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 official FSAE competition as described in the 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)	☐
2		Receipt, donation letter (if materials donated) or proof for non-steel materials	☐
3	Chassis Pics	**Chassis Pictures** colour code for different materials?	☐
4		Proof of materials = used materials for different areas?	☐
5		3 different views and an isometric view is shown	☐
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)	☐
7		[FSE only] HV components included?	☐
8[1]	Material Data	**Material data** for each different laminate must be provided Material data for used aluminium provided?	☐
9	Tab T3.1 Rule T2.9	**Main Hoop [MH]** must be a single piece of uncut, continuous, closed section steel tubing	☐
10		MH angle (shown in TAB “Chassis Pics”) is above the top of the major structure the angle between the MH and the vertical must be not more than 10deg	☐
11		MH angle is below the top of the major structure can be inclined at any angle to the vertical in the forward direction, in the rearward direction, maximal 10deg to the vertical	☐
12		MH angle - Check the evidence of the used values! (SE3DM file)	☐
13	Tab T3.12 Rules T2.10 T2.17	**Front Hoop [FH]** Angle between the FH and the vertical is inclined not more than 20deg (please note T2.4.2)	☐
14		FH - Check the evidence of the used values! (SE3DM file)	☐
15	Tabs T3.14 T3.36 Rule T2.11	**Main Hoop Bracing [MHB]** must be made of a straight tube, on both sides of the MH directed in inclination from the main hoop	☐
16		MHB must be attached as near as possible to the top of the MH but no more than 160 mm below the top-most surface of the MH	☐
17		MHB support must be properly triangulated to the bottom of the main hoop and upper member of the SIS	☐
18		MHB - Check the evidence of the used values! (SE3DM file)	☐
19	Tabs T3.13.6 T3.36 Rules T2.11.5 T2.4 T2.5 T2.17	**Monocoque Main Hoop Bracing Support [MHBS]** (see also T2.17) 30 kN for each attachment point, for each support 2 M8 8.8 bolt or 1 M10 8.8 bolt.	☐
20		MHBS - Check laminate test	☐
21		MHBS - Check the shear strength of the laminate!	☐
22		MHBS - Check the calculation of the welding seam	☐
23		MHBS - Check the evidence of the used values	☐
24	Tabs T3.14 T3.36 Rules T2.12 T2.17 T2.4 T2.5	**Front Hoop Bracing** [FHB] directed only in front direction on both sides, max. 50.8 mm below top of front hoop	☐
25		If FH > 10° inclined to the rear, additional support to the rear is required	☐
26		Check laminate test	☐
27		Check the shear strength of the laminate!	☐
28		Check the evidence of the used values!	☐

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.

