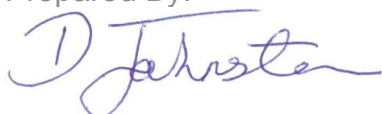


Test Report - Commercial in Confidence W0017 IWA14-1 2013 N3 Rapid Deployment Barrier

Test Laboratory HORIBA MIRA Ltd
Date of Report 24/04/2019
Client GDTech S.A
Test Item F18 Steel rapid deployment system
Date of Test 26/02/2019
Test Number W0017
Report Number IWA14-1 1219545-002-01
Test Type Vehicle Impact
Product Rating IWA 14-1:2013 Barrier V/7200[N3C]/48/90:29.1
Number of Pages 21

Prepared By:



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Approved By:



Rachael Kennedy
Head of HSPI Test Centre

Date: 24th April 2019



1105

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1 Introduction

1.1 Test laboratory

Name	HORIBA MIRA Limited
Address	Watling Street, Nuneaton, Warwickshire, CV10 0TU. United Kingdom
Telephone number	+44 (0)24 7635 5000
Facsimile number	+44 (0)24 7635 8000
Internet address	http://www.horiba-mira.com
Test site location	At above address.
Accrediting body	United Kingdom Accreditation Service 21-47 High Street, Feltham, Middlesex. TW13 4UN
Accreditation details	HORIBA MIRA is designated as UKAS testing laboratory 1105, with approval dated 31 July 1992, subsequently renewed periodically, for details of the latest approval, and schedule of accreditation see: http://www.ukas.org/testing/lab_detail.asp?lab_id=826

1.2 Product Manufacturer

Name	Pitagone SA/NV
Address	Paepsem Boulevard 16 1070 Brussels Belgium
Internet address / email	marcw@pitagone.com
Type	Barrier
Model No	F18

1.3 Client

Name	GDTech S.A
Address	7 Avenue De L'Expansion, Liège, 7 – B-4432
Internet address / email	joseph.marra@gdtech.eu
Additional information	Purchase order: PITAGONE/2019/002/BDC01
	Client Engineer: Joseph Marra

1.4 Test Area

The test was carried out on the Highway Safety & Protection of Infrastructure Test Area adjacent to the HORIBA MIRA Ltd Vehicle Proving Ground.

The test area was generally flat with a gradient not exceeding 2.5 %. It had a level hardened paved surface and was kept as clear of dust, debris, standing water, ice and snow at the time of the test, as was practicably possible.

Vehicle propulsion was by use of a computer controlled electric drum winch with guidance to the impact point by means of a tensioned wire system attached to the front wheel of the test vehicle. Both towing and guidance systems were detached approximately 3m prior to contact with the test article.

1.5 Test Procedure

Item	Requirement
Test Specification	IWA 14-1:2013
Target Speed (km/h)	48.0 +3.0 /-1.0
Target Impact Angle (deg)	90.0 ±2.0
Target test vehicle mass (kg)	7200 ±400
Product Classification	A-Foundation/Passive/Barrier
Target Impact Energy (kJ)	640.0

2 Test Set-up

2.1 Product Description

The tested item was a PITAGONE F18 steel rapid deployment barrier system manufactured and installed by Pitagone SA/NV.

This consisted of 8 x steel 'L' shaped barrier with square and round tube connectors set at the 250mm gap between barrier uprights. These were held in place with pins with retractable ball bearings on lanyards. On the lower front there was a crush tube with a spike inside and wheels on the lower part of the system for aiding with positioning or moving.



2.2 Foundation/Installation Description

The test items were placed on smooth level tarmac surface free of water with no pinning or connection to any other item.



2.3 Test Vehicle Description

Item	Information / Measurement
Vehicle Make and Model	DAF 55
Registration Mark and VIN	MX09FRO / XLRAE55GF0L352850
Engine	Diesel
Gearbox	Manual
Body Type	Flatbed
Delivery Mass (kg)	6466
Test Mass (kg)	7508
Delivery Mass (kg)	6466
Ballast (kg) – 1x concrete blocks, chains and ratchets	1010
Test Equipment (kg) – DTS, GPS, Remote Braking	50
Components Removed (kg) – Side underrun bar	18
Test Vehicle condition	Test vehicle acquired with valid current MOT certificate. The roadworthiness of the following items was checked prior to test: Tyres and wheels, Suspension, Wheel Alignment, Bodywork, Brakes and Chassis. The engine was running for the test.



