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Guidance on Industry Standard for Monolithic Refractory Material

GIS 72-110

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GIS 72-110. This Guidance on Industry Standard (GIS) is not based on previous specifications for BP group but was used by Amoco before merging with BP.

This GIS was developed in collaboration with refractory manufacturers in Europe and the U.S. and represents consensus physical properties that are used for preshipment testing approval.

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1. Scope

- a. This GIS provides guidance for procurement of monolithic refractory material and preshipment testing requirements.
- b. This GIS provides data requirements related to preshipment testing of monolithic refractory products as defined in GIS 72-001.
- c. This GIS establishes preshipment testing requirements that are part of quality control program as defined in GIS 72-002.
- d. Product listings do not restrict use of other materials. However, alternate materials shall be subject to approval by BP refractory specialist, and approved compliance data shall be developed in accordance with this GIS.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

BP

GIS 72-001	Refractory Procurement.
GIS 72-002	Refractory Installation.

3. Terms and definitions

For the purposes of this GIS, the following terms and definitions apply:

Abrasion resistance

Ability of product to withstand abrasive or erosive action of fluidised particulate. Abrasive (erosive) resistant linings are used in areas where abrasion (erosion) will compromise vessel walls or pressure boundaries.

Batch

- a. "Batch" has numerous meanings and shall be properly identified for each case.
- b. In relation to batch size for Vendor manufacturing procedures, batch size generally relates to quantity of material mixed at one time. Quantity varies somewhat, but this GIS uses empirical data from Vendors to establish testing requirements. In most cases, batch size is approximately 1360 kg (3000 lb) and varies with density of material being mixed.
- c. In field applications, batch refers to each individual mixing exercise and varies considerably based on type of mixing equipment.

Castable refractory

Castable is general term for mixture of heat resistant aggregates and heat resistant binder. Binder is typically hydraulic calcium aluminate cement that produces bonding necessary for physical property development. However, low cement and cement free castables are available that have noncementitious matrix capable of developing desired physical properties. Castable is mixed with water and rammed, cast, cast vibrated, pumped, or gunited. Combination of refractory grain and



bonding agent (cement or sintering aids) develops designed physical or chemical properties after addition of water.

Cold crushing strength (CCS)

Force measured in MPa or psi necessary to cause rupture of refractory test specimen. For most quality control programs, CCS is measured on 50 mm (2 in) cubes, either moulded or saw cut.

Density

Weight per unit volume of mass. For refractory materials, density is typically reported as kilograms per cubic metre (kg/m^3), grams per cubic centimetre (g/cm^3), tonnes per cubic meter (tonne/m^3), and pounds per cubic foot (lb/ft^3).

Gunit refractory

Application of monolithic refractory by air placement (pneumatic) gunit equipment. Application technique is susceptible to numerous variables. An excellent quality control plan is necessary to achieve desired results.

Permanent linear change (PLC)

Change in length of specimen after firing to designated temperature. For castable refractories, PLC is calculated from dried to fired dimensions. For plastic refractories, PLC is calculated from moulded to fired dimensions.

Plastic refractory

Composition of aggregate and plasticisers tempered with water and extruded. Extruding develops level of workability (workability index), permitting ramming with pneumatic tools to form monolithic structure. Plastic refractory mixes are prepared at Vendor facility, extruded into columns, sliced, and packaged in 25 kg to 45 kg (55 lb to 100 lb) cartons. Quality of plastic refractory linings is dependent upon manufacturer quality control program and skill of applicator that produces fully consolidated lining. Installer affects lining quality but not material quality. Gunning of plastic refractory is possible but has limited applications, subject to BP approval.

Purchaser

Party placing direct purchase order. Purchaser is representative designated by BP.

Thermal conductivity

Property of matter by virtue of which heat energy is transmitted through medium, such as refractory. Thermal conductivity is measure of heat flux transmitted through material reported in $\text{W/m}^\circ\text{K}$ and $\text{BTU in/hr ft}^2^\circ\text{F}$.

4. Symbols and abbreviations

For the purpose of this GIS, the following symbols and abbreviations apply:

CCS	Cold crushing strength.
MDV	Manufacturer data value.
PLC	Permanent linear change.

5. General

- a. Refractory category numbers shall comply with GIS 72-001.
- b. Category numbers for required refractory shall be obtained from BP.

