SCHEDULE – L

OPERATION AND MAINTENANCE (O&M) REQUIREMENTS

1. Introduction

The Concession Agreement stipulates that length of **Project Highway** shall be constructed, operated and maintained during the Concession Period by the Concessionaire in accordance with scope defined in Schedules B & C and thereafter transferred of National Highways Authority of India (NHAI). In addition, the Concessionaire is also responsible for improvement and operation and maintenance of the Additional Highways considered for the BOT packages as mentioned in the Schedule A. This Schedule elaborates the operation and maintenance requirements of the Concession and is to be read together with the Concession Agreement for this purpose. For clarification of doubt, the period during which the Concessionaire shall comply with O&M requirements covers the entire Concession Period including the Construction Period. In particular, during the Construction Period, the Concessionaire is required to operate and maintain the existing two lanes as provided in the Concession Agreement and this Schedule. The Concessionaire shall operate and maintain the Project Highway such that during the Construction Period, at least two lanes are ordinarily open to traffic at all times and from Commercial Operation Date (COD), lane availability at the end of each year of the Concession will be a minimum of 99% on a cumulative basis. For this purpose, lane availability at the end of each year will be computed as follows:

$$\frac{\text{(Length in Km x no. of lanes x number of days since COD)} - \Sigma \text{ (lane Kms closed x number of days for which closed)}}{\text{(Length in Km x no. of lanes x number of days since COD)}}$$

Note:

- In the above formula the lane Km closed does not include the Additional Highways considered for BOT package if the same has not been completed by the time the Concessionaire completed developments to Project Highway.
- If the Additional Highway considered for BOT package is completed in all respects and handed over to Concessionaire, the above formula shall include total length of BOT package from the day of handing over the Additional Highways to the Concessionaire.
- Any Lane closure due to emergency reasons shall be excluded for computing lane availability.

2. Operation and Maintenance (O&M) Requirements

2.1 The Concessionaire shall take all such actions and do all such things (including without limitation, organising itself, adopting measures and standards, executing procedures such as inspection procedures, highways patrols, and engaging and managing contractors, agents and employees) as will secure:

a) The safety of users of the Project Highway, workers or other persons on the Project Highway and/ or facilities thereon;

b) Unimpaired performance of statutory duties and functions of NHAI and other Authorities in relation to the Project Highway and/or Other adjoining roads and facilities;

and subject to paragraphs a) and b), above, ensure that;

2.1.1 adequate safety measures, taking into account Schedule 'S", are taken up on the Site during the Construction and Operation periods.

2.1.2 delay to users of the Project Highway and of adjoining road or facilities is minimised;

2.1.3 risk of adverse affects on the environment and on the amenity enjoyed by the owners and occupiers of property and /or land adjacent to the Project Highway, adjoining road and facilities is minimised;

2.1.4 accidents and emergencies on the Project Highway and facilities thereon are responded to as quickly as possible and their adverse effects minimised;

2.1.5 risk of disturbance or damage or destruction to property of third party is minimised;

2.1.6 members of the public are treated with due courtesy and consideration;

2.1.7 users are given adequate information and forewarning of any event on or any other matter affecting the Project Highway which will enable them to minimise any adverse consequences on them of that event or matter;

2.1.8 members of the public and others are given adequate opportunity to bring to the attention of the Concessionaire any matters affecting its ability to meet the O&M Requirements;

2.1.9 Traffic data and data relating to the operation and maintenance of the Project Highway an Project Facilities and events on the Project Highway are collected and disseminated such that NHAI and other persons or bodies with statutory duties or functions in relation to the Project Highway or adjoining road are able to perform those duties and functions efficiently;

2.1.10 the Project Facilities shall be operated and maintained in order to fulfill the requirements set forth in the Concession Agreement and in this Schedule L;

2.1.11 The Scope of Operation Maintenance includes but not limited to following:

- Improvement – this includes improvement in the existing assets as per requirement of this Agreement and safety audit if any in consultation with IC.
- Road maintenance – this includes routine maintenance, major maintenance, period preventive maintenance, disaster maintenance and inspections;
- Traffic Management – incident management; enforcement of regulation together with the relevant authorities, hazard response; information gathering and dissemination, road patrols and surveillance;
- Safety – accident prevention; after care; user behaviour; education; enforcement; data collection and analysis.
- Facility management – including periodic inspections, routine maintenance, rehabilitation and expansion planning

- Road property management – management of access, encroachment and ribbon development
- Toll fee collection – provision of the appropriate equipment and systems, revenue collection, administration and auditing
- General responsibilities – including budgeting, compliance with legal and accounting requirements, and public relations
- Planning of Operations and Maintenance Centre – including the basic planning, comments on the detail design, and design co-ordination.
- Maintaining public relations unit to interface with and attend to suggestions from users of the highway, the media, Govt. agencies and other external agencies.

The broad limit of responsibilities of the Concessionaire shall be as described below:

(a) In general the limit of the Concessionaire's responsibility is to maintain all areas within the Right of –Way (ROW) of the Project Highways inclusive of all facilities such as interchanges, street lighting facilities, traffic light facilities, emergency telephone networks and other facilities constructed by the Concessionaire within the Project Highways.

(b) Limit of maintenance by the Concessionaire for another road joining or crossing the concession limit, shall be according to the following conditions:

(i) Where the other road crosses an underpass, the Concessionaire shall be responsible to maintain the crossing structure, viz., culverts, bridges and their abutments and related facilities, such as drainage, turfing, etc. The Concessionaire shall not be responsible for maintenance for the road surface, or the roadside drains of the other roads that are 100m beyond the ROW of Project Highway.

(ii) For the road that crosses and overhead bridge, and the bridge is not a part of an interchange, the Concessionaire shall be responsible for maintenance of the surface of the bridge, joints repairs, drainage linked to the bridge and its abutments.

(c) The Concessionaire shall operate and maintain all the street lighting, traffic light system, structures, roadway surface and the related facilities such as drainage, turfing, etc within the interchanges, and such maintenance shall be extend until the end of the flare and the deceleration and acceleration lanes of the interchanges.

(d) The Concessionaire shall be responsible for maintaining all cross roads indicated in Schedule – B upto a length of 100 metres from the Right-Of-Way of the Project Highways, and their flares to Junctions at any interchanges within the Project Highway, whichever is more.

(e) For setting out the limit of maintenance for the Concessionaire, National Highways Authority of India shall be responsible for negotiating with the local authorities or where required, with other relevant third parties. The Concessionaire shall maintain all the drainage system within the Right-Of-Way including the culvert crossing and the drains. However, the Concessionaire shall not be liable to maintain rivers and the streams

under the jurisdiction of Irrigation Department except when such maintenance is required as a result of exception discharge.

2.2 TRAFFIC MANAGEMENT AND LANE CLOSURE

2.2.1 Traffic Management during the entire Concession Period is an important activity that the Concessionaire has to attend to ensure safety of the road user as well as the construction workers simultaneously throughout the concession period. It is an usual activity to carryout various types of construction works at different stages at different periods as per site requirements. Also, it is a vital activity during unforeseen and /or emergency situations arising on account of natural causes or accidents or administrative reasons.

2.2.2 Traffic Management is required during planned/ scheduled construction and maintenance activities. However, traffic management will also be called for during unscheduled activities such as

(i) Emergency situation arising on account of

a) Force Majeure;

b) Accident/Incident on the Project Highway;

(ii) Special repairs required on account of failure of an element of the Project Highway; and

(ii) Default of the Concessionaire with respect to an operation activity on the Project Highway.

2.2.3 The basic principles to be followed for traffic management and lane closure on the Project Highway shall be as follows:

2.2.3.1 Work programme schedule shall be prepared such that diversion roads for the main traffic are minimised. The existing two lane carriageway is utilised to the maximum extent possible.

2.2.3.2 . Measures shall be taken the traffic is guided from a closed lane onto the operating lanes without its conflict with the traffic from the opposite direction.

2.2.3.3 The activity of renewal of pavement surface and/ or strengthening of the pavement structure shall not be taken up in a continuous length of more than 2 kilometres at a time to avoid long detour of the traffic.

2.2.3.4 The traffic diversion road where provided shall be appropriately designed for the traffic plying on the highway. It shall also be properly maintained during its operation period.

2.2.3.5 During Traffic detour involving traffic diversion adequate safety measures, as in Schedule 'S' shall be followed.

2.2.3.6 Proper and adequate information about the maintenance activity shall be notified to the users of the Project Highway in advance and displayed at the Site during the Operation Period.

2.2.4. Traffic Management plan and programme for a planned scheduled construction and /or maintenance activity shall be prepared in advance of that activity keeping 2.2.1 above in view and got approved by the Independent Consultant/ NHAI as the case may be.

2.3. In case of un-scheduled activities, described in 2.2.2(i) to (iii) above, an emergency traffic management for the affected reach of the highway shall be prepared and implemented in consultation with the Independent Consultant immediately. This emergency traffic management plan shall take into account the various requirements spell out in the Concession Agreement as well as in this schedule.

2.4. Lane closure is a vital activity during construction and/or maintenance in the Concession Period that the Concessionaire shall carryout in an organised, planned and disciplined manner.

2.4.1. Lane Closure involves traffic management in the affected reach of the highway, as such it is always a time bound activity and the Operation and Maintenance Manual incorporates it accordingly. In case where the Concessionaire fails to perform in time, a penalty shall be levied on the Concessionaire for the delay in reopening the closed lane to the traffic in terms of the Concession Agreement.

