

Fiberfrax® Fiberwall® Systems Hardware

Introduction

The Fiberwall® systems family of anchoring hardware and accessory components provides an array of attachment options to cover a broad range of lining system designs and application requirements.

Intended for use with Fiberfrax Fiberwall lining systems, Fiberwall hardware is available in a variety of metal alloy grades as well as in various ceramic compositions. This family of hardware components has been developed to provide optimal service life for an assortment of Fiberwall lining systems including layered blanket and board linings, stackbond linings, Hefty-Loc™ bonded modular systems and L.O.R. (lining over refractory) linings.

Fiberwall Alloy Stud and Washer Assembly

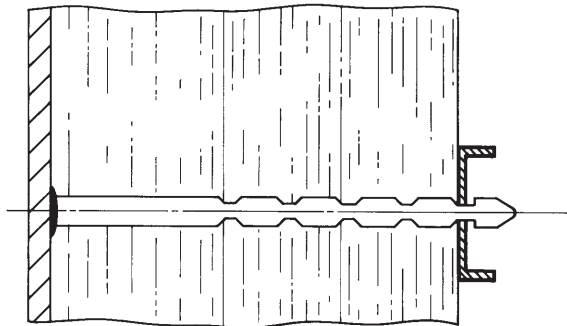
Fiberwall alloy stud and washer assemblies are utilized as anchors in layered lining systems.

The studs are available in four standard lengths: 3½", 4½", 6" and 8". Upon special request, Fiberwall alloy studs are also available in non-standard lengths up to 12" in ½" increments.

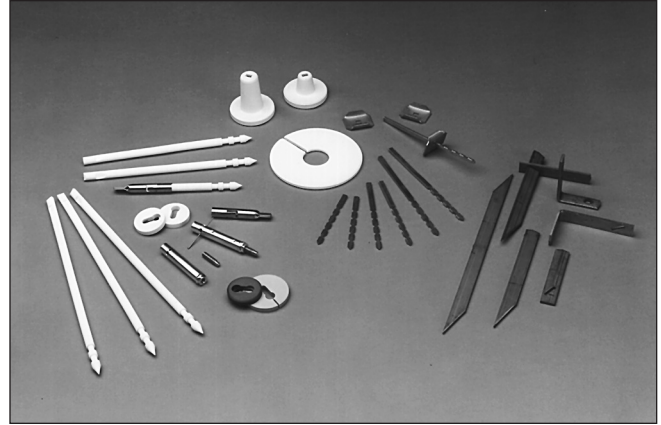
Fiberwall alloy studs and washers are available in four standard alloy grades. They are shown below, along with corresponding maximum recommended operating temperatures (under normal oxidizing atmospheres):

| Alloy | Maximum Recommended Operating Temperature |
|-------------|---|
| 304 SS | 760°C (1400°F) |
| 310 SS | 927°C (1700°F) |
| 330 SS | 1038°C (1900°F) |
| 601 Inconel | 1093°C (2000°F) |

Fiberwall Stud/Washer Assembly



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



Recommended stud length is determined by adding 1" to the applicable lining thickness. For example, an 8" thick layered lining will require a stud length of 8" + 1", or 9".

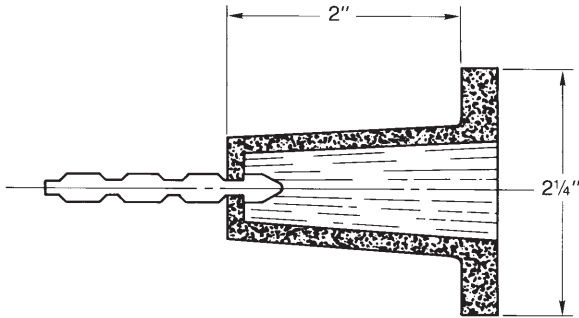
| Length, inches | Alloy | | | |
|----------------|-------|-----|-----|-----|
| | 304 | 310 | 330 | 601 |
| 1½" | • | • | | |
| 2" | • | • | | |
| 2½" | • | • | | |
| 3" | • | • | | |
| 3½" | • | • | • | • |
| 4" | • | • | • | • |
| 4½" | • | • | • | • |
| 5" | • | • | • | • |
| 5½" | • | • | • | • |
| 6" | • | • | • | • |
| 6½" | • | • | • | • |
| 7" | • | • | • | • |
| 7½" | • | • | • | • |
| 8" | • | • | • | • |
| 8½" | • | • | • | • |
| 9" | • | • | • | • |
| 9½" | • | • | • | • |
| 10" | • | • | • | • |
| 10½" | • | • | • | • |
| 11" | • | • | • | • |
| 11½" | • | • | • | • |
| 12" | • | • | • | • |

