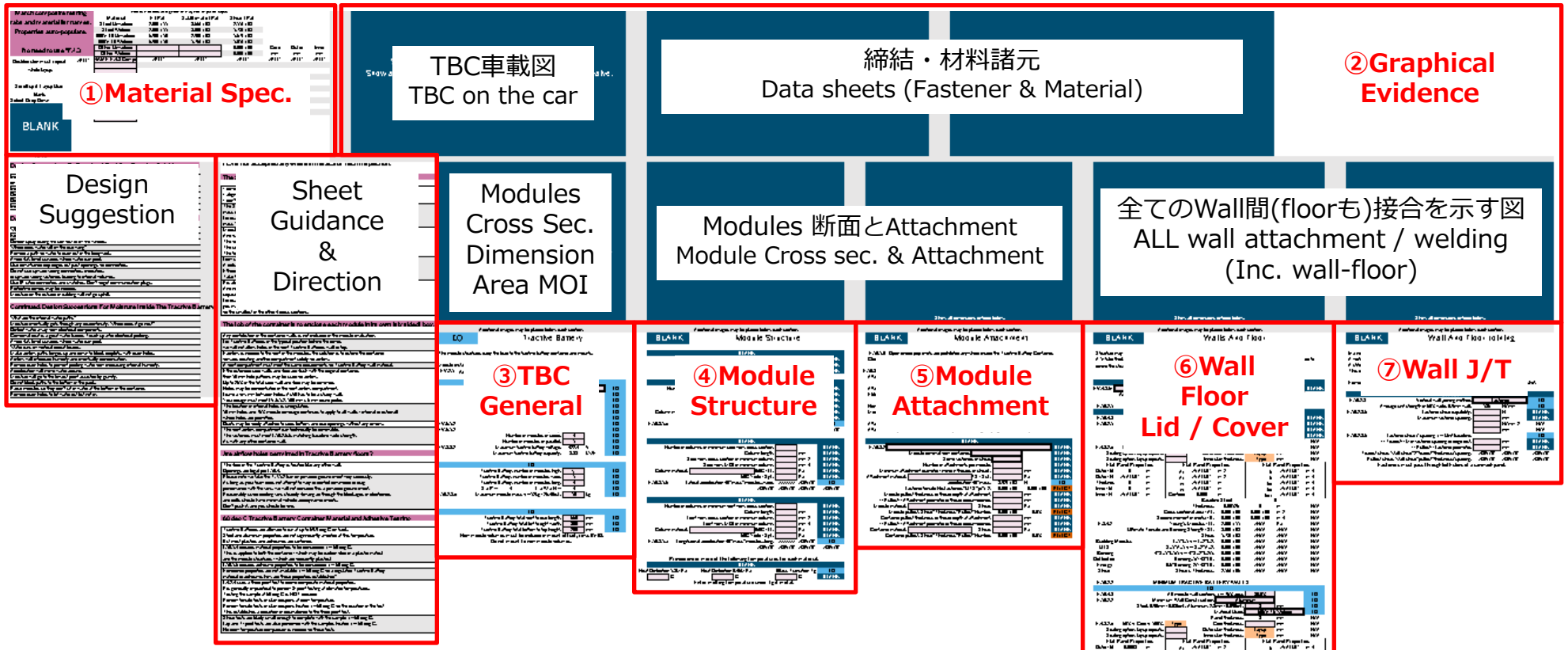
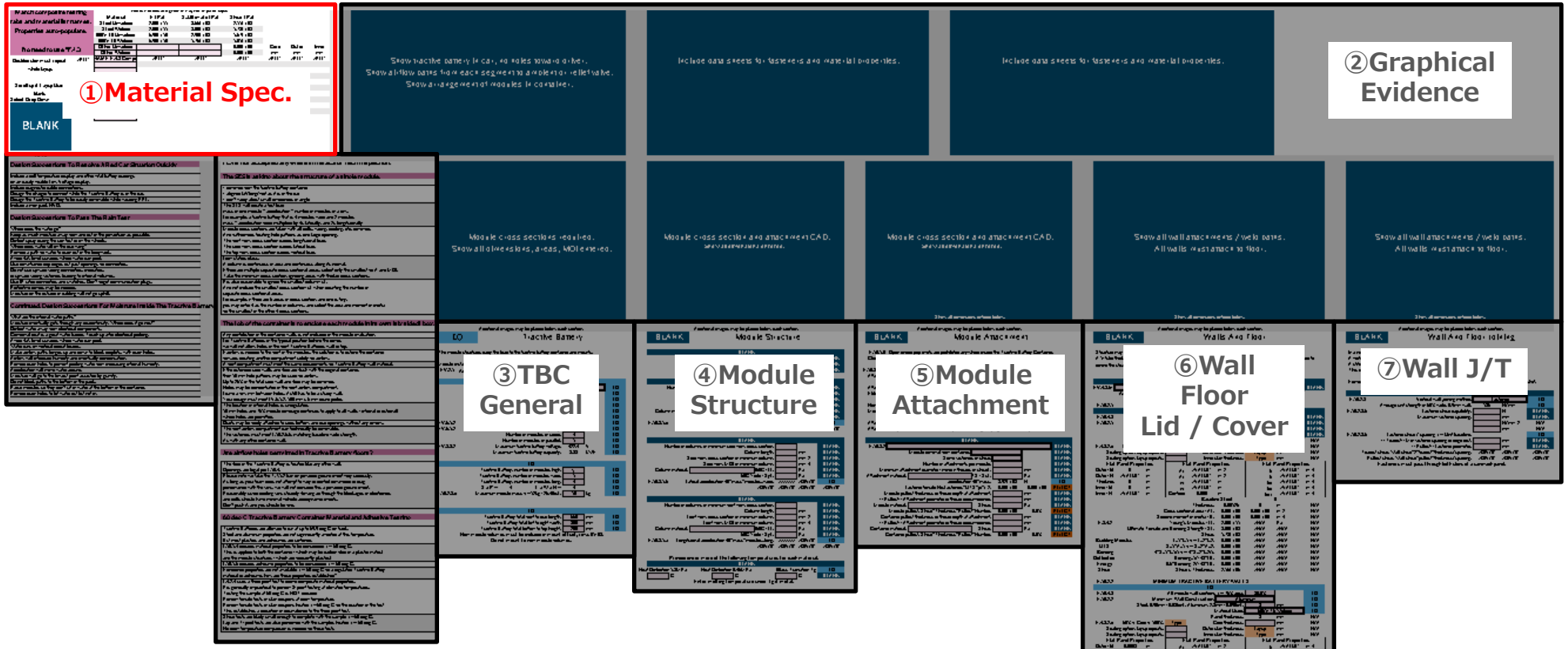
SES Guidance
F.10.1-4 Modules And Container

Sheet 構成 / Sheet Map



① Material Specification
② Graphical Evidence
③ Tractive battery Container General Specification
④ Module Structure
⑤ Module Attachment
⑥ Wall, Floor, Lid/Cover
⑦ Wall And Floor Joining

①Material Specification



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①Material Specification

・TBCのInt/Ext Wall/Floor/Lidに用いる材料を記述する
Describe Material Specification for Int/Ext wall/floor/lid.

Note： Modules Structureの材料特性は別だが、Compositeは記述する事
Material Specification for Module Structure is not necessary but Composite Material should be described.

Match composite testing tabs and material list names. Properties auto-populate.

No need to use "F.4.3 Composite" in the name.

Doubled skin must repeat whole layup.

Scroll up if Layup Used blank.

