MATERIAL STANDARD

FOR

PLASTIC GRID (AS ROCKSHIELD)

FOR

PIPE COATING

ORIGINAL EDITION

JULY 1995

This standard specification is reviewed and updated by the relevant technical committee on Jan. 2000. The approved modifications are included in the present issue of IPS.

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1. SCOPE

This Standard specification covers the minimum requirements for polyethylene plastic grid sheet including fastening accessories intended to be used as rockshield for mechanical protection of coating of buried or submarine coated pipes that are subject to: Aggressive and rocky terrain, soil consolidation or shrinkage stresses, etc., and also in conjunction with concrete saddles or set-on-weights.

Note:

This standard specification is reviewed and updated by the relevant technical committee on Jan. 2000. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No. 119 on Jan. 2000. These modifications are included in the present issue of IPS.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

D 570	"Standard Test Method for Water Absorption of Plastics"
D 638	"Standard Test Method for Tensile Properties of Plastics"
D 746	"Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact"
D 1238	"Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer"
D 1505	"Standard Test Method for Density of Plastics by the Density-Gradient Technique"
D 1525	"Standard Test Method for Vicat Softening Temperature of Plastics"
D 2240	"Standard Test Method for Rubber Property-Durometer Hardness"
D 4801	"Standard Specification for Polyethylene Sheeting in Thickness of 0.25 mm and Greater"
G 21	"Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi"
G 22	"Standard Practice for Determining Resistance of Plastics to Bacteria"

BSI (BRITISH STANDARDS INSTITUTION)

BS 3412	"Polyethylene Materials for Moulding and Extrusion"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-GN-100	“Units”
IPS-E-TP-270	"Engineering Standard for Coatings"

3. DEFINITIONS AND TERMINOLOGY

In this Standard, the following definitions shall apply:

Brittleness Temperature

That temperature, estimated statistically, at which 50% of the specimens would fail in the specified test.

Density

The weight per unit volume of material at 23°C , expressed as follows:

D^{23c}, kg/m^3

Three density ranges of polyethylene are generally recognized, these being:

a) Low density polyethylene from 910 kg/m^3 up to 925 kg/m^3.

b) medium density polyethylene from 926 kg/m^3 up to 940 kg/m^3.

c) high density polyethylene greater than 940 kg/m^3.

Note:

These densities refer to the base polymer, without pigment or carbon black, before extrusion , as determined by the method described in Clause 6. For compounds containing a nominal 2.5 % carbon black, a correction factor of +10 kg/m^3 can be used.

Extrusion

A process in which heated or unheated plastic is forced through a shaping orifice (a die) in one continuously formed shapes, as in sheet, film, or tubing.

Lot or Batch

The lot or batch shall consist of an indefinite number of sheets, offered for acceptance, of materials manufactured by a single plant run through the same processing equipment, with no change in ingredient materials.

Nominal Parameters

The nominal parameters are the parameters (e.g., weight, thickness, density, etc.) specified on product labels, invoices, sales literature, and the like. The actual parameters shall not be less than 95% of nominal parameters.

Polyethylene Plastics

Plastics or resins prepared by the polymerization of no less than 85 w% ethylene and no less than 95 w% of total olefins.

Sheet

An individual piece of film.

Thermoplastic

A plastic that repeatedly can be softened by heating and hardened by cooling through a temperature range characteristic of the plastic, and that in softened state can be shaped by flow into articles by moulding or extrusion.

Vicat Softening Point

The temperature at which a flat-ended needle of 1-mm^2 circular cross section will penetrate a thermoplastic specimen to a depth of 1 mm under a specified load using a selected uniform rate of temperature rise.

4. UNITS

This standard is based on International System of Units, (SI) except where otherwise specified.

5. DESCRIPTION

The plastic grid shall be made of virgin polyethylene thermoplastic material extruded into a grid mesh pattern to provide a tough flexible protective sheeting with high mechanical properties and good resistance to chemical agent. The grid pattern shall be so designed to ensure that the maximum area of exposure is achieved, with maintaining strength, to encourage the passage of cathodic protection current to the coating surface. It shall be resistant to shocks, fungi when tested with ASTM G 21, bacteria when tested with ASTM G 22, and artificial agents contained in the soil or in the surrounding medium. The plastic grid may also be air-blown type.

6. MATERIALS AND MANUFACTURE

The base material from which the sheet is produced shall be polyethylene to which shall be added only those antioxidants, UV stabilizers and pigments necessary for the manufacture of sheets to the specification and to its end use. The base material shall be as uniform in composition and size and as free of contamination as can be achieved by good manufacturing practice. Impurities which are occasionally contained in polymers shall not exceed 0.1% by mass. The nominal density of the base material, when determined in accordance with ASTM D1505, shall be greater than 940 kg/m^3. The nominal melt flow rate (melt index) of the material shall not be less than 0.4 g/10 min. when determined in accordance with ASTM D1238 (condition E). The compound shall be class W as defined in BS 3412:1976 (as amended by amendment Nos. 1 and 2) and the antioxidants used shall comply with 8.1 and 8.2 of that standard. The carbon black characterization, dispersion and content shall be in accordance with BS 3412: 1976.

7. PROPERTIES

The physical properties of finished material shall comply with the requirements of Tables 1 and 7.1 to 7.5 inclusive.

7.1 Form

The sheet shall be supplied flat or in rolls in the dimensions specified with clean cut edges.

7.2 Appearance

The sheets shall have appearance qualities conforming with those produced by good commercial practice. It shall be as free as commercially possible of cracks, discolorations, particles of foreign matter, undispersed raw material and other defects that could affect appearance or serviceability.

