

No. NHVI-50 (20)/77

Dated the 27th Septembr. 1977

The Chief Engineers/Addl. Chief Engineers of the State PWDs. and Union Territories dealing with National Highways (except C.E., P.W. & H Deptt. Maharashtra)

Sub : Instructions regarding quality control of Works—responsibility of officers.

In order to ensure better quality execution of all centrally sponsored works, it is necessary that appropriate follow-up instructions clearly demarcating the responsibilities of the Engineering Officers in respect of supervising various items of work are issued. In this connection, copies of the two following circular letters, issued by the C.E., Public Works & Housing Deptt., Maharashtra, are enclosed for your information and guidance :

- (i) Circular No. BRG—1076/233-Desk 4 dated 31st January, 1977 regarding "Erection and Passing of centering for Buildings and Bridges."
- (ii) Draft circular No. nil regarding Responsibility of Engineering Officers in respect of supervising various items of work, including P.S.C. and R.C.C. bridges, buildings and roads.

2. It is suggested that you may consider issuing instructions on similar lines in your Deptt., with appropriate modifications where considered necessary, with copies to this Ministry.

#### ERECTION AND PASSING OF CENTERING FOR BUILDINGS AND BRIDGES

##### GOVERNMENT OF MAHARASHTRA

Public Works and Housing Department  
Chief Engineer's Circular No. BRG 1076/233—DSK4.  
Bombay, Dated the 31st January 1977

##### CHIEF ENGINEER'S CIRCULAR

Detailed instructions in respect of execution and passing of erected centerings for building and bridge works have been issued under Chief Engineer's circular No. 4 of 1972 circulated under No. WCA 1071/4618-C (D-II) dated the 3rd July 1972. In supersession of these instructions, following instructions are issued which should be followed most scrupulously hereafter by all the field officers concerned.

2. The various officers competent to approve the design of centering and passing of the erected centering shall be as indicated below :

- |      |                                                                            |                                                                                 |
|------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| a)   | Approving design of centering for building as well as bridge works :       |                                                                                 |
| i)   | Clear spans upto 6 metres and with clear heights upto 5 metres             | Officer-in-charge of the Sub-Division (A.E.I., A.E.II, D.E., S.D.E., or S.D.O.) |
| ii)  | Clear spans above 6 metres but not exceeding 15 metres and with any height | Executive Engineer                                                              |
| iii) | Clear spans above 15 metres and with any height                            | Superintending Engineer                                                         |
| b)   | Passing of erected centering for building as well as bridge works :        |                                                                                 |
| i)   | Clear spans upto 10 metres and with clear heights upto 5 metres.           | Officer-in-charge of the Sub-Division (A.E.I., A.E.II, D.E., S.D.E., or S.D.O.) |
| ii)  | In all other cases                                                         | Executive Engineer                                                              |

**Note :** The height for this purpose shall be from the lowest bed level upto the soffit level of the girder. (In case of slabs only, it will be upto soffit of slab)

The approved designs of the centerings should include sketches to show details of the joints. The record of the detailed design of the centering and its approval by the competent authority as well as record of its passing after its erection, by the competent authority should be maintained in a systematic manner. It is impressed on all the field officers that they should invariably see that the design and erection of the centering is got duly approved in writing by the competent authority as indicated above before starting of concreting. The passing of the erected centering should invariably be recorded by the competent authority in the work order book and in no case concreting should commence prior to such an entry in the work order book.

3. A photographic set consisting of at least 5 photos taken from different directions to show the various members and their connections of the centering for bridges and buildings structures with clear spans above 10 metres should also be kept on record prior to concreting.

4. The Code of Practice for Design and Construction of Framework for Concrete published by the Government of Maharashtra should invariably be followed. If earth filling is to be provided below the props, its height should not exceed 2 metres and it should be thoroughly compacted and other necessary precautions should be taken. Where nailed joint: ... specifically permitted in lieu of bolts, the size and number of nails should be worked out and got approved by the authority competent to approve the design of centering.

5. To facilitate the erection and passing of erected centering, the Check-Lists-Annexure— A for Bridges and Annexure 'B' for building should be strictly followed and observed. The Check-list should be got duly filled in and entry about passing of the erected centering should be got duly recorded by the competent authority in the work Order Book and copies of these should invariably be posted by the Junior Engineer in charge of the work to the office of the Executive Engineer before starting actual concreting work.

