

AMIT KAUSHIK
Director
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D.O. 13-6/2005-EE-12

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Dear

Sub: Inbuilt Quality Control System

The recently concluded SSA JRM has, *inter alia*, emphasized that “...*there is a need to strengthen and improve quality control overall in respect of civil works*”. The successful execution of civil works clearly requires that adequate attention be paid to the quality aspects of construction. As you may recall, guidelines related to quality in civil works were issued through our earlier letters of even number dated September 12, 2002 and August 25, 2004. The importance of in-built quality control mechanisms was also discussed during review meeting with Civil Works Coordinators on 25-26th September 2003 and 17-18th November 2004.

In continuation of correspondence on the subject, some of the measures to be adopted for achieving quality in civil works are reiterated below:

(i) Implementation of good construction practices

Although most engineers are aware of good construction practices, implementation of these practices has not yet started in many States. Details of some of these practices are at Annexure 1.

(ii) In-built quality control system during construction

Quality control checks that proceed along with construction enable corrective measures to be taken immediately. Such in-built quality control systems can be implemented by engineers in the field during construction. However, except for a few States, others have still to put such a system in operation. Some simple quality control tests for material and technologies, which can be conducted in the field and/or through test houses/laboratories of Polytechnics and Engineering Colleges, have also been indicated in Annexure 1.

(iii) Third party evaluation of civil works

Given the large number of Civil Works under SSA in each State, it may not be possible to supervise all their components at all the required stages. In such circumstances, it may be useful to develop a mechanism of third party evaluation, which would provide feedback regarding the quality of works at different stages of construction. One such system is being implemented in Gujarat, and you may perhaps like to consider a similar model for your State.

I would be grateful if action taken in this regard is indicated to us at your earliest convenience.

Yours sincerely

(AMIT KAUSHIK)

Encl: As above.
All State Project Directors of States/UTs

Quality Control System

a. Good construction practices: To maintain quality in civil works and to avoid cracks, dampness, etc. in the school infrastructures, it is necessary to adopt good construction practices during execution. All engineers, communities, masons and unskilled workers shall be regularly trained and briefed by technical resource persons to adopt such practices. Some of the good construction practices are indicated below:

- **Foundation:** Foundation of any building shall not be laid on filled up soil or in low-lying areas. Occasional testing of bearing capacity of soil may be undertaken.
- **Bricks Masonry:** Only well burnt bricks with ringing sound, having crushing strength of around 100kg/cm² shall be used. The bricks shall be drenched for 6 hours before use. The thickness of the brick masonry joints shall be between 6.25 to 10 mm only. Raking of masonry joints up to 12 mm depth shall be undertaken when mortar is still green. Similarly clearing of cement mortar over brick masonry is undertaken regularly and bricks are bought to its original colour.
- **Stone Masonry:** Stones for stone masonry shall be uniform in colour, texture, and sound, durable, free from flaws, cracks, cavities, veins, etc. Porous stones or sand stone with slates shall not be used. Ensure using bond stones at regular intervals.
- **Sand:** Only well-graded fine sand shall be used for brick masonry and plastering. Similarly well-graded coarse sand shall be used for RCC work and flooring. In no case shall fine sand be used in RCC work and flooring.
- **RCC work:** Only steel shuttering or good wooden planks shuttering shall be used. Katcha shuttering is prohibited. Use only ISI or ISO marked steel and 43 grades Portland cement only. Always provide bedplates below beams and bearing plaster below slabs. Use of concrete mixer and vibrator is essential for laying slabs and beams.
- **Flooring and plastering:** Cement concrete floors may be laid in panels of not more than 2 sq m. Use only wooden float (Garmala) while plastering. Steel float is prohibited in plastering the walls.
- **Doors and Windows:** All doors and windows frame may be fixed in the masonry during construction only. Use of angle iron for door and window frames may be avoided; instead 2 mm thick pressed steel sheet frame for doors and windows conforming to IS 226-1962 may be used. Do not use plywood panels for doors and windows exposed to rain
- **Roofing:** Provide proper slope while laying roof for draining rainwater. Spouts or rain water pipes of not less than 100 mm diameter shall be used. 100 mm diameter pipes can drain rain water up to 35 sq m of roof area.
- **Timber:** Wherever timber is used, it is to be commercial hard wood, well seasoned and properly treated with wood preservative conforming to IS 401-1982. Timber for use in structures constantly in contact with water or damp earth, shall be treated with suitable preservative laid down in IS-401-1982 so as to resist fungi, termites and marine borer. Moisture contents of seasoned timber for thicker sections for beams, rafters shall not be more than 14%, whereas for thinner sections for doors and windows, it shall be within 12%.

- **Bamboo in building work:** Life of raw untreated bamboo is very low i.e. up to 5 years. However life of specially treated bamboos by pumping out sap and pumping in CCB compound by sap displacement machines is up to 20 years. Hence only treated bamboos shall be used for construction of any building. For further details, contact (i) FOSET New CMC Building, New Market Complex (5th Floor) 15 N Lindsay Street, Calcutta-700087. (ii) N.B. Institute, Agartala, Tripura. (iii) Forest Research institute, Dehradun.
- **General:** Provide drip course on all projections and sunshades. Provide grooves wherever two different materials join together. Curing of all cement works for minimum 15 days is mandatory. Dry cement mortar of not more than one cement bag shall be prepared at a time. Cement mortar or cement concrete shall be used within 30 minutes after adding water. **Providing of apron or plinth protection is essential for safety of the foundation of the building.**

b. Quality control tests for materials and technologies during execution:

- (i) **Sieve Analysis and gradation test for fine and coarse sand as per IS-2720.**
- (ii) **Water absorption test for bricks**
- (iii) **Compressive strength test for bricks**
- (iv) **Compressive strength tests for cement concrete work by testing 6 cubes of 15 cm x 15 cm x 15 cm for slab, beam and flooring.**
- (v) **Slump test for RCC work for ascertaining water-cement ratio in concrete work particularly at the time of laying RCC slab.**
- (vi) **Cement sand mortar test for ascertaining cement and sand contents in the mortar.**