EV - Other Equivalence

EQ

mm

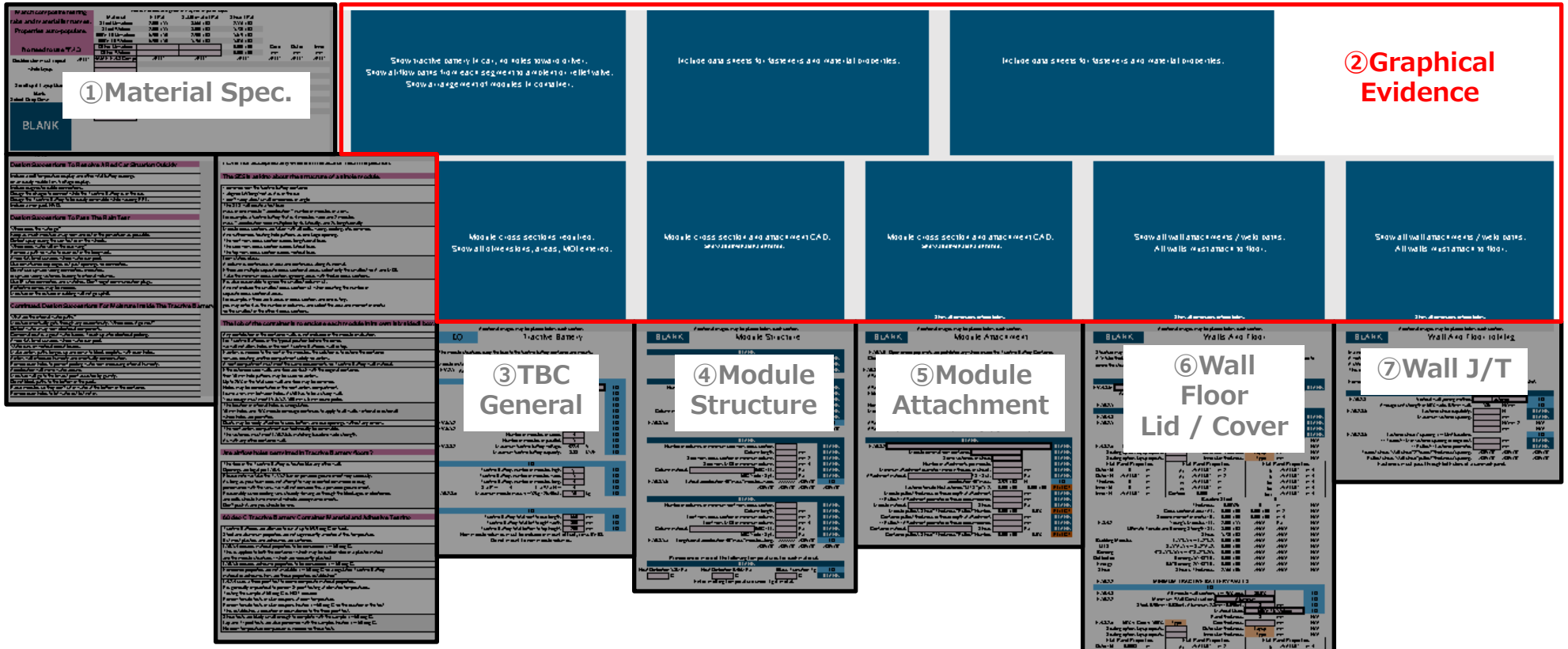
Note: Forces are given in Pa, not Mpa or Gpa.

Material	E (Pa)	S_Ultimate (Pa)	Shear (Pa)	Core	Outer	Inner
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			
Other Welded			0.00E+00	mm	mm	mm
EQ TestComp2026	2.88E+10	1.21E+08	2.25E+08	3	1.9	1.9

SteelおよびA6061-T6 以外のアルミ(A5052等)や金属材料はOther Unwelded/Weldedに材料特性を記述する
For metal materials (including aluminum such as A5052) other than steel and A6061-T6, describe the material properties in Other Unwelded/Welded.

当該LaminateのSheet名を入力する
Enter the sheet name for the laminate used in TBC.
(Composite材を使用する場合はMonocoque-Hybrid-Aluminum版のSESで作成すること)
If using composite materials, use the SES Template for Monocoque-Hybrid-Aluminum.

② Graphical Evidence



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② Graphical Evidence

車載状態のTBCを図示 / Show TBC in the car

- 内部Modulesの配置（透視図or複数図）
  Arrangement of Modules in TBC
  (by Perspective or multiple view)
- 開口部を明示 / Show all openings and vents

使用材料・Fastenerのデータシート(Evidence)を貼り付け
Attach data sheets (Evidence) of the materials used and Fasteners

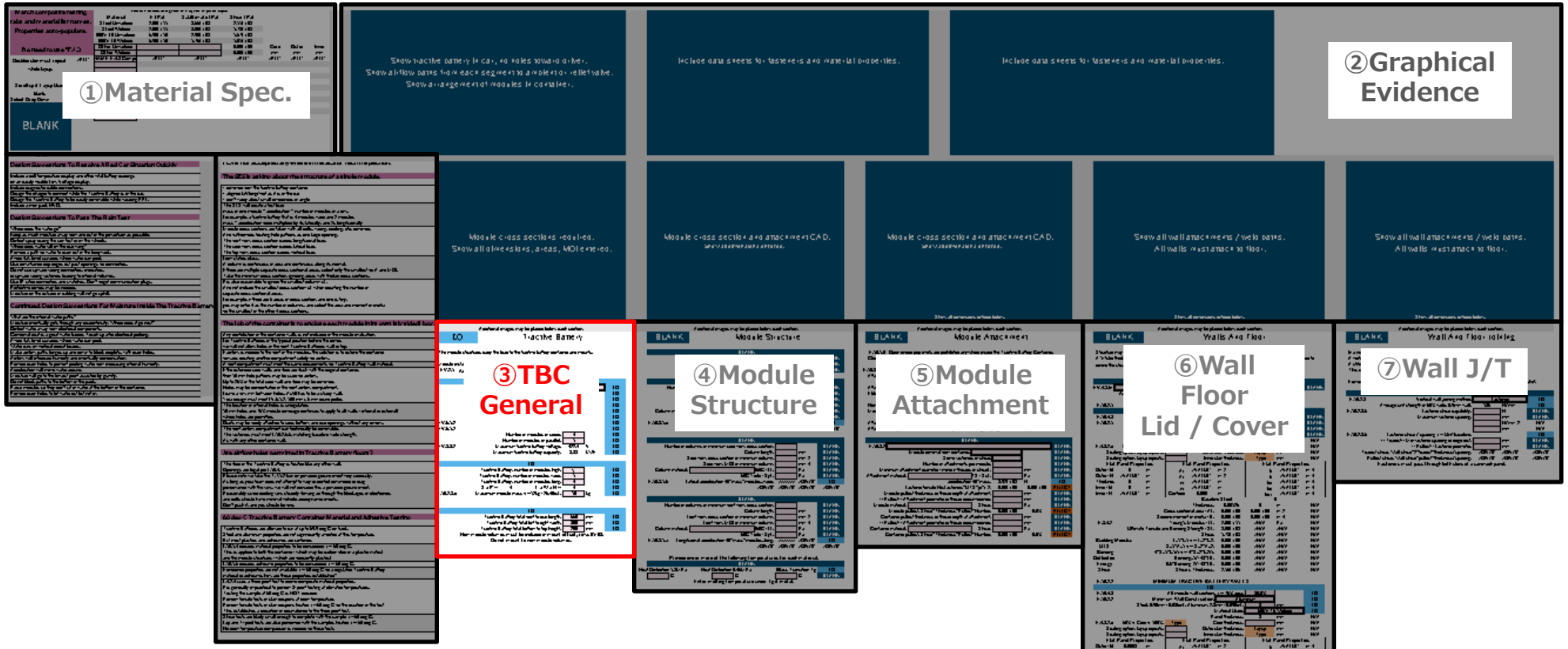
Moduleの断面図：各方向の寸法・面積・MOIを明示
Module cross section: dimensions, area, and MOI in each direction are clearly indicated

Moduleの取り付け構造
Module Attachment

全てのExt/Int Wall、Floor、Lid/Cover間の接合
All Wall Joint (between Walls, Floor and Lid/Cover)

スペースが足りない場合は下方空白に添付して良い
If there is not enough space, you can add it in the blank space below.
(但し、審査員が見つけられなかった場合はないものとして扱われる)
(However, if the judges cannot find it, it will be treated as if it does not exist.)