7.3 Color

The color of plastic sheet shall be black.

7.4 Dimensions

The plastic sheets shall be supplied with the dimensions (width and length) as per specified by the purchaser.

7.5 Heat Reversion

The diameter of a disc of approximately 50 mm diameter cut from the sheet shall not alter by more than 3% when immersed in boiling water for 30 minutes and allowed to cool.

TABLE 1 - PHYSICAL PROPERTIES

PROPERTY	UNIT	REQUIREMENT	TEST METHOD ASTM
Density of base polymer (min.)	kg/m^3	940	D 1505
Tensile strength (min.)	Mpa	19	D 638(A)
Thickness (nominal)	Mm	3.2	D 4801 (sub clause 11.5)
Weight (min.) (B)	g/m^2	700	___
Brittleness temperature (max.)	°C	-70	D 746
Vicat softening point (min.)	°C	120	D 1525
Hardness	___	55-75	D 2240 (shore D)
Water absorption	%Wt.	0.25	D 570

(A) Determine tensile strength at break, except that speed of grip separation shall be 50 mm/min.

(B) The actual net weight of each sheet shall be determined to the nearest 50 g on suitable calibrated equipment.

8. FASTENING ACCESSORIES

The fastening accessories intended to secure individual sheets placed around the pipe may be either non-slip quick fit, self locking, plastic ties or circumferential strapping with 15 mm. Wide plastic bands and associated buckles as specified by the purchaser. The fastening accessories shall be made from virgin plastic materials conforming with those produced by good manufacturing practice. Additional requirements specific to the property and application shall be identified by the manufacturer upon request.

9. STORAGE LIFE, PACKAGING AND SAMPLING

9.1 Storage Life

The product shall meet the requirements of clause 7 after storage for 24 month from date of delivery, in a full tightly covered container.

9.2 Packaging

The materials purchased according to this Standard specification shall be packaged in suitable containers to ensure acceptance and safe delivery to their destination. Individual fabricated sheets shall be packaged in such a manner as to protect the material against physical and mechanical damage and contamination during shipment, handling and storage. Each container shall contains application instructions.

9.3 Sampling

Unless otherwise specified by purchaser, the number of samples for testing shall consist of 10 percent of the lot, but in no case shall be less than one or more than ten sheets. The results of the tests on four specimens cut from each sample sheet shall be averaged for each test specified in table 1 to determine conformance with the specified requirements. The numbers and types of test specimens shall be in accordance with the ASTM test method for the specific properties to be determined.

10. INSPECTION AND TESTING

10.1 All materials supplied under this Standard specification shall be subject to timely inspection by the purchaser or his authorized representative. The purchaser shall have the right to reject any material (s) supplied which is (are) found to be defective under this Standard specification. In case of dispute, the arbitration or settlement procedure, established in the procurement documents shall be followed.

10.2 The supplier shall be responsible for the performance and costs for all laboratory test requirements as specified in this Standard. The supplier shall set up and maintain such quality assurance and inspection systems as are necessary to ensure that the materials comply in all respects with the requirements of this Standard Specification.

10.3 Samples of any or all ingredients used in the manufacture of this material may be requested by the purchaser and shall be supplied upon request, along with the supplier's name and identification for the sample.

10.4 Purchaser's inspector(s) shall have free access to the supplier's work to follow up the progress of the materials covered by this Standard and to check the quality of materials. The supplier shall place free of charge at the disposal of the purchaser's inspector(s) all means necessary for carrying out their inspection: Results of tests, checking of conformity of materials with this Standard requirements, checking of marking and packing and temporary acceptance of materials.

10.5 Samples submitted to the purchaser and/or collected by the purchaser will be tested in the purchaser's laboratory or in a responsible commercial laboratory including manufacturer's laboratory designated by the purchaser.

10.6 The supplier shall furnish the purchaser with a certified copy of results of tests made by the manufacturer covering physical and performance characteristics of each batch of product to be supplied under this Standard specification. The supplier shall furnish, or allow the purchaser to collect samples of the material representative of each batch of product. Certified test reports and samples furnished by the supplier shall be properly identified with each batch of product.

10.7 Prior to acceptance of the supplier's and/or manufacturer's materials, samples of material submitted by the supplier, or collected by the purchaser, will be tested by the purchaser. If any of the sample sheets (see 9.3) is found not to conform to this Standard, materials represented by such sample will be rejected. If samples of the supplier's and/or manufacturer's material that have been previously accepted are found not to conform to this Standard, all such material will be rejected.

10.8 Unless otherwise specified in this Standard specification, the methods of sampling and testing shall be in accordance with applicable methods of the International Organization for Standardization (ISO), British Standards Institution (BSI) And German Standards (DIN).

11. MARKING

11.1 Each sheet or package of sheets shall be durably marked with the following information:

Name: Plastic Grid (As Rockshield) .....
Specification: IPS-M-TP- 316 .....
Order No.: .....
M.E.S.C. No. .....
Type or trade name of grid: .....

Sheet sizes: Length: .....m, Width: ..... cm
Weight: .....g/m^2, thickness: ..... mm.
Maximum temperature resistance (°C): .....
Batch No.: .....
Stock No.: .....
Date of manufacture: .....
Quantity (number of sheets): .....
Storage conditions: .....
Name or trade mark of the supplier: .....
Manufacturer's name and address: .....

11.2 Each package of fastening accessories shall be plainly marked with the name of the material, type, order No., batch No., quantity contained therein, date of manufacture, and manufacturer's name and/or symbols.

Design guide: For guidance on the usage of this material reference shall be made to IPS-E-TP-270.