# Design of Bleach Towers & CUI

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# ELEMENTS OF A BLEACH TOWER

**DESIGN CONSIDERATION (all components showing)**

- 1) Carbon Steel Structure
- 2) Membrane
- 3) Mortar
- 4) Brick, Tile
- 5) Paint
- 6) Insulation

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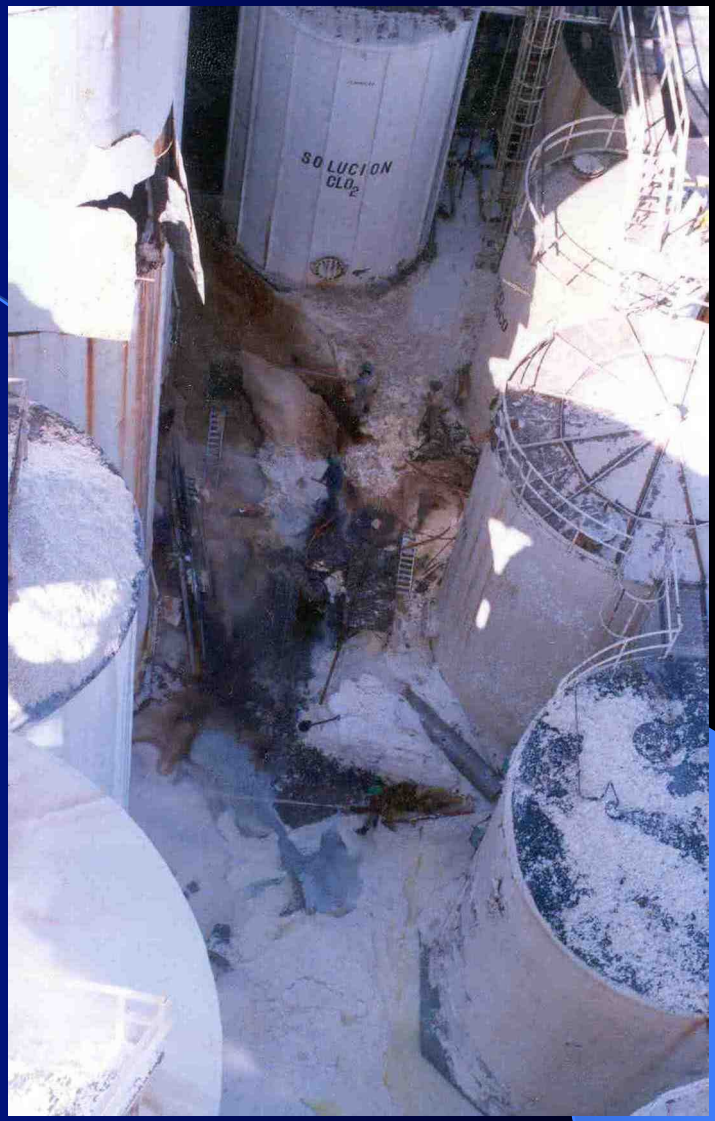


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# Carbon Steel Shell Guidelines

- Bleach Towers must be designed for maximum working stress of 9,000 psi.
- Minimum plate thickness 3/8 inch.
- Roof cover must have a minimum 15 degree rise.
- Out of-roundness not to exceed +- ½" of radius. Plumbness not to exceed 1/8" for each 10'-0" of height.
- Floor plates must always be in intimate contact with the supporting concrete foundation. Pressure grouting to accomplish this is normally required.
- A minimum of 6" of concrete floor fill is needed to prevent crowning or oil canning of bottom plates.

# MEMBRANES

## What about from the other side?

## The Forgotten Phenomena

- The brick lining provides mechanical, thermal and increased chemical resistance for the membrane.
- In essence, as the brick/mortar lining is somewhat porous, the membrane is the impervious barrier protecting your steel shell.

# Types of Membranes

- Concrete — Portland Cement
- (RL)Latex — Sarancote
- **Polyurethane — Elastomeric**
- **FRP-Membrane — Vinyl ester-(VE)**
- FRP-Membrane — Unsaturated Polyester –(UP)

# MORTAR CONSIDERATIONS

- Chemical Resistance
- Moisture Sensitivity
- Curing Capabilities
- Surface Tolerance
- Handling Characteristics
- Pricing and Availability
- Shelf Life
- Tensile (bonding)

95% - 100% of HB joint will break tile

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# TYPES OF MORTARS

- Portland Cement
  - Calcium Carbonate
  - Micro-Silica
- Furan
- Vinyl-Ester
  - High molecular weight (HMW)
  - High Temperature (HT)
- Polyester
  - Halogenated
  - Saturated
  - Unsaturated (UPR)
  - High Bond (HB)

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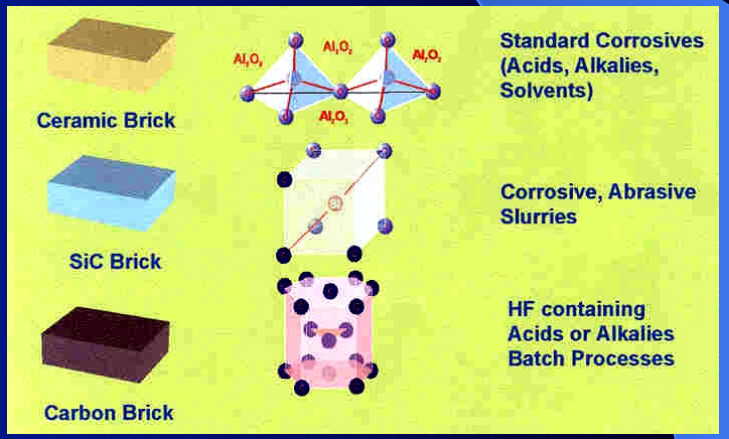
# ACID RESISTANT BRICK AND TILES

## Purpose

- Brick or tile linings constitute a mechanical protection against abrasion and impacts to the membrane.
- Thermo protection (thickness of lining ) must be calculated according to the delta T, so as not to exceed the max. temp. of the membrane.

