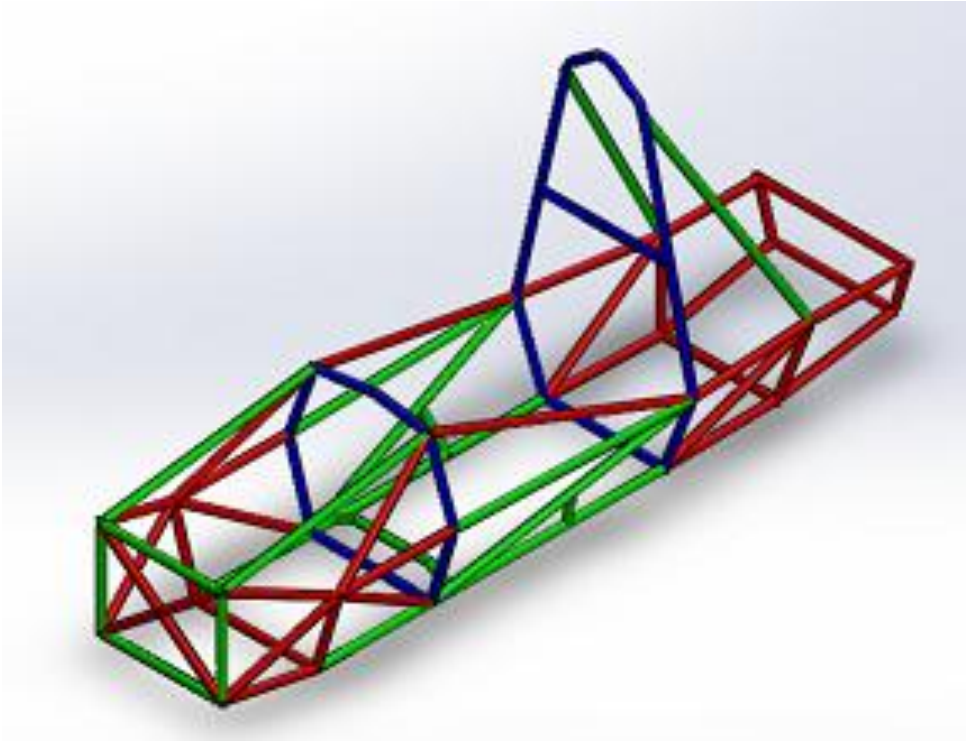
SES Guidance
(Structural Equivalency Spreadsheet)
(等価構造計算書)

FOR Tube Chassis



SES : Structural-Equivalency-Spreadsheet

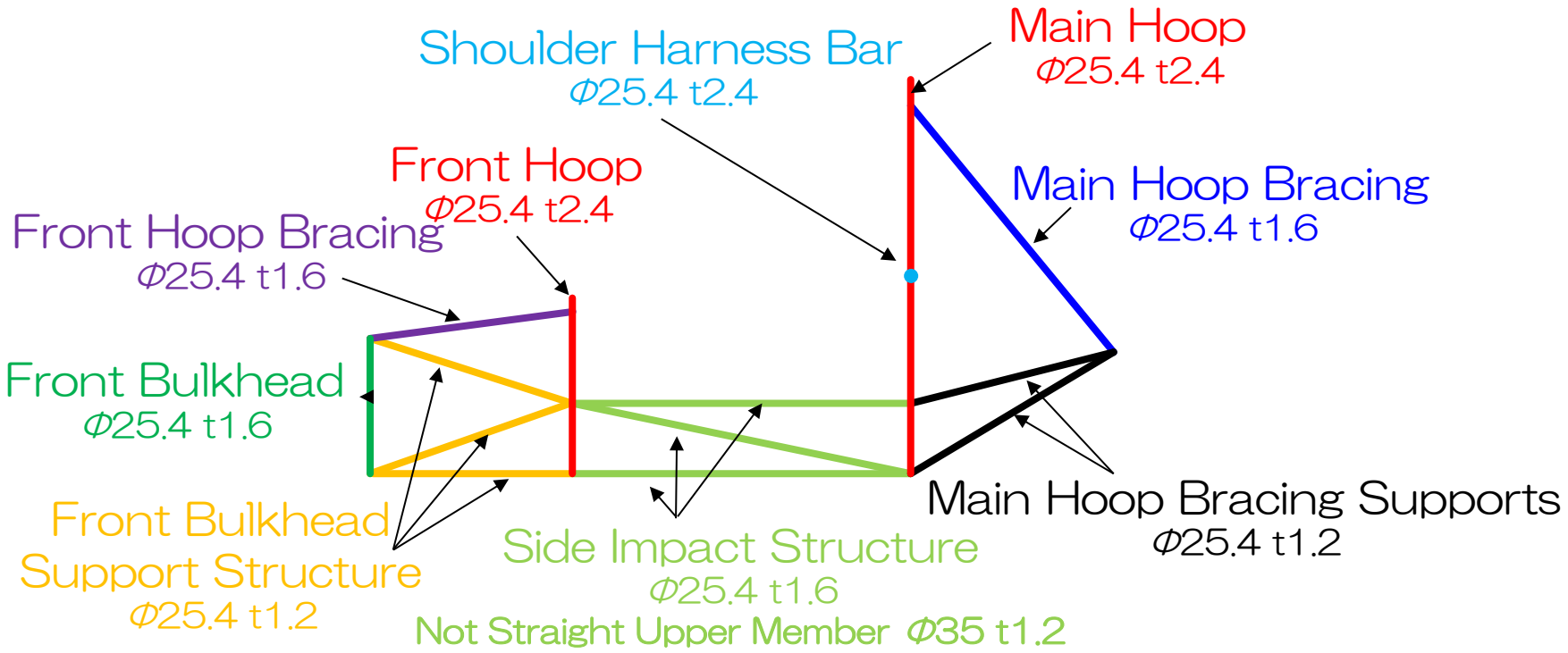
The document that certifies that the Primary Structure designed by you has the same functionality as the Formula SAE Rules is called SES. / 設計した基本構造が Formula SAEのルールに準拠しているかを証明するための資料（等価構造計算書）をSESと呼称

- Regulation / レギュレーション
  - F.2.1 Structural Equivalency Spreadsheet - SES
  - F.2.1.2 The SES provides the means to:
    a. Document the Primary Structure and show compliance with the Formula SAE Rules
       SESで基本構造を文書化し、SAE Rulesに準拠していることを示す。
    b. Determine Equivalence to Formula SAE Rules using an accepted basis
       SAE Rulesとの同等性を証明する。

- The Purpose / 目的
  - To ensure driver safety by meeting the Formula SAE Rules / Formula SAE Rulesを満足することでドライバーの安全を確保すること
  - To detect violations of regulations early and increase the passing rate of vehicle inspections at competitions / 早期にレギュレーション違反に気づき、大会での車検合格率を上げること

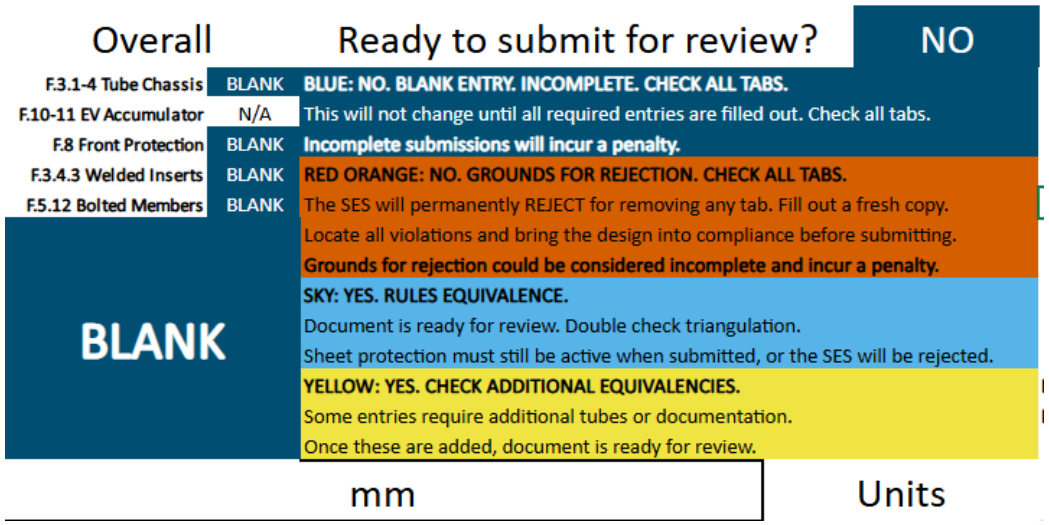
What is SES?/SESって何？

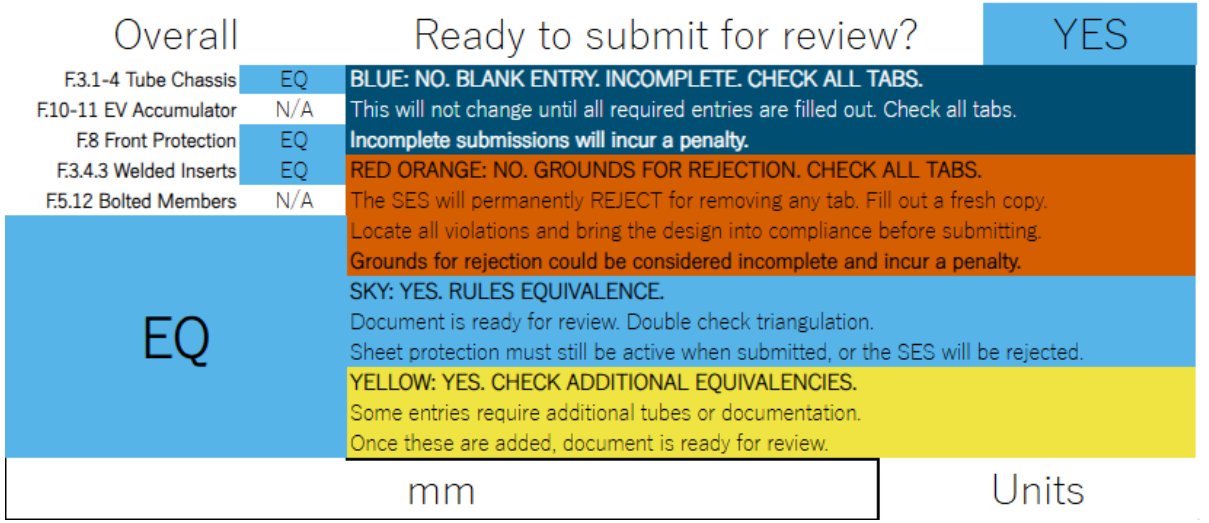
- Primary Structure / 基本構造



Use SES to check whether the above structure has the same or higher level of safety.
上記の構造に対して同等以上の安全が確保されているかSESを使って審査