③ Tractive battery Container General Specification



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③ Tractive battery Container General Specification

BLANK

Tractive Battery

The module structures carry the load to the tractive battery container and mounts.

Module installation is expected to increase the strength of containers.
EV.2.1 Additional documentation is required in the ESF.

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

	BLANK			
	Tractive Battery, number of modules high:			BLANK
	Tractive Battery, number of modules wide:			BLANK
	Tractive Battery, number of modules long:			BLANK
	S x P = 0 **L x W x H =**	0		EQ
F.10.2.3.c	Maximum module mass <=12kg (26.4lbs):		kg	BLANK

	BLANK			
	Tractive Battery total front to rear length:		mm	BLANK
	Tractive Battery total left to right width:		mm	BLANK
	Tractive Battery total bottom to top height:		mm	BLANK

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

Rows 62-64 in [F.10.5 Battery Attachment] Sheet

TBCの基本諸元 / TBC General Specification

電気的諸元/ Electrical Specification

- Cell仕様 / Cell Specification
- Module内のCell直列数 / Num of Cells in series in a Module
- Module内のCell並列数 / Num of Cells in parallel in a Module
- Moduleの直列数 / Num of Modules in series
- Moduleの並列数 / Num of Modules in parallel

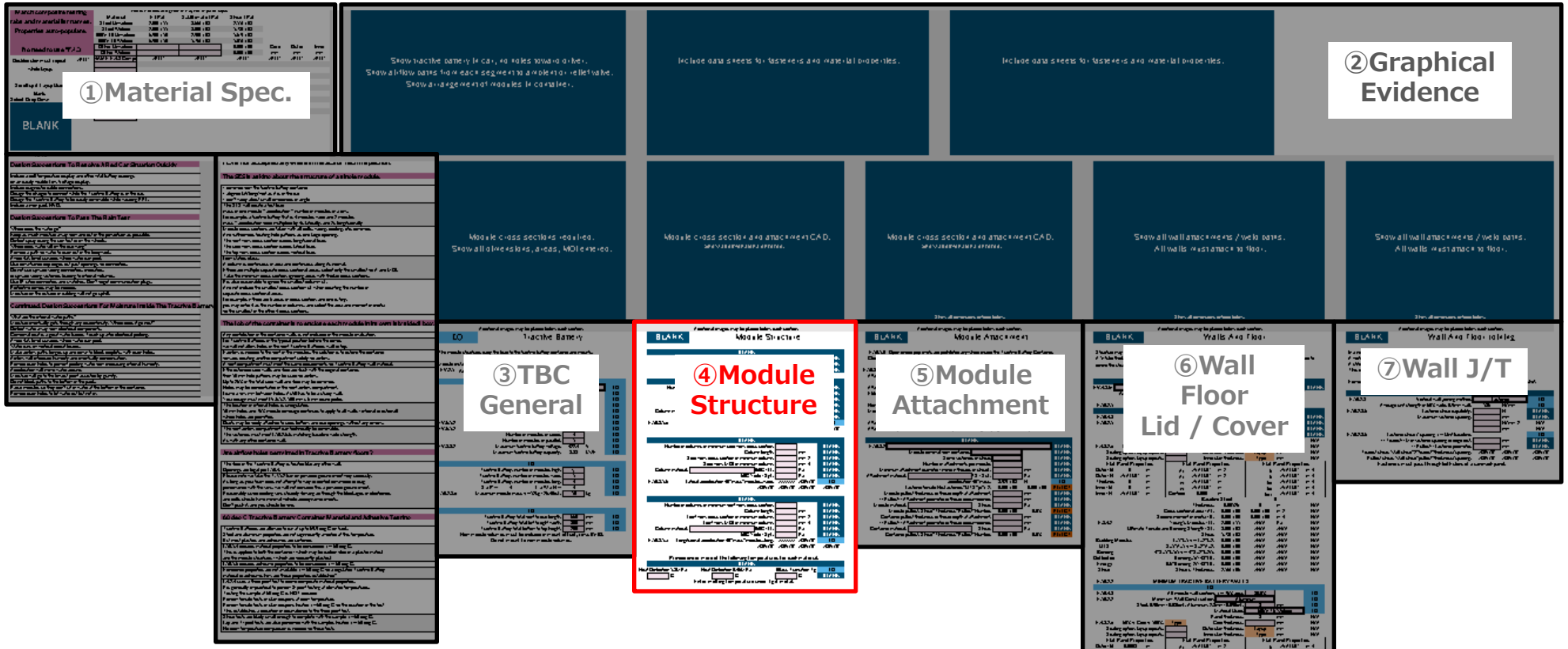
TBC内Module配置 / Modules Location in the TBC:

- 上下個数 / Num of Modules in vertical
- 左右個数 / Num of Modules in Lateral
- 前後個数 / Num of Modules in Longitudinal
- Moduleの最大重量 / Max. Mass of Module

TBCの外寸/ External dimension of TBC

- Mount Offsetは非Modules空間も含めること
- Modulesのない部分にMountを設けてはならない

④ Module Structure



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④ Module Structure

- Module 強度計算方法 / Strength calculation method of Module Structure

強度要件 / Criteria

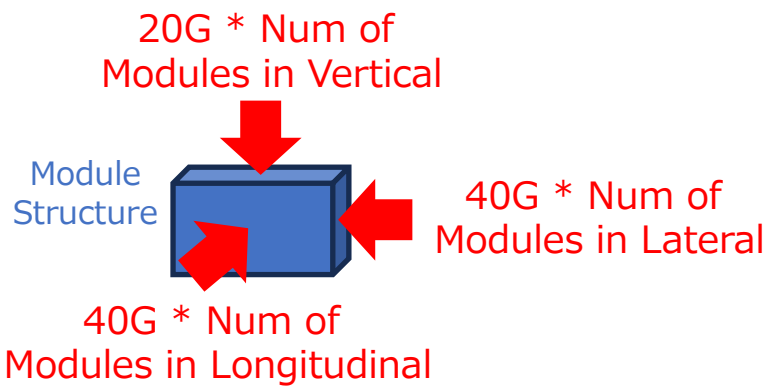
F.10.3.1 The structure of the Modules (without the structure of the Tractive Battery Container and without the structure of the Cells) must prevent Cells from being crushed in any direction under the following accelerations:

a. 40 g in the longitudinal direction (forward/aft)

b. 40 g in the lateral direction (left/right)

c. 20 g in the vertical direction (up/down)

負荷条件 / Load Condition

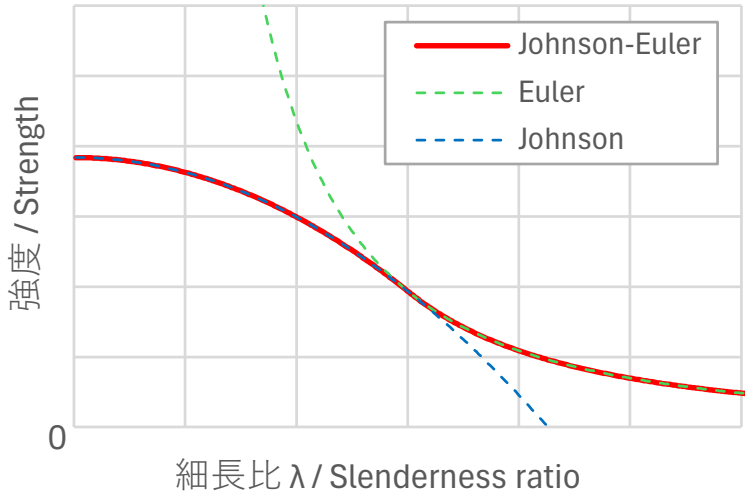


計算方法/ Calculation Method

Johnson-EulerによるColumnの座屈強度計算
Johnson-Euler buckling strength calculation

No. columns * A * (Sy-(A/EI) * (Sy*0.5*L/2pi)^2) (Johnson):

