

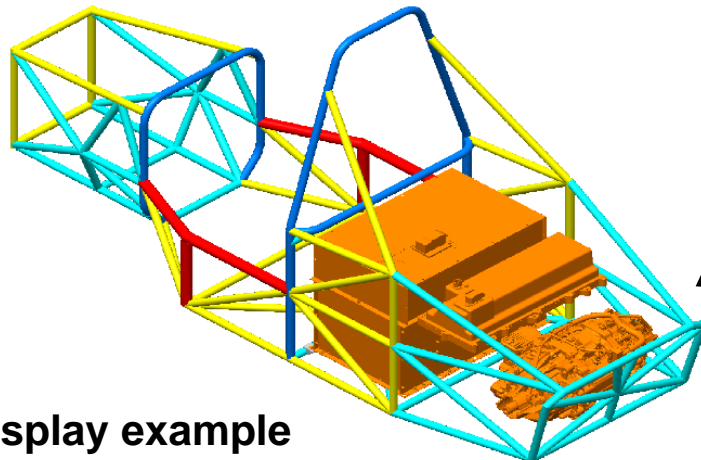
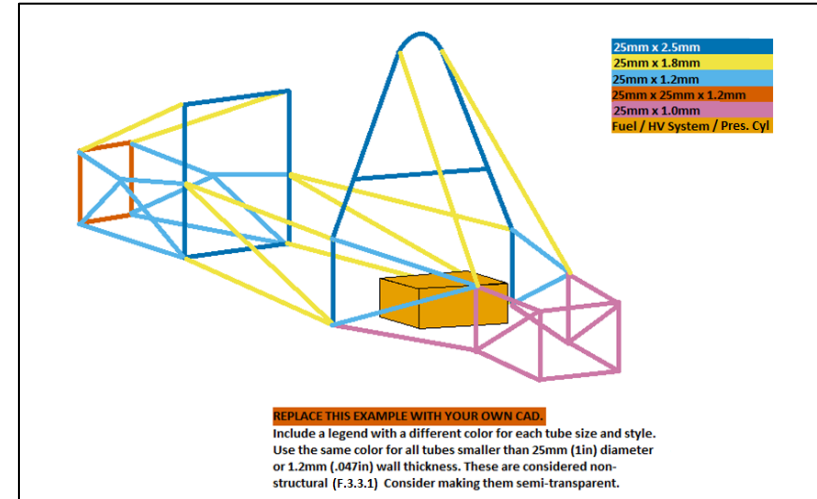
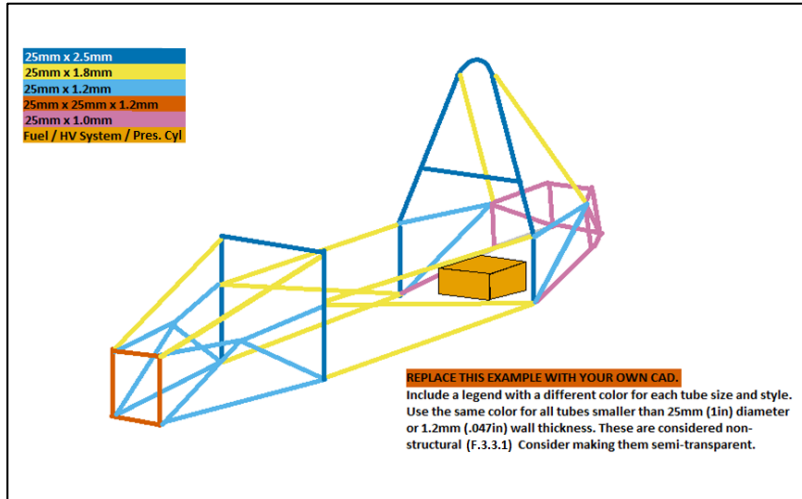
# 2020 SES Inspection

## Precautions for EV

SES = **S**tructural **E**quivalency **S**preadsheet

# About the display of HV Systems

Show accumulator installation/removal.  
Use different colors for square and round.  
Include a legend that shows each color and size.  
Fuel tank, HV systems, pressurized tanks shown in orange.



