

**TECHNICAL SPECIFICATIONS FOR ZIRCONIA BASED REFRACTORY  
BRICKS AND MORTARS TO BE PURCHASED FOR USE AT THE  
MELTING FURNACE AT THE DEHYDRATED  
BORAX WORKS**

**1- SUBJECT OF WORK**

Subject of this technical specification covers supply of refractory bricks and mortars to be used at the Dehydrated Borax Works Unit of our Management in conformity with the required characteristics and period, and delivery to the Entity.

The bidding firms will be referred to as the “BIDDER”, Eti Mine Works General Management will be referred to as the “ENTITY”, Kirka Boron Works will be referred to as the “PLANT MANAGEMENT” and the BIDDER who is awarded the contract will be referred to as the “CONTRACTOR” herein after.

**2- CHARACTERISTICS OF THE REFRACTORY BRICKS AND MORTARS**

Zirconia based refractory bricks of different chemical compositions in various dimensions and mortar materials of two different grain size will be used at the Dehydrated Borax Factory Unit. Chemical compositions related with required bricks and mortars, their dimensions and the quantities are provided in the following tables.

**Table -1:** Chemical Composition of Zirconia based Refractory Bricks and Mortars

<b>TYPE</b>	<b>ZrO<sub>2</sub>+HfO<sub>2</sub> % (min.)</b>	<b>Al<sub>2</sub>O<sub>3</sub> % (max.)</b>	<b>SiO<sub>2</sub> % (max.)</b>	<b>Other% (max.)</b>	<b>Density (mkg/m<sup>3</sup>) (min.)</b>
TYPE -2	40	46	12	2	3.900
TYPE -3	93	2	5	0,5	5.200

MORTAR	Grain Size	ZrO <sub>2</sub> +HfO <sub>2</sub> % (min)	Al <sub>2</sub> O <sub>3</sub> % (max)	SiO <sub>2</sub> % (max.)	Other % (max.)	Density (mkg/m <sup>3</sup> ) (min.)
MORTAR-1	0-5 mm	36	51	11	1	3.600
MORTAR-2	0-0,5mm	30	51	11	2	3.400

**Table -2:** Supply List for Zirconia Based Refractory Bricks and Mortars

LIST OF REQUIRED REFRACTORY BRICKS			
1	FEEDER WALL		
	Material Type	Dimension (mm)	Qty
	TYPE -2	600x200x200	72
	TYPE -2	440x200x200	10
	TYPE -2	570x540x200	16
	TYPE -2	250x200x200	12
2	FLANK WALL		
	Material Type	Dimension (mm)	Qty
	TYPE -2	800x200x200	24
	TYPE -2	150x500x200	12
	TYPE -2	350x600x200	12
	TYPE -2	<b>FIGURE -1</b>	30
3	SIDE WALL		
	Material Type	Dimension (mm)	Qty
	TYPE -2	200x500x200	30
	TYPE -2	600x250x200	100
	TYPE -2	350x250x200	20
	TYPE -2	350x480x200	12
	TYPE -2	500x480x200	120
	TYPE -2	300x250x200	24
	TYPE -2	420x60x200	24



STACK PASSAGE			
4	Material Type	Dimension (mm)	Qty
	TYPE -2	FIGURE -11(Flank Wall Dome)	16

TANK AREA			
5	Material Type	Dimension (mm)	Qty
	TYPE -2	1000x200x350	32
	TYPE -2	830x200x350	16
	TYPE -2	500x200x350	60
	TYPE -2	FIGURE -4	24
	TYPE -2	FIGURE -5	24
	TYPE -3	600x230x200	30
	TYPE -2	200x150x230	24
	TYPE -2	200x528x350	24
	TYPE -2	450x465x140	24
	TYPE -2	465x320x140	24

RUNNER BRICK			
6	Material Type	Dimension (mm)	Set
	TYPE -3	FIGURE -6 (One set of runner brick will consist of three pieces)	16