No. columns * pi^2 * EI / (0.5L)^2 (Euler):



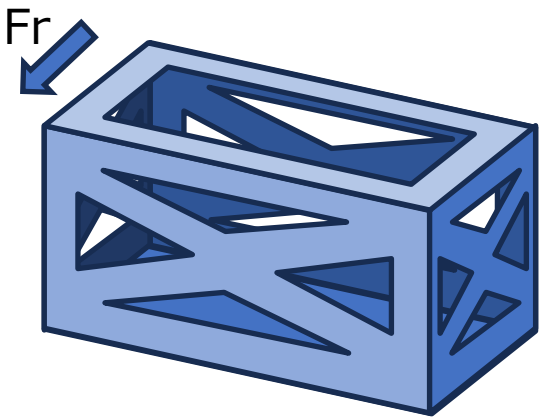
細長比 / Slenderness ratio

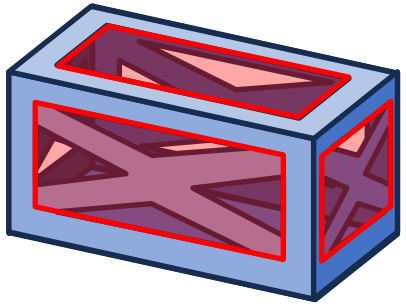
λ = 長さ/断面二次半径

Length / Radius_of_Gyration

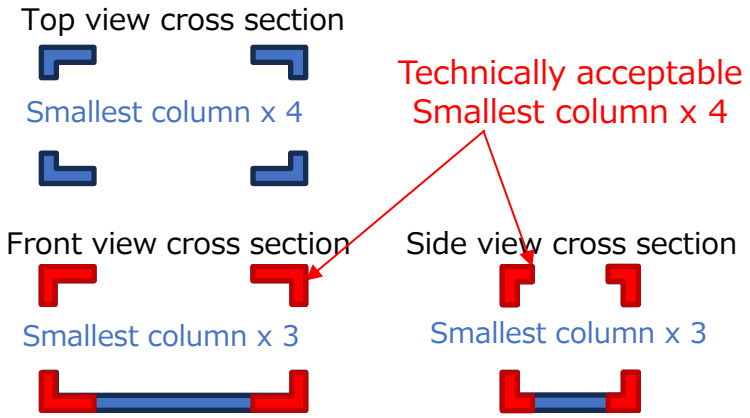
④ Module Structure

- Number of Column & the Smallest Column





Ignored by F.10.3.4a
Don't count as column!



Number of Column example for each view

1断面に複数種のColumnがある場合
In the case that multiple type column in one cross section

最小(最弱)Columnは断面二次半径が最小のColumn
Smallest(weakest) column is minimum radius of Gyration

$$\text{断面二次半径} = \sqrt{\frac{\text{断面二次モーメント}}{\text{面積}}}$$

$$\text{Radius_of_Gyration} = \sqrt{\frac{\text{MOI}}{\text{Area}}}$$

It is also reasonable to ignore the smallest column(s).
And not include the smallest cross section(s) when counting the number of separate cross sectional areas.
For example, if there are 5 areas in cross section, and one is tiny,
you may enter 4 as the number of columns, and select the area and moment of inertia for the smallest of the other 4 cross sections.

Smallest column

x 5 -> Count is OK … But…

x 4 -> Technically Acceptable

Smallest of the other 4

④ Module Structure

- 主断面二次モーメント / Principal MOI

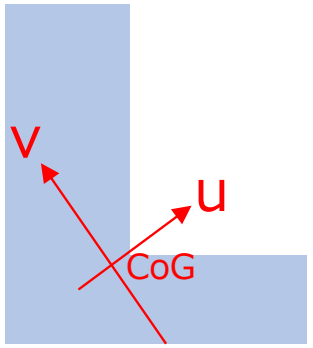
F.10.3.4 Cross sectional properties of Module structures must be used for SES loads **F.10.3.1**

b. Enter the minimum principal moment of inertia for each cross section

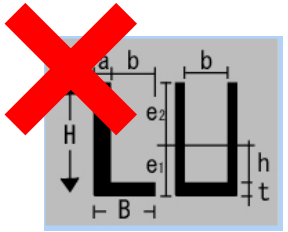
用いるMOIは**最小主断面二次モーメント**でなければならない
They MUST be MINIMUM PRINCIPAL MOI

CADの断面Propertyのスクリーンショット推奨 (選択断面も同一画像に示すこと)
CAD Screenshot is recommended (selected cross section MUST be shown in same picture)

特にL字型断面は注意！ / Be especially careful with L-shaped cross sections!



v軸(主軸,弱軸)周りのMOIが最小主断面二次モーメント
The Minimum Principal MOI is that about v-axis



$A = BH - b(e_2 + h)$

$e_1 = (aH^2 + bt^2) / (2(aH + bt))$

$e_2 = H - e_1$

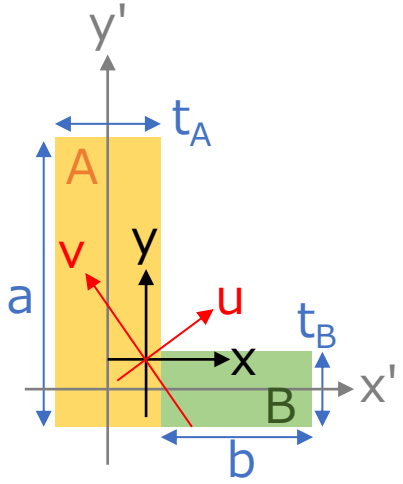
$I = (Be_1^3 - bh^3 + ae_2^3) / 3$

主軸回りのMOIではない
It's NOT Principal

公式集　断面性能（面積・断面係数・断面二次モーメント・断面二次半径）　構造 材料力学

手計算式は付録参照のこと
Refer to Appendix for hand calculation

Appendix：The Minimum Principal MOI of L-Shape



Area of Cross section

$$A_A = at_A \ , \quad A_B = bt_B$$

Centroid in x′,y′ axis

$$C_{x'} = \frac{A_A \frac{a+t_A}{2}}{A_A + A_B} \ , \qquad C_{y'} = \frac{A_B \frac{b+t_A}{2}}{A_A + A_B}$$

distance from Centroid in x,y axis

$$dx_A = -C_{x'} \ , \qquad dy_A = \frac{a-t_B}{2} - C_{y'}$$

$$dx_B = \frac{b+t_A}{2} - C_{x'} \ , \qquad dy_B = -C_{y'}$$

Properties about x,y axis

$$I_{Axx} = \frac{t_A a^3}{12} + A_A dy_A{}^2 , \qquad I_{Ayy} = \frac{a t_A{}^3}{12} + A_A dx_A{}^2 , \qquad I_{Axy} = A_A dx_A dy_A$$

$$I_{Bxx} = \frac{b t_B{}^3}{12} + A_B dy_B{}^2 , \qquad I_{Byy} = \frac{t_B b^3}{12} + A_B dx_B{}^2 , \qquad I_{Bxy} = A_B dx_B dy_B$$

$$I_{xx} = I_{Axx} + I_{Bxx} \ , \qquad I_{yy} = I_{Ayy} + I_{Byy} \ , \qquad I_{xy} = I_{Axy} + I_{Bxy}$$

Total Area of L-Shape

$$A_{Total} = A_A + A_B$$

MOI about u,v axis

$$I_{uu} = \frac{I_{xx}+I_{yy}}{2} + \sqrt{\left(\frac{I_{xx}-I_{yy}}{2}\right)^2 + I_{xy}} \ , \qquad I_{vv} = \frac{I_{xx}+I_{yy}}{2} - \sqrt{\left(\frac{I_{xx}-I_{yy}}{2}\right)^2 + I_{xy}}$$

