

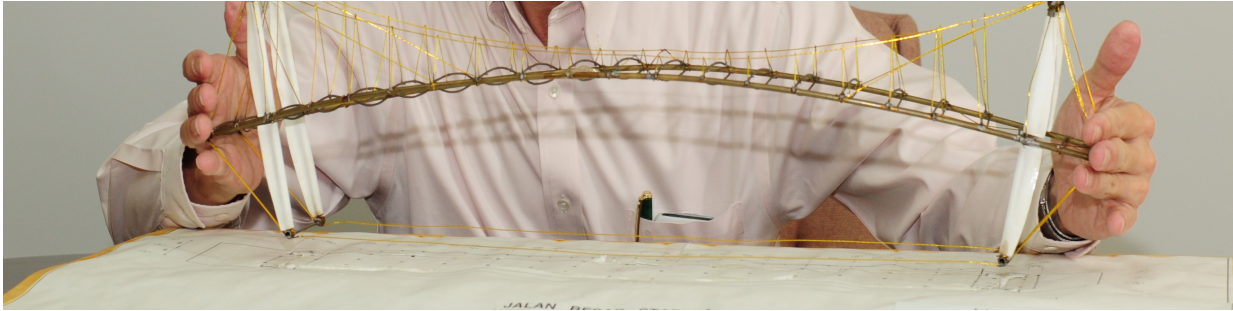
The Use of Scale Models in ALC

A picture is worth a thousand words - Chinese saying

A scale model is worth a thousand pictures - ALC

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INTRODUCTION



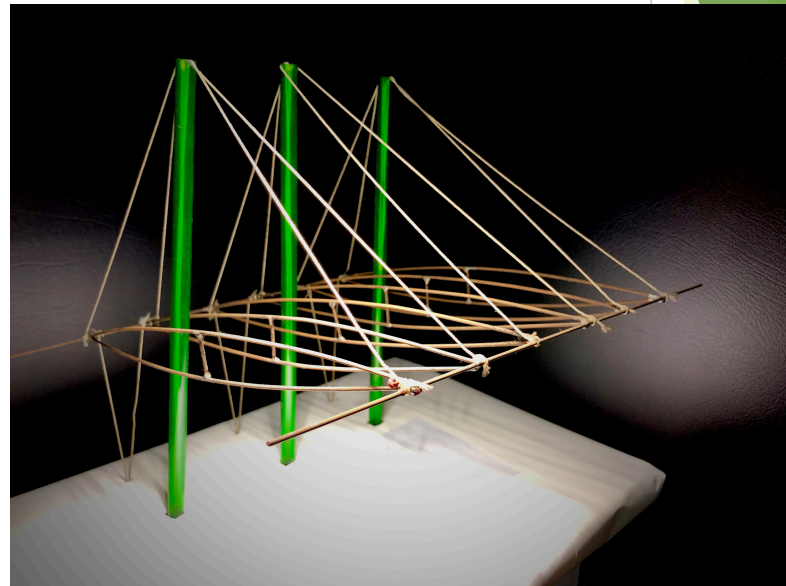
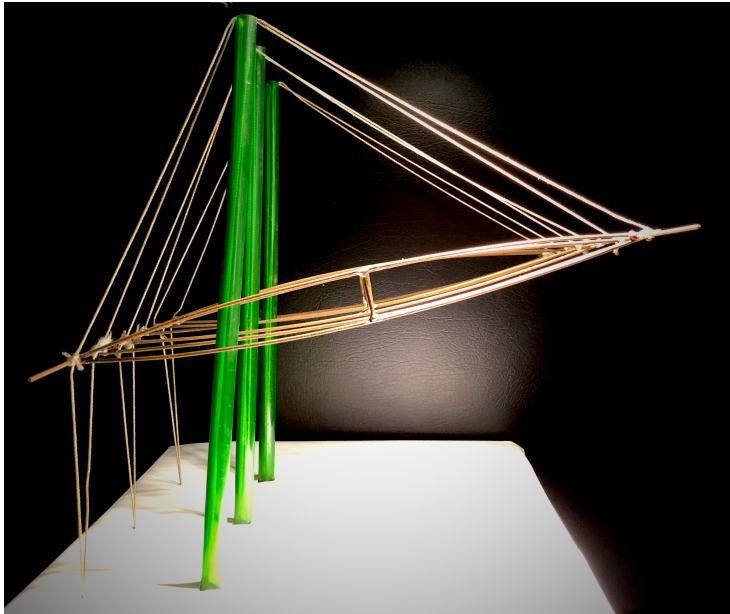
- ▶ Scale models are invaluable to help understand, illustrate, convey and improve on engineering design concepts.
- ▶ The following is a sampling of some of the models which our engineers have built in-house to aid in our work.

