

## Technical Specification

### **I. STONE FOR MASONRY**

Stone obtained from quarries approved by the Engineer shall be hard & sound, free from vents, cracks, fissures, discoloration, or other defects that will adversely affect strength or appearance. Stone for dressed exposed faces shall be fair chiseled and in average 300mm and individual not less than 250mm length.

#### **Building Mortar for masonry work**

Cement mortar for stone walling shall be 1 part cement and 3 parts aggregate.

#### **Mixing mortar**

The ingredients of mortar shall be measured in accurate gauge boxes for volume. Mortar shall be mixed in an approved mechanical batch mixer. Dry ingredients of mortar shall in the first instance, be mixed until there is a uniform consistency in colour. Water shall be added and the mixing continued until there is a uniform distribution of the materials and the mass is uniform in color and consistency. In no case shall mixing be carried out for less than two minutes after adding water. Sufficient water shall be added to the mix to produce a pure consistency.

In instances where hand mixing is unavoidable, the cement content shall be increased by 10%. The dry and wet mixes shall be turned over sufficient number of times to produce the respective consistencies as required by batch mixers. Mortar shall not be allowed to stand more than 1 hour without mixing. Cement mortar shall be used within half hour of adding cement to the mix.

Compo-mortar shall be used within one hour of adding cement to the mix.

#### **Dressed stone wall facing**

The pattern, type and size of the stone units and the pattern of laying and bonding for dressed stone walls shall be as detailed on drawings or from the site. The joints of dressed stone walls shall be finished slightly proud and cleaned off flush at completion. The joints shall be raked out to an approximate depth of 15mm as the work proceeds and prepared for pointing.

### **II. CONCRETE WORK**

#### **Formwork Design**

Formwork shall be designed and erected to safely support, vertical and lateral loads that might be applied until such load can be supported by the concrete structure. Vertical and lateral loads shall be carried to the ground by formwork and in place construction that has attained adequate strength for the purpose. Formwork and false work shall be designed to include assumed value of live loads, dead load, weight of moving equipment operated on formwork, concrete mix, height of dropping concrete, vibrator frequency, ambient temperature, and other factors pertinent to safety of structure during construction.

#### **Formwork Construction**

Forms shall be constructed to the exact sizes, shapes lines and dimensions shown and as required to obtain accurate alignment, location grade, level and plumb work in finished structures. Provision shall

## Technical Specification

be made for openings, offset, sinking, keyways, recesses, moldings, reglets, chamfers, blockings, screeds bullheads, anchorages, inserts and other features as required. Forms for openings, and construction which accommodate installation by other trades whose materials and products must be fabricated before the opportunity exists to verify the measurements of adjacent construction which affects such installations, shall be accurately sized and located as dimensioned on the Drawings. In the event that deviation from the drawing dimensions results in problems in the field, the Contractor shall be responsible for resolution of the conditions as approved, without additional expense to the Investor.

Forms shall be fabricated for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal. Temporary openings shall be provided where interior area of formwork is inaccessible for, clean out, in section before concrete placement, and placement of concrete. Brace temporary closures and set tightly to temporary openings on forms in as inconspicuous locations as possible, consistent with design requirements. Shores and struts shall be provided with positive means of adjustment using wedges, jacks or other appropriate means, capable of taking up formwork settlement during concrete placing operations. Truss supports shall be used where adequate foundation for shores and struts cannot be secured.

Form facing materials shall be supported by structural members spaced sufficiently close to previous objectionable deflection. Cambers in formwork shall be provided as required for anticipated deflections due to weight and pressure of fresh concrete and construction loads. Forms shall be fitted in successive units for continuous surface to accurate alignment, free from irregularities and within allowable tolerances. Formworks shall be constructed to produce concrete in the dimensions shown in drawings and within the limits of tolerance allowed in the "Cast in place concrete section" of this Specification. Side footings of forms may be omitted and concrete placed directly against excavation if approved by the Engineer. If omitted a minimum additional coverage of 50mm of concrete of the same quality shall be provided on each side.

### **Formwork Removal**

No undue deflection or damage whatsoever shall be caused to a structure by the removal of formwork. In no circumstances, shall formwork be struck until the concrete attains cube strength of at least twice the stress to which it may be subjected at the time of striking. No formwork shall be removed until the concrete has hardened sufficiently.

