Standard for Musoir Poles

NO: T.E.L. - 606 - Rev 2-15.

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1. SCOPE

This standard specifies the requirements for thermoplastic Musoir Road Poles for use on National Roads and Motorways, including their fixing. This standard applies to Musoir Poles that are open and not subject to any over pressure and having a height between 0.75m and 3.0m.

It covers Performance Requirements, Test Methods, Colorimetric and Retroreflective properties, taking into account International Commission on Illumination (CIE) recommendations and applicable EN Standards.

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-illuminated products are not covered in this standard.

Companies manufacturing to the standard must be certified to I.S. EN 9001:2008 or equivalent.

2. 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 & Retroreflectors.
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 287-1	Welding.
EN 45020	General terms and their definitions concerning standardization and related activities.

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3. DEFINITION

Musoir Road Pole; Vane devices for signalling divergent roads that are specifically designed to improve traffic safety. Monolithic Musoirs / Bollards are dealt with under different standards.

A Road Marking Pole 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. 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 a dangerous obstacle.

4.2. Height;

The Musoir Poles should be available individually or as part of a set capable of forming a chevron suitable for junction intersections of various designs. The system should be capable of erection in a variety of configurations, including make up of 6; 8; 10 or 12 units/ poles. The design should be such, that when erected they should create an increasing chevron away from introduction nose, and should be decreasing in height in equal steps away from the lead pair of poles.

4.3. Cross Section;

The cross section of the unit should be a maximum of 400mm tolerance +/- 5% and minimum of 300mm +/- 5%, and of such a design so as to facilitate the placing of reflective markings. Its design should be of oval shape so as to give adequate surface facing oncoming 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;

Three sizes are available as shown in

- Annexe A Smaller Model
- Annexe B Normal Model
- Annexe C 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 base fixing detail should be of such design so as to allow for rapid replacement of damaged units. It should incorporate facility to enable fixing and adjusting of the pole in the vertical position. The fixing detail should incorporate external fixings to ensure that misalignment will not occur after erection.

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4.7. Adjustment;

The design of the system should be such, that it allows adjustments to be available with regard to junction layout. The configuration of the size and angle of the chevron should not inhibit in any way the functionality of the system. Each location layout should be specified by the road design engineer or delegate.

4.8. Receptacle design;

The base receptacle design should be of such design so as to accommodate it's fixing in the ground by placing it in a concrete surround, and be of adequate design to give stability in all national wind conditions. The base foundation should be of adequate design to pass impacting testing as set out below. No Fixings shall protrude more than 0.60m from the ground.

4.9. Unit design;

The base of the pole should be of such design so as to facilitate the shearing off, of the pole at the base of the unit upon impact. This shall occur as per the test below, unless a flexible material is used as per 5.1 (b) below. In such a case the unit shall fold under the vehicle upon impact and or tear off at base.

4.10. Method of fixing;

The Poles should be fixed to the ground by means of weakened foot/base section of the same material as the pole. These are either directly moulded into the pole or fixed to the pole with the aid of non metallic bolts.
Gluing of these feet to the pole is strictly forbidden.

4.11. Reflective Material;

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

The self adhesive coverings are applied uniquely to the front part of the poles; they should be completely attached to the pole.

4.12. Reflective material Pattern;

The front face has a graphic detail should be white in colour on blue or green background, there is an option to choose from 4 design patterns. This will be decided by National Standards Authority or by the Road Design Engineer in the installation area.

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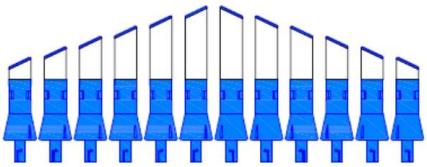
OPTION 1



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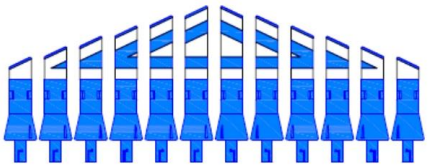

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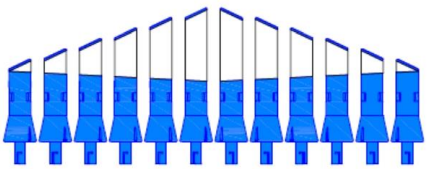

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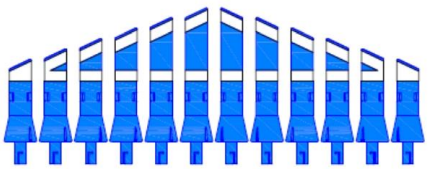

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5. MATERIAL PROPERTIES:

5.1. Density - (Raw materials)

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	

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5.4. Steel Base Receptacle

Manufactured from steel to BS.1387 with a minimum wall thickness of min 3mm. and a tolerance of +/- 5%.

