PART CC35
LOW PRESSURE STEAM CURING OF PRECAST UNITS

CONTENTS

1. GENERAL

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

.1 Low pressure steam curing shall 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 shall be of sufficient duration to ensure the concrete has attained its required compressive strength. The relative humidity under the steam covers shall be maintained at 100% during steam application.

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

DEFINITIONS

.3 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 shall 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 shall 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.

2. TEMPERATURE RECORD

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

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

.3 The following information shall be recorded by the Contractor:

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

(b) Time of completion of concrete placement;

(c) Temperature of the concrete at completion of placement;

(d) Time of commencement of steaming;

(e) Variation of air temperature under steam covers with time;

(f) Time of shutting off steam;

(g) Time of removing covers;

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

(i) Name of Contractor and date of operation.

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

3. STEAM DELIVERY

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

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

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

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

4. STEAM CURING CYCLE

.1 Concrete shall have an initial maturity of not less than 40°C.h and shall 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 shall not exceed 30°C.

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

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

5. STEAM CURED TEST SPECIMENS

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

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

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

.4 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 shall be carried out until the required strength is achieved.

.5 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 shall continue until that strength is reached.

6. REMOVAL OF STEAM COVERS

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

7. ADDITIONAL MOIST CURING

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

8. HOLD POINTS

.1 There are no Hold Points referenced in this Part.