1. PRODUCT DESCRIPTION

FireMaster® Thermal Tile is a pre-fired refractory tile. The thermal tile is produced from 99% fused silica offering the best thermal shock resistance available. These characteristics make the thermal tile ideal for use as thermal protection in burn buildings.

2. SYSTEM PROPERTIES

- Zero thermal expansion, providing excellent thermal shock resistance
- Spall resistance
- Easy installation and repair
- Recommended use limit of 2000°F

3. TEST DATA

Thermal Ceramics Research Development Laboratory conducted a spall resistance test and a thermal conductivity test. In both tests, a test panel consisting of six thermal tiles attached to a 125 pcf cast concrete panel 3” thick was used.

**Spall Resistance Test** - The test panel was heated at 1400°F for 30 minutes and then exposed to a high pressure hose stream. The thermal tile showed no signs of cracking or spalling.

**Thermal Conductivity Testing** - Two test panels were used.

**Test 1** was performed with the thermal tiles anchored directly to the concrete panel.

**Test 2** was performed with a $\frac{3}{4}2”$, 6 pcf FireMaster Blanket between the thermal tile and the concrete. In both tests, the temperature was recorded on the surface and $\frac{1}{4}4”$ below the surface of the concrete. In both Test 1 and 2, the thermal tiles were exposed to 1400°F for 30 minutes.
4. APPLICATION

Thermal tiles are designed specifically for the unique conditions found in burn buildings, where the walls and ceilings are exposed to thermal cycling and excessive temperature causing spalling. If spalling can be eliminated, the life of the building can be extended. This can be achieved by protecting the structure with thermal tiles. Most burn buildings are constructed of concrete block or poured concrete. These products contain portland cement which will spall and lose strength at temperatures above 600°F. FireMaster Thermal Tiles are installed on the wall and ceilings over the concrete block or poured concrete and will not crack or spall with repeated cycles of heat and hose stream. In addition, thermal tiles will prevent the structure from reaching 600°F.

<table>
<thead>
<tr>
<th>MINUTES</th>
<th>F1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1400</td>
<td>74</td>
<td>72</td>
</tr>
<tr>
<td>15</td>
<td>1400</td>
<td>254</td>
<td>78</td>
</tr>
<tr>
<td>30</td>
<td>1400</td>
<td>443</td>
<td>118</td>
</tr>
</tbody>
</table>

F1 - Temperature °F on hot face of thermal tile.
T2 - Temperature °F behind thermal tile, on surface of concrete.
T3 - Temperature °F behind thermal tile, 1/4" below surface of concrete.

Test 2 - Thermal tiles anchored to concrete with 1/4" 6 pcf FireMaster blanket between tiles and concrete.

<table>
<thead>
<tr>
<th>MINUTES</th>
<th>F2</th>
<th>T3</th>
<th>T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1400</td>
<td>79</td>
<td>79</td>
</tr>
<tr>
<td>15</td>
<td>1400</td>
<td>109</td>
<td>83</td>
</tr>
<tr>
<td>30</td>
<td>1400</td>
<td>183</td>
<td>89</td>
</tr>
</tbody>
</table>

F2 - Temperature °F on hot face of thermal tile.
T3 - Temperature °F behind thermal tile and the FireMaster blanket on the surface of the concrete.
T4 - Temperature °F behind thermal tile and the FireMaster blanket 1/4" below the surface of the concrete.

RESULTS

SUMMARY

The results of the testing clearly show that the thermal tile withstands heating and water cooling without cracking or spalling. The temperatures recorded on the concrete were significantly lower than the hot face and well below 600°F, at which portland cement starts to deteriorate.
5. INSTALLATION
The thermal tile is attached to the wall or ceiling using a stainless steel TC-768-28 or Ramset SRS-1420 anchor. The thermal tile is held in place and a pilot hole drilled to the required depth, the anchor is then pushed into the hole and tightened to hold the tile in place. The anchor hole on the thermal tile is 1” off center, this allows the thermal tile to be rotated and a new anchor hole to be drilled if required.
Thermal tiles are applied in a staggered pattern utilizing three cornered joints. Installation details are shown in Figures 1 to 4.

6. STORAGE
- Warehouse product
- Dry environment, raise from floor

7. AVAILABILITY
FireMaster Thermal Tiles are available in two sizes:
- 12" x 12" x 3¼" packed in boxes of 8, gross weight 45 lb
- 12" x 6" x 3¾" packed in boxes of 16, gross weight 45 lb
Note: Anchors are supplied separately.

