Standard for Monolithic Musoir

NO: T.E.L. - 604 - Rev 2-15.

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STANDARD FOR MONOLITHIC MUSOIR
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1.0 SCOPE

This standard specifies the requirements for a thermoplastic Monolithic Musoir for use on National Roads and Motorways, including their fixing. This standard applies to Monolithic Musoirs that are open and not subject to any over pressure and having a height between 1m and 1.7m.

It covers performance requirements and test methods, colorimetric and retro-reflective properties and are specified taking into account International Commission on Illumination (CIE) recommendations.

The purpose of the standard is to define the material used, requirements, tests, type tests and production quality control tests.
Provision is made for safety in use, including vehicle impact.
Trans-illumination products are not covered in this standard.
Companies manufacturing to the standard must be certified to I.S. EN 9001:2008 or equivalent.

2.0 NORMATIVE REFERENCE

This standard incorporates by dated or undated reference from other publications. These 'normative' references subsequent amendments to, or revisions of, any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated reference the latest edition of the publication referred to applies.

ISO 1133 - 1981	Plastics Determination of the Melt Flow Rate of Thermoplastics.
ISO 1183	Plastics: Method of determining density.
I.S. EN 527 - 1995	Determination of Tensile Properties.
I.S. EN 12899- 3: 2007	Fixed Vertical Road Traffic Signs 3; Delineator Post & Retro-reflectors.
I.S. EN 12899-1: 2007	Fixed Vertical Road Traffic Signs 1; Fixed Signs
ISO 175	Plastics: Determination of the effects of liquid chemicals, including water.
ISO 1872 – 1986	Plastics: Test specimen preparation.
EN 45020	General terms and their definition concerning standardisation and related activities.
EN ISO 877: 1996	Plastics- Method of exposure to direct weathering, to weathering using glass-filtered daylight, and to intensified weathering by daylight using Fresnel mirrors (ISO 877-1994).
ISO 1461	Hot Dipped Galvanising
I.S. EN 12767: 2007	Passive Safety of Support Structures for Road Equipment- Requirements, Classification and Test methods.
EN 45020	General terms and their definitions concerning standardization and related activities

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3.0 DEFINITION

A Monolithic Musoir; is a bollard device for signalling divergent roads that are specifically designed to improve traffic safety. Musoir Poles are dealt with under different standards. A Road Marking Monolithic Musoir that retains its design shape for the purpose of directing and /or guiding road traffic when erected, without any external support other than base fixing detail. Having reflective panels as specified in National Standards.

4.0 DESIGN REQUIREMENTS

4.1 The Product must imperatively;

- Be clearly seen and identified by road users either by day or by night,
- Identify precisely the area of divergence,
- Be capable of staying in place,
- Be easy to install and quickly replaceable,
- Not be deemed in themselves to be dangerous obstacles.

4.2 Height;

The Monolithic Musoirs are available individually to be positioned on a divergent chevron at junction intersections of various designs. The product should be capable of being placed in a variety of locations, on motorways (blue) and on national routes (green). The design should be such, that when placed they should give guidance and direction at the road divergence.

4.3 Cross Section;

There are two sizes, large and small. The cross section of the units should be a maximum as per Annexe A & B, and of such a design so as to facilitate the placing of reflective markings. Its design should be of semi circular shape so as to give adequate surface facing to on coming vehicles to enable safe directing of traffic. The design should be such, so as to cater for national wind and temperature conditions as shown below.

4.4 Sizes;

Two sizes are available as shown in

- Annexe A Smaller Model
- Annexe B Larger Model

4.5 Thickness;

The units should be manufactured to give a minimum wall thickness of 5mm and a maximum thickness of 8mm +/- 10% tolerance. Only virgin material should be used. The product should however be fully recyclable and the supplier should offer a “take back” recycling service.

4.6 Base fixing;

The fixing detail should be of such design so as to allow for rapid replacement of damaged units. The Monolithic Musoir / Bollards to signal road divergence shall be fixed in position by fixing to the ground with anchor bolts and or clamps.

4.7 Unit design;

The base positioning / fixing of the Musoir should be of such design so as to facilitate the shearing off, of the fixings at the base of the unit upon impact or the release of the unit from the clamping arrangement upon impact. This shall occur when tested to I.S. EN 12767; 2007.