Fiberwall Ceramic Cuplocks

When hot face temperatures exceed 1093°C (2000°F) but are below 1149°C (2100°F), the ceramic cuplock retainer can be employed to extend the recommended operating temperature of the 601 Inconel stud to 1149°C (2100°F). The alloy washer is not required when the cuplock is used to retain the insulation lining.

The stud length dimension, when using a 2" cuplock retainer, is determined by subtracting 1" from the applicable lining thickness. For example, an 8" thick layered lining will require a 7" stud length when used with a 2" cuplock.

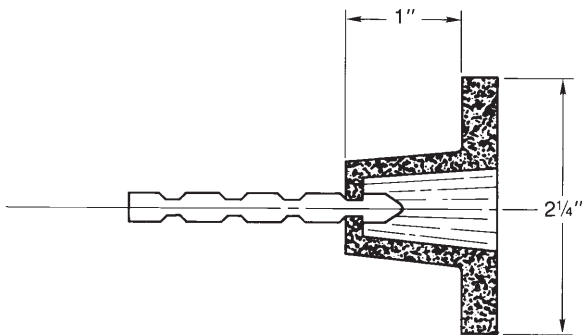
2" Shank Ceramic Cuplock



To be effective, the cuplock's inner core must be filled with LDS moldable. This can be done either before or after engaging the cuplock to the stud's tip.

The 1" cuplock is used primarily in layered lining over refractory (L.O.R.) installations where lining thickness is usually 2" or less, corrosive elements are present in the fuel, or when the hot face temperature is below 1121°C (2050°F).

1" Shank L.O.R. Ceramic Cuplock



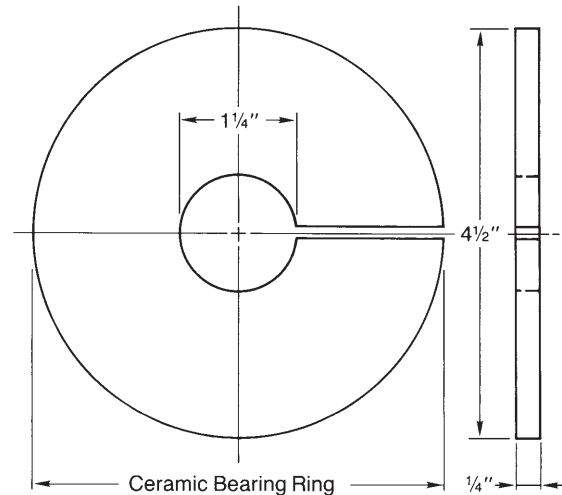
Typically, the 1" cuplock is used in conjunction with barbed 601 Inconel studs in L.O.R. applications. The "barb" of a barbed stud is configured so that it will easily enter within, but will lock securely to, predrilled holes in the refractory surface.

LDS moldable is employed as a filler to plug the cuplock's 1" deep core and, as in the 2" cuplock, is carried over to the face of the cuplock to effect a seal around the core's perimeter edge.

Fiberwall Ceramic Bearing Ring

The ceramic bearing ring is used in higher temperature layered lining applications, particularly on roofs, where added bearing support may be required. The bearing ring is used in conjunction with a cuplock, or ceramic washer. The maximum recommended operating temperature should be limited to 1343°C (2450°F).

