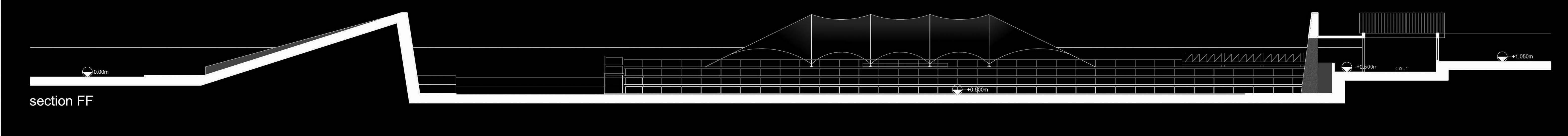
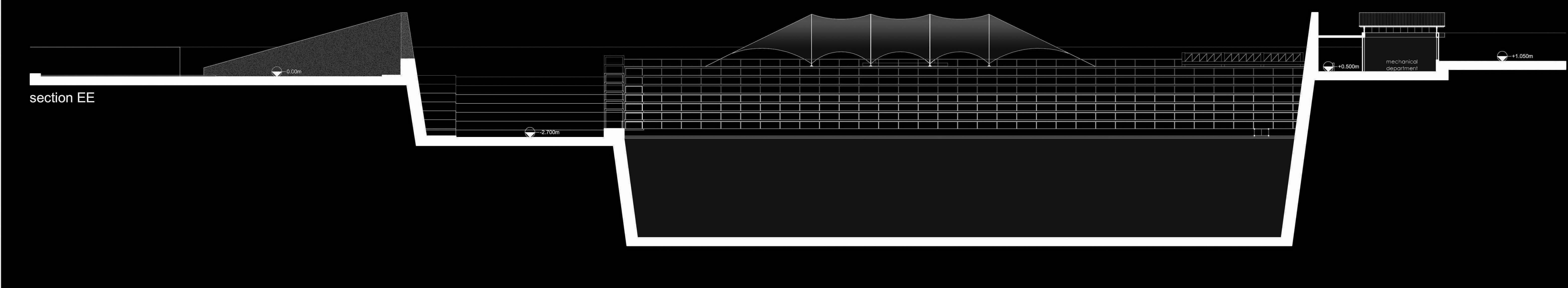
0.00m
ground zero
-0.900m
-1.800m
-2.700m
-3.600m
-4.500m
-5.400m
cafetaria
plaza -6.300m
rain water collection tank
overhead water tank capacity 50,000 lts.
0.00m

section BB



section FF



section EE

PHYSIC-CHEMICAL TREATMENT/REMOVAL PROCESSES FOR METALS

01 Aeration
Air-stripping is a physical diffusion process which separates gases or volatile components from water by mechanically increasing the air/liquid surface area, thus permitting a greater rate of diffusion. In stream aeration can be accomplished using cylinders of compressed air, or perforated pipes attached to an on-shore compressor.

02 Precipitation
All precipitation processes operate under the same fundamental chemical principles and utilize similar type of equipment and process configurations.
The principal mechanism of precipitation involves the alteration of the ionic equilibrium of a metallic compound to produce an insoluble precipitate. Typically, an alkaline reagent is used to lower the solubility of the metallic constituent and thus, bring about precipitation . In general, precipitation reactions form a salt and an insoluble metal.

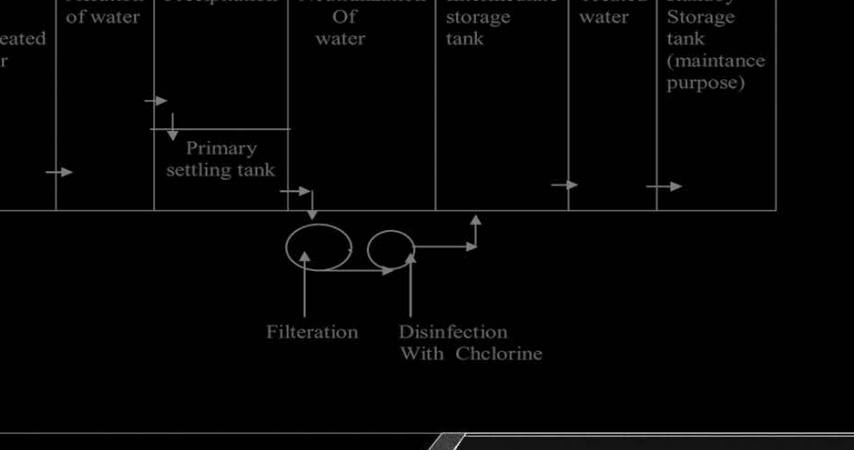
Hydroxide, sulphide and carbonate precipitation of heavy metal removal:
a. Hydroxide precipitation:
The most common method of reducing heavy metals concentrations in aqueous wastes is by hydroxide precipitation and sedimentation. Excess lime or caustic soda is used to precipitate metal hydroxide which are relatively insoluble in alkaline solutions.
b. Sulphide precipitation:
Sulphide precipitation using soluble Na2S or sparingly soluble FeS can remove heavy metals effectively even in the presence of complexing and chelating agents. Because metal sulphides are generally less soluble than the corresponding hydroxides, better removal efficiencies are achieved with sulphide precipitation over a broad pH range.
c. Carbonate Precipitation:
Carbonate precipitation with soda ash is used to remove heavy metals because of the lower operating pH and the lower solubility of the metal carbonate compared with metal hydroxide.

