Annexure (1)

TEST REPORTS

Recommendations given by the University of Moratuwa

1:1 PHYSICAL PROPERTIES

01 Although the grading of offshore sands can be variable, they are generally within the BS 882 limits, and can be used for concretes, mortars and plasters.

02 Both offshore sand and manufactured sand can be used in concrete mixes. However, the use of offshore sand is more advantageous, as the water content requirement is around 20 kg/m3 lower, this results in cement contents that are around 30 to 40 kg/m3 lower for concrete grades from 20 to 30.

03 The shell content of offshore sand is within BS 882 limits. The shells larger than 5 mm (which constitute around 2% of the entire sample) can be extracted for sale to lime kilns; this could reduce the harvesting of coral for lime production. The shells do not impair the workability, permeability of other engineering properties of the concrete.

04 Both offshore sand and manufactured sand are satisfactory for both mortars and plasters and reasonably acceptable to masons, although they may rank river sand as their first choice.

1:2 INFLUENCE OF CHLORIDES

01 A conservative limit for allowable CI ions in offshore sand for OPC based reinforced or metal-embedded concrete is 0.075% by weight of the sand. This is based of (1) an allowable CI percentage of 0.3% by weight of cement (lower than the Bs 5328: Part 1 limit of 0.4% to account for warmer Sri Lankan temperatures etc.); (11) an allowance of 0.05% by weight of cement for chlorides in cement (which is the accepted upper limit); (111) a sand: cement ratio of 3.3 ^which will rarely be exceeded for reinforced concrete); and (1V) the availability of chloride free coarse aggregate.

02 Offshore sand saturated with sea water has a CI content of around 0.3% whereas if the seawater is gravity drained, it reduces to around the acceptable 0.075%. Some care has to be taken at the top of the stockpile where the CI% may be higher due to excessive evaporation, and at the bottom of the stockpile, where sea water may be held by capillary action.

03 The action of even 80 mm of rain will reduce CI contents to below acceptable levels, even at the top and bottom of a 2 m high stockpile. (The lowest mean monthly rainfall in Colombo is 71 mm in February.)

04 The efflorescence and corrosion performance of grade 20 concrete (i.e. the most critical grade) with the allowable CI content of 0.075% in the sand is satisfactory and similar to a chloride free control mix; on the other hand, a mix with 0.3% CI in the sand shows clear evidence of efflorescence and early corrosion.