



Car number

University name

Please Note

All teams must submit the SES form and the 3D-CAD model in the team area, on the FSG website, by the official deadline. The uploaded SES form must be checked and approved by a third party or any other competition following the same rules. If any changes to the original SES form have become necessary due to the approval process, the updated final SES form must be uploaded again in the team area. This must be done as soon as the FSG officials have set the previous upload to "Fail". The detailed changelog with all made changes from the "Version History" tab of the SES form must be attached to this SES Approval document.

All pages must also be signed by the SES reviewer.

SES reviewer

Title, Name, Surname	
Company	
Street	
City, zip	
Country	
Phone number	
Email address	
URL	

I hereby declare that I have reviewed the SES document and can conclude that the final SES version has passed all requirements listed on the following pages.

City, Date, Signature, Stamp



#	SES Tab/ Rule	Content	OK
1	Cover sheet	Cover Sheet duly completed (team name, contact details, international material-nr. or material name, number of layers, layer orientation, core thickness, type of resin)	<input type="checkbox"/>
2		Receipt for used materials, proof for non-steel materials on TAB "Additional Info"	<input type="checkbox"/>
3	Chassis Pics	Chassis Pictures colour code for different materials or different composite layups	<input type="checkbox"/>
4		Proof of materials = used materials for different areas?	<input type="checkbox"/>
5		3 different views and an isometric view is shown	<input type="checkbox"/>
6		angle of main and front hoops, angle between main hoop bracing and main hoop, distance from top of main hoop to main hoop bracing attachment, distance from top of front hoop to front hoop bracing attachment, outer diameter and wall thickness of all tubes / monocoque layup? (cross-check with SE3DM file)	<input type="checkbox"/>
7		EV only: HV components included / CV only: fuel tank included	<input type="checkbox"/>
8 ¹	Material Data	Material data and values for each different laminate must be provided Material data and values for used aluminium (also as in welded condition) provided?	<input type="checkbox"/>
9	Tab T2.9	Main Hoop [MH] must be a single piece of uncut, continuous, closed section steel tube	<input type="checkbox"/>
10	Rule T2.9	MH angle (shown in TAB "Chassis Pics") above the top of the major structure must be inclined less than 10deg from vertical.	<input type="checkbox"/>
11		MH angle below the top of the major structure can be inclined in forward direction at any angle to the vertical, in the rearward direction, maximal 10deg to the vertical	<input type="checkbox"/>
12	Tab T2.10	Front Hoop [FH] Angle between the FH and the vertical is inclined less than 20deg	<input type="checkbox"/>
13	Rules T2.10 T2.17	FH - Check the evidence of the used values! (Material Data for Aluminium as "in welded condition"+ SE3DM file)	<input type="checkbox"/>
14	Tabs T2.11 T2.17	Main Hoop Bracing [MHB] must be made of a straight tube, on both sides of the MH; directed in inclination from the main hoop	<input type="checkbox"/>
15	Rule T2.11	MHB must be attached to the main hoop no lower than 160 mm below the top-most surface of the main hoop. The included angle formed by MH and the MHB must be at least 30deg.	<input type="checkbox"/>
16		MHB support made of steel tubes must be properly triangulated to the bottom of the main hoop and upper member of the SIS	<input type="checkbox"/>
17		MHB - Check the evidence of the used values! (SE3DM file)	<input type="checkbox"/>
18	Tabs T2.11.5 T2.17	Monocoque Main Hoop Bracing Support [MHBS] (see also T2.17) 30 kN for each attachment point, for each support 2 M8 Grade 8.8 bolt or 1 M10 Grade 8.8 bolt.	<input type="checkbox"/>
19		MHBS - Check laminate 3 point bending test!	<input type="checkbox"/>
20	Rules T2.11.5 T2.4	MHBS - Check the shear strength of the laminate!	<input type="checkbox"/>
21	T2.5 T2.17	MHB attachment - Check the calculation of the welding seam + backing plate perimeter	<input type="checkbox"/>
22		MHBS - Check the evidence of the used values	<input type="checkbox"/>
23	Tabs T2.12 T2.17	Front Hoop Bracing [FHB] extended to the drivers feet in front direction; attached on both sides, max. 50.8 mm below top of front hoop	<input type="checkbox"/>
24		If FH > 10° inclined to the rear, additional support to the rear is required	<input type="checkbox"/>
25	Rules T2.12 T2.17	Check laminate 3 point bending test	<input type="checkbox"/>
26	T2.4	Check the shear strength of the laminate!	<input type="checkbox"/>
27	T2.5	Check the evidence of the used values for the weakest area!	<input type="checkbox"/>

