
Ministry of Transport
Department of Surface Transport
(Roads Wing)

2

**MINISTRY'S TECHNICAL CIRCULARS AND DIRECTIVES
ON NATIONAL HIGHWAYS AND CENTRALLY
SPONSORED ROAD AND BRIDGE PROJECTS**

VOLUME II

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On behalf of the Govt. of India,
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of Surface Transport (Roads Wing)

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FOREWORD

Technical circulars, guidelines and directives play a very important role in the functioning of any organisation. For better performance, these circulars must be appropriately classified, compiled and updated periodically. This publication marks the first step in this direction as Ministry's volume of technical circulars embracing, planning, design, project preparation, construction and monitoring of National Highways and other Central Schemes as well as management, upkeep and accounting of central machinery, all appropriately grouped in a book form.

2. The policy circulars given herein are for information and guidance of officers of the Ministry and the State Public Works Departments. Periodic updating of these will of course be necessary to accommodate amendments and modifications based on feed-back etc. The document is expected not only to arm the highway engineers with a treasure of authentic information but also aid their administrative judgement. It is hoped that the feed-back will throw ideas on further shaping and updating of the document besides stimulating further thinking leading to appropriate revisions.

3. This compilation includes policy and other circulars issued upto 16th August 1985. Those circulars on which IRC standards, Ministry's Specifications etc. have since been published have not been included in this compilation. Also, some circulars have been edited by deleting those portions on which standards have been published subsequent to their issue. In compiling the circulars, it is quite likely that there might have been some inadvertent omissions. If these are brought to the notice of the Ministry, it will be of help in incorporating the same in future editions.

4. The circulars, notifications etc. are classified subjectwise and arranged in chronological order. A simple decimal coding system is used which permits identification by main subject, subject and sub-topic. The code number is printed on the top corner of the first page of each circular, the number after the last decimal point indicating serial number of the circular. Future circulars will follow this classification and have the succeeding numbers. If a circular covers two or more subjects, the appropriate subject codes are printed on it and cross references are given in the relevant subject indexes without repeating the circular. The documents are printed and bound in loose-leaf form to facilitate addition of new circulars to it. The holder of this compilation should keep on updating it as new circulars are received. New subjects may be added in the blank numbers, wherever necessary.

While dealing with multifaceted subject of highway engineering where value judgement is quite important, we cannot be tied to a fixed framework that curbs innovative thinking. Improved and innovative solutions based on current thinking and experience should always be welcome without being unduly tied down to guidelines. Such solutions should always be critically evaluated and if found relevant and practicable should be accepted for common good.

New Delhi, July 1986

K.K. Sarin
Director General (Road Development) and
Addl. Secretary to the Govt. of India

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1100.1
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No. WI-48 (18)/56

Dated the 10th July 1957

To

All State Governments

Subject: Construction of new rail and road bridges

I am directed to say that the Government of India have under consideration, the question regarding the distance at which new road and/or rail bridges should be constructed from existing bridges. It is considered desirable that the distance should be as large as possible, but not less than 400 yards in any case. The Ministry of Defence desire that they should be consulted whenever a new bridge is proposed to be constructed near an existing bridge.

1100.2
121.2.6

No. PL-2 (1)/70

Dated the 18th January, 1971

To

All State Govts. and Administrations of UTS (Deptts dealing with Roads)

Subject: Standardisation of the procedure and data for preparation of bridge projects relating to National Highways and Other Centrally Aided Scheme

I am directed to say that the bridge projects relating to National Highways and Other Centrally Aided State Roads of inter-State or Economic importance received in this Ministry from the State Governments/ Local Administrations for obtaining Government of India's technical approval and financial sanction show considerable divergence in their preparation and presentation. In order to have uniformity of practice and to ensure that project estimates are prepared in sufficient detail, it has been considered desirable that some guidelines may be laid down for this work. This will also ensure collection of complete hydraulic and other data and also a proper and thorough study and appreciation of the project.

2. The need for carrying out detailed surveys and investigations and having a uniform procedure for their presentation had been discussed at the Chief Engineers' meetings also from time to time. At the meeting held at Kulu in October, 1969, a proforma had also been discussed. Subsequently, this proforma was circulated to all the State Chief Engineers and on the basis of the comments received from them, the proforma has now been finalised in this Ministry. Two proformae have been drawn up—one for the preparation of bridge estimates for major bridges (length 150 metres or more) and the other for medium and minor bridges. These are enclosed.

I am to request that Chief Engineers dealing with Highway in your State/Territory may kindly be asked to follow these proformae while submitting bridge project estimates relating to the National Highways and other Centrally aided State roads.

Enclosure to letter No. PL-2 (1)/70

Dated the 18.1.71

GUIDELINES FOR PREPARATION AND PRESENTATION OF BRIDGES PROJECTS

(For all Bridges-Major and Minor)

An estimate for a bridge work must contain the following items:

- (i) Report
- (ii) Specifications
- (iii) Design Data
- (iv) Design Calculations
- (v) Detailed Estimates
- (vi) Analysis of Rates
- (vii) Abstract of the Estimate
- (viii) Construction Schedule
- (ix) Drawings and Plans
- (x) Sub-estimate for the approach roads.

The above items are explained in brief in the subsequent paragraphs.

3. **REPORT**—A detailed report is a very important part of any bridge project estimate. It should be so written that after going through it a complete picture of the project can be visualised. It should, therefore, include the following information.

3.1. **Reference of the authority asking for the estimate and location of the bridge** *i.e.* the mileage and name of the N.H. should be mentioned.

3.2. **Existing Conditions**—The present arrangements for crossing, brief details of the existing bridge, if any, its roadway width, loading capacity and present condition of structure. It may also be mentioned whether the existing alignment and geometrics of the approaches would need any change and if so its details.

3.3. **Necessity of the new bridge in respect of traffic needs present and future and its benefits.** Reference to any cost benefit studies done. Available traffic data, and the anticipated growth over a period of 25-30 years may be given as far as possible in respect of large bridges.

3.4. **Selection of site**—Mention of the different alternative sites possible for the bridge, (marking them as I, II, III.....) the merits and demerits of each site. It may also be mentioned whether the final site has been inspected and approved, if so, by whom. Reference of the bench-mark which has been used for carrying out survey should be mentioned. It would be preferable to correlate the bench mark and levels with G.T.S. Bench Mark and levels as far as possible.

3.5. **High Flood Level**—How it has been fixed *e.g.*, from any existing flood marks, local enquiry or observation on existing structures.

3.6. **Discharge**—Methods for working out the design discharge and the basis for the value adopted for design.

3.7. **Waterway**—The waterway required. If possible, its adequacy may be discussed in comparison with the nearby bridges on the same stream. Data of railway or other bridges, if available, to be collected and furnished.

3.8. **Foundation investigations**—Discuss the type of soil strata and boring data.

3.9. **General arrangement of the bridge**—The span length adopted, the economics of adoption of the particular span length and type of foundations and superstructure.

3.10. **Sub-structure**—Type of foundations, piers and abutments adopted. Discuss the depth of foundations required with reference to the bearing capacity of the strata and the scour depths with reference to Lacey's silt factor and other physical characteristics of the sub-strata revealed by samples of the borings.

3.11. **Superstructure**—Type and brief details of the superstructure.

3.12. **River Training Works**—Discuss the necessity of the river training and protective works, if required. Brief details may be given. If any model studies have been done, their details should also be given.

3.13. **Approaches**—Length of approaches on either side which will require to be taken up along with the bridge with special features, if any.

3.14. **Miscellaneous items** such as diversion or temporary bridge needed during construction, site accommodation, laboratory and other buildings required and quality control methods to be used. Also discuss any special features or problems about the site or the locality here.

3.15. **Rates**—The basis of adopting the rates or various items with particular reference to the availability of materials and their distance from the bridge site and the modes for transporting construction materials.

3.16. **Total cost of the bridge.**

3.17. **Construction Schedule**—Construction schedule giving programme of construction and the time required for completion to be given.

3.18. **Any other useful information concerning the bridge**, such as the approach to the bridge site, the nearest town, nearest rail-head, the extent of working season, etc.

4. **SPECIFICATIONS**—Detailed specifications for each item of the work required to be done during the construction of the bridge for which quantities have been worked out in the estimate should be given. In case any standard specifications of the State are being followed, reference should be given of the number in the specification which will cover the item concerned.

5. **DESIGN DATA**—Complete design data for the bridge should be given. This may cover loading to be used for design, hydraulic data, soil information etc. (See Annex I and II)

6. **DESIGN CALCULATIONS**—Detailed calculations for the following must be given :—

6.1. **Discharge by various methods**, discussion of different values obtained and justification for adopting the design values.

6.2. **Waterway to be adopted.**

6.3. **Depth of scour and design of foundations.**

6.4. **Design of piers and abutments, wing walls, return walls etc.**

6.5. **Design of superstructure and bearings.**

6.6. **Design of miscellaneous items such as railings, kerbs etc.**

6.7. **Design of guide bunds and other protective work.**

7. **ESTIMATE OF QUANTITIES**—Detailed estimate of quantities of each item should be prepared and an abstract also given.

8. **ANALYSIS OF RATES**—Detailed analysis of rates for various items in the estimates which are not covered by the prevailing schedule of rates must be given. If the rates are as per standard sanctioned schedule of the State, full reference of the same may be given.

9. **ABSTRACT OF COST**—This will comprise two parts, one in which cost of each item has been worked out and in another an abstract giving costs under main heads *e.g.* foundations, substructure, superstructure, approaches and miscellaneous items. The charges for contingency, w.c. establishments and agency may be added in the abstract.

10. **CONSTRUCTION SCHEDULE**—The construction programme in pictorial forms may be given.

11. **DRAWINGS AND PLANS**—These will be as mentioned below :—

(a) Key map.

- (b) Index Plan
- (c) Contour survey plan
- (d) Site Plan
- (e) Three cross-sections
- (f) Longitudinal section
- (g) Trial boring charts
- (h) Drawings of the bridge showing general arrangement on the cross-section at site, details of foundations sub-structure and superstructure
- (i) Elevation, sections and plans of existing bridges including foundation details.

NOTE 1 —The sizes of drawing sheets (outside dimensions) may be any one of the following but all drawing sheets for one project should be of the same size.

- (i) 1000 mm×700 mm.
- (ii) 700 mm×500 mm.
- (iii) 500 mm×350 mm.

NOTE 2 —As far as possible the scales for various drawings may be as given in Annexure III.

12. SUB-ESTIMATE FOR APPROACH ROADS—Detailed estimate of the approaches prepared in accordance with the guidelines laid down by the "Roads Directorate" should invariably accompany the bridge estimate as Part B, so that there is no likelihood of the cost of approaches being missed.

ANNEXURE I

DESIGN DATA FOR MAJOR BRIDGES (Length 150 metres or more)

A. GENERAL

- 1. Road and its classifications
- 2. Name of the Stream
- 3. Road chainage at centre line of the stream.
- 4. What arrangement exists for crossing the river at present :
 - (a) During monsoon
 - (b) During dry season.
- 5. Has earthquake ever occurred in the region of bridge site?
If so, what was its intensity?

B. CATCHMENT AREA & RUNOFF

- 6. Catchment area—
 - (a) In hilly parts
 - (b) In plains
- 7. Maximum recorded intensity of rainfall in catchment
- 8. Rainfall in centimeters per year in the region
- 9. Length of catchment in Kilometres
- 10. Width of catchment in Kilometres
- 11. Longitudinal slope of catchment
- 12. Cross slope of catchment
- 13. Indicate broadly the nature of catchment
- 14. Are there any artificial or natural storage such as lakes etc. in the catchment
- 15. Is the nature of catchment likely to change such as due to afforestation, deforestation?

Total _____ sq.

C. NATURE OF STREAM

- 16. Is the stream :
 - (a) Alluvial (with erodable banks), or
 - (b) Quasi-alluvial (with more or less fixed bed but erodable banks), or
 - (c) Rigid (with inerodable banks and bed)
- 17. Is the stream :
 - (a) Perennial, or
 - (b) Seasonal
- 18. Does the stream meander or change course?
If so, the extent or meander experienced in the past be shown on the site plan.
(in case of major bridges, the courses of the river, particularly during various years, may be shown in different colours on the large scale plan for sufficient distance upstream and downstream of the proposed bridge site).
- 19. Are banks at the proposed site
 - (a) Firm and steep
 - (b) Firm but gently sloping
 - (c) Erodable and Indefinite
 - (d) Does the stream confine itself within banks, or overtops banks in floods?
- 20. Nature of stream in the vicinity of proposed site—
 - (a) Clean bed, straight banks or rifts or deep pools
 - (b) As in (a) but with some weeds or stones
 - (c) Winding, some pools and shoals, but clean
 - (d) As in (c) but with weeds or stones

- (e) Stony section with ineffective slopes and shoals.
 - (f) Sluggish river reaches, rather weedy or with deep pools.
 - (g) With very weedy reaches.
21. (a) Low water level.
(b) Surface velocity at L. W. L. Metre/Second
(c) Water surface slope at L. W. L. Metre/km.
(d) Bed slope at L. W. L. Metre/km.
 22. (a) Ordinary Flood Level—
(i) at site
(ii) at U/S cross-section
(iii) at D/S cross-section
(b) Surface velocity at O. F. L. Metre/Sec.
(c) Water-surface slope at O. F. L. Metre/km.
(d) Area of X-section at site at O. F. L. Sq. Metres.
(e) Discharge at O. F. L. Cu. M/Sec.
 23. (a) High Flood Level
(i) at site
(ii) at U/S cross-section
(iii) at D/S cross-section
(b) Surface velocity at H. F. L. Metre/Sec.
(c) Water-surface slope at H. F. L. Metre/km.
(d) Area of X-section at HFL.
(i) at site
(ii) at U/S cross-section
(iii) at D/S cross-section
(e) Discharge at H. F. L. Cu.-M/Sec.
 24. R. L. and location of maximum recorded scour below H.F.L.
 25. R. L. of maximum anticipated scour below H. F. L.
 26. Location on the plan of borings taken in the bed of the river at proposed bridge site available.
 27. Test results of the samples of bores, giving therein the values obtained of the soil available at differe the following :
(a) Mean diameter of the particle in mm.
(b) Value of Lacey's silt factor.
(c) Angle of internal friction (O).
(d) Cohesion (C).
(e) Angle of wall friction (S).
 28. Allowable bearing capacity of the strata at foundation level, in tonnes per sq. meter—
(a) calculated theoretically
(b) calculated by conducting standard test (if carried out)
 29. Does stream carry drifting matter in floods? If so, state its nature, such as bushes, tree branches, boulders etc.
 30. Are banks susceptible to scour? If so, indicate the extent of cutting of banks occurred in the past.
 31. Is stream navigable? If so, the clearance required?
 32. Are large scale river training works necessary? If so, give the following detailed plans :—
(a) Course of the stream for sufficient distance upstream and down-stream of the bridge site indicating in different colours courses adopted by the river in different years.
(b) Contour survey plan of the bed of the river both on the upstream and down-stream of the bridge extending to a distance beyond the location of the proposed guide bunds or other protection.
(c) A plan showing the maximum loop chord ratio attained by the stream in the vicinity of the bridge site.
(d) Any other plans considered necessary for proper appreciation of the proposal for protective works. If any model experiments have been carried out, a copy of the report to be attached.
- D. ALIGNMENT AND APPROACHES**
33. Is the proposed alignment of the bridge skew or normal to channel? If skew, give angle of skew.
 34. Will approach be straight? If not, give radii of curves on.
(a) Right approach
(b) Left approach
 35. Proposed gradients in approaches :
(i) Right approach
(ii) Left approach
 36. Will visibility of bridge be unobstructed upto 50 Metres on either side of the bridge? If not, give details.
 37. Proposed type of surface of approaches.
- E. SUPERSTRUCTURE**
38. Proposed clear roadway over the bridge.
 39. Proposed width of footpaths, if necessary.
 40. (a) Proposed formation level of the road over the bridge at the Centre.
(b) Gradient, if any, in the road formation along the length of the bridge.
(c) Camber in the road formation.

41. Is the proposed bridge to be designed to pass—
 (a) Maximum floods
 (b) Ordinary floods with dips to pass excess discharge in high floods
 (c) Only dry season discharge (Submersible bridge)
42. Number and size of spans recommended
- F. FOUNDATIONS
43. What type of foundations are recommended?
 (1) Open foundations
 (2) Well foundations
 (3) R. C. Pile foundations
- G. EXISTING STRUCTURES
44. Do any bridges exist on the stream? If so, have their positions been marked on Index Plan?
45. Details of each of the existing bridges :
 (a) Size and No. of spans
 (b) Type of substructure
 (c) Type of superstructure
 (d) Type and depth of foundations
 (e) X-sectional area at H. F. L. underbridges
 (f) Is the waterway found to be adequate or excessive or inadequate?
 (g) Whether the foundations have been trouble free and depth provided is adequate or inadequate.
 (h) Any other information
- H. MISCELLANEOUS
46. Name of nearest town and its distance from site
47. Is accommodation available at site or in the neighbourhood for construction staff?
48. Nearest railway Station and its distance from site
49. Cost at site of the following materials—
 (Give information in respect of items of materials applicable)
 (a) Brick I Class
 (b) Masonry stone
 (c) Stone ballast
 (d) Dressed stone for arches
 (e) 3/4" grit for RCC work
 (f) Sand for masonry work
 (g) Sand for RCC work
 (h) Cement
 (i) Mild steel bars and M. S. structurals
 (j) Sal Wood
 (k) Boulders or block kankar for pitching
50. Have the following been enclosed duly completed? Plans at Serials b, c, d, e, and f to be as per provisions in Clause 101 of I. R. C. Bridge Code, Section 1
 (a) Key Map-Scale 1 cm.=50 km.
 (b) Index Plan
 (c) Contour survey plan
 (d) Site Plan
 (e) Three X-section
 (f) Longitudinal Section
 (g) Trial Boring Charts
 (h) Drawing of the bridge showing general arrangement on the cross section at site, details of foundations, substructure and superstructure
 (i) Elevation, sections and plans of existing bridges including foundation details.
- NOTE : The sizes of the drawing sheets (outside dimensions) may be any one of the followings but all the drawings sheets for one project should be of the same size :
 (i) 1000 mm × 700 mm
 (ii) 700 mm × 500 mm
 (iii) 500 mm × 350 mm

Assistant Engineer

Executive Engineer

1. The proposed site for the bridge has been inspected by _____
2. Any other remarks considered worth mentioning by the Superintending Engineer _____

SUPERINTENDING ENGINEER
ANNEXURE II

DESIGN DATA FOR MEDIUM AND MINOR BRIDGES
(Less than 150 metres in length)

A. GENERAL

1. Road & its classification
 2. Name of the stream

3. Road chainage at centre
4. What arrangement exists for crossing the river at present
 - (a) During monsoon
 - (b) During dry-season
5. Liability of site to seismic disturbances
- B. CATCHMENT AREA & RUNOFF**
 6. Catchment Area
 - (a) in hilly parts
 - (b) in plains.
 7. Rainfall during the year and maximum recorded intensity
 8. Nature of catchment
 9. Any artificial or natural storage present in catchment
- C. NATURE OF STREAM**
 10. Is the stream
 - (a) Alluvial with erodable banks.
 - (b) Quasi-alluvial with fixed bed but erodable banks
 - (c) Rigid with inerodable bed & banks
 11. Is the stream
 - (a) Perennial
 - (b) Seasonal
 - (c) Navigable
 12. (a) L. W.L./average bed level
 - (b) Surface velocity at L. W. L.
 - (c) Water surface slope at L. W. L.
 - (d) Bed slope at L. W. L.
 13. (a) High Flood Level
 - (i) at site
 - (ii) at 300 m U/S Cross-section.
 - (iii) at 300 m D/S cross-section
 - (b) Surface velocity at H. F. L.
 - (c) Water surface slope at H. F. L.
 - (d) Area of X-section at H. F. L.
 - (i) at site
 - (ii) at up-stream cross-section
 - (iii) at D/S cross-section
 - (e) Discharge at H. F. L.
 14. R. L. & location of maximum scour recorded below H. F. L.
 15. R. L. of maximum anticipated scour below H. F. L.
 16. Location and plan of borings taken in the bed of the river & at other locations
 17. Test results of the samples of bores giving the following soil characteristics
 - (a) Lacey's Silt Factor
 - (b) Angle of internal friction (ϕ)
 - (c) Cohesion (C)
 - (d) Angle of wall friction (S)
 - (e) Safe bearing capacity of soil at foundation level
 18. Does the stream carry drifting matter in floods;
 19. Details of training works, if needed
- D. ALIGNMENT AND APPROACHES**
 20. Whether the bridge proposed is right or skew? If skew, give the angle of skew.
 21. Will the approaches be straight? If not, give radii of curves.
 22. Proposed gradient on approaches
- E. SUPERSTRUCTURE**
 23. Proposed clear roadway over the bridge
 24. Width of Footpaths, if any
 25. Formation level
 26. No. and size of spans recommended
- F. FOUNDATIONS**
 27. Foundations recommended.
 - (a) Open
 - (b) Well
 - (c) Piles
- G. EXISTING STRUCTURES**
 28. Details of each of the existing bridges on the same channel in the vicinity (within 5 Kms.)
 - (a) Size & No. of spans
 - (b) Type of structure
 - (c) Depth & Foundations

- (d) Whether the existing structures are trouble free
- (e) Any other information

H. MISCELLANEOUS

- 29. Name of town nearest to bridge site
- 30. Nearest Railway Station and its distance from bridge site
- 31. Cost at site of the materials required for construction
- 32. Have the following plans been enclosed duly completed
 - (a) Key Map—Scales 1 cm=50 Km.
 - (b) Index Plan
 - (c) Contour survey Plan
 - (d) Site Plan
 - (e) Longitudinal and three cross sections of the river
 - (f) Trial boring charts
 - (g) Drawing of the bridge showing general arrangement, details of foundations, sub-structure and superstructure
 - (h) Elevation, section and plans of existing bridges including foundations details

NOTE—The sizes of the drawing sheets (outside dimensions) may be any one of the following but all drawings sheets for one project should be of the same size.

- (i) 1000 mm × 700 mm
- (ii) 700 mm × 500 mm
- (iii) 500 mm × 350 mm

ANNEXURE III

SCALES RECOMMENDED TO BE ADOPTED IN THE PREPARATION OF DRAWINGS FOR BRIDGE WORKS

1. (a) Key Plan	1/5000000
(b) Index Plan	1/50000
2. Contour Survey Plan	
(a) For catchment Area less than 15 sq. Km.	1/1000
(b) For catchment Area of 15 sq. Km. or more	1/5000
3. Site Plan.	1/2500
4. Cross-section of the river	
(a) Horizontal	1/1000
(b) Vertical	1/100
5. Longitudinal section of the river	
(a) Horizontal	1/2500
(b) Vertical	1/100
6. General Arrangement Drawings	
(a) Elevation—To suit the size of the drawing sheet	
(b) Plan	1/200
(c) Section	1/100
7. Details of foundations	
(a) Curb	1/10
(b) Steining	1/50
8. Details of substructure	1/50
9. Details of Bearings	
10. Details of Superstructure	1/5
(a) Deck Slab	1/20
(b) Beams longitudinal section	1/20
(c) Beams Cross-section	1/10

1100.4.

121.2,301

No. NHII/Misc./12/75

Dated the 2nd July, 1975

To

All Chief Engineers/Addl. Chief Engineers, of States PWDs and Union Territories dealing with National Highways

Subject : Level surveying for National Highway Road and Bridge projects-Reference to G.T.S. Bench Marks

You will kindly recall that in this Ministry's letter No. PL-2 (1)/70, dated the 18th January, 1971 regarding standardisation of the procedure and data for preparation of Bridge projects relating to National Highways and other Centrally aided schemes, the guide lines for preparation and presentation of bridge projects were

also given therein. The bench Marks preferably correlated to G.T.S. Bench Marks were requested to be adopted for carrying out the surveys.

2. It has been observed that there is general lack of appreciation on the part of the field officers in charge of surveys and investigations of the projects regarding accuracy of levelling and fixing of appropriate Bench Marks. In many cases the Bench Marks to which the level for the projects are related, are fixed temporarily and in an arbitrary manner without relating their levels to some standard and stable Bench Marks. During course of execution of works quite often the temporary Bench Marks established for the purpose of surveying are not traceable and, therefore, the levels could not be correlated. Even in case of different projects in the near vicinity different temporary Bench Marks are adopted. This has, in general, resulted in serious complications during construction, delay in completion of work, possibly excess over the sanctioned estimate and even calling for fresh survey. In few cases the Bench Marks used for road and bridge works forming part of the same project located very near to each other have been found to be different making it difficult to correlate the levels of the integral part of the project in respect of the very vital data like Highest Flood Level, Lower Water Level, the bed levels and the natural surface levels etc.

3. It is, therefore, requested that the instructions may please be issued to your staff engaged on surveying and investigation of National Highway works that in all surveys permanent Bench Marks should be established and their levels fixed with reference to the nearest G.T.S. Bench Mark and in a very accurate manner by carrying out the circuit levelling and double levelling. The position of the reference Bench Marks used for survey of the project as well as that of nearest G.T.S. Bench Mark from where the levels have been carried over and also other necessary details needed for locating them during the course of construction must be clearly indicated in the survey plans. These Bench Marks should be preferably fixed and their levels checked by a responsible officer not below the rank of Assistant Engineer to ensure accuracy of framing and execution of the projects in order to avoid complications.

1100.7.

No. NHIII/P/75/76

Dated the 9th December, 1976

To

The All State Chief Engineers/Addl. Chief Engineers of State PWDs and Union Territories, (dealing with National Highways)

Subject : Construction of new bridges on national highways at the sites of existing bridges-Guidelines to be followed in case of

Some instances have recently come to the notice of this Ministry where delay in completion of new bridges taken up for construction at the site of existing bridges has led to washing away of the bed level diversions and consequent disruption of traffic on the national highway. The matter has been considered in all its aspects and it has been decided that the following policy guidelines shall be followed in all such cases in future :

(i) Type of bridges to be considered for construction at the sites of existing bridges :

Only those bridges which can be conveniently completed within one working seasons should be considered for construction at the sites of existing bridges. Although it is difficult to lay down any hard and fast rule in this regard, generally only medium or minor bridges should be considered for construction at the same sites as those of existing bridges. In case of major bridges which require two or more working seasons for completion, the site of the new bridge should invariably be selected away from the existing bridge though some changes in the alignment and construction of new approach roads are involved. In such cases, the existing bridge can be used to carry the traffic during the time of construction of the new bridge, as construction of an all-weather diversion capable of functioning for two or more years would prove to be very costly and uneconomical.

(ii) Diversions :

The diversions shall be constructed along the bed of the river and shall be of sufficient width and specifications to carry the volume of traffic passing on the concerned national highway. Hume pipes should be provided on the liberal side, the number being sufficient to carry not only the normal dry weather flow but also any minor floods that may be expected during the working season.

(iii) Dismantling :

The dismantling of the existing bridge should be carefully planned and carried out so that it is completed within the shortest possible time. The actual method of dismantling employed will depend largely on the type and material of the existing bridge. However, blasting can be conveniently employed after taking the usual precautions.

(iv) Preliminary preparations :

All the designs and working drawings of the new bridge shall be got approved and kept ready before the start of the working season. It would be preferable to collect in advance all the materials required for completion of the bridge so that shortage of materials will not affect the progress of the work. The tenders for the work, clearly stating that the time of completion will be strictly limited to one working season, should be called during the slack season so that they can be decided early. The agency for the work should be fixed and informed well in advance so that their initial mobilisation can be completed before the start of the working season.

(v) Sequence of operations :

The construction of the bed level diversion should be taken up first as soon as the water level in the river has gone down sufficiently to permit the work being started. Thereafter when the traffic has started using the diversion, the dismantling of the existing bridge should be taken up. The construction of the new bridge should be so programmed that it can be completed in all respects at least 15 days before the normal on-set of floods in the river. It is desirable that a CPM chart should be drawn up for the construction so that snags and bottlenecks can be identified well in time and corrective action taken during the course of construction. It should be ensured at all times that sufficient labour force, machinery and equipments are available at the site to carry out the work continuously without any slackening in the pace of progress. If considered necessary, night shifts should also be arranged so that the target date of completion can be adhered to. After the new bridge has been completed, the bed level diversion should be fully dismantled and the hump pipes removed before the floods so that there is no undue obstruction to the normal flow of the river.

(vi) Type of decks to be adopted :

It would be desirable to adopt RCC superstructure of standard spans for which approved standard drawings of this Ministry are already available. However, where the volume of work is larger, adoption of a deck consisting of a number of prestressed concrete girders can also be considered. In such cases, it can be examined whether the prestressed concrete girders can be cast and stored during the rainy season itself so as to gain time. If necessary, widening of the approach embankments on either side of the existing bridge to serve as temporary casting yards can also be considered.

The prime requisite is to ensure that the traffic on the national highway is not disrupted under any circumstances. It is requested that the above guidelines may please be meticulously followed in all cases where it is proposed to construct new bridges at the sites of existing bridges. With proper planning, management and co-ordination, it should be possible to complete such works well before the advent of the first floods in the rivers and thus avoid any threat of disruption of traffic on the National Highways.

1100.8.
121.2

No.PL-67 (35)/76

Dated the 14th January, 1977

To

All the Chief Engineers of States/Union Territories (connected with roads)

Subject: Construction of bridges across irrigation canals and distributories on National Highways and other centrally financed roads

It has been observed that the execution of several bridges across irrigation canals and distributories gets delayed due to the restrictions in working periods because of the perennial flowing nature of such canals. In the case of some such bridges, the Irrigation Authorities have had to be specially approached for getting closure in the canals for the execution of bridges. Such special closures affect the normal irrigation activities and therefore are not only not easily possible but also are not desirable in the overall national interest.

2. In order to obviate such difficulties in future and to ensure completion of such bridges as per the pre-determined schedule, the following guidelines may henceforth be followed in their planning and execution.

- (i) In case of all bridges proposed for construction across irrigation channels, the assured closure periods and the periods during which these channels are expected to run at low supply levels should be determined and got authenticated by the Irrigation Authorities so as to determine the type of structure most suitable from this consideration. The report prefacing the estimate for such works should contain unambiguous information on this aspect.
- (ii) In cases where adequate and assured closure periods are not expected to be available, foundations requiring open excavation in the canal portions should be avoided even though that may be the most suitable type from other technical considerations viz., scour depth and safe bearing capacity of subsoil. In such cases, either pile foundation or shallow/deep well foundations depending on the suitability of the subsoil strata should be adopted. Since such contingencies of non-availability of adequate closure periods would normally arise in the cases of major canals only, it should generally be possible in such situations to construct well foundations by constructing temporary islands without creating appreciable constriction of waterway of the canals.
- (iii) The selection of the type of substructure should also be made to suit the expected, assured closure periods and the normal supply level of the canals. In case, adequate canal closures for executing conventional type of substructure are not expected to be available, the foundation wells themselves may be continued upto the normal supply level.
- (iv) The number of spans should be minimum consistent with economy so as to have minimum possible number of foundations located in the canal bed. In case of smaller canals, it may even be preferable to provide a single span so as to altogether avoid the problems, associated with the construction of foundations and piers in the canal bed.
- (v) As the centering for superstructure would have to be supported on piles driven in running water, the type of superstructure should be selected from considerations of availability of centring and shuttering equipment. In some cases, it may be preferable to adopt superstructures which can be laid without any centering or alternatively suspended centering should be used.

NO. NHIV-50 (20)/77

Dated the 27th September 1977

To

The Chief Engineers/Addl. Chief Engineers of the State P.W.D's and Union Territories
(dealing with National Highways)

Subject: Fixation of the deck level of High Level bridges and culverts across cross—drainage for National Highways

The deck levels of high level bridges and culverts are generally fixed after allowing for the necessary vertical clearances in accordance with the provisions contained in Clause 106 of I.R.C. Bridge Code Section I. This, in some cases, may result in the deck levels as worked out being lower than the finished road formation level of the approaches, arrived at after allowing for the necessary vertical clearance of 1 metre for the subgrade level above the designed H.F.L., in accordance with para 2 of this Ministry's circular letter No. PL-67 (12)/76 dated 10th Sept. 1976 (copy enclosed for ready reference).

2. In order to ensure that such abrupt changes in longitudinal profile of the road are avoided, it has now been decided that in all such cases, the bridge or culvert deck levels shall be raised to be in line with the finished adjoining road formation levels, and in no case should the clearance above the affluxed H.F.L. to the top of finished deck level be less than 1.75 metres. This is also subject to the minimum free board requirement above the affluxed HFL to the bottom of deck as specified in Clause 106 of Section I of IRC Bridge Code being duly satisfied.

3. These instructions shall be kept in view while preparing proposal for new bridges and culverts and wherever possible may be incorporated in all other cases which have yet not been put to tender.

4. These instructions shall, however, not apply to cases where the finished road formation level has been kept higher from other considerations e.g. bridges on valley curves/bridges, over-bridges and under-passes, etc.

No. PL-67 (12)/76

Dated the 10th September, 1976

To

The Chief Engineers/Addl. Chief Engineers of State PWDs and Union Territories (dealing with National Highways)

Subject: Fixation of grade-line for new roads/sections of existing roads proposed to be raised

An important consideration in the design of new roads, or the raising of existing sections due to submergence, is the fixation of grade-line with reference to HFL or the water table. Present instructions of the Ministry contained in circular letter No. NHI-36 (2)/70 dated the 2nd April, 1970, are that the subgrade should be kept at least 2 ft. above the HFL and in the case of water-logged conditions, due consideration should be given to the raising of formation to a suitable level above the subsoil water level as well or adoption of other recommended measures against water-logging.

2. Since, National Highways occupy a key position in the country's road network, and it is desirable to keep these open to traffic with least disruption, in modification of the earlier instructions it has now been decided that the subgrade level on new roads or sections proposed to be raised should be kept at least one metre above the HFL. Where waterlogging conditions apply, after careful examination of the involved factors, the embankment should be raised to a suitable level above the water table as well, and other measures such as deep drains/capillary cutoffs adopted on the lines of IRC:34-1970 "Recommendations for Road Construction in Waterlogged Areas" so that the subgrade is not saturated due to capillary action.

3. In fixing the design HFL, care should be given to the possible rise in water level due to such factors such the embankment of the road itself, construction of the Waterway at bridges, and gradual accretion of water level because of siltation of the drainage courses. Where submersible section of an existing road is to be raised, additional cross-drainage facilities should be provided, as required, so that cross flow of flood waters is ensured that without any heading up.

4. In general, when raising proposals are formulated, effect on adjoining section of the highway should also be simultaneously considered. It will be advisable to frame an integrated plan for a stretch of reasonable length than designing piecemeal proposals for short sections.

No. NHIII/P/30/77

Dated the 25th February 1978

To

All State Chief Engineers (dealing with National Highways)

Sub : Requirement for integrated project planning for construction of bridges on adjacent streams with over-lapping catchments and approaches to the same

Various circulars have been issued by the Ministry from time to time and some guidelines have also been given in the IRC codes about the preparation of project estimates for NH road and bridge works. In this Ministry's circular No. NH III/P-30/77 dated 19th Oct. 1977, the need for simultaneous submission of estimates for bridges and approaches to the same was also emphasised. The idea underlying this circular was to ensure that both the bridges and approaches could be commenced and completed simultaneously and thrown open to traffic, to avoid a situation of the bridges being completed without approaches or *vice versa*. Besides this essential requirement, the preparation of a combined project will also help avoiding discrepancies in design data such as HFL's, freeboard/clearances above HFL's, Bench marks, etc., which are likely to crop up if the projects for the bridge and approaches are prepared separately and at different times, and may go unnoticed during their preparation or even during further checks exercised at different levels by two independent organisations exclusively dealing either with bridges or roads, for want of proper coordination. In a particular instance that has recently come to the notice of the Ministry, there are two rivers in close proximity with overlapping catchments separated by a flood bank, and two bridges have been constructed across the same, adopting two different HFL's differing by about 2 metres. The approaches to these bridges were, however, based on HFL's with a difference of only 0.2 m and the reference bench marks were also different. After a few years of their construction, during one flood season, the flood bank developed some breaches in the upper reaches, the flood waters in the two catchments got merged, and caused heavy damages to the approaches due to overflows, and one or two minor bridges provided in the approaches were also severely damaged. Although the damages could be attributed to the unexpected breaching of the flood bank, the damage could perhaps have been minimised, had the bridges and approaches been designed for the correct HFL's without any discrepancies, and if proper enquiries had been made about the stability and dependability of the existing flood bank. In the absence of co-ordinated effort, estimates sanctioned on the basis of faulty data may lead to unsatisfactory performance of the road alignment as well as cross drainage structures. With a view to avoiding such situations in future, it is suggested that in case of bridges and approaches thereto across rivers or streams not having well defined and independent catchments which may get overlapped, the following additional data/information should be furnished along with the project estimates :—

- (1) If the 2 (or more) streams branch off a single river in the upper reaches, the total discharge in the parent river, the discharges to be apportioned between the different branches, their HFL's at the proposed bridge sites etc. should all be ascertained from the irrigation or the flood protection authorities in that area.
- (2) The vulnerability or the stability of the existing flood banks (dividing the catchments) based on their past performance to be ascertained from the irrigation authorities, and duly taken into account, for deciding upon suitable free board for the approaches, clearance under the bridge deck, depth of foundations for the bridge etc., so that in the event of occurrence of discharges of HFL's higher than the designed figures, the bridge and the approaches could remain in tact, with minimum damage, if any.
- (3) Irrigation and other multipurpose river projects undertaken in the area, their operational modes and their controlling abilities on the discharges of the river, as well as their influence on the scour or silting up of bed in the different branches.
- (4) Irrigation/Flood Control projects undertaken/proposed to be undertaken by the concerned authorities on some other river system in this area which may have repercussions on the flow as well as the levels in the streams proposed to be bridged.
- (5) The road net work in the area, the existing major and minor openings through them, the flow pattern, the submergence records etc., of the same and hydraulic details of existing bridges for a considerable length u/s and d/s of the proposed bridge sites.
- (6) Any Railway bridges in the area if located close by within the influence zone of the streams proposed to be bridged, the existing waterways through them, the HFL etc recorded on the concerned structures, and other hydraulic particulars.
- (7) Probability of occurrence of parallel flow along approaches, and if so, suitable remedial measures;
- (8) Nature of fill materials and their availability for the purpose of construction of approaches. (No borrowing of earth in Khadir portion of rivers should be proposed);
- (9) The need for any training works in the form of guide bunds or groynes, and the desirability or otherwise of providing cross-drainage openings in the approaches to be substantiated if necessary, by model tests conducted in river research institutes.
- (10) Necessity of protective measures, if any, along the approaches including the immediate approaches of the culverts proposed

in the approach alignment;

- (11) Other miscellaneous factors like inter section with local traffic, social and economic considerations, etc.,

Various alternatives may be outlined for bridge crossings and approaches thereto in such cases, keeping an eye on economy as well and the project reports for the various components of the scheme should be furnished in an integrated manner so as to arrive at a comprehensive solution. These project reports should also be in conformity with the guidelines/circulars/codal requirements and should inter-alia cover the points mentioned above. This may please be noted for future guidance.

1100.12.

121.2

No. NHIII/P/31/77

Dated the 31st May, 1978

To

All the Chief Engineers/Addl. Chief Engineers of States/U.Ts. dealing with Roads

Subject : Need for proper and thorough survey, investigation and preparation of bridge projects

The importance of proper and thorough survey, site investigation, surface and sub-surface explorations, collection of hydraulic data and other inputs leading to the preparation of economical and well planned bridge projects have time and again been impressed upon the State Chief Engineers through numerous circular letters in the past.

2. In order to facilitate the field engineers in preparing and presenting, adequately investigated road and bridge projects, this Office has prepared a consolidated list of IRC Codes/Special Publications/Ministry's Circulars and Guidelines issued so far on bridge project preparation etc. and the same is enclosed. It is suggested that the preparation of Central and Centrally sponsored bridge projects be suitably based on these Codes/Circulars/Guidelines. The consolidated list of references may be brought to the notice of all the engineers in your Department engaged in the work of survey, investigation and preparation of bridge projects.

GROUP I

SURVEY AND INVESTIGATIONS

1. I.R.C. Bridge Code Section I, I.R.C. 5—General Features of Design.
2. Ministry of Shipping & Transport (Roads Wing) Circular letters :
 - i) NHV-11 (6)/73 dated 19.11.74—Ensuring Safety of bridge structures—Guidelines for Engineers
 - ii) NHIII/P/15/78 dated 26.4.1978—Guidelines for subsurface Investigations for Bridge Foundations
 - iii) NHII/Misc/12/75 dated 2.7.1975—Level Surveying for National Highway Road and Bridge Projects—Reference to G.T.S. Bench Marks
 - iv) NHI-40 (3)/71 dated 29.1.71—Siting of bridges and fixation of alignment of approaches thereto on National Highways and other Centrally financed road projects
3. I.R.C. Special Publication 9. "Report on rating of bridges"

GROUP II

PROJECT PREPARATION

1. Ministry of Shipping & Transport (Roads Wing) Circular letters—
 - i) No. PL-2 (1)/70 dt. 18.1.1971, "Standardisation of the Procedure and data for preparation of Bridge Projects relating to National Highways and other Centrally aided schemes"
 - ii) No. NHIII/P/30/77 dated 19.10.1977, "Need for coordination between the construction of bridge and their approaches for the completion of both the components simultaneously"
 - iii) NHIII/Misc/51/73 dated 19.10.1973, "Proper location of culverts and bridges, and selection of appropriate design of parapet/ hand rails for these, so that the structures fit in well with the roadside"
 - iv) No. 8/GR/128-W-NHVI dated 8.10.1975 "Construction of guidebunds for training of rivers—Provision of extra height as compensation for anticipated settlement of embankment of guidebunds"
 - v) NHIII/P/75/76 dt. 9.12.1976, "Construction of new bridges on national highways at the sites of existing bridges—Guidelines to be followed in case of"
 - vi) NHIII/P/1/75 dated 24.11.75, "Electrification of bridges on National Highways"
 - vii) PL-67 (35)/76 dated 14.1.1977, "Construction of bridges across irrigation canals and distributories on National Highways and other centrally financed roads"
 - viii) PL-67 (4)/76 dated 21.3.1977, "Criteria for fixing the top level of Guide Bunds, Approaches behind Guide Bunds in the Khadir width Plain of river which are constructed by road embankments"
 - ix) NHIV-50 (20)/77 dated 27.9.1977, "Fixation of the deck level of high level bridges and culverts across cross drainage for National Highways"
 - x) NHIII/P/30/77 dated 25.2.1978, "Requirement for integrated project planning for construction of bridges on adjacent streams with overlapping catchment and approaches to the same" portion of rivers should be proposed);

- xi) PL-30 (20)/77 dated 21.2.1978, "Gradients for approaches to Railway Over bridges on National Highways"
- xii) NHI-37 (2)/70 dated 2.4.1970, "Plan for the Development of National Highways during 1970-71"
- xiii) LR-16 (150)/66 dated 21.12.1971, "Provision of wearing coat on bridges and culverts being constructed on National Highways and other Centrally financed roads"
- xiv) RM-16 (1)/71 dated 23.10.1974, "Report of the Committee on Economy in consumption of steel."

GROUP III

GENERAL GUIDELINES ON DESIGN OF HIGHWAY BRIDGES

1. I.R.C. Bridge Codes
 - i) Section I—General Features of Design
 - ii) Section II—Loads and Stresses
 - iii) Section III—Cement Concrete (Plain and Reinforced)
 - iv) Section IV—Brick, Stone and Block Masonary
 - v) Section V—Steel Road Bridges
 - vi) Section VI—Composite Construction for Road Culverts and Medium Span Bridges
2. IRC : 18—Design Criteria for Prestressed Concrete Road Bridges (Post-tensioned Concrete)
3. IRC : 45—Recommendations for estimating the Resistance of soil below the maximum scour level in the design of well foundation for bridges
4. IRC Special Publication 13 : "Guidelines for the design of small bridges and culverts."
5. IRC Special Publication 9 : Report on rating of Bridges"
6. Ministry of Shipping & Transport (Roads Wing) : "Specification for Road and Bridge Works"
7. Ministry of Shipping & Transport (Roads Wing) Circulars—
 - i) NHIH/P/75/76 dated 9.12.1976—"Guidelines for construction of bridges in place of existing bridges"
 - ii) PL-86 (4)/74 dated 8.2.1976, "Maximum allowable diameter of High Yield strength deformed bars"
 - iii) PL-87 (16)/75 dated 26.3.1975, "Design Procedure for shear in Prestressed concrete Beams of Road Bridges for all bridge works on National Highways and other Centrally Aided schemes—Provisional modifications to clause 141 of IRC : 18—1965 (Design Criteria for Prestressed concrete Road Bridges)—Reg. also corrigendum on above vide letter of even number dated 2.7.1975.
 - iv) SP-67 (6)/61 dated 7.5.64, Notice inviting tenders for construction of bridges financed in full or in part from the Central Funds—Wells founded on Rock
 - v) Transport—Communication Monthly Review Sept. 1952 Note issued by M.O.T. "Bridges in Spill Zones of Big streams or rivers"
 - vi) PL-67 (17)/68-SP dated 7.6.1968, "Loading conditions of bridges with T-Head or Hammer head piers during erection"
 - vii) SP-67 (1)/65 dated 28.7.1956, "Designing of footways on road bridges for a 4-Ton wheel—Uniform procedure for
8. Ministry of Shipping & Transport (Roads Wing) : Standard Designs—
 - i) Standard Plans for Highway Bridges. Vol. I comprising (Note for mild steel reinforcement)
 - (A) R.C.C. simply supported slab bridges
 - a) without foot paths—spans 3, 4, 5, 6 & 8 m.
 - b) with foot paths—spans 4, 6 & 8 m
 - (B) R.C.C. simply supported skew slab bridge without for paths—skew angle 15° to 60° spans 5, 6 & 8 m
 - (C) R.C.C. T-Beam Bridges-with and also without foot paths spans 10, 12, 15, 20 and 25 m
 - (D) Composite construction Bridge-without foot paths-span 12 mm
 - (E) R.C.C. Box cell Bridges without foot paths cells of 3 m clear span-height 1.5, 2 & 2.5 m
 - (F) R.C.C. Railings for Bridges with and also without foot paths-Types I, II & III
 - (G) Wearing coat, expansion joints and Drainage spouts
 - ii) Standard Plans for Highway Bridges-Vol. II comprising (Note: for High yield strength deformed bars)
 - (A) R.C.C. slab type right bridges with and without foot paths-spans 3.37 to 10.37 m with 1 m interval
 - (B) R.C.C. piers for bridges in (A) above
 - (C) R.C.C. slab type skew bridges-skew angle 15°-60°
 - (a) with foot path-spans 4.37 to 8.37 m
 - (b) without footpath-spans 5.37 to 8.37 m
 - iii) Standard drawings for R.C.C. T-Beam superstructure using high yield strength deformed bars.
 - (a) without footpaths-spans-10.5 to 21.75 m
 - (b) with footpaths-spans-10.5 to 16.5 m

1100.14.
121.2

No. NHI/Misc/84/78

Dated the 1st March, 1979

To

The Chief Engineers of all the States and U.Ts : (dealing with N.H.) and other centrally sponsored works

Sub : Construction of bridge projects on National Highways-Co-ordination with other departments-regarding

A case has come to our notice where a bridge project taken up by the Road authority in the normal course

had to be abandoned half way through resulting in infructuous expenditure because in the meanwhile, the Irrigation Department of State took up the construction of a dam down stream of it and the reservoir of the dam would submerge the bridge and approaches. This lack of co-ordination between the two departments of the State has been adversely commented by the Comptroller & Auditor General.

In order to avoid any such situation in future, proper co-ordination must be established between the State P.W.D. and other executive Departments like the Irrigation Department even at the planning stage of the project. As far as National Highway and other Centrally sponsored works are concerned, it is suggested that whenever any proposals are made for the construction of new bridges, a certificate should be given that the State Irrigation and other Departments have been consulted and the bridge project in question will not be affected by any future development plans that those Department may have in that area and that the proposed bridge would not be rendered infructuous by the construction of any structure being planned by the Irrigation or other Department.

The contents of this letter may please be brought to the notice of concerned in your State including Irrigation department for their guidance.

1100.15.
121.2

No. NHVI/Misc/25/79

Dated the 11th July, 1979

To

All the Chief Engineers of the States/UTs (dealing with N. Hs and other Centrally sponsored works)

Subject: NHs and other Centrally Sponsored Works—Irrigation Dams-Road and Bridges affected

Kindly refer to this Ministry's circular letter No. NHI/MSC/84/78, dated the 1st March, 1979 (copy enclosed) in which the necessity of establishing proper co-ordination between the State P.W.Ds and other Departments like the Irrigation Department etc. even at the planning stage of project was stressed.

2. There is imperative need for timely expeditious coordinated pursuit of requirements to re-locate or raise any N.H. sections (road and bridges) where occasioned by the back-water of any new dam/irrigation reservoirs, planned to be put up by the Irrigation authorities. It has been the experience of this Ministry for the last two Plan periods that activity of the State P.W.D. in regard to such N.H. requirement has seriously lagged behind pursuit of the irrigation projects by the Irrigation authorities with the result that much valuable time is lost which leads to the State P.W.D. authorities incharge of N.H. system racing with time in the latter phase of the irrigation project execution periods.

3.1. At the start of every Five Year Plan, the State authorities incharge of the N.H. system should have a meeting with the State authorities incharge of the irrigation to know about all the programmes of dam construction and the requirements for raising/relocation of the N.H. system and then to chalk out a co-ordinated programme with the construction of the dam by the I.B. for the modification of the N.H. system where needed in consequence of the coming up of the dam.

3.2. For all such requirements of road relocation/raising, the State authorities incharge of the N.H. system should carry out preliminary recce survey and then immediately associate the Officers of this Ministry from the Regional Office and Hqrs for a joint recce survey, thereafter through joint discussion of higher officers and if necessary associating C.W.C. officers preliminaries should be got finalised upon which detailed survey and designs etc. of the proposed diversion/reconstruction processed by the State authorities incharge of the N.H. system in consultation with the State authorities incharge of the irrigation.

3.3. The cost apportionment between the Road authority and Irrigation authority should also be worked out by the State P.W.D. The Roads Wing may be consulted wherever necessary.

4. The intention of this circular is to emphasize that these important project requirements should speedily move through joint coordinated pursuit and efforts rather than being left to mere exchange of correspondence to arrive at decisions and it is imperative that delays have to be cut out.

1100.16.
121.2

No. NHIII/P/13/80

Dated the 6th October, 1980

To

All Chief Engineers/Addl. Chief Engineers of State PWDs and Union Territories dealing with Roads

Subject : Improvement/reconstruction of weak and narrow bridges-Data to be furnished along with detailed proposals

It has been observed that the proposals for improvement/reconstruction of weak and narrow bridges are not accompanied by suitable detailed inspection reports on the bridges giving their condition as also calculations supporting the rating of bridges. The information often included is based on the survey data collected as per Ministry's letter No. NHIII/Misc./129/77 dated the 3rd December, 1977, which is basically meant for overall planning purposes to facilitate decisions about *interse* priorities and not complete enough for furnishing detailed proposals.

2. It is, therefore, requested that in future all proposals relating to improvements/reconstruction of weak and narrow bridges should be accompanied with the rating of bridges based on detailed provisions contained in IRC Special Publication No. 9 "Report on Rating of Bridges" for proper appreciation. Further, the inspection shall be done for collection of data which should be furnished in accordance with the provisions contained in Chapter R-3 of the aforesaid publication.

1100.17.

No. NHIII/Misc./137/78

Dated the 12th November, 1980

To

- (1) ADG (B)
- (2) All Chief Engineers/Superintending Engineers/Executive Engineers/Asstt. Executive Engineers and Assistant Engineers in the Bridge Directorate.

Subject : Norms for working out the requirements of Materials in respect of Bridge works

Enclosed herewith the copy of norms for steel and cement on the above subject. All CEs/SEs/EEs/AEEs and the AEs in the Bridge Directorate are requested to see for information and necessary action.

Enclosure to circular No. NHIII/Misc/137/78

Date the 12.11.80

NORMS FOR WORKING OUT THE REQUIREMENTS OF MATERIALS IN RESPECT OF BRIDGE WORK

1. MILD STEEL REINFORCMENT	QUANTITY/RFT. OF BRIDGE IN TONNES
(i) For Major Bridges more than 500 ft. in length (Superstructure in PSC)	0.15
(ii) For Major Bridges less than 500 ft. in length	0.30
(iii) For Minor bridges and culverts	0.25
2. M.S. DEFORMED BARS	
(i) For Major Bridges more than 500 ft. in length (Superstructure in P.S.C.)	0.05
(ii) For Major Bridges less than 500 ft. in length	0.10
(iii) For Minor Bridges and culverts	Nil
3. H.T. STEEL	
(i) For Major Bridges more than 500 ft. in length	0.08
(ii) For Major Bridges less than 500 ft. in length	Nil
(iii) For Minor bridges and culverts	Nil
4. STRUCTURAL STEEL	
(i) For Major Bridges more than 500 ft. in length	0.05
(ii) For Major Bridges less than 500 ft. in length	0.05
(iii) For Minor Bridges	0.02
(iv) Culverts.	Nil
5. G.I. SHEETS	
(i) For Major Bridges more than 500 ft. in length.	0.06
(ii) For Major Bridges less than 500 ft. in length.	0.04
(iii) For Minor bridges.	0.03

6. CEMENT	
(i) For Major bridges	2.00
(ii) For Minor bridges	2.00
(iii) For culverts (Average length of culvert : 5 ft.)	2.50
7. COARSE AGGREGATE	
(i) For major bridges more than 500 ft. in length.	150 cft.
(ii) For major bridges less than 500 ft. in length.	175 "
(iii) For minor bridges.	150 "
(iv) For culverts.	500 "

1100.20.
121.2

No. NHIII/P/31/77

Dated the 10th January 1985

To

The Secretary, Public Works Department and Chief Engineers of State PWDs & Union Territories dealing with National Highways & other Centrally Financed Roads, D.G. Works, CPWD, and D.G.B.R.

Subject : Bridge works costing more than Rs 10 lakhs each on National Highways and under other Centrally Financed Schemes—modified procedure for submission of detailed estimates of cost thereof

With a view to improving the quality of preparation of bridge projects, detailed guidelines have been issued by the Ministry from time to time. In this connection, the following important Circular letters may kindly be referred to :—

- (i) PL-10 (48)/69 dated 15.9.69
- (ii) PL-2 (1)/70 dated 18.1.71
- (iii) NHIII/P/31/77 dated 31.5.78

It may kindly be noted that complete and adequate surveys and sub-soil investigations are the most important pre-requisites for the proper preparation of a bridge project.

2. A number of instances have come to the notice of the Ministry where detailed estimates for bridge projects have been furnished without ensuring the supply of all the requisite technical inputs as outlined in the above mentioned guidelines. This has resulted in avoidable back references to the concerned PWDs and has thus led to a great deal of delay in the sanction of the projects.

3. In order to ensure that the quality of project preparation improves and the time taken for the scrutiny of detailed estimates relating to bridges in the Roads Wing is substantially reduced, it has been decided to adopt the modified procedure as outlined hereunder for the submission of detailed estimates for bridge works costing more than Rs 10 lakhs each.

- (a) In the first instance, the State PWD will furnish a Technical Appraisal Note indicating the proposal in brief, various alternatives considered to arrive at the most suitable one from the view point of economy and technical feasibility, important technical parameters etc. and concrete recommendations of the State Chief Engineer. A suggested format for the Technical Appraisal Note is enclosed here with. This may be suitably modified/elaborated depending upon the type of project.
- (b) The above mentioned Technical Appraisal Note will be examined in the Ministry and approval for all the relevant technical parameters will be conveyed to the State PWD to enable them to prepare the detailed cost estimate on the basis of the latest Schedule of Rates.
- (c) The detailed project estimate prepared on the basis of the approved technical parameters will then be furnished to the Ministry for getting the financial sanction.

3. It is hoped that the modified procedure outlined above will help in the adoption of technically sound and economically viable alternatives and also cut down delays in the sanction of detailed cost estimates. Incidentally, it will also help the officers of the Roads Wing to make adequate provisions in the Budget Estimates for new works likely to be sanctioned.

5. It is requested that suitable instructions may kindly be issued to all concerned to follow the modified procedure mentioned in para 3 above for the submission of detailed estimates relating to bridge works costing more than Rs 10 lakhs each.

Enclosure to letter No. NHIII/P/31/77 dated 10.1.85

Technical Appraisal Note relating to bridge works costing more than Rs 10 lakhs each on National Highways and under other Centrally Financed Schemes

1. Name of the Project.
2. Proposal in brief indicating the existing position and the improvement desired such as construction of a new bridge, reconstruction of an existing weak and narrow bridge, widening of an existing bridge, construction of protective works etc.
3. Site Plan (if the type of crossing is not a right angled one, the angle of skew crossing must be indicated on the drawing). Before finalising the site, if more than one site has been considered, merits and demerits of various alternatives may be indicated.
4. Position of land acquisition, if required, for the construction of the bridge and its approaches.
5. Detailed Hydraulic particulars as stipulated in Annexures I & II of the Ministry's Circular letter No. PL-2 (1)/70 dated 18.1.71. In addition to other items, these must include the following :—
 - (a) Three cross sections of the river/stream, one at the proposed site and other two at 300 m. u/s and 300 m. d/s.
 - (b) A longitudinal section of the river/stream (for determining the bed slope) indicating the H.F.L. also.
 - (c) Calculations regarding discharge worked out by different methods (viz. empirical formula and area velocity method etc.) and concrete recommendations regarding design discharge.
 - (d) Calculations accompanied by definite recommendations regarding proposed waterway alongwith the span arrangements, type and depth of foundations keeping in view the design discharge and the expected scour.
 - (e) Proposed deck level of the bridge taking into account the vertical clearance required for the design discharge and the type of proposed superstructure.
 - (f) Values of soil parameters (silt factor, C, and safe bearing capacity of soil at the proposed foundation level) based on subsoil investigations.
6. Detailed plan showing alignment of approach roads.
7. Broad features of the proposed protective works, if any, alongwith plan and cross-sections.
8. Whether any model studies have been carried out (alongwith results there of) or are proposed to be carried out.
9. Any other relevant data for proper technical appreciation of the proposal.

1200 SUBSOIL AND HYDRAULIC INVESTIGATIONS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1210.	SUBSOIL INVESTIGATIONS		
1210.1.	NHV-11(6)/73 dt. 19.11.74	Guidelines for ensuring Safety of Bridge Structures	1210/1

No. NHV-11 (6)/73

Dated the 19th November, 1974

To

The Chief Engineers of all the State PWDs and Union Territories

Sub : Ensuring safety of bridge structures-Guidelines for Engineers

Consequent upon the failure of a major Highway Bridge due to yielding of one of its foundations, the Government of India appointed a Technical Committee of Experts to suggest ways and means of avoiding similar failures in future in addition to investigating the causes of the damage. Flowing from the recommendations of this Committee some guidelines are given in the subsequent paragraphs for engineers engaged in the planning design and execution of bridge projects.

2.1. Need for proper advance sub-surface investigations

2.1.1. Before proceeding with the project preparation sub-surface explorations are very important and should always be insisted upon so that a clear appreciation is available of the types of strata to be met with at different depths. Both visual examination and scientific and expert identification of these strata should be carried out for proper classification, properties, bearing capacity and settlement characteristics, so that level of foundations and type of foundations can be decided judiciously. In this connection, it may be advantageous to have recourse to modern methods of foundation investigation, such as refraction geophysical surveys to determine depth of bedrock or resistivity geophysical surveys to distinguish the overall characteristics of over burden when rocky strata is expected in the beds of rivers. The adoption of these methods would lead to a quicker appraisal of overall foundation conditions and also minimise the required drilling effort for sub-surface exploration.

2.1.2. Any phenomenon of unusual nature, such as, the occurrence of artesian conditions during boring and presence of sulphates, pockets of cavities, altered rock zones, and the like, must be identified and investigated thoroughly.

2.1.3. The safety of a bridge structure, finally constructed, depends to a very large extent, upon the accuracy of these sub strata investigations and, therefore, it should be ensured that the investigations are exhaustive and complete in all respects and are carried out with great care and accuracy.

2.2. Coordination with Geologists

2.2.1. Misjudgement in the identification of the strata on which well foundations are to be rested may lead to failure of a bridge. While it is not uncommon to come across sub-surface stratification wherein comparatively harder variety of strata overlie pocket/pockets of weak strata, there may also be cases where the same type of strata at different depths and locations may be in different stages of disintegration. While several State Public Works Departments, Central executive agencies and the Ministry of Shipping and Transport (Roads Wing) have, amongst their engineering cadre, engineers who have acquired expertise in soil mechanics, it is felt that adequate emphasis is not being laid on the knowledge of geology, particularly rock mechanics. It is essential that expert opinion with regard to the suitability of the rock strata available for foundations is obtained by associating a qualified geologist with the work of subsurface explorations, especially in the case of major bridges with foundations on rock.

2.3. Need for frequent site inspections by officers responsible for according approval

2.3.1. According of approval to the suitability of foundation strata and design of all important components of bridges should be on the basis of actual site inspection by the officers responsible for according approval.

2.3.2. It is also necessary to ensure that the assumptions made in the design regarding levels, safe bearing capacity and nature of foundation strata and the like are actually realised at site. Changes, if any, in the hydraulic, strata conditions and other soil characteristics from those assumed in the design should be kept in view and reviewed prior to and during execution, as may be required. For this purpose the design engineers should be in constant association with the works by frequent site inspections.

2.3.3. Identification of exact foundation strata

To avoid future complications in respect of bridges founded on rock, wherever the locations of the piers and abutments materially differ from the contemplated initial locations where borings were originally done, it is imperative to take new borings at the final locations of the piers and abutments in advance of the commencement of the work and decide about the required depth of foundations and the strata on which the foundations will rest and review the design.

2.4. Construction techniques

In case of bridge foundations on rock, even-seating of well foundation is essential. Further, it would be desirable to take the well cutting edge into rock, where necessary by adopting pneumatic sinking, if required, the depth being dependent in each case on the type, nature and quality of the rocky strata met with.

2.5. Need for proper 'after construction inspections and maintenance'

2.5.1. Some states in the country have laid down procedures for regular inspection of bridge works for the purpose of their proper maintenance. However, in several states no regular practice is in vogue for detailed periodic inspection of bridge structures.

2.5.2. Proper and timely inspection of all components of bridges including the foundations and the training works etc. is absolutely essential and should be strictly enforced. Such a system is in vogue in the Railways. To achieve this objective, it is suggested that the following procedure may be considered for adoption by all State Public Works Departments/executive agencies.

- (i) Complete up-to-date records relating to the bridge structure, viz., the design data, detailed drawing completion drawings, the construction history and field observations after completion of structure shall be available with the officer-in-charge of its maintenance.
- (ii) Apart from the normal inspection by junior departmental officers, inspection of the major bridges, shall be carried out by an officer, not below the rank of an Executive Engineer. Such an inspection would also be necessary for medium and minor bridges where defects have been noticed and/or serious problems are apprehended.
- (iii) There shall be at least two inspections every year one prior to and the other following the monsoon season. In case of problematic bridges more frequent inspections may be called for.
- (iv) The inspection should cover all facets of the bridge structure including examination of the conditions of foundations where possible, scour around foundations, conditions of the sub-structure, articulations, bearings, superstructure, deck slab, wearing course, wheel guards and guard rails, all members of steel and timber trusses, stringers and floor beams, painting of superstructure where applicable, strings and wire ropes, spurs and bunds, other protective works and approaches.
- (v) Special care shall be taken to check up the relevant levels of the structure to ensure that the bridge is on grade as per original design and construction and there has not been any undue settlement of foundation. The time gap between successive observations of this nature could be increased, if there are no problems noticed.
- (vi) Where changes in the river course or large scale scouring are manifested, the bed contours may be plotted by taking soundings to study the effect of any change in the bed configuration.
- (vii) A check list should be formulated to facilitate these inspections so that none of the required items needing examinations is lost sight of.
- (viii) Further it is equally important to take timely steps to implement thoroughly the suggestions and recommendations based on these inspections well in time.

1300 MATERIALS

<i>Code No</i>	<i>Circular No & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1310	CEMENT		
1310.1.	RM-29 (3)/75 dt. 16.9.75	Use of Portland Pozzolana Cement	1310/1
1310.2.	NHVI-50(20)/77 dt. 15.12.77	Acceptance Tests on Cement before Using the Same	1310/1
1310.3.	PL-50 (8)/74-A-NHVI dt. 9.3.78	Use of Portland Pozzolana Cement	1310/2
1310.4.	PL-50 (8)/74-A-NHVI dt. 20.4.83	Use of Various Types of Cements for Bridge Works	1310/3
1310.5.	NHVI-50 (18)/80 dt. 12.12.83	Deficiencies in the Quality/Quantity of Cement Bags	1310/3

No. RM-29 (3)/75

Dated the 16th September 1975

To

The Cement Controller and Joint Secretary to the Government of India, New Delhi

Sub: Use of Portland-Pozzolana cement in bridges

Please refer to the circular letter No. CC/CO/25 (3)/73/12804, dated the 7th September, 1974 on the above mentioned subject.

It may please be noted that though the 7-days strength for both Ordinary and Pozzolana cement has been proposed to be the same, 3-days strength of the Pozzolana cement has not been specified in IS Code. It has also been stated in para 0.2 of "Foreword" of the latest draft IS:1489-1975 for this cement that "the addition of Pozzolana does not contribute to strength at early ages" In view of that it is not clear how it has been stated in your letter that the impediment in this respect is removed now. It is also noted from the "Foreword" that the "strength similar to ordinary Portland cement can be expected in general only at later ages provided the concrete is cured under moist conditions for a sufficient period". This may also be considered as one of the impediments for general use particularly for bridges where the work is required to be completed faster without any doubt about the development of strength. Moreover, this type of cement is still to be accepted in IS/IRC-Codes for general use for all types of structures/Bridges.

The full performance data on the aspects listed below are essential before this cement can be used in reinforced cement concrete and prestressed cement concrete bridges:-

- i) Bond strength of steel with concrete;
- ii) Shrinkage of concrete;
- iii) Creep of concrete;
- iv) Modulus of rupture;
- v) Young's modulus;
- vi) Shear capacity;
- vii) Tensile strength; and
- viii) Corrosion of steel.

The designs of RCC and P.S.C. bridges, which are mostly the types adopted for Highway Construction, in this country, are based on the specific values of the above aspects which can be determined based on performance data only. But the sufficient data in this regard are not available for Portland Pozzolana cement. Till such time, sufficient data for this cement are available, and the same examined, the use of Portland-Pozzolana cement in R.C.C. and P.S.C. bridges will have to be deferred. This may be kept in view while introducing this cement for general use particularly for Highway bridge construction. These points should be brought out so that the users it usefully knowing these limitations.

Copy forwarded for information and necessary action to the Chief Engineers/Principal Engineers of States/Union Territories in-charge of Highway, Director (Civil), I.S.I. and C.A. I.

No. NH. VI-50(20)/77

Dated the 15th December, 1977

To

All State Chief Engineers/Addl. Chief Engineers of the State PWDs and Union Territories dealing with Roads

Sub: The requirement of insisting on acceptance tests on cement before using the same on all Centrally sponsored works

The supplies of cement, conforming to the relevant prescribed Indian Standards, for all centrally sponsored works are being arranged to the States against orders placed by them on rate contracts entered into by the Director General of Supplies & Disposal. Instances have, however, come to notice where such cements have failed to satisfy the relevant requirements of the Indian Standards. This issue was discussed at the Chief Engineer's meeting held at New Delhi on 30th July, 1977, when it was felt that it may not be sufficient to rely solely on the test reports/certificates issued by the Inspection Directorate of the Director General of Supplies & Disposal based on the periodic samples tested by them. In order to ensure that only cement of the requisite quality is used on our works, it is very essential that the States also take samples and get them tested indepen-

cently in accordance with the provisions of the rate contract, to check that the cement actually conforms to the prescribed standards. The cement should also be stored properly and tested again at the time of actual use on works.

2. Normally, cements manufactured in the country are covered by the following Indian Standards:

- IS: 209—Specifications for Ordinary, Rapid Hardening and low heat Portland Cement
- IS: 455—Specifications for Portland blast-furnace slag cement
- IS: 1489—Specifications for Portland Pozzolana Cement

3. The necessary tests for checking the quality of cement are also indicated in the aforesaid Standards as well as in the Ministry of Shipping & Transport Specifications for Road and Bridge Works and IRC Bridge Code Section III. These tests must necessarily be carried out on each batch of cement received. The test cubes should be tested before the start of the work for both the 7-days and 28-days strengths as given in the relevant standards. In case low strengths are indicated, timely action should be undertaken to ascertain the cause of poor quality as well as to prevent the use of such sub-standard cements on the works. If after conducting the necessary tests the cements are found to be sub-standard, the matter should be brought to the notice of the State Civil Supplies Department, with copies to this Ministry and the concerned Controller of Cement under whose direction the cement has been released, for taking up necessary remedial action.

1310.3.

No. PL-50 (8)/74-A-NH VI

Dated the 9 March, 1978

To

All State Chief Engineers/Addl. Chief Engineers of the State PWDs and Union Territories dealing with Roads

Sub: Use of Portland Pozzolana Cement in Highway Bridges

The production of Ordinary Portland Cement (OPC) has fallen short of the demand in the country. To meet the increasing demand, the Ministry of Industry has tried to maximise the production of cement by fuller utilisation of the installed capacity in the country by allowing the production of Portland Pozzolana Cement (PPC). This has resulted in a sizable reduction in the OPC now available for use on highway bridges.

2. So far, the use of PPC for concrete work in bridges has not been permitted. This has been because of some apprehensions regarding the properties of concrete made with PPC, as already brought out in a circular issued by this Ministry (Circular letter No. RM-29(3)/75 dated 16.9.75).

3. The matter has recently been again reviewed and in order to utilise the existing production of Portland Pozzolana Cement strictly conforming to IS: 1489, it has been decided to permit the use of such PPC on components of bridges where plain concrete work is involved and where reinforcement is not taken into account in the design of the member. However, all such concrete works shall be carried out under the strict control subject to the following:-

- (a) Portland Pozzolana Cement shall only be factory made and strictly conforming to IS : 1489. Mixing of pozzolana with Ordinary Portland Cement at site shall not be permitted.
- (b) All such cements shall be tested for ascertaining the quality of cement conforming to the standards laid down in IS : 1489. In this connection, reference is also invited to the requirements spelt out in Ministry's Circular letter No. NH. VI-50 (20)/77 dated 15.12.1977. Any cement falling short of the prescribed standards shall not be used on the works.
- (c) Before taking any supply of Portland Pozzolana Cement from any factory, the following should also be insisted upon:
 - (i) Manufacturer's certificate that the cement conforms to the requirements of IS : 1489 and also stating the type of pozzolana used in the finished cement.

The distinguishable identification marks put on the cement bags which would help in identifying these bags from other types of cement for purposes of storages and use.
- (d) All such PPC shall be stored separately from Ordinary Portland Cement so as to ensure that both the cements do not get mixed up for use on the works.
- (e) All concrete made from Portland Pozzolana cement need long period of wet curing. This aspect will depend upon the Pozzolanic material used in the manufacture of cement. However, at site adequate wet curing shall be ensured for attaining the design strength of the concrete, which shall be ascertained either by resorting to pre-testing or as advised by the manufacturers in this regard.
- (f) Since the initial increase in strength of concrete made from Portland Pozzolana Cement is slower than that made from Ordinary Portland Cement, it is essential to allow for a larger period of curing before the centering and supporting shutters are removed. It is suggested that pre-testing be resorted to ascertain this period of curing in order to ensure that 75% of the design concrete strength is achieved before the centering and supporting shutters are removed. However, this curing period shall not be less than that specified for concretes made from Ordinary Portland Cement.

4. In order to ensure that the Cement Controller makes available the necessary quantity of Portland Pozzolana Cement and Ordinary Portland Cement for use on highway bridges, it is suggested that in future all tenders for cements should clearly mention the requirements of Portland Pozzolana Cement and Ordinary Portland Cement separately, the latter being primarily meant for use in R.C.C. and prestressed concrete members of the bridge.

1310.4.

No. PL-50 (8)/74-A-NH VI

Dated the 20th April 1983

To

The Chief Engineers of the State P.W.Ds./Union Territories dealing with National Highways.

Sub : Use of Portland Pozzolana Cement, Ordinary Portland Cement Grade I conforming to IS : 269 and Ordinary Portland Cement Grade II conforming to IS : 8112 in Highway Bridges

Kindly refer to this Ministry's letter of even number dated 9th March 1978 wherein it had been pointed out that in order to utilise the existing production of Portland Pozzolana Cement strictly conforming to IS : 1489, the same may be used in components of bridges where plain concrete work is involved and where reinforcement is not taken into account in the design of the members. It was further pointed out in the aforesaid letter that all such concrete works shall be carried out under the strict control subject to the conditions stipulated in the letter.

2. However, ordinary Portland Cement will have to be used in RCC work and prestressed concrete work where reinforcement is taken into account in the design of members. This cement is generally manufactured in two grades viz. OPC Grade I conforming to IS : 269 and OPC Grade II conforming to IS : 8112. Cement OPC Grade I conforming to IS : 269 should normally be sufficient for making concrete of grades upto M20.

3. During discussions in the meeting of the ISI held on 19th April 1983 in connection with 30th meeting of Cement and Concrete Sectional Committee, BDC 2 in joint session with the 24th meeting of Cement Subcommittee BDC 2:1, the representatives of the manufacturing firms reported that with proper mix design, it will be possible to obtain concrete of M50 even with OPC Grade II conforming to IS : 8112. It was also informed by the representatives of the manufacturing firms that absolutely limited quantity of cement conforming to IS : 8112 is at present being manufactured in the country.

4. Many bridge works are in progress. For some bridge works tenders for which have been finalised, the work is to be taken up shortly. It is also likely that the estimates of some bridge works are in the advanced stage of processing. Thus large quantity of OPC cement may be required. Since OPC Grade II cement is needed only when the strength of the concrete required is more than M20, it is necessary that its use is limited to such components of the bridge structures where concrete of strength more than M20 is needed. For leaner concrete, OPC Grade I cement may be used. Moreover, in the case of plain cement concrete work, Portland Pozzolana Cement may be used.

5. Secretary, Ministry of Shipping & Transport is very particular about the completion of all bridge works as per the time schedule specified in the sanction letters issued by the Ministry. This Ministry will not tolerate any slippage in the completion of each of the bridge work in your State. This may kindly be noted

1310.5.

No. NH VI-50 (18)/80

Dated the 12th December, 1983

To

The Secretary (All State PWDs.)/The D.G. of Works, C.P.W.D. and the Chief Engineers of all State PWDs dealing with bridge works on N.H. and other Centrally financed projects.

As the PWDs are aware, a significant trend of degradation in the quality of cement has been the cause of serious concern of consumers all over the country in recent years. In this context with a view to reinforcing consumer protection ISI certification of all cement supply has been made mandatory since August, 1983.

2. In the past few years defective or low quality of Ordinary Portland Cement to be used in reinforced or Prestressed concrete bridges has been reported frequently. The major deficiencies are mostly of two kinds:

i) Shortfall in weight of an individual bag or average weight of a bag with a nominal weight of 50 Kg. exceeding the tolerance limit i) specified in IS-269 and IS-8112 (rate with the latest amendments);

ii) 3 and 7 day mortar cube strength falling below the specified limits of IS : 269 and IS : 8112.

3. In view of the added accent on consumer protection and compulsory ISI Certification introduced, it is now necessary on the part of all engineer-in-charge of reinforced and prestressed concrete bridge works to ensure that the quality of cement supplied to site strictly conforms to IS standards.
4. In a recent meeting of the Committee for Promotion of Consumer Protection and Rational Utilisation of Cement (CPU) attended by the Additional Director General (Bridges) of this Ministry, it was suggested by members that all specific cases of defective quality of cement received by the consumers may be brought to the notice of the Cement Controller, who welcomed the suggestion.
5. We will, therefore, urge upon you to advise all your Engineering Officers dealing with bridge works on National Highways and other Centrally financed bridge projects that in specific instances of deficiencies in specified quality of cement either in quantity or in strength may be brought immediately to the notice of the Cement Controller directly with a copy to this Office.
6. It is hoped that in view of the critical importance of quality assurance of cement used in bridge works, these instructions will be implemented immediately.

1500 FOUNDATIONS (WELL AND OTHER FOUNDATIONS)

1510. WELL FOUNDATIONS

<i>Code No.</i>	<i>Circular.No & Date</i>	<i>Brief Subject</i>	<i>Page No</i>
1510.1.	PL-67(22)/77 dt. 11.4.77	Checking of Wells during Sinking Process	1500/1
1510.2.	NHVI-50(3)/83 dt. 24.6.83	Variation from Approved Depth of Foundation	1500/1
1510.3.	RW/NHVI-50(3)/83 dt. 23.2.84	Plugging of Well Foundation	1500/1

1510.1.

No. PL-67 (22)/77

Dated the 11th April, 1977

To

All State Chief Engineers (dealing with Roads)

Sub: Bridge works financed in full or in part from Central Funds-Checking of wells during sinking process

It has come to the notice of this Ministry, that in some cases of bridges with well foundations, cracks in the steining of the wells have been observed, after sinking operations. Such cracks result during sinking operation and impair the structural soundness of the wells, requiring very costly remedial measures to be undertaken.

2. In this connection, it is emphasised that the State Public Works Departments executing the work should not only ensure strict compliance of the requirements contained in Clause 1205 of the "Specification for Road and Bridge Works" and the provisions of "Hand-Book of Quality Control", but also verify and satisfy themselves about the soundness of the entire steining during the sinking operations at periodic intervals. In order to achieve this, it is suggested that the concerned Public Works Department may consider employing a diver under the establishment of the Department. With the help of this diver the inside surface of the well steining shall be got verified independently in addition to the inspection by the divers of the contracting firm.

3. The bottom plug may be permitted to be laid only after the departmental diver has inspected thoroughly the inside surface of the well for the total depth and the concerned Engineer-in-charge has satisfied himself about the soundness of the steining.

1510.2.

No. NHVI-50 (3)/83

Dated the 24th June, 1983

To

All C.Es. of States/Union Territories dealing with N.Hs and other Centrally sponsored roads

Sub: Variation in depth of foundation from those approved by Roads Wing

It was observed during my inspection of some minor bridges that the Executive Engineers in-charge of the work made a proposal during inspection that the foundations of abutments/piers may be laid at levels higher than those approved by the Ministry.

2. Foundation of a bridge is an important component of the structure from the point of view of safety of the bridge as a whole and it is therefore necessary that the case should be examined in all its aspects before arriving at a modified depth of foundation. It is, therefore, requested that in case the State PWDs in-charge of execution consider that the foundations of the piers and abutments are to be laid at a higher level than those provided in the approved drawings, a detailed note indicating the reasons for the said raising may please be sent to Roads Wing in advance so that the views of this Department, if any, could be communicated.

1510.3.

No. RW/NHVI-50 (3)/83

Dated the 23rd. February, 1984

To

All Chief Engineers of States/Union Territories dealing with National Highways and other Centrally sponsored roads

Sub: Plugging of well foundations of bridges on National Highways and other Centrally sponsored roads

The question of obtaining prior approval of this Ministry for the plugging of well foundations of bridges on National Highways and other Centrally-sponsored roads in each case, as laid down in the circular of even number dated 20.4.83, has been reviewed in the light of difficulties likely to be experienced, as reported in their further correspondence, by the various State Chief Engineers in-charge of such works, and discussions held in the Chief Engineers' meeting held at Pondicherry on the 20th August, 1983.

2. After careful consideration of the matter, it has been decided to withdraw the above-referred circular letter requiring compliance in each and every case of plugging of wells.

3. However, still a few instances may arise actually making design assumptions invalid despite taking confirmatory borings at the exact locations of wells before starting work. As per practice in the past, it is requested that only such problematic cases of well foundations for which the designs were approved by this Ministry and where considerable divergence in design assumptions regarding the soil/rock properties at or below the founding level and/or above up to the maximum anticipated scour level are noticed during actual execution and/or deviations from any other design parameters or extra financial liability are involved, may be referred to this Ministry for prior approval along with the following data:—

- i) History of sinking of the well;
- ii) Nature of strata met with from bed level to foundation level;
- iii) Final figures of tilt and shift;
- iv) Foundation pressure as per design at the proposed foundation level;
- v) Permissible safe bearing capacity at the proposed foundation level based on soil strata actually met with;
- vi) Report of a diver (of the Government and not of the contractor) regarding the condition of steining and rock at the foundation level; and
- vii) Financial implications, if any.

4. Notwithstanding the above instructions, it may be emphasized that work shall be carried out according to all records as indicated in this Ministry's specifications, CI. 1200 IRC Bridge Code (78-1983) Section VII, (First Revision) for Foundations and substructure and other extant circulars for well foundations shall be maintained duly for all bridges.

1600 SUBSTRUCTURE AND BEARINGS

1610. SUBSTRUCTURE

<i>Code No.</i>	<i>Circular No & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1610.1.	PL-67 (17)/68-SP dt. 7.6.68	Loading Conditions for Bridges with Hammerhead Piers	1600/1
1610.2.	NHVI-50 (3)/83 dt. 24.2.83	Cat-walk Ladder arrangement for Piers	1610/1
1610.3.	NHVI-50 (3)/83 dt. 12.4.83	Layout for Construction of Bridges	1610/1

1610.1.

No. PL-67 (17)/68-SP

Dated the 7th June, 1968

To

The Chief Engineers of all States

Sub: Loading condition of bridges with T-head or hammer head piers during erection

The design of a bridge has to be checked for stress conditions during various stages of its construction. The forces to be considered for checking of design for any stage of construction would be distinct from those acting on a completed bridge.

2. It is suggested that while checking the designs for conditions during erection following considerations may be kept in view.

2.1. The load combination and permissible stresses may be taken as per provisions of Indian Roads Congress Code of Practice.

2.2. Only such dead loads should be considered as would be existing at that time, and so dead load due to wearing coat, footpath, slab, railing etc. can be omitted if they are not there and contractor gives an undertaking not to put them during that stage of erection.

2.3. As far as live loads are concerned only such live loads need be considered as would be present during erection operations. This may include a number of men, materials, tackle, etc. If any materials for casting etc. are kept on the girders, their effect has to be considered. It should be ensured that no men or materials whose effect has not been considered should remain on the span at the time of launching or any other erection operation. A note to this effect should be given on the drawing.

1610.2.

No. NHVI-50 (3)/83

Dated the 24th February, 1983

To

The Chief Engineers of all State P.W.Ds and Union Territory Administrations dealing with National Highways and other Centrally Financed Roads

Sub: Inspection of Bridges-Cat-Walk Ladder arrangement for piers

At present, Inspection and Maintenance of road bridges is not as perfect as in Railways. This needs the personal attention of the State Chief Engineer and requires to be improved.

2. In order to enable inspection of bearings, underside of bridges superstructure to the extent possible, it is necessary that cat-walk ladder arrangement is provided for the piers of all bridges with the help of protruding reinforcement embedded in the masonry of the piers. This has to be provided for all bridges with piers of height more than 2 metres above the lowest bed level or low water level in the case of tidal reaches.

3. It is requested that in respect of bridges in progress or those yet to be taken up, the above arrangements may please be provided.

1610.3.

No. NHVI-50 (3)/83

Dated the 12th April 1983

To

The Chief Engineers of all State P.W.Ds and Union Territories dealing with NHs and other Centrally Financed Roads

Sub. Lay-out for construction of bridges on National Highways and other Centrally sponsored road

It has been observed in some cases that the abutments are wrongly located at site. In order to avoid such a situation, it is requested that the lay-out at site before the start of construction of bridges may please be fixed by a responsible officer of the State P.W.D not below the rank of an Executive Engineer.

1620 BEARINGS

<i>Code No.</i>	<i>Circular No & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1620.1.	NHII-86 (108)/66 dt. 7.7.69	Positioning of Bearings for Skew Bridges	1620/1
1620.2.	RW/NHVI-67 (3)/76- Vol. III dt. 27.6.85	Interim Specifications for Elastomer Bearings	1620/3
1620.3.	RW/NHVI-67 (3)/76- Vol. III dt. 3.7.85	Clarification of Application Procedure of Interim Specification for Elastomer Bearings	1620/3
1620.4.	RW/NHVI-50 (3)/83 dt. 12.7.85	Necessity of taking Supply of Elastomer Bearings from reputed Firms only	1620/4

No. NHII-86 (108)/66

Dated the 7th July, 1969

To

All Technical Officers in the Bridges Directorate at the Headquarters/Superintending Engineers of all Regional Offices

Sub: Positioning of bearings for skew bridges in beam and slab construction

While designing bearings for a skew bridge with T-beam-cum-slab arrangement, correct positioning of bearings deserves special attention, so as to permit a longitudinal movement as well as a rotation of the beam ends simultaneously. Accordingly, a reference was made to Dr. Leonhardt, requesting for his views in the matter as well as the current practice in Germany. Copies of letters exchanged on this subject are enclosed for information and guidance of technical officers in the Bridges Directorate and in the Regional Offices.

Enclosures to Circular No. NHII-86 (108)/66

Dated 7.7.69

D.O. No. NHII-86 (108)/66 dt. 3.3.1969 from ADG (B) to Dr. Leonhardt

Sub: Positioning of bearings for skew bridges in beam and slab construction

I am writing this letter with a view to obtaining your valuable opinion, as well as the present practice in your country in respect of the correct positioning of bearings under girders of skew bridges.

In India, the practice, so far, in respect of road bridges, has been to keep the movable as well as the fixed bearings at right angles to the longitudinal axis of the skew girders. While this arrangement permits a free horizontal movement (due to expansion or contraction) of the girders in the direction parallel to their axis, a doubt has arisen as to whether this will permit a free rotation of the beams over the fixed as well as the movable bearings. The contention is that the span tends to rotate about the line joining the centres of bearings (i.e. parallel to the supports) while the horizontal movement takes place parallel to the axis of the beams. If this position is to be accepted as correct, in principle then some difficulty may arise in the actual design and positioning of bearings. For instance, in the case of metallic roller bearings (either with single roller or multiple roller assembly), kept at right angles to the beam axis, it may become difficult to provide for rocking parallel to the piers, unless some special provision is made for such rocking, between the top plate under the beam and the saddle plate over the rollers. Similar complicated arrangements may become necessary even in the case of concrete pendulum bearings.

I understand that a very careful thought has been given in Germany to this problem of orientation of bearings for skew bridges. I shall be grateful if you could throw some light on this problem and help us with a few sketches illustrating the practice being followed in your country particularly with regard to the orientation of such bearings (metallic, concrete and also rubber) for one or two typical cases, and also indicating thereon, if possible, the procedure of the design generally being followed for such bearings. As I have to incorporate these ideas in the design of some skew bridges now under consideration, I shall be obliged if you could kindly send me your reply at your earliest convenience.

D.O. letter dt. 7.5.1969 from Dr. Leonhardt to ADG (B)

Sub: Positioning of bearings for skew bridges in beam and slab construction

For skew bridges with girders parallel to the main longitudinal axis of the bridge, the bearings should always be placed at right angles to the longitudinal axis of the girders. However, the girders should be connected only by the top slab and a slender transversal beam along the skew end, in order to avoid torsional fixity to this end beam. For load distribution, there could be one stiff transversal diaphragm in the middle of the span, but not close to the bearings.

In Europe, we prefer solid slabs for our skew bridges and I am sending you the principles which we use for the bearings of skew slabs. For dimensioning these skew slabs, big books are available, giving all the necessary influence surfaces for bending moments, shear forces, bearing forces etc.

Annexure to Dr. Leonhardt's D.O. letter dt. 7.5.1969

Positioning of Bearings for Skew Bridges

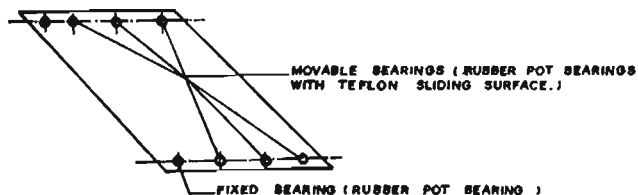
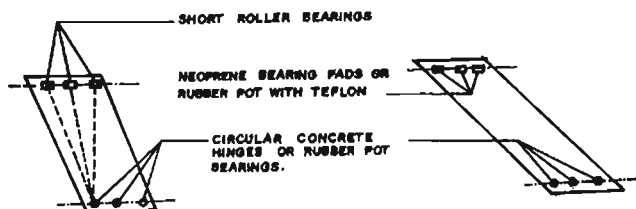
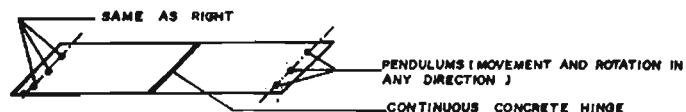
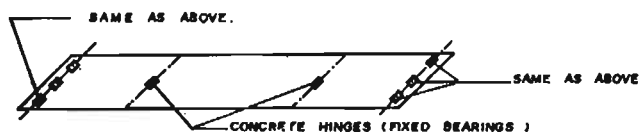
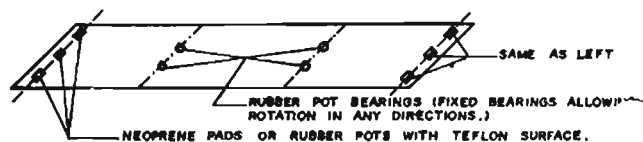
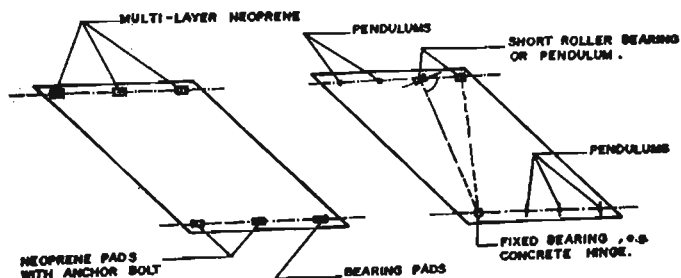
A General Principles:

1) Fixed Bearings : All types of bearings (steel or concrete) with rotation along one axis only are generally not suitable for bridges with considerable skew, e.g. the conventional rocker bearings are inadequate. Since the axis of rotation and the direction of longitudinal movements are not perpendicular, point bearings have to be used allowing rotation in any direction.

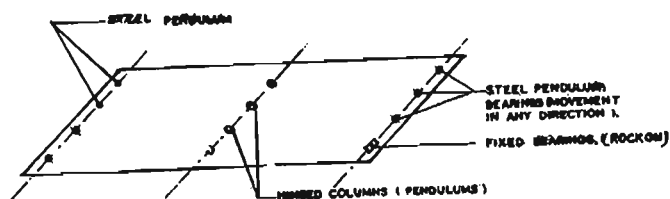
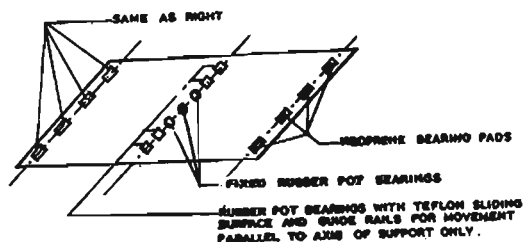
Encl. to NH II-86(108)/66 dt. 7.7.1969

Encl. to NH II-86(108)/66 dt. 7.7.1969

ALTERNATE FOR LARGE SPAN AND HEAVY LOADING.

D - EXAMPLES1 SINGLE SPAN BRIDGES1.1. SMALL TO MEDIUM WIDTHSMALL SKEWLARGE SKEW2 CONTINUOUS BRIDGES2.1. SMALL-TO-MEDIUM WIDTH.1.2. WIDE BRIDGES (WIDE SLAB OR MULTI-BEAM BRIDGES)SMALL SPAN OR LOADLARGE SPAN OR LOAD

Encl. to NH II-86(108)/66 dt. 7.7.1969.

2.2. WIDE BRIDGES (SLAB OR MULTI-BEAM BRIDGES)

Suitable point bearings are for example:

Steel point bearings

Circular concrete hinges

Modern rubber pot bearings [for high loading up to 5000 tons, compare (3)].

2) Movable bearings

Bearings must allow rotation and movement in any direction, thus e.g. conventional steel roller bearings are inadequate. Suitable bearings are:

multi-layer rubber pads with inserted steel plates

rubber pot bearings with sliding surface made of Teflon (see (3))

steel pendulums

hinged columns (usually concrete)

B. Special Design Principles for wide bridges

1) Place fixed bearings preferably into obtuse corner of bridge and allow movement parallel and perpendicular to axis of bridge.

2) Spacing of bearings along support line not too close in order to avoid high concentration of negative bending and shear as well as support reaction in obtuse corner. Most economical spacing should be about 1/6 to 1/4 of span (Lit. (4), (5)).

3) Elastic bearings (rubber) also reduce concentration of reaction and negative moment in obtuse corner (Lit. (4)).

C. Design of Bearings

(1) M. Weihprecht:	Auflagerung von Brücken, Arthur Tetzlaff-Verlag, Frankfurt
(2) Lindley:	Design and use of natural rubber bridge bearings. London, Natural Rubber Producers' Research Association, 1962 Technical Bulletin No. 7
(3) Andra/Leonhardt:	Neue Entwicklungen für Lage-von Bauwerken, Gummi-und Gummitopflage, Die Bautechnik 39 (1962), Heft 2, S. 37.
(4) Mehmel/Weisa:	Ein modellstatistischer Beitrag zum Tragverhalten schiefwinkliger Platten.
(5) Andra/Leonhardt:	Beton-u. Stahlbetonbau 1962, No 10. Einfluß des Lagerabstandes auf Biegemomente und Auflagerkräfte Schiefwinkliger Einfeld-Platten. Beton-u. Stahlbetonbau 1960, Heft 7, S. 151.

1620.2.

No. RW/NHVI-67 (3)/76-Vol. III

Dated the 27th June 1985

To

All Chief Engineers of State PWDs and Union Territories dealing with National Highways and other Centrally financed roads, D.G. Works, C.P.W.D. and D.G.B.R.

Sub: Interim Specifications for Elastomer bearings July, 1985 Amendment to Specifications for Road and Bridge Works (First Revision, Reprint 1981)

The following amendments to Specifications for Road and Bridge Works (First Revision, Reprint 1981) of this Ministry comes into force with effect from July 1, 1985.

1.1. Clause No. 2005 and Appendix 5 (inclusive of all sub-clauses) of Specifications for Road and Bridge Works (first revision) relating to Elastomer Bearing are superseded.

1.2. Interim Specifications for Elastomer Bearings July, 1985 of this Ministry (abbreviated name Interim 'N') replaces the said superseded clauses and shall be read as part of specifications for Road and Bridge Works with effect from July 1, 1985.

2. A copy of Interim 'N' is enclosed for being followed.

Note: Enclosure not printed because the same is under revision

1620.3.

No. RW/NHVI 67 (3)/76-Vol. III.

Dated the 3rd July, 1985

To

The Chief Engineers of all State PWDs and Union Territories dealing with N.H. & other Centrally Financed Roads, D.G. Works, CPWD. & D.G.B.R.

Sub: Clarification of application procedure of Interim Specifications for Elastomer Bearings (Interim 'N')

It is requested that the provisions of Interim Specifications for Elastomer Bearings (abbreviated name Interim 'N') of this Ministry may be strictly followed with effect from July 1, 1985 for all design and use of elas-

elastomer bearings in the bridges on National Highways and under other Centrally Financed Schemes. The following points of clarification may kindly be kept in view :

- 1.1. Application of Interim 'N' with effect from July 1, 1985, is without any prejudice to the non-conforming design and use of elastomer bearings prior to July 1, 1985.
- 1.2. Interim 'N' shall apply to all contract specifications after July 1, 1985. For current contracts also, in case the design of elastomer bearing is yet to be finalised, revised specifications conforming to Interim 'N' may be adopted, if contract conditions permit.
- 1.3. During the limited transition period, until the standard plans for elastomer bearing issued by this Ministry are amended to conform to Interim 'N', the existing standard plans may be used. Such use of standard plans for elastomer bearings not conforming to Interim 'N' shall only be permitted in cases of bridges where the entire design of superstructure conforms to standard plans issued by the Ministry. In such cases, the acceptance criteria laid down in clause No. 106 of Interim 'N' shall be fully complied with.
- 1.4. Where bearings of special use under the purview of Clause Nos. 100.1.2 and 100.2 are required to be provided, prior approval of the complete specifications by this Ministry may be obtained.
2. Your experience in the application of Interim 'N' will be an invaluable aid to its improvement. Comments may be sent to this Ministry for any clarification needed or modification suggested.

1620.4.

No. RW/NHVI 50 (3)/83

Dated the 12th July, 1985

To

The Secretaries, Public Works Departments and Chief Engineers of State Public Works Departments and Union Territories dealing with National Highways and other Centrally Financed Roads, D.G. Works, CPWD, D.G.B.R. and C.E. Pamban Bridge, Madras

Sub : Use of elastomeric bearings on bridges-need for ensuring use of best quality raw materials and carrying out tests on the bearings-need to restrict the supply of elastomeric bearings from reputed firms having proper equipments and testing facilities and also the responsibility of inspection and testing of such bearings to be entrusted to DGS&D

As is well known, bearings form a very important component of any bridge and the long term structural safety and servicability of the entire structure depends on the bearings. Since more and more of elastomeric bearings are coming in vogue, it is of paramount importance to ensure that only the best quality raw materials and workmanship are used in manufacturing these bearings, which should invariably satisfy the prescribed standards and specifications laid down in the Interim Specifications issued by the Ministry vide our letter No. RW/NHVI-67 (3)/76-Vol. III dated 27.6.85. Suitable instructions in this regard have already been issued vide this office letter Nos. PL-67 (20)/76-NHVI dated 24.8.77 and 29.6.79 and RW/NHVI-67 (20)/76-Vol. II dated 11.1.83.

2. In continuation of the detailed instructions issued by the Ministry vide the above referred circular letters, it appears that the requisite safeguards are not being insisted upon with the result that some instances have recently come to our notice where substandard elastomeric bearings have been deployed, even though unintentionally. Needless to say that the replacement of substandard bearings (after a bridge has been opened to traffic) is not only costly in terms of time and money, it also leads to dislocation of traffic and a serious risk to the safety of the bridge structure is involved. Keeping this in view, the instructions contained in the Ministry's letter No. RW/NHVI-67 (20)/76-Vol. II dated 11.1.83 are again reiterated to impress upon all Highway Engineers the desirability of complying with the guidelines issued from time to time.

3. For the sake of flawless compliance, the important steps required for avoiding dilution of quality of the raw materials and fabrication of elastomeric bearings are enumerated hereunder :

3.1. Suitable provision in the N.I.T. :

The following clauses shall be inserted in the N.I.Ts. relating to bridges on National Highways or under other Centrally Financed Schemes :

- (i) "In respect of elastomeric bearings intended for use in the superstructure of any bridge, the contractor shall be required, in the course of manufacture, to arrange and afford all facilities for the purpose of inspection and testing of all or any of the parts and the materials used in these bearings, to any officer of the Directorate of Inspection, DGS&D, Ministry of Supply, Government of India, and such bearings shall not be used except on production of a certificate of acceptance alongwith a

summary of test results thereof from the Directorate of Inspection. All inspection charges shall be payable by the Contractor".

- (ii) The suppliers shall ensure that the elastomeric bearings are designed and manufactured strictly in accordance with the Interim Specifications issued by the Ministry of Shipping & Transport (Roads Wing) vide their letter No. RW/NHVI-67 (3)/76-Vol. III dated 27.6.85.

3.2. Pre-qualification of Suppliers :

As far as possible, the supplies of elastomeric bearings shall be taken only from a panel of pre-qualified firms, the panel being drawn up by the State Chief Engineers in consultation with this Ministry. This panel may be updated from time to time, as found necessary. In order to ensure that a uniform policy is adopted in the procedure relating to pre-qualification of firms for the supply of elastomeric bearings, the pre-qualification may be carried out on the basis of the Questionnaire enclosed as Annexure I. The requirement of pre-qualification of firms for the supply of elastomeric bearings will also have to be clearly stipulated in the N.I.T.

4. A Statement showing (i) acceptance requirements; and (ii) institutions in the country where facilities for conducting various tests on elastomeric bearings are available is enclosed vide Annexure II. A list of addresses of the Regional Directors of Inspection of the Directorate of Inspection, Ministry of Supply, Government of India, who undertake such jobs of inspection, is enclosed vide Annexure III.

5. It is requested that suitable instructions may kindly be issued to the field officers for judicious selection of manufacturers/suppliers of elastomeric bearings, strict enforcement of the Interim Specifications relating to such bearings issued by the Ministry vide letter No. RW/NHVI-67 (3)/76-Vol. III dated 27.6.85 and insistence on inspection certificate before acceptance of the bearings for use on bridges.

6. Further, it is requested that for a proper feed-back, the performance of elastomeric bearings is got checked at regular intervals (say twice a year) and records maintained for future reference.

7. It is hoped that action on the above lines would be taken so as to minimise the chances of sub-standard elastomeric bearings being accepted for our bridge works.

Enclosure to letter No. RW/NHVI-50 (3)/83 dated 12.7.85

ANNEXURE I

QUESTIONNAIRE TO BE SUBMITTED ALONGWITH APPLICATION FOR PRE-QUALIFICATION OF FIRMS FOR SUPPLY OF ELASTOMERIC BEARINGS FOR USE IN BRIDGES

Sl. No.	Question	Reply		
1.	How many years has your organisation been in business as a manufacturer/supplier of elastomeric bearings under your present business name?			
2.	Do you have your own factory with complete facilities for the manufacture of elastomeric bridge bearings? If so, furnish documentary evidence in support thereof.			
3.	What is the technical experience of the principal individuals of your organisation?			
Individual's Name	Present position of office	Total years of technical experience	Years with the firm	In what capacity
(1)	(2)	(3)	(4)	(5)
4.	Are you on the approved list of manufacturers/suppliers of elastomeric bridge bearings with DGS&D? If so, furnish a copy of the registration certificate.			
5.	What are your sources of procurement of synthetic rubber? Give documentary evidence in support thereof.			
6.	What is the average consumption of synthetic rubber per year in your factory for the last 3 years?			
7.	What is the average volume of production (in cubic cms. per month) of elastomeric bearings in your factory?			
8.	Have you got testing facilities for raw materials as well as finished products (elastomeric bearings) as per procedures laid down in the Interim Specifications of the Ministry of Shipping & Transport (Roads Wing) issued vide their letter No. RW/NHVI-67 (3)/76-Vol. III dated 27.6.85? If so, give detailed information about the arrangements for conducting various tests (the details should include the make of testing equipment, its technical details, date of purchase and whether the equipments are in working order at present).			
9.	If you are not having your own testing arrangements, where do you propose to get the testing of elastomeric bearings done? Give evidence in support thereof.			
10.	Mention special manufacturing techniques, if any, adopted by your firm?			
11.	Mention special quality control measures, if any, adopted in your factory?			

12. Has there been any instance of elastomeric bearings supplied by your firm showing signs of distress? If so, furnish details. Have your bearings been rejected by some client?
13. Performance record for the past 5 years (list all supply contracts completed by your organisation during the past 5 years).

Name & location of the bridge	Authority for which the supply order was executed	Brief details of elastomeric bearings (plan size, thickness etc.).	Year of supply	Inspection certificate No. and date.
(1)	(2)	(3)	(4)	(5)

NOTE : Certificates from the Heads of the Organisation/Department/Project in respect of the satisfactory execution of the supply orders within the stipulated time should be attached.

14. Has your firm been blacklisted or removed from the approved list of suppliers or demoted to lower class etc.?

NOTE : The following declaration should be furnished alongwith the replies to the Questionnaire :

"I/We agree that if any of the information furnished by me/us in the above document is found to be incorrect, the Department will have the absolute right to strike off my/our name from the approved panel without assigning any reason.

Dated :

Signatures

With Stamp of the firm

ANNEXURE II

STATEMENT SHOWING AVAILABILITY OF FACILITIES FOR CONDUCTING TESTS ON ELASTOMERIC BEARINGS IN INDIA

FACILITIES AVAILABLE IN VARIOUS ORGANISATIONS IN INDIA										
Sl. No.	Name of the test	Relevant Indian Standard or ASTM Standard	Requirement as per Acceptance Criteria	I.L.T. Powai Bombay.	Structural Engg. Research Centre, Roorkee	National Test House, Alipore, Calcutta	I.L.T. Madras	I.L.T. Kharagpur	C.R.R.I. New Delhi	
1	2	3	4	5a	5b	5c	5d	5e	5f	6
A.	Tests on the physical Properties of Rubber									
(i)	Determination of Hardness	IS:3400 (Part II)	65 IRHD maximum. 55 IRHD minimum.	Yes	Yes	Yes	Yes	Yes	Yes	
(ii)	Minimum Tensile Strength	IS:3400 (Part I)	17 MPa.	Yes	No.	Yes	Yes	Yes	No	
(iii)	Minimum percentage Elongation at Break	IS:3400 (Part I)	400	Yes	No	Yes	Yes	Yes	No	
(iv)	Maximum percentage Compression Test at 24±2° hrs., at 100±1°C.	IS:3400 (Part X)	35	Yes	No.	Yes	Yes	Yes	No	
(v)	Accelerated Ageing Tests 70 hrs. at 100±1°C	IS:3400 (Part IV)		Yes	No.	Yes	Yes	Yes	No	
(vi)	Maximum change in hardness		15 IRHD							
(vii)	Maximum change in tensile strength (%)		15							
(viii)	Maximum change in elongation (%)		40							
B.	Tests on elastomeric bearings									
(i)	Minimum Adhesion to metal	IS:3400 (Part IV) (Method A)	7 KN/m	Yes	No.	Yes	Yes	No.	No.	

(ii) Ozone Resistance	IS:3400	No Cracks	No.	Yes	No.	No.	No.	Yes	This apparatus is also going to be available with HRS Madras soon.
20% Strain, 96 hrs. (Part XX).									
at 40±1°C, 50 pphm.									
(iii) Stiffness in Compression (determination of vertical stress strain curve)	—	± 20%	Yes	Yes	No.	Yes	Yes	Yes	
(iv) Stiffness in Shear (determination of modulus G)	—	± 20%	Yes	Yes	No.	Yes	No.	Yes	
(v) Minimum Ultimate Compression Strength	—	60 MPa	No.	Yes	No.	Yes	Yes	Yes	

ANNEXURE III**LIST OF ADDRESSES OF REGIONAL DIRECTORS OF INSPECTION**

1. The Director of Inspection, Aayaker Bhavan Annexe, New Marine Lines, Bombay.
2. The Director of Inspection, 1, Ganesh Chandra Avenue, Calcutta-13.
3. The Director of Inspection, 35, Haddows Road, Madras-5.
4. The Director of Inspection, N.I Circle, Block No. 13, Jamnagar House Hutment, New Delhi-11,
5. The Deputy Director of Inspection, 4/286, Nawabganj, Kanpur.

1700 SUPERSTRUCTURE AND OTHER MINOR COMPONENTS
1710 SUPERSTRUCTURE

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1710.1.	PL-87 (16)/75 dt. 26.3.75	Design Procedure for Shear in PSC Girders	1710/1
1710.2.	PL-87 (16)/75 dt. 1.8.75	Properties of Epoxies and their Usage in Cantilever Segment Construction	1710/3
1710.3.	N. 31/AS/366/W dt. 10.5.76	Coordination with P&T Deptt. regarding carrying Coaxial Cables over Bridges	1710/6
1710.4.	PL-67 (3)/77 dt. 8.3.77	Control on Stacking of Construction Materials on Bridge Decks	1710/6
1710.5.	NHIII/P/18/78 dt. 18.12.78	Special precautions during Construction of PSC Structures	1710/6
1710.6.	NHI/Misc/84/78 dt. 1.3.79	Decking of old Steel Girder Bridges	1710/10
1710.7.	NHVI-50 (3)/83 dt. 5.5.83	Taking of Levels on Top of Precast Girders before laying RCC Deck Slab	1710/11
1710.8.	NHVI-50 (3)/83 dt. 18.8.83	Design of Superstructure with RCC deck Slab on Precast Girders	1710/11
1710.9.	RW/N6/MP/1706/W dt. 3.10.83	Requirement of Test Certificates regarding high Tensile Steel	1710/11
1710.10.	RW/EI/PB/10/W dt. 22.10.83	Use of Shutter Vibrators while Concreting of PSC Girders	1710/11
1710.11.	RW/N-3&4/MAH/2379/W dt. 22.11.83	Problems and Practice of Grouting Cable Ducts in PSC Bridges	1710/12
1710.12.	NHVI-50 (3)/83 dt. 7.12.83	Effective Flange Width for PSC Girders	1710/13

No. PL-87 (16)/75

Dated the 26th March, 1975

To

All the Chief Engineers of States/Union Territories (connected with roads)

Sub : Design Procedure for Shear in Prestressed Concrete Beams of Road Bridges for all Bridge works on National Highways and other Centrally Aided Schemes-Provisional modifications to Clause 14 of IRC : 18-1965 (Design Criteria for Prestressed Concrete Road Bridges)-Reg.

The design rules laid down in Clause 14 of IRC: 18-1965 (Design Criteria for Prestressed Concrete Road Bridges-Post tensioned Concrete), hitherto being adopted for the design of shear in prestressed concrete bridge beams, have since been reviewed in this office in the light of the present state of the art of design practice. This review has revealed certain major deficiencies and anomalies in the aforesaid design rules.

2. In order to remove the above mentioned deficiencies and to ensure safety of prestressed concrete bridge beams in shear, a set of modified design rules have now been framed and enclosed in Annexure 'A', for adoption with immediate effect.

3. The modified design rules given in Annexure 'A' may be treated as a provisional modification to clause 14 (including sub-clauses 14.1 and 14.2 thereof) of IRC 18: 1965 and shall substitute the said clauses which shall be deemed inoperative for the purposes of design specifications of all P.S.C. bridge works on National Highways and other Centrally sponsored bridge works.

3.1. These provisional modifications shall be considered applicable only until the prestressed concrete code of the Indian Roads Congress, now under preparation is finalised, which will then supersede IRC : 18-1965, currently in force.

3.2. The design rules defined in Annexure 'A' shall substitute and supersede the said clause 14 only, without prejudice to any other stipulations of IRC : 18-1965 or any other IRC Codes. The shear design of reinforced concrete structural elements shall conform to IRC-21 in all respects and the applicability of the design principles defined in Annexure A shall not be extended thereto in any form.

4. The design procedure given in Annexure 'A' may be included in design specifications forming part of tender conditions of 'design and construction' type of tenders to be invited for bridge works.

Enclosure to letter No. PL-87 (16)/75 dt 26.3.75

ANNEXURE 'A'

DESIGN RULES FOR SHEAR IN PRESTRESSED CONCRETE BEAMS FOR ROAD BRIDGES

1. Scope

The specifications hereof shall apply to prestressed concrete beams in simple bending and not to slabs, deep beams and short cantilevers etc. for the design of which a reference may be made to specialist literature on the subject.

2. General

2.1. Webs of beams shall in all cases be provided with shear reinforcement.

2.2. Shear reinforcement shall be placed perpendicular to the axis of the beam.

2.3. Calculations for shear are required to be done for ultimate load conditions only.

3. Design Shear Force V :

3.1. The design shear at any section shall be calculated for ultimate loads specified in clause 12 of IRC : 18-1965

3.2. For sections with inclined prestressing tenders, the component of the effective prestressing force available (after deducting all prestress losses from the initial prestressing force) normal to the longitudinal axis of the beam shall be deducted from the total shear calculated according to 3.1 above.

3.3. Wherever applicable, the effects of variable depths of a beam shall also be taken into account.

4. Shear reinforcement as per design :

The shear reinforcement shall be calculated from the formula

$$A_v = (V - V_c) s / f_{y,d}$$

where

A_v = cross sectional area of one stirrup in cm^2

b = web width in cm

V = design shear force in kg

$V_c = 10.b.d$ in kg

s = longitudinal spacing of stirrups

f_y = specified yield or proof strength of reinforcement in kg/cm^2

(f_y shall in no case exceed 4250 kg/cm^2 even if high-strength deformed bars are used).

d = effective depth or 0.80 times the overall depth of the section whichever is more, in cm.

5. Minimum web reinforcement

The minimum percentage of web reinforcement shall be 0.25 as specified in clause 15 of IRC:18-1965 if it is mild steel. For high strength deformed bars, this minimum shall be 0.14 per cent.

6. Maximum shear force permissible :

In no case shall the design shear force V exceed the value of $0.1 F_c b.d$ where F_c is the specified cube of strength of concrete. If this is exceeded, the section shall be redesigned.

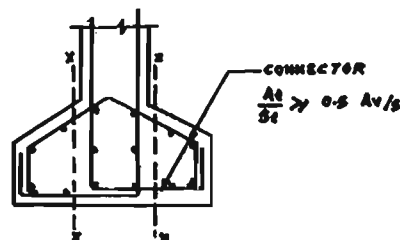
7. Connector Reinforcement :

For flanged beams including box girders, adequate shear connection across the vertical junction planes between tension/compression flanges and the web shall be provided by horizontal connector reinforcement. The area of such reinforcement per unit length of beam shall not be less than 50% of the web steel, both in top and bottom flanges, and for L-beams it shall not be less than web steel, both in top and bottom flanges. The spacing of the connector reinforcement shall in no case be greater than that of the main web reinforcement.

(Vide Fig. 1)

Note : Reinforcement if available at Section XX from considerations of flexural resistance may also be taken into account as connector steel independently, provided the requirements of anchorage and spacing are satisfied. Only when A_t required exceeds the tensile steel available, additional connector steel is to be provided. The top flange of beam would therefore require generally little additional connector steel.

ENCL. TO LETTER No. PL-87(16)/75 DATED 26.3.75



CONNECTOR DETAILS TENSION FLANGE
(BUILT) OF T-BEAM.

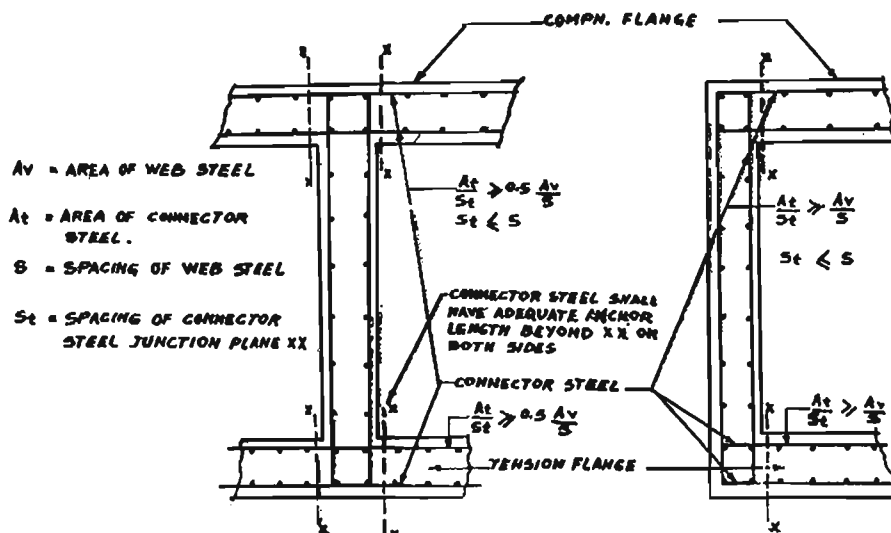


FIG.1 CONNECTOR REINFORCEMENT FOR COMPRESSION
FLANGE & TENSION FLANGE.

No. PL-87 (16)/75

Dated the 1st August, 1975

To

All Chief Engineers/Additional Chief Engineers of State PWDs/Union Territories

Sub : Article of interest in Engineering Journals properties of epoxies and their usage in cantilever segmental bridge constructions

Please find enclosed a copy of the extracts from the paper presented by Dr. M.G. Ernani Diaz during the Technical Session, at the New York Congress. These extracts appeared in FIP Notes 52, 1974 and deal mainly with tests carried out on various properties of the epoxies used and their variations with time and other factors. This article may serve as a useful guide in precast-prestressed-segmental construction type of bridges.

Enclosure to letter No. PL-87 (16)/75 dt 1.8.75

GLUEING TOGETHER OF PRECAST ELEMENTS IN BRIDGE CONSTRUCTION

One of the papers presented during the Technical Session at the New York Congress, described the construction work on the Rio-Niteroi Bridge. The paper was presented by Dr. M.G. Ernani Diaz (Brazil) and extracts, dealing with the glueing techniques, are given below :

The extracts deal mainly with the tests carried out on various properties of the epoxies used and their variations with time and other factors.

The Rio-Niteroi Bridge is part of the 13 km long roadway, crossing the Guanabara Bay, between the cities of Rio de Janeiro and Niteroi. For a length of nearly 8 km, over the sea, the superstructure consists of continuous box girders, built in prestressed concrete. The normal spans are 80 m in length and the width of the bridge is 26.6 m.

The prestressed spans were precast as two separate structures, joined together by transverse prestress after erection. Each span of 80 m was formed of 17 precast elements, with a maximum weight of 110 tonnes. The precast elements were cast one against the other, so that each contact surface of an element corresponded exactly to the contact surface of the adjacent element. Joints were formed with Epoxy resin, 1.00 to 1.50 mm thick. The main longitudinal reinforcement consists of cables with approximately straight trajectories. Each box girder normally has 42 cables (12 strands, 12.7 mm diam) as top reinforcement and 14 cables of the same type in the bottom. There are not inclined tendons in the webs, so that all shear must be carried by the stirrup reinforcement and the vertical prestressing bars and, of course, by the diagonal compressive stresses in the webs.

The bridge was erected in about 22 months, with the help of 4 erection gantries. A normal span of 80 m was usually erected in 5 days.

Structural behaviour of the glued joints

Usually in the design of glued bridges it is required that there be no tension stresses in the concrete under service loads. This requirement is important because of the necessary security against formation of bending cracks. In the glued joints, the longitudinal normal reinforcement has no continuity. As a result, at these joints, cracks have a tendency to develop under specific loads, higher than the service loads.

An important problem, is to know how a glued joint can influence a structure in its failure behaviour. There are two aspects to be analysed. One refers to the capacity of the joint to transfer only compression stresses, for instance, in a compression flange of a concrete I beam. In this case the conditions are favourable because the Epoxy glue has a higher compressive strength than the concrete and the stresses are perpendicular to the joint. On the other hand, the transfer of shear stresses in a web of a beam is far more important. This problem must be studied very carefully and the influence of the glued joint on the shear capacity of the beam has to be determined.

In the case of the Rio Niteroi Bridge, where no inclined tendons have been used in the webs, in the plane of the joint the shear must be entirely carried by the vertical components of the diagonal compressive stresses which exist in the web between the cracks, for loads near the failure of the beam. It is important to notice that even with inclined tendons in the webs, in almost all the existing glued bridges with constant depth, the shear must be carried essentially in the same way in the ultimate limit state, in view of the relative small part of the shear carried by the vertical components of the cable forces in that state. For bridges with variable depth, the problem has the same degree of importance because of the high shear stresses in the bridge webs.

Experiment on a model of a glued structure

In order to be able to examine the behaviour of a glued structure up to failure, an experiment was made on a structural model of the bridge to a scale of 1:6. The model represents the part of the bridge near the support and the corresponding 7 precast elements. This part of the structure is critical, because of the relative high values of shear force and moment. The main structural characteristics of the bridge were reproduced, although an I section for the model was adopted. The precast elements of the model were cast exactly as the bridge segments were cast, i.e. cast one against the other. In the contact surface of the web, a key was used in order to provide contact between the elements. The transverse reinforcement in the web of the model corresponds only to that used in the bridge to carry the shear forces, and not to that used to resist the bending moments in the plane of the web.

The failure in the model was due to web-crushing, which occurred prematurely, because the yield strength of the steel in the stirrups had been attained. The conventional tangential stress in the web was 6.8 MN/m², or 0.23 of the mean cylinder compressive strength of 29.5 MN/m². The glued joint did not interfere with the trajectories of the inclined web cracks and the web-crushing failure occurred as if the beam were monolithic.

The first detected bending cracks occurred at 93% of the computed cracking load, which was determined as the load which produced a bending stress in the tension flange of 3.9 MN/m^2 . The bending cracks have a tendency, as would be expected, to build up in the joint zone, where the normal reinforcement has no continuity.

Defining 'r' as the relation between the measured stresses in the stirrups and the theoretical stresses according to the classic Moersch truss theory, a value of 0.642 was obtained for r for the mean value of the measured stresses, and of 0.817 for the maximum measured stresses. This shows that glued joints do not interfere unfavourably with the behaviour of the stirrups. This is to be expected, as the direction of the cracks have not been changed by the joints.

Model for the investigation of a jointed web

For the evaluation of the behaviour of a glued web, it was necessary to provide a model of a web with a glued joint. For the Rio-Niteroi bridge, 3 types of test specimen were used. One type corresponded to a cylinder, 0.30 m high and 0.15 m diameter, with an inclined joint at midheight. This test specimen was used initially, but was abandoned owing to the difficulty of joining the two parts perfectly by a glued joint.

Later, a prismatic test specimen was developed with an X-form. In cross section it is $0.15 \text{ m} \times 0.15$ and has a height of 0.4 m. In the direction perpendicular to the plane of the joint, two concrete projections are provided, which allow the application of a normal stress to the joint during the glueing operation, which is carried out during the erection of the precast elements of the bridge. In order to allow perfect adjustment between the two parts of the test specimen, two keys were installed at the contact surface. These projections consist of two half spheres 20 mm diameter. Otherwise the joint surface is a plane. In a special series of tests, to reproduce the 3 keys used at the bridge 3 keys were provided at the glueing surface of the test specimen.

In the preparation of the tests specimen, initially one part is cast. After the first one is hardened the other is cast against the first. Before the glueing operation the two surfaces are sandblasted, similar to the sand-blasting of the precast elements of the bridge.

Properties of the cured Epoxy resin

The main properties of the cured Epoxy resin which should be examined for use in the erection of precast elements of bridges are as follows :

- a. Behaviour of the cured resin at high temperatures
- b. Pot life
- c. Resin strength
- d. Curing properties
- e. Viscosity
- f. Thixotropic properties
- g. Rating for compression test with glued test specimens
- h. Mix-sensibility of the Epoxy resin with the hardener
- i. Work conditions for mixing the resin and hardener

It is well known that cured resin is a material, which does not retain its properties under high temperatures. Therefore special care must be given to the investigation of the behaviour of the cured resin at high temperatures, as well as to the study of the creep values for service temperatures. For application at the Rio Niteroi Bridge a product was chosen, which had shown the best qualities in regard to maintaining the values of the modulus of shear, G, at high temperatures.

The strength of the cured resin was measured with the help of a bend test on a prismatic test specimen ($40 \text{ mm} \times 160 \text{ mm}$). For the bend test, a point load was applied in the middle of a 140 mm span. The tensile strength of the Epoxy resin system with an age of 6 hours varied very much depending on the air temperature and on the temperature of the mix. These values for a 6 hours old glue and for the work conditions at the bridge site in Rio de Janeiro (variable temperature from 13° to 39°C) varied between 8 MN/m^2 and 20 MN/m^2 . The 7 day old cured Epoxy resin presented a mean bending tensile strength of 29 MN/m^2 .

The variation of the tensile strength with the temperature of the 7 day old Epoxy resin used on the bridge was the following:

Temperature $^\circ \text{C}$	23	36.5	50	65.5
Mean bending tensile strength MN/m^2	30	27.4	25.5	25.4

The variation of the bending modulus of elasticity as a function of the temperature for the same 7 day old Epoxy system can be represented using the following values :

Temperature oC	23	36.5	65.5			
Modulus of elasticity GN/m2	6.3	4.46	2.21	1.95		

It was shown by Q. Guedes that the splitting tensile strength ($40 \times 40 \times 40 \text{ mm}^3$) is on the average, 28% of the bending tensile strength ($40 \times 40 \times 160 \text{ mm}^3$) for the above Epoxy system. It was also determined that the bending tensile strength was on the average 51% of the compressive strength ($40 \times 40 \text{ mm}^3$).

In a compression test on a test specimen having an inclined glued joint, it can be verified that a reduction in the compressive strength always exists in relation to the test values determined in monolithic test specimens. One of the most important required properties of the cured Epoxy resin to be used in segmental bridge construction is to keep this reduction very small. In the case of using a prismatic test specimen with an X-form, the compressive strength measured in test specimens with glued joints, varied from 90% to 98% of the compressive strength measured on monolithic specimens. The relation between the compressive strength measured for prisms with an X-form and the compressive strength measured for cylinders ($h=300 \text{ mm}/150 \text{ mm}$) has a mean value of 0.87. The larger values are obtained for the cylindrical test specimen. For example, the following values for the mean compressive strength utilizing a 7 day old cured resin were obtained.

Measured in monolithic cylindrical test specimen	53.4 MN/m^2
Measured in glued prismatic test specimen (a)	42.8 MN/m^2

Computed for monolithic prismatic specimen (b)

46.4 MN/m²

Efficiency = (a)/(b)

0.92

A very important consideration in the erection of the precast elements is to be able to predict the compressive strength of a glued test specimen, with a low-age cured resin. During erection, it is easy to measure the bending tensile strength of the cured resin, therefore the relationship between the bending tensile strength measured in a prismatic test specimen, using the X shape, was studied. The efficiency of a 7 day old cured resin had a mean value of 0.96. The prismatic test specimen with the X shape allows application of the variable normal stress at the joint during the curing process of the resin. In the erection of the precast elements of the bridge, the next element could be erected 4 hours after the adjacent unit. In this way, the stress at the joint is increased during a period in which the Epoxy system is not completely cured. For investigation of the influence of this fact, an investigation was made of the variation of the compressive strength measured in glued concrete prisms with two different conditions of joint prestress. In the first condition, 15 minutes from the mix-time, the joint was subjected to a compressive stress of 0.15 MN/m² and the prism was tested after 6 hours and 45 minutes (age of the Epoxy system 6 h 45 min). In the second condition, the joint was compressed to a stress of 0.15 MN/m² after 45 minutes, the compressive stress was then increased to 1.0 MN/m² and after 6 hours 45 minutes the prism was tested (age of the Epoxy system 6 h 45 min). It was determined that the compressive strength with the second condition of prestress was 1.29 times greater than the first condition, i.e. an increase of the compressive stress in the glued joint during the process of curing of the resin is not prejudicial.

Because 3 keys exist at the contact surface of the bridge precast elements, a series of experiments was conducted using a prismatic test specimen having 3 keys at the joint. It was shown that the prism with keys at the joints has a mean efficiency of 0.42 even without resin in the joint.

Investigations concerning erection problems

At the beginning of construction, investigations were made to determine if it was necessary to undertake any treatment of the contact surfaces of the precast elements, where a layer of talc and soap had been used to prevent bond between the old and the new concrete. It was seen that the test specimens, without any joint treatment, had compressive strength values which were 78% of the compressive strength values obtained with test specimens with washed and brushed joints. In view of these results it was decided that the contact surfaces would be sand blasted in the construction yard.

The control of the Epoxy system during the erection was done essentially through the determination of the bending tensile stress (40 x 40 x 160 mm³). Three test specimens were prepared for each glued joint using the Epoxy system adopted for the bridge. They were tested near the erection site, along with the erection of the precast elements. The main idea was to control the curing of the Epoxy system and, in case of doubt about the quality of the glue, to stop the erection. In this way, any construction problems associated with a glued joint subjected to the action of high values of forces could be avoided.

The curing process of the utilized Epoxy system in the first hours was very dependent on the air temperature, the temperature of the mix and even the material. In view of the fact that erection went very fast (it was usually possible to erect a precast element every 6 hours) and occurred during the day and night it was essential to control the curing of the Epoxy system, and to check to see if the shear force in any given joint could be carried with sufficient security with the available tensile strength of the cured resin.

Another problem investigated was the influence of wet surfaces on the results of compression tests. Below are the computed efficiencies for a seven day old Epoxy, obtained with the help of glued concrete test specimens with different joint surface conditions:

	Efficiency
wet surface	0.55
humid surface	0.58
humid surface dried with anhydrous alcohol	0.72
humid surface dried with anhydrous alcohol and heat	0.92
surface dried with air spray	0.37

It can be noted that glueing on wet or humid surfaces should not be allowed. Because it is possible that the surfaces could become wet during a rain shower, a process was developed to dry the contact surfaces. This process consists of removing the water on the surface with a cloth, spraying anhydrous alcohol over the surface and burning this alcohol. It was also seen that a delay in the glueing operation had no negative influence on the compression test values. It was feared that water, by capillarity, would come to the contact surface, harming the curing of the glue.

It was also established that, if the contact surface is dry but yellowish, because it has been contaminated by water containing rust (iron oxide), the concrete strength measured in glued test specimens is 90% of that of test specimens with clean surfaces. In this case, the contaminated surface of the precast elements were cleaned by sand blasting at the erection site.

In a few cases, during the erection the contact surfaces were contaminated with oil from the prestressing jacks. It was established that cleaning the oil with anhydrous alcohol and sand blasting the surfaces gave satisfactory results for the compression strength.

Injection of prestressing ducts and joint waterproofing

During the erection, where too much Epoxy is used, the mix is squeezed and can be forced inside the prestressing ducts, preventing the cable threading operation. The recommended technique is to thread a wire brush from the face of the precast element through the ducts and clearing them, immediately after erection.

In cases where the design provides a cable distribution having cables side by side at the glued joints, there will be passage of mortar between the ducts at the joints during grout injection. In this case it is necessary to use simultaneously two injection pumps, to ensure that the two ducts are completely filled with mortar. The design must provide, however, that only the same two cables can touch at the glued joints, because otherwise more injection pumps would be required.

As an additional security against the penetration of water at the joints, the superstructure of the Rio-Niteroi Bridge received a coal-Tar-Epoxy waterproofing membrane at the joints.

No. N31/AS/366/W

Dated the 10th May, 1976

Sub: Carrying coaxial cables over the proposed bridge across Gangadhar River on NH-31 in Assam

Indian Posts and Telegraphs Department were requested under this Ministry's letter of even no. dated 23rd April, 76 to send their requirements in the form of ducts etc. to be provided in the new bridge being constructed across Gangadhar river on NH-31 in Assam. Director General Posts & Telegraphs under letter No. 31-2/65-TPL (CX) dated 30th April, 76 have informed that since the proposed bridge across Gangadhar river lies in an area which is almost on the border, a coaxial scheme as and when it materialises is likely to avoid this route.

2. Indian Posts & Telegraphs Department have however desired that in all future cases in which the major bridges are to be constructed on important National Highways, P&T Department may also kindly be consulted for indicating their requirements in the form of ducts etc. to be provided on the bridges.

3. All the technical officers of the Roads Wing are requested to keep the instructions contained in para 2 above in view while sanctioning the estimates for major bridges on National Highways and take suitable necessary action.

No. PL-67 (3)/77

Dated the 8th March, 1977

To

All State Chief Engineers/Addl. Chief Engineers (dealing with Highways financed from Central Funds)

Sub: Instructions regarding stacking of constructional material on bridge decks during construction

In order to facilitate construction of superstructure spans, often constructional materials like sand, coarse aggregate, steel form work, precast elements, etc. are stacked on the already completed portion of the bridge decks. In this context it is necessary to emphasise that the field staff should exercise a strict control on the stacking of the constructional materials on the completed decks so as to ensure that under no circumstances the loads sustained by the bridge decking generate moments, shears, etc. larger than that provided for in the approved designs. As the extent of stacking of materials would need to be calculated for each bridge case, it is generally felt that it may be desirable to avoid as far as possible stacking of materials on completed bridge decks. However, under no circumstances shall such stacking be permitted as to impair the safety of the structure.

No. NHIII/P/18/78

Dated the 18th December, 1978

To

All Chief Engineers/Addl. Chief Engineers of States/Union Territories-Public Works Departments dealing with Roads

Sub: Some guidelines for ensuring safety to men and materials during the construction of bridges-Special Precautions for Prestressed Concrete Structures

Bridge construction, right from the foundation stage upto its final completion, involves numerous operations, and constitutes one of the most difficult tasks in civil engineering jobs. Its execution calls for a very careful planning and handling by really competent and experienced technical personnel to avoid any mishaps leading to injury to workmen, loss of life or damage to structural components, with a consequent severe set back to the progress of work, lot of public criticism, prolonged enquiries and so on. A thorough knowledge of safety precautions is a must for ensuring a smooth progress and successful completion of the job.

2. Keeping the above requirements in view, a number of circulars have been issued by the Ministry in the past, some of which are now listed in Annexure I, for ready reference. The I.R.C. publication embodying the M.O.T. Specifications for Road and Bridge Works also covers some of the safety measures required to be taken on bridge works. In addition, a list containing various standards on safety measures published by the Indian Standards Institution from time to time, is furnished in Annexure II. The State Chief Engineers dealing with

road bridges are requested to bring the same to the notice of their field staff for information, guidance, and strict compliance. Some of the States might have already issued more comprehensive and detailed instructions on this subject. If so, they are requested to kindly furnish to this Ministry copies of such instructions, to facilitate the pooling of information and for disseminating the same amongst the other States.

3. Barring a few cases of departmental execution, normally most of the bridge works are got executed through contractors, and the departmental site engineer, while confining his supervisions to compliance with the working drawings made available to him, is generally prone to pay less attention to the mode of execution, the equipment used and the procedure followed by the contractor, either due to ignorance or a tendency to shift the responsibility to the contractor for successful completion of the job, particularly on major projects handled by big contracting firms (though the contracting firms are no doubt fully responsible for all sizes of jobs). Sometimes, the site engineer is blissfully ignorant of the various prestressing operations, the jack pressures and elongations etc., which are left to be taken care of by the firm's site engineers. If such things go unchecked, even major firms can commit very big blunders, such as concreting a prestressed beam without vibrators, carrying out launching operations without ensuring proper safety precautions etc., all of which may lead to very serious disasters. There is, therefore, an urgent need to train and educate the departmental staff properly through detailed circulars, detailed instructions furnished on all the working drawings, and a liberal supply of codes and books for their guidance. The field man must know what to look for and control. Proper detailing on drawings is even more important than designs.

4. While stressing the importance of compliance with the various previous circulars/codes/specifications mentioned in para 2 above, a few guidelines to be followed for ensuring safety in the construction of prestressed concrete bridge components are now furnished in Annexure III. The State Chief Engineers may, if desired, enhance or elaborate the same, before circulating amongst all the departmental officials.

Enclosures to letter No.NH III P/18/78 dt. 18.12.78

ANNEXURE I

LIST OF CIRCULARS ALREADY ISSUED BY THE MINISTRY OF SHIPPING & TRANSPORT (Roads Wing) ON SAFETY IN CONSTRUCTION

- (1) NHV—11 (6)/73 dated 19.11.74 "Ensuring Safety of Bridge Structures—Guidelines for Engineers."
- (2) Deleted Refer to IRC : 87-1984
- (3) NHIII—23 (123)/72 dated 20.3.76 "Regulation of traffic on National Highways (i) in the event of flood breach or damage due to certain other reasons or (ii) when widening/reconstruction of any existing C.D. structure is in progress or construction of a new structure on an existing section."
- (4) PL-67 (3)/77 dated 8.3.1977 "Instructions regarding stacking of constructional material on bridge decks during construction."

ANNEXURE II

LIST OF INDIAN STANDARDS ON SAFETY IN CONSTRUCTION

1.	IS : 3696 (Part I)—1966	Safety code for Scaffolds and Ladders: Part I—Scaffolds
2.	IS : 3696 (Part II)—1966	Safety Code for Scaffolds and Ladders: Part II—Ladders
3.	IS : 3764-1966	Safety Code for Excavation Work
4.	IS : 4081-1967	Safety Code for Blasting and Drilling Operations
5.	IS : 4130-1975	Safety Code for Demolition of Buildings (First Revision)
6.	IS : 4138-1967	Safety Code for Working in Compressed Air
7.	IS : 4756-1968	Safety Code for Tunneling Work
8.	IS : 4912-1968	Safety Requirements for Floors and Wall Openings : Railing and Toe Boards
9.	IS : 5121-	Safety Code for Piling and Other Deep Foundations
10.	IS : 5916-1970	Safety Code for Constructions Involving use of Hot Bituminous Materials
11.	IS : 7293-1974	Safety Code for Working with Construction Machinery
12.	IS : 7969-1975	Safety Code for Storage and Handling of Building Materials

ANNEXURE III

GUIDELINES FOR SAFETY IN CONSTRUCTION OF PRESTRESSED CONCRETE BRIDGES

1 Introduction

The art of prestressed concrete construction is a specialised job, requiring a high order of workmanship, quality materials and equipment. The constructional operations involve sophisticated techniques which have a relatively high potential of hazards if they are not well planned and all safety measures not undertaken. Numerous cases have come to notice where constructional lapses have resulted

in serious failures resulting not only in loss of materials and equipment but also human life. Whereas, the entire construction programme for the successful completion of the work is the sole responsibility of the contracting firm, it is also incumbent on the departmental staff to be fully conversant with all the operations to oversee the procedures to ensure that no accidents occur at site which may ultimately cause not only loss of materials and at times human lives but also delay the progress of the work. In order to ensure that all prestressed concrete works are carried out with the utmost care conforming to prescribed specifications and adopting foolproof techniques, some broad guidelines have been evolved for guidance of the field engineers. Mere compliance with these guidelines will not, however, absolve the contractor of the entire responsibility for a successful and safe completion of the work.

2. General

2.1. It shall be ensured that the general safety precautions as applicable to any civil engineering construction relating to false work, centering, shuttering, excavation, protection against floods, rain, etc., shall be adequately taken care of.

2.2. Complete and detailed working drawings for carrying out the temporary and permanent works shall be available at site.

2.3. All works shall be carried out in accordance with the prescribed specifications and strict quality control to meet the specified standards.

2.4. Any change in the construction programme not reflected in the design while seeking approval, shall be examined *denovo* for ensuring the safety of the structure.

2.5. All works shall be executed under the direct supervision of competent engineering departmental officers, as well as contractor's site engineers.

3. To ensure safety of all form works, necessary guidance may be had from item No. 2 of Annexure I, and clause 1500 of Ministry of Shipping & Transport (Roads Wing) Specifications for Road and Bridge Works, for concrete jobs. In addition, casting bed required for precast P.S.C. beams, or centering for cast-in-situ P.S.C. beams need special attention. The end supports of casting beds for precast beam should be capable of supporting full beam weight when prestressed. The centering for in-situ work should be sturdy enough to withstand the heavy vibrations during compaction.

4. Prestressing for structures :

4.1. The design of prestressed concrete structures should not only satisfy the various loading conditions during service but also cater to the various constructional loads and forces that would come into play during the different stages of construction leading to the completion of the work.

4.2. All aspects relating to materials, (viz. prestressing tendons, sheaths, anchorages, grout) tensioning equipment, tensioning procedure, grouting, etc., shall conform to the provisions contained in section 1800* of the Ministry of Shipping & Transport (Roads Wing) Specifications for Road and Bridge Works, and the approved drawings for the project.

* Clause 1807 regarding grouting is being revised to conform to Ministry's circular No. NH VI-50 (3)/83 dated 2nd Nov, 1983.

4.3 Special precautions to ensure safety during construction :

While planning the various constructional operations involved in the execution of prestressed concrete works utmost and careful attention must be paid to the following requirements to ensure safety.

4.3.1. Stressing schedule :

Prestressing involves the application of very high forces and high pressures in the hydraulic pipelines and jacking devices and calls for appropriate precautions to prevent accidents. For this purpose, the following should be given special attention :

- (i) The various procedures laid down in the stressing schedule shall be strictly adhered to;
- (ii) The sequence of stressing individual tendons at various stages as specified in the stressing schedule shall be strictly followed;
- (iii) The concrete strengths as specified in the designs for prestressing at various stages shall be ensured by checking the test cubes;
- (iv) In cases where pre-loading has been specified by the designer before prestressing is resorted to, the same shall be ensured;
- (v) The removal of formwork/scaffolding shall strictly follow the indications given in the stressing operations;
- (vi) All precast members shall be designed to withstand all stresses likely to occur in the member during handling, placing and assembly, and subsequent prestressing, to ensure the stability and safety of all members; and
- (vii) The stressing operations should be carried out by experienced personnel under a competent supervisor.

4.3.2. Stressing equipment :

All temporary strengthening devices, handling appliances (lifting equipments viz. cranes, jacks, pullies, hoists, etc), temporary supports shall be designed to withstand safely all the effects due to loads and forces coming into play during the various constructional operations. In addition, the following checks shall be made before the equipments are actually used on the work :

- (i) The stressing equipment shall be thoroughly checked to satisfy the manufacturer's instructions for operations and the same shall be strictly followed.
- (ii) The pressure gauge of the pump shall be checked and shall be calibrated where necessary.
- (iii) A proper arrangement for handling the jack shall be made to avoid any mishap. For example : A small jack can be handled manually but for a large jack some suitable mechanical device will need to be made.
- (iv) It is desirable that all working personnel wear gloves when handling prestressing tendons.
- (v) Temporary suspension of any other construction operations shall be made which might warrant a workman to stand directly behind the jack during stressing.

- (vi) Utmost care shall be taken when handling coils of high tensile wire or strand, as this may whip back if not securely bound.
- (vii) Wedges and the inside surfaces of anchorages shall be cleaned so that the wedges are free to move inside without hindrance.

4.3.3. Stressing Operation :

- (i) Stressing shall be carried out as per manufacturer's instruction manual.
- (ii) During stressing standing behind the jack as well as behind the preblocked anchorage being stressed from the other end shall be forbidden.
- (iii) Side ejection of the jack can be caused by poor concrete in the anchorage zone or by insufficient corner or edge reinforcement, which shall be avoided.
- (iv) Sudden dewedging or a broken wire in a cable can cause ejection of the jack and wedges and shall be avoided.
- (v) Handrail arrangement must be provided if working personnel are likely to fall when jumping clear of the jack, as may happen in the case of bridge decks constructed by the cantilever technique.
- (vi) Workmen must not be allowed to become casual just because they have stressed hundreds of tendons successfully before.
- (vii) Hydraulic hoses shall be examined regularly as a matter of necessity and, likewise, oil in the pump shall be examined regularly.
- (viii) Hydraulic pressure pipes shall be checked for flaws or bubbles after each stressing operation.
- (ix) Double-check the wedges or grips for fixing of tendons to the prestressing jack.
- (x) Tension the tendons to a low initial stress and then recheck the positioning of wedges or grips as also of the jack.
- (xi) The jack shall not be hit with a hammer to adjust its alignment when the load is on.
- (xii) A competent person shall always be available at the non-jacking end to check on anchorages during stressing, if one end stressing is adopted.
- (xiii) Detensioning shall be done gradually.

4.3.4. Launching the precast girders :

The operation of launching precast prestressed concrete girders is basically a specialised art which varies from one system to another, depending upon site conditions, facilities available with the contractors, etc., and as such it is difficult to offer specific guidelines in this regard. It shall, however, be ensured that the launching beams and trusses and all connected structural members are structurally safe during the various launching operations.

It is also necessary that the prestressed girder and the supporting system is duly designed for loads and forces likely to come into play during the various operations connected with launching viz. lifting, side shifting, transporting, launching in position, etc.

All launching operations shall be avoided during high winds.

4.3.5. Handling and erection :

Where a precasting technique is used for construction, all lifting operations, all temporary situations shall be analysed in advance to ensure safety. The following shall also be considered during handling and erection operations :

- (i) The aim of the precaster shall be to devise a system requiring minimum amount of handling of a precast unit from the casting bed to its final location.
- (ii) Before handling, it shall be checked that the concrete has gained sufficient strength to resist handling stresses, particularly when accelerated curing techniques are used.
- (iii) A check shall be made to ensure that the pressure developed below the erection equipment base does not exceed the permissible bearing pressure of the soil.
- (iv) In case of erection of bridge elements, with a launching truss, the stability of the approach embankment shall be checked for the safe movement of the launching truss.
- (v) If shifting of the precast units is done by mounting on trolleys, then their stability against toppling over shall be checked.
- (vi) In case of deep girders, the top flange of the girders shall be stiffened adequately, if necessary, to prevent buckling during erection.
- (vii) Adequate hairpin mesh shall be provided over the area of support during erection to prevent bursting cracks developing in the concrete.
- (viii) Lifting of the girders (and similarly at the time of lowering) shall be done gradually at both ends and with equal increments aiming to keep the girder horizontal.
- (ix) Sometimes, the precast unit is required to be supported temporarily before placing it on bearings. In such cases, the adequacy of the device providing such support shall be checked.
- (x) The stability of all temporary works shall be ensured.
- (xi) If jacking or any temporary support is provided under the end diaphragm of the structure, then the structural adequacy of the end diaphragm shall be ensured to cater for the reaction developing during jacking operation.
- (xii) It shall be ensured that jibs and booms of cranes do not come into contact with overhead electric transmission lines.
- (xiii) Only one person shall signal to the operator of the lifting appliance at the time of hoisting/lowering.
- (xiv) No mobile lifting appliance shall be used on a sloping surface until adequate precautions are taken to ensure stability of the equipment.

- (xv) Mobile cranes shall not be operated while being parked on loose earth or slushy area.
- (vi) If a chain or rope of a lifting machinery has a knot in any of its part, then this shall not be used for lifting until the knot is removed.
- (xvii) All chains, ropes and lifting gears shall be checked and tested by a competent person at regular time intervals.
- (xviii) When mobile lifting equipment is not in operation, the boom must be lowered to the horizontal position and tied securely in place to prevent accidental drop.
- (xix) No person shall be present under a load which is suspended by a lifting equipment.
- (xx) Hoisting machines used to lift a load shall be such that the load to be lifted falls within their working capacity and not overloaded.
- (xxi) Pulleys used for hoisting loads shall be examined at regular intervals to see if any undue wear has taken place.
- (xxii) Correct lifting equipment shall be used to avoid uncalled for torque and eccentric loading on all components.

4.4.6. Other precautions :

- (i) Fencing arrangement shall be provided in accessible area at the back of the jack so that no passers by can appear suddenly behind the jack. Also warning sign board shall be put up, as a safe guard for stressing operations.
- (ii) It shall be ensured that adequate precautions are taken to restrain any possible skewing or lifting of the stressing equipment during tensioning or release.
- (iii) No prestressing steel shall be permitted to be used for earthing electrical equipment of any kind.
- (iv) All equipments must be kept thoroughly clean and in a workmanlike condition (as badly maintained equipment always gives rise to trouble and consequently is dangerous).
- (v) After stressing, the wires or strands behind the anchorages shall be cut off preferably with a disc cutting tool or a cropper or a snapping off tool.
- (vi) A clear eyeshield shall be worn by workmen during grouting operations.
- (vii) Before grouting, all ducts shall be checked to see that none are blocked.
- (viii) If possible, only threaded connectors shall be used between grout nozzles and grouting points (A sudden spurt of grout under pressure can cause severe injury, especially to eyes).
- (ix) One should not peer into duct bleeders to see if grout is coming through. Grout may jam temporarily and as pressure is applied, may spurt suddenly from the bleeders, or the far end of the duct, causing serious injury.
- (x) When grouting over railways or public roads or other public places, precautions shall be taken to see that escaping grout does not cause a hazard to traffic below.

1710.6.

No. NHI/Misc/84/78

Dated the 1st March, 1979

To

The Chief Engineers of States and Union Territories (dealing with National Highways and other Centrally Sponsored works)

Sub: Decking of old steel girder bridges

Some time back, an abandoned railway bridge (with steel girders) was taken up for re-decking for the passage of road traffic. The re-decking over the steel girders was done with precast RCC slabs with a view to completing the work quickly. However, soon after opening the bridge to traffic, many of the precast concrete slabs cracked at different places. The cause of this failure was investigated by an expert committee and it was found that many of the precast girders had not made proper contact with the intermediate steel girders, and, therefore, the effective span of the slab was more than double that was assumed in the design. In order to avoid any such failures and the consequent infructuous expenditure in future, it is suggested that whenever redecking of old bridge with steel girders is taken up, it will be desirable not to adopt precast RCC slabs for the decking, but to go in for cast-in-situ decking to ensure its proper seating over the girders and, if possible, make the deck also composite with the girders by the use of shear connectors.

1710.7.

No. NHVI-50 (3)/83

Dated the 5th May, 1983

To

All Chief Engineers of States/Union Territories dealing with N.Hs. and other Centrally sponsored roads
Chief Engineer, Pamban Bridge Project

Sub : Taking of levels on top of pre-cast girders before laying RCC deck slab

In case of bridges where R.C.C. deck slab is to be provided over pre-cast girders, levels are to be taken on top of the girders in order to determine extra depth of slab required to meet different magnitudes of hogging in individual girders due to difference in their ages, so that the top portion of the deck slab can be made level. For this purpose it is also necessary that the design calculations of girders are checked to see whether they can take the additional dead load. It is requested that this may kindly be got verified in the Office of the State C.E. before permitting the RCC deck slab to be laid.

1710.8.

No. NHVI-50 (3)/83

Dated the 18th August, 1983

To

All Chief Engineers of State/Union Territories dealing with N.Hs and other Centrally sponsored roads
Chief Engineer, Pamban Bridge Project

Sub : Design of superstructure with RCC deck slab entirely over pre-cast girders

Wherever designs of superstructure with RCC deck slab and pre-cast prestressed girders are proposed to be adopted, the entire thickness of RCC deck slab should be over the top flange of pre-cast girders.

1.2. A combination of thickness of top flange of precast girder and a small thickness of cast-in-situ slabs to form the deck slabs under working load condition is not acceptable to this Ministry.

2. The above point may please be incorporated in the NIT for the bridges financed either in part or in full from Central Fund to be issued in future.

1710.9.

No. RW/N6/MP/1706/W

Dated the 3rd October, 1983

As desired by ADG (B), two additional paras as given below regarding testing of High Tensile Steel to be used in the construction of Prestressed Concrete Bridges, should be added while according approvals for the superstructures of such bridge works on National Highways :

1. The values of the Ultimate Tensile Strength and Young's Modulus for the High Tensile Steel adopted in the design are allowed for design purposes only. The firm may, however, be asked to produce test certificates in support of these values before execution.

2. Further, it is requested that representative samples of High Tensile Steel to be used on this bridge should be got tested independently by the State PWD to verify the properties assumed in the designs.

1710.10.

No. RW/EI/PB/10/W

Dated the 22nd October, 1983

To

To all the Technical Officers in the Bridges Directorate at Headquarters

CIRCULAR

As desired by Additional Director General (Bridges) an additional para as given below, regarding the casting of pre-stressed concrete girders, should be added, while according approval to the design of pre-stressed concrete girders for bridge works on National Highways and other Centrally financed works :

"For ensuring good compaction of concrete in prestressed concrete beams either precast or cast in situ, it is absolutely essential to use shutter vibrators. The use of needle vibrators, however, may also be permitted with extra precaution and after ensuring that the vibrator does not touch or damage the sheathing. Design of shuttering should be adequately safe for the use of shutter vibrators in addition to other aspects with stiffeners at appropriate intervals. The location of shutter vibrators shall be fixed carefully for obtaining dense compacted concrete.

The first precast girder, shall be inspected by a senior officer of the State P.W.D. thoroughly after casting for any defect due to shuttering etc. Necessary modifications, if any, have to be carried out before casting of the remaining girders."

1710.11.

No. RW/N-3&4/MAH/2379/W

Dated the 22nd November, 1983

Sub: Problems and practice of grouting of ducts for post-tensioned cables in prestressed concrete Bridges

As desired by Additional Director General (Bridges), copies of D.O. letters dated 17th August, 1983 from Additional Director General (Bridges) to Dr. Ing. Fritz Leonhardt, his reply dated 26th August, 1983 and ADG (B)'s letter to him dated 2nd September, 1983 on the above subject are enclosed herewith to all Officers of the Bridges Directorate for information and guidance.

Enclosures to circular No. RW/N-3 & 4/MAH/2379/W

Dated the 22.11.83

D.O. LETTER NO. RW/N-3&3/2379/W DATED THE 17TH AUGUST, 1983 FROM ADDITIONAL DIRECTOR GENERAL (BRIDGES) MINISTRY OF SHIPPING & TRANSPORT (ROADS WING) TO DR. LEONHARDT, STUTTGART-I (WEST GERMANY)

I have great pleasure in seeking your valuable opinion and advice on the problem faced in grouting of the post-tensioned cables in the prestressed concrete beams of an important bridge situated on the sea coast. Our experience of another bridge with prestressed concrete superstructure completed only about 15 years ago near the sea at Bombay across a creek, has been sad on account of corrosion of the prestressing cables, some of which have also snapped endangering the safety of the structure. I am, therefore, impelled to refer this instant bridge under construction to avoid repetition of mistake affecting the durability and long-term serviceability of the bridge.

2. To describe briefly, the superstructure consists of two precast prestressed concrete beams with simply supported spans of nearly 50 metres each, launched into position after initially tensioning the cables required for supporting the self-weight and the deck slab. The deck slab of reinforced concrete laid over the beams is to act in composite with the beams by the provision of shear connectors. For imparting subsequent stages of prestressing, cables are anchored in the top flanges of beams (in the deck slab portion) after superimposed dead loads like wearing coat, hand-rails etc. are applied. These are about 30% of the total number of cables, which were left in position during the concreting of the precast beams in order that they may be tensioned finally for resisting the live loads, etc. and the tension is allowed in the design under service conditions. Freyssinet system of prestressing with each cable comprising of 24 nos. of 8 mm dia, parallel wires is adopted. Accordingly the problem has arisen for tensioning the cables at the final stage prestressing, as stated in the next para.
3. These cables were left inside the metallic sheathing lining the ducts in the forms before concreting of the beam in the precasting yard and the usual precaution of sea-saw operation (to loosen cables) was taken during concreting of the beam to safeguard against the cables getting stuck up by leakage of mortar. But while stressing and grouting the previous stage prestressing cables, some of which were also grouped in the mid span portions, apparently no step was taken to ensure freedom of the balance cables to be stressed after launching of the beams, etc., as mentioned above. Further, the anchorages of these cables were sealed temporarily with lean concrete for allowing the trolley line on the beams previously launched for carrying the beams to be launched in the subsequent spans. Now during the final tensioning of these cables, barring a few cables stuck up, the rest have been stressed more or less to the required elongations and forces. But the real difficulty came up in the process of grouting of these cables. Prior to grouting, flushing by water in the ducts indicated blockages which did not permit escape of the water through the exists provided or through the other ends. It is suspected the grouting mortar of the cables previously tensioned penetrated into the ducts of these cables. We are unable to locate the points of such blockages nor remove the obstructions otherwise. Any crude method of locating the blockades and chipping and concrete at these points to free the cables, however, is not desirable due to the risk of damaging the structure. Some literature published regarding the radiographic examination of the cable profile adopted in developed countries as well as sonic devices is available, but their use is not known in our country. I am confident that such problems might have been encountered in your country and naturally, we would like to be guided by your experience in the solution of the problem.
4. Another concomitant issue is that delay by a few months has taken place in grouting of the tensioned cables (though grouting is insisted within 48 hours) because of the deleterious consequences feared in an aggressive marine environment, like ordinary corrosion as well as probably stress corrosion. It may be stated for your kind information that the tendons are not galvanized or epoxy coated and specially treated for eliminating corrosion. What measures are warranted under the circumstances to inhibit the occurrence of corrosion of cables? I should like to be enlightened whether there is any practice in your country to give such protective treatment against corrosion of cables.
5. I would also like to know how to ensure that grouting has been effectively carried out and cables are fully covered inside the ducts without any voids even after the shrinkage of the grout, etc.
6. I shall be obliged, if you can kindly spare your precious time and offer us the benefit of your experience in this connection.

Dr. Leonhardt's DIO. letter dt. 26.8.1983 addressed to ADG (B)

I have received your letter of 17th August, 1983 and understand your worries. You described typical deficiencies of prestressed concrete beams designed following the French way, using tendons which are anchored at the surface of the roadway slab. We have abandoned this type of design many years ago. In addition, we have specified rather strong and absolutely tight ducts in order to prevent any intrusion of mortar. We have further very strict specifications for the grout and for the grouting process because all that is most important for the durability of the bridges.

I am sending to you our latest specifications for the grout, part 5 of DIN-4227.

In the case which you describe, it is most important to remove the blockade of the cables. This can perhaps be reached by repeated stressing and unstressing, by which the blocking mortar can be broken and grinded and then spilled out by water jetting. If this does not succeed, then it would be necessary to find the location of the blockade at least approximately by measuring the elongation of the cable for a known stressing force. Then one should drill holes from the outside to the duct on both sides of the blockade, so that the grout can be injected through these drilled holes. In such cases we use the vacuum method which makes sure that all voids will be filled.

The delay of the grouting can, of course, have caused corrosion of the wires in the ducts and therefore, these wires should be specially treated before the grouting, may be by flushing with lime white wash, which has an alkaline PH-value.

I have tried to contact Professor Rehm of our Otto-Graf-Institut, University of Stuttgart, who is our specialist for these problems. But, unfortunately, I can not reach him before the middle of next week. His advice may be helpful in this matter.

Successful grouting requires a lot of special knowledge and also of very strict control. You may perhaps engage one of our specialists for informing some of your engineers. Mistakes in grouting have also been made in our country, and we have found quite a number of bridges where the ducts had not been perfectly filled with grout and the prestressing steel corroded. This was mainly due to lack of diligence at the execution of the work. Personally, I suggest more and more to use the vacuum method, for which the patents expired about a year ago, so that it is now available for general use.

I am sorry that I cannot help you in a better way at the moment. As soon as I can reach Professor Rehm, I shall ask him to write to you his advice for the anti-corrosive treatment of such wires.

D.O. LETTER NO. RW/N-3&4/2379/W DATED 2ND SEPT. 83 FROM ADDL. DIRECTOR GENERAL (BRIDGES), MINISTRY OF SHIPPING & TRANSPORT (ROADS WING) TO DR. LEONHARDT, STUTTGART (WEST GERMANY).

I acknowledge with thanks the receipt of your kind letter dated the 26 th August, 1983 alongwith one copy of the latest German specifications for the grout for the ducts of prestressed concrete cables. Many thanks for your prompt reply. We have really benefitted from your advice in the problem.

2.1. The course of action suggested by you regarding the removal of blockade in the cable ducts was thought of by us also. Practical difficulty in carrying out the field operations after the beams are already launched in position is hampering our move in this matter.

2.2. We would like to get the literature about the vacuum method, referred to in your letter.

3. As regards corrosion of wires in the ducts caused by the delay in grouting, we would like to hear further your esteemed views after contacting Prof. Rehm as soon as possible.

