



# GRAFTech

*International*

**HotPressed™ Refractory Systems**

## METALS PROCESSING

In the manufacture of GrafTech refractory and structural materials, quality controls are imposed from raw material selection through final packaging of finished product to maintain consistency and to minimize product variation. The user can be confident that standards for quality and uniformity have been met and that product variations are consistent with those historically observed.

Product grades are defined on the basis of controlled raw materials processed through defined standard manufacturing processes and meeting certain ranges of product properties. Statistical process control techniques are employed to monitor and improve product uniformity.

The following essential properties are routinely measured for control purposes:

Bulk Density, Crushing Strength, Ash, and Permeability.

Many additional properties can be measured on refractory products. For products having standard raw materials processed in a standard procedure, these additional properties will be found to correlate with the essential control properties listed above. This specification distinguishes between essential control properties that provide a basis for acceptance/rejection and informational properties that are not routinely measured and are provided for information only. Examples of informational properties include modulus of rupture, dimensional change during reheat, porosity, and thermal conductivity.



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**TECHNICAL INFORMATION**  
**RPD-08 JANUARY, 2008**

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Further acceptance/rejection criteria covered by this specification include dimensional conformity, workmanship, and dry assembly inspection (optional). An indication of standard packaging methods is also provided. During product manufacture, GrafTech uses internal inspection procedures and sample frequencies to assure the quality of the final product. Historically, these procedures have resulted in product that consistently meets lot acceptance inspection by customers using plans such as ISO-5022 at a 4% AQL level.

#### A. Properties (Physical & Chemical)

Essential & Informational Properties are given in the attached product definition Technical Information sheets, along with the associated test methods.

#### B. Dimensional Conformity

All limits for dimensional conformity and workmanship are based on an acceptance quality level of 95%.

1. Dimensions measured: Length, Width, Thickness, Squareness face to side/end, and Warpage.
2. Instruments of Measurement - Steel rule, calipers, framing square and taper gauge for Squareness and Warpage.



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#### 3. Acceptance/Rejection Criteria:

- a. Length and Width - Nominal +/- 1/16" (1.6mm)
- b. Thickness - Nominal +/- 1/32" (0.8mm), with within brick variation not to exceed 1/32" (0.8mm).
- c. Squareness - See Figure I. Face-to-Side: 0.040" (1.0mm) maximum. Face-to-End: 0.080" (2.0mm) maximum
- d. Warpage - Deviation from true plane surface is +/-1/32" (0.8mm). See Figure II. Warpage is measured diagonally across the face.

#### 4. Stack Height

- a. Method of Measurement - Randomly select samples of brick and assemble to form stack. Measure stack height with tape measure and compare to criteria.
- b. Acceptance/Rejection Criteria:

BRICK THICKNESS	Number of Brick in Stack	Stack Height
114.3mm 4-1/2"	8	914.4 +/- 6.4mm 36" +/- 1/4"
76.2mm 3"	12	914.4 +/- 9.5mm 36" +/- 3/8"
63.5mm 2-1/2"	14	899 +/- 11.1mm 35" +/- 7/16"



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### C. Workmanship

GrafTech brick are ground to size, not machined. This grinding operation adequately meets the required dimensional tolerances and results in a surface finish suitable for cemented joints.

Discoloration: Some brick grades are specially formulated to provide excellent chemical resistance. As a result, NMA brick can develop a white and brownish surface discoloration over time and exposure to moisture and atmospheric conditions. This discoloration is normal and characteristic of the grade.

### Surface

Condition: HotPressed™ brick are manufactured one at a time by a unique process that, by its nature, results in some surface conditions such as ram marks, flashings, and unground area. These conditions do not hinder brick performance. They should not exceed 5% of area of any face on maximum of two faces. The maximum depth for ram marks and unground surface is 3mm (1/8").



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### Chip Specification:

A chip is defined as a void on the edge or corner of a brick where all three dimensions are greater than 4mm x 4 mm x 4 mm. The maximum chip size is defined in the table below that shows the relationship between the size of the two smallest dimensions (A and B) and the largest dimension of the chip. A maximum of two chips per brick is allowed.

