

## Fiberfrax® Duraboard® Products

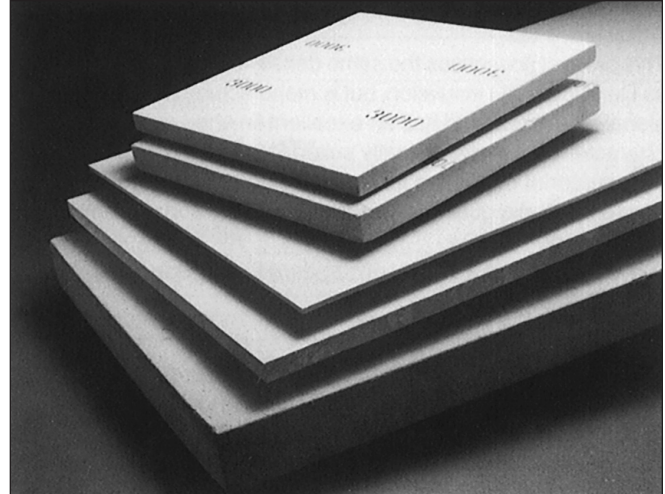
### Introduction

Fiberfrax® Duraboard® products are a family of rigid, high-temperature ceramic fiber boards manufactured in a wet forming process using Fiberfrax alumina-silica fibers and binders. All Duraboard products offer low thermal conductivity, high temperature stability, uniform density, and excellent resistance to thermal shock and chemical attack.

They are also well-suited for applications experiencing vibration, mechanical stress and strong erosive forces. The excellent rigidity and modulus of rupture possessed by these boards makes them strong and self-supporting, yet relatively lightweight and easy to cut or machine.

These product features allow for quick, efficient handling and high installation rates, thereby enabling fast turnaround times in a variety of industrial insulation applications. Once installed, they can help reduce energy costs and cycling times due to their high insulating capability, as well as serving to protect refractory surfaces from thermal shock.

The Fiberfrax Duraboard family exhibits excellent chemical stability, resisting attack by most corrosive agents. Exceptions are hydrofluoric, phosphoric, hydrochloric and sulfuric acids as well as concentrated alkalis. Fiberfrax Duraboard products also resist oxidation and reduction. If wet by water, steam or



oil, thermal and physical properties are completely restored upon drying.

In order to provide handling strength during the manufacturing process, small quantities of organic and inorganic binders are typically added to the board formulation. Where present, the organic binding agents burn out at temperatures between 450°F/232°C to 600°F/316°C during initial heat up by the end user. Following burnout of the organic binder, the boards are white in color.

### Product Range

| Temperature Grade | Target Density | Board Type | Description  |
|-------------------|----------------|------------|--|
| 2300°F            | 14-24#         | RG         | — A rolled, rigidized surface finish and high MOR give a tough, economic refractory grade product.   |
|                   | 16-20#         | LD         | — A higher quality surface finish and tighter dimensional tolerances make this board suitable for use in situations where aesthetic quality, as well as performance, is important. |
|                   | 23-27#         | HD         | — The addition of clay gives a higher density, MOR, and strength.  |
|                   | 18-21#         | ES         | — Unique family of highly machinable lightweight boards manufactured with three to four times the green strength as standard board products.                                       |
| 2600°F            | 10-14#         | 2600       | — Formed from a special blend of regular Fiberfrax alumina-silica fibers and Fibermax® Mullite Fibers. These boards give high stability at temperatures up to 2450°F/1343°C.       |
| 3000°F            | 9-12#          | 3000       | — Formed from a special blend of regular Fiberfrax alumina silica fibers and Fibermax® Mullite Fibers. These boards give high stability at temperatures up to 2700°F/1482°C.       |

Data are average results of tests conducted under standard procedures and are subject to variation. Results should not be used for specification purposes.

Refer to the product Safety Data Sheet (SDS) for recommended work practices and other product safety information.

