Summary of Decisions of the Structural Engineering Committee
SEC 11/2012 held on 04.09.2012

(a) Case 11/2012

Issue: Use of Polypropylene Fibres in concrete to replace the use of reinforcement mesh within the concrete cover of reinforced concrete linings for tunnel construction

Recommendation: The use of Monofilament Polypropylene (PP) Fibres (dosage 1 kg/m^3 of concrete) in concrete mix to replace the use of reinforcement mesh within the concrete cover which is more than 40mm thick as specified in Tables C & E of the Code of Practice for Fire Resisting Construction 1996 (FRC Code) for the precast and cast-in-situ reinforced concrete linings for tunnel construction be accepted subject to:

(a) Fire test and assessment in accordance with BS476-20:1987 and BS476 21:1987 on the performance of PP fibres concrete under fire situation with respect to insulation, integrity and strength performance; and

(b) Qualified supervision of the PP fibre concrete works including dosage, mixing and distribution by an experienced and competent person should be provided to ensure works are carried out in accordance with the accepted plan and the required standards are complied with.

(c) Post-fire investigation and assessment be conducted to ascertain the durability, residual strength and fire-resisting capacity of the reinforced concrete tunnel lining after fire. The reinforced concrete lining shall be repaired and/or replaced according to the outcome of the post-fire assessment.

Decision: Members endorsed the recommendation subject to the following conditions:

(a) A quality assurance proposal is to be submitted.

(b) A copy of manufacturer's certificates of the PP fibres used, which should be appended with a statement signed by the competent person to confirm that the monofilament PP fibres are conformed to the required standards (i.e. BS EN 14889-2-2006, EN 13392, EN 10002-1, ISO 11357-5 and OSHA (US)) and the PP fibres used are produced from a manufacturer with an acceptable Quality Assurance system, is to be submitted prior to the acknowledgement of completion certificate.

(c) The proposed dosage should be substantiated by test results.

(d) Discussion to substantiate the proposed dosage of 1 kg/m^3 should be provided.

(e) A satisfactory clarification on the acceptance criteria of the fire tests and the reasons for explaining the adoption of the use of the Code of Practice for Fire Resisting Construction 1996 in the design in lieu of the Code of Practice for Fire Safety in Buildings 2011 to confirm that the requirements in PNAP APP-153 is complied with shall be included in the submission.

(f) As concrete in wet conditions will spall faster and more extensive than at dry condition, the specimens for the fire tests should be soaked in water till saturated before testing to simulate the wet and humid conditions in the tunnel.

(g) Submission of a satisfactory performance review report of the fire tests.