SES(等価構造計算書) EV編

F.3.1-4 Tube Chassis

F.10-11 EV Accumulator

SES(等価構造計算書) EV編

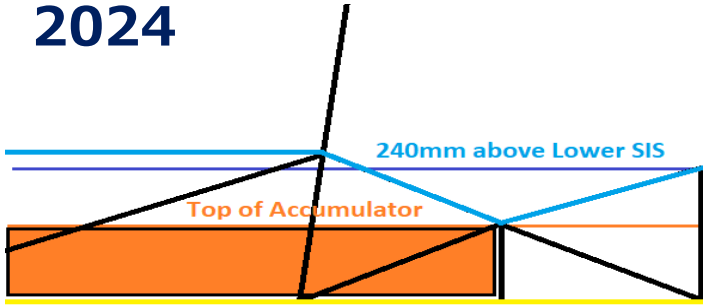
F.3.1-4 Tube Chassis

- ✓ Accumulator Side Protection,
- ✓ Tractive Side Protection, RBHS (EV Only)
- ✓ Rear Bulkhead (EV only)

Accumulator Side Protection

Attach a drawing confirming that the entered values are correct.

2024

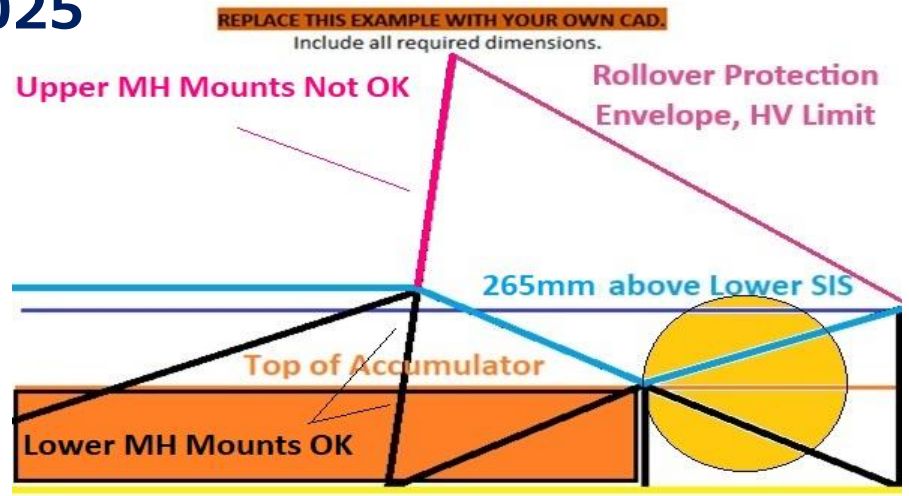


The triangulated HV protection between the SIS and Rear Impact may be as low as 240mm above the Lower SIS or the top of the accumulator, whichever is lower.
There is no maximum height.

SIS とRear Impact の間の三角構造による HV 保護は、**Lower SISの上方 240 mm** または アキュムレータの上部のいずれか低い方まで低くすることができます。
最大高さはありません。

変更あり

2025



The triangulated HV protection between the SIS and Rear Impact may be as low as 265mm above the Lower SIS or the top of the accumulator, whichever is lower.
There is no maximum height.

2025

SIS と Rear Impact の間の三角構造による HV 保護は、**Lower SIS またはアキュムレータ上部のいずれか低い方から 265 mm 上まで**低くすることができます。 最大高さはありません。

BLANK					
F.11.2.1.a Accumulator Side Protection		**Minimum**	**Tube Used**		EQ
F.3.2.1.m	Example: 25.4mm x 1.6mm round	Size B	Round		EQ
F.3.4.1.b	Wall thickness:	1.2		mm	BLANK
	Outer Diameter (OD):	25		mm	BLANK
	Wall thickness:	1.2		mm	BLANK
	Outer Diameter (OD):	25.0		mm	BLANK
	Tube cross sectional area (A):	114		mm^2	BLANK
	Tube second moment of inertia (I):	8509		mm^4	BLANK

Air Gap to Driver's Seat

Attach a drawing confirming that the entered values are correct.

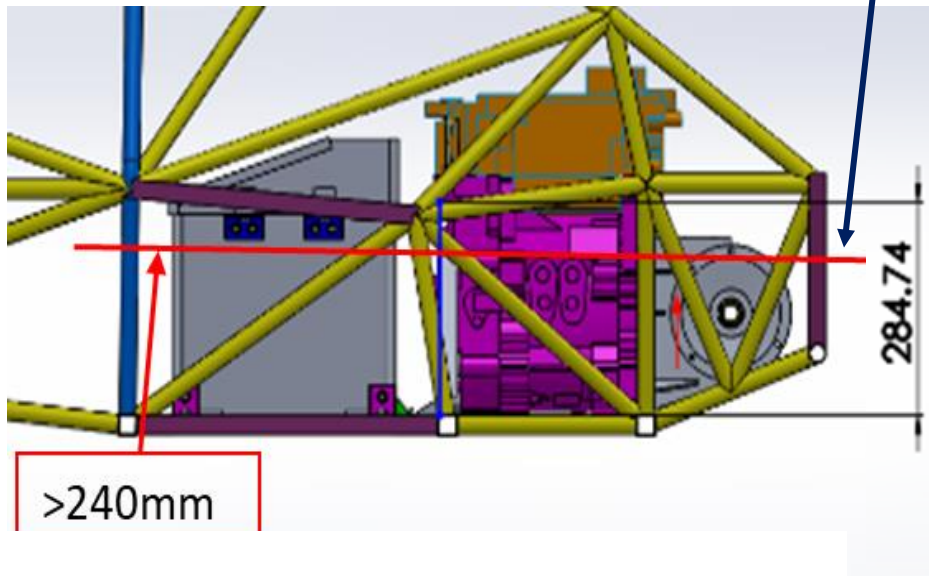
T.1.6 Heat insulation requirements apply at operating and failure temperatures.
T.1.6.3.b An air gap no less than 25mm is required between the accumulator and the driver's seat.

BLANK			
T.1.6.3.b	Air gap to driver's seat >=25mm:	mm	BLANK
	Top surface of HV Protection	>=240mm	EQ

>=240mm
Above Accumulator

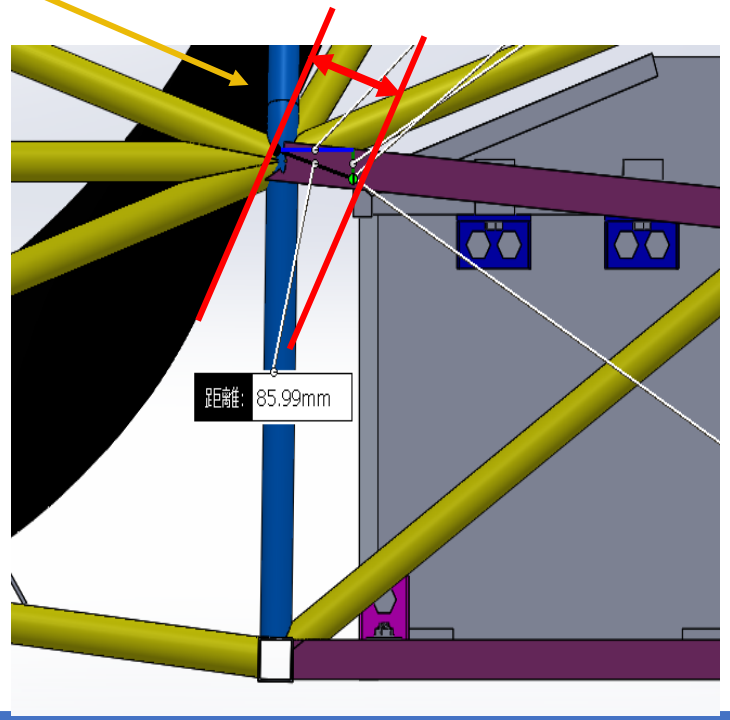
Indicate that it is 240 mm or more.

左図のように240mm以上であること示すこと



Enter the minimum distance between ACC and the driver’s sheet as shown in the figure.

右図のようにACCとシートとの最小距離を入力すること



Tractive and HV Side Protection

Attach a drawing confirming that the entered values are correct.

2025 SES.V1.1 states the following, but since the 2025 rule states that it is required at 350 mm or less, provide evidence with dimensional lines as shown at right.

2025年 SES.V1.1には、以下の記載があるが、2025ルールでは、350mm以下で必要と記載されているため、右図の様な寸法線を入れたエビデンスを示すこと。

2025 SES.V1.1

F.11.2.4
From the side, all HV components must be protected with an upper tube, a lower tube, and a diagonal tube or tubes completely triangulating the upper and lower tubes

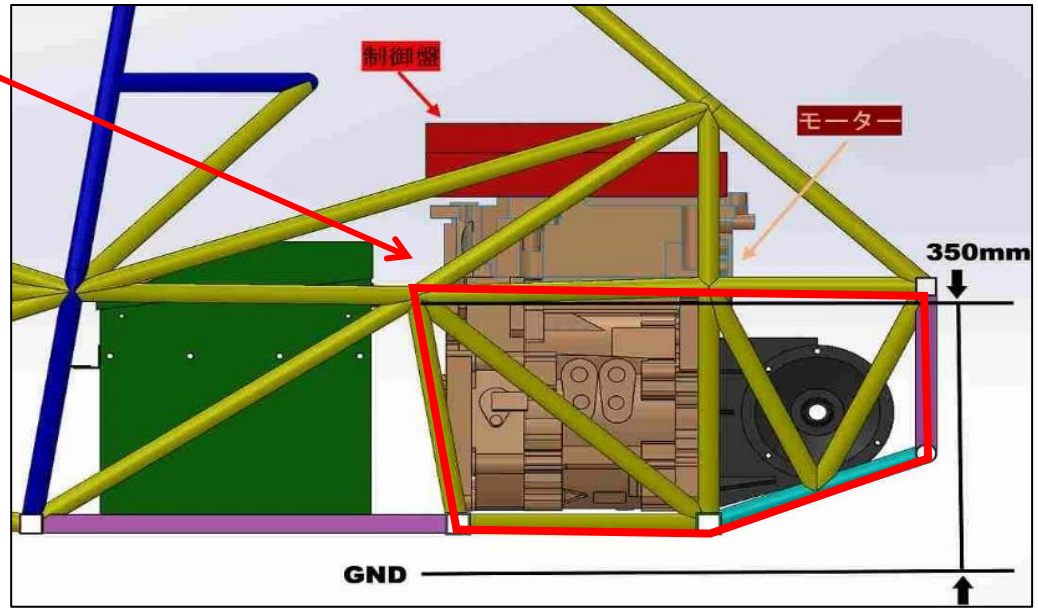
BLANK				
F.11.2.1.c Tractive Side Protection		**Minimum**	**Tube Used**	EQ
F.3.2.1.n	Example: 25.4mm x 1.2mm round	Size C		BLANK
F.3.4.1.c	Wall thickness:	1.2	mm	BLANK
	Square side:	25	mm	BLANK
	Wall thickness:	1.2	mm	BLANK
	Square side:	25.0	mm	BLANK
	Tube cross sectional area (A):	91	mm^2	BLANK
	Tube second moment of inertia (I):	6695	mm^4	BLANK

F.11.2.1.b The entire top edge of the upper tube must be at least 240mm above the lowest point of the top surface of the Lower SIS tube.

BLANK		
EV motor location:	Select Drop Down	BLANK
Top surface of HV Protection:		BLANK

2025 rule

F.11.2.4
Tractive System components other than Accumulator Containers in a position **below 350 mm from the ground** must be protected from side impact by structure that meets F.5.16 Component Protection.



Required in the zone enclosed by the red line; as with MHBS and FBHS, a pipe with a minimum strength of Φ25.4 t=1.2mm is required.

図で赤枠に囲まれたゾーンで必要。MHBSやFBHSと同様、Φ25.4mm、t=1.2mm以上のパイプが求められる

Rear Bulkhead

Attach a drawing confirming that the entered values are correct.

2025 Change: ~~350 mm or less~~ → 265 mm or less

2025年変更点：~~350mm以下で必要~~ → 265mm以下で必要に改訂

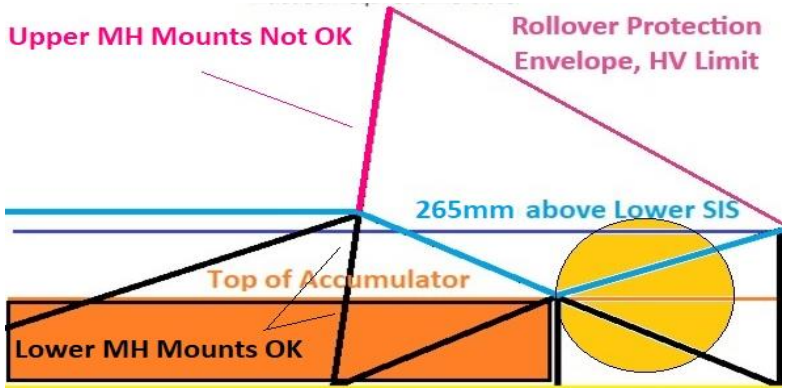
BLANK				
F.11.3.1.a	Min distance from Accumulator to Rear Bulkhead?		mm	BLANK
	Accumulator Rear Bulkhead	**Minimum**		
F.3.2.1.m	Example: 25.4mm x 1.6mm round	Size B		
F.3.2.1.b	Wall thickness:	1.2	mm	BLANK
	Square side:	25	mm	BLANK
	Wall thickness:	1.2	mm	BLANK
	Square side:	25.0	mm	BLANK
	Tube cross sectional area (A):	114	mm^2	BLANK
	Tube second moment of inertia (I):	8509	mm^4	BLANK

Tube
Diff Carrier Diagonal
Billet Plate

F.11.3.2 The entire top edge of the upper tube or plate must be at least 265mm above the lowest point of the top surface of the Lower SIS tube.

Required in the zone framed in red in the figure.
Φ25.4mm, t=1.6mm or □25mm, t=1.2mm or larger pipe required

図で赤枠に囲まれたゾーンで必要。
Φ25.4mm、t=1.6mmまたは、□25mm、t=1.2mm 以上のパイプが求められる



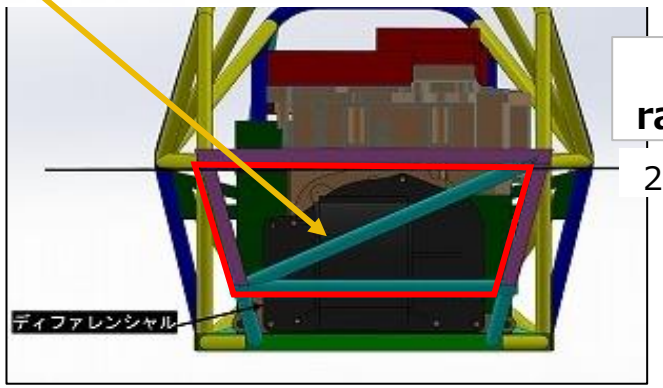
The triangulated HV protection between the SIS and Rear Impact may be as low as 265mm above the Lower SIS or the top of the accumulator, whichever is lower. There is no maximum height.

SISとRear Impactの間の三角形のHV保護は、Lower SISまたはACCの上部のどちらか低い方の265mmまでとすることができる。
高さの上限はない。

F.5.16 Component Protection When specified in the rules, components must be protected by one or two of:
a. Fully Triangulated structure with tubes meeting F.3.2.1.n
b. Structure Equivalent to the above, as determined per F.4.1.3

The CAD drawing shows that F.5.16 is valid.

F.5.16 が成立している事を示すCAD図をエビデンスとして示すこと



Indicating a range of 265 mm

265mmの範囲を示すこと

Rear Bulkhead

Attach a drawing confirming that the entered values are correct.

2025 Change: ~~Required over 240 mm~~ → Required over 265 mm

2025年変更点：~~240mm以上で必要~~ → 265mm以上で必要に改訂

F.11.2.2.b The entire top edge of the upper tube or plate must be at least 240mm above the lowest point of the top surface of the Lower SIS tube.

2024年

Top surface of Lower SIS to top Rear Impact >=240mm: [ ] mm BLANK

F.11.3.2 The entire top edge of the upper tube or plate must be at least 265mm above the lowest point of the top surface of the Lower SIS tube.

2025年

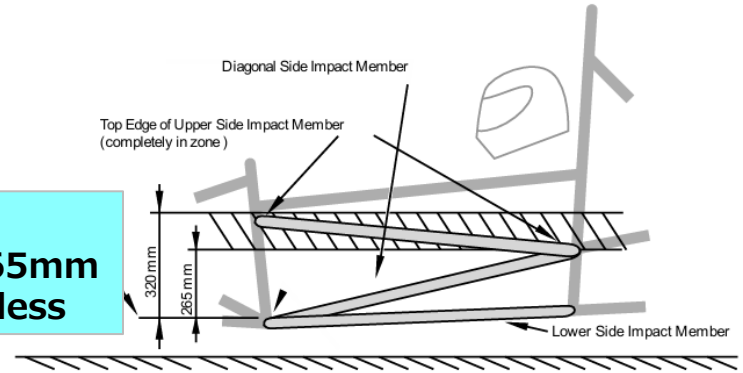
Top surface of Lower SIS to top Rear Bulkhead edge >=265mm: [ ] mm BLANK

F.11.3.2
The entire top edge of the Rear Bulkhead must go to a minimum height of the Upper Side Impact Structure **F.6.4.4 / F.7.5.1**

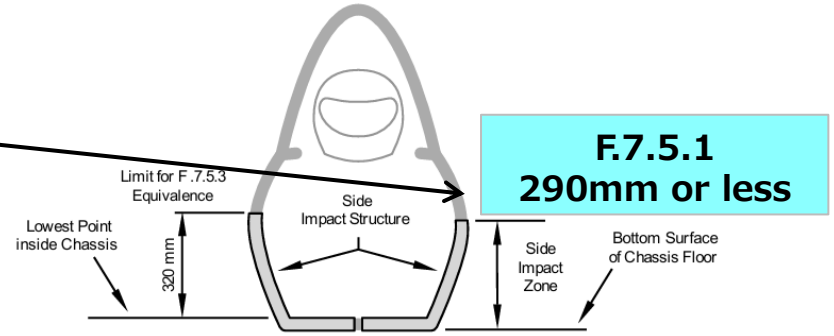
The CAD drawing shall show that the following are connected to the height of F.6.4.4 (Tube Chassis) or F.7.5.1 (Monocoque)

以下、F.6.4.4（Tube Chassis） または F.7.5.1（Monocoque）の高さに接続されている事をCAD図で示すこと

F.6.4.4
More than 265mm
320mm or less



F.7.5.1
290mm or less



Rear Bulkhead

Attach a drawing confirming that the entered values are correct.

BLANK					
F.11.3.1.a	**Rear Bulkhead Tubes Replaced:**	**0**			BLANK
F.3.3-5	Material:	Steel			N/A
F.3.4.2	Young's Modulus (E):	2.00E+11		Pa	N/A
	Yield Strength (Sy):	3.05E+08		Pa	N/A
	Ultimate Strength (Su):	3.65E+08		Pa	N/A
(S)		0.00E+00	0.00E+00	Pa	N/A
		0.00E+00		mm^2	N/A
		0.00E+00		mm^4	N/A
Mount Longitudinal Edge to Moment of Inertia Centroid (R):		12.500		mm	N/A
Buckling Modulus	E_1*I_1 <= E_2*I_2:	0.00E+00			N/A
Critical Strength	S_1*A_1 <= S_2*A_2:				N/A
Bending	4*S_1*I_1/r <= 4*S_2*I_2/r:				N/A
Deflection	Bending_1/(48*EI):				N/A
Energy	0.5*Bending^2/(48*EI):				N/A

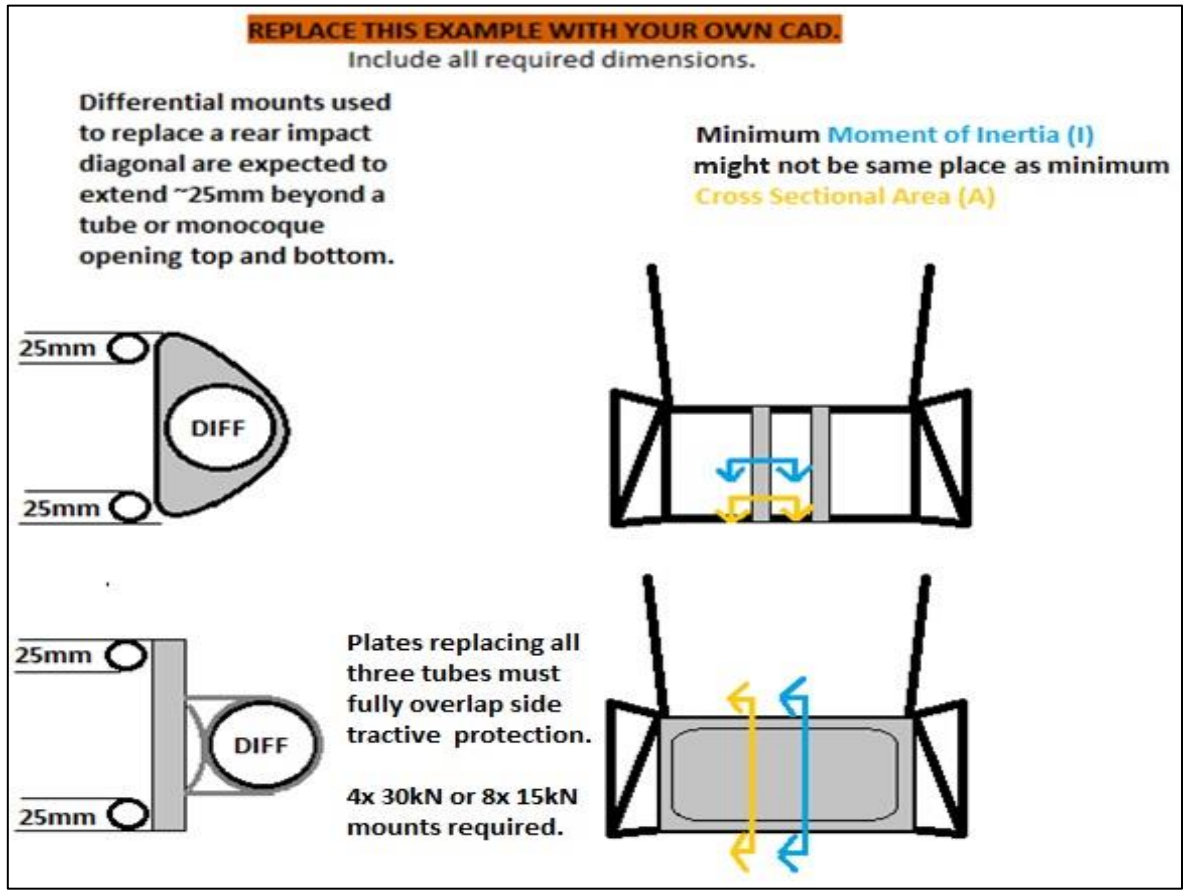
In rear view, a billet rear bulkhead plate must fully overlap the F.11.2.2.b chassis load paths to the SIS. The billet must rest on the tubes so the fasteners carry lateral loads only, not the 120kN rear impact load.

