PART CC35

LOW PRESSURE STEAM CURING OF PRECAST UNITS

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SCOPE

This Part applies to the low pressure steam curing of precast concrete components manufactured in accordance with Part CC30 "Precast Concrete Units".

GENERAL

Low pressure steam curing must involve heating of precast units, after an initial maturing period, by the controlled application of wet steam at atmospheric pressure into an enclosure containing the units. Low pressure steam curing must be of sufficient duration to ensure the concrete has attained its required compressive strength. The relative humidity under the steam covers must be maintained at 100% during steam application.

Proposals for steam curing of concrete with mineral additions must be subject to prior approval.

DEFINITIONS

The following definitions apply:

Concrete Mass The concrete product, member or part of a structure, or the concrete in the products on a pre-tensioning bed or in a group of similar products made within the one casting period, to which steam curing is applied.

Steam Covers Flexible or rigid barrier that retains heat and moisture around the concrete mass and test specimens during steam curing.

Initial Maturity °C.h The product of temperature of the concrete in °C and time in hours (h). Temperature is that of the concrete mass at the completion of placement. The time is measured from the time of completion of placement of the concrete mass to the first introduction of steam.

Recording Thermometer An instrument capable of continuously recording and printing a permanent record of temperature vs time. The report must be accurate to within 2°C.

Temperature Probe A probe with thermometer which can be inserted under the steam covers to check the steam temperature. The thermometer must be accurate to within 1°C.

Test Specimen Any compression, flexural or other test specimen which is to be tested for the purpose of determining a property of the concrete mass following steam curing.

TEMPERATURE RECORD

A sufficient number of temperature probes and recording thermometers must be used to ensure that any temperature difference between any 2 points under the steam covers is detected.

A printed continuous record of temperature variation with time must be obtained.

The following information must be recorded by the Contractor:

Description of concrete mass (e.g. pile, girder, etc., with identifying element number);

Time of completion of concrete placement;

Temperature of the concrete at completion of placement;

Time of commencement of steaming;

Variation of air temperature under steam covers with time;

Time of shutting off steam;

Time of removing covers;

Ambient air temperature at the time of removal of steam covers; and

Name of Contractor and date of operation.

These records must be kept until completion of the Contract and must be made available upon request.

STEAM DELIVERY

Sufficient steam jets or steam entry points must be provided to ensure that the temperature between any two points adjacent to the concrete mass is not more than 10°C*.*  The Contractor must provide evidence that this requirement is met.

Steam jets must not be allowed to impinge upon any part of the concrete mass, test specimens, formwork or moulds, nor must steam delivery piping be attached directly to any formwork or moulds in such a manner that may cause localised overheating of the concrete mass.

Covers for steaming must be placed over the concrete mass immediately following the concrete finishing operations to minimise evaporation from the surface of the concrete mass.

The covers must be placed in such a manner that they will allow free circulation of steam around the concrete mass and the test specimens.

STEAM CURING CYCLE

Concrete must have an initial maturity of not less than 40°C.h and must be more than 2 hours old before steam may be admitted to the steam covers, except where necessary a small amount of steam may be used to maintain the concrete at the temperature at which it was placed. During this period the temperature at the surface of the concrete mass must not exceed 30°C.

The maximum rate of air temperature rise/fall under the steam covers must be 24°C/h.

The maximum air temperature within the steam enclosure must not exceed 70°C.

STEAM CURED TEST SPECIMENS

The sampling and testing of specimens for steam cured concrete must conform to the requirements of AS 1379 "The Specification and Manufacture of Concrete", as applied to non-steam cured concrete.

Test specimens must be subjected to the same curing procedure adopted for the elements they represent, including any subsequent moist curing. They must be located under the steam covers such that they are not subjected to overheating from the steam points.

The Contractor must ensure that sufficient cylinders are provided to enable the required testing to be undertaken.

If, on testing at the end of the steaming cycle, compressive strength test specimens made for the purpose of determination of time of transfer of prestressing force and/or handling do not achieve the required strength, further curing must be carried out until the required strength is achieved.

If 0.75 of the target 28 day compressive strength has not been achieved at the end of the curing cycle, curing by either moist or steam methods must continue until that strength is reached.

REMOVAL OF STEAM COVERS

Steam covers must not be removed until the surface temperature of the concrete has fallen to within 20 Cof the ambient air temperature outside the steam covers. Steam covers must remain in place longer if the concrete product shows signs of damage due to thermal shock or differential cooling.

ADDITIONAL MOIST CURING

Additional moist curing, if required, must not be applied until the concrete mass has cooled to the ambient air temperature, nor must it be delayed beyond this time.

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