4.8 Musoir fixed to the ground;

The number of fixing points is left to the manufacturer's discretion. To ensure proper contact with the ground, any metal parts should not protrude more than 0.06m from the ground. Musoirs should have outlets included to ensure that rain water can be evacuated.

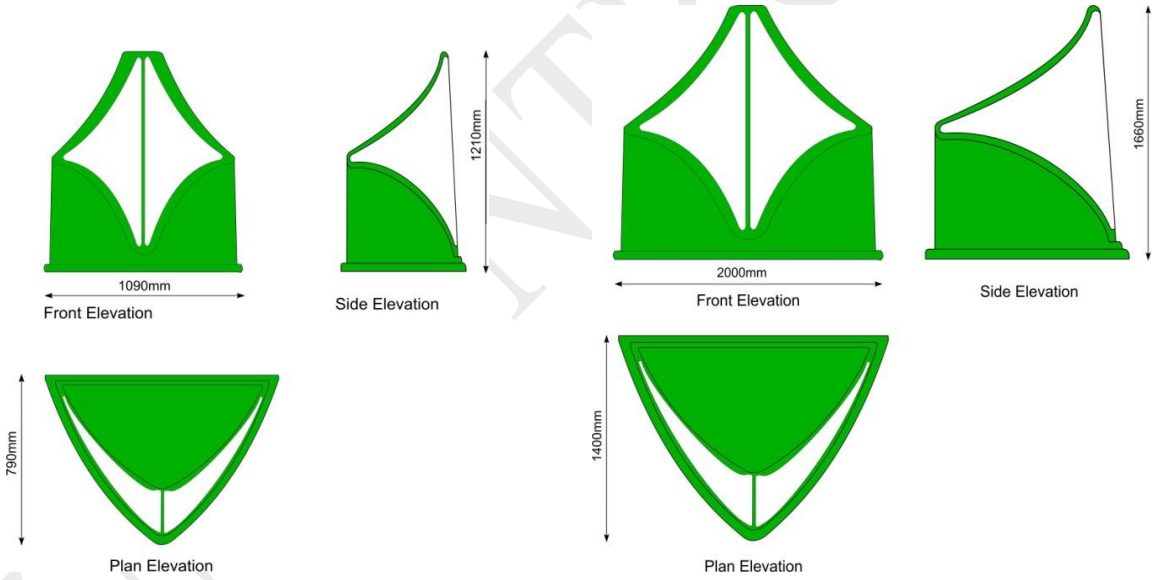
4.9 Reflective Material;

The white sticker material should be retro-reflective. The retro-reflective stickers with white half diamond shapes should be class 2 or as defined by the Roads Engineer and in accordance with EN 12899-1:2007.

The self adhesive coverings should be applied uniquely to the front part of the Musoir; they should be completely attached to the product.

4.10 Reflective Material Pattern

The front face of the Musoir shall have a graphic detail half diamond in shape, white in colour on blue or green background. There is an option to vary this shape slightly to make it more aesthetically pleasing, for example as shown here;



5.0 MATERIAL PROPERTIES:

5.1 Density - (Raw materials)

The use of regrind material shall not be permitted.
The use of reground material shall not be permitted.
Determined in accordance with ISO 1183 method A or D. A single resin polymer shall have a density not less than 890kg/m³ and not greater than 940kg/ m³.

5.2 Melt Flow Rate - (Raw materials)

The melt flow rate, (measured in accordance with ISO 1133 Section 4), must be a maximum of 10g/ 10min and a minimum 3g/ 10min.

5.3 Weather Resistance

The material used in the manufacture of the body shall be ultra violet light stabilised to a minimum of UV 8 and the material should be certified to have a colour fastness on the "Blue Wool Scale" of not less than 6. A 3,000 hour weathering test shall be completed on the material and shall be carried out on a prepared sample of the rotationally moulded material. The outer surface should be exposed to UV radiation in accordance with EN ISO 4892-1 and EN ISO 4892-2.

The relative change in tensile elongation shall be less than 50%.
The colour fastness shall not have significantly deteriorated.