		Chip Dimension "A"				
		3 mm	6 mm	10 mm	13 mm	16 mm
Chip Dimension "B"	3 mm	Total Edge	75	50	50	50
	6 mm	75	50	50	40	40
	10 mm	50	50	40	40	25
	13 mm	50	40	40	25	25
	16 mm	50	40	25	25	20
	20 mm	50	25	25	20	
	50 mm	50				



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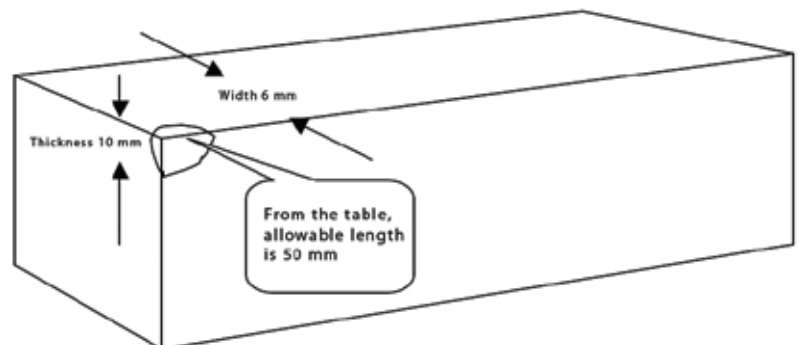
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Examples:

If a chip thickness or width does not exceed 6 mm, then the length of the chip may not exceed 75 mm.

If a chip is 10 mm thick and 6 mm wide, then the length of the chip may not exceed 50 mm.



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### D. Packaging

Hotpressed Brick

#### 1. Pallet

Three stringer, winged hardwood, double-faced pallet with annular nail construction.

#### 2. Overpack

Water repellent, double wall 350 pound test corrugated cardboard overpack banded to pallet. With 0.4 mil plastic shroud banded over cardboard for waterproof protection. Export packaging is the same as above except that heavy cardboard or plastic edge protectors are banded to top and sides of the palletized brick before the cardboard overpack are put in place.

#### 3. Identification

Brick Pallets - 6" letters on all four sides describing Key or Arch Number and Length, or Marked Brick description. 1" letters on two sides giving full size description of 24 characters each for address and miscellaneous information.



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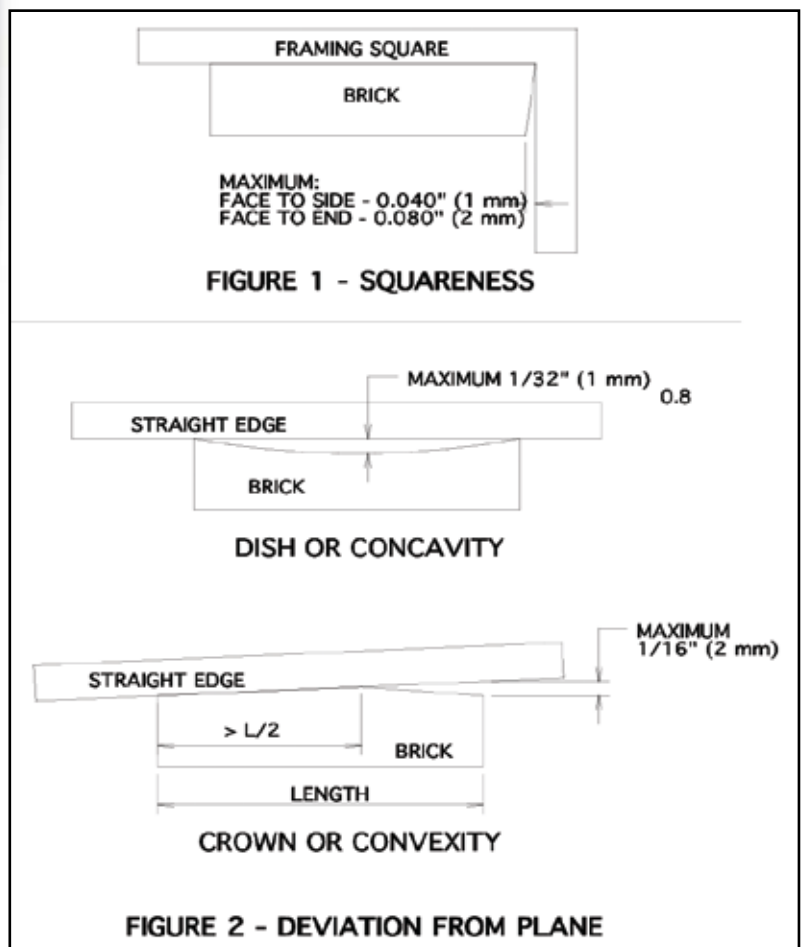
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