

**DEPARTMENT OF OCEAN ENGINEERING & NAVAL ARCHITECTURE**

Date: 25 February, <sup>2010</sup>~~2007~~ (AN)      Time: 2 Hrs      Full Marks: 30  
Mid-Spring Semester Examination      Sub. No. NA60013  
IV Yr. B.Tech(H)/M.Tech      Subject: Port & Harbour Engineering

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Answer any **3** Questions (all questions carry **equal** marks)

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1. (a) What are the guiding principles for port design at individual port level? Describe the factors attributable to port productivity? How does traffic fluctuation affect the operation of a port? With a schematic diagram explain the port cost as a function of traffic volume and cost of operation? [5]
- (b) With a schematic diagram describe a 'natural' and 'artificial' port? What are the various factors essential for the construction of a 'natural' port? [5]
- 2.(a) Explain the various land installation unit in a port complex? Provide an appropriate mathematical expression for vessel's waiting time applicable to a general cargo vessel? Comment on the berth occupancy factor in a medium sized port? What is the occupancy factor for 10 general cargo berths with an average of 2 vessels/day heading for a berth (assume, average servicing time as 3.5 days)? [5]
- (b) What are the various functions a fishing port? How are fishing vessels classified? Consider a fishing vessel with the following specification (length=60 meters; draft = 6.0 meters and beam = 12 meters), what would be the typical time this vessel can spend in the sea? [5]
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3. (a) Explain in detail the approach and methodology for design of a Navigation channel? What are the various factors which contribute to the Squat of a vessel entering the navigation channel?

[3]

(b) A tanker with draft of 36.5 feet and beam of 89 feet enters a harbour entrance channel at a speed of 10 knots relative to channel velocity. Harbour entrance channel has a width of 800 feet and depth of 41 feet. Assuming the ship is in the centre of channel and is the only ship within the channel, find the Squat in feet? (use Sogreah Laboratory squat curves provided)

[7]

4. (a) What are the necessary criteria used to evaluate currents in an entrance channel? How is the threshold value of tidal currents related to the design aspect of a port?

[3]

(b) Given a rectangular basin with non-constricting entrance with the following dimensions:

Basin Length = 10,000 feet	Basin width at entrance = 500 feet
Basin depth = 30 feet	Semi-diurnal tidal range = 6.0 feet (T = 12.4 hours)

Calculate the average cross-section velocity at harbour entrance?

[7]