Table 1 — Material requirements

Material type	Property	Requirement	
Rotationally moulded polyethylene	Density[a]	A single polymer resin shall have a density not less than 934 kg/m^3.	
	Melt flow rate[b]	Shall be 4,0 g/10 min ± 3,0 g/10 min at 190ºC, 2,16 kg. Maximum variation of the melt flow rate of moulded products shall not be greater than 20 % of the value determined on the raw material.	
	Tensile[c]	Tensile strength at yield shall not be less than 15 MPa. Elongation at yield shall not be more than 25 %. The elongation at break shall not be less than 200 %.	
	Resistance to weathering	Initial Tensile Elongation shall be 912(+/-148) % Final Tensile Elongation after 9.3 GJ/m.sq (3000 hours)(%) UV Exposure time	

6.0 Monolithic Musoir Design Properties

6.1 Height and Tolerance

(a) When measured, the ambient temperature shall be 15ºC ± 5ºC. The height of each unit shall measure from the top of the base fixing point to the upper top point of the unit to an accuracy of ± 10%.
(b) The system should include units of various designs see Annexe A & B. Additional sizes may also be provided if approved by Road Design Engineer.

6.2 Visual inspection

On visual inspection of the Musoir there should be no bubbles, blisters, or other defects that could cause a hole or fracture, the product should be ascetically pleasing and free from warping.

6.3 Weight

The maximum weight of any Musoir, measured with any attachments, shall not be more than 50kg. Tolerance in these weights shall be +10%.

6.4 Wall thickness

The minimum wall thickness on any point of the sides or base shall not be less than 5mm. +/-10% is permitted.

6.5 Colour

The Colour of the unit shall be in accordance with EN 12899-1;
Blue; RAL 5019 or British Standard 381C No. 109 (Middle Blue) for Motorway use, or Blue; RAL 5009
Green; RAL 6003 or British Standard 381C No. 225 (Light Brunswick Green) for National Roads, or Green; RAL 6001
"Colours from BS381C are given for comparative purpose only. In practice, the colour of all signs will comply with chromaticity requirements of BS873 Parts 6 and EN 12899-1" or may be as dictated by National Authority preference, in area of installation.

6.6 Fixings;

All above ground or exposed fixings shall be galvanised in accordance ISO 1461 and have no sharp edges. Manufactured from steel to BS.1387 with a minimum wall thickness of min 3mm. and a tolerance of +/- 5%.

7.0 MONOLITHIC MUSOIR TESTING:

The Musoir, complete with all its base framework and fixings shall be subject to a series of impact and load tests as follows:

7.1 Impact Test & Classification ;

The Product shall be tested in accordance with EN12767:2007 as applicable.

7.2 Impact Test Positioning;

(a) The Musoir shall be fixed to the ground in accordance with manufactures instructions.
(b) The Musoir shall be erected in the vertical position or if designed otherwise in accordance with the design criteria.
(c) The test position shall be on a level surface with adequate surface to simulate Motorway or National Road conditions.
(d) The Test shall be carried out on each size of Monolithic Musoir Design
(e) Result: results shall be recorded by means of video and photographic evidence and shall be certified by a Director of the Manufacturing Company and an independent external certification body as having passed the tests.

7.3 Test frequency

(i) Dimension Measurement is a type test and shall be completed prior to certification, once off, ref. 4.2 and 6.1.

(ii) Weight: The weight of the Musoir as defined in 6.3 shall be tested every 3 months from samples randomly picked from production.

(iii) Impact Test. This is a design type test and shall be completed once before certification. Should the design of the Musoir change in any way this test must again be repeated

(iv) Visual inspection: Every product

(v) Wall thickness: From production, once every 3 months on sample of each size unit.

7.4 Wind load Test.

The highest Musoir in a "family" shall be subjected to a wind test.
The Musoir should be able to resist the force required to withstand wind pressure of (90+/-5) daPa (which corresponds to a speed of about 137km/hr). See Fig.1

The test is carried out, at a temperature of (15°C +/-5) on the largest traffic facing surface of the highest Musoir. Force is applied, by way of 2 daN, with the centre of gravity of the pressure forces mid point and at the top point of the Musoir i.e. applied at the centre point of the longest side, and extremity height.