2.4.2. The basic principles to be followed in preparation of a planned lane closure shall be as follows:

2.4.2.1 The activity of renewal of pavement surface and /or strengthening of the pavement structure shall be taken up in one lane of the 2/3 lane carriageway so that at least one lane of that carriageway so that at least one lane of that carriageway is available to the traffic.

2.4.2.2 The activity of renewal or strengthening, item 2.5.1 below, shall not be carried out in a continuous length of more than 2km in rural section and 1 km in urban section so that the closure of a lane is not more than 2 days and 1 day in rural and urban sections respectively.

2.4.2.3 Lane Closure adopted for diverting the main traffic on account of the traffic management during construction works of the Project Highway shall be governed by the approved programme of Construction Works.

2.4.2.4 Lane Closure in short lengths less than or equal to 500 metres for carrying out a routine maintenance activity defined in item 4.2.1.1 of this Schedule shall not be for more than a continuous period of 1 day.

2.4.2.5 The lane closure needed on account of emergency shall be distinguished from the lane closure described in item 2.4.2.3 above. The lane closure on account of the Emergency shall be dealt with under sub Clause 18.9, Emergency De-Commissioning, Article XVIII Operation and Maintenance, Chapter IV, Project Development and Operation of this Agreement.

Traffic Management and Lane Closures Requirements during various situations arising on the Project Highway needing Traffic Management are detailed below:

2.5. Initial Construction Stage

2.5.1 Rural Section

i) The widening of the existing 2 lane carriageway shall be generally eccentric to make a four/six (4/6) lane divided carriageway facility. A new 2/3 lane carriageway separated from the existing carriageway with a 4.5m central median will be constructed in the first instance and then strengthening and widening of existing 2 lane carriageway shall be undertaken.

ii) The construction sequence in this case will be asunder:

a) 2/3 lanes will be constructed initially. There will be no conflict area for the main traffic using the existing two lanes during this construction stage. It shall be ensured that the construction traffic does not conflict with the main traffic in this stage.

b) On completion of the 2/3 new lanes throughout, the total traffic will be diverted on it and the existing 2 lanes will be widened with paved shoulders /additional lane with pave shoulder depending upon the new carriageway configuration upto the existing road level, Thereafter, entire width including the existing 2 lanes and the widened portion shall be given bituminous base courses uniformly.

2.5.2 Urban Section

i) The widening of the existing 2 lane carriageway shall be generally concentric to make it a 4/6 lane divided carriageway facility. The divider will be a 1.5m wide central median.

In addition, service road will be provided on either side of the 4/6 lane carriageway facility

ii) The construction sequence in this case will be as under;

a) Service roads and side drain on both the sides will be constructed initially. There will be no conflict area for the main traffic, which will be using the

existing two lanes. It will be ensured that the construction traffic does not conflict with the main traffic at exit and entry points.

b) On completion of the service roads on both sides, the main traffic will be diverted on them direction wise and the existing 2 lanes will be widened to 2/3 lanes on each side duly accounting for the 1.5m wide central median. On completion of the widening upto the existing road level, the median will be constructed. On its completion, the existing road will be strengthened in such a manner that the bituminous base courses and the wearing course layers are laid uniformly in 2/3 lanes and paved shoulder on either side of the 1.5m wide central median. During this operation, the construction traffic will not be conflicting with main traffic on the service roads.

c) On completion of the divided lane carriageway of the Project Highway, the main traffic from the service road be restored on them

2.6 Operation and Maintenance Stage

2.6.1 This is applicable for the entire Operations Period for the Project Highway during the entire Concession Period. Various important activities to be carried out during this stage are:

a) Regular periodic maintenance activities:
   i) Renewal of the wearing surface of the road pavement once every 5 years;
   ii) Strengthening course to be provided on 'as required' basis.

b) Maintenance activities arising out of the specific need(s) on account of the site conditions are:

i. Strengthening course required on account of the Benkelman Beam Deflection (B.B.D) values in excess of the prescribed criteria obtained during regular testing as per the Concession Agreement requirement;

ii. Wearing course required on account of the IRI values higher than the prescribed criteria obtained during regular testing as per the Concession Agreement requirement;

iii. Localised repairs in short lengths less than 500 m on account of pot holes, cracking subsidence in isolated spots on in scattered areas.

2.6.2 In order to cater to the execution of the said activities, para 2.6.1 above the main traffic will have to be diverted to an extent dependent on the site requirement.

2.7 EMERGENCY STAGE

2.7.1 This stage could arise any time in an emergency situation and shall have to be address to on its own merits. The extent of the traffic management shall be assessed as per the site requirement and situation.

2.7.2 The emergency situation could be faced in the following three situations.

a) During the period between the award of the work and commencement of the construction works on financial close.

In this situation the existing two lane facility is only available. The traffic management will have to be tailored accordingly. Either the existing one lane will have to be closed passing the traffic on another lane and its adjoin shoulder or both the existing lanes will be closed and a diversion road provided.

b) During the period when construction works are in progress.

In this case the availability of the carriageway at site shall decide the nature and extent of the traffic diversion.

c) During the period when the Project Highway is under operation and/or maintenance, the nature of emergency requirement in this case will determine the type and extend of the traffic diversion.

2.7.3 Traffic Management in emergency situation shall be provided immediately in consultation with the Independent Consultant

3. OPERATIONS

3.1. Introduction

3.1.1 The Concessionaire shall in consultation with the Independent Consultant evolve an Operation and Maintenance Manual (Maintenance Manual) as per sub-clause 18.2 of this Agreement.

3.1.2. The said Maintenance Manual shall have two separate sections, namely

(i) Section I – Operations; and

(ii) Section II – Maintenance

These are briefly described in items 3.2 and 4 of this Schedule respectively.

3.2 Section I – Operations

It shall prescribe procedures and systems for activities including but not limited to the following for the regular and emergency operations of the Project Highway and Project Facilities thereon.

3.2.1 Regular Operations

- Permitting smooth and uninterrupted flow of traffic during normal opening conditions.
- Functioning of the Toll System including charging and collecting the fees from the road user in accordance with this Agreement.
- Functioning of the lighting system;
- Functioning of the Patrolling System
- Functioning of rescue and medical aid services
  - Ambulance
  - Fire Brigade
  - Tow away truck and cranes
- Functioning of the Highway Traffic Management System
  - Emergency Call Boxes (ECBs) for Road Users
  - Central Control System
- Functioning of the Project Facilities
  - Administrative, Operational and Maintenance Base Camp
  - Rest Areas
  - Truck Parking Laybys
  - Electrical Services at Laybys, Bus Stops and Rest Areas
  - Potable Water supply system including supply of drinking water at truck parking laybys, rest areas etc.
  - Public toilets and other sanitary facilities
  - Pick Bus Stops
  - Solid waste disposal system including those from litterbins.

3.2.2 Emergency Operations

Minimising disruption to traffic in the event of accidents road/or incidents affecting the safety and use of the Project Highway by providing a rapid and effective response and maintaining liaison procedures with emergency services.

- Reasonably smooth and safe movement of traffic during emergency activities such as special repairs during floods, storms, hurricanes and earthquake.
- Failure of a system due to human error, electrical or mechanical failure.

3.3 The Concessionaire shall keep regular record of accidents that occur including the nature of accident, location of occurrence, time and date in the prescribed format, included in the Maintenance Manual and shall forward the monthly particulars of the same to the Independent Consultant and NHAI regularly in the first week of the following month.

3.4 The Concessionaire shall programme inspection of the Project Highway for its smooth operations in terms of the Concession Agreement classified in the following categories:

- Visual Inspection
- Close Inspection
- Thorough Inspection

And described herein under

3.5 **3.5. Visual Inspection**

Visual Inspections are broad general inspections carried out quickly and frequently by highway /bridge maintenance engineers having knowledge of road structures. The purpose of this visual inspection is to report the obstacles to traffic and fairly obvious deficiencies, which could lead to accidents or maintenance problems. Such inspections should be frequent. The visual inspection may be carried out by visual assessment with careful observation of the specific object/item of the Project Highway for identification and for quantification of the deficiencies or damages of the Project Highway.

3.6 **Close Inspection**

The close inspection may be visual and/or supplemented by standard instrumental aids for assessment of defects / deficiencies of Project Highway with careful observation of specific element(s). The close inspection may be daily / periodic but it is more intensive and would require detailed examination of elements of the Project Highway. It should cover all the aspects of the specific element of Project Highway against a checklist. The close inspections are to be carried out quite frequently depending upon the nature of structure of Project Highway. This inspection is to be carried out by the Highway/Bridge Engineer having good knowledge of road structures with theoretical background to analyse the nature, and extent of defects/deficiencies, suggest suitable remedial measures to rectify/remedy them and quantify repair work.

3.7. Through Inspection

A thorough inspection is comprehensive and detailed for assessment of defects/deficiencies of the Project Highway by visual inspection or with aid of standard equipment and non-destructive testing where necessary. Such an inspection is to be carried out on the basis of comprehensive checklist of items related to the materials, condition and situation of the structure etc. The checklist is to be prepared meticulously well in advance of inspection. The thorough inspection should be undertaken during the most critical weather condition, which is generally rainy season in India. During rainy season the Road/Bridge structures are under severe condition, thereby the damage and deficiencies of the Project Highway are more pronounced. The inspection carried out during the said period offer the most critical evaluation of the performance of the structure.

The thorough inspections are all the more important for Bridges, Culverts and drainage structures, as well as road pavements during adverse weather condition of monsoon period.

