

4 CONCRETE FORMWORK

4.1 Structure and Material

4.1.1 Structure

4.1.1.1 Formwork shall be performed to obtain accurate concrete in accordance with the designated drawings.

4.1.1.2 Formwork shall be firmed and secured to bear the force of concreting and tightened to avoid cement paste seeping.

4.1.2 Materials

4.1.2.1 Sheathing for formwork shall be waterproof plywood of not less than 12 mm thick. Joint of sheathing shall be butt joint and firmly assembled. In case of using wood board for sheathing, boards shall be 15 mm thick with an applied planer. Joint shall be tongued and grooved unless otherwise approved by the Consultant.

4.1.2.2 Form liners shall be sound and suitable materials to accurately and safely cast the in situ concrete structure as shown on the Drawings.

4.1.2.3 Timber form boards for sheathing where used for fair-faced concrete shall be of such new materials as not to cause any defects to the surface of the concrete. Special care shall be taken in fabrication, storage and protection of these boards.

4.1.3 Other Material

4.1.3.1 Fastening hardware to be used shall be those with allowable tensile strength guaranteed by manufacturer through strength tests.

4.1.3.2 Form oil shall not have injurious effects on quality of concrete nor to bonding of surface finishing materials and shall be subject to approval of the Consultant.

4.2 Performance

4.2.1 Design of formwork

4.2.1.1 Formwork shall be designed to withstand construction loads during concreting, lateral pressure of fresh concrete, shock and vibrators due to concrete placing.

4.2.1.2 Formwork shall be free of injurious leakage of water, easy to remove, and shall not damage concrete at removal.

4.2.1.3 Supports shall be provided with the adequate horizontal and diagonal bracing and/or stays to prevent collapsing, heaving and twisting of formwork due to horizontal loads working during concrete placing.

4.2.2 Tolerance

4.2.2.1 The dimensional tolerances in location and cross section of concrete member used for designing and construction of formwork shall conform to the following table.

4.3 Standard Values of Dimensional tolerances

Item	Tolerance (mm)
Tolerance in distance from datum line of each floor to respective members	+ 10
Tolerance in cross section of columns, beams and walls	- 5 , + 10
Tolerance in thickness of floor and roof slabs	0, +10

4.3.1 Fabrication and Erection

- 4.3.1.1 Erection of formwork, and transportation and storage of materials thereof shall be started only after previously placed concrete has reached an age which acceptance of these loads will not have any adverse effect on the concrete.
- 4.3.1.2 Sheathing shall be fabricated and installed accurately to match the locations, shapes and dimensions of members called for in the Drawings.
- 4.3.1.3 Sheathing shall be installed tightly so as not to permit cement paste or mortar to escape from joints.
- 4.3.1.4 Pipes, boxes and other embedded hardware shall be properly secured to sheathing or others so that they will not move during concrete placing.
- 4.3.1.5 Supports shall be erected plumb. Supports at any two vertically consecutive floors shall be erected as near as possible to identical locations on a common plane.
- 4.3.1.6 Shoring shall be erected paying special attention to safety.
- 4.3.1.7 If sheathing is reused, the surface in contact with the concrete shall be thoroughly cleaned off and sufficiently repaired before reuse. In case of using for fair-faced concrete, the same sheathings shall be used twice after approval of the Consultant.

4.3.2 Inspection

- 4.3.2.1 Formwork shall be inspected by the Consultant prior to placing of concrete.

4.3.3 Striking of forms

- 4.3.3.1 The minimum period for keeping the forms in position and for watering after laying the concrete shall be as stated below, except otherwise specified in drawings. Forms shall be removed in such a manner as to ensure the complete safety of the structure, so that there is no shock or vibration as would damage the reinforced concrete.
- 4.3.3.2 The responsibility for the safety of the concrete shall rest entirely with the Contractor and the Contractor shall be held liable for any damage done and shall have to make good the same at his own expenses.
- 4.3.3.3 The Contractor shall inform the Consultant when he intends to remove shuttering and shall obtain his consent, but the consent of the Consultant shall not relieve the Contractor of his responsibility.
- 4.3.3.4 The minimum time for formwork to remain in place shall be as per the following table.

Vertical sides of beams, slabs and columns	24 hours
Soffits of slab	10 days
Soffits of beams	21 days
Cantilevers	28 days

4.3.4 Relocation of Support

4.3.4.1 Supports under concrete shall be not relocated

4.3.5 Removal of formwork

4.3.5.1 Formwork shall be removed gently, after its removal has been approved by the Consultant.

4.3.5.2 Inspection by the Consultant shall be obtained immediately after the removal of sheathing and defects shall be immediately remedied according to instruction of the Consultant.

4.3.5.3 After shorings have been removed, members shall be carefully observed for cracking and deflection, when found, they shall be reported immediately to the Consultant.