lap average recorded, by an FIA approved and sealed sensor located in an FIA approved location situated in the engine plenum, during every lap of the qualifying practice session and the race. The first lap of the race, laps carried out whilst the safety car is deployed, laps with a time at least 20% greater than the fastest lap of the session, pit in and out laps and any laps that are obvious anomalies (as judged by the FIA) will not be used to assess the average temperature. The ambient temperature will be that recorded by the FIA appointed weather service provider. This information will also be displayed on the timing monitors.
- C5.15.9** Any pressure sensor used to measure pressure of any fluid necessary to ensure the power unit functions correctly at all times (including but not limited to coolant, oil, fuel and air) will be classified as a regulatory sensor (reference item 22 Appendix C4).
- C5.15.10** With the exception of exhaust temperature sensors and temperature sensors embedded in electronic boxes, any temperature sensor used to measure temperature of any fluid necessary to ensure the power unit functions correctly at all times (including but not limited to coolant, oil, fuel and air) will be classified as a regulatory sensor (reference item 22 Appendix C4).
- C5.15.11** A maximum of one knock sensor per cylinder is permitted. This sensor must be an accelerometer-type.
- C5.15.12** No sensor of any kind, designed or installed to measure or infer internal cylinder pressure, temperature, or to determine the heat release characteristics will be permitted, with the exception of the standard knock sensors permitted by Article C5.15.11 with standard signal processing by the FIA Standard ECU.

Any other sensor which is incidentally capable of measuring or inferring internal cylinder pressure, temperature, or determining the heat release characteristics must have an attenuation of no less than 40dB above 1kHz at any point in the measurement chain and will be subject to the homologation required by Article 8 (TR 2023).

#### **C5.16 Engine high rev limits**

Engine high rev limits may vary for differing conditions provided all are contained within a band of 750rpm. However, a lower rev limit may be used when:

- a. The gearbox is in neutral.
- b. Stall prevention is active.
- c. The driver clutch request is greater than 95% of the total available travel of the driver clutch actuation device, used only to protect the engine following a driver error.



- d. An engine protection is active.
- e. The bite point finder strategy is active.
- f. The safety car is deployed or during the formation lap.

Except for the above conditions, power unit actuators may not be used to artificially control the power unit speed or alter the power unit response in a rev range more than 750rpm below the final rev limit.

#### **C5.17 Starting the engine**

The car must be fired up with its on-board system (MGU-K) at any time.

#### **C5.18 Stall prevention systems**

If a car is equipped with a stall prevention system, and in order to avoid the possibility of a car involved in an accident being left with the engine running, all such systems must be configured to stop the engine no more than ten seconds after activation.

The sole purpose of such systems is to prevent the engine stalling when a driver loses control of the car. If the car is in second gear or above when the system is activated multiple gear changes may be made to either first gear or neutral, under all other circumstances the clutch alone may be activated.

Each time such a system is activated the clutch must be fully disengaged and must remain so until the driver de-activates the system by manually operating the clutch with a request greater than 95% of the total available travel of the drivers clutch actuation device.

#### **C5.19 Energy Recovery System (ERS)**

**C5.19.1** The system will be considered shut down when no high voltage will be present on the portion of the HV DC Bus located on the CU-K side of the ES main contactors, across any capacitor belonging to the CU-K or outside of the RV-PU-ERS.

It must be possible to shut down the ERS via the following means:

- a. The **driver Master Switch** required by Article C8.8.1 ~~of the 2023 Technical Regulations~~.
- b. The **switches handles** required by Article C8.8.2 ~~of the 2023 Technical Regulations~~.
- c. The **switch or clutch disengagement button** required by Article C9.5. ~~of the 2023 Technical Regulations~~.

The shutdown process must take no longer than two seconds from activation and must be started immediately when the electrical circuits to the ignition are cut off by any of the means described in articles C8.8.1 and C8.8.2. ~~of the 2023 Technical Regulations~~.

**C5.19.2** The ERS must shut down when the FIA Standard ECU initiates an anti-stall engine shut off.

**C5.19.3** All cars must be fitted with two ERS status lights which:

- a. Have been supplied by an FIA designated manufacturer and fitted to the car in accordance with the instructions in the Appendix to the Technical and Sporting Regulation.
- b. Are in working order throughout the Competition.

- c. Must remain powered for at least 15 minutes following the start of the shutdown process. The FIA ADR internal battery will be responsible for power supply to those lights once the ERS is shutdown.
- d. Are marked with a “HIGH VOLTAGE” symbol according to ISO3864 of at least 30mm along the triangle side and no more than 50mm away from the lights.

**C5.19.4** All cars must be fitted with one ERS Status Buzzer unit which:

- a. Have been supplied by an FIA designated manufacturer and fitted to the car in accordance with the instructions in the Appendix to the Technical and Sporting Regulation.
- b. Are in working order throughout the Competition.
- c. Remains powered for at least 15 minutes following the start of the shutdown process. The FIA ADR internal battery will be responsible for the power supply to the unit once the ERS is shutdown.

**C5.19.5** All cars must provide signals regarding the current car operating safety status to the FIA ADR in order to facilitate control of the ERS status lights and ERS Status Buzzer unit. The status of the car must be based at least on the insulation measurement, cells voltage, cells temperature, contactors and the systems defined in C5.23.4. The systems which provide these signals managed by the BMS must remain powered and working 15min after the shutdown process has been started. **They must be connected to a source of energy independent of the ES and ensure that these systems remain powered in the event of reasonably foreseeable ES issues.**

**C5.19.6** The maximum working voltage on the car must never exceed 1000V.

**C5.19.7** The following elements of the power unit must be fitted inside the ES main enclosure installed within the ERS Reference Volume (RV-PU-ERS):

- a. ES elements as defined in items ~~32~~ 34 (ES) and ~~35~~ 37 (HV elements) of Appendix C4 to these regulations.
- b. The HV safety elements and sensors defined in items ~~33~~ 35 (DC sensor, IMD) and ~~34~~ 36 (safety devices) of Appendix C4 to these regulations.
- c. The DC-DC Unit and its connection to the ES HV DC bus. Includes active parts, enclosure, brackets and supports.
- d. CU-K. Includes active parts, enclosure, brackets and supports.
- e. HV DC connections between ES and CU-K/DC-DC Unit. Includes all conductors, insulation, EMC screening, mechanical and thermal shielding.

**C5.19.8** In addition to the components listed in Article C5.19.7, the following elements may also be fitted within the ES main enclosure:

- a. Low voltage Power Distribution Board (PDB).
- b. PU Electric pump Driver units and non ICE-mounted ERS cooling systems as defined in item ~~54~~ 58 of Appendix C4 ~~to these regulations~~.
- c. Low Voltage systems passive protection devices - Fuse box.
- d. Low Voltage looms exclusively used: for PU functionalities or power supply to non-PU devices.

- e. ~~General electrical Any Electronic Box~~ devices exclusively used for PU functionalities, as defined in item 41 of Appendix C4

With the exception of wiring or any mechanical supports for these components, no additional elements may be fitted in the ES main enclosure.

**C5.19.9** The minimum mass for the ES Main Enclosure PU Mass group elements as defined in Appendix ~~C4 to these Regulations~~ is 35.0kg. The procedure which will be used to determine this value may be found in the Appendix to the Technical and Sporting Regulations.

**5.19.10** Any significant debris resulting from a failure of the elements located inside the RV-PU-ERS and defined in Appendix 3 items 25(MGU-K) and 26 (MGU-K mechanical power transmission) must be contained by and within the housing(s) hosting those parts. Documents demonstrating compliance with this requirement must be part of the PU Manufacturer homologation dossier. Additional guidance may be found in the Appendix to the Technical and Sporting Regulations.

## **C5.20 MGU-K**

**C5.20.1** The MGU-K must be mechanically fixed to the survival cell, the ICE or both.

**C5.20.2** Under normal operating conditions all MGU-K rotating parts must be permanently mechanically linked to the ICE with a fixed speed ratio to the crankshaft. The MGU-K and its drive axis must be parallel to the crankshaft axis.

**C5.20.3** All mechanical power to and from the MGU-K must pass through a single shaft to the MGU-K transmission. The connection to the ICE crankshaft must be ahead of  $X_{PU}=100$ .

**C5.20.4** An in-line, passive, dissipative energy torque limitation device may be incorporated in this link which temporarily allows the speed ratio to change for the sole purpose of protecting the components from dynamic torque overshoots. This device may only act above 520Nm when referred to crankshaft speed.

**C5.20.5** The relative rotational speed between any two parts of the MGU-K may not exceed 60,000rpm.

**C5.20.6** The thickness of the stack magnetic soft alloy laminated sheets may not be less than 50µm.

**C5.20.7** Depending on where the MGU-K mechanical transmission is located, the total mass of the MGU-K “PU Mass group” elements as referred to in Appendix ~~C4 to these regulations~~ must be no less than the values defined below:

- If all of the speed ratio of the MGU-K mechanical transmission ~~resides in the MGU-K~~ is located in the RV-PU-ERS the total mass of the MGU-K must be no less than 20.0kg.
- If all of the speed ratio of the MGU-K mechanical transmission ~~resides in the ICE~~ is located in the RV-PU-ICE the total mass of the MGU-K must be no less than 16.0kg.
- If part of the speed ratio of the MGU-K mechanical transmission is ~~situated in the MGU-K and part in the ICE~~ located in both the RV-PU-ICE and the RV-PU-ERS the total mass of the MGU-K must be no less than 18.0kg.

The total mass of ~~any shaft passing across the ICE/MGU-K boundary~~ item 28 (MGU-K torque sensor) and item 30 (K torque sensor shaft and mechanical connection between MGU-K and ICE) must be allocated to either the MGU-K or the ICE to assess compliance with this article and article C5.7.1.

**C5.20.8** All rotating parts of the MGU-K and its mechanical transmission must have a fixed inertia by design. Any system other than that permitted by article C5.20.4, the effect of which is to vary the inertia, is prohibited.

**C5.20.9** The elements defined in item ~~29~~ 30 (MGU-K torque sensor shaft) of Appendix C4 to these regulations must be dismountable from their respective PU elements without breaking any FIA permanent seal.

### **C5.21 Energy Store**

**C5.21.1** Only cells approved by the FIA Technical Department may be used in the ES. Subject for provision of the Article C18.3.5, the approval of the FIA Technical Department is conditional upon the PU manufacturer, intending to use such parts during a Championship season undertaking not to conclude any exclusivity agreement (see definition article C5.1.30) for the supply of such parts with the supplier of these parts. The approval request form must be sent by the PU Manufacturer to the FIA before the 1st of November of the preceding year.

**C5.21.2** Solely a single specification of cell may be homologated, including the same exiting position of the cell connection terminals (cell tabs - Article C5.2.26). The cell tabs may have different shapes for integration purposes inside the ES.

**C5.21.3** Any non-ERS energy storage and components supplied by it will be considered an ancillary and subject to Article C5.13.1.

**C5.21.5** The DC-DC unit HV DC Bus branch must have a DC-DC unit fuse, and, additionally, DC-DC unit relay(s) if connected on the ES side of the ES Main contactors. Those protective devices will insulate the DC-DC unit from the HV DC Bus DC+ and DC- poles and protect the installation in case of short circuit.

The DC-DC unit relay(s) must provide a dielectric strength:

- a. between the relay control circuit and any of the high voltage contacts and;
- b. across high voltage contacts, when the high voltage circuit is open.

For each of (a) and (b) above:

- c. A dielectric withstanding voltage test must be performed with a DC voltage at least equal to the ES maximum DC voltage plus 1200V. The device must withstand the DC voltage for 60 seconds with a leakage current lower than 1mA and without flashover. The test must be performed on both HV terminals polarities if solid-state relays are used.
- d. The electrical resistance measured by applying a DC voltage of 500VDC when the circuit is open must be higher than 50MΩ.

Once commanded to open, the DC-DC unit relays must be able to keep the DC-DC unit insulated from the ES HV DC Bus branch.

**C5.21.6** With the exception of the ES safety systems, the ES cells defined in C5.2.25 are the only energy storage source allowed in the ES.

**C5.22 ES design and installation**

**C5.22.1** High voltage must not be present or accessible by any reasonable means between the ES main enclosure and any ES off-board charging connector when the off-board charger is not connected.

**C5.22.2** No high voltage is permitted outside of the RV-PU-ERS, except:

- a. For the high voltage inside the power box where the boost converter can generate up to 80V DC.
- b. When an off-board charger is connected to charge or discharge the ES.

**C5.22.3** The ES must be equipped with a BMS which:

- a. Must detect internal faults and must trigger power reduction delivered from/to the battery or shutdown the ERS if it considers that the ES is operating unsafely.
- b. Must be capable of reducing the voltage dispersion between each cell to its minimal level without breaking any FIA seal.
- c. Must only be capable of consuming energy and cannot transfer energy from any PU-CE into the ES. This must be guaranteed by design and verifiable by inspection.

**C5.22.4** The ES must be equipped with a fuse to protect the system in case of a short circuit. The fuse shall be located as close as possible to the cells.

The fuse must be tested and demonstrated to work in realistic load cases.

**C5.22.5** The ES must have at least two contactors, one per positive and negative pole. Those ES main contactors must insulate the CU-K from the high voltage parts of the ES once the shutdown process is completed.

Contactors must provide a dielectric strength:

- a. between the contactor's control circuits and any of the high voltage contacts and;
- b. across high voltage contacts, when the high voltage circuit is open.

For each of (a) and (b) above:

- c. A dielectric withstanding voltage test must be performed with a DC voltage at least equal to the ES maximum DC voltage plus 1200V. The device must withstand the DC voltage for 60 seconds with a leakage current lower than 1mA and without flashover.
- d. The electrical resistance measured by applying a DC voltage of 500VDC when the circuit is open must be higher than 50MΩ.

Once commanded to open, contactors must be able to keep the high voltage circuit open.

The contactors must be tested and demonstrated to work in realistic load cases, as described in the Appendix to the Technical and Sporting Regulations.

- C5.22.6** Only Fuses and Contactors for ERS application approved by the FIA Technical Department will be accepted. The approval of the FIA Technical Department is conditional upon such parts being available on a non-exclusive basis and under normal commercial terms to all Competitors. The approval request form must be sent by the component supplier to the FIA before the 1st of November of the year preceding the year of introduction.
- C5.22.7** In addition to the contactors mentioned in C5.22.5, the ES HV DC+ and DC- poles must be capable of being isolated from the PU-CE(C5.2.10) consumers by means of a manual action(s). The operator must be able to perform the manual operation(s) before opening any ERS-K phase conductors connection or interface giving access to live parts while the ERS is fitted to the car.
- C5.22.8** Interfaces must be present on the ESME and may be present on the MGU-K to allow the connection of the ERS-K Phase Conductors between the ESME and the MGU-K. Should such interfaces not be present on the MGU-K then the parts that fulfil the function of the ERS-K Phase Conductors will be considered to be part of the MGU-K.
- C5.22.9** The ES main enclosure must be equipped with a gas evacuation system which in case of ES cell(s) venting or electronic components explosion prevents irreversible mechanical damage to the ESME. The design and operating conditions of such a system are of responsibility of each PUM and must be detailed in their respective FMEA. This venting system must be approved by the FIA Technical Department before the 21st of March of the year preceding the year of introduction.
- C5.22.10** The ES main enclosure material(s) must satisfy a minimum fire protection equivalent of UL94 V0 unless the ES cells are proven to not be susceptible to self-heating phenomenon. A document demonstrating compliance with this article must be included in the PU Manufacturer homologation dossier. Guidance on how to demonstrate that ES cells aren't prone to thermal runaway behaviour may be found in the Appendix to the Technical and Sporting Regulations.
- C5.22.11** The ES must have only two poles, the ES HV DC+ and ES HV DC-, that are connected to the HV DC Bus. Additionally, the CU-K, the DC-DC Unit and any other PU-CE may only be connected to the HV DC bus via the ES HV DC+ and ES HV DC- poles.

## **C5.23 ERS General electrical safety**

### **C5.23.1 Principles**

- a. A single point of failure of the electric system or ERS cannot result in a person being exposed to a live part.
- b. The components used cannot cause injury under any circumstances or conditions, whether during normal operation or in reasonably foreseeable cases of malfunction.
- c. If a single fault can predictably generate multiple failures, they must be considered as a single point of failure.

### **C5.23.2 Protection of cables, lines, connectors, switches, electrical equipment**

The following design practices must be adhered to for all electrical parts external to the ES main enclosure or accessible and which operate at high voltage:

- a. Protection against electrical shock via basic insulation combined with equipotential bonding, double insulation or reinforced insulation

- b. Protection against risks of mechanical damage
- c. Parts should be secured with cable guides, enclosures and conduits if exposed to stress (mechanical, vibration, thermal)
- d. Each cable must be rated to the respective circuit current and must be insulated adequately for the environment and operating conditions
- e. Sections of looms containing high voltage wiring must be coloured orange
- f. Connectors must be IP2X when not connected and IP65 when mated
- g. A connector plug must physically only be able to mate with a single correct socket of any sockets within reach
- h. Comply with creepage and clearance distances according to IEC-60664. Connectors which are opened in the garage must be considered PD3 or higher. Clearance and creepage requirements can be verified by safety tests proposed in IEC-60664-1 session 6.
- i. If, under the provisions of Article C5.20.1, the MGU-K is fixed to the ICE, the PU manufacturer must provide proof that the ERS-K phase conductors and connectors would not lead to exposed high voltage in case of foreseen damage conditions.

**C5.23.3** The ES main enclosure, MGU-K and any HV box residing outside the ES main enclosure must be marked with a “Danger High Voltage” symbol according to ISO 7010. In addition to that, the ES main enclosure must be orange coloured.

- C5.23.4** All ERS high voltage conductors outside of the ES main enclosure must be equipped with:
- a. A system to prevent high voltage on the CU-K side of the ES contactors when ERS-K phase conductors are not connected or incorrectly mated. In the event of detection of any of those conditions, actions must be immediately taken to ensure safe operation. The list of actions must be pre-defined in a Failure Mode and Effect Analysis provided to the FIA by each competitor. To avoid spurious detections a software debounce of maximum one second may be used.
  - b. A system to allow detection of insulation faults or damaged high voltage lines by an isolation monitoring device.

**C5.23.5** To mitigate the risk failure mode where a high voltage is AC coupled onto the car’s low voltage system, bonding is required for any system component to which a wire, cable or harness connects, or passes in close proximity, and which is able to conduct current by means of AC coupling.

The bonding must protect against short circuit currents generated by an insulation failure and low currents generated by capacitive coupling. It can be achieved using wires or conductive parts of an appropriate dimension.

Any components that require equipotential bonding will be connected to the car main ground and the resistance of potential equalization paths must not exceed 5.0  $\Omega$ .

In addition, the resistance measured between any two exposed conductive parts of the high voltage system must not exceed 0.1  $\Omega$ .



**C5.23.6** An insulation monitoring device must be used to measure the insulation resistance between the car main ground and the entire conductively connected high voltage system. The insulation monitoring device (reference item ~~35~~ Appendix C4) will be used as the primary source of measurement and the DC sensor connected to the ES high voltage negative DC pole as a backup source. They must be connected on the ES side of the contactors.

**C5.23.7** The UN38.3 energy store transportation certification must be shared with the FIA during the homologation of each Energy recovery system specification.

#### **C5.24 Replacing power unit parts**

Refer to the Article 2.1.10 of the Sporting Regulations.

#### **C5.25 Oil and coolant systems and charge air cooling**

**C5.25.1 Coolant header tanks:** Any header tank used on the car must be fitted with an FIA approved pressure relief valve which is set to a maximum of 3.75 barG, details of the relief valve may be found in the Appendix to the Technical and Sporting Regulations. If the car is not fitted with a header tank, an alternative position must be approved by the FIA.

**C5.25.2 Cooling systems:** The cooling systems of the power unit, including that of the air destined for combustion, must not intentionally make use of the latent heat of vaporisation of any fluid with the exception of fuel for the normal purpose of combustion in the engine as described in Article C5.11.3.

**C5.25.3 ~~Main Oil tank:~~** ~~All cars must be fitted with a main oil tank.~~ All cars must be fitted with a single oil tank. Oil, as defined in article C16.1.5, may only be contained by the oil tank and associated lines, elements defined in item 46 of Appendix C4, ICE, oil radiators/heat-exchangers, Turbocharger, MGUK and MGUK transmission.

**C5.25.4 ~~Main Oil tank level measurement:~~** The ~~main~~ oil tank must be fitted with an oil level sensor. The measurement of the oil level in the ~~main~~ oil tank must be supplied to FIA at all times.

**C5.25.5 Oil injection:** The use of active control valves between any part of the PU and the engine intake air is forbidden.

**C5.25.6 ~~Engine Oil (reference item 75 Appendix C4), as defined in Article C16 of the Technical Regulations, may only be contained by the main oil tank defined in C5.25.3, lines associated with it and the engine.~~** The use of an auxiliary oil tank, or other forms of oil storage other than the single oil tank defined in C5.25.3 is not permitted. Accumulation of oil in other volumes (such as catch tanks) may be deemed acceptable only if incidental.

#### **C5.26 Component Classification**

**C5.26.1** All components belonging to the power unit (PU) are listed in Appendix C4. Their classification (“SSPUC”, “DSPUC”, “LPUC”, “OSPUC”), as defined in Article C18 ~~of the Technical Regulations~~, is listed under column “COMPONENT CLASSIFICATION”.

#### **C5.27 Single ICE Mode**

The power unit must be operated in a single ICE mode during each competitive lap in all sessions of a Competition, with the exception of free practice sessions. All details concerning policing of this article may be found in the Appendix to the Technical and Sporting Regulations.



**ARTICLE C6: FUEL SYSTEM****C6.1 Fuel tanks**

- C6.1.1** The fuel tank must be a single rubber bladder conforming to or exceeding the specifications of FIA Standard FT5–1999, the fitting of foam within the tank however is not mandatory. A list of approved materials may be found in the Appendix to the Technical and Sporting Regulations.
- C6.1.2** With the exception of the fuel out of the survival cell permitted under Article C5.11.6, all fuel on board the car must be stored within the following limits:
- Ahead of  $X_{PU}=0$ .
  - Rearward of RS–FWD–FUEL–LIMIT.
  - Inboard of  $Y=450$ .
- C6.1.3** No fuel bladders shall be used more than 5 years after the date of manufacture.
- C6.1.4** All fuel tanks must be fitted with a pressure relief valve to prevent overpressure, and with a fuel tank pressure sensor as specified in the diagram of Article C6.6.4. The FIA may request Competitors to demonstrate that the specification of all relevant parts of the fuel tank, and the strength of the surrounding structure, are consistent with the pressure that the pressure relief valve is set to.
- C6.1.5** The maximum internal pressure exerted on the fuel bladder must not exceed 1.0 barG.

**C6.2 Fittings and piping**

- C6.2.1** The total area of apertures in the fuel bladder must not exceed 35 000mm<sup>2</sup>.
- Circular apertures smaller than 35mm diameter may be closed with a fitting, secured with a single threaded fastener on the full diameter of the opening, provided that this threaded fastener is provided with mechanical secondary locking.
- All other apertures in the fuel bladder must be closed by hatches or fittings which must:
- Be secured to metallic bolt rings bonded to the inside of the bladder.
  - Have bolt hole edges no less than 5mm from the edge of the bolt ring, hatch, or fitting.
  - Attach directly to the fuel bladder and have no part of the survival cell structure included in the closure.
  - Be secured with multiple fasteners in such a way that the absence of any single fastener does not compromise the security of the closure.
- C6.2.2** Where the fuel bladder is attached to the survival cell, fixings must be designed so that if it is pulled away from the survival cell, the attachment will fail without compromising the integrity of the fuel bladder. For this assessment, the pull–out load for any fitting will be calculated from the clamp area between the fitting and the bladder (on one face of the bladder). Between a clamp area of 1650mm<sup>2</sup> and 9 500mm<sup>2</sup>, the load will be a linear interpolation between points (1650mm<sup>2</sup>, 11kN) and (9 500mm<sup>2</sup>, 37.5kN). Below a clamp area of 1650mm<sup>2</sup>, the load will be taken as 11kN. Above a clamp area of 9 500mm<sup>2</sup>, the load will be taken as 37.5kN. No fitting may have a clamp area of less than 600 mm<sup>2</sup>.

- C6.2.3** All fuel lines between the fuel tank and the engine must have a self-sealing breakaway valve. This valve must separate at less than 50% of the load required to break the fuel line fitting or to pull it out of the fuel tank.
- C6.2.4** No lines containing fuel may pass through the cockpit.
- C6.2.5** All lines must be fitted in such a way that any leakage cannot result in the accumulation of fuel in the cockpit.
- C6.2.6** All components containing fuel at a pressure greater than 10barG must be located outside the fuel tank.

### **C6.3 Fuel tank fillers**

Fuel tank fillers must not protrude beyond the bodywork. Any breather pipe connecting the fuel tank to the atmosphere must be designed to avoid liquid leakage when the car is running, and its outlet must not be less than 250mm from the cockpit opening.

All fuel tank fillers and breathers must be designed to ensure an efficient locking action which reduces the risk of an accidental opening following a crash impact or incomplete locking after refuelling.

### **C6.4 Refuelling**

- C6.4.1** A cover must be fitted over any refuelling connector at all times when the car is running on the track. The cover and its attachments must be sufficiently strong to avoid accidental opening in the event of an accident.
- C6.4.2** The fuel in a car must not be colder than the lowest of: ten degrees centigrade below ambient temperature, or ten degrees centigrade, at any time when the car is running after leaving the Competitor's designated garage area.

When assessing compliance:

- a. The ambient temperature will be that recorded by the FIA appointed weather service provider one hour before any practice session or three hours before the race or sprint session. and will be displayed on the timing monitors.
- b. The temperature of the fuel (TFFMFuel) will be that recorded in the car by the Fuel Flow Meter.

**C6.4.3** The use of any device on board the car to decrease the temperature of the fuel is forbidden.

**C6.4.4** Fuel may not be added to nor removed from a car during a race.

**C6.4.5** Any refuelling procedure must respect the provisions of Article XX of the Sporting Regulations.

### **C6.5 Fuel draining and sampling**

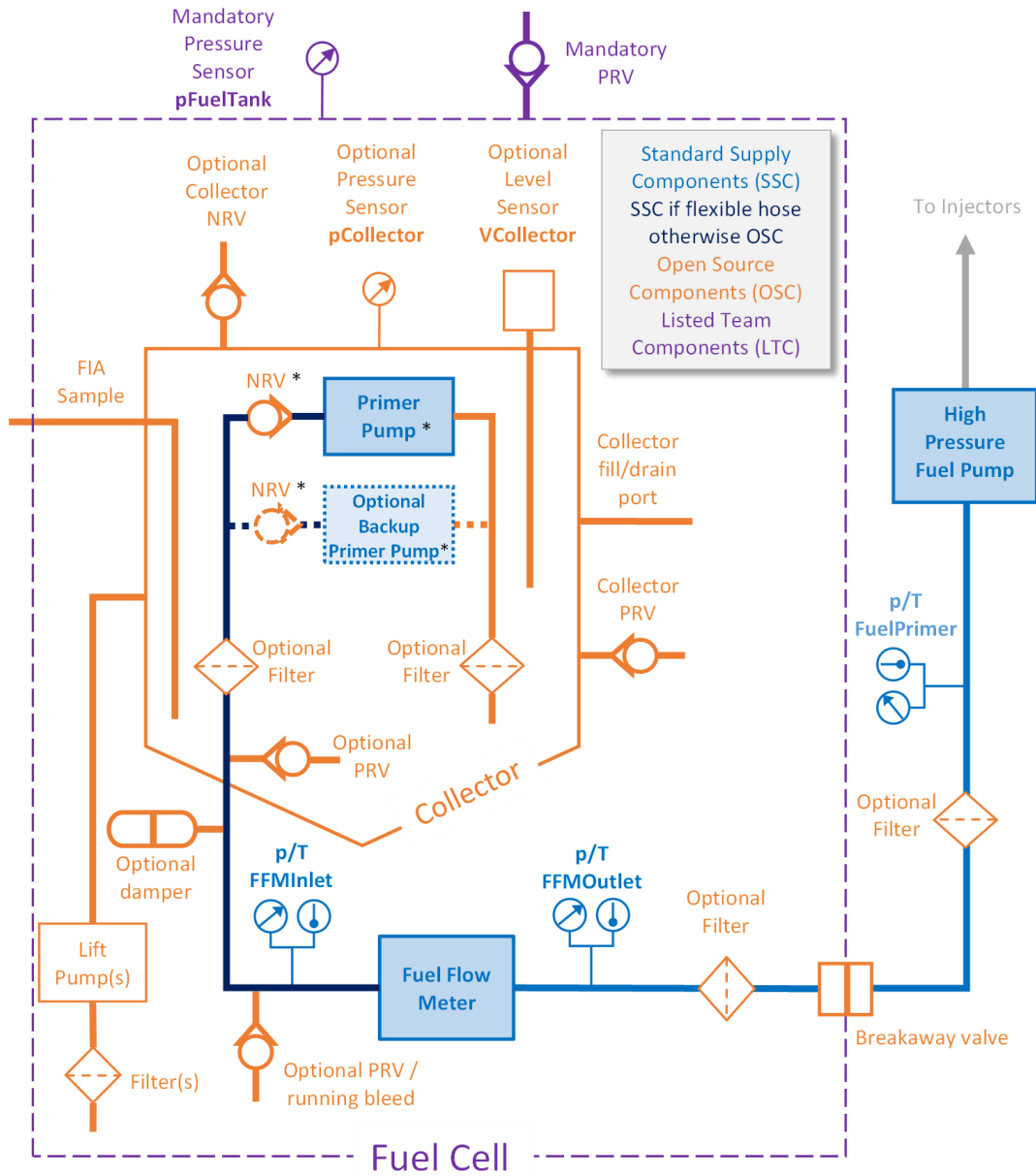
**C6.5.1** Competitors must provide a means of removing all fuel from the car.

**C6.5.2** Competitors must ensure that a 0.70 litre sample of fuel may be taken from the car at any time during the Competition.

After a practice session, if a car has not been driven back to the pits under its own power, it will be required to supply the above-mentioned sample plus the amount of fuel that would have been consumed to drive back to the pits. The additional amount of fuel will be determined by the FIA.

- C6.5.3** ~~All cars must be fitted with a -2 'Symetrics' male fitting in order to facilitate fuel sampling. It must be possible to take a fuel sample drawn from the fuel collector or the main fuel line that connects the fuel collector to the breakaway valve, where these locations are as defined in the fuel system hydraulic schematic shown in Article C6.6.4. To facilitate fuel sampling the car must be equipped with a - Parker Stratoflex Slide-Lok -2 Nipple or the Competitor must provide a suitable adaptor to connect an alternative fitting to this format.~~ If an electric pump on board the car cannot be used to remove the fuel an externally connected one may be used provided it is evident that a representative fuel sample is being taken. If an external pump is used it must be possible to connect the FIA sampling hose to it and any hose between the car and pump must be -3 in diameter and not exceed 2m in length. Details of the fuel sampling hose may be found in the Appendix to the Technical and Sporting Regulations.
- C6.5.4** The sampling procedure must not necessitate starting the engine or the removal of bodywork (other than the nosebox assembly and the cover over any refuelling connector).
- C6.6 Fuel System Hydraulic Layout**
- C6.6.1** Parts listed in Appendix C7 sections 6A and 6E are classified as OSC.
- C6.6.2** The primer pump(s) and fuel flow meter are SSC, the high pressure fuel pump and the pressure and temperature sensors are SSPUC; as mandated by the FIA and specified in the Appendix to the Technical and Sporting Regulations.
- C6.6.3** All flexible pipes and hoses and their fittings between the primer pump and the high pressure fuel pump are SSC, as mandated by the FIA. The specification and permitted lengths are given in the Appendix to the Technical and Sporting Regulations. Rigid pipes and manifolds and their fittings may be used instead of flexible pipes and hoses up to the inlet of the Fuel Flow Meter.
- C6.6.4** The hydraulic layout of the fuel system must functionally conform to the schematic given in the drawing below. Additional components (such as collector pressurisation system) are permitted, subject to the approval of the FIA if they are deemed necessary for the proper behaviour of the system.

Furthermore, fuel cell components, such as fuel cell pressurisation system and fill/drain hoses, are permitted provided they do not functionally interfere with the system shown.



**C6.6.5** If a fuel pressure damper is fitted it must be fitted upstream of the Fuel Flow Meter described in article C5.11.3.

**C6.6.6** The pressure of the fuel inside the collector may be increased relative to the pressure in the fuel cell volume by the lift pumps and/or either:

- i. air pressure acting on the free surface of the fuel,
- ii. or hydraulic oil or air pressure acting on a piston.

In all cases the increase in pressure in the collector must be for the sole purpose of maintaining the primer pump(s) inlet pressure above the cavitation point. And it must be demonstrated to the satisfaction of the FIA that any fluid used for this purpose cannot be used to change to composition of the fuel.

\* The primer pump(s), the NRV(s), the damper, the filter and PRV downstream of the NRV(s) may be installed inside or outside the Collector.

**ARTICLE C7: OIL AND COOLANT SYSTEMS AND CHARGE AIR COOLING****C7.1 Location of lubricating oil tanks**

All oil storage tanks must be situated between  $X_F=0$  and  $X_{DIF}=150$ , and must be no further outboard than the lateral extremities of the survival cell.

**C7.2 Location of lubricating oil system**

No other part of the car containing lubricating oil may be situated behind  $X_{DIF} = 150$  or outboard of  $Y=750$ .

**C7.3 Oil and coolant lines**

**C7.3.1** No lines containing coolant or lubricating oil may pass through the cockpit.

**C7.3.2** All lines must be fitted in such a way that any leakage cannot result in the accumulation of fluid in the cockpit.

**C7.3.3** No hydraulic fluid lines may have removable connectors inside the cockpit.

**C7.4 Heat exchangers****C7.4.1 Definitions**

For the content of Articles C7.4 and 17, the following definitions apply:

- a. **Heat Exchanger:** a device for transferring heat between two or more fluids.
- b. **Primary Heat Exchanger:** a heat exchanger that uses the air flowing over or through the car to cool a fluid, which includes all of the core, tubes, header plates, header tanks and fins.
- c. **Secondary Heat Exchanger:** a heat exchanger that uses a fluid other than the air flowing over or through the car to cool another fluid.
- d. **Core:** any part of the heat exchanger where one of the fluids is divided into multiple channels, and in which the primary function of the Heat Exchanger is achieved. If two or more such components lie on the same side of the car and outboard of  $Y=200$  or two or more such components are centred around the  $Y=0$  plane, and have an inlet liquid from the same source, or an outlet liquid that goes to the same destination, these will be considered to be part of the same core. Such components which share neither an inlet liquid from the same source, nor an outlet liquid that goes to the same destination are considered to form separate cores, even if the individual components are integrated to each other for construction purposes.
- e. **Tubes:** the enclosed channels within the core in which one of the fluids flows.
- f. **Header plates:** The face of the header-tank adjacent to the core, through which the tubes pass and to which they are sealed.
- g. **Fins:** devices between the tubes or within the tubes whose function it is to increase the level of heat exchange by convection and/or an increase of contact area.

**C7.4.2 Primary heat exchanger specification and technology**

For Primary Heat Exchangers used on the car, the following restrictions apply:

- a. The core and header tanks must be made from aluminium alloy.

- b. The core must not be produced using additive manufacturing.
- c. Tubes must have a wall thickness of at least 0.18mm.
- d. The internal cross section of any tube must have an area of at least 10mm<sup>2</sup>, without considering structural stiffening ribs and the internal fins described in point (e) below.
- e. Fins fitted inside the tubes must have a thickness of at least 0.06mm. Fins fitted between the tubes must have a minimum thickness of 0.05mm.

~~In any liquid to air primary heat exchanger, the following additional restrictions apply:~~

- ~~f. Its core may be divided in to two or more parts, each part must be planar and all parts must be parallel with each other. Tubes must be straight and parallel.~~
- ~~g. Header plates must be perpendicular to the face of the core when measured in the plane of the tubes and air fins. The angle between the header plate and a tube, at their intersection, must not be less than 60°. Furthermore, with the exception of up to two sharp corners per header plate, the header plate may not have a radius of curvature of less than 50mm, prior to the holes being added for the tubes.~~

#### C7.4.3 Secondary heat exchanger specification and technology

Secondary heat exchangers must be constructed from metallic materials with the exception of any sealing or bonding.

**ARTICLE C8: ELECTRICAL SYSTEMS****C8.1 Definitions****C8.1.1 Electronically controlled**

Any command system or process that utilises semi-conductor or thermionic technology.

**C8.1.2 Control**

A sensor, actuator, wiring loom or unit will be referred to as “Control” if it is used by any on-board strategy other than input handling, input failure detection or functions used for logging only.

It includes for example units, sensors, actuators, wiring looms used in control loops, protections or driver information.

**C8.1.3 Electronic Control Unit (ECU)**

A programmable embedded system that controls one or more car sub-systems.

**C8.1.4 FIA Standard ECU**

An ECU or set of ECUs and their sub-components manufactured by an FIA designated supplier to a specification determined by the FIA.

The FIA Standard ECU comprises at least a master control unit and modules used for driver information and driver input device interfacing.

**C8.1.5 FIA Accident Data Recorder (FIA ADR)**

An ECU manufactured by an FIA designated supplier to a specification determined by the FIA.

The primary purpose of the FIA ADR is to monitor, record or control the following:

- a. Data relevant to an accident or incident.
- b. The management of marshalling and safety systems.

**C8.1.6 Telemetry**

Wireless transmission of data from remote sources.

**C8.2 Software and electronics inspection**

**C8.2.1** Prior to the start of each season the complete electrical and electronic system on the car must be examined and all on board and communications hardware and software must be inspected by the FIA Technical Department.

**C8.2.2** The FIA must be notified of any changes prior to the Competition at which such changes are intended to be implemented.

**C8.2.3** All re-programmable devices must have a mechanism that allows the FIA to accurately identify the software version loaded.

Acceptable solutions to verify the programmed software may be found in the Appendix to the Technical and Sporting Regulations.



- C8.2.4** All electronic units containing a programmable device, and which are intended for use at a Competition, must be presented to the FIA before each Competition in order that they can be identified.
- C8.2.5** All on-car software versions must be registered with the FIA before use.
- C8.2.6** The FIA must be able to test the operation of any compulsory electronic safety systems at any time during a Competition.
- C8.2.7** Competitors may only run custom software that has been homologated by the FIA for their control applications hosted inside or outside the ECU described in Article C8.3.1.

Details of the homologation process can be found in the Appendix to the Technical and Sporting Regulations.

- C8.2.8** The number of versions used in any single championship season will be limited as shown in the table below. Figures are given per custom control application.

	2026 See Note 1	2027	2028	2029	2030
ECU Competitor applications	5	4	3	3	3
ECU PU applications	5	4	3	3	3
ERS and PU-CE Applications	5	4	3	3	3

A version will be deemed to have been used once the car's timing transponder has shown that it has left the pit lane.

Changes made solely for reliability, bug fix, compatibility with standard or other custom applications or changes requested by the FIA will not increase the version counter.

Note 1: for the 2026 Championship season only, the limits defined in the above table will apply starting from the fifth Competition.

### **C8.3 Control electronics**

- C8.3.1** All components of the power unit, fuel system, transmission systems, brake system, tyre pressure monitoring system and adjustable bodywork in addition to all associated actuators, must be controlled by the FIA Standard ECU.

The FIA Standard ECU may only be used with FIA approved software and may only be connected to the control system wiring loom, sensors and actuators in a manner specified by the FIA.

Additional information regarding the FIA Standard ECU software versions and setup may be found in the Appendix to the Technical and Sporting Regulations.

- C8.3.2** All ECUs, control sensors, actuators and FIA monitoring sensors will be homologated by the FIA. Details of the homologation process may be found in the Appendix to the Technical and Sporting Regulations.

Each and every component of the control system will be sealed and uniquely identified and their identities tracked through their life cycle.

These components and units may not be disassembled or modified in any way and seals and identifiers must remain intact and legible.

**C8.3.3** The control system wiring loom connectivity must be approved by the FIA.

All wiring looms must be built to ensure that each control sensor and each control actuator is electrically isolated from logging-only sensors.

In general, there must be no active or passive electronic component in the control loom. Exceptions (e.g. termination resistors) must be approved by the FIA before use.

Additional wiring guidelines may be found in the Appendix to the Technical and Sporting Regulations.

**C8.3.4** If sensor faults or errors are detected by the driver or by the on-board software, back-up sensors may be used and different settings may be manually or automatically selected. However, any back-up sensor or new setting chosen in this way must not enhance the performance of the car. Any driver default turned on during the start lockout period may not be turned off before the end of that period.

**C8.3.5** Pneumatic valve pressure may only be controlled via a passive mechanical regulator or from the FIA Standard ECU and its operation will be monitored by the FIA Standard ECU.

## **C8.4 Start systems**

**C8.4.1** Any system, the purpose and/or effect of which is to detect when a race start signal is given, is not permitted.

**C8.4.2** The FIA Standard ECU will implement a “lockout” period after each race start or pit stop during which a number of power unit and transmission related functions will be frozen or disabled. Details of the strategy may be found in the Appendix to the Technical and Sporting Regulations.

## **C8.5 Data acquisition**

**C8.5.1** To assist scrutineering, the FIA requires unlimited access to the following FIA Standard ECU information before, during and after any track session:

- a. Application parameter configurations.
- b. Logged data and events.
- c. Real-time telemetry data and events.

Throughout the Competition, the logging memory and events buffer may only be cleared by an FIA engineer.

The FIA must have the ability to connect to the FIA Standard ECU via a Competitor-provided standalone equipment using an FIA laptop. The Competitors should make a jump battery available at all times during the Competition.

The Competitors should transfer the real-time telemetry data and events on the FIA network as requested by, and in the format defined by, the FIA.

Prior to the race or sprint session, the FIA Standard ECU data logger must be configured in such a way that allows logging of data for at least two hours and fifteen minutes without exceeding the size of the logger memory.

**C8.5.2** Any data acquisition system, telemetry system or associated sensors additional to those provided by the FIA Standard ECU and FIA ADR must be physically separate and electrically isolated from any control electronics with the exception of:

- a. The primary regulated voltage supply.
- b. The car system ground.
- c. Communication links to the FIA Standard ECU, telemetry unit and FIA ADR.
- d. Power supplies, provided they are not used to power any control electronics, control sensors or actuators.
- e. Time synchronisation lines.
- f. Power unit synchronisation lines.
- g. An umbilical loom whose connector will remain disconnected when the car is moving.

Unless approved by the FIA, no junction box or break-out box may be shared between the FIA Standard ECU system and a Competitor data acquisition system.

The use of any coupling, be it hard wired, magnetic, optical or other such link which allows the transmission of signals will not be considered as adequate isolation in the context of this Article.

## **C8.6 Telemetry**

**C8.6.1** All cars must be fitted with a car to Competitor telemetry system which has been manufactured by the FIA designated supplier to a specification determined by the FIA.

**C8.6.2** Telemetry systems must operate at frequencies which have been approved by the FIA.

**C8.6.3** Competitor to car telemetry is prohibited, with the exception of:

- a. The FIA Marshalling System defined in Article C8.12;
- b. Handshaking required by the car to Competitor telemetry system defined in Article C8.6.1.

## **C8.7 Driver inputs and information**

**C8.7.1** With the exception of voice radio communication, all signals associated with driver information and driver input devices must be generated by the FIA Standard ECU.

**C8.7.2** Any single input device, including but not limited to switch, button, paddle or pedal, used by the driver must be connected to a single analogue or digital input of the FIA Standard ECU.

Exceptions will be considered to handle the following:

- a. A spare clutch paddle sensor.
- b. A spare accelerator pedal sensor.
- c. A separate "kick-down" sensor which indicates that the accelerator pedal has been deliberately depressed past full travel.
- d. Multiplexed shift signals.
- e. A spare brake pressure and pedal sensor.

Any interface between such driver input devices and the FIA Standard ECU must be approved by the FIA.

**C8.7.3** Any alteration of the driver's inputs may only be commanded by direct, deliberate and primary driver actions.

The logged raw signals from the FIA Standard ECU inputs must provide a true representation of the driver's actions.

## **C8.8 Master switch**

**C8.8.1** The driver, when seated normally with the safety belts fastened and the steering wheel in place, must be able to cut off the electrical circuits to the ignition, all fuel pumps and the rear lights by means of a spark proof circuit breaker switch.

This switch must be located on the dashboard and must be clearly marked by a symbol showing a red spark in a white edged blue triangle.

**C8.8.2** There must also be two exterior horizontal handles which are capable of being operated from a distance by a hook. These handles must be situated at the base of the main roll over structure on both sides of the car and have the same function as the switch described in Article C8.8.1.

The handles must enclose a circle of diameter 40mm and be red or yellow if the surrounding bodywork is predominantly red.

The handles must be marked with a letter "E" in red at least 80mm tall, with a line thickness of at least 8mm, inside a white disc of at least 100mm diameter with a red edge with a line thickness of at least 4mm.

## **C8.9 Driver radio**

**C8.9.1** All cars must be fitted with a voice radio communication system which has been manufactured by the FIA designated supplier to a specification determined by the FIA.

**C8.9.2** Other than authorised connections to the FIA Standard ECU, any voice radio communication system between car and pits must be stand alone and must not transmit or receive other data. All such communications must be open and accessible to both the FIA and broadcasters.

## **C8.10 Accident analysis**

For the purpose of accident analysis and driver rescue, during each Competition and all tests which are attended by more than one Competitor, each car must be fitted with:

- a. One FIA ADR;
- b. One external 500g accelerometer;
- c. One high speed camera;

and each driver must wear:

- d. In-ear accelerometers;
- e. Biometric devices subject to Article C8.10.5.

Competitors must use their best endeavours to ensure that all those parts are in working order at all times.

**C8.10.1 FIA ADR**

The FIA ADR must be fitted and operated:

- a. In accordance with the instructions of the FIA.
- b. With its centre plane no more than 25mm from Y=0 and with its top facing upwards.
- c. With each of its 12 edges parallel to the coordinate system defined in Article C2.10.1.
- d. In a position within the cockpit which is readily accessible at all times from within the cockpit without the need to remove plank or floor.
- e. Positioned so that the entire unit lies:
 

either

  - i. Behind RV-COCKPIT-DRIVER, between  ~~$X_e = -450$~~   $X_c = -475$  and  $X_c = 100$  and below  $Z=440$ , with its connectors facing forward,

or

  - ii. Ahead of RV-COCKPIT-DRIVER, behind  $X_c = -1075$  and below  $Z=250$ , with its connectors facing either forward or rearward.
- g. Via anti-vibration mountings giving a clearance of 5mm to all other objects.
- h. In order that the download connector is easily accessible when the driver is seated normally and without the need to remove bodywork.
- i. Within the operating limits specified by the supplier, in particular the maximum temperature limits.

The FIA ADR must be powered from a nominally 12V supply such that its internal battery can be recharged at all times when the car's electronic systems are powered and when the car systems are switched off, but a jump battery or umbilical is connected.

Details of the connections to the FIA ADR may be found in the Appendix to the Technical and Sporting Regulations.

**C8.10.2 External accelerometer**

The FIA ADR must be connected to one external 500g accelerometer which has been manufactured by a FIA designated supplier to a specification determined by the FIA.

The accelerometer must be fitted:

- a. In accordance with the instructions of the FIA.
- b. Within the cockpit, solidly bolted to the Survival Cell using four 4mm bolts, with a body clearance of 5mm to all other objects.
- c. With each of its 12 edges parallel to and matching the coordinate system defined in Article C2.10.1.
- d. In order that the entire accelerometer body lies as close as possible to the plane Y=0 and within an axis-aligned cube with an internal diagonal bounded by points  $[X_c, Y, Z]$   $[-500, -130, 0]$  and  $[-250, 130, 150]$ .

- e. In a position which is readily accessible at all times from within the cockpit when the seat is removed.

Details of the accelerometer may be found in the Appendix to the Technical and Sporting Regulations.

#### **C8.10.3 High speed camera**

Each car must be fitted with a high speed camera which has been manufactured by the FIA designated supplier to a specification determined by the FIA.

The camera must be fitted in accordance with the instructions of the FIA, details of which may be found in the Appendix to the Technical and Sporting Regulations.

#### **C8.10.4 In-ear accelerometers**

Each driver must wear in-ear accelerometers which have been manufactured by the FIA designated supplier to a specification determined by the FIA.

#### **C8.10.5 Biometric device**

For the purpose of aiding driver rescue, the FIA may define biometric devices, to be worn by each driver and which have been manufactured by the FIA designated supplier to a specification determined by the FIA.

#### **C8.11 Accident data**

At any time following an accident or incident Competitors must make the FIA ADR available and accessible to the FIA. A representative of the Competitor concerned may be present when data relevant to an accident or incident is being uploaded from the recorder. A copy of the data will be made available to the Competitor.

Any conclusions as to the cause of an accident, or any data relevant to an accident, may only be published in the form of a report which has been agreed between the Competitor concerned and the FIA.

#### **C8.12 FIA Marshalling system**

**C8.12.1** All cars must be fitted with a marshalling system, comprising a car positioning system and a bidirectional race control to car communication system, which has been manufactured by the FIA designated supplier to a specification determined by the FIA.

No other parts which, in the opinion of the FIA are capable of performing a similar function, may be fitted to any car.

#### **C8.12.2 Car Positioning Unit**

The Car Positioning Unit must be positioned:

- i. With its upper surface at  $Z=855$
- ii. With the cover positioned symmetrically about  $Y=0$
- iii. With its forward face at  $X_c=-638$

**C8.12.3** Details of the marshalling system may be found in the Appendix to the Technical and Sporting Regulations.

**C8.13 Track signal information display**

All cars must be fitted with red, blue and yellow cockpit lights, supplied as part of the FIA Standard ECU, the purpose of which are to give drivers information concerning track signals or conditions. The lights must be fitted directly in the driver's normal line of sight.

**C8.14 Medical Impact warning system**

In order to give rescue crews an immediate indication of accident severity each car must be fitted with a warning light which is connected to the FIA ADR.

The light must face upwards and be recessed into the top of the survival cell **and be positioned according to Drawing 10 of Appendix C3. The light must be visible to the Camera in Position 4.** ~~inboard of  $Y=150$ , rearward of  $X_c=1150$  and as near to the clutch disengagement system, as described in Article 9.5, as is practical.~~

Details of the light and its control system may be found in the Appendix to the Technical and Sporting Regulations.

**C8.15 Installation of electrical systems or components**

**C8.15.1** Exceptionally, each car may be equipped with a maximum of five test sensor installations, which do not comply with Article C3 ~~of the Technical Regulations~~, during P1 and P2, provided:

- They could not materially affect the outcome any of the impact tests described in Article C13.
- They lie entirely within an axis-aligned cuboid with an internal diagonal bounded by points  $[X_F=-1350, -950, -200]$  and  $[X_{DIF}=1000, 950, 1100]$ .
- No part of any sensor may lie above a triangular surface with vertices at  $[X_C=-200, 0, 655]$ ,  $[X_F=-1350, 1300, 655]$  and  $[X_F=-1350, -1300, 655]$ .
- They do not obstruct on-board camera views.

Any such test sensor installations do not need to be homologated.

The FIA technical delegate must be notified of any intended test sensor installations prior to the Competition at which they are first used.

**C8.15.2** Competitors must be notified of any changes to the installation instructions for any FIA specified systems or components before 1 March of the previous season.

**C8.15.3** Notwithstanding the provisions of Article C8.15.1, the use in testing of any system designed to adjust the ride height of the car in a way that is not compliant with Article C10 is prohibited.

**C8.16 Timing transponders**

All cars must be fitted with two timing transponders supplied by the officially appointed timekeepers. These transponders must be fitted in strict accordance with the instructions detailed in the Appendix to the Technical and Sporting Regulations. Competitors must use their best endeavours to ensure that the transponders are in working order at all times.

**C8.17 Cameras and camera housings**

**C8.17.1** ~~At all times throughout the Competition, All~~ cars must be equipped with ~~eight~~ six positions in which cameras or camera housings can be fitted ~~at all times throughout the Competition~~. Referring to Drawing 2 of Appendix C3, all cars must carry:

- a. a camera in positions 4, and 5.
- b. a camera or camera housing in positions 1 and 2 ~~(both sides) and 3~~.

If requested by the Commercial Rights Holder, a car must carry;

- c. ~~either~~ a camera fitted in the driver's helmet and pointing forward,
- d. ~~or~~ a camera in position 6.

**C8.17.2** Details concerning the technical specification of all cameras may be found in the Appendix to the Technical and Sporting Regulations.