Besides being a qualified Highway/Bridge engineer; the inspection team leader must be familiar with design and construction features of the Highway /Bridges to be inspected so that the condition can be properly and accurately assessed for a meaningful report and quantification of repair works. The competence of team leader to recognise any structural distress/deficiencies and assess its seriousness with complete recommendation for appropriate repairs are important pre-requisites for entrusting this assignment to him.

3.8 Frequency of Inspections

The inspection frequency of various items of Project highway has been indicated in the Table L-1 hereunder. The frequency of inspection can be suitably revised in consultation with the Independent Consultant if the emergencies so warrant.

Table L-1: Objective and Frequency of Inspection

(The objective and minimum frequency of inspections under normal circumstances shall be as under. If some exigencies arise, the interval of inspection may be reduced)

Object	Item	Daily	Monthly	Quarterly	Before and after rainy Season
Riding surface	Pavement	+	++		●
	Expansion joints	+	++		●
Median	Kerb	+	++		●
Side Slopes	Shape	+		++	●
	Turfing		+		●
	Pitching & masonry				●
	Retaining wall		++		●
Drainage	Shoulder drain	❖	++		
	Median drain	❖	++		
	Side slope drain	❖	++		
	Bridge catch basin	❖	++		
	Gullies and catch pits	❖	++		
Bridges	Superstructure		+	++	●
	Substructure		+	++	●
	Head walls an aprons		+	++	●
	Painting		+		●
	Hand rail		++	●	
Culverts	RC Culverts				●
	HP Culverts				●
Guard rails	Shoulders	+		++	●
	Medians	+		++	●
Traffic Operation facilities	Signs	❖	●		●
	Marking	❖	++	++	●
	Delineator	❖	++	++	
	Lighting	❖	++	++	
Other facilities	Vegetation / landscaping	❖	++	●	
	Toll Plaza	❖	++	++	●
	Way side amenities	❖	++	●	
Traffic conditions		❖	●	++	
Encroachment		❖	●		

LEGEND

\+ *visual inspection*

++ *close inspection*

● *thorough inspection*

❖ *visual inspection during rainy season only*

4. MAINTENANCE

4.1 Introduction

4.1.1 The Concessionaire shall maintain the Project Highway in traffic-worthy condition and the Project Facilities in usable condition throughout the Concession Period or any extension thereof in terms of the Concession Agreement through regular maintenance and preventive maintenance of the various items and elements of the Project Highway.

4.1.2 The Concessionaire shall maintain the existing 2/3 lanes of the Project Highway and already constructed 4/6 lanes of the Project Highway during construction of new lanes in such a manner that the unevenness index of the pavement does not exceed 3000 mm per km, or the present roughness value of the existing pavement, whichever is lesser and it is free of pot holes.

4.1.3. The following MORT&H and IRC publications shall be referred for preparation of the said Section - II Maintenance of the "Operation and Maintenance Manual"

- MORT&H Manual for Maintenance of Roads.
- IRC-SP-35-1990, Guidelines for Inspection and Maintenance of Bridges.
- The manufacturer's Maintenance manual(s) of the equipment including that of the Toll Collection System to be used in the Project Highway Operations shall form part of the said O&M Manual.

4.2. Maintenance Section of Maintenance Manual

The Section II Maintenance, of the Operation and Maintenance Manual, shall include the activities described hereinunder amongst other activities required for the regular and preventive maintenance of the equipment during the Operations Period, so that the Project Highway is maintained in a manner that at all times it complies with the specifications and standards and at the time of Divestment of Rights and Interests by the Concessionaire in terms of Article XXXIII of this Agreement it is in sound, durable and functional condition.

4.2.1. Regular Maintenance

It consists of the routine maintenance and periodic maintenance throughout the Concession Period and extension thereof, if any, for all elements of the Project Highway.

4.2.1.1 Routine Maintenance

The Concessionaire is required to perform all routine maintenance activities along the project road. The Routine Road Maintenance means planned ongoing works and activities required to ensure public safety, repair small defects and to maintain the road and the entire RoW in the required condition.

The Concessionaire is required to develop maintenance sheets for each component of the works. The Concessionaire has to utilise mechanised equipment, method and innovative solutions and technology to perform these obligations and include such

process in the Maintenance Manuals.

All maintenance activities are to be carried out in accordance with relevant IRC Codes, Guidelines and Special Publications as are applicable to National Highways, MORT&H specifications and Technical circulars with all updates. In the absence of any definite provisions on any particular issue related to the specifications and/or standards, reference may be made to the latest codes and specifications of the Bureau of Indian Standards (BIS), AASHTO, ASTM, British Standards or any other International Standards. But where even these are silent, the work shall conform to sound engineering practice with the approval of the IC. The requisite Quality Control Tests as per specifications and codes are to be carried out by the Concessionaire at his cost as per the directions of the IC.

Routine Maintenance broadly includes:

(i) Maintenance of pavement
(ii) Maintenance of turfed areas.
(iii) Maintenance of landscaping
(iv) Maintenance of drainage system
(v) General cleaning including CD structures
(vi) Cleaning, maintenance of toll plaza and other buildings within concession limits.
(vii) Maintenance of main line structures.
(viii) Maintenance of Right-of-Way fences.
(ix) Maintenance of Highway Accessories.
(x) Maintenance of guardrails.
(xi) Other miscellaneous responsibilities such as stand by/on-call, emergency plant & equipment, stray animal catching operations etc.
(xii) Provision of traffic and safety control devices during the routine maintenance works or any accidents.

4.3. Periodic Maintenance of Pavement

The framework of activities relating to pavement maintenance and rehabilitation in respect of flexible and rigid pavement are given in the flow charts in Appendix 3.1 and Appendix 3.2 respectively. The Concessionaire shall set forth in the Operations and Maintenance Manual the detailed procedures to be followed under each of these activities, and also choose the operational and performance criteria from the performance standards set forth in this Schedule.

4.3.1. Pavement Riding Quality

The riding quality of the pavement shall be ensured by satisfying the minimum requirements given herein under.

i) Surface roughness of the Project Highway on completion of construction shall be 2000 mm/km as measured by vehicle mounted Bump Integrator.

ii) Surface roughness shall not exceed 3000 mm/km during the service life of pavement at any time. A renewal coat of bituminous concrete shall be laid every 5 years after initial construction or where the roughness value reaches 3000 mm/km whichever is earlier to bring it to the initial value of 2000 mm/km.

4.3.2. Structural Condition of the Pavement

I) The structural condition of the flexible pavement of the Project Highway shall be assessed every year by taking Benkelman Beam Deflections and working out characteristic deflections of homogeneous sections of the Project Highway as per IRC-81-1997. Wherever the characteristic deflection exceeds 1.2 mm a bituminous overlay shall be provided appropriately designed according to IRC-81-1997 or its latest versions or amendments to it.

II) Recycling of existing crust using milling as an option can be explored by the Concessionaire in consultation with the IC to maintain the FRL at the same level throughout the concession period. However, while adopting such measures, the residual strength of existing pavement shall be estimated and equivalent thickness of new material added before laying the designed overlay. The design of profile with altered pavement treatments shall be finalised in consultation with IC.

III) In the case of cement concrete pavement, joints shall be thoroughly inspected every year and the loss of sealing compounds made good.

4.3.3. Preventive Maintenance

Preventive Maintenance shall include the activities related to each element and the system as a whole of the Project Highway to ensure that during the Concession Period and at its end, it is in sound, durable and functional condition.

4.3.4. Special Repairs

Damages occurring due to natural calamities like heavy floods, sand storms, hurricanes, cyclones, earthquakes to any element or system of the Project Highway, shall be rectified and the system restored to function as per programme prepared in consultation with Independent Consultant. All such activities shall fall under 'Maintenance' and shall form a part of the said Maintenance Manual.

4.4. Minimum Requirements of Maintenance Activities

4.4.1. Major Breaches in the Roadway

Major breaches in the roadway of any type endanger safety of traffic and cause

obstruction in movement of vehicles. These breaches shall be repaired urgently. Steps as mentioned in O&M manual shall be followed by the Concessionaire for repairing the breaches.

The Concessionaire shall ensure speedy restoration of traffic and take immediate action to repair the damages as permanent measures for the Project Highway. The restoration of traffic shall be made within 24 hours of its occurrence. The permanent measures shall be completed within a period of one week.

4.4.2. Minor cuts, rutting or blockage

Minor cuts, rutting and damages on Project Highway which do not completely obstruct the traffic but endanger the safety of traffic, shall be attended to on an urgent basis. For this purpose any cut which is in width more than 1 m shall be repaired within 24 hours. Any minor blockage, which partially obstructs the traffic and endangers safety, shall be removed by the Concessionaire immediately.

4.4.3. Branches of trees

The branches of the roadside trees if hanging closer than 5.5m over the road level of the Project Highway shall be cut, trimmed or lopped within 24 hours.

4.4.4. Shoulders

The shoulder (Earthen/Hard) shall be maintained in such a way that the shoulder drop off shall not be more than 25 mm for a length of 10m in a section length of 100m and/or there shall not be any false ditch causing the water to drain in reverse direction i.e. towards pavement instead of away from pavement surface, the same shall be rectified within 2 days as described below:

If the shoulders are deformed or scoured and are lower than 25mm from the adjacent carriageway, these shall be corrected by excavation, filling, dressing and compacting a material matching the existing material and it shall conform to the relevant MORT&H Specifications. In case of earthen shoulder repairs shall be carried out as per MORT&H Specifications 3003.

4.4.5. Drainage / Side Drains.

4.4.5.1. The Concessionaire must ensure that all drainage elements and structures are without any obstructions, which may reduce their normal cross section and impede the free flow of water. They should not have silting more than 25% of their size at any part of length.