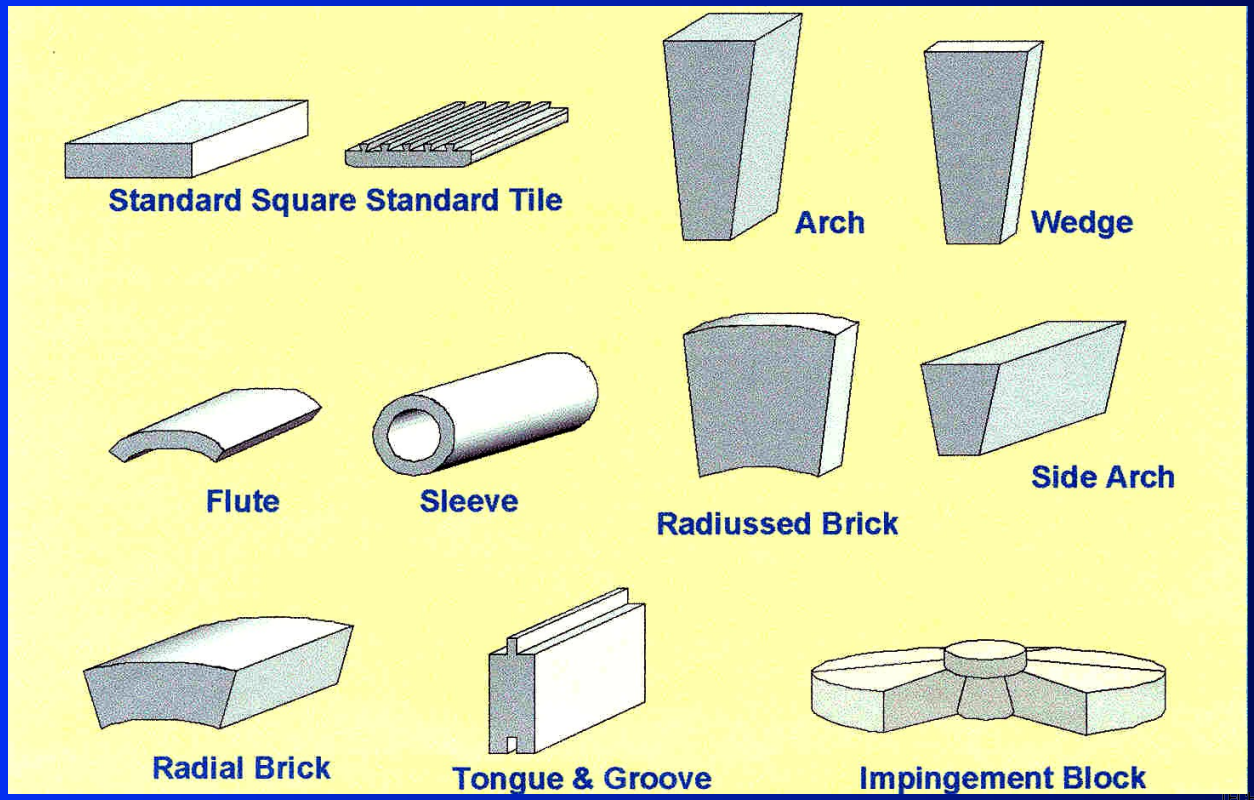
# TYPES OF BRICKS AND TILES

- North American Fireclay Mod. L Type 11
- European Acid-Resistant “SF”Grade
- Silicon Carbide (SiC)
- Carbon Brick
- Structural Ceramic Tile



# SHAPES OF CERAMIC BRICKS

Brick linings should fit as precisely as possible onto the steel vessel shape.



# EXTERIOR PAINT

## Environment

- Painted metal surfaces are exposed to corrosive fumes, highly oxidizing chemicals, and high humidity.
- Spills and leakage are common.

- Bottom Flange of
- D-Stage Tower

# TYPES OF EXTERIOR PAINT

- Modified Epoxy Primers
- Inorganic Zinc
- Zinc-Rich Epoxy-Polyamide
- Vinyl-Ester
- Polyurethane
- Acrylic Polymer
- Ceramic Cover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# Insulation

## Failure Avoidance

- Water that intrudes into insulation has major, destructive thermal and structural effects on the system.
- The climate and the micro climates within buildings and /or processes are factors to be taken in the planning stage.
- By using proper materials, specifications, engineering design, inspection and maintenance methods the cost can be kept to a minimum.

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# A Hidden Problem

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# Corrosion / Roof Flashing


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