**C8.17.3** With the exception of the position in the driver's helmet, camera housings, when used, must be fitted in the same location as cameras, and satisfy all the relevant regulations. They must be identical in size, shape, and mass to the camera in lieu of which they are fitted, and must be supplied by the relevant Competitor. Details concerning the shape and mass of all camera housings may be found in the Appendix to the Technical and Sporting Regulations.

Any decision as to whether a camera or camera housing is fitted in those positions will be by agreement between the relevant Competitor and the Commercial Rights Holder.

If a car is not required to carry either a camera in the helmet of the driver, or a camera in position 6, ballast of 0.35 kg must be securely fitted in the location of the Helmet Camera Processing Unit.

**C8.17.4** Competitors must be notified of any changes to the camera or transponder installation instructions before 30 June of the previous season.

**C8.17.5** Any camera fitted in positions 2, ~~3~~ or 4 shown in Drawing 2 of Appendix C3 must be mounted in order that its major axis does not subtend an angle greater than 1° to the plane Z=0, and its lateral axis is normal to the plane Y=0.

**C8.17.6** Any camera fitted in position 1 must be fitted above the survival cell, forward of the cockpit opening, rearwards of the forward attachment of the Secondary Roll Structure described in Article C12.4.2. and symmetrically with respect to the plane Y=0, with the camera pointing towards the driver. The electronic conditioning unit for this camera must be positioned within the survival cell and in accordance with the Appendix to the Technical and Sporting Regulations.

**C8.17.7** The entire camera in position 2 must lie within RV-CAMERA-2.

~~Any~~The camera fitted in ~~the left hand~~ position 2 shown in Drawing 2 of Appendix C3 must be mounted in order that its major axis where passing through the centre of the camera lens does not intersect any part of the car lying forward of the camera

Any part provided by the Competitor for the purpose of aligning the camera in position 2 correctly will be considered part of the camera provided it does not exceed 25mm in width and is being fitted for that sole purpose.

~~C8.17.8~~ ~~The camera fitted in position 3 must be mounted in order that its forward-most point is situated between  $X_e=0$  and  $X_e=300$  and between  $Z=865$  and  $Z=900$ . The inner face of the camera unit should be between  $Y=120$  and  $Y=150$ .~~



~~Any part provided by the Competitor for the purpose of aligning the camera in position 3 must be an extrusion of the camera unit profile. A radius of up to 10mm will be permitted where this component meets the bodywork or survival cell.~~

~~No part of the camera fitted in position 3 may be positioned vertically above the opening provided to lift the car, defined in Article 12.4.1.~~

**C8.17.8** The camera fitted in position 4 must be mounted in order that its forward-most point is forward of  $X_C=80$ .

**C8.17.9** The camera fitted in position 5 must be mounted, symmetrically about  $Y=0$ , with the lens centre forward of  $X_C = -1250$  and with its lower surface at an angle no greater than  $6^\circ$  to the plane  $Z=0$ . In order to not impinge on its 360deg image, any shrouding or cutout should be no higher than "Shoulder X", as defined in the Appendix to the Technical and Sporting Regulations.

**C8.17.10** The camera fitted in position 6 must be mounted within the Rear Impact Structure with the face of the lens pointing rearwards at an angle no greater than  $1^\circ$  to the plane  $X=0$ .

### **C8.18 Electromagnetic radiation**

Electromagnetic radiation between 2.0 and 2.7GHz is forbidden save with the written consent of the FIA.

### **C8.19 Sensor signals**

Any system, device or installation which is contrived or operated in a way to alter the measurement or the signal of a sensor used by the FIA to establish compliance with the Regulations is forbidden.

**ARTICLE C9: TRANSMISSION SYSTEM****C9.1 Definitions****C9.1.1 Gearbox**

All the parts in the power train which transfer torque from the power unit output shaft, as described in Article C5.6.5, to the drive shafts (the drive shafts being defined as those components which transfer drive torque from the sprung mass to the unsprung mass). It includes all components whose primary purpose is for the transmission of power or mechanical selection of gears, bearings associated with these components (as described in Articles C9.1.2 to C9.1.4) and the casing in which they are housed (as described in Articles C9.1.5 to C9.1.7).

**C9.1.2 Driveline components**

The rotating components involved in transmitting torque between the gearbox input shaft and the drive shafts. This includes gears, shafts, dog rings, differential and rotating parts of the differential control mechanism. Bearings between these components and the Gearbox Case are included in this definition.

**C9.1.3 Gear-Change Components**

Mechanical components that are involved in selecting the forward gears; barrel(s) and associated bearings, selector forks, selector rail, detent mechanisms and hydraulic actuator(s).

**C9.1.4 Auxiliary Components**

Components that are not included in Driveline or Gear-Change Components but interact directly with these components and are essential for the functioning of the Gearbox. This includes oil pressure and scavenge pumps, reverse-gear idler and its actuator, differential actuator, electronic sensors and actuators.

**C9.1.5 Gearbox Case**

The structure that encloses the Driveline Components and Gear-Change Components, mounts the rear impact structure, takes suspension loads and aerodynamic loads and transfers them to the power unit through the studs defined in Article C5.6.17.

**C9.1.6 Parts Not Included for Compliance with Article 29 of the Sporting Regulations**

Only in the context of Article 29 of the Sporting Regulations, the following parts are not considered part of the gearbox and may be changed without incurring a penalty under that Article's provisions. If changing any of these parts involves breaking an FIA applied seal this may be done but must be carried out under FIA supervision:

- a. The clutch assembly and the power unit output shaft, provided this is located prior to any mechanical speed reduction from the engine.
- b. The clutch actuator and clutch release bearing(s).
- c. Inboard driveshaft joints and seals but not their housing if that housing is integral with the gearbox output shaft and therefore part of the sprung mass.
- d. The hydraulic system prior to the point at which it produces direct mechanical movement of the gear selection mechanism by means of hydraulic actuator(s).

- e. Oil, oil pumps, oil filters, oil seals, oil coolers and any associated hoses or pipes.
- f. Electrical sensors, actuators, servo valves and wiring.
- g. Any parts associated with the suspension or functioning of the sprung suspension that are attached to the gearbox casing.
- h. The rear impact structure provided it can be separated from any gearbox casing.
- i. Any other component mounted to the casing whose primary purpose is unconnected with the transmission of power or selection of gears.

#### **C9.1.7 Clutch**

The mechanical device that can connect or disconnect the ICE output shaft with the transmission input shaft, or transmit torque between these two shafts.

### **C9.2 Fundamental provisions**

#### **C9.2.1 Transmission type**

The transmission may only drive the two rear wheels.

#### **C9.2.2 Traction control**

No car may be equipped with a system or device which is capable of preventing the driven wheels from spinning under power or of compensating for excessive torque demand by the driver.

Any device or system which notifies the driver of the onset of wheel spin is not permitted.

### **C9.4 Clutch control**

**C9.4.1** Clutch operating devices must be in the form of paddles, which comply with the following principles:

- a. There should be a maximum of two, mounted on the steering wheel for direct access in all circumstances.
- b. They should be of pull-type, opening the clutch when pulling the paddle towards the driver.
- c. Their travel should be in a plane nominally normal to the face of the steering wheel, with a maximum displacement of the driver's contact surfaces of 80mm between end stops.
- d. They should have only a single degree of freedom.
- e. Where two paddles are fitted, they must be a left and right handed pair, identical in function and ergonomics, mounted in a symmetrically opposite manner on either side of the steering wheel centre plane. For the avoidance of doubt, they must have the same mechanical travel characteristics and be mapped identically.

No interaction between them or the associated FIA Standard ECU inputs will be permitted and, furthermore, Competitors must be able to demonstrate beyond any doubt that each of the paddles may only be operated with only one hand.

- f. To ensure that the signals used by the FIA Standard ECU are representative of the driver's actions, each Competitor is required to demonstrate that the paddle percentage calculated by

the FIA Standard ECU does not deviated by more than  $\pm 5\%$  from the physical position of the operating device measured as a percentage over its entire usable range.

In that context, the physical position of the paddle will be measured at the location operated by the fingers.

**C9.4.2** Designs which allow specific points along the travel range of the clutch operating device to be identified by the driver or assist the driver to hold a position are not permitted.

In order to prevent interaction between the clutch paddles and other driver control devices, at least one of the following arrangements must be respected:

- a. When pulled to its maximum travel position, any clutch paddle should not reach further than the driver's contact surfaces of any other paddle, lever or switch in any of their positions.
- b. The outboard 60% portion of any clutch paddle, measured from its mounting point to its outer edge by the driver's contact surface, should be a minimum of 50mm away over its entire travel range from any other paddle, lever or switch.
- c. A clutch paddle should be separated from any adjacent paddle, lever or switch by a physical stop preventing any practical interaction between them by the driver. Such stop should be sized and shaped so that it cannot be used as a reference point during paddle operation.

In addition, other parts of the steering wheel or chassis should not be practically usable as reference points for the driver to identify or hold a specific position.

**C9.4.3** The minimum and maximum travel positions of the clutch operating device must correspond to the clutch fully engaged normal rest position and fully disengaged (incapable of transmitting any useable torque) positions respectively.

**C9.4.4** Designs or systems which are designed to, or have the effect of, adjusting or otherwise influencing the amount, or rate, of engagement being demanded by the FIA Standard ECU, are not permitted, with the exception of minimal inherent hydraulic and mechanical properties.

**C9.4.5** The amount by which the clutch is engaged must be controlled solely and directly by the driver with the exception of:

- a. Stall prevention.
- b. Gearshifts.
- c. Bite point finder where brake pressure, wheel speed and driver clutch demand safeguards are used.
- d. De-clutch protections.
- e. Power train protection on the track outside of any start lockout period or immediately following stall prevention activation only.
- f. Test signals enabled only when the car is connected to the garage system.

When commanded by the driver, the amount of clutch engagement will be expressed in the FIA Standard ECU as torque at the rear axle by applying a gain of 5200Nm / 90% to the clutch paddle position between 5% and 95%.

In that case the clutch torque controller implemented in the FIA Standard ECU must be used. Except for the first 70ms following the initial step in clutch torque demand during a launch, the control error, calculated using the power unit output shaft torque sensor, must be contained in a band of  $\pm 150\text{Nm}$  when converted at the rear axle.

**C9.4.6** When the clutch operating device is released from its maximum travel position it must return to its resting position within 50ms.

The maximum delay allowed, computed from the respective signals as recorded by the FIA ADR or FIA Standard ECU, between the clutch driver control input signal and the corresponding output demand being achieved is 50ms.

**C9.4.7** Any device or system which notifies the driver of the amount of clutch slip or engagement is not permitted.

### **C9.5 Clutch disengagement**

All cars must be fitted with a means of disengaging the clutch for a minimum of fifteen minutes in the event of the car coming to rest with the engine stopped. This system must be in working order throughout the Competition even if the main hydraulic, pneumatic or electrical systems on the car have failed. This system must also disconnect any ERS system fitted to the car.

In order that the driver or a marshal may activate the system in less than five seconds, the **switch** ~~or~~ button which operates it must :

- a. Face upwards and be recessed into the top of the survival cell and be ~~inboard of  $Y=150$  and behind  $X_e=1150$~~  positioned according to Drawing 10 of Appendix C3.
- b. Be designed in order that a marshal is unable to accidentally re-engage the clutch.
- c. Be marked ~~according to Drawing 10 of Appendix C3. with a letter "N" in red at least 40mm tall, with a line thickness of at least 4mm, inside a white circle of at least 50mm diameter with a red edge with a line thickness of at least 2mm.~~

### **C9.6 Homologated Gearbox and Component Classification**

The design of the Driveline Components (with the exception of the gear ratios, for which the provisions of Article C9.8.2 apply), Gear-Change components and Auxiliary Components must be homologated by each gearbox supplier before the start of the 2027 season and must not be modified, except in exceptional circumstances, throughout the 2027, 2028, 2029, and 2030 seasons.

The Gearbox Case may be modified provided that the layout of the Driveline Components, Gear-Change components and Auxiliary Components is unchanged, except for a translation, as a group, in X.

A single upgrade to the gearbox specification and layout will be permitted during this four-year period, such change only being permitted between two consecutive Championship Seasons. This **then** will be the only gearbox design that can be used **subsequently** in the Championship by the supplying competitor. This upgrade must be made available to customer competitors, who may opt to continue with the original specification and upgrade in a subsequent year.

Modifications may be made to the homologated gearbox in the following cases:

- a. To resolve reliability problems.
- b. For cost saving, at the start of each season.
- c. In the case of materials, processes or proprietary parts becoming unavailable or having their use restricted for health and safety reasons.

In all cases; clear documentation justifying the change must be provided, prior approval must be obtained from the FIA, and the modification must not give any performance advantage. A summary of the modification will be circulated to all Competitors by the FIA.

With reference to Article 40.3 of the Sporting Regulations, if a Gearbox part is subsequently replaced after a qualifying practice session by another which differs only by one or more modifications permitted by this article C9.7, the replacement Gearbox part will be considered the same in design and similar in mass, inertia, and function.

The Gearbox, as defined in Article C9.1.1, is classified as **TRC**.

## **C9.7 Gearbox Dimensions**

### **C9.7.1 Layout**

The primary (lay) shaft must be concentric with the PU crankshaft centreline and must be driven at the same speed.

The secondary (main) shaft must lie within 30mm of  $Y=0$ , above the Primary Shaft and be parallel to it. The axes of the primary and secondary shafts must be between 90mm and 110mm apart.

The axis of any gear-change barrel must be above the axis of the secondary shaft.

The distance between the front lateral gear-tooth face of the forward-most forward gear ratio pair and the rear lateral gear-tooth face of the rearward-most forward gear ratio pair must be at least 175mm. The minimum distance must be respected by both the gears on the primary (lay) shaft and the gears on the secondary (main) shaft.

The axis of the final drive (at  $X_{DIF}=0$ ) must be between  $X_R = -60$  and  $X_R = 60$ , between  $Z=260$  and  $Z=280$ , and be between 390mm and 450mm behind the front lateral gear-tooth faces of both gears of the forward-most forward gear ratio pair.

The tip diameter of the final drive gear must be at least 205mm.

### **C9.7.2 Mass**

The combined mass of driveline and gear-change components must be at least 22kg.

## **C9.8 Gear ratios**

**C9.8.1** The number of forward gear ratios must be 8. Continuously variable transmission systems are not permitted.

**C9.8.2** Each Competitor must nominate the forward gear ratios (calculated from engine crankshaft to drive shafts) to be employed within their gearbox. These nominations must be declared to the FIA technical delegate at or before the first Competition of the Championship.

In the event the Competitor obtains the Gearbox from another Competitor as a TRC, the gear ratios used must be the same between those two Competitors unless the customer competitor opts to continue with the ratios used in the previous Championship Season.

During 2026 only, the nominated set of forward gear ratios may be changed once during the Championship Season.

Changes to the forward gear ratios under the provisions of this Article may involve changes to either the gear ratio pairs defined in Article C9.8.3, or to the final drive, but not both at the same time.

**C9.8.3** No forward gear ratio pair may be:

- a. Less than 12mm wide when measured across the gear tooth at the root diameter or any point 1mm above or below the root diameter. Above this area each side of the gear teeth may be chamfered by a maximum of 10°. In addition, a chamfer or radius not exceeding 2.0mm may be applied to the sides and the tip of the teeth.
- b. Less than 600g in mass (excluding any integral shaft or collar). If an integral shaft or collar is to be excluded the mass of this may be shown by calculation assuming the gear to be 12mm wide and the shaft geometry to be the same as that where slide on gears are used.

**C9.8.4** Gear ratio pairs must be made from steel.

### **C9.9 Reverse gear**

All cars must be able to be driven in reverse by the driver at any time during the Competition.

### **C9.10 Gear changing**

**C9.10.1** Automatic gear changes are considered a driver aid and are therefore not permitted.

For the purposes of gear changing, the clutch and power unit torque need not be under the control of the driver.

**C9.10.2** Gear changing is restricted during the following periods:

One gear change is permitted after the race or sprint session has started and before the car speed has reached 80km/h, provided every gear fitted to the car is capable of achieving at least 80km/h at 15 000rpm.

**C9.10.3** The minimum possible gear the driver is able to select must remain fixed whilst the car is moving.

Each individual gear change must be separately initiated by the driver and, within the mechanical constraints of the gearbox; the requested gear must be engaged immediately unless over-rev protection is used to reject the gear shift request. Once a gear change request has been accepted no further requests may be accepted until the first gear change has been completed.

Multiple gear changes may only be made under Article C5.18 or when a shift to gearbox neutral is made following a request from the driver.

If an over-rev protection strategy is used this may only prevent engagement of the target gear, it must not induce a delay greater than 50ms. If a gear change is refused in this way, engagement may only follow a new and separate request made by the driver.

Any de-bounce time used to condition driver gear change requests must be fixed.

**C9.10.4** The maximum permitted duration for down changes and up changes is 300ms and 200ms respectively. The maximum permitted delay for the latter is 80ms from the time of the driver request to the original gear being disengaged.

The duration of a gear change is defined as the time from the request being made to the point at which all gear change processes are terminated. If for any reason the gear change cannot be completed in that time the car must be left in neutral or the original gear.

**C9.10.5** Distance channel or track position is not considered an acceptable input to gearbox control.

### **C9.11 Torque transfer systems**

**C9.11.1** Any system or device the effect of which is capable of transferring or diverting torque from a slower to a faster rotating wheel is not permitted.

**C9.11.2** Any device which is capable of transferring torque between the principal axes of rotation of the two front wheels is prohibited.

### **C9.12 Driveshafts**

Driveshafts must be made from steel. The bore, more than 150mm from the ends, must be of constant diameter. At one of the ends, the internal diameter of the final 150mm must be equal to or greater than the diameter of the bore of the constant diameter section.

Driveshafts must have the required features for the driveshaft torque sensor defined in Article C9.12

### **C9.13 Driveshaft Torque Sensors**

Regulatory torque sensors must be fitted to measure the torque in each drive shaft.

The installation and the connectivity of each of these torque sensors to the FIA Standard ECU must be approved by the FIA.

### **C9.14. Structural Connection to Survival Cell**

Any part which provides an additional load path, aside from the path through the studs defined under Art. C5.4.8, from the survival cell to the gearbox case is prohibited unless this is incidental to its principal purpose.

Furthermore, any such part must not provide a structural connection between this pair of assemblies beyond that which is reasonable for the safe and reliable fulfilment of its purposes.



**ARTICLE C10: SUSPENSION, STEERING SYSTEMS, WHEELS AND TYRES****C10.1 Definitions****C10.1.1 Sprung suspension**

The means whereby all complete wheels are suspended from the sprung mass by a spring medium.

**C10.1.2 Complete wheel**

Wheel, inflated tyre, wheel rim covers and also the items permitted by Article ~~C10.7.3~~ C10.7.6. The complete wheel is considered part of the suspension.

**C10.1.3 Wheel or wheel rim**

Rim (including lips and barrel), spokes and centre hub.

**C10.1.4 Legality ride height**

The attitude of the unsprung mass, in relation to the sprung mass, for the assessment of its compliance to the Technical Regulations.

A competitor must define a unique legality ride height for the front axle and for the rear axle. These values:

- a. Must be physically attainable without changing or removing suspension components, with the exception of ride-height adjustment.
- b. Must be within 10mm at the front and within 30mm at the rear of the ride height of the car when presented for scrutineering.

**C10.1.5 Mass damper**

A mass or system that has a degree of freedom relative to the sprung mass, which either performs no other function, or while performing another legitimate function has a compliance beyond what is necessary for its safe and reliable operation.

**C10.1.6 Sprung mass**

All parts of the car that are entirely supported by the sprung suspension.

**C10.1.7 Unsprung mass**

All parts of the car composing the sprung suspension external to the sprung mass and/or not entirely supported by the sprung suspension. For the purpose of this definition the boundary between sprung and unsprung mass will be at the suspension members' inboard attachments.

**C10.2 Sprung suspension**

**C10.2.1** Cars must be fitted with sprung suspension.

**C10.2.2** The suspension system of each axle (front and rear) must be independent from the other axle and so arranged that its response results only from changes in load applied to the wheels of that axle.

**C10.2.3** The suspension system comprises of:

- a. Outboard suspension: the suspension members connecting the uprights to the sprung mass, the upright and attachments, the wheel axles and bearings, wheel fasteners and the complete wheels.

- b. Inboard suspension: the mechanical arrangement of the components that provide the vertical suspension travel response of the suspension system to the changes in load applied to the wheels.

The inboard suspension is considered to be part of the sprung mass, whereas the outboard suspension is considered to be part of the unsprung mass.

- C10.2.4** Any powered device which is capable of altering the configuration or affecting the performance of any part of any suspension system is forbidden.
- C10.2.5** No adjustment may be made to any suspension system while the car is in motion.
- C10.2.6** On each axle, the state of its suspension system must be uniquely defined by the angular position, and angular velocity of its two rockers. Inertial and hysteresis effects are acceptable provided they are incidental.

In addition, the following systems or configurations are not permitted:

- a. Any response of the suspension elements to body accelerations and/or angular acceleration of the rockers (e.g. any inerters, mass dampers, acceleration-sensitive valves in the dampers).
- b. Any coupling of the suspension systems to the braking or steering systems. Furthermore, any variation of ride height caused by the suspension geometry's kinematics must not exceed 2mm over the range of  $\pm 12^\circ$ , measured between the principal axis of rotation of the front wheel and an X-plane. Compliance must be demonstrated using CAD with the vehicle at the legality ride height, using a rigid set-up wheel of spherical outer surface and diameter 700 mm with its centre point at  $[X_w=0, Y_w=-168, Z_w=0]$ .

For the avoidance of doubt, fixed suspension kinematic geometries which affect the reaction of contact patch forces such as "anti-dive", "anti-squat", "anti-lift" are permissible.

- c. Any form of ride height control or alteration via self-levelling systems or feedback loops.
- d. Any change of suspension characteristics resulting from track events acting as triggers with the exception of passive damping conforming to Article C10.4.3(b).
- e. Any storing of energy via any means for delayed deployment and/or any suspension system that would result in a non-incidental asymmetry (e.g. hysteresis, time dependency, etc.) in the response to changes in load applied to the wheels.
- f. Coupling between suspension elements, such that the state of an element(s) is used to alter the response of another element(s).
- g. Any system such as spool valves, switches, ratchets, etc. intended to change the suspension elements' characteristics between different states. Valves within a suspension damper element are acceptable as long as the only function is to provide a passive change in the damper force response whilst conforming to Article C10.4.3(b).
- h. Mass dampers, as defined in Article C10.1.5.

**C10.3 Outboard suspension**

**C10.3.1** With the steering wheel rotation fixed, the position of each wheel centre and the orientation of its rotation axis must be completely and uniquely defined by a function of its principally vertical suspension travel, save only for the effects of reasonable compliance which does not intentionally provide further degrees of freedom.

Additionally, once the wheel **axis coordinate** system defined in Article ~~C2.12.3~~ C2.6.3 is applied, in side view the angle subtended between the  $Z_w$  axis and the Z axis may not exceed 5 deg. of variation over the range of suspension vertical travel, with the steering wheel rotation fixed. Compliance must be demonstrated using CAD.

**C10.3.2** There must be six suspension members connecting each suspension upright to the sprung mass. Redundant suspension members are not permitted.

On the front axle, one suspension member per wheel must be connected to the steering system.

**C10.3.3** Suspension members having shared attachment points will be considered by a virtual dissection into discrete members.

**C10.3.4** The outboard attachment points of each suspension member (defined as the kinematic centre of rotation of the joint that allows relative rotation between a suspension member and its adjoining upright) must lie:

- a. outboard of  $Y_w=0$ .
- b. Above  $Z_w = -100$  for the front axle and above  $Z_w = -40$  for the rear axle
- c. Inside the Drum defined in Article C3.13.2.

Exceptionally, the outboard attachment point of a suspension member connected inboard, to the rockers defined in Article C10.4.1 and outboard, directly to another suspension member, may not satisfy the provisions of this Article, but must in any case:

- a. lie outboard of  $Y_w=50$
- b. no more than 25mm from the load line of the suspension member it is attaching to
- c. together with the inboard attachment point of the same suspension member, lie on the same side of the suspension member it is attaching to when viewed from the front

**C10.3.5** On the front axle only, considering the six suspension members connected to an upright, but excluding the members connected inboard to the steering system or the rockers defined in Article C10.4.1, they must form 2 independent pairs of members each with their inboard attachment points separated in X by no less than 300mm and above  $Z=250$ mm. Furthermore to form a pair, each suspension member must also be accompanied by the suspension member with the closest outboard attachment point in  $Z_w$ .

**C10.3.6** The structural part of each suspension member must:

- a. In any normal cross section relative to its load line (defined as a straight line between the inner and outer attachment point centres of the member) have two orthogonal axes of symmetry. Over the whole length of the member, the cross section must have a constant size, shape, and incidence to the plane  $Z=0$  when assessed at the legality ride height.

Furthermore, the centroid may not be more than 5mm from the load line with the exception of front suspension elements locally for the sole purpose of ensuring minimum clearance with the wheel rim at full steering lock.

In the case of the suspension member connecting the front upright to the steering system this dimension may be up to 10mm.

Minimal exceptions will be permitted for the following:

- i. static ride height, camber, or toe adjustment components
  - ii. the passage of hydraulic brake lines, electrical looms, or wheel tethers.
  - iii. the attachment of flexures, rod ends or bearings.
  - iv. along the interface between members that are structurally connected to each other
  - v. Cut-outs to allow the passage of a suspension member connected at the inboard end to the rocker (Art C10.4.1)
  - vi. installation of strain gauge systems
- b. Not be in contact with the external air stream, unless it is of a circular cross section when measured normal to the load line.
  - c. Not vary the angle subtended by the major axis of the cross section in (a) and the plane  $Z=0$  by more than  $\pm 5\text{deg}$  over the range of suspension vertical movement and by more than  $\pm 1\text{deg}$  over the range of steering movement.
  - d. One of the six rear suspension members per side may be exempt from part a) above.

**C10.3.7** It must be possible to achieve a minimum angle of  $+23^\circ/-21^\circ$  (positive angles mean toe in) between the principal axis of rotation of the front wheel and an X-plane. If necessary, the steering system may be disconnected from the suspension members or the steering arm may be changed to verify this requirement. The achievement of the minimum angles is intended at legality ride height and the bodywork defined in Articles C3.13.3, C3.13.4 and C3.13.5 may be removed.

**C10.3.8** In order to help prevent a wheel becoming separated in the event of all suspension members connecting it to the car failing, flexible tethers as specified in Article C14.4.1 must be fitted. The sole purpose of the tethers is to prevent a wheel becoming separated from the car, they should perform no other function.

**C10.3.9** Where any Suspension Member attaches to the survival cell behind  $X_c=-1580$ , Competitors should provide calculations showing that there would be no damage to the survival cell if a load of 1.25 times the compressive failure load of the leg is applied to the mounting, along the axis of the leg.

#### **C10.4 Inboard suspension**

**C10.4.1** The inboard suspensions of the front and rear axles must only be actuated via a single rocker per wheel, with only a single outboard suspension connection to each rocker.

A rocker is a mechanical device that is rigidly supported on the sprung mass and rotates about a fixed axis on the sprung mass with no other relative degree of freedom.

**C10.4.2** Suspension elements can only connect to the rockers or sprung mass, where any such connection is classified as a node, subject to the following restrictions :

- a. They only permit relative rotation at their nodes.
- b. They must be so arranged that any suspension element functions only in parallel to any other, even if multiple elements are physically combined into a single component and/or share physically coincident nodes.
- c. There is only one degree of freedom between the end nodes of each element. No functional connection may be used to any other part of the element in order to obtain, for example, a feedback signal for other parts of the suspension system.
- d. With the exception of sensors whose sole purpose is to provide data, no other device(s) may connect to a node or act on the rocker.

**C10.4.3** The only permitted suspension elements are:

- a. Springs – the primary purpose of which is to absorb and release energy in a monotonically increasing load relationship with relative deflection between its nodes (or increasing torque with twist). Multiple springs may be combined in series or parallel to generate a single spring element entity between its nodes providing the result, as measured at the nodes, conforms to the monotonic requirement above and no part of the design has the purpose and/or effect of altering this relationship. Spring elements using a fluid medium are not permitted.
- b. Dampers – the primary purpose of which is to dissipate energy by generating an opposing force to the direction of motion as a function of the relative velocity between its nodes. Utilisation of heavily asymmetric damping forces for the purpose and/or effect of contravening Article C10.2.6 is not permitted. A gas spring as part of the functionality of a damper element, for the purposes of anti-cavitation, is acceptable as long as the spring rate, as measured between the nodes does not exceed 10N/mm.

Hysteresis is acceptable in an element providing it is at an incidental level and no attempt is made to utilise any inherent hysteresis to alter the response of the element relative to its primary purpose.

Links may be used to actuate the suspension elements that are mounted remotely from the rockers but cannot be used to circumvent or subvert the requirement of Article C10.2.6. Such links must be rigid and of minimal mass and design so as to achieve the linking mechanism. Links using a fluid medium are not permitted.

## **C10.5 Steering**

**C10.5.1** The steering system is the mechanical system, on and part of the sprung mass, that converts the steering column demand into the outboard suspension position control for the re-alignment of only the two front wheels (the steered wheels).

**C10.5.2** The re-alignment of the steered wheels must be uniquely defined by a monotonic function of the rotation of a single steering wheel about a single axis. Furthermore, the inboard attachment points of the suspensions members connected to the steering system must remain a fixed distance from each other and can only translate in Y.

**C10.5.3** Power assisted steering systems may not be electronically controlled or electrically powered. No such system may carry out any function other than reduce the physical effort required to steer the car.

**C10.5.4** No part of the steering wheel or column, nor any part fitted to them, may be closer to the driver than a plane formed by the entire rear edge of the steering wheel rim. All parts fixed to the steering wheel must be fitted in such a way as to minimise the risk of injury in the event of a driver's head making contact with any part of the wheel assembly.

**C10.5.5** The steering wheel, steering column and steering rack assembly must pass an impact test, details of the test procedure may be found in Article C13.8.

## **C10.6 Suspension Uprights**

**C10.6.1** The upright is the structural component, in the outboard suspension, which provides the physical mounting, kinematic restraint and load path connections of the wheel axle to the suspension member outboard attachments as well as the reaction of the brake calliper loads into the suspension.

There can only be one suspension upright per complete wheel.

**C10.6.2** The loads from the suspension members and wheel bearings must individually and entirely be carried by the suspension upright. Exceptionally up to three suspension members may be connected together by titanium, aluminium alloy or steel components before their load is passed into the upright. Any such components are in any case considered to be part of the upright assembly.

**C10.6.3** No part of the upright assembly may be inboard of  $Y_w=0$  except for parts solely for the attachment and fixing of a suspension member outboard attachment point, conforming to Article C10.3.4 (a) to (c), to the upright which may encroach no more inboard than a sphere of radius 25mm about the attachment point.

## **C10.7 Wheel rims**

### **C10.7.1 Wheel rim material**

With the exception of surface treatments for appearance and protection, wheel rims must be made from AZ70 or AZ80 magnesium alloy.

### **C10.7.2 Wheel rim dimensions**

a. The wheel rim key dimensions are:

	Front Wheel	Rear Wheel
Rim Diameter	462.6 ± 0.1	462.6 ± 0.1
Tyre Mounting Width	315 ± 0.5	401.3 ± 0.5
Lip External Diameter	496 ± 0.5	496 ± 0.5
Overall Width	334 ± 0.5	420.3 ± 0.5
Lip Thickness	9 ± 1	9 ± 1
Outboard Lip Thickness	8.5 ± 0.2	8.5 ± 0.2
Inboard Lip Thickness	10.5 ± 0.2	10.5 ± 0.2

- b. The Wheel Rim must be a solid of rotation formed by revolving a single profile around the axis of rotation of the wheel rim. The profile must be tangent continuous with a minimum radius of curvature of 8mm ~~except for~~ in the area:
- i. more than 80mm from the axis  $Y_w$
  - and
  - ii. outboard of  $Y_w = -36$
  - and
  - iii. inboard of;  $Y_w = -302$  for the front rim and  $Y_w = -388$  for the rear rim
- ~~i. the bead profile~~
- ~~ii. the external diameter of the lips~~
- ~~iii. the mounting face to the axle~~
- ~~iv. the bore and wheel nut seat.~~
- ~~c. Once the solid of rotation has been fully defined, an annulus with an internal diameter of 310mm and thickness of 2mm must be added. Its outer face must be coincident with the outer plane of the revolution defined in (b). A bead of up to 3mm radius may be added to the inner diameter. This annulus does not have to be integral with the rim and may be constructed from a different material.~~
- c. Once the revolved solid has been fully defined, material may be removed:
- i. ~~to form spokes, removed~~ between  $Y_w = -210$  and  ~~$Y_w = -340$~~   $Y_w = -392.5$  on the rear wheel and between  $Y_w = -188$  and  ~~$Y_w = -290$~~   $Y_w = -319$  on the front wheel. Any new surface created must have no concave radius of curvature smaller than 6mm.
  - ii. ~~for wheel pegs and other features on the mounting flange~~ removed in areas less than 80mm from the axis  $Y_w$
  - iii. added or removed to form features for mounting the inflation valve and TPMS sensors
  - iv. removed on the outer flanges, between a radius of 238mm and a radius of 246mm from ~~wheel~~ the axis  $Y_w$  and up to 1mm deep for wheel branding, logo, or part numbers, ~~or similar features.~~
  - v. added or removed to form features for mounting the disc described in Article C10.7.
- d. ~~Except for the inflation valve, No part of the wheel rim or anything attached to it~~ may lie within **RV-F-RIM-MIN** (front) or **RV-R-RIM-MIN** (rear).
- e. There must be no passage for air between the inboard and outboard cavities of the Wheel Rim. ~~All apertures through the spokes must be closed by a panel on the inboard turned face of the spokes. This~~ Any closing panel may either be integrated into the rim or may be a separate piece.
- f. The minimum wheel rim thickness is 2.5mm.
- g. The minimum bead thickness is 4.0mm (measured from hump to outer edge of the lip).
- h. The ETRTO standard bead profile is prescribed.

- i. The design of the wheel must meet the general requirements of the tyre supplier for the mounting and dismounting of tyres including allowance for sensors and valves.
- j. The wheel rim design cannot be handed between left and right designs.
- ~~t. Features (including but not limited to, ribs, fins, turbulence generators), surface treatments, or coatings which influence the heat transfer characteristics of the wheel rim are not permitted.~~

#### C10.7.3 Wheel Rim Impact Test

All wheel rims must pass the impact test defined in Article C13.10.

#### C10.7.4 TPMS Sensor

All cars must be fitted with tyre pressure and temperature monitoring sensors which have been manufactured by an FIA designated supplier to a specification determined by the FIA.

The TPMS sensor must be mounted in accordance with the specification given in the Appendix to the Sporting and Technical Regulations.

Wheel rims and tyre pressure and temperature sensors should be marked according to the corner colouring and labelling scheme defined in the Appendix to the Technical and Sporting Regulations.

#### C10.7.5 Outboard Disc

A disc with an internal diameter of 310mm must be fitted to all wheels. Its outer face must be coincident with the outer plane of the revolution defined in Article C10.7.2.b.

No part of the annulus or its fixings may lie within RV-F-RIM-MIN (front) or RV-R-RIM-MIN (rear).

#### C10.7.6 Parts attached to the wheel rim

The only parts which may be physically attached to the wheel in addition to the tyre are listed below. ~~surface treatments for appearance and protection, valves for filling and discharging the tyre, wheel fasteners, balance weights, drive pegs, standard supply tyre pressure and temperature monitoring sensors, closing panels required by C10.7.2.f, and spacers on the inboard mounting face of identical specification on all wheels for the same axle.~~

Item	Article	May enter RV-RIM-F/R-MIN	Additional Restrictions
Wheel Fastener	C10.9.1	Yes	
Disc and fixings	C10.7.5	No	
Drive Pegs	-	Yes	
Wheel Spacers	-	No	Must be equal thickness left and right on same axle.
Inflation Valve	-	Yes	
Closing Panels	C10.7.2.e	No	
Balance weights	-	Yes	Only as fitted by Tyre Supplier
Standard TPMS Sensor (Mandatory) and mounting	C10.7.4	Yes	



Standard Rim Temperature Sensor (Optional) and mounting	-	Yes	
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**C10.8 Tyres**

**C10.8.1 Tyre supply**

- a. All tyres must be used as supplied by the manufacturer, any modification or treatment such as cutting, grooving, the application of solvents or softeners is prohibited. This applies to dry, intermediate and wet-weather tyres.
- b. If, in the opinion of the appointed tyre supplier and FIA technical delegate, the nominated tyre specification proves to be technically unsuitable, the stewards may authorise the use of additional tyres to a different specification.
- c. If, in the interests of maintaining current levels of circuit safety, the FIA deems it necessary to reduce tyre grip, it shall introduce such rules as the tyre supplier may advise or, in the absence of advice which achieves the FIA's objectives, specify the maximum permissible contact areas for front and rear tyres.

**C10.8.2 Tyre specification**

Tyre specifications will be determined by the tyre supplier, in agreement with the FIA, data will be divided into data blocks as defined in the Appendix to the Sporting and Technical Regulations and according to the timetable given in that appendix.

Once determined in this way, the specification of the tyres will not be changed without the agreement of the Formula One Commission.

Notwithstanding the above, the FIA may decide to change the specification during the Championship season for safety reasons without notice or delay.

**C10.8.3 Treatment of tyres**

- a. Tyres may only be inflated with air or nitrogen.
- b. Any process the intent of which is to reduce the amount of moisture in the tyre and/or in its inflation gas is forbidden.
- c. A complete wheel must contain a single fixed internal gas volume. No valves, bleeds or permeable membranes are permitted other than to inflate or deflate the tyre whilst the car is stationary.
- d. The only permitted type of tyre heating devices are blankets that comply with the design prescriptions listed in Article C10.8.4.

Any other device, system or procedure (except for driving of the car) the purpose and/or effect of which is to heat the wheels, hubs or brakes above the ambient air temperature, or to maintain their temperature if they are already warm, is prohibited.

**C10.8.4 Tyre heating systems design prescriptions**

- a. Tyre heating systems may only use resistive heating elements and act upon the outer tyre surface.
- b. No more than three temperature controllable zones may be present on a single tyre blanket.
- c. A temperature controllable zone is at most composed of one heating element (the actuator) and one or more temperature sensor(s) solidly mounted on the blanket.
- d. The blanket temperature sensors may be used to control the delivered power of the actuator using a single-input single-output (SISO) feedback control strategy approved by the FIA. There should be no other sensors involved in the temperature control strategy.

If a temperature controllable zone contains more than one temperature sensor, the signals must be arbitrated by software prior to being used in the SISO feedback control loop. Additional software design guidelines may be found in the Appendix to the Technical and Sporting Regulations.

- e. At any time during a Competition, the heating system must provide mechanisms to:
  - i. Log and download an accurate record of the last 96 hours of operations. **Information to be logged is defined in the Appendix to the Technical and Sporting Regulations and will include power, and energy consumption.**
  - ii. Accurately display in real-time the calibration, inputs and outputs of all control and arbitration strategies,
  - iii. Enable the FIA to test the operation of any tyre heating systems.

[Appendix will be modified accordingly]

- f. All software, hardware and wiring must:
  - i. Be approved and homologated by the FIA prior to being used at a Competition,
  - ii. Provide a unique and unambiguous identification that enables the FIA to identify and compare the versions being used to the version presented in the homologation dossier at any time during a Competition.

Additional details may be found in the Appendix to the Technical and Sporting Regulations.

**C10.9 Wheel attachment and retention**

**C10.9.1** The wheel must be attached to the car with a single fastener. The outer diameter of the fastener must not exceed 105mm and the axial length must not exceed 75mm. The wheel fastener may not attach or mount any part to the car except the wheel assembly described in Article C10.7.

**C10.9.2** With the exception of manual torque wrenches, devices which are used to fit or remove wheel fasteners during a pit stop during the qualifying practice session, sprint session or race may only be powered by compressed air or nitrogen or electricity.

Any sensor systems may only act passively.

- C10.9.3** All cars, whilst under their own power, must be fitted with dual stage devices which will retain the wheel fastener in the event of it coming loose from both its full fitted position and from any angular position before the fastener begins to engage on the axle thread.
- C10.9.4** Each Competitor must provide test results which demonstrate that all dual stage devices must be able to :
- Withstand 20kN of axial tensile force exerted on the wheel nut in a direction away from the car centre line whilst the wheel nut is fully disengaged from the thread.
  - Withstand 300Nm of torque exerted on the wheel nut in the unwinding direction whilst the wheel nut is partially engaged on the thread.
- C10.9.5** Furthermore, the dual stage retaining systems must incorporate a means of allowing the wheel operator/fitter to visually identify an incorrectly fitted fastener.
- C10.9.6** No part of the axle, wheel–nut, or wheel retention device may lie outboard of the outboard plane of the Wheel Rim.

## **C10.10 Dimensions**

### **C10.10.1 Suspension Width**

The origin of the front wheel **axis coordinate** system may not lie outboard of Y=603 at Legality Ride Height.

The origin of the rear wheel **axis coordinate** system may not lie outboard of Y=525 at Legality Ride Height.

**ARTICLE C11: BRAKE SYSTEM****C11.1 Brake circuits and pressure distribution**

**C11.1.1** With the exception of a power unit, all cars must be equipped with only one brake system. This system must consist of one pedal which operates two master cylinders. On the outlet side of the master cylinders the system must comprise of two hydraulic circuits, one circuit from one master cylinder to operate the two front wheels, the other circuit from the other master cylinder to operate the two rear wheels.

~~In the case of failure of one circuit, the remaining system must be capable of bringing the car to a stop in less than 200m from 330km/h, without assistance from the Power Unit or MGUK.~~

~~The rear braking system must be capable of providing at least 2500Nm of braking torque at each rear wheel without assistance from the Power Unit or MGUK. This torque must be achieved with a maximum calliper pressure of 150barG. Competitors ~~may be~~ are required to submit a test report demonstrating this requirement~~

The rear brake control system described in Article C11.6 will be regarded as part of circuit that operates the rear wheels. This system must be designed so that if a failure occurs in one circuit the pedal will still operate the brakes in the other.

The diameters of the master cylinders acting on the two rear wheels and the two front wheels must be within 2mm of each other and have the same available travel. The same principle must be applied in multi-stage master cylinder designs.

**C11.1.2** The brake system must be designed so that within each circuit, the forces applied to the brake pads are the same magnitude and act as opposing pairs on a given brake disc. Any system or mechanism which can produce systematically or intentionally, asymmetric braking torques for a given axle is forbidden.

**C11.1.3** Any powered device, other than the system referred to in Article C11.6, which is capable of altering the configuration or affecting the performance of any part of the brake system is forbidden.

**C11.1.4** Any change to, or modulation of, the brake system, whilst the car is on the track must be made by the driver's direct physical input or by the system referred to in Article C11.6, and may not be pre-set.

**C11.2 Brake callipers**

**C11.2.1** Brake callipers are defined as the parts of the braking system outside the survival cell, other than brake discs, brake pads, calliper pistons, components directly associated with the system referred to in Article C11.6, brake hoses and fittings, which are stressed when subjected to the braking pressure. Bolts or studs which are used for attachment are not considered to be part of the brake callipers.

**C11.2.2** All brake callipers must be made from aluminium materials permitted in Article C15.3.1.b.

**C11.2.3** No more than three attachments may be used to secure each brake calliper to the car.

**C11.2.4** Each wheel must be equipped with one calliper. This calliper must have a minimum of one pair of opposing pistons and a maximum of four pairs of opposing pistons.

**C11.2.5** The section of each calliper piston must be circular.

**C11.3 Brake discs and pads**

- C11.3.1** Each wheel must be equipped with one brake disc which must have the same rotational velocity as the wheel it is connected to.
- C11.3.2** All discs must have a maximum thickness of 34mm.
- C11.3.3** The diameters of the discs are between 325mm and 345mm for the front and between 260mm and 280mm for the rear.
- C11.3.4** The minimum diameter of cooling holes in the discs is 2.5mm.
- C11.3.5** Each wheel must be equipped with one or two opposing pairs of brake pads.

**C11.4 Brake pressure modulation**

- C11.4.1** No braking system may be designed to prevent wheels from locking when the driver applies pressure to the brake pedal.
- C11.4.2** No braking system may be designed to increase the pressure in the brake callipers above that achieved by the driver applied force to the pedal under all conditions.

**C11.5 Liquid cooling**

Liquid cooling of the brakes is forbidden.

**C11.6 Rear brake control system**

The pressure in the rear braking circuit may be provided by a powered control system provided that:

- a. The driver brake pedal is connected to a hydraulic master cylinder that generates a pressure source that can be applied to the rear braking circuit if the powered system is disabled.
- b. The powered system is controlled by the control electronics described in Article C8.3.

**C11.7 Supply of Brake Friction and Brake System Hydraulic components**

The Brake Disks and Pads described in Article C11.3, the Brake Calliper described in Article C11.2, the Master Cylinder described in Article C11.1 and Rear brake control system described in Article C11.6 are classified as OSC, in accordance with the provisions of Article C17.6.

**ARTICLE C12: SURVIVAL CELL****C12.1 Definitions and General Requirements****C12.1.1 Cockpit**

The volume that accommodates the driver.

**C12.1.2 Survival cell**

The continuous closed structure containing the fuel tank, the cockpit and the parts of the Energy Store and MGUK, listed in Articles ~~5.3.6~~ C5.20 and C5.21 which lie ahead of  $X_{PU}=0$ .

The lower plate of the Energy Store assembly is considered to be part of the Survival cell.

**C12.1.3 Cockpit padding**

Non-structural parts placed within the cockpit for the sole purpose of improving driver comfort and safety. All such material must be quickly removable.

**C12.1.4 Homologation**

The survival cell must be homologated in accordance with the provisions of Article C13.

**C12.1.5 Demonstration by Calculation**

Where the regulations require a Competitor to demonstrate the strength of a component or structure by calculation, a reserve factor of 1.0 at ultimate failure should be used for metallic components and first-ply failure for composites.

The FIA may request Competitors to submit models and material properties used in these calculations for inspection.

**C12.2 Survival cell specifications****C12.2.1 Cockpit Opening**

In order to ensure that the opening giving the driver access to the cockpit is of adequate size; with the exception of the steering wheel, steering column, chassis mounted PCU8 display unit, seat and all padding required by Article C12.6.1 (including the forward most fixings), or the Windscreen defined in Article C3.11.1 and its fixings, no part of the survival cell or bodywork may lie within **RV-COCKPIT-ENTRY**.

With the secondary roll structure removed, **RV-COCKPIT-ENTRY** must be entirely visible from directly above.

The shape of the survival cell must be such that no part of this volume is visible when viewed from either side of the car.

The parts of the survival cell which are situated each side of the driver's head must be no more than 550mm apart.

**C12.2.2 Survival Cell Dimensions**

Before the openings and recesses allowed in Articles C12.2.1, C12.2.4 and C12.2.5 are created, a single volume, which is ~~symmetrical about  $Y=0$~~ , continuous, and has no apertures must be defined in accordance with the conditions laid out in (a)–(d), below. **All parts of the Survival Cell in contact with the External Air Stream must comply with C3.2.3. For this purpose, the panels specified in ~~C12.3.2 and C12.3.3 are considered part of the survival cell.~~**

- a. No part of the Survival Cell may lie ahead of  $X_A=0$ .
- b. No part of the Survival Cell may lie behind  $X_{PU}=0$ .
- c. The minimum dimensions of the survival cell between  $X_A=0$  and  $X_C=0$  are defined by the union of **RV-CH-FRONT-MIN** and **RV-CH-MID-MIN**.
- d. ~~The external surface of the survival cell, behind **RV-CH-MID-MIN**, ahead of  $X_{PU}=100$ , above  $Z=50$ , and below  $Z=380$  must be outboard of  $Y=\pm 280$~~  **The survival cell must fully enclose RS-PU-ERS.**
- e. The maximum dimensions of the survival cell between  $X_A=0$  and  $X_C=-875$  are defined by the union of **RV-CH-FRONT** and the portion of **RV-FLOOR-BODY** that lies forward of  $X_C=-875$  and inboard of  $Y=\pm 210$ .
- f. Material may be removed from the upper front part of the volume defined in ~~(c) (d) and (e)~~ above. In order to do so, a Z-plane must be defined such that the remaining part of **RV-CH-FRONT-MIN** below it is at least 250mm high in every X-plane ahead of  $X_C=-1600$ . Material may only be removed above this Z-plane and ahead of  $X_C=-1600$ , in two stages:
  - i. After the first stage of material removal, the external surface of the survival cell forward of  $X_C=-1590$ , must enclose all mechanical components and associated brackets of the inboard front suspension at Legality Ride Height. Furthermore, any normal to this external surface must not subtend an angle greater than  $25^\circ$  to an X-plane, with the exception of the areas covered by the structural part of the front impact structure.
  - ii. In the second stage, further material may be removed down to the Z-plane defined above. In every X-plane, a cumulative total width of 100mm must remain from the surfaces created in the first stage of material removal. This may be either a single part 100mm wide, symmetrical about  $Y=0$  or two parts, each 50mm wide, adjacent to each vertical side of the Survival Cell.

Structure that lies above the Z-plane and ahead of  $X_C=-1600$  may be removable provided that the fastenings can resist a load of  $[50, 0, -30]$  kN, to be demonstrated by calculation.
- g. With the exception of any minimal apertures for front suspension members, and a recess for the timing transponder, the external surfaces of the survival cell and the external surfaces of the structural part of the front impact structure must coincide over the entire periphery of the survival cell at its front bulkhead.

**C12.2.3 Identification Transponders**

Every survival cell must incorporate three FIA supplied transponders for identification purposes. These transponders must be a permanent part of the survival cell, be positioned in accordance with Drawing 2 and must be accessible for verification at any time.

**C12.2.4 Openings in the Survival Cell**

The survival cell must have an opening for the driver, the dimensions of which are given in Article C12.2.1. Any other ducts, or openings in the survival cell must only:

- a. Be of the minimum size, and for the sole purpose of, allowing access to mechanical components.
- b. Be for the sole purpose of cooling the driver or mechanical or electrical components, the area of any such duct or opening may not exceed 3000mm<sup>2</sup>.
- c. Be for the sole purpose of routing wiring looms, cables or fluid lines, the total combined area of any such openings must not exceed 7000mm<sup>2</sup>.
- d. In the rear bulkhead for access to the ERS. The Fuel Bladder must not be exposed by this opening.

No openings may be made in the 100mm wide section(s) defined in Article C12.2.2.f.ii.

**C12.2.5 Recesses in the Survival Cell Minimum Volume**

Recesses are permitted in the Survival Cell minimum volume, defined in Article C12.2.2, for the following:

- a. For the sole purpose of, allowing the side impact structures and their mountings to be installed in accordance with Article C13.5.1. The area of each such recess for each side impact structure must not exceed 8 000mm<sup>2</sup> when projected onto a Y-plane.
- b. For the sole purpose of allowing the secondary roll structure front fixing and fairings to be installed in accordance with Articles C12.4.2 and C3.12.3 (b). The total area of any such recess must not exceed 50 000mm<sup>2</sup>.
- c. Minimal Recesses for the sole purpose of mounting mandatory components. Including but not limited to; timing transponder, F1MS Antenna, position 5 camera, medical light, datum-target seats, ERS Status Light, and clutch disengagement button.
- d. Minimal Recesses for the sole purpose of mounting team specified components. Including but not limited to; suspension brackets, suspension fairings, slip-angle sensor, bib stay mounting, and antennae.
- e. Recesses of maximum area 75 000mm<sup>2</sup> per side and of maximum depth 1mm, within the volume **RV-CH-FRONT-MIN**, for the sole purpose of mounting team specified Bodywork Components.
- f. Recesses of maximum area 75 000mm<sup>2</sup> per side and of maximum depth 1mm, within the volume **RV-CH-MID-MIN**, for the sole purpose of mounting team specified Bodywork Components.

Furthermore:

- g. The step surfaces of recesses no more than 3mm deep are not required to comply with the angle constraints of ~~C12.2.2.c.i~~ C12.2.2.f.i.
- h. Any recesses in areas covered by Article C12.3.1 – Anti Intrusion Laminate, must comply with that article's requirements for maintaining equivalent intrusion strength.



### C12.2.6 Structure behind the driver

The parts of the survival cell immediately behind the driver which separate the cockpit from the car's fuel tank, must lie outside **RV-COCKPIT-DRIVER**.

No head and neck support worn by the driver may be less than 25mm from any structural part of the car when the driver is seated in the normal driving position.

