How to receive & store the bricks

Introduction

This procedure is intended for plant managers, production managers, plant refractory champions, store managers and store yard supervisors. This document deals with both refractory bricks and monolithics.

Expected benefits:

- To use the refractory before their shelf life is over
- To avoid usage of shelf life expired refractory inside kiln and other locations of pyro- system

Indicator to monitor progress:

- Decrease in yearly Refractory inventory cost (or) Reduction in quantity of refractory rejected each year (after expiry date)
- NSFRI

Safety aspects

- Transport related safety (container truck movements, unloading/loading containers, forklift movements, crane operation and falling object from height).
- Refractory yard internal roads are to be clearly marked with signs.
- Ensure sufficient lighting inside closed yard and open yard
- Engage trained and certified operators for the operation of fork lift and crane
- All vehicles should have reverse gear alarm
- No smoking inside the yard
- Hands free communication system should be used (e.g. hands free walkie talkie)

Prerequisites

- Pre-work needed
  - For new projects – The refractory yard should be included in the basic plant lay out, Ensure that the refractory yard with closed store is ready before receiving the refractory at site. No make shift arrangement is accepted.
  - For running plant – Assess the existing facility, the gap need to be analysed and actions to be taken on priority
- Resources
  - Space for refractory yard (ventilated covered store for basic brick and monolithics) near main store, satellite storing facility (covered) near kiln platform.
  - Container unloading facility
- Specific equipment required
  - Fork lift, hand lift trolleys, over head crane inside the closed store and near kiln platform
  - Minimum refractory testing facility in the Laboratory

    Example of SOP for Refractory inspection on arrival
  - Relative humidity meter and room temperature indicator inside the closed store.

- Packing norms
  - Make sure that packing norms are prescribed in the brick order (examples below):

Packaging on pallet covered with pre-shrunk plastic sheet
Carton put over the standard packaging

Covered again with pre-shrunk plastic sheet

Time frame

- Receiving and storage of brick two times in a year (two weeks each year).
- Return of unused refractory and re arranging refractory two times in a year (two weeks each year).

In this procedure you may find references to other information (Job aids, other "How to" procedures, knowledge documents, etc) which are available from their respective domain of the Web Cement Portal (e.g. Refractory, Grinding, Pyroprocessing..) or from the BRS database (indicators).

Action Steps

1. Ensure transport conditions to plant site

- Check for adequate packaging.
- Do not withdraw the pallets from container and store in harbour yard.

- Bricks must be cleared from the custom as soon as they arrive to the final port destination.
- Transport from the port to the plant must be done using professional companies (load must be covered).

Ensure that the refractory is transported to site without any kind of contact with moisture and not subjected to physical damage (preferably by container).

2. Ensure adequate storage in refractory yard

- Ensure the refractory yard is available in the plant site

Example of Lay out of Refractory yard (Job aids > Templates)

Storage must be fully covered and well ventilated.

- Bricks must be stored per brick type and format.
- Provide separate bay with marking on wall for each quality/brand/size inside the covered store. Pallets labelling must be visible.
- Basic bricks, chemical bonded bricks, mortar and castable (monolithics) are stored in ventilated and covered store.
- Ensure that storage facility is elevated enough to avoid water flooding during rainy season.
- Storage floor must be flat without water floor streaming.
- Enough space must be reserved to allow pallets manipulation using forklift.

Pallets must be stored as such as FIRST IN FIRST OUT.

Alumina bricks:

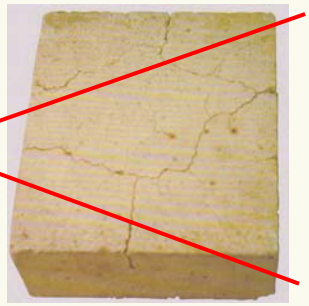
- Alumina bricks are stored in concrete floored open yard and covered with Tarpaulin
- The concrete floor should be elevated and free from water stagnant
- It is recommended to dry the wet Alumina bricks before use.

Castable & mortar:

- If castable and mortar are received in bags
  - Stack them on a wood platform
  - Stack height should be 2 meters maximum
  - Cover the stack with tarpaulin

EXAMPLE

Hydration cracks on Magnesia bricks.
MgO reacts with water → Bricks cannot be used any more!



3. *Inspect refractory upon arrival at plant site*

- It is recommended to follow the SOP about test on arrival

Example of SOP for brick inspection (Job aids > Templates)

4. *Stack the bricks properly*

- Stack the refractory at the dedicated space for each brand/size
- Ensure that the pallets are arranged for inventory management, first IN first OUT facility
- Leave 1 meter distance between each row of pallet stacks to allow for ventilation.
- Leave the pallets in their original packing, no additional cover is required inside the covered store.
- It is recommended to follow the norms stated below in pallet stacking:

Basic brick	3-4 pallets
High Alumina – fire clays bricks	4-5 pallets
Lightweight – insulating bricks	3 pallets
Mortar, concrete	3 pallets not more than 2 m
Precast material	1 pallet

Proper storage of refractory bricks pallets :

5. Transport the bricks properly inside plant site

- Transport the refractory in pallets (preferably by forklift)
- Use crane or lift for lifting of refractory to work floors
- Use forklift or belt to transport bricks inside the kiln.

Satellite store

- Build temporary covered store for refractory near kiln platform before each shutdown
- Avoid rain water or any kind of moisture contact with basic brick/castable and mortar.

Shelf life of Refractory

- For basic brick:
  - For tropical climate (above 85% relative humidity and average atmospheric temperature above 30 deg °C) = 9-12 months (request a date for manufacturing)
- For monolithics:
  - As recommended by supplier
- For Alumina bricks
  - No shelf life, it can be stored for long time. If the alumina bricks were found wet, dry it before it is used.
  - Avoid dust deposition on the brick surface.

Return of refractory back to store after shut down

- This is an important job supervised by refractory champion or supervisor
- Broken corner bricks and moisture contaminated basic bricks are rejected at site and sent to reject yard
- Stack the good refractory on wooden pallets
- No mix of brand/size

- Wrap it with plastic or card board
- Make clear marking of brand/size/quantity/date of manufacturing (left out from which lot of manufacturing or arrival at site).
- Send the information to store for inventory control
- Shift back to respective storage place and stack it in first out position.
- Keep the bar or order number of the opened pallets in case you need to make reference to.

Appendix

1. Technical & Service requirements for ordering bricks

Example in Job aids > Templates

2. Flow sheet of Refractory storage activity