EQ				
F.7.8.1				N/A
	30000	N		N/A
F.7.8.7		mm		N/A
		Pa		N/A
	0	0.00%		N/A
		mm		N/A
		mm		N/A
	0	0.00%		N/A
		mm		N/A
		mm		N/A
	0	0.00%		N/A

Bracket/tab to tube welding must be on both sides of the bracket/tab.

Proof of strength equal to or greater than that of a Rear Bulkhead consisting of a pipe of Φ25.4mm, t=1.6mm or □25mm, t=1.2mm or larger.

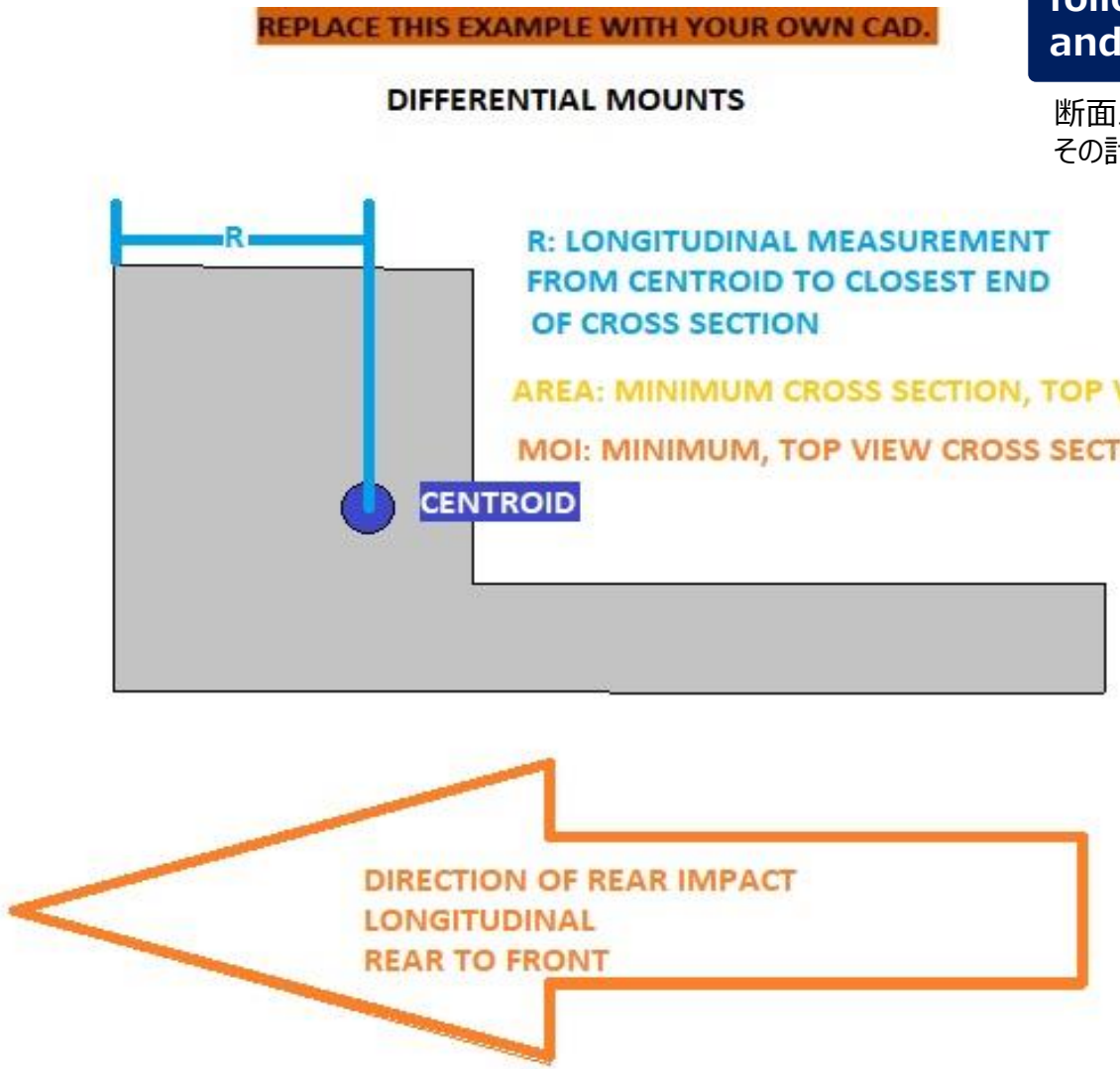
Φ25.4mm、t=1.6mm または、□25mm、t=1.2mm 以上のパイプで構成された Rear Bulkhead と同等以上の強度を持つことを証明すること



Rear Bulkhead

MOI calculations should be based on the following conditions and the calculation process and results should be posted as evidence.

断面二次モーメントの計算は、以下の条件に基づいて算出し、
その計算過程と結果をエビデンスとして掲載すること



← 断面の中心から最も近い端までの
長手方向の測定値

← AREA：上面図での最小断面

← 断面二次モーメント： 上面断面図での最小値

← 後面衝突の方向
長手方向後方から前方へ

SES(等価構造計算書) EV編

F.10-11 EV Accumulator

- ✓ Accumulator Segments
- ✓ Accumulator Container

Material Properties and Weight

Indicate which materials were used to make the Segment and Container.

If materials such as A2024, A5052, acrylic, etc., are used: enter in the “Other Unwelded” or “Other Welded” field.

A2024, A5052 アクリル等の材質を使った場合：「Other Unwelded 」または「Other Welded」の欄に記載する

Note: Forces are given in Pa, not Mpa or Gpa.

Material	E (Pa)	S_Ultimate (Pa)	Shear (Pa)	FEA is not accepted anywhere in the SES or Tech Inspection.
Steel Unwelded	2.00E+11	3.65E+08	2.11E+08	
Steel Welded	2.00E+11	3.00E+08	1.73E+08	
6061-T6 Unwelded	6.90E+10	2.90E+08	1.67E+08	
6061-T6 Welded	6.90E+10	1.75E+08	1.01E+08	
Other Unwelded			0.00E+00	Core mm / Outer mm / Inner mm
Other Welded			0.00E+00	
NAME F.4.3 Compos	#REF!	#REF!	#REF!	#REF! / #REF! / #REF!

Incorrect values are cause for resubmission!

誤った数値が記載されていると、再提出の原因となる

Composite teams: Enter tab names for materials used.

EQ

Low Est	High Est	Cell Mass
2	26	2.04

Total mass of all segments:	48	kg	EQ	
Total accumulator mass:	62	kg	EQ	
F.10.5.6 Corner attachmen	test load:	6082.2	N	each
F.10.5.7 Mass based min attachment number:	10x at	15000	N	each

Criteria for calculating Load values for Corner Attachment and Mass Based

Corner Attachment と Mass Based の Load値の計算基準

EQ

	Cell type:	Pouch		EQ
	Maximum Voltage:	4.2	V	EQ
	Cell mass:	255	g	EQ
	Nominal Capacity:	10000	mAh	EQ
	Maximum segment cells in series:	12		EQ
	Maximum segment cells in parallel:	1		EQ
EV.5.1.2	Maximum segment voltage:	50.4	V	EQ
EV.5.1.2	Maximum segment capacity:	1.81	MJ	EQ
	Number of segments in series:	8		EQ
	Number of segments in parallel:	1		EQ
	tage:	403.2	V	EQ
	acity:	4.03	kWh	EQ

All 8 Segment are 6kg => 48kg

8個のSegmentが全て6kg⇒48kg

EQ

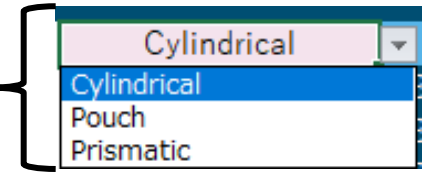
	Accumulator, number of segments high:	1		EQ
	Accumulator, number of segments wide:	2		EQ
	Accumulator, number of segments long:	4		EQ
	S x P = 8	L x W x H =	8	EQ
F.10.3.2.b	Maximum segment mass <=12kg (26.4lbs):	6	kg	EQ
F.10.3.2.d	Min fastener count in fastened connections between vertical walls:		2	

Accumulator Segments

'Voltage ', 'Capacity', etc. are to be compared with the ESF submitted in advance. Do not make any input errors.

	BLANK			
	Cell type:			BLANK
	Maximum Voltage:		V	BLANK
	Cell mass:		g	BLANK
	Nominal Capacity:		mAh	BLANK
	Maximum segment cells in series:			BLANK
	Maximum segment cells in parallel:			BLANK
EV.5.1.2	Maximum segment voltage:	0.0	V	EQ
EV.5.1.2	Maximum segment capacity:	0.00	MJ	EQ
	Number of segments in series:			BLANK
	Number of segments in parallel:			BLANK
EV.3.3.2	Maximum accumulator voltage:	0.0	V	EQ
	Maximum accumulator capacity:	0.00	kWh	EQ

	BLANK			
	Accumulator, number of segments high:			BLANK
	Accumulator, number of segments wide:			BLANK
	Accumulator, number of segments long:			BLANK
	S x P = 8	**L x W x H =**	0	BLANK
F.10.2.3.c	Maximum segment mass <=12kg (26.4lbs):		kg	BLANK

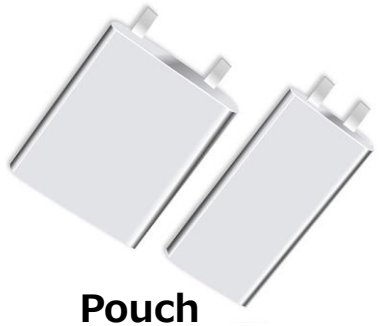


3択から選ぶ事

The next page is an example of input

次のページで
入力例を示す

Cylindrical



Pouch

Prismatic

Accumulator Segments Input Example

Attach a drawing confirming that the entered values are correct.

EQ

Accumulator Segments

	EQ			
	Cell type:	Pouch		EQ
	Maximum Voltage:	4.2	V	EQ
	Cell mass:	255	g	EQ
	Nominal Capacity:	10000	mAh	EQ
	Maximum segment cells in series:	12		EQ
	Maximum segment cells in parallel:	1		EQ
EV.5.1.2	Maximum segment voltage:	50.4	V	EQ
EV.5.1.2	Maximum segment capacity:	1.81	MJ	EQ
	Number of segments in series	8		EQ
	Number of segments in parallel:	1		EQ
EV.3.3.2	Maximum accumulator voltage:	403.2	V	EQ
	Maximum accumulator capacity:	4.03	kWh	EQ

Total cells are 96

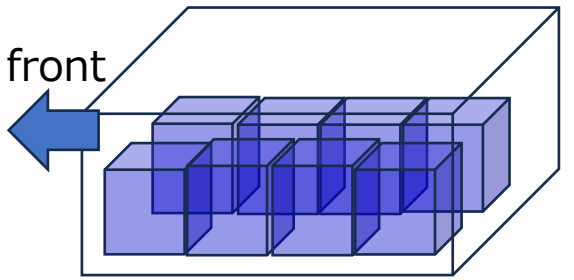
Number of cells in one segment

1 = 1 series inside the segment（直列）

Number of segments

1 = All segments are in 1 series（直列）

If 8 segments are mounted as shown in the figure
もしセグメントが8個
図のように搭載されていたら



	EQ			
	Accumulator, number of segments high:	1		EQ
	Accumulator, number of segments wide:	2		EQ
	Accumulator, number of segments long:	4		EQ
	S x P = 8	**L x W x H =** 8		EQ
F.10.2.3.c	Maximum segment mass <=12kg (26.4lbs):	6	kg	EQ

Height = 1
Width = 2
Front and back = 4

高さ方向 ＝1段
横方向 ＝2列
前後方向＝4個

=IF(D82=G82,"EQ",IF(OR(D82=0,G82=0),"BLANK","CHECK"))

Criteria:
If D82 = G82, then “EQ”.
In the example on the left, 8 = 8

判定基準：D82＝G82となれば「EQ」となる
左の例では 8＝8

=G73*G74

=G79*G80*G81

Segment count is automatically calculated Segment数は自動計算

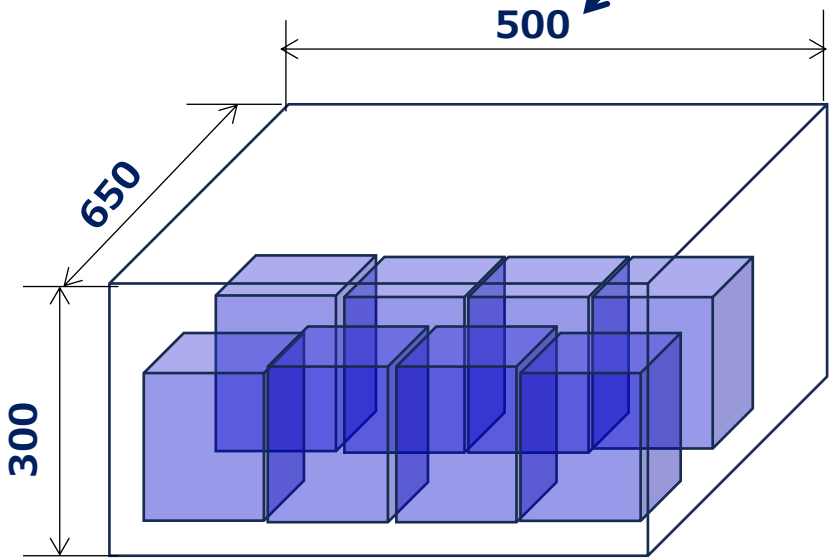
Accumulator Size Input Example

Attach a drawing confirming that the entered values are correct.

EQ				
Accumulator total front to rear length:	500	mm	EQ
Accumulator total left to right width:	650	mm	EQ
Accumulator total bottom to top height:	300	mm	EQ

Non-segment volumes must be included in mount offset, rows 61-63.
Do not mount to non-segment volumes.

Enter ACC size

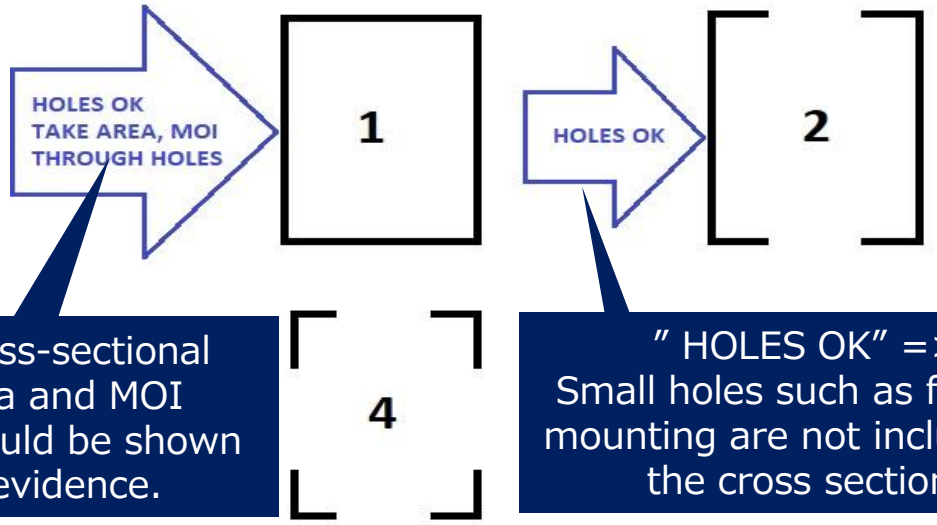


Top View Cross Section of a Segment

セグメント構造の断面については、上面、側面、正面図の面積と
断面二次モーメントをスクリーンショットで表示する

REPLACE THIS EXAMPLE WITH YOUR OWN CAD
FOR SEGMENT STRUCTURE CROSS SECTIONS IN TOP, SIDE, AND FRONT VIEW
INCLUDE AREA AND MOI IN SCREENSHOTS

NUMBER OF COLUMNS

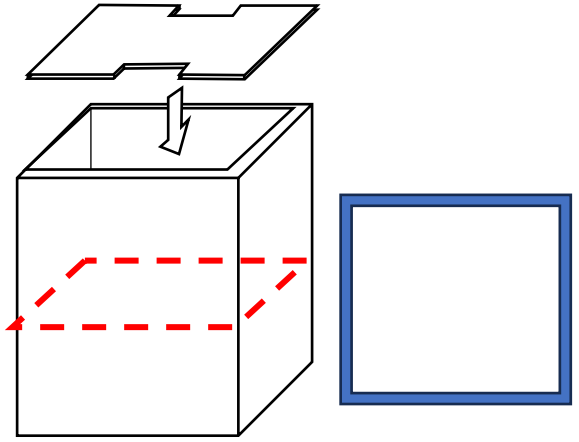


Cross-sectional area and MOI should be shown as evidence.

断面積と断面二次
モーメントをエビデンス
として示すこと

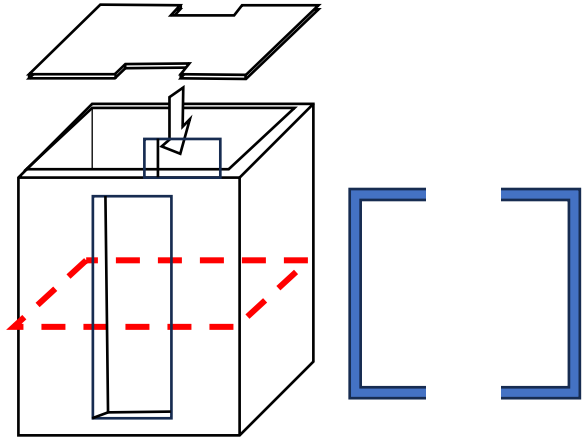
" HOLES OK" =>
Small holes such as for bolt mounting are not included in the cross section.

「HOLES OK」とは
ボルト取付用の様な小さな穴は
断面に含めないと言う意味



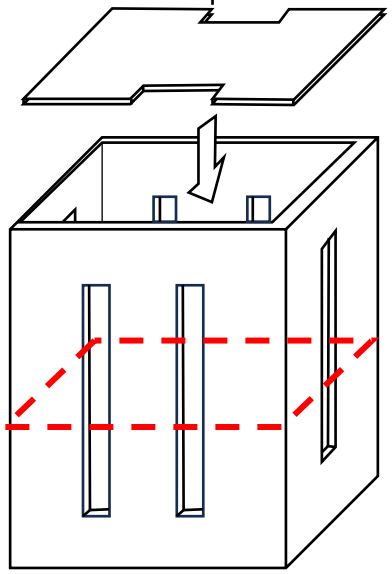
Number of Columns = 1
Column length = Total circumference

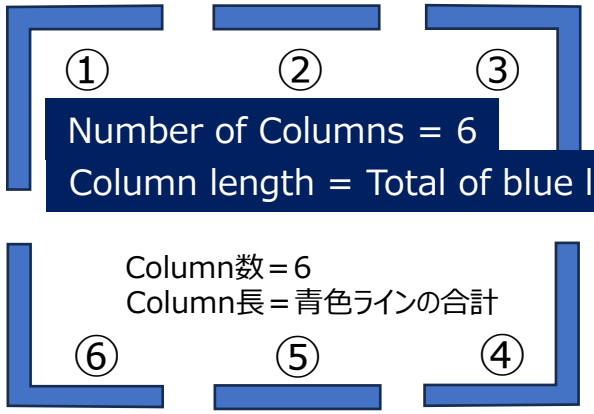
Column数＝1　Column長＝全周



Number of Columns = 2
Column length = Total of blue line

Column数＝2　Column長＝青色ラインの合計





Example of filling out the SES (1)

Top view cross section

Minimum cross-sectional area of Column: ②and ⑤ in the figure

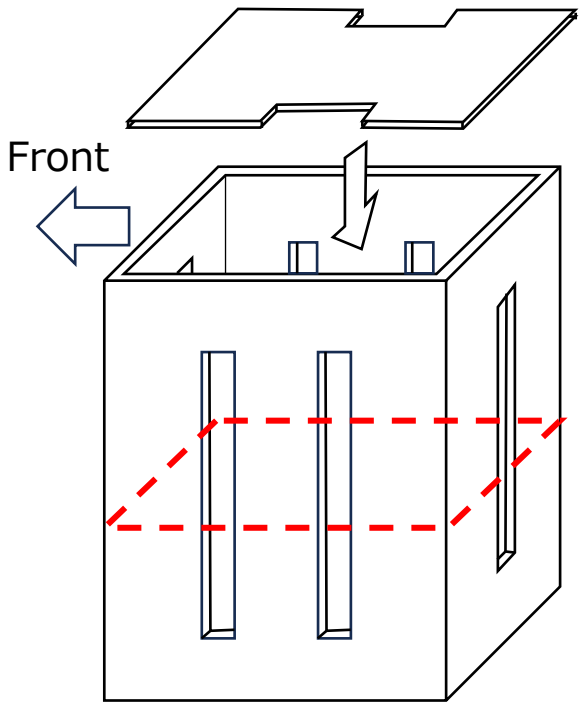
Columnの最小断面積：図では②と⑤

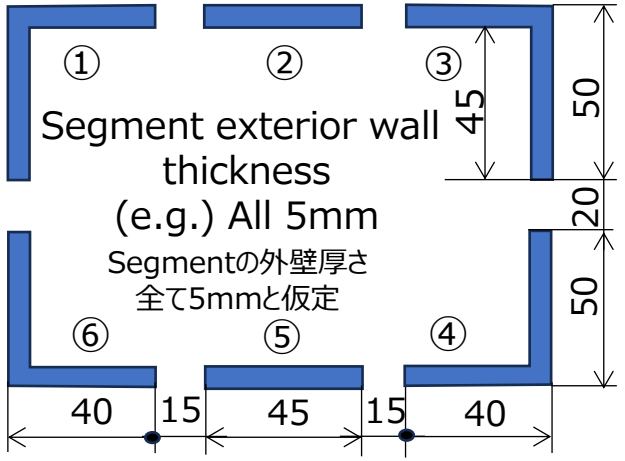
BLANK			
Number of columns in minimum top view cross section: トップビューの最小断面における柱の数	6		EQ
Column length (L):	4.30E+02	mm	EQ
Top view cross section of minimum column (A):	2.25E+02	mm^2	EQ
Top view MOI of minimum column (I):	4.69E+02	mm^4	EQ
Column material: 6061-T6 @60C (E):	2.4E+08	Pa	EQ
60C Yield (Sy):	2.76E+08	Pa	EQ

Material	E (Pa)	S_Ultimate (Pa)	Shear (Pa)
Steel Unwelded	2.00E+11	3.65E+08	2.11E+08
Steel Welded	2.00E+11	3.00E+08	1.73E+08
6061-T6 Unwelded	6.90E+10	2.90E+08	1.67E+08
6061-T6 Welded	2.4E+08	1.75E+08	1.01E+08
Other Unwelded			0.00E+00
Other Welded			0.00E+00

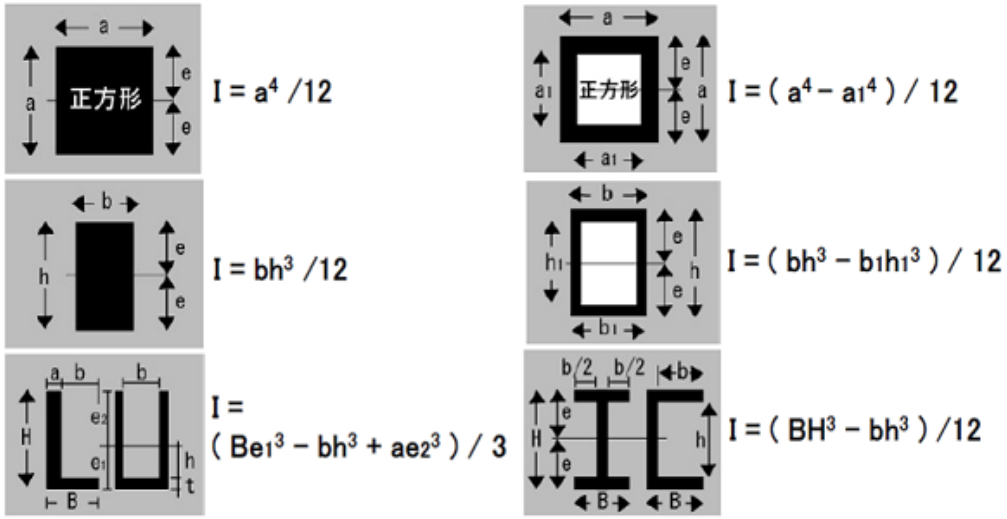
材料特性　6061アルミニウム合金
降伏強さ　276MPa

Yield strength





断面二次モーメントは計算式を参照



Example of filling out the SES (2)

The following illustration is based on F.10.3.2.a.