4.1. Specifications for the grout contained in latest DIN 4227 would be made use of after getting translated from German.

4.2. To obtain an accurate English translation of any technical document in German is somewhat difficult in our country. In case an English translation of this particular German Specification is available, kindly arrange to send a copy for our immediate use.

5. It has also been educative to note the design with anchorages for tendons at the surface of the roadway slab being abandoned in your country.

6. We are, indeed, grateful to you for all the pains taken for rendering your quick and valuable advice. Hope to hear from you further.

1710.12.

NO. NH VI-50 (3)/83

Dated the 7th December, 1983

To

The Chief Engineers of all State PWDs and Union Territories dealing with NHs and other Centrally Financed roads, Chief Engineer, Pamban Bridge Project

Sub : Width of effective compression flange for prestressed concrete girders

In the IRC design criteria for prestressed concrete road bridges (post tensioned concrete) nothing is specified regarding the width of effective compression flange of 'T' beams in prestressed concrete to be considered in design. The relevant provisions in IRC Bridge Code Section III—Cement Concrete (Plain and reinforced) for T-beams shall apply to prestressed concrete girders also till a new code for prestressed concrete is finalised.

1710/14

The above points may please be incorporated in the NIT to be issued for bridges financed in full or in part from Central funds in future.

2. The above comments will be applicable for bridges in progress for which superstructure designs are yet to be submitted to this Ministry.

1720 EXPANSION JOINTS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1720.1.	NHVI-50 (3)/83 dt. 23.2.83	Expansion Joints and Wearing Coat for Bridges Costing more than Rs 10 lakhs	1720/1

No. NHVI-50 (3)/83

Dated the 23rd February, 1983

To

All Regional Officers/Engineer Liaison Officers, Ministry of Shipping and Transport (Roads Wing)

Sub : Expansion joints and wearing coat for bridges costing more than Rs 10 lakhs

It has been observed that expansion joints for bridges and wearing coat of many bridges even major constructed by reputed contracting firms are not properly done leading to inconvenience for traffic and maintenance problems even after a year of opening the bridge to traffic. It is, therefore, requested that in respect of each of the bridge each costing more than Rs 10 lakhs, Regional Officers/Engineer Liaison Officers shall invariably associate themselves with the work when the first expansion joint and the wearing coat for the first span of that particular bridge are being done.

2. In the case of bridges, each bridge costing less than Rs 10.00 lakhs, the Regional Officer, or Engineer Liaison Officer will associate with the execution of the first expansion joint and laying of the wearing coat for the first span to the extent possible.

1730 WEARING COAT

<i>Code No.</i>	<i>Circular No & Date</i>	<i>Brief Subject</i>	<i>Page No</i>
1730.1.	RW/NHVI-67 (5)/74 dt 10.1.83	Modifications in details of Wearing Coat	1730/1
1730.2.	NHVI-50 (3)/83 dt 22.2.83	Provision of Wearing Coat on Bridges	1730/1
1730.3.	NHVI-50 (3)/83 dt 23.2.83	Expansion Joint and Wearing Coat for Bridges Costing more than Rs 10 lakhs	See Code No. 1720,1
1730.4.	NHVI-67 (5)/74 dt 18.11.83	Revised Standard Design for Wearing Coat, Expansion Joints etc.	1730/5

1730.1.

No. RW/NHVI-67 (5)/74

Dated the 10th January, 1983

To

The Chief Engineers of all State P.W.D. and Union Territories

Sub : Standard plans for slab bridges-details of wearing coat

REVISION-A

The cross camber and thickness of asphaltic concrete wearing coat at the centre shown as 1 in 50 and 125 mm respectively in this Ministry's Standard Drawings No. BD/1-74, BD/3-74, BD/5-74, BD/7-74, BD/10-74 and BD/12-74 (contained in Standard Plans for Highway Bridges Vol. II—Concrete Slab Bridges) and BD/9-74 have been modified to 1 in 62.5 and 110 mm respectively. The drawings mentioned above may be revised suitably and adopted wherever applicable on all National Highway works to be executed in future.

1730.2.

No. NHVI-50 (3)/83

Dated the 22nd February, 1983

To

Chief Engineers of all State P.W.D.s and Union Territory Administrations dealing with National Highways and other Centrally Financed Roads

Sub : Provision of wearing coat on bridges being constructed on National Highways and other Centrally Financed Roads

Asphaltic wearing coat is provided for some of the bridges at present. Asphaltic wearing coat has the following difficulties :

- (i) Unless the required machines are available it becomes difficult to carry out the work of asphaltic wearing coat on bridges in a satisfactory way.
- (ii) Further asphaltic wearing coat does not have a good grip with the concrete of the superstructure as on a Water Bound Macadam road with the result the wearing coat comes out very easily.
- (iii) Whenever renewals are done for the approaches the Engineer-in-charge lays the renewal coat on the bridge also resulting in increase in the thickness of wearing coat and consequent dead load on the structure. This is very dangerous in simply supported prestressed concrete bridges as the bottom fibres are designed for zero tension. In some bridges it has been seen that with the renewals, the total wearing coat has come upto the level of the kerb.
- (iv) As a camber of 1 in 62.5 is required for asphaltic wearing coat compared to about 1 in 75 for cement concrete wearing coat, the initial dead load on the structure with asphaltic wearing coat is also higher which increases further due to renewals mentioned above.
- (v) With cement concrete wearing coat, there is a distant possibility of the wearing coat acting together with the deck slab thereby increasing the strength of the structure. Such a possibility is not there with asphaltic wearing coat.

2. In view of the above factors, it is considered desirable to provide cement concrete wearing coat on all bridges. Specifications to be followed regarding cement concrete wearing coat are enclosed as Appendix I.

3. In case asphaltic concrete wearing coat is considered desirable in view of road paving work in the adjacent stretches being done simultaneously with machinery etc., then the specification to be followed for the same are enclosed as Appendix II.

Enclosures to letter No. NHVI-50 (3)/83 dt. 22.2.83

Appendix I

SPECIFICATIONS FOR CEMENT CONCRETE WEARING COAT FOR BRIDGES

1. GRADE OF CONCRETE

The concrete for the wearing coat should be of minimum M 300 (with mix not leaner than 1 : 1½ : 3).

2. QUALITY OF CONCRETE

- 2.1. The concrete shall be dense with water cement ratio not greater than 0.4.
- 2.2. The concrete shall be properly vibrated and compacted using flat footed vibrators.
- 2.3. The wearing coat after concreting should be kept covered and cured at least for 28 days.

2.4. As early opening of the bridge to traffic before the wearing coat has properly cured for the specified period, will damage the wearing coat, no traffic should be allowed unless curing has been done for 28 days.

3. THICKNESS OF WEARING COAT

The thickness of wearing coat shall be an average of 75 mm, with a thickness of 100 mm at the crust and 50 mm at the edge.

4. REINFORCEMENT

4.1. For simply supported spans, the reinforcement for wearing coat should be 6 mm dia at 200 mm c/c in both directions where the slab is in compression and it should be 6 mm dia at 100 mm c/c in both directions where the slab is in tension.

4.2. In zones where hogging moments occur such as in hammer-heads, cantilever and balanced cantilever bridges where tension will develop, 6 mm dia at 100 mm c/c in both directions should be provided.

4.3. The reinforcement shall be placed at the middle of the wearing coat.

4.4. The free ends of the reinforcement at panel joints should be bent down to protect the ends of the joints.

5. JOINTS AND PANELS

5.1. The cement concrete wearing coat shall be laid in two longitudinal strips with casting of alternate panels in each strip.

5.2. The joints of the panels in the two strips shall be staggered.

5.3. The left out panels have to be subsequently concreted by placing bituminous papers at the joints with the previously laid panels.

5.4. Shuttering will have to be provided at free ends for getting vertical face as well as for ensuring good compacted concrete.

5.5. As smaller panel lengths near expansion joints are susceptible to crack formation, the length of all the panels between expansion joints shall be made equal.

Appendix II

SPECIFICATIONS FOR ASPHALTIC CONCRETE WEARING COURSE OVER BRIDGE DECKS

1. MATERIALS:

1.1. **Binder** : The binder shall be straight run bitumen of Grade 80-100 satisfying the requirements of IS : 73.

1.2. **Coarse Aggregate** : The coarse aggregate shall consist of crushed stone, crushed gravel (shingle) or other stones. These shall be clean, strong, durable, of fairly cubical shape, free of disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table 1.

Table 1 : PHYSICAL REQUIREMENTS OF AGGREGATES FOR BITUMINOUS MACADAM :

Sl. No.	Test	Test Method	Requirements
1.	Los Angeles Abrasion Value*	IS : 2386 (Part IV)	35% Maximum
2.	Aggregate Impact Value*	—do—	30% Maximum
3.	Flakiness Index	IS : 2386 (Part I)	35% Maximum
4.	Stripping Value	IS : 6241	25% Maximum
5.	Water Absorption	IS : 2386 (Part III)	2% Maximum

* Aggregates may satisfy requirements of either of the two tests.

1.3. **Fine Aggregate** : The fine aggregates shall be the fraction passing 2.36 mm sieve and retained on 75 micron sieve, consisting of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry, and free from any injurious, soft or flaky pieces and organic or deleterious substances.

1.4. **Filler** : The filler shall be an inert material the whole of which passes 600 micron sieve, at least 90 per cent passing 150 micron sieve and not less than 70 per cent passing 75 micron sieve. The filler shall be stone dust, cement, hydrated lime, fly ash or other non-plastic mineral matter approved by the Engineer-in-charge.

1.5. **Aggregate Gradation** : The mineral aggregates, including mineral filler shall be so graded or combined as to conform to the gradings set forth in Table 2.

Table 2. AGGREGATE GRADATION FOR ASPHALTIC CONCRETE

Sieve Designation	Per cent by weight passing the sieve
20 mm	100
12.5 mm	80-100
10 mm	70-90
4.75 mm	50-70
2.36 mm	35-50
600 micron	18-29
300 micron	13-23
150 micron	8-16
75 micron	4-10

1.6. MIX DESIGN

1.6.1. **Requirement of Mix :** Apart from conformity with the grading and quality requirements of individual ingredients, the mix shall meet the requirement set forth in Table 3.

TABLE 3. REQUIREMENTS OF ASPHALTIC CONCRETE MIX :

Sl. No.	Description	Requirement
1.	Marshall stability (ASTM Designation : D 1559) determined on Marshall specimens compacted by 50 compaction blows on each end.	750 lb Minimum
2.	Marshall flow—(0.01 inch)	8-16
3.	Per cent voids in mix	3-5
4.	Per cent voids in mineral aggregate filled with bitumen	75-85
5.	Binder content per cent by weight of mix.	5-7.5

1.6.2. **Binder Content :** The binder content shall be so fixed as to achieve the requirements of the mix set forth in Table 3 and shall be in the range of 5 to 7.5 per cent by weight of total mix.

1.6.3. **Job mix formula :** The contractor shall intimate to the Engineer-in-charge in writing, at least 20 days before the start of the work, the job mix formula proposed to be used by him for the work and shall give the following details:

- i) the source and location of all materials
- ii) proportions of all materials expressed as follows where each is applicable :

Binder as percentage by weight of total mix

Coarse Aggregate (I)

Coarse Aggregate (II)

Fine Aggregate (I)

as percentage by weight of total aggregate including mineral filler.

Fine Aggregate (II)

Mineral filler

iii) a single definite percentage passing each sieve for the mixed aggregate.

iv) the results of test enumerated in Table 3 as obtained by the contractor.

While working out the job-mix formula, the contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredients satisfy the physical and strength requirements of the specification.

Approval of the job-mix formula shall be based on independent testing by the Engineer-in-charge, for which samples of all ingredients of the mix shall be furnished by the Contractor as required by the former.

1.6.4. **Permissible variations from the job-mix formula :** It shall be the responsibility of contractor to produce a uniform mix conforming to the approved job-mix formula subject to the permissible variations indicated in Table 4. These variations are intended to apply to individual specimens taken for quality control tests.

Table 4 : PERMISSIBLE VARIATIONS FROM THE MIX FORMULA

Sl. No.	Description of ingredient	Permissible variation by weight of total mix
1.	Aggregate passing 4.75 mm sieve	± 5.0 per cent
2.	Aggregate passing 2.36 mm sieve	± 4.0 per cent
3.	Aggregate passing 600 micron sieve	± 3.0 per cent
4.	Aggregate passing 75 micron sieve	± 1.0 per cent
5.	Binder	± 0.3 per cent

1.7. Construction Operations

1.7.1. **Weather and seasonal limitations :** Asphaltic concrete shall not be laid during rainy weather or when the base course is damp or wet.

1.7.2. **Preparation of base :** The slab surface should be cleaned of all foreign matter, laitance and loose or scaled concrete with wire brushes and then thoroughly swept.

1.7.3. **Tack coat :** The surface should then be applied with a tack coat of 80/100 bitumen at the rate of 7.5 kg to 10 kg per sq. m. immediately before laying the asphaltic concrete wearing course.

1.7.4. **Preparation of mix :** Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant may either be of batch type or continuous one, having coordinated set of essential units such as dryer for heat-

ing the aggregates, device for grading and batching feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimate mixing of the binder and aggregates. A fines feeder for incorporation of the correct quantity of filler is also a necessary auxiliary.

The temperature of binder at the time of mixing shall be in the range 150°-177° C and of aggregates in the range 155°-163°C. Provided also that at no time shall the difference in temperature between the aggregates and binder exceed 14° C.

Mixing shall be thorough to ensure that a homogeneous mixture is obtained in which all particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered in transit, if so directed by the Engineer-in-charge.

1.7.5. **Spreading :** The mix transported from the hot mix plant to the site shall be spread by means of a self-propelled mechanical paver with a suitable screeds capable of spreading, tamping and finishing the mix true to specified grade, lines and cross sections. The temperature of the mix at the time of laying shall be in the range of 121°-163°C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material. While laying two or more layers, the longitudinal joints should be offset by at least 150 mm. The longitudinal joint in the top layer should be preferably at the centre line of the pavement.

1.7.6. **Rolling :** After the spreading of mix by paver, it should be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 kms/hr. The initial or breakdown rolling shall be with 8 to 12 tonne three-wheeled roller and surface finished by final rolling with 8 to 10 tonne tandem rollers or suitable pneumatic rollers.

Rolling should begin at the edge and proceed longitudinally parallel to the road central line—each trip overlapping 1/2 the roller width and gradually progressing to the crown of the road. On superelevated portions the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the central line.

The rolling operation should always progress with the drive wheel forward in the direction of paving. During rolling the wheels of roller shall be kept moist to prevent the mix from adhering to them but in no case shall oil/lubricating oil be used for this purpose.

Rolling shall be continued till the density achieved is 95% of that of the laboratory. Marshall specimen prepared from mix sampled from the plant and all roller marks are eliminated. Rolling operations should be completed in every respect before the temperature of the mix falls below 100°C.

1.8. Surface Finish

1.8.1. **Longitudinal Profile :** The maximum permissible undulation on A.C. surface should not be more than 8 mm when measured with a 3—metre straight edge. Also in any 300 metres length, the maximum number of undulations, exceeding 6 mm should not exceed 10.

1.8.1. **Cross Profile :** The maximum permissible variation from specified profile under camber template should not be more than 4 mm.

1.9. **Opening to Traffic :** Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

2.0. **Quality Control :** The following tests should be carried out according to frequencies indicated in Table 5.

TABLE 5. CONTROL TESTS AND FREQUENCIES FOR ASPHALTIC CONCRETE

Sl. No.	Type of construction	Test	Frequency
1.	Tack Coat	i) Quality of binder ii) Binder temperature for application iii) Rate of spread of binder	As required At regular close intervals Two tests per day
2.	Asphaltic Concrete	i) Quality of binder ii) Aggregate Impact value, Flakiness Index and stripping value of aggregate iii) Mix-grading iv) Control of temperature of binder in boiler, aggregate in the dryer and mix at the time of laying and rolling v) Stability of mix (vide ASTM : D-1559) vi) Binder content and gradation in the mix (binder content test vide ASTM : D—2172) vii) Rate of spread of mixed material viii) Density of compacted layer	As required One test per 50-100 m ³ of aggregate. One set of tests on individual constituents and mixed aggregates from the dryer for each 100 tonnes of mix subject to a minimum of two sets per plant per day. At regular close intervals. For each 100 tonnes of mix produced, a set of three marshall specimens to be prepared and tested for stability, flow value density, and void content, subject to a minimum of two sets being tested per plant per day. One test for each 100 tonnes of mix subject to a minimum of two tests per day per plant. Regular control through checks on the weight of mixed material and layer thickness. One test per 500 m ² .

3. Construction Details

3.1. As the adjustment of camber required in deck slab, bed blocks etc. has proved to be difficult in some cases, the camber required may be achieved in wearing coat itself as shown in Standard Drawing No. BD/1—69A.

3.2. Wherever, gaps are required to be left in asphaltic wearing coat for expansion gap purposes, it is suggested that initially the wearing coat for the full length including the gap width required may be laid and then vertical cuts made to achieve the gap at the required locations to be marked on the RCC kerb on either side before laying the asphaltic wearing coat.

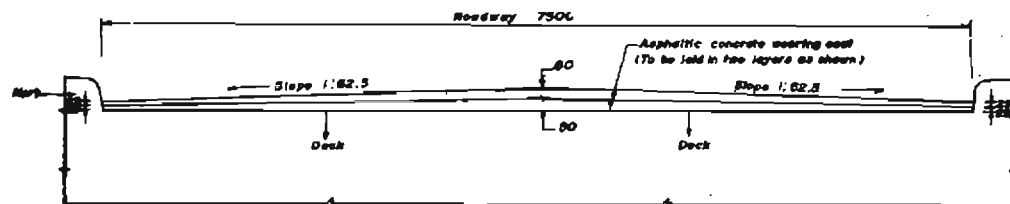
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No. RW/NHVI-67 (5)/74

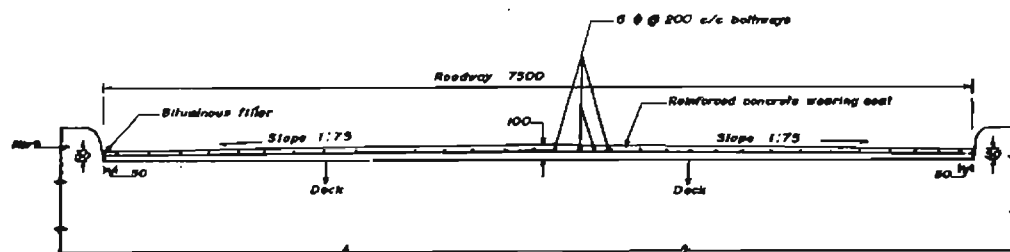
Dated the 18th November, 1983

Sub : Standard designs of concrete bridges—details of wearing coat, expansion joints and drainage spout

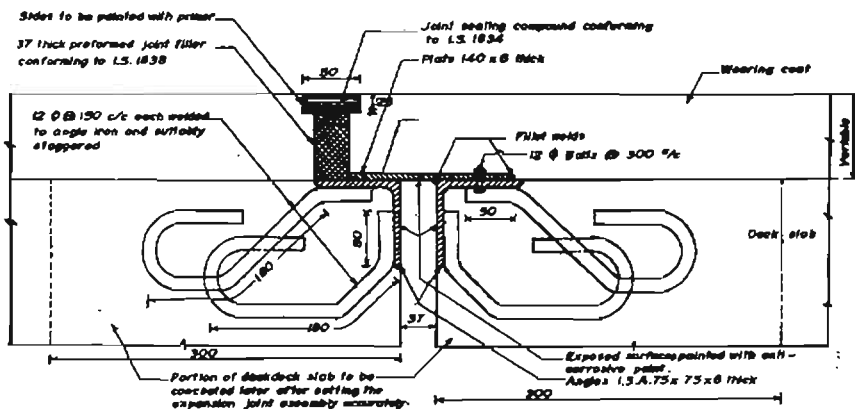
This Ministry's standard drawing No. BD/1-69 showing the details of wearing coat, expansion joints and drainage spout was revised and printed as drawing No. BD/1-69 A in Vol. II—Concrete Slab Bridges (1st revision) published by IRC in 1983. This drawing has been further revised and the revision will be published by IRC in due course of time. A copy of the final revised drawing No. BD/1-69 B incorporating all the revisions is enclosed for adoption on National Highway and other Centrally Financed Bridge Projects.



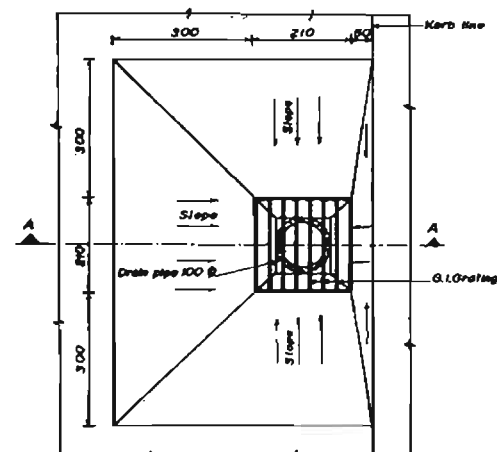
CROSS-SECTION SHOWING DETAILS OF ASPHALTIC CONCRETE WEARING COAT



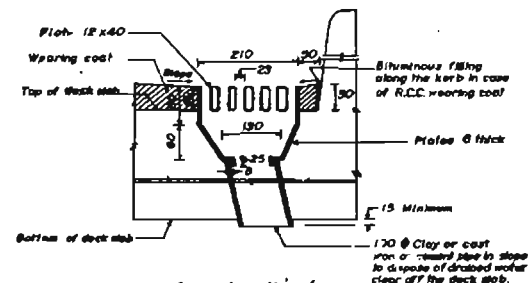
CROSS-SECTION SHOWING DETAILS OF REINFORCED CONCRETE WEARING COAT



DETAILS OF EXPANSION JOINT FOR BEAM TYPE BRIDGES



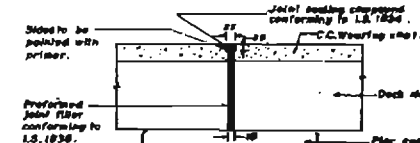
PLAN



SECTION AT 'AA'
DETAILS OF DRAINAGE SPOUT AND COLLECTION PIT

ENCL. TO LETTER NO. RM/MW-67(5)/78 DT. 18.8.83
NOTES:

- The details shown in this drawing are applicable for two lane highway bridges with level decks.
- All dimensions are in millimetres.
- Material specifications and workman ship shall be in accordance with Ministry's specification for road and bridge works unless stated otherwise in this drawing.
- Reinforced concrete wearing coat -
(i) Wearing coat shall be bonded type.
(ii) Concrete mix shall be of M 300 grade with cement content not less than 350 kg/m³ and water cement ratio not more than 0.4.
(iii) Reinforcement shall be placed in the middle of wearing coat.
(iv) Spacing of reinforcement shall be reduced to 100mm in either direction over a strip of 300mm near the expansion joints.
(v) Joints in the wearing coat may be avoided as far as possible. Reinforcement shall however, be continued across the joints, if provided.
- Expansion joint details shown in this drawing are applicable for R.C./beam and slab type bridges superstructure of precast/cast in situ concrete.
- Drainage spout shall be galvanneal steel welded the plates and flaps together.
- Grating shall not be provided under footpath slab, 75mm dia. drainage pipe shall only be used.
- Spacing of drainage spout shall not exceed 10 metres.
- For slab bridges with asphaltic concrete wearing coats, details of expansion joint shown in relevant standard drawings like Drg. no. BD/1-74 A, shall be followed.



DETAILS OF EXPANSION JOINT FOR SLAB BRIDGES WITH CONCRETE WEARING COAT

REVISION	YEAR	DESCRIPTION	INITIALS
A	1983	Details of wearing coat and native modified.	18/8/83 S.E.(B) Sd/-
B	1983	Thickness of sealing compound changed and details of expansion joint for slab bridges with c.c. wearing coat added.	18/8/83 S.E.(B) Sd/- Sd/-

SCHEDULE OF REQUIREMENTS FOR A CLEAR ROADWAY WIDTH OF 7.5 METRES											
R.C. Wearing coat (Per metre span)			Asphaltic concrete wearing coat (Per metre span)			Expansion joint for beam type bridges (Per joint)		Drainage spout (Per spout)			
Sl. No.	Item	Quantity	Sl. No.	Item	Quantity	Sl. No.	Item	Quantity	Sl. No.	Item	Quantity
1.	Cast in situ concrete of grade M 300	0.58 m ³	1.	Asphaltic concrete	0.8 m ³	1.	M.S. Angle LSA 75x75x6 mm thick 7.5m long.	2 Nos. 20 kg	1.	M.S. Plate 6mm thick 2.5m x 2.5m	0.625 m ² 2.5 kg
2.	Steel reinforcement mesh 6mm Ø @ 200mm c/c both ways	18.5 kg	2.	Straight run bitumen	2.5 kg	2.	M.S. Plate 140mm x 6mm x 1.5m long	1 No. 30 kg	2.	Plate 6mm x 40mm	300 mm 1.37 kg
						3.	12mm Ø anchor bars 180 mm long	300mm 27 kg	3.	100mm Ø Drain pipe	1 No.
						4.	6mm Ø bolts with nuts	25 Nos.			

GOVERNMENT OF INDIA MINISTRY OF SHIPPING AND TRANSPORT ROADS WING, NEW DELHI		
STANDARD CONCRETE BRIDGES		
DETAILS OF WEARING COAT, EXPANSION JOINT AND DRAINAGE SPOUT.		
RECOMMENDED BY 18/8/83 O.P. AGARWALA S.E.	RECOMMENDED BY 18/8/83 R.G. THAKUR S.E.	NOV. 1983
RECOMMENDED BY 18/8/83 R.S. SHARMA S.E.	APPROVED BY 18/8/83 S.P. CHANDRASEKHAR S.E.	DRG No. BD/1-60B

N.S. Ramaswamy,
Addl. Director General (Bridges)

Government of India
Ministry of Shipping & Transport
(Roads wing)

"Transport Bhavan"
No.1, Parliament Street

D.O. No. PL-17(28)/76.

New Delhi, dated 17/11 Feb '77.

Dear Shri

Instances have come to our notice where it is seen that the wearing coat of the bridge decks have not been functioning properly. To evaluate this aspect it is requested that data as per proforma attached may please be collected for some important bridges and sent to this office.

2. we are specifically interested in the asphaltic/bituminous wearing coat besides cement concrete wearing coats of bridges. What type of expansion joints have been provided for decks in these cases and how has been the performance of these joints.

3. A very early action is requested.

To State CE's dealign with
Roads by name.

Yours sincerely,

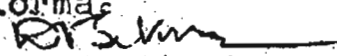

(N.S. Ramaswamy)

Encl: As above

1. Copy for information to all Regional Officers of the Ministry of Shipping & Transport (Roads wing) with a copy of the proforma.

2. Copy to all officers of the Bridges Directorate, at Headquarters with a copy of the proforma.

Encl: As above.


(D.V. Sikka)

Executive Engineer (Br.)
for Director General (Road Development)

1740 RAILING & APPROACH SLAB

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1740.1.	PL-67 (18)/76 dt. 22.11.76	Painting of Kerbs	1740/1
1740.2.	NHVI-50 (3)/83 dt. 1.9.83	Precast RCC Elements for Railings	1740/1

No. PL-67 (18)/76

Dated the 22nd November, 1976

To

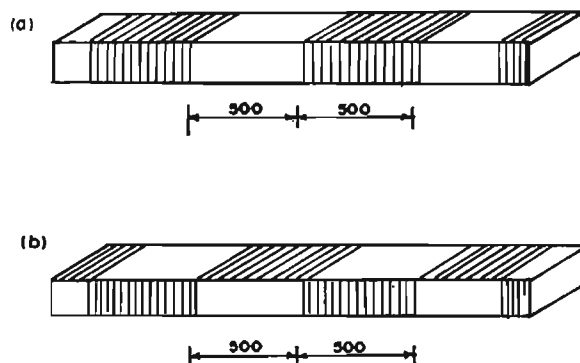
All the State Chief Engineers

Sub : Painting of Kerbs-Road Bridges on National Highways and Bridges financed in full or in part from Central Funds

It has been decided that the kerbs on bridges and their approaches should be distinctly painted with a luminous paint so as to improve traffic safety and also enhance the aesthetics of the bridge.

2. The markings on the kerbs may be made as per sketch attached. The alternate strips should be painted with black and white paint. Any of the two types as shown in the sketch may be adopted.
3. The expenditure on this item of work may please be met from the Annual Maintenance Grants in respect of National Highway Bridges.

Encl. to PL- 67(18)/76. dt. 22.11.76

KERB MARKINGS

(BASED ON
I.R.C: 35-1970
CODE OF PRACTICE FOR ROAD MARKINGS
WITH PAINTS.).

No. NHVI-50 (3)/83

Dated the 1st September, 1983

To

The Secretaries of all the State P.W.Ds. Chief Engineers of all State PWDs and Union Territories dealing with N.Hs. and other Centrally Financed roads, Chief Engineer, Pamban Bridge Project

Sub : Use of thin small size pre-cast RCC elements for railings of bridges on N.Hs and other Centrally financed roads

It has been observed that very thin and small size precast RCC elements have been used as railing for some of the road bridges. There have been instances where these precast elements have been pilfered presumably to salvage the reinforcement provided in these elements. As these precast elements are very slender, these elements are also subjected to both atmospheric corrosion and to marine corrosion in areas near to the sea.

2. It is, therefore, requested that use of such slender and small size precast RCC elements as railings may please be dispensed with in respect of Centrally sponsored bridge works.
3. This point may please be incorporated in the NITs to be issued for Centrally sponsored bridges in future.

1910 GENERAL TOPICS

<i>Code No.</i>	<i>Circular No & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1910.1.	NHVI-67 (5)/74 dt. 24.4.79	Deviations from Standard Bridge Drawings	1910/1
1910.2.	NHIII/P/35/77 dt. 5.2.81	Ensuring fluent Grade Lines at Culvert/Bridge Approaches	1910/1

No. NHVI-67 (5)/74

Dated the 24th April, 1979

To

The Chief Engineers/Principal Engineers All State PWDs/Union Territories (dealing with National Highways)

Sub: Bridge works financed in full or in part from Central funds-Deviations from Standard Bridge Drawings

This Ministry has, from time to time, been issuing the standard drawings for Highway Bridges for adoption on the National Highways and other roads financed partly or wholly from Central funds.

2.1. It has come to the notice of this Ministry that some of the State PWDs are adopting the standard drawings after making certain changes therein of their own without obtaining prior approval of this Ministry for such deviations. For instance standard bridge drawings for RCC superstructure using mild steel as reinforcement provide for use of metallic bearings, but instead of using metallic bearings, use of elastomeric bearings is resorted to without obtaining the approval of the design of elastomeric bearings from this Ministry.

2.2. In case where elastomeric bearings are proposed to be adopted instead of metallic bearings provided in the standard drawings, it is necessary to work out the relative economy between metallic bearings and elastomeric bearings.

3. Further it may be mentioned that if elastomeric bearings are adopted, the end cross girders will also have to be checked for safety under the conditions of lifting for facilitating the replacement of the bearings, if required at a later date. Thus the design of end cross girders should also be got approved by this Ministry in such cases.

4. It is requested that necessary instructions in this regard may please be issued to all concerned and prior approval of this Ministry be invariably obtained to any modifications in the standard drawings.

No. NHIII/P/35/77

Dated the 5th February, 1981

To

All the State Chief Engineers concerned with National Highways

Sub: Ensuring fluent grade lines at the approaches to the culverts and bridges on National Highways

The need for ensuring fluent grade lines at the approaches to culverts and bridges on all Highways has been long felt, integral to their geometric design and the Ministry has been drawing the attention of all concerned for the incorporation of this very important aspect on the National Highways time and again. In this connection, Ministry's letter No. NHI-37 (2)/70, dated 2.4.1970 (paragraphs 9 (b) (iii), 9 (e) (ii) and (iii) of the technical Memorandum Note attached thereto); reiterated vide letter No. NHI-37 (2)/70, dated 1.2.1971 and again followed up by another circular issued vide letter No. NHI-I/P/35/77 dated 24.12.1977 may be referred to.

2. In spite of very clear instructions on the subject issued and discussions in the various forums laying stress on this aspect particularly in the meetings of the Chief Engineers, it has been observed that the shock-free treatment of approaches has so far not received its due attention it deserves. It may once again be emphasized that any deficiency in the vertical profile at the culverts and bridges, results not only in accident and reduction in speed of traffic on the National Highways but also produce discomfort and some times causes injuries to passengers due to unexpected sudden shock and attracts criticism of the travelling public. It is, therefore, imperative that proper treatment to ensure shock-free fluent grade lines at all existing approaches to culverts and bridges is given by the State PWDs.

3. It is suggested that immediate survey of all the culverts and bridges, where the grade lines on either side are not fluent and shock-free, may be made and properly designed vertical and valley curves provided at each such location depending on the slope of the approaches to the bridges.

GOVERNMENT OF INDIA
MINISTRY OF TRANSPORT
DEPARTMENT OF SURFACE TRANSPORT
(ROADS WING)

2.12.85

12113

....

TELEGRAMS
'ROADIND'

TRANSPORT BHAVAN,
No.1, PARLIAMENT STREET.

NO. RM/NH.III/P/2/79.

New Delhi, 2.12.1985

To

1. The Chief Engineers of State P.W.Ds
Union Territories,
dealing with National Highways and other
Centrally Financed Roads.
2. The Director General (Works),
Central P.W.D.,
Nirman Bhavan,
New Delhi.
3. Director General (Border Roads),
Kashmir House,
New Delhi.

Subject:- Keeping proper record of completion drawings
for bridges on NHs and other Centrally Financed Road

.....

Sir,

It has been observed that completion drawings of even some major bridges, are not available for reference during the service stage of the bridge. In order to ensure adequate maintenance during the service stage of a bridge, it is very necessary that a proper record of the completion drawings is kept for immediate and ready reference as and when it becomes necessary. For this purpose the following procedure is suggested:-

- (i) In respect of major bridges involving alternative designs, a para may be included in the notice inviting tenders for such bridges that soon after the completion of the bridge, the contracting firm will have to supply 4 copies of completion drawings for different components of the bridge duly bound and also supply the original tracings of the completion drawings to the State P.W.D.

One set of the completion drawings is to be sent to Roads Wing and other three sets are to be kept in the Offices of Executive Engineer, Superintending Engineer and Chief Engineer. The tracings of completion drawings are to be kept in the office of Chief Engineer.

(ii) *inf* In respect of other bridges, the folders contain the completion drawings are to be kept in the offices of the Executive Engineer, Superintending Engineer and Chief Engineer of the Dept.

2. To meet the expenditure on the completion drawings and photographs etc., it is suggested that henceforth a separate item may be put down in the estimates relating to bridge projects.

3. It is requested that necessary instructions in this regard may please be issued to all concerned.

Yours faithfully,

[Signature]
(R. L. KARPOOR)
CHIEF ENGINEER (BRIDGES)
for DIRECTOR GENERAL (ROAD DEVELOPMENT)

Copy forwarded for information and necessary action to:-

- (i) All Regional Officers and Engineer Liaison Officers.
- (ii) All Technical Officers at the Headquarters.
- (iii) Desk Officer - I (10 copies).

[Signature]
(R. L. KARPOOR)
CHIEF ENGINEER (BRIDGES)
for DIRECTOR GENERAL (ROAD DEVELOPMENT)

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1920 SAFETY MEASURES

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1920.1.	PL-30 (128)/69 dt. 9.4.70	Safety Measures to be taken at Submersible Bridges/Causeways	1920/1
1920.2.	NHVI-50 (3)/83 dt. 19.5.83	Vertical Clearance for through type Bridges	1920/2
1920.3.	NHVI-50 (3)/83 dt. 7.6.83	Horizontal clearance for through type Bridges	1920/2

No. PL-30 (128)/69

Dated the 9th April, 1970

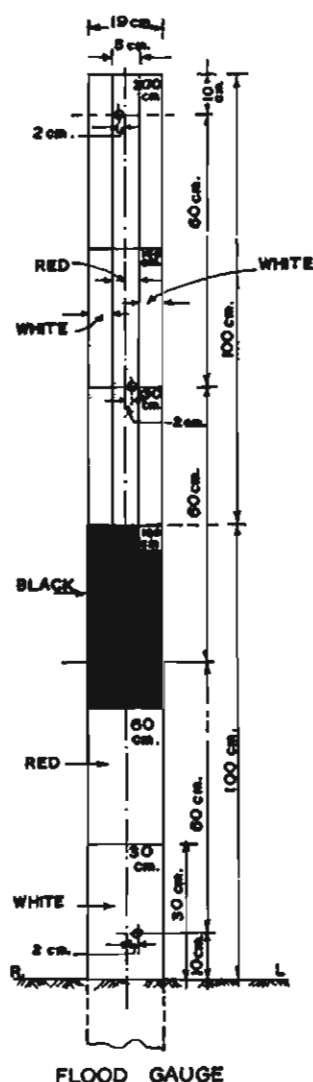
To

The Chief Engineers of the States (Deptts. dealing with Roads) Engineer-in-Chief CPWD., D.G.B.R.,
Principal Engineer, Manipur

Sub: Safety measures to be taken at submersible bridges/causeway on National Highways

The question of providing suitable warning signs near and on causeways and submersible bridges on National Highways with a view to caution approaching traffic for avoiding risk of accidents has been under consideration of this Ministry as some accidents on submersible bridges have come to notice. Such accidents can be minimised if suitable signs and aids are provided to warn and inform the road traffic of the approaching submersible bridge or causeway and the depth of water as well as the limits of the carriageway of the submers-

Encl. to letter No.PL-30(128)/69 Dt. 9.4.70



NOTE:-

THE GAUGES SHOULD BE PLACED ON THE UPSTREAM SIDE OF IRISH BRIDGES OR CAUSEWAYS. THEY SHOULD CONSIST OF ENAMELLED IRON PLATES BOLTED TO A 8cm.x8cm.x8cm. T IRON. THEY SHOULD BE 200cm. IN HEIGHT FROM THE DEEPEST PART OF THE GAP; THE BOTTOM 30cm. — SHOULD BE WHITE, THE SECOND 30cm. RED, THE THIRD BLACK & FROM THE TOP OF THE BLACK, i.e. FROM 100cm. ABOVE ZERO TO THE TOP, THE GAUGE SHOULD BE WHITE & HAVE A RED LINE 5cm. WIDE RUNNING UP THE CENTRE.

THE "FLOOD GAUGE" SHOULD BE PLACED ON THE UPSTREAM EDGE OF IRISH BRIDGES OR CAUSEWAYS AT THE LOWEST POINT & AT SUITABLE DISTANCES MAX. 50 M. ALL ALONG THE IRISH BRIDGE OR CAUSEWAY, KEEPING IN VIEW THE LONGITUDINAL SECTION AFFECTED BY FLOOD WATER ON EITHER SIDE OF THE LOWEST POINT. THE MARKING ON ALL THE FLOOD GAUGES ON A CAUSEWAY SHOULD INDICATE THE DEPTH OF FLOW AT THE LOWEST POINT ON THE CAUSEWAY.

R.L. — ROAD LEVEL AT LOWEST POINT OF IRISH BRIDGE OR CAUSEWAYS ETC.

SOURCE	FILE No.	MINISTRY OF SHIPPING & TRANSPORT (ROADS WING) GOVT. OF INDIA.
M.V.A. 1939 IX SCHEDULE (PART 'C') & I.S.D. DRG. No. 7309/1 DATED 16.6.39.	DATED INITIAL	FLOOD GAUGE
I.R.C. PUBLICATION TRAFFIC SIGNS PARA 3.4	DRN.	(INFORMATORY TRAFFIC SIGN.)
	TRD.	
	CHD.	
		DRG. NO. 315 / MARCH, 1952

ible structure. It is, therefore, desired that following measures may be taken on all submersible bridges and causeways on National Highways :—

- (i) Provision and subsequent maintenance of either collapsible or removable railings on submersible bridges as laid down in clause 116.2 of the I.R.C. Standards Specifications and Code of Practice for Road Bridges-Section I;
- (ii) Provision and subsequent maintenance of 800 mm high guide posts at intervals of 4.5 metres along the deck edge of causeways on both sides (the posts may be 200 mm x 200 mm of stone or R.C.C.).
- (iii) Provision and subsequent maintenance of flood gauges to the design, specifications, location etc. as laid down in the I.R.C's reproduction of the 'Traffic Signs' from the 9th Schedule of the Indian Motor Vehicles Act, 1939; and
- (iv) Fixing and subsequent maintenance of advance sign boards (with words or symbol in luminous paint if possible) on approaches to the submersible bridges and causeways, giving information as to the nearness of the submersible structure. These should be fixed at about 300 m from the submersible bridge/causeway and repeated at about 120 m.

1920.2.

No. NHVI-50 (3)/83

Dated the 19th May, 1983

To

The Chief Engineers of all State PWDs and Union Territories dealing with N.Hs. and other Centrally Financed Roads

Sub : Vertical clearance available in respect of steel through type bridges or concrete bowstring girder bridges where bracings are provided at the top

In case of steel through type bridges or concrete bowstring girder bridges where bracings are provided at the top, the structures are likely to be damaged in case vehicles of excessive dimensions are allowed to pass through. In order to avoid this, it is requested that in all such cases, rigid steel rail portals may be provided at the entrance to such bridges with a vertical clearance of the portal slightly less than what is actually available at the bridge. This would prevent the vehicles with excessive dimensions trying to pass through the bridge and causing irreparable damage to the structure.

2. The Transport Commissioners of the concerned State Government may please be intimated about the vertical clearance available at such structures and the exact location of such structures so that they can exercise a rigid check on the vehicles that are passing through as the State Transport Commissioners are responsible for checking the vehicle dimensions using the National Highway system.

1920.3.

No. NHVI-50 (3)/83

Dated the 7th June, 1983

To

The Secretaries of PWDs, C.Es of all State PWDs and Union Territories dealing with N.Hs. and other Centrally Financed Roads

Sub : Horizontal clearance available in respect of steel through type bridges or concrete bowstring girder bridges

During the visit of ADG (B) to some of the States, it was observed that huge circular units were being transported on the N.Hs. for manufacture of cement etc. Such vehicles with excessive dimensions are likely to cause damage to the through type bridges, to bowstring girder bridges and railings of narrow bridges.

2. The Transport Commissioners of the concerned State Government may please be intimated about the horizontal clearance available at such structures and the exact location of such structures so that they can exercise a rigid check on the vehicles that are passing through.

1930 RATING AND TESTING OF BRIDGES

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1930.1.	RW/NHII/Misc/53/82-W dt 18.10.82	Prior permission of Ministry for Testing of Bridges	1930/1
1930.2.	RW/PL-30 (106)/82 dt 17.5.83	Load Restrictions on Weak Bridges	1930/1
1930.3.	PL-30 (106)/82 dt 7.9.83	Rating of Existing Bridges and providing Cautionary Boards	1930/1

1930.1.

No. RW/NHII/Misc/53/82-W

Dated the 18th October, 1982

To

All State Governments (Departments dealing with National Highways)

Sub : Tests on bridges on National Highways

It has come to the notice of this Ministry that dynamic test studies on the prestressed concrete super-structure on one of the bridges on National Highways was conducted by a State Government without obtaining prior permission of this Ministry. It will be appreciated that this Ministry is responsible for not only maintaining free and uninterrupted flow of traffic but also to ensure safety of all bridges on National Highways during test. It is, therefore, requested that the prior permission of this Ministry should invariably be obtained as and when any tests are required to be conducted on such bridges.

2. Further, requests for such permissions should be accompanied by a detailed note outlining the objective, methodology and instrumentations for the proposed tests. The results of the studies may also kindly be intimated without fail to the Ministry on their completion.

1930.2.

No. RW/PL-30 (106)/82

Dated the 17th May, 1983

To

The Secretaries and Chief Engineers of the State P.W.Ds.

Sub : Assignment of SAW/RLW of Transport vehicles-Reference to Central Govt.-Rating of bridges

I would like to draw your kind attention to this Ministry's letter of even number dated 12.5.83 on the subject noted above. While you will be taking immediate action for arranging the task of determining the rating of existing bridges and culverts and having the same notified through the State Transport authorities, I take this opportunity to bring to your kind notice two unfortunate incidents where unduly heavy transport vehicles were plying resulting in collapse of bridges over the river Lingra on NH 42 in Orissa and over river Damodar on NH 33 in Bihar. This has caused heavy national loss and inconvenience to the heavy traffic using these two National Highways as the collapsed bridges will take time for their replacement and the traffic has, in the meantime, to be either re-routed or subjected to inconvenience.

2. I shall be grateful if the State Governments/UTs. kindly take all preventive steps to avoid such instances and ensure with the State Transport authorities that the enforcement regarding the load restriction on any bridge, if any, as reported by the State PWD authorities is more strict and damages to the existing weak bridges on the NHs. are avoided. We shall be thankful to know the steps being taken by you in this matter.

1930.3.

No. PL-30 (106)/82

Dated the 7th September, 1983

To

1. All Secretaries of States Public Works Deptts.
2. The Chief Engineers of all State PWDs dealing with NHs and other Centrally sponsored roads

Sub : Rating of existing bridges and providing cautionary boards on NHs

Please refer to this Ministry's letter of even number dated 12.5.83 wherein the following action to be taken immediately by the State PWD was indicated :

- i) To determine rating (load carrying capacity) of the existing bridges and culverts.
- ii) To have the same notified through the State Transport Authorities; and
- iii) To provide necessary traffic signs indicating the prohibition or restriction near such places.

2.1. In case vehicles with excessive loads or excessive dimensions pass through the bridge, they are likely to cause irreparable damage to the structure.

2.2. It has to be made clear on the cautionary board that the State Government would not be responsible for

1930/2

any damage to the vehicles or persons travelling thereon on account of carrying excessive loads or in case the vehicle dimensions are excessive.

It has also to be made clear that in case of any damage to the structures, the owner of the vehicle will have to reimburse to the Government, the cost of reconstruction of the structure.

1950 DISMANTLING

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1950.1.	NHIII/Misc/43/73 dt. 16.10.73	Dismantling of Diversion after Opening of new Bridge	1950/1
1950.2.	NHIII/Misc/43/73 dt. 17.6./4	Dismantling of Old Structures after Opening of New Bridge	1950/1
1950.3.	RW/NHIII/P/17/83 dt. 3.10.83	Dismantling and auctioning of Existing Steel Bridges after Construction of New Bridges	1950/1

1950.1.

No. NH.III/Misc./43/73

Dated the 16th October, 1973

To

All State Chief Engineers (dealing with roads)

Sub : Dismantling of diversions provided through bed and flood planes of rivers-instructions regarding

It has been noticed that often after opening of a bridge, diversion provided through bed and flood plane of the river is left undismantled. This results in constriction of the flow-regime and greater velocity, and may cause damage to the bridge. It is, therefore, requested that immediately on opening a bridge either on a National Highway or a Centrally financed road, the diversion, if provided, may be got dismantled.

1950.2.

No. NH.III/Misc./43/73

Dated the 17th June, 1974

To

All State Chief Engineers (dealing with roads)

Sub : Dismantling of old structures where new bridges are being constructed to replace them

Instructions have already been issued vide Ministry's letter of even number dated the 16th October 1973 about the dismantling of diversions provided through the bed and flood plane of the river after a new bridge has been constructed and opened to traffic. In continuation of this it is requested that the existing bridge structure which is being replaced by the new bridge should also be dismantled upto the bed level of the river along with the diversion. However, in such rare cases where the new bridges are constructed a considerable distance away from the old bridge and the flow conditions through the new bridge are not in any way affected by the existence of the old-bridge, if the State P.W.D. desires, the old structure may be allowed to remain but in such cases the cost of maintenance of the approaches and the old bridge shall be borne by the State Govt. and shall not be a charge on National Highway funds. However, concurrence of this Ministry shall be obtained for all such cases where the old structure is intended to be retained after the construction of the new bridge.

1950.3.

D.O. No. RW/NH.III/P/17/83

Dated the 3rd October, 1983

To

The Secretaries of all State PWDs. (Deptts. dealing with N.Hs.) by name and CEs. of all State PWDs. dealing with N.Hs. (by name)

Sub : Dismantling and auctioning of existing steel bridges after construction of new bridges on National Highways

During inspection of various National Highways in different States, I have observed that wherever new concrete (RCC or prestressed concrete) bridges have been constructed in place of existing steel girder or truss bridges, the already existing steel bridges have not been dismantled. It is a sheer waste of national wealth to allow the steel bridges to weather away in such a way. The old steel bridge superstructure is the property of the nation.

2. We shall, therefore, be grateful if you have a survey of all the bridges conducted on top priority of each of the National Highways in the State to identify such abandoned steel bridges and arrange to dispose them of by auctioning, if no longer required by the State PWD. The sale proceeds as obtained by auction may be credited to the account of the Govt. of India.

1960 ELECTRIFICATION OF BRIDGES

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1960.1.	NHIII/P/1/75 dt 24.11.75	Electrification of Bridges	1960/1

No. NHIII/P/1/75

Dated the 24th November, 1975

To

All State Governments/Administrations (Departments dealing with National Highways)

Sub : Electrification of bridges on National Highways

In supersession of all previous orders on the above cited subject I am directed to say that normally it is not the policy of the Government of India to meet the cost of electrification of bridges on National Highways from their funds as the Vehicular traffic on National Highways moves under their own lights and hence no provision for electrification should be made in the estimates for bridge works on National Highways. However, it has been decided that structural elements like light posts and cable ducts for electrification of new bridges of length 300 metres and more may be provided if required, and the cost thereof included in the estimate for the bridge proper provided that the Municipal Board/concerned local authority is prepared to meet the initial cost as well as subsequent maintenance charges of electrical installations including the cost of wiring, lamps etc. and also to bear the electricity charges. Accordingly the estimate should be accompanied by a clear certificate from the local authority who is prepared to meet the cost of the electric installations and maintenance and running charges.

For the electrification of an existing bridge separate estimate may be prepared showing in detail the fixtures to be provided and the method of attachment of these fixtures to the existing bridge. This estimate should also be accompanied by a certificate in the above mentioned form from the concerned local authority.

1970 GUIDELINES REGARDING EXECUTION

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
1970.1.	RW/NHIV-2 (2)/81 dt. 31.10.81	Simultaneous action for Construction of Minor Bridges and diversion Roads	1970/1
1970.2.	NHVI-50 (3)/83 -Part dt. 15.4.83	Safety Measures for Excavation and Blasting Operations	1970/1

No. RW/NHIV-2 (2)/81

*Dated the 31st October, 1981***To****All the State Chief Engineers dealing with National Highways****Sub : Simultaneous action in respect of construction of minor bridges and their diversion roads**

Recently it has come to the notice of this Ministry that in respect of reconstruction of some minor bridges there was some delay in execution because of not taking up simultaneous action for the construction of bridges and their diversion roads. This has invited comments from the audit. All the State P.W.Ds. are, therefore, requested that simultaneous action should always be initiated in respect of construction of bridges, approaches and their diversion roads so that the projects as a whole are completed expeditiously as per targetted programme. It is preferable that the work on the diversion road is done either departmentally or as a part of the work on the main bridge.

No. NHVI-50 (3)/83-Part

*Dated the 15th April, 1983***To****All Chief Engineers/Principal Engineers of State PWDs/Union Territories dealing with National Highways****Sub : Safety measures dealing with excavation and blasting operations**

A number of cases involving accidents including fatal ones during excavation operations in foundations for bridge structures have come to the notice of this Ministry.

2. In the case of minor bridge under construction on a National Highway a few years back, when the excavation work for open foundation was in progress and some labourers were inside the pit, the sides of the foundation trench caved in trapping several labourers inside and burying them alive resulting in loss of several lives. Consequently work was suspended for a considerable time which resulted in time over-run in the completion of the bridge and the consequent cost over-run due to price escalation.

3. Recently, in the case of a major bridge on a National Highway where blasting operations were resorted to for excavation in foundation, one labourer was killed and two others were seriously injured at the work site. This happened because one of the charges remained unblasted and went unnoticed with the result that after two days when labourers were working on the work site the unblasted charge exploded suddenly by itself resulting in the said accident.

4. Though the responsibility of the safety of the labourers and the compensation to be paid to the bereaved family in the event of death in such accidents rests with the contracting agencies, it is also obligatory on the part of the Departmental Officers to ensure that adequate safety measures are adopted by all concerned during such construction works so that precious lives are not lost due to any negligence or lack of safety measures and also increase in cost of the projects on account of the cost and time over-runs can be avoided.

5.1. It is, therefore, suggested that the excavation for bridge structures is carried out strictly according to the specifications contained in clause No. 304 of Specifications for roads and bridge works published in May 1978 and safety measures as spelt out therein are scrupulously observed.

5.2. Where blasting operations are resorted to the safety measures and precautions as specified in Clause No. 302 of the above referred specifications shall always be strictly enforced.

6. These safety measures may also be included to form part of N.I.T. for bridge works with a view to ensure their strict adherence by the executing agencies.

1980 CORROSION

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
<u>1980.1.</u> 4310	RW/PL-17 (14)/76-Vol. II. dt. 31.3.81	Maintenance of Existing Concrete Bridges Susceptible to Corrosion	1980/1
1980.2.	RW/PL-17 (14)/76-Vol. II dt. 4.1.82	Specification for New Concrete Bridges to be Constructed in Marine Environments	1980/5

No. RW/PL-17 (14)/76-Vol. II

Dated the 31st March, 1981

To

*All the Chief Engineers/Addl. Chief Engineers of littoral States,
Union Territories PWDs dealing with Highways*

Sub : Guidelines for maintenance repair of existing concrete bridges susceptible to being affected by corrosion

Your kind attention had already been drawn in this Ministry's circular letter No. PL-67 (29)/76-NHVI dated 22.9.78 to the need for conducting periodic inspection of highway structures on National Highways, in accordance with the provisions contained in I.R.C. Special Publication No. 18—"Manual for Highway Bridge Maintenance Inspection."

2. The problem of corrosion and corrosion protection of concrete bridges exposed to marine environment has been engaging since some time the attention of this Ministry which has launched a research on this subject. Until findings of research are available, it has been decided that the maintenance and repairs to the concrete highway bridges/structures located in coastal areas and affected by corrosion, shall be carried out in accordance with the provisions in the enclosed guidelines.
3. In order to ensure the safety and efficient functioning of the bridge structures, the Chief Engineers are requested to attach utmost importance to such inspections for "preventive" maintenance of these structures and to bring it to the notice of their officers and staff the above guidelines to be followed.
4. Suggestions to improve/augment the above guidelines based on experiences are welcome.

Enclosure to letter No. RW/PL-17 (14)/76-Vol. II dt. 31.3.81

GUIDELINES FOR MAINTENANCE AND REPAIRS OF EXISTING CONCRETE BRIDGES SUSCEPTIBLE TO BEING AFFECTED BY CORROSION

Concrete bridges mainly in the coastal areas are vulnerable to corrosion due to the aggressiveness of the environment. Repairs to the affected structures have to be made as soon as deterioration is noticed, and this requires a regular and timely inspection of the existing bridges by a competent engineer.

2. It is essential that records are maintained to provide a complete upto—date history of structure right from construction stage with a mention of any special anti-corrosive treatments adopted at the time of design and construction stage itself.

3. Inspection

- 3.1. All bridges shall be inspected once a year to ascertain if there are any signs of distress such as appearance of strains, cracks, spalling etc. and action taken to remedy such defects. Such bridges be kept under constant observation by resorting to frequent inspections and further remedial measures undertaken as considered necessary.

- 3.2. The inspection report should cover the items listed in the proforma—Annexure-A. The items requiring special attention during inspection are briefly elucidated in notes at the end of Annexure-A.

- 3.3. The reports shall be compared with previous reports to get an idea of the rate of deterioration. If the rate of deterioration is alarming, further detailed investigations to ascertain causes of deterioration etc. shall be undertaken. Thereafter the desired adequate remedial measures suggested.

4. Identification of Corrosion and Damage of Concrete

- 4.1. The durability of the structure varies considerably in various zones of exposure which could be delimited for the purpose of applying these specifications as under:

- a) **Submerged zone** : that part of the structure which falls below the splash zone.

In this area, the primary concern is to prevent chemical deterioration of concrete, corrosion of embedded steel and abrasion.

- b) **Splash zone** : area of the structure subjected to repeated wetting and drying by sea water, viz. the difference between the highest and the lowest water levels reached by the waves with a statistical return period of 6 months super-imposed on the highest and lowest level of spring tides plus one metre above highest tide level.

In this area, attention has to be paid to chemical deterioration of concrete and corrosion of embedded steel. In very cold climate the aspect of freezing and thawing has also to be considered though the same is not generally applicable to India.

- c) **Atmospheric zone** : that part of the structure above the splash zone exposed to the atmosphere.

In this area, attention has to be paid to the prevention of corrosion of embedded steel due to wind action carrying salt/sand particles.

- 4.2. The causes leading to corrosion of reinforcement and/or damage of concrete such as inadequate cover, poor concrete quality, type and quality of aggregates and cement used, quality of water used, etc. shall be investigated to ascertain, whether they have been responsible

for the deterioration of concrete and steel.

4.3. For bridges more than 5 years old and exposed to adverse atmospheric conditions detailed inspection using techniques mentioned in para 6 may be undertaken.

5. Remedial Measures :

5.1. Based on the detailed inspection and after identification of the causes leading to the defects in the structure, the remedial measures could be classified as follows :

i) **Inadequate cover** : For components having inadequate cover, surface treatment by way of providing additional good quality dense concrete cover with 20 mm size of aggregates, so as to have a minimum cover of 50 mm shall be considered.

ii) **Repairs to cracks** : Where corrosion has just set in and cracks appear but spalling has not started, it is felt that it may be adequate to seal the narrow cracks against ingress of moisture etc. For this purpose where rigid type sealant is required, it may be sufficient to cement grout or gunite or inject into the cracks epoxy mortar with adequate bonding and tensile strength. For flexible sealants a chase should be cut along the line of crack and then sealed with an elastic material such as poly-sulphide rubber or by the insertion of a prepared neoprene or rubber bitumen sealing strip. Even after such a treatment, it will be necessary to keep a constant watch on its performance, so as to undertake further steps as and when required.

(iii) **Repairs to damaged/spalled concrete** : For repairs to damaged/spalled concrete, where extensive damage has already occurred due to corrosion, the defective concrete should be cut out to the full depth but not less than 50 mm beyond the loose concrete layer and all loose materials removed. The exposed reinforcement should be thoroughly cleaned up to the root of the rust with brushes, sand blasting, chemical solution, etc. If felt necessary the bar could also be removed and replaced by another new bar duly welded in position. On the replaced as well as remaining steel surface either a thin coat of neat cement grout or epoxy coating as per specifications enclosed (Annexure-B) with adequate bonding and tensile strengths should be applied before any further treatment. The repairs can either be done by reconcreting with smaller chips of 20 mm size preferably and good quality dense concrete, or guniting with cement mortar or epoxy mortar. The guniting for cement mortar shall satisfy the following specifications :

- (a) Water cement ratio 0.35 to 0.50 by weight wet enough to reduce rebound.
- (b) Mortar mix of 1 part of cement: 3 to 4 parts of sand.
- (c) Drying shrinkages 0.06 to 0.1 per cent.
- (d) Cement used shall be with inhibitors such as calcium nitrite of approved specifications.
- (e) Thickness of guniting 50 to 65 mm.
- (f) Test panels should be gunned under field conditions to check or reduce rebound.
- (g) Conventional 150/300 mm cylinder moulds shot-creted shall give strength of about M 300 at 28 days.

Where epoxy mortar guniting is to be preferred, the specifications in respect of the same will have to be drawn in consultation with experts in the field as this is a specialised job. However, not much experience has been gained to draw the specifications and report on performance of such treatment for bridges in this country.

(iv) For exposed components of expansion joints, the same shall be protected by a suitable covering of proven specification.

6. The performance of the remedial measures undertaken shall be carefully watched and monitored. For monitoring use of copper sulphate half cell for measuring the potential difference over a time period in the affected portion and comparing such values with previous records, use of non-destructive tests such as SCHMIDT Hammer, Ultrasonic Pulse Transmission Techniques etc. could be considered.

ANNEXURE A

PROFORMA FOR INSPECTION

A. HISTORY OF BRIDGE

1. Name of Bridge
2. Location of Bridge (with map showing predominant direction of wind)
3. Age of Bridge on the date of inspection.
4. Approximate distance from sea. Whether located in back waters.
5. Whether any chemical industry is nearby or harmful affluent passing in the river.
6. Type of bridge along with GAD-R.C.C. Prestressed.
7. Grade of concrete with cement content
8. W/C ratio used (if available).
9. Chemical analysis of all the materials (if available).
10. Minimum cover to steel reinforcement used.
11. Whether any anti-corrosive treatment adopted at the time of construction.
12. Position of Construction Joints (if available).

B. INSPECTION REPORT

- I Bridge component affected
 - i). Superstructure
 - ii). Substructure
 - iii). Foundations

- iv) Bearings
- v) Any other

2. NATURE OF DISTRESS OBSERVED

- i) Rusting or staining of concrete
- ii) Bulging and/or cracking of concrete
- iii) Spalling of concrete
- iv) Rusting of metallic bearings
- 3. Extent of increase in deterioration since previous inspection
- 4. Repair measures proposed to be taken.

C. ANY OTHER OBSERVATION

NOTE : The items of inspection, as listed in proforma (item B I) are briefly elucidated here.

1. **Bearings :** While inspecting the bearings, following shall be kept in mind :

- i) The general condition like cleanliness, rusting and greasing of metallic/plate bearings.
- ii) Condition of rubber bearings, deterioration due to oxidation, flattening, bulging & splitting.
- iii) Condition of grease/oil (if provided) in case of metallic bearings.
- iv) Whether any structural cracks in supporting members like abutment cap, pier cap, pedestal, etc.

2. **Superstructure :** The inspection officer shall inspect the superstructure and report in respect of the following :

(i) **Reinforced concrete members :** The following aspects shall specially be looked for spotting (rusting), cracking, leaching, spalling and other signs of deterioration in critical areas of the structure viz., splash zone, water line at low tide level and portions exposed to atmospheric attack on the windward side. For the latter the web of concrete girder and box girder, articulations, under-side of decks, etc., shall particularly be inspected.

(ii) **Prestressed Concrete Members :** For prestressed concrete members aspects like loss of camber, excessive deflection, cracking, deterioration in concrete viz., spalling etc. shall be looked for. The critical areas being end anchorage zones, junction of diaphragms, under-side at the centre of span for longitudinal cracking etc.

3. **Expansion Joints :** Besides inspection for proper functioning of the expansion joint, any deterioration in the material such as rusting etc., shall be looked for along with remedial measures required.

4. **Wearing Coat :** The surface condition i.e. whether there are any cracks, spalling of concrete, disintegration etc. need to be reported along with remedial measures.

5. **Hand rails and Footpaths :** Hand rails, being slender members, are susceptible to corrosive distress. Appearance of rust stains, cracks, scaling deterioration in concrete, spalling etc. need to be reported along with remedial measures.

ANNEXURE B

CONCRETE CLASSES PSD, PSG, AND XYP

Concrete classes PSD, PSG, and XYP shall meet all of the requirements of concrete Class AX except the materials shall be proportioned to produce a concrete which shall have a minimum compressive strength of not less than 5000, 7000 and 6500 pounds per square inch, respectively, at the age of 28 days.

The Contractor shall design a mix that meets the specified strength requirements in conformance with ASTM C 685. A coefficient of variation of 20 per cent shall be assumed unless the supplier can demonstrate a record of sufficient tests to justify the use of a lower coefficient in conformance with ASTM C 685.

The mix shall be reviewed by the Engineer and verified by tests of cylinders made from the mix prior to commencing work on the portion of the bridge using this concrete. The use of calcium chloride as an admixture to the concrete will not be allowed.

EPOXY-COATED STEEL REINFORCING BAR

This item of work shall consist of furnishing, fabricating, coating and placing epoxy-coated steel reinforcing bars in accordance with the plans, the standard specifications and these special provisions. The coating material shall be applied by the electrostatic spray method or the electrostatic fluidized-bed method.

COATING MATERIAL

The coating material shall be one of the following or an approval equal :

- (a) SCOTCHKOTE 202 by the Minnesota Mining and Manufacturing Company, Inc.
- (b) FLINTFLEX 531-6080 by the E.I. Dupont de Nemours Company, Inc.
- (c) EPOXY POWDER 720-A-009 by the Cook Paint and Varnish Company.
- (d) CORVEL ECA-1440-J-Green-2779 by the Polymer Corporation.
- (e) EPOXIPLATE-346, 347, 348 and 349 by the Armstrong Products Company.
- (f) MOBILOX 1004-R-2 by Mobil Chemical Company.
- (g) SCOTCHKOTE 213 by the Minnesota Mining and Manufacturing Company Inc.
- (h) NAP-GARD 7-2000 by the Napco Corporation.
- (i) OXY-PLAST EL-704-P-9 by the Fuller-O'Brien Corporation.
- (j) SCOTCHKOTE 214 by the Minnesota Mining and Manufacturing Company Inc.
- (k) HYSOL DK 23-0602 by the Dexter Corporation.

Manufacturer's information on the proper use and application requirements of the resin to be used shall be submitted to the Engineer by the Contractor.

The Contractor shall furnish a written certification that the material furnished for the coating of the reinforcing steel is the same formulation as previously approved by the National Bureau of Standards, or the Materials Laboratory of the Washington State Department of Transportation. The Contractor shall supply to the Engineer a representative sample of 8 ounces of the powdered epoxy resin used to coat each given lot of bars. The sample shall be packaged in an airtight container with identification by lot numbers.

SURFACE PREPARATION

The surface of the steel reinforcing bars which are to be coated shall be blasted to near white metal in accordance with the steel structure Painting Council Surface Preparation Specification SSPC-SPIO-63T, amended January 1, 1971.

All traces of grit and dust from the blasting shall be removed. The surface shall be clean and free of any oil, grease, or other surface contaminants at time of coating.

The coating shall be applied to the cleaned surface as soon as possible after blast cleaning. The time between blast cleaning and coating of the bars shall not be more than approximately eight hours without specific approval of the Engineer.

COATING PROCESS

Bars shall be coated in accordance with the resin manufacturer's recommendations and these specifications. The coated bars shall meet the requirements specified and may be inspected for approval at the coating plant. Samples of coated bars of each size for testing shall be submitted to the Engineer for plant and process approval. A certification statement stating that all bars have been coated in accordance with the resin manufacturer's recommendations and these specifications shall be furnished with each shipment. This certification shall include for each bar size the preheat temperatures, cure times, thickness checks, holidays detected and bend test results. Two copies of these certifications shall be forwarded to the Engineer.

The coating applicator shall submit certifications of compliance with the above requirements. In addition, the Contractor shall submit to the Engineer six samples of each size of epoxy coated bars shown in the plans. The samples shall be four feet long and the Contractor shall ensure that samples for this testing shall not short the bar lengths specified in the project plans.

HANDLING

To protect the coated reinforcement from damage, the Contractor shall use padded or nonmetallic slings and padded straps. Bundled bars shall be handled in a manner which will prevent excessive sagging of bars which will damage the coating. The bundled bars shall not be dropped or dragged and must be stored on wooden cribbing. If, in the opinion of the Engineer, the coated bars have been extensively damaged, the material will be rejected. The Contractor may propose, for approval of the Engineer, alternate precautionary measures.

FABRICATION AND PLACEMENT

The bars shall be fabricated as specified in section 9-07 of the standard specifications before or after applying the epoxy coating.

Metal chairs and supports shall be coated with an epoxy or other inert coating approved by the Engineer. The Contractor may propose the use of other devices for approval of the Engineer. Plastic-coated tie wires approved by the Engineer shall be used to protect the coated bars from physical damage during placement.

The bars shall be accurately placed in the position shown in the plans and firmly held in place during placing and setting of the concrete. All epoxy-coated bars in the top mat of the roadway slab shall be tied at all intersections. All other epoxy-coated bars shall be tied at all intersections except where the spacing is less than 1 foot 0 inches in either direction, in which case alternate intersections shall be tied.

After placement of the coated bars and before pouring the bridge deck concrete, the coated bars will be inspected and, at the Engineer's direction, the Contractor shall patch damaged areas as specified elsewhere in this specification.

COATING THICKNESS

A film with a thickness after curing of 8 mils $\pm$ 2 mils shall be applied in a uniform, smooth coat. Thickness of the film will be measured on a representative number of bars from each production lot by the same method as outlined in ASTM Designation B 499, Non-magnetic Coatings on Magnetic Basis Metals.

CONTINUITY OF COATING

The coating shall be checked after cure at the coating plant for continuity of coating and shall be free from holes, voids, contamination, cracks, and damaged areas. In addition, there shall not be more than two holidays (pinholes not visually discernible) in each linear foot of coated bar. A holiday detector shall be used in accordance with the manufacturer's instructions to check the coating for holidays. A 67-1/2 volt, A.C. powered, on-line, holiday detector shall be used.

FLEXIBILITY AND BONDING OF COATING

The coated reinforcing bars shall be capable of being bent 120 degrees over a mandrel of the following diameter without and visible evidence of cracking or disbonding of the coating. The diameter of the mandrel for number 4, 5, 6, 7, 8, 9, 10 and 11 bars shall be 4, 5, 6, 7, 8, 9, 10 and 11 inches, respectively. The rate of bending shall be one minute plus or minus 15 seconds. The coating applicator shall test one sample of each bar size as prescribed above for each day's processing. If there is any evidence of cracking or disbonding of the coating, two additional test samples from different bars shall be secured and tested from the bars previously coated that day. Any evidence of cracking or disbonding will be considered cause for rejection of the coated bars represented by these samples.

PATCHING MATERIAL

Patching or repair material, compatible with the coating and inert in concrete, shall be supplied by the epoxy resin manufacturer and shall have approval of the Engineer. The material shall be suitable for repairs of areas of coating that have been damaged.

PATCHING

Patching material shall be applied to damaged areas at the points of occurrence, such as at the initial application, fabrication, destination or installation points.

Areas to be patched shall be clean and free of surface contaminants. They shall be promptly treated in accordance with the resin manufacturer's recommendations and before detrimental oxidation occurs.

Unless otherwise shown in the plans, all bars shall be epoxy-coated.

All costs for furnishing and installing epoxy-coated reinforcing bars shall be incidental to and included in the unit contract prices of the various contract items containing epoxy-coated reinforcing steel.

1980.2.

No. RW/PL-17 (14)/76-Vol. II

Dated the 4th January, 1982

To

All the C.Es/Addl. C. Es of Littoral States, Union Territories, PWDs dealing with Highways

Sub : Interim specifications for new concrete bridges to be constructed in marine environments and susceptible to corrosion

Your kind attention is invited to this Ministry's circular letter of even number dated the 31st March, 1981 forwarding "Guidelines for maintenance and repairs of existing concrete bridges susceptible to/being affected by corrosion". It is equally important that specifications adopted for the construction of new concrete bridges in such environments are adequate for inhibiting corrosion, so as to ensure durability and long term safety, and serviceability of our bridge structure. The Ministry has undertaken a research programme in which a detailed study of the problems of corrosion has been sponsored in the Central Electro Chemical Institute at Karaikudi, with a view to drawing up suitable specifications for concrete bridges to be constructed in marine environments susceptible to corrosion. However, till such time final results of this study are made available, it has been decided that for all centrally financed new concrete bridges located in marine environment susceptible to corrosion the interim specifications, herewith enclosed, may be adopted.

2. It is also recommended that amongst concrete superstructures preference should be given to a structural arrangement which is fully prestressed both longitudinally and cross-wise. A system with gap slabs should be avoided as not only the joints permit ingress of moisture into cable ducts however effectively sealed and promote chances of corrosion but also holes in some cases are not in the same vertical and horizontal alignments causing difficulties for threading cables. Comparatively speaking easy accessibility of steel structures for inspection and periodic protective painting, combined with feasibility of convenient repairs and replacement of members made them for the bridge superstructures an equally viable alternative and in certain locations even a preferable solution. These must also be considered in spite of the initial higher cost of steel structures. Conventional normal practice of using fully galvanised sections and painting with special anti-corrosive paints should be continued at regular intervals for protection against corrosion.

3. It is, however, imperative that corrosion protection of concrete bridges special attention is paid to the requirements of quality control, ensuring strict compliance of the prescribed standards for materials, concrete production and placement laid down in the "Specifications for Road and Bridge Works" and the enclosed interim specifications, the latter superseding the former, wherever conflict occurs.

4. A complete record should invariably be kept on all important aspects of the work such as specifications of the materials actually used, the field test data for ensuring requisite process control in making good quality concrete and periodic maintenance inspection reports as already highlighted in this office circular letter of even number dated March 31, 1981 along with the performance data of the structure.

Enclosure to letter No. RW/PL-17 (14)/76-Vol. II dt 4.1.82

Interim specifications for new concrete bridges to be constructed in marine environments and susceptible to corrosion

1. Scope :

Till such time the final results of the detailed condition survey of concrete bridge structures located in marine environment, susceptible to corrosion, and findings of research undertaken by the Ministry, are available, the interim specifications contained herein should be adopted.

2. Durability and zones of exposure :

In order to ensure long term serviceability of the structure, both durability of concrete and immunity against corrosion of embedded reinforcements are the essential requirements and these are achieved by concrete properly proportioned with low-water-cement ratio, low permeability, well laid and compacted and dense with the absence of cracks joints, adequate curing, etc. It has been noticed that the effects of corrosion vary considerably in various zones of exposure which could be de-limited for the purpose of applying this specification as under :

a) Submerged Zone : That part of the structure which falls below the splash zone.

In this area, the primary concern is to prevent chemical deterioration of concrete, corrosion of embedded steel and abrasion.

b) Splash zone : area of the structure subjected to repeated wetting and drying by sea water, viz. the difference between the highest and the lowest water levels reached by the waves with a statistical return period of 6 months superimposed on the highest and lowest level of spring tides plus one metre above highest tide level.

In this area, attention has to be paid to chemical deterioration of concrete and corrosion of embedded steel. In very cold climate the aspect of freezing and thawing has also to be considered though the same is not generally applicable to India.

c) **Atmospheric zone** : that part of the structure above the splash zone exposed to the atmosphere.

In this area, attention has to be paid to the prevention of corrosion of embedded steel due to wind action carrying salt/sand particles.

3. **Detailed specifications** : Apart from the provisions contained in the specifications for Road and Bridge works, published by this Ministry, the following interim specifications related to the various zones of exposure shall be followed. It must be ensured that the quality control measures undertaken at site are reliable enough to check that not only the materials as specified therein are upto the prescribed standards, but process control adopted also is of high order so as to achieve good quality of the end product.

3.1 Materials :

3.1.1. **Cement** : The cement used shall invariably be any of the following types with the prior approval of Engineer-in-charge and tested to comply with the relevant standards.

- i) Ordinary Portland cement conforming to IS:269.
- ii) Rapid Hardening Portland cement conforming to IS:8041.
- iii) High Strength Ordinary Portland cement conforming to IS:8112.
- iv) Supersulphated cement conforming to IS:6909.

In submerged as also less exposed atmospheric zones, ordinary portland cement will normally prove satisfactory. In the splash and more exposed atmospheric zones, concrete made with Portland cement having a Tri-calcium aluminate (C_3A) content ranging between six to nine per cent will give satisfactory long term performance. To improve resistance to sea water, supersulphated cement will be better or additions of specified Pozzolanic material may be made to Ordinary Portland cement having C_3A content greater than eight per cent, with the proviso that the total chloride content in the cement shall be such that the overall chloride content including that from water is less than 500 PPM.

3.1.2. **Aggregates** : The aggregates shall conform to the provisions contained in Cl. 302.2 of IRC:21:1972 (Bridge Code Sec. III). The max. size of aggregates shall neither exceed the value of concrete over nor 20 mm. In well foundations with concrete steining the maximum size of aggregates shall not exceed 40 mm.

Aggregates from coastal areas having salts etc. shall not be used in concrete unless they are thoroughly washed in fresh water to reduce the salt content to acceptable levels and to have sufficiently low shale and chloride content.

3.1.3. **Admixtures** : Admixture may be used with the approval of the Engineer-in-charge. Calcium chloride or admixtures containing calcium chloride shall not be permitted.

3.1.4. **Water** : Water used for mixing concrete shall comply with Cl. 302.4 of IRC:21-1972. The sub-soil water shall be tested for its chloride and sulphate content and suitable measures taken where necessary.

3.1.5. **Reinforcement** : Reinforcements shall comply with clause 302.5 of Section III IRC Bridge Code IRC:21-1972.

All reinforcement shall be free from rust, loose scale or coats of oil, paint etc. which may destroy bond. The reinforcement may be coated with cement slurry before embedment.

Binding wires shall be of stainless steel or galvanised wire. Use of polythene binding strings and galvanised bar grips may be made after making sure that they have no adverse effect on the concrete.

3.2 Production of concrete

3.2.1. **Cement content** : Minimum cement content of 400 kg/m^3 , not considering the quantity of Pozzolana material, shall be used for concrete in the splash zone. In other zones, the minimum cement content in reinforced concrete work shall be 360 kg/m^3 cement content in excess of 540 kg/m^3 shall not be used unless special consideration has been given to the increased risk of cracking due to shrinkage. For well steining in zones other than splash zone the minimum cement content shall be 300 kg/m^3 .

3.2.2. **Water/cement ratio** : To obtain concrete of low permeability, the water/cement ratio should be kept as low as possible, the value should normally be less than 0.45. A value less than 0.40 should be preferred subject to attainment of adequate workability.

3.2.3. **Strength of concrete** : Use of controlled concrete with weigh batching shall be adopted in all works. For reinforced concrete work in the submerged zone the minimum characteristics compressive strength at 28 days shall not be less than 20 N/mm^2 , for other zones it shall not be less than 35 N/mm^2 .

3.2.4. **Placement of concrete** : Strict attention shall be paid to proper batching, mixing and compaction of concrete, to achieve a homogenous and dense end product. For adequate compaction use of form and needle vibrators are essential.

3.2.5. **Curing** : Special attention should be paid to curing of concrete in order to ensure maximum durability and to minimize cracking. Concrete shall be cured with fresh water and the surface of concrete shall be kept wet by providing proper cover. Sea water shall not come in contact with concrete unless it has attained the desired strength.

3.3 Prestressed concrete :

3.3.1. **Cement** : Ordinary Portland cement, high strength ordinary portland cement shall only be permitted for prestressed concrete work.

3.3.2. **Prestressing steel** : The diameter of prestressed tendons shall in no case be less than 5 mm.

3.3.3. **Sheathing** : Metal sheathing to be used for prestressed concrete work shall be of galvanised type. For semi rigid type of metallic sheathing, the thickness of sheathing shall not be less than 0.6 mm. Vents shall be provided at any changes of section and at high and low points of the duct for the sheathing.

3.3.4. Protection of tendons during storage : Water soluble oils of proven specifications, if available, shall be used for coating over prestressed tendons during storage.

3.3.5. Grouting : It is suggested that grouting should be carried out as soon as possible after stressing. Wherever it is necessary to leave one side of formwork of girders open for tying reinforcement or any other purpose, the open side shall be the leeward side. The grout used shall be of non-shrink type with ordinary portland cement devoid of admixtures containing chloride, nitrates, sulphides or any other material liable to cause corrosion. The detailed specifications for grouting shall be as per provisions contained in Annexure I.

3.3.6. Anchorages : Anchorages shall be suitably protected immediately after completing the prestress work by applying dense cement mortar layer of at least 15 mm thickness to safeguard against corrosion.

3.4. OTHER COMPONENTS

3.4.1. Hand Rails : Use of steel sections shall be preferred as the same can be suitably protected by galvanising, painting, etc. to prevent corrosion. However, where R.C.C. handrails are used, these shall be shop fabricated and brought to site and erected in position. It is preferable to adopt steel reinforcements duly protected by a suitable protective layer, e.g. epoxy mortar, cement slurry coating with inhibitor of proven performance etc.

3.4.2. Expansion joints : The exposed metallic components of expansion joints shall be galvanised.

3.4.3. Bearings : Corrosion resistant bearing such as elastomeric or PTFE type shall be preferred. However, where metallic bearings are used adequate safeguards against corrosion such as oil baths etc. shall be adopted.

3.4.4. Wearing coat : Asphaltic type wearing coat of approved specifications shall preferably be adopted.

4. Design & Detailing :

In RCC work, detailing plays an important part and good detailing adds to durability. Some of the aspects are as follows :

4.1. Thickness of member : In the submerged and splash zone the minimum thickness of the members shall not be kept less than 450 mm.

4.2. Diameter of the reinforcing bar : Tensile reinforcement bars exceeding 28 mm and shear stirrups exceeding 12 mm shall not be permitted. The diameter of reinforcing bars shall be kept as small as permissible to effect close spacing with reduced resulting cracking.

4.3. Cover to reinforcement : The concrete cover to reinforcement shall satisfy the following requirements :

- a) 2 times the nominal maximum size of aggregate is or 1.5 times maximum diameter of bar whichever/greater but not less than those specified below.
- b) Minimum concrete cover to any reinforcement shall not be less than 35 mm nor more than 50 mm for R.C.C. and 60 mm for prestressed concrete.

4.4. Arrangement of reinforcement : The reinforcement steel shall be so arranged that concrete can be placed and compacted properly. Congestion of reinforcing steel at critical locations shall be avoided.

4.5. Crack with limitation : The crack width for mild steel and HYSD bars at the tensile face of the concrete under the worst combination of dead and live load shall not exceed 0.15 mm for members of concrete bridge structure located in the splash zone and 0.3 mm for other zones. The evaluation of the crack width shall be based on any rational formula. For this purpose, the formula given in CEB-FIP is acceptable with the dominantly occurring live load being taken as 0.5 times L.R.C. Class A wheel loads.

For solid slab bridges the check of the crack width shall deem to be satisfied, if the spacing of the longitudinal main reinforcement bars does not exceed 150 mm nor that of the transverse bars 300 mm.

4.6. Surface reinforcement : For mass concrete structures surface reinforcement shall continue to be provided in accordance with clause 306.4 of IRC:21 (Bridge Code Section III).

4.7. Abrasion : Where severe abrasive action due to pebbles, sand or silt is expected, the coarse aggregate used in the concrete shall be at least as hard as the material causing abrasion and the sand content of the mix kept as low as possible. In very severe conditions, stone masonry jacketting or concrete lining of design strength not less than 35 N/mm² shall be used.

5. Special techniques : Adoption of special techniques like providing a protective layer to the mild steel reinforcement, surface coatings to the finished concrete surface, special type of steel, cathodic treatment etc., are still to be tried on large scale in this country and their performance data is lacking.

As such any special technique may be used only if backed by a research/testing laboratory experimental work. In such cases complete technical data regarding material used, specifications adopted and subsequent performance of the structure shall invariably be kept.

Encl Annexure I

Annexure I

SUMMARY OF INTERNATIONAL (FIP) RECOMMENDATIONS FOR GROUT AND GROUTING

(quoted from ref. 71)

Preamble

In accordance with the general instructions of the Executive Committee of FIP, the Commission has refrained from going into details of giving figures which would not be applicable in all cases and in all countries in the belief that these remain the responsibility of

the Member Groups and the bodies responsible for supervision of works.

It is believed that what has resulted will form an adequate basis whose principles are applicable in all cases, and which should meet the aims of achieving durability, and the complete effectiveness of one of the basic components of the structure.

Summary

(1) Objectives of grouting : There are two principle objectives in grouting post-tensioned concrete members;

- (a) to prevent corrosion of the prestressing steel;
- (b) to provide an efficient bond between the prestressing steel and the concrete.

(2) Ducts : Vents should be provided at any changes of section and at high and low points of the ducts.

(3) Properties of the grout (a) where a cement-based grout is used, the water/cement ratio should be as low as possible consistent with adequate workability.

It is recommended that the fluidity of the grout should be measured on the site as a method of control.

(b) The bleeding of the grout at 20°C should not exceed the following :

2 per cent of the volume 3 hours after mixing; a maximum of 4 per cent.

In addition, the separated water must be adsorbed after 24 hours.

Bleeding should be measured in a metal or cylinder with an internal diameter of approximately 100 mm with a height of grout approximately 100 mm. During the test, the container should be covered to prevent evaporation.

(c) The compressive strength of the hardened grout after 28 days at a temperature of 20°C and relative humidity of approximately 70 per cent should not be less than 300 kg/cm², the method of measurement being that laid down by RILEM/Cembureau.

(d) Products other than cement-based grouts may be used following acceptable agreement tests.

(4) Materials for grout : (a) Cement normally used should be portland cement. The use of other cement may be authorised following agreement tests.

(b) If aggregates are used, they should consist of siliceous fine aggregate, finely-ground limestones, trass or fine sand.

(c) Acceptable admixtures may be used if tests have shown that their use improves the properties of the grout, e.g. by increasing workability, reducing bleeding, entraining air or expanding the grout. Admixtures must be free from any product liable to damage the steel or the grout itself, such as chlorides, nitrates, sulphides, sulphites, etc.

(5) Mixing grout : (a) The cement (and aggregates if used) should be measured by weight.

(b) The mixing equipment should be of a type capable of producing grout of uniform, and if possible, colloidal consistence.

(c) Mixing time depends on the type of mixer.

(d) Mixing by hand should be prohibited.

(e) After being mixed, the grout should be kept in continuous movement, it is essential that the grout should be free from lumps.

(6) Injecting grout : (a) Injection should be carried out with as little delay as possible after tensioning of the steel. If for structural reasons, it has to be put off, protection of the steel by methods or products which will not prevent the ultimate adherence of the injected grout, should be ensured.

(b) The method of injecting should ensure complete filling of the ducts and complete surrounding of the steel. To check this, it is advisable to compare the volume of the spaces to be filled by the injected grout with the quantity of grout actually injected.

Equipment for this check should be installed at the entry and exit points of the grout.

(c) Injection by compressed air should be forbidden.

(d) The pump should be fitted with an effective control against build-up of excessive pressure.

(e) In all cases, the ducts should be cleaned out by compressed air. Before injecting grout in unlined ducts, it is advisable to flush the duct with water to wet the concrete, except in cold weather. After flushing, excess water should be removed by suitable means.

(f) The connection between the nozzle of the injection pipe and the ducts should be hermetic so that air cannot be sucked in.

(g) Injection must be continuous and should not be interrupted. It should be slow enough to avoid producing segregation of the grout.

(h) In cold weather, and especially in frosts, special precautions should be taken when injecting. If the temperature is not likely to hinder setting, grouting may continue using a frost-proof grout, containing a certain proportion of entrained air, generally 6 to 10 per cent.

(i) Injection must be continued until the consistence of the grout flowing from the free end and vent openings is equal to that of the injected grout.

(i) After a certain time, it is recommended that further injections should be carried out to fill any possible cavities.

(7) Precautions to be taken after grouting :

- (a) In cold weather, or if there is a danger of the temperature falling below 2°C within 48 hours of injection, the work should be protected to avoid frost effects.**
- (b) In all cases, after final injection, openings and vents should be hermetically sealed, so as to avoid the ingress of water, de-icing materials and other corrosive agents.**

2100 UTILIZATION OF CENTRAL MACHINERY

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2100.1.	RM-3 (34)/70 dt. 18.3.72	Utilization Programme for Central Govt. Equipment	2100/1
2100.2.	RM-16 (1)/77 dt. 23.5.78	Quarterly Performance Report of Central Machines	2100/6
2100.3.	RM-4 (10)/71 dt. 13.4.72	Procurement of Bituminous Pavement Equipment	2100/7
2100.4.	DO No. RM-14 (1)/81 dt. 17.3.83	Annual Utilization Programme	2100/12
2100.5.	RM-14 (1)/83 dt. 22.10.83	Review of Schedule of Working Hours	2100/12
2100.6.	RM-14 (1)/83 dt. 29.10.83	Utilization of Central Machines	2100/14
2100.7.	RM-16 (3)/83 dt. 1.1.85	Use of Hotmix Plant on NH Works	2100/14
2100.8.	RW/RMP. 16 (3)/83 dt. 29.5.85	AC Works with 20-30 TPH Hot Mix Plant	2100/15

D.O. LETTER NO. RM-3 (34)/70 DATED THE 18TH MARCH, 1972, FROM THE DIRECTOR GENERAL (ROAD DEVELOPMENT) & ADDL. SECY. TO THE GOVT. OF INDIA ADDRESSED TO THE SECRETARIES TO THE GOVTS. OF ASSAM, BIHAR, W. BENGAL, ORISSA, U.P., RAJASTHAN, GUJARAT, MAHARASTRA AND PUNJAB

Subject : Utilisation programme for Central Government equipment

Please refer to Ministry's letter No. RM-10 (8)/68 dated the 10th August, 1970 regarding review of utilisation of Central Government equipment, their upkeep etc.

2. The matter of full utilisation of all Central equipment has been stressed by the officers of this Ministry during the various inspection tours, in the bimonthly meeting held, and in various correspondences in this connection.

3. The reports received from our regional Superintending Engineer (Mech)'s indicate that most of the Central equipment though in working order, as also those which can be put in order without much difficulty, are lying unutilised. I am, therefore, to request you to kindly intimate the present condition of Central Government Machinery in your State as in the Proforma (I) enclosed.

4. A number of new works on National Highways and other centrally sponsored road projects for execution during the Fourth Plan period have been sanctioned by the Ministry. With the completion or nearing completion of L.R.P., Strategic Road Programme etc., it is necessary that all the Central machinery is now used on the N.H. development works and only when these are surplus of the requirements of these works that for a limited period these are used on other Centrally financed road works. For achieving optimum utilisation of available machinery a fresh review of utilisation of Central Govt. equipment is very much necessary. I am, therefore, to request you to kindly send an utilisation programme of all central Govt. machinery available in your State particularly the units of (a) earth moving equipment (Scrapers, Dozers, Motor graders, etc.) (b) Compaction equipment (Road rollers, sheep-foot rollers, water tankers etc.) (c) Bituminous pavement Equipment (Hot Mix Plant, Paver Finishers, Tippers Tandem Rollers and other ancillary equipment), and (d) Stabilisers (Voegelle or Howard) with connected ancillary equipments for the period ending March, 1973. Please indicate therein the quantum of various items of work required to be executed by these equipments and the expected performance of these equipments against each item of work based on the output norms and expected working hours of machinery earlier spelt out by this Ministry in letter No. RM-15 (3)/70 dated 5.6.70. A specimen form indicating the extent to which the machinery is expected to be used in each item of work, is also enclosed. A list of machinery not likely to be utilised may also be sent to this Ministry so that they can be transferred to other needy states for execution of central works. This information may kindly be furnished in the attached proforma (II). Similar utilisation programmes would be required to be submitted on annual basis for subsequent financial years also in every preceding month of March.

5. A proper mechanical organization set up and repair facilities are a must for better upkeep of machinery. Attention of State Chief Engineers for separate and adequate organization for N.H. Works was drawn in the Minutes of the P.W.D. Secretaries, Chief Engineers' meeting held at New Delhi from 5th to 7th June, 1971, which were circulated vide this Ministry's letter No. PL-2 (2)/71 dated 3.7.71 wherein a sketch of model set up was also enclosed which duly envisaged setting up of a requisite mechanical organization too. I am to request you to kindly intimate the present organizational set-up on mechanical side, workshop facilities available, mobile workshop and field workshop staff available in the state of proper running, operation, maintenance and care of the Central Govt. equipments in the Proforma (III).

6. At present practically no monthly/quarterly performance report of the working of the central equipment in the State is being received in the Ministry. You are requested to send the performance report of the Central Govt. machinery in the proforma (IV) every quarter and ensure their regular submission, in future.

It is requested that the above information may be furnished to this Ministry latest by the end of April, 1972 and copies thereof may also please be supplied to our Superintending Engineer (Mech.) concerned and to our regional offices.

PROFORMA I

PROFORMA SHOWING THE CONDITION OF MACHINERY

Name of State : _____

Sl. No.	Name of Machinery	Quantity available in the State					No. in working order		No. under breakdown which can be repaired with the indigenous parts & those in stock	No. which cannot be made ready until & unless the parts are imported with brief details	No. which are beyond economical repairs	Remarks
		IDA	LRP.	Emergency	S.R.	Total	IN USE	IDLE				
1	2	3	4	5	6	7	8	9	10	11	12	13

PROFORMA II

PROFORMA INDICATING THE UTILISATION PROGRAMME OF MACHINERY

Name of State : _____

Sl. No.	Name of Machinery	Quantity available in the State	Quantity required for the period ending March '73 (Detailed calculations to be enclosed)	Surplus	Remarks
1	2	3	4	5	6

PROFORMA III

PROFORMA INDICATING THE PRESENT ORGANIZATIONAL SET-UP AND WORKSHOP FACILITIES AVAILABLE IN THE STATE

Sl. No.	Details of organization						Workshop and their location				Remarks
	S.E. (M)	E.E. (M)	A.E. (M)	Overseers	Foremen	Mechanics	Central	Regional	Mobile	Field	
1	2	3	4	5	6	7	8	9	10	11	12

PROFORMA IV

QUARTERLY REPORT OF PERFORMANCE OF MACHINERY USED ON CENTRAL ROAD WORKS, FOR THE QUARTER ENDING

Sl. No.	Name of Machinery	M/C No.	Total No. of Days worked	Total No. of Hrs. Actually worked	Total idle hrs. for want of work	Breakdown hrs. with brief reasons	Total output Achieved (Cu. M) etc. (Sq. M)	Remarks
1	2	3	4	5	6	7	8	9

NAME OF STATE

1. SCRAPERS

Quantity of Earth work involved :

- (i) Construction of missing links @ 10% by machines
- (ii) Approaches to new bridges, overbridges and high embankments upto 50% by machines
- (iii) Widening roads to four lanes @ 20% by machines

Total quantity of earth work involved

Assuming average output of a scraper

= 30 Cu. yd/hr. or
810 Cu. ft/hr.

Assuming working hours/year

= 1500

Time Period

=

	No. of scrapers required	=	
2.	PUSHERS		
	@ 1 for 4 Scrapers	=	
3.	TRACTOR DOZERS (150 H.P.) for spreading etc		
	@ 1 for 4 scrapers	=	
4.	TRUCK MOUNTED WATER TANKERS		
	@ 1 for 4 Scrapers	=	
5.	ROAD ROLLERS, 8-10 TONS CAP. (For compaction and Metalling)		
	(a) <i>Earth-work compaction :</i>		
	(i) Missing links @ 95%		
	(ii) Improvement of low grade sec. (100%).		
	(iii) Widening and strengthening of single lane section to two lanes (100%)	=	
	(iv) Strengthening existing weak double lane stretches (100%)		
	(v) Widening roads to two lanes (without strengthening) (100%)	=	
	(vi) Providing bye-passes (100%)	=	
	(vii) Approaches to new bridges, overbridges and high embankments (50%)	=	
	(viii) Widening roads to four lanes (80%)	=	
	Total Earthwork	=	
	Assuming out-turn of a Roller	=	15,000 C. ft/day 428 cum/day
	Time period	=	
	Assuming No. of working days/year	=	200
	No. of Rollers required	=	
	(b) <i>Muram Gravel</i>		
	Quantity of Gravel	=	
	Assuming out turn of a Roller	=	15,000 C. ft/day 428 cum/day
	Time period	=	
	No. of Rollers required	=	
	(c) <i>Soling :</i>		
	(i) <i>Oversize metal</i>	=	
	(ii) <i>Overburnt bricks</i>	=	
	Total	=	
	Assuming out-turn of a Roller	=	1500 C. ft/day 43 cum/day
	No. of Rollers required	=	
	(d) <i>Metalling :</i>		
	Quantity of work	=	
	Assuming out-turn of a Roller	=	1200 C. ft/day 34 cum/day
	No. of days/year	=	200
	Time period	=	
	No. of Rollers required	=	
	(d) <i>Surface Dressing :</i>		
	<i>First Coat</i>		
	Quantity of work	=	
	Assuming out-turn of a roller/day	=	7000 S. ft. 650 sqm.
	Time period	=	
	No. of Rollers required	=	
	<i>Second Coat</i>		
	Quantity of work	=	
	Assuming out-turn of a roller/day	=	10,000 S. ft.
	Time period	=	
	No. of Rollers required	=	
	(f) <i>Rolling of ¾" Carpet :</i>		
	Quantity of ¾" carpet	=	

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	Assuming out-turn/day	=	5000 S. ft. day 465 Sq. m.
	Time period	=	
	No. of Rollers required	=	
(g)	<i>Seal Coat over ¾" Carpet</i>	=	
	Quantity of Seal Coat	=	
	Assuming out-turn of a Roller/day	=	10,000 S. ft.
	Time period	=	
	No. of Rollers required	=	
(h)	<i>Rolling of Bitumen Macadam/Built-in Spray Grout :</i>	=	
	Quantity of 2" Bitumen Macadam/Spray Grout	=	
	Assuming out-turn of a roller/day	=	3000 S. ft/day 280 Sq. m.
	Time period	=	
	No. of Rollers required	=	
6.	<i>SHEEP-FOOT ROLLER (DOUBLE DRUM)</i>		
	Quantity of Earthwork		
(i)	Missing links @ 5%	=	
(ii)	Approaches to new bridges, overbridges and high embankments upto 50% by machines		
(iii)	Widening to 4 lane @ 20%		
	Total Earthwork	=	
	Assuming out-turn of a Roller	=	3,000 C. ft. hour 85 cum/day
	Time period	=	
	No. of Rollers required	=	
7.	<i>SINGLE PASS SOIL STABILIZERS (HOWARD)</i>		
	Quantity of stabilized soil (sub-base)	=	
	Assuming out-turn of a Howard stabilizer	=	4,000 C. ft/day 115 cum/day
	Time period	=	
	Working days per year	=	
	No. of Stabilizers	=	
8.	<i>MOTOR GRADERS</i>		
	@ 1 No. each for Four Nos. Soil Stabilizers		
9.	<i>WATER TANKERS. 1000 GALS. CAP (TRAILER MOUNTED) :</i>		
	Assuming quantity of water required to be 10% of total quantity	=	
(i)	Earthwork high approaches	=	
(ii)	Quantity of metal consolidation	=	
	Assuming output of a water-Tanker	=	2000 gallons/hour
	Time period	=	
	No. of Tankers required	=	
	Due to availability of local water to an extent of one-third quantity, tankers may be reduced to	=	
	Add 3 Trailer mounted Water Tankers for each Soil Stabilizer	=	
	Total Water Tankers	=	
10.	<i>TRACTORS</i>		
	@ 1 per Sheep-Foot Roller	=	
	@ 1 per 3 Nos. Trailer mounted Water Tankers	=	
	Total	=	
11.	<i>ROAD ROLLERS (4-6 TONS) :</i>		
(i)	Double brick sub-base 6" thick	=	
	Assuming out-turn of roller	=	1500 C. ft. day
	Time period	=	
	No. of Rollers	=	

12.	HOT MIX PLANTS		
	(i) Quantity of $\frac{3}{4}$ "-1" carpetting	=	
	Assuming 20 C. ft. = 1 Ton	=	
	(ii) Quantity of 2"-3" bitumen Macadam	=	
	Assuming 25 C. ft. = 1 Ton	=	
	Total quantity of Bitumen Macadam and Carpetting	=	
	Assuming out-turn of Hot-Mix Plant/hour	=	15 Tons/Hr.
	Time period	=	
	Working hours/year	=	1500
	No. of Hot Mix Plants	=	
13.	PAVER FINISHERS		
	@ 1 No. per 3 Hot Mix Plants	=	
14.	TIPPERS		
	@ 5 Nos. per Hot Mix Plant	=	
15.	BITUMEN BOILERS		
	(a) @ 5 Nos. per Hot Mix Plant	=	
	(b) Quantity of Seal Coat over $\frac{3}{4}$ " carpet	=	
	(c) Assuming Bitumen required @ 20 lbs/100 S. ft. of Seal Coat	=	
	(d) Quantity of seal coat over $1\frac{1}{4}$ " carpet	=	
	Assuming Bitumen required @ 25 lbs/100 S. ft. of Seal Coat	=	
	(e) Quantity of Seal Coat over 2" Bitumen Macadam	=	
	Assuming Bitumen required @ 32 lbs/100 S. ft. of Seal Coat	=	
	(f) Quantity of Surface Dressing	=	
	Assuming Bitumen required @ 70 lbs/100 S. ft. of surface dressing	=	
	(g) Quantity of Spary Grout	=	
	Assuming Bitumen required @ 85 lbs/100 S. ft. of Spray Grout	=	
	Total Bitumen required = (b)+(c)+(d)+(e)+(f)	=	
	Assuming out-turn of Bitumen Boiler/day	=	500 Gallons
	Time period	=	
	No. of Bitumen Boilers required	=	
16.	AIR COMPRESSORS (210-250 C. f.m.) (For quarrying job)		
	(i) Qty. of soling	=	_____ cft.
	(ii) Qty. of metalling	=	_____ cft.
	(iii) Qty. of surface dressing	=	_____ cft.
	Total	=	_____ cft.
	Assuming out-turn of a compressor	=	8×10^5 C. ft/year
	Time period	=	
	Therefore, No. of compressors	=	_____ Nos.
17.	JACK HAMMERS		
	@ 2 Nos. per compressor	=	_____ cft.
18.	STONE CRUSHERS (16" X 9" opening)		
	Qty. of metalling	=	_____ cft.
	Assuming output of crusher	=	240 cft/hr or 12 tons/hour
	Time period	=	
	No. of Crushers required	=	_____ Nos.
19.	GRANULATORS		
	Total quantity of chips required	=	_____ cft.
	Assuming output of Granulator	=	130 cft/hr.
	Time period	=	
	Granulators required	=	_____ Nos.
20.	TRUCKS/TIPPER for carriage of materials from quarry		
	(i) Qty. of material	=	_____ Tons
	(ii) Lead	=	_____ Km

(iii) Assuming output per day	=	_____ tons
(iv) No. of Trucks required	=	_____ Nos.
Total :	=	_____
* When lead = 1 mile, output per day	=	8 trips
* When lead = 5 miles, output per day	=	6 trips
* When lead = 10 miles, output per day	=	5 trips
* When lead = 20 miles, output per day	=	4 trips

NOTE : The following assumptions may be made.

(i) No. of working days/year	=	200
(ii) No. of working hours/year	=	1,500

2100.2.

D.O. LETTER NO. RM-16 (1)/77 DATED THE 23RD MAY 1978, FROM DIRECTOR GENERAL (ROAD DEVELOPMENT) AND ADDL. SECY. TO THE GOVT. OF INDIA ADDRESSED TO SECRETARIES (DEALING WITH N.Hs.) TO THE GOVTS. OF ASSAM, ANDHRA PRADESH, BIHAR, GUJARAT, H.P., HARYANA, J & K, KARNATAKA, KERALA, MAHARASHTRA, M.P., MANIPURE, NAGALAND, MEGHALAYA, PUNJAB, RAJASTHAN, TAMIL NADU AND U.P., W. BENGAL, D.G. (WORKS) C.P.W.D.

Kindly refer to my Demi Official letter No. RM-16 (1)/77, dated the 29th March, 1978 regarding submission of quarterly performance report of Central machinery in your State. This question of timely submission of the quarterly performance report indicating the actual extent of utilisation is being repeatedly stressed by us in a number of correspondences and also in review meetings held with you, your Chief Engineer and other officers of your State Public Works Department. Your attention has also been drawn about the serious view taken by the Audit, Public Accounts Committee, and Planning Commission about the non-receipt of quarterly performance report in time and non-furnishing the essential data such as the working hours done to appreciate the percentage utilisation.

2. Public Accounts Committee vide their recommendation No. 7.61 has stated "The Committee further note that in order to have continuous record of the performance of the Central machinery in the Headquarters, the States are required to submit from 1972-73 onwards a quarterly performance report indicating the number of hours the equipment has worked, remained idle or under breakdown etc. The Committee find that whereas all the 8 States concerned had furnished reports for all the 4 quarters during 1974-75, the position had deteriorated in 1975-76 as only 2 States viz. Haryana and Punjab, submitted these reports for the whole year. The Committee would desire the Ministry to ensure that these quarterly reports are received regularly and in time from all the States so that on the basis of particulars furnished therein the Index Cards now being maintained at the headquarters are kept up-to-date, all the time".

3. Public Accounts Committee has also pointed out that further expenditure on purchase of road building machinery for Central works should be considered only after making sure that the machinery already available has been put to effective use. We are also not able to effectively convince Finance and Planning Commission the requirement of additional equipments and the funds needed for the procurement and upkeep, due to non-availability of utilisation data.

4. There is large volume of earthwork in high embankments such as rail and river bridge approaches, pavement strengthening works etc. and it should not be difficult to utilise the general purpose equipments allotted to your State. They were purchased specifically to ensure quality and speed of construction. What is needed is only advance planning of works, and earmarking work for the use of the machines and watching the actual utilisation subsequently. For this purpose, I had already suggested to you to have a separate officer in the office of your Chief Engineer who can obtain the required information from the field officers, consolidate the same and send to us. I may be informed about the action taken in this connection.

5. The quarterly performance report for the quarter ending 31st March, 1978 may please be sent immediately, and the reports of the previous quarters may be sent subsequently but as early as possible.

No. RM-4(10)/71

Dated the 13th April, 1972

To

The Secretary to the Government of West Bengal Public Works Department dealing with National Highways and other Central works

Subject : Procurement of bituminous pavement construction equipment for execution of **central/centrally sponsored works**

I am directed to say that a tentative assessment of requirement for the following items of bituminous pavement construction equipment was made in the Ministry for the execution of Central/Centrally sponsored road works, being taken up in the States in IV Plan period.

- (1) Mobile Hotmix Asphalt 6-10 per hour capacity
- (2) Tipper trucks 5-7½ tons capacity

On that basis an indent has already been placed on DGS & D for their supply with the specifications detailed in Appendix I. It may be seen that the Indian standards specification have been followed with slight modifications. Your views, if any, on these specification may please be communicated immediately.

After taking into consideration the quantity of similar equipments already supplied to some of the States for the execution of earlier special projects like the IDA, a tentative distribution of the number of above categories of equipments likely to be purchased between various States, has been worked out and the number in respect of some of these types likely to be finally considered for allotment to your State on receipt of detailed reply to this letter furnishing the information called for in the above and in the succeeding paragraphs is indicated below :

- (1) Hotmix plant 6 to 10 Tonnes/hour capacity = 4 Nos.
- (2) Tipper Trucks 5-7½ tonnes capacity = 21 Nos.

It may be confirmed that the entire quantity indicated above, in case finally decided to be allotted on receipt of the reply asked for from you, will be fully utilised for the execution of Central Works in your State, and if so the following information regarding consignee instructions may be furnished immediately for communicating to D.G.S. & D.

- (1) Designation of officers to whom the equipment allotted are to be consigned
- (2) Railway station to which these may be booked
- (3) Postal address to which Railway receipt is to be sent
- (4) Telegraphic address of receiving officer
- (5) Phasing of supply preferred, consignee-wise

2. As already intimated earlier, ending with D.O. letter dated 18.3.72 from DG (RD) & Additional Secretary it would be necessary to ensure that proper and adequate mechanical organisational set up and repair facilities are arranged so as to ensure proper and timely commissioning, better operation and upkeep of the equipment. As West Bengal already have bigger sized Hot mix plants and Pavers they may be aware of the need to have proper set up for handling the same satisfactorily. In this connection an organisational set up etc. that may be required for operating one hot mix plant unit station is enclosed for your guidance, which of course will vary from State to State according to the conditions prevailing in the State.

4. Adequate co-ordination between works (supply of material, etc) and mechanical branches (shifting to sites, assembly, commissioning, etc.) are also required to be arranged for proper utilisation of equipments and for their uninterrupted smooth working so that bituminous pavement work is executed with requisite speed and to target schedule. Hence timely preliminary action may also have to be taken in this connection.

5. Your detailed reply to this communication with full information asked for and bringing out the State PWD's due preparedness for being able to take on and thereafter properly and fully utilise these important categories of machinery and also being able to look after, maintain and operate them properly may please be furnished at your earliest in order to enable this Ministry to **finally** consider the proposed distribution of machinery and thereafter communicate to the State the final quantity of machinery to be allotted and also transmit the consignee instructions to the D.G.S. & D.

SPECIFICATIONS

Item I : Mobile Hot Mix Asphalt Plant Light duty 6-10 Tonnes per hour

The Specifications will generally conform to I.S.S. 5890/1970 subject to such other amplifications, modifications, alterations and additions as are detailed below :

- (i) The plant shall be driven by a diesel engine of adequate H.P. conforming to the latest I.S.S. is acceptable to us.
- (ii) Two numbers cold feed storage hoppers with total capacity of about 3.5 cu. m. with suitable and efficient feeding arrangement sufficient to feed material to get a maximum output of 10 T.P.H. Feeding height should be about 1½ metres suitable for manual loading. Feeding platform will be required to be provided if the feeding height exceeds the same. This arrangement is suggested in preference to loading skip arrangement detailed in para 8.1 of I.S.S.
- (iii) Dryer unit of adequate capacity of about 1.7 cu. m. to ensure 6 T.P.H. output when aggregates fed have 6% moisture content and increasing to 10 TPH output with aggregates having a favourable moisture content of 2%. This is in addition to the details in paras 9.1 and 9.2 of I.S.S.
- (iv) Means may be provided for ascertaining the temperature of the heated aggregate at the discharge and of the dryer or any other suitable location (Para 9.3 I.S.S. refers).
- (v) As per requirements for clause 7.1 (e) of I.S.S. Bitumen boilers or bitumen storage tanks with heating arrangements or bitumen heating kettle may be provided with the capacity not less than 3000 litres so as to ensure continuous flow of bitumen to cater for the maximum capacity of the plant, when supply is made in bitumen drums (Packed drums), complete with burners of adequate capacity to raise the temperature quickly to 175°C and to maintain the continuous supply of Hot Bitumen at the same temperature. Means shall be provided for the filling of storage tanks with packed bitumen so as to ensure the complete emptying of bitumen drums at a rate not less than the maximum demand of the plant. Suitable insulation is necessary to avoid clogging of bitumen pipe lines, bitumen pumps and spray bars etc.
- (vi) The burners must be suitable to work satisfactorily using furnace oil as well as light diesel oil. Preheater for oil supply is necessary. The choice of type is being indicated referring to para 9.4 of I.S.S. Tenderer should indicate oil consumption of burner when aggregates with 6 per cent moisture content is dried.
- (vii) Twin shaft Paddle mixer of about 275 kg capacity to ensure an average output of 10 TPH at 2 per cent Moisture content of aggregate (Amplification of para 10.2. ISS).
- (viii) In addition to details specified under para 9.2 of I.S.S. the Hot Mix Plant will be using a maximum aggregate size of 63 mm. and minimum aggregate size passing through sieve of size of 2.36 mm with a moisture content varying from a maximum of 8% to a minimum of 1%.
- (ix) In addition to details under (iii) above, Thermometers or similar instruments to indicate temperature of heated aggregate, heated bitumen and the final mix are to be provided.
- (x) Out of 50 Nos. Diesel engines to be supplied, cold starting arrangements for 15 engines only are necessary (Amplification of para 5.1 of I.S.S.).
- (xi) Details of site conditions are as follows :

(a) The maximum altitude above mean sea level	= about 2400 metres.
(b) (i) The maximum temperature	= 48°C
(ii) Relative humidity corresponding to the maximum temperature	= 10%
(c) (i) Max. R.H. as attained in Kerala State during rainy season	= 100%
(ii) Corresponding to max. R.H. Dry Bulb temperature	= 32°C
(d) Minimum temperature for 15 engines out of 50 vide para (x) above	= -2°C

Tenders must specify the outputs at various moisture contents ranging from 2 to 6%.

Lubrication means suggested in para 6.4 I.S.S. is acceptable to us. The arrangement detailed in para 9.5 of I.S.S. will be suitable to us.

The height and location of the discharge end of mixer shall be such as to allow free use of standard wheel barrow for carrying the mixed material as specified in para 10.2 of I.S.S.

IV. Tippers

All Steel cab and all steel way tipping rear body on 118"-127" wheel base chassis, 5 tons capacity driven by a suitable diesel engine of about 100 HP capacity and complete with hydraulic tipping gear. The rear body may be about 7'-0" wide and 10'-0" long with 2' high sides, and hinged tail gate. The cab details are as per DGS & D Drg. No. 18507.

Floor and the sides of the Rear Body are to be built with 10 gauge M.S. sheets and the sides are to be properly reinforced. The body to be generally as per DGS & D Dr. No. 16853.

The tipper trucks are required to work in conjunction with Paver Finishers for the carriage of hot bitumen mixed material. 20 per cent spares for each of the above units.

**Type Estimate for the Installation of Hot-Mix Plant at each Station
(Provisions of accommodation and service roads)**

1. Cost of tents, tarpaulins and other tentage equipments for one Station Vide Appendix 'A'
2. Fencing with 3 horizontal lines of barbed wire fixed to the 6'-0" long 6" dia. Sallunger pitched @ 8'-0" etc including cost of

materials, labour for pitching etc. all complete.

Residential :

300'-00"

100'-00"

25'-00"

300'-00"

125'-00"

850'-00" @ Rs. 3/- per ft. _____

Rs 2550=00

3. Wooden gate for the colony enclosure
12'-0"×4'-6" of numbers as per the P.W.D. standards
L.S. _____

Rs 250=00

4. Approach road inside the colony made of moorum,
cindres or coarse sand as stone ballast etc. whichever is readily available

100'-00"

100'-00"

25'-00"

100'-00"

300'-00"

625'-00"×12'-0" 7500 sft. @ Rs. 2.00 per sft.

including 6" thick moorum, flank dressing etc. all complete _____

Rs 15,000=00

5. Site development including levelling and dressing and
provision of Katcha drains etc. _____

Rs 1,000=00

6. Provision of temporary service latrines etc. for the
officers and others within the colony _____

Rs 2,500=00

Rs 21,300=00

7. Electric installation in the campus including the cost of wiring (temporary)
etc. all complete within a max. lead of 1000 ft. from the Electric Mains

L.S. _____

Rs 2,500=00

8. Temporary shed for the testing laboratory for the quality control works etc. all completed
20'×8'=160 sft.
@ Rs 15/- per sft. _____ 2400/-
(including water connection)

Rs 2,400=00

9. Provision of Tube well or pucca wells for the drinking water supply
for the workers and the people residing within the colony.
2 nos. @ Rs 1500/- each _____

Rs 3,000=00

Rs 29,200=00

10. Cost for fixing the cash chest in the pucca B.W. including all costs.
2 nos. @ L.S. 500/-
Cost vide appendix for item No. 1 _____

1,000=00

Rs 30,200=00

17,600=00

Rs 47,800=00

11. Extra for temporary L.S. for 4 acres @ Rs. 500/- per year for 2 years

Rs 2,000=00

Rs 49,800=

Say : Rs 50,000=

Appendix for Item I

			Rs
1. Swiss cottage	4	@ Rs 500	2000
Kobul pal	8	@ Rs 300	2,400
Petro-max	6	@ Rs 100	600
Lavatarus	80	@ Rs 10	800
Tarpaulins sheds	68	@ Rs 100	6800
Steel folding table	10	@ Rs 60	600
Steel folding chairs	24	@ Rs 50	1200
Steel trunks	12	@ Rs 50	600
Cash chest	2	@ Rs 800	1600
Steel camp cots	2	@ Rs 500	1000

17,600

ACCOMMODATION FOR OFFICE AND TEMPORARY RESIDENCES FOR OPERATIONAL STAFF AT EACH HOT-MIX PLANT STATION

Details of staff Grade	Total Nos.	Swiss Cottage	Kabul pal double cover	Pet-max	Lan-terns	Tar-pau-lin Sheds (12'×10')	Steel folding tables	Steel folding chairs	Steel trunks 36'×24" ×18"	Cash chest	Steel camp cots	Remarks	
1	2	3	4	5	6	7	8	9	10	11	12.	13	
1. Assistant Engineer		2	2	—	2	2	—	2	4	—	—	2	Residential
2. Subdivisional Officer		2	2	—	4	2	—	4	8	6	2	—	Office
3. Engineer Asst. Overseer (Civil)		2	—	2	—	2	—	2	4	2	—	2	Resident & Office
4. Engineer Asst. Overseer (M)		2	—	2	—	2	—	—	4	2	—	2	Residential
5. Research Asst.		2	—	2	—	2	—	2	2	2	—	2	Residential
6. Laboratory Asst.		2	—	1	—	1	—	—	—	—	—	2	Residential
7. Orderly Peons		6	—	—	—	3	3	—	—	—	—	—	Joint Occupation Residential
8. Foreman		1	—	1	—	1	—	—	2	—	—	1	Residential
9. Grade IV Employees		76	—	—	—	38	38	—	—	—	—	—	Residential
10. Labourers Sheds		105	—	—	—	27	27	—	—	—	—	—	Residential
Total			4	8	6	80	68	10	24	12	2	11	

N.B. : Accommodation for Testing Lab. will be provided in Semipermanent Hutments with 10" brick wall and C.A. sheats. Size of hall will be 20'×8" at each station.

GRADATION OF STAFF AT EACH HOT-MIX PLANT

Details of Staff	Gr. II	Gr. III	Gr. IV	Labourers
Assistant Engineer	2	—	—	
Engineer Assistant Overseer (Civil)	—	2	—	
Engineer Assistant/Overseer (Mechanical)	—	2	—	
Subdivisional clerk	—	2	—	
Orderly peons	—	—	6	
Research Assistants	—	2	—	
Laboratory Assistants	—	2	—	
Helpers	—	—	6	
H.M. Plant Operator	—	—	6	
Paver Finisher Operator	—	—	1	
Three Wheeled Roller Drivers	—	—	1	
Tandem Roller Drivers	—	—	1	
Tipping Trucks Drivers	—	—	15	
Tipping Trucks Khalasis	—	—	15	
Ordinary Truck Drivers	—	—	1	
Ordinary Truck Khalasi	—	—	1	
Foreman	—	1	—	
Senior Mechanics	—	—	2	
Junior Mechanics	—	—	3	
Mechanical Helpers	—	—	4	
Greasers	—	—	6	
Fitter	—	—	1	
Welder	—	—	1	
Cleaners	—	—	9	

Electrician	—	—	1	
Coolies	—	—	—	2
Labourers	—	—	—	
Mason	—	—	—	1
Road Surface cleaners	—	—	—	20
Roller Wheels cleaners	—	—	—	2
Flank dressing	—	—	—	20
Chowkidars				
Paver site	—	—	1	—
Plant site	—	—	1	—
H.M. Plant feeders	—	—	—	60
Total :	2	11	82	105

D. STAFF FOR MOBILE QUALITY CONTROL SUB-DIVISION (CIVIL) UNDER ONE ASSISTANT ENGINEER

1. Research Assistants — 2 nos. (May be increased to 4 nos. as per quantum of work)
2. Laboratory Assistants — 4 nos. (May be increased to 8 nos. as per quantum of work)
3. Helpers — 6 nos. (May be increased to 10 nos. as per quantum of work)
4. Coolies — 2 nos.

E. LABOURERS FOR ONE HOT-MIX PLANT STATION AND ITS OPERATION (PER DAY)

1. Labourers for feeding aggregates — 60 to 70 nos.
2. Labourers for Paver Finisher :
 - (a) Mason — 1 No.
 - (b) Labourers — 20 nos. (for clearing the road surface etc.)
 - (c) Labourers — 2 nos. (for cleaning the roller wheels).
3. Labourers for flank dressing — 20 nos.
4. Chowkidars at :
 - (a) Paver site — 2 nos.
 - (b) Plant site — 2 nos.

F. REGULAR ESTABLISHMENT AT SITE

- i. Mobile Mechanical Subdivision :
 - (a) Assistant Engineer (Mechanical) — 1 no.
 - (b) Engineer Asst. Overseer for Plant — 1 no.
 - (c) Engineer Asst. Overseer for Paver — 1 no.
 - (d) Sub-divisional clerk — 1 no.
 - (e) Orderly peons — 3 nos.
2. Mobile civil sub-division
 - (a) Assistant Engineer (Civil) — 1 no.
 - (b) Engineer Assistant Overseer for Plant — 1 no.
 - (c) Engineer Assistant Overseer for Paver Finisher — 1 no.
 - (d) Sub-divisional clerk — 1 no.
 - (e) Orderly peon — 3 nos.

APPENDIX III

DETAILS OF WORK CHARGED STAFF ESSENTIAL FOR ONE STATION FOR INSTALLATION OF HOT-MIX PLANT FOR THE BITUMINOUS MACADAM WORKS IN NATIONAL HIGHWAY WING

A. PLANTS AND MACHINERIES REQUIRED FOR EACH HOT-MIX PLANT STATION

1. Hot-Mix Plants — 3 Nos. (Two operating, one stand-by)
2. Paver Finisher — 1 No.
3. Three wheeled roller — 1 No.
4. Tandem Roller — 1 No.
5. Tipping Trucks — 15 Nos.
6. Ordinary Trucks — 1 No.
7. Tanker for storage of fuel — 2 Nos.
8. Tar boilers (Coal fired) — 15 Nos.

B. OPERATIONAL STAFF FOR THE ABOVE MACHINERIES

1.	Hot mix plants operators	— 6 Nos. (2 Nos. in each plant)
2.	Paver finisher operator	— 1 No.
3.	Three wheeled roller Driver	— 1 No.
4.	Tandem Roller Driver	— 1 No.
5.	Tipping trucks drivers	— 15 Nos.
6.	Tipping trucks Khalasis	— 15 Nos.
7.	Ordinary truck driver	— 1 No.
8.	Ordinary truck Khalasi	— 1 No.

(for the operation for tar boilers casual labour will be needed as per the requirement during the work in progress)

C. MECHANICAL STAFF REQUIRED FOR THE MAINTENANCE OF THE ABOVE PLANTS AND MACHINERIES AT ONE STATION

1.	Foreman	— 1 No.
2.	Senior Mechanics	— 2 Nos.
3.	Junior Mechanics	— 3 Nos.
4.	Mechanical helpers	— 7 Nos.
5.	Greasers	— 6 Nos.
6.	Fitter	— 1 No.
7.	Welder	— 1 No.
8.	Cleaners	— 9 Nos.
9.	Electrician	— 1 No.

2100.4.

D.O. LETTER NO. RM-14 (1)/81 DATED THE 17TH MARCH 1983 FROM DIRECTOR GENERAL (ROAD DEVELOPMENT) AND ADDL. SCEY. TO THE GOVT. OF INDIA ADDRESSED TO CHIEF ENGINEERS OF ALL STATE P.W.Ds. (BY NAME)

From time to time we have been writing to you regarding preparation and submission of utilisation programme of the Central Machinery given to your State for the execution of National Highways and other Central Sector Road Works. As the same is now due for the year 1983-84, I am taking advantage to draw your kind attention to the following important aspects, of which I am sure you are already aware :

- (1) Proper planning and efficient management of machines will lead to their optimum utilisation and thereby reduce the unit cost of work.
- (2) By now most of the State PWDs have developed fairly good team of experienced and skilled staff for the operation and maintenance of heavy and sophisticated equipments, who are also to be usefully engaged to the extent possible.
- (3) Some of the items of Central machines might not be needed on a long term basis in the State, which should be listed as overall surplus, for further action in the Ministry.
- (4) At the present juncture, there is paucity of funds for N.H. works which is acting as constraint for taking up all the desired works. Hence, the need for extra efforts to engage the machines as best as possible on already sanctioned works—original, renewal and maintenance.

In view of the above the annual utilisation programme for the year 1983-84 has acquired added importance. It is in this context that I seek your cooperation, and would request you to closely review the position, and forward the realistic utilisation programme, after having been discussed and finalised at your end, latest by 30th April, 1983. Needless to say that Ministry's Regional SE (Civil) and SE (Mechanical) will be too willing to help you in this task.

2100.5.

No. RM-14 (3)/83

Dated the 22nd October, 1983

To

All the Chief Engineers of States/UTs/CPWD dealing with National Highways

Subject : Review of scheduled working hours of machines per annum

The Road Building Machinery Committee had recommended that for machines working in a single shift for 8 hours on road construction projects, a maximum of 1500 working hours per annum may be adopted for calculating the requirement of machines and hire charges, evaluating performance, provision in the works estimates, etc. The Committee had also suggested that Ministry may go into the question of fixing reasonable quantum of working hours per annum, for the machines which cannot have continuous

work, or where working season is of less duration, due to climatic condition, etc.,. These recommendations of the RBMC were accepted by the Minsitry and circulated to all the State PWDs vide letter No. RM-21 (1)/75 dated 20.6.75.

2. Some States like Assam, West Bengal, etc., while submitting the annual utilisation programmes had expressed that because of longer monsoon and heavy rainfall the availability of working days in a year varies from 150 to 175 days and hence, it was not possible to achieve the target of 1500 working hours in a year on road works. However, in absence of proper feed back from the States, the scheduled yearly working hours could not be revised or refixed.

3. Further, the working season also varies for different types of equipment and work to be done. For e.g., working period for Hot-mix plant, Paver finisher and allied machinery may be less than that of Road-rollers and trucks, as they have to be shifted periodically from one site to another, etc.

4. Similarly, no continuous work can be provided to the machines like Cranes, Air-compressors, Generating sets, Welding sets, Water pumps, Concrete mixer, Power Winches, etc.,. Some of these are not directly deployed on work but, are meant for repairs and maintenance of main equipment.

5. Keeping the above in view an attempt has been made to categorise the different machines in the following three categories as per Annexure.

- A. Machines for which regular work can be provided throughout the year.
- B. Machines for which work can be provided only for a limited period i.e., in working season alone.
- C. Machines which cannot be used continuously, and which are not directly deployed on work.

6. You are requested to kindly intimate with details, taking into consideration the rainy season, holidays, weekly offs, maintenance days of machines, nature of work, etc., what in your considered opinions the scheduled yearly working hours should be for each of the above three categories of machines, to enable the Ministry to revise the norms in this regard, if necessary. Your reply latest by 30th November, 1983 would be appreciated.

ANNEXURE

(A) MACHINES FOR WHICH REGULAR WORK CAN BE PROVIDED : THROUGHOUT THE YEAR:

- (i) Road-Roller
- (ii) Trucks
- (iii) Tractors
- (iv) Stone Crushers

(B) MACHINES WHICH CAN BE UTILISED ONLY DURING WORKING SEASON i.e., FOR LIMITED PERIOD OF THE YEAR :

- (i) Hot-Mix Plants
- (ii) Paver Finishers
- (iii) Pay Loaders
- (iv) Dozers
- (v) Scrapers
- (vi) Bitumen Boilers
- (vii) Graders
- (viii) Concrete Mixers

(C) SERVICE MACHINES i.e., THE MACHINES WHICH CAN BE USED FOR SPECIFIC WORK AS AND WHEN NEEDED :

- (i) Cranes
- (ii) Air-Compressors
- (iii) Generators
- (iv) Welding Sets
- (v) Pumping Sets
- (vi) Vibrators
- (vii) Grit Spreaders
- (viii) Power Winches
- (ix) Soil Stabilisers
- (x) Pile Driving Sets
- (xi) Core Drilling machines

No. RMP-14 (1)/83

Dated the 29th October, 1983

To

All the State Chief Engineers dealing with National Highways and D.G., CPWD

Subject : Utilisation of Central machines

You are aware that the utilisation of Central machines supplied by the Ministry for the execution of National Highways and other centrally sponsored work is not satisfactory due to various reasons. Besides the factors like non-availability of work due to lack of adequate funds etc., it has been observed that in some cases, even if central machines were available in the State, instead of utilising them, either the machines belonging to State PWDs or contractors have been deployed on National Highway Works. With the view to improve utilisation of Central machines to the maximum extent possible, it has been decided that :

- (a) The availability of Central machines in the State and prospects of their being utilised on NH Works should be kept in view, right from the stage of preparation of works estimates.
- (b) Items of works to be done by machines should be identified, and provisions in the works estimates should be made accordingly.
- (c) Items of works like earth work in high embankments, bridge approaches, bye-passes; etc., and bituminous macadam, semi-dense carpets, pre-mix carpets, etc., should be earmarked to be executed by the Central machines wherever available;
- (d) When the central machines are available, State plants or those belonging to contractors should not be used on NH works at the cost of Central machines.
- (e) In the event of machines required to be lent to Contractors, wherever available, Central machines should be lent to Contractors on prescribed hire charges basis.

It is, therefore, requested that the above requirements may kindly be complied with and also brought to the notice of all the concerned Officers for implementation.

No. RW/RMP-16 (3)/84

Dated the 1st Jan., 1985

To

All Chief Engineers of the States and Union Territories, dealing with National Highways, The Director General Works, CPWD, The Director General, Border Roads

Subject : Use of Hot Mix Plant on National Highway works

It has been observed that sometimes Hot Mix Plants used on National Highway works are not properly equipped with arrangements for gradation control of aggregate, measuring of bitumen and mineral filler feed system which are essential to obtain mix of desired specifications and ensure quality of asphaltic road works.

2. It has, therefore, been decided that while inviting tenders and allotting work to contractors, it may be specified that Hot Mix Plants should conform to component arrangements as per Annexure. This should also form part of the contract documents. The work should not be allowed to be executed by contractors, with the plant which do not fulfil these minimum requirements.

3. Similarly, departmental Hot Mix Plants which already have the essential features should be used on works as such, without putting in disuse or removing any of the components.

ANNEXURE

TECHNICAL REQUIREMENT OF HOT MIX PLANT TO BE USED ON NATIONAL HIGHWAY WORKS

Compositions of Plant : The Hot Mix Plant shall conform generally to I.S. Specifications No. IS-3066/1965 as amended from time to time and shall be equipped with the following arrangements.

1. *Cold Aggregate Feeder :* The cold aggregate feeder shall have minimum three independent bins or compartment, each provided with accurate mechanical means for feeding the aggregate at a uniform and predetermined rate to the Cold elevator or to some intermediate conveyor or directly into the dryer. The feeder shall provide for the adjustment of total and proportional feed and shall be capable of being locked in any setting.

2. **Dryer :** The dryer shall be capable of continuously agitating the aggregates while heating to desired temperature. At the discharge end of the dryer or any other suitable location, means shall be provided for ascertaining the temperature of the heated aggregate.
3. **Screening Unit and Gradation Control :** The dried aggregate shall be screened into not less than three sizes. The plant shall include means for accurately proportioning each bin size of aggregate either by weight or by volumetric measurement. When the gradation control is by volume, the unit shall include a feeder mounted under the compartment bins. Each bin shall have an accurately controlled, individual gate to form an orifice for proportioning the material drawn from each respective bin compartment. The orifice shall have positive mechanical adjustment and provided with a lock. Indicators shall be provided on each gate to show the gate opening in centimetres.
4. **Mixer Unit :** The plant shall include a mixer of an approved twin shaft pugmill type capable of producing a uniform mix. If not enclosed, the mixer box shall be equipped with a dust hood to prevent loss of fines.
5. **Mineral Filler Supply Unit :** There shall be an independent arrangement to feed mineral filler directly into the pugmill. The hopper to bin for mineral filler shall provide for the adjustment proportion the feed with the aggregate and bitumen feeds and shall be capable of being locked in any setting.
6. **Bitumen Heating :** A heating system for bitumen always with effective and positive control of temperature shall be provided, to maintain proper temperature and for allowing continuous circulation between storage tank and proportioning units during the entire operating period. Suitable arrangements shall be provided for recording the temperature at the tanks and in the circulating system.
7. **Synchronisation :** For synchronisation of Aggregate Bitumen and filler feeds satisfactory means shall be provided to afford positive interlocking control between the flow of aggregate from the bins or compartment, flow of bitumen from the tank and flow of mineral filler.

2100.8.

No. RW/RMP-16 (3)/84

Dated the 29th May, 1985

To

All the State Chief Engineers (dealing with National Highways)

Subject : Asphaltic concrete work by 20-30 TPH Marshal Hot Mix Plant

Some of the State PWDs have expressed difficulties in doing asphaltic concrete work with the 20-30 TPH Marshal Hot Mix Plant procured by this Ministry. This was particularly with reference to the feeding arrangement of mineral filler especially time. Based on the experience of some other States, it is suggested that while using lime as a filler material, it should be dry and screened before feeding the same into the hopper of the plant. This will prevent clogging as well as break-down of filler feeding mechanism. Daily clearing and maintenance of the feed arrangement system, will ensure smooth and continuous flow of filling of the measure quantity.

2. It is, therefore, requested that above requirements may kindly be brought to the notice of all Field Officers for observing the same while executing asphaltic concrete work.

2200 HIRE CHARGES

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2200.1.	IDA/W-25 (10)/63 dt. 8.10.64	Rate of Hire Charges	2200/1
2200.2.	IDA/W-25(10)/63 dt. 28.10.65	Adjustment of Hire Charges	2200/3
2200.3.	LRM-1 (4)/67 dt. 20.12.66	Hire Charges of Machines Loaned to Contractors	2200/5
2200.4.	RM-1 (4)/65 dt. 30.4.68	Adjustment of Hire Charges of Machinery for use on Works covered by LRP	2200/8
2200.5.	RM-21 (3)/75 dt. 4.6.76	Procedure for Accounting of Hire Charges for Central Machinery allotted to the States	2200/8
2200.6.	RM-21 (3)/75 dt. 1.10.77	—do—	2200/13
2200.7.	RM-21 (3)/75 dt. 2.5.78	—do—	2200/14
2200.8.	RM-21 (3)/75 dt. 4.5.78	—do—	2200/15
2200.9.	RM-21 (3)/75-Pt dt. 22.3.79	Calculations & Accounting of Hire Charges, Clarifications etc.	2200/18
2200.10.	RM-26 (3)/80 dt. 18.7.83	Recovery Accounting & Adjustment of Hire Charges for Central Machinery allotted to the States	2200/21
2200.11.	RW/RM-26 (10)/84 dt. 21.8.84	Revision of Rates of Hire Charges for Central Machines	2200/21
2200.12.	RM-26 (3)/80-II dt. 18.9.84	Accounting & Adjustment of Hire Charges of Central Machines	2200/22
2200.13.	RW/RM-26 (1)/84 dt. 7.11.84	Revised Rates of Hire Charges of Central Machines	2200/22

No. IDA/W-25 (10)/63

Dated the 8th October, 1964

To

The Additional Chief Engineer, World Bank Projects Wing, Public Works Department, Bihar, The Chief Construction Engineer, National Highway Project, Orissa, The Chief Engineer, Buildings & Communications Department, Maharashtra, The Chief Engineer, Special Road Development Directorate, W. Bengal.

Subject : Procurement of machinery for works covered by the I.D.A. credit—3—IN—Rate of hire charges regarding

As you are aware, the Government of India have been stipulating the following condition for the use of heavy machinery in the sanctions to the estimates for road & bridge works covered by the I.D.A. Credit—3—IN.

"As soon as the utilisation of the heavy road making equipment ordered from abroad commences, a revised estimate taking into account the economies resulting from the utilisation of this equipment may be prepared and sent to this Department".

The question of fixation of rates of hire charges to be levied on the items of machinery provided to you for use on IDA works is under consideration of the Government of India. A copy of the formula proposed to be adopted for determining the hire charges is forwarded herewith. It will be seen from the enclosed copy of the formula that the projects on which this machinery has been employed will bear the relative proportion of the overall cost to the extent of the utilisation of the equipment on each work. It is, therefore, requested that pending the final decision of the Government of India, this formula may be adopted for determining the hire charges and tentative adjustments made wherever necessary. It is also requested that all possible care may kindly be taken to ensure that no machinery is kept idle.

The final formula for the fixation of hire charges presently under consideration by the Government of India will be communicated to you as soon as it is finalised.

NOTE ON DETERMINATION OF "USAGE" CHARGES OF EQUIPMENT USED ON INTERNATIONAL DEVELOPMENT ASSOCIATION WORKS

For the various road construction works included in the I.D.A. Credit Programme, use is being made of road making machinery. The concerned road projects will bear the relative proportion of overall cost to the extent of the utilisation of equipment on each work.

2. The total usage charges to be charged for an equipment will cover the following elements :
 - I. Ownership Charges : This will include (1) Depreciation and (2) storage charges.
 - II. Operational Charges : This will include repairs maintenance and replacement of tyres.
 - III. Running Charges : This will cover expenses incurred on P.O.L. consumed, servicing of equipment and personnel employed for operating equipment.
3. Item I constitutes "Fixed Charges", while item II provides for a reserve for covering repairs and replacements of tyres. Items I and II will thus constitute the "Usage Rate" while item III covering "Work charges" can be charged directly to the work on which machinery is actually used.
4. The correct assessment of the life of an equipment has to be correlated with the working conditions in which it is employed. The useful life of the equipment in hour is given below :

Equipment	Job conditions		
	Excellent	Average	Severe
Dozers	12,000	10,000	8,000
Motor Graders	12,000	10,000	8,000
Scrapers	12,000	10,000	8,000
Excavators-Cranes, Clamshells, Draglines :			
3/8-3/4 cu. yd.	12,000	10,000	8,000
1-1½ cu. yd.	18,000	12,000	10,000
Soil Stabilisers	12,000	10,000	8,000
Core Drilling Machines	12,000	10,000	8,000
Smaller Pneumatic Tractors	16,000	12,000	10,000
Bituminous Hot Mix Plant & Finisher	12,000	10,000	8,000

The life of other equipment may be taken as under :

Jeeps	75,000 miles
Diesel Trucks	1,00,000 miles
Sheeps or Rollers	8 years or 16,000 hours
Air Compressors	10,000 hrs.
Chip Spreaders	15,000 hrs.
Bitumen Pressure Distributors	15,000 hrs.
Bitumen Boilers	15,000 hrs.
Rear Dumpers	10,000 hrs.
Mechanical Brooms	12,000 hrs.
Road Rollers	15,000 hrs.
Deflectometres	15 years or 30,000 hrs.
Motor Survey Launches	15,000 hrs.
Water Tankers	10 years or 20,000 hrs.
Barges	20 years or 40,000 hrs.
Pontoon	20 years or 40,000 hrs.
Water Pump	6 years or 12,000 hrs.
Tube well	25 years or 50,000 hrs.
Compression Testing Machine	20 years or 40,000 hrs.
Stabilometer	20 years or 40,000 hrs.
Tri Axial Apparatus	5 yers or 10,000 hrs.
Sampling Apparatus	4 hrs. or 8,000 hrs.
Pick up Van	75,000 miles

5. To determine the cost of owning and operating the equipment, the following cost sheet may be used taking the life of equipment in hours mentioned above :

		Machine Description _____			
I. Ownership charges :					
(i) Depreciations :					
(a)	Total investment at site of work	Rs	.....		
(b)	Deduct salvage value 20% of A.	Rs	.....		
(c)	Total investment to be depreciated (A-B)	Rs	.....		
(d)	Economic life in hours	Rs	.....		
(e)	Depreciation per hour (C-D)	Rs	.....		
	D				
(ii) Storage :					
(f)	Storage charges per hour (1% of C spread over economic life) (O. OIC)	Rs	.....		
	D				
II. Operational charges :					
(g)	Repair charges per hour including maintenance and replacement of tyres (15% of 'C' spread over economic life) (LS-C)		.....		
	D				
III. Running charges :					
(i) Fuel, lubrication etc.					
		Consumption	Rate/Gal. lb.	Cost/Hr.	
(a)	Fuel	Gals/Hr.	Rs	Rs	.....
(b)	Lub	Gals/Hr.	Rs	Rs	.....
(c)	Spec. Hydraulic Lub	Gals/Hr.	Rs	Rs	.....
(d)	Grease	Lbs/Hr.	Rs	Rs	.....
(h)	Cost of Fuel, Lub & Misc/Hr. Rs.	.....			
(ii) Labour and Wages :					
		Numbers	Wages	Wages per Hr.	
(a)	Operators	.....	Rs	Rs	.....
(b)	Bilers/Cleaners	.....	Rs	Rs	.....
(c)	Helpers	.....	Rs	Rs	.....

(d) Total Wages	.....	Rs	Rs
(e) Misc. Expenses	.....	Rs	Rs
(f) Overtime	.....	Rs	Rs
(j) Cost of labour per hour	Rs		
(k) Overheads at 5% of the total charges per hour	Rs		
(E+F+G+H+J)			

6. Log Book or the Machinery Register should be maintained for each machine to record hours worked, down time and brief reasons for same, consumption of fuel and lubricants, spares consumed and output. A sample of Log Book to be maintained in parts is given as Appendix I.

N.B. : In respect of Jeeps, Diesel Truck and pickup Vans, hire charges may be calculated on mileage basis as the useful life of this equipment is determined in miles. While calculating the wages of operators etc., the average distance travelled by the vehicles per hour may be taken as 25 miles and rate calculated accordingly.

2200.2.

LETTER NO. IDA/W-25 (10)/63, DATED THE 28TH DECEMBER 1965 FROM THE MINISTRY OF TRANSPORT AND SHIPPING (ROADS WING), NEW DELHI ADDRESSED TO THE SECRETARY TO THE GOVERNMENT OF BIHAR/ORISSA/WEST BENGAL AND MAHARASHTRA (DEPARTMENT DEALING WITH ROADS).

Subject : Adjustment of hire charges of machinery supplied by the Government of India for works covered by the IDA Credit 3-IN

I am directed to refer to this Ministry's letter No. IDA/W-25 (10)/63, dated the 5th April, 1965 on the subject noted above and to request that the hire charges for the use of machinery given by the Government of India for use on works covered by the International Development Association Credit 3-IN may kindly be adjusted as quickly as possible. As the works covered by the International Development Association programme are now coming to a completion stage, early adjustment of hire charges is necessary firstly because the Government of India have to finalise the accounts with the International Development Association and secondly because the machinery will be transferred to other works after completion of the International Development Association works. The Government of India is, therefore, anxious that the accounts pertaining to the use of machinery are cleared as soon as possible.

2. For the purpose of calculating hire charges on a uniform basis, a formula was prescribed by the Government of India and forwarded to the State Governments for adoption with this Ministry's letter under reference. According to this formula the total "usage" charges to be recovered for an equipment cover the following elements :

- (i) **Ownership Charges :** These include depreciation and storage charges.
- (ii) **Operational Charges :** These include repairs, maintenance and replacement of tyres etc.
- (iii) **Running Charges :** These cover expenses incurred on P.O.L. consumed, servicing of equipment and personnel employed for operating equipment.

For calculating the hire charges, ownership and operational charges have to be assessed on the basis of capital cost, while running charges will be debited directly to the works on which the machinery is actually used. For each machinery the ownership charges for a particular working period would be in direct proportion to the total economic life as assumed in the formula referred to above, after deducting 20% of the capital cost as salvage value of the machinery and allowing 1% extra for storage charges.

3. As regards operational charges, as suggested in the formula referred to in this Ministry's circular mentioned above, these may be taken as 1½ times the capital cost spread over the economic life of the machinery.

The following example will illustrate how the hire charges for any particular item of machinery are to be calculated :

1. Name of the Equipment	Tractor Dozer
2. Cost per unit :	Rs 1, 35, 586 (c.i..)
3. Ownership charges :	
(i) Depreciation :	
(a) Total investment at site of work	Rs 1,50,000
(b) Deduct salvage value, 20% of (a)	Rs 30,000
(c) Total investment to be depreciated (a-b)	Rs 1,20,000
(d) Economic life of the machine in hours (average)	Hours 10,000

$$(e) \text{ Depreciation per hour } c = \frac{1,20,000}{10,000} = \text{Rs } 12$$

(ii) *Storage:*

$$(f) \text{ Storage charges per hour (1\% of c) spread over the economic life } 1. \frac{1,20,000}{100} \times \frac{1}{10,000} = \text{Rs } 0.12$$

(2) *Operational Charges :*

$$(g) \text{ Repair Charges per hour including maintenance and replacement of tyres (150\% of c) spread over economic life } 1.5 \times \frac{1,20,000}{10,000} = \text{Rs } 18$$

4. It will be seen from the above illustration that the hire for a Tractor Dozer for an hour will be Rs 30.12 (Rs 12.00+Rs 0.12+Rs 18= 30.12). If a Tractor Dozer has been used on a particular work for say 10 hours, the total hire charges to be recovered from that work will be Rs 301.20 païse (Rs 30.12 × 10 hrs).

5. According to this formula, the operation charges per hour come to Rs 18. As the economic life of a Tractor Dozer is 10,000 hours, the total operational charges for this through out its economic life would come to Rs 1,80,000 (Rs 18 × 10,000 hrs.).

6. The hire charges accruing from the use of machinery will be calculated on the basis of the number of hours worked in the State. The "ownership" charges will be debited to the works and corresponding credit afforded to the estimate sanctioned for the purchase of machinery. The "operational" charges recovered from works on the basis of the formula, should be credited to a Reserve which would be specifically intended for repairs etc.

7. When machinery is transferred from one State to another, the following procedure is suggested for adoption for adjustment of accounts :—

- (i) When the machinery is diverted to another State at the very initial stage without its having been used in the State for which it was sanctioned, the first State may close the estimates while the second State should take over all the liabilities incurred by the first State and get an appropriate estimate covering the capital cost of the machinery approved by this Ministry.
- (ii) When the machinery transferred after use, the first State should for each item of machinery so transferred, account for
 - (a) Ownership and average charges for the number of hours for which the machinery has actually been used in that State.
 - (b) Operation charges at the prescribed rates minus the amount actually spent.

After this has been done, the machinery will be transferred to the second State with its depreciated estimate and also the balance, if any, remaining unspent in respect of operational/charges.

It may in this connection be stated that the first State is also expected to carry out, before transferring the machinery, maintenance and repairs to the extent laid down on the basis of working hours. If for any reason the repairs to the extent necessary are not carried out, the first State will pass on to the Second State the unspent balance of this reserve to enable the latter to take up necessary repair work.

8. The adoption of the above procedure will enable each State to clear up all the accounts of each item of machinery at the time of its transfer to the other State and avoid any subsequent complications.

9. When the hire charges of the machinery in question have been adjusted, i.e. the debit of the hire charges has been given to the works and relevant credits thereof afforded, the rates resulting from the utilisation of this equipment will be reflected in the estimate for each work. The revised estimates for such works would, therefore, have to be framed after taking these adjustments into consideration.

10. The work of preparation of revised estimates should also be proceeded with expeditiously and concluded by February 1965 as was agreed to at the last International Development Association Chief Engineers' Conference.

LETTER NO. LRM-1 (4)/67, DATED 20.12.66 FROM THE UNDER SECY. TO THE GOVT. OF INDIA, MINISTRY OF TRANSPORT & AVIATION, DEPTT. OF TRANSPORT & SHIPPING (RW) TO THE SECRETARY TO THE GOVT. OF U.P./BIHAR/WEST BENGAL/ ASSAM P.W.D. AND COPY ENDORSED TO ALL CHIEF ENGINEERS AND ADDL C. E.S CONCERNED.

Subject : Hire charges in respect of machinery to be loaned to the contractors

In continuation of this Ministry letter No. WVIII-1 (4)/65-I dated the 7th Sept., 1966, I am directed to forward herewith the following :

- (i) Scale of hire charges of the machinery and assumption made for calculating the charges;
- (ii) Conditions for issuing machinery to contractors for use of L.R.P. or National Highway works, and
- (iii) Specimen form of agreement to be executed by the contractor for taking the machinery on hire.

The hire charges prescribed may please be recovered from the contractors' bills and proper accounts maintained.

2. It is suggested that the account of recovery of hire and other charges for tools and plants issued to contractors may be kept in a register in the enclosed form both in the Divisional and Sub-Divisional offices. This Register would be subsidiary to the Register of Tools and Plants in the Public Works Department. Instructions may please be issued to the Sub-Divisional Officers to submit to the Divisional officer a true copy of the Register so maintained as an annexure to the monthly return of receipts and issues of the Tools and Plants.

3. Arrangements for overhauling the equipment when necessary may be made so that the equipment is kept in serviceable condition. Any shut-down during the working season of a machine hired out to the contractor except for major overhauls, however long it may be, should be treated as idle time.

4. These hire charges should be reviewed periodically with the concurrence of this Ministry on the basis of the actual expenses incurred during the previous years.

AGREEMENT FOR LOAN OF GOVERNMENT TOOLS & PLANTS (FOR CONTRACTORS)

THIS AGREEMENT made the _____ of one thousand nine hundred and sixty between (hereinafter referred to as "The Hirer" which expression shall, unless excluded by or repugnant to the context, include his heirs executors, administrators and assigns) of the one part, and the Governor of _____ (hereinafter referred to as "the Govt." which expression shall, unless excluded by or repugnant to the context, include his successors in office and assigns) of the other part.

Whereas the Hirer is desirous of hiring the tools and plant of the Public Works Department of the _____ Government and more particularly specified in the schedule hereunder written hereinafter referred to as "the tools and the plant"

And whereas Govt. has agreed to let on hire the tools and plant to the Hirer on the terms and conditions hereinafter mentioned.

Now it is hereby agreed by and between the parties hereto, as follows :

- (1) In consideration of the agreement that hire charges be recovered from their bills for work executed on which machinery will be used or any other dues standing in the name of contractor in the books of the department or any other Govt department, the Govt. agrees to let the Hirer, the tools and the plant for a period of _____ to be computed from the date of delivery of the tools and plant to the hirer at the P.W.D. workshop at _____
- (2) The rate of hire charges will be as mentioned in the schedule.
- (3) The Hirer shall not transfer, assign or sub-let or in any way part with the tools and the plant or any part thereof without the previous written approval of the Engineer incharge.
- (4) On the expiry of the period of the hire the Hirer shall return the tools and the plant to the Public Works Deptt. _____ Workshop/Store-yard at _____ in the same good condition in which they were received by him.
- (5) In the event of the tools and the plant not being returned on the expiry of the above mentioned period, the hirer shall without prejudice and any other liability pay to the Govt. an amount equivalent to the rate of hire specified for the working period and an increase of ten per cent.
- (6) The tools and plant shall be open for inspection at all times to the officers of the Government.
- (7) The Hirer shall not operate the tools and plant so hired for more than one shift/two shifts of 8 hours each per day without the prior sanction of the Engineer Incharge. If the hirer operates the tools and plant beyond the aforesaid limit with the prior sanction of the Engineer Incharge, he shall pay to the Govt. additional hire charges as well as overtime charges for staff for such excess operation at the rate approved by the Engineer Incharge from time to time.
- (8) In case of break-down repairable at site within a period of 3 days, hire charges as specified in the schedule will be levied except in case of major repairs.
- (9) Normally, the tools and plants will be supplied with operating staff.
- (10) The Hirer shall be responsible for any claims for compensation for loss of life, injury or damage to property, etc., arising due to any cause whatsoever during the period the machinery is in his charge.

- (11) All municipal or other dues and taxes payable on account of the use or operation of the tools and plant for the period of hire, shall be defrayed by the Hirer.
- (12) The Hirer shall make good any loss or damage, arising out of causes other than fair wear and tear, to the tools and the plant, during the period of hire. The cost recoverable from the hirer shall be the full replacement value as determined by the Engineer Incharge. In the event of any loss or damage not being made good by the Hirer to the satisfaction of the said Engineer Incharge, that officer shall be at liberty, to make good himself such loss or damage and recover the cost thereof from the hirer. The Hirer shall pay to the said Engineer Incharge on demand, such sum as shall be necessary to make good the loss or damage failing which the same will be recovered from his dues as in case of hire charges.
- (13) On the breach of any term of condition of this agreement by the Hirer, the Engineer Incharge shall be entitled to demand return of the tools and the plant and the hirer shall return the tools and the plant within 72 hours from the date of receipt of such order in writing. In case of failure on the part of the Hirer to comply with such order, he shall be liable to pay such penalty as may be imposed by the Engineer Incharge for the period the tools and plant are detained provided that the maximum penalty shall not exceed the cost of replacement of the tools and plant.
- (14) In the case of any dispute between the Hirer and the Government _____ the decision of the Superintendent Engineer shall be final.
- (15) In case any question, dispute or difference shall arise between the Engineer Incharge and the hirer as to what additions, if any ought in fairness to be made to the amount of the hire by reason of break-down of the machinery shut down of the works due to reasons beyond the control of the hirer through no fault of the hirer, also due to the increase in quantities of the work beyond that included in the contract or due to any other matter or thing arising under or out of this contract except as to the matters left to the sole decision or requisition of the Engineer Incharge under the clauses in the contract then such questions, dispute, difference should be referred to the arbitration and decision of an arbitrator to be chosen by both the parties to the contract. The award of such arbitrator shall be equivalent to a final decision of the matter.
- (16) This agreement shall be operated by the Engineer Incharge on behalf of the Government and the term Engineer Incharge shall include all officers duly authorised by him to exercise powers on his behalf.

THE SCHEDULE

Sl. No.	Name and description of the Articles	Nos.	Amount of hire per hour

In witness whereof the Hirer and the Engineer Incharge has for and on behalf of the Governor of the State have set their respective hands the day and the year herein above written.

Signed by

In the presence of

- 1.
- 2.

Signed, sealed and delivered by Seal

in the presence of

- 1.
- 2.

REGISTER SHOWING RECOVERY OF HIRE CHARGES ETC. OF TOOLS AND PLANT HIRED TO CONTRACTORS

..... Division (..... Sub-Division)

Name of work :

Name of Contractor :

Sl. No.	Description of articles issued	Value of each article	Date of issue	Date of return stipulated	Date of actual return	Period and Rate of normal hire charges		Period & Total Rate of hire enhanced charges		Recovery of hire charges		Initial of Sub-Divisional Officer	Remarks
						Working	Idle	hire charges	hire charges	Date	Amount		
1	2	3	4	5	6	7	8	9	10	11	12	13	14

(Reference to log book etc. should be recorded including record of compensation recovered for loss or damages,

Signature of the
Officer Incharge.

HIRE CHARGES FOR MACHINERY PROCURED FOR LATERAL ROAD PROJECT

Sl. No.	Description of Plant	Usage charges per hr. when P.O.L. is supplied by Department	Usage charges per hr. when P.O.L. is supplied by contractor	Idle charges	Remarks
1	2	3	4	5	6
ROAD MAKING MACHINES					
1.	Motorised Scraper	99.00	80.25	18.75	
2.	Towed Scraper	67.25	55.00	12.80	
3.	Pusher	56.00	44.25	11.00	
4.	Tractor Dozer	78.00	58.25	15.00	
5.	Motor Grader	49.25	37.75	10.30	
6.	Road Roller (Agrind Moore)	14.75	9.40	3.70	
7.	—do— (Britannia-Marshall)	12.80	9.30	3.60	
8.	Tandem Road Roller	8.90	7.50	3.10	
9.	Tractor 40-50 H.P.	10.60	5.45	2.20	
10.	Diesel Truck/Tipper/Truck mounted water tanker (for pucca roads only)	16.00/hr 1.40/mile	9.50/hr 1.00/mile	— —	Whichever is higher is to be recovered
11.	Stone Crusher	19.50	12.75	4.30	
12.	Granulators	17.10	10.20	3.80	
13.	Air Compressor —315 CFM	20.10	11.60	3.60	
14.	Air Compressor —210 CFM	14.60	8.20	2.80	
15.	Diesel Driven Pump —5 H.P.	2.80	1.90	1.00	
16.	Diesel Driven Pump —10 H.P.	4.30	3.25	1.25	
17.	Bitumen Boiler 250/300 gallons	3.05	1.25	0.90	
BRIDGE MACHINES					
1.	Diamond Core Drilling machine Engine HP-30 (5½" dia. Core Dia 4" and depth 450 ft.)	29.50	24.55	6.70	
2.	Diamond Core Drilling machine, small (with 12.5 H.P. engine)	12.40	10.30	3.55	
3.	Concrete Mixer	4.60	2.75	1.40	
4.	Colcrete Mixer	7.40	6.35	2.10	
5.	Diesel Generating Set	8.00	5.50	2.10	
6.	Ordinary Vibrator	2.10	1.10	0.80	
7.	Diesel Winches	21.00	10.10	3.40	
8.	Grab Dredging Crane ¼ cyd.	72.25	59.65	15.00	
9.	—do— ½" "	106.00	91.60	23.25	
10.	Mobile Crane 5 Tons	53.00	46.75	12.00	

ASSUMPTIONS FOR CALCULATING OF HIRE CHARGES OF MACHINERY PURCHASED FOR LATERAL ROAD PROJECT

- Salvage Value = 20% of the cost of the M/C at site
- Depreciation (By Straight line method) = C where C = cost of M/C at site

$$D$$
- Interest charges = 6% on the average investment per year and the same is distributed for 2000 working hours of equipment every year.
- Storage charges per hour = (1% of the cost, spread over economic life)

$$= 0.01 \times C$$

$$D$$

Where 'C' is the cost of M/C at site
'D' is the economic life in hours

5. Operational charges :
$$= \frac{\text{Repair charges per hour including maintenance (150\% of 'C' spread over economic life)}}{D}$$

$$= 1.5 \frac{C}{D}$$
6. Running charges
- (a) Diesel engine consumption $= \text{B.H.P.} \times \text{load factor (60\%)} \times \text{lbs. of fuel per H.P. hour (0.4)}$
- (b) Lubricating oil consumption $= \frac{\text{H.P.} \times 0.6 \times 0.006 \times c}{7.4 \times t}$
- Where c = Crank case capacity = 0.06 × H.P. in gallons
t = time for changing oil = 100 hours.
- (c) The other lubricants, grease, cottonwaste, etc. are assumed to cost twice the cost of lubricant oil in case of heavy machinery. In case of the rest, it is to cost same as lubricant, oil.
- (d) Wages of operating Staff : Although the staff will be paid for the whole year, the actual working days have been assumed to be 250 days of 8 hours each. The hourly wages have, therefore, been calculated accordingly.
7. Overhead @ 5% of the total charges per hour.
8. (i) C.I.F. cost — F.A.S. or F.O.B. + 10% of cost of M/C for ocean free cost
- (ii) Customs duty and clearance charges = 50% of C.I.F. Value (35% customs duty + 10% regulatory duty + 3% clearance charges)
- (iii) Loading and unloading charges @ Rs 7/- per ton.
- (iv) Railway freight charges are calculated taking the average distance of various destinations from Calcutta in the case of each equipment.
- (v) Idle charges per hour = $\frac{1}{4}$ of depreciation per hour + Interest + Wages of work charged staff per hour + Overheads @ 5% of the total charges per hour.

2200.4.

No. RM-1 (4)/65

Dated the 30th April, 1968

To

The Secretary to the Govt. of Bihar/West Bengal/U.P./Assam
(Departments dealing with roads)

Subject : Adjustment of hire charges of machinery supplied by the Government of India for use on works covered by the Lateral Road Project

I am directed to refer to this Ministry's letter No. WVII-1 (4)/65-LRM dated the 7th September, 1966 on the subject noted above and to say that the Government of India have decided that the hire charges accruing as a result of the use of the machinery supplied by the Central Government, for the execution of the works covered by the Lateral Road may be credited to the Head "Deduct Receipts and Recoveries on Capital Account subordinate to the Major Head "103-Capital Outlay on Public Works" adjustable by the Accountant General, Commerce, Works and Miscellaneous, New Delhi in his books. I am, therefore, to request that the hire charges so far recovered or still to be received for use of the machinery in question should be credited to this head of account. The amount of the adjustments involved may kindly be intimated to this Ministry at an early date.