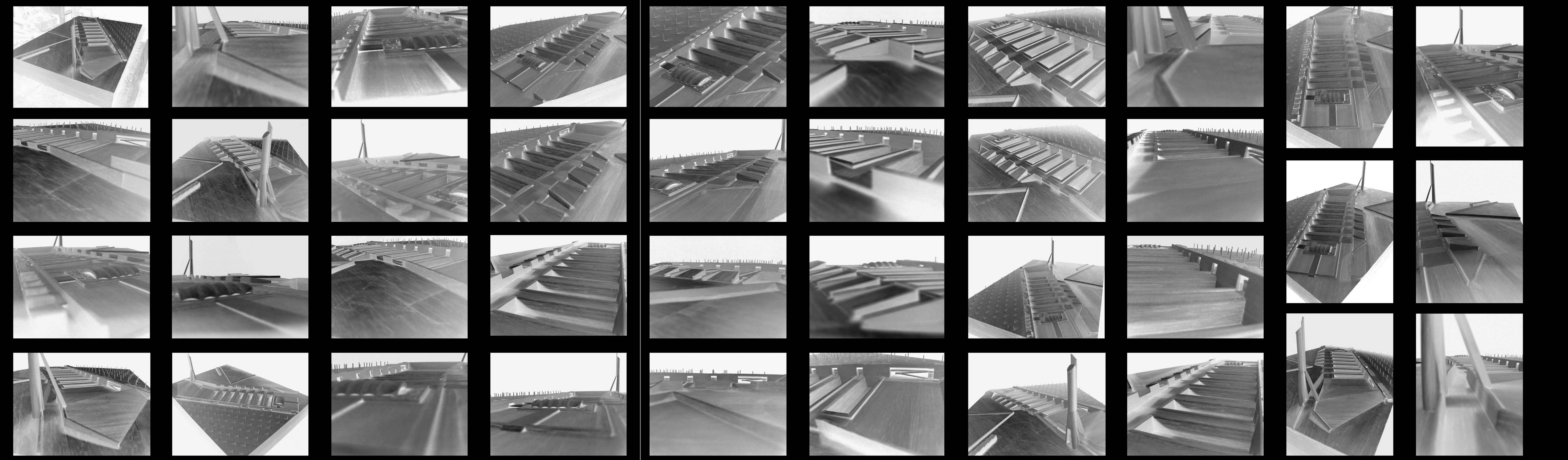
03 Neutralization:
Neutralization consists of adjusting an acidic or alkaline condition of water by appropriate reagent to a final pHof 6 to 9, which meets surface water discharge requirements established under the Clean Water Act.
The selection of the appropriate reagent for water neutralization is site-specific and dependant on the following considerations: water characteristics, reagent costs and availability, speed of reaction, buffering qualities, product solubility, costs associated with reagent handling and residual quantities and characteristics.**04 Membrane Seperation for Metal Removal:**
The membrane processes considered here include commercially proven technologies such as ultra filtration, reverse osmosis and electro-dialysis. Reverse osmosis and elctro-dialysis are used to recover plating compounds from rinse water and to permit possible reuse of rinse water as plating bath makeup.
The primary function of a membrane is to allow preferential containment and transports of certain components present within waste streams. Membrane can be classified in a number of ways in accordance with factors such as their origin, chemical composition, structure (eg. pore size and symmetry of pore structure) and mechanism of membrane action (eg. absorptive, ion exchange, osmotic or inert membranes).