3 Test Results

3.1 General

Item	Information / Measurement
Test Number	W0017
Test Date	26/02/2019
Impact Angle (deg)	89.6
Impact alignment (mm)	44 Left
Impacted height (mm)	675
Impact velocity (km/h)	47.8
Impact energy (kJ)	0.0
Vehicle penetration - dynamic (m)	29.1
Vehicle penetration - static (m)	29.1
Clear gap >1200mm at 600mm above ground?	Yes
Debris ejected?	19m, 1 unit
Vehicle disabled?	Yes

3.2 Test Sequence Description

The test vehicle centreline was aligned to the middle of the deployed units. Upon impact the units rotated forward with the rear lower spikes digging into the ground and the units coming into contact with the underside of the vehicle and engine. The front axle lifted off the ground and the units were pushed forward. As the units were pushed they became separated and rotated. The vehicle dropped back down onto the units which then came into contact with the prop shaft causing more damage to the test item and lifting the rear axle from the floor. The vehicle then slowed coming to a halt with 29.1m of penetration.



3.3 Ambient Conditions*

Item	Measure
Rainfall (mm)+	0.0
Temperature (°C)	12.0

+ From midnight to time of test

*Weather records are not UKAS accredited

3.4 System Damage Description

2 units remained trapped under the vehicle, 5 units were attached together 16m into the incident with the link bars twisted and some torn through the drilled pinning points. 1 unit was at 19m forward and 2.5 m to the left of target impact point. All of the units had suffered damage from the impact to varying degrees including all the positioning wheels which were all damaged, rear ground hooks were bent and powder coating damage with some twisting of the main structures.



3.5 Vehicle Damage Description

The front cosmetic panels suffered damage. As did the front bumper. Front driver side tyre was cut. The engine sump was torn open allowing engine oil to be distributed along the floor. The engine was still running and allowed for a follow on attempt which failed due to the 2 units underneath becoming entangled and causing the wheels to loose traction. The centre and rear prop shaft bearings were also damaged along with marking on the prop shaft itself. The Ad-Blue tank was torn from its mountings and the rear exhaust silencer was detached.



4 Conclusions

The Pitagone SA/NV F18 was assessed according to IWA 14-1:2013 and achieved the following classification:

Product Classification	A-Foundation/Passive/-/Barrier
Performance Rating	IWA 14-1:2013 Barrier V/7200[N3C]/48/90:29.1

5 General Comments and Disclaimers

The installation of the product was the responsibility of the product manufacturer or their representative.

The test results in this report relate only to the product tested.

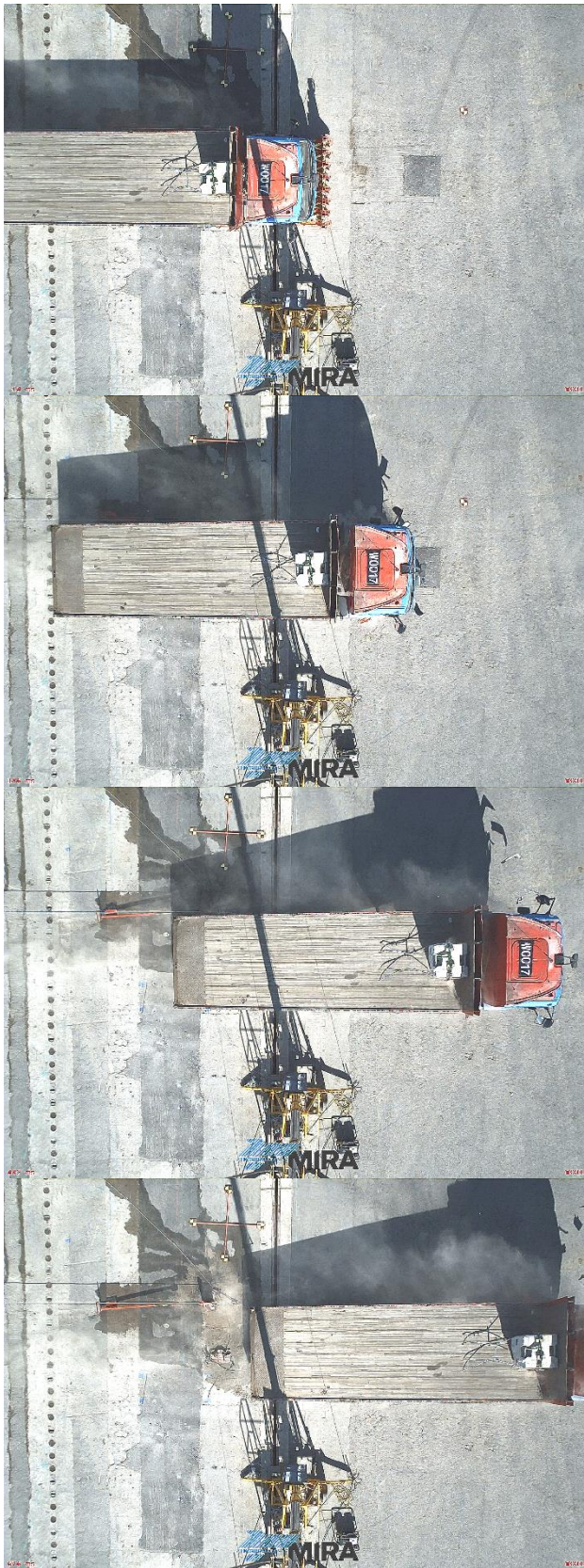
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Opinions, interpretations and meteorological information included in this report are not part of the UKAS accreditation and are marked thus *.