PRIZE WINNING STRUCTURES

- Unique structures especially require extra engineering effort and scale models to verify their stability, strength and robustness



***BISHAN STADIUM
SUSPENDED ROOF
TRUSSES***

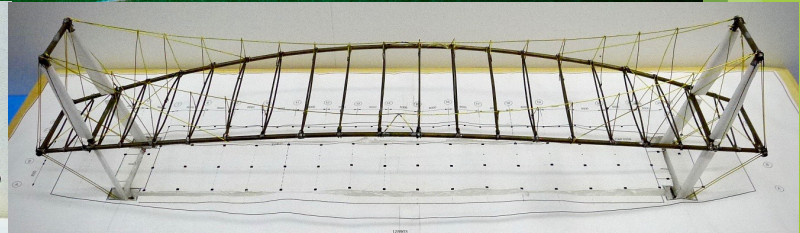
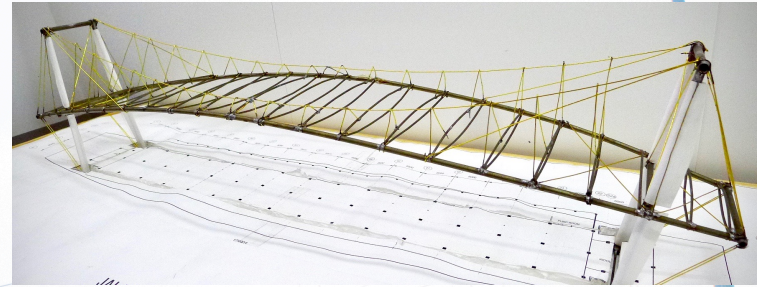


- Cable suspended structures are difficult to simulate properly in FEM. For this project, a scale model was used to prove the feasibility, stability and robustness of a unique structural concept.

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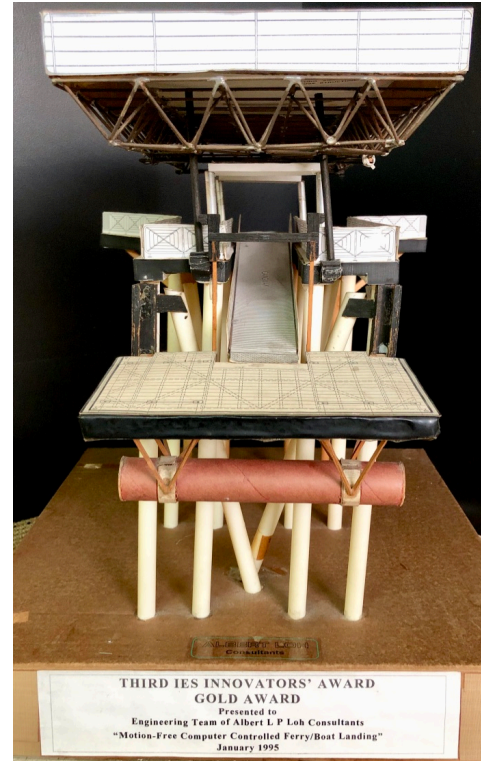
JALAN BESAR STADIUM MAIN GRANDSTAND ROOF

SINGAPORE STRUCTURAL STEEL SOCIETY
DESIGN AWARD



- ▶ This prize-winning project impressed the judges with its novel structure which is a combination of an arch with suspension cables.
- ▶ The design was proved feasible and developed with the aid of an accurate structural scale model.