8. OTHER PRODUCTS
FireMaster Blanket, Duct Wrap, Bulk, Board, FP-60, Firecrete® 85 and 125, Structo-Gard®.
These products are used in a number of fire protection systems for the following:
- Grease and air ducts
- Structural steel
- Cable tray/conduit
- Safing/construction joints
- Ships and offshore platforms
- Aboveground storage tanks
- Plastic pipe
- Manufactured engineered systems

<table>
<thead>
<tr>
<th>PROPERTIES</th>
<th>FireMaster THERMAL TILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk density, pcf, (gm,cc)</td>
<td>124 - 126 (1.99 - 2.02)</td>
</tr>
<tr>
<td>Apparent porosity, %</td>
<td>7 - 8</td>
</tr>
<tr>
<td>Water absorption, %</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Modulus of rupture, psi (kg/cm²)</td>
<td>1500 - 1800 (105 - 126)</td>
</tr>
<tr>
<td>Linear shrinkage</td>
<td>NIL</td>
</tr>
<tr>
<td>@ 2000°F (1100°C)</td>
<td></td>
</tr>
<tr>
<td>Coefficient of thermal expansion</td>
<td>0.4 (0.6)</td>
</tr>
<tr>
<td>in./in./°Fx10⁻⁶, (cm/cm/°Cx10⁻⁶)</td>
<td></td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>5.8</td>
</tr>
<tr>
<td>@ 500°F, Btu•in./hr•ft²•°F</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: Layout of FireMaster Thermal Tile

Figure 3: Installation of FireMaster Thermal Tile
**ARCHITECTURAL GUIDE SPECIFICATION**

**FireMaster THERMAL TILE**

### PART 1 - GENERAL

1.1 **Scope**

1.1.1 This specification guide covers the installation of FireMaster Thermal Tiles. Designed to provide insulation for burn rooms within a Fire Training Facility. The tiles provide structural protection for walls and ceilings and protect against heat, spalling and hose stream.

1.1.2 Tiles should not require dry out before use, and must not be subject to spalling due to heat/moisture conditions. Tiles must be unaffected by freeze, thaw conditions.

1.2 **Qualifications**

1.2.1 All materials, unless otherwise indicated, shall be supplied by Thermal Ceramics Inc., or its authorized distributors.

1.3 **Delivery and Storage**

1.3.1 Materials should be delivered in the original, sealed containers and clearly labeled with the manufacturer's name and product identification.

1.3.2 Materials shall be stored within shelter to prevent damage from weather.

1.4 **Submittals**

1.4.1 Submit product data indicating product characteristics, performance and service temperature limits. Provide data on product showing that it has been tested to ASTM C-20 (Water Absorption %) and ASTM C-133 (Modulus of Rupture, PSI). The product should have properties in the following ranges. ASTM C-20 (Water Absorption %) - 3-4; ASTM C-133 (Modulus of Rupture, PSI) - 1500 Min. Bulk Density - 120-128 lb/ft³; Thermal Expansion - <0.4 in/in°F x 10⁻⁶.

1.4.2 Submit copy of fire testing detailing insulation properties of product.

1.4.3 Submit manufacturer's installation drawings and instructions.

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### PART 2 - PRODUCTS

2.1 **Materials**

2.1.1 Insulating fused silica tile: FireMaster Thermal Tile as supplied by Thermal Ceramics Inc.

2.1.2 The tile itself is produced from fused silica, the material is cast into the shape of the tile and fired to 2000°F. The tile contains no fibers and is extremely durable.

2.1.3 The tile is supplied in two standard sizes: 12" x 12" x ¼", 12" x 6" x ¼". Both tiles have the mounting hole 1½" off center.

2.1.4 Anchoring System: Stainless steel anchors that are suitable for use in substrate and are approved for use by Thermal Ceramics Inc. For poured concrete or concrete block, typical anchor would be Ramset sleeve anchors, stainless steel, ¼" diameter by 2" length, type TC-768-28 (Ramset S14-1420) roundhead. ¼" Stainless steel washer is required.

### PART 3 - EXECUTION

3.1 **Examination**

3.1.1 Examine surfaces to receive work; report any defects which may affect the work of this section.

3.1.2 Verify that substrate surfaces are ready to receive work.

3.1.3 Beginning of installation means acceptance of existing surfaces.

3.2 **Preparation**

3.2.1 Surfaces should be free of loss materials.

3.3 **Installation**

3.3.1 Tile is placed by as follows. Hold tile in place, drill ¾" hole in substrate (minimum 1.5" depth) through the tile containing the mounting hole. If substrate is less than 1.5" thick, contact tile manufacturer for anchor recommendation. Continue to hold tile in place, fit anchor into hole, ensure it bottoms on tile. Tighten anchor with screwdriver; once tightened, check tile to ensure it will not pull off substrate.

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

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this brochure are intended as a guide only. For specifications and estimating purposes, contact your nearest Thermal Ceramics representative.

For further information, contact your nearest Thermal Ceramics technical sales office or your local Thermal Ceramics authorized distributor. You may also fax us toll-free at 1-800-KAOWOOL or write to Thermal Ceramics, P. O. Box 923, Dept. 140, Augusta, GA 30903.