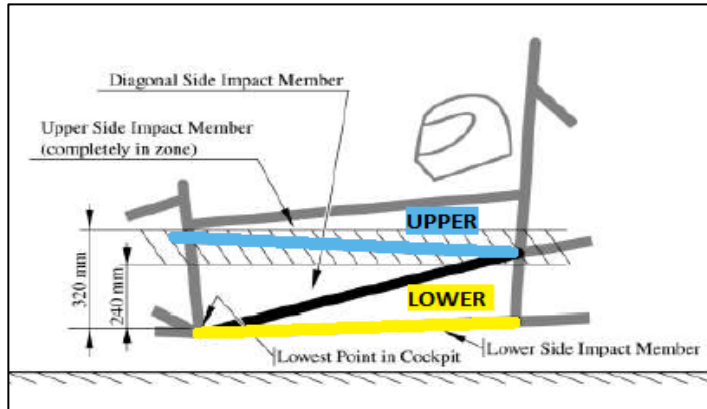
## Described required as HV systems

- Accumulator Container
- Inverter System
- Tractive System

Display all of these

# Accumulator Side Protection

**The need for protection is based on the height of the Upper Side Impact Member.**



## F.11.2.1

All Accumulator Containers must be protected from side impact or rear impact by Side Impact Structure (F.6.4, F.7.6, or Equivalent)

- The Accumulator Container must not form part of the equivalent structure.

**Accumulator Container must be within the height of Major Structure.**



**Fig.1 is according to the rules.**



If the Accumulator Container is higher than the Major Structure, protect the protruding part with a triangular structure as shown in Fig.2.  
(The red line is an example)

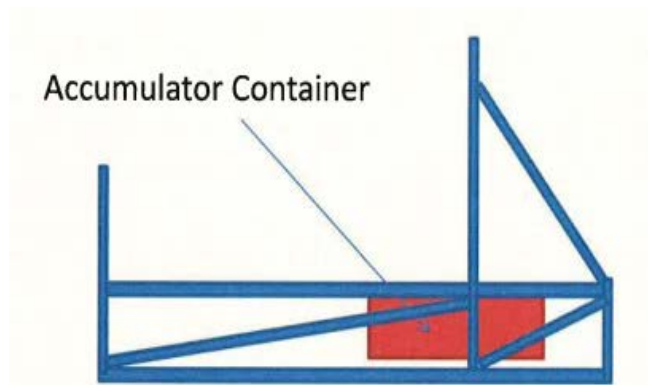


Fig.1

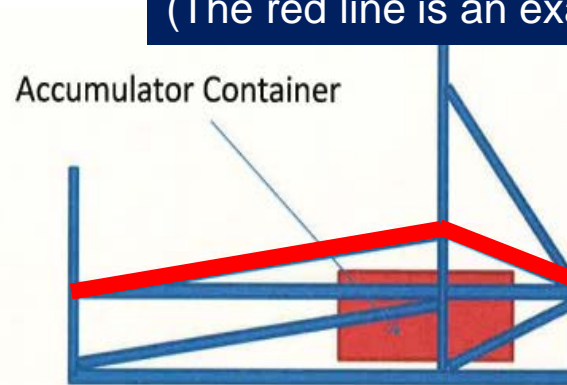


Fig.2

# Attention : Accumulator Side Protection

The need for protection is based on the height of the Upper Side Impact Member

**Note: SES sheet is incorrect**

BLANK

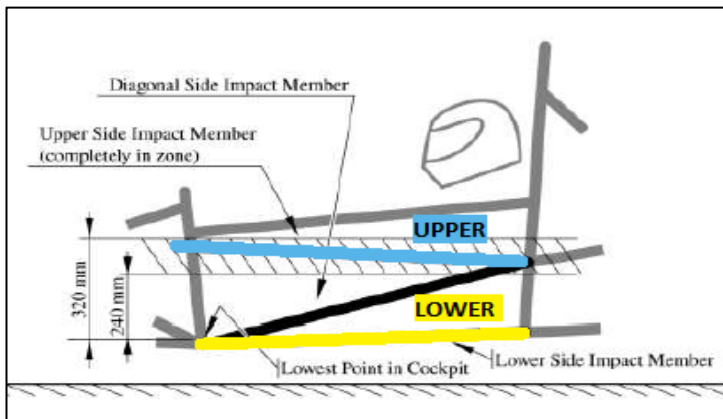
## EV Accumulator Side Protection

**F.11.1.1 F.1.1j** Accumulators must be within the Primary Structure.

**F.11.2.1** Accumulator protection tubes are part of the Primary Structure

**F.11.2.1** From the side, below 350 mm the accumulator must be protected with:

1. An upper tube, generally not above Upper SIS height or below the top of the accumulator.
2. A lower tube meeting F.11.1.1.
3. A diagonal tube or tubes completely triangulating the upper and lower tubes.



### Rules original

**F.11.2.1**

All Accumulator Containers must be protected from side impact or rear impact by Side Impact Structure (F.6.4, F.7.6, or Equivalent)

- The Accumulator Container must not form part of the equivalent structure.