6. One carpenter should be detailed to watch the behaviour of the centering from below, while concreting operations are going on to notice any cracking noises or movement of props (wobbling) so as to alert the staff concerned of the first signs of failure. The failure should be forestalled by taking immediate remedial measures, duly stopping the concreting work for a while if necessary.

## ANNEXURE A

### CHECK-LIST FOR ERECTION AND PASSING OF THE CENTERING FOR EACH SPAN OF A BRIDGE

1. Span Number
2. a Is the design of the centering duly approved by the competent authority as prescribed in para 2 (a) of the Chief Engineer's circular No. BRG 1076/233-DSK-4, dated 31st January, 1977?
2. b Are detailed drawings of approved design of centering kept on record?
3. If the design is approved subject to certain remarks, are these remarks duly and properly complied with before erection?
4. a What is the depth of river flow in the span at the time of passing the centering?
4. b What is its velocity at the time of passing the centering?
4. c Is the post monsoon flow in the River/Nalla properly diverted?
5. a In case of mud centering, does the top 30 to 35 cms. consist essentially of selected soil such as good moorum?
5. b Is this layer thoroughly consolidated?
5. c Is the height of earth filling as per approved design of centering?
5. d Is the filling evenly done on both sides of the pier to avoid earth pressure acting on one side of the pier?
6. Is the top of centering covered with non-absorbant material?
7. a Are the side slopes of the mud centering to proper prescribed slope?
7. b Are they steeper than 1½ : 1?
7. c Alternatively is the filling closed by dry rubble walls on upstream and downstream faces?
7. d Is the extra width of 1.5 m on both sides provided as a working platform as required by para 4.1.1. of the prescribed code of practice?
8. In the case of timber post type centering is the ground (Bed) strong enough, say rocky or of hard murum and boulders, so that the verticle can be kept directly on the levelled ground?
9. a In case the ground is not firm, is the top 60 cms. filled up with good selected material such as hard murum properly rammed and levelled and protected by masonry walls on u/s and d/s?
9. b Is the bearing capacity of the filling material adequate to withstand the maximum designed loads?
10. a In case of steel trestles, where concentrated loads are coming are T.W. sleepers placed in 2 or 3 tiers in a crib form to satisfactorily distribute the load on to the ground?
10. b Are all members of the crib properly secured and connected to each other?
11. a In case the timber posts need to be spliced, are the ends made square to abut against each other?
11. b Is the solicing, done with timber plates and using proper nuts and bolts?
11. c Is the length of the splicing piece at least 75 cms. or more as per design?
11. d Are all posts across or along in one line?
12. Is the splicing of timber posts in one tier well dispersed?  
(i.e. a number of spliced posts are not grouped in one area and that not more than 25% spliced joints are provided at any one level in the tier)
13. In case of multi-tier type of centering is horizontal connection provided in both the directions at the tier level?
14. a Are the timber posts or steel trestles adequately braced along and across the roadway?
14. b Is the first bracing provided at least 2 mts. from the bottom of vertical props?
14. c Is the spacing of bracing within permissible limits?  
(1.5 mts. for timber posts and 2.5 mts. for steel trestles).
15. Are suitable cleats provided at crossings or junctions of any two members?
16. Are proper lateral supports of scantlings given to the vertical faces of the webs of beams?
17. Is every individual beam supported independently right upto ground level?
18. Are proper steel clamps used to tie the wooden brackings to the steel trestles?
19. a In case of C.C. arches and beams with curved soffit is a tier necessarily provided near the springing level?
19. b Is the profile of arch/curve soffit of beam checked as per approved plan?
20. In case of C.C. arches and balanced cantilever T-beams and slabs is the sequence of concreting and the sequence of removal of centering shown on the drawing of centering?
21. Have wedges of good materials been properly and adequately provided below the props?
22. Is a set of photos of the created centering kept on record as per para 3 of the Chief Engineer's Circular No. BRG 1076/233-Desk-4, dated the 31st January 1977 before commencement of concreting?
23. a Has the erection of centering been passed by the competent authority as per para 2 b of the Chief Engineer's Circular No. BRG 1076/233-DSK 4, dated 31st January 1977?
23. b Has a note to that effect been recorded in the work order book?
23. c Mention the name of the officer who has passed the centering and the date on which he has passed the same.