MOTION-FREE FERRY/ BOAT LANDING

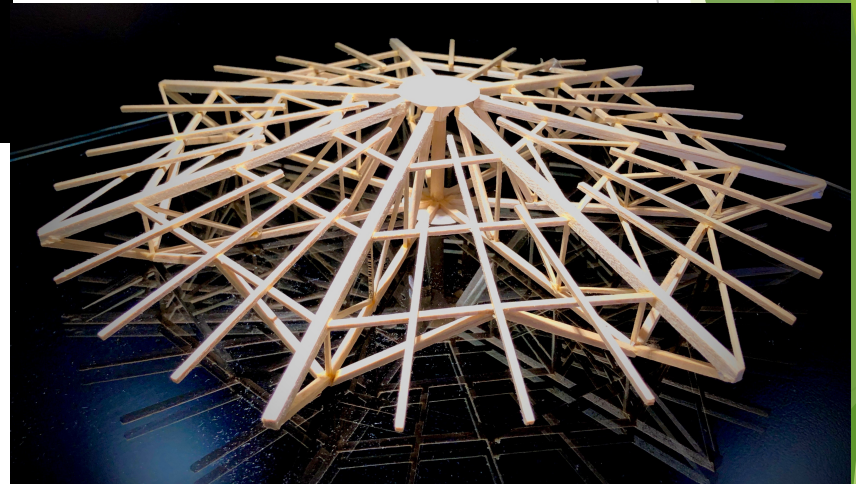
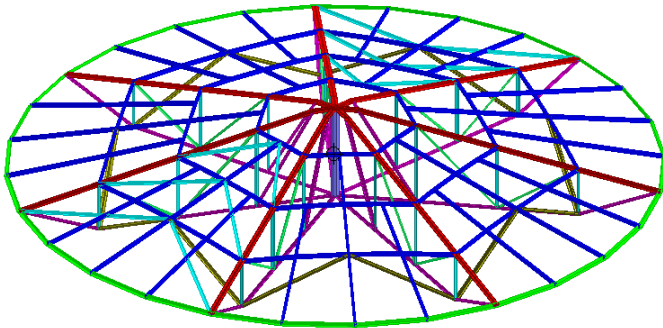
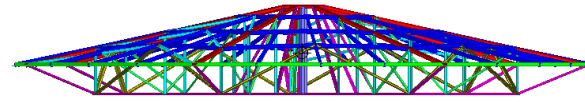


- Scale models are extremely useful in helping to understand and explain the layout and relative location of its component parts to all parties involved.