# Tractive Side Protection

The need for Protection is based on a height of 350mm from the ground

**Note: SES sheet is consistent with the rules**

BLANK

## EV Tractive Side Protection

**F.11.1.3 F.1.1** HV Components must be within the Rollover Protection Envelope.

**F.11.1.2** Outboard wheel motors are the only exception.

- F.11.2.3** - From the side, below 350mm, the tractive HV components must be protected with:
1. An upper tube, generally not above Upper SIS height or below the top of a motor at axle level.
  2. A lower tube.
  3. A diagonal tube or tubes completely triangulating the upper and lower tubes.

### Rules original

F.11.2.3

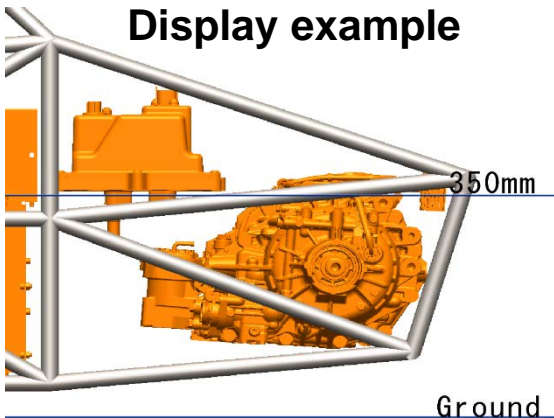
Tractive System parts in a position below 350 mm from the ground must be:

a. Protected from:

- Side impact
- Rear impact
- Intrusion by non-crushable objects (such as a differential)

b. Protected by structure meeting F.5.13 Component Protection

Display example



# Rear Impact Protection

The choice is divided between Tractive Rear Impact Protection and Accumulator Rear Impact Protection.

F.11.2.3 Your motor or diff could fit between the acc.and rear impact? ☒ Yes

**Tractive Rear Impact Protection**

**Minimum**

**Tube Used**

F.3.2.1 Example: 25.4mm x 1.2mm round

Size C

☒ Round

F.11.2.3

Rear Impact Diagonal:

☒ Differential Mounts

Tractive Rear Impact Protection

**Minimum**

**Tube Used**

F.11.2.3

Rear Impact Diagonal:

☐ Tube

Tractive Rear Impact Protection

**Minimum**

**Tube Used**

F.11.2.1 Your motor or diff could fit between the acc.and rear impact? ☒ No

**Accumulator Rear Impact Protection**

**Minimum**

**Tube Used**

F.3.2.1 Example: 25.4mm x 1.6mm round

Size B

☒ Round

F.11.2.1

Rear Impact Diagonal:

☒ Differential Mounts

Accumulator Rear Impact Protection

**Minimum**

**Tube Used**

F.11.2.1

Rear Impact Diagonal:

☐ Tube

Accumulator Rear Impact Protection

**Minimum**

**Tube Used**

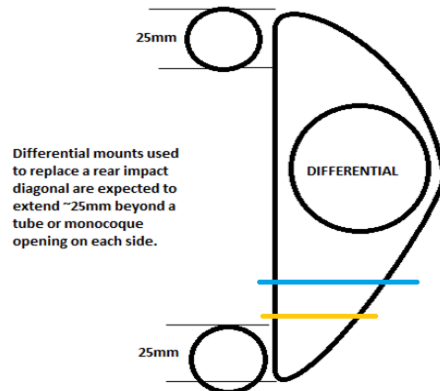
F.3.2.1

Example: 25.4mm x 1.6mm round

Size C

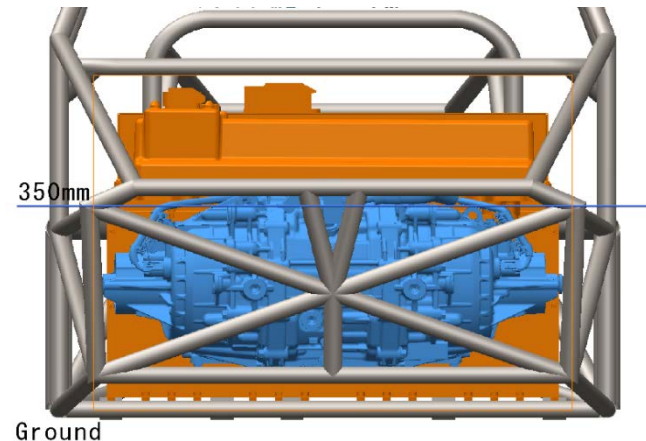
☒ Round

REPLACE THIS EXAMPLE WITH YOUR OWN CAD.  
Include all required dimensions.



