

SPECIFICATIONS FOR ENCLOSING AND HEATING

1043. 1. DESCRIPTION

The work will consist of the supply of materials, equipment and labour as required to enclose and heat the superstructure of bridges, including curbs, sidewalks, medians, end newel posts, abutment backwalls and approach slabs, where precast concrete channels, precast box girders or precast flat slabs are used.

1043. 7. CONSTRUCTION METHODS

7.1 General

The enclosing and heating shall be done only on the written order of the Engineer and will depend on the weather conditions.

7.2 Housing

The housing to be built by the Contractor shall provide sufficient clearance to permit the placing of concrete and grout to proceed unhindered. The temperature inside of the housing shall be maintained as specified herein.

Sufficient clearance shall be provided also to allow for the removal of forms so that any required rub-finishing of the concrete surfaces and the filling of the post-tensioning recesses with mortar can be completed three days before the heating inside of the housing is discontinued.

Precautions shall be taken to prevent damage from condensation to fresh concrete surfaces occurring inside of the housing during all heating of the enclosure.

7.3 Heating

7.3.1 General

The methods of heating concrete and grout materials, and of maintaining the temperature of deposited concrete and grout will be subject to the approval of the Engineer in all particulars.

The Contractor shall supply heating apparatus and the necessary fuel. When dry heat is used, a means of maintaining atmospheric moisture shall be provided.

The heating apparatus for the aggregates and the housing shall be such as to heat the aggregates and the air inside of the housing uniformly and preclude the possibility of the occurrence of hot spots which may burn the materials or damage the concrete.

Sufficient stand-by heating equipment shall be available to allow for a sudden drop in the outside temperatures and any breakdowns in the equipment that might occur.

All heating apparatus used to heat the housings shall be of a type approved by the Department of Labour and Manpower.

Every heater and other heating apparatus used in a housing which discharges or releases smoke or gas fumes, shall be adequately ventilated to carry away all such smoke or gas fumes from the housing.

1043. 7. CONSTRUCTION METHODS (Cont'd)

7.3 Heating (Cont'd)

7.3.1 General (Cont'd)

Before starting concrete placing operations, the Contractor shall show that enough heating equipment is available to keep the air temperature surrounding the forms within the specified range of not more than 30⁰ C and not less than 20⁰ C. This shall be accomplished by bringing up the temperature inside of the housing to the specified 20⁰ C at least 12 h prior to the start of the first concrete pour and maintaining this minimum temperature until all concrete placing has been completed.

The air surrounding the fresh concrete shall be kept at a temperature of not less than 20⁰ C nor more than 30⁰ C for 4 d, not counting the day on which the concrete was deposited. During the next 3 d, the concrete shall be allowed to cool to a temperature of not less than 5⁰ C. However, this cooling of the concrete must be done gradually over a minimum 12 h period.

7.3.2 Heating of Concrete Materials and Concrete

Aggregates shall be heated by steam to a temperature of not less than 20⁰ C and not more than 65⁰ C.

The water shall be heated to a temperature between 55⁰ C and 65⁰ C. The temperature of the mixed concrete shall not be less than 15⁰ C and not more than 25⁰ C at the time of placing in the forms.

7.3.3 Heating of Grout for the Lateral Stressing Ducts

The precast prestressed girders shall be brought up to a temperature of not less than 15⁰ C before the start of grouting.

The temperature of the mixed grout shall be between 10⁰ C and 15⁰ C and the water for the grout shall not be heated to more than 20⁰ C.

The grout shall be kept above a minimum temperature of 15⁰ C for at least 96 h reckoned from the time of the completion of the grouting operation. The Contractor is hereby advised, that, should the grout freeze, he may be required to replace the affected precast prestressed girders, as well as the damaged grout.

7.3.4 Heating of Grout for Anchor Rods

In the event that the temperatures of the substructure units are below freezing, the Contractor will, at his own choice and cost, be allowed to use melted sulphur as the grout for the anchor rods, providing that any surface frost inside of the holes is removed by the blowing of hot air into the holes. If the Contractor chooses not to use sulphur, then the heating of the grout and the substructure units shall be as per Section 7.3.3 of this Specification.

7.3.5 Heating of Grout for Keys

The temperature of the girders and the grout shall be as per Section 7.3.3 of this Specification and the grout shall be kept from freezing for at least 96 h reckoned from the time of the completion of the grouting.

1043. 9. METHOD OF MEASUREMENT

The supply of all materials for housing and the supply of all equipment, fuel, and labour as required for the heating operation will be paid for on a lump sum basis and no measurements will be taken for this work.

1043. 11. BASIS OF PAYMENT

The supply of all materials for housing and the supply of all equipment, fuel, and labour as required for the heating operation will be paid for at the Contract Lump Sum Price for "Enclosing and Heating", which price will be payment in full for performing all operations herein described and all other items incidental to the work included in these Specifications.