1 #8: If the ply layup (number of plies, orientation used material) is the same but the core thickness is different, it is still acceptable to use the derived properties from one laminate panel test. If the core thickness is the same but the number of plies or the orientation or the used material is different than additional test are required (T2.6.3).



#	SES Tab/ Rule	Content	OK
28	Tab T2.14	Front Bulkhead [FBH] ; if L-shaped, the EI of the vertical and horizontal axis must be equivalent to steel	<input type="checkbox"/>
29		L maximal 25.4 mm towards to the inside	<input type="checkbox"/>
30	Rules T2.14 T2.4	Check dimensions of cut out in 3D-model	<input type="checkbox"/>
31	T2.5	Shear strength of bulkhead equivalent to a 1.5 mm thick steel plate (T2.14.1)	<input type="checkbox"/>
32		Check laminate test	<input type="checkbox"/>
33		Check the evidence of the used values!	<input type="checkbox"/>
34	Tab T2.15	Front bulkhead support [FBHS] check the drivers leg protection	<input type="checkbox"/>
35		In side view max. 50 mm from top of front bulkhead and from front bulkhead back to the front hoop	<input type="checkbox"/>
36	Rules T2.4 T2.5	EI of the FBHS must be equivalent to the sum of the EI of the six (6) baseline steel tubes	<input type="checkbox"/>
37	T2.15 T3.2.3	EI of vertical side of the FBHS (T2.15.3) = EI from one baseline tube	<input type="checkbox"/>
38		Check laminate 3 point bending test	<input type="checkbox"/>
39		Shear strength (T12.15.4) min. 4kN	<input type="checkbox"/>
40		Check the evidence of the used values for the weakest area!	<input type="checkbox"/>
41	Tab T2.16	Side impact structure [SIS] SIS incl. bottom until 320mm above the lowest inside chassis point \geq EI of 3 baseline tubes	<input type="checkbox"/>
42	Rules T2.4	SIS (up to 320mm above the lowest inside chassis point) \geq EI of 2 baseline tubes	<input type="checkbox"/>
43	T2.5	Horizontal floor to the middle of the car (on the weakest area) \geq EI of 1 baseline tube	<input type="checkbox"/>
44	T2.16	SIS between the upper surface of the bottom up to 320mm above the lowest inside chassis point must have an absorbed energy equivalent to two baseline steel tubes ► see Figure 7	<input type="checkbox"/>
45		Shear strength (T2.16.2) min. 7.5kN	<input type="checkbox"/>
46		Check laminate 3 point bending test	<input type="checkbox"/>
47		Check the evidence of the used values	<input type="checkbox"/>
48	Tab T4.5	Shoulder Harness bar	<input type="checkbox"/>
	Rule T4.5	Stiffness must be equivalent to 1 baseline tube	<input type="checkbox"/>
49	Tab T2.20	Anti-Intrusion Plate [AIP] 1.5 mm steel or 4 mm aluminium or composite material if approval given	<input type="checkbox"/>
50	Rules T2.18.2 T2.18.4	Attached with min. 8 x 8 mm Grade 8.8 bolts (Proof in longitudinal and transversal direction for alternative attachments)	<input type="checkbox"/>
51	T2.4 T2.5	If composite material check laminate test or results of composite IAD test	<input type="checkbox"/>
52	Tab T2.6	3 point bending test ► test sample 275x500 mm / load applicator \varnothing 100 mm / support span >400 mm (test specimen with closed flanges are NOT accepted)	<input type="checkbox"/>
53	Rules T2.5 T2.6	Proof for SIS with 2 tubes, other different laminate structures (see page 1) require additional tests with baseline materials (T2.3.3)	<input type="checkbox"/>
54		Calculated absorbed energy from start up to max. 12.7 mm.	<input type="checkbox"/>
55		Perimeter shear test ► sample 100x100 mm on a plate with \varnothing 32 mm hole and with a punch of \varnothing 25 mm	<input type="checkbox"/>
56		Compare values from diagram with values from the TAB	<input type="checkbox"/>
57		Check the evidence of the used material values	<input type="checkbox"/>