Introduction / 初めに

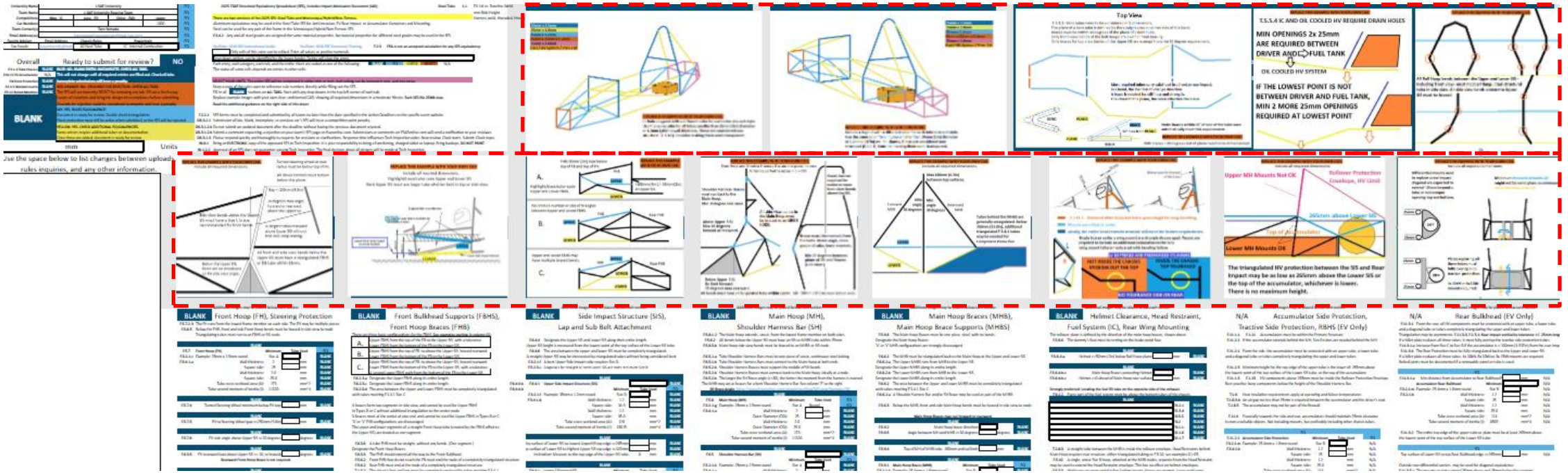




If everything is filled out correctly, the BLANK will change to EQ as shown in the figure on the right, so be sure to check before submitting. Note: There are some exceptions.

すべてが正しく記入できていると右図のようにブランクがEQに変わるので、提出前に必ず確認すること。※一部例外あり

Introduction / 初めに



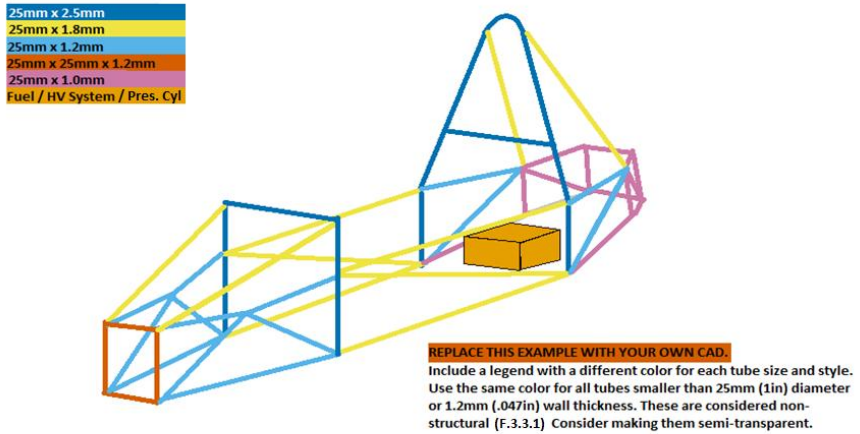
Replace the example entries within the red frame with your own CAD data. There are frequent careless mistakes where the dimensions entered in the SES differ from those in the CAD, or where the illustrations are unclear and the dimensions are unreadable.

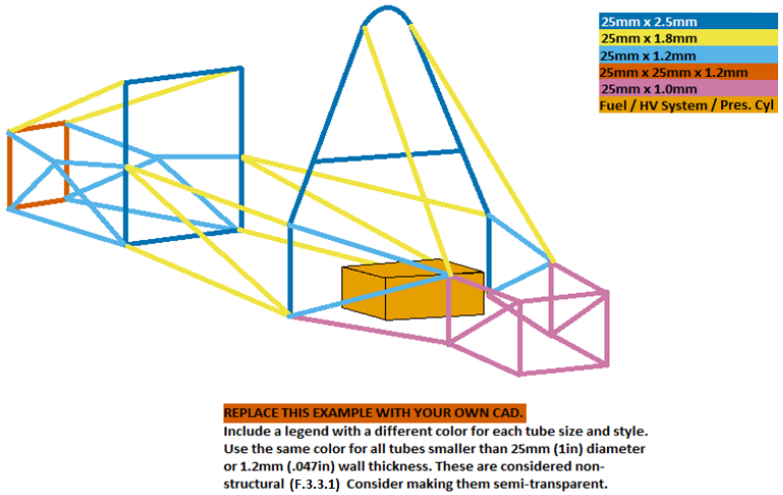
赤枠内の記載例を自身のCADに置き換えること。

SESに記入した寸法とCADの寸法が異なっていたり、

図示が不鮮明で寸法が読めないなどのケアレスミスが非常に多い。

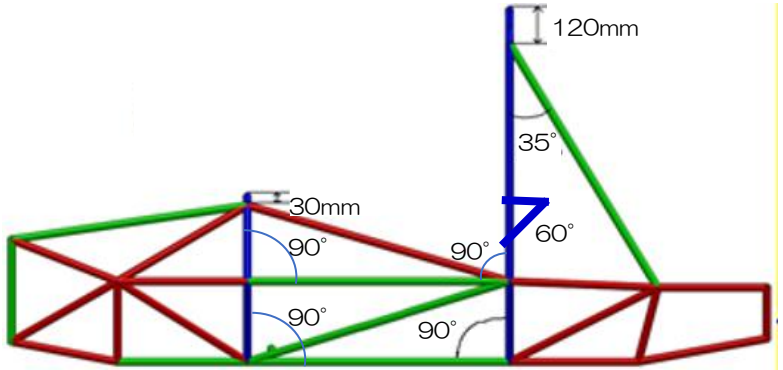
Introduction / 初めに





1. For ICVs, illustrate the fuel tank, and for EVs, illustrate the Tractive Battery container.
2. It is recommended that the color coding of the pipes be done in the same way as in the sample.
3. All pipes with an outer diameter of 25 mm or a wall thickness of 1.2 mm or less should be the same color.

1. **ICVでは燃料タンクを、EVではTractive Battery Containerを図示する**
2. **パイプの色分けはサンプルと同様な書き方を推奨**
3. **外径25mm、又は肉厚1.2mmより小さいパイプは全て同一色とする**



Example of Dimension Entry / 寸法記載例

Ensure that the dimensions entered in the SES are accurately reflected in the replaced CAD in all instances

全てにおいて、SESに記載した寸法が置き換えたCADでも確認できるようにすること

Team Information / チーム情報

University Name					BLANK
Team Name					BLANK
Competitions	May - IC	June - EV	Other - Edit	Other - Edit	EQ
Car Numbers					BLANK
Team Contact(s)					BLANK
Email Address(es)					BLANK
Faculty Advisor	Email Address	Chassis Rules	Powertrain		EQ
		Select Drop Down	Select Drop Down		BLANK

University Name	J-SAE University				EQ
Team Name	J-SAE University Reacing Team				EQ
Competitions	May - IC	June - EV	Other - Edit	Japan	EQ
Car Numbers				1000	EQ
Team Contact(s)	Taro Yamada				EQ
Email Address(es)	taroyamadajsaeuniversity@mail.jsae.co.jp				EQ
Faculty Advisor	Email Address	Chassis Rules	Powertrain		EQ
Sae Suzuki	jsaeuniversity@mail.	All Steel Tube	IC - Internal Combustion		EQ

Example / 記入例

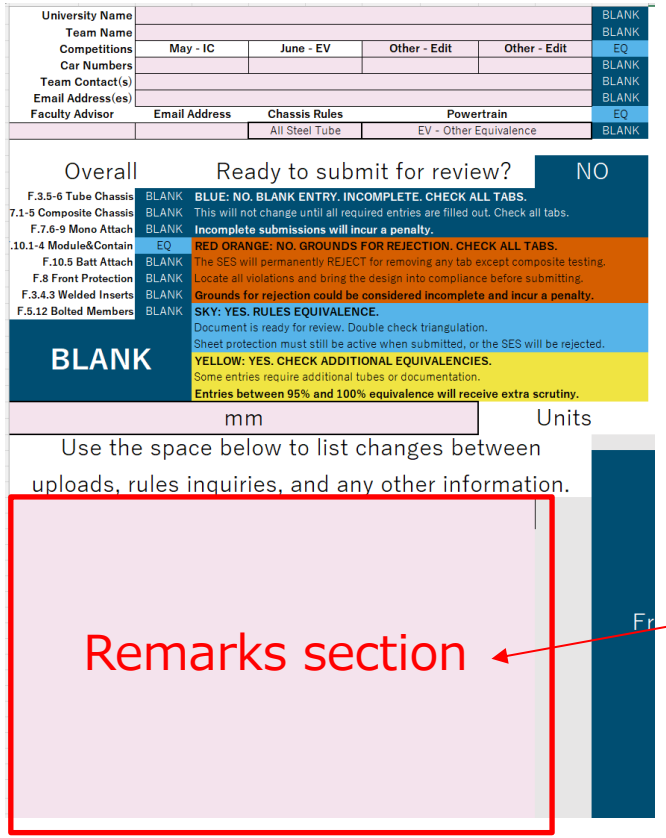
This section is prone to frequent omissions, so please be careful.

記入漏れが多発する箇所なので注意すること

Vehicle year

J2026-F-12 Structural Equivalency Spreadsheet - SES
(refer to Formula SAE® Rules 2026 F.2.1)
Special rule only for 2026

Vehicle year (First, Second or Third Year Vehicle : Third is only for EV) MUST be described in SES. It should be written in the remarks section of the top sheet.



Vehicle yearを記述すること
(注釈欄への記述が望ましい)
Describe the vehicle year.
(It should be in the remark section)

Alternative Tube F.3.4 &F3.5

Since 2026, "F. 3.4 Steel Tubing and Material" and "F. 3.5 Aluminum Tubing" have been clearly defined as pipe materials that can be used in Tube Chassis, and adoption of "CFRP Tubing, etc." has become virtually impossible.

Be careful when considering the structure of the Tube Chassis.

2026年より、Tube Chassisに採用できるパイプ材として「F.3.4 Steel Tubing and Material」と「F.3.5 Aluminum Tubing」が明確に定義され、CFRP Tubing 他の採用が実質不可となったのでTube Chassisの構造検討の際に、ご注意願います。

Multiple Tubes F.5.2.4

Since 2026,The following rules have been added for Multiple Tubes.
"Open end state of connection (weld, etc.) is not allowed."
However, due to the transition period in 2026, it will be allowed even if it is not implemented.
This will be required from 2027.