The deflection at the highest most extremity of the product should less than 10mm. The deflection of the Musoir at the centre point when loaded shall be less than 2mm.

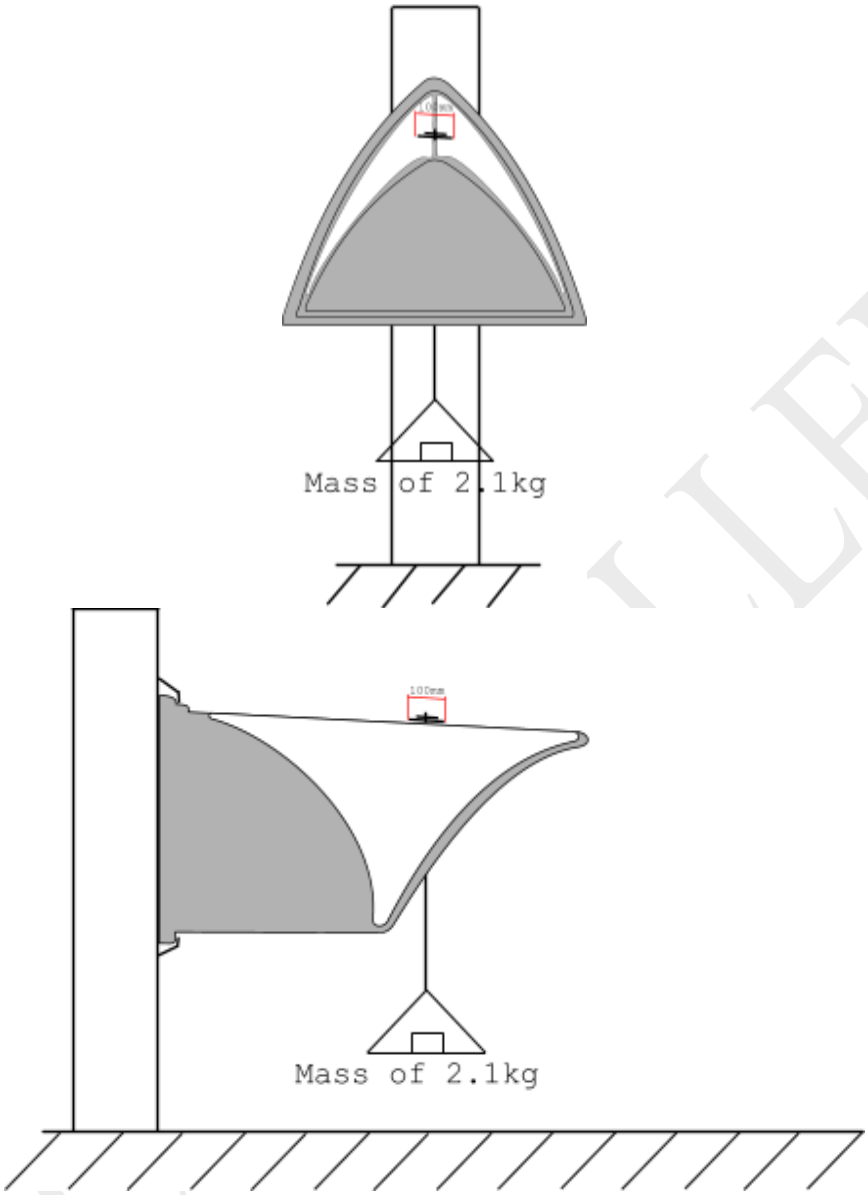


Fig. 1 Wind Load Test

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8.0 FINISH OF METAL PARTS

All metal parts shall be protected as follows.

Nut /Bolt fixings; shall be Galvanised or Stainless Steel.

Clamps; shall be Galvanised or Stainless Steel

9.0 MARKINGS:

The following information should be marked on each Musoir:

- Height;
- Year of Manufacture;
- Standard to which manufactured to;
- Name and contact details of manufacturer;
-

9.1 CE Marking

The manufacturer or their authorised representative established within the EEA is responsible for the affixing of the CE marking.