6 Side Views from High Speed Videos



7 Overhead Views from High Speed Videos



8 Post Impact Product and Vehicle Images



Appendix 1 Executive Summary

Manufacturer Details

Company Name	Pitagone SA/NV
Company Address	Paepsem Boulevard 16 1070 Brussels Belgium
Contact Name	Marc Weissberg
Contact Email	marcw@pitagone.com

Test Item Details

Item Reference	PITAGONE F18
Item Description	Steel rapid deployment system x8
Thickness (mm)	1030 (front tip to rear spike)
Width (mm)	4248 (All 8 Units)
Height (mm)	1000
Foundation type	Surface mount
Installation Date	26/02/2019
Concrete strength	n/a

Test Parameters

	Requirement	Measured Value
Test Vehicle category	N3C	N3C
Test Mass (kg)	7200 ±400	7508
Impact Speed (km/h)	48 +3/-1	47.8
Impact Angle (deg)	90 ±2	89.6
Alignment (mm)	0 ±300	44 Left
Vehicle penetration – dynamic (m)	-	29.1
Vehicle penetration – static (m)	-	29.1
Major Debris ejection distance (m)	-	19.0
Vehicle disabled?	-	Yes
Follow-on vehicle encroachment possible?	-	No
Follow-on pedestrian encroachment possible?	-	Not assessed

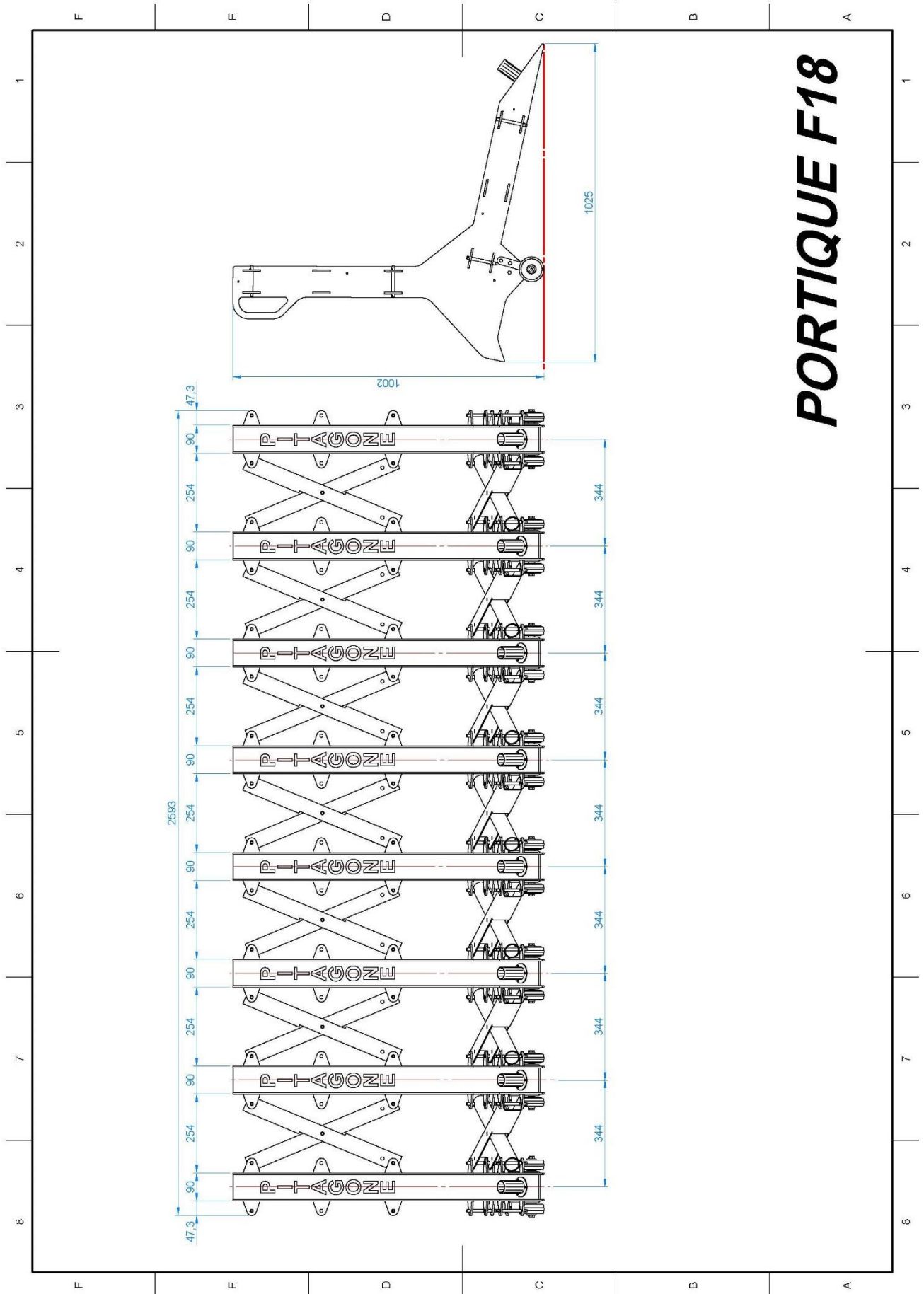
Performance Classification – Vehicle Impact