STEEL STRUCTURES

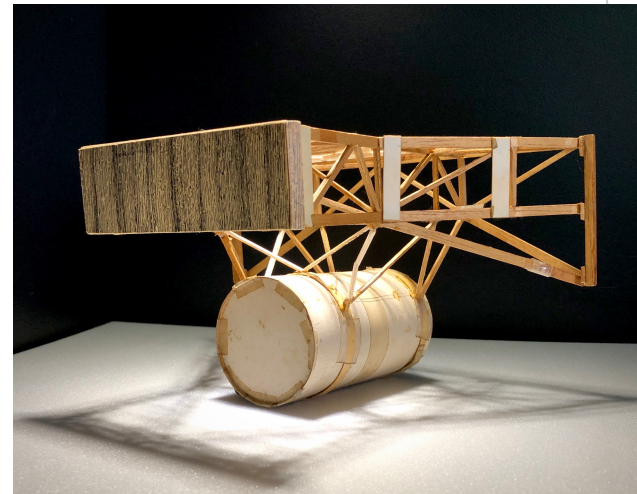
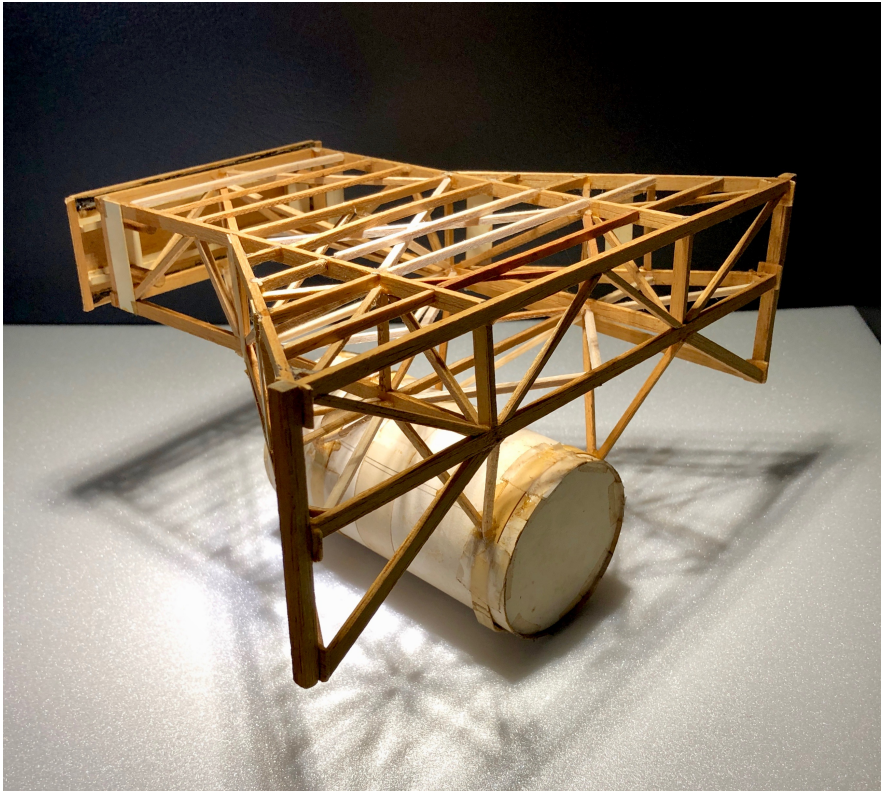
- Steel structures can be modeled in FEM, but scale models can illustrate the qualitative structural behavior much better than a computer

CIRCULAR ROOF TRUSS



- ▶ Although computer models are available in so-called 3D, they can only show a 2D image on the computer screen.
- ▶ A far better 3D visualization and understanding can be achieved using a well conceived scale model.

***PLATFORM WITH SUBMERGED
BUOYANCY TANK***

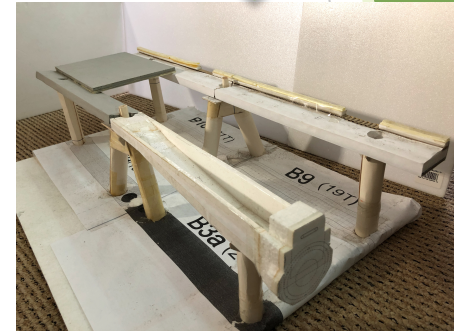
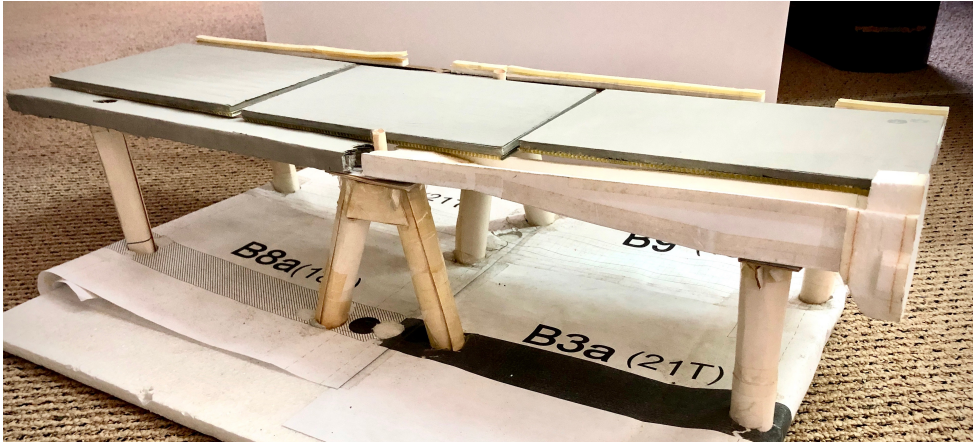