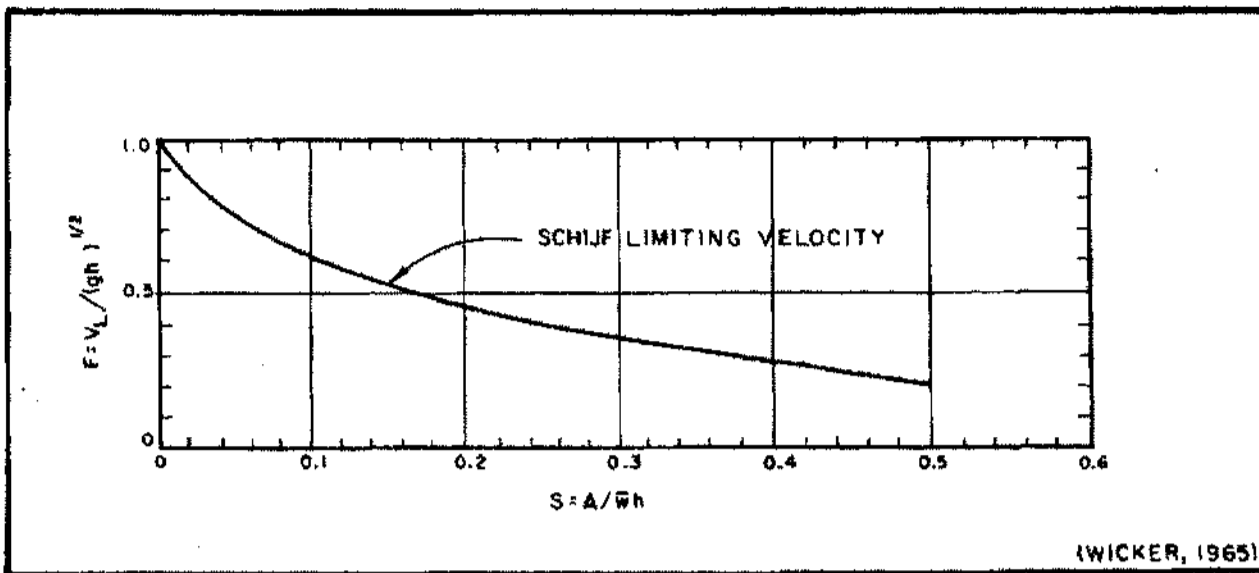


Figure 1: Sogreah Laboratory Squat Curve

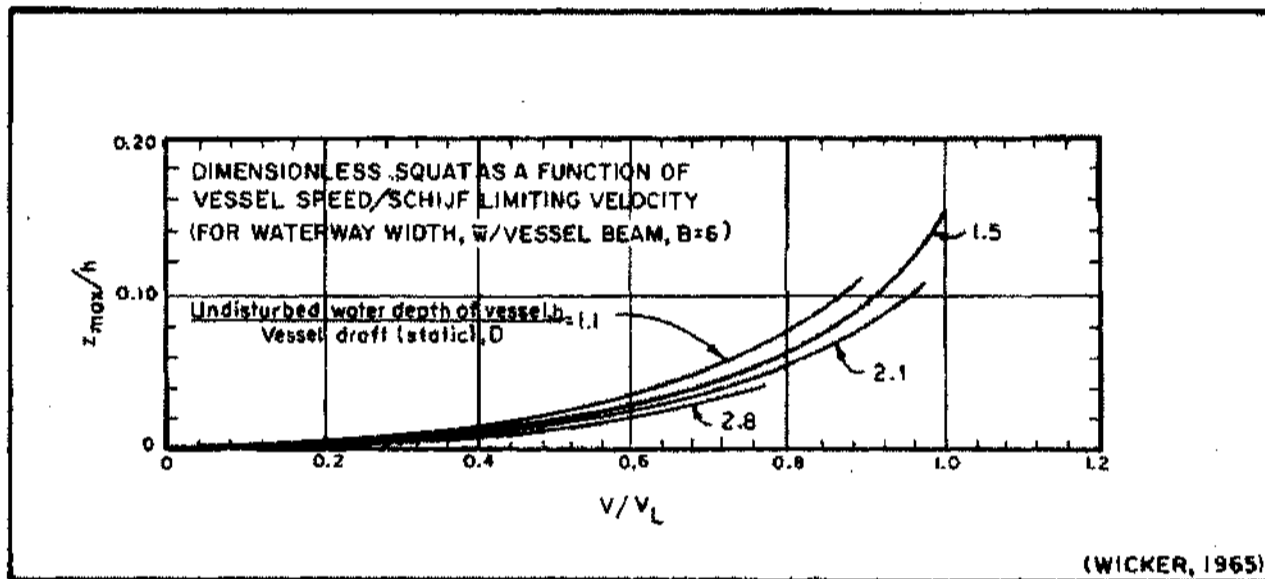


Figure 2: Sogreah Laboratory Squat Curve