Ceramic Bearing Ring



Fiberwall Ceramic Whistle Stud Assembly

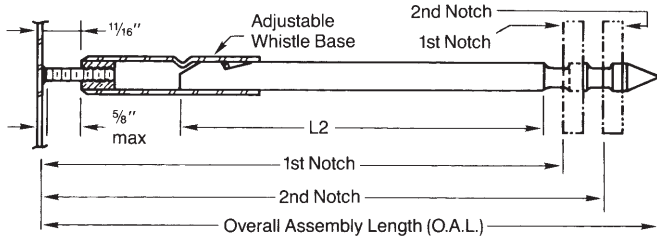
The ceramic whistle stud assembly is comprised of three distinct components: the adjustable whistle (or base), the high-alumina spike and the ceramic washer.

The adjustable whistle base is a two-component, adjustable length system consisting of a whistle base (with retaining pin) and a 1/4"-20 NC x 1 1/4" long arc welded stud. After the stud is arc stud welded to the casing plate, the whistle base is screwed onto the stud. This feature provides up to 1/2" adjustment of the overall assembly length.

The second component of the ceramic whistle stud assembly is the high-alumina ceramic spike which is available in seven standard lengths. The appropriate ceramic spike length for any given lining thickness is determined by referring to the charts shown on page 3. As indicated by the chart, the appropriate spike is defined by its "L2" dimension.

The third component, the ceramic washer, is available in two ceramic compositions: high-alumina and mullite. Like the spike, the high-alumina washer's recommended operating temperature extends to 1510°C (2750°F). The mullite ceramic washer's maximum recommended operating temperature, while only 1343°C (2450°F), affords excellent resistance to thermal shock.

Ceramic Whistle Stud Assembly



Maximum Recommended Operating Temperatures

| Overall Assembly Length (O.A.L.) | Adjustable Base SS-310 |
|----------------------------------|------------------------|
| 6" | — |
| 7" | 1149°C (2100°F) |
| 8" | 1177°C (2150°F) |
| 9" | 1260°C (2300°F) |
| 10" | 1343°C (2450°F) |
| 11" | 1427°C (2600°F) |
| 12" | 1482°C (2700°F) |

Ceramic Hardware Selection Chart Using Adjustable Base

| Lining Thickness with Board-Over-Blanket | Assembly* Length Min/Max | L2** Dimension | Distance from Furnace* Casing to Washer on | |
|--|--------------------------|----------------|--|-----------------|
| | | | 1st Notch | 2nd Notch |
| 5 3/4"-7" | 6 7/8"-7 1/2" | 3 3/4" | 5 5/8"-6 1/4" | 6 1/8"-6 3/4" |
| 6 3/4"-8" | 7 7/8"-8 1/2" | 4 3/4" | 6 5/8"-7 1/4" | 7 1/8"-7 3/4" |
| 7 3/4"-9" | 8 7/8"-9 1/2" | 5 3/4" | 7 5/8"-8 1/4" | 8 1/8"-8 3/4" |
| 8 3/4"-10" | 9 7/8"-10 1/2" | 6 3/4" | 8 5/8"-9 1/4" | 9 1/8"-9 3/4" |
| 9 3/4"-11" | 10 7/8"-11 1/2" | 7 3/4" | 9 5/8"-10 1/4" | 10 1/8"-10 3/4" |
| 10 3/4"-12" | 11 7/8"-12 1/2" | 8 3/4" | 10 5/8"-11 1/4" | 11 1/8"-11 3/4" |
| 11 3/4"-13" | 12 7/8"-13 1/2" | 9 3/4" | 11 5/8"-12 1/4" | 12 1/8"-12 3/4" |

*Based on 1/4" long threaded arc stud

**Please use L2 dimension on all quotations and purchase orders

Typical Properties

| | |
|---------------------------|--|
| Chemical Composition: | High alumina (Al ₂ O ₃) |
| Tensile Strength: | |
| @ 25°C (77°F): | (38K lb/in ²) |
| @ 1000°C (1832°F): | (18K lb/in ²) |
| Temperature Grade (Max.): | 1510°C (2750°F) |