F.10.3.2 Segments must be held by one of the two:
- a. Mechanical Cover and Lid attachments must show equivalence to the strength of a welded joint F.10.2.5.a
- b. Mechanical Segment attachments to the container must show they can support the acceleration loads F.10.3.1 above in the direction of removal

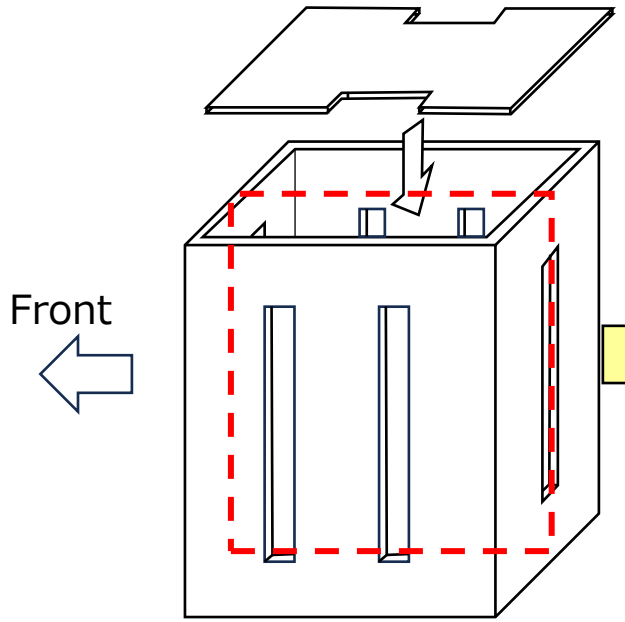
The "Cover and Lid" is considered to be a continuous structure with side walls, and the MOI is calculated.

以下図解は F.10.3.2.a を元に解説する
即ち、「Cover and Lid」は、側面の壁と連続した構造と見なし、
断面二次モーメントを算出する

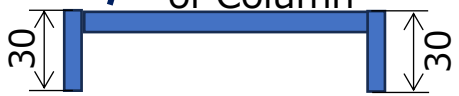
Side view cross section

F.10.3.1.c

Vertical acceleration 20*mass*segments_high:	0.00E+00	N	BLANK
No. columns * pi^2 * EI / (0.5L)^2 (Euler):	4.14E+10	0.00%	BLANK
Number of columns in minimum side view cross section:	2		EQ
Column length:	4.10E+02	mm	EQ
Side view cross section of minimum column:	1.03E+03	mm^2	EQ
Side view MOI of minimum column:	○○○	mm^4	EQ
Column material: 6061-T6 @60C (E):	2.4E+08	Pa	EQ
60C Yield (Sy):	2.76E+08	Pa	EQ

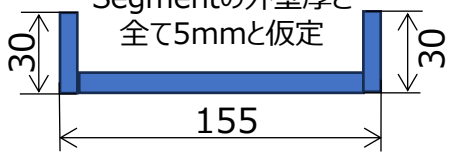


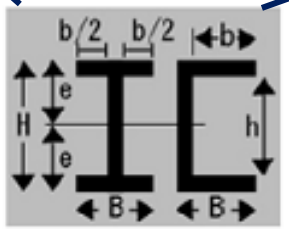
Minimum cross-sectional area of Column



Columnの最小断面積

Segment exterior wall thickness
(e.g.) All 5mm



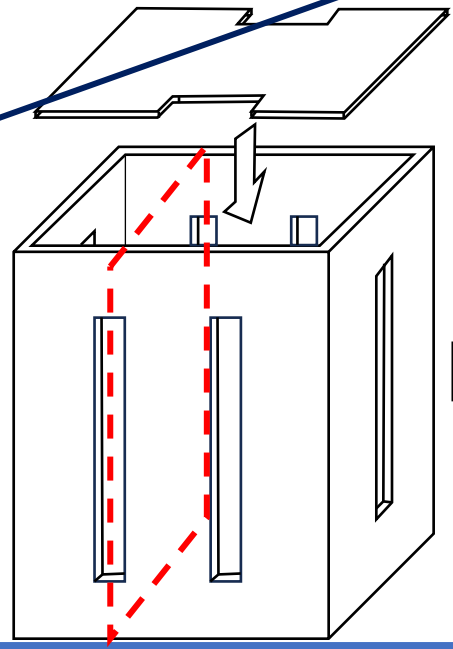


$I = (BH^3 - bh^3) / 12$

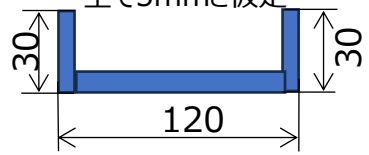
Front view cross section

F.10.3.1.b

Lateral acceleration 40*mass*segments_wide:	0.00E+00	N	BLANK
No. columns * pi^2 * EI / (0.5L)^2 (Euler):	3.65E+11	0.00%	BLANK
Number of columns in minimum front view cross section:	2		EQ
Column length:	3.40E+02	mm	EQ
Side view cross section of minimum column:	8.50E+02	mm^2	EQ
Side view MOI of minimum column:	○○○	mm^4	EQ
Column material: 6061-T6 @60C (E):	2.4E + 08	Pa	EQ
60C Yield (Sy):	2.76E+08	Pa	EQ



Segment exterior wall thickness
(e.g.) All 5mm



Segment Fixing Methods（1）

F.10.3.2 Segments must be held by one of the two:
- a. Mechanical Cover and Lid attachments must show equivalence to the strength of a welded joint F.10.2.5.a
- b. Mechanical Segment attachments to the container must show they can support the acceleration loads F.10.3.1 above in the direction of removal

F.10.3.2 セグメントは、次の 2 つのいずれかで保持する必要があります：
- a. カバーと蓋の機械的な取付は、溶接ジョイントと同等の強度を示さなければならない F.10.2.5.
- b. コンテナへの機械的セグメントの取付は、取外し方向の上記 F.10.3.1 の加速荷重に耐えられることを示さなければならない。

Note the two choices of items.

Segments mechanically attached to container
Lid attachment equivlent to weld

F.10.3.2	Segments mechanically attached to container			EQ
Segment removal from container:				BLANK
Some fasteners in shear:				BLANK
Number of fasteners:				BLANK
Minimum fastener diameter (minor if threads in shear):			mm	BLANK
Fastener material:		UTS (Su):	Pa	BLANK
acceleration 40*mass:	0.00E+00		N	EQ
Fastener tensile No.Fasteners*UTS*pi*r^2:	0.00E+00	#DIV/0!		#DIV/0!
Segment pullout thickness or thread depth at fastener:			mm	BLANK
--Pullout--Fastener perimeter or thread circumference:			mm	BLANK
Segment material:		Shear:	Pa	BLANK
Segment pullout: Shear*Thickness*Pullout*Number:	0.00E+00	#DIV/0!		#DIV/0!
Container pullout thickness or thread depth at fastener:			mm	BLANK
--Pullout--Fastener perimeter or thread circumference:			mm	BLANK
Container material:		Shear:	Pa	BLANK
Container pullout: Shear*Thickness*Pullout*Number:	0.00E+00	#DIV/0!		#DIV/0!

Segments mechanically attached to container
Lid attachment equivlent to weld

F.10.3.2	Lid attachment equivlent to weld			EQ
Segment removal from container:				BLANK
Some fasteners in shear:				BLANK
Maximum fastener spacing:			mm	BLANK
Minimum fastener diameter (minor if threads in shear):			mm	BLANK
Fastener material:		UTS (Su):	Pa	BLANK
acceleration 40*mass:	0.00E+00		N	EQ
Fastener tensile No.Fasteners*UTS*pi*r^2:	0.00E+00	#DIV/0!		#DIV/0!
Lid pullout thickness or thread depth at fastener:			mm	BLANK
--Pullout--Fastener perimeter or thread circumference:			mm	BLANK
Lid material:		Shear:	Pa	BLANK
Lid pullout: Shear*Thickness*Pullout/Spacing:	#DIV/0!	#DIV/0!		#DIV/0!
Container pullout thickness or thread depth at fastener:			mm	BLANK
--Pullout--Fastener perimeter or thread circumference:			mm	BLANK
Container material:		Shear:	Pa	BLANK
Container pullout: Shear*Thickness*Pullout/Spacing:	#DIV/0!	#DIV/0!		#DIV/0!

Segment Fixing Methods（2）

Note the three choices of items.

	BLANK			
F.10.3.2	Segments mechanically attached to container			EQ
	Segment removal from container:	Vertical		EQ
	Some fasteners in shear:			BLANK
	Number of fasteners:			BLANK
	Minimum fastener diameter (minor if threads in shear):		mm	BLANK
	Fastener material:	UTS (Su):	Pa	BLANK
	Vertical acceleration 20*mass:	0.00E+00	N	EQ

	BLANK			
F.10.3.2	Segments mechanically attached to container			EQ
	Segment removal from container:	Lateral		EQ
	Some fasteners in shear:			BLANK
	Number of fasteners:			BLANK
	Minimum fastener diameter (minor if threads in shear):		mm	BLANK
	Fastener material:	UTS (Su):	Pa	BLANK
	Lateral acceleration 40*mass:	0.00E+00	N	EQ

	BLANK			
F.10.3.2	Segments mechanically attached to container			EQ
	Segment removal from container:	Longitudinal		EQ
	Some fasteners in shear:			BLANK
	Number of fasteners:			BLANK
	Minimum fastener diameter (minor if threads in shear):		mm	BLANK
	Fastener material:	UTS (Su):	Pa	BLANK
	Longitudinal acceleration 40*mass:	0.00E+00	N	EQ

F.10.3 Cells and Segments

F.10.3.1 The structure of the Segments (without the structure of the Accumulator Container and without the structure of the cells) must prevent cells from being crushed in any direction under the following accelerations:

a. 40 g in the lateral direction (left/right)
b. 40 g in the longitudinal direction (forward/aft)
c. 20 g in the vertical direction (up/down)

Segment removal from container:

コンテナからセグメントを取り出す方向

Vertical 垂直方向
Lateral 横方向
Longitudinal 縦方向

Segment Fixing Methods（3-1）

F.10.3.2 Segments must be held by one of the two:
- a. Mechanical Cover and Lid attachments must show equivalence to the strength of a welded joint F.10.2.5.a
- b. Mechanical Segment attachments to the container must show they can support the acceleration loads F.10.3.1 above in the direction of removal

せん断を受けるファスナー

If "Tension" is selected for the fastener, it is calculated using "Pullout".

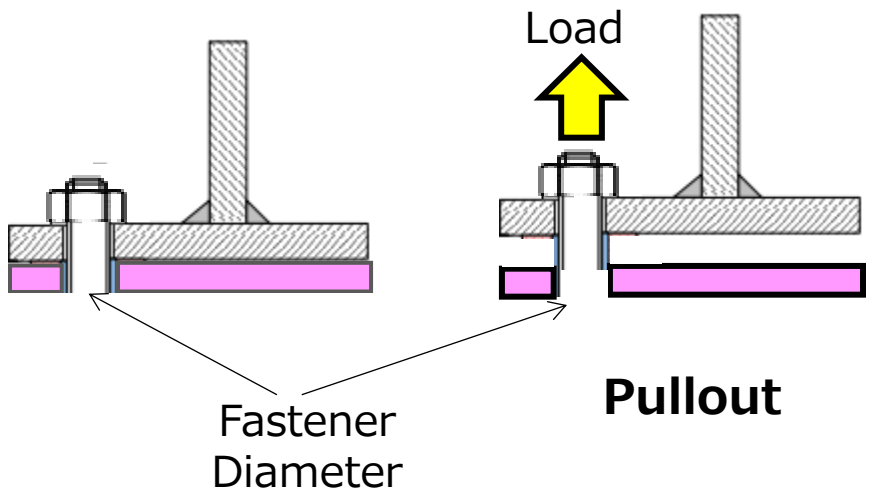
BLANK				
F.10.3.2	Segments mechanically attached to container			EQ
	Segment removal from container:	Longitudinal		EQ
	All fasteners in tension:	Tension		EQ
	Number of fasteners:			BLANK
	Minimum fastener diameter (minor if threads in shear):		mm	BLANK
	Fastener material:	UTS (Su):	Pa	BLANK
	Longitudinal acceleration 40*mass:	0.00E+00	N	EQ
	Fastener tensile No.Fasteners*UTS*pi*r^2:	0.00E+00	#DIV/0!	#DIV/0!
	Segment pullout thickness or thread depth at fastener:		mm	BLANK
	--Pullout--Fastener perimeter or thread circumference:		mm	BLANK
	Segment material:	Shear:	Pa	BLANK
	Segment pullout: Shear*Thickness*Pullout*Number:	0.00E+00	#DIV/0!	#DIV/0!
	Container pullout thickness or thread depth at fastener:		mm	BLANK
	--Pullout--Fastener perimeter or thread circumference:		mm	BLANK
	Container material:	Shear:	Pa	BLANK
	Container pullout: Shear*Thickness*Pullout*Number:	0.00E+00	#DIV/0!	#DIV/0!

All fasteners in tension: Tension
Number of fasteners:
Tension
Shear
引張り
せん断

容器の引き抜き厚さまたはファスナーのネジ深さ

ファスナー部での容器の引き抜き厚さまたは、またはネジ深さ

Simple image

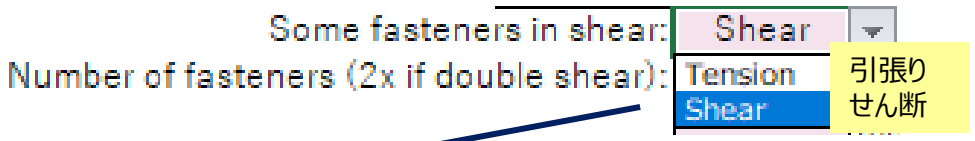


Segment Fixing Methods（3-2）

F.10.3.2 Segments must be held by one of the two:
- a. Mechanical Cover and Lid attachments must show equivalence to the strength of a welded joint F.10.2.5.a
- b. Mechanical Segment attachments to the container must show they can support the acceleration loads F.10.3.1 above in the direction of removal

If “Shear" is selected for the fastener, it is calculated using “Tearout“.

BLANK				
F.10.3.2	Segments mechanically attached to container			EQ
	Segment removal from container:	Vertical		EQ
	Some fasteners in shear:	Shear		EQ
	Number of fasteners (2x if double shear):			BLANK
	Minimum fastener diameter (minor if threads in shear):		mm	BLANK
	Fastener material:	UTS (Su):	Pa	BLANK
	Vertical acceleration 20*mass:	0.00E+00	N	EQ
	Fastener shear No.Fasteners*0.577*UTS*pi*r^2:	0.00E+00	#DIV/0!	#DIV/0!
	Segment tearout thickness or thread depth at fastener:		mm	BLANK
	--Tearout--Min fastener spacing, edge, or thinner material dist:		mm	BLANK
	Segment material:	Shear:	Pa	BLANK
	Segment tearout: Shear*Thickness*2*Tearout*Number:	0.00E+00	#DIV/0!	#DIV/0!
	Container tearout thickness or thread depth at fastener:		mm	BLANK
	--Tearout--Min fastener spacing, edge, or thinner material dist:		mm	BLANK
	Container material:	Shear:	Pa	BLANK
	Container tearout: Shear*Thickness*2*Tearout*Number:	0.00E+00	#DIV/0!	#DIV/0!

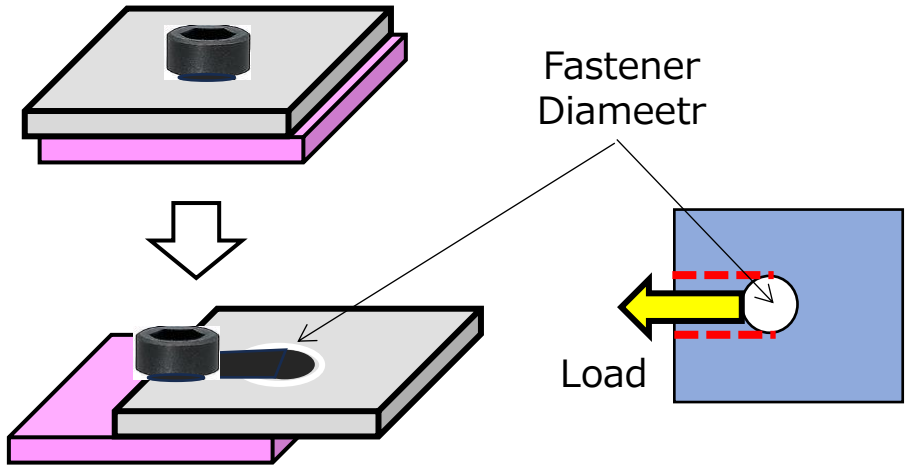


容器の引裂き方向の厚さ、またはファスナーのネジ山の深さ

ファスナー部でのセグメントの引裂き方向の厚さ、またはネジ山の深さ

ネジは谷径です

Simple image



Tearout

Air Flow to Outside & Relief Valve Position

Attach evidence (CAD drawings) showing the values entered.

Describe the CAD drawing according to your selection.

BLANK

EV.4.3.5-7 BLANK

Any opening, including pressure relief valves, must face away from the driver.

Image shows airflow to outside container for every segment

Image shows pressure relief valve is not pointed at the driver

EV.4.3.5 Any Accumulators that may vent an explosive gas must have a ventilation system or pressure relief valve to release the vented gas

EV.4.3.6 Segments sealed in Accumulator Containers must have a path to a pressure relief valve

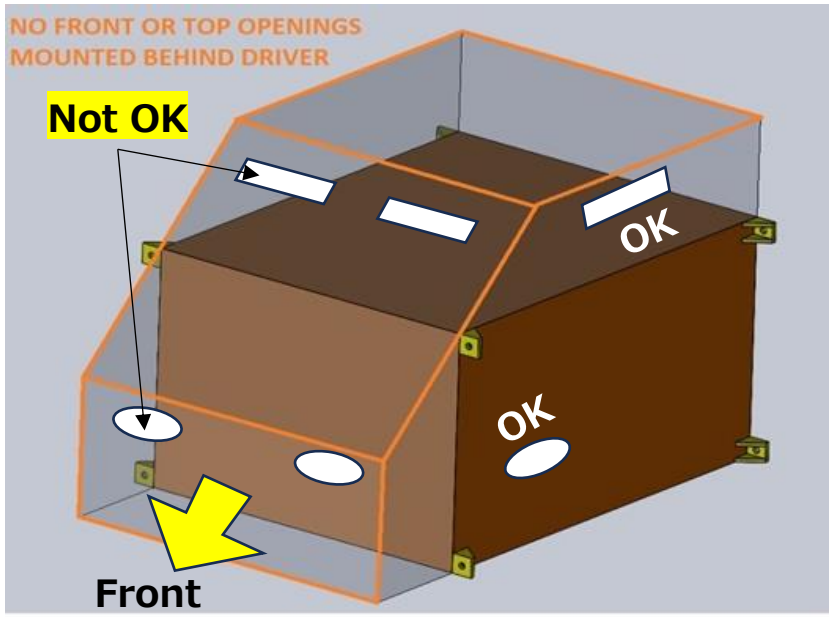
EV.4.3.7 Pressure relief valves must not have line of sight to the driver, with the Firewall installed or removed

EV.4.3.5 爆発性ガスを排出する可能性のあるアキュムレータには、排出されたガスを逃がすための換気システム または 圧力リリーフバルブが必要です

EV.4.3.6 アキュムレータコンテナに密閉されたセグメントには、圧力リリーフバルブへの経路が必要です

EV.4.3.7 ファイアウォールを取付けた状態または取外した状態で、圧力リリーフバルブがドライバーの視界に入ってはなりません

ドライバーの後ろには前面または上部の開口部は取り付けられていません。



（Driver's Side）

Internal Vertical Walls

Attach evidence (CAD drawings) showing the entered values and Joining method.

