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CODE OF PRACTICE FOR CONSTRUCTION OF COCOA BEANS STORAGE STRUCTURES

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0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 12 December 1981, after the draft finalized by the Stimulant Foods Sectional Committee, had been approved by the Agricultural and Food Products Division Council.

0.2 The damage to cocoa beans due to fungal, microbial and insect attacks can be minimized to a large extent if cocoa beans are stored in structures which prevent as far as practicable, their entry inside and also if suitable measures are taken during handling, transport and storage.

0.3 The damage and pollution of cocoa beans during storage are due to temperature, moisture and dampness, insects and rodents. It is, therefore, obvious that in order to conserve cocoa beans they should be stored in sound structures of different types, each type being suitable for a particular region in the country and code of practice should be formulated and adopted for handling, transporting and storing; when such standards become available and are implemented, they will go a long way in minimising the loss of cocoa beans.

0.4 This standard has been formulated mainly with a view to guiding processors, dealers and other agencies connected with handling of cocoa beans so that the damage to cocoa beans is, as far as possible, reduced to the minimum.

0.5 This code has been prepared for the construction of structures which would permit effective control of insect and other pests of stored cocoa beans and which entirely exclude rain and ground moisture.

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1. SCOPE

1.1 This standard covers requirements and method for construction of cocoa beans bag storage type structures.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Bag — A container made either of jute, fabric or laminates having the standard dimensions and containing a net content of 60 to 65 kg of dry cocoa beans.

2.2 Bag Storage Structure — Structure in which bags containing cocoa beans are stored.

3. LOCATION

3.1 The cocoa beans bag storage structure shall be located on a raised and well-drained site, or on suitably made-up soils, if necessary.

3.2 The structure shall not be located on lands subjected to floods or inundations and shall be safe from damage by surface or seepage water.

3.3 The structure shall be at least 15 m away from residential buildings, factories (other than cocoa processing factories), dairies, poultry farms, kilns and other possible sources of fire and 30 m away from garbage, dumping grounds, slaughter houses, hide curing centres, tanneries and such other places, the close vicinity of which is deleterious to safe storage of cocoa beans.

3.4 The structure shall be away from large trees.

3.5 The structure shall be generally accessible to lorries and preferably situated near a rail head with goods siding.

3.5.1 Where the structure is near waterways, such as ferry heads and docks sufficient berthing, loading and unloading facilities shall be made available.

4. BAG STORAGE STRUCTURES

4.1 The bag storage structure may be of dimensions most economically suited to the land available. The storage capacity shall be calculated taking into account the coefficient factor of 0·8m² per metric tonne of cured cocoa seeds.

NOTE 1 — The coefficient factor is derived from (a) 14 bags stacked one over the other; (b) each such bag containing 62·5 kg of cocoa beans; (c) 30 percent floor area for passage, in between the stacks; and (d) stacks of 30 bags.

NOTE 2 — The minimum height of the wall may be 5·5 m for flat roofed structures and in the case of other structures the minimum wall height may be 4·25 m inside at the point where the roof crosses the wall.

5. FOUNDATION

5.1 The foundation shall be carried to a depth of not less than one metre unless rock, sheet-rock or laterite is met with at a higher level and shall have concrete bedding of suitable thickness unless rock, sheet-rock or laterite is met with.

5.2 The foundation masonry shall be of stone burnt bricks, concrete blocks or other suitable materials depending upon the availability of the same at a particular region. It shall be constructed either in lime mortar 1 : 3 (1 part lime and 3 parts of sand) or cement mortar of proportion not less than 1 : 5.

5.3 The foundation trenches on both sides shall be filled with coarse sand or gritty material and shall be flush with ground level.

5.4 Necessary measures shall be taken to make the structure termite-proof.

6. PLINTH

6.1 The plinth level shall be at a minimum height of 0·7 m from the surrounding ground level.

6.2 The plinth shall be filled up as given under **7.1.**

6.3 The plinth (or basement) masonry shall be of stone in cement mortar of proportion not less than 1·5 and cement pointed 1 : 4 or plastered on its outer surface with cement plaster not less than 1 : 6.

6.4 75 mm thick stone slab or 1 : 2 : 4 cement concrete plinth slab over the plinth masonry and below superstructure shall be laid.

7. FLOOR

7.1 Filling of Plinth or Basement — Fill with gritty moorum soil or red earth, sand or coal clinker. The layers should be of 75 mm up to a height of 150 mm in case of cement concrete floor or 225 mm in case of granite or any other good stone slabs floor, below the plinth level. Water profusely and compact each of these layers. Lay over these a layer of coarse sand and stone. Water and compact these layers of coarse sand and rubble stone and again compact these layers thoroughly.