Officer-in-Charge of Sub-Division/Executive Engineer

(Signature of the authority competent to pass the centering).

**CHECK LIST FOR ERECTION AND PASSING OF CENTERING FOR EACH FLOOR OF A BUILDING**

1. a Building Number.
1. b Floor Number.
2. a Is the design of the centering duly approved by the competent authority as prescribed in para 2 (a) of the Chief Engineer's circular No. BRG 1076/233-DSK-4 dated the 31st January 1977?
2. b Are detailed drawings of approved design of centering kept on record?
3. If the design is approved subject to certain remarks, are these remarks duly and properly complied with before erection?
4. Is the bearing capacity of the material used in the plinth filling adequate to withstand the maximum designed loads?
5. a In case the timber posts need to be spliced, are the ends made square to abut against each other?
5. b In the splicing done with timber plates and using proper nuts and bolts?
5. c Is the length of the splicing piece at least 75 cm or more as per design?
5. d Are all posts across or along in one line?
6. Is the splicing of timber posts in one tier well dispersed? (i.e. a number of spliced posts are not grouped in one area and that not more than 25% spliced joints are provided at any one level in the tier).
7. In case of multi-tier type of centering, is a horizontal connection provided in both the direction at the tier level?
8. a Are the timber posts or steel trestles adequately braced in both the direction?
8. b Is the first bracing provided at least 2 mts. from the bottom of vertical props?
8. c Is the spacing of bracing within permissible limits (1.5 mts for timbers-posts and 2.5 mts. for steel trestles).
9. Are suitable cleats provided at crossings on junctions of any two members?
10. Are proper lateral supports of scantlings given to the vertical faces of the webs of beams?
11. Is every individual beam supported independently upto ground/floor level?
12. Are proper steel clamps used to tie the wooden bracings to the steel trestles?
13. Have wedges of good materials been properly and adequately provided below the props?
14. In case of load bearing walls, are C.C. bed blocks provided below soffit of R.C.C. beams, prior to erection of centering?
15. Is a set of Photos of the erected centering kept on record as per para 3 of the Chief Engineer's Circular No. BRG 1076/233-DSK-4, dated 31st January 1977 before commencement of concreting?
16. a Has the erection of centering been passed by the competent authority as per para 2 b of the Chief Engineer's circular No. BRG 1076/233-DSK 4, dated 31st January 1977?
16. b Has a note to that effect been recorded in the work order book?
16. c Mention the name of the Officer who has passed the centering and the date on which he has passed the same.

Officer-in-Charge of Sub-Division/Executive Engineer

(Signature of the authority competent to pass the centering).

*Responsibility of engineering Officers in respect of supervising various items of work.*

GOVERNMENT OF MAHARASHTRA Public Works & Housing Department, Chief Engineer's Circular No..... Bombay.

**CHIEF ENGINEER'S CIRCULAR**

Detailed instructions have been issued, prescribing the level at which the different types of centerings for the bridges and buildings are to be approved and passed on site by different engineering Officers. Many a times, certain important operations like concreting of major structures, stressing of cables, launching of girders etc. are carried out in absence of personal supervision at the minimum adequate level necessary for a particular operation. Sometimes, execution of such important elements is left entirely to the contractor and lower level supervisors. It has thus become necessary to prescribe the responsibility of officers at different levels who should personally supervise and guide by remaining present during various important operations of works in the interest of better and safe execution of works in this Department. Accordingly the following instructions are issued for guidance of engineering officers in this Department and strict observance in future :

**A. Prestressed Concrete Bridges :****(A-1) Laying of reinforcement and cables**

- (i) The Executive Engineer shall generally check the technical correctness of laying of reinforcement and cable profiles, their junctions, couplings, anchorages etc. before the shuttering is closed for concreting of the first unit. (He need not necessarily check the measurements).
- (ii) The Deputy Engineer shall check and record measurements of cent-per cent components, irrespective of whether the work is on item rate or lumpsum contract.