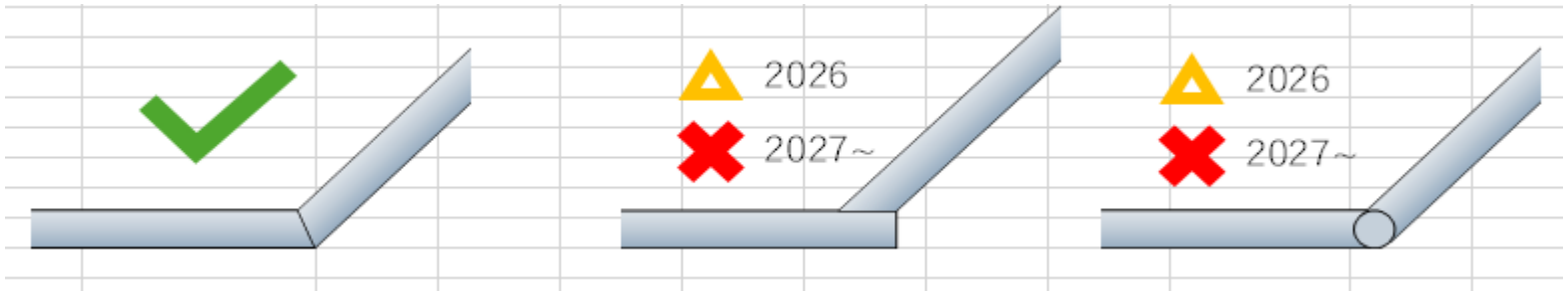
2026年より、Multiple Tubes（連接パイプ）について、接合部（溶接　等）のOpen end状態は、不可のルールが追加された。ただし、2026年は移行期間につき未対応でも可とする。2027年より対応必須となります。

RULE CHANGES AFFECTING ALL TEAMS

PHASING OUT SIDE VIEW TUBES F.3.4.3, F.5.2.4, F.6.6.3

Tubes sticking sideways through regulated members has always been a bad idea. The tube cross section is completely interrupted. Following a failure last year, this is strongly discouraged in 2026 (should), and will be completely illegal in 2027 (must). You should fix this now. There is a three pronged approach:

1. Welded inserts must be smaller than the OD of the tube they are welded into.
2. Miter together the ends of multi-piece upper or lower members.
3. Miter the ends of the MHB to the LOWER MHBS.



Front Hoop（FH）

BLANK **Front Hoop (FH), Steering Protection**

F.5.7.2-3 The FH runs from the lowest frame member on each side. The FH may be multiple pie
F.5.6.2.b Front view FH bends below the Upper SIS must meet a triangulated FBHS or SIS nod
F.5.6.2 All FH side view bends must meet a triangulated FBHS or SIS tube end.

BLANK

	F.5.7 Front Hoop (FH)	Minimum	Tube Used		EQ
F.3.2.1.c	Example: 25mm x 2.5mm round	Size A			BLANK
F.3.4.1.a	Wall thickness:	2		mm	BLANK
	Square side:	25		mm	BLANK
	Wall thickness:	2.0		mm	BLANK
	Square side:	25.0		mm	BLANK
	Tube cross sectional area (A):	173		mm^2	BLANK
	Tube second moment of inertia (I):	11320		mm^4	BLANK

BLANK

F.5.7.4	Turned Steering Wheel minimum below FH top:		mm	BLANK

BLANK

F.5.7.5	FH to Steering Wheel gap <=250mm (9.8in)		mm	BLANK

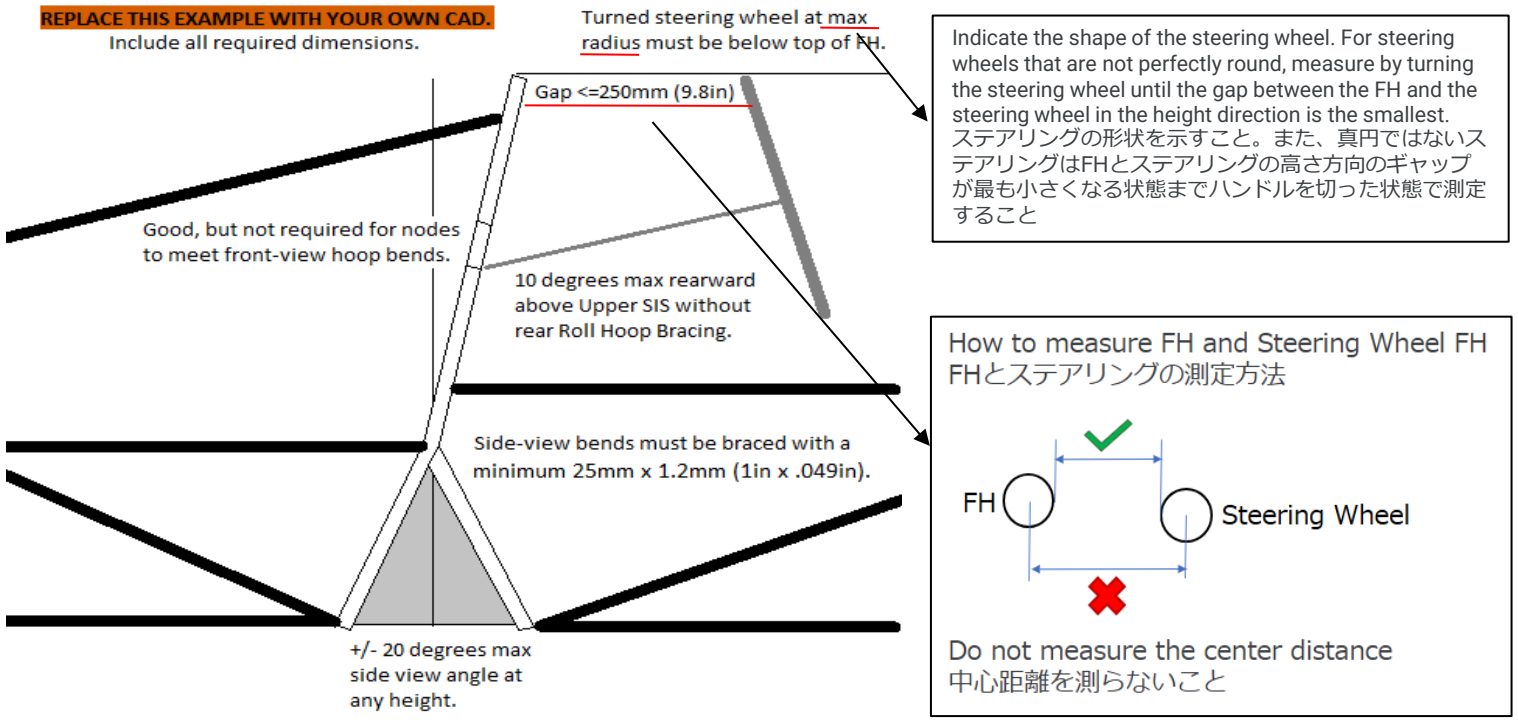
BLANK

F.5.7.6	FH side angle above Upper SIS <=20 degrees:		degrees	BLANK

BLANK

F.6.3.5	FH rearward lean above Upper SIS <= 10, or braced:		degrees	BLANK

Rearward Front Hoop Brace is not required.



Indicate the shape of the steering wheel. For steering wheels that are not perfectly round, measure by turning the steering wheel until the gap between the FH and the steering wheel in the height direction is the smallest.
ステアリングの形状を示すこと。また、真円ではないステアリングはFHとステアリングの高さ方向のギャップが最も小さくなる状態までハンドルを切った状態で測定すること

How to measure FH and Steering Wheel FH
FHとステアリングの測定方法

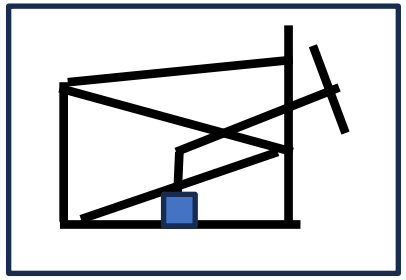
Do not measure the center distance
中心距離を測らないこと

Be sure to attach illustrations that show the measurement positions and dimensions.

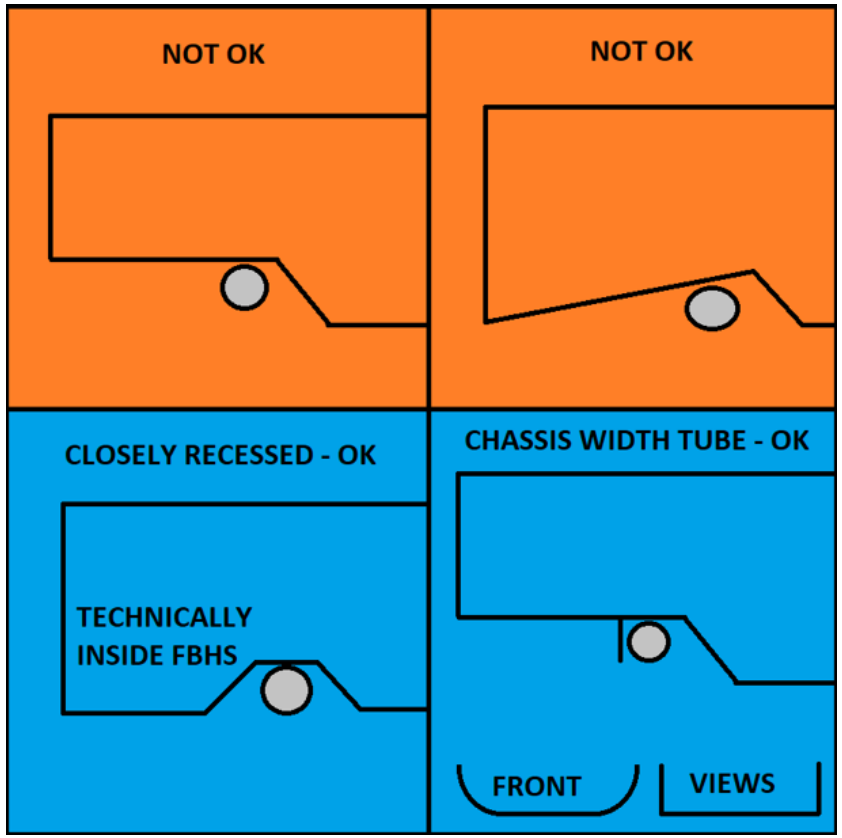
計測の位置や寸法の証明ができているかに注意して図示を添付すること

Steering Protection

	EQ			
F.5.14	Steering rack is inside the FBHS?	Below		EQ
	Additional steering protection required Belo	Inside		EQ
F.5.14	Steering Protection	Above	ed	EQ
F.3.2.1.n	Example: 25.4mm x 1.2mm round	Below		BLANK
F.3.4.1.c	Wall thickness:	1.2		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