Change in 2025 !

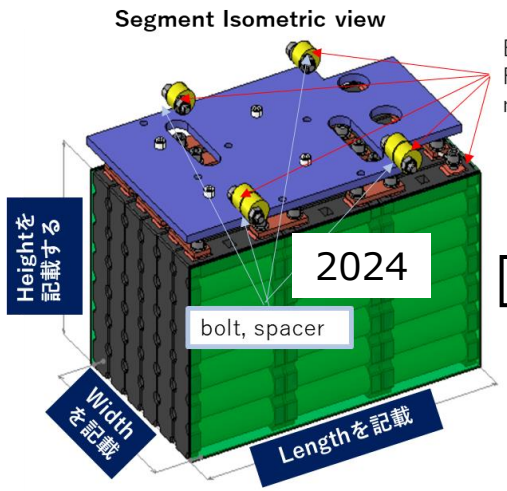
F.10.2.3 Internal Vertical Walls:

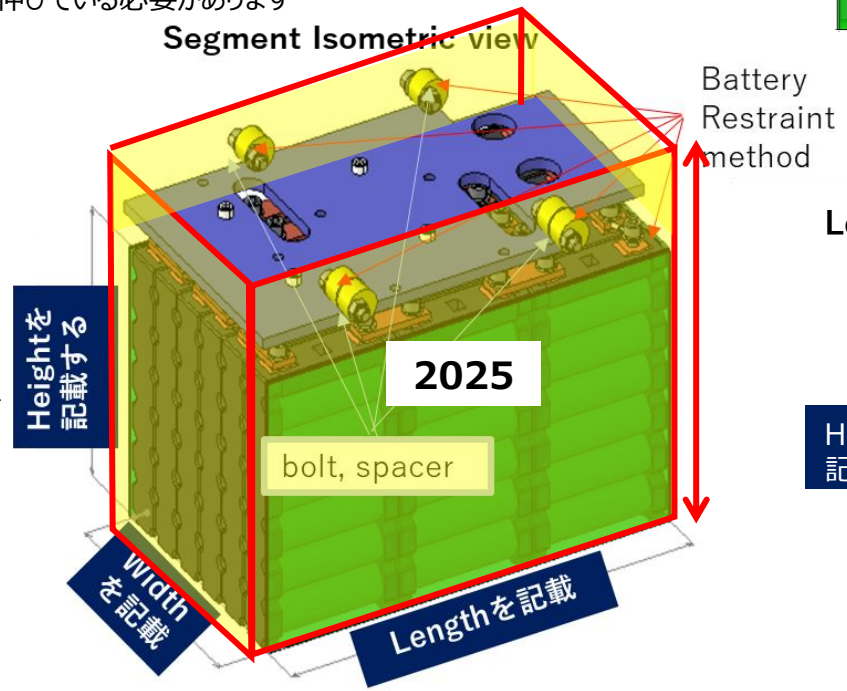
a. Must surround and separate each Accumulator Segment EV.5.1.2
b. Must have minimum height of the full height of the Accumulator Segments.
The Internal Walls should extend to the lid above any Segment

F.10.2.3 内部垂直壁:

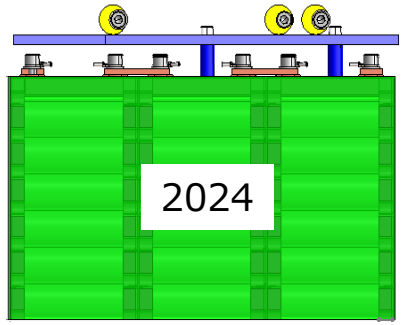
a. 各アキュムレータ セグメントを囲み、分離する必要があります EV.5.1.2
b. アキュムレータ セグメントの全高と同じ高さ以上である必要があります
内部壁は、どのセグメントの上の蓋まで伸びている必要があります

Segment Isometric view



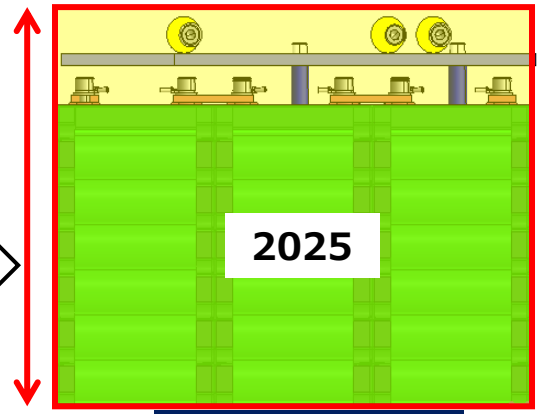


Lateral Cross Section



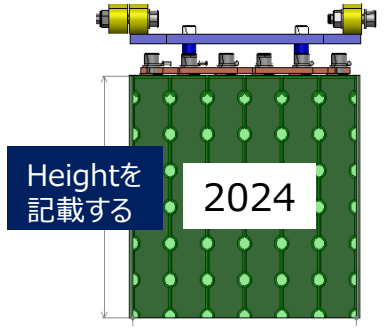
Lengthを記載する

Lateral Cross Section



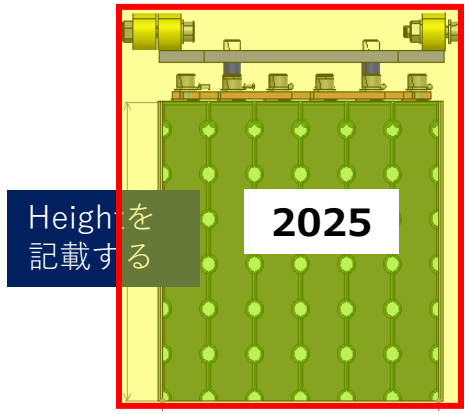
Lengthを記載する

Longitudinal Cross Section



Widthを記載する

Longitudinal Cross Section



Widthを記載する

At least 75% Covered

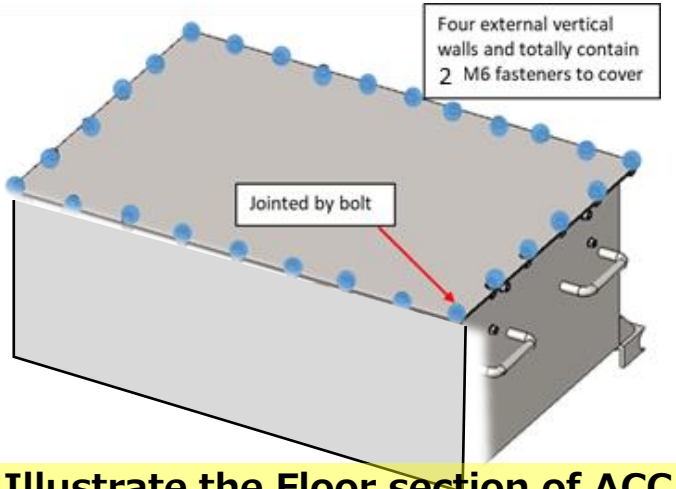
Attach evidence (CAD drawings) showing the entered values and Joining method.

最低75%が覆われていること

Regarding the 75% rule, there are many evidence deficiencies each year. If a team's evidence is incomplete, the SES will give them a "Not OK".

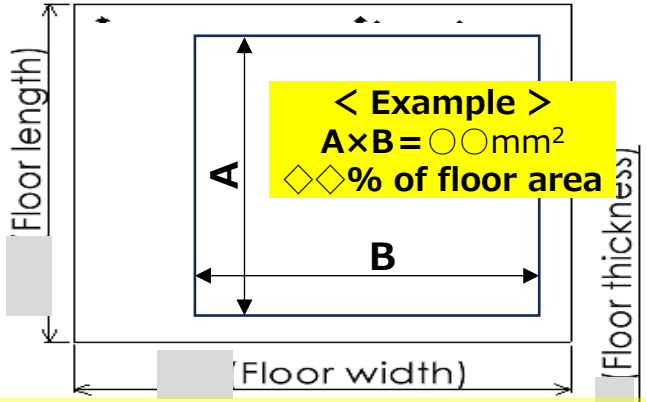
75%ルールについて、毎年エビデンス不備が多い。もしチームのエビデンスが不備なら、SESは「Not OK」と判定する。

F.10.2.1	**MINIMUM ACCUMULATOR FLOOR**			
	BLANK			
F.10.4.3	All segment floor sections >= 75% area:			BLANK
F.10.2.1	**Accumulator Floor Construction:**			EQ
	Steel: 1.25mm (0.049in), Aluminum: 3.2mm (.125in):		mm	BLANK
	Material Used:			BLANK
F.10.2.2	**MINIMUM ACCUMULATOR WALLS**			
	BLANK			
F.10.4.3	All segment wall sections >= 75% area:			BLANK
F.10.2.2	**Minimum Wall Construction:**			EQ
	Steel: 0.90mm (0.035in), Aluminum: 2.3mm (0.090in):		mm	BLANK
	Material Used:			BLANK
F.10.2.2	**MINIMUM ACCUMULATOR COVER/LID**			
	BLANK			
No accumulator holes with line of sight to driver:				BLANK
F.10.4.3	All segment cover sections >= 75% area:			BLANK
F.10.2.2	**Accumulator Lid:**			EQ
	Steel: 0.90mm (0.035in), Aluminum: 2.3mm (0.090in):		mm	BLANK



Illustrate the Floor section of ACC and enter the required size.

ACCのFloor部を図示し、必要サイズを入力する



The same is illustrated for the Walls and Cover/Lid sections, and the necessary sizes should be entered.

Walls部、Cover/Lid部についても同様に図示し必要サイズを入力する

Cover & Lid Fasteners

Attach evidence (CAD drawings) showing the entered values and Joining method.

Change in 2025 !

2024 **F.10.2.4** Covers and Lids must be attached with a minimum of one fastener F.10.2.3.b for each external vertical wall per section

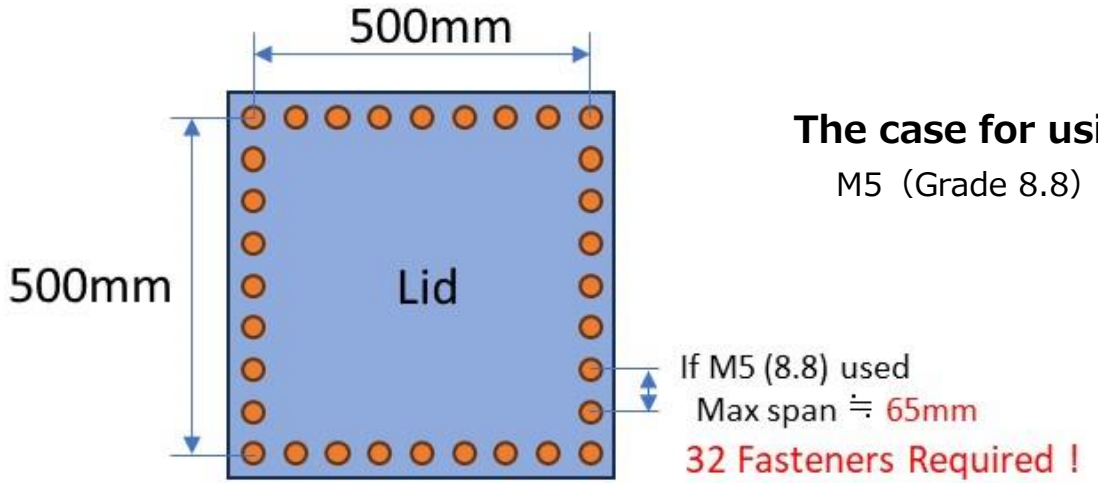
ACCのカバー／蓋は、各External Vertical Wall(ACCの外壁）にSection 毎にボルト1本以上必要。

変更あり

T.8.3 Positive Locking Mechanisms

2025 **F.10.2.6** Covers and Lids must be mechanically attached and include **Positive Locking Mechanisms**

カバーと蓋は機械的に取り付けられ、確実なロック機構を備えている必要があります



The case for using M5 (Grade 8.8)

M5（Grade 8.8）の場合

All Fasteners must have Positive Lock mechanism!!

F.10.3.2a Cover/Lid holding

Vertical Wall Joining Method

Attach evidence (CAD drawings) showing the entered values and Joining method.

Check how to join the Segment's Cover and Vertical Wall to make the Segment hexahedral.

Segmentを6面体にする為に、SegmentのCoverとVertical Wall との接合方法をチェックする

BLANK				
F.10.2.3	Vertical wall joining method:	four options		BLANK
	Average unit strength of 50% weld, 0.9mm wall:	135	N/mm	N/A
			N	N/A
			mm	N/A
			N/mm^2	N/A
			mm	N/A
F.10.2.3.b				EQ

Select the joining method for the Vertical Wall, and enter the items requested in "BLANK" for each.

Vertical Wall の接合方法を選択し、
各々「BLANK」で要求されている項目を入力する。

BLANK				
F.10.2.3	Vertical wall joining method:	Fastened		EQ
	Average unit strength of 50% weld, 0.9mm wall:	135	N/mm	EQ
F.10.2.3.b	Fastener shear capability:		N	BLANK
	Maximum fastener spacing:		mm	BLANK
			N/mm^2	N/A
			mm	N/A
F.10.2.3.b	Fastener shear / spacing >= Unit baseline:			EQ
	--Tearout--Min fastener spacing or edge dist:		mm	BLANK
	--Pullout--Fastener perimeter:		mm	BLANK

BLANK				
F.10.2.3	Vertical wall joining method:	Bonded		EQ
	Average unit strength of 50% weld, 0.9mm wall:	135	N/mm	EQ
			N	N/A
			mm	N/A
	Shear strength of adhesive (Use 'Fastened' for rivets):		N/mm^2	BLANK
	Minimum bond overlap:		mm	BLANK
F.5.5.3	0.5*adhesive x overlap >= Unit baseline:			EQ

BLANK				
F.10.2.3	Vertical wall joining method:	Welded		EQ
	Average unit strength of 50% weld, 0.9mm wall:	135	N/mm	EQ
10.2.3.a	At least half the perimeter must be welded:		%	BLANK
	Shortest weld >= 25mm (1in):		mm	BLANK

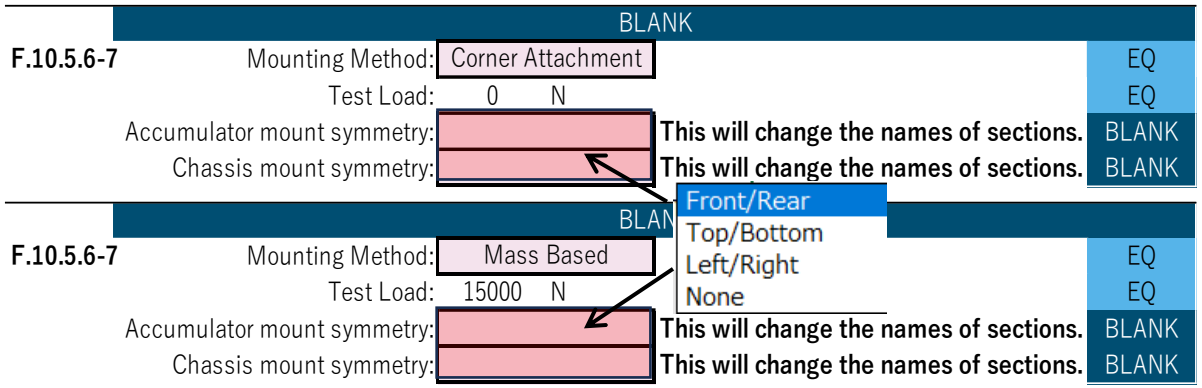
EQ				
F.10.2.3	Vertical wall joining method	Continuous Layup		EQ
	Average unit strength of 50% weld, 0.9mm wall:	135	N/mm	EQ

No input required for Continuous Layup only

Continuous Layup のみ入力不要

ACC Mounting Location & Method

Mount can be installed in either Coner Attachment or Mass Based.



F.10.5.6 Accumulator Attachment – Corner Attachments

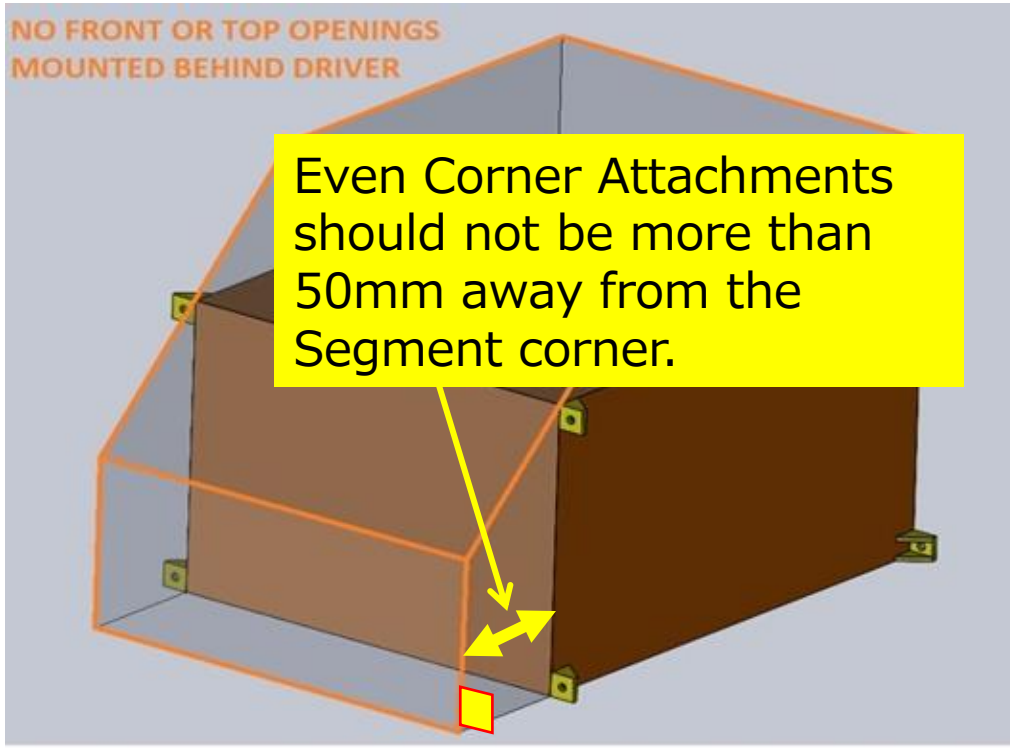
b. The mechanical connections at each corner must be 50 mm or less from the corner of the Segment

F.10.5.6 アキュムレータの取り付け – コーナーの取り付け

b. 各コーナーの機械的接続は、セグメントのコーナーから 50 mm 以内の必要がある。

Corner Attachments should not be more than 50mm from the corner of the segment, even if they are Corner Attachments.

Corner Attachments であっても、Segment のコーナーから 50mm 以上離してはいけない



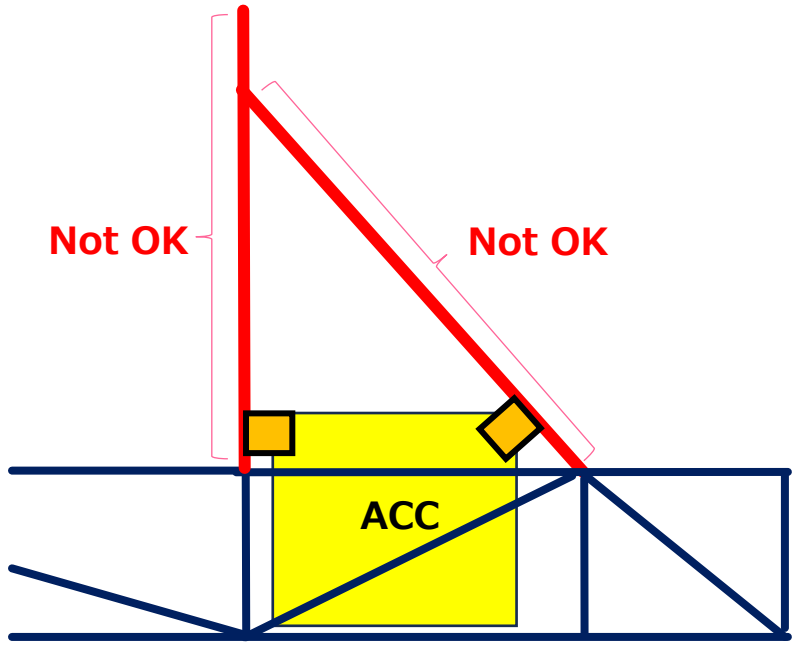
セル セグメントのないコンパートメントへの取り付けは避けてください。
測定は常にセル セグメントまで行われます。

ACC Mounting Location

Note mounting location

F.5.11.4 Engine mount, motor mounts. or Accumulator Containers should not mount to the span of the Main Hoop Braces or Main Hoop above other tube nodes or composite attachments

F.5.11.4 エンジンマウント、モーターマウント、またはアキュムレータコンテナのマウントは、他のチューブノードやコンポジットアタッチメントの上にあるメインフープブレースやメインフープのスパンに取り付けてはならない。



F.11.4.2 The Accumulator Container should have a minimum 25mm total clearance to each of the front, side, and rear impact structures.
The clearance may be put together on either side of any Non Crushable items around the accumulator

F.11.4.2 アキュムレータコンテナは、フロント、サイド、リア の各衝撃構造に対して、最低 25 mm の合計クリアランスが必要です。
このクリアランスは、アキュムレータの周囲にある Non Crushable items の左右にまとめることができます。

SES(等価構造計算書) EV編

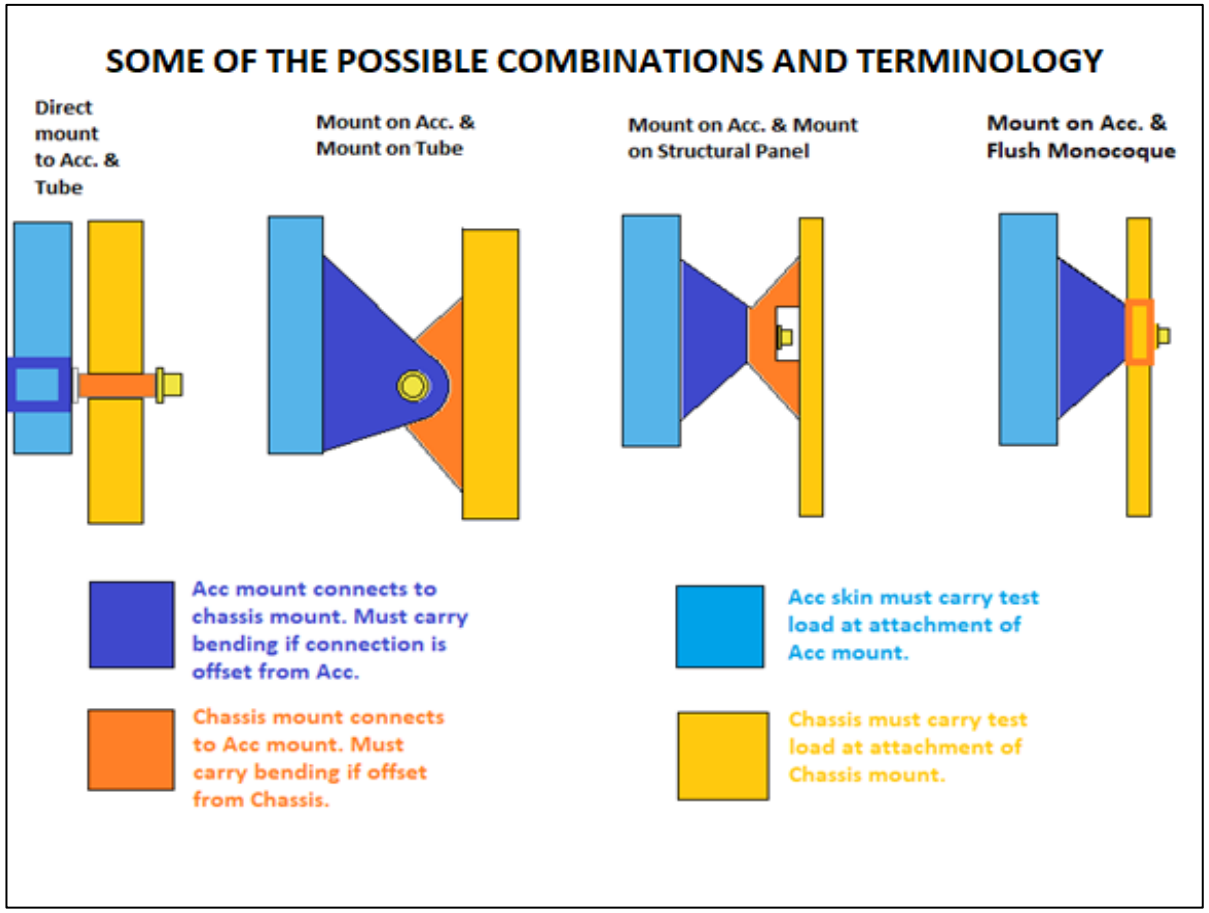
F.10-11 EV Accumulator

- ✓ Accumulator Mount and Chassis Mount

ACC Attach/Mount : Calculation Basics

ACC Attach/Mount calculation in SES

Load Based : Minimum 15 kN per location in any direction.
Corner Mount : For a load of 1/4*40G of the weight, the specified strength is sufficient, but the mounting point must be specified.



