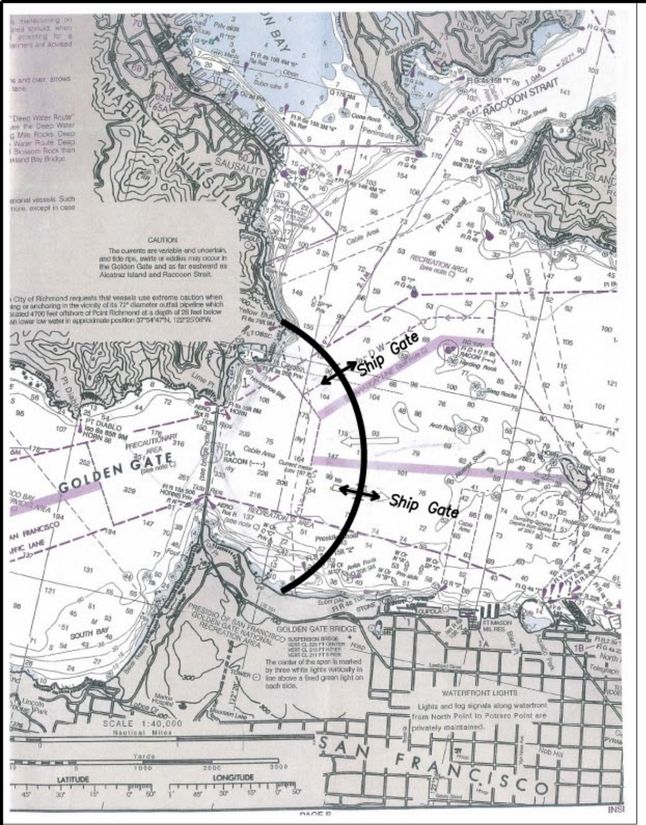
Golden Gate Permeable Flood Barrier (GGPFB)



DESIGN BASIS

System Layout and Operation

Located approximately 2 miles east of the Golden Gate Bridge in water generally less than 100 feet deep.

Approximately 2.6 miles long.

Contains 2 sets of closable ship gates with clear openings of 400 feet wide by 60 feet deep.

Gates are positioned to allow separate shipping lanes for incoming and outgoing traffic.

System is normally open (permeable) with minimum effect on bay tidal action.

When the flood condition – a combination of high tide and storm surge – is predicted, ship gates and permeable module butterfly valves are closed at low water slack tide.

This ship gate system is designed to act as a weir to restrict water flow in the event of a failure to close.

PERMEABLE BARRIER MODULE DESIGN

The system contains 32 modules each 400 feet long by 100 feet wide. The height is varied to suit the water depth.

Modules are constructed of reinforced concrete and fabricated on shore.

The base is buoyant and constructed with watertight bulkheads to provide floodable compartments for towing and installation.

Tidal control butterfly valves are steel. The valves are opened and closed by shafts connected to hydraulic actuators mounted on top of the modules.

Valve openings could be fitted with water turbine electrical generators in the future.

SHIP GATE DESIGN

Rotational gate, semi–circular, approximately 480 feet long, 120 feet wide, and up to 40 feet thick. Constructed of steel plate with stiffening ribs and floodable compartments.

The gate is connected to the concrete housing structure by hollow steel end trunnions and rotated via hydraulic machinery located above the waterline. The machinery is covered to provide protection from the weather.

The gate has 4 operating positions:
– Open: Normal position, the gate flat at the base of the ship channel providing maximum flow. Compartments are flooded.

– Weir Mode: The gate is rotated to restrict flow through the ship channel. Compartments remain flooded.

– Closed: The gate is rotated to block all flow from ocean toward bay. Compartments are partially flooded.

– Maintenance: The gate is rotated fully above water for inspection, cleaning, and repairs. Compartments are pumped free of water.

MODULE INSTALLATION

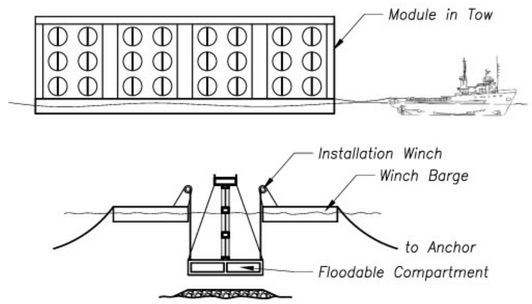
– Prior to the arrival of the modules, the seabed will be prepared for levelness and scour protection by installation of a riprap bed and mat.

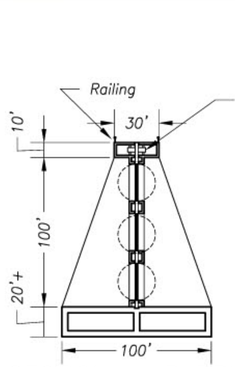
– Upon arrival of the module tow at the installation site, the module will be positioned between 2 anchored winch barges.

– The module will then be lowered by pumping seawater into the floodable compartments.