ROOF AREA BRICK			
7	Material Type	Description	Set
	TYPE -2	FIGURE -7	6

BURNER BRICK			
8	Material Type	Dimension (mm)	Qty
	TYPE -2	FIGURE-9	96

REPAIR BRICK			
9	Material Type	Dimension (mm)	Qty
	TYPE -2	230x114x50	3000

MORTAR MATERIAL			
10	Material Type	Packaging	Quantity
	MORTAR-1	In metal cans of 50 kg each	25 metric tons
	MORTAR-2	In metal cans of 50 kg each	5 metric tons

### 3- OTHER ISSUES

**3.1.** All zirconia based refractory bricks to be supplied will be produced with electromelting molding and will be free of casting cavities.

**3.2.** Each of the refractory bricks included into the FEEDER WALL, FLANK WALL, SIDE WALL, STACK PASSAGE, TANK AREA, ROOF AREA, BURNER BRICK groups will be produced with separate casting. The inner and outer casting surfaces of the cast brick will not be cut. The joining areas of the bricks will have a clean-cut. There will be no bumps, bulges or similiar defects in the joining areas. The combination of each brick in contact with each other will be balanced and in structure that the whole surface will be fully covered (leveled).

**3.3.** The 3000 bricks of 230x114x50 mm, required as REPAIR BRICKS, are not required to be cast separately and all surfaces will have a clean-cut so as to ensure that the chemical composition of the bricks of the REPAIR BRICKS are not changed.

**3.4.** All surfaces of the refractory bricks in the RUNNER BRICKS group, required as per Article 2 of the Technical Specifications, Table 2 and of which the dimensions and characteristics are provided in the list of required refractory bricks will be prepared with a clean-cut. Each refractory brick in this group will be produced by separate casting.

**3.5.** As specified in Figure 6, sets will be produced so that each set will consist of 3 (three) pieces.

**3.6.** Figures (Figure - 1,4,5,6,6.1,6.2,7,9,11) related with the required refractory bricks specified in Table-2 are provided in the annex of the technical specifications.

**3.7.** One set of roof (arch) area refractory bricks will be produced in the dimensions and shapes shown in Figure-7. Each arch block (a row of refractory brick block, each consisting of a total of 11 refractory bricks, in the refractory brick group of 10 (ten) rows forming the roof area) will be refractory bricks with cutting surfaces divided into smooth segments and will be free of deformation. Arch block, divided into segments, will be free of deformation, static weakness and disjointedness with other segments.

- 3.8.** All refractory bricks will be free of casting cavities. The surface and inner sections of all refractory bricks will be free of cracks and casting cavities.
- 3.9.** All materials (raw materials) used in the production of refractory bricks ( $ZrO_2$ ,  $Al_2O_3$ ,  $SiO_2$  etc.) will be new and previously unused materials and each brick will have the production date written on it , and none of the bricks will be previously used bricks.
- 3.10.** Dimensions and characteristics of all refractory bricks and mortars will be in conformity with dimensions and characteristics provided in the tables. All refractory mortars will be of suitable structure and chemical composition for production of precast bricks.
- 3.11.** Each group specified in Table-2 will be packed separately. A list of materials will be provided on each package, containing the package contents and quantities.
- 3.12.** Each piece in the scope of the technical specifications will be priced and offered separately. Partial delivery will not be accepted.
- 3.13.** Contractor will be required to submit all kinds of information and documents, specified in the specifications of the refractory bricks and mortars to be delivered, to the Entity.
- 3.14.** The storage period of the refractory bricks and mortars will be **specified in the bids** by the Bidder along with the storage conditions.
- 3.15.** Physical and chemical analysis certificate (ISO 17025), issued by a laboratory or establishment with international accreditation, will be presented along with the shipping documents to evidence conformity of the material at the time of shipment for shipments from abroad and at the time of delivery for inland bids. **Said certificate/information submitted will not be binding upon receipt in any way.** These will be only for preliminary information purposes.
- 3.16.** Contractor firms cannot submit partial bids for the refractory bricks and mortars. Bid will be presented for all refractory bricks and mortars Partial bids will not be taken into consideration.
- 3.17.** Bidders will provide information on the origin (country), supplying company and production factory for the refractory bricks and mortar materials to be produced and/or supplied **in their bids**.
- 3.18.** Zirconia based refractory bricks which is the subject of this technical specification in Table.2 will be used in the glass contact surface and will be resistant to 1600 °C and wear.
- 3.19.** Contractor will present certificates evidencing conformity of the materials to the characteristics required in Article 6 of the technical specifications, issued by

national/international accreditation institutions (in the scope of International Accreditation Forum Mutual Recognition Agreement).