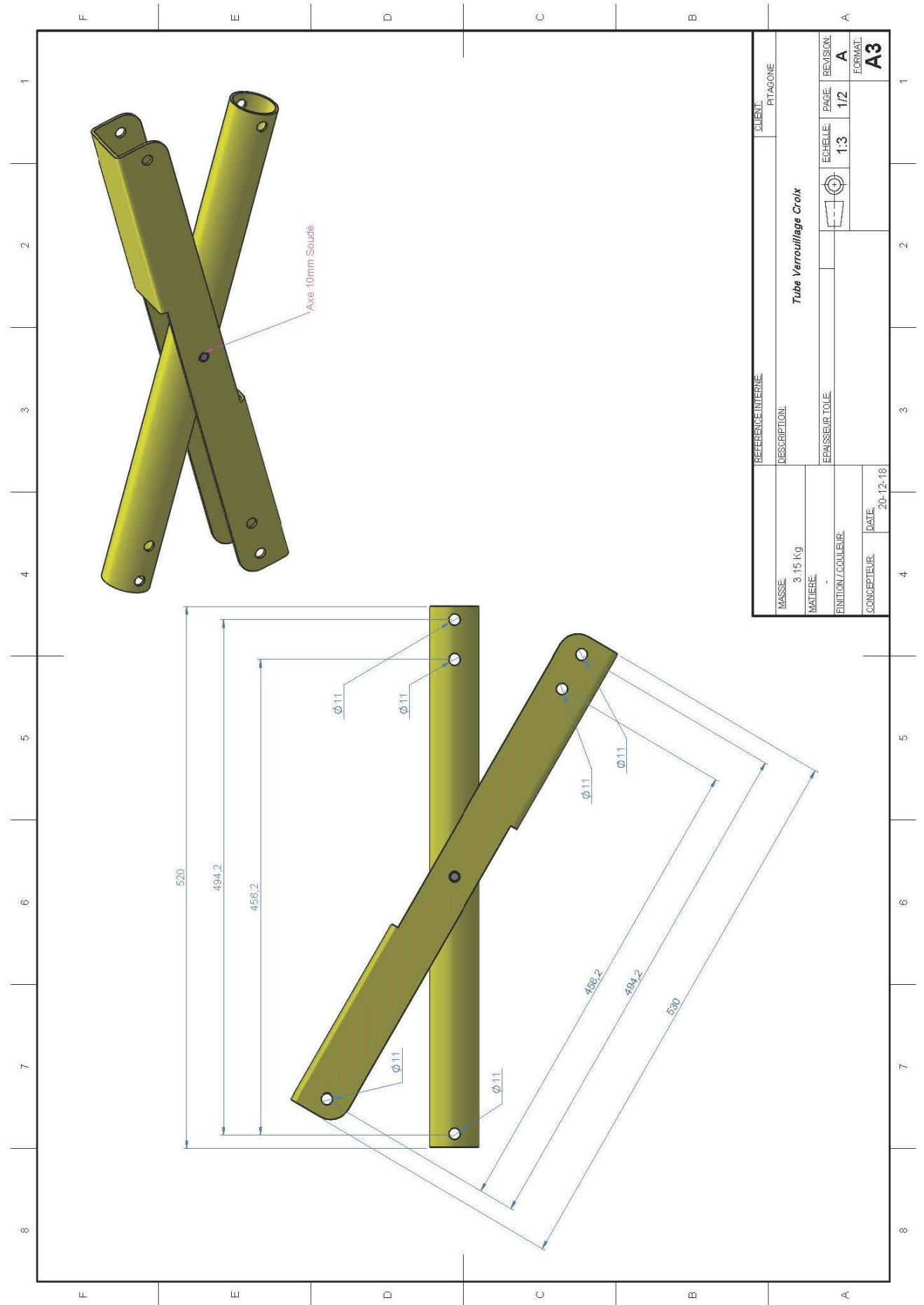
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Product Classification	A-Foundation/Passive/Barrier