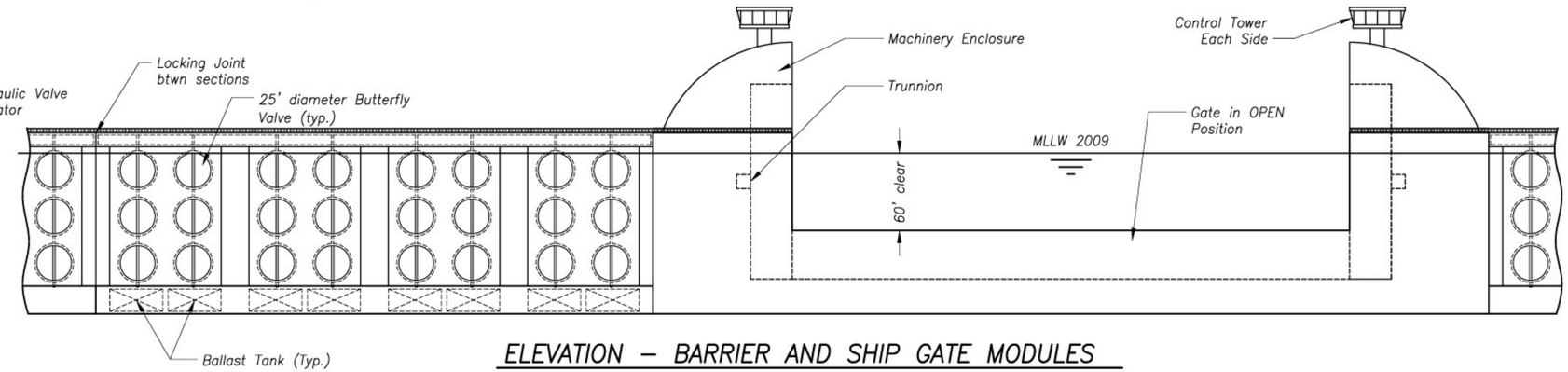
– Concurrently, the winch barges will orient the module into its final position.

– Once in the correct position on the seabed, the module is fully ballasted to provide stability for the design load conditions.

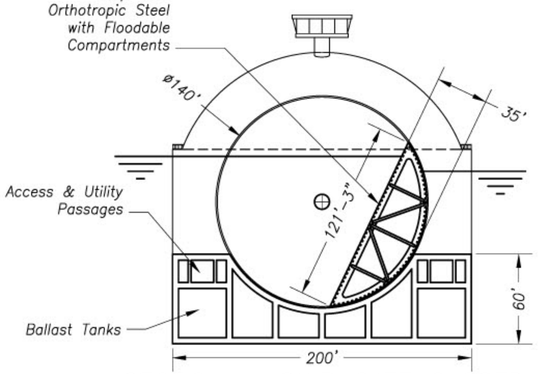




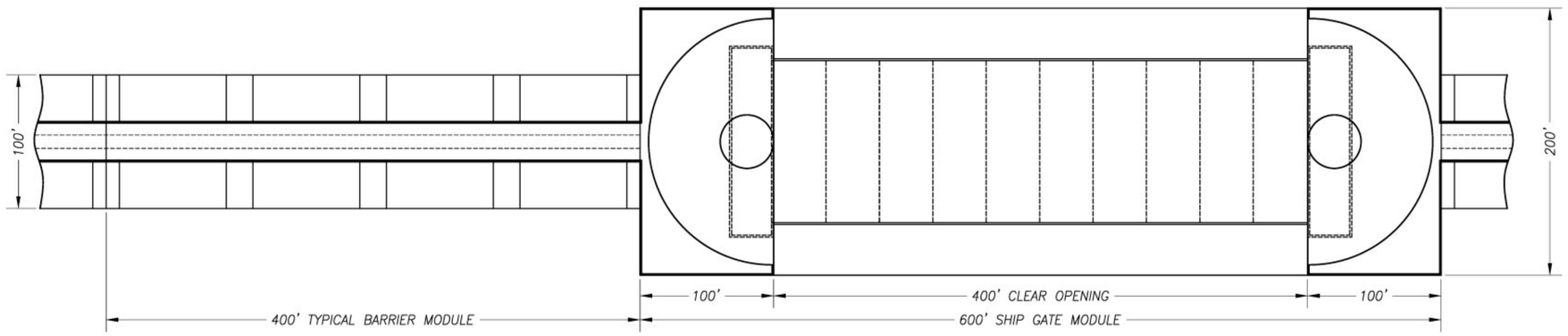
SECTION – BARRIER



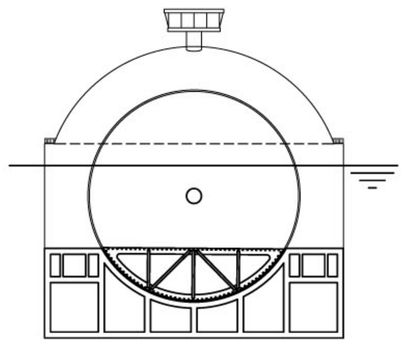
ELEVATION – BARRIER AND SHIP GATE MODULES



SECTION – SHIP GATE CLOSED



PLAN – BARRIER AND SHIP GATE MODULES



SECTION – SHIP GATE OPEN

RISING TIDES COMPETITION – 015528