#### **4. DELIVERY**

In domestic purchases, the refractory brick and mortar material will be delivered to Spare Parts Storehouse of Kirka Boron Works of the Entity. Delivery place will be DAP KIRKA WORK in international purchases. Subsequent to delivery of all materials to Kirka Boron Works, the physical and chemical examinations will be realized by the Entity/Plant Management within 30 (thirty) work days. In the event of tests for physical and chemical conformity, carried out by or for the Entity/Plant Management, taking a period longer than 30 (thirty) days, the results will be awaited until the analysis results are concluded. Contractor will not be entitled to any objections or claims based on this situation. Refractory bricks and mortars, which are determined as not being in conformity with the technical specifications as a result of the analysis, will not be accepted. In this case, materials that are found to be non-conforming by the Entity will be notified to the Contractor in writing and the Contractor will replace the non-conforming materials with conforming materials within a period of 100 (hundred) calendar days subject to fine as of the notification date. All costs incurred during said replacement processes (loading, shipping, insurance, costs of analysis to be carried out again, customs etc.) will be borne by the Contractor.

#### **5- DELIVERY TERM**

Delivery term will be 200 (two hundred) calendar days for all materials in the scope of the technical specifications, as of the signing date of the contract.

#### **6- ANALYSIS AND WARRANTY**

Refractory bricks and mortars will be under warranty for a period of 1 (one) year for all kinds of material, production and workmanship defects. Random samples will be taken from the refractory bricks and mortars delivered to the Entity and these samples taken will be subjected to physical and chemical analysis at an accredited laboratory or a university laboratory to be designated by the Entity with the related costs being borne by the Entity. Results of these laboratory analyses will be accepted by both parties.

## 6.1. Physical Characteristics

**Visual Inspection:** Crack, porosity and bumps, bulges etc. in the joining surface controls will be realized on the refractory bricks along with the controls and tests related with all issued required and specified in Article 3 of the technical specifications.

**Geometrical Control:** Conformity control of refractory bricks to the dimension requirements specified in Table-2 of Article 2 of the Technical Specifications.

## 6.2. Chemical Characteristics;

**Chemical Analysis:** Refractory bricks and mortars will be subjected to conformity analysis in terms of chemical composition analysis requirements specified in Table-1 of Article 2 of the Technical Specifications.

Samples taken will be subjected to weight control. During the weight control, the volumes of the samples will be multiplied with the density of the brick type specified in Table-1 and controlled in terms of whether the required value is achieved. It will be construed that the results of the analyses and weight control will be representative for all materials produced in the scope of the technical specifications.

If any non-conformities are found during the physical and chemical analyses and the weight controls of the refractory bricks and/or mortars, the refractory bricks and/or mortars will be replaced by the Contractor with conforming ones with all costs (loading, shipping, insurance, customs, etc.) being borne by the Contractor within a period of 100 (hundred) calendar days.

In this case, the Contractor will not be entitled to any objections or claims based on this.

## 7. PAYMENT

### 7.1 In domestic delivery;

Payment will be made at once following determination of the fact that all refractory bricks and mortars delivered to the Entity are in conformity with the chemical and physical requirements specified in Article 6 of the Technical Specifications, as a result of the tests conducted. No advance payments will be made for this work. The Contractor will issue the invoice after conformity of the materials delivered is confirmed by the PLANT MANAGEMENT. After

necessary controls are realized by the PLANT MANAGEMENT, the payment will be realized on 5th (fifth) calendar day subsequent to transfer of the invoice and other documents related with payment to the Financial Affairs Department.