No part of ~~the~~ any component that is required to be installed within **RV-PU-ERS**;

- a. that lies above Z=50, may lie ahead of **RS-FWD-FUEL-LIMIT**.
- b. that lies on or below Z=50, may lie more than 50mm ahead of **RS-FWD-FUEL-LIMIT**.

### C12.2.7 Front Floor Structure

Below the survival cell, a structure, called "Front Floor Structure" must be fitted.

The Front Floor Structure:

- a. Must lie within **RV-BIB** and be fully enclosed by the Floor Bodywork as specified in Article C3.5.6 such that no part of the structure is in contact with the external air flow.
- b. Must be rigidly mounted to the Survival Cell using at least 4 fasteners.
- c. Must only deform in the event of an impact with the ground.

A single device may be fitted between the Front Floor Structure and the Survival Cell. This device:

- d. Must not incorporate any component, mechanism or structure whose characteristics vary with time, velocity, acceleration or temperature. Including, but not limited to viscous damping, hysteretic damping and hydraulic systems.
- e. Must not incorporate any parts which may systematically or routinely exhibit permanent deformation.
- f. Must not be designed in such a way, or incorporate any component, mechanism or structure that can cause it to exhibit anything other than the same load deflection relationship measured during the test described in Article C3.18.6 whilst on the circuit (other than minor incidental effects such as those caused by inertia).
- g. Must not be in contact with the external air stream.

### C12.2.8 Chassis Datum Points

For aligning the car for scrutineering, the survival cell should have the necessary precisely machined details to allow for the relevant legality datum points defined in Article C3.2.6 to accurately positioned.

## C12.3 Intrusion Protection

### C12.3.1 Survival Cell Intrusion Specification

In order to protect the driver and the fuel bladder in case of an impact, the sides and lower surfaces of the survival cell must comply with the following requirements:

- a. Surfaces which lie on or outside **RV-CH-FRONT-MIN**, or that are created by the recesses defined in Article C12.2.5.e, and lie;

- i. Longitudinally, ~~between~~ behind  $X_c = -1630$  and ahead of **RS-INTSN-LAM-FWD**  ~~$X_e = -875$~~
- ii. Vertically, ~~above~~  $Z=100$  and below the lower of;  $Z=550$  and a curve ~~more than~~ 50mm below the top curve of **RV-CH-FRONT-MIN**

Must be constructed with the homologated laminate **HL-FWD-SC**

Any panel covering the Timing Transponder required by Article C8.16 is excluded from this requirement.

- b. Surfaces which lie;
  - i. Longitudinally, ~~between  $X_e = -875$ , and the rear of **RV-CH-MID-MIN**~~ behind **RS-INTSN-LAM-FWD** and ahead of the intersection of **RS-FWD-FUEL-LIMIT** with the surface.
  - ii. Vertically, between  $Z=100$  and  ~~$Z=570$~~   $Z=550$
  - ~~iii. Laterally, more than 140mm from  $Y=0$~~
  - iii. Excluding recessed permitted by Article C12.2.5.a

Must be constructed with the homologated laminate **HL-COCKPIT-SIDE**.

- c. Surfaces which lie;
  - i. Longitudinally, ~~between  $X_e = -875$  and  $X_e = -350$~~  ahead of  $X_c = -415$ .
  - ii. Vertically, below  ~~$Z=200$~~   $Z=100$ .
  - iii. Excluding recessed permitted by Article C12.2.5.a

~~And are not constructed to the laminate **HL-COCKPIT-SIDE**;~~ Must be constructed with the homologated laminate **HL-COCKPIT FLOOR**.

- d. Surfaces that lie:
  - i. Longitudinally, ~~between rear of **RV-CH-MID-MIN** and~~ behind the intersection of **RS-FWD-FUEL-LIMIT** with the surface and ahead of  ~~$X_{pu} = -50$~~  **RS-INTSN-LAM-RWD**.
  - ii. Vertically, between  $Z=100$  and  ~~$Z=450$~~   $Z=550$
  - iii. Excluding recessed permitted by Article C12.2.5.a

Must be constructed with the homologated laminate **HL-FC-SIDE**.

~~Additional plies may be added to these laminates. The core thickness or density may be increased, or the core may be replaced with solid inserts.~~

~~Between  $X_A = -975$  and 100mm behind the rear of **RV-CH-MID-STRUCT**, the core may be supplemented or replaced by an alternative reinforcing method.~~

The following changes are permitted to the Homologated Laminates. The FIA Technical Delegate must be satisfied that the overall strength of the modified structure has been improved by ~~doing so~~ the modification and that its ability to pass the tests defined in Article C15.6.3 ~~given by **Side Intrusion Test Procedure 02/24**, as defined in the Appendix to the Technical and Sporting Regulations~~ is maintained.

- e. Where the Homologated Laminate is monolithic:
  - i. Plies may be added to the laminate

- ii. Solid Inserts may be incorporated into the laminate
  - iii. Core, reinforcing structures, and an additional skin may be added to the inside face of the laminate.
  - iv. Core or hollow reinforcing structures must not be added within the laminate.
- f. Where the Homologated Laminate is a sandwich construction:
- i. Plies may be added to the laminate of either skin
  - ii. Solid Inserts may be incorporated within the laminate of either skin
  - iii. Core density and thickness may be increased.
  - iv. Reinforcing structures and may be added within the core.
  - v. Core or hollow reinforcing structures must not be added within either skin.

#### C12.3.4 Frontal Intrusion

It must be demonstrated by calculation that during a collision, the rear impact structure of a car ahead could not enter the survival cell through the front bulkhead if the Front Impact Structure were not present. For this calculation, a load of [215, 0, 0]kN should be applied through a pad of the same dimensions as the prescribed rear impact structure, anywhere on the front bulkhead of the survival cell. The pad should not intrude into the survival cell more than 50mm behind  $X_A=0$ . All components normally attached to the survival cell, except for the Front Impact Structure, must be considered in this evaluation.

#### C12.3.5 Cockpit Side Structure

The survival cell visible from the side that covers **RV-CH-MID-MIN** must be designed to resist the force of an impacting Front Impact Structure, at up to ~~350kN~~ 380kN. This should be demonstrated by the tests and calculations defined in Article ~~C13.4.6~~ C13.4.7

The volume **RV-CH-MID-STRUCT** may only contain

- i. Survival cell structure
- ii. Wiring looms or cables, excluding connectors, electrical boxes, or other electrical components
- iii. Electrical components that require direct driver input
- iv. Fluid lines and their fittings
- v. Fire extinguisher nozzles, tubes and brackets
- vi. Padding for driver comfort
- vii. Ducts for the sole purpose of cooling the driver and/or mechanical and/or electrical components

#### C12.4 Roll Structures

All cars must have two roll structures that are designed to help prevent injury to the driver in the event of the car becoming inverted.

**C12.4.1 Principal Roll Structure**

The principal roll structure must satisfy the following geometric requirements:

- a. It must have structure at  $[X_c=55, 0, 968]$ .
- b. A horizontal section through the structure at  $Z=950$  must enclose an area of at least  $6000\text{mm}^2$ . The cross-sectional area may not be less than  $6000\text{mm}^2$  in any horizontal section below this plane.
- c. Above  $Z=935$ , the external surface of the structure must be tangent continuous, and must not contain any concave radius of curvature. Any convex radius of curvature must be no smaller than  $20\text{mm}$ .

Compliance will be assessed without considering an opening in the structure to allow aerodynamic ducts to pass through. Any such opening must be below  $Z=955$

Minimal local deviations from this surface are permitted at the intersection of the external surface and openings for an internal duct, and for the mounting of Camera 4.

- d. A horizontal section through the structure at  $Z=910$  must enclose an area of at least  $10000\text{mm}^2$ . Furthermore, the section must enclose an axis-aligned square of side  $70\text{mm}$ . These requirements must be maintained in any horizontal section below this plane.

When evaluating the above, only parts that genuinely contribute to the strength of the principal roll structure will be considered and no fairings may be included. Parts of the structure above  $Z=935$  must be designed to support the car in a  $20g$  vertical impact with the ground and be made from an abrasion resistant material.

The areas required in (b) and (d) above, will be taken as the area of the minimum convex polygon enclosing the structural parts of the roll hoop in that plane.

In order that a car may be lifted quickly in the event of it stopping on the circuit, the principal rollover structure must incorporate an unobstructed opening, whose section measures  $60\text{mm} \times 30\text{mm}$  with internal radii of no more than  $R15\text{mm}$ , clearly visible in side view, to permit a strap to pass through it.

It must be shown by calculation that this opening is capable of resisting a load of  $20\text{kN}$  applied by a strap in an upwards direction, on the  $ZX$  plane between  $+45^\circ$  and  $-45^\circ$  to the  $Z$ -axis. In designs where the strap could be threaded in different ways, calculations must be provided for all possibilities.

**C12.4.2 Secondary Roll Structure (Halo)**

The secondary roll structure, which is not considered part of the survival cell, must be positioned symmetrically about the car centre plane with its front fixing axis at  $X_c = -975$  and  $Z=660$ . The mounting faces for the rearward fixings must lie on the plane  $Z=695$ .

The secondary roll structure must be made to standard FIA8869-2018 and supplied by an FIA designated manufacturer. Details of the structure and its mountings may be found in the Appendix to the Technical and Sporting Regulations.

The FIA will take the appropriate measures to ensure that secondary roll structures supplied by different FIA designated manufacturers are of similar mass.

## C12.5 Cockpit Specification

### C12.5.1 Entry and Exit

The driver must be able to enter and get out of the cockpit without it being necessary to open a door or remove any part of the car other than the steering wheel or the headrest as defined in Article C12.6.1.

From the normal seating position, with the safety harness fastened and whilst wearing the usual driving equipment, the driver must be able to remove the steering wheel and get out of the car within 7 seconds and then replace the steering wheel in a total of 12 seconds.

For this test, the position of the steered wheels will be determined by the FIA technical delegate and after the steering wheel has been replaced steering control must be maintained.

### C12.5.2 Helmet Position

When seated normally, the driver must be facing forwards and the rearmost part of the crash helmet must be between  $X_C = -50$  and  $X_C = -125$ .

The driver's helmet must lie below a line drawn between the front fixing axis of the secondary roll structure and a point 75mm vertically below the highest point of the principal roll structure.

### C12.5.3 Steering Wheel

The steering wheel, at any rotation, must lie below a line drawn between the front fixing axis of the secondary roll structure and a point 75mm vertically below the highest point of the principal roll structure.

The steering wheel must be at least 50mm behind the front edge of the cockpit opening.

The steering wheel must be fitted with a quick release mechanism operated by pulling a concentric flange installed on the steering column behind the wheel.

The steering wheel must be positioned so as it intersects RV-COCKPIT-HELMET at all angular positions.

### C12.5.4 Internal cockpit volumes

- a. With the exception of the steering wheel, pedal assembly, driver's seat, and any padding that is required by Article C12.6.2, no part of the car may lie within a volume created by sweeping the outer vertical section shown in Drawing 3 of Appendix C3 between  $X_C = -850$  and  $X_C = -1415$ .
- b. With the exception of the steering wheel, steering column, driver's seat, and pedal assembly, no part of the car may lie within a volume created by sweeping the inner vertical section shown in Drawing 3 of Appendix C3 between  $X_C = -850$  and  $X_C = -1515$ .
- c. No part of the car may lie within the volume defined in **RV-COCKPIT-DRIVER** with the exception of:
  - i. Items required for driver comfort or restraint e.g., the seat and its mountings, safety harness and its mountings, drinks system, padding required by Article C12.6.1.
  - ii. Items required for the driver to control the car e.g. steering wheel, steering column, dash display, switch panels, associated looms, driver microphone & earpiece.

- iii. Items that need to be accessed whilst the driver is seated in the car e.g. SDR download connector, connector for driver radio, associated looms, ES dousing connector.
  - iv. Driver ballast.
  - v. wiring looms or cables, excluding connectors, electrical boxes, or other electrical components.
  - vi. Fire extinguisher nozzles, tubes, and brackets.
  - vii. Fluid lines and their fittings
  - viii. The accelerometer close to the centre of gravity, required by Article C8.10.2.
  - ix. The accelerometer required by Article C8.20.
- d. The driver, seated normally with the safety harness fastened and with the steering wheel removed must be able to raise both legs together so that the knees are past the plane of the steering wheel in the rearward direction. This action must not be prevented by any part of the car.

#### **C12.5.5 Position of the Pedals**

The face of the foremost pedal, when in the inoperative position, must be situated behind  $X_c = -1515$ .

It must be possible to mount the pedals with the face of the brake pedal as far forward as  $X_c = -1515$ . When mounted in this position, the brake pedal, through the full pedal sweep, must maintain at least 10mm longitudinal clearance from any structure or component that could limit further movement.

#### **C12.6 Cockpit Padding**

##### **C12.6.1 Headrest**

All cars must be equipped with three areas of padding for the driver's head which:

- a. Are so arranged that they can be removed from the car as a single part.
- b. Are made from a material which is suitable for the relevant ambient air temperature, details of approved materials and the temperature bands in which they should be used may be found in the Appendix to the Technical and Sporting Regulations.
- c. Are covered, in all areas where the driver's head is likely to make contact, with laminate **PL-HEADREST**.
- d. Are positioned to be the first point of contact for the driver's helmet in the event of an impact projecting the driver's head towards them during an accident.
- e. Must have a cover and internal structure which have no features that obstruct the padding's freedom to compress to 5% of its uncompressed thickness.
- f. Must be so installed that if movement of the driver's head, in any expected trajectory during an accident, were to compress the padding fully at any point, the driver's helmet would not make contact with any structural part of the car.

- g. Do not obscure sight of any part of the driver's helmet when he is seated normally and viewed from directly above the car.

### Rear Padding

The first area of padding ~~for the driver's head~~ must be positioned behind ~~him~~ the driver's head, be between 260mm and 380mm wide and be between 75mm and 90mm thick over an area of at least 40000mm<sup>2</sup>. If necessary, and only for driver comfort, an additional piece of padding no greater than 10mm thick may be attached to this headrest provided it is made from the same material.

### Side Padding

Two areas of padding must be positioned either side of the driver's head. These areas must:

- h. Be symmetrically positioned about  $Y=0$ .
- i. Be positioned with their upper surfaces at least as high as the survival cell over their entire length.
- j. Have a radius on their upper inboard edge no greater than 10mm.
- k. Be positioned in order that, forward of  $X_c=-150$ , the distance between the two is no less than 320mm.
- l. Be as high as practicable within the constraints of driver comfort.
- m. Extend as far forward as the forward face of **RV-COCKPIT-HELMET**.

Between  $X_c = -75$  and  $X_c = -400$  and above  $Z=545$ , the padding must be at least 95mm thick over an area greater than 35750mm<sup>2</sup> when viewed from the side of the car. This minimum thickness must be maintained to the upper edges of the survival cell and over their entire length. The minimum thickness will be assessed perpendicular to the plane  $Y=0$  and prior to the application of the radius required by (j).

Furthermore, any void between these areas of padding and the rear part described above must also be completely filled with the same padding material.

If necessary, and only for driver comfort, an additional piece of padding no greater than 20mm thick may be attached to these headrests provided they are made from the same material which incorporates a low friction surface.

### Fixings

The Headrest should be fixed in a way that is clearly indicated and should be easily removable without tools. Fixings should consist of:

- n. Two cylindrical longitudinal pegs with a diameter of at least 6mm and with an engagement of at least 12mm into the rear of the cockpit opening
- o. A keyhole fixing at  $X_c = -250 \pm 50$ mm and  $Z=610 \pm 25$ mm on each side of the car. These fixings must comply with C12.6.1 (e) and the receptacle mounted on the survival cell must be flush with the survival cell structure. These fixings must prevent the headrest from moving laterally or vertically with up to 12mm of forward movement of the headrest. They may not be inside **RV-COCKPIT-HELMET** and should be designed to minimize the risk of injury should the driver come in contact with them during an accident.

- p. A quick release fixing which is clearly indicated at the front corner on each side of the car. No tape or similar material may be used to cover the forward fixings of the headrest.

#### **C12.6.2 Leg Padding**

In order to minimise the risk of leg injury during an accident, additional areas of padding must be fitted each side of, and above, the driver's legs.

These areas of padding must:

- a. Be made from a material described in the Appendix to the Technical and Sporting Regulations.
- b. Be no less than 25mm thick over their entire area.
- c. Cover the area situated between the plane  $X_c = -875$  and 100mm behind the face of the rearmost pedal when in the inoperative position.
- d. Cover the area 50mm above the lower surface of the volume defined in Article C12.5.4.a, over its entire length, as defined in (c) above.

#### **C12.7 Seat fixing and removal**

In order that an injured driver may be removed from the car in the seat following an accident, all cars must be fitted with a seat which, if it is secured, must be done so with no more than two fastenings. If fastenings are used, they must be:

- a. Clearly indicated and easily accessible to rescue crews.
- b. Fitted vertically.
- c. Removable without tools.

The seat must be equipped with receptacles which permit the fitting of belts to secure the driver and one which will permit the fitting of a head stabilisation device.

The seat must be removable without the need to cut or remove any part of the safety harness.

Details of the belt receptacles and the head stabilisation device may be found in the Appendix to the Technical and Sporting Regulations.

#### **C12.8 Driver Fit Information**

Driver-fit information may be transferred between teams. Such information may include CAD geometries and measurements directly relating to driver-fit but must not include construction details.

Information that can be transferred includes: seat geometry, helmet position, steering wheel position, safety harness installation, elbow and knee clearance, pedal position, pedal-pad geometry, and heel-rest geometry.

In all cases, the content of the information to be transferred must be approved by the FIA before it is exchanged.



**ARTICLE C13: SAFETY STRUCTURES AND HOMOLOGATION****C13.1 General Principles**

- C13.1.1** The purpose of this Article is to define the safety structures of the car and all the homologation processes necessary to guarantee that each car that is eligible to race satisfies all the relevant requirements.
- C13.1.2** Should a fundamental weakness or sub-optimal level of safety become evident in either the definition of the structures or the homologation procedures, the FIA retains the right to modify the relevant regulations without observing the deadlines otherwise dictated by the prevailing governance regulations. In any case, such actions will be discussed in the Technical Advisory Committee.
- C13.1.3** All impact tests must be carried out in accordance with FIA Test Procedure 01/00, in the presence of an FIA technical delegate and by using measuring equipment which has been calibrated to the satisfaction of the FIA technical delegate. A copy of the test procedure may be found in the Appendix to the Technical and Sporting Regulations.
- C13.1.4** Any significant modification introduced into any of the structures tested shall require that part to pass a further test.
- C13.1.5** With the exception of tests described by Article C13.3.2, all static and dynamic load tests must be performed with the secondary roll structure (whether dummy or otherwise) removed.

**C13.2 Survival Cell Frontal Impact Test**

A 50mm ( $\pm 1$ mm) thick aluminium plate should be attached to the front bulkhead of the survival cell through the mounting points of the frontal impact absorbing structure. The plate should:

- Measure 430mm ( $\pm 1$ mm) wide x 430mm ( $\pm 1$ mm) high.
- Be fitted symmetrically about the plane  $Y=0$ .
- Be fitted in a vertical sense in order to ensure force distribution is similar to that with the nose fitted.
- Have seven M10 x 30mm holes in the outer face arranged in a grid pattern as shown in the diagram below. The test laboratory will then fit a 5mm thick 430mm x 430mm steel plate to these holes using a 5mm washer stack.

All parts which could materially affect the outcome of the test must be fitted to the test structure which must be solidly fixed to the trolley through its engine mounting points but not in such a way as to increase its impact resistance.

The fuel tank must be fitted and must be full of water.

A dummy weighing at least 75kg must be fitted with safety harness described in Article C14.5 fastened. However, with the safety harness unfastened, the dummy must be able to move forwards freely in the cockpit. The dummy shall be equipped with a helmet to FIA8860 or FIA8859 and an FHR to FIA8858 (the mass of the helmet and FHR should be recorded, but should not be included in the 75kg). The safety harness shall be fastened to represent in-race conditions.

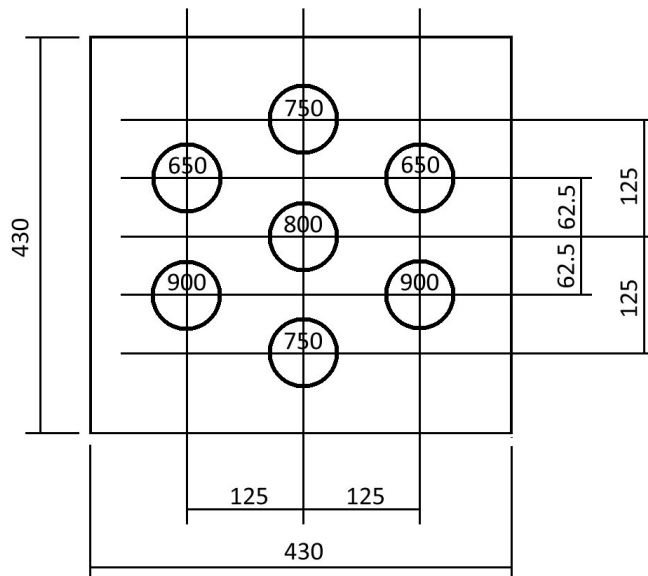
The fire extinguishers, as described in Article C14.1 must also be fitted.

For the purposes of this test, the total mass of the trolley and test structure shall be between ~~875kg~~ 900kg and ~~900kg~~ 925kg and the velocity of impact not less than 15 metres/second.

The impact wall must be fitted with seven carbon composite crush tubes which develop a combined 500kN nominal load as follows:

- 2 x tubes, 900mm long, from T-zero to T-end, directed into the lower left and right M10 attachment points.
- 1 x tube, 800mm long, from T-100mm to T-end, directed into the central M10 attachment point.
- 2 x tubes, 750mm long, from T-150mm to T-end, directed into the central upper and lower M10 attachment points
- 2 x tubes, 650mm long, from T-250mm to T-end, directed into the upper left and right M10 attachment points.

The specification of the tubes and details of how they should be mounted is given in the Appendix to the Technical and Sporting Regulations.



The resistance of the test structure must be such that following the impact there is no damage to the survival cell or to the mountings of the safety belts or fire extinguishers.

The maximum deceleration in the chest of the dummy for a cumulative 3ms shall be reported, this being the resultant of data from the three orthogonal axes.

This test may be carried out on any survival cell provided it has been successfully subjected to the tests described in Articles C13.3.1, C13.3.2 and C13.4. The test must however be carried out on the survival cell which was subjected to the test described in Article ~~C13.4.9~~ C13.4.8.

The peak Survival Cell acceleration from T=30ms must be at least 52g.

The maximum Survival Cell displacement from T=Zero is 425mm.

**C13.3 Roll Structure Testing**

**C13.3.1** The principal roll structure must be subjected to one of the following static tests at 75% of the load (129kN), followed by one of the tests at full load (172kN). Both tests must be carried out on the same structure. The tests will be chosen at random and communicated to the Competitor 3 weeks before their scheduled homologation date.

- a. A load of [99, 99, -98]kN
- b. A load of [-99, 99, -98]kN
- c. A load of [0, 0, -172]kN

For each test:

- i. Initially, the pad must not contact the roll structure below Z=935.
- ii. At any time during the test, the pad must not contact the structure below Z=900.
- iii. Rubber 3mm thick may be used between the load pads and the roll structure.
- iv. The peak load must be applied in less than three minutes and be maintained for 10 seconds.
- v. Under the load, deformation must be less than 25mm when measured along the loading axis and any structural failure limited to 100mm below the top of the roll structure when measured vertically.
- vi. During the test, the roll structure must be attached to the survival cell which is supported on its underside on a flat plate, fixed to it through its engine mounting points and wedged laterally by any of the static load test pads described in Article C13.4.2.
- vii. The load must be applied to the structure through a rigid pad with a recess up to 3mm deep, which conforms to the geometry of the Roll Structure. The Pad must be 200mm in diameter and perpendicular to the loading axis. The edge of the recess may be blended with a radius of up to 5mm.

Before performing the physical tests specified above, the Competitor must submit detailed calculations to show that the principle roll structure and survival cell are able to sustain the 3 loads above and following loads:

- d. [141, 0, -98]kN
- e. [-141, 0, -98]kN
- f. [0, 141, -98]kN
- g. A load of 50kN applied normal to the surface through a 10mm diameter pad, anywhere on the external surface of the structure above Z=935.

**C13.3.2** The secondary roll structure attachments must be subjected to the following two static tests. For each test:

- a. Rubber 3mm thick may be used between the load pads and the roll structure.
- b. A secondary roll structure as prescribed by C12.4.2 must be fitted.

- c. The loads shall be applied using a 150mm diameter flat, rigid pad whose centre lies in the specified loading position. The pad shall have only one translational degree of freedom, this being along the axis of load application.
- d. For each test, peak loads must be applied in less than three minutes and be maintained for five seconds.
- e. After five seconds of application, there must be no failure of any part of the survival cell or of any attachment between the structure and the survival cell.

#### Centreline Test

A load equivalent to 130.1kN vertically downward and 51.6kN longitudinally rearward must be applied at a position  $[X_c -785, 0, 830]$ . in one of the following two ways:

- a. A physical test to 100% of the test load (140kN); or
- b. A physical test to 57% of the test load (80kN) plus detailed calculations to show that the attachments are able to sustain more than 120% of the test load (168kN) when fitted with the secondary structure as specified in Article C12.4.2 and with the deformation simulated as elastic.

The methodology for the calculations shall be authenticated with data from the physical test prescribed above for the load range from 0kN to 80kN. The load and displacement shall be recorded along the axis of load application together with the vertical displacement of the three attachments.

During the test, the structure must be attached to the survival cell which is supported on its underside on a flat plate, fixed to it through its engine mounting points and, optionally, through the front bulkhead and/or the mountings of the lower side impact structures.

#### Lateral Test

A load equivalent to 104.5kN laterally inward and 93.2kN longitudinally rearward must be applied to the outer surface of the structure at a position  $[X_c -590, 233.5, 810]$ . in one of following two ways:

- a. A physical test to 100% of the test load (140kN); or
- b. A physical test to 71% of the test load (100kN) plus detailed calculations to show that the attachments are able to sustain more than 120% of the test load (168kN) when fitted with the secondary structure as specified in Article C12.4.2 and with the deformation simulated as elastic.

The methodology for the calculations shall be authenticated with data from the physical test prescribed above for the load range from 0kN to 50kN. The load and displacement shall be recorded along the axis of load application together with the lateral displacement of the three attachments.

During the test, the survival cell should be fixed at its rear bulkhead via its engine mounts to a strongwall and supported along its lower face by a surface plate.

The survival cell may be restrained laterally and vertically at its front end by a cradle that wraps around all four sides of the survival cell. This cradle may extend as far forward as the plane  $X_A=0$ , but may not extend further rearwards than  $X_A=600$ .

The side of the survival cell that is opposite to the application point of the Halo test load may be restrained laterally by supports that conform to the sides of the survival cell. These lateral supports may not extend further forward than  $X_C = -1075$  or above  $Z = 545$ .

A drawing of the method of support is given in the Appendix to the Technical and Sporting Regulations

**C13.3.3** In addition to the static load tests described above, each team must supply detailed calculations which clearly show that:

- a. The survival cell will sustain a load of 75kN vertically upward on each rear attachment of the Secondary Roll Structure.
- b. The survival cell and bracket will sustain a load equivalent to 99kN vertically upward and 99kN longitudinally rearward on the axis of the front attachment of the Secondary Roll Structure.

## **C13.4 Survival Cell Load Tests**

### **C13.4.1 Conditions applicable to all static load tests**

- a. The tests described in Articles C13.4.2 to C13.4.7 must be carried out on every survival cell intended for use. During these tests, the deflection across the inner surfaces must not exceed 120% of the deflection obtained on the survival cell used for the tests described in Articles C13.3.1 and C13.3.2. In cases where the original deflection was less than 3mm, the maximum permitted deflection will be the lower of; the permitted deflection, or 3.6mm.
- b. The tests described in Articles ~~C13.4.7~~, C13.4.8, ~~C13.4.9~~ and ~~C13.4.11~~ C13.4.10 must be carried out on the survival cell used for the tests described in Articles C13.3.1 and C13.3.2.
- c. Deflections and deformations will be measured at the centre of area of the load pad unless otherwise stated.
- d. All peak loads must be applied in less than three minutes, through a ball jointed junction at the centre of area of the pad and maintained for 30 seconds.
- e. All tests must be carried out by using measuring equipment which has been calibrated to the satisfaction of the FIA technical delegate.
- f. A radius of 3mm is permissible on the edges of all load pads and rubber 3mm thick may be placed between them and the test structure.
- g. For the tests described in Articles C13.4, the survival cells must always be produced in an identical condition in order that their mass may be compared. If the mass differs by more than 5% from the one subjected to the impact test described in Article C13.2 further frontal and side impact tests and roll structure tests must be carried out.
- h. Any significant modification introduced into any of the structures tested shall require that part to pass a further test.
- i. The Survival cell may be mounted in any orientation provided that the mounting arrangement does not increase the strength or stiffness of the survival cell being tested.
- j. For tests C13.4.2, C13.4.3, and C13.4.6 to ~~C13.4.9~~ C13.4.8, the Survival Cell must be supported by a cradle conforming to the shape of the side of Survival Cell opposite the load application.

**C13.4.2 Survival cell fuel tank side test**

A pad of diameter 225mm, which conforms to the shape of the survival cell, must be placed against the outermost side of the survival cell with the centre of the pad positioned at  $[X_c, Z] = [-145, 320]$  [100, 300].

A constant transverse horizontal load of 110kN will be applied and, under the load, there must be no structural failure of the inner or outer surfaces of the survival cell.

Deflections will be measured along the axis of load application.

Permanent deformation must be less than 3mm after the load has been released for 1 minute.

**C13.4.3 Survival cell wheel contact side test**

A pad 200mm in diameter which conforms to the shape of the survival cell, must be placed against the outermost side of the survival cell. The centre of this pad must lie at  $X_c = -1195$  and in the Z-direction, at the mid-point of the height of the structure at that section.

Deflections will be measured across the inside of the survival cell along the axis of load application.

A constant transverse horizontal load of 100kN will be applied to the pad and, under the load, there must be no structural failure of the inner or outer surfaces of the survival cell and the total deflection must not exceed 15mm.

Permanent deformation must be less than 3mm after the load has been released for 1 minute.

**C13.4.4 Survival cell floor test**

A pad of 200mm diameter must be placed on the survival cell floor, in a position determined by the FIA technical delegate, and corresponding to the fuel tank. A vertical upwards load of 25kN will be applied.

Under the load, there must be no structural failure of the inner or outer surfaces of the survival cell.

Permanent deformation must be less than 1.0mm after the load has been released for 1 minute.

**C13.4.5 Cockpit floor test**

A pad of 200mm diameter must be placed beneath the survival cell, at  $[X_c, Y] = [-600, 0]$ , and a vertical upwards load of 75kN applied.

Under the load, there must be no structural failure of the inner or outer surfaces of the survival cell.

Deflections will be measured relative to the cockpit rim along the axis of load application.

Permanent deformation must be less than 3mm after the load has been released for 1 minute.

**C13.4.6 Cockpit rim tests**

A pad of 50mm in diameter, must be placed on the side of the cockpit rim with its upper edge at the same height as the top of the cockpit side with its centre at  $X_c = -250$ .

A constant transverse horizontal load of 50kN will then be applied at 90° to the plane  $Y=0$  and, under the load, deformation must be less than 10mm when measured along the loading axis and there must be no structural failure of the inner or outer surfaces of the survival cell.

Permanent deformation must be less than 1.0mm after the load has been released for 1 minute.

~~C13.4.7 Cockpit Side Test 1~~

~~A 225mm diameter pad which conforms to the shape of the survival cell at the load application point, must be placed against the outermost sides of the survival cell, centred at  $[X_e, Z]$   $[-520, 400]$~~

~~At the Competitor's discretion, a load of either  $[0, 200, 0]$ kN or  $[48.6, 194, 0]$ kN shall be applied through a ball joint and, under the load, there must be no structural failure of the inner or outer surfaces of the survival cell and the total deflection must not exceed 15mm. The load and displacement shall be recorded along the axis of load application.~~

~~Permanent deformation must be less than 5mm after the load has been released for 1 minute.~~

~~The chassis support conditions shall be the same as those for the lateral test in Article C13.3.2, but the chassis may be mounted in any orientation, provided that the supports do not increase the strength of the survival cell in this load case, beyond the Article C13.3.2 arrangement.~~

~~A temporary spacer constructed to the same specification as the panels described in Article C12.3.2 with a maximum diameter of 325mm may be placed between the pad and the survival cell.~~

## C13.4.7 Cockpit Side Test 2

A 225mm diameter pad which conforms to the shape of the survival cell at the load application point, must be placed against the outermost sides of the survival cell, centred at **one of the positions**  $[X_c, Z]$ ;

- i.  $[-320, 490]$
- ii.  $[-690, 490]$
- iii.  $[-690, 320]$
- iv.  $[-520, 400]$
- v.  $[-585, 150]$
- vi.  $[-450, 320]$

The position for the reference Survival Cell will be chosen at random and communicated to the Competitor 3 weeks before their scheduled test date. Subsequent Survival Cells will be tested in the same position.

At the Competitor's discretion, a load of either  $[0, 300, 0]$ kN or  $[72.9, 291, 0]$ kN shall be applied through a ball joint and, under the load, there must be no structural failure of the inner or outer surfaces of the survival cell and the total deflection must not exceed 30mm. The load and displacement shall be recorded along the axis of load application.

After 5 seconds of application, there must be no failure of the survival cell.

The chassis support conditions shall be the same as those for the lateral test in Article C13.3.2., but the chassis may be mounted in any orientation, provided that the supports do not increase the strength of the survival cell in this load case, beyond the Article C13.3.2 arrangement.

A temporary spacer ~~constructed to the same specification as the panels described in Article 12.3.2~~ with a maximum diameter of ~~325mm~~ 275mm and a maximum thickness of 4mm may be placed between the pad and the survival cell. The spacer must be composite with a quasi-isotropic laminate with Zylon, Dyneema, or Kevlar reinforcing.

In addition to the physical test, the team shall provide detailed calculations to show that the cockpit side is able to sustain a lateral load of ~~371kN~~ 380kN applied at any six of the positions defined above. ~~the following 6 positions: [X<sub>c</sub>, Z], [-320, 400], [-600, 400], [-600, 320], [-520, 400], [-585, 450], and [-450, 320].~~

The methodology for the calculations shall be authenticated by comparing data from the physical test for the load range from 0kN to 275kN and the calculated case.

#### C13.4.8 Nose Push-off Test

During this test, the survival cell must be resting on a flat plate and secured to it solidly but not in a way that could increase the strength of the attachments being tested.

A dummy front impact structure may be used for this test. The 250mm of the dummy structure closest to the survival cell should be identical in design and construction to the structure used in C13.6.2. The dummy structure should not in any way increase the strength of the survival cell or of the attachment between the survival cell and the impact structure.

A constant transversal horizontal load of 92kN must be applied to one side of the impact structure at X<sub>A</sub> = -600 and at the mid-point of the height of the structure used in C13.6.2. All loads must be applied through a ball-jointed junction at the centre of area of the pad.

After 30 seconds of application, there must be no failure of the survival cell or of any attachment between the structure and the survival cell.

Additionally, teams must supply calculations that show that there would be no failure of the survival cell or of any attachment between the structure and the survival cell if a load of 110kN were applied X<sub>A</sub> = -600 through the dummy structure.

#### C13.4.9 Engine Separation

It must be demonstrated by calculation that in the case of an accident that causes the engine to become separated from the survival cell, significant structural failure of the survival cell does not occur.

The survival cell should be restrained ahead of the seatback bulkhead. A load of [F<sub>x</sub>, F<sub>y</sub>, M<sub>z</sub>] = K.[-1N, 5N, 3Nm], acting through and about [X<sub>PU</sub>=0, 0, 210], should be applied to the survival cell through the engine mounts using a representative engine. K should be increased up to the first engine mount failure. The analysis should be repeated, disconnecting the failed fixing until only two engine fixings remain. In all cases, the failure should remain local to the engine mounts and there should be no significant exposure of the fuel cell.

#### C13.4.10 Forward Survival Cell Test

A rigid pad measuring 100mm in X and only contacting the surface defined in 12.2.2.f.i, which has a single degree of freedom along the direction of loading, must be placed against the outer surface of the survival cell. The pad should conform to the shape the survival cell. The load axis must lie:

- On the plane Y=0
- In a position between the front of the survival cell and X<sub>C</sub>=-1600, determined by the technical delegate and communicated to the team two weeks before the homologation.
- Normal to the surface of the survival cell.



A constant load of 30kN will be applied and, under the load, there must be no structural failure of the inner or outer surfaces of the survival cell and the deflection must be less than 5mm.

A cradle may be used on the opposite side of the survival cell to react the load.

### **C13.5 Side Impact Structure**

#### **C13.5.1 Side Impact Structure Specification**

Two impact absorbing structures must be fitted on each side of the survival cell and must be solidly attached to it. The purpose of these structures is to protect the driver in the event of a lateral impact and, in order to ensure this is the case, strength tests of the mountings must be carried out successfully. Details of the test procedure may be found in Articles C13.5.3 and C13.5.4.

The impact absorbing structures must be manufactured and mounted to the survival cell in accordance with the following specifications:

- a. The construction and geometry of the structures may be found in the Appendix to the Technical and Sporting Regulations.
- b. The structures must be mounted with the principal axes of their prismatic mounting sections perpendicular to the longitudinal and vertical centre plane of the car, and with an incidence (defined as the angle between the major axis and  $Z=0$ ) of  $0^\circ$  for the upper structure and within the range of  $0^\circ$  and  $-10^\circ$  (nose up) for the lower structure.

The centres of area of their outermost longitudinal vertical cross sections must be positioned:

- i. Longitudinally: between  $X_c = -500$  and  $X_c = -475$  for the upper structure and between  $X_c = -525$  and  $X_c = -425$  for the lower structure.
- ii. Vertically: between  $Z=460$  and  $Z=550$  for the upper structure and between  $Z=75$  and  $Z=100$  for the lower structure.
- iii. Laterally: Within 15mm of each other.

Refer to the drawings which may be found in the Appendix to the Technical and Sporting Regulations.

The two side impact structures must be fully enclosed by bodywork, and hence no part of them should be exposed to the external air stream.

- c. Mountings must be permanently bonded to the structures to enable them to be attached to the survival cell, each of them must :
  - i. Incorporate a closed end and internal abutment to the impact structure that must be capable of withstanding the lateral load described in Article C13.5.4 without a structural contribution from the bonded interface.
  - ii. Lie entirely inboard of a plane which lies 292mm inboard of the outermost longitudinal vertical cross section of the impact structure.
  - iii. Be arranged in order that the outermost surface created by an interface between the mounting and structure lies on a vertical surface that is located between the plane defined in c.ii) and a vertical plane which intersects the leading and trailing edges of the structure

- no more than 357mm and 332mm inboard of the outermost longitudinal vertical cross section of the impact structure respectively.
- iv. Be arranged in order that the innermost extent of the bonded interface between the mounting and structure is offset inboard by a minimum of 44mm from the vertical surface defined in (iii) above.
  - v. Be arranged in order that the bonded interface covers the entire external area of the structure between the innermost and outermost extents defined in iii) and iv) above.
- d. To allow for debris compaction, the internal volumes of the structures must be empty outboard of vertical planes which:
- i. For the upper structure, intersects the leading, and trailing edges of the structure at least 342mm inboard of the outermost longitudinal vertical cross section of the impact structure. Furthermore, the projected area of the structure onto a Z-Plane, between this plane and the plane defined in c.ii) must be greater than 7440mm<sup>2</sup>.
  - ii. For the lower structure, intersects the leading, and trailing edges of the structure at least 357mm inboard of the outermost longitudinal vertical cross section of the impact structure. Furthermore, the projected area of the structure onto a Z-Plane, between this plane and the plane defined in c.ii) must be greater than 9225mm<sup>2</sup>.

No parts which, in the opinion of the FIA technical delegate, would prevent proper function of the impact structures in the event of a lateral impact may be present in the volume lying between  $X_C = -700$  and  $X_C = -300$ , and between  $Z=50$  and  $Z=600$ , and outboard of a plane 280mm inboard of the outermost longitudinal vertical cross section of the inboard most impact structure.

The following components may be placed in this volume;

- i. Bodywork
- ii. Components of the oil and coolant systems and charge air cooling (excluding any secondary heat exchangers)
- iii. Electrical systems (excluding electrical pumps and filters)
- iv. Pneumatic pressure vessels (excluding regulators operating at over 5 barG inlet pressure)
- v. Brake system, hydraulic system and pneumatic system hoses

Provided that;

- i. The construction of any of the components is such that they would not, in the opinion of the FIA technical delegate, cause significant damage to the survival cell in the event of a lateral impact,
- ii. Components of the oil and coolant systems and charge air cooling, electrical units and pneumatic pressure vessels are no closer than 20mm at any point to the closest impact structure,
- iii. Electrical units and pneumatic vessels;  
have a total volume that does not exceed 2 litres on each side of the survival cell,  
have an individual assembly density of no more than 1500 kg/m<sup>3</sup>,

are orientated such that corners or edges are not likely to cause significant damage to the survival cell in the event of a lateral impact.

#### **C13.5.2 Side impact structure push-off calculations**

Each team must supply detailed calculations which clearly show that the mountings of the upper and lower side impact structures are capable of withstanding:

- a. Horizontal loads of 40kN and 60kN applied simultaneously to the upper and lower structures respectively in a rearward direction through ball-jointed pads, which may conform to the shape of the structures, measuring 100mm high x 100mm wide and whose centre of area lies 100mm inboard of the centre of the outermost longitudinal vertical cross-section of the impact structure.
- b. Horizontal loads of 40kN and 60kN applied simultaneously to the upper and lower structures respectively in a forward direction through ball-jointed pads, which may conform to the shape of the structures, measuring 100mm high x 100mm wide and whose centre of area lies 100mm inboard of the centre of the outermost longitudinal vertical cross-section of the impact structure.
- c. A vertical load of 35kN applied in an upward direction to the lower impact structure through a ball-jointed pad, which may conform to the shape of the structure, measuring 200mm long x 100mm wide whose centre of area lies 100mm inboard of the centre of the outermost longitudinal vertical cross section of the impact structure.
- d. A vertical load of 27kN applied in a downward direction to the upper impact structure through a ball-jointed pad, which may conform to the shape of the structure, measuring 200mm long x 100mm wide whose centre of area lies 100mm inboard of the centre of the outermost longitudinal vertical cross section of the impact structure.

In all cases, the calculations should show that there will be no structural failure of the parts. It should be assumed that ball-jointed pads are used, the joint lying at the centre of area of the pad.

#### **C13.5.3 Side impact structure push-off tests**

These tests may be carried out on any survival cell provided it has been successfully subjected to the tests described in Articles C13.3 and C13.4. The tests may be performed on either side of the survival cell.

During the push off tests the survival cell must be resting on a flat plate and secured to it solidly but not in a way that could increase the strength of the attachments being tested.

~~Temporary spacers representing part sections of the panels described in Article 12.3.2 and 12.3.3 may be incorporated within the assembly of the impact structures to the survival cell. These spacers may not in any way increase the strength of the survival cell being tested.~~

Dummy test parts may be used in place of the impact structure provided the test part incorporates identical mounting details to those described in Article C13.5.1 and does not in any way increase the strength of the attachments being tested.

During the first test rearward horizontal loads of 40kN and 60kN must be applied simultaneously to the upper and lower structures respectively through ball joints or ball-jointed pads whose centre of area lies 100mm inboard of the centre of the outermost cross-section of the dummy impact structures.

During the second test an upward vertical load of 35kN must then be applied to the lower impact absorbing structure using a ball joint or a ball-jointed pad whose centre of area lies 100mm inboard of the centre of the outermost cross section of the dummy lower impact structure.

After five seconds of application there must be no failure of any structures or of any attachment between the structure and the survival cell.

#### C13.5.4 Side impact structure squeeze tests

This test may be carried out on any survival cell which has been subjected to the tests described in Articles C13.3 and C13.4. The test may be performed on either side of the survival cell.

During the test, the survival cell may be supported in any way provided this does not increase the strength of the attachments being tested.

~~Temporary spacers representing part sections of the panels described in Article 12.3.2 and 12.3.3 may be incorporated within the assembly of the impact structures to the survival cell. These spacers cannot in any way increase the strength of the survival cell being tested.~~

Dummy test parts may be used in place of the impact structure provided the test parts incorporate identical mounting details to those described in Article C13.5.1 and do not in any way increase the strength of the attachments being tested.

Loads of 100kN and 150kN must be applied simultaneously to the dummy upper and lower structures respectively in a lateral direction using a hemispherical pad or ball joint, loading through the centre cross section, 292mm from the outermost longitudinal vertical cross-section of both impact structures.

After five seconds of application, there must be no failure of the survival cell or the attachments between the structures and the survival cell.

Each team must supply detailed calculations which clearly show that the mountings of the upper and lower side impact structures satisfy the requirement of C13.5.1.(c).(i).

### C13.6 Front Impact Structure

#### C13.6.1 Front Impact Structure Specification

An impact absorbing structure (**FIS**) must be fitted in front of the survival cell. This structure must not be an integral part of the survival cell but must be solidly attached to it and be arranged symmetrically about the plane  $Y=0$ .

The ~~impact absorbing structure~~ **FIS** must affix to the survival cell using a minimum of four attachments having the same nominal strength.

Excluding fairings or any bodywork defined as **Front Wing Assembly**; Between  $X_{FIS} = 50$  and  $X_A = -100$ , the intersection of the **FIS** with an X-plane must create a single cross section where:

- a. The height, width and enclosed area must increase monotonically **with increasing X distance**.

- b. At  $X_{FIS}=50$ , the enclosed area must exceed  $9\,000\text{mm}^2$  and must enclose a rectangle  $120\text{mm}$  wide by  $65\text{mm}$  high.
- c. At  $X_{FIS}=150$ , the enclosed area must exceed  $20\,000\text{mm}^2$ .
- ~~d. Between  $X_{FIS}=150$  and  $X_A=-650$  the enclosed area must not exceed  $30\,000\text{mm}^2$~~
- d. Between  $X_A=-400$  and  $X_A=-100$ , the enclosed area must exceed a value given by a linear taper between  $45\,000\text{mm}^2$  and  $60\,000\text{mm}^2$  respectively.
- e. Ahead of ~~the plane~~  $X_{FIS}=50$ , no part may lie above  $Z=235$
- f. Behind ~~the plane~~  $X_{FIS}=50$ , no part above a plane that is normal to  $Y=0$  and contains points  ~~$[Y, Z]$~~   $[0, 235]$  in plane  $X_{FIS}=50$  and  $[0, 305]$  in plane  $X_{FIS}=150$   $[X_{FIS}, Z]$ ;  $[50, 235]$  and  $[150, 305]$ .
- g. Behind ~~the plane~~  $X_{FIS}=250$ , with the exception of bodywork joggles, any normal to the external surface of the Impact structure must not subtend an angle greater than  $25^\circ$  to an X-plane.
- h. All lines drawn normally and externally to a cross-section taken at  $X_A=-100$  must not cross the plane  $Y=0$

Once the requirements of (a) to ~~(g)~~ (h) have been met, minimal apertures may be applied for mechanical components or sensors.

Any bodywork ahead of the plane defined in ~~(g)~~ (f), above  $Z=235$ , and less than  $166\text{mm}$  from the centre plane must be constructed of laminate with an areal weight of reinforcing, ~~less than  $4500\text{gm}^{-2}$~~  no greater than  $800\text{gm}^{-2}$  with optional aramid or foam core.

### C13.6.2 Front Impact Structure Homologation

Two identical FISs must be presented for homologation. By random allocation by the FIA delegate:

- i. One will be subject to push-off tests described in Articles C13.6.3.a and C13.6.3.b followed by the dynamic test described in Article C13.6.5.

and

- ii. The second will be subject to push-off test described in Articles C13.6.3.c followed by the dynamic test described in Article C13.6.6.

In the case where a dynamic test did not meet the acceleration requirements, at the discretion of the FIA, the Competitor may be permitted to repeat only the failed test.

### C13.6.3 Front Impact Structure Push-Off Tests

~~Tests (a) and (b) must be performed on the structure used for the dynamic test defined in Article C13.6.5. Test (c) must be performed on a second structure of identical specification. A Competitor may submit a request for test (c) to be passed by inspection based on the similarity of the structure to a structure that previously passed this test.~~

During these tests, the ~~nose~~ FIS must be mounted to the same fixture that is used for the tests described in Article C13.6.5 and C13.6.6.

- a. **Lateral Push-off Test**

A constant transversal horizontal load of 92kN must then be applied to one side of the **FIS impact absorbing structure, using a pad 200mm long and 300mm high,** at  $X_A = -600$  and at the mid-height of the **FIS** at this plane.

~~All~~The loads must be applied through a ball-joint, ~~at junction~~ using a pad measuring 200mm in X, positioned symmetrically about  $X_A = -600$ . ~~at the centre of area of the pad.~~ The stiffness of the pad may be chosen by the team. Rubber or foam may be used between the pad and the test structure.

The centre of area of the pad must pass through the plane mentioned above and the mid-point of the height of the structure at the relevant section. After 30 seconds of application, there must be no failure of the structure or of any attachment between the structure and the fixture.

**b. Wing Section Push-off Test**

Two equal loads, each equivalent to 3.2kN vertically downward and 2.2kN longitudinally rearward, must be applied simultaneously to the wing section at  $Y = \pm 250$ mm. The load vector should intersect the top surface of the wing section between 75mm and 200mm behind the leading edge of the forward wing element, measured in the X-direction.

The loads shall be applied through a ball joint, using rectangular pads measuring no more than 100mm in Y and no more than 200 mm in X and with the lower surface shaped to match the wing section. 3mm rubber or foam may be used between the pad and the test structure. The pads must lie entirely between 200mm and 300mm from the plane  $Y=0$ .

After 30 seconds of application, there must be no failure of the impact structure or of any attachment between the impact structure and the wing section.

**c. Lateral Push-off Test to Failure**

A transversal horizontal load must then be applied to one side of the **FIS impact absorbing structure, using a pad measuring 200mm in X** at  $X_A = -900$  and at the mid-height of the Front Impact Structure at this plane.

~~All~~The loads must be applied through a ball-joint, ~~at junction~~ using a pad measuring 200mm in X, positioned symmetrically about  $X_A = -900$ . ~~at the centre of area of the pad.~~ The stiffness of the pad may be chosen by the team. Rubber or foam may be used between the pad and the test structure.

The load must be increased to failure, defined as the point where the load supported by the structure has fallen to 75% of ~~is unable to maintain~~ the maximum load reached ~~with increasing travel of the ram~~ and an area of failure is apparent.

Failure should occur at a load greater than ~~50kN~~ 52.5kN and the failure must be ~~between~~ behind  $X_A = -650$  ~~and~~  $X_A = -400$ .

**C13.6.4 Front Impact Structure Dynamic Tests – General Requirements**

To simulate in-car conditions, all parts that could materially affect the outcome of the test must be fitted to the test structure. The test structure must be solidly fixed, ~~either to the trolley or~~ to the impact wall, through the mounting points of the ~~nose structure FIS,~~ but not in such a way as to increase its impact resistance.

If the test facility includes a system to manage excess residual energy (in the event that the ~~nose~~ **FIS** fails to absorb all the test energy), such a system must not in any way modify the results during a successful test.

~~For the purposes of this these tests,~~ The total mass of the trolley and test structure shall be 900kg (+1%/-0). ~~and the velocity of impact not less than 17 ms<sup>-1</sup>.~~

The resistance of the test structure must be such that during the impact:

- a. The deceleration profile measured in g from the first deformation of the complete assembly to  ~~$X_A = -375$~~   $X_A = -382$  does not exceed the limit curve defined by  ~~$41.74/X^{+25}$~~   $13.5/X^{1.13}$ , where X is the longitudinal distance from  $X_A = 0$ , calculated by the test laboratory in metres.
- b. The peak deceleration does not exceed 40g.
- c. Exceptionally, when filtered with a CFC60 filter (ISO 6487), the limit curve may be exceeded by up to 10g with an absolute ceiling of 43g, for a maximum cumulative period of 15ms. ~~and an absolute ceiling of 20g.~~
- ~~c. The average deceleration over the first 150mm of deformation of the impact absorbing structure defined article in C13.6.1 exceeds 2.5g.~~
- ~~c. After the impact, the remaining length of the impact absorbing structure must be greater than 150mm. This will be measured between the furthest point that the trolley reaches and the most forward of:~~
  - ~~i. Any significant change in the construction of the impact structure such as inserts, or openings.~~
  - ~~or~~
  - ~~ii. Any mechanical components mounted to the survival cell ahead of the front bulkhead except for components listed in (f) below.~~
- ~~f. Subject to approval by the FIA Technical Delegate, the following components may be placed in the 150mm remaining length:~~
  - ~~i. Brake reservoirs, their mounting brackets, associated pipes and fittings.~~
  - ~~ii. Electrical systems with an individual assembly density of no more than 1500kg/m<sup>3</sup>~~
  - ~~iii. Composite internal bodywork panels with a wall thickness less than 1.5mm.~~
  - ~~iv. Parts of the X-mode adjustment system.~~

Furthermore, there must be no damage to the mountings of the ~~nose~~ **FIS** to the test fixture.