**\*(A-2) Concreting**

- (i) The Superintending Engineer shall generally inspect the arrangements a few days before commencing concreting of the first girder to satisfy himself about the various arrangements made and to issue detailed instructions on spot as may be relevant for the guidance of the supervisory field staff and contractor. (A similar visit by Executive Engineer, Quality Control and designs should also be arranged).
- (ii) The Executive Engineer shall remain present and supervise concreting of the first girder to be cast. In addition, he may also supervise or remain present for casting of the further girders, as he may feel necessary.
- (iii) The Deputy Engineer shall remain present and supervise concreting of the cent percent girders and other components in prestressed concrete.

**\*(A-3) Stressing of cables and grouting**

- (i) The Superintending Engineer shall generally inspect the arrangements a few days before commencing stressing of cables and grouting of the cables of first girder to satisfy himself about the various arrangements made and to issue detailed instructions on spot as may be relevant for the guidance of the supervisory field staff and contractor. (A similar visit by Executive Engineer,

Quality Control and Designs should also be arranged).

- (ii) The Executive Engineer shall remain present and personally supervise and guide the stressing and grouting of all the cables for all the stages of the first girder and the cables of the first unit of any other prestressed component of the bridge.
- (iii) The Deputy Engineer shall remain present and personally supervise stressing and grouting of all the cables of first three girders of a bridge and cables of the first three units of any other prestressed component of the bridge. In addition, he shall personally supervise and remain present for stressing and grouting of at least 50% of the balance number of cables stressed and grouted on the bridge during his tenure.
- (iv) The Junior Engineer shall supervise and personally remain present during stressing and grouting of cent percent cables of all the prestressed components on the bridge.
- (A-4) *Launching, conveying, side shifting etc. of girders and other precast components (prestressed as well as R.C.C.)*
  - (i) The Superintending Engineer shall generally inspect the arrangements a few days before commencing launching, conveying, side shifting etc. of the first girder to satisfy himself about the various arrangements made and to issue detailed instructions on spot as may be relevant for the guidance of the supervisory field staff and contractor (A similar visit by E.E. Designs may also be arranged).
  - (ii) The Executive Engineer shall remain present and personally supervise the entire operation for the first girder or the unit of each type.
  - (iii) The Deputy Engineer shall remain present and personally supervise the entire operation for the first 3 units of each type and in addition, 50% of the subsequent units executed during his tenure.
  - (iv) The Junior Engineer shall remain present and personally supervise the entire operation of cent percent units executed during his tenure.
- B. *R.C.C. Bridges (Major as well as Minor)*
- (B-1) *Reinforcement of superstructure*
  - (i) The Executive Engineer shall generally check the technical correctness of laying of reinforcement before the concreting of the first unit (He need not necessarily check the measurements).
  - (ii) The Deputy Engineer shall check and record measurements of cent percent components, irrespective of whether the work is on item rate or lumpsum contract.
- (B-2) *Concreting of (a) components of bridges involving more than 20 Cum concrete at a time and (b) concreting of superstructure.*
  - (i) The Executive Engineer shall generally inspect the arrangements a few days before commencing concreting of the first unit, satisfy himself about the arrangements made and to issue detailed instructions on spot as may be relevant for the guidance of the supervisory field staff. However, for casting of deck units for spans in excess of 10 metres and centering heights in excess of 5 metres the Executive Engineer shall remain present and supervise the entire concreting of the first unit.
  - (ii) The Deputy Engineer shall remain present and supervise concreting of cent percent girders or units to be cast.
- (B-3) *Concreting of other components involving quantities less than 20-Cum at a time*
  - (i) The Deputy Engineer shall remain present and supervise concreting of the cent percent units to be cast.
  - (ii) However, the Suprintending Engineer may, by written prior approval, allow selected Junior Engineers to supervise concreting of smaller elements or where concreting is carried out in lifts involving less than 10 Cum. concreting at a time, with the stipulation that at least 25% of such concreting carried out during the tenure of any Deputy Engineer should be supervised by the Deputy Engineer.
- C. *Buildings*
- (C-1) *Reinforcement for RC/PSC*
  - (i) The Executive Engineer shall generally check the technical correctness of laying of reinforcement before the concreting of the first unit (He need not necessarily check the measurements).
  - (ii) The Deputy Engineer shall check and record measurements of cent percent components.
- \*(C-2) *Concreting of beams longer than 5 metres, slabs bigger than 20 Sq. m in area and components involving more than 20 Cum. concreting :*
  - (i) The Deputy Engineer shall remain present and supervise concreting of cent percent units.
- (C-3) *Concreting of smaller components and columns, footings etc.*
  - (i) The Deputy Engineer shall remain present and supervise concreting to the extent of 25% of the quantity concreted during his tenure.
  - (ii) The Jr. Engineer shall remain present and supervise concreting cent percent units.
- D. *Roads :*
- \*(D-1) *Asphalt works like hot mix asphaltic concrete and premix carpets of more than 25 mm thickness*
  - (i) The Executive Engineer shall remain present and personally supervise the first 200 metre length.
  - (ii) The Deputy Engineer shall remain present and personally supervise at least 50% of the length executed during his tenure.
  - (iii) The Junior Engineer shall present and personally supervise sent percent length executed during his tenure.
- \*(D-2) *Soil stabilisation and other experimental surfaces overlays etc*
  - (i) The Executive Engineer shall remain present and personally supervise the first 200 metre length.
  - (ii) The Deputy Engineer shall remain present and supervise at least 50% of the length executed during his tenure.
  - (iii) The Junior Engineer shall remain present and personally supervise cent percent length executed during his tenure.
- E. *Miscellaneous :*
- \*(E-1) *Load testing of any component of bridge or building or other structure :*
  - j) Any load testing of a component of a bridge building or structure to be carried out either in compliance of the requirements of contract specifications or in case of doubt about strength/efficacy shall be carried out under the direction and guidance of the Superintending Engineer who may lay down any particular guidelines over and above those given by Codes/Designs Circle/M.E.R.I. before start of the test.
  - (ii) The Executive Engineer shall remain present and personally supervise the important stages of the load testing, taking observations, etc. The decision about whether the test was satisfactorily conducted and about the acceptance or rejection will be taken by the Executive Engineer who may seek guidance or consult his superior officers and/or Designs Circle/M.E.R.I.
  - (iii) The Deputy Engineer shall remain present and supervise the entire operation of the load testing and taking observations as well as recording the same.
- (E-2) *Execution of all unusual items, like mastic asphalt experiments, laying of bearings and expansion joints (for bridges as well as buildings) any patented processes, special water proofing treatments, anchors for foundations etc.*

