

TABLE OF CONTENTS

26.	WELL SINKING	26-1
26.1	SCOPE	26-1
26.2	GENERAL	26-1
26.3	MATERIALS & WORKMANSHIP	26-1
26.4	CONSTRUCTION	26-1
26.5	LOG RECORD OF EXCAVATION	26-3
26.6	ALTERNATIVE PROCEDURE FOR SINKING	26-3
26.7	MEASUREMENT AND PAYMENT	26-3
26.7.1	COMPOSITE RATE	26-3
26.7.2	LABOUR RATE	26-3
26.7.3	QUANTIFICATION	26-4

26. WELL SINKING

26.1 SCOPE

The works to be done under Well Sinking, consist of all such related works which extend below the ground specified in the Contract or as directed by the Engineer-in-Charge. Those works shall include constructing brick masonry reinforced brick masonry wells with reinforced concrete well curbs and steel angle cutting edges including bottom and top concrete plugs and sand filling as shown on the Drawings and specified herein. The works to be done shall include constructing reinforced concrete well curbs with steel cutting edges, brick masonry walls (Unless reinforced brick Masonry has been specifically specified or directed by the Engineer-in-Charge) dredging and sinking the wells, placing the bottom and. top concrete plugs and sand filling, and all incidental operations required to construct and sink the well foundations as shown on the Drawings or specified herein.

26.2 GENERAL

- a) All operations of the Contractor for well sinking and all materials used shall be subject to the approval of the Engineer-in-Charge.
- b) The Contractor shall sink the well at the designated locations in accordance with the lines and grades shown on the Drawings or established by the Engineer-in-Charge.

26.3 MATERIALS & WORKMANSHIP

The Contractor shall furnish all materials for the complete construction and sinking of the wells and all materials and workmanship shall meet the following requirements.

- a) Brick masonry shall conform to the applicable requirements of Section 11-Brick Work.
- b) Concrete shall conform to the applicable requirements of the Section 5, Plain & Reinforced Concrete.
- c) Reinforcement for Concrete shall be as shown on drawings and shall conform to Sub-Section 5.4, Plain & Reinforced Concrete.
- d) Sand filling shall be approved unprocessed river bed sand or, at the option of the Contractor approved river bed gravel, cobbles or brick bats mixed with sufficient river bed sand to completely fill the interstices in the coarser material.

26.4 CONSTRUCTION

The wells shall be constructed and sunk as open caissons as specified herein. Unless otherwise authorized by the Engineer-in-Charge, the Contractor will not be permitted to sink the well by any method which does not utilize the dredging and sinking principle substantially as follows:

- a) The area at which the well is to be sunk shall be excavated to the approximate top elevation of the completed well foundation, In case spring level is higher than the top elevation of the completed well, the excavation shall be maintained in a dry condition by utilizing cofferdams and un-watering methods.

The excavation shall comply with provision of Section 3 - Earthwork.

- b) The well curb shall be constructed in place in the proper position, or if a pre-cast curb is used it shall be set in proper level position at the surface below which well sinking is to be carried. If a precast curbs is used it shall be set in proper level position. Precast curb shall not be handled until they have been cured for at least 14 days. The vertical bars for masonry reinforcement (wherever reinforced brick work has been specified or specially directed by the Engineer-in-Charge) shall be attached to the steel angle cutting edge by means of nuts and washers as shown on the Drawings.

- c) After placing of precast curbs; or not earlier than three days after placing of Concrete for cast-in-place curbs, brick Masonry walls with an approximate height of 1.5 meters shall be constructed on the curbs as shown on the Drawings. Two straight edges as approved by the Engineer-in-Charge shall be rigidly attached to each of the outside faces of the well for the purpose of ensuring that the brick masonry courses are laid truly plumb and level and to provide a means by which the departure of the well from plumb and the drift of the well from its correct position during sinking may be determined, The well height in decimeters above the cutting edge as well as the level of each course of masonry shall be marked on the straight edges,

Wherever reinforced brick masonry walls have been specified or directed by the Engineer-in-Charge, vertical reinforcing and horizontal bond steel flats shall be embedded in the masonry as shown on the Drawings, Splices in the vertical reinforcing bars shall be made by welding or the screwing of sleeve nuts. Each strip shall be in place and drilled or punched to permit vertical reinforcing bars to pass through) horizontal bars,

- d) The well shall be sunk by dredging (defined as removal of material from inside the well) until the top of the masonry is approximately 0.7 meters above the ground, whereupon straight edges for another lift of masonry shall be set and a second lift of masonry up to 3 meters in height constructed. Care shall be taken that the exterior faces of succeeding masonry lifts are constructed parallel to the axis of the well rather than plumb so as to indicate any uneven sinking of the well and permit remedial action to be taken. Each successive lift of masonry shall be allowed to set for three days before sinking of the well is resumed.

In caser spring level is high, then operation shall be maintained in a dry condition using coffer dams and dewatering methods.