#### C13.6.5 Front Impact Structure Dynamic Test 1

This test ~~must~~ may only be carried out on the **FIS** which was subjected to the tests described in Article C13.6.3 (a) & (b).

As well as the general requirements defined in Article C13.6.4;

- a. The impact velocity must exceed 17ms<sup>-1</sup>
- b. The average deceleration over the first 150mm of deformation of the **FIS** must exceed 2.5g.

- d. After the impact, the remaining length of the **FIS** must be greater than 150mm. This will be measured between the furthest point that the trolley reaches and the most forward of:
  - i. Any significant change in the construction of the **FIS** such as inserts, or openings.
  - or
  - ii. Any mechanical components mounted to the survival cell ahead of the front bulkhead except for components listed in (e) below.
- e. Subject to approval by the FIA Technical Delegate, the following components may be placed in the 150mm remaining length:
  - i. Brake reservoirs, their mounting brackets, associated pipes and fittings.
  - ii. Electrical systems with an individual assembly density of no more than 1500kg/m<sup>3</sup>
  - iii. Composite internal bodywork panels with a wall thickness less than 1.5mm.
  - iv. Parts of the X-mode adjustment system.

#### C13.6.6 Front Impact Structure Dynamic Test 2

This test may only be carried out on the **FIS** which was subjected to the test described in Article C13.6.3 (c). A competitor may trim material from the **FIS** before this test.

As well as the general requirements defined in Article C13.6.4, the impact velocity must exceed 14ms<sup>-1</sup>.

### C13.7 Rear Impact Structure

#### C13.7.1 Rear Impact Structure Definition

An impact absorbing structure must be fitted behind the gearbox in accordance with the following specifications:

- a. Between  $X_{DIF}=325$  and  $X_{DIF}=750$ , the external geometry of the Rear Impact Structure must conform to **RV-TAIL-RIS** with a manufacturing tolerance of  $\pm 0.5$ mm.
- b. The rearmost face of the structure must be positioned at  $X_{DIF}=750$ . The upper surface of the structure on  $Y=0$  must lie at  $Z=372.5$ . A tolerance of  $\pm 2$ mm will be accepted for manufacturing reasons only.
- c. To minimise the likelihood of the structure penetrating a survival cell, it must be designed so that the majority of its material lies evenly around its perimeter. The perimeter of any X-plane between points 50mm forward of its rear face and 200mm forward of its rear face must be of a uniform construction and have a minimum thickness of 1.6mm. Material with a specific gravity of less than 1 will not be considered when calculating these thicknesses and, furthermore, any internal structure must not be thicker than any part of the perimeter at that section.

Only those parts of the structure which genuinely contribute to its performance during the impact test, and which are designed and fitted for that sole purpose, will be considered when assessing compliance with any of the above.

- d. No parts which, in the opinion of the FIA technical delegate, would prevent proper function of the impact structure in the event of a rear impact may be present behind  $X_{DIF}= 325$ .



The Rear Impact structure is classed as TRC.

### **c13.7.2 Rear impact Structure Static Load Tests**

To verify the strength of the gearbox and the attachment of the rear impact structure to the gearbox, the gearbox and impact structure must pass three static load tests.

During the tests, the gearbox should be solidly fixed by the engine studs and the test load may be reacted ahead of any joint between the impact structure and the Gearbox Case. No support may increase the strength of this joint.

The gearbox and crash structure will be subjected to the following separate tests:

- a. A lateral load of 40kN applied at the mid-height of the structure at  $X_{DIF}=500$  applied using a pad measuring 100mm in X and at least 150mm in Z.
- b. A load of 40kN vertically upwards applied on the plane  $Y=0$  at  $X_{DIF}=500$  applied using a pad measuring 100mm in X and at least 100mm in Y.
- c. A load of 40kN vertically downwards applied on the plane  $Y=0$  at  $X_{DIF}=500$  applied using a pad measuring 100mm in X and at least 100mm in Y.

These pads should conform to the shape of the rear impact structure and their centres of area must pass through the plane mentioned above and the mid-point of the height/width of the structure at the relevant section.

A radius of 3mm is permissible on the edges of all load pads and rubber 3mm thick may be placed between them and the test structure.

In each case, the load should be applied through a ball-joint and after 30 seconds of application, there must be no failure of the impact structure, of the gearbox, or of the attachment between the impact structure and the gearbox.

### **c13.7.3 Rear impact Structure Dynamic Test**

All parts which will be fitted behind the rear face of the engine and which could materially affect the outcome of the test must be fitted to the test structure. If suspension members are to be mounted on the structure they must be fitted for the test. The structure and the gearbox must be solidly fixed to the ground and a solid object, having a mass of 875kg (+1%/-0) and travelling at a velocity of not less than 11 metres/second, will be projected into it.

The object used for this test must be flat, measure 450mm ( $\pm 3$ mm) wide by 550mm ( $\pm 3$ mm) high and may have a 10mm radius on all edges. Its lower edge must be at  $Z=0$  ( $\pm 3$ mm) and must be so arranged to strike the structure vertically and parallel to  $X_c=0$ .

During the test, the striking object may not pivot in any axis and the crash structure may be supported in any way provided this does not increase the impact resistance of the parts being tested.

The resistance of the test structure must be such that during the impact:

- a. The deceleration profile measured in g does not exceed the limit curve defined by  $15 + 26.5 X$ , where X = the longitudinal distance from the start of the impact, calculated by the test laboratory in metres.

- b. The maximum deceleration does not exceed 25g.
- c. For  $X > 0.225\text{m}$ , the maximum deceleration may exceed the limits defined in (a) and (b) for up to a cumulative 15ms.

Furthermore, all structural damage must be contained within the area behind  $X_R = 0$ .

This test must be carried out on the rear impact absorbing structure which was subjected to the test described in Article C13.7.2.

### C13.8 Steering Column Impact Test

The parts referred to in Article C10.5.5 must be fitted to a representative test structure; any other parts which could materially affect the outcome of the test must also be fitted. The test structure must be solidly fixed to the ground and a solid object, having a mass of 8kg (+1%/-0) and travelling at a velocity of not less than 7metres/second, will be projected into it.

The object used for this test must be hemispherical with a diameter of 165mm ( $\pm 1\text{mm}$ ).

For the test, the centre of the hemisphere must strike the structure at the centre of the steering wheel along the same axis as the main part of the steering column.

During the test the striking object may not pivot in any axis and the test structure may be supported in any way provided this does not increase the impact resistance of the parts being tested.

The resistance of the test structure must be such that during the impact the peak deceleration of the object does not exceed 80g for more than a cumulative 3ms, this being measured only in the direction of impact.

After the test, all substantial deformation must be within the steering column and the steering wheel quick release mechanism must still function normally.

### C13.9 Headrest Load Test

The headrest must pass a load test. The load applied will be  $P = (700 \times m_{HR})\text{N}$ , where  $m_{HR}$  is the mass of the complete headrest in kg fitted with 'pink' Confor foam. The load may be applied either:

- a. With the headrest mounted in a dummy cockpit surround, a force of  $[-P/2, 0, 0]$  will be applied simultaneously to each of two positions on the back of the headrest, at  $Z=630\text{mm}$  and  $Y=\pm 130\text{mm}$ .

or

- b. With the headrest mounted in the car, a force of  $[-P, 0, 0]$  will be applied, evenly shared between two pull rods, to the back of the headrest, at  $Z=630\text{mm}$  and  $Y=\pm 130\text{mm}$ . The pull rods should pass through holes in the headrest of no greater than 2.5mm diameter. The force should be reacted against the secondary roll structure forward mount.

At the test load, the pegs at the rear of the headrest must remain engaged in the holes in the chassis or dummy chassis, and there must be no failure of the headrest backing structure or the quick release mountings.

Load spreader plates may be used to apply the load to the back of the headrest provided that each load spreader is more than 80mm and less than 180mm from the car centre-plane.

**C13.10 Wheel Rim Impact Test**

All wheel rim designs must pass an impact test, derived from the standard ISO 7141:2022, to the outer flange.

The wheel must be mounted on a compliant fixture with the outer flange uppermost and at 13° to horizontal. The Wheel nut must be tightened to a torque of 500 Nm.

The rim must be fitted with a tyre, inflated to 150 ±10 kPa.

A mass of 75 kg must be dropped onto the highest point of the rim from a height of 2000mm. The striker must have a rectangular section and overlap the rim by 25 ±1mm.

The wheel is considered to have failed the test if any of the following apply:

- a) visible fracture(s) (not by dye penetrant) penetrating through the barrel, spokes, or hub of the rim and more than 25mm away from the area of the rim section struck by the face plate of the striker.
- b) the tyre loses more than 100kPa of air pressure within 1 min.

Details of the equipment, calibration and test procedure are given in standard ISO 7141:2022.

**ARTICLE C14: SAFETY EQUIPMENT****C14.1 Fire Extinguishers**

All cars must be fitted with a fire extinguishing system which:

- a. Will discharge into the cockpit, the engine compartment, and the sidepods.
- b. Is approved according to the FIA Standard 8876–2022 and homologated for Class II fires.
- c. Must be installed and maintained according to the manufacturer's recommendations.

The bottle and firing mechanism must be situated within the survival cell and all extinguishing equipment must withstand fire.

The triggering system must have its own source of energy and it must be possible to operate all extinguishers should the main electrical circuits of the car fail.

The driver must be able to trigger the extinguishing system manually when seated normally with the safety harness fastened and the steering wheel in place.

Furthermore, a means of triggering from the outside must be combined with the circuit breaker switches described in Article ~~8.7 C8.8. They must be marked with a letter "E" in red at least 80mm tall, with a line thickness of at least 8mm, inside a white circle of at least 100mm diameter with a red edge with a line thickness of at least 4mm.~~

The pressure gauge required by Item 4.6 of FIA Standard 8876–2022 may be replaced by a pressure sensor.

All extinguisher nozzles must be included in the homologation of the fire extinguishing system. At least one nozzle must be aimed at the driver's midriff.

**C14.2 Rear view mirrors**

**C14.2.1** All cars must have two mirrors positioned symmetrically about the car's centre plane and mounted so that the driver has visibility to the rear and both sides of the car.

**C14.2.2** The reflective surface of each mirror must satisfy the following conditions:

- a. It must be contained within **RV-MIR-HOU** and not be obstructed by the Mirror Housing, as defined in Article C3.6.4 either towards the driver or in the rearward direction.
- b. Its four edges must project orthogonally onto the edges of a vertical rectangle which is 200mm wide and 50mm high (+2mm/-0mm for both dimensions), with a radius of up to 10mm applied to each corner.
- c. Over its whole area it must:
  - i. not contain any concave parts
  - ii. be tangency continuous
  - iii. not have any normal radius of curvature less than 400mm.
- d. When cut by any Z-Plane and before any radius is applied to the corners:
  - i. the normal to the curve at its inboard end must subtend an angle of between 24deg and 28deg to the X axis, pointing towards the Y=0 plane.

- ii. the angle between normals to the curve at its inboard and outboard ends must be greater than 8 degrees.

For the avoidance of doubt, any non-reflective parts of the mirror must be contained within the Mirror Body.

**C14.2.3** Competitors will be required on request to supply the FIA with CAD data with regard to the visibility of their mirror arrangement, and the FIA will retain the right to modify the position of the volume defined in Article C3.6.4 (a) should it become apparent that the mirror position does not meet the safety requirements.

### **C14.3 Rear lights**

**C14.3.1** All cars must have three rear lights which:

- a. Have been supplied by FIA designated manufacturers.
- b. Are clearly visible from the rear.
- c. Can be switched on by the driver when seated normally in the car.

**C14.3.2** The first such light must have:

- a. Its rear face on an X-Plane and at least 750mm behind  $X_{DIF}=0$ .
- b. The centre of its rear face on  $Y=0$ .
- c. The centre of its rear face between  $Z=295$  and  $Z=305$ .

**C14.3.3** Two further lights

- a. Must be fitted, one on each side of the car, within the bodywork defined in Article ~~3.9.2~~ C3.11.2 and in full compliance with Article ~~3.9.2~~ C3.11.2 .
- b. May be curved in the plane of the lens of the LED elements with a radius of not less than 200mm.
- c. The normal to the plane of the lens of the LED elements must be no more than 5° from the X-axis.
- d. Lie in its their entirety between  $Z=500$  and  $Z=870$ .
- e. Respect the directionality of the lens of the LED elements, which should point in a nominally horizontal direction towards the rear of the car.
- f. Be fitted in accordance with the instructions detailed in the Appendix to the Technical and Sporting Regulations.

**C14.3.4** Both types of rear light are classed as **SSC**, and all the relevant details can be found in the Appendix to the Technical and Sporting Regulations.

### **C14.4 Safety Tethers**

#### **C14.4.1 Wheel Tethers**

Each wheel must be fitted with three tethers compliant with FIA standard 8864-2022. The sum of the three maximum absorbed energy, as per FIA Technical List n.93, must be at least 15kJ. No suspension member may contain more than two tethers.

Each tether:

- a. must have a minimum energy absorption of 3kJ.
- b. must have its own separate attachments at both ends, which:
  - i. Are able to withstand a tensile force of 70kN in any direction within a cone of ~~45°~~ 90° (included angle) measured from the load line of the relevant suspension member.
  - ii. Are able to accommodate tether end fittings with a minimum inside diameter of 15mm.
  - iii. Do not share a common fastener and are designed such that the failure of one attachment point will not lead to the direct failure of an adjacent attachment point.
- c. Must register a peak force during homologation of no greater than 70kN.

Furthermore, at least two of the three tethers must have attachment points which:

- d. On the survival cell are separated from each other by at least 300mm in the X-direction, measured between their centres.
- e. On the gearbox are separated from each other by at least 250mm in the X-direction, measured between their centres.
- f. On each wheel/upright assembly are separated by at least 90° radially with respect to the rotational axis of the wheel and 100mm measured between the centres of the two attachment points.

Each Competitor must supply detailed geometries which clearly show that all of the three tethers will independently prevent a wheel from making contact with a driver's head during an accident, with the secondary roll structure fitted, assuming 40% elongation in each tether.

#### **C14.4.3 Rear Impact Structure Tether**

The rear impact structure should be attached to the gearbox case with a tether with a cross sectional area of at least 20mm<sup>2</sup>, a minimum breaking strength of 24kN and a length of at least 600mm. The attachment to the gearbox case should be ahead of  $X_{DIF}=300$ , should be able to accommodate the tether with a minimum bend radius of 6mm. This fixing should withstand a load of 20kN in a rearward direction at up to 22.5° from the X-axis. The attachment to the RIS should be behind  $X_{DIF}=650$ , should be able to accommodate the tether with a minimum bend radius of 6mm. This fixing should withstand a load of 20kN in a forward direction.

#### **C14.5 Safety Harnesses**

It is mandatory to wear a safety harness that has been homologated to FIA Standard 8853-2016. The safety harness must be used in accordance with the safety harness manufacturer's instructions and must be securely fixed to the car. Approved harnesses are listed in Technical List n°57.

#### **C14.6 Driver Cooling Systems**

**C14.6.1** The driver cooling system is defined as a system, the sole purpose which, is to provide additional cooling for the driver.

The driver cooling system may make use of the latent heat of vaporisation, or of sublimation, of a substance.

No materials that could cause cold injuries (e.g. dry ice) may be stored within the cockpit.

**C14.6.3** Cooling suits or balaclavas must be homologated to relevant FIA Standards for Protective Clothing and may only use coolants that are shown to be safe for exposure to skin.

**C14.6.4** Subject to the approval of the FIA, parts of the driver cooling system may be placed within **RV-CH-MID-STRUCT**, in exception to Article C12.3.5, or within **RV-COCKPIT-DRIVER**, in exception to Article C12.5.4.

#### **C14.7 Lateral Safety lights**

All cars must be fitted with a lateral safety light on each side of the car.

#### **C14.8 Driver's Drink System**

All cars must be fitted with a system for providing the driver with drink. The system must have a capacity of between 1 litre and 1.5 litres and must be located between  $X_C=-1400$  and  $X_C=0$ .

**ARTICLE C15: MATERIALS****C15.1 Definitions****C15.1.1 Commercially Available material**

A material that:

- a. Is available on a non-exclusive basis and under normal commercial terms to all Competitors.
- b. Is not supplied to a specification tighter than the standards listed in Section C15.3 (where applicable) with a primary aim of improving the baseline mechanical properties. Additional specifications concerned with process control and/or quality control are permissible.
- c. Has no restrictions or agreements in place that prevents the supplier from openly marketing it.

**C15.1.2 Shape Memory Material**

A material that is configured to move reversibly between two (or more) different shapes when it is subjected only to a non-mechanical uniform stimulus (thermal, electrical, magnetic, optical, etc.), or exhibits a reversible phase change when subject to an applied stress. For clarity, this does not include consequential geometric changes that result solely from the effects of thermal expansion.

**C15.1.3 Foil Metallurgy**

A process by which a material or component is made by the consolidation of metallic foils (by co-forging, welding etc.) which increases the mechanical properties of the material with respect to those of a bulk material. For this definition, a foil is considered a material with a thickness of less than 1mm.

**C15.1.4 Metallic Materials Used for Additive Manufacture**

A group of materials in powder form used for manufacturing near-net shape components from a digital model processed in separate layers and joined by either selective melting, bonding, or sintering.

**C15.1.5** X Based Alloy (e.g., Ni based alloy) – X must be the most abundant element in the alloy on a %w/w basis. The minimum possible weight percent of the element X must always be greater than the maximum possible of each of the other individual elements present in the alloy.

**C15.1.6** X-Y Based Alloy (e.g., Al-Cu based alloy) – X must be the most abundant element as in Article C5.16.1 above. In addition, element Y must be the second highest constituent (%w/w), after X in the alloy. The mean content of Y and all other alloying elements must be used to determine the second highest alloying element (Y).

**C15.1.7** Intermetallic Materials (e.g., TiAl, NiAl, FeAl, Cu<sub>3</sub>Au, NiCo) – These are materials where the material is based upon intermetallic phases, i.e. the matrix of the material consists of greater than 50%v/v intermetallic phase(s). An intermetallic phase is a solid solution between two or more metals exhibiting either partly ionic or covalent, or metallic bonding with a long-range order, in a narrow range of composition around the stoichiometric proportion.



- C15.1.8** Composite Materials – These are materials where a matrix material is reinforced by either a continuous or discontinuous phase. The matrix can be metallic, ceramic, polymeric or glass based. The reinforcement can be present as long fibres (fibre length greater than 13mm) or short fibres, whiskers and particles (discontinuous reinforcement). Nanoscale reinforced materials are to be considered as composites. (a reinforcement is considered to be nanoscale if any dimension of the reinforcement is less than 100nm)
- C15.1.9** Metal Matrix Composites (MMC's) – These are composite materials with a metallic matrix containing a minimum ratio of 0.5% volume/volume of other ceramic, metallic, carbon or intermetallic phase which is not soluble in the liquid phase at 100°C above the melting point of the metallic matrix.
- C15.1.10** Ceramic Materials (e.g. Al<sub>2</sub>O<sub>3</sub>, SiC, B<sub>4</sub>C, Ti<sub>5</sub>Si<sub>3</sub>, SiO<sub>2</sub>, Si<sub>3</sub>N<sub>4</sub>) – These are inorganic, nonmetallic solids.
- C15.1.11** Nanomaterials – These are purposely created objects that have one or more dimensions (e.g., length, width, height, diameter) which is less than 100nm. (100x10<sup>-9</sup>m) as defined in ISO 80004-1:2023.
- C15.1.12** Surface Texturing: Modification of a component surface to obtain a defined patterning to enhance the tribological performance.
- C15.1.13** Coating: a covering that is applied to the surface of an object, referred to as the substrate.
- C15.1.14** Polymeric material: any thermoplastic or thermoset material.
- C15.1.15** The whole percentage range of an element, as declared in the applicable international standard for a specific alloy, shall be inside all the limits set in these Technical Regulations.
- C15.2** **General Principles**
- C15.2.1** Materials used in the construction of the Formula One car – excluding the power unit – are limited to those defined in article C15.3 and to the specific exceptions in article C15.5.
- C15.2.2** Materials and processes used or prohibited in the power unit are defined in Articles C15.7 to C15.10.
- C15.2.3** All materials used must be commercially available.
- C15.2.4** No parts of the car may be made from metallic materials that have a specific modulus of elasticity greater than 40 GPa/(g/cm<sup>3</sup>). Tests to establish conformity will be carried out in accordance with FIA Test Procedure 03/03, a copy of which may be found in the Appendix to the Technical and Sporting Regulations.
- C15.2.5** A Competitor or PU Manufacturer may submit a proposal to the FIA to add or to remove a material from this article. The proposal should include mechanical characteristic, cost, and supply considerations. The proposal will be considered by the TAC or PUAC after the Competitors or PU Manufacturers have reviewed the proposal.
- C15.2.6** Materials that are a direct equivalent to permitted materials may be added by presenting justification to the FIA, who may at its absolute discretion ask more information or tests to be carried out to support the claim.

**C15.2.7** Competitors are required to make submissions of the materials that they will use on the car as part of their annual homologation submission. These shall be listed according to the categories in Article C15.3. This information will be compiled, anonymised, and circulated to the relevant group.

**C15.2.8** Unless explicitly permitted otherwise for a specific application, only material approved by the FIA Technical Department may be used on the power unit. The approval of the FIA Technical Department is conditional upon the material concerned being available on a non-exclusive basis and under normal and equivalent commercial terms to all PU Manufacturers. The approval request form must be sent by the PU Manufacturer to the FIA before the 1st of November of the preceding year. This information will be compiled, anonymised, and circulated to all PU Manufacturers by the end of March of the same year.

### **C15.3 Permitted Materials (Components Outside the PU Perimeter)**

With the exception of materials specifically permitted for certain components, as listed in Article C15.5, only the following materials may be used:

#### **C15.3.1 Metallic Materials – Not Used for Additive Manufacture**

- a. Iron Alloys: any
- b. Aluminium Alloys:
  - i. Cast Aluminium based alloys from the 2xx, 3xx, 4xx, 5xx and 7xx series.
  - ii. Wrought Aluminium based alloys from the 1xxx, 2xxx, 3xxx, 4xxx, 5xxx, 6xxx and 7xxx series containing less than 1% Lithium.
  - iii. 2050 with a chemical composition conforming to UNS A92050.
  - iv. 2055 with a chemical composition conforming to UNS A92055.
  - v. 2099 with a chemical composition conforming to UNS A92099.
- c. Magnesium Alloys:
 

As defined under ASTM B107-13

  - i. UNS M18432, WE43B
  - ii. UNS M18434, WE43C
  - iii. UNS M18410, WE54A
  - iv. UNS M11800, AZ80A
- d. Ni or Co based Superalloys:
 

i. UNS N06625; W.Nr.2.4856	Inconel 625
ii. UNS N07718; W.Nr.2.4668	Inconel 718
iii. UNS N07001; W.Nr.2.4654	Waspaloy
iv. UNS R30035; W.Nr.2.4999	MP35N
v. UNS R30159	MP159
- e. Titanium Alloys:



**C15.3.3 Permitted Polymer Composite Materials**

- a. Matrix Systems:** the matrix system utilised in all polymer composite materials must be based on one of the following:
- i. Epoxy
  - ii. cyanate ester
  - iii. bismaleimide
  - iv. phenolic
  - v. polyurethane
  - vi. polyester
  - vii. Thermoset resins not derived from petrochemicals – subject to approval.
  - viii. Thermoplastic materials
- b. Reinforcing:** reinforcing is permitted using the following materials:
- i. Carbon fibres manufactured from polyacrylonitrile (PAN) precursor, which have:
    - A nominal tensile modulus  $\leq 550\text{GPa}$
    - A nominal tensile strength  $\leq 7100\text{ MPa}$  (i.e. up to and including that of Toray T1100 or Mitsubishi MR70)
    - A density  $\leq 1.92\text{ g/cm}^3$
  - iii. Aramid fibres.
  - iv. Poly(p-phenylene benzobisoxazole) fibres (e.g. “Zylon”).
  - v. Polyethylene fibres.
  - vi. Polypropylene fibres.
  - vii. Glass fibres.
  - viii. Natural Fibres (i.e. flax, hemp, linen, cotton, bamboo)
- c. Core Materials:**
- i. Aluminium Honeycomb
  - ii. Meta-Aramid Honeycomb (e.g. Nomex or equivalent)
  - iii. Para-Aramid Honeycomb (e.g. Kevlar)
  - iv. Polymer foams
  - v. Polymer syntactic foams
  - vi. Balsa wood

**C15.3.4 Permitted Polymer Materials**

In addition to materials permitted in C15.3.3, the following polymer materials are permitted:

- a. Thermoplastics – monolithic or particulate filled.

- b. Thermosets – monolithic or particulate filled.

#### C15.4 Specific Prohibitions and Restrictions (Components Outside the PU Perimeter)

**C15.4.1** Notwithstanding the list of permitted materials in Article C15.3, the following materials or processes are forbidden:

~~a. Metal Matrix Composites, except where allowed under article C15.3.2.~~

- a. Shape Memory Materials except for piezoelectric materials used in electrical sensors.
- b. Additive manufactured materials containing Beryllium.

**C15.4.2** Notwithstanding the list of permitted materials in Article C15.3, the following materials or processes are forbidden unless listed in Article C15.5:

- a. Alloys where the combined weight of Platinum, Ruthenium, Iridium, Rhenium and Gold is more than 5%
- b. Components produced by foil metallurgy.
- c. Intermetallic alloys.

**C15.4.4** Suspension uprights may only be made from:

- i. wrought UNS A92014, UNS A92618, UNS A97075 or EN/AA 7022 aluminium alloys
- ii. wrought or cast titanium alloys permitted by ~~C15.3.2.e~~ C15.3.1.e.
- iii. particulate reinforced aluminium alloy matrix composites permitted by C15.3.1.h.
- iv. additive manufactured titanium permitted by C15.3.2.d
- v. additive manufactured aluminium permitted by C15.3.2.a or C15.3.2.b

**C15.4.5** The **Primary Roll Structure** may ~~only be made from materials with an elongation at break of no less than 10%~~ not be made from materials with particulate reinforcing (Articles C15.3.1.h or C15.3.2.b).

#### C15.5 Specific Exceptions (Components Outside the PU Perimeter)

The following materials, components or processes do not have to comply with articles C15.2 or C15.3 but may be subject to restrictions elsewhere in these regulations:

- a. Monolithic Ceramic Materials may be used for; rolling elements of rolling-element bearings, high-pressure fuel pumps elements, electrical components, thermal insulation, clutch friction materials and spherical bearings.
- b. Ceramic Matrix Composites may be used for; friction materials, seals and thermal insulation.
- c. Carbon-carbon composites may be used for friction materials.
- d. Materials used in any electrical component (e.g. control boxes, wiring looms, sensors).
- e. All seals and rubbers (e.g. rubber boots, o-rings, gaskets, any fluid seals, bump rubbers).
- f. Fluids (e.g. water, oils).
- g. Tyres.

- h. Coatings and platings (e.g. DLC, chroming) whose primary purpose is not thermal or electrical insulation and provided the total coating thickness does not exceed 25% of the section thickness of the underlying base material in all axes. In all cases, the relevant coating must not exceed 0.8mm.
- i. Paint.
- j. Adhesives.
- k. Thermal insulation (e.g. felts, reflective foils or heat shields).
- l. Any currently regulated materials (e.g. fuel bladder, headrest, extinguishant, padding or plank).
- m. Materials used in any component that is supplied to an FIA Single Supply Contract.
- n. Z-pinning is allowed in composite components.
- o. Nano particles are permitted when part of a commercially available polymer or polymer resin.
- p. UNS R30006 (Stellite 6 – Cast), UNS R30106 (Stellite 6 – Sintered), UNS R30016 (Stellite 6 – Wrought) and UNSR30012 (Stellite 12) may be used on or above Z=0 (i.e. not in RV-PLANK)
- ~~q. Particulate reinforced aluminium alloy matrix composite SupremEX 225XE or SupremEX 225XF may be used in suspension uprights.~~

#### C15.6 Prescribed and Homologated Laminates (Components Outside the PU Perimeter)

The following are the prescribed laminates referred to in other articles of these regulations.

**C15.6.1** The materials referred to in Article C15.6.2 are defined below:

- ~~a. CC200 – Woven carbon cloth, fibre weight 200gsm, epoxy prepreg~~
- a. CC100 – Woven carbon cloth, fibre weight between 50gsm and 150 gsm, epoxy prepreg
- b. KC60 – Woven aramid cloth, fibre weight 60gsm, epoxy prepreg
- c. KC170 – Woven aramid cloth, fibre weight 170gsm
- d. R135 – 135gsm elastomeric material
- e. R350 – 350gsm elastomeric material
- ~~g. CC280UHS – Woven carbon cloth, fibre weight 280gsm,  $F_{tu} > 6500\text{MPa}$ , epoxy prepreg~~
- g. CC-UHS – Woven carbon cloth, fibre  $F_{tu} > 6250\text{MPa}$ , epoxy prepreg

**C15.6.2** The prescribed laminates in use throughout the Technical Regulations are listed below:

- a. **PL-HALO:** [KC60, CC100, KC60] stacking sequence is free.
- b. PL-ANTI-SPLINTER may be one of the three specifications listed below:
  - i. Laminate Type **A** – a laminate where more than 50% by weight of the reinforcing is: aramid, poly(p-phenylene benzobisoxazole) (e.g. “Zylon”), polyethylene, polypropylene or natural fibres. In this case, no additional precautions are required.
  - ii. Laminate Type **B** – Laminates not covered by **A** and with areal weight of reinforcing up to 1000gsm: [**B**/2, R135, **B**/2] where **B**/2 is half the laminate  $\pm 1$  ply.

iii. Laminate Type **C** – Laminates not covered by **A** and with areal weight of reinforcing is greater than 1000gsm: [**C**/2, R350, **C**/2] where **C**/2 is half the laminate  $\pm$  1 ply.

c. **PL-HEADREST:** [KC60, KC60]

**C15.6.3** The homologated laminates used in the Survival Cell are listed below. Representative panels must resist the specified load when it is applied through a rigid pad measuring 100mm x 130mm. Details of the test procedure are given in the [Appendix to the Technical and Sporting Regulations Annex to this Article](#). The construction of these panels is OSC.

Where a laminate is of sandwich construction;

- i. The areal weight of reinforcing in the outer skin, must be as great as, or greater than that in the inner skin.
- ii. The core must be aluminium honeycomb with a thickness of at least 6mm.
- iii. Each skin must include plies of **CC-UHS** with an areal weight of reinforcing of at least 800gsm.
- iv. the test load must be applied to the outer skin.

a. **HL-FWD-SC:**

A laminate of sandwich construction. A representative test panel must resist an intrusion load of 325kN.

b. **HL-COCKPIT-SIDE:**

A representative test panel must resist an intrusion load of 440kN.

c. **HL-COCKPIT-FLOOR:**

A representative test panel must resist an intrusion load of 325kN.

d. **HL-FC-SIDE:**

A laminate of sandwich construction. A representative test panel must resist an intrusion load of 325kN.

## **C15.7 Materials, processes and construction – General (Components inside the PU Perimeter)**

**C15.7.1** Unless explicitly permitted for a specific application, the following materials may not be used on the power unit:

- a. Magnesium based alloys.
- b. Metal Matrix Composites (MMC's) containing more than 2.0% volume/volume of other ceramic, metallic, carbon or intermetallic phase which is not soluble in the liquid phase at 100°C above the melting point of the metallic matrix.
- c. Intermetallic materials.
- d. Alloys containing more than 5% by weight of Platinum, Ruthenium, Iridium or Rhenium.
- e. Copper based alloys containing more than 2.2% Beryllium
- f. Any other alloy class containing more than 0.25% Beryllium.

- g. Tungsten base alloys.
- h. Ceramics and ceramic matrix composites.
- i. Aluminium based alloys containing more than 1.0% weight Lithium (Li).
- j. Materials which at least one element during production is a nanomaterial.
- k. Thermal insulation containing unbound nanomaterials.
- l. Material with a density exceeding 18,400 kg/m<sup>3</sup>.
- m. Aluminium based alloys containing more than 1.0% weight Silver (Ag).
- n. Polymer composite material not listed in C15.3.3 except Metallic reinforced polymer.

**C15.7.2** For coatings, the restrictions in Article C15.7.1 do not apply to coatings provided the total coating thickness must not exceed 25% of the section thickness of the underlying base material in all axes.

In all cases, other than under Article C15.7.3(b), the relevant coating must not exceed 0.8mm.

Where the coating is based on Gold, Platinum, Ruthenium, Iridium or Rhenium, the coating thickness must not exceed 0.035mm.

Graphene is not permitted in any coating.

**C15.7.3** The restrictions in Article C15.7.1(h) do not apply to the following applications:

- a. Any component whose primary purpose is for electrical or thermal insulation.
- b. Any coating whose primary purpose is for thermal insulation of the outside of the exhaust system.

**C15.7.4** For Aluminium-based alloy, in addition to the restrictions in article C15.7.1(b), TiB<sub>2</sub> is only permitted up to a maximum of 0.3% v/v. *Additionally AMS 4471A, AMS 4482 and AMS 7033 are authorized.*

**C15.7.5** The creation of a textured surface using an energy beam (e.g., electron or laser beam) or photo-chemical etching may not be used on the power unit, except for part marking purposes.

**C15.7.6** For all seals and rubbers, the restrictions in Article C15.7.1 do not apply (e.g., rubber boots, O-rings, gaskets, any fluid seals, bump rubbers).

**C15.7.7** An approach aiming to respect the REACH and ROHS standards shall be actively pursued by the manufacturers.

## **C15.8 Materials and construction – Components (Components inside the PU Perimeter)**

**C15.8.1** Pistons must be produced from one of the following iron-based alloys: AMS 6487, 15cdv6, 42CrMo4, X38CrMoV5-3.

**C15.8.2** Piston pins must be manufactured from an iron-based alloy and must be machined from a single piece of material.

**C15.8.3** Connecting rods must be manufactured from iron or titanium-based alloys and must be machined from a single piece of material with no welded or joined assemblies (other than a bolted big end cap or an interfered small end bush).

**C15.8.4** Crankshafts must be manufactured from an iron-based alloy.



No welding is permitted between the front and rear main bearing journals.

Crank counterweights assembled to the crankshaft may be manufactured in a Tungsten based material.

**C15.8.5** Camshafts must be manufactured from an iron-based alloy.

Each camshaft and lobes must be machined from a single piece of material.

No welding is allowed between the front and rear bearing journals.

**C15.8.6** Valves must be manufactured from TiAl intermetallic materials or from alloys based on Iron, Nickel, Cobalt, Titanium. Hollow valves (e.g., sodium, or similar, filled for cooling) are permitted for the exhaust only, but the main cavity created must be a cylindrical feature of constant diameter. Machined features to facilitate manufacture and assembly are allowed above and below the main cavity, however such features must not create a volume that extends beyond a virtual plain cylinder positioned on the valve centreline with a diameter which is 1.0 mm greater than that of the main cavity.

In addition, the restrictions detailed in Articles C15.7.2 and C15.2.4 do not apply to the intake and exhaust valves.

**C15.8.7** Reciprocating and rotating components:

- a. Reciprocating and rotating components must not be manufactured from graphitic matrix, metal matrix composites or ceramic materials, this restriction does not apply to the clutch discs and any seals.
- b. Rolling elements of rolling element bearings must be manufactured from an iron-based alloy or from a ceramic material.
- c. All timing gears between the crankshaft and camshafts (including hubs) must be manufactured from an iron-based alloy.
- d. High pressure fuel pump elements may be manufactured from a ceramic material.
- e. Torsional damper elements may be manufactured in a Tungsten based material.

**C15.8.8** Static components:

- a. Other than inserts within them, engine crankcases including sump, cylinder heads and cylinder head cam covers must be manufactured from aluminium or iron-based alloys.
- b. On the crankcase including sump, cylinder head and cylinder head cam cover, composite or metallic materials are permitted for local repairs to components following damage or failure and after consultation with all PU manufacturers. The total area should in any case not exceed 100cm<sup>2</sup> and the thickness is limited to 3mm. Composite repairs must not be present on the components used during the following Championship season.
- c. Any metallic structure whose primary or secondary function is to retain lubricant or coolant within the engine must be manufactured from an iron-based alloy or an aluminium alloy.
- d. All threaded fasteners must be manufactured from Waspaloy, Rene 41, Inconel 718, A286, PH 13-08Mo, 35NiCrMo16, 30NiCrMo16, AISI H11, 17-4PH, [UNS S32205/S31803](#), 42CrMo4 or any

steel covered by the ISO 898-1 and ISO 898-2. Additional materials are authorized for the following three functions:

- i. Fasteners whose primary function requires them to be an electrical insulator may be manufactured from ceramic or polymeric materials.
  - ii. Fasteners that are used in electronic control units may be manufactured from aluminium or copper-based alloys or polymeric (plastic) materials.
  - iii. Fasteners used between the cylinder head and crankcase, crankcase upper and lower, conrod and crankshaft counterweight bolts may be manufactured from AMS5758, AMS5844, AMS5845 and AMS5937 materials.
- e. Valve seat inserts, valve guides and any other bearing component may be manufactured from metallic infiltrated pre-forms with other phases which are not used for reinforcement.
  - f. ICE ballast may be manufactured in a Tungsten based material.
  - g. Only one cylinder head is permitted for each bank and each cylinder head must be made from a single piece of material with the exception of inserts defined in Article 5.3.7 and must include inlet ports, exhaust ports and all water cores and/or water passages above the top deck.
  - h. The plenum must be made from polymer composite material with the exception of inserts.

#### **C15.9 Materials and construction – Pressure charging and exhaust systems (Components inside the PU Perimeter)**

- C15.9.1** All components of the Engine exhaust system, turbine, turbine housing and wastegate exit housing that are in contact with the main exhaust gas flow must be manufactured from an Iron or Nickel based alloy.
- C15.9.2** Static components that are neither in the exhaust system nor in the compressor line must be manufactured from iron-based alloys, aluminium alloys or titanium alloys.
- C15.9.3** The restrictions detailed in article C15. 7.1 i) do not apply to the compressor housing (from compressor inlet to compressor outlet(s)) which must be manufactured from aluminium-based alloy containing up to 2.5% weight Lithium.
- C15.9.4** The restrictions detailed in article C15.7.1 i) do not apply to the compressor wheel, which must be manufactured from aluminium-based alloy containing up to 2.5% weight Lithium or from Titanium.
- C15.9.5** Measures must be taken to ensure that in the event of failure of the turbine wheel any resulting significant debris is contained by and within the turbine housing, except in the case of an axial failure where this debris must be contained within the turbine housing and/or tailpipe assembly.
- C15.9.6** Nickel Alloys limited to Inconel 625, 625 LCF and 718 on the exhaust primaries / secondaries / flange / brackets / turbine housing
- C15.9.7** Additive manufacture is only permitted in three areas within the exhaust assemblies as defined in 5.1.20 (see drawing 8 in Appendix C3 is a representation of these constraints, included for reference only):
- a. One stub/flange element per primary at the connection to the cylinder head. The maximum dimension of this additive element in any direction is 150mm.

- b. One 3-into-1 element per bank joining the primaries to the secondary. The maximum dimension of this additive element in any direction is 230mm.
- c. One connection between the secondary and the TC per bank. The maximum dimension of this additive element for transition to TC and wastegate mounting in any direction is 150mm.

**C15.9.9** exhaust insulation may not use ceramic matrix composite (CMC) or polymer composite material (PMC).

**C15.10 Materials and construction – Energy recovery, storage systems and electronic systems (Components inside the PU Perimeter)**

**C15.10.1** All metallic casings for the energy recovery and storage systems must be manufactured in aluminium-based alloy and must comply with all aspects of Article C15.7 except for power electronic cooling base plate where metal matrix composite may be used.

**C15.10.2** All casings for electronic systems, including break up boxes, with exception of the ERS and storage system must be manufactured from polymeric material or aluminium based alloys.

**C15.10.3** Energy storage devices are not subject to Articles C15.7.1a), b), c) and h) nor to C15.7.2.

**C15.10.4** Permanent magnets in electrical machines are not subject to Articles C15.7.1 a), b), c) or h) nor to Article C15.7.2.

**C15.10.5** Soft electromagnetic materials used in electrical machines are not subject to Articles C15.7.1 a), b), c) or h) nor to Article C15.7.2. Cobalt concentration is limited to 10% on soft magnetic alloys. Concentration up to 49% is permitted providing that all end-of-life cobalt is recycled. In addition, any cobalt used must come from an ethical source.

**C15.10.6** Electronic components contained inside electronic units are not subject to any material restriction.

**C15.10.7** ES Cells materials are not subject to Article C15.7.1 j).

**ARTICLE C16: FUEL AND ENGINE OIL****C16.1 Basic principles**

**C16.1.1** The purpose of this Article is to ensure that the fuel and engine oil used in Formula One correspond to what these terms are generally understood to mean.

**C16.1.2** With regard to fuel, the detailed requirements of this Article are intended to ensure the use of Advanced Sustainable (AS) fuels comprising solely AS components, that are composed of certified compounds and refinery streams and fuel additives and to prohibit the use of specific power-boosting chemical compounds. Co-processing of these certified compounds or refinery streams is not permitted. All AS components and fuels must be segregated from non-sustainable components and fuels at all times. The final, blended fuel must achieve a greenhouse gas (GHG) emissions savings, relative to fossil-derived gasoline, of at least that defined for the transport sector in the EU Renewable Energy Directive RED<sup>(1)</sup>, which was current on January 1st in the year prior to the relevant Formula One Championship. The GHG savings calculation takes into account any net carbon emissions from land-use change, the energy used in harvesting and transporting the biomass and the production and processing of the advanced sustainable component. In any process where sustainable energy is used, this must be surplus to the local domestic requirements. Where available, GHG emission savings will be taken from the current EU Renewable Energy Directive (RED) or other equivalent, internationally recognised sources. The use of these compounds and refinery streams in F1 fuel will be dependent on evidence indicating that the supplier is genuinely developing these compounds for use in commercial fuels and that they are available from plants capable of producing at least 5m<sup>3</sup> per year or are commercially available at similar volumes from a third party. Acceptable compounds and compound classes are defined in C16.2 and C16.4.3. In addition, to cover the presence of low-level impurities, the sum of components lying outside the C16.2 and C16.4.3 definitions are limited to 1% max m/m of the total fuel.

<sup>(1)</sup> Article 29, Section 10(c) of Directive (EU) 2018/2001 for biofuels, and Article 25, Section 2 for RFNBO

**C16.1.3** Only approved fuel (Article C16.5) may be released into the engine combustion chamber by the fuel injector (5.1.12).

**C16.1.4** Only ambient air may be mixed with the fuel as an oxidant.

**C16.1.5** The function of an engine oil is to lubricate moving parts, to improve ~~the overall~~ efficiency ~~of the engine~~ by reducing friction and to reduce wear. It also cleans, inhibits corrosion, improves sealing, and cools ~~the engine~~ by carrying heat away from ~~moving parts~~. Engine oils should not enhance the properties of the fuel nor energize the combustion. The presence of any component that cannot be rationally associated with the defined functions of the engine oil will be deemed unacceptable.

**C16.1.6** Any fuel or engine oil, which appears to have been formulated in order to subvert the purpose of this regulation, will be deemed to be outside it.

**C16.1.7** All Competitors must be in possession of a Material Safety Data Sheet for each type of fuel or engine oil used. This sheet must be made out in accordance with EC Directive 93/112/EEC and all information contained therein strictly adhered to.

**16.1.8** ~~The following components, irrespectively of their location inside the car, can only be lubricated with the oil as defined in article 16.1.5:~~

- - ICE
- - Turbocharger
- - MGUK mechanical transmission
- - MGUK

Greases are not considered as part of this restriction.

**16.1.9** Only one oil specification, as defined in 16.1.5, is allowed inside the PU perimeter, with the following exceptions:

- Hydraulic fluid, only for the following devices under their normal and intended operation:
  - Actuators and relative control valves, as described in Appendix 3 Table 1 items 63 and 64
  - Hydraulic pump, if mechanically driven by the ICE, as described in Appendix 3 Table 1 item 62
  - Hydraulic lines associated with the above, as described in Appendix 3 Table 1 items 62 to 66.
- ERS fluid used for the normal and intended operation of the following PU Area as listed in the Appendix 3: ERS cooling, MGU-K, ES and PU-CE.

Greases are not considered as part of this restriction.

**16.1.10** Excluding fuel, hydraulic fluid, ERS fluid and engine oil as defined in 16.1.5, any other liquid inside the PU perimeter can only have the function of coolant/thermal exchange, and cannot act as a lubricant, with the only possible exception of lubricating its own pump(s) and valve(s).

## **C16.2 Definitions**

**C16.2.1 Paraffins** Straight chain and branched alkanes.

**C16.2.2 Olefins** Straight chain and branched monoolefins and diolefins. Monocyclic monoolefins (with five or more carbon atoms in the ring) with or without paraffinic side chains.

**C16.2.3 Diolefins** Straight chain or branched or monocyclic hydrocarbons (with five or more carbon atoms in any ring) with or without paraffinic side chains, containing two double bonds per molecule.

**C16.2.4 Naphthenes** Monocyclic alkanes (with five or more carbon atoms in the ring) with or without paraffinic side chains.

**C16.2.5 Aromatics** Monocyclic and bicyclic aromatic rings with or without paraffinic side chains.

**C16.2.6 Oxygenates** Organic compounds containing oxygen.

**C16.2.7 Additive** An additive is a component added to the fuel at low concentration to improve a particular property of the fuel. These include (but are not limited to) antioxidants, antiknock agents, antistatic additives and deposit control additives.

- C16.2.8 Advanced Sustainable component** An Advanced Sustainable (AS) Component is one that is certified to have been derived from a renewable feedstock of non-biological origin (for example, a RFNBO), municipal waste, or non-food biomass. Such biomass includes, but is not limited to, lignocellulosic biomass (including sustainable forest biomass), algae, agricultural residues or waste, and dedicated non-food energy crops grown on marginal land unsuitable for food production. RFNBOs are considered renewable when the hydrogen component is produced in an electrolyser that uses new renewable electricity generation capacity. Pre-commercial plants producing RFNBOs do not need to use electricity from new renewable electricity generating capacity. Pre-commercial plants, producing AS fuel or AS fuel components, may use renewable energy certificates and/or low-carbon hydrogen guarantees-of-origin certificates to improve their GHG emission reduction. Biocomponents from food crops can be regarded as an advanced sustainable component only if they have already fulfilled their food purpose (e.g. waste vegetable oil because it has already been used and is no longer fit for human consumption). Furthermore, the biomass, from which the advanced sustainable component was made, must not originate from land with high biodiversity such as undisturbed primary forest or woodland, land designated for nature protection or highly biodiverse grassland, and were in this state in or after January 2008. Additionally, the biomass must not originate from any land with high-carbon stock such as wetlands and peatlands.
- C16.2.9 Metals** are defined as alkali metals, alkaline earth metals, transition metals, actinides, lanthanides, post-transition metals and metalloids.
- C16.2.10 Alkali Metals** Group 1 elements, excluding hydrogen.
- C16.2.11 Co-processing** is the procedure of processing feedstocks blended of sustainable and non-sustainable origin.
- C16.2.12 Denaturant** in this instance is a toxic and/or unpalatable adulterant added to ethanol making it unsuitable for human consumption.
- C16.2.13 A Pre-commercial plant** is one that has a total maximum production capacity of all AS products of 40,000m<sup>3</sup> per year.
- C16.2.14 Municipal Waste** is household waste and waste similar in nature and composition to household waste. For the purposes of this article, only solid, non-toxic, non-hazardous waste material that cannot be re-used, re-covered or recycled, meeting the principles of the waste hierarchy, is considered suitable source material for AS components or AS fuel production.

### C16.3 Fuel properties

The only fuel permitted is petrol having the following characteristics:

Property	Units	Min	Max	Test Method
RON		95.0(1)	102.0(1)	ISO 5164/ ASTM D2699
Sensitivity (RON-MON)			15.0(1)	ISO 5164/ ASTM D2699 ISO 5163/ ASTM D2700
LHV	MJ/kg	38.0	41.0	GC
Density (at 15oC)	kg/m3	720.0	785.0	ISO 12185/ ASTM D4052
Methanol (2)	% v/v		3.0	EN 1601 or EN 13132 or EN ISO 22854

Oxygen	wt%	6.70	7.10	Elemental Analysis
Nitrogen	mg/kg		500	ASTM D 5762
Benzene	wt%		1	GCMS
DVPE	kPa	45	68	EN130161
Lead	mg/l		5	ASTM D 3237 or ICPOES
Manganese	mg/l		2	ASTM D 3831 or ICPOES
Metals (excluding alkali metals)	mg/l		5	ICPOES
Oxidation Stability	minutes	360		ASTM D 525
Sulphur	mg/kg		10	EN ISO 20846
Electrical conductivity	pS/m	200		ASTM D 2624
Distillation Characteristics:				
At E70oC	% v/v	20.0	52.0	ISO 3405/ ASTM D86
At E100oC	% v/v	40.0	80.0	ISO 3405/ ASTM D86
At E150oC	% v/v	75.0		ISO 3405/ ASTM D86
Final Boiling Point	oC		210	ISO 3405
Distillation Residue	%v/v		2	ISO 3405
A correction factor of 0.2 for MON and RON shall be subtracted for the calculation of the final result in accordance with EN 228: 2012				
A stabilising agent must be added				

The fuel will be accepted or rejected according to ASTM D 3244 with a confidence limit of 95%.

## C16.4 Composition of the fuel

C16.4.1 The composition of the petrol must comply with the specifications detailed below:

Component	Units	Min	Max	Test Method
Aromatics	wt%		40	GCMS
Olefins	wt%		17	GCMS
Total diolefins	wt%		0.1	GCMS
Total styrene and alkyl derivatives	wt%		0.1	GCMS

In addition, the fuel must contain no substance which is capable of exothermic reaction in the absence of external oxygen.

C16.4.2 The total of individual hydrocarbon components present at concentrations of less than 5% m/m of the total fuel must be at least 30% m/m of the hydrocarbon component of the fuel.

C16.4.3 The only oxygenates permitted are paraffinic monoalcohols and paraffinic monoethers with a final boiling point below 210°C.

C16.4.4 An additive package from non-sustainable sources, comprising additives (as defined in Article C16.2.7), and denaturants (as defined in Article C16.2.12) from non-sustainable sources may be used, at a total combined concentration of no more than 1.0% m/m of the blended fuel. The presence of any non-sustainable component that cannot be rationally associated with the defined functions of the additive package or the denaturant will be deemed unacceptable.

## C16.5 Fuel approval

C16.5.1 Before any fuel may be used in the Formula One Championship:



- a. The supplier must comply with the requirements set in Appendix C5, Paragraph 1.2. ~~of the Technical Regulations.~~
- b. Two separate five litre samples, in suitable containers, must be submitted to the FIA for analysis and approval.
- c. Certification must be presented to the FIA, from a recognised body, assuring the origin and the calculated GHG reduction of each AS compound and AS refinery stream blended into any Formula One fuel blend submitted to the FIA for approval.
- d. The fuel must be shown to be compatible with the fuel bladder and seal materials used by all Competitors or PU Manufacturers that will be using the fuel by passing the tests specified in The Appendix to the Technical and Sporting Regulations.

**C16.5.2** No fuel may be used in a Competition without the prior written approval of the FIA.

### **C16.6 Fuel sampling and testing at a Competition**

**C16.6.1** All samples will be taken in accordance with the FIA Formula One fuel sampling procedure, a copy of which may be found in the Appendix to the Technical and Sporting Regulations.

**C16.6.2** Fuel density will also be checked and must be within 0.15% of the figure noted during preapproval analysis.

**C16.6.3** Fuel samples taken during a Competition will be checked for conformity by using a gas chromatographic technique, which will compare the sample taken with an approved fuel. Samples which differ from the approved fuel in a manner consistent with evaporative loss, will be considered to conform. However, the FIA retains the right to subject the fuel sample to further testing at an FIA approved laboratory.