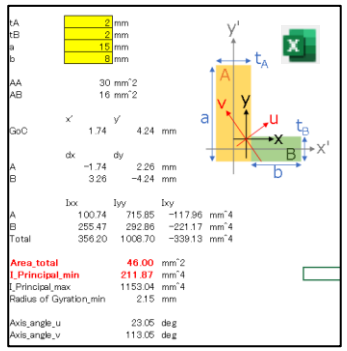
The Minimum Principal MOI

Radius of Gyration

$$i = \sqrt{\frac{I_{vv}}{A_{Total}}}$$

Axis Angle x → u

$$\theta_{x \to u} = \frac{1}{2} \tan^{-1}\left(\frac{2I_{xy}}{I_{xx}-I_{xx}}\right)$$



tA	2	mm
tB	2	mm
a	15	mm
b	8	mm
AA	30	mm^2
AB	16	mm^2
	x'	y'
GoC	1.74	4.24 mm
	dx	dy
A	−1.74	2.26 mm
B	3.26	−4.24 mm
	Ixx	Iyy	Ixy	
A	100.74	715.85	−117.96	mm^4
B	255.47	292.86	−221.17	mm^4
Total	356.20	1008.70	−339.13	mm^4
Area_total	46.00	mm^2
I_Principal_min	211.87	mm^4
I_Principal_max	1153.04	mm^4
Radius of Gyration_min	2.15	mm
Axis_angle_u	23.05	deg
Axis_angle_v	113.05	deg

手計算できる
⇒検算できる
Inspector can check MOI

④ Module Structure

- Young Modulus & UTS @60℃

TBC or Moduleで / In TBC or Module

SteelまたはAluminum等金属を用いる場合
Metal Material (Such as Steel or Aluminum) is used

・気にしなくてよい(物性値をそのまま用いてよい)
No need to care (Properties can be used as is)

樹脂(Composite除く)を使う場合
Plastic Material (except for Composite) is used

Provide one or more of the following temperatures for each material:

REJECT			
Heat Deflection 1.8MPa	Heat Deflection 0.45MPa	Glass Transition Tg	EQ
C	C	50 C	REJECT

Enter melting temperature under Tg if metal.

・物性値が60℃で適切と言えるEvidenceを提示
Provide evidence that the properties used at 60℃ are appropriate.

・ガラス遷移温度・熱たわみ温度(1.8MPa, 0.45MPa)が60℃を超える事
Glass Transition Temp, HDT 1.8MPa, and 0.45MPa MUST be >60℃

Composite材を使う場合
Composite Material is used

F.4.2.4 uses a three point test to derive composite material properties.
It is generally impractical to perform 3-point testing at elevated temperatures.
Testing the sample at 60 deg C is NOT required
Perform tensile tests of skin coupons at room temperature.
Perform tensile tests of skin coupons heated >=60 deg C for the duration of the test
This establishes a reduction in equivalence to the three point test.

Shear tests are likely small enough to complete with the sample >=60 deg C.
Lap and T-peel tests are also performed with the samples heated >= 60 deg C.
No room temperature comparison is needed for these tests

・F.4.2 Laminate Test・Perimeter Test時に60℃以上に加熱して試験
Test sample MUST be heated to >60℃ at Laminate Test & Perimeter Shear Test(F.4.2)

・ガラス遷移温度・熱たわみ温度(1.8MPa, 0.45MPa)が60℃を超える事
Glass Transition Temp, HDT 1.8MPa, and 0.45MPa MUST be >60℃

接着剤を使う場合
Adhesive used

・せん断強度が60℃で適切と言えるEvidenceを提示
Provide evidence that the Shear Strength used at 60℃ is appropriate.

④ Module Structure

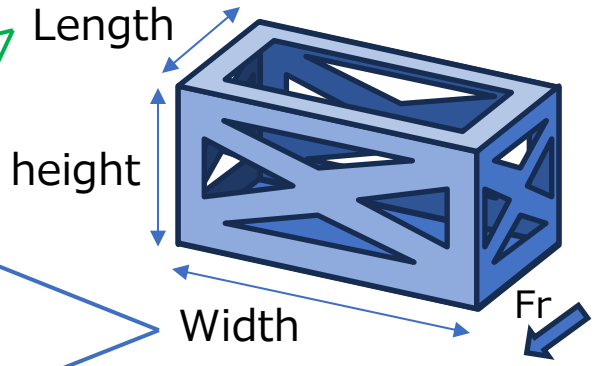
BLANK | Module Structure

BLANK			
Single Module front to rear length:		mm	BLANK
Single Module left to right width:		mm	BLANK
Single Module bottom to top height:		mm	BLANK
BLANK			
Number of columns in minimum top view cross section:			BLANK
Column length (L):		mm	BLANK
Top view cross section of minimum column (A):		mm^2	BLANK
Top view MOI of minimum column (I):		mm^4	BLANK
Column material: @60C (E):		Pa	BLANK
60C Yield (Sy):		Pa	BLANK
F.10.3.1.c Vertical acceleration 20*mass*modules_high:	#######	N	BLANK
	#DIV/0! #DIV/0!	0.00%	BLANK
BLANK			
Number of columns in minimum side view cross section:			BLANK
Column length:		mm	BLANK
Side view cross section of minimum column:		mm^2	BLANK
Side view MOI of minimum column:		mm^4	BLANK
Column material: @60C (E):		Pa	BLANK
60C Yield (Sy):		Pa	BLANK
F.10.3.1.b Lateral acceleration 40*mass*modules_wide:	#######	#DIV/0!	BLANK
	#DIV/0! #DIV/0!	0.00%	BLANK
BLANK			
Number of columns in minimum front view cross section:			BLANK
Column length:		mm	BLANK
Front view cross section of minimum column:		mm^2	BLANK
Front view MOI of minimum column:		mm^4	BLANK
Column material: @60C (E):		Pa	BLANK
60C Yield (Sy):		Pa	BLANK
F.10.3.1.a Longitudinal acceleration 40*mass*modules_long:	#######	#DIV/0!	BLANK
	#DIV/0! #DIV/0!	0.00%	BLANK

Provide one or more of the following temperatures for each material:

BLANK			
Heat Deflection 1.8MPa	Heat Deflection 0.45MPa	Glass Transition Tg	EQ
C	C	C	BLANK

Enter melting temperature under Tg if metal.