- Complex shapes can be checked and verified

PRECAST CONCRETE STRUCTURES

- Precast concrete structures benefit from scale models to ensure the fit and constructability of different modules

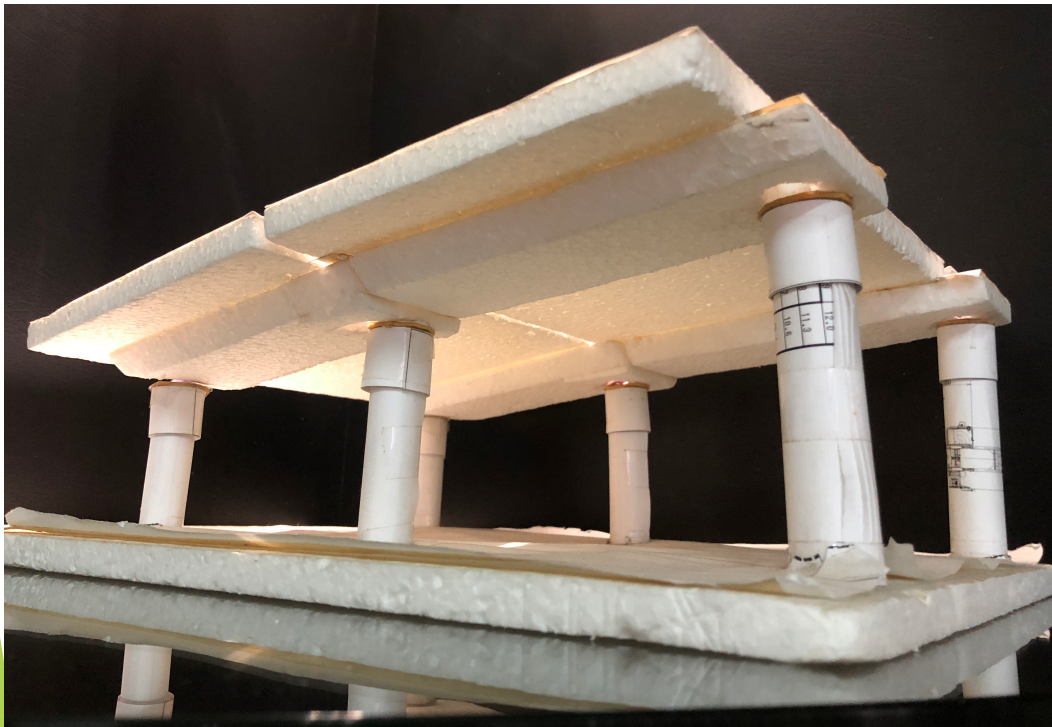
PRECAST BEAM-SLAB JETTY DECK



- ▶ Precast systems are dependent on good design for ease of construction and strength
- ▶ Construction sequences are easily shown to all parties

PRECAST BARGE RAMP

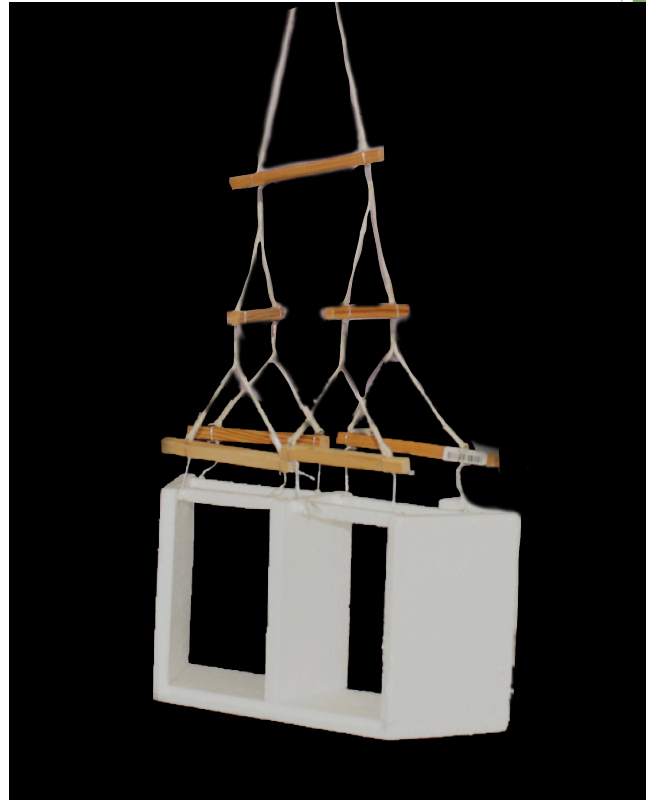
- ▶ This scale model was constructed to illustrate the relative fit of large precast modules and ensure their stability during the crucial installation phase.