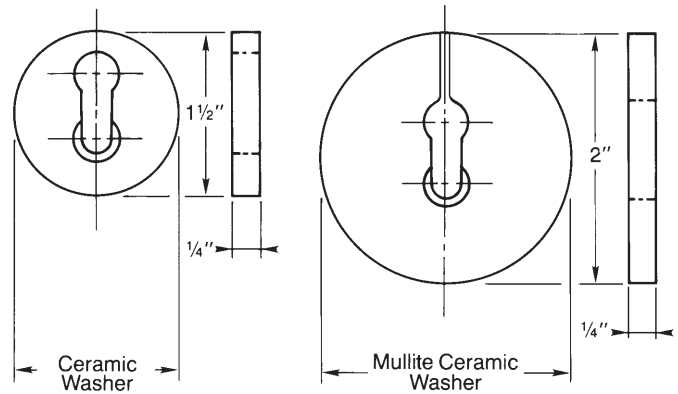
Stick Welding

When hand welding, the following welding rods are recommended:

Whistle Base Welding Rod

| | |
|--------|--|
| SS-304 | Stainless steel electrode Type 304 AD/DC coated |
| SS-310 | Stainless steel electrode Type 316 AD/DC coated |

Ceramic Washer

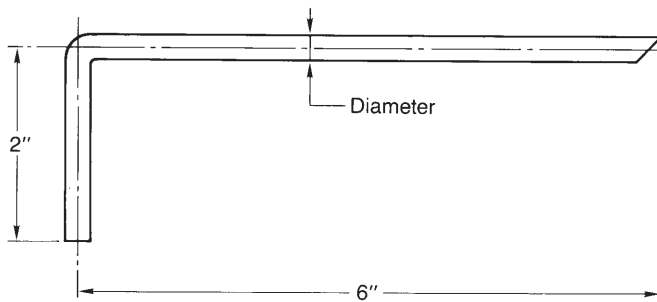


Fiberwall Stackstuds

Stackstud type anchors are required in the construction of stackbond lining systems. Stackbond linings consist of layers of blanket strips, or folded blanket battens, that are stacked together and simultaneously impaled and compressed over the stackstud anchor. Both blanket strips and folded blanket battens are compressed about 25% when installed.

The stackstud illustrated below is typical. Other dimensional forms are available by special request. Stackstuds are available in standard alloy grades of 304 SS and 310 SS. 601 Inconel is available by special request.

Stack Stud



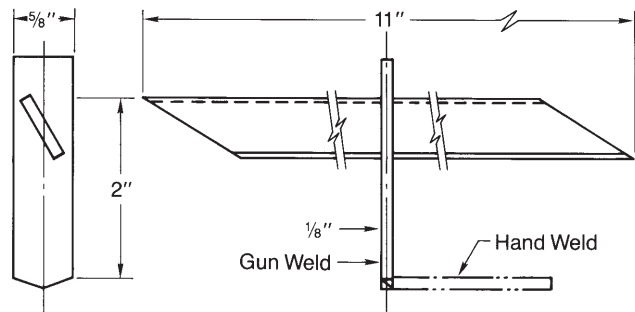
For additional information about product performance or to identify the recommended product for your application, please contact the Unifrax Application Engineering Group at 716-278-3888.

Fiberwall Hefty-Loc Modular System Hardware

The Hefty-Loc anchor assembly is a multipurpose, two component anchor consisting of a tine and base leg. Hefty-Loc anchors can be utilized as stackstuds in the construction of stackbond lining systems or in the construction of Fiberwall Hefty-Loc bonded modular lining systems.

Tines are available in half- or full-length beams. Base leg options allow for hand welding or for arc stud gun welding to the casing plate. Hefty-Loc anchor assemblies are available in standard alloy grades of 304 SS and 310 SS. 601 Inconel is available by special request.

Hefty-Loc Gun Weld/Hand Weld Anchor



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