

## CHAPTER IV

## CONSTRUCTION OF CONICAL RICE BIN

A prototype rice bin was constructed at the site at Chulalongkorn University and used in the experimental investigation. The cross-section of the bin, designed bamboo-cement section and details of ring girders were shown in Fig. (6).

#### 4.1 Materials

The skeletal reinforcements for the bin wall and ring girders, and bamboo mesh used as fibers had the size of all bamboo sections which was approximately 0.50 cm. x 1.00 cm. and 0.10 cm. x 1.00 cm. respectively. The spacing of the bamboo mesh was approximately 2.25 cm. Rapid hardening portland cement Type III (ASTM Standard 150 - 62) and natural coarse sand of gradation shown in Fig. (9) were used the mixing of the mortar which was designed to have a cement-sand ratio of 1 : 2 by weight with a water-cement ratio of 0.45. The above proportion was recommended by test specimens. The fine aggregate was then filled into ground pockets and flintkote was used casted on the base foundation.

## 4.2 Construction of Prototype Rise Bin.

The construction procedure of the bin can be summarized as the followings :

### 4.2.1 Preparation of Foundation.

The foundation was prepared by excavating the original ground until the approximate shape of the inverted bottom cone of the bin was obtained. Sand and fine aggregation were then filled into ground pockets and compacted manually by using wood column. Finally, 4 cm. thick mortar was coated without reinforcement to form the base of foundation see Fig. (17).

### 4.2.2 Fabrication of Reinforcements.

All bent bars and curved bars used for reinforcements of the bin wall and ring girders were prepared first. Details of these bars were shown in Fig. (6). The wall reinforcement of the top and bottom cone was then fabricated. This could be done directly in the field. The skeletal reinforcement consisting of three layers of bamboo bars had the size of all bamboo sections which approximately 0.50 cm. x 1.00 cm. Two layers and one layer of bamboo bars were longitudinal and circumferential directions. The bars in the longitudinal and circumferential direction were spaced at 10 cm. and 20 cm. along the upper and lower cones,

and was tied by wire (BWG No.18) at any junction. One layer of fibers bamboo mesh was tied by wire (BWG No.18) on both sides of the skeleton reinforcements. The orientation of the fibers bamboo mesh was shown in Fig. (6). An overlap of 10 cm. between fibers bamboo mesh was provided to develop the bond. After the reinforcement of the bottom cone was finished, the reinforcements for the bottom ring girder was shown in Fig. (6), the top cone and the top ring girder was shown in Fig. (6) were fabricated successively. At this step, a wooden frame was made to provide entrance into the bin. The bottom ring girder consisted of three skeletal bamboo bars and the top one of two skeletal bamboo bars, all of which are 0.50 cm. x 1.00 cm. in size. The wall reinforcement of the top cone were similar to that of the bottom cone. The finished skeletal reinforcements of the whole bin were shown in Fig. (18).

#### 4.2.3 Casting of Prototype Rice Bin.

Before casting the rice bin, electrical resistance strain gauges were stucked to skeletal reinforcements in both longitudinal and circumferential directions by using CI adhesive at various positions (to be mentioned in chapter (V)) and the bin should be shaded by a temporary roof using the wooden frame as shown in Fig. (29) as the

supporter. This would prevent the wet mortar during construction, the proportion of which was rather dry, so that it would not fall off the fibers bamboo mesh and from being exposed to the sunlight and the initial shrinkage in mortar would be reduced. The whole bin was plastered with mortar in one operation. The mortaring was carried out by five workman and was completed in 15 hours which form-work was required for inner top cone only. There were four steps of casting as follows : The first step, the bottom cone was constructed by pressing wet mortar through fibers bamboo mesh from the inner side of the rice bin, the second, the bottom ring girder was casted see Fig. (20), the third, the top cone was constructed by pressing wet mortar through fibers bamboo mesh from the outer side of the rice bin see Fig (21) and finally, the top ring girder was casted then the rice bin was formed completely. Cement surface finishing was done a few minutes after the casting finished. After the period of 24 hours, the wet gunny sack were used to cover the prototype rice bin, the covering should be continued for a week. The formwork was removed on the third day after being casted. The sparsely blow holes occurred on surface of the prototype rice bin since the mortar was loosely compacted could be eliminated by cement surface finishing.

#### 4.2.4 Prefabrication of Bin Lid.

Skeletal grid of bamboo bars 0.5 cm. x 1.0 cm. in size spaced at 12.5 center to center each way were formed to conform with the desired dimensions of the lid. One layer of fibers bamboo mesh was tied on both sides of the grid. Machine finished plywood mold was used in casting the lid. The mold was oiled properly and the reinforcement was positioned in place. The mortar was then mixed and applied into the mesh in the same manner as in the casting of the bin. The lid was cured by wet gunny sacks for 7 days and then removed from the mold see Fig. (24).