In the event of any non-conformity being found in the materials delivered to the Contracting Entity, no payments will be made until conforming new materials are delivered by the Contractor to the Entity (These materials will be subjected to the physical and chemical analysis, specified in Article 6 of the technical specifications, also).

## **7.2 In delivery abroad;**

A letter of credit will be opened for 100% of the total price of the refractory bricks and mortars prior to shipment in the scope of the total contract price, and 10% of the total order amount will be paid upon loading and presentation of 100% shipping documents to the bank, free of errors, and 90% will be paid upon achievement of positive results in the analysis to be carried out by the Institution after delivery.

## **8. FINE**

**8.1.** In the event of failure of the Contractor in delivering the goods in a timely manner in conformity with the contract, the period under fine specified in the administrative specifications/contract will be granted to the Contractor subject to a fine of 0.3% (three per thousand) of the price of the delayed goods in domestic purchases and 0.07% (seven per ten thousand) of the delayed goods in international purchases.

**8.2.** The period subject to fine, specified in the administrative specifications/contract, will be granted with a fine of 0.3% (three per thousand) of the price of the delayed goods for each day of delay in domestic procurements and a fine of 0.07% (seven per ten thousand) of the price of the delayed goods for each day of delay in international procurements for replacement of the goods/materials that are delivered in the contract scope by the Contractor and found to be defective or faulty as a result of the physical and chemical analysis or controls by the Entity with new ones conforming to the technical specifications. This period cannot be more than 100 (hundred) calendar days subject to fine.

**8.3.** Delay fine will be deducted from the payments made to the contractor without any warnings and written notices. This fine amount will be deducted from the Contractor if it



cannot be covered by the payments, performance bond and the supplementary performance bonds, if any. The Contractor will not be entitled to object to this and will not be entitled to any claims.

**8.4.** Subsequent to delivery of the refractory bricks and mortars to the Plant Management, the Contractor will be granted the right to replacement for one time only in the event that these are found to be non-conforming to the specifications in the analysis and weight controls to be made by and/or on behalf of the Entity. The maximum period for replacement will be 100 (hundred) calendar days, and no additional period under fine will be granted. Otherwise, the Entity will be entitled to terminate the contract unilaterally. The Contractor will not be entitled to object to this and will not be entitled to any claims.

## **9-PACKAGING**

**9.1.** Refractory bricks will be packed in wooden cases of minimum 8 mm in thickness. The covers of the wooden cases will be minimum 10 mm in thickness.

**9.2.** The wooden pallets on which the refractory bricks will have four sides and will provide for easy placement of forklift blades in all four sides. Pallets will be capable of carrying minimum two times the weight of the load on them.

**9.3.** Mortar materials will be in packages of 50 kg in nylon etc. protectors preventing contact of the mortars with the air, inside metal cans.

**9.4.** Runner bricks group will be packed separately on their own and will not be together with other groups.

**9.5.** Burner bricks group will be packed separately on their own and will not be together with other groups.

**9.6.** The Group of Figure11-Flank Wall Dome will be packaged separately on their own and will not be together with other groups

**9.7.** Brick types and dimensions will be specified comprehensively by painting templates on each brick.

**9.8.** Sets to be used for each furnace in the Roof Area Bricks group will be numbered with different colors. Each color group will be packed together on their own.

**9.9.** All materials will be packed in a suitable manner which will not fall apart during handling and stowing. Contractor will be responsible for taking all necessary measures on this issue. In case of occurrence of all kinds of breaking, falling apart etc. events causing damaging of the materials as a result of non-conforming packaging, the damaged materials will be replaced unconditionally, free of charge on one to one basis with new and unused ones.

## **10. ANNEXES**

**Annex-1:** Figure-1, Figure-4, Figure-5, Figure-6, Figure-6.1, Figure-6.2

**Annex-2:** Figure-7

**Annex-3:** Figure-9

**Annex-4:** Figure-11