2200.5.

No. RM-21 (3)/75

Dated the 4th June, 1976

To

The Secretaries dealing with the Roads in the States of : Andhra Pradesh/Assam/Bihar/Gujarat/Haryana/Himachal Pradesh/Jammu and Kashmir/Kerala/Karnataka/Madhya Pradesh/Maharashtra/Manipur/Meghalaya/Nagaland/Orissa/Punjab/Rajasthan/Tamil Nadu/Tripura/Uttar Pradesh/West Bengal/and Sikkim

Subject : Calculation of hire charges for Central machinery allotted to the states and procedure of accounting for the same

I am directed to say that this Ministry vide letter No. IDA/W. 25 (10)/63, dated the 8th October, 1964 and 28th September, 1965, and vide letter No. LRM. 1 (4)/67, dated the 20th December, 1966 and LRM. 1 (4)/65 dated the 30th April, 1968, intimated to the States about the procedure to be followed, for working out the hire charges for use of Central machinery, and for its accounting. According to this procedure, the

hire charges of machinery were to be calculated and debited to the works on which they were engaged, commensurate with their utilisation on those works, so that the expenditure for the usage of machinery was duly reflected in the cost of execution of central works. The State Public Works Departments accordingly had to make provisions for the same, in the works estimates before getting the same sanctioned by the Ministry.

2. It was also intimated that the hire charges of an equipment would cover the following elements :

- (i) Ownership charges
- (ii) Operational charges
- (iii) Running charges
- (iv) Over head charges

After debiting the works with the hire charges of each equipment, to the extent of utilisation of that equipment on that particular work; the ownership charges element of the hire charges were to be recovered from works and credited to the Capital Account Head "Deduct Receipt and Recoveries on Capital Account", Subordinate to Major Head "103 Capital Outlay on Public Works" adjustable by Accountant General, Commerce, Works and Miscellaneous, New Delhi in his books. Similarly Operational Charges element of hire charges were to be recovered from the works and credited to a reserve which was to be specifically earmarked for repairs etc.

3. The Road Building Machinery Committee, set up by the Government of India, examined the existing procedure, and suggested a number of modifications, both for calculating the amount of hire charges, and their accounting. Ministry examined the same, in consultation with the Ministry of Finance, and decisions arrived at, were communicated to you vide Ministry's letter No. RM. 21 (1) 75, dated the 20th June, 1975 for your information and for taking further necessary/implementation/follow-up action. The important modifications suggested by this Committee and accepted by the Ministry for calculating the hire charges, pertain to the quantum of salvage value, and economic life of the machines to be adopted. With regard to accounting, it has been decided that the procedure of crediting the operational charges element of hire charges to a reserve fund for the purpose of meeting the repair and maintenance charges of the machinery should be dispensed with. These are to be treated revenue receipts and accordingly credited to the account head "059-Public Works Hire Charges of Machinery & Equipment." The expenditure on maintenance and repairs of Central machinery will be met by making requisite provisions for the same in the Budget, in the normal course, as a revenue charges, the receipts representing operational charges being credited to the head referred above.

4. Taking the above into consideration, the economic life now to be adopted for calculation of hire charges is enclosed in Appendix I. An example, illustrating as to how revised hire charges for Central machinery are now to be worked out is given in Appendix II, for one particular machine namely Bull-Dozer. It is requested that the hire charges may please be immediately worked out for each Central machine allotted to you. The details of calculations may please be sent to the Ministry, with a copy to the Ministry's Regional Offices. As some bituminous pavement construction equipments have recently been supplied to you and may perhaps be given to Contractors by you in the State, the usage charges of these equipments may please be worked out on priority and recoveries made from the contractors on that basis. Revised hire charges for the other machines supplied earlier may also kindly be worked out at an early date. As already suggested, the amount of recovery of hire charges for tools and Plants specially those issued to contractors, may be kept both in the Divisional and Subdivisional offices in a register, in the proforma enclosed with Ministry's letter No. LRM. 1 (4)/67, dated the 20th December, 1966.

5. The hire charges may please be reviewed periodically, with the concurrence of the Ministry on basis of the actual expenses incurred during the previous years, and also taking into account the prevalent rates of P.O.L. etc.

6. Action detailed below may also kindly be taken :

- (a) In respect of vehicles like trucks, tippers etc. the Hire charges may be worked out on kilometer basis.
- (b) Minimum of 1/8th of the expected annual depreciation of machinery should be charged to the central works towards hire charges, if equipment is used for less than 1/8 of expected working hours in any particular year.

As per the recommendation No. 4.9.20 of R.B.M.C., a maximum of 1500 working hours per annum may be considered for this purpose.

- (c) In the case of equipment lent to contractor, the conditions for issuing machinery to them for use on National Highway and other Central works may be stipulated, and agreement executed with them, as suggested in Ministry's letter No. LRM-1 (4)/67, dated the 20th December, 1966. *In this case of equipment lent to contractors, minimum number of hours for which the hire charges will be recovered irrespective of hours actually used, may be stipulated in the tender conditions.* These minimum working hours for which recoveries are to be made from contractors are to be worked out by the State and sent to the Ministry for approval before adoption. Ministry has already requested the State to do the needful vide letter No. RM-21 (1)/75, dated the 20th June, 1975;

- (d) For accounting of the quantum of hire charges towards idle depreciation, for use on works other than Central or Centrally sponsored works, the formula prescribed by the Ministry earlier, namely $1/4$ depreciation per hour + wages of work charged staff per hour + over head at 5% of the total charges per hour, may be continued to be adopted.

(e) *Accounting of Hire Charges : Ownership Charges :*

At present capital head of account for T & P has been changed to "537 — AA Capital outlay on roads and bridges AA-National Highways, AA. 1 (2) — Tools and Plants". Therefore, the states may kindly credit the ownership charges element of the hire charges recovered from the works, to this new head of account, instead of the one indicated in Ministry's letter No. RM. 1 (4)/65, dated the 30th April, 1968.

It is understood that some State Public Works Departments did not calculate the ownership charges correctly, as total capital cost of equipment paid by Pay and Accounts Officer, Directorate General of Supplies and Disposals was intimated to them quite late. Some States also appear to have calculated the hire charges as per the State Government's Rules, since the machinery were put to use in a number of cases, prior to the communication of the procedure of working out of hire charges by the Ministry. Some States did not levy hire charges for minor equipments such as vibrators, pumps etc. A number of States have directly credited the ownership charges recovered, to the State Revenues. Some of the amounts recovered from works in this connection has also been kept under "Deposit or Suspense Head of Accounts".

It is requested that all the amounts kept under "Deposit or Suspense Head of Account" may kindly be transferred immediately to the correct head of account. Wherever, the credits were given to the State Revenues, etc. action may kindly be taken to transfer the same to the Capital Head of Central Account indicated now. The States may intimate the machinewise details of ownership charge credits already passed to Central Head of Account, the details of credits kept under "Deposit or Suspense Head of Account" and are likely to be transferred to the Central Head of Account shortly, and action proposed to be taken with regard to the credits not given to the Central head of Account or directly credited to the State Revenues.

OPERATIONAL CHARGES :

Similar action may also kindly be taken regarding credit of the Operational Charges element of hire charges. The Credits accrued in this connection may be given to the Head "059 — Public Works Hire Charges of Machinery and Equipment" adjustable by the Accountant General, Commerce, Works and Miscellaneous, New Delhi. The past credits, if kept in "suspense or deposit account" may also kindly be credited to this head of account. Action may also kindly be taken for transferring the credits to Central Head now indicated, in case they were credited to State Revenues etc. The detailed account of Operational Charges earned by each machine from the time of its receipt, may kindly be sent to Ministry.

MAINTENANCE AND REPAIR OF MACHINERY :

7. The State Public Works Departments may continue to submit maintenance and repairs estimates of Central Machinery, as per the prescribed procedure indicated in Ministry's letter No. RM. 1 (4)/70, dated the 21st July, 1972, for issuing technical sanction. The expenditure for the same would be met out of the Budget provisions made in the normal course as revenue charge and will be debitable to the sub-head 'A' — Roads and Bridges, —A—2—National Highways, A. 2 (1) (3) Machinery, subordinate to the Major Head "337 — Maintenance and Repairs of National Highways" under — Demand number 76 — Roads, and could be met from the allotment placed at your disposal from time to time.

8. This issues with the concurrence of the Ministry of Finance (Department of Economic Affairs) vide their U.O. No. 792 — E (AC)/76, dated the 24th May, 1976 and Ministry of Finance (Expenditure) vide their U.O. No. 1773-TFSII/76, dated the 26th May, 1976.

APPENDIX I

S. No.	Name of machine	Working life in hours
1.	Road Rollers (Britania-Road Marshal) 8-10 Tons capacity	18,000
2.	Truck mounted water tankers of 1000 gallons capacity	1,00,000 miles
3.	Tractor (40-50 H.P.)	12,000
4.	Air Compressors 315 C.F.M.	
5.	—do— 210 C.F.M.	10,000
6.	Tandem Road Rollers 4-6 Tons Capacity	18,000
7.	Trucks upto 5 Tons Capacity	1,50,000 miles
	Trucks above 5 Tons Capacity	2,00,000 miles
8.	Diesel driven pumping set 5 H.P.	10,000
9.	Bitumen Boilers 250/300 gal. Cap.	(Directly charged to works)
10.	Diesel generating set 15 KW	12,000
11.	Ordinary Vibrator (Immersion)	8,000
		(Charged to works)

12.	Diesel driven pumping set 10 H.P. and above	12,000
13.	Diesel winches 3-5 tons Capacity	15,000
14.	Concrete Mixers 10/7 Cft	8,000
		(Charged to works)
15.	Stone crushers 16"×9" size, 10/12 Tons/hr. capacity	
16.	Granulator 12"×7" size, 4/5 tons per hr. capacity	10,000
		(Charged to works)
17.	Diamond core drilling machine	12,000
18.	Road Rollers (Agrind Moore) 8-10 Tons	18,000
19.	Tractor Dozer, Rubber — Tyred. 140 HP and above	12,000
20.	Motor Grader, 12 ft. and above	15,000
21.	Grab dredging crane, Diesel operated (¾ cyd. and 1½ cyd.)	15,000
22.	Mobile Crane (5 ton)	10,000
	—do— (10 tons and above)	12,000
23.	Motorised scraper 9-13 cyd.	12,000
24.	Towed Scraper 9-12 cyd.	15,000
25.	Pusher (crawler tractor) 108 HP	12,000
26.	Soil Stabilisers 4' to 7 ft.	12,000
27.	Bituminous Hot Mix Plant, 25 tons hour capacity	15,000
28.	Paver Finisher, 100 ton hr. capacity	15,000
29.	Chip spreaders capable of spreading 3/8" to ¾" size chips	15,000
30.	Bitumen Pressure Distributors (10000 Gallons)	15,000
31.	Rear Dumpers 9/11 cyd.	10,000
32.	Bitumen Mixers 8-10 Tons cap.	10,000
33.	Mechanical brooms	10,000
34.	Pile driving equipment	15,000

LIFE OF SMALL ITEMS COST OF WHICH IS TO BE CHARGED TO WORKS (Only when used departmentally on central works)

1.	Air Compressors 160 CFM and below	8,000 Hrs.
2.	Sheep foot Rollers	16,000 Hrs.
3.	Compression testing machine	40,000 Hrs.
4.	Bitumen storage tank	15,000 Hrs.

(RM-21 (3)/75 dt. 5.6.76)

APPENDIX II

EXAMPLES TO ILLUSTRATE CALCULATION OF HIRE CHARGES TAKING INTO ACCOUNT THE MODIFICATIONS FINALISED ON THE BASIS OF RECOMMENDATIONS OF RBMC.

1.	Name of the equipment	— Tractor Dozer
2.	Cost per unit as per A/T	— Rs 1,02,300 (c.i.f.)—in case of imported equipments only.
3.	Ownership Charges :	
I.	Depreciation :	
(A)	Total investment at site of work including A/T Cost, sales tax, excise and other duties, transport expenses consisting of freight, insurance, loading/unloading charges and erection & commissioning on receipt	= Rs. 2,40,000.00
	<i>Note : In case of imported machines the Import duty, ocean freight, insurance, clearance and other charges incurred in port is also to be taken into account.</i>	
(B)	Deduct salvage value = 15% of (A)	
	$\frac{15 \times 2,40,000}{100}$	= Rs. 36,000.00
(C)	Total investment to be depreciated = (A-B) = Rs. 2,40,000-36,000	= Rs. 2,04,000.00
(D)	Economic life of the machine in hrs. (adopted as per RBMC recommendations)=12,000 hrs. (see Appendix I)	
(E)	Depreciation per hour $\frac{C}{D} = \frac{2,04,000}{12,000}$	= Rs. 17.00

- (F) Storage charges per hr. (1% of (C)
spread over the economic life)

$$= \frac{1 \times 2,04,000}{100 \times 12,000} = \text{Rs. } 0.17$$

Total ownership charges (I+II) Rs. 17.17

4. *Operational charges :*

- (G) Repair charges per hr. including maintenance and replacement of tyres (150% of (C) Spread over economic life $1.5 \times 2,04,000$
= $\frac{\quad}{12,000}$ Rs. 25.50

5. *Running charges :*

I. Operating Staff/labour & wages :

<i>Designation</i>	<i>No.</i>	<i>Wages/month</i>
(i) Operator	—	—
(ii) Helper	—	—
(iii) Cleaners	—	—
(iv) Misc. expenses	—	—
(v) Overtime etc.	—	—

TOTAL

- (H) Wages per Hr. = Rs. 5.20 (Also refer (d) of note below)

II. *Servicing charges :*

<i>Designation</i>	<i>No</i>	<i>Expenditure/month</i>
(i) Mechanic	—	—
(ii) Cleaner	—	—
(iii) POL	—	—

TOTAL

- (J) Servicing charges per hr. = Rs. 2.80

III. *Fuel lubricants etc.*

<i>Consumption/hr.</i>	<i>Rate/Lit.</i>	<i>Cost/hr.</i>
(i) Fuel *—	—	—
(ii) Lubricant —	—	—
(iii) Grease	—	—
(iv) Hyd. Oil	—	—
(v) Gear Oil, cotton waste, etc.	—	—
(vi) Furnace oil etc. (in case of hot mix plants etc.)	—	—

TOTAL

- (K) Cost of Lub. Oil, fuel etc./Hr. Rs. 55.90

- (L) Total running charges per hour = I+II+III = Rs. 63.90

6. Overhead charges @ 5% of the total charge per hour

$$= \frac{5}{100} (E+F+G+H+J+K)$$

$$= \frac{5}{100} (17.00+0.17+25.50+5.20+2.80+55.90)$$

$$= \frac{5}{100} (106.57)$$

$$= \text{Say Rs } 5.33$$

Summing up :

- Ownership charges (as in (3)) = (E+F) = 17,000 + 0.17 = Rs 17.17
 Operational charges (as in (4)) = G = Rs 25.50
 Running charges (as in (5)) = L = 63.90
 Overhead charges (as in (6)) = Rs 5.33

Hire charges per hour = A 111.90 or say Rs. 112.00

Note : While the hire charges should be calculated on the basis of actual expenditure incurred on each machine, on various items indicated above, as soon as any machine is received, provisional hire charges can be fixed assuming the following :

(a) *For Imported equipments only :*

- (i) c.i.f. cost = (F.A.S. or F.O.B. Cost) + 10% cost of machine for ocean freight.

- (ii) Custom duty and clearance charges = 50% of c.i.f. value (35% custom duty + 10% regulatory duty + 3% clearance charges)
- (b) (i) Diesel consumption = B.H.P. $\times$ Load Factor (60%) $\times$ Lbs. of fuel per H.P. hour (0.4)
- (ii) Lubricating oil consumption = $\frac{\text{H.P.} \times 0.6 \times 0.006}{7.4} = +c$

Where C = Crank case capacity 0.06 $\times$ HP in gallons

t = time for changing oil = 100 hours.

- (c) the other lubricants, grease, Hyd. oil, gear oil, cotton waste etc., may be assumed to cost twice the cost of lubricant oil in case of heavy machinery. In case of rest, it is to cost same as lubricant oil.
- (d) Wages of operating staff : Although the staff will be paid for the whole year, the actual working hours is to be assumed as 1500 hours. per year. The hourly wages, may, therefore, be calculated accordingly.
- (e) For equipments given to contractors & outside agencies :

When the machines are issued to contractors, interest and insurance charges @ 10% of average investment will be calculated as under and added.

$$(M) = \frac{2,40,000}{1,500} \times \frac{60}{100} \times \frac{10}{100} = \text{Rs } 9.60$$

Therefore the total charges in that case would be as follows :

Ownership charges (E+F+M) = 17.00 + 17 + 9.60 = Rs 26.77

Operational charges G (as in 4) = Rs 25.50

Running charges (as in 5) = L = Rs 63.90

Overhead charges @ 5%
of the total charges per hr.

$$= \frac{5}{100 (E+F+G+H+J+K+M)}$$

$$= \frac{5}{100 (17.00 + 17 + 25.50 + 5.20 + 2.80 + 55.90 + 9.60)}$$

$$= \frac{5}{100 (116.17)}$$

Say = Rs 5.81

Hence hire charges per hour = Rs 120.54

Say = Rs 121.00

2200.6.

No. RM-21 (3)/75

Dated the 1st October 1977

To

The Secretaries (dealing with the Roads) Andhra Pradesh/Assam/Bihar/Gujarat/Haryana/Himachal Pradesh/Jammu & Kashmir/Kerala/Karnataka/Madhya Pradesh/Maharashtra/Manipur/Meghalaya/Nagaland/Orissa/Punjab/Rajasthan/Tamil Nadu/Tripura/Uttar Pradesh/West Bengal and Sikkim

Subject : Calculation of hire charges for Central machinery allotted to the States and procedure of accounting for the same

In modification of this Ministry's letter of even number dated 4th June, 1976, on the above subject, wherein necessary instructions regarding calculation of hire charges and accounting of ownership and operational component of hire charges have been issued, I am directed to clarify the following points :

2. *A-Running charges* : The present practice of debiting running charges component of hire charges directly to the works, on which the machinery is actually used, may be continued.

B-Overhead charges : The overhead charge component of hire charges may be credited to the Major Head *137-Roads/Bridges-other receipts". adjustable by the Pay and Accounts Officer, National Highways, Ministry of Shipping and Transport, Jamnagar House, New Delhi. The past credits, if kept in suspense or deposit account, may also kindly be credited to this head of account. The detailed account of overhead charges earned by each machine from the time of its receipt may also kindly be sent to the Ministry.

3. In short, the four components of hire charges will be accountable as under :

- (a) Ownership charges to be credited to the Major head "537-AA. Capital Outlay on road and bridges-AA.1-National Highways-AA. 1 (2)-Tools and Plants"
- (b) Operational charges to be credited to the Major head "137-Roads/Bridges-Other Receipts".
- (c) Running charges to be debited to the works on which the machinery is actually used.
- (d) Overhead charges to be credited to the Major head of "137-Roads/Bridges other receipts".
- (e) Whenever the machine is given to the contractor the recovery of hire charges from him will be credited as under :
 - (i) Ownership charges to be credited to the Major head "537-AA. Capital Outlay on Roads and Bridges-AA. 1-National Highways-AA. 1 (2)-Tools and Plants".
 - (ii) All other charges i.e. operational, overhead and running are to be credited to the Major head "137-Roads/Bridges other receipts".

This issues with the concurrence of the Ministry of Finance (DEA) vide their U.O. No. 1366/D/AC/77 dated 9th September, 77 and Finance Division vide their U.O. No. 3608-TF. II/77 dated 23rd September, 1977.

2200.7.

No. RM-21 (3)/75

Dated the 2nd May, 1978

To

The Secretaries dealing with roads in the States of A.P./Assam/Bihar/Gujarat/Haryana/Madhya Pradesh/J & K/Kerala/Karnataka/Himachal Pradesh/Maharashtra/Meghalaya/Manipur/Nagaland, Orissa/Punjab/Rajasthan/Tamil Nadu/Uttar Pradesh and West Bengal.

Subject : Calculation of hire charges for Central Machinery allotted to states and procedure of accounting for the same

I am directed to refer to Ministry's Circular letter of even number dated 1.10.77 wherein procedure for accounting various component of hire charges, including the Heads of accounts were communicated to the States. In para 3 (a) (ii) of this letter, it has been indicated that whenever the machine is given to contractor, the recovery made towards operational, overhead and running components of hire charges may be credited to the Major head "137-Roads/Bridges-other receipts".

2. While re-examining this position from the works angle, it is observed that the States would be drawing money from the works or debiting to the works account for the procurement of POL and for the payment of wages of staff, as states may not have any separate funds for this purpose. At the same time, the payment for the works executed by the contractor, on the basis of unit rate of work indicated in the contract agreement, which naturally includes total hire charges (Usage charges) of machinery, is also paid from the works (against sanctioned works estimates). This might result in duplicate debiting to the works account with the running charge component of hire charges.

3. In order to obviate such an eventuality it has been decided to issue this letter in supersession of this Ministry's letter of even number dated 1.10.77 clearly indicating instructions for accounting of each component of hire charges, namely ownership operational, running and overhead charges both when the machines are used departmentally, and also when the machines are given to the contractor for use on Central Works. The revised instructions are as under :

1. *For use of machinery departmentally*

(a) *Ownership charges*

The component of ownership charges is to be calculated for each machine by the State PWD as indicated in Ministry's letter No. RM-21 (3)/75 dated 4.6.1976 and debited to the works. The corresponding credit should be afforded to the Major Head "537-AA Capital Outlay on Roads and Bridges — AA. 1 -National Highways-AA. 1 (2)-Tools and Plants" as this credit is to be afforded to the estimate sanctioned for the purchase of machinery.

(b) *Operational charges*

The operational charge component of hire charges meant for the maintenance and repairs of machinery is to be calculated as indicated in Ministry's letter No. RM-21 (3)/75 dated, 4.6.1976 and debited to the works. The corresponding credit is to be given to the Major Head "137-Roads/Bridges-Other Receipts". As per the system already in vogue, Ministry would be providing separately actual funds required for the maintenance and repairs of Central equipment against sanctioned estimates. The funds for the same are being released from M&R Grants of machinery separately.

(c) *Running charges*

The present practice of debiting the actual running charge components of hire charges directly to the work on which the machinery is actually used will be continued which would mean that the expenditure on procurement of POL etc. and towards the wages of staff shall continue to be directly debited to the work.

(d) *Overhead charges*

The overhead charge component of ownership and operational charge components of hire charges are to

be worked out as indicated in Ministry's letter No. RM-21 (3)/75 dated 4.6.1976 and debited to the work. The corresponding credit is to be given to the Major Head "137-Roads/Bridges-Other Receipts".

(The overhead charge component of running charges (if any expenditure for it is incurred) is also debited directly to the works on actual basis.)

II. *Accounting of hire charges when the machinery is given to contractor for execution of Central Works*

The hire charges for each Central machinery when given to the contractors for execution of Central works should be calculated as indicated in Ministry's letter No. RM-21 (3)/75 dated 4.6.1976 and indicated in the N.I.Ts. The Bills of the contractors for the entire work prepared on the basis of unit rate of work incorporated in the contract agreement (which naturally include unbuilt total hire charges of the machinery) will be adjusted against/paid against the sanctioned works estimates. In other words, the works will thus get debited with the total hire charges of the machinery. The amount recovered from the bills of the contractors towards usage/hire charges of Central machinery should be credited as follows :

- (i) The ownership component of hire charges is to be credited to the Capital Head of account against which the purchase of machinery was sanctioned namely Major Head "537-AA. Capital Outlay on Roads and Bridges-AA. I-National Highways-AA. I (2)-Tools and Plants".
- (ii) The operational charge component is to be credited to the Major revenue head "137-Roads-Bridges-other receipts".
- (iii) The overhead charge component of the ownership and operational charges components is to be credited to the Major Head "137-Roads/Bridges-other Receipts".
- (iv) The running charges component including overheads for running charges is to be credited to the concerned works on which the machinery was used.

4. Even when the equipment are given to the contractors on hire basis the department should continue to preferably to arrange the actual quantity, and proper quality POL, required for the operation and maintenance of the equipment and supply for the operation and maintenance of the equipment and supply for the use of the machinery to be suitably regulated and governed by the terms to be provided as stipulations in the original NIT. Similarly, the departmental operators should be engaged in the machinery to ensure proper operation and timely maintenance to be similarly stipulated through the NIT Provisions. As such, the expenditure incurred on running charges and overhead charges of running charges i.e. on crew wages, POL etc. will be incurred by the Department themselves, and the actual expenditures on this account would be charged directly to the works on which the machinery is engaged.

5. The above procedure is essential to ensure that the works are not debited twice with the running charges and overhead charges of running charge component of the hire charges.

6. As already stated, this supersedes Ministry's earlier letter of even number dated 1.10.1977. This issues with the concurrence of the Finance Division vide their U.O. No. 4489/TF. II/78. dated 28.4.1978.

2200.8.

No. RM-21 (3)/75

Dated the 4th May, 1978

To

The Secretaries dealing with roads in the States of Andhra Pradesh/Assam/Bihar/Gujarat/Haryana/Himachal Pradesh/Jammu & Kashmir/Karnataka/Kerala/Madhya Pradesh/Maharashtra/Manipur/Meghalaya/Nagaland/Orissa/Punjab/Rajasthan/Tamil Nadu/Uttar Pradesh/West Bengal and C.P.W.D.

Subject : Calculation of hire charges for Central machinery allotted to states and procedure for accounting for the same

I am directed to say that at the time of execution of I.D.A. LRP & S.R. works, this Ministry had intimated to concerned states, about the procedure to be followed for working out the hire charges for use of Central machinery and for its accounting. Subsequently whenever machinery were transferred to other states, this procedure was brought to their notice also. According to this procedure, the hire charges of machinery were to be calculated by the states and debited to the works on which they were engaged, commensurate with their utilisation on those works, so that the expenditure for the usage of machinery was duly reflected in the cost of execution of Central works. The State P.W.Ds. accordingly made provisions for the same, in the works estimate before getting the same sanctioned by the Ministry. For the execution of L.R.P. works, requisite instructions were also issued regarding hire charges when Central machines are given to the contractor, (with POL supplied by Department/POL supplied by the contractor).

2. Road Building Machinery Committee in their Report had brought out that accounting of hire charges was far from satisfactory. On completion of earlier projects of I.D.A., L.R.P. etc., the central machines have now been distributed among almost all the states throughout the country for execution of National Highways and other Centrally Sponsored Works. Ministry have also procured in addition a large fleet of

bituminous Pavement construction equipments and distributed them to all the States. Based on the recommendations in the report of R.B.M.C., Ministry issued revised instructions to all State P.W.Ds. regarding calculations of hire charges and accounting of its various components vide Ministry's letter of even number dated 4.6.1976. The State P.W.Ds. were also requested to work out the hire charges for each Central machine allocated to them and send details of calculation of hire charges to the Ministry with a copy to Regional office for information.

3. However, it is seen that only few states have submitted such calculations of hire charges. Even these are incomplete in many respects. Perhaps some of the states are finding difficulties in working out the procurement cost of machines at site, as the information has not been received by them from the States from where the equipments have been received on transfer, proper records for transportation charges, erection, commissioning charges etc. are not available or are not being received from the lower formations which matters though were needed to be duly pursued to proper conclusion and settlement in proper time. Due to one reason or the other the calculation of hire charges of some Central machines could not be done by some states resulting in delay in their adoption and proper accounting. With a view to overcome these difficulties of the States P.W.Ds., in order to expedite the calculation and accounting of hire charges of Central machinery without further delay, and their adoption on uniform basis by all State P.W.Ds. having Central machines, the components of hire charges, viz. ownership and operational, including their overhead component for all central machinery have been calculated and summarised in the enclosed statement. The statement indicates the rates of these components of hire charges when the machines are used departmentally and when the machines are issued to the contractor for execution of central works separately.

4. It is requested that the rates now indicated in the enclosed statement may be adopted with effect from 1.4.1978 and use the same for debiting to the Works and crediting to the Central head of Accounts prescribed by the Ministry. There is no necessity to reconcile the rates of hire charges charged in the past (prior to 31.3.1978) with those indicated now in the enclosed statement.

5. The running charge components of hire charges which is likely to vary from state to state due to prevailing rate of staff wages consumption and cost of POL which would differ due to job conditions, terrain and climate etc. have not been calculated by the Ministry. As such, the State P.W.Ds. are requested to continue to calculate the running charges and its overhead (at 5% of the calculated running charges) themselves, include the same while calculating the total hire charges for use of machinery and incorporate in NITs, whenever central machines are given to contractors.

6. State P.W.D. is requested to issue suitable instructions in this regard immediately to all concerned in their department under intimation to the Ministry. This issues with the concurrence of Ministry of Finance TF vide their U.O. No. 146/TF.II/78 dated 25.4.1978.

HIRE CHARGES FOR CENTRAL MACHINERY

Sl. No.	Description of machinery	When used by the Department				When used by Contractors			
		Owner-ship charges per hour	Operational charges per hr.	Over-head charges per hr.	Total usage charges excluding running charges	Owner-ship charges per hour inclusive of interest and Insurance	Operational charges per hr.	Over-head charges per hr.	Total usage charges per hr. excluding running charges
1	2	3	4	5	6	7	8	9	10

BITUMINOUS CONSTRUCTION EQUIPMENTS

1.	Hot Mix Plant 20-30 TPH Marshalls								
(i)	Batch diesel								
(ii)	Continuous diesel	36.60	54.40	4.55	95.55	62.20	54.40	5.80	122.40
2.	Hot Mix Plants 20-30 TPH Marshalls								
(i)	Batch Electric								
(ii)	Continuous Electric								
	Sayaji-continuous electric	51.40	34.60	4.30	90.30	58.80	51.40	5.50	115.70

3.	Hot Mix Plants 20-30 TPH Sayaji								
	(i) Batch Electric								
	(ii) Continuous Electric	38.20	56.75	4.75	99.70	54.90	56.75	5.60	117.25
4.	Hot Mix Plants 15-20 TPH (i) Cutter								
	(ii) Parker (iii) Bristones	19.80	29.40	2.45	51.65	33.65	29.40	3.15	66.20
5.	Hot Mix Plants 15-20 TPH Parker Starmix	22.30	33.15	2.75	58.20	37.90	33.15	3.55	74.60
6.	Hot Mix Plants 6-10 TPH Millars, Sayaji (old)	10.15	15.05	1.25	26.45	14.85	15.05	1.50	31.40
7.	Hot Mix Plants 6-10 TPH Marshalls Sayaji (new) VAK	13.55	20.15	1.65	35.35	19.85	20.15	2.00	42.00
8.	Paver Finishers-75 TPH Marshalls Sayaji (old)	17.20	25.50	2.15	44.85	29.20	25.50	2.75	57.45
9.	Paver Finishers (new) Marshalls & Appolo	20.30	30.15	2.30	52.95	34.50	30.15	3.25	67.90
10.	Paver Finisher-Goegila	6.30	9.35	0.75	16.40	10.70	9.35	1.00	21.05
11.	Bitumen Mixer 8-10 TPH	4.90	7.25	0.60	12.75	7.20	7.25	0.70	15.15
12.	Bitumen Pressure distributor	3.15	4.65	0.40	8.20	5.35	4.65	0.50	10.50
13.	Tippers-5 Ton (New)	0.25/km.	0.35/km.	0.03/km.	0.63/km.	0.40/km.	0.35/km.	0.04/km.	0.79/km.
14.	Tippers 3-5 Tons (Old)	0.15/km.	0.20/km.	0.01/km.	0.36/km.	0.25/km.	0.20/km.	0.02/km.	0.47/km.
15.	Loader 1½ cyd.	7.35	10.95	0.90	19.20	11.50	10.95	1.10	23.55
16.	Front End Loader 1.5 cum	49.00	72.80	6.05	127.85	76.40	72.80	7.45	156.65
17.	Front End Loader 0.5 cum	8.60	12.75	1.05	22.50	13.40	12.75	1.30	27.45
18.	Bitumen Boilers 250-300 gals	0.45	0.70	0.05	1.20	0.65	0.70	0.05	1.40
19.	Bitumen Storage Tank	2.95	4.40	0.35	7.70	5.05	4.40	0.45	9.90
20.	Grit Spreader	1.05	1.60	0.15	2.80	1.80	1.60	0.15	3.55
21.	Mechanical Broom	6.85	10.20	0.85	17.90	10.05	10.20	1.00	21.25
HEAVY EARTH MOVING MACHINES									
22.	Motorised Scraper (Michigan)	20.15	29.95	2.50	52.60	31.45	29.95	3.05	64.45
23.	Motorised Scraper (Russian)	24.70	36.70	3.05	64.45	38.50	36.70	3.75	78.95
24.	Towed Scraper (Russian)	13.40	19.90	1.65	34.95	22.75	19.90	2.15	44.80
25.	Tractor Dozers (Pneumatic) Michigan	14.65	21.80	1.80	38.25	22.85	21.80	2.25	46.90
26.	Tractor Dozer Crawler 108 HP Russian	13.35	19.80	1.65	34.80	20.80	19.80	2.05	42.65
27.	Grab dredging crane (Priestman)	9.95	14.80	1.25	26.00	16.90	14.80	1.60	33.30
28.	Grab dredging crane 1½ cyd. E-1252	26.40	39.20	3.30	68.90	44.85	39.20	4.20	88.25
29.	Grab dredging crane ¾ cyd. E-652	14.30	21.25	1.75	37.30	24.30	21.25	2.25	47.80
30.	Dragline Crawler 1½ cyd.	23.40	34.75	2.90	61.05	39.75	34.75	3.70	78.20
31.	Cranes-5 Tons "Coles"	11.00	16.30	1.35	28.65	16.10	16.30	1.60	34.00
32.	Cranes-5 Tons "P & H"	16.65	24.75	2.05	43.45	24.40	24.75	2.45	51.60
33.	Cranes-10 Tons "Coles"	15.85	23.60	2.00	41.45	24.75	23.60	2.40	50.75
34.	Rear Dumper-9/11 cyd.	14.60	21.65	1.80	38.05	21.40	21.65	2.15	45.20
35.	Motor Grader-Caterpillar	7.15	10.60	0.90	18.65	13.15	10.60	1.15	24.90
36.	Motor Grader-Russian	8.80	13.10	1.10	23.00	14.95	13.10	1.40	29.45
37.	Single Pass Soil Stabilizer (Voegale)	33.60	49.90	4.15	87.65	52.40	49.90	5.10	107.40
38.	Single Pass Soil Stabilizer (Howard)	13.60	20.20	1.70	35.50	21.20	20.20	2.05	43.45
COMPACTION EQUIPMENTS									
39.	Road Roller-Rubber Tyred	0.70	1.05	0.10	1.85	1.10	1.05	0.10	2.25
40.	Road Roller-Tandem (Schcid)	2.10	3.10	0.25	5.45	3.85	3.10	0.35	7.35
41.	Road Roller-Tandem (Garlik)	1.80	2.70	0.20	4.70	3.30	2.70	0.30	6.30
42.	Road Roller-8-10 Tons	2.50	3.70	0.30	6.50	4.60	3.70	0.40	8.70
43.	Roller-Sheepfoot single drawn	0.20	0.35	0.03	0.58	0.35	0.35	0.03	0.73
44.	—do— double drawn	0.40	0.60	0.05	0.05	0.70	0.60	0.06	1.36
45.	Tankers-Truck mounted 1000 gal.	0.20/km.	0.30/km.	0.02/km.	0.52/km.	0.40/km.	0.30/km.	0.03/km.	0.73/km.
46.	Tankers-Trailor mounted	0.03/km.	0.04/km.	Nil	0.07/km.	0.05/km.	0.04/km.	Nil	0.09/km.
47.	Tractors 40-50 HP	1.40	2.10	0.15	3.65	2.20	2.10	0.20	4.50
48.	Tractor Wheelled-Zetor	0.80	1.15	0.10	2.05	1.25	1.15	0.10	2.50
OTHER EQUIPMENTS									
49.	Diamond core drilling m/c Joy 12 B Voltas large	7.15	10.60	0.90	18.65	11.15	10.60	1.10	22.85

50.	Diamond core drilling m/c (mandrill)	2.60	3.90	0.30	6.80	4.05	3.90	0.40	8.35
51.	Diamond core drilling m/c Joy & Voltas small	2.70	4.00	0.35	7.05	4.20	4.00	0.40	8.60
52.	Fressymet Jack	4.00	6.00	0.50	10.50	4.95	6.00	0.55	11.50
53.	Welding set	0.20	0.30	0.02	0.52	0.30	0.30	0.03	0.63
54.	Generating set	1.65	2.50	0.20	4.35	2.60	2.50	0.25	5.35
55.	Pile driving Equipment	3.95	5.85	0.50	10.30	6.70	5.85	0.60	13.15
56.	Winches 3 X 5 Tons	2.30	3.40	0.30	6.00	3.90	3.40	0.35	7.65
57.	Colcrete Mixers	2.00	3.00	0.25	5.25	2.75	3.00	0.30	6.05
58.	Concrete Mixers	0.70	1.05	0.10	1.85	0.95	2.05	0.10	2.10
59.	Air Compressors 160 cfm.	2.45	3.65	0.30	6.40	3.60	3.65	0.35	7.60
60.	Air Compressors 315 cfm	4.00	5.95	0.50	10.45	5.85	5.95	0.60	12.40
61.	Air Compressors 210 cfm	2.70	4.00	0.35	7.05	3.95	4.00	0.40	8.35
62.	Vibrators	0.15	0.25	0.02	0.42	0.20	0.25	0.02	0.47
63.	RPL Barge	28.60	42.50	3.55	74.65	52.60	42.50	4.75	99.85
64.	Mar boat-Steel	5.50	8.20	0.70	14.40	9.35	8.20	0.90	18.45
65.	Mar boat-Wooden	6.40	9.50	1.25	17.15	9.40	9.50	0.95	19.85
66.	Pumping Sets-5 HP	0.55	0.80	0.07	1.42	0.80	0.80	0.08	1.68
67.	Pumping Sets-20 HP	1.10	1.65	0.15	2.90	1.70	1.65	0.15	3.50
68.	Power Rammer	0.15	0.25	0.01	0.41	0.25	0.25	0.02	0.52
69.	Cube Testing Machine	0.20	0.30	0.02	0.52	0.60	0.30	0.05	0.95
70.	Stone crushers-Sisco	3.35	5.05	0.40	8.80	4.95	5.05	0.50	10.50
71.	Stone crushers-Marshalls	4.20	6.25	0.50	10.95	6.15	6.25	0.60	13.00
72.	Stone crushers-Aggarwalla	2.90	4.35	0.35	7.60	4.25	4.35	0.45	9.05
73.	Granulator-Prabhat	3.25	4.85	0.40	8.50	4.75	4.85	0.50	10.10
74.	Trucks-5 Tons	0.10/km	0.20/km	0.01/km	0.31/km	0.20/km	0.20/km	0.02/km	0.42/km

2200.9.

No RM-21 (3)/75-Pt

Dated the 22nd March, 1979

Subject : Calculation and accounting of hire charges, Clarifications etc.

Ministry have issued instructions for calculation and accounting of hire charges of Central machinery. Some queries/doubts have been raised by a few State Public Works Departments and Regional Superintending Engineers (Mechanical) of this Ministry. The queries/doubts and clarifications thereon, are forwarded herewith in the enclosed statement for your information and necessary action.

To .

1. The Chief Engineer, National Highways and Projects, Bhubaneswar, Orissa, with reference to his letter No. PUR-VII-ME-1/76/34832/NH, dated the 10th August, 1976, addressed to the Ministry's Regional Superintending Engineer (Mechanical), Calcutta.
2. The Engineer-in-Chief, Public Works (Roads), Directorate. Writers' Building, Calcutta, with reference to the letter No. 3988/MC/E-19, dated the 28th September, 1976 of Superintending Engineer, Mechanical, Circle, Public Works (Roads) Directorate, Calcutta.
3. The Chief Engineer, Public Works Department, Roads and Buildings, Chandmari, Gauhati, Assam, with reference to his letter No. CEM/TECH/30/77/1032, dated the 5th April, 1978.
4. The Chief Engineer, National Highways Chepauk, Madras-600 005, with reference to his letter No. 13512/DI/NH/77-10, dated the 15th May, 1978.

Copy with enclosures also forwarded for information to :

1. Secretaries dealing with Roads in the States of Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Manipur Meghalaya, Nagaland, Orissa, Punjab, Rajasthan, Tamilnadu, Uttar Pradesh, West Bengal and Director General Works (Public Works Department).
2. Chief Engineers and Additional Chief Engineers, concerned with roads in the States of Andhra Pradesh, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Punjab, Rajasthan and Uttar Pradesh.
3. Chief Engineer, Ministry of Shipping and Transport, (Roads Wing), Bamuni Maidan, Gauhati-781 021 (Assam).
4. Superintending Engineer, (Mechanical), Ministry of Shipping and Transport, (Roads Wing), 8, Lindsay Street, IIIrd Floor, Calcutta-700 016 (West Bengal), with reference to his letter No. SEM/Cal/HC/76, dated the 3rd September, 1976.
5. The Superintending Engineer, (Mechanical), Ministry of Shipping and Transport, (Roads Wing), D-38, A, Ashok Marg, 'C' Scheme, Jaipur, with reference to his letter No. SE (M)/J/76/G-1/4017, dated the 24th August, 1977.

6. The Superintending Engineer, (Mechanical), Ministry of Shipping and Transport, (Roads Wing), A-11/-H, Sector 'A', Mahanagar, Lucknow.
7. Superintending Engineer, (Mechanical), Ministry of Shipping and Transport, (Roads Wing), No. 101-Diagonal Road, Visveswarpuram, Bangalore-560 004, (Karnataka),
8. All Regional Officers/Executive Engineer (Mechanical) Gauhati/Assistant Executive Engineer (Mechanical), Patna and Engineer Liaison Officers.
9. P.S. to D.G. (R.D.) and Additional Secretary/P.As. to Additional Director General (Bridges)/Additional Director General (Roads)/C.E. (M)/S.E. (M) I/II/III and IV/RM Section/All Under Secretaries/All Sections in the Roads Wing.
10. Finance Division with reference to their U.O. No. 208. TF. II/79, dated the 19th January, 1979.
11. All Accountant Generals of the above mentioned States.
12. Accountant General, Central Revenues and Accountant General, Commerce, Works and Miscellaneous, New Delhi-110 011.
13. Controller of Accounts, Ministry of Shipping and Transport, (Roads Wing), IDA Building, Jamnagar House, New Delhi-110 011.

REFERENCE RM-21 (3)/75 dt. 4.6.76, 1.10.77, 2.5.78 & 4.5.78

QUERIES/POINTS RAISED REGARDING WORKING OUT AND ACCOUNTING OF HIRE CHARGES AND CLARIFICATIONS THEREON

Sl. No.	Query/Point	Clarification
(1)	(2)	(3)
1.	The life of some categories of machines like (i) Pile Driving Sets (ii) Arc Welding sets (iii) Pay Loaders (iv) 6-10 TPH Hot Mix Plants (v) Marboats & RPL barges has not been stated.	The life of these equipments may be taken as under : (i) <i>Pile Driving Equipments</i> R.B.M.C. in Appendix 19 has recommended a life of 12 years for pile Driving Equipments. Assuming a regular working of 1000 hrs. per year, a total life of 12,000 hrs. may be considered. (ii) <i>Arc welding sets</i> A life of 6 years has been recommended by RBMC as indicated in Appendix (19) of the RBMC's report. This item of machinery has been covered in the category of small items, the cost of which is to be charged to the works. (iii) <i>Pay loaders</i> The pay loader may be considered similar to motorised scraper or Pusher (Dozer). The life of these equipments as recommended by the RBMC in Appendix (19) of the Report is 12,000 working hours. Similarly, life of Pay Loader may also be taken the same i.e. 12,000 hours. (iv) <i>Hot Mix Plants (6-10 TPH)</i> RBMC in Appendix (19) to their report at item (32) has recommended a life of 10,000 hours for Bitumen Mixer of 8-10 TPH capacity. The Mini Hot Mix Plant '6-10 TPH' capacity purchased by the Ministry recently are similar to those. As such, life of 10,000 hours may be assumed for 6-10 TPH Hot Mix Plants. (v) <i>Marboats and RPL barges</i> It has been ascertained from Director (Mech) Transport Wing of this Ministry that normally, a depreciation of 7% annually for Marboats, RPL barges and other similar vessels, is considered. Hence a life of approximately 14½ years, say 15 years, may be assumed for marboats/RPL barges etc.
2.	It has been stated that a minimum of 1/8th of the expected annual depreciation of machinery should be charged to the Central works towards the hire charges if equipment is used for less than 1/8th of expected working hours in any particular year. The head of a/c to which the amount so recovered would be credited, has not been indicated. Also it has been assumed that a machine will be used only on one work for less than 1500 hrs. in a year. If the machine is used on more than one work during a year and the scheduled 1500 hrs. are not achieved then it should be clarified as to which work will bear the cost of the remaining working hours.	Since the minimum charges consists of 1/8th of the Annual depreciation only, amount recovered against this item should be credited to the capital account head "537-AA. Capital Outlay on Roads and Bridges -AA. I-National Highways-AA. 1 (2)-Tools & Plants" as indicated in Ministry's letter No. RM-21 (3)/75 dated 1.10.77. Regarding the particular central work to which this minimum of 1/8th of expected annual depreciation of machinery is to be charged in case of under-utilisation of machinery, it may be pointed out that it is expected that all efforts will be made to ensure its utilisation throughout the

3. The question of machines which are idle throughout the year without being used on any works will have to be considered and if idle charges are to be recovered the head of a/c to which such will be debited will also have to be clarified.
4. No such instructions have been given about other categories of the equipment whose hire charges are fixed on Kilometres basis. It is presumed that procedure of charging 1/8th of average run in KM per annum will equally be applicable to these cases. This may be clarified.
5. It is felt that the running charges which are variable on account of pay and emoluments of the operating staff and also on account of variations in POL costs, should not become a part of the hire charges. In the example of calculation of hire charges, this element has been included and the total hire charges worked out. The Ministry may clarify the position in this regard.
6. It has been stipulated in Ministry's letter of 4th June, 1976 to review the hire charges periodically. But the period when to be reviewed, the contingencies under which the review is to be made, have not been specifically mentioned.
7. The formula given for calculating additional charges towards interest and insurance is not quite clear. This may be clarified.
8. In case expected working hours per year are not achieved due to one reason or another like rains, shortage of funds etc. then the cost of running charges which include Pay and Wages of the operators cannot be debited to the Construction Divisions as full working hours are not obtained in the year. The Civil Divisions will only accept the debit for the number of hours, the equipment has actually worked. But the payment for the whole year is to be made. Now the question arises who is to bear the cost if the plant is not fully utilized.

working season, and in case of anticipated non-utilisation of the plant, same should be declared surplus. However, in a stray case, if machine, in spite of all efforts, did not have the minimum 1/8th utilisation in the year, the same should be charged to different works in proportion to the quantum of those works indicated in the utilisation programme, but could not be taken up as per schedule anticipated.

The idle charges are recoverable only from contractors and that too in case of use of machinery on works other than Central/Centrally sponsored works as indicated in Ministry's letter no. RM-21 (3)/75 dated 4.6.76.

The idle charges of machinery consists of the following three components :

- (i) 1/4th depreciation of machinery.
- (ii) Interest
- (iii) Wages of work charged staff
- (iv) Overhead at 5% of the total charges.

The components of these charges should be credited to the head of Accounts concerned intimated in Ministry's circular letter No. RM-21 (3)/75 dated 2nd May, 1978.

However, to avoid improper assessment/recovery of idle charges, states have been requested to fix the minimum number of hours for which the hire charges will be recovered from contractor, irrespective of hours of actual use.

Average annual use of trucks/Tippers etc. may be assumed as 30,000 km (Average speed of 20 km/hour is assumed). For such vehicles also, minimum of 1/8th charges are to be recovered, in case of their under-utilisation.

Running charges of machinery are essentially needed to be taken into account mainly to assess the total usage charges to be included in works estimate, so that the realistic cost of works including the use of machinery is reflected therein.

If tenders are invited by any state indicating total usage rates, and if running charges are incurred by department and are debited to works separately, in that case running charges are to be calculated for watching recovery from contractor as per N.I.T. terms and conditions for crediting to Central works concerned. Thus the works will not be debited twice with running charge component of hire charges.

In practice, and as per instructions of the Ministry, the running charges are directly debited to the works and therefore need not become a part of hire charges to be indicated in N.I.T.

Hire charges may be reviewed, say once in three years, or earlier, if States P.W.D. finds that existing rates of hire charges are not realistic due to considerable increase or decrease in staff wages, cost of fuel and lubricants, repair expenditure (including cost of spares) etc.

Taking salvage value of 15% of the machine, average investment would work out to about 57.7% say, 60%.

The calculation of interest/insurance is always made on the average investment cost.

Regarding the mode of meeting the cost of wages of operators for the period when the plants cannot be utilised due to rainy season or any other reason, it may be stated that the wages of the staff for the whole year may be assessed and proportionately distributed to the works undertaken during the year. Efforts are however, to be made to utilise both the machines and staff to the optimum, without idling, by advance planning of works shifting during the slack season etc.

No. RM-26 (3)/80

Dated the 18th July, 1983

To

The Secretaries dealing with the Roads in the States of Andhra Pradesh/Assam/Bihar/Gujarat/Haryana/Himachal Pradesh/Jammu and Kashmir/Kerala/Karnataka/Madhya Pradesh/Maharashtra/Manipur/Meghalaya/Nagaland/Orissa/Punjab/Rajasthan/Tamil Nadu/Tripura/Uttar Pradesh/West Bengal and Sikkim.

Subject : Recovery accounting and adjustment of hire charges for Central machinery allotted to the States

I am directed to say that repeated instructions have been issued, laying down the procedure to be followed for the calculation of hire charges for Central machinery allotted to the States and the manner in which they should be accounted for. The State Government were also requested to credit the recoveries made on the account of hire charges to Central heads of Account. The latest instructions issued by this Ministry are contained in the Ministry's communications indicated below :

RM-21(3)/75 dt 4.6.1976

RM-21(3)/75 dt. 2.5.78

RM-21(3)/75 dt. 4.5.78

The internal test audit parties of the Controller of Accounts of the this Ministry have repeatedly brought to the notice of this Ministry that these instructions are not being followed. In several cases, the amount of hire charges have not been promptly credited to the Central Head of Accounts.

Under the existing system, the expenditure on account of National Highway works is met in the first instance by the State Government concerned from its own resources and it is subsequently got reimbursed. It has, accordingly been decided that, in future, the claims for reimbursement of the expenditure on National Highways works from State P.W.D. should be accompanied by a separate statement indicating the amount of hire charges of Central machinery creditable to the accounts of the Central Government. On this basis, the amount of hire charges to be credited to the Central Government account will be deducted from every reimbursement claim made by the P.W.D. Divisional Officers of the State and Government by the Regional Pay and Accounts Officers of this Ministry. The Regional Pay and Accounts Officer will credit the amount of hire charges to appropriate Central head of accounts per contra debit to the works estimate.

I am, accordingly, to request the State Government to issue instructions to the P.W.D. Divisional officers that, in future, their claims for reimbursement for expenditure on account of National Highways works should be accompanied invariably by a separate statement indicating the amount of hire charges of Central machinery to be credited to the Central Government account and that the claims for reimbursement should be made as payable by the Central Government for the net amount. This procedure will be brought into operation from the current financial year 1983-84.

No. RW/RM-26 (1)/84

Dated the 21st August, 1984

To

The Chief Engineers of all State Public Works
Departments (dealing with National Highways)

Subject : Revision of rates of hire charges for Central Machines

I am to draw your kind attention towards this Ministry's letter No. RM-21 (3)/75, dated the 4th May, 1978 vide which rates of hire charges of Central machines were intimated to all the States. It had been *inter alia* mentioned therein that provision in the works estimate for the usage of Central machines should be made at these rates and should be notified in the N.I.T. accordingly.

2. The present rates of hire charges prescribed by the Ministry are based on the original purchase price of the equipments and are accordingly very low. The same was to be reviewed by states once in 3 years or earlier due to increase in staff wages, cost of POL, repair expenditure etc. Ministry is now considering revision of hire charges and the revised rates will be circulated shortly. Meanwhile, some of the States have revised rates of hire-charges of road-rollers and other machines belonging to them which are also used on N.H. works due to non-availability of Central machines and the revised rates have been taken into con-

sideration in the current schedule of rates. Such State P.W.Ds. particularly where enough central machines to cope up with the requirement of N.H. works are not available, have expressed difficulties in providing in the works estimate the low rate of hire charges prescribed by the Ministry and effect recoveries from contractors etc.

3. It has, therefore, been decided that pending revision rates of hire charges of Central machines, whenever machines are intended to be given to contractor, that the States may indicate in the N.I.T. either the rates of hire charges prescribed by the Ministry, or the rates adopted for the State Government owned machines, whichever is higher. When the Central machines are given to contractor, the actual hire charges as recovered from the contractor excluding running charges should be credited to the Central Head of Account as per existing procedure. In case the State machines are given to contractor, due to non-availability of Central machines, the hire charges recovered need not be credited to the Central head of Account.

2200.12.

No. RM-26 (3)/80-II

Dated the 18th September, 1984

To

All the State Chief Engineers
dealing with National Highways

Subject : Accounting and adjustment of hire charges of Central machines

Kindly refer to the Ministry's letter of even number dated 18th July 1983 on the above subject. According to instructions contained therein from the Financial year 1983-84 the State PWD Divisions are required to submit a schedule of recovery of hire charges of central machines with the monthly accounts claiming reimbursement of expenditure on National Highways.

It has, however, been brought to the notice of the Ministry by the Regional Pay and Accounts Officers NH that some of the State PWD Divisions are not following these instructions and are not enclosing any schedule for the recovery of hire charges of machines.

You are, therefore, requested to kindly impress upon all the Executive Engineers to comply with the aforesaid instructions failing which it may not be possible for the Regional Pay and Accounts Officers NH to make payment of the reimbursement claims. If in any particular month/claim there is no recovery of hire charges a 'nil' return should be attached.

2200.13.

No. RW/RM-26 (1)/84

Dated the 7th November 1984

To

All Secretaries of the State Governments dealing with National Highways

Subject : Revised rates of hire charges of Central machines

Please refer to Ministry's letter No. RM-21 (3)/75 dated 4.5.78 with which the hire charges of central machines were intimated to you. Subsequently vide Ministry's letter of even number dated 21st August '84 the State PWDs were informed that the revision of hire charges of central machines is under consideration and revised rates would be circulated shortly.

2. The revised rates of hire charges have now been worked out and are enclosed herewith. As in the previous case the revised rates include the components of ownership charges, operational charges and overhead charges per hour. These do not include running charges which are likely to vary from State to State with different pay scales of staff, and due to prevailing rates of fuel and lubricants. The running charges may therefore be worked out by the State PWDs and included while calculating the total hire charges for being incorporated in NIT and works estimates.

3. The revised rates may be adopted w.e.f. 1.12.84 and the estimates already sanctioned and the tenders already decided based on the old rates of hire charges need not be revised or reopened.

4. In case due to non-availability of Central machines, State Government owned machines are used on National Highway work, the revised rates of hire charges now prescribed by the Ministry of rates adopted by the State Government for their machines whichever is higher may be indicated in the NIT, as already intimated vide Ministry's letter dated 21st August, 1984 referred to above.

5. There is no change in the procedure for accounting of hire charges of central machines already intimated by this Ministry's letter No. RM-21 (3)/75 dt. 4.6.76, 1.10.1977 and 2.5.78.

6. The above instructions may kindly be brought to the notice of all concerned in their department under intimation to the Ministry.

HIRE CHARGES FOR CENTRAL MACHINERY

S. No.	Description of machinery	When used by the Department				When used by Contractors			
		Owner-ship charges per hour	Operational charges per hour	Over-head charges per hour	Total usage charges excluding running charges	Owner-ship charges per hr. inclusive of interest & Insurance	Operational charges per hr.	Over-head charges per hr.	Total usage charges per hr. excluding running charges
1	2	3	4	5	6	7	8	9	10
(A)	BITUMINOUS CONSTRUCTION EQUIPMENT								
1.	Hot Mix Plant 20-30 TPH	105.88	157.25	13.16	276.29	179.88	157.25	16.66	353.79
2.	Hot Mix Plant 15-20 TPH	80.12	119.00	9.95	209.07	136.12	119.00	12.75	267.87
3.	Hot Mix Plant 6-10 TPH	40.67	60.54	5.54	106.81	59.76	60.54	6.15	126.45
4.	Paver finisher 75 TPH	30.05	44.63	3.72	78.40	51.05	44.63	4.78	100.46
5.	Bitumen Mixer 8-10 TPH	5.95	8.92	0.74	15.58	10.81	8.92	0.88	20.61
6.	Bitumen Pressure Distributor	25.76	38.25	3.20	67.21	43.75	38.25	4.10	86.10
7.	Tippers 5 Ton	0.72	1.06	0.09	1.87/km	1.22/km	1.06	0.11	2.39/km
8.	Tippers 3-5 Ton	0.59	0.87	0.07	1.53/km	0.99	0.87	0.11	1.97/km
9.	Loader 1½ cyd.	49.01	72.78	6.09	127.88	76.41	72.78	7.45	156.64
10.	Front End Loader 1.5 cum.	50.08	74.37	6.22	130.67	78.08	74.37	7.60	160.05
11.	Front End Loader 0.5 cum.	20.75	30.81	2.58	54.14	32.35	30.81	3.15	66.31
12.	Bitumen Boilers 200-300 gals	1.81	2.69	0.23	4.73	2.65	2.69	.26	5.60
13.	Bitumen storage Tank	5.92	8.92	0.74	15.58	10.81	8.92	0.88	20.61
	HEAVY EARTH MOVING								
14.	Motorised Scraper	193.16	286.88	24.00	504.04	301.16	286.88	25.40	617.44
15.	Towed Scraper	186.00	279.24	23.26	488.50	290.00	279.24	28.46	597.70
16.	Tractor Dozers (Pneumatic)	114.47	170.00	24.22	308.69	178.46	170.00	17.42	265.88
17.	Tractor Dozers (crawler)	135.93	201.87	16.89	354.69	151.13	201.87	17.65	370.65
18.	Grab Dredging crane 1½ cyd.	103.02	153.00	12.75	268.77	175.02	153.00	16.40	344.42
19.	Grab Dredging crane ¾ cyd.	85.85	127.50	10.66	224.01	145.58	127.50	13.66	286.74
20.	Dragline Crawler 1½ cyd.	103.02	153.00	12.75	268.77	175.02	153.00	16.40	344.42
21.	Cranes-5	60.80	90.30	7.56	158.66	94.79	90.30	9.25	194.34
22.	Cranes 10 Tons	76.15	113.10	9.26	198.51	114.02	113.10	11.36	230.48
23.	Motor Graders	84.59	125.63	10.51	220.73	143.71	125.63	13.46	282.80
	COMPACTION EQUIPMENTS								
24.	Road Roller 8-10 tons	10.39	15.58	1.30	27.27	19.29	15.58	1.28	36.15
25.	Tankers-Truck mounted 1000 gal	0.54	0.79	0.06	1.37	1.10	0.79	0.12	2.01
26.	Tractors 40-50 H.P.	5.35	7.29	0.63	13.27	8.08	7.29	0.76	22.13
	OTHER EQUIPMENT								
27.	Welding set	1.29	1.92	0.16	3.37	1.65	1.92	0.18	3.75
28.	Generating set (100/125 RVP)	18.23	27.10	2.25	47.58	28.43	27.10	2.25	57.78
29.	Concrete Vibrator	1.07	1.59	0.13	2.79	1.47	1.59	0.15	3.21
30.	Air compressor (210 cpm)	18.63	27.67	2.31	48.61	27.39	27.67	3.19	58.25
31.	Air compressor (210 cpm)	13.85	20.58	1.71	36.14	20.31	20.58	2.36	43.25
32.	Air compressor (160 cpm)	12.28	18.24	1.52	32.04	16.83	18.24	1.98	37.05

2200/24

33.	Pumping sets 5 H.P.	0.73	1.08	0.09	1.90	1.07	1.08	0.10	2.25
34.	Pumping sets 10 H.P.	1.28	1.91	0.15	3.34	2.00	1.91	0.19	4.60
35.	Stone crushers 10 Ton	17.17	25.50	2.13	44.80	25.17	25.50	2.53	53.20
36.	Granulators	17.17	25.50	2.13	44.80	25.17	25.50	2.53	53.20
37.	Trucks-5 ton	0.72	1.06	0.09	1.87/km	1.22	1.06	0.11	2.39/km
38.	Concrete Mixers (10 cft)	3.43	5.10	0.43	8.96	4.68	5.10	48	10.26

2300 **MAINTENANCE & REPAIR ESTIMATES OF CENTRAL MACHINERY**

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2300.1.	RM-1 (4)/70 dt 21.7.72	Procedure for Submission of Maintenance & Repair Estimates	2300/1
2300.2.	RM-1 (1)/76 dt 17.6.76	Creation of New Sub-head for M & R of Central Machines	2300/5
2300.3.	RM-23 (33)/75 dt 5.6.80	Technical Committee for Assessing the Need of Repairs of Machines	2300/6
2300.4.	RW/RMP-8 (5)/83 dt 23.12.83	Adhoc Allotment of Funds under M & R Grants	2300/7
2300.5.	RM-25 (1)/83 dt 26.12.83	Progress Report in respect of Repair Expenditure	2300/7

No. RM-1 (4)/70

Dated the 21st July, 1972

To

All the State Secretaries
(Dealing with Roads),

Bihar, Maharashtra, Orissa, West Bengal, Rajasthan, Himachal Pradesh, Madhya Pradesh, Assam,
Uttar Pradesh, Punjab, Tamil Nadu, Gujarat and Andhra Pradesh

Subject : Procedure for the submission of maintenance and repair estimates for the Central Government Machinery in various States

I am directed to say that the estimates for maintenance and repairs of Central Government Machinery submitted by the State Governments from time to time are not being prepared on an uniform basis. These lack in essential data and are incomplete in many respects. Such estimates, therefore, cannot get readily processed and sanctioned. Repairs to equipments have been delayed and these remain unutilised or under utilised. Funds for maintenance placed at the disposal of State Governments are also, therefore, not being utilised usefully and get surrendered. In order to streamline the procedure to be followed and to avoid delays and back references, it has been decided that the following instructions should be followed for (a) preparing and submitting maintenance and repair estimates and (b) for submission reports at regular intervals on progress of repairs against approved estimates :

1. **REPAIR ESTIMATES**

- 1.1. A set of instructions to be followed for preparation and submission of repair estimates is enclosed.
- 1.2. The repair estimate will consist of three parts :
 - (a) An abstract for each category of Equipment as per Appendix I
 - (b) Detailed estimate for repair of each category of equipment vide proforma I
 - (c) Report detailing essential information justifying the necessity for the repairs (provided in the estimate) indicating the present condition of equipment and previous performance records vide proforma II

2. **MAINTENANCE ESTIMATE FOR IDLE/SURPLUS MACHINERY**

With a view to economise on cost of road construction by optimal use, longer life, maximum outputs and low operation cost of equipment every possible effect should be made to utilise properly. The plan in advance the utilisation of the machines on Central Works throughout the State and by timely shifting of equipment from one site/project to another.

- 2.1. Maintenance during short periods of idling of equipment is chargeable to the estimate of the works concerned.
- 2.2. Maintenance estimate for idle/surplus equipment should be prepared and submitted only when the equipments are declared overall surplus by the State and for the transit period awaiting their shifting from that State to another needy State.
- 2.3. It is necessary that the utilization programme and the overall surplus list should be submitted to the Ministry well in advance (at least 3 months) so that the other needy States may take over the equipment as soon as they are surplus.
- 2.4. The maintenance estimate referred to under para 2.2 should be prepared on the basis of the equipment being started and run for one hour each fortnight. This one hour may be achieved by starting the machines two times i.e. once in every week and running for half an hour at a time wherever possible.
- 2.5. P.O.L. for washing purposes, topping up and starting only have to be provided. If the condition of lubricants in some equipment necessitate complete renewal, the same may be provided.
- 2.6. Particulars as part of the estimates are required to be furnished in proformae III and IV

3. **PROGRESS REPORTS**

- 3.1. In order to watch the progress of the repair works to be carried out against the sanctioned estimates it will be obligatory on the part of the State Government to send a monthly progress report in the prescribed proforma No. V, directly to this Ministry with a copy to the Regional Superintending Engineer so as to reach this Ministry latest by 15th of subsequent month.
- 3.2. Monthly progress report regarding idle/surplus maintenance of machinery in the prescribed

proforma No. VI should be sent directly to the Regional Superintending Engineer so as to reach him latest by 15th of subsequent months.

4. Progress reports in respect of repairs and maintenance estimates already sanctioned by this Ministry since the commencement of IV Plan (from 1969) should be sent to this Ministry, if not already done.
5. This Ministry is anxious that all machinery needed for the execution of Central works are kept ready in order to achieve the targets of road programme assigned. It is requested that necessary action for planning the repairs and submission of requisite estimates may please be taken immediately.

INSTRUCTIONS FOR PREPARATION AND SUBMISSION OF REPAIR ESTIMATES

1. Repair estimates in triplicate, should be prepared and sent well before the commencement of the year direct to the Ministry with a copy to the Regional Superintending Engineer (Mechanical) so that they can be examined and sanctioned in time for the work of repair being taken up and completed during slack season (rainy season).
2. As far as possible the estimate should be sent in bunched up batches so that the condition of machines can be inspected by the Ministry's Regional Officers in one tour for satisfying the provisions made in the estimate. All relevant records should be made readily available at the time of inspection.
3. Separate estimate for repair of individual machines should be sent on the basis of visual inspection and condition of machines, also based on previous performance records.
4. Repair estimate should be sent for such machines only that will be utilised in the State after repairs.
5. Repair estimate for each category of machine will consist of an Abstract detailing the total cost for spare parts to be used labour charges and cost of other materials alongwith the detailed information as in proforma I and II.
6. Cost of complete assemblies/sub-assemblies such as auxiliary engine, self starter, dyna-mo fuel pump assemble etc. should not normally be provided in the repair estimates. However, if the same are needed to be replaced due to premature failure or being uneconomical to repair, in that case full justification should be furnished based on the records.
7. In case some assembly/sub-assembly is missing or lost, State Government should fix responsibility for the loss and take further necessary action.
8. If batteries, tyres etc. are needed for replacement justification based on records indicating their earlier performance should be indicated.
9. All spare parts procured out of Central Funds or an order against earlier sanction of this Ministry for all the central machines supplied to the State should be taken into account before making provision for additional requirement of spare parts in the estimate.
10. Normally all the repair jobs should be got attended to in the Department itself. However, if due to unavoidable circumstance the jobs like fuel pumps calibration, crank shaft grinding etc. have got to be done from outside agencies, prior approval of competent authority should be obtained. In such cases also, the spare parts should be supplied by the Department, as far as available with them.
11. All old and replaced parts should be positively accounted for by taking in appropriate books/records. All efforts should be made to retrieve as many old parts as could be reconditioned for re-use during subsequent repairs in the same or similar machine. The amount realised by way of auctioning the old parts etc. that could not be re-used may be credited to this Ministry. The Ministry should be informed while formulating proposals for such auctions.
12. Purchase of all proprietary items should be done at D.G.S. & D rate contracts rates where they exist and other items at competitive rates, following the relevant purchase procedures provided under State rules.
13. The basis for adopting the rates detailed in the estimate should be indicated so that the rates can be checked for reasonableness. If any schedule of rates exist, reference should be made to them.
14. Repair Reserve Fund available and the head under which credited should be invariably indicated so that only technical sanctions will be necessary in most of the cases, cost of repairs being met out of the balance Repair Reserve Fund available. Where no such reserve credit is reported available and if on consideration of urgency of requirement of repairs Ministry considers sanction of such estimates, in that case the adjustment of credit for component of "Operational Charges" of usage charges of machinery shall subsequently thereafter be afforded as a credit to the Central Government account.
15. It should be indicated as to how the repair expenses of the equipment have been met with, so far, prior to this estimate, in case where no repair estimate was sanctioned earlier.
16. The labour sanctioned for the maintenance of idle/surplus declared equipment, if any, maintenance estimate have been sanctioned out of Central Funds, will also be counted for utilisation to the extent available for special repairs work also. This point shall be taken into account while providing labour for repairs in the repair estimate.

APPENDIX I

ABSTRACT TO ACCOMPANY THE REPAIR ESTIMATE

(a) Cost of spares is detailed in (Proforma I)	Rs _____
(b) Cost of Miscellaneous items such as cotton waste, split bins, P.O.L. and other consumable materials	Rs _____
(c) Cost of Labour	
(i) Foreman/Chargeman Hrs. @ Rs per hour	

- (ii) Mechanic Hrs. @ Rs per hour
 (iii) Helper Hrs. @ Rs per hour
 (iv) Deptl. Agency charges (with details)
 (v) Outside Workshop expenses if any

Rs _____

Total : Rs _____

PROFORMA I**ESTIMATE FOR REPAIR OF (ONE CATEGORY OF MACHINE I.E. RUSSIAN MOTORISED SCRAPERS ETC).**

in _____ Division, P.W.D. _____

Sl. No.	Name of Parts	Part No.	Qty. fitted per Machine	Quantity required for each Machine in case estimate (provides for repair of) more than one machine			Availability			Balance Qty. required	Rate in Rs	Amount	Remarks	
				Moto-rised Scra-per No. 1.	Moto-rised & so on Scra per No. 2	Total	In Site/numer-ical account	On order against earlier sanction of Mi-nistry	Total					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ENGINE GROUP														
1.	Sleeve & Piston set	2041-1000112	6	6	Nil	6	12	6	Nil	6	—	1000	12000	

PROFORMA II**PROFORMA FOR SUBMISSION OF ESSENTIAL INFORMATION ALONG WITH REPAIR ESTIMATE**

State _____

Division _____

Sl. No.	Type of Machine	Machine Sl. No.	Engine No. Chassis No.	Date of Receipt (originally by transfer) of Machine in the State	Total No. Hrs Worked upto date	Date of last Major over haul	Details of last Major overhaul
1	2	3	4	5	6	7	8

PROFORMA III**PROFORMA FOR SUBMISSION ALONGWITH MAINTENANCE ESTIMATE FOR WORKING OUT /POL/ CONSUMPTION ONE HOUR IDLE RUNNING PER FORTNIGHT**

Sl. No.	Category of Machine	Qtr.	Type of Engine fitted & H.P.	Average consumption of H.S.D. oil in litres/ hour/machine	Total H.S.D. oil consumption litres	Crank case capacity for Engine oil per litre	Average consumption of Engine oil for topping up in litres/Hour/ machine
1	2	3	4	5	6	7	8
1.	Aircompressors			6	6	16	0.030
2.	Motorised Scrapers & so on						

Abstract					Total Rate Cost	Litres	Total Rate Cost	
Ref. to Estimate sanctioned by Ministry pertaining to column 456	No of Hrs worked after last overhaul	Present condition of machine	Repair Reserve		Value of present estimate	Brief details of repairs to be carried out	Reference of future utilisation programme already communicated to this Min- (if not already) sent, to be enclosed now)	Remarks
			Total earned upto date	Balance available and head to which credited				
9	10	11	12	13	14	15	16	17

PROFORMA IV

PROFORMA FOR SUBMISSION ALONGWITH MAINTENANCE ESTIMATE FOR IDLE/SURPLUS MACHINES

STATE
DIVISION

Sl. No.	Category of Machine	Total as available in the State	No. actually required as per utilisation programme already communicated to this Ministry justifying their retention	Reference of utilisation programme sent to Ministry (if not already sent to be enclosed now)	Qty. surplus to State requirement	Reference of intimating surplus to Ministry
1	2	3	4	5	6	7

1. Motorised Scrapers
2. Motor grader & so on

Total Consumption of Engine oil in litres/ litre/hour	Other consumables	Qty. per Machine	Total Qty.	Remarks
8	9	10	11	12

Litres

PROFORMA V

PROFORMA FOR MONTHLY PROGRESS REPORT IN RESPECT OF REPAIR OF CENTRAL MACHINERY SANCTIONED OUT OF CENTRAL FUND

STATE _____

Sl. No.	Job No.	Sanctioned Amount of Estimate				Type of Machine	Sl. No. of Machine	Brief details of repairs done
		Spares	Other Materials	Labour	Total			
1	2	3	4	5	6	7	8	9

Staff required with average salary for one set of Machine								Remarks
Mechanic		Operator		Helper		Other		
No.	Amount	No.	Amount	No.	Amount	No.	Other	
10	11	12	13	14	15	16	17	18

PROFORMA VI

**PROFORMA FOR MONTHLY PROGRESS REPORT IN RESPECT OF IDLE MAINTENANCE OF CENTRAL MACHINERY
SANCTIONED OUT OF CENTRAL FUNDS FOR SUBMISSION TO REGIONAL SUPERINTENDING ENGINEER,
MINISTRY OF SHIPPING AND TRANSPORT (ROADS WING)**

STATE _____ DIVISION _____ MONTH OF REPORT _____

Sl. No.	Job No.	Name of Machine	Sl. No. of machine	Details of Maintenance Action			Expenditure during the month	Cumulative Expenditure
				Engine Starting date	Date of oil change crank case/GB/Differential	Other items attended to with date		
1	2	3	4	5	6	7	8	9

Expenditure on spare parts	Expenditure on other material	Expenditure on Labours		Total expenditure in the period	Cumulative total	Likely date of cumulation of work	Bottle-necks if any	Remarks
		Depot	Outside Agency					
10	11	12	13	14	15	16	17	18

2300.2.

No. RM-1 (10)/76

Dated the 17th June, 1976

To

All The Chief Engineers/Additional Chief Engineers of State Public Works Departments dealing with National Highways

Subject : Creation of new sub-head for the maintenance and repairs of Central Road Construction machinery

I am to invite your attention to last sub-para of item (6) of the draft minutes of the Chief Engineers meeting held at Hyderabad on the 6th January 1976 forwarded vide this Ministry's letter No. PL-2 (13)/75 dated the 3rd March 1976 and to say that the following new sub-head has been opened for meeting the expenditure on the maintenance and repairs of Central Road Construction Machinery.

A. Roads & Bridges. A. 2-National Highways

A. 2 (1)-Maintenance. A. 2 (1) (3)-Machinery Subordinate to the Major Head "337"

2. As per the earlier instructions issued, the operational component of Hire charges is to be credited to 'Repair Reserve Fund' so that the expenditure incurred for repair and maintenance of Central machinery is met out of this fund. It is learnt that some of the States could not adopt this procedure due to various reasons. The matter was examined by Road Building Machinery Committee and on the basis of its recommendation, it has been decided in consultation with the Ministry of Finance (i) that the operation of such system of 'Repair Reserve Fund' may be dispensed with immediate effect (ii) The operational charges component of (Hire Charges of machinery) may be treated as revenue receipt (iii) The Credits accrued in this connection may be given to the Head "059-Public Works Hire Charges of Machinery and Equipment" adjustable by the Accountant General, Commerce, Works and Miscellaneous New Delhi. (iv) The past credits, if kept in 'suspense or deposit account' may also be credited to this head of account. (v) Action may also be taken for transferring the credits to Central head now indicated, in case they were credited to State Revenue etc. (vi) The detailed account of Operational Charges earned by each machine from the time of its

receipt, may be sent to Ministry.

It is requested that suitable instructions may please be given to all concerned.

3. The estimates for the repairs of all Central machinery and maintenance of surplus/idle machines may however be continued to be prepared and submitted to the Ministry in the beginning of each financial year as per the existing instructions issued vide Ministry's letter number RM. 1 (4) 70 dated 21st July 1972. These estimates will be examined in the Ministry and funds for the sanctioned amount will be allotted under the new sub head indicated in para 1 above, for being spent within the same financial year.

4. The State Public Works Department's are, therefore, requested to intimate the details of the repairs/maintenance estimates already submitted to the Ministry/Ministry Regional offices, and also likely to be submitted during the financial year 1976-77, to enable the Ministry to assess the requirement of funds for the repair and maintenance of central machinery for your State. In case no information is received by the 30th June, 1976, it will be presumed that no funds are required by the State for the repairs/maintenance of Central machines during 1976-77.

5. It is also requested that States may ensure to submit all the repairs/maintenance estimates in respect of central machinery for the year 1976-77 positively by 31st July, 1976 so that these could be examined, sanctioned, funds allotted and utilised before the end of financial year i.e. 1976-77.

2300.3.

No. RM-23 (33)/75

Dated the 5th June, 1980

To

The Chief Engineers/Addl. Chief Engineers of State P.W.Ds. dealing with National Highways

Subject : Technical Committee for assessing the need of repairs and maintenance of Central Machinery

Powers were delegated vide Ministry's letter No. RM-25 (33)/75 dated 3-11-76 to Ministry's Regional SE (M)s for according technical approval to the repair/maintenance estimates of central machinery received from State Govts. concerned. But it is found that the estimates are not sent in the beginning of the financial year, and the provisions made therein are not found justified on the basis of data, such as working hours, repairs to be carried out etc., furnished by the States along with estimates. Due to these reasons, the sanctioning of the estimates could not, therefore, be expedited in many cases, inspite of delegating the powers referred to above.

It needs no emphasis that correct documentation and technical checks by the State P.W.Ds. are essential, for framing the repair estimates which would be of great help in sanctioning the estimate expeditiously by the Ministry/Ministry's Regional Officers. As such, due care for the maintenance of records, and documentation may be taken.

2. In this connection, it was suggested in Item 4 (v) of the Memorandum for the State Chief Engineers' Meeting held on 23rd Jan. '79 at Bangalore that the State P.W.Ds. may consider setting up a Technical Committee of State officers to go into this matter and certify the need for repairs of each equipment needing repairs before forwarding the repair estimates to the Regional Officers of the Ministry. Such a Technical Committee would obviously go into the records maintained by State PWD regarding utilisation, previous repairs attended to etc. None of the State Chief Engineer had indicated any difficulty to set up such a technical committee in the meeting held at Bangalore.

It is hoped that all the State P.W.Ds. must have formed the same as now. The major repairs for the equipment can be visualised, and properly assessed before preparing the repair estimates, support it with justifying data and the same can be submitted to the Ministry's Regional Mechanical Officer in the beginning of each financial year so that it can be sanctioned at the earliest. This would result in better availability of Central Machinery for execution of central works, resulting in better utilisation of central machines. It is, therefore, requested that the action taken by the State PWD, in the matter may kindly be intimated at a very early date. In case, such a Committee has not been formed so far, appropriate necessary action in the matter may kindly be taken immediately under intimation to the Ministry, and Ministry's Regional Mechanical Officer.

2300.4.

No. RW/RMP-8 (5)/83

Dated the 23rd December, 1983

To

All the Secretaries P.W.D. (dealing with Roads) in the States of A.P./Assam/Bihar/Gujarat/Haryana/M.P./J&K/Kerala/Karnataka/H.P./Maharashtra/Manipur/Meghalaya/Orissa/Punjab/Rajasthan/Tamil Nadu/Uttar Pradesh/West Bengal

Subject : Adhoc allotment of funds under M & R Grants of machinery for repairs in the beginning of financial year

This Ministry have been releasing funds under M & R Grant of machinery for repairs/maintenance of Central machinery against sanctioned estimates. There is a time lag between submission of estimates, their sanction and release of funds. Difficulties have been expressed by various State PWDs regarding repairs of central machinery due to non-availability of funds in the beginning of the financial year. This delay is reported to be adversely affecting the utilisation of central machines and also the progress in the execution of NHs works. To utilise the slack season available for repairs of machinery, it has been suggested by various States to release some funds for repairs of machines on adhoc basis to the States in the beginning of the financial year.

The matter has been considered in this Ministry, and it has been decided that some funds must be made available to the State PWDs in the beginning of the financial year for repairs of central machinery on adhoc basis. This adhoc release will be limited to 30% of the total amount released during the last financial year, and will be subject to adjustment on lumpsum basis during the normal release of funds made by this Ministry against regular sanctioned estimates in the II Quarter of that financial year.

In view of the above, you are requested to send your requirement of funds for release on adhoc basis during the next financial year onwards, which should be received in this Ministry by 15th April every year positively, restricted to 30% of total release made by the Ministry during the last financial year under M & R Grants of machinery. On receipt of this request, necessary funds will be placed at the disposal of States for arranging repairs of Central machinery in the beginning of May every year.

2300.5.

No. RM-25 (1)/83

Dated the 26th December, 1983

To

All the State Chief Engineers dealing with National Highways

Subject : Progress Report in respect of repairs/expenditure of Central machine against sanctioned estimate

Kindly refer to this Ministry's letter No. RM-1 (4)/70 dated 21-7-72 vide which procedure and guidelines for preparation of submission of repair estimates of Central machines was prescribed. This *inter alia* included submission of monthly progress report on repairs/expenditure against the sanctioned estimates. Subsequently, as a result of discussion in the group meeting of State Chief Engineers held in the Ministry at New Delhi on 11th and 12th November, 1975, it was decided that such progress reports may be submitted quarterly instead of monthly. Accordingly, the States were intimated vide letter No. RM-21 (5)/75 dated 28.11.1975.

2. It is regretted that progress reports, on the repairs, and expenditure, against the sanctioned estimates are not being received from most of the States. The State PWDs are aware that this Ministry and its Regional SEs (M) have been sanctioning a number of repairs and maintenance estimates for Central machines in recent years. It will be appreciated that unless such progress reports are submitted by the State PWDs regularly and in time, the Ministry and its Regional SEs (M) will not be aware of the progress of the repair works, and utilisation of funds allotted against the sanctioned jobs. It is thus obligatory on the part of the State P.W.Ds. to submit progress reports on repairs and expenditure in prescribed proforma, regularly and it is needless to over emphasise the importance of such periodical reports.

3. On a further review of the matter in the Ministry it has now been decided that the aforesaid progress reports may be sent half yearly instead of quarterly. The proforma for submission of these reports has also been simplified and the revised proforma is attached herewith.

You are, therefore, requested to kindly ensure the submission of the half yearly progress reports by 31st October and 30th April for the half yearly period April to September and October to March respectively. The demands for release of funds under M & R Grant of Central machines against sanctioned estimate

2300/8

will be considered in the light of half yearly progress report. It is, therefore, requested that these instructions may also kindly brought to the notice of all concerned P.W.D. Officers.

**PROFORMA FOR HALF YEARLY PROGRESS REPORT OF REPAIRS AND EXPENDITURE ON CENTRAL MACHINERY
AGAINST SANCTIONED ESTIMATES**

Half yearly report for the month ending _____								
Sl. No.	Name of the work	R.A/JOB No.	Amount sanctioned	Total expenditure incurred	Progress/% of work completed	Month of completion if completed	Reasons for slow progress	Remarks
1	2	3	4	5	6	7	8	9

2400 INVENTORY OF CENTRAL MACHINERY

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2400.1.	LRM-1 (2)/66 dt. 27.4.66	Basic Records of Construction Equipment in Lateral Road Project	2400/1
2400.2.	RM-15 (6)/68 dt. 16.8.71	Transfer of Machinery from one State to another Details required to be Furnished in each State	2400/5
2400.3.	RM-21 (2)/69 dt. 22.3.72	Distinctive Numbering of the Machinery belonging to the Central Government	2400/7
2400.4.	RM-21 (5)/75 dt. 28.11.75	Draft minutes of the Group of CEs meeting held at New Delhi on 11th & 12th November, 1975	2400/7
2400.5.	RM-15 (1)/76 dt. 2.4.76	Annual Physical verification of Central Machinery	2400/22
2400.6.	RM-21 (6)/75 dt. 11.4.77	Plan Data Sheet for Maintaining Records of Central Machinery	2400/23
2400.7.	RM-30 (1)/83-Vol. II dt. 22.10.83	Reconciliation of Inventory of Machines belonging to the Ministry	2400/24

NO. LRM-1 (2)/66

Dated the 27th April, 1963

To

The Addl. Chief Engineer (Roads), PWD (B&R), Lucknow, U.P. The Addl. Chief Engineer (East), L.R.P., P.W.D. (B & R), Bihar, The Addl. Chief Engineer (West), L.R.P., P.W.D. (B & R), Bihar, The Addl. Chief Engineer, L.R.P., P.W.D., West Bengal, The Addl. Chief Engineer & Secretary, P.W.D. (R & B), Assam.

Subject : Basic records of construction equipment in Lateral Road Project

A substantial quantity of costly construction equipment is being procured for use in the Lateral Road Project. In any large scale operation of construction equipment it is essential to have a minimum number of basic equipment records. These records serve a variety of purposes, the more important of which are :

- (a) to lay down a well planned system of operation, maintenance, repairs and overhaul.
- (b) to provide a continuous record of the condition of equipment so that repairs can be planned in advance, and the capacity of equipment for future use can be estimated.
- (c) to reveal useful statistics on performance and unit rate for objective review and also for use in future estimations.

2. It is suggested that two basic documents viz. Driver's Log Book and History Book for each item of construction equipment may be maintained.

3. Five specimen copies of these two documents are enclosed herewith. Suitable dimensions have also been shown for the various columns in the specimen copies. To ensure uniformity these documents may be got printed to the same size according to dimensions given in the specimen in a book form with the card board/rexins cover.

4. Each equipment would have two Drivers' duty Log Books-One for even months with a green cover and the other for odd months with a yellow cover. When one of the two Log Books is submitted to Divisional Office for scrutiny at the end of the month, the other Log Book would be in use during the subsequent months. At the end of each month an abstract of operating hours and P.O.L. consumption would be prepared from the Log Book and posted in the History Book in the section "Monthly Data". Abstracts of output, consumption of stores, operating hours, idle hours, sickness hours etc. can then be made out for working out the unit rates.

5. Whenever equipment is transferred, it would be accompanied by the Driver's Duty Log Book and History Book duly completed. The officers handing over and taking over should sign in the section "Record of Transfer of Machine" in the History Book.

6. In view of the importance of having a permanent record of basic statistics, History Books should be kept in duplicate. The original History Book would remain in the custody of the Division maintaining and operating the equipment and the duplicate copy in the Chief Engineer's Office. It is suggested that every 3 months an Officer from Chief Engineer's Office may go round the work sites and get the duplicate copy brought up-to-date. Alternatively the History Books could be called from the Field Divisions for posting the duplicate copies in the Chief Engineer's office.

7. It is requested that necessary action may please be intimated to introduce these documents on the lines as above at the very earliest.

**GOVERNMENT OF INDIA
MINISTRY OF TRANSPORT & AVIATION
DEPARTMENT OF TRANSPORT SHIPPING & TOURISM
(ROADS WING)**

**LATERAL ROAD
PROJECT**

HISTORY SHEET

NOMENCLATURE OF MACHINERY/EQUIPMENTS :

PLANT NO. :

INDEX

<i>Sl. No.</i>	<i>Details</i>	<i>Pages</i>
1.	Component Main Assemblies	1
2.	Particulars of Equipment	2 - 3
3.	Record of Tyres	4 - 10
4.	Alterations, Additions & Modifications	11 - 13
5.	Record of Repair and Replacement	14 - 53
6.	Monthly Data	54 - 55
7.	Record of Wire Ropes & Wire Rope Changes	56 - 63
8.	Battery Change Record	64 - 68
9.	Record of Transfer of Machine	69 - 70
10.	Notes	71 - 75

COMPONENT MAIN ASSEMBLIES

(Where different manufacturer's assemblies are mentioned, full details with manufacturer's number should be furnished)

Name of Assembly	Make	Model	Voltage	Sl. No.	Any other information
1. Fuel Injection Equipment					
2. Generator					
3. Starter Motor					
4. Torque Converter					
5. Hydraulic System					
6. Air Compressor					
7. Turbo-Charter					
8. Any other information :					

PARTICULAR OF EQUIPMENT

- Brief description of machine :
- Dimensions :
Overall length :
Overall width :
Weight of equipment :
Transportation weight :
- Project Identification No :
- Date of receipt/purchase :
- Supply Order No. :
- Name of supplier and bill details :

7. Total cost at site : _____
8. Name of manufacturer : _____
9. Manufacturer's make _____ Model _____ Sr. No. _____
10. Capacity/Pay load/Draw Bar Pull : _____
Speedal range : I Gear _____ II Gear _____ III Gear _____ IV Gear _____ V Gear _____
Reverse _____
11. Engine details :
(i) Make : _____
(ii) Model : _____
(iii) Sr. No. : _____
(iv) Type : _____
(v) H.P. : _____
(vi) No. of Cyl. : _____
(vii) Bore & Stroke : _____
(viii) R.P.M. : _____
12. Aux. Engine Details :
(i) Make : _____
(ii) Model : _____
(iii) Sr. No. : _____
(iv) Type : _____
(v) H.P. : _____
(vi) No. of Cyl. : _____
(vii) Bore & Stroke : _____
(viii) R.P.M. : _____
- Tyre Sizes :
Front _____ No. Fitted _____ Inflation Pr. _____
Rear _____ No. fitted _____ Inflation Pr. _____
- Battery :
Size _____ No. of Plates _____ Voltage _____
Capacity _____

List of tools received with equipment :

4 to 10

RECORD OF TYRES

Tyres Front

Size _____ Ply _____ No. fitted _____

Tyres Rear

Tyre changes

Date	Tyre size	Sr. No. & Make	Changed/repai red to SR No. & Make	Reason	Signature

11-13

ALTERATIONS, ADDITIONS & MODIFICATIONS

Date	Details of work carried out	Cost	Resasons for alterations	Authority & Signature

14-

RECORD OF REPAIR

Date	Details of breakdown	Hours/Mile Run	Approx. Oil Consumption	Date of Completion of repair

AND REPLACEMENT

Nature of repairs carried out	Parts replaced with Part No./Issue Voucher No. (valued more than Rs. 50/- only)	Remarks	Signautre

2400/4

54-55

MONTHLY DATA

Month	No. of Hours/ mile worked	Progressive total hours	P.O.L. Consumption				Signature
			Diesel Oil	Petrol	Engine Oil	Other lubricants	

56-63

RECORD OF WIRE ROPE

Description	Specification	Length fitted
HOIST		
Derrick/Suspension		
Back haul & digging		
Tripping		

WIRE ROPE CHANGES

Date	Description	Approx. hrs./miles worked after last change	Probable cause of breakdown	Signature

64-68

BATTERY CHANGES RECORD

Date	Work done (Replacement/ Repair/Charging)	Hours worked	Reasons for Replacement/ Repair/Charging	Signatures

69-70

RECORD OF TRANSFER OF MACHINE

Date of transfer	From	To	Hours used	Present cost	Remarks	Sig. of Officer	
						Handing over	Taking over

71-75

NOTES

LATERAL ROAD PROJECT

STATE

DRIVER'S DUTY LOG BOOK

Nomenclature of Machine _____

Plant No. _____

INDEX

Sl No.	Details	Pages
1.	Particulars of equipment	1-2
2.	Driver's duty log sheet	3-103
3.	Notes	104-109.

PARTICULARS OF EQUIPMENT

1. Brief description of Machine :
2. Dimensions :
Overall length :
Overall width :
Weight of equipment :
Transportation weight :
3. Project identification No. :
4. Name of manufacturer :
5. Manufacturer's Make _____ Model _____ Sr. No. _____
6. TYRE SIZES :
Front _____ No. fitted _____ Inflation PR _____
Rear _____ No. fitted _____ Inflation PR _____
7. Battery size, No. of plates & Voltage Capacity :
8. List of tools received with equipment :

3-103

DRIVER'S DUTY

Date	Shift	Driver's name	P.O.L. used				Other materials
			Petrol	Diesel	Engine oil	Other lubricants	

103

LOG SHEET

Signature of issuer	Hour meter/Milometer Reading		Details of work done	Signature with designation of the officer of using Deptt.	Remarks
	From	To			

104-109

NOTES

2400.2.

No. RM-15 (6)/68

Dated the 16th August, 1971

To

The Secretary to the Govt. of Andhra Pradesh/Assam/Bihar/Gujarat/Haryana/Himachal Pradesh/Jammu and Kashmir/Kerala/Manipur/Madhya Pradesh/Maharashtra/Mysore/Nagaland/Rajasthan/Punjab/Orrissa/Tamil Nadu/Uttar Pradesh/West Bengal

Subject : Transfer of machinery from one State to another Details required to be furnished in each case

I am directed to state that several orders have been issued from this Ministry for transfer of various items of Central equipments from one State to the other, required in connection with the execution of National Highways and other Centrally-Sponsored Schemes works. Some items of equipments were also asked to be released on sale basis. As a rule, it was expected that a complete history would accompany each machine at the time of its transfer. Therefore, detailed specific instructions in this regard were not issued alongwith the transfer orders. But it has been observed that the State Public Works Depts. are not following this practice. Great difficulty has, therefore, been experienced in collecting necessary details of the equipments transferred from one State to the other. It has now been decided that standardised proformae should be sent to all concerned, for furnishing the required details. Accordingly, I am to forward herewith two standardised proformae, with the request that necessary details may please be furnished urgently in respect of (i) all machines transferred from other States/Projects to your State and (ii) all machines transferred from your State to other States/Projects for record in this Ministry. The statements may kindly be sent in triplicate.

2. As this is most urgent, I am to request that a copy of the instructions issued in this respect may kindly be endorsed to this Ministry.

PROFORMA I

Position as on (Date

State Division

REPORT OF RECEIPT OF MACHINES TRANSFERRED FROM OTHER STATES/PROJECTS

Sl. No.	Name of Machine & Project identification number	State from which transferred	Date of taking over the machine in that State	Date of despatch with (name of the Rly. Station)	Date of arrival at the Rly. Stn. (Name of the Rly. Station)	Date of transporting it to the site (name the site)
1	2	3	4	5	6	7
Period of assembly with dates	Date of commissioning of the Plant	What are the bottlenecks if not commissioned	Expenditure involved in reaching the site of work and total cost at site		Location of the Plant	Remarks
8	9	10	11		12	13

PROFORMA II

Government of India
Ministry of Shipping & Transport
(Roads Wing)

Position as on (Date

PROFORMA FOR THE TRANSFER OF MACHINERY BELONGING TO THE GOVERNMENT OF INDIA, MINISTRY OF SHIPPING & TRANSPORT (ROADS WING), NEW DELHI

1. Name of Equipment :
2. State in which it is located :
3. (i) State to which transferred :
(ii) Date of transfer :
4. Brief description of the machine :
5. Make
6. Main Engine Make
Sl. No.
7. Auxiliary Engine Make
Sl. No.
8. Registration No. (if any) :
9. Chassis No. and/or Serial No. :
10. Major attachments transferred 1.
2.
3.
(Mention if any major component is missing or not transferred)
11. Presnet cost
12. Condition of the plant :
 - (a) External :
 - (b) Internal : Say whether the plant was run at the time of transfer
 - (c) Number of hours run by the plant upto the time of transfer, hour meter/Milemeter reading
13. Major Repairs Carried out :
 - (a) When were the last major repairs carried out
 - (b) No. of hours worked after the above
 - (c) What is the balance in the Repair Fund ?
14. Tools transferred along with the Plant (a list may be attached) to include the tools supplied for the plant, and purchased for the plant subsequently from Central funds.
15. Whether any spare parts are transferred along with the plant (a list may be attached) include all spares purchased out of Central funds for that machine.
16. Literature transferred with the Plant
 - (a) Spare parts Catalogue
 - (b) Operational Manual
 - (c) Repair Manual
 - (d) Abstract of History Sheet

17. Any other remarks :

Signature of Rep.
of Transferer State

Signature of Rep.
of Transferee State

2400.3

No. RM-21 (2)/68

Dated the 22nd March, 1972

To

All the State Chief Engineers (Departments dealing with Roads) Bihar, Maharashtra, Orissa, West Bengal, Rajasthan, Himachal Pradesh, Madhya Pradesh, Assam, Uttar Pradesh, Punjab, Tamil Nadu and Gujarat

Subject : Distinctive numbering of the machinery and equipments belonging to the Central Govt.

I am directed to refer to this Ministry's letter No. RM-21 (2)/69 dated the 1st February, 1969, wherein instructions were issued for painting the name of this Ministry on the Road/Bridge construction machinery belonging to the Central Government [Ministry of Shipping and Transport (Roads Wing)] and for giving a distinguishing number on each of these machines, so that this machinery can be readily distinguished from the other machinery owned by the State Government. Certain suggestions were received in response to that letter. It has now been decided that :

- (i) The distinguishing number should consist of the code number (as given in the attached statement) followed by the numerical or serial number of the machine according to the total number of machines of that type in that State. For example, if Orissa has three cranes (Mobile), each of 5 tons capacity, the distinctive numbers of these three cranes will be C-21, C-22 & C-23.
- (ii) A record of the distinguishing number is to be kept by the State P.W.D. in a register in which the details of the machine, e.g. its make model, capacity, engine number, and chassis number year of purchase/receipt etc. are also to be given against the distinguishing number. One copy of this record is to be supplied to this Ministry and another to this Ministry's Regional Superintending Engineer (Mech.) concerned.
- (iii) When a machine is transferred to another State, under instructions from this Ministry, necessary entry of the transfer will be recorded in that register and the complete details of that machine will be communicated to the Ministry and transferee State. The transferee State will add in its register a record of the distinguishing number already given on that machine by the transferer State which number shall continue to be retained.

The name of this Ministry should be painted on each machine in English and Hindi in the following manner :

GOVERNMENT OF INDIA
MINISTRY OF SHIPPING AND TRANSPORT
(ROADS WING)

- (v) The size of each letter denoting the name of Ministry should be two inches/one inch and the size of each letter and figure of code number should be one inch/half inch only for heavy machines/minor equipments respectively. The State P.W.D. may paint all the central machinery in Dark yellow colour and print the letters and the figures with black paint. The paint should, however, be enamel of the best quality and as soon as the writing gets defaced with the passage of time the same should be re-written.

2. I am to request that necessary action as indicated above may kindly be taken immediately and a list of the Central Government's road/bridge building machinery, indicating therein the distinguishing number painted on each machine, may kindly be sent to this Ministry as early as possible.

2400.4.

No. RM-21 (5)/75

Dated the 28th November, 1975

To

The Chief Engineer, Public Works Department (R & B), Assam, The Addl. Chief Engineer, P.W.D. (NH) Bihar, The Addl. Chief Engineer (Roads), P.W.D. (B & R), Haryana, The Chief Engineer, P.W.D. (Roads), The Chief Engineer, National Highway, Tamil Nadu, The Chief Engineer, P.W.D. Uttar Pradesh, The Chief Engineer, P.W.D. Directorate (Roads), West Bengal

Subject : Draft minutes of the group of State Chief Engineers meeting held at New Delhi on 11th and 12th November, 1975 to consider some aspects of the Central Machinery

Two copies of the draft summary record of the group of State Chief Engineers meeting, concerning Central Road Making machinery, held at New Delhi on the above mentioned dates are enclosed herewith. Corrections/modifications, if any, in the draft may kindly be intimated, so as to reach this Ministry by 20th

December, 1975, positively. If no reply is received by the said date, it will be assumed that you have accepted the draft.

2. In this connection I am to request that such further action as may be necessary on the recommendations of the meeting may please be initiated, pending acceptance of the minutes.

DRAFT MINUTES OF THE MEETING OF GROUP OF STATE CHIEF ENGINEERS HELD ON 11TH NOVEMBER, 1975, AND 12TH NOVEMBER, 1975 FOR CONSIDERATION OF SOME ASPECTS OF CENTRAL MACHINERY

The following persons were present in the meeting :

As per Annexure I

A group of 7 State Chief Engineers had been set up during the meeting of the State Chief Engineers held on 29th June, 1975 to consider various points regarding training programmes for mechanical staff, pay scales of mechanical personnel, incentive schemes, modification of proforma prescribed by the Ministry for submission of reports, etc. Director General (Road Development) in his opening remarks stressed the importance of various points, to be discussed, on which further action can be taken as suggested by the Group of State Chief Engineers.

ITEM NO. 1 CONSIDERATION OF VARIOUS PROFORMAE PRESCRIBED BY THE MINISTRY FOR SUBMISSION OF REPORTS REGARDING CENTRAL ROAD MAKING MACHINERY

The Group of Chief Engineers considered the different proformae prescribed by the Ministry in detail. On the basis of the Group discussions, various modifications were suggested in them. A set of the modified Proformae finalised on the basis of the discussions is attached below.

(a) Code Numbers for machinery :

It was explained that Code Nos. for different machinery were already allotted by the Ministry to different States and are to be painted on the machines, as information regarding these machines will be kept in the Ministry and in the Regional Offices of the Ministry in index cards. This system is expected to be more convenient for keeping information as well as locating the same quickly. The index cards in which such information is to be kept is being finalised in the Ministry. After finalisation, the card will be sent to the State Governments so that they may adopt the same and keep the information in the same fashion as will be kept in the Ministry.

The required information for filling in the index cards in the Ministry is to be sent by the State P.W.Ds. to the Ministry as early as possible so that the master index cards can be compiled very soon in the Ministry. For this purpose, a proforma "plant data sheet" was finalised by the group.

(b) Basic records of construction equipment

Detailed discussion was held on the various columns to be filled in, in the history sheets and the log books for Central equipment to be maintained by the State P.W.Ds. It was decided that at the time of transfer of a machine from one State to another, it will be sufficient to transfer the history sheet. It will not be necessary to transfer the log book alongwith the equipment, as the log book will be required to be kept in the State for meeting audit requirements etc.

In the history sheet, information is to be kept regarding the monthly performance of the machines, from the information collected from the log books. One of the columns is with regard to progressive total hours of working of the machine. Chief Engineer of Rajasthan mentioned that for machines received on transfer in one State from another State, previous running hours are not available. It was decided in such an event, information should be filled in, from the date of receipt of the machines in the State or from any other date from which data have been maintained. It was pointed out by DG (RD) that efforts to collect the missing information should however be continued and the information incorporated later on.

Regarding log books the, Chief Engineer, Tamil Nadu explained that in his State the Daily log sheets are maintained in triplicate for each machine. The original and a copy of the daily log sheet are detached from a bound book and sent to the Sub-Division and Divisional Office for account purposes and record. He also mentioned that the primary responsibility for filling in the entries of the log sheet as well as for the safe custody of the bound log book, which will contain the 3rd copy of the daily reports, rests with the operator/driver of each machine. The machine numbered copies received in the Sub-Divisional office and the Divisional Office are kept bunched together for permanent record. In this system there is no need for maintenance of separate log books for alternate months.

The advantages and disadvantages of the above system with the system prescribed by the Ministry i.e. of keeping separate log books for alternate months were discussed in detail. It was suggested that the States may adopt either of the systems they consider suitable to their requirements.

- (c) While considering utilisation programme and the norms fixed by the Ministry for working the same, the Chief Engineer, Tamil Nadu pointed out that whereas the Ministry have indicated in the norms that one paver is to be used with 3 hot mix plants, the experience in Tamil Nadu would indicate that one Marshalls paver PF-45 cannot cope up with the production of 3 Marshalls hot mix plants of 20-30 TPH. It was decided that a complete report on the performance of the pavers for coping with the production of Marshalls hot mix plants would be sent to the Ministry by the Chief Engineer, Tamil Nadu for further consideration. It was decided that after this report is received and considered, if necessary, field trials may be conducted by associating the Ministry's representative.
- (d) Proforma for disposal of machines beyond economical repairs was considered at great length. Some of the Chief Engineers suggested that as there is already a standard form accepted by the Audit authorities for this purpose, the same may be adopted. It was decided that the information for write off may be furnished in the proforma prescribed by the Ministry as suitably modified, and also in the proforma approved by the audit. Ministry will then be able to appreciate the reasons for write off and take action accordingly.
- (e) The proformae for submission of repair estimates to the Ministry for sanction were considered. It was decided that estimate will be submitted for each machine individually. In proforma II there is a column for furnishing information of total number of hours worked out upto date for each machine. As some Chief Engineers indicated that there may be difficulties in filling this column in respect of machines received on transfer from other States, it was decided that informa-

tion should be given from the date of receipt of machines in the State if possible or from the date from which the records have been maintained in the State. it was impressed upon by DG (RD) that efforts to collect all previous information should be continued to be made and this information filled in as and when available.

- (f) Some of the State Chief Engineers mentioned that there would be difficulty and delay, if estimates for minor repairs to machine are to be forwarded to the Ministry or for small maintenance works of surplus machines. They suggested that there must be delegation of powers to the State Chief Engineers to sanction repair/maintenance estimates upto a certain percentage of the annual expected repairs/maintenance cost. It was explained to them that the proposal will be considered by the Ministry and action taken so that the powers for sanction of estimates can be apportioned in suitable proportion amongst Ministry's Headquarter, Regional offices of the Ministry and State Chief Engineers.
- (g) It was decided that Proforma V & VI for reporting progress in respect of repair of Central machinery against sanctioned estimates and maintenance of idle machinery against sanctioned estimates are to be sent quarterly instead of monthly.

ITEM NO. 2 TRAINING PROGRAMMES FOR MECHANICAL STAFF FOR USING FACILITIES AVAILABLE WITH I.T.Is

The need for imparting training to the mechanical staff in the proper operation, maintenance, and repair of machines was accepted by the Group. It was also felt that necessary training to supervisory personnel in the management of machines should be given. As the I.T.Is set up in the various States are not fully occupied and may have some spare facilities available these may be used by the P.W.Ds., for imparting training to their mechanical personnel. It was decided that the States would consult the Directors/ Assistant Directors of Training, Incharge of the I.T.Is, and work out suitable proposals so that by using the facilities available in the I.T.Is and supplementing them by providing machines, personnel, sandwiching integrating with on road job field training on actual operation etc, a suitable training programme can be worked out. It was felt that a period of 3-6 months may be required for one such training course. The course will consist of lectures on theoretical aspects of using machines, display of cutaway models, or models of actual machines which may not be or may be in working condition and can end with field training on actual jobs. Wherever higher facilities are available, as in the case of Nangal Project at Irrigation projects, with B.R.D.B. workshops, at manufacturers plants, such higher facilities may also be used. The staff to be trained should already be in the employment of the P.W.Ds. and should not be taken or recruited specifically for the training purpose. The training programmes may be organised by the States individually. Any State which is not able to organise the training programme due to lack of facilities, may approach the neighbouring States where such facilities may be available for arranging training programmes for their staff.

Regarding the expenditure to be incurred in organising and running such a training programme it was mentioned that the per capita training cost for each trainee should be worked out, taking into account the fact that the training will be imparted both for operating, maintenance and repair etc of the State machines and Central machines. The proportionate per capita training cost for Central machines alone then can be provided from Central works estimate, as an national component of the crew wages for operating central machinery for such Central works, spread over a certain period and could then be debited to such works through usage charges debit. However, if any State approaches the Ministry for loan assistance to meet the expenses of training programmes for Central machines, such proposals would be considered by the Ministry in consultation with Ministry of Finance.

ITEM NO. 3 PAY SCALES OF MECHANICAL PERSONNEL HANDLING THE SOPHISTICATED MACHINERY

The Pay Scales for mechanical personnel as available in the various States were considered. It was felt that in order to attract qualified and experienced personnel, the following pay scales for each category may be considered for adoption :

	<i>All inclusive pay ranges</i>
Foreman Special	800-1200
Foreman Heavy Plant	700-1000
Foreman Other Plant	600-800
Assistant Foreman	500-700
Chargeman	450-650
Operator Heavy Plant	450-650
Mechanic Gr. I	400-600
Mechanic Gr. II	350-550
Operator Other Plant	350-550

The above pay ranges will include Pay and all other allowances. The State Governments may work out and consider suitable pay scales for different posts, so that the above pay ranges may be obtained.

ITEM NO. 4 INCENTIVE SCHEMES FOR MECHANICAL STAFF (OPERATING AND MAINTENANCE) CENTRAL MACHINERY

At present no incentive scheme is being followed in any of the State P.W.Ds for doing work by machines. The Chief Engineer, Tamil Nadu mentioned that they have worked out a scheme of giving incentives to the personnel working on the hot mix plants complex. He stated that the scheme provides for the payment of half per cent basic salary to each person employed on the hot mix plant complex, for every 10 tons of extra output, over a minimum targetted output for the complex. The assessment will be made every week but the payment will be made to the crew on monthly basis. It was agreed by the Group that an incentives scheme will go a long way, towards improving the performance of mechanical equipment, both in the field of operation as well as in the field of repair. It was decided that the incentive scheme available with big firms who are doing similar kind of work will also be examined in the Ministry, and a suitable scheme will be worked out in the Ministry and communicated to the States for their comments and finalisation.

ITEM NO. 5 PLANNING AND PROCUREMENT OF IMPORTED SPARE PARTS FOR CENTRL MACHINERY

DG (RD) mentioned that no proposals were coming to the Ministry for release of foreign exchange needed for import of spares. In case these cannot be procured by the States from the dealers or from the local markets, and the States wanted to import them, proposals will have to be sent to the Ministry for the release of foreign exchange and for sponsoring the case for issue of Actual Users Import Licence. The necessary formalities for the release of foreign exchange and for issue of Actual Users Import License will have to be completed by them in all respects. He also mentioned that all the machines belonging to the Ministry have to be re-paired and kept in order fit for operation. The estimates for the repair of machines required for use according to utilisation programme as

well as for surplus machines will be considered in the Ministry. The procedure for obtaining spare parts against stock has already been prescribed by the Ministry and intimated to States. In case of any difficulty regarding exceeding of stock limits, appropriate action will have to be taken by the State P.W.Ds.

ITEM NO. 6 INADEQUACY OF THE OPERATIONAL CHARGES COMPONENT OF HIRE CHARGES TO MEET THE COST OF REPAIRS

As per the procedure prescribed by the Ministry 150 per cent of ownership charges are to be recovered from works for keeping in reserve for utilising subsequently for the repair of machines. These charges are called operational charges. It has been pointed out by some State Govts., particularly U.P., that due to the increase over the last several years in the cost of spares and the cost of labour this percentage is inadequate to meet the cost of repairs and it has been exceeded in the case of several machines which have not yet completed their useful life. DG (RD) explained the background for fixing up the percentage of operational charges. He also mentioned that instead of changing the percentage from 150% to any other higher figure it would be more reasonable to adopt after consulting Ministry of Finance the present value of the equipment and apply the 150% for calculating the operational charges component. The ownership charges could however be calculated on the basis of the cost of acquisition. In any case this matter can be considered only when complete details of the History of the repairs of different machines from the time of receipt and commissioning of the machines giving the amount earned towards the operational charges, the actual expenditure incurred in repairs etc. are furnished. The States were requested to do so to enable further examination and Ministry of Finance being consulted.

The meeting ended with a vote of thanks to the Chair.

Annexure I

List of Officers who participated in the meeting of the Chief Engineers held in New Delhi on 11th and 12th Nov., 1975, in the room of Director General (Road Development)

Sl. No.	Name of State or Ministry	Name of Officer	Designation
1.	Ministry of Shipping and Transport	Shri J.S. Marya	Director General (Road Development) & Addl. Secretary
2.	—do—	Shri S.L. Kathuria	Addl. Director General (Roads)
3.	—do—	Shri P.K. Thakur	Chief Engineer (Mechanical)
4.	Assam	Shri H. Gohain	Chief Engineer
5.	Assam	Shri J.C. Deka	Superintending Engineer (Mech)
6.	Bihar	Shri H.N. Singh	Superintending Engineer (Mech)
7.	Haryana	Shri K.L. Kapoor	Addl. Chief Engineer
8.	Haryana	Shri S.K. Gupta	Executive Engineer (Mech)
9.	Rajasthan	Shri D.P. Jain	Chief Engineer
10.	Tamil Nadu	Shri E.C. Chandrasekharan	Chief Engineer
11.	Tamil Nadu	Shri J.R. Cornelius	Divisional Engineer (T&M)
12.	Uttar Pradesh	Shri Pratap Singh	Chief Engineer
13.	Uttar Pradesh	Shri Hanuman Prasad	S.E. (Mech)
14.	West Bengal	Shri P.K. Sen	S.E. (Mech)
15.	Ministry of Shipping and Transport	Shri G. Viswanathan	S.E. (Mech)
16.	—do—	Shri B. Natrajan	Under Secretary (RM)
17.	—do—	Shri P.H. Bhavnani	S.E. (Mech) — Patna
18.	—do—	Shri R. Ramaswamy	S.E. (Mech) — Calcutta
19.	—do—	Shri B.K. Mehn	E.E. (Mech) — Lucknow

REPORT FOR RECEIPT OF MACHINERY

Sl. No.	Name of equipment	Name of the supplier	DGS&D A/T No.	Location of the plant	Ministry's Code No.	Make/ Model	Chasis No./ Serial No.
1	2	3	4	5	6	7	8
Engine Sl. No.	Registration No. (if any)	Date of receipt at Consignee's rail head	Date of commissioning of the plant	Cost of the plant at site including A/T cost, transportation charges, assembly and erection/ commissioning charges etc.	Remarks		
9	10	11	12	13	14		

PLANT DATA SHEET

Code No. _____	6. A/T No. & date _____	Name of equipment _____
1. Machine Serial No. _____	7. A/T Cost _____	11. Prime Mover
2. Weight _____	8. Over-all Dimensions _____	Make : 1. _____ 2. _____
3. Make & Model _____	9. Rate of Hire Charges	12. H.P./K.W. 1. _____ 2. _____
4. Capacity _____	(a) Ownership component	13. Engine No. 1. _____ 2. _____
5. Year of Receipt _____	(b) Operational component	14. Name of Manufacturer/supplier
	10. Name of Manufacture suppliers	of engines
	of main plant	1. _____
		2. _____

HISTORY SHEET

NOMENCLATURE OF MACHINERY/EQUIPMENT :

 PLANT NO. (MACHINE SERIAL NO)

 PLANT CODE NO. _____

INDEX

Sl. No.	Details	Pages
1.	Component Main Assemblies	1
2.	Particulars of Equipment	2-3
3.	Record of Tyres	4-10
4.	Record of Repair and Replacement	11-53
5.	Monthly Data	54-55
6.	Record of Wire Ropes & Wire Rope Changes	56-63
7.	Battery Change Record	64-88
8.	Record of Transfer of Machine	69-70
9.	Records of observations of Inspecting Officers	71-75

COMPONENT MAIN ASSEMBLIES

(Where different manufacturer's assemblies are mentioned, full details with manufacturer's number should be furnished)

Name of Assembly	Make	Model	Capacity Voltage	Sr. No.	Any other information
1. Fuel Injection Equipment					
2. Generator					
3. Starter Motor					
4. Torque Converter					
5. Hydraulic System					
6. Air Compressor					
7. Turbo-Charger					
8. Any other information :					

PARTICULARS OF EQUIPMENT
(2-3)

- Brief description of machine :
- Dimensions :
 - Overall length :
 - Overall width :
 - Weight of equipment :
 - Transportation weight :

2400/12

3. Project Identification No :
4. Date of receipt/purchase :
5. Supply Order No.
6. Name of supplier :
7. Total cost at destination :
8. Name of manufacturer :
9. Manufacturer's make _____ Model _____ Sr. No. _____
10. Capacity/Pay load/Draw Bar Pull :
 Speed range : I Gear _____ II Gear _____ III Gear _____
 IV Gear _____ V Gear _____ Reverse _____
11. Engine Details :
 (i) Make :
 (ii) Model :
 (iii) Sr. No. :
 (iv) Type :
 (v) H.P. :
 (vi) No. of Cyl :
 (vii) Bore & Stroke :
 (viii) R.P.M. :
12. Aux. Engine Details :
 (i) Make :
 (ii) Model :
 (iii) Sr. No. :
 (iv) Type :
 (v) H.P. :
 (vi) No. of Cyl :
 (vii) Bore & Stroke :
 (viii) R.P.M. :
13. Tyre sizes :
 From _____ No. fitted _____ Inflation Pr. _____
 Rear _____ No. fitted _____ Inflation Pr. _____
 Battery :
 Size _____ No. of plates _____
 Voltage _____ Capacity _____
 List of tools received with equipment :

(4 to 10)

RECORD OF TYRES

Tyres Front
 Size _____ Ply _____ No. fitted _____
 Tyres Rear
 Size _____ Ply _____ No. fitted _____
 Tyre changes

Date	Tyre size	Sr. No. & Make (old)	Changed/to Sr. No. & Make (new)	Reason	Signature

(11-53)

RECORD OF REPAIR REPLACEMENT

Date	Details of breakdown	Hours/ Miles run	Date of completion of repair	Nature of repairs carried out	Parts replaced	Cost of repairs	Remarks	Signature

(54-55)

MONTHLY DATA

Month	No. of Hours/mile	Progressive total hours	P.O.L. Consumption				Signature
			Diesel Oil	Petrol	Engine Oil	Other lubricants	

(56-63)

RECORD OF WIRE ROPE

Description	Specification	Length fitted
HOIST		
Derrick/Suspension		
Back haul & Digging		
Tripping		

WIRE ROPE CHANGES

Date	Description	Approx. hrs/miles worked after last change	Probable cause of breakdown	Signature

(64-68)

BATTERY CHANGES RECORD

Date of fitting new battery	Battery Make size and its number	Reasons for replacement	Signature

(69-70)

RECORD OF TRANSFER OF MACHINE

Date of transfer	From	To	Hours used	Present depreciated cost	Remarks	Sig. of Officer	
						Handing over	Taking over

(71-75)

Records of observations of the Inspecting Officer

STATE

DRIVER'S DUTY LOG BOOK

Nomenclature of Machine _____

Plant No. (Machine Serial No.) _____

Plant Code No. _____

INDEX

Sl. No.	Details	Pages
1.	Particulars of equipment	1-2
2.	Driver's duty log sheet	3-103
3.	Notes	104-109

(1-2)

PARTICULARS OF EQUIPMENT

1. Brief description of Machine :
2. Dimensions :
 Overall length :
 Overall width :
 Weight of equipment :
 Transportation weight :
3. Project identification No. :
4. Name of manufacturer :
5. Manufacturer's Make _____ Model _____ Sr. No. _____
6. TYRE SIZES :
 Front _____ No. fitted _____ Inflation PR _____
 Rear _____ No. fitted _____ Inflation PR _____
7. Battery size, No. of plates and Voltage Capacity :
8. List of tools received with equipment :

(3-103)

Driver's Duty

Date	Shift	Driver's name	P.O.L. used				Other materials
			Petrol	Diesel	Engine oil	Other lubricants	

LOG SHEET

Signature of issuer	Hour meter/Milometer Reading		Total hours worked/ kms run	Detilas of work done	signature with designation of the officer of using Deptt.	Remarks
	From	To				

(104-109)

RECORDS OF OBSERVATIONS OF INSPECTING OFFICERS**PROFORMA I****PROFORMA SHOWING THE CONDITION OF MACHINERY**

Name of State _____

Sl. No.	Name of Machinery	Quantity available in the State						No. in working order		No. under break down which can be repaired with the indigenous parts and those in stock	No. which cannot be made ready until & unless the parts are imported with brief details	No. which are beyond economical repairs	Remarks
		IDA	LR	Emergency	SR	Others (NH)	Total						
								In use	Idle				
1	2	3	4	5	6	7	8	9	10	11	12	13	14

PROFORMA II

PROFORMA INDICATING THE UTILISATION PROGRAMME OF MACHINERY

NAME OF STATE _____

Sl. No.	Name of Machinery	Quantity available in the State	Quantity required for the period ending March (Detailed calculations to be enclosed)	Surplus	Remarks
1	2	3	4	5	6

PROFORMA III

PROFORMA INDICATING THE PRESENT ORGANISATIONAL SET-UP AND WORKSHOP FACILITIES AVAILABLE IN THE STATE

Sl. No.	Details of organisation						Workshop and their location				Remarks
	S.E. (M)	E.E. (M)	A.E. (M)	Overseers	Foremen	Mechanics	Central	Regional	Mobile	Field	
1	2	3	4	5	6	7	8	9	10	11	12

PROFORMA IV

QUARTERLY REPORT OF PERFORMANCE OF MACHINERY USED ON CENTRAL ROAD WORKS, FOR THE QUARTER ENDING

Sl. No.	Name of machinery	M/C No.	Total No. of days worked	Total No. of hrs. actually worked	Total idle hrs. for want of work	Break down hrs. with brief reasons	Total out put achieved (Cu. M) etc.		Remarks
							Sq.	M	
1	2	3	4	5	6	7	8	9	

NAME OF STATE _____

1. **SCRAPERS :**

Quantity of Earthwork involved :

- (i) Construction of missing links @ 10% by machines
- (ii) Approaches to new bridge over-bridges and high embankments upto 50% by machines
- (iii) Widening roads to four lanes @ 20% by machines

Total quantity of earth work involved.

= 30 cu. yd/hr. or
810 c ft/hr.

Assuming average output of a scraper

Assuming working hours/year

= 1500

Time period

=

No. of scrapers required

=

2. **PUSHERS :**

@ 1 for 4 scrapers

=

3. **TRACTOR DOZERS (150 H.P.) for spreading etc.**

@ 1 for 4 scrapers

=

4. **TRUCK MOUNTED WATER TANKERS**

@ 1 for 4 scrapers

=

5. **ROAD ROLLERS, 8-10 TONS CAP (for Compaction and Metalling)**(a) **Earth work compaction :**

- (i) Missing links @ 95%
- (ii) Improvement of low grade sec. (100%)
- (iii) Widening and strengthening of single lane section to two lanes (100%)
- (iv) Strengthening existing weak double lane stretches (100%)
- (v) Widening roads to two lanes (without strengthening) (100%)
- (vi) Providing bye-passes (100%)
- (vii) Approaches to new bridges, over-bridges and high embankments (50%)

=

=

=

=

=

=

=

(viii) Widening roads to four lanes (80%)	=
Total Earthwork	=
Assuming out-turn of a Roller	= 15,000 c ft/day
Time period	=
Assuming No. of working days/year	= 200
No. of Rollers required	=
(b) <i>Muram Gravel</i> ;	=
Quality of Gravel	=
Assuming out-turn of a Roller	= 15,000 c ft/day
Time period	=
No. of Rollers required	=
(c) <i>Soling</i> :	=
(i) Oversize metal	=
(ii) Overburnt bricks	=
Total	=
Assuming out-turn of a roller	= 1,500 cft/day
No. of Rollers required	=
(d) <i>Metalling</i> :	=
Quantity of work	=
Assuming out-turn of a Roller	= 1200 cft/day
No. of days/year	= 200
Time period	=
No. of Rollers required	=
(e) <i>Surface dressing first coat</i>	=
Quantity of work	=
Assuming out turn of roller per day	= 7000 s. ft
Time period	=
No. of rollers required	=
<i>Second coat :</i>	=
Quantity of work	=
Assuming out turn of a roller/day	= 10,000 sft
No. of Rollers required	=
(f) <i>Rolling of 3/4" carpet</i> :	=
Quantity of 3/4" carpet	=
Assuming out-turn/day	= 5000 sft/day
Time period	=
No. of rollers required	=
(g) <i>Seal coat over 3/4" carpet</i>	=
Quantity of seal coat	=
Assuming out-turn of a roller/day	= 10,000 sft
Time period	=
No. of rollers required	=
(h) <i>Rolling of Bitumen Macadam/Built-in-spray Grout</i> :	=
Quantity of 2" Bitumen Macadam/spray grout	=
Assuming out-turn of a roller/day	=
Time period	= 3000 sft/day
No. of rollers required	=
6. SHEEP FOOT ROLLER (DOUBLE DRUM)	=
Quantity of earthwork	=
(i) Missing links @ 5%	=
(ii) Approaches to new bridges over-bridges and high embankments upto 50% by machines	=
(iii) Widening to 4 lanes @ 20%	=
Total earthwork	=
Assuming out-turn of a roller	= 3000 cft/hr.
Time period	=

	No. of Rollers required	=
7.	SINGLE PASS SOIL STABILIZERS (HOWARD) :	
	Quantity of stabilized soil sub-base	=
	Assuming out-turn of a Howard stabilizer	= 4000 cft/day
	Time period	=
	Working days per year	=
	No. of Stabilizers	=
8.	MOTOR GRADERS :	
	@ 1 No. each for Four Nos. soil stabilizers	=
9.	WATER TANKERS, 1000 GALS. CAP (TRAILER MOUNTED)	
	Assuming quantity of water required to be 10% of total quantity	=
	(i) Earthwork high approaches \	=
	(ii) Quantity of metal consolidation	=
	Assuming output of a water tanker	= 2000 Gals/hour
	Time period	=
	No. of Tankers required	=
	Due to availability of local water to an extent of one-third quantity, tankers may be reduced to	=
	Add 3 trailer mounted water tankers for each soil stabilizer	=
	Total water tankers	=
10.	Tractors	
	@ 1 per Sheep Foot Roller	=
	@ 1 per per 3 Nos. Trailer mounted Water Tankers	=
	Total :	=
11.	ROAD ROLLERS (4-6 TONS)	
	(i) Double brick sub-base 6" thick	=
	Assuming out-turn of roller	= 1500 cft/day
	Time period	=
	No. of rollers	=
12.	HOT MIX PLANTS :	
	(i) Quantity of 3/4"-1" carpetting	=
	Assuming 20 cft = 1 ton	=
	(ii) Quantity of 2"-3" bitumen macadam	=
	Assuming 25 cft = 1 ton	=
	Total quantity of bitumen macadam and carpetting	=
	Assuming out-turn of hot mix plant/hour	= 15 tons/hr.
	Time period	=
	Working hours/year	= 1500
	No. of Hot Mix Plants	=
13.	PAVER FINISHERS :	
	@ 1 No. of per 3 Hot Mix Plants	=
14.	TIPPERS :	
	@ 5 Nos. per Hot Mix Plant	=
15.	Bitumen Boilers	
	(a) @ 5 Nos. per Hot Mix Plant	=
	(b) Quantity of seal coat over 3/4" carpet	=
	(c) Assuming bitumen required @ 20 lbs/100 sft of seal coat	=
	(d) Quantity of seal coat over 1 1/4" carpet	=
	Assuming Bitumen required @ 25 lbs/100 sft of seal coat	=
	(e) Quantity of seal coat over 2" Bitumen Macadam	=
	Assuming Bitumen required @ 32 lbs/100 sft of Seal coat	=
	(f) Quantity of surface dressing	=
	Assuming bitumen required @ 70 lbs/100 sft of surface dressing	=
	(g) Quantity of spray grout	=
	Assuming Bitumen required @ 85 lbs/100 sft of spray grout	=

- Total bitumen required = (b)+(c)+(d)+(e)+(f)
 Assuming out-turn of bitumen boiler/day = 500 Gallons
 Time period =
 No. of Bitumen boilers required =
16. **AIR COMPRESSORS** (210-250 c. ft) (For quarrying job)
 (i) Qty. of soling _____ cft.
 (ii) Qty. of metalling _____ cft.
 (iii) Qty. of Surface dressing _____ cft.
 Total : _____ cft.
- Assuming out-turn of compressor = 8×10^5 c ft/year
 Time period =
 Therefore, No. of Compressors = _____ Nos.
17. **JACK HAMMERS :**
 @ 2 Nos. per compressor = _____
18. **STONE CRUSHERS** (16"X9" opening)
 Qty. of metalling _____ cft.
 Assuming out put of crusher = 240 cft/hour
 12 tons/hour
 Time period =
 No. of crushers required = _____ Nos.
19. **GRANULATORS :**
 Total quantity of chips required =
 Assuming output of granulator = 130 cft/hr.
 Time period =
 Granulators required = _____ Nos.

PROFORMA FOR THE TRANSFER OF MACHINERY BELONGING TO THE GOVERNMENT OF INDIA, MINISTRY OF SHIPPING AND TRANSPORT (ROADS WING), NEW DELHI.

1. Name of Equipment & Code No.
2. State in which it is located.
3. (i) State to which transferred
(ii) Date of transfer
4. Brief description of the machine
5. Make
6. Main engine
Make & S.No.
7. Auxiliary Engg.
Make & S.No.
8. Registration No. (if any).
9. Chassis No. and/or serial No.
10. Major attachments transferred
 - 1.
 - 2.
 - 3.
- (Mention if any major component is missing or not transferred)
11. Present cost
12. Condition of the plant
13. No. of hours run by the plant upto the time of transfer; hour metre/kilometre reading.
14. Major Repairs Carried out :
 - (a) When were the last major repairs carried out.
 - (b) No. of hours worked after the above
 - (c) What is the balance in the Repair fund ?
15. Tools transferred along with the Plant (list may be attached) to include the tools supplied for the plant, and purchased for the plant subsequently from Central funds.
16. Whether any spare parts are transferred along with the Plant. If so a list be attached showing all spares purchased out of Central funds for that machine.
17. Literature transferred with the Plant.
 - a) Spare parts Catalogue
 - b) Operational Manual
 - c) Repair Manual
 - d) History Sheet
18. Any other remarks.

Signature of Rep.
of Transferer State

Signature of Rep.
of Transferee State.

DISPOSAL OF MACHINERY BEYOND ECONOMICAL REPAIRS

PROFORMA

Sl. No.	Brief description of machine with make, model & type	Engine No.	Chassis No.	SLNo.	Date of receipt after purchase/transfer	Source of receipt (New or transfer)	Purchase price	Hours/kms run
1	2	3	4	5	6	7	8	9
Book value (depreciated cost)		Present condition		Reasons for condemning the equipment or stating it is beyond economical repairs.		Remarks of State Executive Engineer, Superintending Engineer, Chief Engineer		
10		11		12		13		

SPECIMEN FORM

C.P.W.A. 18

SURVEY REPORT OF STORES

(Central P.W.D. Code, Paragraphs 140, 160 and 161)

REPORT OF SURVEY OF STORES WHICH HAVE BECOME UNSERVICEABLE

Division _____

Sub-Division _____

Number or Quantity	Description of articles	Value on the books Rate Amount	Date of receipt	Remarks by the Officer-in-charge explaining the cause of the articles becoming unserviceable	Remarks or orders of the Divisional Officer	Order of the Superintending Engineer

No. _____ dated the _____ 19____ No. _____ dated the _____ 19____

Submitted to Superintending Engineer, _____ Returned to the Divisional Officer, for _____ for orders with reference to necessary action as per orders noted above.
paragraph 129 of the Central P.W.D. Code.

Divisional Officer

Superintending Engineer

APPENDIX I

ABSTRACT TO ACCOMPANY THE REPAIR ESTIMATE

- (a) Cost of spares (is detailed in proforma I). Rs _____
- (b) Cost of miscellaneous items such as cotton waste, split pins, P.O.L. and other consumable materials Rs _____
- (c) Cost of Labour
- i) Foreman/Chargeman Hrs. @ Rs per hour _____
- ii) Mechanic Hrs. _____
@ Rs _____ per hour
- iii) Helper Hrs. _____
@ Rs _____ per hour
- iv) Departmental workshop expenses (with details) _____
- v) Outside agency charges _____
if any (with details)
- Total :Rs _____

PROFORMA I

ESTIMATE FOR REPAIR OF MACHINE

Code No. _____ Machine Name _____ Machine Serial No. _____
 State _____ Division _____

Sl. No.	Name of part	Part No.	Qty. required	Availability from parts previously procured by Ministry	Balance quantity required	Rate in Rs	Amount	Remarks
1	2	3	4	5	6	7	8	9

PROFORMA II

PROFORMA FOR SUBMISSION OF ESSENTIAL INFORMATION ALONG WITH REPAIR ESTIMATE

State _____ Division _____

Sl. No.	Type of machine	Code No.	Total No. Hrs. worked up to date.	Brief particular of last major repairs overhauling if any, with month.	No. of Hrs. worked after last major repairs	Present condition of machine
1	2	3	4	5	6	7
Repair Reserve Balance available and head to which credited		Value of present estimate		Remarks		
8		9		10		

PROFORMA III

PROFORMA FOR SUBMISSION ALONG WITH MAINTENANCE ESTIMATE FOR WORKING OUT POL CONSUMPTION ONE HOUR IDLE RUNNING PER FORTNIGHT

Sl. No.	Category of machine	Qty.	Type of Engine fitted and H.P.	Average consumption of H.S.D. oil in litres/hour/machine	Total H.S.D. consumption litres	Crank case capacity for engine oil in litre.	Average consumption of engine oil for topping up in litres/hour/machine
1	2	3	4	5	6	7	8
1.	Air compressors			6	6	16	0.030
2.	Motorised Scrapers & so on.						

ABSTRACT

Total State Cost	Litres		Total Rate Cost	Litres	
Total consumption of engine oil in litres/hour	Other consumable	Qty. per machine	Total quantity	Remarks	
9	10	11	12	13	

PROFORMA IV

PROFORMA FOR SUBMISSION ALONGWITH MAINTENANCE ESTIMATE FOR IDLE/SURPLUS MACHINES

STATE
DIVISION

Sl. No.	Category of machine	Total as available in the State	No.actually required as per utilisation programme already communicated to this Ministry justifying their retention	Reference of utilisation programme sent to Ministry (if not already sent to be enclosed now)	Quantity surplus to State requirements	Reference of intimating surplus to Ministry		
1	2	3	4	5	6	7		
1.	Motorised Scrapers							
2.	Motor grader and so on.							
Mechanic No.	Amount	Staff No.	required Operator Amount	with average salary for one set of Helper Amount	No.	machine Other Amount	Remarks	
8	9	10	11	12	13	14	15	16

PROFORMA V

PROFORMA FOR QUARTERLY PROGRESS REPORT IN RESPECT OF REPAIR OF CENTRAL MACHINERY
SANCTIONED
OUT OF CENTRAL FUND

State.....

Sl. No.	Job No.	Sanctioned	amount of estimate			Type of machine	Sl.No. of machine	Brief details of repairs done.	
		Spares	Other materials	Labour	Total				
1	2	3	4	5	6	7	8	9	
Expenditure on spare parts	Expenditure on other material		Expenditure on labour		Total expenditure in the period	Cumulative total	Likely date of completion of work	Bottlenecks if any	Remarks
			Depot	Out side agency					
10	11	12	13	14	15	16	17	18	

PROFORMA VI

PROFORMA FOR QUARTERLY PROGRESS REPORT IN RESPECT OF IDLE MAINTENANCE OF CENTRAL MACHINERY SANCTIONED OUT OF CENTRAL FUNDS FOR SUBMISSION TO REGIONAL SUPERINTENDING ENGINEER, MINISTRY OF SHIPPING AND TRANSPORT (ROADS WING)

STATE _____ DIVISION _____ MONTH OF REPORT _____

Sl. No.	Job No.	Name of the machine	Sl. No. of machine	Details of Engine starting date	maintenance Date of oil charge crank case/GB/ differential	action Other items attended to with date	Expenditure during the month	Cumulative expenditure	Remarks
1	2	3	4	5	6	7	8	9	10

No. RM-15(1)/76

Dated the 2nd April 1976

To

The Secretaries to the State Govts. of Andhra Pradesh, Assam, Bihar, Karnataka, Haryana, J&K, Gujarat, Kerala, Madhya Pradesh, Manipur, Maharashtra, Meghalaya, Nagaland, Orissa, Punjab, Rajasthan, Tamil Nadu. U.P. and West Bengal

Subject: Annual physical verification of Central machinery allotted to various State P.W.D's for use on National Hiighways/ Centrally financed works

I am directed to state that Govt. of India procured quite a large quantum of road construction machinery out of Central funds, and allotted the same to the Public Works Departments for use on National Highways/other Centrally sponsored works.

2. Audit Review Reports of the State Accountant Generals (addressed to the States with a copy to the Ministry) indicate that the accounting of Central machinery is not satisfactory. It is also noticed that there is discrepancy between the machinery position available in the records of this Ministry and that reported by the States in the utilisation programme.

It is, therefore, necessary that 'annual physical verification' of all the Central machinery given to the States should be arranged immediately, wherever the States are not already doing the same. A copy of the report of the annual physical verification done, may be sent to the Ministry in the prescribed proforma sent herewith, before the end of each financial year i.e. 31st March.

3. The annual physical verification can be arranged by you, preferably by deputing a separate officer of your Department exclusively for this purpose or by getting them verified by the individual Divisions and then consolidating them in the Chief Engineers' Office. Ministry may, however, be sent only the consolidated annual physical verification report of all items of Central machinery, grouped under different type of equipments, so that the quantum of each type of equipment and their condition could be readily appreciated.

4. Since the financial year 1975-76 is already over, a copy of the physical verification report of the last year may be sent to reach the Ministry latest by the end of May, 1976, in the enclosed proforma.

PROFORMA FOR ANNUAL PHYSICAL VERIFICATION OF CENTRAL MACHINERY GIVEN TO STATES

Name of State :

For the year ending 31st March 19

S.No.	Name of machinery	Capacity	Make/model	Chassis No. Serial	Engine No & its make	Code No.
1	2	3	4	5	6	7

1. Road Rollers
- 2.
- 3.
- 4.

Tipping Trucks

Division/location	Working or under break down	Engine	Present condition of M/C	Remarks
			Chasis	
8	9	10	11	12

No. RM-21(6)/75

Dated the 11th April, 1977

To

The Chief Engineers Addl. Chief Engineers to the States of Assam/Orissa/West Bengal/Manipur/Bihar/Madhya Pradesh/Uttar Pradesh/Gujarat/Himachal Pradesh/Haryana/Rajasthan/Punjab/Andhra Pradesh/Karnataka/Kerala Tamil Nadu and Maharashtra (dealing with National Highways)

Subject: Plant Data Sheet for maintaining records of Central Machinery

I enclose herewith Assam 775, Orissa 150, West Bengal 850, Manipur 25, Bihar 1550, M.P. 75, U.P. 900, Gujarat 500, H.P. 60, Haryana 30, Rajasthan 525, Punjab 100, A.P. 50, Karnataka 40, Kerala 30, T.N. 100, Maharashtra 50, Nos. of Plant Data Sheet finalised during group of Chief Engineer's meeting on 11th/12th November, 1975 in the Ministry for maintaining systematic records of Central machinery available in your State.

It is requested that all the particulars required in the Plant Data Sheet may be filled in your office as far as possible and copy of the same in a consolidated statement may be sent to the Ministry for records, at an early date.

This information in Index Card may be up-to-dated from time to time, as the same is essential for proper upkeeps of Central machinery and for satisfying audit etc. The action taken by you may please be intimated to the Ministry.

Form No. : RM-1/76

PLANT DATA SHEET

1.	Code No. Machine S. No.	7.	A/T Cost Cost at Site			Name of Equipment Prime Mover Make-1		2
2.	Weight	8.	Rate of Hire Charges	(a) Ownership Component	13.	HP/KW1		2
3.	Make & Model			(b) Operation Component	14.	Engine No. 1		2
4.	Capacity	10.	Over all Dimensions		15.	Name of Manufacturer/ Suppliers of Engine		1
5.	Year of Receipt	11.	Name of Manufacturer/Suppliers of Main Plant					2
6.	A/T No. & Date							

S.No.	Date	Location	Cumulative Working Hours	Idle Hours	Cumulative Hire Charges Realised Ownership Component	Operational Component	Reference	Repair Estimate Sanctioned Amount	Actual Expendi- ture Repairs	Brief Details of Repairs Carried Out
1	2	3	4	5	6	7	8	9	10	11

Code No.

Name of Equipment

(P.T.O.)

Sl.No.	Date	Location	Cumulative Working Hours	Idle Hours	Cumulative Hire Charges Realised Ownership Component	Operational Component	Reference	Repair Estimate/ Sanctioned Amount	Actual Expendi- ture Repairs	Brief Details of Repairs Carried out
1	2	3	4	5	6	7	8	9	10	11

2400/24

Code. No.	Name of Equipment
39-Misc. — 20,000—3-1-77—GIPRB.	

2400.7.

No. RM-30(1)/83. Vol. II

Dated the 22nd October, 1983

To

The Chief Engineer (National Highways) Public Works Department

Subject : Reconciliation of Inventory of machines belonging to the Ministry

Ministry have been receiving Annual physical verification Reports of Central Machinery available in your State. Based on various reports and comments on the same from Ministry's Regional Officers, transfers and sale already affected, efforts have been made to prepare an up-dated inventory of Central machines as on 1-4-1983.

Accordingly please find enclosed herewith a list of Central machines available in your State and quantity reported in physical Verification Reports.

It will be seen that there are certain discrepancies which have been shown as (+) or (-) showing excess and shortages respectively. You are requested to kindly check the enclosed statement and confirm the correctness of the quantities shown therein. In case of excess and shortages complete details and references, if any, clarifying the position may kindly be sent to this Ministry urgently.

The above information is necessary to reconcile the Central Register of machines in this Ministry. It is, therefore, requested to kindly send the requisite information latest by 30th November, 1983.

2500 CONDEMNATION & DISPOSAL OF CENTRAL MACHINERY

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2500.1.	RM-15(15)/71 dt. 31.8.71	Condemnation and Disposal of Machines - Procedure	2500/1
2500.2.	RM-31(1)/83-Genl. dt. 5.10.83	—do—	2500/1

2500.1.

No. RM-15(15)/71

Dated the 31st August 1971

To

The Secretary to the Govt. of West Bengal, P.W. (Roads) Department, Orissa, Works & Transport Dept., Bihar, P.W.D. Maharashtra Buildings & Communications Department, Uttar Pradesh, P.W.D., Assam P.W.D., Punjab P.W.D., Rajasthan P.W.D., Gujarat P.W.D.,

Subject: Disposal of machinery beyond economical repairs

I am directed to say that certain items of road construction machinery which were procured by the Government of India and allotted to your State for the execution of centrally sponsored projects, might have outlived their useful life and become unserviceable for future use. I am accordingly to request that such cases may kindly be scrutinised as to whether the particular machine has been utilised for expected normal life span or come to a state of disrepair for any other reasons having got into a state beyond possibility of economic repairs even though not having given full normal life or serviceability; your report of such cases may kindly be submitted in the proforma enclosed to this Ministry through our Regional office concerned at a very early date.

PROFORMA

Sl.No.	Brief description of machine with make model & type	Engine No.	Chassis No.	Sl.No.	Date of receipt after purchase/transfer	Source of receipt (new or transfer)	Purchase price at site Rs	Hours/kms worked at the time of transfer
1	2	3	4	5	6	7	8	9

Hours/kms run upto date	Book value as on 31.3.71	Total repair reserve obtained	Balance of repair reserve available	Present condition	Estimated cost of repairs to bring in order	Date of major repair/overhauls done from the time of receipt uptill now.	Hours/kms to which col. 16 refers i.e. period machinery worked after those repairs	Brief reasons for condemning the equipment
10	11	12	13	14	15	16	17	18

Remarks of State Executive Engineer's, Superintending Engineer's, Chief Engineer's	Remarks of Regional Superintending Engineer (Mech.) Ministry of Shipping and Transport
19	20

2500.2.

No. RM-31(1)/83-Genl.

Dated the 5th October, 1983

To

The Secretary of all State Governments, Departments dealing with National Highways, and D.G. Works, CPWD

Subject: Condemnation and Disposal of machines beyond economical repairs

Reference: Ministry's letter Nos. (i) RM-15 (15)/71 dated 31.8.71 (ii) RM-21 (5)/75 dated 28.11.75 (iii) RM-12(5)/81 dated 16.3.81

Kindly refer to the Ministry's letter under reference on the above subject. Instructions for the disposal of machines beyond economical repairs were issued by the Ministry vide letter No. RM-15(15)/71 dated

31.8.71. Based on the recommendations of group of State Chief Engineers in the meeting held at New Delhi on 11th and 12th November, 1975 original proforma for disposal of machines beyond economical repairs was revised. Subsequently, in the review meeting of the State Chief Engineers on central machines held at New Delhi on 18./19.2.81, it was suggested that wherever full information about working hours of the machines, etc., are not available, Technical Committee should be constituted by the State to go into the matter.

2. With the view to incorporate all the previous instructions of the Ministry and to make them more exhaustive for ready and uniform application by all the State PWDs, comprehensive guidelines and procedures have been evolved as per the enclosed Annexure which should be followed henceforth. It is requested that these instructions may kindly be brought to the notice of all concerned.

3. Some of the equipments purchased for the IDA and LRP works during 1962-65 might have become unserviceable and beyond economical repairs. It is necessary to dispose of such equipments so as to reduce the dead inventory. Accordingly, it would be appreciated that the condition of all the Central machines in your State is assessed and necessary proposals for the condemnation of the machines presently found unserviceable and beyond economical repairs may kindly be sent to this Ministry latest by 31st October, 1983.

4. Subsequently, the progress of this work may kindly be reviewed quarterly and intimated to this Ministry.

ANNEXURE

CONDEMNATION AND DISPOSAL OF EQUIPMENT BEYOND ECONOMICAL REPAIRS :

Equipment belonging to the Ministry may have to be written off in course of time, when it becomes beyond economical repairs. The action for writing off is to be initiated by the State Govt. and sanction is to be obtained from the Ministry. The procedure and the guidelines to be followed for writing off Ministry's equipment are as under.

GUIDELINES :

- (1) *A machine should normally be condemned, only when it has completed its useful life, that is, the life fixed according to the standard norms, and when it is giving trouble in day to day operation, and hence not reliable.*
- (2) *If the machine has completed its useful life and is still in good working condition, it need not be condemned. ...*
- (3) *When the machine has covered its prescribed useful life and is not in good condition, in some cases, it may be worthwhile to repair the machine, if the present cost of a new machine of the same type has gone very high, and the repaired machine's reliability and further useful life will be commensurate with the amount spent on repairs.*
- (4) *Even if a machine has not covered its useful life as per records but its general condition is not at all satisfactory and further repairs may not be economical or feasible because of non-availability of spare parts due to obsolescence etc., it may be condemned on technical grounds.*
- (5) *When data of working hours i.e., used life of a machine are not available but the condition of the machine is bad and the repairs may not be economical, with the above criteria, it should be considered for condemnation on technical grounds.*
- (6) *Sometimes, even when a machine is in working condition, it may be necessary to write it off, if its operation is uneconomical because of high running and maintenance costs.*

PROCEDURE FOR CONDEMNATION :

- (1) *The Executive Engineer incharge of the machine should initiate the action for condemnation by submitting a report to the Ministry through the State Govt. in the proforma attached, in quadruplicate.*
- (2) *In case of item Nos. 1, 2, & 3 of the guidelines for condemnation, the formation of a Technical Committee or Condemnation Board may not be necessary. The report of the Executive Engineer duly recommended by the State Chief Engineer should be sent in triplicate to the Regional Superintending Engineer (Mechanical) with copy to the Ministry for approval.*
- (3) *For the machines covered by criteria 4 and 5 of the above guidelines, a Technical Committee or Condemnation Board should be formed, which should examine the available records, assess the past utilisation of the machines on the basis of work done, its condition, shortage of components (if any) and other relevant factors, and then given recommendations for condemnation or otherwise. The State Govt. should forward the Committee's report with their comments to the Ministry in triplicate with copy to Ministry's Regional SE(M) for further necessary action.*
- (4) *A Technical Committee should be constituted by the Chief Engineer, National Highways of the State under intimation to the Ministry. The constitution of the Committee may be on the following lines.*
 - (i) *Superintending Engineer Mechanical Circle/National Highway Circle of the State PWD — Chairman.*
 - (ii) *Regional Superintending Engineer (Mech) of the Ministry — Member.*
 - (iii) *The officer of the level of Superintending Engineer (Mechanical) from any other Department of the State like irrigation, river valley project, transport, etc., — Member.*

- (iv) *Executive Engineer of the State PWD holding charge of the machines — Co-opted*
- (5) *After receipt of approval from the competent Authority the Executive Engineer should survey off the machine from the inventory.*
- (6) *The condemned machine should then be disposed off by public auction through DGS&D or any other mode approved by the Ministry.*
- (7) *The sale value of the auctioned machine should be credited to the Central head of account viz, Major Head — 537-AA Capital Outlay on roads and Bridges-AA I National Highways - AA.1 (2)-Tools and Plants "*

DISPOSAL OF MACHINERY BEYOND ECONOMICAL REPAIRS

Sl.No.	Brief description of machine with make model and type.	Engine No.	Chassis No.	Sl.No.	Date of receipt after purchase/transfer.	Source of receipt (New or transfer)	Purchase price	Hours kms run
1.	2.	3.	4.	5.	6.	7.	8.	9.
Book value (depreciated cost)		Present condition		Reasons for condemning the equipment or stating it is beyond economical repairs.		Remarks of State Executive Engineer, Superintending Engineer, Chief Engineer.		
10.		11.		12.		13.		

SURVEY REPORT OF STORES (CPWD CODE, PARAGRAPHS 140, 160 & 161)

SPECIMEN FORM

Report of Survey of Stores which have become Unserviceable
Division _____

Sub-division _____

Number or Qty.	Description of Articles	Value on the books Rate Amount	Date of Receipt	Remarks by the Officer incharge explaining the cause of the articles becoming unserviceable.	Remarks or order of the Divisional Officer	Order of S.E.

No. _____ Dated the _____ No. _____ Dated the _____

Submitted to S.E. _____ for orders
with reference to paragraph 129 of CPWD Code.

Divisional Officer

Returned to the Divisional Officer for
necessary action as per orders noted above.

Superintending Engineer.

2600 MODERNISATION OF ROAD CONSTRUCTION

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
<u>2600.1.</u> 406	RW/RMP-18(3)/84 dt. 20.4.85	Introduction of Vibratory Rollers for Highway Construction	2600/1

No. RW/RMP-18(3)/84

Dated the 20th April, 1985

To

The Chief Engineer (NHs) of all the State and U.Ts/Director General (Works) C.P.W.D.

Subject: Introduction of vibratory rollers for highway construction.

The question of introduction of vibratory rollers for Highway construction was under consideration of this Ministry for some time past. In order to provide guidelines for the use of these rollers to the Highway Engineers, a background paper on 'Introduction of vibratory rollers for Highway construction' was finalised by a Working Group set up by the Highway Research Board of the Indian Roads Congress. This background paper has been published under Information Section of Volume 45 part 3 of the Journal of the Indian Roads Congress of Nov. 1984. A summary of recommendations made in the background paper for introduction of vibratory rollers for Highway construction is given in Annexure I.

2. The advantages of use of vibratory rollers are as follows :

- i) it can replace a number of different types of conventional static rollers theoretically needed for different materials as well as for different compaction operations.
- ii) it can give higher degree of compaction in less number of passes.
- iii) it can compact materials in a wide range of lift thicknesses.
- iv) it can compact efficiently bituminous materials over a wider range of temperatures.

3. In view of the inherent advantages this Ministry is considering to specify/stipulate the use of vibratory rollers on National Highway works while issuing sanctions in future.

4. It is, therefore, necessary that vibratory rollers are extensively used for Highway construction and concurrently ensure that ordinary rollers are phased out in due course.

5. In addition to the two categories of vibratory rollers mentioned in the recommendations of the background paper vibratory rollers 2 to 4 tonnes static weight are also being manufactured in the country for light applications. A list of names and addresses of the firms presently manufacturing the vibratory rollers of different specifications in the country is given in Annexure II for your information and guidance.

ANNEXURE I

RECOMMENDATIONS FOR INTRODUCTION OF VIBRATORY ROLLERS FOR HIGHWAY CONSTRUCTION

i) Vibratory rollers have certain advantages vis-a-vis static rollers. These are compaction of pavement materials in greater lift thicknesses, achievement of higher compaction densities, use of smaller number of roller passes and efficient compaction of bituminous materials over a wider range of temperatures. Vibratory rollers need therefore to be introduced in highway construction on a large scale to take advantage of technological improvement.

ii) Dual-drum vibratory rollers of 4 to 6 tonne and 8 to 10 tonne static weight may be manufactured to serve compaction needs of highway construction. The higher rollers may be useful as substitutes for 10 tonne static rollers employed at present for highway construction. They may be also used conveniently for widening of existing pavements, construction of narrow city roads and footpaths and maintenance jobs like trench reinstatement and patch repairs. The heavier roller may be suitable for highway construction jobs, where greater outputs of work and higher compaction densities are to be achieved.

iii) The vibratory rollers may have a frequency range of 1400 to 3000 vibrations/min. and an amplitude range of 0.4 to 1.4 mm with appropriate number of settings for varying frequency and amplitude values suitable for compaction of different pavement layer materials and thicknesses.

iv) If it is not possible to introduce the above mentioned settings to cover the entire ranges of frequency and amplitude, two different types of vibratory rollers may be manufactured with the following characteristics :

a) Frequency range of 14000 to 18000 vibrations/min. and amplitude range of 0.8 to 1.4 mm suitable for compaction of soil and granular layers.

b) Frequency range of 2000 to 3000 vibrations/min. and amplitude range of 0.4 to 0.8 mm suitable for compaction of bituminous macadam and asphaltic concrete layers.

v) In view of the higher cost and the greater degree of technological sophistication of vibratory rollers, it is necessary to achieve fuller utilisation. For this purpose, it is necessary to provide appropriate facilities for training of operation and maintenance personnel and to schedule construction programme so as to minimise idle time.

vi) After introduction of vibratory rollers by several highway construction organisations in the country, feed-back data are required to be collected for more comprehensive evaluation and refining of specifications of vibratory rollers indicated in this paper and for modifying construction specifications with respect to layer thickness and compaction density.

List and Addresses of firms manufacturing Vibratory Road Rollers

1. **USHA ATLAS**
Hydraulic Equipment Ltd.,
14, Princep Street,
Calcutta-700072
2. **Garlic & Co. Pvt. Ltd.**
Haines Road, Jacob Circle
Bombay
3. **International Engineering & Construction Co.,**
16, Biplabi Rashbehari Basu Road, (Canning Street),
Calcutta-700001.
4. **Jessop & Co. Ltd.**
63, Netaji Subhash Road,
Calcutta-700001.
5. **Escorts Ltd.,**
Industrial Equipment Department,
Sector-13, Faridabad-121007. (Haryana)
6. **Garden Reach Shipbuilders and Engineers,**
Calcutta
7. **Electromag Devices Pvt. Ltd.,**
1201, Pragati Tower,
26, Rajindra Place,
New Delhi-110008.
8. **Larsen and Tubro Ltd.**
32, Shivaji Marg,
New Delhi-110015.

TRAINING OF PERSONNEL

<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
RM-4 (15)/77 dt. May, 78	Training of Personnel on Sophisticated Bituminous Pavement Construction Equipments	2700/1
RM-20(40)/76 dt. 25.5.78	Training Facility for Mechanics, Fitters, Operators etc. with ITT's	2700/1

No. RM-4(15)/77

Dated the May, 1978

To

The Engineer-in-Chief/Chief Engineer/Addl. Chief Engineer of the States of Assam, Andhra Pradesh, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh & West Bengal (dealing with National Highways)

Subject: Training of personnel on sophisticated bituminous pavement construction machinery

D.G.S. & D., for the first time, placed bulk order for supply of hot mix plants and paver finishers on indigenous manufacturers (viz) Marshalls, vide A/T No. ME-7/220/07/702/17.2.72/514/PAOM dated 27.3.73 M/s. Sayaji vide A/T/ No. ME-7/220/07/702/17, 2.72/5/516/PAOB dated 28.3.73 and M/s Millers vide A/T No. ME-7/220/07/702/17.2.72/1/515/PAOB dated 5.4.73, on account of this Ministry. The bituminous pavement construction work with these sophisticated hot mix plants was new to most of the States. Therefore, trained personnel were essential to operate such closely and sophisticated machines in proper manner, economically and to improve utilisation. As such a provision was made in the above A/Ts. that the supplying firms will train operating and maintenance personnel free of cost at their works and also at work-site during erection and initial trial run of 150 hours operation.

The supply against above A/Ts. have since been completed and the plants are being utilised in your State. But the Ministry is not aware, the number of staff you have engaged in these hot mix plants/paver finishers, the number of staff trained at firms' works and during trial run at work sites.

P.A.C. of the Parliament, in para 7.56 of 18th Report of 6th Lok Sabha has urged that in case of new range of equipment, the State authorities may be persuaded to send the machine operators and mechanics to the manufacturing units for training well ahead of arrival of the equipments so that there is no loss of machine-time at the work-sites.

It is requested that the following information may be furnished to this Ministry :

- i) Number of operators/mechanics engaged on hot mix plants and paver finishers
- ii) Number of technical staff already trained at works of different firms and at work sites on different makes of hot mix plants and paver finishers.
- iii) Number of technical staff undergoing training
- iv) The action being taken to get the remaining staff trained expeditiously.

No. RM-20(40)/76

Dated the 25th May, 1978

To

The Chief Engineer of Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal

Subject: Proposal for establishing training facilities for mechanics, fitters, operators etc. in association with I.T.Is.

Public Accounts Committee of Parliament in their recommendation and Accountant Generals of some of the States in their reports have adversely commented on the low utilisation of Central equipments allocated to State P.W.Ds. for execution of Central/NH works. The Road Building Machinery Committee in their report already communicated to States vide RM-21(1)/75 dated 20.6.1975 had brought out that one of the reasons for low utilisation of Central equipments was lack of skilled operators, know-how for operation, and trained technicians for maintenance and repairs of Central equipments, and for manning workshops.

2. P.A.C. in their recommendation No. 7.55 have stressed for early establishing of training centres for imparting training to the staff at Industrial Training Institutes which have been set up almost in all States. The committee has also suggested that the States, may review the present strength vis-a-vis the future requirement of operators and technicians so that a regular training programme is arranged in every State

expeditiously to meet the future requirements. They have also suggested that it will be beneficial if refresher and in-service training courses are also arranged from time to time so that staff is made conversant with the work of equipment of the latest design and technology.

3. Ministry have been pursuing this matter with State P.W.Ds. since long, when they were requested to have the staff trained in the training centre run by the C.W. & P.C. etc. Finally in June, 1975 when the States Chief Engineers meeting was held on 29th June, 1975 at New Delhi, it was decided to establish the centres in association with IIT. The Minutes of the meeting were communicated to all the States vide Ministry's letter No. RM-10(2)/75 dated 18.7.1975. The matter was further discussed in the group of State Chief Engineers meeting held in the Ministry on 11/12th November, 1975 and the Minutes of the same were communicated to all the States vide Ministry's letter No. RM-21(5)/75 dated 28th November, 1975. The matter was also discussed with the State Chief Engineers individually in the review meetings held with them, in the Ministry during October/November, 1976. The States were also reminded vide Ministry's letter No. RM-20(40)/76 dated 20.4.1977 to finalise the training programme expeditiously under intimation to the Ministry. But it is regretted that such proposals are still awaited from almost all the States.