#	SES Tab/ Rule	Content	OK
29	Tabs T3.18 T3.31	**Front Bulkhead** [FBH]; if L-shaped, the EI of the vertical and horizontal axis must be equivalent to steel	☐
30	Rules T2.14 T2.4 T2.5	L maximal 25.4 mm towards to the inside	☐
31		Check dimensions of cut out in 3D-model	☐
32		Shear strength of bulkhead equivalent to a 1.5 mm thick steel plate (T2.14.3)	☐
33		Check laminate test	☐
34		Check the evidence of the used values!	☐
35	Tabs T3.19 T3.32	**Front bulkhead support** [FBHS] check the drivers leg protection	☐
36	Rules T2.4 T2.5 T2.15 T3.2.3	In side view max. 50 mm from top of front bulkhead and from front bulkhead back to the front hoop	☐
37		EI of the FBHS must be equivalent to the sum of the EI of the six (6) baseline steel tubes	☐
38		EI of vertical side of the FBHS (T2.16.2) = EI from one baseline tube	☐
39		Check laminate test	☐
40		Shear strength (T12.15.4) min. 4kN	☐
41		Check the evidence of the used values!	☐
42	Tabs T3.24 T3.33	**Side impact structure [SIS]** SIS incl. bottom until 320mm above the lowest inside chassis point ≥ EI of 3 baseline tubes	☐
43	Rules T2.4 T2.5 T2.16	SIS (up to 320mm above the lowest inside chassis point) ≥ EI of 2 baseline tubes	☐
44		Horizontal floor to the middle of the car ≥ EI of 1 baseline tube	☐
45		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	☐
46		Shear strength (T2.16.2) min. 7.5kN	☐
47		Check laminate test	☐
48		Check the evidence of the used values	☐
49	Tab T5.4 Rule T4.5	**Shoulder Harness bar** Stiffness must be equivalent to 1 baseline tube	☐
50	Tab T3.20	**Anti-Intrusion Plate** [AIP] 1.5 mm steel or 4 mm aluminium or composite material if approval given	☐
51	Rules T2.18.2 T2.18.4 T2.4 T2.5	Attached with min. 8 x 8 mm 8.8 bolts	☐
52		Proof for bolts in longitudinal and transversal direction	☐
53		If composite material check laminate test	☐
54	Tab T3.30	**3 point bending test** ► test sample 275x500 mm / load applicator Ø100 mm (test specimen with closed flanges are NOT accepted)	☐
55	Rules T2.5 T2.6	Proof for SIS with 2 tubes, other different laminate structures (see page 1) require additional tests	☐
56		Absorbed energy from start up to 12.7 mm	☐
57		Perimeter shear test ► sample 100x100 mm on a plate with Ø32 mm hole and with a punch of Ø25 mm	☐
58		Compare values from diagram with values from the TAB	☐

#	SES Tab/ Rule	Content	OK
59		Check the evidence of the used material values	☐
60		Numbers of different laminate structures = numbers of different test	☐
61	Tab T3.34 Rule T2.17	**Main Hoop Attachment** Analogue to rule T2.17	☐
62	Tab T3.35 Rule T2.17	**Front Hoop Attachment** Analogue to rule T2.17, no lower than 50 mm from top of front hoop	☐
63		Fully laminated in is accepted if a calculation of the equivalence to four attachment points is shown (min. 4 x 30kN)!	☐
64	Tab T3.36 Rule T2.17	**Main Hoop Bracing Attachment** Analogue to rule T2.17	☐
65	Tab T3.39 Rule T2.17	**Hoop Attachment Points** must carry a load of min. 30 kN in each direction	☐
66		Mounting plates, backing plates and inserts must have sufficient shear area, weld area and strength (check shear strength rule T2.17)	☐
67		Mounting plates, backing plates 2 mm steel	☐
68		Each attachment point must have 2 bolts 8mm 8.8 or alternative	☐
69		Front and main hoop bracing attachment 1 bolt M10 8.8	☐
70		No crushing of the core is permitted rule T2.17.6	☐
71	Tab T3.37 Rule T2.18.5	**Impact Attenuator Attachment to Monocoque** Equivalency to a minimum of eight (8) 8 mm Metric Grade 8.8 bolts	☐
72	Tab T3.40 Rules T3.5 T4.3	**Harness Attachment Points** Shoulder and lap belt attachments must be tested	☐
73		Distance from the test specimen to the load application point must be at least 125 mm away	☐
74		Test specimen should represent the design on the car as driven at a competition	☐
75		Check the panel height in SES with test specimen dimension	☐
76		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	☐
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77	Tabs EV3.4.4 EV3.4.6	**Accumulator Container** Material as given in rule EV3.5 or equivalent if equivalence is shown	☐
78	Rule EV3.5	Protected with a SIS (rule T2.16)	☐
79	Tabs EV3.4.8 EV3.4.9	**Accumulator Attachment** 20 g in vertical direction, 40 g in horizontal direction Calculation, simulation or physical test required	☐
80	Rule EV3.5	**Accumulator container attachment** Brackets / backing plates 1.6 mm steel or 4 mm aluminium	☐
81		Attachment with bolts M 8 grade 8.8 / numbers of fasteners depend of the accumulators weight	☐
82	Tab EV4.2.2 Rule EV4.2	**HV Protection structure** All components below 350 mm above the ground must be protected against side and rear impact with a structure	☐

Changelog