- e) Dredging shall be accomplished in such a manner that the hole within the well shall not be extended below the cutting edge by more than 1.25 meter and that, when the well is sunk to its final position, the material outside of the well will not have been disturbed. Except when specifically authorized by the Engineer-in-Charge, explosives shall be used in conjunction with dredging. Dredged material shall be used for backfill or placed in spoil banks adjacent to the locations of work as approved by the Engineer-in-Charge.
- f) Each well shall be frequently checked for plumb by means of plumb lines and mason's level or other approved means. Corrective action, consisting of dredging from the high side until the well rights itself, shall be taken immediately if the well is found to be sinking unevenly. If required, weights shall be added at the top of the well masonry on the high side or the Contractor may be required to employ shoring or tension rigging on the upper body of the well foundation to assist in plumbing the well foundation. The corrective force shall be applied concurrently with sinking of the well. Completed well foundations shall not depart from plumb by more than 2.5 cm in 1.27 m which shall be the only deviation allowed from the true position of the well as shown on the Drawings.
- g) Each well shall also be frequently checked for longitudinal and lateral drift during sinking by the use of a suitable sighting device, or other means approved by the Engineer-in-Charge, and by establishing satisfactory control points a safe distance from the construction so as to remain undisturbed, from which the straight edges outlined in sub-clause (b) above may be clearly sighted. The longitudinal and lateral centerlines of the top of any well foundation shall not deviate from the centerlines established on the Drawings by an amount greater than an equivalent tilt of 2.5 cm in 1.27 m. The vertical distance used to establish the equivalent tilt shall be the vertical distance from the level shown on the Drawings to the top of the well. The deviation may consist of tilt, drift, or combination thereof; however, the completed well shall not depart from plumb by more than 2.5 cm in 1.27 m.

- h) If the well does not sink as the dredging is advanced, a greater height of masonry, weighting or running shall be employed. Running, defined as the practice of removing water from within the well to reduce buoyancy and thereby increase the effective weight of the well, shall not be employed without the approval of the Engineer-in-Charge.
- i) If for any reason a well is cracked either vertically or horizontally, the masonry shall be removed insofar as practicable to eliminate the crack and rebuilt. A crack or portion thereof, which cannot be eliminated practicably by rebuilding in the opinion of the Engineer-in-Charge, shall be grouted to the satisfaction of the Engineer-in-Charge.
- j) When a well has been sunk to its indicated elevation, the bottom interior of the well shall be carefully sounded to detect the presence of any material within the space to be occupied by the bottom plug, and any material so detected shall be removed. The false masonry if constructed to increase the weight for sinking shall also be removed.

2. Where specified:

- a) Without un-watering, the bottom plug concrete shall be placed by means of a tremie, bottom dump buckets, or other approved means which will preclude any free fall of the concrete in the water. The concrete shall be worked under the masonry corbelling and carried at least to the height indicated on the Drawings.
- b) After the bottom plug concrete has set at least one day, and without unwatering the well, the sand filling shall be placed in lifts not exceeding one meter in depth and with a 24-hour elapse of time between placement of the lifts to permit settlement of the fill.
- c) After the sand filling is placed to the demarcated elevation within the well, the top plug concrete shall be placed and screeding level at the elevation of the top of the brick masonry, If the well is tilted within the permissible limits, the masonry at the top of the well shall be constructed, so that the top surface of the masonry around the perimeter of the well meets the specified elevation.

26.5 LOG RECORD OF EXCAVATION

The Contractor shall furnish to the Engineer-in-Charge log of the Sinking of each well. The log record the day and hour at which sinking commenced, suspended, resumed and completed, a description of materials dredged; time during which each lift of brick masonry is built; the height of the lift; the daily record of sink age obtained, deviation of the well from plumb position and description of action. to plumb the well, and any unusual occurrences or data as is required to document the progress of well sinking. The form of the log shall be approved by the Engineers-in-Charge.

26.6 ALTERNATIVE PROCEDURE FOR SINKING

Sinking of the well by any other of the so called traditional methods employed in Pakistan may be utilized when approved by the Engineer-in-Charge provided the essential requirements of these Specifications are met.

26.7 MEASUREMENT AND PAYMENT

26.7.1 COMPOSITE RATE

The measurement and payment for the items of the work of Well Sinking hereof shall be made corresponding to the applicable CSR item as provided in Contract Agreement and shall constitute full compensation, for procurements, transportations, performance in all respect and completion of work as specified including the site clearance as approved by the Engineer-in-Charge.

26.7.2 LABOUR RATE

The measurement and payment for the items of the work of Well Sinking hereof shall be made corresponding to applicable CSR item as provided in Contract Agreement and shall constitute full compensation for procurements transportations, performance in all respect and completion of work

as specified including site clearance, as approved by the Engineer-in-Charge except the cost of materials to be provided by Department at designated location as defined in the Contract Agreement.

26.7.3 QUANTIFICATION

The unit of measurement shall be measured as mentioned below in accordance with corresponding CSR items.

1. For Volumetric items, the unit of measurement shall be cubic meter or cubic foot. Following items of CSR are measured in the above mentioned criteria;
Item No.: 26-1 to 26-6,26-8 and 26-10
2. Following items of CSR shall be measured as each Job;
Item No.: 26-7
3. Following items of CSR shall be measured per %age Kg/Lb;
Item No.: 26-9