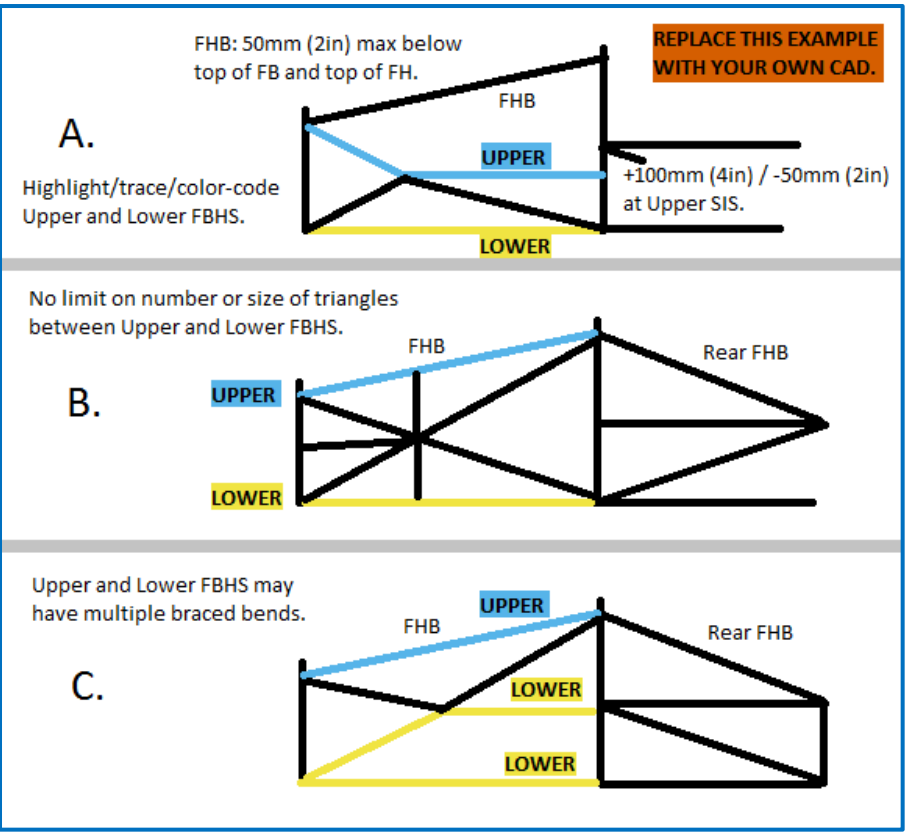
Illustrated example



If the steering rack is located outside the primary structure, please attach a diagram and indicate the size of the Steering Protection Tube.

ステアリングラックがプライマリストラクチャーの外側にくる場合は、ステアリング保護に使われるTubeのサイズ記入と図示を添付すること

Front Bulkhead Supports (FBHS), Front Hoop Braces (FBH)



A: The upper and lower parts of the FHB and FBHS are independent and connected to the SIS by a truss structure. If this is met, it is an A type.

A ： FHB と FBHSのUpperとLowerがそれぞれ独立しトラス構造でSISに繋がってる事。これを満たせばAタイプ

B: The upper part of the FBHS is shared with the FHB, so a rear FHB is required! Also, the entire structure from the FBH to the rear FHB must be a truss structure. If this is met, it is a B type.

B： FBHSのUpperがFHBと共有していることてRear FHBが必要。またFBHからRear FHBまでは全てトラス構造で有る事。これを満たせばBタイプ

C: The upper FBHS is shared with the FHB, so a Rear FHB is required, and it is connected to the MH and SIS upper nodes. Also, there must be two lower FBHS, one of which is connected to the upper SES. If these are met, it is a C type.

C： FBHSのUpperがFHBと共有している事でRear FHBが必要かつMHとSIS Upperのノードに繋がってる事。またFBHSのLowerが2本存在し、1本はSESのUpperに繋がってる事。これを満たせばCタイプ

Choose A, B, or C that best suits your team's structure.

A, B, Cそれぞれから自チームの構造と合致するものを選択

Side Impact Structure(SIS)

		BLANK			
F.6.4.4.b	F.6.4.1 **Upper Side Impact Structure (SIS)**				BLANK
F.6.4.4.b		**Minimum**	**Tube Used**		EQ
	F.3.2.1.f Example: 35mm x 1.2mm round	Size D			BLANK
	F.3.4.1.d Wall thickness:	1.2		mm	BLANK
	Square side:	34.9		mm	BLANK
	Wall thickness:	1.2		mm	BLANK
	Square side:	35.0		mm	BLANK
	Tube cross sectional area (A):	126		mm^2	BLANK
	Tube second moment of inertia (I):	18015		mm^4	BLANK
		BLANK			
	Lowest edge of Lower SIS to Lowest UpperSIS top edge >=290mm:			mm	
	Lowest edge of Lower SIS to Highest Upper SIS top edge <=345mm:			mm	
	Inclination: Measure to the top edge of the Upper SIS tube.	0		mm	BLANK

Change point

ructure.

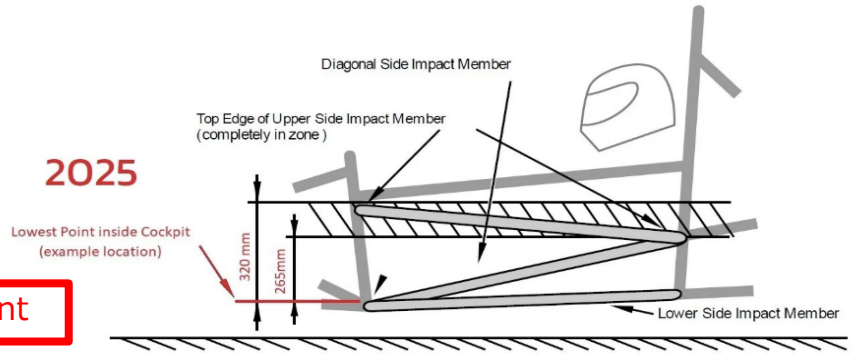
		BLANK			
	F.6.4.1 **Lower / Diagonal SIS**	**Minimum**	**Tube Used**		EQ
	F.3.2.1.e Example: 25.4mm x 1.6mm round	Size B			BLANK
	F.3.4.1.b Wall thickness:	1.2		mm	BLANK
	Square side:	25		mm	BLANK
	Wall thickness:	1.2		mm	BLANK
	Square side:	25.0		mm	BLANK
	Tube cross sectional area (A):	114		mm^2	BLANK
	Tube second moment of inertia (I):	8509		mm^4	BLANK

T.2.4.2 F.3.2.1.j Lap and sub belts attachments must be located on minimum Size B tubes.

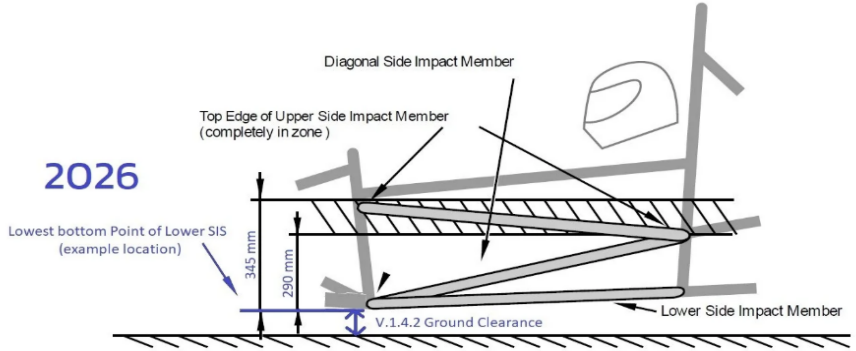
REFERENCE POINT CHANGE F.6.4.4, F.7.5.1, F.7.5.3, F.8.5.6, F.11.3.2

The Side Impact Zone, Rear Bulkhead height, and Impact Attenuator height are all **exactly the same as 2025.** The reference point has moved from the top of the Lower Side Impact Tube to the bottom of the Lower Side Impact Tube. All of the numbers are 25mm different than 2025, but **the heights on the cars are exactly the same.** Monocoque may be > the height maximum, with the higher section not counted toward equivalence.

2025



2026



Measure from the bottom of the Lower Tube Surface
Lower Tube表面の下端から測定する

Rules have been changed since 2026.

Be careful as it is easy to make mistakes when measuring points.

2026年よりルール変更有り。測定ポイントを間違えやすいので注意

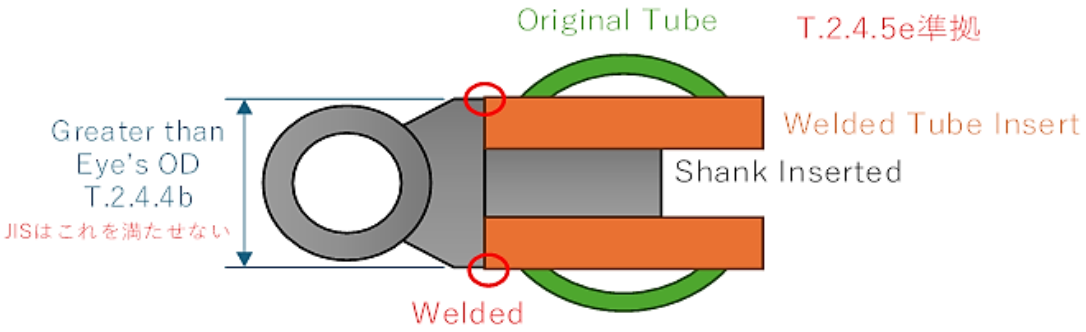
Belt Attachment

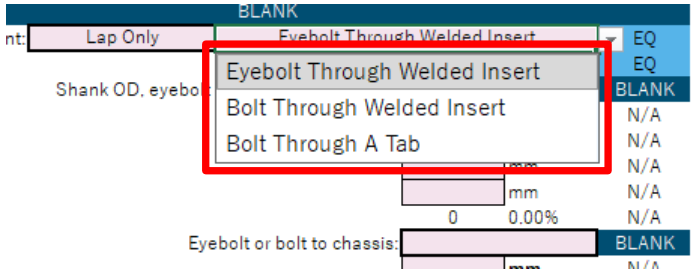
Since 2026, the rules have been changed to allow belt attachment eyes to be used only in products manufactured by harness suppliers.General-purpose products and JIS products cannot be used (T. 2.4. 5b).

The weld eye must be attached with a shank insert over the welded tube insert. Cannot be welded to the surface of the tube. (T. 2.4. 5e)

However, Only for FSAEJ 2026, Eyebolts regulation is relaxed as the 2025 FSAE Rules by J2026-T-02, J2026-T-03

2026年より、 Belt Attachmentのアイについてハーネスサプライヤからの供給品のみ使用可能のルールに変更された。
汎用品やJIS品は不可（ T.2.4.5b）。また、溶接アイはWelded Tube Insert越しにシャンクインサートで取付けなければならない。Tubeの表面に溶接しただけのものは不可。（ T.2.4.5e）
ただし、2026年大会に限り J2026-T-02, J2026-T-03 によりEye Bolt は2025 FSAE Rules同等に緩和とする。





2026_SES does not have a choice for “Clip Through A Pad Eye,” so for a team that chooses“ Clip Through A Pad Eye,” this item allows the “BLANK” state.
However, it is necessary to clearly state that and present evidence of eye bolt.

2026_SESには”Clip Through A Pad Eye”の選択肢が無いため、”Clip Through A Pad Eye”を選択するチームは、この項目は“BLANK”状態を許可します。
ただし、その旨を明記しアイボルトのエビデンス提示が必要です。

Belt Attachment

Lap and anti-sub belts must attach directly to a Size B tube. Eyebolts must use welded inserts. Tabs must be welded on, or be bolted (with positive locking) using welded inserts.