7.2 Laying of the Floor — It shall be of either cement concrete, granite stone or any other good quality stone slabs. If the floor is of cement concrete it shall be 75 mm thick (25 mm thick 1 : 2 : 4 of 20 mm metal over 50 mm of 1 : 4 : 8 of 40 mm metal) and shall be laid in alternate panels, not exceeding 2·5 m^2. The joints of panels shall be neatly grouted with cement mortar 1 : 3. If the floor is of stone slabs, a layer of lime concrete or cement concrete 1 : 4 : 8 of 38 mm metal of not less than 75 mm thickness shall be laid over the 150 mm layer of rubble stone, over which the stone slabs shall be set in lime mortar 1 : 3 or cement mortar 1 : 4. The stone slabs shall not be less than 50 mm in thickness and shall be pointed with cement 1 : 3.

8. WALLS

8.1 The walls shall be solid and shall be at least 300 mm thick in the case of brick construction. In the case of laterite or other hard stone construction, the thickness of the wall shall be 450 mm up to a height of 3 m from the plinth and 225 mm thick from this height upwards. In the case of brick construction the walls shall be plastered with lime mortar 1 : 2 or cement mortar 1 : 4 and shall be finished smooth. In case of laterite or stone construction, cement mortar of 1 : 3 to 1 : 4 shall be used for pointing purpose. There shall be no off-sets or projections in the wall. The wall shall be flush with the outer surface of the plinth; in case this is not possible, the plinth projections shall be rounded off.

9. DOOR

9.1 The door opening shall be not less than 2 m wide and 2·5 m high. The door leaves shall be of steel or timber and either rolling type or opening outside. When open, the door leaves shall flush with the outside surface of wall. When closed, they shall be close filling with the frame of the door. The door leaves shall not have cracks or open joints.

10. AIR VENTS

10.1 Air vents shall be provided at floor level for the ingress of fresh air. Windows shall not be provided.

10.2 The clear opening of the air vents should not be more than 25 cm^2, and shall be provided with shutters opening inside. When the godown abuts the road and safety considerations preclude the erection of air vents in the outer wall, they may be provided in the inner wall.

10.3 For every 5 m length of wall, there shall be one air vent.

11. VENTILATORS

11.1 For every 6 m length of the wall, one ventilator of the size 0·7 m high and 1·2 m wide shall be provided. A centrally rotating shutter shall be provided to the ventilator and the shutter shall be close fitting with the frame of the ventilator. The frame of the ventilator shall be fixed flush with the inside face of the wall.

11.2 The ventilator shall be protected by glazed sun shades and frame work of expanded metal or wire mesh.

12. ROOF

12.1 The roof may be either of reinforced concrete flat, or shell roof, a sloping roof with asbestos cement sheets or Mangalore tiles, if the former is not available. The sloping roof shall be a single-span or two-span structure with a central longitudinal gutter which is a source of leakage. Galvanized steel sheets shall not be used.

12.1.1 The leaves of the roof shall project at least 0·7 m from the outer surface of the walls. The purlins and sheets shall be well anchored and secured.

13. DRAINAGE

13.1 Gutter and drain pipes shall be provided with the required dimensions taking into consideration the intensity of rainfall and the projected area of the roofing.

13.2 A stone or concrete slab of suitable dimensions shall be provided on the ground below each drain pipe so that the ground is not secured due to the water falling from the drain pipe. The drain pipe shall be located in such a way that it shall not obstruct the ventilators.

13.3 All round the structure, abutting the plinth a pavement 0·5 m wide and 150 mm thick of lime concrete or cement concrete 1 : 3 : 6 or rubble stone pitching set in cement mortar 1 : 4 shall be constructed with suitable drainage arrangement. The pavement shall slope outside at 1 in 10.

14. UNDERGROUND DRAINAGE — BY RUBBLE DRAIN

14.1 Where ground water is likely to rise during the rainy season above the lowest level of the foundation, a trench 0·7 m wide shall be constructed all round the structure.

14.2 The trench shall be one metre away from the outer periphery of the structure, and shall be at the lowest level of the foundation with a longitudinal bed slope towards the natural fall of the ground. It shall be connected to an outfall drain for ultimate disposal of the water. It shall be filled with rubble or brick bats or graded jelly to a depth of 0·7 m and the rest with earth, and then levelled.

14.3 The rubble filling of drain should be so arranged as to have the effect of an inverted filter, that is, bigger rubble should be put at the bottom and the size of rubble, brick bat or jelly to be reduced gradually.

NOTE — The requirements given under 14 above depend upon locality and site conditions may and not be insisted upon in the case of inland region with rainfall of less than 750 mm. In coastal and heavy rainfall regions these are necessary, where the soil conditions require.