

**USER MANUAL  
FOR  
WHYTHEAT-K**

Whytheat-K is 60% alumina hydraulic bonding refractory dense castable, which is used for service temperature up to 2912°F (1600°C). It is premixed refractory composition which can cast into any require shape & size. It has great compressive strength & low iron content, so it can be used for construction of shock pit covers, forge furnace, tunnel kilns, heat treatment furnace, car tops, foundries, blast furnace, electro phosphorus furnace and other general purposes.

**Specification:**

<b>Maximum Service Temperature</b>	2912°F (1600°C)
<b>Maximum Grain Size</b>	5 mm
<b>Water required For Casting</b>	10.60 – 11.80% by weight

<b>Physical Properties</b>	
<b>Dry Density</b>	
After drying at 230°F/24 Hrs.	2.20 (g/cc)
<b>Cold Crushing Strength</b>	
After drying at 230°F / 24 Hrs.	37 MPa (380 kg/cm <sup>2</sup> )
After heating at 2012°F / 3 Hrs.	22 MPa (225 Kg/cm <sup>2</sup> )
After heating at 2552°F / 3 Hrs.	39 MPa (400 Kg/cm <sup>2</sup> )
<b>Permanent Linear Change</b>	
After heating at 2012°F / 3 Hrs.	-0.15%
After heating at 2822°F / 3 Hrs.	-1.70%

<b>Chemical Properties</b>	
Al <sub>2</sub> O <sub>3</sub>	56 - 60%
CaO	4 - 4.70%
Fe <sub>2</sub> O <sub>3</sub>	1 – 1.25%

**Delivery State:** Dry Powder

**Storage:** Always store castable in a cool dry area

**Tools Tackles:** Require tools tackles are Pan Mixture machine, Carpentry tools, masonry tools, weight machine, water drum, thermometer, etc.

**Instruction when using castable:**

- Mixer & tools must be clean and free of any old castable, cement, or other material. Any material of this nature will affect the set time and the ultimate strength of castable.
- Use only clean drinkable water for mixing castables. In cold weather warm, water can be used to raise the temperature of the mix to between 60-75°F. In hot weather, the water or castable should be cooled so the temperature does not exceed 80°F at the mixture. Cold water can delay setting time. Warm water accelerates the setting time. Avoid excess water when mixing any castable. Too much water dilute the binder and weakens the mix.
- For large quantity installation of castable, always mix in batch,

- When mixing castables pour  $\frac{1}{2}$  to  $\frac{3}{4}$  of total amount of the required water per batch, add the dry castable, and let it mix to a uniform colour. Then add the balance of the water required in small increments. Mix the castable long enough to produce a uniform mix (approximately 2-3 minutes). Too much mixing generates heat & spreads up the setting time. When a castable has been mixed to the desired consistency place it into the forms as rapidly as possible. The recommended consistency for cast installation is the ball and hand test. Tossed 6-12 inches, a ball of properly mixed castable should adapt to the shape of the hand when catch, but should not flow through the fingers.
- When forms are used, they should be coated with oil or grease to prevent the moisture loss from the castable and /or to add in the removal of forms. After placing the castable, an internal vibrator of 10000 to 12000 v.p.m rating should be used to remove air pockets and air bubbles and to increase the density of the castable. Caution must be used as not over vibrate causing segregation of the components and weakening the castable.
- After placement and vibrating the castable should be cure for 18 to 24 hours. All calcium aluminate bonded castables generate heat while curing. They should be covered with polyethylene sheet, damp sacks, or sprayed with cold water periodically to maintain moisture and promote uniform curing. After the above procedure is complete, uncover and let air dry 12 to 24 hours. At no time during casting, curing, or drying process should the castable reach freezing temperatures. In addition, at no time during curing process should be casting be moved or shaken; vibration will interrupt the bonding process thus greatly reducing the ultimate strength of the casting.
- After air drying is completed, start raising the temperature 100°F per hours from room temperature to 1600°F. Should any steaming develop during heat up, hold the temperature at the level until all steam dissipates. Heat will the free water as steam at around 212°F while the water of hydration will be driven off between 400°F and 1600°F. Hold temperature at 400°F to 450°F and again 1000°F to 1100°F for as many hours as inches thick of the cast pieces.
- Avoid direct flame impingement on refractory.

### **Application Procedure for castables:**

#### **Anchor Welding:**

- Refractory anchor welding is necessary for large application area. Whenever castables are to be placed as roofing material or as spanning material between supports or as short cantilevers, suitable anchors should be secure firmly to the supporting frame or shell. Metallic (stainless steel Y or V type) or ceramic based anchoring devices are recommended. Anchor spacing should be approx. 10" or 12" in horizontally & vertically.
- For small area & small thickness of casting anchors are nor necessary.

#### **Surface Preparation:**

- Clean the shell with wire brush / sandpaper/compressed air thoroughly before going to apply refractory castable.
- Apply one coat of anti-corrosion paint (bituminous) on the shell to take care of shell.

#### **Back-Up Layer Installation:**

- After drying apply anti corrosion paint, a back-up layer of ceramic fiber blanket & calcium silicate board over the shell. Thickness of the back-up layer should be 0.5" (minimum) or 2" (maximum), it depends on the casting thickness.

## **Formworks (Shuttering) Preparation:**

### **For Small Application:**

- Before casting, formwork is necessary to hold the refractory material. Prepare shuttering panel as per casting design. Shuttering materials can be either wood or metal. But ensure shuttering has to be strong enough to bear the load of material, vibration.

### **For Large Application:**

- Make plan for casting as per installation area.
- Prepare shuttering as per casting plan
- Decide the panel size, panel size normally should not exceed 800mm x 600mm (31.49" x 23.6")
- Plan staggered panels as far as possible to ensure staggered joints.
- Stoppers plate has to be designed in such a way that, it should have a step of minimum 25mm with a slope of 25mm at the middle of stopper. Avoid straight stopper plate.
- Shuttering materials can be either wooden or metal. But ensure shuttering has to be strong enough to bear the load of material, vibration, etc. If required give further supports. Ensure shuttering material is having holes for making vent holes at an intervals of 300-400mm (11.8"-15.75").
- Ensure orientation of shuttering for casting suitability.
- Apply grease / oil at shuttering surface for easy removal and prevention of water absorption.

### **Mixing:**

- Mixing procedure mention above on the instruction of castables

### **Method of Installation:**

- The mixed castable should be cast as early as possible. In any case it should not exceed 15 minutes after mixing
- Fill the mixed castable in the shuttering and vibrate thoroughly
- Drawback the vibrator needle slowly in running condition.
- Ensure proper filling of shuttering
- Ensure providing vent holes in the cast panel before setting.
- Check the surface for proper setting
- Remove shuttering carefully after material has set

### **Curing:**

- Curing procedure mention above on the instruction of castable