Number of Column

Top view cross section

Smallest column x 4

Technically acceptable
Smallest column x 4

Front view cross section

Smallest column x 3

Side view cross section

Smallest column x 3

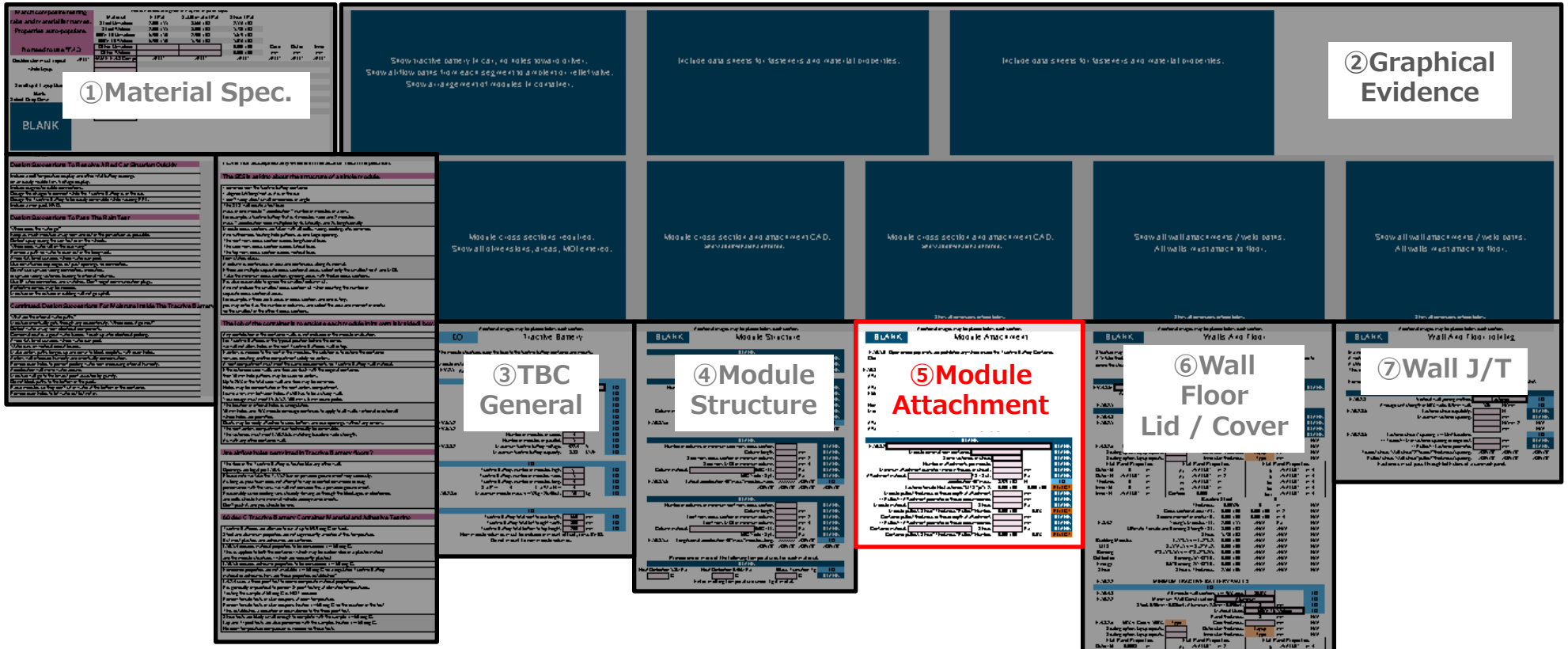
Number of Column example for each view

用いるMOIは最小主断面二次モーメントでなければならない
They MUST be MINIMUM PRINCIPAL MOI

60℃以上での物性値を用いる事 (要Evidence)
Use property at 60°C or higher (Evidence required)

全ての材料ごとに示せ(Screen Shot可)
Show for all Materials (Screenshots are acceptable)

④ Module Attachment



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④ Module Attachment

BLANK

Module Attachment

F.10.1.6 Open ended pop rivets are prohibited anywhere inside the Tractive Battery Container.
Closed end or solid rivets are acceptable.

F.10.3.2.ab Modules are expected to be mechanically attached to the Container.
Attachment will be mandatory in 2027. Lid equivalence will not be accepted in 2027.

Attachment may use a threaded fastener in tension.
If blind threads are used, another positive locking mechanism is required.

Non-conductive fasteners and positive locking are recommended inside the Container.
Module designs with full shielding against dropped conductive items is strongly regommended.

Attachments do not have to use fasteners.
Attachment may use material in shear, with positive locking keeping the material in place.

Open ended pop rivet はTBC内で使用禁止

2種類の締結法 / 2 Types Module Attachment
F.10.3.2a TBCに直接固定 / Attachment to Container
F.10.3.2b 蓋で押さえる / Mechanical Cover and Lid Attachment
F.10.3.2bは2027年廃止 / F.10.3.2b will be abolished in2027

FastenerにはPositive Lock Mechanismが必要
Positive Lock Mechanism is required for Fasteners

Fastener等は非電導品を推奨

締結はFastenerである必要はないがせん断でしっかり固定されること

BLANK				
F.10.3.2	Modules mechanically attached to container			EQ
	Module removal from container:	Vertical		EQ
	Some fasteners in shear:			BLANK
	Number of attachments per module:			BLANK
	Minimum attachment diameter (minor if threads in shear):		mm	BLANK
	Attachment material:	UTS (Su):	Pa	BLANK
	Vertical acceleration 20*mass:	0.00E+00	N	EQ
	Fastener tensile No.Fasteners*UTS*pi*r^2:	0.00E+00	#DIV/0!	#DIV/0!
	Module pullout thickness or thread depth at attachment:		mm	BLANK
	--Pullout--Attachment perimeter or thread circumference:		mm	BLANK
	Module material:	Shear:	Pa	BLANK
	Module pullout: Shear*Thickness*Pullout*Number:	0.00E+00	#DIV/0!	#DIV/0!
	Container pullout thickness or thread depth at attachment:		mm	BLANK
	--Pullout--Attachment perimeter or thread circumference:		mm	BLANK
	Container material:	Shear:	Pa	BLANK
	Container pullout: Shear*Thickness*Pullout*Number:	0.00E+00	#DIV/0!	#DIV/0!

F.10.3.2a Attachment to Container

BLANK				
F.10.3.2	Lid attachment equivalent to weld			EQ
	Module removal from container:	Vertical		EQ
	Some fasteners in shear:			BLANK
	Maximum fastener spacing:		mm	BLANK
	Minimum attachment diameter (minor if threads in shear):		mm	BLANK
	Attachment material:	UTS (Su):	Pa	BLANK
	Vertical acceleration 20*mass:	0.00E+00	N	EQ
	Fastener tensile UTS*pi*r^2/fastener spacing:	#DIV/0!	#DIV/0!	#DIV/0!
	Lid pullout thickness or thread depth at attachment:		mm	BLANK
	--Pullout--Attachment 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 attachment:		mm	BLANK
	--Pullout--Attachment perimeter or thread circumference:		mm	BLANK
	Container material:	Shear:	Pa	BLANK
	Container pullout: Shear*Thickness*Pullout/Spacing:	#DIV/0!	#DIV/0!	#DIV/0!

F.10.3.2b Mechanical Cover and Lid Attachment

④ Module Attachment

F.10.3.2a Attachment to Container

	BLANK		
F.10.3.2	Modules mechanically attached to container		EQ
Module removal from container:	Vertical		EQ
Some fasteners in shear:			BLANK
Number of attachments per module:			BLANK

Fastenerの強度

Minimum attachment diameter (minor if threads in shear):		mm	BLANK
Attachment material:	UTS (Su):	Pa	BLANK
Vertical acceleration 20*mass:	0.00E+00	N	EQ
Fastener tensile No.Fasteners*UTS*pi*r^2:	0.00E+00	#DIV/0!	#DIV/0!

Module側の強度

Module pullout thickness or thread depth at attachment:		mm	BLANK
--Pullout--Attachment perimeter or thread circumference:		mm	BLANK
Module material:	Shear:	Pa	BLANK
Module pullout: Shear*Thickness*Pullout*Number:	0.00E+00	#DIV/0!	#DIV/0!

Container側の強度

Container pullout thickness or thread depth at attachment:		mm	BLANK
--Pullout--Attachment perimeter or thread circumference:		mm	BLANK
Container material:	Shear:	Pa	BLANK
Container pullout: Shear*Thickness*Pullout*Number:	0.00E+00	#DIV/0!	#DIV/0!

Modulesの取出し方向

取出し方向荷重をFastenerのせん断で受ける場合はShear
引張で受ける場合はTension

1ModuleあたりのFastener本数 (Double Shearの場合は2倍)

Fastener径 (Shearの場合は谷底径)

Fastener材料・UTS

Moduleの取り付け部の肉厚・雌ネジの場合は深さ

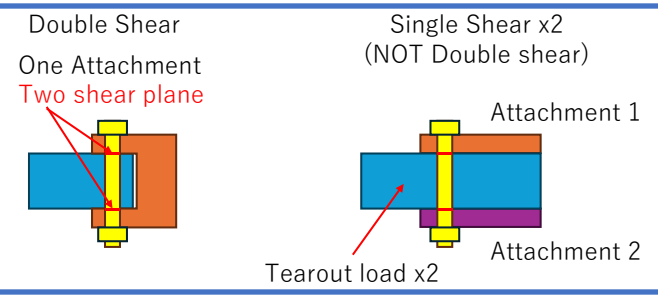
Tension：締結の最小外周長(ワッシャ・ボルト頭等)・雌ネジはボルト径
Shear：場合はEdge Distance

Module Structureの材料・UTS

Containerの取り付け部の肉厚・雌ネジの場合は深さ

Tension：締結の最小外周長(ワッシャ・ボルト頭等)・雌ネジはボルト径
Shear：場合はEdge Distance

Containerの材料・UTS



1つのFastenerにModulesを2個付けた場合、Container側のTearout強度は200%以上必要

If two modules are attached to one Fastener, the tearout strength on the container side must be 200% or more.