Rules上の要求

Load Based ：いかなる方向へも1か所辺り15kN以上の強度
Corner Mount：重量の1/4*40Gの荷重に対し、所定の強度で良いが
取付箇所の指定あり

SESでは、

①Accumulator ContainerのWall
②Accumulator Mount — **Acc. Mount**

③Chassis Mount
④Chassis (Tube or Monocoque Skin) — **Chassis Mount**

の4つに分けてそれぞれ計算している

2 types of mounting methods (1)

Understand and decide the Rules of Mounting Method.
Note that requirements differ depending on the Mounting Method.

Mounting Method の Rulesを理解したうえで決めておくこと
Mounting Methodによって要件が異なるので注意

Mass Based = Load Based

F.10.5.7 Accumulator Attachment – Load Based

a. The minimum number of attachment points depends on the total mass of the container:

Accumulator Weight	Minimum Attachment Points
< 20 kg	4
20 – 30 kg	6
30 – 40 kg	8
> 40 kg	10

b. Each attachment point, including any brackets, backing plates and inserts, must be able o withstand 15 kN minimum in any direction

F.10.5.6-7	Mounting Method:	Mass Based	EQ
	Test Load:	15000 N	EQ
	Accumulator mount symmetry:	Left/Right	**This will change the names of sections.** EQ
	Chassis mount symmetry:	Left/Right	**This will change the names of sections.** EQ

If you select Mass Based,
The input title will be “Accumulator Mount”.

Mass Basedを選択すると、
入力タイトルは「Accumulator Mount」となる

BLANK

Accumulator Mount 1

Entry fields vary by selection

入力項目は選択により異なる

ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount

BLANK				
	Intersection of fastener axis and fastener shear plane.			EQ
Outside	the front/rear planes of the accumulator segments:		mm	BLANK
Outside	the top/bottom planes of the accumulator segments:		mm	BLANK
Outside	the left/right planes of the accumulator segments:		mm	BLANK
	Total Surface Offset, zero for an internal hardpoint:	0	mm	EQ
	Mount material (Accumulator skin if directly mounted):			EQ
	Young's Modulus (E):	#N/A	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	#N/A	Pa	EQ
	Shear:	#N/A	Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:		mm	BLANK
	earout--Minimum - Fastener spacing, edge, or corner distance:		mm	BLANK
	Number of fasteners used (2x if in double shear):			BLANK
	Fastener shear diameter:		mm	BLANK
	Threads in shear:			BLANK
	Fastener UTS:		Pa	BLANK
	llout--Min total perimeter of washers or inserts on one surface:		mm	BLANK
F.10.5.8.a	--Shear--0.577*fasteners*UTS*pi*r^2 >= Test Load:	0.00E+00		EQ
	--Pullout--Mount shear*thickness*perimeter >= Test Load:	#N/A	#N/A	#N/A
	-Tearout--Mount shear*thickness*edge distance >= Test Load:	#N/A	#N/A	#N/A
	Thread pullout min(UTS)*face_thickness*pi()*minor_r^2:	#N/A	#N/A	#N/A

MOUNT GEOMETRY - ACCUMULATOR SIDE

EQ				
	Mount cross section on accumulator skin:			N/A
	Mount thickness (B):		mm	N/A
	Mount length (L):		mm	N/A
	Minimum gusset thickness (T):		mm	N/A
	Minimum gusset height normal to mount face (H):		mm	N/A
F.3.5	0.0 15000N Bending in shear M*y / I < Su:			N/A
#N/A	0.0 15000N Bending normal M*y / I < Su:			N/A
#N/A	Parabolic shear 3*Test Load/2*area <= Shear:			N/A

ACCUMULATOR MOUNT :: Accumulator Skin interface

① **Accumulator Mount**

② **Mount Geometry Accumulator SIDE**

2 types of mounting methods (1)

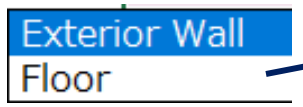
Understand and decide the Rules of Mounting Method.
Note that requirements differ depending on the Mounting Method.

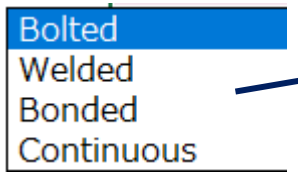
Mounting Method の Rulesを理解したうえで決めておくこと
Mounting Methodによって要件が異なるので注意

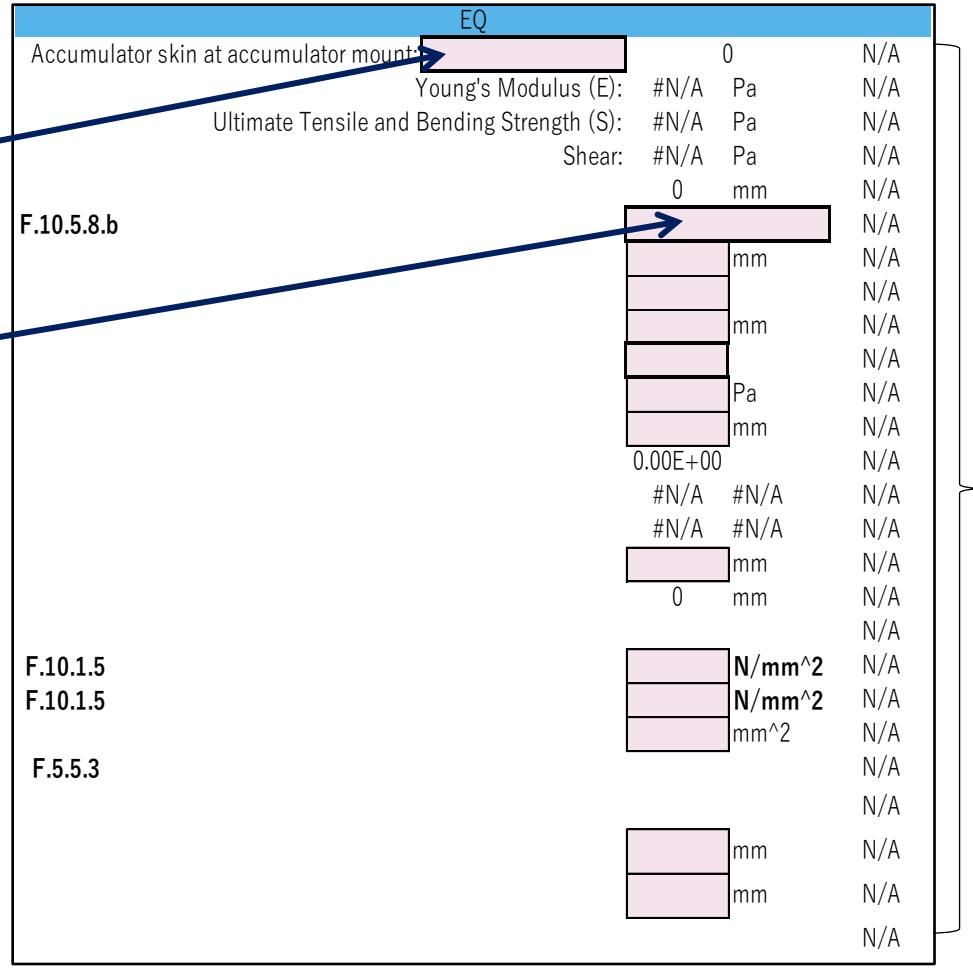
Mass Based = Load Based

Entry fields vary by selection

入力項目は選択により異なる







③ Accumulator Mount Accumulator Skin interface

2 types of mounting methods (2)

Corner Attachment

F.10.5.6 Accumulator Attachment – Corner Attachments

a. Eight or more attachments are required for any configuration.

- **One attachment for each corner of a rectangular structure of multiple Accumulator Segments**
- **More than the minimum number of fasteners may be required for non rectangular arrangements**

Examples: If not filled in with additional structure, an extruded L shape would require attachments at 10 convex corners (the corners at the inside of the L are not convex); an extruded hexagon would require 12 attachments

b. The mechanical connections at each corner must be 50 mm or less from the corner of the Segment

c. Each attachment point must be able to withstand a Test Load equal to 1/4 of total mass of the container accelerating at 40 g

		EQ		
F.10.5.6-7	Mounting Method:	Corner Attachment		EQ
	Test Load:	0 N		EQ
	Accumulator mount symmetry:	Top/Bottom	**This will change the names of sections.**	EQ
	Chassis mount symmetry:	Top/Bottom	**This will change the names of sections.**	EQ

If Corner Attachment is selected,
The input title will be “Front Left Accumulator Mount” etc.

Corner Attachment を選択すると、
入力タイトルは「Front Left Accumulator Mount」等となる

BLANK

Front Left Accumulator Mount

ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount				
BLANK				
	Intersection of fastener axis and fastener shear plane.			EQ
Outside	the front/rear planes of the accumulator segments:		mm	BLANK
Outside	the top/bottom planes of the accumulator segments:		mm	BLANK
Outside	the left/right planes of the accumulator segments:		mm	BLANK
	Total Surface Offset, zero for an internal hardpoint:	0	mm	EQ
	Mount material (Accumulator skin if directly mounted):			EQ
	Young's Modulus (E):	#N/A	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	#N/A	Pa	EQ
	Shear:	#N/A	Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:		mm	BLANK
	Tearout--Minimum - Fastener spacing, edge, or corner distance:		mm	BLANK
	Number of fasteners used (2x if in double shear):			BLANK
	Fastener shear diameter:		mm	BLANK
	Threads in shear:			BLANK
	Fastener UTS:		Pa	BLANK
	Pullout--Min total perimeter of washers or inserts on one surface:		mm	BLANK
F.10.5.8.a	--Shear--0.577*fasteners*UTS*pi*r^2 >= Test Load:	0.00E+00		EQ
	--Pullout--Mount shear*thickness*perimeter >= Test Load:	#N/A	#N/A	#N/A
	Tearout--Mount shear*thickness*edge distance >= Test Load:	#N/A	#N/A	#N/A
	Thread pullout min(UTS)*face_thickness*pi()*minor_r^2:	#N/A	#N/A	#N/A
	MOUNT GEOMETRY - ACCUMULATOR SIDE			
	EQ			
	Mount cross section on accumulator skin:			N/A
	Mount thickness (B):		mm	N/A
	Mount length (L):		mm	N/A
	Minimum gusset thickness (T):		mm	N/A
	Minimum gusset height normal to mount face (H):		mm	N/A
F.3.5	0.0 15000N Bending in shear M*y / I < Su:			N/A
#N/A	0.0 15000N Bending normal M*y / I < Su:			N/A
#N/A	Parabolic shear 3*Test Load/2*area <= Shear:			N/A
	ACCUMULATOR MOUNT :: Accumulator Skin interface			
	EQ			
	Accumulator skin at accumulator mount:		0	N/A
	Young's Modulus (E):	#N/A	Pa	N/A
	Ultimate Tensile and Bending Strength (S):	#N/A	Pa	N/A
	Shear:	#N/A	Pa	N/A
			0 mm	N/A
F.10.5.8.b				N/A
			mm	N/A
				N/A
			mm	N/A
				N/A
			Pa	N/A
			mm	N/A
			0.00E+00	N/A
		#N/A	#N/A	N/A
		#N/A	#N/A	N/A
			mm	N/A
			0 mm	N/A
				N/A
F.10.1.5			N/mm^2	N/A
F.10.1.5			N/mm^2	N/A
			mm^2	N/A
F.5.5.3				N/A
				N/A
			mm	N/A
			mm	N/A
				N/A

Entry fields vary by selection

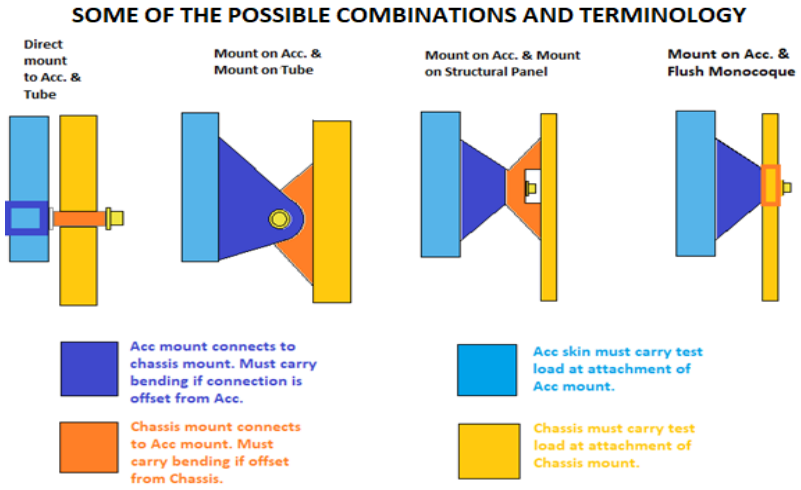
入力項目は選択により異なる

① **Accumulator Mount**

② **Mount Geometry Accumulator SIDE**

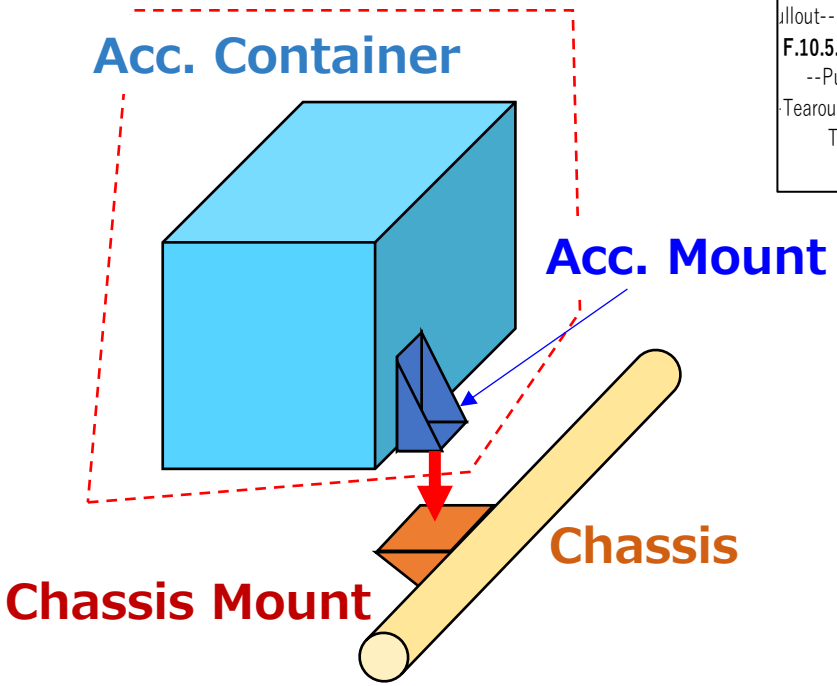
③ **Accumulator Mount Accumulator Skin interface**

ACC Mount 1-5 configuration (1)



ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount

BLANK				
	Intersection of fastener axis and fastener shear plane.			EQ
Outside	the front/rear planes of the accumulator segments:		mm	BLANK
Outside	the top/bottom planes of the accumulator segments:		mm	BLANK
Outside	the left/right planes of the accumulator segments:		mm	BLANK
	Total Surface Offset, zero for an internal hardpoint:	0	mm	EQ
	Mount material (Accumulator skin if directly mounted):			EQ
	Young's Modulus (E):	#N/A	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	#N/A	Pa	EQ
	Shear:	#N/A	Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:		mm	BLANK
	earout--Minimum - Fastener spacing, edge, or corner distance:		mm	BLANK
	Number of fasteners used (2x if in double shear):			BLANK
	Fastener shear diameter:		mm	BLANK
	Threads in shear:			BLANK
	Fastener UTS:		Pa	BLANK
	ullout--Min total perimeter of washers or inserts on one surface:		mm	BLANK
F.10.5.8.a	--Shear--0.577*fasteners*UTS*pi*r^2 >= Test Load:	0.00E+00		EQ
	--Pullout--Mount shear*thickness*perimeter >= Test Load:	#N/A	#N/A	#N/A
	Tearout--Mount shear*thickness*edge distance >= Test Load:	#N/A	#N/A	#N/A
	Thread pullout min(UTS)*face_thickness*pi()*minor_r^2:	#N/A	#N/A	#N/A



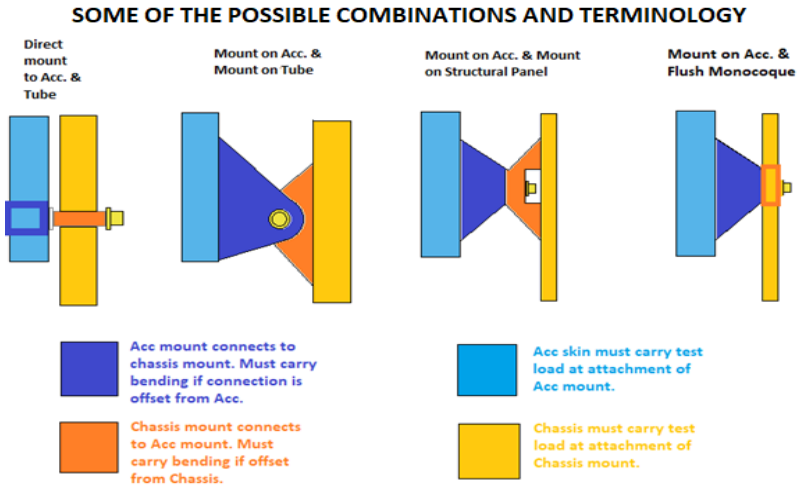
"Acc. Mount". Strength calculations for attachment to Chassis Mount

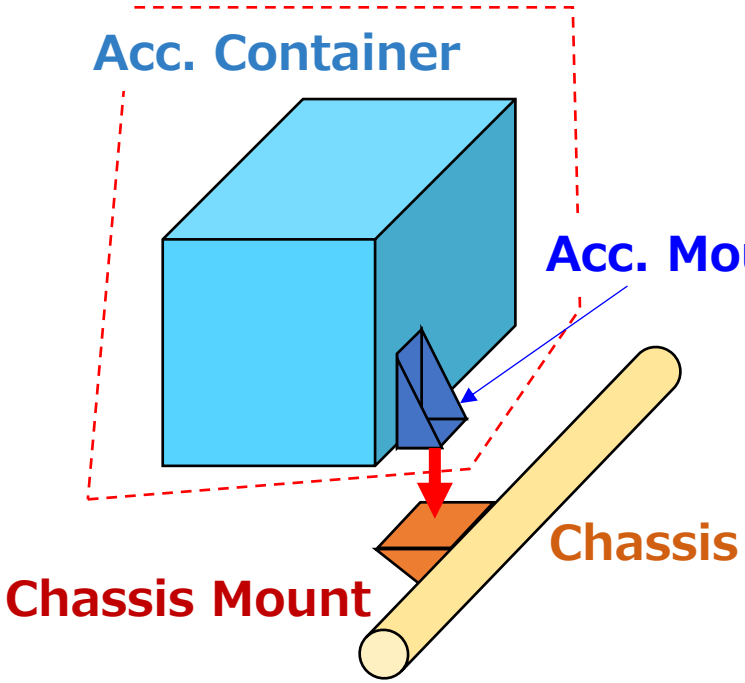
- Shear of Bolt
- Shear by minimum perimeter (if female threads are cut directly, enter pullout strength)
- Tear-out to nearest edge (If directly female threaded, enter the strength of the threaded insert or the skin strength, whichever is weaker.