Concrete which is damaged by premature removal or collapse of the formwork shall be made good. Formwork shall be removed without such shock or vibration as would damage the concrete. Before the soffit formwork and struts are removed, the concrete surface shall be exposed where necessary, in order to ascertain that the concrete has hardened sufficiently.

## Technical Specification

### **PERIOD OF REMOVAL:**

Vertical formwork to columns, walls & beams	16 hours
Soffit formwork to slab	21 days
Props to slabs	14 days
Soffit formwork to beams	21 days
Props to beams	14 days

### **Gauging and Mixing**

Concrete produced by on site batching and mixing shall conform to the requirement hereunder. Measurement of volume of aggregate shall be made in impervious gauge boxes or containers of accurate size, to a predetermined uniform depth without compacting. The measurement of aggregates by weight shall be made in an approved weight batch. The weight of aggregates shall be as to produce the same mix as produced by volume batching. Allowance for the water content of the aggregates must be made. The concrete shall be mixed in an approved mechanical batch mixer. Mixing shall continue until there is a uniform distribution of the materials and the mass is uniform in colour and consistency but in no case shall the mixing continue for less than two minutes after adding water. The volume of concrete in any batch shall not exceed the rated capacity of the mixer. Concrete shall be proportioned and produced to have the limits of Slump. The slump may be varied from the limits as given in the Specification provided approval for such variation is given by the Engineer.

Hand mixing of concrete shall not be done. If the situation makes hand mixing unavoidable, the cement content of the concrete in the mix shall be increased by 10%. The whole of the mixed batch shall be removed before materials for fresh batch enter the mixer. On cessation of concreting, including all stoppages exceeding 20 minutes, the mixer handling plant and tools shall be washed with water. Mixed concrete shall not be modified by the addition of extra water or cement or otherwise, in order to facilitate handling or for any other purpose. Additives to improve workability may be used only with prior approval.

The consistency of the concrete shall be controlled by direct measurement of the water content, making allowance for any water in the aggregate. The limits to slump as given in the concrete class section of this Specification shall be used for control purposes. Admixtures shall be used as directed by manufacturers. Aggregates in hot weather shall be sprayed with water before mixing to ensure that, the temperature of the aggregate and water mix does not exceed 32 degree Centigrade.

### **Placing and Consolidation**

Formwork shall be completed reinforcement, expansion joint material, anchors, block outs add other embedded items shall be placed in position before concrete is cast. No concrete shall be placed until the reinforcement and formwork have been checked and approved. The method and equipment used for casting concrete shall be approved by the Engineer. Concrete must be placed before setting has commenced and must not be subsequently disturbed. Concrete shall be thoroughly worked around reinforcement and embedded around fixtures and into corners of the formwork.

## Technical Specification

Tampers of approved types shall be used. Mechanical vibrators of approved patterns shall be used wherever possible and especially in all precast work. The consistency of the concrete shall be maintained correct for mechanical vibration and the vibration must not be carried out too long to cause separation of materials and bring cement laitance to the surface. Poker type vibrators shall not be allowed to lie unattended in concrete while switched on, nor shall any vibrating equipment be used for spreading concrete. No concrete shall be dropped during placing from a height exceeding two meters, unless special methods of consolidation of the concrete are approved. The methods shall be such as not to displace the reinforcement. After being placed in position, the concrete must be left absolutely undisturbed by any movements or thrusts while setting. An accurate record must be kept showing dates and items when various portions were cast. Concrete shall be cast continuously and when in layers, the fresh concrete shall be cast before the under layer has hardened. Construction joints as approved or directed by the Engineer or provided in the drawings shall be placed if concrete cannot be cast continuously.

Wherever waterproof concrete is cast, it shall be compacted by mechanical vibration, so that a dense and homogeneous mass of concrete is obtained throughout every part of the structure. Waterproofing additive directed to be added to the mix shall be applied in shall be so constructed to achieve full continuity. Structures required to be constructed in waterproof concrete shall be completely watertight and any work found to be defective shall be made good by pressure grouting or otherwise as instructed by the Engineer.

In hot dry weather suitable means shall be provided to avoid premature stiffening of concrete placed in contact with hot dry surfaces. Where necessary the surfaces including reinforcement, against which concrete is to be placed shall be shielded from the direct rays of the sun and shall be sprayed with water to prevent excessive absorption by the surfaces of