④ Module Attachment

F.10.3.2b Mechanical Cover and Lid Attachment

	BLANK		
F.10.3.2	Lid attachment equivalent to weld		EQ
	Module removal from container:	Vertical	EQ
	Some fasteners in shear:		BLANK

Fastenerの強度

Maximum fastener spacing:		mm	BLANK
Minimum attachment diameter (minor if threads in shear):		mm	BLANK
Attachment material:	UTS (Su):	Pa	BLANK
Vertical acceleration 20*mass:	0.00E+00	N	EQ
Fastener tensile UTS*pi*r^2/fastener spacing:	#DIV/0!	#DIV/0!	#DIV/0!

Lid/Cover側の強度

Lid pullout thickness or thread depth at attachment:		mm	BLANK
--Pullout--Attachment perimeter or thread circumference:		mm	BLANK
Lid material:	Shear:	Pa	BLANK
Lid pullout: Shear*Thickness*Pullout/Spacing:	#DIV/0!	#DIV/0!	#DIV/0!

Container側の強度

Container pullout thickness or thread depth at attachment:		mm	BLANK
--Pullout--Attachment perimeter or thread circumference:		mm	BLANK
Container material:	Shear:	Pa	BLANK
Container pullout: Shear*Thickness*Pullout/Spacing:	#DIV/0!	#DIV/0!	#DIV/0!

Modulesの取出し方向

取出し方向荷重をFastenerのせん断で受ける場合はShear
引張で受ける場合はTension

最大Fastener間距離

Fastener径 (Shearの場合は谷底径)

Fastener材料・UTS

Lidの取り付け部の肉厚・雌ネジの場合は深さ

Tension：締結の最小外周長(ワッシャ・ボルト頭等)・雌ネジはボルト径
Shear：場合はEdge Distance

Lidの材料・UTS

Containerの取り付け部の肉厚・雌ネジの場合は深さ

Tension：締結の最小外周長(ワッシャ・ボルト頭等)・雌ネジはボルト径
Shear：場合はEdge Distance

Containerの材料・UTS

Weld Steel UTS

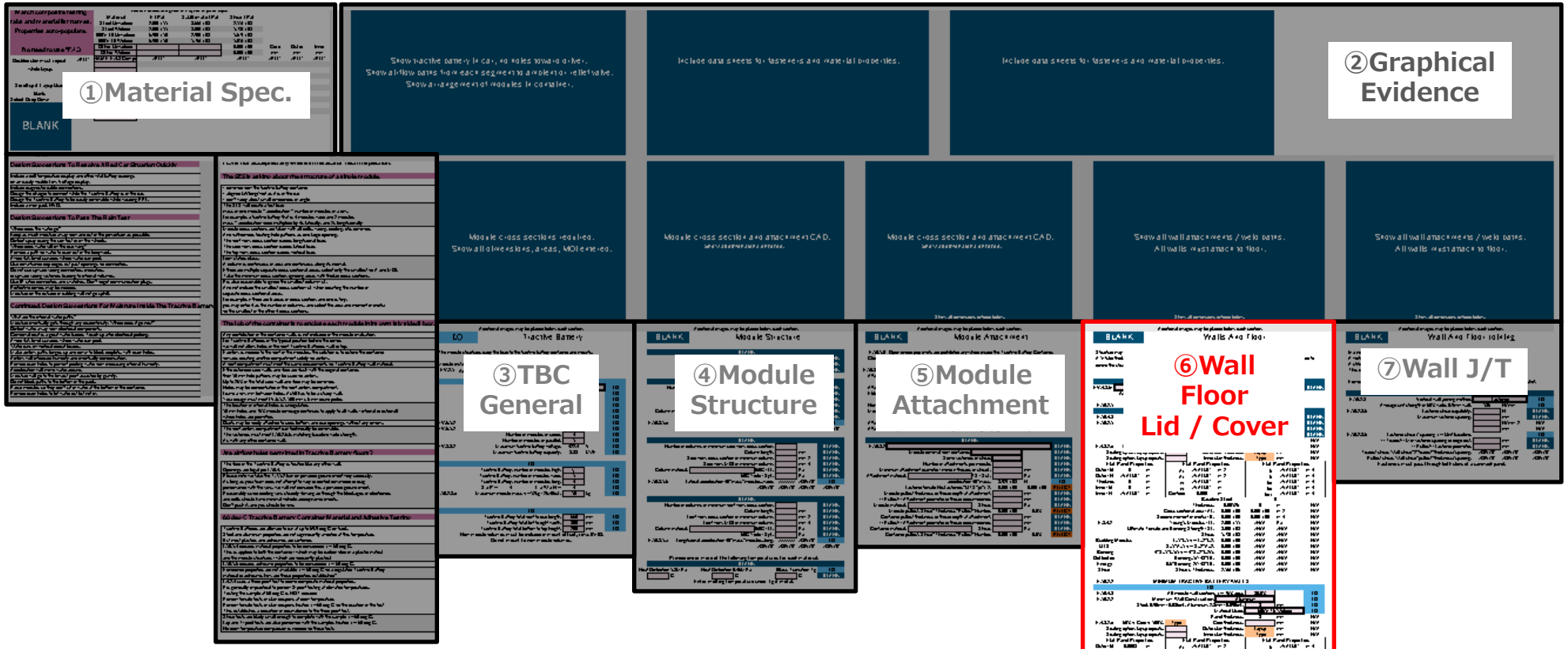
0.9 mm x 300 MPa x 50% = 135 N/mm

Thickness of Steel wall　　Interval welding

The Equivalence to the strength of a welded joint F.10.2.5.a

このModules締結方法は2027年以降は禁止
This Attachment way won't be permitted in 2027 or later

⑤ Wall and Floor



① Material Specification
② Graphical Evidence
③ Tractive battery Container General Specification
④ Module Structure
⑤ Module Attachment
⑥ Wall, Floor, Lid/Cover
⑦ Wall And Floor Joining

⑤ Wall and Floor

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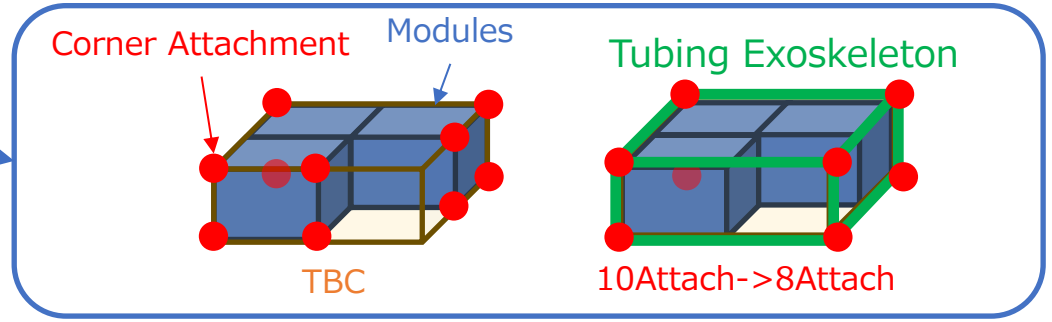
Walls And Floor

Structure may be added between or around modules to define a rectangular structure.
A 1-tube thick exoskeleton with a direct load path around the perimeter of the assembled modules may be used to define the structural limits and corners. F.10.5.6 Corner Attachment: definition of corner