#	SES Tab/ Rule	Content	OK
58		Numbers of different laminate structures = numbers of different test	<input type="checkbox"/>
59	Tab T2.17 Rule T2.17	Main Hoop Attachment Analogue to rule T2.17	<input type="checkbox"/>
60	Tab T2.17	Front Hoop Attachment Analogue to rule T2.17, no lower than 50 mm from top of front hoop	<input type="checkbox"/>
61	Rule T2.17	Fully laminated in is accepted if a calculation of the equivalence to four attachment points is shown (min. 4 x 30kN)!	<input type="checkbox"/>
62	Tab T2.17 Rule T2.17	Main Hoop Bracing Attachment Analogue to rule T2.17	<input type="checkbox"/>
63	Tab T2.17	Hoop Attachment Points ► each must carry a load of min. 30 kN in each direction	<input type="checkbox"/>
64		Mounting plates, backing plates and inserts must have sufficient shear area, weld area and strength (check shear strength rule T2.17)	<input type="checkbox"/>
65	Rule T2.17	Mounting plates, backing plates 2 mm steel	<input type="checkbox"/>
66		Each attachment point must have 2 bolts 8mm Grade 8.8 or alternative	<input type="checkbox"/>
67		Front and main hoop bracing attachment 1 bolt M10 Grade 8.8 is acceptable	<input type="checkbox"/>
68		No crushing of the core is permitted rule T2.17.5	<input type="checkbox"/>
69	Tab T2.18.5 Rule T2.18.5	Impact Attenuator Attachment to Monocoque Equivalency to a minimum of eight (8) 8 mm Metric Grade 8.8 bolts	<input type="checkbox"/>
70	Tab T3.5	Harness Attachment Points Shoulder and lap belt attachments must be tested (harness attachment bracket incl.)	<input type="checkbox"/>
71	Rules T3.5 T4.3	Distance from the test specimen to the load application point must be at least 125 mm away	<input type="checkbox"/>
72		Test specimen should represent the design on the car as driven at a competition	<input type="checkbox"/>
73		Check the panel height in SES with test specimen dimension	<input type="checkbox"/>
74		Shoulder and lap attachment must support a load of 13 kN, anti-submarine attachment 6.5 kN; lap and anti-submarine at the same attachment point 19.5 kN	<input type="checkbox"/>
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75	Tab EV6.5.5	Accumulator Container Material as given in rule EV6.5.5 or equivalent if equivalence is shown	<input type="checkbox"/>
76		Check used material is fire resistant according to UL94-V0.	
77	Rule EV6.5.5	Protected with a SIS (rule T2.16 + EV 6.5.1)	<input type="checkbox"/>
78	Tab EV6.5.12	Accumulator Attachment 20 g in vertical direction, 40 g in horizontal direction Calculation, simulation or physical test required	<input type="checkbox"/>
79	Rule EV6.5.12	Accumulator container attachment Brackets / backing plates 1.6 mm steel or 4 mm aluminium	<input type="checkbox"/>
80		Attachment with bolts M 8 Grade 8.8 / numbers of fasteners depend of the accumulators weight	<input type="checkbox"/>
81	Tab EV5.4 Rule EV5.4	HV Protection structure All components below 350 mm above the ground must be protected against side and rear impact with a structure	<input type="checkbox"/>



Changelog