**C16.6.4** GC normalised peak areas of the sample will be compared with those obtained from the reference fuel. Variations in any given normalised peak area (relative to those of adjacent peaks of a similar size) which are greater than 12%, or an absolute amount greater than 0.10% for compounds present at concentrations below 0.8%, will be deemed not to comply.

If a peak is detected in a fuel sample that was absent in the corresponding reference fuel, and its peak area represents more than 0.10% of the summed peak areas of the fuel, the fuel will be deemed not to comply.

If the deviations observed (above) by GC indicate that they are due to mixing with another Formula One fuel, which has been approved by the FIA for use by the team, the fuel sample will be deemed to comply, provided that the adulterant fuel is present at no more than 10% in the sample. Any systematic abuse of mixed fuels will be deemed not to comply.

### **C16.7 Engine oil definitions**

Engine oil (serving the purpose stated in Article C16.1.5) must comprise base oils and additives as defined below.

Base Oil General:

- a. A base oil is a base stock or blend of base stocks.



- b. A base stock is a lubricant component that is produced by a single manufacturer. Base stocks may be manufactured using a variety of different processes including but not limited to distillation, solvent refining, hydrogen processing, oligomerization, esterification, and rerefining.

All base stocks are divided into five general categories:

- a. Group I base stocks contain less than 90 percent saturates and/or greater than 0.03 percent sulphur and have a viscosity index greater than or equal to 80 and less than 120 using the test methods specified in the table below.
- b. Group II base stocks contain greater than or equal to 90 percent saturates and less than or equal to 0.03 percent sulphur and have a viscosity index greater than or equal to 80 and less than 120 using the test methods specified in the table below.
- c. Group III base stocks contain greater than or equal to 90 percent saturates and less than or equal to 0.03 percent sulphur and have a viscosity index greater than or equal to 120 using the test methods specified in the table below.
- d. Group IV base stocks are polyalphaolefins (PAO).
- e. Group V base stocks include all other base stocks not included in Group I, II, III, or IV.

The Analytical Methods for Base Stock are defined below:

Property	Test Method
Saturates	ASTM D2007
Viscosity index	ASTM D2270
Sulfur (use one listed method)	ASTM D1552 ASTM D2622 ASTM D3120 ASTM D4294 ASTM D4927

Additives are defined as the chemical compounds added to the base oil in small concentrations in order to improve the performance characteristics of the engine oil.

### C16.8 Engine oil properties

The engine oil must comply with the following characteristics:

Property	Units	Min	Max	Test Method
Kinematic Viscosity (100°C)	cSt	2.8		ASTM D445
HTHS Viscosity at 150°C and Shear Rate of 10 <sup>6</sup> s <sup>-1</sup>	mPa.s	1.4		ASTM D4741
Initial Boiling Point	°C	210		ASTM D7500
Flashpoint	°C	93		ASTM D3828

The oil will be accepted or rejected according to ASTM D 3244 with a confidence limit of 95%.

**C16.9 Composition of the engine oil**

**C16.9.1** In the event that the initial boiling point test (ASTM D7500) suggests the presence of compounds with a boiling point of less than 210°C the sample will be further analysed by GCMS. The total of any components with boiling points less than 210°C must not exceed 0.5% m/m.

**C16.9.2** The engine oil must not contain any organometallic petrol additives or other octane boosting petrol additives.

**C16.10 Engine oil approval**

**C16.10.1** Before any engine oil may be used in the Formula One Championship:

- a. The supplier must comply with the requirements set in Appendix C5, Paragraph 1.2. ~~of the Technical Regulations.~~
- b. Two separate one litre samples, in suitable containers, must be submitted to the FIA for analysis and approval.

**C16.10.2** No engine oil may be used in a Competition without the prior written approval of the FIA.

**C16.10.3** In addition to the engine oils approved for use in a Competition, one type of dyno engine oil may be approved by the FIA.

**C16.11 Sampling and testing at a Competition**

**C16.11.1** Each Competitor must declare, prior to every Competition, which oil will be used in each of their engines during the Competition.

**C16.11.2** For reference purposes, before any oil may be used at a Competition, a sample must be submitted to the FIA together with the oil reference number.

**C16.11.3** Engine oil samples taken during a Competition will be checked for conformity by using a Fourier transform infrared (FTIR) technique, which will compare the sample taken with that submitted at the start of the Competition. Samples which differ from the reference engine oil in a manner consistent with fuel dilution, engine fluids contamination and oil ageing as a result of normal engine operation, will be considered to conform. Samples which differ from the reference engine oil in a manner consistent with the mixing with other engine oils, which have been approved by the FIA for use by the team at a Competition, will be deemed to comply, provided that the adulterant oils are in total present at no more than 10% in the sample. This tolerance will also be applicable for the mixing with the approved dyno engine oil but only for a new engine during the competition at which it is first used. However, the FIA retains the right to subject the oil sample to further testing at an FIA approved laboratory.

**C16.12 Recycling of Engine Oil**

**C16.12.1** All used engine oils must be collected for recycling.

**ARTICLE C17: COMPONENTS' CLASSIFICATION****C17.1 Definitions**

In this Article C17:

**“Associate”** means, with respect to a Competitor in the Championship (and any entity representing that Competitor):

- a. any other person or entity (including any corporate or unincorporated body) that (directly or indirectly):
  - i. owns share capital or business assets of the Competitor; or
  - ii. has the power to exercise voting rights in relation to the Competitor; or
  - iii. has the power to appoint members of the supervisory board, board of directors or bodies legally representing the Competitor; or
  - iv. has the power to conduct the affairs of the Competitor by constitutional documents or agreement or otherwise; and
- b. any other person or entity in the same legal group structure as the Competitor from time to time; and
- c. any agent, contractor (or sub-contractor) or other person or entity (including any corporate or unincorporated body) that is set up or used by a Competitor to circumvent the requirements of this Article C17.

**“Outsourcing”** means procuring goods or services by contract with an external supplier.

**“Design Specification”** means, in respect of a component all design (including three-dimensional geometry, tolerances, materials, surface finishes and design standards), manufacturing, installation and operational information related to that component.

And for the purposes of these Technical Regulations, including in this Article C17:

"Intellectual Property" means:

- a. patents, rights to inventions, designs, copyright and related rights, database rights, trade marks and trade names, rights in get-up and related goodwill and the right to sue for passing off or unfair competition (in each case whether registered, registerable or unregistered);
- b. proprietary rights in domain names;
- c. rights to use, and protect the confidentiality of, trade secrets, know-how and confidential information;
- d. applications, and rights to apply for and be granted registrations, including extensions and renewals of, such rights; and
- e. all other rights of a similar nature or having an equivalent effect anywhere in the world.

**C17.2 General Principles****c17.2.1 Classification:**

- a. Subject to Article C17.2.1 (d), all components used in Formula One cars and all equipment used to support a Competitor's operations during a Championship shall be classified as a Listed Team Component (LTC), a Standard Supply Component (SSC), a Transferable Component (TRC), a Defined Specification Component (DSC), or an Open Source Component (OSC), each as defined in Article C17.3–C17.7 (inclusive).
- b. Unless otherwise specified, such components/equipment will be classified as LTC.
- c. All Aerodynamic Components described in Article C3 of these Technical Regulations are LTC, unless specifically defined as SSC or OSC.
- d. Power Unit components shown as “INC” in the column “Definitions – Article C5.1.2” of the table in Appendix C4 of the Technical Regulations do not fall under any of the four categories set out in this Articles C17.
- e. In cases of doubt, the FIA should be consulted and shall determine the classification of a particular component or piece of equipment, should that differ from the default classification mentioned in Article C17.2.1(b) above.

**C17.2.2** For the purposes of the remaining provisions of this Article C17, any reference to any Competitor shall include (a) any Associate of such Competitor; and (b) any external entity (i) working on behalf of a Competitor or (ii) working for its own purposes and subsequently providing the results of its work to a Competitor.

**C17.2.3** For the purposes of the remaining provisions of this Article C17, any reference to a “component” may also refer to complete assemblies.

**C17.2.4** No Competitor may use movement of personnel (whether employee, consultant, contractor, secondee or any other type of permanent or temporary personnel) with another Competitor, either directly or via an external entity, for the purpose of circumventing the requirements of this Article C17.

**C17.2.5** From time to time the FIA may request that a competitor shares certain information in connection with this Article C17 with the FIA (a) so that the FIA may share with the other competitors for safety reasons only, or (b) to assist the FIA in considering future amendments to the Technical Regulations, subject in each case to receiving the appropriate undertaking of confidentiality from the FIA.

**C17.2.6** Except as otherwise expressly permitted by these Technical Regulations or by the FIA, no competitor may directly or indirectly disclose or transfer any Intellectual Property to another competitor that is reasonably likely to impact upon the performance of the receiving competitor, and no competitor may directly or indirectly obtain (by any means) the same from another competitor.

**C17.2.7** Where a Competitor is made responsible under these Technical Regulations for raising any issues of safety, incompatibility and/or reliability of a component that it uses on its car, it shall not make any claim against any other party that is inconsistent with that responsibility.

**C17.2.8** Competitors may make available to other Competitors test facilities and equipment such as (but not limited to) wind tunnels or dynamometers. The Intellectual Property involved in the operation of such shared facilities may be used by and/or disclosed to the sharing party but the results of any experimental or test work carried out on such facilities may only be used by the originator of the work. Where facilities are shared, robust processes must be put in place to ensure there is no transfer of Intellectual Property through common personnel and that all data can only be accessed by the originator of the work. Any such sharing of facilities must be declared to the FIA with a full description of the work that will be carried out, and also of the processes that will be put in place in order to avoid an exchange of information that could lead to the transfer of knowledge leading to the performance enhancement of an LTC (as required by Article C17.3.4), or a TRC (as required by Article C17.5.8) or an OSC (as required by Article C17.6.11).

### **C17.3 Listed Team Components (LTC)**

**C17.3.1** “**Listed Team Components**” (LTC) are components whose design, manufacture and Intellectual Property is owned and/or controlled by a single Competitor or its agents on an exclusive basis (including, without limitation, the components identified as such in Appendix C7).

**C17.3.2** A Competitor may only use LTC in its Formula One cars that it has designed (including, for the avoidance of doubt, its three-dimensional shape and the evolution history leading to it, any preliminary designs, simulations, wind tunnel tests, and analysis) and manufactured itself. However, this does not prevent the Competitor Outsourcing any R&D, engineering and/or CAD design and/or the manufacture of any LTC to a third party (including, for the avoidance of doubt, an Associate of such Competitor) provided that:

- a. the Competitor retains the exclusive right to use the LTC in Formula One for so long as it competes in Formula One;
- b. the third party to whom manufacture of the LTC is Outsourced may not be another Competitor or an Associate to another Competitor; and
- c. the third party to whom design of the LTC is Outsourced may not be another Competitor, an Associate to another Competitor, or a party that directly or indirectly designs LTCs or TRCs for any other Competitor.

**C17.3.3** Although it is permissible to be influenced by the design or concept of a Competitor's LTC using information that must potentially be available to all Competitors, this information may only be obtained at Competitions or Tests (as defined respectively in Articles 5 and 10.1 3 of the Sporting Regulations), and no Competitor may design its LTCs based on “reverse engineering” of another Competitor's LTC. For the purpose of this Article, “reverse engineering” shall mean:

- a. The use of photographs or images, combined with software that converts them to point clouds, curves, surfaces, or allows CAD geometry to be overlaid onto or extracted from the photograph or image
- b. The use of stereophotogrammetry, 3D cameras or any 3D stereoscopic techniques
- c. Any form of contact or non-contact surface scanning
- d. Any technique that projects points or curves on a surface so as to facilitate the reverse-engineering process

In cases where isolated features of a Competitor's LTC(s) may closely resemble the features of another Competitor's LTC(s), it will be the role of the FIA to determine whether this resemblance is the result of reverse engineering or of legitimate independent work. The following further provisions apply:

- e. All Competitors must provide to the FIA, upon request, any data or other information that is required to demonstrate compliance with this Article.
- f. For all LTCs used during the Championship, the restrictions described in this Article apply to their entire design process, including actions carried out before the calendar year of the Championship.
- g. The FIA may issue guidance from time to time to define more specifically the requirements and constraints of this Article.

**C17.3.4** No Competitor may, either directly or via a third party:

- a. pass on any information in respect of its LTC (including but not limited to data, designs, drawings, or any other Intellectual Property) to another Competitor or receive any information from another Competitor in respect of that Competitor's LTC; or
- b. receive consultancy or any other kind of services from another Competitor in relation to LTC, or supply any such services to another Competitor; or
- c. pass any methodology which can be used to enhance the performance of LTC (including but not limited to simulation software, analysis tools, etc.) to another Competitor, or receive any such methodology from another Competitor.

Notwithstanding the provision of this Article, Supplying Power Unit Manufacturers or Supplying Competitors of TRCs may carry out the assembly of the components they supply with adjacent LTC components of the Customer Competitor. In such cases, the Customer Competitor may provide the minimal assembly information of the LTCs they need to assemble to the supplying Competitor or Power Unit Manufacturer. The FIA must approve such a transaction to its absolute discretion and must be satisfied that it is not used as a means to circumvent the provisions of Article C17.3.

**C17.3.5** A Competitor (or its agents) must have exclusive ownership of (or the Competitor must have the exclusive right to use in the Championship) any and all rights, information or data of any nature (including but not limited to all aspects of the design, manufacturing, know-how, operating procedures, properties and calibrations) in respect of the LTC in its Formula One cars. However, notwithstanding the foregoing:

- a. the use of specialist Intellectual Property or technology of third parties is permitted in respect of LTC, provided that this Intellectual Property or technology is commercially available to all Competitors. The principal parameters of such components must in any case be determined by the Competitor and not be available to other Competitors;
- b. Similarly, it is permitted to use commercially available sub-components or sub-assemblies in respect of LTC, provided these are commercially available to all Competitors. This provision applies if these components or sub-assemblies are not specifically listed as LTC. The FIA may request Competitors to provide a list of such sub-components and their technical specification. The FIA may classify such sub-components or sub-assemblies as LTC if it deems that they are being contrived to circumvent the purpose of this Article C17.

**C17.4 Standard Supply Components (SSC)**

- C17.4.1** “Standard Supply Components” (SSC) are components whose design and manufacture will be carried out by a supplier appointed by the FIA, to be supplied on an identical technical and commercial basis to each Competitor (including, without limitation, the components identified as such in Appendix C7).
- C17.4.2** Should a selection process fail to lead to appointment of a supplier of a component classified as a SSC, or should the arrangement with such supplier be terminated for whatever reason, the FIA reserves the right to re-classify the SSC as an LTC, TRC, DSC or OSC and to introduce appropriate technical rules in the relevant Article of these Technical Regulations in order to control the technical specification and cost of this component.
- C17.4.3** Components supplied as SSC must not be modified, and they must be installed and operated exactly as specified by the supplier, except for minor changes explicitly permitted in the Appendix to the Technical and Sporting Regulations. However, each Competitor is responsible for communicating directly to the relevant SSC supplier, while keeping the FIA informed at all times, regarding any issues of compatibility, reliability or safety in respect of a SSC. This may include submitting proposals for modifications to the SSC that a Competitor considers should be made to ensure the necessary levels of safety, compatibility and reliability while at all times having due regard to cost and performance implications. In consultation with the relevant SSC supplier, the FIA will consider in good faith all issues raised (and modifications proposed) during the consultation process, and shall determine in its sole discretion whether or not to take any action. In exceptional circumstances, where a Competitor establishes that a SSC is critically incompatible, unreliable or unsafe, the FIA may, at its sole discretion, authorise such Competitor to carry out modifications to the SSC in question or use an alternative component in order to resolve the compatibility, reliability or safety issue. Permission for such a modification or usage of an alternative component will be communicated to all Competitors, and will continue to be applied until the relevant supplier introduces a new specification that resolves the reliability, compatibility or safety concern. In accordance with the severity of the reliability, compatibility or safety concern, the FIA may authorise a phased introduction of the modified SSC. In such cases, after consultation with Competitors and with the Supplier, the FIA will define the period of the phase-in, and any measures that need to be taken to ensure that no performance advantage (e.g., mass) is obtained by using either the old or the new specification of the SSC.
- C17.4.4** The use of an SSC is mandatory and the particular function of that SSC must not be by-passed, replaced, duplicated or complemented by another component. This provision also applies to any TCC as defined in the Sporting Regulations. In exceptional circumstances, the FIA, at its sole discretion may authorise the use of alternative components.
- C17.4.5** No Competitor may, either directly or via a third party pass any information (including but not limited to data, know how, operating procedures, properties and calibrations) or methodology (including but not limited to simulation software, analysis tools, etc.) which can be used to enhance the performance of a SSC to another Competitor, or receive any such methodology from another Competitor.



**C17.5 Transferable Components (TRC)**

- C17.5.1** “**Transferable Components**” (TRC) are components whose design, manufacture and Intellectual Property resides within a single Supplying Competitor, or third party, but can be supplied to another Customer Competitor (including, without limitation, the components identified as such in Appendix C7).
- C17.5.2** The provisions of this Article C17.5 regard the supply of such TRC components by a Supplying Competitor or a third party to a Customer Competitor. In the event a component classified as TRC does not get supplied to any Customer Competitor, the rules governing such a component will be identical to the rules governing LTC’s. Furthermore, with regard to any component classed as TRC, any two teams who are not operating in a Supplying Competitor–Customer Competitor relationship with regard to the specific component must observe all the rules that govern LTC’s.
- C17.5.3** The Supplying Competitor (or its agent) must own and/or control all rights, information and/or data of any nature (including all aspects of the design, manufacturing, know-how, operating procedures, properties and calibrations) in respect of TRC, but it may supply such TRC to other Competitors.
- C17.5.4** The components supplied as TRC by a Supplying Competitor to a Customer Competitor must be components identical to those used by the Supplying Competitor in the same Championship or a previous one. Under no circumstances is it permitted for the Supplying Competitor to carry out the design or manufacture of bespoke TRC’s for the specific use by a Customer Competitor. The Customer Competitor may however elect to replace or modify sub components of a TRC, but in that case all the related additional work (including, but not limited to Research and Development, simulations, design, manufacture etc.) must be carried out by the Customer Competitor or its agents. In exceptional circumstances, and with the prior approval of the FIA, the Supplying Competitor may provide assistance to the Customer Competitor for the resolution of reliability or safety issues regarding the TRC.
- C17.5.5** The Supplying Competitor may outsource the design (intended for this Article as any R&D, Engineering and CAD design) and/or manufacture of any TRC to a third party (including, for the avoidance of doubt, an Associate of such Competitor) provided that:
- a. the third party to whom manufacture of the TRC is Outsourced may not be another Competitor; and
  - b. the third party to whom design of the TRC is Outsourced may not be another Competitor, or a party that directly or indirectly designs TRCs or LTCs for any other Competitor.
- C17.5.6** The Supplying Competitor (or its agents) must have exclusive ownership of and/or control over any and all rights, information or data of any nature (including but not limited to all aspects of the design, manufacturing, know-how, operating procedures, properties and calibrations) in respect of the TRC in its Formula One cars. However, notwithstanding the foregoing:
- a. the use of specialist Intellectual Property or technology of third parties is permitted in respect of TRC, provided that this Intellectual Property or technology is commercially available to all Competitors. The principal parameters of such components must in any case be determined by the Competitor and not be available to other Competitors.



- b. similarly, it is permitted to use commercially available sub-components or sub-assemblies in respect of TRC, provided these are commercially available to all Competitors.

**C17.5.7** A third party unrelated to any Competitor may supply a TRC to a Customer Competitor, provided that it also offers to supply the TRC to any other Customer Competitor on similar commercial terms.

**C17.5.8** In respect of the conditions at Article C17.3.4, any information on TRC passed on or received by a Competitor or any consultancy or any other kind of services involving a Competitor in relation to TRC shall be strictly limited to the designs or drawings necessary for the integration of the TRC into the design of the car and/or the data of the TRC necessary for the correct operation of the TRC on the car. For the avoidance of doubt, the following passage of information is strictly prohibited:

- a. Information specific to a particular circuit or race (e.g. suspension setup information)
- b. Software or methodology for the optimisation of the performance of a TRC (e.g. simulation software)

**C17.5.9** In respect of the compliance by the Customer Competitor with the Financial Regulations, the Supplying Competitor is mandated to provide the Customer Competitor all financial information that may be necessary to allow the Customer Competitor to demonstrate compliance with all FIA Regulations in force.

## **C17.6 Open Source Components (OSC)**

**C17.6.1** “**Open Source Components**” (OSC) are components whose Design Specification and Intellectual Property is made available to all Competitors through the mechanisms defined in this Article C17.6 (including, without limitation, the components identified as such in Appendix C7).

**C17.6.2** For all OSC in use by all Competitors, the Design Specification must reside on a designated server specified by the FIA, and be accessible by all Competitors. Details about the server, access credentials and file naming and format conventions may be found in the Appendix to the Technical and Sporting Regulations.

**C17.6.3** Any Competitor who designs a new OSC or modifies the Design Specification of a previous OSC must upload the new Design Specification to the designated server as specified in the Appendix to the Technical and Sporting Regulations.

**C17.6.4** Any Competitor who creates a new, or modifies an existing, Design Specification of an OSC or any OSC manufactured to a Design Specification grants an irrevocable, royalty-free, non-exclusive, worldwide licence to all other Competitors to use and modify any of its Intellectual Property subsisting in such OSCs or Design Specifications to the extent contemplated by these Technical Regulations.

**C17.6.5** Any Competitor wishing to access the server referred to in Article C17.6.3, or to exercise its rights under the licence described in Article C17.6.4, may only do so if it has agreed to be bound by the terms of the terms and conditions applicable to the FIA's designated server, by accepting the FIA Open Source Component Licence (“FOSCL”), as provided by the FIA from time to time.

- C17.6.6** In the event the OSC or the Design Specification of any OSC contains proprietary information and/or Intellectual Property of a third party supplier, this must be made clear by the Competitor when uploading the Design Specification of the OSC, and use of the uploaded Design Specification (and any OSC manufactured to that Design Specification) by any other Competitor exercising its rights in accordance with these Technical Regulations must be approved in writing by the third party supplier, with a copy of such approval to be available to the FIA on request. Should it become necessary to remove any sensitive information, then the uploaded Design Specification must:
- Contain a clear reference to the supplier in question.
  - Contain sufficient information for another Competitor to be able to order an identical component from the supplier.
  - Contain all the necessary information to permit another Competitor to install the OSC in their own car.
- C17.6.7** All Competitors are obliged to declare to the FIA the version of each OSC that gets used on their car. This information will be made available to all Competitors.
- C17.6.8** The complete responsibility for the installation and operation of an OSC (including any matters related to its function, performance, reliability, compatibility or safety) resides with the Competitor who uses this version of the OSC. Notwithstanding this provision, any Competitor who encounters a functionality, reliability, compatibility or safety issue with a particular version of an OSC is obliged to provide such information to the FIA and all other Competitors via the designated server.
- C17.6.9** OSC's may be provided from one Competitor to another, provided that the specification supplied from the Supplying Competitor to the Customer Competitor is of the same specification utilized by the Supplying Competitor. In such cases, their supply should be governed by all the provisions detailed in Article C17.5 for TRCs, however none of these restrictions shall prevent a Competitor from fulfilling their obligations with respect to OSC as required by Article C17.6.
- C17.6.10** For any year (N) where a component is designated as OSC for the first time, Competitors in the preceding year (N-1) must upload the design of the equivalent component in use during that preceding Championship (N-1), no later than 15 July of that year (N-1), regardless of the suitability of this component to the Technical Regulations of the following year (N).
- C17.6.11** No Competitor may, either directly or via a third party pass any information (including but not limited to data, know how, operating procedures, properties and calibrations) or methodology (including but not limited to simulation software, analysis tools, etc.) which can be used to enhance the performance of an OSC to another Competitor, or receive any such information or methodology from another Competitor.
- C17.7 Defined Specification Components (DSC)**
- Further information concerning implementation is given in the Appendix to the Technical and Sporting Regulations.
- C17.7.1 Defined Specification Components (DSC)** are components produced to a technical specification defined by the FIA.

A DSC must be approved by the FIA, who will ensure compliance with the technical specification and with Article C17.7. Once approved, details of the component will be added to a Technical List contained in the Appendix to the Technical and Sporting Regulations.

- C17.7.2** The use of a DSC is mandatory and is limited to components on the relevant Technical List. The particular function of that DSC must not be by-passed, replaced, duplicated or complemented by another component. This provision also applies to any TCC as defined in the Sporting Regulations. In exceptional circumstances, the FIA, at its sole discretion may authorise the use of alternative components.
- C17.7.3** Any supplier of a DSC must treat all the Competitors that they supply on an equitable basis.
- C17.7.4** The technical specification of a DSC (to its required level of detail) will be defined by the FIA and communicated to all Competitors via relevant documents in the Annexe to this Article. Changes to the specification will only be made under exceptional circumstances. Should a change become necessary, the details and timescale of the change will be decided after consultation with all interested parties.
- C17.7.5** A supplier that would like to supply a DSC for year (N) must provide the FIA with a full dossier containing complete technical description and commercial terms for the DSC before the date given in the Technical Specification. The FIA will examine the dossier in consultation with the Competitors and decide, within 30 days of its receipt, whether to add the DSC component in question to the list of approved DSCs, which will be set out in the Annexe to this Article.
- C17.7.6** The number of variants that an approved DSC supplier may supply will be defined in the technical specification of the DSC. Each variant of the DSC must be made available by the supplier to all Competitors on identical commercial terms. With the exception of changes to the technical specification and design of the DSC that are necessary for reliability or cost reasons, the period that the technical specification and design of the DSC must remain unchanged will be defined in the technical specification of the DSC. Any subsequent changes must follow the approval process and timescales described in Article C17.7.4. Changes to the technical specification or design that are necessary for reliability or cost reasons are subject to the prior approval of the FIA and must be communicated to all Competitors.
- C17.7.7** A Competitor must not, either directly or indirectly via a third party or otherwise pass to another Competitor any information (including but not limited to data, know how, operating procedures, properties and calibrations) or methodology (including but not limited to simulation software, analysis tools, etc.) that could be used by another Competitor to enhance the performance of a DSC, or receive any such information or methodology from another Competitor.
- C17.7.8** Should a selection process fail to approve sufficient suppliers to cover the requirements of all Competitors, the FIA reserves the right to re-classify the DSC as an LTC, TRC, or OSC and to introduce appropriate technical rules in the relevant Article of these Technical Regulations in order to control the technical specification and cost of this component.
- C17.8 List of LTC, SSC, TRC, OSC, and DSC**

A complete list of the parts' classification, as well as a definition of the perimeter of each assembly can be found in Appendix C7.

Components which are part of an assembly will assume the classification status of that assembly unless otherwise specified.

**ARTICLE C18: POWER UNIT COMPONENTS' CLASSIFICATION****C18.1 Definitions**

In this Article C18:

**“Associate”** means, with respect to a PU Manufacturer in the Championship (and any entity representing that PU Manufacturer):

- a. any other person or entity (including any corporate or unincorporated body) that (directly or indirectly):
  - i. owns share capital or business assets of the PU Manufacturer; or
  - ii. has the power to exercise voting rights in relation to the PU Manufacturer; or
  - iii. has the power to appoint members of the supervisory board, board of directors or bodies legally representing the PU Manufacturer; or
  - iv. has the power to conduct the affairs of the PU Manufacturer by constitutional documents or agreement or otherwise; and
- b. any other person or entity in the same legal group structure as the PU Manufacturer from time to time; and
- c. any agent, contractor (or sub-contractor) or other person or entity (including any corporate or unincorporated body) that is set up or used by a PU Manufacturer to circumvent the requirements of this Article C18.

**“Outsourcing”** and **“Outsourced”** means procuring or procured goods or services by contract with an external supplier.

**“Design Specification”** means, in respect of a component all design (including three-dimensional geometry, tolerances, materials, surface finishes and design standards), manufacturing, installation and operational information related to that component.

And for the purposes of these Technical Regulations, including in this Article C18:

"Intellectual Property" means:

- a. patents, rights to inventions, designs, copyright and related rights, database rights, trademarks and trade names, rights in get-up and related goodwill and the right to sue for passing off or unfair competition (in each case whether registered, registerable or unregistered);
- b. proprietary rights in domain names;
- c. rights to use, and protect the confidentiality of, trade secrets, know-how and confidential information;
- d. applications, and rights to apply for and be granted registrations, including extensions and renewals of, such rights; and
- e. all other rights of a similar nature or having an equivalent effect anywhere in the world.

**“PU component”** means any component listed as “ICE”, or “EXH”, or “TC”, or “MGU-K”, or “ES”, or “PU-CE” in Table 1 of Appendix C4 under the column “PU ELEMENT (Art. 5.1.2)”.

**“External PU Manufacturer”** means a person or entity (including any corporate or unincorporated body) that (directly or indirectly): (i) was registered to supply Power Units in the Championship and has withdrawn for any reason; or (ii) a power unit manufacturer that is undertaking development work to supply Power Units but has not yet registered with the FIA to supply for the Championship. This definition does not include third parties undertaking development work in accordance with these Regulations on behalf of the instructions of a PU Manufacturer unless that third party ceases to have a contract or other arrangement with a PU Manufacturer.

## **C18.2 General Principles**

### **C18.2.1 Classification:**

- a. All Power Unit components used in Formula One cars shall be classified as:
  - i. a Listed Power Unit Component (LPUC);
  - ii. a Standard Supply Power Unit Component (SSPUC);
  - iii. an Open-Source Power Unit Component (OSPUC); or
  - iv. a Defined Specification Power Unit Component (DSPUC),each as defined in Articles C18.3-C18.6 (inclusive).
- b. Unless otherwise specified, or determined by the FIA, such components/equipment will be classified as LPUC.
- c. In cases of doubt, the FIA should be consulted and shall determine the classification of a particular PU component or piece of equipment, should that differ from the default classification mentioned in Article C18.2.1(b) above.

**C18.2.2** For the purposes of the remaining provisions of this Article C18, any reference to any PU Manufacturer shall include any Associate of such PU Manufacturer; and (b) any external entity (i) working on behalf of a PU Manufacturer or (ii) working for its own purposes and subsequently providing the results of its work to a PU Manufacturer.

**C18.2.3** For the purposes of the remaining provisions of this Article C18, any reference to a “component” may also refer to complete assemblies.

**C18.2.4** A PU Manufacturer must not use movement of personnel (whether employee, consultant, contractor, secondee or any other type of permanent or temporary personnel) from or to another PU Manufacturer (*or an External PU Manufacturer*), either directly or indirectly via an external entity, for the purpose of circumventing the requirements of this Article C18.

**C18.2.5** From time to time the FIA may request that a PU Manufacturer shares certain information in connection with this Article C18 with the FIA, but only for the following purposes: (a) so that the FIA may share such information with the other PU Manufacturers for safety reasons only, or (b) to assist the FIA in considering future amendments to the Technical Regulations, subject in each case to the relevant PU Manufacturer receiving an appropriate undertaking of confidentiality from the FIA.

**C18.2.6** Except as otherwise expressly permitted by these Technical Regulations or by the FIA, a PU Manufacturer must not

- a. directly or indirectly disclose or transfer (by any means) any Intellectual Property to another PU Manufacturer,

or

- b. directly or indirectly obtain (by any means) any Intellectual Property from another PU Manufacturer.

**C18.2.7** The following will constitute a breach of this Article C18:

- a. the knowledge sharing, Intellectual Property transfer/receipt, merger or joining forces of:

- i. two (or more) PU Manufacturers,

or

- ii. one or more PU Manufacturers and one or more External PU Manufacturers,

or

- b. the acquisition by one PU Manufacturer of part or whole of the company of another PU Manufacturer (or an External PU Manufacturer),

or

- c. two PU Manufacturers entering into a services or other arrangement to support the other in delivering all or part of its supply.

In the event that a PU Manufacturer is unable to continue its participation in Formula 1 for any reason, the Intellectual Property, components or business of that External PU Manufacturer must not be acquired in part or in whole by a PU Manufacturer including by way of the External PU Manufacturer entering into an agreement to provide manufacturing or other support to the PU Manufacturer.

The FIA may, at its sole discretion, take any measures it considers appropriate in order to ensure that no PU Manufacturer obtains an unfair advantage from such an eventuality.

**C18.2.8** Where a PU Manufacturer is made responsible under these Technical Regulations for raising or reporting any issues of safety, incompatibility and/or reliability of a component that it uses on its Power Units, it shall not make any claim against any other party that is inconsistent with that responsibility.

**C18.2.9** PU Manufacturers must not share any test facilities or equipment with another PU Manufacturer unless such facilities or equipment are commercially available to all PU Manufacturers. If PU Manufacturers are using commercially available facilities or equipment they must put in place relevant processes to ensure there is no transfer of Intellectual Property or knowledge through common personnel (or otherwise) leading to the performance enhancement of an LPUC (contrary to Article C18.3.3), or an OSPUC (contrary to Article C18.5.11), or a DSPUC (contrary to Article C18.6.7).

All PU Manufacturer' Intellectual Property (including any data) available through shared facilities or equipment shall only be available to the PU Manufacturer requesting such access to the test facilities or equipment and shall fully and exclusively remain its property.

**C18.2.10** This Article C18 and these Technical Regulations shall not restrict the normal business as usual including but not limited to mergers or acquisitions by Associates of PU Manufacturers, or investments, that are not relevant to Formula 1.



**C18.3 Listed Power Unit Components (LPUC)**

- C18.3.1** “Listed Power Unit Components” (LPUC) are PU components whose design, manufacture and Intellectual Property is owned and/or controlled by a single PU Manufacturer or its agents on an exclusive basis (including, without limitation, the PU components identified as such in Appendix C4).
- C18.3.2** A PU Manufacturer must only use LPUC in its PUs that it has designed (including, for the avoidance of doubt, its three-dimensional shape and the evolution history leading to it, any preliminary designs, simulations, dynamometer tests, and analysis) and manufactured itself. However, this does not prevent the PU Manufacturer Outsourcing any R&D, engineering and/or CAD design and/or the manufacture of any LPUC to a third party (including, for the avoidance of doubt, an Associate of such PU Manufacturer) provided that:
- the PU Manufacturer retains the exclusive right to use the LPUC in Formula One for so long as it participates in Formula One;
  - the third party to whom design and/or manufacture of the LPUC is Outsourced must not be another PU Manufacturer or an Associate of another PU Manufacturer; and
  - In the case the third party to whom design and/or manufacture of the LPUC is Outsourced is not another PU Manufacturer or an Associate the provisions of Article C18.3.5 apply.
- C18.3.3** A PU Manufacturer must not, either directly or indirectly via a third party or otherwise:
- pass on any information in respect of its LPUC (including but not limited to data, designs, drawings, or any other Intellectual Property) to another PU Manufacturer or receive any information from another PU Manufacturer in respect of that PU Manufacturer’s LPUC; or
  - receive consultancy or any other kind of services from another PU Manufacturer in relation to LPUC, or supply any such services to another PU Manufacturer; or
  - pass on any methodology that could be used by another PU Manufacturer to enhance the performance of LPUC (including but not limited to simulation software, analysis tools, etc.) to another PU Manufacturer, or receive any such methodology from another PU Manufacturer.
- C18.3.4** In determining whether and to what extent a PU Manufacturer is to be held liable for a breach of Article C18.3.3 that has occurred via a third party, the FIA may take into account amongst other things the extent to which the PU Manufacturer: (i) took steps to prevent the breach in question; and (ii) took steps to remedy and negate the consequences of the breach immediately upon becoming aware of the breach.
- C18.3.5** A PU Manufacturer (or its agents) must have exclusive ownership of (or the PU Manufacturer must have the exclusive right to use in the Championship) any and all rights, information or data of any nature (including but not limited to all aspects of the design, manufacturing, know-how, operating procedures, properties and calibrations) in respect of the LPUC in its PUs. However, notwithstanding the foregoing:
- The use of specialist Intellectual Property or technology of third parties is permitted in respect of LPUC, provided that this Intellectual Property or technology is commercially available to all PU Manufacturers. The detailed specifications of such LPUC must in any case be determined by the PU Manufacturer and must not be available to other PU Manufacturers;



- b. Similarly, the use of commercially available sub-components or sub-assemblies in respect of LPUC is permitted, provided such sub-components or sub-assemblies are commercially available to all PU Manufacturers and are not specifically listed as LPUC. The FIA may request PU Manufacturers to provide a list of such sub-components and/or sub-assemblies and their technical specification. The FIA may classify such sub-components or sub-assemblies as LPUC if it deems, in its sole discretion, that they are being contrived to circumvent the purpose of this Article C18.
- c. Similarly, the use of services from a third-party supplier which assist the PU Manufacturer in the design or development of its LPUCs is permitted, provided such services are commercially available to all PU Manufacturers on similar commercial terms. When two or more PU Manufacturers use the services from a given third-party supplier, full details must be made available to the FIA to demonstrate that such activity does not constitute a means to transfer, directly or indirectly, information from one PU Manufacturer to another. The services covered by this Article include but are not limited to: the use of test facilities, and the use of software.

#### **C18.4 Standard Supply Power Unit Components (SSPUC)**

- C18.4.1** “Standard Supply Power Unit Components” (SSPUC) are PU components whose design and manufacture will be carried out by a supplier appointed by the FIA, to be supplied on an identical technical and commercial basis to each PU Manufacturer (including, without limitation, the PU components identified as such in Appendix C4).
- C18.4.2** In certain cases, determined by the FIA in its sole discretion, more than one configuration of an SSPUC may be made available by the appointed supplier, in order to address installation differences between different PUs. In such a case, the FIA will require that any differences between the available configurations are kept to a minimum by the supplier.
- C18.4.3** Should the FIA’s selection process fail to lead to the appointment of a supplier of a PU component classified as an SSPUC, or should the arrangement with such supplier be terminated for whatever reason, the FIA reserves the right to re-classify the SSPUC as an LPUC, OSPUC or DSPUC and to introduce appropriate technical rules in the relevant Article of these Technical Regulations in order to control the technical specification and cost of this such PU component.

- C18.4.4** PU components supplied as SSPUC must not be modified, and they must be installed and operated exactly as specified by the supplier, except for minor changes explicitly permitted in the Appendix to the Technical and Sporting Regulations. However, each PU Manufacturer is responsible for directly and promptly informing both the FIA and the relevant SSPUC supplier, of any issues of compatibility, reliability or safety in respect of a SSPUC. This may include submitting proposals for modifications to the SSPUC that a PU Manufacturer considers should be made to ensure the necessary levels of safety, compatibility and reliability while at all times having due regard to cost and performance implications. In consultation with the relevant SSPUC supplier, the FIA will consider in good faith all issues raised (and modifications proposed) during the consultation process and shall determine in its sole discretion whether or not to take any action. In exceptional circumstances, where a PU Manufacturer establishes that a SSPUC is critically incompatible, unreliable or unsafe, the FIA may, at its sole discretion, authorise such PU Manufacturer to carry out modifications to the SSPUC in question or use an alternative PU component in order to resolve the compatibility, reliability or safety issue. Permission for such a modification or usage of an alternative PU component will be communicated by the FIA to all PU Manufacturers, and will continue to apply until the relevant supplier introduces a new specification that resolves the reliability, compatibility or safety issue.
- C18.4.5** The use of an SSPUC is mandatory and the particular function of that SSPUC must not be by-passed, replaced, duplicated or complemented by another PU component. This provision also applies to any TCC (as defined in the Sporting Regulations). In exceptional circumstances, the FIA may, at its sole discretion may authorise the use of alternative PU components.
- C18.4.6** A PU Manufacturer must not, either directly or indirectly via a third party or otherwise pass to another PU Manufacturer, any information (including but not limited to data, know how, operating procedures, properties and calibrations) or methodology (including but not limited to simulation software, analysis tools, etc.) that could which can be used by another PU Manufacturer to enhance the performance of a SSPUC to another PU Manufacturer, or receive any such information or methodology from another PU Manufacturer.
- C18.5 Open-Source Power Unit Components (OSPUC)**
- C18.5.1** “Open-Source Power Unit Components” (OSPUC) are PU components whose Design Specification and Intellectual Property is made available to all PU Manufacturers through the mechanisms defined in this Article C18.5 (including, without limitation, the PU components identified as such in Appendix C4).
- C18.5.2** For all OSPUC in use by all PU Manufacturers, the Design Specification must reside on a designated server specified by the FIA and be accessible by all PU Manufacturers. Details of the server, access credentials and file naming and format conventions may be found in the Appendix to the Technical and Sporting Regulations.
- C18.5.3** Any PU Manufacturer who designs a new OSPUC or modifies the Design Specification of a previous OSPUC must upload the new Design Specification to the designated server as specified in the Appendix to the Technical and Sporting Regulations.

- C18.5.4** Any PU Manufacturer who creates a new, or modifies an existing, Design Specification of an OSPUC or who manufactures any OSPUC manufactured to a Design Specification must grant an irrevocable, royalty-free, non-exclusive, worldwide licence to all other PU Manufacturers to use and modify any of its Intellectual Property subsisting in such OSPUC s or Design Specifications to the extent contemplated by these Technical Regulations.
- C18.5.5** Any PU Manufacturer wishing to access the designated server referred to in Article C18.5.3, or to exercise its rights under the licence described in Article C18.5.4, may only do so if it has agreed to be bound by the terms of the terms and conditions applicable to the FIA's designated server, by accepting the FIA Open-Source Power Unit Component Licence (“FOSPUCL”), as provided by the FIA from time to time.
- C18.5.6** In the event the OSPUC or the Design Specification of any OSPUC contains proprietary information and/or Intellectual Property of a third-party supplier, this must be made clear by the PU Manufacturer when uploading the Design Specification of the OSPUC to the designated server. Use of the uploaded Design Specification (and any OSPUC manufactured to that Design Specification) by any other PU Manufacturer exercising its rights in accordance with these Technical Regulations must be approved in writing by the third-party supplier, with a copy of such approval to be made available by the PU Manufacturer to the FIA on request. Should it become necessary for a PU Manufacturer to remove any confidential or commercially sensitive information from the Design Specification prior to its upload on the designated server, then the uploaded Design Specification must nevertheless contain:
- Contain a clear reference to the third-party supplier in question.
  - Contain sufficient information to enable another PU Manufacturer to order an identical OSPUC from the third-party supplier.
  - Contain all the necessary information to permit another PU Manufacturer to install the OSPUC in its own PU.
- C18.5.7** All PU Manufacturers are obliged to declare to the FIA the version of each OSPUC that gets used in their PU. This information will be made available by the FIA to all PU Manufacturers.
- C18.5.8** The complete responsibility for the installation and operation of an OSPUC (including any matters related to its function, performance, reliability, compatibility or safety) resides with the PU Manufacturer who uses this version of the OSPUC. Notwithstanding this provision, any PU Manufacturer who encounters a functionality, reliability, compatibility or safety issue with a particular version of an OSPUC must promptly disclose that issue to the FIA and all other PU Manufacturers via the designated server.
- C18.5.9** For any year (N) where a PU component is designated as OSPUC for the first time, PU Manufacturers in the preceding year (N-1) must upload to the designated server the design of the equivalent PU component in use during that preceding Championship (N-1), no later than 15 July of that year (N-1), regardless of the suitability of that PU component to the Technical Regulations of the following year (N).

**C18.5.10** PU Manufacturers supplying Power Units for the 2022 Championship must upload to the designated server the design of the equivalent OSPUC component in use during that Championship, no later than 31 December 2022, regardless of the suitability of that PU component to the 2026 Technical Regulations.

**C18.5.11** A PU Manufacturer must not, either directly or indirectly via a third party or otherwise pass to another PU Manufacturer any information (including but not limited to data, know how, operating procedures, properties and calibrations) or methodology (including but not limited to simulation software, analysis tools, etc.) that could be used to by another PU Manufacturer enhance the performance of an OSPUC, or receive any such information or methodology from another PU Manufacturer.

### **C18.6 Defined Specification Power Unit Components (DSPUC)**

**C18.6.1** “**Defined Specification Power Unit Components**” (DSPUC) are PU components whose overall technical specification is defined by the FIA, which can be either (a) manufactured by the PU Manufacturer; or (b) supplied to the PU Manufacturer by one or more third party suppliers, who own and control the design, manufacture, and Intellectual Property of the PU components they supply (including, without limitation, the PU components identified as such in Appendix C4).

**C18.6.2** A PU Manufacturer may be the supplier of a DSPUC, provided there is compliance by that PU Manufacturer with all of the provisions of this Article C18.6 are respected and the DSPUC in question is made available to all other PU Manufacturers on an equitable basis.

**C18.6.3** The technical specification of a DSPUC (to its required level of detail) will be defined by the FIA and communicated to all PU Manufacturers via relevant documents in the Appendix to the Technical and Sporting Regulations. Changes to the specification for year (N) will be defined by the FIA before 1 January of year (N-2) and will require the consent of the FIA and at least 50% of the PU Manufacturers registered to compete in year (N). Changes to the specification after that date and before 1 January of year (N-1) will need the consent of the FIA and at least 75% of the PU Manufacturers registered to compete in year (N).

**C18.6.4** A third-party supplier that would like to supply a DSPUC for year (N) must provide the FIA with a full dossier containing complete technical description and commercial terms for the DSPUC before 30 June of year (N-2). The commercial terms must include any formulas for the adjustment of the supply price as a function of quantity ordered by a PU Manufacturer, or external parameters, such as inflation, material cost, etc. The supplier of the DSPUC may decide to lower the supply price at any time. The FIA will examine the dossier in consultation with the PU Manufacturers and decide, within 30 days of its receipt, whether to add the DSPUC component in question to the list of approved DSPUCs, which will be set out in the Appendix to the Technical and Sporting Regulations.

- C18.6.5** An approved DSPUC supplier may make only one technical specification and design of a DSPUC. Such technical specification and design must be made available by the supplier to all PU Manufacturers on identical commercial terms. With the exception of changes to the technical specification and design of the DSPUC that are necessary for reliability or cost reasons, the technical specification and design of the DSPUC must remain unchanged for at least three complete calendar years. Any subsequent changes must follow the approval process and timescales described in Article C18.6.4. Changes to the technical specification or design that are necessary for reliability or cost reasons are subject to the prior approval of the FIA and must be communicated to all PU Manufacturers.
- C18.6.6** The DSPUC used by a PU Manufacturer must remain unchanged for at least two complete calendar years. During that period, a change of supplier for that DSPUC will only be permissible in the event of significant reliability issues and is subject to prior approval by the FIA.
- C18.6.7** A PU Manufacturer must not, either directly or indirectly via a third party or otherwise pass to another PU Manufacturer any information (including but not limited to data, know how, operating procedures, properties and calibrations) or methodology (including but not limited to simulation software, analysis tools, etc.) that could be used by another PU Manufacturer to enhance the performance of a DSPUC, or receive any such information or methodology from another PU Manufacturer.

#### **C18.7 List of LPUC, SSPUC, OSPUC and DSPUC**

A complete list of the PU components' classification, as well as a definition of the perimeter of each assembly can be found in Appendix C4.

PU components that are part of an assembly will assume the classification status of that assembly unless otherwise specified.

## APPENDIX C1: DEFINITIONS

The definitions of this Appendix apply to all the Sections of the Regulations, unless specifically stated otherwise. Additional definitions provided either in Appendix 1 of each Section, or, for context, in the main text of the Regulations, also apply to all the Sections of the Regulations.

## APPENDIX C2: REGULATION VOLUMES

## 1 General Definitions

- 1.1 This Appendix defines the construction of CAD reference sections, reference surfaces and reference volumes used throughout the Regulations in order to assess legality in conjunction with Article C3. However numerous further usages of such definitions are used in other Articles.
- 1.2 Unless otherwise stated, only the declared reference section, reference surface or reference volume from each Article can be used to assess legality. All other geometry used during the construction of these sections, surfaces or volumes must be considered for reference purposes only.
- 1.3 In cases where an object (surface or volume) is trimmed using a surface, this must be performed by first finding the intersection between the object and the surface and then partitioning the object into two, by separating it at this intersection. One of these two parts is then discarded according to the relevant Article and the residual of the trimmed object is all that remains after the operation.
- 1.4 All volumes are implicitly symmetrical about the plane  $Y=0$ .
- 1.5 The prefix “RV-“ always refers to a Reference Volume, whereas the prefix “RS-“ refers to a Reference Surface.
- 1.6 The CAD models of all the volumes and surfaces listed in this Appendix are available for Competitors or PU Manufacturers to download with a standard range of parameters. The FIA will provide Competitors or PU Manufacturers with a specific model on request.
- 1.7 Should an inconsistency arise between a volume generated manually using the process outlined in this Article, or a volume that has been downloaded by the process outlined in Article 1.6 of this Appendix, the FIA will adjudicate on a case-by-case basis the volume that will be applicable and correct the one that will be judged to have an inconsistency or error.

## 2 Legality Volumes or Surfaces Defined by CAD Models

- 2.1 The legality volumes and surfaces listed below are defined exclusively by CAD data and are available to download from the FIA’s CAD Portal. Unless otherwise stated, the volumes must be positioned with the origin of the model at the coordinates given and with the model axes parallel to, and in the same direction as the corresponding car axes.

Volume or Surface	CAD Part No	Revision	Notes
RV-PU-ICE	FIA-LEG-0076	C	Positioned at $[X_{PU}=0, 0, 0]$
RV-PU-OT	FIA-LEG-0075	A	Positioned at $[X_{PU}=0, 0, 0]$
RV-PU-TC	FIA-LEG-0077	A	Positioned at $[X_{PU}=0, 0, 0]$
RS-PU-FWD-ERS	FIA-LEG-0101	A	Positioned at $[X_{PU} \leq -360, 0, 0]$
RS-FWD-FUEL-LIMIT	FIA-LEG-0010	C	Positioned at $[X_C=0, 0, 0]$
RV-CH-MID-MIN	FIA-LEG-0001	E	Positioned at $[X_C=0, 0, 0]$
RV-CH-MID-STRUCT	FIA-LEG-0015	C	Positioned at $[X_C=0, 0, 0]$
RV-COCKPIT-ENTRY	FIA-LEG-0004	C	Positioned at $[X_C=0, 0, 0]$
RV-COCKPIT-DRIVER	FIA-LEG-0006	D	Positioned at $[X_C=0, 0, 0]$
<del>RS-FWD-FUEL-LIMIT</del>	<del>FIA-LEG-0010</del>	<del>C</del>	<del>Positioned at <math>[X_C=0, 0, 0]</math></del>
RV-COCKPIT-HELMET	FIA-LEG-0012	B	Positioned at $[X_C=0, 0, 0]$

RS-FWH-DRUM	FIA-LEG-0141	A B	Positioned at [X <sub>w</sub> , Y <sub>w</sub> , Z <sub>w</sub> ] = [0, 0, 0] (front wheel)
RS-RWH-DRUM	FIA-LEG-0140	A B	Positioned at [X <sub>w</sub> , Y <sub>w</sub> , Z <sub>w</sub> ] = [0, 0, 0] (rear wheel)
RV-F-RIM-MIN	FIA-LEG-0138	A	Positioned at [X <sub>w</sub> , Y <sub>w</sub> , Z <sub>w</sub> ] = [0, 0, 0] (front wheel)
RV-R-RIM-MIN	FIA-LEG-0139	A	Positioned at [X <sub>w</sub> , Y <sub>w</sub> , Z <sub>w</sub> ] = [0, 0, 0] (rear wheel)
RV-DIFF	FIA-LEG-0137	A	Positioned at [X <sub>R</sub> =0, 0, 0]

### 3 ERS Reference Volume (RV-PU-ERS)

**RV-PU-ERS** is composed of the following elements:

- 3.1 The reference surface **RS-PU-FWD-ERS** must be positioned with the origin of the model at [X<sub>PU</sub> ≤ -360, 0, 0].
- 3.2 On the plane X<sub>PU</sub>=0, ~~a surface bounded by a polygon created by connecting the following points in sequence [Y, Z]~~ a simple, closed polygon whose edges pass through the following [Y, Z] vertices sequentially:
- a. [0, 1], [240, 1], [280, 4.1], [280, 51], [230, 51], [230, 380], [0, 380], [0, 1]
- 3.3 Once the surface in Article §3.2 is fully defined, it must be extruded ~~in the direction [-1, 0, 0] up to the plane along X~~ to X<sub>PU</sub>=-1500.
- 3.4 Once the volume in Article §3.3 is fully defined; it must be trimmed by the surface **RS-PU-FWD-ERS** with all ~~of the parts of the volume material~~ ahead of this surface ~~being~~ discarded.
- 3.5 The fully defined volume in Article §3.4 is **RV-PU-ERS**

### 4 Floor Body Reference Volume (RV-FLOOR-BODY)

**RV-FLOOR-BODY** is composed of the following elements:

- 4.1 On a plane through Z=0, a simple, closed polygon whose edges pass through the following [X, Y] vertices sequentially:
- a. [X<sub>F</sub> = 350, 0], [X<sub>F</sub> = 350, 25], [X<sub>F</sub> = 1400, 390], [X<sub>R</sub> = -1050, 390], [X<sub>R</sub> = -775, 350], [X<sub>R</sub> = -475, 240], [X<sub>R</sub> = ~~465 300, 400 75~~], [X<sub>R</sub> = ~~465 300, 0~~], [X<sub>F</sub> = 350, 0].
- 4.2 Once the surface in §4.1 is fully defined, it must be extruded along Z to Z = 275.
- 4.3 Once the volume in §4.2 is fully defined, it must be trimmed with a plane passing through the following three points with all material below the plane discarded.
- a. [X<sub>F</sub> = 1650, 250, 0], [X<sub>F</sub> = 850, 250, 0], [X<sub>F</sub> = 1650, 375, 10].
- 4.4 Once the volume in §4.3 is fully defined, an edge radius of ~~R25~~ **R200**, applied to the external corner that lies on the X-Aligned axis through [Y, Z] = [250, 0].
- 4.5 On a plane through Y=0, a section whose edges pass through the following [X, Z] vertices sequentially:
- a. [X<sub>F</sub> = 1450, 275], [X<sub>F</sub> = 1450, 75], [X<sub>R</sub> = -600, 75], [X<sub>R</sub> = ~~300 -350, 175~~], [X<sub>R</sub> = ~~465 300, 200 250~~].
- 4.6 Once the section in §4.5 is fully defined it must be extruded along Y to Y= 400.