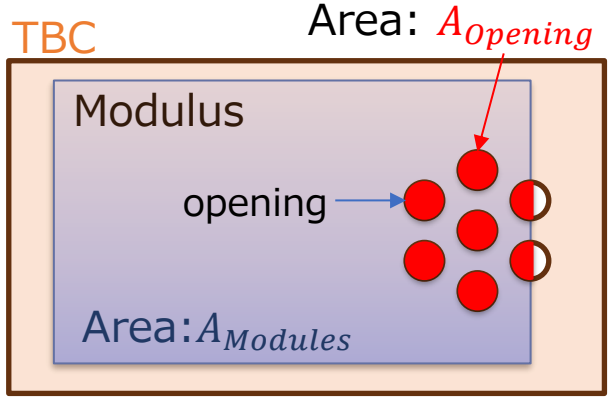


	BLANK				
EV.4.3.5-7					BLANK
	Any opening, including pressure relief valves, must face away from the driver.				
F.10.2.1	MINIMUM TRACTIVE BATTERY FLOOR				
	BLANK				
F.10.4.3	All module floor sections >= 75% area:				BLANK
F.10.2.1	Tractive Battery Floor Construction:				BLANK
	Steel: 1.25mm (0.049in), Aluminum: 3.2mm (.125in):		mm		BLANK
	Material Used:				BLANK
	Panel thickness:	0	mm		N/A
F.4.3.2.d	50% < Core < 100%:	Typo	Core 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
F.10.2.2	MINIMUM TRACTIVE BATTERY WALLS				
	BLANK				
F.10.4.3	All module wall sections >= 75% area:				BLANK
F.10.2.2	Minimum Wall Construction:				BLANK
	Steel: 0.90mm (0.035in), Aluminum: 2.3mm (0.090in):		mm		BLANK
	Material Used:				BLANK
	Panel thickness:	0	mm		N/A
F.4.3.2.d	50% < Core < 100%:	Typo	Core 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
F.10.2.2	MINIMUM TRACTIVE BATTERY COVER/LID				
	BLANK				
	No tractive battery holes with line of sight to driver:				BLANK
F.10.4.3	All module cover sections >= 75% area:				BLANK
F.10.2.2	Tractive Battery Lid:				BLANK
	Steel: 0.90mm (0.035in), Aluminum: 2.3mm (0.090in):		mm		BLANK
	Material Used:				N/A
	Panel thickness:	0	mm		N/A
F.4.3.2.d	50% < Core < 100%:	Typo	Core 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

Module遮蔽率

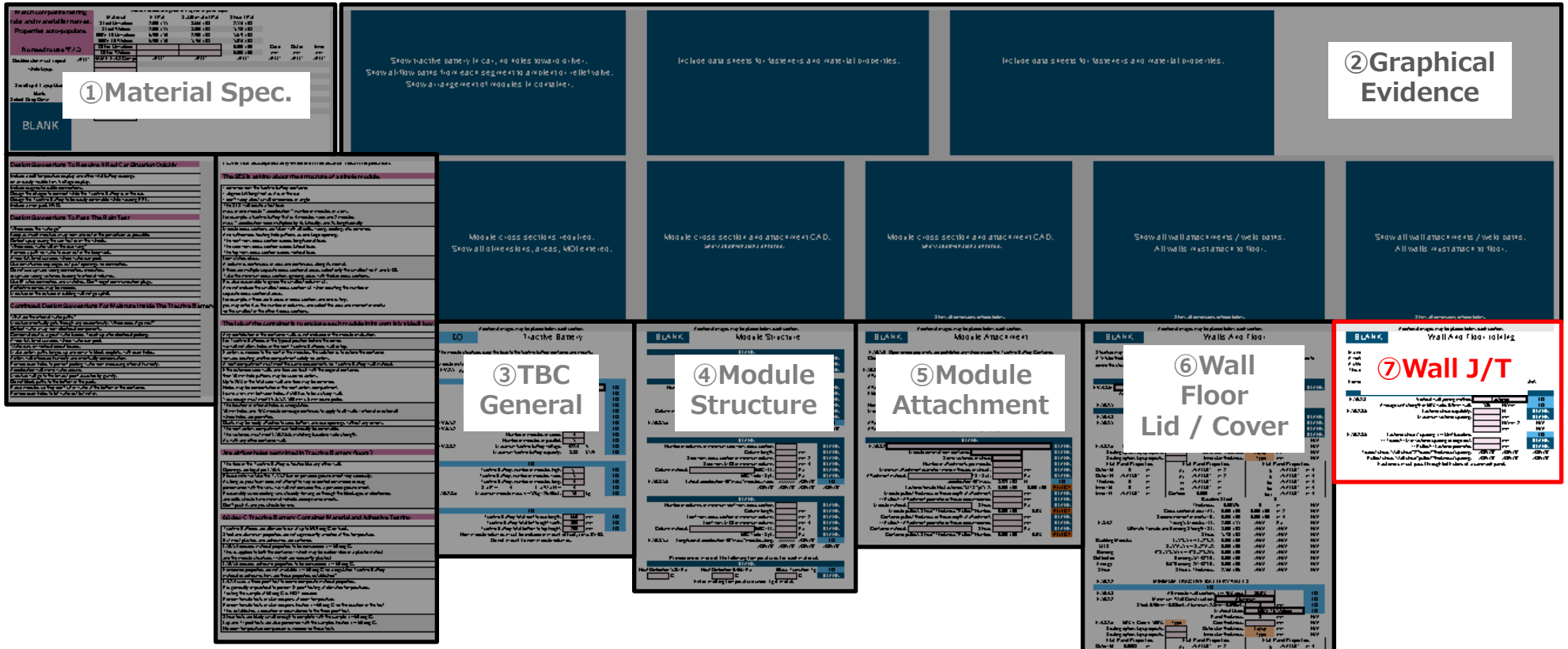
$$\frac{A_{Modules} - A_{Opening}}{A_{Modules}}$$

$A_{Opening}$はModuleと開口が重なっている部分だけで良い
Only overlap part of Modules & opening



Wallについては前後左右各面で算出し最小値を入力
(他の面もスクリーンショットを提示のこと)
For walls, describe the minimum cover rate of 4 sides.
(Screenshot must be attached for other sides)

⑥ Wall And Floor Joining



① Material Specification
② Graphical Evidence
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⑤ Module Attachment
⑥ Wall, Floor, Lid/Cover
⑦ Wall And Floor Joining

⑥ Wall And Floor Joining

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Wall And Floor Joining

In a nominal top lid arrangement:
A vertical stitch weld or equivalent is required along the full height at each end of each wall.
A stitch weld or equivalent is required along the full length of each wall to the floor.
This includes interior and exterior walls.

If different joining methods are used in different areas, fill out this section for each, and screenshot.

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
	Tearout shear: Wall shear*2*tearout*thickness/spacing:	#N/A	#N/A	#N/A
	Pullout shear: Wall shear*pullout*thickness/spacing:	#N/A	#N/A	#N/A
	Fasteners must pass through both skins of a sandwich panel.			

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

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

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

一般的なLidの場合
垂直Wall間の間欠溶接は各Wallの全高に対しての割合
Wall-Floor間の間欠溶接は全周に対しての割合
WallはInternal/External両方とも満たさなければならない

F.10.3.2b　Lid/Coverの締結はModule Attachmentで計算済なので不要
F.10.3.2b　Lid/Cover fastening is already Evaluated at Module Attachment

異なる接合方法の箇所があれば、
それぞれで作成しScreenshotを貼り付ける事

FastenedはF.10.3.2b Lid/Cover fastening と同じ計算手法
(但しTearout/Pullout両方が評価される)
Fastened is calculated using the same method as F.10.3.2b Lid/Cover fastening (except that both tearout and pullout are evaluated).

Welded は溶接長さをEvidenceとして図示する事
Welded: The weld length MUST be shown as evidence.

Bondedは入力数値のEvidenceを添付のこと
Bonded: Evidence of the input values is required.

Continuous Layup はComposite専用
Continuous Layup is only for Composite