The CE marking shall appear on the product or on an attached durable label. Additionally, the CE marking (in accordance with Directive 93/68/EEC) and the following information shall appear on the packaging and/or shall be shown on the accompanying commercial documents:

- The identification number of the notified body (if relevant)
- the name or identifying mark of the producer supplier
- the last two digits of the year in which the marking was affixed
- the appropriate number of the certificate of conformity (if relevant)
- the number of this standard
- the product name and type of Product
- information on the relevant essential characteristics

Fig. 2 Example CE marking information for Monolithic Musoir

Fig. 2 gives an example of the information to be given on the packaging and/or on the accompanying commercial documents for the Musoir.

10.0 PRODUCTION AND QUALITY CONTROL

The tests described in section 7 of this standard should be carried out at the frequency indicated above during production with quality control, and other records maintained within a quality system. This system should be audited and certified by a Certified External Authority in accordance with CEN regulator EN 45020.

11.0 HANDLING AND USE

The manufacturer should supply instructions for the handling and installation of the Monolithic Musoir.

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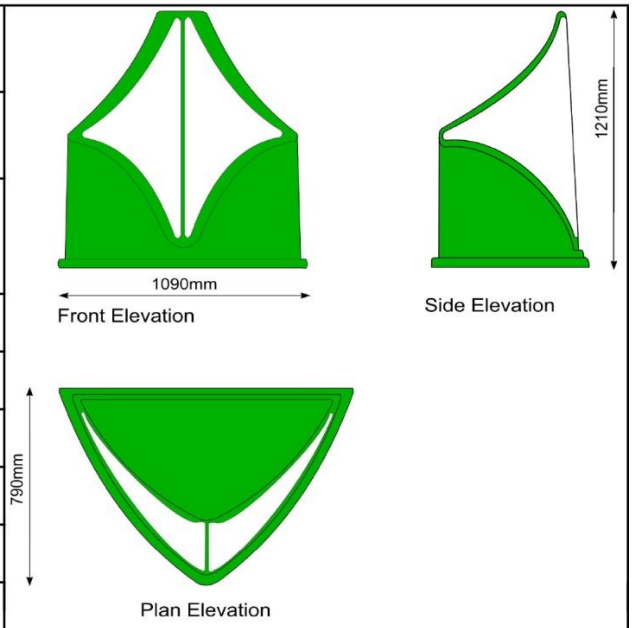
ANNEXE A
TECHNICAL SHEET FOR SMALL MUSOIR ROAD DIVIDER

Section 1: Manufacturers Details

Manufacturer	Sturdy Products Ltd.
Address	Blessington Industrial Estate Blessington Co. Wicklow Ireland
Telephone	00353 (0)45 865044

Section 2: Product Characteristics

Description	The Musoir Divider is designed to divert/direct traffic flow		
Fixing	Fixed to ground using clamps and bolts.		
Optional Extra Anchoring	Sand Filling: 100kg (4 x 25kg Bags) Water Filling: 100lt up to overflow hole		
Type	Mould		
Shell	Medium Density Polyethylene		
Reflection Type	Non Reflecting (*see below for film)		
Dimensions	**Height**	1210mm	47.5"
	Width	1090mm	43"
	Depth	790mm	31"
Weight	20kg (110.2lbs)		
Reflective Film	Avery T6100 (self adhesive)		



Section 3: Product Benefits

Product is available in two standard colours, Green or Blue. It is manufactured from UV stabilised MDPE which means the colour will not fade over time. It has excellent resistance to weather and temperature changes. The Musoir Dividers clearly indicate road divisions to oncoming motorists.

Section 4: Suggested Uses

Slip Road Entrance from Motorways & National Roads, Road Divisions, Toll Road Booths, Ferry Entrance Car Parks, Airports, etc.

Disclaimer of Liability

The information contained herein is based on manufacturers data. However, the information is provided without any warranty, expressed or implied. The conditions or method of handling, storage, use and disposal of this product are beyond our control. Therefore, we expressly disclaim any liability for loss or damage, whether direct, incidental or consequential, expressed or implied, for loss, product damage or expense arising out of handling, storage, use and disposal of this product.