"Acc. Mountの" Chassis Mountへの取付部の強度計算

- BoltのShear
- 最小Perimeterによるせん断 (直に雌ねじを切った場合は引抜強度)
- 最っも近傍エッジへのティアアウト ※(直に雌ねじを切る場合、ねじインサートの強度か、Skinの強度の弱い方)

ACC Mount 1-5 configuration (1)





MOUNT GEOMETRY - ACCUMULATOR SIDE

	EQ				
		Mount cross section on accumulator skin:			N/A
		Mount thickness (B):		mm	N/A
		Mount length (L):		mm	N/A
		Minimum gusset thickness (T):		mm	N/A
		Minimum gusset height normal to mount face (H):		mm	N/A
F.3.5	0.0	15000N Bending in shear M*y / I < Su:			N/A
#N/A	0.0	15000N Bending normal M*y / I < Su:			N/A
#N/A		Parabolic shear 3*Test Load/2*area <= Shear:			N/A

ACCUMULATOR MOUNT :: Accumulator Skin interface

	EQ				
		Accumulator skin at accumulator mount:			N/A
			0		N/A
		Young's Modulus (E):	#N/A	Pa	N/A
		Ultimate Tensile and Bending Strength (S):	#N/A	Pa	N/A
		Shear:	#N/A	Pa	N/A
			0	mm	N/A
F.10.5.8.b					N/A
				mm	N/A
					N/A
				mm	N/A
					N/A
				Pa	N/A
				mm	N/A
			0.00E+00		N/A
			#N/A	#N/A	N/A
			#N/A	#N/A	N/A
				mm	N/A
			0	mm	N/A
					N/A
F.10.1.5				N/mm^2	N/A
F.10.1.5				N/mm^2	N/A
				mm^2	N/A
F.5.5.3					N/A
					N/A
				mm	N/A
				mm	N/A
					N/A

Strength calculations based on the shape of the ACC Mount itself.

- **Shear bending**
- **Normal Bending**
- **Parabolic Shear**

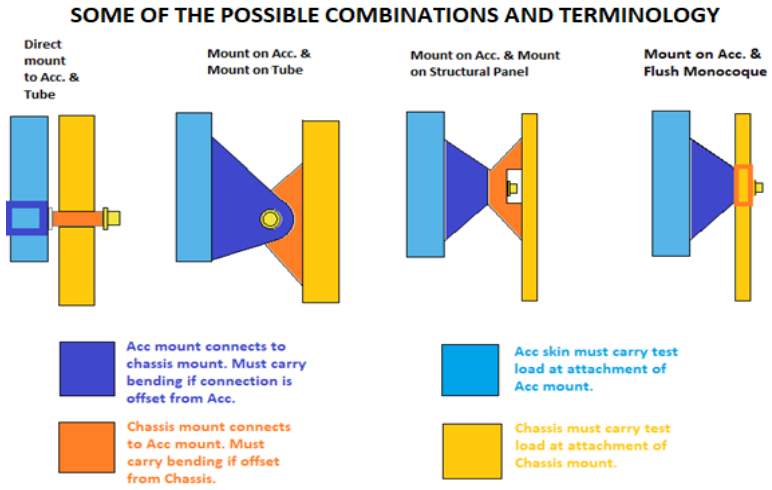
"ACC Mountそのものの"形状による強度計算
- ・せん断曲げ
- ・通常曲げ
- ・Parabolic Shear

Strength calculations for ACC Container wall sections

- **Calculation for each mounting method**

ACC ContainerのWall部の"強度計算
- ・マウント方法ごとに計算

ACC Mount 1-5 configuration (2)



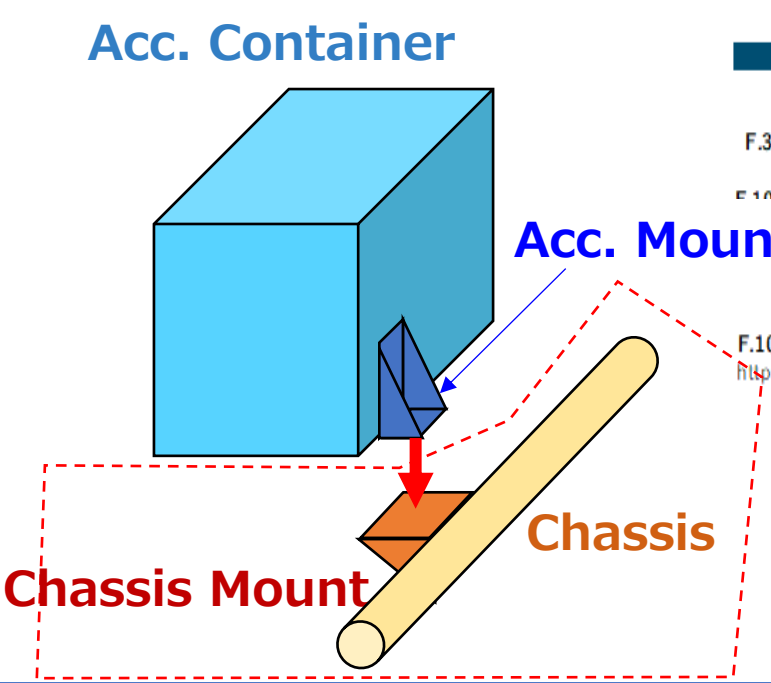
CHASSIS MOUNT: Where fastener passes through to Accumulator Mount

BLANK			
Intersection of fastener axis and fastener shear plane.	Offset Mounts		EQ
Review sections below: mounts per tube, bending if fastener shear is offset.			EQ
Offset from composite panel or radially from tube surface:	20	mm	EQ
Mount material (Composite skin for internal hardpoint):	Steel Welded		EQ
Young's Modulus (E):	2.00E+11	Pa	EQ
Ultimate Tensile and Bending Strength (S):	3.00E+08	Pa	EQ
Shear:	1.73E+08	Pa	EQ
5.8.b Pullout Face thickness, do not include core:	3.2	mm	EQ
t Minimum Fastener spacing, edge, or corner distance:	29	mm	EQ
Number of fasteners used (2x if in double shear):	0		BLANK
mulator Mount 1 Fastener shear diameter:	0	mm	BLANK
F.3.2.1.m Threads in shear:	0		BLANK
Fastener UTS:	0.00E+00	Pa	BLANK
Min total perimeter of washers or inserts on one surface:	45	mm	EQ
5.8.a Shear 0.577*fasteners*UTS*pi*r^2 >= Test Load:	0.00E+00		EQ
Pullout Mount shear*thickness*perimeter >= Test Load:	2.49E+04	166.2%	EQ
ut Mount shear*thickness*edge distance >= Test Load:	0.00E+00		EQ

TUBE CHECK: < 95% not a cause for rejection in 2025. See cell AC12.

BLANK			
Chassis type at mount:			BLANK
			BLANK
F.3.2.1. Square side, Size B required:		mm	BLANK
Chassis tube wall, Size B required:		mm	BLANK
.a Number of chassis mounts on this tube:			BLANK
Ultimate Strength (Su):	3.00E+08	Pa	EQ
unt Tube second moment of inertia (I), Size B required:	0.00E+00	mm^4	REJECT
Tube Length (L):		mm	BLANK
Chassis mount distance to closest triangulated node (a):		mm	BLANK
F.10.5.6-7 Tube Max Bending Force (Su*I)/(a*(1-a/L)*OD/2):			BLANK

https://engineeringlibrary.org/reference/beam-forces-moments-air-force-stress-manual



"Chassis Mount".
Strength calculations for attachment to ACC Mount

- Shear of Bolt (calculated by ACC)
- Shear with minimum perimeter
  Shear by minimum perimeter
  (or pullout strength if female threads are cut directly)
- Tear-out to re-near edge

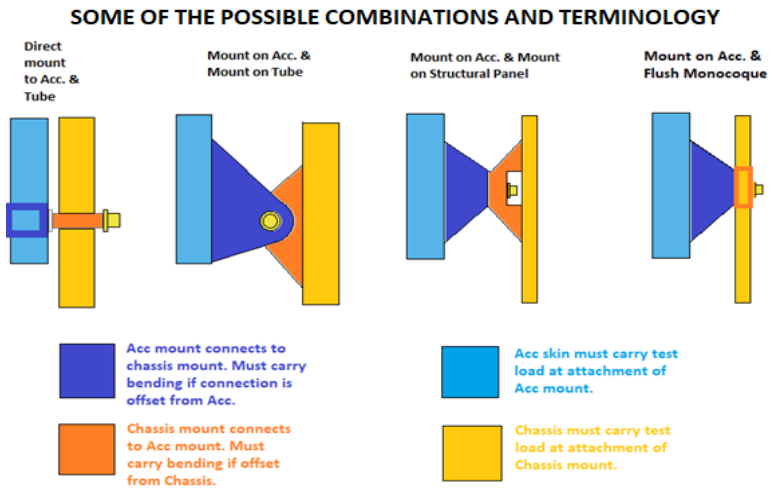
"Chassis Mount"
Acc. Mountへの取付部の強度計算
- BoltのShear（Accで計算済み）
- 最小Perimeterによるせん断
  (直に雌ねじを切った場合は引抜強度)
- 再近傍エッジへのティアアウト

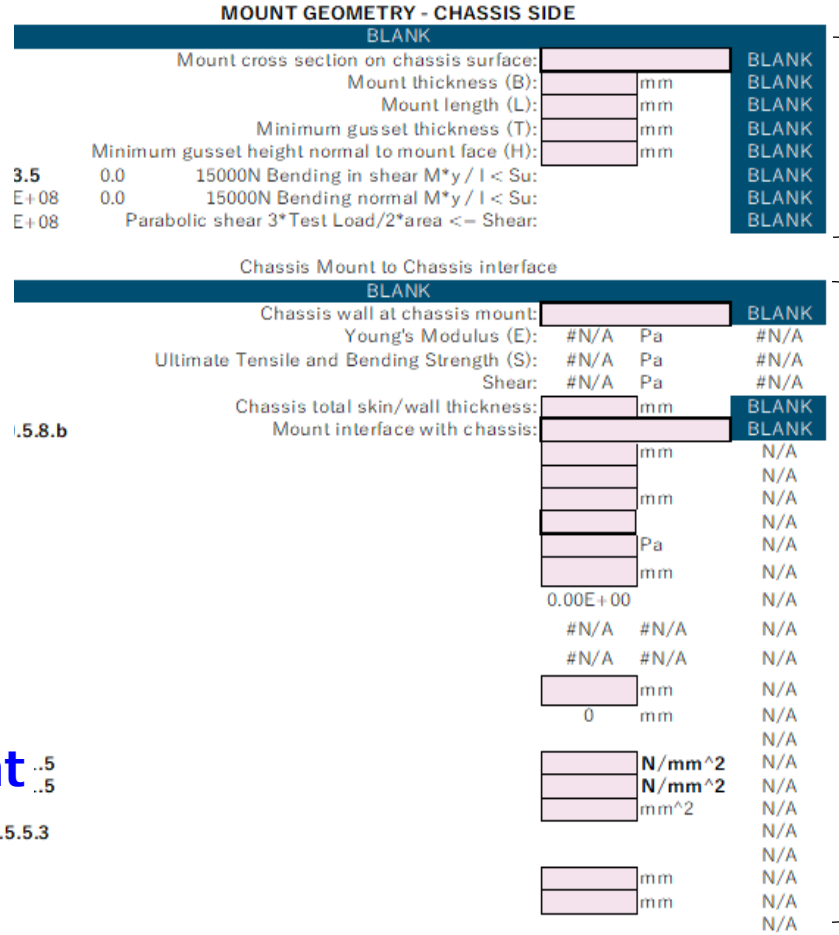
"Tube Strength" (Tube Only)
Check the strength against 15kN

- Calculated with simply supported beams, so it is roughly equivalent to "Check".
- Should be calculated with fixed beams at both ends.

"Tubeの強度" (Tube Only)
15kNに対する強度を見ている
- 単純支持梁で計算しているため大体Checkになる
- 本来は両端固定梁で計算すべき

ACC Mount 1-5 configuration (2)





Strength calculations based on the shape of the “Chassis Mount” itself

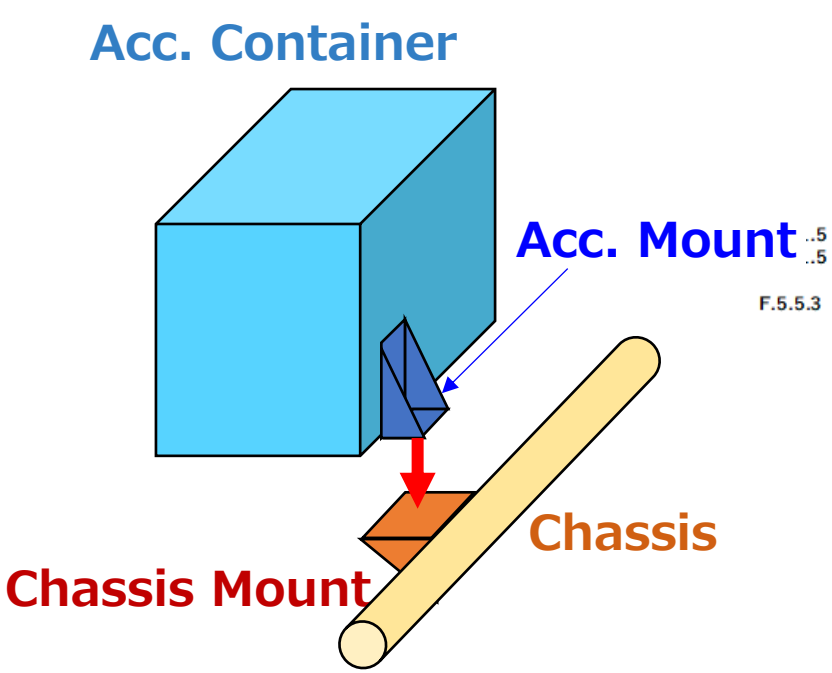
- Shear bending
- Normal Bending
- Parabolic Shear

“Chassis Mount”
そのものの形状による強度計算

- せん断曲げ
- 通常曲げ
- Parabolic Shear

“Chassis side joint strength”

“Chassis側の接合強度“



ACC Mount Position

ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount

	CHECK			
	Intersection of fastener axis and fastener shear plane			EQ
Outside	the front/rear planes of the accumulator segments:	0	mm	EQ
Outside	the top/bottom planes of the accumulator segments:	0	mm	EQ
Outside	the left/right planes of the accumulator segments:	14.5	mm	EQ
	Total Surface Offset, zero for an internal hardpoint:	14.5	mm	EQ
	Mount material (Accumulator skin if directly mounted):	6061-T6 Welded		EQ
	Young's Modulus (E):	6.90E+10	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	1.75E+08	Pa	EQ
	Shear:	1.01E+08	Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:	10	mm	EQ
	--Tearout--Minimum - Fastener spacing, edge, or corner distance:	8.7	mm	EQ
	Number of fasteners used (2x if in double shear):	1		EQ
	Fastener shear diameter:	6	mm	CHECK
	Threads in shear:	Yes		CHECK
	Fastener UTS:	1.40E+09	Pa	EQ
	--Pullout--Min total perimeter of washers or inserts on one surface:	20.73	mm	EQ
F.10.5.8.a	--Shear--0.577*fasteners*UTS*pi*r^2 >= Test Load:	2.28E+04	152.3%	EQ
	--Pullout--Mount shear*thickness*perimeter >= Test Load:	2.09E+04	139.5%	EQ
	--Tearout--Mount shear*thickness*edge distance >= Test Load:	1.76E+04	117.1%	EQ
	Thread pullout min(UTS)*face_thickness*pi()*minor_r^2:	4.95E+04	329.9%	N/A

Location of "Segment end in container" and "fastening point of ACC Mount to Chassis Mount".

「コンテナ内のSegment端」と「ACC Mount の Chassis Mountとの締結点」との位置関係

Distance from bolt hole to nearest edge

ボルト穴から最寄りのエッジまでの距離

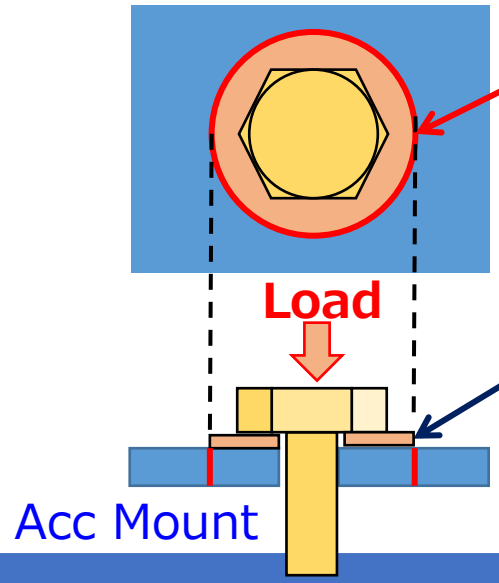
Shear against load in front-rear direction ⇒ Yes (F.10.1.1a)

車両前後方向への荷重に対しせん断ならば：Yes (F.10.1.1a)

Bolt strength ボルトの強度

Minimum circumference of the object (bolt head, washer, collar) that can shear the ACC Mount in connection with the Chassis Mount

Chassis Mount との締結でAcc. Mountをせん断しうる物体(ボルトヘッド・ワッシャ・カラー)の最小の周長



***Normal case: Dimensions to be entered into Min total Perimeter**

※通常の場合：Min total Perimeterへ入力する寸法

Check the strength of the part to be sheared at the outer circumference of the washer.

このワッシャ外周でせん断する部分の強度をみています

- **Note that if a collar with a small diameter is inserted between ACC Mount <-> Chassis Mount, the outer circumference of the collar may become the Min Perimeter.**

  Acc. Mount <-> Chassis Mount間に径の小さいカラーを挟む場合はそのカラーの外周がMin Perimeterになる場合があるので注意

- **If the bracket is directly female threaded, enter the circumference of the bolt diameter and enter the thread depth for Thickness. (This is a general female thread pullout strength calculation.)**

  ブラケットに直接雌ねじを切った場合は、ボルト径の周長を入力し、Thicknessにはねじ部深さを入力する　(一般的な雌ねじ引抜強度の計算になる)

ACC Mount Position

ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount

CHECK

Intersection of fastener axis and fastener shear plane.

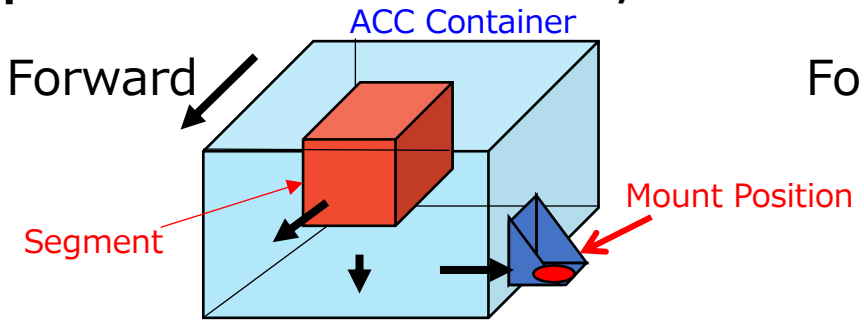
Between	the front/rear planes of the accumulator segments:	0	mm	EQ
Between	the top/bottom planes of the accumulator segments:	0	mm	EQ
Outside	the left/right planes of the accumulator segments:	13.32	mm	EQ
	Total Surface Offset, zero for an internal hardpoint:	13.32	mm	EQ
	Mount material (Accumulator skin if directly mounted):	core		EQ
	Young's Modulus (E):	9.46E+10	Pa	EQ

There are many input errors!

Distance: Enter the distance between the nearest Segment ↔ Conclusion point.
(It is almost impossible for all of them to be Between)

距離：最寄りのSegment↔締結点間の距離を入力のこと
(全部Betweenになる事はほぼあり得ない)

Exp: How to choose Outside, Between

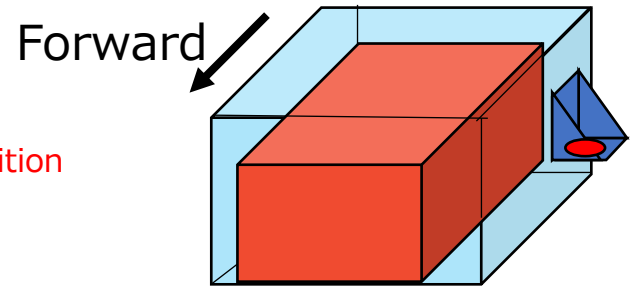


the front/rear “Outside“
the top/bottom “Outside“
the left/right “Outside“

前後：締結点はsegmentよりも前なので
Front/Rear → Outside

上下：締結点は床板分だけ
Segmentよりも下なので
Top/Bottom → Outside

左右：締結点はsegmentよりも左なので
Left/Right → Outside

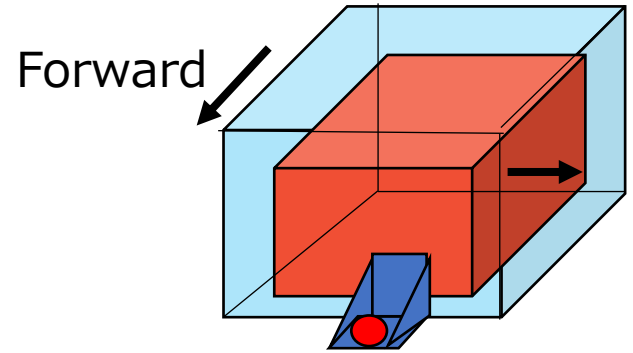


the front/rear “Between“
the top/bottom “Between“
the left/right “Outside“

前後：締結点はSegmentの間
Front/Rear → Between

上下：締結点はSegmentの間
Top/Bottom → Between

左右：締結点はSegmentよりも左なので
Left/Right → Outside



the front/rear “Outside“
the top/bottom “Outside“
the left/right “Between“

前後：締結点はsegmentよりも前なので
Front/Rear → Outside

上下：締結点は床板分だけ
Segmentよりも下なので
Top/Bottom → Outside

左右：締結点はSegmentの間
Left/Right → Between

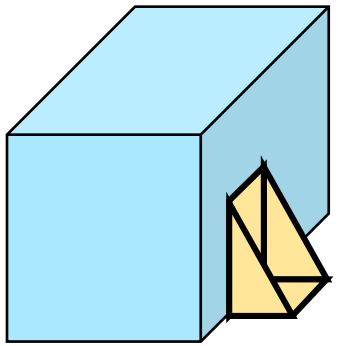
Mount Geometry-ACC Side

MOUNT GEOMETRY - ACCUMULATOR SIDE

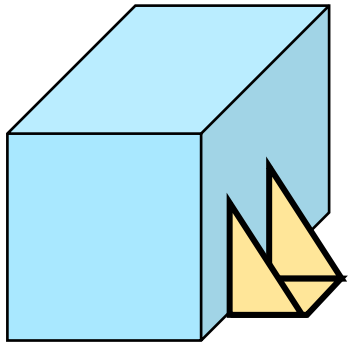
		EQ			
		Mount cross section on accumulator skin:	U-Shape		EQ
		Mount thickness (B):	8.8	mm	EQ
		Mount length (L):	24	mm	EQ
		Minimum gusset thickness (T):	2.7	mm	EQ
		Minimum gusset height normal to mount face (H):	53.8	mm	EQ
F.3.5	12.0	15000N Bending in shear M*y / I < Su:	4.60E+07	11.8%	EQ
3.89E+08	22.0	15000N Bending normal M*y / I < Su:	2.43E+07	6.3%	EQ
1.08E+08		Parabolic shear 3*Test Load/2*area <= Shear:	4.48E+07	41.5%	EQ

Decide by referring to the sample below or the input example attached to the SES.