- 4.7 Once the volume in §4.4 and the sheet in §4.6 are fully defined, the volume must be trimmed with the sheet with all material above the sheet discarded.
- 4.8 Once the volume in §4.7 is fully defined, it must be trimmed with a plane passing through the following three points with all material forward of the plane discarded.
- a.  $[X_F = 350, 0, 275]$ ,  $[X_F = 425, 0, 0]$ ,  $[X_F = 425, 75, 0]$ .
- 4.9 On a plane through  $Z=50$ , a simple, closed polygon whose edges pass through the following  $[X, Y]$  vertices sequentially:
- a.  $[X_F = 525, 1100, 0]$ ,  $[X_F = 4200, 1100, 725, 770]$ ,  $[X_R = -350, -335, 725, 700]$ ,  $[X_R = -350, -335, 300, 400]$ ,  $[X_R = 465, -150, 365]$ ,  $[X_R = 465, 300, 0, 365]$ ,  $[X_R = 300, 0]$ ,  $[X_F = 525, 1100, 0]$ .
- 4.10 Once the surface in §4.9 is fully defined, it must be extruded along Z to  $Z = 200, 250$ .
- 4.11 On a plane through  $Y=0$ , a section whose edges pass through the following  $[X, Z]$  vertices sequentially:
- a.  $[X_F = 525, 150]$ ,  $[X_F = 4225, 1100, 450, 175]$ ,  $[X_F = 4625, 1775, 75]$ ,  $[X_R = -600, 75]$ ,  $[X_R = -300, -350, 175]$ ,  $[X_R = 465, 300, 200, 250]$ .
- 4.12 Once the section in §4.11 is fully defined, it must be extruded along Y to  $Y = 725, 770$ .
- 4.13 Once the volume in §4.10 and the sheet in §4.12 are fully defined, the volume must be trimmed with the sheet with all material above the sheet discarded.
- 4.14 On a plane through  $X_F = 525, 930$ , a section whose edges pass through the following  $[Y, Z]$  vertices sequentially:
- a.  $[0, 350, 450, 175]$ ,  $[300, 650, 450, 125]$ ,  $[725, 770, 445, 75]$ .
- 4.15 Once the section in §4.14 is fully defined, it must be extruded along X to  $X_F = 4500, 1775$ .
- 4.16 Once the volume in §4.13 and the sheet in §4.15 are fully defined, the volume must be trimmed with the sheet with all material above the sheet discarded.
- ~~4.17 On a plane through  $X_R = -600$ , a section whose edges pass through the following  $[Y, Z]$  vertices sequentially:  
 $[400, 175]$ ,  $[450, 75]$ ,  $[300, 75]$ .~~
- ~~4.18 Once the section in §4.17 is fully defined, it must be extruded along X to  $X_R = -350$ .~~
- ~~4.19 Once the volume in §4.16 and the sheet in §4.18 are fully defined, the volume must be trimmed with the sheet with all material above the sheet discarded.~~
- 4.17 An axis-aligned cuboid, which has one interior diagonal defined by the points:
- a.  $[X_R = -600, 400, 85]$ ,  $[X_R = -335, 760, 250]$ .
- 4.18 Once the volume in §4.17 is fully defined, it must be trimmed with a plane passing through the following three points with all material inboard of the plane discarded.
- a.  $[X_R = -600, 550, 85]$ ,  $[X_R = -335, 400, 85]$ ,  $[X_R = -335, 400, 250]$ .
- 4.19 Once the volume in §4.18 is fully defined, it must be subtracted from the volume defined in §4.16 to leave one unified volume.

- 4.20** On a plane through  $Y=0$ , a simple, closed polygon whose edges pass through the following  $[X_R, Z]$  vertices sequentially:
- a.  $[-450 -525, 50]$ ,  $[465 300, 165]$ ,  $[465 300, 50]$ ,  $[-450 -525, 50]$ .
- 4.21** Once the surface in §4.20 is fully defined, it must be extruded along Y to  $Y = 345$ .
- 4.22** Once the volumes in §4.19 and §4.21 are fully defined, they must be combined with all overlapping material discarded.
- 4.23** On a plane through  $Y = 390 425$ , a section whose edges pass through the following  $[X_R, Z]$  vertices sequentially:
- a.  $[-350, 50]$ ,  $[-325 -335, 50]$ ,  $[-175 -150, 100]$ ,  $[465 300, 100]$ .
- 4.24** Once the section in §4.23 is fully defined, it must be extruded along Y to  $Y = 325$ .
- 4.25** Once the volume in §4.22 and the sheet in §4.24 are fully defined, the volume must be trimmed with the sheet with all material below the sheet discarded.
- 4.26** Once the volumes in §4.8 and §4.25 are fully defined, they must be united to create a single unified volume.

The fully defined volume in §4.26 is **RV-FLOOR-BODY**.

## 5 Floor Foot Reference Volume (RV-FLOOR-FOOT)

**RV-FLOOR-FOOT** is composed of the following elements:

- 5.1** On a plane through  $Z = 50$ , a simple, closed polygon whose edges pass through the following  $[X_F, Y]$  vertices sequentially:
- a.  $[650, 650]$ ,  $[650, 875 890]$ ,  $[725 825, 875 890]$ ,  $[4300 1350, 740 760]$ ,  $[4440 1350, 475 625]$ ,  $[1000, 600]$ ,  $[650, 650]$ .
- 5.2** Once the surface in §5.1 is fully defined, it must be extruded along Z to  $Z = 100$ .

The fully defined volume in §5.2 is **RV-FLOOR-FOOT**.

## 6 Floor Board Reference Volume (RV-FLOOR-BOARD)

**RV-FLOOR-BOARD** is composed of the following elements:

- 6.1** On a plane through  $Z = 70$ , a simple, closed polygon whose edges pass through the following  $[X_F, Y]$  vertices sequentially:
- a.  $[650, 875 890]$ ,  $[725 825, 875 890]$ ,  $[4300 1350, 745 760]$ ,  $[4500 1350, 650 710]$ ,  $[4500 750, 600 800]$ ,  $[650, 775 800]$ ,  $[650, 875 890]$ .
- 6.2** Once the surface in §6.1 is fully defined, it must be extruded along Z to  $Z = 375 450$ .
- 6.3** Once the volume in §6.2 is fully defined, it must be trimmed with a plane passing through the following three points with all material above the plane discarded.
- a.  $[X_F = 4500 1350, 675 730, 200]$ ,  $[X_F = 4500 1350, 600 710, 200]$ ,  $[X_F = 800 1000, 875 890, 375 400]$ .

The fully defined volume in §6.3 is **RV-FLOOR-BOARD**.

**7 Floor Bib Reference Volume (RV-FLOOR-BIB)**

**RV-FLOOR-BIB** is composed of the following elements:

- 7.1** On a plane through  $Z = 0$ , a simple, closed polygon whose edges pass through the following  $[X, Y]$  vertices sequentially:
- a.  $[X_F = 425, 0]$ ,  $[X_F = 425, 100]$ ,  $[X_F = 1050, 325]$ ,  $[X_F = 1150, 200]$ ,  $[X_F = 1150, 0]$ ,  $[X_F = 425, 0]$ .
- 7.2** Once the surface in §7.1 is fully defined, it must be extruded along  $Z$  to  $Z = 50$ .

The fully defined volume in §7.2 is **RV-FLOOR-BIB**.

**8 Floor Leading Edge Device (RV-FLOOR-LED)**

**RV-FLOOR-LED** is composed of the following elements:

- 8.1** On a plane through  $Z = 50$ , a simple, closed polygon whose edges pass through the following  $[X, Y]$  vertices sequentially:
- a.  $[X_F = 930, 350]$ ,  $[X_F = 1100, 625]$ ,  $[X_F = 1225, 625]$ ,  $[X_F = 1225, 350]$ ,  $[X_F = 930, 350]$ .
- 8.2** Once the surface in §8.1 is fully defined, it must be extruded along  $Z$  to  $Z = 150$ .
- 8.3** Once the volume in §8.2 is fully defined, it must be trimmed with the sheet defined in §4.15 with all material above the sheet discarded.

The fully defined volume in §8.3 is **RV-FLOOR-LED**.

**9 Front Bodywork Reference Volume (RV-BODY-FRONT)**

**RV-BODY-FRONT** is composed of the following elements:

- 9.1** A cylinder of diameter 11,000mm centred on the Y-Aligned axis  $[X_C, Z] = [-1000, -4853]$ , extruded between  $Y = 0$ , to  $Y = 400$ .
- 9.2** On a plane through  $Y = 0$ , a simple, closed polygon whose edges pass through the following  $[X, Z]$  vertices sequentially:
- a.  $[X_C = -875, 195]$ ,  $[X_C = -875, 645]$ ,  $[X_F = -1300, 645]$ ,  $[X_F = -1300, 125]$ ,  $[X_F = -1000, 125]$ ,  $[X_C = -1830, 225]$ ,  $[X_C = -875, 195]$ .
- 9.3** Once the surface in §9.2 is fully defined, it must be extruded along  $Y$  to  $Y = 400$ .
- 9.4** Once the volumes in §9.1 and §9.3 are fully defined, they must be combined with ALL non-overlapping regions discarded.
- 9.5** On a plane through  $Y = 0$ , a simple, closed polygon whose edges pass through the following  $[X_C, Z]$  vertices sequentially:
- a.  $[-875, 0]$ ,  $[300, 0]$ ,  $[300, 970]$ ,  $[0, 970]$ ,  $[0, 770]$ ,  $[-350, 770]$ ,  $[-350, 645]$ ,  $[-875, 645]$ ,  $[-875, 0]$ .
- 9.6** Once the surface in §9.5 is fully defined, it must be extruded along  $Y$  to  $Y = 400$ .
- 9.7** Once the volumes in §9.4 and §9.6 are fully defined, they must be combined to make one unified volume.
- 9.8** On a plane through  $Z = 0$ , a simple, closed polygon whose edges pass through the following  $[X, Y]$  vertices sequentially:

- a.  $[X_F = -1300, 0]$ ,  $[X_F = -1300, 150]$ ,  $[X_C = -1830, 200]$ ,  $[X_C = -1015, 265]$ ,  $[X_C = -400, 400]$ ,  $[X_C = 300, 400]$ ,  $[X_C = 300, 0]$ ,  $[X_F = -1300, 0]$ .

**9.9** Once the surface in **9.8** is fully defined, it must be extruded along Z to  $Z = 970$ .

**9.10** Once the volumes in **9.7** and **9.9** are fully defined, they must be combined with all non-overlapping regions discarded.

**9.11** An axis-aligned cuboid, which has one interior diagonal defined by the points:

- a.  $[X_C = 75, 150, 0]$ ,  $[X_C = 300, 400, 970]$ .

**9.12** Once the volume in **9.11** is fully defined, it must be subtracted from the volume defined in **9.10** to leave one unified volume.

The fully defined volume in **9.12** is **RV-BODY-FRONT**

**9.13** **RV-BODY-FRONT** is further split by the planes defined in Article 2.7:

- a. **RV-NOSE** refers to a sub part of **RV-BODY-FRONT** forward of  $X_A = 0$ .
- b. **RV-CH-FRONT** refers to a sub part of **RV-BODY-FRONT** between  $X_A = 0$  and a plane through  $X_C = -875$ .
- c. **RV-CH-MID** refers to a sub part of **RV-BODY-FRONT** rearwards of a plane through  $X_C = -875$ .

The fully defined volume in **9.13a** is **RV-NOSE**.

The fully defined volume in **9.13b** is **RV-CH-FRONT**.

The fully defined volume in **9.13c** is **RV-CH-MID**.

## **10** **Survival Cell Front Minimum Reference Volume (RV-CH-FRONT-MIN)**

**RV-CH-FRONT-MIN** is composed of the following elements:

**10.1** A volume bounded by  $X_C = -2030$  and  $X_C = -875$  that must be symmetrical about  $Y = 0$ , and when cut with any X plane, the cross section must:

- a. Contain a four-sided section, with two sides parallel to Z.
- b. Have width that varies linearly from 268 at  $X_C = -2030$  to 380mm at  $X_C = -1330$  and then linearly to 490mm at  $X_C = -875$ .
- c. Have height at  $Y = 0$  that varies linearly from 300 at  $X_C = -2030$  to 415 at  $X_C = -875$ .
- d. Have the side visible from above, a convex circular arc, with radius varying linearly from  $R = 400$  at  $X_C = -2030$  to  $R = 2500$  at  $X_C = -875$ .
- e. Have the side visible from below, a convex circular arc, with a constant radius of  $R = 2500$ .

[Width at  $X_C = -1830$  is 300mm. Height at  $X_C = -1830$  is 320. Refer to supporting document for further explanation]

**10.2** Once the volume in **10.1** is fully defined, it must be trimmed with the plane  $X_A = 0$  with all material ahead of this plane discarded.

**10.3** Once the volume in **10.2** is fully defined, radii with a convex radius of curvature of 50mm must be applied to the longitudinal edges, drawn tangent to both surfaces and perpendicular to the boundary.

The fully defined volume in §10.3 is **RV-CH-FRONT-MIN**.

#### 11 Mirror Body Reference Volume (RV-MIRROR-BODY)

**RV-MIRROR-BODY** is composed of the following elements:

11.1 On a plane through  $Z = 640$ , a simple, closed polygon whose edges pass through the following  $[X, Y]$  vertices sequentially:

a.  $[X_C = -830, 470]$ ,  $[X_C = -730, 470]$ ,  $[X_C = -650, 680]$ ,  $[X_C = -750, 680]$ ,  $[X_C = -830, 470]$ .

11.2 Once the surface in §11.1 is fully defined, it must be extruded along  $Z$  to  $Z = 720$ .

The fully defined volume in §11.2 is **RV-MIRROR-BODY**.

#### 12 Driver Cooling Reference Volume (RV-DRI-COOL)

**RV-DRI-COOL** is composed of the following elements:

12.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:

a.  $[X_A = 100, 0, 550]$ ,  $[X_A = 525, 100, 675]$ .

12.2 A cylinder of diameter 11,040mm, centred on the Y-Aligned axis  $[X_C, Z] = [-1000, -4855]$ , extruded between  $Y = 0$ , to  $Y = 100$ .

12.3 Once the volumes in §12.1 and §12.2 are fully defined, they must be combined with all non-overlapping regions discarded.

The fully defined volume in §12.3 is **RV-DRI-COOL**.

#### 13 Sidepod Reference Volume (RV-SIDEPD)

**RV-SIDEPD** is composed of the following elements:

13.1 On a plane through  $Z = 125$ , a simple, closed polygon whose edges pass through the following  $[X_F, Y]$  vertices sequentially:

a.  $[900, 0]$ ,  $[900, 275]$ ,  $[1200, 715]$ ,  $[1300, 715]$ ,  $[1300, 0]$ ,  $[900, 0]$ .

13.2 Once the surface in §13.1 is fully defined, it must be extruded along  $Z$  to  $Z = 600$ .

The fully defined volume in §13.2 is **RV-SIDEPD**.

#### 14 Engine Cover Reference Volume (RV-EC)

**RV-EC** is composed of the following elements:

14.1 On a plane through  $Z = 50$ , a simple, closed polygon whose edges pass through the following  $[X, Y]$  vertices sequentially:

a.  $[X_F = 1300, 0]$ ,  $[X_F = 1300, 715]$ ,  $[X_R = -1500, 715]$ ,  $[X_R = -500, 575]$ ,  $[X_R = -500, 350]$ ,  $[X_R = -50, 225]$ ,  $[X_R = -50, 0]$ ,  $[X_F = 1300, 0]$ .

14.2 Once the surface in §14.1 is fully defined, it must be extruded along  $Z$  to  $Z = 600$ .

14.3 Once the volume in §14.2 is fully defined, it must be trimmed with a plane passing through the following three points with all material above the plane discarded.

a.  $[X_C, 0, 600]$ ,  $[X_C, 725, 600]$ ,  $[X_R = -50, 0, 350]$ .

- 14.4** On a plane through  $Y=0$ , a simple, closed polygon whose edges pass through the following  $[X, Z]$  vertices sequentially:
- a.  $[X_C = 300, 50]$ ,  $[X_R = -50, 50]$ ,  $[X_R = -50, 600]$ ,  $[X_C = 500, 970]$ ,  $[X_C = 300, 970]$ ,  $[X_C = 300, 50]$ .
- 14.5** Once the surface in §14.4 is fully defined, it must be extruded along  $Y$  to  $Y = 400$ .
- 14.6** Once the volume in §14.5 is fully defined, it must be trimmed with a plane passing through the following three points with all material outboard of the plane discarded.
- a.  $[X_R = -500, 350, 50]$ ,  $[X_R = -50, 300, 50]$ ,  $[X_R = -50, 300, 600]$ .
- 14.7** On a plane through  $Y=0$ , a simple, closed polygon whose edges pass through the following  $[X, Z]$  vertices sequentially:
- a.  $[X_R = -160, 760]$ ,  $[X_R = -395, 760]$ ,  $[X_C = 500, 970]$ ,  $[X_C = 500, 500]$ ,  $[X_R = -160, 500]$ ,  $[X_R = -160, 760]$ .
- 14.8** Once the surface in §14.7 is fully defined, it must be extruded along  $Y$  to  $Y = 25$ .
- 14.9** An axis-aligned cuboid, which has one interior diagonal defined by the points:
- a.  $[X_C = 75, 150, 50]$ ,  $[X_C = 300, 400, 970]$ .
- 14.10** Once the volumes in §14.3, §14.6, §14.8 and §14.9 are fully defined they must be united to create a single unified volume.

~~14.10~~ Once the volume in §14.9 is fully defined, it must be trimmed with a plane passing through the following three points with all material outboard the plane discarded:

- a.  ~~$[X_R = 1300, 715, 50]$ ,  $[X_R = 1300, 715, 600]$ ,  $[X_R = 50, 225, 50]$ .~~

The fully defined volume in §14.10 is **RV-EC**.

## 15 Bodywork Aperture Reference Volume (RV-BW-APERTURE)

**RV-BW-APERTURE** is composed of the following elements:

- 15.1** On a plane through  $Z = 375$ , a simple, closed polygon whose edges pass through the following  $[X, Y]$  vertices sequentially:
- a.  $[X_F = 1400, 380]$ ,  $[X_R = 800, 80]$ ,  $[X_R = 800, 400]$ ,  $[X_R = -1650, 600]$ ,  $[X_F = 1400, 600]$ ,  $[X_F = 1400, 380]$ .
- 15.2** Once the surface in §15.1 is fully defined, it must be extruded along  $Z$  to  $Z = 700$ .

~~14.3~~ Once the volume in §14.2 is fully defined, it must be trimmed with the following planes:

~~A plane passing through the following three points with all material above the plane discarded:~~

- a.  ~~$[X_F = 1400, 400, 675]$ ,  $[X_R = 850, 100, 700]$ ,  $[X_R = 850, 400, 650]$ .~~

~~A plane offset by 200mm, parallel to and below the plane defined in §14.3 (a) with all material below the plane discarded.~~

The fully defined volume in §15.2 is **RV-BW-APERTURE**.

## 16 Tail Reference Volume (RV-TAIL)

**RV-TAIL** is composed of the following elements:

- 16.1** On a plane through  $Y = 0$ , a simple, closed polygon whose edges pass through the following  $[X_{DIF}, Z]$  vertices sequentially:
- $[-110, 0], [-110, 480], [10, 480], [350, 380], [760, 380], [760, 175], [350, 175], [10, 0], [-110, 0]$ .
- 16.2** Once the surface in **§16.1** is fully defined, it must be extruded along  $Y$  to  $Y = 125$ .
- 16.3** On a plane through  $Z = 0$ , a simple, closed polygon whose edges pass through the following  $[X_{DIF}, Y]$  vertices sequentially:
- $[-110, 0], [760, 0], [760, 60], [350, 60], [10, 125], [-110, 125], [-110, 0]$ .
- 16.4** Once the surface in **§16.3** is fully defined, it must be extruded along  $Z$  to  $Z = 480$ .
- 16.5** Once the volumes in **§16.2** and **§16.4** are fully defined, they must be combined with all non-overlapping regions discarded.
- The fully defined volume in **§16.5** is **RV-TAIL**.
- 17 Tailpipe Reference Volume (RV-TAILPIPE)**
- RV-TAILPIPE** is composed of the following elements:
- 17.1** An axis-aligned cuboid, which has one interior diagonal defined by the points:
- $[X_R = -55, 0, 350], [X_R = 250, 400, 75, 550]$ .
- The fully defined volume in **§17.1** is **RV-TAILPIPE**.
- 18 Front Wing Reference Section (RS-FW-SECTION)**
- RS-FW-SECTION** is composed of the following elements:
- 18.1** A plane through the following three points:
- $[X_F = -1250, 100, 0], [X_F = -975, 700, 0], [X_F = -975, 700, 275]$ .
- The fully defined plane in **§18.1** is **RS-FW-SECTION**.
- 19 Front Wing Profiles Reference Volume (RV-FW-PROFILES)**
- RV-FW-PROFILES** is composed of the following elements:
- 19.1** On a plane through  $X_F = -1250$ , a simple, closed polygon whose edges pass through the following  $[Y, Z]$  vertices sequentially:
- $[0, 60], [100, 60], [675, 450, 125], [675, 275], [400, 275, 300], [0, 425, 140], [0, 60]$ .
- 19.2** Once the surface in **§19.1** is fully defined, it must be extruded along  $X$  to  $X_F = 500 - 450$ .
- 19.3** Once the volume in **§19.2** is fully defined, it must be trimmed using the plane defined in **§18.1** with all material forward of the plane discarded.
- 19.4** Once the volume in **§19.3** is fully defined, it must be trimmed with a plane passing through the following three points with all material rearward of the plane discarded.
- $[X_F = -750, 0, 0], [X_F = -500, 400, 0], [X_F = -500, 400, 275]$ .
- 19.5** Once the volume in **§19.4** is fully defined, it must be trimmed with a plane passing through the following three points with all material below the plane discarded.
- $[X_F = -750, 0, 110], [X_F = -825, 675, 450, 125], [X_F = 500 - 450, 675, 225]$ .

The fully defined volume in §19.5 is **RV-FW-PROFILES**.

## 20 Front Wing Endplate Body Reference Volume (RV-FWEP-BODY)

**RV-FWEP-BODY** is composed of the following elements:

- 20.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:
- $[X_F = -1250, \del{600} 575, \del{50} 75]$ ,  $[X_F = -300, 680, 375]$ .
- 20.2 Once the volume in §20.1 is fully defined, it must be trimmed using the plane defined in §18.1 with all material forward of the plane discarded.
- 20.3 A cylinder of diameter 825mm centred on the Y-Aligned axis  $[X_F, Z] = [0, 360]$ , extruded between  $Y = \del{600} 575$ , to  $Y = 900$ .
- 20.4 Once the cylinder in §20.3 is fully defined, it must be used to trim the volume in §20.2 with both the cylinder and all overlapping regions discarded.
- 20.5 Once the volume in §20.4 is fully defined, it must be trimmed with a plane passing through the following three points with all material above the plane discarded.
- $[X_F = \del{-675} -700, 675, 375]$ ,  $[X_F = -1050, 675, \del{225} 250]$ ,  $[X_F = -1050, 600, \del{225} 250]$ .

The fully defined volume in §20.5 is **RV-FWEP-BODY**.

## 21 Front Wing Endplate Outer Footplate Reference Volume (RV-FWEP-OFP)

**RV-FWEP-OFP** is composed of the following elements:

- 21.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:
- $[X_F = -1250, 750, \del{50} 75]$ ,  $[X_F = -300, 900, \del{140} 170]$ .
- 21.2 Once the volume in §21.1 is fully defined, it must be trimmed using the plane defined in §18.1 with all material forward of the plane discarded.
- 21.3 Once the volume in §21.2 is fully defined, it must be trimmed with the cylinder defined in §20.3 with both the cylinder and all overlapping regions discarded.

The fully defined volume in §21.3 is **RV-FWEP-OFP**.

## 22 Front Wing Endplate Inner Footplate Reference Volume (RV-FWEP-IFP)

**RV-FWEP-IFP** is composed of the following elements:

- 22.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:
- $[X_F = -1250, \del{600} 560, \del{50} 75]$ ,  $[X_F = -300, 750, \del{85} 110]$ .
- 22.2 Once the volume in §22.1 is fully defined, it must be trimmed using the plane defined in §18.1 with all material forward of the plane discarded.

The fully defined volume in §22.2 is **RV-FWEP-IFP**.

## 23 Front Wing Endplate Diveplane Reference Volume (RV-FWEP-DIVEPLANE)

~~RV-FWEP-FENCE~~ **RV-FWEP-DIVEPLANE** is composed of the following elements:

- 23.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:
- $[X_F = \del{-825} -950, \del{825} 575, \del{50} 175]$ ,  $[X_F = \del{-300} -550, 900, \del{200} 340]$ .



~~22.2~~ Once the volume in §22.1 is fully defined, it must be trimmed with the cylinder defined in §19.3; with both the cylinder and all overlapping regions discarded.

The fully defined volume in ~~§22.2~~ §23.1 is ~~RV-FWEP-FENCE~~ RV-FWEP-DIVEPLANE.

## 24 Front Wing Strake Reference Volume (RV-FW-STRAKE)

RV-FW-STRAKE is composed of the following elements:

24.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:

a.  $[X_F = -1100, 450, 75]$ ,  $[X_F = -250 - 325, 555, 200]$ .

24.2 Once the volume in §24.1 is fully defined, it must be trimmed using the plane defined in §18.1 with all material forward of the plane discarded.

The fully defined volume in §24.2 is RV-FW-STRAKE.

## 25 Front Wing Sensor Reference Volume (RV-FW-SENSOR)

RV-FW-SENSOR is composed of the following elements:

25.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:

a.  $[0, 0, 0]$ ,  $[60, 15, 50]$ .

25.2 A cylinder of diameter 30mm centred on the X-Aligned axis  $[Y, Z] = [7.5, 50]$ , extruded between  $X = 0$ , to  $X = 60$ .

25.3 Once the volumes in §25.1 and §25.2 are fully defined, they must be united to create a single unified volume.

The fully defined volume in §25.3 is RV-FW-SENSOR.

## 26 Camera 2 Reference Volume (RV-CAMERA-2)

RV-CAMERA-2 is only on the left-hand side of the car and is composed of the following elements:

26.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:

$[X_F = -150, 0, 325]$ ,  $[X_F = -450, -330, 550]$ .

26.2 Once the volume in §26.1 is fully defined, it must be trimmed with a plane passing through the following three points with all material above the plane discarded.

a.  $[X_F = -1250, 0, 220]$ ,  $[X_A, 0, 550]$ ,  $[X_A, -200, 550]$ .

26.3 Once the volume in §26.2 is fully defined, it must be trimmed with a plane passing through the following three points with all material inboard of the plane discarded.

a.  $[X_F = -1250, -85, 0]$ ,  $[X_A, -135, 0]$ ,  $[X_A, -135, 200]$ .

The fully defined volume in §26.3 is RV-CAMERA-2.

## 27 Rear Wing Profiles Reference Volume (RV-RW-PROFILES)

RV-RW-PROFILES is composed of the following elements:

27.1 An axis-aligned cuboid, which has one interior diagonal defined by the points:

a.  $[X_R = 240, 0, 700 690]$ ,  $[X_R = 630, 575, 880]$ .

**27.2** Once the volume in **§27.1** is fully defined, it must be trimmed with a plane passing through the following three points with all material below the plane discarded.

- a.  $[X_R = 240, 400, 150, 700, 690]$ ,  $[X_R = 240, 575, 750]$ ,  $[X_R = 630, 575, 750]$ .

The fully defined volume in **§27.2** is **RV-RW-PROFILES**.

## **28 Rear Wing Endplate Reference Volume (RV-RWEP-BODY)**

**RV-RWEP-BODY** is composed of the following elements:

**28.1** On a plane through  $X_R = 225$ , a simple, closed polygon whose edges pass through the following [Y, Z] vertices sequentially:

- a.  $[350, 345, 250]$ ,  $[350, 345, 425]$ ,  $[540, 535, 700]$ ,  $[540, 535, 880]$ ,  $[575, 880]$ ,  $[575, 675]$ ,  $[375, 375]$ ,  $[375, 250]$ ,  $[350, 345, 250]$ .

**28.2** Once the surface in **§28.1** is fully defined, it must be extruded along X to  $X_R = 750$ .

**28.3** Once the volume in **§28.2** is fully defined, it must be trimmed with the following planes:

- a. A plane passing through the following points  $[X_R, Y, Z]$ , with all material forward of the plane discarded:
- $[225, 575, 650]$ ,  $[375, 575, 250]$ ,  $[375, 375, 250]$ .
- b. A plane passing through the following points  $[X_R, Y, Z]$ , with all material rearward of the plane discarded:
- $[750, 575, 625]$ ,  $[625, 575, 250]$ ,  $[625, 375, 250]$ .
- c. A plane passing through following points  $[X_R, Y, Z]$ , with all material below the plane discarded:
- $[450, 425, 250]$ ,  $[750, 425, 325]$ ,  $[750, 400, 325]$ .

The fully defined volume in **§28.3** is **RV-RWEP-BODY**.

## **29 Rear Wing Pylon Reference Volume (RV-RW-PYLON)**

**RV-RW-PYLON** is composed of the following elements:

**29.1** On a plane through  $Y=25$ , a simple, closed polygon whose edges pass through the following [X, Z] vertices sequentially:

- a.  $[X_R, 300]$ ,  $[X_R, 450]$ ,  $[X_R = 250, 775]$ ,  $[X_R = 375, 775]$ ,  $[X_{DIF} = 375, 300]$ ,  $[X_R, 300]$ .

**29.2** Once the surface in **§29.1** is fully defined, it must be extruded along Y to  $Y = 80$ .

The fully defined volume in **§29.2** is **RV-RW-PYLON**.

## ~~**28 Front Wheel Scoop Reference Volume (RV-FWH-SCO)**~~

~~**RV-FWH-SCO** is composed of the following elements:~~

~~**28.1** A cylinder of diameter 440mm, centred on the  $Y_w$ -Aligned axis  $[X_w, Z_w] = [0, 0]$  and extruded between  $Y_w = 0$ , to  $Y_w = 150$ .~~

~~**28.2** Once the volume in **§28.1** is fully defined, it must be trimmed with the following planes:~~

~~A plane passing through  $Z_w = 125$ , with all material above the plane discarded.~~

A plane passing through the following three points  $[X_w, Y_w, Z_w]$ , with all material inboard of the plane discarded:

~~$[0, 150, 20], [0, 0, 100], [50, 0, 100]$ :~~

A plane passing through the following three points  $[X_w, Y_w, Z_w]$ , with all material rearward of the plane discarded:

~~$[0, 150, 20], [100, 150, 200], [200, 0, 100]$ :~~

The fully defined volume in ~~S28.2~~ is ~~RV-FWH-SGOOP~~:

### ~~29~~ **Rear Wheel Scoop Reference Volume (RV-RWH-SGO)**

~~RV-RWH-SGO~~ is composed of the following elements:

~~29.1~~ A cylinder of diameter 440mm, centred on the  $Y_w$ -Aligned axis  $[X_w, Z_w] = [0, 0]$  and extruded between  $Y_w = -6$ , to  $Y_w = 60$ :

~~29.2~~ Once the volume in ~~S29.1~~ is fully defined, it must be trimmed with a plane through  $Z_w = 0$ , with all material below the plane discarded:

The fully defined volume in ~~S29.2~~ is ~~RV-RWH-SGO~~:

### ~~30~~ **Rear Wheel Lip Reference Volume (RV-RWH-LIP)**

~~RV-RWH-LIP~~ is composed of the following elements:

~~30.1~~ A hollow cylinder of internal diameter 390mm and external diameter 700mm, centred on the  $Y_w$ -Aligned axis  $[X_w, Z_w] = [0, 0]$  and extruded between  $Y_w = -6$ , to  $Y_w = 60$ :

~~30.2~~ Once the volume in ~~30.1~~ is fully defined, it must be trimmed with the following planes:

~~a.~~ A plane passing through  $Z_w = 0$ , with all material below the plane discarded:

~~b.~~ A plane passing through  $ZW = 195$ , with all material above the plane discarded:

~~c.~~ A plane passing through  $XW = 0$ , with all material behind the plane discarded:

The fully defined volume in ~~S30.2~~ is ~~RV-RWH-LIP~~:

### **30 Stay / Bracket / Support / Fairing Reference Volumes**

Each individual Stay, Bracket, Support or Fairing Volume is composed of the elements listed, by row, in the following table.

In each row, the fully defined Reference Volume is an axis-aligned cuboid, which has one interior diagonal defined by the listed points.

<b>30.</b>	<b>Name</b>	<b>Code (RV-)</b>	<b>Point 1 [X, Y, Z]</b>	<b>Point 2 [X, Y, Z]</b>
1	Floor Board Brace	<b>FLOOR-BRACE</b>	$[X_F = 650, 0, 300]$	$[X_F = 800, 890, 450]$
2	Lifting Strap Roll Hoop	<b>STRAP</b> <b>ROLL-HOOP</b>	$[X_C = -250, 0, 700]$ <del><math>695]</math></del>	$[X_C = 150, 300, 150, 825]$ <del><math>970]</math></del>
3	Mirror Inner Stay	<b>MIRROR-ISTAY</b>	$[X_C = -830, 175, 600]$	$[X_C = -730, 470, 665]$

4	Mirror Rear Stay	<b>MIRROR-RSTAY</b>	[X <sub>C</sub> = -765, <del>500</del> 500, <del>500</del> 450]	[X <sub>C</sub> = -450, 630, <del>640</del> 700]
5	Tailpipe Bracket	<b>TAILPIPE-BRACKET</b>	[0, 0, 0]	[30, 25, 55]
6	Front Wing Pylon	<b>FW-PYLON</b>	[X <sub>F</sub> = -1200, 50, 60]	[X <sub>F</sub> = -1025, 150, 200]
7	Front Wing Flap Hanger	<b>FW-HANGER</b>	[0, 0, 0]	[40, 10, 50]
8	FW Adjuster Plate	<b>FW-ADJUSTER</b>	[0, 0, 0]	[175, 5, 100]
9	Front Wing Separator	<b>FW-SEPARATOR</b>	[0, 0, 0]	[30, 10, 30]
10	Rear Wing Brace	<b>RW-BRACE</b>	[X <sub>R</sub> = <del>400</del> 375, 0, 310]	[X <sub>R</sub> = <del>500</del> 625, 375, 350]
11	Rear Wing Flap Hanger	<b>RW-HANGER</b>	[0, 0, 0]	[40, 10, 50]
12	Rear Wing Separator	<b>RW-SEPARATOR</b>	[0, 0, 0]	[30, 10, 30]
13	Rear Wing Fairing	<b>RW-FAIRING</b>	[X <sub>R</sub> = 250, 0, 725]	[X <sub>R</sub> = 600, 25, 900]
14	Rear Wing Bracket	<b>RW-BRACKET</b>	[X <sub>R</sub> = 0, 0, 0]	[X <sub>R</sub> = 60, 30, 30]
15	Secondary Roll	<b>SECONDARY-ROLL</b>	[X <sub>C</sub> = -1066, -25, 600]	[X <sub>C</sub> = -835, 25, 705]
16	Slip Sensor	<b>SLIP</b>	[X <sub>F</sub> = 50, -25, 120]	[X <sub>F</sub> = 450, 25, 250]

**31 Reference Surfaces**

Each individual Reference Surface is composed of the elements listed, by row, in the following table.

Each fully defined Reference Surface is a simple, closed polygon, that lies exactly on the listed plane, with edges that pass through the listed vertices sequentially.

31	Name	Code (RS-)	Plane	Ref.	Vertices
1	Floor Body	<b>FLOOR-BODY</b>	Z = 450	[X, Y]	[X <sub>F</sub> = <del>700</del> 1150, 0], [X <sub>F</sub> = <del>1300</del> 1150, <del>720</del> 730], [X <sub>R</sub> = -360, <del>720</del> 680], [X <sub>R</sub> = -360, <del>370</del> 350], [X <sub>R</sub> = <del>420</del> 290, 350], [X <sub>R</sub> = <del>420</del> 290, 0], [X <sub>F</sub> = <del>700</del> 1150, 0]
2	Floor Reference	<b>FLOOR-REF</b>	Z = <del>50</del> 300	[X, Y]	[X <sub>F</sub> = 575, 0], [X <sub>F</sub> = 575, 50], [X <sub>F</sub> = 1400, 310], [X <sub>R</sub> = -1100, 310], [X <sub>R</sub> = -800, 260], [X <sub>R</sub> = <del>-500</del> -545, 200], [X <sub>R</sub> = <del>-600</del> -545, 0], [X <sub>F</sub> = 575, 0]
3	Floor Step	<b>FLOOR-STEP</b>	Z = <del>50</del> 300	[X, Y]	[X <sub>F</sub> = <del>-1100</del> -300], [X <sub>F</sub> = <del>1400</del> 1250, 390], [X <sub>R</sub> = <del>-1150</del> -1050, 390], [X <sub>R</sub> = -775, 350], [X <sub>R</sub> = <del>-575</del> -625, <del>280</del> 300], [X <sub>R</sub> = <del>-400</del> -500, <del>425</del> 475], [X <sub>R</sub> = <del>-375</del> -400, <del>425</del> 475], [X <sub>R</sub> = <del>-375</del> -400, <del>600</del> 600], [X <sub>F</sub> = <del>1400</del> 1250, 690], [X <sub>F</sub> = <del>1100</del> 1250, <del>300</del> 390]
4	Floor Foot	<b>FLOOR-FOOT</b>	Z = 50	[X <sub>F</sub> , Y]	[ <del>600</del> 675, <del>670</del> 700], [ <del>600</del> 675, <del>850</del> 800], [ <del>1200</del> 750, <del>600</del> 850], [ <del>1150</del> 1300, <del>500</del> 725], [ <del>1000</del> 1300, <del>600</del> 650], [ <del>600</del> 675, <del>670</del> 700]
5	Floor Board	<b>FLOOR-BOARD</b>	Y = 600	[X <sub>F</sub> , Z]	[675, 325], [1050, 325], [ <del>1475</del> 1300, <del>150</del> 160], [ <del>1475</del> 1300, <del>80</del> 90], [675, <del>80</del> 90], [675, 325]
6	Nose	<b>NOSE</b>	Z = 0	[X, Y]	[X <sub>F</sub> = -1200, 0], [X <sub>F</sub> = -1175, 100], [X <sub>A</sub> , 150], [X <sub>A</sub> , 0], [X <sub>F</sub> = -1200, 0]
7	Engine Cover	<b>EC</b>	Y = 0	[X, Z]	[X <sub>R</sub> = -53, 50], [X <sub>R</sub> = -53, 570], [X <sub>R</sub> = -165, 605], [X <sub>R</sub> = -165, 755], [X <sub>R</sub> = -400, 755], [X <sub>C</sub> = 300, 967], [X <sub>C</sub> = 300, 50], [X <sub>R</sub> = -53, 50]

8	Bodywork Aperture	<b>BW- APERTURE</b>	Z = 400	[X, Y]	<del><math>[X_E = -400, X_F = 1400, 400, 380]</math></del> , <del><math>[X_R = -850, -800, 400, 80]</math></del> , <del><math>[X_R = -850, -800, 400]</math></del> , <del><math>[X_E, X_R = -1650, 600]</math></del> , <del><math>[X_E = -400, X_F = 1400, 600]</math></del> , <del><math>[X_E = -400, X_F = 1400, 400, 380]</math></del>
9	Front Wing Profiles	<b>FW- PROFILES</b>	Z = 0	$[X_F, Y]$	<del><math>[-1225, 0]</math></del> , <del><math>[-975, 675]</math></del> , <del><math>[-650, 675]</math></del> , <del><math>[-850, 0]</math></del> , <del><math>[-1225, 0]</math></del>
10	Front Wing Endplate Top	<b>FWEP-TOP</b>	Z = 0	$[X_F, Y]$	<del><math>[-880, -850, 895]</math></del> , <del><math>[-325, -360, 895]</math></del> , <del><math>[-325, -360, 670]</math></del> , <del><math>[-980, 670]</math></del> , <del><math>[-880, -850, 895]</math></del>
11	Front Wing Endplate Side	<b>FWEP-SIDE</b>	Y = 700	$[X_F, Z]$	<del><math>[-975, -950, 55, 80]</math></del> , <del><math>[-975, -950, 225, 175]</math></del> , <del><math>[-650, 600, 370, 350]</math></del> , <del><math>[-420, -450, 370, 350]</math></del> , <del><math>[-410, -450, 225]</math></del> , <del><math>[-305, -350, 55, 80]</math></del> , <del><math>[-975, -950, 55, 80]</math></del>
12	Rear Wing Endplate	<b>RWEP</b>	Y = 0	$[X_R, Z]$	<del><math>[310, 870]</math></del> , <del><math>[740, 870]</math></del> , <del><math>[740, 700]</math></del> , <del><math>[630, 350]</math></del> , <del><math>[400, 275]</math></del> , <del><math>[230, 700]</math></del> , <del><math>[245, 800]</math></del> , <del><math>[310, 870]</math></del>
13	ERS Protection Surface	<b>PU-ERS</b>	Y=280	$[X, Z]$	<del><math>[X_C = -365, 50]</math></del> , <del><math>[X_C = -365, 170]</math></del> , <del><math>[X_C = -70, 380]</math></del> , <del><math>[X_{PU} = -100, 380]</math></del> , <del><math>[X_{PU} = -100, 50]</math></del> , <del><math>[X_C = -365, 50]</math></del>

### 32 Forward Intrusion Laminate Reference Surface (RS-INTSN-LAM-FWD)

**RS-INTSN-LAM-FWD** is composed of the following elements:

32.1 On the plane Y=0, a profile of two lines passing through the following points  $[X_C, Z]$ ;

a.  $[-740, 0]$ ,  $[-875, 235]$ ,  $[-875, 650]$ .

32.2 Once the profile in §32.1 is fully defined, it must be extruded in Y to Y = 500.

The fully defined surface in §32.2 is **RS-INTSN-LAM-FWD**.

### 33 Rearward Intrusion Laminate Reference Surface (RS-INTSN-LAM-RWD)

**RS-INTSN-LAM-RWD** is composed of the following elements:

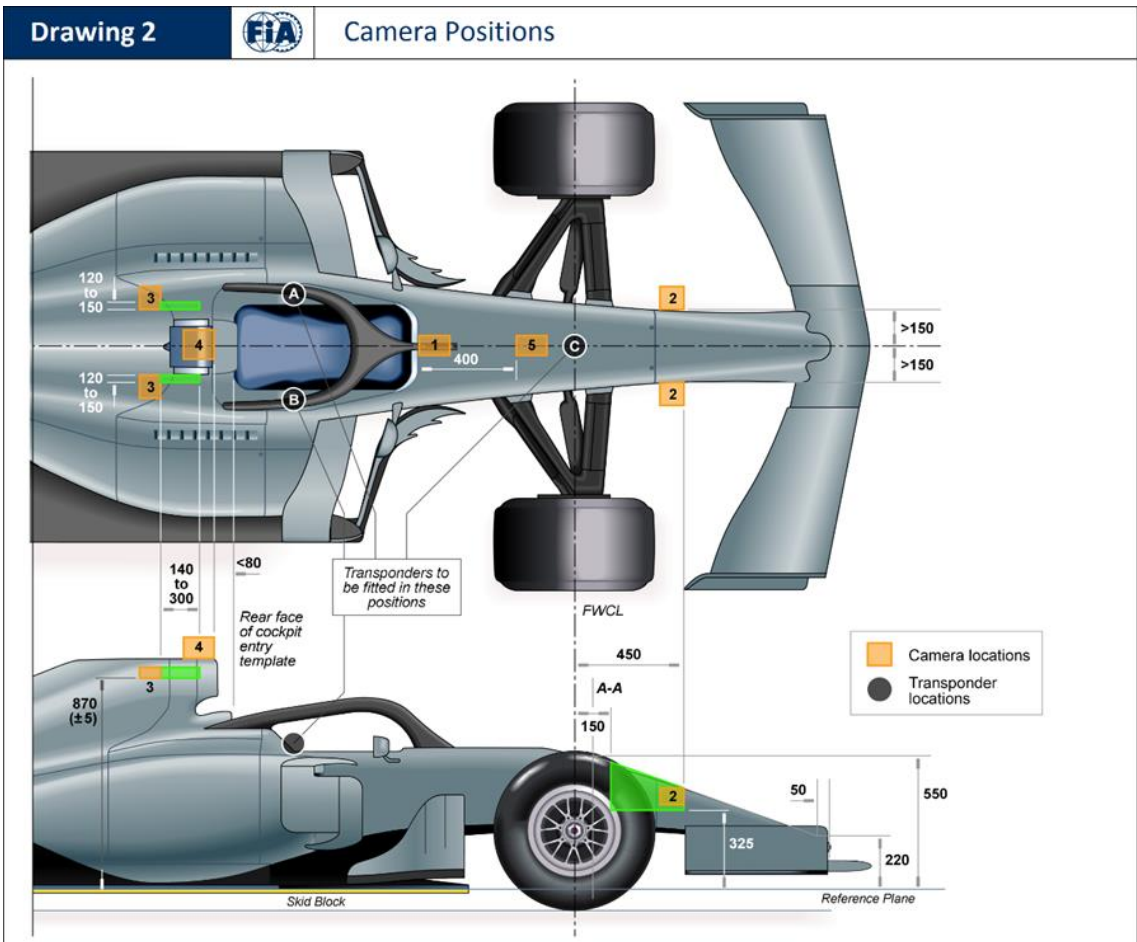
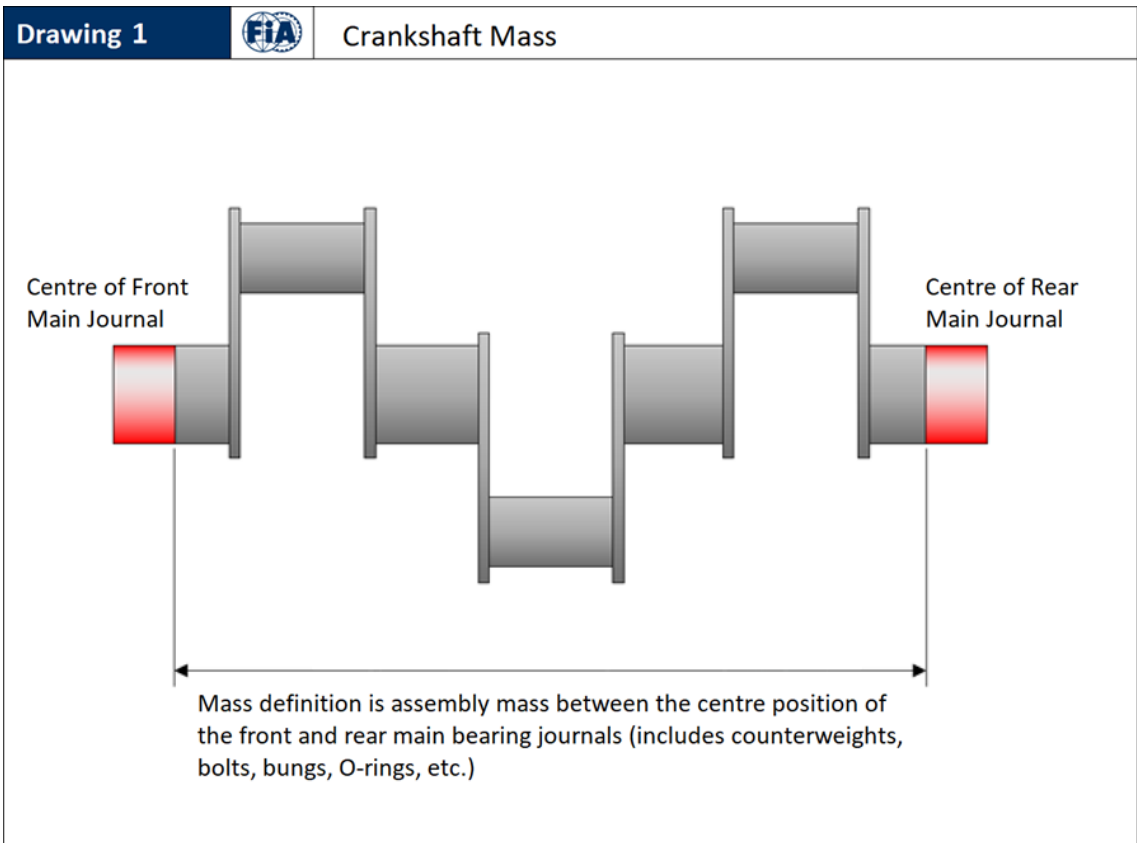
33.1 On the plane Y=0, a profile of two lines passing through the following points  $[X, Z]$ ;

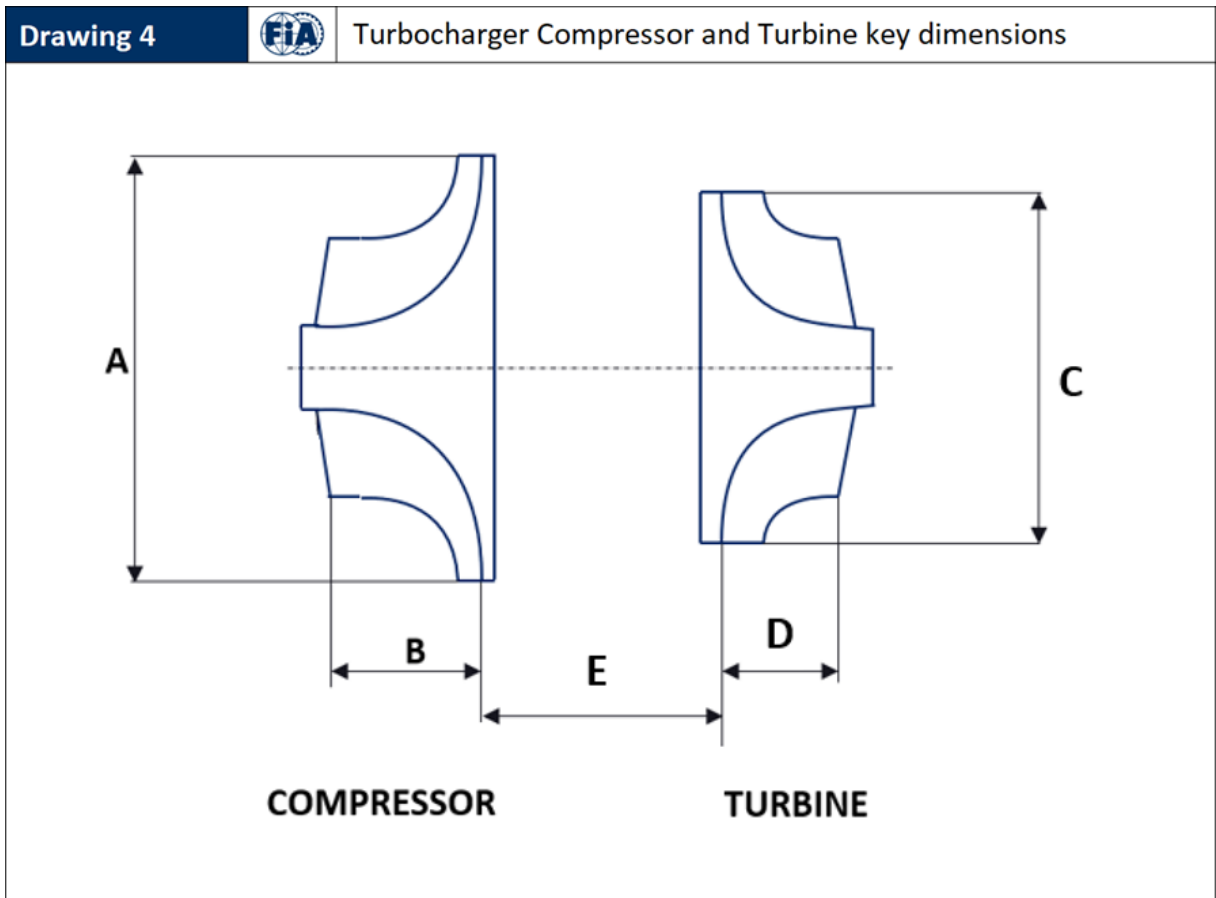
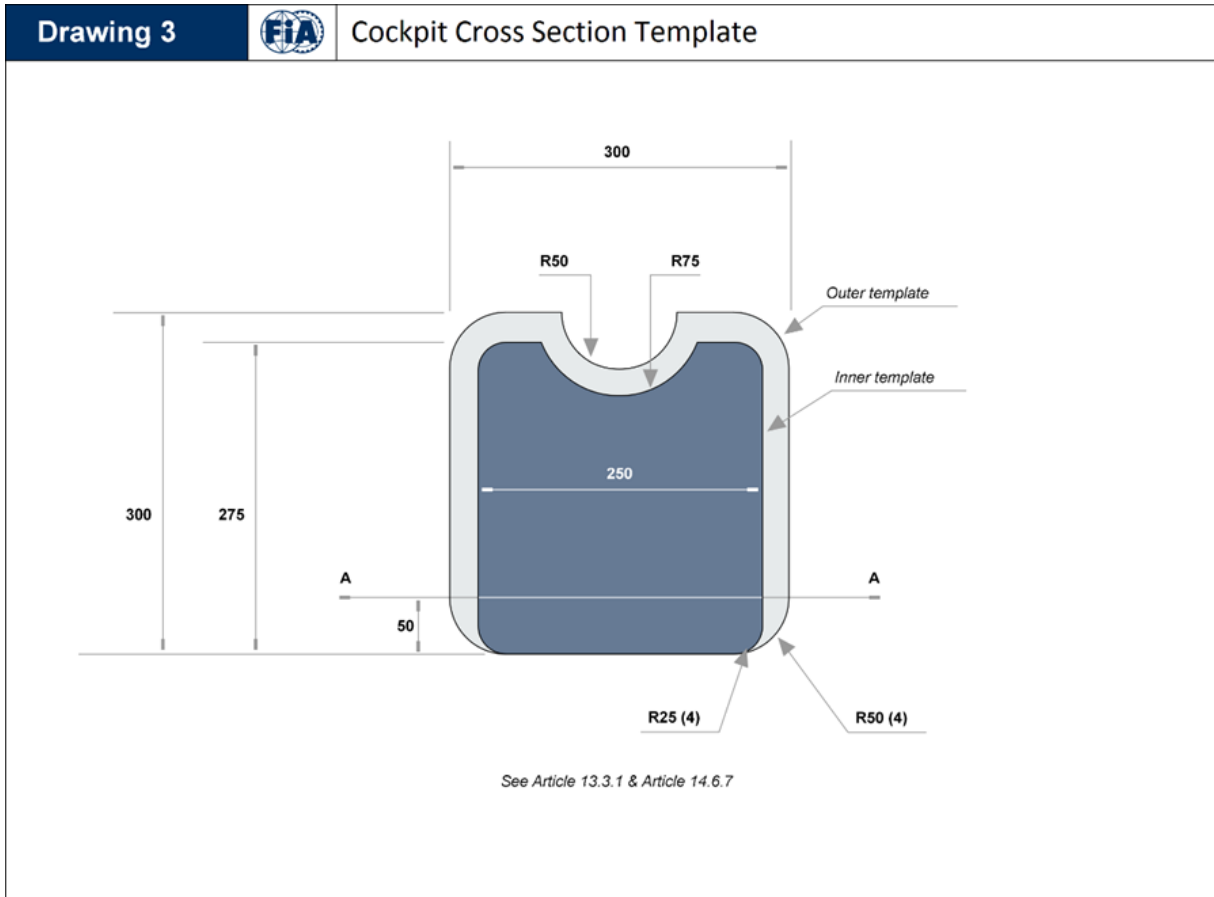
a.  $[X_C = 0, 550]$ ,  $[X_{PU} = -75, 450]$ ,  $[X_{PU} = -75, 100]$ .