All fabrication of steel components to be completed by certified welder in accordance with EN 287-1.

6. MUSOIR POLES 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 heights reducing in equal steps, and conform to Annexe A - C. Additional sizes may be provided.

6.2. Visual inspection

On visual inspection of the Musoir Pole 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 pole, measured with any attachments, shall not be more than 20kg. Tolerance in these weights shall be +20%.

6.4. Wall thickness

The minimum wall thickness on any point of the sides or base shall not be less than 5mm. A margin of 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.

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7. MUSOIR ROAD POLES TESTING:

7.1. Impact Test & Classification;
The Product shall be tested in accordance with EN12767:2007 as applicable.

7.2. Impact Test Positioning;
(a) The Base receptacle shall be fixed in the ground in accordance with manufactures instructions and allowed cure to obtain its design strength.
(b) The Musoir Pole shall be fitted/ fixed in position with all fixings secured.
(c) The Musoir shall be erected in the vertical position or if designed otherwise in accordance with the design criteria.
(d) The test position shall be on a level surface with adequate surface to simulate Motorway or National Road conditions.
The Test shall be carried out on each Musoir Pole design and with each variation of material used or on the largest and smallest units in any one complete set.
(f) 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 test body as having passed the tests or by external certification body.

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 pole 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 pole change in any way this test must again be repeated.
(iv) Visual inspection: Every pole.
(v) Wall thickness: From production, once every 3 months on sample of each size of pole.

7.4. Wind load Test
The longest pole in a “family” shall be subjected to a wind test.
The Pole 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).

The test is carried out, at a temperature of (15 +/-3) °C on the largest traffic facing surface of the highest pole. Force is applied, by way of 2 daN, with the centre of gravity of the pressure forces mid point and at the end point of the pole, in accordance with the diagram below, i.e. applied at the centre point of the longest side, and extremity.
The deflection at the outer most extremity of the pole should less than 10mm.
The deflection of the pole at the centre point when loaded shall be less than 2mm.

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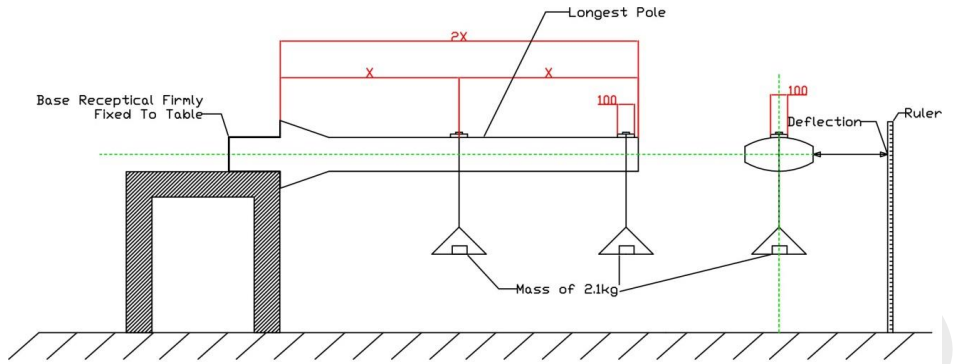

Figure 1: Test of Stability

8. FINISH OF METAL PARTS

All metal parts shall be protected as follows.

Frame:	Where it is to be set in concrete a clean surface shall be provided.
Exposed surface;	The top surface of the base receptacle shall be wire brushed and treated with an epoxy paint or similar.
Nut / bolt fixings;	Shall be galvanised or stainless steel or better.

9. MARKINGS:

The following information should be marked on each pole:

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

9.1. CE Marking

The manufacturer or his 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

Gives an example of the information to be given on the packaging and/or on the accompanying commercial documents for the Musoir Poles.

10. 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. HANDLING AND USE

The manufacturer should supply instructions for the handling and fitting of the Musoir Pole.