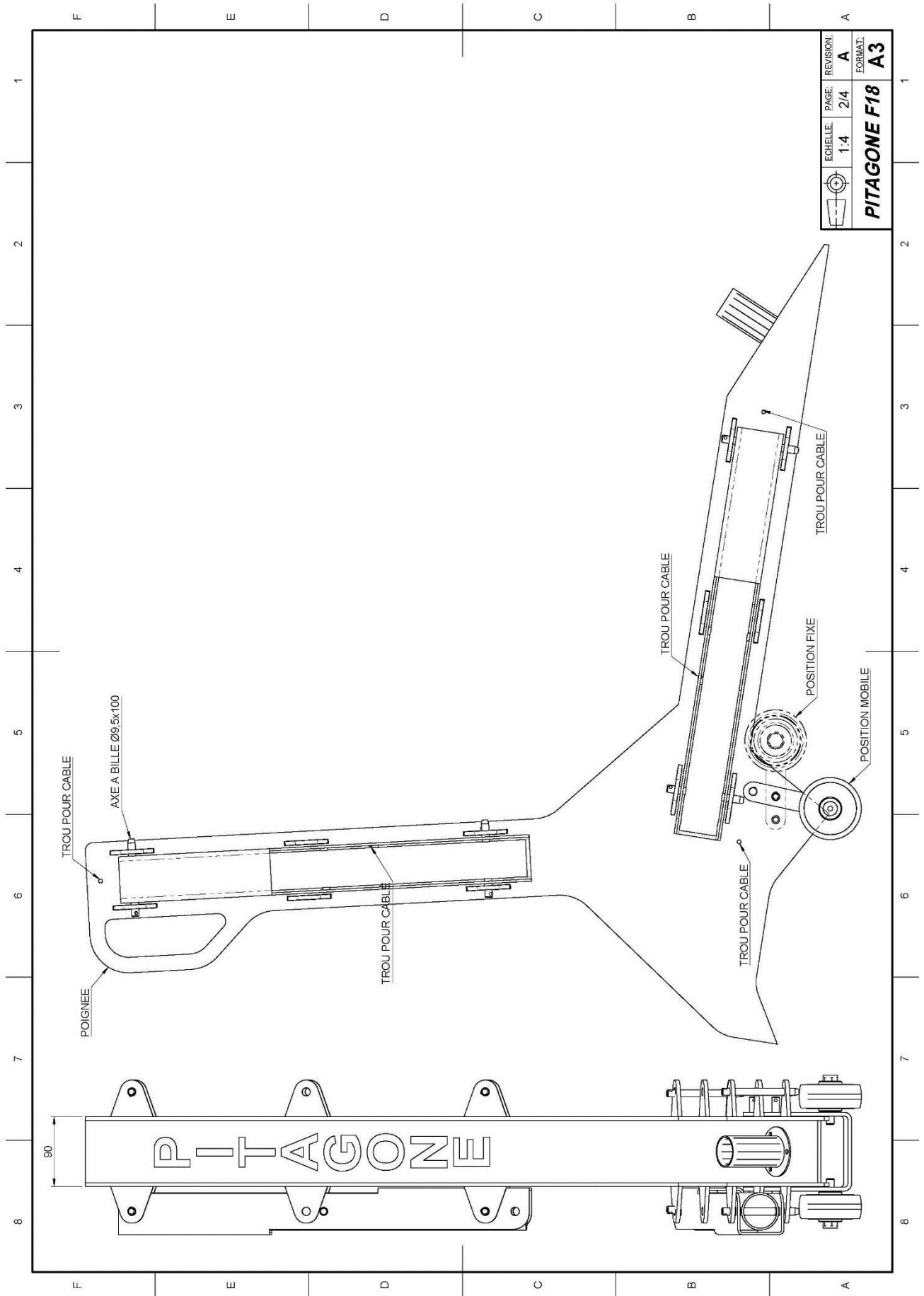
Appendix 2 Product Drawings and Details

No. ARTICLE	NUMERO DE PIECE	Quantité
1	Pièds Portique AC 18T - V2	1
2	Tube Verrouillage Croix	2
3	ASM Roules	1
4	AXE 9.5mm - 146mm - A BILLE	2
5	AXE 9.5mm - 100mm - A BILLE	8
6	TUBE PROTECTION POINTE	1