Differential mounts used to replace a rear impact diagonal are expected to extend ~25mm beyond a tube or monocoque opening on each side.

Minimum horizontal Moment of Inertia (I) may not be same place as minimum horizontal Cross Sectional Area (A)



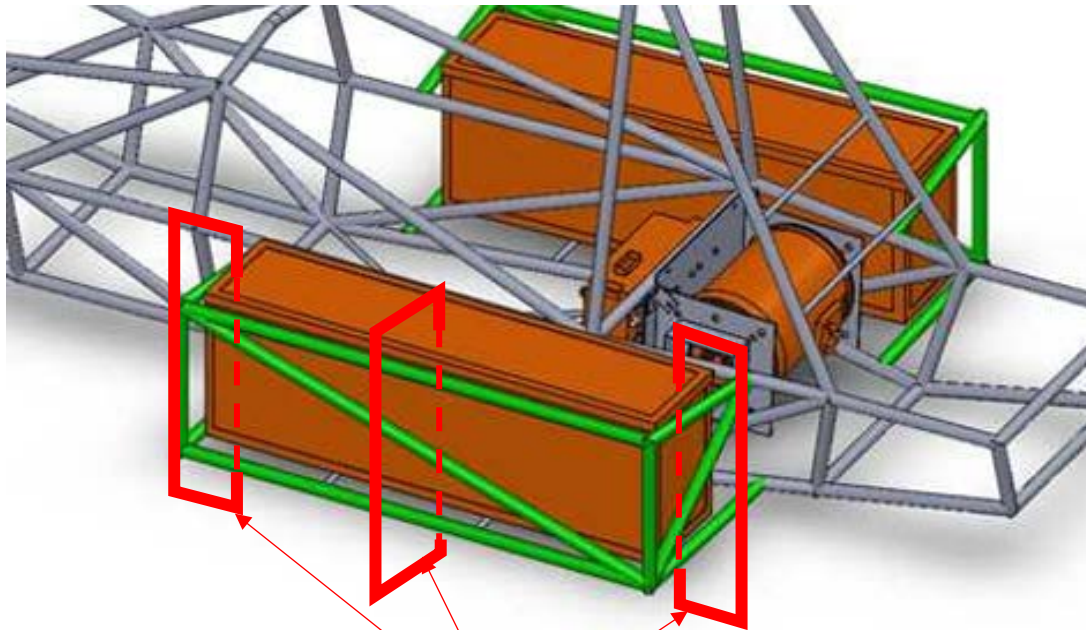
Display example

# Protection Strength Calculation

## Accumulator & Tractive System Protection

Protections should be considered as Side Impact Structure equivalent.

You calculate in the composition pipe of the weakest perpendicular section.

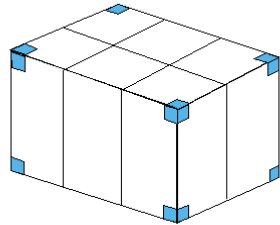


**Tube number should be counted in the weakest cross-section**

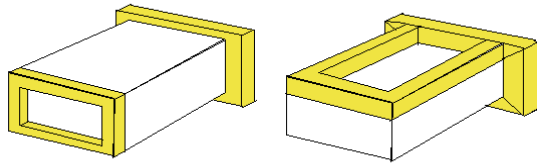


# Display of EV Accumulator

For EV Accumulator, describe correctly referring to the illustration.

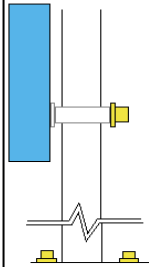


REPLACE THIS EXAMPLE WITH YOUR OWN CAD.

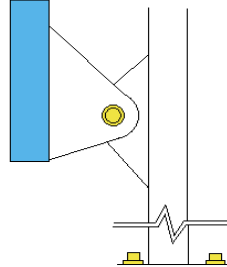


Guidance images vary by section. REPLACE THIS EXAMPLE WITH YOUR OWN CAD.  
Equivalence calculations and required dimensions are the same for every attachment.

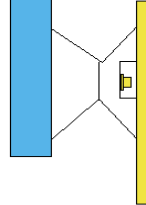
Direct  
mount  
to Acc. &  
Tube



Mount on Acc. &  
Mount on Tube



Mount on Acc. & Mount  
on Structural Panel



Copy this tab for equivalence if a subframe is used.