4.4.5.2. All the Pipe and Box culverts shall have less than 10% deteriorated barrel and have more than 90% of the diameter/size open. There should be no evidence of flooding with end protection intact and no dip on the road over culvert indicating structural weakness.

4.4.5.3. Routine maintenance under this category shall cover pipe drainage system, slot drains, porous drains, gullies, catch-pits, open grills, ditches, side drains and median drains etc.

4.4.5.4. If the side drains / median drains where provided, and other drainage structures have been silted up in such a manner that it is causing obstruction in flow of water, the same shall be cleared off regularly within 7 days after detection in order to keep the drains free from obstructions all the time.

4.4.5.5. If the drainage system of Project Highway is covered and damaged, it obstructs the flow of water causing damage to the road pavement. Such damaged structures shall be reconstructed to required shape, size and proper slope within 21 days after detection or as instructed by IC.

4.4.6. Cross Drainage Works & Other Structures

4.4.6.1. The Concessionaire shall set forth in the Operation and Maintenance Manual, the detailed procedures to be followed for the maintenance and repairs of bridges and other structures keeping in view IRC-SP-35: 1990`Guidelines for the Inspection and Maintenance of Bridges' in consultation with the Independent Consultant. The flow chart for Bridge and Culverts maintenance activities in given in Appendix 3.3.

4.4.6.2. The scouring of piers and abutments of bridges and culverts shall be observed carefully particularly before and after rainy season and suitable remedial measures as deemed fit looking to site conditions shall be taken in consultation with IC.

4.4.6.3. The bridge deck must be clean and have minimal spalls, cracks or scaling. The drains /scuppers on the deck must be clean and functional always.

4.4.6.4. The Super-structure should not have any cracks or loss of section. There should be no spalling and have proper vertical clearance and opening height. Paint on the super structure must be in good shape.

4.4.6.5. The sub-structure should not have spalls, cracks and scaling. The bearing assembly should be functional and lubricated periodically. Abutment /pier seats should be clean and sound.

4.4.6.6. The joints on the structures shall not be loose and should be sealed always.

4.4.6.7. Retaining walls should not have spalling or cracks and its weep holes must be open always. There should be no indication of settlement or rotation.

4.4.6.8. If any settlement cracks are appearing in substructure and superstructure of the CD works beyond permissible limits, the same shall be carefully observed and suitable

remedial measures as per sound engineering practice taken.

4.4.6.9. The treatment for the damaged culverts/bridges shall be assessed at site after ascertaining the damaged portion as per site exigencies. The repair shall be carried out expeditiously in consultation with IC.

4.4.7. Pavement

As part of pavement maintenance the pavement shall be treated for various distresses occurring as described below.

4.4.7.1. Cracking

Cracking of bituminous pavements shall include all types of cracks such as hairline, alligator, longitudinal, transverse, shrinkage, reflective and edge cracking, linear and slippage etc. For any 50 m section of the pavement, the cracked area should not be more than 10% of the pavement surface of that section and/or the cracked area shall not exceed 0.5 sq.m at a place. The treatment shall be completely done within 7 days after their detection. The treatment shall be followed as described below:

i. If the width of the cracks is less than 3mm and resulting into settlement of pavement up to 10 mm in depth and exceeding in area more than 0.5 sq.m. at a place, such cracking shall be sealed by fog sealing in accordance with the MORT&H Specification 3004.

ii. If the width of the cracks is more than 3mm and resulting into settlement of pavement up to 10 mm in depth and exceeding in area more than 0.5 sq.m. at a place, such cracked surface shall be repaired by slurry sealing in accordance with MORT&H Specification 516.

iii. If the cracked portion has settled more than 10mm and its area exceeds 0.5 sqm, such areas shall be repaired by patching as per MORT&H Specification 3004.

iv. In case of alligator cracks, the permanent repair by full depth patching shall be carried out. The slippage cracks shall be repaired by removing the affected bituminous layer and replacing it with surface patch. In edge cracking, if shoulders are not providing adequate lateral support, the shoulder shall be reconstructed with good quality materials.

4.4.7.2. Rutting

For any 50 m section of the pavement, there shall not be ruts deeper than 10 mm and/or the length of rutting should not be more than 5m. The treatment shall be completely done within 15 days after their detection. The pavement surface shall be

rectified/corrected as per directions laid out in IRC 82-1982 and based on sound engineering practice at such locations.

4.4.7.3. Corrugations and Shoving

If corrugations and shoving in the pavement area exceeds 1 sq. m at any place and depth / height of corrugation / shoving exceeds 10mm, the same shall be rectified/corrected within 2 days after its detection, as per directions laid out in IRC 82-1982 and based on sound engineering practice.

4.4.7.4. Settlement or Grade Depressions

If the settlements and grade depressions exceed 1 sqm in area and their depth is within 10mm, such defects shall be treated within 3 days after detection as per directions laid out in IRC 82-1982 and based on sound engineering practice.

4.4.7.5. Upheaval or Swell

For any 50 m section of the pavement, there shall not be upheaval or swell that exceeds 0.5 sq. m in area; if its height is more than 10mm, the same shall be treated within 7 days after its detection as per as per directions laid out in IRC 82-1982 and based on sound engineering practice.

4.4.7.6. Ravelling

For any 50 m section of the pavement, if the ravelling of bituminous surface is not more than 3% of the pavement surface of that section and/or the ravelled area does not exceed 1 sq.m. at a place, the same shall be rectified within 7 days after their detection by slurry seal treatment in accordance with the MORT&H Specification.

4.4.7.7. Potholes

There shall not be any pothole on the pavement surface. Irrespective of the size and depth, the potholes shall be repaired by patching / pothole filling in accordance with MORT&H Specification 3004. The potholes shall be repaired immediately if causing a threat to safety; other potholes shall be repaired within 2 days after their detection.

4.4.7.8. Skid Hazards

The skid resistance of the pavement surface shall be maintained in such a way that the skid number is a minimum of 55 when tested as per BS-812 Part 114ASTM-274. Skid hazards, irrespective of size, shall be corrected by improving the surface drainage and skid resistance including cleaning the surface of contamination, surface treatments or milling or resurfacing.

4.4.7.9. Bleeding or Flushing

For any 50 m section of the pavement, if the bleeding surface area is not more than 1% of the pavement surface of that section and/or the bleeding surface area does not exceeds 0.25 sq.m. at a place, the same shall be treated immediately within a day after its detection in accordance with IRC:82-1982 or any other relevant guidelines in consultation with the IC.

4.4.7.10. Edge deformation/Breaking

For any 100 m section of the pavement, if the edge breaking is more than 1m and/or the width of edge breaking is more than 0.1m at a place, the same shall be treated immediately within a day after its detection in accordance with IRC:82-1982 or any other relevant guidelines in consultation with the IC.

4.4.7.11. Loss of Cover Aggregate

If the loss of cover aggregate occurs in area exceeding 1 sqm of the pavement, treatment of seal coat shall be applied.

4.4.7.12. Longitudinal / Transverse Streaking

If the longitudinal and transverse streaking appears on the pavement surface in area exceeding 5sqm, the same shall be treated by application of new surface treatment or by a second treatment over the streak surface.

4.4.8. If any defects other than those mentioned above occur on the pavement of the Project Highway, the same shall be rectified/corrected by the Concessionaire as per directions laid out in IRC 82-1982 and based on sound engineering practice.

4.5. Other Maintenance Activities

4.5.1. Maintenance of Traffic Signals

The traffic signals shall be maintained at all times as per clause 18 of IRC: 93 -1985 and shall be periodically inspected, maintained and repaired so as to be in satisfactory working condition all the time.

4.5.2. Maintenance of Highway Lighting System

4.5.2.1. Maintenance of all lighting installations and related appurtenances shall be as per relevant clauses of IS : 1944 (Part I-V) 1981.

4.5.2.2. Lighting wherever provided shall be maintained by the Concessionaire in a condition nearly similar to original condition.

4.5.2.3. The faults shall be repaired instantly and lighting restored. Missing and damaged items

shall be replaced instantly.

4.5.2.4. Cleaning shall be done at regular intervals to be mentioned in the Maintenance Manual to ensure that lighting is not below the specified standard.

4.5.2.5. All installations shall be safeguarded against weathering and ageing effects by repainting and other preventive measures.

4.5.2.6. The servicing of stand-by power generation units shall be carried out in accordance with the manufacturer's instructions.

4.5.3. Maintenance of Highway Signs and Pavement Markings

4.5.3.1. All traffic signs and markings shall always be kept clean, visible and in correct alignment and position.

4.5.3.2. Any damage to traffic signs, which reduces or threatens to reduce full and clear visibility shall be rectified within twenty four (24) hours of its occurrence. If they are used as base for posters, the posters shall be removed and the signs cleaned within 24 hours. Signs shall be washed using detergent solution followed by clean water to maintain their visibility and reflectivity unimpaired due to dust etc.

4.5.3.3. Any part of traffic signs damaged due to weathering, corrosion, vandalism or any other cause shall be replaced by the Concessionaire within seven days.

4.5.3.4. Any mandatory signs including those for traffic safety and toll, `damaged beyond repair' shall be replaced within 2 days and all other signs with similar condition shall be replaced within 3 days.

4.5.3.5. Appropriate devices for measuring the luminosity and reflectivity shall be used to check visibility and reflectivity of signs, delineators and markings. These shall be replaced by similar material if the reduction in the level of these two requirements falls below 50% of the original level.

4.5.3.6. Pavement marking with thermo plastic paint shall be carried out soon after any overlay/renewal coat is provided.