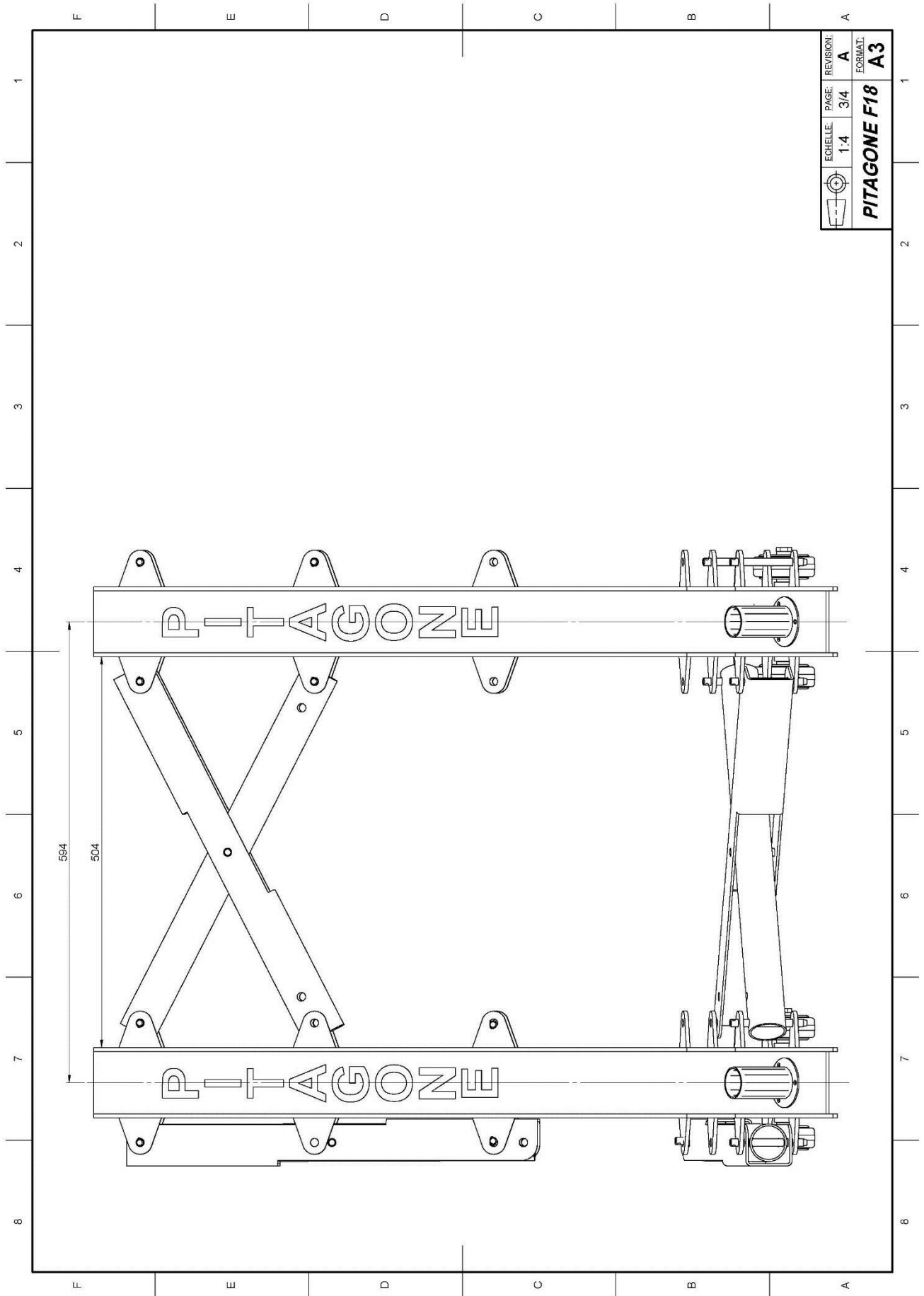
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Demandé Par			
CLIENT: PITAGONE			
PITAGONE F18			
REFERENCE INTERNE:			
DESCRIPTION:			