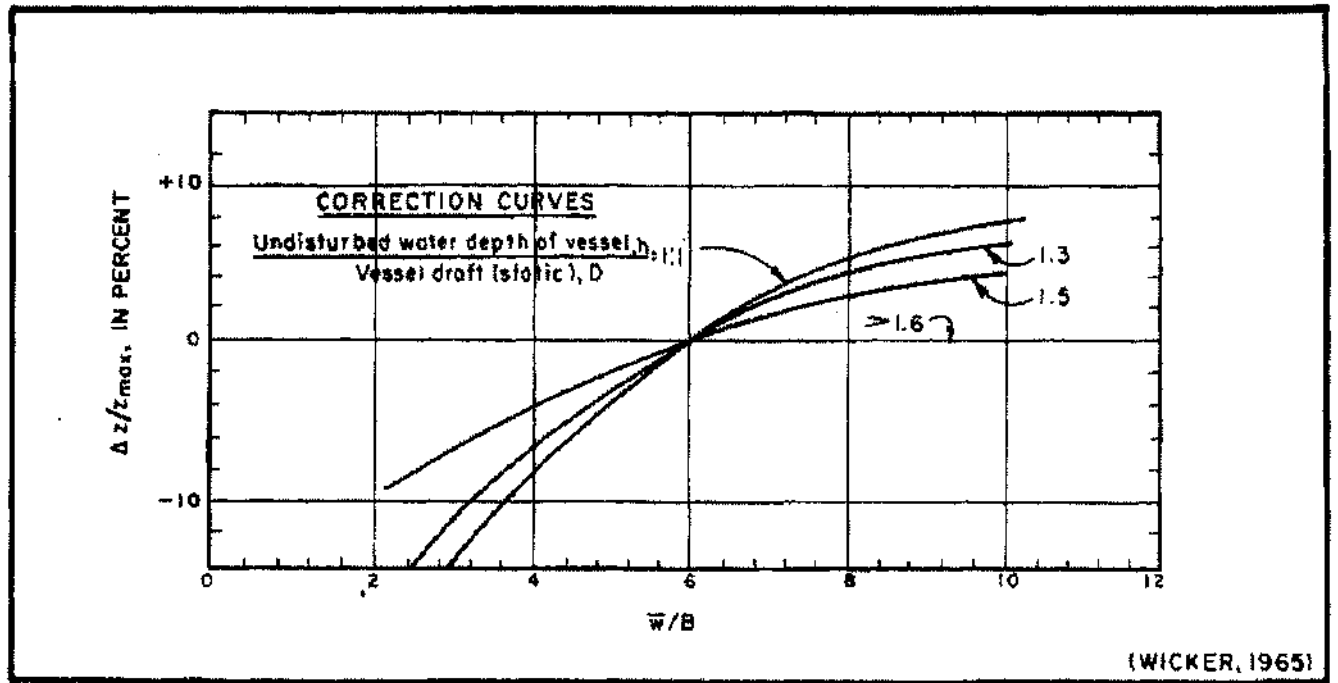


Figure 3: Sogreah Laboratory Squat Curve

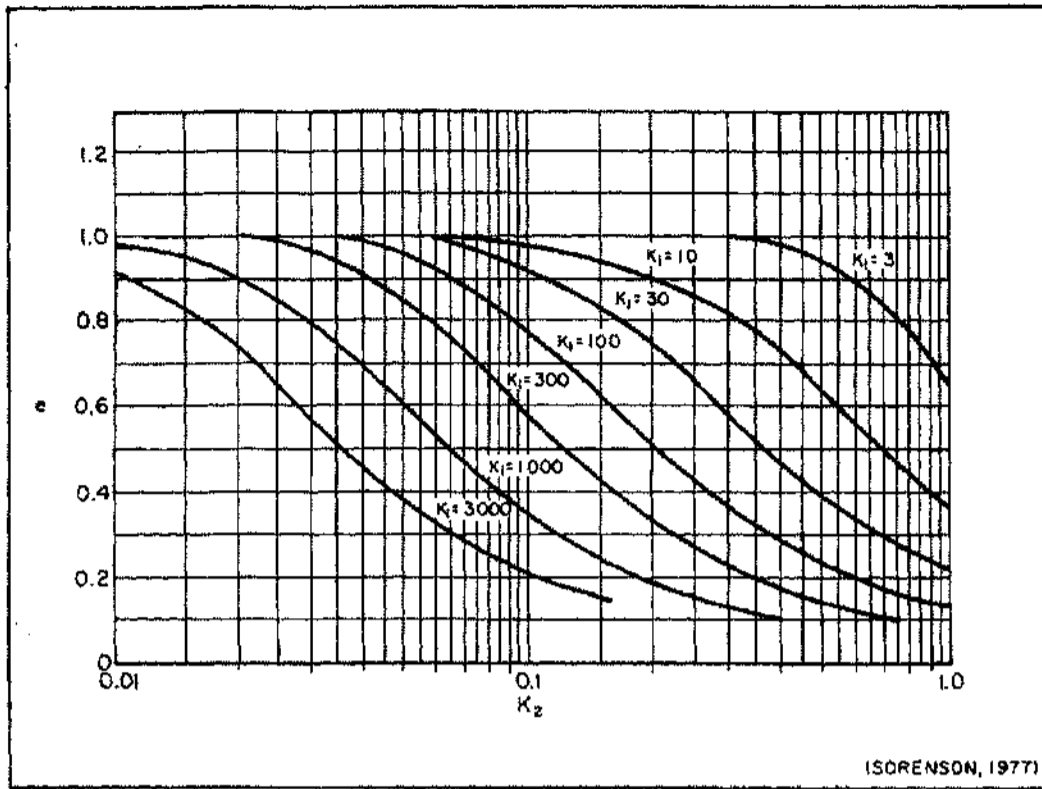


Figure: 4 - Dimensionless Maximum Velocity