	BLANK			
	Lap Belt Attachment:			BLANK
	Lap Only / Single Lap/AntiSub			
T.2.4.3.a		Harness Test Load:	30000 N	EQ
T.2.5.8	Shank OD, unmodified harness, no thread shear:		mm	BLANK
	Bolt rated UTS:		Pa	BLANK
	Fastener shear strength 0.577*UTS*A (N):	0	0.00%	REJECT
			mm	N/A
			mm	N/A
		0	0.00%	N/A
	Eyebolt or bolt to chassis:			BLANK
			mm	N/A
			mm	N/A
		0.01	mm	N/A
			mm	N/A
		0	0.00%	N/A

At least 2x 6mm critical fasteners, Welded Inserts, and external Positive Locking required.

	BLANK			
	Anti-Submarining Belt Attachment:			BLANK
	Wrapped / Eyebolt Through Welded Insert / Bolt Through Welded Insert / Bolt Through A Tab			
T.2.4.3.a				EQ
T.2.5.8	Shank OD, unmodified harn			BLANK
				BLANK
	Fastener shear strength 0.577*UTS*A (N):	0	0.00%	REJECT
			mm	N/A
			mm	N/A
		0	0.00%	N/A
	Eyebolt or bolt to chassis:			BLANK
			mm	N/A
			mm	N/A
			mm	N/A
			mm	N/A
		0	0.00%	N/A

At least 2x 6mm critical fasteners, Welded Inserts, and external Positive Locking required.

Wrapping shoulder harness belts around the SH bar is strongly preferred.

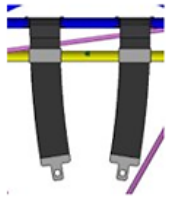
	BLANK			
	Shoulder Harness Attachment:			BLANK
T.2.4.3.a		Harness Test Load:	15000 N	EQ
T.2.5.8	Shank OD, unmodified harness, no thread shear:		mm	BLANK
	Bolt rated UTS:		Pa	BLANK
	Fastener shear strength 0.577*UTS*A (N):	0	0.00%	REJECT
			mm	N/A
			mm	N/A
		0	0.00%	N/A
	Eyebolt or bolt to chassis:			BLANK
			mm	N/A
			mm	N/A
			mm	N/A
			mm	N/A
		0	0.00%	N/A

At least 2x 6mm critical fasteners, Welded Inserts, and external Positive Locking required.

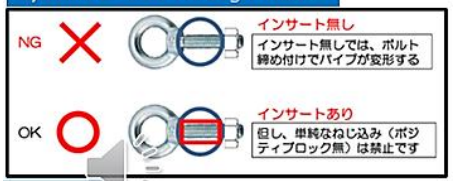
Only the lap belt attachment requires you to choose whether to share the attachment with the anti-submarine belt.
ラップベルトアタッチメントだけはアンチサブマリンベルトとアタッチメントを共有するか選択する必要がある。

Belt attachment type
ベルトアタッチメントの種類

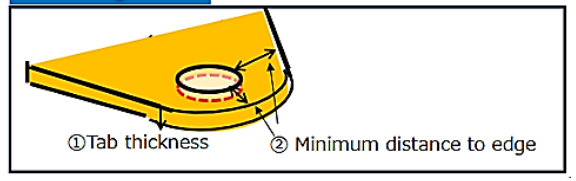
Wrapped



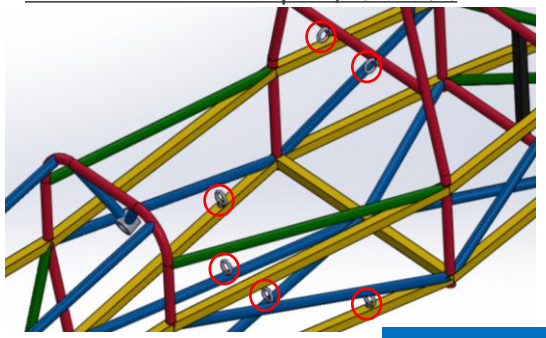
Eyebolt Or Bolt Through Tube



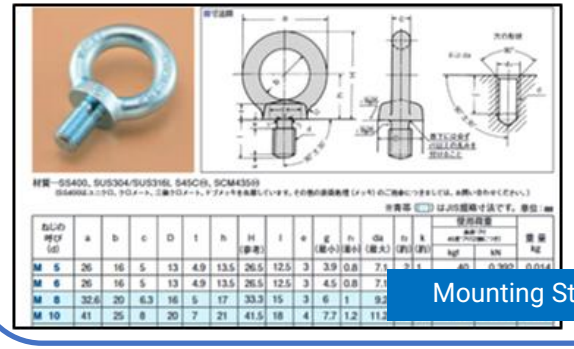
Bolt Through A Tab



Illustrated example / 図示例



Mounting location

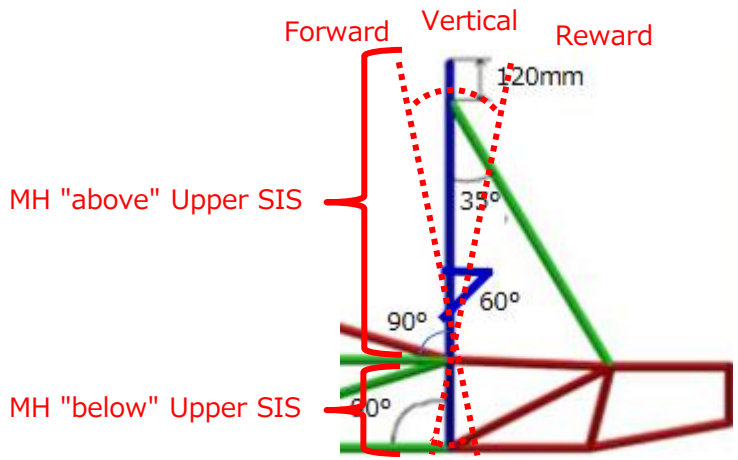


Mounting Structure

Not only the structure selection but also the dimensions and structure are illustrated
構造選択だけでなく、取り付け寸法、取り付け構造を図示で示すこと

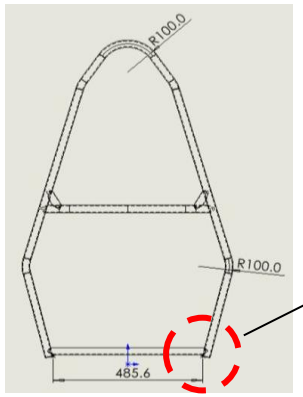
Main Hoop(MH), Shoulder Harness Bar(SH)

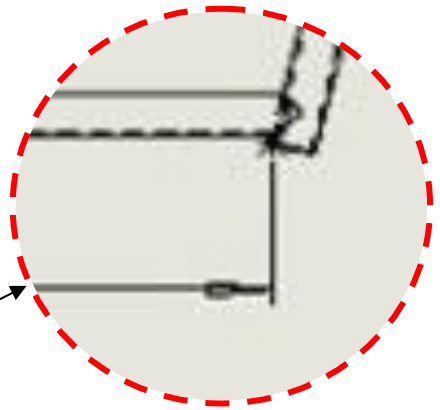
BLANK					
F.5.8.1	Main Hoop (MH)	Minimum	Tube Used		EQ
F.3.2.1.g	Example: 25mm x 2.5mm round	Size A	Round		EQ
F.3.4.1.a	Wall thickness:	2		mm	BLANK
	Outer Diameter (OD):	25		mm	BLANK
	Wall thickness:	2.0		mm	BLANK
	Outer Diameter (OD):	25.0		mm	BLANK
	Tube cross sectional area (A):	173		mm^2	BLANK
	Tube second moment of inertia (I):	11320		mm^4	BLANK
BLANK					
F.6.5	Shoulder Harness Bar (SH)		Straight		EQ
		Minimum	Tube Used		EQ
F.3.2.1.k	Example: 25mm x 2.5mm round	Size A	Round		EQ
F.3.4.1.a	Wall thickness:	2		mm	BLANK
	Outer Diameter (OD):	25		mm	BLANK
	Wall thickness:	2.0		mm	BLANK
	Outer Diameter (OD):	25.0		mm	BLANK
	Tube cross sectional area (A):	173		mm^2	BLANK
	Tube second moment of inertia (I):	11320		mm^4	BLANK
	Shoulder Harness Bar does not require braces.				
EQ					
F.6.5.2.b	Brace angle to plane of SH side view >= 30:			degrees	N/A
F.5.2.3	The plane of a bent tube is defined by the straight axes on either side of the bend.				
	Shoulder Harness Bar does not require braces.				
EQ					
F.6.5.1	Shoulder Harness Braces	Minimum	Tube Used		N/A
F.3.2.1.l	Example: 25.4mm x 1.2mm round	Size C	Round		N/A
F.3.4.1.c	Wall thickness:	1.2		mm	N/A
	Outer Diameter (OD):	25		mm	N/A
	Wall thickness:	1.2		mm	N/A
	Outer Diameter (OD):	25.0		mm	N/A
	Tube cross sectional area (A):	91		mm^2	N/A
	Tube second moment of inertia (I):	6695		mm^4	N/A
BLANK					
F.5.8.3.a	Main Hoop direction above Upper SIS, in side view:		Vertical		EQ
	Main Hoop angle from vertical above Upper SIS, in side view, <=10:			degrees	BLANK
F.5.8.2	**Main Hoop Braces may run forward or rearward.**				
BLANK					
F.5.8.3.c	Main Hoop direction below Upper SIS, in side view:		Vertical		EQ
	Main Hoop side angle from vertical below Upper SIS:			degrees	BLANK
BLANK					
F.5.8.4	Distance between Main Hoop ends, >=380mm (15")			mm	BLANK
F.5.2.1	Enter the tightest bend on any T.5-6 tube in the chassis (usually in the MH or SH.)				
BLANK					
F.5.2.1	Minimum tube centerline radius:			mm	BLANK
	Outer Diameter (OD):			mm	BLANK
	Minimum radius:diameter ratio, >=3:				



Be careful not to forget to select the MH tilt direction.
MHの傾斜方向の選択を忘れやすいので注意すること

How to measure the dimensions of the Main Hoop End





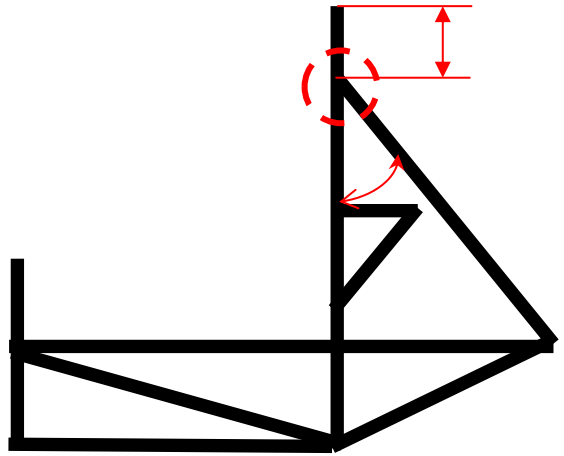
Measure the inside of the left and right tubes, not the center distance between the left and right tubes.
左右のTUBE中心間距離ではなく左右のTUBEの内側を測ること