4.5.4. Maintenance of Pickup Bus Stops

4.5.4.1. Maintenance of pickup bus stops shall include attending to repairs to the bus-bay pavement and also to various parts of the passenger shelter and connected facilities as and when necessary. Replacement of irreparable items shall be done within 2 days.

4.5.5. Maintenance of Control Centre

4.5.5.1. There shall be periodic inspection and maintenance of the Control Centres. This shall include attending to repairs and maintenance (both regular and periodic) to various parts of the building and connected services and facilities as and when necessary, and replacement of irreparable items of work. Cleaning & disinfecting of the water supply systems, inspection and maintenance of drainage/sanitation systems and electrical installations shall be as per relevant clauses of National Building Code (NBC).

4.5.5.2. Maintenance of Emergency Telephone system including its equipment shall include periodic servicing, checking of the system, replacement of components, attending to all necessary repairs and other incidentals to keep the system in working condition.

4.5.5.3. All the vehicles shall be maintained in smooth running condition at all times. In the event of any vehicle being off the road for maintenance or on account of breakdown, substitute vehicle shall be provided immediately.

4.5.5.4. At the end of the Concession Period or the extended period thereof, Control Centres together with all equipment in working order shall be handed over to NHAI.

4.5.6. Maintenance of Buildings

4.5.6.1. Maintenance of buildings shall include routine maintenance and attending to repairs to various parts of the building and connected services as and when necessary, and replacement of irreparable items of work, cleaning & disinfection of the water supply systems, inspection and maintenance of drainage/sanitation systems and electrical installations shall be as per relevant clauses of NBC.

4.5.6.2. At the end of the concession period or the extended period thereof, all buildings shall be in useable condition and handed over to NHAI.

4.5.7. Maintenance of Road Furniture and Facilities

4.5.7.1. Maintenance of road furniture and facilities shall include attending to repairs to various parts of the road furniture and connected services as and when necessary, and replacement of irreparable items of work in reasonable period.

4.5.7.2. All the hectometre stones, Kilometre stones and 5th Km stones shall be kept 100% clear of obstruction; and up to 5% surface damage shall be rectified within 3 days after detection and shall bring it to its original state. If the surface damage is more than 10%, the same shall be removed and replaced with new ones meeting IRC standards.

4.5.7.3. At the end of the concession period or extended period thereof, all road furniture and facilities in useable and in working order shall be handed over to NHAI.

4.5.8. Maintenance of Highway Landscape

4.5.8.1. Maintenance of Highway Landscape shall include attending to repairs to elements of the landscape connected services as and when necessary, and replacement of irreparable items of work.

4.5.8.2. Trees shall be maintained as per the guidelines in IRC: SP: 21-1979 and no indiscriminate felling of trees shall be resorted to while upgrading, widening and improving the highway. The felling of trees shall be undertaken in consultation with the Independent Consultant and after obtaining due permission of the Forest Department, as applicable.

4.5.8.3. While borrowing earth from roadside land for routine maintenance it shall be ensured that no earth is removed around root of trees. All borrowing operations shall be as per IRC : 10-1961.

4.5.8.4. Maintenance operations include numbering and maintaining a register of all road side trees within the Right of Way.

4.5.8.5. The routine maintenance such as trimming and shaping shall also cover those hedges and trees within the RoW, which affect the performance of the Project Highway.

4.5.8.6. Cutting or clearance to safeguard visibility at intersections, road bends, accesses and signs shall be carried out in such a way as to avoid permanent damage to hedges and trees. Hedges and trees overhanging carriageways shall be trimmed to provide a minimum headroom of 5.5 metres at all times.

4.5.8.7. Turfing within the RoW shall be mown as to achieve a visual pattern in harmony with adjacent areas. Mowing shall be done when the height of cut reaches 150 mm.

4.5.8.8. The grass/turf within RoW shall be maintained in such away that the roadway is free of obstruction and the availability of sight distance is ensured at intersections, passing zones, curves etc. The grass/turf around crash barrier, headwalls, paved ditches etc. shall be maintained neatly.

4.5.8.9. The Operation and Maintenance Manual shall include a maintenance and management plan for trees, shrubs, turfing and hedges to sustain their development in a manner pleasing in appearance.

4.6. Incident Management

4.6.1. Scope

- The Concessionaire shall initiate, co-ordinate and maintain an Incident Management System (IMS) and supply regular incident statistics to client.

- Incident Management entails a set of co-ordinated activities initiated by the Concessionaire when an incident (an extraordinary event resulting in the reduction of road capacity or creates a hazard for users) occurs, in order to minimise the effects of the incident and restore normal capacity and safety levels to all affected road facilities as efficiently as possible.

- If at the commencement date, there is no existing IMS at the site, then the Concessionaire should develop and implement an IMS within a period of not more than 3 months from the commencement date.

- The client shall assist the Concessionaire to identify relevant agencies (e.g. rescue, fire, hazardous materials, traffic, police, ambulance, alternative routes, cleanups) and their representatives and to liase with these representatives on behalf of the Concessionaire.

- The Concessionaire shall set up a steering committee, which shall include representatives of the various relevant agencies, to identify current & potential issues and problem areas which need addressing.

- The incident management centre shall be continuously staffed on a 24 hour basis. The Concessionaire shall record all incoming calls, along with the description of the nature of the call and the corresponding action taken.

- The Concessionaire shall record and maintain records of the details of all the SOS calls received (e.g. collision, hazardous material, breakdown, etc)

- After occurrence of any major incident, resulting in multiple loss of life, significant periods of road closure or major route rehabilitation work, an incident debriefing report shall be produced and forwarded to the client within one month of occurrence.

4.6.2. Levels of Service

The following levels of service apply to the incident management system:

- Implementation of fully functioning IMS system – 3 months after commencement
- Staffing – 24 hrs/day and 365 days/year
- Response time to a single incident – ½ an hour after receiving notification
- Multiple incidents – as soon as possible
- Incident debriefing reports – 1 month

- Steering committee monitoring report – quarterly

4.7. Safety Management

4.7.1. Scope & Levels of Service.

The following scope of operations and levels of service applies to facilities under management:

- The Concessionaire shall comply with all the requirements of the relevant Indian Laws on Occupational Health and safety, and the necessary certification/documentation proving compliance shall be made available by the Concessionaire at any time.

- The Concessionaire shall take all necessary measures to minimize accident occurrences on the highway section. For this purpose he shall liaise with the relevant local agencies such as Police, Hospital, Fire Brigade, Highway Police, etc. as required.

- The Concessionaire shall maintain a comprehensive register and database of all accidents occurring on the Project Highway Section. The Concessionaire shall utilize this data to define and identify "Black Spots" and the like, make the necessary analysis of the cause of the "Black Spot" and make appropriate recommendations to the client for counter measures.

- The Concessionaire shall provide educational programs for the improvement of safety for the Users of Roads under operation. This shall occur four times per annum. This shall be carried out by the issuing of pamphlets, billboards, etc. The Road Patrols shall in addition take every opportunity at events such as accidents and the like to educate Users.

- The Concessionaire shall repair all damaged fencing that prevents access to animals and pedestrians to the highway. In addition the Concessionaire shall recommend to the client for installation of additional fencing where necessary to prevent access to the Highway.

In addition, the Concessionaire shall assume full responsibility for the safety of employees by providing competent training, safety clothing and safety equipment.

In addition, the Concessionaire shall be responsible for the security of the project:

- Security guards shall patrol the toll plazas and route facilities areas shall be provided by the Concessionaire. These guards shall operate on a 24 hour basis, for 365/6 days per year.
- The Concessionaire shall be responsible for maintaining/upgrading all facilities for site security, including fencing, intercom system, emergency communications system, access control system and the like.

4.8. Road Asset Management

4.8.1. Scope

The Concessionaire shall ensure the maximum availability and efficient utilisation of the assets for the client. This shall also include the protection of the right of way from encroachments and other unauthorised activities.

In addition to the main carriageways, the Concessionaire shall also provide for the management of rest areas, bus bays, bus parking areas and other facilities for highway users, so that these facilities operate without hindrance to the through traffic.

The Concessionaire shall maintain the buildings, plaza facilities in a manner that projects a well managed professional image to the motoring public. This shall require the Concessionaire to:

- Keep the plaza neat and litter free at all times.
- Maintain the vegetation, lawns and shrubs etc
- Maintain the parking areas and approaches neat and litter free.
- Maintain all the toll plaza such that the walls remain freshly painted, the woodwork neat, and all structural defects immediately attended to.
- The Concessionaire shall ensure that any visual defects of the buildings, occasioned by accident or wear and tear are rectified within one week.

4.8.2. Encroachments

The Concessionaire's enforcement of the requirements of the client shall be a significant obligation under the Contract. The client shall define the Right of Way and their requirements with respect to unauthorised accesses, encroachments and the like". From the date of the commencement of O&M period, the Concessionaire shall be required to determine all encroachments and unauthorised accesses to the highway. The Concessionaire shall list the encroachments with a description, location and extent of each encroachment, draw up a method statement and programme for the removal of the accesses or encroachments for approval by the client. All encroachments shall be removed, and unauthorised accesses closed within 3 months of the commencement of O&M period.

4.8.3. Inspections

Full and component inspections of the highway section shall be undertaken at appropriate intervals. The Concessionaire shall draft Inspection procedures for each part and component of the National Highway Section that requires periodic inspection.

4.9. Inspection Reports and Remedial Measures

4.9.1. Periodicity of inspections for maintenance activities by the Concessionaire shall be regulated as per this Agreement and governed by the exigencies of the situation. The said inspections shall be followed by reports to the Independent Consultant and the NHAI. Based on reports, detailed investigations shall be undertaken by the Concessionaire itself

and/or on advice of the Independent Consultant and the NHAI as the case may be.