PRECAST SEAWATER INTAKE STRUCTURE



- Checking fit and matchup of different modules

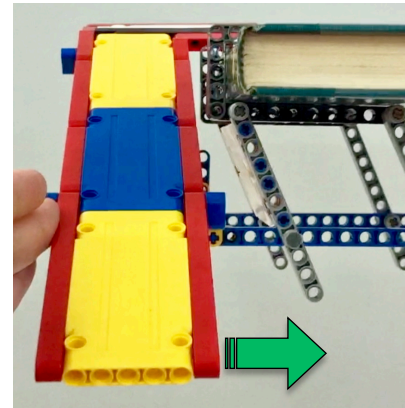
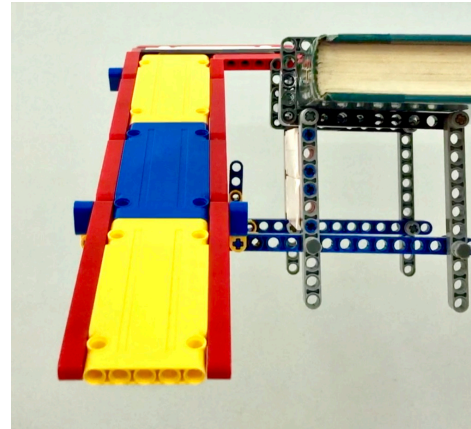
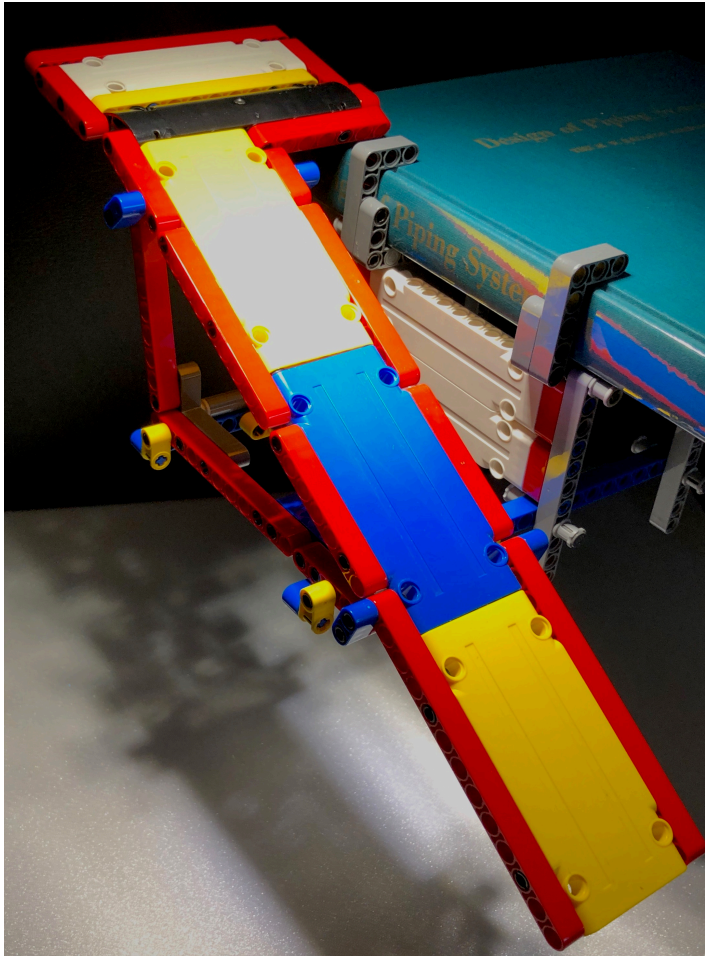