CD 50/Design 30.03.2009/General/Musoir Spec Sheet (Small)

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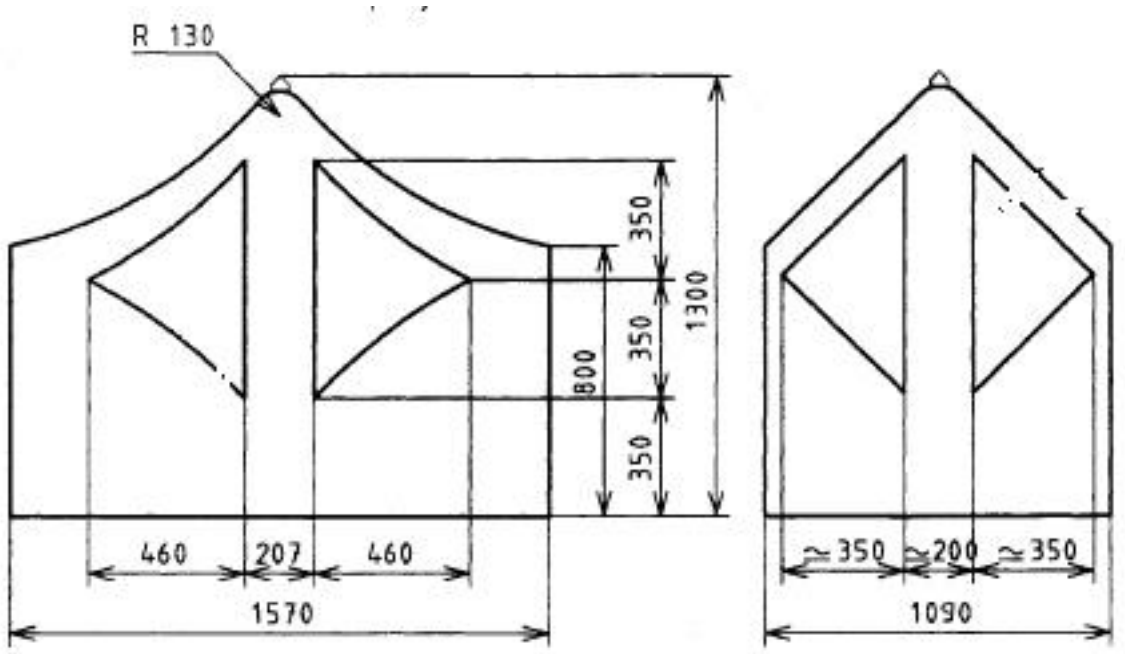

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ANNEXE B

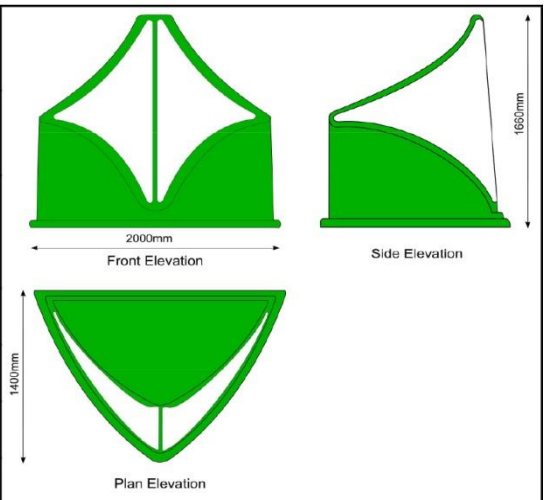
TECHNICAL SHEET FOR LARGE MUSOIR ROAD DIVIDER

Section 1: Manufacturers Details

Manufacturer	Sturdy Products Ltd.
Address	Blessington Industrial Estate Blessington Co. Wicklow Ireland
Telephone	00353 (0)45 865044

Section 2: Product Characteristics

Description	The Musoir Divider is designed to divert/direct traffic flow.		
Fixing	Fixed to ground using clamps and bolts.		
Optional Extra Anchoring	Sand Filling: 600kg (24 x 25kg Bags) Water Filling: 600lt up to overflow hole		
Type	Mould		
Shell	Medium Density Polyethylene		
Reflection Type	Non Reflecting (*see below for film)		
Dimensions	**Height**	1660mm	65.5"
	Width	2000mm	78.75"
	Depth	1400mm	55"
Weight	50kg (110.2lbs)		
Reflective Film	Avery T6100 (self adhesive)		



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