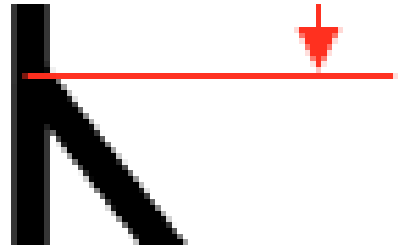
Show the structure of MH and SH using isometric drawings, side views, etc.
アイソメ図や側面視等を使って、MHやSHの構造と寸法を示すこと。

Main Hoop Braces (MHB), Main Hoop Brace Supports (MHBS)

	Main Hoop Braces may run forward or rearward.				
	BLANK				
F.5.9.2	Main Hoop brace direction:	Rearward			EQ
F.5.9.5	Angle between MH and MHB >=30 degrees:		degrees		BLANK
	BLANK				
F.5.9.4	Top of MH of MHB tube, 160mm vertical limit:		mm		BLANK
	BLANK				
F.5.9.1	**Main Hoop Brace (MHB)**	**Minimum**	**Tube Used**		EQ
F.3.2.1.h	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
	BLANK				
F.6.6	**Main Hoop Brace Support (MHBS)**	**Minimum**	**Tube Used**		EQ
F.3.2.1.i	Example: 25.4mm x 1.2mm round	Size C	Round		EQ
F.3.4.1.c	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):	91		mm^2	BLANK
	Tube second moment of inertia (I):	6695		mm^4	BLANK

How to measure from MH top to MHB node





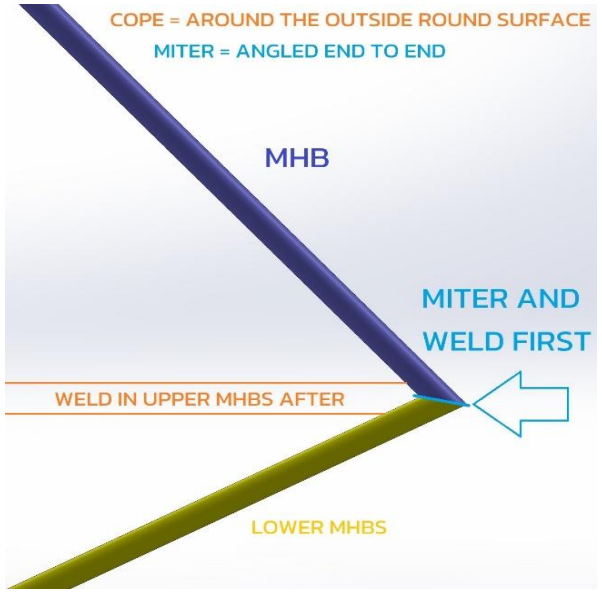
Measure from the top of the tube, not the center.
Tube中心ではなく、チューブの頂点から計測すること

Pay attention to the measurement points
測定ポイントに注意すること

Main Hoop Braces (MHB), Main Hoop Brace Supports (MHBS)

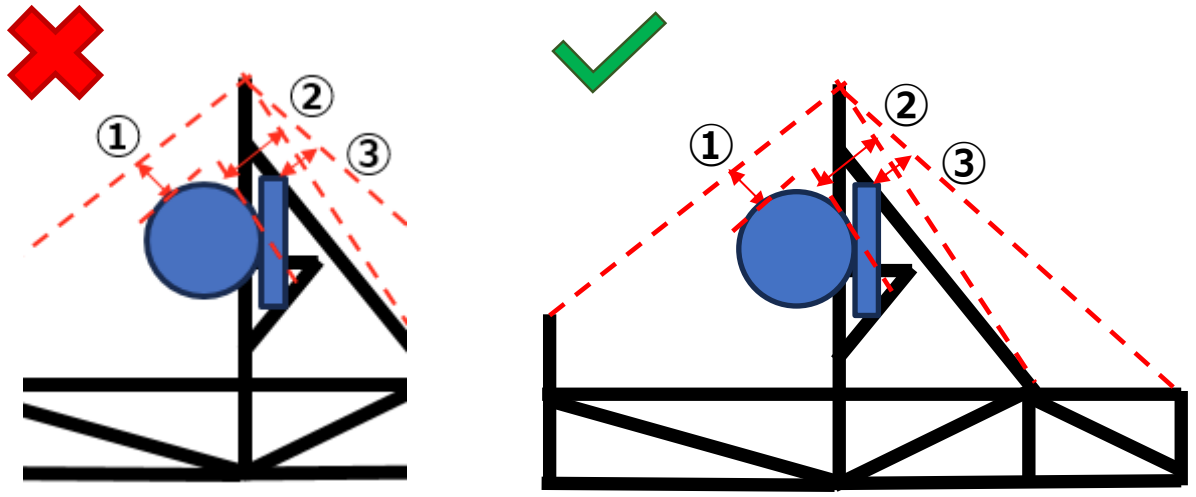
Since 2026,The following rules have been added for MHB.
"Open end state of the lower end connection (weld, etc.) is not allowed."
However, due to the transition period in 2026, it will be allowed even if it is not implemented.
This will be required from 2027.

2026年より、 MHBについて下端接合部（溶接　等）のOpen end状態は不可のルールが追加された（ F.6.6.3_MitterCut 必要）。ただし、2026年は移行期間につき未対応でも可とする。2027年より対応必須となるので、注意願います。



Helmet & Head Restraint Clearance

BLANK					
F.5.6.3.a	Helmet >=50mm (2in) below Roll Hoop plane:		mm	①	BLANK
BLANK					
F.5.6.3.bc	Main Hoop Braces protecting Helmet:	Rearward		②	EQ
F.5.6.3.bc	Helmet >=50mm (2in) below MH to bottom of MHB:		mm	②	BLANK
BLANK					
T.2.8.3	Head Restraint >=0 from rollover envelope:		mm	③	BLANK
F.5.10	**Head Restraint Protection Hoop Used?**				BLANK
F.3.2.1.h	Example: 25.4mm x 1.6mm round	Size B			N/A
F.3.4.1.b	Wall thickness:	1.2	mm		N/A
	Square side:	25	mm		N/A
	Wall thickness:	1.2	mm		N/A
	Square side:	25.0	mm		N/A
	Tube cross sectional area (A):	114	mm^2		N/A
	Tube second moment of inertia (I):	8509	mm^4		N/A

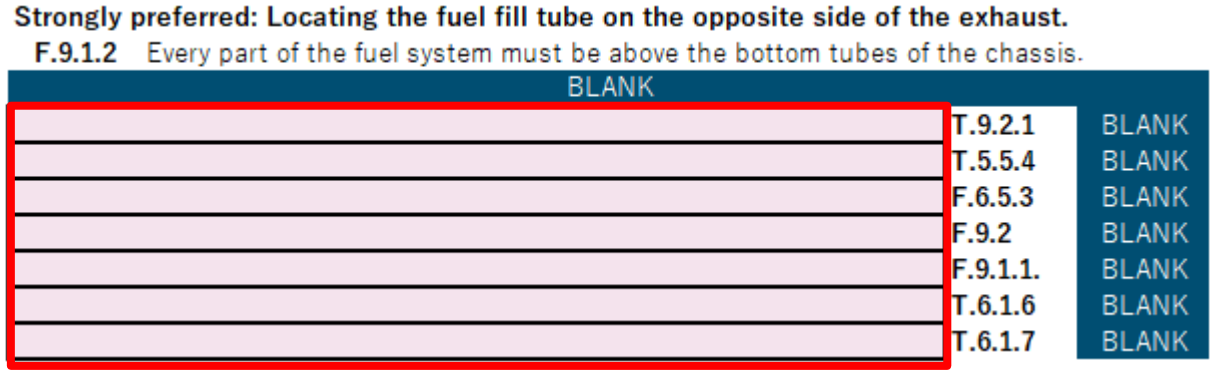


All measurement points should be shown in a diagram.
測定点がすべて見えるように図示で示すこと

Please note that the measurement points on the helmet and headrest will vary depending on the structure.

構造によってヘルメットとヘッドレストの測定箇所が変わるので注意すること

Fuel System (IC)　etc.



Make sure all items are set to "EQ".
全ての項目が「EQ」となるように記入すること

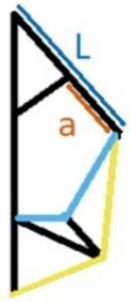
- Select EQ for all items. There is no need to select items marked "N/A" for EV.
- It is assumed that the design of fuel tanks and high-pressure gas cylinders is not complete at the time of creating the SES, so **these questionnaire items are not subject to review in the SES.**

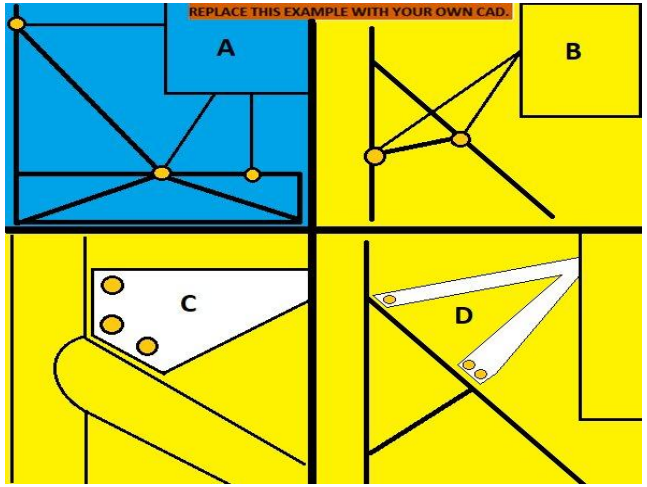
・すべての項目に対して、EQとなるように選択すること。EVで“N/A”の項目は選択不要。
・SES作成時点では燃料タンクや高圧ガスシリンダの設計は未完了と想定し、 **これらの問診項目は、SESでは審査対象外とする。**

Rear Wing Mount

	BLANK				
F.5.11	Rear Wing chassis mounting locations:				BLANK
	Number of fasteners per chassis mount fo	No rear wing.			N/A
F.5.11.2.b	**Wing Mount Braces**	Wing not mounted to MHB or MH.			N/A
F.3.2.1.o	Example: 25.4mm x 1.2mm round	Wing mounted to MHB nodes.			N/A
F.3.4.1.c	Wall thickness:	Mounted on MHB with Brace.			N/A
	Square side:				N/A
	Wall thickness:	1.2	mm		N/A
	Square side:	25.0	mm		N/A
	Tube cross sectional area (A):	91	mm^2		N/A
	Tube second moment of inertia (I):	6695	mm^4		N/A
F.5.11.2.b	**Calculation of buckling strength of MHB tube.**				N/A
F.3.4.2	Yield Strength (Sy):	3.05E+08	Pa		N/A
	Main Hoop Brace Outer Diameter (OD):	25.4	mm		N/A
	Main Hoop Brace second moment of inertia (I):	8509	mm^4		N/A
	Main Hoop Brace Length (Main Hoop to MHBS) (L):		mm		N/A
	Braced Wing Mount distance to closest MHB end (a):		mm		N/A
	MHB Max Bending Load (Sy*L*I)/(a*(L-a)*OD/2):		N		N/A
	Rear Wing Mount Limit:				N/A
			N		N/A
					N/A
		0.00			N/A

Please enter the dimensions shown in the red box.
赤枠内は右記の寸法を記入すること





F.5.11 Approaches to wing detachment.