MASSE: 36.98 Kg		EPAISSEUR TOLE: -mm	
MATIERE:		FINITION / COULEUR:	
CONCEPTEUR: GGH		DATE: 20-12-18	
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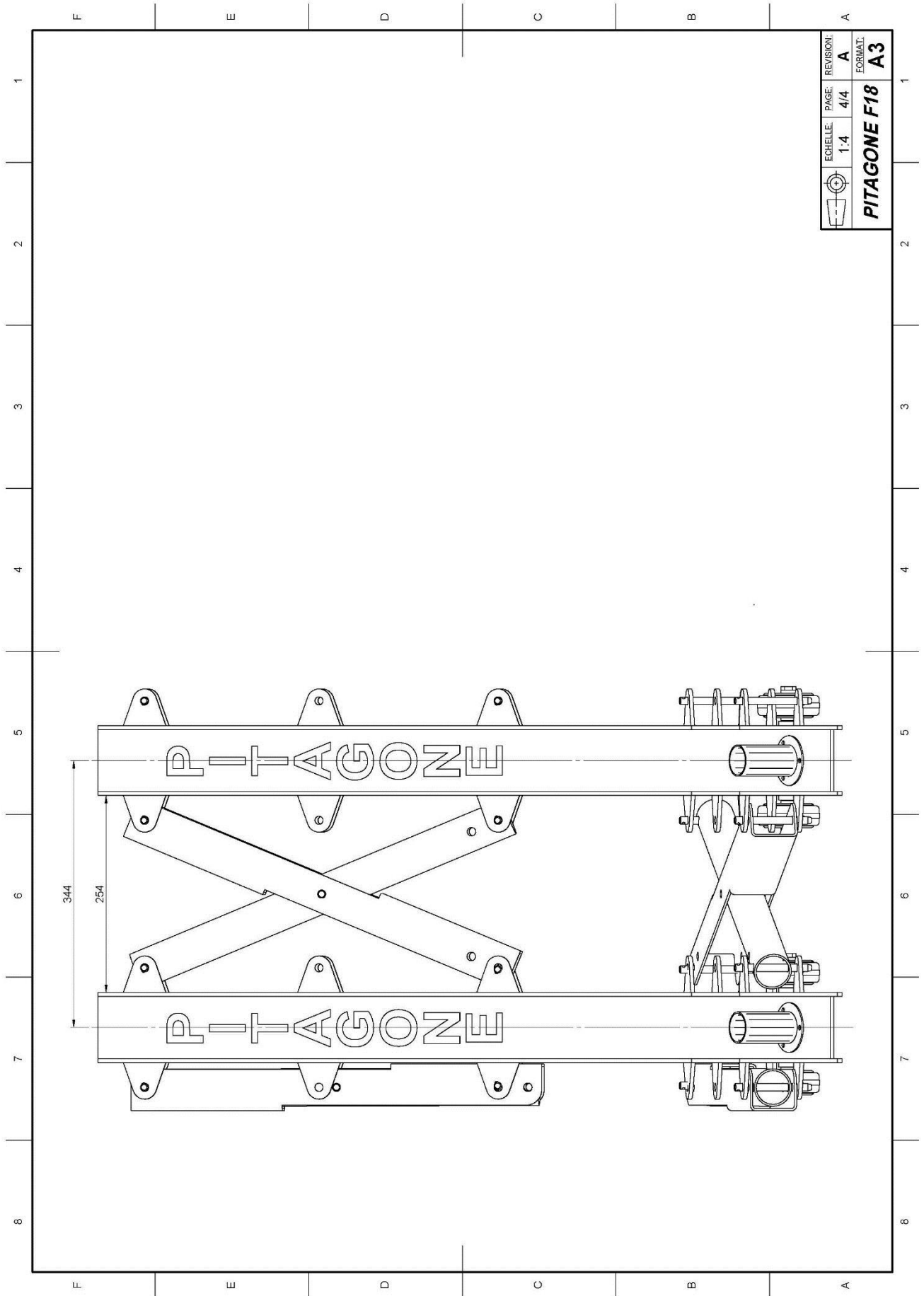