4. The State Chief Engineers are again requested to look into the matter personally, and work out suitable proposals so that by using the facilities available in the ITIs. and supplementing them by providing machines, personnel, sandwiching integrating with on road job field training on actual operation etc., a suitable training programme can be worked out. It is also requested the State P.W.D. may assess their present vis-a-vis future requirements of operators and technicians so that, as desired by PAC, required training programme is arranged in every state to meet the future requirements.

5. As suggested by P.A.C., the State P.W.D. may also consider for starting refresher and in-service training courses so that the staff is made conversant with the working of the equipment of latest design and technology.

6. The State Chief Engineers may finalise such proposals at the earliest under intimation to the Ministry.

2800 WORKSHOPS CENTRAL/DIVISIONAL/MOBILE

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2800.1.	RM-24(1)/73 dt. 9.8.74	Shifting of LRP Workshops	2800/1
2800.2.	RM-24(8)/78 dt. 17.5.78	Establishment of additional Workshops for Repair & Maintenance of Central Machines used for Execution of Central/NH Works	2800/1
2800.3.	RM-24(6)/76 dt. 26.5.78	Procurement of additional Mobile Workshops	2800/4

No. RM-24 (1)/73

Dated the 9th August, 1974

To

C.E. Assam PWD, C.E. PWD W. Bengal, C.E. PWD Roads Directorate, W. Bengal, C.E. UP, PWD,
C.E. Bihar, PWD

Subject : Shifting of LRP workshops

A number of workshops were set up out of Central funds and established in your State in connection with execution of IDA & LRP works. These works have been completed. CE (M) & Regional S.Es. (Mech) of this Ministry during the course of review meetings and in their inspection reports have brought to your notice, that these workshops may be shifted to the areas or locations where there are more concentration of Central/National Highway works, so that these may be put to proper & adequate use. It is not known whether all of these workshops have since been shifted from their original locations and put into use for attending to repairs of central machinery in the interest of early & uninterrupted execution of Central/National Highway works. If some of them have already been shifted, their present location and date of shifting may kindly be intimated. In case of workshops which have not been shifted, it may kindly be confirmed that these workshops are still needed for attending to central machines & the further programme of their shifting may please be intimated. In case any of the workshops has become surplus and is not being used, the same may also be indicated. In any case, it should be ensured that all the workshops in your State are shifted to the areas without further delay, where there is more concentration of National Highway/Central works so that they can be used for repairs of central machines in your State.

An early action in the matter is requested. The present position may also be intimated.

No. RM-24 (8)/78

Dated the 17th May, 1978

To

1. The Chief Engineer, National Highways, Andhra Pradesh PWD (B&R)
2. Chief Engineer, Assam PWD (B&R)
3. Addl. Chief Engineer, National Highways, Bihar PWD
4. Chief Engineer (Roads) Haryana PWD
5. Chief Engineer, National Highways, Madhya Pradesh PWD
6. Chief Engineer & Joint Secretary (National Highways), Public Works & Housing Department, Govt. of Maharashtra
7. Chief Engineer, National Highways, & Projects, Orissa
8. Chief Engineer, Punjab PWD
9. Chief Engineer (Roads) Rajasthan PWD
10. Chief Engineer, National Highways, Tamil Nadu
11. Chief Engineer, National Highways, PW (Roads) Directorate, West Bengal

Subject : Establishment of additional workshops for repair and maintenance of Central machines used for execution of Central/NH works

For quite some time, this Ministry have been pursuing with Ministry of Finance and Planning Commission, a proposal for augmenting the workshop facilities required for repairs and maintenance of Central equipments deployed for execution of Central/NH works. In this proposal, the requirement of Divisional/Central Workshops was assessed, assuming that after 2-3 years of use, depending upon the extent of utilisation, it is essential to carry out major/medium repairs in every machine. Thus, approximately, 30% of the equipments will need repairs facilities in the Workshops every year. It was also assessed that for every 200 numbers of road construction equipments, one Divisional/Central Workshop is essential.

In the Divisional Workshop, jobs like top overhaul of engine, replacement of assemblies/parts, adjustments of various components, welding jobs, manufacture of certain categories of nuts, bolts, bushes etc. servicing and maintenance of equipment, charging of batteries, retreading of tyres etc. will be carried out.

In Central workshops all types of repair jobs, like major overhauls/repairs, re-clamation/reconditioning of worn out parts, repairs of fuel injection pump, dynamos, self-starter, various machining

jobs, painting/numbering etc. would also be undertaken besides the jobs mentioned against the Divisional workshop in the above para.

While assessing the requirements of workshops, it was considered essential to provide Divisional/Central Workshops for certain States, even when the population of the equipments is less than 200, due to other reasons, like topography and strategic location of the State, types of equipments, and for providing minimum repairs facilities etc.

2. The details of workshop machinery decided to be provided in Divisional and Central workshops, along with their approximate cost are enclosed herewith. The cost of a Divisional Workshop works out to Rs 4 lakhs (Rs 1 lakhs for workshop machinery and Rs 3 lakhs for sheds/buildings). The cost of Central workshop is Rs 5 lakhs (Rs 3 lakhs for machinery and Rs 3 lakhs for building/sheds etc.). It has been assumed that these workshops would be established on PWD/Govt. land, so as to restrict the capital cost to the barest minimum.

3. Taking the above into consideration, it has been proposed to establish Nos. workshops in your State.

4. Expenditure Finance Committee, to whom the proposal was submitted, has pointed out that the facilities already available with the Public/Private Sector should also be availed off by the States, as it was essential to utilise fully the investments already made. The Committee had agreed in principle for the necessity of setting up of these workshops but has directed that before final clearance for execution of the proposal is given, the location of the workshops should be identified, and cost firmed up, in consultation with the State Governments. The costs as re-cast are required to be presented to the Ministry of Finance and their approval sought in due course.

5. The information asked for by Expenditure Finance Committee may please be supplied by you immediately, complete in all respects so that a consolidated reply may be furnished to them, at an early date but positively by 30th May 1978. The information should include consideration on the following :

(a) Location of the Workshop proposed to be allocated to your State

The proposed workshop should be located on available Government land already acquired, and at such a place in an area where there is concentration of Central equipments. Moreover, the location of the proposed workshop should be away from such places where State/Public Sector workshop facilities are already existing and can be made use of. The place should also be well connected by rail/roads. The justification to arrive at this decision of location may also be indicated.

(b) Estimate

The cost of Central/Divisional Workshop and Workshops machinery considered to be provided has already been estimated taking into consideration that these are only repairs/Maintenance workshops and not meant for manufacturing purposes, where very costly and sophisticated workshop machinery to manufacture items to very close tolerance may be required. It is requested that a detailed estimate for the sheds/buildings and workshop machines, within the prescribed financial limits may be prepared and submitted to the Ministry. It is suggested with regards to sheds/buildings, that there can be 8-10 bays under one roof in all, with concreted flooring. Out of these, two or three bays may be fully covered from all sides and provided with doors and windows, to be used as machine-shop and stores room. 2 or 3 bays may be used for carrying out repairs of engines/assemblies etc. The remaining bays can be utilised for keeping the stripped machines awaiting assembly after repairs of various components like engine, differential, gear box etc. There may be sufficient open area for parking the machines, before and after the repairs. A lay out of the workshop with details of location of various workshop machines etc. may please be sent to the Ministry and Ministry's Regional Office.

6. The requisite establishment for running the workshops efficiently is to be created by State PWD themselves, as already done for earlier established workshops.

7. Initially workshop expenses for staff wages, POL etc. are to be kept under suspense account through the job cards to be maintained by state PWD. These are subsequently to be debited to the repairs/maintenance estimates of equipments, on the basis of quantum of repair work carried out and the number of man-hours/POL utilised on the equipment, concerned. The repairs/maintenance estimates which include provisions for such workshop expenses, are being sanctioned by the Ministry against "Repairs & Maintenance" grant of machinery.

8. In case, spare capacity is available, the machine purchased against Central loan assistance and State owned machinery may also be got repaired on appropriate charges.

9. The receipt of the letter, may please be acknowledged. It may be ensured that the information called for in para (5) (a) & (b) above is submitted to the Ministry at the earliest but positively by 30th May, 1978.

APPENDIX I

DETAILS OF WORKSHOP MACHINERY REQUIRED FOR EACH CENTRAL WORKSHOP

Sl. No.	Name of Machinery	Capacity	Qty.	Cost
1.	Lathe 10" Center	8' bed length	1 No.	40,000
2.	Drilling m/c pillar	1" capacity	1 No.	10,000
3.	Hacksaw m/c	9" capacity	1 No.	4,000
4.	Tool Grinder (Electric double wheel pedestal)	6"	1 No.	2,000
5.	Arc, Welding Plant with accessories	400 Amp. 440 Volt	1 No.	12,500
6.	Gas Welding & Cutting set comp. with oxygen. Acetylene cylinders with tools		1 No.	5,000
7.	Battery Charger set 6 Nos.-12 volt Batteries		1 No.	3,000
8.	Air compressors with accessories 60 cuft/min		1 No.	8,000
9.	Vulcanising equipment		1 No.	2,000
10.	Car washer m/c with water pump and double gun with hose pipe		1 No.	8,000
11.	Servicing Ramp (cement) and brick mortar constn.		1 No.	2,000
12.	Nozzle Tester		1 No.	1,000
13.	Cylinder boring and honing m/c with attachments		1 No.	75,000
14.	Fuel pump testing and calibration m/c		1 No.	1,00,000
15.	Valve seat cutter complete with cutters		1 No.	3,000
16.	Valve refacer		1 No.	3,500
17.	Portable drill & Grinder Heavy duty		1 No.	4,000
18.	Spray Painting Gun with hoses		2 Nos.	1,000
19.	Chain Pulley Block 5 Tons		1 No.	4,000
20.	Travelling Jacks 10 Ton cap.		2 Nos.	2,000
	Hydraulic Jacks 10 Ton cap.		2 Nos.	2,000
	Heavy duty tool kit including box spanners, ring spanners, double and spanner sets, hammers 2 & 5 lbs., assorted filed 8" to 14" Torque wrenches, bench-vice, feeler gauges, Tachometer, micrometer valve lifter, stud puller, compression gauge, cylinder gauge			15,000
				3,05,000
	Workshop shed, office room, store shed compound wall etc. including land			3,00,000
		Total		6,05,000
		Say Rs		6,00,000

Types of jobs to be attended to in the above Central workshop

1. Major Repairs/overhauls.
2. Reclamation of reconditioning and rebuilding of worn out parts.
3. Manufacture of certain categories of scarce items of spares and components.
4. Repairs/overhauls of components like fuel pump, crank shafts etc.
5. Painting and numbering of equipments.

DETAILS OF WORKSHOP MACHINERY REQUIRED FOR EACH DIVISIONAL WORKSHOP

Sl. No.	Name of machinery	Capacity	Qty.	Cost
1.	Lathe 8" Center	1 No.	6' bed length	25,000
2.	Drilling machine pillar	1 No.	1"	10,000
3.	Tools Grinder (Electric) double wheel	1 No.	6"	2,000
4.	Arc welding Plant with Accessories	1 No.	400 Amp 440 Volts	12,000
5.	Gas welding & cutting set complete with Oxygen Acetylene cylinders, with tools etc.	1 No.		5,000
6.	Battery charger set	1 No.	6-12 Volts Battery	3,000

2800/4

7.	Air compressors with accessories	1 No.	60 cuft	3,000
8.	Vulcanising Equipment			2,000
9.	Car washer m/c with water pump and double gun with hoze pipe (Teccalmiter equivalent make)			8,000
10.	Servicing Ramp (Cement and brick mortar constn.)			2,000
11.	Nozzle Tester	1 No.		1,000
12.	Chain pulley Block with Tripod, derrick 3 Ton	1 No.		3,000
13.	Heavy duty tool kit, comprising of box spanner, ring spanner, double and spanner sets, hammers 2 & 5 lbs. assorted files 6' to 14" Torque wrenches, guages, bench-vice, feller guage, thread guages, pullers valve lifter, stud puller hydraulic jack			9,000

*contingencies @ 3%

Total
Say Rs

1,00,000

3,00,000

4,00,000

Rs 4 lakhs

Types of jobs to be attended to in the above Divisional Workshop

1. Servicing and maintenance
2. Adjustment of various components
3. Replacement of assemblies and parts
4. Top overhaul of engine
5. Various welding jobs
6. Battery charging
7. Vulcanising of tubes
8. Manufacture of certain categories of belts and nut bushes and other scarce of items of spares

2800.3.

No. RM-24 (6)/78

Dated the 26th May, 1978

To

The Pay and Accounts Officer, Ministry of Shipping and Transport (R.W.), IDA Building,
New Delhi

Subject : Procurement of Additional Mobile Workshops for repairs and maintenance of Road Construction machinery for National Highway works

In partial modification of this Ministry's letter of even number dated the 15th April 1978 on the subject noted above, I am directed to say that the Statewise allotment of Mobile Workshops out of additional 20 Nos. being procured has been revised. A revised statement of Statewise allocation of Mobile Workshops is forwarded herewith which may be substituted for the earlier statement enclosed with this Ministry's letter referred to above.

Copy also forwarded to :

- (1) The Secretary to the Govt. of-Public Works Depaterment,—Nos. of Mobile Workshops have been allocated to your State and an indent will be placed shortly by the Ministry.
- (2) Chief Engineer/Addl. Chief Engineer (NH) of respective State.—Nos. of Mobile Workshops have been allocated to your State and an indent will be placed on DGS&D shortly by the Ministry.
- (3) Accountant Generals of respective States.

MODIFIED STATEMENT TO BE SUBSTITUTED FOR THE STATEMENT SENT WITH THE MINISTRY'S LETTER DATED THE 15TH APRIL, 1978

STATE-WISE ALLOTMENT OF MOBILE WORKSHOPS OUT OF ADDITIONAL 20 NOS. BEING PROCURED

Sl No.	Name of State	Qty. of Mobile Workshops		Remarks
		Existing No.	Being allocated No.	
1.	Andhra Pradesh	—	1	
2.	Assam	—	2	
3.	Bihar	2	2	1 No. will be transferred for Gujarat.
4.	Gujarat	4	—	3 Nos. surplus as per assessment made in the Ministry.
5.	Haryana	—	1	
6.	Himachal Pradesh	—	1	1 No. will be transferred from Gujarat.
7.	Karnataka	—	1	
8.	Kerala	—	1	
9.	Madhya Pradesh	—	1	
10.	Manipur	—	1	
11.	Meghalaya		1	
12.	Orissa	2	—	1 No. surplus as per assessment made in the Ministry.
13.	Punjab	—	1	
14.	Rajasthan	2	1	
15.	Tamil Nadu	—	2	
16.	Uttar Pradesh	—	2	Besides this, 1 No. will be transferred from Gujarat.
17.	West Bengal	—	2	Besides these, 1 No. will be transferred from Orissa.
Total :		10	20	

- NOTE :** 1. Gujarat has 4 Nos. mobile workshops. As per assessment 3 Nos. are surplus to their requirement and these will be transferred as mentioned in remarks column above to U.P., Bihar and Himachal Pradesh.
2. Orissa has 2 Nos. mobile workshops. As per assessment, 1 No. is surplus to their requirement and this will be transferred as mentioned in remarks column above to West Bengal.

STATEMENT SHOWING STATEWISE POPULATION OF CENTRAL MACHINES WITH THEIR COST, WORKSHOP FACILITIES NEEDED/EXISTING & ADDITIONALLY REQUIRED, COST OF WORKSHOPS AND RECURRING EXPENDITURE

Sl. No.	State	Quantity of central equipment allocated in Nos.	Approximate cost of equipment (Rs lacs)	Workshop facilities required as assessed			Workshop facility existing			Addl. workshop facilities required			Remarks
				Mo- bile Nos.	Central Nos.	Divi- sional Nos.	Mo- bile	Central	Divi- sional	Mo- bile	Central	Divi- sional	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Andhra Pradesh	34	21.17	1	—	1	—	—	—	1	—	1	
2.	Assam	787	352.45	2	1	2	—	—	1	2	1	1	
3.	Bihar	1505	714.05	5	2	5	2	1	5	3	1	—	
4.	Gujarat	488	189.92	1	—	2	4	—	2	* (-3)	—	—	* To be transferred
5.	Haryana	23	30.25	1	—	1	—	—	—	1	—	1	
6.	Himachal Pradesh	50	31.23	2	—	—	—	—	—	2	—	—	
7.	Jammu & Kashmir	2	2.00	—	—	—	—	—	—	—	—	—	
8.	Karnataka	24	34.67	1	—	—	—	—	—	1	—	—	
9.	Kerala	21	30.25	1	—	—	—	—	—	1	—	—	
10.	Madhya Pradesh	37	40.74	1	—	1	—	—	—	1	—	1	
11.	Maharashtra	54	20.70	—	—	1	—	—	—	—	—	1	
12.	Manipur	17	13.30	1	—	—	—	—	—	1	—	—	
13.	Meghalaya	10	7.00	1	—	—	—	—	—	1	—	—	
14.	Nagaland	1	2.00	—	—	—	—	—	—	—	—	—	
15.	Orissa	126	60.50	1	—	1	2	—	—	(-1)	@—	1	@ to be transferred
16.	Punjab	86	61.23	1	1	—	—	—	—	1	1	—	
17.	Rajasthan	508	269.20	3	1	1	1	—	—	2	1	1	
18.	Tamil Nadu	83	125.15	2	1	—	—	—	—	2	1	—	
19.	Uttar Pradesh	896	361.54	3	1	6	—	1	6	3	—	—	
20.	West Bengal	836	300.55	3	1	3	1	—	1	2	1	2	
Total		5588	2778.20	30	8	24	10	2	15	24-4 =20	6	9	

2910 GRANT OF LOAN ASSISTANCE FOR MACHINERY

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2910.1.	RM-1 (2)/72 dt. 15.7.72	Purchase of Road Making Machines for Central Works Conditions etc. for Loan	2910/1

TERMS AND CONDITIONS OF LOAN

No. RM-1 (2)/71

Dated the 15th July, 1972

To

The Secretary to Government, P.W.D., Maharashtra/Andhra Pradesh/Tamil Nadu/Himachal Pradesh/Punjab/Kerala

Subject : Purchase of road-making machinery for execution of Central Works-Grant of loan

I am directed to refer to this Ministry's letter of even No. dated 25th February 1972 informing you of the approval of Government of India, in principle, to the proposal for grant of loan to the State Government for purchase of machinery for Central works, and to say that the loan will be subject to the following conditions :

- (1) The loan will be payable only after firm purchase arrangements have been made. In this connection your attention is invited to this Ministry's letter of 25th February 1972 referred to above wherein the State Government have been requested to forward to this Ministry their proposal detailing the items of machinery sought to be purchased and their number with due regard to their requirement for central works and Central equipment if any already allotted to your State. The State should have such proposal approved immediately as it shall be only after such approval has been obtained that the State Government shall really become entitled to place firm purchase orders on the suppliers. A copy of the purchase order together with the confirmation of the supplier to comply with the order will be sent to this Ministry for considering issue of sanction for release of funds.
- (2) The loan will carry an interest of 5% per annum or such rate as may be fixed by the Government of India from year to year in respect of loans granted to the State Governments.
- (3) The loan will be repayable in 25 years in equal annual instalments together with interest on the outstanding balance. The amounts annually payable (by way of principal and interest) would be paid in four equal instalments on 1st July, October, January and March each year. The loan would be deemed to have been drawn as on 1st October of the year in which the loan is sanctioned irrespective of the fact whether the loan has been sanctioned prior to that date or after that date. In case there is more than one loan during the same year, these loans would be consolidated and deemed to have been drawn as on 1st October as indicated above. A rebate of ¼% will be admissible for timely payment of principal and interest.
- (4) The repayment of loan will commence from the first anniversary date of its drawal and not in lump on the expiry of the period of loan.
- (5) In the event of any default in repayment of loan and/or payment of interest, a penal rate of compound interest @ 2½% per annum would be charged over and above the rate of loan interest upon all overdue instalments of principal and/or interest from the due date of payment to the actual date of payment.
- (6) The State Government shall furnish the details of machinery purchased from this loan and details of expenditure incurred thereon duly verified by Audit, in course of time.
- (7) The State Government shall at all times maintain and keep in good order and repair all machineries and accessories thereto at their own cost.
- (8) For the use of these machines on Central road works, the State Government shall be entitled to debit the usage charges against the approved Central works estimates at rates based on the formula supplied with this Ministry's letter No. IDA/W-25 (10)/63, dated the 8th October (copy enclosed) addressed to the States of Bihar, Orissa, West Bengal and Maharashtra, subject to such revision as may be made by the Government of India from time to time.
- (9) The State Government will ensure that the machinery and equipment bought with the loan are actually earmarked and used for Central Road and bridge works as long as Central schemes or Centrally operated schemes are available and require the use of the machinery or equipment purchased out of this loan. Only if such works are not available at any time, such machinery could be used for State Government's works.
- (10) In regard to conditions 7, 8 and 9 the State Government shall furnish all information, reports and returns which the Government of India may, either generally or specially, prescribe in this regard and shall allow access and facility and assistance for inspection as may be required by Government of India or any of its officers so authorised in this regard.
- (11) No machinery or accessory thereto shall be disposed of in any manner so long as the loan or any part thereof remains unpaid by State Govt.
- (12) The State Government shall not use the loan for re-lending to their industrial or commercial undertakings but shall utilise it entirely for the purchase of road building machinery required for execution of Central works.

2. The loan will not be paid in cash but adjusted against monthly Plan Ways and Means advances sanctioned by the Plan Finance Division of the Ministry of Finance.

3. The Government of— are requested to communicate their acceptance of the conditions mentioned above before the loan is formally sanctioned.

2920 PROCUREMENT OF ADDITIONAL SPARE PARTS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2920.1.	RM-3 (51)/70 dated 19.2.71	Procurement of additional Spare parts required for Central Machines—Procedure	2920/1

2920.1.

No. RM-3 (51)/70

Dated the 19th February, 1971

To

The Secretary to the Govt. of Assam/West Bengal/Bihar/Uttar Pradesh/Madhya Pradesh/Orissa/
Maharashtra/Gujarat/Rajasthan/Punjab, P.W.D.

Subject :- Procedure for the procurement of additional spare parts required for the maintenance and repairs of machinery purchased out of Central Funds for the execution of I.D.A. Project, Emergency Works, Lateral Road Works and Strategic Road Works

Although Government of India had purchased several specialised items of road/bridge building equipments out of Central Funds and made available to the State Public Works Departments for the execution of projects like the emergency works, I.D.A. works, L.R.P. works and the strategic road works, it appears that adequate timely action is not being taken for the procurement of additional spare parts for the proper repair, maintenance and operation of these equipments. As you are aware, spare parts to the extent of 20% of the cost of the main equipments had already been supplied but it is observed from sporadic reports and discussions with technical officers that additional spare parts, are, in several cases, necessary and should have been procured in time. It is also seen that the State P.W.Ds. have either been purchasing some spare parts as and when required by them or are now making ad hoc references. This is being done without any advance proper planning to assess the requirement of these spare parts and the mode of obtaining these specially for the imported equipments. Therefore, with a view to streamline action for procurement, the following procedure is laid down for guidance and further action by the State Public Works Department at their end :

- (i) The requirements for additional spare parts for the maintenance, repairs and operation of Central Govt. machinery, which are with State Public Works Departments, should be assessed primarily by them (State P.W.Ds) and planned well in advance so that these spare parts are available when they are actually needed.
- (ii) The indigenous spare parts should be procured by the State P.W.Ds. directly against the Directorate General Supplies & Disposals; rate contracts, wherever available (as Direct Indenting Officers) and from other sources, when not available against Directorate General of Supplies and Disposals rate contracts, according to their local purchase rules.
- (iii) Spare parts of imported origin could also, like-wise be obtained against Directorate General of Supplies and Disposals rate contracts wherever available. In case, there is any difficulty about the procurement of such parts of imported origin, against Directorate General of Supplies and Disposals rate contracts, D.G.S. & D. should be kept informed and full details should be furnished to this Ministry well in time for further action to procure actual users' licences/foreign exchange as the case may be.

2. The cost of the spare parts may be debited to the repair estimates sanctioned by this Ministry for which advance steps may be taken by furnishing full details. In case, spare parts are immediately required and the repair estimates have not been prepared and sanctioned, the cost may be initially charged to the Suspense Stock A/c of the State Public Works Departments but debited to the repairs estimates when the same are sanctioned by this Ministry.

3. I am to request you that the procedure outlined above may be brought to the notice of all concerned for their information and guidance.

2930 ACCIDENTS TO CENTRAL MACHINES

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No</i>
2930.1.	RM-RMP-11(3)/80 dt. 24.12.83	Accident to Central Machines— Procedure for Reporting & Repairs/Disposal	2930/1

No. RW/RMP-11 (3)/83

Dated the 24th December, 1983

To

All the State Chief Engineers (dealing with NHs)

Subject : Accident to Central machines-Procedure for reporting and Repairs/Disposal

During the execution of National Highways works by the State PWDs with the help of machines supplied to them by this Ministry, sometimes accident to the Central plant and equipment take place, while these are parked on the road side or in transit from one location to another, etc.,. In such cases, the State PWDs do follow their own rules and procedures for reporting the accident and further follow up action. However, sometimes the preparation of repair estimates and carrying out the repairs to the accidented machines remains in doubt. With the view to regulate the reporting repairs and disposal of accidented machines and for uniform action in this regard by all the State PWDs, the following guidelines are issued :

When accident takes place on Highway .

- (1) As and when any accident takes place involving damage to the machines/injury to the operating staff, necessary F.I.R. should be lodged with the nearest Police Station by the Section Officer or the Asstt. Engineer incharge of the machine.
- (2) The concerned Officer incharge of the machine involved in the accident should immediately report the matter to the State Chief Engineer with a copy to Regional SE (M) of this Ministry, giving details of accident i.e. time of accident, place of accident, nature of accident, details of damages/injuries etc., within 24 hours of the occurrence of the accident.
- (3) After the preliminary investigation by the police permission should be obtained from Police authorities for removal of the machine to a safer place, and it should then be immediately shifted to remove blockage of traffic, if any.
- (4) Irrespective of the Police investigation, the concerned Executive Engineer should order a Departmental Enquiry and depute an Officer to investigate the cause of the accident and submit a complete report of the accident to the State Chief Engineer within one month. This investigating Officer may record statements of concerned persons present at site and those involved in the accident and enquiry report should accompany the same. The Enquiry Officer should also examine the extent of damage to the machines alongwith rough cost of damage and indicate the same in his report.
- (5) Based on the Departmental Enquiry, the State Chief Engineer should send a report on the accident to the Ministry with copy to Regional SEs (Mech.) concerned.
- (6) In case there is minor damage to the vehicle/equipment which can be repaired and the machine can be brought to operational condition, necessary estimate for repairs of such machines may be prepared and sent to Ministry's Regional SE (Mech.) for sanction supported with a copy of the enquiry report as stated at para (4) above. On receipt of the sanction from the Ministry, State may go ahead with the repair of the machines without awaiting final report of the police authority or court as the case may be.
- (7) Accident which involves court case the matter should continue to be pursued with the Police Authority/Court till finalisation of the case and further action taken as per court orders regarding recovery of cost of damage, etc.
- (8) In case, where due to accident extensive damage is caused to the machine, audit becomes beyond economical repairs, a Board of Officers (Committee) may be asked to investigate the cause of damage and survey report of the same alongwith Police report and committee's report may be sent to this Ministry for approval and for ordering disposal.

When Accident occurs at a place other than Highway e.g., Workshop, at work site, etc.,

- (1) In such cases para (1), (3) and (7) above, will not apply and the rest procedure will be same.
- (2) The Departmental Enquiry referred to at (4) above should also go into the aspect of fixing responsibility of the person(s) concerned, if any.

You are, therefore, requested to kindly bring the above guidelines/procedures to the notice of all concerned Officers for implementation.

2940 DISPOSAL OF MACHINERY TO STATE P.W.D.

<i>Code No</i>	<i>Circular No & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
2940.1.	RM-1 (4)/71 dt 24.8.73	Procedure for Disposal of Central Machines to State Government	2940/1

No. RM-1(4)/71

Dated the 24th August, 1973.

To

The Secretary to the Govt. of Assam/Bihar/Gujarat/Himachal Pradesh/Madhya Pradesh/Maharashtra/Orissa/Punjab/Rajasthan/Uttar Pradesh/West Bengal

Sub : Disposal of Central Government Road and Bridge Making Machinery to State Governments

As the State Governments are already aware some road/bridge construction machinery were purchased out of Central Funds and supplied to the State P.W.D. for execution of works relating to I.D.A., L.R.P., Emergency, Strategic road and other Centrally financed works. It is now proposed to retain the ownership of only heavy, sophisticated and allied equipments with the Ministry and dispose of the remaining equipments to the States. The list of such machinery presently with your State/that are intended to be disposed of is enclosed. It is proposed to meet the demand of your State, for these machines, in the first instance before considering the demands of other needy States, in order to avoid shifting the equipment from one State to another which will also be uneconomical and involve liability of damage/shortage in transit.

2. Disposal of these machines will be at the book value, on "as is where is" basis and on the basis of demand being received from you in time. The book value will be the purchase cost at site if the machinery is sold without any use or the depreciated cost on the basis of actual number of hours worked.

3. The sale of these equipments would be on the basis of sale value being treated as loan assistance to the State that will be extended by this Ministry on receipt of the State Government's request for price adjustment being made in this manner. This loan is to be repaid by the State Government and the same will be governed by the following terms and conditions :

- (i) The equipment shall be utilised by the State for the execution of Centrally financed works on the basis of usage charges being debited against Central projects.
- (ii) These shall be used on State Works, only when specially permitted by this Ministry, after ascertaining that the requisite quantum of work for the use of the machinery is not available in the State for execution of Centrally financed works.
- (iii) As and when there may be any special or emergency requirement for such equipment, the Central Government should be entitled to withdraw and utilise them in such manner as found necessary by them on the basis of usage charges for their such utilisation being duly credited to the State account.
- (iv) The items of machinery for which transfer orders may have been issued earlier, in favour of the State, for the execution of Central Works in Fourth Plan, will also be governed by these terms and conditions.
- (v) The loan will be deemed to have been paid to the State Govt. only after firm purchase settlement has been made and transfer of such equipment to the State Government effected. The loan would be deemed to have been drawn as on First October of the year in which the firm purchase settlement has been made and transfer of equipment to the State Government effected irrespective of the actual date of such transfer.
- (vi) The loan will carry an interest of 5% per annum or such rate as may be fixed by the Government of India from year to year in respect of loans granted to the State Government.
- (vii) The loan will be repayable in 5 (Five) years in equal annual instalments together with interest on the outstanding balance commencing from the first anniversary of its deemed date of drawal. A rebate of ¼% in interest rate will be admissible for timely payment of principal and interest.
- (viii) In the event of any default in repayment of loan and/or payment of interest, a penal rate of compound interest at the rate of 2½% per annum would be charged over and above the rate of loan interest from the due date of payment to the actual date of payment.
- (ix) The State Government shall at all times maintain and keep in good order and repair all machines and accessories thereof at their own cost.
- (x) For the use of these machines on Central/Centrally sponsored works, the State Government shall be entitled to debit the usage charges against the approved Central works estimates at rates based on the formula contained in this Ministry's Circular letter No. IDA/W-25(10)/63 dated the 28th December, 1965 (copy enclosed), subject to such provision as may be made by the Government of India from time to time. The accounts in respect of the same may be properly maintained and kept ready for inspection by Officers of this Ministry at any time. The log Book and History sheets are also to be maintained by the State Government for the Plant transferred to them in the manner explained in this Ministry's circular letter No. IDA/W-25(10)/63 dated the 8th October, 1964 (copy with its enclosures enclosed) and all the documents relating to the use and maintenance of equipment will be opened to inspection at any time by the representative of this Ministry.
- (ix) In regard to conditions (ii), (ix) and (x) the State Government shall furnish all information reports and returns which the Government of India may either generally or specially, prescribe in this regard and shall allow access and facility and assistance for inspection as may be required by Government of India or any of its officers so authorised in this regard.

2940/2

(xii) No machinery or accessory thereof shall be disposed of by any manner so long as the loan or any part thereof remains unpaid by State Government.

5. You are requested to send your State's requirements, afresh for the sale transfer of the machinery as per list attached on the terms and conditions referred to above, latest by the 15th September, 1973 to enable this Ministry to consider the same for issue of necessary orders for release of the machinery, so that the same can in future be utilised on works on the above described basis.

Encls : Not printed.

3100 ROADS

<i>Code No.</i>	<i>Circular No. & Date.</i>	<i>Brief Subject</i>	<i>Page No.</i>
3100.1.	NH III-33 (90)/72 dt. 24.8.73	Quality Control on NH Works & Other Centrally Financed Works	3100/1
3100.2.	NH III-33 (90)/72 dt. 9.1.74	Quality Control on NH/Other Centrally Financed Works	3100/2
<u>3100.3.</u> <u>3200</u>	NH III/P/16/75 dt. 17.3.76	Quality Control on NH and Other Centrally Financed Road Works	3100/2
3100.4.	NH-III/P/16/75 dt. 28.6.76	Proper Control over the quality of Crushed Stone Aggregates	3100/4
<u>3100.5.</u> <u>170</u>	CRF/IRC/18 dt. 26.2.81	Setting up of a Research Development & Quality Promotion Cell at the Headquarter office at the CE in each State out of Central Road Fund (Allocations) Account	See Code No. 170
<u>3100.6.</u> <u>3200</u>	NHIII/P/1/83 dt. 19.4.84	Quality Control on NHs and other Centrally Sponsored Works	3100/4
<u>3100.7.</u> <u>170</u>	RW/NHIII/Coord/33/84 dt. 5.5.84	Recommendations of the Vohra Committee—Setting up of Traffic Engineering Cell, R & D, Monitoring Material Management & Quality Control Cell in States	See Code No. 170
3100.8.	D.O. No. NHIII/P/12/82 dt. 15.6.84	Quality Control in Bituminous Construction	3100/17
3100.9.	NHIII/P/20/83 dt. 27.7.84	Use of Quality Control Equipment with I.S.I. mark-regarding	3100/18
<u>3100.10.</u> <u>121.3</u>	RW/NHIII/P/20/83 dt. 18.12.84	Guidelines on Utilisation of the 1% Provision Allowed in the NH Work Estimates for Quality Control	See Code No. 121.3
<u>3100.11.</u> <u>170</u>	NHIII/P/1/83 dt. 28.5.85	Quality Control on NHs and other Centrally Sponsored Schemes—Staffing pattern for Testing Laboratories	See Code No. 170

No. NHIII-33 (90)/72

Dated, the 24th August, 1973.

To

All Chief Engineers of State Public Works Departments and Union Territories dealing with National Highways

Sub: Quality control on National Highway works and other Centrally financed works like Strategic Roads

During the last decade there has been a rapid increase in traffic and load intensities on National Highways, and the trend is towards a further increase in the subsequent Plan periods. Due to this, demand has grown for a more efficient performance of the National Highway facilities and a better level of service for the road users. A pre-requisite for this is that adequate quality control may be exercised during execution of the works. The present system of controls through sensory checks has already proved inadequate and been responsible for failures/faulty construction in several cases. This has to give way to an improved system based on objective and qualitative measurements carried out by staff exclusively set up for this purpose. Besides more economical utilisation of materials, this will result in a significant reduction in user costs. The subject of quality control has figured at the earlier Chief Engineers' meetings, for instance the meeting held at New Delhi in June, 1971, and even at subsequent meetings.

2. To meet the extra cost of quality control a separate percentage provision is being allowed in all National Highway estimates being sanctioned presently. This provision is meant to cover the cost of quality control staff, cost of equipment and testing, and the miscellaneous recurring expenses of the quality control teams. State Chief Engineers are requested to ensure that the requisite quality control staff, with needed equipment, is placed in position as soon as the execution of any National Highway project or Centrally financed work like Strategic Road begins. Exact set-up of the quality control organisations in the States will depend on the nature and size of the project and departmental set-up of the State PWD concerned. But, broadly, the quality control units should be independent of the execution staff and work under the technical direction of the Central Laboratory/Chief Engineers' headquarters office. A suggestion to this effect was contained in the model set-up for State PWDs discussed at the Chief Engineers' meeting at New Delhi in June, 1971. No doubt, results of the quality control tests would be regularly and promptly fed by these units to the site staff as the latter will have the prime responsibility for ensuring good quality of construction. So that full benefit is reaped from the presence of quality control units, the construction staff must be directed to take urgent note of the results communicated to them for any corrective action necessary. Where there is persistent trouble in achieving the desired quality, the matter should be brought to the notice of Regional Offices of the Ministry as to any modifications required in designs, specifications or the process of construction. To this effect, Ministry's Regional Offices are being asked to maintain a close liaison with the State PWDs.

3. The tests to be performed by the quality control units, and their frequency, should be in accordance with accepted norms in which respect the Ministry's Specification for Road and Bridge Works/IRC Handbook on Quality control, both of which have been published, should be referred to. It may be recalled that copies of the Draft Handbook on Quality Control had been circulated among State Chief Engineers by Member—Secretary of the IRC Quality Control Committee earlier in August, 1971. Now the final version of the Handbook having been published the same should be followed. It is highly important, and an essential requirement, that results of quality control tests should be properly recorded regarding the same as a very important record supposed to be well preserved, of course results of these tests being regularly fed to the construction supervisory staff as also to the senior officers in-charge of quality control teams in the Central Laboratory or Chief Engineer's headquarters office as mentioned in the foregoing paragraph. These senior officers in-charge of the quality control units should constantly see to the proper evaluation of the test results so that immediate notice is taken of results showing any deficiency in construction compared to the specifications/designs provided for so that prompt action is taken to tackle such situations. These records of test results should also be made available for reference to the inspecting officers from the Ministry's (Roads Wing) headquarters office as also from its Regional Offices when required. Ministry's officers are also requested to be afforded the necessary facilities during their visits to works of observing the actual carrying out of any quality control tests by the State PWD quality control teams.

4. Since the Ministry attaches great importance to the measures taken for improving quality of construction both on National Highway and Centrally financed works like Strategic Roads, it is requested that action being taken in this respect may be intimated to us.

No. NHIII-33 (90)/72

Dated the 9th January, 1974

To

All Chief Engineers of State PWDs and Union Territories dealing with National Highways

Sub: Quality control on National Highway/other Centrally financed works

The need for strict quality control on National Highway/other Centrally financed works has been stressed by this Ministry at various occasions in the past. Attention is invited in this connection to the circular letter of even No. dated the 24th August, 1973, copy enclosed for ready reference.

2. In addition to the points made in above-referred circular, you are requested to take the following steps so that the National Highways and other Centrally financed highway development and improvement works are executed to specified desired qualitative standards as durable investments and are able to offer a better level of service to the roadusers :

- (i) Field officers at designated levels should be instructed to approve and certify the work as having been correctly executed at different stages of execution namely, embankment, subgrade, sub-base, base course and wearing course etc. for road work, foundations, substructure, superstructure, wearing coat etc. for cross-drainage culverts, before construction proceeds further from one stage to the next;
- (ii) Record of the test results observed by the quality control teams should be kept at site apart from copies kept in different offices so that it is available to the inspecting officers of the State PWD/Ministry of Transport; and
- (iii) Officers from the Regional Offices of the Ministry, who are being asked to intensify their inspections, should be afforded all possible cooperation to check the record of quality control measurements and verify these by additional tests in their own presence, if necessary.

3. It is requested that the contents of this circular may be brought to the notice of the Officers in your Department engaged on National Highway/other Central works.

No. NHIII/P/16/75

Dated the 17th March, 1976

To

All State Governments & Union Territories, Governments Departments dealing with National Highways

Sub: Quality control on National Highways and other Centrally Financed Road Works

In continuation of earlier instructions issued vide this Ministry's letters No. NHIII-33 (90) 72 dated 24th August, 1973, 9th January 1974 and 8th May, 1974 on the subject mentioned above. I am directed to issue elaborated/argued instructions as below :

2. During the last decade there has been a rapid increase in traffic and load intensities on National Highways, and the trend is towards a further increase in the subsequent plan periods. Due to this, demand has grown for a more efficient performance of the National Highways facilities and a better level of service for the road users. A pre-requisite for this is that adequate quality control may be exercised during execution of the works. The present system of controls through sensory checks has already proved inadequate and been responsible for failures/faulty constructions in several cases. This has to give way to an improved system based on objective and qualitative measurements carried out by staff exclusively set up for this purpose. Besides more economical utilisation of materials this will result in a significant reduction in user costs.

3. To meet the extra cost of quality control a separate percentage provision is being allowed in all National Highways estimates being sanctioned presently. This provision is meant to cover the cost of quality control staff (besides that covered by agency charges) cost of equipment and testing and the miscellaneous recurring expenses of the quality control teams. State Chief Engineers are requested to ensure that the requisite quality control staff, with needed equipment, is placed in position as soon as the execution of any National Highway project or Centrally financed work like Strategic Road begins. Quality control staff should preferably be recruited on permanent basis and trained properly and equipped with the full range of equipment to perform the prescribed test. Exact set-up of the quality control organisations in the States will depend on the nature and size of the project and departmental set up of the State PWD concerned. But broadly, the quality control units should be independent of the execution staff and work under the technical direction of the central Laboratory/Chief Engineers' headquarters office. No doubt results of the quality control tests would be regularly and promptly fed by these units to the site staff as the latter will have the prime responsibility for ensuring good quality of con-

3200 BRIDGES

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
3200.1.	W-III-58 (2)/57 dated 17.6.67.	Strength of Concrete in Bridges on NHs	3200/1
<u>3200.2.</u> 3100	NH-III/P/11/75 dated 17.3.76	Quality Control of NH Works	See Code No. 3100
3200.3.	NHVI-50 (20)/77 dated 27.9.77	Instructions regarding Quality Control of Works-Responsibility of Officers	3200/2
3200.4.	N-25/UP/717/W dated 1.3.78	Casting and Testing of Concrete Test Cubes for NHs and other Centrally Spon- sored work	3200/6
<u>3200.5.</u> 3100	NHIII/P/1/83 dated 19.4.84	Quality Control NH Works.	See Code No. 3100

No. WIII-58 (2)/57-LR

Dated the 17th June, 1967

To

All State Chief Engineers

Sub : Strength of Concrete in Bridges on National Highways

It has come to notice that in the construction of Bridges the concrete cubes tested from some of the beams did not attain the specified strength. The cubes and the beams had not been marked properly and proper records were not maintained with the result that it was not possible to identify the beams, which had weak concrete. Obviously, this is not a desirable state, and Departmental instructions should be issued to ensure that proper records are kept which would enable the site engineers to identify the portions of the structures containing concrete which does not comply with the prescribed standards, especially in the case of bridges on National Highways. The following suggestions are offered for adoption as the basis of suitable instructions, but these can be modified or amplified as you consider fit.

2. Whenever test cubes are cast, they should be suitably numbered and there should be corresponding markings on the individual components, or portions of the components, to enable the identification of the unit from which the sample for test cubes was obtained. Alternatively, a detailed description of the structural member or the portion thereof from which the sample of concrete was taken, should be entered in a register. Also, the sampling of concrete and testing of cubes should be done with the full knowledge of the contractor and this fact should be clearly noticeable from the records.
3. Whenever the results of the cube tests carried out after three or seven days show a strength which is not satisfactory, the Engineer in charge of the bridge work should draw the attention of the contractor in writing to the possibility of the concrete not attaining the prescribed standards at the end of 28 days. He may also be warned that it may be inadvisable to proceed further with the work as the 28 day strength of concrete may show sub-standard results, entailing the work done becoming liable to rejection. As soon as the 28 day results are available another notice should be given to the contractor if the prescribed standard strength has not been attained. The unit of which the sub-standard work forms part should normally be rejected.
4. When cube tests persistently point to a concrete strength lower than that specified, a change in the preparations of concrete for subsequent batches must be given serious thought.
5. In case, however, the concrete strength falls below that demanded in the contract but its use can be permitted under Clause 303.3.7 of the I.R.C., Bridge Code Section III, the unit may be accepted at the discretion of the Chief Engineer, and the information that it complies with the Code should be placed on record. A copy of the decision should also be sent to this office so that on any future date when evaluating the strength of the bridge, this fact may be given due consideration.
6. It may be difficult to lay down specifically at the time of issuing the tenders a scale of charges which would enable the reduction in prices to be worked out for any substandard work which is accepted. The reduction in price will have to be determined by the Chief Engineer according to the circumstances of the case, and, if necessary, in consultation with the concerned Financial Adviser of the State. The contractor has always the option of replacing the concrete if he does not agree with the price reduction offered.
7. It should be made clear to the site staff as also to the contractors that the sampling of concrete and making, curing and testing of cubes should be done most carefully and that it will not be permissible to attribute the low strength of concrete obtained on cube test, to defects in the method of sampling and testing cubes.
8. The Notice Inviting Tenders should be so framed that it is impossible to give effect to the procedure suggested above without any difficulty.
9. A copy of the instructions on the subject that you might issue may please be sent to this office for information.

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 or 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).

3200.4

No.N-25/UP/717/W

Dated the 1st March, 1978

To

The Chief Engineers/Addl. Chief Engineers of all State P.W.Ds. and Union Territories dealing with National Highways and other Centrally Sponsored Works

Sub: Casting and testing of concrete test cubes for National Highways and other Centrally Sponsored Works

In one of the major National Highway bridge works currently in progress in the country, it was noted that most of the steel moulds being used at site for the casting of concrete cubes were deformed in one way or the other and did not conform to the required specifications. Apparently, by the hammering of moulds at the sides at the time of casting, the sides had bulged inside and further some of the moulds had also suffered a lateral distortion. Clearly, these deficiencies in the moulds will be reflected in the strength of the concrete cubes cast in those moulds and the strength values so obtained will not be representative of the concrete actually used on the job and cannot be taken as reliable. It is, therefore, very essential that the moulds are checked up at frequent intervals and are made to conform to the standards prescribed in IS : 516.

2. It is equally important that the standard procedure given in the aforesaid IS Code is strictly followed in the preparation of the test cubes, their curing etc. The testing machine should also be recalibrated at regular intervals so that any defect in the machine will be detected in time. Further, it will be a good practice if instead of testing all the cubes on only one machine at the site, some of the cubes selected at random are got tested at one of the established testing laboratories nearby so that results can be compared.

4110 MAINTENANCE NORMS & SCOPE

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
<u>4110.1</u> 4310.	NHI/40 (2)/68 dated 10.4.69	Monetary Limits up to which Expenditure on petty & misc. items of works pertaining to NHs ordinarily called as new works, can be charged to repairs	4110/1
4110.2.	NHI-41 (6)/69 dated 24.7.69	Final Report of the Technical Group set up by the GOI regarding norms for Maintenance of National & State Highways (1968)	4110/1
4110.3.		Formulation of norms for Maintenance of Lower Category Roads Viz. Major District Roads other District Roads & Village Roads	4110/11
4110.4.	NHIII-31 (12)/73 dt. 18.6.74	Norms for Maintenance of NHs—Revision of	4110/25
4110.5 142.	NHIII/33 (50)/72 dated 12.3.76	Improvement & Maintenance of Inspection Bungalow and Rest House on NHs.	4110/26
<u>4110.6</u> 4310.	NHIII/P/16/76 dt. 17.3.76	Acceptance of Central Financial Liability for the Development/ Maintenance of Urban Road links of NHs.	— do —
<u>4110.7</u> 4310.	NHIII/P/13/75 dt. 10.8.76	— do —	4110/31
4110.8.	NHIII/P/13/75 (i) dated 12.8.76	Acceptance of Central Financial Liability for the Development/ Maintenance of Urban Road links of NHs.	— do —
<u>4110.9</u> 702.	NHIII/P/15/75 dated 8.6.79	Charging Landscaping and Arboriculture to Maintenance	See Code No 702
4110.10.	NHIII/Misc/116/79 dt. 30.8.79	Maintenance & Repairs of NHs—Updating of Unit Rates for Ordinary Repairs and Periodical Renewals.	4110/32
<u>4110.11</u> 150.	NHIII/P//11/82 dt. 27.4.84	Payment to Railway authorities for Maintenance of Level Rail crossing on NHs.	4110/33

No. NHI/40 (2)/68

Dated the 10th April, 1969

All State Govts./Administrations except Tripura and Andaman and Nichobar Islands, Departments dealing with roads

Sub: Monetary limits upto which expenditure on petty and miscellaneous items of works pertaining to National Highways ordinarily called as new works, can be charged to repairs

I am directed to invite a reference to memoranda No. B-30 (9)/49, dt. the 14th June '49, from the Consulting Engineer (Roads), Govt. of India to all Provincial Chief Engineers etc. and this Ministry's Circular letter No. WI-43 (13)/60, dt. the 5th May '61, to all State Govt etc. and to say that the monetary limit of Rs 20,000/- under the 'exception' below para 27 (4) of Appendix No. 2 to the Central Public Works Account Code which was fixed in 1961 needs further upward revision in view of general rise in the cost of materials and labour. The Govt. of India have reviewed the position and decided that the present limit of Rs 20,000/- under the 'exception' below para 27 (a) of Appendix No. 2 to the Central Public Works Account Code should be raised to Rs 25,000/-. The revised instructions are reproduced below in consolidated form for information and guidance:

1. Works that can be financed from maintenance and repairs grant:
 - a) The following petty and miscellaneous items of work (which ordinarily should be classed as "new works") upto the prescribed limit of Rs 25,000/- in any one case, provided that the works in question do not, in the opinion of the Superintending Engineer concerned, forms part of any comprehensive scheme or project covered by the works estimate:
 - i) Superelevation at curves.
 - ii) Cutting back a hillside to improve vision at curves.
 - iii) Improvements of alignment or gradients or changes of grade at Irish bridges, or dips, carried out at the time of renewing a surface.
 - iv) Improvement to or reconstruction of the surface or road in some different material where it is desirable to carry out such improvements or reconstruction at the time of renewing a surface.
 - v) The construction or reconstruction of road surfaces in different materials for the purposes of experiment.
 - vi) The construction or remodelling of bridges, causeways, embankments, ferry approach, protective or training works in connection with a road.

Notes: Item (vi) includes replacement of boats and other apparatus connected with ferries.
 - b) Petty works of the following nature (which are considered to be covered by the spirit of the Exception to para 27 (4) of the Central Public Works Account Code) upto the prescribed limit of Rs 25,000/- in any one case, with the prior approval of the Govt. of India.
 - i) Petty survey work, including survey required to complete records relating to land widths, encroachments etc.
 - ii) Demarcation of road boundaries.
 - iii) Traffic surveys for planning of road development.
 - c) Ordinary repairs and maintenance, including surface painting and the necessary addition of stone chips, gravel or sand.
 - d) Widening the formation or carriageway of a road including a drain or culvert and reconstruction a drain or culvert.
 - e) Special Repairs and periodical renewals.
2. Original works taken up for the first time, that cannot be financed from maintenance and repairs grant
 - a) Works involving land acquisition which may otherwise come under items (1) (a) (ii) and (iii) above.
 - b) Provision of asphaltic or bituminous concrete, premix asphalt or bituminous macadam, bituminous grout, bituminous semi-grout, mix-in-place, cement concrete or cement macadam surface.

No. NHI-4(6)/69

Dated the 24th July 1969

FINAL REPORTS OF THE TECHNICAL GROUP SET UP BY THE GOVERNMENT OF INDIA REGARDING NORMS FOR MAINTENANCE OF NATIONAL AND STATE HIGHWAYS (1968)

Page No.

Part I	Composition of the Committee and Terms of Reference....
Part II	Considerations involved in Maintenance of National Highways
Part III	Estimation of Maintenance Costs for National Highways....
Part IV	Norms for Computing Maintenance Costs for State Highways....

PART I**COMPOSITION OF THE COMMITTEE AND TERMS OF REFERENCE****1.1. INTRODUCTION**

For the preservation of the huge public investment in highways, their timely upkeep and maintenance is an inescapable necessity. In so far as Indian Roads go, the problem of maintenance has acquired a fresh colour in recent years as the traffic using the roads has shown a steep climb and this has been to the accompaniment of an all round rise in the cost of materials and labour. Highway maintenance budgets have, however, not risen correspondingly over this period in keeping with these changed conditions. As a consequence there has been a general fall in the maintenance standards and deterioration of surfaces in many cases. With maintenance slipping behind actual requirements, attention has been focussed on the need for enlarged maintenance allotments.

The problem is however, very acute in the case of the National Highways which form the backbone of the country's road system and carry the bulk of the nation's long-distance heavy traffic. The maintenance of National Highways figured prominently at the Transport Development Council meeting held at Bangalore in June 1968 where the consensus was that the maintenance allocations needed to be stepped up in tune with the spiralling traffic and prices of construction. The Council further expressed the view that in order to fix suitable norms for assessing maintenance costs, a small technical group should be set up at the Centre.

1.2. COMPOSITION OF THE COMMITTEE

Pursuant to this conclusion, the Government of India set up a Technical Group of the following composition vide their letter No. NHI-41 (11)/68 dated the 9th July, 1968 (Appendix A) :

Director General (Road Development)	Chairman
Chief Engineer, Haryana	Member
Chief Engineer, U.P.	 "
Chief Engineer, Bihar	 "
Chief Engineer, Mysore	 "
Chief Engineer, Madras	 "
Chief Engineer, Roads Wing	Member Secretary

1.3. TERMS OF REFERENCE

The terms of reference to the Group were as follows:

- i) to suggest suitable norms for assessing maintenance costs; and
- ii) to recommend a formula for the widening of roads from single-lane to double lane carriageway.

1.4. SCOPE OF THE REPORT

This report by the Technical Group relates to maintenance problem of the National Highways and State Highways

1.5. FRAMEWORK OF THE REPORT

The report of the Committee has been divided into four parts as under:

- Part I —Composition of the Committee and Terms of Reference
 Part II —Considerations involved in maintenance of National Highways
 Part III—Estimation of maintenance costs for National Highways
 Part IV—Norms for computing Maintenance costs for State Highways

PART II**CONSIDERATION INVOLVED ON MAINTENANCE OF NATIONAL HIGHWAYS**

2.1. The problem of maintenance of National Highways can be properly appreciated only if factors peculiar to their past development and present use are well understood. The different factors are identified and commented upon in the succeeding paragraphs first before going to a discussion of the components of maintenance and making suggestions for estimation of the cost of these.

2.2. Factors Affecting Maintenance of the National Highways

2.2.1. **Inherent Deficiencies of the Crust:** The National Highway system came into being in 1947 when at one stroke over 12,200 miles of roads belonging to the State Governments or other local authorities were brought within fold of the Central Government. Some of these roads were old through routes like Grand Trunk Road

running from Peshawar to Calcutta and the trunk road between Bombay and Delhi. But many other sections were mere District Board roads replete with deficiencies and having substandard surfaces and temporary or low capacity culverts/bridge crossings National Highway No. 6 traversing Orissa is one example of such roads. The thickness of the road pavements in majority of these newly designated National Highways ranged from barely 6 to 10 inches. As explained later this thickness is far from sufficient for the traffic intensities actually sustained by most of the National Highways Sections. Although in the past two decades a lot of effort has been exerted in the direction of strengthening as many weak sections as possible, the stark facts stares in the face that all the National Highways by and large have only inadequate crust thickness. This inherent deficient factor aggregating the maintenance problem.

The majority of the National Highways have a flexible type of pavement surface. For the purpose of checking if a road is provided with sufficient crust thickness, the most widely used method of flexible pavement design is an empirical method going by the designation California Bearing Ratio Method. This method has been evolved after extensive observation of actual behaviour of thousands of miles of existing roads, situated under varying traffic and climatic conditions, by different road authorities. The minimum thickness of pavement is determined after finding out the strength of the soil in the laboratory at the worst moisture content the subgrade is expected to attain during its entire service life. This parameter of soil strength is known as the C.B.R. value. Curves have been developed correlating the CBR value with pavement thickness/for various traffic intensities. One such set of curves which has emanated from the Road Research Laboratory, U.K. is at Figure I. It will be seen that the range of traffic of these curves is from 0 to over 7,000 commercial vehicles of 30 CWT unladen weight per day.

As mentioned above, for very long lengths in our National Highway System, the thickness of metalling is between 6 to 10 inches only. The average CBR value of the subgrade at the same time is of the order of 3 to 6%. For these values of CBR and the amount of traffic actually plying over the National Highway sections (usually in E curve range) the designed thickness according to CBR design charts works out to between 14 and 19 inches. Thus, there is wide gap in the thickness of crust actually existing and what are to be available. The effect of deficient thickness the surfaces are increasingly showing signs of distress and pavement failures have become common place. As an end result, heavy patch repairs and frequent renewals of surfaces are a common feature of maintenance even for retaining the surface in their present substandard condition.

2.2.2. Preponderance of Single lane Carriageways: Another factor aggregating the maintenance problem of National Highways is that almost 70% of the total mileage belongs to single lane category. In such lengths both passing and crossing manoeuvres of vehicles are made most difficult as the vehicles are forced to frequently get on and off the Central paved width. Barring few stretches most of the National Highways have got only earth shoulders and these get very soon badly rutted under passage of vehicles. The deterioration is even more in the monsoon periods when the softening effect of water is an additional source of destruction causing practically a dislocation of traffic on certain sections of the National Highways.

* Studies carried out by the Road Research Laboratory, U.K. have sufficiently shown that on a single lane road where traffic is about 100 vehicles per day each vehicles has to cross the edge of the running surface about once every two miles. When traffic flow is 100 vehicles per day each vehicle must cross the edge about 5 times every mile and it will be running on the shoulders for approximately a quarter of the time. At the moment about 80% of the single lane sections of the N. Highways (which means about 8,000 miles out of the total length, of about 15,000 miles) are supporting traffic in excess of 1000 vehicles per day. All these sections are, therefore, obviously badly stressed and the side shoulders and edges of the pavement in their case require additional care to keep them traffic worthy.

Another feature of extra strain on single lane roads which does not exist in the case of 2 lane carriageways is the concentration of wheel loads at a particular spot across the transverse width of the carriageway. Experiments conducted elsewhere have demonstrated that this concentration of wheel loads can be of the order of 3 to 4 times than that in the case of two lane roads which should be stronger and fit for 3 to 4 times the intensity of traffic than that on comparable two lane sections. Unfortunately this is not true of the single lane sections of the National Highways.

The preponderance of single lane carriageways, therefore, is a major cause for the fact degenerating maintenance of the National Highways. It will be not out of place to mention that in other advanced countries two lanes of traffic are considered the barest minimum for all arterial roads connecting major centres of population, commerce and industry. In the introduction to the Highway Capacity Manual (3) this requirement has

(*) Road Research Technical Paper No. 76, published by Her Majesty's Stationery Office, U.K.

(") Millard, R.S.: "Road Transport and Traffic in developing countries" Conference on Civil Engineering Problems Overseas 1962, organised by the Institution of Civil Engineers, U.K.

been stressed in following words:

("At least two lanes for traffic movement, one in each direction, represent the minimum Highway installation normally, provided. The decision to provide a two lane highway many times is not justified on demand and capacity requirements alone, but on minimum level of service requirements which justify at least one travel lane in each direction for safety convenience and tolerable operating conditions."

2.2.3. Increase in the Intensity of Traffic: Although the National Highway network constitutes just 21.5% of the country's road system it carries traffic much in excess of its linear share on purely mileage basis. Practically all long distance traffic is concentrated along the National Highways and in it the major component is of the heavily laden commercial vehicles. Therefore, the number of commercial vehicles as per cent of the total traffic is a higher on National Highways than on other roads. The number of commercial vehicles in the traffic stream has a direct bearing on the thickness of pavement requirement.

Further, gross laden weight of vehicles have risen substantially in the course of the past few years. A contributory factor has been the permission granted by the Central Government some years back for an *ad hoc* increase of 25% over the maximum axle weights certified previous to that with the objective of relieving the then occurring serious shortage in the country's goods carrying capacity. The result was that whereas the axle weight did not previously exceeded about 18,000 lbs their limit was increased to over 23,000 lbs. In the recent multi-million dollar AASHO Road Test (4) it has been proved that the destructive effect on pavement of a 22,000 lbs axle load is a little over two times than for a 18,000 lbs axle. In actual practice even overloading beyond this limit is not uncommon. In contract, the axle loads of buses and trucks playing on highways of India in 1940 hardly exceeded 9,000 lbs.

Some of our highways cater for even higher loads when special machinery required for factories has to be transported by road owing to dimensional limitations of the railways wagons. An example of this demand for increasing the permissible loads is the Madras-Navyali Section of N.H. 45 where all the structures had to be reconstructed for the transport of machinery required for Navyali Lignite complex.

Increasing axle loads, therefore, are a major cause of deterioration of the National Highway surfaces.

Apart from this, traffic within the country has increased by leaps and bounds to phenomenal levels in the course of just 10-15 years. This is exemplified by the figures of motor vehicle registrations (5) in the country from 1951 to 1967 reproduced below which show that the vehicle number shot up by three times over this period. The magnitude of this increase is about 8% compound every year.

YEAR	NUMBER OF VEHICLES	INDEX
1950-51	1,59,263	100
1955-56	2,03,184	128
1960-61	3,09,576	194
1961-62	3,39,644	213
1962-63	3,75,396	236
1963-64	3,87,947	243
1964-65	4,28,055	269
1965-66	4,56,793	287
1966-67	4,77,250	299

Maintenance allotments for National Highways have, however, not sympathetically increased over the same period. As a consequence the maintenance operations have been left behind in relation to the requirements generated by heavier and larger number of vehicles.

2.2.4. Increase in Cost of labour and Materials: In the years immediately proceeding there has been an appreciable rise in the cost of labour and materials. But the maintenance grants have not increased at the same pace with the result that it has not been possible to pay the desired amount of attention to National Highways and in the process their riding quality has steadily gone down. The maintenance grants (6) for the past ten years are shown below along with the length of the National Highways in that year and the index number (7) of the wholesale prices:

(3) "Highway Capacity Manual—1965 Highway Research Board, U.S.A., Special Report No. 37.

(4) "The AASHO Road Tests, Special Report No. 61, Highway Research Board, U.S.A., 1962.

(5) *Basic Road Statistics, published yearly by the Ministry of Transport and Shipping, Government of India.

(6) Annual Reports of the Ministry of Transport.

(7) "Records and Statistics" issue of August 1968.

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?
5. 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 $1\frac{1}{2} : 1$?
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 :*
 - (i) 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).

3200.4

No.N-25/UP/717/W

Dated the 1st March, 1978

To

The Chief Engineers/Addl. Chief Engineers of all State P.W.Ds. and Union Territories dealing with National Highways and other Centrally Sponsored Works

Sub: Casting and testing of concrete test cubes for National Highways and other Centrally Sponsored Works

In one of the major National Highway bridge works currently in progress in the country, it was noted that most of the steel moulds being used at site for the casting of concrete cubes were deformed in one way or the other and did not conform to the required specifications. Apparently, by the hammering of moulds at the sides at the time of casting, the sides had bulged inside and further some of the moulds had also suffered a lateral distortion. Clearly, these deficiencies in the moulds will be reflected in the strength of the concrete cubes cast in those moulds and the strength values so obtained will not be representative of the concrete actually used on the job and cannot be taken as reliable. It is, therefore, very essential that the moulds are checked up at frequent intervals and are made to conform to the standards prescribed in IS : 516.

2. It is equally important that the standard procedure given in the aforesaid IS Code is strictly followed in the preparation of the test cubes, their curing etc. The testing machine should also be recalibrated at regular intervals so that any defect in the machine will be detected in time. Further, it will be a good practice if instead of testing all the cubes on only one machine at the site, some of the cubes selected at random are got tested at one of the established testing laboratories nearby so that results can be compared.

No. NHI/40 (2)/68

Dated the 10th April, 1969

All State Govts./Administrations except Tripura and Andaman and Nichobar Islands, Departments dealing with roads

Sub: Monetary limits upto which expenditure on petty and miscellaneous items of works pertaining to National Highways ordinarily called as new works, can be charged to repairs

I am directed to invite a reference to memoranda No. B-30 (9)/49, dt. the 14th June '49, from the Consulting Engineer (Roads), Govt. of India to all Provincial Chief Engineers etc. and this Ministry's Circular letter No. WI-43 (13)/60, dt. the 5th May '61, to all State Govt etc. and to say that the monetary limit of Rs 20,000/- under the 'exception' below para 27 (4) of Appendix No. 2 to the Central Public Works Account Code which was fixed in 1961 needs further upward revision in view of general rise in the cost of materials and labour. The Govt. of India have reviewed the position and decided that the present limit of Rs 20,000/- under the 'exception' below para 27 (a) of Appendix No. 2 to the Central Public Works Account Code should be raised to Rs 25,000/-. The revised instructions are reproduced below in consolidated form for information and guidance:

1. Works that can be financed from maintenance and repairs grant:
 - a) The following petty and miscellaneous items of work (which ordinarily should be classed as "new works") upto the prescribed limit of Rs 25,000/- in any one case, provided that the works in question do not, in the opinion of the Superintending Engineer concerned, forms part of any comprehensive scheme or project covered by the works estimate:
 - i) Superelevation at curves.
 - ii) Cutting back a hillside to improve vision at curves.
 - iii) Improvements of alignment or gradients or changes of grade at Irish bridges, or dips, carried out at the time of renewing a surface.
 - iv) Improvement to or reconstruction of the surface or road in some different material where it is desirable to carry out such improvements or reconstruction at the time of renewing a surface.
 - v) The construction or reconstruction of road surfaces in different materials for the purposes of experiment.
 - vi) The construction or remodelling of bridges, causeways, embankments, ferry approach, protective or training works in connection with a road.

Notes: Item (vi) includes replacement of boats and other apparatus connected with ferries.
 - b) Petty works of the following nature (which are considered to be covered by the spirit of the Exception to para 27 (4) of the Central Public Works Account Code) upto the prescribed limit of Rs 25,000/- in any one case, with the prior approval of the Govt. of India.
 - i) Petty survey work, including survey required to complete records relating to land widths, encroachments etc.
 - ii) Demarcation of road boundaries.
 - iii) Traffic surveys for planning of road development.
 - c) Ordinary repairs and maintenance, including surface painting and the necessary addition of stone chips, gravel or sand.
 - d) Widening the formation or carriageway of a road including a drain or culvert and reconstruction a drain or culvert.
 - e) Special Repairs and periodical renewals.
2. Original works taken up for the first time, that cannot be financed from maintenance and repairs grant.
 - a) Works involving land acquisition which may otherwise come under items (1) (a) (ii) and (iii) above.
 - b) Provision of asphaltic or bituminous concrete, premix asphalt or bituminous macadam, bituminous grout, bituminous semi-grout, mix-in-place, cement concrete or cement macadam surface.

No. NHI-4(6)/69

Dated the 24th July 1969

FINAL REPORTS OF THE TECHNICAL GROUP SET UP BY THE GOVERNMENT OF INDIA REGARDING NORMS FOR MAINTENANCE OF NATIONAL AND STATE HIGHWAYS (1968)

Page No.

Part I	Composition of the Committee and Terms of Reference....
Part II	Considerations involved in Maintenance of National Highways
Part III	Estimation of Maintenance Costs for National Highways....
Part IV	Norms for Computing Maintenance Costs for State Highways....

PART I**COMPOSITION OF THE COMMITTEE AND TERMS OF REFERENCE****1.1. INTRODUCTION**

For the preservation of the huge public investment in highways, their timely upkeep and maintenance is an inescapable necessity. In so far as Indian Roads go, the problem of maintenance has acquired a fresh colour in recent years as the traffic using the roads has shown a steep climb and this has been to the accompaniment of an all round rise in the cost of materials and labour. Highway maintenance budgets have, however, not risen correspondingly over this period in keeping with these changed conditions. As a consequence there has been a general fall in the maintenance standards and deterioration of surfaces in many cases. With maintenance slipping behind actual requirements, attention has been focussed on the need for enlarged maintenance allotments.

The problem is however, very acute in the case of the National Highways which form the backbone of the country's road system and carry the bulk of the nation's long-distance heavy traffic. The maintenance of National Highways figured prominently at the Transport Development Council meeting held at Bangalore in June 1968 where the consensus was that the maintenance allocations needed to be stepped up in tune with the spiralling traffic and prices of construction. The Council further expressed the view that in order to fix suitable norms for assessing maintenance costs, a small technical group should be set up at the Centre.

1.2. COMPOSITION OF THE COMMITTEE

Pursuant to this conclusion, the Government of India set up a Technical Group of the following composition vide their letter No. NHI-41 (11)/68 dated the 9th July, 1968 (Appendix A) :

Director General (Road Development)	Chairman
Chief Engineer, Haryana	Member
Chief Engineer, U.P.	 "
Chief Engineer, Bihar	 "
Chief Engineer, Mysore	 "
Chief Engineer, Madras	 "
Chief Engineer, Roads Wing	Member Secretary

1.3. TERMS OF REFERENCE

The terms of reference to the Group were as follows:

- i) to suggest suitable norms for assessing maintenance costs; and
- ii) to recommend a formula for the widening of roads from single-lane to double lane carriageway.

1.4. SCOPE OF THE REPORT

This report by the Technical Group relates to maintenance problem of the National Highways and State Highways

1.5. FRAMEWORK OF THE REPORT

The report of the Committee has been divided into four parts as under:

- Part I —Composition of the Committee and Terms of Reference
 Part II —Considerations involved in maintenance of National Highways
 Part III—Estimation of maintenance costs for National Highways
 Part IV—Norms for computing Maintenance costs for State Highways

PART II**CONSIDERATION INVOLVED ON MAINTENANCE OF NATIONAL HIGHWAYS**

2.1. The problem of maintenance of National Highways can be properly appreciated only if factors peculiar to their past development and present use are well understood. The different factors are identified and commented upon in the succeeding paragraphs first before going to a discussion of the components of maintenance and making suggestions for estimation of the cost of these.

2.2. Factors Affecting Maintenance of the National Highways

2.2.1. Inherent Deficiencies of the Crust: The National Highway system came into being in 1947 when at one stroke over 12,200 miles of roads belonging to the State Governments or other local authorities were brought within fold of the Central Government. Some of these roads were old through routes like Grand Trunk Road

running from Peshawar to Calcutta and the trunk road between Bombay and Delhi. But many other sections were mere District Board roads replete with deficiencies and having substandard surfaces and temporary or low capacity culverts/bridge crossings National Highway No. 6 traversing Orissa is one example of such roads. The thickness of the road pavements in majority of these newly designated National Highways ranged from barely 6 to 10 inches. As explained later this thickness is far from sufficient for the traffic intensities actually sustained by most of the National Highways Sections. Although in the past two decades a lot of effort has been exerted in the direction of strengthening as many weak sections as possible, the stark facts stares in the face that all the National Highways by and large have only inadequate crust thickness. This inherent deficient factor aggregating the maintenance problem.

The majority of the National Highways have a flexible type of pavement surface. For the purpose of checking if a road is provided with sufficient crust thickness, the most widely used method of flexible pavement design is an empirical method going by the designation California Bearing Ratio Method. This method has been evolved after extensive observation of actual behaviour of thousands of miles of existing roads, situated under varying traffic and climatic conditions, by different road authorities. The minimum thickness of pavement is determined after finding out the strength of the soil in the laboratory at the worst moisture content the subgrade is expected to attain during its entire service life. This parameter of soil strength is known as the C.B.R. value. Curves have been developed correlating the CBR value with pavement thickness/for various traffic intensities. One such set of curves which has emanated from the Road Research Laboratory, U.K. is at Figure I. It will be seen that the range of traffic of these curves is from 0 to over 7,000 commercial vehicles of 30 CWT unladen weight per day.

As mentioned above, for very long lengths in our National Highway System, the thickness of metalling is between 6 to 10 inches only. The average CBR value of the subgrade at the same time is of the order of 3 to 6%. For these values of CBR and the amount of traffic actually plying over the National Highway sections (usually in E curve range) the designed thickness according to CBR design charts works out to between 14 and 19 inches. Thus, there is wide gap in the thickness of crust actually existing and what are to be available. The effect of deficient thickness the surfaces are increasingly showing signs of distress and pavement failures have become common place. As an end result, heavy patch repairs and frequent renewals of surfaces are a common feature of maintenance even for retaining the surface in their present substandard condition.

2.2.2. Preponderance of Single lane Carriageways: Another factor aggregating the maintenance problem of National Highways is that almost 70% of the total mileage belongs to single lane category. In such lengths both passing and crossing manoeuvres of vehicles are made most difficult as the vehicles are forced to frequently get on and off the Central paved width. Barring few stretches most of the National Highways have got only earth shoulders and these get very soon badly rutted under passage of vehicles. The deterioration is even more in the monsoon periods when the softening effect of water is an additional source of destruction causing practically a dislocation of traffic on certain sections of the National Highways.

* Studies carried out by the Road Research Laboratory, U.K. have sufficiently shown that on a single lane road where traffic is about 100 vehicles per day each vehicle has to cross the edge of the running surface about once every two miles. When traffic flow is 100 vehicles per day each vehicle must cross the edge about 5 times every mile and it will be running on the shoulders for approximately a quarter of the time. At the moment about 80% of the single lane sections of the N. Highways (which means about 8,000 miles out of the total length, of about 15,000 miles) are supporting traffic in excess of 1000 vehicles per day. All these sections are, therefore, obviously badly stressed and the side shoulders and edges of the pavement in their case require additional care to keep them traffic worthy.

Another feature of extra strain on single lane roads which does not exist in the case of 2 lane carriageways is the concentration of wheel loads at a particular spot across the transverse width of the carriageway. Experiments conducted elsewhere have demonstrated that this concentration of wheel loads can be of the order of 3 to 4 times than that in the case of two lane roads which should be stronger and fit for 3 to 4 times the intensity of traffic than that on comparable two lane sections. Unfortunately this is not true of the single lane sections of the National Highways.

The preponderance of single lane carriageways, therefore, is a major cause for the fact degenerating maintenance of the National Highways. It will be not out of place to mention that in other advanced countries two lanes of traffic are considered the barest minimum for all arterial roads connecting major centres of population, commerce and industry. In the introduction to the Highway Capacity Manual (3) this requirement has

(*) Road Research Technical Paper No. 76, published by Her Majesty's Stationery Office, U.K.

(**) Millard, R.S.: "Road Transport and Traffic in developing countries" Conference on Civil Engineering Problems Overseas 1962, organised by the Institution of Civil Engineers, U.K.

been stressed in following words:

("At least two lanes for traffic movement, one in each direction, represent the minimum Highway installation normally, provided. The decision to provide a two lane highway many times is not justified on demand and capacity requirements alone, but on minimum level of service requirements which justify at least one travel lane in each direction for safety convenience and tolerable operating conditions."

2.2.3. Increase in the Intensity of Traffic: Although the National Highway network constitutes just 21.5% of the country's road system it carries traffic much in excess of its linear share on purely mileage basis. Practically all long distance traffic is concentrated along the National Highways and in it the major component is of the heavily laden commercial vehicles. Therefore, the number of commercial vehicles as per cent of the total traffic is a higher on National Highways than on other roads. The number of commercial vehicles in the traffic stream has a direct bearing on the thickness of pavement requirement.

Further, gross laden weight of vehicles have risen substantially in the course of the past few years. A contributory factor has been the permission granted by the Central Government some years back for an *ad hoc* increase of 25% over the maximum axle weights certified previous to that with the objective of relieving the then occurring serious shortage in the country's goods carrying capacity. The result was that whereas the axle weight did not previously exceeded about 18,000 lbs their limit was increased to over 23,000 lbs. In the recent multi-million dollar AASHO Road Test (4) it has been proved that the destructive effect on pavement of a 22,000 lbs axle load is a little over two times than for a 18,000 lbs axle. In actual practice even overloading beyond this limit is not uncommon. In contract, the axle loads of buses and trucks playing on highways of India in 1940 hardly exceeded 9,000 lbs.

Some of our highways cater for even higher loads when special machinery required for factories has to be transported by road owing to dimensional limitations of the railways wagons. An example of this demand for increasing the permissible loads is the Madras-Navyali Section of N.H. 45 where all the structures had to be reconstructed for the transport of machinery required for Navyali Lignite complex.

Increasing axle loads, therefore, are a major cause of deterioration of the National Highway surfaces.

Apart from this, traffic within the country has increased by leaps and bounds to phenomenal levels in the course of just 10-15 years. This is exemplified by the figures of motor vehicle registrations (5) in the country from 1951 to 1967 reproduced below which show that the vehicle number shot up by three times over this period. The magnitude of this increase is about 8% compound every year.

YEAR	NUMBER OF VEHICLES	INDEX
1950-51	1,59,263	100
1955-56	2,03,184	128
1960-61	3,09,576	194
1961-62	3,39,644	213
1962-63	3,75,396	236
1963-64	3,87,947	243
1964-65	4,28,055	269
1965-66	4,56,793	287
1966-67	4,77,250	299

Maintenance allotments for National Highways have, however, not sympathetically increased over the same period. As a consequence the maintenance operations have been left behind in relation to the requirements generated by heavier and larger number of vehicles.

2.2.4. Increase in Cost of labour and Materials: In the years immediately proceeding there has been an appreciable rise in the cost of labour and materials. But the maintenance grants have not increased at the same pace with the result that it has not been possible to pay the desired amount of attention to National Highways and in the process their riding quality has steadily gone down. The maintenance grants (6) for the past ten years are shown below along with the length of the National Highways in that year and the index number (7) of the wholesale prices:

(3) "Highway Capacity Manual—1965 Highway Research Board, U.S.A., Special Report No. 37.

(4) "The AASHO Road Tests, Special Report No. 61, Highway Research Board, U.S.A., 1962.

(5) *Basic Road Statistics, published yearly by the Ministry of Transport and Shipping, Government of India.

(6) Annual Reports of the Ministry of Transport.

(7) "Records and Statistics" issue of August 1968.

YEAR	MAINTENANCE MENT (Rs. Lakhs)	ALLOT- MENT	LENGTH OF NATIONAL HIGHWAYS (MILES)	INDEX NO. OF WHOLE- SALE PRICES
1958-59	461.54		13922	112.9
1959-60	505.95		13906	117.1
1960-61	531.63		13906	124.9
1961-62	567.54		13815	125.1
1962-63	582.61		14815	127.9
1963-64	620.50		14913	135.3
1964-65	709.80		14922	152.7
1965-66	780.00		14922	165.1
1966-67	700.00		14922	191.3
1967-68	700.00		14955	212.4

It will be seen from the Table that during the last five years the costs of materials labour, etc. which are reflected by the index of wholesale prices have shot up by over 30%, the incidence of rise in labour costs (which constitute the major part of maintenance expenditure) being much higher. On the other hand, the amount allotted for maintenance has practically been at a standstill. This is spite of the fact that the length of the National Highways has also increased somewhat over this period and concurrently there has been upgrading of several sections from single lane to two lane width. The maintenance grant should have been automatically raised on the score of rise in prices alone, but this was not done.

2.3. COMPONENTS OF MAINTENANCE

2.3.1. The Technical Group has considered the maintenance of the National Highways under the following three main heads:

- i) Ordinary repairs
- ii) Periodic renewals
- iii) Special repairs on account of flood damages etc.

2.3.2. Separately, consideration has also been given in assessing the total cost requirements to special features of maintenance like the heavy rainfall areas, hilly areas and desert terrain.

2.3.3. The scope of the three major components of maintenance and the basic principles underlying the calculations of unit costs for each are explained in the succeeding paragraphs.

2.3.4. Scope of ordinary repairs

2.3.4.1. The main items of routine maintenance involved to keep the road in good condition are as under:

- i) Keeping the road pavement and shoulders in proper shape and condition;
- ii) Ensuring that the shoulders and roadside areas were free from undergrowth and other obstructions;
- iii) Attending periodically to drainage system so that it functioned efficiently at all times;
- iv) Maintenance of highway signs, kilometre stones and other traffic aid devices, and safeguarding these against damage;
- v) Repairs to culverts and bridges, including their periodic painting;
- vi) Repairs to Inspection Bungalows,
- vii) Taking care of avenue trees, and
- viii) Annual traffic census.

The scope of these items is explained in detail below:

2.3.4.2. **Road Pavement:** The majority of the National Highways have only a thin bituminous wearing surface on top. The wearing surface usually overlies one or two layers of water bound macadam, but the thickness of the water bound macadam base in most cases is less than what would be considered optimum worked out from the application of the design principles. Through wear and tear brought about by traffic, rise in sub-soil water level, and action of other similar factors like the destructive effect of climatic elements, the surface is constantly undergoing decay. The resulting deterioration manifests in the form of following types of failures :

- i) Unravelling
- ii) Waviness in surface
- (iii) Cracking of surface
- (iv) Pot holes; and
- (v) Edge breaking

The road gangs employed by the various PWDs have to attend to these above defects as soon as these come to notice by means of sample patch repairs, employing the most elementary equipment to which they have access and using materials like bitumen, stone and sand. Unless these defects are alleviated in time they may

well lead to a total disintegration of the crust and the scope of the repair work may become enhanced many times over.

2.3.4.3. Shoulders (Berms) : Berms serve many functions. They provide side support to the pavement, are used for passing and overtaking manoeuvres by the traffic when carriageway width is insufficient, come in handy for the parking of disabled vehicles, and at times serve as a track for slow moving vehicles. In order to satisfactorily perform these functions it is necessary that the surface of the shoulders be hard enough to resist the abrasive action of vehicles, and likewise the disrupting influence of the elements of nature. The shoulder surface should always slope uniformly away from the edge of the pavement so that any water falling on the road surface or shoulders is speedily drained off. In most other countries it is a common practice to pave a part of the shoulders nearest to the carriageway. But on National Highways, barring very few instances, the practice of paving of shoulders is as a rule absent from the scene. Consequently shoulders which consist mostly of earth borrowed from the sides get rapidly worn out under traffic. The work of maintenance staff consists in periodically replacing earth or moorum carried away from the shoulders by combined effects of abrasion by traffic and wind action, to remove ruts, and to restore the camber to the former design level. This work is particularly heavy during and immediately after rains in most parts of the country and during summer in arid regions.

2.3.4.4. Bridges and Culverts: In respect of bridges and culverts the following tasks are regularly required to be carried out as part of the maintenance effort:

- i) Keeping the area in the vicinity of the bridge clear of undergrowth and rubbish.
- ii) Preventing accumulation of logs and debris against upstream side of the piers at the time of floods.
- iii) Undertaking minor repair works for timber bridges.
- iv) Periodic painting of steel bridges and greasing of bearings.
- v) Temporary repairs to structures involved in accidents.
- vi) Attending to expansion joints of concrete bridges.
- vii) Cleaning pipe and other culverts of blocked material.
- viii) Pointing or/and plastering exposed masonry faces of structures.

If the above repairs are not attended to in time it is quite likely there may be a more serious damage to the structure itself and traffic may be seriously interrupted.

2.3.4.5. Drainage: Drains are necessary for collecting runoff water from the roadway so that it does not enter the body of the pavement and weaken it. If the drainage system is not effectively functioning, the road may be damaged in various ways, as under:

- i) Scouring of shoulders and drains.
- ii) Softening of subgrade to such an extent as to cause failure or distortion of the pavement surface.
- iii) Extensive slips both at cuttings and embankments caused on account of infiltrating water.

As the ill effects of a defective drainage system show up normally only when it is too late to undertake remedial measures, a great lot of care must be exercised during periods of routine maintenance itself to see that efficacy of the system is in no way impaired. Lack of attention to this act of maintenance may lead subsequently to expenditure of several times the money saved originally in routine maintenance to make good the damage caused by rain and flood waters.

2.3.4.6. Roadside plantations and other Miscellaneous Works: The work of maintenance includes paying attention to the general appearance of the roadside, by preservation natural scenery, planting of fresh avenue trees and repairing of damages to the existing trees and shrubs. In addition fallen branches and dead plants must be removed at intervals to improve the wayside appearance. Further, road must all time be kept free of all obstructions, so whenever any tree falls and obstructs the roadway it must be speedily removed. Periodic lopping of trees to maintain necessary clearance and keeping tree guards and fences in trim are other tasks falling within orbit of the maintenance work.

Proper maintenance of highway signs and other traffic aid devices which would include such signs as road direction signs, warning signs as at sharp curves, signs informing about maximum speed limit on the highway, route markers, Kilometre stones etc. is also of equal importance. All these signs must always be in their designated positions and be renovated periodically as and when that becomes necessary.

2.3.4.7. Annual Traffic Census: Another important item that has to be taken up annually is the census of highway traffic. Since the programme of widening, strengthening and other improvements to National Highways depends largely on the volume, axle weights and mix of the traffic, it is necessary to have information about these on every section of the system brought up to date by an annual census.

2.3.5. Method of Computing the Cost of Ordinary Repairs

2.3.5.1. For the purpose of computing the cost of ordinary repairs for the National Highway network, the Technical Group recommends that the country may be demarcated into convenient zones on the basis of average cost of the stone chips in these and National Highways further categorised in each according to carriageway width and the intensity of traffic.

2.3.5.2. **Division into Zones:** The cost of stone chips, which in essence is labour cost, was taken as the basis for grouping because in the opinion of the technical group this is the single most important factor which is responsible for the prevalent difference in the costs of ordinary repairs between various areas. Chips are the main element both in patch repairs and renewals and their cost varies widely in the country. It is as low as Rs 90 per cft. in parts of Madras and Mysore but as high as Rs 230 per 100 cft. in West Bengal and parts of U.P. and Bihar.

The Technical Group recommends the division of the country into four zones as regards cost of stone chips. The recommended divisions are shown in the map enclosed at figure 2. This map is based mainly on the divisions recommended in the M.E.S. Standard Schedule of Rates, 1962 except for the modification that areas to north of Ganga in U.P. and Bihar have been considered in Zone IV instead of Zone III and States of Kerala and Himachal Pradesh have been brought under Zone II.

This division is, however, based on the conditions obtaining at the time of this report. The pattern of costs of road works in the various sections of the Country is likely to change with time. Therefore, it is suggested that the divisions into zones should be revised periodically keeping with cost changes. A periodicity of 4 years is recommended.

2.3.5.3. **Categorization of Roads by Intensity of Traffic and Width of Carriageway:** The National Highways, single and two lane sections separately, have been categorised into 3 classes as under so as to reflect the effect of traffic:

- (i) Sections carrying traffic less than 450 commercial vehicles per day.
- (ii) Sections supporting traffic of commercial vehicles in the range 450-1500 commercial vehicles per day; and
- (iii) Sections carrying traffic in excess of 1500 commercial vehicles per day.

2.3.6. **Scope of Periodic Renewals:** While routine repairs can certainly prolong the life of surface, a time comes when the cost of maintaining the roadway in its original condition by purely routine maintenance not only becomes prohibitive but even impossible. Renewals of the wearing surface at periodic intervals is thus inescapable. The renewal in the case of National Highways consists usually of a bituminous surface dressing or in few cases, where traffic is more, of the more durable type 3/4 inch thick premix carpet.

In the Technical Group's opinion patch repairs can stretch the life of new surface by only 3 to 6 years depending upon local circumstances. After that a good part of the carriageway is covered by patchwork and further work of this type does not help in removing the rapidly growing deficiencies of riding quality. Unless surface is renewed at that juncture the structural failure of the whole pavement may well be in sight.

On evaluation of all the variables involved, and on the basis of experience of renewals in various parts of the country, the following general norms for surface renewals are recommended. These are subject to the conditions recounted later.

(i) In the case of single lane sections of National Highways with traffic less than 450 commercial vehicles per day the renewal should consist of a single coat of surface dressing to be placed every four years. The same treatment may be imparted to two lane sections with traffic intensity in the range 450-1500 commercial vehicles per day.

(ii) In the case of two lane National Highways with traffic volume below 450 commercial vehicles per day the renewal treatment may consist of a single coat of surface dressing to be repeated in a 5 year cycle.

(iii) For the case of single lane National Highways carrying traffic between 450 to 1500 commercial vehicles per day the renewal may similarly take the form of a single coat of surface dressing but it should be repeated at a closer interval, every three years.

(iv) For National Highways carrying traffic in excess of 1500 commercial vehicles per day, be they of single lane or two lane width of a 3/4 inch thick bituminous carpet (with allowance for extra material for initial levelling prior to laying) to be renewed every six years.

The adoption of above norms is recommended subject to the following two conditions:

(i) The recommendation of the Technical Group are based on a fair riding quality standard not different from the type of surface in vogue presently on most of the National Highways i.e. one or two coat surface dressing. Increase in traffic, however, is making it necessary that the riding quality standards should be upgraded in the near future and then it should be the aim to renew National Highway surface with only 3/4 inch premix carpet rather than a single coat of surface dressing advised currently. For National Highways, which are burdened by more than their normal share of heavy vehicle traffic, a premix coat of 3/4 inch thickness is regarded as the minimum acceptable

standard of renewal capable of moving traffic at design speed. When this change in maintenance policy comes about, and the sooner it happens the better shall it be, it will result in slight increase in the maintenance expenditure for renewals.

(ii) The renewal cycles suggested above are on the assumption that almost the entire National Highway pavements will be taken up for strengthening and a major portion strengthened and widened or provided with hard shoulders during the period of the Fourth Five Year Plan. Until strengthening of the pavements is taken up in right earnest, no amount of renewals, even at closer intervals, will succeed in attaining the desired level of service for the road-users. If for some reasons it is not possible to take on a large programme of a strengthening and widening and providing shoulders and make a substantial headway on these during the next plan period an extra allowance for increased maintenance requirements, which will arise on account of the crust thicknesses being inadequate for the traffic presently on the roads, will be absolutely necessary. The Technical Group feels that to cater for this exigency a surcharge of 25% must be permitted over the amount otherwise accepted for periodic renewals.

2.3.7. Method of Computing the Cost of Periodic Renewals: The Technical Group recommends the categorisation of National Highways for periodic renewals under the same four zones and three intensities of traffic suggested for Ordinary Repairs.

2.3.8. Scope of Special Repairs including Flood Damages : Next to Ordinary repairs and periodic renewals, the expenditure on special repairs which becomes unavoidable on account of flood damages or other calamities or minor improvements is of essence in a maintenance programme. The need for special repairs may arise on account of :

- (i) Damage by floods, cyclones or other natural calamities;
- (ii) Special repairs made necessary on account of such occasional items as reconstruction of a retaining wall, providing water supply and electricity to Inspection Bungalows, etc.; and
- (iii) Major improvements such as improvements to curves, visibility, etc.

As will be evident, making provision for special repairs and flood damages involves evaluation of several unknown factors. The cost of the repairs cannot, therefore, be predicted with confidence in advance, and only lumpsum provision can be made.

2.3.9. Other Factors Requiring Cognizance During Assessment of the Total cost of Maintenance : Besides the requirement of funds for ordinary repairs, renewals and special repairs, it is also necessary to cognize, while estimating total funds for maintenance, certain special factors of terrain and climate which demand an increased allotment for corrective maintenance. Worthy of consideration under this head are the needs of areas of heavy rainfall, mountainous areas and desert regions.

For each of these areas, amount of maintenance allocation will need to be enhanced for the following reasons:—

- (i) High rainfall areas:—In heavy rainfall sections the renewals will require to be done at closer intervals. Moreover, the expense on patch repairs and berm repairs will be more than otherwise.
- (ii) Roads in Hilly Sections:—In hilly sections the cost of maintenance arises on account of extra work involved in the renewal of slips, maintenance of high retaining walls, breast walls, hairpin bends, drainage facilities etc.
- (iii) Roads in desert areas:—For roads situated in desert terrain, the extra work befalling the maintenance personnel is removal of sand from road surface.

2.4. GENERAL RECOMMENDATIONS :

2.4.1. Maintenance Studies: The Technical Group also wishes to record that continuous attempts should be made to relate allotments to actual requirements based on scientific field control experiments. For this purpose the Committee recommends that systematic maintenance studies organised over a few representative sections of the National Highways under different terrain and climatic conditions should be carried out on a continuing basis. The maintenance studies will consist of chosen road sections, subject to the effect of different variables, being maintained to standards prescribed by the Technical Group for a period of at least one renewal cycle which will vary from 3 to 6 years. Accurate records of expenditure will have to be kept during this period. The Technical Group have already arranged with the Chief Engineers of the five States who are members of the Group to take up the experiments on 30 miles in each of their States with effect from 1969-70.

2.4.2. Modernizing of Maintenance Operations: The Technical Group wishes to stress that to overcome the difficulties of maintenance operations, experienced all round in recent years, a change in the present methods of road maintenance affected solely through gang labour is necessarily called for. It is high time a shift was made to the system prevalent in other advanced countries where instead of moving individually on foot the labourers move about collectively in groups of about 10 in a truck equipped with the necessary basic tools for routine maintenance. Such groups, because of their mobility, are capable of looking after sections of road from 20 to 30 miles with much greater ease and efficiency than dispersed dispersed gang labourers as now. Such a system may be expensive to start with but in the long run its advantages should outscore the apparent disadvantages.

tages. A party of 10 trained workmen is better placed to execute a heavy job of patch repairs or berm repairs than a batch of 4 or 5 gangmen who must walk several miles to reach the spot of work.

It is recommended that in some sections of National Highways mobile gangs must urgently be set upon experimental basis so that the effect of the experiment could be watched and long range decisions on the basis of results for a complete reorganization of the maintenance operations, for improved efficiency, taken. It was decided that this experiment also will be undertaken in the five States whose Chief Engineers are members of the Technical Group and who are fully aware of the requirements of reorganisation. The five Chief Engineers have undertaken to commence work on this system in 1969-70.

PART III

ESTIMATION OF MAINTENANCE COST FOR NATIONAL HIGHWAYS

4.1. For computing the total requirement of maintenance funds for National Highways in different States costs of the following must separately be determined :

- (a) Unit cost of Ordinary Repairs,
- (b) Unit cost of Renewals,
- (c) Provision to be made for Special Repairs including Flood Damages, and
- (d) Premia to be allowed for difficult areas.

4.2. Cost of Ordinary Repairs

For computing the unit cost of ordinary repairs, it has already been indicated in Part II that the country will be divided into 4 divisions (see fig. 2.) on the basis of divisions recommended in the M.E.S. Standard Schedule of Rates 1962. The cost of the chips in these zones based on 1962 M.E.S. Schedule of Rates increased by a flat premium of 40 per cent to more truly reflected the present day costs is given as under:

Zones	Range of cost of chips (in Rs per 100 cft.)	Average cost (in Rs per 100 cft.)
Zone I	80-100	90
Zone II	100-130	115
Zone III	130-170	150
Zone IV	170-230	200

The National Highways, single and two lane sections separately, have been further classified in each of the Zones according to the traffic classification as recommended in Part II.

Taking into account the various items of routine maintenance outlined in Part II, the Technical Group first worked out the cost of labour required for maintenance for all the above referred classifications. For the purpose of these costs it was decided on *ad hoc* basis on the strength of experience of the Chief Engineers of the five Zones that optimum requirement of gang labour was 0.5 gangman per mile in the case of single lane sections of National Highways supporting low intensity of traffic. In the case of 2 lane sections carrying a higher volume of traffic the optimum requirement of gang labour could be assumed as 0.75 labour per mile of road.

In the next step, the costs for such items as patch repairs, berm repairs, arboriculture, repairs to culverts, inspections bungalows, etc. have been computed and added to the former to obtain the final figures of unit cost of ordinary repairs.

The tabulation of costs is at Table I. It will be seen that the unit cost varies from Rs 2700 per mile for a two lane road situated in Zone I supporting a low volume of traffic to Rs 4450 per mile in the case of a two lane section situated in zone IV subject to heavy volume of traffic.

4.3. UNIT COST OF RENEWALS

On the basis of recommendations made in part II, the Technical Group has worked out the cost of renewals for National Highways in each of the 4 Zones by width of pavement and traffic intensity. The abstract of Unit costs is at Table 2. It will devolve therefrom that the annual cost of renewals varies from Rs 1688 for a single lane National Highways situated in Zone I having a low intensity of traffic to Rs 3733 per mile in the case of a two lane section situated in Zone IV and supporting a very heavy intensity of traffic i.e. about 1500 commercial vehicles per day.

4.4. PROVISION FOR SPECIAL REPAIRS INCLUDING FLOOD DAMAGES

The Technical Group examined the question of quantum of money required for these types of repairs in

detail. Drawing from the experience of various Public Works Departments, the Group decided that provision for special repairs and flood damages should be on a lumpsum basis at 20% of the total cost of routine repairs and renewals for all the National Highways in the country. Of this 12½% will be meant for repairs arising out of damage by floods etc. and 7½% for other sundry repairs termed as special repairs.

It was also realised that whereas the allotment for ordinary repairs and renewals was purely on a per mile basis, the allocation for flood damages and special repairs had of necessity to be on the basis of works specifically required. Examination and sanction of individual estimates by competent authorities, must therefore, precede before any allotment from the special repairs quota of the maintenance grant was made.

4.5. PREMIA FOR DIFFICULT AREAS

a) **High rainfall Areas :** The Technical Group decided to provide an extra allowance of Rs 700 per mile per year for roads situated in heavy rainfall zones to cope with the extra patch and berm repairs in these areas.

b) **Roads in Hilly Areas :** It was felt that the provision of Rs 1500 per mile per year will meet the needs of extra maintenance in hilly sections.

c) **Roads in Desert Areas :** A provision of Rs 500 per mile per year has been made to meet the extra demands in desert areas.

4.6. TOTAL REQUIREMENTS OF MAINTENANCE FUNDS FOR NATIONAL HIGHWAYS IN DIFFERENT STATES

4.6.1. Based on the unit costs for ordinary repairs and renewals, and the premia for difficult areas given above, the Technical Groups has worked out the cost of maintenance of National Highways in different States in Table 3. Maintenance requirements have been estimated first under the two major heads of Ordinary Repairs and Periodic Renewals and afterwards an allowance has been made over and above these in lieu of the terrain requirements. Agency charges at 7½% have been added in the end as is customary for all National Highway works. The categorization of single and double lane sections in the various States under different traffic intensities has been done on the basis of available information and is subject to periodic review on the basis of latest traffic figures.

4.6.2. FLOOD DAMAGES AND SPECIAL REPAIRS

For flood damages and special repairs provision is made on a lumpsum basis at 20% of the total cost of maintenance worked out for ordinary repairs, renewals, premia for difficult areas and agency charges. Since the fund requirements under flood damages and special repairs will vary in each State from year to year, this lumpsum provision will be distributed by the Ministry of Transport (Roads Wing) only after receipt of detailed reports from the State Chief Engineers. The estimates for special repairs will be reviewed usually between July and September every year and of flood damages during November and December.

4.7. PERIODIC COMPUTATION OF MAINTENANCE AMOUNT

The maintenance amounts worked out by the Technical Group in Table 3 for different States are for the period 1968-70, as they were prepared on the basis of traffic, cost and highway width data of 1968. Because of constantly shifting costs changing traffic and lane widths, it is felt that these estimates should be periodically modified, and in any case at least biennially. The next review is recommended to be carried out in January-February, 1970.

4.8. ABSTRACT OF COSTS

The abstract of total costs worked out in Table 3 is reproduced below :

1.	Cost of Ordinary Repairs	Rs 438.3 lakhs
2.	Cost of Renewals	Rs 365.9 lakhs
3.	Premia for Difficult Terrain	
	(a) Hilly Sections	Rs 13.9 lakhs
	(b) Heavy Rainfall Sections	Rs 16.0 lakhs
	(c) Desert Sections	Rs 0.9 lakhs
	Sub Total :	Rs 835.0 lakhs
4.	Agency Charges at 7½%	Rs 62.8 lakhs
	Sub Total :	Rs 897.8 lakhs
5.	Provision for Special Repairs and flood damages	
	(a) Special Repairs at 7½%	Rs 67.35 lakhs
	(b) Flood Damages at 12½%	Rs 112.25 lakhs
	Total :	Rs 1077.4 lakhs

4.9. The above estimate of maintenance costs is subject to the assumption that a sufficiently big programme of strengthening the pavements will be undertaken during the 4th Plan period and simultaneously as many sections will be widened or provided with hard shoulders as found necessary from needs of traffic. If this promise is not fulfilled, and strengthening of pavements cannot be tackled to the scale envisaged, the maintenance allocations will required to be increased by an *ad hoc* amount of 25% calculated over the cost of the periodic renewals. With this addition the total amount required for maintenance will work out to Rs. 1178.8 lakhs instead of Rs 1077.4 lakhs.

PART-IV

NORMS FOR COMPUTING MAINTENANCE COSTS FOR STATE HIGHWAYS

5. The Technical Group considers that the problem of maintenance of State Highways is identical to that of the National Highways. The norms for assessing maintenance requirements on their case will, therefore, be the same as those developed for the National Highways in the preceding sections. It is suggested that the funds required for maintenance of its State Highways be calculated by each State with the help of these norms. These estimates should be periodically reviewed, and in any case biennially, as already recommended under para 4.7.

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4110.3

FORMULATION OF NORMS FOR MAINTENANCE OF LOWER CATEGORY ROADS VIZ. MAJOR DISTRICT ROADS OTHER DISTRICT ROADS AND VILLAGE ROADS

INTRODUCTION

Construction of Roads of various categories in different states of India is costing crores of rupees every year. In order to make the best use of this investment and to avoid deterioration of roads which can result in tremendous loss to the Nation, timely and adequate maintenance cannot be over-emphasised. The problem of maintenance in our country has acquired high priority on account of steep rise in the volume of traffic using our roads and the increase in cost of labour and materials. The problem has been accentuated because the increase in budget for the maintenance of roads has not kept pace with the increase in road length, growth of traffic volume and the rise in prices. This has naturally, resulted in deterioration in the condition of roads and the standard of their up-keep and maintenance has gone down.

This situation came to the notice of Transport Development Council in its meeting held in Mysore during June, 1968 and on the recommendations of the Council a small technical group was formed to fix norms for the maintenance of National Highways and State Highways. This technical group submitted its report which has since been circulated among various State Governments.

During the meeting of State Chief Engineers held on 28th August, 1976 at Madras, it was felt that while maintenance of National Highways was receiving adequate attention on account of availability of required funds, the condition of lower category of roads i.e. Major district roads, other district roads and village roads was going from bad to worse. The length of these roads was increasing in every State but the funds which were being placed at the disposal of the State Public Works Departments were not keeping pace with the requirements, which were increasing not only due to additional length of roads but also due to the rising cost of labour and materials.

It was felt in this meeting that a small group of Chief Engineers may be assigned the duty of recommend-

NATIONAL HIGHWAY

COST PER MILE IN RUPEES															
SINGLE LANE (12 FEET WIDTH)								DOUBLE LANE (22 FT WIDTH)							
TRAFFIC CORRESPONDING								TRAFFIC CORRESPONDING							
TO C.B.R. CURVES A, B TO C.B.R. CURVE E, E TO C.B.R. CURVES F, A, G								TO C.B.R. CURVES A, B, C TO C.B.R. CURVE E, E TO C.B.R. CURVES F, A, G							
C AND D, E, E, 450 : 450 - 500 COMMERCIAL, E, E, 1500 COMMERCIAL								C AND D, E, 450 COMM : 450 - 500 COMMERCIAL, E, E, 1500 COMMERCIAL							
VEHICLES PER DAY								VEHICLES PER DAY							
ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
420	470	540	640	585	648	735	860	750	825	930	1060	630	705	810	940
(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6	(0.6
COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)	COEFF + 1/2 MILE)
150	350	350	350	350	350	350	550	700	700	700	700	200	200	200	200
200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
2770	2820	2890	2990	3279	3342	3429	3554	3738	3813	3918	4068	2610	2761	2868	3016
2820	2870	2940	3040	3330	3393	3480	3605	3789	3864	3969	4119	2660	2811	2918	3066
2870	2920	2990	3090	3380	3443	3530	3655	3839	3914	4019	4169	2710	2861	2968	3116
2920	2970	3040	3140	3430	3493	3580	3705	3889	3964	4069	4219	2760	2911	3018	3166
2970	3020	3090	3190	3480	3543	3630	3755	3939	4014	4119	4269	2810	2961	3068	3214
3020	3070	3140	3240	3530	3593	3680	3805	3989	4064	4169	4319	2860	3011	3118	3264
3070	3120	3190	3290	3580	3643	3730	3855	4039	4114	4219	4369	2910	3061	3168	3314
3120	3170	3240	3340	3630	3693	3780	3905	4089	4164	4269	4419	2960	3111	3218	3364
3170	3220	3290	3390	3680	3743	3830	3955	4139	4214	4319	4469	3010	3161	3268	3414
3220	3270	3340	3440	3730	3793	3880	4005	4189	4264	4369	4519	3060	3211	3318	3464
3270	3320	3390	3490	3780	3843	3930	4055	4239	4314	4419	4569	3110	3261	3368	3514
3320	3370	3440	3540	3830	3893	3980	4105	4289	4364	4469	4619	3160	3311	3418	3564
3370	3420	3490	3590	3880	3943	4030	4155	4339	4414	4519	4669	3210	3361	3468	3614
3420	3470	3540	3640	3930	3993	4080	4205	4389	4464	4569	4719	3260	3411	3518	3664
3470	3520	3590	3690	3980	4043	4130	4255	4439	4514	4619	4769	3310	3461	3568	3714
3520	3570	3640	3740	4030	4093	4180	4305	4489	4564	4669	4819	3360	3511	3618	3764
3570	3620	3690	3790	4080	4143	4230	4355	4539	4614	4719	4869	3410	3561	3668	3814
3620	3670	3740	3840	4130	4193	4280	4405	4589	4664	4769	4919	3460	3611	3718	3864
3670	3720	3790	3890	4180	4243	4330	4455	4639	4714	4819	4969	3510	3661	3768	3914
3720	3770	3840	3940	4230	4293	4380	4505	4689	4764	4869	5019	3560	3711	3818	3964
3770	3820	3890	3990	4280	4343	4430	4555	4739	4814	4919	5069	3610	3761	3868	4014
3820	3870	3940	4040	4330	4393	4480	4605	4789	4864	4969	5119	3660	3811	3918	4064
3870	3920	3990	4090	4380	4443	4530	4655	4839	4914	5019	5169	3710	3861	3968	4114
3920	3970	4040	4140	4430	4493	4580	4705	4889	4964	5069	5219	3760	3911	4018	4164
3970	4020	4090	4190	4480	4543	4630	4755	4939	5014	5119	5269	3810	3961	4068	4214
4020	4070	4140	4240	4530	4593	4680	4805	4989	5064	5169	5319	3860	4011	4118	4264
4070	4120	4190	4290	4580	4643	4730	4855	5039	5114	5219	5369	3910	4061	4168	4314
4120	4170	4240	4340	4630	4693	4780	4905	5089	5164	5269	5419	3960	4111	4218	4364
4170	4220	4290	4390	4680	4743	4830	4955	5139	5214	5319	5469	4010	4161	4268	4414
4220	4270	4340	4440	4730	4793	4880	5005	5189	5264	5369	5519	4060	4211	4318	4464
4270	4320	4390	4490	4780	4843	4930	5055	5239	5314	5419	5569	4110	4261	4368	4514
4320	4370	4440	4540	4830	4893	4980	5105	5289	5364	5469	5619	4160	4311	4418	4564
4370	4420	4490	4590	4880	4943	5030	5155	5339	5414	5519	5669	4210	4361	4468	4614
4420	4470	4540	4640	4930	4993	5080	5205	5389	5464	5569	5719	4260	4411	4518	4664
4470	4520	4590	4690	4980	5043	5130	5255	5439	5514	5619	5769	4310	4461	4568	4714
4520	4570	4640	4740	5030	5093	5180	5305	5489	5564	5669	5819	4360	4511	4618	4764
4570	4620	4690	4790	5080	5143	5230	5355	5539	5614	5719	5869	4410	4561	4668	4814
4620	4670	4740	4840	5130	5193	5280	5405	5589	5664	5769	5919	4460	4611	4718	4864
4670	4720	4790	4890	5180	5243	5330	5455	5639	5714	5819	5969	4510	4661	4768	4914
4720	4770	4840	4940	5230	5293	5380	5505	5689	5764	5869	6019	4560	4711	4818	4964
4770	4820	4890	4990	5280	5343	5430	5555	5739	5814	5919	6069	4610	4761	4868	5014
4820	4870	4940	5040	5330	5393	5480	5605	5789	5864	5969	6119	4660	4811	4918	5064
4870	4920	4990	5090	5380	5443	5530	5655	5839	5914	6019	6169	4710	4861	4968	5114
4920	4970	5040	5140	5430	5493	5580	5705	5889	5964	6069	6219	4760	4911	5018	5164
4970	5020	5090	5190	5480	5543	5630	5755	5939	6014	6119	6269	4810	4961	5068	5214
5020	5070	5140	5240	5530	5593	5680	5805	5989	6064	6169	6319	4860	5011	5118	5264
5070	5120	5190	5290	5580	5643	5730	5855	6039	6114	6219	6369	4910	5061	5168	5314
5120	5170	5240	5340	5630	5693	5780	5905	6089	6164	6269	6419	4960	5111	5218	5364
5170	5220	5290	5390	5680	5743	5830	5955	6139	6214	6319	6469	5010	5161	5268	5414
5220	5270	5340	5440	5730	5793	5880	6005	6189	6264	6369	6519	5060	5211	5318	5464
5270	5320	5390	5490	5780	5843	5930	6055	6239	6314	6419	6569	5110	5261	5368	5514
5320	5370	5440	5540	5830	5893	5980	6105	6289	6364	6469	6619	5160	5311	5418	5564
5370	5420	5490	5590	5880	5943	6030	6155	6339	6414	6519	6669	5210	5361	5468	5614
5420	5470	5540	5640	5930	5993	6080	6205	6389	6464	6569	6719	5260	5411	5518	5664
5470	5520	5590	5690	5980	6043	6130	6255	6439	6514	6619	6769	5310	5461	5568	5714
5520	5570	5640	5740	6030	6093	6180	6305	6489	6564	6669	6819	5360	5511	5618	5764
5570	5620	5690	5790	6080	6143	6230	6355	6539	6614	6719	6869	5410	5561	5668	5814
5620	5670	5740	5840	6130	6193	6280	6405	6589	6664	6769	6919	5460	5611	5718	5864
5670	5720	5790	5890	6180	6243	6330	6455	6639	6714	6819	6969	5510	5661	5768	5914
5720	5770	5840	5940	6230	6293	6380	6505	6689	6764	6869	7019	5560	5711	5818	5964
5770	5820	5890	5990	6280	6343	6430	6555	6739	6814	6919	7069	5610	5761	5868	6014
5820	5870	5940	6040	6330	6393	6480	6605	6789	6864	6969	7119	5660	5811	5918	6064
5870	5920	5990	6090	6380	6443	6530	6655	6839	6914	7019	7169	5710	5861	5968	6114
5920	5970	6040	6140	6430	6493	6580	6705	6889	6964	7069	7219	5760	5911	6018	6164
5970	6020	6090	6190	6480	6543	6630	6755	6939	7014	7119	7269	5810	5961	6068	6214
6020	6070	6140	6240	6530	6593	6680	6805	6989	7064	7169	7319	5860	6011	6118	6264
6070	6120	6190	6290	6580	6643	6730	6855	7039	7114	7219	7369	5910	6061	6168	6314
6120	6170	6240	6340	6630	6693	6780	6905	7089	7164	7269	7419	5960	6111	6218	6364
6170	6220	6290	6390	6680	6743	6830	6955	7139	7214	7319	7469	6010	6161	6268	6414
6220	6270	6340	6440	6730	6793	6880	7005	7189	7264	7369	7519	6060	6211	6318	6464
6270	6320	6390	6490	6780	6843	6930	7055	7239	7314	7419	7569	6110	6261	6368	6514
6320	6370	6440	6540	6830	6893	6980	7105	7289							

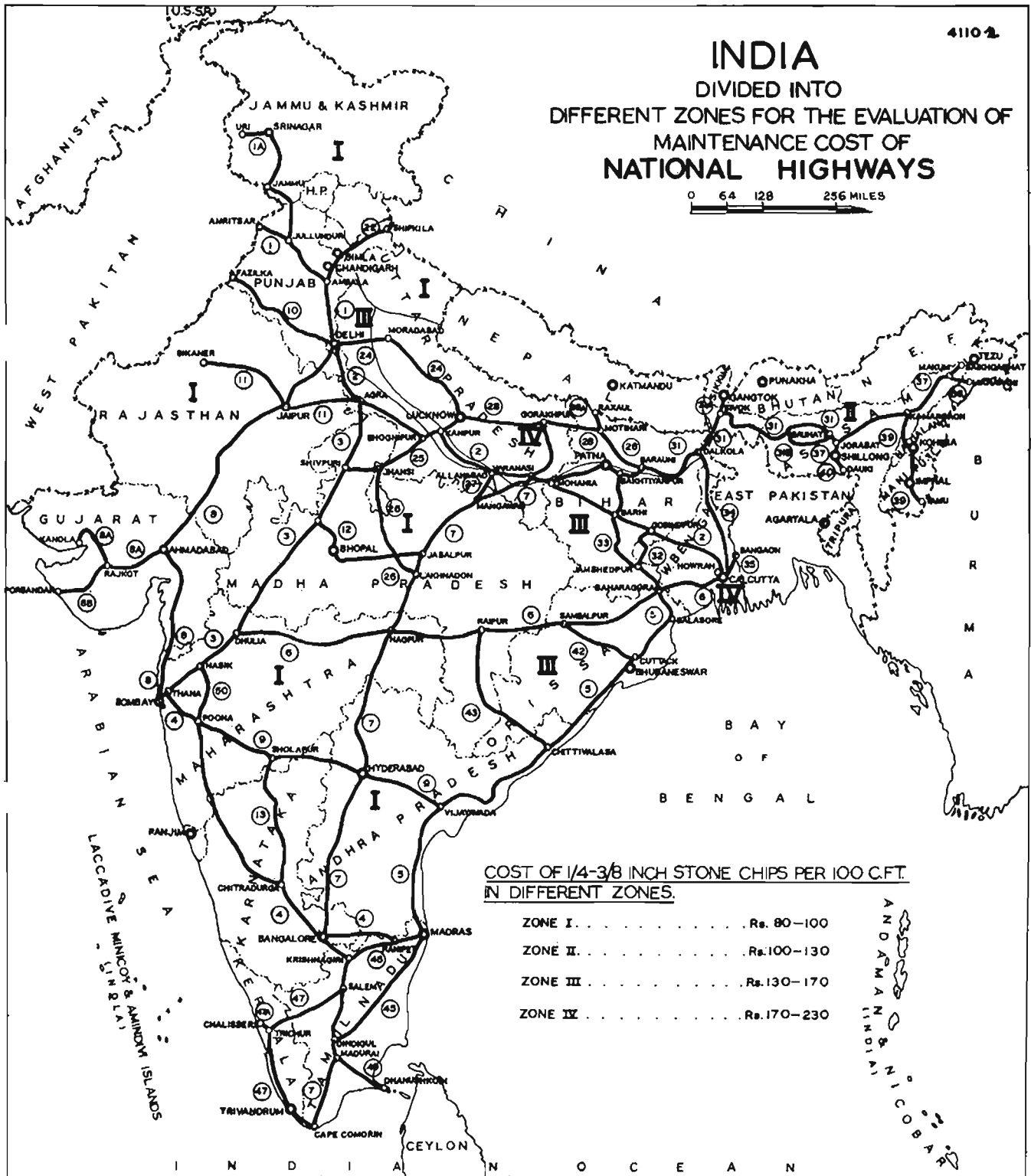
TABLE -2 UNIT COST OF PERIODIC RENEWALS - NATIONAL HIGHWAYS

TRAFFIC CLASSIFICATION	SINGLE LANE (12 FT. WIDTH)				DOUBLE LANE (22 FT. WIDTH)			
	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 1	ZONE 2	ZONE 3	ZONE 4
1. COST OF RENEWAL PER YEAR PER MILE FOR TRAFFIC CORRESPONDING TO CURVES A,B,C AND D OF CBR DESIGN CHART C.P. 2006 I.E. <450 COMMERCIAL VEHICLES PER DAY	$\frac{1688}{SD_1^{12}}$	$\frac{1825}{SD_2^{12}}$	$\frac{2025}{SD_3^{12}}$	$\frac{2300}{SD_4^{12}}$	$\frac{2470}{SD_1^{22}}$	$\frac{2670}{SD_2^{22}}$	$\frac{2960}{SD_3^{22}}$	$\frac{3370}{SD_4^{22}}$
2. COST OF RENEWAL PER YEAR PER MILE FOR TRAFFIC CORRESPONDING TO CURVE E I.E. 450 - 1500 COMMERCIAL VEHICLES PER DAY	$\frac{2250}{SD_1^{12}}$	$\frac{2433}{SD_2^{12}}$	$\frac{2700}{SD_3^{12}}$	$\frac{3067}{SD_4^{12}}$	$\frac{3088}{SD_1^{22}}$	$\frac{3338}{SD_2^{22}}$	$\frac{3700}{SD_3^{22}}$	$\frac{4203}{SD_4^{22}}$
3. COST OF RENEWAL PER YEAR PER MILE FOR TRAFFIC CORRESPONDING TO CURVES F AND G I.E. >1500 COMMERCIAL VEHICLES PER DAY	$\frac{3367}{PC_1^{12}}$	$\frac{3683}{PC_2^{12}}$	$\frac{4133}{PC_3^{12}}$	$\frac{4767}{PC_4^{12}}$	$\frac{6167}{PC_1^{22}}$	$\frac{6750}{PC_2^{22}}$	$\frac{7567}{PC_3^{22}}$	$\frac{8733}{PC_4^{22}}$
NOTES: SD = COST OF SINGLE COAT SURFACE DRESSING WITH 3½" OF CHIPS AND 25% OF BITUMEN P.C. = COST OF LEVELLING THE SURFACE, PATCH REPAIRING AND PROVIDING ¾" IN. PREMIX CARPET WITH SEAL COAT AS PER I.R.C. SPECIFICATIONS SUPPLIES 1, 2, 3, AND 4 REPRESENT THE NUMBER OF THE ZONE SUPPLIES 12 AND 22 REPRESENT THE LANE WIDTH. THUS SD₁¹² REPRESENTS THE COST OF SINGLE COAT SURFACE DRESSING IN ZONE 1 FOR 12 FT. WIDTH								

INDIA

DIVIDED INTO DIFFERENT ZONES FOR THE EVALUATION OF MAINTENANCE COST OF NATIONAL HIGHWAYS

0 64 128 256 MILES



ing suitable norms for the maintenance of these lower category roads so that the respective State Public Works Departments are able to put up their case before their Finance Departments and before the Finance Commission for allocation of adequate funds for the maintenance of these roads.

COMPOSITION OF COMMITTEE

As a result of the decision arrived at this meeting, a committee was set up with the constitution as follows :

1. Shri H.C. Malhotra,
Chief Engineer, Himachal Pradesh ...Convenor
2. Shri M.D. Patel,
Secretary and Chief Engineer,
Gujarat, P.W.D.
3. Shri K. Krishna Mohan Rao,
Chief Engineer,
Andhra Pradesh, P.W.D.
4. Shri C.V. Padamnabhan,
Chief Engineer, Highways and
Rural Works, Tamil Nadu
5. Shri A.K. Dass Gupta,
Chief Engineer, West Bengal
6. Shri B.M. Mukherjee,
Secretary & Chief Engineer,
Manipur, P.W.D.
7. Shri R.T. Aire,
Additional Chief Engineer,
Maharashtra
8. Shri A. Chowdhary,
Chief Engineer P.W.D. Gauhati (Assam)
9. Shri N. Sen,
Chief Engineer (Roads)
Ministry of Shipping & Transport,
Govt. of India.

The committee held 2 meetings, first on 1st August, 1977 and the Second meeting on 7th August, 1978. In the first meeting, a note was put up before the committee, in which various vital points which needed decision were discussed and the recommendations were finalised. In the second meeting, the report prepared on the basis of the discussions and decisions taken in the first meeting was finalised.

FRAME WORK OF THE REPORT

The committee studied thoroughly the report of the technical group, for the maintenance norms for National Highways and State Highways. These norms have been prepared by dividing the country into four zones depending upon the cost of stone chips which, according to the technical group, was the single most important factor which was responsible for the variation in the costs of ordinary repairs between different areas. The present group is of the considered view that there are many more reasons for variation in cost which have to be taken into account while working out unit cost of maintenance. The division of the country into a few zones were formulated for National Highways to work out the total maintenance cost of National Highways. In the present study norms per km of roads in various States have to be recommended and therefore, division of country into zones will pose practicable problem when there is no much variation from State to State and even within each State. The group has, therefore worked out typical estimates for Earthen Roads, Water Bound Macadam Roads and Black topped roads separately for hilly areas and plains. The rates of material and labour may be changed according to a State or Region to work out the unit rates of maintenance. This will not only give realistic norms for individual States and will also enable the State Public Works Departments to revise the norms as the prices of materials and labour keep on changing.

COMPONENTS OF MAINTENANCE

The maintenance cost can be divided into the following sub-heads :

- i) Ordinary Repairs
- ii) Periodic Renewals

- iii) Special Repairs and Flood & Rain Damages
- iv) Premium on account of location

The terminology for different heads of repairs varies from State to State. It is considered advisable that the terminology followed by the Technical Group on National and State Highways should be followed in this report as well by all State Highway Departments on a uniform pattern.

BASIC RATES

Before working out norms for maintenance of roads it is necessary to determine basic rates on which the analysis of cost is worked out. Accordingly a Statement is attached at Annexure-II which gives basic rates of labour and materials on which the norms have been based. This has been given separately so that the different states can compare their basic rates with those adopted for this report and make modifications to suit their actual conditions of working.

METHOD FOLLOWED IN COMPUTING COSTS

The cost of maintenance under various components has been worked out as discussed in the following paragraphs:

I. ORDINARY REPAIRS

The annual repairs are aimed at keeping road pavement and shoulders in proper shape and condition and free from under-growth and other obstructions. It also includes attending periodically to the drainage system for its efficient functioning. In addition, it includes the following items :

- i) Patch repairs
- ii) Heavy Berm Repairs
- iii) Repairs to Arboriculture and Landscaping
- iv) Maintenance and repair to Road Side drainage, Road signs, Inspection Bungalows, Rest Houses and Godowns and Road side stock-yards, and collection of traffic data.

(a) ROAD GANGS

For general up-keep of the road pavements, shoulders etc. the technical group from the joint experience recommends the strength of road gangs to be as follows :

i) Black topped roads	0.3 persons per km
ii) Water Bound macadam roads	0.4 persons per km
iii) Earthen roads	0.5 persons per km

For Supervisory staff, it was felt that we should provide Mates at the rate of 1/20 persons per KM and Road Inspectors or Road Supervisors or work Assistants at the rate of 1/48 persons per km. Higher strength of maintenance gangs has been recommended for earthen roads and water bound macadam roads because they need greater attention than black topped roads. In the typical estimate the salary of the road gangs and supervisory staff as is prevalent in Himachal Pradesh P.W.D. has been taken into account. So far as the other States are concerned, the pay scales prevalent there can be substituted to work out the cost per kilometre.

(b) PATCH REPAIRS

On account of wear and tear brought about by the traffic and action of other similar factors, like the destructive effects of climatic elements, the road surface is constantly under-going deterioration and the road gangs are required to attend to these defects as soon as they come to light by simple patch repairs employing most elementary equipment and using materials like bitumen, stone and sand. Idea of these patch repairs is to prevent further deterioration and disintegration of the crust which may need very heavy expense to bring the pavement back to normal traffic worthy condition.

Provision has been made for 5 cu.m. of stone grit 10 mm gauge per km and 0.6 M.T. of bitumen per km length of road. No labour charges have been provided for patch repairs because this work is expected to be done by the road gangs. No provision has been made for patch repairs in the Analysis of cost for earthen roads and water bound macadam roads, because these roads do not need such repairs.

(c) Heavy Berm Repairs

Most of the members of the committee were of the opinion that a provision of Rs 400/- per km on lumpsum basis was necessary for carrying out heavy repairs to berms. The berms are required to be used for parking and for over-taking and passing, and therefore, it is very necessary to keep them in proper shape. No special provision has been made for this item in case of earthen roads for obvious reasons.

(d) Repairs to Arboriculture and Landscaping

Maintenance of roads also included proper up-keep and general repairs of the road sides by maintaining the existing avenues of trees and shrubs and for planting fresh avenues and their maintenance & protection. Road has to be kept free of all obstructions and

wherever any trees get uprooted due to storms and winds, these have to be removed speedily. Periodical lopping of trees and maintaining tree guards and fencing is also required to be done. Provision of Rs 220/- per km for this work is necessary for all types of roads. This provision will, however, not be required in case of States where the road-side plantations are being looked after by the State Forest Departments out of their funds.

(e) Original work to be treated as Repairs

On every road, some jobs of the nature of original works are required to be undertaken for the proper up-keep of the road. If such items are to be charged to the Capital head, it becomes difficult to undertake such works expeditiously because it requires considerable time to get sanction of the competent authority for the original works. It is, therefore, very essential that certain amount should be available within the maintenance estimates of the road for carrying out such essential items. It has, therefore, been decided to provide Rs. 250/- per km for original works to be treated as repairs.

(f) Structures

Permanent works like culverts, bridges, retaining walls, breast walls etc. require proper maintenance and up-keep. If this repair is neglected it may lead to deterioration of the structures which may require considerable amount to rebuild them. An amount of Rs 275/- per km is necessary for this item of work for all types of roads.

(g) Road Side Drainage and Road Signs

Road side drains are necessary for collecting run-off water from the road-way and draining it away so that it does not enter the bed of pavement and weaken it. This item of maintenance is very vital because its neglect can lead to softening of the sub-grade which may cause failure or distortion of the pavement surface. It may also lead to scouring of the shoulders and drains and slips and cuts in road embankment. It is very necessary that the road side drainage system is maintained properly to function efficiently, otherwise it may lead to damages to the road, the repairs to which may cost very heavy expense. Similarly the proper maintenance of Road Signs and Traffic Aid Devices is necessary to give proper guidance to the traffic and to ensure road safety. For this purpose a sum of Rs 165/- per km is the barest minimum and must be provided on all types of roads. This provision also includes the expense of collecting Traffic Data.

(h) Maintenance of Inspection Bungalows, Rest Houses and Godowns :

Inspection Bungalows and Rest Houses are necessary for touring officers as a facility for their inspection tours. Similarly, godown buildings have to be set up to store essential maintenance material for use in case of any damage to the road. For proper annual repair and maintenance to these buildings a sum of Rs 250/- per km has been recommended to be made. This provision includes the salary of Rest House Chowkidar and Mali and any other expenditure contingent to the up-keep of Rest Houses and Inspection Bungalows.

(i) Watch and Ward of Road Side Stock-Yards and Godowns :

The road side godowns are normally located in out of the way places, away from habitation. Similarly we require to store grit, stone metal and bitumen along the road side. It is essential to keep a proper watch and ward over these materials to avoid theft and pilferage. A sum of Rs 100 per km has, therefore, been provided for this purpose.

II. PERIODIC RENEWALS

All types of roads whether black topped, water bound macadam or earthen roads, need periodical renewals to keep the surface traffic worthy. It is felt that on earthen roads it is necessary to lay one layer of loose moorum or gritty earth in thickness of 15 cm every 3 year. Provision has accordingly been made for this while working out norms for earthen roads.

In case of water bound macadam roads, it is necessary to lay an additional layer of 7.5 cm thickness of stone metal every 3rd year after sacrificing the old surface and to properly consolidate the additional layer with a road roller.

In case of black topped surfacing, separate treatment is recommended for roads in hilly areas and roads in Plains. In case of roads in plains, it is suggested that a renewals cycle of 4 years may be followed and every 4th year surface dressing may be provided using bitumen at the rate of 12 kg per 100 sq. m and hard stone grit 10 mm gauge at the rate of 1.067 cu. m. per 100 sq. m.

As the road gets wavy during the period of 4 years, it is necessary to provide levelling course for correcting such defects of pavement by patch work before laying the renewal coat. An amount of 10 per cent of the cost of renewal coat is necessary for this levelling course. In case of plain roads carrying heavy traffic or in special locations, premixed carpet may be laid instead of surface dressing repeating the cycle every six year. The additional cost may be met out of the premium to be provided for such locations as detailed in subsequent paragraphs.

In case of hill roads, surface dressing is not recommended, because the roads are full of curves and the grit flies off with the action of pneumatic tyres. It is, therefore, necessary to provide pre-mixed carpet surface on hilly roads with a renewal cycle of six years with a levelling course.

III. SPECIAL REPAIRS INCLUDING RAINS AND FLOOD DAMAGES

In addition to ordinary repairs and periodical renewals there may be occasions for carrying out special repairs which cannot be foreseen or predicted in advance. These repairs may be required to make good the damage caused by nature calamities like cyclones, earthquakes or heavy rains, cloud bursts and floods. The

items required to be executed may be rebuilding the washed away embankment, reconstruction of culverts, retaining or breast walls or road side drains. The cost of such repairs cannot be estimated correctly and it can be met out of a lumpsum provision. It is the considered view of the committee that a provision of 5 per cent be made for special repairs and 10 per cent for flood and rain damages, the percentage being worked out on total cost of maintenance including not only ordinary repairs and periodical renewals but also the premix required for special location of a stretch of road.

SMALL TOOLS AND PLANT

It is necessary to purchase small Tools and Plant like Shovels, Kassis, Tarring Kit, Brushes, Baskets etc. for which a provision of one per cent of the total cost is necessary. This provision does not include the cost of purchase of Road Rollers and Tar Boilers. These items are supposed to be provided under a separate head "NEW SUPPLY OF MACHINERY AND TOOLS AND PLANT"

IV. SPECIAL PROVISION ON ACCOUNT OF LOCATION OF THE ROAD

While working out norms of road maintenance we have to take into account certain special factors in addition to ordinary repairs, special repairs and renewals. These factors are the terrain, climate, and special soil characteristics as described below. For each special location lumpsum rates per km. have been recommended which should however, be applied for the *actual lengths* falling under these locations and not for the overall length of the road.

(a) High Rainfall Areas

On Roads passing through sections where there is a heavy rain fall, renewals will have to be done at shorter intervals. Moreover, the expenses on repairs to the berms and patch repairs will increase. Therefore, more funds are needed for the repair and upkeep of such sections and an additional provision of Rs 770/- per km is recommended for this purpose where rainfall is more than 3000 mm per annum.

(b) Roads in Hilly Areas

In hilly areas the cost of maintenance of Road increases on account of extra work involved in removal of slips maintenance of high retaining walls, breast walls, hair pin bends and greater efficiency in drainage system. The committee felt that provision of Rs 1000/- per km is absolutely necessary to cover the additional expenses involved in hilly sections. This provision does not cover the reconstruction of high retaining walls and restoration of road crust where landslides occur in long stretches of roads. These items will have to be executed by framing separate estimates for restoration.

(c) Snow Bound Areas

Where the hilly roads are located at an elevation of about 2150.00 metres above mean sea level they are liable to snow falls. In these areas snow clearance has to be done to keep the roads open for traffic. In shady reaches of such roads snow lying on the hill side slopes does not melt quickly and the water from the slow melting of the snow seeps into the sub-grade causing damage to the pavement. The side drains and cross drains also get choked up with snow and require clearance. An additional provision of Rs. 300/- per km over and above the provision of other items including allowance for Hilly Sections and heavy rainfall locations, is recommended where the annual snow fall is more than 40 centimetres.

(d) Roads in Desert Areas :

In case of road sections falling within desert areas, work is required to be done for removal of sand from the road surface and this needs extra expenditure. A provision of Rs. 300/- per km is recommended for such sections of the roads.

(e) Roads in Black Cotton Soil :

The Roads built in black cotton soil areas also need extra expenditure on maintenance, because of the poor bearing capacity of the black cotton soil during the wet season and the consequent breaking of pavement. In such areas much greater attention and efficiency in maintaining the road side drainage is also required. Therefore, an additional provision of Rs 300/- per km is recommended for such sections of the roads, where we encounter black cotton soils.

(f) Urban Links

Wherever the roads pass through urban areas like Municipal Committees/Municipal Corporations, they require higher maintenance cost, because of environmental problems, problems of drainage and difficult working conditions where repairs have to be carried out under constant traffic. It is recommended that for such stretches of roads which pass through urban areas an additional amount of Rs 2000/- per km should be provided for actual length of such stretches.

CONSIDERATION OF TRAFFIC INTENSITY :

The norms which have been given in this study are for traffic volume upto 450 commercial vehicles per day i.e. for C.B.R. Curves A, B, C & D. Where traffic volume is higher the maintenance expenditure will increase on account of shorter renewal cycle and greater expense on Patch Repairs. The committee recommends an additional provision of 15% over and above the annual cost per km as computed on the basis of recommendations made so far.

DOUBLE LANE ROADS :

The norms recommended in this report are for single lane roads because predominantly the roads of the

lower categories are single lane in the country. But there are certain exceptions where some of the major district roads carry heavy traffic and have been made double lane. In case of double lane roads cost of renewal will be more because of the increased area of pavement. On the other hand the wear and tear of the pavement will be much less on account of two lane width and the cost of Patch Repair will also be reduced. The cycle of renewal can also be made longer. On account of these reasons, the increase in cost of renewal due to greater surface area will be offset to some extent. The committee has come to the conclusion after careful thought that the cost of renewal, keeping in view the above-factors, will be higher by 60 per cent than the cost in case of single lane pavement. The provision for periodical renewals can therefore, be increased by 60 per cent wherever the roads are double lane. As an alternative, the overall cost of maintenance per km can be increased by 25 per cent for double lane pavement.

V RECOMMENDATIONS

The Committee recommends that all the State PWDs should work out the norms of maintenance of roads per km in their respective States basing the same on the rates of labour and materials prevalent in a particular region and working out the total cost of maintenance required for the roads in their States. It is also recommended that these norms may be revised every 3rd year by each State P.W.D. taking into account, the increase in the cost of material and labour.

ANNEXURE-I

UNIT COST OF ORDINARY REPAIRS OF STATE ROADS OF DIFFERENT CATEGORIES IN RUPEES PER K.M. PER YEAR

Sl. No.	ITEM OF WORK	SINGLE LANE ROADS HILLY AREAS			PLAIN AREAS		
		EARTHEN ROAD	WBM ROAD	BLACK- TOPPED ROAD	EARTHEN ROAD	WBM ROAD	BLACK- TOPPED ROAD
	ORDINARY REPAIRS						
1.	ROAD GANG	2303.00	1907.00	1511.00	2303.00	1907.00	1511.00
2.	PATCH REPAIRS	—	—	1083.00	—	—	1083.00
3.	HEAVY BERM REPAIRS	—	400.00	400.00	—	400.00	400.00
4.	ARBORICULTURE AND LANDSCAPING	220.00	220.00	220.00	220.00	220.00	220.00
5.	ORIGINAL WORKS TO BE TREATED AS REPAIRS	250.00	250.00	250.00	250.00	250.00	250.00
6.	STRUCTURES	275.00	275.00	275.00	275.00	275.00	275.00
7.	MISCELLANEOUS :—						
	(i) ROAD SIDE DRAINAGE, ROAD SIGNS AND COLLECTION OF TRAFFIC DATA ETC.	165.00	165.00	165.00	165.00	165.00	165.00
	(ii) INSPECTION BUNGALOWS REST HOUSES GODOWNS	250.00	250.00	250.00	250.00	250.00	250.00
8.	WATCH AND WARD OF ROAD SIDE STOCK YARDS AND GODOWNS	100.00	100.00	100.00	100.00	100.00	100.00
	TOTAL ORDINARY REPAIRS	3563.00	3567.00	4254.00	3563.00	3567.00	4254.00
	PERIODICAL RENEWALS	1600.00	4650.00	5135.00	1600.00	4226.00	2460.00
	TOTAL	5163.00	8217.00	9389.00	5163.00	7793.00	6714.00
	SPECIAL PROVISIONS AS PER LOCATION (ON ACTUAL LENGTH OF SECTION INVOLVED)						
	i) ADDITIONAL PROVISION FOR HIGH RAIN FALL AREAS	770.00	770.00	770.00	770.00	700.00	700.00
	ii) ADDITIONAL PROVISION FOR HILLY AREAS	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
	iii) ADDITIONAL PROVISION FOR SNOW BOUND AREAS	300.00	300.00	300.00	—	—	—
	iv) ADDITIONAL PROVISION FOR DESERT AREAS	—	—	—	300.00	300.00	300.00
	v) ADDITIONAL PROVISION FOR BLACK COTTON SOIL AREAS	—	—	—	300.00	300.00	300.00

vi) ADDITIONAL PROVISION FOR URBAN LINK	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
GRAND TOTAL	WILL	VARY	ACCORDING	TO	LOCATION	
i) SPECIAL REPAIRS	50%	OF	THE	GRAND	TOTAL	
ii) RAIN DAMAGES	10%	OF	THE	GRAND	TOTAL	
iii) SMALL TOOLS & PLANTS	1%	OF	THE	GRAND	TOTAL	

ANNEXURE II

STATEMENT OF BASIC RATES

LABOUR RATES :

a) MONTHLY BASIS :

i) Road Inspector	...	450=00 per month
ii) Mate/Head Coolie	...	350=00 per month
iii) Mazdoor:	...	330=00 per month

b) TEMPORARY LABOUR EMPLOYED ON DAILY WAGES :

i) Mistry	...	10=00 per day
ii) Mate	...	5=75 per day
iii) Beldar/coolie	...	5=25 per day
iv) Sprayman	...	9=33 per day
v) Bhishti	...	7=00 per day

MATERIALS :

i) Bitumen	...	1300=00 Per metric tonne
ii) Sand	...	250=00 % cft.
iii) Grit 10 mm size	...	125=00 % cft. or (48.50 per cum. including Contractor's profit).
iv) Stone Metal 38 mm size	...	90=00 % cft. (35.20 per cum. including Contractor's profit).

ANALYSIS FOR COST OF ROAD GANGS

1) EARTHEN ROAD :

Cost per km

ROAD GANG

Mazdoor=0.5 per km @ 330/- p.m. (Average rate)= $0.5 \times 330 \times 12$... 1980=00Mate/Head Coolies=1/20 per km @ 350/- p.m.= $1/20 \times 12 \times 350$... 210=00Road Inspector=1/48 per km. @ Rs 450/- p.m.= $1/48 \text{ per km} \times 12 \times 450$... 113=00

Total :

2303=00

Rs 2303=00 only

2) WATER BOUND MACADAM ROADS :

Cost per km.

ROAD GANG :

Mazdoor=0.4 per km @ Rs 330/- p.m.= $0.4 \times 330 \times 12$... 1584=00Mate/Head Coolies=1/20 per km. @ 350/- p.m. += $1/20 \times 12 \times 350$... 210=00Road Inspector=1/48 per km @ 450/- p.m.= $1/48 \times 12 \times 450$... 113=00

Total :

1907=00

Say Rs 1907=00 per km

3) BLACK-TOPPED ROAD :

Cost per km.

ROAD GANG :

Mazdoor, 0.3 per km @ 330/- p.m.= $0.3 \times 330 \times 12$... 1188=00Mate/Head Coolie=1/20 per km @ Rs 350/- p.m.= $1/20 \times 12 \times 350$... 210=00Road Inspector=1/48 per km. @ Rs 450/- p.m.= $1/48 \times 12 \times 450$... 113=00

Total :

1511=00

Say Rs 1511=00 per km.

PATCH REPAIRS-BLACK TOPPED ROADS

Cost per km

1) Bitumen=0.6 M.T. @ Rs 1300/- per M.T. (M.R.) ... 780=00

2) Grit 10 mm=5 cu. M. @ Rs 48.50 per cu. m. (M.R.) ... 242=50

3) Fuel & Sundries; L.S. ... 60=00

Total :

1082=50

Say Rs 1083=00

No provision has been made for Labour
as this work done by maintenance gangs.

PERIODICAL RENEWAL-BARTHEN ROADS

1)	Providing and laying 6" thick gritty soil and consolidation at O.M.C. with Road Roller complete. Cutting in pick work. Average width of road 6 metres. $1000 \times 6 \times 0.15 = 900$ cubic metre @ Rs 184/- per % cum. ... 1656=00 (As per Analysis given below); Carriage of earth average lead $1\frac{1}{2}$ km or 1 mile 900 cu. m. @ 2.54 ... 2286=00 per cum. (As per H.P. Schedule of Rates, 1968) Labour for laying gravel earth (work to be done by road gangs) ... NIL Consolidation with Road Roller 6000 sq. metre @ Rs 13/0 per sq. metre (%) ... 780=00 (As per Analysis given below); Total : 4722=00 Say Rs 4700=00 Cost per kilometre... Rs 4700=00 Cost for every 3rd Year, $4700/3 = 1567=00$ Say Rs 1600=00
2)	Providing and laying 6" thick (loose) gritty soil and consolidation at O.M.C. with road rollers complete. Cost per km 1. Cutting in pick work soil. Details of cost for 1000 cft. ... 47=25 Beldars & Coolies 9 Nos. @ Rs 5.25 per day Cost for 1000 cft. Rs 47.25 Cost for % Cum Rs 166.84 Add 10% Contractor's profit & overheads : Rs 16.68 Rs 183.52 Say Rs 184=00
3)	Consolidation of 6" thick gritty soil with road roller. Details of cost per 1000 Sft. ... 6=00 Hire charges for road rollers $1/20$ days @ Rs 120/- per day ... 0=26 Chowkidar $1/20$ Nos. @ Rs 5.25 per day; ... 4=20 Steam coal 0.42 mounds @ Rs 10/- per mound ... 0=60 Sundries; L.S. ... 11.06 Add 10% Contractor's profit and overheads; ... 1.11 12=17 Cost per 1000 sft. =Rs 12.17 Cost per % sq. metre =Rs 13.10 Say Rs 13/-

RENEWAL OF WATER BOUND MACADAM ROAD (HILLY AREAS)

	Cycle of renewal = 3 years	
a)	Scarifying= 1000×3.55 = 3350 Sq.m. 10% for curves; = 335 Sq.m. 3685 Sq.m.	=529=00
	@ 14.35 (H.P. Schedule of Rate 1968+Cost Index)	
b)	Collection and stacking of 38 mm gauge hard stone metal. $1000 \times 3.35 \times 0.075$ = 251=00 10% for curves; = 25=10 276=10 Cu. M	=9719=00
	@ Rs 35.20 per cu.m.	
c)	Laying wearing coat Qty. as per (b) 276.10 cu.m. @ 13.40 per cu.m. (H.P. Schedule of Rate 1968+Cost Index)	=3700=00 13948=00
	Cost of renewal per year $= 1/3 \times 13948 = 4650=00$ Say Rs 4650=00	

RENEWAL OF WATER BOUND MACADAM (PLAIN AREAS)

	Cycle of renewal = 3 Years	
a)	Scarifying= $1000 \times 3.35 = 3350$ Sq. m. @ 14.35 per % Sq.m. (H.P. Schedule of Rate, 1968+Cost Index) ... 480=00	
b)	Collection and stacking of $1\frac{1}{2}$ " gauge hard stone ballast. $1000 \times 3.35 \times 0.075 = 251=00$ @ 35.20 per cu.m. ... 8835=00	
c)	Laying wearing coat 251.00 Cu. m. @ Rs 13.40 per cu.m. (H.P. Schedule of Rates plus premium) ... 3363=00 12678=00	
	Cost of renewal per year $1/3 \times 12678 = 4226=00$	

PERIODICAL RENEWALS BLACK TOPPED ROADS (PLAIN AREAS)

Cost per km.

1.	Cycle of renewal=4 Years.		
	Surfacing dressing= $1/4 \times 1000 \times 3.35 = 837.50$		
	@ Rs. 2.67 per Sq m. (As per analysis given below)	...	2236=00
	Levelling course of renewal 10% of above item.	...	224=00
			2460=00
	Analysis of repainting with hot bitumen (Burmah shell mexpalts 80/100 or equivalent) using 25 lbs. of bitumen with $3\frac{1}{2}$ cft. of hard stone grit $3/8''$ gauge per 100 Sft. of road surface complete.		
	Detail of cost for 18,000 Sft.		
	MATERIAL :		
	Bitumen @ 25 lbs./% Sft.		
	$25 \times 18000 = 2.01$ Tonnes. Tons. 2.01 @ 1300/- per ton (M.R.)	...	2613=00
	100 $\times$ 2240		
	Hard stone grit $3/8''$ gauge @ $3\frac{1}{2}$ cft. per 100 sft.		
	$18000 \times 3\frac{1}{2} = 630$ 100 cft. 630 @ 125/- per % cft. (M.R.)	...	788=00
	100		
	Steam coal for heating bitumen @ 4 Cft. per ton of bitumen. $= 4 \times 2.01 = 8$ cwt. or 11.4 Mds. Mds. 11.04 @ 10/- per Md	...	114=00
	Labour for cleaning road surface, heating and spraying bitumen & gritting etc.		
	a) For cleaning :		
	Mate; Each 1 No. @ 5.75	...	5=75
	Beldars @ 0.45 per 1000 Sft. Each. 8 Nos. @ 5.25	...	42=00
	Coolie @ 0.90 per 1000 Sft. Each. 16 Nos. @ 5.25	...	84=00
	b) For heating and spraying :		
	Bitumen		
	Sprymen; Each. 1 No. @ 9.33	...	9=33
	Mistry; Each. $3/4$ No. @ 10.00	...	7=50
	c) For screening and spraying grit		
	Mate; Each. 1 No. @ 5=75	...	5=75
	Beldar; @ 1.6 per % Cft. of grit		
	$1.6 \times 6.30 = 10.1$ Nos. Say 10 Nos. Each 10 Nos. @ 5=25	...	52=50
	100		
	Coolies @ 1.6 per % Sft. of Grit Each. 10 Nos. @ 5=25	...	52=50
	d) Miscellaneous :		
	Chowkidar (i.e. for barrier for night watch and for road roller).		
	Each. $2\frac{1}{2}$ Nos. @ 5=25 P/D	...	13=12
	Bhishti Each. 1 No. @ 7=00 P/D	...	7=00
	Hire charges for road rollers. Per Day. 1 Day @ 120/- P D.	...	120=00
	Hire charges for Boiler; do- 1 Day @ 28/- P/D	...	28=00
	Hire charges for Sprying Unit; do- 1 Day @ 28/- P/D	...	28=00
	Brushes etc. for cleaning wire brushes (with thick wires);	...	1=87
	Each. $3/4$ Nos. @ 2=50 Each		
	Soft brushes; Each. $3/4$ Nos. @ 2=50 Each	...	5=00
	Brooms and Gunny Bags. Each. L.S.	...	1=50
	Sundries L.S.	...	4=50
			4056=75
	Add 10% for contractors' profit and overheads; cost of 18000 Sft.	...	405=68
			4462=43

Cost per Sqm. Rs 2.67

BLACK-TOPPED (PREMIX CARPET) (HILLY AREAS)

Cost per km

PERIODICAL REPAIRS :

1)	$1/6$ th length to be taken for premix carpet and seal coat		
	Premix carpet= $1/6 \times 1000 \times 3.35$	=558.00 Sqm.	
	10% for curves;	56.00 Sqm.	
		614=00 Sqm.	
	@ 6.25 per Sqm. (Analysis given below)	...	3838=00
2)	Seal coat 614 Sqm. @ Rs 1.30 per Sqm. (As per Analysis given below :	...	829=00
	Levelling course for renewals 10% of Item No. 1 & 2.	...	467=00
			5134=00

Cost per Km. 5135=00

Analysis of rate for $3/4''$ thick premix carpet surfacing with 2.44 cum. of stone grit $3/8''$ gauge and 122 kg. of hot bitumen (Burmah shell shels par B.S. or equivalent) per 100 Sq.m. of road surface complete.

Details of 100 Sqm.

MATERIALS :

i)	Bitumen @ 230/- kg. % Sqm.=230 Kg @ 1300 (M.R.)	299=00

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ii)	Grit @ 2.44 cum. % Sq.=2.44		
	Hard stone grit 3/8" gauge @ 2.44 Cum. % Sqm. 2.44 Cum @ 48=50 (MR)	...	118=34
	Steam coal for heating bitumen @ 4 cwt. per ton of bitumen 0.50 @ 10/- (M.R.) or 0.7 Mds.	...	7=00

LABOUR

Labour for cleaning road surface heating bitumen applying tack coat mixing & Spreading Grit

a)	For cleaning :		
	Mate 7/100 Nos. Each. 5=75	...	0=40
	Beldar @ 1.3 per % Sft. 1.3 Nos. Each. 5.25	...	6=30
	Coolie @ 1.3 % Sft. 1.3 Nos. Each. 5.25	...	6=30
b)	For heating bitumen :		
	Beldar @ 44 Nos. per tonne of Bitumen=4×230=.920 or .92 Nos. Each. 5.25	...	4=83
c)	For applying tack coat		
	Beldar @ 0.65 per 1000 Sft. or .7 Nos. % Sqm. @ 5.25	...	3=68
d)	For screening and spreading premixed grit		
	Mistry 1/6 No. Each. @ 10=00	...	1=67
	Beldar @ 5.25 Nos. per % Sft. of Grit 18.5 Nos. Each. @ 5.25	...	97=13
			544=65

MISCELLANEOUS :

	Chowkidar (at barrier) for night watch and for road roller. 0.23 Nos. Each. 5.25	...	1=21
	Bhishti; 1/10 No. Each 7.00	...	0=70
	Hire charges for Road roller. 1/10 Day, 1 Day. 120=00	...	12=00
	Hire charges for boiler; 1/10 Day, 1 Day. 28=00	...	2=80
	Hire charges for mixer 1/10 Day. 1 Day. 28=00	...	2=80
	Brushes etc. for cleaning wire brushes; 1/10 Nos. Each. 2=50	...	0=25
	Soft wire brushes; 3/10 Nos. Each. 2.50	...	0=75
	Brooms & Gunny Bags; L.S.	...	3=00
	Sundries; L.S.	...	0=50
			568=66
	Add 10% for contractor's profit and overheads;	...	56=87
			625=53
	Rate per 100 Sq.m =625.50		
	Rate per Sqm. Rs 6.25		

Laying seal coat with 8 lbs hot bitumen (Burmah shell mexphalts 80/100) 1 Cft of approved sand per 100 Sft. of Road Surface complete.

Details of cost per 10,000 Sft.

MATERIAL :

	Unit	Qty.	Rate	Amount
1)	Bitumen @ @ 8 lbs/100 Sft. 8×10000=0.36 Tonnes. Tonnes. 100×2240	0.36 Tonnes	1300=00 (M.R.)	468=00
2)	Approved sand @ 1 Cft. % Cft. 10000×1=100 Cft. Cft. 100	100 Cft	250=00 (MR)	250=00
3)	Steam coal for running roller and heating bitumen.			
i)	For heating bitumen @ 4 Cwts. per tonne of bitumen =4×0.46=1.44 or 2 Mds. Mds.	2 Mds.	10=00 (M.R.)	20=00
4)	Labour for cleaning of road surfacing heating and spraying bitumen for spreading.			
a)	For cleaning :			
	Mate;	Each. 1 No.	5=75	5=75
	Beldar @ 1.3 per 100 Sft.	Each. 13 Nos.	5=25	68=25
	Coolies @ 1.3 per 100 Sft.	Each. 13 Nos.	5=25	68=25
b)	For heating and spraying bitumen;			
	Mistry;	Each. 3/4 Nos.	10=00	7=50
	Sprayman.	Each. 1 No.	9=33	9=33
	Beldar @ 7 Nos. per ton of bitumen 7×0.36×=2.52 Nos.	Each. 2.52	5=25	13=13
c)	For screening and spreading sand, beldar @ 1.6 per % Cft.			
	1.6×100/100=1.6 Nos.	Each. 1.6 Nos.	5=25	8=40
	Coolies; 1.6 per % Cft of sand. 1.6×100/100=1.6 Nos.	Each. 1.6 Nos.	5=25	8=40

MISCELLANEOUS :

d) Chowkidar i.e. for barrier	Each 2½ Nos.	5=25	13=13
for night watch and for Road Roller	Each. 1 No.	7=00	7=00
Bhishti;	Per Day. 1 Day.	120=00	120=00
Hire charges for Road Roller per day	Per Day. 1 Day.	28=00	28=00
Hire charges for Boiler per day	Per Day. 1 Day	28=00	28=00
Hire charges for Spray Unit	Each 1 No.	2=50	2=50
Wire Brushes (with thick wire)	L.S.		3=00
Sundries.			1131=14
Add 10% for Contractors profit and overheads;			113=11
			1244=25
Cost for 10,000 Sft.	=1244.25		
Cost for 100 Sft.	=12.44		
Cost per Sqm.	=1.34 Say Rs 1.30 only.		

4110.4

No. NHII-31 (12)/73

Dated the 18th June, 1974

To

The Secretaries to all State Govts. (dealing with roads).

Sub : Norms for maintenance of National Highways—Revision of.

In response to Ministry's letter No. NHI-41 (1)/70, dated the 9th February 1970 certain suggestion/data for revising the norms for maintenance of National Highways were received from the State. The same have been examined and analysed in the Roads Wing. In view of the current financial stringency however, it is felt that it is not the opportune time to make any upward revision of the same at this stage. It is, therefore, essential to restrict expenditure on the maintenance and repairs of National Highways to the barest minimum possible. For this purpose, the following measures are suggested for adoption.

A. Ordinary repairs

(i) In para 2.4.2. of the final report of the Technical Group regarding norms for maintenance of National Highways, it was suggested that the maintenance operation should be modernised leading both to efficiency and perhaps some economy. For this purpose the labourers should move about collectively in groups of about 10 in a truck equipped with necessary basic tools for routine maintenance. This suggestion of the group may be considered for being implemented. Any existing crew found surplus as a result of the same, could be diverted to maintenance works on nearby States roads, Rural roads etc.

(ii) An effective control should be exercised on the maintenance gangs with a view to ensuring the required output of work assigned to them each day on a weekly or fortnightly work programme assignment basis.

(iii) The approved norms allow a lumpsum/provision of Rs. 200 per mile for Arboriculture and landscaping. The same should be utilised sparingly and only on really inescapable works. The amount thus saved could be utilised on more important items of ordinary repairs.

(iv) There is a provision of Rs 400/- per mile allowed for the item of original works treated as repairs under the sub-head "ordinary repairs" This amount should be utilised only on urgent and inescapable works to be personally selected by the State Chief Engineer. Attempt should be to save on this for utilising amount for other more items of repairs.

(v) For inspection bungalows, rests houses, godowns etc., a lumpsum provision of Rs 150/- per mile has been allowed under the sub-head 'ordinary repairs'. This amount should be utilised only on such of those structures the ownership of which vests in the Central Government. This requirement has been brought to the notice of the State Government also in the past.

B. Renewals

As large scale works of improvements/upgrading of National Highways have been sanctioned during the Fourth Five Year Plan and the same are in various stages of progress/completion, the lengths requiring renewals would be substantially less than those indicated in the approved norms. The extra costs involved in the work due to increase in wages and labour and prices of materials could be met from the savings which would thus be available.

3. It is requested that the above instructions may be brought to the notice of all concerned. It may also please be ensured that no excess of any kind occurs over the funds allotted for maintenance during the year, maintaining sub-head-wise control as well as National Highway-wise.

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No. NHIII-33 (50)/72

Dated the 12th March, 1976

Sub : Improvement and maintenance of Inspection Bungalows and Rest Houses on National Highways

According to the advice given by the Union Ministry of Law, Inspection Bungalows or Rest Houses adjoining or appurtenant to the National Highways are not covered by the definition of the term "National Highways" as given in Section 4 of the National Highways Act, 1956, and, therefore, these buildings cannot become part of the National Highway property simply by virtue of declaration of a road as a National Highway under the aforesaid Act. No expenditure can thus be incurred from National Highway Funds, on the improvement and maintenance of the Inspection Bungalows Rest Houses, adjoining or appurtenant to the National Highways, which have not been constructed on National Highway land with Central Government money. The position is, however, different in the case of Inspection Bungalows/Rest Houses, the ownership of which has been formally transferred, by executing an agreement, to the Central Government by the State Governments; in such cases, these buildings formally vest in the Central Government and have, therefore, to be improved/maintained from National Highway Funds. So far, only one State Government, namely Andhra Pradesh, has executed a transfer deed transferring ownership of certain Inspection Bungalows/Rest Houses to the Central Government. Since the Governments of Uttar Pradesh, Bihar, West Bengal and Assam had agreed to transfer ownership of the Inspection Bungalows/Rest Houses to the Central Government, this Ministry had agreed on 20th August, 1963, to meet all expenditure on the maintenance and improvement on the buildings in question. But, despite a number of reminders, the State Governments of Uttar Pradesh, West Bengal and Assam have not formally executed a transfer deed and, therefore, they have been informed that if they do not execute the requisite transfer deed by 31st March, 1976 at the latest it will be assumed that they want to retain the ownership of these buildings and in that event they will have to reimburse to the Government of India the entire expenditure incurred by them from Central Funds on the maintenance and improvement of the Inspection Bungalows and Rest Houses in their States.

2. The State Governments of Bihar and Rajasthan have forwarded the requisite transfer deeds which are being examined. As regards the remaining States, it has been decided not to pursue the matter of transfer of the ownership of the Bungalows/Rest Houses there to the Central Government.

3. All the Technical Officers etc. in the Roads Wing are requested to take note of the position stated above, while approving/releasing any funds to the State Governments for the maintenance/improvement of National Highways.

All Technical Officers, L.S. (N.H.) A/US (NH)B/W.S. (B)/All Sections (Roads Wing)

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No. NHIII/P/16/76

Dated the 17th March, 1976

To

All State Governments
(Departments dealing with roads)

Sub : Acceptance of central financial liability for the development/maintenance of urban road links of National Highways

I am directed to say that under the constitution, the Government of India are primarily responsible for maintenance and development of roads declared as National Highways and all other roads fall within the sphere of State responsibilities. According to Section 2 (1) of the National Highway Act, 1956 (No. 48 of 1956), such Sections of the National Highways as are situated within any "municipal area" (which term under the aforesaid Act means with a population of twenty thousand or more, the control or management of which is entrusted to a municipal committee, a town area committee, a town committee or any other authority) are not regarded as part of the National Highways. The responsibility for the development, improvement and maintenance of the urban road links of National Highways lying within the aforesaid municipal areas is thus that of the State Government or the local body concerned. However, in order to assist the State Governments in the proper maintenance and upkeep of the urban road links of the National Highways, the Government of India

had worked out a Scheme in 1954. The details of the Scheme, which have been set out in the attached annexure, are hereby re-circulated for your information. The Governments of Orissa, Bihar, Rajasthan, Haryana and Uttar Pradesh have already executed the agreement under the Scheme. Agreements have also been received from a few more States which are under scrutiny. As the Government of India are anxious to ensure unimpeded free flow of traffic through the urban road links of National Highways the need and urgency for execution of the agreements under the scheme has been impressed upon the States in a number of meetings of the Chief Engineers and standing Committee on Roads of the T.D.C. I am therefore to request that in case your State Government have not already executed, or forwarded the agreement to this Ministry, the matter may please be looked into and an agreement executed for and on behalf of the Governor of the State may be forwarded to this Ministry in the manner indicated in the annexure, at an early date.