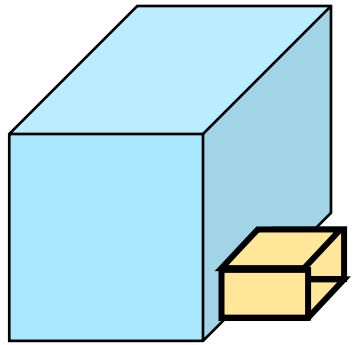
下図のサンプルやSESに添付された入力例を参考に決めること



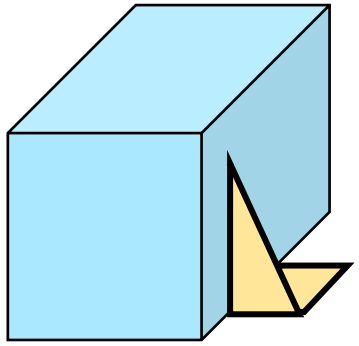
←U-Shape



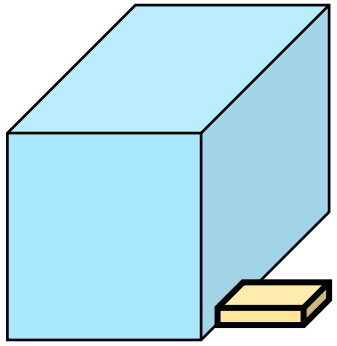
←U-Shape



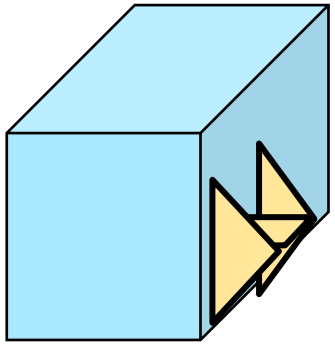
←Rectangular Tube



←L-Shape



←Single Layer

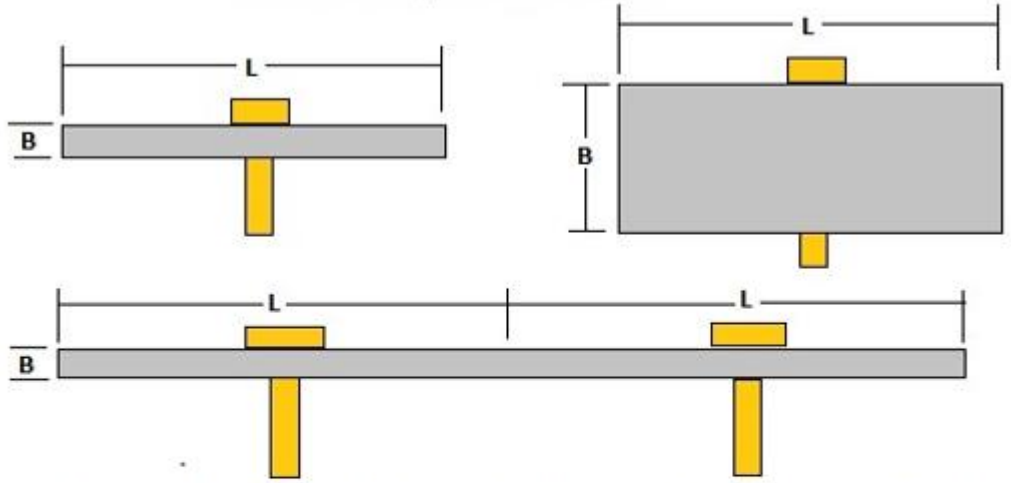


←H-Shape

Mount Cross Section on ACC Skin

These are the shapes of the mounting surface to ACC or Chassis side ACCまたはChassis側への取付面の形状です

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



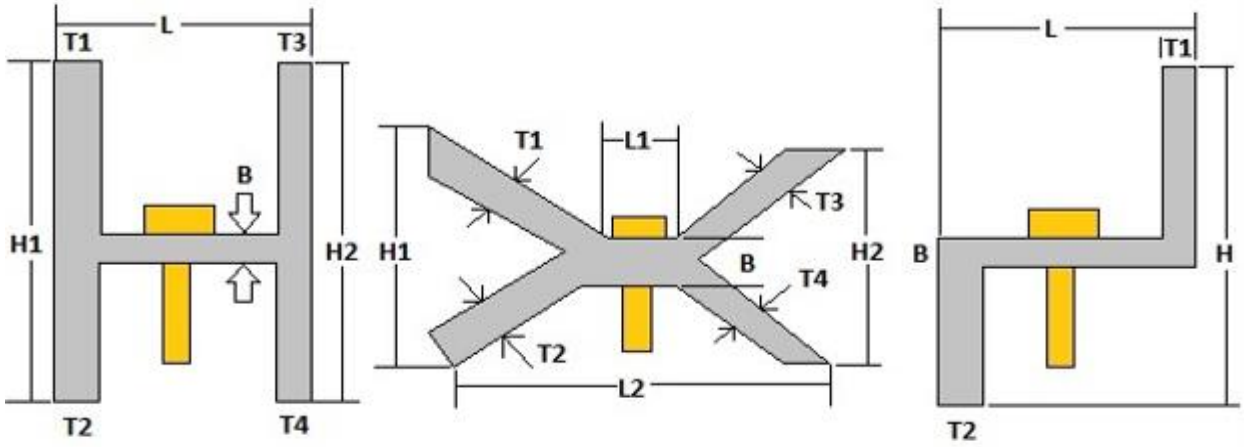
THIN SHEET METAL FLANGES WILL NOT CARRY THE TEST LOADS

THE CROSS SECTION IS MEASURED WHERE THE MOUNT CONTACTS THE ACCUMULATOR OR CHASSIS SURFACE

CROSS SECTION	SINGLE LAYER
MOUNT THICKNESS (B)	B
MOUNT LENGTH (L)	L
MINIMUM GUSSET THICKNESS (T)	L
MINIMUM GUSSET HEIGHT (H)	B

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

THE CROSS SECTION IS MEASURED WHERE THE MOUNT CONTACTS THE ACCUMULATOR OR CHASSIS SURFACE



	H-SHAPE
(B)	B
(L)	L
(T)	min (T1, T2, T3, T4)
(H)	min (H1, H2)

	H-SHAPE
(B)	B
(L)	average (L1, L2)
(T)	min (T1, T2, T3, T4)
(H)	min (H1, H2)

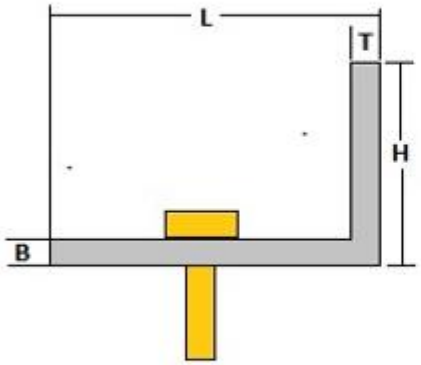
	H-SHAPE
(B)	B
(L)	L
(T)	0.5 x min (T1, T2)
(H)	H

Mount Cross Section on ACC Skin

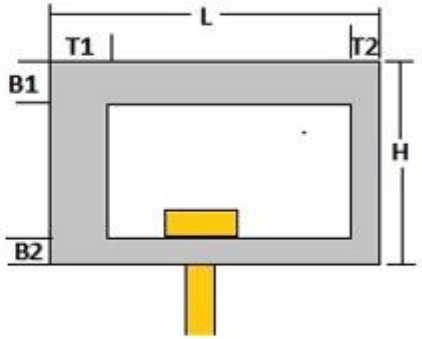
These are the shapes of the mounting surface to ACC or Chassis side ACCまたはChassis側への取付面の形状です

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

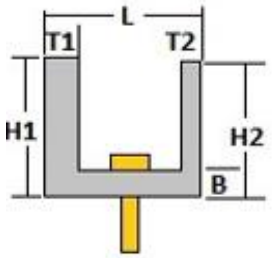
THE CROSS SECTION IS MEASURED WHERE THE MOUNT CONTACTS THE ACCUMULATOR OR CHASSIS SURFACE

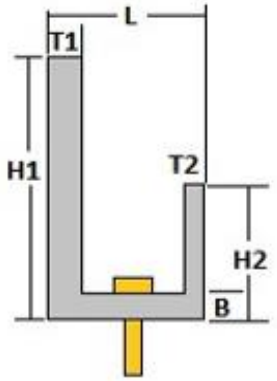


L-SHAPE	
(B)	B
(L)	L
(T)	T
(H)	H

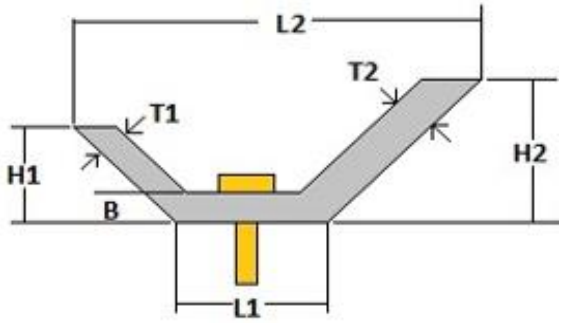


RECTANGULAR TUBE	
(B)	min (B1, B2)
(L)	L
(T)	min (T1, T2)
(H)	H

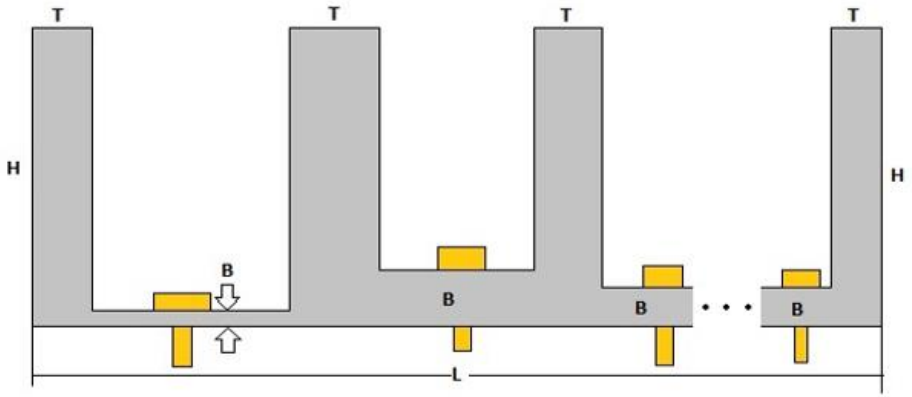




U-SHAPE	
(B)	B
(L)	L
(T)	min (T1, T2)
(H)	min (H1, H2)



U-SHAPE	
(B)	B
(L)	average (L1, L2)
(T)	min (T1, T2)
(H)	min (H1, H2)



U-SHAPE	
(B)	min (B)
(L)	L
(T)	min (T)
(H)	min (H)

ACC Skin Interface (1)

ACCUMULATOR MOUNT :: Accumulator Skin interface

	BLANK			
	Accumulator skin at accumulator mount:	Exterior Wall	0	EQ
	Young's Modulus (E):	#N/A	Pa	#N/A
	Ultimate Tensile and Bending Strength (S):	#N/A	Pa	#N/A
	Shear:	#N/A	Pa	#N/A
	Accumulator total skin/wall thickness:	0	mm	BLANK
F.10.5.8.b	Mount interface with accumulator:	Bolted		EQ
--Tearout--Min fastener spacing, accumulator edge, or corner distance:			mm	BLANK
	Number of fasteners used:			BLANK
	Fastener shear diameter:		mm	BLANK
	Threads in shear:			EQ
	Fastener UTS:		Pa	BLANK
--Pullout-- Min total perimeter of all washers or inserts on one surface:			mm	BLANK
	Fastener shear >= Test Load:	0.00E+00		EQ
	Accumulator Pullout >= Test Load:	#N/A	#N/A	#N/A
	Accumulator Tearout >= Test Load:	#N/A	#N/A	#N/A

Exterior Wall
Floor

Select where to mount the Mount on the ACC

MountをACCの何処に取付けるか選択

Bolted
Welded
Bonded
Continuous

Continuous for Monocoque or shaved.

Continuousは Monocoqueや削り出し

Welded → For welding a Mount to a Container.
Enter the length of the weld.

Bonded → If the mount is bonded to the container.
Enter the strength of the adhesive (shear & T-Peel), the bonded area, the perimeter length of the bonded area, and the thickness of the outer container wall/floor to which it is bonded.

Continuous → For one-piece molding.
Enter the centerline length of the mount shape.

Welded → **ContainerにMountを溶接の場合**
溶接長を入力

Bonded → **ContainerにMountを接着の場合**
接着剤の強度(せん断＆T-Peel強度)、接着面積
接着部の外周長、接着したContainer外壁/床の厚さを入力

Continuous → **一体成型の場合**
Mount部形状のCenterline長を入力

ACC Skin Interface (2)

ACCUMULATOR MOUNT :: Accumulator Skin interface

BLANK				
Accumulator skin at accumulator mount:	Exterior Wall	0		EQ
	Young's Modulus (E):	#N/A	Pa	#N/A
	Ultimate Tensile and Bending Strength (S):	#N/A	Pa	#N/A
	Shear:	#N/A	Pa	#N/A
	Accumulator total skin/wall thickness:	0	mm	BLANK
F.10.5.8.b	Mount interface with accumulator:	Bolted		EQ
--Tearout--Min fastener spacing, accumulator edge, or corner distance:			mm	BLANK
	Number of fasteners used:			BLANK
	Fastener shear diameter:		mm	BLANK
	Threads in shear:			EQ
	Fastener UTS:		Pa	BLANK
--Pullout-- Min total perimeter of all washers or inserts on one surface:			mm	BLANK
	Fastener shear >= Test Load:	0.00E+00		EQ
	Accumulator Pullout >= Test Load:	#N/A	#N/A	#N/A
	Accumulator Tearout >= Test Load:	#N/A	#N/A	#N/A

Min Total Perimeter of ～ とは
Skin(wall)をせん断しうる最小周長

Tubeの場合
- ワッシャ外周長(Backing Plateの場合も)
- Bolt Head / Nut座面の外周長
- Mount の Skinとの接触部外周長

→ **この中の最小値**

Monocoque時
- インサートの外周
- Acc. Mount の Skinとの接触部外周長
- Backing Plate の外周長

→ **この中の最小値**

Min Total Perimeter of ～:
Minimum perimeter of skin (wall) that can be sheared.

In case of Tube
- Outside circumference of Washer (also in case of Backing Plate).
- The circumference of the bolt head/nut seating surface.
- The circumference of the contact area with the skin of the mount.

→ **Minimum value in the above.**

In case of Monocoque
- Outer circumference of insert.
- Outer circumference of Acc. Mount in contact with Skin
- Outer circumference of the backing plate

→ **Minimum value in the above**

ACC Skin Interface (3)

ACCUMULATOR MOUNT :: Accumulator Skin interface

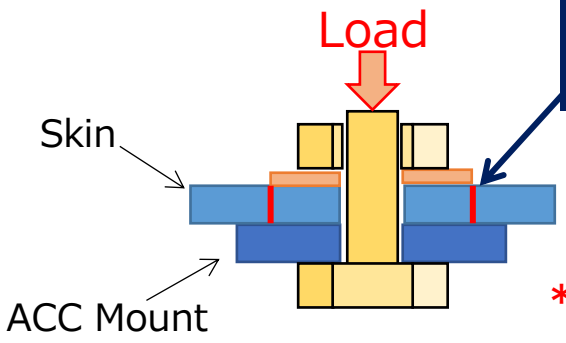
BLANK				
Accumulator skin at accumulator mount:	Exterior Wall	0		EQ
Young's Modulus (E):	#N/A	Pa		#N/A
Ultimate Tensile and Bending Strength (S):	#N/A	Pa		#N/A
Shear:	#N/A	Pa		#N/A
Accumulator total skin/wall thickness:	0	mm		BLANK
F.10.5.8.b Mount interface with accumulator:	Bolted			EQ
--Tearout--Min fastener spacing, accumulator edge, or corner distance:		mm		BLANK
Number of fasteners used:				BLANK
Fastener shear diameter:		mm		BLANK
Threads in shear:				EQ
Fastener UTS:		Pa		BLANK
--Pullout-- Min total perimeter of all washers or inserts on one surface:		mm		BLANK
Fastener shear >= Test Load:	0.00E+00			EQ
Accumulator Pullout >= Test Load:	#N/A	#N/A		#N/A
Accumulator Tearout >= Test Load:	#N/A	#N/A		#N/A

To fasten Mount to ACC Wall with bolt and nut

ACC WallにMountをボルト・ナットで締結する場合

Check the strength of the part to be sheared at the outer circumference of the washer.

このワッシャ外周で、せん断する部分の強度をみています

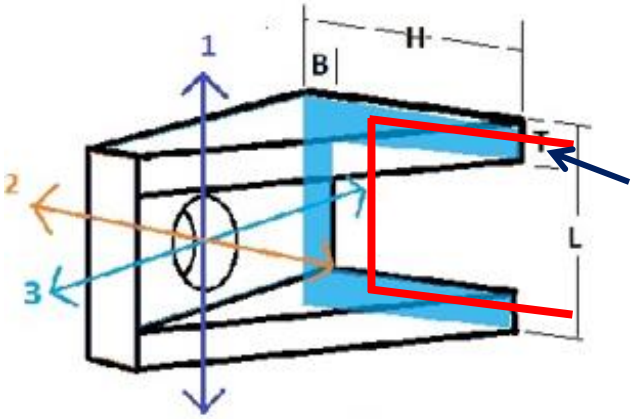


***The smallest perimeter is the weakest.**

※ 最小外周が一番弱い

To enter in Continuous

Continuousで入力する場合



Enter Centerline length

Centerline長を入力する

Chassis Mount

Where fastener passes through to Accumulator Mount

CHASSIS MOUNT: Where fastener passes through to Accumulator Mount

	CHECK			
	Intersection of fastener axis and fastener shear plane.	Offset Mounts		EQ
	Review sections below: mounts per tube, bending if fastener shear is offset.			EQ
	Offset from composite panel or radially from tube surface:	20	mm	EQ
	Mount material (Composite skin for internal hardpoint):	Steel Welded		EQ
	Young's Modulus (E):	2.00E+11	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	3.00E+08	Pa	EQ
	Shear:	1.73E+08	Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:	3.2	mm	EQ
	--Tearout--Minimum - Fastener spacing, edge, or corner distance:	29	mm	EQ
From	Number of fasteners used (2x if in double shear):	1		EQ
Accumulator Mount 1	Fastener shear diameter:	6	mm	CHECK
	Threads in shear:	Yes		CHECK
	Fastener UTS:	1.40E+09	Pa	EQ
	--Pullout--Min total perimeter of washers or inserts on one surface:	45	mm	EQ
F.10.5.8.a	--Shear--0.577*fasteners*UTS*pi*r^2 >= Test Load:	2.28E+04	152.3%	EQ
	--Pullout--Mount shear*thickness*perimeter >= Test Load:	2.49E+04	166.2%	EQ
	--Tearout--Mount shear*thickness*edge distance >= Test Load:	3.21E+04	214.2%	EQ

Mounting structure (Figure 1) 取り付け構造 (図①)

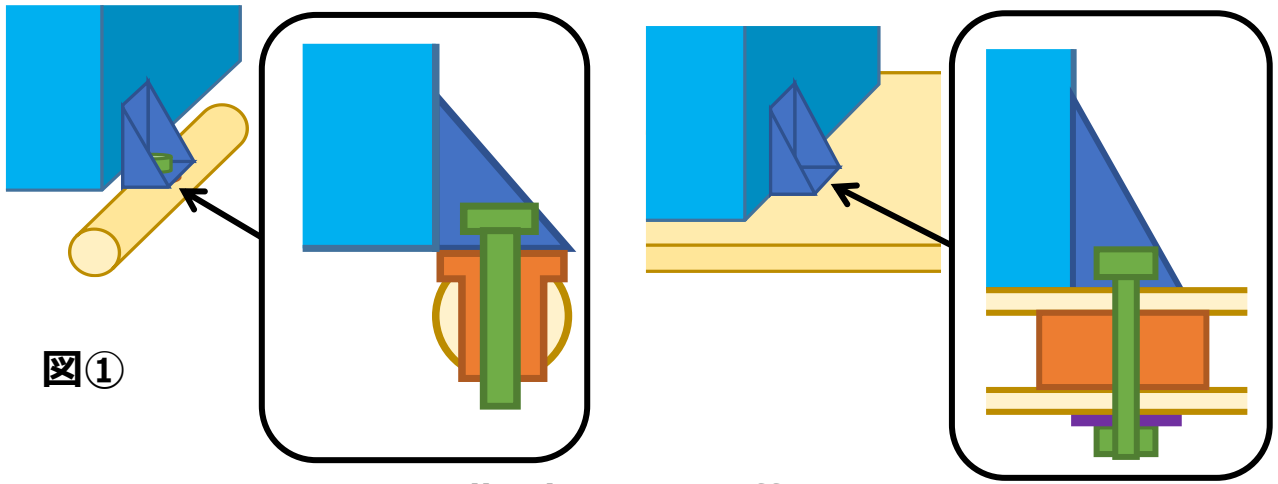
Distance from Chassis to junction with ACC Mount (Figure 2) ChassisからACC Mountとの接合点までの距離 (図②)

Mount Material Mountの材質

Mount thickness and distance from mounting hole to edge

Mountの厚さと、取付穴からエッジまでの距離

↓Centerline Inserts ↓Flush Monocoque



図①

All others are Offset Mounts.