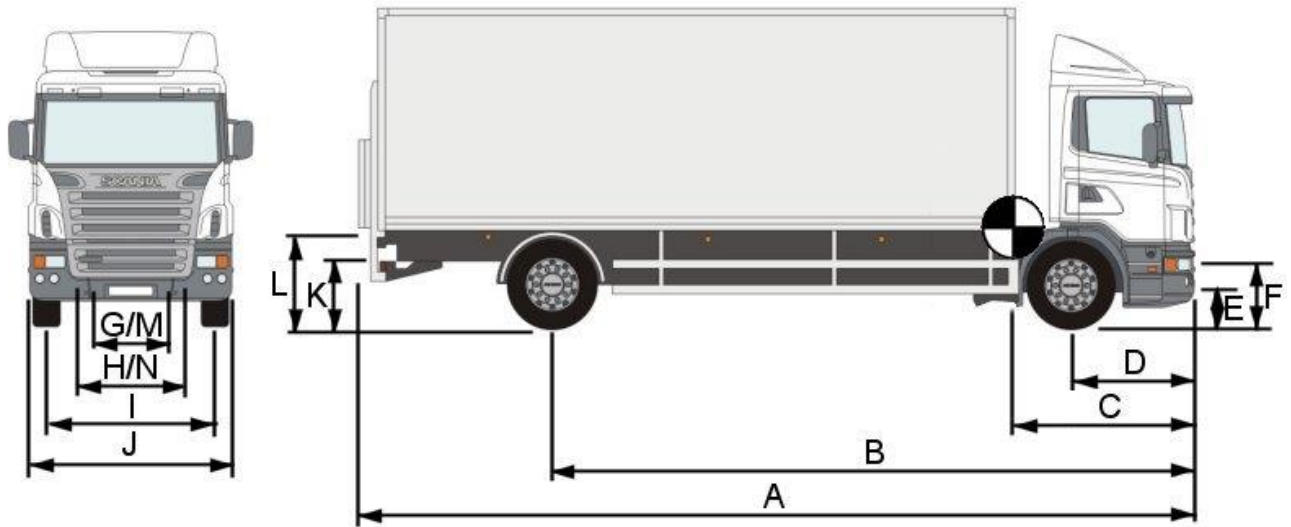


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Appendix 3 Test Vehicle Details



Test Vehicle Details	
Vehicle classification	N3C
Vehicle Registration No.	MX09FRO
Vehicle Identity No (VIN)	XLRAE55GF0L352850
Unladen Mass (kg)	6466
Test Inertial Mass (kg)	7508
Net Ballast Mass (kg)	1042
Number of axles x driven axle	2 x 1
Tyre Size	295/80/R22.5

Test Vehicle Measurements					
A	Vehicle Length	9727	H	Distance between outside edges of chassis rail at front	807
B	Vehicle front to rearmost axle	6783	I	Front track width (tyre centres)	2008
C	Vehicle front to datum point	1928	J	Vehicle width	2563
D	Vehicle front to front axle	1378	K	Height from ground level to bottom of chassis rear	795
E	Height from ground level to bottom of chassis front	778	L	Height from ground level to top of chassis rear	1074
F	Height from ground level to top of chassis front	1051	M	Distance between inside edges of chassis rails at rear	640
G	Distance between inside edges of chassis rails at front	635	N	Distance between outside edges of chassis rails at rear	809

Appendix 4 Calibration Information

Other Tools

Item	QA No	Used for Measuring	Cal Due Date
Scales (LHF)	32098	Vehicle mass	09/10/2019
Scales (RHF)	32099	Vehicle mass	09/10/2019
Scales (LHR)	32098	Vehicle mass	09/10/2019
Scales (RHR)	32099	Vehicle mass	09/10/2019
Tape Measure	41047	Vehicle	25/01/2020
Inclinometer	39700	General angles	10/03/2020
VBox GPS	36509	Impact Speed and Angle	09/10/2019

High Speed Cameras

Position	Camera QA No	Cal Due Date	Lens Type	Image Rate (pps)	X (m) to impact	Y (m) to impact	Z (m) to impact
OH Standard	41526	23/03/19	12	500	0	0	12.4
OH Close	41527	23/03/19	16	500	0	0	12.4
Side on RH	41524	23/03/19	35	500	0	-30	1.4
Downstream	41528	23/03/19	300	500	76	0	1.4
Oblique	41523	23/03/19	35	500	11	13	1.4

Appendix 5 Revision History

Report Number	Date	Comments	Sections Affected
IWA14-1 1219545-002-01	24/04/2019	First Issue	n/a