

shall then be added to make flowing mortar. In the process of making the mortar the materials shall be turned over at least five times. If concrete is to be made the crushed stone or gravel shall then be added and the whole mass turned over at least four times and until it has become homogeneous and of even color and consistency.

Mixing by machine shall produce a homogeneous mass of concrete perfectly uniform in color and even in consistency, and the whole mass shall be in continuous motion within the machine for a period of not less than one minute.

The re-mixing or re-tempering of mortar or concrete which has partly set shall not be permitted.

The general consistency of the mortar or concrete shall be such that the mass will flow readily in the forms, and that it can be conveyed from the mixer to the forms without separation of the ingredients.

The temperature of the mixture on completion of the mixing shall not be less than 40° Fahrenheit. The crushed stone or gravel shall be heated artificially, if necessary, to obtain this result. In no case shall crystals of ice either in the sand or in the crushed stone be permitted to reach the mixing platform or the mixing machine.

#### 51. PLACING ABOVE WATER.

The surface on which concrete is to be deposited shall be specially cleaned for the purpose. If the surface be rock it shall be given a coat of grout composed of equal parts of cement and sand well brushed into the surface and all the crevices. If the surface, vertical or otherwise, be of concrete which has set hard it shall be spalled or roughened and afterwards thoroughly brushed over with grout composed of equal parts of cement and sand. If the surface be of concrete which has not set hard the spalling or roughness may be omitted, but grout composed of equal parts of cement and sand shall be applied as specified above.

Mortar and concrete shall be placed immediately after being mixed. Mortar or concrete which has partly set shall not be used.

Concrete shall be deposited in such a manner that the ingredients will not be separated, and the mass shall be consolidated by being worked after placing. The coarser ingredients shall be removed from contact with the formwork by the manipulation of a special tool.

The depositing of concrete at expansion joints shall be done with the same care and attention as that required to ensure a smooth finish to exposed surfaces.

In all cases laitance which may have formed on the surface of deposited concrete shall be carefully and entirely removed.

Concrete shall be deposited in approximately horizontal masses, and the work shall be stopped only at regular or temporary vertical bulkheads.

During freezing weather concrete shall be taken from the mixer and deposited in the forms so that no part of it shall be frozen and the temperature of the mass when deposited shall not be less than 35° Fahrenheit. The concrete shall be prevented from freezing until setting has taken place and until the process of hardening has begun.

Trowelled or floated horizontal surfaces shall be not less than one inch in thickness. They shall be composed of mortar or concrete proportioned according to the requirements for wear. The mortar shall contain at least one part of cement to two parts of sand. The concrete shall contain at least one part of cement to one part of sand and one part of finely crushed rock or gravel.

If possible the surfacing shall be applied immediately after the placing of the mass concrete, but when this is impracticable the mass concrete shall be thoroughly washed and treated with a coat of grout composed of equal parts of cement and sand thoroughly brushed in before the surfacing is applied. In trowelling or floating the surface pure cement shall not be used.

#### 52. CURING.

Concrete shall be protected from the direct rays of the sun for at least three days after being deposited when the maximum temperature is above 60° Fahrenheit in the sun.

For a period of seven days after being deposited concrete shall be kept moistened when the maximum temperature in the shade is above 60° Fahrenheit.

#### 53. FORM REMOVAL.

The forms shall not be removed from concrete work until the concrete is safely self-supporting, and, where additional concrete is to be added, until it has sufficient strength to safely sustain the superimposed load.

#### 54. PLACING UNDER WATER.

When concrete is to be deposited under water the site shall be cleaned from all foreign matter and all currents of water shall be eliminated.

The concrete shall be deposited immediately after mixing in such a way as to displace the water and at the same time to obviate the separation of the ingredients. The work shall be carried on in such a manner as to prevent the formation of laitance between successive masses of concrete.

### REINFORCED CONCRETE

#### 55. GENERAL.

All the requirements of the preceding sections shall apply to reinforced concrete as far as consistent.

#### 56. CRUSHED STONE AND GRAVEL.

The largest fragments of crushed stone or pieces of gravel for reinforced concrete shall be of such a size as to pass through a circular hole  $\frac{3}{4}$ " in diameter in a thin plate.

#### 57. STORAGE OF STEEL.

Steel shall be stored on skids clear of the ground and protected from rain and snow.

#### 58. FABRICATION AND PLACING OF STEEL REINFORCING.

All steel reinforcing shall be fabricated and placed in strict conformity with the dimensions on the approved drawings, and it shall be truly lined up and so held in position that displacement shall not occur during the depositing or manipulation of the concrete. All bars shall be free from bonds not specifically required by the approved drawings.

No material shall be permitted to adhere to the surface of the steel reinforcing until the concrete in which it is to be embedded is being deposited.

#### 59. CLEANING OF FORM WORK.

Immediately before depositing the concrete the form work shall be entirely cleaned of all foreign material, preferably by the use of a pressure hose and nozzle discharging water, steam or air.

In column forms an opening shall be provided at the bottom of the form work of every column in order that every particle of foreign material may be readily removed.

#### 60. DEPOSITING OF CONCRETE.

The concrete shall be deposited in small quantities preferably as a uniform stream. It shall be manipulated in such a manner as to ensure perfect adhesion to the entire surface of the steel reinforcing and to remove all impounded water or air.

In depositing concrete in columns the work shall be discontinued at the elevation of the bottom of beams for a period of not less than three hours before depositing the beam concrete. In the absence of beams the elevation of the bottom of the slab shall be taken as the stopping plane. Before commencing the depositing of the beam concrete (or slab concrete in beamless systems), every column shall be examined for laitance, which if present shall be immediately removed.

The concrete for slabs shall be deposited continuously with the beams. Special care shall be exercised to procure perfect homogeneity of tee-beam construction.

#### 61. DISCONTINUANCE OF WORK.

Every structural element shall be completed without discontinuance if practicable. Unless completed in one operation, beams and slabs shall be discontinued only by the use of vertical bulkheads placed at the section of maximum bending moment.

#### 62. FREEZING WEATHER.

In protecting reinforced concrete from frost a system which will drive the moisture out of the concrete shall not be used.

#### 63. FORM REMOVAL.

The forms shall not be removed until the times named in the following table have elapsed after depositing concrete, not counting periods in which the temperature has been below 35° Fahrenheit.

Part	Minimum number of 24-hour days elapsed after depositing
Posts under beams and girders.....	20
Floor slab panels.....	10
Wall forms.....	2
Column forms.....	4
Sides of beams and girders.....	4
All other parts.....	10