Guidance images vary by section. REPLACE THIS EXAMPLE WITH YOUR OWN CAD.  
Equivalence calculations and required dimensions are the same for every attachment.

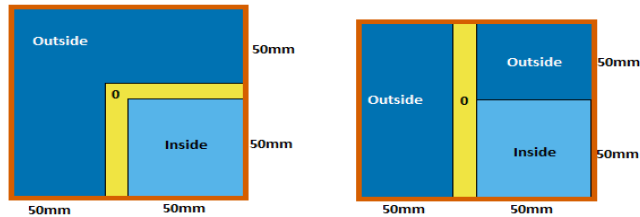
Outside the surfaces of the segment structures.

Outside the surfaces of the segment structures.

Inside the surfaces of the segment structures.

Outside the surfaces of the segment structures.

Guidance images vary by section. REPLACE THIS EXAMPLE WITH YOUR OWN CAD.  
Equivalence calculations and required dimensions are the same for every attachment.

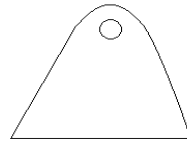


For corner attachment, in all three planar views, the shear area or axis of the fastener must be within 50mm of the corner of the segment structure. The entire skin thickness counts as 0mm.

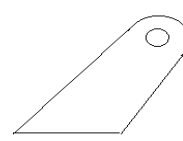
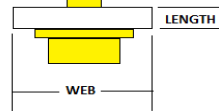
Mounts that are inside the segment edges (on the surface) in one view with less than 12.7mm to the fastener centerline in the others do not require braces.

REPLACE THIS EXAMPLE WITH YOUR OWN CAD.  
Include all required dimensions.

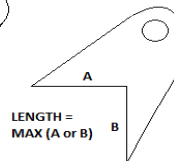
LENGTH IN THE FASTENER SHEAR PLANE  
FOR A FLAT TAB, WEB IS THICKNESS



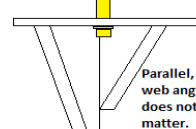
Without gussets,  
length and web are  
reversed parallel  
to the axis.



Parallel to fastener  
axis, add web  
thicknesses.

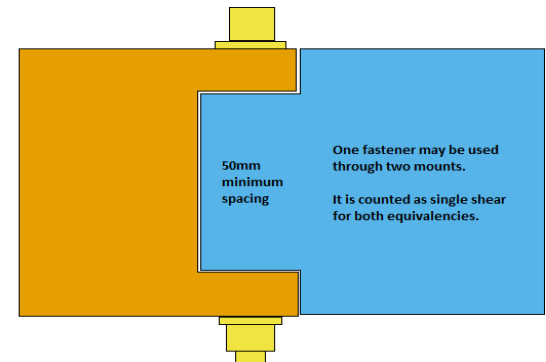


Parallel to fastener axis,  
length is minimum of web  
included.



Parallel,  
web angle  
does not  
matter.

Guidance images vary by section. REPLACE THIS EXAMPLE WITH YOUR OWN CAD.  
Equivalence calculations and required dimensions are the same for every attachment.





# About Accumulator Segment

The following rules are the criteria for the Accumulator Segment.  
Confirm consistency with separately registered ESF.

① EV.3.1.2	Maximum segment voltage:
② EV.3.1.2	Nominal segment capacity:
③ EV.1.3.2	Maximum accumulator voltage:

BLANK				
	Cell type:	Cylindrical		EQ
	Maximum Voltage:		V	BLANK
	Nominal Voltage:		V	BLANK
	Nominal Capacity:		mAh	BLANK
	Maximum segment cells in series:			BLANK
	Maximum segment cells in parallel:			BLANK
EV.4.1.2	Maximum segment voltage:	0	V	EQ
EV.4.1.2	Nominal segment capacity:	0	MJ	EQ
EV.1.3.2	Total accumulator cells in series:			BLANK
	Total accumulator cells in parallel:			BLANK
	Maximum accumulator voltage:	0	V	EQ
	Nominal accumulator capacity:	0	kWh	EQ
BLANK				
F.10.2.3	Cell mounting and bracing material:	E:	Pa	BLANK
		UTS:	Pa	BLANK
		Shear:	Pa	BLANK
	Assembled Segment moment of inertia, Lateral cross section:		mm <sup>4</sup>	BLANK
	Assembled Segment moment, Longitudinal cross section:		mm <sup>4</sup>	BLANK
	Maximum segment length:		mm	BLANK
	Maximum segment width:		mm	BLANK
	Maximum segment height:		mm	BLANK
BLANK				
F.10.2.3	Restraint Method:	Examples: Bolted, Friction, Adhesive		BLANK