Enclosure to letter No. NHIII/P/16/76 dt. 17.3.76

ANNEXURE

SCHEME FOR DEVELOPMENT AND MAINTENANCE OF URBAN ROAD LINKS OF NATIONAL HIGHWAYS

For the purpose of this scheme, urban road links have been defined as follows:

DEFINITION

- a) Portions of existing National Highways lying within towns having a population of 20,000 or more; and
- b) Roads in towns having a population of 20,000 or more connecting the terminal points of two or more different National Highways at the boundary of the town or city.
(The maintenance and development of such links lying within towns having a population upto 20,000 is already the responsibility of the Central Government).

URBAN ROAD LINKS ELIGIBLE FOR BEING TREATED AS PERMANENT ROUTES OF N.Hs

2. The Central Government have decided to accept financial liability both for the development and maintenance of only those urban road links which are suitable for taking through traffic and being declared as National Highway. The general criteria for this purpose are:

- (a) The road land should be adequate for a through traffic road in the centre and parallel service roads for local traffic on the sides. At the very minimum the road land width should be not less than 100 ft (50 ft. for the National Highway proper and 25 ft. on either side for service roads in built up areas.)
- (b) The road land should be free from encroachments or any leased structures. If there are any encroachments or leased structures the State Government should undertake to remove the encroachments and in cases or leases, not to renew them.

3. The centres contribution towards the development and maintenance of the urban road links described above will be to the extent indicated below:

1) **Improvement** : The Central Government will meet the full cost of improvements to the carriageway for through traffic. In addition, the Central Government will also meet the initial cost of providing parallel service roads excluding the cost of acquisition of built up property if required therefor. Once constructed, the service roads will be maintained and improved by the State Government or the local municipality and the Central Government will have no liabilities for these items. The provision of municipal services such as lighting, drainage, scavenging, and sanitation for both the National Highway and service roads will be the responsibility of the Municipality concerned.

(2) **Maintenance** : The Central Government will pay for the maintenance of these road links upto a sum calculated at the rate of Rs 3,100/- per km. or the actual expenditure incurred, whichever is less. If any expenditure has to be incurred in excess of Rs. 3,100/- per km. for the proper maintenance of these link roads, such additional expenditure will have to be borne by the State Government.

URBAN ROAD LINKS NOT SUITABLE AS PERMANENT ROUTES OF N.Hs

4. The road links within large towns served by National Highways which do not satisfy the criteria laid down in para 2 above will be eligible for Central assistance in regard to maintenance only and that too only till such time as a new bypass is constructed. In these cases also the Central financial liability for maintenance will be limited to Rs. 3,100 per km or the actual expenditure incurred, whichever is less and if any expenditure has to be incurred in excess of Rs. 3,100/- per km on the proper maintenance of these link roads, such additional expenditure will be borne by the State Government.

CONSTRUCTION OF BY-PASSES PARALLEL SERVICE ROADS

5. If the road link in any town is not suitable for through traffic and it is decided to construct a new bypass, the incidence of the cost of construction of such a bypass will be as follows:

(1) Where the new bypass (which will be the National Highway proper) runs through the municipal limits, the Central Government will bear the full cost of land acquisition, construction, and future maintenance of the national highway proper. The State Government will be responsible for providing parallel service roads and meeting the cost of land acquisition, construction and future maintenance of the same. The land required for the parallel service roads to a width of at least 35 ft. on either side of the national highway proper should be acquired simultaneously with the acquisition of land for the national highway proper. The actual construction of the parallel service roads may be taken up later but, in any case, it should be before any building activity is allowed near the bypass.

(2) Where the new bypass runs outside the municipal limits, the Central Government will bear the cost of land acquisition, construction and future maintenance of the National Highway without

insisting on the State Government providing parallel service roads for future development. If, however, at any time the area begins to get built upon the State Government shall construct at its cost parallel service roads before allowing any building activity near the bypass or extending the municipal limits to include the whole or a part of the bypass. Where these service roads can be accommodated in National Highway land this will be permitted but the entire responsibility for constructing and maintaining these will be that of the State Government.

6. The scheme as described above will be governed by the following general conditions:

(i) All the construction and maintenance work debitable to the Centre shall be done through State Public Works Department.

(ii) The parallel service roads shall have limited access to the National Highway and these points of access shall be got approved by the Central Government.

(iii) The State Governments should ensure that octrois or any other terminal taxes on through traffic and tolls are not levied by the local body concerned on the link roads maintained and/or developed at Central expense.

(iv) The extent to which the Central Government can make available every year funds for improvement works on road links will depend on the grants voted annually by Parliament.

(v) Funds for improvement works will be sanctioned on the basis of detailed plans and estimates to be submitted to the Central Government for technical approval and financial sanction.

(vi) The Central contribution towards the maintenance of road links will be given on the basis of abstract particulars of estimates in the first instance and will eventually be limited to Rs 3.100 per km or the actual expenditure incurred during the year, whichever is less.

(vii) The Central Government will have power to impose conditions so as to ensure the prevention and removal of encroachments from the road links. Road land should not be leased to any one without the approval of the Central Government.

7. There will be no objection to the State Governments meeting the expenditure on the acquisition of land and construction of parallel service roads under this scheme (vide para 5 above) from their allocation account in the Central Road Fund.

8. As required in Section 8 of the National Highways Act, 1956, an agreement has to be entered into between the Central Government and the State Government for availing of the financial assistance under the Scheme. A specimen copy of the agreement form is enclosed (Appendix I). The agreement is to be sent to the Ministry of Shipping and Transport (Roads Wing) in duplicate duly executed for and on behalf of the Governor of the State. Following points should be kept in view while executing the agreement:

- a) The agreement form should be typed on a durable paper.
- b) The agreement should be forwarded in duplicate.
- c) Each page of the agreement, including the Schedule, should be signed by the Officer executing the agreement for and on behalf of the Governor.
- d) All typographical mistake, interlineations alteration, typing faults etc. in the agreement should be authenticated by the signature of the Officer signing the agreement.
- e) The dates in the opening sentence of the agreement and in para 2 thereof should be left blank as these will be indicated by the Ministry of Shipping and Transport.
- f) The signature of the Officer executing the agreement should be attested by two witnesses (as indicated in the agreement form).

AGREEMENT TO BE SIGNED UNDER THE SCHEME.

DOCUMENTS TO BE SENT ALONGWITH THE AGREEMENT

9. Following documents may please also be sent to the Ministry alongwith the agreement:

- i) Details of the urban road links as per proforma attached (Appendix II).
- ii) Maps of the towns showing all the existing roads, including the National Highways urban road links.

APPENDIX I

AGREEMENT ENTERED INTO BETWEEN THE PRESIDENT OF INDIA AND THE GOVERNOR OF

This agreement made this day of One thousand nine hundred and seventy..... between the President of India (herein after called "The Central Government", which expression shall, where the context so admits, include his successors and assigns) of the one part and the Governor of..... (Hereinafter referred to as "The State Government" which expression shall, where the context so admits, include his successors and assigns) of the other Part.

WHEREAS section 8 of the National Highways Act, 1956 (No. 48 of 1956) (Hereinafter called "The said Act") authority the Central Government to enter into an agreement with the Government of any State or with any authority entrusted with the control or management of any municipal area in relation to the development or maintenance of the whole or any part of a National Highway situated within the State or, as the case may be, in relation to the development or maintenance of any such part of a highway situated within a municipal area as is referred to in sub-section (I) of Section 2 of the said Act and any such agreement may provide for the sharing of expenditure by the respective parties thereto:

AND WHEREAS the road links described in the Schedule hereunder written which will fall in the State of..... are covered by the exception to sub-section (I) of the Section 2 of the said Act:

AND WHEREAS the Central Government and the State Government have decided to enter into an agreement in respect of the development and maintenance of such road links subject to the terms and conditions hereafter mentioned.

Now it is hereby agreed by and between the parties hereto as follow:

1. The following words and expressions wherever appearing in this Agreement, shall have the meaning assigned to them as hereunder:

BYEPASS :	A road to enable through traffic to avoid congested areas or other obstruction to passage.
NATIONAL HIGHWAY :	A Highway declared as such by the Government of India by a notification in the official Gazette.
ROAD :	A way over which both vehicles and other types of traffic may lawfully pass. It includes the whole area upto the defined boundary and all structures and appurtenance pertaining to the road.
ROAD LAND :	The land secured and reserved to the public for road purpose
PARALLEL SERVICE ROAD :	A subsidiary road constructed between a road and buildings or properties facing therein and connected only at selected points with the principal road.
ROAD LINK :	(a) Portions of existing National Highway lying within towns having a population of 20,000 or more; (b) Roads in towns having a population of 20,000 or more connecting the terminal points of two or more different National Highways at the boundary of the town or city.
MUNICIPAL AREA :	Any municipal area with a population of 20,000 or more the control or management of which is entrusted to a municipal Committee, town Committee, or any local authority.

2. The agreement will take effect from.....

3. Road links considered eligible for being treated as permanent routes of National Highways.

The Central Government accepts financial liability both for the development and maintenance of those urban road links described in the schedule hereunder written which are considered suitable for being treated as permanent routes of National Highway. The general criteria for this purpose will be:

- a) The road land should be adequate for a through traffic road in the centre and parallel service roads for local traffic on the sides. At the very minimum the road land width should be not less than 30.5 m (100 ft) 15.25 m (50 ft) for the national highway proper and 7.63 m (25 ft) on either side for service roads in built-up area.
 - b) The road land should be free from encroachments or any leased structures. If there are any encroachments or leased structures the State Government should undertake to remove the encroachments and in cases of leases not to renew them.
4. The Central Government's contribution towards the development and maintenance of the urban road links described in clause 3 hereof will be to the under mentioned extent namely:

(a) IMPROVEMENTS :

The Central Government will meet the full cost of improvements to the carriageway for through traffic. In addition, Central Government will also meet the initial cost of providing parallel service roads excluding the cost of acquisition of built up property if required therefor. Once constructed, the service roads will be maintained and improved by the State Government or the local municipality and the Central Government will have no liabilities for the said roads. The State Government shall ensure that the provision of municipal services such as lighting, drainage, scavenging and sanitation for both the national highway and service roads will be the responsibility of the Municipality concerned.

(b) MAINTENANCE :

The Central Government will pay for the maintenance of the said road links upto a sum calculated at the rate of Rs. 3,100/- per km. (Rupees Three thousand and one hundred) only Rs. 5,000/- (Rupees Five Thousand) only per mile or the actual expenditure incurred, whichever is less. If any expenditure has to be incurred in excess of Rs. 3,100/- per km (Rs 5,000/- per mile) for the proper maintenance of the said road links, such additional expenditure will be borne by the State Government.

5. Treatment of road links which are not suitable for through traffic.

The road links within large towns served by national highways which do not satisfy the criteria laid down in clause 3 hereof will be eligible for Central Government assistance in regard to maintenance only and that too only till such time as a new bypass is constructed. In these cases also the financial liability of the Central Government for maintenance will be limited to Rs. 3,100/- per km (Rupees 5,000/- per mile) or the actual expenditure incurred, whichever is less, and if any expenditure has to be incurred in excess of Rs. 3,100/- per km (Rs 5,000/- per mile) on the proper maintenance of the said link roads, such additional expenditure will be borne by the State Government.

6. Construction of new bypasses:

If the road link in any town is not suitable for through traffic and it is decided to construct a new bypass, the incidence of the cost of construction of such a bypass will be as follows :

- (a) Where the new bypass (which will be the national highway proper) runs through the Municipal Limits, the Central Government will bear the full cost of land acquisition, construction and future maintenance of the national highway proper. The State Government will be responsible for providing parallel service roads and meeting the cost of land acquisition, construction and future maintenance of the same. The land required for the parallel service roads to a width of at least 10.7 m (35 ft.) on either side of the National Highway proper should be acquired simultaneously with the acquisition of land for the National Highway proper. The actual con-

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struction of parallel service roads may be taken up later but in any case, it should be before any building activity is allowed near the bypass.

- (b) Where the new bypass runs outside the Municipal limits, the Central Government will bear the cost of land acquisition, construction and future maintenance of the National Highway without insisting on the State Government providing parallel service roads for future development. If, however, at any time the area begins to get built upon, the State Government shall construct at its cost parallel service roads before allowing any building activity near the bypass, or extending the municipal limits to include the whole or a part of the bypass. Where the said service roads can be accommodated in national highway land, this will be permitted but the entire responsibility for constructing and maintaining the same will be that of the State Government.
7. The Scheme as described above will be governed by the following general conditions;
- (i) All the construction and maintenance work debitable to the Centre shall be done through State Public Works Department.
- (ii) The parallel service roads shall have limited access to the national highway and in respect of these points of access the State Government shall obtain the prior approval of the Central Govt.
- (iii) The State Government shall ensure that octroi or any other terminal taxes on through traffic and tolls are not levied by the local Body concerned on the link roads maintained and/or developed at Central Government's expense.
- (iv) The extent to which the Central Government can make available every year funds for improvement works on road link will depend on the grants voted annually by Parliament.
- (v) Funds for improvement works will be sanctioned on the basis of detailed plans and estimates to be submitted to the Central Government for the technical approval and financial sanction.
- (vi) The Central Government's contribution towards the maintenance of road links will be given on the basis of abstract particulars of estimates in the first instance and will eventually be limited to Rs 3,100/- per km (Rs 5,000/- per mile) or the actual expenditure incurred during the year, whichever is less.
- (vii) The Central Government will have power to impose conditions so as to ensure the prevention and removal of encroachments from the road links. Road land shall not be leased to any one without the prior approval of the Central Government.
8. The State Government may, if it so decides, meet the expenditure on the acquisition of land and construction of parallel service roads under this scheme (Vide Clause 6 hereof) from its allocation amount in the Central Road Fund.

IN WITNESS WHEREOF this agreement is executed in duplicate by the parties hereto on the dates mentioned below their respective signatures.

Signed for and on behalf of the President of India by Shri
in the presence of

For and on behalf of the President of India

- i) Name and Designation
- ii) Name & Designation

Signed for and on behalf of the Governor of by
in the presence of

- i) Name & Designation
- ii) Name & Designation

SCHEDULE (SEC. CLAUSES 3 & 5)

S.No.	Name of town or City	National Highway Route	Length in kms	Remarks (whether suitable unsuitable as permanent links)

For and on behalf of the President of India

For and on behalf of the
Governor of.....
Dated

URBAN ROAD LINKS CONNECTING NATIONAL HIGHWAYS**(1) SUITABLE FOR DEVELOPMENT AND MAINTENANCE AS PERMANENT ROUTES OF N.Hs.****(2) NOT SUITABLE FOR THROUGH TRAFFIC.**

Name of Town and City	Routes Nos. of N.Hs. serving the town or city.	Description of the Length	of the N.H. at terminal points	urban links		Type of surface	Date from which State Govt. assumed responsibility for maintenance of the urban links.	Whether the property in the urban link vests in the State Govt.	REMARKS
				Road land in built up area	width In open area				
1	2	3	4	5	6	7	8	9	10

Notes: 1. Only those towns and cities lying on National Highways and having a population of 20,000 (according to last census) or over should be included in this statement.

2. Under column 6 an indication should be given, in case the existing road width is less than 150 ft., whether there is scope for acquiring additional land to make up 150 ft.

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NO. NHIII/P/13/75

Dated the 10th August 1976

To

All State Governments (Deptt., dealing with National Highways)

Sub: Acceptance of Central financial liability for the development/maintenance of urban road links of National Highways

I am directed to refer to this Ministry's letters No. PL-13(17)/51, dated the 16th February, 1954, and No. NHIII/P/16/75, dated the 17th March, 1976, and to say that in the meeting of the Standing Committee on Roads of the Transport Development Council held on 27th June, 1975, some of the States felt that the ceiling of Rs 5,000/- per mile per year (or Rs 3,100/- per km.) prescribed in this Ministry's letter dated the 16th February, 1954, as financial assistance for maintenance of National Highway urban links needed to be raised in view of the increase in the cost of material, wages of labour, increase in carriageway width etc. This suggestion was commended by the Standing Committee on Roads for consideration. The matter has since been considered and I am to say that the President has been pleased to decide that with effect from 1st April, 1976, the financial assistance for maintenance of the urban road links of National Highways in Municipal areas with a population of 20,000 or more will, subject to the terms and conditions outlined in the letters referred to above, be admissible at the rate of Rs 8,000/- per km. per year or the actual expenditure, whichever is less.

2. These orders issue with the concurrence of the Finance Division vide their U.O. No. 2345-TF-II/76, dated the 17th July, 1976.

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No. NHIII/P/13/75 (i)

Dated the 12th August 1976

Sub: Acceptance of Central financial liability for the development/maintenance of Urban road links of National Highways

A copy of this Ministry's letter No. NHIII/P/13/75, dated the 10th August, 1976, on the subject noted above is forwarded herewith for information and necessary action.

It is to be noted that the ceiling figure of Rs 8 000/- per km per year is to be regarded as all inclusive i.e. inclusive of agency charges as well.

To

1. All Officers in the Roads Wing (including Regional Officers and Engineer Liaison Officers)
2. All Sections in the Roads Wing
3. Internal Finance Division with reference to their U.O. No. 257/TFS-II/76, dated the 4th August, 1976.

No. NHIII/MISC/116/79

Dated the 30th August 1979

To

All the Chief Engineers concerned with National Highways in the States and Union Territories

Sub : Maintenance and Repairs of National Highways-Updating of Unit Rates for Ordinary Repairs and Periodical Renewals

In order that the unit rates for Ordinary Repairs and Periodical Renewals for Maintenance of National Highways are updated to account for the rises in labour wages and cost of materials, it is necessary to have up-to-date information on the same. I am to request that the required information may please be forwarded to this Ministry immediately in the enclosed sample proforma for the National Highways in your jurisdiction.

2. The statements should be accompanied by a Road map of the State/District (1" = 16 miles or 1" = 8 miles) on which the National Highways and their sections falling in different Zones are clearly marked.

(SAMPLE PROFORMA)

Statement of lengths of National Highways (outside Municipal Limits) in different Zones, Labour Wages and Cost of Materials

Name of State Maharashtra

S. No.	N.H. No./Reach with kilometrage	Length in kms in			Length in km in premium			sections			Labour wages	p.m.	Remarks		
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Heavy areas 1500-3000 mm	rainfall Over 3000 mm	Hilly Area	Black Cotton Soil Areas	Desert Areas	Ordinary Labour (Maz-door)	Mate	Rate of Bitumen at site per M.T.	
												Rs	Rs	Rs.	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1.	N.H. No. 3														
a)	Thana to Kasara km 561.20 to 470.84	—	87.55	—	—	—	—	87.55	16.00	—	—	300/-	350/-	1300/- (Bulk)	
b)	Kasara to Chander Ghat km 470.84 to 346	124.80	—	—	—	—	24.00	16.00	5.65	14.66	—	280/-	300/-	1350/- (Bulk)	
c)	Chander Ghat to M.P. Border km 346 to 168.30	174.16	—	—	—	—	—	—	7.80	74.10	—	275/-	300/-	1400/- (Bulk)	
2.	N.H. No. 4														
	Thana to Khopoli km 143.25 to 80.04	—	59.05	—	—	—	59.05	—	—	—	—	300/-	350/-	1300/- (Bulk)	
b)	Khopoli to Satara km 70.05 to 9.09 & km 833.91 to 735.84	—	132.47	—	—	—	17.36	14.80	21.20	—	—	300/-	325/-	1360/- (Bulk)	
c)	Satara to Karnataka Border km 732.24 to 592.24	135.32	—	—	—	—	—	—	—	73.00	—	280/-	300/-	1610/- (Packed)	

* Basis for classification into Zones is given below

Note : Classification of Zones is done on the basis of average rate of stone chips on the roadside as follows :

Zone I	—	Rs. 28/- to Rs. 35/- per cum
Zone II	—	Rs. 35/- to Rs. 46/- per cum
Zone III	—	Rs. 46/- to Rs. 60/- per cum
Zone IV	—	Rs. 60/- to Rs. 81/- per cum
Zone V	—	Rs. 81/- to Rs. 100/- per cum

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No. RW/NHIII/P/11/82

Dated the 27th April, 1984

MAINTENANCE CELL

4120

Sub : Payments to Railway authorities for Maintenance of **Level Rail** crossings on National Highways

It is observed that some States are requesting for additional funds for making payments to the Railway Authorities for maintaining rail level crossings on National Highways. Normally, such payments have to be made out of the provision for Ordinary Repairs. However, in order to ensure that suitable provision is made under O.R. and no arrears accumulate, it has now been decided that the project zones shall obtain from the respective State PWDs Divisionwise, the amount to be paid to the railway authorities as per debits raised by the Railway Authority. This information should be received and incorporated to the Abstract Particulars Estimates of 1984-85. These amounts as admissible should be included in Ordinary Repairs Sub-head of the Abstract Particulars and indicated separately while intimating the allotment Divisionwise. The States should be advised to make the payment yearly and no accumulations of such dues may be allowed. Necessary action in this regard may please be taken early.

To

C.Es. & S.Es Road Project Zones.

4120	ABSTRACT PARTICULARS		
<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
4120.1.	NHIII/Misc/195/73 dt. 26.12.74	Maintenance & Repairs of National Highways-Abstract Estimate for 1975- 76.	4120/1
4120.2.	NHIII/Misc/139/77 dt. 5.12.77	Maintenance & Repairs of National Highways-Abstract Particulars Estimates.	4120/2
4120.3.	B-20 (3)/78 dt. 15.5.78	Abstract Particulars for Maintenance & repairs of National Highway	4120/7
4120.4.	NHIII/Misc/92/78 dt. 3.10.78	Maintenance & Repairs of National Highway-Renewal Programme	4120/8
4120.5.	NHIII/Coord/1/80 dt. 24.12.80	Maintenance & Repairs of National Highways Abstract Particulars Estimates for the Year 1981-82	4120/9
4120.6.	NHIII/Coord/38/82 dt. 16.1.84	Maintenance & Repairs of National Highways	4120/10

No. NHIII/Misc/195/73

Dated the 26th December 1974

Sub : Maintenance and Repairs of National Highways. Abstract—Estimate for 1975-76

As per standing instructions issued on the subject, the Abstract particulars estimates for Maintenance and Repairs of National Highways for the year 1975-76 are to be received in this Ministry by 1st January 1975. Superintending Engineers (Roads) may take up the matter with the States if the same are not received by the due date.

2. Comments and recommendations on the abstract estimates from the Regional Officers are due to be received in this Ministry by 1st February 1975. Superintending Engineer (Roads/Bridges) may please ensure that the comments on these estimates, are received by the scheduled dates so that there is no delay in finalisation of the proposals sent by the States and in release of funds for the same.

3. While scrutinising the proposals for renewals Superintending Engineers (Roads) should take into account the Miles (or kms) that are being improved or proposed to be improved by June 1976 under Original works as also the miles (or kms) where pavement surface has already been improved or proposed to be improved during 1975-76 under special repairs or flood damage repairs and consider only the balance lengths for renewals depending upon their entitlement as per renewal cycles. Their recommendations on the requirements of funds for ordinary repairs and renewals should reach S.E. (R) IB before 1st April, 1975. These recommendations are to be furnished National Highwaywise and Divisionwise in the enclosed *Proforma I in duplicate* so that the same can be incorporated in the allotment letters.

4. Superintending Engineers (Roads/Bridges) should also examine the demands of the State Chief Engineers for continuing special repair works and continuing flood damage repair works and keeping in view the comments received from the Regional Superintending Engineers, give their final recommendations of funds admissible for these sub-heads in the enclosed *proformae II and III in duplicate* to S.E. (R) IB by 1st May 1975. Since release of further funds for continuing special repair works and continuing flood damage repair works depends upon the actual expenditure incurred on individual works during previous years, it may be ensured this information is obtained from State Chief Engineer without fail.

5. The estimates for new Special Repair works, if any, received from the State Chief Engineers should be examined keeping in view the recommendations received from the Regional Superintending Engineers. They should give their final recommendations of funds admissible for this sub-head to S.E. (R) IB by 15th July 1975.

6. The estimates/Reports received from the States for the fresh flood damage repairs, if any, rendered necessary due to monsoons of 1975 should be scrutinised and keeping in view the recommendations received from the Regional Superintending Engineers give their assessment of total cost of restoration (National Highway-wise and work-wise) in Proforma No. IV and the funds required during 1975-76 to S.E. (R) IB by 15th November, 1975.

To All Superintending Engineers (Roads and Bridges), Roads Wing, New Delhi.

Copy also forwarded to all the Chief Engineers (Roads and Bridges), (Roads Wing), New Delhi, for information.

ENCL : AS ABOVE.

Copy with copies of enclosures also forwarded to :

All Regional Officers and Liaison Officers, Ministry of Shipping and Transport (Roads Wing), outside Delhi.

They should ensure that the prescribed time schedule for submission of estimates is strictly adhered to by the State Chief Engineers.

2. As soon as the estimates along with bar charts etc. are received, their recommendations (National Highway-wise and Division wise) regarding demands for Ordinary Repairs and Renewals, should be forwarded to the Ministry immediately and in any case not later than 1st February 1975.

3. Similarly their recommendations for continuing special repair works and continuing flood damage repair works should be forwarded to the Ministry latest by the 15th April, 1975 and while forwarding their recommendation on individual works, they should see that expenditure incurred up to 31st March, 1975 on these works are also furnished.

4. They should also forward their comments on the estimates for new special repairs works latest by 1st July, 1975.

5. They should, without waiting for estimates from State Public Works Department also arrange to forward a detailed report on the flood damages along with rough costs of restoration and requirements of funds during 1975-76 for the States in their Jurisdiction, latest by 1st November, 1975.

6. They should also ensure that detailed estimates for new flood damage repairs are forwarded by the States soon after the occurrence of the floods and also arrange to send their comments on these estimates soon there after and in any case before 15th December, 1975.

II. Copy to All Under Secretaries and works section.

It is observed that in some cases that technical approvals have been issued without ascertaining the availability of funds from the maintenance cell. In this connection their attention is invited to paragraph 8 of this circular where in it is emphasized that the technical approvals should be issued only after obtaining the clearance from the Maintenance Cell.

4120.2

No. NHIII/MISC/139/77

Dated the 5th December, 1977

To

All State Chief Engineers concerned with National Highways in the States and Union Territories

Sub : Maintenance and Repairs of National Highways—Abstract particulars Estimates

The procedure and time schedule for the State Government to forward the proposals and abstract particulars estimates for maintenance and repairs of National Highways to this Ministry was prescribed vide Ministry's D.O. letter No. NHIII-32 (1)/72, dated the 3rd February, 1973. This has been reiterated from year to year and the following detailed instructions are now being communicated to be adhered to for the year.

2. Ordinary Repairs, Renewals, Maintenance of Urban Links and Major Bridges :

2.1. As per the instructions, the Abstract particulars estimate for the Maintenance and Repairs of National Highways for the year (in duplicate) would be due in this Ministry by 1st January. It has been observed that all the States are not sending the Abstract particulars Estimates in uniform proforma. In order to have uniformity, a sample estimate has been prepared, which is enclosed herewith as Proforma No. 1 (alongwith enclosures viz. Tables No. 1 to 4 and a bar chart). The requirement of funds should be worked out Circle-wise for each National Highway, as given in the sample estimate under the following sub-heads on the forms mentioned against each :

2.1.1 Ordinary Repairs on Table No. 1.

2.1.2 Renewals on Table No. 2.

2.1.3 Maintenance of Urban Links on Table No. 3.

2.1.4 Maintenance of Major Bridges (length 60 metres and above) on Table No. 4.

These figures should then be carried over to Proforma I so as to get the total figure for the State.

2.2. Unless full particulars are furnished, as stated above, it will not be possible for this Ministry to make realistic allotments.

2.3. One set of Abstract Particulars Estimate alongwith necessary details, referred to above, should be sent simultaneously to the Ministry's Regional Officer concerned with the State.

3. Continuing S.R. Works/F.D.R. Works :

3.1. Requirement of funds for Continuing S.R./F.D.R. works may please be furnished *in duplicate* on the *Proforma No. II* (enclosed) and these should reach the Ministry latest by *30th April*, with a copy to the Regional Officer of the Ministry.

3.2. It may be mentioned that expenditure during the year 1977-78 and total expenditure upto 31.3.1978 under columns 6 and 8 respectively of the Proforma No. II must be furnished for all the works, otherwise release of further allotment cannot be considered.

3.3. It is also to be pointed out that all the Continuing S.R./F.D.R. works on which expenditure was incurred during—should be included in the Proforma No. II, irrespective of the fact whether funds for the year are required or not. For the works completed during—and for which further allotment is not required, a remark to the effect "*work completed*" may be given against such works in the remarks column of the above referred proforma. This would thus give the full picture of the funds allotted and expenditure incurred on these sub-heads during.

3.4. Allotment of funds to Continuing S.R./F.D.R. works cannot be considered, if full information is not furnished as per the Proforma No. II.

4. Special Repair Works (New) :

Estimates for New S.R. Works required, if any, should be sent to this Ministry with full justifications, as

far as possible, before *1st June*, and a copy of the same should also be simultaneously forwarded to the Ministry's Regional Officer concerned.

5. **Flood Damage Repairs (New) :**

Estimates for Flood Damage Repairs, if any, rendered necessary during the monsoon of should be sent to this Ministry immediately after intimation of occurrence of damages has been given to the Ministry and in any case from 15th October, onwards (15th December,—for the States on the East Coast). A copy of such estimates should also be forwarded to the Regional Officer of the Ministry. An abstract of the requisition for funds in respect of flood damage repairs should also be prepared as soon as the assessment of damages is made and forwarded to the Ministry as in Proforma No. III (enclosed).

6. **Re-appropriation of funds :**

6.1. Allotment of funds for Maintenance and Repairs of National Highways is made to the States under different sub-heads for specific purposes. It has been observed that some States are diverting funds from one sub-head to other e.g. from Renewals to Ordinary Repairs or from S.R./F.D.R. works to Ordinary Repairs/Renewals etc., without this Ministry's prior approval. This is not a correct practice and it has been decided that in future such transfer of funds from Renewals to Ordinary Repairs or S.R./F.D.R. works to Ordinary Repairs/Renewals etc., will not be acceptable unless expressly approved in advance by this Ministry in specific cases.

6.2. The State Government must ensure that expenditures on various sub-heads do not exceed the allotments made during the financial year. In case the State Government are not able to spend the allotted funds in respect of any particular sub-head, the proposal for re-appropriation/surrender of funds must be sent to this Ministry latest by *28th February*.

7. In view of the tight financial position under Maintenance and Repairs Grants, it is requested that the proposals for maintenance and repairs should be thoroughly screened by the Chief Engineer before same are forwarded to this Ministry. Also, in case the particulars are not received by the due dates, as indicated above, the allocation of funds might have to be finalised without waiting for these particulars and may involve unavoidable subsequent references which would be difficult to entertain.

PROFORMA NO. I
(with Annexures Tables 1, 2, 3 and 4)

REQUIREMENT OF FUNDS FOR MAINTENANCE AND REPAIRS OF NATIONAL HIGHWAYS

Name of State : **MAHARASHTRA**

Sl. No.	Name of Circle	N.H. No.	Length excluding Municipal limits (Kms.)	Amount required during 1978-79				Total	Remarks
				Ordinary Repairs	Renewals	Maintenance of Urban Links	Maintenance of Major Bridges		
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
-----Rs. in lakhs-----									
1.	N.H. Circle, Nagpur								
	a) N.H. No. 7		228.64	4.82	2.78	1.86	0.67	10.13	
	b) N.H. No. 6		466.40	10.87	19.10	3.61	0.75	34.33	
	Total for the Circle		695.04	15.69	21.88	5.47	1.42	44.46	
2.	_____ Circle _____								
3.	_____ Circle _____								
	Total for State								

**TABLE NO. I STATEMENT SHOWING THE DETAILS FOR ALLOTMENT REQUIRED FOR
ORDINARY REPAIRS FOR THE YEAR 1978-79**

Circle : N.H. Circle : Nagpur

Name of State MAHARASHTRA

Sl. No.	Name of Division/N.H. No./Section of road	Total length excluding municipal limits (Kms.)	Length of single lane (kms.) <450 C.V./ day 450-1500 C.V./ day >1500 C.V./ day	Length of double lane (kms.) <450 C.V./ day 450-1500 C.V./ day >1500 C.V./ day	Premiums due to length in kms. Heavy Rainfall 1500 to 3000 mm Desert Area Hilly Area Black cotton soil area								
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	N.H.No. 7												
i)	N.H. Divn. No. 13 Nagpur												
	a) Nagpur-Jabalpur Road (Km 0 at Varanasi)												
	Km. 721.00 to 715.40												
	Km. 711.00 to 652.50	(3) 64.10	(4) —	(5) —	(6) —	(7) —	(8) 64.10	(9) —	(10) —	(11) —	(12) —	(13) —	(14) —
	b) Nagpur-Hyderabad Road (Km. 0 at Nagpur)												
	Km.10.86 to 175.40	164.54	22.40	—	—	79.34	62.80	—	—	—	—	—	—
	Total length (Km)	228.64	22.40	—	—	79.34	126.90	—	—	—	—	—	—
	Rate per km. as per Norms		Rs 1730/-	Rs 2050/-	Rs 2340/-	Rs 1680/-	Rs 2130/-	Rs 2470/-	Rs 440/-	Rs 625/-	Rs 940/-	Rs 310/-	Rs 310
	Cost	—	38752/-	—	—	133291/-	270297/-	—	—	—	—	—	—

Total of Col.

4 to 14 Rs 4,42,340/-

Add Agency Charges @ 9% Rs 39,811/-

Total Rs 4,82,151/-

for the Division & N.H. say Rs 4.82 lakhs C/o to Proforma No. I.

(If there are two or more divisions in the same circle in-charge of different lengths of same N.H. give similar details for other division and then total for the N.H. which may then be given)

II. N.H. No. 6

i) N.H. Division

No. 14, Nagpur

a) Nagpur-Raipur Sec.

(Km. 0 at Sambalpur)

Km. 402.00 to 487.00 and

Km. 490.60 to 540.50

b) Nagpur-Edlabad Sec.

(Km. 0 at Nagpur)

Km. 8.30 to 149.90

Km. 158.60 to 161.80

Km. 165.00 to 246.20

Km. 250.30 to 297.40

Km. 301.60 to 360.00

Total length (Km.)

Rate per Km. as

per Norms

Cost

Total of Columns 4 to 14

Add Agency Charges @ 9%

Total

for the N.H. Divn. and N.H.

Rs 9,96,856/-

Rs 89,717/-

Rs 10,86,573/-

Say Rs 10.87 lakhs C/o to Proforma No. I

Total amount for the Circle Rs 4.82 lakhs + Rs 10.87 lakhs

=Rs 15.69 lakhs

TABLE NO. 3-REQUIREMENT OF FUNDS FOR MAINTENANCE OF URBAN LINKS FOR 1978-79

(As per agreement entered into with Government of India)

Circle : N.H. Circle, Nagpur

Name of State : MAHARASHTRA

Sl. No.	N.H. No./ Name of Link	Length in kms	Budget provision made by State Govt. for 1978-79. (Rs in lakhs)	**Amount of Central contribution required during 1978-79 (Rs in lakhs)	Remarks
1.		2.	3.	4.	5.
1.	N.H. No. 6				
i)	Jalgaon Kms. 429.80 to 434.00	4.20	0.42	0.34	** The Central contribution for the Urban Links will be actual expenditure subject to a limit of Rs 8,000/- per Km
ii)	Nagpur Kms 540.50 to 550.20	9.70	0.97	0.78	
iii)	Nagpur SDEN Road Nagpur-Edlabad Section.	8.30	1.95	0.66	
iv)	Amravati Kms 149.90 to 158.60	8.70	2.87	0.70	
v)	Bandenra Kms 161.80 to 165.00	3.20	0.22	0.22	
vi)	Akola Kms 265.00 to 272.37	7.37	1.44	0.59	
vii)	Khamgaon Kms 297.04 to 301.06	4.02	0.40	0.32	
	Total :	45.49	8.27	3.61	C/o to Proforma No. I.
2.	N.H. No. 7				
i)	Kamptee Kms 711.00 to 715.40	0.40	0.44	0.35	
ii)	Nagpur Kms 721.00 to 729.05	8.05	1.80	0.64	
iii)	Nagpur 0 to 10.86	10.86	2.48	0.87	
	Total :	23.31	4.72	1.86	C/o to Proforma No. I

TABLE NO. 4-REQUIREMENT OF FUNDS FOR MAINTENANCE OF MAJOR BRIDGES DURING THE YEAR 1978-79

(To be given separately for each N.H. in the State)

Circle : N.H. Circle, Nagpur

Name of State MAHARASHTRA
N.H. No. 6

Sl. No.	Name of major bridge (length 60 m and above)	Location (Name of road and kilometrage)	Amount required for maintenance (Rs in lakhs)	Details and nature of the requisite work	Remarks
1.	2.	3.	4.	5.	6.
1.	Bridge across Uma river (length 135 m)	Mile 9/3 of Murtizapur-Lone Road	0.20	Normal maintenance of and ordinary repairs to protective works, removal of obstruction to waterway, attention to minor repairs due to floating bodies.	* Amount in column 4 should be worked out keeping in view the instructions contained in this Ministry's letter No. PL-67 (29)/76, dt : 26.5.77 on periodic inspection of highway structures on National Highways.
2.	Bridge across Katepurna river (length 148 m)	Mile 140 of Nagpur-Dhulia Road	0.20	Maintenance of drainage of back-fill behind abutments, greasing/oil bath of metallic bearings, general clearing of the bridge structure, cement wash to the concrete members, maintenance of wearing coat, approach slab, expansion joints.	
3.	Bridge across Man river (length 127 m)	Mile 184/4 of Nagpur-Dhulia Road	0.20		
4.	Bridge across Bhikunda river (length 95 m)	Mile 182/8 of	0.15		
	Total :		0.75		C/o to Proforma No. 1

TABLE NO. 4 (Contd.) REQUIREMENT OF FUNDS FOR MAINTENANCE OF MAJOR BRIDGES DURING THE YEAR 1978-79
(To be given separately for each N.H. in the State)

Circle : N.H. Circle, Nagpur

Name of State MAHARASHTRA
N.H. No. 7

Sl. No.	Name of major bridge (length 60 m and above)	Location (Name of road and kilometrage)	Amount required for maintenance (Rs in lakhs)	Details and nature of the requisite work	Remarks
1.	2.	3.	4.	5.	6.
1.	Bridge across Kanhan river (length 300 M)	Mile 12/1 of Nagpur-Jabalpur Road	0.25	Same remarks as for N.H. No. 6.	
2.	Bridge across Veena river (length 65 M)	Mile 17/6 of Nagpur-Hyderabad Road	0.10		
3.	Bridge across Wana river (length 140 M)	Mile 31/1 of Nagpur-Hyderabad Road	0.20		
4.	Bridge across Khuni river (length 75 M)	Mile 0/2 of Panderkawda-Dhohi Road	0.12		
Total :			0.67		

C/o to Proforma No. I

PROFORMA NO. II
REQUIREMENT OF FUNDS FOR CONTINUING SPECIAL REPAIR WORKS AND
CONTINUING FLOOD DAMAGE REPAIR WORKS FOR THE YEAR 1978-79.

Name of State _____

Sl. No.	Name of work	T.A. No. and date of sanction	Amount of sanctioned estimate	Amount allotted during 1977-78	Expenditure during 1977-78	Total allotment upto 31-3-78	Total expenditure upto 31.3.78	Amount required during 1978-79	Reasons for variation in allotment/ expenditure, if any.	Remark
-----Rs in lakhs-----										
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.

PROFORMA NO. III
REQUIREMENT OF FUNDS FOR RESTORATION OF FLOOD DAMAGES RENDERED
NECESSARY DUE TO RAINS AND FLOODS OF 1978.

Name of State _____

Sl. No.	The National Highway and the reach affected (Please give the nearest town village)	Brief description of damages	Estimated cost of restoring to the exactly pre-damage condition.	Estimated cost of further improvement strengthening etc. if need be.	Total estimated cost	Brief description of proposed improvement strengthening etc.	Amount required in the current financial year i.e. 1978-79	Amount required during 1979-80	Remarks
-----Rs in lakhs-----									
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

NO. B-20 (3)/78

Dated the 15th May, 1978

Sub : Abstract particulars for maintenance and repairs of National Highways-Expenditure disposal thereof and allotment of funds to States in due time

DG(RD) desires that the Ministry's clearance on the abstract particulars 1978-79 should, as far as possible, be communicated by end of May and funds released immediately thereafter.

2. In order to expedite the process of the scrutiny of the abstract particular estimates and the allocation of funds to the States, the following procedure should be adopted by the Project Zones :

- (i) On receipt of the Abstract Particulars, the form on maintenance of major bridges should be detached and sent on a part file to the concerned Bridge Project Zone for scrutiny.
- (ii) After scrutiny of the abstract particulars, the Road and Bridge project Zones should furnish, on a part file, the information required by the Maintenance Cell for consideration and indicating the availability of funds. The details may be given (in duplicate) in the form enclosed.
- (iii) The Maintenance Cell would return, with their remarks and recommendations, one copy of the form to the concerned project zone. Simultaneously the Budget Section would be informed of the amounts to be released under the various sub-heads.
- (iv) On receipt of the recommendations of the Maintenance Cell, the Road/Bridge Project Zones would finalise their technical note. The Bridge Project Zone would forward the part file for the bridge portion with their remarks to the Road Project Zone for issuing a combined technical note. A copy of the technical note may also be endorsed to the Maintenance Cell.

3. It is to be emphasised that the disposal of the abstract particulars should be done in time and the project Zone should ensure that there is no undue delay at any stage i.e. right from the receipt of the abstract particulars in due time from the State onwards. Whenever necessary, reminders may be given to the State, R.O., Section etc. to expedite action.

Copy with copy of enclosure forwarded to :—

CE (R) I/CE (R) II/CE (R) III/CE (R) IV

CE (B) I/CE (B) II/CE (B) III/CE (B) IV

SE (R) _____ (with _____ copies of Road proforma)

SE (B) _____ (with _____ copies of Bridge proforma)

NO. NHIII/MISC/92/78

Dated the 3rd October, 1978

To

All State Chief Engineers connected with National Highways in the States and Union Territories

Sub : Maintenance and Repairs of National Highways-Renewal Programme-Achievement of-

As per the extant instructions, programme of surface renewals of National Highways is approved by this Ministry on the advice of the State Chief Engineer. However, in the absence of timely information from field formations on the actual achievements and the reasons for deviations if any, it is not possible to monitor effectively the programme and take necessary corrective action. It is, therefore, requested that in future the information as in the form-cum-chart enclosed may please be forwarded to the Ministry by 30th April of the next financial year.

2. Further, during the course of each year, quarterly progress reports may be forwarded by the concerned Executive Engineer directly to this Ministry on the physical achievements of 'Renewals' on each National Highway. These reports should reach by 15th July, 15th October and 15th January.

3. The information in respect of the financial year ending 31st March, 1978 may please be sent by October end.

MAINTENANCE OF NATIONAL HIGHWAYS IN _____ STATE.
ACHIEVEMENTS ON THE SURFACE RENEWALS PROGRAMME FOR THE YEAR 19____ 19____

N.H. NO. _____
SECTION _____
DIVISION _____

1.	Programme approved by the Ministry of Shipping & Transport (Roads Wing)	KM	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		KM	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
2.	Actual achievement	KM	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		KM	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
3.	Reasons/justification for deviations, if any, from the approved programme																	

4120.5

No. RW/NHIII/COORD/1/80

Dated the 24th December, 1980

To

All Chief Engineers concerned with National Highways in the States and Union Territories

Sub: Maintenance and repairs of National Highways—Abstract Particular Estimates for the year 1981-82

Abstract particulars estimates for maintenance and repairs of National Highways are required to be forwarded to the Ministry in the proformae and time schedule prescribed vide Ministry's letter No. NH III/MISC/139/77 dated the 5th December, 1977. Similar time schedule to be adhered to for the year 1981-82 is given below :

Sl.No.	Item	Target date for receipt in the Ministry
1.	Ordinary repairs, renewals, maintenance of urban links and major bridges	1.1.1981
2.	Continuing special repairs and flood damage repairs works	30.4.1981
3.	Special repairs (New) works	1.6.1981
4.	Flood damage repairs (New) works	15.10.1981 (15.12.1981 for East Coast States)
5.	Reappropriation of funds	28.2.1982

2. The proposals prepared by the local officers should be thoroughly screened in the Chief Engineer's Office with a view to effecting maximum economy and rationalising the operations. It may also be ensured that particulars are forwarded to the Ministry by due date otherwise the allocation of funds might have to be finalised without waiting for the data from the States and it may not be possible to entertain modified proposals on the basis of subsequent references by the States.

3. Regarding the demand of funds for continuing special repairs and flood damage repairs works, it may be mentioned that in many cases the particulars forwarded by the States are not in the prescribed proformae. Also, it is seen that the details of the total expenditure incurred work-wise during the previous year under these sub-heads against the amount allotted by the Ministry are not indicated while forwarding the demand proposals for next financial year. This information should invariably be given otherwise it would not be possible to finalise the proposals for release of funds under the sub-heads.

No. RW/NHIII/COORD/38/82

Dated the 16th January, 1984

To

Shri.....
Chief Engineer.....PWD

Sub: Maintenance and Repairs of National Highways during 1984-85

It was brought out in the Ministry's letter of even number dated 22.4.1982 that the lengths of National Highways included in the renewal programme of the previous year but not actually renewed due to any reason should be taken up for renewal in the beginning of the next year i.e. these lengths automatically stand included in the renewal programme of the next year. Further it is considered desirable that the bulk of the renewal programme for the year should be completed as far as possible before onset of monsoons. This is of utmost importance to keep National Highways traffic worthy during monsoons and at the same time to minimise the damage to them due to rains/floods. To achieve this objective, it is essential that the renewal programme for the year 1984-85 is got approved well in advance say by February 1984.

2. It is, therefore, requested that immediate suitable action may be taken to finalise the renewal programme for 1984-85 in consultation with the Ministry's Regional Office so as to enable State PWDs to complete the renewals before the onset of monsoons of 1984. The finalised renewal programme clearly indicating the lengths carried over from the approved programme for 1983-84 and further lengths included for 1984-85 may be forwarded to the Ministry latest by end of February 1984.

4130 MAINTENANCE MANAGEMENT

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
4130.1	Refer to Manual for Maintenance of Roads 1983		
4130.2	NHI-41(5)/70 dt. 5.4.71	Chart for Supply of Information Regarding Renewals	4130/1
4130.3 603	RW/NHIII/P/10/83 dt. 27.3.85	Recording the Information of Renewals/ Surfacing in Respect of NH Works	4130/2

No. NHII-41(5)/70

Dated the 5th April, 1971

To

All State Chief Engineers

Dealing with Roads in the State Public Works Departments of the State Union Territories.

Sub : Chart for supply of information regarding renewals

Please refer to the endorsement below this offic letter of even number dated the 19th March, 1971. In para 2 (b), (c) and (d) of this letter it has been indicated that full details of previous renewals, including the type of renewals carried out should be supplied in a chart. It was also suggested in the same letter that the proposals for renewals should take into account the road sections included for improvement in the Annual Plan Programme for the years 1969-72 and/or special or flood damage work involving premix carpet and surfacing work etc., for the years 1968-71. In this connection, a chart in which the full particulars are to be supplied is enclosed. It will be seen from the chart that particulars of renewals of the pavement are to be supplied for a period of six years immediately preceding the year under consideration for release of funds under Maintenance & Repair Grant. It is requested that full particulars for the all National Highways lying in your State may be furnished in the prescribed chart in duplicate by the due date. It is also suggested that for future years also information in this form may be supplied in duplicate alongwith abstract particulars.

No. RW/NH/III/P/10/83

Dated the 27th March, 1985

To

All State Chief Engineers dealing with National Highway Works, DGBR, New Delhi, DG (Works),
C.P.W.D., New Delhi

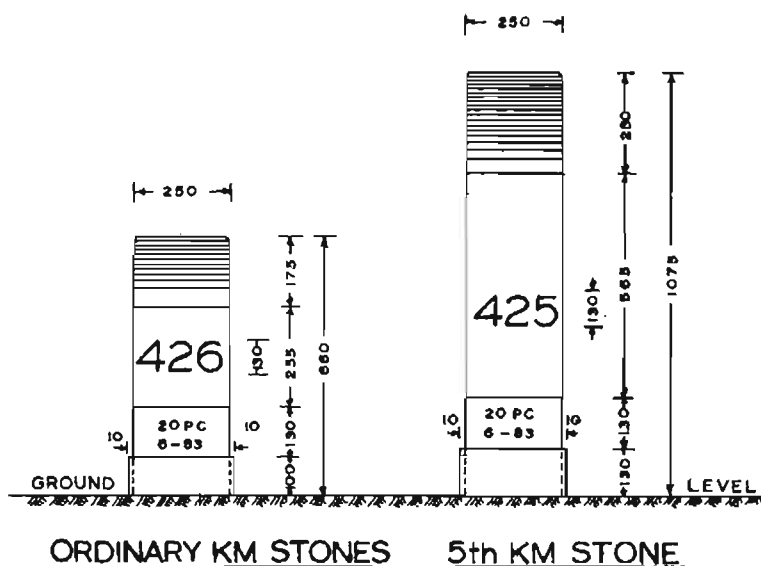
Sub: Recording the information of Renewals/Surfacing in respect of National Highway Works

It has been observed that at present the practice of recording the information regarding renewals of surfacings in respect of National Highway works is not uniform all over the country. This information often is not readily available during inspections. It is therefore, considered necessary to lay down a uniform practice in this regard.

2. The existing practice of maintaining the bar charts and registers showing the details of renewals/surfacings including the type and thickness of renewal done, year of renewal etc. shall continue. It is also necessary to write the same in an abbreviated form on the side of the Km Stone where the Km No. is indicated. The writing should contain information pertaining to the Kilometre yet to be travelled when travelling in the direction from the starting station to the terminal station of the National Highway. The details of the same has been indicated in the enclosed sketch. The lettering may be in black colour. This will be of use to the inspecting officers in monitoring the performance of the surface treatments. The information needs to be up dated whenever a renewal is carried out.

3. It is requested that these instructions may be brought to the notice of all the field officers for necessary compliance.

4130.3
603



TYPE OF TREATMENTS

- P_o D : PRECOATED SURFACE DRESSING
P_c : PREMIX CARPET WITH SEAL COAT
S D : SURFACE DRESSING
A C : ASPHALT CONCRETE
M S : MIX SEAL SURFACING
L S : LIQUID SEAL COAT
20P_c : 20mm PREMIX CARPET
6-83 : MONTH & YEAR OF ORIGINAL
TREATMENT / RENEWAL

SIZE OF LETTERS: 3cm. WIDE 5cm. LONG

4140 RELEASE OF FUNDS AND REAPPROPRIATION

<i>Code No.</i>	<i>Circular No and date</i>	<i>Brief Subject</i>	<i>Page No.</i>
4140.1	W&A-20 (3)/83 dt. 25.2.84	Surrender/Reappropriation of Funds Under Various Sub-heads for maintenance	4140/1

No. W & A-20 (3)/83

Dated the 25th Februry, 1984

To

All State Governments
(dealing with National Highways)

Sub : Surrender/re-appropriation of funds under various sub-heads for maintenance and repairs of National Highways

I am directed to say that, as the State Governments are aware, funds for the maintenance and repairs of National Highways are allotted under various sub-heads viz. (i) Ordinary Repairs (ii) Renewals (iii) Special Repairs (Continuing) (iv) Special Repairs (New) (v) Flood Damage Repairs (Continuing) (vi) Flood Damage Repairs (New) etc. The funds allotted under various sub-heads referred to above are required to be spent on works pertaining to the respective sub-heads and these funds cannot be re-appropriated from one sub-head to another sub-head or from the work to another without the prior approval of this Ministry. Also, in normal circumstances diversion of funds from 'SR' and 'FDR' sub-heads to 'OR' or 'Renewals' sub-head is not permissible. It has been observed in the past that proposals from certain State Governments for surrender of funds or sanction to re-appropriation of funds from one sub-head to another sub-head are received in this Ministry very late towards the close of the financial year and therefore it becomes impossible to take any action on such proposals.

2. It is, therefore, requested that proposals for surrender or re-appropriation of allotment from one sub-head to another if any, may be sent to this Ministry as early as possible but not later than 10th March, 1984 in duplicate and in the case of SR/FDR works details of changes should be given workwise in the proforma enclosed. Proposals received after this date will not be entertained.

3. It is also requested that the monthly statements of expenditure should be submitted regularly before the due date in the prescribed proforma.

STATEMENT OF RE-APPROPRIATION OF ALLOTMENT ON SR/FDR WORKS (NEW AND CONTINUING) FOR THE YEAR 1983-84

Name of State: _____ (Rs in lakhs)								
Sl. No.	Name of sub-head/ Name of work	T.A.No./ Date of sanction	Sanctioned cost	Expendi- ture upto 30.3.83	Allotment during 83-84	Anticipated expenditure ie. final allot- ment for 83-84	Increase/ Decreases from original allot- ment	Reasons for variation
1	2	3	4	5	6	7	8	9

TOTAL:

Signature :
Chief Engineer, P.W.D.

4210 MAINTENANCE PROCEDURE & OPERATION MEASURES ON FLOOD DAMAGES

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
4210.1	WI-43 (12)/63 dt. 21.9.63	Damage to National Highways	4210/1
<u>4210.2</u> <u>4310</u>	NHI-41 (11)/71 dt. 14.9.71	Reports Regarding Damage to National Highways	4210/1
<u>4210.3</u> <u>605</u>	NHIII-33 (125)/72 dt. 20.3.73	Regulation of Traffic on NH in the event of Flood Breach or Damage when widening/Reconstruction of an existing cross-Drainage Structure is in Progress	See Code No. 605
<u>4210.4</u> <u>602</u>	NHIII/P/24/76 dt. 2.4.76	Maintenance of Road System and Berms	See Code No. 602
<u>4210.5</u> <u>4310</u>	PL-67 (29)/76-NHVI dt. 28.6.79	Measures to Mitigate Adverse Effects or Rains and floods on Traffic Operation and Performance of Highways	4210/2
<u>4210.6</u> <u>4310</u>	NHIII/P/13/79 dt. 8.8.79	Damages to NHs due to Heavy rains, Floods/Water-logging-Need for Proper Permanent Remedial Measures	4210/3
4210.7	NHIII/P/13/79 dt. 7.8.80	Flood preparedness—Steps to be taken for Maintenance of Road Communication	4210/4
<u>4210.8</u> <u>4310</u>	NHIII/P/13/79 dt. 4.8.81	Flood damages to NHs—Instructions Regarding Mitigation, Reporting and Remedial Measures	4210/4
4210.9	RW/N. 17/KNT/32/W dt. 25.8.82	Prompt action Regarding Execution of Special Repair and Flood Damage Repair Works	4210/5

struction for discharging which responsibility the staff having the works executed would also exercise their own testing control through their own staff strength. So that full benefit is reaped from the presence of quality control units, the construction staff must be directed to take urgent note of the results also communicated to them by quality control unit for any corrective action necessary. Where there is persistent trouble in achieving the desired quality the matter should be brought to the notice of Regional Office of the Ministry as to any modifications required in designs, specifications or the process of construction. To this effect, Ministry's Regional Officers are being asked to maintain a close liaison with the State PWDs. For constant evaluation and improvement of specifications and quality of work a regular feedback of information about practical difficulties being faced should also be sent to the Ministry.

4. The tests to be performed for quality control and their minimum frequency, should be in accordance with accepted norms in which respect the Ministry's Specifications for road and bridge works/IRC Handbook on Quality Control both of which have been published by Indian Roads Congress should be referred to. Rate of testing may be stepped up if frequent deficiencies in quality of works are noticed at any particular location. It is highly important and an essential requirement, that results of quality control tests are properly recorded, regarding the same as a very important record supposed to be well preserved, and that results of the tests also conducted by quality control unit are regularly fed to the construction supervisory staff as also to the senior officers in charge of quality control teams in the Central Laboratory or Chief Engineer's headquarters office as mentioned in the foregoing paragraphs. These senior officers in-charge of the quality control units should constantly see to the proper evaluation of the test results so that immediate notice is taken of results showing and deficiency in construction compared to the specifications/designs provided for, so that prompt action is taken to tackle such situations.

5. In addition, State PWDs etc. are requested to ensure that following steps are taken immediately on all National Highway and other Centrally financed works :

- (i) Field officers at designated levels are instructed to approve and certify the work as having been correctly executed at different stages of execution (namely embankment, subgrade, sub-base, base course and wearing course etc., for road work, foundations, substructures, superstructures wearing coat etc. for cross/drainage culverts) before construction proceeds further from one stage to the next;
- (ii) Record of the test results observed by the quality control teams are kept at site apart from copies kept in different offices so that it is available to the inspecting officers of the State PWD/Ministry of Transport, and
- (iii) Officers from the Regional Offices of the Ministry, who are being asked to intensify their inspections, are afforded all possible cooperation to check the record of quality control measurements and verify these by additional tests in their own presence, if necessary.

6. Construction specifications and tender documents for each work should specifically provide for the desired quantum of quality control test and rectification by the contractor where defects are noticed. In addition the contractor should be required to ensure that all the implements for proper execution like thermometers to check temperature of bitumen, templates to verify camber and cross fall etc. are available at work site. A system of penalties for contractor may be introduced to ensure that contractor complies with these requirement of equipment.

7. The general instructions in respect of quality control contained in the preceding paragraphs apply to both the road and bridge works. However, in respect of bridge works the following additional observations are made :

- (i) For testing of materials for bridge construction relevant I.S. Specifications should be referred to.
- (ii) For testing the strength of the finished products like cement concrete, masonry, bearings, and also the workmanship to be ensured in the various construction works of bridges reference may be made to the relevant clauses of I.R.C. Bridge Codes.
- (iii) For bridge foundations, soil tests specified in clause 2400 of "Specification for Road and Bridge Works" published by this Ministry should be referred to.
- (iv) Proper and pucca reference pillars for fixing the longitudinal centre line of the bridge and the transverse centre lines of the piers should always be made before starting the work. The main point about these reference pillars is that they should be so located as not to be disturbed during construction or during floods and should last till the work is completed.
- (v) Some of the records which should be kept at site and be made available to the inspecting officers are given below :
 - (a) Record of tilt and shift of wells and of the strata met with during sinking should be kept. The tilt and shift observations should be done more closely in the case of wells sunk close to the river banks where surcharge loads from approach embankment and or guide bunds may be expected.
 - (b) Tests for controlling the quality of cement concrete such as grading analysis of aggregate, moisture content of sand, water cement ratio etc.
 - (c) Test results on samples of mild steel high tensile steel and cement.
 - (d) The handling and placing of reinforce in respect of their shape, spacing and cover in the case of reinforces members should be checked and a certificate recorded in the site register of having done so before concreting is done.
 - (e) Wherever guide bunds are provided it is necessary to maintain record of settlement of the foundation soil and of the body of the guide bund and the compared with respective calculated settlements.
 - (f) To prevent excessive tilting of bearings during service, a proper record should be kept about the placing of bearings, especially reverse tilt actually provided in segmental rollers, date, time and temperature at the time of casting superstruc-

- ture concrete. Similar record will also to be needed in case of prestressed concrete girders laid in stages.
- (vi) The line and surface of the various components depend on the care taken in preparing the form work and, therefore, attention should be given to a very thorough check of the formwork before concreting is done. It is much easier and cheaper to correct a bad form than to remove a defect in the finished concrete due to defective forms.
 - (vii) The use of level and theodolite during construction should be insisted upon and the old system of using strings and plumbobs as a substitute for these should be discouraged.

8. It is requested that the contents of this circular may be brought to notice of all officers in your department engaged on National Highway/other central works and action being taken intimated to us.

3100.4.

No. NHIII/P/16/75

Dated the 28th June, 1976

To

Chief Engineers and Addl. Chief Engineers of State P.W.Ds. and Union Territories dealing with National Highways

Sub: Proper control over the quality of crushed stone aggregates used in pavement courses of National Highways

Crushed stone is mostly used as aggregate for base-course and bituminous base/surfacing courses on National Highways. For good performance and durability of these courses, it is essential that the aggregates used are of the requisite quality and gradings. Requirements in this regard are spelt out in the Ministry's Specification for Road and Bridge Works.

2. To ensure that the aggregates used in the works are of the specified quality and gradings, quality control tests are required to be carried out. The tests to be performed in this regard and their minimum frequency are laid down in the Ministry's Specification/I.R.C. Handbook on Quality Control. This Ministry have also been issuing instructions regarding the manner of exercising adequate control over the quality of materials and of works from time to time, the last one being the letter of even number, dated the 17th March, 1976.

3. With a view to clarifying and emphasizing further, it may be pointed out that the primary control should be exercised in selecting quarry itself and by stationing staff at the quarry to ensure that the weathered overburden or the stones of sub-standard quality are not crushed for the supply and carried to the site. The same staff could also carry out some tests for physical properties like Aggregate Impact Value and grading to ensure that the material actually crushed is of the requisite quality. No doubt, additional testing would also be needed at the site of works for secondary control. It is necessary that samples for the tests should be representative of the aggregates to be used, and collected in accordance with the procedure set forth in IS : 2430.

4. It is requested that the contents of this circular may be brought to the notice of all officers in your department engaged on National Highway Works.

3100.6.

3200

No. NHIII/P/1/83

Dated the 19th April, 1984

To

The Director General (Works), Central Public Works Department, D.G.B.R., All State/Union Territories Administrations Chief Engineers dealing with National Highways and Centrally sponsored Schemes

Sub: Quality Control on National Highways and other Centrally sponsored works

For any highway construction Quality Control is an important requirement for ensuring quality and for creating durable assets and National Highway works are no exception. In fact stringent Quality Control measures are warranted for those works since National Highways carry bulk of the country's passenger and freight traffic. Improved level of service of these highways will result in considerable savings in vehicle operating costs, and in favourable road user reaction and public opinion.

The need for effective Quality Control has been emphasized by the Ministry from time to time. An exclusive provision of 1% of cost is allowed in all works estimates of National Highway Projects. Financial support is also available for augmenting laboratory facilities and for setting up mobile testing laboratories. Guide lines regarding requisite tests, their frequency and acceptance criteria are available in Hand Book of Quality Control for construction of Roads and Runways (IRC Special Publication No. 11).

The impact of Quality Control on works, however, has not been felt the way it should have been primarily

because of lack of an uniform and effective implementation system. Examination and Evaluation of the systems prevailing in various States has led to favouring an in built system which places the responsibility for exercising Quality Control squarely on the staff executing the work. The Quality Control should be viewed based on this system, outlined in the subsequent paragraphs, may be adopted for implementation on all National Highway and Centrally aided works within a period of six months from the date of issue of this letter. Quality Control however, being a growing and dynamic process, the proposed system will have to be periodically evaluated based on the feed back information on its performance, for incorporating any modifications.

2. TESTING FACILITIES

Testing facilities should comprise of Laboratories at Central, Regional and Field levels. The Central laboratory located at headquarters will (a) provide testing facilities for tests of specialized nature (b) act as regional laboratory for works circle (s) at headquarters (c) act as the model laboratory for Research schemes in the State and Central sectors (d) bring out manuals for testing procedures. The Central laboratory headed by the Director, may have for quality control work, scientists from Geology, Chemistry and Physics disciplines. The list of suggested equipments to be provided in Central laboratory are available at Annex 1.

The Regional laboratories located at circle level will be headed by Executive Engineers (Quality Control) assisted by scientists from Geology, Physics and Chemistry disciplines. Regional laboratories will provide testing support to the (a) Engineers working in the circles and (b) Research teams from Central and State Highway R & D institutions. In addition they shall provide all facilities for training of all the Quality Control staff in the Region. The list of suggested equipments to be provided in Regional laboratories is given at Annex 2.

It is neither feasible nor advisable to send samples for routine tests all the way to the Regional laboratories and delay the work for want of test results. Setting up facilities for basic tests at the level of Junior Engineer/Engineering subordinate is therefore necessary. Some other equipments may have to be provided at Sub Divisional/Divisional level. A list of equipments suggested to be provided at Site/Sub Divisional/Divisional level can be seen at Annex 3.

3. NORMS FOR FREQUENCY OF TEST CHECK

In order to ensure attention on quality of work at all levels of supervision the following minimum frequencies of test check are recommended.

Field/Supervisory level	Percentage of prescribed tests to be performed/samples to be taken
1. Junior Engineer/Engineering subordinate	70%
2. Assistant Engineer/SDO/Deputy Engineer	20%
3. Executive Engineer	10%

4. QUALITY CONTROL ORGANISATION

The quality control organisation basically shall function directly under the Chief Engineer/Engineer-in-Chief. It shall be headed by a Director of suitable rank but not less than the Superintending Engineer and located at the Headquarters or the place where the Central Laboratory exists. The regional laboratories headed by the Executive Engineer shall be under his overall control. He shall deal with specific cases all policy matters, training of the staff etc. as broadly brought out in para 2 and in the Annexure 4.

The Quality Control Divisions headed by Executive Engineers may be created at each circle level. These should function under a dual control, primarily of the Superintending Engineer of the concerned circle for their day to day working and also under the Central Quality Control management for receiving guidelines to ensure uniformity throughout the state and for providing other technical support. The Executive Engineer (QC) will also be the incharge of Regional Laboratory. The functions of Quality Control Divisions are given at Annexure 5.

5. RECORDING OF TEST RESULTS

The samples of the suggested proformae for recording the test results for undermentioned items of the work are enclosed for adoption :

Road Works

1) Q/R/1	—	Characteristics of borrow materials
2) Q/R/2	—	Compaction characteristics of Earthwork/Gravel/Stabilized layers
3) Q/R/3	—	Characteristics of Aggregate/Binding Material/Screening for WBM (Surface, Base, and sub-base)
4) Q/R/4	—	Characteristics of bricks for sub base/base courses

5)	Q/R/5	—	Aggregate Characteristics for Bituminous courses
6)	Q/R/6	—	Rate of spread of Binder, Aggregate and Bitumen content for Bituminous work
7)	Q/R/7	—	Temperature record for Bituminous work
8)	Q/R/8	—	Surface Evenness Record

Bridge Works

1.	Q/BR/1	—	Coarse Aggregate for Concrete
2.	Q/BR/2	—	Water for Bridge Construction Works
3.	Q/BR/3	—	Fine aggregates for Concrete
4.	Q/BR/4	—	Cement Concrete
5.	Q/BR/5	—	Mortar for Masonry Work
6.	Q/BR/6	—	Stones/Blocks for masonry/Pitching work
7.	Q/BR/7	—	High Tensile Steel wire for Prestressed work
8.	Q/BR/8	—	Grout for Prestressed Concrete Work
9.	Q/BR/9	—	Steel for Bearings
10.	Q/BR/10	—	Neoprene Bearings

The quality control Records in the prescribed proformae should be maintained in serially numbered registers, issued to personnel in charge of quality control tests on works in the same way as measurement books are issued. These registers should be presented with every third running bill. The payments of bills should thus be linked with assured quality of work.

6. TRAINING FOR QUALITY CONTROL

In order to bring awareness in the departmental officers and to bring them up to date in testing methods regular workshops on Quality Control should be held. These workshops should aim at the basic necessities like (a) Making participants aware of the specification requirements (b) Required Tests and Acceptance criteria (c) Frequency of testing (d) Methodology for conducting the Tests. The participants should thus be thoroughly imbued with all the aspects of (a) Quality Control system (b) Operation of the Regional Laboratory and the part these play in the construction process.

The persons employed for testing in laboratories should also be got trained through (a) CRRI or other R & D institutions (b) "on the job" training in the section where they are assigned. It should be the responsibility of Executive Engineer (QC) to see that new employee becomes familiar with all the prescribed test procedures and develops skill, care and accuracy in performing these tests. In order to ensure that proper testing procedures are being followed, each testing section should have a testing manual.

7. A true indication of a good Quality Control system is in obtaining accurate, reliable and repeatable test results, using standard methods and accurate equipment, instruments, and materials. A check system of proficiency testing and inspection of equipment and procedures can help in monitoring the Quality Control system, and in improving the same.

ANNEXURE 1**CONSOLIDATED LIST OF EQUIPMENT TO BE PROVIDED IN THE STATE CENTRAL LABORATORIES**

S. No.	Equipments	Number required
1	2	3
A.	General Equipment	
i)	High sensitivity proving ring— 100 kg.-Capacity	2
ii)	200 kg.-Capacity	2
iii)	500 kg.-Capacity	2
iv)	1000 kg.-Capacity	1
v)	2000 kg.-Capacity	1
2.	Dial Gauges	
i)	12 mm Travel	6
ii)	25 mm Travel	6
3.	Balances	
i)	7 kg. capacity-Accuracy 1 gm.	1
ii)	500 gm capacity-Accuracy. 001 gm.	2
iii)	Chemical Balance-100 gm. Accuracy 0.0001 gm.	1
iv)	Pan balance-5 kg. capacity	1
v)	Physical balance-.001 gm. accuracy-	2
vi)	Platform scale-Scwt. capacity	
4.	Ovens : Electrically operated, thermostatically controlled.	
i)	Upto 110 C-Sensitivity 1 C	
ii)	Size 24" × 16" × 14"	2

	iii) Upto 400 F rotating type-Determination of loss on heating bitumen Sieves :	1
5.	i) B.S. Sieves-size-18" dia. 3", 2", 1½", ¾", 2"	1 set
	ii) B.S. Sieves-8" dia. 7, 14, 25, 36, 52, 72, 100, 170 & 200	1 set
6.	Sieve shaker capable of taking 8" and 12" dia. sieves-electrically operated with time switch assembly	1
7.	Proving Rings :	
	i) 400 lbs. capacity	1
	ii) 6000 lbs. capacity	1
	iii) 5 ton capacity	1
8.	Dial Guages :	
	i) 1" travel-.001" division	6
	ii) 2" travel-.001" division	6
9.	Load frame-5 ton capacity electrically operated with speed control	1
10.	200 ton compression testing machine	1
11.	Stop watches 1/5 sec. accuracy	3
12.	Glass ware	
13.	Miscellaneous	
14.	Hot plates 7" dia	
B.	Sub-Surface Investigations	
1.	Truck	1
*2.	Drilling Rig, upto 60 m depth	1
3.	Soil & rock drilling kit	1
4.	Vane Shear kit	3
*5.	Portable equipment for seismic survey (TERRASOOUT)	1
*6.	Stratometer for electrical resistivity survey	1
7.	Borehole Camera	1
*8.	Binosular type micro scope	1
*9.	Borehole deformation meter	1
10.	Static penetrometer equipment (10 tonnes)	1
11.	Hydraulic Jacks (30, 50, 100 and 200 tonnes)	1
12.	Undisturbed soil samplers (Dension & Piston Sampler)	1
13.	Plate load test equipment.	1
14.	Thin wall sampling tubes (100 & 50 mm. Dia. and 0.75 m long)	100 each type
15.	SPT Test equipment and static cone penetrometers.	3
	*Optional items depending on the requirements.	
C.	Soils.	
1.	Water Still	1
2.	Liquid Limit device and tools	
3.	Sampling pipette fitted with pressure and suction inlets, 10 ml. capacity	
4.	B.S. compaction apparatus (Proctor)	
5.	Modified AASHO compaction apparatus.	
6.	Sand Pouring cylinder with conical funnel and tap	
7.	Capillary water absorption test equipment	
8.	Sampling tins with lids 03" dia. X 21" ht. 1 lb. size-100 nos. and miscellaneous items like moisture tins etc.	
9.	PH meter.	
10.	Constant head & variable head permometer.	
11.	Unconfined compression test apparatus with a set of 4 proving ring and guages.	
12.	Lab. CBR test equipment. with 12 moulds	
13.	Field CBR test equipment.	
14.	Plate bearing test equipment with 12" dia. plate	
15.	Shear box test equipment	
16.	Triaxial compression test equipment	
17.	Consolidation test equipment.	
18.	5-ton capacity mechanical jack	
19.	Post hole augere 4" dia. with extensions and shelby tube for undisturbed sampling	
20.	Truck chassis capable of loading, upto 8 tons	
21.	Sample extractor frame with hydraulic jack hand operated	1
22.	Motorised unconfined compression testing machine	1
23.	Motorised direct shear operators with 12 rate of strain	1
24.	Triaxial testing equipment (Motorised) with 8 rates of feed and Assembly for lateral-pressure and pore pressure	1
25.	Tor Vans Apparatus	3
26.	Universal Automatic Compactor	1
27.	Core cutter	6
28.	Soil Lathe	1
29.	Vacuum pump	1
30.	Proctor needle, spring type	6
*31.	Consolidation test equipment	3

D.	Bitumen	
1.	Constant Temperature Bath	1
2.	Petrol gas generator (Laboratory model)	1
3.	Ring & Ball softening point apparatus.	
4.	(BRTA) Viscometer with 4 mm and 10 mm cups	
5.	Englor viscometer for emulsions	
6.	Red wood No. 1 and 2 viscometers	
7.	Penetrometer automatic type, adjustable weight arrangement, and needles	
8.	Soxhlet extraction apparatus type SJB 50.	
9.	Moisture determination apparatus with still (copper) and other accessories	
10.	Extraction thimbles 43 × 123 mm. size.	30
11.	Laboratory mixer 1/2 cft. capacity, electrically operated fitted with heating jacket	
12.	Ductility testing apparatus with variable speed gears complete with moulds	
13.	Moulds for Hubbard-Field stability test 6" × 2" dia.	
14.	Equipment for distillation of tars, cut-backs etc.	
15.	Hveem stabilometer	
16.	Marshall compaction apparatus	
E.	Rock Testing Equipment	
1.	Rock Sample height Gauge	1
2.	Rock Classification Hammer	1
3.	Portable Rock Tester	1
*4.	Field direct shear kit	1
F.	Concrete and structures	
1.	Water still	1
2.	Vicat needle apparatus for setting time test with plungers	
3.	Moulds	
	i) 4" × 4" × 20"	12
	ii) Cubical 6", 4", 2.78"	6 each size
4.	Lechat eller soundness testing apparatus	
5.	Air permeability apparatus	
6.	High frequency mortar cube vibrator.	
7.	Concrete mixer power driven 1 cft. capacity	1
	Concrete mixer power driven 5 cft. capacity	1
8.	Variable frequency and amplitude vibrating Table size 2" × 3" load 200 lbs.	
9.	Aggregate crushing test apparatus	
10.	Aggregate impact test apparatus	
11.	Los-angeles abrasion apparatus	
12.	Deval attrition apparatus.	
13.	Flexural attachment to compression testing machine	
14.	Concrete laboratory set up.	1
15.	Insitu concrete strength testing equipment, test hammer & Pachometer	1
16.	UTM for tension, compression and other tests	1
17.	Strain measuring equipment set.	1
G.	Equipment for Hydraulic Studies	
1.	Current meter	1
2.	Echo sounding equipment	1
H.	Road Testing Equipment	
1.	Benkelmen Beam	2
2.	Profile meter (hand towed)	2
*3.	British portable skid tester	4
*4.	Accelerated polishing machine	1
I.	Traffic Engineering	
*1.	Radar Speed meter	1
2.	Enoscope	1
*3.	Electronic Traffic counter	1
4.	Multi-bank event recorder	6
*5.	Multi-pen event recorder	1
6.	Time lapse photography camera and projector unit	1
J.	Terrain evaluation and photography	
*1.	Pocket stereoscope	2
*2.	Stereoscope with Parallax Bar	1
K.	Mobile laboratory	
*1.	Laboratory Truck	1
*2.	Equipment	1
L.	Special Research Equipment	
*1.	Equipment (individual items should be identified depending on actual needs).	1
M.	Quality Control Equipment in Field	
*1.	Equipment. (individual items to be identified depending on actual needs)	1
N.	Miscellaneous	
1.	Electronic Desk Calculator	1
*2.	Slide Projector	1

*3.	Camera	1
*4.	Photostat Machine	1

STATEMENT SHOWING THE RANGE OF ADDITIONAL EQUIPMENT PROPOSED BY SOME OF THE STATES FOR AUGMENTING THEIR CENTRAL LABORATORIES

S. No.	Discipline	Additional Equipment
1	2	3
1.	Soils	Dynamic cone penetrometer; soil lathe Flash shaker; Grimilaboratory blender; winkworth laboratory mixer; dieter's compaction apparatus; speedy moisture tester; conductivity bridge; Electrical earth pressure apparatus; sand equivalent test apparatus; soil density probe with utility scater; automatic compaction machine; platform vibrator with relative density kit; rotary high vacuum pump; Genco presso-vac pump; mechanical stirrer; mechanical mixer; shrinkage facior apparatus; protor needle; abbot's cylinder; calcimeter; soil centrifuge apparatus; sand equivalent test apparatus; vane shear apparatus; PVC meter.
2.	Bitumen	Distillation apparatus; electro-hydraulic kneading compactor; float test apparatus; settlement ratio apparatus; new model versa tester; higler speaker absorption meter; Barometer; Gilson testing screen and accessories; Kipp's apparatus; hydro-vapourising unit.
3.	Concrete & Bridges.	Prestressing bed; jack and other equipment concrete corling equipment; beam breaker concrete test hammer; twisting machine; universal testing machine; boring plant; supersonic tester; Acrow weighmore consistometer. drying shrinkage apparatus B.T.L. oven; muffle furnace; internal vibrator; shutter vibrator; masonry saw; briquette testing machine; K.C.P. tensile testing machine; fatigue tester; cold bend test; askamia vibrator;
4.	Aggregates	Dorry's attrition test; stewart's impact test; page impact test; jaw crusher slitting, grinding and polishing machine.
5.	Traffic	Electronic traffic counter; Electric speed meter; skyke's vehicle counter; enoscope wheel weigher; brake inspection decelerometer; instrument for tracing track width of curves; hand tally counter.
6.	Road Testing	Benkelmen beam; bump integrator; immersion tracking machine; skid resistance tester electronic roughness tester.
7.	Photographic/sound equipment.	Photometer; lux meter; recording camera; super cameras; enlarges; movie camera; sound projector; slide projector; epidioscope; amplifiers; photostat machine.
8.	Electric/Electronic and other miscellaneous equipment.	Polarising microscope; electronic weighing machine; generator; osoilloscope; vibration pick up; excitation amplifier; strain measuring bridge; oscolo script; G.K. Varistant; electronic calculator; duplicating machine; pallet trucks, mobile van; gas generator; electric tube furnace cassette tape recorder; refrigerator analytical and other preecision balances.

ANNEXURE 2

TESTING EQUIPMENT REQUIRED FOR SETTING OF REGIONAL LABORATORY

S. No.	Particulars of equipment	Nos. required
	I. GENERAL	
1.	Balances :	
	i) 7 kg to 10 kg capacity-semi-self indicating type-Accuracy 1 gm.	2
	ii) 500 gm capacity-semi-self indicating type-Accuracy. 001 gm.	2
	iii) Chemical Balance-100 gm capacity-Accuracy 0.0001 gm.	1
	iv) Pan Balance-5 kg capacity	3
	v) Physical Balance-.001 gm. accuracy.	3
	vi) Platform scale-300 kg capacity	1
2.	Ovens-Electrically operated, thermostatically controlled :	
	i) Upto 110°C-Sensitivity 1 C.	1
	ii) Upto 200°C-for determination on loss on heating bitumen.	1
3.	Sieves : as per I.S. 460-1962 :	
	i) I.S. Sieves-450 mm internal dia. of sizes 100 mm, 80 mm, 63 mm, 20 mm, 12.5 mm, 10 mm, 6.3 mm, 4.75 mm complete with lid and pan.	1 set
	ii) I.S. Sieves-200 mm internal dia (brass frame) consisting of 2.36 mm, 1.18 mm, 600 microns 425 microns, 300 microns, 212 microns, 150 microns, 90 microns and 75 microns with lid and pan.	1 set
4.	Sieve shaker capable of taking 200 mm and 300 mm dia. sieves-electrically operated with times switch assembly	1 No.
5.	Proving rings-complete with dia guage and calibration charts :	
	i) 250 kg capacity	2
	ii) 2000 kg capacity	2
	iii) 5 tonnes capacity	2

6.	Dial guage :	
i)	25mm travel-.01 mm/division	2 Nos
7.	Load frame-5 tonnes capacity electrically operated with speed control	1
8.	200 tonnes compression testing machine	1
9.	Stop watches 1/5 sec. accuracy	4
10.	Glassware Comprising of Brakers, Pipettes, dishes, measuring cylinders (100 to 1000 cc capacity) rods & funnels.	1 Doz. each
11.	Hot plates 200 mm dia (1 no 1500 watt)	2 Nos
12.	Enamel trays :	
i)	600 mm × 450 mm × 50 mm	6
ii)	450 mm × 300 mm × 40 mm	6
iii)	300 mm × 250 mm × 40 mm	6
iv)	Circular plates of 250 mm dia.	6

2. SOILS

1.	Water still	1 No.
2.	Liquid limit device with Casagrande and A.S.T.M. grooving tools and as per I.S. 2720-Part V-1970	2
3.	Sampling pipettes fitted with pressure and suction inlets, 10ml. capacity	—
4.	Compaction apparatus (Proctor) as per I.S. 2720 part VII-1974.	2
5.	Modified AASHO compaction apparatus as per I.S. 2720-Part VIII-1974.	1
6.	Sand pouring cylinder with conical funnel and tap and complete as per I.S. 2720 Part XXVIII-1974.	1 Doz.
7.	Sampling tins with lids 100 mm dia × 50 mm ht. ½ kg. capacity-and miscellaneous items like moisture tins, etc.	2 Doz.
8.	Unconfined compression test apparatus with a set of 4 springs and masks and complete as per I.S. 2720 Part X-1974.	1
9.	Lab C.B.R. test equipment for conducting CBR test as per I.S. 2720-Part XVI-1965 and consisting of following :	
i)	CBR moulds 150 mm dia-175 mm ht, complete with collar, base plate, etc.	
ii)	Tripod stands-for holding dial guage holder.	
iii)	C.B.R. plunger with settlement dial guage holder	
iv)	Surcharge weight 147mm dia-2.5 kg wt. with central hole.	
v)	Spacer discs 148mm dia., 47.7mm ht. with handle.	
vi)	Perforated plate (Brass)	
vii)	Soaking tank for accommodating 6 CBR moulds each	
10.	Field C.B.R. test equipment consisting of hand operated mechanical jack of 5 tonnes capacity, capable for sliding on I section fixable to truck chassis, proving ring of 2000 kg. capacity, extension pieces (of adjustable length upto 1 metre length), CBR Plunger, settlement dial guage holder, datum bar 254mm (10 in) dia. surcharge wt. with central hole (47.7mm dia) and 4.53 kg (10 lb)-nos. and 9.07 kg (20 lb)-2 nos. and one I-section of 1.25 metre length having arrangement of clamping to truck assis.	1 Set
11.	Plate bearing test equipment consisting of following items :	1 Set
i)	M.S. plates 254mm (1 in thick and dia 762 mm (30 in) 660 mm (26 in) 558 mm (22 in) 457 mm (18 in) 305 mm (12 in) 228 mm (9 in) and 154 mm (6 in).	
ii)	Hydraulic jack 20 tonnes capacity with remote control through flexible tubing of 2-3 metre length.	
iii)	Proving ring 25 tonnes capacity with dial guage and calibration chart.	
iv)	Ball bearing plates 25mm thick and 100 mm dia with centre groove.	
v)	Datum Bar 3 metre long with stand and dial guage clamps (2 nos.) with suitable attaching arrangements.	
12.	Standard Penetration test equipment	2 Nos.

3. BITUMEN

1.	Constant temperature bath for accommodating bitumen test specimen, electrically operated, and thermostatically controlled.	1
2.	Petrol gas generator (Laboratory model or any other alternative arrangement for heating of specimens in laboratory)	1
3.	Penetrometer automatic type, adjustable weight arrangement, and needles as per I.S. 1203-1958.	1
4.	Soxhlet extraction apparatus complete with extraction thimbles, etc.	1
5.	Laboratory mixer about .02 cu. metre capacity electrically operated fitted with heating jacket	1
6.	Hubbard-field stability test apparatus complete	1
7.	Marshall compaction apparatus as per ASTM 1559-62 T and complete with electrically operated loading unit, compaction pedestal bearing head assembly, dial micrometre and bracket for flow measurement, load transfer bar, specimen mould (4 in. dia) with base plate, collars, specimen extractor, compaction hammer 4.53 kg. (10 lb) × 457mm (18 in.) fall.	1
8.	Distant reading thermometers.	1

4. CONCRETE AND MATERIALS

1.	Water still	
2.	Vicat needle apparatus for setting time test with plungers, as per I.S. 269-1967.	1 No.
3.	Moulds :	
i)	100 mm × 100 mm × 500 mm	
ii)	Cubicals 150 mm, 100 mm (each size)	
4.	Air permeability apparatus	1 No.

5.	High frequency mortar cube vibrator	1 No.
6.	Concrete mixer power driven, 1 cu. ft. capacity	1 No.
7.	Variable frequency and amplitude vibrating table size 1 metre × 1 metre, as per I.S. 257-1963.	4
8.	Flakiness index test apparatus.	6
9.	Aggregate impact test apparatus as per I.S. 2386-Part IV-1963.	6
10.	Los-Angeles abrasion apparatus as per I.S. 2386 Part IV-1963.	1
11.	Flow table as per I.S. 712-1973.	4
12.	Equipment for slump test	4
13.	Equipment for the determination of specific gravity of fine and coarse aggregate as per I.S. 2386-Part III-1963.	4
14.	Flexural attachment to compression testing machine	2
15.	Core cutting machine.	1

5. CONTROL OF PROFILE AND SURFACE EVENNESS

1.	Survey level and staff	Set
2.	3 metre straight-edge and measuring edge	1 Set
3.	Unevenness indicator (optional)	1
4.	Camber templates Single lane 2 Double lane 2	
5.	Profilograph for checking pavement unevenness	1
6.	Automatic road unevenness recorder.	1

ANNEXURE 3

LIST OF TESTING EQUIPMENTS REQUIRED TO BE MAINTAINED AT DIVISION/SUB DIVISION/FIELD LEVEL

S. No.	Particulars	Requirement		
		Divisional level	Sub Divisional level	Field (each selection)
	(1) For testing soil			
1.1	Set of I.S. Sieves	1	—	1
1.2	Sand replacement equipment	—	—	2
1.3	Core Cutter	—	—	2 (Optional)
1.4	Field oven	—	—	2
1.5	Electric oven	1	—	—
1.6	Proctor Mould & hammer	1	1	—
1.7	Proctor needle	1	1	—
1.8	Balance	—	—	—
	(i) 5 to 7 kg.	1	—	1
	(ii) 500 grams	1	—	1
1.9	Pan Balance (15 kg)	1	—	1
1.10	Load frame for testing CBR (5 tonnes capacity)	1	1	—
1.11	CBR Moulds	—	—	9
1.12	Equipment for testing LL & PL	—	1	1
1.13	Speedy moisture meters	1	2	—
	(2) For Testing Aggregate			
2.1	Impact test equipment	1	1	1
2.2	Flakiness index testing equipment	1	1	1
	(3) For Testing concrete Mortar			
3.1	Slump cone & tamping rod Moulds	1	1	1
3.2	Moulds			
	i) 150 × 150 × 150 mm	—	3	12
	ii) 70 × 7 × 70.7 × 70.7	—	3	12
	iii) 50 × 50 × 50 mm	—	3	12
3.3	i) Proving ring for 1 ton	1	—	
	ii) Proving ring for 5 tons	1	—	
	(4) Bitumen			
4.1	Test trays	1	—	3
4.2	Thermometers	1	—	12
4.3	Spring balance	1	—	1

ANNEXURE 4

FUNCTIONS OF THE DIRECTOR QUALITY CONTROL

- i) To carry out the instructions of the Engineer-in-Chief/Chief Engineer regarding policy matter, work audit, arrange seminars and training programmes, help in nomination of the staff for outside training and as directed.
- ii) To issue guidelines to the regional Quality Control Executive Engineers and other staff from time to time.

- iii) To keep in touch with the latest developments on use of new materials, Quality Control methods and R & D activities in the State and elsewhere.
- iv) To frame and organise the training programmes for the new entrants and in-service staff.
- v) To analyse the reports received from the regional Quality Control Officers and issue necessary instructions to the officers concerned with the works.
- vi) To arrange closer association with Quality Control aspects in case of major projects for roads and bridges.

ANNEXURE 5

FUNCTIONS OF QUALITY CONTROL DIVISIONS

- i) To provide all assistance to the field officers for compliance of the instructions contained in the Circular connected with quality control.
- ii) Inspection works identified by Chief Engineer or Superintending Engineer concerned to ensure quality control.
- iii) To carry out tests on construction and road materials locally available and to suggest use of alternative materials.
- iv) To give suggestions for improving the quality at the site of work.
- v) To identify the various types of building and road construction materials available in a specified area or for the execution of a particular project. While doing so the desired properties of the material and also the economic viability of their use, should be kept in view.
- vi) To provide testing and investigation facilities to the field officers.
- vii) To educate and train the technical personnel engaged at construction sites for carrying out the field tests.

Q/R/1

TESTS OF COARSE AGGREGATES FOR CONCRETE

S. No.	Qty. Collected cum.	Gradation							Impact or crushing value %	Delete-rious consti-tuents. %	X Water absorption %	X Soundness	Checking by		
		% Passing IS			Sieve size (mm)		4.75	AE %					EE %	SE %	
		80	40	20	12.5	10									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Minimum

X — One test for each source of supply and subsequently when warranted by changes in Quality of aggregate.

Maximum

c — One test for every 50 cum of collection.

Q/R/2

TESTS OF WATER FOR BRIDGE CONSTRUCTION WORKS

S. No.	Date	Source	O. I Normal Nao H, to Neutralise 200 ml of sample (ml)	O. I Normal Hcl to neutralise 200 ml of sample (ml)	Organic %	Inorganic %	% SOLIDS IN WATER	
							Sulphates %	Alkali Chloride %

Minimum

x One test for each source of water or subsequently when warranted by change in quality.

Q/Br/3

TESTS OF FINE AGGREGATES FOR CONCRETE

S. No.	Qty. Applied	% passing		I.S. 2.36	GRAD-ATION				Deleterious constituents %	Bulking %	Silt contents %
		10	4.75		Sieve size 1.18	600 m	(mm) 300 m	150 m			
1	2	3	4	5	6	7	8	9	10	11	12
									1		
									2		
									3		
									4		

Minimum

x One test for 50 cum of supply

Q/Br/4

TESTS FOR CEMENT CONCRETE

S. No.	Date	Location in the structure	Qty. (cum)	Workability Slump/Compaction factor Vee bee Value	Compressive Strength After 7 days					Compressive Strength After 28 days					Checked by		
					Sample Nos.					Sample Nos.					AE %	EE %	SE %
					I	II	III	IV	V	I	II	III	IV	V			

x Minimum. Ten samples per 60 cum of concrete.

Q/Br/5

TESTS OF MORTAR FOR MASONRY WORK

S. No.	Qty. cum	Location in structure	Compressive Strength After 7 days				Strength (kg/cm ²) After 28 days				AE %	Checking	
			I	II	III	IV	I	II	III	IV		EE %	SE %
1	2	3	4	5	6	7	8	9	10	11			

Minimum Six Samples per 20 Cum of Masonry work.

Q/Br/6

TESTS OF STONE/BRICK FOR MASONRY/PITCHING WORK

S. No.	Date	Quantity Supplied cum	Compressive Strength Kg/Cm ²	Water Absorption %	Efflors cence %	For Bricks Only		For Pitching stone weight per unit kg	Specific Gravity	Checking		
						-Warp Cm/Cu	Dimension Cm			AE %	EE %	SE %
1	2	3	4	5	6	7	8	9	10			

x For Bricks minimum one test per 10,000 nos.

e Once for each source and subsequently when warranted. due to change in quality

K All stores to be checked.

3100/14

Q/Br/7

TESTS FOR H.T. WIRE FOR PRESTRESSED WORK

S. No.	Quantity	UTS Kg/mm ²	Tolerances %	Proof Strength at 20% Strain. Kg/mm ²	Checking for AE %	EE %	SE %
1	2	3	4	5	6	7	8

Q/Br/8

TESTS FOR GPANT FOR P.C.C. WORK

Sl. No.	Date	Quantity	Location in Structure	Bleeding %	Compressive I Sample	Strength II Sample	Kg/Cm ² III Sample	Checking AE %	EE %	SE %
1	2	3	4	5	6	7	8	9	10	11

Q/Br/9

TESTS FOR STEEL BEARINGS

S. No.	TOLERANCES IN (mm)									
	Diameter of Rollers and all convex surfaces	Diameter of all concave surfaces mm	Height of Components mm	Base Plate Length mm	Width mm	MC on deviation on rolling/rocking/ sliding surfaces M	Checking AE %	EE %	SE %	
1	2	3	4	5	6	7	8	9	10	

Q/Br/10

TESTS FOR NEOPRENE BEARINGS

Sl. No.	Date	Identifications	Durometer Hardness (pts)	Ultimate Tensile Strain %	Tensile Strength kg/Cm ²	Adhesion to metal kg/Cm ²	Ozone resistance for 20% Strain	Length mm	Tolerances Width mm	Total Thickness of single layer mm	Thickness mm
1	2	3	4	5	6	7	8	9	10	11	12

CHARACTERISTICS OF BORROW MATERIAL

Sl. No.	Location of borrow area	Km. in which material is used	Sand content %	4.75 mm	GRADING					P.I. value %	Proctor Density gm/cc	CBR %	Delete-rious content	Natural Moisture content.	Lab compacted soil Den	Moist-ure cont	Recor-Marked by JE AE SDO EE	Remarks				
					passing 600 mic	200 mic	150 mic	75 mic														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

TEST FREQUENCY : for gradation, Plasticity Index and standard Proctor test 1 test per 8000 m³
 CBR (on a set of 3 specimens) one test per 3000 m³
 Deleterious constituents — as required.
 Natural Moisture content — one test per 250 m³ of soil.

COMPACTION CHARACTERISTICS EARTHWORK/GRAVEL/MURUM

Q/R/2

S. No.	KM	Layer no	Lab fr-om bottom.	Lab OMC	Lab DD	LOCATION WITHIN KILOMETRES																																Recorded	Remarks
						MC	DD	Ref	0 to .1		.1 to .2		.2 to .3		.3 to .4		.4 to .5		.5 to .6		.6 to .7		.7 to .8		.8 to .9		.9 to 1												
									by	JE	AE	EE	by	JE	AE	EE	by	JE	AE	EE	by	JE	AE	EE	by	JE	AE	EE	by	JE	AE	EE							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	

LEGEND —

Ref : Reference of observation sheet number (page) and observation No.
 MC : Percentage moisture content at the time of compaction,
 DD : Dry Density achieved in gm/cc.
 %C : Percentage Compaction.

TEST FREQUENCY : 1-2 tests per 1000 m² of compacted layer each of 150 mm thick.

Note : Use separate sheet for compaction of gravel and other sub base layers.

CHARACTERISTICS OF AGGREGATE/BINDING MATERIAL/SCREENING FOR WBM.
 SURFACE, BASES & SUB-BASE COURSE

S. No.	LO-CA-TI-ON, KM/M	Layer Number from bottom	Type of aggregate	Grading % Passing through IS Sieve														Aggregate Ref impact value		Flakiness Index. %		Ref
				100 mm	80 mm	63 mm	50 mm	40 mm	20 mm	12.5 mm	10 mm	6.3 mm	4.75 mm	600 mic	300 mic	150 mic	75 mic	Ref				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Screening LL PI Ref			PI value of Binding Material % Ref.		Recorded by JE AE EE			Remarks
24	25	26	27	28	29	30	31	32

TEST FREQUENCY — Grading, Impact value, Flakiness index.
 Screening
 PI Value.

one test for 200 m³ of material
 one test for 25 m³ of material
 one test for 250 m³ of material

BRICK CHARACTERISTICS FOR SUB-BASE AND BASE COURSE

Q/R/4

S. No.	Location Km/m	Layer number from bottom	Water absorption										Compressive strength.									
			0 to .2 %	.2 to .4 %	.4 to .6 %	.6 to .8 %	.8 to 1.0 %	0. to .2 %	.2 to .4 %	.4 to .6 %	.6 to .8 %	.8 to 1 %	Ref kg/cm ²	Ref kg/cm ²	Ref kg/cm ²	Ref kg/cm ²	Ref kg/cm ²	Ref kg/cm ²	Ref kg/cm ²	Ref kg/cm ²	Ref kg/cm ²	Ref kg/cm ²
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Recorded by
 JE AE EE
 24 25 26

Remarks.
 27

TEST FREQUENCY : 5 bricks to be tested for crushing strength and water absorption for every 5000 bricks.

AGGREGATE CHARACTERISTICS FOR BITUMINOUS COURSES

Q/R/5

S No.	Location Km/m	Type of aggregate	Gradation % passing through IS Sieve												Aggregate		Flakiness	
			20 mm	12.5 mm	10 mm	6.3 mm	4.75 mm	2.36 mm	1.7 mm	600 mic	300 mic	180 mic	150 mic	75 mic	Ref value %	impact Ref	Index %	Index
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 20

Water absorption		Stripping value		Recorded by			Remarks
%	Ref	%	Ref	JE	AE	EE	
21	22	23	24	25	26	27	28

TEST FREQUENCY : Gradation. 1 test for 25 m³ of material
Impact value, Flakiness Index, water absorption,
Stripping value 1 Test for 50 m³ of material.

RATE OF SPREAD OF BINDER, AGGREGATE & BITUMEN CONTENT FOR BITUMINOUS WORK

Q/R/6

S No.	Km/m	TEST RESULTS																																							
		0 to .1	.1 to .2	.2 to .3	.3 to .4	.4 to .5	.5 to .6	.6 to .7	.7 to .8	.8 to .9	.9 to 1.0	BA	Bc	Ref	BA	Bc	Ref	BA	Bc	Ref	BA	Bc	Ref	BA	Bc	Ref	BA	Bc	Ref	BA	Bc	Ref	BA	Bc	Ref	BA	Bc	Ref	BA	Bc	Ref
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

Recorded by			Remarks
JE	AE	EE	
43	44	45	46

LEGEND: B = Rate of spread of binder for surface painting or tack coat.
A = Spread of aggregate for surface painting or premix work.
Bc = Bituminous contents of premix work.

TEST FREQUENCY : for B 1 test per 500 m² of surface.
for A 1 test per 500 m² of surface
for Bc 2 tests per day

TEMPERATURE RECORD FOR BITUMEN WORK

Q/R/7

S No.	Date	Km/m	Time con- tinuous minimum half hourly.	TEMPERATURE					Recorded by			Remarks
				TA	TB	TM	TL	TR	JE	AE	EE	
1	2	3	4	5	6	7	8	9	10	11	12	13

LEGEND: TA = Temperature of Aggregate. TEST FREQUENCY: The temperature is to be taken regularly at an interval of half an hour.
 TB = Temperature of Bitumen at the time of tack coat.
 TM = Temperature of Mix.
 TL = Temperature while laying the Mix.
 TR = Temperature while rolling.

SURFACE EVENNESS RECORD

Q/R/8

S. No.	Date	Location Km/m	Stage of work	at .6 left	GRADE			Left	CAMBER		Recorded by			Remarks
					from edge	at .6 right	from edge		Centre	Right	JE	AE	EE	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

NOTE : This test is to be done regularly along with the progress of work at different stages starting from sub base to B/T surface.

3100.8

D.O. No. NHIII/P/12/82

Dated the 15th June, 1984

To

All State Chief Engineers dealing with National Highways (By name)

Sub : Quality Control in Bituminous Construction

It has often been observed during inspection that bituminous works on the National Highways in the States/Union Territories are still being carried out through manual means. With steep increase in price of bitumen, use of bituminous specifications has become very costly and every effort should therefore, be made so that appropriate quality is ensured.

2. Requisite quality cannot be achieved through manual means of construction and these should be avoided at all costs in such works. The control of temperature in bitumen is vital from the point of view of durability. Heating of bitumen is mostly carried out in drums which often leads to overheating with consequent loss in durability. This highlights the need for use of equipments like bitumen boilers.

3. Hand or mechanically operated sprayers with a pump attached to the bitumen boiler will ensure uniform distribution of bitumen on the pavement surface.

4. Manual mixing of bitumen and aggregate continues to be practised extensively. Sometime the mini hot-mix plants, although available with the States, are not used for one reason or the other. It has also been observed that occasionally mini hot-mix plants are used with heating of bitumen in drums only. All these practices are unsound and result in non-uniform and poor quality work. As a result, the bituminous surface gets prematurely disintegrated. In this regard reference is invited to this Ministry's letter No. RW/NHIII/P/12/82 dated

3100/18

the 27th March, 1982 wherein use of Bitumen boilers, mechanical sprayers and gritters etc. on National Highway works had been advocated.

5. In view of the high cost of bituminous specifications and the need for using them as a durable riding surface, it is essential that improvised methods of heating and manual mixing are dispensed with and bitumen boilers and mini hot-mix plants are made use of in heating the bitumen and mixing of material. The weak links in this process of mechanisation should be identified and suitable measures taken to improve the supply of such machinery, build up an infrastructure for smooth operation along with necessary training of personnel. All these issues were also discussed with you during the review of works held in May this year.

6. If suitable action on the above lines are not taken, a situation may arise when this Ministry may be compelled to suspend the sanction/execution of works, till the State PWD is fully equipped for the purpose.

7. Action taken in this matter may please be reported to this office.

3100.9

No. NH. III/P/20/83

Dated the 27th July, 1984

To

The Chief Engineers of States/Union Territories Dealing with National Highways and Centrally Sponsored Works

Sub: Use of quality control equipment with I.S.I. mark — regarding

It has been observed that the testing equipments used for quality control tests of works on National Highways sometimes do not bear I.S.I. Standard marks.

National Highway works are required to be executed with proper quality control and for this it is imperative that standard equipment for tests are used. It is, therefore, requested that I.S.I. marked equipments and accessories be used in all quality control and testing works. Such markings assure the quality and reliability of the product for testing purposes.

No. WI-43 (12)/63

Dated the 21st September, 1963

To
The Chief Engineers of All State PWDs
Sub : Damage to National Highways

The State Governments were requested (with copies to the State Chief Engineers) in this Department's letter No. WI-6 (4)/56, dated the 22nd March, 1956, to issue instructions to the local officers, in charge of National Highways, to report to this department immediately after the occurrence, direct by wire or telephone, whichever is quicker, and thereafter to send a detailed report with regard to damages caused to the National Highways by floods, earthquakes etc. Thereafter, the State Chief Engineers were requested in this Department's letter No. WI-51 (12)/58, dated the 2nd January, 1959 to instruct the officers in charge of the National Highways to intimate to this Department by telegram whenever any breach on a National Highway got extensively damaged and was closed to traffic. Such telegrams were to be followed by detailed reports showing the particulars of the damages and the causes thereof, the period for which the affected breaches were likely, to be closed to the traffic and alternative arrangements were made in the aforesaid letter to the State Chief Engineers that wide publicity should be given whenever a road was closed to traffic and suitable warning signs should be posted and diversions were provided, they should be prominently indicated at the site. They were further requested that the roads, after restoration of the damage, when reopened to traffic necessary intimation should be sent to this department telegraphically.

2. It is, however, noticed with regret that from some States no reports are received at all for example in the recent floods there have been serious damages in certain National Highways and traffic thereon has been dislocated for many days but still no report from any local officer was received in this department.

3. It will be realised that this department being responsible for the maintenance and development of the National Highways should be given upto date information with regard to any unusual damage to them which might result in the dislocation of traffic. The necessity of this department getting all this information promptly particularly in the present emergency cannot be over emphasised. Moreover, a large number of queries in regard to the condition of roads are received from time to time from Members of Parliament, tourists, Government departments and non-official agencies. In the absence of reports from the local officers correct information about the condition of the roads cannot be supplied by this Department.

4. I am, therefore, to reiterate the necessity of sending by telegram or telephone, the reports of damage to the National Highways immediately after such damages have occurred, followed by detailed reports about the extent of the damage and measures taken to restore it and the time expected to be taken in opening the road to traffic. It is further requested that suitable instructions may be issued to all Executive Engineers in charge of the National Highways for strict compliance with these instructions. Action taken in the matter may kindly be intimated to this Deptt.

No. NHI-41 (11)/71

Dated the 14th September, 1971

To
All State Governments/Administrations
(Departments dealing with roads)

Sub : Reports regarding damages to National Highways

I am directed to refer to this Ministry's letter No. WI-6 (4)/56, dated the 22nd March, 1956, in which State Governments were requested to issue suitable instructions to all concerned to the effect that whenever damages were caused to or dislocation of traffic occurred on, National Highways by floods, earthquakes etc., the event should be reported to this Ministry immediately after the occurrence by the local officers direct by telegram or telephone, whichever is quicker, and thereafter a detailed report should be sent at the earliest. Copies of this letter were endorsed to all the State Chief Engineers also. As the required intimations and reports were not being received in many cases, the need of following this procedure was reiterated in greater detail in the Director General (Road Development) letter No. WI-51 (12)/68, dated the 2nd January, 1959 and letter No. WI-43 (12)/63, dated the 21st September, 1963 to all the State Chief Engineers. A copy of the last mentioned letter dated the

21st September, 1963 is enclosed for ready reference. It is also further clarified that similar information is also required to be sent in cases where a National Highway stretch gets substantially submerged under flood water even though traffic may have somehow with difficulty continued to ply over it and may not have been completely disrupted.

2. It has again come to this Ministry's notice that the instructions mentioned above, are not being followed strictly by the State officials. I am, therefore, to request that fresh instructions may kindly be issued to all concerned (including the Executive Engineers in-charge of the National Highways) and a copy of the instructions issued may kindly be supplied to this Ministry for information and record.

4210.5
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No. PL-67 (29)/76-NH-VI

Dated the 28th June, 1979

To

The Engineer-in-Chief/Chief Engineers/Addl. Chief Engineers of State P.W.Ds and Union Territories dealing with National Highways. The Director General, Works, C.P.W.D., New Delhi.

Sub : Measures to mitigate the adverse effects of rains and floods on traffic operation and performance of Highways

It has been the general experience that rains and floods effect traffic operation and the performance of road pavements, and in certain cases are cause of severe damage. Adverse effects of this kind can, however, be mitigated to a great extent by timely action based on inspections and close monitoring of the road condition. During rainy season close watch should be kept on flood levels, possibility of overtopping of road sections general flow pattern of the runoff water, proper functioning of drains and culverts etc. so that prompt measures can be taken to regulate the flow of traffic, and to evolve permanent remedial measures wherever warranted.

2. For safeguarding the National Highways in this respect, the following points should be specially kept in view :

- (a) Advance action prior to rains :
 - (i) Roadside drains, catch water drains, catch pits etc. should be cleaned of all debris.
 - (ii) Any blockage in the waterways of culverts should be cleared.
 - (iii) Protection works such as slope pitching on embankments, bed flooring and other erosion control provisions at culverts should be inspected, and kept in good order.
 - (iv) Scoured areas in the vicinity of abutments piers of culverts, which are likely to endanger the safety of the structure, should be appropriately filled with stones/boulders.
 - (v) Road construction materials should be stored in areas not likely to be effected by floods.
 - (vi) Any potholes, cracks, pitting in the pavement surface should be properly repaired and filled up.
 - (vii) Berms should be dressed and made good in profile so that water does not stagnate but flows off during rains.
- (b) Action during the rainy season :
 - (i) Close watch should be kept on flood levels along the National Highways, and the HFLs. recorded. Stretches specially susceptible to rain/flood damage should be frequently inspected.
 - (ii) In locations where flood water rises fast to danger levels, or has the tendency to overtop the road, it should be ascertained whether this phenomenon is due to inadequacy of waterway at cross-drainage structures, low road level, or some other reason. This will be helpful in designing permanent remedial measures against overtopping.
 - (iii) Potholes and other incidental damage occurring to the pavement should be promptly repaired and the road maintained in traffic-worthy condition.
 - (iv) In certain cases, it may become unavoidable to suspend or divert traffic if the road section gets heavily damaged or breached by rain/flood waters. This will call for appropriate measures to regulate the flow of traffic and warn it of the danger ahead so as to obviate any accidents. Detailed instructions in this behalf have already been issued vide Ministry's letter No. NHIII-33 (125)/72 dated 20th March, 1973, and relevant extracts are enclosed for ready reference.
- (c) Post-rainfall period :
 - (i) After cessation of rainfall, the road should be inspected carefully to assess the total damage and devise a concrete action programme for restoration. The objective should be to repair the road to a traffic-worthy condition in the least possible time.
 - (ii) Utmost priority should be given to the repair of any breaches and blockages so that the flow of traffic can be resumed as expeditiously as possible.
 - (iii) Any stagnant water on the road surface or shoulders should be drained out promptly. Similarly, blocked drains and culverts

- should be attended to as early as possible.
- (iv) Road stretches subject to recurring damage should be studied closely to ascertain causes for the same so that appropriate permanent remedial measures could be planned.
 - (v) In some situations, water may get locked up within the road crust which can be highly injurious to the pavement. This generally shows up in the form of wet patches on the surface or water oozing from the berms and side slopes. In such cases, the excess water should be drained by providing suitable lateral drains on the shoulders.
 - (vi) Potholes, cracks, pitting in the pavement surface etc. should be promptly repaired and filled up.
 - (vii) Road repairs should be so planned and executed that the flow of traffic is not hampered unduly. In this connection, the contents of Clause 105 "Arrangements for Traffic During Construction" in the Ministry's "Specification for Road and Bridge Works" should be adhered to as closely as possible.

(d) Miscellaneous :

Behaviour record of road stretches should be studied with a view to improve the Specifications for future construction.

3. It is requested that the points emphasised in this letter may be given careful attention, and the same brought to notice of all officers concerned in your Department for compliance.

4210.6
4310

No. NHIII/P/13/79

Dated the 8th August, 1979

To

The Secretary to all State Govts. (Departments dealing with National Highways)

Sub : Damages to National Highways due to heavy rains, floods waterlogging—need for proper permanent remedial measures

In recent years, there have been reports of damages to National Highways in the monsoon periods due to heavy rains, floods and waterlogging conditions in different parts of the country. The State Governments are aware of the need for immediate repairs for restoration of the traffic which as per para 3 (3) of National Highway Rules 1957, should be carried out immediately with a report sent to the Ministry indicating the approximate amount of the likely liability. It is, however, very important that permanent remedial measures are devised, as early as possible after duly studying the causes for the damages and the drainage requirements of the area, so as to prevent recurrence of the damages in the future monsoons. These requirements have been brought to the notice of the concerned road authorities from time to time in various forums, such as, Chief Engineers meetings held at Chandigarh in March, 1975, at Bangalore in January, 1979 and in the meeting of Transport Development Council held at New Delhi in June, 1975 etc., as also in different circulars issued by the Ministry i.e. NHIII-33 (122)/72 dated 19.9.75, PL-67 (12)/76 dated 10.9.76 and PL-67 (29)/76-N.H. VI dt 28.6.79 etc. It is again to be emphasised that the concerned authorities may be impressed upon to take prompt and adequate action keeping in view the above mentioned circulars, guidelines etc., so as to mitigate the adverse effects of rains and floods on traffic operations and performance of highway.

2. It has been noticed in recent years that due to large-scale developmental activities undertaken during the Five-Year Plans, considerable changes in drainage patterns of different areas have taken place, for example, due to construction of large and medium power and irrigation projects, construction of canal systems, increase in the area under agriculture and multiple cropping etc. At places, apart from flooding, large areas are subjected to waterlogging resulting in rise of ground water table and consequent damaging effects on the road pavement due to migration of water by capillary action. The problem is aggravated in certain areas due to the presence of detrimental salts, such as, Sodium Sulphate, Calcium, Magnesium or Sodium Carbonate etc. In this connection, it may be pointed out that long lengths of National Highways consist of local roads which have been upgraded at different times since 1948 and these are having low heights and are vulnerable to damages due to heavy rains, floods etc. Further, the pavements are overstrained due to large-scale increases in traffic volume and the heavier axles plying on them since recent past. It is, therefore, imperative that immediate attention is paid to improvement needs of such stretches. While formulating these proposals, all concerned authorities, such as, Irrigation Department, Flood Control Authority, Irrigation/Power Project Authority, Agriculture Department etc. should be consulted as may be necessary and desirable and a co-ordinated plan of action for the area and road communications in it developed as far as possible. Co-ordination with individual authority for specific problems could also help, e.g., effect of waterlogging could be reduced if the concerned authority is prevailed upon to provide a net-work of tubewells for irrigation/water supply in the area.

3. In the areas subject to waterlogging and/or flooding with or without the presence of detrimental salts, progressive deterioration of the strength of the subgrade soil takes place and many a times the constantly wet con-

4210/4

ditions result in heaving (or boggy action as termed in U.P.) leaving the pavement in a floating condition totally unfit for traffic operations. In such cases, raising of the road formation with suitable capillary cut off would be a solution unless diversion of the road through a higher and nearby area be feasible without deterioration of alignment. The Indian Roads Congress recommendations for "Road Constuction in Waterlogged Areas" (I.R.C. : 34-1970) should be followed for the formulation of remedial measures in such cases. Such proposal should be formulated during or immediately after monsoon season and forwarded to this Ministry for consideration so that the measures could be implemented as far as possible before the next monsoon to prevent recurrence of damages to the road.

4. It is suggested that the concerned authorities may be directed to take action as laid down above and this Ministry kept informed of the same from time to time.

4210.7

No. NHIII/P/13/79

Dated the 7th August, 1980

To

All State Chief Engineers
(dealing with National Highways)

Sub: Floods preparedness—Steps to be taken for maintenance of road communication

I am directed to say that recently the Govt. of India (Department of Agriculture) has issued urgent instructions to all State Govts. and Union Territories on flood preparedness. Amongst other things, it has been desired that cross drains and natural drains should be kept open and vital road communications maintained.

2. It is presumed that you have already taken necessary action regarding proper maintenance of roads and are also maintaining close liaison with the State Flood Control authorities so that in case of sudden floods or breaches in bunds/tanks etc. preventive action is taken promptly. In regard to maintenance of roads, following aspects may kindly be kept in view :

- i) All longitudinal and cross-drains may be cleaned up so that there is no clogging up during rainfall.
- ii) For prompt repairs to potholes, advance collection of aggregates and binder may be made specially in vulnerable sections of highways. In areas of continuous and heavy rainfall, it may be desirable to use cut-back or suitable type of binder. Patching of potholes may be done promptly.
- iii) Road shoulders may be kept nearly dressed to a slope of 4%.
- iv) Road side ditches/borrow pits may be continuously connected so that surface water is drained out to a suitable outfall.
- v) All culverts may be inspected to ensure that there is no reduction in water-way and that the structures are sound.
- vi) In case of high embankments, existing protection works may be inspected and repaired wherever necessary. Where there is no pitching etc., turfing may be done during the rainy season.

4210.8

4310

No. NHIII/P/13/79

Dated the 4th August, 1981

To

The Engineer-in-Chief/Chief Engineers/Addl. Chief Engineers of State PWDs & U.Ts. dealing with National Highways/D.G. of Works, CPWD.

Sub: Flood damages to National Highways—Instructions regarding mitigation, reporting and remedial measures

The need for keeping the National Highways, which form the life lines of road transport in the country, open to traffic at all times needs no special emphasis. Because of unprecedented rains and floods, however, certain road sections may get over-topped breached or severely damaged, but adverse effects of this kind can be mitigated to a great extent by timely action based on inspection and close monitoring of the road condition.

2. Whenever, any road section becomes so damaged or over-topped or breached as to necessitate suspension of traffic, the immediate requirement would be to arrange for diversion of traffic through alternate routes, and take up immediate repairs for restoration of traffic in accordance with the para 3 (3) of National Highway Rules 1957, with a report sent to the Ministry and the concerned Audit Officer, indicating the approximate

amount of the likely liability. After immediate restoration, permanent remedial measures should be devised so that the affected sections are not subject to such damages in the future years.

3. The Ministry had issued detailed instructions to all State PWDs on the above aspects from time to time besides bringing forth the subject for discussion at the Chief Engineers' meetings. Because of the importance of the problem, some of the salient points made in these are brought out once again to the notice of State Chief Engineers so that none of these is lost sight of:

(a) Advance action prior to rains

While the PWDs should be geared up to meet any exigency caused by floods, the aspects which need special attention are:

- (i) cleaning of all roadside/catch water drains of debris and remedial of any blockade in the waterway of cross-drainage structures so that the flood waters flow freely without any heading up;
- (ii) protection of abutments and piers of cross-drainage structures, embankment slopes etc. prone to erosion. (Circulars No. PL-67 (29)/76-NHVI dated 28.6.79 and No. NHIII/P/13/79 dated 7.8.80).

(b) Action during the rainy season

A close watch should be kept on the flood levels and the road should be maintained in traffic-worthy condition. (Circular No. PL-67 (29)/76-NHVI dated 28.6.79).

(c) Where a road section gets heavily damaged or breached necessitating suspension of traffic.

- (i) Immediate arrangement should be made for diverting the traffic through alternate routes. (Circular No. NHIII-33 (126)/72 dated 20.3.73).
- (ii) Concurrently, the Ministry must be informed of the traffic dislocation by wire or telephone. (Circulars No. WL/43(12)/63 dated 21.9.63 and No. NHIII/P/13/79 dated 8.8.79).

The general experience, however, has been that the telegraphic message, many a time are unusually delayed, and in some cases are not received at all with the result that the Ministry remains in dark about the emergency situation on the National Highways. In future, therefore, it is requested that whenever any traffic dislocation is anticipated for a period of 24 hours or more, the concerned EE/AEE should ensure that the concerned officer in this Ministry is informed of the situation on telephone. In case the telephone services are also dislocated the field officers may obtain the help of District Authorities for use of wireless facility for establishing contact with the Chief Engineer at State Headquarters who in turn should immediately inform this Ministry over telephone. In some cases, particularly for major dislocations on important National Highways, when all other possible communication channels have failed, the services of a special messenger might be utilised for intimating the position to this Ministry.

(iii) The measures at (ii) above should be followed by detailed reports showing particulars of the damage and the causes thereof of the period over which the affected reaches are likely to be closed to traffic, the restoration measures being undertaken and the approximate amount of likely liability.

(Circular No. WL/43/12/63/ dated 21.9.63 and No. NHIII/P/13/79 dated 7.8.79).

(d) Permanent remedial measures

These should be designed and proposals thereof formulated to ensure that the damages that had happened do not recur in the future. The proposal should be framed after an in-depth study and causes of the damages, the drainage requirements of the area and its possible changes due to construction of river valley/irrigation projects etc. While formulating the proposals, all concerned authorities such as Irrigation Department, Flood Control Authority, Irrigation/Power Project Authority, Agriculture Department etc. should be consulted as may be necessary and desirable, and a coordinated plan of action for the area and road communication in it, developed as far as possible. Coordination with individual authority for specific problems could also help, e.g., effect of water logging could be reduced if the concerned authority is prevailed upon to provide a network of tubewells for irrigation or water supply in the area.

(Circular No. NHIII/P/13/79 dated 8.8.79).

4. It is requested that contents of this circular may be brought to the notice of all officers in your Department dealing with National Highways for strict compliance. A record of floods National Highways Stretches affected nature of damages and details of breaches may be kept.

5. Action taken in the matter may please be intimated to this Department.

4210.9

No. RW/N. 17/KNT/32/W

Dated the 25th April, 1982

To

All the State Chief Engineers dealing with National Highways

Sub: Prompt action regarding execution of special repair and flood damage repair works

There have been cases where execution of special repairs or flood damage repairs has got inordinately

4210/6

delayed even though estimates had been sanctioned in time. The very objective of sanctioning such special repair or flood damage repair estimates is to prevent further deterioration of the structure road or suspension of traffic on a National Highway by immediate completion of proposed repairs. Such repairs should in future be got executed on priority basis and for that purpose it should be advisable that proper monitoring is done at a senior level in the C.Es office.

4300 BRIDGE MAINTENANCE

4310 MAINTENANCE PROCEDURE AND OPERATION

<i>Code No.</i>	<i>Circular No Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
<u>4310.1</u> 4110	NHI.40 (2)/68 dt. 10.4.69	Monetary Limits upto which expenditure on Petty & Mise. Items of Works Pertain-No. 4110 ing to NHs Ordinary called as New works Can be Charged to Repairs	See Code No. 4210
<u>4310.2</u> 4210	NHI-41 (11)/71 dt. 14.9.71	Reports Regarding Damages to NHs	4310/1
<u>4310.3</u>	LR-16 (150)/66 dt 8.3.72	Repairs to Asphaltic Wearing Coat	4310/1
<u>4310.4</u>	NHVI-8 (46)/72 dt 13.4.73	Maintenance of Bridges	4310/1
<u>4310.5</u> 4110	NHII/P 16/76 dt. 17.3.76	Acceptance of Central Financial Liability for the Development/Maintenance of Urban Road Links of NHs	See Code 4110
<u>4310.6</u> 4110	NHIII/P/13/75 dt. 10.8.76	-do-	See Code No. 4110
<u>4310.7</u>	PL-67 (20)/76 dt. 26.3.77	Maintenance of Bearings	4310/2
<u>4310.8</u>	PL-30 (28)/77 dt 27.4.77	Removal of Stains from Concrete Surfaces	4310/2
<u>4310.9</u>	NHIII/P/2/79 dt. 8.1.79	Close Watch on Bridges During Post Construction Period	4310/4
<u>4310.10</u>	NHIII/P/2/79 dt. 2.5.79	Need for Ensuring Safety of Completed bridges	4310/5
<u>4310</u> 4210	PL-67 (29)/76-NHVI dt. 28.6.79	Measures to Mitigate Adverse Effects of Rains and Floods on Traffic Operation and performance of Highways	See Code No. 4210
<u>4310.12</u>	NH-VI-67 (3)/79 dt. 4.8.79	Removal of Vegetational Growth Obstructing Waterway	4310/6
<u>4310.13</u> 4210	NHIII/P/13/79 dt. 8.8.79	Damages to NHs due to heavy rains, Floods/water-logging-Need for proper, Permanent Remedial Measures	See Code No. 4210
<u>4310.14</u> 1980	PL-17 (14)/76 Vol.II dt 31.3.81	Maintenance of Existing Concrete Bridges Susceptible to Corrosion	See Code No 1980
<u>4310.15</u> 4210	NHIII/P/13/79 dt. 4.8.81	Flood Damages to NHs-Instructions Regarding Mitigation, Reporting, and Remedial Measures	See Code No. 4210
<u>4310.16</u>	NH-VI-50 (3)/83 dt. 21.4.83	Records to be kept with Maintenance Engineer	4310/6
<u>4310.17</u>	PL-17 (14)/76-Vol. II dt. 16.6.83	Repairs of Bridges by Shotcreting	4310/7
<u>4310.18</u>	NHVI-50 (3)/83 dt. 18.11.83	Clearance of Drift Wood Entangled in Box/Pipe Structures	4310/8
<u>4310.19</u>	NH-VI-67 (29)/76 dt. 3.12.83	Periodic Inspection and Maintenance of Bridges	4310/8
<u>4310.20</u> 608	RW/NHIII/P/13/85 dt. 27.6.85	Load Restrictions on Weak Bridges and Culverts	4310/9

No. LR-16 (150)/66

Dated the 8th March, 1972

To

The Chief Engineers of all State PWDs, and Union Territories (dealing with roads)
E-in-C, C.P.W.D.

Sub: Maintenance of asphaltic wearing coat on bridges and culverts on National Highways and other Centrally financed roads

Please refer to this Ministry's Circular letter of even number dated 21st December 1971 regarding provision of wearing coat on bridges and culverts being constructed on National Highways and other Centrally financed roads.

Wherever asphaltic concrete wearing coat is given on bridges/culverts whenever renewal coats of the wearing coat becomes necessary, care should be taken by the maintenance staff that the total thickness of the wearing coat, after the repairs/renewals, does not exceed the thickness originally provided and allowed for in the design to avoid over-stressing of the bridge members due to increase in dead load. Also care should be taken that pot holes and corrugations are not allowed to develop in the wearing surfaces to reduce the chances of excessive impact due to live load.

No. NHVI-8 (46)/72

Dated the 13th April, 1973

To

All the Chief Engineers of States/Union Territories (connected with Roads)

Sub: Bridges on National Highways-Maintenance

Two cases concerning lack of attention to maintenance of bridges on the National Highways have come to the notice of this Ministry recently. These are as below :

(a) In a particular bridge, the course of the Nalla on the upstream side became skew to the bridge. In the monsoons of 1972, this skew current attacked the embankment behind the abutment and breached it. It also caused excessive concentration of flood discharge through the end span resulting in heavy scour of the bed. All this caused dislocation of the traffic on the National Highway. Obviously, this change in the flow direction was not noticed by the officers incharge of the maintenance of the bridge and, therefore, no preventive measures against the expected damage could be taken.

(b) In another bridge on National Highway, it was noticed that sand obtained from sand quarries located elsewhere used to be washed and cleaned on one of the banks immediately downstream of the bridge. Due to this the bed gradually silted up in a few years and it got raised approximately up to the level of the surrounding natural ground. Due to blocking of the channel downstream of the existing bridge, the bridge though it existed in the structural sense, was not functioning in the hydraulic sense. This was also not noticed by the maintenance staff.

2. These cases are brought to the notice of the State Chief Engineers dealing with the roads to emphasise the need of vigilance on the part of the maintenance staff by issuing suitable instructions to the officers of the State P.W.D. incharge of maintenance and inspecting officers on the following lines :

- (i) To observe such aspects, e.g. skewness of the current, of the behaviour of the river on the upstream side of the existing bridges like spilling over its bank and crossing the approaches at some distance for the bridge which may adversely affect the bridge and also to see that there is no blocking of the natural course of the stream, and
- (ii) To take immediate steps, if any of the above conditions are noticed, so that there is no damage to the Highway.

3. The State Chief Engineers may also consider issuing instructions for inspection of all bridges before and after the floods every year and for this it is for their consideration if officers at different levels can be charged with the responsibility of inspecting and bringing out reports on the specified category of bridges.

No. PL-67 (20)/76

Dated the 26th March, 1977

To

The Chief Engineers (All State PWDs/UTs)

Sub: Use of Rubber Bearings-Plate Bearings-Instructions regarding

It has been observed during inspections by the Officers of this Ministry that the space around the bearings fixed on the substructure of some of the bridges on National Highways is generally full of extraneous materials such as grit, sand and droppings from concrete (while casting) etc., which is a hindrance to the proper and satisfactory functioning of the bearings. The very purpose of allowing free movement to the superstructure, whether translation or rotation, for which the bearings are provided is, therefore, defeated.

2. In the case of bridges provided with rubber bearings, it can be easily appreciated that the aforesaid materials will not permit the elastomer to experience the desired shear strain and volumetric strain under the designed vertical load and horizontal forces and thus prevent the rubber bearings from functioning in the fashion as assumed in the design. This may lead to very heavy horizontal forces on the substructure and foundations which apparently would not have been designed for such a condition.

3. It is, therefore, impressed upon all concerned that for proper functioning of the bridge bearings, the space surrounding the bearings should always be kept free from such materials at all times by the maintenance field staff. Further, the installation instructions as listed in the Standard Drawing No. BD/4-75 for 'Elastomeric Bearings for Girder Bridges' circulated vide Ministry's letter No. PL-67 (5)/74 dated 30th September 1975, should also be rigorously enforced.

4. Often to provide for adequate working space between the bottom of the main girders and top of the pier/abutment caps, as well as to facilitate lifting of the superstructure for replacement of bearings at a later date, R.C. pedestals are provided. These R.C. pedestals shall be of adequate size, properly designed as per codal requirements and built monolithic with the pier/abutment caps.

5. A rapid survey of all the bridges on the National Highway system may be made to clear the above defects, if any.

6. These instructions shall apply to all the bridges on the National Highways and other roads financed either in full or in part from the Central funds.

No. PL-30 (28)/77

Dated the 27th April, 1977

To

All the State Chief Engineers (Dealing with Roads)

Sub: Bridges financed either in part or in full from Central Funds-Removal of stains from concrete surfaces

A copy of the article "How to remove stains from concrete surfaces" that has appeared in the Journal of the American Concrete Institute, December 1975, is enclosed for your reference and necessary action.

1.2. This article gives details for the removal of metallic stains, bitumen stains, smoke stains etc., on concrete surfaces. This may please be given wide circulation to all the officers in your departments.

2.1. A detailed survey of all the existing bridges on National Highways may please be made and examined to see how far the stains wherever noticed could be removed by the process indicated in the enclosed article. Thereafter, it could be considered as to how the expenditure towards this could be met i.e. either from the annual maintenance Grants or from other heads.

3. This note may please be included in the Notice Inviting Tender for all bridges to be constructed in future financed either in full or in part from Central Funds. A new bridge after completion may be accepted only after all the stains are removed.

Enclosure to Letter No. PL-30 (28)/77

Dated the 27.4.77

HOW TO REMOVE STAINS FROM CONCRETE SURFACES

Unightly stains on concrete surfaces need not be tolerated. Almost any stain can be removed from cured concrete, but old, long neglected stains may require repeated treatments. Listed below are treatments for the removal of the most frequently encountered specific stains :

Metallic stains are among the more common discolorations found. Iron stains are easily recognizable by their resemblance to rust, or by their nearness to steel or iron in or on the concrete.

To remove deep and intense iron stains, the surface should be soaked with a solution made of one part sodium citrate crystals in six parts water. Dip white cloth in this solution and paste over the stain for 10-15 min. on horizontal surfaces, sprinkle a thin layer of sodium hydrosulphite, moisten with water and cover with a paste of whiting and water.

On vertical surfaces, after moistening with the sodium citrate solution, place the paste of whiting on a trowel, sprinkle on the hydrosulphite, moisten, and apply to the stain.

Do not leave the paste in place more than 1 hr. as black staining may result. Remove and flush with clear water. If stain remains, repeat the treatment.

Copper or bronze stains are usually green but can be brown. Either may be removed by making a dry mixture of sal ammoniac and powdered talc (1:4) and adding ammonia water (household ammonia) to make a paste. Place over the stain and allow to dry. (All label precautions should be observed when using ammonia water, particularly cautions regarding eyes and mucous membranes).

Old stains of this kind may require several applications for complete removal. Aluminium chloride may be used instead of sal ammoniac.

Aluminium stains are usually a white deposit which may be removed by scrubbing with 10 to 20 per cent muriatic acid solution. On coloured concrete, weaker solutions should be used. Flush with clear water after removal to prevent etching of the concrete. (Again, label precautions must be observed since muriatic acid can affect eyes, skin and breathing).

Bitumen Stains

Molten bitumen. This material can be removed satisfactorily because it does not penetrate the concrete surface. Cool with ice until it is brittle and chip off with a chisel, scrub the surface with abrasive powder to remove the residue and rinse with clear water.

Emulsified Bitumen. Bitumen emulsions consist of very small drops dispersed in water. They do not penetrate very deeply into the concrete surface. Scrub the stained area with Scouring powder and water. Do not use solvents since these would increase the penetration of the stain into the surface and make satisfactory removal impossible.

Cut-back Bitumen. Cutback bitumen consists of a solution of bitumen in a solvent. This penetrates very deeply into the surface of the concrete and it is practically impossible to remove the stain completely. The intensity of the stain can be reduced by application of a poultice impregnated with toluence (toluol) or benzene (benzol, not to be confused with bensine). Then scrub the surface with scouring powder and water.

Fire-Smoke Stains. Fire often causes severe stains on concrete. The appearance may be restored by: scrubbing with pumice or grit scouring powder to remove surface deposit; apply white flannel soaked in a mixture of 2 lb trisodium phosphate and 12 oz. chlorinated lime (use caution chlorinated lime can irritate eyes and skin) in 2 gal water (use only clear liquid after lime has settled).

The soaked flannel should be covered and kept moist with the solution. Deep stains from burning pitch may require several treatments.

Grease stains. Scrape off all excess grease from the surface and scrub with scouring powder, soap, trisodium phosphate, or detergent, if staining persists, methods involving solvents are required.

Use benzene, refined naphtha solvent, or a chlorinated hydrocarbon solvent such as trichloreethylene to make a stiff poultice. Apply to the stain and do not remove until the paste is thoroughly dry. Repeat the application as often as necessary. If required, scrub with strong soap, scouring powder, trisodium phosphate, or proprietary detergents specially formulated for use in concrete. Rinse with clear water at end of treatment.

Lubricating oil stains. Lubricating or petroleum oil readily penetrates into the concrete surface. If the free oil is removed promptly there will be little danger of staining. It should be soaked up immediately with an absorbed material such as paper towels or cloth. Wiping should be avoided as it spreads the stains and drives the oil into concrete. Cover the spot with a dry, powdered, absorbent, inert material (the same as used in a poultice) or portland cement, and leave it for one day. Repeat this treatment until no more oil is absorbed by the powder. If a stain persists or if oil has been allowed to remain for some time and has penetrated the concrete, other methods are required.

Remove all liquid or solidified oil from the surface and scrub it with strong soap, scouring powder, trisodium phosphate, or proprietary detergents specially formulated for use on concrete. The following method can then be used.

Make a poultice with a solution of 5 per cent sodium hydroxide (caustic soda). Let dry for 20 to 24 hrs. remove, and scrub the surface with clear water.

Paint stains. Scrape off as much as possible of the hardened paint. Apply a poultice impregnated with a commercial paint remover. Allow to stand for 20 to 30 min. Scrub the stain gently to loosen the paint film and wash off with water. Any remaining residue can be

scrubbed off with scouring powder. Colour that has penetrated the surface can be washed out with dilute hydrochloric or phosphoric acid. This treatment can be applied also to dried enamel, lacquer, or linseed-oil-based varnish. For shellac stains, the paint remover is replaced by alcohol.

More detailed information on specific staining problems can be obtained from the New York concrete Construction Institute, or from the Portland Cement Association.

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4310.9

No. NHIII/P/2/79

Dated the 8th January, 1979

To

All State Governments (Departments dealing with Highways)

Sub : Need for keeping a close watch on completed National Highways/Bridges during Post-construction observation periods, and for a proper maintenance and upkeep thereafter, and the importance of proper handing over notes while transferring such works to new Divisions/other Government Agencies

It has been observed in the recent past that in many cases, soon after the completion of a National Highway road/bridge work, officers who were directly in charge of construction are transferred without even waiting for the expiry of the observation period or at least one flood season after the road/bridge has been opened to traffic. It would be appreciated that many important points needing detailed observations during the performance period of road/bridge, are best known only to the staff associated with the execution of the work. The officers taking over the maintenance of the bridge or the road more so the bridge cannot legitimately be expected to be familiar with the points requiring proper attention for observations during the floods or during service unless, of course, very detailed handing over notes are made available to them by the handing over staff. Non-compliance with this essential requirement of proper handing over notes has led to failure of structures due to the blissful ignorance of the authority taking over in some cases that have come to our notice. It may, therefore, be necessary that the construction staff, at least officers upto the level of the Executive Engineers, should continue to be in charge of the maintenance of the bridge/road works at least for one full year including at least one flood season, after the same have been got completed by them. In some cases where the works are executed by Divisions specially created for that purpose for a specified period, it may become difficult to continue those Divisions, and the completed works may have to be handed over to regular maintenance Divisions. Similarly, where N.H. Works are got executed through agencies other than the State road authorities (such as C.P.W.D. etc.), such agencies may not be prepared to undertake the responsibility of subsequent upkeep and maintenance. In all such cases, proper handing over notes highlighting the various important issues requiring close watch, and observation and as detailed in para 2 below, should be insisted upon and ensured. The State Governments are, of course, the deciding authority for posting and transfer of their officers for personnel management, keeping in view the exigencies of the administrative requirements, but, if the above suggestion is implemented, it would ensure a long range serviceability and safety of such structures and a good care of investments involved.

2. Besides complete technical data and notes highlighting special features of the structure requiring particular attention for maintenance during service, the handing over notes should invariably contain the following documents :

(A) For Bridges :

- i) Brief description of the bridge.
- ii) Completion drawing for all the components.
- iii) Basic design data/assumptions including those for the rivers training works.
- iv) Complete construction history of the bridge including foundations, substructure, super-structures and training works, if any.
- v) Special features of the bridge including the points requiring particular attention for maintenance with special reference to stability of foundations and the founding strata.
- vi) Any other details having relevance to the proper upkeep of the bridge structure and its safety.
- vii) Extracts of the bridge registers.

(B) For Roads :

- i) Completion drawings of road structure, drainage structures (culverts etc.), retaining walls, protective works, longitudinal section showing H.F.L. etc.
- ii) Pavement composition and the basic pavement design data like C.B.R. values etc.
- iii) Quarry locations from which road aggregates have been obtained.

- iv) In case of high approach banks exceeding 6 metres height, basic design data and assumptions utilised for design.
- v) Extract of the Road Register.
- vi) Any other special important features requiring particular attention for maintenance of road, road structures etc.

3. It is requested that the contents of this circular may kindly be brought to the notice of all officers in your Department who are directly or indirectly concerned with the planning, design, construction and maintenance of bridges/roads. Guidelines issued earlier for the safety of bridge structures *vide* this Ministry's letters No. NHV-11 (6)/73 dated the 19th Nov. 1974., PL-67 (29)/76 dt. the 31st August 1978 and NHIII/P/18/78 dated the 18th December 1978 may please be kept in view as far as bridge maintenance inspection -IRC Manual for the Highway Bridge Maintenance Inspection (IRC Special Publication 18) which may kindly be referred to and strictly followed by all officers concerned with the Maintenance Inspection of bridges so as to ensure proper maintenance and taking of timely protective measures to the bridge structures.

4310.10.

NHIII/P/2/79

Dated the 2nd May, 1979

To

All State Governments. (Deptts. dealing with Highways)

Sub : Need for ensuring safety of completed bridges on National Highways and under other Centrally financed Schemes—Carrying out soundings in the river bed after every flood season and reporting the results thereof to Roads Wing with copies to Regional offices

You might be aware that with a view to highlighting the need for paying proper attention to all important aspects essential for proper planning, designing, execution and maintenance of bridges this Ministry has already brought to your kind notice suitable steps (as enumerated hereunder) that should be taken to ensure safety and serviceability of our bridge structures :

- i) Detailed guidelines for ensuring safety of bridge structures issued *vide* this Ministry's circular No. NHV-11 (6)/73 dated 19.11.1974;
- ii) Circular issued *vide* this Ministry letter No. PL-67 (29)/76 dated 31.8.1978;
- iii) Circular issued *vide* this Ministry letter No. NHIII/P/18/78 dated 18.12.1978; and
- iv) Instructions regarding need for keeping a close watch on completed National Highway bridges during post-construction observation periods for proper maintenance and upkeep thereafter and importance of proper handing over notes while transferring such works to new Divisions/other Government Agencies conveyed *vide* our Circular No. NHIII/P/2/79 dated 8.1.1979

In addition, the I.R.C. has already brought out a very useful publication of theirs entitled "Manual for the Highway Bridge Maintenance Inspection" (IRC Special Publication-18).

2. In para 2.5 (iv to vi) of our Circular No. NHV-11 (6)/73 dated 19.11.74 and our circular of 31.8.1978, the importance of carrying out soundings in the river bed has been emphasised. It is expected that necessary instructions have since been issued to your Field Officers to the effect that soundings should be taken in the river bed before and after every flood season and immediate corrective measures should be taken to prevent any detrimental effect of scour in the vicinity of the piers, abutments and other parts of substructure and training works. It has now been decided that for all bridges on National Highways and those financed from Central funds, the detailed reports embodying the above mentioned observations/soundings should be sent to the Roads Wing with copies being endorsed to our Regional Offices. Necessary instructions may kindly be issued to all concerned for suitable compliance in this regard in future. This may kindly be treated as urgent and it is requested that receipt of this letter may please be acknowledged.

No. NHVI-67 (3)/79

Dated the 4th August, 1979

To

All State Chief Engineers dealing with N.Hs

Sub : National Highways Bridges Financed either in full or in part from Central Funds Highway Bridge Maintenance—Removal of vegetational growth obstructing waterway and that over masonry arch bridges

Your kind attention is invited to paras 4.3. (3) (v) and 4.3. (7) (iv) of I.R.C. Special Publication No. 18 "Manual for Highway Bridge Maintenance Inspection", which prescribes keeping a watch during the periodical maintenance inspections on any obstruction in the waterway due to the plant growth below the bridges across nallahs/streams and on the vegetational growth over masonry arches spandrel walls, parapet walls etc. As the consequences of allowing such growth are obvious, the importance of removing such vegetation regularly need not be over emphasized on the bridge/road engineers.

2. Instances have, however, come to the notice of this Ministry wherein the field engineers of State Public Works Departments do not appear to have paid any attention to this important aspect of highway bridge maintenance. It is, therefore, once again stressed that the growth of vegetation under the bridges, which blocks the waterway and thus creates higher afflux and higher velocities of flow through the bridge and resultant damages and that over the superstructures of masonry arch bridges, spandrel walls, parapets, wing walls, etc. which causes disintegration of mortar and masonry and thus weakens the structure should not be allowed to develop. All such vegetational growth should be detected and removed during the pre-monsoon inspections of bridges.

3. It is requested that a bridge-wise report of such pre-monsoon inspections and removal of vegetation wherever observed should be prepared by each field Executive Engineer in respect of bridges in his jurisdiction and forwarded regularly to the concerned Regional Officer of this Ministry and also to the Ministry before the onset of monsoons every year.

4. Contents of this letter may be brought to the notice of all Road/Bridge Engineers dealing with National Highways and other Centrally aided Road/Bridge Works in your State.

No. NHVI-50 (3)/83

Dated the 21st April, 1983

To

All Chief Engineers of States/Union Territories dealing with N.Hs. and other Centrally sponsored roads

Sub : Records to be kept in respect of bridges on N.Hs. and other Centrally sponsored roads

To facilitate the Engineer Incharge of maintenance of bridge to understand the critical points that need to be looked into during periodic inspection and maintenance of bridges, it is requested that the following documents may please be got bound with cloth wrapper and kept with maintenance Engineer for ready reference.

- i) One copy of designs for the bridge;
- ii) One copy to the finally approved drawings for the bridge;
- iii) History of well sinking for each of the wells as per proforma enclosed
- iv) Problems met with during construction along with brief details.

2. Each bridge is unique. After the construction, the Engineer-in-charge (preferably the S.E. Incharge of execution) will have to prepare a maintenance manual indicating the critical points for maintenance, obtain the approval of Roads Wing and hand over to the Superintending Engineer-incharge of maintenance.

Enclosure to letter No. NF/VI-50 (3)/83 dt. 21.4.83

PROFORMA FOR HISTORY OF WELLS

Date	Steining work		Sinking work		Average sump during the stage	Strata		Kentledge		Any obstacles during sinking Yes/No.
	From	To	From	To		As per boring chart	As actually met	Average value	Eccentricity Along X axis Along Y axis	

Sand blowing during sinking Yes/No.	Dewatering done during sinking Yes/No.	Any special methods used during sinking	Tilts		Shifts		Action taken when tilt went beyond 1/100	Remarks
			Along X axis	Along Y axis	Along X axis	Along Y axis		

4310.17

No. RW/PL-17 (14)/76-Vol. II

Dated the 16th June, 1983

To

All Chief Engineers of States/Union Territories dealing with N.Hs and other Central Sector Bridge Works

Sub : Guidelines for repair of existing concrete bridges by shotcreting

Attention is invited to this Ministry's circular letter of even number dated 31.3.81 wherein "Guidelines for maintenance and repair of existing concrete bridges susceptible to being affected by corrosion" were issued.

2. The particular provisions with respect to repairs to damaged concrete given in para 51 (iii) have been further reviewed. Certain essential aspects of the procedure for repair by "shotcreting" are being outlined in the enclosed guidelines. These would be applicable for use not only in marine environments but also in any other situations where repairs to damaged/spalled concrete are found necessary. Para 5.1. (iii) of the aforesaid circular is, therefore, superseded by the provisions indicated in the enclosure.

3. The guidelines mentioned in the enclosure may be followed in conjunction with Indian Standard Recommended Practice for Shotcreting—IS : 9012-1978 and the Equipments for Application of the same should comply with the requirements given in IS-6433-1972.

4. Suggestions to improve/augment the above guidelines based on experience are welcome.

Enclosure to letter No. RW/PL-17 (4)/76-Vol. II dt. 16.6.83

Guidelines for repairs of damaged/spalled concrete of existing concrete bridges by Shotcreting—Some important points to be borne in mind.

- (i) In general Dry-Mix-Shotcrete which is also known by the trade name "Guniting" shall be applied for repair of concrete in bridge works.
- (ii) Ordinary Portland cement conforming to I.S. 269-1976 shall be used in shotcreting.
- (iii) Sand for shotcreting shall comply with the requirements stipulated in I.S. 383-1970 and graded evenly from fine to coarse as per Zone II grading. In general, sand should neither be too coarse to increase the rebound nor too fine to increase the slump. Sand used should preferably have a moisture content between 3 to 6%.
- (iv) For thick sections and where adequate guniting equipment is available, it may be advantageous to incorporate coarse aggregate in the mix. Coarse aggregate, when used, shall conform to grading given in Table I of I.S. 9012-1978.
- (v) Water/cement ratio for shotcrete should fall within the range of 0.35 to 0.50 by mass, wet enough to reduce the rebound.
- (vi) Drying shrinkage may be between 0.06% to 0.10%.
- (vii) Test panels simulating actual field conditions should be fabricated for conducting preconstruction testing. The procedure for testing the cubes or cylinders taken from the panels stipulated in Clause 6 of I.S. 9012-1978 should be followed.
- (viii) Cement mortar mix should be generally within the range of one part of cement to 3 to 4½ parts of sand. In case coarse aggregate is proposed to be included in the mix, its percentage may be normally kept as 20 to 40% of the total aggregate and the mix should be suitably designed.
- (ix) It should be ensured from tests that a strength of about M 280 at 28 days is available for the mortar/concrete mix.
- (x) The defective concrete should be cut out to the full depth till sound concrete surface is reached. Under no circumstances,

should the thickness of concrete to be removed be less than the clear cover to the main reinforcement. No square shoulders shall be left at the perimeter of the cut-out portion and all edges shall be tapered. Thereafter all loose and foreign materials should be removed and the surface shall be sand-blasted to make it rough to receive shotcrete.

- (xi) The exposed reinforcement should be thoroughly cleaned free of rust, scales etc. by wire brushing. Wherever the reinforcements have been corroded, the same should be removed and replaced by additional reinforcement. Before application of shotcrete a coat of neat cement slurry should be applied on the surface of the reinforcement.
- (xii) The additional reinforcement should preferably be welded to the existing reinforcement. In case the existing reinforcement is not weldable and provision of laps becomes necessary, the lapped reinforcing bars should not be tied together. They should be separated by at least twice the diameter of the bar wherever possible.
- (xiii) Sufficient clearance should be provided around the reinforcement to permit encasement with sound shotcrete. Care has to be taken to avoid sand pockets behind the reinforcement.
- (xiv) A thickness of 25 to 40 mm of shotcrete can normally be deposited in one operation. If, for some reason the total thickness is to be built up in successive operations, the previous layer should be allowed to set but not become hard before the application of the subsequent layer. It would always be necessary to apply shotcreting on a damp concrete surface.
- (xv) It would be desirable to provide welded wire fabrics in the first layer of shotcreting. In case the damage to the concrete member is too deep, the specifications for shotcreting as well as requirement of placement of wiremesh has to be decided as per field conditions.
- (xvi) The stipulations given in I.S. 9012-1978 regarding application of shotcrete should be scrupulously followed so as to keep the rebound to a minimum. The quality of shotcreting and workmanship should be such that the percentage of rebound mentioned in Clause 8.6 of the Standard can be adhered to. In no circumstances should the rebound material be reused in the work.
- (xvii) Adequate care has to be taken regarding curing of the shotcrete. It would be desirable that green shotcrete is moistured for at least 7 days.
- (xviii) Shotcreting work should not be done during windy or rainy conditions.

4310.18

No. NHVI-50 (3)/83

Dated the 18th November, 1983

To

Secretaries of all State PWDs, Chief Engineers of all State PWDs and Union Territories dealing with N.Hs. and other Centrally Financed roads

Sub : Clearance of drift wood entangled in box/pipe structures

Accumulation of any debris may be specially guarded against in case of box or pipe culverts/bridges. In vulnerable areas, all such structures may be frequently inspected by an Engineering Officer during the monsoon season.

4310.19,

D.O. No. RW/NHVI-67 (29)/76

Dated the 3rd December, 1983

To

- 1) All Secretaries of State PWDs Incharge of National Highways (by Name)
- 2) All Chief Engineers of State PWDs, incharge of National Highways (By Name), including C.E. Pamban Bridge Project.

Sub : Periodic inspection and maintenance of bridges on N.Hs.

Indian Roads Congress has brought out Special Publication No. 18 "Manual for Highway Bridge Maintenance Inspection" in Feb '78 to serve as a guideline to Maintenance Engineers. The Ministry has been from time to time issuing circular letters pressing the necessity of periodic inspection of bridges as brought out in the above publication. The importance of periodic inspection of bridge structures has been highlighted and brought to the notice of State Chief Engineers vide D.O. letter of even no. dated 28.2.83 from Director General (Road Development) & Addl. Secretary.

2. The salient aspects like periodicity of the inspection, level of inspection, details of inspection, system of reporting etc. were enumerated and circulated once again to all the State Chief Engineers for guidance vide Circular letter of even no. dated 2.3.83. This was followed up with my D.O. letter of even no. dated 6.5.83 addressed to all State PWD Secretaries and all State Chief Engineers. The matter was also discussed in several meetings of the Chief Engineers. It is, however, noticed during my inspections that the matter has not received the adequate attention that it deserves and it is paining me very much.

3. Some of the important points are again listed below for ready reference :

- i) Bridge registers to be maintained after careful inspection of various components of the bridge so that timely action can be

- taken to repair the bridges, especially in the coastal region where sea atmosphere corrodes the reinforcement.
- i) Each Superintending Engineer to have guniting machine in his T & P and train one of the workers to use this machine. Any crack, spalling should be sealed immediately. "A stitch in time saves nine."
 - iii) To indicate the date of cleaning and greasing of metallic bearings on the face of pier/abutment.
 - iv) To provide necessary steps on either side of the bridge to enable the inspecting officer to go down to the bridge to inspect the underside of the girders etc.
 - v) To inspect the underside of the bridge with a boat and measure scour during monsoon at each of the piers with an echo sounder in respect of major bridges; and
 - vi) To remove at regular frequent intervals to be specified by the Superintending Engineer of the State PWD incharge of the particular bridge any vegetation growth observed in the various parts of the bridge.

3.1. We shall be thankful if suitable instructions are issued to all officers incharge of maintenance of bridges to bestow special attention regarding the above important requirements.

3.2. A copy of the instructions so issued may please be sent to this Ministry for record.

4310.20
809

No. RW/NH.III/P/13/85

Dated the 27th June. 1985

To

All Secretaries of State Governments & Union Territories dealing with Transport and Roads

Sub : Imposition of load restriction on certain sections of National Highways in which weak bridges and culverts are located

You may be aware that the tendency to overload transport vehicles beyond the statutory limits has been increasing and has led to some bad accidents causing serious damages or even collapse of weak bridges and culverts on the National Highways at several places and disrupting traffic. It is, therefore, necessary that strict vigilance is enforced with regard to loading of vehicles as well as restricting the load on vehicles which pass through Sections of National Highways where weak bridges and culverts are located.

2. In terms of provisions under Section 74 of the Motor Vehicles Act, 1939, the State Government/Union Territories are empowered to take action to restrict the weight that may be carried in any specified area/road in the interest of public safety and convenience or because of the nature of any road or bridge. While doing so, necessary traffic signs indicating the prohibition or restriction should also be put for the information of all concerned. In this connection, circular letter No. TW/TGM (18)/82 dated 27th September 1982 issued by the Ministry of Shipping and Transport, Government of India, may please be referred to and suitable action may kindly be taken by the concerned State authorities immediately, to avoid accidents and/or damages to cross-drainage structures on the National Highways and other roads.

4320 INSPECTION OF BRIDGES

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
4320.1.	PL-67 (29)/76 dt. 31.8.78	Observation of River Behaviour during Floods	4320/1
4320.2	PL-67 (29)/76 dt. 22.9.78	Periodic Inspection of Highway Schemes	4320/2
4320.3	NHVI-67 (29)/76 dt. 2.3.83	Periodic Inspection and Maintenance of Highway Structures on National Highways	4320/3

No. PL-67 (29)/76

Dated the 31st August, 1978

To

All the Chief Engineers of States/Union Territories dealing with National Highways and other Central Sector Bridge Works

Sub : Periodic inspection of highway structures on National Highways and other Centrally financed bridge works-Observation of river behaviour during floods and prompt attention to any adverse effects noticed

The need for conducting periodic inspections of highway structures on National Highways has already been brought to the notice of the State Chief Engineers vide this office circular letter of even number dated 26th May, 1977, wherein it was desired that all bridges shall be got inspected by a responsible officer of the Public Works Department once a year and the data compiled, to begin with, latest by 30th June, 1977. So far no information as to whether such inspections have been carried out and bridge registers completed, has reached this office. A report on the present stage of action taken on the above circular may please be sent to this office immediately.

2. It has recently come to the notice of this Ministry that in the case of some major highway bridge structures built across alluvial rivers, with or without guidebunds, and having deep well foundations resting on clay/sand/silty soil, deep scours have occurred near some of the piers, even with discharges much smaller than those for which the bridges were originally designed for. This could perhaps be due to development of some adverse flow conditions in the river such as curved or oblique flow, concentration of discharge in only a few spans, etc., resulting from meandering nature of the river, which could cause dangerous scours which are not specifically quantified or formulated in the relevant codal stipulations. Such deep scours have resulted either in settlement or tilting of foundations/piers and consequent dislodgement of the superstructure beams from the bearings, particularly of the segmental or the cut-roller type, causing serious dislocation to traffic. It is felt that such situations could have been avoided if the data on the hydraulic behaviour of the structures has been recorded periodically and analysed to ascertain the necessary and timely protective measures to be undertaken. In order to avoid such unpleasant and undesirable situations in future the State Chief Engineers are advised to ensure proper attention to the following points :

- (i) To take soundings before, during and after each flood at all foundation locations for all bridges built across major rivers with alluvial beds (foundations seated on soils), particularly where the rivers show a tendency to meander and give rise to concentrated flows, and maintain a permanent record of the same.
- (ii) To observe the high flood level, discharge, obliquity of flow, erosion of banks, functioning of the bridge waterway, changes in flow pattern, etc., as already brought out in the circular letter of even number dated 26th May 1977.
- (iii) In cases where such records reveal that scour as observed have a tendency to exceed the earlier anticipated/design scour depths, appropriate protective steps like dumping of boulders around the foundation locations or resorting to full fledged garlanding of the foundations laid at suitable levels which will not cause adverse or deteriorating flow conditions of the river round piers, may be resorted to after obtaining necessary approval of the Competent Authority.
- (iv) In some cases, it may even be found necessary to train the river and guide the flow more uniformly through the various openings, by means of proper training works, such as guidebunds, or spurs, etc.
- (v) Since even small settlement of foundations may adversely effect the safety of super-structure resting on bearings, particularly cut-roller bearings, it is suggested that suitable concrete blocks/wooden packings be provided under the beams near the bearings to ensure that in the event of the superstructure getting dislodged from the bearings, it would ultimately rest on such concrete blocks/wooden packings, avoiding the risk of a total collapse. Also observations on the movements and tilts of the rollers be periodically made and a permanent record of the same maintained. If in any case the bearings are found to be in a critical condition, immediate action has to be taken for lifting the spans and resetting the bearings.

3. The above requirements are of utmost importance for the safety and proper functioning of the bridge structures. The State Chief Engineers are requested to kindly accord top most priority to such inspections and

ensure that the suggestions made above are carried out latest by 31st December, 1978 under intimation to this Office.

4320.2

No. PL-67 (29)/76-NHVI

Dated the 22nd September, 1978

To

All Chief Engineers of States/Union Territories dealing with National Highways and other Central Sector Bridge Works

Sub: Periodic Inspection of Highway Structures on National Highways

Kindly refer to this Office letter No. PL-67 (29)/76 dated 26th May 1977, forwarding therewith the detailed requirements alongwith the proforma for maintaining Bridge Registers as well as conducting periodic inspections of highway structures on National Highways. Since the Indian Roads Congress has now published a Special Publication No. 18 viz. "Manual for Highway Bridge Maintenance Inspection", it is requested that from now onwards the instructions contained in the aforesaid manual may please be adhered to instead of those communicated vide letter dated 26th May, 1977. The aforesaid manual is a priced publication and is available with the Secretary, Indian Roads Congress, Shahjahan Road, New Delhi-110011, at a cost of Rs 15.00 per copy (plus packing and postage charges).

2. It is, however, reiterated that the instructions communicated vide letter No. PL-67 (29)/76 dated 31st August, 1978, regarding observations of river behaviour during floods and prompt attention to any adverse effects noticed thereof, shall also continue to be followed in addition to the instructions contained in the IRC Special Publication No. 18 mentioned above.

4320.3.

No. NHVI-67 (29)/76

Dated the 2nd March, 1983

To

All Chief Engineers of States/Union Territories dealing with National Highways and other Central Sector Bridge Works

Sub: Periodic Inspection and Maintenance of Highway Structures on National Highways

The importance of periodic inspection of bridge structures on National Highways has been highlighted and brought to the notice of State Chief Engineers vide D.O. letter of even No. dated the 28th Feb'83 from Brig. Gobindar Singh, Director General (Road Development) & Addl. Secretary and circular letters issued from time to time. In this connection the I.R.C. have also issued "Special Publication 18-Manual for Highway Bridge Maintenance Inspection" in Feb'78 for providing uniformity throughout the country and to serve as a guideline to maintenance Engineers. The State Chief Engineers dealing with National Highways and other Central Sector bridge works were also requested to refer to the above mentioned Special Publication vide this office circular letter of even number dated the 22nd September, 1978 and again highlighted vide circular letter of even number dated the 26th August, 1982. So far the response in this connection has not been encouraging, and therefore, to stress the importance of regular maintenance inspection of bridges for ensuring long term serviceability, it has become imperative to enumerate below the salient aspects once again for guidance:

1.1. Manual of Inspections:

For uniformity in Maintenance inspection, various aspects as brought out in the I.R.C. Special Publication No. 18-Manual for Highway Bridge Maintenance Inspection should be strictly followed.