- Demonstration of lifting during construction

SPECIAL MODELS

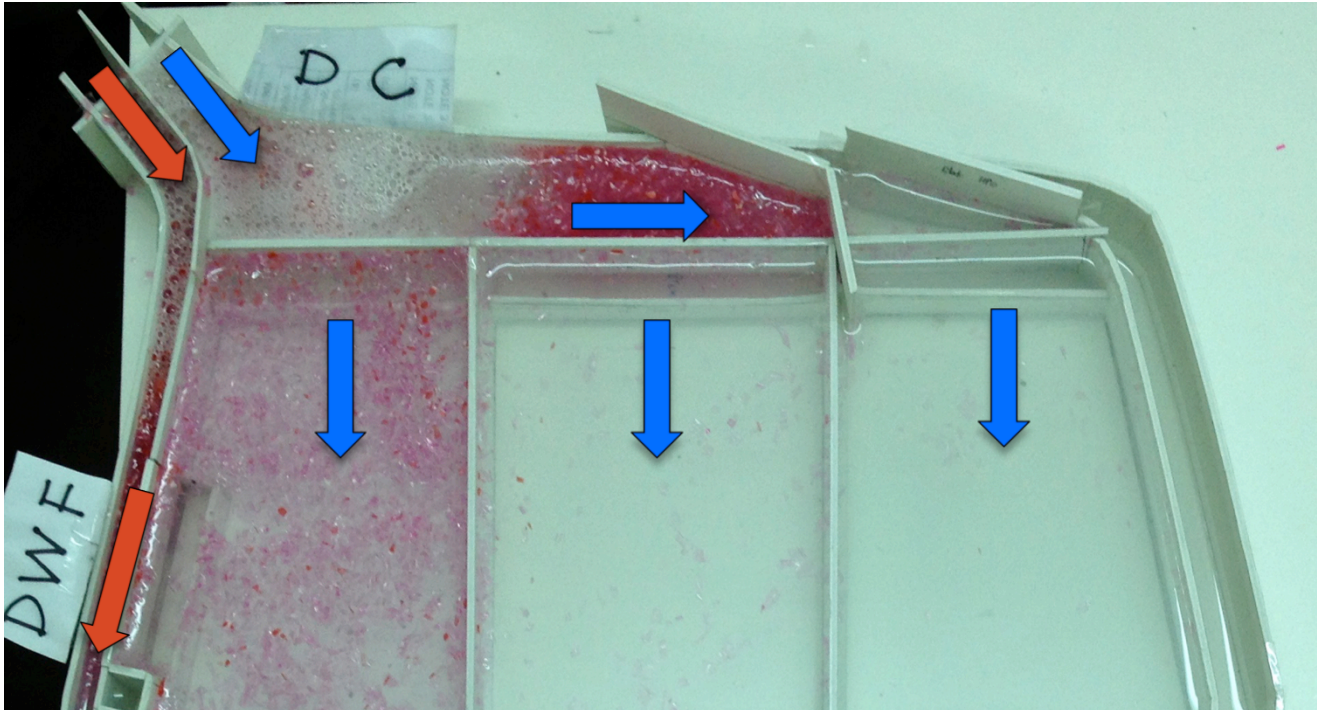
- With a little ingenuity special models can be built to qualitatively illustrate movement and flow

MOVABLE ACCESS STAIRCASE



- For structures with moving parts, complex motions can readily simulated and checked.

POLLUTION CONTROL FACILITY



- ▶ Phenomena that are difficult to model mathematically become obvious when shown on a scale model.
- ▶ This flow model illustrates how oil pollution (modelled in red) is trapped and controlled in the different compartments of the model.

REFERENCES

1. D.J. Schuring, “Scale Models in Engineering”, *Pergammon Press*, 1977.
2. G. Murphy, “Similitude in Engineering”, *Ronald Press*, 1950.