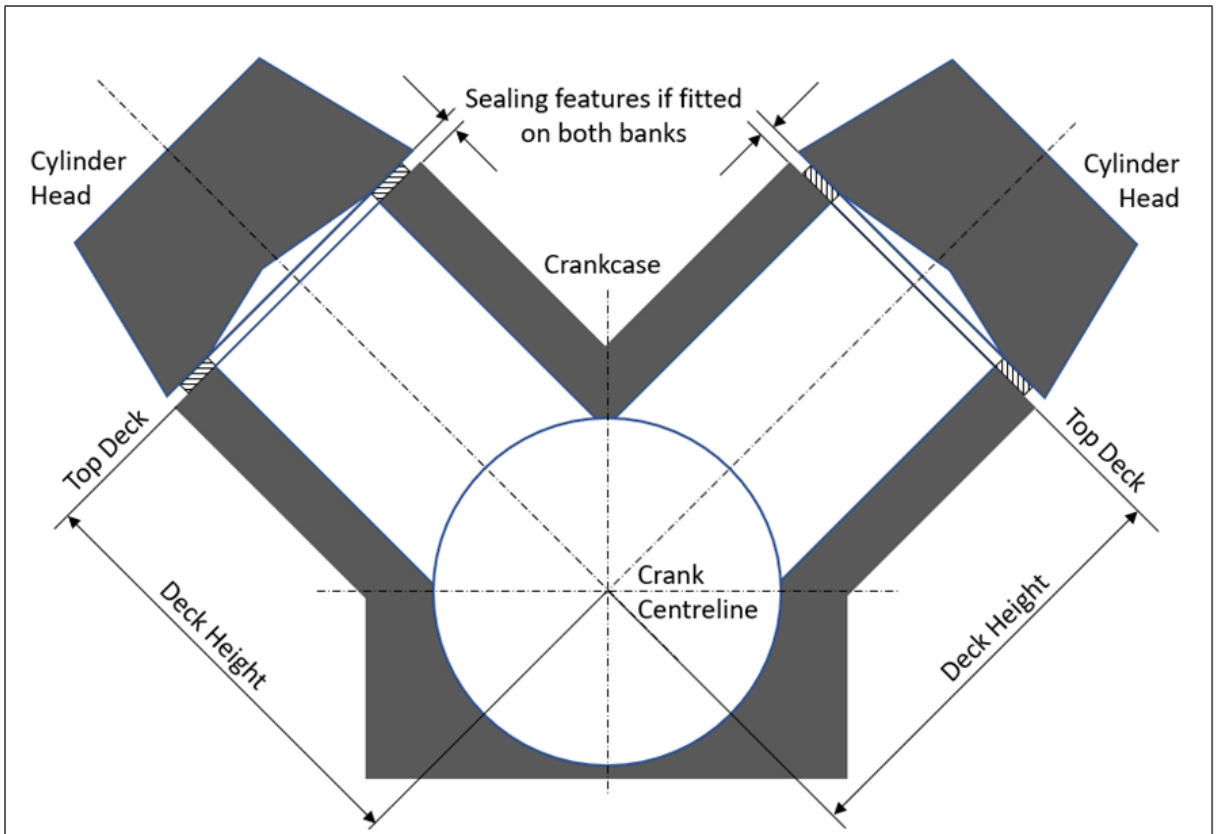
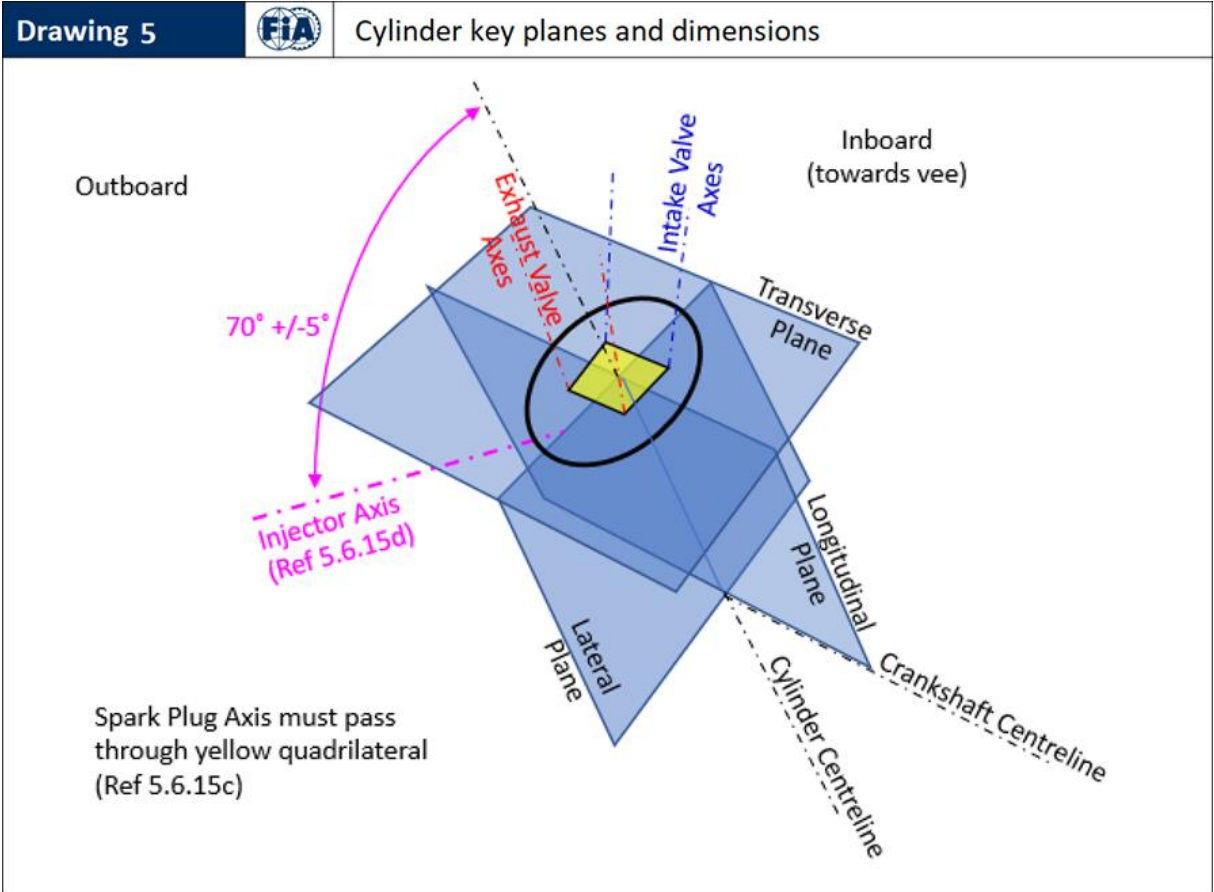
33.2 Once the profile in §33.1 is fully defined, it must be extruded in Y to Y = 500.

The fully defined surface in §33.2 is **RS-INTSN-LAM-RWD**.

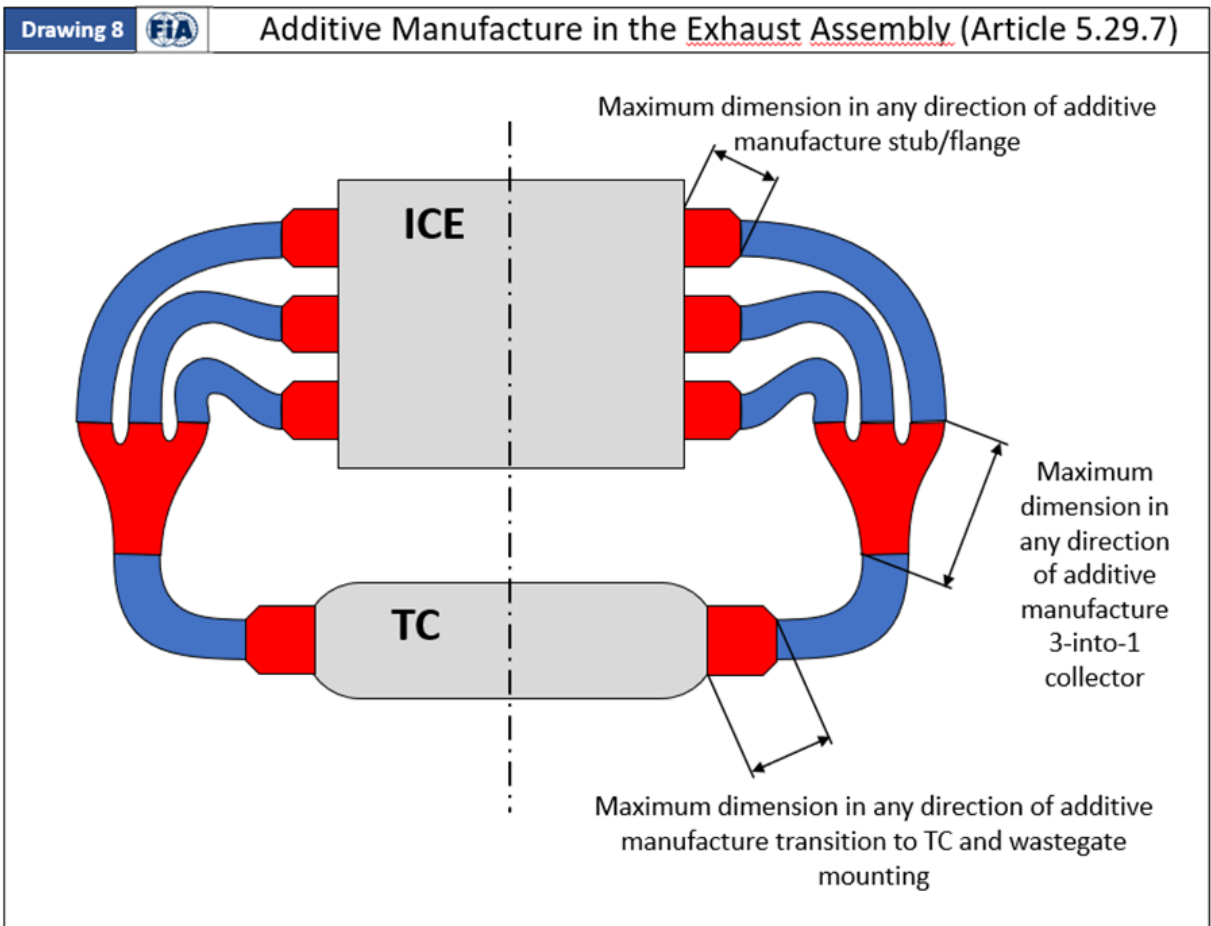
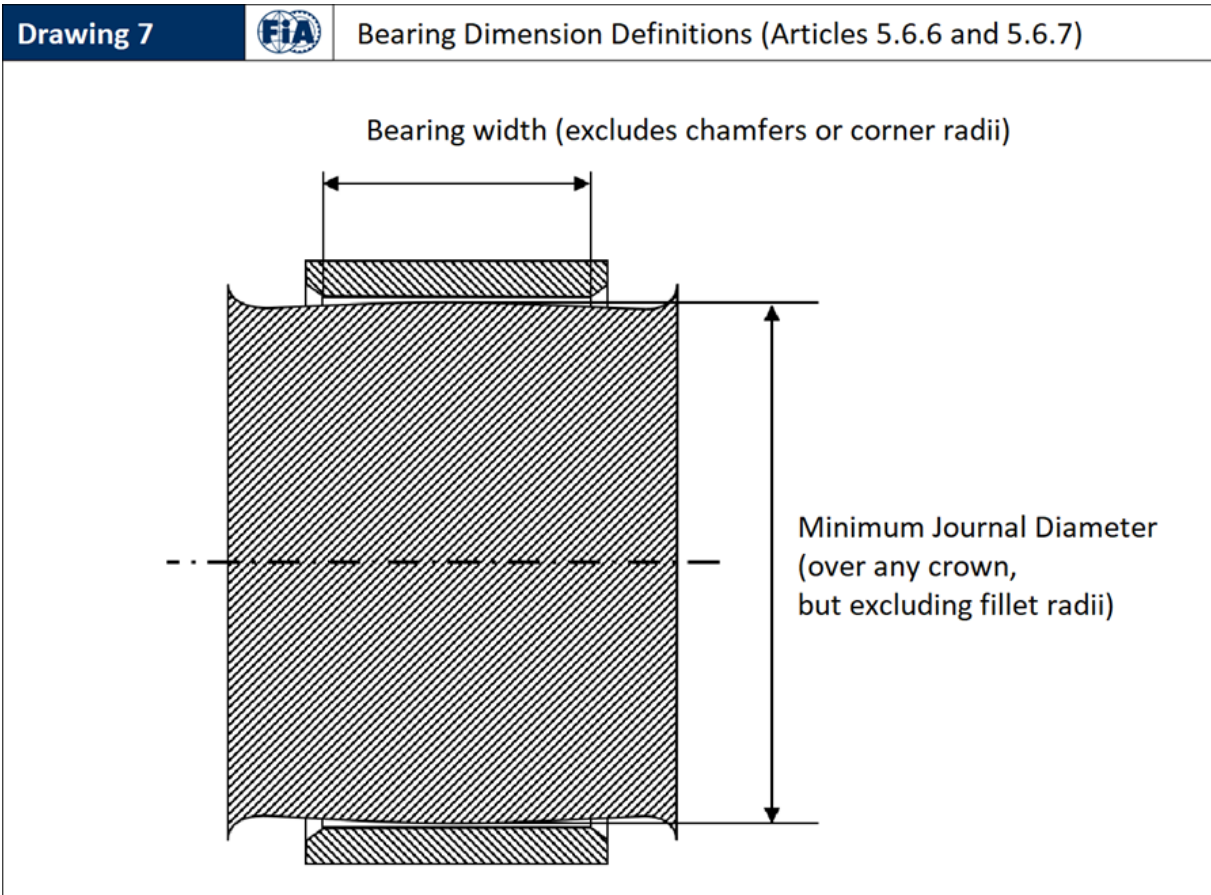
APPENDIX C3: DRAWINGS









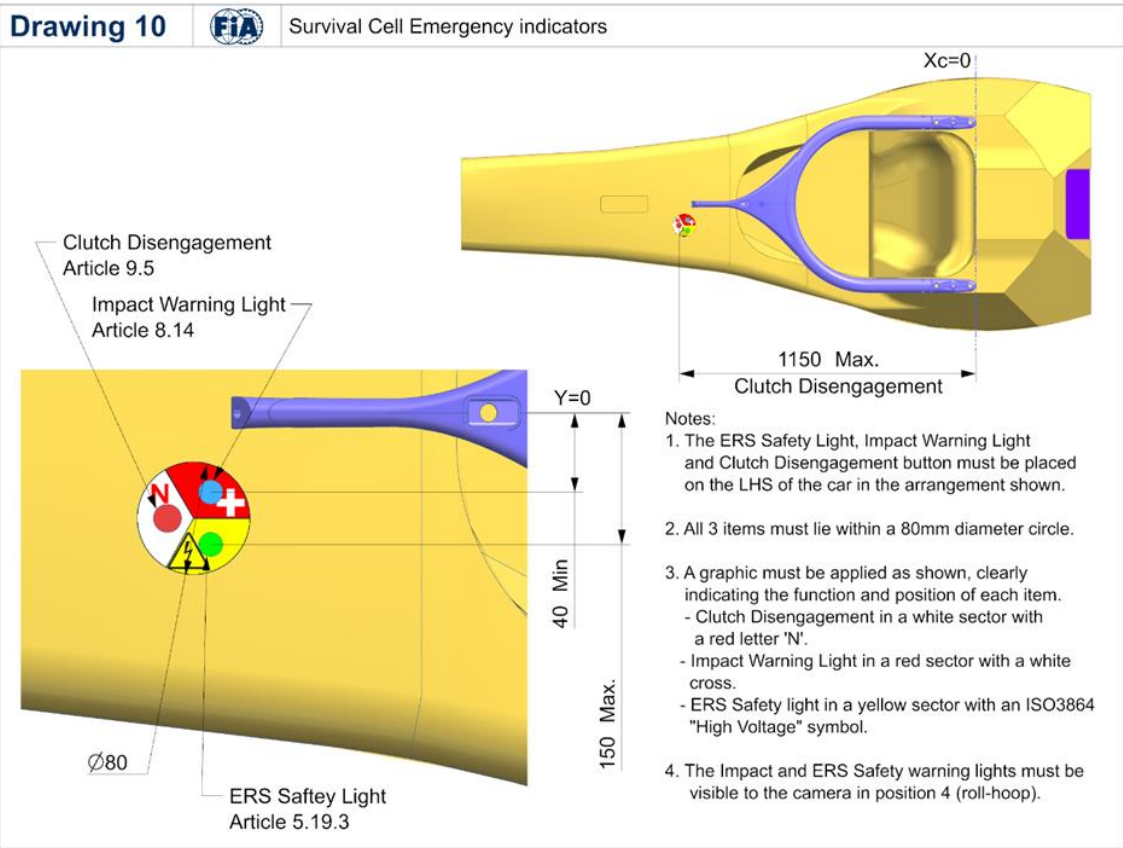


**Drawing 9** **2026 PU ELEMENT MINIMUM MASS LIMITS (for reference only)**

<b>ESME</b>	<b>MGUK</b>	<b>MGU-K Mechanical Transmission</b>	<b>ICE</b>	<b>TC</b>	<b>Powerbox</b>
Min <b>35kg</b>	Min <b>16kg</b>	Assumed <b>4kg</b>	No individual mass limit	Min <b>12kg</b>	No individual mass limit
Min ICE+TC+Powerbox <b>130kg</b>					

2026 PU MASS ALLOWANCES AS WEIGHED						
	ESME Min Mass as weighed	MGUK Min Mass as weighed	Not weighed		ICE Min Mass as weighed	TOTAL PU MINIMUM MASS
Drive in MGUK	> 35kg	> 20kg	> -	>	130kg	> 185kg
Drive Split	> 35kg	> 18kg	> -	>	132kg	> 185kg
Drive in ICE	> 35kg	> 16kg	> -	>	134kg	> 185kg



## APPENDIX C4: POWER UNIT SYSTEMS, FUNCTIONS, COMPONENTS AND SUPPLY PERIMETER

**Table 1: ‘Power Unit Components’** below provides all category allocations and specific permissible upgrade schedule for every part of the PU.

**Column 1** provides a description of the general area of the PU for the rows bracketed by the description and is for reference only.

**Column 2, ‘Item No’** provides a sequential item number for ease of navigation within the table and is for reference only.

**Column 3, ‘List of PU functions/systems/components’** provides a description of the functions, systems and components in enough detail to place any aspect of the PU into one of the columns. The understanding of what each of the elements listed refers to will be taken as that which is widely understood unless there are specific definitions elsewhere in the regulations. For these items, the definition will take precedence.

**Column 4, ‘PU Element’** identifies which of the six ‘Sealed Perimeter’ PU elements (ICE, TC, EXH, MGU-K, ESME or PU-CE) the item belongs to (see also Column 5). If the item does not belong to any of these six elements, then ‘EXC’ is shown in the column.

**Column 5, ‘Sealed Perimeter’** differentiates those items included in a PU element sealed perimeter (‘INC’) and those items excluded from a PU element sealed perimeter (‘EXC’).

The parts listed as ‘INC’ are included within the PU element shown in Column 4. Treatment of these items is defined in Article 2 of the F1 Sporting Regulations.

The parts listed as ‘EXC’ are not part of a PU element. Treatment of these items is defined in Article 2 of the F1 Sporting regulations.

**Column 6, ‘Supply Perimeter’** differentiates those items included in the PU supply within Power Unit Maximum Supply Price described in Tech Regs Appendix 5 Article 1.4.

**Column 7, ‘Reference Volume’** identifies which of the four PU Reference Volumes (RV-PU-; ICE, OT, TC or ERS) defined in Appendix 1 of these regulations the item belongs to. If the item does not belong to any of these four elements, the ‘EXC’ is shown in the column.

**Column 8, ‘PU Mass Group’** identifies which of the four PU Mass Groups (ICE, TC, MGU-K or ESME) the item belongs to. The minimum masses of the mass groups are defined in Articles 5.7.1, 5.5.4, 5.20.7 and 5.19.9 respectively. If the item does not belong to any of these four elements, the ‘EXC’ is shown in the column. For reference, Drawing 9 summarises all masses involved.

**Columns 9-14, Upgrade Schedule (Homologation Status)’** is described in Appendix 4.

**Columns 9-13** show which season the upgrades described in Appendix 4, Article 3 are permitted. A tick in a green cell indicates that the item may be upgraded for that season while a cross in a red cell indicates the item may not be upgraded in that season and must be carried over from the previous season – both subject to the provisions described in Appendix 4, Article 3.

**Column 14** refers to items that may be upgraded as described in Appendix 4, Article 4 – Additional Development and Upgrade Opportunities. A tick in a green cell indicates that the item may be upgraded if the PU Manufacturer is granted ADUO status. A cross in a red cell indicates that no upgrade is permitted even if the PU Manufacturer is granted ADUO status.

**Column 15, ‘Component Classification’** identifies which classification of components the item belongs to.

PU component classifications are described in Article 18 of these regulations and any item so regulated will be shown as one of the four PU component classifications (LPUC, SSPUC, OSPUC or DSPUC).

For those items associated with a car component classification, the table will show ‘App ~~5-C7~~’ referring to Appendix ~~C7 5 of the 2023 Technical Regulations. Once the 2026 Technical Regulations are subsequently expanded to include articles pertaining to the car, the references to App 5 will be replaced with the correct car component classification.~~

**Column 16, ‘Ancillary Components’** identifies those items which are considered as ancillaries, included in the sealed perimeter, and which are subject to the provisions of Article 2.1.4 of the Sporting Regulations.

Any other non-listed ancillary parts, considered minor but which are necessary for the assembly and normal operation of the Power Unit, must be considered as belonging to the main component they are attached to. As such, they benefit from the same category allocations except for the sealed perimeter from which they are excluded. Such parts are typically mountings, brackets, fixings, tubes, hoses, screws, bolts, studs, shims, nuts, washers, gaskets, O-rings and other seals. It is accepted that such parts can cross the boundaries between 2 reference volumes when they create a link between components belonging to these 2 volumes.

**Table 1: Power Unit Components**

PU Area	Item No	List of PU functions/ systems/ components	PU ELEMENT	SEALED PERIMETER	SUPPLY PERIMETER	REFERENCE VOLUME	PU MASS GROUP	UPGRADE SCHEDULE (HOMOLOGATION STATUS)					COMPONENT	CLASSIFICATION	ANCILLARY COMPONENTS
								2026	2027	2028	2029	2030			
ICE ASSEMBLY	1	Main ICE assembly comprising Crankcase, Cylinder heads (except combustion chamber and ports machining), Crankshaft, Camshaft (excluding camshaft lobe profiles), Cam drive, Cam covers, Front and rear covers, <del>Valvegear (valves, finger followers, air spring sub-assemblies).</del> Internal gear drives, any part which provides a structural connection between the survival cell and the gearbox case through the ICE mounting studs.	ICE	INC	INC	ICE	ICE	✓	x	x	x	x	✓	LPUC	

PU Area	Item No	List of PU functions/ systems/ components	PU ELEMENT	SEALED PERIMETER	SUPPLY PERIMETER	REFERENCE VOLUME	PU MASS GROUP	UPGRADE SCHEDULE (HOMOLOGATION STATUS)						COMPONENT	CLASSIFICATION	ANCILLARY COMPONENTS
								2026	2027	2028	2029	2030	ADUO			
	2	ICE-mounted water pumps, ICE oil pumps, ICE oil scavenge pumps, any air/oil separator Non-hydraulic actuators (to allow PU to function), ICE-mounted air valve compressors and storage bottles.	ICE	INC	INC	ICE	ICE	✓	x	x	x	x	x	✓	LPUC	YES
	3	Flywheel	EXC	EXC	INC	EXC	ICE								App 5	
	4	Main ICE assembly comprising Combustion chamber surface and pre-chamber detail within cylinder heads, piston, connecting rod, camshaft lobe profiles, intake and exhaust ports, <b>Valvegear air spring sub-assemblies.</b>	ICE	INC	INC	ICE	ICE	✓	✓	x	✓	x	✓	LPUC		
	5	Trumpets, Throttle system, Plenum	ICE	INC	INC	ICE	ICE	✓	✓	x	✓	x	✓	LPUC	YES	
	6	ICE intake air system components, other than those included in item 5 and downstream of those included in item <b>52-56</b>	ICE	INC	INC	EXC	ICE	✓	✓	x	✓	x	✓	LPUC	YES	
	7	PU mounted fuel system components <b>downstream of the High Pressure Fuel Pump</b> : (e.g., high pressure fuel hoses, fuel rails)	ICE	INC	INC	ICE	ICE	✓	x	x	x	x	✓	LPUC	YES	
	8	High Pressure Fuel Pump [5.1.10]	ICE	INC	INC	ICE	ICE	✓	x	x	x	x	✓	SSPUC	YES	
	9	ICE Fluid Filters (Oil, Fuel)	ICE	EXC	INC	ICE	ICE	✓	x	x	x	x	✓	LPUC		
	10	Fuel Injectors	ICE	INC	INC	ICE	ICE	✓	x	x	x	x	x	SSPUC	YES	
	11	Fuel Injector spray pattern tuning feature	ICE	INC	INC	ICE	ICE	✓	✓	x	✓	x	✓	LPUC		
	12	Knock Sensors [5.1.8]	ICE	EXC	INC	ICE	ICE	✓	x	x	x	x	x	SSPUC		
	13	Spark Plugs	ICE	EXC	INC	ICE	ICE	✓	✓	x	✓	x	✓	LPUC		
EXHAUST	14	Engine exhaust system (including thermal insulation, excluding fasteners and seals)	EXH	INC	INC	ICE	ICE	✓	✓	x	✓	x	✓	LPUC		
	15	Exhaust fasteners and seals	EXH	EXC	INC	ICE	ICE	✓	✓	x	✓	x	✓	LPUC		



PU Area	Item No	List of PU functions/ systems/ components	PU ELEMENT	SEALED PERIMETER	SUPPLY PERIMETER	REFERENCE VOLUME	PU MASS GROUP	UPGRADE SCHEDULE (HOMOLOGATION STATUS)						COMPONENT	CLASSIFICATION	ANCILLARY COMPONENTS
								2026	2027	2028	2029	2030	ADUO			
TURBO	16	TURBOCHARGER - Includes Compressor and Turbine Wheels, Shaft, Bearings, Centre, Compressor and Turbine Housings, Inlet VG Device	TC	INC	INC	TC	TC and ICE	✓	✓	x	✓	x	✓	LPUC		
	17	Turbocharger-mounted electrical components (e.g. wiring looms, non-regulatory sensors)	TC	EXC	INC	TC	TC and ICE	✓	✓	x	✓	x	✓	LPUC		
WG / POP-OFF	18	Wastegate or similar	EXH	INC	INC	ICE	ICE	✓	✓	x	✓	x	✓	OSPUC	YES	
	19	Pop-off valve or similar	ICE	INC	INC	ICE	ICE	✓	✓	x	✓	x	✓	OSPUC	YES	
ICE ELECTRICAL	20	ICE or EXH-mounted electrical components (e.g. wiring looms within legality volume, non-regulatory-sensors, actuators)	ICE	EXC	INC	ICE	ICE	✓	✓	x	✓	x	✓	LPUC		
	21	Clutch shaft regulatory torque sensor	EXC	EXC	EXC	EXC	EXC							App 5		
	22	ICE-mounted regulatory temperature and pressure sensors	ICE	EXC	INC	ICE	ICE	✓	x	x	x	x	x	SSPUC		
	23	Ignition coils	ICE	EXC	INC	ICE	ICE	✓	✓	x	✓	x	✓	DSPUC		
	24	FIA Standard ECU.	EXC	EXC	EXC	EXC	EXC							App 5		
ERS - MGU-K	25	MGU-K excluding mechanical power transmission components	MGU-K	INC	INC	ERS	MGU-K	✓	x	✓	x	✓	x	LPUC		
	26	ICE mounted MGU-K mechanical power transmission components, housing assembly and mounting accessories	ICE and/or MGU-K	INC	INC	ICE and/or ERS	MGU-K and/or ICE	✓	x	✓	x	✓	x	LPUC		
	27	MGU-K mounted MGU-K mechanical power transmission components, housing assembly and mounting accessories	MGU-K	INC	INC	ICE and/or ERS	MGU-K	✓	x	✓	x	✓	x	LPUC		
	28	MGU-K regulatory Torque sensor. Field sensor assembly	MGU-K	EXC	INC	ICE and/or ERS	MGU-K or ICE	✓	x	✓	x	✓	x	SSPUC		
	29	MGU-K torque sensor signal conditioning module (SCM)	MGU-K	EXC	INC	EXC	MGU-K or ICE or ESME		✓	x	✓	x	✓	x	SSPUC	

PU Area	Item No	List of PU functions/ systems/ components	PU ELEMENT	SEALED PERIMETER	SUPPLY PERIMETER	REFERENCE VOLUME	PU MASS GROUP	UPGRADE SCHEDULE (HOMOLOGATION STATUS)						COMPONENT CLASSIFICATION	ANCILLARY COMPONENTS
								2026	2027	2028	2029	2030	ADUO		
	30	The MGU-K torque sensor shaft, mounting accessories and the mechanical connection elements between K and ICE, if applicable.	ICE and/or MGU-K	EXC	INC	ICE and/or ERS	MGU-K or ICE	✓	x	✓	x	✓	x	LPUC	
	31	ERS-K phase conductors, associated interfaces and mounting accessories. MGU-K terminal box	MGU-K	EXC	INC	ERS	MGU-K	✓	x	✓	x	✓	x	LPUC	
	32	MGU-K electrical components fitted outside of sealed perimeter of item <del>25</del> 25 (e.g. wiring looms, non-regulatory sensors)	MGU-K	EXC	INC	ERS	MGU-K	✓	x	✓	x	✓	x	LPUC	
ERS - ES	33	ES Main Enclosure (ESME)	ES	INC	INC	ERS	ESME	✓	x	✓	x	✓	x	LPUC	
	34	Energy Store	ES	INC	INC	ERS	ESME	✓	x	✓	x	✓	x	LPUC	
	35	Regulatory DC sensors and Insulation monitoring device	ES	EXC	INC	ERS	ESME	✓	x	x	x	x	x	SSPUC	
	36	Safety devices (Fuses, Contactors, MSD, relays)	ES	EXC	INC	ERS	ESME	✓	x	✓	x	✓	x	LPUC	
	37	Busbars, connectors conductors, looms or any other component fitted inside the ESME that is not explicitly mentioned in any other rows of this table.	ES	EXC	INC	ERS	ESME	✓	x	✓	x	✓	x	LPUC	
PU-CE	38	CU-K	PU-CE	INC	INC	ERS	ESME	✓	x	✓	x	✓	x	LPUC	
	39	DC-DC Unit	PU-CE	INC	INC	ERS	ESME	✓	x	✓	x	✓	x	LPUC	
	40	Powerbox (ignition, injection, high pressure fuel pump driver)	PU-CE	EXC	INC	EXC	ICE	✓	x	x	x	x	x	SSPUC	
	41	General electrical devices <b>inside the ESME</b> , including Power distribution board, Driver for PU electric pumps, LV fuse box and any electronic box exclusively used for PU functionalities.	PU-CE	INC	INC	<del>EXC</del> ERS	<del>ICE</del> or ESME	✓	x	✓	x	✓	x	LPUC	
	42	General electrical devices <b>outside or on the ESME</b> , including Power distribution board, Driver for PU electric pumps, LV	PU-CE	INC	INC	EXC	ICE or ESME	✓	x	✓	x	✓	x	LPUC	

PU Area	Item No	List of PU functions/ systems/ components	PU ELEMENT	SEALED PERIMETER	SUPPLY PERIMETER	REFERENCE VOLUME	PU MASS GROUP	UPGRADE SCHEDULE (HOMOLOGATION STATUS)						COMPONENT	CLASSIFICATIO	ANCILLARY COMPONENTS
								2026	2027	2028	2029	2030	ADUO			
		fuse box and any electronic box exclusively used for PU functionalities.														
	43	Source of energy independent of the ES exclusively used for PU functionalities	ICE or PU-CE	EXC	INC	EXC	ICE or ESME	✓	x	✓	x	✓	x	LPUC		
OIL TANK	44	Main PU oil tank	ICE	INC	INC	OT	ICE	✓	x	x	x	x	✓	LPUC	YES	
	45	Oil level sensor	ICE	EXC	INC	OT	ICE	✓	x	x	x	x	✓	SSPUC		
	46	Catch tanks, any breather system connected to the PU excluding tubes and hoses	ICE	INC	INC	OT and ICE	ICE	✓	x	x	x	x	✓	LPUC	YES	
FUEL SYSTEM	47	Fuel cell including fuel bag, internal baffles/foam, fixings	EXC	EXC	EXC	EXC	EXC							App C7		
	48	Lift pump(s) and filter(s)	EXC	EXC	EXC	EXC	EXC							App C7		
	49	Collector including any NRVs, pressure sensors, level sensors, fill/drain ports, PRVs, running bleeds, filters, FIA sample tube	EXC	EXC	EXC	EXC	EXC							App C7		
	50	Primer pump(s)	EXC	EXC	EXC	EXC	EXC							App C7		
	51	Pressure and temperature sensors at inlet and outlet of FFM and at inlet of high pressure fuel pump	EXC	EXC	EXC	EXC	EXC							App C7		
	52	FFM (regulatory fuel flow meter) [5.1.11]	EXC	EXC	EXC	EXC	EXC							App C7		
	53	Breakaway valves and any filters	EXC	EXC	EXC	EXC	EXC							App C7		
ICE COOLERS	54	Secondary heat exchangers for water and oil plus any associated accessories, header tanks, connections to the ICE, tubes, pipes, hoses, and fixings	EXC	EXC	EXC	EXC	EXC							App C7		
	55	Primary heat exchangers for water, oil and any associated accessories, header tanks, connections to the ICE, tubes, pipes, hoses, and fixings	EXC	EXC	EXC	EXC	EXC							App C7		



PU Area	Item No	List of PU functions/ systems/ components	PU ELEMENT	SEALED PERIMETER	SUPPLY PERIMETER	REFERENCE VOLUME	PU MASS GROUP	UPGRADE SCHEDULE (HOMOLOGATION STATUS)						COMPONENT	CLASSIFICATION	ANCILLARY COMPONENTS
								2026	2027	2028	2029	2030	ADUO			
	56	ICE intake air heat exchangers and their associated accessories (including but not limited to housings, supports, brackets, fasteners and maximum 2 simple and smooth bore outlet tubes for intake air lines)	EXC	EXC	EXC	EXC	EXC								App C7	
ERS COOLING	57	ICE-mounted ERS cooling system including pumps, associated motors, actuators, excluding tubes and hoses	PU-CE	INC	INC	ICE and/or ERS	ICE	✓	x	✓	x	✓	✓	LPUC	YES	
	58	Non ICE-mounted ERS cooling system including pumps, associated motors, actuators, excluding tubes and hoses	PU-CE	INC	INC	ICE and/or ERS	ESME	✓	x	✓	x	✓	✓	LPUC	YES	
	59	Primary and Secondary heat exchangers for ERS cooling fluid plus any associated accessories, header tanks, tubes, pipes, hoses, and fixings connecting to items 33, 57, 58	EXC	EXC	EXC	EXC	EXC								App C7	
	60	ICE-mounted ERS cooling system filters	PU-CE	EXC	INC	ICE	ICE	✓	✓	✓	✓	✓	✓	LPUC		
CLUTCH	61	Clutch and clutch actuation system between the PU and the gearbox	EXC	EXC	EXC	EXC	EXC							App C7		
HYDRAULICS	62	ICE-mounted hydraulic pump including associated brackets, fixings, tubes and hoses	EXC	EXC	EXC	EXC	EXC							App C7		
	63	Hydraulic system servo valve(s) for PU control.	ICE	INC	INC	EXC	ICE	✓	x	x	x	x	✓	LPUC	YES	
	64	Hydraulic system actuator(s) for PU control	ICE	INC	INC	ICE	ICE	✓	x	x	x	x	✓	LPUC	YES	
	65	Hydraulic system (e.g., accumulators, manifolds, servo-valves, solenoids, actuators, hoses) other than servo valve(s) and actuator(s) for PU control.	EXC	EXC	EXC	EXC	EXC								App C7	
	66	ICE-mounted hydraulic circuit filters	ICE	EXC	INC	EXC	ICE	✓	✓	✓	✓	✓	✓	LPUC		

PU Area	Item No	List of PU functions/ systems/ components	PU ELEMENT	SEALED PERIMETER	SUPPLY PERIMETER	REFERENCE VOLUME	PU MASS GROUP	UPGRADE SCHEDULE (HOMOLOGATION STATUS)						COMPONENT	CLASSIFICATION	ANCILLARY COMPONENTS
								2026	2027	2028	2029	2030	ADUO			
INSTALLATION AND MISCELLANEOUS	67	Fuel feed pumps delivering less than 10 bar <sub>G</sub> and their associated accessories (included but not limited to tubes, hoses, supports, brackets, and fasteners).	EXC	EXC	EXC	EXC	EXC								App C7	
	68	Heat Shields and associated mounting hardware.	EXC	EXC	EXC	EXC	EXC								App C7	
	69	PU air valve regulators	ICE	EXC	INC	EXC	ICE	✓	✓	✓	✓	✓	✓	LPUC		
	70	Any ancillary equipment associated with the PU air valve system excluding regulators (e.g., pneumatic bottles, hoses, filling valves).	ICE	EXC	INC	EXC	ICE	✓	✓	✓	✓	✓	✓	LPUC		
	71	Intake upstream of compressor inlet/VG Intake device up to and including the air filter.	EXC	EXC	EXC	EXC	EXC								App C7	
	72	Exhaust beyond turbine exit and WG exit and associated brackets, support, screws, nuts, dowels, washers, or cables.	EXC	EXC	EXC	EXC	EXC								App C7	
	73	Any breather system ducting between the PU and the orifice referenced in 5.3.9.	EXC	EXC	EXC	EXC	EXC								App C7	
	74	Wiring harnesses attached to the PU which are not ordinarily part of a power unit (car looms)	EXC	EXC	EXC	EXC	EXC								App C7	
	75	Studs used to mount PU to the Survival Cell or gearbox.	EXC	EXC	EXC	EXC	EXC								App C7	
	76	Boost pressure measurement devices	EXC	EXC	INC	EXC	EXC	✓	✗	✗	✗	✗	✗	SSPUC		
77	Lambda sensor(s) [5.10.4]	EXC	EXC	INC	EXC	EXC	✓	✓	✗	✓	✗	✓	DSPUC			
FLUIDS	78	Fuel	EXC	EXC	EXC	EXC	EXC	✓	✓	✗	✓	✗	✓			
	79	Engine oil	EXC	EXC	EXC	EXC	EXC	✓	✓	✗	✓	✗	✓			
	80	Hydraulic fluid	EXC	EXC	EXC	EXC	EXC	✓	✓	✓	✓	✓	✓			
	81	Engine Coolant	EXC	EXC	EXC	EXC	EXC	✓	✓	✓	✓	✓	✓			

PU Area	Item No	List of PU functions/ systems/ components	PU ELEMENT	SEALED PERIMETER	SUPPLY PERIMETER	REFERENCE VOLUME	PU MASS GROUP	UPGRADE SCHEDULE (HOMOLOGATION STATUS)						COMPONENT	CLASSIFICATION	ANCILLARY COMPONENTS
								2026	2027	2028	2029	2030	ADUO			
	82	ERS Coolant Fluid	EXC	EXC	EXC	EXC	EXC	✓	✓	✓	✓	✓	✓			
BALLAST	83	Any ballast mounted on the PU in order to reach the mass requirement is permitted ICE Ballast (subject to Article C4.4)	ICE	INC	INC	ICE	ICE	✓	✓	✓	✓	✓	✓	LPUC		

**Table 2: ‘Additional Power Unit matters affecting the Supply Perimeter’** below relates to additional PU functions, systems and components not included within the PU component definition defined in Table 1 and classifies them as included in or excluded from the Supply Perimeter.

**Column 1** provides a description of the general area of the PU – in this case Operational matters and is for reference only.

**Column 2, ‘Item No’** provides a continuation of the sequential item number from Table 1 for ease of navigation within the table and is for reference only.

**Column 3, ‘List of PU functions/systems/components’** provides a description of the functions, systems and components in enough detail to differentiate what is included in or excluded from the Supply Perimeter.

place any aspect of the PU supply described into one of the columns. The understanding of what each of the elements listed refers to will be taken as that which is widely understood unless there are specific definitions elsewhere in the regulations. For these items, the definition will take precedence.

**Column 4, ‘Supply Perimeter’** differentiates those items included in the PU supply within Power Unit Maximum Supply Price described in Tech Regs Appendix 5 Article 1.4. ‘INC’ is included in the Supply Perimeter and ‘EXC’ is excluded from the Supply Perimeter.

**Table 2: Additional Power Unit matters affecting the Supply Perimeter**

	Item No	List of PU functions/ systems/components	SUPPLY PERIMETER
Operational	84	PU and spares for all Competitions in F1 World Championship plus 5000 km testing.	INC
	85	Minimum number of PUs per team to be (number of PUs per driver per season according to F1 Sporting Regulations) x 2 + Necessary number of units to achieve 5000 km of testing.	INC

86	Additional PUs or spares required to replace units out of service due to accident damage or other cause induced by team will be outside the supply perimeter and will incur additional charges	EXC
87	Demo event Power Units	EXC
88	Transport of Power Units and support equipment from Manufacturer's factory to event	EXC
89	Personnel to support Power Unit (5 people per Competitor) at test and race events	INC
90	Travel, accommodation, and reasonable expenses for support personnel	EXC
91	Quantity of manufacturer specified fuel and oil	EXC
92	Garage equipment defined as compulsory by Manufacturer (e.g., battery management)	INC
93	Garage IT equipment, connection to factory, servers, telemetry, radio, team clothing	EXC
94	Dyno testing of installation components (Y hours or km)	EXC

**APPENDIX C5: HOMOLOGATION AND DEVELOPMENT OF POWER UNITS, FUEL AND OIL FOR 2026-2030****1 Homologation dossier**

- 1.1 Any PU Manufacturer registered in accordance with the procedures set out in Article 1 of Appendix 5 to supply Power Units for use by one or more Competitors in the 2026 to 2030 Championships must submit to the FIA a Power Unit homologation dossier before 1 March of the first year in which it intends to supply such power unit for use during the Championship period indicated. Each PU Manufacturer shall be permitted to present only one homologation dossier with respect to the period and the homologation granted will be valid until the end of the 2030 Championship.
- 1.2 The homologation dossier must:
- include details of all the parts described as “ICE”, “PU-CE”, “EXH”, “TC”, “ES” and “MGU-K” in the “PU ELEMENT” column of Appendix C4 3 of the Technical Regulations.
  - include a detailed list of all minor parts associated with ancillary components (as described in Appendix C4 3 of the Technical Regulations) which may be replaced when those components are fitted, removed or swapped between Power Units. This list must be approved by the FIA.
  - include all documents required in Article 1 of this Appendix.
  - be submitted and updated according to the procedure detailed in the Appendix of the Regulations.
- 1.3 A Power Unit will be homologated for a Competitor once a complete homologation dossier has been submitted by the relevant Power Unit Manufacturer and has been approved by the FIA, such approval to take place within 14 days from the submission of the homologation dossier.
- 1.4 Each Power Unit Manufacturer must submit one homologation dossier which applies to all Competitors it intends to supply. Only the fuel specification, the engine oil specification, the ~~parts hoses~~ defined in item ~~66~~ 69 and 70 of Appendix C4 and Power Unit wirings may differ between Competitors. In this event they must be declared separately in the dedicated sections of the homologation dossier.
- All Power Units supplied by a single Power Unit Manufacturer must also be operated in the same way, they must therefore be:
- Identical according to the dossier for each Competitor.
  - Run with identical software for PU control and capable of being operated in precisely the same way.
  - Run with identical specifications of engine oil and fuel, and associated software calibrations, unless an alternative supplier is preferred by a customer Competitor.
- 1.5 PU Manufacturers carrying out modifications to the homologated Power Unit under the provisions of Article 3 of this Appendix must submit to the FIA an updated homologation dossier at least 14 days before the first introduction of the requested modifications in a Competition. The homologation dossier thus submitted:
- Will not constitute a new dossier but will instead be considered as updates to the initial dossier

- b. Must have a clear indication of version number, and all the new changes appropriately highlighted.

## 2 Information provided by the PU Manufacturer to their customer Competitors

Any PU Manufacturer intending to supply a Power Unit to a Competitor during a Championship (year N) must:

- a. Declare to the FIA, before 1 August of year N-1, that they provided to their customer Competitors:
  - i. An initial full external space model of the Power Unit including details and locations of all physical interfaces required by the team to install the Power Unit.
  - ii. Preliminary estimates of important operating parameters such as heat rejection, fuel mass and density, clutch shaft stiffness and engine stiffness.
- b. Declare to the FIA, before 1 November of year N-1, that they provided to their customer Competitors:
  - i. A final full external space model of the Power Unit including details and locations of all physical interfaces required by the team to install the Power Unit.
  - ii. Firm predictions of important operating parameters such as heat rejection, fuel mass and density, clutch shaft stiffness and engine stiffness.
  - iii. Initial details of any other parts, procedures, operating conditions and limits or any other information required by the team to install and operate the Power Unit as intended.

After the 1 August of year N-1, any significant change compared to previous communication, must be notified to the customer Competitors in due time. Should a customer Competitor consider that the change has an unreasonable impact on the Power Unit installation in the car, they may contact the FIA within 7 days of the notification. The FIA will then contact the relevant PU Manufacturer and its customer Competitors in order to conduct its investigation. If the FIA is satisfied, in its absolute discretion, that these changes are acceptable, the FIA will confirm to the PU Manufacturer and the customer Competitors within 14 days that they may be carried out.

## 3 Permitted upgrades for the Power Unit

- 3.1 Following the first homologation of a Power Unit by a PU Manufacturer in the period 2026-2030, upgrades to Power Unit components may only be carried out if they are specifically covered by the provisions of this Article 3.
- 3.2 For the years 2027, 2028, 2029 and 2030, upgrades to the components marked with a “✓” in the table of Appendix 3, in the relevant column for each year, may be carried out. Such upgrades must be introduced for the first Competition of the year when they are allowed and used for the whole Championship season.
- 3.3 PU Manufacturers who fulfil the criteria described by Article 4 of this Appendix in year N, will be permitted to upgrade the components marked with a “✓” in the column “ADUO” in the table of Appendix 3 for the first Competition in year N+1.
- 3.4 Components may be modified in order to comply with an amendment to the published regulations or issued FIA guidance. Such modifications must be first approved by the FIA.