4.9.2. The Concessionaire shall carry out any maintenance, repair or rehabilitation works found necessary by these investigations in accordance with the Maintenance Manual and this Agreement.

4.10. Maintenance of Facilities for Road Users

4.10.1. The Concessionaire shall ensure that all the Project Facilities provided for users of all categories are kept in a neat, hygienic and tidy condition. Special attention shall be given to the preparation of food items so that they are cooked with unadulterated ingredients in a hygienic manner.

4.11. Items of Maintenance

4.11.1. The Concessionaire shall maintain the Project Highway, Project Facilities and Project Assets in working and orderly condition at all times during the Concession Period or any extension thereof.

4.12. The specifications and standards for maintenance items shall be governed and regulated as per Schedule 'D' of this Agreement.

5. DIVESTMENT

5.1. The Concessionaire shall take action(s) in terms of Article XXXIV Defects Liability and Article XLIV Miscellaneous of this Agreement prior to proceeding with Transfer of the Project Highway, Facilities and Assets thereon to NHAI.

5.2. The Concessionaire shall obtain a Transfer Certificate as per Schedule L_1 appended to this Schedule, from the Independent Consultant, who shall issue it after satisfying itself that the Project Highway and Facilities and Assets thereon have been constructed, operated and maintained in terms of this Agreement during the Concession Period and meet the divestment requirements as per this Agreement for the issue of Vesting Certificate (Schedule V) by NHAI.

5.3. The Concessionaire shall take action(s) under Article XXXIII Divestment of Rights and Interests of this Agreement after obtaining the Transfer Certificate (Schedule L_1) from the Independent Consultant as spelt out in 5.2 above in order to obtain Vesting Certificate (Schedule V) from NHAI.

5.4. The issuance of the Vesting Certificate (Schedule V) by NHAI as per sub clause 33.4 of Article XXXIII Divestment of Rights and Interest, to the Concessionaire shall result in the completion of the transfer of the Project Highway in terms of this Agreement.

Schedule L

TRANSFER CERTIFICATE

I/We,_____(name of the Independent Consultant) issue this certificate, designated Transfer Certificate for widening of the existing 2-lanes to 4/6 lanes divided carriageway facility including rehabilitation of existing 2- lanes, from ------- Km to ------ Km on ---------- section of National Highway No. 7 (NH-7) in the State of _____, India on Build, Operate and Transfer (BOT) basis by the Concessionaire _____ (name of the Concessionaire) on Build, Operate and Transfer (BOT) basis as per the Concession Agreement between the National Highway Authority of India (NHAI) and the said Concessionaire, being satisfied that the Project Highway has been constructed, operated and maintained during the Concession Period is in sound, durable and operational condition on completion of the said concession period, and it is in a fit condition for transfer by the said Concessionaire to the NHAI or its nominee. The transfer of the said Project Highway together with facilities thereon shall be effected on the strength of this certificate.

Place of Issue _____

Date of Issue _____

(Independent Consultant)

Appendix – 3.4

Schedule L

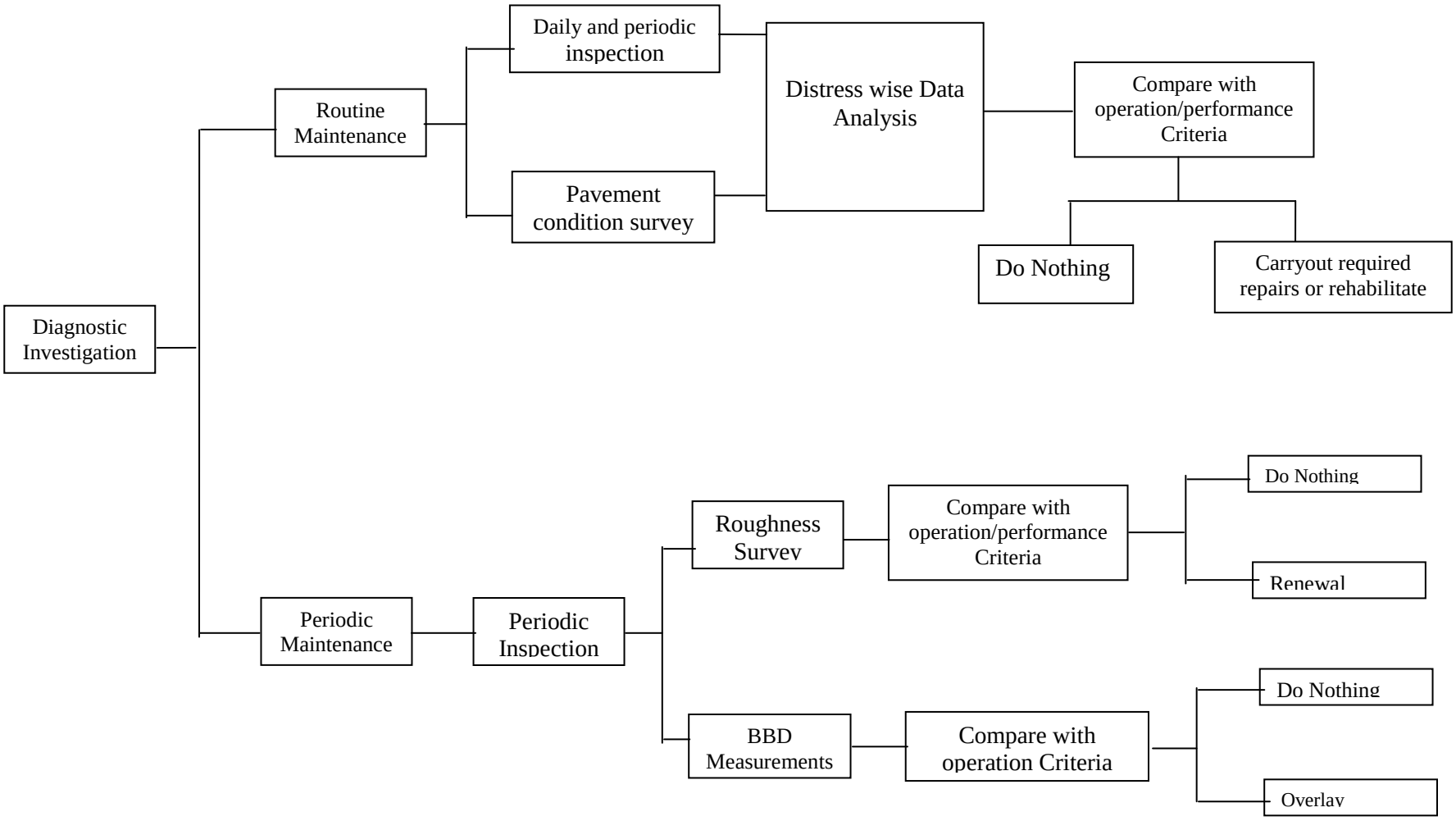
Equivalent Rating Conditions

Category	Status	Rating
Very Good	on completion as per specification and standards	9
Good condition	no repairs needed	8
Generally good condition	Potential exists for minor maintenance	7
Fair condition	Potential exists for major maintenance	6
Generally fair condition	Potential exists for minor rehabilitation	5
Marginal condition	Potential exists for major rehabilitation	4
Poor condition	repair or rehabilitation required immediately	3
Critical condition	need for repair or rehabilitation is urgent. Facility should be closed until the indicated repair is complete	2
Very critical condition	Facility is closed. Study should determine the feasibility for repair	1
Unserviceable	facility is closed and is beyond repair	0

Sufficiency Rating System

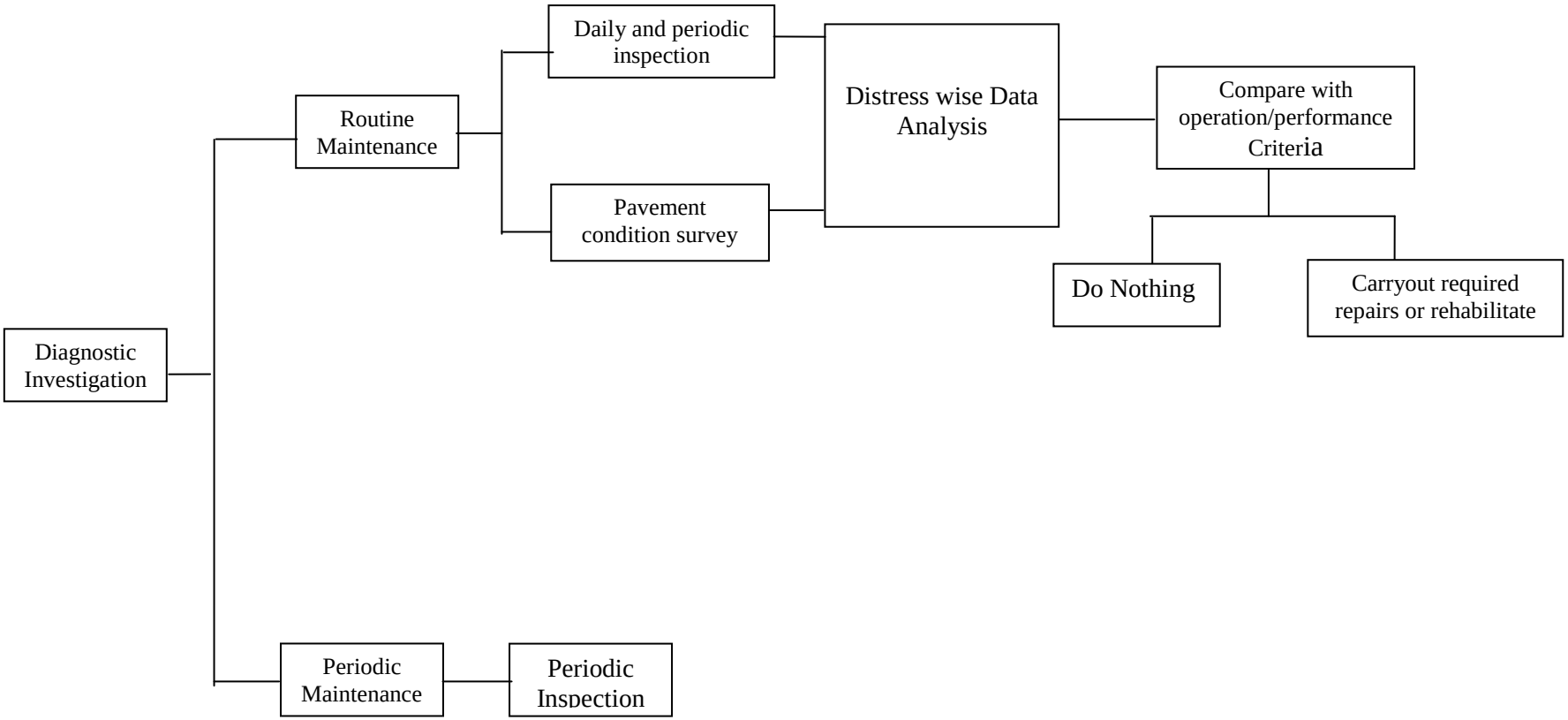
1. Load performance
2. Safety Performance
3. Remaining Life