1.2. Periodicity and Timing of Inspections:

1.2.1. It is desirable to undertake inspection in those periods of the year which offer the most critical evaluation of the performance, as suggested below:

Items	Time of Inspection
(a) Foundations, protective, works, scour effects, maximum flood level etc.	During and after monsoon
(b) High structures	During season of high velocity winds
(c) Bearings and expansion joints	During the extreme seasons and after floods
(d) Bridges in hilly terrain	Before and after monsoon

No. PL-67 (29)/76

Dated the 31st August, 1978

To

All the Chief Engineers of States/Union Territories dealing with National Highways and other Central Sector Bridge Works

Sub : Periodic inspection of highway structures on National Highways and other Centrally financed bridge works-Observation of river behaviour during floods and prompt attention to any adverse effects noticed

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- (i) To take soundings before, during and after each flood at all foundation locations for all bridges built across major rivers with alluvial beds (foundations seated on soils), particularly where the rivers show a tendency to meander and give rise to concentrated flows, and maintain a permanent record of the same.
- (ii) To observe the high flood level, discharge, obliquity of flow, erosion of banks, functioning of the bridge waterway, changes in flow pattern, etc., as already brought out in the circular letter of even number dated 26th May 1977.
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- (iv) In some cases, it may even be found necessary to train the river and guide the flow more uniformly through the various openings, by means of proper training works, such as guidebunds, or spurs, etc.
- (v) Since even small settlement of foundations may adversely effect the safety of super-structure resting on bearings, particularly cut-roller bearings, it is suggested that suitable concrete blocks/wooden packings be provided under the beams near the bearings to ensure that in the event of the superstructure getting dislodged from the bearings, it would ultimately rest on such concrete blocks/wooden packings, avoiding the risk of a total collapse. Also observations on the movements and tilts of the rollers be periodically made and a permanent record of the same maintained. If in any case the bearings are found to be in a critical condition, immediate action has to be taken for lifting the spans and resetting the bearings.

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ensure that the suggestions made above are carried out latest by 31st December, 1978 under intimation to this Office.

4320.2

No. PL-67 (29)/76-NHVI

Dated the 22nd September, 1978

To

All Chief Engineers of States/Union Territories dealing with National Highways and other Central Sector Bridge Works

Sub: Periodic Inspection of Highway Structures on National Highways

Kindly refer to this Office letter No. PL-67 (29)/76 dated 26th May 1977, forwarding therewith the detailed requirements alongwith the proforma for maintaining Bridge Registers as well as conducting periodic inspections of highway structures on National Highways. Since the Indian Roads Congress has now published a Special Publication No. 18 viz. "Manual for Highway Bridge Maintenance Inspection", it is requested that from now onwards the instructions contained in the aforesaid manual may please be adhered to instead of those communicated vide letter dated 26th May, 1977. The aforesaid manual is a priced publication and is available with the Secretary, Indian Roads Congress, Shahjahan Road, New Delhi-110011, at a cost of Rs 15.00 per copy (plus packing and postage charges).

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4320.3.

No. NHVI-67 (29)/76

Dated the 2nd March, 1983

To

All Chief Engineers of States/Union Territories dealing with National Highways and other Central Sector Bridge Works

Sub: Periodic Inspection and Maintenance of Highway Structures on National Highways

The importance of periodic inspection of bridge structures on National Highways has been highlighted and brought to the notice of State Chief Engineers vide D.O. letter of even No. dated the 28th Feb'83 from Brig. Gobindar Singh, Director General (Road Development) & Addl. Secretary and circular letters issued from time to time. In this connection the I.R.C. have also issued "Special Publication 18-Manual for Highway Bridge Maintenance Inspection" in Feb'78 for providing uniformity throughout the country and to serve as a guideline to maintenance Engineers. The State Chief Engineers dealing with National Highways and other Central Sector bridge works were also requested to refer to the above mentioned Special Publication vide this office circular letter of even number dated the 22nd September, 1978 and again highlighted vide circular letter of even number dated the 26th August, 1982. So far the response in this connection has not been encouraging, and therefore, to stress the importance of regular maintenance inspection of bridges for ensuring long term serviceability, it has become imperative to enumerate below the salient aspects once again for guidance:

1.1. Manual of Inspections:

For uniformity in Maintenance inspection, various aspects as brought out in the I.R.C. Special Publication No. 18-Manual for Highway Bridge Maintenance Inspection should be strictly followed.

1.2. Periodicity and Timing of Inspections:

1.2.1. It is desirable to undertake inspection in those periods of the year which offer the most critical evaluation of the performance, as suggested below:

Items	Time of Inspection
(a) Foundations, protective works, scour effects, maximum flood level etc.	During and after monsoon
(b) High structures	During season of high velocity winds
(c) Bearings and expansion joints	During the extreme seasons and after floods
(d) Bridges in hilly terrain	Before and after monsoon

Apart from these, special inspections shall also be undertaken for unusual occurrence like earthquake, passage of abnormal loads, heavy impact of barges or floating debris on substructure, foundations or fenders etc., to ascertain their performance.

1.2.2. All bridges shall be inspected once a year. However, bridges located in hilly terrain and prone to effects of slips, etc., shall be inspected twice a year i.e. once before the monsoons and then after the monsoons are over.

1.3. Level and Extent of Inspection :

Bridges shall be inspected by a competent qualified engineer, who has a thorough knowledge about bridge engineering. In general the status of the Inspecting Officer shall be as mentioned below but the same can be altered depending upon the importance of the work.

Bridge length	Status of Inspecting Officer of the State PWD
(i) Upto 30 m.	Junior Engineer
(ii) From 30 to 60 m.	Assistant Engineer/ Assistant Executive Engineer
(iii) From 60 to 200 m.	Executive Engineer
(iv) Above 200 m and all prestressed concrete continuous structures, suspension bridges, cable stayed girder bridges and special structures.	Chief Engineers and Superintending Engineers

1.4. Details of Inspection :

Inspection of each part of the bridge structure should be planned and outlined in detail before hand to avoid any over-sight. For this, systematic inspection procedures should be followed. Check list techniques should be employed to preclude the possibility of any bridge component being overlooked during the course of inspection. Inspection results of each bridge should provide a comprehensive records of bridge deterioration over a period of time. Aspects regarding details of inspection of various components are already covered in the I.R.C. Special Publication No. 18, however, some points regarding inspection of bearings, expansion joints, corrosion in bridge members, scour effects and protective works are highlighted below :

1.4.1 Bearings :

Bearings transmit and distribute the superstructure loads both vertical and horizontal to the substructure, and they permit the superstructure to undergo necessary deformations without developing harmful over-stresses. It is very necessary to ensure that the bearings actually perform the functions for which they have been designed. This can be achieved only by proper maintenance and regular inspection. Improper functioning of bearings can lead to major failures. All bearings should normally be inspected during temperature extremes and after floods have receded. These should also be inspected for unusual occurrences.

What to Look for During Inspection :

- (i) **Metallic bearings :**
 - (a) The general conditions like cleanliness, collection of dust, sand etc., rusting casing of plates etc.
 - (b) Check that rockers, pins, and rollers are free of corrosion and debris. Excessive corrosion may cause bearing to "freeze" or lock and become incapable of movement.
 - (c) Rocker bearings, where slots are provided for anchor bolts, should be checked to ensure that the bolt is not frozen to the bearing.
 - (d) Check that the bearing surfaces of rockers and rollers and the deflection slots around pins are clean and free of corrosion.
 - (e) Determine whether the bearings are in proper alignment, in complete contact across the bearing surface and that the bearing surfaces are clean.
 - (f) Check the condition of grease/oil, when last greased and whether it needs replacement. The bearings should be inspected for this aspect at least twice a year i.e. before and after monsoons and the grease/oiling should be done, whenever found necessary. (It has been found in a bridge on a N.H. that when the grease boxes of the bearings were opened, at least 1/2" thick muck had collected on all the surfaces of the bearings).
 - (g) Detect rattling of bearings under live load. If present, the condition usually indicates that the bearings are loose. Determine the cause of this condition.
 - (h) Check anchor bolts for looseness and for missing nuts.
 - (i) See whether rollers are in proper position, and are not jumping off the guide. Look for unusual tilting of rollers and see whether adequate clearance is available for rollers to roll.
 - (j) Measure the rocker tilt to the nearest 3 mm offset from the reference line. Record the temperature at the time of inspection.

(k) Measure horizontal travel of the sliding bearing as well as roller bearing to the nearest 3 mm. from reference point. Record the temperature at the time of observations.

(l) Special care should be taken while inspecting special joints such as central hinges in cantilevers, articulations etc. It should be observed whether the supporting arrangement for these bearings are well in tact.

(m) Observe for any structural cracks in supporting members like abutment cap, pier cap, pedestal, R.C.C. cantilever, wing walls etc.

(ii) ELASTOMERIC BEARINGS :

(a) Splitting or tearing either vertically or horizontally, if any, should be properly investigated. This is often due to inferior quality pads.

(b) Bulging caused by excessive compression may be looked for.

(c) Inspect the physical condition of the bearing for defects like oxidation, creep, flattening etc.

(d) Look for the cleanliness of the bearings and its surroundings, particularly to avoid contact with grease, oil, petrol etc.

(e) Look for variable thickness other than that which is due to normal rotation of the bearing.

(f) Observe for any abnormal deformation.

(g) See whether any structural crack in supporting member like abutment cap, pier cap, pedestal etc. are present.

1.4.2. Expansion Joints :

Since all materials expand and contract with change in temperature, provisions must be made in the bridge superstructure to permit movement to take place without damage to the bridge.

What to Look for During Inspection

(a) Check all expansion joints for freedom of movement, proper clearance and proper vertical alignment. There should be sufficient room for expansion but the joint should not be unduly open. Closed or widely opened joints can result from substructure movements.

(b) Look for cracks, if any in the wearing coat of the deck slab in the neighbourhood of the expansion joints. Such cracks are observed in most of the bridges. Careful observation for the reasons of such cracks in wearing coat adjacent to expansion joints should be made to formulate remedial measures and such measures should be taken early.

(c) Check seals for water tightness and general condition such as seal or sealant pulling away from the edges of the joints, abrasion, or other physical deterioration of the seal, stain and other signs of leakage underneath the deck. Leaking seal permit water and brine to flow on to the bridge seat and the pier cap causing erosion of bearings, disintegration of concrete and staining. Sealant will have to be poured if a gap has formed between the sealant and the adjacent wearing coat.

(d) Check for locking of joints, especially for finger type expansion joints.

(e) Look for corrosion in top sliding plate, connecting member etc.

(f) Check to see that the expansion joints are free from stones and other debris. This is most important as such obstacles impede the movement of the expansion joint.

(g) Examine steel finger type joints and sliding plate joints for evidence of loose anchorages, cracking or breaking of welds or other defective details.

(h) Verify that surfacing material has not jammed the finger joints on the bridges that have been resurfaced.

(i) Examine specifically the under side of the expansion joint regardless of accessibility to detect any existing or potential problem.

1.4.3. Corrosion in Bridge Members :

Concrete bridges mainly in the coastal area are most vulnerable to corrosion. All bridges shall be inspected once a year to ascertain if there are any signs of distress such as appearance of stains, cracks, spalling etc. and action taken to remedy such defects. Such bridges shall be kept under constant observations by resorting to frequent inspections and further immediate remedial measures undertaken as considered necessary.

The durability of the structure varies in various zones of exposures such as submerged zones, splash zones and atmospheric zones. The inspection should cover the items listed in the Proforma at Annexure-A. The items requiring special attention during inspection are mentioned briefly in notes at the end of Annexure-A. This has already been brought to the notice of State Chief Engineers vide this office letter No. RW/PL-17 (14)/76-Vol. II dated 31.3.1981. Various points mentioned in the above circular should be kept in view.

The reports should be compared with previous reports to get an idea of the rate of deterioration. If the rate of deterioration is alarming then further detailed investigations should be undertaken and immediate remedial measures adopted.

1.4.4. Foundations, Scour Level etc :

In the case of major bridges built across alluvial rivers deep scour may occur near some of the piers even with discharges much smaller than the design discharge. Such deep scour may result in tilting of foundations and consequent damages to various components of the bridges. During inspection, proper attention should be given to the following points :

- (a) To take soundings before during and after each flood at all foundation locations for all bridges built across major rivers with alluvial beds (foundations seated on soils), particularly where the rivers show a tendency to meander and give rise to concentrated flows, and maintain a permanent record of the same.
- (b) To observe the high flood level, discharge, obliquity of flow, erosion of banks, functioning of the bridge waterway, changes in flow pattern, etc. as already brought out in the circular letter of even number dated 26th May 1977.
- (c) In cases where such records reveal that scours as observed have a tendency to exceed the earlier anticipated/design scour depths, appropriate protective steps like dumping of boulders around the foundation locations or resorting to fullfledged garlanding of the foundations laid at suitable levels which will not cause adverse or deteriorating flow conditions of the river around the piers, may be resorted to after obtaining necessary approval of the Competent Authority.
- (d) In some cases it may even be found necessary to train the river and guide the flow more uniformly through the various openings, by means of proper training works, such as guide-bunds, or spurs, etc.
- (e) Since even small settlement of foundations may adversely effect the safety of superstructure resting on bearings, particularly cut-roller bearings, it is suggested that suitable concrete blocks/wooden packings be provided under the bearings near the bearings to ensure that in the event of the superstructure getting dislodged from the bearings, it would ultimately rest on such concrete blocks/wooden packings, avoiding the risk of a total collapse.

1.4.5. Protective Works :

- (a) Most careful patrolling and watch is necessary during each flood season especially the first flood season to detect any weakness in construction and to take prompt action.
- (b) The Engineer in charge should acquaint himself with the past history of the protective works and the behaviour of the river as it is only when he possesses all this knowledge that he can deal effectively with any problem that may arise.
- (c) It is advisable to have a reserve quantity of stones which can be used in case of an emergency. A part of the stones may be stacked on the guide bund itself and a part in the nearest store from where it can be loaded and transported quickly to the site. The quantity of reserve boulders would depend upon site conditions. However, a minimum of 1% of the total quantity of boulders used in the apron and slope pitching should be kept as reserve.
- (d) It is necessary that during the flood season, the field Engineers remain vigilant and keep a careful watch on the behaviour of the river as it affects the training works. During flood season it is advisable to have regular patrolling of the guide bund and the approach banks and taking proper action when any abnormal swirls, eddies or scour is apprehended. Any small rain cuts or wave cuts along the guide bund or the approach bank must be repaired immediately as there is always the danger of a small cut developing into a major disaster.
- (e) Any settlement in the bank or bridge or slip in the slope needs immediate attention.
- (f) During winter or dry weather a survey of river course has to be carried out to a sufficient distance on the upstream and downstream of bridges with guide bunds.
- (g) Soundings preferably with the help of an echo sounder shall be taken near the guide bund when the river is in flood.

1.4.6. General

- (a) Elements like wearing coat, drainage spouts hand rails, footpaths and construction joints should be inspected to see whether their performance is satisfactory. Surface condition such as cracks, spalling of concrete, disintegration etc. shall be looked for. Reinforcement should be inspected for corrosion. The condition of joints where pre-cast slabs resting on kerbs are used shall be examined to ascertain that no slab falls off the support. Any missing footpath slab shall be reported and replaced immediately so that pedestrians do not fall into the gap caused by the absence of footpath slabs. Hand rails near the maximum rotation point shall be inspected to see whether the gap between the two adjacent hand rails is widening or coming closer.
- (b) Construction joints should be examined to see whether there is a possibility for water to percolate through the construction joints. Important construction joints like the joints between main deck and kerb in the case of cantilever footpaths etc. should be inspected carefully.

1.5. System of Reporting to Higher Authorities :

The inspection reports should cover the items listed in IRC Special Publication No. 18 and also items mentioned above, wherever applicable. The inspecting officer should also indicate as to whether the repairs that had to be carried out based on the past inspection have been undertaken or not. Bridge register shall be maintained national highway-wise and again division-wise and should be made available to the inspecting officers of this Ministry as well as the Regional Officers. The inspection reports in respect of various bridges should be sent to the headquarters of the State PWDs. The State PWDs have to examine these reports critically and assess the gravity of situation in case of each of the severely affected bridges. Problematic cases should be reported to this Ministry, alongwith the details of inspection carried out on these bridges, in the month of January every year. While sending such proposals the PWD should also outline their proposals for rectification. Any special repair estimate, if required, shall follow subsequently. If in any particular State, in any particular year there is no problematic bridge, a "nil" report should be submitted without fail to the Ministry.

1.6. The inspection reports of major bridges as well as bridges which require repairs should be sent to the concerned Regional Office of this Ministry. Such bridges should be independently inspected by ELO/RO and their observations sent to the Headquarters of the Ministry separately. For specific cases, senior officers of the Ministry will also visit the site and assess the extent of damage depending on the gravity of the problem.

1.7. Facilities for Maintenance and Inspection

To facilitate proper inspection and maintenance of bridges, especially major bridges, special permanent fixtures may be provided in the bridge at suitable points at construction stage itself. These could be like provision of catwalk ladders for reaching pier, provision of manhole in foot-paths near central hinges or articulations in the case of cantilever bridges for leading to the underside of deck, bearings etc. through a system of ladders and platforms along with required connecting member. Provision of fixtures such as railing supported platform, which could be moved by hand operated winches between the piers can be examined and provided at the construction stage. For inspection of existing bridges the P.W.D. can make arrangement for procuring movable platforms which can move on rails located at deck level. Fixed type of platform will also be useful in inspecting bridge girders and members, underside of the deck hinges etc.

2. Necessary action in the light of above may please be taken and the field officers instructed accordingly. One copy of the instructions issued by the State Chief Engineer to the lower formation of State P.W.D. in this connection may please be sent to this Ministry for record. It is once again emphasised that proper upkeep, regular inspection and maintenance will alone ensure long term serviceability of the bridges. "A stitch in time saves nine".

Enclosure to letter No. NH VI-67 (29)/76 dt. 2.3.83

ANNEXURE 'A'

PROFORMA FOR INSPECTION

A. HISTORY OF BRIDGE :

1. Name of Bridge
2. Location of Bridge. (with map showing predominant direction of wind)
3. Age of Bridge on the date of inspection
4. Approximate distance from sea. Whether located in back waters
5. Whether any chemical industry is nearby or harmful affluent passing in the river
6. Type of bridge along with GAD-R.C.C./prestressed
7. Grade of concrete with cement content
8. W/C ratio used (if available)
9. Chemical analysis of all the materials (if available)
10. Minimum cover to steel reinforcement used
11. Whether any anti-corrosive treatment adopted at the time of construction
12. Position of construction joints (if available)

B. INSPECTION REPORT :

1. BRIDGE COMPONENT AFFECTED

- i) Superstructure
- ii) Substructure
- iii) Foundations
- iv) Bearings
- v) Any other

2. NATURE OF DISTRESS OBSERVED :

- i) Rusting or staining of concrete
- ii) Bulging and/or cracking of concrete
- iii) Spalling of concrete
- iv) Rusting of metallic bearings

3. Extent of increase in deterioration since previous inspection

4. Repair measures proposed to be taken

C. Any other observation

NOTE :

The items of inspection, as listed in proforma (item B1) are briefly elucidated here

1. BEARINGS

While inspecting the bearings, following shall be kept in mind :

- i) The general condition like cleanliness, rusting and ceasing of metallic/plate bearings
- ii) Condition of rubber bearings, deterioration due to oxidation, flattening, bulging and splitting
- iii) Condition of grease/oil (if provided) in case of metallic bearings
- iv) Whether any structural cracks in supporting members like abutment cap, pier cap, pedestal, etc.

2. SUPERSTRUCTURE :

The inspection officer shall inspect the superstructure and report in respect of the followings :

- (i) **REINFORCED CONCRETE MEMBERS:** The following aspects shall specially be looked for spotting (rusting), cracking, leaching, spalling and other signs of deterioration in critical areas of the structure viz., splash zone, water line at low tide level and portions exposed to atmospheric action on the windward side. For the latter the web of concrete girder and box girder, articulations, underside of decks etc., shall particularly be inspected.
- (ii) **PRESTRESSED CONCRETE MEMBERS:** For prestressed concrete members, aspects like loss of camber, excessive deflection, cracking, deterioration in concrete viz., spalling etc., shall be looked for. The critical areas being the end anchorage zones, junction of diaphragms, under-side at the centre of span for longitudinal cracking etc.

3. EXPANSION JOINTS

Besides inspection for proper functioning of the expansion joint, any deterioration in the material such as rusting etc., shall be looked for alongwith remedial measures required.

4. WEARING COAT :

The surface condition i.e. whether there are any cracks, spalling of concrete, disintegration etc. need to be reported alongwith remedial measures.

5. HAND RAILS AND FOOTPATHS :

Hand rails, being slender members are susceptible to corrosive distress. Appearance of rust stains, cracks, scaling, deterioration in concrete, spalling etc. need to be reported alongwith remedial measures.

5100 PROGRESS REPORT AND MONITORING OF ROAD CONSTRUCTION AND MAINTENANCE

<i>Code No.</i>	<i>Circular No & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
5100.1	RW/NHIII/Coord/5/84 dt. 28.3.84	Report of the Working Group on the Development of Management Information System in the Ministry of Shipping and Transport (Roads Wing)	5100
5100.2	RW/NH-III/P/10/84 dt. 3.4.84	Use of Roughness Measurement for Monitoring of Road Construction and Maintenance Operations	5100/
5100.3	RW/NHIII/P/10/84 dt. 19.5.84	Guidelines for the use of Roughometres for Measuring Road Roughness	5100
5100.4	RW/NHIII/P/10/84 dt. 25.7.84	Use of Roughness Measurements as an Aid to More Effective Monitoring to Road Construction and Maintenance Operations	5100/
5100.5	RW/NHIII/P/10/84 dt. 14.1.85	—do—	5100/
5100.6	NH-III/Coord/27/85 dt. 12.4.85	Critical Workwise Review of On-going Sanctioned Works	5100/
5100.7	NHIII/P/10/84 dt. 31.7.85	Testing of Roughometers at CRRI— Certificate to be Furnished by the Manufacturer	5100/

No. RW/NH.III/COORD/5/84

dated the 28th March, 1984

To

The Secretaries of all States (Dealing with Roads)

Sub : Report of the Working Group on the Development of Management Information System in the Ministry of Shipping and Transport (Roads Wing)

I am directed to say that the Ministry of Shipping and Transport had constituted a Working Group to review the existing monitoring system in the Roads Wing and to devise a suitable Management Information System to enable monitoring effective in both financial and physical terms in respect of various activities concerning road and bridge construction. A copy of the Report which has since been finalised and accepted by the Ministry is enclosed for information and further necessary action.

2. It is requested that the recommendations made in the Report may kindly be implemented so far as the National Highways and other Centrally sponsored schemes are concerned. Necessary information and periodic reports in the reporting formats as per Annexure II of the Report may kindly be arranged to be sent to the organisations concerned by the due dates as prescribed on the formats itself. Reports in the prescribed formats may be sent starting with the quarter ending March, 1984.

3. Copies of the formats required for periodic reporting may kindly be got printed on double foolscap size at your end so that the information reported is clear, properly filled in the appropriate columns and is legible.

Enclosure to letter No RW/NH.III/COORD/5/84 dt. 28.3.84

EXTRACTS FROM REPORT OF THE WORKING GROUP ON THE DEVELOPMENT OF MANAGEMENT INFORMATION SYSTEM IN THE MINISTRY OF SHIPPING & TRANSPORT (ROADS WING)

3. THE PROPOSED M.I.S.

3.1. Salient Features :

The proposed M.I.S. has the following salient and distinguishing features :-

- 3.1.1. It provides for reporting of informations relating to pre-construction activities, particularly with regard to land acquisition, which is one of the major constraints resulting in time and cost over-run. A suitable format for this purpose has been evolved which would inter alia indicate the present stage of acquisition of land etc. relevant to each work and actions taken at various levels to control delays and expedite acquisition.
- 3.1.2. In these days of rapid cost-escalation, delays in finalising tenders turn out to be very expensive. In order to control delay in finalising tenders, a suitable format has been evolved.
- 3.1.3. The formats for reporting Quarterly Progress Reports cover all the salient features of various activities in the field including reporting of progress (in physical and financial terms) against target during the quarter, actions taken for removing bottlenecks hampering progress etc.
- 3.1.4. To reduce the period of gestation from the date of sanction of project to the actual date of starting on the ground, a specific time limit has been prescribed in the format which will enable the Ministry to control the possible first stage of time over-runs.
- 3.1.5. In case of bottlenecks hampering progress, a suitable format has also been evolved for reporting :
 - i) Remedial actions taken at different field levels as well as State CE's level; and
 - ii) Actions to be taken at the Ministry's level.
- 3.1.6. To have effective budgetary and financial control, the reporting system so provides that the expenditure figures should be regularly reported by the State PWD and these should be reconciled simultaneously by the Controller of Accounts of this Ministry.
- 3.1.7. So far as departmental machinery and equipments are concerned, the system of reporting has been streamlined to avoid repetition of routine paper work at different levels. While the Regional Officers concerned would keep record of performance and maintenance of machinery within their areas, only the broad details are to be sent to the Ministry which are necessary for planning and Inter-State Transfers of the same as and when necessary.
- 3.1.8. Formats have been framed in order to avoid multiplicity and repetitive informations. Several new returns have been introduced in the new system for the areas inadequately covered in the past. These formats will help in monitoring and exercising control by the process of filtration and consolidation at different levels.
- 3.2. Prescribed Formats
- 3.2.1. Formats proposed for the information system are at Annexure-II, a brief description of which is given below :-

REPORTING FORMATS

3.2.2. Pre-Construction Stages

- i) MIS/1-Acquisition of land is a time consuming process and involves various agencies/authorities. Besides, acquisition is often held up due to litigation/court injunction. At present there is no separate format for reporting different stages of land acquisition. The format now designed covers details of all activities necessary for monitoring the process of land acquisition,

pinpointing delay, if any, for each activity, for further remedial action. A bar chart should also accompany the format indicating progress made in each quarter for assessment of the pace of progress to ensure completion of acquisition by the target date.

- ii) MIS/2-This is also a new format designed to monitor the activities at the pre-construction stage. In the present days of rapid cost escalation, the delay in finalising tenders would lead to cost over-run and revision of estimates. For initiating first call of tender, a time limit has been prescribed and the proposed return will indicate delay, if any, at different stages of finalising tenders and help in taking effective steps to minimise the same.

3.2.3. Monitoring at construction stage

- iii) MIS/3-The Group was informed that generally there is inordinate delay in according technical approval and financial sanction by the State Chief Engineers for works costing upto Rs. 10.00 lakhs for which he has been authorised, resulting in undue delays in completion of works. To control such delays and to monitor effectively the progress of such works, a new format has been designed to highlight reasons for delays in this respect, if any, and the remedial actions taken.
- iv) MIS/4 and MIS/5-These two formats are for reporting physical and financial progress for works and are to be submitted quarterly by the concerned State Executive Engineer directly to the Ministry with copies to the State Chief Engineer and Regional Officers of the Ministry. These formats have been designed with reference to all significant milestones against which monitoring and control at various levels are called for. The formats are required to be accompanied by bar charts/pictorial progress charts indicating a graphic representation of the progress achieved during the quarter as well as cumulative progress to the end of the quarter, vis-a-vis the set targets. The formats *inter alia* provide for reporting cumulative overall physical progress of the project. Since this information is of great relevance, it should be assessed carefully after taking into account the actual work done on ground, work remaining to be done and expenditure/liabilities incurred, etc. (see also para 4.3.2.)
- v) MIS/6-This format is for submitting a consolidated report by the State Chief Engineers to the Ministry indicating bottlenecks, if any, in executing various jobs in progress and remedial action taken at different decision making levels and by the State Chief Engineers. The information contained in this report is most vital as it helps in determining whether the project will be completed by due date and also enables the higher authorities to know at the earliest the nature of bottlenecks requiring action at their level.

3.2.4. Budgetary and Financial control

With prior consultation and based on realistic assessment of the capabilities of the State P.W.Ds. Ministry formulates budget proposals. On clearance of the same from the Planning Commission, Ministry makes Statewise allocations for National Highways original and maintenance works for the year. To have control over the financial parameters and proper reconciliation, the following three formats have been designed :

- vi) MIS/7-For speedy reconciliation of discrepancies in the expenditure figures reported by the State Chief Engineer and those compiled independently by the Controller of Accounts of this Ministry, this quarterly return has been designed. The information in the format is to be furnished to the Ministry proper and the Controller of Accounts by the State Chief Engineers for National Highways original and maintenance works.
- vii) MIS/8-For other categories of works sponsored and financed partly or wholly by the Centre, expenditure returns are to be submitted by the State Chief Engineers to the Ministry indicating expenditure against Central and State share.
- viii) MIS/9-On receipt of information from State Chief Engineers as per format, the Controller of Accounts will reconcile the expenditure figures with those booked in his office, and take necessary action for calling for vouchers etc. and making necessary reimbursement to the concerned States. He will send the consolidated information in the format to the Ministry.

3.2.5. Machinery and Equipments.

To avoid repetitive informations that were being collected and reported by the Regional Offices to the Ministry in the past, two new formats have now been designed.

- ix) MIS/10-This format indicates static informations which are required to be preserved at the headquarters for new machines purchased during the year.
- x) MIS/11-This provides informations regarding performances and utilisation of all machines during the year. Besides monitoring those performances and utilisation, the details will also enable the Ministry to take policy decisions with regard to inter-State transfers of machines when needed.

3.2.6. Data Storage Formats

- ix) MIS/DS/1 and MIS/DS/2-These will provide useful information in respect of all National Highways which could be utilised in assessing deficiencies in the Highway system for purposes of planning and for development. The data will need updating every five years.
- x) MIS/DS/3 and MIS/DS/4-These will provide useful data for documentation of important Road and Bridge projects which have been completed. The data would be useful in devising ways and means to avoid delays/bottlenecks in future projects. They will also help in assessing cost of future projects for planning purposes.
- xi) MIS/DS/5-This will provide data on traffic census which would be useful for taking decision on design of carriageways and also for planning development of National Highways.

3.3. Information Flow

The Reports/returns that are to be submitted by different levels as well as their periodicity has been discussed in para 3.2. above.

3.3.1. It can be seen that quarterly progress reports are the basic informations that are to be submitted by the Executive Engineers direct to the Ministry. These informations will flow upward directly in a single channel and thus it will eliminate delay at intermediate levels.

3.3.2. The returns required to be sent by the State Chief Engineers to the Ministry will

- i) Indicate the actions taken at different levels for reconciliation accelerating progress, removing bottlenecks etc. and
- ii) Specify actions to be taken at the Ministry's level.

3.3.3. In addition to the reviews being carried out on the various reports received, a critical workwise review should also continue to be held with the State Chief Engineers at least twice a year, once preferably after the close of the financial year and a second time during November-December, to make such reviews purposeful and effective. The Chief Engineers should make available latest informations regarding progress of work, requirement of funds, necessity, if any, for revision in target dates, revision of costs etc. during such reviews.

3.3.4. Besides reports/returns in the prescribed formats to be sent under the new integrated Management information system, the existing procedure of monthly demi-official letters from the State Chief Engineer to the Ministry would continue bringing out significant events or major problems which are not susceptible of reporting in formats. These demi-official letters should be confined to identifying problems of importance which need actions at the highest level.

3.3.5. Ministry's Regional Officers should also continue to intimate the Ministry in their monthly reports field problems, actions taken by them and State PWD to tide over the same, assessment of pace of progress, compliance of instructions conveyed through technical notes and various other related matters.

3.3.6. Road and Bridge Registers should continue to be maintained at the executive divisions and up-dated copies sent to the Regional Offices by 1st September every year incorporating various deficiencies observed in the NHs system after periodic survey which are very vital for planning purposes.

3.4. Arrangement for processing and preparation of Out-put

3.4.1. For implementation of the proposed system, separate M.I.S. cell at the Ministry's Headquarters would be needed. The duties assigned to this cell will be;

- a) Collection, consolidation, analysis of informations received and preparation of critical notes of reviews and discussions.
- b) Follow up actions for decision making process.
- c) Preparation of summary records of salient features of major completed projects.
- d) Storage and retrieval of informations. (this part to be looked after by a separate documentation unit)

This cell would have to be manned by Officers and staff having requisite expertise and specialisation.

3.5. Utilisation of Information

3.5.1. For effective utilisation of the processed information, is necessary to link the reporting system with the mechanism of review meetings to be held at various levels at regular intervals.

REVIEW AT REGIONAL OFFICERS LEVEL

3.5.2. Review meetings at the Regional Officers level with the State Chief Engineers are of pivotal importance. These meetings should be held on quarterly basis where State Field Officers should also be present. Physical and financial progress of work, over all review of budgetary control, remedial actions for bottlenecks hampering progress, etc. are to be discussed in such meetings. Monthly report of the Regional Officer to the Ministry should contain a gist of the discussions in such review meetings in a systematic manner.

WORK-WISE REVIEW MEETING WITH THE MINISTRY

3.5.3. Critical workwise review for on-going works as mentioned in para 3.3.3 are to be conducted twice a year with State P.W.D. and Senior Officers of the Ministry. Such meetings should review the action taken on the decision of the last review Meeting as well as on any decisions outstanding from the previous meeting. Besides reviewing progress of individual work and the remedial actions for preventing slippages, such reviews should initiate actions to accelerate the progress to achieve completion by target dates, sort out financial problems, if any, and take other high level decisions. Proper minutes of all such review meetings taken shall be drawn up. It would be the responsibility of the State Chief Engineers to ensure that necessary instructions are disseminated to the field officers for compliance of the decisions taken.

4. IMPLEMENTATION

4.2. Target Setting

It is essential that target dates should be set for all projects for completion of each of the major activities involved, both for pre-construction and construction phases.

4.2.1. The State Chief Engineer should furnish to the Ministry a programme indicating the time required for completion of each important activity of the job and the target for completion of the entire job while sending the estimate for the project. This will enable to assess shortfall, if any, even at the intermediate stage of progress of work and would also enable to take suitable measures to expedite the pace of progress of different activities. Broad indication of requirement of funds for the different years till completion of the job should also be given in the estimate itself so that budget provision and allocation could be planned accordingly.

4.2.2. For major projects costing Rs. 1.00 crore and above, CPM Charts setting pre-planned targets for different activities upto completion of the project must be prepared by the State PWD and furnished along with the project estimate.

4.2.3. After a job has been sanctioned, the target dates from start to completion should be fixed as per requirements of the prescribed formats. If a revision of such targets becomes inevitable, full reasons for the same should be given and also discussed and finalised during critical workwise review meetings.

4.3. Indication of Physical Progress

4.3.1. The existing practice is based on usual inspection for assessment of physical progress and needs to be replaced by a more reliable method for purposes of reporting.

4.3.2. Various alternative methods for measuring physical progress of works were examined. An essential feature of the method to be

adopted should be that it is simple enough to be understood at the lowest reporting level and does not involve lengthy or complicated calculations. There are practical difficulties in assigning relative weightages in terms of time and effort involved in different types of project activities such as earthwork, pavement work, concreting, well sinking, girder casting, launching etc. Taking all these aspects into consideration, the present practice of visual estimation should give way to a system under which physical progress at any stage of the work is reported on the basis of the financial value of the work actually completed. Thus, physical quantities of different items of work done should be converted into financial value on the basis of contract rates. The progress achieved on a particular item of work can then be expressed as a percentage of the latest anticipated cost of that item. Likewise, the overall percentage progress can be worked out. Targets for physical progress would also be worked out on the basis of financial value of activities planned to be completed by a particular date. This would be a relatively simple and reliable method of assessing the quantum of physical achievement and may be adopted for reporting purposes. Moreover, by taking into account the liabilities in respect of work done but not paid for, it will also provide a measure of correlation between physical and financial progress.

* * * * *

7. CONCLUSIONS

The proposed MIS, if properly implemented is expected to :-

- a) Enable effective monitoring of progress of construction projects at all stages in physical and financial terms;
- b) Indicate slippages against time targets, identify bottlenecks and problem areas and help in taking timely corrective action.
- c) Facilitate controlling the time taken for execution of projects and indirectly, reduction of overall costs.
- d) Enable the department to monitor progress against Plan Outlays and to forecast timely shortfalls or cost over-runs.
- e) Improve existing mechanisms for budget formulation and control of expenditure.
- f) Establish a meaningful working relationship between the State PWD and the Ministry on whose behalf it undertakes the execution of work;
- g) Allow the Ministry an overall view of the performance and efficiency of the State P.W.D. in regard to its main activities.

ANNEXURE II

FORMAT : MIS/I

QUARTERLY PROGRESS REPORT FOR LAND ACQUISITION FOR QUARTER ENDING 19.....

Due date of submission : 20th of the month following
the quarter under report

From : E.E. Division.

To : Ministry/R.O./C.E. PWD/S.E. PWD.

STATE :

Name of work	N.H. No.	
Job No. :	Section :	
Date of Sanction	Length and Area involved :	
	Original	
	Revised	
Sanctioned amount	No. of structures, if any :	
	Original	
	Revised	
Date of commencement of work;		
1. a) Due date of issue of Preliminary Notification;		
(Should be latest by 3 months from date of sanction)		
b) Actual date of issue of Preliminary Notification :		
2. Date of issue of award by L.A. Collector :		
3. Cumulative length and area acquired upto the end of the quarter :		
4. Cumulative no. of structures acquired upto the end of quarter :		
5. Overall Progress in % of acquisition upto the quarter :		
6. Likely date of completion of acquisition of Land and structures :		
7. Bottlenecks in acquisition if any, give details :		
8. Action taken to remove bottlenecks :		
9. Cumulative Expenditure upto end of the current quarter :		

Signature of E.E.
.....Division.

- NOTES : 1) Bar Chart to be attached (Format MIS/IA)
- 2) Overall Progress in % in column 5 to be worked out on the basis of area/structures actually acquired against total area/structures to be acquired.
- 3) Actual and/or anticipated delays over 6 months in taking possession of Land/structures counting from the date of Preliminary Notification should be explained in detail in column 7.

ANNEXURE-II (Contd..)

FORMAT: MIS/1A

**POSITION OF LAND ACQUISITION
BAR CHART TO ACCOMPANY QUARTERLY PROGRESS REPORT (FORMAT MIS/1)
FOR QUARTER ENDING.....19**

STATE.....

NAME OF WORK.....

N.H. NO..... STRETCH.....

**LEGEND**NOTIFICATION ISSUED AWARD MADE POSSESSIN OBTAINED 

**SIGNATURE OF EXECUTIVE ENGINEER
DIVISION**

FORMAT : MIS/2

**QUARTERLY PROGRESS REPORT FOR TENDER POSITION
(SEPARATELY FOR EACH PRINCIPAL COMPONENTS OF ROADS & BRIDGE WORKS)
FOR QUARTER ENDING.....19**

Due date of submission : 20th of the month following
the quarter under report

From : E.E.

To : Ministry/R.O./C.E. PWD/S.E. PWD

STATE :

Name of work		N.H. No.
Job No. :		Section :
Date of Sanction	Original Revised	Length
Sanctioned amount	Original Revised	

1. Item of work tendered :
2. Date of call of latest Tender & Date of opening of Tender.
3. Whether Tender for entire work or part work called for, give details;
4. Date of finalisation of Tenders :
5. Bottlenecks, if any, in finalising tender (including previous tender, if any) and action taken to remove the bottlenecks)
6. Date of issue of work order :
7. Date of commencement of work :
8. Contract date of completion :
9. Actual tendered cost and whether revised estimate is necessary :

Signature of E.E.
.....Division.

- NOTES : 1) First call of tender should be within
- a) 3 months of date of sanction for Road Work
 - b) 6 months of date of sanction for Minor Bridge Work
 - c) 2 months of approval of NIT documents for Major Bridge Work
- 2) Informations about tenders called by higher officers to be collected by Executive Engineer and reported.

**QUARTERLY PROGRESS REPORT ON ISSUE OF TA AND FS FOR WORKS COSTING UPTO
Rs. 10 LAKHS FOR WHICH A/A ISSUED BY MINISTRY
(SEPARATELY FOR ROAD & BRIDGE WORK AND CONSOLIDATED FOR WHOLE STATE)
FOR QUARTER ENDING.....19.....**

Due date of submission: 25th of the month following the quarter under report

From : Chief Engineer, To : Ministry

Sl. No.	Name of work	Job No.	Date of issue of A.A.	Date of issue of TA & FS by State Government	Reasons for delay, if any, in accord of TA and FS by State, in case TA & FS is not issued within 2 months of A/A.

1	2	3	4	5	6

- 1.
- 2.
- 3.
- 4.

CHIEF ENGINEER STATE :

FORMAT : MIS/4

**QUARTERLY PROGRESS REPORT FOR ROAD WORKS INCLUDING BRIDGE APPROACHES
FOR QUARTER ENDING.....19.....**

Due date of submission : 20th of the month following the quarter under report

From : E.E.....Division

To : Ministry/RO/C.E. PWD/S.E. PWD

STATE :

Name of work

Job No.

N.H. No.

Section :

Length :

Date of Sanction

Original
Revised

Date of commencement of work :

Target Date of Completion :

Sanctioned Amount

Original
Revised

Sl. No.	Item of work	Cumulative physical progress upto end of previous year in %.	Progress in % during the Quarters of Current year				Yearly targets for subsequent years 198.. to 198
			June	September	December	March	
			T	A T	A T	A T	A

1. Earthwork
2. Laying of Sub-base
3. Laying base course
4. Laying of B.M.
5. Laying of wearing course
6. Culverts
7. Other Structures (Drain, Retaining Wall)
8. Labour strength—Skilled :

Unskilled :

9. Length completed in all respects (Kms.)
10. Overall Physical Progress %.
11. Bottlenecks if any :

(If actual progress falls short of targets by 15% or more, then itemwise reasons should be explained for the slippage against targets and revised target date of completion furnished, if revision of target becomes inevitable).

ANNEXURE II(Contd...)

12. Remedial action taken for removal of bottlenecks :
13. Progressive Expenditure incurred upto the end of last financial year :
14. Progressive Expenditure incurred upto the end of Quarter under review :
15. Allotment during the current year :
16. Reasons for likely excess/savings against allotment if any :
17. Compliance of Technical Note : Quote Reference No. and date if not, give reasons for non-compliance :

QUALITY CONTROL : Certified that requisite quality control tests for ensuring the execution of work to proper standards and specifications have been carried out during the period under report and that records of Test results thereof are maintained.

Signature of E.E.
.....Division

- NOTES : 1) Progress in respect of items 1 to 6 and 8 to be shown in the Bar Chart enclosed (Format : MIS/4A).
2. In item No. 9 overall physical progress is to be assessed on the basis of actual work done on ground, work remaining to be done and expenditure/liabilities incurred
3. T=Target
A=Achievements

FORMAT : MIS/5

QUARTERLY PROGRESS REPORT FOR BRIDGE WORKS
FOR QUARTER ENDING.....19.....

Due date of submission : 20th of the month following the quarter under review

From : E.E.

To : Ministry/RO/C.E. PWD/S.E. PWD

Name of work :

N.H. No.

Job No. a) Bridge Works :

b) Approaches :

c) Protective Works :

Location K.M. (M.....)

Spans..... (Total length.....M).

Date of sanction Original
 Revised

Sanctioned Amount

Original

Revised

Date of commencement of work :

Target date of completion :

Name of contractor.

Sl. No.	Items	Cumulative physical progress upto end of previous year in %	Progress in % during the Quarter of current year								Yearly targets for subsequent years 198.....to 198
			June		September		December		March		
			T	A	T	A	T	A	T	A	
1	2	3	4	5	6	7	8	9	10	11	12

1. FOUNDATIONS :

- a) Excavation
- b) Foundation concrete
- c) Curb
- d) Steining
- e) Sinking
- f) Plugging
- g) Well Caps

2. SUB-STRUCTURE

- a) Piers
- b) Abutments
- c) Wings
- d) Bearings

3. SUPER-STRUCTURE

- a) Girders Casting
- b) Girders Launching
- c) Deck Slab/Foot Paths :
- d) Wearing Coat
- e) Handrails

4. PROTECTIVE WORKS :

- a) Collection of boulders
- b) Earthwork
- c) Laying of boulders.

5. OVERALL PHYSICAL PROGRESS FOR THE WHOLE JOB % AGE

6. Materials :	Quantities required	Quantities collected upto the end of quarter
a) Cement		
b) M.S.		
c) H.T.S.		
d) Tor steel		

7. Labour strength : Skilled :
Unskilled :

8. CUMULATIVE EXPENDITURE UPTO

- 1. End of Last March Rs.....
- 2. End of Present Quarter Rs.....

9. Allotment During Current year Rs.....

10. COMPLIANCE OF TECHNICAL NOTE :

If compliance done quote reference and date; if not, give reasons for non-compliance.

11. BOTTLENECKS, IF ANY (If actual progress falls short of targets by 15% or more, then itemwise reasons should be explained for the slippages against targets and revised completion targets furnished, if revision of targets becomes inevitable).

12. REMEDIAL ACTION TAKEN FOR REMOVAL OF BOTTLENECKS :

QUALITY CONTROL :- Certified that the requisite quality control tests for ensuring the execution of work to proper standards and specification have been carried out during the period under Report and that Records of tests Results thereof are maintained.

Signature of E.E.
.....Division.

- NOTES : 1. Pictorial Progress Chart to be attached for works costing Rs. 25 lakhs and above in MIS/5A.
2. Progress on approaches to be reported in MIS/4.
3. In column No. 5 overall physical progress is to be assessed on the basis of actual work done on ground, work remaining to be done and expenditure/liabilities incurred.
4. T-Target : A-Achievement.

FORMAT : MIS/6

BOTTLENECK REPORTS
(In respect of Land acquisition, Road & Bridge Works)
FOR QUARTER ENDING.....19

Due date of submission : 20th of the month following the quarter under report.

STATE :

From : Chief Engineer
To : Ministry

Sl. No.	Name of work	Job No.	Target date of completion	Shortfall in achievement of targets in %	Item of work having bottleneck	Bottle-necks & reasons	Action taken by Field Officers for accelerating progress	Action taken by State C.E.	Action, if any, suggested to be taken up by the Ministry
1	2	3	4	5	6	7	8	9	10

CHIEF ENGINEER (N.H.)
STATE :

NOTE : Specify whether change of target date of completion is necessary in view of bottlenecks and action taken thereon as indicated in Col. (9).

ANNEXURE-II (Contd...)

ENCL. TO LETTERS No/ N.H. III/ COORD 15/84 DT. 28.3.84

PICTORIAL PROGRESS CHART
TO ACCOMPANY QUARTERLY PROGRESS REPORT (BRIDGES)
FOR WORKS COSTING Rs.25-00 LAKHS AND ABOVE.

STATE JOB No.
FOR QUARTER ENDING

BRIDGE IN KM. (M.) OF N.H. No.

FOUNDATION:
PERMISSIBLE VALUES: TILT SHIFT
ACTUAL TILTS: TRANSVERSE LONGITUDINAL RESULTANT
ACTUAL SHIFTS: TRANSVERSE LONGITUDINAL RESULTANT

SUPERSTRUCTURE: BEAM No. 1
LAUNCHING/CASTING BEAM No. 2
BEAM No. 3
CASTING BEAM No. 4
PIERS
FOOT PATHS
WEARING COAT

INSTRUCTIONS:
1. WORK COMPLETED UPTO END OF PREVIOUS QUARTER TO BE SHOWN IN ☐ COLOUR.
2. WORK COMPLETED DURING THE PRESENT QUARTER TO BE SHOWN IN ☐ COLOUR.
3. THE CHART NEED NOT BE TO SCALE, BUT SHOULD REPRESENTATIVE OF TOTAL WORK TO BE DONE AND THE WORK ACTUALLY EXECUTED, INDICATING ALL SALIENT LEVELS OF DIFFERENT COMPONENTS.
4. FOR LONG BRIDGES HAVING A NUMBER OF SPANS, MORE THAN ONE SHEET MAY BE USED BUT THE SIZE OF THE SHEETS SHALL BE THE SAME AND THE SHEETS SERIALY NUMBERED (SUCH AS 1 OF 3, 2 OF 3 ETC.).

ENCLOSURE TO REPORT No.
DATE:
SIGNATURE OF EXECUTIVE ENGINEER
NAME & ADDRESS.

FORMAT : MIS/7

CONSOLIDATED EXPENDITURE REPORT

(In respect of N.H. Works)

FOR QUARTER ENDING 19.....

STATE :

Due date of submission : 15th of the month following the quarter under report

From : Chief Engineer.

To : Ministry/Controller of Accounts.

Head of Account	Nature of Expenditure	Budget allotment sanctioned for the year	Expenditure during the quarter	Expenditure upto the end of quarter	Indicate month in which relevant voucher in respect of expenditure in column sent to A.G.	Remarks
1	2	3	4	5	6	7
1) N.H. (O)—a) Works	b) T.P.					
2) M.R.	a) N.H.					
	b) Machinery					

CHIEF ENGINEER

STATE :

**PROGRESSIVE EXPENDITURE REPORT FOR SCHEMES
OTHER THAN NATIONAL HIGHWAYS
FOR THE QUARTER ENDING.....19**

STATE :

Due date for submission : 15th of the month following the quarter under report

From : Chief Engineer

To : Ministry

Name of schemes	Amount sanctioned for the year	Expenditure during the Quarter		Progressive Expenditure upto the end of Quarter		Remarks
		Against amount out of sanctioned by Government of India	State resources	Against sanctioned by Government of India	Out of State resources	
1	2	3	4	5	6	7
E & I S.B.A. Strategic Road CRF R. D. Tools & Plants Loans for machinery & Equipment						

CHIEF ENGINEER

STATE :

FORMAT : MIS/9

**PROGRESSIVE EXPENDITURE REPORT
FOR QUARTER ENDING.....19**

STATE :

Due date of submission : 30th of the month following the quarter under report

From : Controller of Account

To : Ministry

Head of Account	Nature of Expenditure	Budget allotment for the year	Expenditure during the quarter	Expenditure upto end of the quarter	Progressive expenditure figure upto end of quarter as intimated by the State C.E.	Difference between col. 5 & 6	Reasons for variation	Action taken to reimburse the amount where voucher already received or call for voucher from A.G. where already sent by State C.E. to AG.	Remarks
1	2	3	4	5	6	7	8	9	10
1) NH (O)—a) Works b) T & P									
2) M & R—a) N.H. b) Machinery									

Controller of Accounts

ANNEXURE-II (Contd.)
FORMAT : MIS/10

PLANT DATA SHEET
 (Separately for each machine)
 Report for the year ending.....19

Due date of submission : 20th April of each year
 From : Chief Engineer
 To : Ministry.

1. Name of Equipment	8. Year of Receipt	13. Name of Manufacturer of main plant
2. Code No.	9. A/T No. & Date	14. Name of Manufacturer of Engine
3. Machine S. No. & Chassis No.	10. A/T Cost	15. Prime Mover Make—
4. Weight		1. Make 2. etc.,
5. Overall Dimensions— Length, breadth & height	11. Cost at site	16. HP/KW
6. Make & Model	12. Rate of hire charge (a) Ownership component (b) Operational component	17. Engine S. No.
7. Capacity		

Chief Engineer
State

Note : First report to contain informations in respect of all machines and subsequent reports to be given only for new machines purchased during the year.

FORMAT : MIS/11.

PLANT UTILISATION SHEET
 (Separately for each machine)
 Report for the year ending.....19.....

STATE :

Due date of submission : 20th April of each year
 From : Chief Engineer
 To : Ministry

Code No. of machine	Chassis No. of machine	Location Div.	K.M. of N.H. during Sec- tion	Working hours the year	Cumula- tive Working hours	Brief reasons for low utili- sation **	Repair Estimate Sanct- ioned Refe- rence	Am- ount	Whether all re- pairs as per san- ction carried out	Brief details of major Repairs carried out	Cumulative Hire charges realised Owner- ship Compo- nent	Opera- tional Compo- nent	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Chief Engineer
 State :

- NOTES : 1. ** Reasons to be given where utilisation is less than 60%.
 2. In case of machines transferred from one State to another, indicate the Name of State from/to which transferred and the month of transfer.

Format : MIS/DS/1

From : Chief Engineer

To : Ministry/R.O.

Due Date of Submission : First Report by 12/84

Second Report by 12/87 and
subsequent reports by end of
December of fifth year i.e., 12/92
etc.,

SURVEY PARTICULARS
(Road Works)

1. State
2. N.H. No.
3. Section
4. Length
5. Nature of terrain Plain Hilly or Rolling country
6. Road land width
7. Formation-indicate whether in cutting or Filling, width and Height/Depth
8. Sub-Grade investigation date, type of soil (clay; silt, sand, loam, sandy loam, sandy clay, silty clay etc.,)
9. Pavement width and type
10. Existing Road structure (Thickness) and materials
 - a) Sub-base
 - b) Base course W.B.M. in 2 layers
 - c) Wearing course B.M. & A.C.
 - d) Surfacing; 2 coats surface dressing, 20 mm pre-mix carpet etc.
11. Riding Quality (Good, Fair, Poor, Very Poor)
12. Hard Shoulders if any (width, thickness and materials)
13. Drainage Features
 - a) Depth of water table
 - b) Sub-soil water level below formation, (bottom of sub-base/base course)
 - c) Height of formation above adjoining high flood level
 - d) Whether adequate arrangements for drainage exist
 - e) Any special remarks water logging and flooding
14. Location of sharp horizontal curves.
15. Location of reaches with steep gradients.
16. Location of reaches with restricted sight distance
17. Location of road intersection where improvements are needed.
18. Location of Railway Level crossing indicating number of closures and average duration.
19. Towns where bypasses are necessary on account of heavy congestion
20. Culverts :
 - a) Location Km.
 - b) Type
 - c) Span length
 - d) Total length in metres
 - e) Width of roadway in metres

f) Present condition

21. Dips-location, interruptions to traffic.

22. Any other information.

NOTE : Details to be furnished for every km

Chief Engineer

State :

Format : MIS/DS/2

Due Date of Submission : First Report by 12/84

Second Report by 12/87 and
subsequent reports by end of
December fifth year i.e., 12/92, etc.,

From : Chief Engineer

To : Ministry/R.O.

SURVEY PARTICULARS (BRIDGE WORKS)

1. State
2. N.H. No.
3. Location (Kilometre)
4. Name of River crossing
5. No. and size of existing Spans in metre
6. Total length in metre
7. Type of existing structure
 - a) Foundation
 - i) Open
 - ii) Well
 - iii) Nature of bed strata
 - b) Sub-structure
 - i) Piers/Abutments
 - c) Super-structure
 - i) Arches
 - ii) Slab
 - iii) R.C.C.
 - iv) Prestressed concrete
8. Width of roadway
9. Present condition of structure
 - a) Foundation
 - b) Sub-structure
 - c) Super-structure
10. Load carrying capacity
11. Type of bridge
 - a) Major
 - b) Minor
 - c) Submersible
12. Category
13. Guide bund or other protection works-give details
14. Remarks

Chief Engineer

State :

ANNEXURE-II (Contd..)

Format : MIS/DS/3
From : Chief Engineer
To : Ministry

Due Date of Submission : Within 6 months from the date of completion of the Project.

**HISTORY SHEET FOR MAJOR COMPLETED PROJECTS
(ROAD WORKS)**

(Costing Rs 1 Crore and above)

1. State
2. N.H. No.
3. Name of work
4. Job No.
5. Date of Sanction
6. Length involved in Km.
7. Estimated cost
8. Nature of Terrain
9. Intensity of Rainfall
10. Traffic intensity
11. Structural Details
 - 1) Sub-Grade
 - a) Type of soil
 - b) CBR of soil
 - 2) Sub Base
 - a) Type
 - b) CBR
 - c) Thickness
 - 3) Base-Course
 - a) Type
 - b) Thickness
 - 4) Wearing Course
 - a) Type
 - b) Thickness
 - 5) Total Thickness of Pavement
12. Unit cost of Per Km.
 - a) Earth work
 - b) Base course
 - c) Bituminous course
 - d) Wearing course
13. Resources involved
 - 1) Man Power :
 - a) Technical
 - b) Skilled
 - c) Unskilled
 - 2) Machineries :
 - a) Earth moving units
 - b) Hot-mix Plants, mobile/installed
 - c) Paver units
 - d) Tipper Trucks
 - e) Other machineries
14. Cost of Actual Completion of the Project
15. Overall Unit Cost per Km. Length of Completed Projects.
16. Date of start
17. Date of completion
18. Bottlenecks/delays during execution and remedial measures taken.
19. Increase in cost due to
 - 1) Escalation

- 2) Changes in specification or scope of works

20. Remarks

Chief Engineer
State :

Format : MIS/DS/4
From : Chief Engineer
To : Ministry

Due Date of submission : Within 6 months from the date of completion of the Project

HISTORY SHEET FOR MAJOR COMPLETED BRIDGES (Costing Rs. One crore and above)

1. State
2. N.H. No.
3. Name of work
4. Job No.
5. Location
6. Nature of Terrain & Nature of River viz.,
wide spread, channelled, gorge, etc.,
Perennial or dry during fair weather,
nature of foundation strata
7. Whether skew or straight crossing
8. Length/Span arrangements
9. Details of foundation
10. Details of Sub-structure
11. Details of Super-structure
12. Quantities
 - 1) Excavation/Grabbing
 - 2) Mild steel
 - 3) Cement
 - 4) HYSD
 - 5) High Tensile Steel
13. Type of Bearings
14. Type of Wearing Coat
15. Type of Expansion Joints
16. Bottlenecks/delays during execution and remedial steps taken in respect of the following items :
 - a) Foundation
 - i) Open Excavation
 - ii) Well-sinking
 - b) Sub-structure
 - c) Super-structure
 - i) While staging & Centering/Shuttering
 - ii) While concreting
 - iii) While pre-stressing
 - iv) While launching
17. Details of guide bunds, if any
Post construction studies
 - a) River behaviour (Hydraulics)
 - i) Scour
 - ii) Meandering
 - iii) Outflanking
 - iv) Attack on guide bunds
 - b) Settlements
 - c) Sagging of super-structure
 - d) Structural failure or cracks
 - e) Tilting of bearings

18. Any other mentionable problem
19. Completion cost/cost per metre/
cost per sq. metre of elevation area
20. **Manpower**
 - a) Technical
 - b) Skilled Labour
 - c) Unskilled Labour
21. **Machineries used**
 - a) Grabs
 - b) Cranes
 - c) Mixers
22. Date of start
23. Date of completion
24. Increase in cost due to
 - i) Escalation
 - ii) Changes in specification or Scope of works
25. Remarks

Chief Engineer

State :

Format : MIS/DS/5

Due Date of submission : Within 2 months from the date of
Completion of census in January &
July of every year.

From : Executive Engineer

To : Ministry/R.O./C.E.

PWD/S.E. PWD.

TRAFFIC CENSUS DATA

1. State
2. N.H. No
3. Section
4. Location of Check Post
 - a) Nearest Town
 - b) Miles/Km.
5. Duration of Census
6. Month of Census
7. Traffic Intensity (No. of vehicles per day
average of 7 days count)
 - a) Cars/Jeeps/Taxis
 - b) Buses
 - c) Trucks
 - d) Articulated and truck-trailer combination
 - e) Motor cycles and two wheelers
 - f) Other vehicles to include
Agriculture Tractors etc.,
 - g) Slow moving vehicles
 - i) Cycles
 - ii) Animal drawn and others
8. Traffic Intensity (Equivalent PCUS)
 - a) Cars/Jeeps/Taxis
 - b) Buses
 - c) Trucks
 - d) Articulated and truck-trailer combination
 - e) Motor cycles and two wheelers

- f) Other vehicles to include
Agriculture Tractors etc.,
- g) Slow moving vehicles
 - i) Cycles
 - ii) Animal drawn and others
- 9. Total Traffic PCUS (Excluding slow moving)
- 10. Total Traffic PCUS (Including slow moving)
- 11. Remarks

Signature of Executive Engineer
.....Division.

5100.2

No. RW/NHIII/P/10/84

Dated, the 3rd April, 1984

To
All Chief Secretaries of the States/Union Territories

Sub : Use of roughness measurements as an aid to more effective monitoring of road construction and maintenance operations

As you are aware, due to various reasons, enough attention has not been possible for the past several years towards the improvement and strengthening of roads in the country keeping in view the increase in traffic intensities as well as towards their maintenance requirements. This has resulted in serious deterioration in the condition of roads in various categories including National Highways, State Highways and other roads in the State sector. One of the factors which has undoubtedly contributed to this unsatisfactory situation has been the inadequate availability of funds both at the Centre as well as in the States, which in turn has been due to the extremely difficult position of overall resources within which the competing demands of many sectors of the economy have had to be met with. At the same time, it has been clearly established that despite the same or similar constraint of funds, there are vast inter-State and inter-unit variations in the condition of roads, thus highlighting the important role that supervision and monitoring obviously play in this context.

2. Another factor which recent studies have brought out is that the poor condition of roads is having an extremely adverse repercussion on user costs like wear and tear of vehicles and tyres, fuel consumption etc. According to the data brought up by the Road User Cost Study conducted recently by the Central Road Research Institute at the request of this Ministry, the poor condition of roads is resulting in an additional fuel consumption in the country of as much as 15%. Considering that the road transport sector is one of the major users of petroleum-based energy in the country, this order of loss on fuel on account of poor road conditions is indeed a matter of grave concern.

3. In the above context, it is obvious, therefore, that all out efforts have to be made to improve the condition of roads in the country both by increasing the allocation of funds to the maximum extent possible and also by ensuring at the same time the most optimum utilisation of these funds through a more effective monitoring of road construction and maintenance operations.

4. In order to achieve better monitoring and greater accountability in road construction and maintenance operations, it has been decided by the Govt. of India that as far as National Highways are concerned, immediate arrangements will be made for the use of Roughometers (also known as Bump Integrators) during inspections so that the degree of roughness of the road stretch concerned is quantified on an electromagnetic counter which is fitted in this machine. Officials of the State and the Central Govt. concerned with the construction and maintenance of National Highways would be expected to draw up a schedule of inspection of different divisions and units and while on inspection make a surprise check of randomly selected stretches of roads with the help of the Roughometer. If during these inspections, the degree of roughness of the road stretch concerned is found to be substantially lower than that of road stretches in other divisions or units with comparable constraint of funds and other comparable parameters like the time interval since the last renewal etc., it would be treated as a fit case in which the contractors and the officials concerned should not only be asked to improve their performance but also explain why this situation was allowed to develop.

5. The Roughometers are now being indigenously manufactured in India and cost only about Rs. 30,000/-. One instrument can measure about 100 kms per day. It is desired that to begin with each State may purchase

one or two Roughometers (depending on the kilometrage involved) for use on National Highways out of the provision under T & P head of Account. Proposals in this regard may be sent to the Ministry at an early date. A copy of the detailed instructions issued in this regard may also please be sent to this Ministry.

6. As far as State Sector roads are concerned, the arrangements postulated in respect of National Highways as indicated in this letter may be treated as guidelines from the Centre which the State Govts. may consider adopting subject to such modifications as they may like to make.

5100.3

No. RW/NHIII/P/10/84

Dated the 19th May, 1984

To

All Chief Engineers, P.W.Ds, in the States and Union Territories dealing with National Highways and State Sector Roads

Sub : Guidelines for the use of Roughometers for measuring road roughness

I am to refer to Ministry's letter of even number dated 3.4.1984 addressed to all the State Govts. and Union Territories regarding the use of roughness measurements by means of roughometers. Guidelines for the use of Roughometers prepared in the Ministry are enclosed herewith for adoption.

GUIDELINES FOR THE USE OF ROUGHOMETRES

1. Roughness measurements are extremely important since they give a quantifiable measure of the riding quality of a road. The roughness of the road surface determines vehicle's speed, road safety and vehicle operating costs. The quality of construction and maintenance of a road is reflected in the roughness measurements. A periodic measurement of roughness is therefore of vital importance to a highway engineer.

2. Description of the Roughometre (Bump-Integrator)

2.1. There are various instruments for measuring the roughness of a road. An important group of such instruments is known as the response-type instruments which measure the response of a mechanical system to the unevenness of a road. The Roughometre also known as the Bump-Integrator is one of the popular response type roughness measuring instruments. It is a towed fifth wheel. The instrument available in India is based on the design standardised by the Transport and Road Research Laboratory, U.K. The instrument is towed by a jeep.

2.2. Frame

The Bump Integrator consists of a trailer of a single wheel mounted within a rectangular steel frame. The wheel is of pneumatic tyre of a standardised size of 6.00X16 (4 ply). The wheel is carried on the centre of the axle by a pair of taper rolling bearings which can be adjusted to prevent and play. The wheel itself supports the chassis through two leaf springs anchored to the front and shackled to the rear end of the frame through ball bearing fixtures. The ends of the axle are locked up by means of clamp blocks on the centre of the two leaf springs.

2.3. Towing Hitch

The members which are attached to the sides of the frame form a tongue at the forward end which carries a hitch for connection to the towing vehicle. The towing hitch maintains the frame in an upright position but provides freedom of movement in either direction by means of a universal joint fitted with ball bearings.

2.4. Shock Absorbers

In order to dampen the vertical movement, a frame is provided over the wheel to form an anchorage for the piston rods of two dash pots. A standard fluid is provided in the dash pot for this purpose.

2.5. Mud Guard

A mud-guard is provided over the wheel.

2.6. Castor Wheels

3 adjustable castor wheels are fitted to the frame for parking, 2 being attached to the tongue in the front and one being attached at the rear of the frame.

2.7. Integrator

The uni-directional movement between the Axle of the wheel and the chasis is recorded by an Integrator unit. This unit performs the function of closing a pair of contacts inserted in the circuit of an electro-magnetic counter, one for every 2.5 cm. of integrated uni-directional movement. These contacts are actuated by a 6-lobed cam mounted on a shaft which is driven in one direction through a wedging-ball type of over-running clutch, by the movement of a small cylindrical drum which reciprocates in accordance with the movement of the axle to which it is connected by a cord. The tension in the cord is maintained by a spring inside the drum.

2.8. Wheel Revolution Counter

The distance traversed by the integrated unit can be measured by counting the number of revolutions of the wheel. A cam fitted to the hub of the wheel actuates a contactor fitted in close proximity which closes the circuit of a second Electro-Magnetic counter, once for each revolution of the wheel.

2.9. Panel Board

Four Electro-Magnetic counters are put into electric circuit. The electric supply to the system is from the 12 Volt battery of the vehicle. For every 2.5 cm of bumps, the bump recording counter registers one unit. The second counter registers the number of wheel revolutions. A duplicate pair of counters is provided for facility of reading. Switch over from one set of counters to the others is effected by means of a switch.

If W indicates the wheel revolutions and B indicates readings, then the Unevenness Index value is $= \frac{B \times R \times 2.5}{W}$ cms/km. For the particular unit 460 revolutions of the wheel denote 1 km length of travel (i.e. R=460).

2.10. Recording Chart

An optional recording chart is provided for the recording the unevenness values. This unit is mainly needed by Maintenance Engineers to locate the exact spots where the surface is extremely bad.

2.11. General Specifications

The general specifications of the equipment are given below :

GENERAL SPECIFICATIONS

Overall length	: 2400 mm
Overall Width	: 700 mm
Height	: 1100 mm
Weight	: 350 kg (approx.)
Tyre Size	: 6.00 X 16 (4 ply)
Inflation pressure	: 2.1 kg/cm ² (30 lb/sq in)
Standard operating speed	: 30 ± 1/2 km/hr.
Dashpot fluid	: 50% by volume, paraffin 50% refrigerating machine oil (Shell clavus Oil-17 or Bharat Freezol -17)
Capacity of dashpots	: 1.2 Litres each
Contacts for integrator Unit and wheel revolution contactor	: Lucas car contact breaker set No. 407-050
Electromagnetic counters	: Keltron, 6 digit with zero setting 12 Volts.
Oil for Integrator	: Light mineral oil, generally used for human consumption.
Bearings	: In the integrator, recording device numerating device, towing hitch and in brackets and shackles are grease packed ZZ type.

3. Operation of the Equipment

3.1. The Bump Integrator should be towed by a suitable vehicle at a speed of 30 KMPH. A jeep with a canvass body is eminently suitable because it affords opportunities for the driver to keep a watch on the Integrator Unit.

3.2. The following operating instructions have been prescribed by the manufacturers.

1. Before putting into operation for test, check the following :—
 - a. Integrator cord is removed from axle;
 - b. Carry necessary data sheets, tool kit and spare parts.
2. To keep machine ready for use.
 - a. Fix the towing bracket with the towing vehicle.
 - b. Fit the towing hitch with the towing bracket fitted with the towing vehicle.
 - c. Remove the castor wheel assemblies.
 - d. Check and adjust tyre pressure to 2.1 kg/cm² (30 lbs./sq. in)
 - e. Check and maintain damping fluid level to 3 cms. below the cylinder cap.
 - f. Set the integrator cord in operative position.
 - g. Check up that the flexible cable is fitted from the integrator unit to the numerating device.
 - h. Fit the two pin flush mounting plug in the panel board, and give supply from the 12 volt battery (with the main switch on the panel board "off"). With the help of battery clamps provided at the end of the wire.

N.B. : If the battery of the towing vehicle is of 12 volt the same could be used, otherwise a separate 12 volt battery may be used.

- i) Fit the three pin flush mounting plug in the panel board and tighten the earth terminal to any convenient point on the machine. Then connect one Wire each to the integrator unit and the wheel revolution contactor with the help of crocodile clips provided at the other two ends of the wire and check the working of the integrator unit.

3 Comprehensive notes should be taken giving particulars of test length, width of road, type of surfacings, data and any other relevant detailed needed.

4 The procedure is to drive over the test section at a speed of 30 ± 1/2km./hr. keeping to a steady position in the testing track, and

avoiding swerving. The observer having set the counters to zero, closes the main switch on the panel board at the beginning of the section and switches it off at the end. The readings of the wheel revolution counter and integrator counters are noted and entered on the form giving the results.

- 5 When testing a series of consecutive sections of road, the tests should be arranged so that the measurements are made on alternate sections on each run, so that the observer has time to write down the readings and re-set the counters to zero between sections. Since the instrument board is equipped with two pairs of counters and a change over switch, consecutive measurements can be made continuously with a substantial saving of time.
- 6 During operation, checks of the tyre pressure should be made, so that the pressure is maintained preferably at 2.1 kg/cm² (30 lbs./sq. in.)
- 7 After testing following may be done.
 - a. Flexible cable from the driven sprocket shaft to the gear box should be removed.
 - b. The end of the cord which actuates the integrator unit should be removed from the axle.

3.3. The manufacturers have prescribed that the following spare parts should be carried alongwith the vehicle :

1. Cord for axle-integrator unit connection in correct length ready for fitting—1 No.
2. Blade-hinges for the flexible couplings which support the dashpots—8 Nos.
3. Dash pot fluid, small funnel, dip rod (for journeys of appreciable duration).

3.4. A suitable form which has been devised for recording the unevenness values and the distance traversed is given in Appendix-I. The vehicle is driven over the test section at a constant speed of 30 KMPH $\pm$ 1 KMPH. Care has taken to keep the instrument in a steady position. The observer sets the counters to 0 and at the commencement of the section operates the switch for recording the values. It is preferable to record the Bump Integrator values when the wheel revolution counter records 460 units, which corresponds to 1 km of travel. The Bump Integrator values are noted whenever the distance counter measures 460 units. The brief description of the surface should be noted by the Observer as the instrument travels over the road section.

3.5. Maintenance

The following instructions have been supplied by the Manufacturers for the periodic maintenance of the equipment :—

To ensure reliable and consistent results, it is essential to maintain the machine efficiently. The following schedule of operations is recommended:

Daily	Tyre	Check and maintain tyre pressure at 2.1 kg/cm ² (30 lbs./sq.in)
	Dashpots	Check and maintain fluid level to 3 cm. below the cylinder cap.
Every 1500 kms or four months	Dashpots	Drain and refill with fresh fluid.
	Towing hitch	Lubricate with grease gun.
	Spring Clamping Bolts	Check for tightness.
	Numerating device	Check all the screws and bolts for tightness.
Every 3000 kms. or 6 months	Dashpots	Drain, detach, remove end-caps inspect and clean if necessary.
	Towing hitch	Lubricate with Grease Gun.
	Integrator Unit	Lubricate by pouring thin oil through the hole (normally sealed by a screw) on the top of the unit, while the screw sealing the side hole is removed, the unit being horizontal, oil will then drain to the correct level, inspect contacts and adjust so as to equalise 'make' and 'break' periods if necessary.
	Wheel revolution contactor	Check that 'make' and 'break' periods are equal and adjust contacts if necessary.
Every 4000 kms	Wheel	Determine variation of effective radius, re-determine the distance corresponding to one revolution.
Every 7500 kms	Wheel Hub	Fill with good quality bearing grease.
Every 15000 kms		Dashpot inspection. Tractor wheel assembly Lubrication.
Every 50000 kms		Recalibration of leaf springs. Inspection of spring mountings.
Annually		Towing hitch inspection Integrator inspection.

N.B. Bearings fitted in the integrator unit, recording device, numerating device, towing hitch, brackets and shackles are grease packed of the ZZ type and are not likely to need any attention for several years.

4. Calibration

It is of extremely great importance to keep the instrument in proper calibration. The precautions to be observed indicated in Section 3 above will generally ensure that the instrument is in calibration. However, it is necessary to check the calibration of the instrument once in a month. This can be done by running the instrument over surfaces of constant roughness, such as the cement concrete road, bridge decks, newly laid WBM surfaces and establishing conversion factors if the readings observed during calibration are different from those when the instrument was new. It is therefore suggested that as soon as the instrument is procured, the measurements should be taken on standard surfaces of known roughness and a permanent record of these readings should be kept. Subsequent readings on the surface will enable calibration equations to be developed.

APPENDIX I

BUMP INTEGRATOR MEASUREMENTS

Read :

Date :-

Section :

Weather

Code

From :

Dry

1

Wet

2

To :

Type of Surface :

Surface Dressing

Premix Carpet

Ashphaltic Concrete

Cement Concrete

W.B.M.

Gravel

Not specified

Code

1

2

3

4

5

6

9

Recorded by

Wheel Rev :

Integrator counter Readings*

Unevenness Index .

mm/km

Remarks

(1)

(2)

(3)

(4)

5100-3

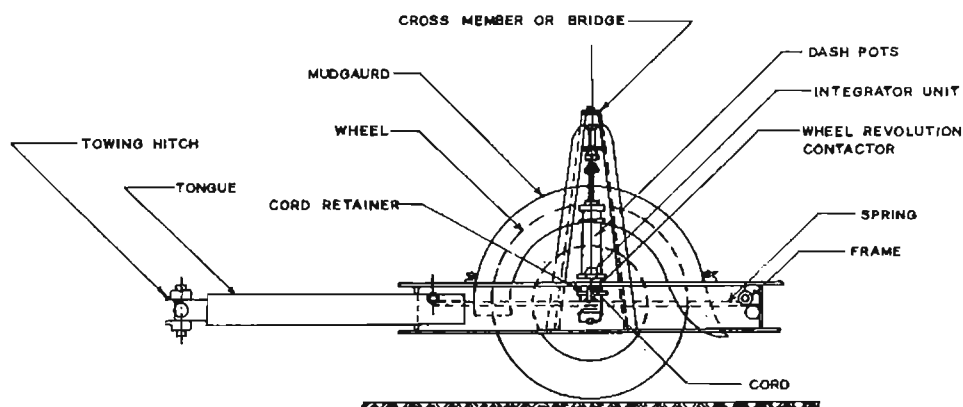


Fig.1 DIAGRAMMATIC SKETCH OF THE BUMP - INTEGRATOR

5100.4

NO. RW/NHIII/P/10/84

Dated the 25th July, 1984

To

All Chief Engineers PWD in the States and Union Territories dealing with National Highways and State Sector Roads

Sub : Use of roughness measurements as an aid to more effective monitoring of road construction and maintenance operations

I am directed to refer to the Ministry's letter of even number dated 3.4.84 requiring that immediate arrangements to be made for the use of roughometers during inspection in order to achieve better monitoring and greater accountability in road construction and maintenance operations. The question of laying down standards for roughness values which could be used for assessing the quality of construction and maintenance of roads under varying parameters is under consideration in the Ministry. In the meanwhile, as far as newly constructed roads are concerned, it has been decided to formulate norms on the basis of experience gained in the programme of roughness measurement extending to nearly 42,000 kms on different types of roads carried out under the Road User Cost Study. On the basis of this data, the recommended roughness values for newly constructed roads are contained in the Table annexed.

2. It is desired that newly constructed road sections in your State may be evaluated for riding quality against the following norms :

1. Asphaltic concrete	—	2500 mm/km
2. Premix bituminous carpet	—	3500 mm/km
3. Surface dressing	—	4500 mm/km

The subsequent readings should be taken within 4-6 months after opening of the road to traffic or the defects liability period whichever is earlier. The roughness values during the second measurement should be judged

5100/22

against the following standards :

1. Asphaltic concrete	—	3000 mm/km
2. Premix carpet	—	4000 mm/km
3. Surface dressing	—	4500 mm/km

If the roughness measurements taken immediately after construction and during the defects liability period are higher than the values suggested above, suitable action should be taken against defaulting contractors and the Supervisory staff.

3. The following periodicity may be observed for surprise checking of the roughness of National Highways in your State :

1. By the Chief Engineer	—	Once a month
2. By the Superintending Engineer	—	Twice a month
3. By the Ministry's R.O.	—	Once a month

The above instructions may be given wide publicity for compliance and the Ministry informed once a quarter about the outcome of the measurements and investigations.

TABLE-RECOMMENDED ROUGHNESS VALUES FOR ROADS IN INDIA IN MM/KM

Surface Type	(Towed Fifth Wheel Bump Integrator)			
	Road condition			
	Good	Average	Poor	Very poor
Asphaltic concrete	2000-2500	2500-3500	3500-4000	Over 4000
Premix bituminous carpet	2500-4500	4500-5500	5500-6500	Over 6500
Surface dressing	4000-5000	5000-6500	6500-7500	Over 7500
Water-bound macadam/gravel	8000-9000	9000-10000	10000-12000	Over 12000

5100.5.

D.O. NO. RW/NHIII/P/10/84

Dated the 14th January, 1985

To

The Chief Engineers of State PWDs (By name)

You may kindly recall Ministry's letters of even number dated the 3rd April, 1984 and the 25th July, 1984 wherein detailed instructions regarding the use of roughometers during the inspection of National Highways for achieving effective monitoring and greater accountability in road construction and maintenance operations, were communicated. Detailed guidelines for the use of Roughometers for measuring road roughness have also been sent to you vide Ministry's letter of even number dated the 19th May, 1984.

2. Further, with the Ministry's letter of 25th July, 1984, standards for roughness of newly constructed roads of various specifications and periodicity and level of checks of roughness on newly constructed stretches of National Highways were suggested and it was also desired that the results of measurements and investigations may be intimated to the Ministry on quarterly basis. The need for immediate action to procure the instruments, obtain necessary proficiency in their use and start taking measurements on newly constructed sections of National Highways and the requirement of submission of periodic progress reports have all been highlighted in Ministry's communications dated the 21st July, 1984, 5th November, 1984 and the 22nd December, 1984.

3. In spite of the urgency for adoption of the suggested system expressed in the aforesaid letters as well as during periodic meetings and visits of officers of the Ministry to the States and concern voiced during review meetings for expeditious action, no significant headway in this direction seems to have so far been made. Moreover, no reports indicating the status of implementation of the suggested procedure for roughness measurements have so far been received from you.

4. I would, therefore, request you to adopt prompt measures for procuring the instruments and arranging necessary proficiency in their use and going ahead with the field measurements on newly constructed sections. A status report on the implementation of the envisaged scheme may please be furnished to the Ministry immediately, to be followed by timely submission of quarterly reports.

Copy forwarded to all the Chief Engineers and Superintending Engineers dealing with roads in the Headquarters for information and necessary pursuit.

5100.6

NO. RW/NHIII/COORD/27/85

Dated the 12th April, 1985

To

The Chief Engineers, P.W.D., of all States and Union Territories (dealing with National Highways, CRF and E&I Works).

Sub : Critical work-wise review of all on-going and sanctioned National Highway (Original) works, CRF and E&I Works at New Delhi

Critical work-wise review of all on-going and sanctioned NH (Original) Works, CRF and E&I Works is proposed to be conducted at New Delhi, as per programme enclosed.

2. For the above purpose, details of all on-going and sanctioned road and bridge works under the four categories viz. (a) Pre-1978 works; (b) works sanctioned during 1978-80; (c) works sanctioned during 1980-81 and (d) works sanctioned after 1.4.1981 upto 31.3.1985 may please be furnished separately for road and bridge works as per proforma I for National Highway works and proforma III for CRF and E&I Works. Targets for completion of these jobs had been indicated by the State Chief Engineers during the last Review Meeting held in January/February, 1985. In case there has been any delay in achieving the targets of completion fixed up earlier, full and justifiable reasons for the fresh delays and action taken to accelerate the progress to make up for the slippages may also be given in detail in the appropriate columns of the proformae. The information in proforma I for National Highways should be given in respect of only those works which were in progress at the time of last review meeting during January/February, 1985 and the present progress including completion of the same may be indicated. List of such works in progress had already been forwarded to the State Chief Engineers with the minutes of the last review meeting, and a copy of the same is enclosed. For easy identification of the works during review, the same order of serial of works as given in the list of on-going works may be maintained. Any new work started after the last review may be added at the end. This proforma should not include works which had been reported complete during last review. Likewise, proforma III for CRF and E&I works should contain only works which were in progress at the time of last review. Works which got completed during earlier periods for which funds are required during the year 1985-86 for clearing liabilities, etc., may be grouped separately and information for the same furnished as an Annexure to proforma I or proforma III, as the case may be.
3. Proformae I and III should not include works sanctioned but not yet started. For such category of works, a separate statement should be prepared in proforma II for NH works and in proforma IV for CRF and E&I Works indicating specific reasons for which the work could not be started and the likely date of commencement of such works. List of NH works which were not started as per last review meeting has been circulated with the minutes of the last meeting.
4. It is requested that the statements in proforma I and II (separately for road and bridge works for National Highways) and in proforma III and IV (separately) for road and bridge works for CRF and E&I works and an abstract in proforma V for NH works duly filled in with relevant details may be sent to this Ministry in duplicate so as to reach latest by the 25th June, 1985.
5. Information regarding programme of utilisation of mechanical equipments during Annual Plan 1985-86 and regarding progress of disposal of B.E.R. machines may be furnished as per proforma VI and VII enclosed. A list of absolute surplus central equipments (all categories) may also be sent. These informations may be sent alongwith the other work-wise informations asked for above.
6. Some other important items which were discussed during the last review meeting, shall also be discussed to ascertain progress made in this regard. A list of such items is enclosed. A note on the action taken against each item after the last review may kindly be given.
7. The Chief Engineers are kindly requested to make it convenient to attend the Review Meeting as per the enclosed programme. Some Chief Engineers have been bringing Superintending Engineers and Executive Engineers also alongwith during earlier review meetings. This practice may kindly be discontinued. We would expect only the Chief Engineer to participate in the discussion.

**PROGRAMME OF WORKWISE REVIEW MEETING TO BE HELD IN
ROOM NO. 212 OF TRANSPORT BHAVAN, NEW DELHI-110 001**

S. No.	State	Date	Time
1.	Andhra Pradesh	3.7.85	10.30 Hrs.
2.	Arunchal Pradesh	4.7.85	15.30 Hrs.
3.	Assam	5.7.85	10.30 Hrs.
4.	Bihar	9.7.85	10.30 Hrs.
5.	Delhi	10.7.85	10.30 Hrs.
6.	Goa	15.7.85	10.30 Hrs.
7.	Gujarat	16.7.85	10.30 Hrs.
8.	Haryana	17.7.85	10.30 Hrs.
9.	Himachal Pradesh	18.7.85	10.30 Hrs.
10.	Jammu & Kashmir	19.7.85	10.30 Hrs.
11.	Karnataka	22.7.85	10.30 Hrs.
12.	Kerala	24.7.85	10.30 Hrs.
13.	Madhya Pradesh	25.7.85	10.30 Hrs.
14.	Maharashtra	30.7.85	10.30 Hrs.
15.	Manipur	31.7.85	10.30 Hrs.
16.	Meghalaya	29.7.85	10.30 Hrs.
17.	Nagaland	4.7.85	10.30 Hrs.
18.	Orissa	2.8.85	10.30 Hrs.
19.	Punjab	12.8.85	10.30 Hrs.
20.	Rajasthan	5.8.85	10.30 Hrs.
21.	Tamil Nadu	6.8.85	10.30 Hrs.
22.	Uttar Pradesh	7.8.85	10.30 Hrs.
23.	West Bengal	9.8.85	10.30 Hrs.
24.	Pondicherry	13.8.85	10.30 Hrs.
25.	Chandigarh	13.8.85	15.00 Hrs.

R.O.S.
meeting

ITEMS TO BE DISCUSSED DURING THE REVIEW MEETING WITH STATE CHIEF ENGINEERS

1. Pre-1980 N.H. Works : Any bottlenecks and measures for expediting completion by the target dates.
2. 1980-81 N.H. works : Any bottlenecks and measures for expediting completion by the target dates.
3. Important works : Expeditions completion of important works, even small works, non-completion of which may withhold commissioning of large projects. Status of works identified under this category during the last review may be indicated.
4. Programme of submission of estimates for 1985-86 and preparation of projects according to IRC Publications : (Annual Programme 1985-86 issued with Ministry's letter No. RW/NH. III Coord/7/85 dated 17.1.1985).
(Guidelines issued with Ministry's letter No. RW/NH. III/P/31/77-Pt. dated 14.1.85 for project preparation).
5. Works to be included in the Annual Programme 1986-87 : (Ref. Ministry's letter No. RW/NH. III/Coord/84 dated 21.3.85). (Now new No. is RW/NH. III/Coord/20/85)
6. Progress of Roughometer Scheme : (Ref. Ministry's letters No. RW/NH. III/P/10/84 dated 3.4.84 and dated 19.5.84).
7. Progress of Documentation work : (Ref. NH. III/Coord/89/82 dated 14.3.83)
8. Progress made towards implementation of the guidelines regarding quality control : (Ref. NH. III/P/1/83 dated 19.4.84).
9. Position of Bypasses and Parallel Service Roads : (Ref. RW/NH. III/Coord/87/84 dated 22.5.84 and NH. III/P/24/84 dated 25.9.84).
10. Measures taken for removal of encroachments and prevention of Ribbon Development and preparation of Land Plans : (Ref. NH. III/P/10/76 dated 19.4.84).
11. Progress made on implementation of the Management Information System : (Ref. NH. III/Coord/5/84 dated 28.3.84)
12. Progress made towards identification of sites and proposals for Roadside amenities and establishing truck parking complexes along National Highways : (Ref. letter No. BY 43/4874/81-82 dated 23.8.82 from Secretary General TOHAS to all Transport Commissioners and minutes of the Review Meeting held in 1984).
13. Further action taken towards establishing monitoring cells at Headquarters : (Ref. D.O. No. NH. III/Coord/23/82 dated the 9.3.82 and NH. III/Coord/28/84 dated 19.4.84).
14. Progress regarding Economic evaluation of projects : (Ref. NH. III/Coord/86/84 dated 18.3.85).
15. Pre-qualification of tenderers for execution of major Road and Bridge works : (Ref. NH. III/P/4/82 dated 11.7.84).
16. Status of computerisation in the State PWD : (Ref. Minutes of the Review Meeting held in 1984).
17. Details of training of staff and organisation thereof :

18. Use of Computer based Simulation Model for identification of needs for road improvements :
19. CRF and E&I Works : Progress since last review.
20. Requirement of funds for NH works : For 1985-86 and 1986-87.
21. Machinery Items : (a) Programme of utilisation of mechanical equipments.
(b) Disposal of BER machines.
(c) Absolute surplus Central Equipments.

PROFORMA I

STATUS OF SANCTIONED/ON-GOING NH WORKS
LATEST POSITION TO BE INDICATED

ROAD WORKS/BRIDGE WORKS
STATE :

Period	Name of work		Job No.	Date of sanction Original Revised	Sanctioned cost Original Revised	Likely cost of completion	Expenditure upto 3/85	Expenditure during 1984-85		
1	2		3	4	5	6	7	8		
Pre-1978										
1978-80										
1980-81										
1981-85										
Requirement of Funds 85-86 86-87 87-88			Uptodated Physical Progress	Target date of completion as per previous revision	Target date of completion as envisaged now	Reasons for any delay	Action taken to accelerate progress	Position of revised estimate & target date of receipt of revised estimate in Ministry	Address of Division executing the work	Remarks
9	10	11	12	13	14	15	16	17	18	19

PROFORMA II

LIST OF SANCTIONED WORKS ON NATIONAL HIGHWAYS WHICH HAVE NOT BEEN STARTED SO FAR
ROAD WORKS/BRIDGE WORKS

STATE : _____

S. No.	Name of work	Job No.	Sanctioned Cost (Rs lakhs)	Date of sanction	Position of call of tender	Probable date of commencement
1	2	3	4	5	6	7
Reasons for delay in commencement	Requirement of funds 1985-86	Requirement of funds 1986-87	Requirement of funds 1987-88	Address of Division executing the work	Remarks	
8	9	10	11.	12	13	

PROFORMA III

STATUS OF CRF/E&I WORKS SANCTIONED/ON-GOING WORKS ROAD WORKS/BRIDGE WORKS

LATEST POSITION TO BE INDICATED

STATE : _____

Name of work	Job No.	Date of Sanction Original Revised	Sanctioned Cost Original Revised	Likely Cost of Completion	Expenditure upto 31.3.85	Requirement of funds 1985-86
1	2	3	4	5	6	7
Requirement of funds 1986-87	Requirement of funds 1987-88	Target date of completion	Upto date physical progress % age	Reasons for delay if any	Action taken to accelerate progress	Remarks
8	9	10	11	12	13	14

PROFORMA IV

LIST OF CRF/E&I SANCTIONED WORKS WHICH HAVE NOT BEEN STARTED SO FAR

STATE _____

S. No.	Name of work	Job No.	Sanctioned Cost (Rs lakhs)	Date of sanction	Probable date of commence- ment	If not commen- ced, reasons for the same	Remarks
1	2	3	4	5	6	7	8

PROFORMA V

ABSTRACT FOR NATIONAL HIGHWAY WORKS

STATE : _____

Period of Sanction	No. of on-going works at the time of last review	No. of jobs comple- ted after the last review	No. of jobs yet to be com- pleted	Likely cost of comple- tion	Exp. upto 31.3.85	Exp. during 1984-85	Requirement of 1985-86	Funds for 1986-87	1987-88	Remarks
	2	3	4	5	6	7	8	9	10	11

I. Pre-1978 Works

- (a) Roads
- (b) Bridges
- (c) Total

II. 1978-80 Works

- (a) Roads
- (b) Bridges
- (c) Total

III. Works sanctioned
during 1980-81

- (a) Roads
- (b) Bridges
- (c) Total

No. RM-23 (33)/75

Dated the 3rd November, 1976

To

The Superintending Engineers (Mech.), Ministry of Shipping & Transport (RW), Calcutta, Lucknow, Jaipur, Bangalore

Subject : Delegation of powers to Regional Superintending Engineer (Mech.) to accord technical approval to repairs and maintenance estimates relating to Central machinery

I am directed to say that it has been decided, in consultation with the Finance Division, to delegate powers vested in the Ministry, for according technical approval, to the repairs and maintenance estimates, relating to Central machinery, received from the State Governments concerned to the Regional Superintending Engineers (Mech.) of this Ministry at Calcutta, Lucknow, Jaipur and Bangalore to the following extent :—

- (a) The maximum amount upto which technical approval is accorded will be limited to Rs 50,000/- (Rupees fifty thousand only) or 15% of the purchase price of each machine, whichever is less
- (b) The total amount of technical approvals to be issued by the Regional Superintending Engineer (Mech.) will not exceed 75% of the budget allocation made by this Ministry in respect of that State every year which shall be intimated in the beginning of the financial year.

2. This delegation is subject to the following conditions and stipulations :

- (i) The Regional Superintending Engineer (Mech.) would endorse a copy of Technical Approval, together with a copy of Technical Note (along with 10 spare copies thereof for RM Section) and modified estimate to this Ministry. The Superintending Engineer (Mech.) would allot a TA number to the estimates passed by him e.g. TA No. 76-77/SE (M)/Calcutta in r/o Superintending Engineer (M), Calcutta .
- (ii) The State Governments may be requested to prepare and get sanctioned, separate estimate for each machine every year, towards anticipated expenditure for meeting day to day routine running repairs and maintenance thereof. In exceptional cases, where the work is likely to be held up on account of non-availability of primary parts like fan-belt, filters etc., the States may be asked to get the job done and charge this petty expenditure, not exceeding Rs. 200/ to the Works contingencies, to be got adjusted subsequently through getting regular repairs and maintenance estimates sanctioned at the earliest.
- (iii) The proposals for release of funds in respect of such estimate will continue to be sent to the Ministry as early as possible and within the specified period, so that quarterly allocation of funds to the concerned States, can be made. In this connection it may be mentioned that funds are released by the Ministry on quarterly basis, for the quarters ending June, September, December and February.

3. The remaining estimates, which exceed the limit indicated under para (1) above or involving policy questions/major differences with the State Governments may, however, be sent to this Ministry, along with comments of the concerned regional Superintending Engineer (Mech.) for technical approval by this Ministry, as per the existing practice.

4. The technical approval will be accorded by Regional Superintending Engineer (Mech.) in the enclosed proforma, for and on behalf of Director General & Additional Secretary (Road Development). The Regional Superintending Engineer (Mech.) should maintain a TA register, containing the following columns :

Name of State	T.A. No.	Brief particulars of estimate	Original amount of estimate	Amount for which TA Accorded by SE (Mech.)	Letter Number & date of SE (M) letter according TA	Amount of funds released by Ministry	Budget Section letter No. & date regarding release of funds	Remarks
1	2	3	4	5	6	7	8	9

e.g.

TA/I/WB/76-77/SE (M)-Calcutta.

Abbreviation "WB" means West Bengal. BR for Bihar and so on.

5. This issues with the concurrence of Finance Division vide their U.O. No. 3252-TFS-II/76 dated the 25th October 1976.

7200/2

Encl :— One proforma copy for information to :

1. All Secretaries to the the State Governments (concerned with PWD and NHs).
2. All State Chief Engineers/Addl. Chief Engineers (concerned with PWD/NHs).
3. All State Accountant Generals.
4. AGCW&M, New Delhi.
5. Finance Division, (TFS-II), Ministry of Shipping and Transport, New Delhi with reference to their U.O.No. 3252/76/TFS-II dated the 25th October 1976.
6. Budget Section (TPT Wing)/Budget Section (RW).
7. Pay & Accounts Officer, Ministry of Shipping & Transport (Roads Wing).

PROFORMA

To

The Secretary to the Govt. of Bihar, Public Works Department, Patna

Subject : Estimate for the repair of one number cutter Hot Mix Plant No. 1298 working under N.H. reach Dn. Muzaffarpur from 74-75 (T.A.No. 106-BR/76-77-RM)

I am directed to refer to the Chief Engineer's letter number NH/TP/263/75-114/WE dated 9.1.76 forwarding a repairs estimate amounting to Rs. 4,600 for the work mentioned above and to say that the estimate has been examined by the Director General (Road Development) and modified to Rs 1600 in the light of the comments given in the enclosed technical note.

2. I am to convey the technical approval of the Government of India to the modified estimate amounting to Rs. 1,600/- (Rupees One thousand six hundred only) for the repairs of the above mentioned machinery.

3. The expenditure will be debitable to the subhead A. Roads & Bridges-A. 2-National Highways-A. 2 (1)-Maintenance A. 2(1) (3) Machinery subordinate to the Major Head "337-M&R of N.H." under Demand No. 80-Roads and should be met from the allotment placed at your disposal from time to time. The aduit is being informed accordingly.

4. The modified copy of the estimate is sent herewith for your guidance.

5. In this connection it may be mentioned that this is only a technical approval and not a financial sanction for incurring expenditure. As such on receipt of this letter the State Government may please send formal proposals for allotment of funds to us for allocation of funds, as early as possible by 15th November, 1976 at the latest.

Copy with a copy of technical note forwarded for information to :

1. The Accountant General, Bihar, Patna
2. The Ministry of Finance (T&P Division), New Delhi.
3. Budget Section, Transport Wing
4. The Additional Chief Engineer, N.H. Wing, Bihar P.W.D. Patna with reference to his letter No. NH/TP/203/75-114/WE dated 9.1.76.

7200.2.

No. NHIII/P/16/80

Dated the 6th January, 1983

To

All State Governments (Department dealing with National Highways)

Subject : Delegation of powers to Regional Officers

I am directed to say that question of delegation of more powers to the Regional Officers of this Ministry has been under consideration of this Ministry for some time past and it has now been decided to delegate the following powers to the Regional Officers :—

- (i) All estimates for road and bridge works costing upto and including Rs 10 lakhs will be scrutinised by Regional Officers and their examination will be final. The Regional Officers after scrutiny will send the papers to this Ministry for issue of administrative approval.

- (ii) The Regional Officer concerned should be associated right at the initial stages in assessing the extent of levelling course. He may be associated in actual checking in the field on a sample basis and for deciding the extent of levelling course needed in any particular work and his recommendation may be accepted as final.
- (iii) The Regional Officer shall approve the selection of specific kms which should be renewed in any particular year against the amount allotted to the State.

2. Keeping in view the above delegation of powers to the Regional Officers, it is requested that in future all estimates for works costing upto and including Rs 10 lakhs may first be finalized in consultation with the Regional Officers. Similarly the Regional Officers may be associated for deciding upon the extent of levelling course needed in any particular work and for selection of specific kilometres (stretches of National Highways) which should be renewed in any particular year.

Note : [Powers to accord technical sanction to estimates costing Rs 10 lakhs delegated to States Refer to Letters No. NHIII/Coord/34/84 dt. 24.3.84 and 26.7.84 under Code No. 121.6]

Copy forwarded to :—

1. All State Chief Engineers dealing with National Highways
2. All R.Os.

7200.3.

No. NHIII/P/16/80

Dated the 10th February, 1984

To

The Chief Engineer, Ministry of Shipping and Transport, (Road Wing), Gauhati

Subject : Delegation of powers to the Chief Engineer, Ministry of Shipping and Transport (Roads Wing), Gauhati in connection with technical scrutiny/clearance of estimates relating to works of North Eastern Council

In supersession of all previous orders on the subject mentioned above, I am directed to say that the Chief Engineer, Ministry of Shipping and Transport at Gauhati is hereby delegated full powers to scrutinise and accord technical clearance to all estimates relating to NEC works irrespective of the amount of the estimate. However notwithstanding these powers, the Chief Engineer may, if he so desires, refer any case to the Director General (Road Development) for such advice as he may consider necessary, and all such cases shall be cleared by the Chief Engineer only after Director General (Road Development) has given his advice.

Copy forwarded to :—

1. Secretary, North Eastern Council, Shillong-793 001. This has reference to his D.O. letter No. NPF. 32 8.1.84. dated the 15th December, 1983 addressed to the Secretary, Ministry of Shipping and Transport, New Delhi.
2. The Deputy Secretary to the Government of India, Ministry of Home Affairs (NEC Cell), North Block, New Delhi.

7200.4.

No. NHIII/Misc./2/84

Dated, the 21st February, 1984

OFFICE MEMORANDUM

In supersession of all previous orders on the subject the Technical Officers posted at the Headquarters in the Ministry of Shipping and Transport (Roads Wing) are delegated the following powers until further orders to accord in the name of the DG (RD) technical approval to detailed estimates for works upto the financial limits (including agency charges) as indicated below :

1. Executive Engineer (Roads)/(Bridges)/(Mech.)	—	Rs 10.00 lakhs
2. Superintending Engineer (Roads)/(Bridges)/(Mech.)	—	Rs 25.00 lakhs
3. Chief Engineer (Roads)/(Bridges)/(Mech.)	—	Rs 75.00 lakhs
4. Additional Director General (Roads)/(Bridges)	—	More than Rs 75 lakhs but less than Rs 2 crores
5. Director General	—	Rs 2.00 crores and above

7200/4

While exercising such powers the officers concerned are required to keep in view specially the following points :—

- (i) In cases where a work is not included in the approved programme or expenditure on which during the year cannot be met from within the sanctioned budget/grant, the orders of the DG (RD) should invariably be taken before technical approval is accorded to such a work, and,
- (ii) In all matters involving policy questions, major difference with the State Governments doubts in regard to interpretation etc. the case will continue to be referred to the DG (RD) irrespective of the amount of the estimate.
- (iii) The delegated powers mentioned above do not apply to SR/FDR works.

All Projects costing Rs. 25 lakhs and above will continue to be submitted for prior approval to the State Minister/Minister before issue of necessary financial sanction.

7200.5.

D.O. LETTER NO. NHIII/P/1/84 DATED THE 27TH MARCH 1984 ADDRESSED TO CHIEF ENGINEER, MINISTRY OF TRANSPORT (RW), GAUHATI

Please refer to your D.O. letter No. RW/GHT/Genl (180)/84, dated 6.3.84 to Director General (Road Development) regarding policy for selection of sites etc. It has since been decided that you can finalise the site and the hydraulic data for bridges on National Highways and strategic roads costing upto Rs 75 lakhs. You may please now take further necessary action.

2. For North Eastern Council works, the powers delegated to you vide letter No. NHIII/P/16/80 dated 10.2.84 will stand.

7200.6.

No. NHIII/P/4/85

Dated the 28th May, 1985

OFFICE MEMORANDUM

In continuation of the O.M. No. NH III/Misc/2/84 dated the 21st February 1984 delegating powers to technical officers at Headquarters in the Ministry of Shipping and Transport (Roads Wing), the following powers are delegated until further orders, to accord, in the name of the Director General (Road Development), technical approval to the detailed estimates for maintenance of Central machines under M&R Grants to the technical officers in the Mechanical Directorate of the Roads Wing at Headquarters as indicated below :

- (i) Executive Engineer (Mech.) Rs 50,000/- or 30% of the purchase price of each machine whichever is less.
- (ii) Superintending Engineer (Mech.) : More than Rs 50,000/- but less than Rs 1 lakh or 50% of the purchase price of each machine whichever is less.
- (iii) Chief Engineer (Mech.) : Rs 1.00 lakh and above.

While exercising such powers, the officers concerned are required to keep in view specially the following points :

- (i) In cases where the expenditure on a work cannot be met from within the sanctioned budget/grant during that year, the orders of the DG (RD) should invariably be taken before technical approval is accorded to such a work, and
- (ii) In all matters involving policy questions, major difference with the State Govts., doubts in regard to interpretation etc. the cases will continue to be referred to the DG (RD) irrespective of the amount of the estimate.

Copy forwarded to :

- (i) All Officers in the Roads Wing/Director (Finance) D.F.O. (T)/TF II Transport Wing.

7300 DUTIES JURISDICTION AND SPECIFIC INSTRUCTIONS TO ROs AND ELOs.

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7300.1.	NHIII/Misc 178/73 dt. 13.12.73	Progress Monitoring and Control on Central Works in the States	7300/1
7300.2.	OO No. 56/76 dt. 1.4.76	Jurisdiction of ROs.	7300/1
7300.3.	NHIII/P/57/76 dt. 28.7.76	Qualitative Aspects of Execution of NH Works and Other Centrally Financed Works like S.R.	7300/2
~~7300.4.~~ ~~6200~~	~~PL-30 (135)/74~~ ~~dt. 23.2.79~~	~~R&D Activites of the Ministry~~	~~See Code~~ ~~No. 6200~~
~~7300.5.~~ ~~7520~~	~~NHIII/Misc/131/79~~ ~~dt. 27.10.79~~	~~Coordination with State P.W.D.~~ ~~Regarding Revised Estimates~~	~~7300~~ ~~7300/2~~
7300.6.	NHIII/Coqrd/4/82 dt. 2.2.82	Association of ROs in Project Preparation	7300/3
7300.7.	OO No. 84/82 dt. 19.10.82	Jurisdiction of RO Bangalore to include Goa.	7300/3
3700.8.	N-48/KNT/330/80-W dt. 19.2.83	Inspection of Sites for Bridges	7300/4
7300.9.	NHIII/P/17/76 dt. 15.3.84	Opening/Foundation Stone laying Ceremonies in Respect of NH Works	7300/4
~~7300.10.~~ ~~7520~~	~~RW/NHIII/P/20/84~~ ~~dt. 10.7.84~~	~~Examination of detailed Estimate~~ ~~Received from State PWDs—Procedure~~	~~7300/4~~ ~~Garding~~
7300.11.	NHIII/P/26/84 dt. 7.8.84	ROs and ELOs Report in respect of R & B Works Financed by the Central Government	7300/5
7300.12.	NHIII/P/26/84 dt. 5.9.84	—do—	7300/5
7300.13.	NHIII/P/4/82 dt. 17.12.84	Pre-qualifications of Tenders for the Execution of Major Road and Bridge Works on NHs and under other Centrally Financed Schemes	7300/6
7300.14.	NHIII/P/1/84 dt. 15.5.85	Use of Roughness Measurement as an aid to more effective Monitoring of road Construction and Maintenance Operations	7300/7
3700.15.	NHIII/P/31/77 dt. 12.8.85	Guidelines for the association of ROs/ELOs in Project Formulation	7300/8
3700.16.	RW/PL-39 (120)/84 dt. 14.8.85	Duties and Responsibilities of Regional Officers (CE and SE) and Engineer Liaison Officers	7300/11

- IV. Works sanctioned after 1.4.1981
 - (a) Roads
 - (b) Bridges
 - (c) Total
- V. Fund requirements for works completed prior to last review
 - (a) Roads
 - (b) Bridges
 - (c) Total
 (Likely cost and exp. upto 3/85 also to be given)
- VI. Fund requirement for works sanctioned but not yet started
 - (a) Roads
 - (b) Bridges
 - (c) Total
 (Likely cost also to be given)
- GRAND TOTAL :
- VII. Fund requirements for works expected to be sanctioned during 1985-86.
(This requirement to be indicated for 1985-86 only).

APPENDIX VI

In our technical talks/lectures on road and bridge topics we often refer to a variety of situations peculiar to India. We must, therefore, have readily available with us 35mm coloured slides depicting interesting features of diversity in terrain, climate and traffic composition, and other features of engineering interest. Slides showing one or two view of the following may please be got prepared/procured from the State PWDs immediately.

1. GENERAL VIEWS SHOWING :

- i) Mighty Rivers
- ii) Deserts
- iii) Highly Expansive Soil Areas
- iv) Alluvial Plains
- v) Western Ghats
- vi) Back Waters of Kerala
- vii) Hilly Areas
- viii) Mountains clad with snow

2. ROADS

- i) High Altitude roads in snow fall areas
- ii) Roads in Hills
- iii) Roads in Western Ghats
- iv) Roads in Deserts
- v) Roads in Black Cotton Soil Areas
- vi) Roads in Flooded/Water Logged situations
- vii) Roads in High Rainfall Areas (in Cherrapunji)
- viii) View of Earthen Roads
- ix) View of Gravel Roads
- x) View of Black topped Single Lane Roads
- xi) View of Black topped two lane roads
- xii) View of Black topped four lane roads
- xiii) View of Urban Roads (Delhi, highlighting landscaping)

3. BRIDGES

- i) Flush Causeways
- ii) Vented Causeways
- iii) Brick/Stone Masonry arch Bridges
- iv) Modern Structures
- v) Flyovers
- vi) Suspension Bridges
- vii) Cable Stayed Bridges (Calcutta)
- viii) Toll Plaza

Note : Photographs of modern structures may also be procured.

NO. NHIII/P/10/84

Dated the 31st July, 1985

To

1. M/s Ved Engineering Company, 10 Gadodia Road, Anand Parbat, New Delhi-110005
2. M/s Vijay Enterprises, 201, New Delhi Okhla Industrial Area, Phase I, New Delhi-110020

In order to ensure reproduceability in the roughness measurements and compatible values, it has been decided that the roughometers being manufactured by you and sold to the Public Works Departments and other organisations may be tested at the Central Road Research Institute along with the imported equipment available in that Institute. The Central Road Research Institute are being requested to give a certificate that the readings obtained by your equipment are consistent with those obtained from the standard imported equipment. It is therefore requested that all future deliveries of the equipment may please be accompanied by such a certificate.

5200 INSPECTION

<i>Code No.</i>	<i>Circular No. & Date.</i>	<i>Brief Subject</i>	<i>Page No.</i>
5200.1.	NHI-48 (8)/68 dt. 4.9.68	Procedure for issue of Inspection Notes	5200/1
5200.2.	RW/NHIII/P/1/f dt. 19.1.83	Guidelines to Inspecting Officers	5200/1

D.O. NO. NHI-48 (8)/68

Dated the 4th September, 1968

Sub : Procedure to be followed in the issue of inspection notes/tour notes.

In order to have a uniform policy in the matter of issue of inspection notes/tour notes by senior officers of the Roads Wing working at headquarters and in the regional offices, it has been decided that *no inspection notes* will be issued by any officer other than the Director General (Road Development). Whenever an officer goes on tour of inspection he should submit within a week of his return to the headquarters a tour note containing his observations about the progress of works etc. and other important points noted by him during his tour. In the forwarding notes specific attention should be drawn to important and unusual matters. Relevant extracts of these tour notes should be taken and brought on to the concerned file and action, as necessary, initiated by the Inspecting Officer himself as quickly as possible.

2. The inspecting officers may discuss cases with the respective officers of the State Government wherever they feel that immediate instructions are required to be issued to stop further work when progress is not satisfactory but the final decision in all such cases should be left to be taken by the State Government officers themselves.

3. Separate tour notes/reports for road works and bridge works should be sent by the regional officers, common points being, however, included in both the notes.

4. Officers upto the rank of Superintending Engineer should submit their tour notes to the Chief Engineers concerned who in his turn will submit them to the ADG. Tour notes of Chief Engineers will be submitted to the ADG's concerned and DG (RD) and the notes by the ADG's will be submitted to DG (RD).

5. If an inspecting officer feels that certain important observations made by him should be brought to the notice of the State Government immediately, official/demi-official reference might be made by him to the respective authorities concerned after obtaining orders of the competent authority. In no case copies of tour notes will be sent to the State Governments/Chief Engineers.

NO. RW/NHIII/P/1/83

Dated the 19th January 1983

To

- (i) All officers of the rank of Superintending Engineer and above in the Headquarters.
- (ii) All Regional Officers and Engineer Liaison Officers.

MEMORANDUM

Sub : Items covering various aspects to be kept in view for discussions/pursuances and observations by the inspecting officers in the Roads Wing

In order to derive full benefit out of the official tours by the officers in the Roads Wing, it is essential that all aspects concerning the works and other related matters are covered in a visit. This will help in obtaining complete and upto date information and for taking follow up action. The main items concerning various aspects have been brought out in the enclosure for necessary action. The items indicated are only illustrative and are not exhaustive.

2. All Officers in the headquarters are requested to contact the concerned counterparts in the Roads Wing and get the details of outstanding issues needing discussions/pursuit before proceeding on tour and try to obtain as much information as possible.

ITEMS TO BE LOOKED INTO/DISCUSSED BY THE INSPECTING OFFICERS

(A) Works in Progress

- (i) Whether the works being executed are as per the provisions of sanctioned estimate.
- (ii) Whether quality of materials collected/being laid are as per the M.O.T./I.R.C. Specifications.
- (iii) Whether all the quality control tests prescribed are being carried out and whether adequate equipment, trained staff and system for quality work is there.
- (iv) Whether any bottlenecks in the progress of works observed or brought to notice.
- (v) Present and future utilisation of Hot-mix Plant and heavy earth-moving equipment.

(B) Sections of N.H. where no works are being carried out

- (i) Whether the manpower available for the maintenance of National Highways is gainfully employed.
- (ii) Whether works sanctioned under periodic renewals have been completed before monsoon.
- (iii) Whether stretches for inclusion in the renewal programmes for the next year have been indentified.
- (iv) Whether road and bridge registers are being maintained and up-dated periodically and utilised.
- (v) Whether plantation/landscaping on the National Highway lands has been carried out as per Ministry's instructions.

(C) Works included in the Annual Plan/Five Year Plans for which projects are yet to be prepared.

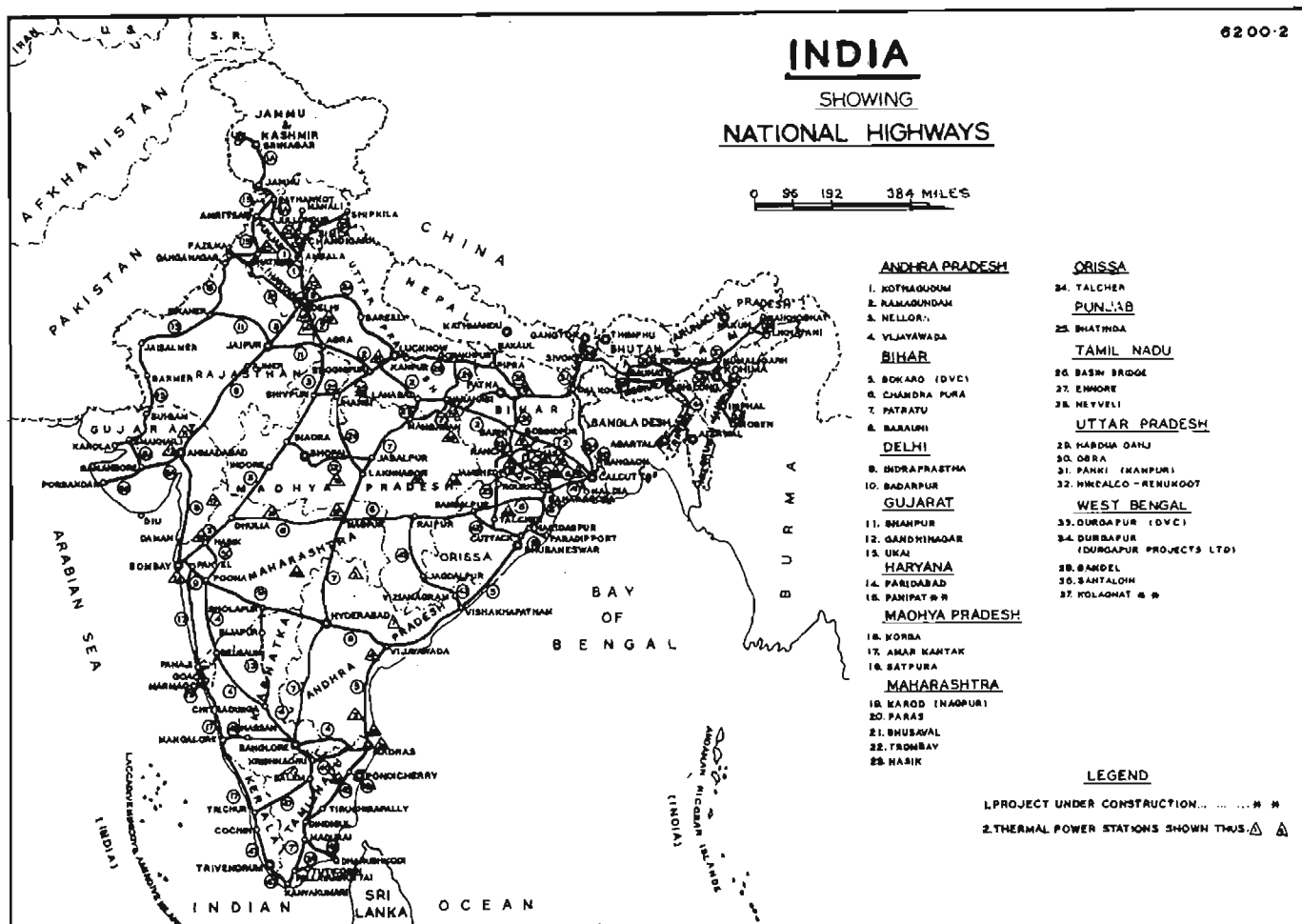
- (i) Advance action taken for survey and investigation of projects included in the Annual Plan/Five Year Plan.
- (ii) Whether Schedule of Rates for all Road and Bridge items have been up-dated.

(D) In the approaches to cities and towns

- (i) Extent of ribbon development and encroachment on National Highway.
- (ii) Steps taken to check/remove these legislation, record and machinery available.

(E) To be discussed with the State Chief Engineers

- (i) Progress of sanction of estimates against the current Annual Plan and works to be included in the next Annual Plan.
- (ii) Progress of sanction of Revised Estimates as per the last review.
- (iii) Progress of Research Schemes and experimental stretches laid/to be laid as also steps taken to popularise C.A.C. techniques.
- (iv) Names to be furnished by the State Government for deputation of AEE/EE to the Ministry.
- (v) Documentation of important/interesting projects.



5300 COMPLETION REPORTS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
5300.1.	WI-70 (24)/52 dt. 1.9.53	Completion Reports on NHs Original Works	5300/1
5300.2.	NHIII/P/1/79 dt. 3.1.79	Ensuring timely Submission of Completion Reports for R&B Works on NHs & under other Centrally Financed Schemes, Docketing of Completion Drawings.	5300/2
5300.3.	NHVI-50 (3)/83 dt. 12.4.83	Taking over of bridges on NHs from Contractors after Completion.	5300/3

Engineer who has to carry out maintenance and inspection of the structure, while the fourth set should be sent to the Ministry for reference and record. It would be appreciated that the absence of a set of completion drawings, design of other relevant important data requiring special attention during inspection/maintenance would seriously hamper proper maintenance operations. Moreover, if at a later stage some modifications are called for in the structure, a reference to these documents would be very helpful and also necessary. It is expected that the importance of the preparation and proper docketing of these documents would be appreciated and immediate instructions issued to all the PWD officers concerned.

The receipt of this letter may kindly be acknowledged.

5300.3.

No. NHVI-50 (3)/83

Dated the 12th April, 1983

To

All Chief Engineers of States/Union Territories dealing with NHs and other Centrally sponsored roads

Sub : Taking over of bridges on National Highways from contractors after completion

After the bridge is completed and taken over by the Department from the contractor, the period for which the contractor is responsible to set right the defects is specified in the contract and is usually very short. In order to ensure that any defects in the completed bridge structure are not lost sight of before the taking over of the bridge from the contractor, the State P.W.D. may fix up the level of the Officer, who would take over each particular bridge depending upon the type and magnitude of the structure and indicate the same in the N.I.T. for the work. The said officer shall be responsible for checking each and every component of the structure before taking over.

6100 CENTRAL ASSESSMENT COMMITTEE

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
6100.1.	PL-4 (9)/59-Pt. II dt. 6.8.61	CAC Resolution	6100/1
6100.2.	RW/RD/Misc/6/81-OR. Vol.III, dt. 25.7.83.	Promoting the Use of C.A.C. Techniques in Road Construction.	6100/2
6100.3.	CAC Schemes	Extracts from "Draft procedures for pre- paring CAC Schemes."	6100/4

No. PL-4(9)/59-Pt. II

Dated the 8th August, 1961

RESOLUTION

The question of utilising new techniques of road construction-evolved as a result of research and thereby effecting economy in the cost of road construction and also increasing the durability of roads has been under the consideration of the Government of India for some time. A committee of the Panel of Scientists appointed by the Planning Commission recommended in December 1956, that in order to bridge the gap between research and the application thereof, Assessment Committees should be set up preferably under the auspices of All-India Technical Bodies, to evaluate the results of research, to decide on large scale trials and constructional work and to make allocations for these works from the funds to be provided for the purpose. As far as road research goes, this suggestion has been examined by the Government of India in consultation with the State Governments and it is resolved that a Central Assessment Committee should be constituted under the aegis of the Indian Roads Congress.

2. The composition of the Committee as suggested by the Indian Roads Congress and approved by the Government of India shall be as follows :

- (i) The Consulting Engineer (Road Development), Department of Transport (Roads Wing);
- (ii) The President, Indian Roads Congress;
- (iii) The Director, Central Road Research Institute;

(iv) and (v) Two Chief Engineers of States :—

- (1) The Chief Engineer, Public Works Department, Government of West Bengal.
- (2) The Chief Engineer, Buildings and Communications Department, Government of Gujarat;

(vi) and (vii) Two Directors of State Road Research Laboratories :

- (1) The Director, Highway Research Station, Madras;
- (2) The Director, Public Works Department, Buildings and Roads, Research Laboratory, Chandigarh.

(viii) One member from a non-Governmental organisation :—

Shri B.V. Vagh, Vice-President,
Indian Roads and Transport Development
Association, Bombay.

The Consulting Engineer (Road Development) shall be the convenor of the Committee and an officer of the Central Road Research Institute, nominated by the Director of that Institute will act as the Secretary to the Committee.

3. In addition, while examining the road projects of a particular State, and while recommending suitable new techniques for replacing conventional ones, the Committee shall co-opt the Chief Engineer and the head of the Research Institute of that State, or their representatives, if they are not already on the Committee. The Committee will also have the power to co-opt three experts who have special knowledge of the subject under consideration.

4. The terms of reference of the Committee will be as follows :

- (i) To select new techniques of road construction for trial. In selecting new techniques, the Committee will confine itself to those which have been tried on Pilot experiments and have reasonable chances of succeeding. The techniques should compare favourably with the existing methods of road construction as regards cost in the region;
- (ii) To examine the road projects of each State and determine the site, length, etc., of roads where the normal methods of construction can be replaced by a suitable new technique in furtherance of research. For each State, the Committee will recommend such replacements to the extent of one per cent of the allocation for road development schemes in the State;
- (iii) To collect, such progress and performance reports to the Committee may prescribe for the work, expenditure and behaviour, and assess the results of trials of the new techniques;
- (iv) In the event of any loss of money occurring as a result of the failure of the road constructed according to the new technique or the total cost of the new technique exceeding that of the conventional method, to assess the loss or the extra expenditure, as the case may be, to be met from the "Risk Fund" set up for the purpose.

5. The members of the Committee, other than the Consulting Engineer (Road Development), the President of the Indian Roads Congress and the Director, Central Road Research Institute, will hold office for three years and will be eligible for re-appointment.

ORDER

Ordered that the above Resolution be communicated to all State Governments/Administrations, the Planning Commission, the

Ministry of Finance (Communications Division), the Ministry of Scientific Research and Cultural Affairs, the Director General, Council of Scientific and Industrial Research, the Director, Central Road Research Institute, the President of Indian Road and Transport Development Association and the Secretary, Indian Roads Congress.

Ordered also that the Resolution be published in the Gazette of India.

6100.2

No. RW/RD/MISC/6/81-OR-Vol. III

Dated the 25th July, 1983

ROADS WING

Sub : Promoting the use of C.A.C. techniques in road construction

The need for extensive utilisation of the C.A.C. techniques in road construction both on National Highways and State Roads has been repeatedly brought out in the past in the Central Assessment Committee meetings and also in forums like Chief Engineers meetings, Transport Development Council meeting and in several communications issued from the Ministry. In this connection reference is also invited to this Ministry's circular letter No. PL-17 (18)/77 dated the 13th April, 1980.

2. Over the year, 20 techniques (Appendix I) have been approved by the Committee. The adoption of these techniques does not entail on the States any additional financial liability and any remote chance of failure due to inadequacy of any of the techniques is covered under the Central Risk Fund. With a view to encouraging and propagating their application, the Projects Chief Engineers (Roads) in the Roads Wing are requested to take up with State authorities so that at least one C.A.C. technique is adopted annually in each PWD circle. Guidelines regarding applicability of the different CAC techniques and their relative advantages are given in Appendix II enclosed for ready reference.

APPENDIX I

To

CE (R) I CE (R) II CE (R) III CE (R) IV CE (R) T & T

CENTRAL ASSESSMENT COMMITTEE

TECHNIQUES APPROVED FOR LARGE SCALE ADOPTION IN CONSTRUCTION OF PAVEMENTS.

<i>Technique No.</i>	<i>Title</i>
1.	Mechanically stabilized soil in sub-base.
2.	Lime stabilized soil in sub-base.
3.	Naturally occurring grave/soil gravel mixtures in sub-base and base course.
4.	Stabilized soil with soft aggregates in sub-base and base-course.
5.	Lime stabilised black cotton soil for base course or sub-base-course.
6.	Lime stabilized moorum for base-course and sub-base-course.
7.	Thin sand-asphalt surfacings.
8.	Bitumen mixes using uncrushed gravel with or without small percentage of fine aggregate.
9.	Precoated aggregates for surface dressing.
10.	Built-up spray grout.
11.	Precoated bitumen carpet over 50 mm thick bituminous macadam.
12.	Composite pavement with lime-burnt clay pozzolana concrete base under flexible topping.
13.	Lime fly ash stabilized soil as sub-base in pavement construction.
14.	Lime-fly ash concrete.
15.	Cement-fly ash concrete.
16.	Lean cement fly ash concrete.
17.	Lime-fly ash water bound macadam.
18.	Rolled lean cement concrete.
19.	Continuously reinforced concrete pavement with elastic joints.
20.	Lime-Fly ash concrete precast blocks for footpaths and pavement kerbs.

CAC TECHNIQUES—CONDITIONS CONDUCTIVE FOR APPLICATION WITH ADVANCE

Technique No.	Technique	Conventional material that could be substituted by the CAC specification.	Conditions conducive for application of the CAC technique with advantage.	Possible advantages compared to conventional specifications.
1	2	3	4	5
A. SUB-BASE CONSTRUCTION :				
1.	Mechanically stabilised soil	Oversize metal WBM	Clayey soils and sands	Cost savings where conventional aggregates are expensive, better performance where subgrade soil is poor.
2.	Lime stabilised soil	Brick/Stone soling, brick	Clayey soils	
3.	Lime-Fly ash stabilised soil	metalling.	alluvial soils, fly ash available within a radius of 50-100 km.	
B. SUB-BASE AND BASE COURSE CONSTRUCTION (GRANULAR)				
3.	Naturally occurring gravel/soil gravel mixtures.	O/S metal WBM, Brick/stone soling, Brick metalling.	Where such materials occur within economic loads.	Cost savings where conventional aggregates are expensive.
4.	Stabilised soil with soft aggregates.	-do-	Medium/low rainfall areas, where conventional aggregates are expensive.	
5.	Lime stabilised black cotton soil.	-do-	In black cotton soil areas.	
6.	Lime stabilized moorum	-do-	In moorum areas where the moorum has high PI value.	
C. SEMI-RIGID BASE AND COMPOSITE CONSTRUCTION :				
2.	Composite pavement with lime burnt clay pozzolana concrete base under flexible topping. Lime-Fly ash concrete. Lean cement-fly ash concrete Lime-fly ash WBM. Rolled lean cement concrete.	WBM, BUSG, BM	Poor soil, high water table, possibility of submergence, heavy traffic, high rainfall.	Longer life and less maintenance for conditions under Col. 4; Economical where conventional aggregates are expensive.
D. BITUMINOUS CONSTRUCTION :				
7.	Thin sand—asphalt surfacing	Premix carpet	Sand available in plenty and stone aggregate expensive.	Economical utilisation of local materials.
8.	Bitumen mixes using uncrushed gravel with proper specifically designed mixes.	-do-	Rounded materials available in plenty.	
9.	Pre-coated chips surface dressing.	Premix carpet and ordinary surface dressing.	Situations where embankment of aggregates is not satisfactory, low pneumatic traffic. Also slick spots.	Better performance skid resistant.
10.	BUSG (Built up spray grout)	WBM or BM	Strengthening existing pavements where traffic diversion is not possible for permitting WBM construction.	Construction convenience.
11.	Precoated carpet over 50 mm thick BM.	WBM	Strengthening existing pavement under heavy traffic.	Better performance, and riding surface.
E. RIGID PAVEMENT CONSTRUCTION :				
15.	Cement fly ash concrete.	Plain c.c.	To save 15-20% cement where fly ash is available within 50-100 km. lead.	Savings in cost and cement.
19.	Continuously reinforcement concrete pavement with elastic joints.	Flexible or Plain c.c pavement.	Heavily trafficked rural highways.	Savings in cement.
F. MISCELLANEOUS :				
20.	Lime-fly ash concrete precast Blocks for foot paths and pavement kerbs.	Stone blocks, or ordinary c.c	To save cement	Savings in cement.

EXTRACTS FROM "DRAFT PROCEDURE FOR PREPARING CAC SCHEMES"

The Central Assessment Committee (CAC) on new techniques of road construction was formed by the Government of India in 1961 under the Chairmanship of Director General (Road Development), Ministry of Shipping and Transport (Govt. of India), with a view to promoting new techniques developed as a result of research and/or experimentation. The techniques recommended under the CAC are those which have been considered to have passed beyond the experimental stage and are ready for large scale utilisation on regular road construction.

The terms of reference of the Committee, as enunciated in letter No. PL-4 (9)/59 Pt. II dated 8.8.1961 of the Ministry of Transport and Communication (Govt. of India) :

2. CAC TECHNIQUES

Over the years, 20 new well-ried techniques have been approved by the Central Assessment Committee for large scale use in the country. A complete list of the techniques approved so far (upto mid-1983) is given in Table 4. enclosed with Ministry's letter No. RD/MISC/6/81 Vol. III dt. 25th July, 1983.

3. RISK COVERAGE IN UTILISATION OF CAC TECHNIQUES-CAC SCHEMES

CAC techniques may be adopted by road construction organisations in the country in their constructions on regular basis as Departmental Specifications. Before approving any technique as a CAC technique, the Central Assessment Committee fully satisfies itself, on the basis of the performance of full scale field test tracks, of the soundness of the technique.

In case, however, before such adoption of the CAC techniques on a regular basis, any organisation desires to try out some or all of the techniques on limited lengths of road sections, with financial cover for risk of failure from the Committee, CAC Schemes can be proposed by the organisation for approval of the Committee, prior to undertaking such construction. Specific proposals of CAC Schemes of road construction utilising CAC techniques, once approved by the Committee, and constructed with proper quality control provide financial cover against risk of failure. In special cases, where the use of a CAC technique is technically imperative from various considerations, but the total cost of construction as per the CAC technique exceeds that of the conventional specification, the Committee also considers CAC Schemes Proposals for meeting the excess cost of construction from the Risk Fund.

4. GUIDELINES ON PREPARATION OF CAC SCHEME PROPOSALS

The CAC Scheme proposals for consideration for approval by the Central Assessment Committee should be prepared in DUPLICATE, keeping in view the guidelines given below, and forwarded to the Secretary, Central Assessment Committee :

1. CAC Scheme proposals should pertain only to such CAC techniques which have not yet gained routine currency with the concerned organisation/in the particular zone.
2. The minimum length requirement for a road section for CAC scheme proposal is 2-5 km, reduceable to 1 km in special cases at the discretion of the State Chief Engineer or head of the executing agency.
3. Each CAC Scheme proposal should be accompanied by some length, at least $\frac{1}{4}$ km, of new construction with conventional specifications for assessment of comparative performance. The construction with conventional specification would, however, not be covered under the risk fund.
4. Adequacy of total pavement, crust thickness as per design requirements should be ensured in case of all CAC scheme proposals, as otherwise the performance of the layer adopting CAC technique could be adversely affected on this account.
5. "Preliminary Survey and Design Data" for the CAC scheme proposal as well the accompanying conventional proposal should be furnished in duplicate the CAC Proforma 'A'. The subgrade soil test data should be furnished separately for each $\frac{1}{4}$ km section, indicating locations where major changes of soil type occur. The information on existing and proposed pavement crust thicknesses should be accompanied by simple illustrative sketches.
6. The CAC Scheme proposal should also include a preliminary abstract estimate for the Scheme proposal as well as the accompanying conventional proposal, in duplicate.
7. At the time of making the CAC Scheme proposal, if not already done, the State PWD (or other executing organisation) should nominate a Liaison Officer (CAC) for the department-preferably Director of State PWD Laboratory or SE (Planning) or SE (Designs) at Chief Engineer's Headquarters for planning and monitoring of CAC Scheme proposals. State PWD Laboratories should be closely associated with the preliminary investigations, construction quality control and performance assessment of these schemes.

5. PROCEDURE FOR PROCESSING OF CAC SCHEME PROPOSALS

The normal procedure followed for processing of CAC Scheme proposals received from the States is as given below :

1. The CAC Scheme proposals received from the States will be scrutinised by the Secretary, Central Assessment Committee. If any proposal is not complete in all respect, or if any supplementary information is considered necessary, the State PWD Chief Engineer or Liaison Officer (CAC) will be intimated accordingly for supplying the needed information.
2. The Scheme proposals which are complete in all respects will be included in the Agenda for the next meeting of the Central Assessment Committee, for consideration of the Committee for approval.
3. The decisions of the Committee in respect of individual scheme proposals approval in principle, rejection, calling for further clarification or information, alternative suggestions, etc. will be communicated to the proposing organisation.
4. The proposals will be approved by the Committee subject to making available the designs to the Secretariat at a subsequent

date but before the construction is undertaken.

5. The Secretary will get the designs checked from CRRJ and comment on their adequacy or otherwise, for modification, if necessary.
6. The detailed estimates may thereafter be prepared by the Proposer States, got approved from competent authority, e.g.—the Ministry of Shipping and Transport (Roads Wing) for National Highways, and a copy of the approved estimate sent to the Secretary.

In all these matters CRRJ will function mainly in an advisory capacity. The services of the Secretary, Central Assessment Committee and other staff of the Institute can be drawn upon by the State Chief Engineers right from the planning stage for each CAC Scheme proposal. The presence of a CRRJ team during construction—at least for some days in initial stages—is, however, imperative to familiarise the State PWD officers with such CAC techniques with which they may not be fully conversant, and to monitor quality control, where such facilities are not available with the concerned department. Towards this an appropriate amount, normally between Rs. 5000 to 10000 should be deposited in advance with the Institute through crossed cheque or demand draft drawn in favour of "Central Road Research Institute, New Delhi and forwarded to the Secretary, Central Assessment Committee, at CRRJ, to meet the TA and DA expenses of the officers/staff of CRRJ in this connection. As and when this deposit is depleted further deposit will be requested for by CRRJ from the States.

6. EXECUTION OF CAC SCHEMES

The field execution of approved CAC Schemes will be carried out by the proposer organisations. The full cost of construction will be met by the proposer organisation, except where special approval of CAC exists for meeting the excess cost of construction over conventional specifications from the Risk Fund.

To qualify for coverage of financial risk in case of failure, or for meeting the excess cost of construction, from the Risk Fund, the execution of CAC Schemes has to be carried out in accordance with the procedure laid down by CAC failing which the same will no longer be valid.

A satisfactory Completion Certificate is essential for the financial cover for additional cost (over and above that of properly designed conventional specification) to be valid. Failing this, any advance for the purpose made to the executing agency from the Risk Fund is liable to refund. For financial cover against risk of failure to be operative, in addition to a satisfactory Completion Report, up-to-date submission of Service Performance Reports to the CAC Secretariat is also essential.

Actual amount in each case will be indicated by the Secretary, CAC at the time of communication of CAC Scheme approval.

6200 RESEARCH AND DEVELOPMENT

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
<u>6200.1.</u> <u>7300</u>	PL-30 (135/74 dt. 23.2.79	R & D activities of the Ministry— Guidelines for Research Agencies and list of R & D Schemes.	6200/1
6200.2.	PL-17 (4)/79 dt. 3.11.79	Constitution of Planning & Implementa- tion Groups for the R & D Schemes on Road Topics.	6200/5
<u>6200.3.</u> <u>170</u>	CRF/IRC/18 dt. 26.2.81	Setting up of a Research Development & Quality Promotion Cell at the HQs. Office at the CE in each States out of Cen- tral Road Fund (Allocation) Account.	See Code No. 170

No. PL-30 (135)/74

Dated the 23rd February, 1979

To

All ROs and ELOs of the Ministry

Sub : Research & Development activities of the Ministry

Please refer to Ministry's letter of even number dated the 15th September, 78, forwarding minutes of the last meeting of R & D Advisory Panel. At the meeting decision was taken (see Item 2 of minutes) to actively associate the Ministry's RO's and ELO's for keeping liaison and watching progress of the R&D schemes. In this connection copies of following documents are enclosed herewith :

- i) Guidelines for Research agencies (Appendix IA & IB)
- ii) List of R & D schemes in progress (Appendix II)
- iii) List of members of R & D Advisory Panel (Appendix III)
- iv) List of members of various P & I Groups (Appendix IV)

2. Copies of Ministry's sanction letters for various research projects are already being endorsed to each regional office. It is requested that in keeping with the recommendations of the R & D Advisory Panel, you may kindly keep close liaison with the research agencies concerned and monitor their progress regularly. A report on your observations may be sent to the Ministry periodically.

(Note : Appendix III & Appendix IV not printed)

APPENDIX-IA

OCTOBER 1977 (Revised)

GENERAL GUIDELINES FOR RESEARCH AGENCIES UNDERTAKING RESEARCH PROJECTS (PERTAINING TO ROADS) SPONSORED BY THE ROADS WING OF MINISTRY OF SHIPPING & TRANSPORT.

1. Background

The Ministry has a standing R & D Panel for identification of critical problem areas on which research may be undertaken with central finance. The Panel is headed by the Director General (Road Development) and has representatives from a wide cross section of highway profession. Selection of schemes by the Panel is done in the light of national priorities, taking into account the recommendations made by the Highway Research Board or other quarters such as the Public Works Departments, research laboratories, knowledgeable highway engineers, teaching institutions, Central Govt. Ministries etc.

To expedite and push the research projects, the R & D Panel has constituted a compact Steering Group which is able to meet more frequently.

Once a particular problem has been selected for investigation, a planning and Implementation Group is set up for formulation of the broad programme of work, preparation of preliminary cost estimate, general guidance during implementation, periodic review of the progress, and dissemination of the ultimate findings. Each Group is composed of operating officials, research specialists, representatives of industry, experts from universities, etc. so as to provide a broad cross-section of expertise.

2. Programme Formulation

The initial planning of the work programme, including the precise objectives of research, preliminary cost estimates methodology to be followed, etc. is carried out by the Planning and Implementation Groups. Wherever possible, the probable research agencies may be associated with planning at this stage.

The broad brush plan evolved by the Planning and Implementation Groups is the basis for further planning and costing by the selected research agency.

3. Project Estimates

After initial design of the research scheme, the Ministry will request the selected research agency/agencies for preparation of the detailed cost estimates. The estimates should provide for the needed additional personnel and equipment, laboratory consumables, cost of experimental sections, travel expenses, of the staff, etc. In certain cases, by specific agreement, the agencies may be required to bear a part of the cost, for instance equipment, staff, travelling expenses etc. Year-wise or stage-wise phasing of the expenditure must be clearly indicated in the project estimates finalised.

In the case of co-operative research projects, each agency is required to individually prepare a separate cost estimate on the basis of the work plan given by the Planning & Implementation Group.

Equipment, tools and plant specially purchased for a project may be redeployed by the Ministry after the project is over.

Recruitment of additional staff and their utilisation after completion of the project will be the responsibility of the research agencies. The Ministry will assume no liability of any kind on this account.

4. Principal Investigator

Research agency will be required to name a Principal Investigator for the study and take reasonable care that no change is made till the project is completed.

5. Project Implementation

Once the project estimate is sanctioned by the Ministry, the agency concerned will have to make the necessary arrangements for implementing the scheme within the agreed time schedule. Unless there are strong reasons, the Ministry will not accept proposals for purchase of extra equipment, or for bearing the cost of the staff beyond the work programme initially accepted. As far as possible, the liability of the staff should be incurred only after other arrangements have been sorted out.

6. Progress Reports

Quarterly progress reports are to be sent to the Ministry within 15 days of the previous quarter giving physical and financial progress in sufficient detail. All major items such as equipment, positioning of staff, construction of experimental sections, laboratory or field studies, findings till that date, etc. should be duly covered. For a better appreciation, it will be desirable that some specimen results are enclosed with the report.

Any difficulties or bottlenecks being experienced in implementation of the project must be clearly brought out in the quarterly reports.

Where any major deviation from the original plan of work appears inescapable, the research again should make a prompt reference to the Ministry for final decision.

(see para 12).

7. Monitoring of Progress

General administering and monitoring of the research projects will be the responsibility of staff looking after R & D in the Ministry's headquarter office who will maintain close liaison with the research agency and render all possible assistance in consultation with the Planning and Implementation Groups. Ministry's Regional Offices will also help in implementation of the project where required.

Apart from constant review by the Ministry's own staff, meetings of the concerned Planning and Implementation Groups will be convened frequently to evaluate the progress of work, determine the degree of compliance with the original plan of action, and solve outstanding problems.

Steering Group and the R & D Advisory Panel will be kept informed of the progress at their periodic meetings.

8. Reports about the Research Undertaken

If any significant findings emerge while the research is still in progress, the research agency may be requested to prepare a short interim report for dissemination.

After the contracted research is over in every respect, the research agency will be required to prepare a final report. The report should be prepared in a manner that it is easily understandable to highway administrators as well as practising highway engineers. For easy assimilation and dissemination, the following broad format is suggested:

- (i) Summary of findings and conclusions
- (ii) Introduction
- (iii) Objectives
- (iv) Plan of work
- (v) Observations
- (vi) Interpretation and discussion of results
- (vii) Conclusions
- (viii) Recommendations of follow-up action about application of results and further research.

Notes : Details of research techniques, calculations etc. should be presented in appendices as far as possible so as to keep the main report as short as possible.

The research agency should supply one copy of the report to each member of the concerned Planning and Implementation Group and 10 additional copies to the Ministry.

Where the project is of a co-operative nature involving more than one agency, the reports of the individual agencies will be consolidated into a composite report by the principal agency if nominated, or by the Ministry.

9. Acknowledgements

The interim and final reports should clearly mention on the front cover as well as suitably in the body of the report that the research in question was sponsored by the Roads Wing of Ministry of Shipping & Transport (if in collaboration with other agencies, this may also be mentioned). Contribution made by the Planning and Implementation Group should also be suitably acknowledged.

Technical papers based on the research should also contain similar credits.

10. Dissemination

The interim and final reports will be reviewed and evaluated by the concerned Planning and Implementation Groups who will advise the Ministry about the best manner of their dissemination. The Groups will also recommend how the research results could be translated for practical usage and the measures that could be taken to promote and stimulate their implementation.

Similarly the Groups will appraise the suggestions made in the reports about further research to be undertaken in the subject area.

11. Completion Certificate

A completion certificate based on the actual expenditure incurred duly verified by audit should be submitted to the Ministry within 3 months of completion of the project. Surplus funds, if any, shall be surrendered soon after the completion of the project and the completion certificate shall invariably indicate this.

12. Revised Estimate

As soon as it is anticipated that the cost of the scheme will exceed the sanctioned estimate, a revised estimate of the probable cost should be submitted to the Ministry and until such time the revised estimate has been sanctioned the expenditure restricted to the sanctioned amount. The revised estimate should be accompanied by a statement comparing the various provisions in the estimate as originally sanctioned and as revised, stating clearly the reasons for variations.

13. Propriety rights and Patents

The ultimate aim of research projects under the R & D programme of the Ministry is to make available fruits of research findings to

the entire engineering profession, subject of course to Ministry's discretion in this regard. Entire propriety rights to all data, computer programmes outcome/findings from the research works will rest with the Roads Wing, Ministry of Shipping & Transport, Government of India. No claim of copyright/patent/propriety rights by others will be valid, except in the case of sponsored schemes entrusted to national laboratories under the CSIR or Ministry of Shipping & Transport, like CRRI which will be governed by the CSIR/CRRI Regulations/guidelines.

14. Audit and Control of Expenditure

Private organisations/persons to whom research work is entrusted shall be subject to such accounting procedures and audit control as the Ministry may specify. Universities and autonomous societies like IIT's, under different Ministries of Government of India, will follow their own audit system in force at present as regards research schemes entrusted to them.

APPENDIX IB

GENERAL GUIDELINES FOR RESEARCH AGENCIES UNDERTAKING BRIDGE RESEARCH PROJECTS SPONSORED BY THE ROADS WING OF MINISTRY OF SHIPPING AND TRANSPORT

1. Background

The Ministry has a standing R & D Panel for identification of critical problem areas on which research may be undertaken with central finance. The Panel is headed by the Director General (Road Development) and has representatives from a wide cross section of highway profession. Selection of schemes by the Panel is done in the light of national priorities, taking into account the recommendations made by the Highway Research Board or other quarters such as the Public Works Departments, research laboratories, knowledgeable highway engineers, teaching institutions, Central Govt. Ministries, etc.

To expedite and push the research projects the R & D Panel has constituted a compact Steering Group which is able to meet more frequently.

Once a particular problem has been selected for investigation, Planning and Implementation Group is set up for formulation of the broad programme of work, preparation of preliminary cost estimate, general guidance during implementation, periodic review of the progress, and dissemination of the ultimate findings. Each Group is composed of operating officials, research specialists, representatives of industry, experts from universities, etc. so as to provide a broad cross-section of expertise.

2. Programme Formulation

The initial planning of the work programme, including the precise objectives of research, preliminary cost estimates, methodology to be followed, etc. is carried out by the Planning and Implementation Groups. Wherever possible, the probable research agencies may be associated with planning at this stage.

The broad brush plan evolved by the Planning and Implementation Groups is the basis for further planning and costing by the selected research agency.

3. Project Estimates

After initial design of the research scheme the Ministry will request the selected research agency/agencies for preparation of the detailed cost estimates. The estimates should provide for the needed additional personnel and equipment, laboratory consumables, cost of experimental sections, travel expenses of the staff, etc. In certain cases, by specific agreement, the agencies may be required to bear a part of the cost, for instance equipment, staff, travelling expenses etc. Year-wise or stage-wise phasing of expenditure must be clearly indicated in the project estimates finalised.

In the case of co-operative research projects, each agency is required to individually prepare a separate cost estimate on the basis of the work plan given by the Planning and Implementation Group.

Equipment, tools and plant specially purchased for a project may be redeployed by the Ministry after the project is over.

Recruitment of additional staff and their utilisation after completion of the projects will be the responsibility of the research agencies. The Ministry will assume no liability of any kind on this account.

4. Principal Investigator

Research agency will be required to name a Principal Investigator for the study and take reasonable care that no change is made till the project is completed.

5. Project Implementation

Once the project estimate is sanctioned by the Ministry the agency concerned will have to make the necessary arrangements for implementing the scheme within the agreed time schedule. Unless there are strong reasons, the Ministry will not accept proposals for purchase of extra equipment, or for bearing the cost of the staff beyond the work programme initially accepted. As far as possible, the liability of the staff should be incurred only after other arrangements have been sorted out.

6. Progress Reports

Quarterly progress reports are to be sent to the Ministry within 15 days of the previous quarter giving physical and financial progress in sufficient detail. All major items such as equipment, positioning of staff, construction of experimental sections, laboratory or field studies, findings till that date, etc. should be duly covered. For a better appreciation, it will be desirable that some specimen results are enclosed with the report.

Any difficulties or bottlenecks being experienced in implementation of the project must be clearly brought out in the quarterly reports.

Where any major deviation from the original plan of work appears inescapable, the research agency should make a prompt reference to the Ministry for final decision.

7. Monitoring of Progress

General administering and monitoring of the research projects will be the responsibility of staff looking after R & D in the Ministry's headquarter office who will maintain close liaison with the research agency and render all possible assistance in consultation with the Planning and Implementation Groups. Ministry's Regional Offices will also help in implementation of the project where required.

Apart from constant review by the Ministry's own staff meetings of the concerned Planning and Implementation Groups will be convened frequently to evaluate the progress of work, determine the degree of compliance with the original plan of action, and solve outstanding problems.

Steering Group and the R & D Advisory Panel will be kept informed of the progress at their periodic meetings.

8. Reports about the Research Undertaken

If any significant findings emerge while the research is still in progress, the research agency may be requested to prepare a short interim report for dissemination.

After the contracted research is over in every respect, the research agency will be required to prepare a final report. The report should be prepared in a manner that it is easily understandable to highway administrators as well as practising bridge engineers. For easy assimilation and dissemination, the following broad format is suggested :—

- (i) Summary of findings and conclusions
- (ii) Introduction, stating the terms of reference, etc. and background and need leading to the selection of the topic for research:
- (iii) Objectives defining briefly the problems:
- (iv) State of Art/literature review: A brief survey of the present status and critical review shall be made therein.
- (v) Plan of work : Describing the methodology proposed instrumentation set up, laboratory and field experiments to be taken up, etc. inclusive of analytical work, if any, to be done.
- (vi) Observation : The observed data should be presented in an agreed format, capable of appreciation and analysis.
- (vii) Interpretation and discussion of results.
- (viii) Conclusions
- (ix) Recommendations of follow-up action about application of results and further research.

Notes: Details of research techniques, calculations etc. should be presented in appendices as far as possible so as to keep the main report as short as possible.

The research agency should supply one copy of the report to each member of the concerned Planning and Implementation Group and 10 additional copies to the Ministry.

Where the project is of a co-operative nature involving more than one agency, the reports of the individual agencies will be consolidated into a composite report by the Principal agency if nominated, or by the Ministry.

9. Acknowledgements

The interim and final reports should clearly mention on the front cover as well as suitably in the body of the report that the research in question was sponsored by the Roads Wing of Ministry of Shipping & Transport (if in collaboration with other agencies, this may also be mentioned). Contribution made by the Planning and Implementation Group should also be suitably acknowledged.

Technical papers based on the research should also contain similar credits.

10. Dissemination

The interim and final reports will be reviewed and evaluated by the concerned Planning and Implementation Group, who will advise the Ministry about the best manner of their dissemination. The Groups will also recommend how the research results could be translated for practical usage and the measures that could be taken to promote and stimulate their implementation.

Similarly the Groups will appraise the suggestions made in the report about further research to be undertaken in the subject area.

11. Completion Certificate

The completion certificate based on the actual expenditure incurred duly credited shall be submitted to this Office within 3 months after the completion of the project. Surplus funds, if any, shall be surrendered soon after the completion of the project and the completion certificate shall invariably indicate this.

12. Revised Estimate

As soon as it is anticipated that the cost of the scheme will exceed the sanctioned estimate a revised estimate of the probable cost shall be submitted to this office and the expenditure shall be restricted to the sanctioned amount until such time as revised estimate is sanctioned. The revised estimate shall be accompanied with a statement of comparison of various provisions made in the project estimate as originally sanctioned and as revised stating clearly the reasons for variations therein.

13. Propriety and Patents

The ultimate aim of the research projects under the R & D schemes of this Ministry is to make available the fruits of the research findings to the entire engineering professions, subject to any discretion of this office. Entire propriety to all the data/computer programme outcome/findings of the research work will rest with the Roads Wing, Ministry of Shipping and Transport, Government of India. No claim of copy right/patent/propriety by others will be valid, except in the case of works entrusted to national laboratories under or Ministry of Shipping and Transport like C.R.R.I. the CSIR as sponsored schemes which shall be governed by the CSIR/C.R.R.I. Regulations/guidelines.

14. Audit and Control of Expenditure

Private organisations/persons to whom research work is entrusted shall be subject to such accounting and audit control and procedures as the Ministry may deem fit to impose. Universities and autonomous societies like I.I.T's under different Ministries of Government of India will extend their audit system at present in force to research schemes entrusted to them.

APPENDIX II

R & D SCHEMES APPROVED BY THE R & D PANEL FOR BEING TAKEN UP IN THE CENTRAL ROAD SECTOR DURING 1976-77.

I.	R & D Schemes on Road Topics	TITLE OF SCHEME
R. 1	Survey and evaluation of locally available materials.	
	Highway Planning and Economic Studies	
R. 2	Study of spectrum of axle loads on roads in different regions.	

- R.3 To develop data on the growth of highway traffic in different regions for different categories of roads
Highway Design Studies
- R.4 **Highway Design Study**
(A) Road User Cost-Study
(B) Road Life Studies
- R.5 Studies on the critical moisture content for the evaluation of subgrade strength for pavement design under different conditions.
- R.6 Development of Methods such as Benkelman Beam Deflection method for evaluation of structural capacity of existing flexible pavements.
- R.7 Study of the efficacy of various measures including drains for lowering/cutting off water table
- R.8 **Studies on Highway Materials and Construction**
Criteria for the choice of the type of bituminous surface courses for flexible pavements
- R.9* Construction of roads on expansive clays
Maintenance
- R.10* Evolving of economic maintenance methods and to fix stages at which up-grading is needed for earth roads in different soil zones
- II. **R & D SCHEMES ON BRIDGE TOPICS**
- B.1 To evolve a rational method of estimating resistance of soil around well foundations of bridges subjected to horizontal loads, moments, and varying direct loads.
- B.2 Estimation of max. discharge for the design of waterway of bridges and the determination of bed scour for the design of foundations and training works the extent of afflux etc.
- B.3 Experimental analysis of box cells of variable cross-section in the cantilever type of bridges laying down criteria in their design
- B.4 Expansion joints for road bridges
- B.5 Studies on Splicing of pre-cast piles
- B.6* Corrosion and corrosion protection of concrete bridges in Marine Environment
- B.7* Determination of live load surcharge behind bridge abutments due to IRC loading.

* These schemes were approved by obtaining concurrence from members of R & D Panel by correspondence.

NO. PL-17 (4)/79

Dated the 3rd November, 1979

Sub : Constitution of Planning and Implementation Groups for the Research and Development Schemes on road topics included in the Central Road Sector Programme

In the year 1976-77, the Ministry launched an R&D Programme consisting of priority schemes on road and bridge topics. For implementing these schemes in a systematic manner, the Ministry has a three-tier system comprising an Advisory Panel, a Steering Group and Planning & Implementation Groups performing the following functions :

Advisory Panel	— To advise on all matters of Research and Development including selection of projects.
Steering Group	— A compact group drawn from the Advisory Panel to expedite and push forward the projects and to supervise and direct the Planning and Implementation groups.
Planning & Implementation Groups	— These will work out details of the research projects and estimates, recommend the agencies to execute the work, lay down the job requirement of each agency and afford general technical guidance during implementation of the schemes at intervals.

2. For each project in the first package of R&D schemes taken up in the year 1976-77, a P&I Group for preparing details of research etc. was constituted with the approval of the Steering Group. You are a member of the P&I Groups for the projects.

3. In the meantime, on the recommendations of HRB, the R&D Advisory Panel has approved a second package of 21 priority schemes for being taken up in Central Roads Sector during the Plan period 1978-83. Of these 18 are on road topics, vide list at Appendix I. In view of the large number of road research schemes (10 of first package and 18 of second package) to be handled currently, it has been decided that the existing P&I Groups, suitably enlarged as necessary, may look after the new schemes falling within their area of expertise. The enlarged composition of the P&I Groups of the first package schemes as also the names of the second schemes which are looked after in addition as approved by the Steering Group are shown in Appendix II. For 3 of the new schemes (i.e. R-11, R-13, and R-14) however, new P&I Group will be constituted as these schemes could not be tied with any of the existing P&I Groups. As may be seen, your name has been included in the P&I Groups of schemes.

4. Members of P&I Groups who are serving in Government organisations, their TA/DA shall be met by the organisations where they are employed. In case of members from teaching institutions and other similar organisations where the employers concerned have expressed their inability to meet the TA/DA expenses involved in participation of their representatives in the meetings of the aforesaid groups, the expenditure on TA/DA of such persons according to their entitlements shall be met by the Central Government out of the provision made for the research and development scheme.

5. It is hoped that you will continue to extend your valuable cooperation and your association with the P&I Groups which presently stand enlarged in composition and scope of work. A line in reply confirming this will be highly appreciated, and this may be sent to us as early as possible, preferably within 15 days of issue of this letter.

Encl : As above

copy for information and necessary action to :

1. Secretary, PWD Rajasthan, Jaipur
2. Chief Engineer, PWD (B&C) Sachivalaya, Gandhinagar, Gujarat State
3. Secretary PWD, Sachivalaya, Gandhinagar, Gujarat State
4. Secretary, Andhra Pradesh PWD, Hyderabad
5. Chief Engineer (H&RW) Highway Department, Madras-600005
6. Secretary, Tamilnadu Transport Deptt., Madras-600009
7. Secretary, Maharashtra PWD, Sachivalaya, Bombay
8. Secretary, Bihar PWD, Patna
9. Chief Engineer, Uttar Pradesh PWD, Lucknow
10. Secretary, Uttar Pradesh PWD, Lucknow
11. Director, Central Road Research Institute, Mathura Road, New Delhi
12. Director, Transport Research, Jamnagar House, New Delhi-110011
13. Secretary, West Bengal PWD, Calcutta
14. Secretary, Kerala PWD, Trivandrum
15. Director, IIT Kharagpur, West Bengal
16. Vice-Chancellor, University of Roorkee, Uttar Pradesh
17. Secretary, Haryana PWD, Chandigarh
18. Secretary, Himachal Pradesh PWD, Simla
19. Secretary, Tamilnadu PWD, Madras
20. Director General Border Roads, Kashmir House, New Delhi
21. Director, IIT Hauz Khas, New Delhi

APPENDIX I

NEW R&D SCHEME APPROVED BY THE R&D ADVISORY PANEL FOR BEING TAKEN UP DURING 1978-83.

