PART CC36

HEAT ACCELERATED CURING

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GENERAL

This Part specifies the requirements where heat accelerated (hot water) curing of precast concrete is to be used for components manufactured in accordance with Part CC30 "Precast Concrete Units" and Part S25 "Prestressed Concrete Work".

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 hot water curing is applied.

Hot Water Jacket A conductive series of steel conduits attached externally to a steel mould that carries heated water through a reticulative system, heating the mould and in turn transferring heat to the concrete member.

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

Presetting Period The interval between placing the last concrete and commencement of heat application.

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 hot water curing.

Document(s) referenced in this Part are listed below:

AS 1379 The Specification and Manufacture of Concrete.

QUALITY REQUIREMENTS

Further to the requirements of Part G20 "Quality System Requirements", the Contractor must prepare and implement a Quality Plan that at a minimum includes detailed procedures and documentation for:

Curing of precast units by the controlled circulation of hot water.

If not provided beforehand, the procedures must be submitted at least 28 days prior to the commencement of the work subject to this Part.

Provision of the procedures listed in this Clause shall constitute a **hold point**.

HEAT DELIVERY

Heat Accelerated curing must involve heating of precast units, after an initial maturing period, by the controlled circulation of hot water through a series of steel conduits attached externally to the steel mould. A purpose built tank used for the curing of concrete test cylinders must be connected to the hot water system. Hot Water curing must be continuously applied until the concrete has attained the required compressive strength.

The hot water system must be controlled by a thermostat so that the temperature difference between ingoing and outgoing water in the Water Jacket is not more than 10°C. The Contractor must provide evidence that this requirement is met.

The maximum temperature (refer Clause 6.3 "Curing Time") of the water system must not be exceeded to ensure that there is no localised overheating of the concrete mass.

Unformed exposed concrete surfaces must be covered immediately following the concrete finishing operations to minimise evaporation from the surface of the concrete mass. Curing covers must be heat insulated to prevent surface heat loss during hot water curing.

HOT WATER CURING CYCLE

Concrete must have an initial maturity of not less than 40°C.h and the duration of presetting period must not be less than 2 hours nor longer than 5 hours, unless wet curing is applied in the interim period prior to heat application.

Where necessary a small amount of hot water heat application 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 at which water temperature rises/falls must not exceed 24°C/h.

The target inlet water temperature must be 70°C with a tolerance of ±5°C.

TEMPERATURE RECORD

A sufficient number of temperature probes and recording thermometers must be used to ensure that any temperature difference between any 2 points in the hot water jacket is detected. Where the hot water jacket consists of more than one section, temperature recording must be undertaken for each section.

Recording thermometers must be capable of continuously recording and printing a permanent record of water temperature versus time. The report must be accurate to within 2°C.

Temperature Probes must be probes with a thermometer, which can be inserted into water-filled temperature stations to check the water temperature. The thermometer must be accurate to within 1°C.

The recording thermometers must be set in operation immediately upon completion of casting and screeding, the temperature sensitive part of each thermometer being installed in position at the same time.

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

The Contractor must record the following information:

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.

Temperature of the concrete at time of commencement of heating.

Time of commencement of heating.

Temperature difference between ingoing and outgoing water for each section of the hot water jacket.

Water temperature in the curing tank.

Time of shutting off heat.

Time of removing covers.

Ambient air temperature at the time of removal of curing covers.

Name of Contractor and date of operation.

HOT WATER CURED TEST SPECIMENS

General

The sampling and testing of specimens for hot water cured concrete must conform to the requirements of AS 1379, as applied to non-hot water 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 in a purpose built tank that is filled with water maintained at a temperature within 10°C but not exceeding the maximum temperature of the water in the jacket.

The Contractor must ensure that sufficient cylinders are provided to enable the required testing to be undertaken (a minimum of 2 cylinders to be tested from the last batch of concrete, the average representing the "Transfer" strength).

Testing for Transfer and/or Handling

If, on testing at the end of the curing 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.

Curing Time

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

REMOVAL OF CURING COVERS

Curing covers must not be removed until the surface temperature of the concrete has fallen to within 30 Cof the ambient air temperature outside the curing covers. Curing 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.

HOLD POINTS

The following is a summary of Hold Points referenced in this Part:

|  |  |  |
| --- | --- | --- |
| **CLAUSE REF.** | **HOLD POINT** | **RESPONSE TIME** |
| 2.3 | Submission of Procedures  | 7 days |

VERIFICATION REQUIREMENTS AND RECORDS

The Contractor must supply written verification that the following requirements have been complied with and supply the verification with the lot package.

| **CLAUSE REF.** | **SUBJECT** | **RECORD TO BE PROVIDED** |
| --- | --- | --- |
| 3.2 | Thermostatically Controlled Hot water System | Evidence of thermostat meeting temperature requirements. |
| 5 | Water Temperature  | Information Specified in Clause 5. |

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