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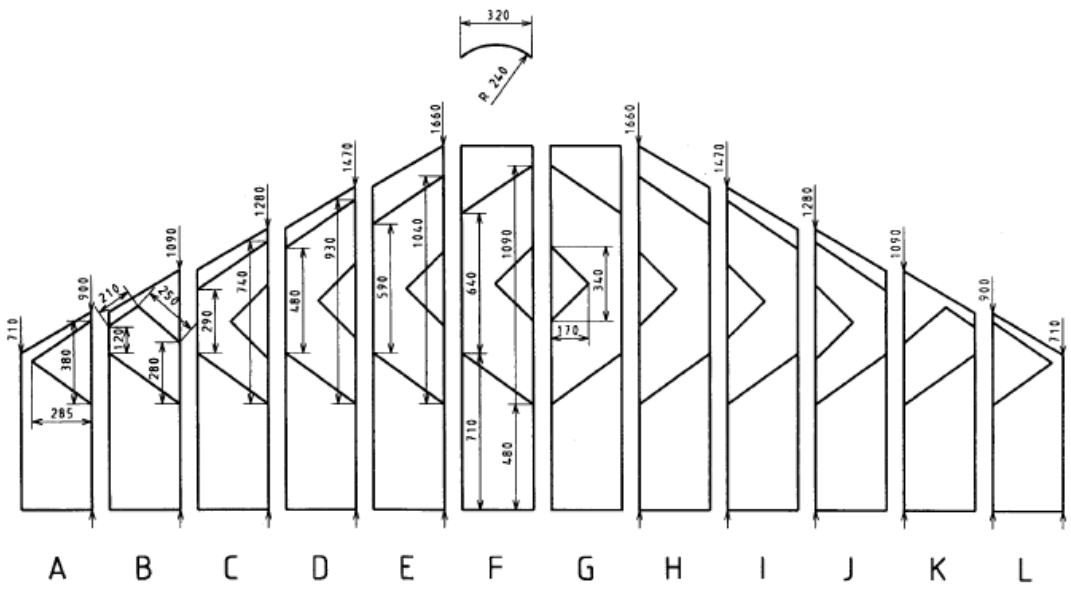
ANNEXE A
Plastic guide Musoir Pole's devices for signalling divergent – smaller model
(Dimensions in mm)



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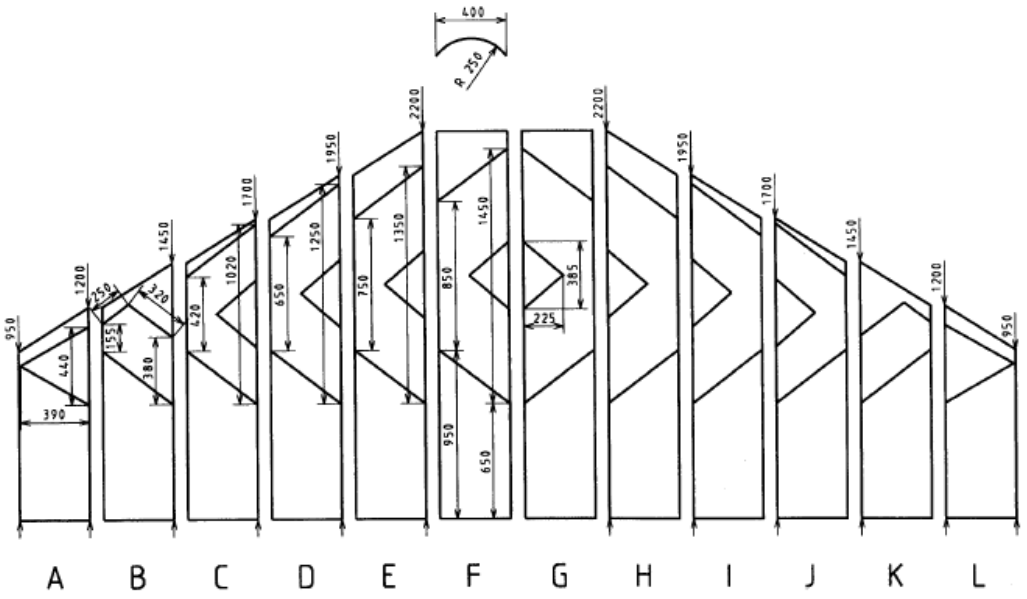
ANNEXE B
Plastic guide Musoir Pole's devices for signalling divergent – medium model
(Dimensions in mm)



ANNEXE C
Plastic guide Musoir Pole's devices for signalling divergent –Large model
(Dimensions in mm)