## Duraboard® Products

### Duraboard RG

Duraboard RG (Refractory Grade) insulation is a cost-effective insulating board manufactured with the specific requirements of the refractory industry in mind. It has a rolled, rigidized surface which gives it a high modulus of rupture and compressive strength as well as high abrasion and hot gas erosion resistance.

These properties make Duraboard RG insulation ideally suited for use both as a backup to dense refractories, such as those used in the glass industry, and as a hot face protective layer over blanket linings where the rigidized surface aids in dust suppression during both installation and operation.

### Duraboard LD

This product possesses the same density and temperature rating as Duraboard RG insulation, but is manufactured to tighter dimensional tolerances and has an excellent finished surface. These characteristics make it ideally suited for use as a sandwich or core material or for use in the manufacture of components where aesthetic quality, as well as uniformity and performance, is important.

It is available in a variety of standard thicknesses ranging from 1/8" to 2".

### Duraboard HD

Duraboard HD insulation is a high-density board product that offers the same high level of dimensional and surface uniformity as Duraboard LD insulation, but provides enhanced compressive strength and a higher modulus of rupture. This higher density is achieved through the inclusion of clay additives during the manufacturing process.

Its higher strength makes Duraboard HD insulation particularly well-suited to weight load support applications such as refractory brick backup or for covering larger unsupported spans.

### Duraboard 350ES and 500ES

These products use a unique fiber formulation to obtain high strength and machinability not normally achieved in light-weight ceramic fiber board products. The innovative composite binder system using both inorganic and organic components results in a strength-to-weight ratio of more than three times that of standard refractory ceramic fiber boards. Improved physical characteristics of these products allow for easier handling and fabrication.

Duraboard 350ES has more than three times the strength of standard boards of similar densities and thicknesses. Duraboard 500ES has more than four times the strength of standard boards of similar densities and thicknesses.

### Duraboard 2600

Duraboard 2600 insulation is a high-temperature insulating board designed to provide high stability at elevated temperatures. This capability is achieved by manufacturing a board formulated with a blend of Fiberfrax® alumina-silica fibers and Fibermax®, Unifrax's patented polycrystalline mullite fibers.

This unique formulation controls thermal shrinkage to a level less than 1.0% after 168 hours at 2450°F/1343°C.

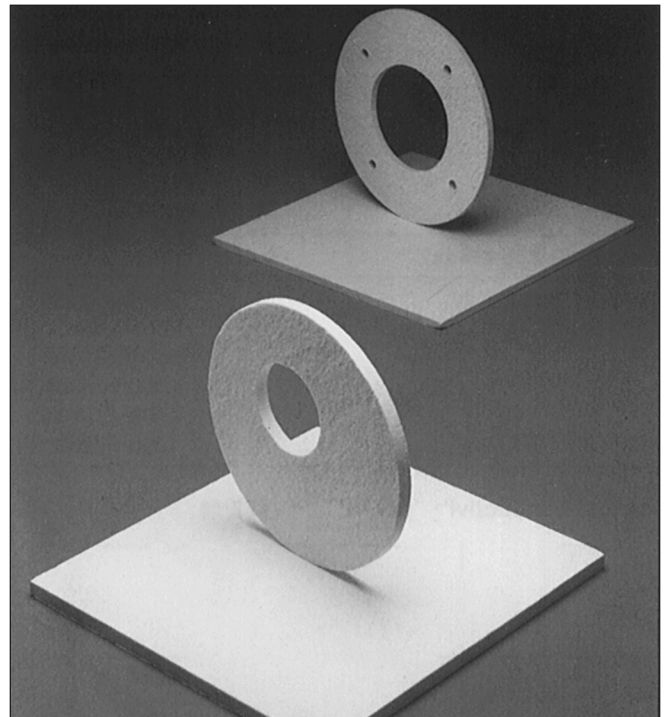
### Duraboard 3000

Duraboard 3000 insulation, the highest temperature rated board manufactured by Unifrax, provides maximum high-temperature stability and shrinkage resistance. Also formulated from a blend of Fiberfrax alumina-silica fibers and Fibermax, Unifrax's patented polycrystalline mullite fibers, Duraboard 3000 insulation derives its exceptional high-temperature capability from an increased Fibermax fiber concentration in the blend.