上記以外は全てOffset Mounts

Chassis Mount

Where fastener passes through to Accumulator Mount

CHASSIS MOUNT: Where fastener passes through to Accumulator Mount

	CHECK			
	Intersection of fastener axis and fastener shear plane.	Offset Mounts		EQ
	Review sections below: mounts per tube, bending if fastener shear is offset.			EQ
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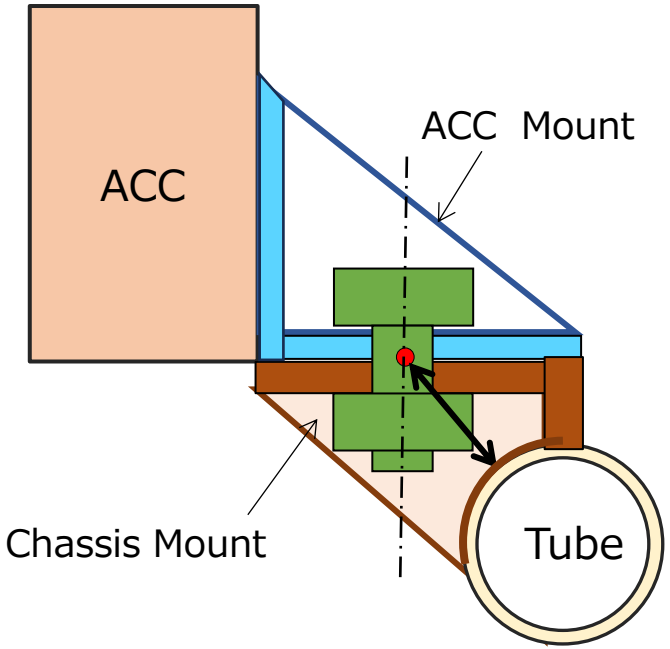
	Mount material (Composite skin for internal hardpoint):	Steel Welded		EQ
	Young's Modulus (E):	2.00E+11	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	3.00E+08	Pa	EQ
	Shear:	1.73E+08	Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:	3.2	mm	EQ
	--Tearout--Minimum - Fastener spacing, edge, or corner distance:	29	mm	EQ
From	Number of fasteners used (2x if in double shear):	1		EQ
Accumulator Mount 1	Fastener shear diameter:	6	mm	CHECK
	Threads in shear:	Yes		CHECK
	Fastener UTS:	1.40E+09	Pa	EQ
	--Pullout--Min total perimeter of washers or inserts on one surface:	45	mm	EQ
F.10.5.8.a	--Shear--0.577*fasteners*UTS*pi*r^2 >= Test Load:	2.28E+04	152.3%	EQ
	--Pullout--Mount shear*thickness*perimeter >= Test Load:	2.49E+04	166.2%	EQ
	--Tearout--Mount shear*thickness*edge distance >= Test Load:	3.21E+04	214.2%	EQ

Distance from Chassis to junction with ACC Mount (Figure 2)

ChassisからACC Mountとの接合点までの距離 (図②)



図②

Offset from composite panel or radically from tube surface

コンポジットパネルまたはチューブ表面から半径方向にオフセット。

Chassis Mount

Where fastener passes through to Accumulator Mount

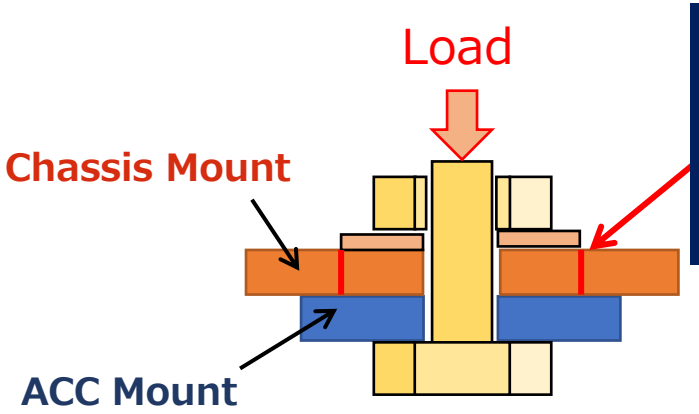
CHASSIS MOUNT: Where fastener passes through to Accumulator Mount

CHECK				
Intersection of fastener axis and fastener shear plane.		Offset Mounts		EQ
Review sections below: mounts per tube, bending if fastener shear is offset.				EQ
Offset from composite panel or radially from tube surface:		20	mm	EQ
Mount material (Composite skin for internal hardpoint):		Steel Welded		EQ
Young's Modulus (E):		2.00E+11	Pa	EQ
Ultimate Tensile and Bending Strength (S):		3.00E+08	Pa	EQ
Shear:		1.73E+08	Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:	3.2	mm	EQ
--Tearout--Minimum - Fastener spacing, edge, or corner distance:		29	mm	EQ
From	Number of fasteners used (2x if in double shear):	1		EQ
Accumulator Mount 1	Fastener shear diameter:	6	mm	CHECK
	Threads in shear:	Yes		CHECK
	Fastener UTS:	1.40E+09	Pa	EQ
--Pullout--Min total perimeter of washers or inserts on one surface:		45	mm	EQ
F.10.5.8.a	--Shear--0.577*fasteners*UTS*pi*r^2 >= Test Load:	2.28E+04	152.3%	EQ
	--Pullout--Mount shear*thickness*perimeter >= Test Load:	2.49E+04	166.2%	EQ
--Tearout--Mount shear*thickness*edge distance >= Test Load:		3.21E+04	214.2%	EQ

図③ Chassis Mountの Min-Perimeter

Washer, ACC Mount shear length, minimum nut circumference length (Figure 3)

ワッシャ、Acc. Mountのせん断長、ナット外周長の最小値(図③)



Check the strength of the part to be sheared at the outer circumference of the washer.

このワッシャ外周でせん断する部分の強度をチェックする

***The smallest perimeter is the weakest.**

※最小外周が一番弱い

Tube Check ：Only Tube Frame

TUBE CHECK: < 95% not a cause for rejection in 2025. See cell AC12.

		EQ		
	Chassis type at mount:	Tube		EQ
		Round		EQ
F.3.2.1.	Chassis tube diameter:	25.4	mm	EQ
	Chassis tube wall, Size B required:	2.4	mm	EQ
F.10.5.2.a	Number of chassis mounts on this tube:	2		EQ
F.3.4.2	Ultimate Strength (Su):	3.00E+08	Pa	EQ
	Acc Mount Tube second moment of inertia (I), Size B required:	1.16E+04	mm^4	EQ
	Tube Length (L):	100	mm	EQ
	Chassis mount distance to closest triangulated node (a):	15	mm	EQ
F.10.5.6-7	Tube Max Bending Force (Su*I)/(a*(1-a/L)*OD/2):	2.15E+04	143.18%	EQ

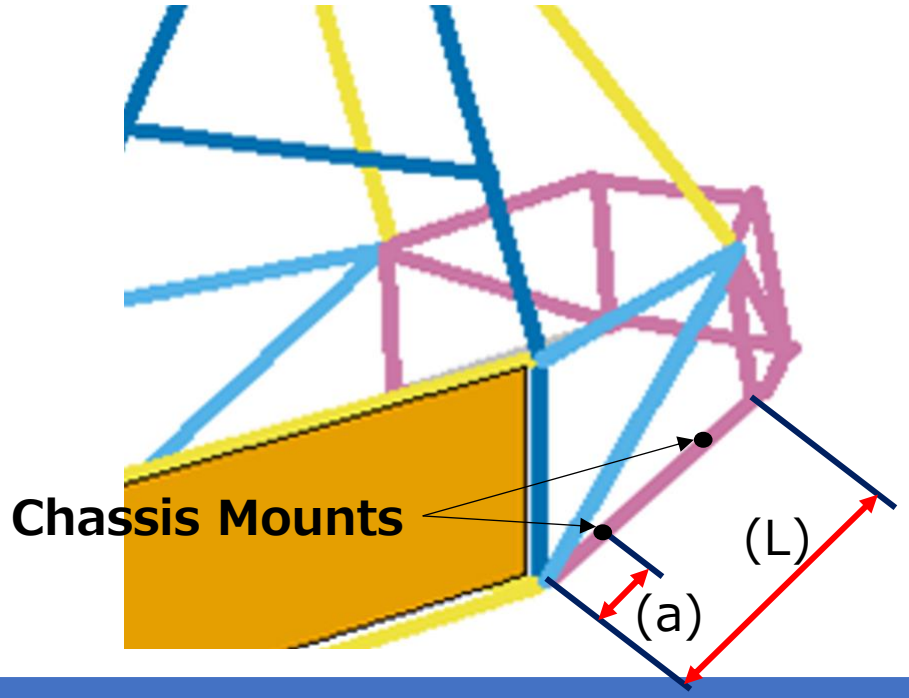
https://engineeringlibrary.org/reference/beam-forces-moments-air-force-stress-manual

Up to 2 Chassis Mounts can be installed on one Tube. F.10.5.2a

1本のTubeに取り付け可能なChassis Mountsは２個まで F.10.5.2a

Tube length (L) and proximity to the node (a) See figure below

Tubeの長さ(L)と、ノードからの近傍距離(a) 下図参照



Calculation of Bending Strength of Tube.

- ✓ If there are two Chassis Mounts on a tube, the moment at the node will be quite large. Therefore, it is desirable to have at least one Chassis Mounts at each node.
- ✓ If one of the Chassis Mounts is located at a node, there will be only one Chassis Mount on the tube, so the number of Chassis Mounts should be set to 1.

Tubeの曲げ強度の計算

- ✓ Chassis Mountsが1Tubeに2か所あるとノードでのモーメントがかなり大きくなるため 少なくとも1か所はノードに設けることが望ましい
- ✓ 一方をノードに設けた場合、Tubeには1点だけとなるので個数を1にし、もう片方の Chassis Mountについて記述すること

Mount Geometry-Chassis Side

MOUNT GEOMETRY - CHASSIS SIDE

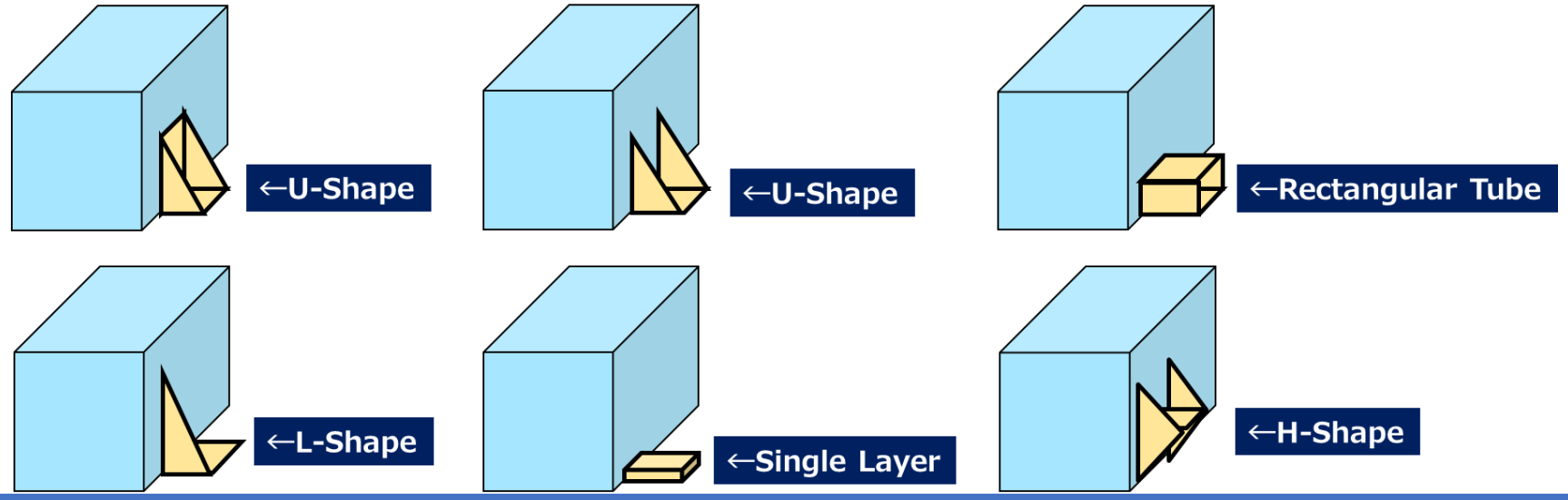
		EQ			
		Mount cross section on chassis surface:	U-Shape		EQ
		Mount thickness (B):	3.2	mm	EQ
		Mount length (L):	25	mm	EQ
		Minimum gusset thickness (T):	2	mm	EQ
		Minimum gusset height normal to mount face (H):	25	mm	EQ
F.3.5	12.5	15000N Bending in shear M*y / I < Su:	2.84E+08	94.6%	EQ
3.00E+08	8.3	15000N Bending normal M*y / I < Su:	2.98E+08	99.5%	EQ
1.73E+08		Parabolic shear 3*Test Load/2*area <= Shear:	1.25E+08	72.2%	EQ

Same as Accumulator Side.
Refer to the guidance for inputting the data.

MOUNT GEOMETRY - ACCUMULATOR SIDE

		EQ			
		Mount cross section on accumulator skin:	U-Shape		EQ
		Mount thickness (B):	8.8	mm	EQ
		Mount length (L):	24	mm	EQ
		Minimum gusset thickness (T):	2.7	mm	EQ
		Minimum gusset height normal to mount face (H):	53.8	mm	EQ
F.3.5	12.0	15000N Bending in shear M*y / I < Su:	4.60E+07	11.8%	EQ
3.89E+08	22.0	15000N Bending normal M*y / I < Su:	2.43E+07	6.3%	EQ
1.08E+08		Parabolic shear 3*Test Load/2*area <= Shear:	4.48E+07	41.5%	EQ

SESに添付されたガイダンスをよく見て入力のこと



Chassis Mount to Chassis Interface

If Offset Mounts, Centerline Inserts or Flush Monocoque and Offset≠0, calculate the strength between Chassis-Chassis Mount.
The entry method is the same as for ACC Mount :ACC Skin Interface.

Offset Mounts または Centerline Insertsか Flush Monocoqueで Offset≠0 の場合は, Chassis-Chassis Mount間の強度を計算する
記入方法はACCUMULATOR MOUNT::Accumulator Skin Interfaceと同じ。

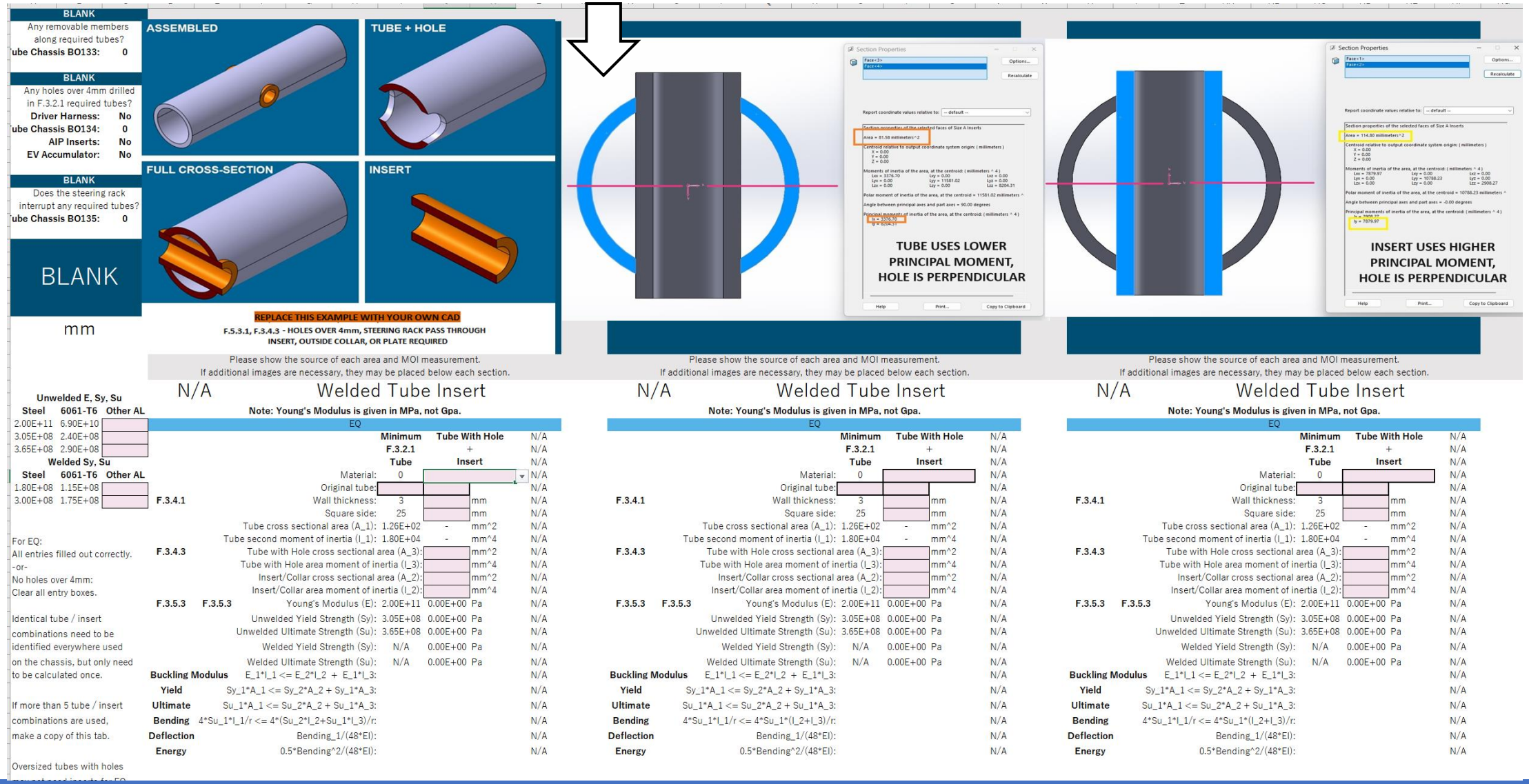
Chassis Mount to Chassis interface

	EQ			
	Chassis wall at chassis mount:	Steel Welded		EQ
	Young's Modulus (E):	2.00E+11	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	3.00E+08	Pa	EQ
	Shear:	1.73E+08	Pa	EQ
	Chassis total skin/wall thickness:	1.6	mm	EQ
F.10.5.8.b	Mount interface with chassis:	Welded		EQ
			mm	N/A
				N/A
			mm	N/A
				N/A
			Pa	N/A
			mm	N/A
		0.00E+00		N/A
		0.00E+00		N/A
		0.00E+00		N/A
	Total weld perimeter:	60.0	mm	EQ
	Thickness is assumed = skin thickness:	1.6	mm	EQ
	Shear strength >= Test Load:	1.66E+04	110.8%	EQ
F.10.1.5			**N/mm^2**	N/A
F.10.1.5			**N/mm^2**	N/A
			mm^2	N/A
F.5.5.3				N/A

Chassis Mount to Chassis Interface

If Offset=0 in Centerline Inserts.
F.3.4.3 Indicate the strength in [Welded Tube Insert] on the Welded Inserts sheet.

Centerline InsertsでOffset=0の場合は　F.3.4.3 Welded Insertsシートの[Welded Tube Insert] で強度を示す。



Chassis Mount to Chassis Interface

If Offset=0 in Flush Monocoque
F.7.8-9 Indicate intensity in [Accumulator To Mono, Hybrid Panels] on the Attachments sheet

Flush MonocoqueでOffset=0の場合は F.7.8-9 Attachmentsシートの[Accumulator To Mono, Hybrid Panels]で強度を示す

Chassis Mount to Chassis interface

	EQ			
	Chassis wall at chassis mount:	Steel Welded		EQ
	Young's Modulus (E):	2.00E+11	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	3.00E+08	Pa	EQ
	Shear:	1.73E+08	Pa	EQ
	Chassis total skin/wall thickness:	1.6	mm	EQ
F.10.5.8.b	Mount interface with chassis:	Welded		EQ
			mm	N/A
				N/A
			mm	N/A
				N/A
			Pa	N/A
			mm	N/A
		0.00E+00		N/A
		0.00E+00		N/A
		0.00E+00		N/A
	Total weld perimeter:	60.0	mm	EQ
	Thickness is assumed = skin thickness:	1.6	mm	EQ
	Shear strength >= Test Load:	1.66E+04	110.8%	EQ
F.10.1.5			**N/mm^2**	N/A
F.10.1.5			**N/mm^2**	N/A
			mm^2	N/A
F.5.5.3				N/A

BLANK Accumulator To Mono, Hybrid Panels

F.7.9.6 The tube centerline should intersect the bolt centerline between the skins.

Brackets without gussets are unacceptable.

	EQ					
F.10.5.6-7	**EV Accumulator Mounts, Flush to Monocoque:**	**Welded**				N/A
	Type SES Tab Name, EV Accumulator Attachment Layup:					N/A
F.7.8.8	**EV Accumulator Attachment:**					N/A
	Fastener diameter:		mm			N/A
	No. of fasteners per mount:					N/A
Insert compressive strength >=12GPa:		Panel thickness:	0	mm		N/A
E>=4GPa:	Shear >=2.5GPa:	Insert thickness:		mm		N/A
Scaling option, layup repeats:		Outer skin thickness:	Layup	mm		N/A
Scaling option, layup repeats:		Inner skin thickness:	Typo	mm		N/A
	For multiple mounts of the same design, enter each worst case value.					N/A
	For multiple mounts on different layups, screenshot this section or copy this tab.					N/A
	Backing perimeter on monocoque skin:			mm		N/A
	Insert Perimeter on monocoque:			mm		N/A
F.7.8.6	Backing:	0.00E+00 0.00E+00	mm:		0.00%	N/A
	Accumulator Mount Perimeter on monocoque skin:			mm		N/A
	Min - Fastener spacing, edge, weaker layup, or corner distance:			mm		N/A
	Skin shear strength:	Typo	Pa			N/A
F.10.5.6-7	Perimeter shear strength >15000N:				0.00%	N/A
	Perimeter shear strength >15000N:				0.00%	N/A
	Tearout shear strength >15000N:				0.00%	N/A