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No. RW/NH/12011/1/99/W/RJ. *Dated, the 15th Jan., 2001*

To

The Chief Secretaries/Secretaries (PWD/Roads) of all State Governments/UTs; Chief Engineers of States/UTs (dealing with NHs and Centrally sponsored schemes); Director General Border Roads; Chairman, National Highways Authority of India.

Subject : Standard Terms of Reference for engagement of consultants for carrying out feasibility studies and inventorisation of new NHs for their improvement to National Highway standards

A number of new National Highways have been declared recently. The newly declared National Highways are deficient in many respects, like, single-lane pavements, inadequate formation width and crust, sub-standard horizontal alignment and poor vertical geometrics, existence of causeways, weak and narrow culverts, bridges, etc. and are required to be improved to bring it to National Highway standards. A feasibility study would be required to prepare road inventory and proposal for removal of deficiencies in these newly declared National Highways, their cost and phasing.

2. The standard document on Terms for Reference for engagement of consultants is enclosed for National Highway works. This may be brought to the notice of all concerned.

[Enclosure to Ministry's Circular No RW/NH/12011/1/99/W/RJ dated, 15th Jan., 2001]

TERMS OF REFERENCE FOR ENGAGEMENT OF CONSULTANTS FOR INVENTORIZATION OF NEW NATIONAL HIGHWAYS AND FEASIBILITY STUDIES FOR THEIR UP-GRADATION

1. BACKGROUND

It is proposed to engage consultants from the list of consultants empanelled by the Ministry of Road Transport & Highways who will work/associate for providing consulting services for preparation of detailed inventories and undertaking feasibility studies of up-gradation of newly declared National Highways to National Highway standards.

2. PROJECT INFORMATION

Sections of National Highway Nos ..... in the State/States of ..... as per details indicated in ..... are deficient in many respects, like, existence of submersible causeways, single-lane pavements, inadequate formation width and crust, sub-standard curves and grades, etc. and are required to be improved to National Highway Standards. The map of National Highways is enclosed at *Annexure.*

3. OBJECTIVE

The main objective of the study is to prepare a road inventory and proposal for removal of deficiencies in National Highways and to systematically prioritize the required works to be taken up for execution in a phased manner depending upon the availability of resources.

4. SCOPE OF THE CONSULTANCY SERVICES

The scope of the consultancy service is to :

(i) Conduct preliminary surveys in accordance with pare 6 of IRC:SP:19.

(ii) Collect inventory data and to conduct condition survey of roads, bridges, culverts, etc. as per IRC:SP:19 and compile the information in the enclosed proforma and in an acceptable computerised data base format.

(iii) Prepare strip plan showing the existing road land width, utility services (both above and below ground level), trees, electric poles, telephone poles, water pipeline, sewer line, bridges, culverts, junctions, adjoining land use, encroachment, etc. Digitise these for computer storage.

(iv) Prepare video filming on compact disk of the present construction of highways particularly with regard to the existence of authorized/unauthorized structures on either side of the highway.

(v) Identify homogeneous section based on traffic and road geometry.

(vi) Conduct 7 day traffic (volume count) survey at one location in each homogeneous section. However, traffic survey shall be conducted at an interval of not more than 50 kms within a homogeneous section.

(vii) Conduct additional traffic survey for each turning movement at major intersection, as per IRC:SP:19.

(viii) Gather information on accidents showing type of accident, frequencies and to identify accident prone locations/sections alongwith main reasons for such situations.

(ix) Digging test pits atleast 1 m below the underside of the lowest pavement layer or up to rock level, whichever is less wherever pavement condition changes or at 2 km intervals whichever is less. Conduct soil tests, e.g., gradation test (IS:2720 part IV), atterberg limits, field density, moisture content, shrinkage limit test (if required), deleterious constituents as per relevant IRC standard.

(x) Determine composition and thickness of existing pavement.

(xi) Identification of borrow area as per IRC:10 and carryout necessary soil tests to determine suitability of soil.

(xii) Conduct representative CBR test on the existing sub-grade as per IRC:37 in alternative kms.

(xiii) Carry out deflection test by Benkelman beam method (IRC:81) for 200 m length in alternative kms.

(xiv) Trial pits (a) for culverts at an interval of 5 kms, (b) for minor bridges (length less than 60 m) at each location.

(xv) Carry out geo-technical investigations and sub-surface exploration by digging borehole at one location for major bridges (length more than 60 m).

(xvi) Collect information about hydrology, e.g., catchment characteristics, rainfall stream/channel characteristics and silt factor for all cross-drainage works (existing as well as new).