Project Code No.	Title of project	Estd. cost (Rs in lacs)	Estd. duration (Years)	The ongoing project, the P&I Group of which will look after the scheme
1	2	3	4	5
HIGHWAY PLANNING & ECONOMIC STUDIES				
R-11	Transportation modelling on regional basis for the truck route system.	15	3	New Group
R-12	Study of the utilisation of bypasses on National Highways	15	3	R-3
R-13	Effect on capacity of National Highways with segregation of slow moving traffic.	5	2	Same new Group as for R-11.
R-14	Increase in capacity of roads in Urban area by provision of adequate lighting	5	2	-do-
R-15	Case studies on ribbon development along the trunk route system.	15	3	R-3
R-16	Maintenance cost studies for pavement under different conditions in order to fix rational norms for maintenance operation.	20	5	R-8
R-3 Phase II	To develop data on growth of highway traffic in different regions for different categories of roads-Phase II.	30	3	This is in continuation of the sanctioned phase I studies occurring as R-3 under first package.
R-17	Case studies to determine extent and scale of road-side amenities like truck parks, lay-byes etc.	10	3	R-3
R-18	HIGHWAY DESIGN STUDIES :			
	Geometric design studies-studies on horizontal friction factors, perception and brake reaction time	20	3	R-6

	of drivers, transverse placement of vehicles and sight distance requirements.			
R-19	Highway Design study, part B Road life studies	80	5	R-8
R-20	Experimental studies on contribution made by shoulders to the structural capacity and performance of flexible pavements.	20	5	R-5
R-21	Studies about high embankment construction in stages	10	5	R-9
R-22	Pre-compression of compressible strata by use of sand drains	10	5	R-9

HIGHWAY MATERIALS & CONSTRUCTION

R-23	Determination of 'E' of pavement layers and sub-grade by vibratory testing in the field.	10	3	R-6
R-24	Determination of 'E' and fatigue characteristics of asphaltic mixes, lean concrete, lime-fly ash aggregate and lime-gravel mixes in laboratory	15	3	R-6

C.R.F. WORKS

R-25	Determination of compaction curves for soils with compactions equipment manufactured in the country			R-9
R-26	Study of the relative effects of single and tandem axles loads on pavement design			R-6
R-27	To develop comprehensive data on the level of surface finish and quality control obtained for different layers under different conditions.			R-8

APPENDIX II

Composition of the Planning & Implementation Group for the Research Schemes approved by the R&D Advisory Panel (Roads Schemes)

Scheme Number	First package of R&D Schemes		Second package of R&D scheme which will have the same R&I Group as in Col.3
	Title of scheme	Proposed revised composition of the R & I Group	
1	2	3	4
R-1	Survey & evaluation of locally available materials.	1. Sh. N. Sivaguru, CE (Stds/R) Min. of S&T... (Convenor) 2. Sh. U.T. Khemani, CE, M.P. 3. Sh. Patnaik, CE (NH) Orissa 4. C.E. Rajasthan 5. Sh. P.J. Mehta, CE Gujarat (Alternate-Director GERI) 6. CE, NH Andhra Pradesh 7. Prof. G.M. Andavan, Director, HRS Madras 8. Rep. DGBR (Sh. Balbir Singh) 9. Sh. R.L. Nanda, Scientist, CRRI. 10. Sh. B.K. Duara, G.S.I. 11. Col. Avtar Singh	
R-2	Study of spectrum of axle loads on roads in different regions.	1. Sh. R.P. Sikka, CE, MOT (Convenor) 2. Sh. P.M. Nadgauda, CE, Maharashtra. 3. Sh. P. Bhagat, Addl. CE (NH), Bihar 4. Sh. S.D. Vidyarthi, Director, U.P. PWD, Research Institute 5. Dr. R.K. Ghosh, CRRI	
R-3	To develop data on the growth of highway traffic in different region for different categories of roads.	1. Sh. R.P. Sikka, CE, MOT (Convenor) 2. Sh. P.M. Nadgauda, CE Maharashtra 3. Prof. M.S.V. Rao, School of Planning & Architecture 4. Dr. A.C. Sarna, CRRI 5. Dr. V.V.P. Rao, D.T.R. 6. Sh. A.K. Das Gupta, E-in-C, WB 7. Director, HRS Madras 8. Director, UPRI, Lucknow 9. Director, GERI, Baroda 10. CE, Haryana	R-12: study of the utilisation on NHs. R-15: case studies of ribbon development along with the trunk route system. R-17: Case studies to determine extent and scale of roadside amenities like truck parks, laybys etc.

R-4	Highway Design Study a Road user cost study	No formal P&I Group	R-3 Phase II
R-5	Studies on the critical moisture content for the evaluation of structural strength for pavement design under different conditions.	1. Sh. N. Sivaguru, CE (Stds/R) MOT (Convenor) 2. Sh. B.K. Roy, SE (Stds/R) MOT. 3. Dr. Bansi Lal, CRRI 4. Prof. G.M. Andavan, Director HRS, Madras 5. CE, West Bengal 6. CE (NH) Kerala 7. Sh. R.T. Atre, CE, Maharashtra 8. Dr. Alam Singh, University of Jodhpur 9. Dr. R.C. Sonpal, L.D. College, Ahmedabad 10. Dr. B.V. Ranganathan, I.I.S., Bangalore	R-20 : Experimental studies on contribution made by shoulders to the structural capacity & performance of flexible pavements.
R-6	Development of methods such as Benkelman Beam Deflection method for evaluation of structural capacity of existing flexible pavement.	1. Sh. N. Sivaguru, CE (Stds/R) (Convenor) 2. Sh. A.K. Bhattacharya, SE (MOT) 3. Sh. P. Bhagat, Addl. CE, Bihar 4. Dr. M.P. Dhir, CRRI 5. Prof. G.M. Andavan, Director, HRS, Madras. 6. Dr. C.E.G. Justo, Bangalore 7. Sh. S.D. Vidyarthi, Director, UP PWD, Research Institute 8. Sh. S.R. Kundu, D.T.R. 9. Dr. S. Koteswar Rao, I.I.T. Kharagpur 10. Dr. S.K. Khanna, University of Roorkee 11. Prof. Ranganathan. 12. C.E. Rajasthan. 13. Director, G.I.R.I. Baroda 14. Director, CRRI.	R-12 Geometric design studies on horizontal friction factors, perception and brake reaction time of drivers, transverse placements of vehicles and sight distance requirements. R-23 : Determination of 'E' of pavement layers and sub-grade by vibratory testing in the field. R-24 : Determination of 'E' & fatigue characteristics of asphaltic mixes, lean concrete, lime fly-ash aggregate & lime-gravel mixes in laboratory. R-26 : Study of the relative effect of single and tandem axle loads on pavements designs.
R-7	Study of the efficacy of various measures including drains for lowering/cutting off water table.	1. Sh. N. Sivaguru, CE (Stds/R) MOT (Convenor) 2. Sh. B.K. Roy, SE (Stds/R) MOT 3. Sh. T.K. Natarajan, CRRI 4. CE (NH), Punjab 5. Dr. S.K. Khanna, University of Roorkee 6. CE, West Bengal	
R-8	Criteria for the choice of the type of bituminous surface courses for flexible pavements.	1. Sh. N. Sivaguru, CE (Stds/R), MOT (Convenor) 2. Sh. A.K. Bhattacharya, SE (Stds/R) MOT 3. Prof. C.G. Swaminathan, Director, CRRI 4. Sh. P.R. Bendra, Bharat Refineries 5. Sh. I.C. Gupta, E-in-C, Haryana 6. Sh. E.C. Chandrasekharan, CE (NH), Tamil Nadu (Alternate-Director, HRS) 7. Sh. R.T. Atre, CE, Maharashtra 8. Brig. S.S. Ahluwalia, DGBR 9. Sh. N.H. Keshwani, CE, MOT. 10. Sh. M.B. Jayawant, CE, MOT 11. Sh. V.K. Arora, SE, MOT 12. Dr. M.P. Dhir, CRRI 13. CE (NH) UP (Alternate Director UPRI) 14. Dr. R.K. Ghosh, CRRI	R-19 : Highway Design study part B-Road Life Studies. R-16 : Maintenance & coast studies for pavement under different conditions in order to fix rational

norms for maintenance operation.

R-27 : To develop comprehensive data on the level of surface finish & quality control obtained for different layers under different condition

R-21 : Studies about high embankment construction in stages.

R-22 : Pre-compression of compressible strata by use of sand drains.

R-25 : Determination of compaction curves for soils with compaction equipment manufactured in the country.

R-9	Construction of Roads in Expansive clays.	1. Sh. N. Sivaguru CE (Stds/R) MOT (Convenor) 2. CE, Andhra Pradesh 3. Sh. R.T. Atre, CE, Maharashtra 4. Sh. T.K. Natarajan CRRI. 5. CE (NH) M.P. 6. Prof. B.V. Ranganathan, I.I.S. Bangalore. 7. Dr. G.V. Rao, IIT, Delhi 8. Sh. A.K. Bhattacharya, SE (Stds/R) MOT 9. Dr. Bhandari 10. Director, GERI, Baroda. 11. Sh. N. Sen, CE (Retd). MOT
R-10	Evolving of Economic Maintenance methods & to fix stages at which upgrading is needed for earth roads in different soil zones.	1. Sh. N. Sivaguru, CE (Stds/R) (Convenor) 2. Sh. N.H. Keshwani, CE, MOT 3. CE (NH), Rajasthan. 4. Sh. L.C. Gupta, E-in-C, Haryana 5. CE (NH) Karnataka. 6. Sh. R.T. Atre, CE, Maharashtra 7. Dr. M.P. Dhir, CRRI. 8. Sh. S.L. Goel/Director, UPRI. 9. Sh. A.K. Bhattacharya, SE (Stds/R) MOT.

New P & I Group

R-11	Transportation modelling on regional basis for the trunk route system	1. Sh. R.P. Sikka, CE, MOT (Convenor) 2. Prof. M.S.V. Rao, School of Planning & Architecture. 3. Dr. A.C. Sarna, CRRI. 4. Sh. L.R. Kadiyali, CRRI 5. Dr. N.S. Srinivasan, NATPAC 6. Dr. Raghvachari, Regional Engineering College, Warrangal. 7. Rep. Planning Commission. 8. Sh. S.M. Parulkar, Bombay Municipal Corporation.
R-13	Effect on capacity of National Highways with segregation of slow moving traffic.	
R-14	Increase in capacity of roads in urban areas by provision of adequate lighting.	

6300 RESEARCH APPLICATION

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
6300.1.	PL-50 (16)/71-SP dt. 8.5.75	Utilisation of fly ash in Road Construc- tion	6300/1
6300.2.	PL-50 (3)/76-SP dt. 8.3.76	Utilisation of fly ash in Road Construc- tion	6300/5
6300.3.	KW/RD/8/WB/77-OR dt. 17.3.83	Dissemination of Results of Study on Spectrum of Axle Loads on NHs	6300/5
6300.4.	PL-17 (5)/76 dt. 4.4.84	Utilisation of Results of Research Scheme on Survey & Evaluation of Locally available Materials	6200/7

No. PL-50 (16)/71-SP

Dated the 8th May, 1975

To

All State Govts. Administrations of Union Territories (Deptts. dealing with Roads)

Sub : Utilisation of Fly Ash in Road Construction

I am directed to say that the question of utilisation of Fly Ash in Road Construction has been engaging the attention of the Government of India for quite sometime and they set up a Technical Group also to go into it. Thereafter, the entire matter was considered by the Committee of Economic Secretaries. As a result certain instructions on the subject have been framed which are enclosed for immediate implementation by the State Governments.

2. I am to request that the contents of the enclosed instructions may kindly be given wide publicity among all officers of your Department engaged on National Highways/Centrally aided works for compliance. Similar instructions may be issued to the Staff engaged on road works in the State Sector also. In particular I am to draw your specific attention to paras 4 and 5 of the instructions at Annexure I, which need immediate action.

ANNEXURE I

Enclosures to Ministry's letter No. PL-50 (16)/71-SP Dated the 8th May, 1975

Instructions to State Governments regarding utilisation of Fly-ash in Road Construction.

Sub : Utilisation of fly ash in road construction

Fly ash is an industrial waste from thermal power stations using pulverised coal as boiler fuel. At present about 6-7 million tonnes of fly ash is produced annually in the country and this figure is expected to rise to over 12 million tonnes in the next ten years. Disposal of this huge quantity of fly ash which gets easily air borne and thus is a health hazard to the community, has grown into a pressing problem. On the other hand both laboratory and field studies have confirmed that this waster material can be used profitably in road construction by taking advantage of its pozzolanic action with lime leading to economy in cost.

2. Despite its known merits, utilisation of fly ash for road construction in this country has been very limited. This could be attributed to two main reasons, namely :—

- (i) non-availability of fly ash of assured quality among other factors due to the mixing of fly ash with coarse bottom ash at the extraction stage in power plants, and
- (ii) virtual absence of a marketing system assuring to the consumers supply of fly ash as per ISI specifications.

For overcoming these deficiencies simultaneous action is being taken to collect fly ash in an unmixed form and to market it with assurance about its quality. With these measures coming into operation, it is felt that there should be no difficulty in greater utilisation of fly ash for road works.

3. To propagate the use of fly ash on a wider scale, the Central Assessment Committee under this Ministry has finalised some specifications using this material:—

- (i) lime-fly ash soil stabilisation;
- (ii) lime-fly ash concrete;
- (iii) lean cement-fly ash concrete; and
- (iv) cement-fly ash concrete.

Brief notes giving essential features of these specifications as approved by the CAC are enclosed at appendix II to V. The CAC is taking further steps towards popularising these specifications. Indian Standards Institution has already laid down quality requirements of fly ash vide IS : 3812 (Part I) "Specification for Fly Ash for Use as Pozzolana" and IS : 3812 (Part II) "Specification for Fly Ash for Use as Admixture for Concrete" and IS : 3812 (Part III) "Specification for fly Ash for Use as Fine Aggregate for Mortar and Concrete." IS : 3812 (Part I) will apply to specification (iv) above, IS : 3812 (Part II) to specifications (ii) and (iii) above and IS : 3812 (Part III) to specification (i).

4. Out of the above specifications one that can be put into practice immediately is stabilisation of alluvial soil with lime and fly ash. This is akin to lime stabilisation except that a percentage of fly ash is incorporated along with lime. Laboratory studies and field trials have shown that this specification can be profitably employed for construction of sub-base on all classes of roads, and even as a base on lightly trafficked roads. As a positive step towards exploiting the benefits of this specification, it has been decided by the Committee of Economic Secretaries that for construction of sub-bases on National Highway Works, where these jobs fall within economic orbit of the thermal power stations, lime-fly ash stabilisation should be increasingly used in place of conventional granular materials like brick soling and over-size W.B.M. Proposals for National Highway works should in future be framed keeping this requirement in view. Similarly it has been decided that lime fly ash stabilisation should be used as much as feasible for the construction of sub-base/base courses on roads under the control of State Governments.

5. For actual application of the above specification on specific works, it will be necessary to determine mix proportions using local soil

and available lime/fly ash. This could be done through the State laboratory/Central Road Research Institute/taking design factors into consideration.

APPENDIX II

ENCLOSURE TO ROADS WING'S LETTER NO. PL-50 (16)/71 DATED THE 8th MAY, 1975
RECOMMENDED PRACTICE FOR LIME FLY ASH STABILIZED SOIL AS SUB BASE IN PAVEMENT
CONSTRUCTION

(As finalised by the Central Assessment Committee)

1. Introduction:

In many parts of the country fly ash is available as a waste product from the Thermal Power Plants. This recommended practice describes a method of utilising fly ash for stabilisation of soils with the help of lime so as to replace the soling or oversize metalling in sub-base course of the pavement.

2. Description :

This work consists of stabilising soil with a mixture of lime and fly ash for use as a sub-base course in road pavements.

3. Design :

The thickness of the sub-base should be designed as per Indian Roads Congress-37:1970 entitled "Guidelines for the Design of Flexible pavements". The C.B.R. value of the stabilized soil is to be determined in the laboratory for pavement design purposes. It has been observed that soils stabilized with lime fly ash mixture give a soaked laboratory C.B.R. value of 40-70 which should yield a field soaked C.B.R. value of 20-35. A typical mix proportion of such a mix is given in para 5.1.

4. Materials :

4.1. Soil : Normally soils with a Plasticity Index (PI) between 5 and 20 are suitable. This technique may also be applied to soils having PI value beyond these limits provided detailed investigations show that these will be suitable.

4.2. Lime : Normally lime used in the stabilization works should have a purity (Ca O plus Mg O content) of not less than 60% when tested in accordance with IS : 1514.

4.3. Fly ash : Fly ash should conform to I.S. 3812 (Part III)—1966.

4.4. Water : Water used for both mixing and curing the stabilized soil should be clean and free from injurious amount of deleterious matter. Potable water is generally considered satisfactory for mixing and curing lime fly ash stabilized soil.

5. Mix Proportions:

5.1. The mix proportion should be determined through laboratory tests meeting the strength requirements (see para 3 above). A typical mix proportion of soil, lime, fly ash is given below :

Soil :	—	85 parts by weight
Lime :	—	3 parts by weight (based on 80% purity of lime)
Fly ash:	—	12 parts by weight

5.2. Water : The quantity of water should be as per the O.M.C. requirements determined on soil, lime fly ash mixture by Proctor density method.

6. Construction :

Lime—Fly ash stabilized soil utilizes the same construction technique as used for lime or cement stabilisation. It is preferable that mixing is done by mechanical plants either of single pass or multiple pass type. Where such plants are not available, manual method may be adopted with rigorous control over quality of construction. In the manual method, the soil is pulverised by means of crowbars, pick axes, bullock-drawn ploughs etc. and deposited on the road bed in stacks of suitable size about 30 cm in height. Water in requisite quantities may be sprinkled on the soil for aiding pulverisation. The degree of pulverisation should be as given in the below table.

Sieve designation	Percent by wt. passing the sieve.
25mm	100
4.75 mm	60

On the pulverised soil stacks, lime and fly ash in a thoroughly mixed form and in requisite quantities should be spread uniformly and mixed by cutting with spades till the whole mass is uniform. The mixed soil should then be spread over the prepared sub-grade to the required thickness and rolled. Before rolling the moisture content should be adjusted to be within +1% and -2% of O.M.C.

7. Rolling:

Rolling should be done with 8-10 tonne roller. Rolling is continued till the required density (100% of Lab. Proctor density) and a smooth surface is obtained without leaving any roller marks on the surface.

8. Curing:

The compacted surface should be cured for a minimum period of 7 days before the next layer is placed. Curing is done by sprinkling water over the surface 5 or 6 times a day. The surface should not be allowed to dry during the curing period. Curing by ponding should not be adopted.

(Enclosure to Roads Wing's letter No. PL-50 (16)/71 Dated the 8th May, 1975)

RECOMENDED PRACTICE FOR LIME-FLY ASH CONCRETE (As finalised by the Central Assessment Committee)

1. Introduction:

The following is the recommended practice for lime-fly ash concrete which can be used in pavement as base/sub-base in flexible and rigid pavement construction. This is particularly useful as a base course in heavy rainfall areas or in black cotton soil areas when laid over lime stabilized black cotton soil.

2. Description:

This work consists of providing lime-fly ash concrete as sub-base or base course in flexible or rigid pavement construction.

3. Design:

3.1. **Thickness:** The thickness of the base/sub base for flexible pavements is to be designed as per C.B.R. method of design (Indian Roads Congress : 37-1970) "Guidelines for Design of Flexible Pavements", with the adoption of an equivalency factor of 1.25 to 1.5 depending on the discretion of the designer for lime fly-ash concrete and then if need be, checking the load factor of lime fly ash concrete slab through Meyerhof equation for ultimate load which would take care of both flexible and semi-rigid pavement design considerations. For sub-base under rigid pavements, the pavement is to be designed as per Indian Roads Congress : 58-1974. "Guidelines for the Design of Rigid Pavements for Highways". In any case the thickness of the layer should not be less than 10 cm.

4. Materials:

4.1. **Lime:** Lime used in these works should have a purity of not less than 60% when tested in accordance with IS : 1514.

4.2. **Fly ash:** Fly ash should conform to IS : 3812 (Part II)-1966.

4.3. **Coarse and Fine Aggregates :** Should conform to I.S. 383-1970.

4.4. **Water :** Water used for both mixing and curing the lime-fly ash concrete shall be clean and free from injurious amount of deleterious matter. Potable water is generally considered satisfactory.

5. Strength and Mix Proportions:

The 28 day compressive strength of lime-fly ash concrete should be in the range of 40-60 kg/cm². The actual mix to be used should be designed in the laboratory by trial and error.

Guidance about the suitable mix proportion to be used in preparation of Lime Fly ash concrete utilising good quality crushed stone, medium coarse sand and fly ash can be had from the following typical mix.

Typical Mix Proportion by weight :

Lime	—	1 Part (based on 80% purity of lime)
Fly ash	—	2 parts
Fine Agg.	—	2.7 parts
Coarse Agg.	—	6.3. parts
Water	—	11% by weight on dry mix.

6. Construction:

The construction technique for lime-fly ash concrete bases is similar to cement concrete construction in respect of batching, mixing and placement excepting compaction. The compaction of the mix is done by rolling with 8-10 tonne roller.

7. Curing:

The compacted surface should be cured for a minimum period of 7 days before the next layer is placed. Curing is done by sprinkling water 5 or 6 times a day, over the surface. The surface should not be allowed to dry during the curing period. Curing by ponding should not be adopted.

8. Surfacing:

Rigid pavement can be laid directly over the Lime Fly ash concrete bases. In case of flexible pavements, a minimum cover 10 cm thick consisting of either W.B.M. or any bitumen-bound layer should be provided before laying the wearing surface.

(Enclosure to Roads Wing's letter No. PL-50 (16)/71 dated the 8th May, 1975).

RECOMMENDED PRACTICE FOR LEAN CEMENT-FLY ASH CONCRETE (As finalised by the Central Assessment Committee)

1. Introduction:

Lean cement-fly ash concrete can be used in all constructions where lean cement concrete is used. It can be used as sub-base/base course in flexible and rigid pavement construction. Addition of fly ash in lean cement concrete mixes, decreases bleeding and segregation, improves plasticity and cohesiveness and permits easier placing and finishing of concrete.

2. Description:

This work consists of providing lean cement-fly ash concrete as sub-base or base course in flexible or rigid pavement construction. With suitably designed mixes of such concrete, it is possible to achieve substantial saving in cement to the extent of 35-40 per cent compared to conventional lean concrete mixes.

3. Design:

3.1. **Thickness :** The layer thickness for flexible pavements is to be designed as per Indian Roads Congress-37-1970 "Guidelines for the design of Flexible Pavements", taking the equivalency factor of lean-cement fly ash concrete in terms of granular material such as W.B.M. in the range of 1.25 to 1.5, depending on the designer's discretion and then if need be, checking the load factor of the lean concrete slab through Meyerhof equation for ultimate load which would take care of both flexible and semi-rigid pavement design considerations. For sub-base under rigid pavements, the pavement is to be designed as per Indian Roads Congress-58-1974, "Guidelines for the design of Rigid Pavements for Highways". In any case, the thickness of the layer should not be less than 10 cm.

4. Materials:

4.1. **Cement :** Should conform to I.S. 269-1967.

4.2. **Fly ash :** Should conform to I.S. 3812 (Part II)-1966 "Specification for Fly ash, Part II for use as admixture for concrete".

4.3. **Coarse and Fine Aggregate :** Should conform to I.S. 383-1970.

4.4. **Water :** Water used for both mixing and curing should be clean and free from injurious amount of deleterious matter. Potable water is generally considered satisfactory.

5. Strength and Mix Proportions:

5.1. The 28 day compressive strength of lean cement-fly ash concrete should be in the range of 40-60 kg/cm². The actual mix to be used should be designed in the laboratory by trial and error.

Guidance about the suitable mix proportions to be used in preparation of lean cement-fly ash concrete utilising good quality crushed stone, medium coarse sand and fly ash can be had from the following typical mix.

Typical mix proportion by weight :

Cement	...	1 part
Sand	...	3.5 parts
Fly ash	...	3.5 n parts
		(where n = ratio of the specific gravities of fly ash and sand which usually ranges between 0.8 and 0.85)
coarse aggregate	...	14 parts

5.2. **Water requirements :** Because of higher specific surface of the fly ash, the water content required will be substantially more than ordinary Lean Cement Concrete, in order to keep the same workability. A water cement ratio of the order of 2.2 is usually found suitable.

6. Construction:

Lean cement fly ash concrete is required to be mixed in a concrete mixer and compacted by rolling with 8.10 tonne roller as is done in the case of Lean Cement Concrete.

7. Curing:

The compacted surface should be cured for a minimum period of 7 days before the next layer is placed. Curing is done by sprinkling water 5 or 6 times a day, over the surface. The surface should not be allowed to dry during the curing period.

8. Surfacing:

Rigid pavement can be laid directly over the lean cement-fly ash concrete bases. In case of flexible pavements, a minimum cover of 10 cm thick consisting of either W.B.M. or any bitumen-bound layer should be provided before laying the wearing surface.

APPENDIX V

Enclosure to Roads Wing's Letter No. PL-50 (16)/71, Dated the 8th May, 1975

RECOMMENDED PRACTICE FOR CEMENT FLY-ASH CONCRETE

(As finalised by the Central Assessment Committee)

1. Introduction:

Cement-Fly ash concrete consists of cement concrete in which upto 20% of cement is replaced by fly-ash. Cement fly-ash concrete can be used in all paving works where plain cement concrete is permissible. By adopting proper mix design method, more economical mixes can be produced with cement fly ash concrete as compared to plain cement concrete, for the same design strength.

2. Design:

2.1. **Thickness :** The thickness of cement-fly ash concrete slab should be designed as per Indian Roads Congress : 37-1970 "Guidelines for the design of Rigid Pavements for Highways".

2.2. **Mix-design :** The mix is to be designed on the basis of absolute volume method as per Indian Roads Congress : 44-1972 "Tentative guidelines for cement concrete mix design". While calculating water for the mix, ratio of water/(Cement + Fly ash) is to be taken instead of water/cement ratio.

3. Materials:

3.1. **Cement :** Should conform to I.S. 269-1967.

- 3.2. **Fly ash :** Should conform to I.S. 3812 (Part I)-1969.
- 3.3. **Coarse and Fine Aggregates :** Should conform to I.S. : 383-1970.
- 3.4. **Water :** Water used for both mixing and curing should be clean and free from injurious amount of deleterious matter. Potable water is generally considered satisfactory.

4. **Construction:**

Cement Fly ash concrete is identical in construction to cement concrete pavements, with the only difference that part of cement is replaced by fly ash at the batching stage.

6300.2

No. PL-50 (3)/76-SP

Dated the 8th March, 1976

To

All Superintending Engineers/Chief Engineers in the Roads Directorate at headquarters.
All Engineer Liaison Officers/Regional Officers.

Sub : Utilisation of fly ash in road construction

Vide letter No. PL-50 (16)/71 dated the 8th May, 1975, instructions had been issued to all the State Governments for ensuring greater utilisation of fly ash in road construction. A copy of the letter was endorsed to all Officers of the rank of Superintending Engineer and above in the Roads Wing at headquarters and all Engineer Liaison Officers/Regional Officers for information and follow-up action.

2. In the letter referred to, the State Govts, were advised that for construction of sub-bases on National Highways works, situated within an economic orbit of the thermal power stations, lime-fly ash stabilisation should be increasingly used in place of conventional granular materials like brick soling and over-size W.B.M., and that proposals for future N.H. works should be framed keeping this requirement in view. The economic application of fly-ash techniques will depend on the lead from nearest thermal power station and the cost of traditional construction materials, but it is expected that fly ash use will generally be advantageous within about 50-100 kms. of the power stations.

3. Director General (Road Development) has desired that all Chief Engineers/Superintending Engineers in the Roads Directorate may examine the on going as well as future road works in their zones to see to what extent fly ash stabilisation could be prescribed for sub-base construction. This should be done on a priority basis. As regard availability of fly-ash in different areas, a map of India showing the N.H. system and the approximate location of the thermal power stations is enclosed for reference.

6300.3

No. RW/RD/8/WB/77-OR

Dated the 17th March, 1983

To

The Chief Engineers of all States, dealing with National Highways/Other Roads

Sub : Research Project R-2-Spectrum of Axle Loads on National Highways—Dissemination of Study Results

As the State PWDs are aware, the Ministry sponsored sometime back a project on the spectrum of axle loads on National Highways with the following objectives :

- (i) To collect data about the frequency distribution of axle loads of commercial vehicles plying on different roads in different regions.
- (ii) To rationalise the procedure of design of road-pavement based on collective data received from different regions.
- (iii) To collect data about traffic intensity and its breakup.
- (iv) To streamline the policy about weights and dimensions of vehicles.
- (v) To evolve a suitable method for design of road crust based on axle load distribution in the region.

2. Earlier to this project there was hardly any data collected about axle loads distribution on commercial vehicles plying on different roads in different regions in the country. The pavement design procedure currently being followed is based on the number of commercial vehicles of more than 3 tonnes laden weight regardless of the axle load frequency distribution. The study on axle load distribution has now been completed in respect of important National Highways in the States of Haryana, Rajasthan, Uttar Pradesh, West Bengal, Maharashtra, Gujrat, Kerala and Tamil Nadu. A summary of the results of the study is enclosed for your information and further necessary action.

3. We have already requested the Indian Roads Congress to undertake a review of the design procedures in the light of available data.

No. RW/RD/8/WB/77
ANNEXURE

SUMMARY OF RESULTS OF R-2 STUDY OF SPECTRUM OF AXLE LOADS ON NATIONAL HIGHWAYS IN DIFFERENT STATES

State	NH. No.	Section/Count Station	Average daily traffic (commercial vehicles only)	Percentage of diffent categories of vehicles Buses	Rigid chassis Trucks	Semi Trailer	Truck Trailer	Percentage of single axles exceeding 8 t	Percentage of single axles exceeding 10 t	No. of standard 8.2 t axles per 100 commercial vehicles	Axle equivalency for the road
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Haryana	1	km 158.7 at Pipli	2508	21.40	78.40	0.20	0.50	32.25	27.38	472	2.31
	8	km 34.5 near Gurgaon	1861	12.46	86.52	0.99	0.03	33.15	26.52	447	2.22
	10	km 68.2 at Asthal Bohar (Rohtak)	1248	22.52	77.17	0.31	Nil	45.94	29.59	460	2.28
Rajasthan	8	Delhi-Ajmer (km 281)	1834	10.60	88.90	0.30	0.20	39.00	34.00	424	2.31
	11	Agra-Jaipur (km 219)	741	29.14	70.38	0.46	0.02	26.19	15.41	353	1.74
West Bengal	31	km 502 near Islampur	772	15.54	84.24	0.22	Nil	38.81	30.28	414	2.07
	34	km 204 near Berhampur	868	17.19	82.79	0.02	Nil	29.75	22.61	326	1.63
	2	km 527 near Bud Bud	2825	8.35	91.07	0.46	0.12	25.31	22.85	555	2.77
Maharashtra	3	Bombay-Agra/Chanwad	1625	9.67	87.26	0.78	2.28	30.32	22.94	355	1.73
	4	Bombay-Pune/Vadgaon	3022	10.74	89.06	0.18	0.02	27.34	11.25	172	0.86
	6	SDEN Road/Nandura	872	7.18	91.10	1.69	0.03	38.02	29.31	451	2.23
	9	Pune-Solapur/Tembhurni	585	8.22	91.53	0.16	0.09	33.94	18.01	242	1.21
Gujarat	8	km 364/0 at Vapi	2202	15.49	84.48	0.03	Nil	31.0	19.0	254	1.26
Kerala	47	km 553/0 to 554/0 (Kariyavattom near Trivendrum)	688	58.30	41.70	Nil	Nil	5.90	2.90	62	0.30
	47	km 342/0 to 343/0 (Edapally-Cochin)	3365	56.47	43.53	Nil	Nil	10.03	3.69	84	0.42
Tamil Nadu	45	km 197/8 near Ulundurpet	923	16.60	79.47	3.62	0.31	29.85	18.60	232	1.14
	7	km 50/2 near Virudhungan	941	21.60	77.40	0.84	0.16	27.74	19.69	210	1.05
Uttar Pradesh	2	Kanpur-Varanasi/Mooratganj	1082	6.61	92.97	0.31	0.11	38.97	35.24	788	3.93
	24	Delhi-Moradabad/Joya	960	19.70	80.26	0.03	Nil	22.87	19.44	397	1.98
	28	Faizabad-Gorkhpur/Vikramjot	506	16.35	83.65	Nil	Nil	21.98	18.35	318	1.59

6300.4

D.C. No. PL-17 (5)/76

Dated the 4th April, 1984

Sub : Ministry's R & D Scheme R-1 "Survey and Evaluation of locally available materials"

We had sanctioned one estimate under the Research and Development Scheme R-1 regarding the "Survey and Evaluation of locally available materials" in your State with the specific purpose of identifying the various useful construction materials, locating their quarries, assessing the quantities of deposits and the strength possessed by them so that these can be used in the design and construction of roads in a more economical manner. Some of the States have already completed the work under this scheme and some other States are in advance stage of its implementation.

6300/8

It is requested that the results of this Research scheme should now be utilised by all concerned in the State. This can be achieved only if the printing of reports is expedited and the same are made available to others. You also like to issue orders making it mandatory for all concerned organisations to make use of the data compiled in the report while framing the estimates.

Rajasthan, Gujarat, Kerala, Haryana, Maharashtra, Bihar, Maripur, Orissa, Tamil Nadu, Assam, U.P., Sikkim, These States achieved more than 60% progress.

7100 ORGANISATION AT HEADQUARTERS AND JURISDICTION

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No</i>
7100.1.		Subjects Allocated to the Ministry of Shipping and Transport	7100/1
7100.2.		Organisation Chart of the Ministry of Shipping & Transport	7100/2
7100.3.		Roads Wing — Administrative set-up and Functions	7100/5
7100.4.		Organisation Chart of Roads Wing	
7100.5.	O.O. No. 56/85 RW. A-23 (69)/85 dt 14.6.85	Project zones and States thereunder	7100/1

SUBJECTS ALLOCATED TO THE MINISTRY OF SHIPPING AND TRANSPORT

The following subjects which fall within List I of the **Seventh Schedule** to the Constitution of India:

1. Maritime shipping and navigation; provision of education and training for the mercantile marine personnel.
2. Lighthouses and Lightships.
3. Major Ports i.e. the ports of Calcutta, Bombay, Madras, Viskhapatnam, Cochine, Kandla, Mormugao, Paradip, New Mangalore and Tuticorin.
4. Compulsory Insurance of Motor vehicles.
5. Administration of the Road Transport Corporation Act, 1950.
6. Highways declared by or under the law made by Parliament to be national highways.
7. Shipping and navigation including carriage of passengers and goods on inland waterways declared by Parliament by law to be national waterways as regards mechanically propelled vessels; the rule of the road on such water-ways.
8. Ship building and ship repairs.
9. Fishing Vessels Industry.
10. Floating craft Industry.

II. In respect of the Union Territories :

11. Roads other than National Highways.
12. Tramways within municipal limits.
13. Inland waterways and traffic thereon.
14. Administration of the Motor Vehicles Act, 1939 and taxation of motor vehicles.
15. Vehicles other than mechanically propelled vehicles.

III. In respect of the Union Territories of Andaman and Nicobar Islands and Lacadive, Minicoy and Amindivi Islands :

16. Organisation and maintenance of mainland-islands and inter-island shipping services.

IV. Other subjects which have not been included under the previous subheads :

17. Central Road Fund.
18. Coordination and Research pertaining to road works.
19. Road Works financed in whole or in part by the Central government including road works in Sikkim and the tribal areas of Assam specified in part A and B of the table appended to para 20 of the Sixth Schedule of the Constitution.
20. Motor Vehicles Legislation.
21. Legislation relating to shipping and navigation on inland waterways as regards mechanically propelled vessels and the carriage of passengers and goods on Inland water-ways.
22. Planning of road and inland waterways transport.
23. Promotion of Transport Cooperatives in the field of motor transport and inland water transport.
24. Development of township of Gandhidham.
25. Legislation relating to and coordination of the development of minor ports.
26. Centralised arrangements for the servicing and repairs of staff cars belonging to the Central Government except those under the control and use of Ministry of Railways (Rail Mantralaya) and the Department of Atomic Energy (Parmanu Ooraja Vibhag).
27. Administration of Dock Workers (Regulation of Employment) Act, 1948 and the Schemes framed there-under other than the Dock Workers (Safety, Health and Welfare) Scheme, 1961.

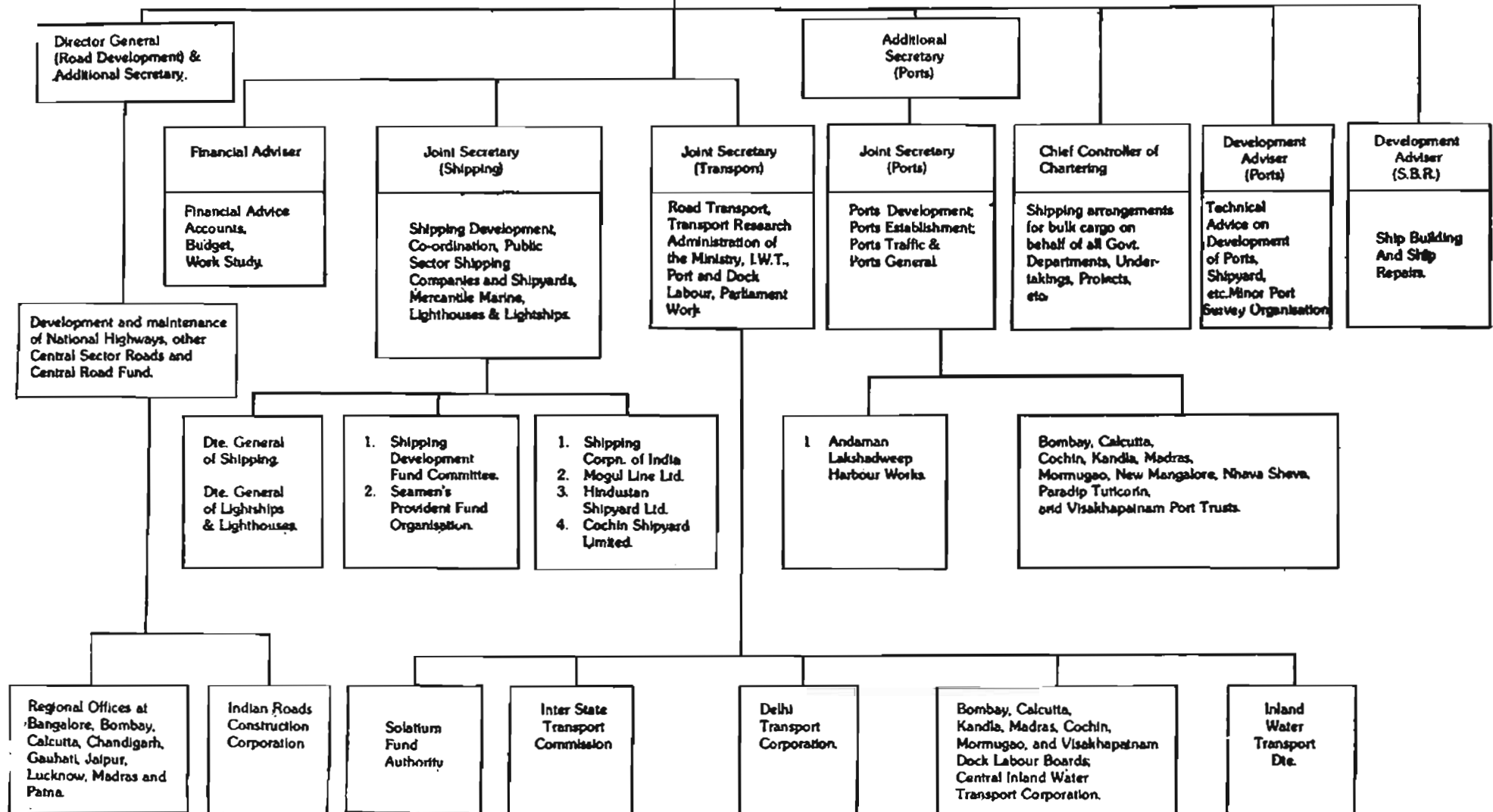
ORGANISATION CHART OF MINISTRY OF SHIPPING AND TRANSPORT

7100.2

AS ON 9.1.85

MINISTER OF STATE

SECRETARY



ROADS WING, MINISTRY OF SHIPPING & TRANSPORT

In 1930, the Office of the Special Chief Engineer was created with a small staff to administer the newly constituted Central Road Fund and to advise the Government of India generally in all matters concerning road development. Later, this became the Office of the Consulting Engineer to the Govt. of India (Roads) and was expanded in 1935 and again during World War II.

The realisation that a balanced road system was a vital prerequisite to the post-war economic development of the country impelled the Central Government to convene a Conference of all the State Chief Engineers (at Nagpur in December, 1943) to make proposals for a comprehensive plan of road development for India. Their report (commonly known as the Nagpur Plan) represents the first integrated Road Plan for India.

In the process of implementation of the various recommendations in this plan and as a result of the Central Government assuming complete financial liability for the maintenance and development of a system of roads accepted by them as National Highways, the Office of the Consulting Engineer to the Government of India (Road Development) was expanded and came to be known as the Roads Wing of the Ministry of Shipping and Transport. In 1966, the head of the Organisation was designated as Director General (Road Development).

Administrative set-up : The Director General (Road Development) is also ex-officio Addl. Secretary to the Govt. of India. He is assisted by one All. Director General (Bridges) and one Addl. Director General (Roads). They are in turn assisted by Chief Engineers, Superintending Engineers, Executive Engineers and Assistant Executive Engineers. On the Secretariat side, there are 2 Deputy Secretaries, 4 Under Secretaries and Secretariat Branches. Besides the Headquarters staff, the Roads Wing has 10 Regional offices which are located in the States of Uttar Pradesh (Lucknow), Bihar (Patna), Karnataka (Bangalore), Rajasthan (Jaipur), West Bengal (Calcutta), Maharashtra (Bombay) Tamil Nadu (Madras), Chandigarh, Assam (Gauhati) and Andhra Pradesh (Hyderabad).

Main Functions : Broadly speaking, the Roads Wing is concerned mainly with the following matters pertaining to :

- (i) to administer the Central Road Fund and allocate it equitably to the various states for works approved by the Government of India;
- (ii) to regulate the construction and maintenance of National Highways and to provide funds for these works;
- (iii) to develop and maintain roads other than National Highways in Union Territories and Centrally administered areas;
- (iv) to provide Central Aid for selected State roads including bridges on inter-State or economic importance;
- (v) to develop and maintain roads considered necessary on strategic grounds;
- (vi) all *ad hoc* projects which the Government of India might want to be undertaken from time to time such as roads/bridge projects which might be financed with World Bank Aid although they are also supposed to be part of normal Plan;
- (vii) to secure balanced development of roads and road transport and to co-ordinate with other systems of transport, principally railways;
- (viii) to collect compile, analyse and interpret road statistics covering all aspects of road development;
- (ix) to draw up Standard Specifications and Designs for roads and bridges;
- (x) to deal with all policy matters relating to the Indian Road Construction Corporation set-up by this Ministry as a Public Sector Undertaking for road bridge construction works abroad;
- (xi) to sponsor, guide and finance Highway Research, Development and Planning Studies;
- (xii) to improve the technical knowledge and experience of the highway engineering personnel by sponsoring the training of engineers in India and abroad; by disseminating information on standards and modern engineering techniques, and by encouraging the study of road economics and administration;
- (xiii) to advise the State Governments in the procurement and the use of road making machinery, including the fostering of their manufacture;
- (xiv) to arrange for the priority and procurement of road making materials in short supply such as steel, cement and bitumen and to assist in securing priority transport;
- (xv) to advise other Central Government Ministries (Defence, External Affairs, etc.) on all matters concerning roads and to advise similarly the State Governments; and
- (xvi) to function generally as a repository of technical, statistical, and administrative information on all matters concerning roads and bridges.

National Highways : The National Highways came into being on 1.4.1947 when the Government of India assumed responsibility for the development and maintenance of certain roads provisionally known as National Highways. In 1956, the Govt. of India enacted the National Highway Act 1956, and the existing National Highways were declared statutorily as National Highways.

Central Road Fund : This fund was constituted in the year 1929 as a non-lapsing Fund. It derives its revenue out of the proceeds from duty of customs and excise levied on non-aviation motor spirit, at the rate of 2½ annas per gallon (now 3.5 paise per litre) of taxed motor spirit.

Twenty per cent of the proceeds from revenue accruing to the CRF is retained by the Central Govt. and credited to the CRF (Ordinary) Reserve. The balance eighty per cent of the revenue forms part of the CRF (Allocations). Account and is distributed to States/Administrations of Union Territories by way of allocations in proportion to the quantity of non-aviation motor spirit consumed by each. In addition, the Fund has also a third sub-division called the Special Reserve. It consists of the funds provided by any Central Ministry (Ministry of Home Affairs, Ministry of Defence, etc.) for road schemes required to be handled by the Ministry of Shipping and Transport for these Central Organisations.

The revised objectives of Fund are to carry out :

- (i) Road Research and Intelligence;
- (ii) Traffic Studies and Economic Surveys;
- (iii) Training of Young Engineers;
- (iv) Scheme of all India importance leading to the removal of regional imbalances such as helping in the development of tribal areas and backward regions, promoting inter-state communication facilities, helping in combating anti-social and criminal elements, part contribution to programmes for setting up roadside resting places and passenger way-side facilities on state roads, promotion of tourism, agricultural marketing areas links and road/bridge works required for National Projects such as Atomic Power Stations, Industrial Undertakings etc.

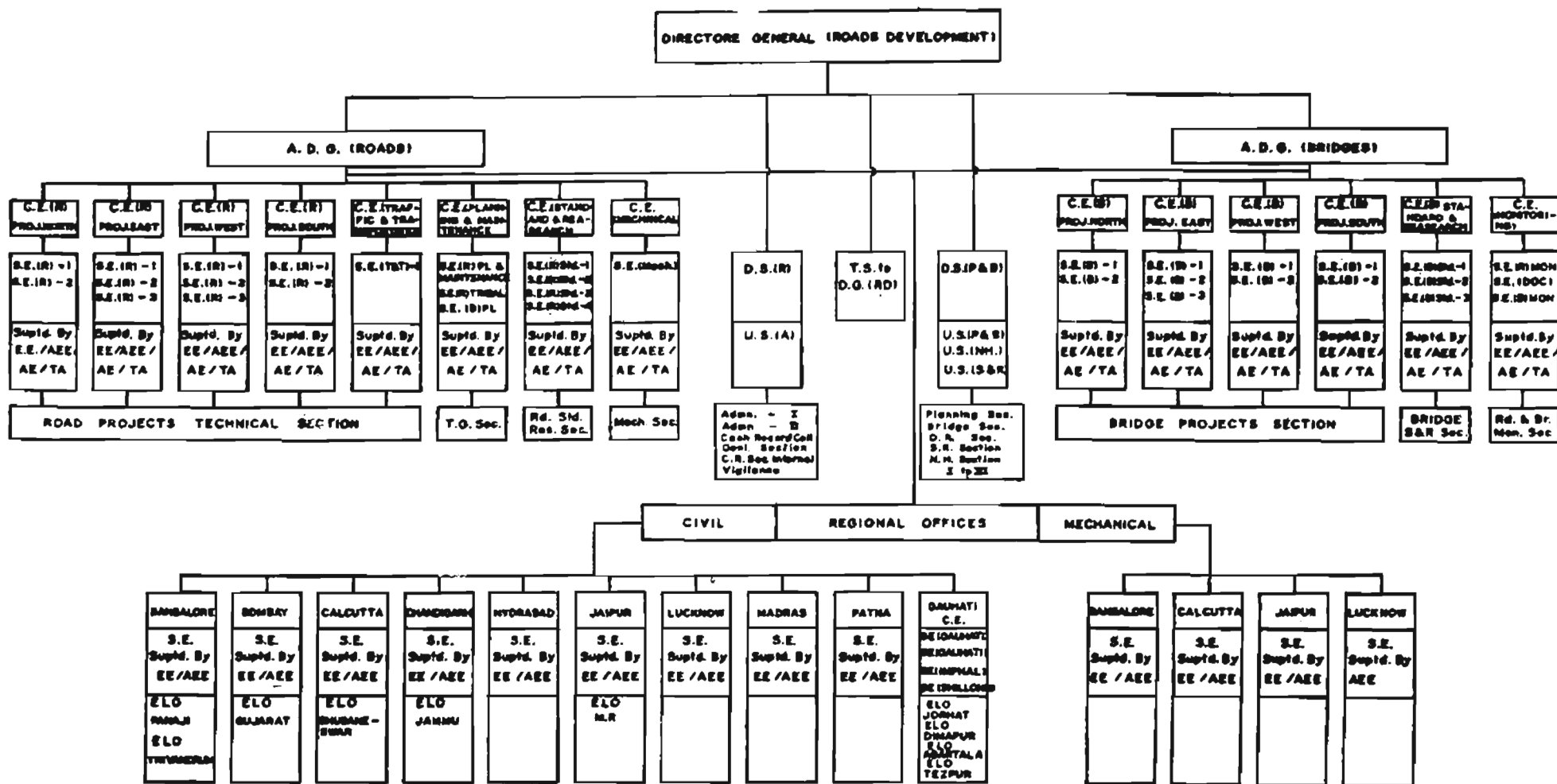
Besides handling the work of sanctioning and implementation of different Central Sector Road Programmes and the development and maintenance of National Highways, the Roads Wing is also responsible for co-ordination and control, standards and specifications, settling priorities and general administration in respect of National Highways. In addition, the Organisation is to coordinate the road policies of the Centre and the States and act as a repository of Technical Information on roads and bridges.

Highway Research Development and Planning Studies :- This Scheme was included in the Fifth Plan for the first time and is intended to provide earmarked funds for the promotion of Highway Research and Planning Studies. With a view to ensuring proper programming, planning and implementation of schemes undertaken under this programme, there is a Highway Research Board set-up under the aegis of the Indian Roads Congress with the Director General (Road Development) as the Chairman. This Board is intended to co-ordinate, disseminate and recommend to the Central and State Govts. schemes to be taken up under this programme. With a view to processing the research scheme further, the Ministry have set-up 3 Groups viz. Highway Research Advisory Panel, Steering Group and Planning and Implementation Group. Important projects undertaken under this programme is the Highway Design Study. This programme is estimated to cost Rs. 74.15 lakhs and is being aided by the World Bank partly to the extent of US \$ 2 lakh (Rs 18 lakh), the balance cost being met by the Ministry of Shipping and Transport and the Central Road Research Institute. Already 15 roads/bridge schemes approved by the Highway Research Advisory Panel are in progress and the preliminary work on most of the second package of 20 schemes approved by the Panel has been completed.

Training Institute for Highway Engineers : This has been set-up with a view to providing facilities for at-entry and in-service training for Highway Engineers. The expenditure involved would be met by this Ministry and the states on a 50:50 basis. The objectives of the Institute are :-

- (i) to help highway engineers develop managerial skill and professional ability to plan, design construct, and maintain an efficient, safe reliable and economic highway system as an integrated part of the nation's economy.
- (ii) to stimulate and encourage amongst the highway engineers a desire to learn and know within the organisation and realise their potential in a spirit of mutual-understanding and co-operation; and
- (iii) to help highway engineers to build up character and develop an all-round personality and 'spirit de corps'.

7100-4



Office Order No. 56/85 (File No. RW.A-23 (69)/85)

Dated the 14th June, 1985

With a view to streamlining the distribution of work and in supersession of all the previous orders on the subject, it has been decided that the Country will be divided into Four Zones for purpose of project works. The divisions into zones will be common for both road and bridge works and these are as indicated below :—

S. No.	Zone	States/Union Territories
1.	North	Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab and Uttar Pradesh.
2.	West	Gujarat, Madhya Pradesh, Maharashtra and Rajasthan
3.	South	Andhra Pradesh, Goa, Karnataka, Kerala, Pondicherry and Tamil Nadu.
4.	East	Andaman & Nicobar, Arunachal Pradesh, Assam, Bihar, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura and West Bengal

2. The distribution of work among the Secretariat Sections will correspond to the work of the States to be handled in the zones.

Copy forwarded for information to :—

1. PS to DG (RD) & AS/PAs to ADG (R)/ADG (B)/DS (R)/DS (P&B)
2. All Chief Engineers/Superintending Engineers in the Roads Wing
3. All Under Secretaries in the Roads Wing
4. All Regional Officers/Engineer-Liaison-Officers
5. All Sections (Secretariat & Technical) in the Roads Wing
6. Administration-I Section, Roads Wing

7200 DELEGATED POWERS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7200.1.	RM-23 (33)/75 dt. 3.11.76	Delegation of Powers to Regional Officers (Mech) to accord Technical Approval to Repairs and Maintenance Estimates relating to Central Machinery.	7200/1
7200.2.	NH III/P/16/80 dt. 6.1.83	Delegation of Powers to Regional Officers — regarding levelling course and Selection of kms for Renewal	7200/2
7200.3.	NH III/P/16/80 dt. 10.2.84	Delegation of Powers to the Chief Engineer, MOS&T (Roads Wing) Gauhati relating to works of North Eastern Council	7200/3
7200.4.	NH III/Misc/2/84 dt. 21.2.84	Delegated Powers to Technical Officers posted at Headquarters	7200/3
7200.5.	NH III/P/1/84 dt. 27.3.84	Delegation of Powers to Chief Engineer, Gauhati	7200/4
7200.6.	NH III/P/4/85 dt. 28.5.85	Delegated Powers to Officers at Headquarters in respect of Central Machinery.	7200/4

D.O. NO. NHIII/MISC/178/73 DATED THE 13TH DEC., 1973 ADDRESSED BY DG (RD), ADDL SECY. TO THE GOVT. TO REGIONAL OFFICERS OF THE MOT (RW) BY NAME

Subject : Progress monitoring and control on Central works in the States

In this Ministry's letter PL-30 (46)/68 dated 18.7.73* the duties and responsibilities of the Superintending Engineers and Engineer Liaison Officers of the Roads Wing posted in the States have been intimated to the States. They have *inter alia* been asked to keep a watch in regard to prompt fixation of agency for execution of Central works by settlement of tenders or arrangements for departmental execution of works, actual commencement of execution of works, frequent inspections and reports thereon and watch on timely submission of progress reports. In order to exercise an effective control on the progress and quality of works it is essential that the officers of this Ministry in the field implement these instructions to the maximum extent possible. They must keep a watch in respect of all the sanctioned works so that there is no delay in fixation of executing agency and commencement of works after sanction of the estimate as also in its subsequent execution. It is also necessary that the quality of work is according to the standards and specifications approved with the estimates and that the changes/modifications suggested in the Technical Note are faithfully implemented. They would need to carry out intensive inspections while on tour and ensure that States resort to requisite quality control measures and that proper testing records therefore are duly satisfactorily maintained. Timely submission of progress reports by the States is another aspect which has to be watched by the field officers as they bring to light delays and bottlenecks, if any, so that the Ministry could take necessary remedial action where possible.

2. It is once again reiterated that the Regional Officers/Engineer Liaison Officers should keep these aspects in mind and ensure proper control on progress and quality of execution of Central works and that this item carries the highest priority and will be treated as one of their prime responsibilities.

*Note : (Revised vide D.O. letter No. RW/PL-30 (120)/84 dt. 14.8.85)

7300.2.

Dated the 1st April, 1976

OFFICE ORDER NO. 46/76
(File No. A-10 (11)/73)

The jurisdiction of the 9 Regional Offices now being set up will be as specified below. The Chief Engineer located at Gauhati in North Eastern Region will also be in charge of the regional office at Calcutta.

Sl. No.	Name of Regional Office	Area of Jurisdiction
1.	Bangalore Region	Karnataka, Kerala, Lakshdweep
2.	Bombay Region	Maharashtra, Gujarat, Goa, Daman and Diu, Dadra and Nagar Haveli.
3.	Chandigarh Region	Himachal Pradesh, Punjab, Jammu and Kashmir, Haryana and Union Territories of Chandigarh and Delhi
4.	Calcutta Region	West Bengal, Orissa, Sikkim and Andaman and Nicobar Islands.
5.	Jaipur Region	Rajasthan and Madhya Pradesh
6.	Lucknow Region	Uttar Pradesh
7.	Patna Region	Bihar
8.	Madras Region	Tamil Nadu, Andhra Pradesh and Pondicherry.
9.	Gauhati Region	Assam, Meghalaya, Manipur, Tripura, Nagaland, Mizoram, Arunachal Pradesh.

2. The area of jurisdiction of the four Mechanical Units being set up in the various states will be as specified below :-

Sl. No.	Location of the Mechanical Unit	Area of Jurisdiction
1.	Bangalore	Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Goa and Maharashtra.
2.	Calacutta	Orissa, West Bengal, Assam, Meghalaya, Manipur, Tripura, Nagaland, Mizoram, Arunachal Pradesh and Andaman and Nicorbar Islands.
3.	Jaipur	Gujarat, Rajasthan, Delhi, Haryana, Punjab, Himachal Pradesh and Jammu & Kashmir.
4.	Lucknow	Bihar, Madhya Pradesh, Uttar Pradesh.

3. The date/s from which the above arrangements will take effect will be notified separately, and this Ministry's Office Order No. 158/68 (File No. A-22 (1)/68) dated the 1st November, 1968, will be treated as cancelled with effect from this/those date/s.

7300.3.

No. NHIII/P/57/76

Dated the 28th July, 1976

To

All the Regional Superintending Engineers (by name)

Subject : Qualitative aspects of execution of National Highway works and other Centrally financed works like Strategic Roads

Although it is primarily the responsibility of the State Governments entrusted with the execution of the above mentioned works to arrange their execution to the expected qualitative standards, duly satisfying the other requirements of expected technical and financial procedural discipline, for the fulfilment of the above objective the Roads Wing have also to oversee the performance of the States in properly handling and supervising the execution of these works. The attention of the State Governments has been invited to the above mentioned requirement repeatedly through correspondence and on every conceivable occasion through the meetings of the State Chief Engineers, the Standing Committee on Roads of the Transport Development Council, etc. The Roads Wing officers posted in the Regional Offices as also at the Headquarters also frequently tour, inspect such works and convey certain observations during such inspections, some bearing on the qualitative aspects of execution of those works and sometimes deficiencies in them. These observations are subsequently confirmed through the inspection notes being issued by them. It is expected that such observations particularly concerning any deficiencies in the execution of works are supposed to be given due attention by the State P.W.D. authorities for rectification/remedying thereof as also for ensuring that such deficiencies do not re-occur. The Regional Officers/Engineer Liaison Officers of the Roads Wing are expected to follow-up such observations so that the objective of qualitative standards of execution being improved is achieved. The State authorities are required to inform the Ministry about the action taken on such observations. The Regional Officers are also expected to be aware of the compliance of such follow-up actions. They should also be apprising the Ministry of such outcome from time to time.

2. The Monthly Reports received pursuant to this Ministry's letter No. NHIII/MISC/43/74 dated the 16th July, 1974 and subsequent communications on the subject often do not give adequate information on the action taken by the State P.W.Ds. on such inspection notes issued from time to time by the officers of the Regional Offices and by the Headquarters Officers from New Delhi. The reports in most cases also do not comment on the correctness or otherwise of the compliance report of inspection observations sometimes made by the State P.W.D. The absence of this information thus handicaps this Ministry in monitoring the quality and progress and in deciding on the workwise budget allotments. Under the circumstances it is impressed that it should be made a point to ascertain the follow-up action taken by the State P.W.D. on such inspection notes during your further inspections and through personal pursuit with the State Chief Engineer. You should also verify at site the compliance of observations by the State P.W.D. It is hoped that in future your Monthly Reports as also individual reports in regard to follow-up action by States on such inspection notes, will cover this aspect. From the above point of view you may please review the requirements of the earlier inspection notes also and further ensure careful compliance in future.

*Note : Discontinued vide letter No. NHIII/P/26/84 dt. 7.8.84

7300.5.
7520

No. NHIII/MISC/131/79

Dated the 27th July, 1979

To

All Inspecting Officers at Headquarters, Regional Officers and Engineer Liaison Officers

The prevalent practice is that as soon as a revised estimate for National Highway Works is received its scrutiny is commenced and correspondence is entered into with the State Public Works Departments for probing into the reasons for excess and justification thereof before the case is processed further and sent to Finance for obtaining their concurrence to the revised cost. Since this system is evidently time consuming and may at times involve asking embarrassing questions resulting into a deadlock, it is better that the Roads Wing's Inspecting Officers from Headquarters and outside make it a point to discuss such cases with their counterparts in the State PWD, particularly the items where the cost over-run have already taken place or are likely to occur, so as to determine their reasonableness or otherwise and sort out the matters. If as a result of such discussions, site verification becomes necessary the same should be undertaken. Such a course of action would help to minimise correspondence and expedite accord of technical and financial sanction to revised estimates in question.

All Roads Wing inspecting officers at Headquarters and outside are therefore, requested to please keep the above instructions in mind whenever they plan their visits/inspections of NH Works in their jurisdiction. The inspecting officers from Headquarters should make a mention in their inspection notes about the estimates discussed with the State PWD Officers during their inspection. Similarly Regional Officers/Engineer Liaison Officers should make a mention in their monthly diaries about the revised estimates discussed.

7300.6.

D.O. NO. NHIII/COORD/4/82 DATED THE 2ND FEBRUARY, 1982 ADDRESSED BY DG (RD) & ADDL. SCEY. TO THE GOVT. OF INDIA TO REGIONAL OFFICERS (by name)

The Ministry is receiving from the State P.W.Ds quite a number of proposals and estimates for various works on National Highways as well as on the Central Sector road schemes. It has been emphasised during the Regional Officers' meetings and during inspection of works in the States by senior officers from the Headquarters and by me that R.Os should associate themselves with proposals regarding improvement and maintenance of National Highways during formative stage and guide the State P.W.D. officers in order to get the proposals and estimates as per required standards and specifications and in conformity with local conditions. This was proposed to eliminate delay and correspondence after the same are received in the Ministry and to obviate the need for furnishing of comments by R. Os to the Ministry on the basic information such as C.B.R., water-table, leads for materials, etc. for road works and hydraulic particulars, foundation strata etc. for bridge works. The Ministry could, thereafter only call for comments on specific points requiring clarification from R.Os.

2. Regional Offices located in the States are primarily meant for sorting out majority of problems by consultations with P.W.D. officers thereby cutting down avoidable correspondence and saving time; steps which are essential for efficient implementation of various schemes. It is, therefore, the responsibility of R.Os to get themselves associated with the schemes at all stages right from survey and investigation, framing of estimates, original and revised, if necessary, execution to their completion as per the predetermined targets. By the above, it does not follow that full time presence by R.Os or their representatives on the job is required. They should ensure that the State P.W.D. proceeds on the right lines during the various stages of work. I am sure you will keep these aspects in mind and ensure.

7300.7.

Dated, the 19th October, 1982

OFFICE ORDER NO.84/82
(File No. RW-A-10 (7)/82)

In partial modification of this Ministry's Office Order No. 46/76 (File No. A-10 (11)/73) dated 1st April, 1976, the area of jurisdiction of R.O. Bangalore will also include Goa which was hitherto under the jurisdiction of R.O. Bombay.

Copy forwarded for information and necessary action to :

1. All ROs/E.LOs including Mechanical Units. All Chief Engineers, Superintending Engineers, Executive Engineers in the Roads Wing. All State Chief Engineers. It is requested that suitable instructions in this regard may kindly be issued to their field officers working under their control.

7300/4

7300.8.

No. RW/N-48/KNT/330/8 /W

Dated the 19th February, 1983

To

All Regional Officers/Engineer Liaison Officers/All other Technical Officers in the Regional Offices

Subject : Inspection of sites for bridges, estimates in respect of which are to be sanctioned

Recently one of the State PWD's have reported to this Ministry that they are not able to commence the work of reconstruction on a particular bridge, owing to the reason that there is no access to the bridge site and that the work can be taken up only after land acquisition for the purpose has been completed. In this case the sanction for the work had been issued by the Ministry more than 2 years back as the P.W.D. had at that time reported that the existing bridge was weak and dilapidated and that cracks had developed on the substructure and superstructure. The delay of more than 2 years in the taking up of the work after sanctioning the estimate, could have been avoided had the P.W.D. taken co-ordinated measures to acquire the land in the initial stage itself so that it synchronised with the commencement of the work on the bridge immediately after sanction.

2. In order to avoid such delays, it is requested that before the estimate for any bridge work is submitted by the PWD to the Ministry the concerned RO/ELO should inspect the site in order to examine the technical feasibility of the location for the bridge and also to get an idea whether similar problems as above are likely to crop up so that any modifications needed can be got incorporated before the estimate is taken up for sanction.

3. In the past in respect of one bridge, the concerned R.O. had reported after issue of sanction to the estimate that the existing bridge was adequate enough for the safe movement of traffic. It will be appreciated that such instances place the Ministry in a somewhat embarrassing situation. In view of the above it is reiterated that the RO/ELO should inspect each of the sites of those bridges, the estimates in respect of which are under submission to the Ministry and if any drawbacks are noticed the same should be reported immediately to the Ministry, so that suitable action can be taken before the scheme is approved.

7300.9.

No. NHIII/P/17/76

Dated the 15th March, 1984

To

All Regional Officers & Engineer Liaison Officers, Ministry of Shipping and Transport (Roads Wing)

Subject : Opening/foundation stone laying ceremonies in respect of National Highway works

I am directed to say that hitherto the practice has been to issue Invitation Cards for opening/foundation stone laying ceremonies in respect of National Highway works on behalf of the Secretary, Ministry of Shipping and Transport irrespective of whether the Secretary attends the function or not.

2. It has now been decided that in future, Invitation Cards should be issued after obtaining prior approval of Director General so that the cards could be issued on his behalf in case he is attending the function or otherwise the cards could be issued on behalf of Director General (Road Development) or whosoever is attending the function on behalf of the Ministry. The format for Invitation Card is enclosed for guidance.

3. All the Regional Officers/ELOs are requested to keep the above point in view and see that suitable action is taken at the appropriate time.

Encl. Not printed

7300.10.
7520

No. RW/NHIII/P/20/84

Dated the 10th July, 1984

To

All Work Sections in the Roads Wing

Subject : Examination of detailed estimate received from State PWDs — Procedure regarding

It has been observed that in many cases R.Os comments are called on each estimate received in this Ministry as a matter of routine before putting up the estimates to the technical officers. Henceforth all estimates for road and bridge works received from State PWDs may be put up to technical officers in the first instance and ROs comments should be called only in those cases where it is specifically recommended by the technical officers.

Copy also forwarded for information to all Technical Officers in the Roads Wing.

7300.11.

No. NHIII/P/26/84

Dated the 7th August, 1984

Subject : Regional Officers and Engineer Liaison Officers reports in respect of road and bridge works financed by the Central Government

In supersession of all previous instructions on the subject, it has now been decided that in future all ROs and ELOs should submit only quarterly reports complying with the following instructions. Monthly reports should be discontinued.

1. Quarterly reports for the quarters ending March, June, September and December should be despatched for each State separately by the 5th of the month following the quarter under report.
2. The report for each state should cover both road and bridge works.
3. The report should be prepared in duplicate and one copy of which would be addressed to the concerned Chief Engineer (Roads) and the Chief Engineer (Bridges) by name.
4. The report should be submitted in the prescribed format which is being sent separately.
 1. All Regional Officers and Engineer Liaison Officers.
 2. ADG (R) and ADG (B) for information.
 3. All Chief Engineers and Superintending Engineers at Headquarters—After the report is seen by the concerned Chief Engineers, it will be examined by the Superintending Engineer and necessary action as required will be taken immediately within a week of the receipt of the report. Important aspects should be brought to the notice of ADGs/DG (RD).

7300.12.

No. RW/NHIII/P/26/84

Dated the 5th Sept., 1984

To

All Regional Officers and Engineer Liaison Officers

Subject : ROs and ELOs quarterly reports in respect of road and bridge works financed by the Central Government—Prescribed format of

With reference to Ministry's instructions dated the 7th August, 1984 on the above noted subject, it has now been decided that the quarterly reports should be furnished in the format enclosed.

2. The report should be concise, well drafted and should not repeat any information which has been already intimated separately or in any previous report.
3. Where it is considered that some action is required to be taken by the Ministry, the same may be clearly suggested.

Copy to : All Chief Engineers and Superintending Engineers at Headquarters.

SUB : ROs/ELOs QUARTERLY REPORT ON ROAD & BRIDGE WORKS

RO/ELO Office :

State :

Ref :

Quarter :

1. SLIPPAGE IN PROGRESS OF PRE-1976 AND 1976-78 WORKS
 - (i) Job details

7300/6

- (ii) Targets (as finalised in the last review meeting) and achievements
- (iii) ~~Reasons for slow progress~~, revised programme, remedial action being taken by the State PWD
- 2. CASES WHERE POOR COORDINATION BETWEEN BRIDGE AND APPROACH CONSTRUCTION IS OBSERVED
 - (i) Job details
 - (ii) Problems
 - (iii) Action suggested to be taken by the Ministry
- 3. ASSOCIATION IN PROJECT FORMULATION
 - (i) No. of works included in the annual plan
 - (ii) Names of projects for which data have been finalised during this quarter
 - (iii) Cumulative number of project finalised
 - (iv) Advance action for projects to be taken up in subsequent plans.
- 4. RESEARCH SCHEMES
 - 4.1 Research Association (Research schemes with which RO/ELO is associated and comments regarding their implementation)
 - 4.2 Research schemes not progressing satisfactorily
 - (i) Reasons
 - (ii) Action suggested to be taken by the Ministry
 - 4.3 Utilisation of research projects which have been completed or for which interim recommendations are available.
- 5. MAINTENANCE
 - 5.1 Renewal Programme
 - (i) Implementation of the renewal programme for the current year (kms renewed against sanctioned programme)
 - (ii) Finalisation of the renewal programme for the next year (must be finalised by December)
 - 5.2 FDR works not progressing satisfactorily.
- 6. QUALITY CONTROL AND R&D PROMOTION
 - 6.1 Position regarding augmentation of laboratory facilities, setting-up of (i) Regional laboratories (ii) R&D and Quality Promotion Cell (iii) Traffic Engineering Cell (also report whether laboratories have the requisite equipment and trained staff, point out deficiencies if any)
 - 6.2 Implementation of Quality Control and Maintenance of records (Ministry's letter No. RW/NHIII/P/1/83 dt. 19.4.83)
 - 6.3 Suggestions towards further improvement of quality control system in the country.
- 7. INSPECTION
 - 7.1 Works inspected and reference of the inspection notes/letters issued.
 - 7.2 Observance of the prescribed frequency of inspection (as per maintenance manual)
- 8. PAVEMENT ROUGHNESS MEASUREMENT
 - 8.1 Position of procurement of roughometers
 - 8.2 Progress on the use of roughometers
 - 8.3 Month-wise details of surprise checks carried out and results thereof (Give date, name of officers of MOT/State, sections checked and values obtained)
- 9. POSITION IN RESPECT OF OTHER IMPORTANT MATTERS
 - 9.1 Implementation of Vohra Committee Recommendations
 - 9.2 Highway inventerisation
 - 9.3 Fixing of new traffic signs and painting km stones as per June 1981 instructions.
 - 9.4 Implementation of management information system (submission of progress reports, traffic census data etc. in the prescribed format)
 - 9.5 Adoption of maintenance manual
 - 9.6 Institutional improvements in the State-Computerisation, monitoring cells etc.
 - 9.7 Position of pending cases.
 - 9.8 List of works sanctioned but not yet started (upto the quarter under-report) with Job Nos. & Dates of sanction
- 10. Matters Requiring Ministry's Immediate Attention (Estimates, designs, budgetary aspects etc).

Note : Added vide letter No. RW/NHIII/P/26/84 dated 16.8.1985

7300.13.

No. NHIII/P/4/82

Dated, the 17th December, 1984

To

All Regional Officers and Engineer Liaison Officers of the Roads Wing

Subject : Pre-qualifications of tenderers for the execution of major road and bridge works on National Highways and under other Centrally Financed Schemes

I am directed to say that in this Ministry's letter of even number dated the 11th July '84 on the subject mentioned above, Secretaries and Chief Engineers of all State PWDs were requested to adopt a uniform policy relating to pre-qualification of tenderers for major highway projects. Detailed guidelines formulated by this Ministry in this regard were also circulated with this letter. A copy of the letter is enclosed for ready reference.

2. It has, however, been observed that these guidelines are not being followed scrupulously by many State PWDs. It is therefore, requested that the matter may be pursued with the States so that these guidelines are followed in respect of all major highway projects.

Encl : See Code No. 130

7300.14.

No. NHIII/P/10/84

Dated the 15th May, 1985

To

Regional Officers, Ministry of Shipping & Transport (R.W.)

Subject : Use of roughness measurement as an aid to more effective monitoring of road construction and maintenance operations

I am directed to invite a reference to letter of even number dated 3.4.84 from the Secretary addressed to all the Chief Secretaries of the States and Union Territories, requesting them that the quality of road construction should be monitored by the use of roughometers.

2. It has been observed that some States have procured the roughometers and have initiated action to take the readings detailed out in the Ministry's circular letter of even number dated 25.7.84. However, it is noted that the progress so far achieved in the effective use of the roughometers has been slow in many of the States. It is requested that this matter may be pursued vigorously and it may be ensured that the State PWDs send to the Ministry the periodical returns on the subject as already laid down.

3. It has also been decided that one roughometer will be procured and placed at the disposal of some of the R.Os/ELOs of the Ministry to enable them to take independent measurement of the roughness of the newly constructed roads and monitor the position. Necessary sanctions for this purpose are being issued separately.

4. It may be noted that the R.Os/ELOs while conducting these inspections would take along with them the concerned official/officials of the State PWD so that the measurements taken are jointly accepted. The programme of roughness measurements will have to be jointly chalked out with the concerned PWD officials.

5. Since the need for observing precautions in the use of equipment is paramount for yielding accurate values of the roughness, it is proposed to conduct a training course, in which the ROs/ELOs and selected PWD officials will participate. A separate communication in this regard will be issued shortly.

6. A copy of this letter is also being endorsed to Chief Engineers dealing with N.Hs in the concerned States to ensure that the proposed measurement programme is pursued vigorously. The ROs/ELOs are requested to discuss the modalities of the measurement programmes jointly with the State PWD officers and report on the arrangements involved to the Ministry from time to time.

Copy forwarded for information and necessary action to the concerned Chief Engineers dealing with National Highways in the States and Union Territories. It is requested that full cooperation may be extended to ROs/ELOs for jointly carrying out roughness measurements on newly constructed roads as per instructions issued from the Ministry already vide Ministry's letter of even number dated 25.7.84.

Copy forwarded for information and necessary action to all Project Chief Engineers (Roads) at Headquarters with a request to pursue the matter. CE (PL), SE (R) T&T, ADG (R) and T.S. to DG (RD).

D.O. LETTER NO. NHIII/P/31/77 DATED THE 12TH AUGUST 1985 FROM DG (RD) & ADDL SECY. TO THE GOVT. OF INDIA ADDRESSED TO SECRETARIES/CEs., PWDs. & COPY WITH ENCLS TO ALL TECH. OFFICERS IN ROADS WING AND ROs/ELOs.

Subject : Formulation of detailed projects for road and bridge works on National Highways and under other Centrally Financed Schemes — detailed guidelines for the association of ROs and ELOs with the officers of the State PWDs

With a view to improving the quality of project preparation, we have been issuing detailed instructions/guidelines from time to time and we have been requesting our ROs and ELOs simultaneously that they should render maximum possible assistance to the officers of the State PWDs. In all stages of preparation of detailed project estimates. This matter has also been discussed at various forums of State Chief Engineers but you will agree with me that even now a large number of detailed estimates for road and bridge works are being projected to the Ministry without ensuring the supply of all the requisite technical inputs as clearly outlined in our oft-repeated guidelines.

2. It is felt that an indepth association (right from the stage of inception of a project) of our ROs/ELOs would be beneficial for improving the quality of project preparation and reducing the time taken by the Ministry for the scrutiny of technical details and the estimates for road and bridge projects. With this end in view, we are issuing detailed guidelines (Appendix 'A') for the association of ROs and ELOs with the State PWDs in the stages of planning, detailed site investigations, surveys, subsoil explorations, collection of soil and hydraulic data and other inputs necessary for the preparation of technically sound and economically viable road and bridge projects. It goes without saying that the above mentioned association of our ROs and ELOs can achieve its desired objective only with the wholehearted cooperation at all levels of State PWDs. Accordingly, I shall be grateful if you kindly issue necessary instructions to all your field formations to extend full cooperation to our ROs and ELOs so as to enable them to associate themselves with the officers of the State PWDs as outlined in the above-mentioned enclosure.

Encl : Appendix 'A'

D.O. LETTER NO. NHIII/P/31/77 DATED THE 12TH AUGUST 1985 FROM DG (RD) & ADDL SECY. TO THE GOVT. OF INDIA ADDRESSED TO SECRETARIES/CEs., PWDs. & COPY WITH ENCLS TO ALL TECH. OFFICERS IN ROADS WING AND ROs/ELOs.

APPENDIX 'A'

Enclosure to D.O. letter No. NHIII/P/31/77 dated 12.8.85

DETAILED GUIDELINES FOR THE ASSOCIATION OF ROs & ELOs WITH THE STATE PWDs IN THE STAGES OF PLANNING, DETAILED SITE INVESTIGATIONS, SURVEYS, SUB-SOIL EXPLORATIONS, COLLECTION OF SOIL AND HYDRAULIC DATA AND OTHER INPUTS NECESSARY FOR THE PREPARATION OF TECHNICALLY SOUND AND ECONOMICALLY VIABLE ROAD AND BRIDGE PROJECTS ON NATIONAL HIGHWAYS AND UNDER OTHER CENTRALLY FINANCED SCHEMES

1. INTRODUCTION

"National Highways" is a Union subject under the Constitution and their development and maintenance are the sole responsibility of the Government of India under the N.H. Act, 1956. As is well known, this responsibility is not discharged directly by us but through the State Governments on an Agency basis. Notwithstanding that, since we are the Funding Authority and are answerable to the Parliament for all matters relating to the NHs, all possible efforts are required to be made by us to see that various types of facilities are created on our NHs within the least possible cost and time. In the past, incomplete and inadequate investigations prior to the preparation and sanction of the projects had led to cost and time over-runs.

Under the above mentioned circumstances, special responsibility devolves on our Regional Officers and it could be said confidently that their most important role lies in assisting the State PWDs for the preparation of well-planned, thoroughly investigated and adequately designed road and bridge projects. With this end in view, the following broad guidelines (which are only illustrative and not exhaustive) are being brought to the notice of our ROs/ELOs so that necessary fillip could be given to improving the quality of preparation of projects to the maximum extent possible.

2. BROAD GUIDELINES

The most appropriate stage at which the ROs and ELOs can start their effective association with detailed project preparation is the formulation of Five Year Plans and Annual Programmes so that priorities for original/improvement works (keeping in view the existing conditions of various sectors of NHs and the appurtenances thereon) could be determined as correctly as possible keeping in view the constraint of funds. In other words, it needs to be ensured that no urgent work is lost sight of and no unimportant work gets included in the Annual Programme. As soon as the schemes are selected by the Ministry under the five year or annual programmes, the Regional Officer of the Ministry should draw up in consultation with State PWD a programme, in order of priority, for finalising various aspects leading to preparation of projects based on systematic study and sound engineering practice.

2.1. Investigations and project preparation for Road Works :

2.1.1. The Regional Officer should associate with the State Engineers at all crucial stages of investigation and fixing of alignments. He is required to inspect jointly with the PWD officials the proposals for re-alignments, bypasses, diversions, raising of roads etc., keeping in view the geometric standards, drainage aspects, feasibility of acquisition of right of way and other salient aspects such as floodability/submergence etc. In the case of road schemes near the towns, co-ordination with respect to land-use plan of the area needs to be considered. Timely association of officials of the Regional Office of this Ministry with the State PWD is essential in all the above activities so that the proposals framed by the State PWD are properly investigated considering various alternatives and the best proposal recommended to the Ministry.

2.1.2. In the case of projects involving widening/strengthening of road, the points needing attention are removal of geometric deficiencies, fixation of horizontal and vertical profiles, evaluation of existing pavement, and provision of adequate drainage. Regional Officer could suggest, after inspection of the site, the optimum solutions for fixing road profiles and indicate drainage arrangement needed. He should also ensure that the necessary pavement survey including deflection tests etc. are carried out before formulation of pavement proposals.

2.1.3. While carrying out soil and material surveys, it is essential to determine the quality of various construction materials as well as their quantity as needed for the project. This involves careful investigation of borrow areas and quarries followed by testing for evolving various properties of the construction materials available in the vicinity. The involvement by the Regional Office in the activity of material survey would ensure realistic costing of the project based on materials obtaining in the area and would avoid unnecessary revision of the estimate at a later stage.

2.1.4. For cases involving high embankment in approaches to river bridges and railway over bridges, detailed sub surface exploration is necessary. Such areas should be identified at the earliest possible stage and Regional Officer should ensure timely investigation of these locations, so that detailed design of the embankment and realistic estimation of cost thereof could be made. This action would also avoid delay in execution of the project.

2.1.5. The Regional Officer would also suggest appropriate specification for pavement keeping in view the road making machinery available with the State Government and taking into account the improvement works carried out earlier on the road.

1.6. In the case of traffic surveys required in connection with the improvement of the road, viz. widening of pavement, bypasses, provision of traffic junctions etc. the Regional Officer could help the State PWD in suggesting to them the type of data to be collected and also in the judicious selection of traffic count locations.

2.1.7. The Regional Officer should also advise the State PWD at the project preparation stage about any special problem of road construction in the area and suggest solutions practicable under the circumstances.

2.2. Matters regarding bridge projects requiring active technical association with the State PWD authorities

2.2.1. Fixation of tentative site for the construction of a missing bridge or reconstruction of a new permanent bridge in lieu of the existing weak/substandard/damaged bridge :

Active association of the Regional Officer right from the very beginning is sure to prove of immense help to the State PWD authorities. The most important thing to be kept in view is that complete and adequate surveys and sub-soil investigations are the vital pre-requisites for the proper preparation of a bridge project and since we want that detailed sub-soil explorations should be carried out, as far as possible, at the exact location of piers and abutments, it would be necessary that a tentative decision about the site of the bridge and its span arrangement is made before the detailed estimate for geo-technical investigations can be prepared and sanctioned. The basic data required to arrive at the above-mentioned decision would consist of (a) an index plan, (b) a site plan (c) three cross-sections, one at the proposed site and other two at 300 m.u/s and 300 m d/s, (d) a longitudinal section of the river indicating the bed level and HFL etc. and (e) calculations regarding discharge worked-out by different methods (viz. empirical formula and area velocity method etc.). For minor bridges, the Regional Officers can themselves give the necessary guidance to the State PWD officers for fixing the tentative site, design discharge, design velocity and the tentative span arrangement so that a realistic estimate could be prepared for sub-soil investigations. For estimating the required depth of borings, the scour depth may be calculated roughly by assuming the silt factor as however, the exact scour depth will be calculated after the detailed sub-soil investigations have been carried out). However, for major bridges (total length greater than 60 m.) Regional Officers can render the necessary assistance to the State PWD officers for collecting all relevant data in the format prescribed by the Ministry and the help of the concerned Chief Engineer (Bridges) or ADG (B) whenever they happen to visit the area) could be taken for the fixation of tentative para-meters detailed above.

2.2.2 Preparation of detailed hydraulic particulars as stipulated in Annexures I and II of the Ministry's Circular letter No. PL-2 (1)/70 dated 18.1.71.

This is by far the most important information for correctly arriving at all the relevant technical parameters of a bridge project and hence and indepth association of our ROs/ELOs would be extremely beneficial for improving the quality of the project preparation and reducing the time taken by the Ministry for the scrutiny of the technical details and the estimates for bridge projects. It has to be ensured that the correct and complete information with regard to hydraulic particulars is furnished to the Ministry so that there does not arise any need to make a back reference to the State PWD for enabling the Ministry to fix the technical parameters (site, design, discharge, design velocity, type of bridge, total length, span arrangement, type and depth of foundations, SBC, soil parameters, vertical clearance, deck level, requirement of footpaths and special features such as fendering of piers etc.). Detailed sub-soil investigations report is also required to be sent alongwith the hydraulic particulars.

2.2.3 Carrying out an appreciation of the proposed bridge scheme from aesthetic considerations especially in hilly and coastal areas. This aspect needs careful consideration as there are a large number of locations which are of a sensitive nature, calling for careful planning of bridges from aesthetic considerations.

2.2.4 Examination of the requirement of protective works, if any.

It has to be carefully examined whether the scheme of protective works can be finalised with or without the help of model studies. RO's objective assessment in this regard can help a lot.

2.2.5 Position regarding availability of land for the approaches :

It has also to be ensured that the standard of geometrics for the approaches are not sacrificed.

2.2.6 Collecting information about any irrigation works, dams or tanks, etc. coming up in the vicinity of the proposed bridge. This information is urgently required for the proper planning of our bridge structures.

2.2.7 Any special problems regarding foundations or other matters likely to be faced and this can be best determined with the help of a knowledge of the local area and here lies the usability of RO's association.

2.3 Other matters requiring association of ROs/ELOs :

2.3.1 R&D activities (Research Schemes) of the Ministry being implemented by State PWDs or Research Stations or Engineering Institutions etc.

2.3.2 Monitoring the quality of road construction by the use of roughometers as laid down in the Ministry's circular letter No. NHIII/P/10/84 dated 15.5.85.

7300-16

D.O. LETTER NO. RW/PL-30 (120)/84 DATED THE 14TH AUG., 1984 FROM D.G. (RD) & ADDL. SECY. TO THE GOVT. OF INDIA ADDRESSED TO SECRETARIES CEs of STATE PWDs. & COPY TO ROs/ELOs & SECY., NORTH EASTERN COUNCIL

Subject : Duties and responsibilities of the Regional Officers (Chief Engineer or Superintending Engineer) and Engineer Liaison Officers of the Ministry of Shipping & Transport (Roads Wing) posted in the Regional Offices situated in various States review thereof

As is well known, the Regional Officers and Engineer Liaison Officers of this Ministry have been functioning in the States for quite sometime past with a view to assisting the State PWDs in the execution of original and maintenance works on National Highways and under other Centrally Financed Schemes. The duties and responsibilities of these officers as previously indicated in our letter No. PL-30 (46)/68 dated 18.7.73, have been reviewed in the light of the experience gained in the past as well as the recommendations made by the Vohra Committee on Agency System for National Highways. The duties and responsibilities of the ROs and ELOs as now stipulated are given in the enclosed Annexures I, II and III.

2. In some States, we have also posted Superintending Engineers (Mechanical) to look after the Central Machinery/Equipment. Annexure IV indicates the duties and responsibilities of the Superintending Engineers (Mech.) posted in the States.

3. I would like to draw your kind attention particularly towards the following two recommendations of the Vohra Committee for bringing about qualitative improvement in the Agency System :

- (i) "The present standard of monitoring of National Highway works both at the Centre and in the States is inadequate and should be suitably improved in order to avoid infructuous expenditure. Greater use of Regional Offices of the Ministry should be made for this purpose." (Para 1.6).
- (ii) "The Ministry must clearly define the scope of surveys and investigations which should precede the preparation of project and must not issue any sanction unless these have been carried out to its satisfaction." (Para 1.2).

Keeping the above observations in view, I hope you will fully agree with me that an indepth association of our ROs/ELOs at critical and important stages of investigations and project preparation is called for and we have accordingly given directions to our ROs/ELOs vide my d.o. letter No. NHIII/P/31/77 dated 12.8.85 with which I have issued detailed guidelines for the association and interaction of our officers with those of the State PWDs.

4. As the successful functioning of the ROs and ELOs of this Ministry depends to a great extent on the cooperation and assistance of the State Governments/State PWDs, so generously extended by them in the past, I shall be extremely grateful if the same assistance and cooperation is continued to be extended to the ROs and ELOs in future also so as to help them in the proper discharge of the duties and responsibilities entrusted to them.

5. I also wish to draw your personal attention towards the contents of our letter Nos. NHIII/P/31/77 dated 10.1.85 and RW/NHIII/P/31/77-Pt. dated 14.1.85 wherein it has been mentioned that before framing a detailed estimate, the State PWD would furnish the technical proposals in respect of road and bridge works in the first instance to the Ministry. In this connection, it may kindly be ensured that whenever a technical proposal relating to a road or bridge work is projected to the Ministry, a copy thereof is invariably supplied to our RO/ELO because otherwise the scrutiny of the same is likely to get delayed in the Ministry in the absence of relevant comments from our Regional Offices.

Encls : Annexure I, II, III and IV.

DUTIES AND RESPONSIBILITIES OF THE REGIONAL OFFICERS (C.E. OR S.Es.) POSTED IN THE REGIONAL OFFICES OF THE MINISTRY OF SHIPPING AND TRANSPORT (ROADS WING)

1. The Regional Officer will act as the local representative of the Government of India, Ministry of Shipping and Transport (Roads Wing) in order to render effective help to the State PWDs. in the areas of planning, field investigations, preparation of detailed projects and execution of original works on National Highways and under other Centrally Financed Schemes and maintenance works on National Highways.
2. He will fully associate himself with the concerned authorities of the State PWDs in the stages of planning, detailed site investigations, surveys, subsoil explorations, collection of soil and hydraulic data and other related inputs necessary for the preparation of technically sound and economically viable road and bridge projects on National Highways and under other Centrally Financed Schemes (for detailed guidelines, reference may be made to Ministry's Circular No. NHIII/P/31/77 dated 12.8.85).
3. He will render technical advice to the State PWDs on alignments of roads, siting of bridges, adoption of suitable flood protection measures, utilisation of proper construction methods and procedures depending upon the locally available materials. He will also render all necessary help in the design of roads and structures thereon.
4. He will examine the detailed estimates (FDR, SR and revised) pertaining to road and bridge works projected by the States and forward his comments thereon to the Director General (Road Development) on various aspects of design, site conditions, alignments, construction materials, specifications, leads and other essential supporting data such as the physical and financial schedule of construction. If there are any points requiring to be brought particularly to the notice of the DG (RD) in the case of original estimates, the same should be specifically mentioned without waiting for invitation of comments on specific points from the Ministry.
5. He will maintain close liaison with the concerned officers of the State Government/State PWD for all matters pertaining to development and maintenance of National Highways and other improvement works for Centrally Financed roads.
6. He will oversee the execution of all Centrally financed road and bridge works (by undertaking frequent inspections) with a view to ensuring implementation of effective quality control and timely execution of the sanctioned jobs so that the bursting of estimates on account of time and cost overruns or violation of the sanctioned specifications could be avoided as far as possible.
7. He will keep necessary watch in regard to the prompt fixation of agency by the State PWDs for execution of sanctioned works on the ground speedily after the sanction of projects. He will also monitor the action taken by the State PWD for prequalification of tenderers as per Ministry's instructions on the subject. He will also monitor the progress of all Centrally Financed works (with an emphasis on pinpointing bottlenecks in the expeditious execution of works) and send a quarterly report to the Ministry in the prescribed format (please refer to Ministry's letter No. RW/NHIII/P/26/84 dated 5.9.84).
8. He will ensure that the field formations of the State PWDs maintain regularly the road and bridge registers as well as traffic census data for National Highways, care being taken that the same are updated regularly.
9. He will ensure that the concerned authorities of the State PWDs furnish according to the prescribed time-table the maintenance Abstract particulars for National Highways to the Roads Wing.
10. He will keep a watch on the State PWDs utilising the Maintenance & Repair grants as per specific programmes that may be approved by the Roads Wing. For this purpose, he will approve (every year in the month of January) the Kilometres on various National Highways under his jurisdiction where the work of periodic renewals is to be carried out in accordance with the funds likely to be placed at the disposal of the State PWD for the ensuing financial year. Simultaneously, he will also identify the specific works relating to Bridge Repair (B.R.) required to be carried out on NHs.
11. He will pursue with the State authorities to see that all reports/information called for from the State in respect of Parliament Questions, items concerning Consultative Committee of Members of Parliament, P.A.C. matters and Audit Paras and observations of the Accountant General are furnished to the Roads Wing promptly and completely.
12. He will ensure that the State PWDs observe and furnish to the Roads Wing regularly and timely the prescribed traffic census data for National Highways as per prescribed instructions in which context he will associate himself with the State authorities for proper adoption of traffic count stations and also occasionally associate his staff to ensure that the traffic counts observed and reported are accurate and reliable.
13. For original works pertaining to roads and bridges costing less than Rs 10 lakhs each (which are required to be accorded only administrative approval by the Ministry), the Regional officer shall strictly follow the procedure laid down in Ministry's letter No. RW/NHIII/COORD/34/84 dated 12th December, 1984.
14. He will associate himself (right at the initial stages of road work) for proper assessment of the extent of levelling course needed before laying strengthening/surfacing courses on the existing pavement and his assessment will be treated as final.
15. He will also monitor the progress of Research Schemes of the Ministry by pursuing the matter suitably with the implementing agencies such as State PWDs or Research Stations or Engineering Institutions etc.
16. He will monitor the quality of road construction on National Highways by the use of roughometers as laid down in the Ministry's letter No. NHIII/P/10/84 dated 15.5.85.

ADDITIONAL DUTIES AND RESPONSIBILITIES OF THE REGIONAL CHIEF ENGINEER, GAUHATI

1. He will accord technical clearance to all estimates for road and bridge works (irrespective of the cost thereof) received from the North-Eastern Council. However, for the estimates amounting to more than Rs 75 lakhs, he may seek advice from the Ministry on certain issues, if need be.
2. He will approve the hydraulic particulars (such as site, design discharge, design velocity, waterway, span arrangement, design scour depth, type and depth of foundations, vertical clearance and deck level etc.) for all bridges (irrespective of the length or cost of bridge) on Strategic Roads in the States of Tripura and Meghalaya. He will also approve the hydraulic particulars for all bridge works on National Highways under his jurisdiction (i.e. in the States of Assam, Meghalaya, Manipur, Nagaland and Arunachal Pradesh) where the cost of bridge work is not likely to exceed Rs 75 lakhs.
3. He will examine the detailed estimates relating to the construction/reconstruction of bridges (and their approaches) on the Strategic Roads in Tripura and Meghalaya and forward the estimates (with or without any modifications, duly carried out in the estimate) along with a technical note for enabling the Ministry to arrange financial sanction.
4. He will approve the detailed working drawings (based on detailed design calculations) for all bridge works (irrespective of the cost thereof) on the Strategic Roads in Tripura and Meghalaya.

ANNEXURE-III**DUTIES AND RESPONSIBILITIES OF ENGINEER LIAISON OFFICERS POSTED IN THE REGIONAL OFFICES OF THE MINISTRY OF SHIPPING & TRANSPORT (ROADS WING)**

1. Under the overall control and direction of the Regional Officer, he will act as local representative of the Government of India, Ministry of Shipping and Transport (Roads Wing) in order to help the State Public Works Department in proper and speedy planning, investigations, project preparation and execution of original and maintenance works on National Highways and other highway projects financed by the Central Government. He shall render all such necessary assistance to the Regional Officer, as he may be called upon to do, for enabling the Regional Officer to perform his functions as defined in 'Duties and Responsibilities of Regional Officers' in respect of the area coming under the jurisdiction of the Engineer-Liaison Officer.
2. He will assist the Regional Officer in associating with the State Public Works Departments, as may be necessary and feasible and as directed by the Regional Officer, in detailed project preparation as explicitly defined in the 'Duties and Responsibilities of the Ministry's Regional Officers' (Annexure-I).
3. He will assist to the best of his ability in the Planning of development works on National Highways with due regard to the requirements of the Central Government.
4. He will furnish all necessary information to the Regional Officer to enable him to furnish comments to the Roads Wing on the suitability or otherwise of the work estimates or furnish comments thereon covering all technical and allied aspects.
5. He will examine proposals for works at site in the company of a P.W.D. Officer of the rank not below that of an Executive Engineer/Assistant Executive Engineer as may be desired by the Chief Engineer of the State concerned, and visit works in progress.
6. He will assist the Regional Officer in monitoring the progress of works periodically and ensure timely submission of periodic financial and physical progress reports by the State Public Works Department to the Roads Wing.
7. In respect of works costing less than Rs 10 lakhs he will assist the Regional Officer in the functions assigned vide relevant para of the 'Duties and Responsibilities of the Regional Officers', as called upon to do by the Regional Officer.
8. He will assist the Regional Officer in ensuring timely submission of Maintenance Abstract Particulars, proper maintenance and periodic renewals of National Highways by the State Public Works Department. He will make himself familiar with the liabilities for maintenance of National Highways within his sphere of jurisdiction and preserve cordial relations with the State P.W.D. Officers.
9. He will be responsible for looking after the interests of the Government of India in road matters and particularly ensure proper maintenance of National Highways and other roads, for the development and proper maintenance of which grants are sanctioned by the Centre, under the overall guidance of the Regional Office of the Roads Wing in the area.
10. He will render necessary assistance to the Regional Officer in timely inspection of flood/rain damages on the National Highways under his jurisdiction and in furnishing necessary assessment regard flood damage repairs as expeditiously as possible. He will also assist the Regional Officer in finalising the Flood Damage Repairs estimates and S.R. estimates in an expeditious and befitting manner.
11. He will ensure that the Engineers of the State Govt. maintain regularly road and bridge registers for National Highways indicating upto date position.
12. He will pursue with the State authorities to see that all reports/information called for from the State in respect of Parliament Questions, items concerning Consultative Committee of Members of Parliament, P.A.C. matters and Audit Paras, observations of the Accountant General and other important matters are furnished to the Roads Wing promptly and completely.
13. He will ensure that the State Public Works Departments observe and furnish to the Roads Wing regularly and timely the prescribed traffic census data and any other data pertaining to road and bridge works for National Highways as per prescribed procedure in which context he will associate himself with the State Public Works Department for judicious selection of traffic count stations and also ensure that the traffic counts observed and reported are accurate and reliable.

14. He will hold periodic meetings/discussions with the State Public Works Department officers for expediting action on important matters and outstanding issues and keep the Ministry/Regional Officer posted with the developments and bring to their notice any important matters regarding estimates, designs, budgetary aspects etc. requiring Ministry's immediate attention.
15. He will ensure that records pertaining to National Highway land are properly maintained by the field formations of the State Public Works Department.
16. He shall furnish prescribed quarterly report covering all the points mentioned therein, as stipulated in the Ministry's letter No. RW/NHIII/P/26/84 dated the 5th Sept., 1984.
17. He will discharge any other official duty assigned to him by the Regional Officer.

ANNEXURE-IV

DUTIES AND RESPONSIBILITIES OF SUPERINTENDING ENGINEERS (MECHANICAL) POSTED IN THE REGIONAL OFFICES

1. The Superintending Engineer (Mechanical) will act as a local representative of the Government of India, Ministry of Shipping & Transport (Roads Wing) for all matters pertaining to Central machines.
2. He will inspect the Central machines available in his region from time to time to check their condition, repairs, maintenance, documentation, and their proper utilisation. He will also inspect documents pertaining to Central machines maintained by State P.W.Ds.
3. He will watch the utilisation of Central machines and monitor their performance. He will also assist the State P.W.Ds. in finalization of annual utilisation, programme of machines and suggest their alternative deployment in the best interest of Government.
4. He will approve and sanction repairs of Central Machines within the financial powers delegated to him by this Ministry vide letter No. RM-23 (33)/75 dated 3rd November, 1976 and also recommend other repairs to this Ministry exceeding his financial powers. He will also watch the progress of repairs of Central machines, so as to keep the down-time to bare minimum.
5. He will watch the recovery of hire charges earned vis-a-vis the repair expenditure, while according sanction of repair estimates.
6. He will assist the State P.W.Ds. for commissioning and trial run of new machines purchased, and take follow-up action in this regard. He will also ensure proper utilisation of initial spares purchased alongwith new machines.
7. He will pursue with the State P.W.Ds. to see that all reports/information called for from the States by this Ministry are furnished by them. He will also ensure that other information called for by this Ministry pertaining to Central machines, involving Parliament Questions, items concerning Parliament/PAC matters, Audit Paras, etc. are furnished to Roads Wing promptly by State authorities.
8. He will associate with the State PWDs for timely disposal of unserviceable machines and surplus machines with them and for expeditious action in this regard.
9. He will process the loan proposals sent by the States for purchase of machines needed for execution of NHs works, and send suitable recommendations to this Ministry.
10. He will keep the Ministry informed about day-to-day important developments pertaining to Central machines through quarterly reports, and watch the overall interest of Central Government on all aspects, so far as the use of machines are concerned.
11. He will see that policies/instructions issued by this Ministry regarding machines are followed by State PWDs and take necessary follow-up action.
12. He will supervise inter-state transfer of Central machines, and assist the collection teams of other States, in their region.
13. He will maintain an upto date inventory of Central machines in the region in his office.
14. He will coordinate with R.Os. of this Ministry, in matters relating to utilisation of Central machinery, unit rate and machinery use in the works estimates etc.
15. He will provide Technical Assistance to the State PWDs regarding specifications, suitability according to job condition etc.
16. He will act as a Technical know-how deputation centre for Mechanisation and modernisation of highway construction.
17. He will assist the State PWDs in organising training for supervisory and operating staff for better operation, up-keep and utilisation of machinery.
18. He will provide data for rate analysis for different items of mechanised work to the Ministry and State P.W.Ds.
19. Wherever necessary, he will assist the State P.W.Ds. in establishing appropriate Mechanical set-up and creation of repair infrastructure.

7410 VIGILANCE, SECURITY, ENDORSEMENT OF COPIES, PATTERN OF JOB NOS. ISSUE OF CIRCULARS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7410.1.	RW/A-8 (3)/82 dt. 25.2.82	Endorsement of copies of important Documents and Papers containing Major Policy Decisions to the Governors of States	7410/1
7410.2.	IWSU-WTA-5/84 dt. 4.5.84	Recommendations of Economic Administration Reforms Commission on 'Accountability'— Inspection Squad	7410/2
7410.3.	RW/4 (2)/79-Genl. dt. 12.7.84	Precautions for Maps and Topo Sheets etc.	7410/2
7410.4.	NHIII/Coord/113/84 dt. 11.10.84	Standard Pattern for Allocation of Job Nos. to Sanctioned Works of various Categories.	7410/3
7410.5.	NHIII/Coord/117/84 dt. 12.12.84	Endorsement of Correspondence with State PWDs to concerned ROs/ELOs.	7410/4

No. RW/A-8 (3)/82

Dated the 25th February, 1982

Subject : Endorsement of copies of important documents and papers containing major policy decisions to the Governors of States

A copy of the Ministry of Shipping and Transport (Transport Wing) O. & M. Section's O.M. No. WOM-7/82 dated 2nd February, 1982, on the subject noted above, is forwarded to all concerned for guidance & strict compliance.

To

D.S. (P&B)/All Under Secretaries/Addl. DG (B), All Chief Engineers/Superintending Engineers in the Roads Wing. All Regional Offices in the Roads Wing.

No. WOM-7/82

Dated the 2nd February, 1982

OFFICE MEMORANDUM

Subject : Endorsement of copies of important documents and papers containing major policy decisions to the Governors of States

A copy of the Cabinet Secretary's D.O. Letter No. 70/5/1/82-Cab. dated 23.1.82 addressed to Secretary along with a copy of D.O. Letter No. 70/5/2/72-CF dated 3.1.73 on the above subject is enclosed for guidance and strict compliance.

D.O. NO. 70/5/1/82-CAB DATED 23.1.82 FROM THE CABINET SECRETARY, NEW DELHI TO SECRETARY, MINISTRY OF SHIPPING AND TRANSPORT NEW DELHI.

I am enclosing copy of d.o. letter No. 70/5/2/72-CF dated 3rd January, 1973, from the then Cabinet Secretary addressed to all Secretaries asking that copies of all important communications addressed to a State Government should also be sent to the Governor of the States. This was reiterated in several subsequent circulars, the last of which was issued by my predecessor on 6th April, 1981. We are still receiving complaints from Governors that they are not receiving copies of such communications. I have to request you, therefore, once again to make sure that action in this regard is taken.

D.O. LETTER NO. 70/5/2/72-CF DT. THE 3RD JANUARY 1973 FROM THE CABINET SECRETARY TO ALL SECRETARIES TO THE GOVT. OF INDIA

At the recent conference of the Governors, several Governors suggested that copies of important documents and papers which are sent to the State Governments by the different Ministries should also be furnished to the Governors so that they are kept informed of the major policy decisions.

2. The rules of business in almost all the State contain a provision that copies of important communications from the Government of India should be expeditiously submitted by the Secretary of the Department concerned in the State to the Governor, the Chief Minister, etc., as soon as they are received. The Home Secretary is separately writing to all the Chief Secretaries to draw their attention to the relevant provision in the rules of business made under article 166 of the Constitution in different States and to request that necessary action may be taken to comply with the requirements of the rules. It would be in keeping with the spirit of these rules in force in different States if different Ministries and Department, Officer under Government were also to make arrangements to ensure that copies of important communications from the Government of India sent to States Governments are also furnished separately to the Governors.
3. It is not the intention that copies of all communications should go to the Governors. You will have to be selective in your approach. Communications which contain significant policy matters, or which draw attention to criticism or suggestions made in Parliament or which relates to formulation of new development programmes could obviously be of interest of the Governors. Similarly, when Central Ministers write to the Ministers of the State Governments on any important issue they may also like to consider whether copies of their communications should also be furnished to the Governors. The whole object of this exercise should be to keep the Governors informed of the views and thinking of the Government of India as well as of the Parliament on important matters so that the Governors are in a better position to discharge their responsibility.
4. It would be appropriate that while furnishing copies of important communications from the Government of India to the Governors, such communications are not endorsed in a routine way by including the name of the Governors in the circulation list. It would be useful if all such communications were to be sent to the Governors with separate forwarding letter indicating wherever possible, any aspect which would be of interest to the Governors.

No. IWSU-WTA-5/84

*Dated the 4th May, 1984***MEMORANDUM**

Subject : Recommendations of Economic Administration Reforms Commission on 'Accountability' — High level Inspection Squad — Setting up of

One of the conclusions of the Committee of Secretaries in the meeting held on 23.8.83 to consider a Note from the Economic Administration Reforms Commission on 'Accountability' states that there was need to fight the spreading malaise of corruption, and to change the ethos of resigned acceptance of the malady at higher levels. It had accordingly been recommended that a high level inspection squad should be formed in each Department. This recommendation was considered by the Ministry of Shipping and Transport and it has been decided to set up a high level inspection squad in this Ministry. The squad will comprise the following officers :

- (1) Shri P.V. Rao, Joint Secretary
- (2) Shri Rajiv Srivastava, Director
- (3) Shri Bhagat Singh, Senior Analyst

2. The functions of the Squad will be as under :

- (1) To look into of complaints received from the general public against the officers and staff of the Ministry, including attached and subordinate organisations as also Public Sector Undertakings, Autonomous bodies, etc.
- (2) To look into of complaints received from various other official agencies such as President's Secretariat, Prime Minister's Secretariat, Commissioner of Public Grievances, etc. against the officers and staff of the Ministry, including all organisations working under it.
- (3) To visit the headquarter/branch offices of various attached and subordinate offices, as also Public Sector Undertakings, Autonomous Bodies, etc. of the Ministry to look into the arrangements that exist for attending to complaints received by them direct from the public as also those referred to them by the Ministry, and to give suggestions to them in this regard for improving the existing arrangements.
- (4) To study the working procedures of the Ministry, including all organisations under it, with a view to examining whether the existing procedures are prone to give rise to the possibility of corruption and, if so, suggest ways and measures to change such procedures and also to adopt the necessary checks to ward off the possibility of corruption.

3. The Squad would evolve its own procedure of functioning.

4. The secretariat assistance to the squad would be provided by the Complaint Cell already functioning in the Ministry.

To

All Attached & Subordinate Offices All Public Sector Undertakings and Autonomous Bodies All Officers Director Public Relations attached to the Ministry.

7410.3.

No. RW/4 (2)/79-Genl..

*Dated the 12th July, 1984***CIRCULAR**

Subject : Precautions for Maps & Topo Sheets etc.

All Officers & Sections in the Roads Wing are requested that the following precautions must be taken for the safe custody and proper maintenance of the Maps as instructed by the Survey of India, Dehradun.

1. Maps should be kept flat as far as possible.
2. No permanent markings should be done on maps and if required for certain reference only marking with soft pencil be done so that it could be erased afterwards easily with rubber.
3. Security certificate should be taken from the Officers to whom maps are issued and the certificate should be signed by a Gazetted Officer with stamp so that a proper check could be maintained in the Issue Register of Maps.
4. No Topo Sheet should be reproduced in part or in whole either by photography or by any other means.

To

1. All Officers/Sections (Secretariat & Technical) in the Roads Wing
2. The Incharge-Maps, Technical-General Section

No. RW/NHIII/COORD/113/84

Dated the 11th October, 1984

Subject : Standard pattern for allocation of job numbers to sanctioned works of various categories.

Presently, any uniform pattern for allocation of job numbers to sanctioned works is not being followed in the Roads Wing. This non-uniformity in job numbers is causing a lot of problems for computerisation as all the relevant details and monitoring by computerisation hinges upon the job number. It has, therefore, been decided that a uniform standard pattern may be followed for allocation of job numbers to sanctioned works of various categories as per pattern and examples given below :

Category

1. National Highway (original works)	: Pattern	: National Highway number followed by state abbreviation followed by year of approval followed by job serial
	Example	: 007 MP 84 648
1.1. For administrative approval	: Example	: AA 31C AS 84 082
2. National Highway SR/FDR works	: Example	: TA 006 MP 84 782
3. For other category of works	: Pattern	: Category abbreviation followed by State abbreviation followed by year of sanction followed by job serial
3.1. Abstract Particulars of National Highways	: Example	: AB NH BR 84 336
3.2. Strategic Roads	: Example	: ST PB 84 130
3.3. Grants in aid works	: Example	: GA RJ 84 032
3.4. Economic Importance works	: Example	: EC BR 84 780
3.5. Interstate Importance works	: Example	: IS BR 84 378
3.6. CRF (Allocation)	: Example	: AL KN 84 381
3.7. CRF (Ordinary Reserve)	: Example	: OR BR 84 048

It is to be noted that no hyphen or stroke is to be given in the job number and also any pre-fix or suffix of any kind has not to be added.

A list of abbreviations for States names is enclosed.

To

All Technical Officers in the Roads Wing DS (P&B), all Under Secretaries and all Section Officers. Copy with a copy of the enclosure forwarded for information to (a) All State Chief Engineers (P.W.D.) and all R.Os/E.L.Os.

CODES AND ABBREVIATIONS FOR STATE NAMES

01	Andhra Pradesh	AP
02	Assam	AS
03	Bihar	BR
04	Gujarat	GJ
05	Haryana	HR
06	Himachal Pradesh	HP
07	Jammu and Kashmir	JK
08	Karnataka	KN
09	Kerala	KL
10	Madhya Pradesh	MP
11	Maharashtra	MH

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12	Manipur	MN
13	Meghalaya	MG
14	Nagaland	NG
15	Orissa	OR
16	Punjab	PB
17	Rajasthan	RJ
18	Sikkim	SK
19	Tamil Nadu	TN
20	Tripura	TR
21	Uttar Pradesh	UP
22	West Bengal	WB
23	Andman and Nicobar Islands (U.T.)	AN
24	Arunachal Pradesh (U.T.)	AR
25	Chandigarh (U.T.)	CH
26	Dadra and Nagar Haveli (U.T.)	DN
27	Delhi (U.T.)	DL
28	Goa, Daman and Diu (U.T.)	GO
29	Lakshdweep (U.T.)	LK
30	Mizoram (U.T.)	MZ
31	Pondicherry (U.T.)	PO

7410.5.

No. RW/NHIII/COORD/117/84

Dated the 12th December, 1984

Subject : Endorsement of correspondence with State PWDs to concerned R.Os/E.L.Os

It has been observed in a number of cases that copies of letters addressed by us to the State PWDs are not endorsed to the concerned Regional Officers/Engineer Liaison Officers. This leads to anomalous situation in as much as R.Os and E.L.Os remain ignorant about the correspondence being exchanged by us with the State PWDs. It is therefore essential that copies of all correspondence with State PWDs should invariably be endorsed by us to R.Os/E.L.Os either for necessary action by them or even for their information. These instructions may please be kept view in all future correspondence with State PWDs.

To

All Under Secretaries/All Desk Officers/All Section Officers in the Roads Wing/All Technical Officers in the Roads Wing

7420 HANDING OVER CHARGE

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7420.1.	RW/NHVI-50 (3)/83 dt 25.5.85	Handing Over Notes about Works being Handled by Technical Officers	7420/1

No. RW/NHVI-50 (3)/83

Dated the 25th May, 1985

Subject : Handing over notes about works being handled by technical officers

It has been observed that when technical officers (A.E.s, EEs, SEs and CEs) at the Headquarters are transferred from one Zone to another Zone or outside the Headquarters or within the regions or from the region to the Headquarters, most of them do not give handing over notes briefly describing the position of works which were hitherto being dealt with by them. In the absence of such notes, the new incumbent is likely to face difficulties when some information is required at short notice for a number of purposes such as preparation of reply to a Lok Sabha/Rajya Sabha Question, preparation of a brief for the Consultative Committee of the Parliament, putting up notes regarding Cut Motions, or Call Attention Notices in the Parliament etc.

2. In order to ensure smooth transition in the dealing of works (involving various types of cases such as original estimates, revised, F.D.R. estimates, approval of designs and drawings, progress of work etc.), all technical officers are requested to give suitable brief notes to their successor officers (or to their next higher officers, if the successor officer does not happen to be at the Headquarters at the time of change over) as soon as they are transferred from one Zone to another Zone or outside Headquarters. The above mentioned notes should generally contain information with regard to the following aspects :

- 2.1. National Highway Nos. along with their lengths lying in the concerned State/Union Territory.
- 2.2. List of works sanctioned during the past 5 years along with their job Nos., sanction letter number, date of sanction, sanctioned cost and the target date of completion as per phasing indicated in the technical note accompanying the sanction letter.
- 2.3. Physical position of various works (not started or started or completed) along with their upto date percentage of physical progress, if already started and expenditure upto the last quarter.
- 2.4. Position of submission of designs/working drawings and their approval component-wise, for bridge works which have been let out on the basis of alternative designs.
- 2.5. List of pending estimates (original or revised or FDR etc.) and designs for which approval is to be conveyed.
- 2.6. Detailed notes about major Road/Bridge works (separate note for each such bridge having overall length more than 200 m or Road works costing more than Rs 50 lakhs).
- 2.7. Annual Programme for the sanction of works.
- 2.8. Other important cases requiring immediate attention.
- 2.9. V.I.P. references and cases monitored at Cabinet Committee levels.
3. The procedure outlined in the foregoing paragraphs shall be invariably followed by all technical officers working in the Headquarters.
4. Similar procedure shall be followed by officers posted outside the Headquarters also.

To

All Technical Officers in the Headquarters. All Technical Officers in the Regional Offices/Engineer Liaisons Officers.

7430 PARLIAMENT QUESTIONS

<i>Code No</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No</i>
7430.1	RW/AII-11 (28)/81 dt. 15.12.81	Procedure for dealing with Parliament Questions	7430/1

No. RW/AII-11 (28)/81

Dated the 15th December, 1981

MEMORANDUM

Subject : Procedure for dealing with Parliament Questions

Several instructions have been issued from time to time by the Coordination Section, Transport Wing, on the above subject. So far as the Roads Wing is concerned, the procedure to be followed is reiterated for the convenience of officers and staff concerned :

- (i) The notice of Question received from Coordination Section will be sent by Admin. II Section to the concerned Section immediately on receipt after entering in the register maintained for the purpose. If any branch does not want to accept notice of a Question, the Section Officer through the Branch Officer and the Desk Officers through the Chief Engineer concerned would mention the fact, sign it and return to the Admin. II Section. In the absence of the Branch Officer and CE concerned being on tour, the next senior officer may be consulted and Admin. II informed accordingly and Admin. II Section will further investigate as to whom the question should be sent. In case of any serious doubt the orders of ADGs/DG (RD) and Addl. Secretary will be obtained.
- (ii) The Branch concerned will make copies of the notice of the question and send to the concerned CEs and other officers for information and collection of material simultaneously through telephone calls to the State Chief Engineers and other authorities concerned. A copy of the notice should be endorsed to DG (RD)/ADG (B)/ADG (R) and another copy sent to US (A) for coordination. No such copies need however be endorsed to ADG (B)/DG (RD) in respect of question where facts have been asked.
- (iii) The branch concerned will process action on the notice of question and take immediate action for collecting relevant material etc. from within the office or from outside sources, as the case may be. Such action will be taken irrespective of the fact whether the question is later on admitted or not.
- (iv) When the admitted list is received from the Coordination Section, the same will be entered in the register maintained by Admin. II Section against the relevant item of notice and sent to the concerned sections.
- (v) The branch concerned will check the text of the question as finally admitted and make any changes in the reply to be given.
- (vi) The Parliament Question files will be submitted to higher officers with a time schedule to ensure that the file reaches Minister atleast two days in advance of the date of answer.
- (vii) The Coordination of and collection of information concerning more than one State will be made by NH-III Section (DO-II). If the question relates to one Section but information has to be collected from other Sections the section dealing with that particular State would do the coordination.

If there is a doubt as to who should deal with such a question, the orders of ADGs/DG (RD) will be obtained.

- (viii) When the question files have been received after approval of the draft answer, sufficient copies will be made out and sent to the Parliament Assistant as follows :

	No. of Copies	
	(Both for Lok Sabha and Rajya Sabha)	
	English Version	Hindi Version
		Lok Sabha Rajya Sabha
Starred Question	400	230 if the Question is in Hindi and 230 copies
Unstarred Question	400	130 if the Question is in English and whether the Question is in English or in Hindi
Note for Supplementaries (on single side with sufficient margin)	15	

The cyclostyled copies of the answer should be sent to the Parliament Assistant in time. A copy of the final answer should be given to PS to DG (RD)/ADG (B)/ADG (R) for putting up to their officers. Five copies of the final answer may also be sent to US (A) for record in Admin. II Section.

- (ix) In order to facilitate quick Hindi translation of answers, a duplicate copy of the draft answer will be placed on the file. When DG (RD) and Additional Secretary has approved the draft answer, the duplicate copy would be suitably altered, if necessary, by PS to DG (RD) and then that copy would be sent to Hindi Section direct to enable them to start translation. The Parliament Assistant would also keep a watch at the final stage that the Hindi and English versions tally.
- (x) In case where question is transferred to some other Ministry, the Section concerned with it by virtue of their dealing with a particular State, will take all necessary action for its transfer and intimation to the Lok Sabha/Rajya Sabha Secretariat. Intimation regarding the transfer should be given to DG (RD)/ADG (B)/ADG (R) and US (A) for record in the Admin. II Section.
- (xi) If a question transferred by some other Ministry and accepted by the Roads Wing is received direct in the Section (not through the Admin. II), intimation regarding its acceptance should be given to Admin. II Section for coordination, with a copy to DG (RD)/ADG (B)/ADG (R) indicating thereon that the transfer of question has been accepted and the Lok Sabha/Rajya Sabha Secretariat duly requested to put this question for answer on a day allotted to this Ministry. Parliament Assistant in the Ministry should also be informed.

- (xii) The branches concerned should intimate Admin. II Section regarding the officers concerned with any particular Starred Question in connection with which they have to be present in the official gallery at the time the question is answered. The Section concerned will communicate to the Admin. II Section after obtaining the orders of DG (RD) so that Admin. II Section could make arrangements for official gallery cards.

2. The above instructions may be scrupulously followed. It is requested that all concerned should take timely action and with a definite time schedule in order to avoid unnecessary delays and tension, so that there is smooth flow of the Parliament files from one level to the other with the ultimate aim of the question files reaching the Ministers well in time as specified in the above instructions.

3. Immediate action should be taken by all concerned at every stage and primarily through personal contact within the Ministry in addition to any notings on the file. Any anticipated likely delay should immediately be brought to the notice of higher officers. Technical and Secretariat officers concerned with any Parliament question should not leave the office at the end of the day without permission from ADGs/CEs/US and DS concerned during three working days prior to the date of answering of the question.

Copy to :

1. All Officers/Sections in the Roads Wing
2. Parliament Assistant for information only.

7440 REPORTS TO PM SECRETARIAT

<i>Code No</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No</i>
7440.1.	NHIII/Coord/26/85 dt. 11.4.85	Fortnightly Report of Important Activities/Achievements for Prime Minister's Secretariat	7440/1
7440.2.	NHIII/Coord/26/85 dt. 15.7.85	Format of Reports to PMs Secretariat	7440/1

No. RW/NHIII/Coord/26/85

Dated the 11th April, 1985

CIRCULAR

Subject : Fortnightly report of important activities/achievements for Prime Minister's Secretariat

The Roads Wing is required to send the above report to the Co-ordination Section by the 2nd and 17th of every month. This report is compiled in the Monitoring Zone on receipt of reports from all officers concerned. The requirement of furnishing the informations promptly by the concerned officers has been emphasised several times in the past. But, it appears, the importance the matter deserves is not being given by some officers as the practice of voluntary furnishing of the informations is yet to be established and the staff of the Monitoring Zone has to remind several times before the report is obtained. It is, therefore, again requested that all Superintending Engineers concerned may please send their reports to Shri R.S. Mahalaha, S.E. (B) Mon. by 1st and 16th of every month positively. The S.Es may entrust the E.Es to send the report only when the S.Es are away on tour/leave.

2. D.S. (R) and D.S. (P&B) may also please send the report concerning important policy decision and declaration of new National Highways, etc. To avoid any chance of inadvertant omission of any activity, even 'nil' report may be sent if there has not been any activity during the fortnight.

3. S.E. (B) Mon. will please put up the draft report to the undersigned latest by 14.30 hrs. of 2nd and 17th of every month, duly compiled on the basis of whatever informations have been received by him, mentioning the names of the States for which informations are not made available.

4. This issues with the approval of the DG (RD).

To

All C.Es, S.Es and E.Es at Headquarters/DS(R)/DS(P&B)

Copy for information to ADG(B)/ADG(R)

7440.2.

No. RW/NHIII/COORD/26/85

Dated the 15th July, 1985

At the instance of the Cabinet Secretariat, the formats for fortnightly reports and monthly summary to be sent to the Prime Minister's Secretariat/Cabinet Secretariat have been modified and approved by the DG (RD). Copies of the modified formats are enclosed. The officers, who are to give material for the report, have been mentioned in the format itself. It is requested that the reports may be sent to the SE (B) Mon. (Room No. 241) positively by the due dates indicated on the formats to enable the Monitoring Zone to send consolidated reports to the Co-ordination Section in time. Even nil report has to be sent.

As per the revised procedure, the details of sanction have now to be reported in the monthly summary for which the period of reporting is 16th of the previous month to 15th of current month. The S.Es Roads/Bridges had furnished reports for the fortnight ending 30.6.85. These statistical reports about sanctions were not sent to the Co-ordination Section in view of the revised procedure. As such, the S.Es are requested to furnish the details of sanction of projects for the period from 16th of last month to 15th of current month for the monthly summary.

Encl : Copy of the formats.

To Addl. DG (B)/Addl DG (R)/All CE/DS (R)/DS(R&B) All SEs/All E.Es.

FORTNIGHTLY REPORT FOR P.M.'s SECRETARIAT/CABINET SECRETARIAT FOR THE FORTNIGHT ENDING 15.7.85
(Report to cover for 1st fortnight from 1st to 15th of the month and for 2nd fortnight from 16th to last day of the month)

From : DS (R)/DS (P&B)/SE Roads/Bridges

To : SE (B) Mon. (Room No. 241)

Due date : 1st and 16th every month

Sl. No.	Item	Officer to Report	Material of Report (Additional sheets to be used in case space is insufficient)
1.	Important Developments	DS (R) DS (P&B)	
	(a) Important Policy decisions		
	(b) Declaration of new N.Hs	DS (P&B)	
	(c) Completion of major Projects	S.E. Roads/Bridges	
	(d) Slow performance and abnormal price variation	S.E. Roads/Bridges	
2.	Issues of Topical interest currently appearing in newspapers or subject of public debate	DS (R) DS (P&B)	
3.	Cases where departure from transaction of Business rules or established policy of the Government has taken place	DS (R) DS (P&B)	

Signature
DS (R)/DS (P&B)/SE Roads/Bridges

To
SE (B) Mon.
(Room No. 241)

MONTHLY SUMMARY FOR CABINET SECRETARIAT FOR THE PERIOD ENDING
(Report to cover period from 16th of previous month to 15th of current month)

From : DS (R)/DS (P&B)/SE (Roads)/(Bridges)
To : SE (B) Mon (Room No. 241)
Due date : 20th of every month

Sl. No.	Items	Officer to Report	Material of Report (Additional sheets to be used if space is insufficient)
1.	Report called for at the instance of Cabinet/Cabinet Secretariat/Cabinet Committees	DS (R) DS (P&B)	
2.	Cases relating to Legislation	DS (R) DS (P&B)	
3.	Cases relating to implementation of decisions of Policy matters	DS (R) DS (P&B)	
4.	Cases which are not of Routine nature	DS (R) DS (P&B)	
5.	Cases relating to sanction of Projects	SE (Roads)/Bridges	

PART I : Total sanctions issued ROADS/BRIDGES

STATE	CATEGORY	TOTAL NUMBER OF PROJECTS SANCTIONED DURING THE PERIOD	TOTAL AMOUNT OF SANCTION
1	2	3	4
	NH		
	CRF		
	E&I		
	STRATEGIC ROADS		
	GRANT IN AID		

PART II Details of individual major projects (costing Rs 1 crore and above), Bridges on major Rivers, Bypasses around important cities, Expressways, etc.

7440/3

STATE	NAME OF PROJECT	AMOUNT OF SANCTION
6.	Important activities of the IRCC	IRCC

Signature
DS (R)/DS (P&B)/SE (Roads/Bridges)

To
SE (B) Mon.
Room No. 241

7450 AUDIT PARAS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7450.1.	RW/B-18 (2)/80 dt. 23.4.80	Processing of Draft Audit Paragraph — Procedure	7450/1

No. RW/B-18 (2)/80

Dated the 23rd April, 1980

Subject : Draft Audit Paragraph

A copy of Secretary's note dated the 15th March, 1980 addressed to Director General (Road Development) and Additional Secretary on the subject noted above is forwarded (Appendix) to all Chief Engineers/Superintending Engineers/Deputy Secretaries/Under Secretaries/Desk Officers/Sections in the Roads Wing for their information and compliance.

To

All Chief Engineers/Superintending Engineers/Deputy Secretaries/Under Secretary (Admn.) U.S. (RM)/U.S. (NH) A/U.S. (NH) B/Desk Officer I/D.O. II/D.O. III/NHI/NHII/NHIII/NHIV/NHV/NHVI/Admn. I/Admn. II/RM/SR/OR/PL/Cash Section/General Section.

Appendix

No. BMR-4/80 dt. 15.3.80

It has been brought to may notice that the detailed instructions (vide Budget Section Circular No. BAS-12/77, dated the 27th August, 1979) in regard to dealing with draft audit paragraphs are not being followed in the Ministry resulting in considerable delay in finalisation of replies to Audit.

2. I would request you to please ensure, that the prescribed procedure is followed by all concerned in future, with a view to ensuring proper action.

No. BAS-12/77

Dated the 27th August, 1979

Subject : Instructions in regard to the processing of the draft audit paragraphs

The following instructions issued by the Ministry of Finance (Department of Expenditure) from time to time for processing of draft audit paragraphs are reiterated for guidance and compliance :—

- (i) Enter the particulars of draft para in the control register maintained for the purpose of watching the disposal of draft audit paras.
- (ii) Open a new file and show the draft para on the file to the Secretary/Joint Secretary concerned;
- (iii) Simultaneously collect all the relevant files and other records relating to the draft paras both of the Ministry/Department as well as of its attached/subordinate offices, wherever necessary;
- (iv) Examine the facts mentioned in the draft para with reference to the basic material;
- (v) Check whether the facts contained in the draft para are correct and whether there was any omission on the part of subordinate offices in furnishing correct information or in explaining the matter in the proper perspective in the correspondence with the Accountant General prior to the finalization of the draft para;
- (vi) Arrange for a personal discussion, where necessary with Audit at appropriate level for clarification of points or for making suggestions including the question of dropping the draft audit para. In this connection, Comptroller and Auditor General suggested demi-officially to the Secretaries in August, 1969 that after the facts stated in the draft para have been clarified by the Ministry and intimated to the Accountant General, the Secretary of the Ministry would discuss the cases with the Accountants General personally. If the Secretary himself takes these meetings, the Accountants General or where necessary, even the Additional Deputy Auditor General incharge of Reports, the latter especially for draft paragraphs prepared by outstation Accountants General could attend the meeting. If the Secretary concerned takes the meeting with the Accountant General alongwith the Joint Secretaries or other officers concerned it will take matters nearer a conclusion. If, however, for any reason the Secretary cannot himself take such a meeting and the Joint Secretaries have to do so, the dealing Joint Secretary may be asked to go over and discuss the cases with the Accountants General or where necessary the Additional Deputy Auditor General (Reports). If, after discussion with the Accountant General/Additional Deputy Accountant General (Reports) any Secretary should still feel that it would be desirable that any particular case should be discussed further with the Comptroller and Auditor General before a decision is taken by him to include a para in the Audit Report or not, C. & A.G. would be glad to do so;
- (vii) Send a reply to the Accountant General within six weeks from the date of receipt of the draft para at the latest after obtaining the approval of Secretary/Joint Secretary, verifying the facts contained in the draft para and indicating the comments of the Ministry thereon, in consultation with the Finance Division. Where, however, the reply cannot be sent within the stipulated time the Secretary could bring the problem to the notice of C. and A.G.;
- (viii) Start simultaneously action to remedy the defects, if any, noticed as a result of the draft audit para;
- (ix) Report to Audit any facts coming to the notice of the Ministries after the draft para has been finalized, for due verification and posting the Public Accounts Committee with up to date information at the time these cases are taken up for consideration by the Committee.

7450/2

- (x) Issue orders, wherever considered necessary that would prevent recurrence of lapses, if any, brought to notice;
 - (xi) As soon as the printed Audit Report is received, collect all the relevant files once agains and verify with reference to the latest facts the correct position and also, consult State Government where necessary; and
 - (xii) Go through the Audit Paras Incorporated in the Audit Report and prepare the requisite brief for the use of the representatives of the Ministry/Department appearing before the Public Accounts Committee.
2. As regards instruction No. (vi), it is clarified Director General (Road Development)/Joint Secretary concerned will obtain orders of the Secretary, as to whether he would like to take the meeting with Accountants General and Additional Deputy Auditor General. If the Secretary decides otherwise, Director General (Road Development)/Joint Secretary, will discuss the draft para with the Accountant General. Record of these discussion will be submitted to Secretary, for further discussions with the Accountant General/Comptroller and Auditor General, if the merits of the case so demand. With regard to instruction No. (VII), the Joint Secretary concerned shall bring to the notice of Secretary all cases where replies to draft paras could not be sent to the Accountant General, within the prescribed period of six weeks.

To

D.G. (RD), J.S. (S), J.S. (P), J.S. (T) and Secretary (B.R.D.B.).

Copy also forwarded to Directors/Deputy Secretaries/Under Secretaries/Desk Officers/Sections in Transport Wing, Roads Wing and Border Roads Development Board.

7460 OFFICIAL LANGUAGE

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7460.1.	HPU/140/79 dt. 14.6.79	Official Language (Use for Official purposes of Union) Rules, 1976	7460/1
7460.2.	HPU/140/79 dt. 8.1.80	—do—	7460/2

No. HPU/140/79

Dated the 14th June, 1979

To

All attached, Subordinate Offices, Companies, Corporations

Subject : Official Languages (use for Official purposes of the Union) Rules, 1976

I am directed to invite your attention to the Official Languages (use for Official purposes of the Union) Rules, 1976, copy enclosed and to say that these rules have already come into effect from 17th July, 1976. The main features of these rules are as under :

I. Communications :

- (i) From Central Government Offices to Hindi Speaking States/Union Territories of region 'A' (i.e. Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh, Bihar, Uttar Pradesh and Delhi), or to any office (not being Central Government Office) or person in that Region shall be in Hindi.
- (ii) to the states of Punjab, Maharashtra, Gujarat, Chandigarh and Andaman-Nicobar Islands (in Region 'B') or to any Office in that Region shall ordinarily be in Hindi and if any communication is issued to any of them in English, it shall be accompanied by a Hindi Translation thereof.
- (iii) between a Ministry/Department and attached/Subordinate offices etc. situated in Region 'A' shall be in Hindi in proportion to be determined by Government (for the present a norm of 75% has been indicated by the Department of Official Languages).
- (iv) between other Central Government Offices situated in Region 'A' shall be in Hindi.
- (v) between Central Government Offices situated in Region 'B' or 'C' may be in Hindi or English (with provision of translation in certain cases).
- (vi) replies to communications received in Hindi shall always be in Hindi. Any application, appeal or representation when made or signed in Hindi shall be replied to in Hindi.

II. Noting in Central Government Offices :

An employee may record a note or minute on a file in Hindi or in English without being himself required to furnish a translation thereof in the other language.

III. Proficiency/Working Knowledge in Hindi :

All employees are required to declare whether they possess proficiency/working knowledge in Hindi in the form annexed to the Rules. (An employee shall be deemed to have acquired proficiency in Hindi if he has passed Matriculation or higher examination in Hindi as medium of examination or he has taken Hindi as an elective subject in degree or higher examination; an employee who has passed Matriculation or equivalent examination with Hindi as one of the subjects or the Pragma examination shall be deemed to have acquired working knowledge of Hindi).

IV. Documents :

(i) Documents specified in Section 3 (3) of the Official Languages Act, 1963 :

Both Hindi and English shall be used for documents specified in Section 3 (3) of the Official Languages Act, viz.

Resolutions, General Orders, Rules, Notifications, Administrative and other Reports, Press communiques, Administrative and other Reports/Official papers to be laid before Parliament, Contracts, Agreements, Licences, Permits, Tender Notices and Forms of Tender.

(ii) Manuals, Codes and other Procedural literature etc :

All manuals, codes and other procedural literature such as Forms, headings or registers, name-plates, sign boards, items of stationery etc. relating to Central Government Offices shall be printed or cyclostyled and published both in Hindi and English in diglot form.

VII. Responsibility :

- (i) It shall be the responsibility of the persons signing the documents noted at IV (i) above to ensure that such documents are issued, made or executed in Hindi and English both.
- (ii) It shall be the responsibility of the administrative head of each office to ensure compliance of the Official Languages Act and the rules mentioned above and to devise suitable and effective check-points for the purpose.

2. As these rules place specific responsibility for strict compliance of the various provisions contained therein, all concerned may be requested to comply with the same scrupulously. A copy of the instructions as issued may be sent to this office.

Encl : As above

Copy for compliance to all Officers and Sections in the Ministry of Shipping & Transport in continuation of this Section

endorsement No. HPU/2/76 dated 31.12.76. They are requested to furnish by the 10th June, 1979, a declaration to Hindi Section in the proforma annexed to the rules indicating whether they have got proficiency in Hindi/working knowledge of Hindi.

Dated the 28th June, 1976

NOTIFICATION

G.S.R. In exercise of the powers conferred by Section 8, read with sub-section (4), of section 3 of the Official Languages Act, 1963 (19 of 1963) the Central Government hereby makes the following rules, namely :—

1. **SHORT TITLE, EXTENT AND COMMENCEMENT** :— (1), These rules may be called the Official Languages (Use for Official purposes of the Union) Rules, 1976.
 - (2) They shall extend to the whole of India except the State of Tamil Nadu.
 - (3) They shall come into force on the date of their publication in the Official Gazette.
2. **DEFINITIONS** :— In these rules, unless the context otherwise requires :—
 - (a) "Act" means the Official Languages Act, 1963 (19 of 1963).
 - (b) "Central Government Office" includes :—
 - (i) any Ministry, Department or office of the Central Government,
 - (ii) any office of a Commission, Committee or Tribunal appointed by the Central Government, and
 - (iii) any office of a corporation or company owned or controlled by the Central Government;
 - (c) "Employee" means any person employed in a Central Government Office
 - (d) "Notified Office" means an office notified under sub-rule (4) of rule 10;
 - (e) "Proficiency in Hindi" means proficiency in Hindi as described in rule 9;
 - (f) "Region A" means the States of Bihar, Haryana, Himachal Pradesh, Madhya Pradesh, Rajasthan and Uttar Pradesh and the Union Territory of Delhi;
 - (g) "Region B" means the States of Gujarat, Maharashtra and Punjab and the Union Territories of Andaman and Nicobar Islands and Chandigarh;
 - (h) "Region C" means the States and the Union Territories other than those referred to in clauses (f) and (g);
 - (i) "Working knowledge of Hindi" means working knowledge of Hindi as described in rule 10.
3. **Communications to States etc. other than to Central Government offices** :— (1) Communications from a Central Government office to a State or a Union Territory in Region A or to any office (not being a Central Government office) or person in such State or Union Territory shall, save in exceptional cases, be in Hindi, and if any communication is issued to any of them in English, it shall be accompanied by a Hindi translation thereof.
 - (2) **Communications from a Central Government office** :
 - (a) to a State or Union Territory in Region B or to office (not being a Central Government office) in such State or Union Territory shall ordinarily be in Hindi and if any communication is issued to any of them in English, it shall be accompanied by a Hindi translation thereof;

Provided that if any such state or Union territory desires the communications of any particular class or category of those intended for any of its offices, to be sent, for a period specified by the Government of the State or Union territory concerned, in English, or in Hindi with a translation in the other language, such communication shall be sent in that manner;
 - (b) to any person in a State or Union territory of region B may be either in Hindi or in English.
 - (3) Communications from a Central Government office to a State or Union Territory in Region C or to any office not being a Central Government office) or person in such State shall be in English.
 - (4) Notwithstanding anything contained in sub-rules (1) and (2), communications from a Central Government office in Region C to a State or Union Territory of Region A or Region B or to any office (not being a Central Government office) or person in such State may be either in Hindi or in English.
4. **Communications between Central Government offices—Communications** :—
 - (a) between one Ministry or Department of the Central Government and another may be in Hindi or in English;
 - (b) between one Ministry or Department of the Central Government and attached or subordinate offices situated in Region A, shall be in Hindi and in such proportion as the Central Government may, having regard to the number of persons having a working knowledge of Hindi in such offices, the facilities for sending communications in Hindi and matters incidental thereto, determine from time to time;
 - (c) between Central Government offices situated in Region A, other than those specified in Clause (a) or Clause (b), shall be in Hindi ;

- (d) by Central Government offices situated in **Region A, Region B or Region C** may be in Hindi or in English;
- (e) between Central Government offices situated in **Region B or Region C** may be in Hindi or in English

Provided that a translation of such communication in the other languages shall :

- (i) Where that communication is addressed to an office in **Region A or Region B**, be provided, if necessary, **at the receiving end**;
- (ii) Where the communication is addressed to an Office in **Region C**, be provided alongwith such communication :

Provided further that no such translation in the other languages shall be required to be provided if the communication is addressed to a notified office.

5. **REPLIES TO COMMUNICATIONS RECEIVED IN HINDI** :— Notwithstanding anything contained in rules 3 and 4 communication from a Central Government office in reply to communications in Hindi shall be in Hindi.
6. **USE OF BOTH HINDI AND ENGLISH** :— Both Hindi and English shall be used for all documents referred to in sub-section (3) of section 3 of the Act and it shall be the responsibility of the persons signing such documents to ensure that such documents are made, executed or issued both in Hindi and in English.
7. **APPLICATION, REPRESENTATIONS ETC** :— (1) An employee may submit an application, appeal or representation in Hindi or in English.
 - (2) Any application, appeal or representation referred to in sub-rule (1) when made or signed in Hindi shall be replied to in Hindi.
 - (3) where an employee desires any order or notice relating to service matters (including disciplinary proceedings) required to be served on him to be in Hindi, or as the case may be, in English, it shall be given to him in that language without undue delay.
8. **NOTING IN CENTRAL GOVERNMENT OFFICES** :— (1) an employee may record a note or minute on a file in Hindi or in English without being himself required to furnish a translation thereof in the other language.
 - (2) No Central Government employee possessing a working knowledge of Hindi may ask for an English translation of any document in Hindi except in the case of documents of legal or technical nature.
 - (3) If any question arises as to whether a particular document is of a legal or technical nature, it shall be decided by the Head of the Department or office.
 - (4) Notwithstanding anything contained in sub-rule (1) the Central Government may, by order specify the notified offices where Hindi alone shall be used for noting, drafting and for such other official purposes as may be specified in the order by employees who possess proficiency in Hindi.
9. **PROFICIENCY IN HINDI** :— An employee shall be deemed to possess proficiency in Hindi if :—
 - (a) he has passed the Matriculation or any equivalent or higher examination with Hindi as the medium of examination; or
 - (b) he has taken Hindi as an elective subject in the degree examination or any other examination equivalent or higher than the degree examination; or
 - (c) he declares himself to possess proficiency in Hindi in the form annexed to these rules.
10. **WORKING KNOWLEDGE OF HINDI** :— (1) An employee shall be deemed to have acquired a working knowledge of Hindi :—
 - (a) if he has passed :
 - (i) the Matriculation or an equivalent or higher examination with Hindi as one of the subjects; or
 - (ii) the Pragma examination conducted under the Hindi Teaching Scheme of the Central Government or when so specified by that Government in respect of any particular category of posts, any lower examination under that scheme; or
 - (iii) any other examination specified in that behalf by the Central Government; or
 - (b) if he declares himself to have acquired such knowledge in the form annexed to these rules.
 - (2) The staff of a Central Government office shall ordinarily be deemed to have acquired a working knowledge of Hindi if eighty per cent of the staff working therein have acquired such knowledge.
 - (3) The Central Government or any office specified in this behalf by the Central Government may determine whether the staff of a Central Government office has acquired a working knowledge of Hindi.
 - (4) The names of the Central Government offices, the Staff whereof have acquired a working knowledge of Hindi, shall be notified in the Official Gazette.

Provided that the Central Government may if it is of opinion that the percentage of the staff working in a notified office and having a working knowledge of Hindi from any date, it may, by notification in the official Gazette, declare that the said office shall cease to be a notified office from that date.
11. **MANUALS, CODES, OTHER PROCEDURAL, LITERATURE, ARTICLES OF STATIONERY ETC** :— (1) All manuals, codes and other procedural literature relating to Central Government offices shall be printed or cyclostyled as the case may be,

and published both in Hindi and English in diglot form.

- (2) The forms and headings of registers used in any Central Government office shall be in Hindi and in English.
- (3) All name-plates, sign-boards, letter-heads and inscriptions on envelopes and other items of stationery written, printed or inscribed for use in any Central Government Office, shall be in Hindi and in English:

Provided that the Central Government may, if it is considered necessary to do so, by general or special order exempt any Central Government office from all or any of the provisions of this rule.

12. **RESPONSIBILITY FOR COMPLIANCE:—** (1) It shall be the responsibility of the administrative head of each Central Government office :—

- (i) to ensure that the provisions of the Act and these rules are properly complied with; and
- (ii) to devise suitable and effective check points for this purpose.
- (2) The Central Government may from time to time issue such directions to its employees and offices as may be necessary for the due compliance of the provisions of the Act and these rules.

No. 11011/1/73-DL (A-1)

(See rules 9 and 10)

I hereby declare that I possess proficiency in Hindi/have acquired a working knowledge of Hindi in view of the following :—

Date

Signature

* Delete whichever is inapplicable.

THE OFFICIAL LANGUAGE ACT, 1963 (as amended)

(ACT NO. 19 OF 1963)

(10th May, 1963)

An Act to provide for the languages which may be used for the official purposes of the Union for transaction of business in Parliament, for Central and States Acts and for certain purposes in High Courts.

BE it enacted by Parliament in the Fourteenth Year of the Republic of India as follows :—

1. **Short title and commencement :—** (1) This Act may be called the Official Languages Act, 1963.
- (2) Section 3 shall come into force on the 26th day of January, 1965 and the remaining provisions of this Act shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint and different dates may be appointed for different provisions of this Act.
2. **Definition :—** In this Act, unless the context otherwise requires :—
 - (a) "appointed day" in relation to section 3, means the 26th Day of January, 1965 and in relation to any other provision of this Act, means the day on which that provision comes into force;
 - (b) "Hindi" means Hindi in Devanagiri script.
3. **Continuance of English language for official purposes of the Union and for use in Parliament :—** (1) Notwithstanding the expiration of the period of fifteen years from the commencement of the Constitution, the English language may, as from the appointed day continue to be used, in addition to Hindi :—
 - (a) for all the official purposes of the Union for which it was being used immediately before that day; and
 - (b) for the transaction of business in Parliament

Provided that the English Language shall be used for purposes of communication between the Union and a state which has not adopted Hindi as its official language;

Provided further that where Hindi is used for purposes of communication between one State which has adopted Hindi as its official language and another State which has not adopted Hindi as its official language, such communication in Hindi shall be accompanied by a translation of the same in the English language:

Provided also that nothing in this sub-section shall be construed as preventing a state which has not adopted Hindi as its official language from using Hindi for purposes of communication with the Union or with a State which has adopted Hindi as its official language, or by agreement with any other State, and in such a case, it shall not be obligatory to use the English language for purposes of communication with that State.

- (2) **Notwithstanding anything contained in sub-section (1). Where Hindi or the English is used for purposes of communication :—**
 - (i) between one Ministry or Department or office of Central Government and another;
 - (ii) between one Ministry or Department or office of the Central Government and any corporation or company owned or controlled by the Central Government or any other office thereof;
 - (iii) between any corporation or company owned or controlled by the Central Government or any office thereof and another;

A translation of such communication in the English language, or as the case may be, in Hindi shall also be provided till such date as the staff of the concerned Ministry, Department office or corporation or company aforesaid have acquired a working knowledge of Hindi.

(3) Notwithstanding anything contained in sub-section (1), both Hindi and the English languages shall be used for :—

- (i) resolution, general orders, Rules, notifications, administrative or other reports or press communiques issued or made by the Central Government or by a Ministry, Department or office thereof or by a corporation or company owned or controlled by the Central Government or by any office of such corporation or company;
- (ii) administrative and other reports and official papers laid before a House or the Houses of Parliament.
- (iii) contracts and agreements executed, and licences, permits, notices and forms of tender issued, by or on behalf of the Central Government or any Ministry, Department or office thereof or by a Corporation or company owned or controlled by the Central Government or by any office of such corporation or company.

(4) Without prejudice to the provisions of sub-section (1) or sub-section (2) or sub-section (3) the Central Government may by rules made under section 8 provide for the languages to be used for the official purposes of the Union, including the working of any Ministry, Department, section or office, and in making such rules, due consideration shall be given to the quick and efficient disposal of the official business and the interests of the general public and in particular, the rules so made shall ensure that persons serving in connection with the affairs of the Union and having proficiency either in Hindi or in the English language may function effectively and that they are not placed at a disadvantage on the ground that they do not have proficiency in both the languages.

(5) The provisions of clause (a) of sub-section (1) and the provisions of sub-section (2) sub-section (3) and sub-section (4) shall remain in force until resolutions for the discontinuance of the use of the English language for the purposes mentioned therein have been passed by the Legislatures of all the States which have not adopted Hindi as their official language and until after considering the resolutions aforesaid, a resolution for such discontinuance has been passed by each House of Parliament.

4. COMMITTEE ON OFFICIAL LANGUAGE :— (1) After the expiration of ten years from the date on which section 3 comes into force, there shall be constituted a Committee of Official language on a resolution to that effect being moved in either House of Parliament with the previous sanction of the President and passed by both Houses.

(2) The Committee shall consist of thirty members, of whom twenty shall be members of the House of the People and ten shall be members of the Council of States, to be elected respectively by the members of the House of the People and the members of the Council of States in accordance with the system of proportional representation by means of the single transferable vote.

(3) It shall be the duty of the Committee to review the progress made in the use of Hindi for the official purposes of the Union and submit a report to the President making recommendations thereon and the President shall cause the report to be laid before each House of Parliament and sent to all the State Governments.

(4) The President may, after consideration of the report referred to in sub-section (3) and the views if any, expressed by the State Governments thereon issue directions in accordance with the whole or any part of that report;

Provided that the directions so issued shall not be inconsistent with the provisions of section 3.

5. AUTHORISED HINDI TRANSLATION OF CENTRAL ACTS, ETC. :— (1) A Translation in Hindi published under the authority of the President in the Official Gazette on and after the appointed day :—

- (a) of any Central Act or of any Ordinance promulgated by the President, or
 - (b) of any order, rule, regulation or bye-law issued under the Constitution or under any Central Act;
- shall be deemed to be the authoritative text thereof in Hindi.

(2) As from the appointed day, the authoritative text in the English language of all Bills to be introduced or amendments thereto be moved in either House of Parliament shall be accompanied by a translation of the same in Hindi authorised in such manner as may be prescribed by rules made under this Act.

6. AUTHORISED HINDI TRANSLATION OF STATE ACTS IN CERTAIN CASES :— Where the Legislature of a State has prescribed any language other than Hindi for use in acts passed by the Legislature of the State or in ordinances promulgated by the Governor of the State, a translation of the same in Hindi, in addition to a translation thereof in the English language as required by clause (3) of article 348 of the Constitution, may be published on or after the appointed day under the authority of the Governor of the State in the Official Gazette of the State and in such a case, the translation in Hindi of any such Act or Ordinance shall be deemed to be the authoritative text thereof in the Hindi Language.

7. OPTIONAL USE OF HINDI OR OTHER OFFICIAL LANGUAGE IN JUDGEMENTS ETC. OF HIGH COURTS :— As from the appointed day or any day thereafter, the Governor of a State may, with the previous consent of the President, authorise the use of Hindi or the official language of the State, in addition to the English language, for the purpose of any judgement, decree or order passed or made by the High Court for the State and where any judgement, decree or order is passed or made in any such language (other than the English language) it shall be accompanied by a translation of the same in the English language issued under the authority of the High Court.

8. POWER TO MAKE RULES :— (1) The Central Government, may by notification in the Official Gazette, make rules for carrying out the purposes of this Act.

(2) Every rule made under this section shall be laid, as soon as may be after it is made, before each House of Parliament

7460/6

while it is in session, for a total period of thirty days which may be comprised in one session or in two successive sessions, and if before the expiry of the session in which it is so laid or the session immediately following, both Houses agree in making any modification in the rule or both Houses agree that the rule should not be made, the rule shall thereafter have effect only in such modified form or be of no effect, as the case may be, so however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under the rule.

9. **CERTAIN PROVISIONS NOT TO APPLY TO JAMMU AND KASHMIR :—** The provisions of section 6 and section 7 shall not apply to the State of Jammu and Kashmir.

7460.2.

No. HPU/140/79

Dated the 8th January, 1980

Subject : Official languages (Use for Official purposes of the Union) Rules, 1976

Reference Hindi Section's endorsement of even number dated 14.6.79 and subsequent reminders dated 4.8.79 and 8.10.79 on the above mentioned subject in which it was requested that each officer/employee in the Ministry of Shipping and Transport may furnish declaration regarding his/her knowledge in Hindi. Some of the officers/employees have not sent the required declaration to Hindi Section so far. It is, therefore, requested that if the information has not been sent so far, the same may kindly be furnished in the form (copy enclosed for reference) and sent to the Hindi Section without further delay. If the Officer/Employees requires/require training in Hindi, the Hindi Section may be informed accordingly so that further reminder is not issued.

To

All Officers/Sections/Stenographers in the Ministry of Shipping & Transport (Transport Roads Wing)

Encl. As above.

DECLARATION AS REQUIRED UNDER RULES 9 AND 10 OF THE OFFICIAL LANGUAGES (USE FOR OFFICIAL PURPOSES OF THE UNION) RULES, 1976

I hereby declare that I possess proficiency in Hindi/have acquired a working knowledge of Hindi in view of the following :—

- (i) I have passed the Matriculation or any equivalent or higher examination with Hindi as the medium of examination; or
- (ii) I have taken Hindi as an elective subject in the degree examination or any other examination equivalent or higher than the degree examination; or
- (iii) I declare myself to possess proficiency in Hindi in the form annexed to these rules.
- (iv) I have passed the Matriculation or an equivalent or higher examination with Hindi as one of the subjects; or
- (v) I have passed the Pragya examination conducted under the Hindi Teaching Scheme of the Central Government or when so specified by that Government in respect of any particular category of posts, any lower examination under that scheme; or
- (vi) I have passed any other examination specified in that behalf by the Central Government.

Name and Signature
Designation

Date

N.B.S. No. (i) to (iii) above are for 'Proficiency in Hindi' and S. No. (iv) to (vi) are for 'Working knowledge of Hindi'.

***Delete whichever is inapplicable.**

7470 WEEDING OUT OF RECORDS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7470.1.	A-25 (9)/70 dt. 13.4.71	Record Retention Schedules for Records Concerning Roads Wing	7470/1
7470.2.	A-25 (9)/70 dt. 3.5.71	—do—	7470/1
7470.3.	A-25 (9)/70 dt. 2.8.71	—do—	7470/2
7470.4.	A-25 (9)/70 dt. 12.8.71	Record Retention Schedules for Papers relating to the Roads Wing	7470/2
7470.5.	OO No. 183/75 A-25 (37)/75 dt. 24.9.75	Weeding out of files by the Section Officer of Record Cell	
7470.6.	C-8 (46)/76 dt. 27.12.77	Recording, Indexing and Weeding of Files	7470/3
7470.7.	RW-C&A-8 (8)/81 dt. 3.12.81	Weeding Out of the Old Files	7470/ 3
7470.8.	A-25 (16)/85 (i) dt. 7.6.85	Weeding Out of Files	7470/5

No. WI-70 (24)/52

Dated the 1st September, 1953

To

The Secretary to the Govt. of Madras, Public Works Department, Madras, etc.

Sub : Completion reports on National Highways Original Works

I am directed to say that, as you may be aware, in the case of all original works on National Highways, a completion report is required to be furnished to the Government of India on completion of the work. The question of the form in which this completion report should be furnished has been under the consideration of this Ministry for some time and it has now been decided as follows :

- 1) In cases where the expenditure exceeds the sanctioned cost by more than the permissible limit (Rs 10% or Rs 25,000—whichever is less) and it has not been possible for the State Government to forward a revised estimate to the Govt. of India and get their technical approval and financial sanction in time, a detailed completion report in the form appended to this letter (Appendix I) or in the corresponding form in usage in the State should be furnished. (In this connection it is desired to point out that, as far as possible, a revised estimate should be forwarded as soon as excess expenditure is foreseen and the use of completion report in place of revised estimates should be resorted to, only in exceptional cases). The detailed report should contain a certificate to the effect that there have been no material deviations from the sanctioned plans and specifications other than those approved of by the Consulting Engineer to the Govt. of India (Road Development). The report should also give a comparison and explanation of differences between the quantities, rate and cost of the work executed and those entered in the estimate.
- 2) In cases where the actual expenditure does not exceed the sanctioned cost by more than the permissible limit, it would suffice if a completion certificate is furnished in the form appended to this letter as Appendix II.
- 3) Completion drawings should be submitted in case of all bridges costing Rs. five lakhs or more.

2. I am to request that, if there is no objection, necessary instructions may be issued to the concerned officers.

Enclosure to letter No. WI-70(24)/52 dt. 1.9.53

APPENDIX I

DETAILED COMPLETION REPORT IN RESPECT OF ORIGINAL WORK ON NATIONAL HIGHWAYS

Division
Name of work
Job No.
Amount of estimate
Major head
Minor head
Expenditure
Excess
Percentage of excess
Date of commencement
Date of completion

Rs

Rs

Rs

Sub-heads of estimate	As estimated			As executed			Difference*			Remarks
	Quantity	Rate	Amount	Quantity	Rate	Amount	Quantity	Rate	Amount	

Total _____

* Excess to be entered in red ink; Savings in black ink.

Certified that there have been no material deviations from the sanctioned plans and specifications other than those approved of by the Consulting Engineer to the Government of India (Road Development).

Executive Engineer

Dated the _____

Division.

COMPLETION CERTIFICATE IN RESPECT OF ORIGINAL WORKS ON NATIONAL HIGHWAYS
Division.

Name of work

Job No.

Sanctioned estimated cost

Rs

Actual expenditure

Rs

Major head

Minor head

Certified that the work mentioned above was completed on _____, and that there have been no material deviations from the sanctioned plans and specifications other than those approved of by the Consulting Engineer to the Government of India (Road Development).

Executive Engineer

Division

NOTE : The figure of actual expenditure should be furnished after getting it verified from Audit.

5300.2

No. NHIII/P/1/79

Dated the 3rd January, 1979

To

All State Governments (Department dealing with National Highways)

Sub : Ensuring timely submission of completion reports for road and bridge works on National Highways and under other centrally financed schemes, docketing of completion drawings (as well as design folders for major bridge works) for reference and record

I am directed to invite your attention towards the contents of this Ministry's circular No. WI-70 (24)/52, dated 1st September 1953, wherein detailed instructions have been issued regarding furnishing of completion certificates or completion reports for works (accompanied by completion drawings for works costing Rs 5 lakhs or more) cited under the heading subject. As you may be aware, submission of completion reports alongwith the completion drawings is an essential requirement under codal provision as per various PWD Codes. In this connection, your kind attention is also drawn towards paras 106 and 107 of CPWD Code.

It has, however, been observed that unfortunately the importance of timely submission of completion certificates/completion reports is not being realised by the field officers of various State PWDs. There are a large number of centrally financed works for which these reports have not been furnished so far though these works were completed long ago. This may please be looked into and appropriate steps taken by the State Government/State PWDs to ensure timely submission of the same.

While the completion reports mentioned above serve the purpose of indicating the excess over sanctioned costs with detailed reasons therefor, the overall cost of projects, material deviations from sanctioned plans and specifications other than those approved by the competent authority, there is yet another essential requirement of collecting important documents like completion drawings for all projects irrespective of cost limits, detailed design folder (for important projects) and completion reports in the prescribed form and docketing them together in the form of neatly bound folders to be carefully preserved for future reference for proper maintenance and upkeep of the structures or for planning of some modifications or improvements in the structural elements as and when found necessary. Unfortunately, however, we find that such records are totally missing even in the case of very major projects, leading to enormous difficulties in dealing with structures in distress. The maintenance/preservation of such records, besides the usual bridge registers supposed to be maintained by the concerned authorities, is of paramount importance which cannot be over-emphasised. It is, therefore, requested that instructions may kindly be issued to the effect that after a bridge work or road project has been completed, the officers in-charge ensure that at least four sets of completion drawings, finally approved design calculations and an explanatory note highlighting important and salient features of the structure or any other important construction operations or modifications, which had to be resorted to during the construction of the bridge/road, are prepared and duly bound in a hard cover volume for better preservation during the years to come. The above mentioned note should also highlight any special features of the structure requiring special attention during maintenance and periodic inspection of the bridge/road. One set of the above mentioned documents should be kept in the Chief Engineer's office, one set should be retained in the Divisional or Circle office under whose jurisdiction the work had been carried out; one set to be kept by the office of the Assistant

MEMO NO. A-25 (9)/70

Dated the 13th April 1971

Subject : Record retention schedules for records concerning Roads Wing

In continuation of Admn. I Section's Memo No. A-25 (9)/70 dated the 3rd Feb., 1971, on the subject mentioned above, a list showing the retention schedules in respect of the technical papers relating to the Roads Wing is sent herewith for information and guidance. As regards the other records i.e. the remaining portions of the files dealing with the estimates relating to the projects and machinery etc. a further communication will follow.

To

1. All the Tech. Officers in the Roads Wing. The files dealing with works will be put up to the E.Es. concerned who will indicate the portions of the files to be retained and the portions to be destroyed in the light of the retention schedules mentioned above.
2. All the Sectt. Sections in the Roads Wing.

LIST SHOWING THE RETENTION SCHEDULES AS RECOMMENDED BY THE TECHNICAL OFFICERS RELATING TO THE TECHNICAL FILES/PAPERS IN THE ROADS WING.