A **STRONGLY PREFERRED**
Single fastener at each node, rotationally free.
No failure force required.
Mounts rearward of the MHB assembly are completely unrestricted

B **NOT RECOMMENEDED - ILLEGAL IN AUSTRALIA**
Mounts in the middle of the MHB or MH require a brace between the two.
All fasteners or mounts on a side must fail simultaneously below the MHB buckling force.

C **NOT RECOMMENEDED - GUSSET MAY BE REQUIRED**
Multiple fasteners within 1x outer diameter of the node.
All but one fastener must fail simultaneously below the MHB buckling force.

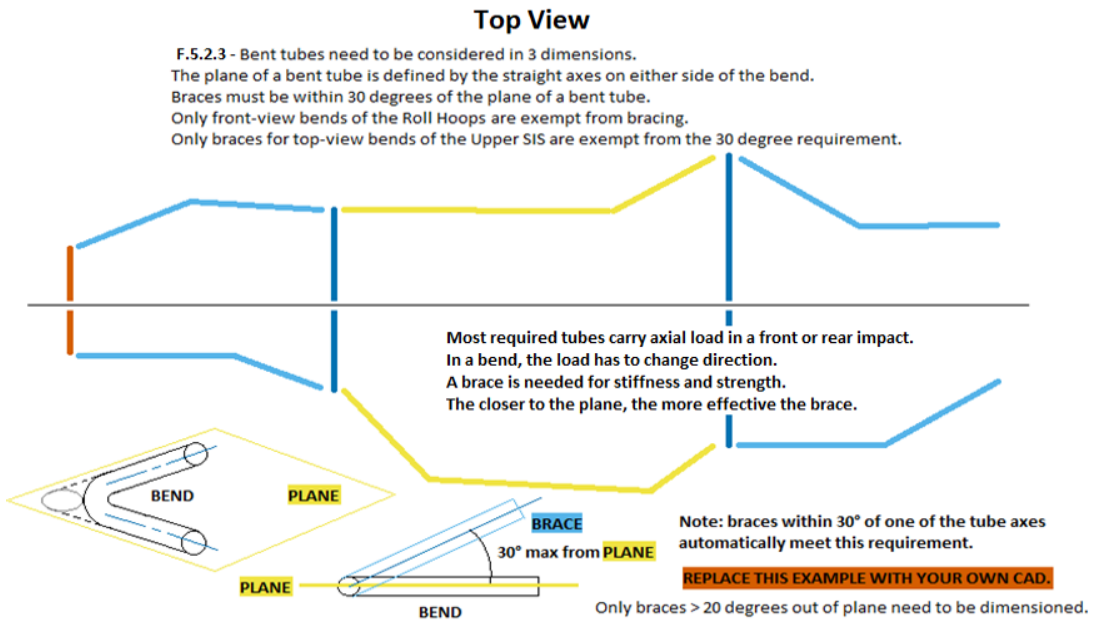
D **NOT RECOMMENEDED - ILLEGAL IN AUSTRALIA**
Multiple fasteners along the MHB.
Brace required between MH and MHB at rearmost fastener.
All fasteners not located at the MH-MHB node must fail simultaneously below the MHB buckling

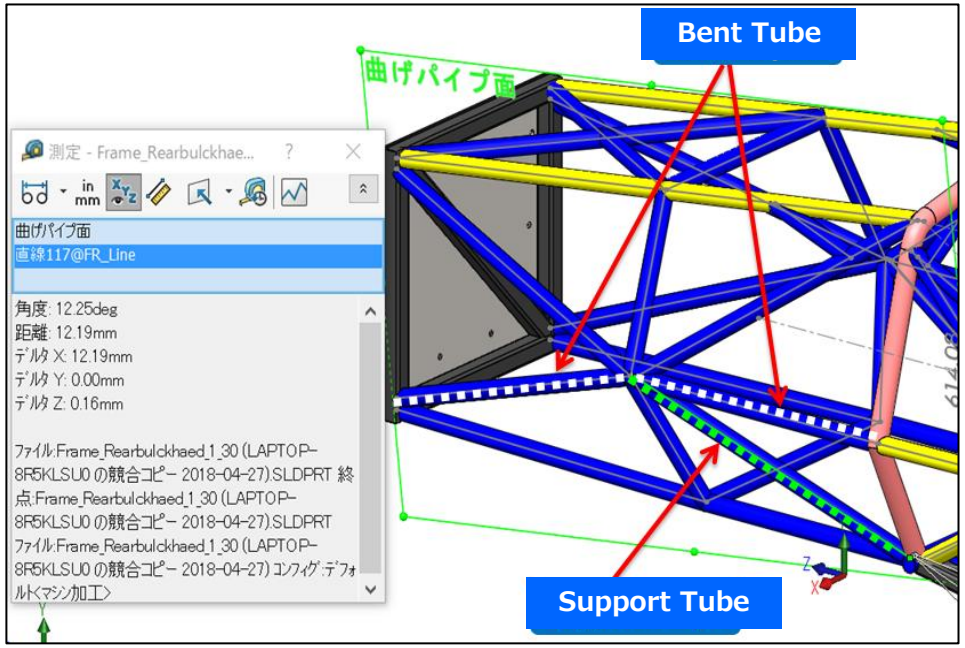
A is strongly recommended, but if any other structure is used, proof that the fastener will break before the MHB buckles is required.
Aを強く推奨しますが、その他の構造を採用する場合はMHBが座屈する前にファスナーが破断することの証明を要求します。

The position of the Rear Wing Mounting must be clearly indicated with a diagram as shown in the reference diagram.

参考図のようにマウントの位置を明確に図で示すこと

Bent Tube



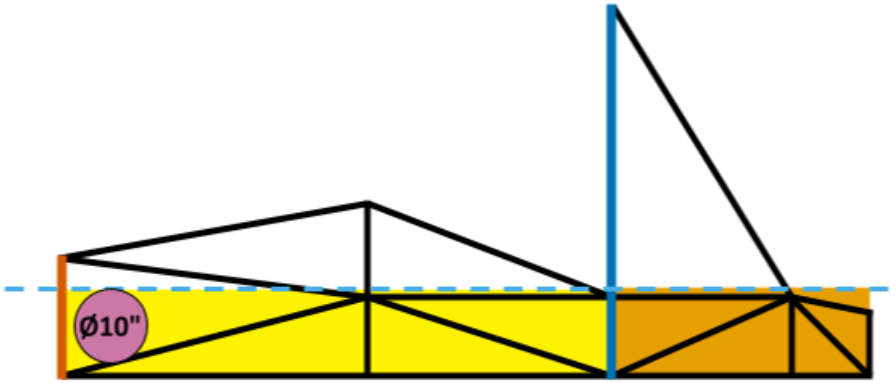


Illustrated example / 図示例

When using bent pipes, support pipes are required. The relative positions of the bent pipes and support pipes must be illustrated as shown in the Illustrated example so that the angle between the surface of the bent pipe and the support pipe is 30 degrees or less.

曲げパイプを使用する場合は、サポートパイプが必要。曲げパイプがなす面とサポートパイプの角度が30度以下であることを、参考図のように曲げパイプとサポートパイプの位置関係を図示すること。

Impactor Check

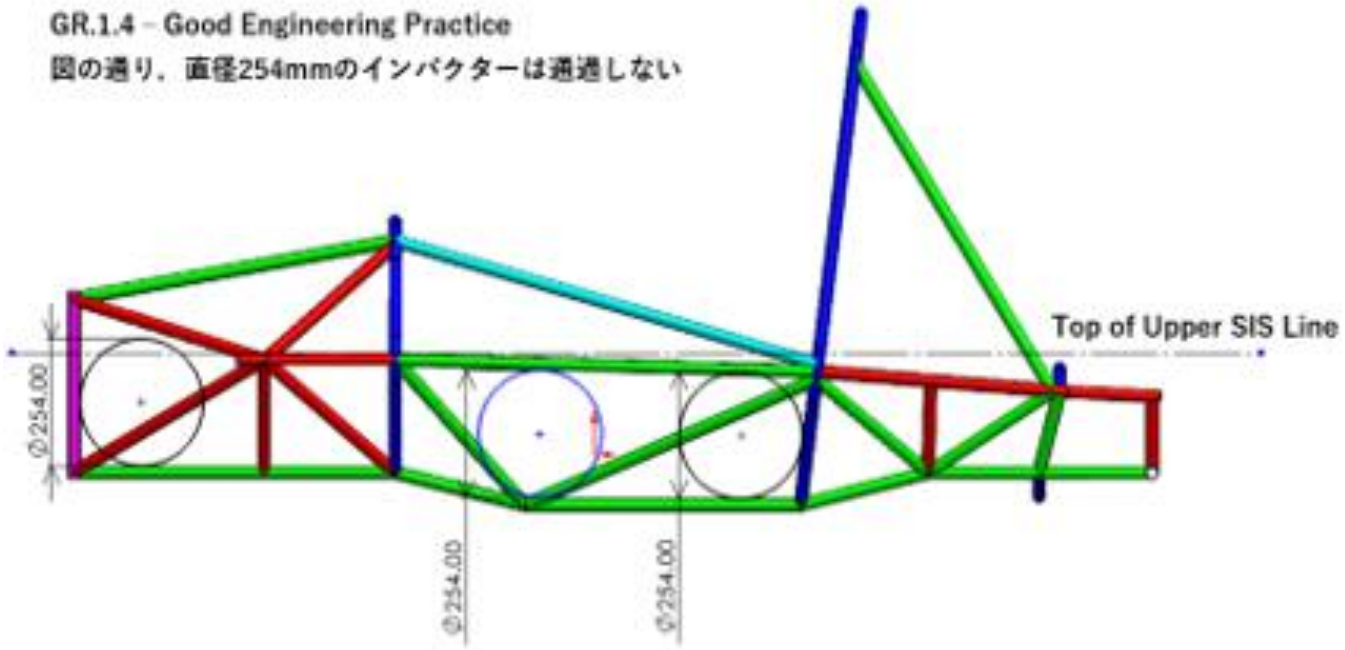


No openings in the region below upper SIS height between the front bulkhead and main roll hoop, or between any tubes used for Fuel, HV, or component protection may allow a 254mm (10in) diameter impactor to pass through.

The impactor will be held vertically and seek to intrude into the frame horizontally between the ground and the maximum upper SIS height per rule F.6.4.4.

The top of the impactor will not be raised above the maximum upper SIS Height per rule F.6.4.4.

Any non-structural tubes per F.3.3 will be ignored.