(xvii) Determine the need of bypass and other re-alignments and geometric improvements and suggest suitable alignments.

(xviii) Preliminary proposals for widening, strengthening, raising, etc.

(xix) Identify Railway level crossing - its type which require up-gradation or construction of R.O.B. on the basis of no. of closures, period of closure and expected traffic. The details of level-crossing may be furnished.

(xx) Identification of suitable location for lay by, truck parking places and wayside amenities.

(xxi) Preparation of rough cost estimates based on

- (a) typical cross-section of road
- (b) GAD for bridge structures
- (c) Standard typical drawing for culverts
- (d) Widening
- (e) Strengthening
- (f) Any other improvement required
- (g) Analysis of Rates based on Ministry of Road Transport & Highways data book and current rates.

(xxii) Identification and need based Prioritization of the required works to be taken-up for execution in a phased manner.

(xxiii) Provide a computer system and requisite original software for keeping computerised inventory and digitized maps.

5. SEQUENCING OF REPORT PREPARATION

Report preparation activities will be split into stages as brought out below.

Stage 1 : Inception Report

The consultant is required to submit his Inception Report within 15 days of award of the work. The report shall cover the following:

(i) Project preparation

(ii) Detailed methodology to meet the requirement of the T.O.R. including number of teams mobilized for deployment, scheduling of various activities to be carried out for completion of different stages of work within the stipulated time schedule.

(iii) Task assignment and work schedule

(iv) Work programme

(v) Proforma for data collection (suggested proforma is given at *Appendix* II)

(vi) Key personnel to be employed

(vii) Time frame for submission of various reports

The consultant shall carryout the modification, if required in the Inception Report. The approval of Inception Report will generally be given within 30 days of its submission.

Stage 2 : Final Report

The consultant may commence the work of preparation of inventory of the existing National Highway and feasibility studies for their up-gradation as per their Inception Report in anticipation of its acceptance but shall modify their programmes and procedures in the light of comments of Ministry of Road Transport & Highways on the Inception Report, if any. They shall submit the draft report within 120 days from the approval of Inception Report. The draft report shall cover the entire scope of services required from the consultant, which inter-alia include:

(1) Strip plans
(2) Alignment plan showing proposals for alignment
(3) Need/justification of bypass
(4) Need/justifications for replacements of level crossing by R.O.B.
(5) Siting of bridges and type of bridges
(6) Hydraulic data for minor and major bridges
(7) Road inventory
(8) Bridge inventory
(9) Typical cross-section of existing/proposed road pavement
(10) Standard typical cross-section of culverts
(11) GAD for bridges
(12) Preliminary cost estimates
(13) Phasing and prioritisation, economic analysis
(14) Comments of Ministry of Road Transport & Highways on the draft report shall be given within 30 days of its receipt. Thereafter, the consultant shall carry out, whatever, modifications are required in the draft report and submit within 60 days the modified draft report for approval. The approval of comments on their report will generally be given within 30 days of its submission.

6. SERVICES AND FACILITIES TO BE PROVIDED BY THE GOVT.

The Govt. shall not provide any services and/or facilities to the appointed consultant during the feasibility studies. The consultants will have to arrange for all facilities/services required to carry out the assigned work on this project at their cost. The financial proposal shall include all the required costs with break-ups. However, introductory recommendation letters shall be provided to the consultants on request for obtaining desired services and facilities from concerned authorities for which the Consultants shall make payments, if any required, to the concerned authorities directly.

7. MAN MONTH REQUIREMENT

Suitable and adequate personnel shall be deployed by the consultant for the work. However, the following man month have been indicated for reference.

(A) Key Personnel	Man-month (for every 200 kms of highway)
Senior Highway Engineer-cum-Team Leader	6
Highway Engineer	1
Material-cum-Geotech/Foundation Engineer	1
Bridge Engineer	1
Senior Survey Engineer	1
	10

(B)	Specialist	
	Traffic Engineer	2
	Hydrology-cum-Drainage Engineer	1
	Estimate Surveyor (for every 400 km of highway)	1
		4
		14 man months

(C) Other Personnel (As per requirement assessed by the Consultants supported with details).

Notes :

(1) Minimum Qualification of Key Personnel/Specialist should be as per *Appendix-I.*

(2) Suggested proforma for data collection are given at *Appendix-II.*

8. REPORTS*

The consultants shall furnish to the client the following report and documents. All reports and documents shall be in English.

(i)	Inception Report	-	6 copies
(ii)	Draft Report	-	6 copies
(iii)	Final Report	-	6 copies

* Reports are to be furnished National Highway-wise/State-wise (in case National Highway passes through different States).