S. No.	Subject	Period of retention	Remarks
1	2	3	4
	BRIDGE PROJECTS :		
1.	Reports giving background leading to the siting of Major bridge, its hydraulic data and foundation soil details	Permanent	
2.	Design Calculations	—do—	
3.	Completion drawings	—do—	
4.	Extracts from the file of any study or decision taken, which may have far reaching effects on the design of future bridges	—do—	
5.	Reports on the behaviour of bridges collapse of bridges and similar technical reports	—do—	
6.	Extracts from files of the Standards Sections as decided by the S.E. (Stds.)	—do—	
7.	ROAD PROJECTS		
1.	Report accompanying the estimate completion drawings and any designs of major road projects	—do—	
2.	Extract from the files leading to the fixation of alignment of National Highways	—do—	
3.	Traffic data and any other technical report specially undertaken on any specific road project	—do—	
	MECHANICAL SUBJECTS		
1.	Files dealing with list of machinery available with the Government of India	—do—	

7470.2

ADDENDUM NO. A-25 (9)/70. DATED THE 3RD MAY, 1971,

Subject : Record retention schedules for records concerning Roads Wing

Reference Administration I Section's Memorandum No. A-25 (9)/70, dated the 13th April, 1971, on the subject mentioned above.

2. The following may be added after S.No. 3 under the caption 'ROAD PROJECTS'
 4. Extracts from files of the standards sections as decided by the Superintending Engineer (Standards)-Permanent
 5. Files/papers containing policy matters relating to Road Projects-Permanent

To

1. All Tech. Officers in the Roads Wing.
2. All the Sectt. Sections in the Roads Wing

CIRCULAR NO. A-25 (9)/70

Dated the 2nd August, 1971

Subject : Record retention schedules for records concerning Roads Wing

Attention of all the Executive Engineers in the Roads Wing is invited to A-I Section's Memo. No. A-25 (9)/70 dated 13th April, 1971, and 3rd May, 1971, on the subject mentioned above, in which it was laid down that technical files will be referred to the Executive Engineers concerned for indication regarding their retention or destruction. It has been reported that files sent to the Executive Engineers by the Records Cell are not being accepted by some of the Executive Engineers for one reason or the other. It is needless to emphasise the importance of weeding out of unwanted papers. As the work of recording and weeding out of papers in the Roads Wing is to be completed as early as possible, all the Executive Engineers in the Roads Wing are requested to return the files received from the Record Cell to them within a week or so with necessary instructions for weeding out etc.

7470.4

No. A-25 (9)/70

Dated the 12th August, 1971

Subject : Record retention schedule for papers relating to the Roads Wing

In continuation of Administration I Section's Memorandum of even number dated the 13th April, 1971, on the subject mentioned above, the period for retention of the other records concerning the works sections in the Roads Wing will be as indicated below :

OTHER RECORDS

BRIDGE PROJECTS

May be destroyed after the lapse of 5 years from the date of receipt of completion report duly verified by the Audit.

ROAD PROJECTS

May be destroyed after a period of 5 years from the date of closure of the file.

MECHANICAL SUBJECTS

May be destroyed after a period of 5 years from the date of closure of the files.

2. All the files which are required in connection with legal proceedings/Court Cases/Arbitration Cases may continue to be retained till receipt of the decisions of the Court etc., and till final settlement of the case by the Department on the basis of such decisions.

7470.5

OFFICE ORDER NO. 183/75 (FILE NO. A-25 (37)/75) DATED THE 24TH SEPT., 1975, TO SECTION OFFICER OF RECORD CELL/ALL SECTIONS/ALL OFFICERS (technical as well as Sectt.)

Subject : Weeding out of files by the Section Officer of Record Cell

It has been observed that a very large number of recorded files in the Record Cell are still pending for review. Some of these files had become due for review in 1948 and others in subsequent years. If all these files are sent to the concerned sections for review, the review work is bound to take a very long time and also hamper the daily work of disposal of receipts and files of those sections.

2. It has also been observed from the files received back in the Record Cell from the Sections after review that the review work has not been done properly. In most of the cases the year of review had been merely changed in pencil and the change had not even been initialled by the Section Officer. For instance, one file related to the demands for grants for 1967-68 and after review the year of destruction was changed from 1975 to 1985. Evidently the demands for grants for 1967-68 cannot be of any use thereafter particularly because the permanent record of these demands is available in the printed book.

3. It has been decided that the Section Officer of the Record Cell will review and weed out the files (except technical files) which become due for destruction, in accordance with the periods of retention of record mentioned in the Record Retention Schedule i.e. the files which become due for review according to

the year of destruction indicated on the concerned file and for which the period of retention indicated in the Record Retention Schedule expires are not to be sent to the concerned sections for review and weeding. However, the Section Officer of the Record Cell will have the discretion to refer to the concerned sections, such file in respect of which he has any doubt, as to whether or the concerned file is to be retained for a further period, even though the period of retention indicated in the Record Retention Schedule has already expired.

4. The files which are sent by the Section Officer of the Record Cell to the concerned sections will be reviewed by those sections very carefully and if any of these files is required to be retained for a further period, the change of the year of the destruction on that file shall be indicated in ink and initialled by the Section Officer of the concerned Section.

5. All the Technical files (i.e. the files relating to estimates/revised estimates and tenders of road/bridge works) which become due for review and weeding, will be sent by the Section Officer of the Record Cell to the concerned Executive Engineer.

7470.6.

No. C-8 (46)/76

Dated the 27th December, 1977

CIRCULAR

Subject : Recording, Indexing and Weeding of files

A meeting was held in the room of DG (RD) & Addl. Secretary on 5th December 1977 to discuss the question of recording, indexing and weeding out of files in the Roads Wing. Besides DG (RD) & Addl. Secy. the meeting was attended by DS (R), the Under Secretaries and the Section Officers in the Roads Wing.

2. DG (RD) & Addl. Secy. stressed on all the officers present in the meeting the need for giving proper attention to the work relating to recording, indexing and weeding out of files. It was brought out at the meeting that the files sent by the Record Cell to the various Sections for review were not given due attention. The files which could be weeded out and destroyed, were sent back to the Record Cell for being kept for further period of three to five years and required to be reviewed again on the expiry of the said period. This is resulting in accumulation of a large number of files in the Record Cell occupying all the available space. It is, therefore, most essential that the files which have outlived their utility should be weeded out and destroyed so as to make room for the fresh files being received by the Record Cell from different Sections.

3. It is, therefore, again brought to the notice of all officers/sections that the work relating to the weeding out of old files should be given due importance and files which are not required to be retained should be marked for weeding out/destruction. Necessary instructions providing guidelines for weeding out old files in the Roads Wing were issued vide circular letter No. A-25 (9)/70 dated 2.8.71 and 24.9.73 (copies enclosed). These guidelines should therefore be kept in view while marking the files for recording, weeding out, etc.

To

All Under Secretaries and Section Officers in the Roads Wing

7470.7.

No. RW-C&A-8 (8)/81

Dated the 3rd December, 1981

OFFICE ORDER

Subject : Weeding out of the old files

It has been observed that a number of old files which have been sent to the various sections by the Record Cell for weeding are lying there and proper steps have not been taken for reviewing these files to decide about their destruction/further retention. With a view to stream-lining the regular flow of these files from the sections to the technical officers and also keeping in view the existing work-load of the Executive Engineers in the various zones, it has been decided that the sections will send at the rate of upto 5 files per week to each of the Executive Engineer for reviewing the old files under the overall supervision of the Superintending Engineers and respective Chief Engineers. It will also be ensured that these files are returned to the sections concerned with definite orders for destruction or further retention as per the exist-

ing instructions. The Sections will also ensure that the older files are taken up for review earlier than the files opened subsequently.

2. This order will come into effect from 3rd December, 1981 and the files for review for the week ending 5th December, 1981 will be sent to the concerned Executive Engineers immediately by the sections. In future, the files will be sent during the first two days of the week so that the technical officers have sufficient time to clear the files by the end of the week.

3. Attention of all the officers is also invited to para 1 (iii) of the minutes of the meeting held in DG (RD) & Addl. Secy's room on 7.1.1978, when the progress made in recording of the files was reviewed. For the benefit of all the officers, the relevant para is reproduced below :

"The files should be sent by the Record Cell to the Sections concerned where the Section Officers will examine and mark the files for destruction/further retention, as the case may be. Where the technical files are involved, the Section Officer will send the files to the Executive Engineer concerned and get his orders for destruction/retention of the file. Wherever the Section Officer or the Executive Engineer considers it necessary to mark the file for further retention, he will put up the file to the next senior officer for obtaining his orders in writing on the title cover. The officer ordering the file to be retained further will do so by assigning necessary reasons. In border line cases, the Superintending Engineer should consult the Chief Engineer as well."

4. DG (RD) has also decided that fortnightly progress reports should be submitted to him by all through the Chief Engineers. The first progress report for the fortnight ending 12th December 1981 will be sent to US (A) by 15th December, 1981. The report should be sent in the enclosed proforma (Annexure-I). In future, the reports will be sent to US (A) on the 1st and 15th of each month for preceding fortnights. The section will also keep proper record of the files sent to the technical officers for review, and where the files are not received back by them by the week end, they should remind the concerned Executive Engineers and furnish a fortnightly report as above to US (A) indicating the number of files not received back in the section. The report will be sent in the prescribed proforma (Annexure-II).

5. In view of the heavy accumulation of old files, all officers and the sections are requested to extend their full cooperation in weeding out the old files. Chief Engineers (Projects) are specially requested to give necessary guidance and help to their officers in this regard.

Copy to :

(i) All Officers at Headquarters/all Sections at Headquarters

Copy also forwarded to all Regional Officers with the request that they should take immediate steps for weeding out the old records. They need not send any reports to the Headquarters.

ANNEXURE I

PROFORMA

(Report by Executive Engineer)

Fortnightly report indicating the progress made in weeding out of old records.

Report for fortnight ending

1. Name of the Executive Engineer
2. Designation.
3. Zone
4. Number of files received for review during the fortnight.
5. Number of files returned to the Sections concerned after passing necessary orders
6. Number of files still pending with the Executive Engineer and the reasons therefor

Signature of Executive Engineer

Countersigned _____
(Chief Engineer)

To

US (A)

ANNEXURE II

PROFORMA
(Report by Section Officer)

Fortnightly report indicating the progress made in weeding out of old records

Report for fortnight ending

1. Name of the Section
2. Number of Executive Engineers concerned with the States dealt with in the Section
3. Number of files sent to the Executive Engineers during the fortnight for review
4. Number of files received back from the Executive Engineers after review
5. Number of files still pending with the Executive Engineers

Signature of the Section Officer

Signature of the Branch Officer

To

US (A)

7470.8.

No. RW. A. 25 (16)/85 (i)

Dated the 7th June, 1985

Subject : Weeding out of files

It has been observed that some of the files which are not really needed to be retained and can be weeded out have been kept in the Sections and also retained in the Records Cell. This not only occupies an enormous volume of limited available space but is also not hygienic as the files are prone to dust and need frequent cleaning. Director General (Road Development) and Additional Secretary has, therefore, decided that the Sections should review and weed out on priority basis following types of files as per guidelines given below :

A. PROCEDURE IN RESPECT OF SPECIFIC CASES

- (1) Proposals and/or estimates for NH (O) works not included in annual plan.

The proposals and/or estimates for NH (O) works which are not included in any of the annual plans of the five Year Plan shall not be entertained and returned to the State P.W.D. from the main file of the annual plan of the concerned State, (i.e. without retaining any copy of the estimate in question in the Ministry) except where the proposal and/or estimate is/are classified as emergent, or the work in question is proposed as a substitute for a plan work.

- (2) NH (O) works where RO's comments have not been received during the past two years.

If there are old pending cases, the files may be weeded out by putting to the concerned Superintending Engineers directly by the Section. But this will not include the cases of revised estimates where sanction to revised estimates is still to be accorded.

- (3) The projects which have been completed long back and completion reports are still awaited.

The case file of the project which has been completed for 5 years or more and where it is certified by the State P.W.D that no revised estimate is pending with them, the file can be destroyed without waiting for the completion certificate duly verified by the audit.

However, where a revised estimate is likely to be received or is under consideration, the main file of the original sanctioned work will not be destroyed but the drawing folder on it will be destroyed unless the Superintending Engineer feels that it should be retained. For this purpose, the file will be put up to the concerned Superintending Engineer by the Section directly.

- (4) Progress Report files

Progress reports for the previous three quarters will only be kept on the file at any time during the period the work is under execution and earlier reports will be destroyed.

After the work is reported to be complete, the progress report file will be destroyed without waiting for the completion certificate.

The quarterly progress reports will be duly entered into the work register maintained by the concerned project drawing section.

- (5) Powers to Section Officers for weeding out of files in respect of FDR and SR works.

Files on FDR and Special Repair estimates will be destroyed by the Section Officers after three years of sanction of the concerned work unless and until specifically recorded by the concerned Technical Officers on the file for its longer retention.

- (6) Weeding out of superfluous documents from current files at various stages.

The earlier documents which become superfluous on receipt of subsequent modified documents shall be destroyed with the concurrence of the concerned Superintending Engineer. Section will put up such cases directly to the concerned Superintending Engineer.

To

All the Technical Officers (Roads/Bridges) DS (P&B)/DS (R), All the Under Secretaries/Desk Officers/Section Officers.

7480 CALENDAR OF RETURNS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7480.1	NHIII/Coord/55/82 dt. 26.3.83	Calendar of Returns	7480/1

CALENDAR OF RETURNS

(Issued vide letter No. NHIII/Coord/55/82 dated 26.3.83)

7480.1

A number of periodical returns are being received in the Roads Wing from various organisations. Some periodical returns are also required to be sent by the Roads Wing to the other organisations. These returns are dealt with in the organisation at various levels. With a view to ensure that each one of these is dealt with by the concerned officers expeditiously for timely submission/disposal, a classified calendar of returns has been prepared indicating the number of returns, periodicity, time schedule for receipt and despatch and the officers who is to deal.

CALENDAR OF RETURNS

Sl. No.	Return No.	Subject	From	To	Due Date	To be dealt by	To be seen by	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.
I.	WEEKLY							
	A Incoming				Nil			
	B Outgoing							
1.	W 1 Consolidated arrears Statement		DS (R)	IWSU	Monday	—	—	—
	C Internal				Nil			
II.	FORTNIGHTLY							
	A Incoming				Nil			
	B Outgoing							
2.	F 1 Report of Important Activities/Achievements of Roads Wing for being sent to P.M.'s Secretariat		CE (Mon). To Coord Section	3rd and 17th	—	—	—	
	F 2 Statement of Important communications recd. from MPs/VIPs.		DS (R) To Coord Section	7th & 22nd	—	—		—
	C Internal				Nil			
III.	MONTHLY							
	A Incoming							
4.	M 1 Monthly Report from R.Os/E.L.Os		All ROs/ELOs To ADGs	7th	SE Concerned	CE		Important aspects to be brought to notice of ADGs/D.G.
	B Outgoing							
5.	M 2 Statement of important activities for Cabinet Sectt.		US (RM)	Coord. Section	17th	—	—	—
6.	M 3 Progress Report regarding recording indexing and weeding of old records		DS (R)	(IWSU)	7th	—	—	—
7.	M 4 Statement of Cases pending for more than a month		DS (R)	—do—	7th	—	—	—
8.	M 5 Return regarding ad-hoc appointments against Group 'A' Tech-posts		DS (R)	Coord	7th	—	—	—
	C Internal							
9.	M 6 Statement of Vacant Posts		DS (R)	DG (RD)	7th	—	—	—
10.	M 7 List of Estimates of NHs pending in the Ministry		All SEs	CE (PL)	5th	CE (PL)	ADG/DG	

	1.	2.	3.	4.	5.	6.	7.	8.	9.
IV	QUARTERLY								
	A Incoming								
11.	Q 1	D.Os from State CEs	State PWD	DG (RD)	7th of month following the Qr.	S.E.	CE/ADGs	Important aspects to be brought to the notice of DG (RD)	
12.	Q 2	Progress Report on Land Acquisition	State PWDs	Concerned Works Sec.	20th of Jan. April July and Oct.	EEs Concerned	SEs/SE (Mon) concerned	—	
13.	Q 3	Report on tender position of sanctioned works	"	"	"	"	"	"	
14.	Q 4	Report on Technical approval and Financial sanctions by the states on administrative approvals	"	"	"	"	"	"	
15.	Q 5	Progress report on Road Works	"	"	"	"	"	"	
16.	Q 6	Progress report on Bridge Works	"	"	"	"	"	"	
17.	Q 7	Report on bottlenecks	State PWDs	Concerned Works Sec.	20th of Jan. April, July and Oct	EEs Concerned	SEs/CEs/ CE (Mon)	Important aspects to be brought to the notice of ADGs/ DG	
18.	Q 8	Progressive, Expenditure Report	Controller of Accts.	Budget Section	30th April, July, Oct. & Jan.	Budget Sec.	Dir. (P&B)		
19.	Q 9	Statement of Fees Collected by State NH Bridges	Controller of Acctt. State PWD	"	"	"	"		
20.	Q 10	Consolidated Expenditure Report on NH Works	State PWD and BRDB	"	"	"	"		
21.	Q 11	Consolidated Expenditure Report on Schemes other than N.H.	"	"	"	"	"		
	B Outgoing								
22.	Q 12	List of pending cases for more than a month	All Sections	Secy.	14th Jan/April, July and Oct.	Sections	CE/DG	—	
23.	Q 13	Return showing the progress made in framing of Recruitment Rules for the various Tech. Gazetted posts	DS (R)	Coord	10th Jan, April, July and Oct	—	—	—	
24.	Q 14	Return showing pending cases regarding Pensions/GPF/DCRG/ Family Pension	"	"	15th	—do—	—	—	
25.	Q 15	Return showing the voluntary Retirement of Central Govt. employees after 20 years of qualifying service	"	"	"	—	—		

1.	2.	3.	4.	5.	6.	7.	8.	9.
26.	Q 16 Progress Report implementation of policy of reservation of vacancies for SC/ST		"	"	10th	—do—	—	—
27.	Q 17 Return regarding (Compulsory) notification of vacancies Rules 1960		DS (R)	Employment Exchange	15th	—do—	—	—
28.	Q 18 Return regarding Reservation of Physically Handicapped Persons in Gr. C&D posts/service		"	Coord Sec.	"		—	—
29.	Q 19 Report on Progress of using Hindi		DS (R)	Hindi Section (TW)	20th Jan, April, and July	—	—	—
30.	Q 20 Return reg. actual expenditure incurred in pay and other allowances of Central Government employees		"	MOF	"	—	—	—
	C Internal			Nil				
	HALF YEARLY							
	A Incoming							
31.	H 1 Report of Traffic Census	State PWD	TG Sec	30th June/ Dec.	EE (PL)	CE (PL)	—	—
32.	H 2 Return regarding Sectt. Officer deputed abroad for training under Colombo Plan etc.		DS (R)	Coord Sec.	July & Jan.	—	—	—
	C Internal				Nil			
	ANNUAL							
	A Incoming							
33.	A 1 Plant Date Sheets		State PWD	RM Sec.	20th April	EE (M)	SE (M) CE (M)	—
34.	A 2 Plant Utilisation Report		"	"	"	"	"	—
	B Outgoing							
35.	A 3 Return regarding representation of SC/ST in Services in Appendices 8 & 9		DS (R)	Coord Section	Jan. each year	—	—	—
36.	A 4 Return regarding representation of SC/ST in service appointment to the post filled by deputation or transfer		"	"	"	—	—	—
37.	A 5 Report regarding inspection of roster by Liaison Officers dealing with the subject of representation of SC/ST		"	"	"	—	—	—
38.	A 6 Report regarding Supersession of SC/ST officers in Central Services		"	"	"	—	—	—
39.	A 7 Return for posts filled by deputation for SC/ST		DS (R)	Coord Sec.	Jan. each Year	—	—	—
40.	A 8 Return regarding premature retirement of employees belonging to SC/ST		"		"	—	—	—

1.	2.	3.	4.	5.	6.	7.	8.	9.
41.	A 9 Report regarding representation of SC/ST in posts filled on ad-hoc basis		"	"	"	—	—	—
42.	A 10 Report regarding arrangement of training for Class I Officers belonging to SC/ST		"	"	"	—	—	—
43.	A 11 Report regarding representation of SC/ST in All India Services and other Central Services and other Commission of SC/ST		"	"	"	—	—	—
44.	A 12 Statement regarding de-reservation of reserved vacancies for SC/ST included in the roster for purely temporary appointments		DS (R)	Coord. Sec.	Jan.	—	—	—
45.	A 13 Statistical information regarding representation of SC/ST in posts filled by promotion		"	"	"	—	—	—
46.	A 14 Inclusion of SC/ST members in the Departmental promotion Committee/Selection Boards		"	"	"	—	—	—
47.	A 15 Inspection of rosters by Liaison Officers nominated for work relating to the representation of SC/ST in various Ministries/ Deptts. of the Govt. of India-material for report of the Commission for SC/ST Annual Reports		"	"	"	—	—	—
C Internal					Nil			

7490 MISCELLANEOUS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7490.1.	OO No. 147/68 dt. 16.10.68	Procedure for Examination of Cases in Secretariat and Technical Sections of Roads Wing	7490/1
7490.2.	OO No. 112/68 dt. 8.7.69	Entertainment of Cases from other Ministries	7490/1.
7490.3.	NHI-41 (6)/71	Estimates for Roads/Bridge Works-Copy for Communication to the State Chief Engineers to be Neatly Corrected in ink.	7490/1

O.O. No. 147/68

Dated the 16th October, 1968

To

All Officers and Sections

Subject : Procedure for examination of cases in Sectt. and Technical Sections of the Roads Wing

In supersession of all previous orders on the subject it has been decided that the procedure indicated in the following paragraphs should be followed by all sections (Secretariat), except Administration Sections, and the Technical Sections of the Roads Wing in regard to examination of cases.

2. Upon receipt of a reference from the State Government or a Local Administration or other authority, the sections concerned will collect all the relevant papers, point out any relevant rulings or decisions taken in the past, and submit the file with all connected papers to the Under Secretary in charge of the branch, with a suitable note. The Under Secretary will forward the case after scrutiny to the Superintending Engineer concerned. The Superintending Engineer will then arrange for the technical examination of the cases by the staff under his control, obtain the orders of the higher officers on technical points, wherever necessary, and then return the file with a technical note approved by the appropriate officer, to the Under Secretary concerned for further action.

3. The Under Secretary will then instruct the office to examine the case further, if necessary, in the light of the views expressed on the Technical side, and then put up the file with a suitable draft, indicating whether a reference to the Ministry of Finance or other Ministries is required. Upon receipt of the file from the office, the Under Secretary will put up the file to the Chief Engineers concerned who will obtain the order of the Additional Director General (Roads)/Additional Director General (Bridges), and the Director General (Road Development) wherever necessary, and on return of the case, take suitable action. He will ensure that a careful watch is kept on the further progress of the case so that in case of delay reminders are issued to the other Ministry or Ministries concerned in time and that upon return of the file orders are issued at the earliest possible without avoidable delay.

O.O. No. 112/69

Dated the 8th July, 1969

To

All Officers and Sections

It has been decided that the Technical Officers of the Roads Wing will entertain references from the Ministries and other offices for advice and that they will endorse technical notes to outside agencies. The examination of cases and approval of superior officers will confirm as now, but it will not be necessary for endorsements to be signed by a Secretariat Officer while forwarding technical notes. All cases involving administration and policy matters will be shown to the Secretariat Officers and the drafts thereof will issue over the signature of the Secretariat Officers.

No. NHI-41 (6)/71

Dated the 11th June, 1971

To

All Technical Officers and Works Sections

Subject : Estimates for road/bridge work — copy for communication to the State Chief Engineer to be neatly corrected in ink wherever necessary, and to be authenticated at the end

It has been decided that the copy of the estimate which is returned to the concerned State Chief Engineer, while communicating our technical approval/financial sanction to the estimate, should be endorsed by the technical officer who has approved the estimate on behalf of the Director General (Road Development). That endorsement should contain the fact of communication of the sanction and the sanctioned amount in figures and also in words. The endorsement should be made at the end of the last page of the abstract of the approved estimate and signed by that officer for Director General (Road Development).

7490/2

2. It has also been decided that in cases where an estimate is mounted in this Ministry, the modifications in the copy which is returned to the concerned State Chief Engineer, while communicating our technical approval/financial sanction to the modified estimate, should be carried out neatly in ink.

3. The above decisions have already been communicated by Additional Director General (Roads) and Additional Director General (Bridges) to the Chief Engineers. They are now communicated to all other Technical Officers, Under Secretaries and Works Sections in the Roads Wing.

7510 **PROGRESS REPORTS**

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7510.1.	Circular dt. 13.11.73	System of Receipt and Disposal of Progress Reports Concerning Works	7510/1
7510.2.	NHIII/Misc/178/73 dt. 13.12.73	Progress Reports in respect of R & B Works Financed wholly or partly by the Central Government	7510/2
7510.3.	Check List for Progress (August 1978)	Check List of Observations to be made while Evaluating Quarterly Progress Reports received from State PWDs (Road Works)	7510/4
7510.4.	Check List for <u>Progress</u>	—do— (Bridge Works)	7510/5
7510.5.	NHIII/Misc/178/73 dt. 18.1.74	Progress Reports in respect of <u>R & B</u> , Works Financed wholly or partly by the Central Government	7510/6
7510.6.	Progress Report	Proforma for Observation on Quarterly Progress Report (Roads)	7510/7
7510.7.	Progress Report	—do— (Bridges)	7510/8
7510.8.	NHIII/Misc/29/54 dt. 15.2.78	<u>NH, SR, E & I and CRF Works</u> — Timely Submission of Progress Reports to the Monitoring Zone	7510/9

SYSTEM OF RECEIPT AND DISPOSAL OF PROGRESS REPORTS CONCERNING WORKS

(Circulated by DGRD on 13.11.73)

Through my earlier notes of 4.3.1972, 18.4.1972, 19.4.1972, 20.9.1972, 4.11.1972, 16.2.1973, 21.2.1973, 31.7.1973 and 21.9.1973, I had been impressing upon the Technical Officers in the Headquarter of the Roads Wing that requisite attention must be paid to the receipt from States of prescribed monthly/quarterly progress reports of works regularly in time and for the due examination/evaluation and disposal and for prompt follow up being made with the State PWDs. for any observations required to be communicated in that respect. The Tech. Plg. Cell (Roads) had been impressed upon to regularly observe the requirement of compiling a consolidated abstracted picture of the progress of works on a quarterly basis and its submission regularly in proper time. The whole position was reviewed with the C.Es/Roads and SEs/Roads in the last two weeks and it was found that in certain respects the matter had not received the desired attention. Below are mentioned the aspects which had lacked in adequate and timely attention and which deserve to be given immediate attention and pursuit hereafter :-

- (1) A review is not being made every month of the sanctioned works for which monthly/quarterly progress reports as prescribed have not been received and consolidated d.o. letters with lists of such works have not been sent regularly to the State C.Es with copies to our R.Os/E.L.Os for the latter to immediately pursue the matter.
- (2) On receipt of progress reports from the State PWDs in certain cases these have not been put up promptly to the Technical Officers for their perusal in dak stage. Later for the reports which had been so put up on their receipt back from the Technical Officers in the Sectt. Sections, the same after being brought on the relevant files have not been put up promptly to the Technical Officers for their making the required evaluation for consequential observations being communicated to the State PWD concerned with copy to R.O./E.L.O. This matter seems to call very careful observance of the prescribed requirements in future at all times. Progress works reports are to be dealt with on separate individual/files.
- (3) It was indicated that when the progress reports in dak stage came up to the Technical Officer they had the contents of the reports suitably recorded in the progress registers supposed to be maintained by the Technical Officers. However, it seemed that this had not been done in all cases of reports received from the State PWDs promptly. Discussions with the Technical Officers had led to the view that such entries in the progress registers should correctly be made as being done at present at the stage a progress report came to the Technical Officer's hand in dak stage. It is, therefore, necessary that progress reports received from States be put up in dak stage promptly so that the entries in the progress registers are kept up-dated within the shortest possible time they are received in the Roads Wing.

2. The progress evaluation aspect to be achieved from the examination of the progress reports is highly important but did not appear to be receiving requisite attention. From this evaluation have to flow observations to the State PWDs regarding sanctioned works not having been settled for fixation of agency for execution, for the work not having actually been started, for the progress being slow and lagging compared to targets and for any other bottlenecks, such as land acquisition, non-availability of materials, etc. as may be noticed from the reports. It is, therefore, extremely important that such evaluation is purposefully and promptly done and observations communicated to the State PWDs and R.Os/E.L.Os promptly. While making evaluation of subsequent progress reports the need paid to earlier communicated observations as a result of evaluation of previous reports would need to be watched for and if the same may have lacked attention this would need to be pointed out in references conveying evaluation observations on these subsequent reports.

3. Tech. Plg. Cell had not compiled consolidated quarterly abstract progress reports after 31.3.1972. They were asked to do so forthwith on priority and bring the work up-to-date and ensure keeping it regularly upto date in future also.

4. The Sectt. Sections who had a vital role to play in this matter along side the Technical Officers were requested through D.S. (R) and Under Secretary concerned to ensure that the work received proper prompt attention and no aspects thereof were allowed to be neglected.

5. Technical Officers were requested to see that balanced attention was given to the work of progress reports alongside and at par with the work of handling project estimate cases.

6. It is requested that the matter should be given by all concerned requisite priority attention in future. Besides the expected normal pursuit of the above requirement regarding progress reports it is also stipulated that hereafter following actions should also be taken :

- (1) Every month one week after the expiry of the due date for receipt of the progress reports from the State PWDs each CE(R) for his zone SE-wise should forward to Tech. Plg. Cell (Roads) an appraisal note covering the following :
 - (a) Whether for reports for sanctioned works due but not received, a consolidated d.o. reminder with the list of works has been issued to the State C.E. with copy to R.O./E.L.O.

- (b) Whether for the progress reports received entries have been made in the progress registers at the dak stage itself.
 - (c) Whether the progress reports have been evaluated and observations communicated to the State PWDs.
- (2) The tabulated information received from the progress reports as presently prescribed for being supplied by Technical Officers to the Tech. Plg. Cell (Roads) shall continue to be promptly furnished to the Cell to enable them present consolidated picture to the higher authorities.

7. The Tech. Plg. Cell (Roads) shall hereafter apart from submitting the consolidated abstract progress picture, also put up a monthly appraisal report based on reports furnished by the Technical Officers whether action under para 6 (a), (b) and (c) above has been taken for all sanctioned road works.

8. It may please be noted that monitoring of progress of works is attached a very high importance by the Ministry as also the Planning Commission and Ministry of Finance and the matter has assumed still greater importance with the Fourth Plan being in the last year and our being on the threshold for entering the Fifth Plan. The matter should, therefore, not be allowed to be neglected at all.

7510.2.

No. NHIII/MISC/178/73

Dated the 13th December, 1973

CIRCULAR

Subject : Progress Reports in respect of road and bridge works financed wholly or partly by the Central Government

A copy of the minutes of the meeting held with Chief Engineers on 26.11.1973 is attached.

2. After the meeting it has been decided that the quarterly reports should come to the Roads Wing directly from the Executive Engineers of the States and these need not be routed through their Chief Engineers for transmission to this Ministry. The Executive Engineers will, however, send a copy of the report sent to us to their Chief Engineers also. This is considered necessary in view of the need to have prompt reporting and have upto date information which can be fruitfully utilised for timely and effective control on progress of works. In this connection it is expected that the targets to be shown in the quarterly reports or their subsequent modifications would have been got approved by the State Executive Engineers from their Superintending Engineers or Chief Engineers.

3. Item II(3) of the minutes will accordingly be substituted by the following :

"The receipt of progress reports will be watched by the Technical Officers from the progress registers and where these are not received in time, necessary reminders will be sent to the State Chief Engineers with copies to their respective Executive Engineers. These statements are scheduled to be received in this Ministry by 15th of the month following the month in which the quarter ends".

4. Instructions in the light of the decisions taken in the meeting and as further modified as per preceding paragraphs have already been issued to the State Governments. All the officers and sections in the Roads Wing will also please ensure prompt and timely action in accordance with the minutes and paras above.

All Officers of the Roads Wing/All Sections

SUMMARY OF THE DECISIONS TAKEN AT THE MEETING HELD BY DIRECTOR GENERAL (ROAD DEVELOPMENT) WITH THE CHIEF ENGINEERS ON 26.11.1973 REGARDING ACTION TO BE TAKEN ON PERIODICAL PROGRESS REPORTS ON WORKS

PRESENT :

1. Shri B. Balwant Rao, C.E. (B) I.
2. Shri D.T. Grover, C.E. (B) II.
3. Shri P.C. Bhasin, C.E. (B) III.
4. Shri S.L. Kathuria, C.E. (R) I.
5. Shri T.N. Bhargava, C.E. (R) III.
6. Shri D.R. Upadhyaya, C.E. (R) IV.
7. Shri A.I. D'Costa, C.E. (R) PL.
8. Shri P.K. Thakur, C.E. (M).
9. Shri D.P. Gupta, S.E. (R) PL.

10. Shri N.H. Keswani, S.E. (R) II-A.
11. Shri H.B. Gajria, S.E. (B) II-A.
12. Shri R. Gopalakrishnan, S.E. (R) II-A.
13. Shri V.R. Mehta, D.S. (R).

The question regarding effective action for control on progress and quality of works was discussed. The need and frequency of existing progress reports on works was also discussed. The following decisions were arrived at :

I. Returns to be sent and registers to be maintained by the State PWDs :

- (1) Monthly progress reports from Executive Engineers of the States must hereafter be discontinued. Only the CEs in charge of N.H./Centrally financed works should send quarterly progress reports, as already prescribed, to this Ministry, with a copy of the progress report to the concerned Regional Officer.
- (2) In lieu of the existing monthly progress reports the State EEs in charge of Divisions will maintain monthly progress registers for each job. These progress registers will be in the same proforma as the monthly progress report so far sent by them to this Ministry. It should be ensured by the ROs and ELOs during their tours and inspection of works that these monthly progress registers are maintained by the Works Divisions of the State PWDs and they should review the pace of progress with respect to targets and convey observations wherever necessary for improvement.
- (3) The prescribed monthly return for achieving speedy commencement in respect of works sanctioned but not yet commenced, introduced by a circular No. NHI-41 (10) 71 dated 7th August, 1971, will continue to be sent to this Ministry by the CEs of the States with copy to ROs/ELOs and submission ensured and made regular so that progress relating to the invitation of tenders, their finalisation and commencement of work can be watched. A copy of this will also be sent to the ROs and ELOs concerned for watch and ensuring implementation.

II. Action in the Ministry

- (1) As soon as a job is sanctioned the Secretariat Works sections will open a separate works progress file with a copy of the sanction.
- (2) The Technical Officers on receipt of a copy of the job sanction will have an entry of the job made in the progress registers to be maintained by them. The proforma for these progress registers will be reviewed for standardisation by C.E. (R) I and C.E. (R) IV on the Roads side and by C.E. (B) I and C.E. (B) II on the Bridges side.
Separate progress registers should be maintained for works pertaining to each State and entries in the progress register will be in the chronological sequence of date of sanction.
- (3) The receipt of progress reports will be watched by the Technical Officers from the progress registers and where these are not received in time, necessary reminders will be sent to the State CEs.
- (4) On receipt of the progress reports these will be put up by the Sections in dak stage to the Technical Officers.
- (5) On receipt of the progress reports in the dak stage, the Technical Officers will have the progress of work noted in the progress registers. The reports should thereafter be promptly returned to the Sections concerned and this period should not ordinarily exceed three days.
- (6) The progress registers, besides showing the physical and monetary progress, should also reflect the targets set and shown in the progress reports.
- (7) On receipt of the progress reports back from the Technical Officers, the Section Officers will have them promptly diarised and put on the relevant progress file. The progress file then be "Submitted" by the Assistant without any noting to the EEs for further study, evaluation and action. The timely submission of these will be watched through weekly arrears statements.
- (8) The study, evaluation and action on the progress report will be finalised at the following levels :

(a) Jobs costing upto Rs 5 lakhs	EEs
(b) Jobs costing upto Rs 25 lakhs	SEs
(c) Jobs costing more than Rs 25 lakhs	CEs
- (9) The points on which check is to be exercised are indicated in the attached Annexure. Letters will be issued promptly by the Technical Officers where action on any of these points or any other important point is required to be taken by the States by marking the item (s) on the cyclostyled letter form and signing it. (It should not be necessary for the case to go back to the section for a draft letter to be put up). A copy of such letters will also be endorsed to the ROs and ELOs. The letters to the States should go latest by the end of the first month of the succeeding quarter.
- (10) Action on certain points will also need to be taken within the Ministry and this should also be done expeditiously.

III. Action on monthly return for jobs newly sanctioned :

Action on the monthly return will continue to be taken in terms of circular No. NHI-41 (10)/71 dated 7.8.1971.

IV. Appraisal sheet :

Two weeks after the due date for receipt of quarterly reports, each SE should prepare quarterly appraisal sheet as per para 6 of DG (RD)'s circular letter of 13.11.73, copy again enclosed, pertaining to all the works within his jurisdiction and send

it to the Technical Planning and Co-ordination Cell through his CE. The Technical Planning & Co-ordination Cells will put up a consolidated appraisal sheet to ADGs and the DG (RD) every quarter within a period of three weeks after due date of receipts of quarterly reports in the Ministry.

2. All the action on quarterly reports should be oriented in such a manner that our control on works is effective so that they start promptly after sanctions, they are carried out according to schedule and are of requisite quality. Where the expenditure exceeds the sanctioned amount the States should be promptly directed to send revised estimates justifying excess, as in the absence of a revised estimate being sanctioned any excess beyond permissible limit would remain unauthorised and inadmissible.

7510.3.

CHECK LIST OF OBSERVATIONS TO BE MADE WHILE EVALUATING QUARTERLY PROGRESS REPORTS RECEIVED FROM STATE P.W.Ds.

(As Revised in Aug., 1978)

ROAD WORKS

1. The amount of the estimate/date of commencement/agency fixed for execution/target date of completion have not been reported.
2. Reasons for not starting the work/delay in starting the work are wanting.
3. Reasons for revising/re-revising the target date of completion are not furnished.
4. Sanctioned cost of the work is shown incorrectly. This should be Rs _____
5. Estimated quantities have not been indicated for item Nos. _____
6. Item Nos. _____ are not covered by the provisions made in the sanctioned estimate.
7. Cumulative physical progress for item Nos. _____ upto and inclusive of quarter under report have not been indicated.
8. Quarterly targets against item Nos. _____ of work for the total completion period of the project have not been indicated.
9. Overall physical progress has not been indicated under column Nos. _____
10. Cumulative expenditure incurred upto and inclusive of the quarter under report has not been indicated.
11. Expenditure is in excess of the sanctioned cost beyond permissible limits and reasons for not furnishing the revised estimate for this work may be given. Submission of revised estimate may be expedited duly justifying the excess.
12. Physical progress is not compatible with expenditure. Reasons for the same may please be furnished.
13. Progress on items _____ of the work is poor/very poor. There is need to speed up the work.
14. Information regarding labour/plant and machinery/bottlenecks/liabilities has not been furnished.
15. Action taken for overcoming the bottlenecks have not been indicated.
16. Bar Chart showing physical progress is not received/incomplete in respect of items _____
17. Items of work/quantities/progress figures shown in the present progress report are not consistent with those shown in the previous progress report for item Nos. _____. Give reasons.
18. The amount/quantities of items as provided in the sanctioned estimate should continue to be indicated. However, if any amount/quantities need to be modified for valid reasons, these may be indicated within brackets underneath the sanctioned amount/quantities.
19. In case this job includes approaches to bridge (s), details of such bridges and stage of progress on them in the body of the report has not been given as directed in this Ministry's letter No. NHIII/P/21/75, dated 11.3.1976. This is important from ensuring simultaneous completion of road and bridge works included in the project.
20. Position regarding compliance of remarks contained in the technical note accompanying the sanction letter has not been given in the body of the report as required in this Ministry's letter No. NHIII/

Misc./178/73, dated the 26th December, 1974.

21. Progress of land acquisition has not been shown as stipulated in this Ministry's letter No. NHIII/Misc/178/73, dated 26th March, 1974.
22. Laying of WBM and bituminous courses should be so coordinated within the available funds as to avoid damage to WBM.
23. Since the work is shown as physically complete the estimate should be closed as soon as possible and completion report duly verified by the Audit submitted.
24. The progress report was received late. The progress report should reach this Ministry by the 20th of the month following quarter under report except for the March quarter which should reach this office by 30th April.
25. The observations made on previous progress reports have not been taken into account while compiling the present report under review.
26. Replies to letter of even number, dated _____ are still awaited. These may be expedited.
27. Progress Report should be submitted on the Ministry's prescribed proforma.
28. Reasons for deviating from the sanctioned specification without obtaining the prior approval of the Ministry may please be furnished.

7510.4.

CHECK LIST OF OBSERVATIONS TO BE MADE WHILE EVALUATING QUARTERLY PROGRESS REPORTS RECEIVED FROM STATE PUBLIC WORKS DEPARTMENTS

BRIDGE WORKS

1. Information incomplete/not furnished/incorrect in respect of the following :
 - (a) Item No. _____
 - (b) Sl. No. and columns _____
 - (c) Item Nos. _____
 - (d) Item Nos. _____
 - (e) _____
 - (f) _____
2. Reasons for the delay in the starting the work/for not starting the work may be furnished.
3. Reasons for delay in calling tenders/for not calling for tenders/in finalizing the tenders may be indicated.
4. Report on the revision of target date may be furnished.
5. Physical progress of item Nos. _____ against columns (b) is behind the scheduled targets. Reasons for the same, and the action proposed to be taken to adhere to the final targets may be furnished.
6. Reasons for delay/difficulties in the procurement of the required quantities of cement/M.S./H.T.S./Torsteel may be furnished.
7. Expenditure is in excess of the sanctioned cost beyond permissible limits and reasons for not furnishing the revised estimate for this work may be given. Submission of revised estimate be expedited giving reasons for justifying excess.
8. Overall physical progress is not compatible with expenditure. Reasons may be furnished.
9. Expenditure is too low/much in excess/when compared with the allotment for the year. Reasons may be furnished.
10. The work is physically completed but expenditure is seen to be progressively increasing quarter by quarter. This may please be explained.

11. Bridge work is completed. Please report whether it has been opened to traffic. If so, when, and if not, give reasons.
12. Since the work is shown as physically complete, the estimate should be closed as soon as possible and completion report duly verified by audit along with a set of completion drawings may be submitted early.
13. Pictorial Charts not received/not properly filled with colour legend.
14. The revised target date of completion has expired although the work is still incomplete. Fresh and realistic target date of completion with justifying reasons may be intimated.
15. It is not correct to show any revised amount/quantities since no revised estimate has been sanctioned.
16. The progress report does not give information on tilts and shifts suffered by the well foundations as required under this Ministry's circular letter No. NHIII/P/21/75, dated 14th December, 1976.
17. In case approaches and protective works form a part of this job No. or have been sanctioned as a separate job number or approaches form a part of a sanctioned road estimate, it is necessary to give details thereof and stage of progress in the body of the report as directed in this Ministry's letter No. NHIII/P/21/75, dated the 11th March, 1976. This is important for ensuring simultaneous completion of the bridge, its approaches and protective works.
18. Requisite steps may please be expedited to complete the work in all respects within target period along with approaches.
19. Excess material, i.e. cement/M.S./H.T.S./Tor Steel booked may please be withdrawn.
20. The progress report was received late. The progress report should reach this Ministry by the 20th of the Month following quarter under report except for the March quarter which should reach this office by 30th April.
21. The observations made on previous progress reports have not been taken into account while compiling the present progress report under review.

7510.5.

No. NHIII/MISC/178/73

Dated the 18th January, 1974

Subject : Progress reports in respect of Road & Bridge works financed wholly or partly by the Central Government

Copies of the following letters in connection with progress, monitoring and quality control on Central sector road works are attached :

- (i) Circular letter No. NHIII/MISC/178/73 dated 13th December 1973 issued to all State Governments in connection with the procedure and proforma for submission of progress reports.
- (ii) Letter No. NHIII/MISC/178/73 dated 13th December 1973 to all Regional Officers/Engineer Liaison Officers in connection with inspection of works and submission of monthly reports by Regional Officers to Director General (Road Development).

I. Action to be taken in the headquarters office

(a) Progress reports from States :

- (i) Progress reports are due to be received in duplicate in this Ministry by the 15th of the month following the quarter under report. These on receipt will be put up by the Sections in dak stage to the Technical Officers.
- (ii) On receipt of the progress reports in dak stage the Technical Officers will remove one copy and insert it at the appropriate place in the looseleaf progress registers. The other copy should be returned promptly to Sections on the same day or at least on the next working day. Where duplicate copy has not come and so long as submission by States of duplicate copies does not become a regular routine procedure, the contents of the report be noted in the progress register as before.
- (iii) On receipt of the progress reports back from the Technical Officers, the Section Officers will have them promptly diarised and put on the relevant progress file of the section. This file will then be "submitted" by the Assistant without any noting to the Executive Engineer for further study, evaluation and action. The timely putting up of the progress reports by the Section will be watched by the Section Officers through the weekly arrear Statements. The study, evaluation and action on the progress reports will be finalised at the following levels :

(a) Jobs costing upto Rs 5 lakhs

Executive Engineers

(b) Jobs costing upto Rs 25 lakhs

Superintending Engineers

(c) Jobs costing more than Rs 25 lakhs

Chief Engineers

The deficient items in the progress reports should be ticked off on the standard check list and letter issued promptly by the Technical Officers to State Chief Engineer copy to Executive Engineer concerned, as per Annexure I for road works and Annexure II for bridge works. (It should not be necessary for the case to go back to the Sections for putting up a draft letter). A copy of such letters will also be endorsed to the Regional Officers/Engineer Liaison Officers. Letters to the State should go latest by the end of the first month of the succeeding quarter.

- (iv) Follow-up on these deficiencies should be undertaken through letters as per Annexure III for road works and Annexure IV for bridge works.
- (v) During evaluation the Executive Engineers should enter on both copies of each quarterly report the position regarding inspection of the work in question during the quarter under report by officers of the Ministry in the region or headquarters. This will be entered in the following form :

Dates inspected

DG (RD)

ADG

C.A.E.

S.E.

R.O.

E.L.O.

The information regarding inspections carried out by ROs/ELOs will be obtained from the monthly D.O. reports received by DG (RD) from the ROs.

- (vi) Action on points needing attention or action within the Ministry should also be taken simultaneously by the Technical Officers.
- (vii) A review of the position regarding non-receipt of quarterly reports should be undertaken one week after the due date and letter issued as per Annexure V for road works and Annexure IV for bridge works in respect of job numbers for which progress reports are not received.

(b) Appraisal sheet

Two weeks after the due date for receipt of quarterly reports, each S.E. should prepare quarterly appraisal sheet as per para 6 of DG (RD)'s circular letter of 13.11.1973, pertaining to all the works within his jurisdiction and send it to the Technical Planning and Co-ordination Cell through his C.E. The Technical Planning and Co-ordination Cells will put up a consolidated appraisal sheet to ADGs and the DG (RD) every quarter within a period of four weeks after due date of receipt of quarterly reports in the Ministry.

2. All headquarter's officers and sections will please ensure that action is taken as per the above instructions correctly and in time.

ADG (B)/All C.Es/All S.Es/All U.Ss/All Work Sections.

7510.6.

No.

Dated the January, 1974

To

The Chief Engineer,

Subject : Quarterly Progress Report for Job No. _____ for the quarter ending _____

Reference your Executive Engineer's _____ Divisions' letter No. _____ dated _____

Sir,

In the progress report referred to above certain omissions/deficiencies/discrepancies mentioned against item Nos. _____ on the reverse of this letter have been noticed. It is requested that these may be looked into and reply thereof be furnished to this Ministry immediately.

Yours faithfully,

(Executive Engineer) (Roads)
for Director General (Road Development) & Addl. Secretary.

7510/8

Copy forwarded to :

1. Executive Engineer, P.W.D., _____
2. Regional Officer, Ministry of Shipping and Transport (Roads Wing) _____
3. The Engineer Liaison Officer, Ministry of Shipping & Transport for ensuring compliance

Item No.

1. The amount of estimate/date of commencement Agency/target date of completion have not been reported.
2. Reasons for not starting the work/delay in starting the work are wanting.
3. Reasons for revising the target date of completion are not furnished.
4. Sanctioned cost of the work is shown incorrectly. This should be Rs _____
5. Estimated quantities have not been indicated for item Nos. _____
6. Item No. _____ are not covered by the provisions made in the sanctioned estimate.
7. Cumulative physical progress for item Nos. _____ upto and inclusive of the quarter under report have not been indicated.
8. Quarterly targets against item Nos. of work for the total completion period of the project have not been indicated.
9. Overall physical progress has not been indicated under column Nos. _____
10. Cumulative expenditure incurred upto and inclusive of the quarter under report has not been indicated.
11. Expenditure is in excess of the sanctioned cost beyond permissible limits. The reasons for not furnishing a revised estimate for the work may be given.
12. Physical progress is not compatible with expenditure. Reasons for the same may please be furnished.
13. Progress on items _____ of work is poor/very poor. There is need to speed up the work.
14. Information regarding labour/plant and machinery/bottlenecks/liabilities have not been furnished.
15. Action taken for overcoming bottlenecks have not been indicated.
16. Bar chart showing physical progress is not received/incomplete in respect of items _____
17. Other remarks.

7510.7.

No.

Dated the

To

The Chief Engineer

Subject : Quarterly Progress Report for bridge _____ Job No. _____
_____ for the quarter ending _____

Reference : Your Executive Engineer's _____ Division endorsement No. _____ dated _____
_____ forwarding the Progress Report in question.

Sir,

In the Progress report mentioned above, certain omission/deficiencies/defects/discrepancies mentioned against item Nos. _____ on the revers are noticed. You are requested to kindly attend to them and arrange to furnish your replies to the same immediately.

Yours faithfully,
Executive Engineer (Bridges)

Copy forwarded to :

1. Executive Engineer, P.W.D. _____
2. Regional Officer, Ministry of Shipping & Transport (Road Wing) _____
3. The Engineer Liaison Officer, Ministry of Shipping and Transport (Roads Wing) _____ for ensuring compliance.

Executive Engineer (Bridges)
for Director General (Road Development)

Item Nos.

1. Information incomplete/not furnished/incorrect in respect of the following items :
A. Item Nos. _____ B. Serial No. _____ C. Item Nos. _____
D. Item Nos. _____
2. Reasons for the delay in starting the work/for not starting the work may be furnished.
3. Reasons for the delay in calling tenders/for not calling for tenders/in finalising the tenders may be indicated.
4. Report on the revision of target dates may be furnished.
5. Physical progress on items Nos. _____ of columns B is behind the scheduled targets. Reasons for the same, and action proposed to be taken to keep up the final targets may be furnished.
6. Reasons for delay/difficulties in the procurement of the required quantities of cement M.S./H.T.S./Torsteel may be furnished.
7. Expenditure is much in excess of the sanctioned cost and without sanctioned revised estimate. Reasons for this may be furnished.
8. Overall physical progress is not compatible with expenditure. Reasons may be furnished.
9. Expenditure is too low/much in excess/when compared with allotment for the year. Reasons may be furnished.
10. The work is physically completed, but the expenditure is seen to be progressively increasing quarter by quarter. This may be explained.
11. Please report if the bridge is opened to traffic; if so, when if not, please give reasons.
12. Please expedite submission of completion report and completion drawings.
13. Pictorial chart not received/not properly filled with colour legend.
14. Other comments.

7510.8.

No. NHIII/Misc/29/74

Dated the 15th February, 1978

Subject : NH, SR, E&I and CRF Works — Timely submission of Progress Reports to the Monitoring Zone

With a view to ensuring that each progress report in respect of the NH, SR, E&I and CRF Works, received in the Roads Wing is positively seen by the Monitoring Zone, the DG (RD) has instructed that the following procedure should be followed strictly adhered to :

CR Section should immediately on receipt of the progress reports forward the same to the respective Works Section. Works Section on receipt of the progress reports from the CR Section should immediately mark the same, at dak stage, first to the Monitoring Zone and only on their receipt back from the Monitoring Zone to their respective Project Officers.

All concerned may see and note the above instructions for strict compliance.

Copy forwarded to US (NH) A/US (NH) B/US(B)/US (RM) and US (A) Section Officers, CR Sec. and all Works Sections CE (B) I/CE (B) II/CE (B) III/CE (B) IV CE (R) I/CE (R) II/CE (R) III/CE (R) IV and copy also forwarded for information to CE (MON)/SE (B) MON/SE (R) MON.

7520 MISCELLANEOUS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7520.1.	NHI-46 (14)/68 dt. 13.11.68	Approval of Subways by Bridge Directorate	7520/1
7520.2.	NHI-46 (5)/70 dt. 28.7.70	Information to be Furnished while referring Works Estimates to the Ministry of Finance	7520/1
7520.3.	NHI-46 (5)/70 dt. 27.7.71	Scrutiny of Estimates — Incorporation of Physical and Financial Targets	7520/2
7520.4.	NHIII/Misc/178/73 dt. 16.11.74	Need for Sanctioning Estimates on the Basis of full Supporting Investigatory Data	7520/2
7520.5.	NHVI-5 (1)/73 dt. 23.5.74	Lighting of portions of NHs in Delhi	7520/3
<u>7520.6.</u> <u>130</u>	N. 47/KR/30/75 dt. 20.7.76	Examination of Tenders for Balance NH Works	7520/3
7520.7.	NHIII/P/70/76-Pt dt. 6.12.76	FDR/SR Estimates for NHs including Bridges	7520/4
7520.8.	NHIII/P/25/78 dt. 1.6.78	Prompt submission of revised Estimates — Instructions Regarding	7520/4 7520/4
7520.9.	NHIII/P/25/78 dt. 1.6.78	—do—	
<u>7520.10.</u> <u>7300</u>	NHIII/Misc/131/79 dt. 27.10.79	Coordination with State P.W.D.	See Code No. 7300
7520.11.	NHIII/Coord/159/83 dt. 19.9.83	Sanction of Projects — Land Acquisition	7520/5
7520.12.	NHIII/Coord/37/84 dt. 16.6.84	Acquisition of Land for Approaches before Estimates for Bridges and Approaches are Sanctioned	7520/5
<u>7520.13.</u> <u>7300</u>	NHIII/P/20/84 dt. 10.7.84	Examination of detailed estimate received from Stae PWD — Procedure Regarding	See Code No. 7300
7520.14.	NHIII/Coord/86/84 dt. 27.9.84	Coordination of Roads & Bridges	7520/5
7520.15.	NHIII/P/31/77 dt. 24.1.85	Preparation of Technical Proposals for the Schemes included in the Plan	7520/6
7520.16.	NHIII/Coord/21/85 dt. 23.3.85	Bank of Sanctions	7520/6
<u>7520.17.</u> <u>121.2</u>	NHIII/Coord/86/84 dt. 25.3.85	Improving the quality of project preparation for Highway Schemes	See Code No. 121.2
7520.18.	NHIII/Coord/7/85-Pt dt. 4.4.85	Progress on receipts and disposal of Estimates	7520/6

No. NHI-46 (14)/68

Dated the 13th November, 1968

CIRCULAR

Approaches to a bridge under construction sometimes cross an existing road. In such cases right-of-way on the existing road can be obtained either by constructing a subway or by providing an inter-section at grade at the point of crossing or a little away on the level portion of the approach road.

Whenever proposals for subways (which usually have road with or more than 20 ft. and, therefore, come in the category of minor bridges) at such places are examined by the Bridges Officers, the Road Officers should also be consulted before the provision of the subway is accepted.

Copy to : All Technical Officers and Sections in the Roads Wing/All Regional officers

7520 2.

No. NHI-46 (5)/70

Dated the 28th July, 1970

Subject : Information to be furnished while referring works estimates to the Ministry of Finance (T&P Division) for their concurrence

In their U.O. No. 1229-TGSII/70, dated 10th April, 1970 the Ministry of Finance (T&P Division) desired that the Roads Wing should furnish to them the information detailed in the enclosed proforma in respect of each works estimate referred to them for their concurrence. They also desired that a plan of the area in which the work in question is proposed to be executed as also a plan to a larger scale should also be sent along with the case.

2. In regard to items (e), (f) & (h) of the proforma it was explained to the Ministry of Finance that the information may not prove useful and at times it may even cause confusion and prove misleading. In this connection, the following points were brought to the notice of the Ministry of Finance.

Items (e) & (f) :

Duration of execution of a project and the phasing of the expenditure and the physical progress is dependent on various factors such as availability of funds for works in different years, the capacity of the executing agencies to execute the works to certain stipulated time schedule which would in turn depend on labour conditions and potential of contractual agencies in the States, the States' ability to acquire land where necessary, climatic and other seasonal factors for the project location and finally on the political and law and order situation in the different regions. The targetted time of completion can be roughly indicated but our experience has been that in a large number of cases the time schedule is exceeded due to various factors mentioned above which it is difficult to foresee and provide for. Phasing of expenditure and physical progress of a work depends upon factors like the availability of funds for work in different years and the physical performance in a particular year and if the progress of a work slows down in a particular year, the requirement of funds in the subsequent years is likely to be affected as the whole physical programme of the work will have to be re-scheduled.

Item (h) :

As regards particulars for comparison of similar works carried out in the same region, the various factors which effect the cost of a project dependent on the nature of the project scope can be :

- (i) traffic intensity present and projected with traffic composition, axle loads, etc.
- (ii) the terrain, climatic, soil and water-table conditions in which the project lies.
- (iii) in case of improvement of an existing road, the present state of highway pavement and allied structures in the matter of sub-grade type, pavement composition and its present state and extent of deficiencies therein.
- (iv) in case of improvement of an existing highway the present standard of existing geometrics and the deficiencies required to be made up to improve it to specified standards.
- (v) the scope of work under the project and the specifications decided upon dependent on the traffic and terrain requirements.
- (vi) the types of material proposed to be used and their unit cost which vary from region to region and project to project dependent on the wage structure in the locality, nature of material in the matter of toughness etc. of stone material and the haulage involved from the quarry source and other sources to the work site and also the rate of transportation cost, which in many areas has been known to fluctuate seasonally dependent on synchronisation of road materials being transported in one direction and other commodities being available for transportation in the other direction bringing down the transportation costs by road.

3. In the light of the foregoing it was explained to the Ministry of Finance that it would be difficult to furnish the required information and it will have no relevance as no two schemes are identical or even similar in terms of the cost and qualities since :

- (i) rates are based on schedule and/or analysis.
- (ii) quantities are arithmetical and
- (iii) specifications are purely technical matters dependent on requirement of individual cases.

4. It has, however, been decided to furnish all the information required by the Ministry of Finance (T&P) Division), in the enclosed proforma in duplicate in case of each estimate referred to them for their concurrence. Instructions have been issued separately to all State authorities/Union Administrations to furnish the required information with each estimate forwarded hereafter to this Ministry. All Officers and Works Section in the Roads Wing are requested to keep in view the points mentioned in paras 2 & 3 above while furnishing detailed information in regard to items (e), (f) and (h) of the proforma.

5. Technical officers are requested to ensure that for all projects to be referred to the Ministry of Finance, the required complete information for all items of the enclosed proforma and the plans are invariably furnished in duplicate.

To

All Technical Officers and Secretariat Sections except services sections.

Note : For proforma See Code No. 121.2

7520.3.

No. NHI-46 (5)/70

Dated the 27th July, 1971

MEMORANDUM

To

All The Technical Officers, Under Secretaries and Works Sections

Subject : Scrutiny of estimates for road/bridge works-year-wise physical and financial targets to be incorporated in the Technical Note

In continuation of NHI Section's endorsement No. NHI-46 (5)/70 dated 28th July, 1970, all the Technical Officers, Under Secretaries and Works Sections in the Roads Wing are hereby informed that it has been further decided that the year-wise physical and financial targets should be included by the Technical Officers in the Technical Note which is to be sent to the concerned State Government/State Chief Engineer etc. alongwith the sanction letter and that it should be specifically stated in the sanction letter put up by the Works Sections that the annual financial and physical targets as indicated in the Technical Note are to be duly observed and adhered to. These instructions apply to road works as well as bridge works.

7520.4.

No. NHIII/Misc/178/73

Dated the 16th November 1974

MEMORANDUM

Subject : Need for sanctioning estimates on the basis of full supporting investigatory data

While sanctioning estimates for works on National Highways in the past, occasionally the provisions were allowed on a tentative basis, where adequate data for design (s) were not made available by the States. In such cases, before the start of execution, the State P.W.Ds. were invariably required through observations made in the technical notes, to satisfy themselves about the adequacy of design (s) after thorough investigations, and to modify, if necessary, the provisions allowed in the sanctioned estimates. These expectations are not properly fulfilled sometimes.

2. To avoid occurrences of this sort, it has been decided for future that no work proposals from the State P.W.Ds. should be entertained unless accompanied by necessary supporting investigatory data, particularly where the same relate to upgrading/reconstruction of pavements.

3. These instructions may please be strictly adhered to henceforth.

To

All Officers in the Roads Wing at Headquarters and in the Regional Offices

7520.5.

Extracts from File No. NHVI 5 (1)/73 dt. 23.5.74

LIGHTING OF PORTIONS OF NATIONAL HIGHWAYS IN DELHI

Under Section 2 (1) of the National Highways Act 1956 portions lying within Municipal areas are not National Highways. However, on account of their special importance such sections of the roads in Delhi have been retained as National Highways. The responsibility for lighting National Highways does not rest with the Government of India, as traffic on these highways move under its own light.

2. Sanctioning of lighting of the central verge between Ashram and Okhla on Delhi — Mathura Road, National Highway No. 2, was done as a very special case. Such departures, if repeated, would invite requests from other States to light similar portions of National Highways within Municipal limits.

3. The Ministry of Law gave a ruling on 14th April, 1971, that since under Section 4 of National Highways Act, 1956, all National Highways vest in the Union and since in view of the provisions of Section 298 of the Delhi Municipal Act 1957, the portions of National Highways falling within the Municipal areas do not vest in the Corporation, the latter has no liability to light the National Highways. Therefore, the Central Government is responsible for lighting the National Highways falling within the jurisdiction of Delhi Municipal Corporation/Cantt. Board. The Ministry of Finance therefore, agreed as a special case to sanction the provision of lighting of Dhaula Kuan to Palam take off Section.

4. The Delhi Admn. were requested in July 1971 to send a detailed estimate for the work. On receipt of the estimate, the case was referred to the Ministry of Finance for their concurrence in the proposal to sanction an estimate amounting to Rs. 7.29 lakhs for the work. The Ministry of Finance suggested that we should again obtain Ministry of Law's opinion whether the lighting of portions of National Highways in Delhi is the responsibility of the Municipal Corporation or ours. The case was accordingly referred to them for advice. They reversed their earlier ruling that the Delhi Municipal Corpn./Cantt. Board had no liability to light the sections of National Highways in Delhi. They expressed the view that this responsibility devolved on the Corpn. This would hold good in respect of Cantt. also.

5. Besides the proposal to light Dhaula Kuan-Palam take off section of N.H. 8, mentioned in the preceding paragraph, we have also under consideration the proposal to provide street lighting on Delhi-Mathura road, N.H. 2 from Okhla road junction to Delhi Haryana Border at an estimated cost of Rs. 12.84 lakhs.

6. It is to be decided in the meeting as to how lighting is to be provided in the two sections of National Highways in Delhi, referred to in the above paragraphs.

7520.6.
130

No. N 47/KR/30/75

Dated the 20th July, 1976

Subject : Examination of tenders for balance National Highway Works at the risk and cost of the original contractor

Director General (Road Development) and Additional Secretary has desired that in cases where an original contractor abandons a National Highway work midway and fresh tenders are required to be called, at the risk and cost of the original contractor, for the balance work the tender papers for the balance work should be called for from the State Government and examined to ensure that the work is awarded to the most competitive tenderer, so that, if at a future date the original tenderer gets exemption, despite best pursuits, from court from the operation of the risk and cost clause, the financial commitments of this Ministry remain limited to the minimum. The existing powers delegated to states shall however, continue to operate and be applicable. This is for information and future guidance of all concerned.

Copy forwarded to : All Technical Officers in the Roads Wing US/(NH) A/US (NH) B/NH Sections.

No. HIII/P/70/76 Pt

Dated the 6th December, 1976

Subject : FDR/SR estimates for National Highways including bridges

DG (RD) has desired that all the FDR and SR estimates for National Highways (Roads & Bridges) should first be concurred in by the Project CEs irrespective of the cost before reference to the Maintenance Cell for release of funds. This is with a view to approving only the restoration and/or inescapable works thus economising on the available Maintenance funds which, as is common knowledge, are very limited.

To

All Chief Engineers & Superintending Engineers (Roads & Bridge)

No. NHIII/P/25/78

Dated the 13th June, 1978

Subject : Prompt submission of revised estimates—Instructions regarding

It has been decided that the following additional para may be incorporated in the letters conveying sanction to the original estimates of National Highway works.

ADDITIONAL PARAGRAPH TO BE INCORPORATED IN THIS SANCTION LETTER FOR NATIONAL HIGHWAY (ORIGINAL) WORKS FOR ALL ROAD AND BRIDGE WORKS

"I am to add that as the State Government are aware, as per N.H. rules and repeated reiterations approval of the competent authority is required to a revised estimate as soon as the expenditure exceeds the sanctioned estimate beyond the permissible limit. Actually, the requirement is that steps to prepare a revised estimate should be initiated as soon as there is an indication of the expenditure as likely to be exceeding the sanctioned estimate beyond the permissible limit and action is supposed to be taken to ensure that the revised estimate is submitted to the competent authority/Ministry for their approval well in time. It has, however, been noticed that in spite of repeated requests in this regard, this practice is not being followed. The Government of India have, therefore, decided that hereafter unless a revised estimate is got sanctioned or in case there are some unavoidable circumstances, due to which submission of the revised estimate in time is not possible and immediate report of the circumstances is submitted to the competent authority, it would not be possible for the Government of India to release funds beyond the permissible limit of excess and the entire responsibility for any consequences resulting therefrom would be that of the State Govt. In order to avoid such a situation, I am to request that suitable instructions may kindly be issued to all concerned bringing this requirement to their notice for strict compliance."

2. All Officers/Sections in the Roads Wing may ensure that the above paragraph is invariably incorporated in the sanction letter.

No. NHIII/P/25/78

Dated the 1st June, 1978

Subject : Prompt submission of revised estimates — Instructions regarding

It has been decided that the following paragraph may be incorporated in the letters conveying sanctions to the revised estimates of National Highway works where the State Government have failed to send the revised estimate in time before exceeding the permissible excess limit.

ADDITIONAL PARA TO BE INCORPORATED IN THE SANCTION LETTERS FOR REVISED ESTIMATES FOR ALL N.H. ROAD AND BRIDGE WORKS WHERE THE REVISED ESTIMATE IS NOT SUBMITTED IN TIME BY THE STATE GOVERNMENT

"In this case, the State Government have delayed the revised estimate and expenditure has exceeded the permissible limit of excess. The excess thus being unauthorised, reasons for not anticipating it earlier and for delaying the submission of revised estimates may be ascertained and responsibility fixed for negligence, if any, in case the reasons be unconvincing.

2. All Officers/Sections in the Roads Wing may ensure that the above paragraph is invariably incorporated in the sanction letter conveying financial sanction to revised estimates where the submission of the revised estimate is delayed by the State Government.

No. RW/NHIII/COORD/59/83

Dated the 19th September, 1983

Subject : Sanctioning of Projects

In the Quarterly Review Meeting held in December, 1982 and March, 1983 in the Planning Commission, it was decided that in order to avoid time and cost over-runs, no project estimate be sanctioned unless the land acquisition estimate is first sanctioned and physical possession of land is taken over.

It is, therefore, brought to the notice of all the Project Chief Engineers/Superintending Engineers that in those projects where land acquisition may be a bottleneck, such Projects should not be sanctioned till such time the land acquisition proceedings are completed and the possession of land is physically taken over.

No. RW/NHIII/Coord/37/84

Dated the 16th June, 1984.

To

All Technical Officers of Roads Wing at the Headquarters/All Technical Officers in the Regional Offices at Roads Wing

Subject : Acquisition of land for approaches before estimates for bridge and approaches are sanctioned

The Vohra Committee on National Highway Agency System had, *inter alia* recommended that the sanction of work should be given only after complete land acquisition has taken place atleast over such a Section which on completion would be used by traffic. The State Governments were, therefore, requested in this Ministry's circular letter of even number dated 5.4.84 that separate land acquisition estimates should be prepared and submitted for sanction expeditiously so that the land could be acquired and estimates for the works could be sanctioned thereafter.

2. Director General (Road Development) & Additional Secretary has observed that estimates are still continuing to be sanctioned without acquiring the land first. As this is not a sound practice, it is requested that it may please be ensured that no project estimate is sanctioned until and unless land acquisition estimate has been sanctioned and land acquired.

3. In respect of projects, which are expected to be taken up in the near future, the matter may please be taken up with the concerned States for expeditious submission of land acquisition estimates and urgent action thereafter so that the sanction of project estimates is not delayed.

No. RW/NHIII/COORD/86/84

Dated the 27th September, 1984

CIRCULAR

It has been observed that proper coordination between the construction of bridges and their approaches does not take place under the present system in the Roads Wing. In order to improve the situation and ensure that the planning, designing and construction of bridges and their approaches proceed in a coordinated manner, the following arrangement should be adhered to in future :

- (i) In-so-far as the major bridges and all Railway overbridges are concerned, the Officers of the Bridges Directorate shall be fully responsible for planning and coordination of the bridges and their approaches. They will also be responsible for providing and construction of the toll plazas wherever they are necessary.
- (ii) In-so-far as minor bridges are concerned, the officers of the Roads Directorate will be responsible for the planning and coordination of the construction of the road portion along with the bridges.

To

1. All Technical Officers in the Ministry
2. DS (P&B)/US (P&B)/US (NH)/US (SR)
3. All Sections and Desks

No. RW/NHIII/P/31/77

*Dated the 24th January, 1985***CIRCULAR****Subject : Preparation of technical proposals for the schemes included in the Plan**

For the schemes included in the Annual Plan 1985-86, a detailed circular has been issued with this Ministry's Circular No. RW/NHIII/P/31/77 dated the 10th January, 1985 (for bridge works) and dated the 14th January, 1985 (for road works) intimating all the Chief Engineers of the State PWDs dealing with National Highway works that initially detailed technical proposal only may be prepared and forwarded to the Ministry for approval. Only after the approval of the technical proposal by the Ministry the cost estimates should be framed by the State P.W.D. and forwarded for sanction to the Ministry.

2. As the procedure being introduced is new, for the transition period for the year 1985-86, no estimate received from the State PWD for the works included in the A.P. 85-86 may be returned in case the technical proposal has not been got approved in the first instance as per RW/NHIII/P/31/77 dated the 10th January, 1985 and 14th January, 1985 from the Ministry. However, this new procedure should be scrupulously followed for the schemes included in the Annual Plan 1986-87 and subsequent years.

To

1. All Technical Officers in the Ministry
2. DS (P&B)/US (P&B)/US (NH)/US (SR)
3. All Sections and Desks

No. RW/NHIII/Coord/21/85

*Dated the 23rd March, 1985***CIRCULAR**

It often happens that after the critical review of National Highway Works instructions are issued to temporarily slow down sanctions in some of the States. These instructions are later rescinded depending upon the pace of expenditure and the bank of sanctions. When the stoppage of sanctions are withdrawn, it becomes too late to get the estimates processed for sanction in that year. After reviewing the slow pace of sanctions this year, Director General (Road Development) and Addl. Secretary has desired that in future we should process the estimate fully and get the clearance from all but withhold the issue of sanctions instead of waiting withdrawal of stoppage of sanctions. Sanctions can be issued immediately after instructions are issued to withdraw the temporary stoppage imposed. This may please be followed in future.

All Technical Officers in the Headquarters

No. RW/NHIII/Coord/71/85-Pt.

*Dated the 4th April, 1985***CIRCULAR**

To keep a watch on the progress of receipt and disposal of estimates for National Highway Works included in the annual programme, it is required that the information may be compiled in the enclosed format by every Executive Engineer in respect of works concerning him which should be updated every month. Such a list is to be received every month by his Superintending Engineer and Chief Engineer and the list may be passed on by the Superintending Engineer concerned to the Planning Zone by 10th of every month who in turn will apprise the Additional Director General (Bridges)/Additional Director General (Roads) of the position.

To

All Chief Engineers/Superintending Engineers/Executive Engineers

Monthly Statement showing receipt and disposal of estimates for works included in the Annual Programme for the month of

From : S.E.

To : S.E. (Planning)

Due: 10th of every month

ROAD WORKS/BRIDGE WORKS

Names of works included in the Annual Programme	Date of receipt of estimate from State	Amount	Date of return of the estimate to State if modifications are required	Date of receipt of modified estimate from State	Date of sending the estimate to Finance	Date of issue of sanction	Amount of sanction	Remarks
1	2	3	4	5	6	7	8	9

Note : Names of all works included in the Annual Plan to be shown in Col. 2 and subsequent developments indicated in the remaining columns.

7600 INTERNAL DIRECTIONS — ROAD

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7600.1.	NHII/Misc/98/77-Vol. II dt 5.7.78	Design Criteria for Flood Protection Embankment Sections	7600/1
7600.2.	NHVI-50 (15)/78 dt 14.8.78	Standard Terminology for Bituminous Pavement Distress Modes	7600/2
7600.3. 143.1	NHIII/Coord/86/84 dt 17.5.84	Drainage of Highways in Towns & Villages	See Code No. 143.1
7600.4.	PL-30 (49)/79-Pt dt 19.10.84	Intersection Designs	7600/5
7600.5.	NHIII/Coord/86/84 dt 21.3.85	Economic Analysis of Major Highway Projects	7600/5
7600.6. 203	RW/RD/Misc/5/81-OR dt 22.3.85	Computer-Based Simulation Model	7600/5
7600.7.	RW NHIII/Coord/86/84 dt 3.5.85	Improving the Quality of Project Preparation for Highway Schemes	7600/6
<u>7600.8.</u> <u>203</u>	<u>RW/RD/Misc/5/81-OR</u> <u>dt 28.5.85</u>	<u>Computer Based Simulation Model</u>	<u>7600/6</u>
<u>7600.9.</u> <u>203</u>	<u>NHIII/Coord/86/84</u> <u>dt 26.6.85</u>	<u>Data for Economic Analysis of</u> <u>Highway Projects</u>	<u>7600/9</u>
<u>7600.10.</u> <u>203</u>	<u>NHIII/Coord/86/84</u> <u>dt 12.7.85</u>	<u>Economic Analysis of Typical</u> <u>Highway Project</u>	<u>7600/10</u>

No. NHII/Misc/98/77-Vol. II

Dated the 5th July, 1978

OFFICE MEMORANDUM

Subject : Design criteria for flood protection embankment sections — A December, 1977 publication of the Ganga Flood Control Commission, Patna

A copy of the above publication is circulated for guidance of all the Technical Officers.

To

All Technical Officers of the Roads Wing/All Regional Superintending Engineers and Engineer-Liaison Officers.

DESIGN CRITERIA FOR FLOOD PROTECTION EMBANKMENT SECTIONS

(Ministry of Agriculture and Irrigation, Ganga Flood Control Commission, Patna — December 1977)

In order to ensure uniformity in preparation and processing of schemes for flood protection embankments, the following design criteria are being laid down. These criteria do not apply to embankments on tidal rivers.

(1) SPACING OF EMBANKMENT

In case of embankments on both Banks of the river the spacing between the embankments should not be less than 3 times Lacey's wetted perimeter, while in case of embankment on only one bank, the spacing of the levee/embankment should preferably be at a distance equal to Lacey's wetted perimeter from the river bank or about 1.5 times Lacey's P.W. from the midstream of the river. In fixing the alignment, care should be taken to obviate costly river training works or anti-erosion works.

(2) DESIGN HIGH FLOOD LEVEL

Subject to availability of observed hydrological data, the design H.F.L. may be fixed on the basis of flood frequency analysis. In no case, the design H.F.L. should be lower than the maximum on record. For small rivers carrying discharge upto 3000 cumecs, the design H.F.L. shall correspond to 25 years return period. For the river carrying peak flood above 3000 cumecs, the design H.F.L. shall correspond to 50 years return period. However, if the embankments concerned are to protect big townships, industrial areas or other places of strategic importance the design H.F.L. shall generally correspond to 100 year return period.

In the case of double embankments, the design H.F.L. shall be determined keeping in view the anticipated rise in the H.F.L.s. on account of jacketing of the river.

(3) FREE BOARD

In earthen embankments along rivers carrying design discharge upto 3000 cumecs, a free board of 1.5 metre (5 ft.) above the design H.F.L. shall be provided. In earthen embankments along rivers carrying more than 3000 cumecs design discharge, a free board of 1.8 metre (6 ft.) over the design H.F.L. shall be provided. This shall also be checked for ensuring a minimum of about 1 metre (3 ft.) free board over the design H.F.L. corresponding to 100 year return period.

(4) TOP WIDTH

Earthen embankments along rivers carrying design discharge upto 3000 cumecs shall have top width of 5 metres (16 ft.) In the case of protective embankments along major rivers carrying design discharge above 3000 cumecs, the top width shall generally be 5.5 metres (18 ft.). Turning platforms 15 m to 30 m long and 3 m wide with side slope of 1 : 1.5 shall be provided along the country side slope of the embankment at every kilometre.

(5) HYDRAULIC GRADIENT

Hydraulic gradient line has to be determined on the basis of the analysis of the soils which are to be used in the construction of embankments. However, keeping in view the present provisions and practices in different schemes, the following is recommended as guidelines for preparation of project report and estimates.

Type of fill	Hydraulic Gradient
Clayey soil	1 in 4
Clayey sand	1 in 5
Sandy soil	1 in 6

In case the hydraulic gradients flatter than those suggested above are proposed this should necessarily be supported by results of laboratory tests and recommendations from the State Research Laboratory.

(6) SIDE SLOPE :**(i) RIVER SIDE SLOPE :**

The river side slope should be flatter than the angle of repose of the material used in the fill. Considering conditions of saturation and draw-down, the river side slope of embankments upto 4.5 metre height shall not be steeper than

1 in 2 and that in higher embankments will not be steeper than 1 in 3. In case, the higher embankments are protected by rip-rap, the river side slope of earthen embankments upto 6 metres high may be 1 in 2 or 1 in 2.5 depending upon the type of slope protection. In embankments constructed of sandy materials, the river side slope should preferably be protected with cover of 0.6 m (2 ft.) thick good soil.

(ii) COUNTRY SIDE SLOPE

The countryside slope will largely depend on the hydraulic gradient line in different types of soil used in the fill. In order to avoid seepage of water from the countryside face and consequent damage to the bank, minimum cover of 0.6 m over the hydraulic gradient line would be necessary. Generally for embankments upto 4.5 m height, the countryside slope should be 1 in 2 from the top of embankment upto the point where the cover over hydraulic gradient line is 0.6 m, after which either a berm of suitable width with the countryside slope of 1 : 2 from the end of the berm upto the ground level may be provided or the slope may run parallel to the hydraulic gradient line down to the ground level. For the embankments above 4.5 m and below 6 m heights, the corresponding slope should be 1 : 3. In this case also, the provision of berms or a slope running parallel to the hydraulic gradient line from the point where the cover over the hydraulic gradient line is 0.6 m only may be considered. Generally the berm will be 1.5 metre (5 ft.) wide. In selecting a section for the embankment, the economics of the type adopted will be examined.

For embankments above 6 m height detailed design may be furnished in the project estimate.

(iii) SLOPE PROTECTION WORKS

Generally the side slopes and 2 ft. wide (0.6 metres) on top from the edges of the embankments should be turfed with grass sods. In embankments which are in imminent danger of erosion, necessity of protective measures such as slope protection by rip-rap and/or river training works should be examined separately.

(iv) TREATMENT ON TOP OF EMBANKMENTS

For embankments protecting bigger towns, industrial establishments and places of strategic importance, the necessity of providing all weather road surface such as water-bound-macadam or brick-on-edge soling or creteways or moorum surface in 3 to 3.5 metres width should be examined for such reaches which are not easily accessible from the existing net-work of roads in order to ensure proper repair and maintenance of the embankments especially during emergencies. In general only creteways should be provided on major embankments from flood sector. If for some special reasons proper road surface is to be provided on top of embankments, the cost thereof should not be borne by the flood sector.

(v) LAND ACQUISITION

To ensure uniformity in respect of land acquisition for flood protection embankments, it is suggested that the provision for land acquisition should include at least 1.5 metres additional width beyond the toe of the embankments on the river side and width of 3 metres beyond the toe of embankment on the countryside.

(7) BORROW AREAS

Generally the borrow area will be on the river side of the embankment. However, in unavoidable circumstances, when the earth is to be borrowed from the countryside, the borrow pits shall not be closer than 10 m from the countryside toe of the embankment. In certain cases when the depth of the borrow pit is limited to 0.3 metres (1 foot) the borrow pit may be closer to the embankment but in no case the distance between the toe of the embankment and the edge of the borrow pit shall be less than 5 metres (16 ft.). In order to obviate development of flow parallel to the embankment 5 to 6 metres wide cross bars spaced at 50 to 60 metres center to center shall be left in the borrow pits.

7600.2.

No. NH VI-50 (15)/78

Dated the 14th August, 1978

MEMORANDUM

Subject : Standard Terminology for Bituminous Pavement Distress Modes

Pavement condition survey is a useful tool in maintenance management and in working out the strategy for strengthening the pavement. This usually consists of a visual survey for the pavement distress or objective measurements for strength/riding quality, or a combination of both.

2. When a visual survey is made, either during the inspection of an officer or specifically for maintenance/strengthening purposes it is necessary to record the distress manifestations of the pavement for objective evaluation etc. in the design office. For the individual bias not to enter into the recording of the distress, it would be desirable to use clearly understood and proper terms for the different distress types. A standardised terminology has therefore been attempted and is given in the Annexure for use of the Technical Officers. The Annexure in addition gives the likely causes and a few illustrations.

3. For detailed information about pavement distress etc. the following books may be consulted :

- (i) "Principles of Pavement Design" by E.J. Yoder and M.W. Witczak — Chapter on pavement distress.

(ii) "Soil Mechanics for Road Engineers" published by Her Majesty's Stationery Office.

To

1. All Technical Officers in the Roads Directorate at Headquarters.
2. ROs/ELOs.

Enclosure to letter No. NHVI-50 (15)/78 dt. 14.8.78

ANNEXURE

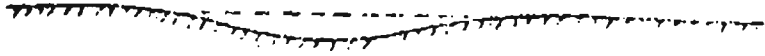
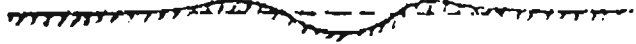
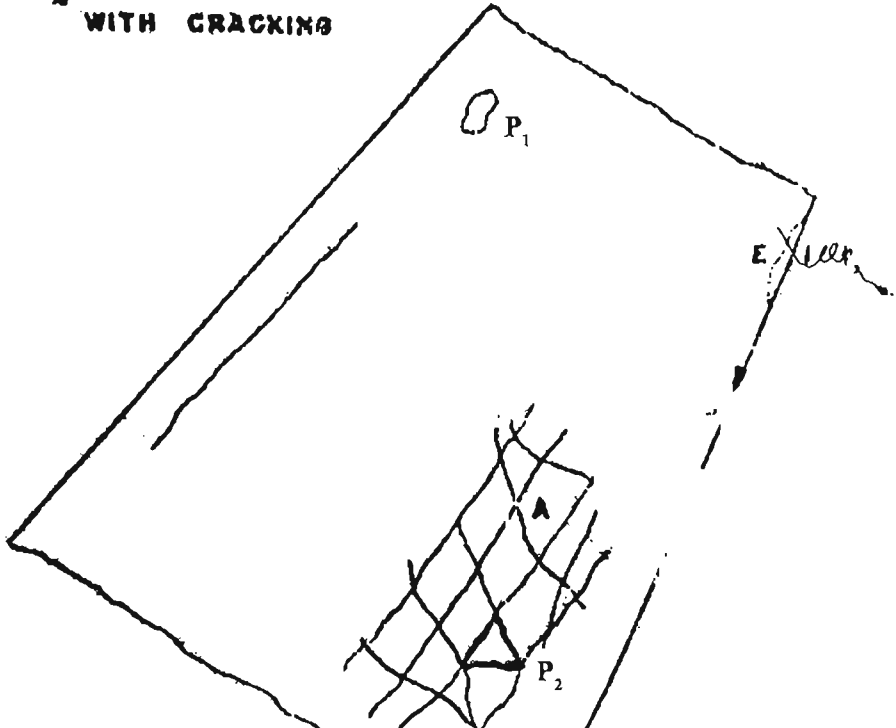
DISTRESS ON BITUMINOUS PAVEMENTS

Sl. No.	Distress type	Distress manifestation	Cause/distress mechanism
1.	2.	3.	4.
1.	Weathering	Surface appearing dry and bitumen seems oxidised.	Too old a surfacing, use of less bitumen.
2.	Bleeding	Surface appearing rich in bitumen; free bitumen on surface particularly in wheel paths.	Too much bitumen in mix, use of too soft a bitumen.
3.	Rutting	Depression in the wheel paths without upheaval in the adjacent area.	Densification, consolidation.
4.	Shear failure in subgrade	Depression in the wheel path accompanied by upheaval at some distance from the depression.	Shear failure due to excessive loading poor shear strength of subgrade.
	(b) in pavement	—Do— but upheaval relatively close to the depression.	—Do— poor shear strength of pavement materials.
5.	Cracking		
	(a) Longitudinal cracks.	Single or multiple cracks in the longitudinal direction.	Differential settlement of fill, lack of internal friction of base.
	(b) Alligator cracks Class I	Cracks in more than one direction joined with each other to form a map pattern. Crack edges are not raised or spalled and there is no rocking under the load.	Fatigue of surface. Excessive resilience of sub grade
	(c) Alligator cracks, Class 2	Same as above but of more in tensive nature. Edges of cracks raised or spalled and the pieces rock under wheel loads.	Pavement in serious distress. Excessive movement of underlying layers. Pavement structurally inadequate.
	(d) Reflection cracks	Reflection of cracks from semirigid or rigid base. Generally regular in occurrence.	Reflection of cracks from underlying layer.
6.	Potholes		
	(a) Isolated pot holes	Potholes at isolated location not associated with other failure modes.	Local distress, local soft spots, local locking up of water.
	(b) Potholes associated with cracking	Potholes associated with alligator cracks. Cracked pieces getting removed under traffic.	Pavement in severe distress, at its last phase of life. Structurally inadequate.
7.	Edge breaking	Pavement edges getting broken	Lack of shoulder support, tracking at pavement edges.
8.	Ravelling	Aggregates, both coarse and fine getting out of the pavement and getting collected in areas other than wheel paths.	Stripping, abrasion by traffic, degradation of aggregates, insufficient bitumen, bitumen oxidised.

Notes : (a) For detailed information the following books may be consulted :

- (i) "Principles of Pavement Design" by E.J. Yoder and M.W. Witczak — Chapter on pavement distress.
- (ii) "Soil Mechanics for Road Engineers" published by Her Majesty's Stationery Office.
- (b) A few illustrations of pavement distress are given in the drawing attached.

ILLUSTRATIONS OF PAVEMENT DISTRESS

RUTTING	
SHEAR FAILURE IN SUBGRADE	
SHEAR FAILURE IN PAVEMENT	
CRACKING AND POT HOLES	A. ALLIGATOR CRACKING E. EDGE BREAKING L. LONGITUDINAL CRACK P₁ ISOLATED POT HOLE P₂ POT HOLE ASSOCIATED WITH CRACKING 

No. PL-30(49)/79-Pt

Dated the 19th October, 1984

CIRCULAR

Even though the Ministry have been attaching great importance to the removal of deficiencies of road junctions specially on National Highways for streamlining and controlling the conflicting vehicular movements, thus enhancing road safety and improved flow conditions, it has been observed that properly designed intersections are not constructed at the take off points of the bypasses. Such locations, if not properly designed, prove potential traffic hazards apart from hampering the intersection performance in terms of travel speed and travel time. The Director General (Road Development) has, therefore, desired that any proposal for construction of a new bypass should be entertained only if appropriate provision, both at the time of submission of estimate for land acquisition as well as at the project estimate stage, has been made therein for suitably designed junctions at the end points as well as at intermediate cross-roads, if any, along the bypass alignment. Adoption of this step will enable provision of properly designed intersections concurrent with the construction of bypasses thus obviating the bottlenecks hampering any subsequent improvement of the junctions.

In respect of the existing bypasses, the DG (RD) has further desired that the intersections requiring improvement should be immediately identified and proposals for their improvement formulated. Provision for such works should get the highest priority in the annual plans.

To

All the Technical Officers at Headquarters and T.S. to DG (RD)/All R.Os. and E.L.Os. of the Ministry.

No. NHIII/Coord/86/84

Dated the 21st March, 1985

CIRCULAR

A reference is invited to Ministry's letter of even number dated 18.3.85 addressed to all State Chief Engineers, copy endorsed to all Technical Officers, on the subject of Economic Analysis of major highway projects.

It has been decided that a beginning in this direction should be made in the Ministry itself. To start with, one road project from each Project Zone may be identified and taken up for economic evaluation. The project should form part of the 1985-86 programme. The Project Chief Engineers are accordingly requested to identify one project in their respective Zones and get in touch with Sri S. Venkatesan, S.E. (Roads) for further instructions on the methodology to be adopted.

To all Technical Officers dealing with Roads in the H.O. Copy to PS to DG (RD) and SPA to ADG (R)

No. RW/RD/MISC/5/81/-OR

Dated the 22nd March 1985

CIRCULAR

A computer-based Simulation Model has been developed as a result of a collaborative research project, jointly sponsored by the Ministry and the Swedish International Development Association. The Model has been developed and implemented at the Indian Institute of Technology, Kanpur. Prof. S. Palaniswamy and Prof. B.R. Marwah are the research coordinators.

The Model is able to predict the speed-flow characteristics of traffic on Indian roads and is thus a valuable tool in determining the need for road improvements, such as widening, provision of shoulders and geometric improvements.

In order to popularise the application of the Model in the day-to-day work of National Highway improvements, it has been decided to take up one case from each Project Zone in the year 1985-86 and carry out the analysis. The following criteria apply to the selection of such projects :

7600/6

- (i) The project should be included in the Annual Programme 1985-86.
- (ii) The project should involve widening single lane to intermediate lane or two lanes, or widening two-lanes to four lanes.

The Project Chief Engineers are requested to identify the projects and get in touch with Shri M.K. Bhalla, SE (R) T&T for guidance in further work. The concerned Project Officers will have to collect the data needed for the Model input and run the Model at I.I.T. Kanpur to obtain the results.

To all Technical Officers (Roads) at H.O.

7600.7.

No. RW/RD/Misc./5/81-OR

Dated the 3rd May, 1985

Subject : Improving the quality of project preparation for Highway Schemes

The subject of improving of quality of the project preparation of Highway Schemes was discussed in the room of DG (RD) on 1.5.85 when the Project Chief Engineers were present.

It was again stressed by DG (RD) in the meeting that the Project Chief Engineers at Headquarters should take immediate action to attend a high degree of precision and expertise in the project preparation of all major Highway and Bridge Schemes on the same lines as adopted for the recent World Bank Schemes.

The Project Chief Engineers are therefore requested to identify suitable schemes and arrange for preparation of projects on the same lines as adopted for the World Bank Schemes.

To

All Technical Officers in the H.Q. Office and Regional Offices.

7600.8.
203

No. RW/DR/Misc./5/81-OR

Dated the 28th May, 1985

CIRCULAR

Reference is invited to earlier circular of even number dated the 22nd March, 1985, issued by Shri L.R. Kadiyali, Chief Engineer (Planning) concerning the development of a computer-based Simulation Model and for conducting analysis of one case from each Project Zone, included in the Annual Plan 1985-86, by application of the Model. The Project Chief Engineers have since been requested to identify one project in their zone, which could be for widening from single lane to intermediate lane or two-lanes, or widening two-lanes to four-lanes or improvement to geometrics etc.

For carrying out the desired analysis through application of the Model, certain Road and Traffic Data would need to be compiled. Annexure I to this circular contains the details of data required to be obtained from the State PWD or collected from the project proposal received from the PWD, to be used as input data for the Simulation Modelling of the selected project. Annexure II indicating salient details of a pavement widening project and the input data in respect of a 3.2 km stretch of Shillong-Jowai section of N.H. 44 in Meghalaya is also enclosed for illustrating the methodology of data collection.

The Project Chief Engineers in the Roads Directorate are requested to arrange for the requisite data collection for the Model input for running the Simulation Model at I.I.T. Kanpur.

To

All Technical Officers in the Roads Directorate at the headquarters.

ANNEXURE I

INPUT DATA TO THE SIMULATION MODEL

- (i) DATA DESCRIBING THE ROAD ALIGNMENT (HORIZONTAL ALIGNMENT AND VERTICAL PROFILE) AND TRAFFIC REGULATION.

Normally it is to be obtained by field measurements with special instrumented vehicles for the road stretches used for simulation (data like curvature, slope, roughness and space coordinates).

Since it may not be feasible to carry out field measurements with special instrumented vehicles, the data could be computed from the alignment plans and longitudinal sections of the selected section. Roughness values could be assumed depending upon the type of surfacing as per the guidelines circulated vide Ministry's letter No. RW/NHIII/P/10/84 dated the 25th July, 1984.

(ii) **DATA ON TRAFFIC TO BE SIMULATED**

Field observations on traffic movements (traffic counts) in conjunction with special traffic generation models.

1. **ROAD DATA :** (i) Road is described for each direction as a series of homogeneous blocks having the same geometrics and other details.

- (i) Space coordinates for the beginning of each block (m) (It means the chainage of the beginning of each block)
- (ii) Carriageway width (m)
- (iii) Hard shoulder width (dm)
- (iv) Speed limit (km/h)
- (v) Curvature (10^4 m^{-1})
- (vi) Slope (m/km)
- (vii) Roughness (mm/km)
- (viii) Sight distance
- (ix) Indicate whether there are any overtaking restrictions in any section of the selected reach.
- (x) Indicate the existence of a hard shoulder/climbing lane and give chainage of its beginning and end.

2. **TRAFFIC DATA :**

Furnish peak hour traffic in terms of number of i) Cars, jeeps and vans ii) Buses iii) Trucks iv) Motor cycles v) Slow moving vehicles like bullock carts etc. vi) Cycles.

SALIENT POINTS OF THE STUDY PROJECT

ANNEXURE II

1. 3.2 km. stretch of Shillong — Jowai section of N.H. 44 in Meghalaya has been selected for Traffic Simulation Modelling and economic evaluation. The work of widening of this reach (mile 31 and 32) stands included in the Annual Plan 1984-85. At present the reach has a single lane pavement with inadequate formation width. The work of widening and strengthening of the carriageway to 5.5 metres (Intermediate Lane) upto 15 mile from Shillong has been sanctioned and is in good progress.
2. Due to recent discovery of coal bearing area near Jowai the Traffic map significantly increased. The average Daily Traffic count recorded on 26th Dec., 1983 to 1st January 1984 was :

FAST MOVING VEHICLES

(i) Cars, Jeeps, Vans, etc.	450 Nos.
(ii) Buses	114 Nos.
(iii) Trucks	1022 Nos.
(iv) Motor-Cycles, Scooters	8 Nos.

SLOW MOVING VEHICLES

- (i) Cycles

3. The Terrain of N.H. 45 from Shillong to Jowai is predominantly hilly with sharp curve and steep gradients. The state P.W.D. has been requesting the Ministry to consider widening the carriageway to double lane in view of increasing traffic volume considering the overall implication of the pavement widening project covering a significant length of road vis-a-vis the financial involvement it was considered prudent to conduct economic evaluation of the various alternative strategies also using the recently developed traffic simulation model, so that a techno-economically viable alternative could be adopted.

Various options considered were :

- (i) Widening to 2 lane pavement
- (ii) Widening to intermediate lane pavement
- (iii) Retain the existing single lane (Null Alternative)

4. **CUMULATIVE RISE AND FALL**

1st km = 31.53 m 2nd. km = 29.85 m 3rd. km = 21.17 m
4th. km (Part) 13.0 m/km

In view of the prevailing gradients the terrain has been taken as rolling

PEAK HOUR TRAFFIC CONSIDERED FOR ANALYSIS

Type of vehicle	Traffic 1983 in No. of vehicles per hour	in,Projected 1986	Traffic in 1991	1996
(i) Cars, Jeeps & Vans	45	56	80	115
(ii) Buses & Trucks	114	142	203	292
(iii) Motor Cycles	1	2	2	3
Total	160	200	285	410

ASSUMPTION MADE FOR ANALYSIS

- (i) Peak hour traffic considered 10% of adt
- (ii) Growth rate as 7.5% per year
- (iii) Period of construction as 2 years
- (iv) Equal directional distribution

Chainage in m	Space Coordinate	Width of carr- iageway in m	Width of hard shoulder in m	Speed limit in km/hour	Gradient in m/km	Curvature in 10^{-4} m	Road Roughness in mm/km	Sight Distance in mm
48000	0	7.0	0	50	0.000	0.000	3000	100
48150	150	7.0	0	50	56.700	208.300	3000	90
48220	220	7.0	0	50	56.700	208.300	3000	70
48228	228	7.0	0	50	11.400	0.000	3000	50
48274	274	7.0	0	50	-16.700	151.520	3000	70
48279	279	7.0	0	50	-40.000	151.520	3000	120
48324	324	7.0	0	50	-77.330	200.000	3000	120
48368	368	7.0	0	50	-68.800	0.000	3000	120
48390	390	7.0	0	50	-70.000	109.890	3000	120
48410	410	7.0	0	50	-33.300	0.000	3000	120
48460	460	7.0	0	50	13.800	0.000	3000	120
48508	508	7.0	0	50	37.700	131.580	3000	120
48529	529	7.0	0	50	50.700	0.000	3000	120
48614	614	7.0	0	50	21.700	113.640	3000	120
48650	650	7.0	0	50	21.600	113.640	3000	120
48661	661	7.0	0	50	-24.500	0.000	3000	100
48721	721	7.0	0	50	-13.900	70.920	3000	120
48785	785	7.0	0	50	-18.000	0.000	3000	70
48805	805	7.0	0	50	-50.000	114.940	3000	70
48853	853	7.0	0	50	-32.700	0.000	3000	70
48874	874	7.0	0	50	-32.700	131.580	3000	60
48886	886	7.0	0	50	23.300	131.580	3000	100
48967	967	7.0	0	50	35.050	54.350	3000	120
49070	1070	7.0	0	50	16.300	0.000	3000	150
49143	1143	7.0	0	50	-7.200	0.000	3000	150
49235	1235	7.0	0	50	-17.800	109.890	3000	120
49283	1283	7.0	0	50	-13.670	0.000	3000	120
49343	1343	7.0	0	50	-16.700	54.640	3000	120
49370	1370	7.0	0	50	0.000	0.000	3000	120
49392	1392	7.0	0	50	-2.350	40.980	3000	120
49431	1481	7.0	0	50	-11.670	0.000	3000	150
49537	1537	7.0	0	50	-8.890	54.640	3000	150

Chainage in m.	Space Coordinate	Width of carriageway in m	Width of hard shoulder in m	Speed limit in km/hour	Gradient in m/km	Curvature in 10^{-4} m	Road Roughness in mm/km	Sight Distance in mm
49580	1580	7.0	0	50	5.400	54.640	3000	150
49700	1700	7.0	0	50	-25.300	54.640	3000	150

7600.9.
203

No. NHIII/Coord/86/84

Dated the 26th June, 1985

CIRCULAR

This is with reference to CE (PL)'s Circular of even No. dated 21st March, 1985, wherein one road project of 1985-86 programme from each Project Zone was required to be identified and taken up for economic evaluation.

The data required for conducting economic analysis for such a project are listed in Annexure I enclosed. The Project Chief Engineers are requested to arrange requisite data collection for enabling economic analysis through the model already developed at I.I.T., New Delhi.

To

All Technical Officers in the Roads Directorate at the Headquarters.

ANNEXURE I**DATA REQUIRED FOR ECONOMIC ANALYSIS FOR HIGHWAY PROJECTS****I. GENERAL INFORMATION**

An index map showing the proposal, brief description of the proposed project and scope of work envisaged may be furnished. Broad features of existing road, the present impediments to traffic and the proposed improvements of the existing facility may be described. The existing geometrics, pavement width, type of surface and shoulder details may also be included herein. The road section should be analysed dividing it into various subsections (links) for every change in traffic volume/terrain. Data should be supplied for each of the link as indicated in Item II below. The model developed in the Ministry is applicable to development of existing two lane roads. The various links of the existing & proposed facility may be indicated with their numbers in the Index Map.

II. DATA REQUIRED FOR ANALYSIS THROUGH COMPUTER

- (1) Link number
- (2) Improvement alternative viz. (i) 'Do Nothing' or No improvement (ii) Strengthening of pavement (iii) Widening to 4 lanes (iv) Construction of 4 lane expressway (v) Construction of 2 lane expressway (vi) Construction of 2 lane bypass.
- (3) Length of link (km)
- (4) Roughness of existing road (mm/km)
- (5) Total rise/fall (m/km)
- (6) Terrain viz. (i) Plain or (ii) Rolling or (iii) Hilly
- (7) Construction period for improvement envisaged (years)
- (8) Construction cost (Rs. lakhs) including all overheads charges.
- (9) Average daily traffic (number of vehicles) separately for (i) Cars (ii) Buses (iii) Trucks (iv) Two wheelers in 1985 on the existing facility.
- (10) Proportion of traffic that will be using the new facility (expressed as a fraction of existing traffic).
- (11) Existing proportion of slow moving vehicles (expressed as a fraction of total number of fast vehicles).
- (12) Speed of (i) Cars (ii) Buses (iii) Trucks (iv) Two wheelers on the existing road.
- (13) Percentage annual traffic growth for future (i) Cars (ii) Buses (iii) Trucks (iv) Two wheelers.

No. RW/NHIII/COORD/86/84

Dated the 12th July, 1985

CIRCULAR

A reference is invited to Ministry's letter of even number dated the 18th March, 1985 addressed to all State Chief Engineers with copy endorsed to all Technical Officers, on the subject of Economic Analysis of major highway projects, followed by Ministry's letter of even number dated the 21st March, 1985, on the subject addressed to all Technical Officers dealing with roads in the Headquarter's Office of the Roads Wing.

2. A case study on Economic Analysis of Alternative Proposals for Pavement Widening of Shillong-Jowai Section of National Highway 44 in Meghalaya has been conducted using I.R.C. Publication 30 "Manual on Economic Evaluation of Highway Projects in India" and the newly developed Traffic Simulation Model. A copy of the Economic Analysis carried out is enclosed for illustrating the methodology and approach to be adopted for conducting similar evaluation studies.

Encl : As above.

To all Technical Officers dealing with Roads in the H.O.

CASE STUDY ON ECONOMIC ANALYSIS — ALTERNATIVE PROPOSALS FOR PAVEMENT WIDENING OF SHILLONG —JOWAI SECTION OF N.H. 44 IN MEGHALAYA

1. INTRODUCTION

Economic evaluation of Highway Projects has assumed special significance due to scarcity of resources and competing demands from various sections in a developing economy needing allocation of the scarce resources in the most beneficial and selective manner. Highway economic analysis, also called Highway Project appraisal, is a technique whereby the costs of and benefits from a scheme are quantified over a selected time horizon and measured by a common yardstick. The technique is also named as cost-benefit analysis.

2. SALIENT POINTS OF THE STUDY PROJECT

2.1 3.2 km stretch of Shillong-Jowai Section of NH. 44 in Meghalaya has been selected for economic evaluation of various alternative strategies of pavement widening. The work of widening of the reach Mile 31 and 32 of this section stands included in the annual plan 1984-85. At present, the reach has a single lane pavement with inadequate formation width. The work of widening and strengthening of the carriageway to 5.5 metres (intermediate lane) up to 15th mile from Shillong has been sanctioned and is in progress.

2.2 Due to recent discovery of coal bearing area near Jowai, the traffic has significantly increased. The average daily traffic-count recorded on the 26th December, 1983 to 1st January, 1984 was :

Fast Moving vehicles :

i) Cars, Jeeps, Vans etc.	450 nos.
ii) Buses	114 nos.
iii) Trucks	1022 nos.
iv) Motor-cycles, Scooters	8 nos.

SLOW MOVING VEHICLES

i) Cycles	1 no.

2.3 The terrain of N.H. 44 from Shillong to Jowai is predominantly hilly/rolling with sharp curves and steep gradients. The State P.W.D. has been requesting the Ministry to consider widening the carriageway to double lane in view of increasing traffic volume. Considering the overall financial implication of the pavement widening project covering a significant length of road vis-a-vis the prevailing resource constraints it was deemed prudent to conduct economic evaluation of the various alternative strategies for pavement widening, also using the recently developed traffic simulation model, so that a techno-economically viable alternative could be selected.

Various options considered were :

- i) Widening to two-lane pavement
- ii) Widening to intermediate lane pavement
- iii) Retain the existing single lane ("Do nothing" or "Null" alternative)

2.4 PEAK HOUR TRAFFIC CONSIDERED FOR ANALYSIS

Type of Vehicle	Traffic in 1983 in No. of vehicles per hour.	Projected Traffic		
		1986	1991	1996
i) Cars, Jeeps & Vans	45	56	80	115
ii) Buses & Trucks	114	141	203	292
iii) Motor cycles	1	1	2	2
Total	160	198	285	409

2.5 ASSUMPTIONS MADE FOR ANALYSIS

- i) Peak hour traffic considered 10% of ADT.
- ii) Growth rate as 7.5% per year.
- iii) Period of construction as 2 years
- iv) Equal directional distribution

2.6 CUMULATIVE RISE AND FALL PER KILOMETRE

As computed from the longitudinal profile of the road.

1st km	= 31.53 m
2nd km	= 29.85 m
3rd km	= 20.17 m
4th km (part)	= 13.0 m

In view of the prevailing gradients, the terrain has been taken as rolling.

3. TOTAL TRANSPORTATION COST

It consists of :

- i) Cost of construction of the facility initially
- ii) Periodic cost of maintaining the facility over its design life.
- iii) Road user cost

3.1 Initial cost of construction of the facility (widening and strengthening of 3.2 km stretch)

i) FOR TWO-LANE PAVEMENT

Pavement widening	= Rs 43.34 lakhs
Formation widening	= <u>Rs 26.31 lakhs</u>
	<u>Rs 69.65 lakhs</u>

ASSUME TWO YEARS CONSTRUCTION PERIOD

Economic cost of road construction and maintenance	= 0.8 (Financial cost)
Economic cost of construction in 1985	= $\frac{1}{2} \times 69.65 \times 0.8$
	= Rs 27.86 lakhs
Economic cost of construction in 1986	= Rs 27.86 lakhs

ii) FOR INTERMEDIATE-LANE PAVEMENT

Pavement widening	= Rs 27.61 lakhs
Formation widening	= <u>Rs 26.31 lakhs</u>
	<u>Rs 53.92 lakhs</u>
Economic cost of construction in 1985	= $\frac{1}{2} \times 53.92 \times 0.8$
	= Rs 21.57 lakhs
Economic cost of construction in 1986	= Rs 21.57 lakhs

3.2 COST OF MAINTENANCE

a) Ordinary repairs per year

- i) For two-lane pavement

$$= 0.8 \times 14,700 \times 3.2$$

$$= \text{Rs } 37,600/-$$

- ii) For 1½ lane pavement $= 0.8 \times 13,500 \times 3.2$
 $= \text{Rs } 34,600/-$
- iii) For single lane pavement $= 0.8 \times 12,500 \times 3.2$
 $= \text{Rs } 32,000/-$

(b) PERIODIC RENEWAL/3 YEAR

- i) For two lane pavement $= 0.8 \times 78300 \times 3.2$
 $= \text{Rs } 2,00,400/-$
- ii) For 1½ lane pavement $= 0.8 \times 61,500 \times 3.2$
 $= \text{Rs } 1,57,400/-$
- iii) For single lane pavement $= 0.8 \times 40,950 \times 3.2$
 $= \text{Rs } 1,04,800/-$

4. DETERMINATION OF HIGHWAY COSTS

4.1 The first two components of the total transportation i.e. the cost of construction of the facility initially and the periodic cost of maintenance of the facility over its design life are known collectively as 'Highway Costs'.

4.2 The cost of construction of the facility includes :

- i) Survey, investigation and design costs
- ii) Lane acquisition costs
- iii) Construction costs
- iv) Physical contingences (unforeseen items and unforeseen increase in cost not attributable to escalation and unforeseen increase in quantities)
- v) Supervision, quality control and administration charges.

4.3 The cost of maintenance of the facility includes :

- i) Ordinary repairs, such as patch repairs, pot-hole filling, dressing earthwork etc.
- ii) Periodic repairs, such as renewals and resurfacing
- iii) Operational expenses, such as traffic signals, traffic aid posts, lighting, policing etc.
- iv) Supervision and administration charges.

4.4 When dealing with the highway costs, it is necessary to phase the same year by year. Similarly in the case of maintenance costs, the year-by-year costs have to be identified.

4.5 DIFFERENCE BETWEEN ECONOMIC COSTS AND FINANCIAL COSTS

In economic analysis, one is concerned with economic costs and not financial costs. Economic costs are based on the "opportunity cost" of each of the constituents of the cost, such as labour, material and machinery. In order to device the economic costs, these constituents have to be isolated, quantified and adjusted on the basis of certain principles.

4.6 SHADOW PRICING

Adjustments needed in the prices of goods and wages to make them reflect truly their market value are known as shadow pricing.

- (i) Shadow wage rate is half the actual wages paid.
- (ii) There is no need to shadow-price for semi-skilled and skilled labour since there is generally a scarcity of these categories and the market wages more or less reflect this situation.
- (iii) Shadow-price foreign exchange at 20% above the official rate.
- (iv) For commodities produced both locally and imported (e.g. fuel oil), border price should be considered (c.i.f. price).
- (v) Taxes like import duty, excise duty and sales tax and licence fees levied by the Govt. on a number of items are not considered in the economic cost. (These are in fact transfer payments within the economy).
- (vi) Subsidies granted to certain commodities (e.g. levy cement) should be disregarded.

The above principles of shadow pricing apply equally to the cost stream (highway construction and maintenance cost) and the benefit stream (road user benefits).

4.7 TREATMENT OF INFLATION

Escalation and inflation, both on the cost stream and the benefit stream, are disregarded.

4.8 INTEREST ON CAPITAL COST OF CONSTRUCTION :

Since Highway projects in India are at present financed solely from Govt. funds, there is no need to include yearly interest on the initial cost of construction in economic analysis.

5. ROAD USER COST

It is composed of the following main components.

- (i) Vehicle operating cost
- (ii) Time cost
- (iii). Accident cost

5.1 VEHICLE OPERATING COST

5.1.1 Cost of operation of vehicles is a function of:

- i) Pavement width
- ii) Rise and fall of road
- iii) Road roughness

Formulae used:

$$\begin{aligned} \log_e \text{VOCB} &= 0.5972 + \frac{1.2253}{W} + 0.0112 \text{ RF} + 0.000037 \text{ RG} \\ \log_e \text{VOCT} &= 0.5869 + \frac{1.1999}{W} + 0.00982 \text{ RF} + 0.000025 \text{ RG} \\ \log_e \text{VOCC} &= 0.7351 + \frac{1.2201}{W} + 0.0148 \text{ RF} + 0.000076 \text{ RG} \end{aligned}$$

VOCB Cost of operation of buses/trucks/cars per km (in Rs/km) exclusive of taxes.

VOCT

VOCC

W = Pavement width in metres

RF = Cumulative rise and fall measured from the vertical profile of the road in terms of the metres of rise and fall per kilometre.

RG = Roughness in mm/km

Cost of operation of two wheelers = $\frac{1}{5} \text{VOCC}$

5.1.2 Cost of operation of various categories of vehicles (car, bus, truck and two wheeler) have been worked out in Rs/vehicle for alternative pavement widths and horizon years 1986, 1991 and 1996 and are shown in table I. For facility of illustrating the technique of economic analysis the period of analysis has been reckoned as 10 years.

Table I: Cost of operation of vehicles for the study stretch for alternative pavement widths in years 1986, 1991 and 1996 in Rs/vehicle.

Pavement width and year		Cost of operation in Rs/vehicle			
		VOCC	VOCB	VOCT	VOCTW
Two Lane	1986	3.62	10.87	9.85	0.72
	1991	3.76	11.07	9.97	0.75
	1996	3.90	11.28	10.09	0.78
Intermediate lane	1986	3.79	11.40	10.32	0.76
	1991	3.94	11.61	10.45	0.79
	1996	4.09	11.83	10.58	0.82
Single Lane	1986	4.58	13.23	11.80	0.92
	1991	4.58	13.23	11.80	0.92
	1996	4.58	13.23	11.80	0.92

Note: Cost of operation for intermediate years may be interpolated.

- 5.1.3 Following assumptions have been made with regard to the roughness values in the absence of actual roughness measurements. With the acquisition of roughometers it should be possible to quantify the actual values.

Pavement width	Roughness values in mm/km.		
	1986	1991	1996
Two-lane	4000	4500	5000
Intermediate-lane	4000	4500	5000
Single-lane	5000	5000	5000

5.2 TRAVEL TIME SAVINGS

- 5.2.1 Savings in travel time are enjoyed by bus passengers, car passengers and two-wheeler riders. These are also relevant in respect of the commodity in transit. The following values at 1984 price level have been used in the present analysis based on results from the Road User Cost Study.

(i) Car and two wheeler passengers	Work trip — Rs 13.13/hour Non work trip — Rs 3.28/hour
(ii) Bus passengers	Work trip — Rs 7.19/hour Non Work trip — Rs 1.80 hour
(iii) Commodity in transit	— Rs 3.00/hour

Take work trips as 75 per cent of total and non work trips as 25 per cent of total.

- 5.2.2 The occupancy of cars, two wheelers and buses should be found from actual surveys. In absence thereof, the following values have been assumed.

Average occupancy of a car	4.0
Average occupancy of a two-wheeler	1.5
Average occupancy of a bus	43.0

- 5.2.3 Based on the above assumptions, value of travel time per vehicle is worked out as below.

Value of travel time per car	= $(0.75 \times 13.13 + 0.25 \times 3.28) \times 4$ = Rs 42.67/hour
Value of travel time per bus	= $(0.75 \times 7.19 + 0.25 \times 1.80) \times 43$ = Rs 25.23/hour
Value of travel time per two-wheeler	= $(0.75 \times 13.13 + 0.25 \times 3.28) \times 1.5$ = Rs 16.00/hour

- 5.2.4 For computation of travel time cost, vehicle speed is another parameter needing quantification. This has been arrived at by the use of the recently developed Traffic Simulation Model. For single lane pavement journey speeds could not be simulated. These have, therefore, been worked out on the basis of speed-volume relationships recommended in 'Manual on Economic Evaluation of Highway Projects in India' (IRC — Special Publication 30) as given below :

Considering the terrain as rolling, journey speeds on single-lane pavement are :

V_C	(Speed of cars)	= $42.43 - 0.084 HV$
V_B	(Speed of buses)	= $40.07 - 0.069 HV$
V_T	(Speed of trucks)	= $37.05 - 0.052 HV$
V_{TW}	(Speed of two-wheelers)	= $37.69 - 0.052 HV$
	Where HV	= Hourly traffic volume (No. of vehicles in peak hour)

	= 0.1 ADT
ADT	= Average daily traffic in number of vehicles.

The average simulated/calculated journey speeds in km/hour for various vehicles types are indicated in table 2.

Cost of travel time for various vehicle types in Rs/vehicle are shown in table 3.

5.3 ACCIDENT COST SAVINGS

These have not been taken into account in the present case since scant data with regard to the accident rate and costing is available which may be inadequate to provide a basis for inclusion in economic analysis at the present. It may be possible to do so after a satisfactory level of data bank has been achieved.

5.4 BENEFITS FROM HIGHWAY IMPROVEMENTS

The benefits from highway improvements can be classified as :—

- (i) ROAD USER BENEFITS

- (a) Vehicle operating cost savings.
- (b) Value of travel time savings
- (c) Value of savings in accident costs
- (ii) **SOCIAL BENEFITS**
 - (a) Improvements in environmental standards i.e. air and noise pollution, aesthetics etc.
 - (b) Improvements in agriculture, industry, trade and mining.
 - (c) Improvements in health and education.
 - (d) Improvements in administration, law and order and defence.

It is at present possible to quantify only the direct road user benefits. Full quantification of benefits can be possible only after evaluation of other aspects is possible on the basis of further research. In the present case study, therefore, only the direct road user benefits have been considered.

6. TECHNIQUE OF ECONOMIC EVALUATION

- 6.1 The basic objective of the economic analysis is to determine the most ideal solution from among a number of alternatives. In the case study the two alternative options i.e. intermediate laning or two-laning of the existing single lane pavement have been evaluated and compared with the "do-nothing" alternative.

6.2 METHODS OF ECONOMIC EVALUATION :

Three common methods of economic evaluation are :—

- (i) Net present Value Method
- (ii) Internal Rate of Return Method
- (iii) Benefit/Cost Ratio Method

All these methods are based on the Discounted Cash Flow Technique of discounting all future costs and benefits to a common year. In this case the base year chosen is 1985.

6.2.1 NET PRESENT VALUE (NPV) METHOD

In this method, the stream of costs/benefits associated with the project over a specified period of time is calculated and discounted at a selected discount rate to yield the present value. Benefits are taken as positive and costs as negative and the summation yields the NPV. Any Project with a positive NPV is reckoned as acceptable. While comparing more than one project, a project with the higher NPV is accepted.

6.2.2 BENEFIT/COST (B/C) RATIO METHOD

All costs and benefits are discounted to their present worth and the ratio of the benefits to costs is calculated. If the B/C ratio is more than one, the project is deemed worth implementation.

6.2.3 INTERNAL RATE OF RETURN (IRR) METHOD

The internal rate of return is the discount rate which makes the discounted future benefits equal to the initial outlay i.e. it is the discount rate which makes the stream of cash flows to zero.

The solution for the appropriate discount rate can be found by trial and error. In the present analysis a graphical technique has been used and found to be quite workable. Three alternative discount rates are chosen and the discounted stream of cash flows is calculated. A graphical plot of discount rates versus net cash flow enables accurate determination of IRR, which is the discount rate which yields zero cash flow.

No doubt with a computer programme, the work is rendered very simple.

6.3 METHOD CHOSEN FOR THE CASE STUDY

IRR method has been selected for the case study in view of the following advantages :—

- (i) The computed rate of return can be easily compared with the market rate of interest.
- (ii) It avoids the need for selecting a discount rate initially.
- (iii) It is well-suited for use in CAD model.
- (iv) It is popular with international lending agencies like the World Bank.

In order to tide over the tedious computations, graphical method, as explained above, has been used rendering the computation work simpler. Manual analysis had to be resorted to since the software (programme) for evaluation in respect of intermediate/two lane strategies is not presently available. Computer programme has so far been developed for pavement widths more than two lane pavements.

7. COMPUTATIONS FOR ECONOMIC EVALUATION :

- 7.1 Based on costs of operation and travel time for various vehicles indicated in Table 2 and 3 and cost of construction and maintenance worked out in para 3 above, the transportation cost comprising of costs of construction, maintenance, vehicle operation and travel time has been calculated yearwise for the analysis period 1985-1986, and for single lane, inter-

mediate lane and two-lane pavements and shown in tables 4 and 5. The traffic has been projected for different years based on 7.5% anticipated growth rate and is shown in table 4.

7.2 Tables 6, 7, 8 and 9 show the IRR calculation for the following options :

- (i) Table-6 for intermediate lane pavement vis-a-vis single lane, without considering cost of travel time.
- (ii) Table-7 for two lane pavement vis-a-vis single lane, without considering cost of travel time.
- (iii) Table-8 for intermediate lane pavement vis-a-vis single lane, considering cost of travel time.
- (iv) Table-9 for two-lane pavement vis-a-vis single lane, considering cost of travel time. Graphical plots for determination of IRR for the above options are shown in Annexures I & II.

7.3 For discounting the future benefits and cost to the present worth (base year 1985), necessary table showing present worth (PW) factors against number of years is annexed (Annexure III)

8. CONCLUSIONS

The computations as shown in the above noted tables yield the following IRR values.

Widening strategy	IRR VALUE	
	Without time cost	With time cost
1. Intermediate-lane pavement	21.2%	48.6%
2. Two-lane pavement	21.75%	50.4%

As may be observed from the above results, the alternative proposal for widening the existing single lane to two lane pavement yields slightly higher economic return as compared to intermediate lane strategy (50.4% IRR against 48.6%). In addition it affords better travel speeds as may be seen from table 2. Additionally it affords better level of service for the traffic with diminished accident risks due to lesser congestion. Moreover the differential economic return should be higher for two lane option in case the normal 20 year analysis period is considered.

Keeping all these considerations in view, it was decided to go in for two-laning of the study stretch.

TABLE 2 : AVERAGE SIMULATED/CALCULATED JOURNEY SPEEDS FOR VEHICLE TYPES IN KM/HOUR

PAVEMENT WIDTH & YEAR		AVERAGE JOURNEY SPEED IN KM/HOUR			
		CAR	BUS	TRUCK	TWO WHEELER
TWO LANE	1986	43.15	36.15	36.15	43.15
	1991	42.40	35.80	35.80	42.40
	1996	40.05	34.55	34.55	40.05
INTERMEDIATE LANE	1986	34.75	30.30	30.30	34.75
	1991	32.05	28.95	28.95	32.05
	1996	28.70	26.25	26.25	28.70
SINGLE LANE	1986	25.80	26.40	26.80	27.40
	1991	18.50	20.40	22.23	22.87
	1996	8.07	11.85	15.78	16.42

TABLE 3 : COST OF TRAVEL TIME FOR VARIOUS VEHICLE TYPES IN RS./VEHICLE

Year	Travel cost/car			Travel cost/bus			Travel cost/truck			Travel cost/two wheeler		
	Two Lane	1½ Lane	Single Lane	Two Lane	1½ Lane	Single Lane	Two Lane	1½ Lane	Single Lane	Two Lane	1½ Lane	Single Lane
1986	3.17	3.94	5.31	22.31	26.62	30.55	0.27	0.32	0.36	1.19	1.48	1.87
1987	3.19	4.01	5.72	22.35	26.86	32.31	0.27	0.32	0.37	1.19	1.50	1.95
1988	3.20	4.07	6.13	22.40	27.11	34.06	0.27	0.32	0.39	1.20	1.53	2.02
1989	3.21	4.14	6.54	22.44	27.36	35.82	0.27	0.33	0.40	1.20	1.55	2.10
1990	3.22	4.21	6.95	22.48	27.61	37.58	0.27	0.33	0.42	1.21	1.58	2.17
1991	3.23	4.27	7.36	22.53	27.86	39.34	0.27	0.33	0.43	1.21	1.60	2.24
1992	3.27	4.37	9.23	22.69	28.43	45.02	0.27	0.34	0.47	1.23	1.64	2.42
1993	3.31	4.47	11.10	22.85	29.00	50.71	0.27	0.35	0.50	1.24	1.68	2.59
1994	3.34	4.57	12.97	23.01	29.58	56.40	0.27	0.35	0.54	1.25	1.71	2.76
1995	3.38	4.67	14.84	23.18	30.15	62.08	0.28	0.36	0.57	1.27	1.75	2.94
1996	3.42	4.77	16.70	23.34	30.72	67.77	0.28	0.37	0.61	1.28	1.79	3.11

TABLE 4 : TRANSPORTATION COST FOR TWO LANE PAVEMENT

ALL AMOUNTS IN THOUSAND RUPEES

Year	Cost of const.	Cost of Maintenance	Traffic Volume (ADT)				Cost of vehicle operation	Cost of Travel Time				
			C	B	T	TW		C	B	T	TW	Total
1985	2,786	—	520	132	1,181	9	—	—	—	—	—	—
1986	2,786	—	559	142	1,270	10	—	—	—	—	—	—
1987	—	38	601	152	1,365	11	6326	699	1,240	133	5	2,077
1988	—	38	646	164	1,467	11	6,823	754	1,341	143	5	2,243
1989	—	238	694	176	1,577	12	7,357	813	1,441	154	5	2,413
1990	—	38	747	189	1,696	13	7,938	878	1,551	166	6	2,601
1991	—	38	803	203	1,823	14	8,559	947	1,669	179	6	2,801
1992	—	238	862	219	1,959	15	9,231	1,028	1,814	194	7	3,043
1993	—	38	927	235	2,106	16	9,955	1,119	1,960	210	7	3,296
1994	—	38	997	253	2,264	18	10,739	1,217	2,125	227	8	3,577
1995	—	238	1,072	272	2,434	19	11,583	1,323	2,301	246	9	3,879
1996	—	38	1,152	292	2,617	20	12,492	1,438	2,488	266	9	4,201

TABLE 5 : TRANSPORTATION COST FOR INTERMEDIATE LANE AND SINGLE LANE PAVEMENT

ALL AMOUNTS IN THOUSAND RUPEES

Year	Cost of Construction		Cost of Maintenance		Cost of vehicle operation		Cost of Travel time	
	Intermediate Lane	Single Lane	Intermediate Lane	Single Lane	Intermediate Lane	Single Lane	Intermediate Lane	Single Lane
1985	2,157	—	—	—	32	—	—	—
1986	2,157	—	—	—	137	—	—	—
1987	—	—	—	35	32	6,630	7,627	2,535
1988	—	—	—	35	32	7,151	8,196	2,763
1989	—	—	—	192	137	7,711	8,808	3,002
1990	—	—	—	35	32	8,319	9,472	3,263
1991	—	—	—	35	32	8,971	10,181	3,546
1992	—	—	—	192	137	9,674	10,943	3,902
1993	—	—	—	35	32	10,433	11,763	4,278
1994	—	—	—	35	32	11,255	12,648	4,698
1995	—	—	—	192	137	12,140	13,598	5,153
1996	—	—	—	35	32	13,092	14,617	5,644

TABLE 6 : I.R.R. CALCULATIONS FOR INTERMEDIATE LANE PAVEMENT WITHOUT TIME COST

ALL AMOUNTS ARE IN THOUSAND RUPEES												
Year	Cost of Operation (V.O.C.)		Benefit (Saving V.O.C.)	Construction and Maintenance cost		Cost	Discounted by 20% to base year 1985		Discounted by 21% to base year 1985		Discounted by 22% to base year 1985	
	Single Lane	Intermediate Lane		Single Lane	Intermediate Lane		Benefit (B)	Cost (C)	Benefit (B)	Cost (C)	Benefit (B)	Cost (C)
1	2	3	4=2-3	5	6	7=6-5	8	9	10	11	12	13
1985	—	—	—	32	2,157	2,125	—	2,125	—	2,125	—	2,125
1986	—	—	—	137	2,157	2,020	—	1,683	—	1,669	—	1,666
1987	7,627	6,630	997	32	35	3	692	2	681	2	670	2
1988	8,196	7,151	1,045	32	35	3	605	2	590	2	575	2
1989	8,808	7,711	1,097	137	192	55	529	27	512	26	495	25
1990	9,472	8,319	1,153	32	35	3	463	1	445	1	427	1
1991	10,181	8,971	1,210	32	35	3	405	1	386	1	367	1
1992	10,943	9,674	1,269	137	192	55	354	15	334	14	315	14
1993	11,763	10,433	1,330	32	35	3	309	1	289	1	271	1
1994	12,648	11,255	1,393	32	35	3	270	1	251	1	233	1
1995	13,598	12,140	1,458	137	192	55	235	9	217	8	199	8
1996	14,617	13,092	1,525	32	35	3	205	—	187	—	171	—
Total = (B-C)							4,067 +	3,867 209	3,892 +	3,850 42	3,723 -	3,836 113

TABLE 7 : I.R.R. CALCULATIONS FOR TWO LANE PAVEMENT WITHOUT TIME COST

ALL AMOUNTS ARE IN THOUSAND RUPEES												
Year	Cost of Operation (V.O.C.)		Benefit (Saving in V.O.C.)	Construction and Maintenance cost		Cost	Discounted by 20% to base year 1985		Discounted by 21% to base year 1985		Discounted by 22% to base year 1985	
	Single Lane	Two Lane Pavement		Single Lane	Two Lane Pavement		Benefit (B)	Cost (C)	Benefit (B)	Cost (C)	Benefit (B)	Cost (C)
1	2	3	4=2-3	5	6	7=6-5	8	9	10	11	12	13
1985	—	—	—	32	2,786	2,754	—	2,754	—	2,754	—	2,754
1986	—	—	—	137	2,786	2,649	—	2,208	—	2,189	—	2,171
1987	7,627	6,326	1,301	32	38	6	903	4	889	4	874	4
1988	8,196	6,823	1,373	32	38	6	795	3	775	3	756	3
1989	8,808	7,357	1,451	137	238	101	700	49	677	47	655	46
1990	9,472	7,938	1,534	32	38	6	616	2	591	2	568	2
1991	10,181	8,559	1,622	32	38	6	543	2	517	2	492	2
1992	10,943	9,231	1,712	137	238	101	478	28	451	27	426	25
1993	11,763	9,955	1,808	32	38	6	420	1	393	1	368	1
1994	12,648	10,739	1,909	32	38	6	370	1	343	1	319	1
1995	13,598	11,583	2,015	137	238	101	325	16	300	15	276	14
1996	14,617	12,492	2,125	32	38	6	286	1	261	1	238	1
Total = (B-C)							5,436 +	5,069 367	5,197 +	5,046 151	4,972 -	5,024 52

TABLE 8 : I.R.R. CALCULATIONS FOR INTERMEDIATE LANE PAVEMENT WITH TIME COST

ALL AMOUNTS ARE IN THOUSAND RUPEES

Year	Cost of Operation and Time cost		Benefit	Construction and Maintenance cost		Cost	Discounted by 30% to base year 1985		Discounted by 50% to base year 1985		Discounted by 40% to base year 1985	
	Single Lane	Intermediate Lane		Single Lane	Intermediate Lane		Benefit (B)	Cost (C)	Benefit (B)	Cost (C)	Benefit (B)	Cost (C)
1	2	3	4=2-3	5	6	7=6-5	8	9	10	11	12	13
1985	—	—	—	32	2,157	2,125	—	2,125	—	2,125	—	2,125
1986	—	—	—	137	2,157	2,020	—	1,554	—	1,347	—	1,443
1987	10,868	9,165	1,703	32	35	3	1008	2	757	1	869	2
1988	11,896	9,914	1,982	32	35	3	902	2	587	1	722	1
1989	13,007	10,713	2,294	137	192	55	803	19	453	11	597	14
1990	14,228	11,582	2,646	32	35	3	713	1	348	—	492	1
1991	15,552	12,517	3,035	32	35	3	629	1	266	—	403	—
1992	17,794	13,576	4,218	137	192	55	672	9	247	3	400	5
1993	20,270	14,711	5,559	32	35	3	681	1	217	—	377	—
1994	23,038	15,953	7,085	32	35	3	668	—	184	—	343	—
1995	26,096	17,293	8,803	137	192	55	639	4	153	1	304	2
1996	29,469	18,736	10,733	32	35	3	599	—	124	—	265	—
Total= (B-C)							7,314	3,718 +3596	3,336	3,489 -153	4,772	3,593 +1,179

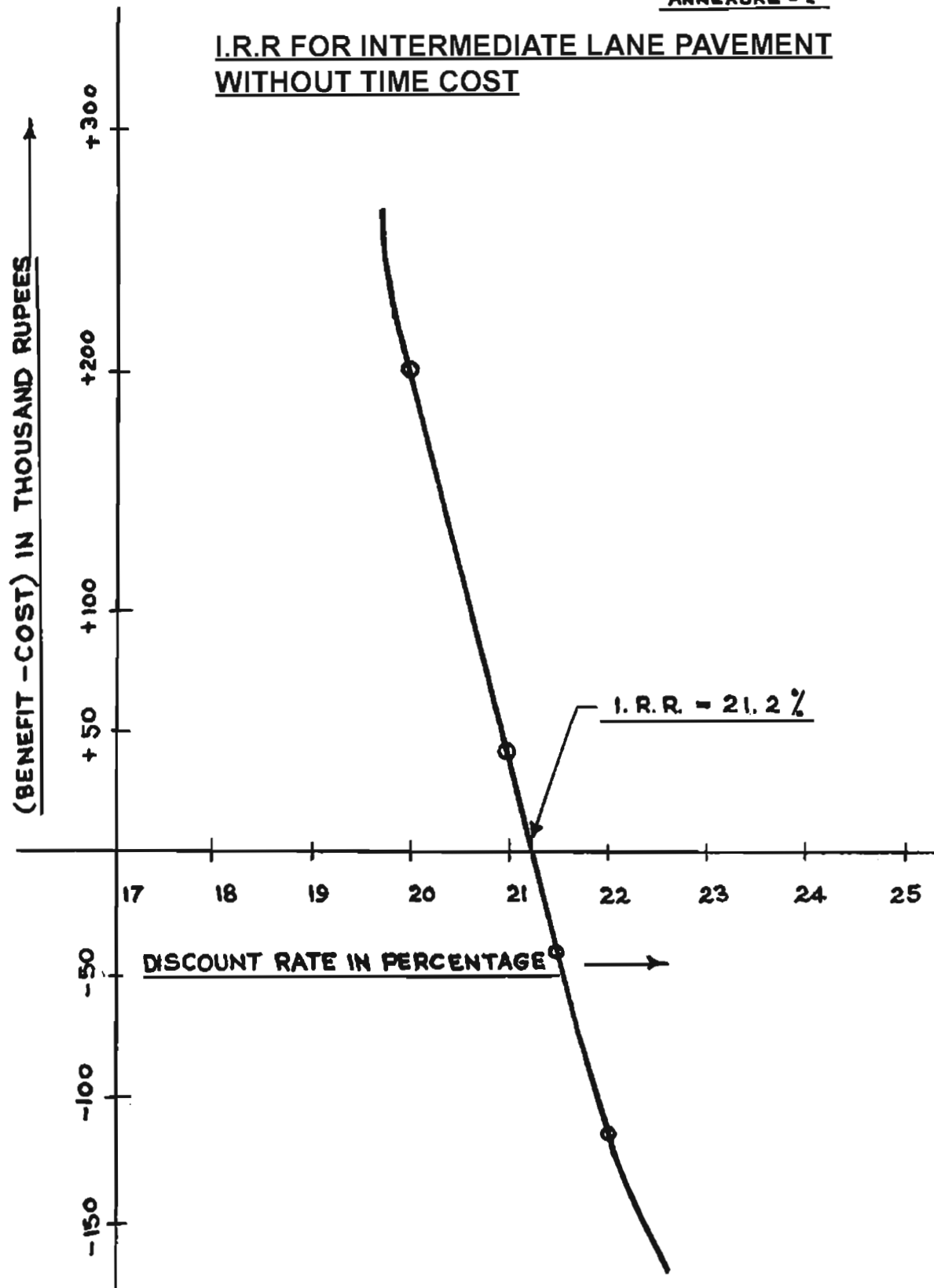
TABLE 9 : I.R.R. CALCULATIONS FOR TWO LANE PAVEMENT WITH TIME COST

ALL AMOUNTS ARE IN THOUSAND RUPEES

Year	Cost of Operation and Time Cost		Benefit	Construction and Maintenance cost		Cost	Discounted by 30% to 1985		Discounted by 50% to 1985		Discounted by 40% to 1985	
	Single Lane	Two Lane		Single Lane	Two Lane		Benefit (B)	Cost (C)	Benefit (B)	Cost (C)	Benefit (B)	Cost (C)
1	2	3	4=2-3	5	6	7=6-5	8	9	10	11	12	13
1985	—	—	—	32	2,786	2,754	—	2,754	—	2,754	—	2,754
1986	—	—	—	137	2,786	2,649	—	2,038	—	1,766	—	1,892
1987	10,868	8,403	2,465	32	38	6	1,459	4	1096	3	1,258	3
1988	11,896	9,066	2,830	32	38	6	1,288	3	839	2	1,031	2
1989	13,007	9,770	3,237	137	238	101	1,133	35	639	20	843	26
1990	14,228	10,539	3,689	32	38	6	994	2	486	1	686	1
1991	15,552	11,360	4,192	32	38	6	868	1	368	1	557	1
1992	17,794	12,274	5,520	137	238	101	880	16	323	6	524	10
1993	20,270	13,251	7,019	32	38	6	860	1	274	—	476	—
1994	23,038	14,316	8,722	32	38	6	822	1	227	—	422	—
1995	26,096	15,462	10,634	137	238	101	771	7	184	2	368	3
1996	29,469	16,693	12,776	32	38	6	713	—	148	—	315	—
Total= (B-C)							9,788	4,862 +4926	4,584	4,555 +29	6,480	4,692 +1788

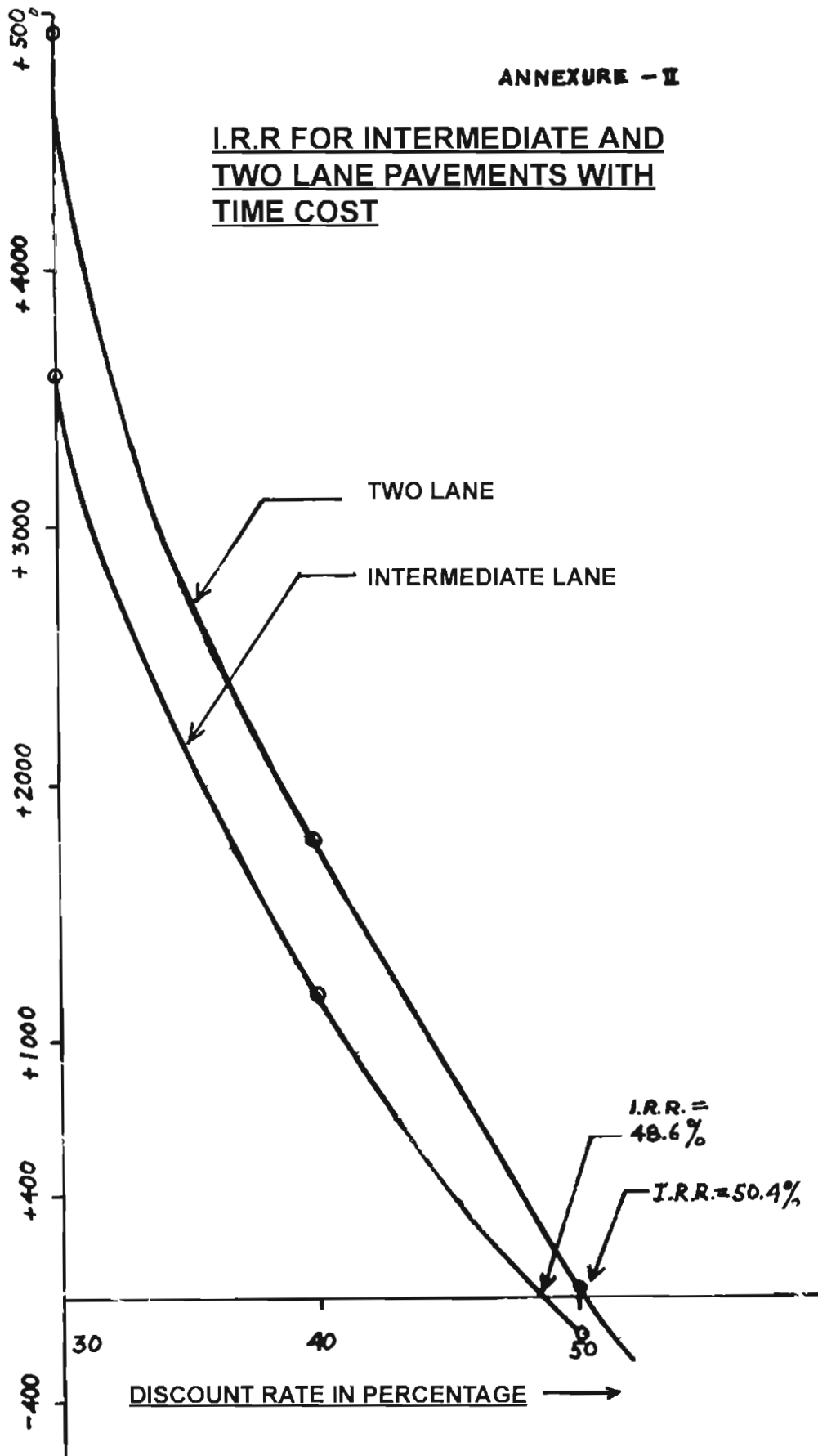
ANNEXURE - I

I.R.R FOR INTERMEDIATE LANE PAVEMENT
WITHOUT TIME COST



ANNEXURE - II

I.R.R FOR INTERMEDIATE AND
TWO LANE PAVEMENTS WITH
TIME COST



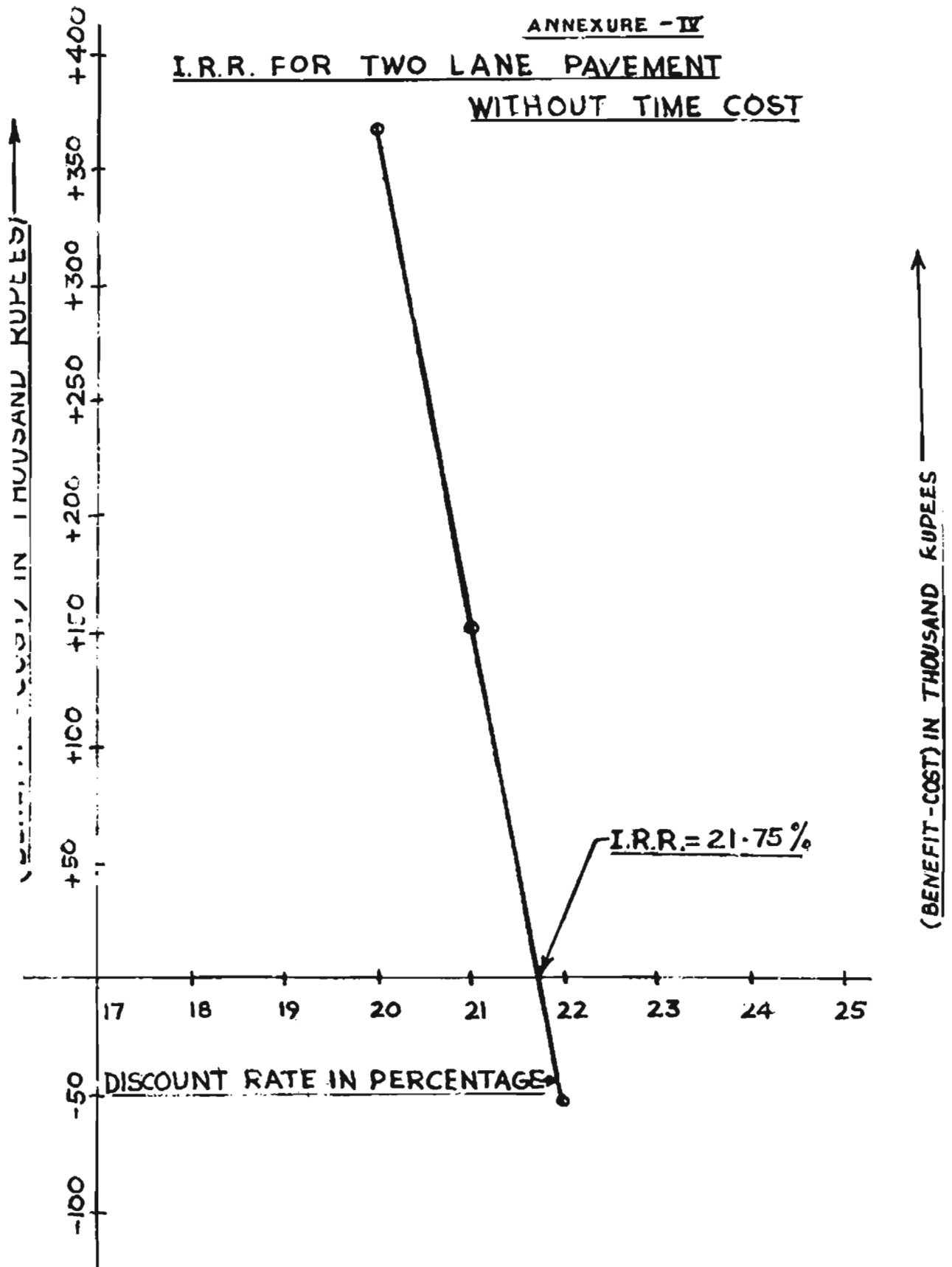
PRESENT WORTH FACTORS FOR FUTURE BENEFITS/COSTS

No. of Years	PW Factors		
	Discount Rate 20%	Discount Rate 21%	Discount Rate 22%
1	0.8333	0.8264	0.8197
2	0.6944	0.6830	0.6719
3	0.5787	0.5645	0.5507
4	0.4823	0.4665	0.4514
5	0.4019	0.3855	0.3700
6	0.3349	0.3186	0.3033
7	0.2791	0.2633	0.2486
8	0.2326	0.2176	0.2038
9	0.1938	0.1799	0.1670
10	0.1615	0.1486	0.1369
11	0.1346	0.1228	0.1122
12	0.1122	0.1015	0.0920
13	0.0935	0.0839	0.0754
14	0.0779	0.0693	0.0618
15	0.0649	0.0573	0.0507

ANNEXURE - IV

I.R.R. FOR TWO LANE PAVEMENT

WITHOUT TIME COST



7810 CHECK LIST FOR REPAIR-ESTIMATES AND PROCEDURE FOR ACCOUNTING OF OLD PARTS

<i>Code No.</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7810.1.	Proforma	Check List to be enclosed by Regional SE (Mech) with Repair Estimates	7810/1
7810.2.	RM-1 (4)/70-Pt dt 18.4.78	Procedure for Accounting of Old and Replaced Parts	7810/2

CHECK-LIST

Make of Machine _____

S. No. of Machine _____

(TO BE ATTACHED BY S.E.(M) ALONGWITH THE ESTIMATE RECOMMENDED FOR SANCTION)

1. PREPARATION OF ESTIMATE

a)	Estimate has been prepared by State as per Ministry's instructions	Yes/No
b)	Estimate contains the report justifying the repairs and brief details of important features	Yes/No
c)	Proforma-II has been enclosed and contains all the essential information like:	
i)	Vehicle equipment details	Yes/No
ii)	Hours run cumulative total and during previous year	Yes/No
iii)	Reference to the previous repair estimate and details of repairs	Yes/No
iv)	Hire charges details	Yes/No
v)	Programme of future utilisation	Yes/No
d)	Justification for replacement of major assembly has been given	Yes/No

2. INSPECTION AND SCRUTINY OF RECORDS

a)	Machine belongs to Ministry	Yes/No
b)	Machine has been inspected by	SE (M)/EE (M)/ AEE(M)
c)	Log book/history sheet has been checked and details tally with Proforma-II	Yes/No
d)	The machine is working on NH works and is located at _____	
e)	The previous sanctioned estimate has been scrutinised and	
i)	Amount sanctioned against this machine was Rs _____ during the year _____	
ii)	Major repairs sanctioned during last sanctioned estimate (tick mark)	
	(1) Engine. (2) Gear Box	
	(3) Clutch/transmission (4) Battery	
	(5) Tyres/Tracks/Rolls (6) Body repairs/painting	
iii)	Hrs. run worked by machine after last sanction are _____	
iv)	Quarterly performance report for the last 4 quarters have been received	Yes/No
f)	Is there any premature failure of assemblies?	Yes/No
g)	Any accident involved? (If yes action has been taken as per Ministry's guidelines or not)	Yes/No
h)	The availability of spare parts supplied by Ministry has been taken into account	Yes/No
i)	The repairs demanded now are justified to the extent modified and the estimate is recommended for sanction of Rs _____	

Regional Superintending Engineer (Mechanical)

Station _____

Date _____

No. RM-1 (4)/70-Pt

Dated the 18th April, 1978

To

The Superintending Engineer, Ministry of Shipping & Transport (Roads Wing),
D—38A Ashok Marg, C-Scheme, Jaipur

Subject : Procedure for accounting of old and replaced parts

I am to refer to your letter No. SE (M)/J/76/G-12/346 dated 17.1.1978 on the subject mentioned above and to state that according to Ministry's policy, the spare parts have to be arranged by the State P.W.Ds. themselves and cost of the same is to be charged to the repair and maintenance estimates of machinery as and when sanctioned by the Ministry. According to the instructions contained in this Ministry's circular letter No. RM-21 (3)/75 dated 1.10.1977 the operational charges recovered from works are to be credited to the major head "137-Roads/Bridges-Other Receipts" which is a revenue head of account. It is suggested that the amount realised by way of auctioning of old spare parts that could not be reused may be credited to the same revenue head of account viz., "137-Roads/Bridges-Other Receipts". All concerned states in your jurisdiction may please be informed accordingly.

Copy forwarded for information and necessary action to the Superintending Engineer, (Mech.) Ministry of Shipping & Transport (Roads Wing), Lucknow, Superintending Engineer, (Mech.) Ministry of Shipping & Transport (Roads Wing), Calcutta E.E. (Mech.) Bangalore

7820 UTILISATION OF CENTRAL MACHINERY

<i>Code No</i>	<i>Circular No. & Date</i>	<i>Brief Subject</i>	<i>Page No.</i>
7820.1.	RM-10 (8)/68 dt. 10.8.70	Review of the utilisation of Central Equipments	7820/1
7820.2.	RMP-14 (1)/83 dt. 19.3.84	Utilisation of Bituminous- Pavement Equipments for Implementation—Record of Discussions	7820/1
7820.3.	RW/RMP-14 (1)/83 dt. 29.8.84	Utilisation of Central Machines- Association of Mech. Wing	7820/2
7820.4.	RM-14 (1)/83 dt. 22.12.84	Implementation of Instruction for Utilisation of Central Machines	7820/2
7820.5.	RW/RM-14 (1)/83 dt. 10.1.85	Utilisation of Central Machines- Guidelines	7820/3

No. RM-10 (8)/68

Dated the 10th August 1970

To

Chief Engineer & Additional Secretary to the Government of Assam, P.W.D., R&B, Shillong. Chief Engineer, P.W.D., Bihar, Additional Chief Engineer, L.R.P., Bihar Chief Engineer, P.W.D., U.P., Additional Chief Engineer, L.R.P., P.W.D., U.P., Chief Engineer, P.W.D., B&R, W. Bengal, Chief Engineer, Roads Directorate, Calcutta Additional Chief Engineer, West Bengal, P.W.D., L.R.P., Jalpaiguri, Additional Chief Engineer, Special Roads Directorate, W. Bengal, Chief Engineer, Gujarat P.W.D. (B&R), Chief Engineer & Addl. Secretary, to the Government of Rajasthan, P.W.D., (B&R), C.E. Project, P.W.D. Orissa.

Subject : Review of the utilisation of Central Equipments, their proper upkeep, maintenance, repairs and accounting etc.

With a view to improve the overall working and efficiency of the machinery and equipments available to the States for execution of Central works, it is considered necessary that this Ministry's Regional Superintending Engineers (Mechanical) posted at Patna and Gauhati should have meetings once every two months with the State Superintending Engineers (Mechanical) and Executive Engineers (Mechanical) at convenient places to review (a) the utilisation, proper upkeep, maintenance, repairs and accounting of central equipments, and (b) the equipping, running of workshops and their accounting. The discussions at these review meetings will be recorded by this Ministry's Regional Superintending Engineer (Mechanical) and reported to this Ministry soon after the meetings.

2. It is felt that it may also be more useful to hold some additional review meetings at higher level. In that case we would like to depute the Ministry's Chief Engineer (Mechanical) for taking part in such discussions at the level of the Chief Engineers. Such a review could perhaps be held thrice in a year during the months of February, June and October. The dates for the meetings will be fixed by the Regional Superintending Engineers (Mech) of this Ministry well in advance in consultation with them so that the discussions take place as per schedule indicated above.

3. We would be grateful if your views in the matter are communicated to us at an early date for further action in the matter from this end.

No. RMP-14 (1)/83

Dated the 19th March, 1984

CIRCULAR

Please find enclosed herewith a copy of the record of discussions held in the DG (RD)'s room on 9.3.1984 regarding the utilisation of Bituminous Pavement Equipment for implementation. In this connection, attention is also invited towards Ministry's letter of even no. dated 29th October, 1983.

To

All Technical Officers at the Headquarters/The Regional SEs including SEs (Mechanical) E.L.Os.

RECORD OF DISCUSSIONS HELD IN DG (RD)'s ROOM ON 9.3.1984

The following is the resume of the discussion held in the DG (RD)'s room on 9.3.1984 to consider ways and means for improving the utilisation of Bituminous pavement Equipments.

2. The discussion took place in the background of circular letter dated 16.2.1984 issued to all the Project Chief Engineers (Roads) and C.E. (PI). Opening the discussion Chief Engineer (Mechanical) stated that inspite of best efforts State Chief Engineers are not taking much initiative to plan and programme the utilisation of Central machines and hence, more effective steps/actions is necessary from the Ministry.
3. The assessment made on the basis of information furnished by the Project Chief Engineers clearly reveals that enough work is available to utilise the existing Hot Mix Plants and allied equipments available with the Ministry. What is needed is only to link or co-ordinate the utilisation of machines with the National Highway works at various stages as per e.g. Planning, sanctioning, execution and monitoring.
4. In this context and in the light of discussions DG (RD) decided the following guidelines may be followed :
 - (i) Broad strategy should be kept in view while finalising the Annual plans in respect of utilisation of Bituminous pavements construction equipments. Chief Engineer (Mechanical) may be associated in this work at the appropriate stage.

- (ii) While sanctioning the strengthening works with BM/SDC/AC specifications, it should be clearly mentioned in the Technical Note that work should be executed with Central machines available in the States,
 - (iii) The use of Contractor's plants should be considered only if all the plants belonging to the Ministry in the State are deployed/utilised, and priority of works so warrant.
 - (iv) In the case of pre-mix carpet works the use of Mini hot mix plants should be insisted upon in the Technical Notes, wherever the quantum of work is more than 2 kms.
 - (v) At the execution stage, the R.Os including SEs (M) should keep a watch, and report any deviation from the above policy to the Ministry. This aspect should also be kept in view by the Officers going on inspection from the Headquarters.
 - (vi) While monitoring the National Highways works in the review meetings the aspect of utilisation of machines should also be included.
5. Taking into consideration the present distribution of bigger Hot-mix plant in the States, it was felt that Bihar, Tamil Nadu, Uttar Pradesh, West Bengal in that order is having surplus plants. Some of the surplus plants should be redistributed amongst the States like Maharashtra, Andhra Pradesh, Gujarat, Rajasthan, Orissa, and Madhya Pradesh, in consultation with the Project Chief Engineers of this Ministry and State Chief Engineers. Similarly, some Mini-hot mix plants, surplus in the Himachal Pradesh and Uttar Pradesh can be considered for the re-distribution amongst the needy States like Andhra Pradesh, Karnataka, Guajart etc.
 6. The question of non-utilisation of Mini-hot-mix plants even though not declared as surplus by the States like Manipur, Meghalaya, Orissa, may be taken by the Project Chief Engineers/ADG (R) with the concerned State Chief Engineer through discussions and D.O. Letters.

7820.3.

No. RW/RM-14 (1)/83

Dated the 29th August, 1984

Subject : Utilisation of Central Machines

In addition to policy/steps outlined in the letters of even number dated 29.10.1983 and 19.3.1984 with a view to improving the utilisation of available machines it has been decided that :

- (i) Mechanical Wing should be associated in the preparation/finalisation of Annual Plans for National Highway works of the States;
 - (ii) All the Draft Technical Notes involving the sanction of bituminous work, earth work in high approaches and embankments, WBM and pre-mix carpet should be shown to the Mechanical Wing before issue so as to incorporate therein a specific mention about the availability and utilisation of machines on the particular work.
2. Further, as decided in RO's meeting held at New Delhi on the 11th and 12th July 1984 henceforth copies of all sanction letters alongwith Technical Notes should invariably be sent to the Mechanical Wing at the Headquarters and the concerned Regional SE (Mech).

To

All Technical Officers at the Hedauarters/All Regional S.Es (Mech.)/Regional S.Es/ELOs US NH-A/USNH-B/Desk Officers and Section

7820.4.

No. RM-14 (1)/83

Dated the 22 December, 1984

To

All R.Os/E.LOs/S.E. (Mech.)

Subject : Utilisation of Central Machines

Please refer to directive of Director General (Road Development) issued vide letter of even No. dated the 29th August, 1984 regarding utilisation of genral machines.

2. After issue of aforesaid directive specific mention about the utilisation of Central machines on particular work is being made in the Technical Notes appended with the sanction letters. It is necessary to know how far these instructions are being implemented by the State, PWDs while executing the work. You are, therefore, requested to ensure that the Central machines are utilised on the NHs works as per the stipulation made in the Technical Notes and report to the Ministry wherever there is any violation of the instructions.

To All Technical Officers at the Headquarters

No. RW/RM-14 (1)/83

Dated the 10th January, 1985

Subject : Utilisation of Central Machines

In response to the directive of Director General (Road Development), dated the 29th August, 1984 Technical Note for N.H. Works/Estimates are being shown to Mechanical Zone with a view to ensuring better utilisation of existing Central Machines in the States. It is, however, seen that all categories of estimates including those which do not have any bearing on the utilisation of central machines, like estimates for land acquisition, culverts etc. are also being referred to Mechanical Zone as a matter of routine. For smooth flow of files and expeditious disposal of cases, following are the further guidelines in this respect :

- (i) Estimates pertaining to Maharashtra, Goa, Daman & Diu, Tripura, Nagaland, Mizoram, Arunachal Pradesh, Jammu & Kashmir, Delhi, Pondicherry, Sikkim and C.P.W.D. (NZ) which do not have any worthwhile Central Machines need not be referred to Mechanical Zone.
- (ii) Estimates for land acquisition, culverts, surface dressing and revised estimates of completed jobs also need not be referred to Mechanical Zone unless Project Officers want comments on any specific points relating to machines.
- (iii) F.D.R. and S.R. estimates and cases of Administration approvals may only be referred wherever B.M. and pre-mix carpet work is involved.
- (iv) All estimates pertaining to B.M., S.A.C., A.C., pre-mix carpet, high approaches and embankment construction need only be shown to Mechanical Zone.
- (v) Estimates may be shown to Mechanical Zone before being sent to Finance for approval.
- (vi) Files may be sent to S.E. (Mech.)/C.E. (Mech.) by their counterparts in the Project Zones instead of by Works Sections.

2. All concerned are requested to follow the above guidelines.

To

All Technical Officers at the Headquarters/All Regional Superintending Engineers (Mechanical)/ROS/ELOs D.S. (P&B)/U.S. (P&B)/U.S. (NH)/U.S. (SR) All N.H. Sections and Desk Officers in the Roads Wing.

“NEW CIRCULARS”