Schedule-L **Appendix 3.1**



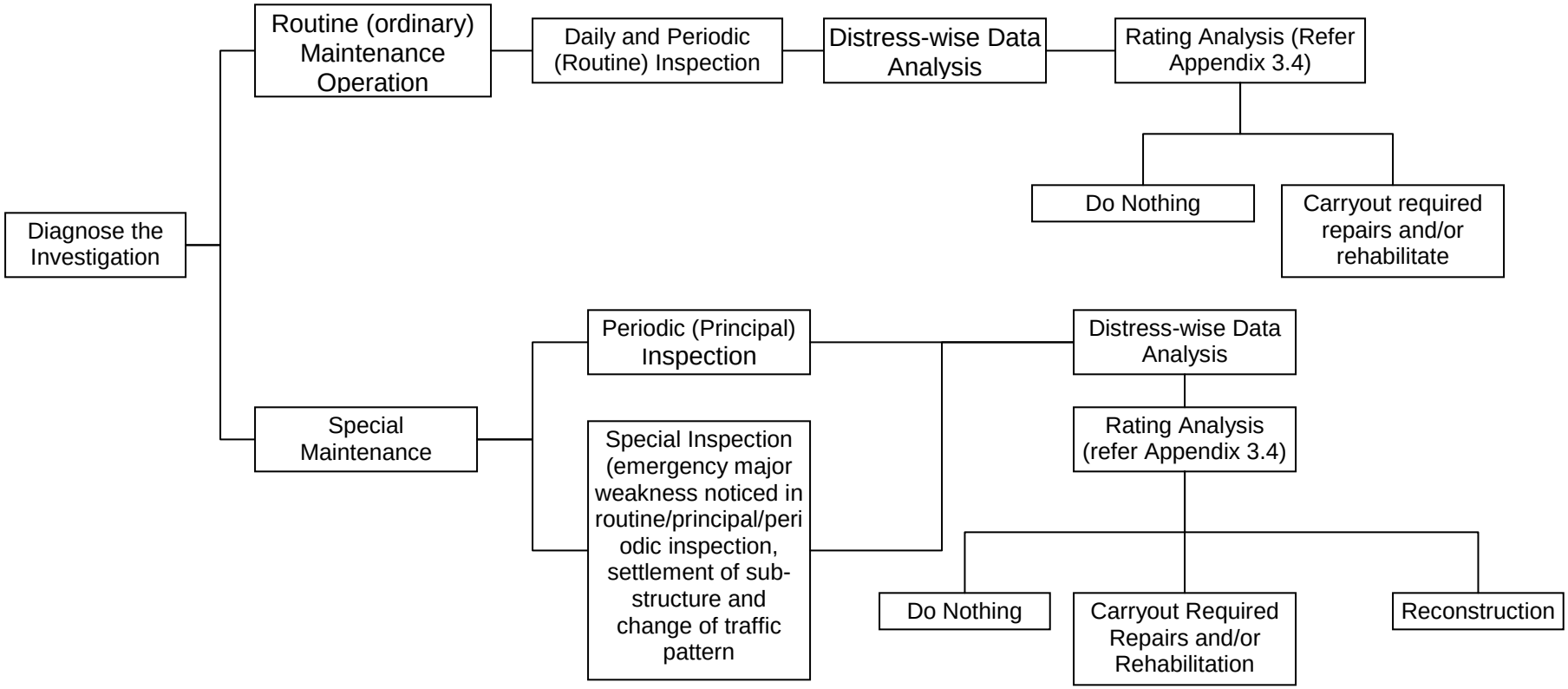
FLOW CHART FOR FLEXIBLE PAVEMENT MAINTENANCE

Schedule-L **Appendix 3.2**



FLOW CHART FOR RIGID PAVEMENT MAINTENANCE

Schedule-L **Appendix 3.3**



FLOW CHART FOR BRIDGES AND CULVERTS MAINTENANCE

SCHEDULE – O

INDEPENDENT ENGINEER – SCOPE OF WORK

TERMS OF REFERENCE

1. PROJECT BACKGROUND

(1) The Govt. of India (GoI) through Ministry of Shipping, Roads & Highways (MoSRT&H) is contemplating to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on the heavily trafficked National Highway sections. The Project under consideration aims at developing section of NH7 as mentioned in Schedule A, by widening the existing 2-lanes to 4/6 lanes dual carriageway, including strengthening of the existing 2-lanes on Build, Operate and Transfer (BOT) basis.

(1) NHAI has started the process of Land Acquisition for acquiring land to accommodate the Project facilities along the Project corridor and shall make the land available to the Concessionaire as per the provisions of the Concession Agreement. NHAI will bear the cost of land to be acquired on the award of concerned Revenue Authority.

(2) The Concessionaire shall make necessary arrangements clearing the encumbrances along the Project corridor under the directions of the concerned agencies and officials at his own cost.

(3) The Concessionaire shall operate and maintain the Project Highway by itself, or through O&M Contractors including tolling contractor, if any, after carrying out improvements to comply with Standards and Specifications spelled out by the NHAI in the Concession Agreement.

(4) NHAI intends to appoint an Independent Consultant (IC) to oversee the activities of the Concessionaire during Design, Construction, Operation and Maintenance of the Project Highway.

2. OBJECTIVES

The objectives of consultancy service are to:

i) Act independently and on behalf of the NHAI to review all activities associated with Design Review, Construction and O&M to ensure compliance of requirements of Concession Agreement in order to have a sound Project.

ii) Report to NHAI on the financial and technical aspects of the project, after visiting the site at least once a week.

iii) Assist the parties to the Concession Agreement in arriving at an amicable settlement of dispute.

iv) Act, if required on behalf of the lenders and fulfil various reporting requirements of the lenders.

3. SCOPE OF SERVICES

The Project Highway provides for widening and strengthening of existing two lanes Section of NH7 and its Operation and Maintenance (O&M) on BOT / BOT (Annuity) basis. The work also includes the widening of existing bridges and culverts and construction of new bridges and culverts for new carriageway. The Project Highway shall include but not be limited to the following:

- Road works
- Fee Collection system including buildings and related structures, hardware and software
- Communication systems
- Administration and Maintenance Depots
- Rest Area and Fuel and Service facilities
- Rest areas
- Lighting system
- Interchanges
- Bridges
- Service Roads
- Lay byes, Bus bays
- Traffic safety, Landscaping, arboriculture and other Project facilities.

The Concession Agreement envisage the appointment of an Independent Consultant (IC) by the National Highways Authority of India (NHAI). The IC shall be, in principle, responsible for review of Designs, Drawings, Construction, Progress Monitoring, affirmation of all certifications done by the Concessionaire, etc. The IC shall be involved in day-to-day implementation of the Project. The Concession Agreement also envisages the appointment of a Consultant by the Concessionaire to undertake the design related work and the day-to-day technical audit and quality control of Construction, monitoring of progress, certification of works of the Contractor(s) to be appointed by the Concessionaire for the Project Highway.

The Independent Consultant shall supervise that all the requirements of the Concession Agreement and various schedules are met by the Concessionaire and in case of any discrepancy/ deviations; he shall inform NHAI and the Concessionaire. The responsibility of the IC during various stages of Design Review, Construction and Operation and Maintenance shall be as follows but not be limited to :

3.1 Design Review Stage

i) Review the adequacy of the geotechnical and sub-soil investigations for road, bridge and other structures and building works, hydrological investigation and the topographical survey.

ii) Review the Design and working drawings prepared for the construction of various components of the highway, bridges / structures, analysis of rates, estimates, reports and other deliverables.

iii) Review the impact of widening proposal on the Archaeological structures, if any.

iv) Review the Project report prepared by the Concessionaire, with respect to the traffic, toll management (only for BOT Projects), traffic management, etc.

v) Review the implementation schedule of Engineering, Design, Procurement and Construction of the Project submitted by the Concessionaire.

vi) Review the Planning and Design of way-side amenities, toll plazas, toll collection system (only for BOT Projects), communication facilities, emergency relief arrangements, traffic operation and safety arrangements.

vii) Review all Project contracts including Detailed Engineering and Design Consultancy Contract, Construction Supervision Consultancy contract , any other EPC contract, O & M Contract and Tolling contract (only for BOT Projects), made by the Concessionaire.

viii) Review the environmental management plan for the Project Highway during Construction and Operation and Maintenance phases.

ix) Review quality assurance and quality control provisions during the design, construction and maintenance stages.

x) Audit the safety of the Project Highway both during Construction and Operation and Maintenance stages.

xi) To mediate and assist in resolving disputes between NHAI and Concessionaire.

xii) Provide Management Information System to NHAI.