9. SCHEDULE OF SERVICES

(i)	Submission of Inception Report	-	15 days from the date of start
(ii)	Submission of Draft Report	-	120 days* from the date of approval of Inception Report
(iii)	Submission of Final Report	-	60 days from the date of approval of Draft Report

Note: * Consultant is required to make a presentation of work done after 60 days.

10. PAYMENT SCHEDULE

Payment schedule for the work will be as follows:

(i)	Submission of Inception Report	10 per cent of the total bid amount
(ii)	Approval of Draft Report	40 per cent - do
(iii)	Submission of Final Report	25 per cent - do -
(iv)	Approval of Final Report	25 per cent -do

Any under prepared, incomplete/inadequate or part submittal shall be deemed as invalid submittal. The adequacy of the submittal shall be determined at the sole discretion of the client. Client will, generally accord approval within 30 days of submission of reports.

11. PERFORMANCE SECURITY

Within 21 days of the letter of acceptance, the consultant shall deliver to the employer a performance security in the form of bank guarantee for an amount equivalent to 5 per cent of the contract price. The bank guarantee will be released at the time of final payment to the consultant.

12. RESPONSIBILITY FOR ACCURACY OF PROJECT REPORTS

The consultants shall be responsible for accuracy of all the data used in project preparation and estimates prepared by him as part of the project. He shall indemnify the client against any inaccuracies in the work. For this purpose he shall furnish bank guarantee for an amount to the extent of 20 per cent of the total consultancy fees to be received by him. The bank guarantee shall be valid for a period of 2 years from the date of submission of the final DPR. The final instalment of 25 per cent of the fees shall be released only on receipt of this bank guarantee.

Appendix-I

MINIMUM QUALIFICATION OF KEY PERSONNEL

1. SENIOR HIGHWAY ENGINEER-CUM-TEAM LEADER

This is the senior most position and the expert engaged will function as Team Leader and will be responsible for the entire project preparation activities including timely completion. The expert will undertake frequent project site visits and shall guide, supervise, co-ordinate and monitor the work of other experts. The candidate should have a proven record of supervising, organising and managing of project preparation and construction of Highway projects. This position requires a senior Highway Engineer who shall be at least a graduate in Civil Engineering with at least 20 years of professional highway engineering experience.

2. HIGHWAY ENGINEER

The Engineer will be a graduate in Civil Engineering with at least 15 years of professional highway engineering experience of handling project preparation and construction of Highway projects (preferably National Highway projects) in India or similar developing countries including project preparation/construction of major Highway/Bridge projects.

3. HYDROLOGIST-CUM-DRAINAGE ENGINEER

The candidate should have relevant Masters degree or equivalent with minimum 15 years experience of which at least 10 years should be on hydrological studies. Experience of 2 years in highway and bridge projects is essential. The person should be fully familiar with the acceptable study methods, 'best practices' and must have experience of successfully using various methods in different situations.

4. BRIDGE ENGINEER

The position requires an engineer, preferably with a Masters degree or equivalent in structural/bridge engineering, with minimum 15 years experience. The candidate must have capability to design bridges with various alternative materials and structural arrangements. He should have designed independently at least two major bridges (200 m length). Experience in designing and implementing bridge rehabilitation is required. The candidate must have the experience of planning and monitoring geo-technical and hydraulic investigations for the bridges and interpreting the findings thereof.

5. TRAFFIC ENGINEER

The position requires a graduate civil engineer preferably with higher qualifications in Traffic Engineering with at least 15 years of professional experience including at least 5 years on projects of similar nature in developed/ developing countries. The candidate must have wide experience of Junction design and road safety.

6. MATERIAL ENGINEER-CUM-GEOTECHNICAL ENGINEER

This position requires an Engineer who should be graduate in civil engineering or science with at least 15 years professional engineering experience including 5 years in supervising sub-soil investigations for roads and bridges and testing and evaluation of highway construction materials used in modern highway construction techniques. The candidate must be thoroughly familiar with all the standard laboratory testing procedures adopted in case of highway projects. Better qualification and experience on above lines will be considered for higher rating in evaluation.

7. SENIOR SURVEY EXPERT

This position is of specialist nature and the expert is expected to have thorough understanding of modern computer based methods of surveying, like, total stations, use of satellite imagery, digital terrain model, etc. as being practiced in project preparation of modern highway construction. The candidate is expected to contribute significantly by guiding/supervising the surveyors in improving the quality of survey works for achieving maximum possible accuracy without any gap in survey based details. The candidate should at least be a qualified Surveyor. He

should have minimum 15 years professional experience including at least 5 years in highway related projects. He should have experience of training other Surveyors.