This unique formulation controls shrinkage to a level of only 1.2% after 168 hours at 2700°F/1482°C.

## Inorganic Boards

Duraboard products are manufactured using a combination of both organic and inorganic binding agents. In certain applications, the presence of organic binders and the low temperature burnout that is associated with them may be unacceptable. These products may be ordered with the organic binding agents already removed by heat treating following the manufacturing process. Heat treated boards display a reduced modulus of rupture and an increase in dustiness. For additional information about inorganic boards, contact the Unifrax Application Engineering Group at 716-768-6460.



Shown above are fabricated pieces of Fiberfrax Duraboard 350ES (foreground) and Fiberfrax Duraboard 500ES (background) die-cut from parent sheet stock. Both are easily and accurately machined with reduced dusting.

## Applications

### Board

| RG | LD* | HD | ES | 2600 | 3000 | Application  |
|----|-----|----|----|------|------|--|
| •  |     | •  |    | •    | •    | Full thickness refractory lining   |
| •  | •   | •  | •  | •    | •    | Insulating backup to dense refractories                                      |
| •  | •   | •  | •  | •    | •    | Insulating backup to brick & castable  |
| •  | •   | •  |    | •    | •    | Furnace hot face lining in ceramic kiln, box furnace & petrochemical furnace |
| •  | •   | •  |    | •    | •    | Board over blanket hot face lining   |
| •  | •   |    |    |      |      | Use in industrial heat processing equipment                                  |
| •  | •   | •  | •  |      |      | Rigid high-temperature gaskets & seals                                       |
| •  | •   | •  |    | •    | •    | High-temperature baffles & muffles   |
| •  | •   | •  |    | •    | •    | Flue & chimney linings in furnaces & kilns                                   |
|    | •   | •  |    | •    | •    | Infra red element supports   |
| •  | •   | •  |    | •    | •    | Glass tank side & end wall & port neck insulation                            |
| •  | •   | •  |    |      |      | Trough linings for conveying molten metals                                   |
| •  | •   | •  |    |      |      | Molten metal trough covers   |
| •  | •   | •  |    | •    | •    | Thermal insulation where high velocities are encountered                     |
| •  | •   | •  |    | •    | •    | Heat shields for personnel protection  |
| •  | •   | •  |    | •    | •    | Hot gas duct linings   |
| •  | •   | •  |    | •    | •    | Low- & high-temperature dryers   |
|    | •   | •  | •  |      |      | Pouring forms for castable   |
| •  | •   | •  |    |      |      | Expansion joints   |
|    | •   |    | •  |      |      | Industrial heat shields & thermal barriers                                   |
|    | •   |    |    | •    | •    | Industrial combustion chamber construction                                   |
|    | •   |    | •  |      |      | Domestic appliance & light-duty industrial combustion chamber construction   |
|    | •   |    |    |      |      | Wood-burning stove backup insulation   |

\*Duraboard LD has been recognized under certain categories at Underwriters Laboratories Inc.

## Typical Product Parameters

| Sheet Size               | Thickness    |              |               |                                |                                |                                |
|--------------------------|--------------|--------------|---------------|--------------------------------|--------------------------------|--------------------------------|
|                          | 1/8"<br>3 mm | 1/4"<br>6 mm | 1/2"<br>13 mm | 1"<br>25 mm                    | 1 1/2"<br>38 mm                | 2"<br>51 mm                    |
| 18 x 18<br>457 x 457 mm  |              |              |               | 2600<br>3000                   | 2600<br>3000                   | 2600<br>3000                   |
| 24 x 24<br>610 x 610 mm  |              |              |               | 2600<br>3000                   | 2600<br>3000                   | 2600<br>3000                   |
| 24 x 36<br>610 x 914 mm  |              | LD<br>ES     | LD<br>ES      | LD<br>HD<br>ES                 | LD<br>HD                       | LD<br>HD                       |
| 24 x 48<br>610 x 1120 mm |              | LD<br>ES     | LD<br>ES      | RG<br>LD<br>HD<br>2600<br>3000 | RG<br>LD<br>HD<br>2600<br>3000 | RG<br>LD<br>HD<br>2600<br>3000 |
| 42 x 48                  | LD           | LD<br>ES     | LD<br>ES      |                                |                                |                                |

Duraboard® HD & Duraboard LD are available 3" & 4" thick by special order.