3.2 Construction Stage

3.2.1 The duties of the IC are to supervise the works on a day-to-day basis and to approve the materials and workmanship of the works. During the construction phase it should be made mandatory that, IC's key staff should check at least 25-30% of Request for Inspection (RFI) pertaining to each item of construction and close them. IC's Team Leader should at least close 5-10% of RFI as per such provisions of Inspection in the Concession Agreement. He/she shall have no authority to relieve the Concessionaire of any of their duties or to impose additional obligations. The IC shall administer the works contracts and ensure that the Contractual Clauses, whether related to quality or quantities of works, are respected. Request for Inspection (RFI) is a formal application from the Concessionaire (or EPC contractor) to Independent Consultant to examine all the aspects of work or activity pertaining to construction or development of the Project Highway. Submission of a RFI for construction activity must be made a minimum of 48 hours in advance of the time the Concessionaire (or EPC contractor) plans to begin work on the RFI activity.

3.2.2 Review and approve works programme.

3.2.3 Review the material testing results and Mix Designs and to order special tests of materials and/or completed works, and/or order removal and substitution of substandard materials and/or works as required.

3.2.4 Review quality assurance and quality control during Construction period.

3.2.5 Ensure that the Construction work is accomplished in accordance with the technical specifications.

3.2.6 Identify Construction delays and recommend to the NHAI the remedial measures to expedite the progress.

3.2.7 Review and certify the `As Built' drawings for each component of the works prepared by the Concessionaire.

3.2.8 Review the safety measures provided for the traffic and Project workers.

3.2.9 Determine any extension of the Project Completion Schedule and the Concession period, to which the Concessionaire is entitled and shall notify the NHAI accordingly.

3.2.10 To mediate and assist in resolving disputes between NHAI and Concessionaire during Construction stage.

3.2.11 Assist the NHAI in arriving at any cost variation and its impact on Concession Agreement.

3.2.12 Evolve MIS and provide it to the NHAI

3.2.13 Issue Completion Certificate after checking the results of prescribed tests, with the approval of NHAI.

3.2.14 Issue Provisional Certificate duly appended with a list of outstanding items (Punch List, as defined in the Concession Agreement) established after joint inspection with the Concessionaire, if the Concessionaire requests for it, after approval of NHAI. .

3.2.15 In case of Change in scope, while calculating the cost implications to the Concessionaire of complying with such Change of Scope Notice, the rates shall be worked out by based on the concerned State PWD (NH) current schedule of rates based on MORTH data book. In case an item is not covered under the above-mentioned schedule of rates, the rate of such item shall be worked out by the Concessionaire on the basis of the prevailing market rate so far as found reasonable and competitive by the IC.

3.2.16 To direct the Concessionaire in all matters concerning construction safety and care of the works and if required, to request the concessionaire to provide any necessary lights, guard, fencing etc.

3.3 Operations and Maintenance Stage

Maintenance shall include cleaning, replacement of equipment/consumables, roadside facilities, horticultural maintenance and repairs to equipment, pavements, bridges, structures, HTMS and other civil works. Maintenance shall not include the extension of any existing pavements, bridges, structures and other civil works unless part of the Project Highway.

3.3.1 Review work plan and schedules of various operation and maintenance activities.

3.3.2 Review Operation and Maintenance manual prepared by the Concessionaire.

3.3.3 Review the performance of Operation and Maintenance (O & M) activities including equipment, service, traffic operation and safety, toll plazas and fees collection system (only for BOT Projects), landscaping, environmental issues and way side amenities.

3.3.4 To mediate and assist in resolving disputes between NHAI and Concessionaire during O&M stage.

3.3.5 Initiate necessary action to undertake maintenance obligations of the Concessionaire at risk and cost of the Concessionaire in the event of his failure to carry out O&M.

3.3.6 Undertake audit of the traffic using the Project Highway at least once a month.

3.3.7 Review and inspect the Project Highway at least once a month during the O&M period and issue an Inspection Report of such inspections.

3.3.8 Review the accident record on the Project Highway and suggest remedial measures.

3.4 **Transfer/Termination**

Satisfy itself that the entire divestment requirement have been met by the Concessionaire.

3.5 All other activities as per provisions of the Concessionaire Agreement

4. INTERACTION WITH NHAI

The Independent Consultants shall interact with the NHAI on a regular basis. NHAI shall generally hold meetings every month to review the progress etc. during the phase of Design and Construction, and every second month during the Operation and maintenance stage. Within 30 days of the receipt of the Drawings, the Independent Consultant shall review the same and convey its comments/observations to the Concessionaire with particular reference to the conformity or otherwise with the specifications and standards set forth in the Agreement.

5. REPORTING REQUIREMENT

The Independent Consultants shall prepare and submit to the NHAI three copies and Concessionaire two copies each of the following reports.

(a) Design Review Phase

- Monthly Progress Report.

(b) Construction Phase

- Monthly and Quarterly Inspection Report covering all aspects such as Progress Monitoring, Quality Assurance (QA)/Quality Control (QC) etc.

(c) Operation and Maintenance Phase

- Monthly and Quarterly report on existing condition of facility including advise on all aspects of Operation And Maintenance, Toll Booths, Bridges or other Structures, Traffic Management & Safety, Telephone, Ambulance, etc.
- Monthly report on audit of the traffic using the Project Highway at least once a month.
- Monthly and quarterly reports for Lane Availability (Including non- availability) (only in case of BOT (Annuity))
- Certification of Annuity Claims (only in case of BOT (Annuity))

(d) Various other reports as provided in the Concession Agreement such as Completion Report.

6. PERFORMANCE CLAUSE

Independent Consultants shall be expected to fully comply with all the provisions of the `Terms of Reference', and shall be fully responsible for supervising that Designs, Construction and maintenance and operation of the facility takes place in accordance with the provisions of the Concession Agreement and other schedules. Any failure of the Independent Consultant in notifying to NHAI and the Concessionaire on non-compliance of the provisions of the Concession Agreement and other schedules by the Concessionaire, non-adherence to the provision of ToR and non-adherence to the time schedule prescribed under ToR shall amount to non-performance.

7. CONSULTANT'S PROPOSAL

7.1 Apart from the list of the key professionals, as mentioned herein below, the Independent Consultant shall appoint its authorised representative, who shall issue on behalf of the IC, the Provisional Completion Certification and Completion Certificate along with the Team Leader and shall carry out any such task as may be decided by NHAI. The IC shall take prior approval of NHAI before issuing Provisional Completion Certification and Completion Certificate. The proposal submitted shall also include the name of the authorised representative along with the authorisation letter and power of attorney.

7.2 List of key personnel to be fielded by the Consultants shall be as below :

i. Team Leader Cum Senior Highway Engineer
ii. Senior Pavement Specialist
iii. Senior Bridge Design Engineer
iv. Highway Design Engineer
v. Bridge/Structural Engineer
vi. HTMS/Toll Expert
vii. Road Safety Expert
viii. Senior Quality cum Material Expert

7.3 In addition to above, consultants are required to propose other key personnel, sub-professional staff and other field engineers as detailed in **Enclosure B**. and the minimum qualification requirements for the same is enclosed in **Enclosure–A**.

7.4 Broad job-description and minimum qualification for key personnel mentioned above is enclosed as **Enclosure–A**. However, higher marks shall be accorded to the Candidate with higher relevant qualification and experience. The Consultant should feel free to submit their proposal on the basis of the man-months which they consider to be necessary to undertake the assignment. All the key personnel mentioned in para 7.1 above shall be evaluated at the time of evaluation of technical proposal. Consultants are advised in their own interest to frame the technical proposal in an objective manner as far as possible so that these could be properly assessed in respect of points to be given as part of evaluation criteria. The bio-data of the key personnel should be signed on every sheet by the personnel concerned and the last sheet of each

bio-data should also be signed by the authorised signatory for the Consultant. The key personnel shall also certify at the end of their bio-data proforma that they have not left any of the NHAI works without completing of their assignment and have not accepted any other offer at the time of signing of the bio-data and as such shall be available to work with the Independent Consultant, if the Project is awarded. In case the key personnel leave the assignment without approval of NHAI, NHAI would be at liberty to take any appropriate action against that key personnel including debarment.

8. PERIOD OF SERVICES

8.1 The services of an Independent Consultant will be in phases as per Article XX - Independent Consultant, of Concession Agreement.

8.2 The appointment of the Independent Consultant shall initially be for a period of **48 months**. Estimated Design and Construction schedule for completion of the Project for commercial operation is **30 months**. The proposed manpower deployment for this period shall be matching the activities to be performed during the said period. The time frame for services during the deployment of key personnel during this period shall be as shown in **Enclosure B**.

8.3 Thereafter, the services of the Independent Consultant shall be for a maximum period of 3 years each time till completion of the Concession period and transfer of the Project Highway.