8. **ESTIMATE SURVEYOR**

He should be graduate in Civil Engineering/Quality Surveying from a recognized University/Institution. Diploma in Civil Engineering with at least 20 years work experience at responsible position will also be acceptable. He should have expertise in quality surveying and tender documentation. He should be conversant with the use of computer software for commuting unit rates, quantities and costs.

Appendix-II a

ROAD INVENTORY DATA SHEET

Sheet No.

From (km)	To (km)	Terrain (Plain) Rolling/ Hilly	Rise & Fall	Land Use (Built-up/ Agri/Forest/ Industrial/ Barren)	Name of Village/ Town	Formation width (m)	Carriageway			Shoulder		Embank-ment Height (m)	Submer-gence (cm)	Right of way	Remarks
							Pavement type	Surfacing type	Width (m)	Type* (BT/CC/ GR/ER)	Width (m)				

Note : Type :- BT = Bituminous CC = Cement Concrete

Condition :- G = Good F = Fair

Surveyed by : _____

*ROW

INVENTORY & CONDITION SURVEY FOR BRIDGES

Sheet No.

Road Name : Road No. :

Section : Date of Survey :

Sl. No.	Location (km)	Name of River and Type of Crossing	Lenght of Bridge/Span Arrangement (m)	Average Vertical Clearance (m)	Type of Bridge			Year of Construction	Details of Superstructure			HFL (m)	Formation Level	Thickness of Girder/ Slab (m)	Type of Protection work and Cond.	Carriageway width	Total width	Loading
					Super-structure	Sub-structure	Foundation		Features	Type	Condition (VG/G/F/P/VP)							
									Deck Carriageway Footway Railing									
									Deck Carriageway Footway Railing									
									Deck Carriageway Footway Railing									

Note : VG = Very Good G = Good P = Poor VP = Very Poor

Surveyed by : _____

Appendix-II c

INVENTORY & CONDITION SURVEY FOR CULVERTS

Sheet No.

Road Name :

Road No.

Section :

Date of Survey :

Sl. No.	Location (km)	Length	Type of Structures (Pipe, Slab, Box, Arch)	FL	Span Arrange-ment and Total Ventway [No.x Length (m)]	Carriage-way width (m)	Width of Culvert (m)	Details of Protection works		Condition of various features of Culvert					HFL	Presence of Scour	Adequacy of Water-way	Remarks
								Type	Condition	Slab/Pipe/ Box/Arch	Head Wall	Wing Wall	Return Wall	Parapet/Handrail				

Note : G = Good F = Fair P = Poor VP = Very Poor
NA = Not Available

Surveyd by : _____

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Appendix-II d

PAVEMENT CONDITION SURVEY

Sheet No.

Road Name :

Road No.

Section (FROM) : To Date of Survey :

District (FROM) : To Weather :

Chainage		Pavement Completion			Shoulder		Riding Quality		Pavement Condition					Pavement Edge drop	Embankment Codition (Good/Fair/ Poor)	Road side Drain (NE/PF/ F)***	Remarks
From (km)	To (km)	Composition	Type*	Thickness (mm)	Composition	Condition (Fair/Poor/ Failed)	Speed (km/hr)	Quality (G/F/P/V P)	Cracking (%)	Ravelling (%)	Potholing (No. and % 100m)**	Rut (None/ Moderate/ Severe)	Patching (No. and % 100m)**	(mm)			
		Surface															
		Binder															
		Base															
		Sub-base															
		Subgrade															
		Surface															
		Binder															
		Base															
		Sub-base															

Note :

* BUSG = Built-up Spray Grout : AC = Asphaltic Concrete; SDC = Semi-Dense Concrete; PC = Premix Carpet; MS = Mix Seal Surfacing
WBM = Water Bound Macadam; DBM = Dense Bituminous Macadam; BM = Bituminous Macadam; BS = Brick Soiling; SS = Stone Soiling

** No. and %/100 m = Total no. of Potholing/Patching and %age area of Potholing/Patching per 100 m of length of road

*** NE = Non Existing; PF = Partially Functional; F = Functional

Surveyed by : _____

DETAILS OF RAILWAY LEVEL CROSSING

Name of the level crossing	Location	Angle of Crossing (Right Angle or Skewed)	No. of Closures	Duration of closure	No. of Traffic Passing Through NHs	Type of level Crossing a) manned b) unmanned	Type of Track		Remarks
							Electrified/ Unelectrified	Single Track/ Double Track	
1	2	3	4	5	6	7	8	9	10