versus "K<sub>1</sub>" and "K<sub>2</sub>"

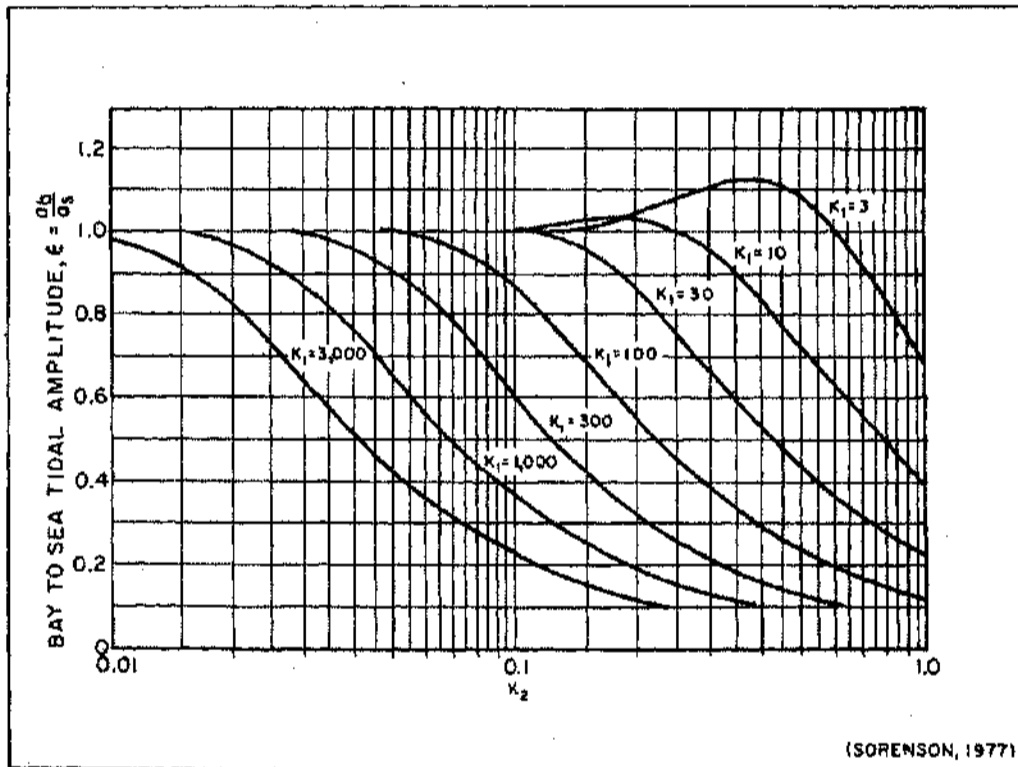


Figure: 5 Ratio of Bay to Sea Tidal Amplitude versus "K<sub>1</sub>" and "K<sub>2</sub>"