\*Other sizes by special request.

## Typical Product Properties

| Properties  |  | Board           |                 |                |                   |                 |                |              |                         |
|---|--|-----------------|-----------------|----------------|-------------------|-----------------|----------------|--------------|-------------------------|
|   |  | RG              | LD              | HD             | 350ES             | 500ES           | 2600           | 3000         |                         |
| Nominal Density                                       | lb/ft³/kg/m³                               | 16/258          | 16/258          | 26/419         | 18/288            | 22/352          | 14/224         | 12/192       |                         |
| Temperature Grade                                     | °F/°C                                      | 2300/1260       | 2300/1260       | 2300/1260      | 2300/1260         | 2300/1260       | 2600/1427      | 3000/1649    |                         |
| Product Melting Point                                 | °F/°C                                      | 3200/1760       | 3200/1760       | 3200/1760      | 3200/1760         | 3200/1760       | 3300/1816      | 3400/1871    |                         |
| Recommended Operating Temperature                     |  | 2100/1149       | 2100/1149       | 2100/1149      | 2100/1149         | 2100/1149       | 2450/1343      | 2700/1482    |                         |
| MOR PSI   | Green (typ.)<br>Fired (24 hrs @ cont. use) | 250<br>110      | 200<br>80       | 300<br>125     | 350<br>90         | 450<br>170      | 150<br>65      | 150<br>55    |                         |
| LOI (% by Wt)   |  | 5-7%            | 6-7%            | 6-7%           | 3-7%              | 4-8%            | 4-6%           | 4-6%         |                         |
| Dielectric Strength                                   |  | 27 volts/mil    | 27 volts/mil    | 27 volts/mil   | 27 volts/mil      | 27 volts/mil    | 27 volts/mil   | 27 volts/mil |                         |
| Color   |  | Cream<br>to tan | Cream/<br>white | Cream          | White to<br>Cream | Cream<br>to tan | Cream          | Cream        |                         |
| Shrinkage (%) 24 Hrs @<br>Recommended Operating Temp. |  | <5%             | <5%             | <5%            | <5%               | <5%             | <2%            | <2%          |                         |
| Compressive Strength                                  | lb/in²                                     | Green<br>48     | Fired<br>25     | Green<br>42    | Fired<br>23       | Green<br>59     | Fired<br>35    | Green<br>40  | Fired<br>27             |
| Deformation @   | 5%<br>10%<br>15%                           | 61<br>25<br>71  | 25<br>50<br>25  | 22<br>50<br>57 | 23<br>22<br>23    | 59<br>70<br>81  | 35<br>33<br>32 | Green<br>41  | Fired<br>28<br>33<br>34 |
| Fiber Content   |  |                 |                 |                |                   |                 |                |              |                         |
| Fiberfrax®**  |  | 100%            | 100%            | 100%           | 100%              | 90%             | 75%            | 50%          |                         |
| Fibermax®***  |  |                 |                 |                |                   |                 | 25%            | 50%          |                         |

\*\*Fiberfrax is Unifrax's patented 2300°F/1260°C amorphous alumina-silica fiber.

\*\*\*Fibermax is Unifrax's patented 3000°F/1649°C polycrystalline mullite fiber.

The recommended operating temperature of Fiberfrax products is determined by irreversible linear change criteria, not melting point.

For additional information about product performance or to identify the recommended product for your application, please contact the Unifrax Application Engineering Group at 716-768-6460.

Data are average results of tests conducted under standard procedures and are subject to variation. Results should not be used for specification purposes.



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