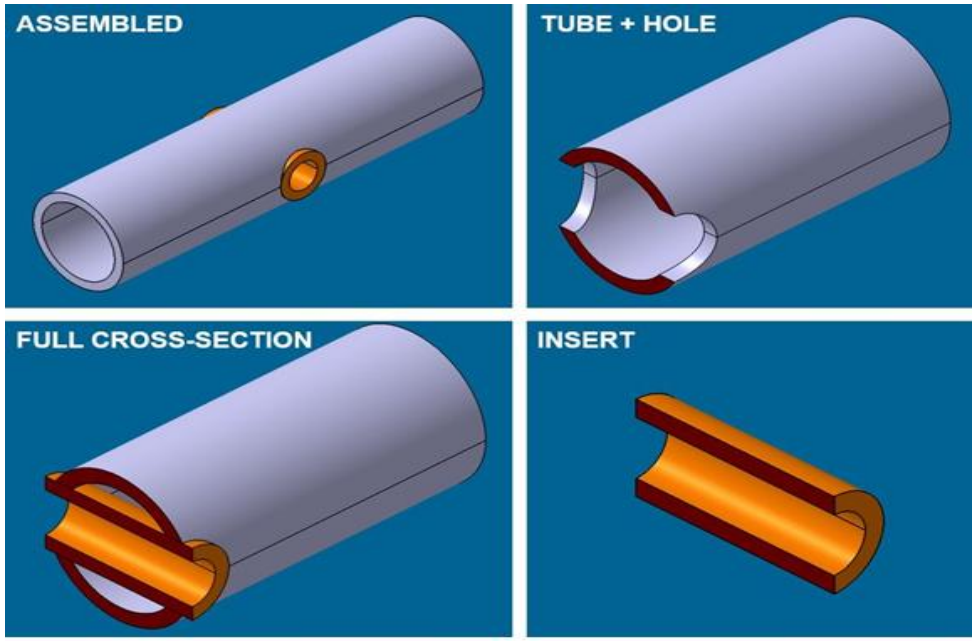
As shown in the reference diagram, the frame opening must not exceed 254 mm (10 inches).

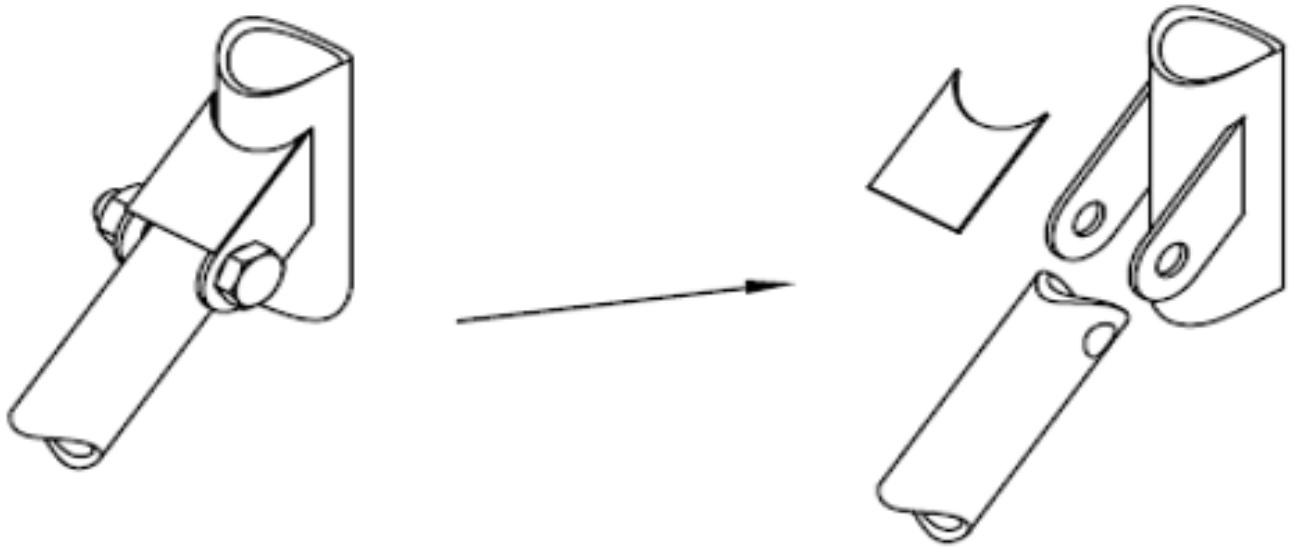
参考図のようにフレームの開口が254mm(10inch)を超えないことを図示すること

SES Guidance
(Structural Equivalency Spreadsheet)
(等価構造計算書)

F.3.4.3　Welded Inserts

F.5.12　Bolted members





Welded Insert

Note: Young's Modulus is given in MPa, not Gpa.

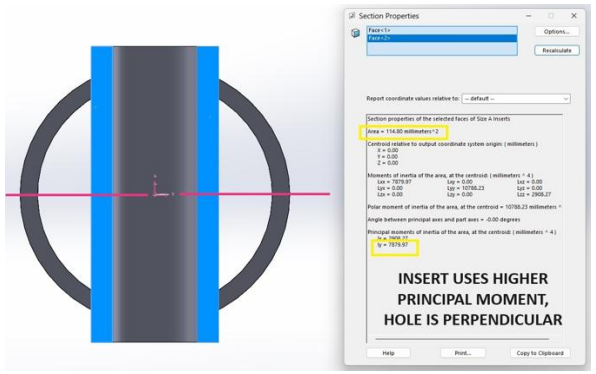
			Minimum F.3.2.1 Tube	Tube With Hole + Insert		
		Material:	Steel	Steel		EQ
		Original tube:	Size A	Round		EQ
F.3.4.1		Wall thickness:	2		mm	BLANK
		Outer Diameter:	25		mm	BLANK
		Tube cross sectional area (A_1):	1.73E+02	-	mm^2	EQ
		Tube second moment of inertia (I_1):	1.13E+04	-	mm^4	EQ
F.3.4.3		Tube with Hole cross sectional area (A_3):			mm^2	BLANK
		Tube with Hole second moment of inertia (I_3):			mm^4	BLANK
		Insert/Collar cross sectional area (A_2):			mm^2	BLANK
		Insert/Collar second moment of inertia (I_2):			mm^4	BLANK
F.3.4.2	F.3.5.3	Young's Modulus (E):	2.00E+11	2.00E+11	Pa	EQ
		Unwelded Yield Strength (Sy):	3.05E+08	3.05E+08	Pa	EQ
		Unwelded Ultimate Strength (Su):	3.65E+08	3.65E+08	Pa	EQ
		Welded Yield Strength (Sy):	N/A	1.80E+08	Pa	EQ
		Welded Ultimate Strength (Su):	N/A	3.00E+08	Pa	EQ
Buckling Modulus		E_1*I_1 <= E_2*I_2 + E_1*I_3:				BLANK
Yield		Sy_1*A_1 <= Sy_2*A_2 + Sy_1*A_3:				BLANK
Ultimate		Su_1*A_1 <= Su_2*A_2 + Su_1*A_3:				BLANK
Bending		I*Su_1*I_1/r <= 4*(Su_2*I_2+Su_1*I_3)/r:				BLANK
Deflection		Bending_1/(48*EI):				BLANK
Energy		0.5*Bending^2/(48*EI):				BLANK

Tube with Hole cross section
穴あけパイプ断面

Tube with Hole second moment of inertia
穴あけパイプ断面2次モーメント

Insert/Collar Cross Section Area
インサートパイプ断面積

Insert/Collar second moment of inertia
インサートパイプ断面2次モーメント



Note：Drilled tubes and insert pipes have different strengths that are applied in the calculation.

穴があけられたパイプとインサートでは、計算に適応される強度が変わるので注意

Enter the total moment of inertia of the drilling tube and the insert tube, and the smaller value in either the X or Y direction.

穴あけされたパイプとインサートの合計の断面二次モーメントかつX方向とY方向いずれかの小さい値を記入すること。

Welded Insert

Since 2026, the details of how to show equivalence in welded tubing have been made into a rule (F. 3.4. 3).

a. The equivalence of welded tubing and stiffeners shall be shown relative to the original non-welded tubing of the SES.

b. The welded insert should have a larger wall thickness than the original non-welded tube.

c. Weld inserts must have an outer diameter smaller than the original non-welded tube diameter or square side.

2026年より、 welded tubingについて等価性の示し方の詳細がルール化された（F.3.4.3）。

a. 溶接されたチューブと補強材の同等性は、SESの元の非溶接チューブに対して示されなければならない。

b. 溶接インサートには、元の非溶接チューブよりも大きな肉厚を使用する必要がある。

c. 溶接インサートには、元の非溶接チューブの直径または正方形の側面よりも小さい外径を使用する必要がある。

Bolted Members

REPLACE THIS EXAMPLE WITH YOUR OWN CAD

Figure – Double Lug Joint

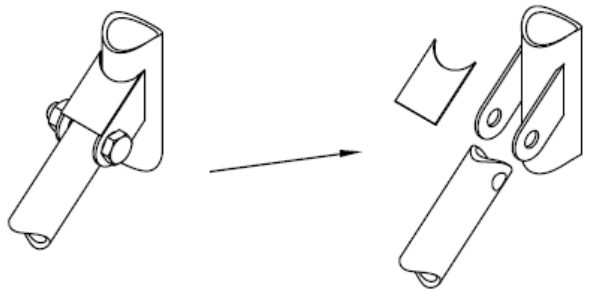
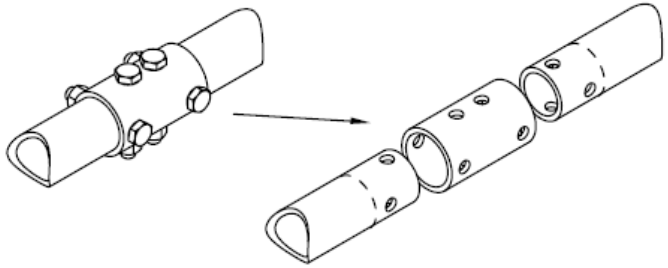


Figure – Sleeved Butt Joint



REPLACE THIS EXAMPLE WITH YOUR OWN CAD

Figure – Double Lug Joint

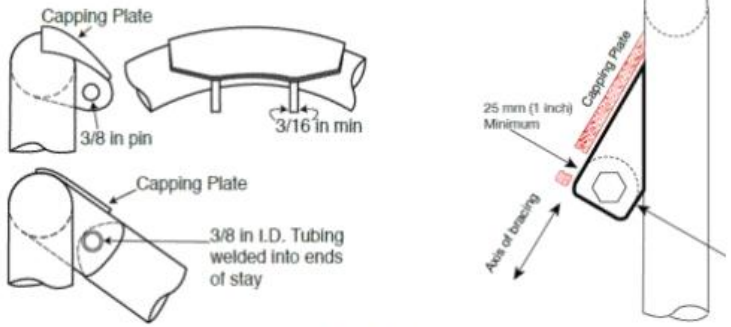
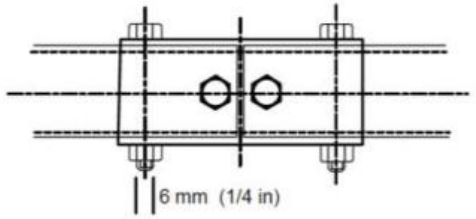


Figure – Sleeved Butt Joint



When connecting the Main Hoop Brace with a bolt, follow the legend above to prove that the rigidity is equal to or greater than that of a single tube.

Main Hoop Brace を Bolt 接続する場合、上記の凡例に従い、
　一本のパイプと同等以上の剛性が保たれていることを証明すること。

Finally / 最後に

【2026 _RuleChangesAndLocalRules_Part1 & 2】, which summarizes the rule changes in 2026, is uploaded, so please refer to it when creating SES.

2026年のルールー変更点をまとめた【2026_RuleChangesAndLocalRules_Part1 & 2】をアップロードしているので、SES作成時に参考にしてください。