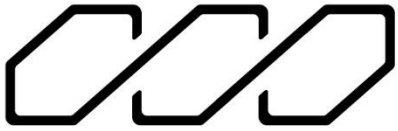

PODIUM

ADVANCED TECHNOLOGIES

Engine Structural Analysis Specification

Version 1

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Scope of the document

The aim of this document is to define the loading conditions, representative of track usage of the car, for which the engine strength has to be verified (Chapter 3).

Moreover, there are load cases for stiffness assessment for which minimum targets are defined (Chapter 4).

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1. Reference system and general indications

The loads specified in this document have to be applied at the tyre contact patch and wheel centre points (TCP_RL, TCP_RR, WC_RL, WC_RR).

The engine to be constrained on the monocoque mounting points (MM_1 to MM_6).

Rigid elements to be used to connect each of the wheel centre points and contact patch points (TCP_RL, TCP_RR, WC_RL, WC_RR) to each of the bell housing mounting points (BM_1 to BM_6).

All the nodes (constraining and not) should transmit translation but not rotation (hinges).

The design reference system is defined as:

- X = 0.0 at front wheel centreline, positive rearwards
- Y = 0.0 on car centreline, positive to right
- Z = 0.0 at chassis bottom surface on reference plane

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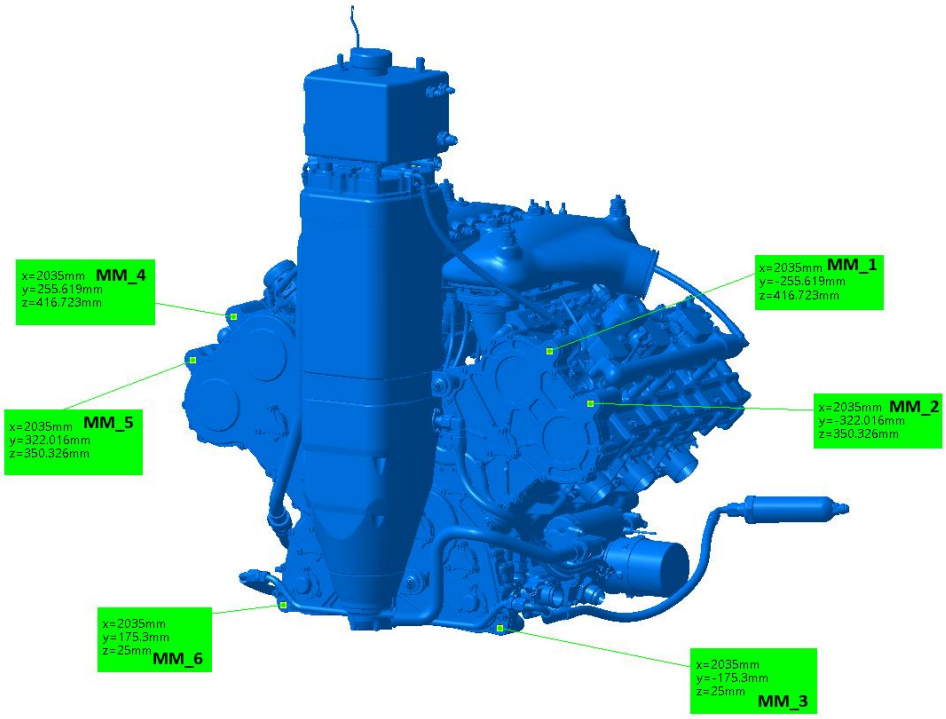
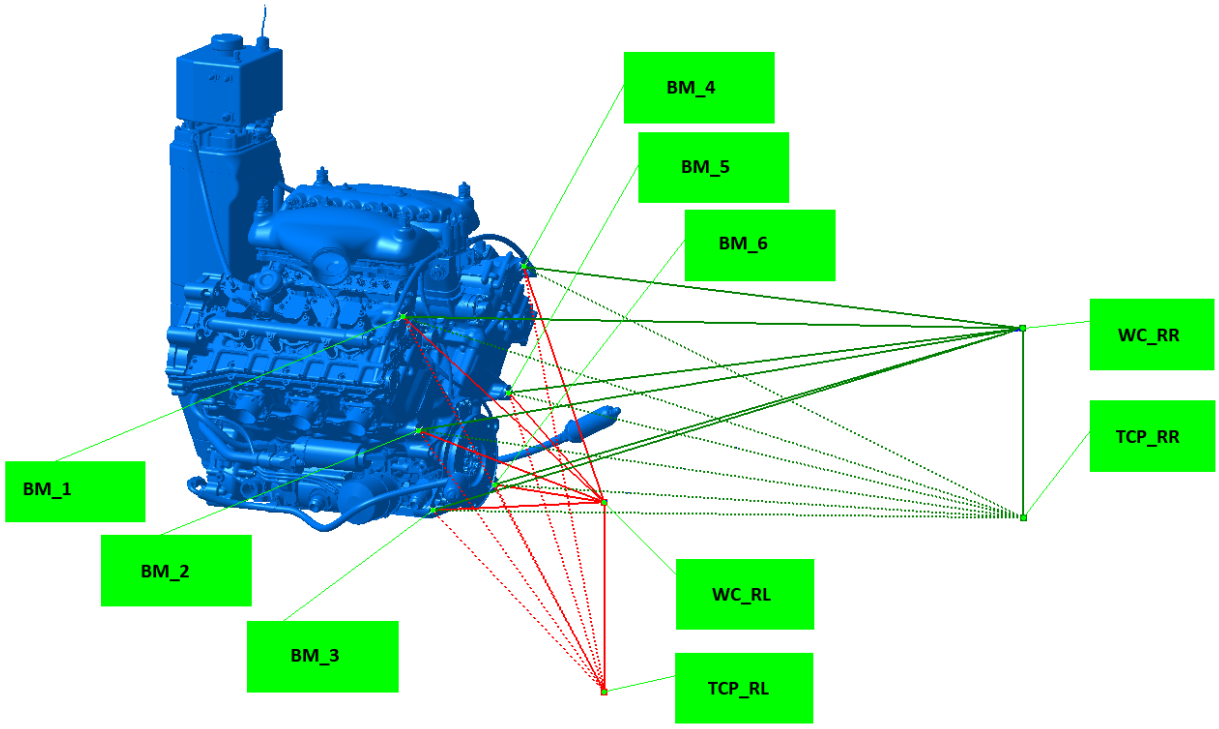
Sketches representative of the proposed constraint and load logic:

Monocoque mountings (constraints, MM_x points)



Bell housing mountings and rigid links to wheel centres and TCP (BM_x, WC_x, TCP_x points)



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Coordinates of indicated points are [mm]:

	x	y	z
TCP_RL	3140	-805.4	-90
TCP_RR	3140	805.4	-90
WC_RL	3140	-799.5	250
WC_RR	3140	799.5	250
MM_1	2035	-255.619	416.723
MM_2	2035	-322.016	350.326
MM_3	2035	-175.3	25
MM_4	2035	255.619	416.723
MM_5	2035	322.016	350.326
MM_6	2035	175.3	25
BM_1	2449.25	-232.072	404.207
BM_2	2449.25	-174	189.2
BM_3	2449.25	-120	35
BM_4	2449.25	232.072	404.207
BM_5	2449.25	174	189.2
BM_6	2449.25	120	35

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2. Structural Verification Loads

The following nodal force have to be applied to verify stresses on the engine, safety factors on the stress results from FEM simulations are left to the engine manufacturer experience / considerations.

	TCP_RL			*WC_RL*	*TCP_RR*			*WC_RR*
Force Direction	*x*	*y*	*z*	*x*	*x*	*y*	*z*	*x*
Brake	11138	0	7607	0	11138	0	7607	0
Bump (Parallel)	0	0	24762	-2481	0	0	24762	-2481
Single wheel bump	0	0	24762	-2481	0	0	0	0
Lateral	0	14180	13825	-2481	-2481	7635	7694	-2481
Lateral + Bump	0	11816	19967	-911	0	9090	14857	-911
Lateral + Brake	7649	11816	11600	0	7649	6363	6490	0
Rev. Brake + Bump	-7304	0	19730	0	-7304	0	19730	0
Acceleration	0	0	5988	-10901	0	0	5988	-10901
Acceleration + Bump	0	0	15254	-13498	0	0	15254	-13498

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3. Stiffness Load Cases

To verify the stiffness of the engine the three following load cases need to be considered:

Vertical Bending Stiffness

Target:	10kN/mm at rear axle
Loading method:	5kN (Z positive) applied to TCP_RL and TCP_RR
Measurement method:	Average of TCP_RL and TCP_RR total displacement < 1mm

Lateral Bending Stiffness

Target:	10kN/mm at rear axle
Loading method:	5kN (Z positive) applied to TCP_RL and TCP_RR
Measurement method:	Average of TCP_RL and TCP_RR total displacement < 1mm

Longitudinal Torsional Stiffness

Target:	60kNm/degree at rear axle
Loading method:	3.75kN (Z direction, opposite sign) applied to TCP_RL and TCP_RR
Measurement method:	Sum of absolute displacement of TCP_RL and TCP_RR < 2.8mm

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