Appendix-II f

DETAILS OF JUNCTION

Link	Location	Type NH/SH/MDR/ODR/VR/MG/BG/NG	Clause Right/Left/Cross

Appendix-II g

Data Base 1, NH BANK: This data base contains kilometre-wise details in respect of the following parameters:

S.No.	Field	Description
(1)	Town	Nearest town/village
(2)	KMP	Km from
(3)	KMTO	Km to
(4)	Rise fall	Rise in m/km
(5)	TR	Terrain
(6)	CW	Carriageway width
(7)	FW	Formation width
(8)	RG	Roughness in mm/km
(9)	LU	Land use (rural/urban, etc.)
(10)	PW	Pavement width
(11)	ST	Surface type (cement/bituminous etc.)
(12)	RQ	Riding quality (very good, good, fair, poor)
(13)	ST2	Surface type PC, SD, AC, MSS etc.
(14)	RW	Right-of-way width
(15)	FT	Formation type (cutting/filling)
(16)	SHT	Shoulder type
(17)	SW	Shoulder width
(18)	Height	Embankment height

Data Base 2, CURVE: The database stores details of horizontal curves under the following five fields:

S.No.	Field	Description
(1)	Link	Link number
(2)	ST KM	Starting chainage of curve
(3)	TO KM	End chainage of curve
(4)	Radius	Radius of curve
(5)	Turn	Curve turning left or right

Data Base 3, JUNCTION : Junction database contains the following information about intersections:

S.No.	Field	Description
(1)	Link	Link number
(2)	Location	Location of intersection
(3)	Type	Intersection with NH/SH/MDR/ODR/VR/BG/MG/NG
(4)	Class	Right/left/cross/level crossing/ROB

Data Base 4, CD WORKS : The database has seventeen fields for each record describing one CD work:

S.No.	Field	Description
(l)	S.N.	Serial Number
(2)	Location	Location of structure
(3)	Length	Length of structure
(4)	Type	Type of structure (Slab culvert, RCC bridge, submerssible bridge etc.)
(5)	Span	Span arrangement
(6)	C width	Carriage width
(7)	T width	Total width
(8)	T protection	Type of protection
(9)	C protection	Condition of protection work
(10)	C headwall	Condition of head wall
(11)	C slab	Condition of slab/pipe/box
(12)	C return	Condition of return wall
(13)	C parapet	Condition of parapet wall
(14)	C Wing wall	Condition of wing wall
(15)	Scour	Presence of scour height
(16)	HFL	HFL
(17)	FL	Formation levels

Data Base 5, TRAFFIC: This data base will contain data on traffic:

S.No.	Field	Description
(1)	S.N.	Count station number
(2)	State-Code	State code
(3)	Month	Month of survey
(4)	Year	Year of survey
(5)	Ocar	Old tech cars
(6)	Near	New teck car
(7)	Bus	Buses
(8)	LCV	Light commercial vehicle
(9)	HCV	Heavy commercial vehicle
(10)	Multi axle	Multi axle vehicle
(11)	MC	Two-wheelers
(12)	Cycle	Cycles
(13)	Animal	Animal driven vehicle
(14)	Other	Other vehicles

Data Base 6, ROB: This database will contain information on ROB:

S.No.	Field	Description
(1)	SN	Serial number
(2)	Name	Name of level crossing
(3)	Location	Location
(4)	Angle	Angle of crossing
(5)	Closure	Number of closure
(6)	Duration	Duration of closure
(7)	Traffic	Traffic in PCU
(8)	Type	Type of Crossing
(9)	Track 1	Type of track electrified/non-electrified
(10)	Track 2	Single/double

Data Base 7, BRIDGES: The database will store information on bridges:

S.No.	Field	Description
(1)	River	Name of the river
(2)	Location	Location of structure
(3)	Name	Name of the river
(4)	Length	Length of bridge
(5)	T Super	Type of superstructure
(6)	T sub	Type of substructure
(7)	T foun	Type of foundation
(8)	Year	Year of construction
(9)	HFL	HFL
(10)	FL	Formation level
(11)	Loading	Design loading
(12)	C Width	Cariage width
(13)	T width	Total width
(14)	Span	Span arrangement
(15)	C deck	Condition of deck slab
(16)	T deck	Type or deck slab
(17)	C car	Condition of carriageway
(18)	T car	Type of carriageway
(19)	C foot	Condition of footpath
(20)	T foot	Type of footpath
(21)	C rail	Condition of railing
(22)	T rail	Type of railing
(23)	T protection	Type of protection
(24)	C protection	Condition or protection works