- (i) The Executive Engineer shall remain present and personally supervise the entire operation of the first such unit.
- (ii) The Deputy Engineer shall remain present and personally supervise at least 50% of the work executed during his tenure.
- (iii) The Jr. Engineer shall remain present and personally supervise cent per cent work executed during his tenure.

2. The levels of officers required to remain present for personal supervision as indicated above, are the lowest level of officer who has to supervise the particular items to the minimum extent indicated above. It goes without saying that all the engineering officers below that rank have necessarily to remain present and supervise along with that officer. On the other hand, this does not prevent any officers at higher levels to themselves remain present for giving their guidance and directions to satisfy themselves that any work is being carried out properly. Further the frequencies of personal supervision at different levels indicated above, are the minimum prescribed and it is open to the respective officers to exceed those as may be found necessary and possible by them.

3. Advance intimation with at least two days notice before commencing any of the operations marked with "\*" above, shall be given in case of every unit or component to the Executive Engineer and Deputy Engineer of the quality control organisation for information to enable them to arrange surprise inspections, as may be necessary. The responsibility for ensuring proper quality and proper execution, however, vests with the engineers in charge of execution.

4. In order to ensure proper quality control and record of the various operations and work on different items during execution, a number of registers should be maintained and reviewed periodically by the Deputy Engineer, Executive Engineer and the Superintending Engineer. These registers will give all the detailed information of various operations taken from time to time such as material consumption register, well sinking, casting, operations, cube registers, stressing register, blasting register, testing register, log books of testing machines, Ghani register, register of supervisory staff with duties, register of inspecting officers, diary of works, etc. These should also contain information about the level of engineering officer supervising a particular item, in accordance with the schedule. Such information in an abstract form should also be attached with all Running Account and Final Bills of works as may be relevant.

Chief Engineer and Joint Secretary to Government

To

All Additional Chief Engineers in Public Works and Housing Deptt.

All Superintending Engineers and Executive Engineers of Public Works and Housing Department (including Zilla Parishad) with 10 spare copies).