- 3.5** Minimal incidental changes may be carried out for car installation purposes to the following components of the Power Unit, subject to the approval process outlined in Article 3.10.a of this Appendix:
- a. Wirings
  - b. Exhaust system, provided the key defining parameters of the system (diameters, lengths, etc.) remain fundamentally unchanged
  - c. Turbo-compressor position (within 20mm from the original position in relation to the ICE), turbo clocking, turbo supports
  - d. Position of the wastegates with housings and pipes
  - e. Position of the pop-off valves with housings and pipes
  - f. Engine intake air system as defined in item 6 of Appendix C4, provided the key defining parameters of the system (diameters, lengths, etc.) remain fundamentally unchanged
  - g. Hoses defined in item ~~66~~ 70 of Appendix C4
- 3.6** Modifications may be made to Power Unit components for the sole purposes of reliability, safety, cost saving, or supply issues, subject to the approval process outlined in Article 3.10.a of this Appendix.
- 3.7** Minor modifications may be made to Power Unit components subject to the approval process outlined in Article 3.10.a of this Appendix. Such modifications may be (but are not limited to) due to different branding, a change of supplier, a change of part number, etc. and may have no or very limited effect on reliability or functionality.
- 3.8** Requests for repair of a Power Unit component in the form of a patch made of the same material or of a composite material, following damage or failure, may be accepted if it is only local and minimal. If accepted, such repair can be applied on a temporary basis to all components available. If the repair is made of a different material, such a repair must not be present on the components used during the following Championship season.
- 3.9** Changes of fuel and oil suppliers will be accepted, provided such changes are intended for commercial and not for performance reasons.
- 3.10** The following additional constraints apply to the permitted modifications discussed in this Article 3:
- a. To carry out modifications under the provisions of Articles 3.5, 3.6 and 3.7 of this Appendix, PU Manufacturers must apply in writing to the FIA Technical Department and must provide all necessary supporting information including, where appropriate, clear evidence of failures. The FIA will circulate the correspondence to all Power Unit Manufacturers for comment. If the FIA is satisfied, in its absolute discretion, that these changes are acceptable, they will confirm to the Power Unit Manufacturer concerned that they may be carried out.

Wherever practical, such requests must be submitted at least 14 days before the requested date of homologation.

The procedure and associated document templates that must be used by the Power Unit Manufacturers for their requests are available in the Appendix of the Regulations.

- b. Any permitted modifications concerning parts that are inside the sealed perimeter (i.e. parts described as “INC” in the “Sealed Perimeter” column of Appendix ~~C4-3 of the Technical Regulations~~) can only be applied to new Power Unit elements.
- c. With reference to the Sporting Regulations, if a Power Unit Element is subsequently replaced by another of a different specification after ~~Sprint and Race Qualifying Session~~ ~~qualifying practice~~, the replacement Power Unit part will be considered the same in design and similar in mass, inertia and function if any differences it contains are limited to components modified under the provisions of Articles 3.6, 3.7 and 3.8 of this Appendix.
- d. A customer Competitor may refuse or request a delay of a Power Unit modified under the provisions of Articles 3.6 and 3.7 of this Appendix if such modifications cause installation issues in their car. In such cases, the customer Competitor must apply in writing to the FIA Technical Department and must provide all necessary supporting information. If the FIA is satisfied, in its absolute discretion, that the installation issues are genuine, they will confirm approval to the customer Competitor and to the PU Manufacturer. In this case, the provisions of (e) below won't apply.
- e. The first time one or more Power Units comprising modified parts, as permitted by Article 3.6 of this Appendix, are used in any of the cars powered by the Power Unit Manufacturer, a minimum of 1 Power Unit with the exact same specification must be available for each Competitor. Each Competitor will have priority use of one of these Power Units until the end of the first day of the Competition.

In the case of a Manufacturer supplying Power Units to more than 2 Competitors, one exception per Championship season can be granted by the FIA, in its absolute discretion, in the event of genuine supply issues. The request must be made in writing to the FIA Technical Department and must provide all necessary information and evidence of the supply issue. If the FIA is satisfied, the minimum required number of Power Units available for all Competitors may be reduced to 2 for the Event where the modified part is used for the first time.

- f. Any new Power Unit element used for the first time in a Competition must always include all modifications included in any Power Unit element already used by any of the cars powered by the PU Manufacturer.
- g. The requirements of e. and f. don't apply to minor modifications as defined in 3.7.
- h. A Power Unit element will be deemed to have been used once the car's timing transponder has shown that it has left the pit lane.

**3.11** Minimal incidental changes may be carried out on PU components as a consequence of changes made to another PU component with a different upgrade schedule. Such modifications are subject to the approval process outlined in Article 3.10.a of this Appendix.

#### **4 Additional Development and Upgrade Opportunities**

Over the first five Competitions of each Championship Season in the 2026-2030 period, the FIA will monitor the performance of Internal Combustion Engine (ICE) part of all the Power Units supplied by each PU Manufacturer to its customer Competitors.

For each ICE supplied by the PU Manufacturers, an average power will be calculated. The methodology to calculate this power can be found in the Appendix to the Regulations.



Any PU Manufacturer whose ICE power is more than 3% below that of the highest ICE power recorded amongst all the PU Manufacturers will be granted Additional Development and Upgrade Opportunities (“ADUO”).

PU Manufacturers granted ADUO may implement further upgrades (as described in Article 3.2 of this Appendix) and extend the usage of their PU Test Benches (as described in Article 3.7 of Appendix 1 of the Sporting Regulations).

The FIA reserves the right to:

- a. Revoke the ADUO if the performance demonstrated by the PU Manufacturer after the first five Competitions is inconsistent with that measured during the first five Competitions.
- b. Take measures, to its absolute discretion, if the resulting upgrades implemented by the PU Manufacturer under the provisions of Article 3.2 of this Appendix give that PU Manufacturer an advantage that is deemed to be unfair in comparison to PU Manufacturers who were not awarded any ADUO. Such measures will be discussed in good faith with all PU Manufacturers.

## **5 Conformity with the power unit homologation dossier**

All Power Units must be delivered such that the seals required under Article 2.1.9 of the Sporting Regulations can be fitted. Both the Power Unit Manufacturer and users of a homologated Power Unit must take whatever steps are required at any time by the FIA Technical Department, in its absolute discretion, to demonstrate that a Power Unit used at a Competition is in conformity with the corresponding Power Unit homologation dossier.

**APPENDIX C6: SUPPLY OF POWER UNITS, FUEL AND OIL FOR 2026-2030****1 Supply of Power Units for the 2026 to 2030 FIA Formula 1 World Championship****1.1 Registration Requirement and Effect for Power Unit Manufacturers**

1.1.1 Any entity that wishes to supply Power Units (“**PU**s”) to one or more Competitors (including a Competitor that is the same legal entity as the supplier or that is affiliated to the supplier) (a “**PU Manufacturer**”) for use in one or more editions of the Championship taking place in seasons 2026 to 2030 must complete the PU Manufacturer registration form, enter into the PU Manufacturer Non-Assert Agreement (as defined in Article 3 below) and also enter into the “2026 F1 PU Governance Agreement”.

1.1.2 The deadline for a PU Manufacturer wishing to supply Power Units starting from year N in this period to complete the PU Manufacturer registration form will be: (a) 30 June of year N-4; (b) 30 days after the publication of the first set of 2026 PU Technical, Sporting and Financial Regulations; (c) 15 October 2022, whichever is the later.

1.1.3 The acceptance (or otherwise) by the FIA of a PU Manufacturer registration form and any confirmation of registration will be at the sole discretion of the FIA. The FIA also reserves the right, at its sole discretion, to accept the registration of a PU Manufacturer who has failed to comply with the deadline defined in Article 1.1.2 of this Appendix. A PU Manufacturer whose registration is accepted notwithstanding its failure to meet the deadline set out at Article 1.1.2 of this Appendix must comply with the requirements of Article 1.1.1 of this Appendix, and additionally demonstrate to the FIA that the failure to comply with of any aspects of the registration process defined in this Appendix has not led to that PU Manufacturer obtaining any competitive or financial advantage over any other PU Manufacturer. The FIA will review any such information provided at its sole discretion.

1.1.4 Notwithstanding any confirmation of registration provided by the FIA, the registration of a PU Manufacturer will only be complete (and so will only become valid and effective) upon the applicant’s payment to the FIA of the applicable administrative fee and its entry into the PU Manufacturer Non-Assert Agreement and the 2026 F1 PU Governance Agreement.

**1.2 Obligations related to the supply of Power Units to a Competitor for the year N**

1.2.1 Each PU Manufacturer of a homologated PU must provide the FIA, before 15 May of year N-1, with the list of Competitors (clearly identifying the appointed “works/factory” Competitor (also referred to as the “Nominated Competitor”)) with which it has concluded a supply agreement for the given Championship season N.

Save for exceptional circumstances, as determined in the FIA’s absolute discretion, the appointed works / factory Competitor must be identified using the following criteria:

- a. If the PU Manufacturer supplies only one Competitor, and/or if only one Competitor belongs to the Legal Group Structure of the PU Manufacturer, then that Competitor will be the works / factory Competitor; or
- b. If the criteria of point (a) do not apply, the works / factory Competitor will be the Competitor who earned the highest Constructors Championship finishing position in the Championship season N-2.

**1.2.2** A PU Manufacturer, if called upon to do so by the FIA before 1 June of year N-1, must supply at least a number of Competitors (“T”) equal to the following equation:

$T = (N_{TOT} - A) / (B - C)$ , where:

T is rounded up to the next whole integer

A = Total number of Competitors (including “works/factory” Competitors) having a supply agreement concluded for year N with a New PU Manufacturer.

B = Total number of manufacturers of homologated PUs for year N.

C = Total number of New PU Manufacturers for year N.

$N_{TOT}$  = is set to 11 and is related to the “total number of entered Competitors” for year N, which is not known until November of year N-1. This number may be reviewed if the number of Competitors exceeds 12.

In doing so, the FIA will first allocate the PU supply between the PU Manufacturers that are supplying the fewest number of Competitors, provided that the Competitors without a supply agreement shall be allocated to the PU Manufacturer(s) that supply or supplies the fewest Competitors and so on and so forth. If there is more than one PU Manufacturer supplying the fewest number of Competitors (i.e. in the same position) and/or more than one Competitor requesting a supply the allocation between such PU Manufacturers shall occur by ballot (which ballot shall be transparent and undertaken by the FIA in the presence of a representative of each of the PU Manufacturers and the New Customer Competitors (as defined below) concerned).

Any such allocation made by the FIA in accordance with this Article will have to be formalised by a supply agreement with the relevant Competitor by 1 August of year N-1 at the latest.

A New PU Manufacturer will not be required to comply with the obligation of supply as set out above.

**1.2.3** Unless agreed otherwise by the FIA, each of the PU Manufacturers of a homologated PU may not directly or indirectly supply PUs for more than (T+1) teams, with T as defined in Article 1.2.2.

**1.2.4** Any PU Manufacturer of a homologated PU wishing to cease the supply of PUs must notify the FIA of its intention to do so no later than 1 January of the year preceding that in which such PUs will no longer be supplied.

**1.2.5** The FIA and all the PU Manufacturers may agree in writing to temporarily revise the dates set out in Articles 1.2.1 and 1.2.2 of this Appendix.

### **1.3 Obligation to the supply Power Units to a New Customer Competitor for the year N**

The FIA shall be entitled to request a PU Manufacturer to supply a Competitor (“New Customer Competitor”) with a PU under the terms of this Appendix except if, at the date set out in Article 1.2.1 of this Appendix above:

Such Competitor has entered into a supply agreement with a PU Manufacturer for year N before the date set out in Article 1.2.1 of this Appendix above, and

Such Competitor has been granted a right, under a currently binding offer with a PU Manufacturer, to be supplied with a PU for year N.

Moreover, such PU Manufacturer shall only be required to supply a New Customer Competitor if the following cumulative conditions are met. If such conditions are not met, then the PU Manufacturer may, at its sole and absolute discretion, decline the request to supply such New Customer Competitor and the decline of such request shall not be deemed to be a breach of the terms set out in this Appendix. However, this Article 1.3 cannot be applied or interpreted by the PU Manufacturer in a way that would deprive the obligation of supply as referred to in Article 1.2 of this Appendix above of any effect and/or that would prevent the FIA from making and enforcing the provisions set out in Article 1.2 of this Appendix.

The PU Manufacturer undertakes to exercise in good faith the conditions referred to in Articles 1.3.1 to 1.3.11 below).

The Competitors and the PU Manufacturers remain free to negotiate the terms of the supply agreement, subject to the fall-back positions set out below which shall apply should a Competitor and a PU Manufacturer fail to reach an agreement, despite negotiating in good faith.

**1.3.1** For the purpose of this Article 1.3.1, supply contract only refers to the contract related to the FIA Supply Perimeter as set out in the relevant column of the two tables in Appendix ~~C4 9~~ of the ~~Technical Regulations~~.

- a. Any supply contract entered into with the New Customer Competitor must be on substantially the same terms as those entered into between the PU Manufacturer and the other customer Competitors (other than its appointed “works/factory” Competitor) to whom it already supplies a PU at the date of the FIA request (“Existing Customer Competitor”), other than the Price as referred to in paragraph 8 below. In particular, the PU Manufacturer may impose, and the Competitor cannot refuse to sign up to any terms which at least one of its other Existing Customer Competitors has agreed to and the PU Manufacturer may refuse and the Competitor cannot request the inclusion of terms which are not included in the supply agreements with other Existing Customer Competitors.
- b. In the event that a PU Manufacturer has not supplied a PU to any other Existing Customer Competitor, the PU Manufacturer shall have the right to decide, at its sole and exclusive discretion, the payment terms and conditions (including the price of additional goods and services not included in the supply perimeter designated “EXC” in the relevant column of the two tables in Appendix ~~C4 9~~ of the ~~Technical Regulations~~, but excluding the Price which shall be determined in compliance with the definition of Price below) applicable to the New Customer Competitor subject to the provisions of paragraph 1.3.8 below.
- c. In case of a dispute about the application or the interpretation of paragraph 1.3.1 hereto, the FIA will be entitled to request copies of the contracts being entered into by the PU Manufacturer with any customer Competitor, provided that such contracts are not disclosed to any new Customer Competitor and subject to the FIA agreeing to comply with strict customary confidentiality obligations.

**1.3.2** The PU Manufacturer shall determine, at its sole and absolute discretion, the duration of the term of the PU supply which:

- a. may not be less than one Championship season; and

- b. shall not exceed three Championship seasons nor go beyond the end of the 2030 Championship season, unless jointly agreed by the PU Manufacturer and the New Customer Competitor
- 1.3.3** The PU Manufacturer shall determine, at its sole and absolute discretion, whether the New Customer Competitor shall use the name of the PU Manufacturer or the New Customer Competitor shall operate under a white label/unbranded way and, for this purpose, use a different name:
- a. The use of this different name shall always be agreed in advance by the PU Manufacturer, which agreement shall not be unreasonably withheld; and
- b. In the event that the white label/unbranded supply is required without being requested by the New Customer Competitor, this supply will not incur additional fees for the New Customer Competitor except if the use of the PU name leads to the conclusion of a commercial agreement between the New Customer Competitor and any third party. In that case, the PU Manufacturer and the New Customer Competitor shall enter into good faith negotiations and shall commonly agree on the fair and reasonable part of the revenues generated by the commercial agreement which could be considered as additional fees;
- c. In the event that the white label/unbranded supply is requested by the New Customer Competitor and agreed by the PU Manufacturer, this supply may incur additional fees for the New Customer Competitor, such fees being determined at the sole and exclusive discretion of the PU Manufacturer in a fair and reasonable manner.
- 1.3.4** The New Customer Competitor shall provide a warranty that it has no binding contracts or option(s) in place with another PU manufacturer for future supply of PUs. The New Customer Competitor shall be required to terminate any such contracts or option(s) which do exist in so far as they conflict with any part of the period of the contract being entered into with the PU Manufacturer.
- 1.3.5** Neither the New Customer Competitor nor any of its affiliated companies shall be an Automotive Manufacturer set up with the purpose of (amongst other things) of participating in the Championship, unless otherwise agreed by the PU Manufacturer.
- 1.3.6** The New Customer Competitor shall not have any sponsorship agreement in place with any entity that is in competition with the Core Activities of an Automotive Manufacturer which are also carried out by the PU Manufacturer, unless otherwise agreed by the PU Manufacturer.
- 1.3.7** The New Customer Competitor and/or any senior executives, directors or beneficial shareholders of the New Customer Competitor must not at any time (i) be listed or included in the official EU and/or US published sanction lists; (ii) have been convicted of any indictable criminal offence; (iii) have been convicted by any government or government agency in connection with fraud, money laundering, racketeering or terrorism activities; and/or (iv) have been declared bankrupt; and/or (v) have committed any other identified action which, in the reasonable opinion of the PU Manufacturer, harms the reputation of such PU Manufacturer. This clause shall also reciprocally apply to the PU Manufacturer.
- 1.3.8** The PU Supply Perimeter listed in the relevant column of the two tables in Appendix ~~C4~~ **C4** of the ~~Technical Regulations~~ and designated “INC” shall be supplied to New Customer Competitors at no more than the maximum supply price set out in Article 1.4 of this Appendix.

The supply of additional goods or services not listed in Appendix ~~C4 3~~ of the Technical Regulations (which shall be agreed between the PU Manufacturer and the New Customer Competitor) shall incur additional charges, the amount of which shall be substantially the same as that applied by the PU Manufacturer to its Existing Customer Competitor. In the event that a PU Manufacturer has not supplied a PU to any other Existing Customer Competitor, the PU Manufacturer shall decide the price of the above-mentioned additional goods and services based on the usages and practices generally recognised and respected in the market for the supply of parts and services in the Championship.

**1.3.9** The FIA shall confirm in writing to the PU Manufacturer that, to the best of its knowledge, the New Customer Competitor, including its officers, directors and beneficial shareholders, has not been convicted of non-complying at all times with the FIA Code of Good Standing.

**1.3.10** Payment of the fees (directly or indirectly through a payment guarantee) under the supply contract for each season shall as a fall-back position (unless otherwise agreed between the PU Manufacturer and the New Customer Competitor) and, notwithstanding the terms of any contract with an Existing Customer Competitor or its own factory Competitor, be made in four instalments:

25% on the date of signature of the supply contract;

25% on or before 30 October of year N-1;

30% before the start of the Championship season (year N); and

The remaining 20% before the fifth Formula One Event of the Championship (year N).

The following additional provisions apply:

- a. In case of any delayed payment for an amount greater than €100,000, the PU Manufacturer shall send the New Customer Competitor a written notice of the breach, with a copy to the FIA and the Commercial Rights Holder. Should the New Customer Competitor fail to resolve this breach to the satisfaction of the PU Manufacturer (with or without the involvement of the FIA and the Commercial Rights Holder) within thirty days from the issuing of this notice the PU Manufacturer shall be entitled to either terminate the supply contract immediately by serving written notice on the New Customer Competitor, with a copy to the FIA and the Commercial Rights Holder, or, suspend delivery of the PUs to the New Customer Competitor.
- b. In case of breach of the obligation to deliver the PUs and/or to supply additional goods or services to the New Customer Competitor pursuant to the supply agreement, such New Customer Competitor may send the PU Manufacturer a written notice of the breach (but only in the event that the New Customer Competitor is not itself in breach of contract including for non-payment except if that non-payment is justified by an alleged breach of the supply contract by the PU Manufacturer), with a copy to the FIA and the Commercial Rights Holder. Should the PU Manufacturer fail to resolve this breach to the satisfaction of the New Customer Competitor (with or without the involvement of the FIA and the Commercial Rights Holder) within thirty days from the issuing of this notice the New Customer Competitor shall be entitled to suspend payment of the fees to the PU Manufacturer.



**1.3.11** The New Customer Competitor and the PU Manufacturer shall not take any action and/or make any omission, deceptive, misleading or disparaging or negative comments, which directly injures, damages or brings into disrepute the public reputation, goodwill or favourable name or image of the other party to the supply agreement. Both parties will procure their affiliates and/or their respective senior executives, employees, directors and shareholders to abide by the same provisions.

#### **1.4 Power unit maximum supply price**

The PU supply perimeter listed in the corresponding column of Appendix ~~C4 3~~ of the Technical Regulations shall be supplied at the maximum price of 17 million euros, adjusted for Indexation. For the purpose of this article, Indexation has the meaning indicated, and will be calculated pursuant to the methodology set forth, in Appendix 1 of the Formula 1 Power Unit Financial Regulations. The supply of additional goods or services not listed in the Appendix hereto (which shall be agreed between the PU Manufacturer and the Competitor) shall incur additional charges, the amount of which shall be based on the usages and practices generally recognised and respected in the market.

## **2 Obligations in order to supply Fuel and Engine Oil to a Competitor**

### **2.1 Obligations of Fuel and Engine Oil Suppliers**

- 2.1.1** Any supplier wishing to supply fuel and/or engine oil to a Competitor in any Championship in the period 2026-2030, starting in year N (“Prospective Supplier”) must:
- a. Complete the Fuel and/or Engine Supplier registration form, no later than 1 January of year N-1;
  - b. agree to be bound by and to observe the provisions of the Code, the Technical Regulations, the Sporting Regulations the Judicial and Disciplinary Rules and all other relevant and applicable FIA rules and/or regulations (as supplemented or amended from time to time);
  - c. agree to be bound by the provisions of Article 2.1.2 of this Appendix with regard to the applicability of any patents or pending patent applications to the 2026-2030 Formula 1 World Championships;
  - d. agree to be subject to the jurisdiction of the internal judicial and disciplinary bodies of the FIA.
  - e. enter into an agreement in the form prescribed by the FIA (“Prospective Supplier Non-Assert Agreement”) with the FIA and the Commercial Rights Holder, pursuant to which the Prospective Supplier agrees not to assert any rights or claims with regard to patents, pending patent applications, or any licensed rights in respect of patents or patent applications against the FIA, the Commercial Rights Holder, any other Fuel and/or Engine Oil Suppliers, all PU Manufacturers and Competitors related to the following:
    - i. blending, processing, developing importing, exporting, testing and/or storing of fuel or engine oil intended for use in Formula 1 in the period 2026-2030. Such provision applies (but is not limited to) the use of any such fuel or engine oil used for development of the fuel or engine oil itself, for the development of the PU by the PU Manufacturer, for track testing or during Competitions; and/or
    - ii. the setting of the Technical Regulations or any activities arising therefrom, or any activities arising out of the compliance with any mandatory or optional requirement of the Technical Regulations.

- 2.1.2** The Prospective Supplier Non-Assert Agreement shall apply to the Prospective Supplier and any of its affiliate companies.
- 2.1.3** For the avoidance of doubt, the Prospective Supplier Non-Assert Agreement shall not impose an obligation on the Prospective Supplier to supply fuel and/or engine oil for use in any Championship in the period 2026-2030. However, the FIA has the right (in its sole discretion) to refuse the participation in the Championship of any Prospective Supplier that does not enter into the Prospective Supplier Non-Assert Agreement within 30 days of being invited to do so by the FIA.
- 2.1.4** The Prospective Supplier Non-Assert Agreement shall remain binding and valid in respect of any Prospective Supplier that supplies fuel and/or engine oil in any of the 2026-2030 Championships and then subsequently ceases to do so.
- 2.1.5** Each Prospective Supplier warrants that the fuel and/or engine oil that it manufactures and/or supplies for use in the Championships staged during the 2026-2030 period (or subsequent period) (“Relevant Period”) do not infringe the Intellectual Property Rights of any third party, and indemnifies the FIA and its affiliates and the Commercial Rights Holder and its affiliates against all liabilities suffered or incurred by such entities arising out of or in connection with any claim that the fuel and/or engine oil that it manufactures and/or supplies for use in the Championship during the Relevant Period infringe(s) the Intellectual Property Rights of any third party. In this context “Intellectual Property Rights” means: (i) patents, rights to inventions, designs, copyright and related rights, database rights, trade marks, related goodwill and the right to sue for passing off and/or unfair competition and trade names, in each case whether registered or unregistered; (ii) proprietary rights in domain names; (iii) knowhow, trade secrets and confidential information; (iv) applications, extensions and renewals in relation to any of these rights; and (v) all other rights of a similar nature or having an equivalent effect anywhere in the world

## **2.2 Obligations of Competitors and PU Manufacturers with respect to Fuel and Oil Suppliers**

### **2.2.1 PU Manufacturers**

- a. Within 90 days of being registered to supply PUs in one or more Championship in the 2026-2030 period under the provisions of Article 1.1 of this Appendix, a PU Manufacturer must nominate in writing to the FIA the Prospective Supplier(s) with whom it intends to develop its PU.

The PU Manufacturer may change its Fuel and/or Oil Supplier at any time, provided the provisions of this Article and Articles 2.1.2 – 2.1.5 are met in relation to any subsequent Prospective Supplier.

Following the nomination of the Prospective Supplier(s), the FIA will invite Prospective Supplier(s) to enter into a Prospective Supplier Non-Assert Agreement in the form prescribed by the FIA pursuant to the provisions of Articles 2.1.2 – 2.1.5 above. Should a Prospective Supplier fail to enter into the Prospective Supplier Non-Assert Agreement within 30 days of being invited to do so by the FIA, the FIA will inform the PU Manufacturer whether, as a result of that failure, the PU Manufacturer will be required to find a different Fuel and/or Oil Supplier.

The FIA reserves the right, at its absolute discretion, to exempt a PU Manufacturer from the nomination requirement, if it is evident that the PU Manufacturer has not entered into an agreement with a Prospective Supplier within 90 days of its registration as a PU Manufacturer.



In such cases, if the PU Manufacturer subsequently enters into an agreement with a Prospective Supplier, it must notify the FIA within 30 days of having done so.

- b. The following information cannot be shared between a PU Manufacturer and any Existing or Prospective Fuel/Oil Supplier:
  - i. Any drawing and/or CAD and/or any physical parts (such as but not limited to piston, cylinder head, etc.) of the combustion chamber
  - ii. Any information relating to gas exchange within the combustion chamber (such as but not limited to cams, ports, plenum, exhausts, cam timing, etc.), apart from cylinder pressure data, simulation and dyno test results.

No PU Manufacturer may use the movement of personnel (whether employee, consultant, contractor, secondee or any other type of permanent or temporary personnel) with an Existing or Prospective Fuel/Oil Supplier or another PU Manufacturer, either directly or via an external entity, for the purpose of obtaining an Intellectual Property transfer and/or circumventing the requirements of this Article. In order that the FIA may be satisfied that any such movement of staff is compliant with this Article, each PU Manufacturer must inform the FIA of all relevant staff movements at the end of each calendar quarter using the template which may be found in the Appendix to the Technical and Sporting Regulations and must demonstrate that they have implemented all reasonable measures to avoid the disclosure of Intellectual Property, including but not limited to that explicitly detailed in this Article, between the PU Manufacturer and an Existing or Prospective Fuel/Oil Supplier involved.

### 2.2.2 Competitors

In the case of Competitors participating in the 2022-2025 Championships (and in relation to whom Article 2.2.1 is inapplicable), the FIA invites each such Competitor to nominate in writing to the FIA their Prospective Supplier(s) within 90 days of: (i) the first publication of these Technical Regulations; or (ii) entering into a commercial or supply agreement with its pre-existing Fuel and/or Engine Oil Supplier in relation to any of the 2026-2030 Championships, whichever is earlier.

Following the nomination of the Prospective Supplier(s), the FIA will invite such Prospective Supplier(s) to enter into a Prospective Supplier Non-Assert Agreement in the form prescribed by the FIA, pursuant to the provisions of Articles 2.1.2 – 2.1.5 above. Should a Prospective Supplier fail to enter into the Prospective Supplier Non-Assert Agreement within 30 days of being invited to do so by the FIA, the FIA will inform the Competitor whether, as a result of that failure, they will be required to find a different Fuel and/or Engine Oil Supplier.

Each Competitor has the right to change their Fuel and/or Engine Oil Supplier at any time, provided the provisions of this Article and Articles 2.1.2 – 2.1.5 are met in relation to any subsequent Prospective Supplier.

## 3 Non-exclusivity of technologies, licences, patents, and pending patent applications

### 3.1 Non-exclusivity

With the exception of agreements relating to the supply of fuel and/or engine oil, no PU Manufacturer may enter into a supply agreement with a third-party supplier that is exclusive, or that prevents an equally advantageous supply of a PU component or technology supplied by the third-party supplier in question to another PU Manufacturer.

For the avoidance of doubt, provisions of a supply agreement prohibiting a third party supplier from disclosing to third parties (whether directly or indirectly) a PU Manufacturer's Intellectual Property and/or any information in respect of its LPUCs shall not breach this provision.

### 3.2 Licences, patents and pending patent applications

The existence of: (i) patents; (ii) pending patent applications; or (iii) any licensed rights in respect of patents or patent applications of a PU Manufacturer shall not prevent any other PU Manufacturer from using any technology, design, or concept in their PUs in Formula 1. To achieve this objective the following provisions must be met:

- a. In registering to supply PUs for the period 2026-2030, the PU Manufacturer must enter into an agreement in the form prescribed by the FIA ("PU Manufacturer Non-Assert Agreement") with the FIA and the Commercial Rights Holder pursuant to which the PU Manufacturer agrees not to assert any rights or claims with regard to patents, pending patent applications, or any licensed rights in respect of patents or patent applications related to PUs against the FIA, the Commercial Rights Holder, any other PU Manufacturers, any suppliers to other PU Manufacturers, or the Competitors.
- b. If the PU Manufacturer obtains any component, design, process or technology relating to a PU from a third-party supplier (the "Third Party Input"), it must obtain written confirmation from the third party supplier in question that the third party supplier will also be bound by the obligations in the PU Manufacturer Non-Assert Agreement as if it was a party to that agreement. Such confirmation should be in the form or substantially the form of the "Supplier Confirmation" at Schedule 2 to the PU Manufacturer Non-Assert Agreement. Failure by the PU Manufacturer to obtain such a confirmation and provide it to the FIA upon request will be considered a breach of these Technical Regulations and may result in the PU or PU component in question that incorporates the third-Party Input not being permitted.

For the avoidance of doubt, this Article regards solely the use of a technology, design or concept in a Formula 1 PU, and does not regard any use of such a technology, design or concept by affiliates of the PU Manufacturer in any other sector.

### 3.3 PU Manufacturer Warranty

Each PU Manufacturer warrants that the Power Units that manufacturers and/or supplies for use in the Championships staged during the 2026-2030 period (or subsequent period, if extended) ("Relevant Period") do not infringe the Intellectual Property Rights of any third party, and indemnifies the FIA and its affiliates and the Commercial Rights Holder and its affiliates against all liabilities suffered or incurred by such entities arising out of or in connection with any claim that the Power Units that it manufactures and/or supplies for use in the Championship during the Relevant Period infringe the Intellectual Property Rights or any third party. In this context "Intellectual Property Rights" means: (i) patents, rights to inventions, designs, copyright and related rights, database rights, trade marks, related goodwill and the right to sue for passing off and/or unfair competition and trade names, in each case whether registered or unregistered; (ii) proprietary rights in domain names; (iii) knowhow, trade secrets and confidential information; (iv) applications, extensions and renewals in relation to any of these rights; and (v) all other rights of a similar nature or having an equivalent effect anywhere in the world.

#### 4 Material breach of the Regulations

In the case of any alleged material breach or alleged material failure by a PU Manufacturer to comply with any of the obligations of this Appendix, the FIA shall engage in good faith and active discussions with the PU Manufacturer and, in the absence of an amicable solution within one month, be entitled to commence proceedings before the FIA International Tribunal against the PU Manufacturer in respect of such alleged breach or failure. In the event that (in accordance of the provisions of the Code and of the Judicial and Disciplinary Rules), the International Tribunal rules that the PU Manufacturer has materially breached or materially failed to comply with this Appendix, the International Tribunal may impose on the PU Manufacturer concerned, to the exclusion of any other sanction it may have the power to impose, a fine (the amount of which shall be no more than fifteen million euros and shall be determined, on a case by case basis, depending on the merits and circumstances of the applicable case).

#### 5 New PU Manufacturers

##### 5.1 Definition of a New PU Manufacturer

A PU Manufacturer intending to supply PUs for the first time in year N, will be considered to be a “New PU Manufacturer” if it (or any related party):

- a. has not homologated a PU at least once in the period 2014-2021; and
- b. has not received any significant recent Intellectual Property from a PU Manufacturer who is not a New PU Manufacturer, subject to the conditions outlined in Article 5.2 of this Appendix.

(together, for this Article 5 only, the “Necessary Conditions”)

The “New PU Manufacturer” status will be granted by the FIA, at its absolute discretion, for the complete calendar years from N-3 to N+1.

In order to be granted the “New PU Manufacturer” status, the PU Manufacturer in question must, upon the request of the FIA, provide the FIA with all of the detailed information or documents requested by the FIA describing the commercial background and details of the PU Manufacturer’s business, the Intellectual Property owned by the PU Manufacturer and the technical relationship between the PU Manufacturer and any other related entity or persons (the “Requested Documentation”).

PU Manufacturers granted a “New PU Manufacturer” status are given additional rights or exemptions in certain provisions of the Technical, Sporting and Financial Regulations.

In order to assess whether the Necessary Conditions have been satisfied by a PU Manufacturer, the FIA will assess the Requested Documentation provided by the PU Manufacturer with regard to three factors:

- a. Infrastructure: the necessity for the PU Manufacturer to build facilities, invest significantly in assets, and hire personnel with prior Formula 1 experience;
- b. ICE status: the prior experience of the PU Manufacturer in Formula 1 Internal Combustion Engines, and potential possession of significant recent Intellectual Property; and
- c. ERS status: the prior experience of the PU Manufacturer in Formula 1 ERS systems, and potential possession of significant recent Intellectual Property.

## 5.2 Partial New PU Manufacturer status

If, following a review of the Requested Documentation, the FIA determines that a PU Manufacturer does not fully satisfy the Necessary Conditions, the FIA reserves the right, at its absolute discretion, to grant the PU Manufacturer a partial New PU Manufacturer status. Partial New PU Manufacturer status will give rise to a reduction of the additional rights accorded to New PU Manufacturers by the Technical, Sporting and Financial Regulations.

The level of reduction of additional rights applied to holders of partial New PU Manufacturer status will be determined according to the weights shown on the following table:

		Regulations Influenced by criteria	
		Financial Regulations: Cost cap and CapEx limits	Technical or Sporting Regulations
Param.	Infrastructure	40% *	20% *
	ICE status	50% *	50% *
	ERS status	10% *	30% *
Outcome:		<b>sum of three parameters</b>	<b>0% or 100% **</b>

\* For each parameter, these weightings are allocated either in full or at zero value, depending on the criteria met by the PU Manufacturer

\*\* For Technical or Sporting Regulations, the Newcomer status is awarded either in full (if the sum of the three parameters is greater or equal to 50%), or at zero value.

## 5.3 Revocation of the New PU Manufacturer status

The FIA reserves the right, at its absolute discretion to revoke a PU Manufacturer's New PU Manufacturer status if:

- it becomes apparent that any of the information provided to the FIA by the PU Manufacturer as part of the Requested Documentation that led to the status being granted have changed in a significant manner; or
- new evidence comes to light indicating that erroneous information has been provided by the PU Manufacturer to the FIA as part of the Requested Documentation.

The knowing provision by a PU Manufacturer of false or misleading information in the Requested Documentation shall be considered a material breach of these Technical Regulations and will be treated by the FIA in accordance with Article 4 of this Appendix.

## 5.4 Transparency

Should a PU Manufacturer be awarded the New PU Manufacturer status (or a partial such New Manufacturer status), the FIA will communicate this to all other PU Manufacturers, alongside a detailed report on such status. The report will include the two percentage scores to be determined in accordance with Article 5.2 of this Appendix and will explain the reasons for the FIA's decision, whilst withholding any confidential information.

## 5.5 No right of appeal

PU Manufacturers shall have no right of appeal against any decision by the FIA in relation to the provisions of this Appendix 5.

### 6 Definitions

- 6.1 An **Automotive Manufacturer** is a Manufacturer of at least one model of automobile (as defined in the Code) that has produced at least 3,000 units during the past 12 months.
- 6.2 The **Core Activities** of an Automotive Manufacturer are the Design, production and sale of automobiles (as defined in the Code).

## APPENDIX C7: COMPONENTS' CLASSIFICATION AND PERIMETER

The following table defines the classification, of components for Formula One cars and support equipment.

Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
<b>1 Survival Cell Items &amp; Safety Structures</b>						
1A	Survival Cell and Primary Roll Structure	C12	LTC	The structure that includes the cockpit, takes suspension loads and aerodynamic loads and transfers them from and to the FIS through the FIS fixings and power unit through the engine studs plus the roll structure as defined in 12.4.1.	Bonded component as submitted for homologation.	Any additional bonded components not required for FIA tests, any components fitted for FIA tests that are then subsequently removed
1D	Front Floor Structure	C12.2.7	OSC	Front floor assembly	Front floor structure, its mounting brackets, and any device or structure (and their mounting brackets) between the front floor structure and the survival cell.	Fairings.
1G	Front Impact structure	C13.6.1	LTC	The structure that takes aerodynamic loads from the front wing and transfers them to the chassis	FIS, hangers, fixings to chassis that are part of the FIS assembly	Fairings, Camera brackets
1H	Rear Impact structure	C13.7.1	TRC	The structure that mounts to the rear of the gearbox behind the differential	Part as bonded to gearbox carrier. Details of flange for Rear Wing Beam attachment, excluding profile details.	Fairings, bolted components
1K	Pedals		OSC	Pedal Assembly	Brake pedal assembly including pushrod connecting to the brake master cylinders(s), throttle Pedal including throttle damper, heel-rest, mounting brackets and local electrical and electronic components	Fixings to the survival cell.
1L	Mirror Lens	C12.2.7	OSC	Mirror Lens	Mirror Lens	Backing structures
1M	Side Impact Structures	C13.5	DSC	Upper & Lower SIS Tubes	SIS Tubes Supply to be agreed before 30 June year N-1	Mounting Brackets
1N	Halo	C12.4.2	DSC	Halo, and fixings	Halo, fwd. pin, rwd. bolts. Supply to be agreed before 30 June year N-1	Fwd, mounting bracket, fairings.

Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
<b>2 Aerodynamic Components</b>						
2A	Aerodynamic components, unless otherwise specified	C3	LTC			
2B	Plank assembly	C3.5.9	LTC	Plank assembly as defined in 3.5.9	Plank structure and skids	
2C	Rear wing adjuster (X-Mode)	C3.10.10	OSC	X-Mode actuator including linkages	Machined X-Mode Actuators, linkages, local electrical and electronic components	Hoses, any component rigidly attached to the rear wing flap.
2E	Wheel drum and drum deflector	C3.13.1 - C 3.13.6	LTC		Drum and deflector strictly to supplied geometry plus all the brake ducts components inside the rim	
2G	Front Wing Adjuster (x-Mode)					
<b>3 Transmission</b>						
3A	Gearbox Case	C9.5	TRC	As defined in Article 9.1.5	Gearbox carrier, associated fastenings, internal heat shields Front Cover, Diff Cap, Seals, Fasteners, Cross-shaft Covers	RIS, Inboard suspension components, Engine mountings
3C	Clutch	C9.2	TRC	Rotating clutch assembly and fixings to PU or Gearbox as appropriate.	Clutch basket assembly, Plates, Spring, fixings to PU or Gearbox, Spigot bearing	
3D	Clutch actuation system	C9.2	TRC	Clutch actuator assembly including sensors and cooling shroud and sensors	Clutch Actuator, Actuator support, local electrical and electronic components, Fixings to PU or Gearbox, Cooling Shroud.	Servo Valves
3E	Clutch shaft	C9.2	TRC	Shaft between clutch and gearbox (if PU mounted) or PU (if Gearbox mounted)	Clutch shaft, intermediate support bearing and bracket if required.	Clutch shaft torque sensor
3F	Clutch shaft torque sensor	C9.2	SSC			
3G	Gearbox Internals	C9.5	TRC	All components involved in transmitting torque between the gearbox input shaft and the drive shafts and components essential for the functioning of the gearbox.	Driveline and Gear-change components defined in Article 9.1	Servo valves
3K	Auxiliary Components	C9.5	TRC	Components that are not included in Driveline or	Oil Pressure and Scavenge Pumps, Oil	Oil cooler

Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
	(Oil system, reverse gear etc.)			Gear-Change Components but interact directly with these components and are essential for the functioning of the gearbox.	Filter, Oil Tank, Reverse-gear idler & Actuator, Differential Actuator, local electrical and electronic components.	
3L	Drive shaft	C9.12	OSC	The assembly that transfers load from the gearbox driveline components to the Axles	Driveshaft, joints, bearings and any required fixings, torque sensors and/or trigger wheels if present	
3M	Drive shaft Torque Sensor	C9.13	SSC			
<b>4</b>	<b>Suspension and Steering</b>					
4A	Inboard Front Suspension	C10.4	TRC	All parts of the front suspension between the connection to the push / pull rod and the survival cell.	Rockers, springs, ARB system, damper, bearings, local electrical and electronic components, ride height adjustment, any brackets which are not integral with the survival cell. A range of set-up options	
4B	Front Suspension Members	C10.3	TRC	Structural members connecting the upright to the survival cell, steering or inboard suspension	Wishbones / Links, Track-rod, Push/pull Rod, Bearings, Inboard Brackets not integrated in the survival cell, Fasteners, Wheel Tethers, local electrical and electronic components	Suspension fairings as defined in 3.14
4C	Front Upright Assembly (Excluding Axles, bearings, nuts & retention system)	C10.6	TRC	Upright assembly between the connection to the suspension members and the wheel bearings	Upright, Brackets – including variants for set-up changes, Fasteners, local electrical and electronic components, Upright Loom.	Any braking system components described in Article 11
4D	Front Axles (Inboard of the contact surface with the wheel spacer) and bearings,		TRC	Axle geometry lying inboard of the contact surface with the wheel spacers and wheel bearing assembly	Axle geometry lying inboard of the contact surface with the wheel spacers, wheel bearings and spacers, interface and mounting to the brake disc bell.	
4E	Front Axles (outboard of the contact surface with	C10.9	OSC	Axle geometry lying outboard of the contact surface with the wheel spacers, wheel nut and	Axle geometry lying outboard of the contact surface with the wheel spacers, axle nuts,	



Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
	the wheel spacer), nuts & retention system			dual stage mechanism to retain nut if loose	wheel nut, fasteners, and wheel nut retention system.	
4F	Inboard Rear Suspension	C10.4	TRC	All parts of the rear suspension between the connection to the push / pull rod and the gearbox carrier	Rockers, springs, ARB system, dampers, bearings, local electrical and electronic components, ride height adjustment, any brackets which are not integral with the Gearbox Carrier. A range of set-up options	
4G	Rear Suspension Members	C10.3	TRC	Structural members connecting the upright to the gearbox case or inboard suspension	Wishbones / Links, Track-rod, Push/pull Rod, Bearings, Inboard Brackets not integrated in the Gearbox Carrier, Fasteners, Wheel Tethers, local electrical and electronic components.	Suspension fairings as defined in 3.14
4H	Rear Upright Assembly (Excluding Axles, bearings, nuts & retention system)	C10.6	TRC	Upright assembly between the connection to the suspension members and the wheel bearings	Upright, Brackets – including variants for set-up changes, Fasteners, local electrical and electronic components.	Any braking system components described in Article 11
4I	Rear Axles (Inboard of the contact surface with the wheel spacer) and bearings,		TRC	Axle geometry lying inboard of the contact surface with the wheel spacers and wheel bearing assembly	Axle geometry lying inboard of the contact surface with the wheel spacers, wheel bearings and spacers, interface and mounting to the brake disc bell,	
4J	Rear Axles (outboard of the contact surface with the wheel spacer), nuts & retention system	C10.9	OSC	Axle geometry lying outboard of the contact surface with the wheel spacers, wheel nut and dual stage mechanism to retain nut if loose	Axle geometry lying outboard of the contact surface with the wheel spacers, axle nuts, wheel nut, fasteners, and wheel nut retention system.	
4L	Power Assisted Steering	C10.5.3	TRC	Steering unit from the attachment to the steering column to the clevises for the track rods, connection to the hydraulic system and connection to the electrical loom	Rack assembly, local electrical and electronic components, protective cover, fasteners to survival cell, options for varying assistance.	

Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
4M	Steering column	C10.x	OSC	The assembly that transfers load from the steering wheel QD through to the Power Assisted Steering	Forward and Rearward columns, bearings, mounting brackets, attachments to chassis, parts required to pass impact test. local electrical and electronic components.	Fixings to the survival cell.
4N	Steering wheel and quick release		OSC	The assembly that transfers load from the driver to the steering column	Steering Wheel, quick release mechanism, gear shift and clutch paddles, local electrical and electronic components, SECU elements integrated in the assembly	Any component that cannot be removed via the operation of the quick release
4P	Wheel rims	C10.7	OSC	Wheel Rim Assembly	Rim, drive pegs, spacers, closing panels, Tyre valve, TPMS sensor mount.	TPMS sensor
4Q	Tyre pressure sensor (TPMS)		SSC	BF1 TPMS	Mountings	Tyre valve
4R	Tyres	C10.8	SSC			
<b>5</b>	<b>Brakes</b>					
5A	Brake disc, disc Bell, and pad assembly	C11	OSC		Structural brake disk bell transferring torque from the axle to the brake disc, brake disk and pads	Any component bolted on the structural disk bell (i.e. deflectors)
5B	Brake calipers	C11	OSC		Machined Brake Calipers, pistons, seals, QD's, local electrical and electronic components	Hoses, pipes, and mounting system to the uprights.
5C	Rear brake control system (BBW)	C12	OSC		BBW master cylinder and actuator, servo or solenoid valves, directly mounted local electrical and electronic components master cylinders, balance bar assembly	Hoses and pipes
5D	Brake master cylinder	C12	OSC		Master cylinder(s), push-rods, brake balance system, local electrical and electronic components	Fixings to the survival cell.
<b>6</b>	<b>Fuel System</b>					
6A	Collector	C6.6.4, C6.6.6	OSC	Collector assembly and pressurisation system if fitted.	Collector assembly including any pressurisation system, any local electrical and electronic components,	Hoses and pipes

Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
					level sensor, filters, AV mounts and mounting fasteners	
6B	Primer pumps, and flexible pipes and hoses	C6.6.2, C6.6.3	SSC	Primer pump(s), and pipes between the primer pump(s) and the breakaway valve.	Primer pump(s), flexible pipes and hoses and their fittings between pump(s) and breakaway valve, fuel flow meter inlet pressure and temperature sensors.	Components classified as part of collector. Components upstream of primer pump(s). Components between primer pump(s) and breakaway valve listed as OSC.
6C	Fuel Bladder	C6.1	LTC			
6D	Fuel system components not listed as OSC or SSC or LTC	C6.2, C6.3, C6.5, C6.6	TRC			Fuel bladder
6E	Fuel System Hydraulic Layout as described by schematic in article 6.6	C6.6.1, C6.6.3, C6.6.4, C6.6.5, C6.6.6	OSC	Low pressure fuel system from lift pump inlet filters up to and including chassis breakaway valve or optional inlet filter to high pressure fuel pump (if fitted)	Pressure Relief Valves (PRV), Non-Return Valves (NRV), Breakaway Valve, filters, lift pumps, optional damper, rigid pipes and manifolds and their fittings, FIA sample, collector fill/drain port, optional collector pressure sensor, optional running bleed Any additional parts which are not shown on the schematic, but which will be deemed to be necessary for the proper behaviour of the hydraulic circuit shown in the schematic, subject to the approval of the FIA Technical Department	Fuel cell pressurisation system. Fuel cell fill/drain, and vent. Primer pump(s), flexible pipes and hoses and their fittings, fuel flow meters and their inlet pressure and temperature sensors
6F	Fuel tank pressure sensor and PRV	C6.1.4 C6.6.4	LTC	The Sensor and PRV specified in 6.1.4 and shown in diagram 6.6.4	Sensor and fittings to fuel bladder. PRV and fittings to fuel bladder	Fuel bladder
<b>7</b>	<b>Hydraulic System</b>					
7A	Hydraulic pump and accumulator		TRC		Hydraulic pump, hydraulic accumulator, local electrical and electronic components, parts required to mount the unit to the PU	
7B	Hydraulic manifold, sensors & control valves		TRC		Hydraulic manifold block, servo valves, solenoid valves, filters, local electrical and	

Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
					electronic components, AV mounts.	
7C	Pipes between hydraulic pump, hydraulic manifold & gearbox or engine actuators		TRC		Pipes, fittings, QD connectors.	Pipes to/from cooler, pipes to/from actuators not associated with gearbox, PU (BBW, PAS etc).
<b>9</b>	<b>Oil &amp; Coolant Systems</b>					
9C	Primary heat exchangers	C7.4.1b	LTC	Heat exchanger assembly as defined in 7.4.1b	Welded cooler, electrical and electronic components directly fitted to cooler	Fittings, hoses, pipes, AV mounts
9D	Secondary heat exchangers	C7.4.1c	TRC	Secondary heat exchanger units as defined in 7.4.1c	Heat exchanger unit, directly mounted electrical and electronic components	Ducts feeding cooling air, pipes, hoses, AV mounts.
<b>10</b>	<b>Power Unit Ancillaries and Sensors</b>					
10A	ES IVT sensor	C5.3.2	<del>SSC</del> SSPUC			
10B	Fuel Flow Meter	C5.11.3	SSC	Prescribed fuel flow meters		Fittings, hoses, pipes, AV mounts
10C	Power Unit Pressure and Temperature sensors	C5.14.3	<del>SSC</del> SSPUC			
10D	Power Unit mountings to gearbox and survival cell	C5.4.8	TRC	Studs between PU and Survival Cell and between PU and Gearbox.	Studs, Nuts, Top-hat Bushes, Barrel nuts.	Inserts integrated into survival cell or gearbox carrier
10E	High Pressure fuel pump	C5.11.6	<del>SSC</del> SSPUC			
10F	Exhaust System Beyond Turbine and Wastegate Exits	C3.8.2	TRC	Exhaust and wastegate pipes downstream of turbine exit / wastegate exit.	Pipes, clamps	
<b>11</b>	<b>Electrical Systems Hardware</b>					
11B	Electrical looms		TRC	Looms interfacing the main chassis electrical system with PU systems, transmission systems and other peripheral control or measurement systems.	Main chassis looms, can be made of separate parts, up to and including the connectors to local PU looms, transmission looms or other local looms for peripheral control or measurement systems.	Looms for test installations linked to Article 8.15.1

Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
11C	car to team telemetry	C8.6.1	SSC			
11D	Driver radio	C8.9	SSC			
11E	Accident Data Recorder (ADR)	C8.10.1	SSC			
11F	High speed camera	C8.10.3	SSC			
11G	In-ear accelerometers	C8.10.4	SSC			
11H	Biometric devices	C8.10.5	SSC			
11J	Marshalling system	C8.12	SSC			
11K	Timing Transponders	C8.16	SSC			
11L	TV Cameras	C8.17	SSC			
11S	Standard Electronic Control Unit (SECU)	C8.1.4	SSC			
11T	SECU FIA applications		SSC			
11U	SECU Team applications		LTC			
<b>12</b>	<b>Safety Equipment</b>					
12A	Fire Extinguishers	1C4.1	OSC			Pipes, hoses, mountings to the survival cell.
12B	Rear lights	C14.3	SSC			Local electrical looms
<b>13</b>	<b>Miscellaneous Components</b>					
13A	Water drink system		OSC			Pipes, hoses, mountings to the survival cell.
<b>14</b>	<b>Pitstop Equipment</b>					
14A	Wheel Guns		TRC	The impact wrenches used to remove and fasten wheels during a pit stop. Either pneumatically, or electrically powered	Guns, Air lines (between gun and gantry for pneumatic), Batteries (if electrical), signalling lights, signal cables, calibration jig, Heatshields (for protecting guns in extreme weather conditions)	
14B	Front Jack		TRC	The jack used to lift the front of the car.	Jack, signalling lights, signal cables.	Cradle shaped to any LTC component.
14C	Rear Jack		TRC	The jack used to lift the rear of the car.	Jack, signalling lights, signal cables.	Cradle shaped to any LTC component.
14D	Side Jack		TRC	Jack inserted from the side in unusual situations	Jack	

Ref.	Component or Assembly	Art.	Class	System Description, & Boundaries	Included Components (List not exhaustive) & Supply Terms	Excluded Components
14E	Overhead Gantry		TRC	Gantry or gantries providing air and electrical connections to other items of pitstop equipment.	Gantry, air lines, air regulators, cabling.	
14F	Control System		TRC	The system used to control the pit-stop	Sensors, cameras, “traffic lights”, associated cabling, software.	
14G	Transport Boxes		TRC	Boxes and stillages used to transport pitstop equipment	Boxes, stillages.	

## APPENDIX C8: APPROVED CHANGES FOR FUTURE YEARS

## Changes Approved for 2027

## 13.6.2 Front Impact Structure Homologation

~~Two identical~~ One FISs must be presented for homologation. ~~By random selection by the FIA on the day of the homologation, this FIS will be subject to either;~~

- i. ~~One will be subject to~~ The push-off tests described in Articles C13.6.3.a and C13.6.3.b followed by dynamic test described in Article C13.6.5.

~~and or~~

- ii. ~~The second will be subject to~~ The push-off test described in Article C13.6.3.c followed by the dynamic test described in Article C13.6.6.

~~In the case where a dynamic test did not meet the acceleration requirements, at the discretion of the FIA, the Competitor may be permitted to repeat only the failed test.~~

## Changes Approved for 2028