a. Reverse Osmosis:
Reverse Osmosis, sometimes called hyperfiltration, may be used to concentrate dilute solutions of many organic species, including dissolved ions and many organic solvents. Ideally it permits only the transfer of water, selectively retaining all other dissolved species within the waste stream. Operating pressure used are high, of the order of 300 to 1500 psig, in order to overcome the osmotic pressure of the solute and to provide adequate flux. Normal operating concentration of the solute increases during reverse osmosis, additional pressure is required to maintain the water permeation rate.
The reverse osmosis technology is capable of achieving zero discharge in certain applications. There should be no detrimental environmental impacts associated with this technology provided the reject stream can be recycled. When properly applied, reverse osmosis systems should achieve economical benefits associated with chemical recovery and the elimination of the expense of hazardous waste disposal.
b. Electrodialysis:
Electrodialysis processes use an electricalpotential gradient and special synthetic membranes, usually ion exchange type resins, to produce an enriched stream and a depleted stream. cation and anion exchange membranes are arranged alternatively to form compartments in a stack maintained between two electrodes. Upon application of an electrical field, the ions entering the compartments within the stack migrate in opposite directions. Depending upon the selectivity of the membrane, the ion will either pass through the first membrane it encounters or be held within its original compartments. Thus, salt solutions are concentrated or diluted in alternate compartments.
The principal area of application of electrodialysis appears to be the recovery of metals from electroplating bath rinse waters. Electrodialysis and reverse osmosis are competitive processes for these applications. Electrodialysis would appear to have the advantage when concentrated levels are low (operating costs are low), or when recovery values justify the expense of achieving concentration levels higher than those possible with reverse osmosis.
Because elctrodialysis is a recovery process, the environmental impacts are limited to those resulting from pre-treatment and post-treatment. Pre-treatment operations generating wastes include filtration to remove solids, oil and grease, chemical precipitation to remove scaling components, and ion exchange to remove organics that could lead to biological fouling or electroplating difficulties. Post-treatment requirements are minimal, but could involve treatment or purification of process streams suffering from a gradual accumulation of contaminants in a near zero zone discharge system.

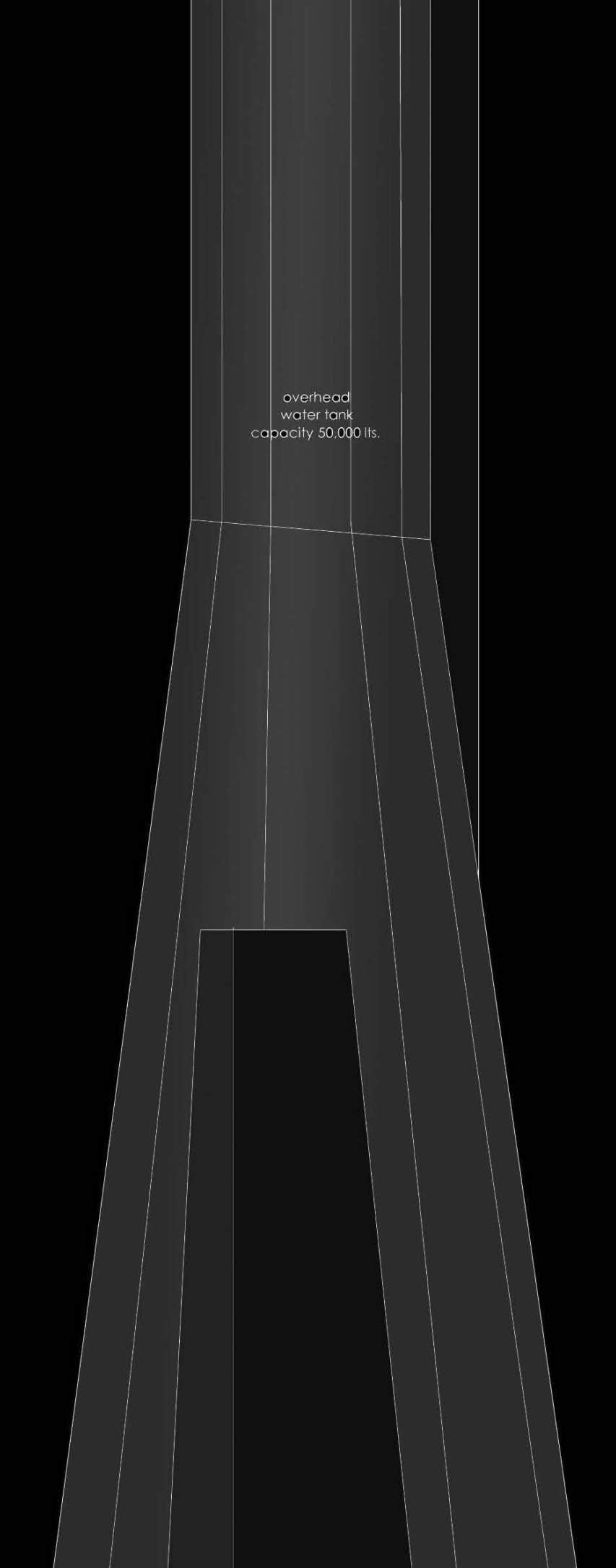
05 Disinfection:
Disinfection is the most important water treatment process for preventing the spread of infections.

Schematic diagram of water treatment:





views



elevation HH

5-A1 PURIFICATION OF WATER AS MEMORIAL
Development of a Memorial Complex for Bhopal gas tragedy victims

SECTIONS
1:200 1 0 200 600

6-A1 PURIFICATION OF WATER AS MEMORIAL
Development of a Memorial Complex for Bhopal gas tragedy victims

SECTIONS
1:200 1 0 200 600

7-A1 PURIFICATION OF WATER AS MEMORIAL
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SECTIONS
1:200 1 0 200 600